



Leaders at the Core of Better Communities

**Final Report
Fire/EMS Operations
Novi, Michigan**

Submitted by:

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ICMA Background

The International City/County Management Association (ICMA) is the premier local government leadership and management organization. Since 1914, ICMA's mission has been to create excellence in local governance by developing and advocating professional local government management worldwide. ICMA provides an information clearinghouse, technical assistance, training, and professional development to more than 9,000 city, town, and county experts and other individuals throughout the world.

ICMA Consulting Services

The ICMA Consulting Services team helps communities solve critical problems by providing management consulting support to local governments. One of ICMA Consulting Services' areas of expertise is public safety services, which encompasses the following areas and beyond: organizational development, leadership and ethics, training, assessment of calls for service workload, staffing requirements analysis, designing standards and hiring guidelines for police and fire chief recruitment, police/fire consolidation, community-oriented policing, and city/county/regional mergers.

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Executive Summary

The City of Novi Fire/EMS Department (NFD), while consisting of dedicated and well-trained personnel, is handicapped by a dysfunctional deployment system which has created two separate fire departments under one management structure. This dysfunction is enhanced by two separate unions, two standards for operations, and continues to the level of uniforms worn by employees.

While functions have been impacted, the personnel are dedicated – both in the paid-on-call as well as the career firefighters. The City is served by excellent, knowledgeable, well-trained staff. The challenge ahead will be uniting that staff into a focused, outcome-based department.

It was clear from interviews with citizens, staff of the department, city personnel, elected officials, and management that service is provided economically but the efficiency was questionable and the safety to both the responder and public can be improved. The department provides a high level of specialized services to the citizens of and visitors to the city at a very affordable cost. Ensuring that performance measures are in place and being utilized on a daily basis is critical to evaluating where and how changes should be made in deploying the resources of the department.

Administrative

Part of the dysfunction in the department can be traced back to a change in leadership in the department. From interviews and information supplied to the ICMA team, former administrators of the department were not aggressive and written documents had not been

kept current with processes communicated to employees. Because of the nature of operations within the NFD, implementing written rules, regulations, and processes can be viewed suspiciously. The new leadership has attempted to implement rules and regulations along with policies and procedures that should be adopted in every modern fire/EMS department. This change in "traditional operation" is often viewed as punitive by some in the department.

Suspicion runs high within the department, possibly exacerbated by ballot initiatives that were viewed as trying to eliminate paid-on-call employees within the department.

A command structure is in place but there appears to be two types of command: career and paid-on-call. There cannot be two different types of command; all command should be unified and, if one or the other is not qualified, then steps should be taken to create an equal structure that governs all facets of the organization. Officers can be created within and from the paid-on-call; they should be recognized as equals to the career and such promotions should be based upon merit and skills. Persons promoted should also have to regularly demonstrate competency or they should be returned to former classifications.

The example of the divisions within the department is shown even in the level of uniforms worn by personnel. Personnel should be uniformly dressed with specific pants, shirts, collar brass, name tags, and badges that recognize rank from firefighter to chief. Having different uniforms

for career and paid-on-call only further exemplifies that there are two different parts to the one department.

Communications Data Analysis

If the department transforms into a unified, non-traditionally deployed and managed agency, it will be critical that performance measures be adopted and regularly reviewed to identify weaknesses in the system. The adoption of these performance measures should be done as a team, utilizing the knowledge of administration, career, and paid-on-call personnel.

In order to present an accurate picture of the time demands facing the department; all activity should be recorded on the Computer Aided Dispatch/Records Management System (CAD/RMS) and accessed to prepare monthly progress reports to City Administration. If service does not meet adopted levels, an explanation should be given for the non-compliance.

Deployment and Staffing

Customer service should always be the focus of deployed staff and resources for NFD. Traditionally fire departments have had a focus on tactics – numbers and type of apparatus and numbers of personnel creating a series of “outputs” which may or may not achieve results that are sought by the customer. NFD has been using the traditional output system. The department should instead deploy using strategies – how that apparatus and personnel will be utilized to create a successful “outcome” or series of outcomes.

The challenge that is facing the department, and ultimately the City, is changing from a reactive, centrally managed, output focused department to one that is lean, flexible, and looking at outcomes.

Central to becoming an outcome focused department is to develop a comprehensive plan that focuses on key service delivery. That stated service delivery must agree with the elected body and the citizens. It also must be developed from within the department and ultimately be embraced by the department to govern everything that it does for the citizens of Novi.

The next step is to create performance measures for goals that achieve the adopted strategies. The performance measures should evaluate outcomes. Instead of just saying the department responded to 10 cardiac arrests last year – the question should be asked and answered: “What was the outcome of that intervention?” If the strategy is to successfully treat and transport viable patients who recover from sudden cardiac onset, performance measures have to be in place to determine if that is being achieved. HIPPA and other rules complicate the quality improvement and performance measuring aspects of departments; they are not total roadblocks.

Similarly, if the strategy is to develop Novi as a fire preventive community, then all aspects of achieving that strategy need to be aligned and functioning.

The department as a whole needs to focus on the outcomes and not just the commanders of the various units. A significant number of

hours are being paid by the City for work by various employees in the department. Not all of these hours are being used and there is substantial talent within the ranks to deliver improved levels of service. By involving all personnel who are being paid to deliver the service to the citizens of Novi, more effort can be made by the many that is consuming the few. The challenge for the command then becomes managing the efforts and coordinating those efforts; not the efforts themselves.

I. Introduction

This study of the operations and deployment of the Novi Fire/EMS Department was authorized by the City of Novi, Michigan. Our work focused on the internal performance of the department and offers a detailed data analysis in Workload, Deployment, and Response Times. As in most communities, fire is not the predominant call that consumes the time of the NFD; rather, medical calls for service occupy an increasing percentage of the deployed time and resources.

Fire departments traditionally use fire loss, fire injury (civilian and personnel), and fire death (civilian and personnel) to measure the “success” of the department. Using the traditional methods is to manage by failure versus managing by successes such as in preventing calls for service. The focus of the department needs to change to one of a proactive nature – not just waiting for the call to be received but attempting to prevent the call in the first place. The adoption of “Integrated Risk Management Planning” techniques should be the strategy used to guide the operations of the department now and into the future.

Integrated Risk Management Planning or IRMP, looks at the risks and hazards that are present in the community and seeks to prevent or mitigate any risk if at all possible BEFORE an incident occurs. These all-hazard planning processes require a greater effort on the part of departments and communities but demonstrate value when reviewed in both the short and long term. IRMP, which evolved in the United Kingdom, builds upon the traditional "Standard of Cover" process. Interestingly, the SOC processes is just gaining acceptance in the United States despite being developed in 1936 with subsequent revisions until 1985 when the UK moved towards the IRMP. According to a 2002 study in the UK, the conventional Standard of Cover did not go far enough in preventing incidents and improving safety; rather it only communicated what an agency would do when an incident happened. The IRMP process seeks not to have the incident at all.

The SOC process was found to focus on outputs; the IRMP process required agencies to focus on desired outcomes and match deployment to achieve the outcome. The difference is meeting customer expectations: customers usually have expectations about both the process and the output (how they get what they want, and what they actually get). That is where outcomes fit in. An outcome is a level of performance or achievement. It may be associated with the process or the output but an outcome implies quantification of performance.

It will be this basis that the following data analysis will be applied to the NFD. Using the analysis and interviews of various groups involved in service delivery, a series of recommendations will be created that can be used to guide the transformation of the NFD.

Just as in the police study, we applied broadly accepted contemporary concepts and principles of organization and management. We recognize that there is no one right way to organize a fire/EMS department and that every department must be structured to meet the specific needs of the community it serves. However, certain principles of organization have been proven valid over time:

- Tasks that are similar or related in purpose, processes, methods, or clientele should be grouped together under the control of one person. The tasks do not have to be performed strictly by this one individual but can be assigned on the basis of deployed personnel with the responsibility for achieving completion upon the assigned leader.
- Each task should be clearly and concisely made the duty of a team or "assigned company"; responsibility for planning, execution, and control should be placed definitively on designated individuals.
- Each individual, company, and situation should be under the immediate control of one, and only one, individual, thus achieving the principle of unity of command.
- Each assignment or duty should carry with it the authority necessary to fulfill the responsibility. The authority need not be with just career members; paid-on-call should also be responsible for carrying out the mission of the department and, ultimately, the city.
- Lines of demarcation between the responsibilities of units should be clearly drawn by a precise definition of the duties of each.

- Rank should be consistent with the duties and responsibilities assigned to the position.
- Personnel who supervise others should hold supervisory rank. There should be no difference between a lieutenant or captain from the paid-on-call or from the career or from the auxiliary.
- Qualified civilian employees should staff functions that can be performed by non-sworn personnel. Civilian employees can be shared between law enforcement and fire functions thus maximizing the investment made.
- Nontraditional or highly specialized functions should be established only if a demonstrated ongoing need exists.

These principles, coupled with the knowledge of the community possessed by the chief and other NFD command personnel, should guide the development of an appropriate table of organization and the operational policies necessary for the direction of the department.

The NFD must be structured to perform its essential functions efficiently and effectively, within its fiscal restraints, consistent with the nature and particular needs of the community it serves. We will identify suggested improvements for provision of essential functions; the timetable to implement these recommended changes is the responsibility of the city.

The ICMA team wishes to thank the officers and civilians of the Novi Fire/EMS Department for their assistance and frankness in completing this project. In particular, we commend Chief Frank Smith and his administrative staff (Deputy Chief Johnson and Training Officer John

Martin and Fire Marshall Mike Evans) for their enthusiasm and their exceptional cooperation with the ICMA team during this study.

II. Overview

We encountered similar issues to those found when analyzing police department data as we analyzed the data supplied by the fire department. We made assumptions and decisions to address these issues. We describe these issues in detail later in the Data Analysis section of this report. However, even with the limitations caused by these data issues, ICMA was able to develop a comprehensive analysis of fire operations.

With regards to the internal functions of the agency, we had no such difficulties. The department provided the ICMA team with specific information on performance and work being accomplished. During interviews with personnel, an often frank and spirited discussion ensued. The concern going forward is that the divisions identified in the interviews be remediated to allow the Novi Fire/EMS Department to deliver the caliber of service it is capable of providing.

The extent of the division cannot be understated. Among departments that the ICMA has reviewed, this level of division has not been seen. The concern is that in a stressful environment the divisions rise to the surface and hinder the outcome that is expected of the department.

The department cannot operate as two 12 hour deployments that do not interact with each other and that are not uniformly commanded.

The two have to be unified and draw upon the considerable talents that each possesses to achieve the desired outcomes.

Despite the high level of performance of NFD officers and management, we believe the present rank structure should be redefined and adjusted to prepare for future growth of the community. The present structure is nontraditional and problematic in that it lacks a significant command level staff/structure. Rank is held by persons in the paid-on-call divisions but is not transferable to authority and responsibility of equivalent rank in the career part of the department.

In the final section of this report, we will recommend and discuss a structure that will take the NFD in to the 21st century. We will provide a proposed table of organization and analysis in section V-H.

The proposed table of organization will not affect the level of service provided to the public; fire personnel safety; or citizen satisfaction with the department.

Recommendations

The ICMA team's report should act as a blueprint for both the city and fire administrations. The city should have periodic meetings with the NFD administration and affected employee groups to ensure that our recommendations are implemented and followed up in a timely fashion.

III. Operations Analysis

The Novi Fire Department has an authorized strength of 31: one chief, one deputy chief, one fire marshal, an account clerk, a part-time

secretary, 20 fire protection officers, three fire protection officer II's, three captains, and one training officer along with 60 paid-on-call members. However, some of the paid-on-call fire fighters are not active.

Senior management staff is made up of one deputy chief, the fire marshal, the training officer, and the three captains. The captains are assigned to 24 hour shifts and are stationed away from other staff but respond to alarms. The ICMA study team believes that it may be necessary to reconfigure or restructure the department somewhat so that it can be divided into two divisions. The two divisions would utilize the COMPSTAT – Computer Statistics or Comparative Statistics -- (explained in later sections) to manage the staff throughout the department with assignments not exclusive to specific individuals but instead shared among all of the members of the various platoons. We will discuss this restructuring more fully at the end of this report.

A. Operations

The operations section of the department is responsible for handling the calls for service received by the department. Staff would continue to utilize the 12 hour shifts but there would be mixing of paid-on-call with career members to provide direction and a seamless approach to service.

The challenge of operations will be updating and communicating with all of the members of the department with a focus on achieving the mission adopted by the department and city council. That mission should utilize jointly created strategies developed from within the

department and from all of its members with specific goals and objectives to meet and report. The city has the resources and knowledge of 90+ individuals with experience across the spectrum; utilizing an open management approach can exploit this experience for the good of the citizens of Novi in a cost-effective manner.

It appears that a more traditional approach is or has been utilized with a chief, deputy chief, and then commander responsible for specific actions. Such an organizational approach creates silo operations which can burden an individual while leaving the great depth and talent of the department unchallenged in achieving the outcome identified by creating the function in the first place. All members need to be charged with achieving the outcome; it cannot rest with one or a couple of the members.

Examples are in the area of fire marshal and training. The current supervisory staff is overwhelmed by the volume of work being required. The supervisor should have the ability to create work assignments that are then communicated to the individual platoons which have been properly trained with reporting back to the supervisor on the outcome of the assignment. If the assignment is not completed, the various personnel should be held accountable for their actions.

Inspections are not the job of only the career personnel. All personnel respond to calls for fire and EMS service. Knowing the building construction and hazards therein is critical to successful outcomes. A glaring example of failure is the Charleston, South Carolina sofa warehouse fire that killed nine firefighters. One of the critical points of

that failure was that personnel did not leave the station, did not know the dangers in the fire district, and had prevention/mitigation had not occurred through an inspection process which led to catastrophic failure.

Every building should be inspected in the City of Novi; non-regulated structures on a voluntary basis.

B. Quality and Services

The second change establishes a “Quality and Services” deputy chief with responsibility for analyzing the performance of the individual functions of the department and providing the information to administrators and council.

The NFD has excellent tools at its disposal; ensuring that the tools are being effectively deployed and utilized is critical.

Services that can be coordinated include working with all city departments to ensure that AED's are operational and that staff is trained. An added dimension would be integrating the location of all AED's in the city to the CAD/dispatch system. Today, publicly available AEDs are rarely retrieved and used because bystanders generally can't see them and 911 dispatchers are unaware they are nearby. In fact, public access AEDs are only used to help an estimated 0.5% of all Sudden Cardiac Arrest (SCA) victims – typically when a device is visible within about 50 feet of the victim's location.

By subscribing to the AED Link system, 911 agencies are able to know

the whereabouts of nearby registered AEDs and can expand from 50 feet to 300 feet the effective coverage range of each AED. Knowing AED location information enables 911 agencies to help increase the number of times AEDs are used from 0.5% to nearly 20%, a 3,500% increase. This difference is remarkable, and this benefit is achieved even without adding any new AEDs.

Other quality issues include interfacing with the building department to ensure fire inspections are completed which may require coordination with on-duty personnel. Reports should be created and results provided for management team meetings to ensure quality is being delivered on all shifts and by all personnel.

A new assignment would be the creation of competency testing and performance of personnel. All personnel receive excellent training and have access to state-of-the-art equipment. Quality measures should be created to determine the competency of all personnel in the operations of equipment in the department, compliance with rules, regulations, policy and procedure with annual testing to determine deficiencies and identify corrective training. The same testing should apply to all members of the agency to provide assurance that the department is progressing and maintaining competency; not just one group or individuals.

C. Equipment

The department has traditionally purchased box-type vehicles for fire response but that double as a potential vehicles for transporting patients and serve as back up the contracted Advanced Life Support

EMS service. These vehicles are ambulances and the justification was that persons have to be transported from time to time.

A review of the number of times that transports occurred revealed the following:

No.	Date	Time	Incident #	Tx-Novi FD Unit	Cx-Chief Complaint	Receiving Hospital	CEMS Disposition
1	05/02/08	15:31:28	0001364	SQD2	Chest Pain from Seat Belt	Providence Novi	MVA- multiple pts.
2	05/16/08	6:36:45	0001540	SQD4	Seizures	Providence Novi	CEMS late arrival-medic rode
3	05/28/08	17:31:51	0001678	SQD4	Diabetic / Seizures	Providence Novi	CEMS late arrival-medic rode
4	06/05/08	5:52:56	0001757	SQD4	Seizures	Providence Novi	CEMS late arrival-medic rode
5	09/21/08	3:47:43	0003060	SQD3	Cardiac Arrest	Providence Novi	CEMS late arrival-medic rode
6	09/25/08	10:04:47	0003104	SQD4	Chest & Head Pain	Providence Novi	MVA- multiple pts.
7	10/01/08	11:35:23	0003184	SQD3	Injury from Fall	Providence Novi	Novi Firefighter - CEMS possibly not called
8	10/05/08	11:39:48	0003231	SQD2	Medical- Anxiety	HVH	CEMS to far- Canceled
9	10/08/08	16:50:21	0003281	SQD3	Dizzy/ General Weakness	Providence Novi	CEMS to far- Canceled
10	10/10/08	8:25:27	0003305	SQD3	Fainting / Weakness	Providence Novi	CEMS late arrival-medic rode
11	11/18/08	12:38:06	0003733	SQD4	Chest Pain	Providence Novi	CEMS late arrival-medic rode
12	12/22/08	16:19:38	0004123	SQD3	Fall- Possibly Fx wrist	Providence Novi	CEMS delayed response - multiple calls for service, medic rode
13	01/10/09	16:25:53	0000126	SQD2	Head Injury- Struck by Vehicle	Providence Novi	Snow/Weather Delay
14	01/14/09	7:43:28	0000164	SQD2	Back Injury- Slip and Fall	Providence Novi	CEMS late arrival-medic rode
15	01/26/09	9:15:23	0000348	SQD2	Neck/Back Pain	Providence Novi	MVA- more than one pt.
16	01/31/09	21:26:29	0000416	SQD3	Dizziness/Vomiting	Providence Novi	CEMS extended response, never made it to the scene
17	02/25/09	12:30:42	0000695	SQD2	Hand Trauma	Providence Novi	CEMS report shows unit responded- possibly canceled to far
18	02/26/09	17:44:48	0000716	SQD4	Seizures	Providence Novi	CEMS late arrival-medic rode
19	03/21/09	20:05:44	0001003	SQD3	Chest Pain	Providence Novi	Multiple Calls - 4 calls within 1 hour

The analysis showed that transports occurred only 19 times between May 1, 2008 and May 1, 2009.

The costs for purchasing the box ambulances from Spartan Motors which is located in Michigan are in the \$135,000 to \$160,000 range. The units are designed for transporting patients. If the city is not going to provide transport which is now delivered by private company, purchasing and replacing these units is an extreme cost that is not necessary.

A successful EMS system uses trained citizens to begin immediate intervention at the onset of a medical emergency. Responders arrive within 4 minutes to increase the level of intervention possible with transport/paramedic staff arriving within 8 minutes and transporting a viable patient to an appropriate and pre-determined trauma center.

Each level of intervention allows for increased levels of treatment. The box ambulances now purchased should be replaced with SUV's that could transport two emergency responders in a quicker time and at a far cheaper price – in the range of \$37,000 each. One box ambulance could be retained at the central station for extraordinary circumstances but having one at each location is an unnecessary cost. The private firm should have a negotiated franchise agreement to operate within the City that should include performance measures.

The Fire Marshal/Quality position should review the performance and compliance of the private firm as well as looking at the outcome of intervention at all levels of service delivery.

Recommendation

Amend the purchasing and replacement program to phase out purchase of ambulances and instead provide SUV-type vehicles to respond to medical calls.

D. Communications

Moving towards an open management to eliminate silos of function will require regular sharing of information among commanders as well as other staff.

A critical issue with the NFD has been the tendency to operate as two distinct departments – a career department and a paid-on-call. The two parts must operate with each other, particularly in delivery service during emergency conditions.

A COMPSTAT approach may afford one additional way to begin breaking down the barriers that have been erected within the department.

COMPSTAT or “Computer Statistics” or “Comparative Statistics” is an organizational management tool that can be used to monitor calls for service, work required to be performed by the department with the focus on deploying the right resources in the right manner at the right time through performance measurement processes.

The program allows for a cross section of the department to provide input on issues and concerns. The program has been successfully used

by many police departments for years and has begun to find its way into fire departments in areas of the Northeast. This program may assist NFD in the transition from a traditional, rigid, hierarchal department to a flexible, lean, and rapidly deployed department. Communication is key to the success of the transformation and the COMPSTAT model provides an excellent base on which to create future deployments.

Recommendation

We suggest the administration explore the feasibility of implementing COMPSTAT meetings and involve in these meetings a cross section of department personnel. COMPSTAT is an acronym for Computer Statistics or Comparative Statistics.

E. Human Resource Management

A small change that would exemplify the transition that is occurring in the department would be the adoption and enforcement of a uniform model across the department. The public's first and only impression is often the way a department members appears when interacting on city functions. Communicating a professional appearance is vital. All personnel should be dressed according to functions for services provided. The command staff was very well dressed and this should carry throughout the department.

F. Citizen Involvement

The police department has developed an extensive network of volunteers to help in times of emergency. The NFD should participate in broadening the services offered by volunteers throughout the fire department. Citizens can be used to assist at various functions, under

the supervision of NFD members (career and POC). Citizens should also be used for staffing rehab programs that can be activated for lengthy or involved incidents. These volunteers can perform many tedious tasks and allow the professionals in the NFD to concentrate on outcome at the scene. The citizens can be used in the highly successful CERT program or expanded into Fire Corps-related programs for funding expansion.

G. Communications Center

The communications center, under the direction of the police department, is a well-designed and a fairly modern facility that was receiving some technology updates during the ICMA team's visit. The civilian dispatchers assigned to the communications unit appear to be professionally trained. During our visit, they interacted well with citizens over the phone.

This unit is responsible for managing the computer assisted dispatch / records management system (CAD/RMS). It is here that we believe an opportunity exists to greatly improve the department's data management which would give managers, as well as city administrators, a greater understanding deployment and response times.

H. Equipment and Facilities

The city has invested heavily in equipment for its department. The stations, for the most part, are adequate and well designed, clean, and properly maintained. In speaking with the department members, it is clear that they feel a great deal of pride as evidenced by the buildings

and assigned equipment. Station 3 is the oldest facility and may not need replacement. Because calls for service are heavy in the area of EMS, it may be more practical to deploy a unit mobile from the headquarters station during identified peak-service times versus building a new building.

This would allow time to analyze patterns that may develop when the economy begins to recover and from rail improvements. Test drives should be made to confirm the distances that can be safely traveled and then mapped into the city GIS system. Predictive software is available commercially that can help in creating a mobile deployment using predictive modeling. The System Status Management software which runs on Computer Aided Dispatch is used by several agencies, most notably by the Fargo-Moorhead Ambulance Service which covers two cities across two state lines; one of the more complicated installations.

IV. Data Analysis

A. Aggregate Call Totals and Dispatches

The data includes calls between 1/1/2008 and 12/31/2008. In a year, 4,005 non-cancelled calls were received and responded to by equipment based at four stations dispersed throughout the city. Each of the four stations has full-time staff for an engine company and an emergency medical/SQD vehicle. Station 1 also staffs a ladder truck and keeps a tanker in reserve. Of these more than four thousand calls, 154 (3.8%) were structure fire or outside fire calls (11 to 20 that from data time required more than 30 minutes to

control), and 2,819 (70%) were EMS calls. We categorize the call type based upon call description. The correspondence between call description and call type is reported in Appendix I. A total of 675 dispatches of non primary units (500, 505, 506, 508, 509, 518, 519, 529, TAC3, U1, U2, U3, U4) were not included in call, workload and response time analysis. The runs and workloads of those units are reported in Appendix II. The analysis of call types is captured in a set of seven tables and figures.

Table 1—Call Types

Figure 2—Fire Calls Partitioned by Type and Duration (formatted as branches of a tree)

Figures 3—Fire Calls by Type (pie chart)

Figure 4—Calls by Month

Figure and Table 5—Calls by Hour of Day

Figure and Table 6—Calls by Hour of Day by Station

Table and Figures 7—Number of Non-Cancelled Units Dispatched to Calls

B. Workload by Individual Unit—Calls and Total Time Spent

We report two types of statistics: dispatches and workloads. In Part I we reported that there were 4,005 non-cancelled calls, but because multiple units were often sent, the total number of non-cancelled dispatched units we analyze here is 5,313. We also look at the actual time spent by each unit at every call. Total busy time was calculated as the difference between unit clear time and unit dispatch time. The average total busy time per completed run was 26 minutes. The total unit workload in a year for all units combined

was 2,267 hours. After the introductory table, we present run data and workload data for every unit, as well as the daily average for engine, and ambulance units by call type.

Table 8— Annual Total Busy Time by Call Type Including Cancelled Units

Figure 9— Annual Total Busy Time by Call Type Excluding Cancelled Units

Figure 10—Total City: Average Busy Hours per Day by Call Type

Table 11—Workload by Unit

Table 12— **Fire Units:** Total Annual and Daily Average Number of Runs by Call Type

Table 13— **Fire Units:** Daily Average Busy Minutes per Day by Call Type

Table 14— **Ambulance Units:** Total Annual and Daily Average Number of Runs by Call Type

Table 15— **Ambulance Units:** Daily Average Busy Minutes per Day by Call Type

C. Dispatch Time and Response Time

Dispatch processing time is the difference between unit dispatch time and call received time. Enroute time is calculated as the difference between unit enroute time and unit dispatch time. Travel time is the difference between unit on scene time and unit enroute time. Response time includes dispatch processing time, unit enroute time and unit travel time. We are interested in the dispatch time and response time mainly of the first arriving units. Overall, the average dispatch processing time was 1.4 minutes, and the average

total response time was 6.8 minutes. However, for structure and outside fire calls, we analyze the response time of both the first, the second and all arriving fire equipments.

Table and Figure 16—Average Dispatch Time, Enroute Time, Travel Time and Response Time of First Arriving Units by Call Type

Table and Figure 17—Which Unit Arrived First for Each Call Type

Figure and Table 18 a) **Total Calls**: Average Dispatch Time, Travel Time, and Response Time of First Arriving Units by Hour of the day for EMS, Injury, Structure Fire and Outside Fire Calls

Figure and Table 18 b) **Weekday Calls**: Average Dispatch Time, Travel Time, and Response Time of First Arriving Units by Hour of the day for EMS, Injury, Structure Fire and Outside Fire Calls

Figure and Table 18 c) **Weekend Calls**: Average Dispatch Time, Travel Time, and Response Time of First Arriving Units by Hour of the day for EMS, Injury, Structure Fire and Outside Fire Calls

Figure and Table 19—Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit for **EMS** Calls

Table 20—Average Response Time of 1st Arriving Fire Equipments for **Structure Fire and Outside Fire** Calls by Unit

Table 21—Average Response Time of All Arriving Fire Units for **Structure Fire and Outside Fire** Calls

Figure and Table 22—Cumulative Distribution Function (CDF) of Response Time of First and Second Arriving Fire Equipments for **Structure and Outside Fire** Calls

Appendix

Appendix I: Correspondence between Call Description and
Call Type

Appendix II: Runs and Workloads Analysis for Non Primary
Units

Table 1—Call Types NFD (Exclusive of Contracted EMS Response)

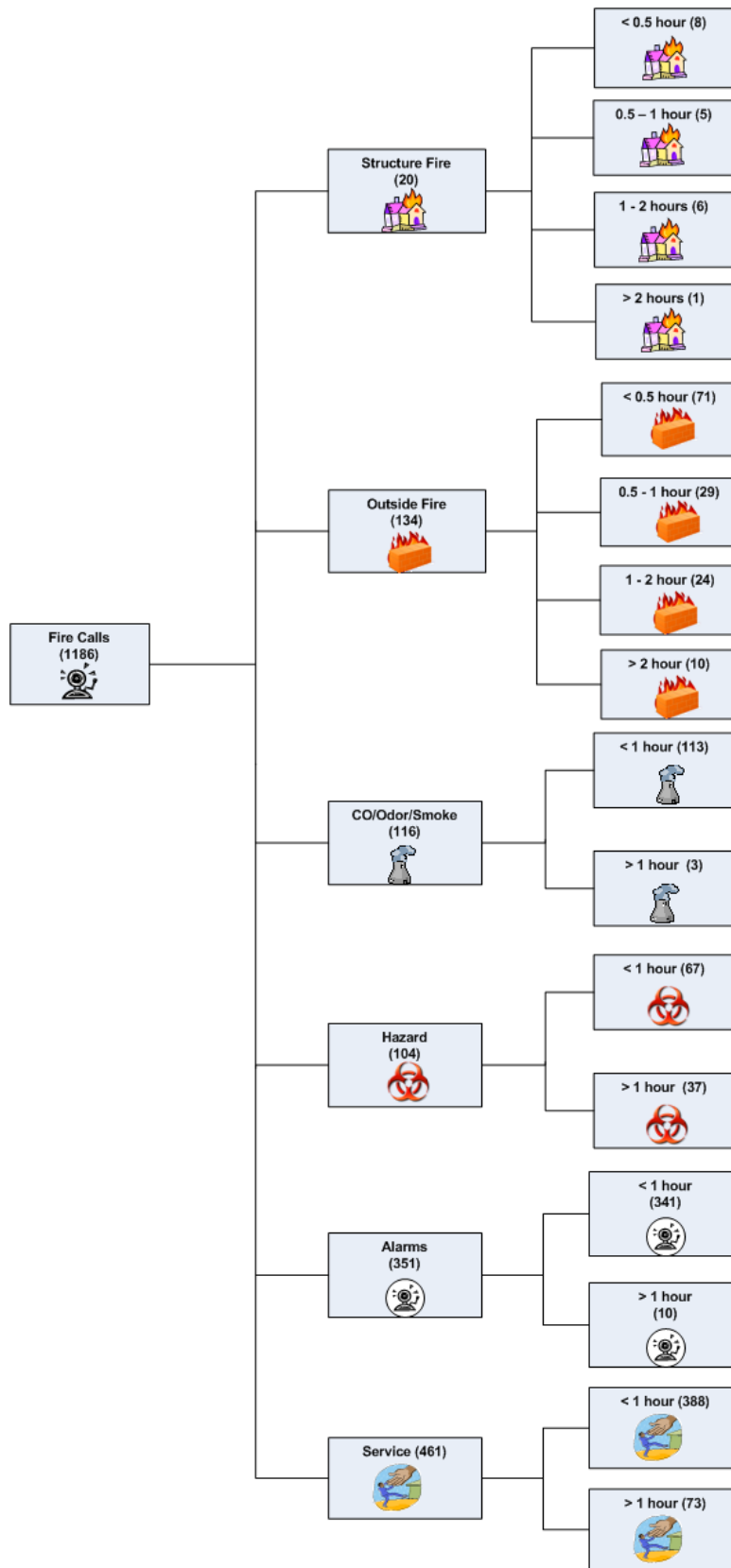
	Call Type	# of Non Canceled Calls	Calls / Day	Calls %	# of Canceled Calls	Canceled %	Total Calls
EMS	EMS	2612	7.2	65.2%	85	3.2%	2697
	Injury	207	0.6	5.2%	16	7.2%	223
	EMS Total	2819	7.7	70.4%	101	3.5%	2920
Fire	Structure Fire	20	0.1	0.5%	0	0.0%	20
	Outside Fire	134	0.4	3.3%	9	6.3%	143
	CO/Odor/Smoke	116	0.3	2.9%	3	2.5%	119
	Hazard	104	0.3	2.6%	5	4.6%	109
	Alarm	351	1.0	8.8%	22	5.9%	373
	Service	461	1.3	11.5%	66	12.5%	527
	Fire Total	1186	3.2	29.6%	105	8.1%	1291
Total		4005	11.0	100%	206	4.9%	4211

Note: Canceled calls were defined as all units stayed on scene less than a minute.

Observations:

- 5% calls were cancelled in a year.
- On average, the city received 11 non cancelled calls per day in 2008.
- EMS calls totaled 2,819 (70.4%), about 7.7 per day.
- Fire category calls totaled 1,186 (29.6%), about 3.2 per day.
- Structure and outside fire combined averaged 0.5 calls per day, 3.8% of total calls.
- There were 116 CO/Odor/Smoke investigation calls in a year, about 0.3 per day.
- There were 104 hazard calls in a year, about 0.3 per day.
- There were 351 alarm calls in a year, about 1 per day.
- There were 461 service calls in a year, about 1.3 per day.

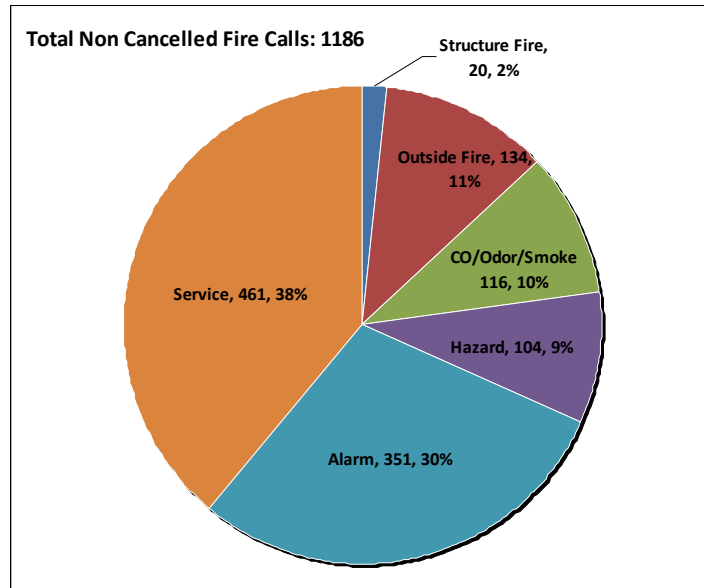
Figure 2—Fire Calls Partitioned by Type and Duration



Observations:

- Of the 20 structure fire calls, 1 lasted more than two hours, 6 lasted between one and two hours, and 13 lasted less than one hour.
- Of the 134 outside fire calls, 34 (25%) lasted more than one hour.
- In all, the department handled 164 calls that lasted more than one hour, slightly more than three long fire category calls per week. Two thirds of these were either service calls (73) or hazardous condition calls (37) – gas leaks, wires down, etc. .

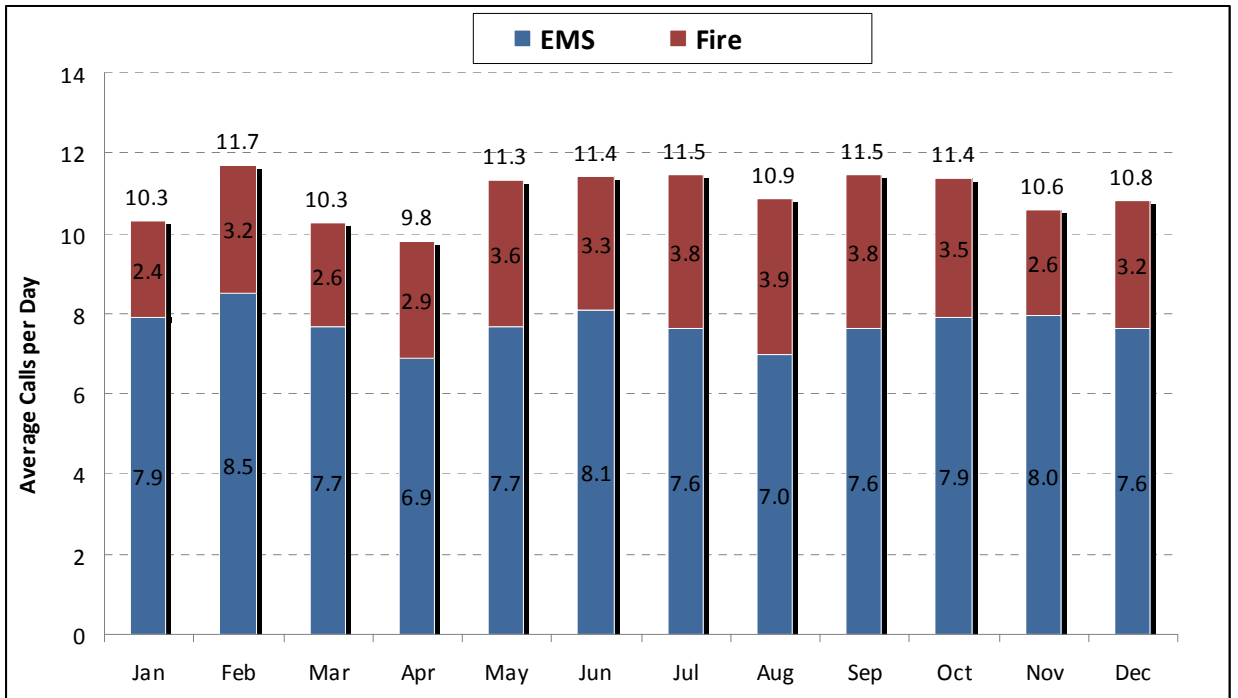
Figures 3— Fire Calls by Type (pie chart)



Observations:

- Structure and outside fire calls, accounted for 13% of the fire category total.
- The largest category was service calls, which were 38% of the total.
- Alarm calls accounted for 30%, CO/Odor/Smoke investigation calls were 10% and hazard calls were 9% of this total.

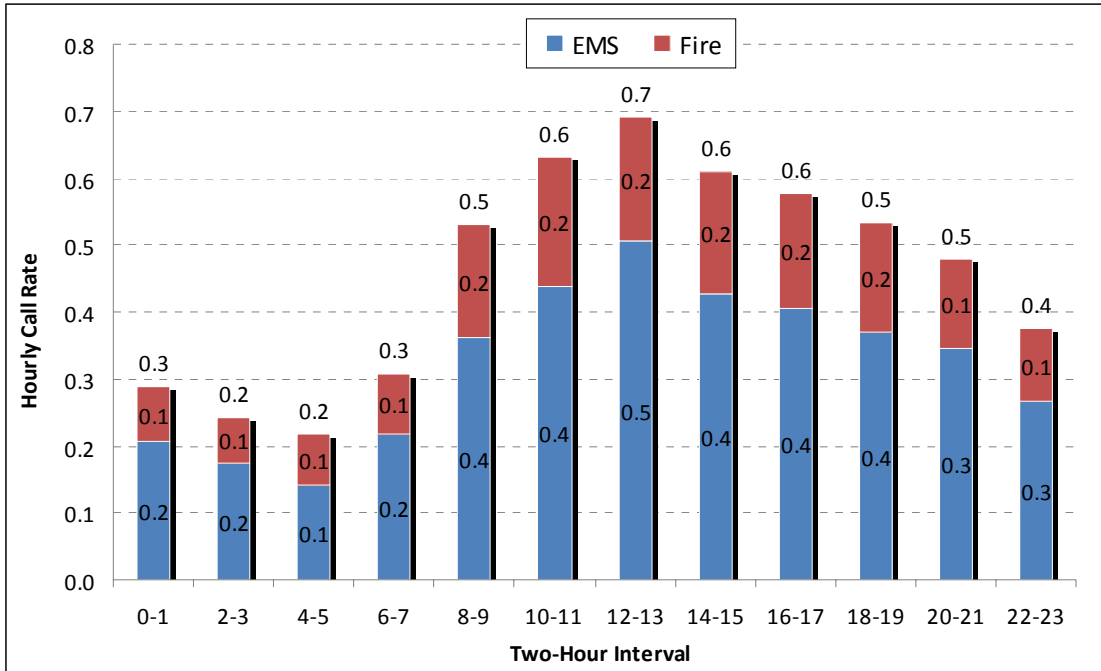
Figure 4—Calls by Month 2008



Observations:

- Average calls per day varied by month and ranged from a low of 9.8 calls per day in Apr to 19 percent more in Feb, which had a high of 11.7 calls per day.
- Average EMS calls per day varied between 6.9 (Apr) and 8.5 (Feb) calls per day.
- Average Fire category calls per day varied between 2.4 (Jan) and 3.9 (Aug) calls per day.

Figure and Table 5—Calls by Hour of Day 2008

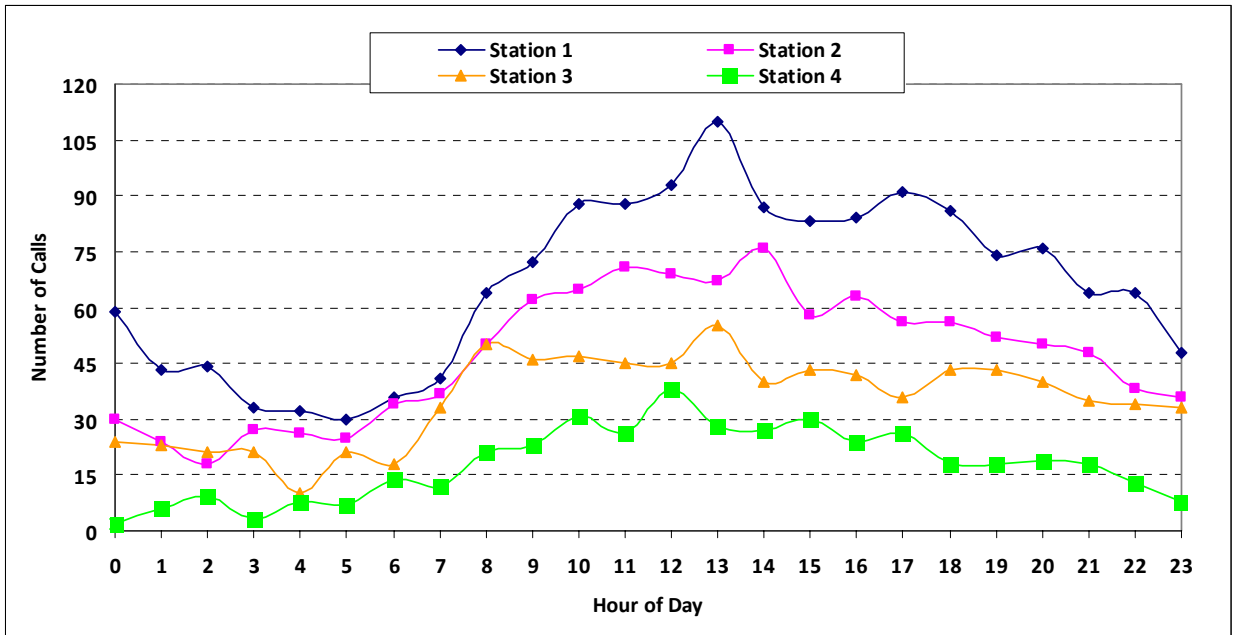


Two Hours Interval	Hourly Call Rate		
	EMS	Fire	Total
0-1	0.21	0.08	0.29
2-3	0.18	0.07	0.24
4-5	0.14	0.08	0.22
6-7	0.22	0.09	0.31
8-9	0.36	0.17	0.53
10-11	0.44	0.19	0.63
12-13	0.51	0.18	0.69
14-15	0.43	0.18	0.61
16-17	0.41	0.17	0.58
18-19	0.37	0.16	0.53
20-21	0.35	0.13	0.48
22-23	0.27	0.11	0.38
Calls/Day	7.72	3.25	10.97

Observations:

- Hourly total call rates averaged less than 0.3 calls per hour between midnight and 6 AM.
- The call rate peaked between 10AM-4PM, more than 0.6 calls per hour.

Figure and Table 6—Calls by Hour of Day by Station for 2008



Note: Number of calls was counted based upon the station of 1st dispatched units.

The following table forms the basis for the graph of calls by hour.

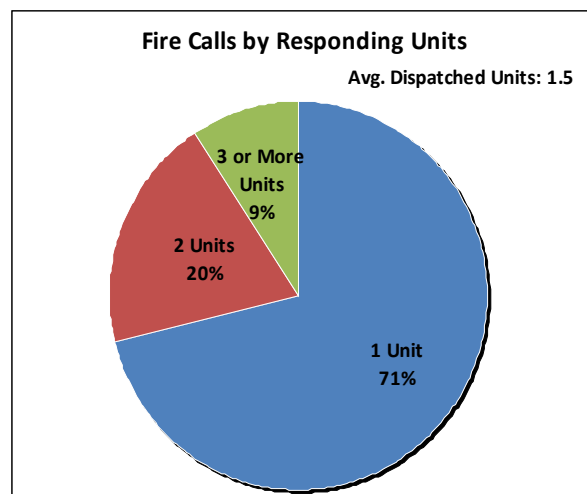
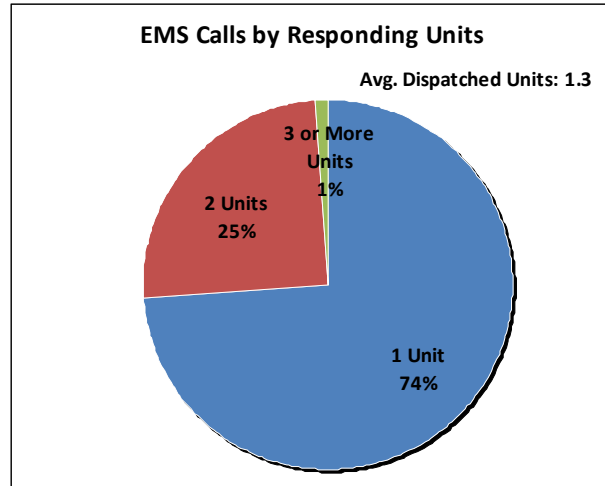
Hour	Station 1	Station 2	Station 3	Station 4	Total
0	59	30	24	2	115
1	43	24	23	6	96
2	44	18	21	9	92
3	33	27	21	3	84
4	32	26	10	8	76
5	30	25	21	7	83
6	36	34	18	14	102
7	41	37	33	12	123
8	64	50	50	21	185
9	72	62	46	23	203
10	88	65	47	31	231
11	88	71	45	26	230
12	93	69	45	38	245
13	110	67	55	28	260
14	87	76	40	27	230
15	83	58	43	30	214
16	84	63	42	24	213
17	91	56	36	26	209
18	86	56	43	18	203
19	74	52	43	18	187
20	76	50	40	19	185
21	64	48	35	18	165
22	64	38	34	13	149
23	48	36	33	8	125
Total	1590	1138	848	429	4005

Observations:

- The call rate was lowest between midnight and 8 AM for all stations.
- Station 1 units were most often the first units dispatched accounting for almost 40% of the total. In contrast, station 4 units were dispatched first only 11% of the time.

**Table and Figures 7—Number of Non-Cancelled Units
Dispatched to Calls**

Call Type	1 Unit	2 Units	3 or More Units	Total
EMS	2030	578	4	2612
Injury	54	129	24	207
EMS Total	2084	707	28	2819
Structure Fire	5		15	20
Outside Fire	61	47	26	134
CO/Odor/Smoke	72	15	29	116
Hazard	70	28	6	104
Alarm	209	114	28	351
Service	425	32	4	461
Fire Total	842	236	108	1186
Total	2926	943	136	4005
Percentage	73.1%	23.5%	3.4%	100%



Observations:

- Overall, 73% percent of calls were dispatched one unit and 24 percent of calls were dispatched 2 units.
- On average, 1.5 non cancelled units were dispatched per Fire category call.
- Of the 20 structure fire calls, 75% were dispatched 3 or more units.
- Of the 134 outside fire calls, 73 (54%) were dispatched more than 1 unit.

Table 8— Annual Total Deployed Time on Calls by Call Type Including Cancelled Units (does not include station time)

All Runs	Avg. Busy Minutes/ Call	Total Busy Hours	%	Avg. Busy Minutes/ Day	# of Runs	Avg. Runs / Day
EMS	16.9	1,226	49.3%	201.5	4,352	11.9
Injury	19.1	182	7.3%	29.9	572	1.6
EMS Total	17.2	1,408	56.6%	231.4	4,924	13.5
Structure Fire	26.5	45	1.8%	7.3	101	0.3
Outside Fire	32.2	212	8.5%	34.8	394	1.1
CO/Odor/Smoke	18.1	109	4.4%	18.0	363	1.0
Hazard	33.4	144	5.8%	23.6	258	0.7
Alarm	15	219	8.8%	36.0	878	2.4
Service	28.8	352	14.2%	57.9	734	2.0
Fire Total	23.8	1,080	43.4%	177.6	2,728	7.5
Total	19.5	2,488	100.0%	409.0	7,652	21.0

Observations:

- The various units were busy a combined 2,488 hours including 221 hours (8.9%) for cancelled dispatches. The average total department workload per day was 6.8 hours. This is the total time of all the units that were busy at calls for service.
- There were a total of 7,652 runs, an average of 21 runs per day. This total includes runs that were cancelled. A total of 2339 runs were cancelled (30.6%) an average of 6.4 cancelled runs per day.
- Medical calls accounted for 57% of the total workload.
- Structure and outside fire calls combined were 10.3% of the workload.
- CO/Odor/Smoke investigation and hazard calls accounted for 10.2% of the total workload.

- Alarms calls accounted for 8.8% of the total workload and service calls were 14% of the total workload.

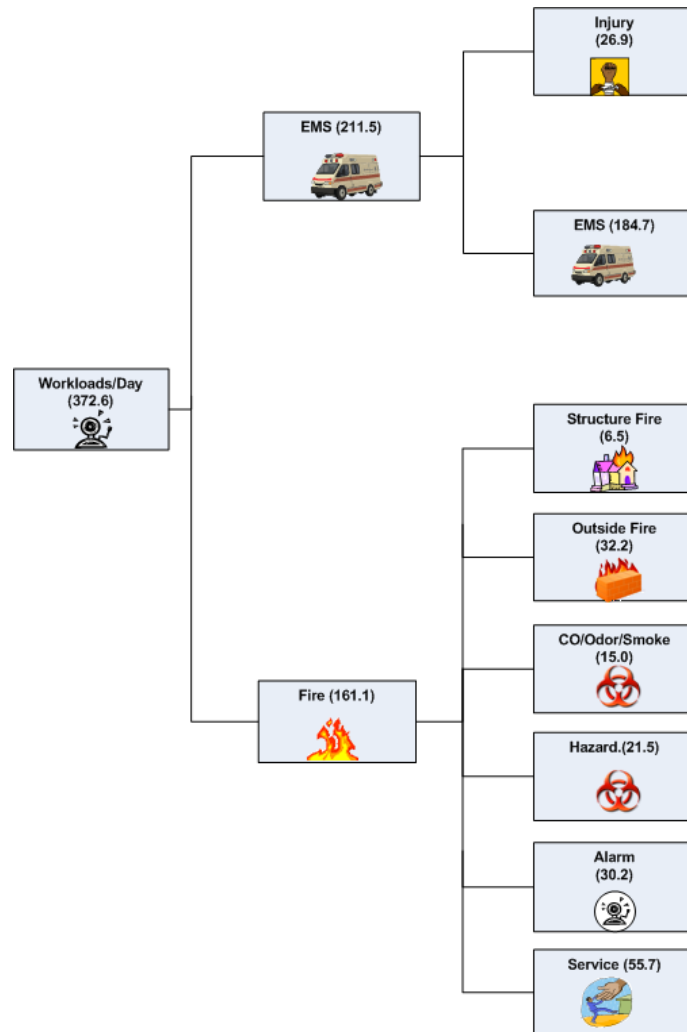
Table 9— Annual Total Busy Time by Call Type Excluding Cancelled Units

Non Cancelled Runs	Avg. Busy Minutes/Call	Total Busy Hours	%	Avg. Busy Minutes/Day	# of Runs	Avg. Runs / Day
EMS	21.1	1,124	49.6%	184.7	3,201	8.8
Injury	25.3	163	7.2%	26.9	388	1.1
EMS Total	21.5	1,287	56.8%	211.5	3,589	9.8
Structure Fire	37.0	40	1.7%	6.5	64	0.2
Outside Fire	45.6	196	8.6%	32.2	258	0.7
CO/Odor/Smoke	25.2	91	4.0%	15.0	217	0.6
Hazard	53.0	131	5.8%	21.5	148	0.4
Alarm	20.6	184	8.1%	30.2	536	1.5
Service	40.5	339	14.9%	55.7	501	1.4
Fire Total	34.1	980	43.2%	161.1	1,724	4.7
Total	25.6	2,267	100.0%	372.6	5,313	14.6

Observations:

- The various units were busy a combined 2,267 hours excluding cancelled runs. The average total department workload per day was 6.2 hours.
- There were a total of 5,313 non-cancelled runs, an average of 15 runs per day.
- The average time spent on a medical call was 22 minutes per run.
- Structure and outside fire calls combined were 10.3 percent of the workload. Average time spent on a structure fire was 37 minutes per run and average time spent on an outside fire call was 46 minutes.
- Alarm calls had the smallest average busy minutes per run, 20.6 minutes.

Figure 10—Total City: Average Busy Minutes per Day by Call Type



Observations:

- The various units combined spent slightly less than 2.7 hours for fire-classified calls per day, including 6.5 minutes for structure fire calls and 32.2 minutes for outside fire calls.
- The various units spent 3.5 hours on EMS calls per day including 0.4 hours (27 minutes) for injury calls.

Table 11—Workload by Unit

Station	Unit ID	Unit Type	Avg Busy Min. per Run	# of Runs	# of Runs / Day	Busy Min. / Day	Total Busy Hours
1	ENG1	Engine	20.5	1514	4.1	85.2	519
	LAD1	Ladder	29.3	108	0.3	8.7	53
	SQD1	Ambulance	23.5	971	2.7	62.6	381
	TANK1	Tank	33.3	47	0.1	4.3	26
2	ENG2	Engine	28.7	396	1.1	31.1	189
	SQD2	Ambulance	24.6	852	2.3	57.3	349
3	ENG3	Engine	40.4	260	0.7	28.8	175
	SQD3	Ambulance	26.6	695	1.9	50.7	308
4	ENG4	Engine	35.9	161	0.4	15.8	96
	SQD4	Ambulance	33.2	309	0.8	28.1	171

Observations:

- Engine company 1, was busy 519 hours in a year, averaged 4 dispatches and 85 busy minutes per day.
- Each of the other engine companies was busy on average a half hour or less per day.
- Three of the four medical units were busy close to an hour per day. However, SQD4 was busy less than a half hour per day.
- Ladder 1 was dispatched 108 times in a year with a total workload of 53 hours. This unit was in use less than 10 minutes per day on average.

Table 12— Fire Units: Total Annual Number and Daily Average Number of Runs by Call Type

Runs	Engine				Ladder	Tank
	ENG1	ENG2	ENG3	ENG4	LAD1	TANK1
EMS	858	164	55	21	13	8
Injury	131	22	27	13	10	2
EMS Total	989	186	82	34	23	10
Structure Fire	12	10	5	7	5	1
Outside Fire	77	31	38	9	15	12
CO/Odor/Smoke	64	17	22	12	20	8
Hazard	39	18	30	23	5	1
Alarm	185	67	48	55	35	4
Service	148	67	35	21	5	11
Fire Total	525	210	178	127	85	37
Fire Calls %	34.7%	53.0%	68.5%	78.9%	78.7%	78.7%
Total	1514	396	260	161	108	47
Average Runs/Day	4.1	1.1	0.7	0.4	0.3	0.1

Observations:

- Engine 1 responded to 525 (35%) fire category calls in a year, including 12 structure fire calls and 77 outside fire calls.
- Engine 2 responded to 210 (53%) fire category calls in a year, including 10 structure fire calls and 31 outside fire calls.
- Engine 3 responded to 178 (69%) fire category calls in a year, including 5 structure fire calls and 38 outside fire calls.
- Engine 4 responded to 127 (79%) fire category calls in a year, including 7 structure fire calls and 9 outside fire calls.
- Ladder 1 responded to 85 (79%) fire calls in a year, including 5 structure fire calls and 15 outside fire calls.

Table 13— Fire Units: Daily Average Busy Minutes per Day by Call Type

Avg. Minutes / Day	Engine				Ladder	Tank
	ENG1	ENG2	ENG3	ENG4	LAD1	TANK1
EMS	36.2	9.1	3.1	1.3	0.7	0.4
Injury	8.0	2.1	2.3	1.8	0.5	0.1
EMS Total	44.2	11.1	5.3	3.1	1.2	0.5
Structure Fire	1.1	0.6	0.6	1.1	0.9	0.1
Outside Fire	6.8	4.7	5.8	1.1	2.2	1.6
CO/Odor/Smoke	4.4	1.2	1.7	1.1	1.1	0.4
Hazard	4.1	2.9	5.3	3.6	1.2	
Alarm	9.8	4.3	2.7	3.7	1.8	0.1
Service	14.7	6.2	7.4	2.2	0.3	1.6
Fire Total	41.0	20.0	23.5	12.8	7.5	3.8
Fire Workloads %	48.1%	64.3%	81.6%	81.0%	86.2%	88.4%
Daily Average	85.2	31.1	28.8	15.8	8.7	4.3
Yearly Busy Hours	518	189	175	96	53	26

Observations:

- Engine 1 was busy 41 (48%) minutes per day on fire category calls, including 1.1 minutes at structure fire calls and 6.8 minutes at outside fire calls.
- Engine 2 was busy 20 (64%) minutes per day on fire category calls, including less than a minute per day at structure fire calls and 4.7 minutes at outside fire calls.
- Engine 3 was busy 23.5 (82%) minutes per day on fire category calls, including less than a minute per day at structure fire calls and 5.8 minutes at outside fire calls.
- Engine 4 was busy 12.8 (81%) minutes per day on fire category calls, including about a minute per day at structure fire calls and another minute per day at outside fire calls.

Ladder 1 was busy 7.5 (86%) minutes per day on fire category calls, including less than a minute per day at structure fire calls and 2.2 minutes at outside fire calls.

Table 14— City vs. CEMS Ambulance Units: Total Annual Number and Daily Average Number of Runs by Call Type

Runs	Ambulance			
	SQD1	SQ2	SQD3	SQD4
EMS	653	640	556	233
Injury	98	31	30	24
EMS Total	751	671	586	257
EMS Calls %	77.3%	78.8%	84.3%	83.2%
Structure Fire	10	4	6	4
Outside Fire	42	13	16	5
CO/Odor/Smoke	29	15	20	10
Hazard	14	6	11	1
Alarm	91	19	19	13
Service	34	124	37	19
Fire Total	220	181	109	52
Total	971	852	695	309
Average Runs/Day	2.7	2.3	1.9	0.8

Observations:

- Ambulance 1 responded to 971 calls in a year, averaging 2.7 dispatches per day. EMS calls were 77% of total responses.
- Ambulance 2 responded to 852 calls in a year, averaging 2.3 dispatches per day. EMS calls were 79% of total responses.
- Ambulance 3 responded to 695 calls in a year, averaging 1.9 dispatches per day. EMS calls were 84% of total responses.
- Ambulance 4 responded to 309 calls in a year, averaging 0.8 dispatches per day. EMS calls were 83% of total responses.

Table 15— Ambulance Units: Daily Average Busy Minutes per Day by Call Type

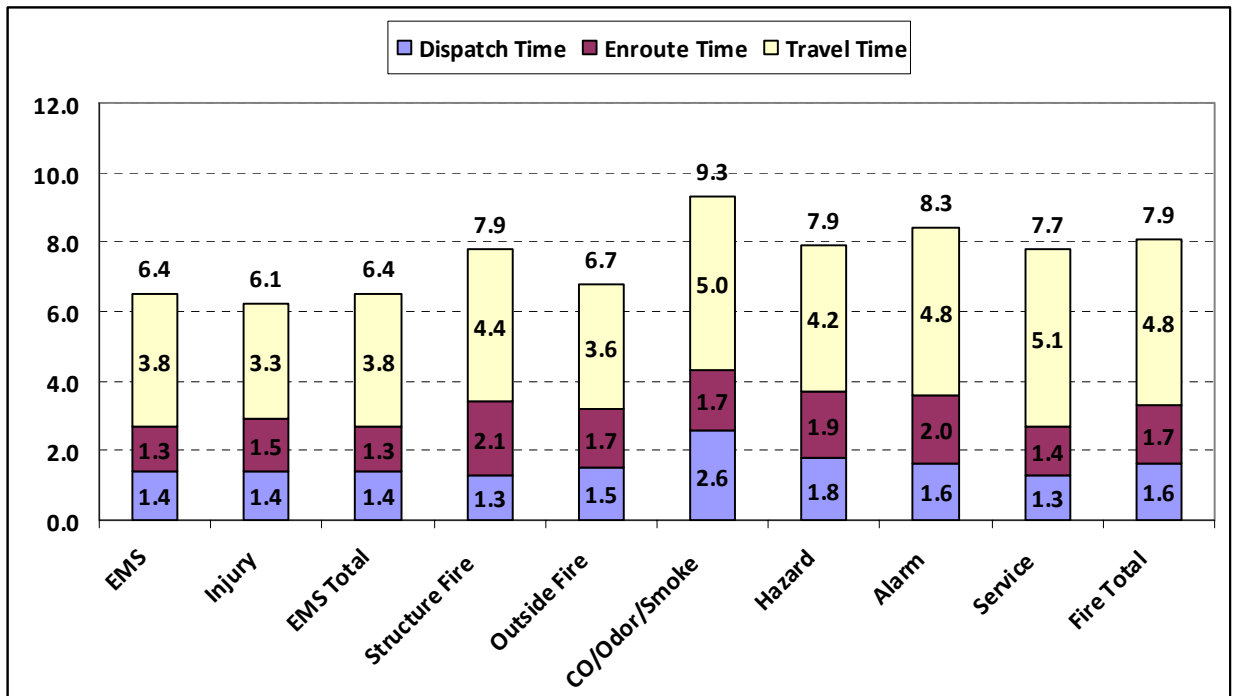
Avg. Minutes / Day	Ambulance			
	SQD1	SQ2	SQD3	SQD4
EMS	38.1	44.1	36.1	15.7
Injury	6.6	1.8	2.1	1.6
EMS Total	44.6	45.9	38.2	17.3
EMS Workloads %	71.2%	80.1%	75.3%	61.6%
Structure Fire	0.9	0.3	0.4	0.5
Outside Fire	5.1	1.8	2.4	0.7
CO/Odor/Smoke	2.1	0.9	1.3	0.9
Hazard	2.1	0.9	1.3	0.1
Alarm	4.8	0.9	1.0	1.0
Service	2.9	6.6	6.2	7.6
Fire Total	17.9	11.4	12.5	10.8
Daily Average	62.6	57.3	50.7	28.1
Yearly Busy Hours	381	349	308	171

Observations:

- Ambulance 1 was busy 381 hours in a year, averaging 63 minutes per day. EMS calls were 71% of the total workload.
- Ambulance 2 was busy 349 hours in a year, averaging 57 minutes per day. EMS calls were 80% of the total workload.
- Ambulance 3 was busy 308 hours in a year, averaging 51 minutes per day. EMS calls were 75% of the total workload.
- Ambulance 4 was busy 171 hours in a year, averaging 28 minutes per day. EMS calls were 62% of the total workload.

Table and Figure 16—Average Dispatch Time, Travel Time, Response Time of First Arriving Units by Call Type

Call Type	Dispatch Time	Enroute Time	Travel Time	Response Time	Number of Calls
EMS	1.4	1.3	3.8	6.4	2612
Injury	1.4	1.5	3.3	6.1	207
EMS Total	1.4	1.3	3.8	6.4	2819
Structure Fire	1.3	2.1	4.4	7.9	20
Outside Fire	1.5	1.7	3.6	6.7	134
CO/Odor/Smoke	2.6	1.7	5.0	9.3	116
Hazard	1.8	1.9	4.2	7.9	104
Alarm	1.6	2.0	4.8	8.3	351
Service	1.3	1.4	5.1	7.7	461
Fire Total	1.6	1.7	4.8	7.9	1186
Total	1.4	1.4	4.1	6.8	4005



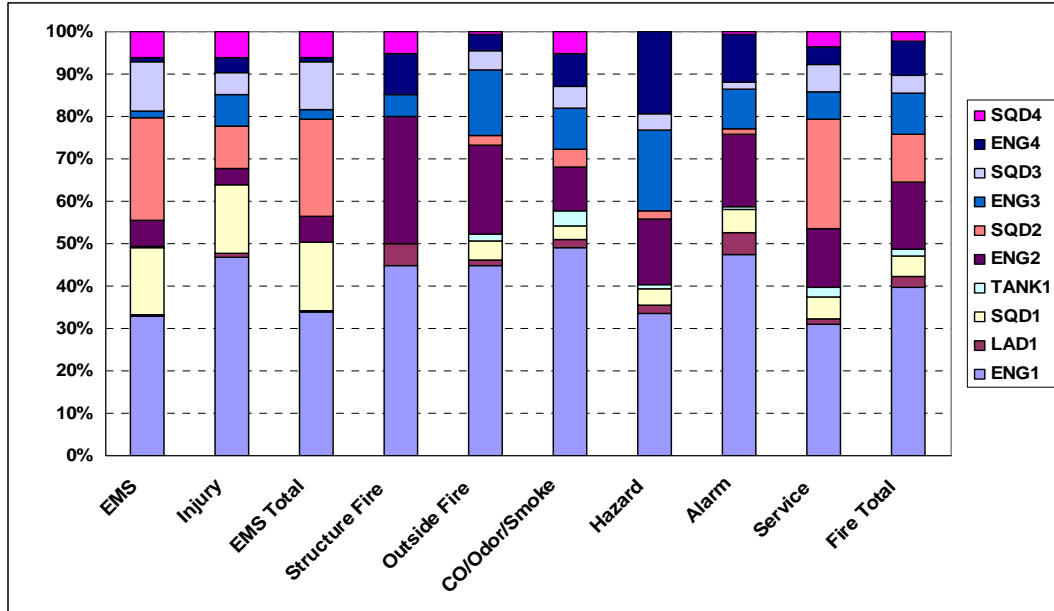
Observations

- The average dispatch time for all calls was 1.4 minutes.
- The average enroute time was 1.4 minutes.
- The average travel time was 4.1 minutes.

- The average response time for all calls was 6.8 minutes.
- On fire calls, the average response time for structure fire calls was 7.9 minutes, and for outside fire calls, 6.7 minutes.

Note: Dispatch time is the amount of time from the first ring until the responders are alerted. Enroute time is also known as “turn-out” time which is the amount of time that occurs between alerting responders and wheels turning. Travel time is the measure of time from wheels beginning to turn to arrival on the scene.

Figure and Table 17—Which Unit Arrived First for Each Call Type



Station	1				2		3		4	
	ENG1	LAD1	SQR1	TANK1	ENG2	SQR2	ENG3	SQR3	ENG4	SQR4
EMS	33%	0%	16%	0%	6%	24%	2%	12%	1%	6%
Injury	47%	1%	16%	0%	4%	10%	7%	5%	3%	6%
EMS Total	34%	0%	16%	0%	6%	23%	2%	11%	1%	6%
Structure Fire	45%	5%	0%	0%	30%	0%	5%	0%	10%	5%
Outside Fire	45%	1%	4%	1%	21%	2%	16%	4%	4%	1%
CO/Odor/Smoke	49%	2%	3%	3%	10%	4%	9%	5%	8%	5%
Hazard	34%	2%	4%	1%	15%	2%	19%	4%	19%	0%
Alarm	48%	5%	5%	1%	17%	1%	9%	2%	11%	1%
Service	31%	1%	5%	2%	14%	26%	6%	7%	4%	4%
Fire Total	40%	3%	5%	2%	16%	11%	10%	4%	8%	2%
Total	36%	1%	13%	1%	9%	20%	4%	9%	3%	5%

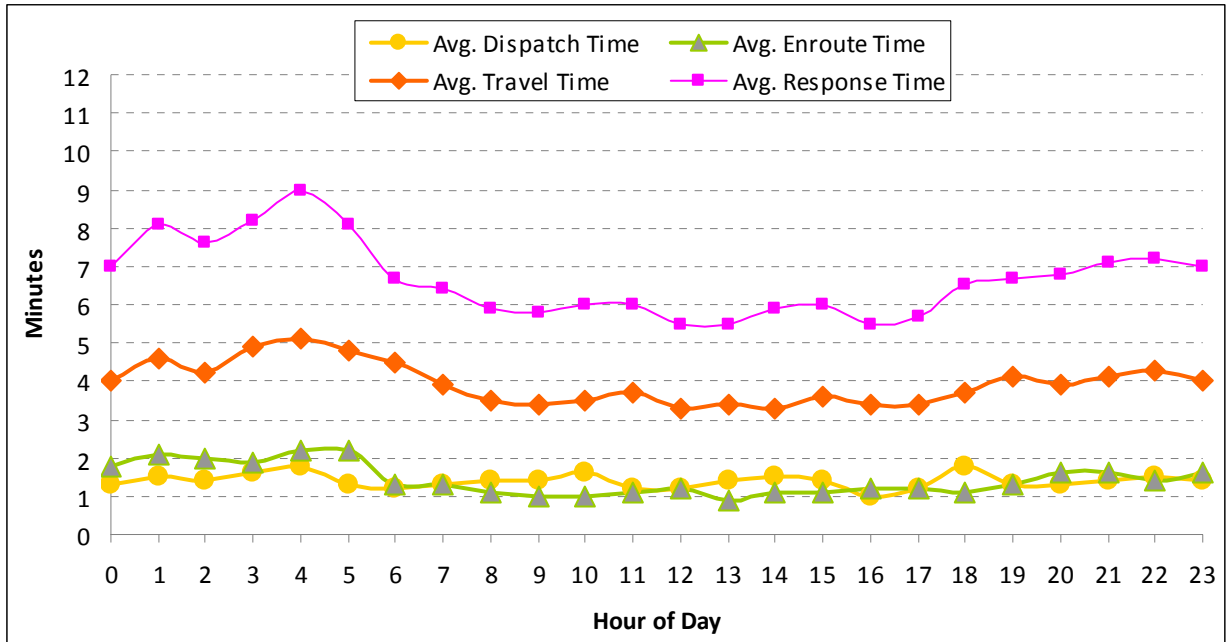
Note: Each row sums to 100%

Observations:

- For medical calls, engine company 1 arrived first on scene 34% of the time. Ambulance unit 2, was first on scene 23% of the time.

- For structure fire calls, engine company 1 was the 1st unit on scene 45% of the time, with engine company 2, first on scene 30% of the time.
- For outside fire calls, engine company 1 were the 1st unit on scene for 45% of the time, with engine company 2, first on scene 21% of the time.

Figure and Table 18 a) Total Calls: Average Dispatch Time, Travel Time, and Response Time of First Arriving Units by Hour of the day for EMS, Injury, Structure Fire and Outside Fire Calls



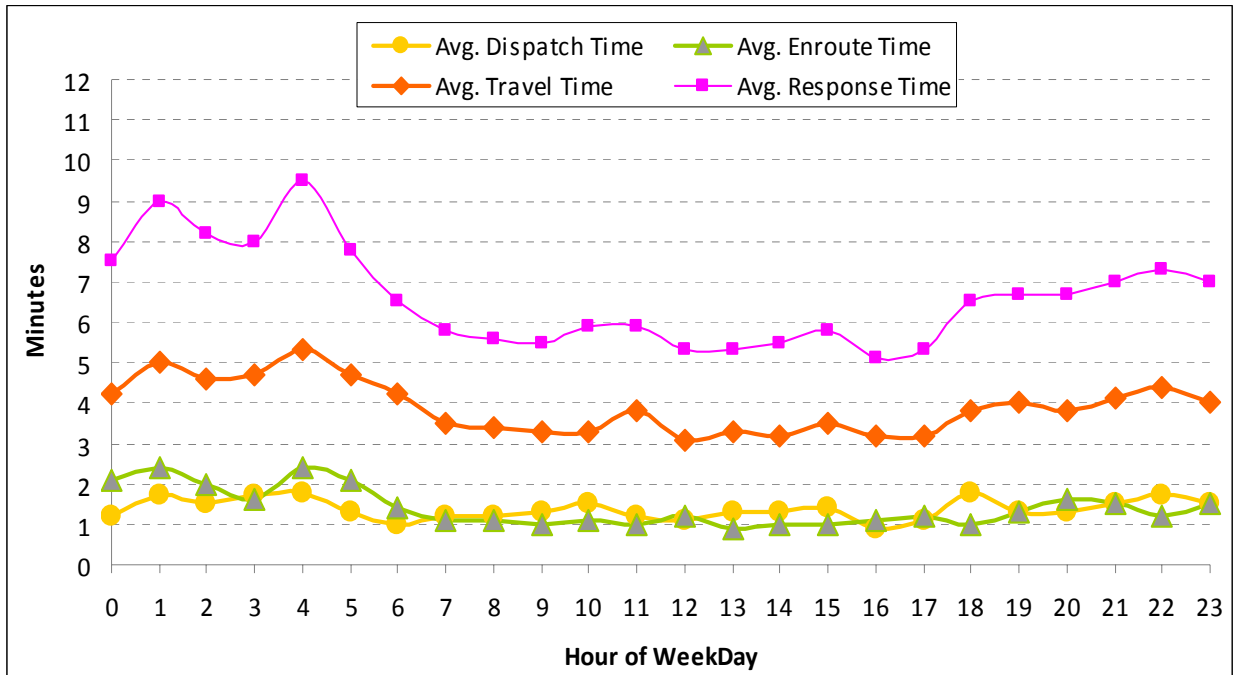
Note: This figure includes EMS, Injury, Structure Fire and Outside Fire calls.

Hour	Avg. Dispatch Time	Avg. Enroute Time	Avg. Travel Time	Avg. Response Time	# of Calls
0	1.3	1.8	4.0	7.0	82
1	1.5	2.1	4.6	8.1	73
2	1.4	2.0	4.2	7.6	67
3	1.6	1.9	4.9	8.2	66
4	1.8	2.2	5.1	9.0	52
5	1.3	2.2	4.8	8.1	52
6	1.2	1.3	4.5	6.7	68
7	1.3	1.3	3.9	6.4	97
8	1.4	1.1	3.5	5.9	137
9	1.4	1.0	3.4	5.8	144
10	1.6	1.0	3.5	6.0	158
11	1.2	1.1	3.7	6.0	174
12	1.2	1.2	3.3	5.5	192
13	1.4	0.9	3.4	5.5	198
14	1.5	1.1	3.3	5.9	172
15	1.4	1.1	3.6	6.0	160
16	1.0	1.2	3.4	5.5	155
17	1.2	1.2	3.4	5.7	160
18	1.8	1.1	3.7	6.5	155
19	1.3	1.3	4.1	6.7	133
20	1.3	1.6	3.9	6.8	135
21	1.4	1.6	4.1	7.1	133
22	1.5	1.4	4.3	7.2	112
23	1.4	1.6	4.0	7.0	98
	1.4	1.3	3.8	6.4	2973

Observations:

- Average response time was consistently under 7 minutes between 6AM and 6PM.
- Average response time peaked between 1AM and 6AM, at more than 7.5 minutes due to the longer recorded enroute and travel time.

Figure and Table 18 b) Weekday Calls: Average Dispatch Time, Travel Time, and Response Time of First Arriving Units by Hour of the day for EMS, Injury, Structure Fire and Outside Fire Calls

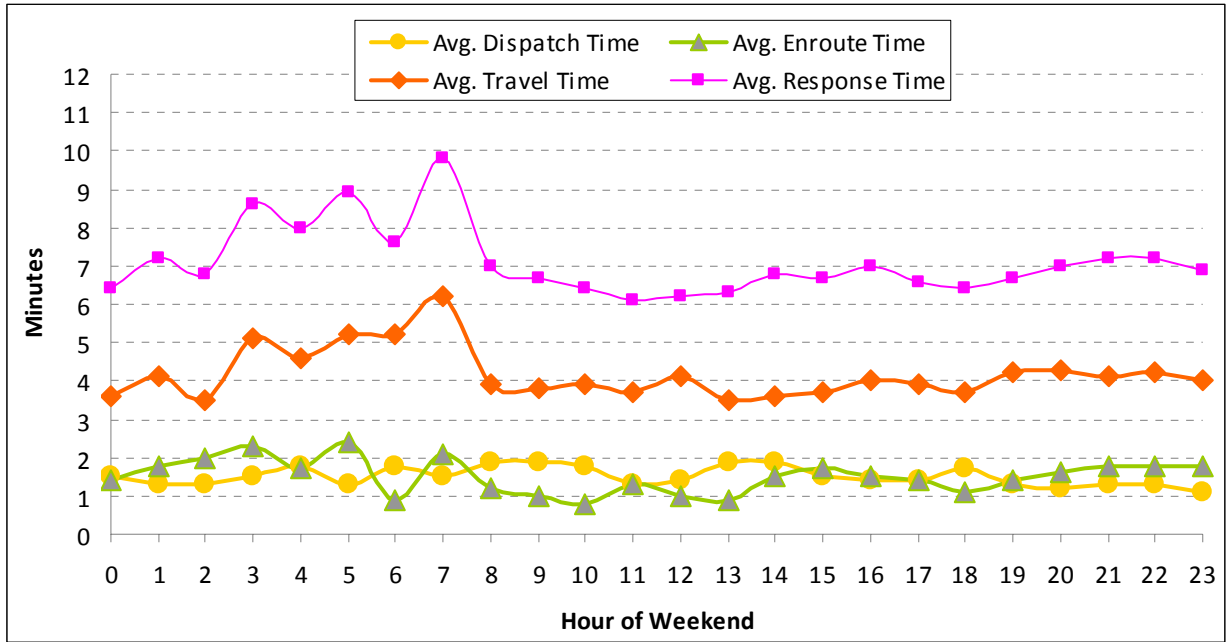


Hour	Avg. Dispatch Time	Avg. Enroute Time	Avg. Travel Time	Avg. Response Time	# of Calls
0	1.2	2.1	4.2	7.5	47
1	1.7	2.4	5.0	9.0	39
2	1.5	2.0	4.6	8.2	40
3	1.7	1.6	4.7	8.0	39
4	1.8	2.4	5.3	9.5	34
5	1.3	2.1	4.7	7.8	38
6	1.0	1.4	4.2	6.5	53
7	1.2	1.1	3.5	5.8	83
8	1.2	1.1	3.4	5.6	110
9	1.3	1.0	3.3	5.5	114
10	1.5	1.1	3.3	5.9	122
11	1.2	1.0	3.8	5.9	119
12	1.1	1.2	3.1	5.3	150
13	1.3	0.9	3.3	5.3	153
14	1.3	1.0	3.2	5.5	117
15	1.4	1.0	3.5	5.8	121
16	0.9	1.1	3.2	5.1	120
17	1.1	1.2	3.2	5.3	111
18	1.8	1.0	3.8	6.5	109
19	1.3	1.3	4.0	6.7	88
20	1.3	1.6	3.8	6.7	100
21	1.5	1.5	4.1	7.0	88
22	1.7	1.2	4.4	7.3	73
23	1.5	1.5	4.0	7.0	70
	1.3	1.3	3.7	6.2	2138

Observations:

- Average response time was consistently under 7 minutes between 6AM and 6PM.
- Average weekday response time peaked between midnight and 7AM, at more than 7.5 minutes due to the longer recorded enroute and travel time.

Figure and Table 18 C) Weekend Calls: Average Dispatch Time, Travel Time, and Response Time of First Arriving Units by Hour of the day for EMS, Injury, Structure Fire and Outside Fire Calls



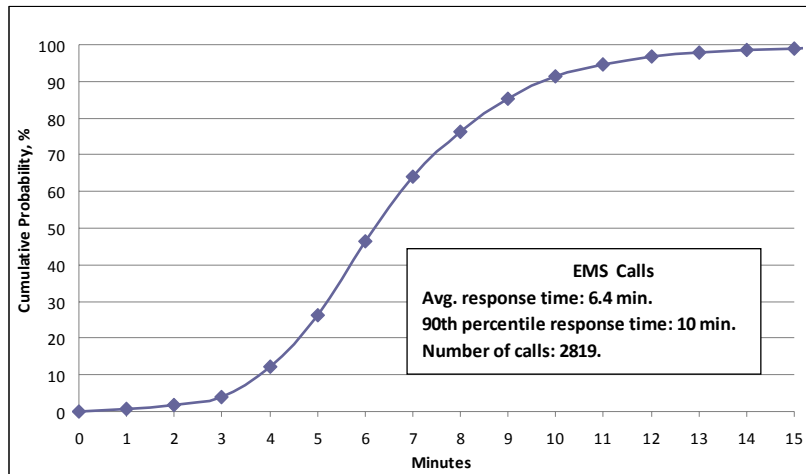
Hour	Avg. Dispatch Time	Avg. Enroute Time	Avg. Travel Time	Avg. Response Time	# of Calls
0	1.5	1.4	3.6	6.4	35
1	1.3	1.8	4.1	7.2	34
2	1.3	2.0	3.5	6.8	27
3	1.5	2.3	5.1	8.6	27
4	1.8	1.7	4.6	8.0	18
5	1.3	2.4	5.2	8.9	14
6	1.8	0.9	5.2	7.6	15
7	1.5	2.1	6.2	9.8	14
8	1.9	1.2	3.9	7.0	27
9	1.9	1.0	3.8	6.7	30
10	1.8	0.8	3.9	6.4	36
11	1.3	1.3	3.7	6.1	55
12	1.4	1.0	4.1	6.2	42
13	1.9	0.9	3.5	6.3	45
14	1.9	1.5	3.6	6.8	55
15	1.5	1.7	3.7	6.7	39
16	1.4	1.5	4.0	7.0	35
17	1.4	1.4	3.9	6.6	49
18	1.7	1.1	3.7	6.4	46
19	1.3	1.4	4.2	6.7	45
20	1.2	1.6	4.3	7.0	35
21	1.3	1.8	4.1	7.2	45
22	1.3	1.8	4.2	7.2	39
23	1.1	1.8	4.0	6.9	28
	1.5	1.5	4.0	6.9	835

Observations:

- Overall, average response time in the weekend is more than 40 seconds longer than response time in the weekday.

- Average weekday response time peaked between 3AM and 8AM, at more than 7.6 minutes due to the longer recorded travel time.

Figure and Table 19—Cumulative Distribution Function (CDF) of Response Time of First Arriving Unit for EMS Calls



Reading the CDF Chart

The vertical axis is the probability or percentage of calls. The horizontal axis is response time. For example, with regard to EMS calls, the 0.9 probability line intersects the graph at a time mark at about 9.8 minutes. This means that 90 percent of these calls were reached in less than 10 minutes.

Response Time	Response Time Code	Frequency	Cumulative Percent
0 min	0	0	0.0
0-1 min	1	21	0.8
1-2 min	2	28	1.8
2-3 min	3	56	3.9
3-4 min	4	224	12.1
4-5 min	5	386	26.3
5-6 min	6	545	46.3
6-7 min	7	486	64.1
7-8 min	8	328	76.2
8-9 min	9	243	85.1
9-10 min	10	172	91.4
10-11 min	11	91	94.7
11-12 min	12	59	96.9
12-13 min	13	30	98.0
13-14 min	14	13	98.5
14-15 min	15	11	98.9
15-20 min	16	25	99.8
>= 20 min	17	5	100.0

Note: 96 first arriving units of EMS calls are missing data needed to calculate response time

Observations:

- The average response time for medical calls was 6.4 minutes.
- Six minutes: the response time for 46 percent of EMS calls was less than 6 minutes.

- For 90 percent of EMS calls, the response time was less than 10 minutes.

Table 20: Average Response Time for Structure Fire and Outside Fire Calls by 1st Arriving Fire Units

1st Arriving Fire Unit	Outside Fire		Structure Fire		Total	
	Avg. Response Time	# of Runs	Avg. Response Time	# of Runs	Avg. Response Time	# of Runs
ENG1	6.9	58	7.7	9	7.0	67
ENG2	7.9	30	7.3	6	7.8	36
ENG3	7.6	25	6.8	1	7.5	26
ENG4	7.1	8	7.9	3	7.3	11
LAD1	11.1	2	13.4	1	11.9	3
TANK1	6.8	2			6.8	2
Total	7.3	125	7.9	20	7.4	145

Note: Tank 1 was not discussed in the observations.

Observations:

- Engine 1 had the shortest response time, 6.9 minutes, for outside fire calls when they arrived first.
- Engine 1 had the shortest response time, 7.0 minutes for structure and outside fire calls combined.
- The average response time of the first arriving fire equipment for outside fire calls was 7.3 minutes.
- The average response time of the first arriving fire equipment for structure fire calls was 7.9 minutes.

Table 21: Average Response Time of All Arriving Fire Units for Structure and Outside Fire Calls

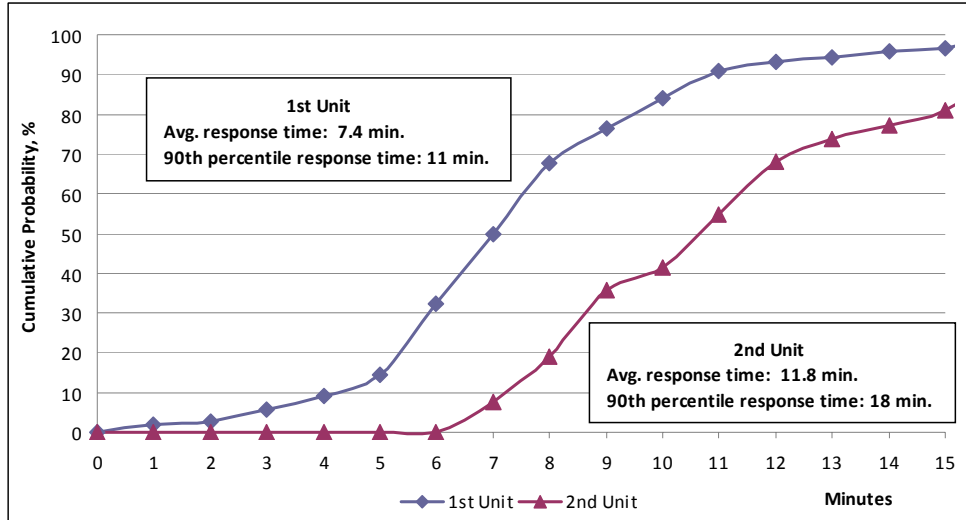
All Arriving Unit	Outside Fire		Structure Fire		Total	
	Avg. Response Time	# of Runs	Avg. Response Time	# of Runs	Avg. Response Time	# of Runs
ENG1	7.7	70	7.9	12	7.7	82
ENG2	8.3	31	8.4	10	8.3	41
ENG3	9.2	37	10.9	5	9.4	42
ENG4	7.1	9	8.9	7	7.9	16
LAD1	13.4	14	13.2	4	13.4	18
TANK1	13.0	12	16.5	1	13.3	13
Total	8.9	173	9.4	39	9.0	212

Note: Dispatches without unit dispatch time or unit on scene time were not included in this table.

Observations:

- For all engine companies, engine 1 had the shortest response time, 7.9 minutes, for structure fire calls and engine 4 had the shortest response time, 7.1 minutes, for outside fire calls.
- For structure fire calls, the average response time of the first arrived unit was 7.9 minutes. The overall average response time of all fire equipment sent to the same call was 9.4 minutes, 1.5 minutes more than the average for the first arriving fire unit.
- For outside fire calls, the average response time of the first arrived unit was 7.3 minutes. The overall average response time of all fire equipment sent to the same call was 8.9 minutes, 1.6 minutes more than the average of the first arriving fire unit.

Figure and Table 22—Cumulative Distribution Function (CDF) of Response Time of First and Second Arriving Fire Equipment for Structure and Outside Fire Calls



Response Time	Response Time Code	1st Unit		2nd Unit	
		Frequency	Cumulative Percent	Frequency	Cumulative Percent
0 min	0	0	0.0	0	0.0
0-1 min	1	3	2.1	0	0.0
1-2 min	2	1	2.8	0	0.0
2-3 min	3	4	5.5	0	0.0
3-4 min	4	5	9.0	0	0.0
4-5 min	5	8	14.5	0	0.0
5-6 min	6	26	32.4	0	0.0
6-7 min	7	25	49.7	4	7.5
7-8 min	8	26	67.6	6	18.9
8-9 min	9	13	76.6	9	35.8
9-10 min	10	11	84.1	3	41.5
10-11 min	11	10	91.0	7	54.7
11-12 min	12	3	93.1	7	67.9
12-13 min	13	2	94.5	3	73.6
13-14 min	14	2	95.9	2	77.4
14-15 min	15	1	96.6	2	81.1
15-20 min	16	4	99.3	5	90.6
>= 20 min	17	1	100.0	5	100.0

Observations:

- The average response time of first arriving fire units for structure and outside fire calls was 7.4 minutes.
- Six minutes or less: 32 percent of the time, the first fire unit arrived on scene.
- For 90 percent of the time, the first fire unit arrived within 11 minutes.
- The response time pattern of the 2nd arriving unit on average was 4.4 minutes longer than the 1st arriving unit.

Appendix I: Correspondence between Call Description and Call Type

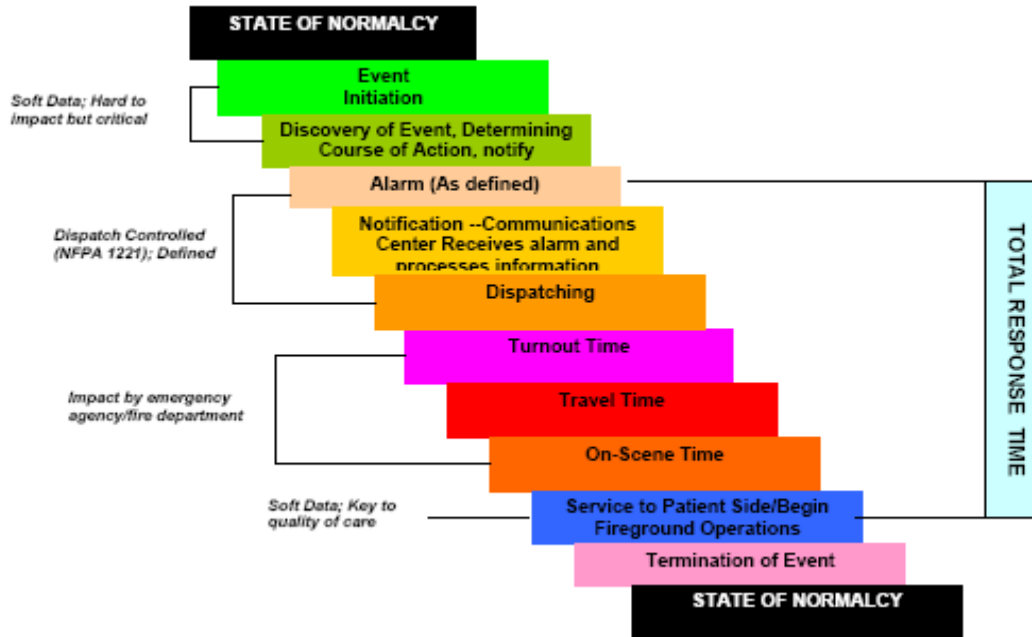
Call Description	Call Type	Number of calls
FIRE ATTEMPT SUICIDE	EMS	18
FIRE DROWNING	EMS	2
FIRE HOSPICE DEATH	EMS	2
FIRE MEDICAL EMERGEN	EMS	2669
FIRE SUICIDE	EMS	6
FIRE PERSONAL INJURY	Injury	223
FIRE STRUCTURE FIRE	Structure Fire	20
"FIRE STRUCTURE, VEHI"	Outside Fire	4
FIRE CONFINED SPACE	Outside Fire	11
FIRE GRASS FIRE	Outside Fire	5
FIRE UNKNOWN FIRE	Outside Fire	86
FIRE VEHICLE FIRE	Outside Fire	37
FIRE CO INVESTIGATIO	CO/Odor/Smoke	37
FIRE ODOR INVESTIGAT	CO/Odor/Smoke	62
FIRE SMOKE INVESTIGA	CO/Odor/Smoke	20
FIRE BOMB THREAT	Hazard	1
FIRE GAS LEAK	Hazard	19
FIRE HAZARDOUS MATER	Hazard	3
FIRE WIRES DOWN/ARCI	Hazard	86
FIRE SMOKE DETECTOR/	Alarm	14
MULTI FAMILY/BUSINES	Alarm	133
SINGLE FAMILY ALARM	Alarm	226
FIRE ACCIDENT UNKNOW	Service	3
FIRE ASSIST CITIZEN	Service	141
FIRE BURNING COMPLAI	Service	30
FIRE ELEVATOR EMERGE	Service	3
FIRE LIFT ASSIST	Service	159
FIRE MISCELLANEOUS C	Service	84
FIRE MUTAL AID	Service	1
FIRE PUBLIC RELATION	Service	66
FIRE WASH DOWN	Service	39
FIRE WATER RESCUE	Service	1

Appendix II: Runs and Workloads Analysis for Non Primary Units

Unit ID	EMS		Fire		Total		
	# of Runs	Total Busy Hours	# of Runs	Total Busy Hours	# of Runs	Total Busy Hours	Avg Busy Min. / Day
500			2	2.3	2	2.3	0.4
505			5	11.4	5	11.4	1.9
506			1	2.3	1	2.3	0.4
508	2	0.8	32	29.4	34	30.2	5.0
509	1	8.0	7	5.3	8	13.2	2.2
518			1	0.0	1	0.0	0.0
519	268	80.2	310	137.6	578	217.8	35.8
529	1	0.7	6	10.6	7	11.3	1.9
TAC3			11	23.8	11	23.8	3.9
U1			9	28.9	9	28.9	4.8
U2	2	5.3	6	21.2	8	26.5	4.4
U3			4	5.7	4	5.7	0.9
U4			7	20.1	7	20.1	3.3
Total	274	95.0	401	298.4	675	393.4	64.7

V. Comments, Observations, and Recommendations

A. Communications



Communication Matrix –Critical time events that occur in emergency events and standards which should be reviewed using performance measurement analysis.

Time is a critical element when looking to achieve successful outcomes in fire and EMS services. The National Fire Protection Association (NFPA) has created two standards that look at the key time elements: NFPA 1221 and NFPA 1710. For the first two components of time in an incident response – event initiation and discovery of the event/notification – there is little that an agency can do except to prevent or mitigate.

Fires rapidly increase in size from the point of ignition but normally are not spotted unless an alarm system is in place or the fire displays

itself to bystanders on the street. When fire is visibly seen, it normally has reached a point called “flashover” meaning all of the contents in the room of origin are on fire and the fire is likely spreading to additional parts of the structure.

For EMS, it is critical that bystanders and citizens be trained in first aid and CPR so that responders receive a viable patient that can be worked and transported to trauma centers.

Other elements that can be measured and be improved occur in succession beginning with notification. Departments regularly evaluate their baseline performance – the level of service that is currently being delivered – against national benchmarks – what other departments provide. Comparison can also be made to recommendations contained in national standards.

National benchmarks indicate that a call should be received, processed, and dispatched within 1 minute (along with 15 to 30 seconds for the phone to ring). Novi information suggests that most times of the day are within this benchmark range. It will be critical to monitor performance and reduce that time if possible.

Once the call is processed, the responder is notified and turnout time benchmarks, nationally, indicate response should be underway within 1 minute to 1:30. Night hours in Novi have longer response times than daytime hours which is a key quality improvement area. ICMA teams have regularly noted that it takes longer for turnout to occur in evening hours and studies are underway by NFPA to quantify how

much longer is needed. It has been commonly presented that longer turnout times are mitigated because travel time is less due to lighter traffic conditions. This is not accurate in the Novi data analysis.

The challenge is to allow responders to arrive on the scene and begin treatment for EMS calls within 4 minutes (transport vehicles within 8 minutes). For fire calls, the first unit should also arrive within 4 minutes and the full planned deployment within 8 minutes.

Recommendation

Performance Measures should be established and regularly reviewed (weekly) as part of the COMPSTAT process. The performance measures should establish 15 seconds to answer the phone 95% of the time and 30 seconds 99 percent of the time; 1 minute to process the information and alert responders 95% of the time; 1:30 seconds for responders to assemble, don protective equipment and safety belts with tires rolling 90% of the time.

B. Administration

An administrative process is in place and rules, regulations, policies and procedures have been created for the department. A team-building and educational program should be created to familiarize all employees with the documents. Employees should be required to sign that they have been provided the documents, have read the documents, and understand all that is contained therein.

All employees should be held to the same standard. For future work, employee teams should be created to formulate policies, procedures, rules and regulations with a stakeholder group drawn from all parts of the organization. This should assist the chief and administration by establishing ownership and also allow for effective communication throughout the organization.

Recommendation

Review, amend, and communicate the rules, regulations, policies, and procedures to all members of the organization.

Shift schedules

The NFD works a 12 hour schedule with career personnel staffing the 6 a.m. to 6 p.m. shift and paid-on-call staffing the 6 p.m. to 6 a.m. shift. Paid, career captains staff Station 4 during the POC time period and respond to significant calls to initiate incident command and direct the events.

A proposal to move towards 24 hour schedules was made by career employees in 2008 but was not adopted by the city. While the 24 hour schedule would have allowed for career staffing across a 24 hour period and provided for a mix of the two units, there are issues inherently found in a 24 hour work schedule. For that reason, a 12 hour shift is recommended with mixed staffing and mixed days of the week.

When looking at the workload of NFD, the peak hours for calls are from 8 a.m. in the morning until 8 p.m. in the evening. From 8 p.m.

to 8 a.m., calls drop off significantly with midnight to 8 a.m. the slowest period.

The problem with 24 hour staffing is aligning staffing with work volume. Staff is designed to handle the peak work load volumes; when those volumes drop off during evening hours, the staffing does not drop; it remains constant. In other words, NFD would pay for work hours that are not needed. One could argue that this is a function of 24 hour shifts – the shift schedule assumes that there will be sleep time. However, even assuming sleep, the 24 hour shift provides for more people sleeping that would be necessary to handle calls that are received during those hours.

The better approach to staffing is the 12 hour work shift which ideally fits the NFD call volume. Using the 12 hour work shift, the department can staff heavier during the 7 a.m. to 7 p.m. peak hours and close a station and eliminate medical units during the 7 p.m. to 7 a.m. Such a scheduling approach does require additional management of resources, aligning the resources with peak times along with time during the year.

Other advantages of the 12 hour shifts:

1. During periods that would normally be sleep time, maintenance on trucks and equipment can occur as well as training. Moving the maintenance from the busy daylight shifts of 8 a.m. to 8 p.m. means that the day shifts can be freed to respond to emergency calls and not have to stop maintenance tasks.
2. Station work and other maintenance can occur on evenings and during night hours versus daytime.

3. Work load and staffing can be aligned to provide usage of hours that are being paid and that are not productive; something that industry and the private sector have used for years.
4. During peak demands of the year, the 12 hour shift assures that staff will have rest time. Working 24 hour shift during peak call periods leads to sleep deprivation and interruption that is extremely unhealthy. Studies funded through the Assistance to Firefighter's Act Grant have repeatedly shown that the 24 hour shift is not the healthiest in busy departments or in departments that have work spread across the 24 hour period. The sleep interruption and deprivation does not end when the work shift ends; it has been found that the human body takes several days to adjust and acclimate to sleep periods and with the 24 hour shift, about the time that the body acclimates, the person returns to work duty.
5. Other work can be better completed with less interruption during the evening hours: the recommendation to use staff for GIS mapping, inspection and flow of fire hydrants, inspection of large occupancies such as night clubs for fire code violations (to avoid something like "The Station" fire in Rhode Island), mobile patrols during special events, updates on licenses and testing, and other administrative tasks.
6. Company inspections can take place during off-peak hours in lieu of sleep time. These company inspections may include public meeting areas, restaurants, sporting venues, and other areas. The appearance of fire staff can be utilized like community policing officers in the law enforcement area both for resources as well as performing official functions. Mall areas are particularly suited to inspection in later hours when customers have gone home and only maintenance staffs are present.

7. Home and other private residence inspections can take place in evening hours more easily than during peak call times. A goal of all departments should be inspection of all structures both for educational efforts of staff as well as to remove hazards before a call for service is needed. In private properties, trip and fall hazards along with other EMS related liabilities should be targeted for mitigation with an eye towards preventing calls for service in the future.
8. If an employee calls in sick, holiday, or vacation time, the 12 hour shift allows flexibility of either relocating existing resources or filling with overtime but at 12 hours instead of 24 hours. When operating at minimum manning and with minimum staffing, overtime can easily mushroom into non sustainable levels.

A minimum manning of two persons in Station 4; three in Station 2; and six in Station 1 should be targeted along with a captain on each shift. The training staff should be expanded to allow for training on each of the three platoons – night and day – and avoid overtime. It will also speed up the process of bringing new fire personnel on the road as well as ensuring competency is retained.

A proposed schedule is attached in the Appendix.

Recommendation

The ICMA team recommends expanding the 12 hour schedule and provide career employees on all shifts while filling other positions with POC positions. It is anticipated that Station 3 would not be staffed.

Dispatching during weather events and medical calls

In a review of calls for service involving weather-related incidents such as storms, power outages, and high winds, we found that police department resources were stretched very thin during these events. It was related to the ICMA team that it is thought the fire department units should play more of an active role in assisting the police department during these events. For instance, even though the police department is still expected to respond to typical police-related calls (crimes, arrests, burglary alarms, and accidents) during these events, police are also expected to protect and cordon off natural disaster scenes. Police officers should not have to man barricades and perform other functions during these situations. Lines down often lead to fires and it is a better policy to have fire units stationed in these locations.

Likewise, calls for medical assistance are often dealt with by the police department which has a policy of physically attending every call for service received. Dispatch protocols should be established that alert responders in the fire department to calls that are medically related such as prescription issues, illness and other similar events.

Recommendation

The city, police, and fire administrations should develop a collective plan whereby fire personnel will be more proactive when incidents of natural disaster occur in the community as well as everyday calls for assistance.

C. Strategic Planning

The Novi Fire Department, like most departments, needs to create a citizen-driven, department-adopted strategic plan. The process should begin with a Strength-Weakness-Opportunity-Threat (SWOT) analysis and create a mission with desired outputs that the public and elected officials would like to see from the fire/EMS. This process should lead to the adoption of a strategic plan for the fire department with accompanying goals and objectives that are assigned across all levels of the department. Regular report cards can be prepared to assess how the goals, objectives and strategies are progressing.

The strategy can also be used in combination with a comprehensive risk assessment of all properties in the City to create or affirm deployment models. If calls for service begin to come from areas with response times outside of those adopted, resources can be deployed mobile. When sufficient volumes of calls are received in an area, it would serve as the trigger for locating fixed bases in the future.

Recommendation

We recommend that the NFD conduct a citizen-involved strategic planning exercise along with comprehensive risk assessment for deployment of resources.

D. Hiring, recruiting, diversity

It was noted to the ICMA team that the NFD has expended as much as \$10,000 recruiting, training, equipping, and getting candidates through the probationary period – both for potential POC staff as well as full-time career members. The issues with POC appear to be the

opportunities which exist in nearby communities to utilize training that has been received and receive compensation. For full-time career members, a number left to work at traditional 24 hour departments nearby.

One way to eliminate this turnover is to establish minimum hiring qualifications. One concept would be to hire only persons who have completed the FF I and II training. A second idea would be to reimburse persons who complete the training once it has been completed and they have finished the probationary period with the department. The third option would be to continue to pay for persons to attend the training but add a caveat that would forgive a portion of the cost for each three months they serve the City of Novi.

Instead of paying the hours for attendees at the training, the NFD could pay for the training but reimburse the hours only after successful completion and joining the department. With the unemployment rate increasing, there is the likelihood more people will take advantage of the training and then choose to relocate not just to other nearby cities, but potentially out of state and seek full time careers.

In addition to establishing the training guidelines, defined probationary periods must be established and personnel moved through the process. The existing program has burdened the training staff with unrealistic expectations of teaching, training, and attempting to certify new hires. The work of certifying should be conducted by shift staff with a report card process created to thoroughly evaluate employees before they complete a defined probationary period.

The NFD should also review demographic data to determine trends and attempt to recruit candidates from various backgrounds. When providing EMS services, communication is critical and having the ability to use staff resources on calls for service may affect the outcome at events. By using demographic studies, the department can also target populations with specific education and recruitment concepts.

A community that used this process extensively was the City of Charlottesville, VA which merged demographic data with GIS information to identify the best uses of marketing resources.

Recommendation

The hiring and recruiting package should be reviewed and updated with candidates receiving payment after completing educational requirements and activating department membership. The department should also target populations to ensure demographic representation on the department.

E. Marketing

The ICMA team noted that in several interviews the comment was made that people, including elected officials, did not always know how the NFD operated.

Marketing is important to the successful outcome of NFD efforts. Smoke detector installation, battery changes in detectors, importance

of sprinklers, removal of trip/fall hazards, planning escapes – all of these programs are common to the fire service but require promotion and marketing.

Likewise, the public is likely to not support change or improvements if they are not familiar with the operations of the department. The NFD has many talented individuals and a marketing plan/program should be designed to carry fire prevention messages year-round and not just isolate them to fire prevention week.

Often messages must be repeated and the NFD should create messages that can be run in various mediums throughout the community. The messages will not only mitigate or prevent calls for service, they can be useful for educating the public on what the department does and how it operates.

A yearly recognition program should be conducted, ideally with Novi PD as a demonstration of integrated public safety services for the City of Novi, for all members of the organization with awards presented for accomplishments during the prior year. The City Council should be invited to attend a program similar to “Fire Ops” that was developed by the International Association of Firefighters.

Recommendation

A marketing plan should be developed to support the strategic plan of the department as well as accomplishing the goals and objectives established for the organization. The marketing plan should include

internal marketing by promoting employee accomplishments as well as marketing to the citizens and businesses of Novi.

Examples might be to feature training programs given to local businesses which may spur other requests and generate additional revenue for the City. An example is in the area of confined space: many businesses would rather contract with the City and pay for the service versus creating their own staff with the associated liability.

F. Communications Equipment

The department has three different manufacturers of its portable radios and lacks the software programs to fully utilize existing Mobile Data devices as well as laptop computers.

A technology team should be created and look at the interoperability of all of the communication devices within the department, particularly since it is looking at moving towards the 800 MHz spectrum through the county.

Radios should be uniform and include alert tones in case an employee is injured and cannot talk. Having similar operating features minimizes the potential for mistakes during emergency situations.

The department calls and utilizes paging devices to call back personnel; it is recommended that a uniform paging device be adopted and utilized by the department as part of the communication review.

The utilization of software and laptops can assist in inspections by prompting staff to look at various locations. The information can be stored and converted to electronic records capable of being attached to dispatch messages for responders leaving the station. Hazards, special circumstances or conditions, immobile occupants, and other important information can be recorded and integrated in the CAD system. The laptops can also aid by speeding up information for billing and automate the transfers rather than manually inputting such information upon return to the station.

Recommendation

A technology task force should review the various technological components of the department with the results integrated into a 5 to 10 year improvement program that can also be used to apply for federal and state dollars.

G. Review Fees for Service

The fire marshal prepared a detailed analysis of options that could generate additional revenue for the NFD and his actions are particularly noteworthy.

A fee for sprinkler inspections as well as re-inspection on a yearly basis should be established. Most communities charge for this service or contract the work out with owners/builders paying for the cost as an addition to basic permits. The NFD offers a valuable service and should be compensated for the time spent.

Site plan reviews should include the fire department. Using the COMPSTAT model, the fire marshal and trained members of the department (in his/her absence) should be regularly meeting with building officials to assist in moving permits forward. The time spent should be charged as part of the permitting fee. The fire marshal recommended a \$250 charge for the fire department review; that is the equivalent of what a professional engineering firm would charge for an hour's worth of work and is certainly within reason.

The department and City should review their response ordinances for accidents and assistance on the highways. As traffic increases, the likelihood of accidents is also likely to increase. Most auto insurance policies contain a provision for paying for emergency response; the City should take advantage of this pre-paid cost and thus save taxpayers money. Without collecting this fee that is charged regardless of use, the cost is transferred to property taxes for support of the department as well as operation of equipment and compensation of employees.

With training and added inspections, cost recovery should be provided for violations of building codes and re-inspection costs. The International Property Maintenance Code through the International Code Council (ICC) should be adopted and fire department personnel trained on utilizing the code to minimize blight in the community.

Recommendation

Review the cost recovery ordinances for the City and make changes as required to collect already paid investments to alleviate additional charges to the taxpayer by way of property tax support of NFD.

H. Outcomes versus Outputs

NFD is delivering many good services to its citizens. During our site visits, staff was willing to undertake the comprehensive review. It has a younger staff who demonstrated a desire to train and improve.

The challenge that is facing the department, and ultimately the city, is changing from a reactive, output-focused department to one that looks at outcomes.

Central to becoming an outcome-focused department is to develop a comprehensive mission, vision, and value that focuses on key service delivery. The elected body and the citizens must agree with stated service delivery goals.

The next step is to create performance measures for goals that achieve the adopted strategies. The performance measures should evaluate outcomes. Instead of saying the department responded to ten cardiac arrests last year, the question should be answered, "What was the outcome of those interventions?" If the strategy is to successfully treat and transport viable patients who recover from sudden cardiac onset, performance measures must be in place to determine if that is being achieved. HIPPA and other rules complicate the quality improvement and performance measuring aspects of departments, but they are not total roadblocks.

Similarly, if the strategy is to develop Novi as a fire preventive community, then all aspects of achieving that strategy need to be aligned and functioning.

The entire department, not only the commanders of the various units, should focus on outcomes. A significant number of hours are being paid by the city for work by various employees in the department. Not all of these hours are being used, and there is substantial talent within the ranks to deliver improved levels. If all personnel are involved, the workload can be more appropriately assigned and not overwhelm the few that are currently trying to handle the functions. The challenge for the command then becomes managing and coordinating these efforts, not conducting the efforts themselves.

I. Organization

Novi Fire Department Proposed 12-Hour Schedule

Week	Team	Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	Day	A	B	B	A	A	B	B
	Night	C	D	D	C	C	D	D
2	Day	B	A	A	B	B	A	A
	Night	D	C	C	D	D	C	C
3	Day	A	B	B	A	A	B	B
	Night	C	D	D	C	C	D	D
4	Day	B	A	A	B	B	A	A
	Night	D	C	C	D	D	C	C

Not: The schedule repeats every 4 weeks.

Purple Shift: Squad A. For the purple shift, 6 full-time, career staff would be assigned along with 6 POC. Four career would staff

Station 1; one at Station 2; one at Station 4. POC would contribute two at Station 1, two at Station 2 and two at station 4.

Orange Shift: Squad B. For the orange shift, 6 full-time, career staff would be assigned along with 6 POC. Four career would staff Station 1; one at Station 2; one at Station 4. POC would contribute two at Station 1, two at Station 2 and two at station 4.

Green Shift: Squad C. For the green shift, 4 full-time, career staff would be assigned along with four POC. Four career would staff Station 1. POC would contribute two at Station 2 and two at station 4. The POC would be partial sleep shifts.

Blue Shift: Squad D. For the blue shift, 4 full-time, career staff would be assigned along with four POC. Four career would staff Station 1. POC would contribute two at Station 2 and two at station 4.

Observations

- Each team gets Friday, Saturday, and Sunday off every other week.
- Teams work 36 hours one week and 48 hours the following week, averaging 42 hours per week. This is within Fair Labor Standards Act requirements, and the extra hours can be paid at straight time.
- These extra 2 hours per week contribute the equivalent of one additional officer for every 20 officers.
- Officers tend to like this shift because of the weekends off and the additional pay. Even if the additional 2 hours are paid at overtime rates, it is cheaper than hiring additional personnel.

Deployment of Personnel, Additional

For all shift models:

1. Each platoon or squad would also have a captain assigned for supervisory purposes. The captain would ensure that orders from the deputy chiefs are communicated and followed, reporting back to the deputy chief on progress made.
2. Administration would work the day shift/40-hour week or could also be moved to the 12 hour schedule for additional command on shifts.

J. Methodology for future fire station locations

All station locations should be made through the evaluation of risks. Utilizing the outdated concepts of Standard of Response Coverage that is traditionally used by the U.S. Fire Service will focus the efforts of the NFD on performance measures centered around failure: buildings lost, property lost or damaged, injuries, and fatalities.

As mentioned earlier in this document, the concept of "Standard of Response Coverage" came from the United Kingdom which began developing the idea in 1936 with the work of the Riverdale Committee that focused on surviving the onslaught that was seen coming from a German attack. Resources were to be deployed to survive the initial attack and minimize losses from ensuing fires.

The work of the Riverdale Committee was revised several times with the last release in 1985. It was about that time the concept was introduced in the United States and it has been slow to catch

on. However, the United Kingdom moved far ahead of this one-dimensional approach to deploying resources using tactical processes such as time, equipment and numbers of people. The UK advanced towards an “outcome” based approach that focused on prevention, mitigation, and elimination of risk so as to not have to respond in the first place. It found that deploying using the old model resulted in the same outcomes year after year with the same or approximately the same losses. By utilizing the new approach and utilizing resources strategically, the outcome was a safer community both for citizens as well as responders.

It is this methodology that the ICMA embraces and encourages Novi to integrate into its developing system.

By forcing the agency to focus on outcomes versus outputs, a number of questions will have to be asked before locating stations or resources in the future:

1. What are the calls for service? If there are no calls, there is no need to locate stations. The former scenario was developed around the theme, “if we build it, they will come,” meaning if we build a fire station, there will be calls for service that will be received. By focusing on prevention and mitigation, there should be fewer calls and the need for stations can be deferred or eliminated. If calls for service are medical related, then the deployed resources should be medical; it does not make sense to deploy heavy rescue if all calls for service in a developing part of the community are medical related.

2. Calls for service – both the need for response as well as time – should be tracked in a performance measurement basis. It is likely that calls for service will be received during a 12 hour period and even more likely during the day. This is nothing ground breaking or just found in Novi; it is the norm across the United States and even in other countries. The 12 hour shift, therefore, makes far more sense because more staff can be engaged during the busy parts of the day; less staff can be deployed during the slower call hours. In both cases, the need for sleep or down time is eliminated and the maximum use of hours being paid can be achieved.

The question often arises, “What do you do for a second shift?” A number of functions can be performed including the transfer of maintenance to that slower shift; inspections of larger occupancies such as shopping malls and industries; inspections of properties where the owner is awake during these hours or the business is concentrated such as nightclubs and bars; assistance in data analysis, GIS, and performance measurement not just for the fire division but also other city services; and training.

The use of the 12 hour shift also decreases the need for expansive stations as well as sleeping quarters and instead focuses on achieving work throughout the hours paid.

3. What risks have developed in the area? By reviewing risks on a regular basis, the right resources can be deployed at the right time. If an area has no population density and no risks, a station should not be built. When density or development does occur, can alternatives to deploying people be achieved through other

means (sprinklers, alarm systems, suppression devices, building construction)? By encouraging the use of other mechanisms other than people, the community can save considerable amounts of capital dollars in future years. One thing that should always be the focus: adding a human resource (one firefighter) is not just a \$75,000 expense. Rather, it is a \$75,000 expense every year for the rest of the history of the station which can equate to millions of dollars (just the career of one firefighter easily moves it into the \$2 million range). What can be achieved to alleviate the expense of \$2 million every 25 years (and one person is never deployed – it requires at least four)?

4. Land should be required as a set aside whenever a section of the city is developed; a station should never be automatic. After the area is developed, a continuing analysis should be conducted to determine when calls for service justify the expense of the station. Alternatives should always first be reviewed such as deployment of mobile resources instead of fixed base. Private ambulance companies have utilized mobile deployment based upon predictive models for calls for service for many years. The United Kingdom has expanded the approach to the deployment of fire apparatus and response and enjoys a 95% success rate (which is greater than even proposed standards in the United States).
5. The use of Geographic Information System technology and staged deployment should be utilized when locating stations or personnel resources.

Geographic Information Systems can be used to develop a grid of the community and ideally locate stations to achieve minimum response times. As areas develop, particularly road systems, planners should evaluate access so as to prevent the necessity of building additional stations to maintain minimum response times. In particular, gated communities, roundabouts and other traffic calming strategies often impact the response times of emergency units and alternatives for routing responders should be incorporated in planning reviews. One community found that by installing secondary emergency "gates" at the rear of gated communities, several fire stations could be eliminated and response time improved.

6. Staged deployment should be recognized in future response protocols.

The fire service became actively involved in delivery of EMS following studies in the 1960's by the U.S. Department of Transportation to improve the safety of roads.

The concept of ambulance protection is based on deployment of resources in two stages to achieve positive outcomes.

Unfortunately, most agencies fail to evaluate outcomes through establishment of performance measures because they fail to ask one key question of the trauma center: "What happened to the patient?" The excuse commonly used is that health rules prevent this information exchanges; this is simply not the case.

The staged deployment recognizes that the first unit will be deployed and reach the patient within 4 minutes. This does not

have to be a paramedic unit; rather, the paramedic unit must arrive within 8 minutes.

For either unit to have success, research in King County, Washington and similar areas with high success outcomes in cardiac defibrillation as well as trauma have shown that intervention needs to occur immediately. Therefore, the public needs to be educated in how and what to respond when an EMS emergency occurs. Defibrillators must be located on GIS maps and available to dispatchers for relay to callers. When such intervention occurs, a viable patient is usually delivered to responders.

Recognizing this staged development, all stations do not have to have transport units. All engine companies do not have to have paramedics. Rather, first responders should arrive within 4 minutes to continue or begin intervention; transport units with paramedics must arrive within 8 minutes. Having paramedics on engine companies is offering a service even higher than envisioned by national standard making groups. The danger is that there will not be sufficient call volumes to keep competencies in all of the interventions necessary by a paramedic such as intubation, IV, and similar procedures. Studies by the AMA have found that even some hospitals are not seeing sufficient patient loads to keep emergency room staff competent on providing these invasive processes with successful outcomes.

By utilizing mobile deployment, rapid response vehicles can be staged in developing areas to meet the 8 minute responses and

avoid duplication in fixed based stations. Less staffing can also be used.

For fire situations, the same staging is envisioned with first-due or arriving units getting to the scene within 4 minutes; the second and full alarm assignment arriving within 8 minutes.

The key to fire deployment is to arrest the fire while it is closest to the insipient stage as possible. By installing and encouraging sprinklers, the first due units can concentrate on minimizing damage and eliminating any extension of fire spread versus trying to locate the origin, clear occupancies, and perform the myriad of other actions necessary in an engulfed structure. Additional time can also be allowed for responding along with lesser amounts of staff. Responders are also safer because fire is contained in a smaller stage.

K. Proposed Table of Organization

Deputy Chief's Position and Quality Control

Often the fire service gets lost in layers of bureaucracy. Every effort should be made to create a new model of fire service delivery in Novi; one that is lean, flexible, and can quickly respond to challenges and changes.

The United States military created the concept of "Incident Command Systems" during World War II when it had to move massive amounts of equipment and personnel around the world. The flexible command structure and decentralized structure was brought into the fire service and, following September 11, 2001, expanded to all disciplines of emergency management.

The basis for Incident Command is that decisions can be made at the lowest levels without the need to request approval from the top person in the organizational chain of command. This concept builds leadership into all levels of the organization and maximizes the use of hours paid.

The strategy proposed uses a Deputy Chief to coordinate the functions throughout the fire department. The Deputy Chief of Operations will primarily focus on getting service delivery to the customer for fire along with the ancillary services such as confined space, hazmat, extrication, etc.

The second Quality Control position will focus his/her efforts on quality and safety of the organization with responsibility for EMS, training, and prevention services.

Civilians will assist in the prevention and training of citizens and be under the direct supervision of the captain who will also coordinate on-duty staff.

One significant key difference in the organizational concept will be in the use of on-duty personnel. In most traditional fire departments, on-duty personnel wait at the fire station for the call to be received; participate in some station or department training, and maintain equipment along with physical fitness.

The proposed concept is that on-duty personnel will not be in the station; they should be charged with prevention and mitigation first and response as a secondary task. By focusing the maximum efforts on prevention and mitigation, the department should begin to develop performance that recognizes success – not having incidents or calls for service – rather than evaluating on failure –

property loss, injuries, and fatalities. As the department matures, the development of some type of reward system should be studied to recognize yearly success and should not be transmitted when significant failures occur. The International Code Council has been instrumental in developing a series of performance measures for benchmarking and evaluating fire prevention and building inspection services. These should be adopted and utilized by the agency.

Goals for the on-duty personnel should be to inspect all mandated occupancies on a yearly basis (high risk, multiple family, high hazards) as well as all other structures in the fire districts of the station. One excuse will be that the staff will be away from the station; this is no different than when they attend training at the training facility but is just as important because department personnel must know what hazards and risks they are likely to encounter when responding to calls for service and every effort should be made to eliminate or minimize these risks.

In addition to inspections, on-duty personnel should be making presentations in schools, contacting and meeting with neighborhood groups, meeting with business owner associations and chambers of commerce, as well as attending other events within the primary station district areas. The same concepts that have endeared Community Policing to the public and administrators should be utilized in developing a Community Safety Officer.

If the intent is to identify a person in charge whenever the chief is not available, the use of the deputy chief title is an acceptable way to achieve the goal. A deputy chief shall be the second in command

of the department and shall have authority commensurate to the chief, but with final disposition made by the chief. A deputy chief:

- Assumes all authority of the chief, when, for any reason, the chief is absent from duty
- Coordinates the operations of all special units and personnel therein
- Develops and guides all long- and short-term planning within the department
- Reviews all disciplinary proceedings against any member of the department before final disposition by the chief
- Is receptive to all community relations programs and develops community spirit
- Controls and maintains personnel files.

As now structured, the department manages with one deputy chief and captains. The Quality Control position would report to the Deputy Chief and can be modified in the future with added responsibilities.

Recommendations

We recommend a restructuring of the department and the creation of a second quality control position using the existing fire marshal. No added staff would be necessary. The present duties of operations and administration can then be redirected to the deputy chief position with new performance measuring programs for the quality control/fire marshal to ensure that the department operates efficiently, effectively, and safely both for the responder as well as the citizen.

Each captain would be assigned to a platoon and would receive orders communicated and coordinated through the deputy chiefs. The captains would, in turn, assign the platoons work assignments to carry out the mission and goals of the department, reporting back to the deputy chief, quality control/fire marshal and chief.

Presently the chief and the deputy chief are *at will* employees. The additional quality control would be an *at will* position.

The concept will follow the Fair Labor Standards Act (FLSA) section regarding executives. The 3 positions; the quality control, deputy chief and chief, should be considered managerial executives and excluded from the bargaining unit applying the following definition:

A person formulates policies when he develops a particular set of objectives designed to further the mission of a segment of the governmental unit and when he selects a course of action from among available alternatives. A person directs the effectuation of policy when he is charged with developing the methods, means, and extent of reaching a policy objective and thus oversees or coordinates policy implementation by line supervisors. Whether or not an employee possesses this level of authority may generally be determined by focusing on the interplay of three factors:

- (1) The relative position of that employee in his employer's hierarchy;*
- (2) his/her functions and responsibilities; and*
- (3) The extent of discretion he exercises.*

We note that given the current staffing and deployment levels it would not be necessary to add additional personnel to accomplish this restructuring. The quality control/fire marshal position should be filled with existing personnel.

City of Novi, Michigan

