FINAL REPORT

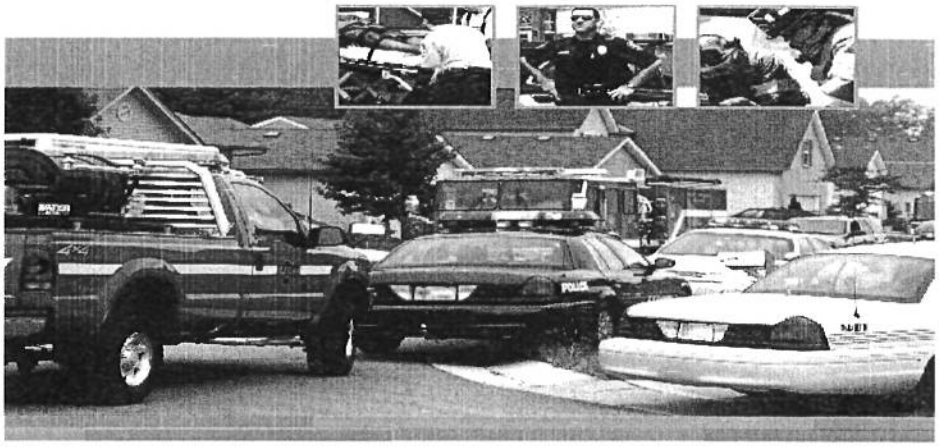
Emergency Services Review

Plymouth, Michigan

August 2010

ICMA CONSULTING SERVICES

PUBLIC SAFETY SERVICES



Helping Local Governments Achieve Measurable Results

ICMA *Leaders at the Core of Better Communities*

Submitted by:

ICMA Consulting Services

International City/County Management Association

777 North Capitol Street NE, Suite 500

Washington, DC 20002

ConsultingServices@icma.org

(202) 962-3585

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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I. Introduction

Overview

Local governments throughout the United States are grappling with the issue of how to deliver emergency services. Until recently most communities were willing to maintain traditional service delivery systems. Typically, a community staffed a full-time police department and funded either a volunteer or part-time fire agency or a career, fully paid fire service. Until the 1970s, medical first response fell largely to the police departments, with officers typically trained in advanced first aid and police vehicles equipped with oxygen and first-aid kits. Transport was typically performed by private vendors (often ambulances were operated by funeral homes) or volunteer ambulance corps. This delivery system, based on local control, has led to the current 18,000 police departments and the 30,000 fire departments which provide emergency services in the United States.

In the 1970s the concept of pre-hospital medicine evolved, which led to the emergency medical services (EMS) that we are familiar with today. Initially, the fire service rejected the idea of training firefighters as paramedics. That role fell to private ambulance companies, volunteer units, or hospital-based systems. Many cities, such as Saginaw, Michigan, still operate under such a system.

However, as the number of fires and fire-related deaths dropped dramatically and as the role of pre-hospital medicine increased, many fire departments began cross training firefighters as emergency medical technicians (EMTs) or paramedics. The premise was that the firefighters could perform medical services between fire calls with no additional staffing. That, of course, was simply not feasible since the medical crews needed to be available constantly and were often

needed at the scene of fires. What started out as a secondary function of fire departments has now become the primary mission in most agencies. Medical calls total at least 60 percent of emergency calls and, in some instances, up to 80 percent of an agency's calls for service.

The current financial challenges facing most local governments are forcing government officials to reconsider the traditional manner of delivering emergency services. Until recently, police and fire departments have been exempt from the kinds of scrutiny often given to other government functions and have avoided productivity analysis. However, as other departments have been cut dramatically, officials have no other place to look for savings.

The potential for significant reductions in emergency services certainly exists. Many cities spend the vast majority of their operating budgets on the police and fire departments. Many local governments are seeking alternatives to traditional delivery systems and are using true workload analysis to make staffing decisions based on facts rather than emotion.

Often this analysis results in a shared-services or regionalization approach, which could involve contracting for services with other local governments, a merger of two or more public safety entities, or the privatization of some services such as EMS.

Regionalization should help to reduce the number of senior administrators that would otherwise be required for each separate service. In a wide range of small and medium-sized cities, true emergencies consume a small fraction of personnel time. High staffing levels are more often an insurance policy for rare events. With the

pooling of resources, regionalization reduces the chance of all units being busy and incurring a shortage of personnel in rare instances of a major emergency. It is especially valuable for sharing specialized units such as SWAT teams or diving teams. It also facilitates sharing of the training function. However, if the goal is that every part of a city be within four or five minutes of the nearest fire station, regionalization has limited impact unless there is an opportunity to place a station on the boundary between participating municipalities to cover both.

In the aftermath of the 9/11 attacks, there has also been a greater emphasis on coordination of the efforts of the police and fire services. Interoperability has become a mandated goal. Many cities have institutionalized this effort by placing the management of all public safety functions under the command of one person. Such an approach is not limited to smaller communities. In Indianapolis, for example, police, fire, EMS, emergency management, and animal control all are managed by the director of public safety.

Advances in technology have given communities alternative delivery systems compared to traditional approaches. For example, the use of a compressed air foam system (CAFS) permits firefighters to extinguish fires with fewer staff members, less water, and far less collateral damage than a traditional response would require. Fire interruption technology (FIT) allows firefighters to extinguish fires or confine them to the room of origin with far less exposure to the firefighters themselves.

An automatic external defibrillator (AED) allows police officers and the public to initiate the only treatment for sudden cardiac arrest. Successful public access programs incorporate public training, installation of AEDs in public areas, coordination with police/fire

dispatch centers, and police response to cardiac events. Miami-Dade County installed AEDs in all police cars after finding that, although dispatched simultaneously with fire and rescue services, the police officers arrived at the scene of a cardiac event before the firefighters in the majority of calls.

Simply put, many local governments are taking a new look at the manner in which these services are being delivered and are devising a more rational use of declining government resources.

We applaud the city of Plymouth's efforts in this regard and appreciate the opportunity to contribute to the discussion.

The Study

The city of Plymouth, Michigan, provides police, fire suppression, EMS (both basic and advanced life support) initial response, and ambulance transport. These services include

1. Municipal police services provided by the city.
2. Fire services provided by contracting with the Plymouth Township Fire Department at a cost of $1,000,000 per year.
3. Advanced life support (ALS) provided by the fire department for EMS calls; although most transport to the nearest hospital is usually turned over to Huron Valley Ambulance (HVA), the fire department often performs this function.
4. Dispatch of police and fire provided by Plymouth Township at an additional cost of $285,000; this service also includes oversight of the lockup of prisoners.
5. Initial EMS response and medical transport provided by HVA at no cost to the city; the service provided is essentially duplicated by the fire department.

The city seeks to review alternative delivery systems that could reduce costs to the city and/or improve service levels. The primary motivations for this study are as follows:

1. The city of Plymouth faces an extremely low risk of less than one substantial fire per month. The total number of fire and EMS calls in the city is only 2.3 per day. Few cities can afford to contribute $1 million to partially fund six or seven full-time fire department positions 24 hours a day, 7 days a week, in three units to handle so few calls. Nor can the city and township afford to spend four times that amount for units that are busy at calls in the city and township combined for only 90 minutes a day.

2. The city police department call workload is modest, with officers busy less than a third of the time at either citizen- or patrol-initiated calls. Their response times to calls are excellent, better than other emergency service units answering city calls. Thus, if more broadly trained, these officers could contribute to initial treatment at the scene of a medical or fire emergency.
3. HVA is already a high-quality, state-of-the-art provider of ALS services in the city and region.
4. The township's fire department seems torn between trying to deliver fire suppression services and expanding further into the EMS delivery system. Since there are far more EMS calls than fire calls, there is always the risk that the fire personnel could be tied up on routine EMS runs when the rare fire occurs. Thus, the department may transport a patient to the nearest treatment center—usually, the more advanced emergency medical facilities in Ann Arbor—even though that facility may not be rated as appropriate for that particular medical emergency. This use of fire resources and diversion of patients does not optimize safety for Plymouth residents.

ICMA has reviewed in great detail the operations of this system and believes that there are at least two major broad categories of alternatives that can be considered to reduce the cost of fire and emergency medical services while maintaining and enhancing the high quality of services provided. In both alternatives, it is critical that the city continue to maintain effective mutual aid agreements.

There is an existing contractual relationship between the City of Plymouth and the Plymouth Township Fire Department. One alternative for maintaining this relationship, albeit at a reduced cost,

involves staffing the township's fire department with full-time firefighters during only daytime hours, when it can be difficult to get on-call personnel to respond. Within this alternative, we evaluate three distinct options (described below). EMS transport would be the almost exclusive responsibility of HVA. This would free up fire resources more quickly and reduce the chances for an emergency incident conflict. The total cost to the city for these options range from $420,000 to $567,000.

The second alternative involves separating from the Plymouth Township Fire Department and transforming the city's police department into a public safety department (PSD). In addition HVA would be contracted to station a paramedic ECHO unit in the city. This unit, which would be staffed by a single paramedic, would respond to medical emergencies by arriving first to assess and begin stabilizing the patient. HVA would dispatch a separate ALS ambulance to transport the patient. Most often the ECHO unit would quickly transfer patient responsibility to ambulance personnel and return to standby status for the next medical emergency. Within this category, we evaluate two distinct options for staffing and deployment; these options range in cost from $499,000 to $771,000.

In reviewing these alternatives and coming to a decision, city officials will need to balance several interrelated factors:

1. Interest in continuing the city's existing relationship with the Plymouth Township Fire Department
2. Cost of service
3. Level of service in terms of response times and coverage for medical emergencies, fires, and police calls

4. Time until changes can be fully implemented and savings begin to accrue

The report proceeds as follows:

II. Summary of workload and response time statistics for the police department, fire department, HVA, and township dispatch services

III. Recommendation with regard to EMS transport, initial response, and dispatch operations

IV. Analysis of five options for fire service delivery and first response to EMS

V. Operation of a public safety department

VI. Paid on-call fire services and mutual aid

VII. Mutual/automatic aid

VIII. Detailed analysis of workloads and response times for police patrol services.

IX. Detailed data analysis of current fire and EMS workloads and response times in Plymouth Township

X. Detailed analysis of HVA calls and response times.

II. Summary of Workload and Response Times

Police Services

In the period from March 2009 to February 2010, the police department recorded 42 events per day, 34 of which would be classified as calls. From November 2009 through February 2010, the department kept better records of officer-initiated calls such as traffic stops. These self-initiated calls averaged one per hour as compared to citizen-initiated calls, which average one every two hours overall. At peak times, the average is one citizen-initiated call per hour.

Table 1. Calls per Day, by Initiator and Months

Initiator	March-April	May-June	July-Aug.	Sept.-Oct.	Nov.-Dec.	Jan.-Feb.
Police-initiated	18.6	18.9	17.8	16.5	23.3	26.6
Other-initiated	14.1	14.5	14.9	13.4	12.7	11.2
Total	**32.7**	**33.4**	**32.7**	**29.9**	**36.0**	**37.9**

- Officer-initiated calls averaged 11 minutes per call as compared to 21 minutes for other-initiated calls.
- The overall mean number of responding units was 1.0 for police-initiated calls and 1.4 for other-initiated calls.

Deployment

The police department deployed an average of 2.5 officers (including supervisors) during the 24-hour day in both summer and winter. There was some variability in average deployment. However, no specific time of day, day of week, or season averaged fewer than 2.3 officers or more than 2.8 officers on duty.

Summer Workload

- Total calls for summer 2009 were 33 per day, or 1.4 per hour.

- Total workload was 8.9 work-hours per day, meaning that an average of 0.37 officers per hour were busy responding to calls. During peak times the average increased to 0.5 units busy with citizen calls—one call per hour.
- After adding self-initiated calls and out-of-service events, the average number of busy units was 1 out of the 2.5 on average deployed.
- Traffic-related activities constituted 57 percent of calls and 33 percent of workload.

Winter Workload

- Total calls in winter 2010 were 38 per day, or 1.6 per hour, which was 15 percent higher than in summer.
- Total workload was 12 work-hours per day, or 0.51 officers per hour.
- Traffic-related activities constituted 72 percent of calls and 59 percent of workload. This higher number was due to improved recording of patrol activities.

Response Time

The average police response time to Priority 1 calls was 4.1 minutes. For all call priorities, the overall average was 5.5 minutes. Priority 1 call rates are of special interest when planning a public safety department. Patrol officers need to be ready to interrupt their lower-priority activities in case of a true fire or medical emergency. Priority 1 calls would in general not be interruptible. Thus, it is important to note that priority 1 calls occur relatively infrequently. In Plymouth such calls occur once every two days.

Fire/EMS Department: City of Plymouth Calls

Workload

The Plymouth Township Fire Department responds to calls in both the city and the township. Here we summarize just the city's share of the workload. Later, we report on all fire department runs. Fire department units were busy at city calls a total of 506 hours in 2009. This is an average of 1.5 hours per day shared by three units. Two-thirds of this work entailed EMS runs, and the department responded to them in rescue units. The three fire engines combined were used to respond to calls on average less than 20 minutes per day, which is less than 10 minutes per engine per day at fire category calls.

Fire-EMS Response Times

The average response time was 7 minutes. This average increased to 8 minutes both in midday and in early morning hour of 5 a.m. Ten percent of the calls resulted in a response time greater than 10 minutes. More than half the average response time was associated with dispatch processing delay and turnout. The data recorded by the regional dispatch database (CLEMIS) indicate a 2.9 minute dispatch processing delay and 0.6 minutes of turnout. This is a total of 3.5 minutes from call receipt until a unit is en route.

Huron Valley Ambulance

HVA is a state-of-the-art service. The organization not only provides ALS services but is also qualified to provide paramedic training for personnel. HVA trained many of the ALS-certified firefighters in the Plymouth Township Fire Department. As new technologies become available, such as a new information system, this organization routinely help transfer the technology to the fire department. The quality of their service is reflected in their expanded service region, which crosses several counties.

HVA's dispatch operation is also state-of-the-art. It has sophisticated computer software packages that can generate recommendations to redeploy ambulances as a result of changing call patterns over the course of a day. Its dispatchers are trained to the highest level of EMS response, which includes protocols for CPR over the phone; their level of training is higher than that of the Plymouth Township dispatchers. As a result, the township dispatchers are supposed to immediately transfer all medical emergency calls to the HVA dispatching center. Recently, the city of Ann Arbor turned over responsibility for dispatching its fire department services to HVA. Thus, it is obvious that turning over more of the responsibility for EMS to HVA cannot reduce the quality of treatment and transport.

HVA responded to an average of 2.2 EMS calls per day in Plymouth. These calls tied up an ambulance, on average, two hours per day. Total response time was 6.4 minutes. During the morning at 5 a.m., the average response time was a minute longer—7.5 minutes. One specific concern was the delay between receipt of a call at the township dispatch center and the time of receipt at HVA. We found this delay to be, on average, 1.7 minutes.

Plymouth Township Dispatch

The Plymouth Township dispatch center receives all local 911 calls in the city and township and then dispatches appropriate police, fire, and ambulance services. The city's share of the cost is $285,000 per year. However, since dispatching is a 24/7 operation, the personnel in the dispatch room also provide oversight for prisoners in lockup.

Overall, the dispatch center handles about one other-initiated police call in a little less than two hours in the city of Plymouth. At the

midday peak, the average in the city is one police call an hour and one EMS-fire call every six hours.

For fire and EMS calls, the average dispatch processing delay was almost 3 minutes for fire personnel. For police calls, the average was between 1.1 and 1.5 minutes, depending on the time of year and the call priority. For notifying HVA, the dispatch delay was 1.7 minutes.

These numbers seem high relative to what is possible. An efficient dispatching system can start a unit in motion in under a minute. The key to rapid dispatching is to immediately identify the type of call and location. Once this minimal information is gathered, a unit can be sent. While the unit is en route, the operator can gather more specific information and pass that on to the emergency unit while it is traveling. This process is facilitated if the emergency unit has a computer in the vehicle to receive the information. The HVA dispatch operation and its ambulances are designed to work this way. The HVA average dispatch delay was only 0.5 minutes and the average turnout time was 0.6 minutes. The township dispatch center staff are working to improve the accuracy of their dispatch record keeping and to reduce delays in getting units en route to emergencies.

III. Recommendation for EMS and Dispatch

Police units were the fastest to respond to emergency calls. Their average response time to the highest priority calls was about 4 minutes. Ambulance response times in Plymouth were 6.5 minutes and fire department response times were 7.5 minutes. Given this pattern of response, we recommend that all police officers receive training as medical first responders and that they carry AEDs (automatic external defibrillators). In addition the city should maintain AEDs in heavily frequented areas. An added dimension would be integrating the location of all AEDs in the area into the computer-aided 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. By subscribing to the AED Link system, 911 agencies can know the whereabouts of nearby registered AEDs. This should be coupled with a public awareness campaign. These recommendations are independent of any of our proposed changes with regard to the fire or ambulance service.

The city and township should review current procedures for obtaining information from callers and dispatching units to an emergency. The goal should be to reduce the delay in processing until a unit is dispatched to less than a minute for all types of emergency calls.

Lastly, it is generally not cost-effective to maintain an independent dispatch operation for small cities and townships. The number of citizen-initiated calls in the city averages a little more than one call every two hours. If we assume that the township has three times as many emergency calls, the total is still only a few emergency calls every hour. It is hard to financially justify a 911 operator and a

separate dispatcher and, at times, a supervisor for this low volume of calls. We recommend that the city and township explore opportunities for regionalizing dispatch operations. Since the lockup is linked to the dispatch center, the communities should explore regionalizing this activity as well. The city of Plymouth processed more than 550 suspects in 2009, for an average of 1.5 per day. In exploring regionalized lockup, the city would need to assess the time it takes for an officer to deliver a suspect and return to patrol.

IV. Five Options for Fire and EMS in the City of Plymouth

Description of Options

Options A, B, and C below are designed to maintain the current basic structure for fire and EMS services 12 hours a day and either 5 or 7 days a week. These options also vary with regard to staffing two or three stations with firefighters. Full-time firefighters are used to staff the stations at times when it may be difficult to have on-call personnel respond. During the remaining hours, part-time firefighters would be at the stations and supplemented with an extensive paid on-call service. The major operational change is that HVA would do all medical transport, enabling firefighters responding to EMS calls to return to standby status more quickly. Moreover, because they would not be transporting, the fire department should use SUV-type vehicles for medical first response rather than large ambulances. The city of Plymouth's share of the costs would be between $420,000 and $567,000 per year, depending upon the option selected.

Option A: Ten full-time firefighters in two stations, 12 hours a day, 7 days per week.

The ten full-time firefighters include three experienced supervisors. This is enough personnel to maintain a minimum of four personnel on duty, including at least one supervisor for 84 hours per week, or 50 percent of the time. Part-timers would fill in the remainder of the week at a much reduced cost. They would be supplemented in the case of a rare fire by a large corps of paid on-call volunteers. Firefighters would continue to be ALS responders but would do no transport. HVA would respond to all medical runs and handle all transports.

This option is the lowest cost option designed to maintain the city's continuing fire/EMS relationship with the township. It would cost an estimated $420,000 per year and could be implemented immediately in a negotiated agreement. Because only two stations would be staffed, average travel time is projected to increase by a minute. However, an improved dispatch operation could compensate for the longer travel times.

Option B. Ten full-time firefighters in three stations, with full-time firefighters 12 hours a day, only 5 days per week.

The ten full-time firefighters include three experienced supervisors. This is enough personnel to maintain a minimum of six firefighters on duty, including at least one supervisor. The full-time firefighters would be deployed only 60 hours per week. The rest of the week, the three stations would be staffed with less costly part-time firefighters supplemented with on-call firefighters. Firefighters would continue to be ALS responders but would do no transport. HVA would respond to all medical runs and handle all transports. This option has the advantage of maintaining three stations and thus not affecting travel times. It would cost almost $70,000 more than the previous option because of the increased use of part-timers.

Option C. Fourteen full-time firefighters in three stations, 12 hours a day, 7 days per week.

The 14 full-time firefighters include four experienced supervisors. This is enough personnel to maintain a minimum of six personnel on duty, including least one supervisor for 84 hours per week, or 50 percent of the time. The rest of the week, the three stations would be staffed with part-time firefighters supplemented with on-call firefighters.

Firefighters would continue to be ALS responders but would do no transport. HVA would respond to all medical runs and handle all transports. This option has the advantage of maintaining three stations and thus not affecting travel times. The city's share of the cost of maintaining four more firefighters than required in options A and B is $100,000. However, fewer part-timers would be needed.

In the three options presented above, there is no fundamental change in the police services except for possibly providing medical first responder training for police. Most of this limited EMS training could be accomplished during regular duty hours with little out-of-pocket cost to the city. However, each option involves firefighters working regular rotations of three or four 12-hour days per week. This could entail a fundamental change in lifestyle as current shift schedules have them working one full day out of every three or four days.

Option D. Conversion to a public safety department with no increase in patrol force. Twelve police personnel trained to fight fires and provide basic first response to EMS calls.

Under option D, the city would convert the police department to a dual-trained PSD over a period of 18 to 24 months. HVA would provide an ECHO unit once the conversion was complete. Fire services would be supplemented by paid on-call personnel, with the full cost borne by the city and continued mutual aid. One of the patrolling public safety officers would be driving an SUV-sized vehicle capable of delivering several hundred gallons of water/foam to a fire.

This plan also calls for the city to have someone near or in the fire station at all times who is trained to drive and operate the equipment. This individual, who would not be a fully trained firefighter, could be

any of a host of staff working in city hall or a part-timer paid a modest hourly wage during non–city hall operating hours.

The annual operating cost would be approximately $500,000 with one-time training and equipment costs of $72,000. This $72,000 is mainly the tuition cost for firefighting courses and for the purchase of firefighting gear for each officer. The biggest start-up in the transition would be the purchase of two major fire engines costing approximately $936,000. However, this cost would be amortized over a ten-year period and included in the increased annual operating budget. No cost estimates were obtained for making changes to the building that would house this fire equipment.

Another major start-up cost is the time that police officers spend cross-training as firefighters. However, the city has already sent one individual through this training; it did so during regularly scheduled hours and incurred no added out-of-pocket costs for overtime to cover the officer's absence. Thus, we did not include payroll costs for this training. This meant that the city absorbed a 10 percent reduction in available patrol personnel while this officer was being trained. If the city wanted to avoid this reduction, it could hire an additional officer for two years at a cost of $75,000 per year to fill in while police officers are rotated through firefighter training at a rate one every two months. This would increase the start-up cost by $150,000 spread over two years.

With public safety officers on patrol and an ECHO unit, initial response time to medical and fire emergencies would improve by three minutes. This is based on the fact that police response times in the city are currently several minutes shorter than fire equipment response times in the township. However, it could take longer to get more than three firefighters to the scene of the rare substantial fire. The key to effective

firefighting in these few instances would be the rapid response of paid on-call volunteers and mutual aid resources. Mutual aid is used today as the township fire department does not routinely staff enough firefighters to attack a major fire incident without it.

Under option D, 12 members of the Plymouth police department's patrol force would be trained as public safety officers. This training would include both fire and basic first responder EMS.

- Two detectives and two other city hall personnel would be trained to drive fire equipment and operate engines and provide coverage 50 hours per week. They would be supplemented by part-time employees who would be paid to stay in fire station 62 hours per week and would also be expected to sleep in the station. In addition, they would be trained to drive and run the fire equipment, and they can be given other jobs while sitting around.
- Public safety officers would earn an estimated $5,000 more per year than regular patrol officers. This would come from a combination of pay raises and extra opportunities for overtime.
- A part-time fire-trained supervisor would be added with responsibility for oversight of fire services. This individual would be expected to respond to substantial fire emergencies.
- Paid-on-call firefighters would respond to fire category calls only. Actual fires occur less than once a month, but they would respond to all fire category calls, which total about 20 a month. This would free up patrol to return to police work while the on-call personnel complete the call.

- EMS calls: HVA would handle all medical runs with one paramedic stationed in the city at all times. Public safety officers would respond to all medical calls as first responders.
- Two major pieces of fire equipment would need to be purchased.

Option E. Conversion to a public safety department with an increase of three more in the patrol force.

Option E is designed to provide more patrol services and quickly convert the police department into a PSD over a period of 12 months. It would also use some of the savings from the new arrangement to fund three more patrol officers. HVA would provide an ECHO unit once the conversion was complete. Fire services would be supplemented by paid-on-call personnel and the continued use of mutual aid just as occurs today. The township fire department does not routinely staff enough firefighters to attack a major fire incident without mutual aid. The full cost of paid-on-call personnel would be borne by the city of Plymouth. The annual operating cost would be approximately $771,000 with a start-up cost of $327,000. Initial response time to medical and fire emergencies would improve significantly.

With this option, the city would immediately hire three more personnel. One of the three should already be an experienced public safety officer. All members of the department, including detectives, would be trained for both fire and basic first-responder EMS. All other aspects of the department would be the same as under option D. The added personnel would allow the city to send teams of two or three police officers to firefighter training at the same time without reducing patrol coverage. Training could be completed in 12 months, at which point the city would have three more officers. The total of 15 public safety

officers including supervisors would enable the city to maintain a minimum complement of three people on patrol around-the-clock. The additional personnel would slightly reduce average response time as compared to that under option D. This, however, would be the most expensive option. The annual operating cost would be $771,000, which is still several hundred thousand dollars less than the city's contract with the township. There would also be a significant start-up cost to pay for the three more people during the first year. The cost of these personnel, plus training and personal equipment, is estimated to be $327,000.

Table 2. Operational Impacts and Costs

Option	EMS	Fire	Police	Cost
A 2 stations 84 hours	Response time slowed by 1 minute. HVA does all transport.	Initial response slowed by 1 minute and takes longer to get more than 4 firefighters to scene.	No impact	$420,000
B 3 stations 60 hours	Response time unchanged. HVA does all transport.	Initial response time unchanged.	No impact	$489,000
C 3 stations 84 hours	Response time unchanged. HVA does all transport.	Initial response time unchanged.	No impact	$567,000
D Public Safety Department	Save approximately 3 minutes on average basic response time.	Save 3 minutes on initial response but longer to get full complement.	More complete service and minor negative impact on response time.	$499,000
E Increased public safety	Save more than 3 minutes on average basic response time.	Save more than 3 minutes on initial response but longer to get full complement.	More patrol coverage and modest improvement in response time	$771,000

Table 3. Detailed Costs for the Five Options for Fire and EMS Delivery in Plymouth

Option	Additional Patrol	Pay Raise & Overtime	In Station	Plymouth, 25% Share: Firefighters Full-Time	Plymouth, 25% Share: Firefighters Part-Time	Fire Engine Equipment	Paid-on-Call	HVA ECHO Unit	Annual Cost	Start-up Year
A	0	0	0	$311,250	$74,256	0	$34,448	0	$419,954	$0
B	0	0	0	$311,250	$143,208	0	$34,448	0	$488,906	$0
C	0	0	0	$421,250	$111,384	0	$34,448	0	$567,082	$0
D	0	$60,000	$45,136	0	0	$146,558	$79,781	$168,000	$499,475	$72,000
E	$261,382	$70,000	$45,136	0	0	$146,558	$79,781	$168,000	$770,857	$327,000

Detailed Costs for Five Options

Options A, B, and C. The city of Plymouth's share of all fire personnel costs, including a full-time fire chief, is 25 percent,

- Full-time firefighter salaries are based on current pay schedules in the township.
- Part-time firefighters would be paid $17 per hour.
- Paid-on-call personnel (estimates based on Northville pay scale)
  - Thirty paid on-call firefighters, trained 100 hours per year and paid $11/hour for training
  - On average, 10 on-call personnel responding to 499 calls per year (the total number of fire category calls for 2009) and paid $21 per response
  - Cost of paid-on-call personnel: $138,000 to cover the city and township, with the city paying 25 percent, or $34,500

Options D and E. City of Plymouth pays 100 percent of all firefighter personnel costs.

- Paid-on-call personnel
  - Twenty paid-on-call firefighters trained 100 hours per year and paid $11/hour for training
  - On average, seven on-call personnel responding to 223 calls per year (the total number of fire category calls in Plymouth for 2009) and paid $21 per response
  - Cost of $25,000 for experienced part-time fire executive to oversee all fire operations and training and to respond to major fire calls
  - Cost of $80,000 for a paid-on-call plus experienced part-time supervisor
  - One person in or near the station 24/7 to drive the first piece of equipment

- 50 hours per week: a detective or other city personnel in city hall trained to drive and operate the fire equipment
- 62 hours per week: an individual to man the station at $14 per hour; this individual would also be expected to sleep in the station with no pay (56 hours).
- Total cost: $45,000

— Fire equipment
  - $586,000 for 75' ladder truck with a pumping capability of 1600 gpm (recent price quote for Northville)
  - $350,000 for a pumper with 750-gallon capacity. Northville paid $269,000 nine years ago for such a unit; assume a 3 percent price annual appreciation rate since 2001.
  - $25,000 per year in small replacement equipment.

— Start-up costs
  - In option D, primarily for fire-training tuition and personal fire gear
  - For all training, done during regular time, for police officers to become firefighters and basic medical responders. With one officer trained at a time, it would take up to 24 months to complete the training of 11 patrol personnel.
  - In option E, the most significant cost involves adding three more personnel, including one experienced public safety supervisor who would be highly paid.

- Training accomplished in 12 months, with the extra personnel covering shifts as groups of three personnel are trained simultaneously.

V. Public Safety Department

Administrative

If the city of Plymouth pursues a public safety consolidation, the effort should be directed toward an ultimate full consolidation. Given the relatively small size of the Plymouth agency, it will be necessary to ensure that the city can field an on-duty team that can mount an initial fire-ground attack. This requires on-duty personnel to be skilled in both police and fire tactics. In addition, personnel should be trained in basic medical first aid since their response times are less than those of other local emergency service personnel.

Training

All public safety officers would need to be both police and fire certified. This would require achieving Firefighter I and II certifications as well as police officer certification and Department of Transportation Medical First Responder certification. Personnel should not, however, be trained to the level of EMT or paramedic as it is too time-consuming to maintain all three levels of training. In addition, HVA provides a cost-effective alternative. Requirements for training are

- 227 hours for Firefighter 1 (A & B) and 2 (A & B) classes. The Firefighter II classes can be challenged; the class can be independently studied with the test only.
- 48 hours for Medical First Responder.

The less a skill is used, the more often training is required to ensure that personnel respond and act effectively in case of an emergency. HVA can provide continuing EMS refresher training for officers while they are on duty. Fire training should be linked with training of paid on-call officers. Some of this training would be done as overtime. This

would provide a financial incentive for officers to obtain and maintain their skill levels.

Staffing

The department should be headed by a chief of public safety who would ultimately hold certification as both a police officer and a firefighter. Initially the new department would have no experienced firefighter supervisors. During this interim period, it would be necessary to retain the part-time services of an experienced firefighter supervisor, who would oversee training and operations and respond to all substantial fires.

With option D, the shift and deployment schedule would be unchanged. There would be four platoons consisting of at least a supervisor and two public safety officers. This might lead to some increase in overtime to ensure that minimum manning levels are maintained. Currently, the city sometimes operates with just two officers on patrol.

One of the public safety officers would patrol in an SUV capable of delivering hundreds of gallons of water with Class A Foam or a Compressed Air Foam System. There should also be one person on duty on or near the station to drive an engine immediately to the scene of a fire call. Upon receipt of the call, paid-on-call personnel would be called in. Some would respond directly to the call scene while others would go to the station to staff a second piece of equipment if needed.

With option E, the city would hire three additional patrol officers. The city should consider recruiting an experienced public safety supervisor as one of the three new hires. Given the number of PSDs in Michigan, the city should be able attract the right candidate for this position. This

individual would be responsible for coordinating all training activities of the agency and would also be expected to assume patrol responsibilities as a first-line supervisor.

Dispatch

The communications center and dispatch operation is the central nervous system of any emergency service. This operation is even more critical in a multifaceted emergency service that includes a PSD, an ECHO paramedic unit from HVA, and paid on-call firefighters. The dispatchers must carefully track the activity of patrol personnel as they may need to interrupt a lower-priority activity in case of a medical or fire emergency.

In case of a fire, the dispatchers would need to send

- Patrol units to the fire scene, especially the public safety officer patrolling in a fire-suppression-capable vehicle
- First piece of equipment from the station
- Some on-call personnel directly to the fire scene
- Other on-call personnel to the station to pick up the second piece of equipment.

For EMS runs, the 911 operator would notify HVA immediately and transfer dispatch to it. HVA would then dispatch

- A paramedic ECHO unit
- A patrol officer as a basic first medical responder
- An ambulance.

Fire Apparatus

Among the recommendations: a Compressed Air Foam (CAF) quick-attack pumper, which would be capable of pumping and delivering water using the on-board CAF system. It is recommended that the unit have a two-person cab and equipment necessary to extricate trapped

motor vehicle occupants. The vast majority of fire calls can be handled by this piece of apparatus. A second apparatus should be a combination 75' ladder truck and pumper (quint).

Additionally the city should consider using one quick-response vehicle (QRV) as part of its patrol fleet. This is typically a pickup or SUV carrying 300 gallons of water and a CAF system. Public safety officers would routinely patrol in such a vehicle and provide immediate, often instantaneous response to fire calls, such as car or dumpster fires. This type of vehicle has been routinely used in industrial fire/security settings as well as in specialized services such as dignitary protection. It provides a highly visible public presence for both the law enforcement and fire-suppression capabilities of the agency.

Fire Interruption Technology (FIT)

Consistent with the use of technology to expand fire suppression capabilities (such as the use of CAFS), we recommend that each patrol vehicle and piece of fire apparatus be equipped with FIT equipment. This technology enables a single officer on scene to have an impact either extinguishing the fire or slowing its spread to allow additional equipment and personnel to respond. This is done without any risk to the individual public safety officer.

VI. Paid On-Call Volunteers/"Wranglers" and Mutual Aid

Paid on-call firefighters are a cost-effective option to supplement either a limited number of full-time firefighters or a PSD. Northville, a neighbor of Plymouth, provides an excellent example of a long-standing on-call fire department. Except for the chief and a part-time inspector, all other personnel are on call. These individuals respond to both fire and medical emergencies.

We did not consider this alternative to the current Plymouth emergency service system. For Plymouth, all alternatives considered involve the stationing of personnel on-duty for immediate ALS response to all medical emergencies. With regard to fires, the deployment plan includes on-duty personnel who could immediately take initial action at a fire scene to put out small fires. For larger fires, they could plan the attack but have to wait for on-call personnel to handle fully engaged home fires. A few times a year, they would need to request mutual aid from neighboring communities.

Additionally, the city may wish to encourage some of its non-sworn employees (such as public works employees) to serve as what are commonly called "wranglers," receiving a stipend for this additional work. These individuals would need to live or work at a reasonable distance from the city. The city should also train its public works personnel in confined space rescue, taking advantage of heavy equipment available in that department.

There are several critical elements for an effective paid on-call operation. As noted earlier, continuing education and practice is important since these firefighters will have few opportunities to fight actual fires. Northville maintains a standard two hours of training

every Thursday night. The city of Plymouth may not need to provide quite as much training; unlike Northville, it will not require its on-call personnel to handle medical emergencies.

Another concern involves encouraging on-call personnel to respond when called. The city should be expansive in calling in on-call personnel. It is important to develop a pattern of regular response. On-call response that is limited to just actual fires occurs too infrequently to sustain a long-term level of awareness and responsiveness. The attitude should be that for noncritical calls, the on-call personnel can relieve the full-time personnel and return them to standby status for next emergency. The total cost for all the on-call personnel is less than the cost of even one full-time officer.

Lastly, there needs to be a well-defined fire scene management structure with clear lines of authority for managing the fire scene. If the city goes with a PSD, it will need to develop a strategy to ensure that in the early years some on-call personnel have significant firefighting experience. If the city continues to partner with a reduced Plymouth Township Fire Department, it needs to be concerned about the relationship between full-time firefighters and paid-on-call personnel. Often this relationship is problematic, so it is critical that the two groups train together. Senior personnel should be held directly accountable for the quality of this relationship.

VII. Mutual/Automatic Aid

The city of Plymouth is a separate signatory to the Western Wayne Mutual Aid Agreement, as is Plymouth Township. It is critical for decision makers (elected officials) to understand that the PSD will continue to rely on existing agreements for mutual aid. Like most of the fire departments in the area, including the Plymouth Township Fire Department, the agency will not have enough personnel on duty to respond to a rare, major event. The department will have the capability to launch an initial attack while awaiting additional resources. The Plymouth PSD will be expected to respond as requested to other communities, just as those communities would respond to the city. This response would be made primarily by the paid–on-call members of the PSD and off-duty public safety officers.

VIII. Police Data Analysis

Introduction

This report on police operations for the city of Plymouth focuses analysis on three main areas: workload, deployment, and response times. These three areas are almost exclusively related to patrol operations, which constitute a significant portion of the police department's personnel and financial commitment.

All information in this report was developed directly from data recorded by the Plymouth Township dispatch center. The purposes of this report are to provide the city with our findings and to allow the police department to review and bring to our attention any dispatch information that may be inconsistent with other internal records of the agency.

Most of the first section of the report, concluding with Table 8, uses the call and activity data for the entire year. For the detailed workload analysis and the response-time analysis, we used two four-week sample periods. The first period was the months of July and August 2009 (July 7 to August 31), or *summer*, and the second period was the months of January and February 2010 (January 4 to February 28), or *winter*.

Workload Analysis

As with similar cases around the country, we encountered a number of issues when analyzing the data supplied by the Plymouth Township's dispatch center. We made assumptions and decisions to address them. We describe these issues, assumptions, and decisions below.

- A small percentage (2 percent, or approximately 380) of events involving patrol units showed zero time spent on-scene.
- The computer software generates a large number of event codes. This led to 170 different event descriptions, which we reduced to 17 categories for our tables and 10 categories for our figures.
- A significant proportion of events (18 percent, or almost 2,700 events for the year) involving patrol units were missing arrival times. For these, we could not calculate a valid response time or on-scene time.
- The police department improved its procedure for recording traffic stops in the middle of November 2009. This means that we will see an increase in activity from November 2009 through February 2010 reflecting this improvement.

Our study team has worked with many of these data problems in previous studies. To identify events that were canceled en route, we assumed zero time on-scene to account for a significant portion of them. Any event with an on-scene time of less than 30 seconds was labeled *zero on-scene*. We also used the data's source field to distinguish between police-initiated and other-initiated calls.

When we analyze a set of dispatch records, we go through a series of steps that we detail as follows.

- We first check all records for accuracy. For example, we remove duplicate records for the same unit recorded for a single activity.

We also identify all incomplete records. These include records lacking valid clear times.

- At this point, we have a series of records that we call "events". We identify these in three ways.
  - — We distinguish between patrol and nonpatrol units.
  - — We assign a category to each event based upon its description.
  - — We indicate whether the call is zero on-scene, police initiated, or other initiated.
- Finally, we remove all records that do not involve a patrol unit, to get a total number of patrol-related *events*.
- We focus on a smaller group of events designed to represent actual *calls* for service by removing
  - — All events with no officer time spent on-scene
  - — All events indicating an out-of-service activity
  - — All events documenting a directed patrol activity

In this way, we first have a total number of records, then limit ourselves to patrol events, and finally focus on calls for service.

To briefly review the data received, in the period from March 2009 to February 2010, there were approximately 15,600 dispatch recorded events. Of that total, roughly 15,400 included a patrol unit as either the primary or secondary unit. When focusing on our eight-week periods, we analyzed 2,156 events in summer (July and August 2009) and 2,902 events in winter (January and February 2010). In addition, when analyzing workloads and response times, we ignored calls with incorrect or missing time data. The inaccuracies included elapsed times

that either were negative or exceeded 8 hours. For the entire year, we excluded fewer than 150 calls from our analysis.

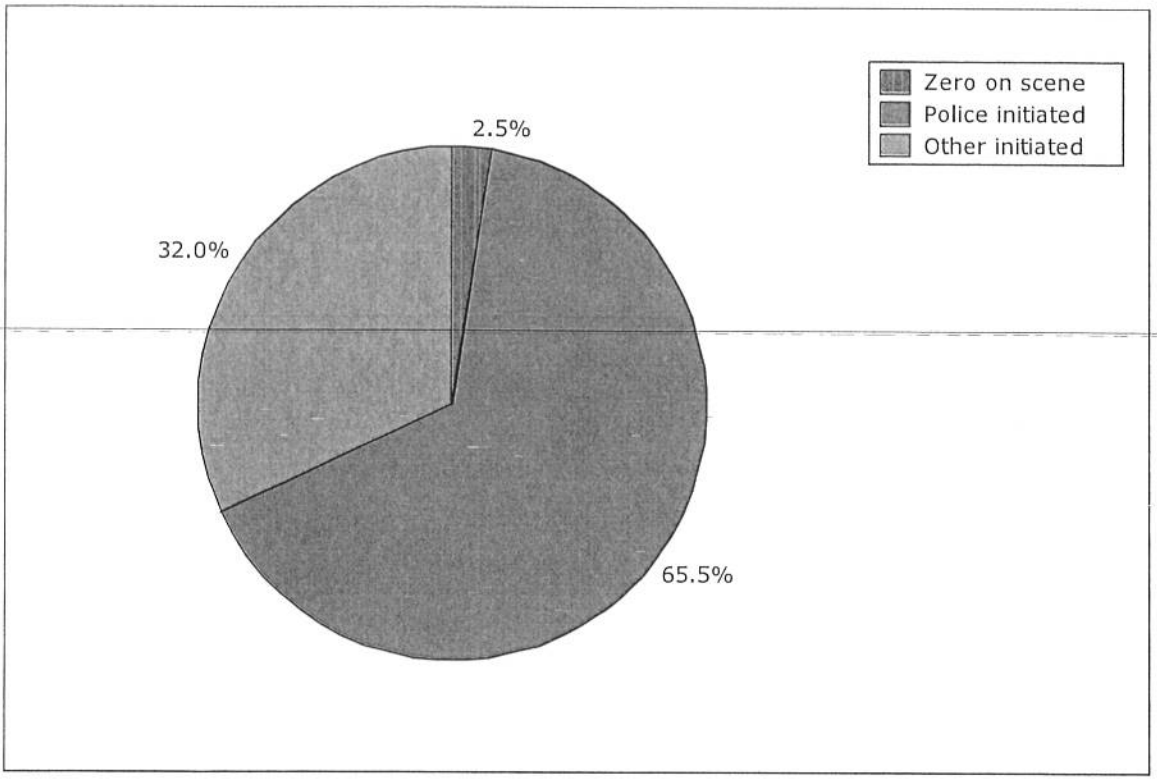
In the period from March 2009 to February 2010, the police department reported 42 events for service per day. As mentioned, 3 percent of these events (1.3 per day) showed no unit time spent on the call.

In the following pages we show two types of data: activity and workload. The activity levels are measured by the average number of calls per day, broken down by the type and origin of the calls and categorized by the nature of the calls (e.g., crime, traffic). Workloads are measured in average work-hours per day.

We used 17 call categories for tables and 10 categories for our graphs. We show our categories chart below.

Table Categories	Figure Categories
Accidents Traffic enforcement	Traffic
Alarm Check/investigation	Investigations
Animal calls Miscellaneous	General noncriminal
Assist other agency	Assist other agency
Crime—persons Crime—property	Crime
Directed patrol	Directed patrol
Disturbance Suspicious person/vehicle	Suspicious incident
Juvenile	Juvenile
Out of service—administrative Out of service—personal	Out of service
Prisoner—arrest Prisoner—transport	Arrest

Figure 1. Percentage Events per Day, by Initiator



Note: Percentages are based on a total of 15,397 events.

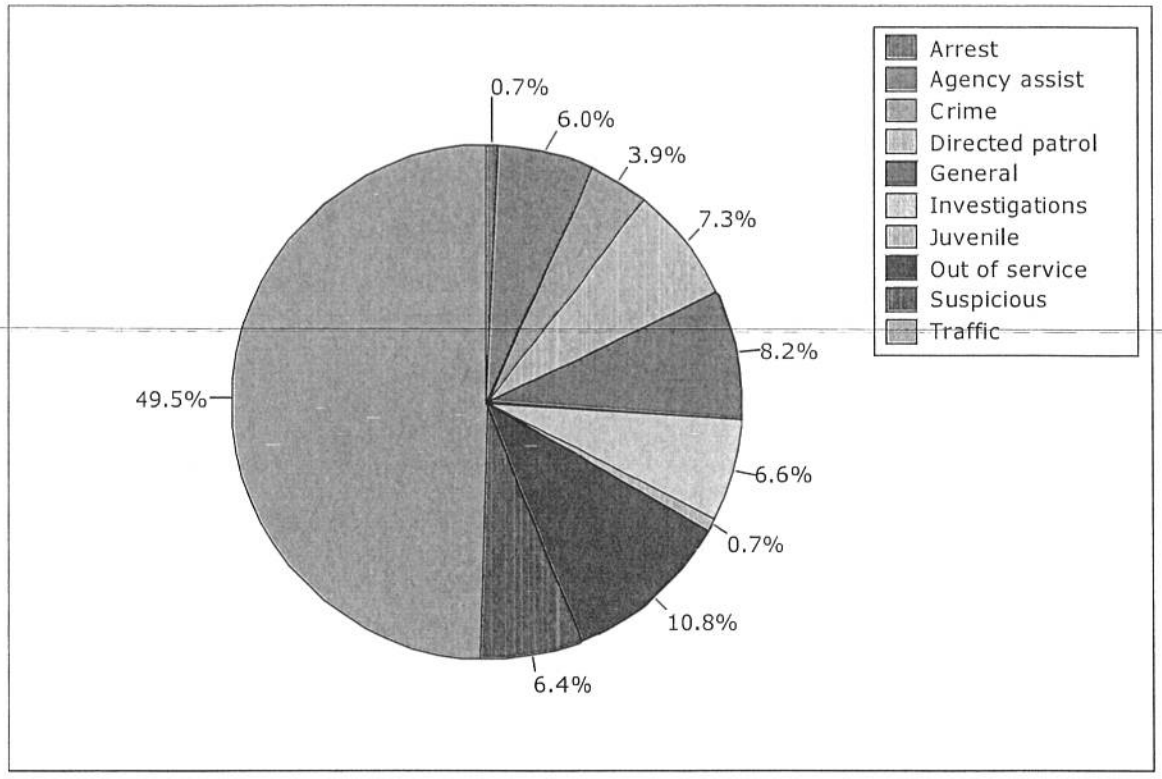
Table 4. Events per Day by, Initiator

Initiator	Total Events	Events per Day
Zero on-scene	379	1.0
Police-initiated	10,092	27.7
Other-initiated	4,926	13.5
Total	**15,397**	**42.2**

Observations

- Two percent of the events had zero-on-scene times.
- Approximately two-thirds of all events (66 percent) were police-initiated.
- Thirty-two percent of all events were other-initiated.
- There were a total of about 42 events per day, or 1.8 per hour.

Figure 2. Percentage Events per Day, by Category



Note: The figure combines categories in the following table according to the description on page 42.

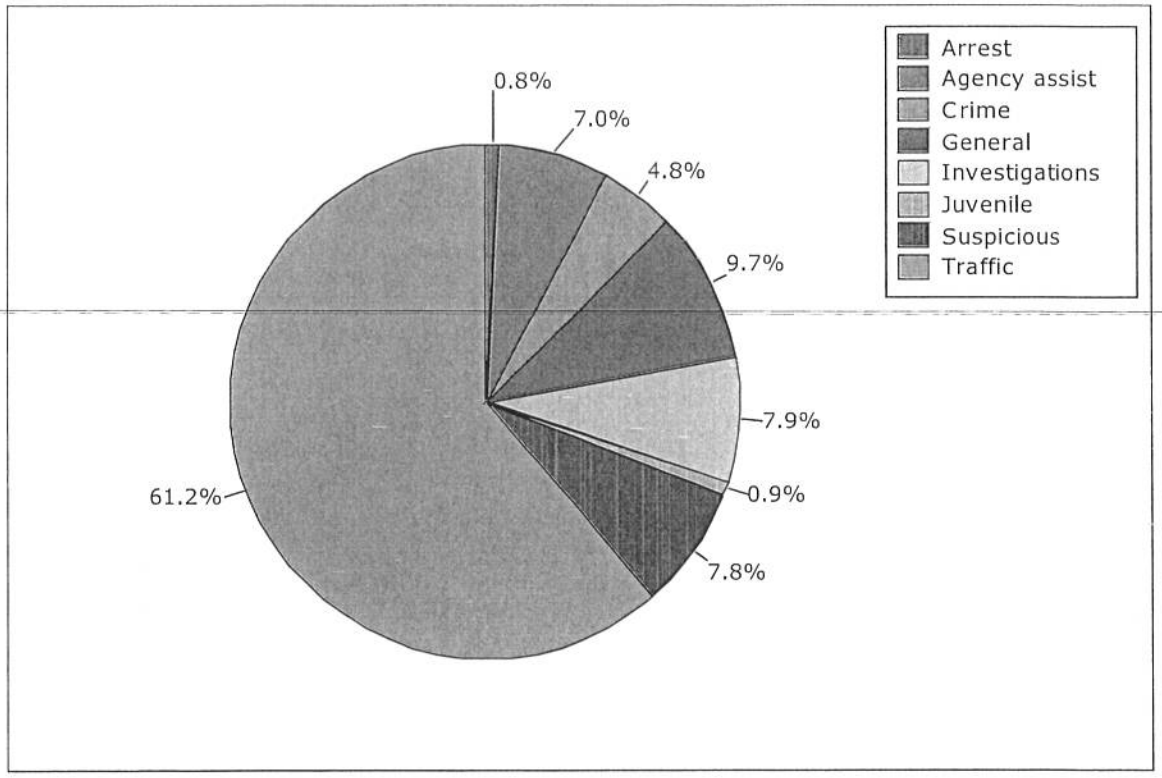
Table 5. Events per Day, by Category

Category	Total Events	Events per Day
Accidents	250	0.7
Alarm	264	0.7
Animal calls	120	0.3
Assist other agency	922	2.5
Check/investigation	746	2.0
Crime—persons	204	0.6
Crime—property	389	1.1
Directed patrol	1,131	3.1
Disturbance	264	0.7
Juvenile	110	0.3
Miscellaneous	1,135	3.1
Out of service—administrative	1,123	3.1
Out of service—personal	541	1.5
Prisoner—arrest	89	0.2
Prisoner—transport	16	0.0
Suspicious person/vehicle	719	2.0
Traffic enforcement	7,374	20.2
Total	**15,397**	**42.2**

Observations

- The top three categories (traffic, out-of–service. and general noncriminal activities) accounted for 69 percent of events.
- Nearly half of all events were traffic related (accidents and enforcements).
- Eleven percent of events involved out-of-service activity.
- Eight percent of events involved noncriminal activities (animal calls and miscellaneous).
- Four percent of events were crime related. This was an average of 1.7 per day.

Figure 3. Percentage Calls per Day, by Category



Note: The figure combines categories in the following table according to the description on page 42.

Table 6. Calls per Day, by Category

Category	Total Calls	Calls per Day
Accidents	248	0.7
Alarm	258	0.7
Animal calls	119	0.3
Assist other agency	858	2.4
Check/investigation	709	1.9
Crime—persons	200	0.5
Crime—property	385	1.1
Disturbance	263	0.7
Juvenile	109	0.3
Miscellaneous	1,070	2.9
Prisoner-arrest	87	0.2
Prisoner-transport	15	0.0
Suspicious person/vehicle	702	1.9
Traffic enforcement	7,290	20.0
Total	**12,313**	**33.7**

Methodology

When we focused on recorded calls rather than recorded events, we removed events with zero-on-scene times, out-of-service records, and directed patrol activities.

Observations

- There were 34 calls per day, or 1.4 per hour.
- Three categories (traffic, noncriminal activities and investigations) accounted for 79 percent of calls.
- Five percent of calls were crime related.
- Sixty-one percent of calls were traffic related (accidents and enforcements).
- Ten percent of calls were noncriminal activities (animal calls and miscellaneous).
- Eight percent of calls were investigations (alarms and checks).

Figure 4. Calls per Day, by Initiator and Months

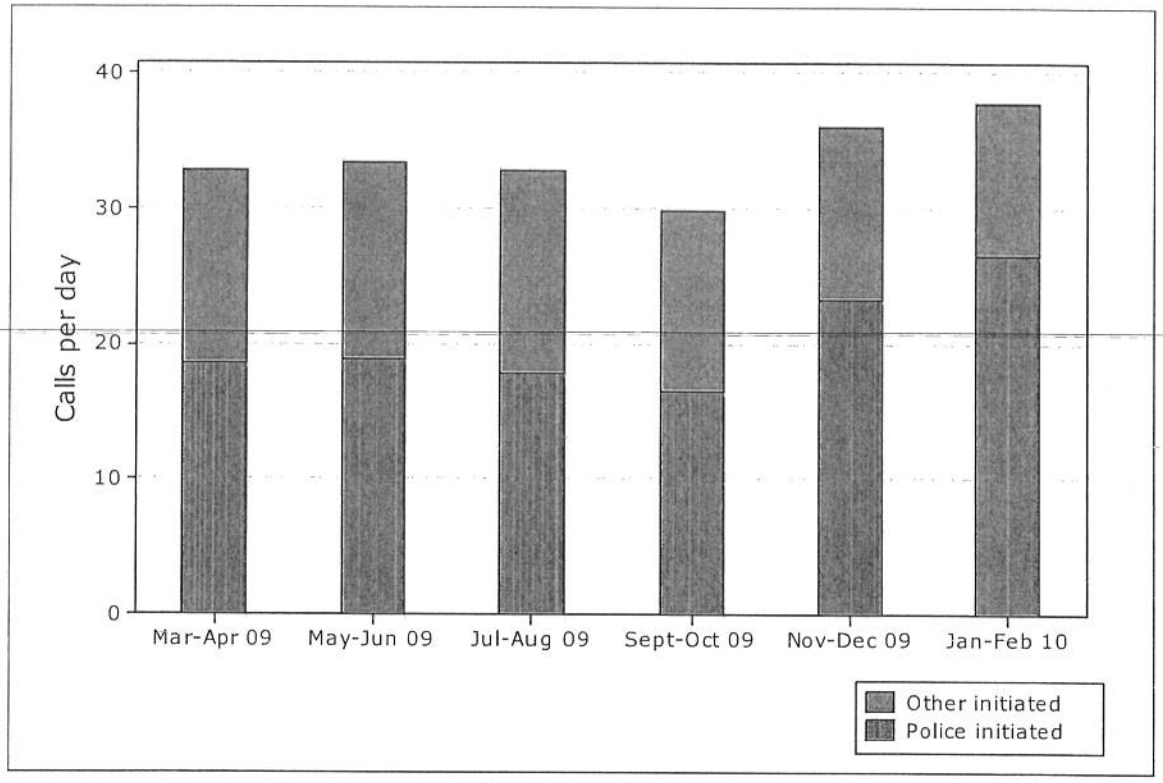


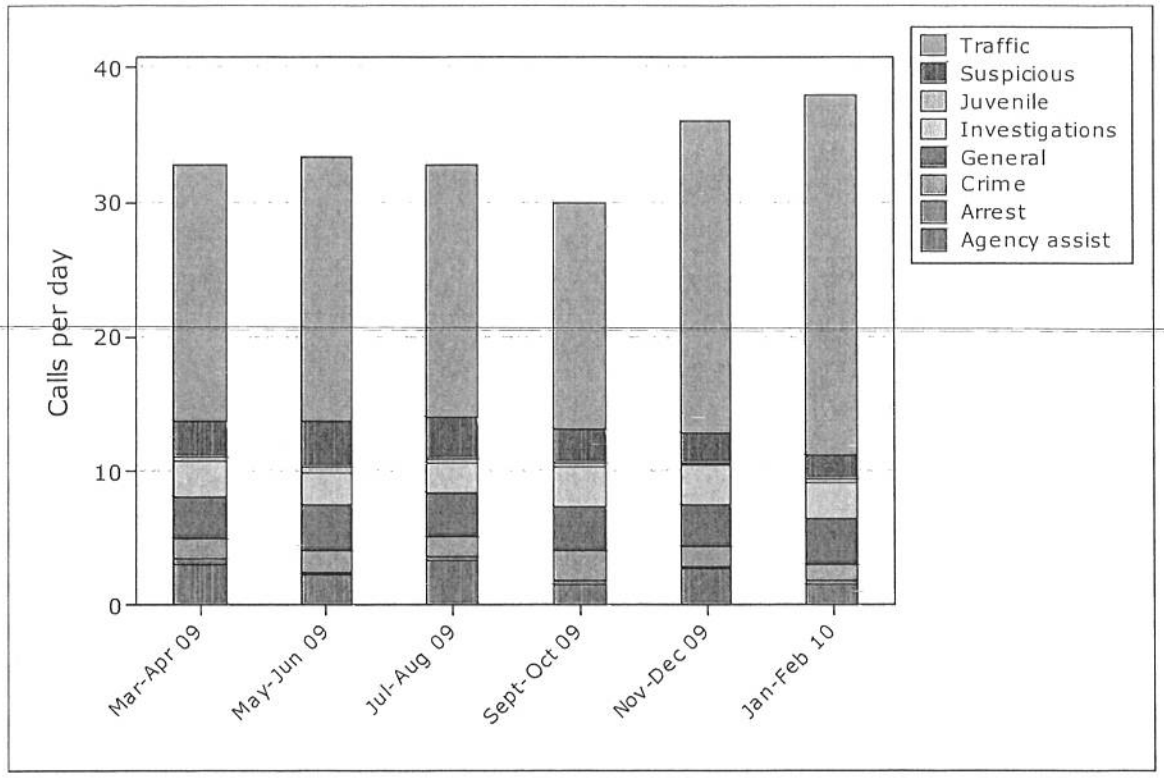
Table 7. Calls per Day, by Initiator and Months

Initiator	March-April	May-June	July-Aug.	Sept.-Oct.	Nov.-Dec.	Jan.-Feb.
Police-initiated	18.6	18.9	17.8	16.5	23.3	26.6
Other-initiated	14.1	14.5	14.9	13.4	12.7	11.2
Total	**32.7**	**33.4**	**32.7**	**29.9**	**36.0**	**37.9**

Observations

- First, we notice that the number of calls rose substantially in the period from November 2009 through February 2010 in comparison with the earlier portion of the year. In addition, this increase consisted primarily of police-initiated calls. We noted at the beginning of the report that the department improved its record keeping of police-initiated activities during this time period.
- The number of calls was smallest from September 2009 to October 2009.
- The number of calls was largest from January 2010 to February 2010.
- The largest months had 27 percent more calls than the smallest months.
- When focusing on police-initiated calls, we notice that the period from January 2010 to February 2010 had the most calls, with 61 percent more than the period from September 2009 to October 2009.
- When focusing on other-initiated calls, we notice that the period from July 2009 to August 2009 had the most calls, with 33 percent more than the period from January 2010 to February 2010.

Figure 5. Calls per Day, by Category and Months



Note: The figure combines categories in the following table according to the description on page 42.

Table 8. Calls per Day, by Category and Months

Category	March -April	May- June	July- Aug.	Sept.- Oct.	Nov.- Dec.	Jan.- Feb.
Accidents	0.6	0.8	0.6	0.7	0.7	0.8
Alarm	0.8	0.6	0.6	0.8	0.9	0.6
Animal calls	0.3	0.4	0.4	0.4	0.2	0.2
Assist other agency	3.0	2.2	3.3	1.5	2.6	1.4
Check/investigation	1.8	1.7	1.6	2.2	2.2	2.2
Crime—persons	0.7	0.7	0.5	0.4	0.6	0.5
Crime—property	0.8	1.0	1.1	1.8	0.9	0.8
Disturbance	0.6	1.1	1.0	0.5	0.5	0.6
Juvenile	0.3	0.5	0.3	0.4	0.1	0.2
Miscellaneous	2.9	3.0	2.9	2.8	2.9	3.1
Prisoner-arrest	0.3	0.2	0.2	0.2	0.2	0.3
Prisoner-transport	0.1	0.0	0.0	0.0	0.0	0.0
Suspicious person/vehicle	2.1	2.3	2.1	2.0	1.7	1.3
Traffic enforcement	18.5	18.8	18.1	16.2	22.5	26.0
Total	**32.7**	**33.4**	**32.7**	**29.9**	**36.0**	**37.9**

Methodology

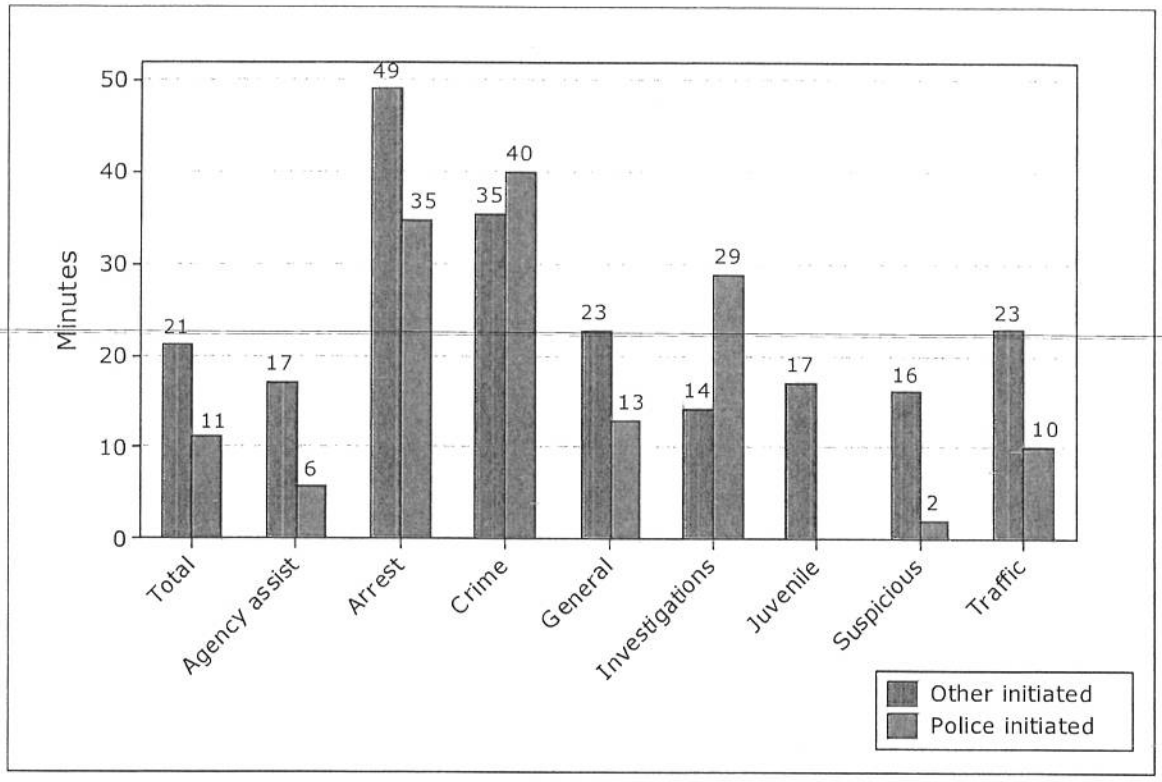
Calculations were limited to calls rather than events.

Observations

- As expected, the number of traffic-related calls rose dramatically from November 2009 through February 2010 owing to improved recording practices.
- Traffic-related calls rose by 59 percent in January 2010 through February 2010 when compared with September 2009 through October 2009.
- Traffic-related calls followed by noncriminal calls were the most common types of activities throughout the year.

- Traffic calls, enforcement plus accidents, averaged between 16.9 and 26.8 per day throughout the year.
- Noncriminal activities averaged between 3.1 and 3.4 per day throughout the year.
- Together, traffic and noncriminal activities were consistently between 67 and 79 percent of all calls.
- Crime calls varied between 1.3 and 2.2 per day throughout the year. This was between 3 and 7 percent of total calls.

Figure 6. Average Occupied Times, by Category and Initiator



Note: The figure combines categories using weighted averages from the following table according to the description on page 42.

Table 9. Primary Unit's Average Occupied Times, by Category and Initiator

	Police-Initiated		Other-Initiated	
Category	Total Calls	Minutes	Total Calls	Minutes
Accidents	0	N/A	248	26.4
Alarm	0	N/A	258	12.3
Animal calls	0	N/A	119	21.7
Assist other agency	4	5.6	853	17.1
Check/investigation	307	28.8	402	15.6
Crime—persons	9	47.1	191	44.0
Crime—property	2	7.5	383	31.2
Disturbance	1	4.0	259	20.3
Juvenile	0	N/A	109	17.1
Miscellaneous	69	12.9	1,001	22.9
Prisoner-arrest	18	35.9	69	51.3
Prisoner-transport	4	29.5	11	35.1
Suspicious person/vehicle	7	1.8	694	14.6
Traffic enforcement	6,973	10.1	317	20.1
Total	**7,394**	**11.0**	**4,914**	**21.2**

Note: We removed five calls with inaccurate busy times.

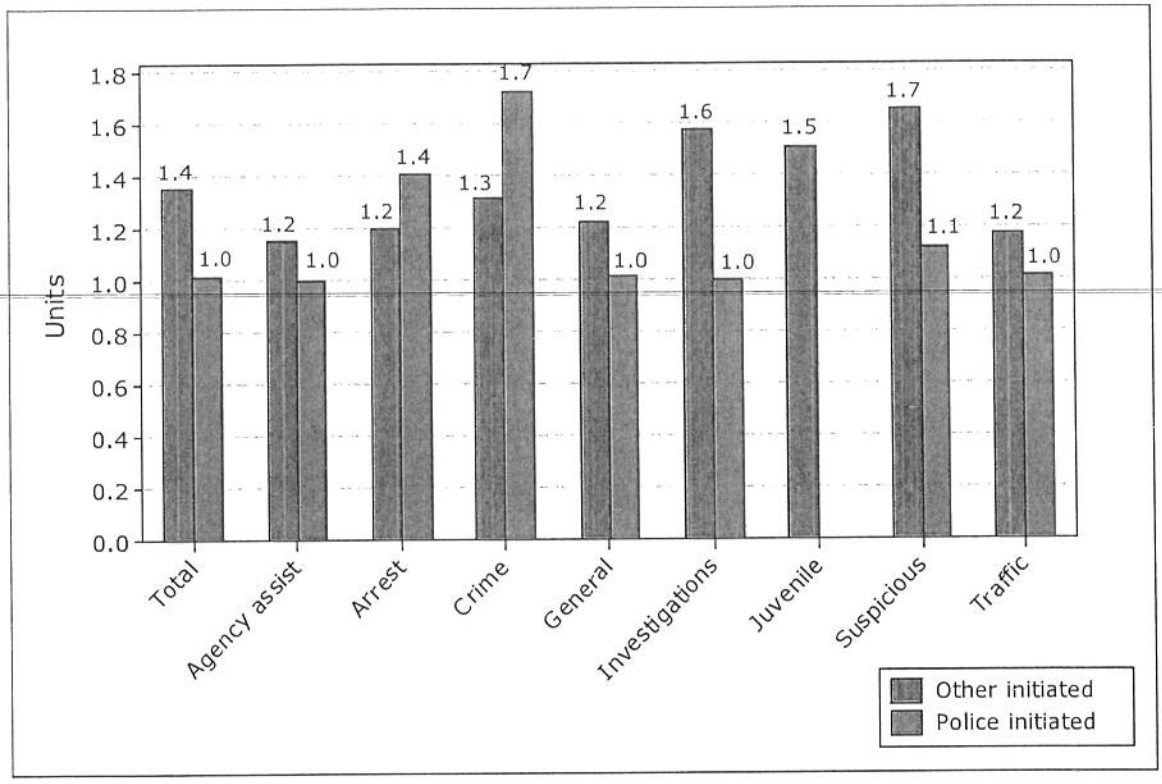
Methodology

This information is limited to calls and excludes all events that show a zero-on-scene time, out-of-service records, and directed patrol activities. A unit's occupied time is measured as the time from when it is dispatched until it becomes available. The times shown above are the average occupied times per call for the primary unit, rather than the total occupied time for all units assigned to a call.

Observations

- A unit's average time spent on a call ranged from 10 to 51 minutes overall for categories with at least 10 calls.
- Officer-initiated calls averaged 11 minutes per call as compared to 21 minutes for other-initiated calls.
- The longest average times were spent on calls involving prisoner arrests, which were other initiated.
- Police-initiated traffic calls (enforcements and accidents) averaged 10 minutes per call, whereas other-initiated traffic calls (enforcement and accidents) averaged 23 minutes.
- Crime calls averaged 40 minutes for police-initiated calls and 35 minutes for other-initiated calls.
- Arrests averaged 35 minutes for police-initiated calls and 49 minutes for other-initiated calls.

Figure 7. Number of Responding Units, by Initiator and Category



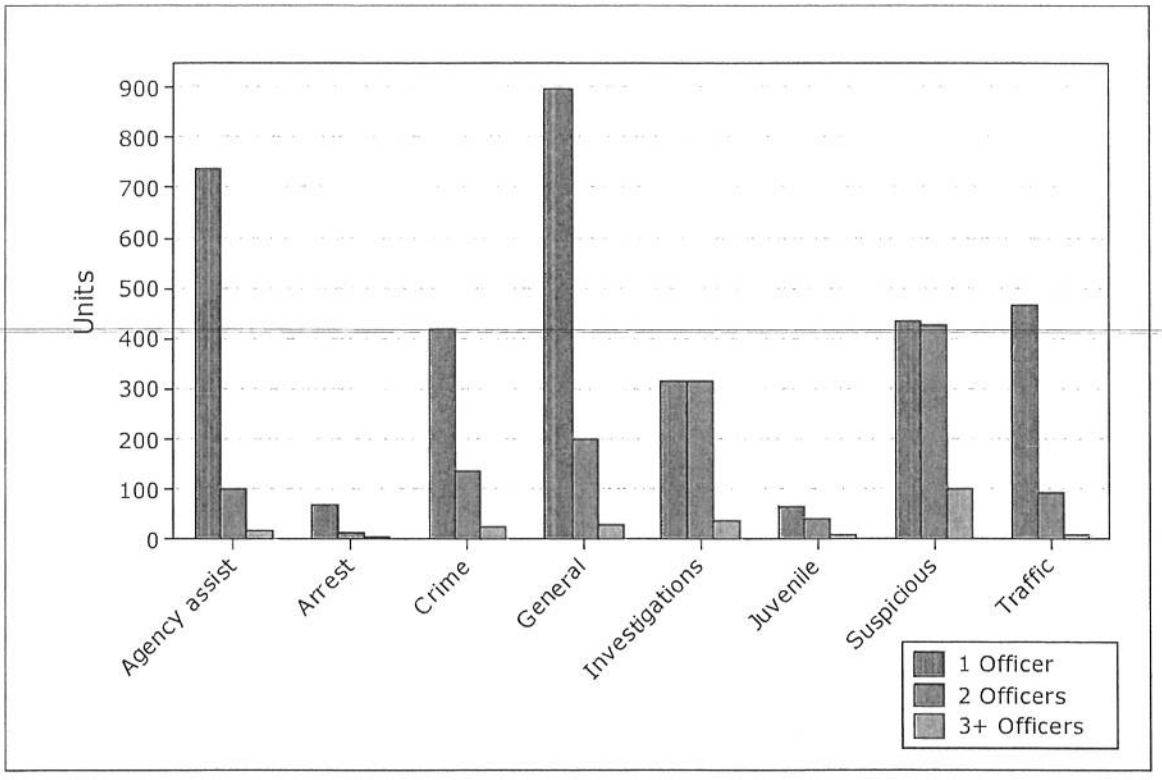
Note: The categories in this figure use weighted averages to combine those of the following table according to the description on page 42.

Table 10. Number of Responding Units, by Initiator and Category

Category	Police Initiated		Other Initiated	
	Average	Total Calls	Average	Total Calls
Accidents	*	0	1.2	248
Alarm	*	0	1.9	258
Animal calls	*	0	1.1	119
Assist other agency	1.0	4	1.2	854
Check/investigation	1.0	307	1.4	402
Crime—persons	1.9	9	1.5	191
Crime—property	1.1	2	1.2	383
Disturbance	1.0	1	1.7	262
Juvenile	*	0	1.5	109
Miscellaneous	1.0	69	1.2	1,001
Suspicious person/vehicle	1.1	7	1.6	695
Prisoner—arrest	1.5	18	1.2	69
Prisoner—transport	1.0	4	1.0	11
Traffic enforcement	1.0	6,973	1.2	294
Total	**1.0**	**7,394**	**1.4**	**4,919**

Note: * is placed where an average is not applicable.

Figure 8. Number of Responding Units, by Category



Note: The categories in this figure use weighted averages to combine those of the following table according to the description on page 42.

Table 11. Number of Responding Units, by Category

Category	Responding units		
	One	Two	Three or more
Accidents	200	47	1
Alarm	41	197	20
Animal calls	103	16	0
Assist other agency	739	100	15
Check/investigation	272	116	14
Crime—persons	102	74	15
Crime—property	315	60	8
Disturbance	97	137	28
Juvenile	62	38	9
Miscellaneous	792	182	27
Prisoner—arrest	55	12	2
Prisoner—transport	11	0	0
Suspicious person/vehicle	336	288	71
Traffic enforcement	268	44	5
Total	**3,393**	**1,311**	**215**

Methodology

The information in Figure 7 and Table 10 is limited to calls and excludes events with zero on-scene time, out-of-service records, and directed patrol activities. The information in Figure 8 and Table 11 is further limited to other-initiated calls. Categories in Figures 7 and 8 are combinations of those shown in Tables 10 and 11 as described on page 42.

Observations

- The overall mean number of responding units was 1.0 for police-initiated calls and 1.4 for other-initiated calls.

- The mean number of responding units was a maximum of 1.9 for police-initiated calls involving person crimes and for other-initiated calls involving alarms.
- Most other-initiated calls (69 percent) involved one responding unit.
- Four percent of all other-initiated calls involved three or more units.
- The largest group of calls with three or more responding units involved suspicious incidents (which includes disturbances), followed by investigations.

Figure 9. Percentage Calls and Work-Hours, by Category, Summer 2009

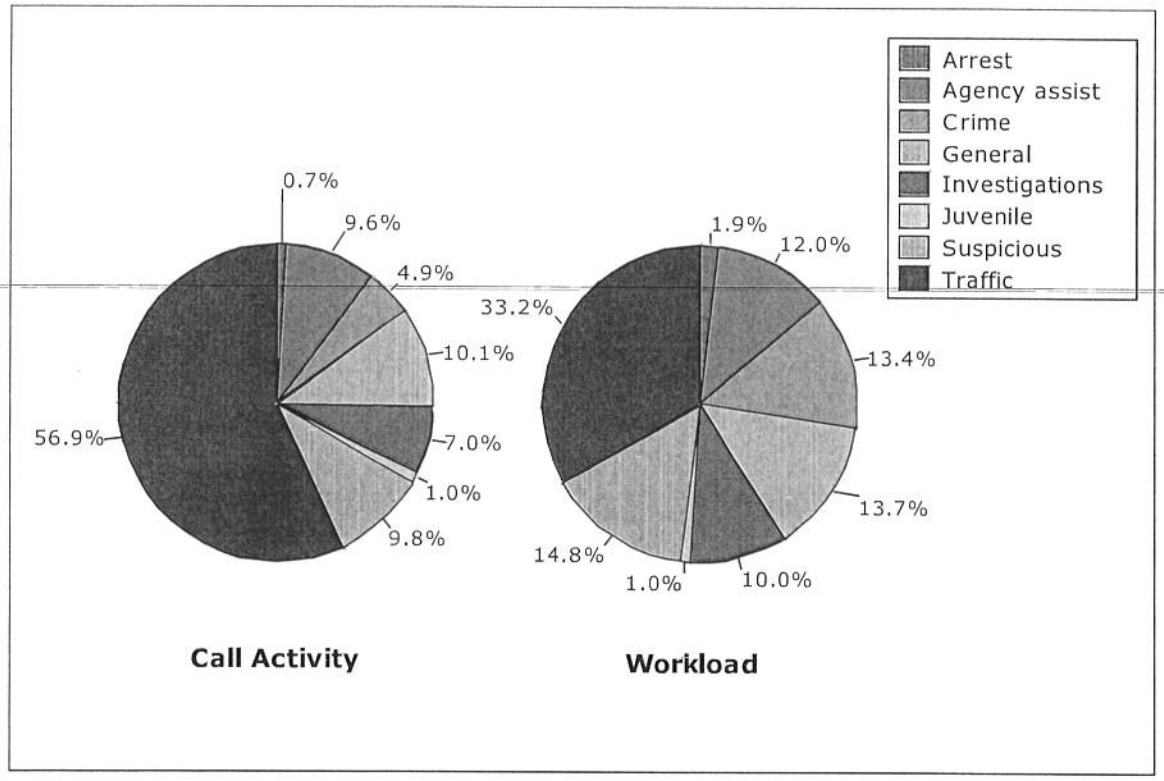


Table 12. Calls and Work-Hours per Day, by Category, Summer 2009

	Per Day	
Category	Calls	Work-Hours
Arrest	0.2	0.2
Assist other agency	3.1	1.1
Crime	1.6	1.2
General non-criminal	3.3	1.2
Investigations	2.3	0.9
Juvenile	0.3	0.1
Suspicious incident	3.2	1.3
Traffic	18.6	2.9
Total	**32.6**	**8.9**

Methodology

Workload calculations focused on calls rather than events.

Observations

- Total calls for summer 2009 were 33 per day, or 1.4 per hour.
- Total workload was 8.9 work-hours per day, meaning that an average of 0.37 officers per hour were busy responding to calls.
- Traffic-related activities constituted 57 percent of calls and 33 percent of workload.
- General noncriminal activities constituted 10 percent of calls and 14 percent of workload.
- Suspicious incidents constituted 10 percent of calls and 15 percent of workload.
- Crimes constituted 5 percent of calls but 13 percent of workload.

Figure 10. Percentage Calls and Work-Hours, by Category, Winter 2010

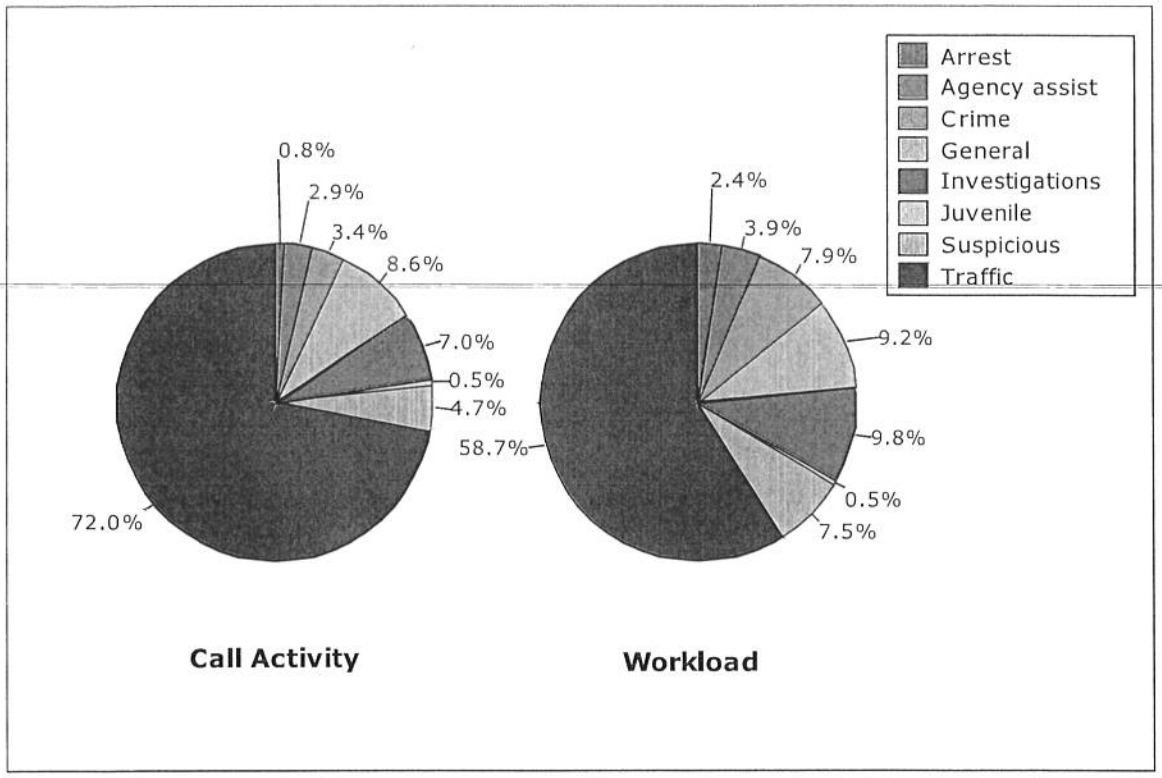


Table 13. Calls and Work-Hours per Day, by Category, Winter 2010

	Per Day	
Category	Calls	Work-Hours
Arrest	0.3	0.3
Assist other agency	1.1	0.5
Crime	1.3	1.0
General non-criminal	3.3	1.1
Investigations	2.7	1.2
Juvenile	0.2	0.1
Suspicious incident	1.8	0.9
Traffic	27.5	7.2
Total	**38.1**	**12.3**

Observations

- In winter, owing to improved reporting of traffic enforcement activities, the total calls per day and corresponding workload were higher than in summer.
- Total calls in winter 2010 were 38 per day or 1.6 per hour, which was 15 percent higher than in summer.
- Total workload was 12 work-hours per day, or 0.51 officers per hour.
- Traffic-related activities constituted 72 percent of calls and 59 percent of workload.
- In absolute terms, traffic-related calls and workload were 48 percent and 146 percent higher than in the summer.
- Noncriminal activities constituted 9 percent of both calls and workload.
- Investigations constituted 7 percent of calls and 10 percent of workload.
- Crimes constituted about 3 percent of both calls but 8 percent of workload.

Deployment

The police department's main patrol force operated on two 12-hour shifts starting at 6:30 a.m. and 6:30 p.m. Most shifts included two officers. In addition, we included patrol sergeants in the total number of patrol personnel on duty.

The police department deployed an average of 2.5 officers (including supervisors) during the 24-hour day both in summer and winter. There was some variability in average deployment. However, no specific time of day, day of week, or season averaged fewer than 2.3 officers or more than 2.8 officers on duty.

In this section, we describe the deployment and workload in distinct steps, distinguishing between summer and winter, and between weekdays and weekends. First, we focus on patrol deployment, with and without additional units. Next, we compare the deployment against workload on the basis of citizen-initiated (a.k.a. "other-initiated") calls for service. We then draw a similar comparison while adding self-initiated (a.k.a. "police-initiated") workload and administrative (a.k.a. "out-of-service") activities. Finally, we include the workload due to directed patrol activities. Comments follow each set of four figures, with separate discussions of summer and winter.

Figure 11. Deployed Officers, Weekdays, Summer 2009

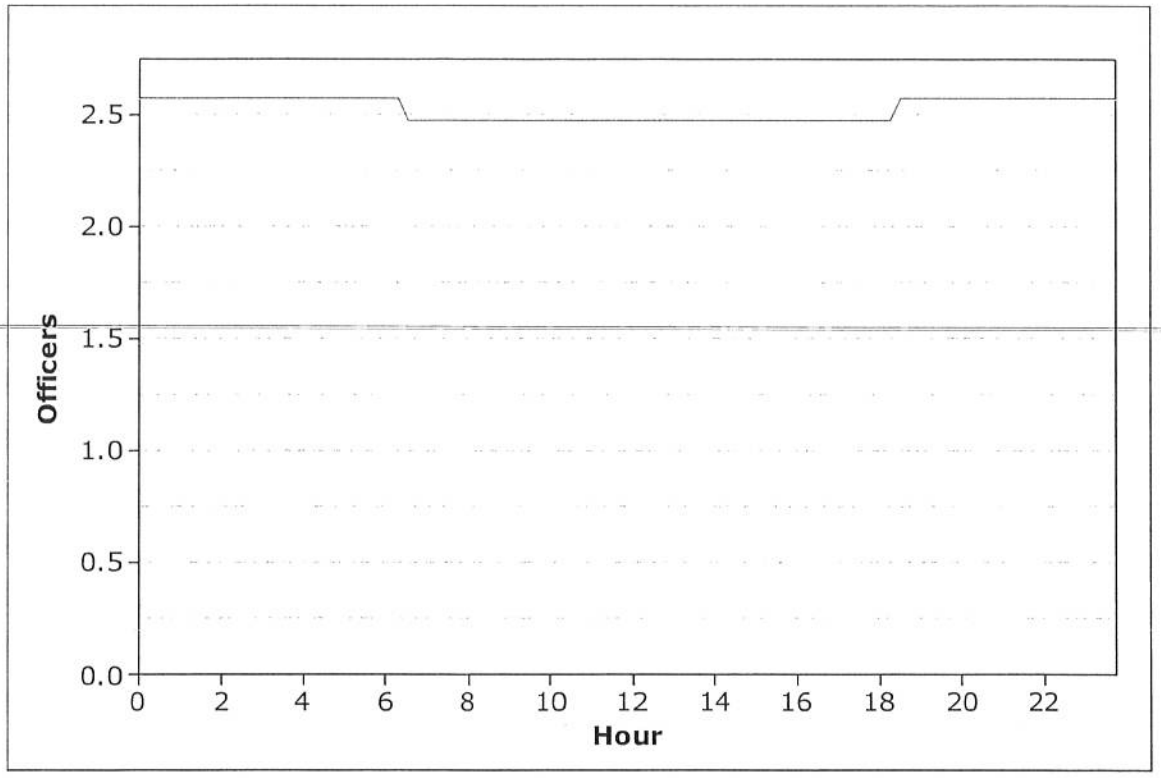


Figure 12. Deployed Officers, Weekends, Summer 2009

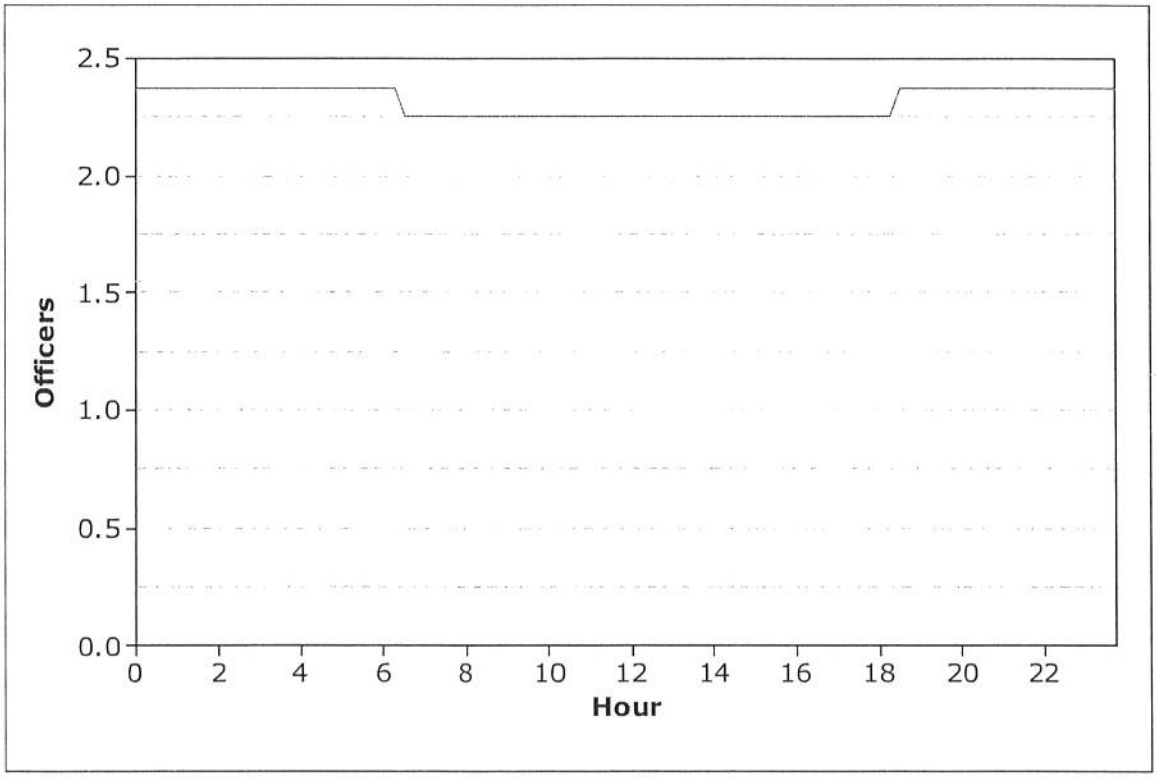


Figure 13. Deployed Officers, Weekdays, Winter 2010

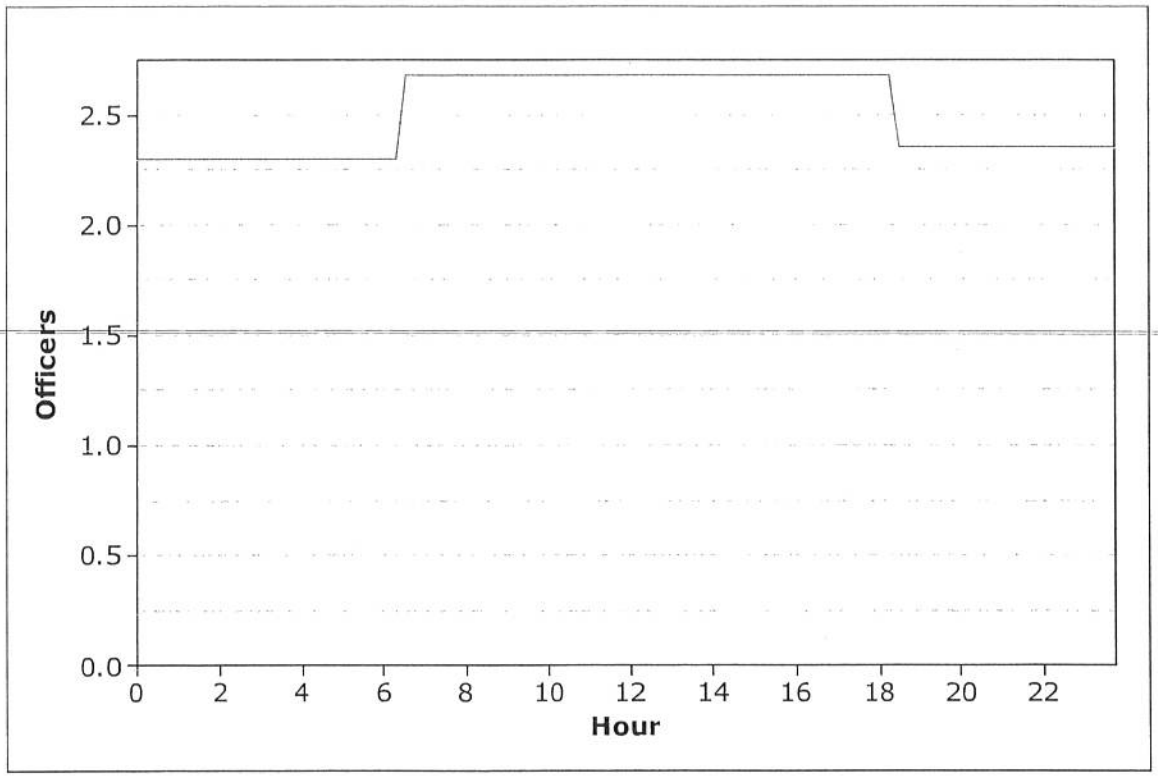
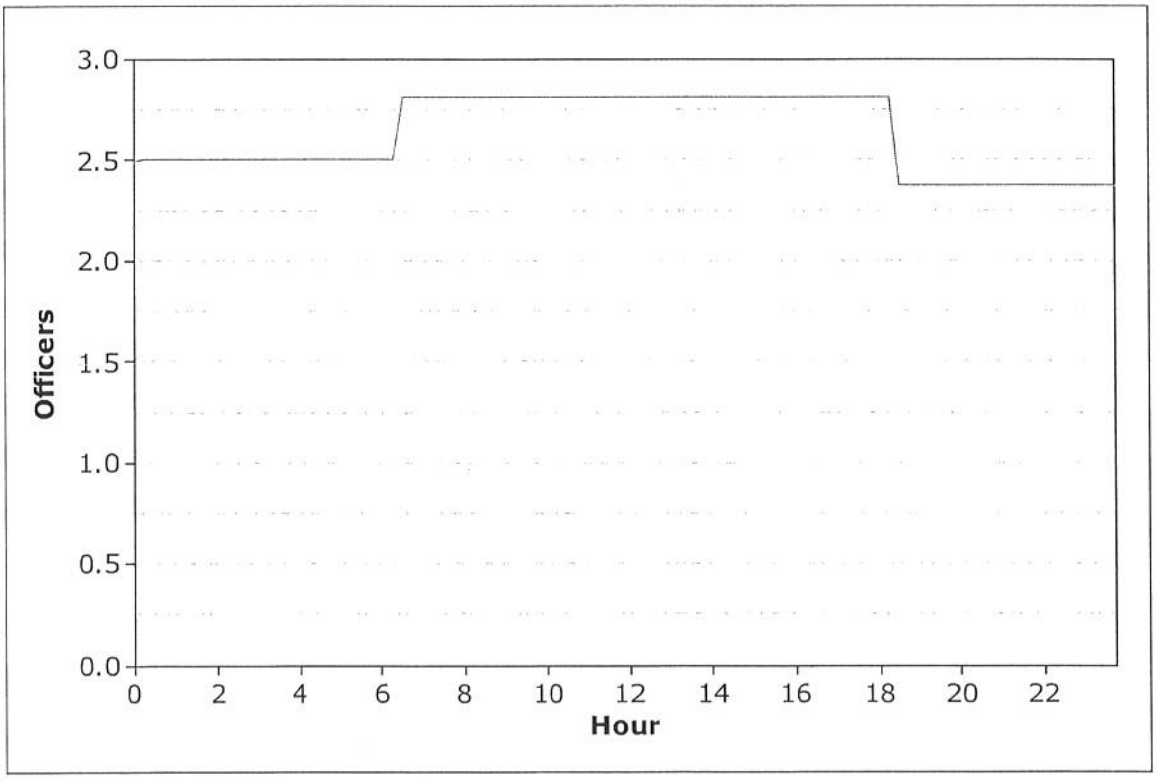


Figure 14. Deployed Officers, Weekends, Winter 2010



Observations

- For Summer 2009:
  - The average patrol deployment was approximately 2.5 officers during the week and 2.3 on weekends.
  - During the week, deployment reached as high as 2.6 officers between midnight and 6 a.m. and again between 6 p.m. and midnight. The deployment was as low as 2.5 officers between 6 a.m. and 6 p.m.
  - On weekends, deployment reached as high as 2.4 officers between midnight and 6 a.m. and again between 6 p.m. and midnight. The deployment dropped as low as 2.3 officers between 6 a.m. and 6 p.m.
- For Winter 2010:
  - The average patrol deployment was slightly higher than in summer. There was also only a slight difference between weekend and weekday deployments.
  - The average deployment was approximately 2.5 officers during the week and 2.6 on weekends.
  - During the week, deployment reached as high as 2.7 officers between 6 a.m. and 6 p.m., and dropped as low as 2.3 officers between midnight and 6 a.m.
  - On weekends, deployment reached as high as 2.8 officers between 6 a.m. and 6 p.m., and dropped as low as 2.4 officers between 6 p.m. and midnight.

Figure 15. Deployment and Other-Initiated Workload, Weekdays, Summer 2009

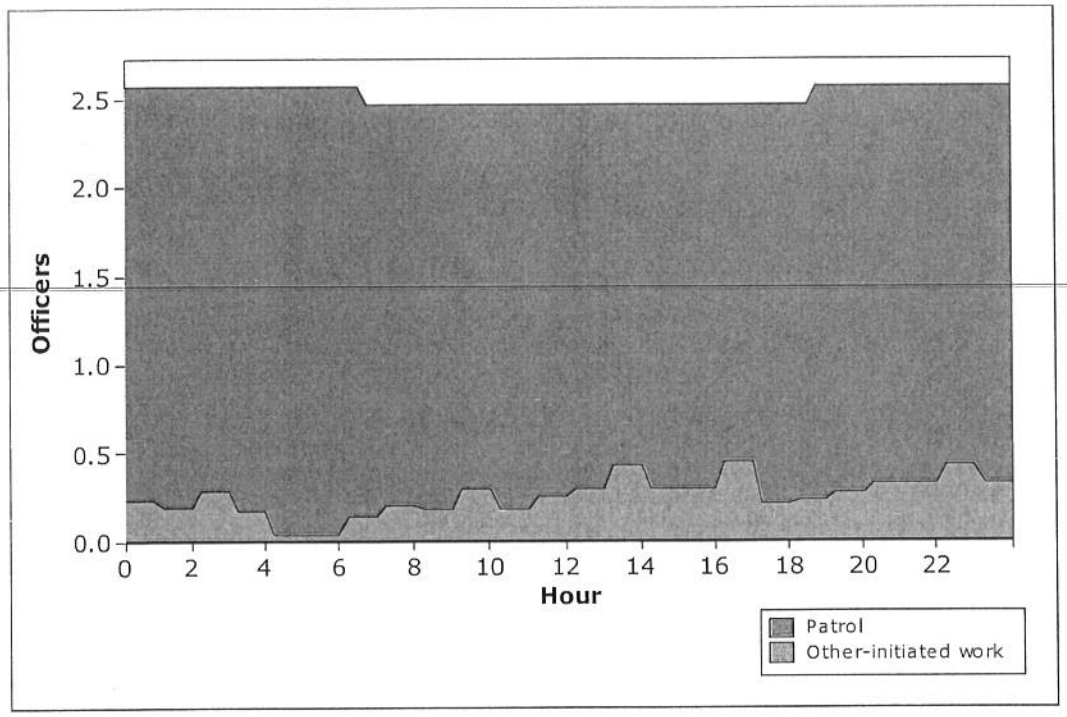


Figure 16. Deployment and Other-Initiated Workload, Weekends, Summer 2009

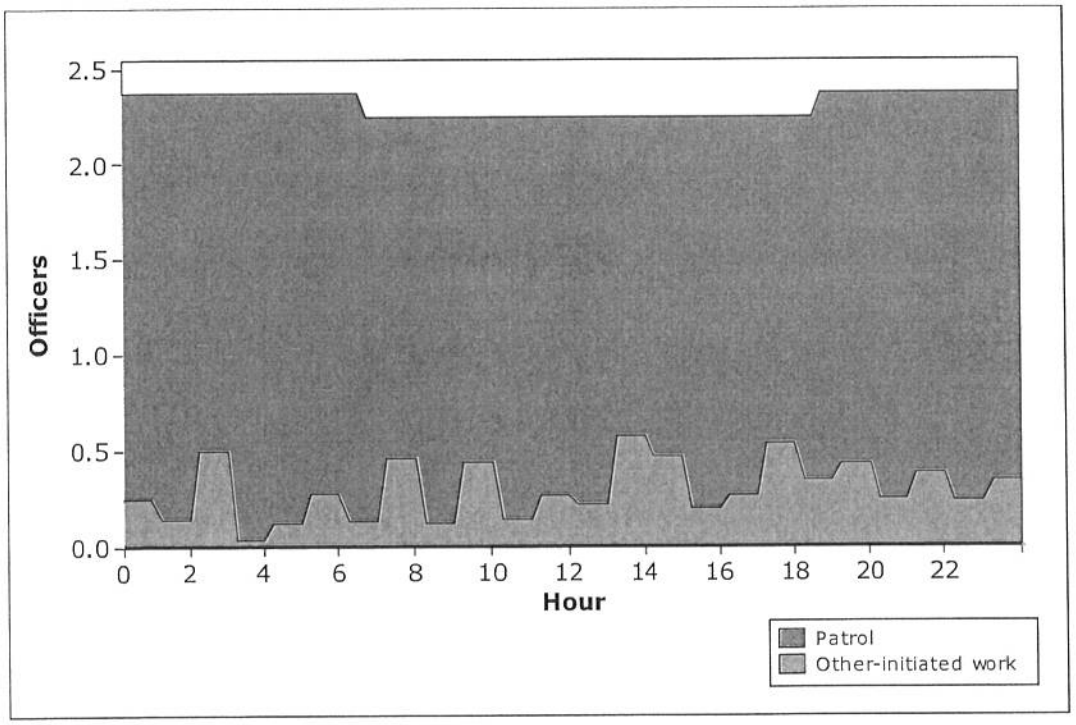


Figure 17. Deployment and Other-Initiated Workload, Weekdays, Winter 2010

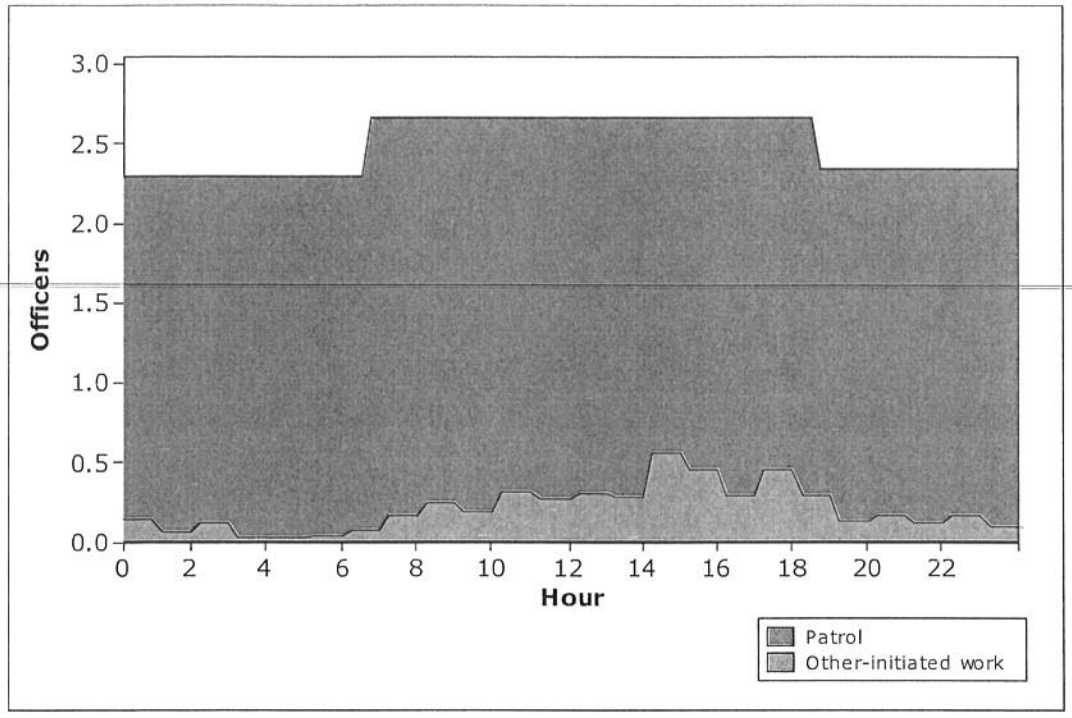
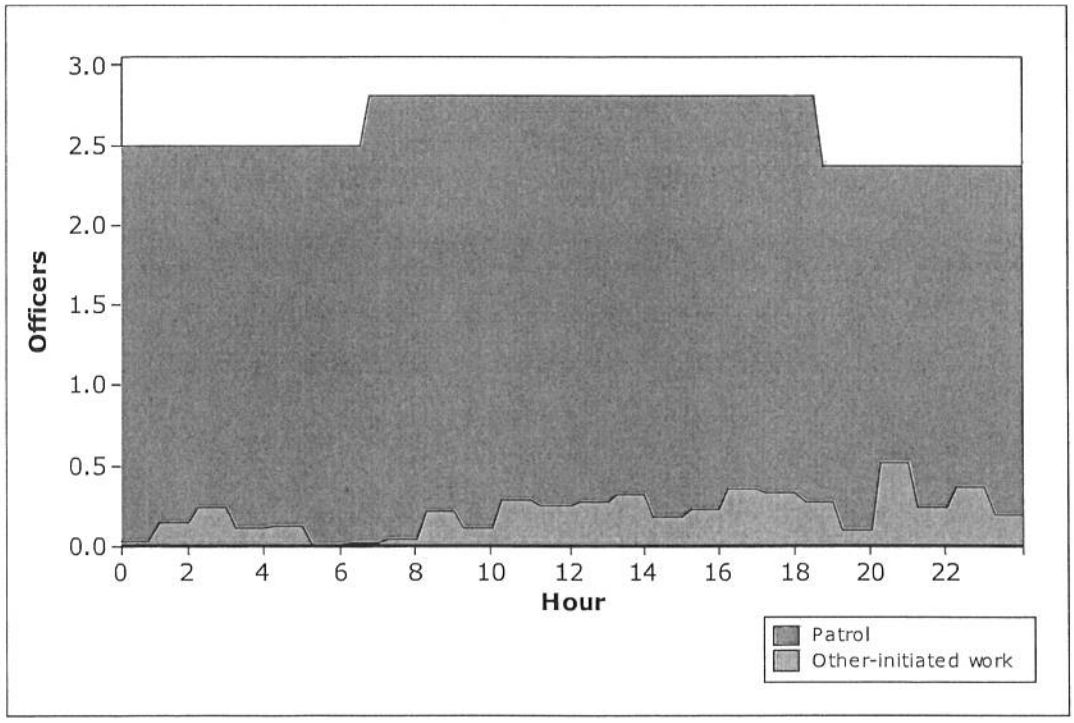


Figure 18. Deployment and Other-Initiated Workload, Weekends, Winter 2010



Observations

- For Summer 2009:
  - Average other-initiated workload was 0.25 officers per hour during the week, and 0.29 officers per hour on weekends. Throughout the day, it was consistently less than 0.5 per hour.
  - This was approximately 10 percent of hourly deployment during the week and 13 percent on weekends.
  - During the week, workload reached a maximum of 18 percent of deployment between 4 p.m. and 5 p.m.
  - On weekends, workload reached a maximum of 25 percent of deployment between 1 p.m. and 2 p.m.
- For Winter 2010:
  - Average other-initiated workload was 0.21 officers per hour during the week, and 0.20 officers per hour on weekends. Throughout the day, it was consistently less than 0.5 per hour.
  - This was approximately 8 percent of hourly deployment both during the week and on weekends.
  - During the week, workload reached a maximum of 21 percent of deployment between 2 p.m. and 3 p.m. On weekends, workload reached a maximum of 21 percent of deployment between 8 p.m. and 9 p.m.

Figure 19. Deployment and Main Workload, Weekdays, Summer 2009

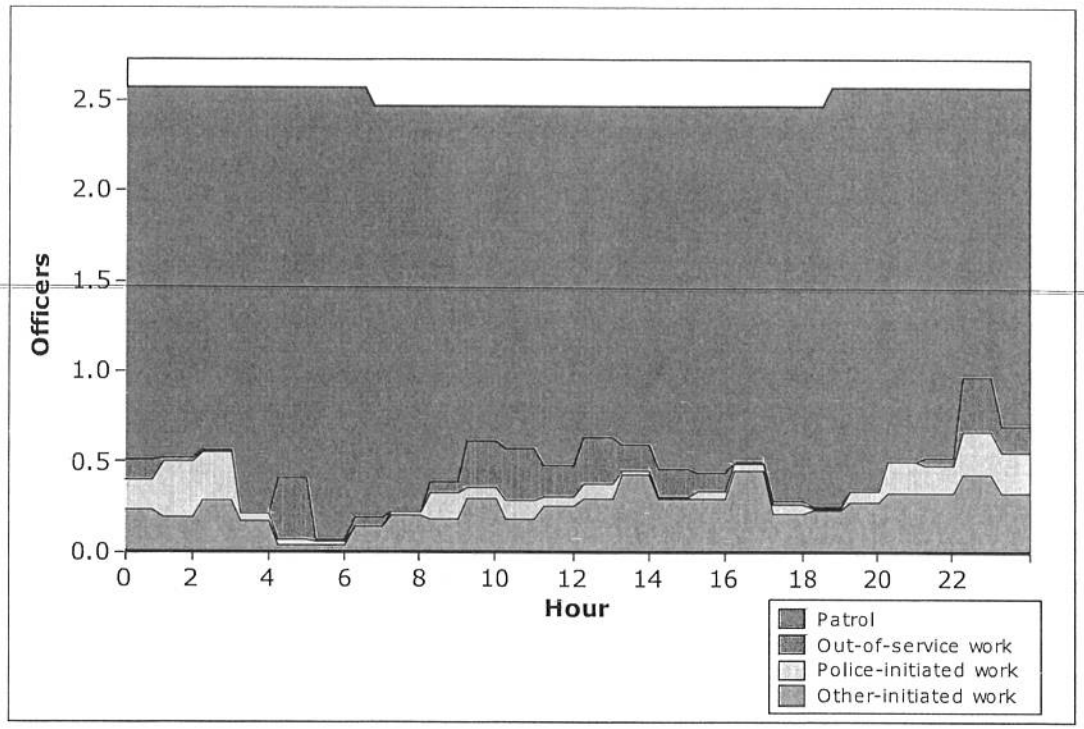


Figure 20. Deployment and Main Workload, Weekends, Summer 2009

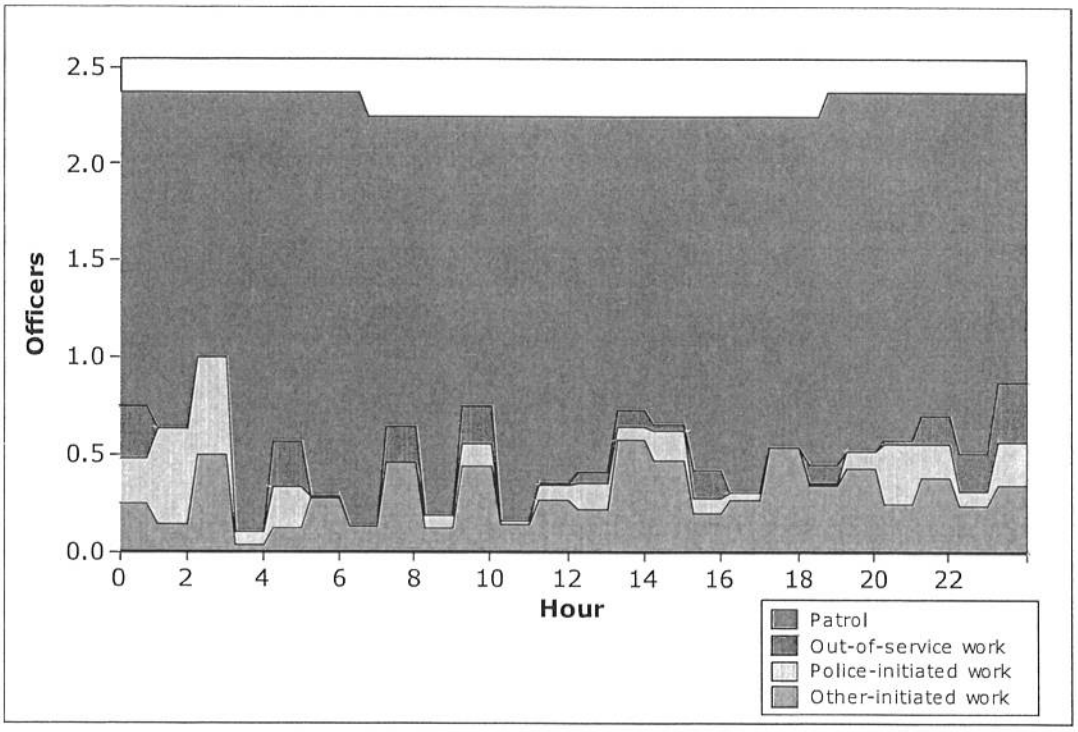


Figure 21. Deployment and Main Workload, Weekdays, Winter 2010

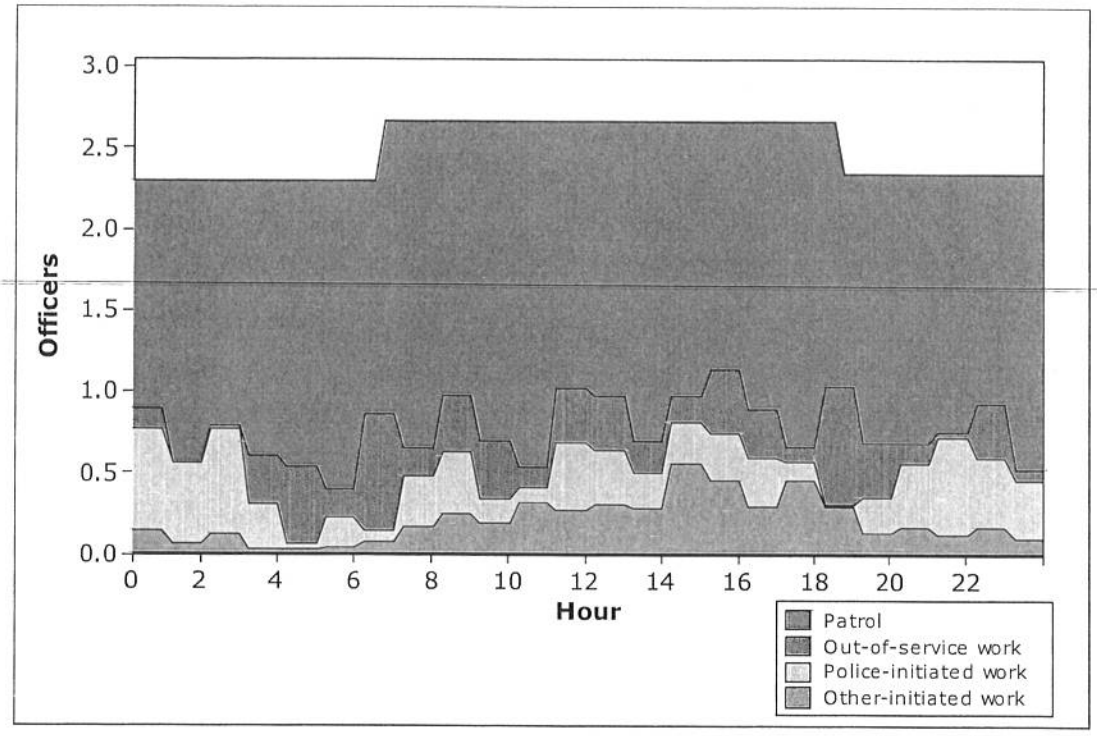
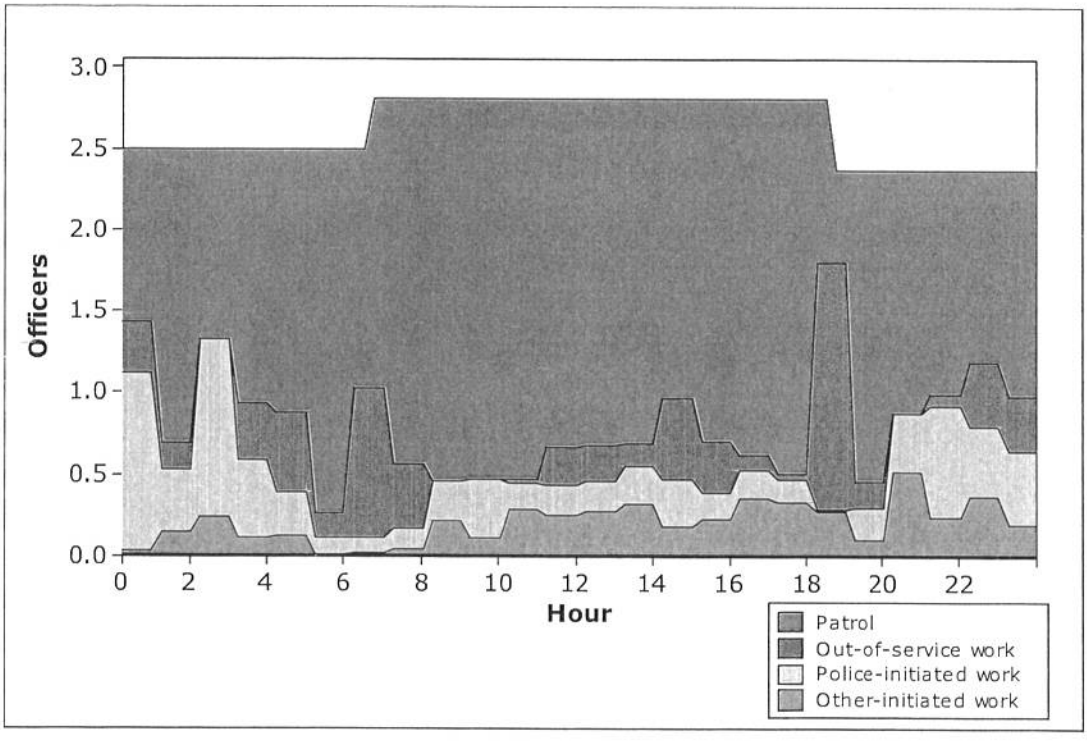


Figure 22. Deployment and Main Workload, Weekends, Winter 2010



Methodology

These figures include deployment along with workload from other-initiated, police-initiated, and out-of-service activities.

Observations

- For Summer 2009:
  - Average workload was 0.45 officers per hour during the week and 0.51 officers per hour on weekends.
  - This was approximately 18 percent of hourly deployment during the week and 22 percent on weekends.
  - During the week, workload reached a maximum of 38 percent of deployment between 10 p.m. and 11 p.m.
  - On weekends, workload reached a maximum of 42 percent of deployment between 2 a.m. and 3 a.m. This was owing to a dramatic increase in police-initiated activities.
- For Winter 2010:
  - Average workload was 0.77 officers per hour during the week and 0.82 officers per hour on weekends.
  - This was approximately 31 percent of hourly deployment both during the week and on weekends.
  - During the week, workload reached a maximum of 42 percent of deployment between 3 p.m. and 4 p.m.
  - On weekends, workload reached a maximum of 70 percent of deployment between 6 p.m. and 7 p.m. This was owing to a spike in out-of-service activities.

Figure 23. Deployment and All Workload, Weekdays, Summer 2009

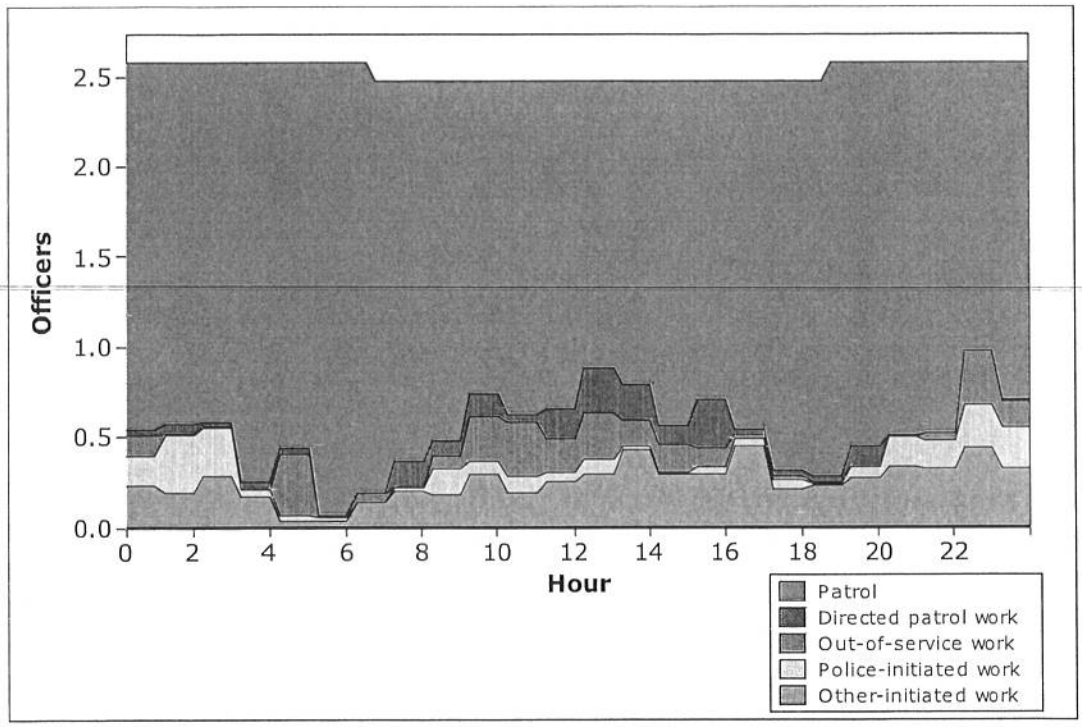


Figure 24. Deployment and All Workload, Weekends, Summer 2009

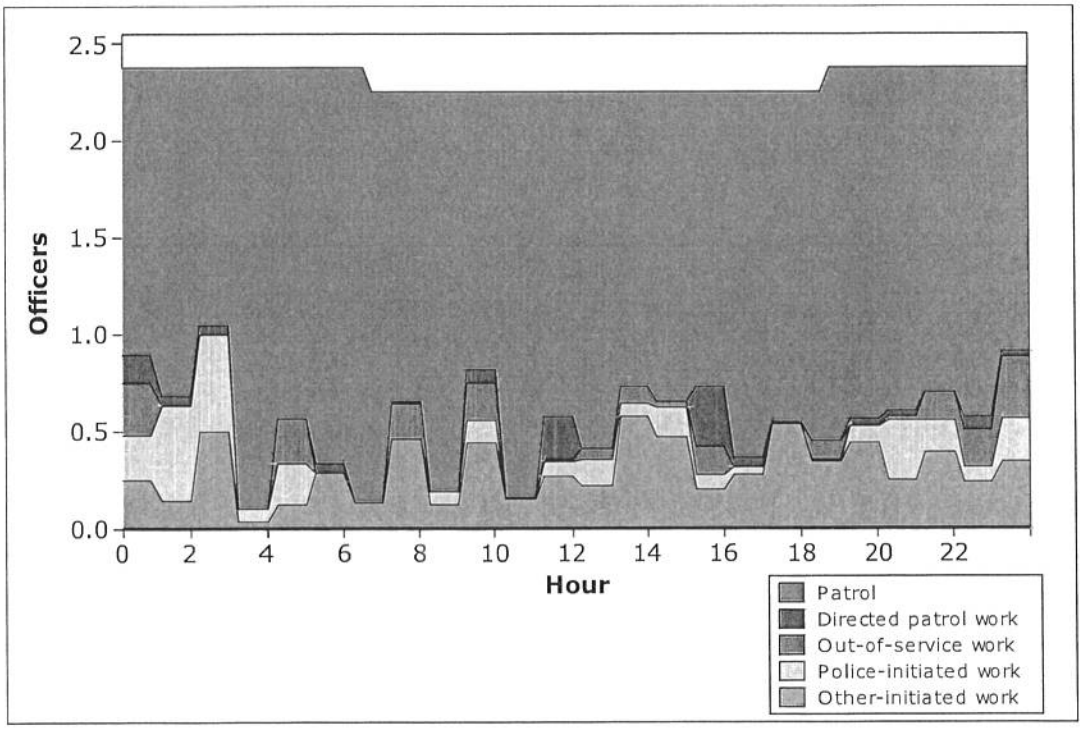


Figure 25. Deployment and All Workload, Weekdays, Winter 2010

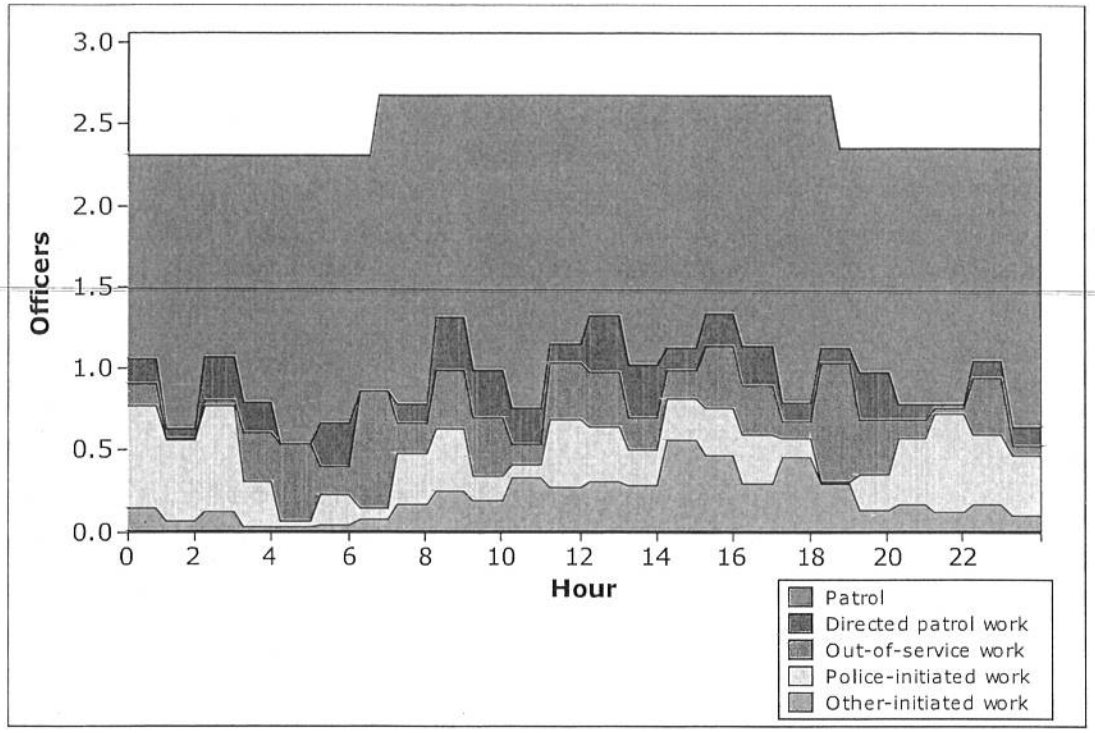
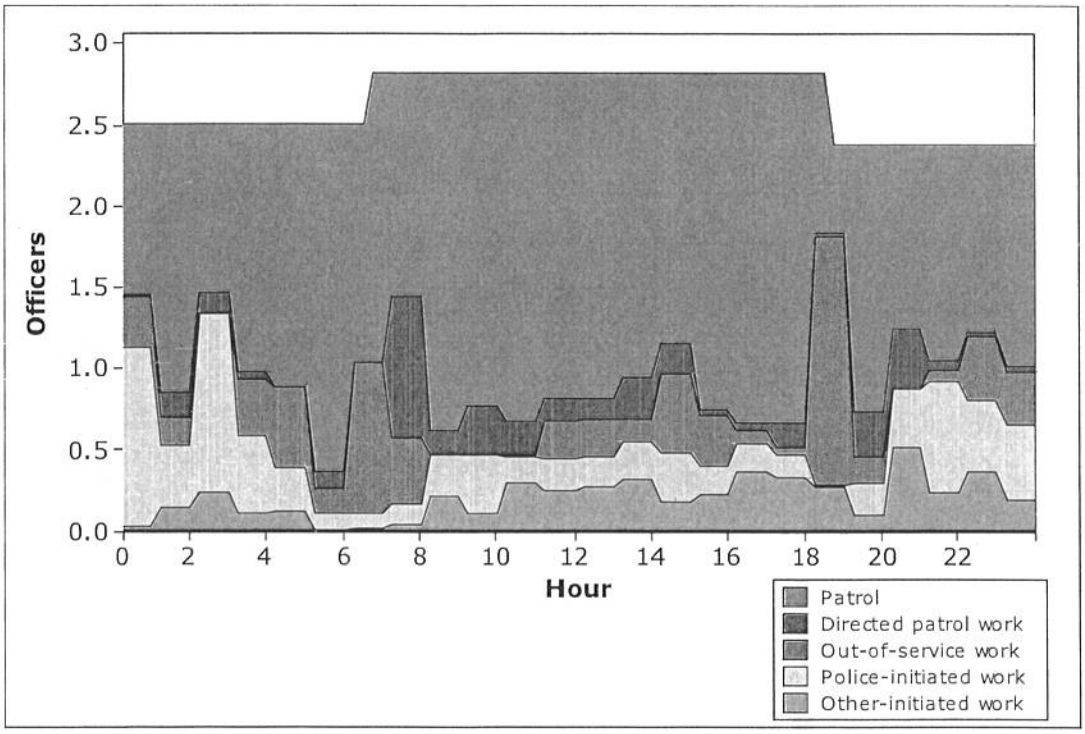


Figure 26. Deployment and All Workload, Weekends, Winter 2010



Methodology

These figures include deployment along with all workload from other-initiated, police-initiated, out-of-service, and directed patrol activities.

Observations

- For Summer 2009:
  - Average workload was 0.53 officers per hour during the week and 0.55 officers per hour on weekends.
  - This was approximately 21 percent of hourly deployment during the week and 24 percent on weekends.
  - During the week, workload reached a maximum of 38 percent of deployment between 10 p.m. and 11 p.m.
  - On weekends, workload reached a maximum of 44 percent of deployment between 2 a.m. and 3 a.m.
- For Winter 2010:
  - Average workload was 0.94 officers per hour during the week and 0.97 officers per hour on weekends.
  - This was approximately 38 percent of hourly deployment during the week and 37 percent on weekends.
  - During the week, workload reached a maximum of 50 percent of deployment between 3 p.m. and 4 p.m.
  - On weekends, workload reached a maximum of 71 percent of deployment between 6 p.m. and 7 p.m.

Response Times

We analyzed the response times to various types of calls, separating the duration into dispatch and travel times. We begin the discussion with statistics that include all calls combined. We analyzed several types of calls to determine whether response times varied by call type.

Before presenting the specific figures and tables, we summarize all of the observations. We started with 2,156 events for summer (July and August 2009) and 2,902 events for winter (January and February 2010). We limited our analysis to other-initiated calls; this included only 842 calls in summer and 614 calls in winter. We also found that approximately half of all other-initiated calls lacked arrival times. These we excluded from our analysis due to lack of information. This left 390 calls in summer and 348 calls in winter.

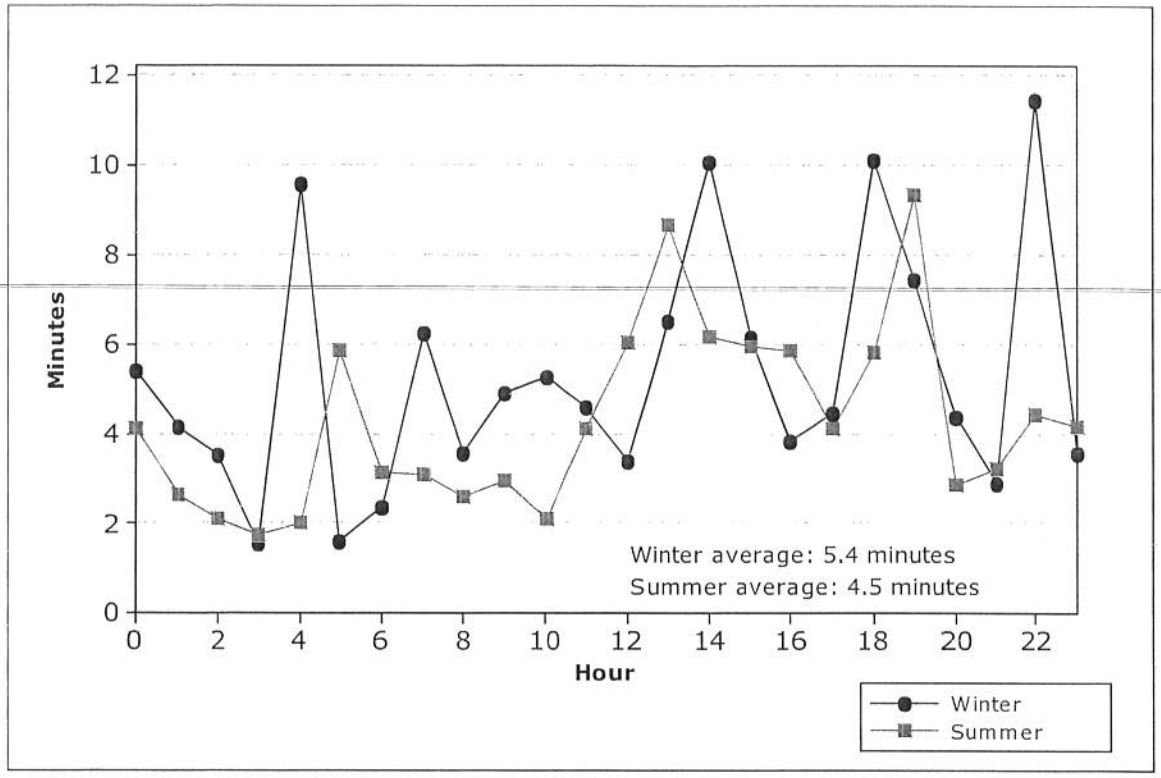
Our initial analysis does not distinguish calls based on their priority. It does examine the difference in response by time of day and compares summer and winter periods. After the overall statistics, we present an analysis based on the priority codes provided within the data. We focus on high-priority calls for the entire year. The response times for these are significantly shorter.

Response time is measured as the difference between when a call is received and when the first unit arrived on scene. This is separated into dispatch delay and travel time. Dispatch delay is the time from when a call is received until a unit is dispatched. Travel time is the time from when the first unit is dispatched until the first unit arrived.

All Calls

This section looks at all calls received, regardless of priority, to examine the differences in response by both time of day and season (summer versus winter).

Figure 27. Average Response Time, by Hour of Day, for Summer 2009 and Winter 2010



Observations

- Average response times varied significantly by hour of day.
- The overall average was higher in winter than in summer.
- In summer, the longest response times were about 9.3 minutes between 7 p.m. and 8 p.m.
- In summer, the shortest response times were between 3 a.m. and 4 a.m., with an average of 1.7 minutes.
- In winter, the longest response times were between 10 p.m. and 11 p.m., with an average of 11.5 minutes.
- In winter, the shortest response times were between 3 a.m. and 4 a.m., with an average of 1.5 minutes.

- Some hourly averages involved small samples and are less reliable. Table 14 displays hourly samples for summer and winter with the times listed in a 24-hour format.

Table 14. Sample Sizes by Hour, Summer 2009 and Winter 2010

Hour	0	1	2	3	4	5	6	7	8	9	10	11
Summer	19	12	15	5	4	1	9	19	20	25	18	25
Winter	8	7	11	3	3	2	5	9	22	20	28	27

Hour	12	13	14	15	16	17	18	19	20	21	22	23	Total
Summer	12	26	27	22	27	19	9	12	13	14	17	20	390
Winter	22	30	18	25	23	25	13	9	13	8	10	7	348

Figure 28. Average Response Times, Summer 2009

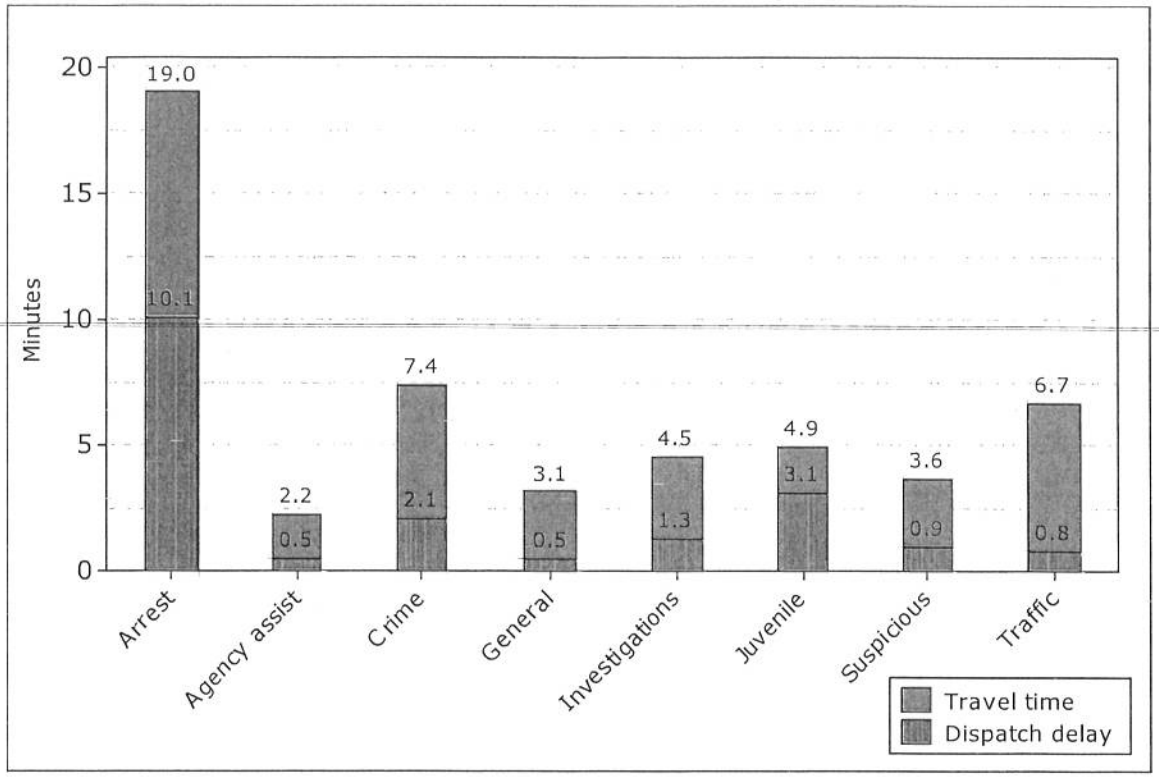


Figure 29. Average Response Times, Winter 2010

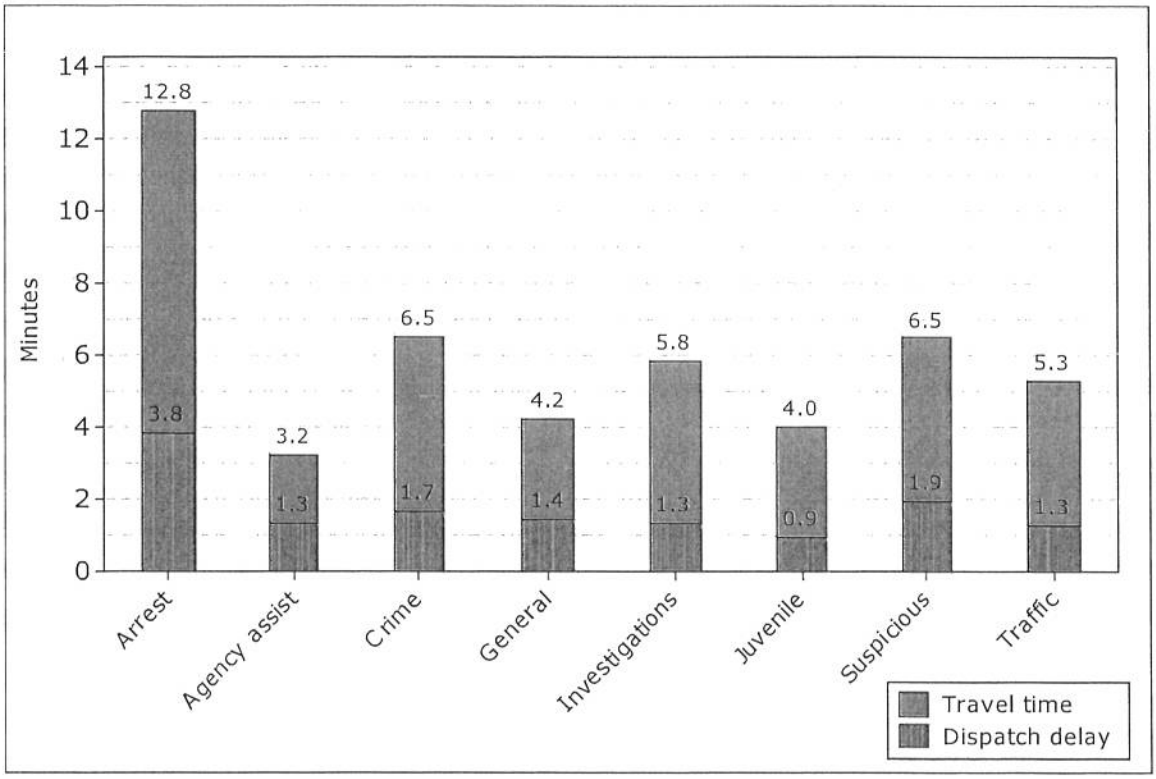


Table 15. Average Response Time Components, by Category

	Summer 2009			Winter 2010		
Category	Dispatch	Travel	Response	Dispatch	Travel	Response
Arrest	10.1	8.9	19.0	3.8	9.0	12.8
Agency assist	0.5	1.7	2.2	1.3	1.9	3.2
Crime	2.1	5.3	7.4	1.7	4.8	6.5
General	0.5	2.6	3.1	1.4	2.8	4.2
Investigations	1.3	3.2	4.5	1.3	4.5	5.8
Juvenile	3.1	1.9	5.0	0.9	3.1	4.0
Suspicious	0.9	2.7	3.6	1.9	4.6	6.5
Traffic	0.8	5.9	6.7	1.3	4.0	5.3
Total	**1.1**	**3.4**	**4.5**	**1.5**	**3.9**	**5.4**

Note: The total average is weighted according to the number of calls per category.

Table 16. 90th Percentiles for Response Time Components, by Category

	Summer 2009			Winter 2010		
Category	Dispatch	Travel	Response	Dispatch	Travel	Response
Arrest	41.5	22.8	44.6	20.4	19.4	39.8
Agency assist	1.6	4.8	6.4	0.7	4.3	5.0
Crime	2.8	10.7	13.2	4.5	7.7	17.6
General	1.1	6.3	6.9	2.5	7.7	11.7
Investigations	3.2	7.6	9.0	3.9	9.3	11.6
Juvenile	11.2	4.1	12.1	2.4	7.4	9.8
Suspicious	2.2	5.5	7.7	3.7	9.4	17.8
Traffic	2.6	12.5	15.8	3.2	7.7	10.1
Total	**2.3**	**7.5**	**10.0**	**3.1**	**8.0**	**11.2**

Note: A 90th percentile value of 9.0 minutes means that 90 percent of all calls respond in fewer than 9 minutes. For this reason, the columns for dispatch delay and travel time will not add to total response time.

Observations

- Response times varied significantly by call category.
- In summer, average response times were as short as 2.2 minutes (for agency assists) and as long as 19.0 minutes (for arrests).
- In winter, average response times were as short as 3.2 minutes (for agency assists) and as long as 12.8 minutes (for arrests).
- Average response times for crimes were 7.4 minutes during summer and 6.5 minutes during winter.
- In summer, average dispatch delays varied between 0.5 minutes (for agency assists and noncriminal activities) and 10.1 minutes (for arrests).
- In winter, average dispatch delays varied between 0.9 minutes (for juvenile incidents) and 3.8 minutes (for arrests).
- In summer, 90th percentile values for response times were as short as 6.4 minutes (for agency assists) and as long as 44.6 minutes (for arrests).
- In winter, 90th percentile values for response times were as short as 5.0 minutes (for agency assists) and as long as 39.8 minutes (for arrests).

High-Priority Calls

A priority code from 0 through 9 was assigned to each call by the dispatch center. Table 17 shows average response times by priority. These averages included nonzero-on-scene other-initiated calls throughout the year from March 2009 to February 2010. Priority codes 1 and 2 represent high-priority calls ranging from "burglary alarms" to "urgent" calls. There were nearly 2,100 other-initiated calls with valid response times. All these calls had valid priority information.

Table 17. Average Dispatch, Travel, and Response Times, by Priority

Priority	Dispatch	Travel	Response	Total Calls
0	1.3	5.8	7.1	26
1	1.1	3.0	4.1	147
2	0.9	5.9	6.8	25
3	1.5	4.9	6.4	731
4	1.3	3.2	4.5	459
5	1.8	4.6	6.4	315
8	1.4	4.4	5.8	155
9	1.2	2.8	4.0	232
Total	**1.4**	**4.1**	**5.5**	**2,090**

Note: The total average is weighted according to the number of calls within each priority level.

Observations

- High-priority calls (priority 1 calls) had shorter response times (4.1 minutes) compared with the overall yearly average of 5.5 minutes.
- Average dispatch delay was 1.1 minutes for high-priority calls and 1.4 minutes overall.

IX. Fire Department Operations

Aggregate Call Totals and Dispatches

The data includes calls between January 1, 2009 and December 31, 2009. The fire department has three primary engines and one reserve engine, three ALS units and one reserve ALS unit, one mobile command post unit, and several cars and pickup trucks located in three stations. Each engine or ALS unit is staffed by two officers. There are typically seven officers on duty with an absolute minimum of six. The fire department responded to EMS and fire calls for both the city of Plymouth and Plymouth Township. This report is focused on the analysis of calls of the city of Plymouth. Summaries of calls, workloads, and response time of calls of Plymouth Township were included only in Tables 18, 19, and 22. In a year, there were 834 EMS and fire calls including 20 real fire calls in the city of Plymouth. This is an average of 2.3 calls per day. We categorized the calls based on the call description and show the correspondence in Appendix Table 1. The analysis of call types is captured in the following tables and figures:

- Table 18: Call Types, City of Plymouth and Plymouth Township
- Table 19: Descriptions and Actions Taken at Real Fire Calls
- Figure 30: Calls by Type and Duration, City of Plymouth
- Figure 31: Calls by Month, City of Plymouth
- Figure 32 and Table 20: Calls by Hour of Day, City of Plymouth
- Figure 33 and Table 21: Number of Units Dispatched to Calls, City of Plymouth

Workload by Individual Unit—Calls and Total Time Spent

We report two types of statistics: dispatches and workloads. In Part VIII we reported that there were 834 EMS and fire calls, but because multiple units were often sent, the total number of dispatched units we analyze is 1,238. In this section, we present the workload, the actual

time spent by each unit on every call. The average time from dispatch until the unit was available for the next dispatch was 25 minutes. The total workload in a year of all fire department equipment responding to all calls in the city of Plymouth was 506 hours. This was an average of one hour and 23 minutes per day.

- Table 22: Annual Total Deployed Time by Call Type, City of Plymouth and Plymouth Township
- Table 23: Call Workload by Unit, City of Plymouth
- Table 24: Engine Units: Total Annual Number and Daily Average Number of Runs by Call Type, City of Plymouth
- Table 25: Engine Units: Daily Average Deployed Minutes by Call Type, City of Plymouth
- Table 26: Ambulance Units: Total Annual Number and Daily Average Number of Runs by Call Type, City of Plymouth
- Table 27: Ambulance Units: Daily Average Deployed Minutes by Call Type, City of Plymouth

Dispatch Time and Response Time

Dispatch processing time is the difference between the "unit dispatch time" and the "call receipt time." Turnout time is the difference between "unit en route time" and "unit dispatch time." Travel time is the difference between the "unit on-scene arrival time" and the "unit en route time." Response time includes dispatch processing time, turnout time, and travel time. Overall, the average dispatch processing time was 2.9 minutes. The average total response time was 7 minutes and the 90th percentile response time was 10.5 minutes. The following figures and tables present the results of dispatch and response times analysis:

- Figure 34 and Table 28: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Units by Call Type, City of Plymouth and Plymouth Township
- Figure 35 and Table 29: Which Unit Arrived First by Call Type, City of Plymouth
- Figure 36 and Table 30: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Units by Hour of Day, City of Plymouth
- Figure 37 and Table 31: Cumulative Distribution Function (CDF) of Response Time of First Arriving Units for EMS Calls, City of Plymouth
- Table 32: Average Response Time by Engine Units Arriving Sequence for Real Fire Calls, City of Plymouth

EMS Transport

The Plymouth Township Fire Department is considering entering full time into the ambulance transport business, replacing the HVA role. The department has indicated that it can do so without adding additional personnel while maintaining its fire-suppression capabilities. Further, it has indicated that it believes that by doing so, it can generate revenues to offset the costs of delivering fire-suppression services.

Currently, the department averages six to seven members on duty at a time. If the department enters into the transport business, at least two of these members would need to be assigned full time to an ambulance, reducing the on duty staffing for fire suppression to four to five.

Any ambulance service must have the capability of responding to multiple calls simultaneously (or dealing with multiple victims from the

same call). Were such an event to occur, the fire department would need to use an additional two members to staff the second ambulance, reducing the fire suppression staffing to two to three members. If a second transport call occurs, another two firefighters would be required to staff the second ambulance.

The department currently does not have enough staff on duty to fight a serious fire. It must rely upon mutual aid for such an event. By reducing its fire suppression staffing to this level, it would have to use mutual aid even more frequently. The surrounding fire departments would then be subsidizing the township's transport business. In effect, the fire department would be getting into the ambulance transport business by getting out of the fire-suppression business.

The department also advises that it wishes to try this system for a year before determining whether additional personnel would be needed. Should additional personnel be needed, the costs of adding them would more than consume whatever revenues are generated by the transport business. Emergency transport fees are notoriously low. Many transport victims carry no insurance. Collecting the co-pays for transports even when the victim is insured is difficult. Collection rates often do not exceed 50 percent. Billing is problematical, and retaining a third-party billing company cuts further into the revenue stream.

Private ambulance transport companies work on narrow margins but can be successful for several reasons. Labor costs are typically much lower than in public sector employment. And these companies generate a significant portion of their revenue stream from nonemergency transport—a function that the public sector systems cannot perform (without even further staffing increases).

In summary we question the value added by having the Plymouth Township Fire Department enter into a business activity that is currently being performed in exemplary fashion by a private company at no cost to the community.

Table 18. Call Types, City of Plymouth and Plymouth Township

	City of Plymouth				Plymouth Township		Mutual Aid
Call Type	Number of Noncanceled Calls	Calls per Day	Calls Percentage	Number of Canceled Calls	Number of Calls	Calls per Day	Number of Calls
Medical	575	1.6	69.5	4	1,307	3.6	16
Personal injury	29	0.1	3.5		172	0.5	2
EMS Total	**604**	**1.7**	**73.0**	**4**	**1,479**	**4.1**	18
Real fire	20	0.1	2.4		38	0.1	0
Hazard	28	0.1	3.4		24	0.1	0
Alarm	59	0.2	7.1	3	139	0.4	2
Other	116	0.3	14.0		298	0.8	7
Fire Total	**223**	**0.6**	**27.0**	**3**	**499**	**1.4**	9
Mutual aid							46
Total	**827**	**2.3**	**100.0**	**7**	**1,978**	**5.4**	73

Observations

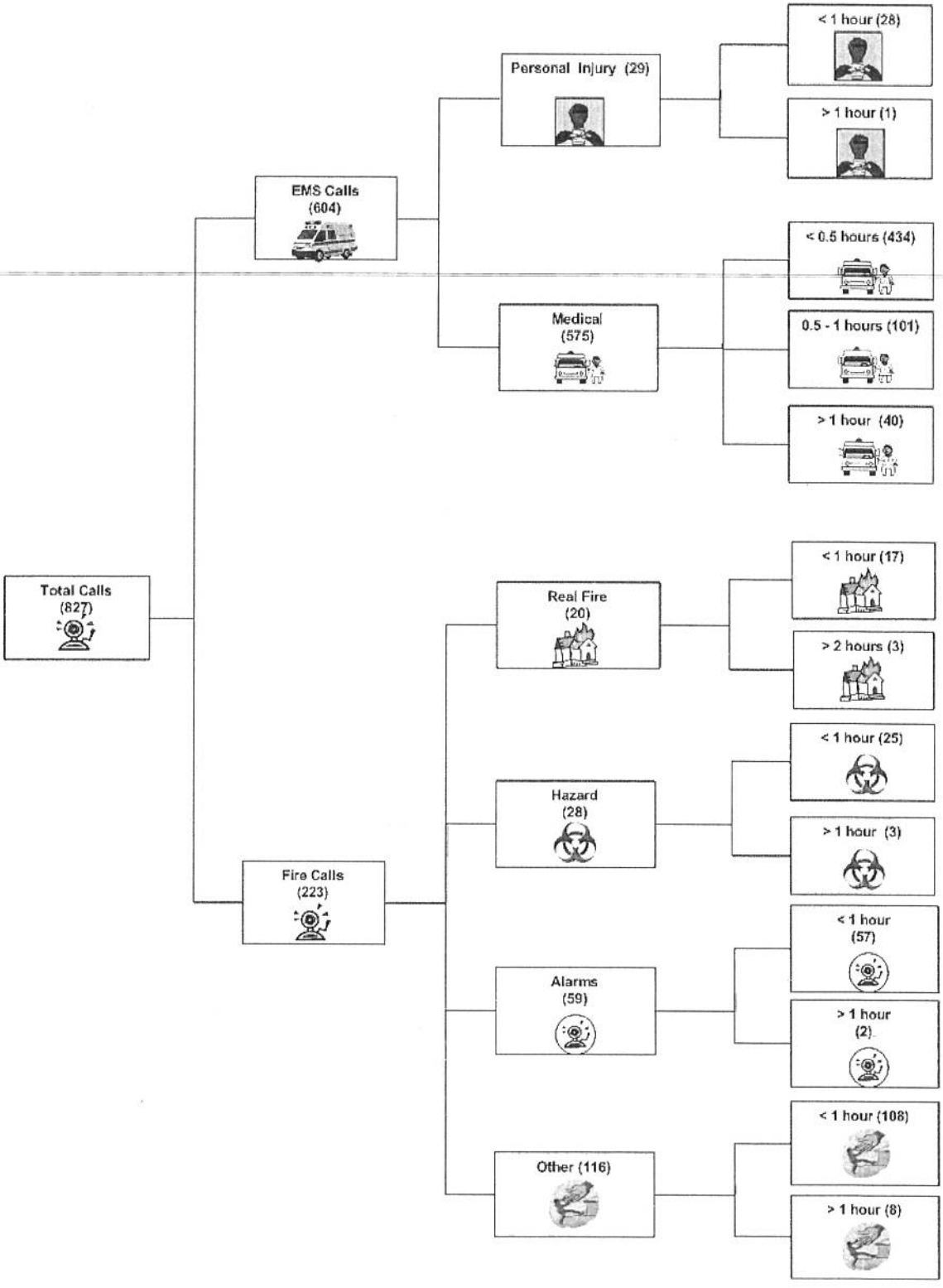
- A total of 827 calls including 604 EMS calls (73 percent) and 223 fire calls in the city of Plymouth were responded to in 2009. In addition, a total of 7 calls were canceled.
- On average, the fire department responded to 1.7 EMS calls and 0.6 fire category calls per day in the city.
- A total of 20 real fire calls in the city were responded to in a year, which is 2.4 percent of the total calls.
- In 2009, the fire department responded to 1,978 calls for Plymouth Township, averaging 5.4 calls per day.
- A total of 73 mutual aid calls were responded to in 2009.

Below is a review of 19 of the 20 calls that the Plymouth Township dispatch center recorded as actual fires based on information received from the caller. Of these, three calls turned out to be substantial fires that required fire hose connections. Each call tied up fire personnel for several hours. Two were in occupied dwellings and one was in a commercial building. Three other calls inside structures could have spread and become more serious if quick fire department action had not been taken. Each of these calls required less than a half hour on scene.

Table 19. Descriptions and Actions Taken at Real Fire Calls

Dispatch Report	Fire Department Found	Time Spent on Scene (in minutes)
House fire	Nothing found	22
Vehicle fire	Vehicle fire - put out by FD	28
Vehicle fire	Police put out fire - Out upon FD arrival:	24
Report of dwelling fire with possible trapped person	FD put out fire: Person out of house on arrival - 4 family dwellings on fire	171
		33
Vehicle fire	Overheated motor - no action	38
House fire	FD put out fire -Flower pot on porch caught fire from cigarette	19
Fire reported at large commercial facility	FD put out fire: Pickup truck on fire inside garage area	187
Smoke reported	Nothing found	14
Wire on fire	Out upon arrival	27
Vehicle fire	Police put out fire - Out upon FD arrival: Alcohol bottles had been on fire next to vehicle	32
Dumpster fire	Out upon arrival	44
Dead tree burning	Fire started by homeowner and put out by fire department	30
House fire	FD put out fire: Major house fire that reignited several times	576
Outside fire	Police put out fire - Out upon FD arrival: Bail of straw burning in field	16
Aluminum ladder on electric wire and possible fire	Small fire behind washing machine. FD Put out with fire extinguisher	24
Possible House fire	Out upon arrival (Decorations)	7
Oven fire	Out upon arrival	29
Building fire	Gas line on fire in building - gas line was then shut off	20
Report of kitchen fire	Our upon arrival: In kitchen - wooden chair with smoldering cushion (candle on table knocked over)	35

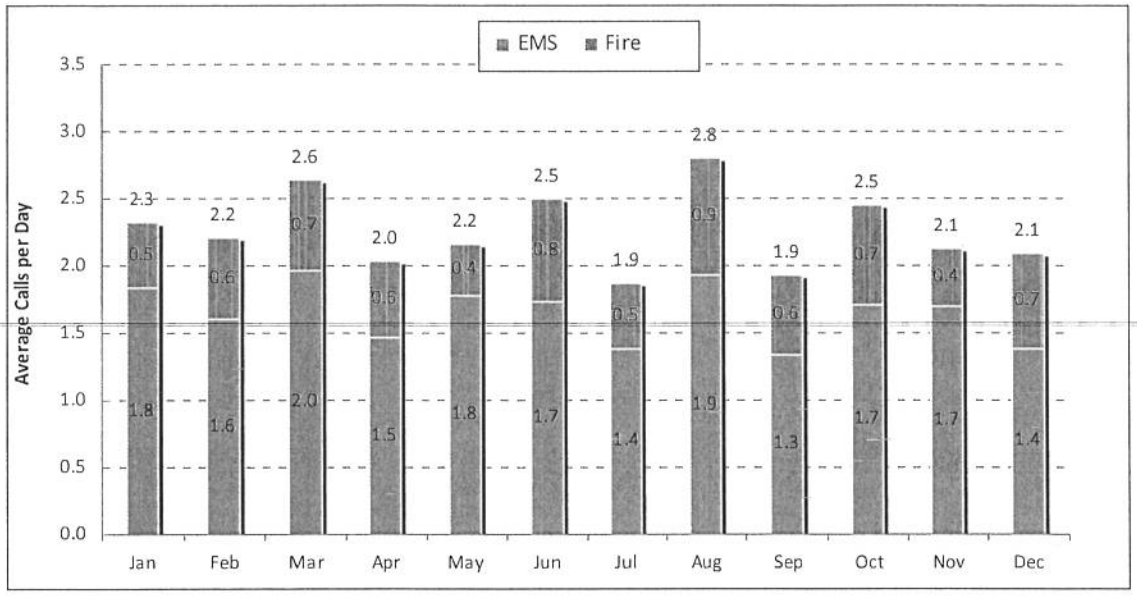
Figure 30. Calls by Type and Duration, City of Plymouth



Observations

- A total of 630 (76 percent) calls lasted less than half an hour, 140 (17 percent) calls lasted between half an hour and one hour, and additional 57 calls (7 percent) lasted more than an hour.
- In all, only 3 real fire calls and 7 other calls lasted more than two hours.
- Of the 575 medical calls, 535 (93 percent) lasted less than one hour.
- Of the 29 personal injury calls, 28 lasted less than one hour.
- Of the 20 real fire calls, 11 lasted less than half an hour, 6 lasted between half an hour and one hour, and 3 lasted more than two hours.
- Of the 28 hazardous condition calls, 25 (89 percent) less than an hour.
- Of the 59 alarm calls, 57 (97 percent) lasted less than an hour.
- Of the 116 fire other calls, 108 (93 percent) lasted less than an hour.

Figure 31. Calls by Month, City of Plymouth



Observations

- The average number of EMS calls per day varied by month and ranged from a low of 1.3 calls per day in September to a high of 54 percent more in March, which averaged 2 calls per day.
- The average number of fire calls per day varied by month and ranged from a low of 0.4 calls per day in May and November to a high of more than double that in August, which averaged 0.9 calls per day.

Figure 32. Calls by Hour of Day, City of Plymouth

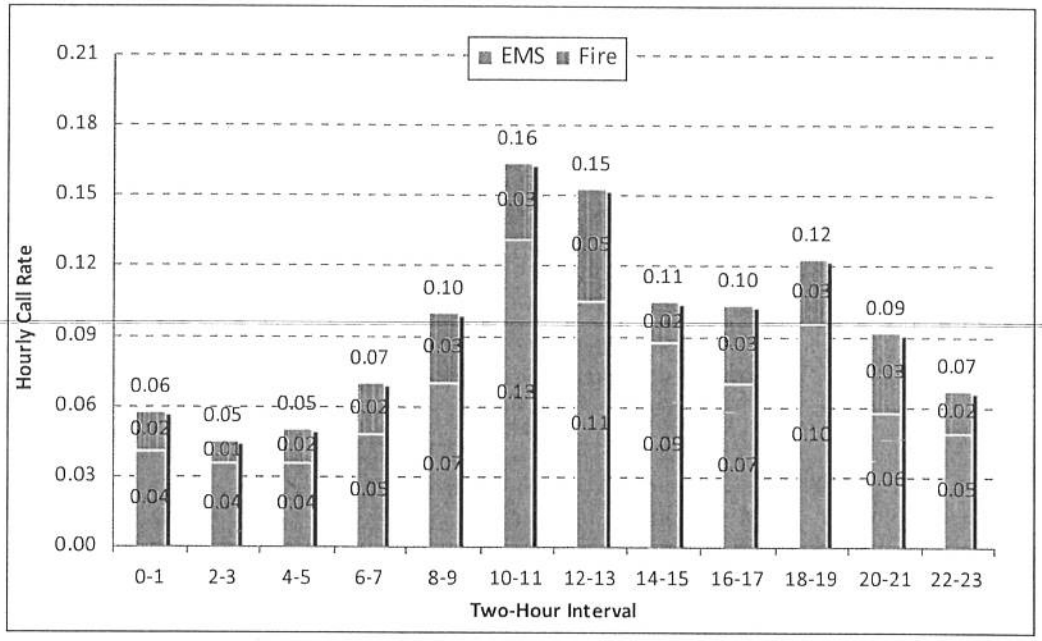


Table 20. Calls by Hour of Day, City of Plymouth

Two-Hour Interval	Hourly Call Rate		
	EMS	Fire	Total
0–1	0.04	0.02	0.06
2–3	0.04	0.01	0.05
4–5	0.04	0.02	0.05
6–7	0.05	0.02	0.07
8–9	0.07	0.03	0.10
10–11	0.13	0.03	0.16
12–13	0.11	0.05	0.15
14–15	0.09	0.02	0.11
16–17	0.07	0.03	0.10
18–19	0.10	0.03	0.12
20–21	0.06	0.03	0.09
22–23	0.05	0.02	0.07
Calls/Day	1.65	0.61	2.26

Observations

- Hourly call rates peaked between 10 a.m. and 2 p.m. This peak is equivalent to an average rate of 1 call every 6 hours.
- The peak rate for just EMS is equivalent to 1 call every 8 hours.
- The call rate was lowest between midnight and 6 a.m.

Figure 33. Number of Units Dispatched to Calls, City of Plymouth

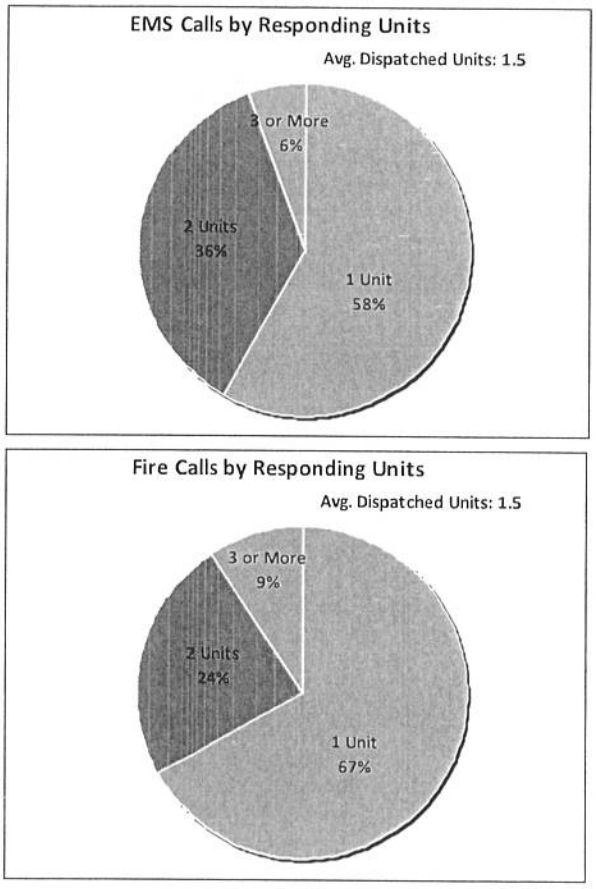


Table 21. Number of Units Dispatched to Calls, City of Plymouth

Call Type	City of Plymouth		
	1 Unit	2 Units	3 or More Units
Medical	325	233	17
Personal injury	7	14	8
EMS Total	**332**	**247**	**25**
Real fire	8	4	8
Hazard	18	9	1
Alarm	39	13	7
Other	84	27	5
Fire Total	**149**	**53**	**21**
Grand Total	**481**	**300**	**46**
Percentage	**58.2%**	**36.3%**	**5.6%**

Observations

- Overall, three or more units was dispatched to 5.6 percent of calls.
- On average, 1.5 units were dispatched per EMS and fire call.
- For EMS calls, 58 percent of the time one unit was dispatched, 36 percent of the time two units were dispatched, and 6 percent of the time three or more units were dispatched.
- For fire category calls, 67 percent of the time one unit was dispatched, 24 percent of the time two units were dispatched, and 9 percent of the time three or more units were dispatched.
- Of the 20 real fire calls, 40 percent of the time three or more units were dispatched, 40 percent of the time one unit was dispatched, and 20 percent of the time two units were dispatched.

Table 22. Annual Total Deployed Time by Call Type, City of Plymouth and Plymouth Township

	City of Plymouth				Plymouth Township		
All Runs	Avg. Busy Minutes/ Call	Annual Busy Hours	Percentage	Number of Runs	Avg. Busy Minutes/ Call	Annual Busy Hours	Number of Runs
Medical	23.3	325	64.2	844	24.4	782	1931
Personal injury	16.7	16	3.2	59	27.9	179	387
EMS Total	**22.8**	**341**	**67.4**	**903**	**25**	**960**	**2,318**
Real fire	80.0	67	13.2	51	30.9	57	111
Hazard	29.6	19	3.8	39	72.9	47	39
Alarm	13.7	21	4.1	91	18.1	60	198
Other	22.8	58	11.5	154	23.8	161	405
Fire Total	**29.7**	**165**	**32.6**	**335**	**25.9**	**325**	**753**
Mutual aid							
Total	**24.7**	**506**	**100**	**1238**	**25.2**	**1,285**	**3,071**

Observations

- The units deployed for calls in the city of Plymouth totaled 506 hours in a year—on average, 1 hour and 23 minutes per day.
- The units deployed for calls of Plymouth Township totaled 1,285 hours in a year—on average, 3.5 hours per day.
- The units deployed for mutual aid calls totaled 52 hours in a year.
- Real fire calls accounted for 13.2 percent of the city's total workload—in total, less than 1 hour and 20 minutes per week.
- EMS calls accounted for 67.4 percent of the city's total workload, averaging 23 minutes per run.
- Hazard calls accounted for 3.8 percent of the city's total workload, averaging 30 minutes per run.
- Alarm calls accounted for 4.1 percent of the city's total workload, averaging 14 minutes per run.
- Other type of calls accounted for 11.5 percent of the city's total workload, averaging 23 minutes per run.

Table 23. Call Workload by Unit, City of Plymouth

			City of Plymouth				Plymouth Township		Combined	
Station	Unit	Unit Type	Number of Calls	Number of Calls/Day	Busy Minutes/ Day	Annual Busy Hours	Number of Calls	Annual Busy Hours	Calls/ Day	Busy Minutes/ Day
1	ALPH1	Advanced life support (ALS)	398	1.1	25.7	156.3	850	355.3	3.4	84.1
	ENG1	Engine	63	0.2	4.8	29.1	155	55.7	0.6	14.0
	UTL1	Mobile Command Post	122	0.3	6.7	41.0	259	96.1	1.0	22.5
2	ALPH2	ALS	210	0.6	15.8	96.3	503	199.7	2.0	48.6
	ENG2	Engine	91	0.2	7.1	43.0	239	93.6	0.9	22.5
3	ALPH3	ALS	226	0.6	15.4	93.6	653	314.4	2.4	67.1
	ALPH4	ALS	5	0.0	0.4	2.4	17	7.8	0.1	1.7
	ENG3	Engine	62	0.2	4.6	28.2	182	85.6	0.7	18.7
	ENG4	Engine	3	0.0	0.1	0.6	8	9.1	0.0	1.6
	TOW3	Aerial truck	2	0.0	0.1	0.3	6	1.4	0.0	0.3
	UTL3	Other apparatus	48	0.1	2.4	14.3	199	66.3	0.7	13.3

Notes: ALPH4 were reserved units for ALPH1, ALPH2, and ALPH3; ENG4 were reserved units for ENG 1, ENG 2, and ENG3.

Observations

- Ambulance unit ALPH1 responded to 398 calls in the city of Plymouth and was busy for 156 hours in a year, averaging 1.1 runs and 26 busy minutes per day.
- Ambulance unit ALPH2 responded to 210 calls in the city and was busy for 96 hours in a year, averaging 0.6 runs and 16 busy minutes per day.
- Ambulance unit ALPH3 responded to 226 calls in the city and was busy for 94 hours in a year, averaging 0.6 runs and 15 busy minutes per day.
- Engine unit ENG1 responded to 63 calls in the city and was busy for 29 hours in a year, averaging 0.2 runs and 5 busy minutes per day.
- Engine unit ENG2 responded to 91 calls in the city and was busy for 43 hours in a year, averaging 0.2 runs and 7 busy minutes per day.
- Engine unit ENG3 responded to 62 calls in the city and was busy for 28 hours in a year, averaging 0.2 runs and 5 busy minutes per day.

Table 24. Engine Units: Total Annual Number and Daily Average Number of Runs by Call Type, City of Plymouth

Runs	Medical	Personal Injury	Real Fire	Hazard	Alarm	Other	Total	Runs/ Day
ENG1	4	**1**	**10**	9	21	18	**63**	**0.17**
ENG2	22	**14**	**10**	8	17	20	**91**	**0.25**
ENG3	8	**5**	**8**	10	22	12	**65**	**0.18**

Note: The workload of ENG4 was counted as ENG3.

Observations

- In 2009, all three engine units were dispatched less than 100 times for calls in the city of Plymouth.
- ENG1 and ENG3 averaged one run per six days.
- ENG2 averaged one run per four days and responded to most of the EMS calls, which is 36 EMS calls in a year.

Table 25. Engine Units: Daily Average Deployed Minutes by Call Type, City of Plymouth

Avg. Min./ Day	Medical	Personal Injury	Real Fire	Hazard	Alarm	Other	Total	Fire Calls, Percentage
ENG1	0.22	**0.02**	**1.31**	0.71	0.88	1.64	**4.79**	**94.8**
ENG2	0.98	**0.53**	**2.81**	0.54	0.54	1.67	**7.07**	**78.6**
ENG3	0.35	**0.18**	**1.21**	1.05	1.06	0.88	**4.73**	**88.8**

Note: The workload of ENG4 was counted as ENG3.

Observation

- In 2009, ENG1 and ENG3 were busy less than 5 minutes per day for calls in the city of Plymouth.

Table 26. Ambulance Units: Total Annual Number and Daily Average Number of Runs by Call Type, City of Plymouth

Runs	Medical	Personal Injury	Real Fire	Hazard	Alarm	Other	Total	Runs/ Day
ALPH1	321	**16**	**7**	3	6	45	**398**	**1.1**
ALPH2	182	**7**	**5**	2	1	13	**210**	**0.6**
ALPH3	186	**7**	**4**		7	27	**231**	**0.6**

Note: The workload of ALPH4 was counted as ALPH3.

Observations

- In 2009, ALPH1 responded to 398 calls in the city of Plymouth, averaging 1.1 run per day, 85 percent of which were EMS calls.
- In 2009, ALPH2 responded to 210 calls in the city, averaging 0.6 run per day, 90 percent of which were EMS calls.
- In 2009, ALPH3 responded to 231 calls in the city, averaging 0.6 run per day, 84 percent of which were EMS calls.

Table 27. Ambulance Units: Daily Average Deployed Minutes by Call Type, City of Plymouth

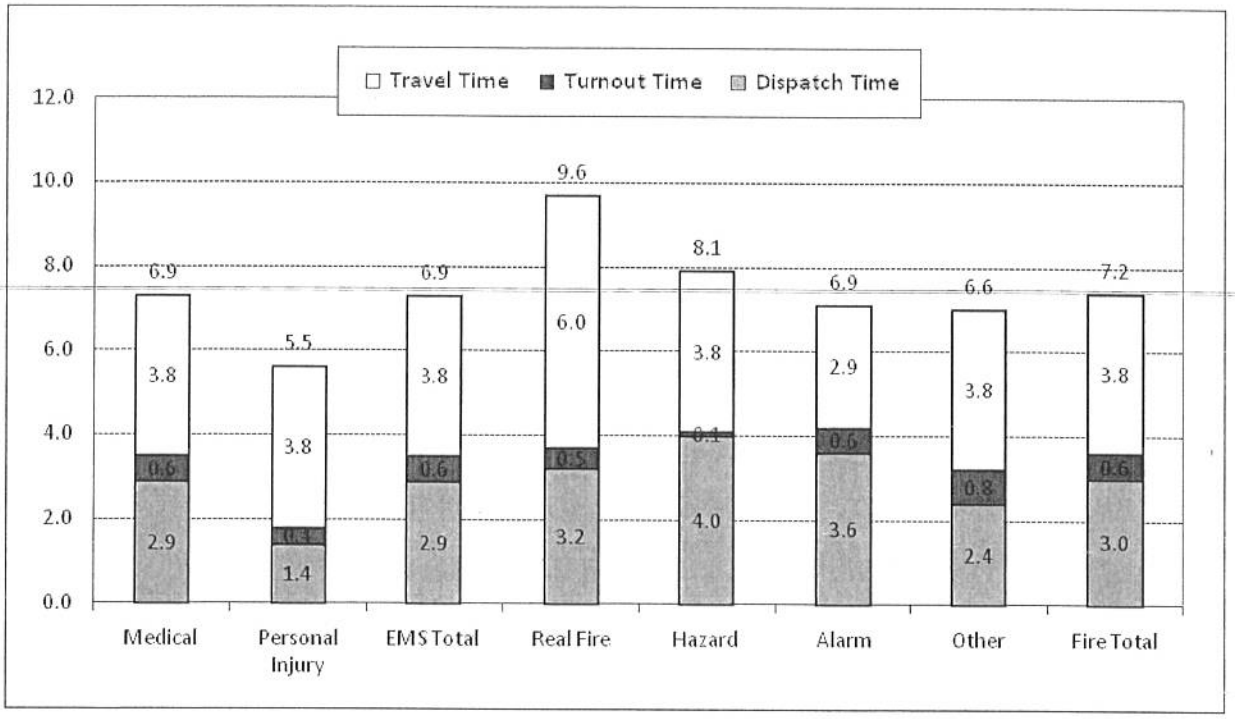
Avg. Min./ Day	Medical	Personal Injury	Real Fire	Hazard	Alarm	Other	Total	EMS Calls, Percentage
ALPH1	21.1	**0.8**	**1.3**	0.1	0.3	2.1	25.7	**85.2**
ALPH2	12.3	**0.2**	**2.3**	0.2	0	0.8	15.8	**79.1**
ALPH3	13.1	**0.5**	**0.4**		0.2	1.6	15.8	**86.1**

Note: The workload of ALPH4 was counted as ALPH3.

Observations

- On average, ALPH1 were busy 26 minutes per day for calls in the city of Plymouth, 85 percent of which were EMS calls.
- On average, ALPH1 were busy 16 minutes per day for calls in the city, 79 percent of which were EMS calls.
- On average, ALPH1 were busy 16 minutes per day for calls in the city of Plymouth, 86 percent of which were EMS calls.

Figure 34. Average Dispatch, Turnout, and Travel Times of First Arriving Unit by Call Type, City of Plymouth



FD Response Time

Table 28. Average Dispatch, Turnout, Travel, and Response Times of First Arriving Unit by Call Type, City of Plymouth and Plymouth Township

	City of Plymouth						Plymouth Township
Call Type	Average Dispatch Time	Average Turnout Time	Average Travel Time	Average Response Time	90th Percentile Response Time	Number of Calls	Average Response Time
Medical	2.9	0.6	3.8	6.9	10.1	574	6.7
Personal injury	1.4	0.4	3.8	5.5	8.6	29	7.2
EMS Total	**2.9**	**0.6**	**3.8**	**6.9**	**10.0**	**603**	**6.8**
Real fire	3.2	0.5	6.0	9.6	11.8	20	7.2
Hazard	4.0	0.1	3.8	8.1	14.2	28	9.2
Alarm	3.6	0.6	2.9	6.9	10.1	58	7.2
Other	2.4	0.8	3.8	6.6	10.5	113	7.5
Fire Total	**3.0**	**0.6**	**3.8**	**7.2**	**11.0**	**219**	**7.4**
Total	**2.9**	**0.6**	**3.8**	**7.0**	**10.5**	**822**	**6.9**

Observations

- The 90th percentile response time for EMS calls in the city of Plymouth was 10 minutes.
- The 90th percentile response time for fire calls in the city was 11 minutes.
- The average dispatch time for calls in the city was 2.9 minutes.
- The average turnout time for calls in the city was 0.6 minutes.
- The average travel time for calls in the city was 3.8 minutes.
- The average response time for calls in the city was 7 minutes.
- Among all types of calls, real fire and hazard had the longest average response time, which were 9.6 and 8.1 minutes, respectively.
- The average response time for calls in Plymouth Township was 6.9 minutes.

Figure 35. Which Unit Arrived First, City of Plymouth

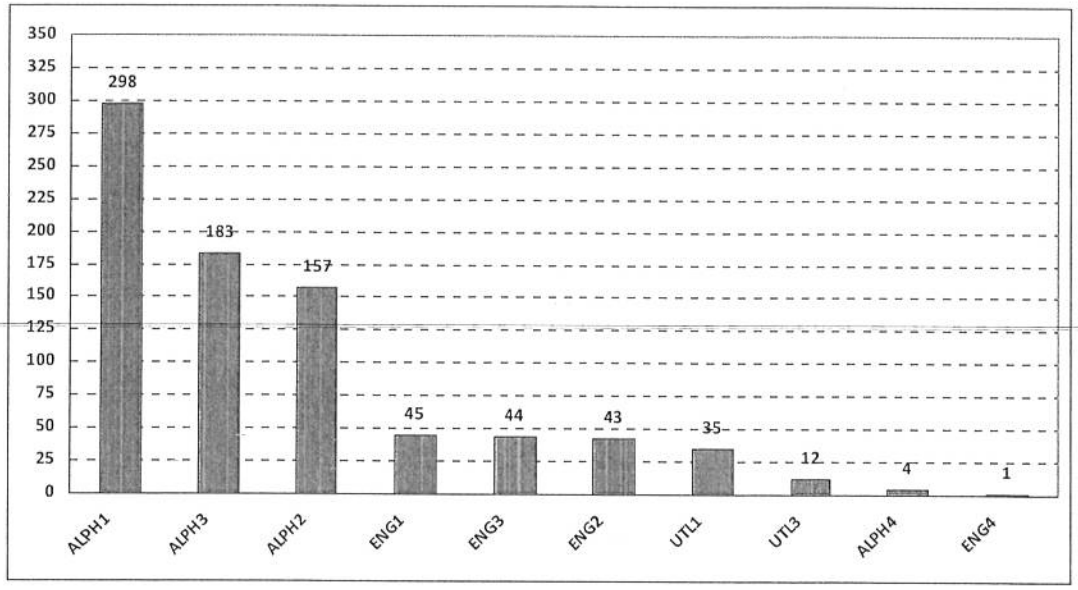


Table 29. Which Unit Arrived First by Call Type, City of Plymouth

Unit	EMS	Real Fire	Fire Other	Total	Percentage	Cumulative Percentage
ALPH1	254	3	41	298	36.3	36.3
ALPH3	158	1	24	183	22.3	58.5
ALPH2	143	1	13	157	19.1	77.6
ENG1	4	5	36	45	5.5	83.1
ENG3	4	4	36	44	5.4	88.4
ENG2	10	3	30	43	5.2	93.7
UTL1	18	2	15	35	4.3	97.9
UTL3	7	1	4	12	1.5	99.4
ALPH4	4		0	4	0.5	99.9
ENG4	1		0	1	0.1	100.0

Observations

- Three ambulance units ALPH1, ALPH2, and ALPH3 were the first units on scene 77.6 percent of the time for all calls in the city of Plymouth.
- Engine companies were listed as first on scene for most real fires and fire other calls.

Figure 36. Average Dispatch, Turnout, Travel, and Response Times of First Arriving Unit by Hour of Day, City of Plymouth

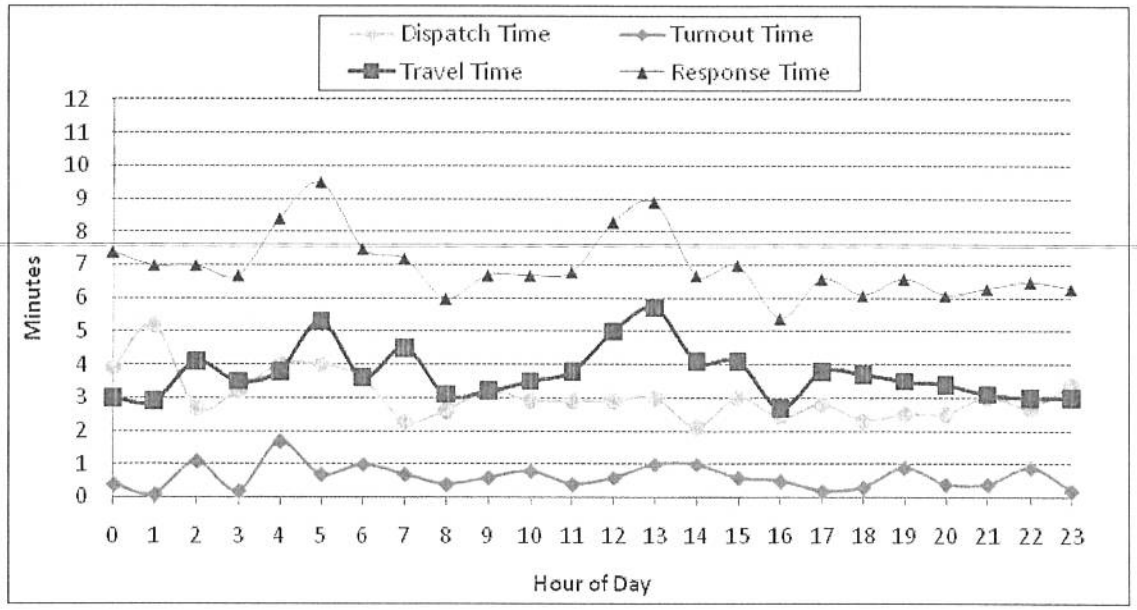


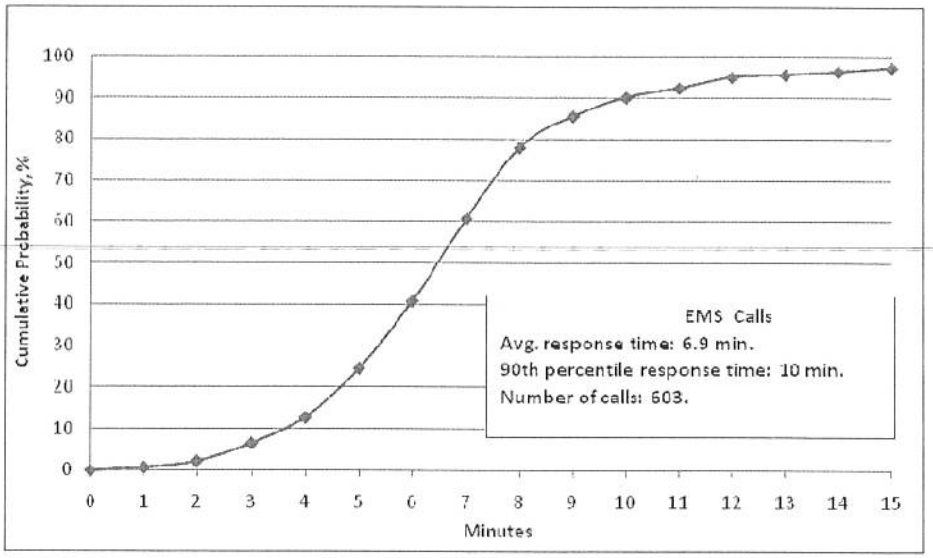
Table 30. Average Dispatch, Turnout, Travel, and Response Times of First Arriving Unit by Hour of Day, City of Plymouth

EMS	Dispatch Time	Turnout Time	Travel Time	Response Time	Number of Calls
0	**3.9**	0.4	3.0	7.4	28
1	**5.2**	0.1	2.9	7.0	14
2	2.7	1.1	4.1	7.0	20
3	3.2	0.2	3.5	6.7	13
4	**4.0**	1.7	3.8	8.4	18
5	**4.0**	0.7	**5.3**	**9.5**	18
6	3.6	1.0	3.6	7.5	21
7	2.3	0.7	4.5	7.2	30
8	2.6	0.4	3.1	6.0	36
9	3.2	0.6	3.2	6.7	37
10	2.9	0.8	3.5	6.7	61
11	2.9	0.4	3.8	6.8	59
12	2.9	0.6	**5.0**	**8.3**	54
13	3.0	1.0	**5.7**	**8.9**	55
14	2.1	1.0	4.1	6.7	41
15	3.0	0.6	4.1	7.0	36
16	2.4	0.5	2.7	5.4	41
17	2.8	0.2	3.8	6.6	35
18	2.3	0.3	3.7	6.1	48
19	2.5	0.9	3.5	6.6	41
20	2.5	0.4	3.4	6.1	33
21	3.0	0.4	3.1	6.3	34
22	2.7	0.9	3.0	6.5	27
23	3.4	0.2	3.0	6.3	22
Average	2.9	0.6	3.8	7.0	822

Observations

- Average dispatch time was between 2.1 and 5.2 minutes.
- Average turnout time was between 0.1 and 1.7 minutes.
- Average travel time was between 2.7 and 5.7 minutes.
- Average response time varied between 5.4 and 9.5 minutes.
- Average response time peaked at 5 a.m. with 9.5 minutes and 1 p.m. with 8.9 minutes.

Figure 37. Cumulative Distribution Function (CDF) of Response Time of First Arriving Units for EMS Calls, City of Plymouth



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 10 minutes. This means that EMS units responded to 90 percent of these calls in less than 10 minutes.

Table 31. Cumulative Distribution Fuction (CDF) of Response Time of First Arriving Units for EMS Calls, City of Plymouth

Response Time in minutes	Frequency	Cumulative Percentage
0	0	0.0
1	4	0.8
2	8	2.3
3	23	6.6
4	33	12.9
5	62	24.6
6	86	40.9
7	105	60.8
8	91	78.0
9	40	85.6
10	24	90.2
11	12	92.4
12	14	95.1
13	3	95.6
14	4	96.4
15	5	97.3
16	2	97.7
17	0	97.7
18	2	98.1
19	1	98.3
20	1	98.5
>= 20	8	100.0

Observations

- The average response time for EMS calls was 6.9 minutes.
- For 41 percent of EMS calls, the response time was less than 6 minutes.
- For 90 percent of EMS calls, the response time was less than 10 minutes.

Table 32. Average Response Time by Engine Units Arriving Sequence for Real Fire Calls, City of Plymouth

	Real Fire			
	First Arriving Engine		Second Arriving Engine	
Unit	Response Time	Number of Calls	Response Time	Number of Calls
ENG1	7.8	6		
ENG2	14.3	5	10.3	1
ENG3	7.4	4		
ENG4			10.8	1

Note: A total of 10 engine dispatches missed unit-arriving-on-scene data to calculate response time.

Observations

- The average response time of ENG1 when it was the first engine arriving on scene was 7.8 minutes.
- The average response time of ENG2 when it was the first engine arriving on scene was 14.3 minutes. However, if we exclude one call with an extreme long dispatch time of more than 30 minutes, the average response time of ENG2 when it was the first engine arriving on scene was 7.4 minutes.
- The average response time of ENG3 when it was the first engine arriving on scene was 7.4 minutes.

X. Huron Valley Ambulance Operations

Aggregate Call Totals and Dispatches

The data include calls between January 1, 2009, and December 31, 2009. The private ambulance company responds to EMS calls for both the city of Plymouth and Plymouth Township. This report is focused on the analysis of calls of the city of Plymouth. However, summaries of calls, workloads, and response time of calls of Plymouth Township are included in Tables 33, 35, and 36. In a year, 807 noncanceled EMS calls from the city were responded to, and 94 EMS calls were canceled. We categorized the calls based on the call description and show the correspondence in Appendix Table 3. The analysis of call types is captured in the following tables and figures:

- Table 33: Call Types, City of Plymouth and Plymouth Township
- Figure 38: EMS Calls by Type and Duration, City of Plymouth
- Figure 39: EMS Calls by Type, City of Plymouth
- Figure 40: EMS Calls by Month, City of Plymouth
- Figure 41 and Table 34: Calls by Hour of Day, City of Plymouth

Workload by Individual Unit—Calls or Activities and Total Time Spent

One ambulance unit was deployed per EMS call. We look at the workload (the actual time spent by each unit on every call) in this section. The average time from dispatch until the unit was available for the next dispatch was 56 minutes. The total workload in a year for noncanceled calls of city of Plymouth was 736 hours, averaging two hours per day.

- Table 35: Annual Total Deployed Time by Call Type, Including Canceled Units, City of Plymouth and Plymouth Township

Dispatch Time and Response Time

Dispatch processing time is the difference between the "unit dispatch time" and the "call receipt time." Turnout time is the difference between the "unit en route time" and the "unit dispatch time." Travel time is the difference between the "unit on-scene arrival time" and the "unit dispatch time." Response time includes dispatch processing time, turnout and travel time. Overall, the average dispatch processing time was 0.5 minutes. The average total response time was 6.4 minutes, and the 90th percentile response time was 9.8 minutes. The following figures and tables present the results of dispatch and response times analysis:

- Figure 42 and Table 36: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Units by EMS Call Type, City of Plymouth and Plymouth Township
- Figure 43 and Table 37: Average Dispatch, Turnout, Travel, and Response Times of First Arriving Units by Hour of Day for EMS Calls, City of Plymouth
- Figure 44 and Table 38: Cumulative Distribution Function (CDF) of Response Time of First Arriving Units for EMS Calls, City of Plymouth
- Table 39: Matching Calls of Plymouth Dispatch Center and Huron Valley Ambulance
- Table 40: Delays in Reporting between the Plymouth Township Dispatch Center Department and Huron Valley Ambulance (HVA)

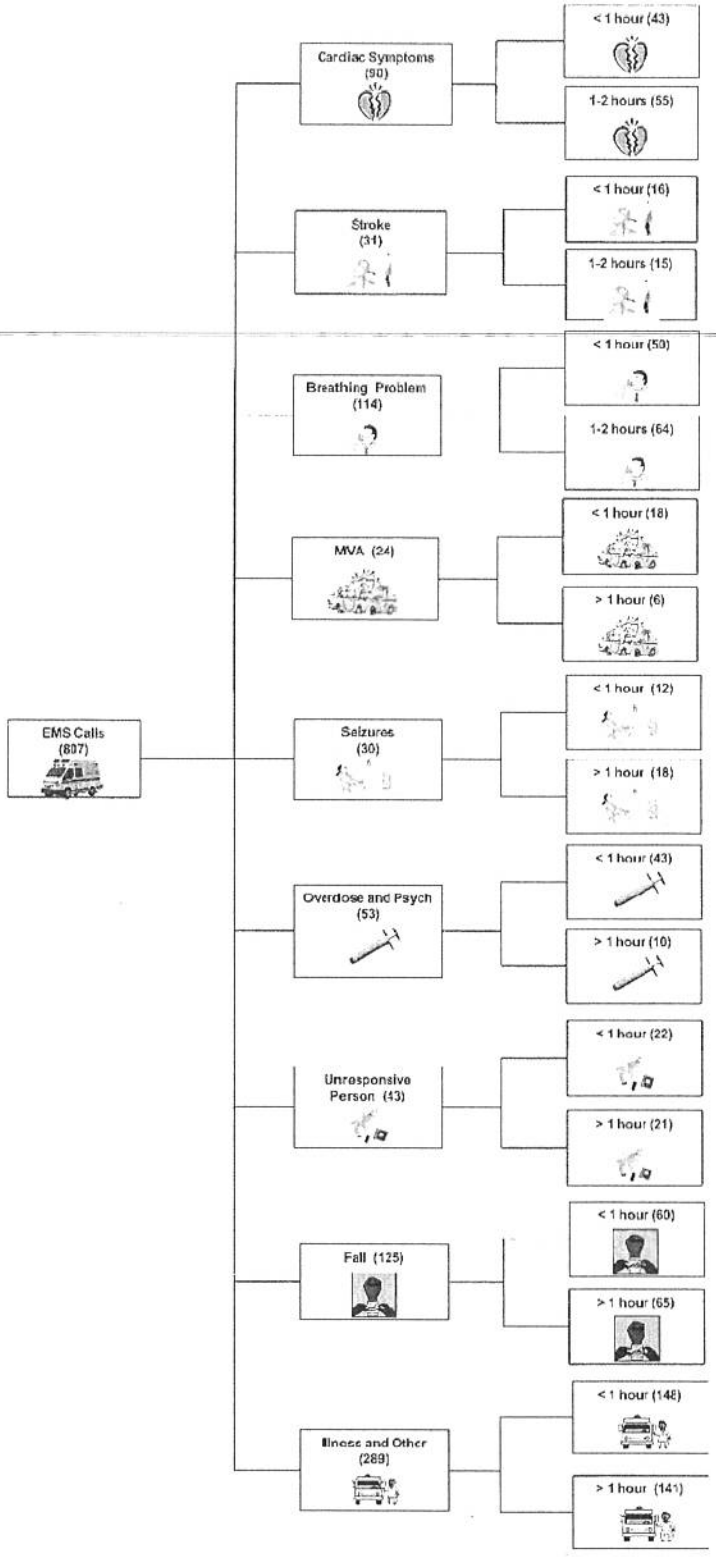
Table 33. Call Types, City of Plymouth and Plymouth Township

	City of Plymouth				Plymouth Township	
Call Type	Number of Non-canceled Calls	Calls/ Day	Calls Percentage	Number of Canceled Calls	Number of Non-canceled Calls	Number of Canceled Calls
Cardiac symptoms	98	0.3	12.1	8	178	22
Stroke	31	0.1	3.8	2	64	2
Breathing problem	114	0.3	14.1	6	156	12
Motor vehicle accident	24	0.1	3.0	15	179	79
Seizure	30	0.1	3.7	3	49	2
Overdose/psych	53	0.1	6.6	4	100	11
Unresponsive person	43	0.1	5.3	2	97	12
Fall	125	0.3	15.5	14	371	19
Illness and other	289	0.8	35.8	40	508	103
EMS Total	**807**	**2.2**	**100.0**	**94**	**1,702**	**262**

Observations

- There were 901 EMS calls including 94 canceled calls in the city of Plymouth in 2009.
- On average, the ambulance company responded to 2.2 noncanceled EMS calls per day in the city.
- In the same period, the ambulance company responded to 1964 calls in Plymouth Township in 2009, including 262 canceled calls, averaging 5.4 calls per day.

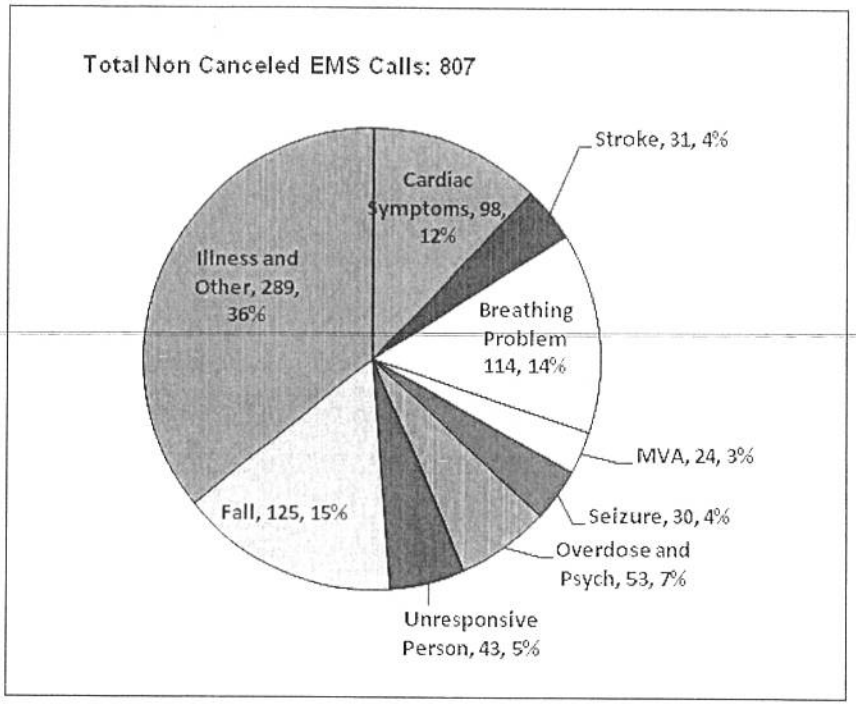
Figure 38. EMS Calls by Type and Duration, City of Plymouth



Observations

- A total of 145 (18 percent) calls lasted less than half an hour, and 267 (33.1 percent) lasted between half an hour and an hour and 395 (48.9 percent) calls lasted more than an hour.
- In all, only three calls lasted more than two hours.
- Of the 98 cardiac symptoms calls, 55 (56 percent) lasted more than one hour.
- Of the 31 stroke calls, 15 (48 percent) lasted more than one hour.
- Of the 114 breathing problem calls, 64 (56 percent) lasted less than one hour.
- Of the 24 motor vehicle accident calls, 6 (25 percent) lasted more than one hour.
- Of the 30 seizure calls, 18 (60 percent) lasted more than one hour.
- Of the 53 overdose and psych calls, 10 (19 percent) lasted more than one hour.
- Of the 43 unresponsive person calls, 21 (49 percent) lasted more than one hour.
- Of the 125 fall calls, 65 (52 percent) lasted more than one hour.
- Of the 289 illness and other calls, 141 (49 percent) lasted more than one hour.

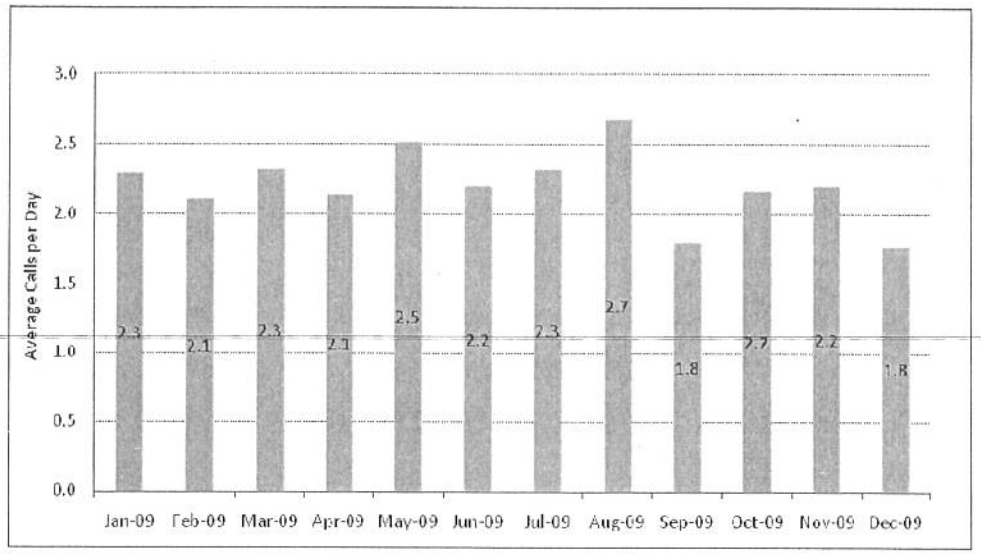
Figure 39. EMS Calls by Type, City of Plymouth



Observations

- The largest category was illness and other calls, which were 36 percent of the EMS total; the second largest EMS category was fall, which were 15 percent of the EMS total.
- Breathing problem accounted for 14 percent of the EMS total.
- Cardiac symptoms calls accounted for 12 percent of the EMS total.
- Overdose and psych calls accounted for 7 percent of the EMS total
- Unresponsive person calls accounted for 5 percent of the EMS total.
- Stroke, seizures, and motor vehicle accidents accounted for 11 percent of the EMS total.

Figure 40. EMS Calls by Month, City of Plymouth



Observation

- Average EMS calls per day varied by month and ranged from a low of 1.8 calls per day in September and December to a high of 50 percent more in August, which averaged 2.7 calls per day.

Figure 41. Calls by Hour of Day, City of Plymouth

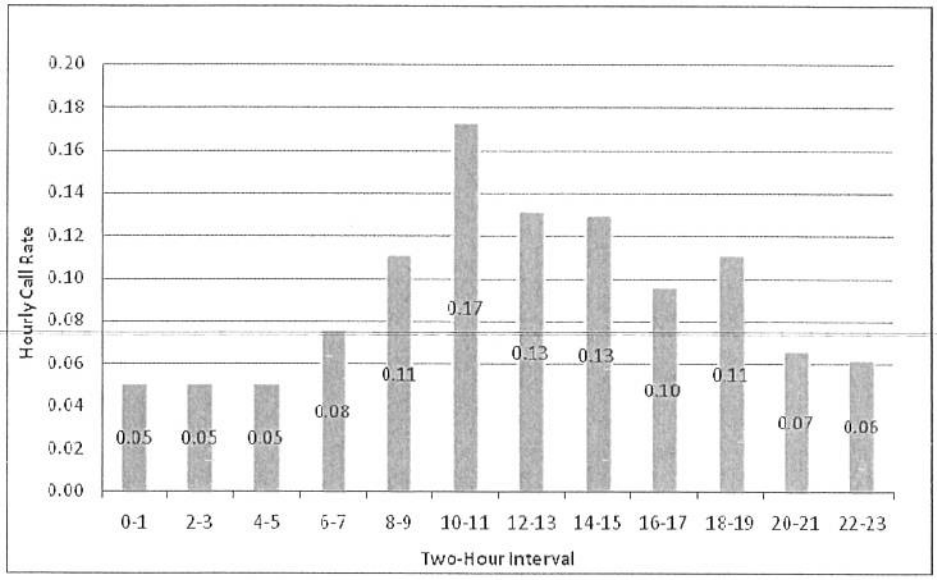


Table 34. Calls by Hour of Day, City of Plymouth

Two-Hour Interval	EMS Hourly Call Rate
0–1	0.05
2–3	0.05
4–5	0.05
6–7	0.08
8–9	0.11
10–11	**0.17**
12–13	0.13
14–15	0.13
16–17	0.10
18–19	0.11
20–21	0.07
22–23	0.06
Calls/day	2.21

Observations

- Hourly call rates peaked between 10 a.m. and 4 p.m.
- The call rate was lowest between midnight and 6 a.m.

Table 35. Annual Total Deployed Time by Call Type, Including Canceled Units, City of Plymouth and Plymouth Township

	City of Plymouth				Plymouth Township			
	Noncanceled Calls			Canceled Calls	Noncanceled Calls			Canceled Calls
Call Type	Avg. Busy Minutes/ Call	Annual Busy Hours	Number of Calls	Annual Busy Hours	Avg. Busy Minutes/ Call	Annual Busy Hours	Number of Calls	Annual Busy Hours
Cardiac symptoms	61.8	100	98	2.1	61.2	177	178	4.2
Stroke	60.9	30	31	1.0	59.9	64	64	0.5
Breathing problem	60.2	109	114	1.0	62.6	157	156	2.6
Motor vehicle accident	31.4	13	24	2.1	42.5	120	179	11.1
Seizure	64.2	31	30	0.7	51.9	42	49	0.7
Overdose/psych	49.1	42	53	1.7	52.7	85	100	2.8
Unresponsive person	54.3	38	43	0.1	58.6	95	97	2.1
Fall	56.7	114	125	3.2	44.5	274	371	3.8
Illness and other	55.1	259	289	10.4	52.8	434	508	21.9
EMS Total	**56.3**	**736**	**807**	**22.3**	**52.2**	**1447**	**1702**	**49.7**

Observations

- The units deployed for noncanceled EMS calls in the city of Plymouth totaled 736 hours in a year, averaging 2 hours per day.
- The units deployed for noncanceled EMS calls in Plymouth Township totaled 1,702 hours in a year, averaging 4.7 hours per day.
- The busy minutes per motor vehicle accident calls were lowest, averaging 31.4 minutes per call.
- Illness and other calls in the city accounted for 35 percent of the total workload.
- Fall calls in the city accounted for 16 percent of the total workload.
- Breathing problems calls in the city accounted for 15 percent of the total workload.
- Cardiac symptoms calls in the city accounted for 14 percent of the total workload.

Figure 42. Average Dispatch, Turnout, and Travel Times of First Arriving Units by EMS Call Type, City of Plymouth

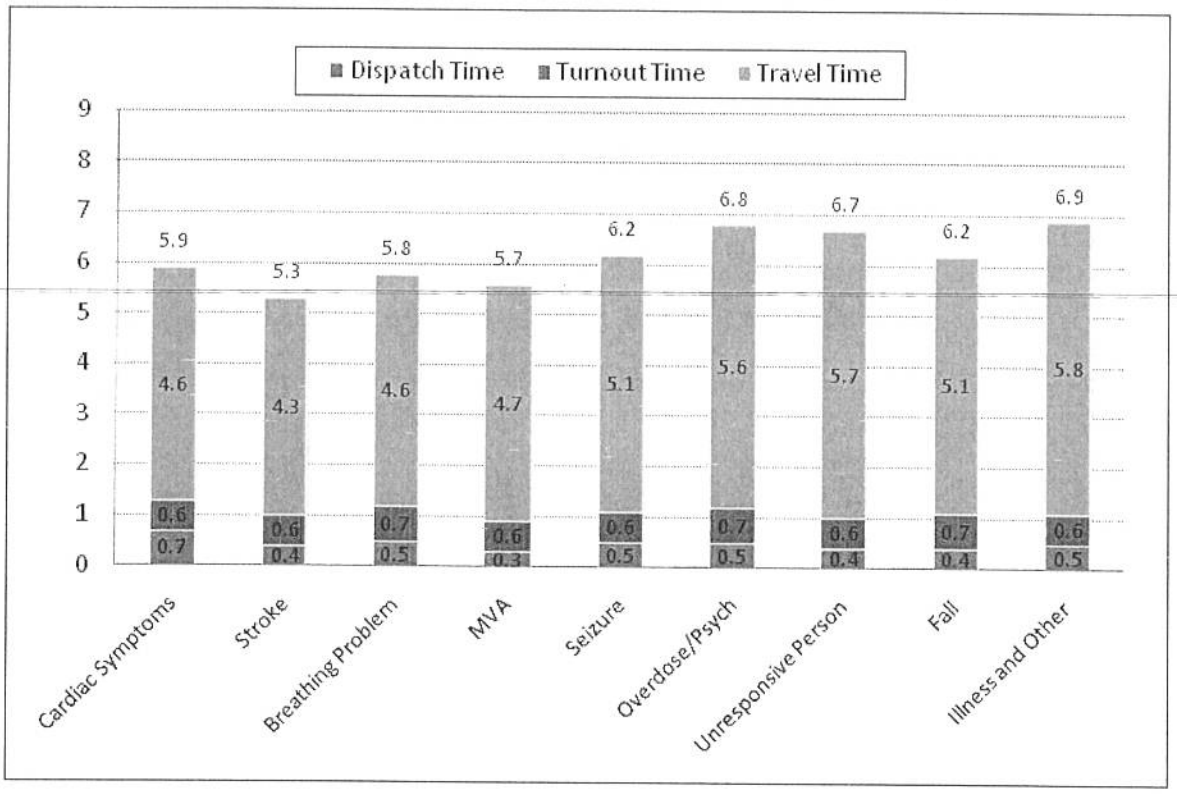


Table 36. Average Dispatch, Turnout, Travel, and Response Times of First Arriving Units by EMS Call Type, City of Plymouth and Plymouth Township

	City of Plymouth						Plymouth Township	
Call Type	Average Dispatch Time	Average Turnout Time	Average Travel Time	Average Response Time	90th Percentile Response Time	Number of Calls	Average Response Time	90th Percentile Response Time
Cardiac symptoms	0.7	0.6	4.6	5.9	9.6	95	6.6	9.8
Stroke	0.4	0.6	4.3	5.3	7.9	30	6.7	9.5
Breathing problem	0.5	0.7	4.6	5.8	8.3	107	7.0	10.3
Motor vehicle accident	0.3	0.6	4.7	5.7	9.7	23	5.9	9.8
Seizure	0.5	0.6	5.1	6.2	10.8	29	6.9	11.4
Overdose/psych	0.5	0.7	5.6	6.8	9.5	50	9.4	14.8
Unresponsive person	0.4	0.6	5.7	6.7	10.1	38	5.9	9.0
Fall	0.4	0.7	5.1	6.2	9.7	116	7.3	11.6
Illness and other	0.5	0.6	5.8	6.9	10.9	266	8.0	12.7
EMS Total	**0.5**	**0.6**	**5.2**	**6.4**	**9.8**	**754**	**7.3**	**11.6**

Observations

- The average dispatch time for all EMS calls in the city of Plymouth was 0.5 minutes.
- The average turnout time and travel time of EMS calls in the city was 0.6 and 5.2 minutes respectively.
- The average response time of EMS calls in the city was 6.4 minutes.
- The 90th percentile response time for all EMS calls in the city was 9.8 minutes.
- The average response time of EMS calls in Plymouth Township was 7.3 minutes.
- The 90th percentile response time for all EMS calls in Plymouth Township was 11.6 minutes.

Figure 43. Average Dispatch, Turnout, Travel, and Response Times of First Arriving Units by Hour of Day for EMS Calls, City of Plymouth

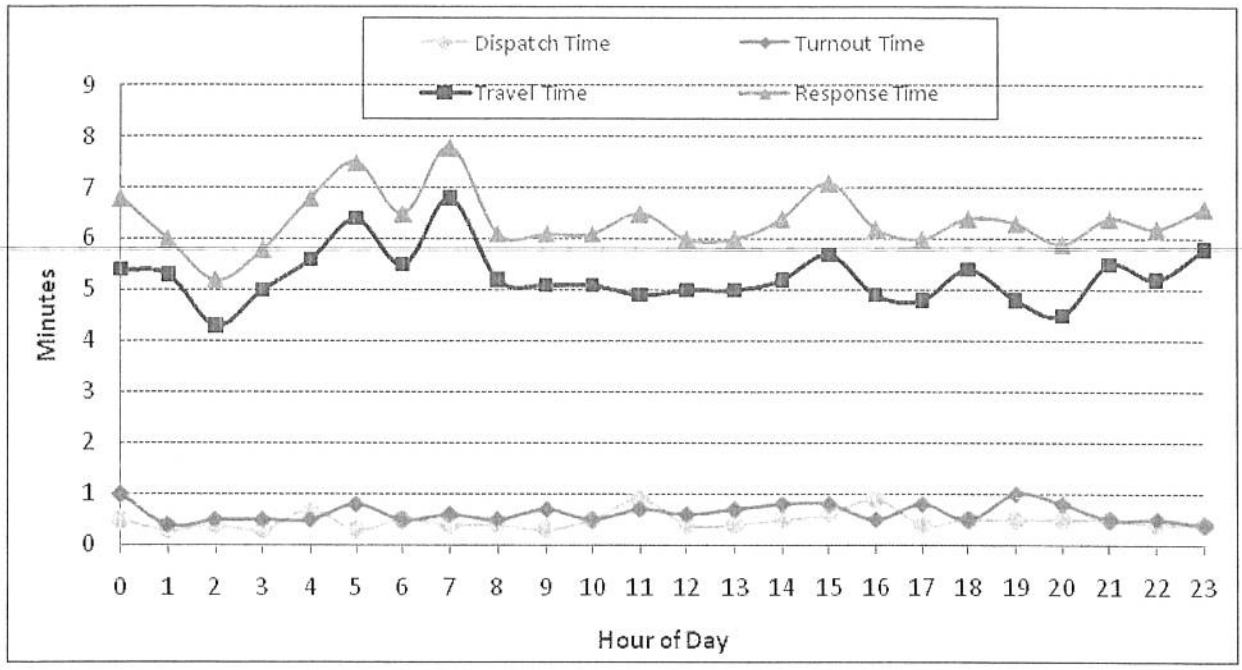


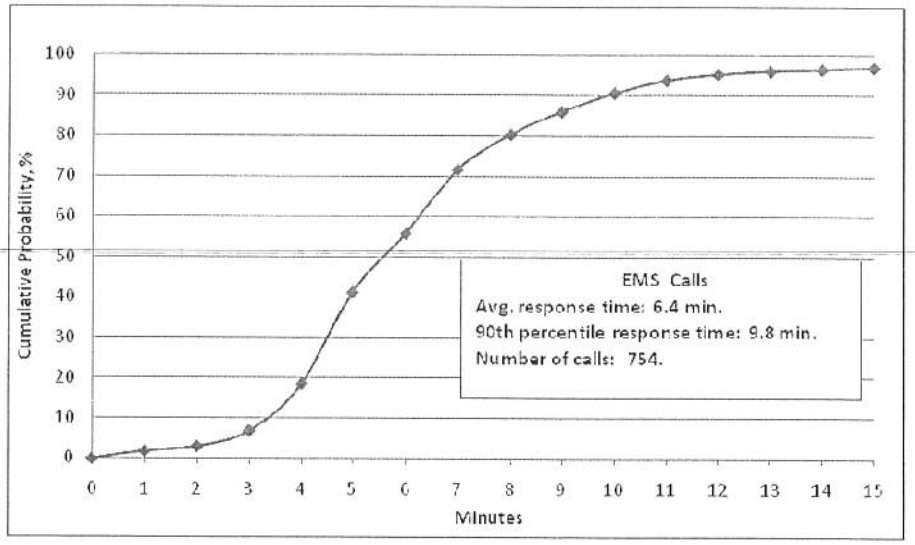
Table 37. Average Dispatch, Turnout, Travel, and Response Times of First Arriving Units by Hour of Day for EMS Calls, City of Plymouth

EMS	Dispatch Time	Turnout Time	Travel Time	Response Time	Number of Calls
0	0.5	1.0	5.4	6.8	22
1	0.3	0.4	5.3	6.0	14
2	0.4	0.5	4.3	5.2	19
3	0.3	0.5	5.0	5.8	16
4	0.7	0.5	5.6	6.8	16
5	0.3	0.8	**6.4**	**7.5**	20
6	0.5	0.5	5.5	6.5	24
7	0.4	0.6	**6.8**	**7.8**	28
8	0.4	0.5	5.2	6.1	40
9	0.3	0.7	5.1	6.1	36
10	0.5	0.5	5.1	6.1	60
11	0.9	0.7	4.9	6.5	52
12	0.4	0.6	5.0	6.0	42
13	0.4	0.7	5.0	6.0	49
14	0.5	0.8	5.2	6.4	46
15	0.6	0.8	5.7	**7.1**	41
16	0.9	0.5	4.9	6.2	32
17	0.4	0.8	4.8	6.0	33
18	0.5	0.5	5.4	6.4	40
19	0.5	1.0	4.8	6.3	32
20	0.5	0.8	4.5	5.9	19
21	0.5	0.5	5.5	6.4	28
22	0.4	0.5	5.2	6.2	20
23	0.4	0.4	5.8	6.6	25
Average	0.5	0.6	5.2	6.4	754

Observations

- Average dispatch time was between 0.3 and 0.9 minutes.
- Average turnout time was between 0.4 and 1 minute.
- Average travel time was between 4.3 and 6.8 minutes.
- Average response time varied between 5.2 and 7.8 minutes.
- Average response time peaked at 5 a.m., 7 a.m. and 3 p.m. at more than 7 minutes due to increased travel time.

Figure 44. Cumulative Distribution Function (CDF) of Response Time of the First Arriving Units for EMS Calls, City of Plymouth



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 EMS units responded to 90 percent of these calls in less than 9.8 minutes.

Table 38. Cumulative Distribution Function (CDF) of Response Time of First Arriving Units for EMS Calls, City of Plymouth

Response Time in minutes	Frequency	Cumulative Percentage
0	0	0.0
1	14	1.9
2	9	3.1
3	29	6.9
4	88	18.6
5	171	41.2
6	110	55.8
7	119	71.6
8	66	80.4
9	43	86.1
10	34	90.6
11	24	93.8
12	11	95.2
13	6	96.0
14	3	96.4
15	4	96.9
16	2	97.2
17	5	97.9
18	0	97.9
19	3	98.3
20	2	98.5
> 20	11	100.0

Observations

- The average response time for EMS calls was 6.4 minutes.
- For 56 percent of EMS calls, the response time was less than 6 minutes.
- For 90 percent of EMS calls, the response time was less than 9.8 minutes.

Table 39. Matching Calls of Plymouth Dispatch Center and Huron Valley Ambulance

		Plymouth Dispatch Center Records	
Plymouth	Call Type	Number of Calls	Percentage Matched
City	Medical	575	67.0
	Personal injury	29	10.3
	Total	604	64.2
Township	Medical	1,307	63.6
	Personal injury	172	2.9
	Total	1,479	56.5

Table 40. Delays in Reporting between the Plymouth Township Dispatch Center Department and Huron Valley Ambulance (HVA)

		Township Dispatch Center Received Call First			HVA Received Call First		
Plymouth	Call Type	Number of Calls	Call Time Difference	Dispatch Time Difference	Number of Calls	Call Time Difference	Dispatch Time Difference
City	Medical	304	1.7	–0.5	81	1.6	2.1
	Personal injury	1	1.8	–0.6	2	0.8	1.5
	Total	**305**	**1.7**	**–0.5**	**83**	**1.6**	**2.1**
Township	Medical	657	1.7	–0.3	174	2.3	2.9
	Personal injury	5	3.2	2.1	—	—	—
	Total	**662**	**1.7**	**–0.3**	**174**	**2.3**	**2.9**

We attempted to match up the individual medical runs recorded for both the Plymouth Township dispatch center and HVA. Calls were matched based on the same location and time and date. The calls were treated as the same if the address was the same and the time differences were 10 minutes or less. Table 39 is based on the medical and personal injury data recorded at the Plymouth dispatch center. In the city of Plymouth, 64 percent of the dispatch center's recorded calls

appear also in the HVA database. However, more than one-third of the calls do not appear in the HVA database.

There were a total of 388 calls in the city of Plymouth that appear in both data sets (see Table 40). Of this total, the dispatch center's reported time was earlier in 305 of the 388 matched records. When this happened, the average delay until the call was recorded as received by HVA was 1.7 minutes. Despite this delay, the dispatch time recorded for HVA was on average 0.5 minutes than the dispatch time recorded for a fire unit. (This appears as a negative number in the table.) When HVA recorded the call first, the average delay until receipt at the fire department was 1.6 minutes.

Appendix. Additional Fire and EMS Tables

Appendix Table 1. Correspondence between Fire Call Description and Call Type

Incident Type Description	Call Type	Grand Call Type
Fire medical emergency	Medical	EMS
Fire PIA call	Personal injury	EMS
Fire structure	Real fire	Fire
Fire down wire	Hazard	Fire
Fire hazardous material	Hazard	Fire
Wires down	Hazard	Fire
Fire alarm - fire, c	Alarm	Fire
Fire commercial alarm	Alarm	Fire
Fire residential alarm	Alarm	Fire
Fire agency assist t	Other	Fire
Fire assist citizen	Other	Fire
Fire call/all other	Other	Fire
Fire type used for d	Other	Fire
Fire mutual aid medi	Mutual aid	Mutual aid
Fire mutual aid to o	Mutual aid	Mutual aid

Appendix Table 2. Workload Analysis of Administrative Apparatus, City of Plymouth and Plymouth Township

Unit Id	Unit Description	Number of Calls	Total Busy Minutes
AIR1	Utility pickup truck	2	57
CAR1	Fire chief	14	364
CAR13	General vehicle	1	4
CAR2	Asst. chief	13	972
CAR3	Fire inspector	7	106
CAR4	General vehicle	10	363
UTL2	Utility pickup truck	5	180
	Total	**52**	**2,045**

Appendix Table 3. Correspondence between EMS Call Description and Call Type

Call Type	Call Description
Cardiac symptoms	06C1-BREATHING PROB-CARDIAC HISTORY
Cardiac symptoms	09B1-CARDIAC ARREST-OBVIOUS DEATH
Cardiac symptoms	09B1A-CARDIAC ARREST-OBV DEATH STIFF
Cardiac symptoms	09D2-CARDIAC ARREST-OBV DEATH QUEST
Cardiac symptoms	09E1-CARDIAC ARREST-NOT BREATHING
Cardiac symptoms	09E2-CARDIAC ARREST-BREATH AGONAL
Cardiac symptoms	09O1-CARDIAC ARREST-EXPECTED DEATH
Cardiac symptoms	10A1-CHEST PAIN-BREATH NORMAL <35
Cardiac symptoms	10C1-CHEST PAIN-ABNORMAL BREATHING
Cardiac symptoms	10C2-CHEST PAIN-MI OR CP HISTORY
Cardiac symptoms	10C4-CHEST PAIN-BREATH NORMAL >35
Cardiac symptoms	10D1-CHEST PAIN-NOT ALERT
Cardiac symptoms	10D3-CHEST PAIN-CHANGING COLOR
Cardiac symptoms	10D4-CHEST PAIN-CLAMMY
Cardiac symptoms	19A1-HEART PROBLEM-HR >50 AND <130
Cardiac symptoms	19C1-HEART PROBLEM-AICD FIRING
Cardiac symptoms	19C2-HEART PROBLEM-ABNORMAL BREATH
Cardiac symptoms	19C3-HEART PROBLEM-CHEST PAIN >35
Cardiac symptoms	19C4-HEART PROBLEM-CARDIAC HISTORY
Cardiac symptoms	19C6-HEART PROBLEM-HR <50 OR >130
Cardiac symptoms	19C7-HEART PROBLEM-UNK/3RD PARTY
Cardiac symptoms	19D1-HEART PROBLEM-NOT ALERT
Cardiac symptoms	19D4-HEART PROBLEM-CLAMMY
Cardiac symptoms	31A2-FAINTING ALERT <35 CARDIAC HISTORY
Cardiac symptoms	33C4-TIP-ACUTE HEART PROB OR MI
Cardiac symptoms	33C4T-TRAN-ACUTE HEART PROB OR MI
Stroke	28B1L-STROKE-UNKNOWN STATUS
Stroke	28B1U-STROKE-UNKNOWN/3RD PARTY CALL
Stroke	28C1G-STROKE-NOT ALERT
Stroke	28C1L-STROKE-NOT ALERT
Stroke	28C1U-STROKE-NOT ALERT

Stroke	28C2G-STROKE-ABNORMAL BREATHING
Stroke	28C3G-STROKE-SPEECH PROBLEMS
Stroke	28C3L-STROKE-SPEECH PROBLEMS
Stroke	28C3U-STROKE-SPEECH PROBLEMS
Stroke	28C4-STROKE-NUMBNESS OR TINGLING
Stroke	28C4G-STROKE-NUMBNESS OR TINGLING
Stroke	28C4L-STROKE-NUMBNESS OR TINGLING
Stroke	28C4U-STROKE-NUMBNESS OR TINGLING
Stroke	28C5L-STROKE-VISION PROBLEMS
Stroke	28C6G-STROKE-SUDDEN ONSET HEADACHE
Stroke	28C7G-STROKE-HISTORY OF STROKE
Stroke	28C7L-STROKE-HISTORY OF STROKE
Stroke	28C7U-STROKE-HISTORY
Breathing problem	06C1-BREATHING PROB-ABNORMAL BEATH
Breathing problem	06C1A-BREATHING PROB-ABNORMAL BREATH
Breathing problem	06D1-BREATHING PROB-NOT ALERT
Breathing problem	06D2-BREATHING PROB-DIFF SPEAKING
Breathing problem	06D3-BREATHING PROB-CHANGING COLOR
Breathing problem	06D4-BREATHING PROB-CLAMMY
Breathing problem	06E1-BREATHING PROB-INEFFECT BREATH
Breathing problem	33C2-TIP-ABNORMAL BREATHING
Breathing problem	33C2T-TRAN-ABNORMAL BREATHING
Motor vehicle accident	29A1-MVA-INJ TO NOT DANGEROUS AREA
Motor vehicle accident	29B1-MVA-INJURIES
Motor vehicle accident	29B3-MVA-OTHER HAZARDS
Motor vehicle accident	29B4-MVA-UNKNOWN / 3RD PARTY CALLER
Motor vehicle accident	29D1B-MVA-MAJOR INCIDENT-BUS
Motor vehicle accident	29D2L-MVA-HIGH MECHANISM-AUTO V BIKE
Motor vehicle accident	29D2M-MVA-HIGH MECHANISM-PEDESTRIAN
Motor vehicle accident	29D2N-MVA-HIGH MECHANISM-EJECTION
Motor vehicle accident	29D2P-MVA-HIGH MECHANISM-ROLLOVER
Motor vehicle accident	29D2S-MVA-HIGH MECHANISM-SINKING VEH
Motor vehicle accident	29D2T-MVA-HIGH MECHANISM-HEAD ON
Motor vehicle accident	29D2U-MVA-HIGH MECHANISM-AIRBAG ACN
Motor vehicle accident	29D4-MVA-PINNED/TRAPPED

Motor vehicle accident	29D4A-MVA-PINNED/TRAPPED
Motor vehicle accident	29D5-MVA-NOT ALERT
Seizure	12A1-SEIZURE-NOT NOW/BREATH REG
Seizure	12A3-SEIZURE-IMPENDING SEIZURE
Seizure	12B1-SEIZURE-BREATHING NOT VERI<35
Seizure	12C1-SEIZURE-FOCAL NOT ALERT
Seizure	12C3-SEIZURE-DIABETIC
Seizure	12D2-SEIZURE-CONTINUOUS / MULTIPLE
Seizure	12D3-SEIZURE-IRR BREATH AGONAL
Seizure	12D4-SEIZURE-BREATHING NOT VERI>35
Overdose/psych	23A1-OVERDOSE-INCAPACITATED
Overdose/psych	23B1-OVERDOSE-NO PRIORITY SYMPTOMS
Overdose/psych	23C1A-OVERDOSE-NOT ALERT
Overdose/psych	23C1I-OVERDOSE-NOT ALERT
Overdose/psych	23C2A-OVERDOSE-ABNORMAL BREATHING
Overdose/psych	23C3I-OVERDOSE-ANTIDEPRESS/TRICYCLIC
Overdose/psych	23C5I-OVERDOSE-NARCOTICS (HEROIN)
Overdose/psych	23C6I-OVERDOSE-ACID OR ALKALI
Overdose/psych	23C7A-OVERDOSE-UNKNOWN STATUS
Overdose/psych	23C7I-OVERDOSE-UNKNOWN STATUS
Overdose/psych	23D1A-OVERDOSE-UNCONSCIOUS
Overdose/psych	23D1I-OVERDOSE-UNCONSCIOUS
Overdose/psych	25A1-PSYCH-NON VIOLENT/NON SUICIDAL
Overdose/psych	25A2-PSYC-SUICIDAL(NON THREATENING)
Unresponsive person	31C1-UNCONSCIOUS-NOW ALERT W/DIB
Unresponsive person	31C2-UNCONSCIOUS-SINGLE/NEAR >35
Unresponsive person	31C3-UNCONSCIOUS-FEM 12-50 W/ABD PN
Unresponsive person	31D1-UNCONSCIOUS-AGONAL BREATHING
Unresponsive person	31D2-UNCONSCIOUS-EFFECTIVE BREATHING
Unresponsive person	31D3-UNCONSCIOUS-NOT ALERT
Unresponsive person	31D4-UNCONSCIOUS-CHANGING COLOR
Unresponsive person	31E1-UNCONSCIOUS-INEFFECTIVE BREATH
Fall	17A1-FALL-NOT DANGEROUS AREA
Fall	17A2-FALL-NON RECENT >6HRS
Fall	17A3-FALL-PUBLIC ASSIST NO INJURIES

Fall	17B1-FALL-POSSIBLY DANGEROUS AREA
Fall	17B1G-FALL-POSSIBLY DANGEROUS AREA
Fall	17B2-FALL-SERIOUS HEMORRHAGE
Fall	17B3-FALL-UNKNOWN STATUS
Fall	17B3G-FALL-UNKNOWN STATUS
Fall	17D1-FALL-EXTREME FALL (>30FT)
Fall	17D2-FALL-UNC OR ARREST
Fall	17D3-FALL-NOT ALERT
Fall	17D3G-FALL-NOT ALERT
Fall	17D4-FALL-CHEST OR NECK WITHDIB
Fall	17D5-FALL-LONG FALL >6FT
Illness and other	01A1-ABDOMINAL PAIN
Illness and other	01C3-ABDOMINAL PAIN; >50; FAINTING
Illness and other	01C4-ABDOMINAL PAIN 12-50YOF FAINT
Illness and other	01C5-ABDOMINAL PAIN ABOVE NAVEL MLE
Illness and other	01C6-ABDOMINAL PAIN ABOVE NAVEL FEM
Illness and other	01D1-ABDOMINAL PAIN - NOT ALERT
Illness and other	02A1-ALLERG/REACT-RASH/HIVES/ITCH
Illness and other	02A2-ALLERG/REACT-SPIDER BITE
Illness and other	02B1-ALLERG/REACT-UNKNOWN STATUS
Illness and other	02C1-ALLERG/REACT-DIFF BREATH/SWALL
Illness and other	02C2-ALLERG/REACT-HISTORY
Illness and other	02D1-ALLERG/REACT-NOT ALERT
Illness and other	02E1-ALLERG/REACT-INEFFECT BREATH
Illness and other	03A1-ANIMAL BITE-NOT DANGEROUS AREA
Illness and other	03A3-ANIMAL BITE-SUPERFICIAL
Illness and other	03B3-ANIMAL BITE-UNKNOWN STATUS
Illness and other	03D4-ANIMAL BITE-DANGEROUS AREA
Illness and other	04A1A-ASSAULT-NOT DANGEROUS AREA
Illness and other	04B1A-ASSAULT-POSS DANGEROUS AREA
Illness and other	04B3A-ASSAULT-UNKNOWN STATUS
Illness and other	04D1A-ASSAULT-UNCON OR ARREST
Illness and other	05A1-BACK PAIN-NON TRAUMATIC
Illness and other	05A2-BACK PAIN-NON RECENT TRAUMA
Illness and other	05C3-BACK PAIN-FAINTING >50

Illness and other	07A4-BURNS-FIRE STANDBY/REHAB
Illness and other	07A4F-BURNS-FIRE STANDBY/REHAB
Illness and other	07B2-BURNS-UNKNOWN STATUS
Illness and other	07C1-BURNS-BLDG FIRE PT TRAPPED
Illness and other	07C2-BURNS-DIFFICULTY BREATHING
Illness and other	07C3-BURNS-OVER 18% BODY AREA
Illness and other	08B1-CO/INH/HAZ-ALERT NO DIB
Illness and other	11A1-CHOKING-NOT CHOKING NOW
Illness and other	11D1-CHOKING- ABNORMAL BREATHING
Illness and other	11D2-CHOKING-NOT ALERT
Illness and other	11E1-CHOKING-INEFFECT BREATHING
Illness and other	13A1-DIABETIC-ALERT
Illness and other	13C1-DIABETIC-NOT ALERT
Illness and other	13C2-DIABETIC-ABNORMAL BEHAVIOR
Illness and other	13C3-DIABETIC-ABNORMAL BREATHING
Illness and other	13D1-DIABETIC-UNCONSCIOUS
Illness and other	14B2-DROWNING-UNKNOWN STATUS
Illness and other	14D2-DROWNING-NOT ALERT
Illness and other	15C1E-ELECTROCUTION-ALERT / BREATH
Illness and other	15D6E-ELECTROCUTION-NOT ALERT
Illness and other	16B1-EYE PROBLEMS-SEVERE INJURY
Illness and other	18A1-HEADACHE-BREATHING NORMALLY
Illness and other	18B1-HEADACHE-UNKNOWN STATUS
Illness and other	18C1-HEADACHE-NOT ALERT
Illness and other	18C2-HEADACHE-ABNORMAL BREATHING
Illness and other	18C4-HEADACHE-SUDDEN ONSET/SEVERE
Illness and other	18C5-HEADACHE-NUMBNESS
Illness and other	20A1H-HEAT-ALERT
Illness and other	21A1-HEMORRHAGE-NOT DANGEROUS
Illness and other	21B1-HEMORRHAGE-POSSIBLY DANGEROUS
Illness and other	21B2-HEMORRHAGE-SERIOUS
Illness and other	21B3-HEMORRHAGE-BLEEDING DISORDER
Illness and other	21B4-HEMORRHAGE-BLOOD THINNERS
Illness and other	21C1-HEMORRHAGE-THROUGH TUBES
Illness and other	21D3-HEMORRHAGE-DANGEROUS

Illness and other	22B2-ENTRAPMENT-PERIPHERAL ONLY
Illness and other	22D1-ENTRAPMENTS-MACHINERY
Illness and other	23O1-POISONING-NO PRIORITY SYMPTOMS
Illness and other	24B2-PREGNANCY-UNKNOWN STATUS
Illness and other	24D5-PREGNANCY-HIGH RISK
Illness and other	25B2-PSYCH-MINOR HEMMORAHAGE
Illness and other	25B3-PSYCH-THREATENING SUICIDE
Illness and other	25B4-PSYCH-JUMPER(THREATENING ONLY)
Illness and other	25B6-PSYCHIATRIC-UNKNOWN STATUS
Illness and other	25B6V-PSYCHIATRIC-UNKNOWN STATUS
Illness and other	25D1-PSYCHIATRIC-NOT ALERT
Illness and other	26A1-SICK PERSON-NO PRIORITY SYMPTM
Illness and other	26A10-SICK PERSON-UNWELL/ILL
Illness and other	26A11-SICK PERSON-FLU LIKE SYPTOMS
Illness and other	26A2-SICK PERSON-BLOOD PRESSURE
Illness and other	26A3-SICK PERSON-DIZZINESS/VERTIGO
Illness and other	26A4-SICK PERSON-FEVER/CHILLS
Illness and other	26A5-SICK PERSON-GENERAL WEAKNESS
Illness and other	26A6-SICK PERSON-NAUSEA
Illness and other	26A7-SICK PERSON-NEW IMMOBILITY
Illness and other	26A8-SICK PERSON-OTHER PAIN
Illness and other	26B1-SICK PERSON-UNKNOWN STATUS
Illness and other	26C1-SICK PERSON-ALTERED LOC
Illness and other	26C2-SICK PERSON-ABNORMAL BREATHING
Illness and other	26D1-SICK PERSON-NOT ALERT
Illness and other	26O11-SICK PERSON-DEF/DIARRHEA
Illness and other	26O20-SICK PERSON-OBJECT STUCK
Illness and other	26O27-SICK PERSON-TOOTHACHE
Illness and other	26O5-SICK PERSON-CAN'T UNRINATE
Illness and other	26O5-SICK PERSON-CAN'T URINATE
Illness and other	26O6-SICK PERSON-CATHETER PROB
Illness and other	26O7-SICK PERSON-CONSTIPATION
Illness and other	27B4S-STABBING-UNKNOWN STATUS
Illness and other	27B4X-GUNSHOT SELF-UNKNOWN STATUS
Illness and other	27D3G-GUNSHOT-CENTRAL WOUNDS

Illness and other	27D3S-STABBING-CENTRAL WOUNDS
Illness and other	27D5G-GUNSHOT-MULTIPLE VICTIMS
Illness and other	30A1-TRAUMA-NOT DANGEROUS AREA
Illness and other	30A2-TRAUMA-NON RECENT INJURIES
Illness and other	30B1-TRAUMA-POSSIBLY DANGEROUS AREA
Illness and other	30B2-TRAUMA-SERIOUS HEMORRHAGE
Illness and other	30D1-TRAUMA-UNC OR ARREST
Illness and other	30D2-TRAUMA-NOT ALERT
Illness and other	31A1-FAINTING ALERT >35 NO CARDIAC
Illness and other	31A3-FAINTING ALERT <35 NO CARDIAC
Illness and other	32B1-UNK PROB-STAND/SIT/MOVE/TALK
Illness and other	32B2-UNK PROB-LIFE LINE ALARM
Illness and other	32B3-UNK PROBLEM-UNKNOWN STATUS
Illness and other	32D1-UNK PROB-LIFE STATUS QUESTION
Illness and other	33A2-ALS TRANSFER/RETURN
Illness and other	33C1-TIP-NOT ALERT
Illness and other	33C3-TIP-SIGNIFICANT BLEEDING
Illness and other	33C6-TIP-EMERGENCY RESP REQUESTED
Illness and other	40B1-PD STANDBY
Illness and other	40B3-FD STANDBY
Illness and other	40B4-2ND UNIT LIFT ASSIST