Fire and Emergency Medical Services Operations and Data Analysis Queen Creek, Arizona

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Center for Public Safety Management

CPSM
Center for Public Safety Management, LLC

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

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About the Association and the Company

International City/County Management Association (ICMA)

The International City/County Management Association (ICMA) is a 100-year-old, nonprofit professional association of local government administrators and managers, with approximately 9,000 members located in 32 countries.

Since its inception in 1914, ICMA has been dedicated to assisting local governments in providing services to its citizens in an efficient and effective manner. Its work spans all of the activities of local government—parks, libraries, recreation, public works, economic development, code enforcement, brownfields, public safety, etc.

ICMA advances the knowledge of local government best practices across a wide range of platforms including publications, research, training, and technical assistance. ICMA's work includes both domestic and international activities in partnership with local, state, and federal governments as well as private foundations. For example, it is involved in a major library research project funded by the Bill & Melinda Gates Foundation and it is providing community policing training in Panama working with the U.S. State Department. It worked in Afghanistan assisting with building wastewater treatment plants and has teams in Central America working with SOUTHCOM to provide training in disaster relief.

The **ICMA *Center for Public Safety Management (*ICMA/CPSM*)*** is one of four centers within the Information and Assistance Division of ICMA providing support to local governments in the areas of police, fire, EMS, emergency management and homeland security. In addition to providing technical assistance in these areas, it also represents local governments at the federal level and is involved in numerous projects with the Department of Justice and the Department of Homeland Security. In each of these Centers, ICMA has selected to partner with nationally recognized individuals or companies to provide services that ICMA has previously provided directly. Doing so will provide a higher level of services, greater flexibility and reduced costs in meeting members' needs, as this expands the services that ICMA can offer to local government. For example, the Center for Performance Analytics is now working exclusively with SAS, one of the world's leaders in data management and analysis. And the Center for Management Strategies is now partnering with nationally recognized experts and academics in local government management and finance.

Center for Public Safety Management LLC

The Center for Public Safety Management maintains the same team of individuals performing the same level of service that it has for the past seven years. The contracting entity will be the "**Center for Public Safety Management, LLC" (CPSM**). This entity is the exclusive provider of public safety technical assistance for ICMA and continues to provide training and research for the association's members and to represent ICMA in its dealings with the federal government and other public safety professional associations.

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 identify industry best practices. We have conducted more than 200 public safety organizational studies in 32 states and 120 communities ranging in size from Boone, Iowa, with a population of 8,000, to Indianapolis, Ind., with a population of 800,000.

Thomas Wieczorek is the Director of the Center for Public Safety Management. Leonard Matarese serves as the Director of Research & Program Development. Dr. Dov Chelst is the Director of Quantitative Analysis.

Methodology

The Center for Public Safety Management team follows a standardized approach to conducting analyses of police, fire, and other departments involved in providing public safety services to the public. We have developed this standardized approach by combining the experience sets of dozens of subject matter experts in the areas of police, fire, and EMS. Our collective team has more than one hundred years of conducting research in these areas for cities in and beyond the United States.

The reports generated by the operations and data analysis team are based upon key performance indicators that have been identified in standards and safety regulations and by special interest groups such as the International Association of Chiefs of Police (IACP), International Police Association, the International Association of Fire Chiefs (IAFC), the International Associations of Fire Fighters (IAFF), and the Association of Public Safety Communication Officials International, and through the Center for Performance Measurement of ICMA. These performance measures have developed following decades of research and are applicable in all communities. For that reason, comparison of reports will reveal similar reporting formats, but each community's data are analyzed on an individual basis by the CPSM specialists and represent the unique information for that community.

The CPSM public safety management team begins most projects by extracting calls for service and raw data from a public safety agency's computer-aided dispatch system. The data are sorted and analyzed for comparison to nationally developed performance indicators. These performance indicators (e.g., response times, workload by time, multiple-unit dispatching) are valuable measures of agency performance regardless of departmental size. The findings are shown in tables and graphs organized in a logistical format. Despite the size and complexity of the documents, a consistent approach to structuring the findings allows for simple, clean reporting. The categories for the performance indicators and the overall structure of the data and documents follow a standard format, but the data and recommendations are unique to the organization under scrutiny.

The team conducts an operational review in conjunction with the data analysis. The performance indicators serve as the basis for the operational review. The review process follows a standardized approach comparable to that of national accreditation agencies. Prior to the arrival of an on-site team, agencies are asked to provide the team with key operational documents (e.g., policies and procedures, asset lists, etc.). The team visits each locality on-site to interview agency management and supervisory personnel, rank-and-file officers, and local government staff.

The information collected during the site visits and through data analysis results in a set of observations and recommendations that highlight strengths, weaknesses, opportunities, and threats of the organizations and operations under review. To generate recommendations, the team reviews operational documents; interviews key stakeholders and observes physical facilities; and reviews relevant literature, statutes and regulations, industry standards, and other information and/or materials specifically included in a project's scope of work.

The standardized approach ensures that the Center for Public Safety Management measures and observes all of the critical components of an agency, which in turn provides substance to benchmark against localities with similar profiles. Although agencies may vary in size, priorities, and challenges, there are basic commonalities that enable comparison. The approach also enables the team to identify best practices and innovative approaches.

In general, the standardized approach adopts the principles of the scientific method: We ask questions and request documentation upon project start up; confirm accuracy of information received; deploy operations and data analysis teams to research each unique environment; perform data modeling; share preliminary findings with the jurisdiction; assess inconsistencies reported by client jurisdictions; follow up on areas of concern; and communicate our results in a formal, written report.

Center for Public Safety Management Project Contributors

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Town of Queen Creek

The town of Queen Creek, Arizona, is located in the southeast portion of the Phoenix metropolitan area, approximately forty-five miles from downtown Phoenix. The town is located primarily in Maricopa County, but the town limits also extend into the northwestern portion of Pinal County.[1] It is within minutes of the Phoenix-Mesa Gateway Airport and Arizona State University at the Polytechnic Campus.[2] The town is bordered by Gilbert, Mesa, and Pinal Counties and the Gila River Indian Community[3] and is surrounded by the San Tan and Superstition Mountains.[2] Queen Creek's corporate boundaries cover approximately 26 square miles[4] and its planning area encompasses 69 square miles.[2] The town's estimated population (as of July 2013) was 31,187. This reflects an approximately 600 percent increase from the 2000 census and a 16 percent increase from 2010.[2] Queen Creek is close to major airports, numerous highway systems, and the Union Pacific railway system, thereby making it quite attractive to a variety of industries including high-tech manufacturing, heavy utility and related industry, chemical processing, aerospace and aviation, healthcare, a business incubator, restaurants, and retail.[2] Queen Creek is served by five public school districts and there are numerous institutions of higher learning in close proximity.[2] Queen Creek also places an emphasis on arts and culture, along with tourism and sports and recreational opportunities.[5]

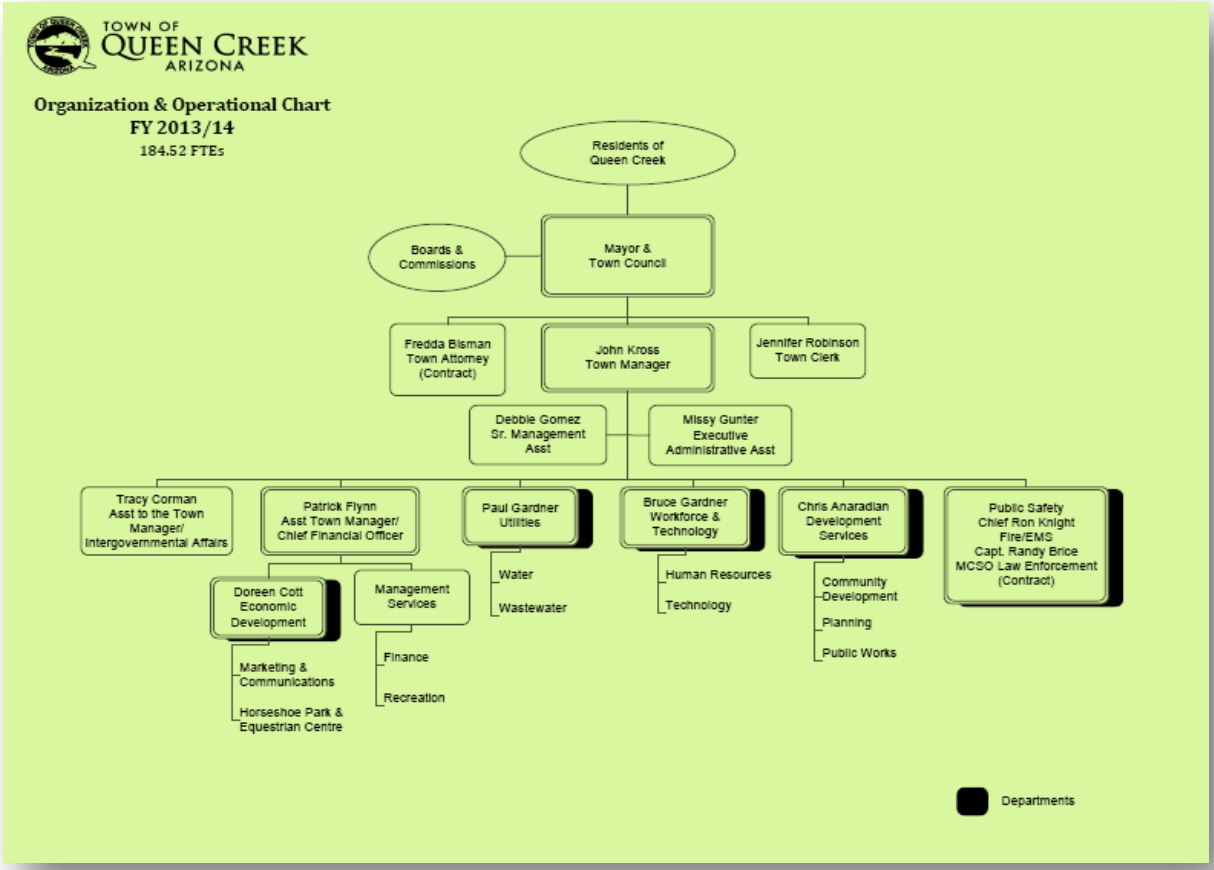
The town was incorporated in 1989. Chapter 2, Article 2-1, Section 2-1-1 of the Code of the Town of Queen Creek, Arizona, provides that the council shall be comprised of a mayor and six council members.[6] The mayor is elected to a four-year term and the council serves four-year staggered terms.[6] Section 2-2-4 defines the mayor as the chief executive officer of the town.[6] He/she presides over meetings. Article 2-2, Section 2-2-2 sets forth the selection of the vice mayor, which shall occur at the December council meeting annually.[6] The mayor nominates a member to serve in this

[1] http://www.queencreek.org/about-us/community-profile/location
[2] Town of Queen Creek, Arizona Economic Profile 2011-2012.
[3] Parks, Trails and Open Space Master Plan, Town of Queen Creek, Arizona, November 2005.
[4] http://www.queencreek.org/about-us/community-profile/population
[5] Town of Queen Creek Economic Development Strategic Plan, 2012-2015.
[6] The Code of the Town of Queen Creek, Arizona.

capacity and the council as a whole votes on the nomination.6 The vice mayor serves a one-year term and serves as the mayor in the mayor's absence.6

Queen Creek is governed under a council-manager form of government. In a council-manager form of government the powers of the elected and appointed officials are segregated for the purpose of providing a fair balance between the political leaders who set the policy for the town, and the apolitical managerial leadership of an appointed official, educated in public management, who carries out this policy and manages the town's day-to-day operations. In this form of government, the effectiveness of the town's executive team should never be undermined as a result of direct staff communication with the political leadership. Thereby, the balance between the political leadership and the managerial leadership is maintained. Chapter 3, Article 3-1, Section 3-1-1 of the code establishes that the town manager shall be appointed by the town council.6 Section 3-2-6 of the code provides that the town manager shall serve as the chief administrative officer and oversee the daily operations of the organization.6 The town manager effectuates the policy, plans, and/or programs established by the town council. Figure 1 illustrates the organizational chart for the town of Queen Creek.

Figure 1: Town of Queen Creek Organizational Chart



Executive Summary

CPSM was retained by the town of Queen Creek to complete a comprehensive analysis of the town's fire and emergency medical department. This analysis is designed to provide the town with a thorough and unbiased review of services provided by the Queen Creek Fire and Medical Department (QCFMD). As well, the report provides information for how the town, based on growth and service demand projections, can plan for the future with regards to the placement of current and additional fire stations. The report further provides a benchmark of the town's existing service delivery performance as analyzed in the accompanying comprehensive data analysis, which was performed utilizing information provided by QCFMD. *This data analysis in itself provides significant value to the town as the town now has a workload analysis from which to move forward in future planning efforts.* Also included in this report is the use of geographic information systems (GIS) data mapping to support the operational discussion and recommendations.

During the study, CPSM analyzed performance data provided by the QCFMD and also examined firsthand the department's operations. Fire and EMS departments tend to deploy resources utilizing traditional approaches, which are rarely reviewed. To begin the review, project staff asked the town for certain documents, data, and information. The project staff used this information/data to familiarize themselves with the department's structure, assets, and operations. The provided information was also used in conjunction with the raw performance data collected to determine the existing performance of the department, and to compare that performance to national benchmarks. These benchmarks have been developed by organizations such as the National Fire Protection Association (NFPA), Center for Public Safety Excellence, Inc., (CPSE), and the ICMA Center for Performance Measurement. Town staff was also provided an electronic shared information folder to upload information for analysis and use by the CPSM project management staff.

Project staff conducted a site visit on July 29-30, 2014, for the purpose of observing fire department and agency-connected supportive operations, interviewing key department staff, and reviewing preliminary data and operations. Telephone conference calls were conducted as well as e-mail exchanges between CPSM project management staff and the town so that CPSM staff could affirm the project scope, and elicit further discussion regarding this operational analysis.

Initial Considerations

Consideration 1 – Community risk and vulnerability assessment are essential elements in a fire department's planning process. The QCFMD has not completed a comprehensive community risk and vulnerability assessment. This is an area of internal planning that is a critical component to determining the proper staffing and deployment model.

Recommendation:

- It is strongly recommended that the QCFMD complete a fire and community risk assessment as a component of future department and town planning. This assessment should be done in conjunction with the fire and EMS calls for service demand analysis provided in this report.

Consideration 2 – Each of the department's stations was visited by CPSM staff during the on-site visit. While each station is currently serving the functional purpose of housing fire apparatus and response personnel for twenty-four hour service, neither is environmentally conducive to the contemporary needs of a continuous around-the-clock service agency.

Recommendations:

- As funding is available, and utilizing information in this report, develop and commit to a fire facility improvement/relocation/new facility plan that represents sustainable fixed fire facilities. It is strongly recommended that if the cost of construction of any new fire facility is prohibitive at this time due to budgetary constraints, it should be a priority to commit funding to refurbish station 2, to include apparatus bay and modular trailer reconditioning or replacement.
- Include space for training both internally (classrooms) and externally (mock-ups and training props) in planning for any new fire station facility and grounds design and costs.

Consideration 3 – The impacts of growth on fire and emergency medical services varies, however as population increases generally the calls for service increase, primarily with regards to EMS. Queen Creek is consistent with this trend, as total calls have increased from 2010 to 2013 as population also increased. Total calls for service have increased from 2,021 in 2010 to 2,325 in 2013, or an increase of approximately 10 percent. Over this same period (2010 to 2013) population has expanded approximately 18 percent (26,361 to an estimated 31,187).

Demand for service runs primarily along the E. Rittenhouse and S. Ellsworth corridors, which is the central core of the town. The higher demand in the northwest portion of the city is serviced in the six to ten minute benchmarking range.

Recommendation:

- CPSM recommends considering the relocation of station 2, based on current demand models, to the northwest portion of the town in the area of 19180 E. Queen Creek Road.

Consideration 4 – Currently the QCFMD has an apparatus replacement plan in place that has established 100,000 miles/10 years as the replacement goal for heavy apparatus, and 130,000 miles/10 years for light response vehicles such as the battalion chief vehicle. This plan is based on regional replacement plans, vehicle manufacturers' recommendations, and a white paper published by a large central Virginia fire department on apparatus replacement planning.

Recommendation:

- Establish a capital vehicle replacement plan that includes, as a benchmark, NFPA 1901. The vehicle replacement plan should also include as benchmarks the projected mileage, wear and tear, annualized maintenance costs, and any internal benchmarking agreed upon by the town council.

Consideration 5 – Efficiencies can be found in a staffing model that uses all available resources by continuous training and staff development so that the workforce is as flexible as possible;

particularly by having staff trained and prepared to fill in at the engineer, captain, and battalion chief level as is done in the QCFMD. This is critical in small organizations where depth in staffing is at a minimum. The QCFMD has programs in place to achieve this (acting engineer and acting captain), and needs to stay aggressive in preparing the workforce for these fill-in opportunities, to include captains filling in for battalion chiefs when a vacancy occurs on a shift in this position, and as well at the paramedic level to maintain the current ALS engine deployment model **with a goal of further minimizing overtime for minimum staffing purposes.**

Recommendation:

- Continue with and enhance training programs that prepare the entire workforce for filling-in out of position to include acting engineer, acting captain, acting battalion chief, and paramedic, and which have a goal of minimizing overtime for minimum staffing purposes when staffing is available (in numbers) to do so.

Long-Term Planning Considerations

Long-term Consideration 1 – Emergency medical services transport is provided to the town by Southwest Ambulance, a Rural Metro company. Southwest provides this service through a regional emergency medical transport agreement that includes the Apache Junction Fire District, town of Gilbert, and city of Mesa (Mesa holds the original agreement). The agreement is performance-based, whereby response priorities and maximum allowable cumulative response time is established. Certain contractual or other factors may present concerns and or issues and which may drive consideration and discussion for the town of Queen Creek to provide this service.

Regarding patient transportation services, it is not uncommon for expenditures to exceed collections in fire-based EMS systems. Therefore, it is typically ruled out rather quickly as a new revenue source. Many fire departments want to provide this service because they believe that they can provide a higher quality of service with more accountability to the community than can their private counterparts. While quality and accountability can vary regardless of the provider, there is a higher likelihood that the town would have to subsidize the service delivery model with general fund revenue.

Recommendation:

- It is strongly recommended that the expansion of the existing town EMS role to ALS patient transportation services only occur if this change is community and policy-driven.

Long-term Consideration 2 – While the current station configuration serves the call demand in the central core and southwest portions of the town, it may not be the most appropriate for a future, built-out town. In addition to the short-term consideration for the relocation of station 2 to the northwest portion of the town, based on current demand models. Once development occurs at a level where demand and travel time become a concern, an additional station may be considered in the southern portion of the town. The mapping and analysis included indicates that travel time may be sufficient into the northeast portion of the town from station 1 and the proposed (relocated) station 2 once a municipal road network is established in this area. Based on the risk associated

with future development in the northeast portion of the town, a station may or may not be needed in that area.

Recommendation:

- At minimum and as stated above, CPSM recommends considering the relocation of station 2, based on current demand, and then considering, based on actual short-term development, locating a third station in the southern portion (southwest initially) of the city as indicated in the mapping presented in this report. CPSM, based on discussion with development services, does not foresee the need for a fourth and fifth station until longer-term development occurs. If, in the short term, development continues at a pace where demand for service grows more rapidly than presented herein, there are identified gaps that then need to be closed by additional stations as presented in the mapping included in this report.

Organizational Analysis

Organization and Structure

Chapter 18, Article 18-1, Section 18-1-1 of the code of the town of Queen Creek establishes the town of Queen Creek Fire Department. Pursuant to the code, the fire chief oversees the operations of the department to include direction of all fire suppression and prevention activities; training, planning, and development of programs for public protection; and enforcement of regulations essential to the fire protection and safety of life and property. In addition to providing fire protection services, Section 18-2-2 authorizes the agency to provide rescue and emergency medical services, along with hazardous material response services.[7] As of the March, 29, 2014, shift roster, these services are provided through 39 men/women who serve in either administrative positions or are assigned to forty-eight hour shifts, with ninety-six hours off between shifts. Figure 2 illustrates the organizational chart for the town of Queen Creek Fire and Medical Department.

The department currently operates out of two stations, which are strategically sited to provide an effective response time to the community and constituents. Figure 3 delineates current station sites and boundaries of the town.

The council of the town of Queen Creek has determined that there are expenses, sometimes substantial in nature, associated with providing fire / rescue services within and outside of the town's corporate limits. As such, the council has implemented an "Emergency Service Cost Recovery Ordinance" in an effort to reduce the burden on the constituents of the town of Queen Creek. Section 18-2-3 of the town code provides a mechanism to recover costs for services related to public safety incidents that were caused by "negligence and/or willful disregard for established fire and life-safety codes" both within and outside of the corporate boundaries. Section 18-2-6 of the code sets forth a myriad of incident(s) or services that are eligible for the recovery of expenses associated with emergency events or calls.

[7] The Code of the Town of Queen Creek, Arizona.

Figure 2: Town of Queen Creek Fire & Medical Department Organizational Chart

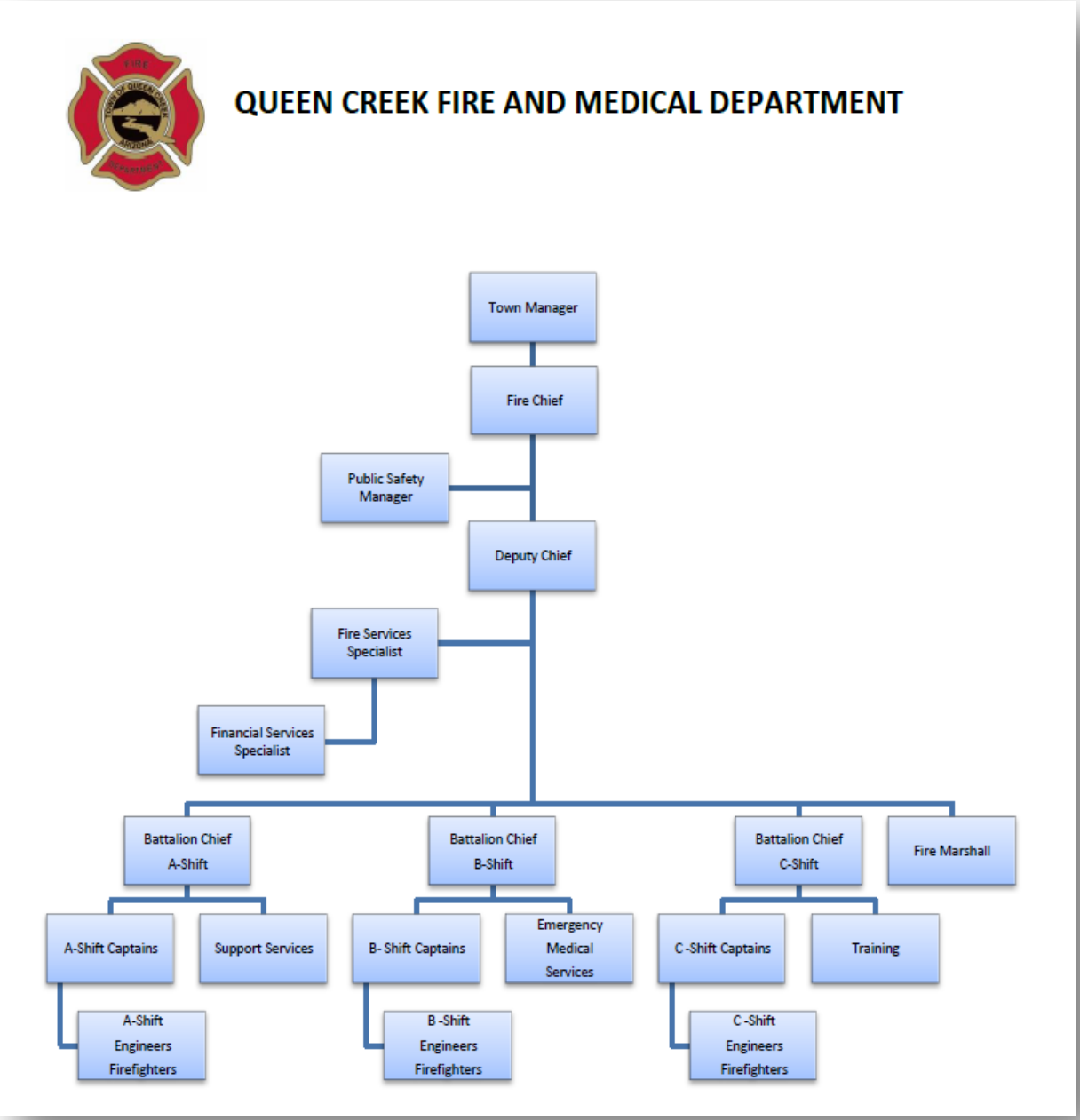
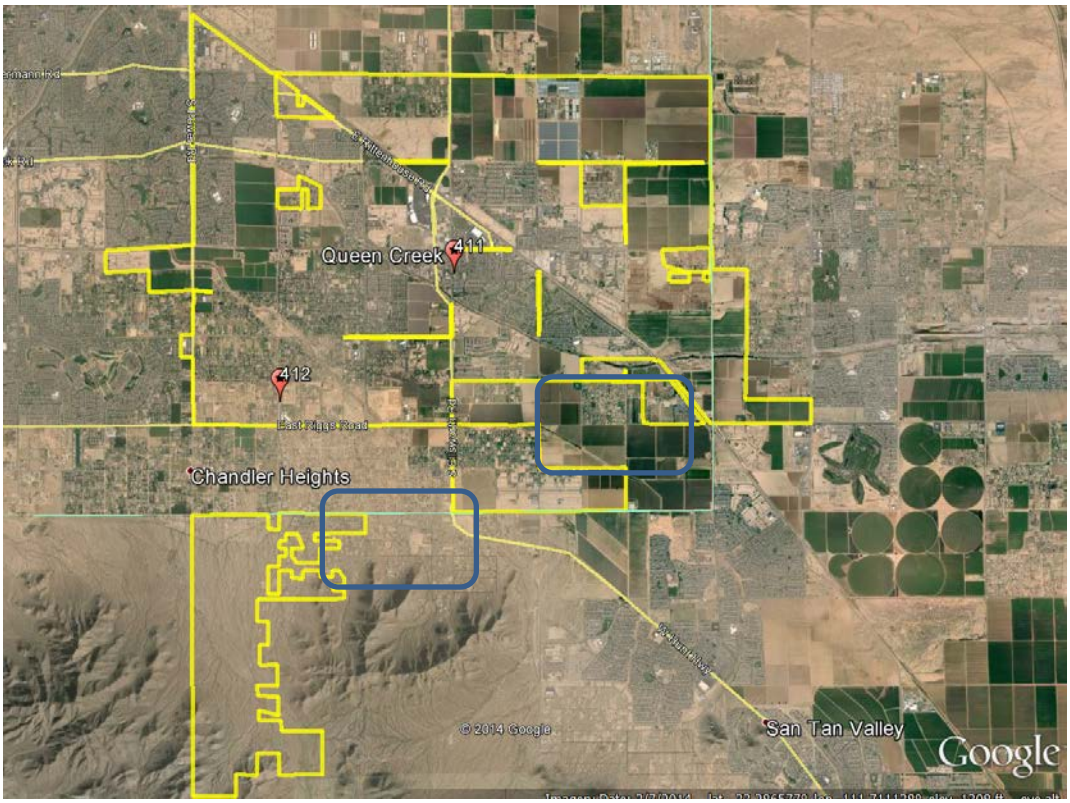


Figure 3: Queen Creek Fire & Medical Department Station Locations



Internal Planning

Organizing and managing a contemporary fire and emergency medical services agency requires results-oriented and well-thought-out and achievable goals and objectives. In addition, to determine how well an organization or program is doing requires that these goals be measurable and that they are measured against desired results. Included in a fire organization's key internal planning components should be a formal strategic plan, community risk and vulnerability assessment and plan, performance measures, and a succession plan.

In 2005, the town of Queen Creek received and implemented certain parts of a *Master Plan for Fire & Emergency Services*. This document is discussed later in this report; it has been used as a strategic planning document for the town with regards to fire protection and emergency medical services, and as well by the newly established QCFMD.

The town has a *Corporate Strategic Plan* (CSP) that has a number of goals and accompanying performance benchmarks that, as one would expect, touch many town activities, departments, and programs. The QCFMD is included in the CSP; specifically CSP goals 1 and 3 which are:

- CSP Goal #1: Update the master plan for fire and medical services.
- CSP Goal #3: Evaluate the current emergency transportation plan (ambulance service options).

The department itself has a number of planning or other documents—such as standard operating guidelines—that serve to provide strategic guidance to various programs such as training, risk management/safety, and succession planning. The succession planning document is specifically focused on the engineer, captain, and battalion chief levels. While they are not all-inclusive strategic planning documents, these documents and guidelines do provide strategic programmatic and organizational guidance. Additionally the department has a *Wildland Fire Risk Assessment* that was completed in 2009 and serves as a strategic guide for the wildland fire risk in and around the town and that includes the QCFMD response area.

The emergency management function resides in the fire department and is directed by an assigned staff member who oversees this vital community component. The emergency management coordinator maintains the town's emergency operations plan (EOP), which is being updated in 2014. This plan links to the county's emergency operations plan, as the county has overarching responsibility for emergency management and is the link to the state emergency operations center.

Risks associated with the emergency management function and which the town EOP is built around includes monsoon winds, flooding, dust storms, and thunderstorms. Special events are an additional risk that drives special planning and awareness within this function.

The emergency management program includes a Community Emergency Response Team (CERT) that has six trainers and approximately 150 community members. Additionally, there are approximately ninety amateur radio operators who are a part of the Queen Creek Emergency Communications Group and whose vital contribution to the emergency management component is to ensure communication is maintained should traditional local communication networks become inoperable in an emergency.

One area of internal planning that is a critical component to determining the proper staffing and deployment model for a fire department is the completion of a *Community Fire Risk Assessment*. What's involved in a fire risk analysis? A fire department collects and organizes risk evaluation information about individual properties, and on the basis of the rated factors then derives a "fire risk score" for each property. This is done by assessing the needed fire flow, probability, consequences, and occupancy risk, and then establishing fire management zones. The score is then used to categorize the property as one of low-, moderate-, or high/maximum-risk. To assist in this endeavor, there are retail products currently available that rate a property based on the information that is inputted.

Plotting the rated properties on a map provides a better understanding of how fire stations, response run cards, and staffing patterns can be used to provide a higher concentration of resources for worse-case scenarios or, conversely, fewer resources for lower levels of risk.[8] The community fire risk assessment may also include determining and defining the differences in fire risk between a detached single-family dwelling, a multifamily dwelling, an industrial building, and a high-rise building by placing each in separate category. Further, an overall community risk profile

[8] Fire and Emergency Service Self-Assessment Manual, Eighth Edition, (Center for Public Safety Excellence, 2009), 49.

can be linked to historical response time data and demand, which is discussed later in this report. This analysis can then be used to informatively establish response time baselines and benchmarks.

Community risk and vulnerability assessment are essential elements in a fire department's planning process. The QCFMD has not completed a comprehensive community risk and vulnerability assessment. However, given the age of the department and how it transitioned into its current state over the past six years, this should however be perceived as a shortcoming.

According to a National Fire Protection Association (NFPA) paper on assessing community vulnerability, fire department operational performance is a function of three considerations: resource availability/reliability, department capability, and operational effectiveness.[9] These elements can be further defined as:

> **Resource availability/reliability:** The degree to which the resources are ready and available to respond.
>
> **Department capability:** The ability of the resources deployed to manage an incident.
>
> **Operational effectiveness:** The product of availability and capability. It is the outcome achieved by the deployed resources or a measure of the ability to match resources deployed to the risk level to which they are responding.[10]

The community risk and vulnerability assessment evaluates the community as a whole, and with regard to property, measures all property and the risk associated with that property and then segregates the property as either a high-, medium-, or low-hazard depending on factors such as the life and building content hazard, and the potential fire flow 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 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.[11]

Figures 4 and 5 illustrate the critical tasks and resource deployment required for certain categories of risk, which traditionally in the fire service are determined by the size of the building, fire flow required, life hazard, and corresponding tasks required to mitigate the emergency. Other risks such as hazardous materials, the likelihood of a high angle rescue, and wild land/urban interface represent fire department response risk as well.

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[9] Fire Service Deployment, Assessing Community Vulnerability: From http://www.nfpa.org/assets/files/pdf/urbanfirevulnerability.pdf.
[10] National Fire Service Data Summit Proceedings, U.S. Department of Commerce, NIST Tech Note 1698, May 2011.
[11] Cote, Grant, Hall & Solomon, eds., *Fire Protection Handbook* (Quincy, MA: National Fire Protection Association, 2008), 12.

The examples illustrated here include low-risk incidents (small, detached unoccupied building) and moderate-risk incidents such as dwelling fires, which represent the most common risks in the community. High risk/high hazard incidents require resources and critical tasking that either stretch or exceed departments the size of the QCFMD. These communities typically depend on mutual aid to assist in mitigating these emergencies. *This is the case in Queen Creek. It cannot be understated that understanding the community's occupancy hazard and fire risk greatly assists fire department management planning for and justification of staffing and apparatus resources.*

Figure 4: Low-Risk Fire Response

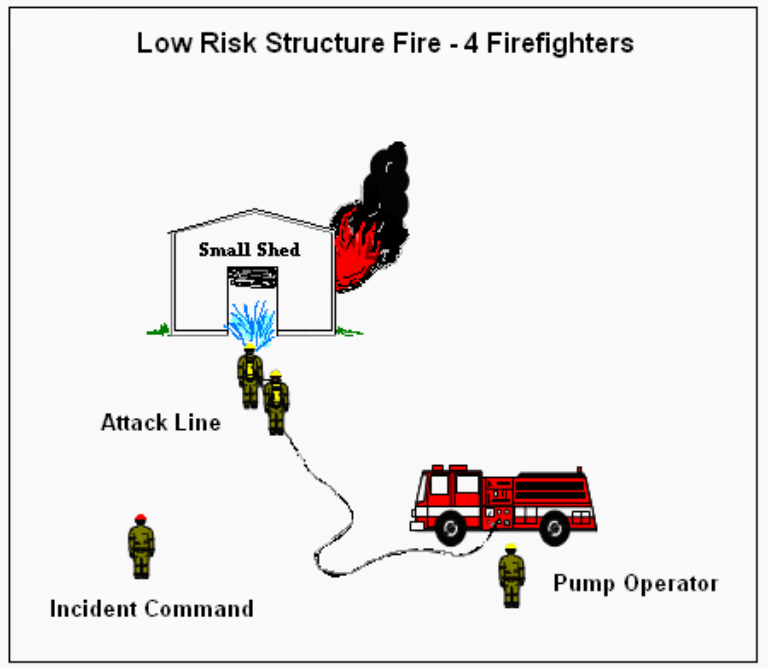
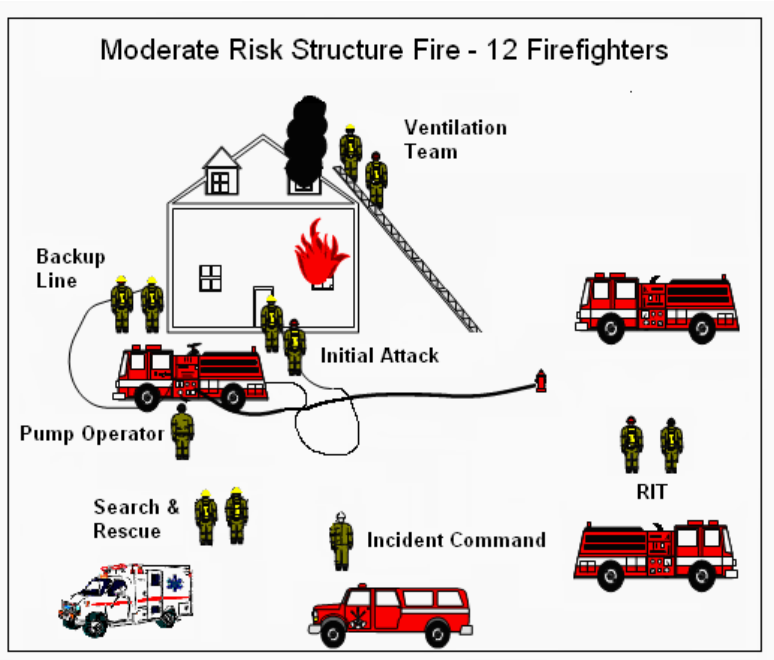


Figure 5 represents critical task elements for a moderate-risk structure fire. Some jurisdictions add additional response resources to meet and in some cases exceed the specifics of national benchmarking, such as National Fire Protection Association (NFPA) 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments,* 2010 Edition.

Figure 5: Moderate-Risk Fire Response



Recommendation:

- It is strongly recommended the QCFMD complete a fire and community risk assessment as a component of future department and town planning. This assessment should be done in conjunction with the fire and EMS calls for service demand analysis provided in this report.

Fiscal Overview

The QCFMD is funded under the town's *Emergency Services Fund* (ESF), which includes funding for the fire department, contractual service with the county sheriff's office for law enforcement, and emergency management. Revenues are generated from a separate property tax, which is a set rate and governed by town ordinance, as well as a sales tax specific for public safety. The ESF also includes revenues from Southwest Ambulance for QCFMD assistance with personnel during EMS transports, as well as fire permitting and inspection fees. Lastly, revenues for the ESF are supplemented by the town's general fund and through a contractual arrangement to service unincorporated areas within or immediately contiguous to the town (Island District). Table 1 shows ESF revenues for FY 2014.

Table 1: FY2014 Emergency Services Fund Revenues

Revenue Description	Amount
Property Tax	$3,628,882
Sales Tax	$1,207,000
Misc. Revenue: SW Ambulance	$30,000
Fire Revenue: Permits and Inspections	$45,000
Transfer in from General Fund	$2,648,410
Island District (Unincorporated Area Response)	$912,000
Total Revenues	**$8,471,292**

In comparison to the FY 2013 budget, the general fund contribution to the ESF grew by almost 213 percent or an increase of just over $1.8 million. This increase is largely due to the contractual agreement with the county sheriff's office, which drove expenditure increases of almost $1.9 million.

Budgeted expenditures for the ESF in FY2014 total $8,471,292 which includes $3,391,374 for law enforcement contractual services with the Maricopa County Sheriff's Office (MCSO). Other expenditures specific to the QCFMD are shown in Table 2. Compared to FY2013, expenditures minus the MCSO contractual component have increased by $816,115 or almost 19 percent. This increase is, however, offset by the addition of the Island District fire revenues in FY2014 of $912,000.

Table 2: FY2014 Emergency Services Fund Expenditures (QCFMD)

Revenue Description	Amount
Departmental Support Cost (Internal Cost)	$315,953
Administration	$629,086
Operations	$2,989,680
Training	$151,510
Resources	$358,068
Medical	$223,972
Public Safety (Emergency Management/Resources)	$226,868
Transfer to Fire Development Fund (Apparatus Debt Service)	$95,300 (Impact Fees)
Contingency	$89,501
Total Expenditures (minus MCSO Contract Costs)	**$5,079,918**

Facilities

Sound community fire-rescue protection requires the strategic distribution of an adequate number of station facilities. Proper siting, which will be discussed later in this report, and adequate facilities 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.

Fire facilities must be designed and constructed to accommodate current and forecasted future 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 forecasted 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 permit performance of daily duties in support of response operations. For personnel, fire facilities must have provisions for vehicle maintenance and repair; storage areas for essential equipment and supplies; space and amenities for administrative work, training, physical fitness, laundering, meal preparation, and personal hygiene/comfort, and—where a fire department is committed to minimize "turnout time"—bunking facilities.

A fire department facility may serve as a de facto "safe haven" during local community emergencies, and also serve as likely command center for large-scale, protracted, campaign emergency incidents. Therefore, design details and construction materials and methods should embrace a goal of building a facility that can perform in an uninterrupted manner despite prevailing climatic conditions and/or disruption of utilities. Programmatic details, like the provision of an emergency generator connected to automatic transfer switching, even going as far as providing 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 small details like 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 byproducts of diesel fuel exhaust emissions. A design should thoughtfully incorporate best practices for achieving a safe and hygienic work environment.

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, it should carefully consider complementary adjacencies, like lavatories/showers in proximity of bunk rooms, and desired segregations, like break rooms or fitness areas that are remote from sleeping quarters.

The QCFMD currently operates and responds from two fire-rescue stations. Station 1 (Figure 6) was constructed in 1983 and is located at 22407 S. Ellsworth Road Station. Station 2 (Figure 7), was constructed in 1999 and 2000 and is situated at 24787 S. Sossaman Road.

Figure 6: QCFMD Station 1

Figure 7: QCFMD Station 2

Each of the stations was visited by CPSM staff during the on-site visit. While each station is currently serving the functional purpose of housing fire apparatus and response personnel for twenty-four hour service, neither is environmentally conducive to the contemporary needs of a continuous, around-the-clock service agency.

Station 1 is the original Queen Creek fire station. This station has undergone expansion and modifications from the original apparatus bay structure (kitchen, bunking, and day-room space) to house staff around-the-clock. It also occupies a portion of a shared structure that serves as a community center. Notable issues and concerns include a single bathroom/shower facility; inadequate storage for fire and EMS equipment; and limited apparatus bay space.

Station 2 was constructed after the town implemented its own fire department in 2008. This assortment of buildings (two manufactured homes and a Butler building that serves as the apparatus bay) was meant to be temporary. Notable issues and concerns include a single bathroom/shower facility; inadequate storage for fire and EMS equipment; limited apparatus bay space (response vehicles are parked outside and are uncovered); internal flooring issues; the apparatus bay structure has gaps in the veneer exposing the interior to the external environment; and external façade issues such as the skirting to the trailers in disrepair.

Recommendation:

- As funding is available, and utilizing information in this report, develop and commit to a fire facility improvement/relocation/new facility plan that represents sustainable fixed fire facilities. It is strongly recommended that if the cost of construction of any new fire facility is prohibitive at this time due to budgetary constraints, it should be a priority to commit funding to refurbish station 2 to include apparatus bay and modular trailer reconditioning or replacement.

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 procurement, maintenance, and eventual replacement of aging response vehicles is one of the largest expenses incurred in sustaining a community's fire-rescue department. While it is the personnel of the QCFMD 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 town.

The QCFMD currently operates a fleet of six fire response vehicles, distributed between the town's two fire-rescue stations. There are also three other vehicles used in reserve or administrative support functions. Table 3 shows the make-up of the fire/EMS response fleet.

Table 3: QCFMD Fleet

Vehicle	Type	Year of Purchase
Engine 411	Pumper	2009
Engine 412	Pumper	2014
Engine-Reserve	Pumper	2009
Brush 412	Brush Vehicle	2006
Tender 411	Water Tender	2009
Battalion 411	Shift Command Vehicle	2007 (replacement in 2014)

Replacement of fire-rescue response vehicles is a necessary, albeit expensive, element of fire department budgeting that should be planned carefully. A well-planned and documented emergency vehicle replacement plan ensures ongoing preservation of a safe, reliable, and operationally capable response fleet. A plan must also schedule future capital outlay in a manner that is affordable to the community. The QCFMD recently placed into service a new pumper apparatus. This was done for two primary reasons: first, to ensure the department has a reliable reserve/backup engine in a ready state when a primary engine goes out of service for mechanical or other reason; and second, after analysis of current miles and wear and tear being placed on the two primary response pumpers, it was decided that the acquisition of a new pumper apparatus would be prudent so that the department has three reliable pumpers. Also, now a rotational schedule can be established to balance road miles and wear and tear, thus extending the service life of the pumper fleet.

The world's leading advocate of fire prevention and an authoritative source on public safety, the National Fire Protection Association (NFPA), develops, publishes, routinely updates, and disseminates more than 300 consensus codes and standards intended to minimize the possibility and effects of fire and other risks.

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 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, 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."

"Apparatus that were not manufactured to the applicable apparatus standards or that are over 25 years old should be replaced."

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, older vehicles simply do not incorporate the many advances in occupant safety like 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.

While the QCFMD apparatus is relatively new (with one very new pumper apparatus), planning now is essential so that replacements can be adequately planned for and funded. This is to avoid replacement of expensive heavy apparatus all at once, or several vehicles over a one to two year period. This type of replacement would potentially create undue stress on budgets. Further, extending replacement of first-run apparatus potentially causes increased maintenance costs that eventually may surpass annualized payments on new apparatus had the replacement plan been followed. As the department grows its fleet, this will be an essential economic component of the fire department budget.

Currently the QCFMD has an apparatus replacement plan in place that has established 100,000 miles/10 years as the replacement goal for heavy apparatus, and 130,000 miles/10 years for light response vehicles such as the battalion chief vehicle. This plan is based on regional replacement plans, vehicle manufacturers' recommendations, and a white paper published by a large central Virginia fire department on apparatus replacement planning.

While it is unlikely the 2009 water tender will reach 100,000 miles in a ten-year period due to its average annual call workload, the two 2009 pumper apparatus may come due for replacement at or about the same time. Additionally, with the likelihood that additional stations may be built over the next three to ten years, additional apparatus will be required, thus it is strongly recommended a formal vehicle replacement plan be developed and approved for implementation.

Recommendation:

- Establish a capital vehicle replacement plan that includes as a benchmark, NFPA 1901. The vehicle replacement plan should also include as benchmarks the projected mileage, wear and tear, annualized maintenance costs, and internal benchmarking agreed upon by the town council.

Training and Education

Training in the QCFMD is coordinated and administered by a shift battalion chief, who is assigned this function as an ancillary duty. The training component has an established goal and four target areas on which implemented training is focused. These include: personal development, specialized training, department needs, and target hazard training.

Training for the QCFMD is extensive, well-managed, and is designed to meet the Insurance Services Organization training regimen as well as any imposed state fire and EMS training/recertification requirements.

The training chief posts a four-month company training schedule three times a year. Included in this schedule are: targeted training subject matter; minimum company standards which are performance-based company evolutions; monthly target hazard training; crew table top discussion training; and lastly, quarterly training that includes interaction with mutual aid jurisdictions.

New hires are not trained initially by the QCFMD per se; rather the department hires individuals who are already certified as Arizona state emergency medical technicians (EMT) or paramedics, and at the Firefighter I&II levels. This is typical of small departments that have to hire one to two operational staff members at a time, and is a best practice. Once the individuals are hired they receive additional training regarding the operations/policy of the QCFMD to ensure they have a seamless transition into the department.

The training chief is also responsible for the promotional processes for engineer, captain, and battalion chief. The training chief works in conjunction with the fire chief and the town's human resource director with these processes. Personnel chosen to "act" as an engineer and captain are done so after satisfying Standard Operating Procedures 5.5.1 (acting engineer packet) and 5.6.1 (actin captain packet).

The QCFMD does not have a training center from which live fire training, training simulators, or "mock-ups" and props are located and available. The department does have access to and utilizes the Chandler Fire Department training center for these training opportunities. There is a cost for this; however, when weighed against the initial capital and perpetual costs of a training facility, and in consideration of potential new fire stations in the future, the current benefits and minimal costs of utilizing the Chandler facility seem reasonable at this time. Consideration should be given, however, to adding both internal (classrooms) and external (mock-ups and props) training space to any new fire station facilities and grounds. Additionally, the QCFMD will receive training as a part of a federally awarded regional grant to the City of Mesa, which focuses on fire ground survival training and includes emergency equipment interoperability, mayday firefighter operations, disentanglement drills, air conservation, mayday prevention, mayday operational consistency between fire fighters and mutual aid departments, and other life-saving techniques.

Recommendation:

- Include space for both internal (classrooms) and external (mock-ups and training props) training in any new fire station facility and grounds planning, design, and cost estimates.

Fire Prevention

Fire prevention in Queen Creek as of the CPSM on-site visit is managed by a fire marshal who was recently added to the QCFMD staff. Prior to this new hire, fire prevention activities were coordinated by the fire chief and a shift captain. Chapter 18 of the Administrative Code of the town of Queen Creek establishes who shall perform the functions of fire prevention. By this code, the fire chief shall appoint a fire marshal who shall have this responsibility through the adopted fire code, which resides in Chapter 7 of the code.

Ordinance 539-13 and Resolution 969-13 amends Chapter 7 of the Administrative Code of the town of Queen Creek to adopt the 2012 editions of the following building, fire prevention, and maintenance codes for use in the town:

- International Building Code, 2012 edition
- International Residential Code, 2012 edition
- International Mechanical Code, 2012 edition
- National Electrical Code, 2011 edition
- International Plumbing Code, 2012 edition
- International Fuel Gas Code, 2012 edition,
- International Existing Building Code, 2012 edition
- International Energy Conservation Code, 2012 edition
- International Property Maintenance Code, 2012 edition
- International Urban-Wildland Interface Code, 2012 edition
- International Fire Code, 2012 edition.

The fire prevention effort in the QCFMD consists of fire inspections, plans review (fire protection related), public education, and the coordination of engine company-level fire prevention inspections. This is typical of communities the size of Queen Creek. Inspections are prioritized as: high risk (annual inspection); medium risk (bi-annual inspection); and low risk (tri-annual inspection). Risk is associated with International Building Code use groups. Engine company inspections are generally the medium- and lower-risk occupancies as identified by the fire marshal's office. Inspections are loaded, scheduled, and completed with a completed inspection form sent to the occupant of the inspected property utilizing an IPad with current technologies and records management software. This best practice is efficient and ensures proper recording of inspections, follow-ups, and any infractions cited. Inspection procedures are outlined by QCFMD SOP 8.1.1.

External Influences

2005 Fire Master Plan

In 2005 the town commissioned a study of fire and emergency medical services seeking recommendations and alternatives to the current delivery of these services, and also to have an independent third party provide recommendations on how fire and emergency medical services may be improved. At the time of this study fire services were being provided by Rural Metro Corporation (RMC) as Rural/Metro Fire Department (RMFD) and Southwest Ambulance. RMFD provided service from one in-town fire station (QCFMD current station 1). Southwest Ambulance provided service from outside of the town as it did not have an ambulance positioned within the town limits.

The 2005 study also assessed the current fire facility and future fire station location needs of the town. In summary, the report communicated the town's fire station was inadequate for the future based on age, size, and configuration and recommended a new fire station be constructed in the general area of the current station location. The report also discussed the need for a five- to six-station configuration for the town. The configuration for this deployment model is illustrated in Figure 3, above.

In all, the 2005 report offered twelve recommendations directly related to the provision of fire and emergency medical services and eight directly related to emergency communications. The report also provided seven options or models for future delivery of fire and emergency services, including funding options. The alternative that the town adopted was the creation of the Queen Creek Fire and Medical Department.

Growth, Risk, and Demand Analysis

As previously mentioned the town of Queen Creek has an estimated 2013 population of 31,187. According to the 2010 U.S. Census, the town's population was 26,361 and was made up demographically as: 83.6 percent white; 3.4 percent African-American; 0.7 percent American Indian and Alaskan Native; 0.1 percent Native Hawaiian and Other Pacific Islander; and 2.8 percent Asian. Of the 83.6 percent of the population that is white, 17.3 percent is Hispanic or Latino. Of the 2010 population, 10.4 percent were under the age of 5 and 5.2 percent were above the age of 65. [12] The community development department projects population at build-out (2035 to 2050 time frame) as 80,000.

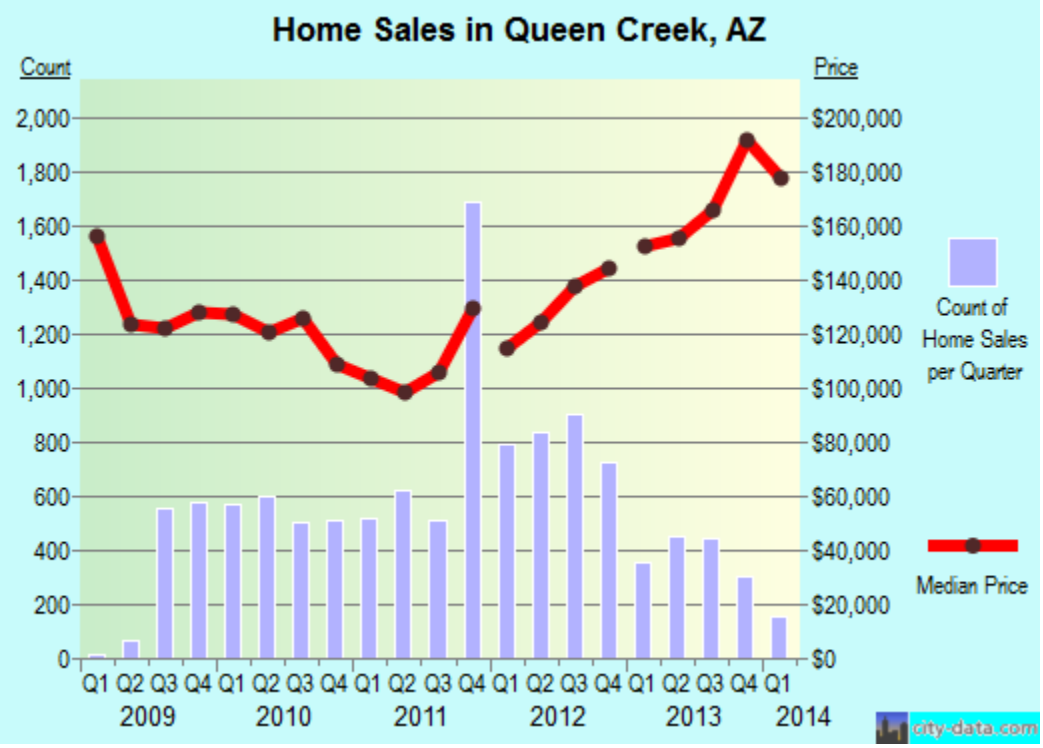
The median household income in Queen Creek (2008-2012) is $88,121 with 5.9 percent of the population living below the poverty level in the same data period. There were 7,298 households for this period with the average owner-occupied housing unit valued at $240,000. There were 8,557 total housing units.[13] Lastly, there are 3.54 persons per household.[14]

[12] http://quickfacts.census.gov/qfd/states/04/0458150.html
[13] http://quickfacts.census.gov/qfd/states/04/0458150.html

The zoning in the town of Queen Creek is currently ninety percent residential and ten percent commercial. Commercial is generally retail with some light industrial. There is no dedicated office complex or industrial park, or multistory office buildings. Future growth includes several residential projects and may include multistory office buildings, two- to three-story mixed-use buildings (commercial/residential), and a hotel that would be more than two stories in height.

Not unlike most communities across the country, Queen Creek was not immune to the effects of the recent Great Recession, particularly on the housing market. While Queen Creek experienced rapid growth between 2000 and 2008, the recession had an adverse impact on continued residential (primarily) and commercial growth. Figure 8 illustrates improved residential home sales in Queen Creek for the period 2009 thru the first quarter of 2014.

Figure 8: Queen Creek Residential Sales 2009-2014 (Q1)[15]



Figures 9 and 10 illustrate planned current and future growth for the town.

[14] http://www.queencreek.org/home/showdocument?id=6
[15] http://www.city-data.com/city/Queen-Creek-Arizona.html

Figure 9: Queen Creek Development–Current

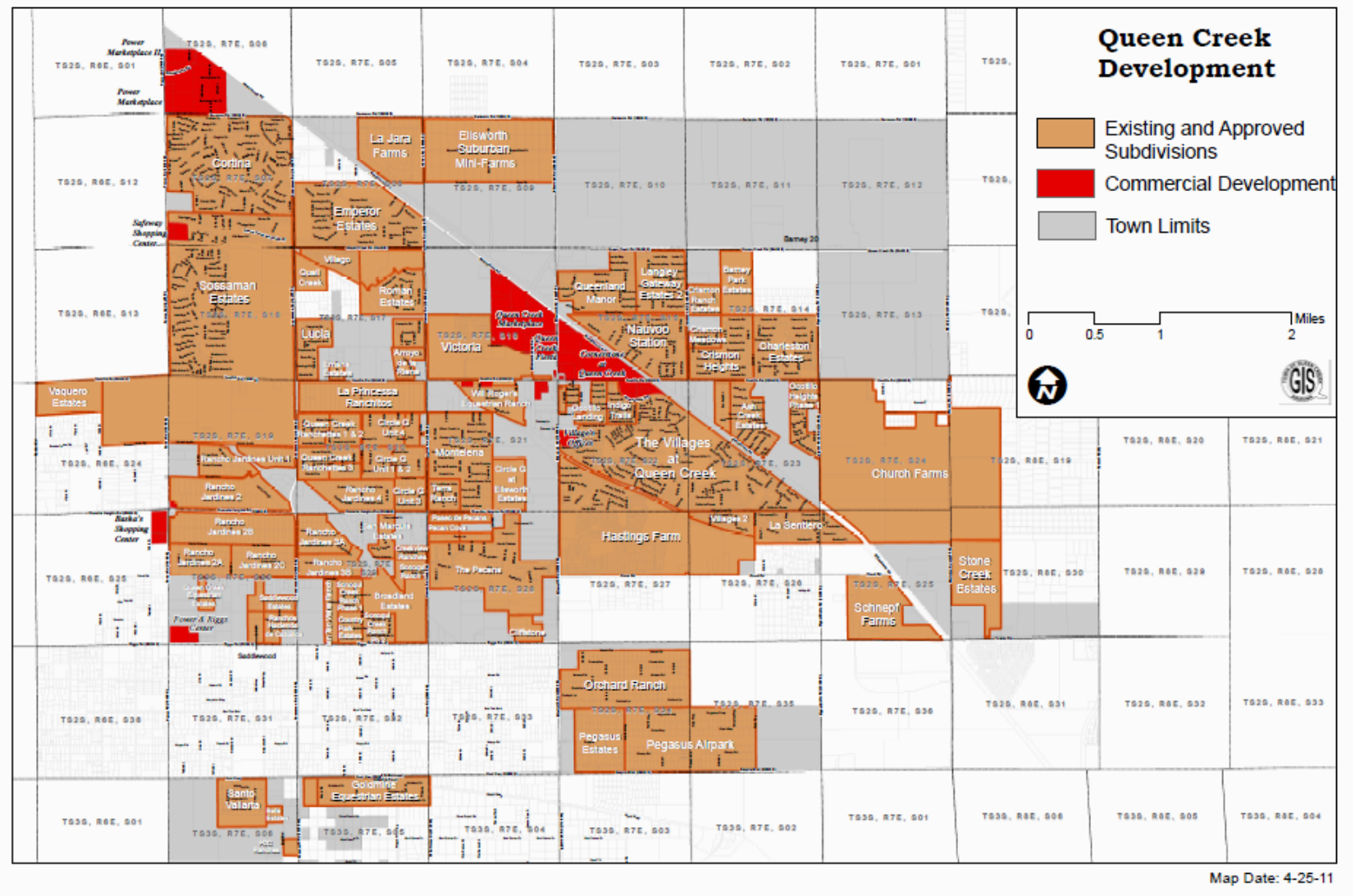
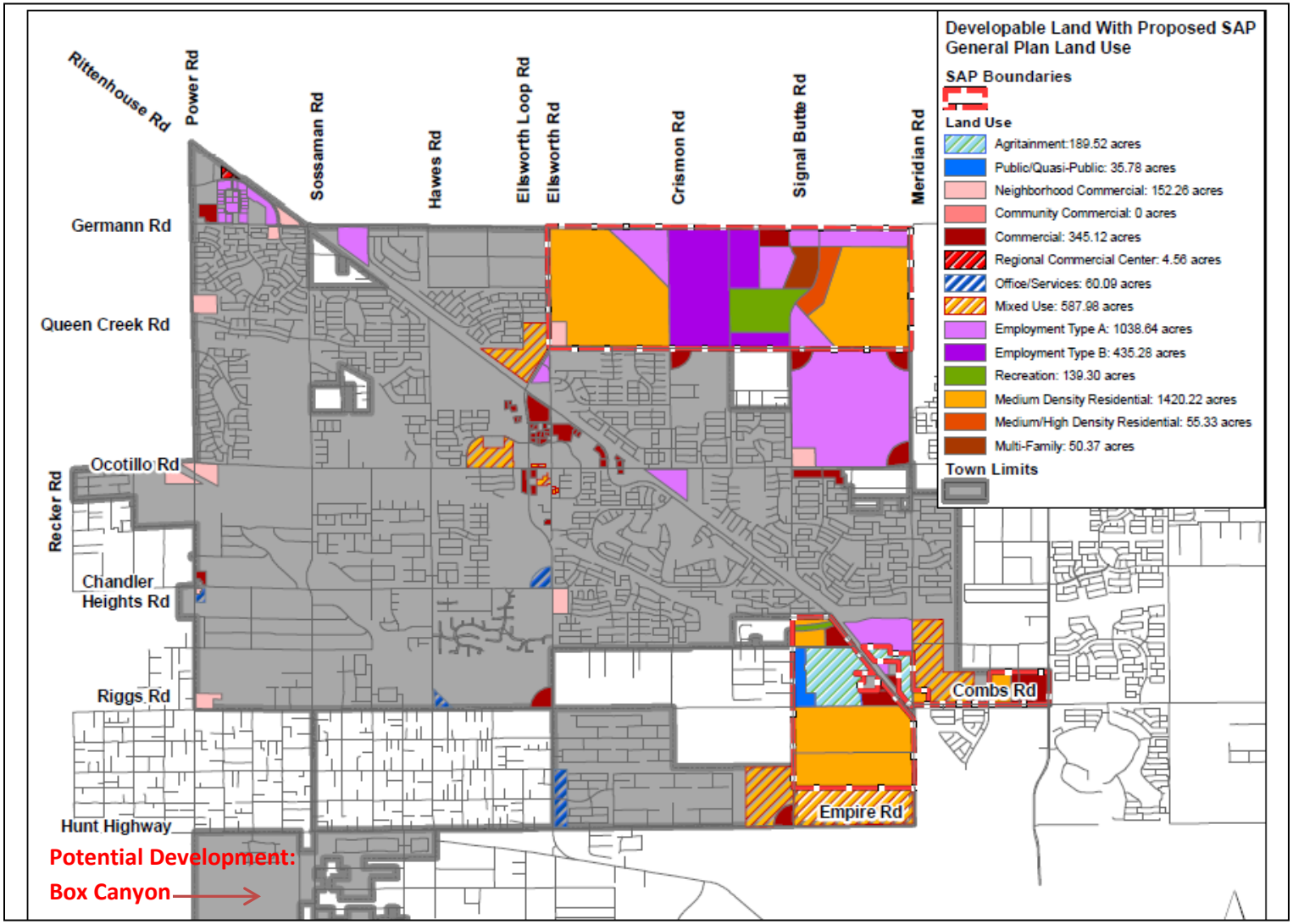


Figure 10: Queen Creek Development–Future



Demand for fire and EMS response is a key component in the staffing and deployment decision-making process. Staffing to meet demand either by geography or by peak demand periods are important considerations. It is essential this component be monitored and reviewed on a regular basis to ensure staffing and deployment of resources is adequately meeting demand, and the most appropriate resources are being deployed.

Figure 11 illustrates the time of day calls are occurring while Table 4 depicts call types of the calls received. Figures 12 and 13 illustrate demand and the distribution of fire and EMS incidents occurring during the study period. Call activity is most concentrated in the town core and is consistent across the response matrix (fire, EMS, and other types of calls for service). The units servicing this core are among the busiest in the system.

Overall, the QCFMD responded to 2,413 calls for service (fire and EMS). Of these, 1,166 or 48 percent were EMS responses and 410 or 17 percent were fire responses. Of the 2,413 calls for service, 360 were mutual/automatic aid given, meaning the QCFMD responded to another jurisdiction. Queen Creek received mutual/automatic aid from another jurisdiction 340 times without a QCFMD unit responding and 89 times with a QCFMD unit. Call rates are highest during the day between 8:00 a.m. and 8:00 p.m. Table 5 presents the types of calls answered by mutual/automatic aid units when QCFMD units were not able to respond.

Figure 11: Calls by Hour of Day

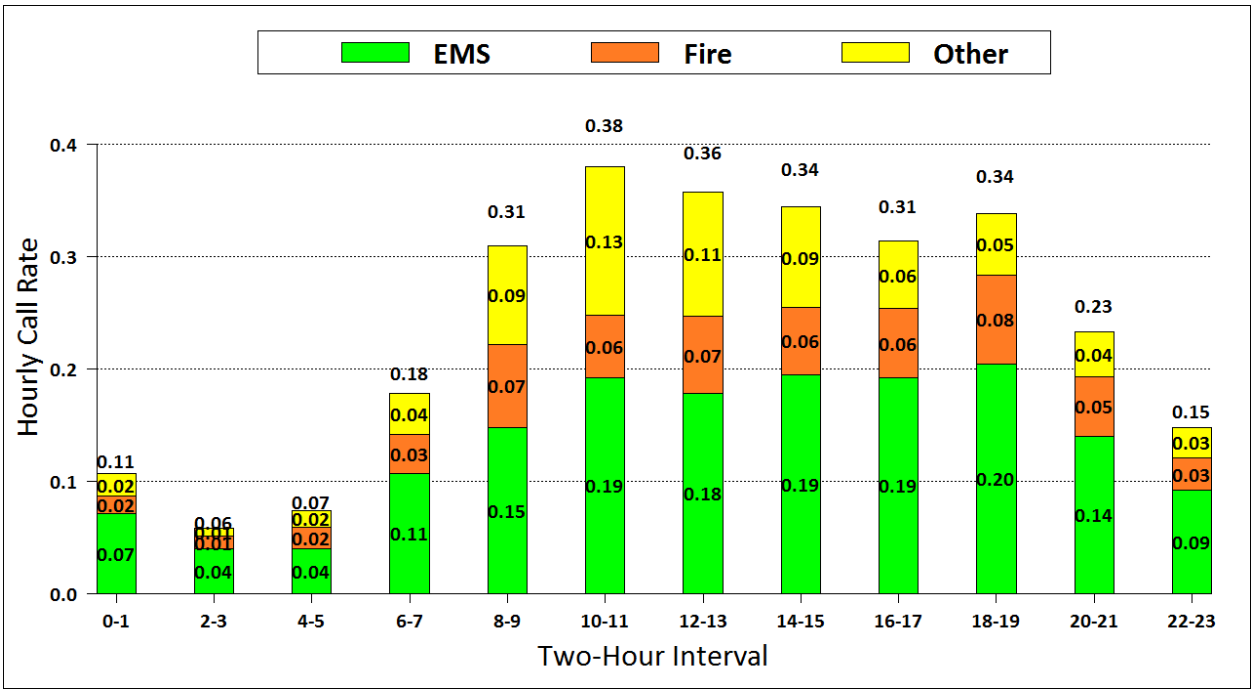


Table 4: Call Types

Call Type	Number of Calls	Calls per Day	Call Percentage
Cardiac and stroke	120	0.3	5.0
Seizure and unconsciousness	139	0.4	5.8
Breathing difficulty	109	0.3	4.5
Overdose and psychiatric	101	0.3	4.2
MVA	206	0.6	8.5
Fall and injury	251	0.7	10.4
Illness and other	240	0.7	9.9
EMS Total	1,166	3.2	48.3
Structure fire	12	0.0	0.5
Outside fire	55	0.2	2.3
Hazard	31	0.1	1.3
False alarm	105	0.3	4.4
Good intent	27	0.1	1.1
Public service	180	0.5	7.5
Fire Total	410	1.1	17.0
Mutual/automatic aid given	360	1.0	14.9
Canceled calls	137	0.4	5.7
Automatic aid received without QCFM unit	340	0.9	14.1
Total	**2,413**	**6.6**	**100.0**

Observations from this table include:

- The department received an average of 6.6 calls per day, including 0.9 automatic aid received calls without a QCFM unit responding.
- EMS calls for the year totaled 1,166 (48 percent of all calls), **averaging 3.2 per day**.
- Fire calls for the year totaled 410 (17 percent of all calls), **averaging 1.1 per day**.
- Structure and outside fires combined for a total of 67 calls during the year, an average of 0.2 calls per day.
- Mutual or automatic aid **given** calls totaled 360 (17 percent of all calls), averaging 1.0 per day. Of these mutual aid calls, 10 were structure fires and 16 were outside fires.

Table 5: Automatic Aid Received Calls by Call Type

Call Type	Number of Automatic Aid Received Calls		
	With QCFM Unit	Without QCFM Units	Total
Cardiac and stroke	3	25	28
Seizure and unconsciousness	3	13	16
Breathing difficulty	1	24	25
Overdose and psychiatric	2	8	10
MVA	27	10	37
Fall and injury	10	42	52
Illness and other	5	40	45
EMS Total	**51**	**162**	**213**
Structure fire	9	0	9
Outside fire	6	5	11
Hazard	9	1	10
False alarm	1	34	35
Good intent	4	4	8
Public service	2	105	107
Fire Total	**31**	**149**	**180**
Canceled	7	29	36
Total	**89**	**340**	**429**
Daily Average	**0.2**	**0.9**	**1.2**

Observations from this table include:

- QCFM received automatic aid for 429 calls in a year, averaging 1.2 calls per day.
- Of the 429 automatic aid-received calls, 340 (79 percent) had no QCFM unit responding.
- A total of 213 automatic aid-received calls were EMS calls (50 percent), 9 were structure fire calls, and 11 were outside fire calls.

Demand for service originates primarily along the E. Rittenhouse and S. Ellsworth corridors, which is the central core of the town. The following two figures illustrate this demand. In each map, the greater the demand for service is represented by the darker the shade of color (red for fire; blue for EMS).

Figure 12: Call Demand: Fire Incidents

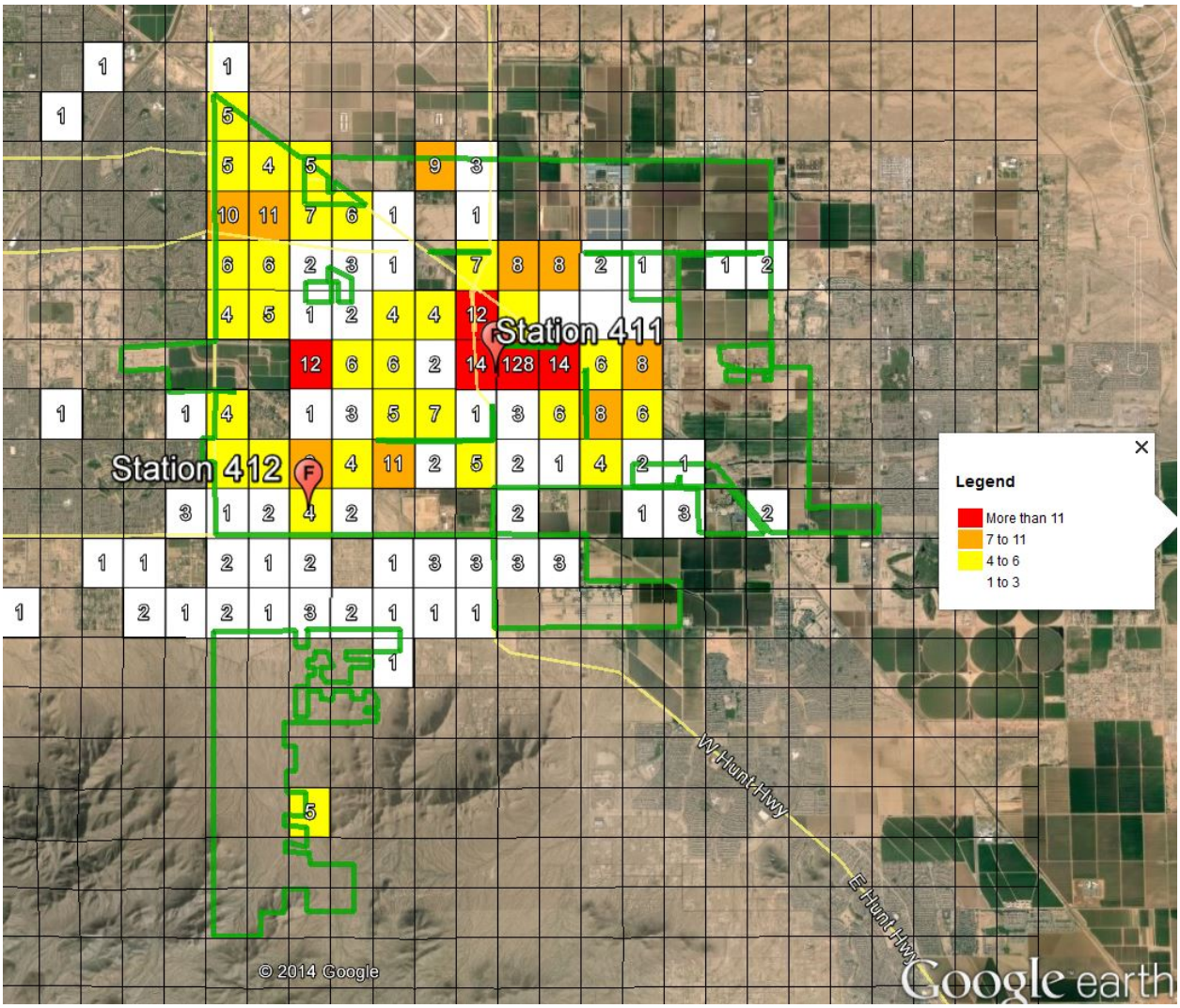
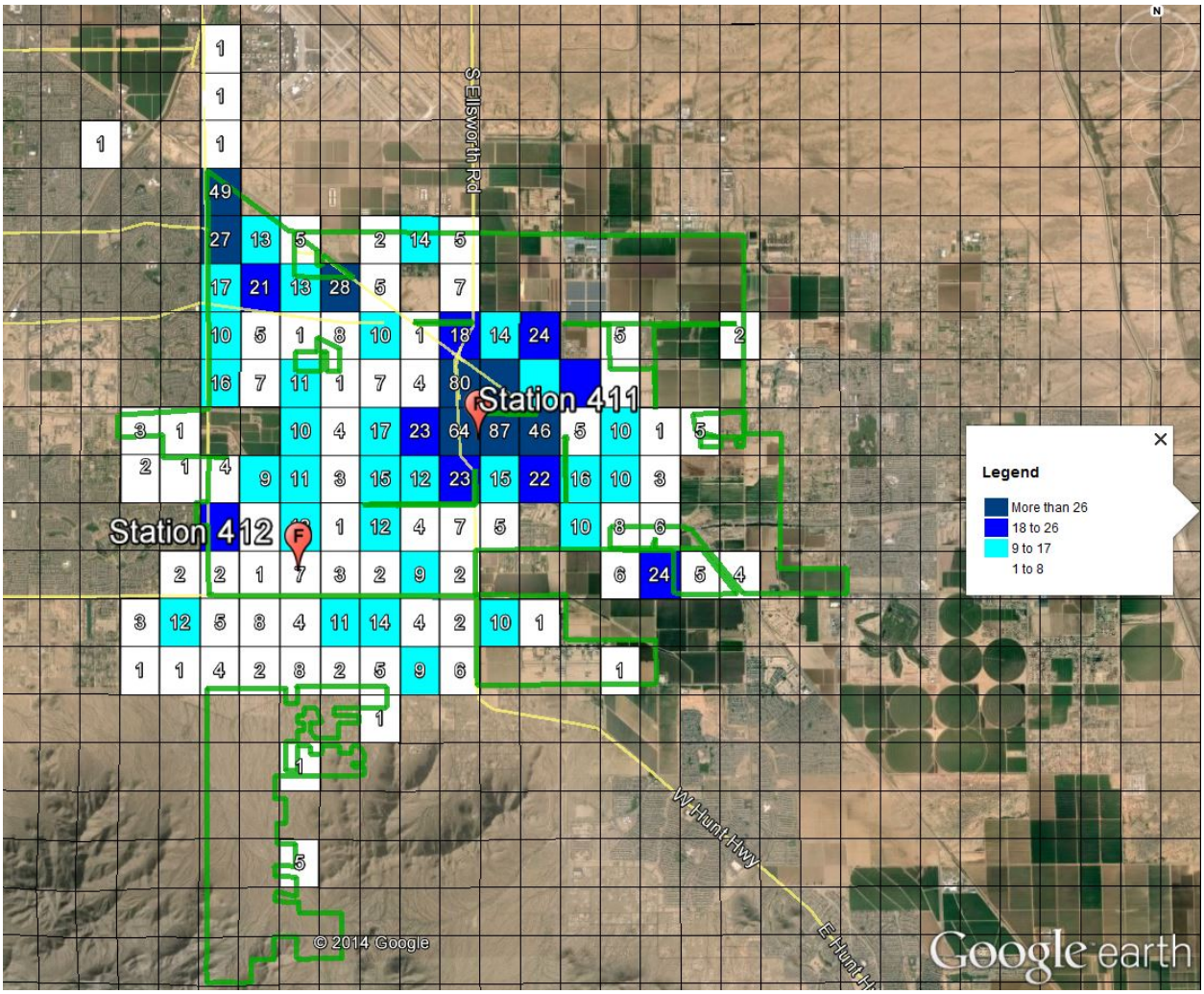


Figure 13: Call Demand: EMS Incidents



The impact of growth on fire and emergency medical services varies, however as population increases the calls for service generally increase, primarily with regards to EMS. Queen Creek is consistent with this assumption as total calls have increased from 2010 to 2013 as population has also increased. Total calls for service increased from 2,021 in 2010 to 2,325 in 2013 or by approximately 10 percent. Over this same period (2010-2013), population grew approximately 18 percent (26,361 to an estimated 31,187).

Operational Analysis

Operational Staffing and Deployment

Fire suppression staff is deployed on a rotational shift of forty-eight hours on and ninety-six hours off. This schedule creates three operational shifts or platoons. One captain is assigned to each shift, each station as the first-line company supervisor. A battalion chief (one) is assigned to each shift and serves as the overall shift commander and incident commander on incidents when warranted. Minimum station/pumper staffing is four and includes the captain, engineer (pumper driver), and two firefighters. Staffing can drop to three on each engine when a firefighter/paramedic is needed to ride along with EMS transport to assist with patient care, and for certain training and administrative short-term periods. No overtime is utilized during these short-term periods.

Staffing is such that station 1 has five personnel assigned (one additional firefighter) on each of the three shifts. This additional position is designed to be utilized as a relief position when a vacancy occurs for scheduled leave (vacation or other known leave) or unscheduled leave (sick leave). Generally the position is utilized for scheduled leave. This type of "overstaffing" is commonly implemented in fire departments to alleviate the need for overtime each time a vacancy occurs (constant staffing). Leave (vacation and sick) and the distribution of overtime are managed through SOGs 1.3.3 and 1.4.1. The QCFMD allows up to one person off each day on vacation leave. This is neither excessive or restrictive based on the total personnel scheduled to work each day (9), and the minimum personnel required to staff each station (8).

In a review of fiscal year 2013 overtime, it was determined the QCFMD utilized $166,662 of $190,000 or 88 percent of budgeted overtime. A total of 5,780 hours of overtime were charged against the budget. Of this total, 4,214 hours or 73 percent were utilized to fill vacancies created by sick, vacation, or floating holiday leave (2,566 for vacation leave; 1,648 hours for sick leave). The other overtime hours were charged for various reasons such as training, wildfire response, special events, committee work, and shift hold-over.

As noted above, the QCFMD has one additional person each day assigned to station 1 to be utilized as a "rover," that is to fill vacancies created by scheduled (vacation/floating holidays) and unscheduled leave (sick leave and other unforeseeable leave). The average overtime utilized per day is 11.5 hours. Theoretically, the rover position would cover this and no overtime would be utilized for minimum staffing. However, one must understand that this is an average and not consistent across the fiscal year period. On some days there may be no leave utilized and on others there may be a vacation day and a sick leave day utilized, thus creating 24 hours of overtime. And on others there may be a vacation day, sick leave day, and an injury leave day taken, creating 48 hours of overtime. However, there are days when one vacation day is taken and overtime is utilized. This is because the vacancy is an engineer, captain, or paramedic rank and there is not a qualified person (rover or some other member) on shift to fill in for that rank. In this case overtime is utilized to fill that vacancy. Efficiencies can be found in this staffing model by continuous training and staff development so that the workforce is as flexible as possible; particularly having staff trained and prepared to fill in at the engineer, captain, and battalion chief level. This is critical in small organizations where depth in staffing is at a minimum. The QCFMD has programs in place to achieve this (acting engineer and acting captain), and the department needs to stay aggressive in

preparing the workforce for these fill-in opportunities. This includes captains filling-in for battalion chiefs when a vacancy occurs on shift in this position, and as well at the paramedic level to maintain the current ALS engine deployment model, with a goal of further minimizing overtime for minimum staffing purposes.

Recommendation:

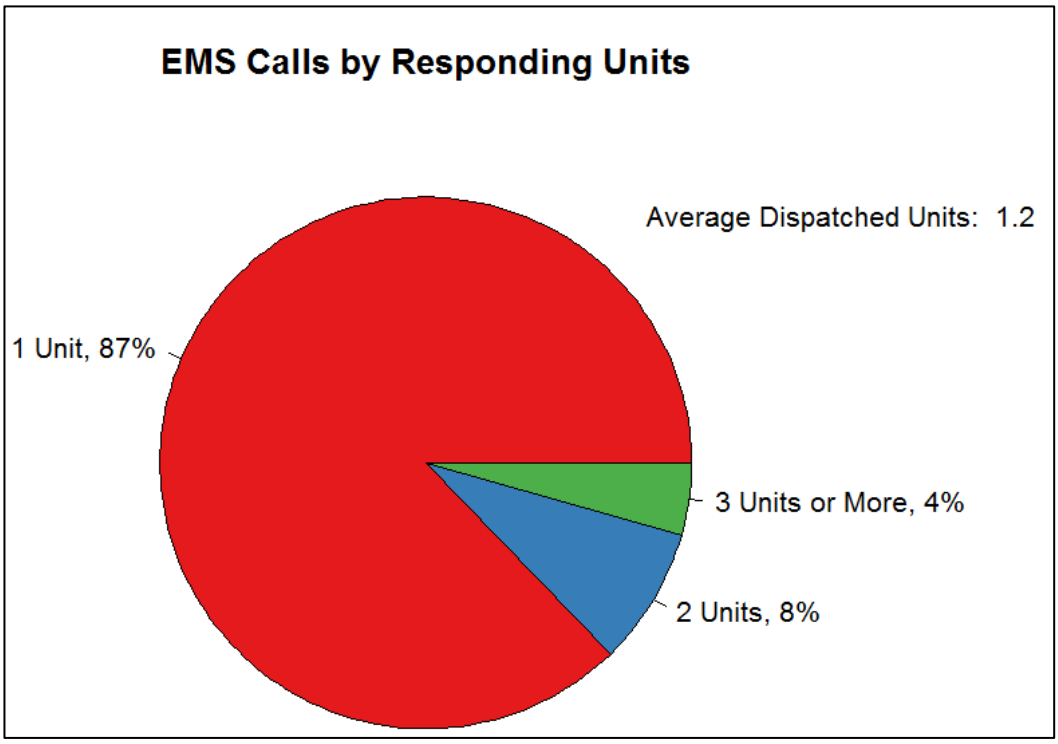
- Continue with and enhance training programs that prepare the entire workforce for filling-in out of position to include acting engineer, acting captain, acting battalion chief, and paramedic, and which that have a goal of minimizing overtime for minimum staffing purposes when staffing is available (in numbers) to do so.

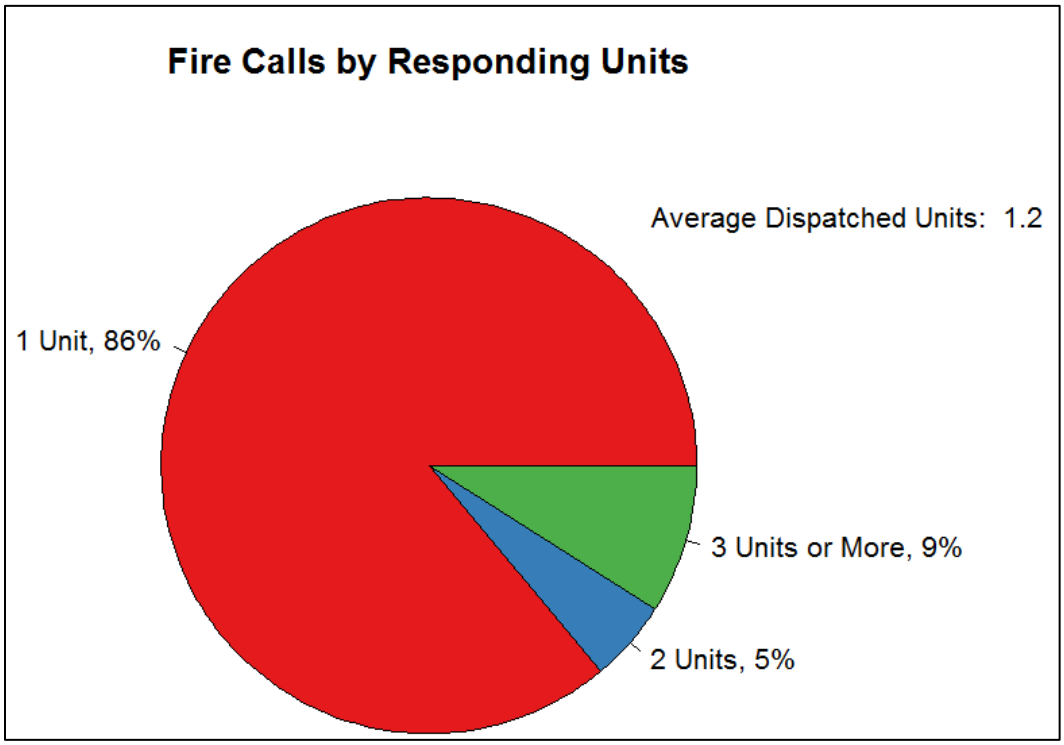
The QCFMD deploys fire and first response EMS equipment from two stations, located in the central and southwest areas of the town. Each station responds a primary Type I pumper apparatus capable of providing the full range of fire suppression engine company services, light technical rescue such as vehicle extrication, and the delivery of first response EMS services. Each station has an additional apparatus. These apparatus are not staffed per se, but rather respond with the crew assigned to the engine when needed. Station 1 houses the water tender apparatus and station 2 houses the brush apparatus. This efficient means of staffing is called “cross-staffing” and is commonly utilized in small departments where the more critical staffing and subsequent demand for apparatus is the pumper.

Deployment of resources to most calls for service is generally accomplished with one unit in Queen Creek, which is an efficient deployment model. Building fire calls for service involves multiple units (3 pumpers, 1 aerial and 2 battalion chefs) and requires the response from neighboring jurisdictions of additional apparatus above what the QCFMD can deploy. This occurs as an automatic function of in-place agreements. Major EMS calls for service to include vehicle extrication involve multiple units as well (2 pumpers, 1 battalion chief and 2 ambulances). Of course, the incident commander can increase or decrease the number of units responding based on incident information and severity of the call.

Figure 14 illustrates further the number of QCFMD units responding to calls for service.

Figure 14: Number of Units Dispatched to Calls





The time a unit is deployed on a single call is referred to as deployed time on a call for service and indicates the workload of that particular unit or station. This can be measured as productive emergency response time over a shift period. In the case of the QCFMD, the shift is twenty-four hours. An analysis of the QCFMD response data shows that a total of 380 fire category calls (**93 percent**) lasted less than one hour, and 822 EMS category calls (**70 percent**) lasted less than one hour. Other observations from the data analysis tell us:

- A total of 5 structure fires (42 percent of this category of call) lasted less than one hour.
- A total of 49 outside fires (89 percent of this category of call) lasted less than one hour.
- A total of 103 false alarms (98 percent of this category of call) lasted less than one hour.
- A total of 96 cardiac and stroke calls (80 percent of this category of call) lasted less than half an hour.
- A total of 131 motor vehicle accidents (64 percent of this category of call) lasted less than half an hour.

Table 6 depicts the annual deployed time for all QCFMD emergency incidents, and Table 7 depicts call workload by individual QCFMD unit.

Table 6: Annual Deployed Time by Call Type

Call Type	Average Deployed Minutes per Run	Annual Hours	Percent of Total Hours	Deployed Minutes per Day	Annual Number of Runs	Runs per Day
Cardiac and stroke	25.4	60	5.7	9.9	142	0.4
Seizure and unconsciousness	25.6	64	6.0	10.5	149	0.4
Breathing difficulty	24.0	46	4.3	7.6	115	0.3
Overdose and psychiatric	27.2	48	4.5	7.9	106	0.3
MVA	28.6	146	13.7	24.0	306	0.8
Fall and injury	27.2	132	12.4	21.6	290	0.8
Illness and other	28.3	125	11.7	20.5	264	0.7
EMS Total	**27.1**	**620**	**58.4**	**101.9**	**1,372**	**3.8**
Structure fire	89.1	50	4.8	8.3	34	0.1
Outside fire	24.6	39	3.6	6.3	94	0.3
Hazard	40.3	32	3.0	5.2	47	0.1
False alarm	17.0	30	2.9	5.0	107	0.3
Good intent	32.0	18	1.7	3.0	34	0.1
Public service	19.9	64	6.1	10.6	194	0.5
Fire Total	**27.5**	**233**	**22.0**	**38.4**	**510**	**1.4**
Mutual aid	26.8	193	18.2	31.7	431	1.2
Canceled	5.7	15	1.4	2.5	159	0.4
Total	**25.8**	**1,061**	**100.0**	**174.4**	**2,472**	**6.8**

Table 7: Call Workload by Unit

Station	Unit Type	Unit ID	Average Deployed Minutes per Run	Annual Number of Runs	Annual Hours	Runs per Day	Deployed Hours per Day
Station 411	Command	B411	32.2	267	143.5	0.7	0.4
	Engine	E411	23.4	1,311	510.6	3.6	1.4
	Tender	T411	10.5	11	1.9	0.0	Negligible
Station 412	Brush	BR412	75.5	23	28.9	0.1	Negligible
	Engine	E412	26.2	860	376.1	2.4	1.0

Table 7 tells us that: engine 411 made the most runs (1,311), and together the engines averaged 6.0 runs per day;[16] the tender and brush truck were utilized thirty-four times during the study period; the stations together were deployed 2.8 hours per day on average.

Emergency Medical Services

Emergency medical services transport is provided to the town by Southwest Ambulance, a Rural/Metro company. Southwest provides this service through a regional emergency medical transport agreement that includes the Apache Junction Fire District, town of Gilbert, and city of Mesa (Mesa holds the original agreement). The agreement is performance-based, whereby response priorities and maximum allowable cumulative response time is established, and by which Southwest must be compliant or suffer liquidated damages for failure to meet the requirements. In FY 2013/2014 Southwest paid the town $8,000 in liquidated damages for not meeting agreement response time requirements.

Southwest has a station in town in the town hall complex. Southwest staffs one ambulance 24/7 and one ambulance twelve hours/day during peak load times, which the service has determined to be 9:00 a.m. to 9:00 p.m. These ambulances are not guaranteed to remain in the town, as they may be moved or dispatched to other areas of the region if needed. By the agreement, Southwest "will operate enough sub-operation stations within the region's *EMS Response Area* to meet the defined response time requirements" of the agreement.[17] Tables 8 and 9 depict Southwest transport and 90th percentile response time data, as analyzed by CPSM.

Table 8: Transport Calls by Call Type

Call Type	Number of Calls			Transport Rate
	Non-Transport	Transport	Total	
Cardiac and stroke	24	96	120	80.0
Seizure and unconsciousness	21	118	139	84.9
Breathing difficulty	15	94	109	86.2
Overdose and psychiatric	17	84	101	83.2
MVA	79	127	206	61.7
Fall and injury	68	183	251	72.9
Illness and other	59	181	240	75.4
EMS Total	**283**	**883**	**1,166**	**75.7**

CPSM identified transport calls where Southwest Ambulance provided transport service and which were not canceled en route. We only focused on transport calls with at least one QCFMD unit responding. Thus, another 173 transport calls in QCFMD jurisdiction, to which Southwest Ambulance solely responded, were not included in our analysis.

[16] Each dispatched unit is a separate "run." As multiple units are dispatched to a call, there are more runs than calls.
[17] Regional Emergency Medical Services Agreement, August 2011.

Table 9: 90th Percentile Dispatch, Turnout, Travel, and Response Times of First Arriving Southwest Ambulance, by EMS Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	1.0	1.9	8.2	**10.3**	96
Seizure and unconsciousness	1.5	2.1	9.7	**12.6**	117
Breathing difficulty	1.4	2.1	8.5	**10.8**	94
Overdose and psychiatric	3.8	2.1	8.0	**12.1**	79
MVA	1.4	1.9	8.0	**10.4**	126
Fall and injury	4.9	1.9	9.4	**13.0**	179
Illness and other	3.6	2.0	8.0	**12.4**	168
EMS Total	**2.6**	**2.0**	**8.6**	**11.6**	**859**

Note: A 90th percentile value of 11.6 indicates that the total response time was less than 11.6 minutes for 90 percent of all calls. Unlike averages, the 90th percentile response time is not equal to the sum of the 90th percentile of dispatch time, turnout time, and travel time.

The QCFMD staffs each station/pumper with a minimum of two paramedics, thus providing advanced life support first-response service. With this tiered deployment model, which is common in the region and the country, the fire department responds with the EMS transport service. If the fire department arrives first it can initiate both basic and advanced life support prehospital care, and working in unison with the EMS transport unit, package the patient for transport if required.

The QCFMD has a quality assurance program in place that also involves the medical director. Certain calls are automatically reviewed to ensure protocols are followed and skills are performed to standard. These include calls involving strokes; ST Elevation Myocardial Infarction (STEMI) alert patients; cardiac arrests; and any call involving a low frequency/high risk skill performed such as a chest decompression. QCFMD staff paramedic and basic skills are reviewed annually, and continuing education classes/hours for required certifications are provided. Mercy-Gilbert hospital participates in the prehospital program through an agreement with regards to pharmaceutical stocking and exchange, as well as with other goods utilized in the pre-hospital setting.

Both Southwest and QCFMD are dispatched by the city of Mesa fire communications center. The Southwest dispatching is somewhat fragmented in that Southwest operations, not the Mesa communications center, moves EMS units around the region based on system status to cover gaps in service. The Mesa communications center dispatches Southwest units based on GPS location, meaning the closet unit is dispatched to the call for service. When Mesa communications identifies units are needed, it contacts Southwest operations, which assesses status of units and advises Mesa communications what units are available for additional service. This potentially creates gaps in service due to unintended gaps in interagency communication links during peak load times.

In June 2011, the Supreme Court upheld the Patient Protection and Affordable Care Act (PPACA) 17). The impact of PPACA on existing emergency medical service (EMS) systems is still largely speculative. The 2,000-page document references EMS only a handful of times. However, there

appear to be several issues that must be considered for existing EMS and patient transport service providers, including the formation of Accountable Care Organizations (ACO), increased call volumes, and decreased revenue streams.

In Queen Creek, EMS is currently provided through an agreement as noted above with Southwest Ambulance. The town relies upon Southwest to provide for patient transportation (per status as the Certificate of Need or CON holder). The current EMS system design does not require a subsidy for ALS-level care or patient transportation; however, the town currently dispatches fire department personnel to all medical calls. In this scenario, Southwest is able to recover a fee for service, while town services rely upon tax revenue to subsidize the operation, and the town has little ability to recover any fees.

The economic downturn has encouraged many organizations to seek new opportunities for revenue streams. Among the prevalent considerations is for the government organization to assume ALS-level patient transportation services and to begin providing out-of-hospital preventative care as part of the goal of reducing hospital readmissions. **Regarding patient transportation services, it is not uncommon for expenditures to exceed collections in fire-based EMS systems.** Therefore, transport service is typically ruled out rather quickly as a new net revenue source. Many fire departments want to provide this service because they believe that they can provide a higher quality of service with more accountability to the community than can their private counterparts. While quality and accountability can vary regardless of the provider, there is a higher likelihood that the town would have to subsidize the service delivery model with general fund revenue.

CPSM recommends that communities align community expectations for service with service design. Instilled in this process is the financial vetting that would take place through the political and representative process. In fairness to the fire departments that wish to provide this service, it can be done very effectively with high clinical outcomes, understanding that there are increased costs associated with public firefighter compensation, higher certification/classifications required, and less efficient deployment strategies.

One of the PPACA's impacts on EMS service is the provision for financial penalties for hospital readmissions. The EMS community believes that EMS service providers could partner with the hospital organizations to reduce readmissions either for a fee or as a value-added measure to the community health system. The fines to the hospitals are substantial, and hospitals will continue to seek out preventative care models in order to lower readmissions. However, due to public employee costs, it is unclear if this approach will have longevity in a fire-based EMS system. The relationship with the local hospital and/or ACO may be the single most important aspect to help the community understand that the town may not be in a position to compete for provision of these services in an open market.

Another result of the PPACA will be to increase the number of U. S. citizens with health insurance. Most people who have been previously uninsured will become insured, either through Medicare or purchased insurance. Experts caution that this will likely increase the number of 911 calls, as a lack of health insurance will no longer serve as a deterrent for seeking medical care. In addition, future EMS operations under the PPACA may require chronically ill patients to be transported to a wider

array of facilities than in the past, as the number of urgent care clinics and stand-alone emergency departments is already growing rapidly. Recent studies suggest that between 7 and 34 percent of Medicare patients who were transported by EMS to an emergency room could have been transported to an alternate destination or did not require transport at all, which significantly impacts cost. The framework for reimbursement and allowable cost recovery for changes in service levels has yet to be determined. Since the purpose of much of the PPACA's and related initiatives is to control costs, it is likely that reimbursement for service will be less. Hence, if the town opts to take on patient transportation services, recognizing that the first factor would be to challenge Southwest Ambulance in order to be assigned their existing CON, the risk to the town is twofold. First, the town will continue to be responsible for increased service demands, which may increase expenditures. Second, Medicare reimburses on the margin for existing services, thus reimbursement rates for spin-off services may be lower in the future. The resulting increased demand for services and lower reimbursement would exacerbate issues related to the tax subsidy and already constrained revenue streams available to fund public safety services.

Finally, the formation of Affordable Care Organizations (ACOs) also may affect EMS delivery in a variety of ways. The intent of an ACO is to monitor and control reimbursements to healthcare providers as well as monitor the quality of care provided to Medicare recipients. The ACO may have the authority to deny or reduce payment if the provider fails to meet quality standards. For example, if a patient is readmitted to the hospital within three days of discharge, the transportation fee may not be reimbursed to the provider of the transport service, even though the transporter may have little ability to control re-admittance to the medical facility.

Regardless of all the changes facing EMS providers, they provide a critical component of the overall health care system, which represents only a small aspect of the financial machine of health care. For example, Medicare is 50 percent or more of the payer mix in most communities. Medicare expenditures on EMS transport services amount to approximately $5 billion of the total $536 billion in healthcare benefits. EMS systems thus are faced with the majority of their cost recovery associated with a huge federally funded program for which this reimbursement amounts to less than 1 percent of the expenditures.

Recommendation:

- It is strongly recommended that the expansion of the existing town EMS role into ALS patient transportation services only occur if this change is community- and policy-driven.

Current Station and Response Time Analysis

This section discusses response time from current stations, which will assist in the overall discussion of future fire facility location in conjunction with current demand and future growth.

Dispatch time is the time interval that begins when an alarm is received at the communication center and ends when the response information begins to be transmitted via voice or electronic means to the emergency response facility or emergency response units in the field. *Turnout time* is the time interval that begins when the notification process to emergency response facilities and emergency response units begins by an audible alarm or visual announcement or both and ends at the beginning point of travel time. **The fire department has the greatest control over these segments of the total response time.** *Travel time* is the time interval that initiates when the unit is en route to the call and ends when the unit arrives at the scene. Response time (or total response time) is the time interval that begins when the call is received by the primary dispatch center and ends when the dispatched unit arrives on the scene to initiate action.

According to NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments*, 2010 Edition, where the primary public safety answering point is the communications center the alarm processing time or dispatch time should be less than or equal to 60 seconds 90 percent of the time.[18] This standard also states that the turnout time should be less than or equal to 80 seconds for fire and special operations 90 percent of the time, and travel time shall be less than or equal to 240 seconds for the first arriving engine company 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. NFPA 1710 response time criterion is utilized by ICMA as a benchmark for service delivery and in the overall staffing and deployment of fire department, and is not an ICMA recommendation, which is discussed further in this report.

A more conservative and stricter measure of total response time is the 90th percentile measurement. Simply explained, for 90 percent of calls, the first unit arrived within a specified time, and if measured, the second and third unit. Table 10 depicts average dispatch, turnout, travel, and total response times of first arriving QCFMD units for fire and EMS category calls. Table 11 depicts the 90th percentile response time (NFPA 1710 benchmark).

Empirical research has found that there is no clinical distinction between response times under eight minutes and those over eight minutes until the response time was less than four minutes for EMS services.[19] Similarly, research has found that there are improved patient survival rates for a response time of less than five minutes but no statistical distinction in patient survival rates for

[18] NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments*, 2010 Edition, 7.
[19] P.T. Pons, et. al. (2005). Paramedic response time: does it affect patient survival? *Academic Emergency Medicine,* 12(7), 594-600.

response times greater than five minutes, and in this study, up to ten minutes and 59 seconds (10:59), 90 percent of the time.[20]

Research into the response times for the EMS role in trauma supportive care revealed similar results. In one study, the efficacy of the eight-minute response standard was researched and it was found that exceeding the eight-minute recommendation did not have a statistically significant impact on patient survival after traumatic injury.[21] In other words, whether units responded in less than or greater than eight minutes, patient survivability due to trauma did not change. Similarly, a study examined the EMS role in the "golden hour" for traumatic care; the study looked at 146 EMS agencies transporting to 51 Level 1 and Level 2 trauma centers across North America. Results found that there was no association between EMS intervals and mortality among injured patients with physiologic abnormality in the field.[22]

Currently, there is no empirical evidence recommending an optimal response time for fire suppression efforts. In addition, there is no empirical evidence linking response times to specific outcomes. Scientifically, it is known that fire grows rapidly and thus, designers of fire department systems attempt to maintain a geographic distribution of fire stations that limit the travel distance between stations. This general design is still evaluated by agencies such as the Insurance Services Office (ISO). For example, ISO recommends that there be a fire engine every 1.5 miles and a ladder truck every 2.5 miles.[23]

In general, fire suppression system design strategies have not changed in upward of 100 years. However, recent research by Underwriter's Laboratories (UL) Fire Research Division has found that today's fires may grow very rapidly and reach untenable levels in as little as four minutes.[24] In the past, possibly due to differences in materials in the home and its furnishings, this time is reported to have been upward of twenty minutes. Few municipalities will be in a position to fund labor-intensive deployment models that will meet the demands of the modern fire ground or the recommendations of NFPA 1710. Therefore, ICMA recommends a risk-based Integrated Risk Management Plan (IRMP) that utilizes a system of efforts to reduce the community's risk; for example, the impact from fire. An IRMP provides a greater return on investment and improves long-term sustainability.

[20] T.H. Blackwell and J.S. Kaufman. (2002). Response time effectiveness: Comparison of response time and survival in an urban emergency medical services system. *Academic Emergency Medicine,* 9(4), 288-295.
[21] P.T. Pons and V. J. Markovchick. (2002). Eight minutes or less: Does the ambulance response time guideline impact trauma patient outcome? *Journal of Emergency Medicine,* 23(1), 43-48.
[22] C.D. Newgard, et. al. (2010). Emergency medical services intervals and survival in trauma: Assessment of the golden hour in a North American prospective cohort. *Annal of Emergency Medicine*, 55(3), 235-246.
[23] Insurance Services Office. (2012). *Fire suppression rating schedule.* Jersey City, NJ: ISO.
[24] S. Kerber. (2010). *Impact of ventilation on fire behavior in legacy and contemporary residential construction* (Chicago, IL: Underwriter's Laboratories).

Table 10: Average Response Times of First Arriving Unit, by Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	0.8	1.0	4.1	5.9	116
Seizure and unconsciousness	0.8	1.0	4.2	5.9	135
Breathing difficulty	0.7	1.0	4.1	5.8	105
Overdose and psychiatric	0.8	1.1	4.0	5.8	67
MVA	0.9	0.9	4.1	5.9	199
Fall and injury	1.0	1.0	4.3	6.3	200
Illness and other	0.8	1.0	4.0	5.9	182
EMS Total	**0.8**	**1.0**	**4.1**	**5.9**	**1,004**
Structure fire	0.8	1.2	4.7	6.7	11
Outside fire	0.9	1.1	4.6	6.6	38
Hazard	1.1	0.9	4.4	6.3	13
False alarm	0.8	1.0	3.2	5.0	15
Good intent	1.1	1.0	3.6	5.7	14
Public service	0.9	1.0	4.0	5.9	41
Fire Total	**0.9**	**1.0**	**4.1**	**6.1**	**132**
Total	**0.9**	**1.0**	**4.1**	**6.0**	**1,136**

Table 11: 90th Percentile Response Times of First Arriving Unit, by Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	1.6	1.9	6.7	8.9	116
Seizure and unconsciousness	1.2	1.6	6.4	8.4	135
Breathing difficulty	1.3	1.7	6.4	8.4	105
Overdose and psychiatric	1.2	1.8	6.3	8.5	67
MVA	1.6	1.5	6.8	9.2	199
Fall and injury	1.6	1.6	7.3	9.2	200
Illness and other	1.3	1.6	6.5	8.6	182
EMS Total	**1.4**	**1.6**	**6.7**	**8.8**	**1,004**
Structure fire	1.3	1.9	6.9	9.5	11
Outside fire	1.8	1.6	7.6	9.9	38
Hazard	2.1	1.3	6.5	8.7	13
False alarm	1.6	1.9	5.5	8.0	15
Good intent	2.1	1.9	7.8	9.4	14
Public service	1.6	1.6	6.6	8.9	41
Fire Total	**1.8**	**1.6**	**7.0**	**9.4**	**132**
Total	**1.5**	**1.6**	**6.7**	**8.9**	**1,136**

Note: A 90th percentile value of 8.9 indicates that the total response time was less than 8.9 minutes for 90 percent of all calls. Unlike averages, the 90th percentile response time is not equal to the sum of the 90th percentile of dispatch time, turnout time, and travel time.

When comparing average response time components with the 90th percentile components, the following is observed:

- The average dispatch time was 0.9 minutes.
    - The 90th percentile dispatch time was 1.5 minutes.
- The average turnout time was 1.0 minutes.
    - The 90th percentile turnout time was 1.6 minutes.
- The average travel time was 4.1 minutes.
    - The 90th percentile travel time was 6.7 minutes.
- The average response time for EMS calls was 5.9 minutes.
    - The 90th percentile response time for EMS calls was 8.8 minutes.
- The average response time for fire category calls was 6.1 minutes.
    - The 90th percentile response time for fire category calls was 9.4 minutes.
- The average response time for structure fire calls was 6.7 minutes.

    - The 90th percentile response time for structure fire calls was 9.5 minutes.
- The average response time for outside fire calls was 6.6 minutes.
    - The 90th percentile response time for outside fire calls was 9.9 minutes.

In each category, at the 90th percentile there is an increase in time from average, which is expected. There is also a slight gap between the NFPA 1710 benchmark and what is actually occurring in Queen Creek. Turnout time, however, is very close to what the benchmark allows for, which indicates commitment to a timely response. Travel time at the 90th percentile is almost 3.0 minutes greater than the NFPA 1710 benchmark. This is due to the geographic challenges of having two fire stations. This is analyzed further through geographic information system (GIS) mapping as illustrated in the next set of figures.

In summary, setting *reasonable* standards for response times should be a local policy decision that incorporates elements of risk, the community's willingness to pay for services, the community's acceptable level of risk it is willing to assume, and the community's expectations for service.

Figures 15, 16, and 17 use GIS mapping to illustrate response time probabilities, showing 240-second, 360-second, and 480-second travel time bleed comparisons, respectively. These comparisons are made by using the road network from each QCFMD fire stations.

Figure 15: 240-Second Response Bleed from QCFMD Stations

NFPA 1710 Travel Time Benchmark-First Arriving Unit (Red Bleed)

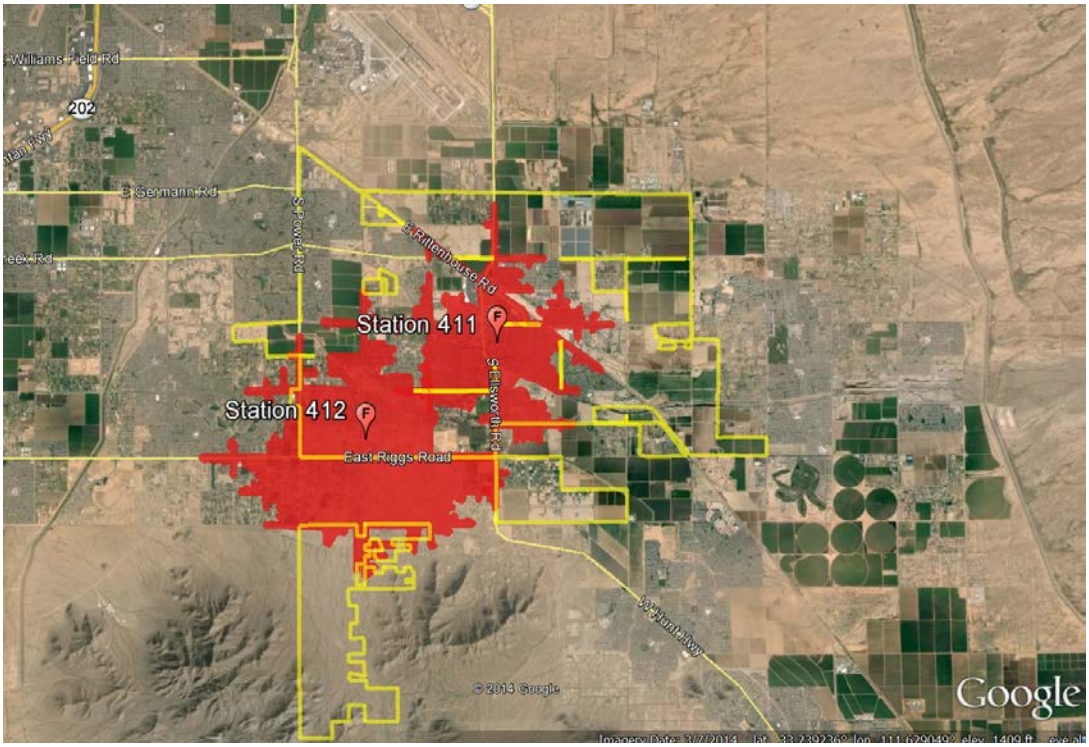


Figure 16: 360-Second Response Bleed from QCFMD Stations (Green Bleed)

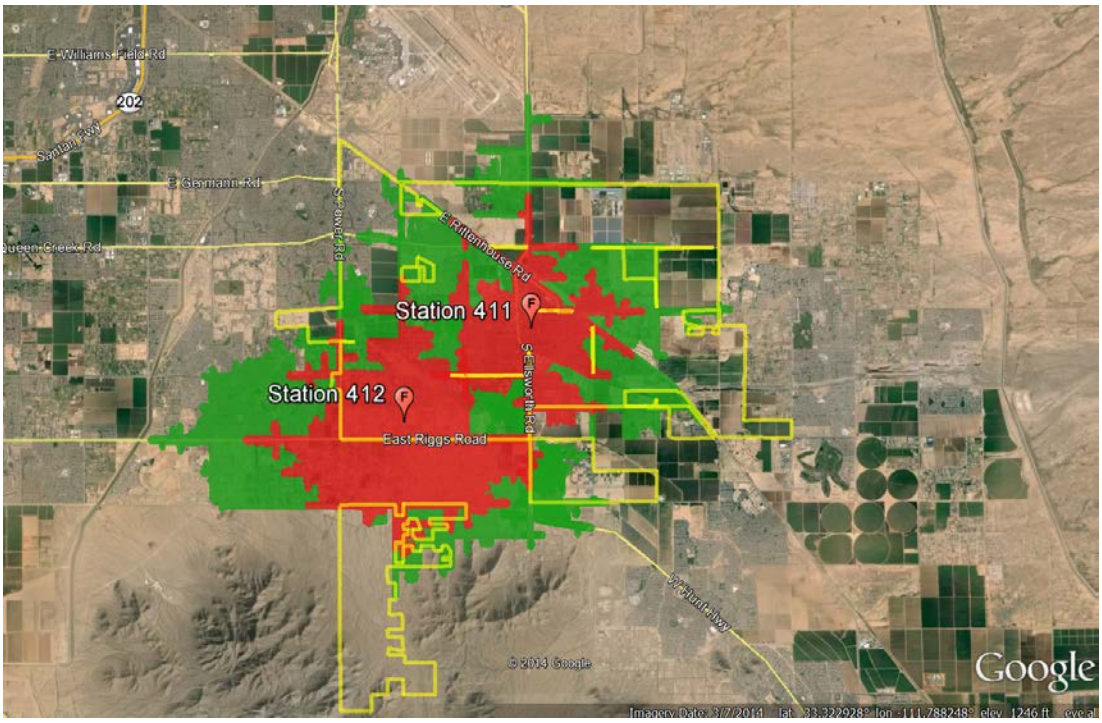
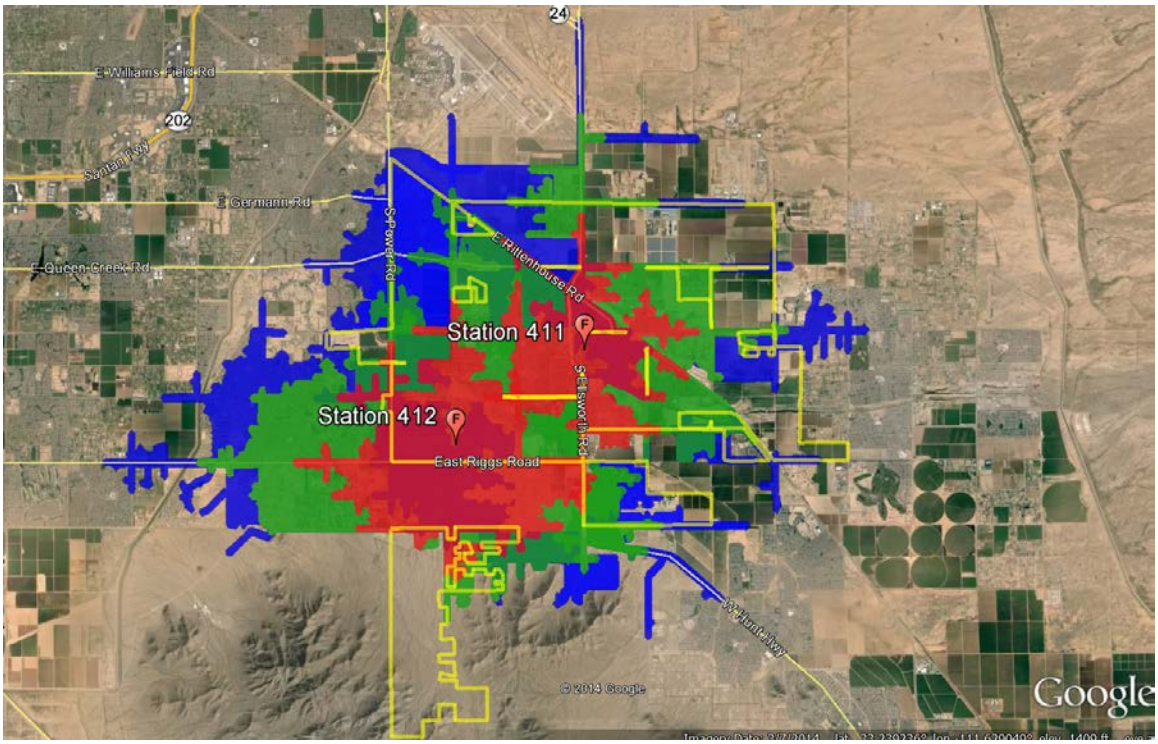


Figure 17: 480-Second Response Bleed from QCFMD Stations

NFPA 1710 Benchmark-Ability to Collect First Alarm Assignment Travel Time (Blue Bleed)



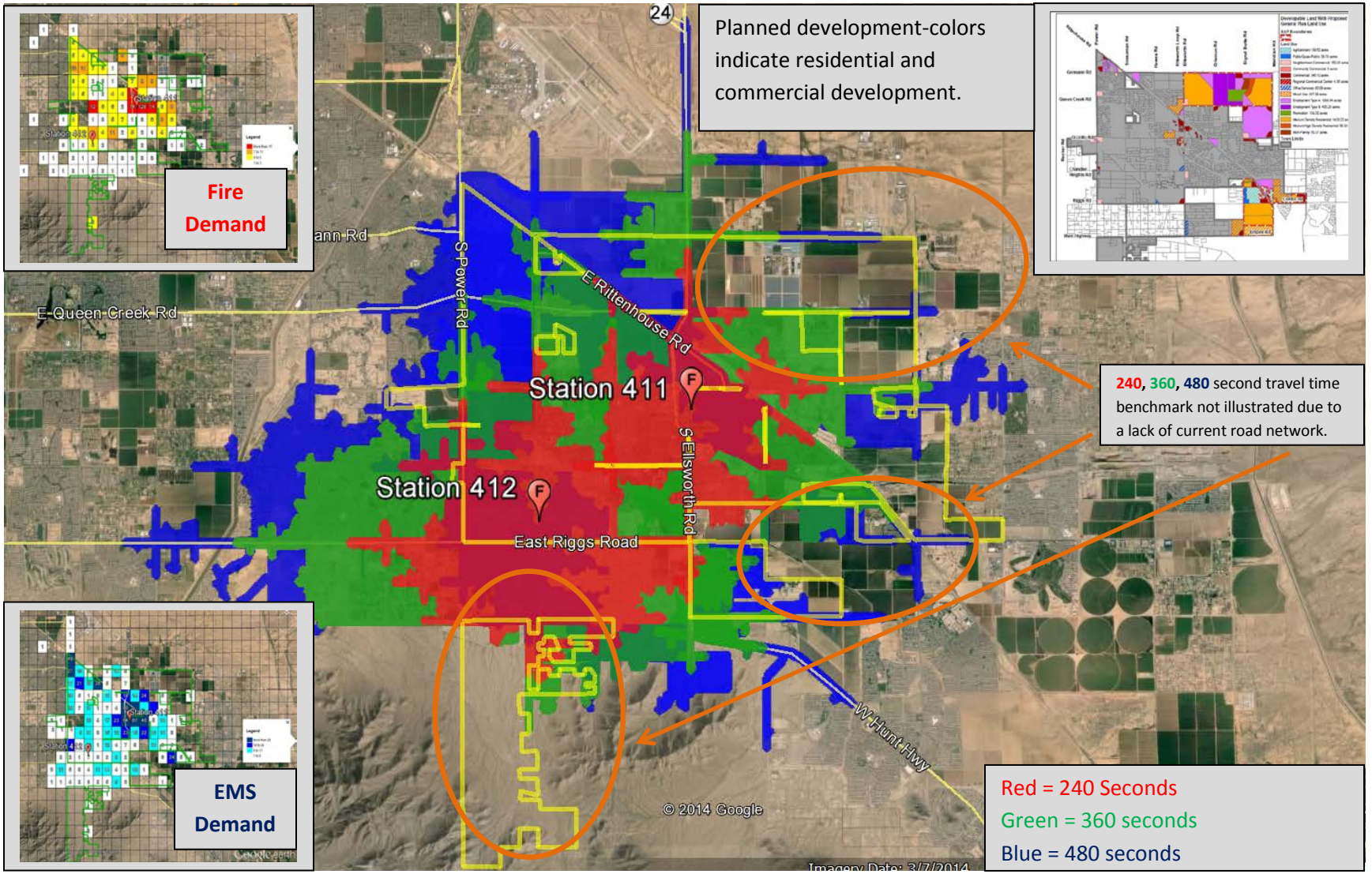
At the 240 second benchmark, there are gaps in the northwest, northeast, southwest, and southeast corners of the town, and where there is demand for calls, as illustrated in Figures 12 and 13 (northwest). The coverage is good concentrically from each station, due to a good networking of roads; however, the gaps are created in this travel time category due to distance of travel, lack of road infrastructure, and the geographic location of the two fire facilities.

At the 360- and 480-second benchmark, the gap in coverage in the northeast portion of the town is closed. This is significant as this area of the town is built upon. The gap is closed somewhat in the northwest and southeast; however, there remain significant portions of the town that are not covered under any of the travel time benchmarks as indicated in Figure 17, *which is due to a lack of road network needed for this mapping.* Currently, these portions of the town are largely not built upon; however, as indicated in Figures 9 and 10, some of these areas have planned development, which gives just cause to consideration of future fire facilities.

Figures 18 compiles station location, demand, planned development, and travel time into one visual illustration.

Meeting current and future service demand from fixed fire facilities is discussed later in this report.

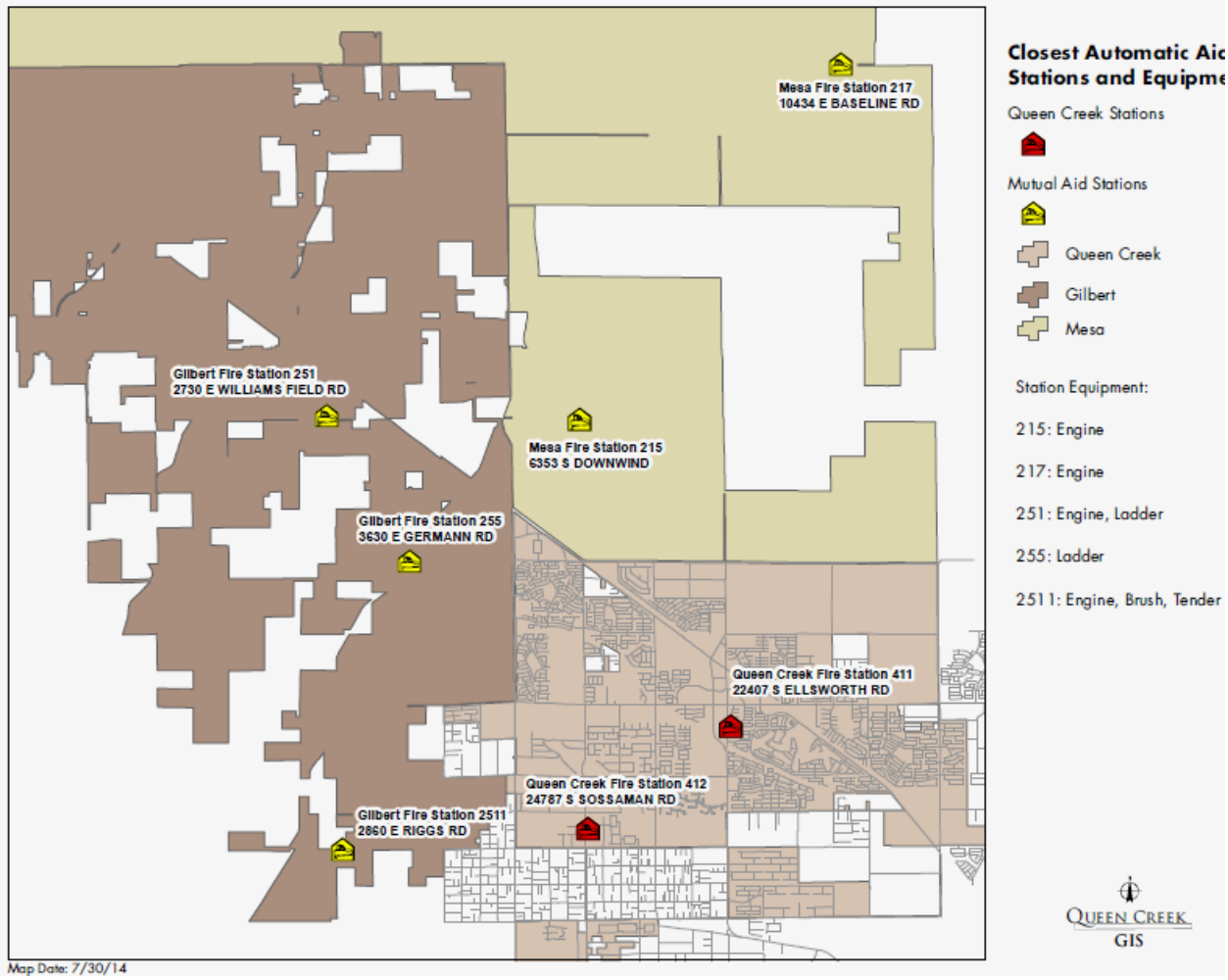
Figure 18: Aggregate Analysis from QCFMD Stations (Travel Time, Demand, Planned Development)



External System Emergency Response Relationships

The town of Queen Creek is signatory to an interlocal agreement for automatic aid for services between seven east valley jurisdictions (eight including Queen Creek) that includes response to fire, medical emergencies, hazardous materials incidents, rescue and extrication, and other types of service that are within the normal scope services provided by fire departments. Other jurisdictions included in this agreement are: Apache Junction, Chandler, Gilbert, Guadalupe, Mesa, Phoenix, and Tempe. Figure 19 illustrates those automatic aid stations most commonly, due to location, dispatched into and with QCFMD units.

Figure 19: Closest Automatic Aid Stations to Queen Creek

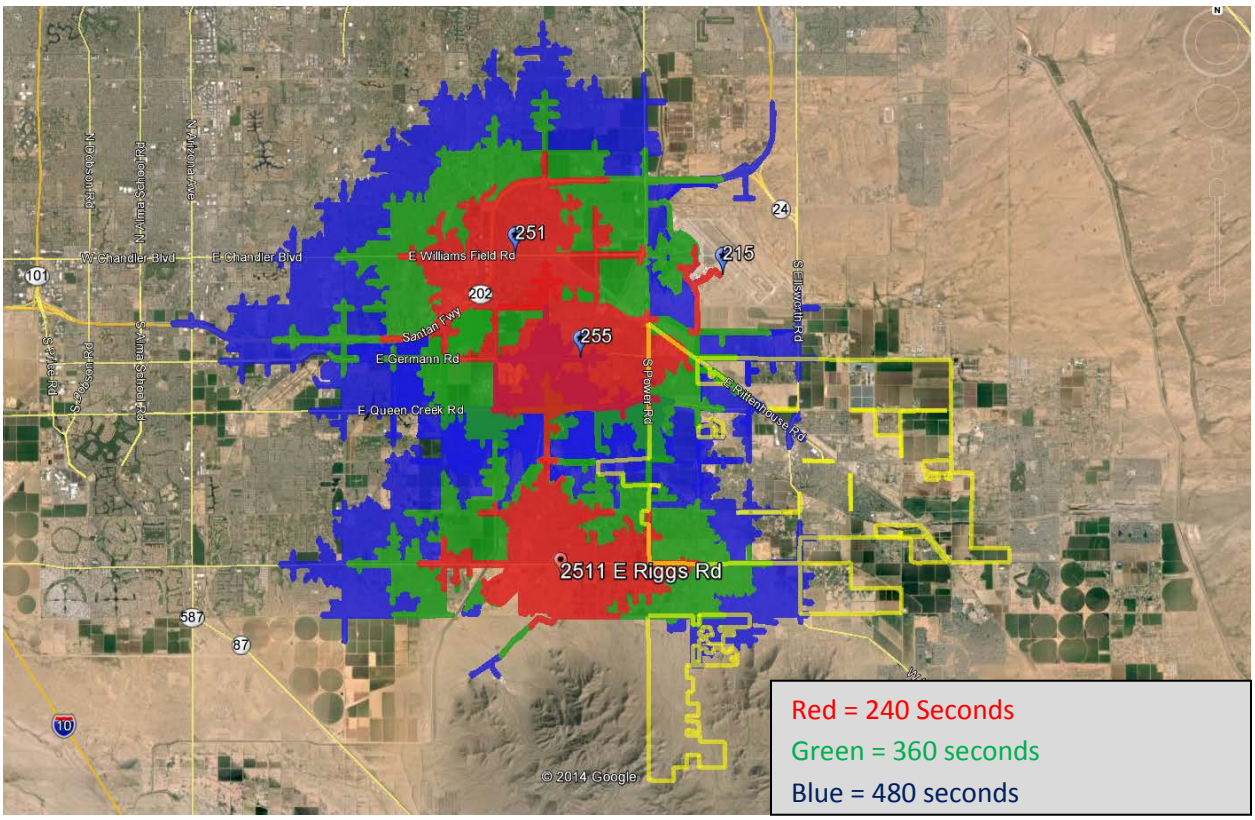


The objective of this type of automatic service delivery system is to dispatch the closest unit to a call for service, regardless of the jurisdiction so that a seamless, timely and effective service delivery can occur. Additional objectives include but are not limited to: the delivery of an effective response force for specific types of emergencies such as structure fires and technical rescue incidents utilizing the available and appropriate unit types from one or more jurisdiction; developing and utilizing standard response and incident command protocols and procedures;

consistent emergency communications and vehicle identifiers; cooperative procedures for activities such as fire prevention, fire investigation, public education, purchasing, and health and safety; compatibility of equipment; and reciprocal response with available resources***. An automatic aid agreement such as this is robust, it affords the town many resources that would not otherwise be rapidly provided under a different mutual aid system, and it is a national best practice.***

Figure 20 illustrates travel time from these stations into the town of Queen Creek. In review of this map one can observe that travel times from Gilbert stations 255 and 2511 provide significant assistance in the northwestern area of Queen Creek where demand is high, and to some degree in the southwestern part of Queen Creek and the unincorporated fire district to the south.

Figure 20: Travel Time Bleeds from Automatic Aid Stations



Future Station Analysis

It is well documented by the National Fire Protection Association, the Insurance Services Office, and the Commission of Fire Accreditation that the strategic location of fire stations and a smoothly operating pattern of response to alarms make a significant difference in the service delivery of fire and emergency medical services. Initial capital outlay or construction costs for a fire station may prove to be relatively insignificant when compared with the upkeep of an around-the-clock facility, crew, and fleet year after year.

Therefore, savings are realized over a period of time if the total number of fire stations is kept to only those that are needed or those with which the community will grow with and from which service demand is effectively managed. One properly located fire station can provide more protection than several poorly located stations. Through the use of a comprehensive plan for fire station location, dollars can be maximized and efficiencies gained through the incremental growth of these facilities. The town of Queen Creek has accomplished this planning through this study and previous studies in an effort to provide policy makers with sound alternatives from which to consider as the city grows and the QCFMD endeavors to continue to provide effective service delivery.

As growth and demand for fire and EMS continues to grow, there is a need to plan for potential future fire station locations. To begin the discussion for future station locations, and as a review, Figure 21 illustrates current demand, and Figure 22 illustrates the recommended station locations from the 2005 report and a more recent report completed by Buracker and Associates.

Figure 21: Fire and EMS Demand

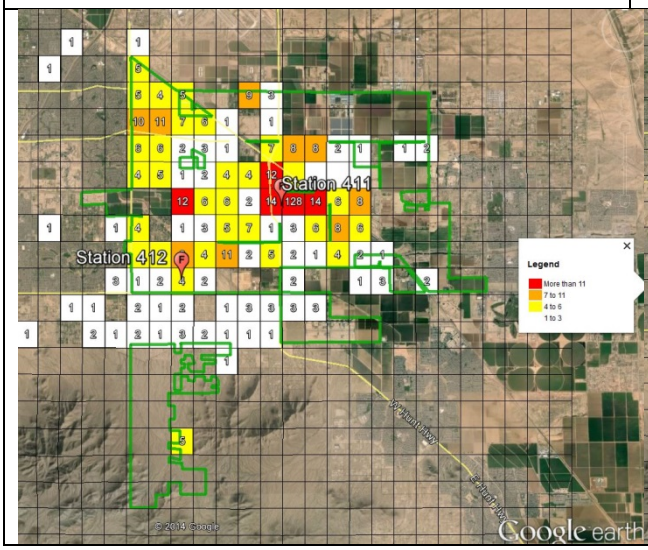
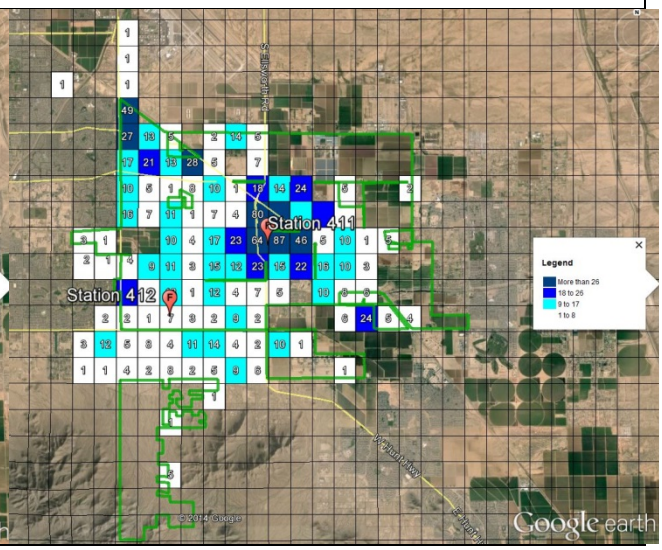
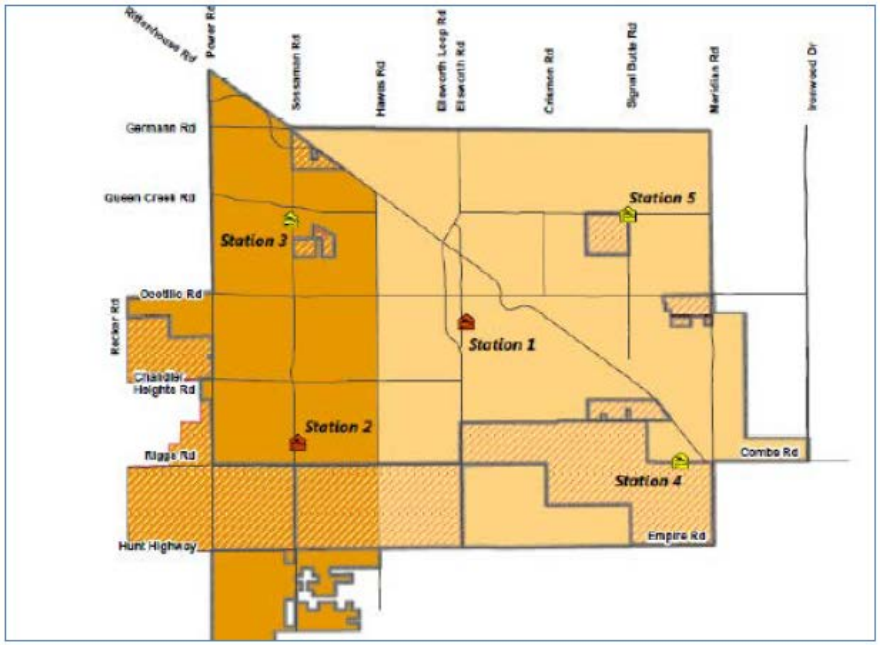
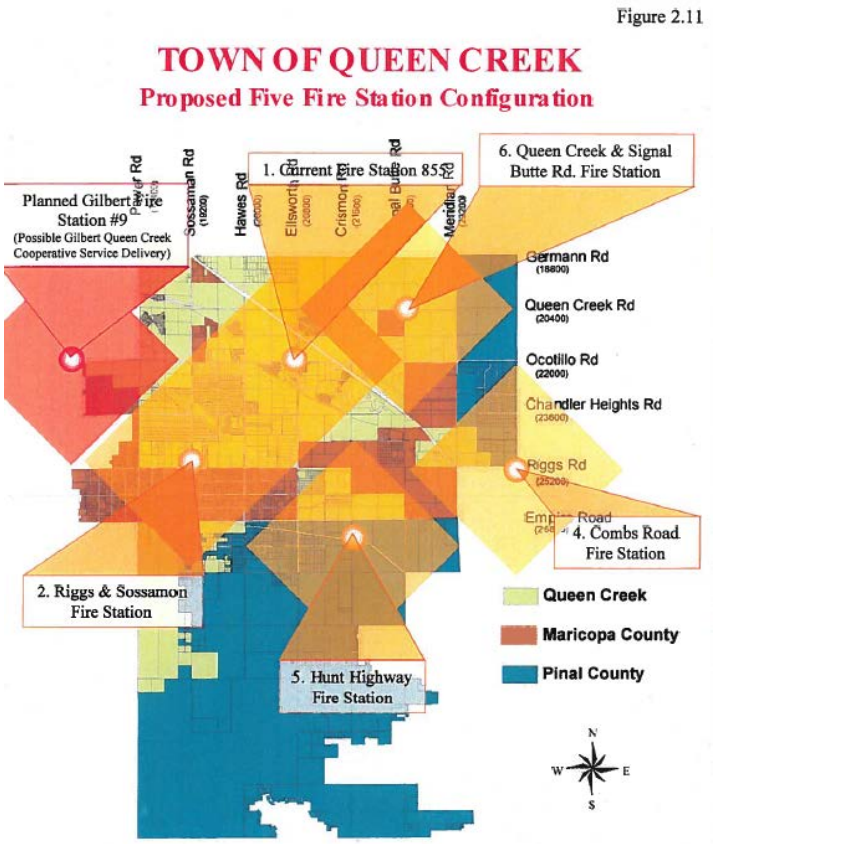
Fire Demand	EMS Demand
	

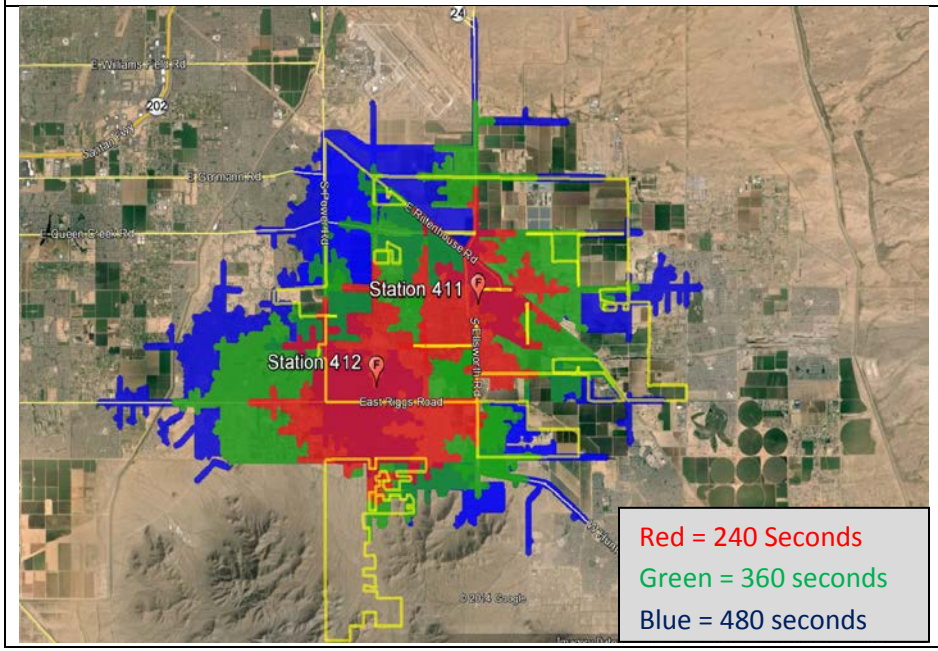
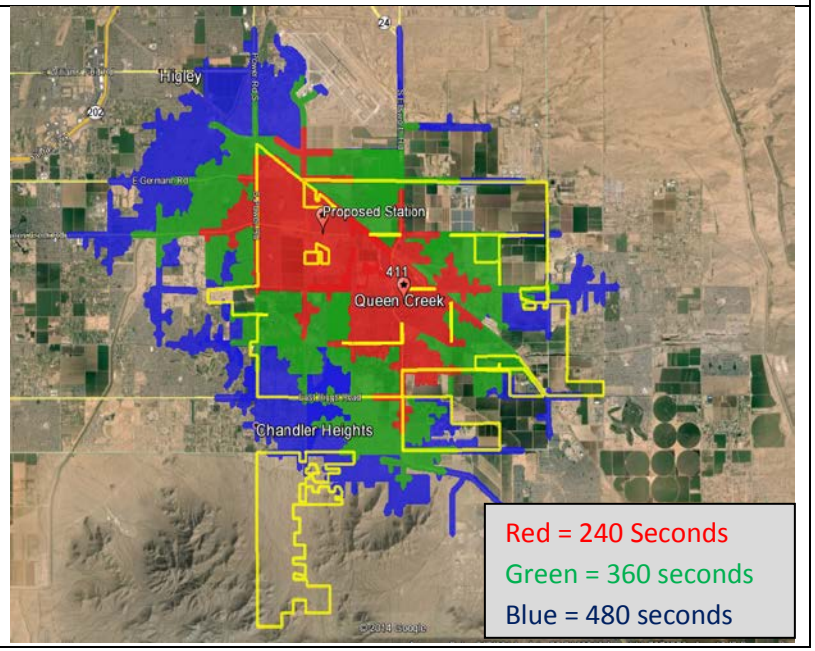
Figure 22: Current and Previously Proposed Future Stations

2005 Report	Carroll Buracker & Associates Report
	

As mentioned above, the initial considerations when deliberating the design and construction of a new fire facility is "do we need to replace an existing facility; where is the current demand we may not be servicing as well as we can be; do we need another facility in addition to current facilities to service increased demand and travel times?" Figure 23 provides illustration to these considerations. Demand is highest in the central (serviced by station 1) and northwestern portions of the town, with a lesser demand in the southwestern portion of the town (serviced by station 2). One consideration is to relocate station 2 (412) to the northwestern portion of the city to meet

the current demand. QCFMD staff provided a potential location for this station in the area of 19180 E. Queen Creek Rd. Figure 23 illustrates travel times in comparison with the current deployment model. In reviewing the two maps, one can see that while some parameters of travel time are lost in the southwestern portion of the town (240-second parameter); there remains good coverage at the 360- and 480-second parameters in this area. What is gained is better travel time coverage in the northwestern portion of the city where the demand for service is higher.

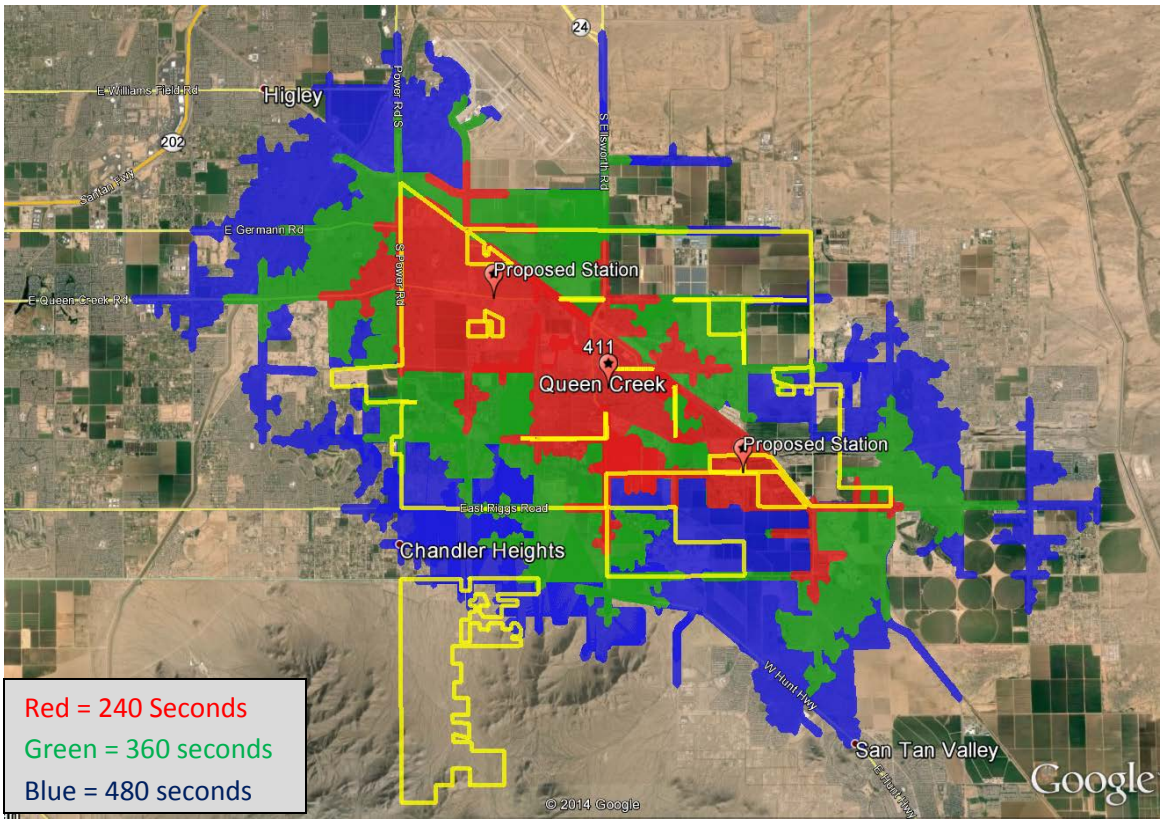
Figure 23: Current Station Locations and Proposed Relocation of Station 2

Current Station Locations	Current Station 1–Relocation of Station 2
	

In fire station location analyses, CPSM primarily considers ISO's road-mile benchmarking as well as NFPA 1710 and 1720, the community risk and vulnerability analysis, current demand for service, and future community growth. Discussed herein are alternatives for the potential location (based on growth) of future fire stations. Although the current demand outside of the central core of the town and the northwest portion the town is not high, future growth as illustrated in Figures 9 and 10 has the potential to become a driver of increased demand for fire and EMS services.

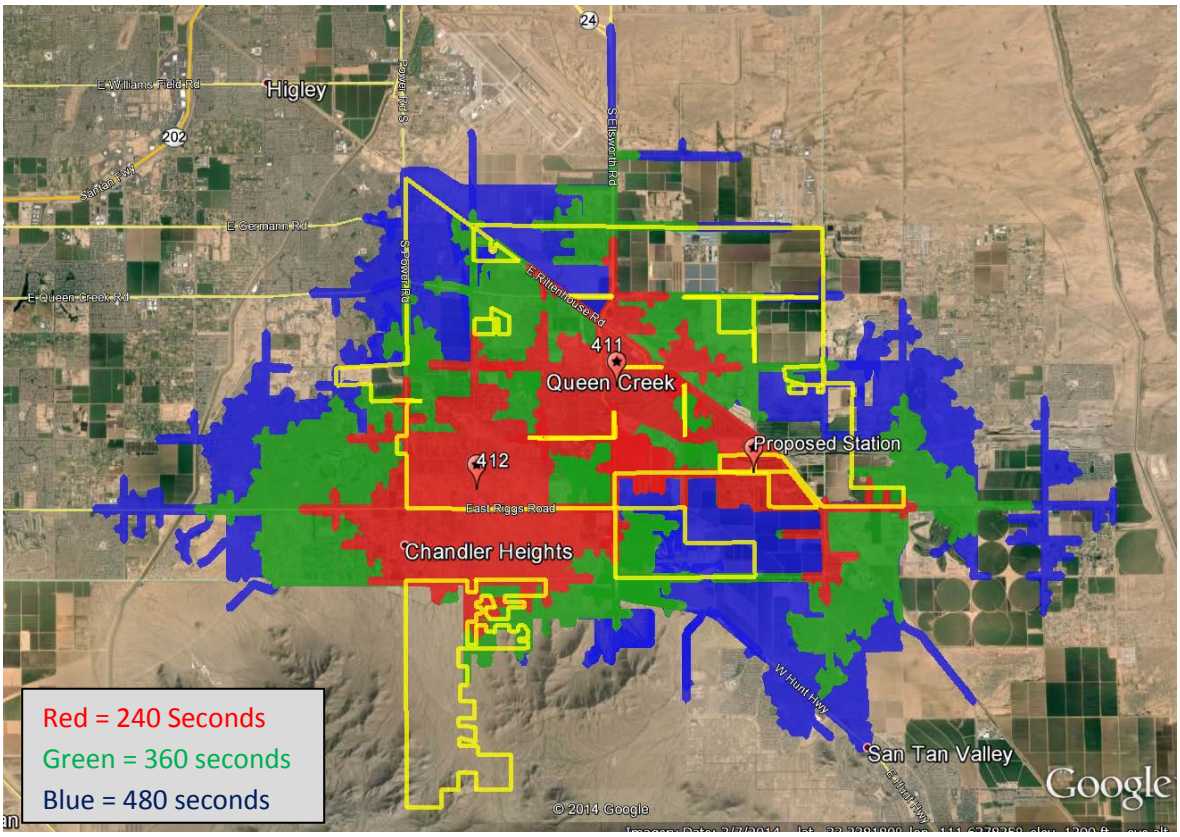
Figures 24 through 28 illustrate the potential locations of future fire stations utilizing travel times (benchmarked against existing road network). Current and potential future demands based on actual growth are essential factors in this decision making as well. For reference, Figure 21 illustrates current demand. As already discussed, there is, based on current demand and travel time, impetus to begin discussions to relocate station 2 (412) to the northwest portion of the city.

Figure 24: Current Station 1, Proposed Relocation of Station 2, Future Southeast Station



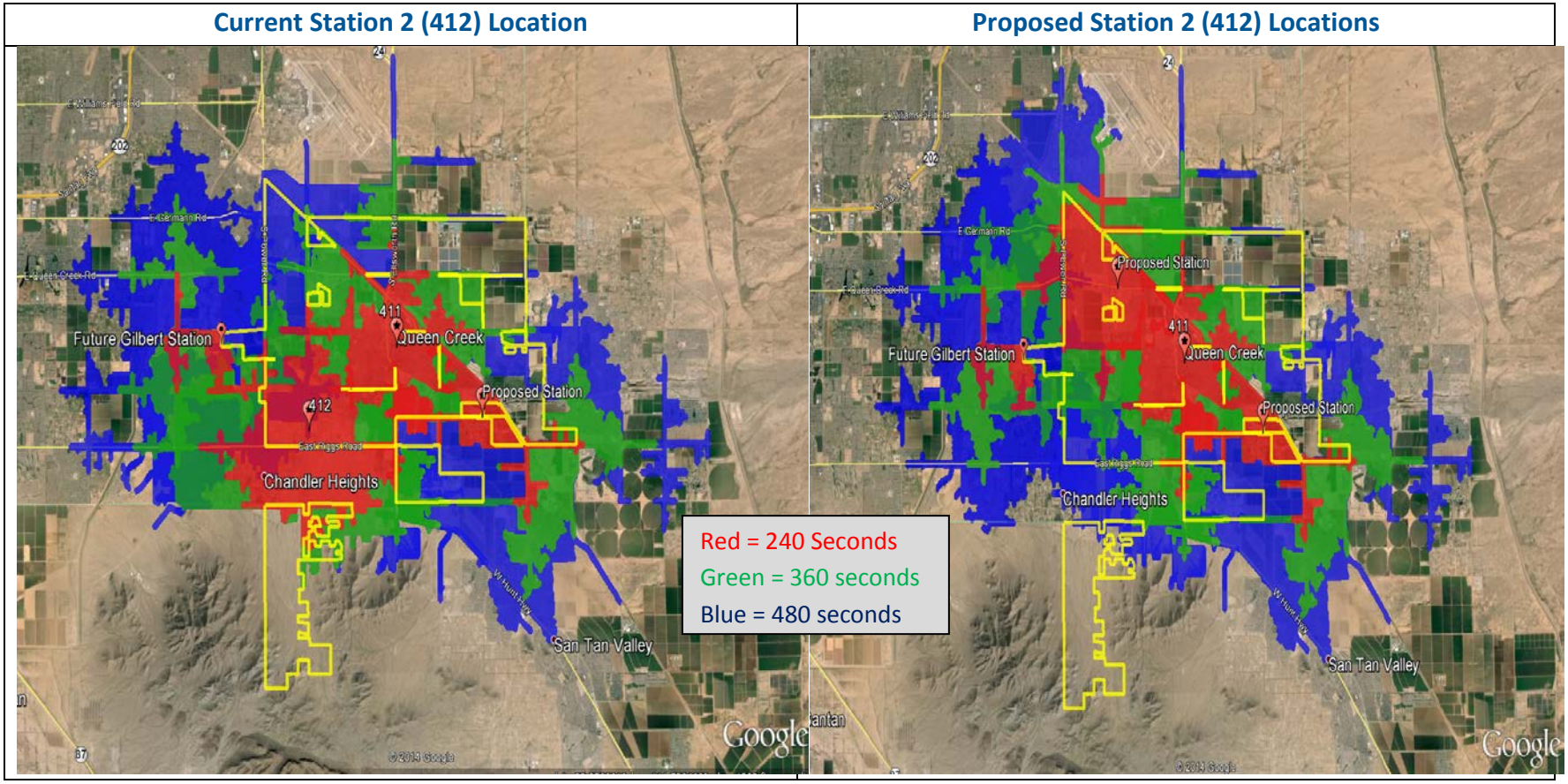
This station configuration serves the call demand as illustrated in Figure 21 in the central core and northeast, and will serve the southeast as growth occurs and demand and travel time become concerns. Because there are areas in town where there is no existing municipal road network, the bleeds stop where they may normally continue. Figure 25 illustrates the current station locations with the addition of the southeast station. In this scenario there remains a gap in travel time service to the higher demand, northwest portion of the town.

Figure 25: Current Stations 1 and 2, Future Southeast Station



One additional consideration when considering the location of station 2 (412) is that Gilbert is considering constructing a fire station in 2018 in the area of Ocotillo and Recker Roads. Figure 26 illustrates the addition of this station into the current discussion of the location of station 2. In consideration of travel time, there is minimal effect on the town of Queen Creek as the proposed Gilbert station offers only secondary relief in the eight- to ten-minute travel time parameter.

Figure 26: Current Stations 1 and 2, Future Southeast Station, Proposed Gilbert Station at Ocotillo and Recker Roads



Figures 27 and 28 illustrate the addition of a station in the northeast portion of the town along with the current station 2 location and the proposed relocation of station 2 to the northwest portion of the city. Due to the lack of a municipal road network in the northeast, the bleeds cannot flow naturally and do not show the completion of the 240- and 360-second travel times.

Figure 27: Current Stations 1 and 2, Future Southeast Station, Future Northeast Station

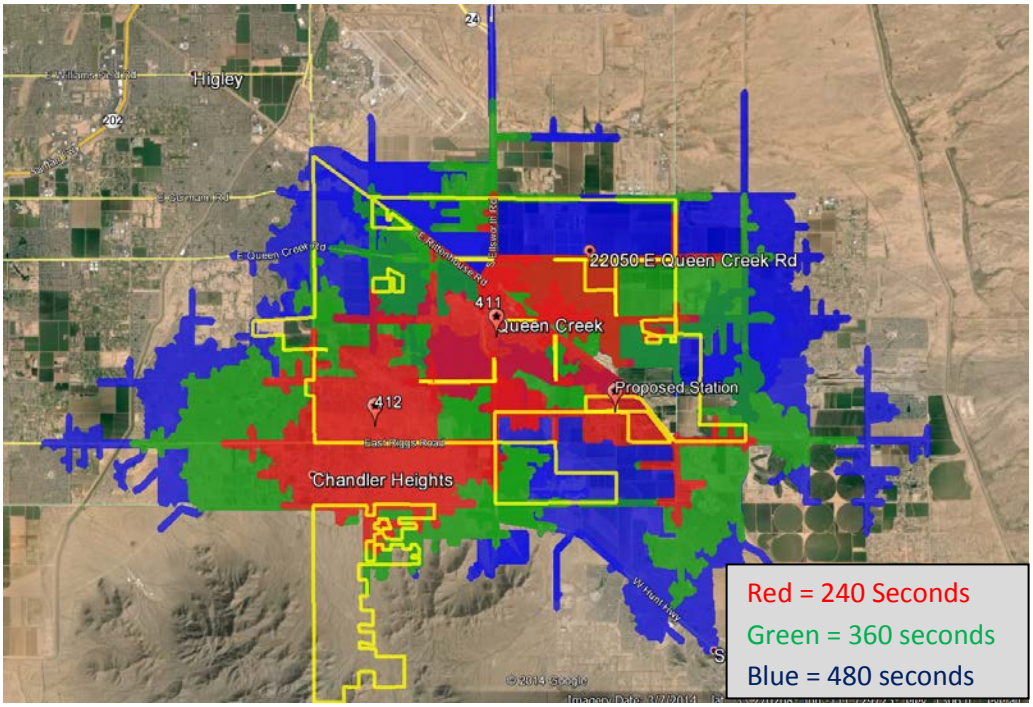
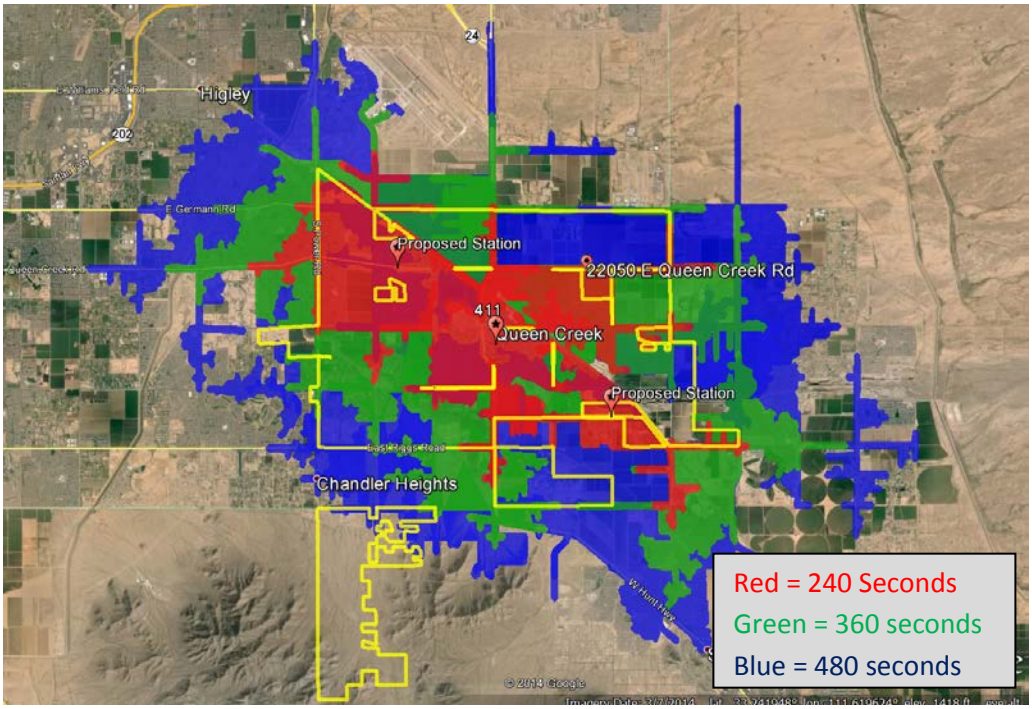
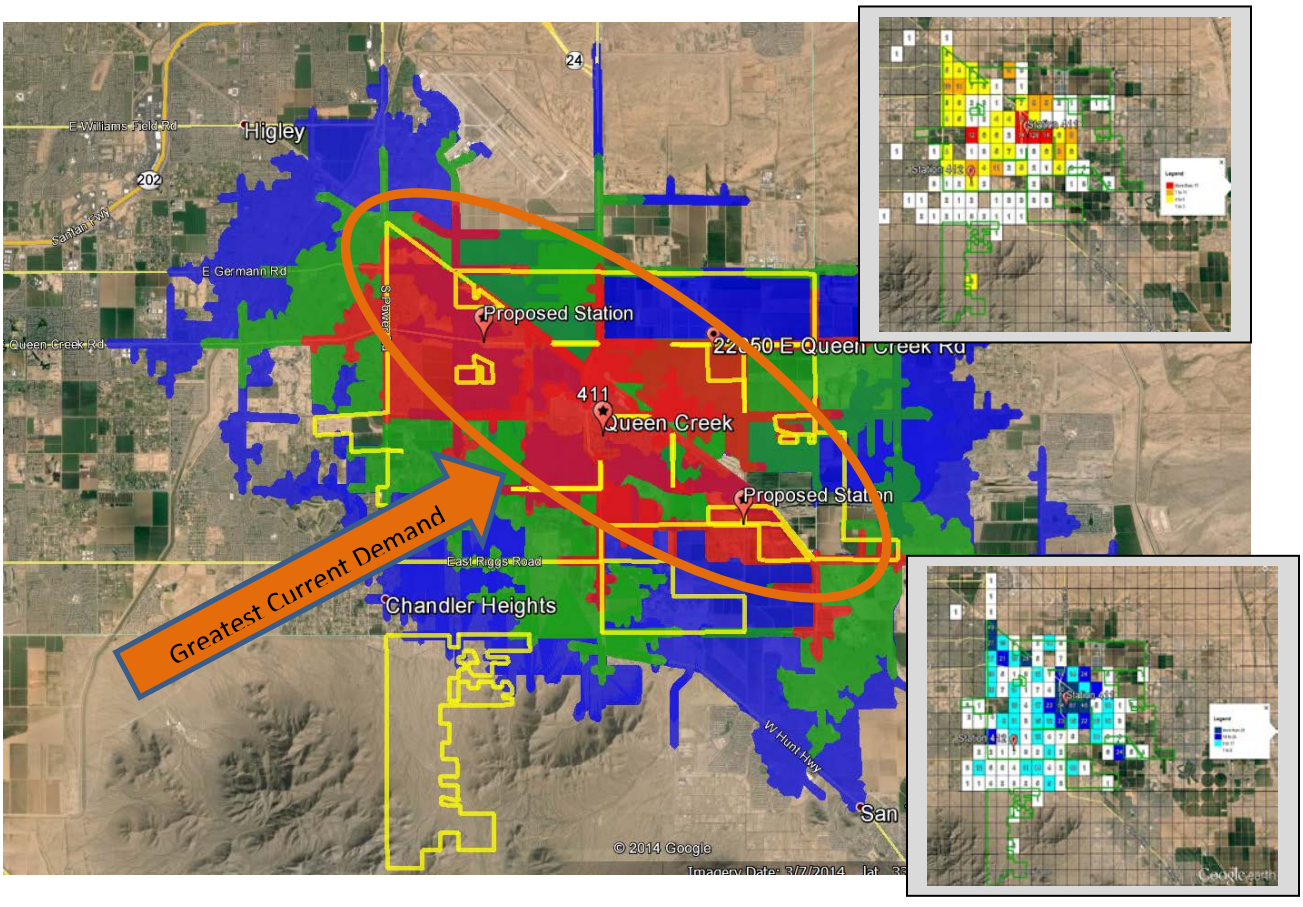


Figure 28: Current Stations 1, Proposed Relocation of Station 2 (Northwest), Future Southeast Station, Future Northeast Station



These maps are presented for consideration as the town plans for future fire stations; they offer a foundational overview of what travel times can be expected (where the current road network allows the bleeds to flow naturally). At minimum, CPSM recommends considering the relocation of station 2, based on current demand, followed by considering, based on short-term development, the location for a third station in the southern portion of the town. CPSM, based on discussion with development services, does not foresee the need for a fourth and fifth station until longer-term development occurs. There was discussion with community development regarding the potential development of the Box Canyon area, which then may drive the need for a fire facility in the southwest area of the town. If, in the short term, development continues at a pace whereby demand for service grows more rapidly than presented herein, there are identified service gaps that then need to be closed by additional stations.

Figure 29: Alternative Station Placement to Serve Current and Future Demand and Growth



Appendix I: Data and Workload Analysis

Introduction

This data analysis was prepared as a key component of the study of the Queen Creek Fire and Medical Department (QCFMD). This analysis examines all calls for service between May 1, 2013, and April 30, 2014, as recorded in the communication center.

This analysis is divided into five sections: the first section focuses on call types and dispatches; the second section explores time spent and workload of individual units; the third section presents analysis of the busiest hours in a year; the fourth section provides a response time analysis of QCFMD units; and the fifth section primarily analyzes Southwest EMS transports and its response time performance.

During the period covered by this study, the department operated out of two stations. The department deploys two engines and a command unit 24 hours a day, 7 days a week. When needed, the department utilizes one tender and one brush truck.

During the study period, the department responded to 2,073 calls, including 360 mutual aid calls. In addition, the department has received automatic aid from contiguous fire departments for 340 calls with no QCFMD unit responding. This is included in the total call count for the town (see Tables D-1 and D-1a). The total combined yearly workload (deployed time) for all QCFMD units was 1,061 hours. The average estimated dispatch time of the first arriving QCFMD unit was 0.9 minutes and the average response time of the first arriving QCFMD unit was 6.0 minutes. The 90th percentile dispatch time was 1.5 minutes and the 90th percentile response time was 8.9 minutes, which means that QCFMD units had a response time of less than 8.9 minutes for 90 percent of these calls. Southwest Ambulance provided transport service on 958 calls, averaging 2.6 transport calls per day. For EMS calls, the transport rate was 76 percent. The average estimated dispatch time of the first arriving Southwest Ambulance was 1.2 minutes and the average response time of the first arriving Southwest Ambulance was 7.6 minutes.

Methodology

In this report, we analyze calls and runs. A call is an emergency service request or incident. A run is a dispatch of a unit. Thus, a call might include multiple runs.

We received National Fire Incident Reporting System (NFIRS) data for the Queen Creek Fire and Medical Department. We first validated randomly selected sample data with printed CAD incident reports. We classified the calls in a series of steps. We first used the NFIRS mutual aid field to accurately identify mutual aid calls from the QCFMD perspective. Then, we used NFIRS incident type to assign EMS, MVA, fire category, and canceled call types. For NFIRS EMS calls, we used the NFIRS EMS reason to assign detailed EMS categories. Lastly, we overrode calls to be canceled calls if all responding QCFMD units were canceled en route. The classification between NFIRS incident type and call type is documented in Attachment IV. A transport call was identified by requiring that at least one Southwest Ambulance unit provided transport service and was not canceled en route.

A total of nine incidents to which support units (bike, support, and gator) were the sole responders are not included in the analysis sections of the report. Nevertheless, the workload of support units is documented in Attachment I. In this report, mutual aid and canceled calls are not included in the analysis of call duration and response time analysis.

Aggregate Call Totals and Dispatches

In this report, each citizen-initiated emergency service request is a call. During the year studied, QCFMD responded to 2,073 calls. Of these, 12 were structure fire calls and 55 were outside fire calls within QCFMD's jurisdiction. Each dispatched unit is a separate "run." As multiple units are dispatched to a call, there are more runs than calls. The department's total runs and workload are reported in the second section of this data analysis.

Table D-1: Call Types

Call Type	Number of Calls	Calls per Day	Call Percentage
Cardiac and stroke	120	0.3	5.0
Seizure and unconsciousness	139	0.4	5.8
Breathing difficulty	109	0.3	4.5
Overdose and psychiatric	101	0.3	4.2
MVA	206	0.6	8.5
Fall and injury	251	0.7	10.4
Illness and other	240	0.7	9.9
EMS Total	**1,166**	**3.2**	**48.3**
Structure fire	12	0.0	0.5
Outside fire	55	0.2	2.3
Hazard	31	0.1	1.3
False alarm	105	0.3	4.4
Good intent	27	0.1	1.1
Public service	180	0.5	7.5
Fire Total	**410**	**1.1**	**17.0**
Mutual/automatic aid given	360	1.0	14.9
Canceled	137	0.4	5.7
Automatic aid received without QCFM unit	340	0.9	14.1
Total	**2,413**	**6.6**	**100.0**

Observations:

- The department received an average of 6.6 calls, including 0.9 calls automatic aid received calls without QCFM unit responding.

- EMS calls for the year totaled 1,166 (48 percent of all calls), averaging 3.2 per day.
- Fire calls for the year totaled 410 (17 percent of all calls), averaging 1.1 per day.
- Structure and outside fires combined for a total of 67 calls during the year, an average of 0.2 calls per day.
- Mutual or automatic aid given calls totaled 360 (17 percent of all calls), averaging 1.0 per day. Of these mutual aid calls, 10 were structure fires and 16 were outside fires.

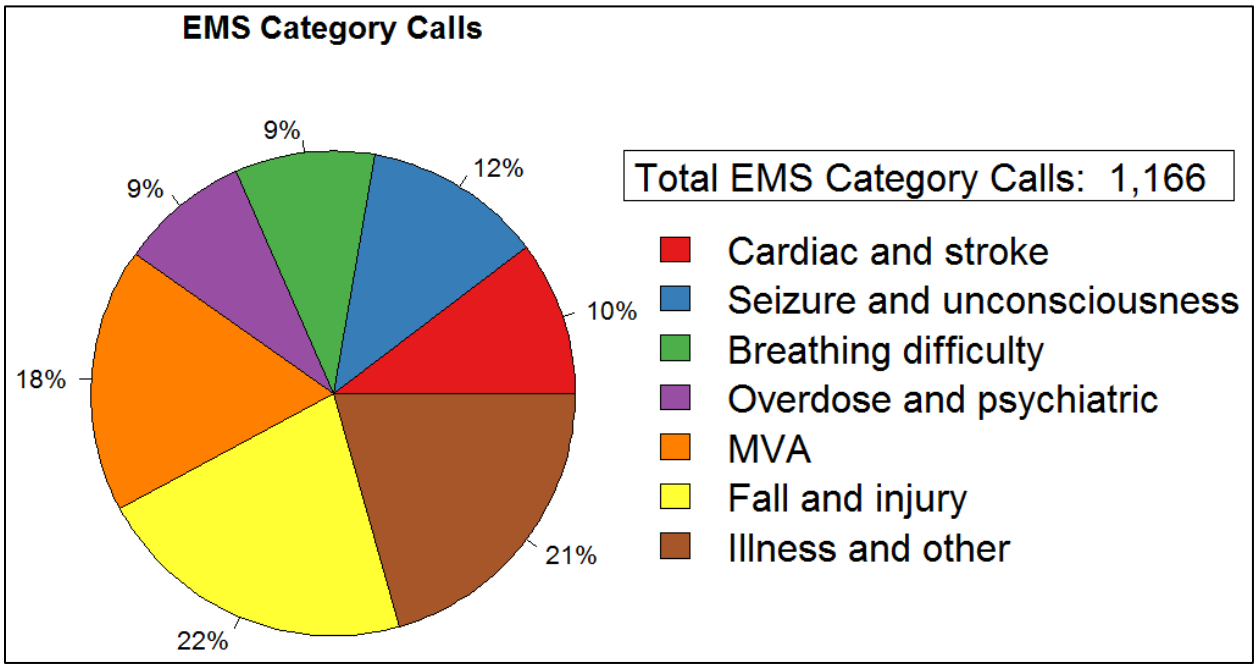
Table D-1a: Automatic Aid Received Calls by Call Type

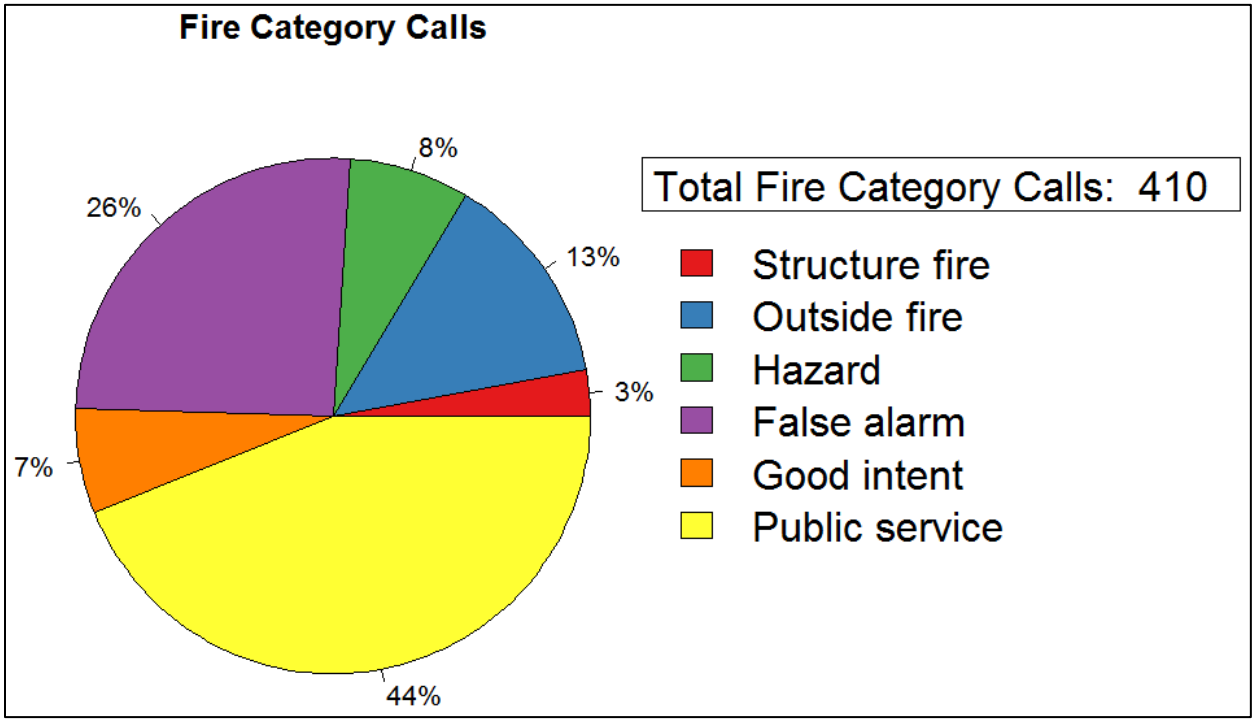
Call Type	Number of Automatic Aid Received Calls		
	With QCFM Unit	Without QCFM Units	Total
Cardiac and stroke	3	25	28
Seizure and unconsciousness	3	13	16
Breathing difficulty	1	24	25
Overdose and psychiatric	2	8	10
MVA	27	10	37
Fall and injury	10	42	52
Illness and other	5	40	45
EMS Total	**51**	**162**	**213**
Structure fire	9	0	9
Outside fire	6	5	11
Hazard	9	1	10
False alarm	1	34	35
Good intent	4	4	8
Public service	2	105	107
Fire Total	**31**	**149**	**180**
Canceled	7	29	36
Total	**89**	**340**	**429**
Daily Average	**0.2**	**0.9**	**1.2**

Observations:

- QCFMD received automatic aid for 429 calls in a year, averaging 1.2 calls per day.
- Of the 429 automatic aid-received calls, 340 (79 percent) had no QCFMD unit responding.
- A total of 213 automatic aid-received calls were EMS calls (50 percent); and 9 were structure fire calls, and 11 were outside fire calls.

Figure D-1: EMS and Fire Calls by Type

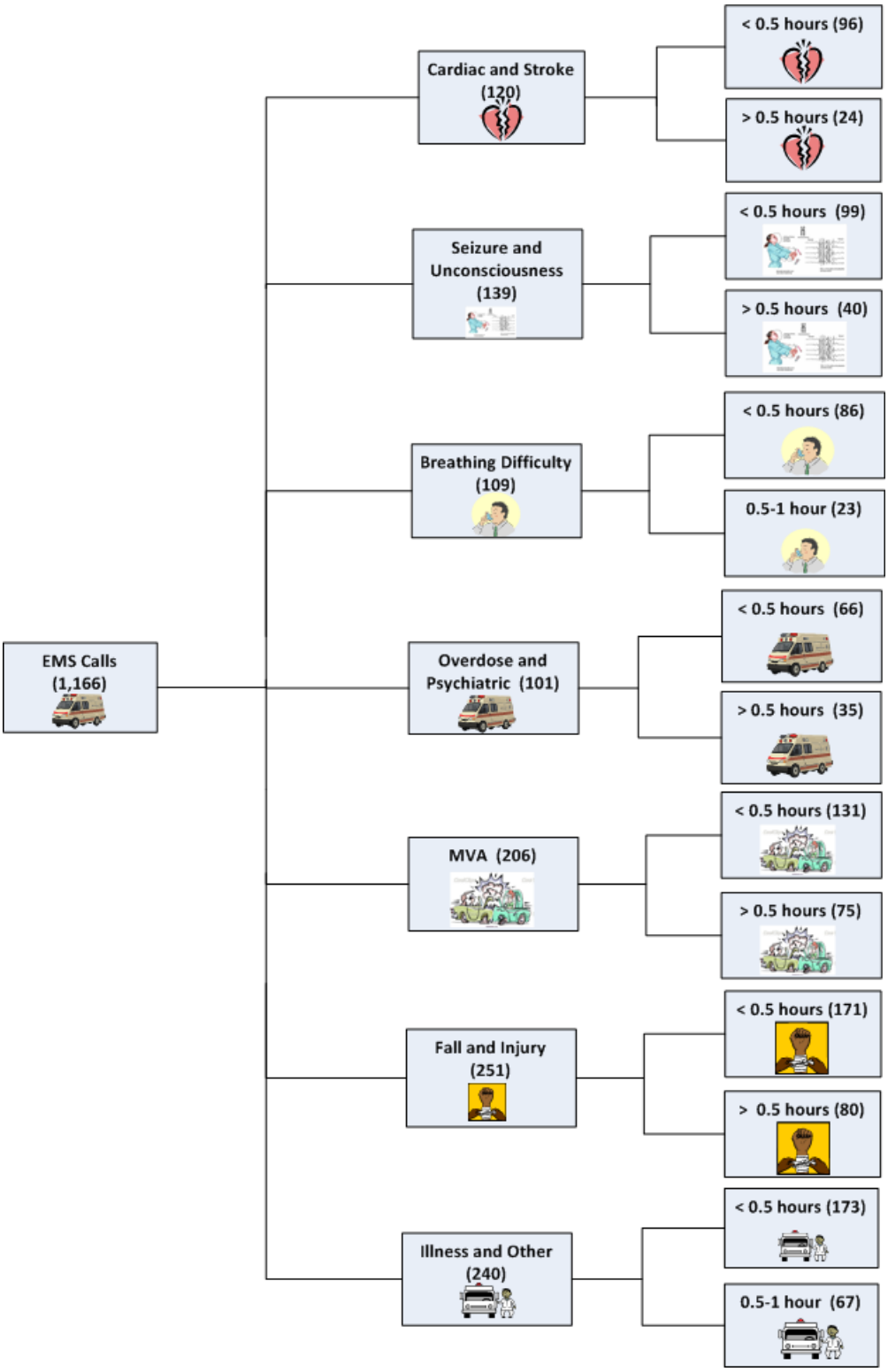




Observations:

- A total of 12 structure fire calls accounted for 3 percent of the fire category total.
- A total of 55 outside fire calls accounted for 13 percent of the fire category total.
- Public service calls were the largest fire call category, making up 44 percent of the fire category total.
- False alarm calls were 26 percent of the fire category total.
- Fall and injury calls were the largest EMS call category and accounted for 22 percent of the EMS category total.
- Cardiac or stroke calls were 10 percent of the EMS category total.
- Motor vehicle accidents calls were 18 percent of the EMS category total.

Figure D-2: EMS Calls by Type and Duration

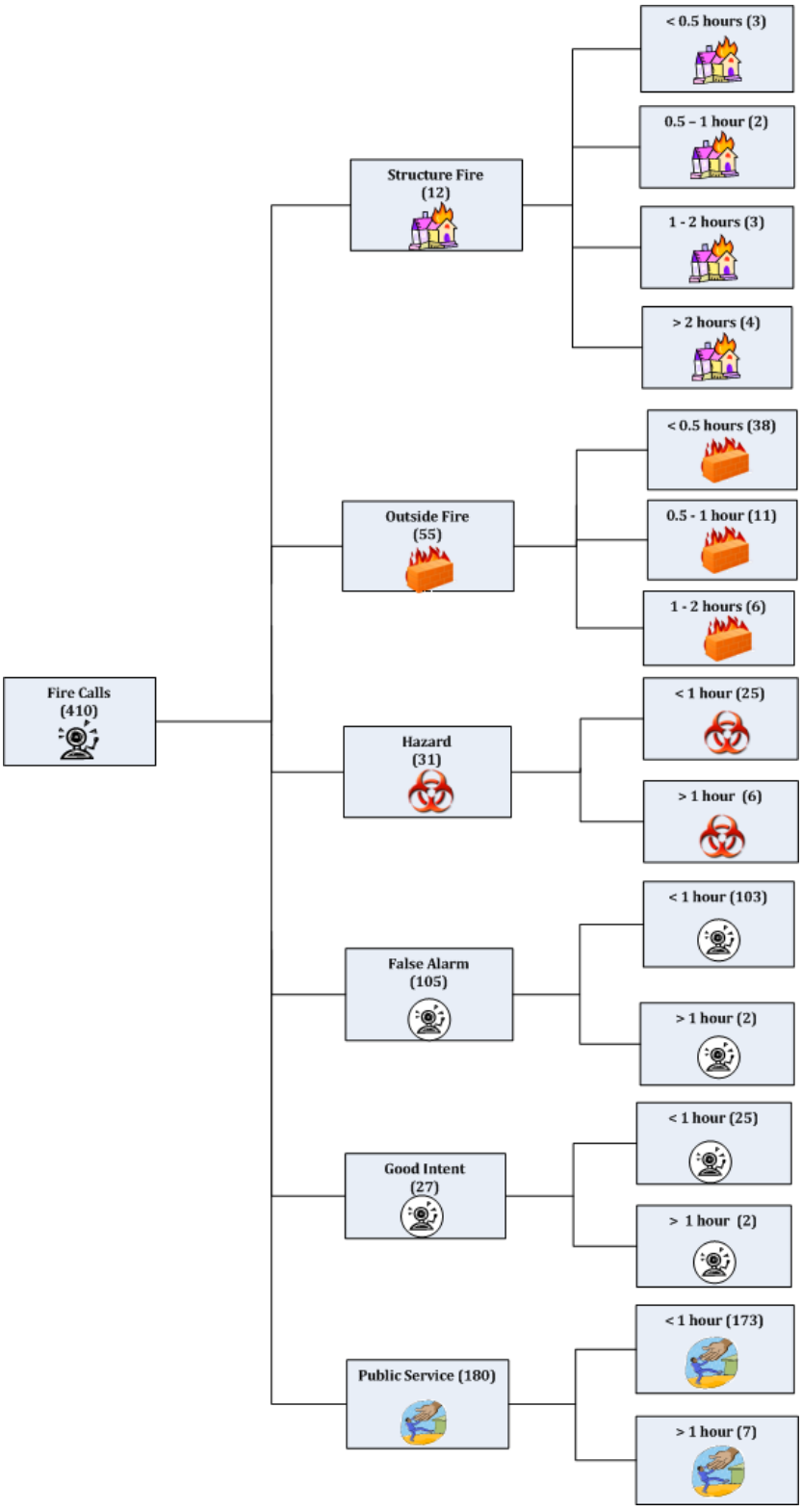


Note: Duration of a call is defined as the longest deployed time of any of the QCFMD units responding to the same call.

Observations:

- A total of 822 EMS category calls (70 percent) lasted less than half an hour, 319 EMS category calls (27 percent) lasted between half an hour and one hour, and 25 EMS category calls (13 percent) lasted more than one hour.
- A total of 96 cardiac and stroke calls (80 percent of this category of call) lasted less than half an hour, 22 (18 percent) lasted between half an hour and one hour, and 2 cardiac and stroke calls (2 percent) lasted more than an hour.
- A total of 131 motor vehicle accidents (64 percent of this category of call) lasted less than half an hour, 63 (31 percent) lasted between half an hour and one hour, and 12 motor vehicle accident calls (5 percent) lasted more than an hour.

Figure D-3: Fire Calls by Type and Duration

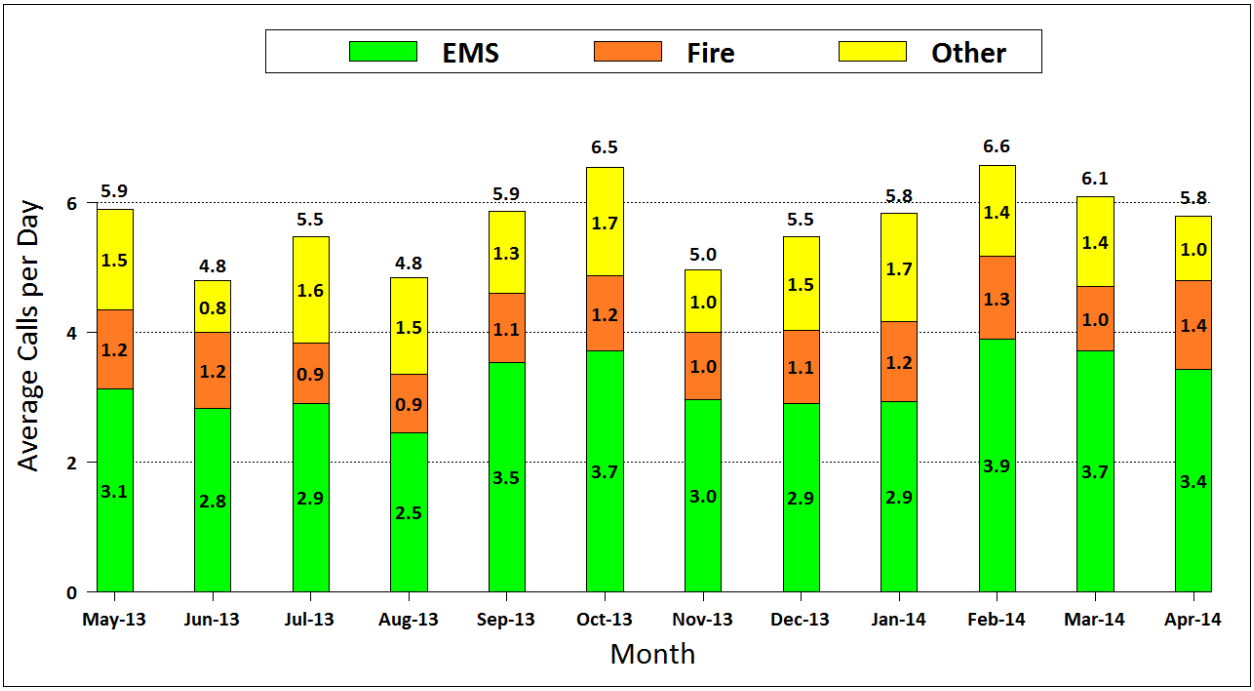


Note: Duration of a call is defined as the longest deployed time of any of the QCFMD units responding to the same call.

Observations:

- A total of 380 fire category calls (93 percent) lasted less than one hour, 21 fire category calls (5 percent) lasted between one and two hours, and 9 fire category calls (2 percent) lasted more than two hours.
- A total of 5 structure fires (42 percent of this category of call) lasted less than one hour, 3 structure fires (25 percent) lasted between one and two hours, and 4 structure fires (33 percent) lasted more than two hours.
- A total of 49 outside fires (89 percent of this category of call) lasted less than one hour, and 6 outside fires (11 percent) lasted between one and two hours.
- A total of 103 false alarms (98 percent of this category of call) lasted less than one hour, and 2 false alarms (2 percent) lasted between one and two hours.

Figure D-4: Average Calls per Day, by Month



Observations:

- Averages calls per day ranged from a low of 4.8 calls per day in June, and August 2013 to a high of 6.6 calls per day in February 2014. The highest monthly average was 37 percent greater than the lowest monthly average.
- Averages EMS calls per day ranged from a low of 2.5 calls per day in August 2013 to a high of 3.9 calls per day in February 2014. The highest monthly average was 59 percent greater than the lowest monthly average.
- Averages fire calls per day ranged from a low of 0.9 calls per day in August 2013 to a high of 1.4 calls per day in April 2014. The highest monthly average was 51 percent greater than the lowest monthly average.
- Average mutual aid/canceled calls per day ranged from a low of 0.8 calls per day in June 2013 to a high of 1.7 calls per day in October 2013 and January 2014.
- The most calls received in a single day were 14. That occurred on February 13, 2013. Those 14 calls included 7 EMS calls, 1 hazard call, 1 false alarm call, 1 public service call, 3 canceled calls, and 1 mutual aid call. Three days (December 10, 2013, May 9, 2013, and October 17, 2013) each saw 13 calls in a day.

Figure D-5: Calls by Hour of Day

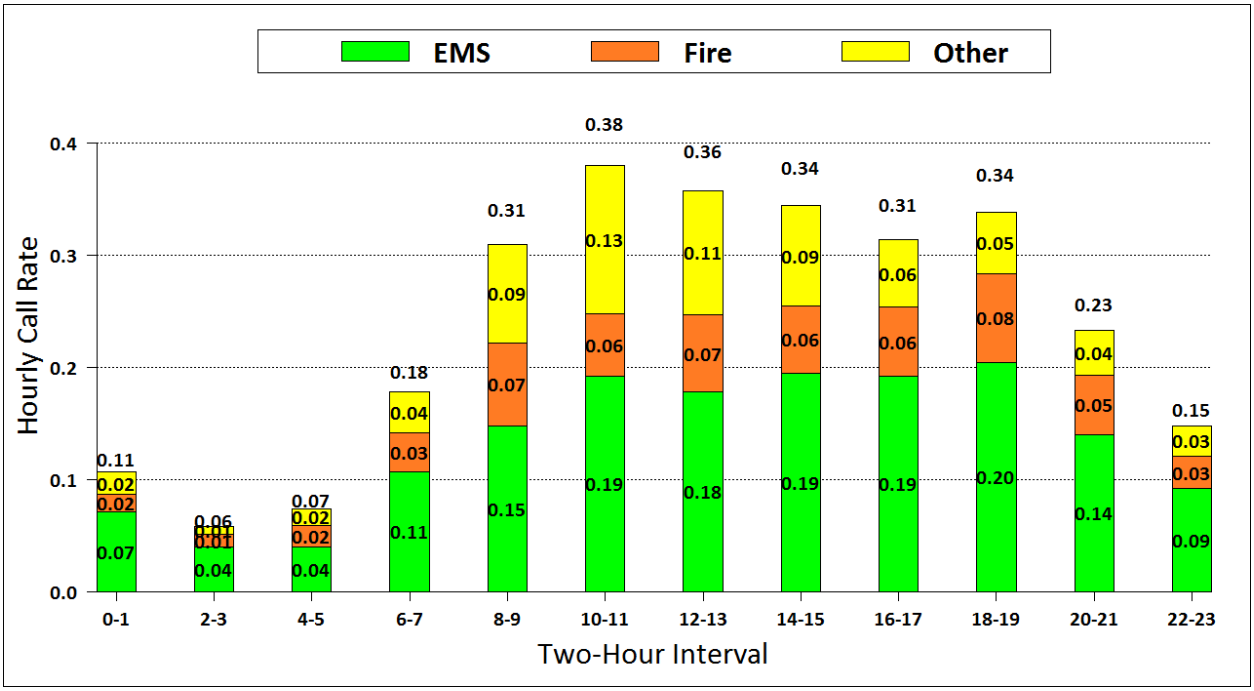


Table D-2: Calls by Hour of Day

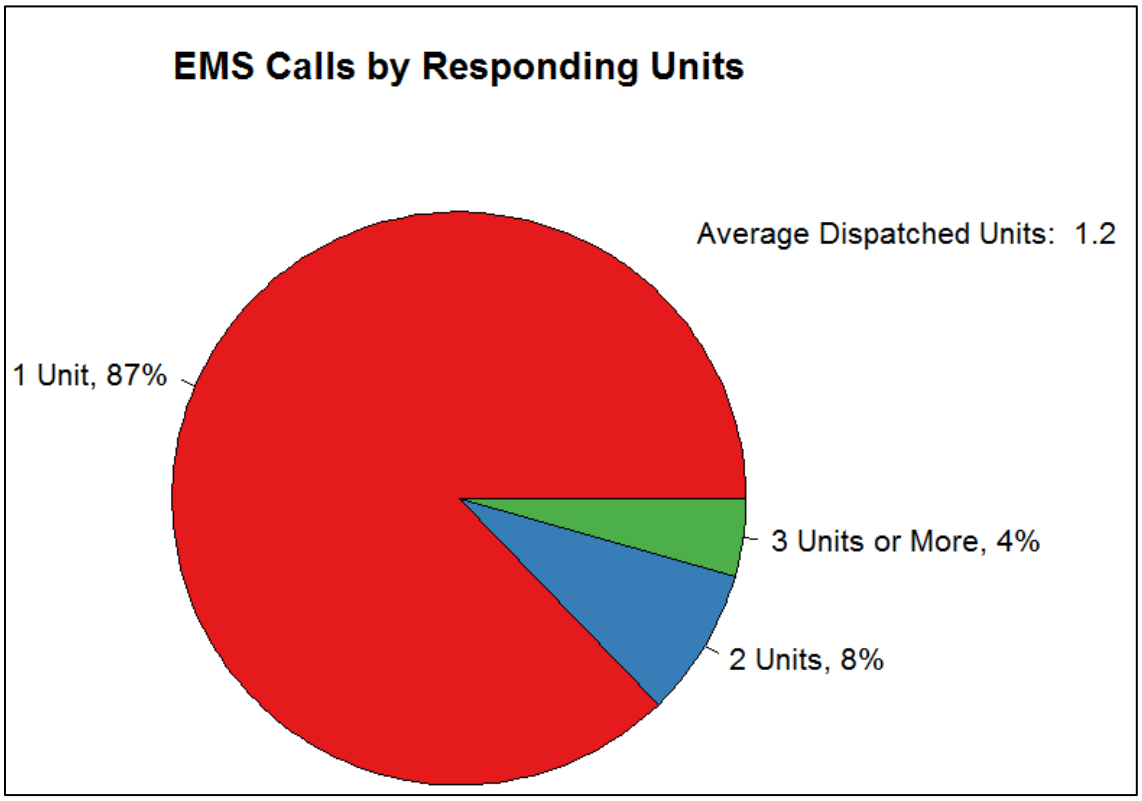
Two-Hour Interval	Hourly Call Rate			
	EMS	Fire	Other	Total
0-1	0.07	0.02	0.02	0.11
2-3	0.04	0.01	0.01	0.06
4-5	0.04	0.02	0.02	0.07
6-7	0.11	0.03	0.04	0.18
8-9	0.15	0.07	0.09	0.31
10-11	0.19	0.06	0.13	0.38
12-13	0.18	0.07	0.11	0.36
14-15	0.19	0.06	0.09	0.34
16-17	0.19	0.06	0.06	0.31
18-19	0.20	0.08	0.05	0.34
20-21	0.14	0.05	0.04	0.23
22-23	0.09	0.03	0.03	0.15
Calls per Day	**3.19**	**1.12**	**1.36**	**5.68**

Note: Average calls per day shown are the sum of each column multiplied by two, since each cell represents two hours.

Observations:

- Hourly call rates averaged between 0.06 calls and 0.38 calls per hour.
- Call rates were highest during the day between 8 a.m. and 8 p.m., averaging between 0.31 and 0.38 calls per hour.
- Call rates were lowest between midnight and 8 a.m., averaging between 0.06 and 0.18 calls per hour. That is equivalent to an average of 0.8 calls in the eight-hour period.

Figure D-6: Number of Units Dispatched to Calls



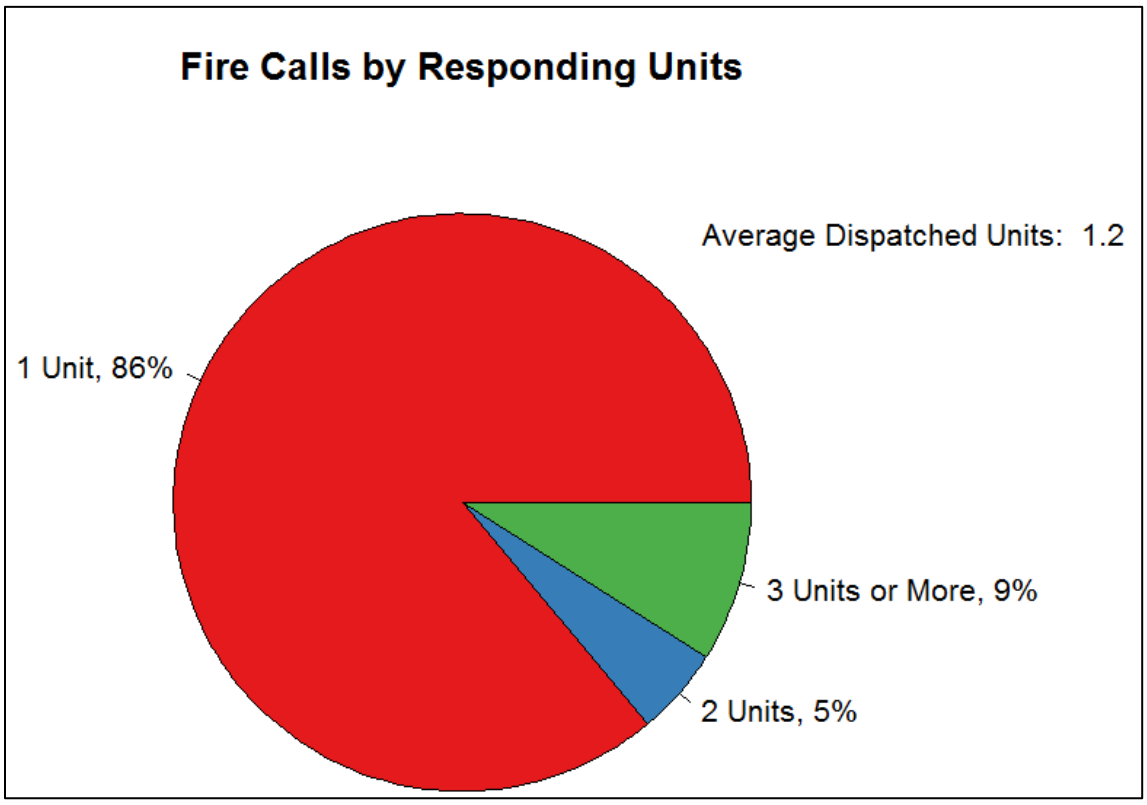


Table D-3: Number of Queen Creek Fire & Medical Units Dispatched to Calls

Call Type	Number of QCFM Units			
	One	Two	Three or More	Total
Cardiac and stroke	101	17	2	120
Seizure and unconsciousness	129	10	0	139
Breathing difficulty	103	6	0	109
Overdose and psychiatric	96	5	0	101
MVA	145	27	34	206
Fall and injury	223	17	11	251
Illness and other	220	16	4	240
EMS Total	**1,017**	**98**	**51**	**1,166**
Structure fire	2	0	10	12
Outside fire	35	5	15	55
Hazard	22	2	7	31
False alarm	103	2	0	105
Good intent	23	1	3	27
Public service	168	10	2	180
Fire Total	**353**	**20**	**37**	**410**
Mutual aid	301	48	11	360
Canceled	120	12	5	137
Total	**1,791**	**178**	**104**	**2,073**
Percentage	**86.4**	**8.6**	**5.0**	**100.0**

Observations:

- On average, 1.2 units were dispatched per fire category call.
- For fire category calls, one unit was dispatched 86 percent of the time, two units were dispatched 5 percent of the time, and three or more units were dispatched 9 percent of the time.
- For structure fire calls, one unit was dispatched 17 percent of the time, and three or more units were dispatched 83 percent of the time.
- For outside fire calls, one unit was dispatched 64 percent of the time, two units were dispatched 9 percent of the time, and three or more units were dispatched 27 percent of the time.
- On average, 1.2 units were dispatched per EMS category call.
- For EMS category calls, one unit was dispatched 87 percent of the time, two units were dispatched 8 percent of the time, and three or more units were dispatched 4 percent of the time.

Table D-4: Annual Deployed Time by Call Type

Call Type	Average Deployed Minutes per Run	Annual Hours	Percent of Total Hours	Deployed Minutes per Day	Annual Number of Runs	Runs per Day
Cardiac and stroke	25.4	60	5.7	9.9	142	0.4
Seizure and unconsciousness	25.6	64	6.0	10.5	149	0.4
Breathing difficulty	24.0	46	4.3	7.6	115	0.3
Overdose and psychiatric	27.2	48	4.5	7.9	106	0.3
MVA	28.6	146	13.7	24.0	306	0.8
Fall and injury	27.2	132	12.4	21.6	290	0.8
Illness and other	28.3	125	11.7	20.5	264	0.7
EMS Total	**27.1**	**620**	**58.4**	**101.9**	**1,372**	**3.8**
Structure fire	89.1	50	4.8	8.3	34	0.1
Outside fire	24.6	39	3.6	6.3	94	0.3
Hazard	40.3	32	3.0	5.2	47	0.1
False alarm	17.0	30	2.9	5.0	107	0.3
Good intent	32.0	18	1.7	3.0	34	0.1
Public service	19.9	64	6.1	10.6	194	0.5
Fire Total	**27.5**	**233**	**22.0**	**38.4**	**510**	**1.4**
Mutual aid	26.8	193	18.2	31.7	431	1.2
Canceled	5.7	15	1.4	2.5	159	0.4
Total	**25.8**	**1,061**	**100.0**	**174.4**	**2,472**	**6.8**

Note: Each dispatched unit is a separate "run." As multiple units are dispatched to a call, there are more runs than calls. Therefore, the department responded to 5.7 calls per day and had 6.8 runs per day.

Observations:

- Total deployed time for the year, or deployed hours, was 1,061. This is the total deployment time of all the units deployed on all type of calls, including 193 hours spent on mutual aid calls. The deployed hours for all units combined averaged approximately 2.9 hours per day.
- There were 2,472 runs, including 431 runs dispatched for mutual aid calls. The daily average was 6.8 runs for all units combined.
- Fire category calls accounted for 22.0 percent of the total workload.
- There were 128 runs for structure and outside fire calls, with a total workload of 89 hours. This accounted for 8.4 percent of the total workload. The average deployed time for structure fire calls was 89.1 minutes, and the average deployed time for outside fire calls was 24.6 minutes.

- EMS calls accounted for 58.4 percent of the total workload. The average deployed time for EMS calls was 27.1 minutes. The deployed hours for all units dispatched to EMS calls averaged 1.7 hours per day.

Workload by Individual Unit–Calls and Total Time Spent

In this section, the actual time spent by each unit on calls is reported in two types of statistics: workload and runs. A dispatch of a unit is defined as a run; thus one call might include multiple runs. The deployed time of a run is from the time a unit is dispatched through the time a unit is cleared.

Table D-5: Call Workload by Unit

Station	Unit Type	Unit ID	Average Deployed Minutes per Run	Annual Number of Runs	Annual Hours	Runs per Day	Deployed Hours per Day
Station 411	Command	B411	32.2	267	143.5	0.7	0.4
	Engine	E411	23.4	1,311	510.6	3.6	1.4
	Tender	T411	10.5	11	1.9	0.0	NA
Station 412	Brush	BR412	75.5	23	28.9	0.1	NA
	Engine	E412	26.2	860	376.1	2.4	1.0

Observations:

- Engine E411 made the most runs, averaging 3.6 runs and 1.4 hours of deployed time per day.
- Engine E412 averaged 2.4 runs and 1.0 hours of deployed time per day.
- Command unit B411 averaged 0.7 runs and 0.4 hours of deployed time per day.
- Brush truck was utilized 23 times in a year.
- Tender unit was utilized 11 times in a year.

Figure D-7: Deployed Minutes by Hour of Day

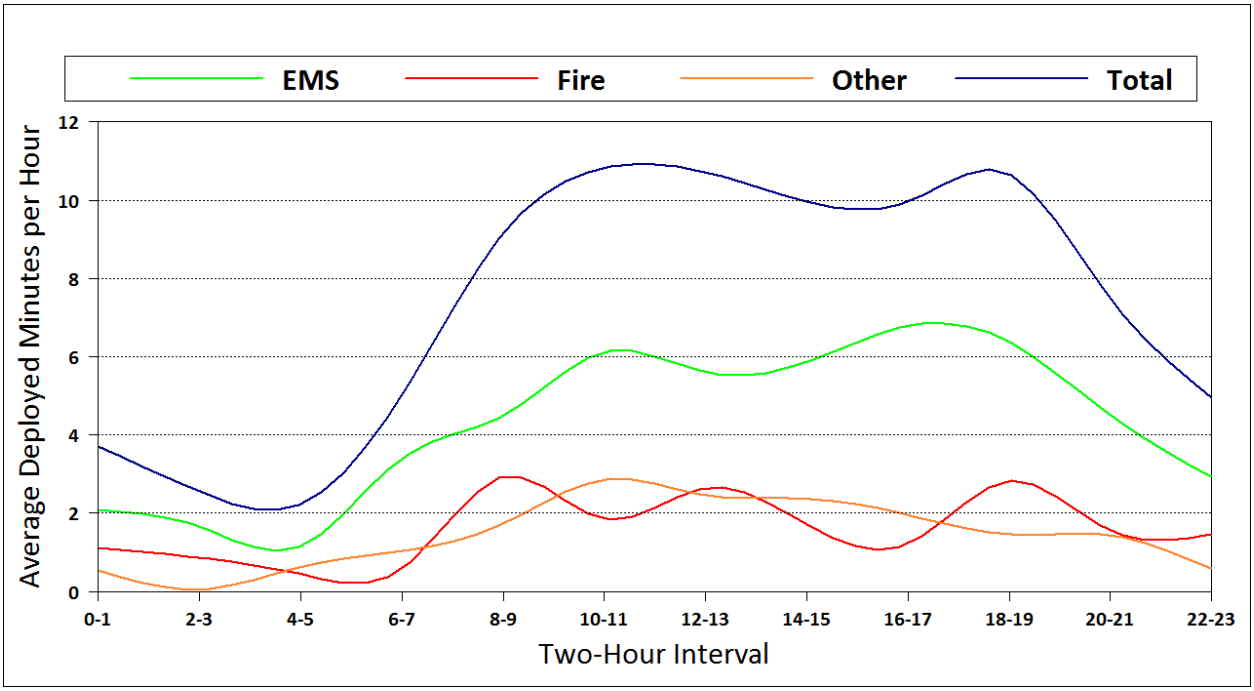


Table D-6: Deployed Minutes by Hour of Day

Two-Hour Interval	EMS	Fire	Other	Total
0-1	2.1	1.1	0.5	3.7
2-3	1.6	0.9	0.0	2.6
4-5	1.2	0.4	0.6	2.2
6-7	3.4	0.6	1.0	5.0
8-9	4.5	2.9	1.7	9.1
10-11	6.1	1.8	2.9	10.8
12-13	5.6	2.6	2.5	10.7
14-15	5.9	1.7	2.4	10.0
16-17	6.8	1.2	2.0	10.0
18-19	6.4	2.8	1.5	10.7
20-21	4.5	1.6	1.4	7.5
22-23	2.9	1.5	0.6	5.0
Daily Total	101.9	38.4	34.2	174.4

Note: Daily totals shown equal the sum of each column multiplied by two, since each cell represents two hours.

Observations:

- Hourly deployed minutes were highest during the day between 8 a.m. and 8 p.m., averaging between 9.1 minutes and 10.8 minutes per hour. Average deployed minutes peaked between 10 a.m. and 12 p.m., averaging about 10.8 minutes per hour.
- Hourly deployed minutes were the lowest between midnight and 6 a.m., averaging between 2.2 minutes and 3.7 minutes per hour.

Table D-7: Total Annual and Daily Average Number of Runs by Call Type and Unit

Station	Unit Type	Unit	EMS	**Structure Fire**	**Outside Fire**	Hazard	False Alarm	Good Intent	Public Service	Mutual aid	Canceled	**Total**	**Runs per Day**
Station 411	Command	B411	130	**11**	**13**	11	2	4	3	81	12	**267**	**0.7**
	Engine	E411	765	**12**	**28**	25	71	18	114	187	91	**1,311**	**3.6**
	Tender	T411	1	**1**	**4**	0	0	0	1	1	3	**11**	**NA**
Station 412	Brush	BR412	1	**0**	**9**	0	0	0	5	2	6	**23**	**NA**
	Engine	E412	475	**10**	**40**	11	34	12	71	160	47	**860**	**2.4**

Note: A dispatch of a unit is defined as a *run*; thus a call might include multiple runs

Observations:

- Engine E411 had the most runs during the year and it averaged 3.6 runs per day. However, most of the runs were EMS responses, and structure and outside fire calls only totaled 40 runs during the year.
- Engine E412 averaged 2.4 runs per day. Structure and outside fire calls only totaled 50 runs during the year.
- Command unit B411 averaged 0.7 runs per day and it responded to 11 structure fire calls and 13 outside fire calls.

Table D-8: Daily Average Deployed Minutes by Call Type and Unit

Station	Unit Type	Unit	EMS	**Structure Fire**	**Outside Fire**	Hazard	False Alarm	Good Intent	Public Service	Mutual aid	Canceled	**Total**	**Fire Category Calls Percentage**
Station 411	Command	B411	11.1	2.9	0.8	1.5	0.4	0.3	0.2	6.2	0.2	23.6	**52.8**
	Engine	E411	54.8	2.5	1.4	2.5	3.3	0.8	5.2	12.1	1.5	83.9	**34.8**
	Tender	T411	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.3	**80.1**
Station 412	Brush	BR412	0.7	0.0	0.9	0.0	0.0	0.0	1.5	1.5	0.2	4.8	**85.9**
	Engine	E412	35.3	2.9	3.1	1.1	1.3	2.0	3.6	11.9	0.7	61.8	**43.0**

Observations:

- On average, engine E411 was deployed 84 minutes (1 hour and 24 minutes) per day. Fire category calls accounted for 35 percent of its workload.
- On average, engine E412 was deployed 62 minutes (1 hour and 2 minutes) per day. Fire category calls accounted for 43 percent of its workload.
- On average, command vehicle averaged 24 deployed minutes per day, and fire category calls accounted for 53 percent of its total.

Analysis of Busiest Hours

There is significant variability in the number of calls from hour to hour. One special concern relates to the fire and EMS resources available for hours with the heaviest workload. We tabulated the data for each of the 8,760 hours in the year. Approximately once every 12.6 days, the Queen Creek Fire & Medical Department responded to three or four calls in an hour. This occurred in 0.3 percent of the total number of hours in the year studied. We report the top ten hours with the most calls received and discuss the two hours with the most calls received.

Table D-9: Frequency Distribution of the Number of Calls

Number of Calls in an Hour	Frequency	Percentage
0	6,968	79.5
1	1,541	17.6
2	222	2.5
3	28	0.3
4	1	0.0

Observations:

- During 29 hours (0.3 percent of all hours), three or four calls occurred; in other words, the QCFMD responded to three or four calls in an hour roughly once every 12.6 days.
- Two calls occurred during 222 hours of the year; this means that QCFMD responded to two calls in an hour roughly once every 39 hours.

Table D-10: Top 10 Hours with the Most Calls Received

Hour	Number of Calls	Number of Runs	Total Deployed Hours
7/1/2013, 9 a.m. to 10 a.m.	4	4	0.2
10/26/2013, 12 p.m. to 1 p.m.	3	6	2.7
5/9/2013, 6 p.m. to 7 p.m.	3	4	1.2
5/16/2013, 7 a.m. to 8 a.m.	3	4	3.1
7/3/2013, 7 p.m. to 8 p.m.	3	4	0.9
7/31/2013, 11 a.m. to 12 p.m.	3	4	3.1
8/20/2013, 8 a.m. to 9 a.m.	3	4	1.4
9/10/2013, 4 p.m. to 5 p.m.	3	4	1.5
10/17/2013, 7 a.m. to 8 a.m.	3	4	1.0
10/21/2013, 6 p.m. to 7 p.m.	3	4	0.9

Note: The combined workload is the total deployed minutes spent responding to calls received in the hour, and which may extend into the next hour or hours. Number of runs only includes dispatches from QCFM units.

Observations:

- The hour with the most calls received was 9:00 a.m. to 10:00 a.m. on July 1, 2013. Three of the four calls were canceled; and the fourth call was a good intent call, which lasted seven minutes.
- The hour with the most runs was 12:00 p.m. to 1:00 p.m. on October 26, 2013. The three calls involved six individual dispatches. These three calls included one MVA and two fall and injury calls. The combined workload was 2.7 hours. The longest call lasted 30 minutes, and it was a fall and injury call, which was responded to by one QCMF unit. The MVA call was responded to by three QCFMD units, and lasted 63 minutes.

Table D-11: Unit Workload Analysis between 12:00 p.m. and 1:00 p.m. on October 26, 2013

Hour	5-Min. Block	Unit			Number of Busy Units
		Station 411		Station 412	
		B411	E411	E412	
10/26/2013 12:00–1:00 p.m.	0–5				0
	5–10				0
	10–15		0.7	3.1	2
	15–20			5.0	1
	20–25			5.0	1
	25–30		2.7	4.8	2
	30–35	0.6	5.0	5.0	3
	35–40	5.0	5.0	5.0	3
	40–45	5.0	3.4	5.0	3
	45–50	5.0	4.0	5.0	3
	50–55	5.0	5.0	5.0	3
	55–60	5.0	5.0	5.0	3
	Total	25.6	30.9	47.9	

Note: The numbers in the cells are the deployed minutes within the five-minute block. The cell values greater than 2.5 are coded red.

Observations:

- During this hour, three units made four runs and responded to three calls. These three calls included one MVA and two fall and injury calls. The combined workload was 2.7 hours. The longest call lasted 30 minutes, and it was a fall and injury call, which was responded to by one QCMFD unit. The MVA call was responded to by three QCFMD units, and lasted 63 minutes.
- During the busiest 30 minutes in the hour (12:30 to 1:00 p.m.), three units (command unit and two engines) were deployed simultaneously.
- Two units were deployed more than 30 minutes in this hour.

Table D-12: Unit Workload Analysis between 7:00 a.m. and 8:00 a.m. on May 16, 2013

Hour	5-Min. Block	Unit			Number of Busy Units
		Station 411		Station 412	
		B411	E411	E412	
5/16/2013 7:00–8:00 a.m.	0–5			1.8	1
	5–10			5.0	1
	10–15	2.0		5.0	2
	15–20	5.0		5.0	2
	20–25	5.0		5.0	2
	25–30	5.0		5.0	2
	30–35	5.0	2.5	5.0	3
	35–40	5.0	5.0	5.0	3
	40–45	5.0	5.0	5.0	3
	45–50	5.0	5.0	5.0	3
	50–55	5.0	5.0	5.0	3
	55–60	5.0	5.0	5.0	3
	Total	47.0	27.5	56.8	

Note: The numbers in the cells are the deployed minutes within the five-minute block. The cell values greater than 2.5 are coded red.

Observations:

- During this hour, three units made four runs and responded to three calls. These three calls included one seizure and unconsciousness call and two mutual aid calls. The combined workload was 3.1 hours. The longest call lasted 77 minutes, and it was a mutual aid call in Gilbert, which was responded to by two QCMFD units. The seizure and unconsciousness call was responded to by one QCFMD unit, and lasted 36 minutes.
- During the busiest 30 minutes in the hour (7:30 to 8:00 a.m.), three units (command unit and two engines) were deployed simultaneously.
- Two units were deployed more than 30 minutes in this hour.

Dispatch Time and Response Time

This section presents dispatch and response time statistics for different call types and units. Since the first arriving QCFMD units had the shortest response time of all responding units, thus we focus on the dispatch and response time of the first arriving QCFMD units for calls responded with lights and sirens. However, for structure and outside fire calls, we also analyze the response time of the second arriving units.

Different terms are used to describe the components of response time: Dispatch processing time is the difference between the unit dispatch time and call received time of the first arriving unit. Turnout time is the difference between the unit time en route and the unit dispatch time. Travel time is the difference between the unit on-scene arrival time and the time en route. Response time is the difference between the on-scene arrival time and call received time.

In this section, we focused on calls that were responded to with lights and sirens; a total of 1,136 calls were used in the analysis. We provided analysis of average and 90th percentile statistics to measure response time performance. The average dispatch time was 0.9 minutes. The average turnout time was 1.0 minutes, and the average travel time was 4.1 minutes. The average response time for EMS calls was 5.9 minutes, and the average response time for fire category calls was 6.1 minutes. The average response time for structure fire calls was 6.7 minutes. The average response time for outside fire calls was 6.6 minutes. The 90th percentile response time was 8.9 minutes, which means that QCFMD units had a response time of less than 8.9 minutes for 90 percent of these calls.

Table D-13: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Unit, by Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	0.8	1.0	4.1	5.9	116
Seizure and unconsciousness	0.8	1.0	4.2	5.9	135
Breathing difficulty	0.7	1.0	4.1	5.8	105
Overdose and psychiatric	0.8	1.1	4.0	5.8	67
MVA	0.9	0.9	4.1	5.9	199
Fall and injury	1.0	1.0	4.3	6.3	200
Illness and other	0.8	1.0	4.0	5.9	182
EMS Total	**0.8**	**1.0**	**4.1**	**5.9**	**1,004**
Structure fire	0.8	1.2	4.7	6.7	11
Outside fire	0.9	1.1	4.6	6.6	38
Hazard	1.1	0.9	4.4	6.3	13
False alarm	0.8	1.0	3.2	5.0	15
Good intent	1.1	1.0	3.6	5.7	14
Public service	0.9	1.0	4.0	5.9	41
Fire Total	**0.9**	**1.0**	**4.1**	**6.1**	**132**
Total	**0.9**	**1.0**	**4.1**	**6.0**	**1,136**

Figure D-8: Average Dispatch, Turnout, and Travel Times of First Arriving Unit by EMS Call Type

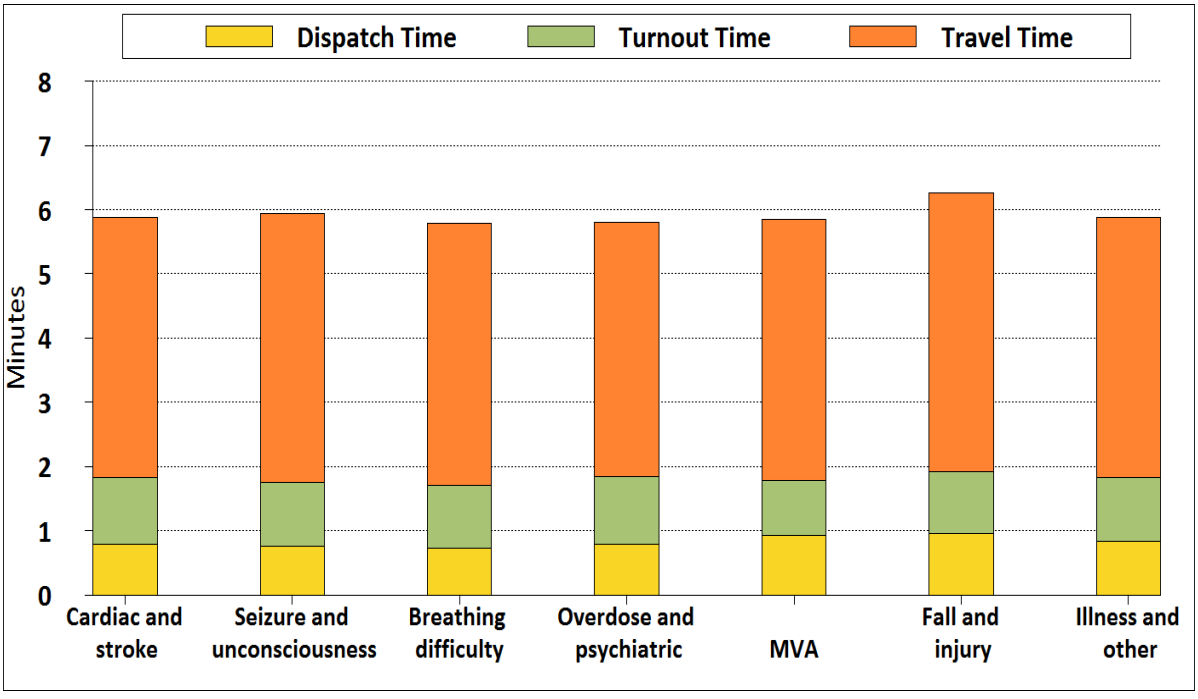
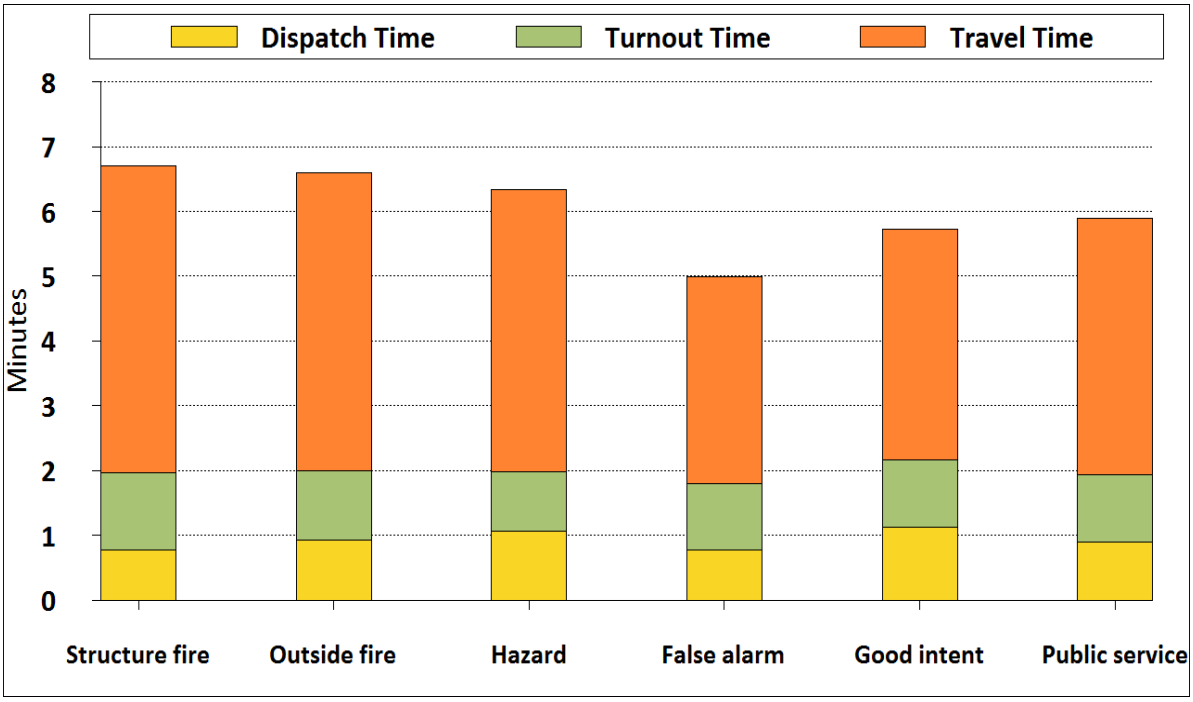


Figure D-9: Average Dispatch, Turnout, and Travel Times of First Arriving Unit, by Fire Call Type



Observations:

- The average dispatch time was 0.9 minutes.
- The average turnout time was 1.0 minutes.
- The average travel time was 4.1 minutes.
- The average response time for EMS calls was 5.9 minutes.
- The average response time for fire category calls was 6.1 minutes.
- The average response time for structure fire calls was 6.7 minutes.
- The average response time for outside fire calls was 6.6 minutes.

Table D-14: 90th Percentile Dispatch, Turnout, Travel, and Response Times of First Arriving Unit, by Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	1.6	1.9	6.7	8.9	116
Seizure and unconsciousness	1.2	1.6	6.4	8.4	135
Breathing difficulty	1.3	1.7	6.4	8.4	105
Overdose and psychiatric	1.2	1.8	6.3	8.5	67
MVA	1.6	1.5	6.8	9.2	199
Fall and injury	1.6	1.6	7.3	9.2	200
Illness and other	1.3	1.6	6.5	8.6	182
EMS Total	**1.4**	**1.6**	**6.7**	**8.8**	**1,004**
Structure fire	1.3	1.9	6.9	9.5	11
Outside fire	1.8	1.6	7.6	9.9	38
Hazard	2.1	1.3	6.5	8.7	13
False alarm	1.6	1.9	5.5	8.0	15
Good intent	2.1	1.9	7.8	9.4	14
Public service	1.6	1.6	6.6	8.9	41
Fire Total	**1.8**	**1.6**	**7.0**	**9.4**	**132**
Total	**1.5**	**1.6**	**6.7**	**8.9**	**1,136**

Note: A 90th percentile value of 8.9 indicates that the total response time was less than 8.9 minutes for 90 percent of all calls. Unlike averages, the 90th percentile response time is not equal to the sum of the 90th percentile of dispatch time, turnout time, and travel time.

Observations:

- The 90th percentile dispatch time was 1.5 minutes.
- The 90th percentile turnout time was 1.6 minutes.
- The 90th percentile travel time was 6.7 minutes.
- The 90th percentile response time for EMS calls was 8.8 minutes.
- The 90th percentile response time for fire category calls was 9.4 minutes.
- The 90th percentile response time for structure fire calls was 9.5 minutes.
- The 90th percentile response time for outside fire calls was 9.9 minutes.

Figure D-10: Average Dispatch, Turnout, Travel, and Response Time of First Arriving Unit, by Hour of Day

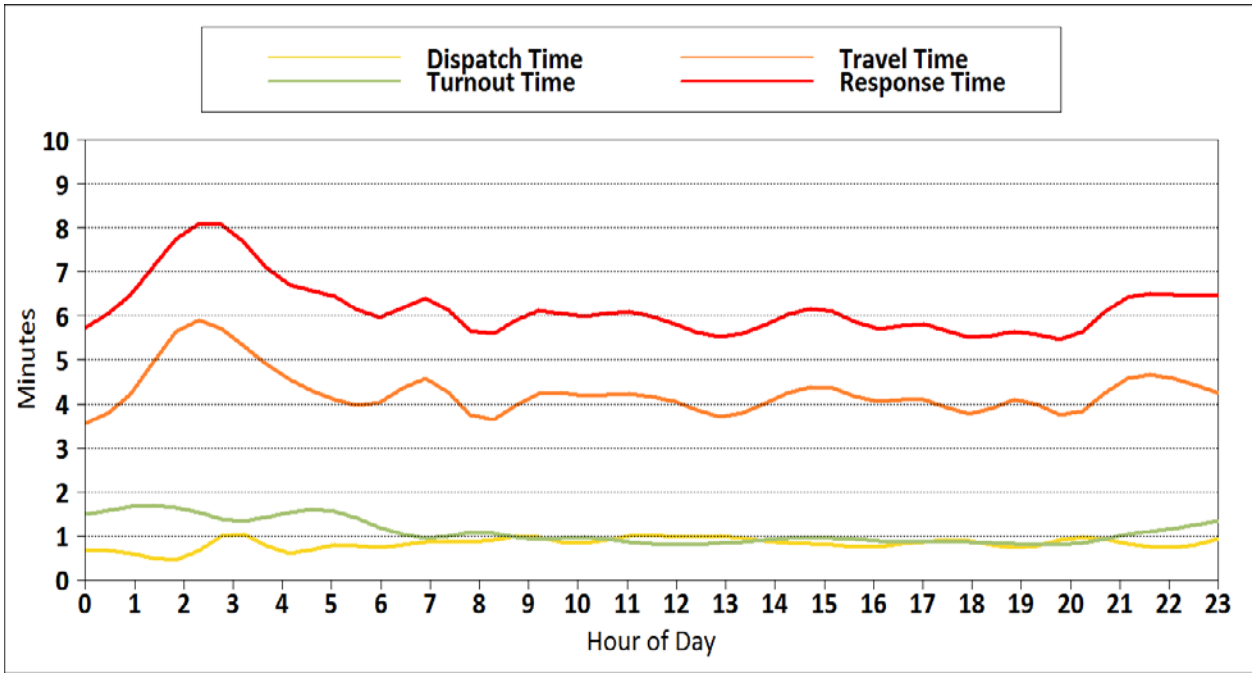


Table D-15: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Unit, by Hour of Day

Hour	Dispatch Time	Turnout Time	Travel Time	Response Time	90th Percentile Response Time	Sample Size
0	0.7	1.5	3.6	5.7	8.2	27
1	0.6	1.7	4.3	6.6	8.4	20
2	0.5	1.6	5.8	7.9	8.5	11
3	1.1	1.3	5.5	7.9	9.2	10
4	0.6	1.5	4.7	6.8	9.3	14
5	0.8	1.6	4.1	6.5	8.1	13
6	0.7	1.2	4.0	6.0	8.6	29
7	0.9	0.9	4.6	6.4	9.7	43
8	0.9	1.1	3.6	5.6	9.2	55
9	1.0	0.9	4.2	6.1	8.8	68
10	0.8	1.0	4.2	6.0	8.5	68
11	1.0	0.9	4.2	6.1	9.7	71
12	1.0	0.8	4.0	5.8	9.1	63
13	1.0	0.8	3.7	5.5	8.6	70
14	0.9	0.9	4.1	5.9	8.4	70
15	0.8	1.0	4.4	6.1	10.4	68
16	0.8	0.9	4.1	5.7	8.6	60
17	0.9	0.8	4.1	5.8	8.4	76
18	0.9	0.9	3.8	5.5	8.3	68
19	0.7	0.8	4.1	5.6	7.7	71
20	1.0	0.8	3.7	5.5	7.5	51
21	0.9	1.0	4.5	6.3	9.8	46
22	0.7	1.2	4.6	6.5	9.4	33
23	0.9	1.3	4.2	6.5	9.5	31

Observations:

- Average dispatch time was between 0.5 and 1.1 minutes.
- Average turnout time was between 0.8 and 1.7 minutes. Turnout time peaked between midnight and 6:00 a.m., averaging between 1.3 and 1.7 minutes.
- Average travel time was between 3.6 and 5.8 minutes.
- Average response time was between 5.5 and 7.9 minutes. Response time peaked between 2:00 a.m. and 4:00 a.m., averaging 7.9 minutes.

Figure D-11: Number of Total Calls by First Arriving Units

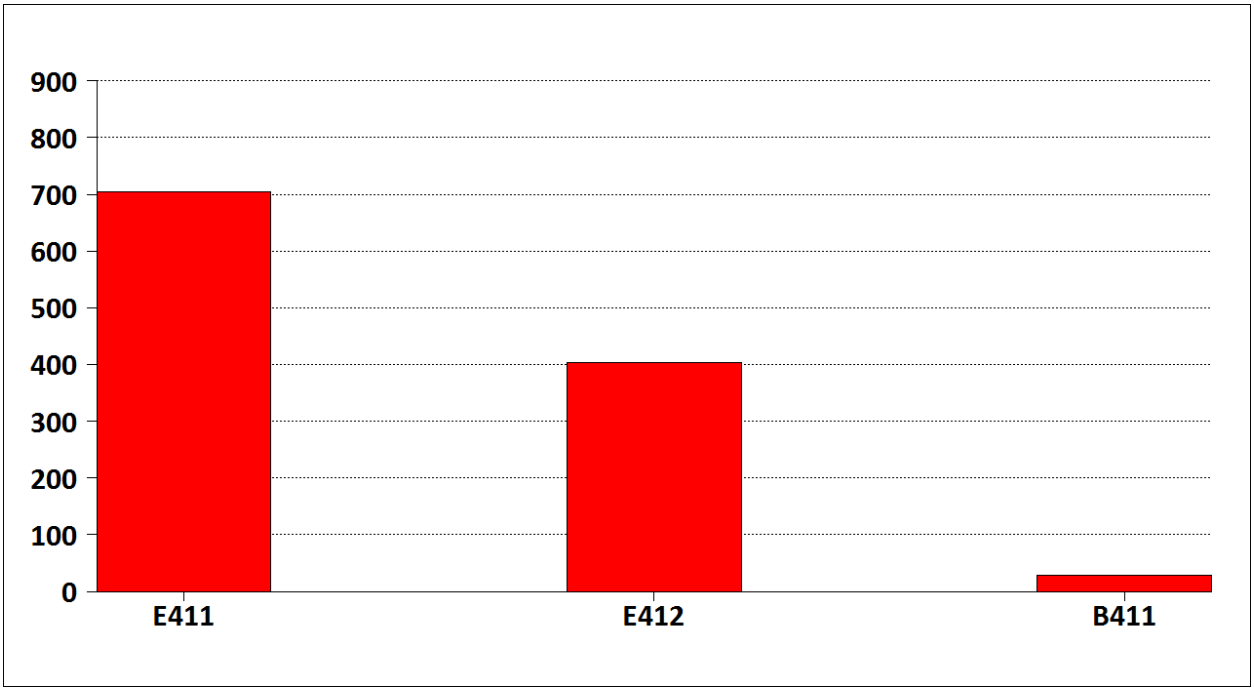


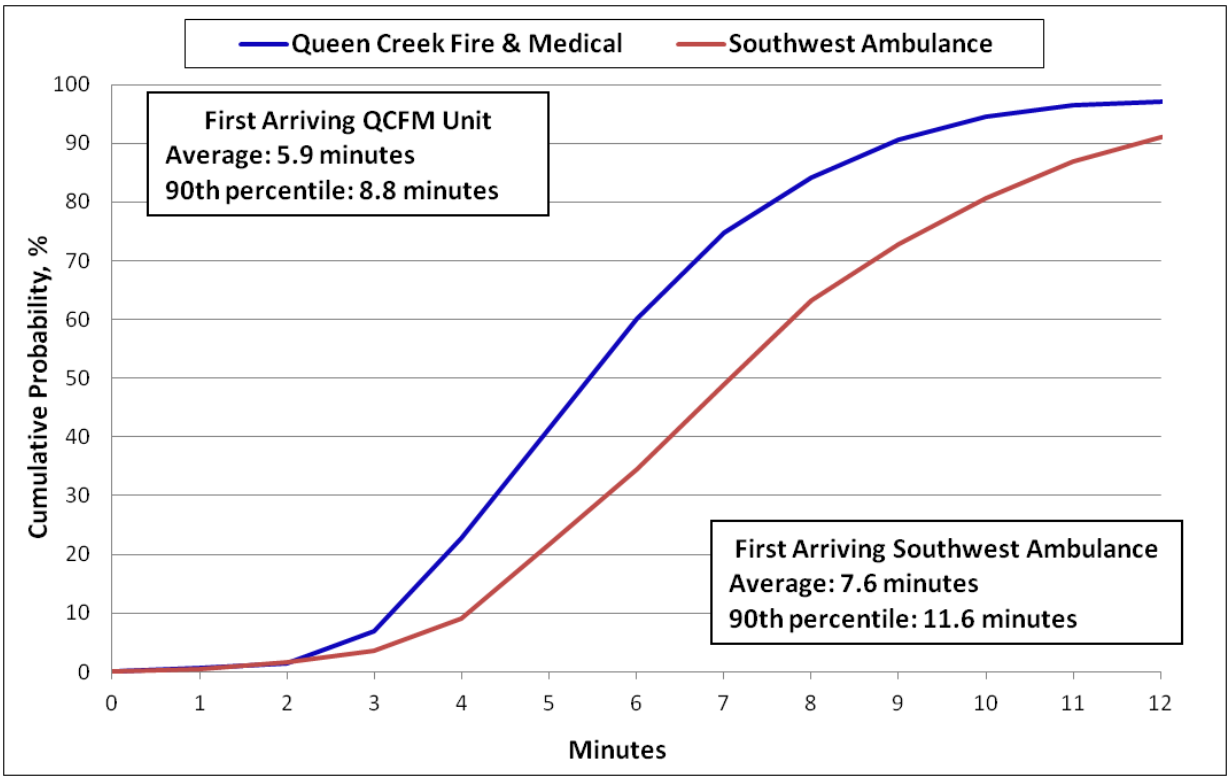
Table D-16: Number of Total Calls by First Arriving Units

Unit	EMS	Structure and Outside Fire	Other Fire	Total	Percentage	Cumulative Percentage
E411	626	21	58	705	62.1	62.1
E412	359	23	21	403	35.5	97.5
B411	19	5	4	28	2.5	100.0

Observations:

- E411 arrived first on scene most often, followed by E412. Those two units accounted for 98 percent of the first arrivals at calls.
- For structure and outside fire calls, E412 and E411, in that order, arrived first on scene most often.

Figure D-12: Cumulative Distribution Function (CDF) of Response Time of First Arriving Queen Creek Fire and Medical Unit and Southwest Ambulance for EMS calls



Reading the CDF Chart: The vertical axis is the probability or percentage of calls. The horizontal axis is response time. For example, with regard to EMS calls, the 0.9 probability line intersects the graph at the time mark at about 8.8 minutes for first arriving QCFMD unit. This means that QCFMD units had a response time of less than 8.8 minutes for 90 percent of these calls.

Figure D-13: Frequency Distribution Chart of Response Time of First Arriving Queen Creek Fire and Medical Unit and Southwest Ambulance for EMS Calls

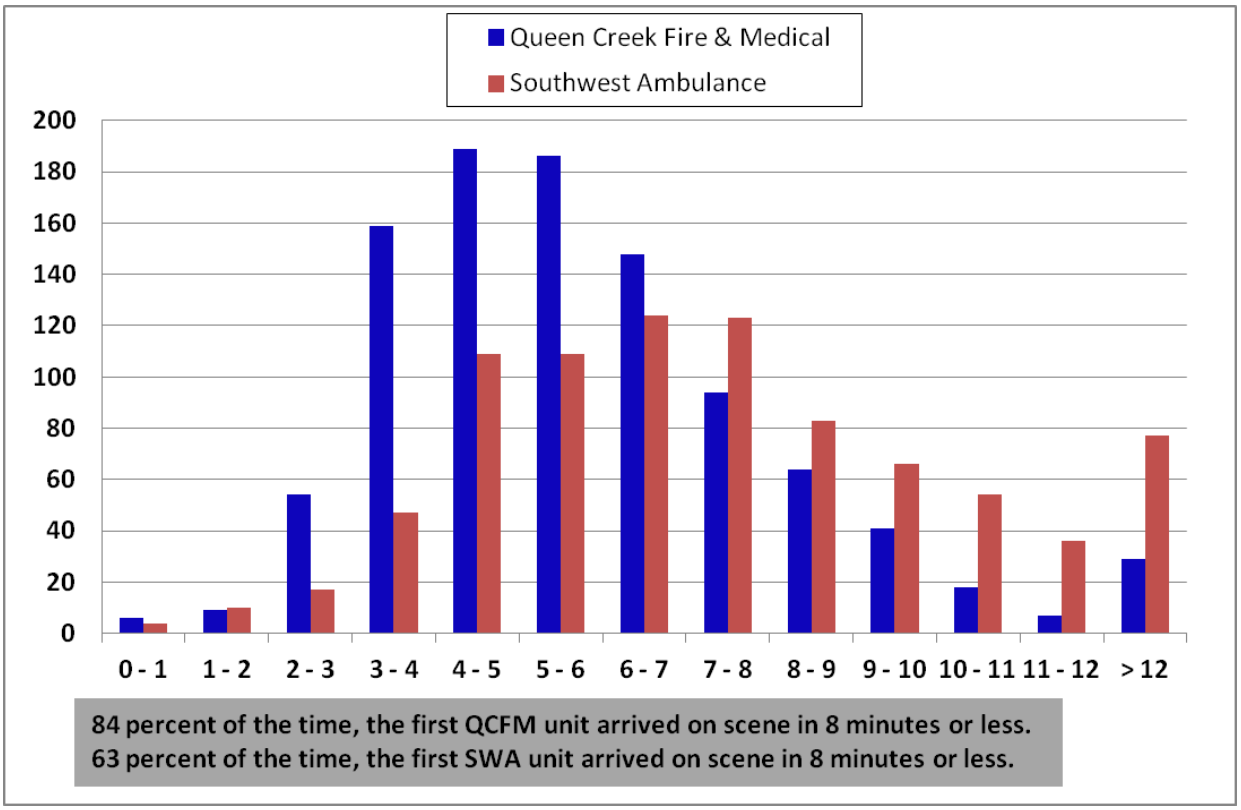


Table D-17: Cumulative Distribution Function (CDF) of Response Time of First Arriving Queen Creek Fire and Medical Unit and Southwest Ambulance for EMS Calls

Response Time (minute)	Queen Creek Fire and Medical		Southwest Ambulance	
	Frequency	Cumulative Percent	Frequency	Cumulative Percent
0 - 1	6	0.6	4	0.5
1 - 2	9	1.5	10	1.6
2 - 3	54	6.9	17	3.6
3 - 4	159	22.7	47	9.1
4 - 5	189	41.5	109	21.8
5 - 6	186	60.1	109	34.5
6 - 7	148	74.8	124	48.9
7 - 8	94	84.2	123	63.2
8 - 9	64	90.5	83	72.9
9 - 10	41	94.6	66	80.6
10 - 11	18	96.4	54	86.8
11 - 12	7	97.1	36	91.0
12 - 13	2	97.3	25	93.9
13 - 14	2	97.5	16	95.8
14 - 15	4	97.9	8	96.7
> 15	21	100.0	28	100.0

Observations:

- The average response time of first arriving QCFMD unit for EMS calls was 5.9 minutes.
- For 84.2 percent of EMS calls, the response time of the first arriving QCFMD unit was less than or equal to 8 minutes.
- For 90 percent of EMS calls, the response time of the first arriving QCFMD unit was less than 8.8 minutes.
- The average response time of the first arriving Southwest Ambulance for EMS calls was 7.6 minutes.
- For 90 percent of EMS calls, the response time of the first arriving Southwest Ambulance was less than 11.6 minutes.

Table D-18: Average Response Time for Structure and Outside Fire Calls by First Arriving Unit

Unit Type	First Arriving Unit	Outside Fire		Structure Fire		Total	
		Response Time	Number of Calls	Response Time	Number of Calls	Response Time	Number of Calls
Command	B411	NA	0	6.3	5	6.3	5
Engine	E411	5.3	17	7.9	4	5.8	21
Engine	E412	7.7	21	5.4	2	7.5	23
Total		**6.6**	**38**	**6.7**	**11**	**6.6**	**49**

Observations:

- For outside fire calls, the average response time of the first arriving unit was 6.6 minutes.
- For outside fire calls, Engine E412 was the first unit on scene most often and had an average response time of 7.7 minutes.
- For structure fire calls, the average response time of the first arriving unit was 6.7 minutes.
- For structure fire calls, Command B411 was the first unit on scene most often and had an average response time of 6.3 minutes.

Table D-19: Average Response Time for Structure and Outside Fire Calls by Second Arriving Unit

Unit Type	Second Arriving Unit	Outside Fire		Structure Fire		Total	
		Response Time	Number of Calls	Response Time	Number of Calls	Response Time	Number of Calls
Command	B411	9.2	2	12.3	2	10.8	4
Engine	E411	6.1	2	8.1	5	7.6	7
Engine	E412	17.4	2	9.7	3	12.8	5
Tender	T411	14.5	1	0.0	0	14.5	1
Total		**11.4**	**7**	**9.4**	**10**	**10.3**	**17**

Observations:

- For outside fire calls, the average response time of the second arriving unit was 11.4 minutes, which was 4.8 minutes longer than the first arriving unit.
- For structure fire calls, the average response time of the second arriving unit was 9.4 minutes, which was 2.7 minutes longer than the first arriving unit.

Figure D-14: Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit for Structure and Outside Fire Calls

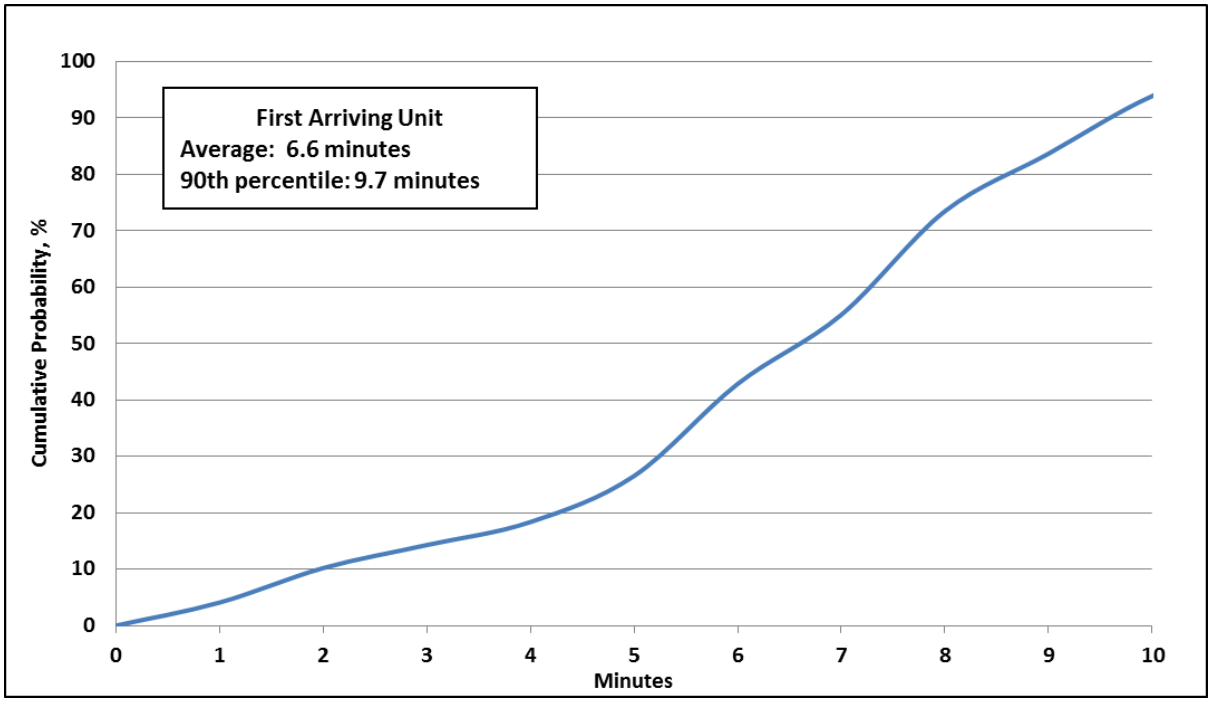


Figure D-15: Frequency Distribution Chart of Response Time of First Arriving Unit for Structure and Outside Fire Calls

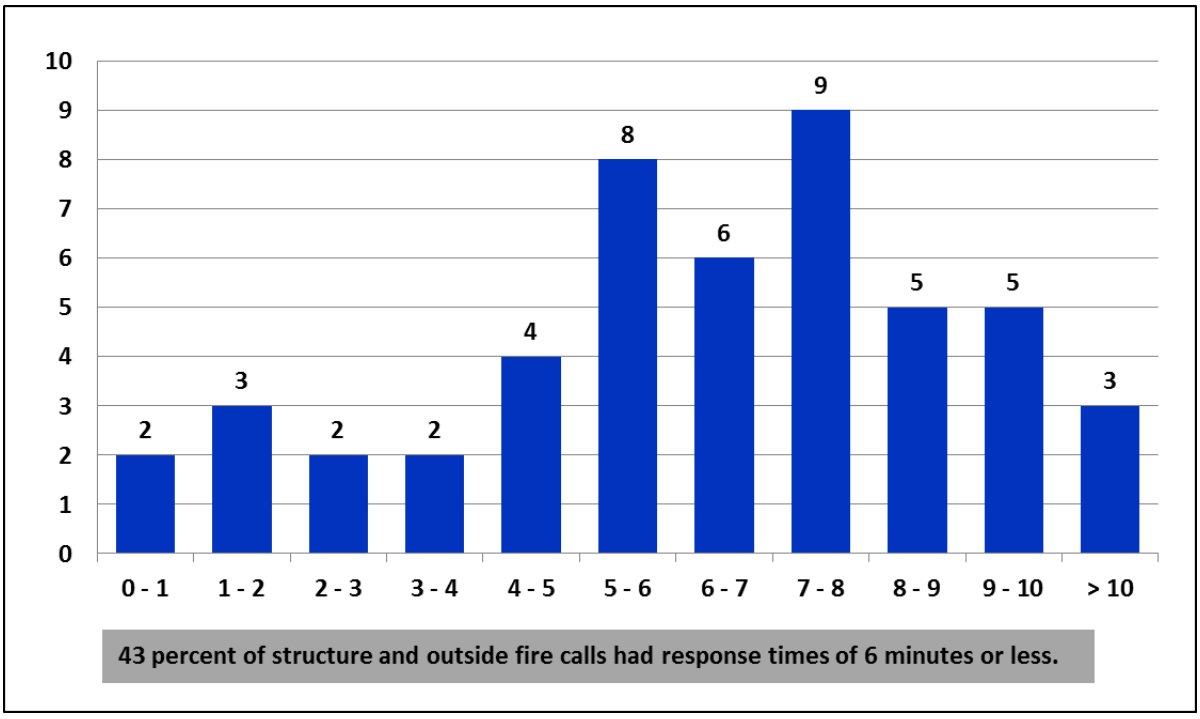


Table D-20: Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit for Structure and Outside Fire Calls

Response Time (minute)	First Unit	
	Frequency	Cumulative Percent
0 - 1	2	4.1
1 - 2	3	10.2
2 - 3	2	14.3
3 - 4	2	18.4
4 - 5	4	26.5
5 - 6	8	42.9
6 - 7	6	55.1
7 - 8	9	73.5
8 - 9	5	83.7
9 - 10	5	93.9
10 - 11	0	93.9
11 - 12	0	93.9
12 - 13	0	93.9
13 - 14	0	93.9
14 - 15	1	95.9
> 15	2	100.0

Observations:

- The average response time of the first arriving fire unit for structure fire calls was 6.6 minutes.
- 36.4 percent of the time, the first fire unit's response time was less than 6 minutes.
- 90 percent of the time, the first fire unit's response time was less than 9.7 minutes.

Southwest Ambulance Transport and Response Time Analysis

To understand how many calls involved transporting patients, and the variations by hour of day, we identified transport calls where Southwest Ambulance provided transport service and was not canceled en route. We only focused on transport calls with at least one QCFMD unit responding. Thus, another 173 transport calls in QCFMD jurisdiction, to which Southwest Ambulance solely responded, was not included in our analysis.

Table D-21: Transport Calls by Call Type

Call Type	Number of Calls			Transport Rate
	Non-Transport	Transport	Total	
Cardiac and stroke	24	96	120	80.0
Seizure and unconsciousness	21	118	139	84.9
Breathing difficulty	15	94	109	86.2
Overdose and psychiatric	17	84	101	83.2
MVA	79	127	206	61.7
Fall and injury	68	183	251	72.9
Illness and other	59	181	240	75.4
EMS Total	**283**	**883**	**1,166**	**75.7**
Fire Total	369	41	410	10.0
Mutual aid	339	21	360	5.8
Canceled	124	13	137	9.5
Total	**1,115**	**958**	**2,073**	**46.2**
Daily Average	**3.1**	**2.6**	**5.7**	**NA**

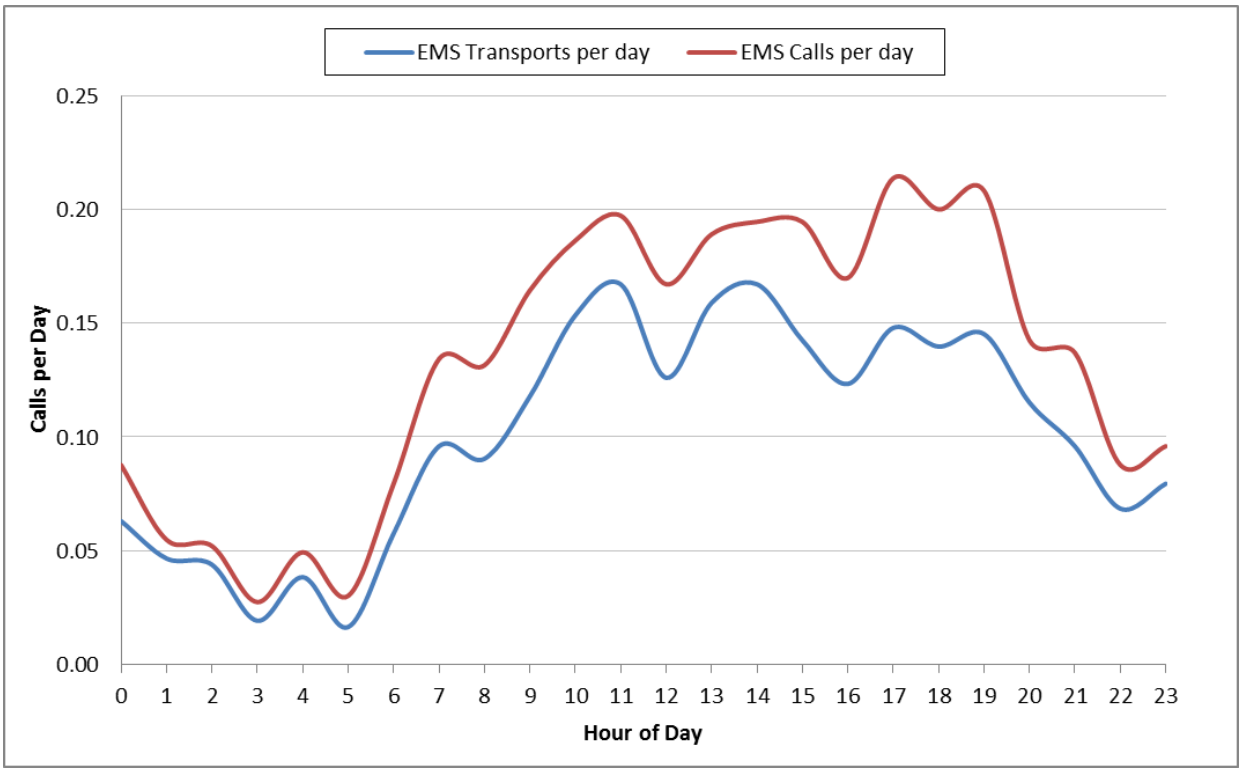
Observations:

- Overall, 76 percent of EMS calls to which QCFMD responded involved transporting patients.
- On average, 2.6 calls per day involved transporting patients.
- EMS calls had the average transport rates of 76 percent, and averaged 2.4 transport calls per day.

Table D-22: Total and Number of EMS Transport Calls per Day, by Hour of Day

Hour	Number of EMS Transports	Number of EMS Calls	EMS Transports per day	EMS Calls per day	Transport Rate
0	23	32	0.06	0.09	71.9
1	17	20	0.05	0.05	85.0
2	16	19	0.04	0.05	84.2
3	7	10	0.02	0.03	70.0
4	14	18	0.04	0.05	77.8
5	6	11	0.02	0.03	54.5
6	21	29	0.06	0.08	72.4
7	35	49	0.10	0.13	71.4
8	33	48	0.09	0.13	68.8
9	43	60	0.12	0.16	71.7
10	56	68	0.15	0.19	82.4
11	61	72	0.17	0.20	84.7
12	46	61	0.13	0.17	75.4
13	58	69	0.16	0.19	84.1
14	61	71	0.17	0.19	85.9
15	52	71	0.14	0.19	73.2
16	45	62	0.12	0.17	72.6
17	54	78	0.15	0.21	69.2
18	51	73	0.14	0.20	69.9
19	53	76	0.15	0.21	69.7
20	42	52	0.12	0.14	80.8
21	35	50	0.10	0.14	70.0
22	25	32	0.07	0.09	78.1
23	29	35	0.08	0.10	82.9

Figure D-16: Number of EMS Transport Calls, by Hour of Day



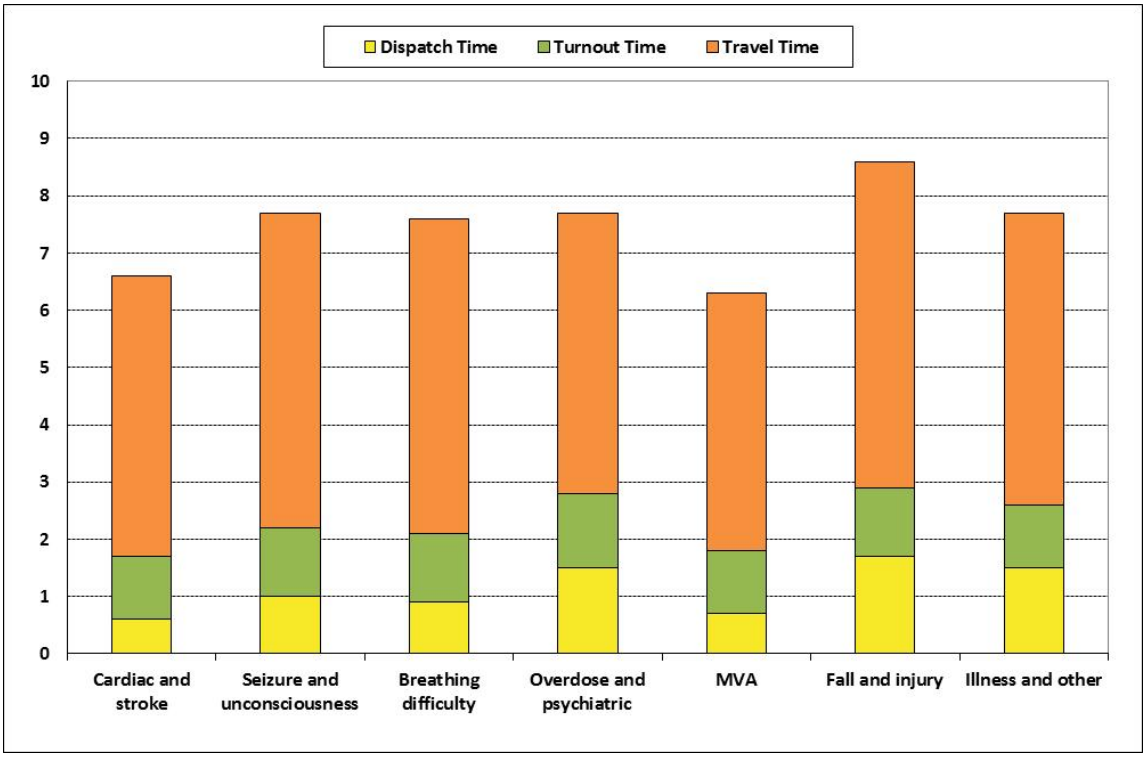
Observations:

- Overall, 76 percent of EMS incidents to which QCFMD responded involved transporting patients.
- On average, Southwest ambulances provided 2.4 transports per day to EMS calls.
- QCFMD-responded EMS call rates and transports were highest between 9:00 a.m. and 9:00 p.m., averaging between 0.12 and 0.17 EMS transports per hour.
- QCFMD-responded EMS call rates and transports were lowest between 10:00 p.m. and 7:00 a.m., averaging between 0.02 and 0.08 EMS transports per hour. In other words, it averaged slightly less than one transport per day in the nine-hour period.

Table D-23: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Southwest Ambulance, by EMS Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	0.6	1.1	4.9	6.6	96
Seizure and unconsciousness	1.0	1.2	5.5	7.7	117
Breathing difficulty	0.9	1.2	5.5	7.6	94
Overdose and psychiatric	1.5	1.3	4.9	7.7	79
MVA	0.7	1.1	4.5	6.4	126
Fall and injury	1.7	1.2	5.7	8.6	179
Illness and other	1.5	1.1	5.1	7.7	168
EMS Total	**1.2**	**1.2**	**5.2**	**7.6**	**859**

Figure D-17: Average Dispatch, Turnout, and Travel Times of First Arriving Southwest Ambulance, by EMS Call Type



Observations:

- The average dispatch time of first arriving Southwest Ambulance was 1.2 minutes.
- The average turnout time of first arriving Southwest Ambulance was 1.2 minutes.
- The average travel time of first arriving Southwest Ambulance was 5.2 minutes.
- The average response time of first arriving Southwest Ambulance for EMS calls was 7.6 minutes.

Table D-24: 90th Percentile Dispatch, Turnout, Travel, and Response Times of First Arriving Southwest Ambulance, by EMS Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
Cardiac and stroke	1.0	1.9	8.2	10.3	96
Seizure and unconsciousness	1.5	2.1	9.7	12.6	117
Breathing difficulty	1.4	2.1	8.5	10.8	94
Overdose and psychiatric	3.8	2.1	8.0	12.1	79
MVA	1.4	1.9	8.0	10.4	126
Fall and injury	4.9	1.9	9.4	13.0	179
Illness and other	3.6	2.0	8.0	12.4	168
EMS Total	**2.6**	**2.0**	**8.6**	**11.6**	**859**

Note: A 90th percentile value of 11.6 indicates that the total response time was less than 11.6 minutes for 90 percent of all calls. Unlike averages, the 90th percentile response time is not equal to the sum of the 90th percentile of dispatch time, turnout time, and travel time.

Observations:

- The 90th percentile dispatch time of first arriving Southwest Ambulance was 2.6 minutes.
- The 90th percentile turnout time of first arriving Southwest Ambulance was 2.0 minutes.
- The 90th percentile travel time of first arriving Southwest Ambulance was 8.6 minutes.
- The 90th percentile response time of first arriving Southwest Ambulance for EMS calls was 11.6 minutes.

Attachment I: Workload of Support Units

Unit Description	Number of Runs	Annual Hours
Bike Team	2	10.4
Gator	8	50.6
Support	1	10.0

Attachment II: Property and Content Loss Analysis for Structure and Outside Fire Calls

Call Type	Property Loss		Content Loss	
	Loss Value	Number of Calls	Loss Value	Number of Calls
Structure fire	$190,000	8	$24,000	5
Outside fire	$80,707	12	$21,508	14
Total	$270,707	20	$45,508	19

Note: This analysis only includes calls with property loss or content loss greater than 0. Mutual aid structure and outside fire calls are not included.

Observations:

- Out of 12 structure fire calls, 8 calls (67 percent) had recorded property loss, with total recorded loss value of $190,000. The largest recorded property loss was $100,000, which occurred at 20845 E Via De Arboles, on May 31, 2013.
- Out of 55 outside fire calls, 12 had recorded property loss and 14 had recorded content loss.

Attachment III: Actions Taken Analysis for Structure and Outside Fire Calls

Action Taken	Number of Calls	
	Structure fire	Outside fire
Extinguishment by fire service personnel	7	22
Fire control or extinguishment, other	1	17
Salvage & overhaul	1	0
Investigate fire out on arrival	1	5
Investigate	1	1
Systems and services, Other	0	1
Assistance, Other	1	5
Enforce codes	0	4
Total	**12**	**55**

Observations:

- A total of eight structure fire calls were controlled or extinguished, which accounted for 67 percent of structure fires in QCFMD's jurisdiction.
- A total of 39 outside fire calls were controlled or extinguished, which accounted for 71 percent of outside fires in QCFMD's jurisdiction.

Attachment IV: Correspondence between NFIRS Incident Type and Call Type

NFIRS Incident Type	Incident Description	Call Type
100	Fire, Other	Outside fire
111	Building fire	Structure fire
112	Fires in structure other than in a building	Structure fire
113	Cooking fire, confined to container	Structure fire
123	Fire in portable building, fixed location	Structure fire
130	Mobile property (vehicle) fire, Other	Outside fire
131	Passenger vehicle fire	Outside fire
138	Off-road vehicle or heavy equipment fire	Outside fire
140	Natural vegetation fire, Other	Outside fire
142	Brush or brush-and-grass mixture fire	Outside fire
143	Grass fire	Outside fire
150	Outside rubbish fire, Other	Outside fire
151	Outside rubbish, trash or waste fire	Outside fire
154	Dumpster or other outside trash receptacle fire	Outside fire
160	Special outside fire, Other	Outside fire
162	Outside equipment fire	Outside fire
251	Excessive heat, scorch burns with no ignition	Hazard
320	Emergency medical service, other	EMS
321	EMS call, excluding vehicle accident with injury	EMS
322	Motor vehicle accident with injuries	MVA
323	Motor vehicle/pedestrian accident (MV Ped)	MVA
324	Motor Vehicle Accident with no injuries	MVA
331	Lock-in (if lock out , use 511)	Illness and other
350	Extrication, rescue, Other	Illness and other
354	Trench/below-grade rescue	Illness and other
381	Rescue or EMS standby	Illness and other
400	Hazardous condition, Other	Hazard
410	Combustible/flammable gas/liquid condition, other	Hazard
412	Gas leak (natural gas or LPG)	Hazard
422	Chemical spill or leak	Hazard
440	Electrical wiring/equipment problem, Other	Hazard
442	Overheated motor	Hazard
444	Power line down	Hazard
4451	Transformer Blew/Exploding/Arcing	Hazard
460	Accident, potential accident, Other	Hazard
480	Attempted burning, illegal action, Other	Hazard

NFIRS Incident Type	Incident Description	Call Type
500	Service Call, other	Public service
510	Person in distress, Other	Public service
511	Lock-out	Public service
520	Water problem, Other	Public service
5201	Hydrant Leaking/Damaged	Public service
531	Smoke or odor removal	Public service
5401	Animal Problem, Snake Removal	Public service
5402	Animal Problem, Bees	Public service
541	Animal problem	Public service
542	Animal rescue	Public service
550	Public service assistance, Other	Public service
5501	Public service assistance, Other	Public service
551	Assist police or other governmental agency	Public service
552	Police matter	Public service
5521	SWAT Police Matter - no patient	Public service
553	Public service	Public service
554	Assist invalid	Public service
561	Unauthorized burning	Public service
571	Cover assignment, standby, moveup	Public service
5711	Encode Test	Public service
600	Good intent call, Other	Good intent
611	Dispatched & cancelled en route	Canceled
6110	Structure Fire - Cancelled en route	Canceled
6111	Vehicle Fire - Cancelled en route	Canceled
6112	System or Detector Malfunction - Cancelled en route	Canceled
6113	Unintentional System/Detector - Cancelled en route	Canceled
6116	Vehicle Accident - Cancelled en route	Canceled
6117	Medical Call (Non Vehicle Acc) - Cancelled en route	Canceled
6119	Service Call - Cancelled en route	Canceled
621	Wrong location	Canceled
622	No Incident found on arrival at dispatch address	Canceled
631	Authorized controlled burning	Good intent
650	Steam, Other gas mistaken for smoke, Other	Good intent
651	Smoke scare, odor of smoke	Good intent
6531	Warming Fire	Good intent
671	HazMat release investigation w/no HazMat	Good intent
700	False alarm or false call, Other	False alarm

NFIRS Incident Type	Incident Description	Call Type
715	Local alarm system, malicious false alarm	False alarm
730	System malfunction, Other	False alarm
733	Smoke detector activation due to malfunction	False alarm
734	Heat detector activation due to malfunction	False alarm
735	Alarm system sounded due to malfunction	False alarm
736	CO detector activation due to malfunction	Canceled
740	Unintentional transmission of alarm, Other	False alarm
7401	Unintentional transmission of alarm, medical	False alarm
743	Smoke detector activation, no fire - unintentional	False alarm
744	Detector activation, no fire - unintentional	False alarm
745	Alarm system activation, no fire - unintentional	False alarm
812	Flood assessment	Public service
900	Special type of incident, Other	Public service
9001	Dispatch Cancel/Never Dispatched/Test/Dup	Canceled