

DOUGLAS, MASSACHUSETTS

FIRE DEPARTMENT STUDY

FEBRUARY 2009

MMA CONSULTING GROUP, INC.
1330 BEACON STREET
BROOKLINE, MASSACHUSETTS 02446

CONTENTS

I. EXECUTIVE SUMMARY	1
FINDINGS	2
RECOMMENDATIONS	2
II. BACKGROUND, FIRE DEPARTMENT ORGANIZATION & DEMAND FOR SERVICE	6
ORGANIZATION AND OPERATION OF THE FIRE DEPARTMENT	6
CALLS FOR SERVICE	7
III. RESPONSE CAPABILITY MEASURES	11
NATIONAL FIRE PROTECTION STANDARD 1720	11
EISENBERG MODEL	12
AMERICAN HEART ASSOCIATION	12
NATIONAL FIRE PROTECTION STANDARD 1710	13
IV. STAFFING AND ORGANIZATION	15
FIRE DEPARTMENT RESPONSE ANALYSIS	15
AVERAGE AND FRACTILE RESPONSE TIME ANALYSIS	20
STAFFING RECOMMENDATIONS	27
V. IMPLEMENTATION OF RECOMMENDATIONS	30
APPENDIX: STANDARDS, BENCHMARKS AND RESPONSE PARAMETERS	32

I. EXECUTIVE SUMMARY

This *Fire Department Study*, conducted by MMA Consulting Group, Inc., examines the current staffing arrangement and makes recommendations regarding the future of fire and emergency medical services in the Town of Douglas. This report is designed to develop a plan to improve operations in the delivery of fire and rescue services. The greatest area of concern raised in meetings with the Fire Chief and the Town Administrator is the provision of emergency medical services (EMS).

Fire and EMS services are provided by a combination of call and career personnel. The Douglas Fire Department (DFD) employs several full-time personnel, including a Fire Chief, two full-time Fire Lieutenants, and one Firefighter. The Fire Chief is an EMT-B; one Lieutenant is an EMT-I; one Lieutenant is an EMT-P; and one Firefighter is an EMT-I. The Department has 22 call firefighters. The Department employs emergency medical personnel, including three EMT-Ps, three EMT-Is, and eight EMT-Bs on a part-time basis.

The Department deploys two full-time personnel between 8:00 a.m. and 5:00 p.m., Monday through Friday. On Saturday and Sunday, between 8:00 a.m. and 5:00 p.m., the Department deploys one full-time employee and one part-time employee. On Saturdays and Sundays, from 5:00 p.m. to 8:00 a.m., the Department assigns two part-time personnel to respond from the fire station.

The current deployment model is designed to provide rapid response for nine hours each weekday (assuming personnel are not on another call) and 24 hours per day on Saturday and Sunday. Generally, during weekday evenings, there is a delay in fire and EMS response. Call or career personnel responding from home must drive to the Fire Station to mount vehicles and respond to an incident. During the workday hours, when a small career workforce is on-duty and many call personnel are not available because of work commitments, there are few resources which can be rapidly deployed to a major emergency or fire incident.

The Town of Douglas is presented with a dilemma regarding the amount of resources which are to be devoted to fire and EMS services. Over the last several years, the demand for services has increased and, assuming the current trend continues, there will be an increasing demand for services.

FINDINGS

The major findings of this study include:

- The Town and the Fire Department have carefully crafted an emergency response system which is designed to be cost effective. The emergency response system is well organized.
- The fire and EMS response is accomplished by the creative use of several full-time employees, part time employees, and paid call personnel.
- The demand for services has increased substantially, which places a great deal of stress on the current complement of Fire Department personnel.
- The Department's emergency response between the hours of 8:00 a.m. and 5:00 p.m., Monday through and Friday, is relatively strong. In our analysis, for example, emergency medical service response time was less than eight minutes and 59 seconds in approximately 90 percent of incidents which occur during the 8:00 a.m. to 5:00 p.m. time period. However, this represents only 50 percent of the calls received by the Department.
- There is delayed fire and EMS response between 5:00 p.m and 8:00 a.m. on weekdays.
- The rural character of the Town, its size (37 square miles), and transportation network make the delivery of services difficult. The fire station is well located to provide service throughout the Town.
- The Fire Department has difficulty responding to simultaneous incidents, because of its limited resources. This difficulty will continue, even with some increase in staffing. Reliance on automatic mutual aid and mutual aid is essential.

RECOMMENDATIONS

The primary recommendations in this report include:

- The Town should continue to use the current response model which uses career personnel, part-time personnel, and call personnel.
- The Town should continue to support the call component of the Fire Department.
- The Town and the Fire Department should adopt reasonable response benchmarks for providing emergency medical and fire services.
- The Town should consider the employment of additional career firefighters/EMTs over the next several years to strengthen fire and EMS response capability.

There are two approaches for increasing the size of the career fire department.

- *Alternative #1* - This approach requires the Fire Department to employ two additional personnel between the hours of 5:00 p.m. and 2:00 a.m., Monday through Friday. The nine-hour shift could initially be filled by one full-time Firefighter/EMT and one part-time Firefighter/EMT. Eventually, two full-time personnel would be employed to provide emergency response. Authorized leave time by career personnel would be filled by part-time personnel. This alternative is designed to address the immediate need for emergency response during weekdays from 5:00 p.m. to 2:00 a.m.
- *Alternative #2* - This approach requires the Fire Department to employ six additional full-time personnel. The Department would organize three shifts of three persons each. Personnel would work 24 hour shifts, but be assigned to work 48 hours per week. It would be necessary to employ part-time personnel to fill authorized leave. It would be necessary to implement this plan over several years.
- Each shift of Firefighters/EMTs should consist of three personnel. However, the Fire Chief should have the authority to reassign personnel among shifts to reflect needs due to authorized leave and service demand.
- There should be one Lieutenant assigned to each shift.

- The Department should employ a staff officer, such as a Deputy Chief or Captain. This staff officer would serve as second in command of the Department and EMS Officer, and perform other administrative functions. The staff officer would also be expected to have some emergency response duties and may be required to provide some fill-in responsibilities.

Exhibit 1 shows the current and proposed number of Firefighters/EMTs. The three-shift staffing model means that, generally, there will be two personnel on-duty, since it is necessary to factor authorized leave into the staffing model.

The availability of financial resources may slow the implementation of recommendations. Exhibit 1 displays the staffing pattern for Alternative #1. Exhibit 2 displays the staffing plan proposed under Alternative #2. Exhibit 3 displays a six-phase plan to implement the proposed long-term staffing plan (Alternative #2).

EXHIBIT 1
ALTERNATIVE #1 - CAREER STAFFING PLAN

	CURRENT STAFFING	PROPOSED STAFFING	CHANGE
Chief	1	1	0
Lieutenant/EMT	2	2	0
Firefighter/EMT	1	3	2
Total	4	6	2

EXHIBIT 2
ALTERNATIVE #2 - LONG-TERM STAFFING PLAN

	CURRENT STAFFING	PROPOSED STAFFING	CHANGE
Chief	1	1	0
Deputy Chief/Staff Officer	0	1	1
Lieutenant/EMT	2	3	1
Firefighter/EMT	1	6	5
Total	4	11	7

EXHIBIT 3

ALTERNATIVE #2 - LONG-TERM STAFFING PLAN - PHASED IMPLEMENTATION

	CURRENT STAFFING	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5	PHASE 6	STAFFING INCREASE
Chief	1							1
Deputy Chief/ Staff Officer	0						1	1
Lieutenant/EMT	2					1		3
Firefighter/EMT	1	1	1	1	1	1		6
Total Staff Increase	4	1	1	1	1	2	1	11

Several abbreviations used in this report are defined below:

AED - Automatic External Defibrillator

ALS - Advanced Life Support

BLS - Basic Life Support

EMD - Emergency Medical Dispatching

EMS - Emergency Medical Services

EMT - Emergency Medical Technician

EMT-B - Emergency Medical Technician - Basic

EMT-I - Emergency Medical Technician - Intermediate

EMT-P - Emergency Medical Technician - Paramedic

NFPA - National Fire Protection Association

II. FIRE DEPARTMENT ORGANIZATION AND DEMAND FOR SERVICE

ORGANIZATION AND OPERATION OF THE FIRE DEPARTMENT

Fire and EMS services are provided by a combination of call and career personnel. The DFD employs four full-time personnel, including a Fire Chief, two full-time Fire Lieutenants, and one Firefighter. The Department has 22 call Firefighters. The Department also employs emergency medical personnel on a part-time or on-call basis.

The call component of the Fire Department is well organized and includes one Deputy Fire Chief, two Captains, two Lieutenants, and 20 Firefighters. Call Firefighters are trained to Firefighter I and Firefighter II levels. Call personnel are organized into two groups. One Captain, one Lieutenant and 10 Firefighters are assigned to each group. Group 1 is assigned to Engine 1 and Group 2 is assigned to Ladder 1. The groups alternate engine and ladder assignments each month. Both groups respond to working fire incidents.

EXHIBIT 5

ORGANIZATION OF THE FIRE DEPARTMENT CALL COMPONENT

<i>DEPUTY FIRE CHIEF</i>		
	GROUP 1	GROUP 2
Captain	1	1
Lieutenant	1	1
Firefighter	10	10

The Fire Department employs four full-time Firefighters/EMTs; the Fire Chief is an EMT-B; one Lieutenant is an EMT-I; one Lieutenant is an EMT-P; and one Firefighter is an EMT-I. The Fire Department employs additional emergency medical personnel on a part-time and call basis, including three EMT-Ps, three EMT-Is and eight EMT-Bs.

The Fire Department does not have ALS capability; EMT-Ps function as EMT-Is. Advanced life support response is provided by mutual aid from fire

departments in Oxford or Webster. The Department transports patients to several facilities: University of Massachusetts, Worcester (15 to 20 minutes travel time); St. Vincent Hospital, Worcester (15 to 20 minutes travel time); and Milford Hospital (15 minutes travel time).

The Douglas Police Department receives 911 calls and dispatches the Fire Department. There is one dispatcher on-duty 24/7. Emergency medical dispatch (EMD) procedures, a method of prioritizing calls for service, are not part of the Department's dispatch protocols.

***RECOMMENDATION 1:** The Fire Department should maintain the current organization structure.*

***RECOMMENDATION 2:** The Town and the Fire Department should continue to foster and support the call component of the Fire Department.*

***RECOMMENDATION 3:** The Town should explore the feasibility of developing a regional emergency communication system.*

***RECOMMENDATION 4:** The Town and the Fire Department should explore the feasibility of implementing an emergency medical dispatch system (EMD).*

An emergency medical dispatch system is designed to screen calls for service and assign priorities to different types of calls. An EMD system can be an asset to any emergency medical service delivery system. The development of an EMD system should be considered as a long-term objective. With one dispatcher on-duty, it would be difficult to implement an effective EMD system. The implementation of an EMD system should be a long-term objective of the Department. In addition, the Town should consider working with other communities to develop a regional communication system. A regional emergency communication system would enable more effective sharing of resources and a more sophisticated level of communication services, including emergency medical dispatch.

CALLS FOR SERVICE

The DFD generates a substantial amount of data which describes the workload. Exhibit 6 shows the total number and percent increase in the number of calls for service from 2003 through 2007. There has been a 34.6 percent increase in the total number of calls for service received by the Department.

EXHIBIT 6
CALLS FOR SERVICE - CALENDAR YEARS 2003 - 2007

	2003	2004	2005	2006	2007	PERCENT INCREASE 2003 - 2007	5-YEAR AVERAGE
Fire	141	192	252	290	242	71.6%	223.4
Service	30	45	81	80	72	140.0%	
EMS	551	497	563	608	658	19.4%	575.4
Total	722	734	896	978	972	34.6%	860.4
% Increase		1.7%	22.1%	9.2%	-0.6%	32.4%	8.1%
Inspection	390	530	371	949	372	-4.6%	522.4
Permit Issued	486	454	498	566	508	4.5%	502.4

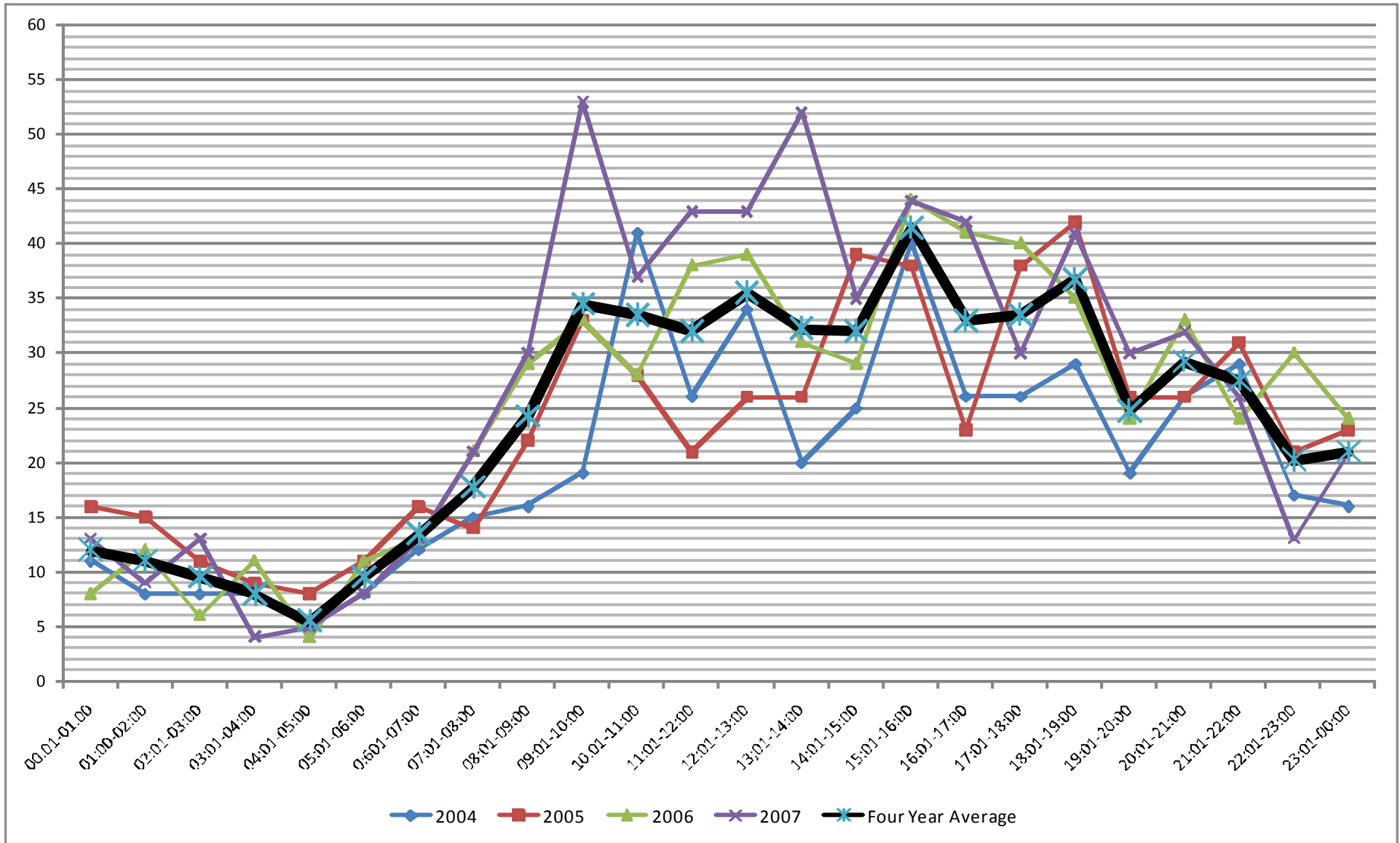
Exhibit 7 shows the total number of EMS calls for service from 2004 through 2007. The exhibit is designed to show calls for service by time of day. The distribution of calls for service shows a typical pattern for service demand. Peak periods of activity are generally between 08:00 and 22:00 (8:00 a.m. and 10:00 p.m.). Exhibit 8 displays the same information as Exhibit 7, but presents the information on a line graph. This exhibit also displays the four-year average. The thin colored lines represent 2004, 2005, 2006 and 2007. The thicker black line presents the four-year average.

EXHIBIT 7

EMS CALLS FOR SERVICE - 2004 TO 2007 BY TIME OF DAY

TIME OF DAY	2004	2005	2006	2007	TOTAL	4-YEAR AVERAGE
00:00-01:00	11	16	8	13	48	12
01:01-02:00	8	15	12	9	44	11
02:01-03:00	8	11	6	13	38	10
03:01-04:00	8	9	11	4	32	8
04:01-05:00	5	8	4	5	22	6
05:01-06:00	8	11	11	8	38	10
06:01-07:00	12	16	13	13	54	14
07:01-08:00	15	14	21	21	71	18
08:01-09:00	16	22	29	30	97	24
09:01-10:00	19	33	33	53	138	35
10:01-11:00	41	28	28	37	134	34
11:01-12:00	26	21	38	43	128	32
12:01-13:00	34	26	39	43	142	36
13:01-14:00	20	26	31	52	129	32
14:01-15:00	25	39	29	35	128	32
15:01-16:00	40	38	44	44	166	42
16:01-17:00	26	23	41	42	132	33
17:01-18:00	26	38	40	30	134	34
18:01-19:00	29	42	35	41	147	37
19:01-20:00	19	26	24	30	99	25
20:01-21:00	26	26	33	32	117	29
21:01-22:00	29	31	24	26	110	28
22:01-23:00	17	21	30	13	81	20
23:01-00:00	16	23	24	21	84	21
Total	484	563	608	658	2,313	578.3
Percent Increase		16.3%	8.0%	8.3%	0.326	

EXHIBIT 8
EMS CALLS FOR SERVICE - 2004 TO 2007 BY TIME OF DAY & 5-YEAR AVERAGE



III. RESPONSE CAPABILITY MEASURES

The development of this report required the consultants to review maps of the Town, examine transportation networks, conduct site visits to the station, and review data. The National Fire Protection Association (NFPA) has established several benchmarks, or standards, for measuring fire and rescue response. NFPA Standard 1720 applies to predominantly volunteer (call) departments; NFPA Standard 1710 applies to career departments. In Douglas, NFPA 1720 is applicable because the Fire Department is predominantly staffed by call personnel.

NATIONAL FIRE PROTECTION STANDARD 1720

NFPA Standard 1720 is a performance standard, concerned with both the number of personnel who respond to an incident and the time it takes to respond to an incident. Exhibit 9 displays the performance standards for volunteer (call) departments. NFPA Standard 1720 states that the Town should identify the minimum staffing required to ensure that sufficient numbers of personnel are available to allow safe operations at an emergency scene. The exhibit presents the staffing and response time requirements from NFPA Standard 1720.

EXHIBIT 9

NFPA 1720 PERFORMANCE STANDARD

STAFFING & RESPONSE TIME STANDARDS FOR VOLUNTEER (CALL) FIRE DEPARTMENTS

DEMAND ZONE	POPULATION PER SQ. MI.	NO. OF PERSONNEL	TIME IN MINUTES	PERCENTAGE OF TIME
Urban	>1,000	15	9	90%
Suburban	500 to 1,000	10	10	90%
Rural	<500	6	14	80%
Remote	travel distance >8 miles	4	-	90%

Source: NFPA 1720

NFPA Standard 1720 indicates that a town with a population density of less than 500 residents per square mile should be able deliver six firefighters to the scene of a fire within 14 minutes. In a town with a population density of 500 to 1,000 persons per square mile, the fire department should be able to deliver 10 personnel within 10 minutes.

Assuming a population of 7,924 (Department of Revenue Municipal Data Bank 2007 population estimate), the Town has a population density of approximately 218 persons per square mile (7,924 population divided by 36.37 square miles). The objective of the Douglas Fire Department, given the current configuration of the Department and NFPA Standard 1720, would be to deliver six personnel at the scene of an incident within 14 minutes, 90 percent of the time. As we understand it, the Douglas Fire Department is generally able to achieve the response objective set forth in NFPA Standard 1720.

The response time and staffing standard provided in NFPA 1720 also states that, upon arrival of the required number of personnel at the scene of an incident, a fire department should have the capability to safely begin initial attack within two minutes, 90 percent of the time. (See NFPA Standard 1720.)

The benchmarks or standards by which emergency medical performance is measured include the commonly applied Eisenberg Model and the American Heart Association's *Statement on Chain of Survival*. The commonly accepted benchmark for the delivery of ALS to the scene of a life-threatening incident requires the delivery of ALS within eight minutes and 59 seconds. This response is measured from the receipt of a call to arrival at the scene of an incident. The following is a summary of benchmarks or standards used to measure emergency medical response.

EISENBERG MODEL

Survivability for a non-breathing person is a function of application of CPR, defibrillation, and advanced life support. Models exist to predict survivability. One commonly applied model is the Eisenberg model, which estimates the probability of survival based on a system's ability to deliver the critical services in a timely manner. The model predicts that one-third of all non-breathing and/or cardiac arrest patients may die immediately, and that the remaining individuals' probability of survival decreases by up to 5.5 percent for each subsequent minute; however, the decrease can be slowed by the application of various procedures (CPR, defibrillation, ACLS).

AMERICAN HEART ASSOCIATION

The American Heart Association, in its *Statement on Chain of Survival*, describes a sequence of events which must occur rapidly to allow a person to

survive a sudden cardiac arrest. The chain of survival includes recognition of early warning signs, activation of the emergency medical system, basic cardiopulmonary resuscitation, defibrillation, intubation and intravenous administration of medications. Early defibrillation is identified as a critical link in the chain of survival. A sudden cardiac arrest victim who is not defibrillated within eight to 10 minutes has a very limited chance of survival.

NATIONAL FIRE PROTECTION STANDARD 1710

The response time benchmarks for substantially career fire departments are found in NFPA Standard 1710. The standard presents response time measures and staffing goals and also stipulates that these response time performance objectives should be achieved in at least 90 percent of the incidents. In summary, the response time standards are:

Fire Suppression Incident - Four minutes (240 seconds) or less for the arrival of the first arriving engine company at a fire suppression incident and/or eight minutes (480 seconds) or less for the deployment of a full first-alarm assignment at a fire suppression incident.

Emergency Medical Incident - Four minutes (240 seconds) or less for the arrival of a unit with first responder (or higher) level capability at an emergency medical incident. Eight minutes (480 seconds) or less for the arrival of an advanced life support unit at an emergency medical incident, where this service is provided by the fire department.

Note: These response time performance objectives should be achieved at least 90 percent of the time.

These NFPA Standard 1710 time lines do not include dispatch and turn-out time. One additional minute is allowed for dispatch and one minute is added for turn-out time, for a total of two minutes. It should be noted that turn-out time is less when a fire department responds to an emergency medical services incident, since personnel are not required to put on turn-out gear.

The Department should use these benchmarks as goals to be achieved in the long-term. (See the Appendix for a more detailed discussion of benchmarks.)

The Town should adopt response benchmarks set forth in NFPA 1720. In addition, the Town should consider adopting an EMS benchmark in which emergency units respond to the scene of an incident within eight minutes and 59 seconds for 90 percent of incidents.

***RECOMMENDATION 5:** The Town and the Fire Department should adopt emergency response benchmarks for fire and EMS.*

IV. STAFFING AND ORGANIZATION

FIRE DEPARTMENT RESPONSE ANALYSIS

The data shown in the exhibits below present the actual response of the Fire Department to EMS incidents. Exhibit 10 presents the number of fire and service calls responded to by the Douglas Fire Department from 2004 through 2007. The Fire Department responded to an average of 244 fire calls and 69.5 service calls from 2004 through 2007.

Exhibit 11 shows the number of emergency medical service calls responded to by the Fire Department from 2004 through 2007. The Department averaged 578 EMS calls for service annually during the four-year period; 69 percent of those calls were for BLS and 31 percent were for ALS. In addition, over the same four-year period, the Fire Department responded to approximately 97 calls for service each year which did not require EMS. The data indicate that the Fire Department responded to an average of 401 BLS calls for service and 177 ALS calls for service each year.

There are a number of instances each year in which the Fire Department receives simultaneous calls for service. The Department received 34 simultaneous calls for service in 2004, 35 simultaneous calls for service in 2005, 32 simultaneous in calls for service 2006, and 10 simultaneous calls for service in 2007. Simultaneous calls are a challenge to any fire department, especially a smaller department. Fire departments rely on mutual aid, or automatic mutual aid, to provide response to simultaneous incidents. The Douglas Fire Department not only receives mutual aid, but also provides EMS mutual aid assistance. The Department provides EMS Mutual Aid assistance approximately 20 times each year.

EXHIBIT 10

FIRE & SERVICE CALLS - 2004-2007

YEAR	2004	2005	2006	2007	5-YEAR AVERAGE
Fire Responses	192	252	290	242	244
Service Responses	45	81	80	72	69.5
Total Responses	237	333	270	314	288.5

EXHIBIT 11
EMS RESPONSES (BLS & ALS) - 2004-2007

YEAR	TOTAL EMS RESPONSES	BLS RESPONSES	ALS RESPONSES	EMS RESPONSES (NO EMS (REQUIRED))*	MUTUAL AID PROVIDED
2004	484	347	137	105	Not Available
2005	563	367	196	96	15
2006	609	443	166	114	18
2007	658	448	210	72	33
4-Year Average	578.5	401.25	177.25	96.75	22

** An EMS unit is deployed but, on arrival, it is determined that EMS is not required.*

Exhibits 10 and 11 indicate that the number of emergency responses has increased during the four-year period (2004 to 2007). The number of EMS calls increased approximately 36 percent; the number of fire and service responses increased approximately 32 percent.

As a result of service demand, the Fire Department has developed a sophisticated method of responding to emergency incidents. The Department uses a combination of full-time, part-time, and call personnel to provide services. Exhibit 12 illustrates the deployment strategy of the Fire Department. This strategy uses three full-time personnel by assigning them to one of three shifts (A, B, or C). Full-time personnel are assigned to work 45 hours per week, or five nine-hour shifts. Under this deployment plan, there is at least one full-time staff person on-duty seven days a week during the hours of 8:00 a.m. to 5:00 p.m. This means that three full-time personnel are on-duty three days a week; two full-time personnel are on-duty two days a week; and one full-time firefighter is on-duty two days a week. For example, on Monday from 8:00 a.m. to 5:00 p.m., three full-time personnel are assigned to work, but on Wednesday two full-time personnel are assigned to work and on Saturday and Sunday, one full-time firefighter is assigned to work. There are two personnel on-duty to respond from 8:00 a.m. to 5:00 p.m., Monday through Friday, the time period in which most calls for service are received.

Exhibit 12 displays the days of the week, with each day subdivided into two time segments: 8:00 a.m. to 5:00 p.m. and 5:00 p.m. to 8:00 a.m. The exhibit shows the assignment of full-time personnel, the number of personnel on duty, and the

location from which a response is made. For example, on Mondays, there are three full-time firefighters responding from the station from 8:00 a.m. to 5:00 p.m. In addition, there are two call personnel assigned to respond to an incident between 5:00 p.m. and 8:00 a.m. However, these call personnel respond from home. On Saturday and Sunday, there are two personnel on-duty; one full-time employee and one part-time employee. These employees are on-duty from 8:00 a.m. to 5:00 p.m. Two part-time employees are on-duty from 5:00 p.m. to 8:00 a.m. Emergency response is made from the fire station on Saturday and Sunday.

Exhibit 12 indicates that for nine hours each work day (Monday to Friday), there are at least two persons available to respond. On Saturday and Sunday, there are two persons available to respond.

EXHIBIT 12

DAILY WORK SCHEDULE - FULL-TIME & PART-TIME STAFFING

	MON.	TUES.	WED.	THURS.	FRI.	SAT.	SUN.
8:00 a.m. to 5:00 p.m.	1 FT Shift A 1 FT Shift B 1 FT Shift C 3 FF/EMTs on duty Personnel respond from Station	1 FT Shift A 1 FT Shift B 2 FF/EMTs on duty Personnel respond from Station	1 FT Shift A 1 FT Shift B 2 FF/EMTs on duty Personnel respond from Station	1 FT Shift A 1 FT Shift B 1 FT Shift C 3 FF/EMTs on duty Personnel respond from Station	1 FT Shift A 1 FT Shift B 1 FT Shift C 3 FF/EMTs on duty Personnel respond from Station	1 FT Shift C 1 PT EMT 2 FF/EMTs on duty Personnel respond from Station	1 FT Shift C 1 PT EMT 2 FF/EMTs on duty Personnel respond from Station
5:00 p.m. to 8:00 a.m.	2 On-Call PT EMTs Personnel respond from home	2 On-Call PT EMTs Personnel respond from home	2 On-Call PT EMTs Personnel respond from home	2 On-Call PT EMTs Personnel respond from home	2 On-Call PT EMTs Personnel respond from home	2 PT EMTs 2 FF/EMTs on duty Personnel respond from Station	2 PT EMTs 2 FF/EMTs on duty Personnel respond from Station

Key:

PT= part-time

FT= full-time

EMT= Emergency Medical Technician

FF/EMT= Firefighter/Emergency Medical Technician

It should be noted that full-time personnel are entitled to time off for vacation, sick leave, personal leave, and other authorized leaves. Thus, assuming that personnel are scheduled to work 45 hours each week, they are scheduled to work 2,340 hours per year (52 weeks x 45 hours); however, with authorized leave,

personnel will typically work 80 to 90 percent of the hours scheduled to be worked. This leave time requires the Department to employ part-time personnel, or personnel on an overtime basis, to fill in for personnel on leave.

In the exhibits below, the number of EMS calls by year and time of day are shown. There were 2,213 EMS calls occurring from 2004 through 2007. These EMS calls are displayed in several time segments: 12:00 a.m. to 8:00 a.m. (an eight-hour time period), 8:00 a.m. to 5:00 p.m. (a nine-hour time period) and 5:00 p.m. to 12:00 a.m. (a seven-hour time period). Fifty-two percent of the calls for service occur between 8:00 a.m. and 5:00 p.m.

EXHIBIT 13

TOTAL EMS RESPONSES BY TIME PERIOD (2004-2007)

TIME PERIOD	2004	2005	2006	2007	TOTAL	FOUR-YEAR AVERAGE	PERCENT OF CALLS
12:00 a.m. - 8:00 a.m.	75	100	86	85	346	86	15%
8:00 a.m. - 5:00 p.m.	247	256	312	378	1,193	298	52%
5:00 p.m. - 12:00 a.m.	162	207	210	195	774	193	33%
Total	484	563	608	658	2,313	578	100%

Exhibit 14 has two parts. The top part of the exhibit shows the total of number of EMS calls for service occurring from 2004 through 2007 and distributes those calls by the same time periods shown in Exhibit 13; the exhibit also distributes those calls by day of week. For example, during the time period studied, 332 of the 2,313 call for service occurred on Monday. Thus, over the four-year period studied, 83 EMS calls for service occurred on Monday.

The bottom part of Exhibit 14 consolidates the time periods into two time periods, 5:00 p.m. to 8:00 a.m. and 8:00 a.m. to 5:00 p.m. This section of the exhibit shows the number and percent of calls to which a response was made during each time period, within eight minutes and 59 seconds. For example, on Mondays between the hours of 5:00 p.m. and 8:00 a.m., 48 percent of responses occurred within eight minutes and 59 seconds. However, between the hours of 8:00 a.m. and 5:00 p.m., 52 percent of responses occurred within eight minutes and 59 seconds. The exhibit also shows that average number of responses by time period.

EXHIBIT 14

TOTAL EMS RESPONSES - BY DAY OF WEEK & TIME PERIOD (2004-2007)

RESPONSES BY TIME OF DAY	MON.	TUES.	WED.	THURS.	FRI.	SAT.	SUN.
12:00 a.m. - 8:00 a.m.	50	48	48	46	46	58	51
8:00 a.m. - 5:00 p.m.	171	169	181	164	217	165	127
5:00 p.m. - 12:00 a.m.	111	113	82	102	112	138	114
Total	332	330	311	312	375	361	292
Annual avg. number of responses by day of week	83.0	82.5	77.7	78.0	93.7	90.2	73.0
NUMBER AND PERCENT OF RESPONSES LESS THAN 8:59 MINUTES (2004-2007) 5:00 p.m. to 8:00 a.m. & 8:00 a.m. to 5:00 p.m.							
	MON.	TUES.	WED.	THURS.	FRI.	SAT.	SUN.
Total Number of EMS Responses	161	161	130	148	158	196	165
Percent of Responses 5:00 p.m. - 8:00 a.m.	48%	49%	42%	47%	42%	-	-
Four-Year Average (Number of Responses <8:59 Minutes)	40.2	40.2	32.5	37.0	39.5	49.0	41.2
Total Number of EMS Responses	171	169	181	164	217	165	127
Percent of Responses 8:00 a.m. - 5:00 p.m.	52%	51%	58%	53%	58%	-	-
Four-Year Average (Number of Responses <8:59 Minutes)	42.7	42.2	45.2	41.0	54.2	41.2	31.7

Exhibit 15 estimates the number of ALS calls for service by day of week and time of day. The ALS calls represent 31 percent of the EMS calls for service responded to by the Fire Department. The exhibit displays two time segments, 5:00 p.m. to 8:00 a.m. and 8:00 a.m. to 5:00 p.m.

EXHIBIT 15

TOTAL ALS RESPONSES - BY DAY OF WEEK & TIME PERIOD (2004-2007)

	MON.	TUES.	WED.	THURS	FRI.	SAT.	SUN.
Total ALS Responses 5:00 p.m. - 8:00 a.m.	49	49	40	46	52	61	51
Avg. Number of ALS Responses per Year	12.2	12.2	10.0	11.5	13.0	15.2	12.7
Total ALS Responses 8:00 a.m. - 5:00 p.m.	53	52	56	51	67	51	39
Avg. Number of ALS Responses per Year	13.2	13.0	14.0	12.7	16.7	12.7	9.7

AVERAGE AND FRACTILE RESPONSE TIME ANALYSIS

The Fire Department provided the consultants with a sample of 390 hospital trip reports to enable us to estimate average response time and fractile response time. Useful response time data was abstracted from 339 of the 390 reports. Reports from January, April, July, and October 2007 and January, April, July, and September 2008 were reviewed. Any privileged information on the hospital trip reports was redacted by the Fire Department. The following 10 exhibits analyze average response times drawn from the sample of ambulance trip reports for 2007 and 2008.

EXHIBIT 16

FIRE DEPARTMENT EMS TRIP REPORTS - 2007-2008

YEAR	NUMBER OF REPORTS	TOTAL NUMBER ANALYZED
2007	205	179
2008	185	160
Total	390	339
% Analyzed		86.9%

Exhibits 17, 18, and 19 show average response time for January, April, July, and October, 2007 by time of day. Exhibit 17 displays 8:00 a.m. to 5:00 p.m., Monday through Friday. The exhibit shows the number of responses for the four months reviewed, the total number of response minutes, and the average number

of response minutes per response. In addition, the exhibit displays the average response time for all calls examined. For example, the average response time in January 2007 was 5.27 minutes, but the average response time for January, April, July, and October was 5.14 minutes. Personnel respond from the fire station from 8:00 a.m. to 5:00 p.m., Monday through Friday.

EXHIBIT 17

AVERAGE RESPONSE TIMES - JANUARY, APRIL, JULY, & OCTOBER 2007
MONDAY THROUGH FRIDAY - 8:00 A.M. TO 5:00 P.M.

MONDAY - FRIDAY 8:00 A.M. - 5:00 P.M.	RESPONSES ANALYZED	TOTAL RESPONSE MINUTES	AVERAGE RESPONSE TIME IN MINUTES	FOUR-MONTH AVERAGE RESPONSE TIME IN MINUTES
January	22	116	5.27	
April	11	76	6.90	
July	22	111	5.04	
October	26	114	4.38	
Total	81	417		5.14

Exhibit 18 is organized in the same manner as Exhibit 17, but displays information for the 5:00 p.m. to 8:00 a.m. time period. Average response time is somewhat slower during the 5:00 p.m. to 8:00 a.m. time period than the 8:00 a.m. to 5:00 p.m. time period shown in the Exhibit 17. Personnel respond from their homes during the 5:00 p.m. to 8:00 a.m. time period.

EXHIBIT 18

RESPONSE TIMES - JANUARY, APRIL, JULY, & OCTOBER 2007
MONDAY THROUGH SATURDAY 5:00 P.M. 8:00 A.M.

MONDAY - SATURDAY 5:00 P.M. - 8:00 A.M.	RESPONSES ANALYZED	TOTAL RESPONSE MINUTES	AVERAGE RESPONSE TIME IN MINUTES	FOUR-MONTH AVERAGE RESPONSE TIME IN MINUTES
January	12	100	8:33	
April	13	106	8:15	
July	11	79	7.18	
October	12	100	8.33	
Total	48	385		8:02

Exhibits 19 and 20 examine weekend response. Exhibit 19 displays information from Saturday at 8:00 a.m. to Sunday at 8:00 a.m. The Department assigns one full-time Firefighter/EMT and one part-time EMT to respond from the Fire Station from 8:00 a.m. to 5:00 p.m. on Saturday and Sunday. Two part-time personnel respond from the fire station from 5:00 p.m. to 8:00 a.m.

EXHIBIT 19

RESPONSE TIMES - JANUARY, APRIL, JULY, & OCTOBER 2007
SATURDAY 8:00 A.M. TO SUNDAY 8:00 A.M.

SATURDAY 8:00 A.M. TO SUNDAY 8:00 A.M.	RESPONSES ANALYZED	TOTAL RESPONSE MINUTES	AVERAGE RESPONSE TIME IN MINUTES	FOUR-MONTH AVERAGE RESPONSE TIME IN MINUTES
January	5	53	10.60	
April	4	46	11.50	
July	5	39	7.80	
October	9	61	6.77	
Total	23	199		8:65

Exhibit 20 displays information for the time period from Sunday at 8:00 a.m. to Monday at 8:00 a.m. During this time period, the Department assigns one full-time Firefighter/EMT and one part-time EMT to respond from the Fire Station from 8:00 a.m. to 5:00 p.m., and two part-time personnel from 5:00 p.m. to 8:00 a.m.

EXHIBIT 20

RESPONSE TIMES - JANUARY, APRIL, JULY, & OCTOBER 2007
SUNDAY 8:00 A.M. UNTIL MONDAY 8:00 A.M.

SUNDAY 8:00 A.M. TO MONDAY 8:00 A.M.	RESPONSES ANALYZED	TOTAL RESPONSE MINUTES	AVERAGE RESPONSE TIME IN MINUTES	FOUR-MONTH AVERAGE RESPONSE TIME IN MINUTES
January	8	59	7:37	
April	4	31	7.75	
July	8	52	6.50	
October	5	32	6.40	
Total	25	174		6.96

Exhibits 21, 22, 23, and 24 are organized in the same manner as Exhibits 17, 18, 19 and 20, and display information for 2008.

EXHIBIT 21

AVERAGE RESPONSE TIMES - JANUARY, APRIL, JULY & SEPTEMBER 2008
MONDAY TO FRIDAY 8:00 A.M. TO 5:00 P.M.

MONDAY - FRIDAY 8:00 A.M. - 5:00 P.M.	RESPONSES ANALYZED	TOTAL RESPONSE MINUTES	AVERAGE RESPONSE TIME IN MINUTES	FOUR-MONTH AVERAGE RESPONSE TIME IN MINUTES
January	15	108	7.20	
April	14	82	5.85	
July	16	85	5.31	
October	17	87	5.11	
Total	62	362		5.83

EXHIBIT 22

RESPONSE TIMES - JANUARY, APRIL, JULY, & SEPTEMBER 2008
MONDAY TO SATURDAY 5:00 P.M. - 8:00 A.M.

MONDAY -SATURDAY 5:00 P.M. - 8:00 A.M.	RESPONSES ANALYZED	TOTAL RESPONSE MINUTES	AVERAGE RESPONSE TIME IN MINUTES	FOUR-MONTH AVERAGE RESPONSE TIME IN MINUTES
January	12	136	11.33	
April	19	187	9.84	
July	18	123	6.83	
October	12	132	11.00	
Total	61	578		9.47

EXHIBIT 23

AVERAGE RESPONSE TIMES - JANUARY, APRIL, JULY, & SEPTEMBER 2008
SATURDAY 8:00 A.M. TO SUNDAY 8:00 A.M.

SATURDAY 8:00 A.M. TO SUNDAY 8:00 A.M.	RESPONSES ANALYZED	TOTAL RESPONSE MINUTES	AVERAGE RESPONSE TIME IN MINUTES	FOUR-MONTH AVERAGE RESPONSE TIME IN MINUTES
January	5	28	5.60	
April	3	18	6.00	
July	3	22	7.33	
October	9	53	5.88	
Total	20	121		6:05

EXHIBIT 24**RESPONSE TIMES - JANUARY, APRIL, JULY, & SEPTEMBER 2008****SUNDAY 8:00 A.M. TO MONDAY 8:00 A.M.**

SUNDAY 8:00 A.M. TO MONDAY 8:00 A.M.	RESPONSES ANALYZED	TOTAL RESPONSE MINUTES	AVERAGE RESPONSE TIME IN MINUTES	FOUR-MONTH AVERAGE RESPONSE TIME IN MINUTES
January	4	26	6.50	
April	1	6	6.00	
July	7	55	7.85	
October	5	35	7.00	
Total	17	122		7.17

Exhibit 25 combines information for 2007 and 2008 and displays overall response times by time periods studied. The exhibit demonstrates that the response of the Fire Department to EMS incidents is more rapid Monday through Friday, 8:00 a.m. to 5:00 p.m.

EXHIBIT 25**RESPONSE TIMES - JANUARY, APRIL, JULY, & OCTOBER 2007 AND****JANUARY, APRIL, JULY, SEPTEMBER & SEPTEMBER 2008**

	TOTAL RESPONSES ANALYZED	TOTAL NUMBER OF RESPONSE MINUTES	AVERAGE RESPONSE TIME FOR PERIOD ANALYZED
Monday to Friday 8:00 a.m. to 5:00 p.m.	143	779	5.44
Monday to Saturday 5:00 p.m. to 8:00 a.m.	109	963	8.83
Saturday 8:00 a.m. to Sunday 8:00 a.m.	43	320	7.44
Sunday 8:00 a.m. to Monday 8:00 a.m.	43	296	6.88

The average response time is only one measure of response effectiveness. Another measure of response effectiveness is fractile response time. Fractile times show the number and percent of calls for service responded to within time increments and the cumulative response during each time segment, such as eight minutes and 59 seconds. Exhibits 26, 27, 28, and 29 display the number and

percent of EMS calls responded to in less than eight minutes and 59 seconds. (Note: in an earlier section of this report, it was suggested that the Fire Department should attempt to achieve the following EMS benchmark: deliver EMS services to 90 percent of all incidents within eight minutes and 59 seconds.)

Exhibit 26 shows that the Fire Department responded to more than 92 percent of EMS calls within eight minutes and 59 seconds from 8:00 a.m. to 5:00 p.m. in the sample period for 2007. The percent of calls responded to within eight minutes and 59 seconds was less in other time periods examined.

EXHIBIT 26**FRACTILE RESPONSE TIMES - JANUARY, APRIL, JULY & OCTOBER 2007**

	TOTAL RESPONSES ANALYZED	RESPONSES <8:59 MINUTES	FRACTILE % <8:59 MINUTES
Monday to Friday 8:00 a.m. to 5:00 pm.	81	75	92.59%
Monday to Saturday 5:00 p.m. to 8:00 a.m.	48	29	60.41%
Saturday 8:00 a.m. to Sunday 8:00 a.m.	23	11	47.82%
Sunday 8:00 a.m. to Monday 8:00 a.m.	25	18	72.00%

EXHIBIT 27**FRACTILE RESPONSE TIMES - JANUARY, APRIL, JULY, & SEPTEMBER 2008**

	TOTAL RESPONSES ANALYZED	RESPONSES <8:59 MINUTES	FRACTILE % <8:59 MINUTES
Monday to Friday 8:00 a.m. to 5:00 pm.	62	54	87.09%
Monday to Saturday 5:00 p.m. to 8:00 a.m.	61	24	39.34%
Saturday 8:00 a.m. to Sunday 8:00 a.m.	20	17	85.00%
Sunday 8:00 a.m. to Monday 8:00 a.m.	17	12	70.58%

Exhibit 28 consolidates fractile response time for 2007 and 2008. These data indicate that 90 percent of incidents were responded to within eight minutes and 59 seconds, Mondays through Fridays, 8:00 a.m. to 5:00 p.m. Response time is slower Monday through Saturday from 5:00 p.m. to 8:00 a.m. Less than 49 percent of calls were responded to within eight minutes and 59 seconds during the time period Monday through Saturday from 5:00 p.m. to 8:00 a.m.

EXHIBIT 28

**FRACTILE RESPONSE TIMES - JANUARY, APRIL, JULY, OCTOBER 2007 AND
JANUARY, APRIL, JULY, SEPTEMBER 2008**

	TOTAL RESPONSES ANALYZED	RESPONSES <8:59 MINUTES	FRACTILE % <8:59 MINUTES
Monday to Friday 8:00 a.m. 5:00 pm.	143	129	90.20%
Monday to Saturday 5:00 p.m. 8:00 a.m.	109	53	48.62%
Saturday 8:00 a.m. to Sunday 8:00 a.m.	43	28	65.11%
Sunday 8:00 a.m. to Monday 8:00 a.m.	43	30	69.76%

The data indicate that:

- The Fire Department has developed an efficient response system with limited resources. The deployment of full-time personnel during peak activity hours is an effective response plan. The Department provides emergency response from the fire station 93 hours of the 168 hours in each week. The Fire Department personnel respond to emergencies from home 75 hours each week.
- The assignment of a combination of career and part-time personnel to provide fire and rescue response from the fire station on weekends (Saturday at 8:00 a.m. to Monday at 8:00 a.m.) is a reasonable use of resources.
- The response data suggest that the Department is able to respond to 90 percent of EMS incidents within eight minutes and 59 seconds, on

weekdays (Monday through Friday, 8:00 a.m. to 5:00 p.m.). The Department is able to respond to 65 to 69 percent of EMS incidents within eight minutes and 59 seconds on weekends (Saturday from 8:00 a.m. to Monday 8:00 a.m.). Currently, less than 50 percent of incidents are responded to within eight minutes and 59 seconds from 5:00 p.m. to 8:00 a.m., Monday through Friday.

STAFFING RECOMMENDATIONS

These data suggest a series of recommendations for the Town to consider. The following recommendations are designed to provide alternatives to the Town.

***RECOMMENDATION 6:** The Fire Department should continue to use the current EMS and fire response model which uses a combination of career, call, and part-time personnel as emergency responders.*

***RECOMMENDATION 7:** The Town should consider the employment of additional career firefighters/EMTs over the next several years to strengthen fire and EMS response. There are two approaches to increasing the size of the career firefighter/EMT workforce.*

***RECOMMENDATION 7A (ALTERNATIVE #1):** The Town should employ two career firefighters/EMTs to be assigned to cover a new nine-hour shift, (Monday to Friday, 5:00 p.m. to 2:00 a.m.).*

Alternative #1 would require the Fire Department to deploy two career personnel Monday through Friday, 5:00 p.m. to 2:00 a.m. The nine-hour shift could be filled initially by one full-time firefighter/EMT and one part-time firefighter/EMT. Eventually, two full-time personnel would be employed to provide emergency response. The employment of two additional personnel would enable the Department to provide an additional 45 hours of emergency response from the fire station each week. Under this approach, the Town would be able to increase emergency response coverage from the fire station for 93 hours each week to 138 hours. (There are 168 hours in a week.)

Alternative #1 assumes that the current deployment of A, B, and C shift personnel and weekend coverage by part-time personnel will continue. In addition, with two additional personnel assigned to work weekday evenings, the Department

could consider adjustments in the starting time of shifts. Exhibit 29 displays the staffing pattern for Alternative #1.

EXHIBIT 29
ALTERNATIVE #1 - CAREER STAFFING PLAN

	CURRENT STAFFING	PROPOSED STAFFING	CHANGE
Chief	1	1	0
Lieutenant/EMT	2	2	0
Firefighter/EMT	1	3	2
Total	4	6	2

RECOMMENDATION 7B (ALTERNATIVE #2): The Town should develop a multi-year plan to increase the number of career emergency responders to nine personnel, an increase of six firefighters/EMTs.

- ▶ *Personnel should be deployed in three shifts, or groups of three firefighters/EMTs.*
- ▶ *Personnel should be assigned to work 24-hour shifts with an average work week of 48 hours.*
- ▶ *Each shift should be commanded by a Lieutenant.*

This alternative results in employing six additional full-time personnel to augment the three full-time emergency responders currently employed. The Department would organize three shifts of three firefighters/EMTs. Personnel would work 24-hour shifts, but be assigned to work an average of 48 hours per week. It would be necessary to employ part-time personnel to fill vacant shifts.

The 48-hour work week is currently somewhat unconventional in Massachusetts. Firefighters typically work an average of 42 hours a week in Massachusetts.

There should be one Lieutenant assigned to each shift to ensure that each shift has a supervisor. In addition, the Department should employ a staff officer, such as a Deputy Chief or a Captain. This staff officer would be the second-in-command of the Department. The new staff officer would also serve as the EMS

Officer and perform other administrative functions. The staff officer would also be expected to have some emergency response duties and may be required to provide some fill-in responsibilities.

Exhibit 30 shows the current and proposed number of firefighters/EMTs recommended under Alternative #2. With three personnel assigned to each shift, there will be times when there will be three personnel on-duty.

EXHIBIT 30
ALTERNATIVE #2 - LONG-TERM STAFFING PLAN

	CURRENT STAFFING	PROPOSED STAFFING	CHANGE
Chief	1	1	0
Deputy Chief/Staff Officer	0	1	1
Lieutenant/EMT	2	3	1
Firefighter/EMT	1	6	5
Total	4	11	7

Exhibit 31 displays a six-phase plan to implement the proposed long-term staffing plan. The plan is designed to be implemented as financial resources become available.

EXHIBIT 31
PHASED IMPLEMENTATION OF LONG-TERM STAFFING PLAN

	CURRENT STAFFING	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5	PHASE 6	PROPOSED STAFFING
Chief	1							1
Deputy Chief/ Staff Officer	0						1	1
Lieutenant/EMT	2					1		3
Firefighter/EMT	1	1	1	1	1	1		6
Total	4	1	1	1	1	2	1	11

V. IMPLEMENTATION OF RECOMMENDATIONS

The implementation of staffing recommendations should be a gradual process which reflects the ability of the Town to pay for services. An estimate of the cost of implementing staffing recommendations, using current wages, is shown for both Alternative #1 and Alternative #2.

Firefighter/EMTs are paid \$16.84 to \$20.66 per hour. Assuming a 45-hour work week, personnel are paid \$43,618 to \$48,344 annually. The cost of implementing Alternative #1 is as follows:

\$43,618 to \$48,344 per firefighter/EMT x two personnel	= \$87,235 to \$96,689*
Direct benefit costs @35 percent of annual wages	= <u>\$30,532 to \$33,841</u>
Total Costs	= \$117,767 to \$130,530**

* Pay rates effective July 1, 2009

** Costs are shown in today's dollars.

The initial personnel cost of implementing Alternative #1 is \$117,767. Personnel costs increase as firefighters/EMTs gain seniority. In addition to personnel costs, there are additional costs for basic equipment and work gear for personnel.

The cost of implementing Alternative #2 is somewhat more complex. A six-phase implementation plan is shown below. The Department should shift to a new work schedule as the number of personnel increases. We have proposed that personnel be assigned to a 24-hour schedule and work an average of 48 hours per week. We assume that the average work week of 48 hours per week would be implemented at Phase 5 of the implementation plan. For the purpose of cost estimates, we have assumed a 45-hour work week. The implementation of the 24-hour work schedule will require the Town to pay three additional hours of wages to each firefighter/EMT each week, or 156 hours each year.

Exhibit 32 presents the cost of implementing Alternative #2. Personnel are paid \$16.84 to \$20.66 per hour. Assuming a 45-hour work week, personnel are paid \$43,618 to \$48,344 annually (effective July 1, 2009). In addition, benefits are

assumed to be equal to 35 percent of annual wages. The annual cost of a Firefighter/EMT is approximately \$58,884 to \$65,265. Exhibit 32 indicates the cost for each phase of the implementation process. (Costs are shown in today's dollars.)

EXHIBIT 32

COST OF A PHASED IMPLEMENTATION OF THE LONG-TERM STAFFING PLAN

	PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5	PHASE 6	TOTAL
Deputy Chief/ Staff Officer						(1*) \$71,249 to \$78,971	(1*) \$71,249 to \$78,971
Lieutenant/EMT					(1*) \$64,772 to \$71,791		(1*) \$64,772 to \$71,791
Firefighter/EMT	(1) \$58,884 to \$65,265	(1) \$58,884 to \$65,265	(1) \$58,884 to \$65,265	(1) \$58,884 to \$65,265	(1) \$58,884 to \$65,265		(5) \$294,418 to \$32,324
Total	\$58,884 to \$65,265	\$58,884 to \$65,265	\$58,884 to \$65,265	\$58,884 to \$65,265	\$123,666 to \$137,056	\$71,249 to \$78,971	\$489,335 to \$542,352

* The salaries of the Lieutenant and Deputy Chief will be higher than the salary of a Firefighter/EMT. For this exhibit, we have assumed that a Lieutenant is paid 10 percent more than a Firefighter/EMT and the Deputy Chief is paid 10 percent more than a Lieutenant.

APPENDIX

STANDARDS, BENCHMARKS AND RESPONSE PARAMETERS

This Appendix describes the emerging standards and benchmarks used to design fire or emergency medical service systems. Meeting benchmarks and standards is difficult for many fire departments, such as Douglas. An approach toward making progress in achieving standards is to maximize the available regional resources. Resources near the Town are limited, but they should be drawn upon, if necessary. The emerging standards, or benchmarks, which affect crew size, firefighter safety, and fire and EMS response times are listed below.

OSHA requirements for a minimum of four equipped personnel to be present before entry in a structure fire incident.

OSHA requirements for a rapid intervention team (RIT) to be present for safety reasons at working structure fires.

OSHA and NFPA requirements for a qualified incident commander and a qualified safety officer to be present at working incidents.

NFPA 1710 and industry standards to have a minimum of 15 firefighters, including an incident commander, present for a low-hazard structure fire, and at least two pumpers and a ladder truck, or similar vehicle.

NFPA 1720 and industry standards to be followed by volunteer (call) fire department. Standards display time and firefighter deployment standards.

Emergency medical service response time benchmarks which are suggested in NFPA 1710, the *American Heart Association Statement on Chain of Survival*; and Eisenberg Model which discuss the survivability for a non-breathing person and the application of CPR, defibrillation, and advanced life support.

A brief discussion of emergency medical service response benchmarks is also contained in this report.

DEVELOPING RESPONSE CAPABILITY OBJECTIVES

Response capability objectives should consider both rapid response and, in the case of fire emergencies, a sufficient number of firefighters to attack the fire. Response objectives must also accommodate variations in fire danger. It is important to consider subsequent responses occurring after the initial response and the possibility of simultaneous emergency events, such as fire, rescue, hazmat and EMS incidents, occurring during or after the initial incident. A number of measures and standards are considered by fire and rescue agencies when developing response capability objectives.

STANDARDS AND FACTORS USED TO DEVELOP RESPONSE CAPABILITY OBJECTIVES

Containment of a Fire/Flashover	NFPA Standard 1710
Geographic Characteristics of the Town	NFPA Standard 1720
Sequence of Emergency Response	Distribution of Capacity (fire station location)
"Two In, Two Out" OSHA Safety Rule	AMA EMS Response Considerations & Standards
Insurance Services Office (ISO) Measures/Standards	AHA Standards for Cardiac Response

The concepts summarized above provide a frame of reference for many of the recommendations in this report.

Containment. In structure fire instances, there are several important factors to consider. First is the behavior of fire within a confined space. The risks associated with this can vary across the Town. In closely developed, built-up areas, it is imperative to consistently contain a fire within the compartment of origin (that area separated from the remainder of the structure by construction). This means that the fire department must interrupt the growth of fire before a condition called flashover occurs. At flashover, there is a rapid transition in fire behavior from localized burning of fuel, to involvement of all the combustibles in the enclosure. At that time, the fire typically expands in six different directions: vertically through the ceiling, horizontally through the four walls, and even through openings in the floor. By then, all barriers to fire growth beyond the original compartment are under attack by extremely hot flame, smoke and gasses. These elements expand at approximately 50 times their volume per minute. At flashover, the probability of

death or serious injury to occupants of the structure is significant. Obviously, life safety within the structure is a basic concern and, when nearby properties are involved, the control of flashover becomes even more paramount as additional lives and property are jeopardized.

Comprehensive testing by the United States Institute of Standards and Technology has generally established that a fire within a typically furnished room will evolve into flashover within four to ten minutes of the event of open flame. At that time, temperatures at ceiling level will reach 1,500 degrees. United States fire department planning generally assumes approximately an eight-minute period before flashover.

Under these circumstances, and where lives and properties are in danger, in order to accomplish timely interruption of fire growth, contain the fire within the compartment of origin, and locate and remove threatened persons, rapid and effective response is essential. Fire companies must receive notification of the fire, don appropriate safety gear, mount the apparatus, travel to the scene of the fire, accomplish sufficient firefighting tasks to inhibit fire growth, and rescue occupants within approximately eight minutes of the event of flame. The tasks to be accomplished at the scene by the initial arriving units include search, rescue, ventilation, ladder placement, hose line deployment and other actions, all requiring immediate and simultaneous execution.

Local Characteristics. When designing response time and response capability objectives, it is important to consider fire risks, how they vary by neighborhood, and the level of service needed. Risks are greatest in wood-frame and non-resistant residential dwelling units, which are normally without automatic detection and reporting systems or suppression systems. In newer construction (particularly commercial, industrial and institutional structures), where buildings may be required to have automatic detection and suppression systems, the fire risk can be less. The latter usually have suppression systems which reduce the unmeasured time between the start of a fire and when the fire is detected and reported, and automatically retard fire development. It is important to recognize the significance of automatic suppression systems. In the following exhibit, data from the NFPA is reproduced indicating the effectiveness of sprinklers in residential occupancy structure fires.