Fire Operations and Data Analysis

Town of Smyrna, Tennessee

February 2013

Final Report

FIRE/EMS OPERATIONS

CENTER FOR PUBLIC SAFETY MANAGEMENT

Submitted by and reply to:
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ICMA

Leaders at the Core of Better Communities

General Information

About 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 28 countries.

Since its inception in 1914, ICMA has been dedicated to assisting local governments in providing services to their citizens in an efficient and effective manner. Our work spans all of the activities of local government: parks, libraries, recreation, public works, economic development, code enforcement, brownfields, public safety, and a host of other critical areas.

ICMA advances the knowledge of local government best practices across a wide range of platforms, including publications, research, training, and technical assistance. Our work includes both domestic and international activities in partnership with local, state, and federal governments, as well as private foundations. For example, we are involved in a major library research project funded by the Bill & Melinda Gates Foundation and are providing community policing training in El Salvador, Mexico, and Panama with funding from the United States Agency for International Development. We have personnel in Afghanistan helping to build wastewater treatment plants and have teams working with the United States Southern Command (SOUTHCOM) in Central America on conducting assessments and developing training programs for disaster preparedness.

ICMA Center for Public Safety Management

The ICMA *Center for Public Safety Management* (ICMA/CPSM), one of four centers within ICMA's U.S. Programs Division, provides support to local governments in the areas of police, fire, emergency medical services (EMS), emergency management, and homeland security. In addition to providing technical assistance in these areas, we also represent local governments at the federal level and are involved in numerous projects with the U.S. Department of Justice and the U.S. Department of Homeland Security.

ICMA/CPSM is also involved in police and fire chief selection, assisting local governments in identifying these critical managers through original research, the identification of core competencies of police and fire managers, and assessment center resources.

Our local government technical assistance includes workload and deployment analysis, using operations research techniques and credentialed experts to identify workload and staffing needs and best practices. We have conducted approximately 140 such studies in 90 communities ranging in size from 8,000 population (Boone, Iowa) to 800,000 population (Indianapolis, Indiana).

Thomas Wieczorek is the Director of the Center for Public Safety Management. Leonard Matarese is the Director of Research & Project Development.

Methodology

The ICMA Center for Public Safety Management team follows a standardized approach to conducting analyses of fire, police, and other departments involved in providing services to the public. We have developed this 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 Fire Chiefs (IAFC), the International Association of Fire Fighters (IAFF), and the Association of Public-Safety Communication Officials International, and through ICMA's Center for Performance Measurement. These performance measures have been developed following decades of research and are applicable in all communities. For that reason, the data yield similar reporting formats, but each community's data are analyzed on an individual basis by the ICMA specialists and represent the unique information for that community.

The ICMA 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 with 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 logical 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. Before the arrival of an on-site team, agencies are asked to provide the team with key operational documents (policies and procedures, asset lists, etc.). The team visits each city to interview fire 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 the strengths, weaknesses, and opportunities of—and threats to—the organizations and operations under review. To generate recommendations, the team reviews operational documents; interviews key stakeholders; 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 ICMA Center for Public Safety 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.

ICMA/CPSM Project Contributors

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Executive Summary

ICMA was retained by the town of Smyrna to complete a comprehensive analysis of the town's fire department. The analysis is intended to provide the town with a thorough and unbiased review of fire services provided by the Smyrna Fire Department (hereinafter, SFD). This report is the result of this analysis and is accompanied by recommendations for ways to improve efficiencies in the delivery of services. The report also provides a benchmark of the town's existing service delivery performance. Benchmark performance information can be found in the data analysis section of this report.

To begin the review, the project management staff asked the town for certain documents, data, and information. The project management staff used this information/data to familiarize themselves with the fire department's structure, assets, and operations. The information provided was also used in conjunction with the raw performance data collected to determine the existing performance of the fire department and 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., and the ICMA Center for Performance Measurement. Town staff was provided an electronic shared information folder to upload information for analysis and use by the ICMA project management staff.

The ICMA project management staff conducted site visits for the purpose of observing fire department and agency-connected supportive operations, interviewing key fire department staff, and reviewing preliminary data and operations. Follow-up telephone calls were also conducted between ICMA project management staff and department staff so that ICMA staff could affirm the project information and elicit further discussion regarding this operational analysis.

The ICMA team, while reviewing information and discussing operations with department members, always seeks first to understand the operations, then to identify ways the department can improve efficiency, effectiveness, and safety for both its members as well as the community it serves. ICMA found that the town of Smyrna is not unique, in that it seeks to create a more efficient fire department within existing financial resources.

ICMA found the SFD has a capable department for the delivery of fire programs, but there is always room for improvement. Critical areas the ICMA team has identified that need improvement and that resulted in our recommendations are: a lack of formal strategic and risk management planning documents with accompanying performance measures and goals that will assist the SFD with current operations and more importantly assist in planning for the future; the need to develop and implement a time allocation model so that staff understands clearly their role in the organization and where, as supervisors and managers, they should be functioning; the need to consider consolidating certain apparatus and cross-staffing of other apparatus for efficient use of limited staffing and financial resources; and the need to ensure external relationships are established so that enhanced service delivery can be realized when needed. Additional recommendations are offered as well to assist the department in overall efficiency, effectiveness, and improvement. Appendix IV provides an alternative staffing matrix linked to recommendations 1, 9, 12, and 30 that have an end goal of efficient utilization of staffing, while maintaining operational effectiveness.

Recommendations

Thirty-eight specific recommendations are listed below and in the report. The recommendations are based on best practices derived from the NFPA, the CPSE, ICMA, the U.S. Fire Administration, the International Association of Emergency Managers (IAEM), and the Federal Emergency Management Agency (FEMA), to name a few, as well as the knowledge of ICMA reviewers. Priority recommendations, as considered by ICMA, are listed first. Additional recommendations follow these in the order they appear in the report.

Priority Recommendations:

1. ICMA strongly recommends the SFD implement recommendations in this report to combine service companies one and three into one centrally located service company/technical squad company with one crew of three; and cross-staff the tower ladder and engine at station 5 with one crew of four. The focus of this recommendation is on overall department efficiencies in staffing and deployment of resources.
2. It is strongly recommended that the SFD develop and implement a comprehensive strategic plan.
3. Adopt a time allocation model; implement and monitor time allocation to ensure effective use of officer and staff time as it relates to achieving the organizational mission and to each individual's position in the organization.
4. Establish a clear chain of command for the department from the rank of firefighter to the fire chief, utilizing basic principles of unity of command and span of control. Each employee should answer to one supervisor and each officer (supervisor) should clearly understand their role in the organization, their responsibility, and the level of leadership and accountability that comes with their position.
5. The SFD should implement mutual aid agreements with the cities of La Vergne and Murfreesboro. The purpose of these agreements is to expand response capabilities in the aftermath of a disaster or during large-scale events, and where applicable, assist with day-to-day responses in areas of extended response times for initial and additional (2nd and 3rd due units) responding SFD units. County fire agencies that are contiguous to the town of Smyrna should be included, recognizing these agencies are made up of volunteer members, and aid provided is based on availability.
6. Focus emergency management planning, training, and exercises using the all-hazards approach. Conduct annual emergency management/emergency operations center drills to include town executive staff and elected officials.

7. The lieutenant assigned to fire prevention should be trained to the level of NFPA Fire Inspector I, and should receive training in plans review. This fire department position should participate in the review of site and building plans to provide input on conditions that would impact fire department response once a building has received the certificate of occupancy. It is understood this function is currently in the department of building codes and safety; however components such as ingress, turning radii, and width of fire lanes affect how fire apparatus will be able to access a building, and should have fire department input. Locations of sprinkler/standpipe connections are typically left to the authority having jurisdiction (AHJ); however, neither the building official nor the deputy state fire marshal have a role in fire suppression and should consult with the fire department on such matters.

8. Complete the installation and system functionality of the mobile data browsers in fire apparatus using ruggedized computer terminals. If compatible and within the means of available funding, initiate AVL technology and implement CAD-recommended closest unit response to all fire incidents.

9. Ensure consistency at each fire station on each shift by having first-line supervisors (lieutenants) assigned at each station on each shift. To achieve this may require the reclassification of firefighter positions to lieutenant positions and the subsequent promotion to this officer level.

10. Undertake a community risk and vulnerability assessment. The SFD should use the results for the ongoing planning of fire response run cards, identification of apparatus needs, and staffing and deployment of resources.

Recommendations (in order as they appear in the report):

11. The proposed functional table of the organization should be developed to accompany the formal department organizational chart and the current SFD functional table of the organization.

12. Configure service company 2 as the primary department incident command vehicle capable of incident accountability tracking, monitoring, and transmitting over interoperable radio channels; diagraming the incident for unit resource tracking and incident planning; and having available comprehensive community risk, emergency management, and pre-fire plans for incident planning use.

13. In the short term, when leave levels are such that they dictate placing the ladder truck out of service, develop a response plan that cross-staffs this unit with the engine crew on all responses that require this apparatus. In the long term, consider staffing station 5 with four personnel on a permanent basis, and cross-staffing the ladder and engine apparatus as a regular practice with one crew. This will allow three extra personnel on a daily basis available to fill vacancies created by scheduled and unscheduled leave and will establish consistent staffing of apparatus. This recommendation will also improve overtime expenditures when utilized to fill scheduled and unscheduled leave vacancies.

14. Develop and implement a communication model for the organization that ensures an effective conduit of clear and productive communication throughout the entire organization.

15. The SFD should work closely with the human resources department developing and administering the hiring and promotional processes. The SFD should assign officers to entry and promotional exam committees working with the human resources department as subject matter experts for continuous overall organizational improvement.

16. Adopt a validated physical agility test in lieu of the current physical agility test administered to SFD candidates.

17. Consider based on available funding, conducting the initial medical exam for entry level firefighters in accordance with National Fire Protection Association (NFPA) 1582 standard.

18. Consider based on available funding, providing annual medical exams for incumbent employees who are subject to entering atmospheres that are immediately dangerous to life and health (IDLH) in accordance with National Fire Protection Association (NFPA) 1582 standard.

19. Develop and implement a succession planning process that identifies and develops future leaders.

20. Consider affiliation with the Rutherford County EMS system with a focus on enhancing EMS training for SFD first response personnel.

21. Incorporate measurable and obtainable goals and objectives into strategic and comprehensive planning documents as well as annual and long-range fiscal documents.

22. The SFD should develop and implement an internal risk management plan following the standards of NFPA 1500, Standard for a Fire Department Occupational Safety and Health Program.

23. Consider the Center for Public Safety Excellence (CPSE) accreditation program and conduct a self-assessment under the CPSE guidelines as a means toward overall organizational improvement. If this program is implemented, appoint an accreditation manager whose primary function is to manage the accreditation process until the SFD is fully accredited.

24. The department should obtain specific data and rationale from property insurance carriers to determine the community financial benefits, if any, for maintaining the current ISO rating to determine if there will be a significant difference in insurance rates should the department change ratings to a lower number, and then balance this change against any potential change in tax rate to maintain the ISO 3 rating.

25. The SFD should develop and implement a performance measure reporting system that expands the type of measurement it uses and includes the use of a program logic model.

26. Performance measures should be developed for each department activity, and should link to the strategic and comprehensive planning documents and fiscal/budget documents.

27. The lieutenant assigned to fire prevention should work with fire suppression and the community to identify occupancy and false alarm trends and implement appropriate measures to mitigate alarm issues with a focus on reducing responses and increasing overall response efficiencies.

28. For planning purposes, call demand in the southwest portion of the town should be monitored. As call demand increases, response times should also be monitored to ensure efficient delivery of service.

29. The SFD should implement a nonemergency documentation program that captures critical nonemergency productivity and should report on/review these regularly (monthly and annually) to find opportunities for continued improvement.

30. Combine service companies 1 and 3 (staffing of three) into one heavy rescue company (utilize the service company 1 vehicle) that can deploy equipment and personnel for all technical rescue and hazardous materials incidents. House the heavy rescue and hazardous materials support units in the same station. Utilize one of the three firefighters to drive the hazardous materials unit to incidents when required. Reclassify one firefighter position on each shift to lieutenant to provide consistent first-line supervision of this specialty unit.

31. The department should seek statutory authority to enforce the Tennessee Fire Prevention Code in conjunction with the building official and deputy state fire marshal.

32. Train all fire company personnel in the National Fire Academy course *Technical Principles and Practices of Fire Prevention (H284).* Utilize fire company personnel for general fire safety checks while performing pre-planning and area familiarization training. Consider training all company officers (lieutenants) to the NFPA Fire Inspector I level. The most egregious fire code violations, such as blocked exits, improper use of electrical extension cords, non-illuminated exit lights, and improper flammable liquid and combustible storage and handling would reduce the risk significantly. Most general fire safety compliance issues can be resolved immediately without the need for legal action.

33. Train on-duty fire suppression officers and additional police staff in basic origin and cause determination, thus ensuring 24/7 coverage and alleviating the need to wait for the state fire marshal. A joint fire-police arson task force could effectively investigate all fires without the need for additional positions in either department.

34. Develop a fee schedule to recoup equipment/expendable expenses for all fire extinguisher, CPR, and AED training.

35. Review the basic emergency operations plan (BEOP) defining the mission, command structure, roles, and relationships in the EOC to enhance the town's emergency management efforts, particularly how they align with Rutherford County.

36. Perform a hazard identification and risk analysis (HIRA) for the town, including for both natural and man-made vulnerabilities.

37. Participate in the Rutherford County Local Emergency Planning Committee.

38. Ensure radio communications interoperability with all surrounding jurisdictions.

Operational Analysis

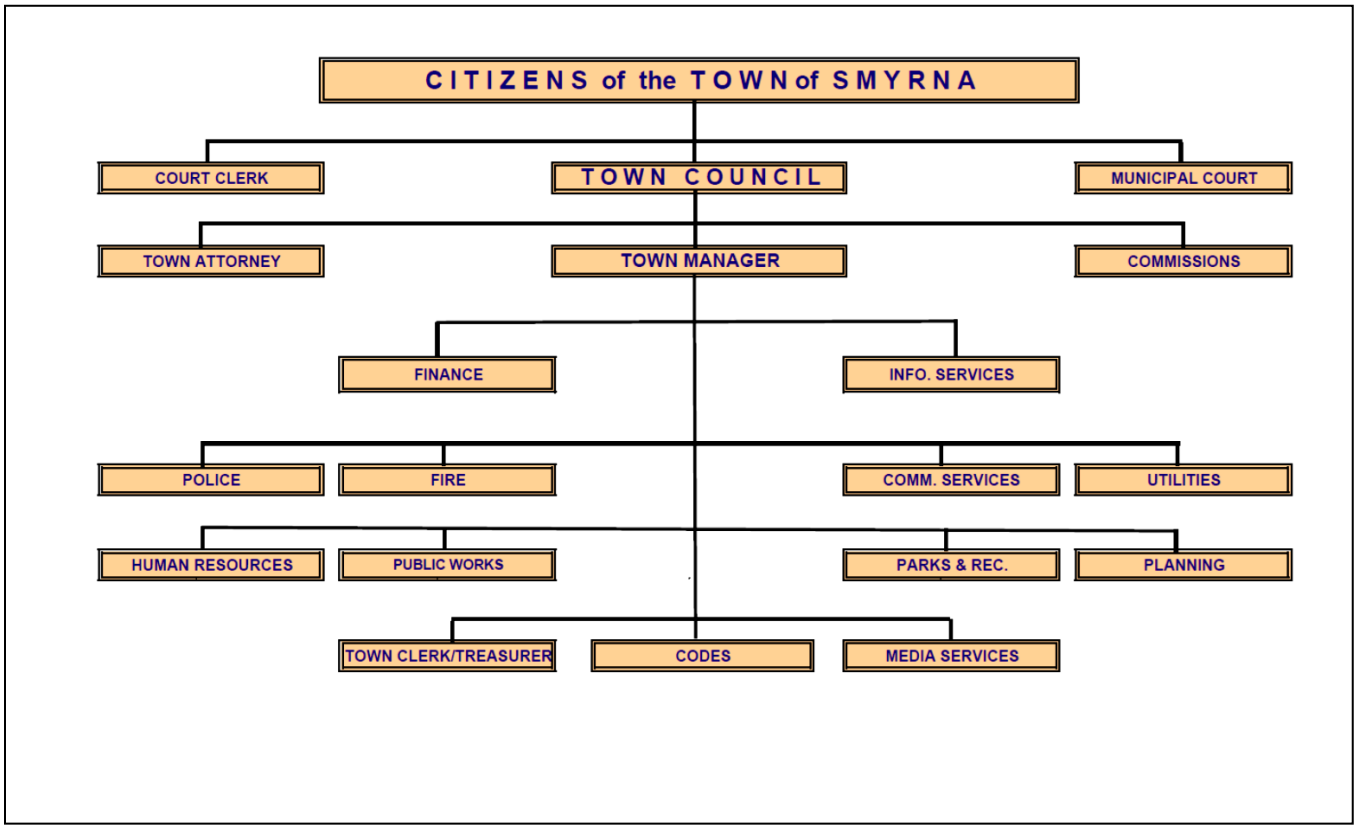
Governance and Administration

The town of Smyrna has a council-manager form of local government. This system combines the political leadership of elected officials in the form of a town council with the managerial experience of an appointed town manager. 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.

The town council consists of a mayor and six council persons elected to serve four-year staggered terms. A town manager is appointed by a majority vote of the town council to serve as the chief administrative officer of the town, overseeing the daily operations of the town and implementing the policy of the council.[1]

Figure 1 illustrates the organizational chart for the town of Smyrna, Tennessee.

Figure 1: Town of Smyrna Organizational Chart



[1] Code of Ordinances, Town of Smyrna, Tennessee.

Organizational Structure/Staffing and Deployment

The SFD is a career fire department serving approximately 40,000 permanent residents and businesses in a land area of nearly 30 square miles. The SFD began as a volunteer fire department, transitioning to a career agency beginning in 1988. Currently, the department is funded for a staff of 100 personnel. These personnel are spread over five operational fire stations and an administrative unit. The ISO Public Protection Classification for the community, which includes the SFD as a major component, is a rating of three.

Title 7, Chapter 3, Section 7-301 of the Town Code establishes the fire department for the town and provides that the organization will be directed by a fire chief. Section 7-302, of the same chapter, delineates the objectives of the department which shall include but not be limited to providing fire suppression, emergency rescue and medical services, enforcement of regulations essential to the fire protection and safety of life and property, and other duties as may be prescribed by the town council through the town manager.

The fire chief oversees the daily operations of the agency and reports directly to the town manager. The fire chief is assisted administratively by an assistant fire chief and two lieutenants. One lieutenant is assigned as the fire prevention officer and the other as the training officer. Operationally, fire suppression staff is deployed on a rotational shift of twenty-five hours on and forty-seven hours off. This schedule creates three operational shifts or platoons. One captain is assigned to each of the three shifts as the overall shift commander. Three of the department's five stations (1, 3, and 5) have lieutenants assigned to each shift and two stations (2 and 6) have only one lieutenant assigned to the station. The lieutenants assigned to each shift at a station serve as shift supervisors. The two stations that have only one lieutenant assigned serve as station supervisors. Firefighters assigned to the two shifts at stations 2 and 6 and which do not have station lieutenants ensure operations are maintained. Not having supervisors across each shift at each station potentially creates inconsistencies in operations and supervision.

Fire suppression and specialty services are provided as noted above out of five fixed facilities strategically located throughout the town. From these stations, two telesquirts/quints,[2] three pumpers, one tower ladder/quint, and two service companies provide first-line response. In addition, a hazardous materials response and mitigation unit is located at station 5 and is cross-staffed with available personnel from either the engine or the tower ladder when a response is required.

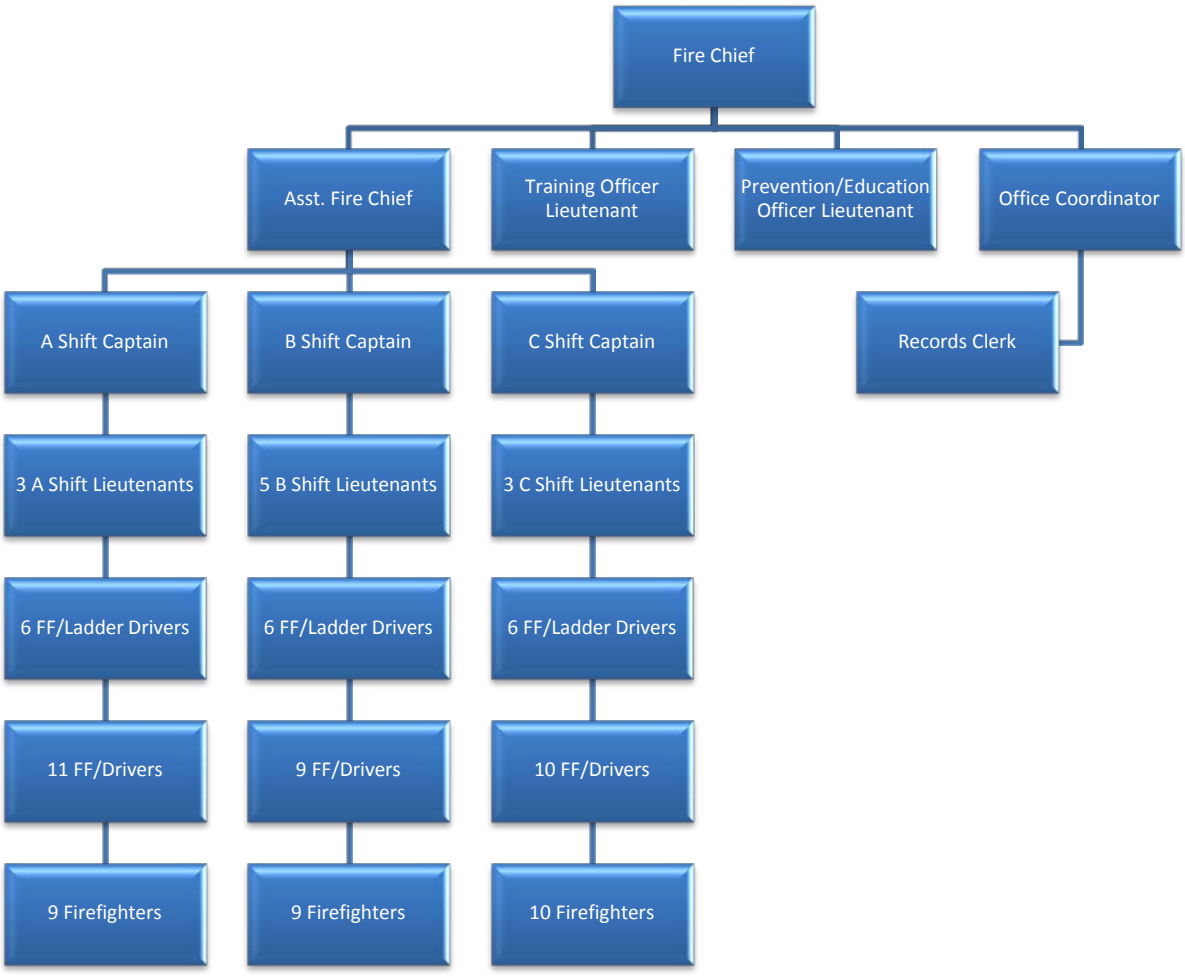
The SFD utilizes a traditional organizational structure that focuses on the core mission of emergency services delivery. This structure provides a clearly defined division of responsibility for critical day-to-day functions, and identifies each functional division/program under the purview of the organization. This also distributes authority so that service is delivered in a timely, orderly, and

[2] A telesquirt/quint is a pumper apparatus with an elevating boom utilized to flow water at an elevated water stream.

effective manner, with leadership and accountability identified from the top of the organization to company-level officers.[3]

Like many other communities, the town of Smyrna has over the years expanded both its fire service delivery area and the types of services that its fire department provides. Technical rescue and hazardous materials (hazmat) are among the SFD's expanded responsibilities. Although the current organizational chart (Figure 2) illustrates the structural hierarchy of the organization and the traditional organizational roles, it does not include functional information about what services each level provides or is expected to execute.

Figure 2: SFD Organizational Chart



Many organizations use functional organizational charts to supplement the information in their formal organizational charts. A functional chart of the organization gives the community a clear picture of what and where key services are located within an organization. In this type of chart, each task or functional area becomes a focal point. Specialization is centralized and employees who

[3] Dennis Compton and John Granito, eds., *Managing Fire and Rescue Services* (Washington, DC: International City/County Management Association, 2002), 115.

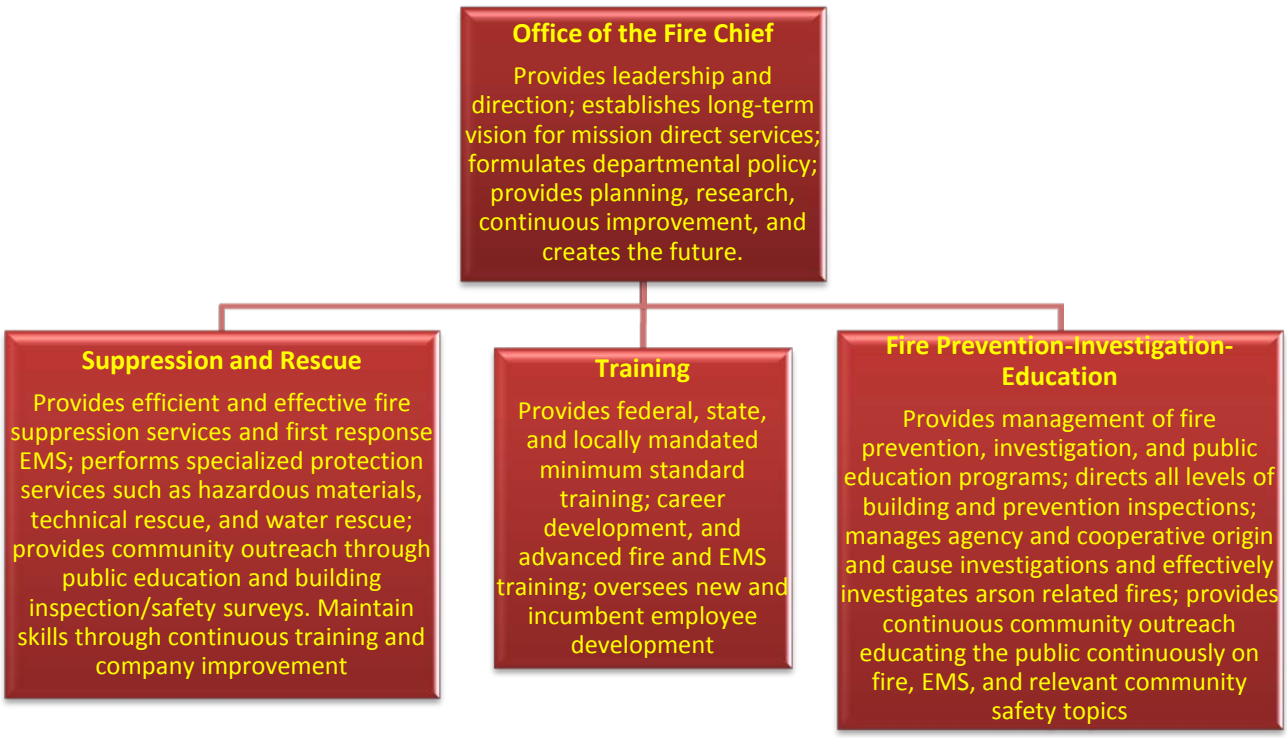
are doing these specialized jobs or tasks are identified. The SFD has a functional organizational chart as illustrated in Figure 3, a best practice. This functional chart enables the SFD to better visualize its division of responsibilities, and offers a high level of transparency to both internal and external stakeholders.

A functional chart of the organization also provides to the SFD a clear picture of the leadership functions at each organizational level and illustrates the work that must be performed at these organizational levels. Integrating the organization's functional and traditional organizational charts facilitates the view of an organization as a set of related responsibilities and creates leadership teams within each organizational component. This reduces organizational silos and promotes lateral team building between organizational divisions.

Figure 3: SFD Functional Table of the Organization

The SFD is acknowledged for establishing a functional table of the organization. As discussed herein, there are certain time allocations and structural organizational issues ICMA noted during the on-site discussions with staff members. ICMA proposes incorporating the functional table of the organization as illustrated in Figure 4 as a more focused representation of each organization component.

Figure 4: Proposed Functional Table of the Organization

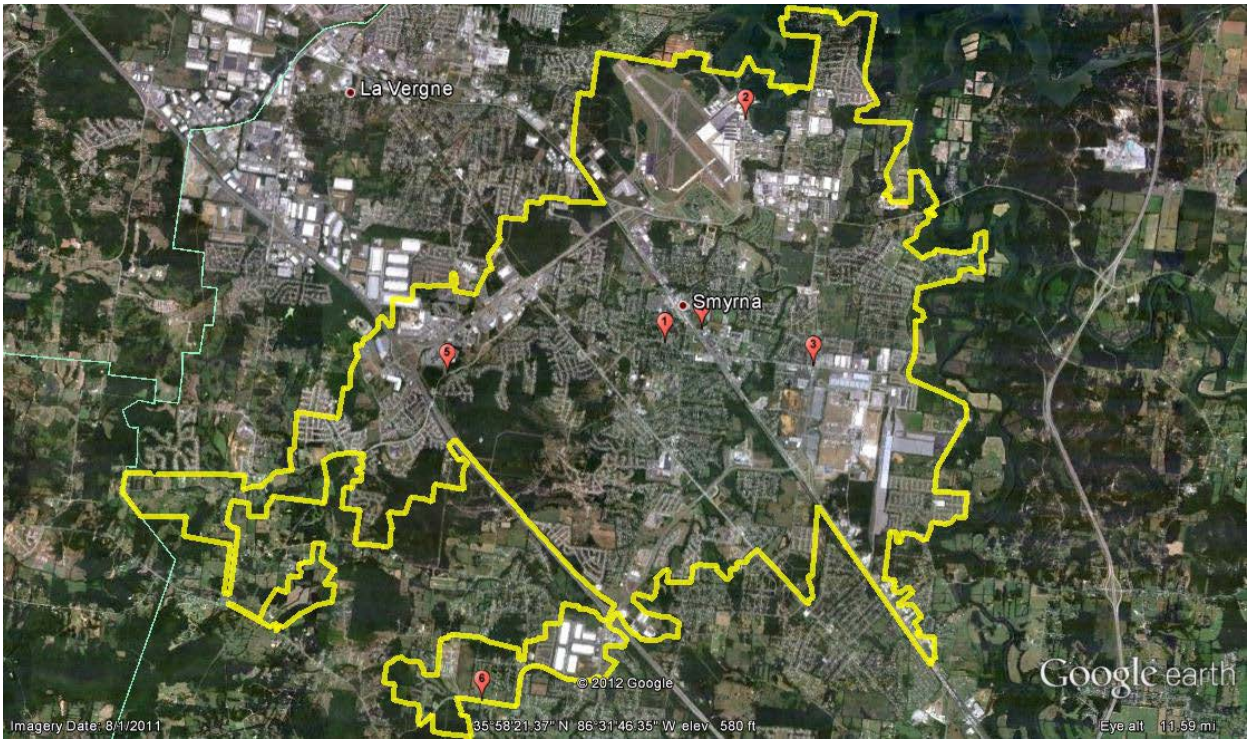


As discussed and illustrated in Figure 2, the SFD deploys its operational force utilizing a three platoon system. Each shift works twenty-five hours on and has forty-seven hours off. Each platoon has a minimum staffing of twenty-three per day. Staff members assigned to the operational twenty-five hour shifts are paid for seventeen hours per day. For the time normally set aside for sleeping (10:00 p.m. – 6:00 a.m.), the staff is not compensated. This agreed-upon schedule between the operational staff and the town maintains the average workweek below fifty-six hours a week, therefore no additional compensation is due these staff members under the Fair Labor Standards Act. Should the staff be utilized or awoken during the non-compensated time period for a call, those assigned to the call are paid by the hour. Should the call time be more than three hours, staff is then paid the entire uncompensated sleep period.

Staffing is such that five personnel are allowed off on leave each day. Leave is administered on a first come-first served basis. The assistant fire chief manages advance leave requests and enforces the five-maximum rule. The shift captain manages the daily unscheduled leave and has the authority to grant leave to up to five personnel if the maximum has not been met. Should unscheduled leave push the number of personnel on leave above five, the tower ladder at station 5 is placed out of service and personnel from this unit are shifted to the vacant positions. There is no overtime available for leave.

Minimum fire suppression staffing is three on each telesquirt, engine (pumper), and the tower ladder. The service companies are staffed with two. First-line officers (lieutenants) are assigned to the telesquirts and engines. Service company 2 is a van staffed by the shift captain who serves in a role similar to a battalion chief in other departments. Service company 2 carries a basic command board, a mister, and other small equipment. Service company 2 is not configured as a command vehicle. Service company 2 should be configured as the overall agency incident command vehicle with the captain, as the shift commander, serving as the lead in command and control of incidents. Figure 5 illustrates the town boundaries and the location of the current fire stations. Station 4, not shown on this map, houses fire administration and the shift captain.

Figure 5: Town Boundaries and Fire Station Locations



Recommendations:

- Ensure consistency at each fire station on each shift by having first-line supervisors (lieutenants) assigned at each station on each shift. To achieve this may require the reclassification of firefighter positions to lieutenant positions and the subsequent promotion to this officer level.
- The proposed functional table of the organization should be developed to accompany the formal department organizational chart and the current SFD functional table of the organization.

- Configure service company 2 as the primary department incident command vehicle capable of incident accountability tracking, monitoring, and transmitting over interoperable radio channels; diagraming the incident for unit resource tracking and incident planning; and having available comprehensive community risk, emergency management, and pre-fire plans for incident planning use.
- In the short term, when leave levels are such that they dictate placing the ladder truck out of service, develop a response plan that cross-staffs this unit with the engine crew on all responses that require this apparatus. In the long term, consider staffing station 5 with four on a permanent basis, and cross-staffing the ladder and engine apparatus' as a regular practice with one crew. This will allow three extra personnel on a daily basis available to fill vacancies created by scheduled and un-scheduled leave and will establish consistent staffing of apparatus. This recommendation will also improve overtime expenditures when utilized to fill scheduled and unscheduled leave vacancies.

Organizational Processes

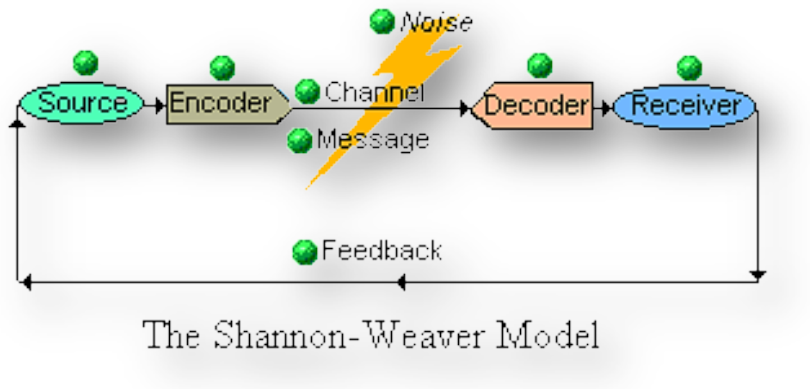
Organizational Communication

In any organization that has a decentralized workforce, the flow of communication will be a challenge. This problem is even more prevalent in a fire service agency that has members working on different shifts and at different locations throughout the jurisdiction. As discussed, the SFD operational staff is deployed on rotating shifts of 25/47, while SFD administrative staff works a normal Monday-to-Friday schedule. Because officers throughout the organization operate outside of their time allocation components, communication consistency has an even greater chance of failure. Additionally, the SFD does not have a first-line supervisor on every shift at every station, further diminishing the accountability for receiving communication in any form that is intended to guide or direct daily operations. In discussion with senior staff of the SFD, it was determined there are accountability issues through the ranks of the department, some of which can be linked to poor communication.

While the department does have certain methods of communication such as e-mail, written directives from senior staff, verbal pass-downs between shifts, and verbal information sharing from top to bottom and bottom to top of the organizational chart, any failure to communicate effectively can create an expectation of not receiving information, which potentially leads to morale issues. The importance of effective communication, established communication processes, and ongoing follow-up cannot be overstated. Developing and implementing an effective communication model is essential to ensuring that good communication is occurring in the SFD.

Figure 6 illustrates a communication model that will enhance the communication flow throughout the SFD.

Figure 6: Communication Model



Following the Shannon-Weaver communication model ensures a circular communication flow with these essential elements of the communication process:[4]

Source: The source of communication is the initiator, or origin, that puts the model into action. It is an individual or group that has a specific reason to begin the communication process.

Encoder: Once the purpose of the source has been decided, there must be a specified format for the message to take. This is what the communication encoder does; it takes the concept that the source wants sent out, and puts it into a suitable format for later interpretation (types the letter/e-mail, prepares notes for a verbal discussion).

Message: The information, idea, or concept that is being communicated from one end of the model to the other is the message. Most of the time, in human communication, the message contains a distinct meaning.

Channel: It is essential for meaningful communication that a suitable means to transmit the message be selected. The channel is the route that the message travels on, be it verbal, written, electronic, or otherwise.

Noise: It is inevitable that noise may come into play during the communication process. Noise could be considered an interference or distortion that changes the initial message; anything that can misconstrue the message may be noise. Noise can be physical, as in an actual sound that muffles the message as it is being said, or it can be semantic, such as if the vocabulary used within the message is beyond the knowledge spectrum of its recipient. In a decentralized organization, it could be the disconnect of shift work or the physical location where the message is delivered and received. In order for communication to be effective, noise must be reduced.

[4] From the University of Rhode Island, "The Shannon-Weaver Model Defined," http://www.uri.edu/artsci/lsc/Faculty/Carson/508/03Website/Hayden/ShanWeav.html.

Decoder: Before the message reaches the intended recipient, it must be decoded, or interpreted, from its original form into one that the receiver understands. This is essentially the same interaction as that of source and encoder, only in a reversed sequence (skills to read, listen).

Receiver: In order for communication to be executed, there must be a second party at the end of the channel the source has used. The receiver takes in the message that the source has sent out.

Feedback: For meaningful communication to come to fruition, it is vital that the receiver provide feedback to the source. Feedback relates to the source whether the message has been received, and most importantly, if it has been interpreted accurately. Without feedback, the source would never know if the communication was successful. Ongoing communication is made possible by the cyclical route feedback allows; if more communication between the parties is necessary, they can follow the model indefinitely.

Recommendation:

- Develop and implement a communication model for the organization that ensures an effective conduit of clear and productive communication throughout the entire organization.

Time Allocation

To effectively operate in an organization, an employee must understand his or her role and, as importantly, where he/she should allocate his/her time during the workday or shift to be most effective. Understanding this concept is essential in an organization that has a broad organizational chart such as the SFD. Three segments of organizational time allocation are central to achieving the goals and objectives of any organization and, more importantly, for enabling the organization to fulfill its mission and realize its vision: (1) operating the system; (2) improving the system; and (3) creating the future.

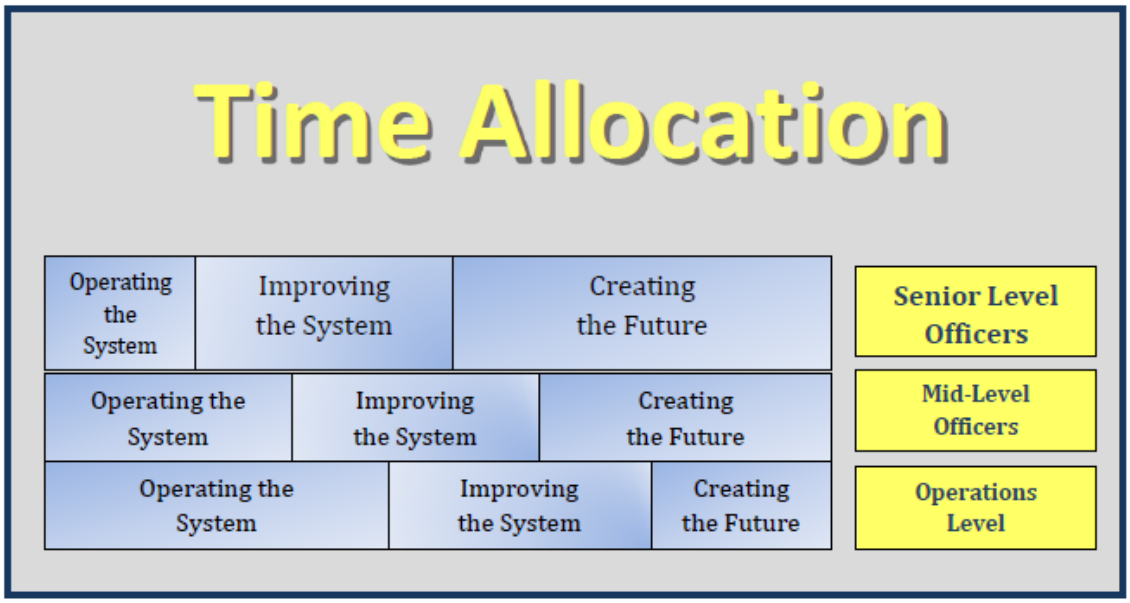
Operating the system is that time during the workday that an organizational member is implementing service deliverables, touching those components of the organization that make it go. *Improving the system* is the time during the workday that an organizational member spends seeking ways to make service deliverables and organizational components more efficient, or, more simply put, better. *Creating the future* is that critical piece of time allocation when an organizational member develops goals and objectives that link to strategic planning and considers the vision of the organization in a way that focuses on successful, effective outcomes.

During conversations with senior and middle management, ICMA learned that captains may not visit each station during each shift to provide programmatic guidance to shift supervisors and/or firefighters serving as shift leaders. This is an important management and leadership contact that must occur on a daily basis to ensure that those operating the system are engaged in consistent practices. As well, middle management can effect improvement across the system through this daily contact and leadership. Additionally, it was learned lieutenants assigned to administrative positions provide direct guidance and counseling to captains, lieutenants, and firefighters. This practice takes

the appropriate level (assistant chief and captain) out of their proper time allocation component, which allows them to migrate to where they are most comfortable, which generally is operating the system. And finally, in review of response data, it is noted the fire chief responded to 1,000+ calls during the analysis period. While this is admirable, the department has first-line supervisors and a shift captain to manage daily calls for service. The fire chief should be spending the majority of his time, along with the assistant fire chief, developing and implementing comprehensive planning documents the department currently lacks (discussed further in this report), updating and improving guidelines and policies, and analyzing current issues and trends, all of which are improving the system and creating the future.

Figure 7 illustrates how various levels of a fire and emergency services department should allocate time each day.

Figure 7: Time Allocation Model



From Virginia Beach, *Guide to the Virginia Beach Quality Service System* (1997).

The SFD organizational chart cross-walks to Figure 7 as follows:

- Senior Level Officers: Fire Chief, Assistant Fire Chief
- Mid-Level Officers: Captains, Staff Lieutenants
- Operations Level: Station Lieutenants, Firefighters

Employees at all levels of the organization—from fire chief to firefighter—need to maintain a balance between each time-allocation component according to their level of responsibility. Managers and firefighters have a responsibility to understand their organizational roles and responsibilities, and to perform the tasks related to these roles and responsibilities. One would not

expect senior-level officers to spend as much time operating the system as a frontline service provider does. Conversely, one would not expect a midlevel officer—a battalion chief, captain, or lieutenant—to spend as much time as a senior-level officer planning for the future of the organization. Through understanding and practicing the concepts of the time allocation model, each level of the organization develops a different set of priorities, and employees at each level successfully allocate their time accordingly.

Recommendations:

- Adopt a time allocation model; implement and monitor time allocation to ensure effective use of officer and staff time as it relates to achieving the organizational mission and to each individual's position in the organization.
- Establish a clear chain of command for the department from the rank of firefighter to the fire chief, utilizing basic principles of unity of command and span of control. Each employee should answer to one supervisor and each officer (supervisor) should clearly understand their role in the organization, their responsibility, and the level of leadership and accountability that comes with their position.

Personnel Services

The town of Smyrna's human resources department is responsible for coordinating aspects of hiring, promotions, compensation, benefits, and personnel-related administrative actions. As an overall goal, "It is the Town of Smyrna Human Resources Department's goal to attract, develop and retain a diverse workforce that both meet and reflect the high standards of the diverse community we serve."[5]

When the decision to hire a firefighter (or firefighters) is approved by the town manager, the town advertises the position opening. Applications are screened against posted qualifications and work experience. Applicants who are selected are required to take the written examination for entry level firefighter positions. The current written examination utilized is the International Public Management Association (IPMA) general aptitude examination. This is not a skill-based exam. Candidates who pass the written exam are then invited to take a physical agility test developed by the fire department. The agility test is not validated. Further screening includes psychological testing, a background investigation that is conducted by the Tennessee Bureau of Investigation, a medical exam, and a formal oral interview. After the oral interview and with the approval of the town manager, the final selection or selections are made.

There is no provision for annual medical testing or cardiac screening for firefighters of certain ages (over the age of 40). Fit testing for self-contained breathing apparatus is conducted annually by a third-party contractor. Additionally each member who participates in the annual mask fit testing completes the Occupational Safety and Health Administration (OSHA) respiratory protection program questionnaire, which is reviewed by a physician. Risk management/workers compensation is administered by the human resources department, which also administers the town's wellness program. Firefighters are allowed one hour in each work day to perform physical

[5] Retrieved from: http://www.townofsmyrna.org/Departments/HumanResources.aspx

fitness activities of their choice. Engaging in physical fitness activities is not required, but is an option.

The fire chief's office handles employee relations issues, working with the town's human resources department. All disciplinary counseling is conducted by a staff lieutenant representing the chief, regardless of rank of the individual receiving this counseling. ICMA recognizes this practice does not link to the organizational chart or a proper allocation of time or organizational position by the lieutenant or senior fire staff. Further, allowing this practice potentially contributes to the perception among some company and midlevel staff that management does not trust them to do their jobs. Moreover, this may direct the focus of senior and mid-managers away from the important managerial and leadership responsibilities they have. This elevates the need for all officers to understand and engage in a time allocation model as proposed in our earlier discussion.

Recommendations:

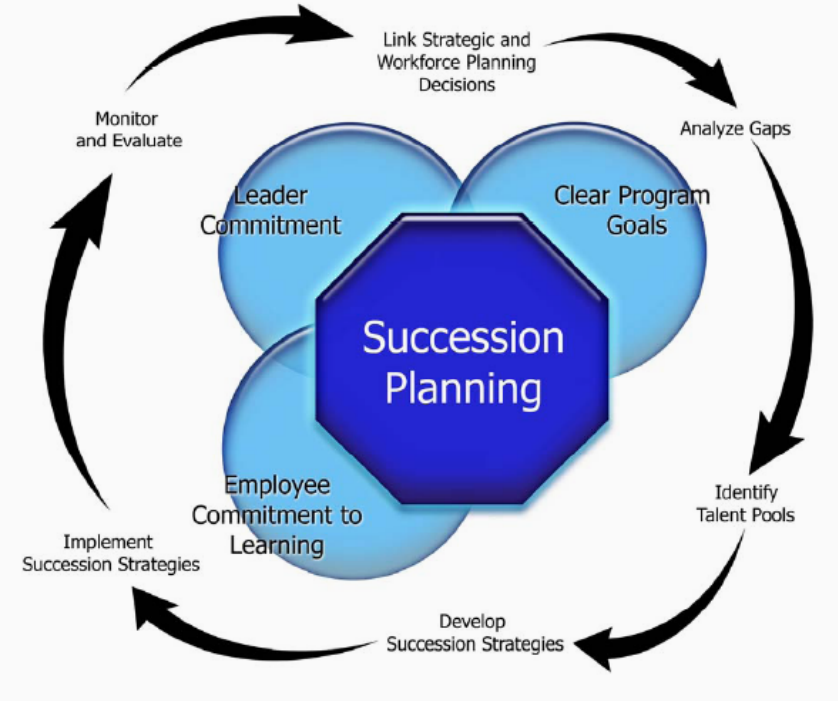
- The SFD should work closely with the human resources department developing and administering the hiring and promotional processes. The SFD should assign officers to entry and promotional exam committees working with the human resources department as subject matter experts for continuous overall organizational improvement.
- Adopt a validated physical agility test in lieu of the current physical agility test administered to SFD candidates.
- Consider based on available funding, conducting the initial medical exam for entry level firefighters in accordance with National Fire Protection Association (NFPA) 1582 standard.
- Consider based on available funding, providing annual medical exams for incumbent employees who are subject to entering atmospheres that are immediately dangerous to life and health (IDLH), in accordance with National Fire Protection Association (NFPA) 1582 standard.

Succession Planning

Our analysis of the SFD did not identify a clear organizational succession plan, career path training model, or expectations that help to prepare staff for advancement in the organization. Succession planning is a systematic approach to developing potential successors to ensure organizational leadership stability. Successful succession planning identifies, develops, and nurtures potential future leaders. It is critical for the long-term success of any organization that such a process occurs.

Critical to the success of succession planning is the engagement and commitment of the senior leaders to the program, as well as a commitment of other members of the organization to their own personal and professional development. To be a part of the succession plan, one must commit to one's own professional development process to be able to compete for and fill critical organizational leadership roles.

Figure 8: Six-Step Succession Planning Model



From United States Office of Personnel Management, HCAAF Systems, 2005.

Recommendation:

- Develop and implement a succession planning process that identifies and develops future leaders.

Education and Training Programs

The Tennessee Commission on Fire Fighting is responsible for the certification of volunteer and career firefighters in the state. The commission also administers the Educational Incentive Pay Program for career firefighters in Tennessee. The commission is responsible for approving training programs to meet the requirements of T.C.A. 4-24-112 (the Minimum Training Statute), and proof of compliance with this statute must be submitted to the commission. The commission will endeavor to raise the standards of firefighting personnel who participate in its certification and training programs by enabling Tennessee firefighters to be better prepared through training courses facilitating the skills and knowledge necessary to save lives and property, and by vigorously promoting firefighting safety, efficiency, decorum and ethical considerations throughout the certification process.[6]

The SFD is responsible for administering the training program for members and maintaining compliance with state training requirements. Training is conducted while on duty with topics identified in the weekly training calendar. The International Fire Service Training Association (IFSTA) manual for firefighting is used by the department as the basis for training and complies

[6] Tennessee Commission on Fire Fighting website, 2012.

with the National Fire Protection Association standards for firefighters, NFPA Standard #1001. All uniformed employees receive a minimum of 40 hours of state required training annually. In addition each member receives 20 hours of required Insurance Services Office (ISO) training. A training lieutenant who works a five-day week coordinates and monitors the training program. Firefighters spend a minimum of two hours each day on training. Multi-company or all-hands drills generally last up to three hours and are conducted on a regular basis. Technical rescue training is provided by a contractor.

Required annual training includes hazardous materials, safety, blood-borne pathogens, driver safety, and emergency vehicle operations. Emergency medical training is at the first responder level. Rutherford County administers the emergency medical system, including the town of Smyrna. The SFD currently has no EMS affiliation with the county and therefore is limited to supported training and to what level SFD members can train to.

Recommendation:

- Consider affiliation with the Rutherford County EMS system with a focus on enhancing EMS training for SFD first response personnel.

Assessment and Planning

A fire department should conduct a needs assessment and community risk analysis within its community for use in the comprehensive strategic planning process. This assessment process assists in determining the necessary resources and assets needed to accomplish the department's defined core mission functions.

Deciding how many emergency response resources to deploy, and where, is not an exact science. The final decision on a deployment model is based on a combination of risk analysis, professional judgment, and a community's willingness to accept more or less public safety risk based on available revenues. Accepting more risk generally means that fewer resources are deployed, or resources are deployed from a greater distance. It is important to note, however, that deploying more resources or deploying resources within a geographically smaller area to reduce response times will not guarantee that loss will be less, especially in the short term. In any case, matching available revenues to expenditures generally is the greatest driver for deploying fire and EMS resources. This comprehensive planning process will assist in determining the necessary resources and assets needed to accomplish the department's core mission functions.

Strategic Planning/Goals and Objectives

The development of a long-range fire protection and prevention comprehensive strategic plan involves three key steps. The first step is to generate an assumption of what the community will look like at the end of the planning process. Second, the department needs to assess realistically the strengths and weaknesses of the existing fire protection system to include codes, standards, and ordinances relating to fire prevention efforts, public safety education programs, and emergency response capability. The third and final step is to project the needed capabilities and capacity of the

fire protection system and its fire department component as the community changes.[7] This process helps to ensure that an adequate level of resources, including staffing and equipment, are allocated to meet the community's needs for the services delivered by the fire department as efficiently as possible. A strategic plan also assists the department in matching resources with available revenues.

Defining clear goals and objectives for any organization through a formal strategic planning document establishes a resource that any member of the organization, or those external to the organization, can view and determine in what direction the organization is heading, and as well how the organization is planning to get there.

In a strategic plan, it is essential that clear and achievable goals and objectives for each program area are developed. Each program area must then (1) define its goals; (2) translate the goals into measurable indicators of goal achievement; (3) collect data on the indicators for those who have utilized the program; and (4) compare the data on program participants and controls in terms of goal criteria.[8] Objectives should be SMART, an acronym that stands for specific, measurable, ambitious/attainable, realistic, and time-bound. Additionally, these goals should link back to fiscal planning goals.

The SFD does not have a departmental comprehensive strategic plan that focuses on the future, provides clear departmental direction, and defines resources that support the strategy for fire protection and EMS service deliverables. The department did begin such a plan; however, it stopped this process when notified of the ICMA study. The SFD does have some established goals and objectives; however, these are not linked to a department document that encompasses a clearly defined strategy. Figure 9 illustrates a basic strategic planning model the SFD can utilize when developing its comprehensive strategic plan.

[7] *Fire Protection Handbook,* Twentieth Edition, Volume II (National Fire Protection Association, 2008), 12-5.
[8] Starling, *Managing the Public Sector,* 287.

Figure 9: Basic Strategic Planning Model

As there is no perfect strategic planning model for an organization, the above model provides one form from which the organization can begin to develop a strategic planning process, and eventually a strategic plan. Listed below are the steps for a successful approach to this critical process: [9]

Purpose-Mission: This is the statement that describes why an organization exists. This statement should describe what customer needs are intended to be met and with what services. Top-level management should agree what the mission statement/purpose is, understnding this will change over the years as the organization changes.

Selection of goals the organization must meet to accomplish its mission: Goals are general statements about what an organization needs to accomplish to meet its purpose, or mission, and address major issues it faces.

Identify specific approaches or strategies that must be implemented to reach each goal: The strategies are often what change the most as the organization eventually conducts more robust strategic planning, particularly by more closely examining the external and internal organizational environments.

Identify specific actions to implement each strategy: Specific activities each division or major function must undertake to ensure it is effectively implementing each strategy must be identified. Objectives should be clearly worded to the extent that staff and the community can

[9] McNamara, C. (1996-2007) *Basic Overview of Various Strategic Planning Models*. Adapted from the Field Guide to Nonprofit Strategic Planning and Facilitation. Minneapolis, MN: Authenticity Consulting, LLC.

assess if the objectives have been met or not. Ideally, top management develops specific committees that each have a work plan, or set of objectives.

Monitor and update the plan: Regulalrly reflect on the extent to which the goals are being met and whether action plans are being implemented. Perhaps the most important feedback is positive feedback from customers, both internal and external.

Recommendations:

- It is strongly recommended that the SFD develop and implement a comprehensive strategic plan.
- Incorporate measurable and obtainable goals and objectives into strategic and comprehensive planning documents as well as annual and long-range fiscal documents.

Risk Assessment and Risk Management Planning

As mentioned earlier, a fire department should conduct a community risk analysis within its community for use in the comprehensive planning process. This assessment process will assist in determining the resources and assets needed to accomplish the department's core mission functions. Deciding how many emergency response resources to deploy, and where, is not always an exact science. There are many factors that affect the final decisions on where and when to expand or contract these services. The final decision on a deployment model is based on a combination of risk analysis, the demand for services, capacity within the current service delivery model, professional judgment, and the SFD's governing body's willingness to accept more or less public-safety risk, based on available revenues.

Community risk and vulnerability assessment are essential elements in a fire department's planning process. 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.[10] 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.[11]

[10] Fire Service Deployment, Assessing Community Vulnerability: From http://www.nfpa.org/assets/files/pdf/urbanfirevulnerability.pdf.
[11] National Fire Service Data Summit Proceedings, U.S. Department of Commerce, NIST Tech Note 1698, May 2011.

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. 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. [12]

Linking a fire department's operational performance functionality to the community risk and vulnerability assessment further assists fire personnel in the planning process by increasing their understanding of the community risk with regard to property and life-hazard potential. By plotting the rated properties on a map, planners can better understand how current and future fire station locations and resource capabilities relate to specific risks and vulnerabilities, and then can identify potential gaps in service delivery. In combination with response run cards and staffing patterns, the analysis can help the SFD shift resources from areas at less risk to concentrate more resources where there is a greater likelihood of incidents, and to prepare for worst-case scenarios.[13] The community risk assessment may also include determining and defining the differences in risk between a detached single-family dwelling, a multifamily dwelling, an industrial building, and a high-rise building by placing each in a separate category.

In addition to examining community risk and vulnerability, the SFD should examine internal risk and vulnerability. Risk assessment and vulnerability analysis are not new to the fire service, as the NFPA 1500 Standard for a Fire Department Occupational Safety and Health Program document requires the development of a separate risk management plan for fire departments aside from the risk management plan in a local government plan.[14]

In order for this process to be effective, the following components must be included in the risk management plan:

Risk identification: Actual or potential hazards.

Risk evaluation: The potential for occurrence of a given hazard and the severity of its consequences.

Prioritizing risk: The degree of hazard based upon the frequency and severity of occurrence.

[12] Cote, Grant, Hall & Solomon, eds., *Fire Protection Handbook* (Quincy, MA: NFPA 2008), 12.
[13] *Fire and Emergency Service Self-Assessment Manual*, Eighth Edition, (Center for Public Safety Excellence, 2009), 49.
[14] Barr and Eversole, eds., *The Fire Chief's Handbook*, Sixth Edition, 270.

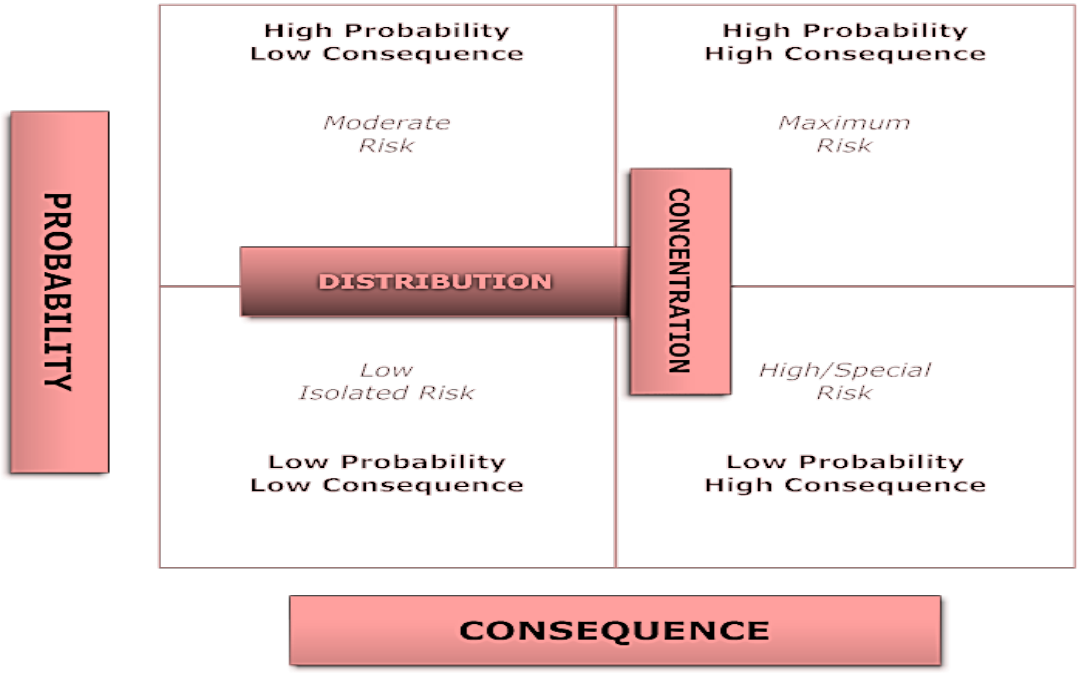
Risk control: Solutions for eliminating or reducing real or potential hazards by implementing an effective control measure.

Risk monitoring: Evaluation of effectiveness of risk control measures. [15]

The risk management plan establishes a standard of safety for the daily operations of the SFD. This standard of safety establishes the parameters within which the SFD should conduct all activities during emergency and nonemergency operations. The intent is for all members to operate within this standard or plan of safety and not deviate from this process.

Figure 10 provides a matrix illustrating the considerations of both internal and external risk assessment: the probability of an event occurring and the seriousness of the consequence if an event should occur. This matrix divides the risk assessment into four quadrants. Each quadrant of the chart suggests different requirements in the community for commitment of resources, and/or in the organization as the organization deploys its resources to combat the risk, whatever it is.

Figure 10: Probability and Consequence Matrix



Recommendations:

- Undertake a community risk and vulnerability assessment. The SFD should use the results for the ongoing planning of fire response run cards, identification of apparatus needs, and staffing and deployment of resources.

[15] NFPA 1500 (2007). Standard for a Fire Department Occupational Safety and Health Program, Annex D.

- The SFD should develop and implement an internal risk management plan following the standards of NFPA 1500, Standard for a Fire Department Occupational Safety and Health Program.

Insurance Services Office Rating

In June 2002 the SFD was notified by the ISO that the town of Smyrna would receive an ISO rating of Class 3. The town had held a Class 4 rating.

ISO is a for-profit subsidiary of Verisk Analytics Company. ISO provides services relating to risk analysis by gathering information through community assessments and providing the information to the insurance industry. The data has historically been used to develop premiums for both residential and commercial policies. The ISO's Fire Suppression Rating Schedule (FSRS) is analyzed to assign the Public Protection Classification (PPC).[16] The FSRS is a manual of the criteria which measures the tools (assets and practices) in a community's arsenal to fight fires. The schedule contains a point system from 0 to 100. Every ten points is a "Class." The grade is presented as a class from 1 to 10: Class 1 is the highest class; a rating of Class 9 is considered the "lowest recognized protection." A Class 10 does not meet the minimum criteria established by the ISO. Table 1 depicts the PPC classifications by point value. The national distribution of PPC classifications is illustrated in Figure 11.

According to ISO, the FSRS evaluates three areas when considering a locality's fire protection: fire alarms, water supply, and the agency itself. [17] Ten percent of the community's score is based on the manner in which a fire department receives and dispatches calls for fire alarms. Included in the observations is a detailed analysis of the communications center (personnel and number of lines coming into the center). In Smyrna, the SFD police emergency communications center handles the dispatch of fire and EMS calls.

Table 1: PPC Classifications

PPC	Points
1	90.00 or more
2	80.00 to 89.99
3	70.00 to 79.99
4	60.00 to 69.99
5	50.00 to 59.99
6	40.00 to 49.99
7	30.00 to 39.00
8	20.00 to 29.99
9	10.00 to 19.99
10	0.00 to 9.99

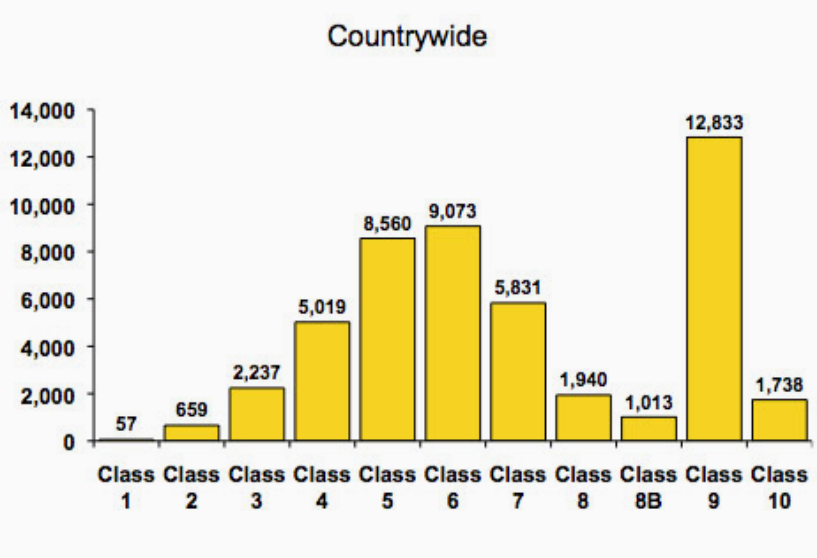
Forty percent of the score is based on the sufficiency of the community's water supply system and its ability to provide water in excess of the daily maximum consumption. In Smyrna, the water supply for fire protection is managed by the town of Smyrna water treatment plant.

Lastly, the fire agency itself is evaluated and contributes to 50 percent of the overall score. Within this module, ISO reviews the distribution of stations and companies throughout the area, all components of personnel training, and equipment inventory to include review of maintenance and testing. There are three particular areas included within the majority of the fire department analysis. Fifteen percent of this module is attributed to company personnel available to respond to first alarms; however, ISO does apply an upper limit for staffing as there is a finite number of personnel who can effectively operate a piece of apparatus at any

[16] ISO Mitigation Online, *About ISO* (2012), http://www.isomitigation.com/docs/about0001.html (accessed on October 31, 2012).
[17] ISO Mitigation Online. *About ISO*.

given time. Ten percent of this module is given for the comparison of in-service pumpers and equipment carried, with the number of necessary pumpers and equipment as determined by "Basic Fire Flow, the size of the area served, and the method of operation." The third-highest weighted score (9 percent) in this module is the rating of the department's training. ISO evaluates the training programs and available training facilities. This review includes the training of officers, drivers, and recruits, along with ensuring familiarization with buildings and pre-fire planning.

Figure 11: National PPC Distribution



Source: ISO Mitigation Online, About ISO (2012), http://www.isomitigation.com/docs/about0001.html.

For decades, the ISO's PPC rating schedule has been utilized to aid insurance companies with determining premiums for property insurance. Recently, there has been some discussion as to whether the system provides the appropriate benchmark for the quality of an agency's delivery of fire suppression services. Professionals within the fire industry have debated whether the ISO's methodology is outdated and whether it provides a comprehensive analysis of the fire suppression ability of the particular agency. In 2010, the ISO began to solicit input from various organizations regarding the process and to determine if there were any necessary changes to the rating schedule. The NFPA, the IAFC, the National Volunteer Fire Council (NVFC), the IAFF, the Association of Public-Safety Communication Officials (APSCO), and the National Association of State Fire Marshals all provided varying forms of suggestions to ISO.[18] In addition to the three components currently examined, the changes being considered include the addition of a fourth component: community risk reduction. This would include a review of all activities relating to fire prevention within an agency, such as administration, adoption, and enforcement of the fire code.

Some critics of the rating system have stated that the ISO is outdated and fails to give credit for new technologies that have proven effective in fire suppression efforts. ISO has taken this criticism into

[18] Janet Wilmoth, "Suppression Ratings See Unscheduled Maintenance," *The Fire Chief* (June 1, 2010), http://firechief.com/print/suppression/ar/suppression-rating-changes-201006 (accessed Oct. 31, 2012).

consideration when reviewing the new proposals to the schedule and system. Janet Wilmoth, in a recent article of *Fire Chief,* reports that ISO has developed a relationship with the CPSE and has been an active participant in fire department accreditation. The ISO recognized the importance of the accreditation process and how it provides an exceptional tool that can be utilized for continuous self-improvement and professional development. Fire professionals also recognize that the accreditation process bolsters the quality of service delivery.

An available best practice that involves a comprehensive assessment of a fire department is the accreditation program managed by the Center for Public Safety Excellence (CPSE). Again, this program provides an analytical self-assessment process to evaluate ten categories of the agency's performance. During this process, the department examines more than 240 separate performance indicators, 98 of which are considered core or required competencies.

Included within the ten accreditation categories is an expectation for the fire department to analyze itself by planning zones, to identify the hazards posed within each planning zone, to rank hazards by potential severity, and to ensure that the appropriate resources are available to manage the hazards.[19] There seems to be a current trend to focus an agency's planning and resources on becoming accredited and/or maintaining the accreditation. As noted, the PPC process evaluates only certain areas of a department's fire program and may not provide an accurate picture of the agency's ability to effectively fight and prevent fires. The accreditation process provides the individual department the benefit of a critical self-analysis of its performance at varying levels to ensure continuous self-improvement. It is an extremely comprehensive review that is conducted over a certain time period and requires reaccreditation, which helps to ensure that the standards are being maintained.

Assuming all other factors are "equal," communities with higher ratings through the PPC program generally benefit from lower property insurance than communities that have a lower PPC rating. A large majority of insurers consider the ISO's PPC program when assessing policies. However, State Farm, one of the nation's largest insurance carriers, has phased out the use of the ISO rating when considering property premiums for communities.[20] Where permissible by law, State Farm has elected to institute its own fire rating system, which analyzes actual claims in a given zip code. State Farm has determined this provides a more accurate depiction of a community's "fire-fighting ability." Tennessee does not require State Farm to consider ISO's PPC.

An argument can be made that a department and its leadership should focus efforts on the accreditation process, which may in turn potentially reduce the ISO PPC rating. Furthermore, the accreditation process helps a local government justify its expenditures by demonstrating a direct link to improved services. Particularly for emergency services, local officials need criteria to assess professional performance and efficiency. The CPSE fire accreditation process provides a well-

[19] CPSE, *CFAI Accreditation Process* (2012) http://www.publicsafetyexcellence.org/agency-accreditation/the-process.aspx (accessed on October 31, 2012).
[20] Insure.com, *Smoke but No Fire where State Farm Abandons Standard Fire Ratings* (February 13, 2003), http://www.insure.com/home-insurance/state-farm-fire.html (accessed on October 31, 2012).

defined, internationally recognized benchmark system to measure the quality of fire and emergency services.[21]

While it is auspicious for a fire department to strive for a higher PPC to potentially achieve an improved insurance rating for residents and businesses, one has to ask at what cost. It is true the increase of the PPC for a jurisdiction can reduce the amount of insurance paid by residents and businesses, but it is equally true that the cost of making the improvements necessary to obtain that reduction (which translates into higher taxes paid by those same residents and businesses) can exceed the insurance savings realized.[22] Fire departments should consider pursuing accreditation, as it also has a positive effect on the community's ISO PPC rating.[23]

Historically, communities have sought to have the highest ISO classification possible. In more recent years, however, local jurisdictions have been attempting to more closely analyze the benefits gained from a high ISO rating as compared to the cost to the taxpayer to reach such a rating. While there can be differences in insurance premiums paid by a private business based on the ISO rating, as a practical matter, most large businesses are individually rated by insurance companies. Insurers take into consideration the very specific characteristics of the building housing a business, the site and the type of business, and if it has fire protection systems in place, such as automatic sprinkler systems.

Insurance premiums may not be significantly affected for residential properties by differences in the ISO rating if the rating is banded in one of the higher classes (between 1 and 5). Stated more directly, it is unknown what specific benefits property owners derive from their community's ISO rating. In an effort to answer that question an increasing number of local governments are seeking information from the insurance industry. This is not to suggest that the town of Smyrna should no longer strive for a Class 3 ISO rating, but it does suggest that data should be obtained and analyzed to determine the relative costs and benefits of this rating. Both the ISO process and the accreditation process are important ways to judge the quality of an organization and community, but on balance, the accreditation process is generally more helpful in building a high-performance fire organization that potentially delivers premier fire services.

Recommendations:

- Consider the Center for Public Safety Excellence (CPSE) accreditation program and conduct a self-assessment under the CPSE guidelines as a means toward overall organizational improvement. If this program is implemented, appoint an accreditation manager whose primary function is to manage the accreditation process until the SFD is fully accredited.
- The department should obtain specific data and rationale from property insurance carriers to determine the community financial benefits, if any, of maintaining the current ISO rating to determine if there will be a significant difference in insurance rates should the

[21] CPSE, *About CPSE* (2012), http://www.publicsafetyexcellence.org (accessed on October 31, 2012).
[22] Barr and Eversole, *The Fire Chief's Handbook*, 203.
[23] Ron Holt, *A Different Perspective of Fire Department Accreditation*, CPSE, http://www.publicsafetyexcellence.org/files/pdf/A-Different-Perspective-Accred.pdf (accessed on October 31, 2012).

department change ratings to a lower number, and then balance this change against any potential change in tax rate to maintain the ISO 3 rating.

Performance Measurement

Fire safety and prevention programs need to be planned and managed to achieve specific, agreed-upon results. This requires establishing intended results and a set of goals for the activities of any given program to achieve these results. Determining how well an organization or program is doing requires that these goals be measurable and that they are measured against desired results. This is the goal of performance measurement.

Simply defined, performance measurement is the ongoing monitoring and reporting of progress toward pre-established goals. It captures data about programs, activities, and processes, and displays data in standardized ways that help communicate to service providers, customers, and other stakeholders how well the agency is performing in key areas. Performance measurement provides organizations with tools to assess performance and identify areas in need of improvement. In short, what gets measured gets done.

The need to continually assess performance requires adding new words and definitions to the fire service lexicon. Fire administrators need to be familiar with the different tools available and the consequences of their use. In *Managing the Public Sector*, business professor Grover Starling applies the principles of performance measurement to the public sector. He writes that the consequences to be considered for any given program include:

Administrative feasibility: How difficult will it be to set up and operate the program?

Effectiveness: Does the program produce the intended effect in the specified time? Does it reach the intended target group?

Efficiency: How do the benefits compare with the costs?

Equity: Are the benefits distributed equitably with respect to region, income, gender, ethnicity, age, and so forth?

Political feasibility: Will the program attract and maintain key actors with a stake in the program area?[24]

Performance measurement systems vary significantly among different types of public agencies and programs. Some systems focus primarily on efficiency and productivity within work units, whereas others are designed to monitor outcomes produced by major public programs. Still others track the quality of services provided by an agency and the extent to which citizens are satisfied with these services.

[24] Starling, *Managing the Public Sector*, 396.

Within the fire service, performance measures tend to focus on inputs (the amount of money and resources spent on a given program or activity) and short-term outputs (the number of fires in the community, for instance). One of the goals of any performance measurement system should be also to include efficiency and cost-effective indicators, as well as explanatory information on how these measures should be interpreted. The types of performance measures are shown in Table 2 on the next page.

One of the most important elements of performance measurement within the fire service is to describe service delivery performance in a way that both citizens and those providing the service have the same understanding. The customer will ask, "Did I get what I expected?" The service provider will ask, "Did I provide what was expected?" Ensuring that the answer to both questions is "yes" requires alignment of these expectations and the use of understandable terms. The author of the "Leadership" chapter of the 2012 edition of ICMA's *Managing Fire and Emergency Services* "Green Book" explains how jargon can get in the way:

> Too often, fire service performance measures are created by internal customers and laden with jargon that external customers do not understand. For example, the traditional fire service has a difficult time getting the public to understand the implications of the "time temperature curve" or the value of particular levels of staffing in the suppression of fires. Fire and emergency service providers need to be able to describe performance in a way that is clear to customers, both internal and external. In the end, simpler descriptions are usually better.[25]

Table 2: The Five GASB Performance Indicators

Category	Definition
Input indicators	These are designed to report the amount of resources, either financial or other (especially personnel), that have been used for a specific service or program.
Output indicators	These report the number of units produced or the services provided by a service or program.
Outcome indicators	These are designed to report the results (including quality) of the service.
Efficiency (and cost-effectiveness) indicators	These are defined as indicators that measure the cost (whether in dollars or employee hours) per unit of output or outcome.
Explanatory information	This includes a variety of information about the environment and other factors that might affect an organization's performance.

From Harry P. Hatry et al., eds. *Service Efforts and Accomplishments Reporting: Its Time Has Come* (Norwalk, CT: GASB, 1990).

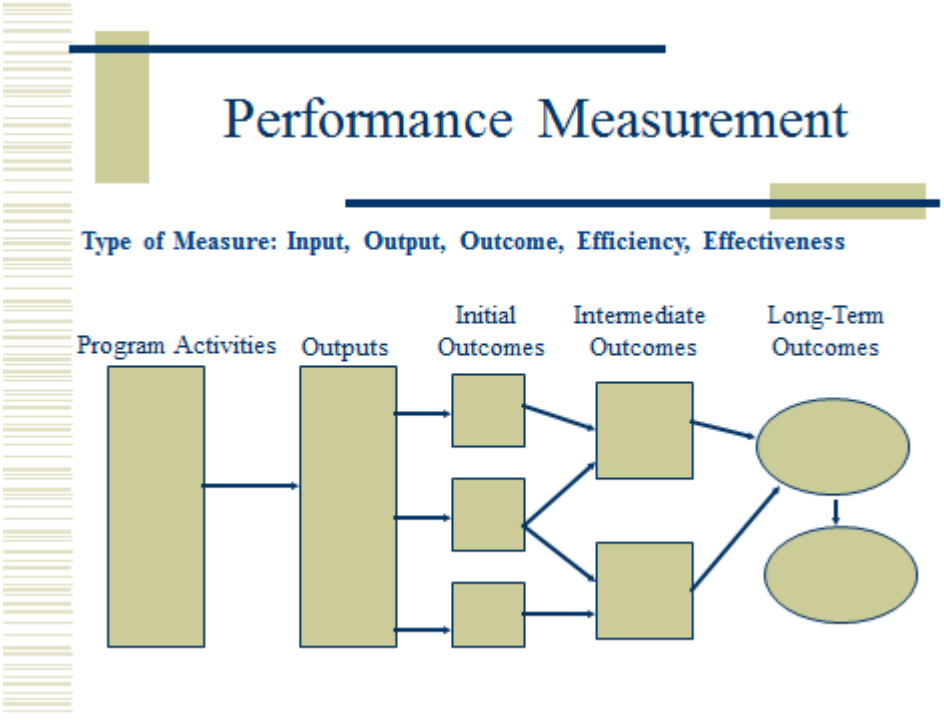
[25] I. David Daniels, "Leading and Managing," in *Managing Fire and Emergency Services* (Washington, DC: 2012), 202.

The SFD measures some aspects of performance within the budget document. For instance, it collects and reports typical fire department data on response times, training, incident responses, pre-fire planning, and public education to name a few. These statistics, although reflecting typical workload measures seen among fire service organizations today, should link department goals to specific target rates or percentages if they are to be used to justify program budgets and service delivery levels.

To accomplish this linkage, other forms of performance measures, particularly service-quality and customer-satisfaction measures, should be incorporated into the system. Staff throughout the organization should participate in developing performance measures. In addition to helping facilitate department wide buy-in, this could provide an opportunity for upper management to better understand what the line staff believes to be critical goals—and vice versa. For the same reason, the process of developing performance measures should include citizen input.

Establishing a performance management system within the framework of an overall strategic plan would help town management and elected officials gain a better understanding of what the SFD is trying to achieve. Building any successful performance management system that measures more than outputs requires a consistent model. Figure 12 illustrates a successful program logic model[26] designed to build consistent performance measures; it should be linked to the performance measure indicators shown in Table 2.

Figure 12: Performance Measure Program Logic Model[27]



[26] Shows the logic by which program activities are expected to lead to targeted outcomes. Poister, 35.
[27] Theodore Poister, *Measuring Performance in Public and Nonprofit Organizations* (San Francisco, CA: 2003), 44.

Program logic component definitions:

- Type of Measure: identifies the type of indicator to be measured.
- Program Activities: the provision of services provided by this program area.
- Outputs: the results of or how much is produced from the program activities.
- Initial/Intermediate Outcomes: substantive changes/improvements/benefits of the program as measured against the program goal.
- Long-term Outcomes: satisfy the stated *Goal*—links to the Budget/Strategic Plan.

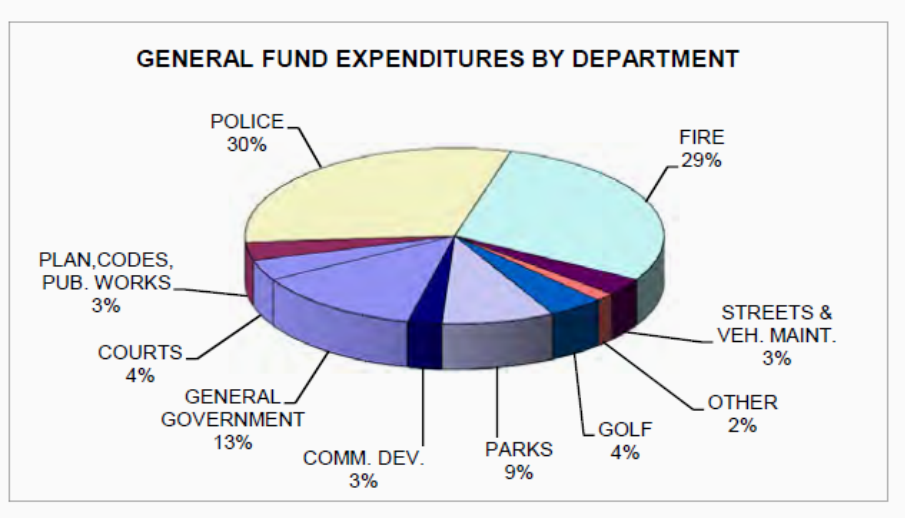
Recommendations:

- The SFD should develop and implement a performance measure reporting system that expands the type of measurement it uses and includes the use of a program logic model.
- Performance measures should be developed for each department activity, and should link to the strategic and comprehensive planning documents and fiscal/budget documents.

Fiscal Resources

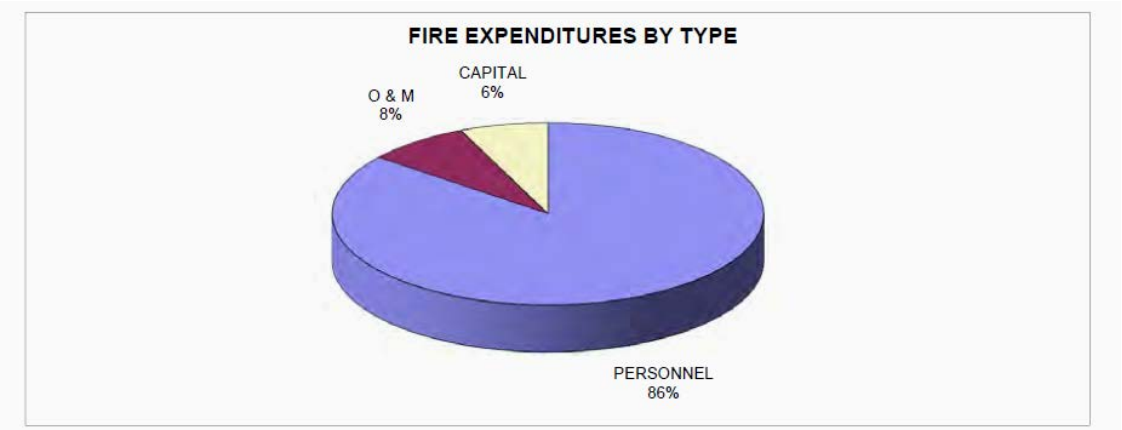
Funding local government functions and programs requires an appropriate balance of needs, requests, future growth, and community vitality versus available annual or borrowed funding resources. The SFD is funded through the city's operating or general fund budget. The SFD's FY 12-13 budget is $8,846,019, which represents approximately 29 percent of the city's overall $34.5 million general fund budget, as illustrated in Figure 13. The SFD budget for FY 12-13 is slightly less than 1 percent greater than FY 11-12. This increase is primarily in personnel services and capital outlay.

Figure 13: Town of Smyrna General Fund Expenditures by Department



The SFD budget is separated into three components: personnel; operations & maintenance (O&M); and capital. Figure 14 illustrates the percentage each component makes up within the SFD budget.

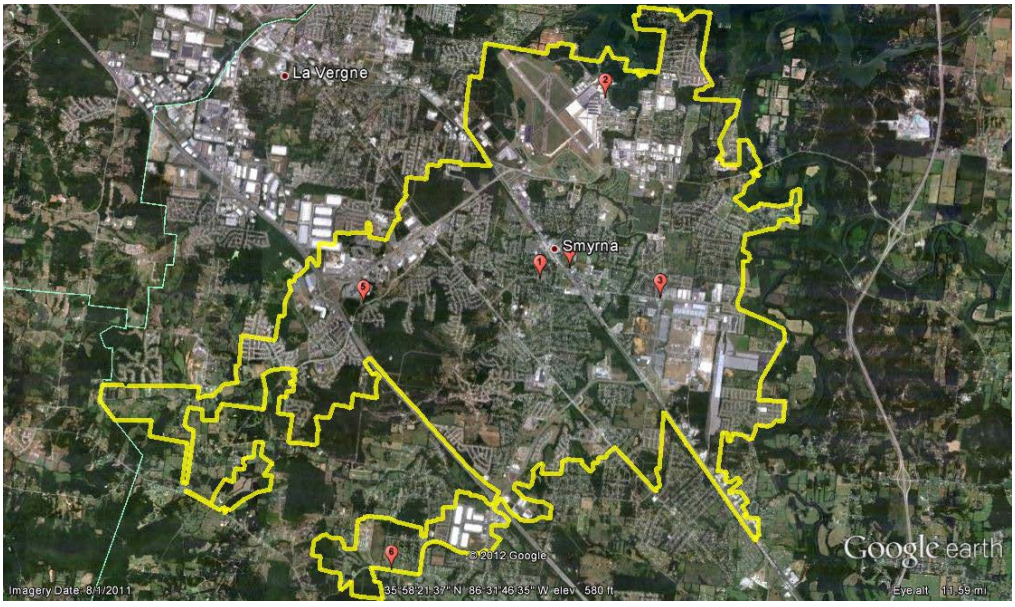
Figure 14: Fire Expenditures by Type



Fixed Facilities/Capital Vehicles

Fire department capital facilities are exposed to some of the most intense and demanding uses of any public local government facility, as they are occupied twenty-four hours a day.[28] The SFD operates out of six fixed facilities located throughout the incorporated town. Of these stations, one (station 4) serves as the administrative offices for the department, and one (station 2) is leased from the airport authority. Figure 15 illustrates the location of the SFD fixed facilities.

Figure 15: SFD Fixed Facility Locations



[28] Compton and Granito, eds., *Managing Fire and Rescue Services,* 219.

The day-to-day cost of operating a fixed capital facility can be burdensome to the operating budget. The cost to the SFD for building maintenance and utility costs is charged directly to the general operating budget, and is included in the 8 percent of the O & M general operating budget as noted above. Any cost incurred for utilities and/or building repairs and maintenance must be controlled, and members must be responsible for seeking opportunities for cost savings. Properly maintaining mechanical and structural components is critical to the longevity of the facility. Deferring routine maintenance creates inefficiencies of mechanical systems and increases costs for replacement and repairs.

As discussed in this report, the SFD deploys an array of heavy fire apparatus to accomplish the mission of the department. This apparatus is strategically placed among the five fire stations and includes pumpers (engines), telesquirts/quints, service companies, and a tower ladder. The SFD also deploys technical services units such as a hazmat unit and a brush truck. There are additional staff and command vehicles the SFD deploys. Further, the SFD has reserve apparatus for use when routine maintenance or long-term maintenance/repair is occurring on front-line apparatus and light vehicles.

The SFD appropriately plans for replacement and maintenance of its vehicle fleet as indicated in the FY 12-13 budget document. As well, the maintenance, care for, and upgrading of fixed facilities and facility furniture, fixtures, and equipment is planned and budgeted for.

Recommendations contained in this report regarding the staffing and deployment of the service companies and the tower ladder may potentially reduce the size of the fleet as well as reduce fuel and maintenance costs if implemented. It is strongly recommended these recommendations be considered with the goal of increasing overall department efficiencies as this relates to staffing and fleet maintenance costs.

Operational Response and Workload

Operational Category Call Type

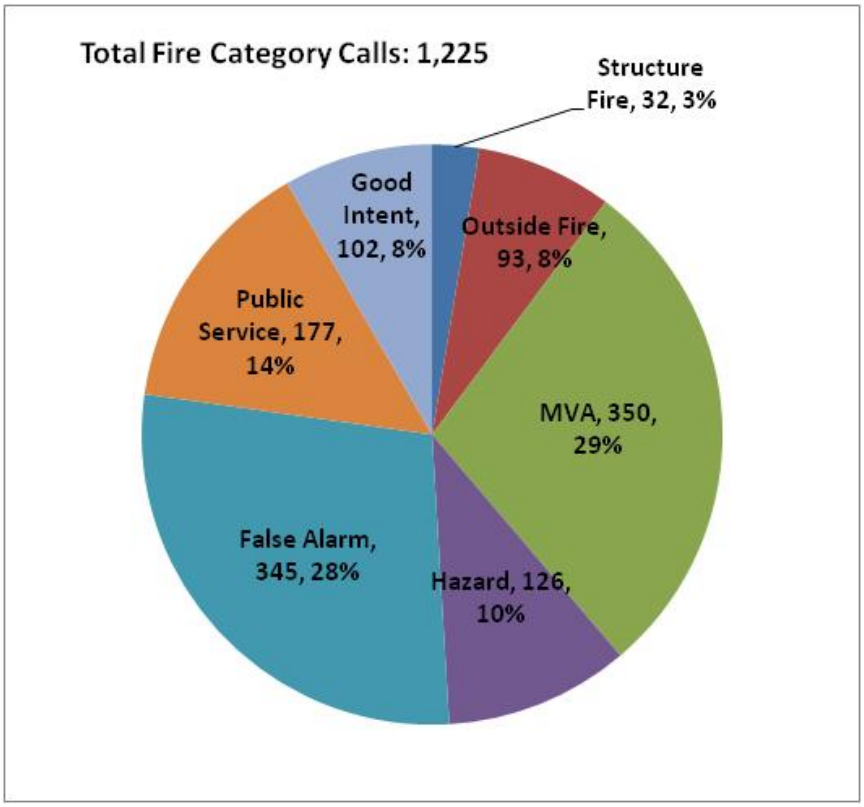
The SFD operates fire suppression assets from five stations strategically located within the town limits to respond to calls for service. The SFD responds to emergency calls received from the town emergency communications center.

During the 12-month study period from which data was derived (July 1, 2012-June 30, 2012), SFD units responded to 1,245 calls. Of these, 32 were structure fire calls and 93 were outside fire calls. There were 350 motor vehicle accident (MVA) calls. Table 3 presents the types of response incidents; Figure 16 presents this information as percentage of the total. Calls per day and call percentage in Table 3 are measured against the overall total number of calls.

Table 3: Call Types

Call Type	Number of Calls	Calls per Day	Call Percentage
Structure fire	32	0.1	2.6
Outside fire	93	0.3	7.5
MVA	350	1.0	28.1
Hazard	126	0.3	10.1
False alarm	345	0.9	27.7
Public service	177	0.5	14.2
Good intent	102	0.3	8.2
Fire Total	**1,225**	**3.3**	**98.4**
Mutual Aid	6	0.0	0.5
Canceled	14	0.0	1.1
Total	**1,245**	**3.4**	**100.0**

Figure 16: Fire Calls by Type



Observations from this data:

- The department responded to a total of 1,245 citizen-initiated emergency calls, averaging 3.4 calls per day.
- Structure and outside fires calls combined accounted for 125 calls. This represents approximately one call every three days.
- Motor vehicle accidents totaled 350 calls for the year (28 percent of all calls), averaging 1.0 per day.
- False alarms totaled 345 calls for the year (28 percent of all calls), averaging 0.9 per day.
- The six mutual aid calls included three structure fires and three aircraft standby calls.
- 32 structure fire calls accounted for 3 percent of total fire calls.
- 93 outside fire calls accounted for 8 percent of total fore calls.
- MVA was the largest call category; it accounted for 29 percent of all calls.
- False alarm was the second largest call category; it accounted for 28 percent of total calls

Recommendation:

- The lieutenant assigned to fire prevention should work with fire suppression and the community to identify occupancy and false alarm trends and implement appropriate measures to mitigate alarm issues with a focus on reducing responses and increasing overall response efficiencies.

Operational Unit Deployment Time

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 SFD, the shift is twenty-four hours. An analysis of the SFD response data shows that a total of 1,088 calls (**89 percent**) lasted less than one hour, 85 calls (7 percent) lasted between one and two hours, and 52 calls (4 percent) lasted more than two hours. On average, every 2.7 days, one call lasted more than one hour.

Additional analysis and observations regarding calls for service in the fire category include: Of the 32 structure fire calls, 15 calls (47 percent) lasted less than one hour, 13 calls (41 percent) lasted between one and two hours, and 4 calls (13 percent) lasted more than two hours. A total of 323 MVA calls (92 percent) lasted less than one hour; 27 MVA calls (8 percent) lasted more than one hour. Of the 93 outside fire calls during the year, 85 calls (91 percent) lasted less than one hour, 5 calls (5 percent) lasted between one and two hours, and 3 calls lasted more than two hours. A total of 339 false alarm calls (98 percent) lasted less than one hour; 6 false alarm calls (2 percent) lasted more than one hour.

The following tables further break down fire unit workload and deployment time by hour of day and by call type. Table 4 depicts the annual deployed time for all SFD emergency incidents, and Table 5 depicts call workload by hour of day.

Table 4: Annual Deployed Time by Call Type

Call Type	Average Minutes per Run	Annual Deployed Hours	Percent of Annual Hours	Deployed Minutes per Day	Number of Runs	Runs per Day
Structure fire	46.2	156	10.3	25.6	203	0.6
Outside fire	27.5	102	6.7	16.7	222	0.6
MVA	27.9	385	25.5	63.1	827	2.3
Hazard	33.4	179	11.8	29.3	321	0.9
False alarm	13.7	249	16.5	40.8	1,091	3.0
Public service	64.5	299	19.8	49.0	278	0.8
Good intent	16.9	76	5.0	12.5	270	0.7
Fire Total	**27.0**	**1,446**	**95.8**	**237.0**	**3,212**	**8.8**
Mutual aid	275.6	60	4.0	9.8	13	0.0
Canceled	9.9	4	0.3	0.7	26	0.1
Total	**27.9**	**1,510**	**100.0**	**247.5**	**3,251**	**8.9**

Table 5: Calls by Hour of Day

Two-Hour Interval	Hourly Call Rate
0–1	0.06
2–3	0.05
4–5	0.04
6–7	0.11
8–9	0.16
10–11	0.16
12–13	0.20
14–15	0.21
16–17	0.27
18–19	0.20
20–21	0.13
22–23	0.09
Calls per Day	**3.35**

The data from Tables 4 and 5 show that:

- Total deployed time for the year was 1,510 hours. This is the total deployment time for all fire units deployed to all (citizen-initiated emergency) calls, including 64 hours spent on mutual aid and canceled calls.
- Hourly call rates were highest between 8:00 a.m. and 8:00 p.m., averaging between 0.16 calls and 0.27 calls per hour. This amounts to 2.4 calls in this 12-hour period, and call rates were lowest between 10:00 p.m. and 6:00 a.m., averaging about 0.06 calls per hour. This amounts to fewer than 0.5 calls in this 8-hour period.

Table 6 breaks down fire unit workload and deployment time for each unit, and is displayed in number and types of calls as well as busy time actuals and averages for each first response fire unit.

Table 6: Call Workload by Unit

Station	Unit Description	Unit Report	Average Deployed Minutes per Run	Number of Runs	Annual Deployed Hours	Runs per Day	Deployed Minutes per Day
1	Ladder truck	L1	28.1	644	301	1.8	49.5
	Service company	SC1	24.5	725	296	2.0	48.7
2	Ladder truck	L2	38.5	332	213	0.9	35.0
3	Fire engine	ENG3	26.9	413	185	1.1	30.5
	Service company	SC3	31.2	177	92	0.5	15.1
5	Fire engine	ENG5	28.9	421	203	1.2	33.4
	Tower	TOWER1	21.5	309	111	1.0	21.2
6	Fire engine	ENG6	28.2	230	108	0.6	17.8

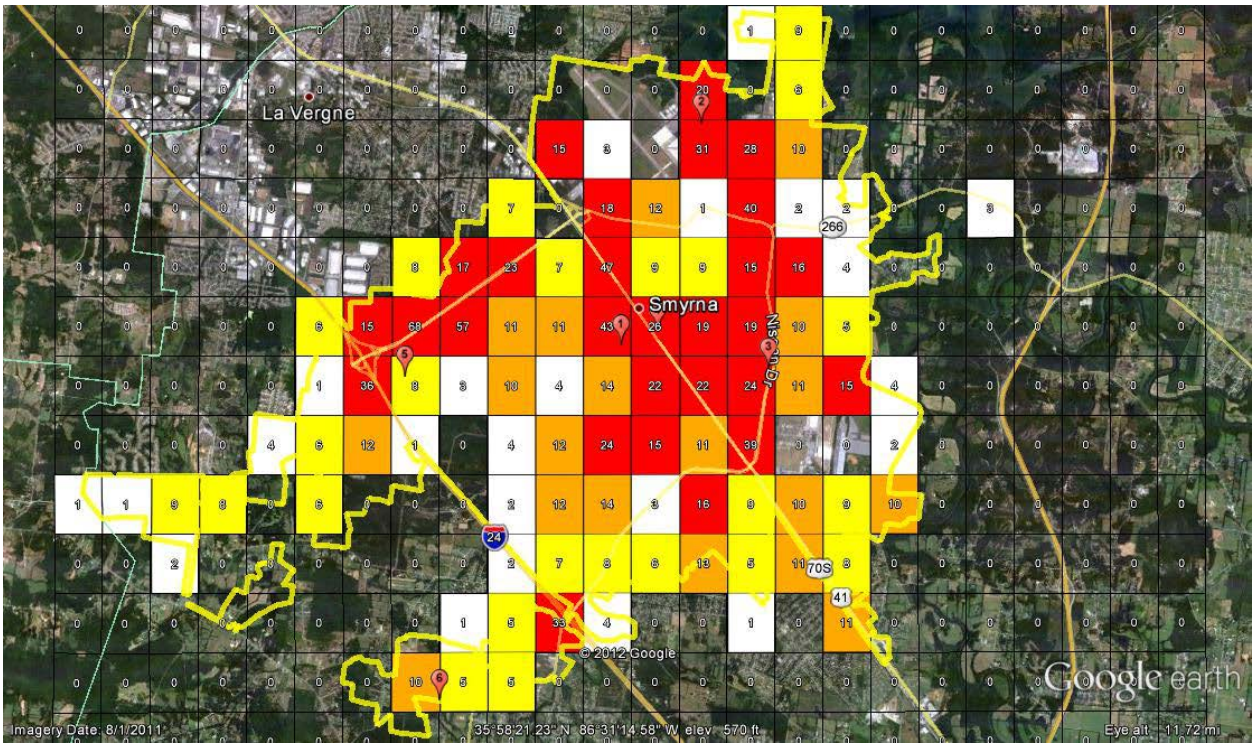
Observations from this table show that:

- Of all units, the most dispatched unit was service company SC1. It averaged 2.0 runs and 48.7 deployed minutes per day.
- Engines ENG3, ENG5, and ENG6 were deployed 30.5, 33.4, and 17.8 minutes per day, respectively, and they averaged 1.1, 1.2, and 0.6 runs per day.
- Ladder truck L1 and engine ENG1 combined had the most annual deployed hours, averaging 49.5 minutes and 1.8 runs per day.
- Ladder truck L2 made 332 runs, averaging 0.9 runs per day and 35 deployed minutes per day.
- Tower unit TOWER1 was in service for 313 days and made 309 runs, averaging 1.0 runs and 21.2 deployed minutes per day.
- Service company SC3 was deployed for 15.1 minutes per day and averaged 0.5 runs per day.

Another method and planning tool to assess the workload of units is through a demand analysis of where the incidents are actual occurring. Figure 17 illustrates call demand and includes station location. The darker the color represents an increase in demand, with the darkest orange representing the highest demand, and the white representing the lowest demand. Current station locations and deployment of apparatus and personnel are appropriate to meet the current incident demand.

For future planning, call demand in the southwest portion of the city should be monitored, as there is also a response time gap to certain locations as well (see Figures 19, 20, and 21 in the next section).

Figure 17: SFD Call Demand



Recommendations:

- ICMA strongly recommends the SFD implement recommendations in this report to combine service companies one and three into one centrally located service company/technical squad company with one crew of three; and to cross-staff the tower ladder and engine at station 5 with one crew of four. The focus of this recommendation is on overall department efficiencies in staffing and deployment of resources.
- For planning purposes, call demand in the southwest portion of the town should be monitored. As call demand increases, response times should also be monitored to ensure efficient delivery of service.

The SFD does not formally report all nonemergency activities in terms of staff hours. This documentation and reporting of nonemergency productive time is critical in the transparency of local government programs. To accurately account for nonemergency time, and to provide an accounting of how resources are utilized in a fire department's nonemergency downtime, a regular reporting system is essential.

Station-level nonemergency tasks that should be captured and reported include: station and equipment maintenance; training, both classroom and practical; fire prevention inspections; pre-fire planning; physical fitness training; and target hazard inspections. This information should be reported in a standard format on a monthly basis by each operational shift. Aggregated information demonstrating both emergency and nonemergency productivity should be included in an annual

summary. This would enable the data to be utilized in planning, setting annual goals and objectives, in performance reviews of staff members where applicable, and in justifying programs and funding.

The SFD should maximize nonemergency time to focus on mission-critical support tasks and programs.

Recommendations:

- The SFD should implement a nonemergency documentation program that captures critical nonemergency productivity and should report on/review these regularly (monthly and annually) to find opportunities for continued improvement.

Operational Response Times

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 (SPD Communications 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.[29] 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 a benchmark for service delivery and not an ICMA recommendation.

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 7 depicts average dispatch, turnout, travel, and total response times of first arriving fire units for fire category calls. The table also includes the 90th percentile response time.

For the study period, the following averages were determined: the average dispatch time was 1.5 minutes; the average turnout time was 1.4 minutes; and the average travel time was 3.5 minutes.

[29] 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.

The average response time was 6.4 minutes, and the 90th percentile response time was 9.1 minutes.

Table 7: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Unit by Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	90th Percentile Response Time	Sample Size
Structure fire	1.6	1.2	4.3	7.1	11.7	20
Outside fire	1.5	1.3	3.8	6.6	9.4	87
MVA	1.2	1.3	3.2	5.7	7.7	256
Hazard	1.5	1.4	3.8	6.6	9.9	101
False alarm	1.6	1.4	3.2	6.2	8.9	336
Public service	1.4	1.4	4.2	7.0	9.6	76
Good intent	2.0	1.4	4.0	7.3	12.9	89
Fire Total	**1.5**	**1.4**	**3.5**	**6.4**	**9.1**	**965**

Benchmarked against NFPA 1710, there are areas in which the FHFD can improve on in the 90th percentile response. The location of responding units is one important factor in response time; reducing response times, which is one of the key performance measures in determining the efficiency of department operations, is often dependent on this factor. The network of responding fire stations in a community of several fire stations seeks to optimize coverage with short travel distances while giving special attention to natural and manmade barriers, and response routes that can create response-time problems.[30]

Figure 18 shows the SFD response area and the location of the SFD stations on a map derived from a geographic information system (GIS). Figures 19, 20, and 21 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 road network from the SFD fire stations. Figure 22 layers the 240-, 360-, and 480-second bleeds in one illustration.

[30] NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Departments, 2010 Edition, 122.

Figure 18: SFD Fire Station Locations

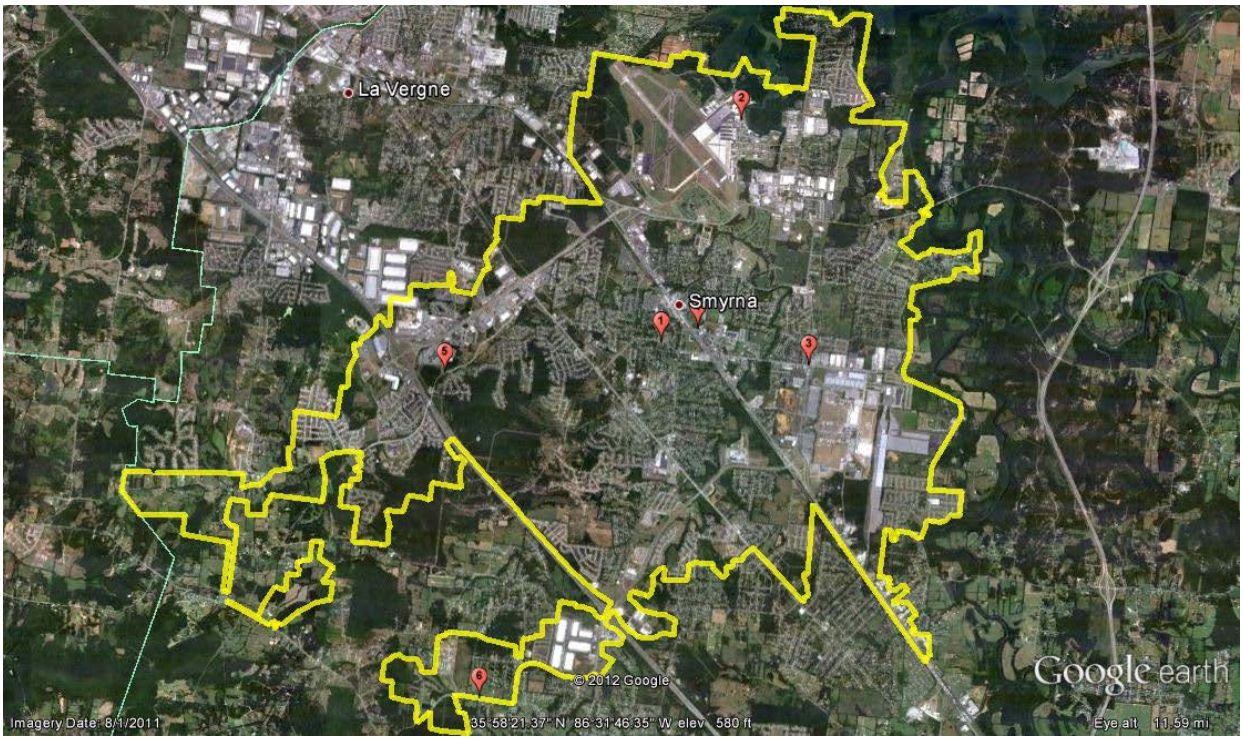


Figure 19: 240-Second Response Bleed from SFD Stations

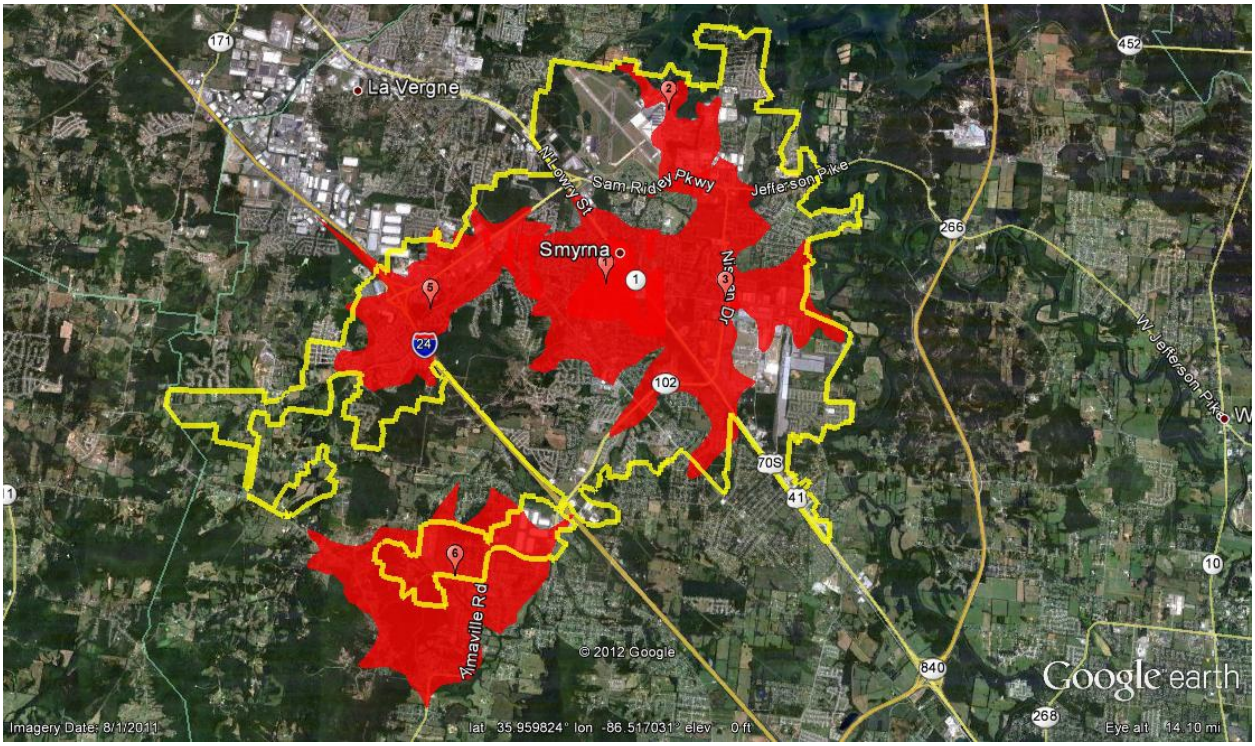


Figure 20: 360-Second Response Bleed from SFD Stations

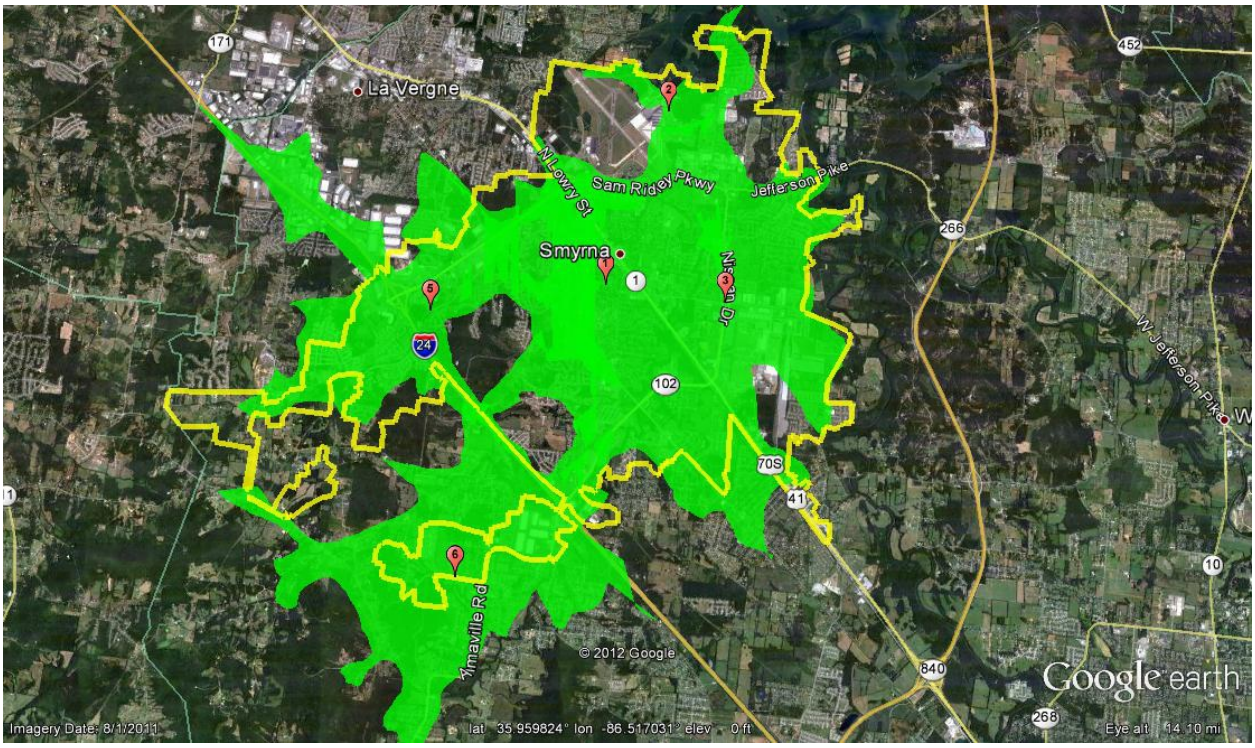


Figure 21: 480-Second Response Bleed from SFD Stations

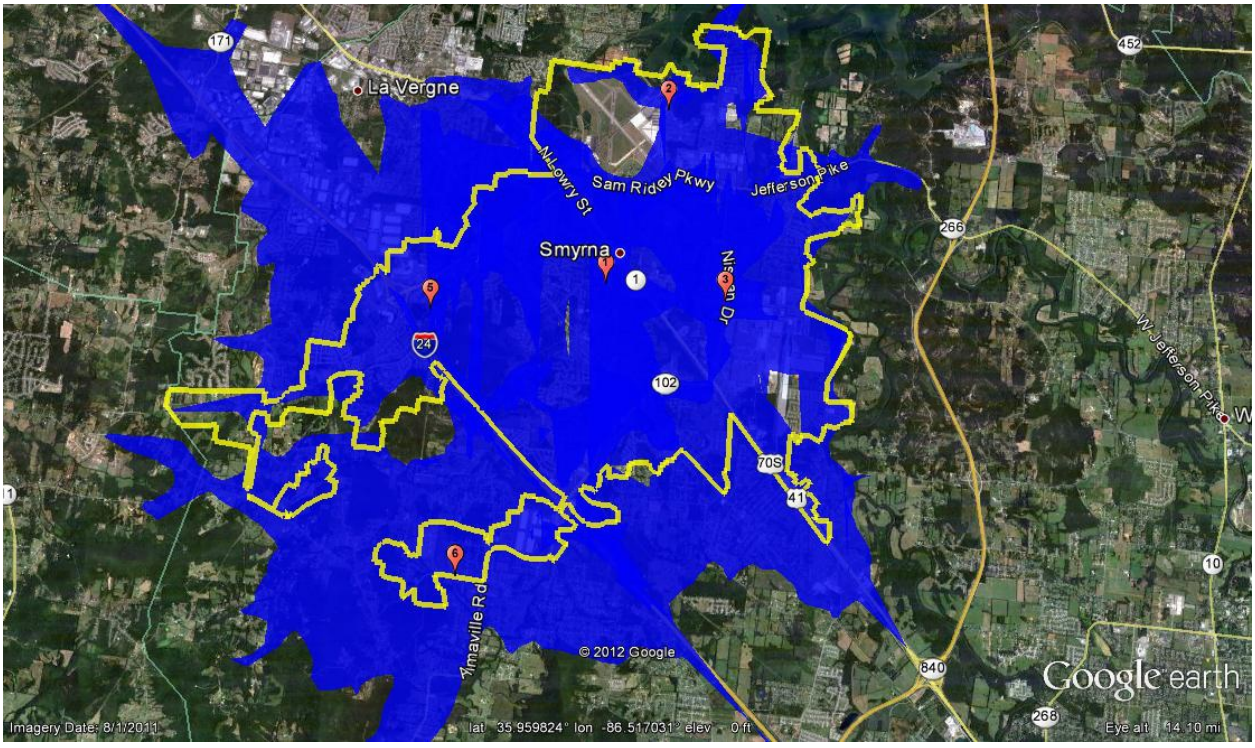
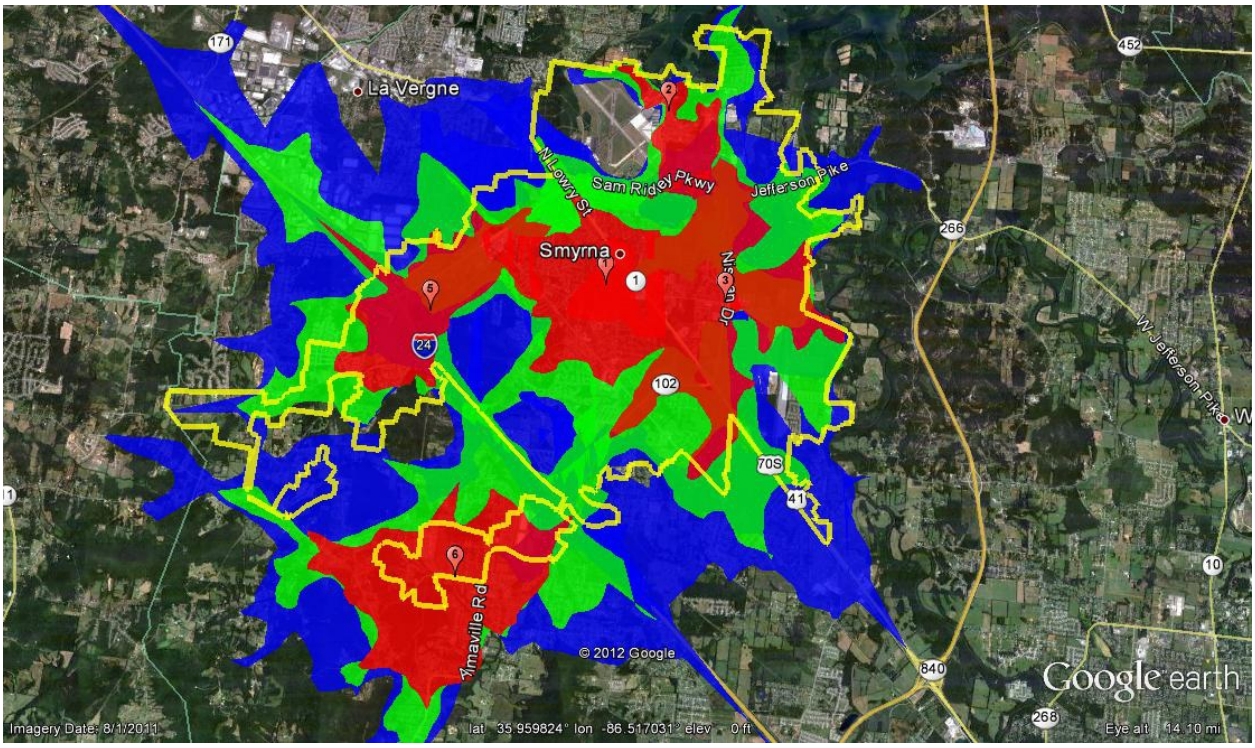


Figure 22: 240/360/480-Second Response Bleed Layers from SFD Stations



Although there are gaps in the 240-second travel time, when benchmarked against the demand map (Figure 17), where the highest demand for service occurs, there is a substantial presence of the 240-second travel time factor. Further, there is marked improvement across the town at the 360-second travel time benchmark. Finally, in other than a few remote areas of the town, the entire first alarm assignment can be collected at the 480-second travel time benchmark.

Recommendations for future planning regarding call demand and response time monitoring as noted previously should be followed to ensure an effective and efficient delivery of the service.

Essential Resources

External System Relationships

Local governments use many types of intergovernmental agreements to enhance local fire protection and EMS services. It is important that fire departments be able to quickly access extra and/or specialized resources in the aftermath of a disaster or other large-scale event. In addition, because these types of incidents do not respect jurisdictional boundaries, they often require coordinated response. Sharing specialized capabilities, such as Hazmat response units, also helps departments reduce costs without impacting service delivery. All of these situations point to the need for good working relationships with other fire and EMS organizations.

In addition, having interoperable communications, such as the linking of CAD systems and unit status monitors, is essential to providing a cohesive and coherent approach to service.

Currently the SFD has no mutual or automatic aid agreements in place with contiguous jurisdictions or agencies (fire or EMS) within the county. The SFD is interoperable with the cities of La Vergne and Murfreesboro as well as Rutherford County. The SFD does provide assistance with airfield response protection to the Smyrna/Rutherford County Airport. This response is provided from a station located on the airfield, which is staffed by SFD personnel and equipment and airport authority personnel. This station and SFD personnel also serve a response area outside of the airport for the town of Smyrna.

Recommendation:

- The SFD should implement mutual aid agreements with the Cities of La Vergne and Murfreesboro. The purpose of these agreements is to expand response capabilities in the aftermath of a disaster or during large-scale events, and where applicable, assist with day-to-day responses in areas of extended response times for initial and additional (2nd and 3rd due units) responding SFD units. County fire agencies that are contiguous to the town of Smyrna should be included, recognizing these agencies are made up of volunteer members, and aid provided is based on availability.

Water Supply for Firefighting

The Smyrna Water Treatment Plant (SWTP) is a conventional drinking water treatment plant that has a capacity of 15.2 million gallons per day.

In October 2000 the plant received the American Water Works Association Kentucky-Tennessee Section Award Winning Plant 1999-2000 Award of Excellence for Plant Operations 10 Million Gallons per Day and Above Category.

The mission of the SWTP is to provide a continuous supply of safe, palatable drinking water—safe and free from contaminants that can cause disease or be toxic to a consumer; and palatable water that is free of unpleasant characteristics such as color, odor, taste, and turbidity. The plant strives to provide the best drinking water possible and to inform customers of the quality of water that they are consuming.[31]

Water for fire protection is supplied through a grid system of fire hydrants with a consistent static pressure of 60 pounds per square inch (psi). The water distribution system is installed and maintained by the Smyrna Department of Public Works. The SFD inspects hydrants for compliance with ISO protocols and conducts flow tests annually. The SFD is confident that its water supply needs can be met with the current system.

Technical Services

The SFD Technical Rescue Team is comprised of 20 members who are trained in hazardous materials operations at the technician level as well as confined space rescue and advanced rope operations. The team is dispersed throughout the department and dispatched to an emergency

[31] Town of Smyrna, TN website, 2012.

scene from their individual station locations. The equipment necessary for complex rescues, including vehicle, high angle, and confined space extrications, as well as hazardous material mitigation, is transported by one or both of the service companies. Service companies 1 & 3 carry technical rescue, confined space, and advanced rope gear. As discussed earlier, these service companies are staffed with two firefighters each. Each service company is also equipped with standard extrication tools used at vehicle accidents with entrapment.

A hazardous materials support unit is available with additional equipment, but must be transported to a scene by placing a unit out of service or recalling off-duty members. The hazardous materials support unit carries spill containment equipment for diking, damming, and plugging leaks and spills of petroleum-based and other substances. Instrumentation and specialized personal protective equipment is carried on the service companies and the hazardous materials support unit. Medical monitoring of SFD responders is provided by SFD staff and/or Rutherford County EMS.

Recommendation:

- Combine service companies 1 and 3 (staffing of three) into one heavy rescue company (utilize the service company 1 vehicle) that can deploy equipment and personnel for all technical rescue and hazardous materials incidents. House the heavy rescue and hazardous materials support units in the same station. Utilize one of the three firefighters to drive the hazardous materials unit to incidents when required. Reclassify one firefighter position on each shift to lieutenant to provide consistent first-line supervision of this specialty unit.

Fire Prevention/Fire Investigation/Public Education

An up-to-date fire code adopted into law and which outlines specific fire prevention requirements and enforcement procedures is essential for an effective fire prevention program. Fire suppression and response, although necessary to protect property, have little impact on preventing fire deaths. Rather, public fire education, fire prevention, and built-in fire protection systems are essential elements in protecting citizens from death and injury due to fire, smoke inhalation, and carbon monoxide poisoning.

Several organizations publish model fire codes that jurisdictions may adopt by reference for enforcement use. NFPA publishes NFPA 1, Uniform Fire Code, which incorporates many NFPA standards by reference. The International Code Council (ICC) has developed its own model fire code, the International Fire Code. This code references codes, standards, and other NFPA documents. The state of Tennessee has adopted by ordinance the International Fire Code, 2006 edition. For state buildings, educational occupancies, and any other occupancy requiring an inspection by the state fire marshal for initial licensure as defined by the 2006 edition of the International Building Code, the Life Safety Code (NFPA No. 101-2006), 2006 edition, published by the National Fire Protection Association, is applicable.

The Smyrna Fire Department has no code enforcement authority, yet responds to “ordinance violations” in such cases as illegal burning. In most instances, the violator complies with the spirit of the law and no further action is required. In rare cases where enforcement is needed, a code or law enforcement officer is dispatched to gain compliance.

The state of Tennessee employs deputy state fire marshals to serve as code enforcement professionals responsible for enforcing state-adopted fire and building codes in specific occupancies that are newly constructed. They also conduct annual inspections for compliance in several occupancy types. Deputy state fire marshals are assigned to each county. Fire prevention code enforcement in the town of Smyrna is conducted by a deputy state fire marshal that also covers the city of LaVergne. Complaint investigation in all occupancies is also a major responsibility. Blasting complaint investigation, and inspection of storage of explosive materials, Class B (display) fireworks, Class C (common fireworks), and Class I and Class II LP gas facilities are other areas of responsibility. Each deputy state fire marshal is certified by a national organization such as NFPA or ICC, and the state of Tennessee.

The Smyrna Fire Department employs a lieutenant assigned to a staff position five days a week for fire prevention and public fire safety education; however, the building official enforces the fire code.

Utilization of fire suppression personnel to supplement fire inspection staff is a common practice among fire service organizations. However, firefighters are generally not trained directly in the finer points of fire and life safety codes; that is, training needed to identify potential problems. The availability of trained and certified fire code personnel, with the appropriate legal authority, is paramount to an effective fire prevention program. Currently the SFD does not utilize fire suppression operations personnel to conduct fire prevention inspections.

The SFD actively promotes smoke detectors in the home. The SFD website states “Smoke alarms that are properly installed and maintained play a vital role in reducing fire deaths and injuries. Having a working smoke alarm cuts the chances of dying in a reported fire in half.”

Fire cause determination is generally made by a company officer who responded to the scene for extinguishment. If there is reasonable suspicion that the fire was incendiary in nature, a police detective is requested to investigate. Only one police detective is currently trained in and available for arson investigations. If the police detective is unavailable, the State Fire Marshal’s Office is requested to respond and investigate the fire. Response times for the state fire marshal can vary up to 12 hours, which makes maintaining the chain of custody, witness accounts and availability, and other evidence gathering techniques more challenging.

Public education and agency training are coordinated by the fire lieutenant assigned to the staff fire prevention lieutenant position. Each year, the department hosts an open house at fire station 1. A youth fire academy is held annually to train children in fire prevention and safety. The SFD has a state-of-the-art fire safety trailer that it shares with surrounding communities. The fire lieutenant conducts the majority of public fire safety education. Fire extinguisher training is available to any person or group at no cost, as is citizen cardiopulmonary resuscitation (CPR) training. The SFD also works with the community and provides training at no cost to those who choose to deploy automated external defibrillators (AEDs).

Public education, public relations, and community value-added programs should include coordination of fire suppression company demonstrations, business community CPR and fire extinguisher training, and other public and community programs. Fire suppression personnel have the knowledge, skills, and abilities and time to effectively convey fire and life safety messages to the

public. Children especially enjoy visiting the local fire station to see and climb aboard the fire apparatus. Each contact with the public should be coupled with a fire prevention and life safety message in the form of a take-away. Children are known to be inquisitive and persistent. If educated in basic fire prevention and life safety, they are apt to take the messages home to parents and siblings to implement fire evacuation and safety plans in the home. This concept could be implemented with minimal training by existing suppression personnel.

Recommendations:

- The department should seek statutory authority to enforce the Tennessee Fire Prevention Code in conjunction with the building official and deputy state fire marshal.
- Train all fire company personnel in the National Fire Academy course *Technical Principles and Practices of Fire Prevention (H284).* Utilize fire company personnel for general fire safety checks while performing pre-planning and area familiarization training. Consider training all company officers (lieutenants) to the NFPA Fire Inspector I level. The most egregious fire code violations, such as blocked exits, improper use of electrical extension cords, non-illuminated exit lights, and improper flammable liquid and combustible storage and handling would reduce the risk significantly. Most general fire safety compliance issues can be resolved immediately without the need for legal action.
- The lieutenant assigned to fire prevention should be trained to the level of NFPA Fire Inspector I, and should receive training in plans review. This fire department position should participate in the review of site and building plans to provide input on conditions that would impact fire department response once a building has received the certificate of occupancy. It is understood this function is currently in the department of building codes and safety; however components such as ingress, turning radii, and width of fire lanes affect how fire apparatus will be able to access a building, and should have fire department input. Locations of sprinkler/standpipe connections are typically left to the authority having jurisdiction (AHJ); however, neither the building official nor the deputy state fire marshal have a role in fire suppression and should consult with the fire department on such matters.
- On-duty fire suppression officers and additional police staff should be trained in basic origin and cause determination, ensuring 24/7 coverage, thereby alleviating the need to wait for the state fire marshal. A joint fire-police arson task force could effectively investigate all fires without the need for additional positions in either department.
- Develop a fee schedule to recoup equipment/expendable expenses for all fire extinguisher, CPR, and AED training.

Emergency Management

Comprehensive emergency management can be defined as the preparation for and the carrying out of all emergency functions necessary to mitigate, prepare for, respond to, and recover from emergencies and disasters caused by all hazards, whether natural, technological, or human caused.

Comprehensive emergency management consists of four related components: all hazards, all phases, all impacts, and all stakeholders.[32]

All hazards within a jurisdiction must be considered as part of a thorough risk assessment and prioritized on the basis of impact and likelihood of occurrence. Treating all hazards the same in terms of planning and resource allocation ultimately leads to failure. There are similarities in how one reacts to all disasters. These event-specific actions form the basis for most emergency plans. However, there are also distinct differences between disaster agents that must be addressed in agent- or hazard-specific plans and these can only be identified through the risk assessment process.

The comprehensive emergency management model[33] on which modern emergency management is based defines four phases of emergency management: mitigation, preparedness, response, and recovery.

> ***Mitigation*** consists of those activities designed to prevent or reduce losses from disaster. It is usually considered the initial phase of emergency management, although it may be a component of other phases.
>
> ***Preparedness*** is focused on the development of plans and capabilities for effective disaster response.
>
> ***Response*** is the immediate reaction to a disaster. It may occur as the disaster is anticipated, as well as soon after it begins.
>
> ***Recovery*** consists of those activities that continue beyond the emergency period to restore critical community functions and manage reconstruction.[34]

Detailed planning and execution is required for each phase. Further, phases often overlap as there is often no clearly defined boundary where one phase ends and another begins. Successful emergency management coordinates activities in all four phases.

Emergencies and disasters cut across a broad spectrum in terms of impact on infrastructure, human services, and the economy. Just as all hazards need to be considered in developing plans and protocols, all impacts or predictable consequences relating to those hazards must also be analyzed and addressed.

This component is closely related to the emergency management principles of coordination and collaboration. Effective emergency management requires close working relationships among all levels of government, the private sector, and the general public.

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[32] Principles of Emergency Management, FEMA, 2007
[33] National Governors' Association. *1978 Emergency Preparedness Project: Final Report*. Washington, DC: NGA, 1978.
[34] William L. Waugh, Jr. Living with Hazards, Dealing with Disasters: An Introduction to Emergency Management. Armonk, New York: M.E. Sharpe, 2000.

The Rutherford County Emergency Management Agency (EMA) is charged with the overall responsibility of coordinating the county's preparedness for and response to disasters. Geographically, its authority extends to the entire county as defined by state law TCA 58-2-110.

The mission of the county's EMA is to develop a comprehensive emergency management program that seeks to: mitigate the effects of various hazards, to prepare for measures which will preserve life and minimize damage, to respond during emergencies, to provide assistance, and to establish a recovery system to return the community to a normal status after an event. This agency combines the local resources of Rutherford County, the city of Murfreesboro, the town of Smyrna, and the city of LaVergne, along with state and federal resources to mitigate, prepare for, respond to, and recover from the effects all types of emergencies including natural or man-made disasters, technological accidents, national security threats, and other disrupting incidents that may impact the area or the general populations. [35]

The fire chief serves as the unofficial emergency coordinator for the town of Smyrna. During a major emergency, the town's emergency operations center (EOC) is activated in the training room at station 2. All town officials contribute to managing the EOC during activation. While the Rutherford County EMA has statutory responsibility for emergency management in all local jurisdictions within its boundaries, the town of Smyrna must coordinate response and recovery efforts as well as continuity of operations among the town's departments and with the county. The SFD does not have interoperable radio communications with surrounding communities. While this negatively affects day-to-day operations, it can be particularly challenging during a regional disaster.

The Rutherford County Local Emergency Planning Committee (LEPC) membership consists of local government officials representing all disciplines and jurisdictions throughout the county: emergency management, police, fire, EMS, public health, and hospitals, as well as representatives/partners of critical infrastructures and facilities subject to the Tier II emergency planning requirements. It is the mission of the LEPC to form partnerships with all parties mentioned to ensure a well-planned, cohesive, and coordinated response to potential events which may impact the citizens of Rutherford County.[36] The SFD does not participate on the Rutherford County LEPC. Consistent engagement of the SFD in Rutherford County LEPC meetings and planning efforts is recommended to strengthen the coordination between the county and the town.

The LEPC's membership is committed to formulate mitigation activities for the protection of life and property throughout all jurisdictions, from the response phase through the recovery phase of any emergency which may occur within Rutherford County. Although the primary focus of an LEPC is hazardous materials related, the Rutherford County LEPC focuses on an "all-hazards" (man-made, natural, or technological events) type of approach. This is accomplished through maintaining a viable and comprehensive emergency operations plan and hazard mitigation plan in accordance with state and federal guidelines.

[35] Rutherford County, TN Emergency Management Agency website, 2012.
[36] Rutherford County, TN Emergency Management Agency website, 2012.

Recommendations:

- Review the basic emergency operations plan (BEOP) defining the mission, command structure, roles, and relationships in the EOC to enhance the town's emergency management efforts, particularly how they align with Rutherford County.
- Perform a hazard identification and risk analysis (HIRA) for the town, including for natural and man-made vulnerabilities.
- Focus emergency management planning, training, and exercises using the all-hazards approach. Conduct annual emergency management/emergency operations center drills to include town executive staff and elected officials.
- Participate in the Rutherford County Local Emergency Planning Committee.
- Ensure radio communications interoperability with all surrounding jurisdictions.

Emergency Communications

The Police Department Communications Division, or dispatch, serves as the primary control center for the police department, fire department, ambulance service, and utilities communications for the town. Additionally, this center serves as the Public Safety Answering Point (PSAP) for the town. The dispatch center is staffed 24/7 with call takers as well as police and fire dispatchers. Personnel within this division are responsible for directing appropriate personnel when calls for service are requested. Fire calls are received and dispatched to the SFD, while emergency medical calls are routed to Rutherford County Emergency Medical Services. The emergency communications function is under the supervision of a police captain.

Each communications shift has a daily minimum staffing of three. As discussed, in addition to handling incoming emergency and nonemergency phone calls, the communications staff dispatches fire and police and handles nonemergency communications such as public utilities. This staff also verifies all warrants data for the court system. The center utilizes Sungard computer-aided dispatch (CAD) software solutions.

Figure 23 depicts the workload for fire incidents for the Smyrna police communications division by hour of the day, and Figure 24 illustrates the average fire call workload per day by month.

Figure 23: SFD Calls, by Hour of Day

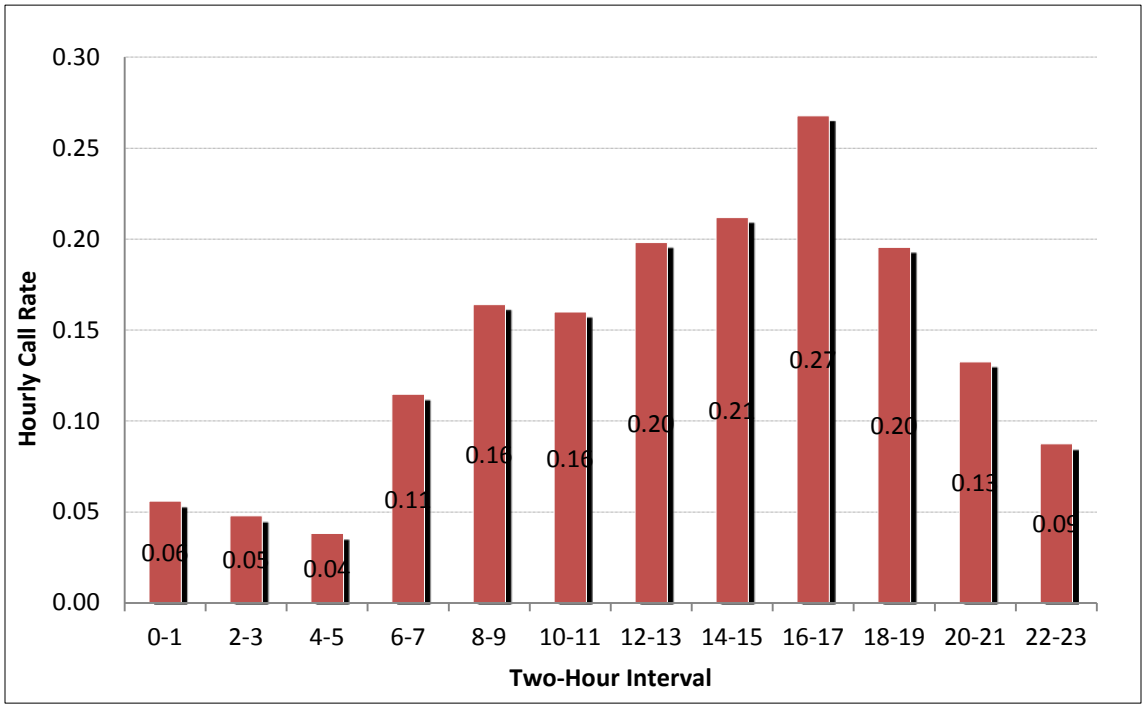
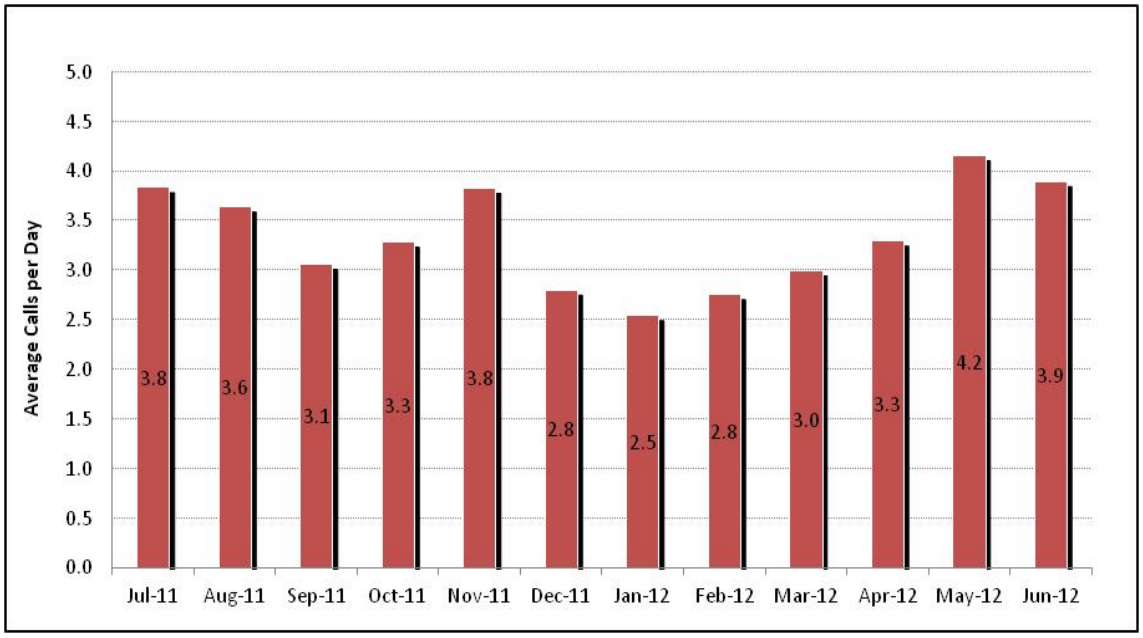


Figure 24: SFD Average Calls per Day, by Month



Observations:

- Average calls per day ranged from a low of 2.5 calls per day in January 2012 to a high of 4.2 calls per day in May 2012. The highest monthly average was 68 percent greater than the lowest monthly average.
- The highest number of calls received in a single day was 11, which occurred on May 1, 2012. These calls included one structure fire call, two outside fire calls, two MVA calls, four false alarm calls, one hazardous condition call, and one public service call.
- There were 17 days in the study year which did not have a single citizen-initiated emergency call. This is not too surprising for a department with the call volume experienced by Smyrna.
- Hourly call rates were highest between 8:00 a.m. and 8:00 p.m., averaging between 0.16 calls and 0.27 calls per hour. This amounts to 2.4 calls in this 12-hour period.
- Call rates were lowest between 10:00 p.m. and 6:00 a.m., averaging about than 0.06 calls per hour. This amounts to fewer than 0.5 calls in this 8-hour period.

Two technology tools that should be incorporated into any communications and dispatch system are automatic vehicle location (AVL) and mobile data computers (MDCs.) An AVL system allows dispatchers to see the precise location of any unit on a computer-generated map of the town. The AVL data can also be integrated into the CAD system to calculate the truly closest unit to any given emergency and make a dispatch recommendation accordingly, rather than making recommendations based on fixed fire station locations.

In addition to improving dispatching, AVL improves personnel safety because a unit that is in trouble can be located quickly. Additionally, an AVL system can be integrated with MDCs installed in each emergency response unit. With the appropriate integration of AVL, navigational, and MDC technologies, the AVL can provide the MDC with a visual map showing the current unit and incident location, together with the most efficient travel route.

MDCs can be used to provide CAD data, town maps, building plans, fire rescue preplans, hospital status, patient information, and navigational directions to responding units directly in the field. MDCs can also be used to log unit status and file field reports. They can be supported by 800 MHz radio system channels, code-division multiple access (CDMA) cellular technology, and other wireless communications technologies. Currently the SFD utilizes mobile data browsers (MDBs) in the majority of frontline apparatus. One notable problem is the lack of connectivity in the apparatus with the computer aided dispatch (CAD) system. The MDB system has never been fully implemented and some units are experiencing leakage of fluid from the LCD screens onto the keyboards of the computers. The computers are not ruggedized and therefore unsuitable for use in firefighting apparatus.

Recommendation:

- Complete the installation and system functionality of the mobile data browsers in fire apparatus using ruggedized computer terminals. If compatible and within the means of available funding, initiate AVL technology and implement CAD-recommended closest unit response to all fire incidents.

Data Analysis

The Smyrna Fire Department operates out of five fire stations that house thirteen pieces of fire apparatus, including six engines, one 65' telesquirt, one 65' telesquirt/quint, one 100' tower ladder/quint, two service companies, one supervisor vehicle, one brush unit, and one hazardous materials unit.

This report is divided into four sections. The first section focuses on the number of emergency service calls by type. The second section explores time spent and workload of individual units. The third section examines the busiest hours in a year. The fourth section analyzes response times.

This report covers all calls for service between July 1, 2011, and June 30, 2012, as recorded in the Smyrna Police Department's computer-aided dispatch (CAD) system. The report focuses primarily on emergency service requests initiated by citizens. Citizen requests for burning permits and the Smyrna Fire Department's self-initiated activities such as training, equipment maintenance, and station maintenance are reported in Appendix II. During the period studied, the fire department responded to 1,245 calls, including 6 mutual aid calls. An additional 14 calls were canceled en route. Within the remaining calls, the department responded to 32 structure fire calls and 93 outside fire calls. Smyrna fire units made 3,251 runs responding to all calls. The total combined yearly workload (deployed time) for all fire units was 1,510 hours. The average estimated response time (measured from the time a call was received until the first unit arrived) was 6.4 minutes and the 90th percentile response time was 9.1 minutes.

Aggregate Call Totals and Dispatches

During the year studied, Smyrna units responded to 1,245 calls. Of these, 32 were structure fire calls and 93 were outside fire calls. There were 350 motor vehicle accident (MVA) calls. Mutual aid calls are first identified using the National Fire Incident Reporting System (NFIRS) mutual aid fields. The correspondence table between NFIRS call descriptions and call types, in Appendix III, was used to categorize call types.

Table 8: Call Types

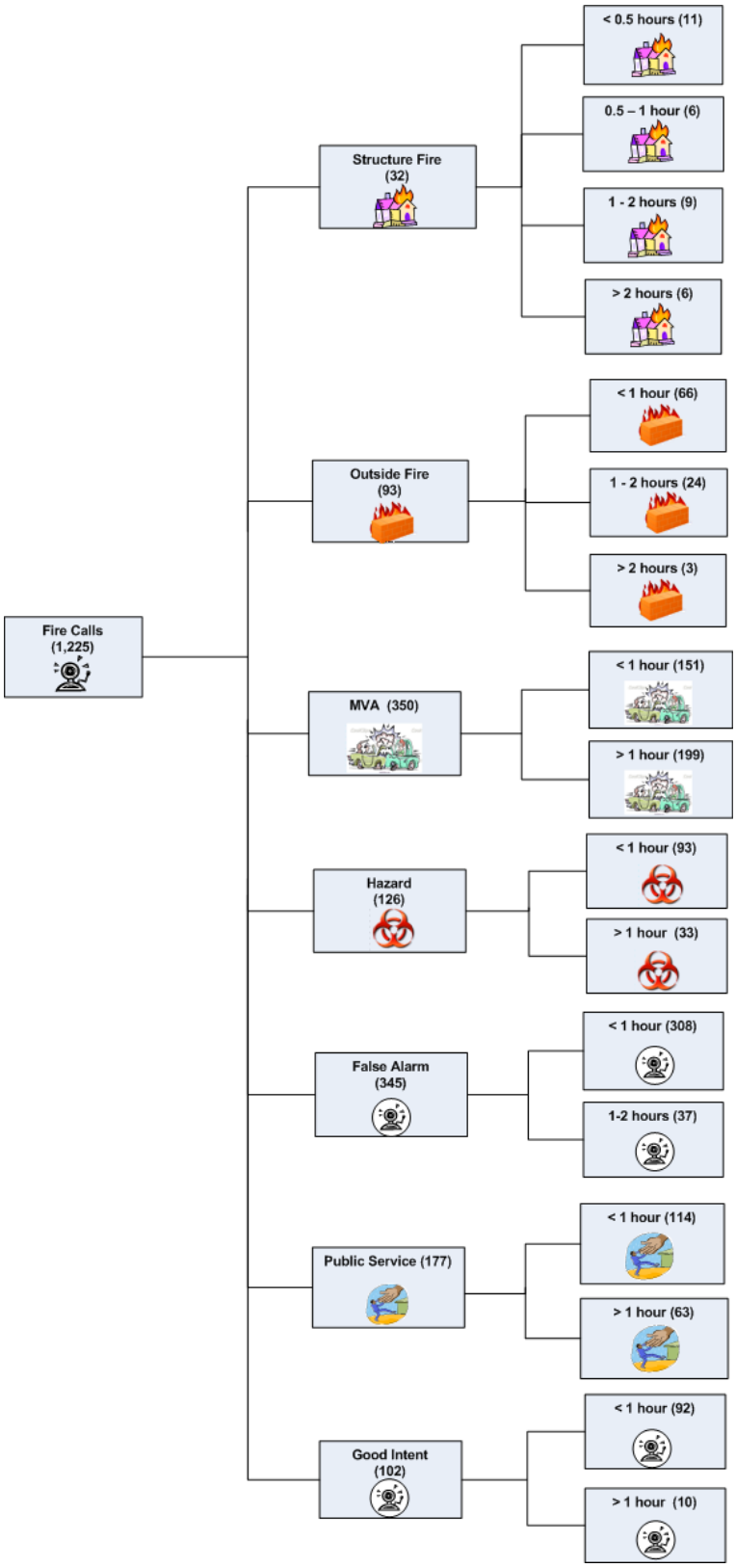
Call Type	Number of Calls	Calls per Day	Call Percentage
Structure fire	32	0.1	2.6
Outside fire	93	0.3	7.5
MVA	350	1.0	28.1
Hazard	126	0.3	10.1
False alarm	345	0.9	27.7
Public service	177	0.5	14.2
Good intent	102	0.3	8.2
Fire Total	**1,225**	**3.3**	**98.4**
Mutual aid	6	0.0	0.5
Canceled	14	0.0	1.1
Total	**1,245**	**3.4**	**100**

Note: Motor vehicle accidents are abbreviated as "MVA" throughout this report.

Observations:

- The department responded to a total of 1,245 citizen-initiated emergency calls, averaging 3.4 calls per day.
- Structure and outside fires calls combined accounted for 125 calls. This represents approximately one call every three days.
- Motor vehicle accidents totaled 350 calls for the year (28 percent of all calls), averaging 1.0 per day.
- False alarms totaled 345 calls for the year (28 percent of all calls), averaging 0.9 per day.
- The six mutual aid calls included three structure fires and three aircraft standby calls.

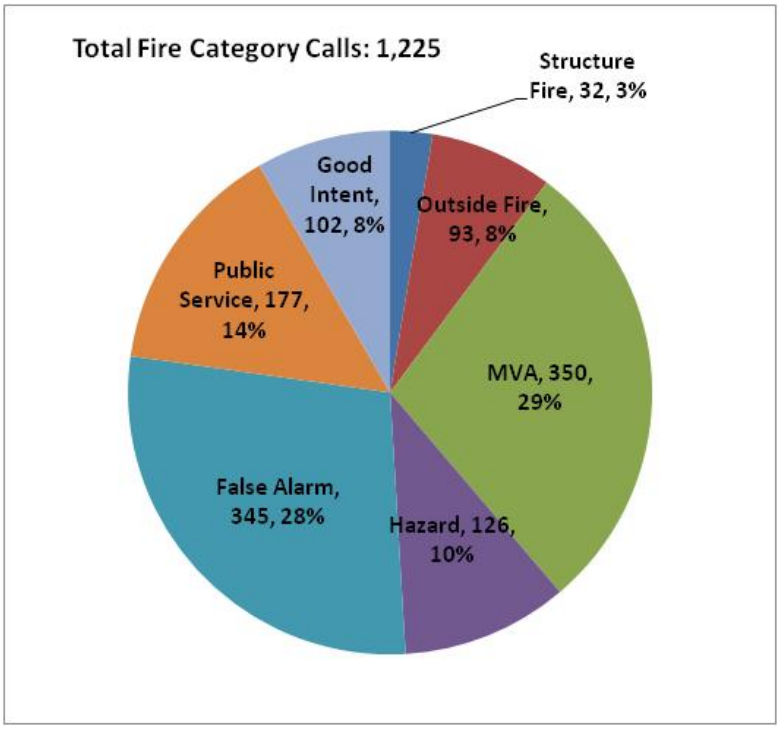
Figure 25: Fire Calls by Type and Duration



Observations:

- A total of 841 calls (69 percent) lasted less than one hour, 328 calls (27 percent) lasted between one and two hours, and 56 calls (5 percent) lasted more than two hours. On average, a total of 1.0 calls per day lasted more than one hour.
- Of the 32 structure fire calls, 17 calls (53 percent) lasted less than one hour, 9 calls (28 percent) lasted between one and two hours, and 6 calls (19 percent) lasted more than two hours.
- Of the 93 outside fire calls during the year, 66 calls (71 percent) lasted less than one hour, 24 calls (26 percent) lasted between one and two hours, and 3 calls lasted more than two hours.
- A total of 151 MVA calls (43 percent) lasted less than one hour; 199 MVA calls (57 percent) lasted more than one hour.
- A total of 93 hazardous condition calls (74 percent) lasted less than one hour; 33 hazardous conditions calls (26 percent) lasted more than one hour.
- A total of 308 false alarm calls (89 percent) lasted less than one hour; 37 false alarm calls (11 percent) lasted more than one hour.
- A total of 114 public service calls (64 percent) lasted less than one hour; 63 public service calls (36 percent) lasted more than one hour.
- A total of 92 public service calls (90 percent) lasted less than one hour; 10 public service calls (10 percent) lasted more than one hour.

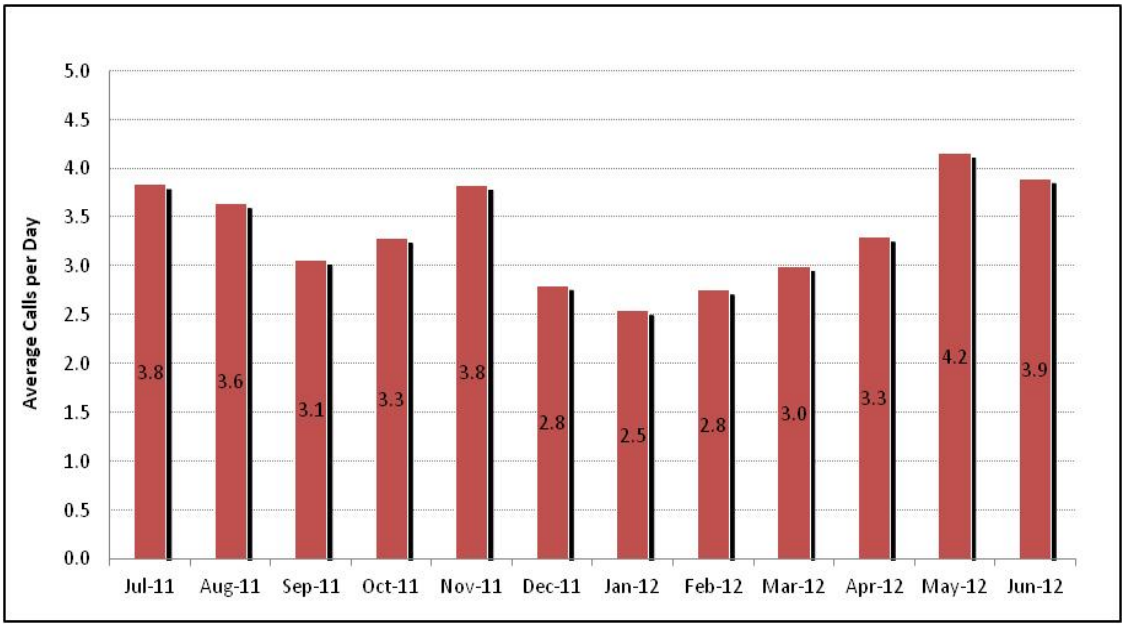
Figure 26: Fire Calls by Type



Observations:

- 32 structure fire calls accounted for 3 percent of total fire calls.
- 93 outside fire calls accounted for 8 percent of total fore calls.
- MVA was the largest call category; it accounted for 29 percent of all calls.
- False alarm was the second largest call category; it accounted for 28 percent of total calls.

Figure 27: Average Calls per Day by Month



Observations:

- Average calls per day ranged from a low of 2.5 calls per day in January 2012 to a high of 4.2 calls per day in May 2012. The highest monthly average was 68 percent greater than the lowest monthly average.
- The highest number of calls received in a single day was 11, which occurred on May 1, 2012. These included one structure fire call, two outside fire calls, two MVA calls, four false alarm calls, one hazardous condition call, and one public service call.
- There were 17 days in the study year which did not have a single citizen-initiated emergency call. This is not too surprising for a department with the call volume experienced by Smyrna.

Figure 28: Calls by Hour of Day

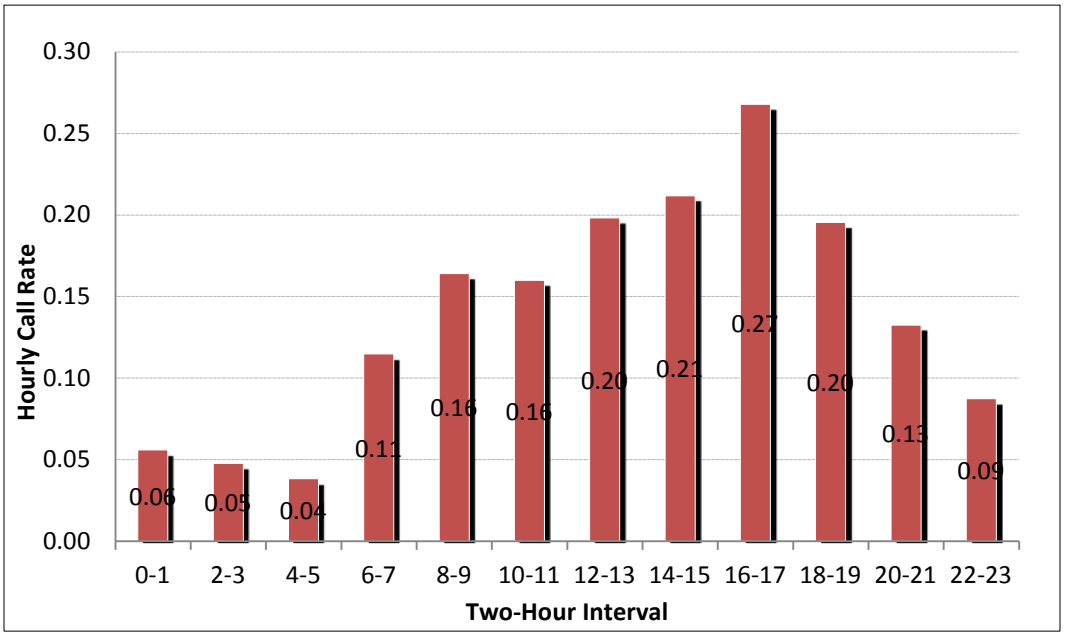


TABLE 9: Calls by Hour of Day

Two-Hour Interval	Hourly Call Rate
0–1	0.06
2–3	0.05
4–5	0.04
6–7	0.11
8–9	0.16
10–11	0.16
12–13	0.20
14–15	0.21
16–17	0.27
18–19	0.20
20–21	0.13
22–23	0.09
Calls per Day	**3.35**

Note: The total shown at the bottom of the table is calculated by adding all rows and multiplying by two, since each cell represents two hours.

Observations:

- Hourly call rates were highest between 8:00 a.m. and 8:00 p.m., averaging between 0.16 calls and 0.27 calls per hour. This amounts to 2.4 calls in this 12-hour period.
- Call rates were lowest between 10:00 p.m. and 6:00 a.m., never higher than 0.09 calls per hour. This amounts to fewer than 0.5 calls in this 8-hour period.

Figure 29: Number of Units Dispatched to Calls

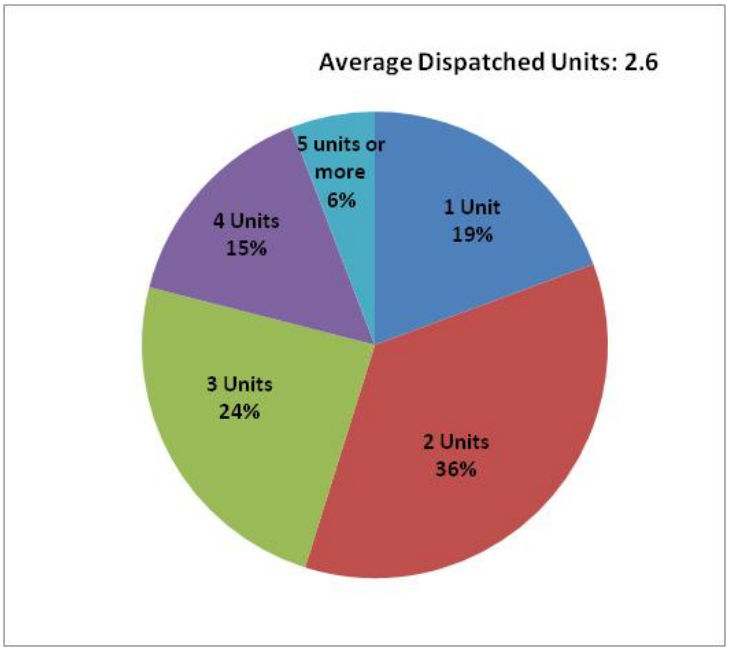


Table 10: Number of Units Dispatched to Calls

	Unit					
Call Type	One	Two	Three	Four	Five or More	Total
Structure fire	2	1	3	0	26	32
Outside fire	19	51	13	3	7	93
MVA	6	224	108	11	1	350
Hazard	32	44	22	12	14	124
False alarm	39	28	120	155	3	345
Public service	98	60	9	1	4	172
Good intent	40	24	19	3	16	102
Fire Total	**236**	**432**	**294**	**185**	**71**	**1,218**
Percentage	**19.4**	**35.5**	**24.1**	**15.2**	**5.8**	**100.0**

Note: Seven calls involving only administrative vehicles are not included.

Observations:

- Overall, four or more units were dispatched to 21 percent of calls.
- On average, 2.6 units were dispatched per call.
- For all calls, one unit was dispatched 19 percent of the time, two units were dispatched 36 percent of the time, three units were dispatched 24 percent of the time, and four or more units were dispatched 21 percent of the time.
- For structure fire calls, five or more units were dispatched 81 percent of the time.
- For outside fire calls, one unit was dispatched 22 percent of the time and two units were dispatched 55 percent of the time.

Table 11: Annual Deployed Time by Call Type

Call Type	Average Deployed Minutes per Run	Annual Deployed Hours	Percent of Annual Hours	Deployed Minutes per Day	Number of Runs	Runs per Day
Structure fire	46.2	156	10.3	25.6	203	0.6
Outside fire	27.5	102	6.7	16.7	222	0.6
MVA	27.9	385	25.5	63.1	827	2.3
Hazard	33.4	179	11.8	29.3	321	0.9
False alarm	13.7	249	16.5	40.8	1,091	3.0
Public service	64.5	299	19.8	49.0	278	0.8
Good intent	16.9	76	5.0	12.5	270	0.7
Fire Total	**27.0**	**1,446**	**95.8**	**237.0**	**3,212**	**8.8**
Mutual aid	275.6	60	4.0	9.8	13	0.0
Canceled	9.9	4	0.3	0.7	26	0.1
Total	**27.9**	**1,510**	**100.0**	**247.5**	**3,251**	**8.9**

Observations:

- Total deployed time for the year was 1,510 hours. This is the total deployment time for all fire units deployed to all (citizen-initiated emergency) calls, including 64 hours spent on mutual aid and canceled calls.
- There were 3,251 runs, including 39 runs dispatched for mutual aid and canceled calls.
- There were 425 runs for structure and outside fire calls, with a total workload of 258 hours.
- Structure and outside fire calls accounted for 17 percent of the total workload but made up only 10 percent of total calls.
- The average deployed time for structure fire calls was 46.2 minutes, and the average deployed time for outside fire calls was 27.5 minutes.

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 and thus a call might include multiple runs.

Table 12: Call Workload by Unit

Station	Unit Description	Unit Report	Average Deployed Minutes per Run	Number of Runs	Annual Deployed Hours	Runs per Day	Deployed Minutes per Day
1	Ladder truck	L1	28.1	644	301	1.8	49.5
	Service company	SC1	24.5	725	296	2.0	48.7
2	Ladder truck	L2	38.5	332	213	0.9	35.0
3	Fire engine	ENG3	26.9	413	185	1.1	30.5
	Service company	SC3	31.2	177	92	0.5	15.1
5	Fire engine	ENG5	28.9	421	203	1.2	33.4
	Tower	TOWER1	21.5	309	111	1.0	21.2
6	Fire engine	ENG6	28.2	230	108	0.6	17.8

Note: Workloads of cross-staffed units are reported under the primary fire apparatus. Workload of ENG1 is included as L1. Workload of ENG2 is included as L2. Brush truck 60 made 13 runs and was deployed 21.8 hours in the study year. Workload of brush truck 60 is included as ENG3. HAZMAT made 6 runs and was deployed 9.9 hours in the year. Workload of HAZMAT is included as ENG5. ENG4 made 13 runs and was deployed 6.4 hours in the study year. Workload of ENG4 is included as ENG6. TOWER1 was out of service for 53 days and the daily averages are calculated using 313 days in service.

Observations:

- Of all units, the most dispatched unit was service company SC1. It averaged 2.0 runs and 48.7 deployed minutes per day.
- Engines ENG3, ENG5, and ENG6 were deployed 30.5, 33.4, and 17.8 minutes per day, respectively, and they averaged 1.1, 1.2, and 0.6 runs per day.
- Ladder truck L1 and engine ENG1 combined had the most annual deployed hours, averaging 49.5 minutes and 1.8 runs per day.
- Ladder truck L2 and engine ENG2 combined made 332 runs, averaging 0.9 runs per day and 35 deployed minutes per day.
- Tower unit TOWER1 was in service for 313 days and made 309 runs, averaging 1.0 runs and 21.2 deployed minutes per day.
- Service company SC3 was deployed for 15.1 minutes per day and averaged 0.5 runs per day.

Figure 30: Deployed Minutes by Hour of Day

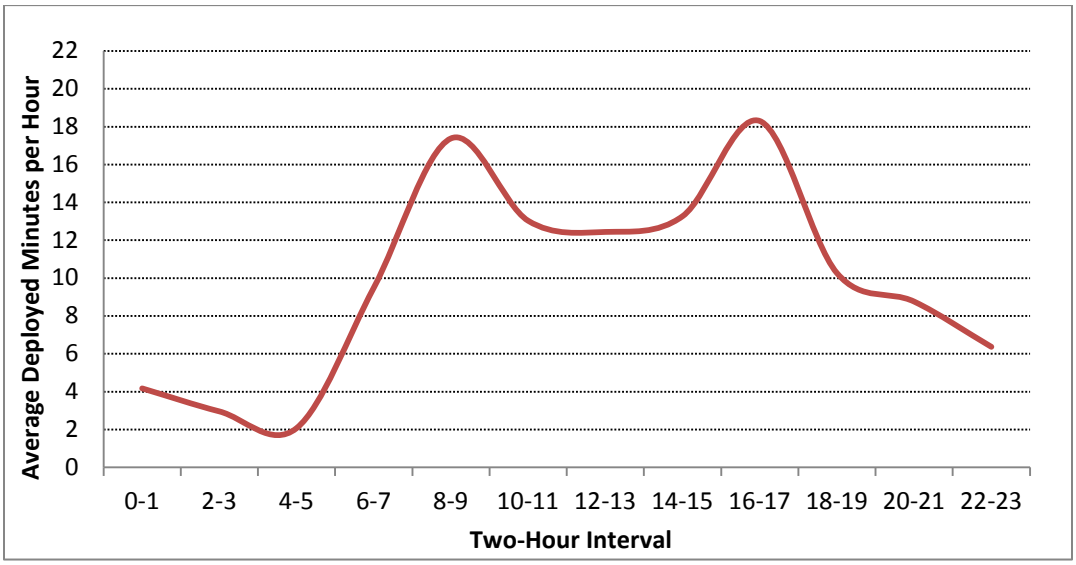


Table 13: Deployed Minutes by Hour of Day

Two-Hour Interval	Deployed Minutes
0–1	4.2
2–3	3.0
4–5	2.1
6–7	9.5
8–9	17.4
10–11	13.0
12–13	12.4
14–15	13.3
16–17	18.3
18–19	10.3
20–21	8.8
22–23	6.4
Daily Total	**237.0**

Note: Daily totals shown equal the sum of each column multiplied by two, since each cell represents two hours. Canceled calls are not included. These minutes represent the total work for all units.

Observations:

- Hourly deployed minutes were the highest between 8:00 a.m. and 6:00 p.m., averaging between 12.4 minutes and 18.3 minutes per hour.
- Hourly deployed minutes were the lowest between midnight and 6:00 a.m., averaging between 2.1 minutes and 4.2 minutes per hour.

Table 14: Total Annual and Daily Average Number of Runs by Call Type and Unit

Station	Unit	**Structure Fire**	**Outside Fire**	MVA	Hazard	False Alarm	Public Service	Good Intent	Mutual Aid	Canceled	**Total**	**Runs per Day**
1	L1	**30**	**61**	159	44	210	66	67	1	6	**644**	**1.8**
	SC1	**27**	**15**	286	73	225	53	41	2	3	**725**	**2.0**
2	L2	**25**	**35**	57	43	106	29	31	4	2	**332**	**0.9**
3	ENG3	**24**	**49**	78	37	140	38	42	2	3	**413**	**1.1**
	SC3	**13**	**3**	63	18	45	18	13	2	2	**177**	**0.5**
5	ENG5	**31**	**26**	104	59	123	34	37	1	6	**421**	**1.2**
	TOWER1	**23**	**11**	48	22	171	16	15	0	3	**309**	**1.0**
6	ENG6	**30**	**22**	32	25	71	24	24	1	1	**230**	**0.6**

Note: Workload of ENG1 is included as L1. Workload of ENG2 is included as L2. Workload of brush truck 60 is included as ENG3. Workload of HAZMAT is included as ENG5. Workload of ENG4 is included as ENG6. TOWER1 was out of service for 53 days and the daily averages are calculated using 313 days in service.

Observations:

- Service company SC1 was dispatched most frequently of all fire equipment. It made 725 runs during the year, averaging 2.0 runs per day. However, the vast majority of calls were not actual fires. Actual fire runs totaled 42 runs in a year.
- On average, engines ENG3 and ENG5 were dispatched on 1.1 and 1.2 runs per day, respectively. Engines ENG4 and ENG6 combined were dispatched on 0.6 runs per day.
- On average, engine ENG1 and ladder truck L1 combined were dispatched 1.8 runs per day. Engine ENG2 and ladder truck L2 combined averaged 0.9 runs per day.
- Service company SC3 was dispatched 177 times during the year, averaging 0.5 runs per day.
- Tower unit TOWER1 was dispatched 309 runs during the year, averaging 1.0 runs per day.

Table 15: Daily Average Deployed Minutes by Call Type and Unit

Station	Unit	**Structure Fire**	**Outside Fire**	MVA	Hazard	False Alarm	Public Service	Good Intent	Mutual Aid	Canceled	**Total**
1	L1	**4.1**	**4.2**	10.9	5.6	7.9	11.7	3.0	1.7	0.2	**49.5**
	SC1	**3.7**	**1.5**	19.3	6.2	7.0	7.8	2.1	0.9	0.1	**48.7**
2	L2	**3.3**	**3.1**	4.6	5.5	6.0	7.3	1.9	3.3	0.0	**35.0**
3	ENG3	**4.1**	**3.5**	8.0	3.2	4.7	3.5	1.6	1.7	0.0	**30.5**
	SC3	**2.3**	**0.2**	4.9	2.0	1.4	1.9	0.5	1.7	0.0	**15.1**
5	ENG5	**3.4**	**1.9**	9.1	3.4	5.5	7.6	2.2	0.0	0.2	**33.4**
	TOWER1	**2.5**	**0.9**	4.2	1.8	6.3	5.0	0.5	0.0	0.1	**21.2**
6	ENG6	**2.5**	**1.5**	2.7	1.9	2.9	4.9	0.8	0.4	0.0	**17.8**

Note: Workload of ENG1 is included as L1. Workload of ENG2 is included as L2. Workload of brush truck 60 is included as ENG3. Workload of HAZMAT is included as ENG5. Workload of ENG4 is included as ENG6. TOWER1 was out of service for 53 days and the daily averages are calculated using 313 days in service.

Observations:

- On average, the most deployed fire equipment were ladder truck L1 and engine ENG1 combined. These units were deployed an average of 49.5 minutes per day. On average, the unit spent 8.3 minutes per day fighting structure or outside fires.
- ENG5 and HAZMAT averaged 33.4 minutes per day. On average, these units spent 5.3 minutes per day fighting structure or outside fires.
- Of two service companies, SC1 was the busier unit and averaged 48.7 minutes of deployed time per day. On average, it spent 5.2 minutes per day fighting structure or outside fire calls.
- Tower unit TOWER1 averaged 21.2 minutes of deployed time per day. On average, it spent 3.4 minutes per day fighting structure or outside fire calls.

Analysis of Busiest Hours

There is significant variability in the number of calls from hour to hour. One special concern relates to the fire resources available for hours with the heaviest workload. We tabulated the data for each of 8,784 hours in the year. Approximately once every three days the Smyrna Fire Department responded to two or three calls in an hour. This is 1.3 percent of the total number of hours. Here, we report the hours with the most calls received and provide a detailed analysis of two hours with the most calls received.

Table 16: Frequency Distribution of the Number of Calls

Number of Calls in an Hour	Frequency	Percentage
0	7,660	87.2
1	1,012	11.5
2	103	1.2
3	9	0.1

Observations:

- During 112 hours (1.3 percent of all hours), two or three calls occurred; in other words, the Smyrna Fire Department responded to two or three calls in an hour roughly once every three days.
- Three or more calls occurred only during nine hours.

Table 17: Top 10 Hours with the Most Calls Received

Hour	Number of Calls	Number of Runs	Total Deployed Hours
8/3/2011, 5:00–6:00 p.m.	3	10	2.1
1/9/2012, 8:00–9:00 a.m.	3	8	1.2
6/21/2012, 4:00–5:00 p.m.	3	6	2.1
9/19/2011, 9:00–10:00 a.m.	3	6	1.8
5/1/2012, 10:00–11:00 p.m.	3	6	1.7
8/22/2011, 7:00–8:00 p.m.	3	5	1.6
7/10/2011, 4:00–5:00 p.m.	3	5	1.3
8/15/2011, 6:00–7:00 p.m.	3	4	1.6
6/23/2012, 8:00–9:00 a.m.	3	3	2.1
4/10/2012, 5:00–6:00 p.m.	2	11	2.4

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.

Observations:

- There were nine hours with three calls received. Between 5:00 and 6:00 p.m. on August 3, 2011, three calls involved 10 individual dispatches. The three calls included one outside fire call, one false alarm call, and one good intent call. The combined workload was 2.1 hours. The outside fire call lasted 9.4 minutes and involved two units. The good intent call lasted 17.2 minutes and involved six units. The false alarm call lasted 13.9 minutes and involved two units.
- The hour with the most dispatches was between 5:00 and 6:00 p.m. on April 10, 2012. The two calls involved 11 individual dispatches. The two calls were one false alarm call and one good intent call. The combined workload was 2.4 hours. The false alarm call lasted 20.5 minutes and involved four units. The good intent call lasted 27.5 minutes and involved seven units.

Table 18: Unit Workload Analysis between 5:00 and 6:00 p.m. on August 3, 2011

Hour	Station	1		2	3		5		6	Number of Busy Units
	Unit	L1	SC1	L2	ENG3	SC3	ENG 5	TOWER1	ENG6	
8/3/2011 5:00-6:00 p.m.	0–5									0
	5–10			4.3	4.3					2
	10–15			5.0	2.8					2
	15–20			0.1						1
	20–25									0
	25–30									0
	30–35									0
	35–40									0
	40–45	3.5		3.5	3.5		3.5	3.5	3.5	6
	45–50	5.0		5.0	5.0		5.0	5.0	5.0	6
	50–55	5.0		5.0	5.0		5.0	5.0	5.0	6
	55–60	3.7		3.7	3.7		5.0	5.0	3.7	6
	Total	17.2		26.6	24.3		18.5	18.5	17.2	

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

Observations:

- During this hour, units made 10 runs and responded to three calls. Those three calls included one outside fire call, one false alarm call, and one good intent call. The outside fire call lasted 9.4 minutes and involved two units. The good intent call lasted 17.2 minutes and involved six units. The false alarm call lasted 13.9 minutes and involved two units.
- During the busiest 20 minutes in the hour (5:40 to 6:00 p.m.), six units were simultaneously busy. Ladder truck L2 was the busiest unit in this particular hour, and was deployed 26.6 minutes.

Table 19: Unit Workload Analysis between 5:00 and 6:00 p.m. on April 10, 2012

Hour	Station	1		2	3		5		6	Number of Busy Units
	Unit	L1	SC1	L2	ENG3	SC3	ENG5	TOWER 1	ENG6	
4/10/2012 5:00–6:00 p.m.	0–5						5.0			1
	5–10						5.0			1
	10–15						1.4			1
	15–20									0
	20–25									0
	25–30									0
	30–35									0
	35–40									0
	40–45							0.8		1
	45–50	4.6	4.6					5.0	4.7	4
	50–55	4.2	5.0		3.3	3.3	3.3	4.2	5.0	7
	55–60		0.7		3.7	3.6	3.7		5.0	5
	Total	8.8	10.3		7.0	6.9	18.4	10.0	14.7	

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

Observations:

- During this hour, units made 11 runs and responded to two calls. The two calls were one false alarm and one good intent call. The false alarm call lasted 20.5 minutes and involved four units. The good intent call lasted 27.5 minutes and involved seven units.
- During the busiest five minutes in the hour (5:50 to 5:55 a.m.), seven units were simultaneously busy. Engine ENG5 was the busiest unit in this particular hour, and was deployed 18.4 minutes.

Dispatch Time and Response Time

This section presents dispatch and response time statistics for different call types and fire units. For most types of calls, the main focus is the dispatch and response time of the first arriving units. However, for structure and outside fire calls, we also analyze the response time of the second arriving fire vehicles.

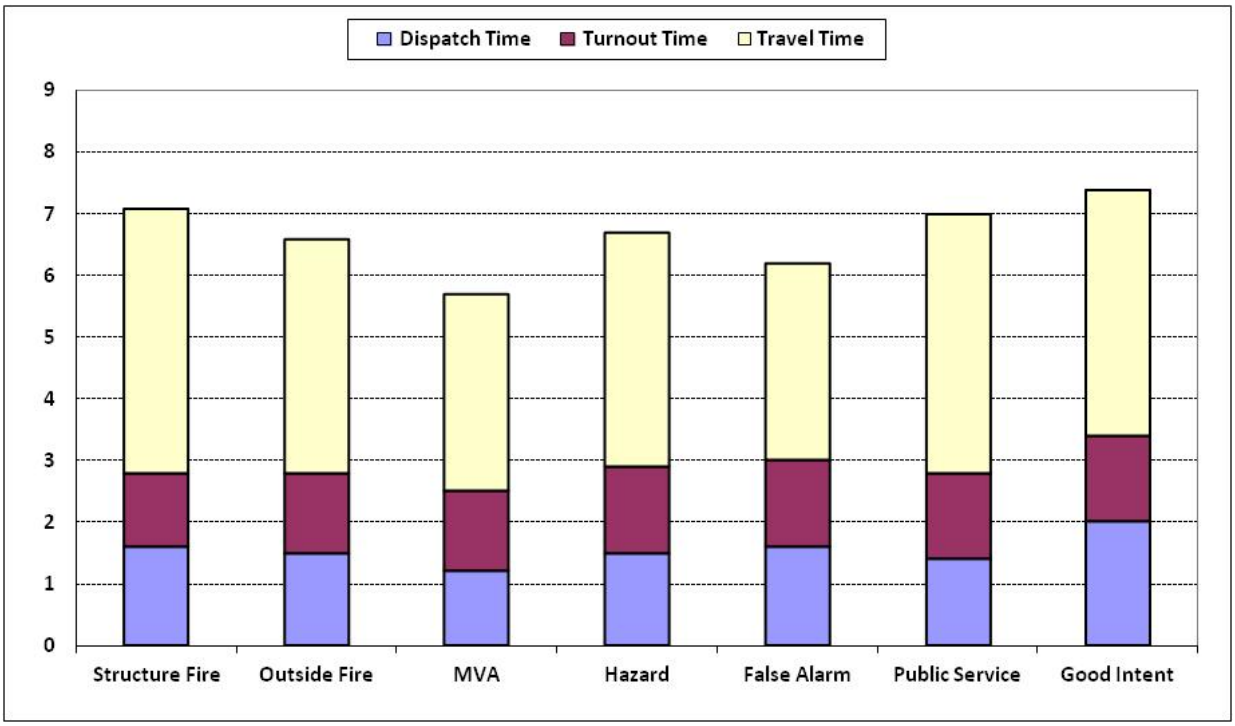
Different terms are used to describe the components of response time: **Dispatch processing time** is the difference between the unit dispatch time and call received time. **Turnout time** is the difference between the unit time en route and the unit dispatch time. **Travel time** is the difference between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

In this section, a total of 965 calls that have valid unit dispatch, time en route, and on-scene times (79 percent of total calls) were used in the analysis. The average dispatch time was 1.5 minutes. The average turnout time was 1.4 minutes, and the average travel time was 3.5 minutes. The average response time was 6.4 minutes, and the 90th percentile response time was 9.1 minutes.

Table 20: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Unit by Call Type

Call Type	Dispatch Time	Turnout Time	Travel Time	Response Time	90th Percentile Response Time	Sample Size
Structure fire	1.6	1.2	4.3	7.1	11.7	20
Outside fire	1.5	1.3	3.8	6.6	9.4	87
MVA	1.2	1.3	3.2	5.7	7.7	256
Hazard	1.5	1.4	3.8	6.6	9.9	101
False alarm	1.6	1.4	3.2	6.2	8.9	336
Public service	1.4	1.4	4.2	7.0	9.6	76
Good intent	2.0	1.4	4.0	7.3	12.9	89
Fire Total	**1.5**	**1.4**	**3.5**	**6.4**	**9.1**	**965**

Figure 31: Average Dispatch, Turnout, and Travel Times of First Arriving Unit by Call Type



Observations:

- The average dispatch time was 1.5 minutes.
- The average turnout time was 1.4 minutes.
- The average travel time was 3.5 minutes.
- The average response time was 6.4 minutes.
- The 90th percentile response time was 9.1 minutes.
- The average response time for structure fire calls was 7.1 minutes.
- The average response time for outside fire calls was 6.6 minutes.

Figure 32: Average Dispatch, Turnout, Travel, and Response Time of First-Arriving Unit by Hour of Day

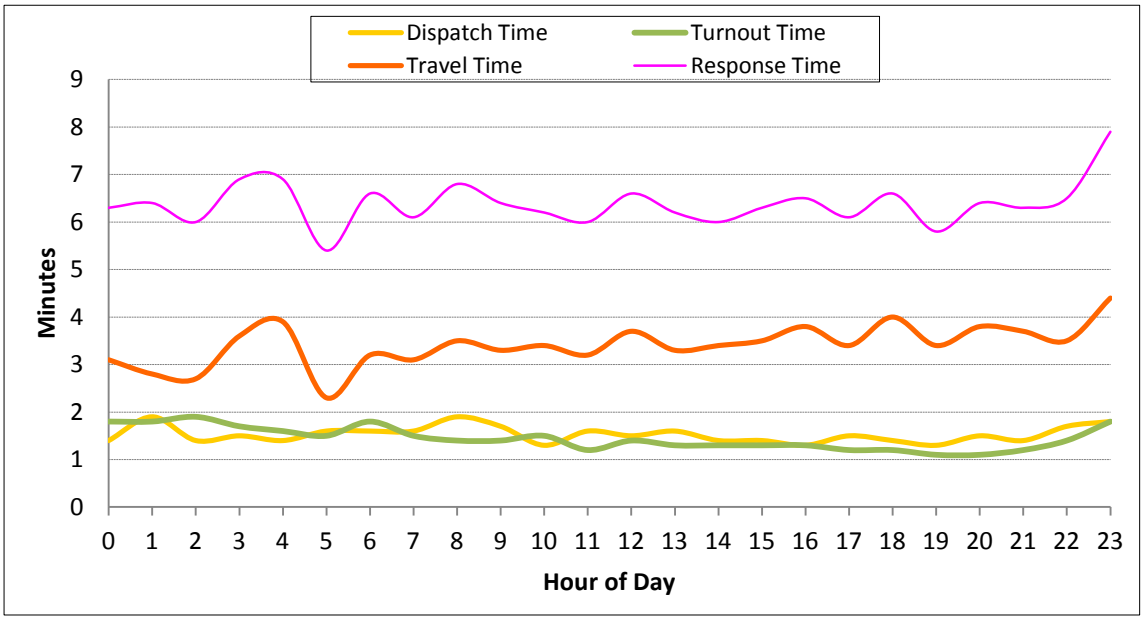


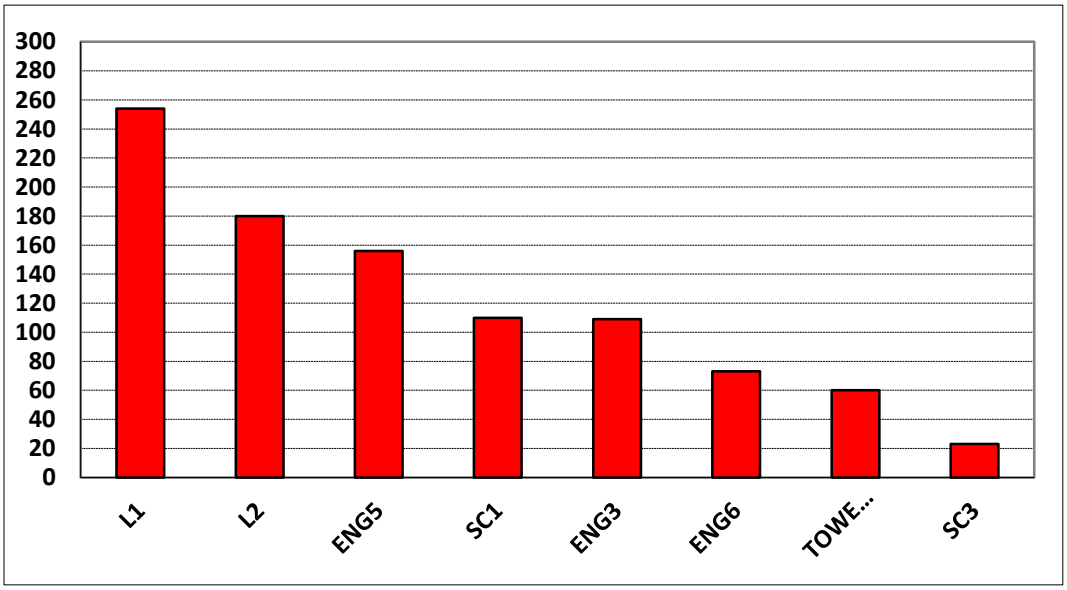
Table 21: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Unit by Hour of Day

Hour	Dispatch Time	Turnout Time	Travel Time	Response Time	Sample Size
	1.4	1.8	3.1	6.3	21
1	1.9	1.8	2.8	6.4	16
2	1.4	1.9	2.7	6.0	13
3	1.5	1.7	3.6	6.9	21
4	1.4	1.6	3.9	6.9	17
5	1.6	1.5	2.3	5.4	9
6	1.6	1.8	3.2	6.6	21
7	1.6	1.5	3.1	6.1	39
8	1.9	1.4	3.5	6.8	34
9	1.7	1.4	3.3	6.4	38
10	1.3	1.5	3.4	6.2	43
11	1.6	1.2	3.2	6.0	47
12	1.5	1.4	3.7	6.6	67
13	1.6	1.3	3.3	6.2	51
14	1.4	1.3	3.4	6.0	47
15	1.4	1.3	3.5	6.3	77
16	1.3	1.3	3.8	6.5	73
17	1.5	1.2	3.4	6.1	82
18	1.4	1.2	4.0	6.6	60
19	1.3	1.1	3.4	5.8	50
20	1.5	1.1	3.8	6.4	48
21	1.4	1.2	3.7	6.3	33
22	1.7	1.4	3.5	6.5	38
23	1.8	1.8	4.4	7.9	20
Total	**1.5**	**1.4**	**3.5**	**6.4**	**965**

Observations:

- Average dispatch time was between 1.3 and 1.9 minutes.
- Average turnout time was between 1.1 and 1.9 minutes. Between midnight and 8:00 a.m., the average turnout time was consistently more than 1.5 minutes.
- Average travel time was between 2.3 and 4.4 minutes.
- Average response time was between 5.4 and 7.9 minutes, peaking between 11:00 p.m. and midnight.

Figure 33: Number of Total Calls by First Arriving Units



Note: Figure 33 and Table 22 include calls of the first arriving unit that had a valid unit on-scene time.

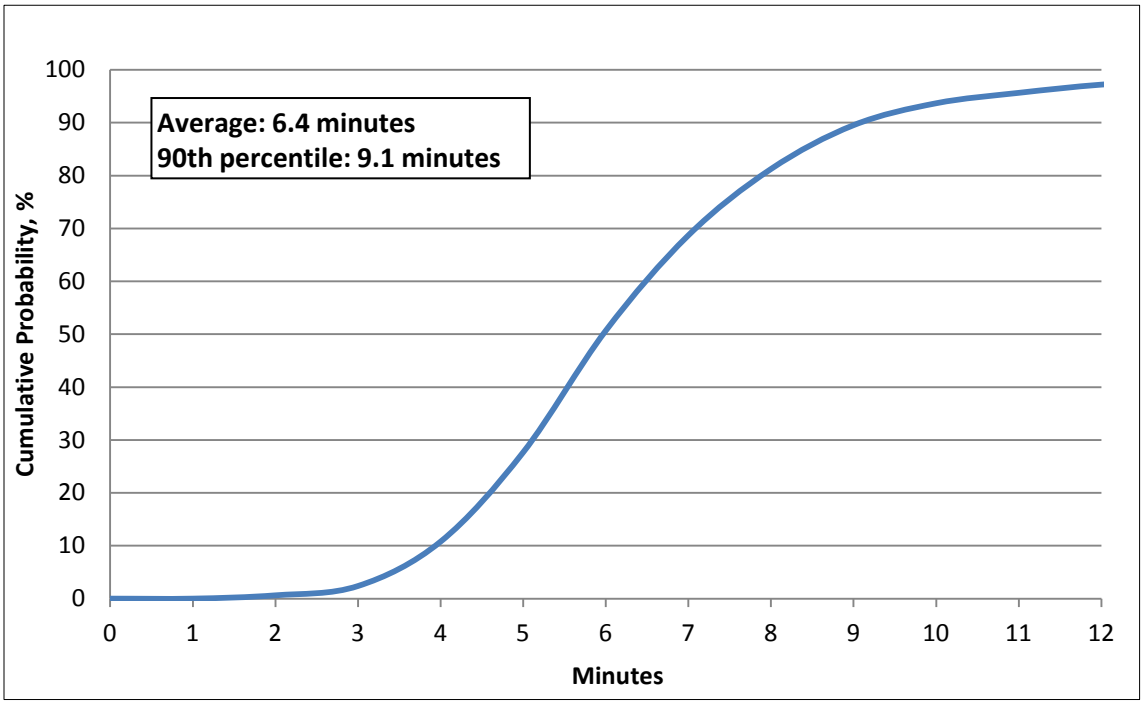
Table 22: Number of Total Calls by First Arriving Units

Unit	Structure and Outside Fire	MVA	Fire Other	Total	Percentage	Cumulative Percentage
L1	32	61	161	254	26.3	26.3
L2	23	34	123	180	18.7	45.0
ENG5	13	35	108	156	16.2	61.1
SC1	3	49	58	110	11.4	72.5
ENG3	22	33	54	109	11.3	83.8
ENG6	9	10	54	73	7.6	91.4
TOWER1	3	27	30	60	6.2	97.6
SC3	2	7	14	23	2.4	100.0

Observations:

- Ladder truck L1 arrived first on scene most often, followed by ladder truck L2 and engine ENG5. The top three first arriving units accounted for 61 percent of the first arrivals at calls.
- For structure and outside fire calls, ladder trucks L1 and L2, and engine ENG3, in that order, were the first units on scene most often.
- For MVA calls, ladder truck L1, service company SC1, engine ENG5, and ladder truck L2, in that order, were the first units on scene most often.

Figure 34: Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit



Reading the CDF Chart: The vertical axis is the probability or percentage of calls. The horizontal axis is response time. For example, the 0.9 probability line intersects the graph at the time mark at about 9.1 minutes. This means that units had a response time of less than 9.1 minutes for 90 percent of these calls.

Figure 35: Frequency Distribution Chart of Response Time of First Arriving Unit

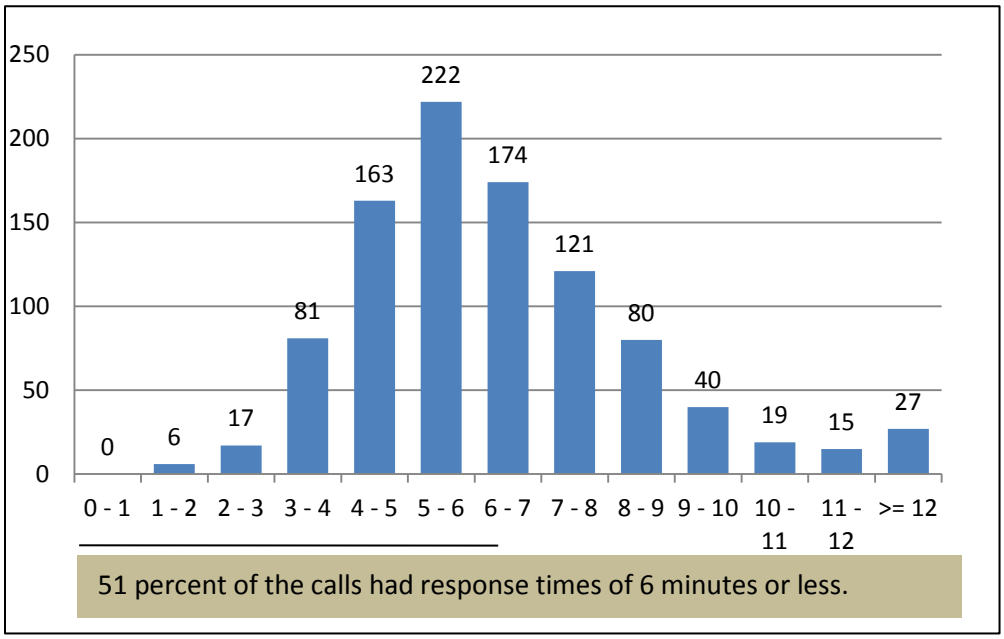


Table 23: Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit

Response Time (minute)	Frequency	Cumulative Percentage
0–1	0	0.0
1–2	6	0.6
2–3	17	2.4
3–4	81	10.8
4–5	163	27.7
5–6	222	50.7
6–7	174	68.7
7–8	121	81.2
8–9	80	89.5
9–10	40	93.7
10–11	19	95.6
11–12	15	97.2
>12	27	100.0

Observations:

- The average response time was 6.4 minutes.
- For 51 percent of calls, the response time was less than or equal to 6.0 minutes.
- For 90 percent of the calls, the response time was less than 9.1 minutes.

Response Time Analysis for Structure and Outside Fire Calls

The following tables and charts report response time analysis of first and second arriving units for structure and outside fire calls.

Table 24: Average Response Time for Structure and Outside Fire Calls by First Arriving Unit

Station	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
1	Ladder truck	L1	6.3	26	8.0	6	6.6	32
	Service company	SC1	6.0	2	10.0	1	7.3	3
2	Ladder truck	L2	6.7	19	6.8	4	6.7	23
3	Fire engine	ENG3	7.4	19	7.1	3	7.4	22
	Service company	SC3	2.3	1	5.0	1	3.7	2
5	Fire engine	ENG5	5.9	11	4.6	2	5.7	13
	Tower	TOWER1	6.2	1	4.6	2	5.1	3
6	Fire engine	ENG6	7.2	8	11.7	1	7.7	9
Total			**6.6**	**87**	**7.1**	**20**	**6.7**	**107**

Observations:

- For outside fire calls, the average response time of the first arriving firefighting equipment was 6.6 minutes.
- For outside fire calls, ladder truck L1, ladder truck L2, and engine ENG3 were the first units on scene most often and had an average response time of 6.3 minutes, 6.7 minutes, and 7.4 minutes, respectively.
- For structure fire calls, the average response time of first arriving firefighting equipment was 7.1 minutes.
- For structure fire calls, ladder truck L1 was the first unit on scene most often and had an average response time of 8.0 minutes.

Table 25: Average Response Time for Structure and Outside Fire Calls by Second Arriving Unit

Station	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
1	Ladder truck	L1	7.6	23	9.8	2	7.8	25
	Service company	SC1	6.4	4	8.4	5	7.5	9
2	Ladder truck	L2	8.3	3	7.1	2	7.8	5
3	Fire engine	ENG3	7.5	20	8.1	2	7.6	22
	Service company	SC3	10.8	1	15.2	1	13.0	2
5	Fire engine	ENG5	6.9	7	10.5	2	7.7	9
	Tower	TOWER1	7.2	2	7.1	4	7.1	6
6	Fire engine	ENG6	9.1	7	6.4	1	8.8	8
Total			**7.7**	**67**	**8.6**	**19**	**7.9**	**86**

Observations:

- The average response time of the second arriving unit for outside fire calls was 7.7 minutes, compared to 6.6 minutes for the first arriving unit.
- The average response time of the second arriving unit for structure fire calls was 8.6 minutes, compared to 7.1 minutes for the first arriving unit.

Figure 36: Cumulative Distribution Function (CDF) of Response Time of First and Second Arriving Units for Structure and Outside Fire Calls

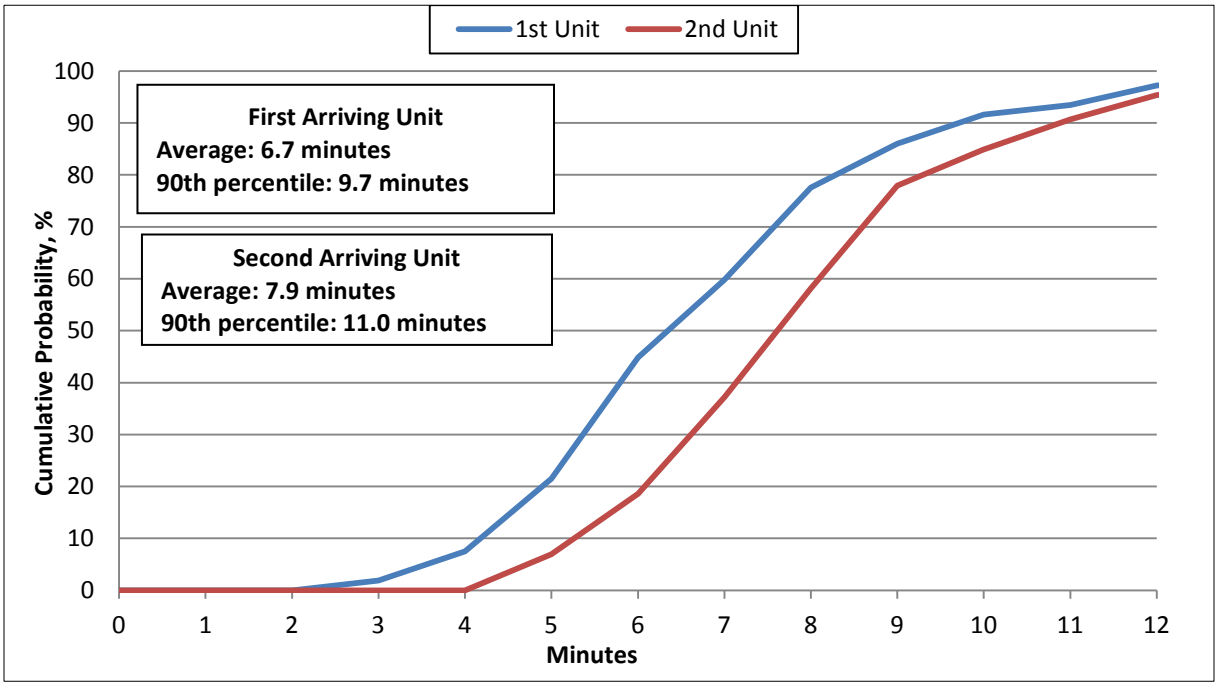


Figure 37: Frequency Distribution Chart of Response Time of First Arriving Unit for Structure and Outside Fire Calls

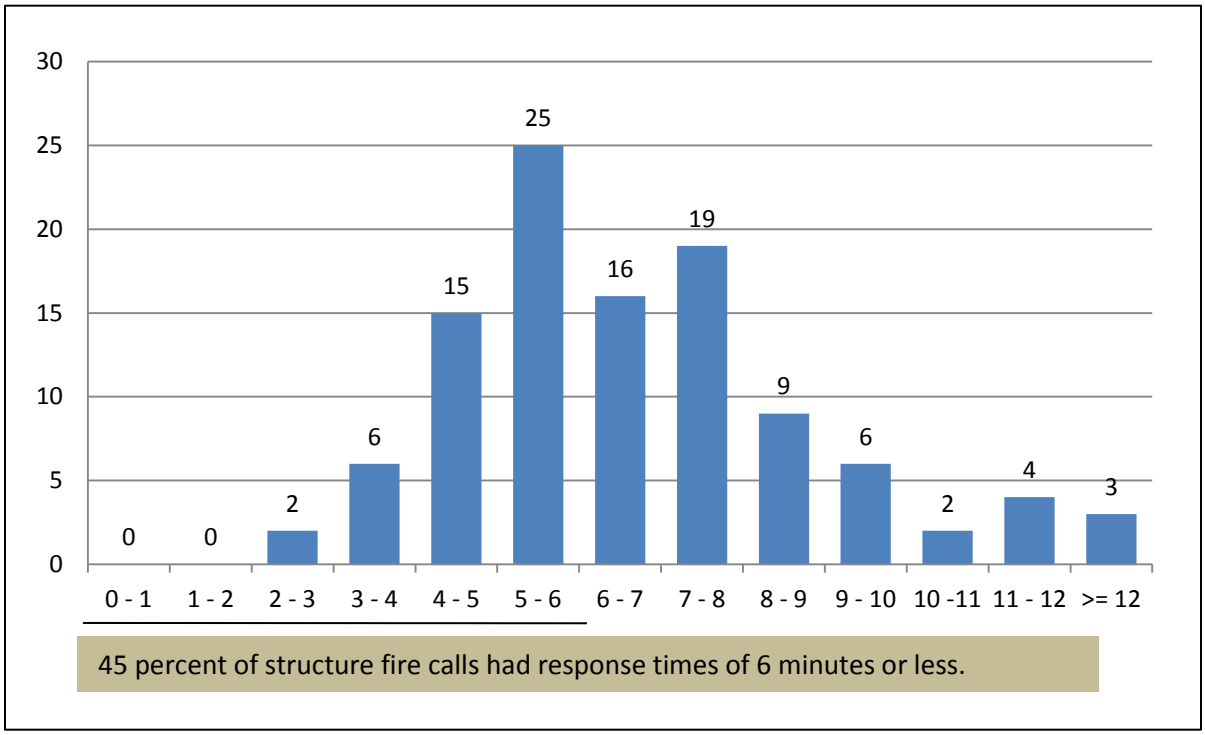


Table 26: Cumulative Distribution Function (CDF) of Response Time of First and Second Arriving Fire Units for Structure and Outside Fire Calls

Response Time (minute)	First Unit		Second Unit	
	Frequency	Cumulative Percent	Frequency	Cumulative Percent
0–1	0	0.0	0	0.0
1–2	0	0.0	0	0.0
2–3	2	1.9	0	0.0
3–4	6	7.5	0	0.0
4–5	15	21.5	6	7.0
5–6	25	44.9	10	18.6
6–7	16	59.8	16	37.2
7–8	19	77.6	18	58.1
8–9	9	86.0	17	77.9
9–10	6	91.6	6	84.9
10 -11	2	93.5	5	90.7
11–12	4	97.2	4	95.3
12–13	1	98.1	1	96.5
13–14	1	99.1	1	97.7
14–15	0	99.1	0	97.7
>15	1	100.0	2	100.0

Observations:

- The average response time of the first arriving fire unit for structure fire calls was 6.7 minutes.
- 45 percent of the time, the first fire unit's response time was less than 6.0 minutes.
- 90 percent of the time, the first fire unit's response time was less than 9.7 minutes.
- On average, the response time of the second arriving unit was 7.9 minutes, which was 1.2 minutes longer than that of the first arriving unit.
- 90 percent of the time, the second fire unit's response time was less than 11.0 minutes.

Appendix I

Workload Analysis for Administrative Units to Citizen-Initiated Emergency Service Calls

Unit Description	Unit	Number of Runs	Annual Deployed Hours
Support vehicle	62	15	36.8
	63	44	48.0
	64	8	7.3
	65	10	26.3
	66	29	74.6
	67	1	0.7
Fire chief	500	1,002	109.7
Service company	SC2	668	422.2
Total		**1,777**	**726**
Daily Average		**4.9**	**2.0**

Appendix II

Analysis of Nonemergency Service Calls and Self-Initiated Activities

Activity Type	Number of Activities	Number of Activities per Day
Diesel pumps	514	1.4
Equipment maintenance	1,041	2.8
Hydrant maintenance	65	0.2
Hydrant testing	219	0.6
Issue burn permit	466	1.3
Out of car / Out of city	616	1.7
Prefire planning	571	1.6
Provision acquisition	269	0.7
Station maintenance	4,609	12.6
Training	865	2.4
Other	478	1.3

Appendix III

Correspondence between Call Description and Call Type

Call Type	NFIRS Incident Type	NFIRS Incident Description
Structure Fire	111	Building fire
Structure Fire	122	Fire in motor home, camper, recreational vehicle
Outside Fire	131	Passenger vehicle fire
Outside Fire	133	Rail vehicle fire
Outside Fire	137	Camper or recreational vehicle (RV) fire
Outside Fire	138	Off-road vehicle or heavy equipment fire
Outside Fire	140	Natural vegetation fire, other
Outside Fire	141	Forest, woods or wildland fire
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	162	Outside equipment fire
MVA	311	Medical assist, assist EMS crew
MVA	322	Vehicle accident with injuries
MVA	323	Motor vehicle/pedestrian accident (MV Ped)
MVA	324	Motor vehicle/pedestrian accident
MVA	352	Extrication of victim(s) from vehicle
Hazard	240	Explosion (no fire), other
Hazard	241	Munitions or bomb explosion (no fire)
Hazard	400	Hazardous condition, other
Hazard	411	Gasoline or other flammable liquid spill
Hazard	412	Gas leak (natural gas or LPG)
Hazard	413	Oil or other combustible liquid spill
Hazard	421	Chemical hazard (no spill or leak)
Hazard	424	Carbon monoxide incident
Hazard	440	Electrical wiring/equipment problem, other
Hazard	444	Power line down
Hazard	445	Arcing, shorted electrical equipment
Hazard	451	Biological hazard, confirmed or suspected
Hazard	462	Aircraft standby
Hazard	463	Vehicle accident, general cleanup

Call Type	NFIRS Incident Type	NFIRS Incident Description
Hazard	471	Explosive, bomb removal (for bomb scare, use 721)
Hazard	481	Attempt to burn
False Alarm	700	False alarm or false call, other
False Alarm	710	Malicious, mischievous false call, other
False Alarm	715	Local alarm system, malicious false alarm
False Alarm	721	Bomb scare—no bomb
False Alarm	730	System malfunction, other
False Alarm	731	Sprinkler activation due to malfunction
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
False Alarm	740	Unintentional transmission of alarm, other
False Alarm	741	Sprinkler activation, no fire—unintentional
False Alarm	743	Smoke detector activation, no fire—unintentional
False Alarm	744	Detector activation, no fire—unintentional
False Alarm	745	Alarm system sounded, no fire—unintentional
False Alarm	746	Carbon monoxide detector activation, no CO
Public Service	311	Medical assist, assist EMS crew
Public Service	321	EMS call, excluding vehicle accident with injury
Public Service	500	Service call, other
Public Service	531	Smoke or odor removal
Public Service	542	Animal rescue
Public Service	550	Public service assistance, other
Public Service	551	Assist police or other governmental agency
Public Service	552	Police matter
Public Service	553	Public service
Public Service	555	Defective elevator, no occupants
Public Service	561	Unauthorized burning
Public Service	911	Citizen complaint
Good Intent	600	Good intent call, other
Good Intent	631	Authorized controlled burning
Good Intent	632	Prescribed fire
Good Intent	651	Smoke scare, odor of smoke
Good Intent	652	Steam, vapor, fog or dust thought to be smoke
Good Intent	653	Barbecue, tar kettle

Call Type	NFIRS Incident Type	NFIRS Incident Description
Good Intent	671	Hazmat release investigation w/ no hazmat
Canceled	611	Dispatched & canceled en route
Canceled	622	Dispatched & canceled en route

Appendix IV

Alternative Operational Staffing Matrix

As discussed in this report, the SFD staffs two telesquirts/quints, three pumpers, one tower ladder/quint, and two service companies each day for first-line protective service to the Town of Smyrna. In addition, one supervisor/command unit is staffed by a Captain. Fire suppression staff is deployed on a rotational shift of twenty-five hours on and forty-seven hours off. This schedule creates three operational shifts or platoons. One captain is assigned to each of the three shifts as the overall shift commander. Three of the department's five stations (1, 3, and 5) have lieutenants assigned to each shift and two stations (2 and 6) have only one lieutenant assigned to the station. The lieutenants assigned to each shift at a station serve as shift supervisors. The two stations that have only one lieutenant assigned serve as station supervisors. Firefighters assigned to the two shifts at stations 2 and 6 and which do not have station lieutenants ensure operations are maintained.

Utilizing the above staffing and deployment model, and as the SFD has it implemented, takes eighty-four total operational personnel (twenty-eight per shift). Currently the SFD is staffed with eighty-three operational personnel (B-shift is staffed with twenty-seven personnel). As a review of this report, minimum fire suppression staffing is three on each telesquirt, engine (pumper), and the tower ladder. The two service companies are staffed with two personnel.

Staffing is such that five personnel are allowed off on leave each day. Leave is administered on a first come-first served basis. The assistant fire chief manages advance leave requests and enforces the five-maximum rule. The shift captain manages the daily unscheduled leave and has the authority to grant leave to up to five personnel if the maximum has not been met. Should unscheduled leave push the number of personnel on leave above five, the tower ladder at station 5 is placed out of service and personnel from this unit are shifted to the vacant positions. There is no overtime available for leave.

Figure A-IV-1 illustrates the current SFD staffing and deployment matrix. Stations 1, 2, 3, 5, and 6 have four personnel assigned per shift, with exception of B-shift, which has only six personnel assigned to station 5 due to a staffing vacancy. This above the minimum staffing (overstaffing) serves as backfill positions for the five personnel daily leave vacancies. Also illustrated in Figure A-IV-1 are the shifts at stations 2 and 6 that do not have lieutenants assigned, as well as each service company which does not have officers assigned across each of the three shifts. Additionally and confirmed by senior staff, the SFD currently has eleven vacancies that are not exhibited in this matrix.

Figure A-IV-1: Current SFD Staffing Matrix

A Shift		B Shift		C Shift	
Station 1		Station 1		Station 1	
Lt. Daryl Wyttenbach	5575	Lt. Josh Hill	6497	Lt Stacy Harrell	7677
FF/LD Jeff Williams	6432	FF/LD Terry Plisch	7831	FF/LD Don Dishno	1677
FF Randy Hite	5097	FF Jonathan Pratt	7586	FF/LD Jeremy Napper	7382
FF Kevin Suter	1319	FF Trey King	0180	FF Daniel Clouse	1349
Service Company 1		Service Company 1		Service Company 1	
FF/D Daniel Turner	5333	FF/D Ryan King	7584	FF/D Cameron Phelps	7579
FF/LD Randall Dickson	7404	FF Michael Mindigo	7421	FF/D Steven Graves	2472
Station 2		Station 2		Station 2	
FF/LD Robby Hall	5682	Lt. Mike Cook	8548	FF/LD Mike Hauger	2580
FF/LD Ryan Kellum	8858	FF/LD William Wheeler	8210	FF/LD Danny Fields	7338
FF Daniel Brownlow	1471	FF/LD Shawn Garmon	7096	FF Robert Fletcher	5660
FF Eric Meyer	7576	FF Chad Hohl	4475	FF Brian Emamalie	2751
Station 3		Station 3		Station 3	
Lt. Justin Cross	1994	Lt. Burt Wilson	7210	Lt. Bobby Moore	9892
FF/D Bryan Peck	5867	FF/D Matt Davis	0188	FF/D Jason Cox	0138
FF Ryan White	1689	FF/D Carl Greer	7803	FF Billy Wilson	7590
FF/D Jeremy Stokes	1901	FF Eric Tenpenny	0105	FF Hyke Holder	4562
Service Company 3		Service Company 3		Service Company 3	
FF/D Patrick Stewart	9557	FF/D Chris Rydel	7587	FF/D Randy Cramblit	9111
FF Daniel Uthus	7589	FF Windsor Scheitel	4969	FF Matt Sensing	7578
Station 4		Station 4		Station 4	
Capt. Shane Patterson	5586	Capt. Floyd Mayes	4294	Capt. Dwayne Stacey	7787
Station 5		Station 5		Station 5	
Lt. Brian Garsnett	3249	Lt Garth Petrilli	4800	Lt Nick Johns	3272
FF/LD Brian Martin	9390	FF/LD David Honeycutt	2989	FF/LD Bryan Travis	0890
FF/LD Brandon Sasser	8573	FF/LD Steven Cootes	0678	FF/LD John Graves	2128
FF/D Blake Connelly	0707	FF/D Erik Mason	4190	FF/D Howard Roberson	9601
FF/D Jason Dean	7581	FF Jordan Hastings	0940	FF/D Mike Dendy	3051
FF Howard Kremer	2874	FF Steven Beasley	7514	FF Nick Link	7585
FF Marc Fraley	3453			FF Matt McCauley	6505
Station 6		Station 6		Station 6	
FF/D Frank Capurso	5274	Lt. Kelly Stacey	3937	FF/D Jerry Mosley	6971
FF/D Erik Samples	1623	FF/D Kenny Campbell	5831	FF/D Austin Hall	7583
FF Zach Beach	2130	FF/D Roger Woods	2780	FF Drew Noland	3270
FF Adam Davis	3698	FF Aaron Gondolfi	1990	FF Dustin Williams	4046

Included in this report is discussion regarding alternative staffing solutions that combine staffing and companies, and provide for in the opinion of the ICMA operations team, a continued effective service delivery. ICMA staffing alternatives are based on unit workload, call type and demand, as well as current SFD practices to cover scheduled and unscheduled leave as discussed and reiterated in this appendix.

Figure A-IV-2 illustrates the ICMA staffing matrix. In this matrix service companies 1 and 3 are combined into Service Company 1 with a minimum staffing of three (currently there are two service companies with a combined minimum staffing of four). Additionally, this matrix illustrates the cross-staffing of engine 5 and tower 5 by staffing station 5 with one crew. Essentially the crew would respond with the engine on typical engine calls and with the tower on calls where the ladder is needed. The SFD fire chief should develop more definitive non-emergency apparatus use to ensure the most appropriate unit responds should one or the other (engine or tower) be out of the station when a call is received. The tower however is equipped with a pump, water tank and hose, and this should be considered when determining emergency and non-emergency use.

More defined, the ICMA staffing matrix allows for up to seven personnel available each day to cover vacancies created by either scheduled or unscheduled leave through 81 operational FTE's.

Smyrna Fire Department current shift operational staffing: 83 FTEs

ICMA Shift Operational Staffing Matrix Requirements

- 3 Captains
- 18 Lieutenants
- 9 Ladder Drivers
- 9 Drivers
- 42 Firefighters

ICMA required total shift operational staffing: 81 FTEs

ICMA required total available shift operational staffing each day: **27**

Leave Management

Daily Vacation Leave Allowed: 5 personnel

Available staff to fill leave/other vacancies (not sick): **5** personnel

Available staff to fill sick leave vacancies: **2** personnel

Daily shift staffing: 27

Daily shift minimum staffing: 20

Available personnel each day to fill in for vacancies: **7**

1 emergency staff position available at station 5 (denoted by **)- this station can be staffed with a minimum of 3 personnel if required for short periods of time.

ICMA recommended total minimum daily staffing: **20**

Figure A-IV-1: ICMA Proposed Staffing Matrix

1 Service Company Cross-Staffing Engine 5 and Tower 5

A Shift	B Shift	C Shift	
Station 1	**Station 1**	**Station 1**	**Staffing**
Lieutenant	Lieutenant	Lieutenant	Minimum Staffing
FF/LD	FF/LD	FF/LD	Minimum Staffing
FF	FF	FF	Minimum Staffing
FF	FF	FF	+1=available for vacancy fill in
Service Company 1	**Service Company 1**	**Service Company 1**	**Staffing**
Lieutenant	Lieutenant	Lieutenant	Minimum Staffing
FF/D	FF/D	FF/D	Minimum Staffing
FF	FF	FF	Minimum Staffing
FF	FF	FF	* +2=available for vacancy fill in
FF	FF	FF	
Station 2	**Station 2**	**Service Company 1**	**Staffing**
Lieutenant	Lieutenant	Lieutenant	Minimum Staffing
FF/LD	FF/LD	FF/LD	Minimum Staffing
FF	FF	FF	Minimum Staffing
FF	FF	FF	+1=available for vacancy fill in
Station 3	**Station 3**	**Station 3**	**Staffing**
Lieutenant	Lieutenant	Lieutenant	Minimum Staffing
FF/D	FF/D	FF/D	Minimum Staffing
FF	FF	FF	Minimum Staffing
FF	FF	FF	+1=available for vacancy fill in
Station 5	**Station 5**	**Station 5**	**Staffing**
Lieutenant	Lieutenant	Lieutenant	Minimum Staffing
FF/LD	FF/LD	FF/LD	Minimum Staffing
FF	FF	FF	Minimum Staffing
FF	FF	FF	** Minimum Staffing
FF	FF	FF	+1=available for vacancy fill in
Station 6	**Station 6**	**Station 6**	**Staffing**
Lieutenant	Lieutenant	Lieutenant	Minimum Staffing
FF/D	FF/D	FF/D	Minimum Staffing
FF	FF	FF	Minimum Staffing
FF	FF	FF	+1=available for vacancy fill in
Shift Captain-A	**Shift Captain-A**	**Shift Captain-A**	**Staffing**
Captain	Captain	Captain	Minimum Staffing

Figure A-IV-3 further breaks down ICMA recommended minimum staffing for the SFD. As illustrated in Figure A-IV-2, each station/company on each shift is assigned a supervisor (lieutenant), which is differs from the current SFD staffing matrix. This is discussed in the report.

Figure A-IV-2: Detail of ICMA Staffing Matrix

ICMA Recommended Minimum Station/Company Staffing Required Each Day:

Assignment	Minimum Staffing #	Specifics
Shift Captain	**1**	**Shift Commander**
Station 1	**3**	**Ladder 1- 65' Telesquirt**
Service Company 1	**3**	**Specialty Company- Heavy Rescue**
Station 2	**3**	**Ladder 2- 65' Telesquirt**
Station 3	**3**	**Engine 3**
Station 5	**4**	**Cross-Staff Engine 5 and Tower 5 with one crew of 4**
Station 6	**3**	**Engine 6**
	20	

ICMA recommends that at any time one of the seven "vacancy positions" is available, the staff member be assigned to Service Company 1 or utilized to assist either the training or fire prevention lieutenant. This position is denoted by the * in the ICMA staffing matrix.

As discussed the SFD currently staffs with 83 FTEs. Additionally the SFD has eleven vacancies not listed in the current SFD staffing matrix. The ICMA recommended staffing matrix utilizes 81 FTEs. ICMA offers the following alternatives with regards to the two additional FTEs not utilized in the ICMA staffing matrix as well as the eleven current SFD vacancies:

- Utilize the 2 additional FTEs from the SFD staffing matrix (83) in the ICMA staffing matrix (81) as additional staffing to cover vacancies created by scheduled and unscheduled leave. The SFD experiences long-term leave vacancies created by illness, injury and military deployment. These positions should be assigned to the shift (s) experiencing a long-term issue to minimize impact on regular staffing vacancies.

- Monitor use of scheduled, unscheduled and long-term leave against daily usage of available vacancy staff. Consideration of reducing current overall staffing (83) by two FTEs (to 81) through attrition is recommended if the positions are not being utilized to staff vacancies on a regular basis.

- Do not fill the current eleven vacancies. Maintain the position numbers if possible and un-fund the positions (if currently funded) as an overall savings strategy in the SFD budget. Should future service demands and workload increase, activate necessary positions to meet a justified increase in staffing and deployment (if funding is available).