

REVISED DRAFT

Northern Middlesex Council of Governments
Feasibility Study for Regional Emergency
Communications Center



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1.0 Introduction

The Northern Middlesex Council of Governments (NMCOG) undertook a feasibility study for establishing a Regional Emergency Communication Center (RECC) in the Greater Lowell area. The feasibility study included the nine communities in the NMCOG region: Billerica, Chelmsford, Dracut, Dunstable, Lowell, Pepperell, Tyngsborough, Tewksbury and Westford. Currently eight of the nine communities each operates its own public safety dispatch center. Three of the communities, Billerica, Dracut, and Westford, also operate a separate fire alarm/dispatch center. The Town of Dunstable is dispatched by the Town of Groton Police Department.

The NMCOG is serving as the lead agency for this project. The COG and its member agencies have been exploring the concept of a shared dispatch center for a number of years. The NMCOG successfully applied for a development grant from the Massachusetts State 9-1-1 Department to perform a consolidation study, and contracted with AECOM to conduct the study.

The study was designed to accomplish the following elements:

- Existing Conditions Analysis
- Consolidation/Regionalization Feasibility Assessment
- Financial Analysis of Alternatives.

The NMCOG identified a number of issues that needed to be addressed. These included:

- How does the current 911 system and police/fire dispatch services work in each NMCOG community and across the region?
- How well do the fire and police departments work together within each community in addressing 911 and dispatch issues?
- What training needs do each of these departments have and what resources are available at the state or federal levels to address these needs?
- If 911 services in Greater Lowell were regionalized, what would it cost and where would the RECC be located? What cost savings and service efficiencies, if any, would be realized if the service were regionalized and what collective bargaining issues would need to be addressed?
- What administrative entity would need to be established in order for all communities to feel that their emergency needs would be addressed in an even-handed and equitable manner?
- What information systems would need to be upgraded, improved or replaced in order to ensure the rapid and compatible transmission of data, messages and information? What equipment would need to be replaced to ensure interoperability?
- What principal coordination issues would need to be addressed in order for a regional 911 system to work?

This report addresses those tasks and issues:

SECTION 2 of the report describes the functional attributes that a consolidated public safety communications center should have;

SECTION 3 describes the Current Communications Environment;

SECTION 4 discusses the Current Communications Problems and Concerns;

SECTION 5 identifies and analyzes alternative designs for a RECC;

SECTION 6 presents AECOM's opinion of probable cost for the selected alternatives; and

SECTION 7 contains AECOM's conclusions and recommendations.

2.0 Current Communications Environment

This section defines the current dispatch operations and communications environment as they exist today in each of the eight towns and the City of Lowell. A brief discussion of the overall community environment and the projected changes in population is also included. Descriptions of the current operations for each of the nine localities involved in this study (Billerica, Chelmsford, Dracut, Dunstable, Lowell, Pepperell, Tewksbury, Tyngsborough, and Westford) are provided and the duties performed by the dispatch staff of the centers are reviewed.

2.1 Current Community Environment

The Greater Lowell region consists of the City of Lowell and its eight suburbs – Billerica, Chelmsford, Dracut, Dunstable, Pepperell, Tewksbury, Tyngsborough and Westford – and has a land area of approximately 195 square miles and an inland water area of 5.76 square miles. The City of Lowell serves as the central city and economic center of the Greater Lowell region. The towns involved in this study have experienced steady population growth. The Greater Lowell region had a population of 235,052 in 1980, 263,656 in 1990, 281,225 in 2000, and a population of 286,901 in 2010, according to the U.S. Census. TABLE 2-1 shows the change in population since 1980 and the projected population for each town through 2030.

**Table 2-1
Population Projections**

Locality	1980 Census	1990 Census	2000 Census	2010 Census	% Change 2000- 2010	2020 Projection	2025 Projection	2030 Projection	% Change 2010- 2030
Billerica	36,727	37,609	38,981	40,243	3.24%	40,269	41,340	41,810	3.89%
Chelmsford	31,174	32,383	33,858	33,802	-0.17%	34,750	35,260	35,880	6.15%
Dracut	21,249	25,594	28,562	29,457	3.13%	32,080	33,140	34,630	17.56%
Dunstable	1,671	2,236	2,829	3,179	12.37%	3,560	3,950	4,370	37.46%
Lowell	92,418	103,439	105,167	106,519	1.29%	106,920	108,220	109,820	3.10%
Pepperell	8,061	10,098	11,142	11,497	3.19%	13,070	13,680	14,660	27.51%
Tewksbury	24,635	27,266	28,851	28,961	0.38%	30,000	31,020	31,820	9.87%
Tyngsborough	5,683	8,642	11,081	11,292	1.90%	12,470	13,070	13,740	21.68%
Westford	13,434	16,392	20,754	21,951	5.77%	24,300	24,320	25,270	15.12%
Total	235,052	263,659	281,225	286,901	2.02%	297,419	304,000	312,000	8.75%

U.S. Census Bureau for the 1980, 1990, 2000 and 2010 figures and MassDOT for the 2020, 2025 and 2030 projections.

The Greater Lowell region is tied together by the Merrimack River and is located in the northeastern section of Massachusetts, abutting the New Hampshire state line. The Greater Lowell region represents the classic development of an urban center and its suburbs. The nine communities within this region initially shared a common agricultural development pattern, but later separated into urban, suburban and rural communities. Initially, this region focused upon agriculture and related activities, such as tanning, blacksmithing, coppering, furniture making. The industrialization of this region began in 1811 with the introduction of wool manufacturing in North Billerica. Subsequently, the first planned industrial city in America was created in Lowell, utilizing the hydraulic power resource of the Merrimack River at Pawtucket Falls. The Depression years were hard on this area due to the overdependence on the textile industry. After World War II, the construction of major highways and the investment in housing particularly outside of the City of Lowell created new growth opportunities for the region. Suburbs to the City of Lowell were being formed, which still depended upon Lowell as the regional economic center of the region. The construction of Route 128, Route 3, I-93, I-495 and the Lowell Connector opened up this region to increased economic opportunities. Development pressures in the region shifted from the City of Lowell to the other communities, particularly Billerica, Chelmsford and Tewksbury, in the 1970s and 1980s. Manufacturing continued to decline in the 1970s as the textile, shoe, metal working and

chemical industries relocated to other parts of the country with cheaper labor and expenses. During the 1980s, the growth of the computer, communications systems and military equipment industries, as well as the construction and housing industries, pulled the Lowell region out of the economic depths it had experienced. During the mid-2000s the Greater Lowell region enjoyed a diversified economy that did not rely as heavily on the City of Lowell or Route 128, as it had in the past, but, rather, expanded economic opportunities in the suburban communities and in New Hampshire. The overall economy has suffered as a result of the housing crisis and national recession. The economic recession that has beset the nation, state, and region has had a very real impact on Lowell and its surrounding suburbs. In 2007 and 2008, two thirds of the NMCOG communities suffered plant layoffs, primarily in the high tech manufacturing, information technology, and retail sectors. The Greater Lowell region has been experiencing unemployment rates that haven't been seen in this area for thirty years.ⁱ

2.2 Current Dispatch Environment

Eight of the nine localities involved in this study operate public safety dispatch centers. These dispatch centers function as primary public safety answering points (PSAP), directly receiving incoming wireline and VoIP 9-1-1 calls. The Town of Dunstable does not operate a dispatch center. Instead 9-1-1 calls for Dunstable are answered by the Groton Police Department. Wireless 9-1-1 calls originating in all of the localities are answered by the State Police, and then transferred to the locality as appropriate.

Each of the localities' dispatch centers dispatch that localities police department. In Billerica, Dracut, and Westford, the Town's fire department maintains and operates a separate dispatch center. Those dispatch centers function as secondary PSAPs, receiving 911 calls that are transferred from the primary PSAP. The Dunstable Police Department is dispatched by the Groton Police Department, and the Dunstable Fire Department is dispatched by the Pepperell Communications Center. The Pepperell Communications Center is a separate agency of Town government. The seven other primary PSAPs are a part of that locality's police department. The dispatch centers also dispatch resources for non-public safety agencies, especially after normal business hours. TABLE2-2 is a listing of the dispatch centers and the public safety departments and agencies they provide dispatch services for.

Table 2-2
PSAPs and Dispatched Agencies

Billerica PD	Billerica Fire	Chelmsford PD	Dracut PD	Dracut FD	Groton PD	Lowell PD	Pepperell	Tewksbury PD	Tyngsborough PD	Westford PD	Westford FD
Billerica PD	Billerica FD	Chelmsford PD	Dracut PD	Dracut FD	Groton PD	Lowell PD	Pepperell PD	Tewksbury PD	Tyngsborough PD	Westford PD	Westford FD
Billerica EMS		Chelmsford FD			Groton FD	Lowell FD	Pepperell FD	Tewksbury FD	Tyngsborough FD		
					Groton EMS		Dunstable FD				
					Dunstable PD						
					Trinity EMS						

2.3 Town of Billerica

The Town of Billerica covers a land area of 26 square miles, and has a resident population of 40,243 persons, according to the 2010 U.S. Census. Over 8% percent of the town's population is 65 years of age or older. There are 6,604 students enrolled in the public school system, which includes six elementary schools, two middle schools, and one high school. One hundred percent of the town is served by the public drinking water supply. The Town's drinking water is drawn from the Concord River, after first passing through a town water treatment plant. In 2000, there were 13,071 housing units in the town. The average household shelters 2.92 people. Forty percent of the town's land is used for residential housing, eight percent of the land is in commercial and industrial use, three percent is used for agriculture, 43 percent is in open space, recreation, or water use, and four percent is used for transportation, mining, or waste disposal. There are 151 public safety personnel in Billerica, including 66 sworn police officers, 73 fire fighters, and 12 EMS personnel.ⁱⁱ

The Town operates 4 UHF conventional repeater channels. One is used by the police and ambulance departments; two are used by the fire department, and the fourth is designated for emergency management. The emergency management channel serves as a back-up for both the police and fire channels. Each repeater channel also uses

satellite receivers. The repeaters and receivers are interconnected using the city owned fiber optic cable. The police department's radios are all narrow-band capable. The fire department has already switched to narrow-band operation. The police department vehicles are equipped with mobile computers and use air cards for connectivity.

2.3.1 Billerica Police Department

The Billerica Police Department is organized into 6 divisions: Administration, Ambulance, Criminal Investigations, Dispatch, Patrol and Records. The Patrol Division is comprised of approximately four Lieutenants, Six Sergeants and 29 Patrol Officers. There are also two specialized units within the Patrol Division: K-9 and Traffic. Typically there between 6 and 8 patrol units on duty.

The Billerica Police Criminal Investigations Division is charged with investigating all major crimes within the Town of Billerica. The division is currently comprised of a sergeant and six additional detectives.

The Town of Billerica Emergency Medical Services (EMS) is a division of the Billerica Police Department and has 1 Paramedic Supervisor, 11 full-time Paramedics and 6 per diem Paramedics who provide the town with twenty-four hour, seven day a week Advanced Life Support, paramedic ambulance coverage. The EMS department currently staffs two ambulances. One is staffed 24 hours per day. A second ambulance is staffed seven days per week 12 hours a day.

The Billerica Police Department is a member of the Northeastern Massachusetts Law Enforcement Council (NEMLEC). NEMLEC functions in many respects as a specialized, regional policing operation. NEMLECs operational units include: Computer Crime, Motorcycle Unit, Regional Communications, Incident Management Assistance (IMAT) RRT/SWAT, and STARS

2.3.2 Billerica Fire Department

The Billerica Fire Department is a career department. The department is staffed with 73 firefighters and 5 civilian personnel. There are 5 stations. The department has five engines, a ladder truck, a rescue truck, and grass/brush truck, and a water tanker.

The Billerica Fire Department provides fire prevention and suppression services to the Town of Billerica. It also provides medical first responder service on critical medical emergency calls.

2.3.3 Billerica Police Department Communications Center

The Billerica Police Department Communications center is the primary public safety answering point for the town. In addition to the Billerica Police Department, the dispatch center also dispatches Billerica Emergency Medical Services. Fire calls are transferred to the Billerica Fire Department Communications Center. The center is the primary public safety answering point for wireline and VoIP 9-1-1 calls for the Town. Wireless 9-1-1 calls are answered by the Massachusetts State Police. The communications center answers all incoming administrative telephone calls for the department.

The dispatch center is located inside the Billerica Police Department at the intersection of Good Street and Boston Road (RT 3A). This building is co-located with the Billerica Town Hall building and the Billerica Fire Department building. All three buildings are connected.

The parking lot to the building is not fenced in and is shared between town hall, police department, and fire department employees, as well as visitors. The building housing the police department is a secured facility with electronic door locks, electrically controlled sally ports, security cameras, and a secure vestibule/visitor area (lobby) located through the front door entry.

The door leading to the inside of the building from the vestibule area is electronically locked and monitored by the dispatch center staff. There is a glass window in the vestibule area where all visitors must check-in. The dispatcher has the ability to electronically unlock this door to allow visitors into the building. There are surveillance cameras located in the vestibule area that are monitored by the dispatch staff. The door leading to the dispatch center is locked by a keyless combination door lock. The dispatchers also monitor the video feed from the holding cells located in the building.

There are external surveillance cameras located around the building. There is a generator located on the Town Hall building area that is shared between the three facilities. The generator and fuel tank were not surveyed during this visit.

The telephone service provider is Verizon. There are a total of five (5) wireline trunks, four (4) wireless trunks, two emergency trunks, and two admin lines coming into the dispatch center.

There are a total of four (4) positions located in this center. Three positions have call-taking and radio dispatching capabilities, while the fourth position has no dispatching or call-taking capabilities. The fourth position is used for CAD and performing CJIS/NCIC queries.

The Motorola Centracom Gold Elite radio consoles, Plant/CML Vesta PALLAS 911 Customer Premises Equipment, and an End to End Cad and Records management system are in use.

There are three (3) transmit sites used by Billerica PD dispatch and the locations are labeled Water Tank, Bear Hill, and Local. There are six (6) voter receive sites labeled Water Tank, Local, East, West, North, South. All three radio consoles are wired into one backup console.

The following channels are used for dispatch: Police, NWTAC 2, Area Wide 3, Digital TAC 3. The console has the following channels programmed: Area 3, Area 4, N. TAC, EMA, Bill FD, NEM DIR FIRE, and DPW. Some of the channels are part of the Boston Area Police Emergency Radio Network (BAPEREN) system and the North East Massachusetts Law Enforcement Council (NEMLEC). There is a combination of VHF Lo Band, VHF High Band, and UHF-T Band frequencies being used for police, fire, and department of public works operations. The data network is handled through Verizon air cards.

There are redundant fiber feeds coming into this complex from Verizon and Comcast.

TABLE 2-3 shows the available metrics for the Billerica Police Department Communications Center.

Table 2-3
Billerica Police Department

Activity	Call Volume		
	2008	2009	2010
Wire-line 9-1-1	5,339	4,669	6,819
Wireless 9-1-1	2,429	2,425	2,482
VOIP 9-1-1			
Total 9-1-1 Calls Received	7,235	7,094	9,301
Wireless Call %	34%	34%	27%
Administrative/Non-Emergency Calls			57,463
Police Calls For Service Dispatched			15,478
Police Officer Initiated Calls			4,655
Fire Calls Dispatched			
Emergency Medical Calls Dispatched			

2.3.4 Billerica Fire Alarm Office

The Billerica Fire Alarm Communications Office is responsible for the receipt of fire alarms and the dispatch of the Billerica Fire Department. In addition, the fire alarm communications office is the operations center of the department.

The Fire Alarm Communications Officer is staffed by 5 civilian fire alarm operators. They are fire department employees and are part of the firefighters' union. They work 8 hour shifts using a 4 days on – 2 days off schedule. There is also a civilian IT support person and a Fire Alarm Superintendent.

The Fire Alarm Communications office is a secondary PSAP. Incoming 911 calls are answered by the police department and then transferred to the fire department if appropriate. In addition both a Zetron radio console and a Zetron Fire Station Alerting system have been installed. A Positron Power 911 CAD system is in use.

The Town has provided a city-owned wired fire alarm reporting system. At the present time approximately 350 separate facilities are connected to the system.

In 2003 the Billerica Fire Department and Westford Fire Department built and installed the district six fire mutual aid radio system, to include four transmitters and three satellite receivers located in Westford, Groton, Wilmington, Chelmsford, Ayer, Dracut, and Billerica. The network now connects eighteen cities and towns in northern Middlesex County.

TABLE 2-4 shows the available metrics for the Billerica Fire Alarm Communications Office.

Table 2-4
Billerica Fire Department

Activity	Call Volume		
	2008	2009	2010
Wire-line 9-1-1			
Wireless 9-1-1			
VOIP 9-1-1			
Total 9-1-1 Calls Received			
Wireless Call %			
Administrative/Non-Emergency Calls			
Outgoing Calls			
Police Calls For Service Dispatched			
Police Officer Initiated Calls			
Fire Calls Dispatched	4,832	5,000	13,219
Emergency Medical Calls Dispatched			2,767

2.4 Town of Chelmsford

The Town of Chelmsford covers a land area of 23 square miles and has a population of 33,802 persons, according to the 2010 U.S. Census. Approximately thirteen percent of the town's population is 65 years of age or older. There are 4,069 students enrolled in the public school system, which includes five elementary schools, two middle schools, and one high school. Ninety-five percent of the town is served by a public drinking water supply. There are 13,025 housing units in the town. The average household shelters 2.61 people. Forty-seven percent of the town's land is used for residential housing, six percent of the land is in commercial and industrial use, four percent is used for agriculture, 39 percent is in open space, recreation, or water use, and five percent is used for transportation, mining, or waste disposal. There are 120 public safety personnel in Chelmsford, including 58 sworn police officers and 62 fire fighters.ⁱⁱⁱ

2.4.1 Chelmsford Police Department

The Chelmsford Police Department is the primary provider of law enforcement services to the Town of Chelmsford. At the present time, the Chelmsford Police Department consists of 49 sworn personnel, 9 civilian dispatchers, 3 clerical support personnel, a custodian, and a mechanic. Typically there are 5 officers and at least one supervisor on duty. There are two sergeants and a Lieutenant assigned to each shift. Normally one of the supervisory personnel is in the field and one is inside. The shift commander's office is adjacent to the dispatch center. The department became the 43rd police agency in the State to receive its Certification from the Massachusetts Police Accreditation Commission in May 2010. The department is pursuing state accreditation.

2.4.2 Chelmsford Fire Department

The Chelmsford Fire department provides fire protection and medical first responder services to the Town. It is a career department and operates from four stations, currently.

2.4.3 Chelmsford Police Department Communications Center

The Chelmsford Police Department Dispatch Center is the primary Public Safety Answering Point for the Town. The center also dispatches the Chelmsford Fire Department. The dispatch center is staffed by nine civilian personnel. The center is fully staffed. The least senior dispatcher has 4 years of experience. Two dispatchers are on duty on each shift. In addition to the Chelmsford Police and Fire Departments, the dispatch center communicates directly with Trinity EMS units once they have been dispatched to a call. These units are tracked in the CAD system. A Microsystems CAD system is in use. They also are able to communicate with tow trucks in the Town. The dispatchers are represented by ASCME. The dispatchers work 8 hour shifts. They work a 4 days on - 2 days off schedule.

In addition to their dispatch duties, the dispatch staff is responsible for fire alarm permits and tests, fire department scheduling, walk-in traffic for the police department and observing court ordered child custody exchanges that occur in the police department lobby.

The Chelmsford dispatch center is in the process of implementing Emergency Medical Dispatch. They have selected Priority Dispatch for their EMD system. Emergency medical transport is provided by Trinity EMS. Once a Trinity EMS unit has been dispatched by their dispatch, the unit switches to the Chelmsford fire channel and communicates with the Chelmsford dispatch center. The units are tracked in Chelmsford's CAD system.

The dispatch center is located inside the Chelmsford Police Department building, which has Old Westford Rd and Olde North Rd located on the west and east side of the campus. This building is not co-located with any other agency; however, there is a school located approximately 158-ft. from the building. The parking lot to the building is not fenced in and is open to visitors. The police vehicles park on the northwest end of the building. This building is a secured facility with electronic door locks, electrically controlled sally ports, security cameras, and a secure vestibule/visitor area (lobby) located through the front door entry.

The door leading to the inside of the building from the vestibule area is electronically locked and monitored by the dispatch center staff. There is a glass window in the vestibule area where all visitors must check-in. The dispatcher has the ability to electronically unlock this door to allow visitors into the building. There are surveillance cameras located in the vestibule area that are monitored by the dispatch staff.

There are external surveillance cameras located around the building. This facility has a 188 kW Diesel generator for emergency backup power.

The telephone service provider is Verizon. There are a total of five (5) wireline trunks, four (4) wireless trunks, two emergency trunks, and two admin lines coming into the dispatch center.

There are a total of four (4) positions located in this center. All positions are capable of dispatching / call-taking.

The Motorola Centracom Gold Elite console positions are installed.

The following channels are used for dispatch: Police, Fire UHF, Digital TAC 3, North-West TAC, Area-Wide 3, Fire VHF, Fire VHF Backup, and District 6. Additionally, the following pagers are set up in the console: All Call, Chief, Deputy 2, Engine 2, Engine 4, Fire Prevention, Officer Call, Deputy 1, Engine 1, Engine 3, and Engine 5. The following voters are monitored by the console position: Locke PD, Robin PD, Doris PD, and Local PD. There is a combination of VHF Lo Band, VHF High Band, and UHF-T Band frequencies being used for police, fire, and department of public works operations.

Microsystems Pro IV CAD and RMS are used by the Chelmsford Police Department.

TABLE 2-5 shows the available metrics for the Chelmsford Police Department Communications Center

Table 2-5
Chelmsford Police Department

Activity	Call Volume		
	2008	2009	2010
Wire-line 9-1-1	5,795	4,940	4,960
Wireless 9-1-1	2,529	2,254	2,371
VOIP 9-1-1			
Total 9-1-1 Calls Received	8,324	7,194	7,331
Wireless Call %	30%	31%	32%
Administrative/Non-Emergency Calls			28106
Outgoing Calls			
Police Calls For Service Dispatched	32908	33684	33353
Police Officer Initiated Calls			
Fire Calls Dispatched	2590	2672	2704
Emergency Medical Calls Dispatched	2463	2572	2553

2.5 Town of Dracut

The Town of Dracut covers a land area of 21 square miles and has a population of 29,457 persons, according to the 2010 U.S. Census. Nearly twelve percent of the town's population is 65 years old or older. There are 4,069 students enrolled in the public school system, which includes four elementary schools, one junior high school, and one high school. Ninety percent of the town is on public drinking water supply. There are 10,451 housing units in the town. The average household shelters 2.89 people. Thirty-two percent of the town's land use is for residential housing, two percent of the land is in commercial and industrial use, fourteen percent is used for agriculture, 46 percent is classified as open space, recreation, or for water use, and five percent is used for transportation, mining, or waste disposal. There are 78 public safety personnel in Dracut, including 39 sworn police officers and 36 fire fighters.^{iv}

2.5.1 Dracut Police Department

Dracut Police Department provides law enforcement services to the Town of Dracut. The Dracut Police Department currently has 39 sworn personnel, eight civilian Dispatchers, one Animal Control Officer, one Administrative Secretary, two maintenance/custodians, two Records Clerks and four School Crossing Guards. One officer is currently deployed on active duty with the military. Twenty six of the sworn personnel are assigned to the Patrol Division. Typically there are 4 patrol officers and a sergeant on duty on each shift. The department moved into a new facility in 2007. The department is certified by Massachusetts Police

Accreditation Commission, an organization that administers a voluntary accreditation process for the Commonwealth's law enforcement profession.

The Dracut Police Department uses a repeated UHF channel. There is an 80 foot tall tower located adjacent to the department. The department has good interoperability with neighboring departments, and there is extensive regional cooperation. The department actively participates in the North Eastern Massachusetts Law Enforcement Council (NEMLEC) and has personnel participating in several of NMLEC's operational units.

2.5.2 Dracut Fire Department

The Dracut Fire Department is a career department providing fire protection and prevention services as well as emergency medical first responder services for the Town of Dracut. The department operates from 3 stations. The Dracut Fire Department has an authorized strength of 41 personnel. Due to budgetary constraints, two positions are not filled. In addition, 1 firefighter is deployed on active military duty and another is on extended medical leave. That leaves the department with an effective strength of 37. There are 8 firefighters assigned to each of four twenty-four hour shifts. Three of firefighters are at Station 1 and 2 firefighters are assigned to each of the other stations. One firefighter is assigned to dispatch. There are two Deputy Chiefs who are on duty during the day and on call at other times. The Deputy Chiefs work a 4 day rotating schedule.

The Dracut Fire Department operates 3 frontline engines, 1 aerial ladder truck, 1 rescue truck, 3 brush trucks, and a reserve engine. The Dracut Fire Department uses a simplex VHF channel with three satellite receivers. They also have UHF radios to enable communications with other departments.

2.5.3 Dracut Police Dispatch Center

The Dracut Police Dispatch Center functions as the primary public safety answering point for the town. It also dispatches the Dracut Police Department. The Dracut Fire Department operates a secondary PSAP. All fire and medical emergency calls are transferred to the fire department. The dispatch center is equipped with three positions. A third position is located in the OIC's office. All of the equipment was installed new when they department moved into the new building. The Pamet Software CAD and RMS was recently updated.

The dispatch center is staffed by 8 Dispatchers. Two are on duty on each shift. The dispatch operations are supervised by the Support Services Lieutenant. Turnover is not a problem. There has not been a full-time vacancy since the department moved to the new facility. The dispatchers are represented by the NEPBA. The dispatch center does not provide emergency medical dispatch at the present time.

TABLE 2-6 shows the available metrics for the Dracut Police Department

**Table 2-6
Dracut Police Department**

Activity	Call Volume		
	2008	2009	2010
Wire-line 9-1-1	3,684	3,180	3,074
Wireless 9-1-1	1,547	1,659	1,759
VOIP 9-1-1			
Total 9-1-1 Calls Received	5,231	4,839	4,833
Wireless Call %	30%	34%	36%
Administrative/Non-Emergency Calls			18,520
Outgoing Calls			
Police Calls For Service Dispatched			9,680
Police Officer Initiated Calls			12,895
Fire Calls Dispatched			
Emergency Medical Calls Dispatched			

2.5.4 Dracut Fire Department Communication Center

The Dracut Fire Department operates a secondary PSAP. A single firefighter is assigned to dispatch on each shift. The center is equipped with a Zetron Model 4010 console and a Zetron Model 26 Fire Station Alerting System.

The fire department operates a municipal fire alarm system. The system uses city owned cable for the facilities to be connected. The cable is maintained by a private contractor. The dispatch center is equipped with a Keltron Form Four fire alarm panel which provides power and supervision for the coded signal loop between fire alarm boxes connected to the system. Currently there are 177 facilities connected to the alarm system.

TABLE 2-7 shows the available metrics for the Dracut Fire Department

**Table 2-7
Dracut Fire Department**

Activity	Call Volume		
	2008	2009	2010
Wire-line 9-1-1			
Wireless 9-1-1			
VOIP 9-1-1			
Total 9-1-1 Calls Received			
Wireless Call %			
Administrative/Non-Emergency Calls			
Outgoing Calls			
Police Calls For Service Dispatched			
Police Officer Initiated Calls			
Fire Calls Dispatched			1,214
Emergency Medical Calls Dispatched			1,803

2.6 Town of Dunstable

The Town of Dunstable covers a land area of 17 square miles and has a population of 3,179 persons, according to the 2010 U.S. Census. 6.9% of the town’s population is 65 years of age or older. There are 2,258 students enrolled in the public school system, which includes four elementary schools, one middle school, and one high school. Five percent of the town is served by a public drinking water supply. The remainder of the Town is extracts its water from

private wells. There are 923 housing units in the town. The average household shelters 3.1 persons. 11% of the town's land is used for residential housing; less than one percent of the land is in commercial and industrial use; twelve percent is used for agriculture; 74 percent is in open space, recreation, or water use; and two percent is used for transportation, mining, or waste disposal. There are 37 public safety personnel in Dunstable, including 7 full-time police officers and 30 volunteer fire fighters.^v

2.6.1 Dunstable Police Department

The Dunstable Police Department provides full time law enforcement service to the Town of Dunstable. The department staff includes the Chief, 1 lieutenant, 1 sergeant, 4 full-time patrol officers, and 7 reserve officers.

The Town of Dunstable does not have a dispatch center. Dispatch service for the Dunstable Police Department is provided by the Groton Police Department. The Groton Police Department also is the primary public safety answering point for the Town of Dunstable.

2.6.2 Dunstable Fire Department

The Dunstable Fire Department is a volunteer fire department. The chief is a part-time employee. The remaining 29 members of the department are volunteers (paid-on-call). The department consists of a Chief, Assistant Chief, Deputy Chief, Captain, 3 Lieutenants, 17 fire fighters, and 6 Emergency Medical Technicians. A number of the fire fighters are also EMTs. The department operates from a single station and has two engines, a tanker, a brush truck, and a light rescue truck. In 2010, the department responded to 276 incidents including 97 medical emergencies.

Dunstable's Emergency Medical Services is section of the fire department and provides medical first responder service. Patriot Ambulance, provides 24/7/365 ambulance coverage for the town. Greater Lowell Paramedics, which are stationed at Saint Memorial Hospital in Lowell, provides the ALS coverage.

The Dunstable Fire Department is dispatched by the Pepperell Communications Center. Dunstable Emergency Medical Services are dispatched by Groton Communications Center. All 911 calls for the town of Dunstable are answered at the Groton Communications Center and then forwarded to the correct facility.

2.7 City of Lowell

The City of Lowell covers a land area of 15 square miles, and has a population of 106,519 persons, according to the 2010 U.S. Census. Lowell is the fourth largest city in the Commonwealth of Massachusetts and is county seat of Middlesex County, Massachusetts. Eleven percent of the City's population is 65 years of age or older. There are 16,374 students enrolled in the public school system, which includes 20 elementary schools, seven middle schools, and one high school. One hundred percent of the city is served by the municipal drinking water supply. There are 37,887 housing units in the City. The average household shelters 2.67 persons. Forty-eight percent of the City's land use is used for residential housing; thirteen percent of the land is in commercial and industrial use; one percent is used for agriculture; 32 percent is in open space, recreation, or water use; and five percent is used for transportation, mining, or waste disposal. There are 483 public safety personnel in Lowell, including 228 sworn police officers and 201 fire fighters.^{vi}

2.7.1 Lowell Police Department

The Lowell Police Department has the primary responsibility for law enforcement and investigation for City of Lowell, Massachusetts. The department is organized into two bureaus (Operational Services and Support Services).

The Lowell Police Department currently has an authorized strength of 228 sworn personnel. There are currently 6 vacant positions. There are also approximately 20 officers who are unavailable for duty due to disability, long-term illness, and so forth. The department uses 3 geographic sectors for the city. Typically,

there are 11 patrol units and 3 supervisors deployed on each shift. There are also 6 officers working designated patrols.

The Lowell Police Department uses the Compstat program. Compstat is an information and management tool that maps crime statistics and holds command staff more accountable for the level of crime in their beats. Bi-weekly meetings are held and one of the three sector commanders presents a detailed briefing on activity in the sector. The presentation is focused on the sector's crime incidents, trends, and tactical responses. The meetings are held in the Emergency Operations Center which is adjacent to the communications center.

The Lowell Police Department operates a UHF radio system. The infrastructure is P25 capable. There is one repeater site and 5 satellite receivers. There is a back-up repeater site at the police department. They have generally good in-building coverage and 95% portable talk-in coverage.

2.7.2 Lowell Fire Department

The Lowell Fire Department provides fire protection, emergency medical response services, prevention and public educational activities. The Lowell Fire Department is a career department with approximately 200 employees. The department operates from 8 fire stations with 8 engine companies, 4 ladder companies, and a rescue squad. There are several divisions within the Department, including administration, fire prevention, the arson bureau, hazmat, fire education, fire training, EMS, the dive team and management information systems.

The Lowell Fire Department is dispatch by the Lowell Police Department Communications Center. The police dispatch center assumed responsibility for fire dispatch in 1998. The fire department operates a VHF radio system.

2.7.3 Lowell Police Department Communications Center

The Lowell Police Department Communications and E911 Center is the primary public safety answering point for the City and provide dispatch service for the Lowell Police Department and the Lowell Fire Department. The police dispatch center assumed responsibility for fire dispatch in 1998. Saints EMS provides emergency medical transport services. Calls are relayed to them. There are 3 Lead Dispatchers and 24 dispatchers in addition to the Director. 2 dispatchers are out on extended leave at the present time. 9 dispatch personnel are assigned to each of the three shifts. The dispatch staff works a 4 on 2 off schedule. Typically 6 of the 9 personnel are scheduled to work on any given day. 5 personnel is the minimum staffing. On occasion the number of personnel on duty in dispatch has dropped to 4. When fully staffed, 2 dispatchers function as call-takers, 1 handles police dispatch, 1 handles LEAPS, 1 is the primary fire dispatcher, and the sixth person is the back-up fire dispatcher. The dispatch has had relatively low turnover. Most of the recent hires have been lateral transfers from other dispatch center. 12 over the dispatch positions are funded through State 911 funds. The communications center answers the non-emergency business lines. It is estimated that more than 100,000 calls are received each year.

The Lowell Police Department has installed a Larimore CAD and RMS system. The City had previously installed a Larimore system, but replaced it with a Lucent CAD system in 2000. They system never became fully functional, and in 2005 the City installed a Larimore Windows based system. Through terminal services the system is interfaced with the mobile computers and the Data Works mug shot system.

The City of Lowell operates a Public Emergency Alarm System for receiving fire alarms from protected premises. Under city ordinance, every commercial building and every facility with more than four dwelling units must be connected to the system. The City is in the process of transitioning from a wired system to a wireless system. The city selected Keltron to be the alarm system provider. The system is a proprietary system, so users must purchase a specific Keltron unit. The alarms are monitored by the Lowell 911 center. Previously the alarms were monitored by the fire department.

The dispatch center was relocated into renovated space in 2009. The dispatch center is located inside the Lowell Police Department building. This building is not co-located with any other agency; however, it is the main police building. The parking lot to the building is fenced in and is not open to visitors. The police vehicles park all around the building. This building is a secured facility with electronic door locks, security cameras, and a secure vestibule/visitor area (lobby) located through the front door entry. The center is equipped with 7 workstations. 6 of the 7 are able to answer 911. The State 911 Department would not approve funding for the 7th position. All of the positions are equipped with CAD terminals and radio consoles. The dispatch center was relocated into renovated space in 2009. All of the positions are equipped with CAD terminals and radio consoles.

TABLE 2-8 shows the available metrics for the Lowell Police Department Communications Center

**Table 2-8
Lowell Police Department**

Activity	Call Volume		
	2008	2009	2010
Wire-line 9-1-1		15,427	13,355
Wireless 9-1-1		6,269	15,153
VOIP 9-1-1			
Total 9-1-1 Calls Received		21,696	28,508
Wireless Call %		29%	53%
Abandoned Call %		15%	9%
Administrative/Non-Emergency Calls		270,000	
Outgoing Calls			
Police Calls For Service Dispatched		79,841	
Police Officer Initiated Calls			
Fire Calls Dispatched		16,280	
Emergency Medical Calls Dispatched			

2.8 Pepperell

The Town of Pepperell covers a land area of 23 square miles and has a population of 11,497 persons according to the 2010 census. 7.5% of the Town’s population is 65 years of age or older. Pepperell is part of the North Middlesex Regional School District, which includes the towns of Townsend and Ashby. There are 4,885 students enrolled in the Regional School District. There is one elementary school in Pepperell and two middle schools. Seventy percent of the Town is served by public drinking water. There are 3,847 housing units in Town. The average household shelters 2.89 people. Eighteen percent of the town’s land use is used for residential housing; two percent is in commercial and industrial use; fifteen percent is used for agriculture; 63 percent is in open space, recreation, or water use; and four percent is used for transportation, mining, or waste disposal. There are 60 public safety personnel in Pepperell, including 16 uniformed police officers, 4 full-time and 39 volunteer fire fighters.^{vii}

2.8.1 Pepperell Police Department

The Pepperell Police Department provides law enforcement services to the Town of Pepperell. The Pepperell Police Department has an authorized strength of 18 sworn personnel and 1.25 civilian personnel. Due to budgetary constraints, 2 sworn positions are not filled. In addition, one officer is on long-term medical leave and another is deployed on military duty, leaving an effective staffing level of 14. When fully staffed there are a Chief, one Lieutenant, 4 sergeants, and 12 patrol officers. The Lieutenant’s position is one of the unfilled positions.

2.8.2 Pepperell Fire Department

The Pepperell Fire Department provides fire protection and emergency medical services to the Town of Pepperell. The department provides Advanced Life Support EMS transport services. The Pepperell Fire Department is a combination department. There are 4 full-time personnel and approximately 45 volunteer or paid-on-call firefighters. 20 of these personnel are also emergency medical technicians. The department provides paramedic level emergency medical services. It operates from two stations. There are 3 engines, 1 tanker, 1 ladder truck, a rescue squad, a brush truck, and a command vehicle. From 6 am until 6 pm there is one firefighter /paramedic on duty as well as the chief.

2.8.3 Pepperell Communications Department

The Pepperell Communications Department is a separate department of town government. The dispatch center is located in the Pepperell Police Department. The building was constructed in 1898 as a school. A separate HVAC system has recently been installed for the dispatch area. The department is the primary public safety answering point for the Town and dispatches the Pepperell Police and Fire Departments as well as Dunstable Fire. They answer the administrative lines for these departments as well. The department also provides dispatch service for the Town’s Highway, Water, and Sewer Departments. They also provide after hours telephone answering for these departments.

The Communications Department is staffed with a Director, Assistant Director, four full-time dispatchers, and 2 part-time dispatchers. Both the Director and the Assistant Director are responsible for filling a shift in addition to their other duties. The Director works the day shift, and the Assistant Director works the night shift. During the week, 7 of the 21 shifts are staffed with 2 personnel. A single dispatcher is on duty during the rest of the shifts.

The Police and Fire Departments utilized UHF radio channels. Each department has a repeated channel. Orbacom radio consoles are in use as is a Tri-Tech/IMC RMS and CAD system. Groton serves both as the alternate PSAP and as the back-up to Pepperell.

TABLE 2-9 shows the available metrics for the Pepperell Communications Center.

**Table 2-9
Town of Pepperell**

Activity			
	2008	2009	2010
Wire-line 9-1-1	1,091	902	926
Wireless 9-1-1	412	451	455
VOIP 9-1-1			
Total 9-1-1 Calls Received	1,503	1,353	1,381
Wireless Call %	27%	33%	33%
Abandoned Call %	8%	7%	7%
Administrative/Non-Emergency Calls			29,000
Outgoing Calls			
Police Calls For Service Dispatched	3,427	3,226	9,743
Police Officer Initiated Calls	5,657	4,414	5,897
Fire Calls Dispatched	446	370	376
Emergency Medical Calls Dispatched	676	668	724

2.9 Tewksbury

The Town of Tewksbury was incorporated in 1734 and covers a land area of 20.7 square miles. As one of the larger communities in the region, the Town of Tewksbury had a total population of 28,961 residents in 2010 according to the U.S. Census Bureau. The overall population in Tewksbury increased by only 0.4% between 2000 and 2010, as

compared to the 2.02% population increase in the Greater Lowell region. The median age in Tewksbury in 2010 was 43.9 years with 24.6% of its population under the age of 20, 60.9% of residents between the ages of 20 and 64 and 14.5% of its population 65 years of age and older. The average household size is 2.7 persons per household.

The Town of Tewksbury had nearly 53.8% of its land developed as of 2005. The amount of developed land increased by 207.6% between 1971 and 2005. The composition of the developed land included residential (75.3%), industrial (8.1%) and commercial (4.7%) uses. Developed land in Tewksbury represented 12.32% of all developed land in the Greater Lowell region in 2005.

Tewksbury operates under an Open Town Meeting form of government with a five member Board of Selectmen. The Selectmen are elected for three-year terms. A Town Manager oversees the day-to-day operations of town government.

2.9.1 Tewksbury Police Department

The Tewksbury Police Department is staffed with fifty-five sworn personnel including the Chief, Deputy Chief, 6 Lieutenants; 10 sergeants, 8 detectives, and 29 patrolmen. In addition, 15 civilians are employed. There are typically 6-8 patrol units on duty at any time.

The Tewksbury Police Department is a member of the North Eastern Massachusetts Law Enforcement Council (NEMLEC). The North Eastern Massachusetts Law Enforcement Council (NEMLEC) is a consortium of 46 Police Departments in Middlesex and Essex Counties, as well as the Essex County Sheriff and Middlesex County Sheriff. The members of the organization operate pursuant to an interagency mutual aid and assistance agreement. As part of this agreement, each member commits resources from its law enforcement agency to assist other members in an effort to increase and improve their capabilities and capacities. NEMLEC is comprised of a Regional Response Team (which includes a Tactical Unit, Special Weapons and Tactics Unit "SWAT", K-9 Unit, and School Threat Assessment and Response System Unit "STARS"), Motor Unit, Computer Crime Unit, Accident Reconstruction Unit, and a Crime Scene Services Unit. 9 Tewksbury officers are currently assigned to NMLEC units in addition to their normal duties.

2.9.2 Tewksbury Fire Department

The Tewksbury Fire Department is a career department. The department operates from three stations with a staff of 50 firefighters, including the Chief And Deputy Chief. The other 48 firefighters work on one of four twenty-four hour shifts. The department provides Basic Life Support (BLS) ambulance service. Advanced Life Support (ALS) ambulance service is provided by Saints EMS. In 2010, the fire department responded to approximately 5,000 incidents, including 2,800 EMS calls.

2.9.3 Tewksbury Police Department Communications Center

The Tewksbury Police Department Dispatch Center provides dispatch service for the Tewksbury Police Department and the Tewksbury Fire Department as well as serving as the primary Public Safety Answering Point (PSAP). The dispatch center is equipped with three positions. Two positions have call-taking and radio dispatching capabilities, while the third position has no call-taking capabilities. The third position does have access to an administrative handset, and can also use the second available PlantCML handset at the nearest position to answer calls. Two of the positions are staffed twenty-four hours a day. There are a total of 8 full-time dispatchers, 2 part-time dispatchers, and a chief dispatcher.

An IMC CAD and RMS system is in use by the Town. It was initially installed in 2006. The police department utilizes a repeated UHF channel as its primary channel, and the fire department utilizes two repeated UHF channels. The Tewksbury DPW and some mutual aid fire departments use VHF. All fire department apparatus have both UHF and VHF radios installed for mutual aid purposes. The police and fire department units use laptop computers with AT&T air cards. The police department uses an Automatic Vehicle Location (AVL) system.

The dispatch center is located inside the Tewksbury Police Department on Main Street. This building is not co-located with any other agency. The parking lot to the building is not fenced in and is open to visitors. The police vehicles park on the northeast end of the building. This building is a secured facility with electronic door locks, electrically controlled sally ports, security cameras, and a secure vestibule/visitor area (lobby) located through the front door entry.

The door leading to the inside of the building from the vestibule area is electronically locked and monitored by the dispatch center staff. There is a glass window in the vestibule area where all visitors must check-in. The dispatcher has the ability to electronically unlock this door to allow visitors into the building. There are surveillance cameras located in the vestibule area that are monitored by the dispatch staff. The door leading to the dispatch center is locked by a keyless combination door lock. The dispatchers also monitor the video feed from the holding cells located in the building. There are external surveillance cameras located around the building.

The telephone service provider is Verizon. There are a total of five (5) wireline trunks, four (4) wireless trunks, two emergency trunks, and two admin lines coming into the dispatch center.

TABLE 2-10 displays the available metrics for the Tewksbury Police Communications Center.

Table 2-10
Tewksbury Police Department

Activity	Call Volume		
	2008	2009	2010
Wire-line 9-1-1	6,074	5,358	5,270
Wireless 9-1-1	1,927	1,894	2,073
VOIP 9-1-1			
Total 9-1-1 Calls Received	8,001	7,252	7,343
Wireless Call %	24%	26%	28%
Average 9-1-1 Answer Time (in seconds)	4 sec	4 sec	4 sec
Average 9-1-1 Talk Time	1:10	1:04	1:12
Abandoned Call %	4%	4%	4%
Administrative/Non-Emergency Calls	95,000	95,000	95,000
Outgoing Calls	3,795	2,974	3,386
Average Talk Time (Outgoing Calls)	:35	:15	:38
Police Calls For Service Dispatched	16,805	13,661	14,026
Police Officer Initiated Calls	10,138	13,435	18,164
Fire Calls Dispatched	1,404	1,545	1,593
Emergency Medical Calls Dispatched	2,072	2,051	2,206

2.10 Tyngsborough

The Town of Tyngsborough covers a land area of 18 square miles and has a population of 11,292 persons according to the 2010 census. 7.6% of the town's population is 65 years of age or older. There are 2,115 students enrolled in the public school system, which includes three elementary schools and one junior/senior high school. Sixty percent of the town is on public drinking water supply. There are 3,806 housing units in the town. The average household shelters 2.97 people. Twenty percent of the town's land is used residential housing; two percent of the land is in commercial and industrial use; five percent is used for agriculture; 63 percent is in open space, recreation, or water use; and five percent is used for transportation, mining, or waste disposal. There are 64 public safety personnel in Tyngsborough, including 24 uniformed police officers and 40 on-call fire fighters, who are overseen by a Fire Chief.

2.10.1 Tyngsborough Police Department

The Tyngsborough Police Department is the primary provider of law enforcement services for the Town of Tyngsborough. The department consists of 23 sworn personnel, six civilian dispatch personnel, one civilian administrative assistant and one custodian. The department is state certified and working on state accreditation.

2.10.2 Tyngsborough Fire Department

The Tyngsborough Fire Department operates from 3 stations. The department has 3 full-time employees. The remainder is paid to on call firefighters. The Fire Department provides fire protection and medical first responder service. Basic Level EMS transport service is provided by Patriot EMS. Advanced Life Support is provided by Saints EMS.

2.10.3 Tyngsborough Police Department Dispatch Center

The Tyngsborough Police Department Dispatch Center is the primary public safety answering point for the Town. The dispatch center is staffed with one dispatcher on four day shifts, two dispatchers on two day shifts, two dispatchers on the afternoon shift, and one dispatcher on the midnight shift. The dispatch center dispatches the Tyngsboro Police Department and the Tyngsborough Fire Department.

The dispatch center is located inside the Tyngsborough Police Department building. The building is located approximately 557-ft from the Merrimack River. This building is not co-located with any other agency. The parking lot to the building is not fenced in and is open to visitors. The police vehicles park all around the building. This building is a secured facility with electronic door locks, security cameras, and a secure vestibule/visitor area (lobby) located through the front door entry. There are a total of two (2) positions located in this center. Both positions are capable of dispatching / call-taking.

The door leading to the inside of the building from the vestibule area is electronically locked and monitored by the dispatch center staff. There is a glass window in the vestibule area where all visitors must check-in. The dispatcher has the ability to electronically unlock this door to allow visitors into the building. There are surveillance cameras located in the vestibule area that are monitored by the dispatch staff.

There are external surveillance cameras located around the building. This facility has a 60 kW diesel generator for emergency backup power.

The telephone service provider is Verizon. There are a total of four (4) wireline trunks, four (4) wireless trunks, two (2) emergency trunks, and two (2) admin lines coming into the dispatch center. TriTech/IMC CAD and RMS systems are in use. The systems were originally installed in 1991 and have been updated. IMC mobile software is also in use. Verizon air cards are used for connectivity for the mobile units. A King-Fisher fire alarm receiver is installed in the dispatch center. This receives alarms from protected facilities transmitted by radio.

The Police Department uses UHF radio channels. All equipment is narrowband capable. The police department also uses BAPER, the Boston Area Police Emergency Radio Network. The fire department uses UHF, VHF high-band, and VHF low-band channels.

TABLE 2-11 displays the available metrics for the Tyngsborough Police Department Dispatch Center.

Table 2-11
Tyngsborough Police Department

Activity	Call Volume		
	2008	2009	2010
Wire-line 9-1-1		1,205	1,095
Wireless 9-1-1		461	578
VOIP 9-1-1			
Total 9-1-1 Calls Received		1,666	1,673
Wireless Call %		28%	35%
Abandoned Call %			1%
Administrative/Non-Emergency Calls			24,523
Outgoing Calls			
Police Calls For Service Dispatched	4,322	3,810	25,917
Police Officer Initiated Calls	17,085	17,115	19,917
Fire Calls Dispatched	375	319	370
Emergency Medical Calls Dispatched	462	513	673

2.11 Westford

The Town of Westford covers a land area of 31 square miles and has a population of 21,951 persons, according to the 2010 U.S. Census. 7.3% percent of the Town's population is 65 years of age or older. There are 4,602 students enrolled in the public school system, which includes six elementary schools, two middle schools, and one high school. Seventy-five percent of the town is on public drinking water supply. Water is withdrawn from eight municipal wells. There are 6,941 housing units in the town. The average household shelters 2.92 people. Twenty-five percent of the town's land use is used for residential housing; two percent of the land is in commercial and industrial use; five percent is used for agriculture; 65 percent is in open space, recreation, or water use; and three percent is used for transportation, mining, or waste disposal. There are 60 public safety personnel in Westford, including 39 uniformed police officers and 52 fire fighters.^{viii}

2.11.1 Westford Police Department

The Westford Police Department provides safety, security and service for all members of the community and has direct responsibility for the preservation of the public peace, for the reduction of the opportunity to commit crime, and for the effective delivery of a wide variety of police services. The Westford Police Department currently consists of 39 sworn personnel, 8 dispatch personnel, and 4 other civilian employees.

2.11.2 Westford Fire Department

The Westford Fire Department provides fire prevention, fire protection, and emergency medical services to the Town of Westford. The department operates from three stations. The Westford Fire Department is staffed with a combination of career and on-call personnel. Currently there are 38 full-time personnel and 14 on-call personnel. The full-time personnel are assigned to one of four 24 hour shifts. Each of the two outlying stations is staffed with two firefighters. The headquarters station is staffed with a captain, a lieutenant, and three firefighters on each shift. The department has upgraded to providing paramedic level emergency medical transport service.

2.11.3 Westford Police Communications Center

The Westford Police Department Communications Center is the primary public safety answering point for the Town. The center dispatches the Westford Police Department and transfers fire and emergency medical calls to the Westford Fire Department.

The Westford Police Department Communications Center is staffed with 2 telecommunicators 16 hours a day and one telecommunicator on the night shift. In addition to their 911 and dispatch duties, the

telecommunicators answer the police department’s administrative lines and provide after-hours answering for the other town services. They are responsible for monitoring 12 security cameras in the police department and the town hall, and handle all walk-in traffic for the police department. They department uses the Medical Priority Dispatch EMD program.

The dispatch center is located inside the Westford Police Department building. This building is not co-located with any other agency. The parking lot to the building is not fenced in and is open to visitors. This building is a secured facility with electronic door locks, security cameras, and a secure vestibule/visitor area (lobby) located through the front door entry.

The door leading to the inside of the building from the vestibule area is electronically locked and monitored by the dispatch center staff. There is a glass window in the vestibule area where all visitors must check-in. The dispatcher has the ability to electronically unlock this door to allow visitors into the building. There are surveillance cameras located in the vestibule area that are monitored by the dispatch staff.

The telephone service provider is Verizon. There are a total of four (4) wireline trunks, four (4) wireless trunks, two (2) emergency trunks, and two (2) admin lines coming into the dispatch. In addition to the Plant Vesta 911 system, the center is equipped with Wrightline workstation furniture, Motorola Centracom Gold radio consoles, and a TriTech/IMC CAD & RMS system. There are 2 full operating positions and a third position equipped with a radio console only.

TABLE 2-12 displays the available metrics for the Westford Police Department Communications Center.

**Table 2-12
Westford Police Department**

Activity	Call Volume		
	2008	2009	2010
Wire-line 9-1-1	2,224	2,084	1,977
Wireless 9-1-1	848	810	940
VOIP 9-1-1			
Total 9-1-1 Calls Received	3,072	2,894	2,917
Wireless Call %	28%	28%	32%
Administrative/Non-Emergency Calls			11,527
Outgoing Calls			
Police Calls For Service Dispatched		7,327	7,104
Police Officer Initiated Calls		9,415	17,907
Fire Calls Dispatched			
Emergency Medical Calls Dispatched			

2.11.4 Westford Fire Alarm Office

The Westford Fire Department’s Fire Alarm is a limited secondary PSAP. 911 calls are initially answered by the Westford Police Department and then transferred to the Fire Department if the incident is a fire or medical emergency. The Alarm Office is staffed with 4 civilian Fire Alarm Operators. In addition to answering incoming emergency and fire department administrative calls, the alarm operators are responsible for monitoring approximately 200 fire alarm systems (boxes) in businesses all over Town as well as station boxes. It also functions as the control point for Mutual Aid District 6. The Fire Alarm Operators work rotating shifts. They work two 10 hour day shifts, two 14 hour night shifts, and then have 4 days off. There is one operator on duty on each shift.

The alarm office is equipped with a TriTech/IMC CAD/RMS system, a Zetron Model 4010 radio console, Zetron Model 6 and 26 Fire Station Alerting system, which controls the doors and lights in the fire stations

TABLE 2-13 displays the available metrics for the Westford Fire Alarm Office.

Table 2-13
Westford Fire Department

Activity	Call Volume		
	2008	2009	2010
Wire-line 9-1-1			
Wireless 9-1-1			
VOIP 9-1-1			
Total 9-1-1 Calls Received			
Wireless Call %			
Administrative/Non-Emergency Calls			
Outgoing Calls			
Police Calls For Service Dispatched			
Police Officer Initiated Calls			
Fire Calls Dispatched	1,856	2,090	2,214
Emergency Medical Calls Dispatched	1,395	1,388	1,429

3.0 Requirements of an Emergency Communications System

The 911/dispatch consolidation project that being considered could have wide reaching effects on public safety operations in the Region. This would not just be an improvement in dispatch operations, but a profound realignment of how the departments and communications operations relate to and intercommunicate with one another.

As background information, this section will describe some of the complex issues involved. Then, recommendations can be made and applied. We will also discuss some effective means of managing the communications operations that have worked in other places.

Modern public safety communications systems have developed to support the operations of the agencies they serve. Public safety communications systems must function under all conditions. The systems typically perform four basic functions:

- receive and classify calls for assistance;
- support agency operations;
- interagency coordination,
- data systems access.

In order to perform these functions, a variety of systems and procedures are employed. This involves at least two separate areas: Operations and Technology. Since its inception, the 911 telephone system has become the primary means of communications from the public to the public safety agencies.

Communications center operations involve dispatch protocols, intensive personnel scheduling and management issues, and statistical and records release maintenance. Communications center technology involves the management of the 911 telephone technology, computer aided dispatch systems, recording systems, radio systems, and other ancillary support systems.

In this section we will describe some of the complex issues involved and identify the requirements and existing standards in order to assure the provision of a high level of service that functions under all conditions. We will also discuss some effective means of managing the communications systems and operations that have been successfully implemented in other locations.

3.1 Communications Center Operations

Communications center operations personnel typically receive little recognition and are asked to function in one of the most complex and stress filled work environments in existence. Included in 911 operations are dispatch functions involved in the center. Center personnel must be proficient in police, fire and emergency medical protocols. The differing disciplines have their own characteristics that create challenges.

- Police - An extremely high volume of calls typically characterizes police dispatch. Most traffic involves small numbers of units sent to a large number of incidents. There is also a significant amount of officer initiated activity, such as traffic stops, that should be tracked and documented.

Most police agencies do not have sufficient field units; therefore at times police calls for service are being held and prioritized. The officers in the field, rather than the dispatcher, originate a large percentage of the activity. The dispatch work is largely reactive to field operations. This creates a constant, unrelenting requirement for dispatch attention.

- Fire - Fire dispatch normally has less call volume than police, however the calls that are dispatched are more complex and time consuming. Fire radio traffic has a smaller number of calls involved with a larger number of units sent to each incident. Working with fire departments comprised of volunteer personnel adds an additional

degree of complexity. Workload for the dispatcher is generally driven by complaints received over the telephone rather than from the field. By definition, fire calls are considered emergency calls unless otherwise specified.

- EMS - Medical dispatch also usually has a lesser number of calls for service than police. These incidents often involve multiple agencies. While most of the dispatch centers involved in this study currently do not provide medical pre-arrival instructions, medical incidents have become the most time consuming of all for dispatchers. Again, workload is driven by complaints received over the telephone rather than from the field. Transfers from one medical facility to another are another important component of medical dispatch.

The results are that while police will have the preponderance of calls statistically, the actual workload for fire and medical can easily equal that of police. In essence, the dispatchers in each of the centers and 911 management must balance the conflicting needs of these disciplines while attempting to meet differing dispatch procedures for each agency.

In general, persons calling 911 and requesting a response from a public safety agency are in stressful situations. Often these situations are literally a matter of life and death. Other situations may cause significant emotional distress. People under stress frequently do not communicate as effectively as they do under normal circumstances. In addition, callers may make demands that are impossible to meet. The 911 operations personnel who deal with these callers may be impacted by the emotional state of the callers. In turn, this may impact the community's perception about the level of service being provided.

The quality of service provided depends upon numerous factors; accuracy and reliability are two of the key factors. Other factors include personnel selection, training, shift personnel, supervisory and operational procedures, and workload. Much more than 911 dispatching must be considered.

Providing accurate and reliable communications depends on a number of factors. One of the most critical is providing a communications system that is adequately staffed with highly trained and experienced personnel. The centers have become much more dependent upon technology. The infusion of technology has not only improved the quality and capabilities of the service being provided, it has increased both the complexity of the job of the public safety telecommunicators and the scope of the training required to perform the required duties. What cannot be overlooked is that the required basic job knowledge, skills, and abilities remain critically important. The job essentially remains one of receiving and communicating information to and from people. All of the technology in use is there to assist the communications process. Careful planning and attention to detail is required to assure that the technology assists rather than hinders that process. Not only do communications personnel need to be skilled in communicating, they must also be proficient in the use of all the different systems and equipment used in the center.

Turnover is frequently cited as a problem. The physical work environment is also often a major factor in turnover.

A number of studies have shown that there is a correlation between the employees' perception of the adequacy of the physical environmental factors of the workplace and their productivity. Employee perception that the workplace environment is inadequate can result in increased absenteeism, lowered employee satisfaction, decreased productivity, and reduced quality. All of these can contribute to decreased customer satisfaction. An emergency communications center has at least two sets of customers, the public and the public-safety agencies and departments served by the center. The perception that the workplace is inadequate can lead to both psychologically unhealthy employees and a psychologically unhealthy organization.

Operational procedures and standards are an equally important aspect of any public safety communications center. Public safety in each community has evolved, based in large measure, by the standard of service demanded by the community being served. This is especially true of the operations of public safety communications centers. There are, however, a number of recognized standards that can be used as guidelines by governing bodies in establishing the level of service being provided to the community.

The Association of Public Safety Communications Officials, International (APCO); the National Emergency Number Association (NENA), the European Emergency Number Association (EENA) the Commission on Accreditation for Law Enforcement Agencies (CALEA); the National Fire Protection Association (NFPA); the Federal Emergency Management Agency (FEMA), and others have each established various standards and guidelines that provide guidance to public safety agencies on their communications systems and facilities.

The National Emergency Number Association (NENA) promotes research, planning, training and education as well as the technological advancement, availability and implementation of a universal emergency telephone number system (911). The European Emergency Number Association (EENA), serves as a discussion platform for emergency services, industry and informed citizens with the aim of getting efficient, interoperable and harmonized emergency telecommunications in accordance with citizens' requirements. NENA has developed a series of technical and operational information and requirements documents focused on the public safety answering point (PSAP) aspects of a public safety communications center. The NENA standards have been adopted as recommendations as appropriate by EENA. One of these is NENA's *Call taking Operational Standard/Model Recommendation* (NENA 56-005).

Standard for answering 911 Calls. Ninety percent (90%) of all 911 calls arriving at the Public Safety Answering Point (PSAP) shall be answered within ten (10) seconds during the busy hour (the hour each day with the greatest call volume, as defined in the NENA Master Glossary 00-001). Ninety-five (95%) of all 911 calls should be answered within twenty (20) seconds. The European Union surveys its member states monthly to learn the percentage of calls answered within twenty seconds.

The National Fire Protection Association is an international nonprofit membership organization which develops consensus codes and standards, research, training, and education on fire prevention and public safety. The NFPA's *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems* (NFPA 1221) provides guidance on many public safety communications matters including communications center design and operations. Public safety communications centers and systems must function under all conditions. They must provide the highest degree of reliability feasible in order to assure continuous functionality. The provisions contained in NFPA 1221 when implemented are key aspects of having a reliable, continuously functioning center.

NFPA 1221 establishes that:

- Ninety-five percent of alarms shall be answered within 15 seconds and 99 percent of alarms shall be answered within 40 seconds.
- Ninety-five percent of emergency dispatching shall be completed within 60 seconds.

In a clarification from previous editions, the 2007 edition of the standard indicates that the sixty second time period begins when the call is answered at the dispatch center and ends with the commencement of the dispatch.

In a clarification from previous editions, the 2007 edition of the standard indicates that the sixty second time period begins when the call is answered at the dispatch center and ends with the commencement of the dispatch.

In situations where calls are transferred from the primary public safety answering point, NFPA 1221 stipulates:

- Where alarms are transferred from the primary Public Safety Answering Point (PSAP) to a secondary answering point, the transfer procedure shall not exceed 30 seconds for ninety-five percent of all alarms processed.

The State of Massachusetts Standards for Enhanced 911 (560 CMR 2.0) stipulates:

- Each PSAP shall have sufficient 911 equipped answering positions and staff to ensure that 90% of all 911 calls are answered in no more than ten seconds during normal peak operating periods.
- 90% of all transfers from primary PSAPs to appropriate secondary, limited secondary and ringing PSAPs shall be initiated within 15 seconds from receipt of call.

A centralized communications center by its nature also becomes the point where the preponderance of public safety statistics are created and compiled. Basic statistics are the numbers of calls for service and response times. An important element to assuring that the system operates as it should is the on-going collection and analysis of system metrics.

3.2 911 Systems

The concept of a common three digit emergency number (999) was first introduced in London, England in 1937. In the United States, the digits 911 were chosen by AT&T, then the largest telephone company, in 1968 and the first system was implemented several months later. In 2002, the European Parliament adopted a directive (2002/22/EC) requiring that all member states implement the single European emergency call number "112". There are several other numbers in use worldwide as emergency number reporting systems. A number of the European Union nations have implement their own emergency number system in addition to 112. As noted above, the United Kingdom uses 999. In Australia, 999 is the number used. In Australia and the United Kingdom as well as a number of other countries, 999 calls are answered by telephone company operators who then connect the caller to the appropriate service. A review of the available data indicates that most emergency number reporting systems are enhanced systems providing information on the callers' number and location.

Initially 911 was used for conventional wired telephone calls. Both 911 and 112 were expanded to include wireless devices.

The first level of service, *Basic 911*, automatically connects a person dialing the digits 911 to an established public safety answering point using normal telephone service facilities. In 1978 a more sophisticated system, known as *Enhanced 911* was introduced. *Enhanced 911* systems offer a variety of additional features. These features include:

- *Forced Disconnect.* Automatically or manual controls the disconnecting at the PSAP to avoid callers jamming the incoming lines.
- *Idle Trunk Tone.* Provides a tone to the answering operator if the caller has hung up before the call was answered, or if the caller is still on the line and either has not spoken or cannot speak.
- *Called Party Hold.* Enables the answering point to hold the line open even after the caller has hung up.
- *Ring Back.* Used with *Called Party Hold*, this allows the 911 operator to ring the number after the calling party has hung up.
- *Automatic Number Identification (ANI).* Displays the calling party's telephone number while the call is in progress. While similar to the Caller Identification Service offered by the telephone companies, ANI has two components, information digits, which identify the class of service¹, and the calling party telephone number. Because ANI is unrelated to caller ID, the caller's telephone number and line type are captured by ANI equipment even if caller ID blocking is activated.
- *Automatic Location Identification (ALI).* With ALI, the wireline telephone companies' subscriber database is queried using the ANI data and the subscriber name and the physical address for the wired telephones are provided. For wireless telephones, the location information is provided as latitude and longitude.
- *Selective Routing.* With *Basic 911* all 911 calls from a telephone central office must be routed to the same answering point. With selective routing, calls are routed to the correct answering point based on the individual address. A database, called the *Master Street Address Guide*, is created and used to route the calls.

Depending on the particular telephone switch and other equipment in use, some of the advance features may not be available. Some of the features may not be required.

3.2.1 911 Technology

A complex and multifaceted technology supports any centralized communications center. One of the primary subsystems is the Enhanced 911 telephone system. The 911 system consists of two principal parts: the 911 network that transports the call from the caller to the 911 center, and the 911 equipment at the 911 center. The equipment at the 911 center or PSAP (Public Safety Answering Point) is commonly referred to as Customer Premises Equipment (CPE).

When the 911 system was initially developed, the public switched telephone network was circuit-based. In other words, a separate pair of wires was used to transport a call from its point of origin to the nearest telephone switching center or central office. From there, the call was routed to its destination. Depending on the location of the originating and end points, calls might have to be routed through other switching centers before reaching its final destination. This same network architecture is still in use today. In order to assure maximum reliability, separate, dedicated circuits were installed between each switching center and the telephone companies 911 switch. As the 911 network evolved, that switch, also known as the 911 Tandem, functioned as the selective router. The selective router's function is to route an incoming 911 call to the correct PSAP based on the location of the telephone. Since wired telephones stay in the same location, a specialized data base, known as the Master Street Address Guide (MSAG) is maintained.

The 911 network was developed more than forty years ago. Since that time, significant technological advances have occurred. Beginning in the late 1980's, wireless enhanced 911 began to be developed. Because wireless callers are by definition not in a fixed location, a different technology was needed to provide the location of wireless callers in an emergency. In addition, new technology needed to be developed to determine the location of the caller and deliver that information to the proper PSAP. In order to provide the wireless callers location additional data needed to be exchanged with the PSAP on each wireless 911 call. These new requirements severely strained the existing 911 network. Because the network was a dedicated network, the cost of replacing it was prohibitive. After extensive research, a network using commonly available data communications technology was settled upon. The new concept has been labeled "*Next Generation 911*" or "*NextGen911*". It will use a private internet, known as the *Emergency Services Internet* to deliver calls to the PSAP from a variety of sources. While the technology is still evolving and standards are not fully complete, the 911 network will use digital technology. Telecommunications systems are moving to use digital rather than analog signaling methods. Internet Protocol (IP) is a common format for digital communications. Digitized voice messages can be transmitted using IP or VoIP. VoIP impacts the 911 system three different ways. First, many newer 911 systems use IP technology between the telephone switch and the individual workstations. Secondly, VoIP is being viewed as the favored technology to replace the Centralized Automated Message Accounting (CAMA) trunks between the 911 switch and the 911 center.

Callers are using VoIP technology make telephone calls over the internet. VoIP calls interface with the conventional telephone network at the VoIP service provider's points of presence, which may or may not be in the local community. There are significant issues that must be resolved in order to assure that a 911 call is routed to the correct PSAP. Current VoIP technology may not provide for the transmission of the caller's physical location along with the voice call. Some VoIP telecommunications service provider networks, however, are not compatible with the existing E-911 infrastructure. Because this is a new and rapidly evolving technology, many of the details have yet to be resolved. Some VoIP providers are able to provide a level of service similar to enhanced 911. Others are not able to provide the enhanced features at this time. The Federal Communications Commission has mandated that VoIP telephony providers implement Enhanced 911 features.

Typically, each 911 center or PSAP (public safety answering point) is equipped with its own 911 switch. Also known as an ANI/ALI controller, this is the equipment that provides the Automatic Number Identification (ANI) and Automatic Location Information (ALI) to the dispatchers.. Because the data is transmitted over the same

channel as the voice call, there is inherent delay in connecting the voice portion of the call to the 911 operator.

In the past few years, 911 Customer Premises Equipment (CPE) has featured the integration of the telephone and computer. Modern 911 customer premise equipment is computer based and integrates several different applications. Most suppliers of the integrated workstation include "instant recall recorders" and integrated Telecommunications Device for the Deaf (TDD) for communications with hearing and speech impaired callers as standardized options. Depending on the option and the vendor, some of the options are included at no additional charge, and some are relatively low cost. By using the replay recorder and TDD included with the telephone, the 911 center can avoid having to purchase separate, expensive pieces of equipment. In addition to the integration of the functions, operation is significantly easier. The US Department of Justice has interpreted the Americans with Disabilities Act (ADA) legislation to mean that each 911 position must be equipped with a device capable of communicating with the hearing and speech impaired 911 caller. The Justice Department has further held that any silent 911 call arriving at a PSAP must be interrogated to make sure it is not a TDD call.

As 911 CPE becomes increasingly computer-based, the use of a standard digital protocol has become more important. The Transmission Control Protocol/Internet Protocol (TCP/IP) or IP has become the standard for digital communications. Many commercial telephone systems are now IP-based. There is a concerted effort to develop the standards for the next generation of the emergency number network, both in North America and Europe. That network will be able to accept and deliver to the PSAP inputs from a wide variety of devices. While the definition of the next generation is still a work in progress, it is known that it will be IP based. For that reason, it is critical that new 911 CPE be IP capable so that it is ready for the change when it occurs.

The development of wireless enhanced 911 has placed additional demands on the PSAP's. Wireless 911 calls require that the 911 equipment be capable of receiving two ten digit telephone numbers as well as location information expressed as latitude and longitude. Many older 911 systems are not capable of fulfilling that requirement. In addition, the PSAP needs some form of computer-based mapping system to be able to rapidly convert the location information to a dispatchable address. In addition, the 911 equipment must allow the telecommunicator to refresh the ALI information in order to obtain the wireless callers location.

Wireless enhanced 911 service has presented significant challenges to the communications industry. Not only is there the PSAP equipment issues noted above, the provision of accurate caller location information within acceptable ranges has been especially controversial. Two different technologies are in use to provide caller location information. The technology deployed by the wireless service providers using CDMA technology uses the Global Positioning System. The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites. A GPS receiver is placed in each handset and uses the signals from the satellites to calculate the handset's location. A GPS receiver must be locked on to the signal of at least three satellites to calculate a two dimensional position (latitude and longitude) and track movement. With four or more satellites in view, the receiver can determine the user's three dimensional position (latitude, longitude and altitude). Currently, the technology deployed in wireless networks only determines the latitude and longitude.

GPS location identification is not available for wireless systems using Global System for Mobile Communications (GSM). GSM systems must use network-based technology. There are several different ways that the network-based technology works. The essence is that the location of the caller is determined by differences in the signal at multiple towers. The more towers that receive the signal, the more accurate the location information will be.

The exponential increase in wireless devices has significantly impacted public safety communications centers. For the most part, there has been little, if any, reduction in wireline 911 calls received at the PSAP.

In many cases, the influx of incoming calls has not resulted in any increase in the staff in the communications center. In addition to the increased total number of calls, PSAP's receive many more calls about the same incident than before. Often these calls take longer to process since the mobile caller may be uncertain of his or her location, and it takes thirty seconds or more to retrieve the location information from the wireless carrier.

The telephone hardware must also be sized to accommodate a centralized center's workload. Often this will require an expansion of the 911 switch subsystem or replacement of the entire 911-switch subsystem.

3.3 Geographic Information Systems (GIS)

Governmental entities are finding that computerized Geographic Information Systems (GIS) are a valuable tool to identify streets, boundaries, infrastructure elements, and property information, and other location based information. GIS is rapidly become a valuable tool for public safety agencies in general and public safety dispatch centers in particular.

While location information from wired telephones is typically provide in tabular form, location information from mobile devices, such as cellular telephones and automatic vehicle location systems, is typically provided as geographic coordinates (latitude and longitude). As noted above, there is a need for computerized mapping in order to convert the latitude and longitude information into a format that can be used by the dispatchers. While there are some relatively inexpensive mapping programs available, they generally are not suitable for public safety purposes. The accuracy of the programs can be problematic. In addition, the programs are generally not designed to work in a networked environment. The result is that these programs generally are not sufficiently reliable for public safety operations.

Integrating the dispatch centers' needs with a high quality GIS can provide many benefits for the public safety community. As noted above, many governmental agencies are finding multiple ways to use GIS. They also finding that sharing information between agencies can reap many benefits. For example, information on the public water supply can also be very useful to the fire departments. Jurisdictional boundary information is essential in determining the proper response. Information on new streets and developments is essential for a prompt emergency response. With a GIS, the data is shown in a series of selectively displayed layers. Only the relevant layers are displayed for the user. Since the creation of an accurate base map is an essential and time consuming activity, many communities are finding that the sharing of the base map to be an effective strategy.

The implementation of a shared GIS can significantly improve the accuracy and reliability of the dispatch process when combined with Enhanced 911 and other technology such as an Automatic Vehicle Location System. An interface between the Enhanced 911 system and the GIS sends the location information to the GIS. The GIS, functioning as the CAD Geofile, described later, quickly verifies the location and provides the recommended response. The map display feature can be especially helpful when the caller or the call taker is unfamiliar with the location. Because location information from wireless 911 callers is received as geographic coordinates, the map display is essential in converting that information into a dispatchable address.

The GIS can also be of great value in supporting crime and event analysis, especially if the GIS is also interfaced with the Records Management System (RMS). The GIS can correlate information on various types of incidents and provide a visual display, plotted on a map to improve analysis. Further discussion on Records Management Systems is included later in this section.

Many emergency communications centers must maintain multiple data bases in order to provide all of the required information. Keeping the various databases coordinated is a major challenge. .

3.4 Computer Aided Dispatch

Currently each of the centers operates its own, separate CAD system. The system verifies the address in the geographic data base and may provide recommendations on response based on the location and nature of the incident. Currently incident information must be entered by each center that will be dispatching resources. Separate databases are maintained.

The geographic database (GEOFILE) can become quite complex as well, due to the differing service disciplines (police, fire, and medical) often with differing jurisdictional boundaries. This results in multiple agencies of similar type within one system. This frequently requires the CAD system to generate different case and run numbers for the same incident. The CAD GEOFILE typically recommends specific units to respond to a given location whereas the MSAG, described earlier, only identifies the address ranges and jurisdictional responsibility.. The GEOFILE must remain coordinated with other databases. The CAD must also interface with all computer and records systems that reside downstream from it. Agency records systems should receive direct input from the CAD system for basic elements, such as incident numbers, date and time, location, and investigating officer. More advance CAD systems integrate the GEOFILE with the GIS to reduce duplication and improve accuracy and reliability.

As noted above, location information for wireless 911 callers is expressed in latitude/longitude coordinates. The CAD must, therefore, be adaptable to latitude/longitude points and translating that to a location in the CAD system. As discussed above, a computerized mapping system is used to plot the location on a map and assist in converting the location information to a dispatchable address.

Generally, a computer aided dispatch system should allow for easy entry of incident information, recommend the resources to be dispatched to the call, track the status of the units both in relation to the incident and otherwise, maintain records of those calls and time related to it, and provide assorted records and reports for analysis and documentation.

A number of the systems being marketed as CAD systems are more focused on the records management and incident reporting aspects rather than on the dispatch aspects. While they may be suitable for use in smaller agencies, these systems may not be suitable for use in busier centers.

AECOM recommends focusing on the functionality as it pertains to dispatch operations. Common CAD functions include:

- Event Entry
- Event Prioritization
- Unit Recommendation for Assignment to Calls
- Time-stamping
- Address Verification
- Unit Status Monitoring/Recording
- Alert Timers
- Call History
- 911 Interface
- Paging Interface
- Radio System Interface
- Mobile Data Interface
- GIS System Interface

These are just a few of the more common features and functions of a modern CAD system. It is important during the procurement to define what functions and features are required. As prospective systems are reviewed, there needs to be appropriate assurances that the system will have adequate capacity to handle the anticipated workload. This should not be just the normal workload, but must focus on estimated peak workloads. What happens when a major

event adds extra units to the system? What happens when an unusual occurrence results in a call volume several times larger than the normal call volume? Does the system have sufficient capacity to handle the demand?

3.5 Records Management System (RMS)

The central records function is important to the effective delivery of law enforcement services. A Records Management System (RMS) is an agency-wide system that provides for the storage, retrieval, retention, manipulation, archiving, and viewing of information, records, documents, or files pertaining to law enforcement operations. RMS covers the entire life span of records development—from the initial generation to its completion. As discussed in Section 4 following, one of the identified best practices in emergency dispatch centers is to keep records and measure performance. Modern public safety systems include sophisticated management information systems that can provide invaluable information to officials on trends and historical information. Ideally, the CAD system is interfaced with the agencies RMS to facilitate the transfer of data from the CAD to the RMS and so that the data entered into one system does not have to be reentered into another system.

As it pertains to this report, the RMS is limited to records directly related to law enforcement operations. Such records include incident and accident reports, arrests, citations, warrants, case management, field contacts, and other operations-oriented records. RMS does not address the general business functions of a law enforcement agency, such as budget, finance, payroll, purchasing, and human resources functions. However, because of operational needs, such as the maintenance of a duty roster, law enforcement personnel records and vehicle fleet maintenance records are included within an RMS and ideally are transmitted to the other systems as appropriate. A fully featured RMS typically includes the following functions:

- Calls for service
- Incident reporting
- Investigative case management
- Traffic accident reporting
- Citations
- Field contact
- Civil process
- Orders and restraints
- Permits and licenses
- Equipment and asset management
- Fleet management
- Personnel
- Internal affairs
- Analytical support (crime analysis)

Modern records management systems include the transfer of the CAD information (location, event times, etc.) into the incident report, completed by the investigating officer(s). Information from that report is then entered automatically into a series of searchable indexes (names, addresses, offense type, property, etc.)

Many CAD software vendors offer integrated RMS as an additional product. Typically, the data from the CAD system drives the RMS. As a result, our experience has demonstrated that it is more effective to software from the same vendor or a vendor with a proven interface between the systems.

3.6 Radio System^{ix}

Because public safety agencies are directly responsible for the protection of life and property, the communications systems that they use must be designed with that requirement in mind. The risk elements of, and the danger to, public safety personnel are unpredictable factors that are never precisely foreseeable far in advance. As a result, the systems serving these agencies must be designed to satisfy both normal and peak requirements on an instantaneous, twenty-four hour a day basis. While the systems must maintain the required degree of performance at the least cost,

they must guarantee that the system will work as needed to fulfill the agency's responsibilities under all reasonable foreseeable conditions.

Given the critical nature of the public safety function, public safety personnel are dependent on the speed and accuracy of the communications system. The system must have sufficient capacity to allow rapid access to the communications channel when the priority of the particular communications requires it. The system must also have sufficient capacity so that, when assigning a detail or call for service, the dispatcher is able to provide all appropriate information to the responding units. This allows the responders to properly plan their actions upon arrival.

An important part of public safety communications, especially law enforcement communications, is the concept of mutual support. Typically each officer maintains awareness of developments in and near his or her assigned area of responsibility by monitoring the dispatch channel and can be prepared to assist other units as necessary.

The system must also have adequate coverage so that communications can occur in all areas as necessary. In urban areas, this includes coverage inside buildings. Because of their construction, coverage inside many larger buildings can be problematic.

A public safety communications system needs to satisfy these minimum functional requirements:

- *Certainty of communication.*

This includes requirements for the total coverage of the designated area of responsibility, reliability of equipment, intelligibility, and immediacy. The role of the communications system in the preservation of life and property places high emphasis on these characteristics of the system.

- *Multiple user monitoring capabilities.*

The operational procedures of most agencies require that all designated units in a given area monitor the designated communications within that area at all times. This is necessary to assure informed, flexible mutual support as needed.

- *Discrete, sub-unit channels.*

Various designated groups and/or activities require communications independent of the basic dispatch channel. Special units or special events require individualized communications, controllable from a field and/or central point, simultaneous to but not interfering with the routine dispatch systems.

- *Interagency coordination capabilities.*

Any incident involving more than one responder requires coordination. Coordination cannot occur without communications. This coordination requirement can often be complex and require significant flexibility in the communications system.

While these are the most critical requirements, there are a number of other requirements that must be considered in the evaluation of communications system alternatives. These include cost effectiveness, reliability, maintainability, and operability among others.

3.7 Communications Center Design

Because of the critical functions performed at public safety communications centers, considerable care is required in the location, design and construction of a center. A multitude of factors influence the selection of the most appropriate site for a new critical public safety facility such as a communications center. These factors must be understood at the

outset so that clear decisions can be made by the governing authorities and for the citizens that the center will serve. The factors generally fall into five major categories: Functional, Natural Conditions, Man-Made Threats, Cost Issues, and Technological.

Functional criteria includes evaluation factors such as accessibility, convenience, multiple access points, site size, closeness to redundant facilities, and overall facility diversity/distribution. It is important in this criterion that the idealized site size be determined. This should include both the size of the facility and the site features such as parking, clearances and equipment. Depending on the facility overall size, this may include an early exploration of two-story vs. one story concepts. A site located on a primary road may be scored higher than one located on a secondary route, provided the primary road is easily accessible from a traffic perspective. Routes with frequent traffic jams are generally not desirable. Special events (such as major sporting events, which could prevent access to the site) should also be considered; even if they are not on the final criteria. The location should also be evaluated for the convenience to the employees in terms of commute distance. Locations on primary roads allow the possibility that employees may mass transit. The convenience of location next to population centers and businesses should be evaluated in relation to site visibility and security. Multiple access points are considered important so that there can be a separation of public and private vehicular traffic as well as a secondary means to enter/exit the site in emergencies. Sufficient space is needed to provide for adequate set-back for security purposes. Where feasible, critical facilities should be set-back a minimum of twenty-five meters, (eighty-three feet) from public roadways. Zoning laws should be reviewed so that any restrictions such as tower height and building size and type might be identified. This can be a major hurdle if not identified early in the process.

Natural conditions include all features which impact the site utilization and/or are risks to the continuous operation of a critical facility. Natural waterways particularly navigable waterways or shipping lanes pose risk as a result of the potential for accidental spills, or catastrophic fire or explosion. For these reasons a buffer zone is usually assigned to this feature with a ranking related to the relative distance from the buffer.

Most standards for PSAP's today include criteria intended to discourage locations within flood prone areas. The standard is based on the designated 500-year flood zone designation. In general, no critical facility should be located in this zone and similarly should not be located in basement locations which can be subject to localized flooding. Wetlands pose a similar threat and hazard, while impacting the environmental conditions in the area. This impact can be mitigated but will cause additional site development costs.

Localized drainage patterns are perhaps the most important feature to review in the site selection process. Sites that have poor drainage and or have major surface drainage features like ditches or natural swales would be considered less desirable than sites with high spots and naturally occurring drainage away from the major building location. Adjacent roadways should be lower than the proposed building location.

Wind hazards are hard to evaluate on a localized basis except in rare cases. Hurricanes and tornados effect whole regions and therefore should be identified for mitigation and protection rather than for individual site selection. For example, for facilities designed in Atlantic coastal regions, the maximum wind speed recorded is usually the design condition required for structural and component hardening.

Man-made threats are easily identified and usually impact the selection of sites the most in terms of overall risk. These factors include roadways (particularly interstate highways), freight rail lines, chemical plants (or other industrial manufacturing facilities which handle toxic or explosive products) and military installations. The relative risks and subsequent buffer areas for each of these factors are usually identified by the local emergency management agency.

Major highways and freight line railways pose similar hazards and thus are usually assigned similar buffer zones (usually one mile on either side). Evaluation criteria can be weighed on relative distance from the buffer zones to the proposed site. The recommended protective action zone for some chemicals can exceed ten miles. Sites near nuclear plants are ranked according to the location either inside or outside the evacuation zone. Likewise chemical or other industrial facilities should have a ranking relative to the assigned buffer zone.

The location of potentially hazardous utilities to the project site (such as high voltage electric transmission lines, cross country gas or oil transmission lines) would tend to lower the desirability of the proposed site for a PSAP.

One criterion which is related to an earlier discussion of convenience and accessibility is the fact that these facilities generally should not be highly visible. Due to the critical nature of the function, public access is not crucial and visibility may lead to potential targeting. Likewise, locations next to regular special events or public target buildings should be avoided.

Costs are always a factor when consider prospective sites. This ranges from the acquisition, utilities availability and extension requirements, overall site grading and physical development and offsite improvements including upgrades and provision of redundancies.

Sites that are already owned by the government are usually preferred and often the first evaluated. On the other end of the spectrum here is a site that requires all the acreage to be acquired through condemnation process, resulting in delays and additional service fees. Other options here include property that is donated but may include tax liabilities or restrictive covenants.

Higher ranking for economy is reserved for sites with all utilities including storm water, sanitary sewer, water, power, gas and data/telecommunications already located at or close by the project site. The availability of redundant utilities should also figure into the evaluation criteria. For example, it is desirable to have redundant feeds following diverse routes from the telephone company central office (CO) or from high speed fiber-optic lines provided either by the utility or the locality. Additionally, power availability from two different substations or two separate utilities is desirable. Utilities which must be extended to provide the required redundancy factors for the site are extremely costly and therefore are added to most cost factor evaluations.

Site development costs include overall grading, roads and parking areas. If there is a large amount of site clearing (tree removal) or leveling required to prepare the site for a building pad then costs can escalate. Generally, steep wooded sites fall into this higher cost category. Critical facilities can be constructed on these sites but costs are higher.

Sites for PSAPs should be evaluated on several technological factors. Diversity of power and data/telecommunications is required for all these sites. If this is not possible then other means must be devised to overcome the redundancy issues. This may include additional generators, or microwave communication links. On site utilities such as well water and septic fields may be provided for remote sites. Finally, the site should be evaluated for the line of sight to adjacent structures or natural features which may have microwave towers or transmission sites.

This review may require an option on the property, so that physical access to the site may be permitted. A complete analysis may also include soil test borings on the site to determine geologic and soil conditions on the site. For example, if the site has large rock outcroppings just below the surface, excavation costs will be higher to level the site for a building pad. Soil borings may also reveal conditions which may require supplemental foundations such as pilings or drilled piers. The process of selecting a site for a new communications center should be carefully considered. It is recommended that each criterion be weighted and ranked in a collaborative forum so that an objective scoring can be made for each potential site. This ranking can then be presented to the proper governmental authority knowing that all factors have been considered and the decision process can move forward.^x

The design of critical communications facilities is a complex field. Public safety communications systems facilities should function under all conditions. The facility should be designed to withstand the anticipated hazards. Any effort to enhance the security and survivability of critical communications facilities should consider all of the hazards that the facility may face. The impact of technology on emergency communication systems and facilities is becoming increasingly significant. Technological advances have affected the way public safety agencies and corresponding

centers operate daily. Technology affects every aspect of doing business directly and indirectly. In order to meet future needs over the next 15 to 20 years, a critical communications center should be designed with the following considerations in mind:

- Avoid fixed objects (walls, furniture, etc.) when practical
- Select equipment and peripherals such as displays, keyboards, and computers that can change and move as much as possible
- The infrastructure (data and power cables, etc.) needs to be moveable and reconfigurable
- The space should be as open as possible, and raised flooring and high ceilings should be used
- Adequate equipment room space must be provided
- Extra attention must be focused on electrical grounding

In addition to determining the location of the ECC, there are several other steps that will need to be taken before construction can begin. First is the Pre-Design Phase, which involves the development of the building program (space planning and functionality requirements), and the conceptual design. The Design Phase follows including Schematic Design, Design Development, and the creation of construction documents. The construction phase follows.

In addition to the primary public safety communications center, there will need to be a fully functional back-up center for both of the centers. That back-up center needs to be sufficiently geographically separated so that the same event is unlikely to impact both centers. There will also need to be a designated alternate. The Alternate center receives 911 calls in the event the primary center doesn't answer. Should the primary center become inoperable or need to be evacuated, the alternate center would take over while the back-up center was being active.

The design of Emergency Communications Centers and Emergency Operating Centers is a specialized field. Most architectural and engineering firms are not familiar with the unique requirements for a fully functioning ECC.

AECOM will use the requirements iterated in this section as we assess the current conditions and make our recommendations.

4.0 Problems and Concerns

The protection of life and property is a high priority for all levels of government in the United States. Based on the needs of their communities, each municipality has developed their own public safety system to meet those specific community needs. Each locality has been diligent in its efforts to provide service to their respective communities, and all are to be commended for their efforts. The localities work collaboratively with each other and provide a high level of service to the communities they serve.

The systems, networks, and dispatch centers generally meet the routine day-to-day needs of the communities. However, the dispatch centers can quickly become overloaded during busy periods. Public safety systems must function under all conditions. When unusual events occur, the issues and concerns highlighted in this section often significantly limit the ability of the public safety agencies involved in this study to respond as effectively as they need to in such a situation.

Public safety communications centers generally provide four functions for the agencies and communities they serve:

- Public Access, which is the way the public accesses the public safety agencies;
- Command and Control Support, which is communication within a particular agency in support of operations;
- Interagency Coordination, which involves communications with other agencies and departments; and
- Information Systems Access, which provides access to the various local, regional, state, and national information systems.

The primary purpose of a public safety communications center is to get the correct assistance to the people who need it in the shortest amount of time. Numerous studies have shown the benefits of a prompt response by public safety agencies in true emergencies. Based on those studies, a number of standards focusing on response time have been developed. The National Fire Protection Association (NFPA) *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (NFPA 1710) establishes time objectives for responses to emergencies that should be met ninety percent of the time for both fire and medical emergencies. Career Fire Departments should arrive on the scene within five minutes of receiving the dispatch of a fire or medical emergency ninety percent of the time. In addition NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems* stipulates that ninety-five percent of emergency dispatching shall be completed within 60 seconds, from the time the call is answered until the dispatch is complete. While response time standards are less defined for law enforcement agencies, numerous studies, at least as far back as the *President's Commission on Law Enforcement and the Administration of Justice* in 1967, found a direct correlation between the response time of police officers and the solvability of the crime.

Each of the dispatch centers have operated as a self-sufficient entity for a long time. Because each locality functions independently, each center has followed a diverse path to meet the needs of their respective communities and its citizens. This diversity presents some challenges in consolidating services. This section will explore the major issues with the current situation and concerns we have identified in moving towards a Regional Emergency Communications Center (RECC). The identification of the issues is based on the interviews we conducted with various agency personnel and on our personal observations.

4.1 Dispatch Center Staffing

Four of the nine primary PSAPs staff their centers with only one dispatcher on-duty around the clock. Three of the remaining centers have a single dispatcher on duty at least part of the time. While the limited staffing may be acceptable for the normal workload, it does not take much of an increase in activity for the lone dispatcher to become overwhelmed by the volume of traffic. Since that single dispatcher is expected to promptly answer incoming 9-1-1

calls as well as immediately answer radio calls from field units, one or the other often suffers. A single motor vehicle crash with injuries can severely strain a single dispatcher no matter their level of proficiency. In addition, the position is left unattended if the dispatcher needs to take a restroom break. There have also been well documented cases in other parts of the country where the single dispatcher on duty has suddenly become ill or otherwise unable to function and has been unable to summon assistance, let alone continue to handle normal duties. Public safety communications systems and public safety communications facilities should function under all conditions. When a significant event occurs, such as a severe storm, major fire, hazardous materials incidents, and so forth, it is not unusual for such a situation to result in a three hundred to four hundred percent increase in workload in the Emergency Communications Center. A dispatch center with only one person on duty almost immediately becomes overwhelmed. As a result, critical communications may not be received or transmitted. A dispatch center that fails, because of inadequate staffing, is the same as a dispatch center that fails because of a system failure. There are several functions that cannot be implemented because of the limited on duty staffing. Emergency Medical Dispatch, discussed in Section 4.4 below is the most notable.

TABLE 4-1 displays the staffing at each of the PSAPS

Table 4-1
Current Personnel

Dispatch Center	FT Authorized	FT Actual	PT Authorized	PT Actual	On Duty Days	On Duty Afternoon	On Duty Nights
Billerica Police Dept	7	7	0	0	2	2	1
Billerica Fire Dept	4	4	1	0	1	1	1
Chelmsford Police Dept	9	9	0	0	2	2	2
Dracut Police Dept	8	8	0	0	2	2	2
Dracut Fire Dept (firefighters)	4	4	0	0	1	1	1
Groton Police Department	5	5	5	5	1	2*	1
Lowell Police Dept	27	25	0	0	6	6	6
Pepperell Communications Dept	6	6	2	2	1	1	1
Tewksbury Police Dept	9	9	4	4	2	2	2
Tyngsborough Police Dept	6	6	6	6	1	1	1
Westford Police Dept	7	7	0	0	2	2	1
Westford Fire Dept	4	4	0	0	1	1	1
Total	96	94	18	17	22	21	20

* Staffed with 2 only for 4 hours 4 days a week.

4.2 Interagency Situational Awareness

Currently the nine dispatch centers either have no or very limited ability to monitor the on-going activity at other dispatch centers. All of the agencies operate on their own channels. As a result, one agency is often unaware of events occurring with a neighboring agency.

Because the towns and City are in close proximity, police units from one jurisdiction frequently are either in or near another jurisdiction. In fact, they may drive by an incident that another agency has been dispatched to without being aware of the incident. Often incidents require assistance from another agency. That assistance is delayed because the only way for assistance to be requested is for the dispatcher at one agency to contact the other agency's dispatch center.

TABLE 4-2 displays the different frequency bands currently being used by the various agencies.

**Table 4-2
Radio Channels Used**

	VHF-Low	VHF-High	UHF	800 MHz
Billerica Police Dept				
Billerica Fire Dept				
Chelmsford Police Dept				
Chelmsford Fire Dept				
Dracut Police Dept				
Dracut Fire Dept				
Dunstable Police Dept				
Dunstable Fire Dept				
Dunstable EMS				
Lowell Police Dept				
Lowell Fire Dept				
Pepperell Police Dept				
Pepperell Fire Dept				
Tewksbury Police Dept				
Tewksbury Fire Dept				
Tyngsborough Police Dept				
Tyngsborough Fire Dept				
Westford Police Dept				
Westford Fire Dept				
Fire Mutual Aid Reg 6				

VHF Conventional
UHF Conventional



4.3 Lack of Interoperability

The nine law enforcement agencies in this study operate on two different frequency bands. While several manufacturers have begun to deliver radios capable of transmitting and receiving on multiple frequency bands, these radios are quite costly. The mobile and portable radios currently being used by the public safety agencies in this study are not capable of operating in multiple frequency bands at the same time. As a result, separate radios must be installed for each frequency band.

4.4 Emergency Medical Dispatch

Emergency Medical Dispatch (EMD) is a systematic program of handling medical calls for assistance. EMD programs serve two main purposes: they help manage the EMS resources in an organized and effective manner, and they provide assistance to callers when needed until trained field response units arrive at the scene. The dispatch staff, using locally-approved EMD Guidecards, quickly and properly determines the nature and priority of the call, dispatches the appropriate response and then gives the caller instructions to help treat the patient until the responding EMS unit arrives. Depending on the information gathered, different resources are dispatched based on the critical nature of the incident. Additional training is required beyond the basic dispatch training received by employees now. The EMD program also includes a quality control program, involvement of medical control, and other elements.

A critical element of an EMD program is medical oversight. This involves a Medical Director, who reviews and approves the program’s medical content, provides direction and oversight of EMD training, quality assurance, and program evaluation. The Medical Director also approves the medical care instructions and information provided by the emergency medical dispatchers.

As noted by the American Society of Testing and Materials (ASTM), the EMD dispatcher is the principal link between the caller requesting emergency medical assistance and the emergency medical service (EMS) resource delivery system. As such, the EMD dispatcher plays a fundamental role in the ability of the EMS system to respond to a perceived medical emergency. With proper training, program administration, supervision, and medical direction, the EMD dispatcher can accurately query the caller, select an appropriate method of response, provide pertinent information to responders and give appropriate aid and direction for patients through the caller. Through careful application and reference to a written, medically approved, EMD protocol, sound decisions concerning EMS responses can be made in a safe, reproducible, and non-arbitrary manner. These benefits are realized by EMS systems when appropriate implementation, sound medical management and quality assurance/quality improvement (QA/QI) at dispatch are provided within the EMD/EMS system.¹

Emergency Medical Dispatch (EMD), complete with pre-arrival instructions, is becoming the established standard of care throughout this country. The Massachusetts State 9-1-1 Board has proposed making EMD a requirement for 9-1-1 systems in the Commonwealth effective July 1, 2012.

The proposed regulations will require that each PSAP provide EMD either through certified EMD dispatchers at the PSAP/RECC or through a certified EMD resource. Further, the PSAP/RECC or certified EMD resource must use a single EMD Protocol Reference System (EMDPRS) on every request for medical assistance; have policies and procedures for use of EMDPRS, and establish a continuous quality assurance (QA) program. In addition, training and certification requirements are proposed for dispatch personnel. In order to act as a certified EMD dispatcher for a PSAP/RECC, the staff person must be a certified E911 telecommunicator; obtain and maintain CPR certification; and obtain and maintain EMD certification.

A number of the PSAPs in this study area either provide EMD or are in the process of implementing an EMD program. Three different programs are being used: APCO, Medical Priority, and Powerphone. There are significant differences in the programs, and not all may meet the proposed state standards.

In addition to the staffing and training requirements, the implementation of an EMD program requires a significant amount of effort in establishing and maintaining the EMD protocol reference system or EMDPRS. The EMDPRS used by the PSAP must be approved by the State 911 Department and meet National Highway Traffic Safety Administration (NHTSA) standards. It must include a protocol for EMD dispatcher response to calls, including structured caller questioning for patient condition, incident facts, and scene safety, pre-arrival instructions, post-dispatch instructions, selection of appropriate field resources to dispatch (such as first responder, basic life support, and/or advanced life support), and a continuous quality assurance program that measures compliance with the protocol through ongoing random case review of each EMD dispatcher.

Implementation of the required quality assurance program will also require significant effort to implement and maintain. The proposed regulations will require a continuous quality assurance, improvement, and management program that shall include, at a minimum, the following:

- (1) Documentation of the quality assurance case review process utilized to identify EMD compliance with the EMDPRS;
- (2) Written approval of the EMD medical director;
- (3) Ongoing random case review in accordance with the guidelines of the EMDPRS; and
- (4) Regular feedback of performance results to emergency medical dispatchers.

Given that with the exception of the Lowell Police Department Dispatch Center, dispatch center supervision is generally a collateral duty; the question arises about who will perform the required quality assurance reviews.

¹ Annual Book of ASTM Standards, Vol. 13.01 Use this footnote example instead of the endnotes.

The implementation of an EMD program could result in significant improvements to the quality of care provided. This service saves many lives and improves the delivery of emergency medical service. EMD calls present challenges because the dispatcher must remain on the telephone with the complainant until responders arrive on the scene. On critical emergency medical calls, an EMD call requires the full attention of the dispatcher, who cannot be asked to perform any other duties for the duration of the call. Not all calls require the dispatcher to stay on the line, but those involving the highest priority calls where potential life-saving pre-arrival instructions are being given typically do.

4.5 Community Diversity

There is a significant diversity in the size of the communities involved in this study. The City of Lowell is a relatively large central city. Billerica, Chelmsford, Dracut, Tewksbury, and Westford are moderately sized towns. The Towns of Dunstable, Pepperell, and Tyngsboro are comparatively small. In addition, there are significant differences in income level and many of the other economic characteristics. Further, the City of Lowell has a large ethnic Cambodian population, which creates a need for different services that may be needed in the other communities. While there are many joys and benefits that come from living in a smaller community, the resources available to meet the needs of the community are more limited. In addition, given the variance in size and the proximity to Boston, there is less commonality of interest than might be found in other areas.

Because of the differences in the various communities, there are significant differences in the financial resources available. As with all governmental entities, there is much competition for the scarce financial resources that are available. This is true with the public safety dispatch operations in the communities. Most of the funds that are available must be used to cover the costs of staffing the PSAP. As PSAPs become more dependent on technology, the challenge of supporting the technology and maintaining current technology becomes especially burdensome in smaller communities. With the shortened lifecycle of computer-based systems needed in the PSAP, there is an ever increasing need for additional resources. In addition, there is a minimum amount of staffing and other expenses that are required in order to have a PSAP operate twenty-four hours a day, seven days a week. As TABLE 4-2 below shows, while the number of calls the PSAP handles per employee may be significantly less than the national average, the cost per 9-1-1 call is significantly higher. This is due to needing to have a significant amount of equipment no matter the number of calls received. In addition, there must be continuous coverage at each PSAP. As noted in Section 4.1 above, four of the nine dispatch centers are only staffed by a single telecommunicator. However, the normal day-to-day workload does not justify additional staffing. As a result, the communities are left vulnerable to a dispatch center breakdown due to overload in emergency situations.

Table 4-3
Dispatch Performance

Agency	Total 9-1-1 Calls Received (2010)	9-1-1 Calls per FTE	9-1-1 Calls per Citizen	Cost per 9-1-1 Call	Total Incoming Calls	Incoming Calls per FTE	Incoming Calls per Citizen	Cost per Incoming Call
Billerica	6,928	990	0.17	\$41.69	66,764	9,538	1.66	\$4.33
Chelmsford	5,771	1,443	0.17	\$108.73	38,473	9,618	1.14	\$16.31
Dracut	4,833	537	0.16	\$45.52	18,250	2,028	0.62	\$12.05
Lowell	31,651	3,956	0.30	\$110.40	270,000	33,750	2.53	\$12.94
Pepperell	3,420	855	0.30	\$91.48	29,000	7,250	3	\$10.79
Tewksbury	7,343	816	0.25	\$73.02	95,000	10,556	3	\$5.64
Tyngsborough	1,673	279	0.15	\$222.84	25,912	4,319	2.29	\$14.39
Westford	2,917	417	0.13	\$71.19	45,000	6,429	2.05	\$4.61
NENA Study Small PSAPs	4,988	635	0.36	\$57.01	6,868	850	0.47	\$47.00
NENA Study Medium PSAPs	28,136	1,858	0.58	\$13.91	52,926	3,459	1.09	\$20.07
NENA Study Large PSAPs	121,187	3,202	0.77	\$13.40	128,523	4,237	\$1.05	\$18.22

4.6 Limited Back-up Capabilities

All of the dispatch centers have taken steps to provide for continued operations of their respective dispatch center in case commercial power is lost by providing uninterruptable power supplies (UPS) and/or emergency power generators. This only provides limited back-up capabilities. While each of the PSAPs has designated an alternate PSAP to answer 9-1-1 calls in the event of an outage or an overflow situation at their center, most of these arrangements do not provide the full functionality that is present at the primary center. Several of the centers reported they do not have a back-up center or arrangements with a neighboring jurisdiction to step in should the primary center need to be evacuated or relocated. As a result, while the 9-1-1 calls may be answered, dispatching the appropriate resources becomes challenging.

The National Fire Protection Association's Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems (NFPA 1221) stipulates that each jurisdiction shall maintain an alternate communication center that is capable, when staffed, of performing the emergency functions performed at the primary communication center.

Public safety communication systems must function under all conditions. Having an adequate, functioning back-up center is essential to assure the continuity of operations. Sufficient facilities, prior planning and trained personnel are the critical key elements to having an adequate back-up center. Without any one of those three elements, chaos may result.

4.7 Public Emergency Fire Alarm Systems

The Code of Massachusetts Regulations (CMR) and some local ordinances impose requirements for certain types of occupancies to have automatic fire alarm systems installed that communicate the alarm activation to an approved communications center. There are several acceptable methods for communicating the alarms to the fire department:

- Proprietary Systems usually involve large commercial facilities with an on-site communications center that is staffed continuously. A separate security office at an industrial complex is an example.
- Central Station Systems are monitored off-site by a contracted service point called a central station. Central-Station is a common term used to refer to a company that provides services to monitor burglar, fire and residential alarm systems. Central-stations use special telephone lines, computers, software and trained staff to monitor their customers' security systems and call the appropriate authorities in the event an alarm signal is received. Typically, there is a fee for services rendered. Some facilities are certified by independent agencies. In the USA Underwriters Laboratories (UL) is a leader in inspection and certification of central-stations. UL Standards 827 and 1981 must be adhered to in order to maintain a UL issued Central-Station license. UL conducts annual audits of these licensed facilities to ensure compliance.
- Auxiliary Systems transmit alarms directly to the fire department using municipally owned and controlled circuits. The circuits were usually installed in conjunction with public fire alarm box. A large number of municipalities have removed the public fire alarm boxes due to the universality of other methods of communications such as cell phones. Many of these localities have abandoned the circuits due to the expense in maintaining the system.
- Remote Station Systems also transmit alarms directly to the fire department, but use a means other than municipally owned cable. These systems either use leased lines or radio signals to transmit the alarm to the fire department.

Several of the localities involved in this study operate Auxiliary Fire Alarm Systems and have a large number of facilities connected to the system. Other localities have Remote Station Systems installed and receive alarm signals transmitted by a dedicated radio system.

These alarm systems must be monitored for integrity and send a "Trouble Signal" when they are not operating properly. The Trouble Signals must be responded to and can add a significant workload to the dispatch center. The City of Lowell, for example, reported receiving over 200 trouble alarms in one day.

The alarm systems are proprietary systems that usually only operate with system elements from the same vendor. The protected premises must purchase compatible alarm sending devices that can be quite expensive. Any change in systems could require these places to purchase new devices in a consolidation. A consolidation could also require the center to have multiple alarm receiving devices installed.

4.8 Dispatch Center Assessment

The communities involved in this study consist of a number of diverse dispatch operations. They range from very small to large-sized dispatch centers. Some Dispatch Centers deal with only law enforcement agencies, while others focus only on Fire and EMS activities and yet others bridge all disciplines, including DPW activities. Some initiate the original, or initial, answering of incoming 9-1-1 calls, while some receive transferred calls. All of the centers evidence certain characteristics; they do the best they can with the equipment at hand; they are dedicated to their community; and they overcome every obstacle to achieve the necessary service for the public safety field personnel and the citizens of the community.

The intent of this Communications Center Analysis is to identify and assess the environment the centers are operating within. During our site visits, AECOM assessed and rated each center on twenty-three different criteria. The results are described below. As shown in TABLE 4-4 each of the centers has areas that need improvement.

**Table 4-4
Dispatch Center Assessment**

Dispatch Center	Dispatch Center Size	Dispatch Center Condition	Equipment Area Size	Equipment Room Condition	Expansion Capacity	Radio Console System	CAD System	CPE System	PBX/Admin Telephones	Furniture	Lighting	HVAC	Reliability	Generator	UPS	Back-Up Provision	Maintainability	Parking	Internal Facilities	Security	Fire Protection	Grounding & Surge Protection	Mapping	
Billerica PD	G	G	G	F	P	G	F	G	G	G	F	F	G	G	G	G	G	F	F	G	F	P	F	
Billerica Fire	P	P	F	F	P	P	P	P	P	P	P	P	F	G	P	F	F	F	F	F	F	F	P	N
Chelmsford	G	G	F	F	F	G	F	G	G	G	G	G	G	G	F	G	G	F	G	G	G	F	F	F
Dracut PD	F	G	G	G	F	G	F	G	G	G	F	G	G	G	G	F	G	F	G	F	G	F	F	F
Dracut Fire	G	F	N	N	F	P	F	P	P	F	F	P	F	G	P	F	P	F	F	F	G	P	P	
Groton PD	F	G	P	P	P	G	F	G	G	G	G	G	G	G	G	P	F	F	G	G	F	P	F	
Lowell	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	P	G	P	F	G	G	F	F	
Pepperell	F	G	G	F	F	P	G	G	F	F	F	G	G	G	G	F	F	F	F	F	F	F	G	F
Tewksbury	P	F	F	F	P	P	G	G	G	P	F	F	P	G	F	F	P	F	P	G	F	P	F	
Tyngsborough	P	P	P	P	P	G	G	G	G	P	P	P	P	F	F	F	P	F	F	P	P	P	F	
Westford PD	G	G	F	F	F	P	G	G	G	G	G	G	G	G	G	F	G	F	G	G	F	F	F	
Westford Fire	P	P	P	P	P	P	G	P	F	P	F	F	F	G	G	F	P	F	F	F	G	P	P	

P = Poor
F = Fair
G = Good
N = None

4.8.1 Dispatch Center Size

The dispatch center has sufficient space to house comfortably the dispatchers, call-takers, management and supervision, and technical support for the current dispatch operation as well as space for expected growth.

- Billerica Police Department- Good – There are four positions in the center. The space is adequate for current operations.
- Billerica Fire Department – Poor – The two positions are in a small room and, because of the size, operations are limited. The space is not adequate for current operations.
- Chelmsford Police Department – Good -There are four positions in the center. The space is adequate for current operations.
- Dracut Police Department - Fair - The dispatch center is equipped with two positions. A third position is located in the OIC's office.
- Dracut Fire Department – The dispatch room is quite large for the needs of the dispatch operations.
- Groton Police Department – Fair – The center is space challenged. There is no room for expansion.
- Lowell Police Department – The center is equipped with 7 workstations. 6 of the 7 are able to answer 911. The center was renovated in 2009 and is adequate for current operations.
- Pepperell Communications Center – Fair – The center is somewhat crowded and more space is needed.
- Tewksbury Police Department – Poor – The center is crowded and the equipment layout is limited by the configuration of the available space.
- Tyngsborough Police Department – Poor – The space provided is not adequate for current operations.
- Westford Police Department – Good – Adequate space is provided for current operations.
- Westford Fire Department – Poor - Because of the space limitations, the room is overly cluttered.

4.8.2 Dispatch Center Condition

The Dispatch Center is neat and clean. The area is organized.

- Billerica Police Department – Good – The center was neat, clean, and appeared well organized
- Billerica Fire Department – Poor – The center was very cluttered and equipment was not installed in the best locations.
- Chelmsford Police Department – Good – The center was neat, clean and appeared well organized.
- Dracut Police Department – Good - The center was neat, clean and appeared well organized
- Dracut Fire Department – Fair- While the center was neat and clean, the equipment layout somewhat limited operations.
- Lowell Police Department – Good - The center was neat, clean and appeared well organized
- Groton Police Department – Good – The center was neat, cleaned, and well organized to use the limited space as effectively as possible.
- Pepperell Communications Center – Good - The center was neat, clean and appeared well organized
- Tewksbury Police Department Fair – The center was neat, but quite cluttered.
- Tyngsborough Police Department – The center was cluttered and not well organized
- Westford Police Department – Good - The center was neat, clean and appeared well organized
- Westford Fire Department – Poor- The center was very cluttered. Equipment had been added in a somewhat haphazard manner.

4.8.3 Equipment Area Size

The dispatch center has sufficient space to house comfortably the equipment used to support the current dispatch operation as well as space for expected growth. There is sufficient space for radios, telephones, and computers.

- Billerica Police Department - Good – There is sufficient space to house the equipment and the space provides some room for future expansion.
- Billerica Fire Department – Fair – There is sufficient space for current operations, but space issues are becoming a problem.

- Chelmsford Police Department – Fair – The space is adequate for current operations, but there is no room for additional equipment.
- Dracut Police Department – Good – The equipment space is adequate for current operations and there is some room for additional equipment.
- Dracut Fire Department – None – There is no separate equipment room all of the equipment is located in the dispatch room.
- Groton Police Department – Poor – The equipment room also serves as the passageway to the dispatch center.
- Lowell Police Department - Good – The recently renovated space provides adequate room for the dispatch center's equipment.
- Pepperell Communications Center – Good- Adequate space is provided for the center's equipment.
- Tewksbury Police Department – Fair – The dispatch equipment is located in several different rooms in the basement. While there is enough room for the existing equipment, it is somewhat crowded.
- Tyngsborough Police Department – Poor – The space available is inadequate for current needs.
- Westford Police Department – Fair – While the room housing most of the equipment is adequate, the 911 switch is basically located in a closet.
- Westford Fire Department – Poor – The space provided is inadequate. Some equipment is located in the dispatch center because there is no room in the equipment closet.

4.8.4 Equipment Area Condition

The equipment area is neat and clean. The equipment is installed in a professional manner.

- Billerica Police Department – Fair – The equipment room was somewhat cluttered.
- Billerica Fire Department – Fair – There was some clutter in the equipment room.
- Chelmsford Police Department – Fair – While the equipment was professionally installed, there is an urgent need for a good cable management plan.
- Dracut Police Department – Good – The equipment room was neat and orderly.
- Dracut Fire Department – None – There is no equipment room.
- Groton Police Department – Poor – There was a large amount of stuff sharing the space provided for the equipment.
- Lowell Police Department – Good – The equipment space was neat and orderly.
- Pepperell Communications Center – Fair – There was a good deal of clutter in the equipment room.
- Tewksbury Police Department – Fair – There was quite a bit of unused equipment and other items in the equipment room.
- Tyngsborough Police Department – Poor – The equipment space was very cluttered.
- Westford Police Department – Fair – While the equipment was installed in a professional matter, there were quite a few items stored in the equipment room.
- Westford Fire Department – Poor – Because of the limited space, it was poorly organized and very cluttered.

4.8.5 Expansion Capability

The Center has sufficient unused space or the facility is designed in such a way as to be expandable both in aspects of dispatching area and equipment space.

- Billerica Police Department- Poor- Expansion of the dispatch center space would require significant remodeling effort.
- Billerica Fire Department – Poor- There is no room for expansion of the dispatch center as the building is currently laid out.
- Chelmsford Police Department – Fair – There is some room for expansion
- Dracut Police Department – Fair – There is some room for expansion
- Dracut Fire Department – Fair – There is room for some expansion
- Groton Police Department – Poor – There is no room for expansion without extensive remodeling.

- Lowell Police Department- Good – There is room for some expansion without requiring extensive remodeling.
- Pepperell Communications Center – Fair – There is some room for expansion
- Tewksbury Police Department – Poor – The existing dispatch center could not be expanded without a major effort.
- Tyngsborough Police Department – Poor – There was no space available for expansion
- Westford Police Department – Fair – Additional positions could be added without major structural remodeling.
- Westford Fire Department – Poor – There is no room to expand the dispatch center in its current location.

4.8.6 Radio Console System

The Console system adequately interfaces with and supports the radio system. Dispatchers easily operate the console system features. All controls and information readouts shall be clear and easily understood. The system supports headsets, foot controls, select and unselect audio, and other modern features.

- Billerica Police Department – Good – Motorola Gold Elite Radio consoles are in use
- Billerica Fire Department – Poor – Zetron push button consoles are in use.
- Chelmsford Police Department – Good - Motorola Gold Elite Radio Consoles are in use
- Dracut Police Department – good – Motorola Gold Elite Radio Consoles are in use
- Dracut Fire Department – Poor – Older Zetron Model 4010 radio consoles are in use.
- Groton Police Department – Good – AVTEC radio consoles were installed in 2009.
- Lowell Police Department – Good – Motorola gold elite Radio consoles are in use.
- Pepperell Communications Center – Good – Motorola Gold elite Radio Consoles are in use
- Tewksbury Police Department – Poor – Motorola CentraCom II consoles are in use. These consoles are obsolete and no longer supported by Motorola.
- Tyngsborough Police Department – Good – Motorola Gold Elite Radio Consoles are in use.
- Westford Police Department- Poor – Obsolete Motorola CentraCom Gold consoles are in use. This product is no longer supported by the manufacturer.
- Westford Fire Department – Poor – A Zetron Model 4010 push button console is installed.

4.8.7 Computer Aided Dispatch (CAD) System

The CAD system adequately interfaces and supports the records management system. The dispatchers easily operate the system features. All controls and information readouts are clear and easily understood. The technology makes the dispatch and call taking easier and not more difficult. The system aids the dispatcher and call takers in answering calls, event locations, unit selection, report and incident numbering, and associative needs. Systems shall be designed for single entry and automation when possible to reduce work activities:

- Billerica Police Department – Fair - An End to End CAD system is installed. It does not appear to be as fully featured as other CAD systems more widely used in the industry.
- Billerica Fire Department – Poor – A older Positron Power 911 CAD system is installed.
- Chelmsford Police Department – Fair – A Microsystems CAD system is in use. It provides strong RMS features, but the CAD system is somewhat limited in functionality.
- Dracut Police Department – Fair – PAMET CAD software has been installed. It does not appear to be as fully featured as other CAD systems.
- Dracut Fire Department - Fair – PAMET CAD software has been installed. It does not appear to be as fully featured as other CAD systems.
- Groton Police Department – Fair – The Next Gen CAD system is being replaced by a TriTech/IMC system.
- Lowell Police Department – Good – A Larimore CAD and RMS system has been installed.
- Pepperell Communications Center – Good – A TriTech/IMC CAD system is in use.
- Tewksbury Police Department – Good – A TriTech/IMC CAD system is in use.
- Tyngsborough Police Department – Good – A TriTech/IMC CAD system is in use.
- Westford Police Department – Good – A TriTech/IMC CAD system is in use.

- Westford Fire Department -- Good – A TriTech/IMC CAD system is in use.

4.8.8 9-1-1 System

The 9-1-1 telephone system (CPE) operates seamlessly all in-coming 9-1-1 calls and out-going transfers. All controls and information shall be easy to read and understandable. The system requires few button pushes in operations.

- All except Billerica Fire Alarm, Dracut Fire, and Westford Fire –Good - Each of the nine primary PSAPs have installed PlantCML VESTA Pallas 9-1-1 Customer Premises Equipment provided by the Massachusetts 9-1-1 Department.
- Billerica Fire Alarm – Poor – As a secondary PSAP, the fire department does not have the fully featured 911 CPE that the primary PSAPs do. Limited information is provided.
- Dracut Fire - – Poor – As a secondary PSAP, the fire department does not have the fully featured 911 CPE that the primary PSAPs do. Limited information is provided.
- Westford Fire -- Poor – As a secondary PSAP, the fire department does not have the fully featured 911 CPE that the primary PSAPs do. Limited information is provided.

4.8.9 PBX/Administrative Telephone System

The PBX telephone system operates seamlessly all in-coming administrative calls and all out-going telephone lines. All controls and information are easy to read and understandable. The system requires few buttons pushes in operations.

- Billerica Police Department Good – The administrative phone system appeared to be functioning properly and meets the needs of the department.
- Billerica Fire Department Poor – The telephone system needs upgrading
- Chelmsford Police Department Good – The administrative phone system appeared to be functioning properly and meets the needs of the department
- Dracut Police Department Good – The administrative phone system appeared to be functioning properly and meets the needs of the department
- Dracut Fire Department – Poor – The administrative telephone system needs upgrading
- Lowell Police Department Good – The administrative phone system appeared to be functioning properly and meets the needs of the department
- Pepperell Communications Center Good – The administrative phone system appeared to be functioning properly and meets the needs of the department
- Tewksbury Police Department Good – The administrative phone system appeared to be functioning properly and meets the needs of the department
- Tyngsborough Police Department Good – The administrative phone system appeared to be functioning properly and meets the needs of the department
- Westford Police Department Good – The administrative phone system appeared to be functioning properly and meets the needs of the department
- Westford Fire Department Poor- The telephone system needs upgrading.

4.8.10 Dispatch Workstation Furniture

The furniture is a full featured design. The design allows raising and lowering the work positions, tilting work surfaces, management of the required cables and power cords. The design of the furniture assists the dispatcher and call takers with a convenient and comfortable layout.

- Billerica Police Department – Good – Wrightline workstations have been installed and are in good condition.
- Billerica Fire Department – Poor – There is a need to replace the dispatch furniture with new workstation furniture.
- Chelmsford Police Department - – Good – Wrightline workstations have been installed and are in good condition.

- Dracut Police Department – Good – Wrightline workstations have been installed and are in good condition.
- Dracut Fire Department – Poor- The cabinetry used for the dispatch equipment needs to be replaced and the facility upgraded.
- Groton Police Department – Good – Evans workstations have been installed and are in good condition.
- Lowell Police Department - – Good – Watson workstations have been installed and are in good condition.
- Pepperell Communications Center – Good – Wrightline workstations have been installed and are in good condition.
- Tewksbury Police Department Poor- Older Motorola console furniture has been installed. This line of furniture does not easily accommodate the multiple monitor environment that dispatch has become.
- Tyngsborough Police Department – Good – Wrightline workstations have been installed and are in good condition.
- Westford Police Department – Good – Wrightline workstations have been installed and are in good condition.
- Westford Fire Department – Poor – The dispatch center furnishings need to be replaced.

4.8.11 Lighting

The dispatch center is lighted in such a manner as to improve the operating environment. This includes individual controlled task lighting, natural light and/or windows, non-glare, and in-direct lighting.

- Billerica Police Department – Fair
- Billerica Fire Department – Poor
- Chelmsford Police Department – Good
- Dracut Police Department – Fair
- Dracut Fire Department - Fair
- Lowell Police Department – Good
- Pepperell Communications Center – Fair
- Tewksbury Police Department – Fair
- Tyngsborough Police Department – Poor
- Westford Police Department – Good
- Westford Fire Department - Fair

4.8.12 Heating Ventilating and Air Conditioning (HVAC)

The dispatch center has an effective heat and air conditioning system that provides for a wide range of conditions, from chilly nights to hot days. Humidity is controlled. There is sufficient movement of air and infusion of fresh air to allow the dispatch area to have a non-stuffy atmosphere. The equipment space is maintained at the recommended temperature and humidity levels.

- Billerica Police Department – Fair
- Billerica Fire Department – Poor
- Chelmsford Police Department- Good
- Dracut Police Department – Good
- Dracut Fire Department – Poor
- Groton PD - Good
- Lowell Police Department – Good
- Pepperell Communications Center – Good – The HVAC system was recently upgraded.
- Tewksbury Police Department – Fair
- Tyngsborough Police Department – Poor
- Westford Police Department – Good
- Westford Fire Department - Fair

4.8.13 Reliability

The systems that support the dispatch operation shall be reliable. Failures shall be far between and the dispatcher shall have a sense of confidence that the systems will be running when needed.

- Billerica Police Department – Good
- Billerica Fire Department – Fair
- Chelmsford Police Department – Good
- Dracut Police Department – Good
- Dracut Fire Department – Fair
- Groton Police Department – Good
- Lowell Police Department – Good
- Pepperell Communications Center – Good
- Tewksbury Police Department – Poor. The radio console system is obsolete.
- Tyngsborough Police Department- Poor
- Westford Police Department –Good
- Westford Fire Department- Fair

4.8.14 Generator

The emergency generator for the dispatch center provides adequate support for the operations including the HVAC system. The fuel is sufficient for 168 hours of operation at full load.

- Billerica Police Department – Good
- Billerica Fire Department – Good
- Chelmsford Police Department – Good
- Dracut Police Department - Good
- Dracut Fire Department - Good
- Groton Police Department - Good
- Lowell Police Department - Good
- Pepperell Communications Center - Good
- Tewksbury Police Department - Good
- Tyngsborough Police Department – Fair – Some generator issues were reported.
- Westford Police Department - Good
- Westford Fire Department - Good

4.8.15 Uninterruptable Power Supply (UPS)

The uninterruptible power supply for the dispatch center provides adequate support for the emergency operations. The capacity is sufficient for 1 hour of operation at full load.

- Billerica Police Department - Good
- Billerica Fire Department- Poor
- Chelmsford Police Department – Good
- Dracut Police Department – Good
- Dracut Fire Department – Poor
- Groton Police Department - Good
- Lowell Police Department – Good
- Pepperell Communications Center – Good
- Tewksbury Police Department – Fair
- Tyngsborough Police Department- Fair
- Westford Police Department – Good
- Westford Fire Department - Good

4.8.16 Back-up Provisions

An alternative dispatch center is maintained that is capable, when staffed, of performing the emergency functions performed at the primary center. The alternate center is separated sufficiently from the primary center to ensure the survivability of the alternate center.

- Billerica Police Department – Good
- Billerica Fire Department – Fair
- Chelmsford Police Department- Good
- Dracut Police Department- Fair
- Dracut Fire Department - Fair
- Groton Police Department – Poor
- Lowell Police Department – Poor
- Pepperell Communications Center – Fair
- Tewksbury Police Department – Fair
- Tyngsborough Police Department- Fair
- Westford Police Department – Fair
- Westford Fire Department - Fair

4.8.17 Maintainability

In the rare occasions when a system or device fails the repairs are quickly begun and performed. Overall there is a high confidence level that the system will be kept running.

- Billerica Police Department – Good
- Billerica Fire Department – Fair
- Chelmsford Police Department – Good
- Dracut Police Department – Good
- Dracut Fire Department – Poor – Because much of the equipment is no longer in production, obtaining parts is challenging.
- Groton Police Department – Fair
- Lowell Police Department – Good
- Pepperell Communications Center – Fair
- Tewksbury Police Department – Poor
- Tyngsborough Police Department – Poor
- Westford Police Department – Good
- Westford Fire Department - Good

4.18.18 Parking

The Dispatch center has easy outside parking access with mass transit and traffic access. The parking lot shall be well lighted and secure.

- Billerica Police Department – Fair – While adequate parking is available it is not a secure parking lot.
- Billerica Fire Department – Fair – While adequate parking is available, it is not a secure parking lot.
- Chelmsford Police Department – Fair – While adequate parking is available it is not a secure parking lot.
- Dracut Police Department – Fair – While adequate parking is available, it is not a secure parking lot.
- Dracut Fire Department – Fair – While adequate parking is available, it is not a secure parking lot.
- Groton Police Department– Fair – While adequate parking is available, it is not a secure parking lot.
- Lowell Police Department – Poor – Parking is challenging
- Pepperell Communications Center – Fair – While adequate parking is available; it is not a secure parking lot.
- Tewksbury Police Department – Fair – While adequate parking is available; it is not a secure parking lot.
- Tyngsborough Police Department – Fair – While adequate parking is available; it is not a secure parking lot.
- Westford Police Department – Fair – While adequate parking is available; it is not a secure parking lot.
- Westford Fire Department – Fair – While adequate parking is available, it is not a secure parking lot.

4.8.19 Internal Facilities

The dispatch center is designed with adequate break areas, restrooms, and quiet rooms. The restrooms are located near to but not in the dispatch area. There are un-recorded telephones for personal use.

- Billerica Police Department – Fair
- Billerica Fire Department – Fair
- Chelmsford Police Department – Good
- Dracut Police Department – Good
- Dracut Fire Department – Fair
- Groton Police Department – Good
- Lowell Police Department – Fair
- Pepperell Communications Center – Fair
- Tewksbury Police Department – Poor
- Tyngsborough Police Department – Fair
- Westford Police Department – Good
- Westford Fire Department - Fair

4.8.20 Security

The dispatch center is designed with controlled access to the Center using locked doors and closed circuit cameras for entrance controls. The exterior of the facility is well lighted and secure. Where a communications center has windows, the Windows shall be a minimum of 4 feet (1.2 meters) above floor level and shall be bullet resistive if they are accessible to the general public. Windows that are required to be bullet resistant shall be configured so that they cannot be opened.

- Billerica Police Department – Good
- Billerica Fire Department – Fair
- Chelmsford Police Department – Good
- Dracut Police Department – Good
- Dracut Fire Department – Fair
- Groton Police Department – Good
- Lowell Police Department – Good
- Pepperell Communications Center – Fair
- Tewksbury Police Department – Good
- Tyngsborough Police Department – Poor
- Westford Police Department – Good
- Westford Fire Department - Fair

4.8.21 Fire Protection

The communications center, equipment room and adjoining spaces are provided with an automatic fire detection, alarm, and notification system. The building is sprinklered. Electronic and Data processing equipment is protected by an FM200 or approved equiv system.

- Billerica Police Department – Fair
- Billerica Fire Department – Good
- Chelmsford Police Department – Fair
- Dracut Police Department – Fair
- Dracut Fire Department – Good
- Groton Police Department – Fair
- Lowell Police Department – Good
- Pepperell Communications Center – Fair
- Tewksbury Police Department – Fair
- Tyngsborough Police Department – Poor
- Westford Police Department – Fair
- Westford Fire Department - Good

4.8.22 Grounding and Surge Protection

There is a single point grounding (earthing) electrode system. All grounding media in or on a structure shall be interconnected to provide a common ground potential. This shall include, but is not limited to, the AC power system ground, communications tower ground, lightning protection system ground, telephone system ground, exposed structural building steel, and underground metallic piping systems. The grounding system shall have low electrical impedance, with conductors large enough to withstand high fault currents.

- Billerica Police Department – Poor
- Billerica Fire Department – Poor
- Chelmsford Police Department – Fair
- Dracut Police Department- Fair
- Dracut Fire Department – Poor
- Groton Police Department – Poor
- Lowell Police Department - Fair
- Pepperell Communications Center – Good
- Tewksbury Police Department – Poor
- Tyngsborough Police Department – Poor
- Westford Police Department – Fair
- Westford Fire Department- Poor

4.8.23 Mapping

Each call taking and dispatch position has ready access to an integrated computerized mapping system that manages, analyzes, and displays all forms of geographically.

Each of the primary PSAPs have PlantCML's Orion mapping software provided by the State 9-1-1 Department. It is integrated with the 9-1-1 system. The State provides updates on a semi-annual basis. The three secondary PSAPs do not have computerized mapping. NMCOG provides GIS mapping to all our communities, while town staffs in Billerica, Chelmsford, Lowell, Tewksbury and Westford provide additional GIS mapping support.

4.9 National Crime Information Center (NCIC)/ Massachusetts Criminal Justice Information Center (CJIS)

Criminal justice computer databases at the National Crime Information Center (NCIC) and the Massachusetts Criminal Justice Information Center (CJIS) permit authorized criminal justice agencies to check for warrants, stolen items, and articles. Integration with other databases also allows for verification of a driver's license status and vehicle registration information. In any consolidation environment, access to this information is critical in performing law enforcement operations.

4.9.1 Legal Responsibility

Information from these systems is used to detain and arrest wanted persons and/or persons in possession of stolen property. The agency that comes into contact with such a person and makes an arrest is depending on the originating agency to provide accurate information. The liability for false arrest, or improper confiscation of items, rests solely with the agency inputting the data. This information must be accurate and completely up-to-date at all times. Failure to do so may result in an agency being denied access to the system.

4.9.2 Ten–Minute Responses

One of the checks and balances required by the NCIC within the system that most directly affects a dispatch operation is the "10-minute response". This can best be illustrated as follows: An officer in Florida stops a vehicle and enters the registration into the system. This particular vehicle has been put into the system as stolen by a department in Greater Lowell. The computer system will immediately notify the officer in Florida that the vehicle has been reported as stolen by an out-of-state police department. The computer system also

notifies the local department immediately that one of its vehicles is being detained in Florida. The local department has ten minutes to confirm or disaffirm that the vehicle is in fact, stolen.

This example requires constant attention to the NCIC/CJIS system and immediate access to accurate records. The gravity of this situation is evidenced by the fact that mistakes will cause innocent persons to be arrested. In a consolidated environment, if a dispatcher is unavailable to perform these tasks, then other personnel must be available to perform them. Wide area records computer systems might allow dispatchers to perform this service remotely, but the database information still must be impeccably maintained.

4.9.3 Article Entry and Clearing

Items in the system must be entered in specific formats. This applies to persons, warrants, vehicles, guns, and articles. In each department there is a NCIC/CJIS operator that enters, clears, and modifies these items. Personnel who perform this function must be certified by the NCIC and the Commonwealth of Massachusetts. These entry functions should best be done on a 24-hour basis. To the extent that consolidation displaces dispatchers at each PSAP, other personnel must be assigned.

4.9.4 Non-Law Enforcement Agencies

There are provisions in the NCIC organization for non-law enforcement agencies to have access to the system. These agencies are normally non-enforcing criminal justice agencies (NCIC 'N' designator) and/or public safety dispatch agencies (NCIC 'P' designator). These agencies may only make inquiries and not entries or confirmations in the system. They also cannot obtain criminal history record information (CHRI). A consolidated dispatch center should gain access to the system as a public safety dispatch agency.

4.10 Warrants

Mandates by the Federal Bureau of Investigation (FBI), which operates NCIC, require that "an agency receiving a hit confirmation request should consult the original warrant and/or case file in order to provide the most accurate response". Currently, several of the primary law enforcement agencies depend on the on-duty dispatch staff for warrant confirmation. If a dispatch consolidation takes place, provisions will need to be made to assure that the NCIC mandates can be met without unduly creating an additional burden on the agencies or dispatch.

In addition, all entries must periodically be validated. Validation (vehicles, plates, fugitives, and missing person entries) requires the entering agency to confirm the record is complete, accurate, and still outstanding or active. This too can be a time consuming process and provisions will need to be made to assure that the validation is accomplished in an acceptable manner.

5.0 Analysis of Alternative Solutions

As part of our study, AECOM examined a number of possible alternative solutions to the issues and problems cited by the participants in this study. This section presents the three most logical alternatives. The alternatives included are:

- No Consolidation – Maintain Existing Situation
- Partial Consolidations
 - A – Lowell and Dracut
 - B – Billerica, Tewksbury, and Chelmsford
 - C – Pepperell, Dunstable, Tyngsborough, and Groton
 - D – Lowell, Billerica, and Tewksbury
 - E – Chelmsford, Westford, and Tyngsborough
 - F – Lowell, Dracut, and Tyngsborough
 - G – Lowell, Dracut, Tyngsborough, and Chelmsford
- Establish One Regional RECC

Each of the alternatives is discussed in terms of the organization, staffing, technology, space aspects, and back-up issues. After the alternatives were identified, we analyzed each in the context of the issues, problems and requirements identified by the study participants and listed both the advantages and disadvantages of each alternative. The advantages and disadvantages of each of the alternatives are discussed in this section.

Previous sections of this report addressed the current situation, the requirements for a consolidated center, and the issues and problems currently encountered. The costs associated with each of the alternatives are outlined in SECTION 6. SECTION 7 includes AECOM's recommendations.

5.1 Technological Assumptions

In developing and analyzing the alternatives, certain assumptions, as shown below, have been made:

5.1.1 Interoperability/Interagency Coordination

Each of the dispatch centers currently uses separate channels for law enforcement and fire communications. The agencies dispatched by the centers use radio channels in the VHF, UHF, and 800 MHz. The use of multiple frequency bands and multiple channels significantly limits interoperability between the agencies. As noted in SECTION 4, Federal Communications Commission requirements will necessitate a major upgrade to the current systems.

5.1.2 Computer-Aided Dispatch (CAD) System

Computer-Aided Dispatch (CAD) systems allow public safety operations and communications to be augmented, assisted or partially controlled by an automated system. It can include, among other capabilities, computer controlled emergency vehicle dispatching, vehicle status, incident reporting, and management information.

Most importantly, the CAD tracks the status of incidents and public safety units and recommends units to assign to the call. All aspects of a CAD system must be optimized for rapid response and system reliability. Since time is of the essence, the CAD system must accurately provide a data and time stamp for every activity. Properly designed and implemented CAD systems increase the accuracy and reliability of the public safety dispatch process. Call processing time is reduced. Case and assignment numbers are created and tracked automatically. CAD systems collect the initial information for an incident and then provide the information to one or more records management systems. The CAD system also supports other activities that assist in the effective use of public safety resources, including shift change roll call, "Be on the lookout" (BOLO) files, and the ability to schedule a call in the future. Currently, each dispatch center operates and maintains its own

separate CAD system. The PSAPs use five different software vendors and none of the systems are interfaced or interconnected so there is no sharing of data.

5.1.3 Records Management Systems (RMS)

A Records Management System (RMS) is an agency-wide system that provides for the storage, retrieval, retention, manipulation, archiving, and viewing of information, records, documents, or files pertaining to department operations. The RMS covers the entire life span of records development, from initial generation until they are complete. An RMS is a comprehensive computer program designed to enter and track appropriate statistical data and provide the agency management staff with the information needed to manage the agency. The RMS system also must interface with appropriate state and federal databases so that automated reporting can occur. Statistics are gathered at the local, state, and federal levels and, ultimately, provide a nationwide view of activity as it is reported by public safety agencies throughout the country. The data is used to indicate the levels and nature of crime, fires, and, soon, emergency medical activity, and to provide a reliable management tool for decision-makers within the criminal justice community. The National Incident Based Reporting System (NIBRS) provides law enforcement with the tool to fight crime by producing detailed, accurate, and meaningful data. The National Fire Incident Reporting System (NFIRS) does the same for the fire service and the National EMS Information System Dataset (NEMSIS) will do the same for emergency medical services. An effective RMS allows the single entry of data while supporting multiple reporting mechanisms. Frequently, the RMS is interfaced with the CAD so that when calls are closed in CAD, the call record is transferred to the RMS to facilitate the capture of all relevant information without having to re-key the data into the RMS.

Currently there are nine separate law enforcement RMS systems in use in the Greater Lowell region. A regional RMS, especially involving the law enforcement agencies, could provide further enhancements in the exchange of information by local law enforcement agencies.

The fire departments are required to participate in the Massachusetts Fire Incident Reporting System (MFIRS). MFIRS is the statewide system for tracking fire-related emergencies. Those fire departments that provide ambulance service must submit reports to the Office of Emergency Medical Services (OEMS). Each individual fire department and ambulance service maintains its own records. These systems are not interfaced with the CAD system.

5.1.4 9-1-1 System

Currently, the 9-1-1 system nationally is in a state of flux. Over the last decade, wireless 9-1-1 has become a reality. Internet telephony is growing. The 9-1-1 network is transitioning from a separate, dedicated, circuit-based infrastructure to one that is digital, using Internet Protocol. The current vision is that the system will migrate to a private Emergency Services Network (ESN). This will allow considerably more flexibility and capabilities than currently exist.

In 1990 the Massachusetts Legislature enacted legislation providing for Enhanced 9-1-1 on a statewide basis. This legislation established the Statewide Emergency Telecommunications Board (SETB) as the state agency responsible for coordinating and administering the implementation of Enhanced 9-1-1 and for promulgating standards to ensure a consistent statewide approach for Enhanced 9-1-1. In 2008, the SETB was changed to the State 911 Department. The Enhanced 9-1-1 program in Massachusetts is funded by a surcharge on all wire-line and wireless telephones. The State 911 Department provides funding for the 9-1-1 network as well as the Customer Premises Equipment (CPE). The State 911 Department also provides training grants. The 2008 legislation also provides for grants for allowable expenses related to enhanced 9-1-1 telecommunicator personnel costs, and the acquisition and maintenance of heat, ventilation and air-conditioning equipment and other environmental control equipment, CAD systems, console furniture, dispatcher chairs, radio consoles, and fire alarm receipt and alert equipment associated with providing enhanced 9-1-1 service. In addition, the grant provides reimbursement to Regional PSAPs and RECCs for allowable expenses related to the acquisition and maintenance of public safety radio systems.

5.1.5 Mapping/Geographic Information Systems (GIS)

GIS integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information or location information. GIS allows for the display of database information on a visual map. While the GIS does not contain any maps or graphics, it creates maps and graphics from the information contained in the databases.

It does this by displaying information in layers. Some of the layers commonly used in public safety communications centers include streets, pipelines, creeks, railroads, fire hydrants, cell tower locations, municipal boundaries, public safety response districts, and so forth. These layers can be turned on or off as needed.

Some form of computerized mapping became a de facto requirement for PSAPs with the deployment of wireless 9-1-1, since wireless caller location information is received in geographic coordinates (latitude and longitude) rather than specific addresses. As the 9-1-1 network migrates to the next generation, this will be even more critical. Each of the PSAPs has a mapping system installed as part of the 9-1-1 CPE provided by the State 911 Department. Updates to the maps are provided periodically by the State.

The municipalities in this study each maintain their own GIS system. Maintaining data integrity within each GIS and keeping the data synchronized with other, existing databases, such as the 9-1-1 Master Street Address Guide (MSAG), and the CAD geo-file requires high levels of coordination and is a challenge.

Integration of the GIS with the various other applications and systems is complex and challenging. Ideally, the 9-1-1 call location data, is seamlessly transferred from the 9-1-1 system to the mapping system and then to the CAD system so that the caller's location is displayed as a dispatchable address and entered correctly into CAD call for service form.

In addition NMCOG is working with the State GIS Office to develop addresses for specific locations in each community to meet the needs of the 911 system and law enforcement agencies.

5.1.6 Emergency Medical Dispatch

The AECOM staffing recommendations are based on the implementation of an EMD program. EMD calls present challenges because the dispatcher must remain on the telephone with the complainant until responders arrive on the scene. An EMD call requires the full attention of the dispatcher, who cannot be asked to perform any other duties for the duration of the call.

5.1.7 Logging Recorder System

Industry standards require both the continuous recording of emergency telephone conversations and radio transmission for long-term retention, as well as the capability of immediate playback of both recorded telephone and radio traffic.

These recording systems are an indispensable source of information for criminal, fire/EMS, civil, and internal investigations. They enhance agency training and quality assurance programs. The ability to instantly replay a conversation while still recording other calls and radio transmissions can literally be the difference between life and death when a person requesting assistance is not able to repeat their request or the conversation is garbled, or spoken too quickly for easy understanding.

As 9-1-1, telephone, and radio systems become more complex, so do recording systems. In addition, some technologically complex systems may require dedicated recording systems.

Currently, the State 911 Department provides recorders as part of the 9-1-1 CPE equipment. It is assumed that they will continue to provide the recording systems.

5.2 Option 1 – Maintain Existing Situation – No Consolidation

This option would continue the status-quo with each of the twelve centers continuing to operate independently.

5.2.1 Organization

Since each center would continue to operate independently, no organizational changes would occur.

5.2.2 Staffing

The staffing levels would continue as they currently exist. TABLE 5-1 displays the current authorized staffing levels.

5.2.3 Technology

Each of the dispatch centers will continue to bear the full responsibility for updating and replacing their 9-1-1 system, mapping, radio consoles, dispatch workstation furniture, CAD and RMS systems, and recording system. There will be limited benefits realized by not consolidating. Interchange of information will continue to be less efficient or effective than it could be.

5.2.4 Space

Each of the dispatch centers will continue to operate in their existing facilities. Several of the centers are limited in term of space, especially in their communications and computer equipment rooms. In order to meet future needs, all nine communities will have to shoulder the cost of any expansion or renovation.

5.2.5 Back-Up

The dispatch centers will continue to have the same back-up provisions as outlined in their existing plans.

**Table 5-1
Current Staffing**

	On Duty	Total
Billerica	2-3	11
Chelmsford	2	9
Dracut	2-3	12
Lowell	6	27
Pepperell	1	6
Tewksbury	2	9
Tyngsborough	1	6
Westford	2-3	11
Total	21	91

5.3 Option 2 – Partial Consolidations

This option would see seven different scenarios of partial consolidation taking place between various communities.

5.3.1 Organization

Within each of the scenarios the combined center would stand alone. The remaining communities would continue to operate independently, no organizational changes would occur outside of the particular scenario participants. There would need to be a Joint Powers Agreement or Memorandum of Understanding (MOU) between the participating entities covering the details of the operation of the consolidated center.

5.3.2 Staffing

Within the communities not participating, the dispatch staffing levels would continue as they currently exist. For the different scenarios there will be differing levels of staff required. Table 5 – 2 displays the required staffing levels for each of the seven scenarios.

**Table 5-2
Option 2**

Partial Consolidation Centers/PSAP					
Partial Consolidations	On Duty	Dispatchers	Supervisors	Manager	Admin
Lowell and Dracut	8	28	5	1	1
Billerica, Tewksbury, and Chelmsford	6	20	5	1	1
Pepperell, Dunstable, Tyngsborough, and Groton	5	16	5	1	1
Lowell, Billerica, and Tewksbury	12	44	5	1	1
Chelmsford, Westford, and Tyngsborough	5	16	5	1	1
Lowell, Dracut, and Tyngsborough	8	28	5	1	1
Lowell, Dracut, Tyngsborough, and Chelmsford	9	32	5	1	1

5.3.3 Technology

For each of the scenarios a new set each of the major systems (9-1-1 CPE, mapping, CAD, RMS, dispatch consoles, logging recorders, and dispatch workstation furniture) would be required. Some of these options would require a technological and operational answer to the alarm receipt process. Two operations utilize municipal owned cable fire and burglar alarm systems and four use either leased lines or wireless alarm systems. These systems are in inter-compatible and the receipt function would need to be relocated to the new center.

5.3.4 Space

Each of the scenarios will require differing amount of space. Adequate, properly conditioned space for the shared technology will be required. For planning purposes the communities should plan on the following space availability for the consolidated center:

- A – Lowell and Dracut - 7,065 square feet
- B – Billerica, Tewksbury, and Chelmsford – 5,399 square feet
- C – Pepperell, Dunstable, Tyngsborough, and Groton – 4,566 square feet
- D – Lowell, Billerica, and Tewksbury – 10,397 square feet
- E – Chelmsford, Westford, and Tyngsborough – 4,566 square feet
- F – Lowell, Dracut, and Tyngsborough – 7,065 square feet
- G – Lowell, Dracut, Tyngsborough, and Chelmsford – 7,300

5.3.5 Back-Up

Depending on which of the various options are enacted; it will be possible to create satisfactory back up arrangements within the NMCOG area. The exceptions will be the Lowell, Billerica, and Tewksbury scenario which like the present situation for Lowell will be too large to a local back arrangement.

5.4 Option 3 - Establish One Regional RECC

This option would consolidate the dispatch operations of up to nine communities into a single Regional Emergency Communications Center (RECC).

5.4.1 Organization

A governance structure would need to be determined for the RECC. The governance alternatives are more fully discussed in SECTION 5.6 below.

5.4.2 Staffing

The estimated staffing is shown in TABLE 5-3. The center would require four administrative or management positions, including the RECC manager/911 coordinator, an operations/training manager, a full-time technical support coordinator and an Administrative Assistant. How do the roles of the RECC manager and the operations/training manager differ? The operations/training manager would be responsible for the day-to-day operation of the center, including staffing, training, and quality assurance, while the technical support coordinator would be responsible for keeping the system and equipment in the dispatch center up to date and functioning properly, as well as maintaining the various data bases used by that center. An Administrative Assistant would also be needed for the center. The center would have a lead dispatcher and twelve telecommunicators on duty. If this option were chosen, more detailed staffing analysis would be required to determine the exact number of staff required in each center.

5.4.3 Technology

A new set each of the major systems (9-1-1 CPE, mapping, CAD, RMS, dispatch consoles, logging recorders, and dispatch workstation furniture) would be required. This option would require a technological and operational answer to the alarm receipt process. Two operations utilize municipal owed cable fire and burglar alarm systems and four use either leased lines or wireless alarm systems. These systems are in inter-compatible and the receipt function would need to be relocated to the new center.

5.4.4 Space

In order to accommodate peak workloads and future growth, each center would need to be of sufficient size for thirteen dispatch workstations. While not all of the positions would be required initially, they would be required by the end of the project. Additional space to house the technology, office for supervisory personnel, training space, and auxiliary space such as break rooms, lockers, etc will be required.

A thirteen position center would require approximately 11,360 square feet of dedicated space along with raised flooring, redundant routing for 9-1-1 and emergency telephone circuits, back-up power supplies, and HVAC systems. It must be noted that the space estimates are just that. Before any facility would be identified or constructed, programming will be required to determine the exact space requirements. There will be space identified at Administrative/Support including space for staff support (break rooms, lockers, etc.), building services, as well as offices for administrative personnel. The requirements may be reduced if the dispatch center were located in an existing building where this space could be shared with other building tenants.

5.4.5 Back-Up

In this scenario, the RECC would need to have a back-up facility either outside of the region or utilizing an assigned available back-up facility within the region. The facility should be designed with the capacity to back-up the primary PSAP.

Table 5-3
Option 3

Consolidated Center		
	On Duty	Total
Manager/9-1-1 Coordinator		1
Administrative Assistant		1
Lead Dispatcher/Shift Supervisor	1	5
Communications Officers	12	48
Total	13	55

5.5 Strengths and Weaknesses of Alternatives

AECOM has investigated a number of alternatives to improve the provision of public safety communications services and public safety services in the Greater Lowell region. Here we discuss briefly the ability of each of these alternatives to meet the needs and requirements of the participating agencies and to address the issues and problems cited.

- **No Consolidation – Maintain Existing Situation**

This alternative has traditionally been the selected option for many communities. Each agency has operated independently and the system has evolved to meet the changing needs. Communities with scarce financial resources do not wish to make significant financial errors. In addition the cost of change can be significant.

Strengths: Retain maximum agency control since each agency is in charge of its own dispatch. Least disruption to current operations and allows most focus on individual communities. Provisions for other dispatch duties would be unchanged. Back-up provisions remain stable.

Weaknesses: The alternative provides no improvement to the current situation. There is significant duplication of equipment since each agency must purchase and maintain its own systems and equipment. There would be no improvement in interagency situational awareness or in interagency communications (interoperability).

- **Partial Consolidations**

This alternative consolidates the technical dispatch systems of particular communities in various collections; the communities not included in each partial consolidation will remain as is.

Strengths: The public safety agencies of the individual towns involved in the partial consolidation would enhance their inter-agency and interoperability knowledge within the dispatch center. Future purchases would be simplified and cost savings would be realized in the central processor and software areas.. Back-up provisions could be developed in a stable environment.

Weaknesses: For the agencies involved this will involve personnel dislocations and possible reassignments. Provisions for other dispatch duties would be required. The communities not involved will not realize any benefits

- **Establish One Regional RECC**

Here the dispatch operations into a single Regional Emergency Communications Center.

Strengths: This alternative provides the greatest improvement in situational awareness and in interagency communications and coordination. Since the systems would be shared, significant improvements could be realized in the exchange of information between agencies. This alternative provides for the elimination of duplication of personnel, equipment and systems. Training and retention can be improved as well.

Weaknesses: There could be the perception of the loss of agency control in that general policies and procedures would be developed to meet the needs of every community rather than an individual community as now exists. A new facility and new systems and equipment would be required. The location could be inconvenient for some communities. This option will require a new alarm receipt system. Other dispatch duties will be disrupted in the existing centers, requiring additional personnel. Back –up provisions become very difficult, being either a dedicated back-up facility or back-up facility outside of the region.

5.6 Governance Alternatives

In addition to the determination of which alternatives will be implemented, the organizational structure and governance of the shared system must be determined unless the communities choose to remain operating as they are and not create a shared communications center or communications systems. Several different methods of governing a shared emergency communications center and communications system have been used in different localities throughout the Commonwealth of Massachusetts and the nation with varying degrees of success. These may be categorized into three broad alternatives:

- One existing agency expands its services to include the other agencies dispatch services
- Collocation of dispatch centers
- Consolidation into separate, independent agency

Following is a brief discussion of each of the alternatives and the comparative advantages and disadvantages of each.

5.6.1 Use Existing PSAP

Under this alternative, one of the nine communities that currently provides dispatch services would expand and assume responsibility for providing dispatch services for the other communities. That community would be responsible for the hiring of personnel, establishing policies and procedures, and providing and operating the various systems used by the dispatch center. In some cases where this method is used, the services are included without any charge to the other communities, while in other cases; communities pay a fee to the host community.

5.6.2 Co-location

With a co-location of dispatch services, each of the participating communities would move their dispatchers into a shared location, but would retain full control of their personnel. The facilities and some systems would be shared, but operations and personnel would remain separate. Cost-sharing agreements with each of the participating communities would be required to cover the costs of the facility and the systems, but all operational costs would be paid through each community budget.

5.6.3 Separate Organization

An independent authority focused on the provision of public safety communications would be created through a Joint Powers Agreement (JPA) or Memorandum of Understanding (MOU) under this approach. Representatives of each participating community would serve on the authority's governing body. The personnel providing dispatch services would be employees of the authority, not employees of the individual communities. This model has been used successfully in a number of consolidations.

5.6.4 Discussion of Governance Alternatives

No two public safety agencies are identical. This is true with the eight towns and the City of Lowell participating in this study as well as across the Commonwealth, nationally, and worldwide as well. In the communities, there is a great deal of commonality in how the public safety dispatch services are provided.

While there is some variation between the agencies, there is sufficient commonality so that a shared communications center is feasible. Each of the alternatives identified above would provide improved situational awareness of what each public safety agency was doing, as well as improving interagency communications through the location of dispatch personnel at the same facility.

While the model of consolidating dispatch services under one of the existing agencies would be the simplest to implement, concerns over the ability of the other agencies to influence policies and procedures generally limits the desirability of this organizational alternative. An unintended consequence with this model is an increase in interagency and intercommunity friction. Personnel from other communities often feel that they come second to personnel from the host community. Another distinct disadvantage is that the public could

lose a significant amount of direct contact with the other communities except for the host community. Dispatch employees of the other communities would either transfer to the host community or to other positions in their current community. This could result in significant employee disruption in terms of pay and benefits. Employee seniority could be significantly changed as well.

The second organizational alternative involves each of the existing dispatch operations being relocated into a new, shared facility. Each organization would retain responsibility and control of its own dispatch operations. Common facilities, such as break rooms, lockers, and other facilities would be shared. It could be feasible to share systems as well. Since each of the employees assigned to the dispatch center would remain an employee of their community, there would be no disruption of employee pay and benefits. There could be significant competition between communities for employees, especially given the differences in pay and benefits among the communities. There would be limited opportunity for more effective use of staff resources since each dispatch operation would be independently staffed.

The most common model shared communications center is the independent agency model. Under this model, a single agency provides the dispatch services for all the participating communities. An advantage of working within a separate organization is that the perception of bias is minimized. The emergency communications function may become more visible and have increased access within local government. A disadvantage of working within a separate organization is that the emergency communications staff must work to build and maintain rapport with officials from many departments and agencies and avoid becoming isolated. Establishing strong networks is critical in this situation. Another significant disadvantage of the shared center is the perception that each agency would lose a degree of control over its dispatch operations.

Dispatch employees then become employees of the independent agency. This would cause significant disruption to the employees of the existing dispatch centers. Typically, when consolidation occurs, the adopted pay and benefits are at least equal to the highest being paid by the participating communities. Two different approaches are taken to employee seniority. One is that the employees bring their seniority with them; the other is that every employee starts without any seniority. This alternative allows the most flexibility in the use of personnel, requires the fewest number of personnel assigned to dispatch.

With proper training, policies, and procedures, the negative effects of this model can be minimized.

6.0 Opinion of Probable Costs

Cost projections were developed for both the staffing and the major categories of equipment as they apply to the general design for the consolidation scenarios that are described in this study. The cost information used in these projections is obtained from historical AECOM cost files and vendor pricing of comparable projects. The various costs are compared and weighted in order to derive average costs. This is what AECOM expects the pricing to be, and these prices are recommended for planning and budgetary purposes. While AECOM cannot guarantee price levels, successful competitive bidding typically results in savings on the list price costs. Below are described the various cost elements that make up the estimates.

Cost Elements – Equipment

Telephone Equipment (CPE)

Customer premise equipment is the telephone equipment that operates the Enhanced 9-1-1 system. It includes dual central processors and various message switches that interpret and produce the location and telephone number information that is received in multiple formats from the telephone service providers. This major category of equipment is provided by the Commonwealth. AECOM has included the cost of an automatic call distributor/PBX to handle the administrative and non-9-1-1 calls for each scenario.

Computer Assisted Dispatch (CAD) Systems

CAD software can be a relatively simple program to keep a record of incidents handled by a public safety agency, or it can be a complex set of programs and external connections to fully support everything that a public safety communication center does. The complexity of the CAD program is usually dictated by the size of the public safety agency and the number of dispatchers working to support it. Like many things in life, it's easy to be attracted to a Chevy Suburban CAD program when all you need is a Smart Car. Matching your needs to the software's capabilities is sometimes half the project.

Simple CAD programs are often called "**calls for service**" programs, because they combine the features of a live, on-line, in-use CAD program with the more off-line features of a records management system.

In the **early** days, CAD systems consisted of mainframe or mini-computers located in a computer room, linked to so-called "dumb" terminals in the communication center showing text-based information. **Today's** systems use a client-server configuration, with data residing on a central computer, physically as small as a PC, linked to workstations that consist of mid-powered PCs. The arrangement allows central storage and retrieval of data, and redundancy in case one workstation stops working. Today's terminals are 19-inch or larger color models, and the software makes use of color, graphics and symbols to convey information.

CAD programs have essential elements or components that support the dispatcher's work:

- **Incident information** - This is a database of the incident data, usually obtained from a telephone caller, and including the location (house number and street name, commonplace name, intersection), caller info, and other information gathered by the dispatcher. When the incident is recorded in the database, CAD typically compares the location to previous entries, and then displays an alert if the new incident is related to a existing incident record, based both on the proximity of current incidents, and address matches on previous incidents.
- **E9-1-1 interface** - The CAD computer is electronically connected to the 911 system, so that the caller's telephone number and address information (ANI/ALI) are displayed on-screen, and automatically transferred to the appropriate fields of the CAD incident entry form.
- **Location verification** - Once the incident location is automatically entered from 911 or manually typed in, the CAD software matches it against the **geofile** created by the agency when the software was first installed. The geofile is a database of standardized locations, including specific house numbers and streets names, commonplace names (Jackson Park), and intersections. The geofile insures that locations are within the

jurisdiction, within a valid block number range, and are consistently entered and entered (which assists in later searches).

- **Information files** - Once the location has been verified, CAD links the incident to any of its information databases, including previous incidents at that same location, address alerts, free-form text information, telephone numbers, personnel lists, emergency medical dispatch procedures, fire pre-plans, HAZMAT info, suspect hazards, etc.
- **Incident display** - Once an incident is entered, CAD can display a list of the pending, current and past incidents, according to the dispatcher's assignment (telephones, radio, Beat 3, fire-police-EMS, special) and preference. Incidents are usually sorted by date, time and priority, but also by location, type of incident or other criteria, to make evaluation of the incidents quicker and easier.
- **Unit display** - CAD has a database of personnel and field units, which is used to display a list of active units. This database includes the unit ID, assigned personnel, special capabilities (K-9, SWAT, etc.). The database is linked to the incident database, allowing the dispatcher to display unit status: in-service, out-of-service, etc. Using commands or on-screen buttons; the dispatcher can change a unit's status or assign it to incidents.
- **Incident dispatch** - With information about incidents and units, the dispatcher can link an incident to one or more field units, which essentially **assigns** the units to the incident. Most CAD software will provide a recommendation of which units should respond, based on pre-determined tables or a unit's actual location from an AVL sub-system. Based on pre-determined tables, CAD also takes into account the type of incident (high danger, low danger), and type of unit (patrol, supervisor, canine, etc.) when making the recommendation.
- **Time-stamping** - whenever the dispatcher takes an action (enter a new incident, dispatch a unit, unit arrives on-scene, etc.), the computer records that time and links it to the incident and unit records for later review
- **Special features** - Some CAD software is focused on EMS or fire operations, and has standing order or jump crew capabilities.
- **Report generation** - to help analyze incident and unit activity, CAD allows production of reports listing all types of information, by ranges of date and time, and sorted by various fields.
- **External links** - The CAD computer and software can be linked to other computer systems, including the agency's E911 system (to automatically fill in the caller's name, address and telephone number), local-county-state-federal law enforcement databases (NCIC, warrants, vehicle registration, driver's license, stolen vehicle and property, etc.), master clock synchronization, radio systems (to show last unit that broadcast, or unit that pressed "emergency" button), mobile data, records management, paging, etc.
- **Mapping** - Many modern communication centers have installed computer mapping systems to assist them in handling Phase II E911 calls. These mapping systems can also be interfaced with the CAD geofile to display units and incident locations.
- **Maintenance** - The software allows the system administrator to create and edit the various support files, and to make data back-ups of the various files.
- **Security** - CAD information is generally considered confidential for investigative reasons, for the privacy of victims and witnesses, and in some cases to comply with state laws (juveniles, etc.). The software provides a flexible method of assigning security levels for all the various types of information, the various CAD functions, and all users. This allows an administrator to very specifically assign access permissions to every user, limiting them to just what functions they are allowed to perform, and what information they are allowed to see.

We have estimated a software upgrade to allow all of the centers to operate on the same software platform and provide equipment changes in the center. The major expenses are in operator position hardware which includes:

- LCD Screens (4)
- CPU (computer)
- Keyboard and Mouse

Radio Console System

This equipment provides the connection for the dispatcher to the various two-way radio systems. The radio consoles also allow access to alerting and siren systems. The major expenses are in operator position hardware which includes:

- LCD Screens (1)
- CPU (computer)
- Keyboard and Mouse
- Audio unit (see description below)
- Speakers

The audio unit acts as a gateway between analog dispatch equipment, telephone interconnect devices, host data gateway and conventional or trunked digital radio systems.

Back-Up desktop control stations are also contained in the budget. They are not hardwired into the consoles. The control stations are used as a backup to console positions to provide a basic dispatch function in the event of total console failure.

Dispatch Console Furniture

The furniture workstations are sized based on the number of monitors and CPU's that will be installed at the positions. A supervisory workstation is larger due to additional monitors. Heavy-duty cycle, dispatch chairs are also provided.

Voice Loggers

Two types of recording functions are needed. One allows the on-duty telecommunicator to quickly retrieve a telephone or radio message in order to capture or verify information from their position. This is known as the instant recall recorder. The other's function is to capture and provide a record of events as they happened. This function is known as a logging recorder.

One new Digital Voice Logger (DVL) system is estimated provided by the Commonwealth. The instant playback feature is incorporated into the DVL system.

Spares Fixed

AECOM's experience indicates that the project should maintain a cache of spare parts for the equipment. Over the years our experience has shown that this cost element should be simple 1% factor of the value of the Fixed Infrastructure costs; including consoles, CADS, and CPE.

Contingency

In an ECC project of this size and complexity, unexpected occurrences and expenditures will happen and must be prepared for. Based on our experience, it is AECOM's opinion that a viable cost element for equipment contingencies should be set at 10% of the project's total cost.

Operational, Maintenance, and Replacement Estimates

The communities require a forecast of the on-going costs for the center and new PSAP arrangements in order to make valid decisions on the approach to using the systems. The challenge here is to accurately forecast the maintenance expenses into areas that are largely undefined at present and to determine how those expenses should be allocated to each of the participating communities.

The model described herein should not be interpreted as limiting future activities of the community to explore alternative funding opportunities or improved methods of financing system sustainability.

We have applied the following assumptions to our analysis:

- Fees for operations and maintenance support and for future equipment replacement should be billed to the participant agencies monthly.
- The O&M costs should be apportioned equally to all participating agencies based on their participation ratio.
- O&M services for the RECC systems infrastructure is to be performed by one centralized support organization directed by the RECC Director.

The tables herein are efforts at that forecast, which will require modification as real time system operation experience is gained in the coming years. At this time, however, we must rely on experience gained in other environments and make many assumptions as to the cost factors. This section explains the assumptions that were used to create the tables.

Maintenance

For maintenance cost projections, we concentrated on the equipment category. For the equipment in the centers we have looked at the predicted capital costs and used a percentage based on experience of 2.5% of the costs per year for maintenance.

Operations

Operations costs differ widely from community to community. This difference is partly due to how communities list line items and account for budgeting the costs associated with providing E9-1-1 services. Additionally, Center Director's manage and create budgets based upon the size, individual needs, and operational differences across jurisdictions. The existing facilities are in differing conditions, causing operations costs to vary based partially on the age of the center. In these scenarios we are attempting to apply a factor to new facilities with no prior experience in the center. Based on nationwide data for similar facilities, it is AECOM's opinion that operations costs will be \$4.00 per square foot for the facility. We applied this to the differing sizes of the facilities in each of the three options.

Personnel

Personnel costs are always among the largest budget items. As discussed elsewhere in the report the nine communities currently have ninety-one (91) full-time and thirteen (13) part-time employees involved in dispatch activities. In 2009-10 the salary budget was \$3,123,576. Each of the proposed options requires a differing number of staff. This is discussed further in other sections but in general the staffing recommendations are:

For example the full Regional Emergency Communications Center (RECC) – Including 9 communities - AECOM recommends 12 Dispatchers and 1 Supervisor on duty at all times; added are the Director position, and one Administrative position. All staff would be full-time employees. The required personnel would be:

- Dispatcher – 48
- Supervisor – 5
- Director – 1
- Administrative – 1

AECOM surveyed and analyzed the salaries of the existing centers. To arrive at cost projections for the above staffing, we used the following assessments: For dispatcher we took the highest entry-level wages paid by the communities, and the highest top-out wages paid by the communities. We then used these to determine a mean salary, and assumed all dispatchers would be paid at this rate. For Supervisors we performed the same calculations. The Technician is estimated at the same rate as the Supervisors. For the Director rate we estimated 125% of the

Supervisor salary rate. The Administrative was calculated using 90% of a dispatcher salary. To account for fringes benefits and other expenses we have included an added 40% increase to each salary computation.

Capital Replacement

The community should plan ahead for the eventual replacement of the equipment in the RECC. We expect this to be on a ten year time frame for planning purposes. The costs for replacement are planned around an annual increase of 1.75% in costs. Due to the differences in equipment we have accounted for the replacement of the following systems and frequency:

- PC's & Laptops – 3 year cycle
- Servers & Routers – 5 year cycle
- Software Upgrades – 7 year cycle
- Radio console – 7 year cycle
- Dispatch furniture – 10 year cycle

We recommend that a fund be established for deposit of monies for future equipment replacement. This account should be an interest bearing account. We have assumed a 1.50% yield. Interest should accrue for application towards future equipment replacement costs. The funds should only be used for equipment replacement purposes unless otherwise directed by the community.

Participation Ratio

In order to fairly divide the costs between the communities involved, a participation ratio has been determined based half on call volume, and half on population. Call volume is a simple calculation of the number of calls generated by the community compared to the total number of calls generated by the communities in each option. The population is data from the 2010 census, applied in the same way that the call volume is. It should be noted that while exact percentages were used in the actual calculations, all displayed values have been rounded to whole numbers. Tables 6-0 shows the participation ratios calculated for the full consolidation scenario; each of the partial scenarios will have its own participation ratio.

TABLE 6-0
OPINION OF PROBABLE COST
Participation Ratio

USER AGENCY	CALL VOLUME	POPULATION	PARTICIPATION RATIO
Billerica	9,301	40,243	14%
Chelmsford	7,331	33,802	11%
Dracut	4,833	29,457	9%
Dunstable	-	3,179	1%
Lowell	28,508	106,519	40%
Pepperell	1,381	11,497	3%
Tewksbury	7,343	28,961	11%
Tyngsboro	1,673	11,292	3%
Westford	6,207	21,951	8%
TOTAL	66577	286901	100%

The cost forecasts will require modification as real time system operation information is gained in the coming years. At this time, however, we must rely on experience gained in other environments and make many assumptions as to the cost factors.

6.1 Option 1 No Consolidation – Maintain Existing Situation

6.1.1 Staffing

The staffing costs are the same as shown above for the 2010 Fiscal Year at \$3,987,904. This information is a total derived from data provided by all potential participating agencies associated with this needs assessment.

6.1.2 Maintenance and Operations

This expenditure category includes such expenditure categories as equipment repair and maintenance, office supplies, training and travel, telephone, and similar non-capital expenditures. We have used the same figure as currently budgeted \$315,631. Each agency currently uses its own 9-1-1 Equipment, CAD, RMS, consoles, workstations, DVRS, and other associated ECC equipment. This would continue as is with all future upgrade and replacement costs borne by each agency individually.

6.1.3 Current Expenditures

For the 2008-2009 Fiscal Year, the eleven entities have a combined budget total of \$4,216,302 for the provision of dispatch services. The expenses are categorized as follows:

Personnel Services	\$3,987,904	61%
Operating Expenses	\$ 315,631	4%
<u>Capital Outlay</u>	<u>\$2,216,800</u>	<u>35%</u>
Total	\$6,520,335	100%

6.2 Option 2 Option 2 – Partial Consolidations

Section 6.2 is AECOM's probable opinion of the costs for the communities for six different partial consolidation scenarios

A – Lowell and Dracut

This scenario consolidates the dispatch operations of communities of Lowell and Dracut only into a single dispatch center/PSAP. The other communities in NMCOG are not addressed by the scenario. Neither existing center has sufficient space nor would equipment to accommodate the new consolidated center; therefore new space and equipment be required. The required characteristics of this particular center are as shown below:

Number of positions	8
Required Space	7,065 square feet (construction covered by grant)
Number of employees	35
Expected Salaries	\$2,141,400.00
Capital Expenses	(covered by grant)
Operations & Maintenance	\$86,800.00

The participation ratio for this center would be based on the population and call volume of the communities and are shown in Table A-1.

TABLE A - 1
OPINION OF PROBABLE COST

Participation Ratio
Lowell and Dracut Consolidated Communication Center

USER AGENCY	CALL VOLUME	POPULATION	PARTICIPATION RATIO
Dracut	4,833	29,457	18%
Lowell	28,508	106,519	82%
TOTAL	33,341	135,976	100%

In order to have 8 fully staffed dispatch positions and 1 fully staffed supervisor position, 28 dispatchers and 5 supervisors are required, as well as one director, and one administrator, as detailed above. A -2 shows the probable annual salary cost for these employees, including fringes. Opinions on salary costs are based on the current salaries paid by the communities. A – 2 shows the probable cost per community for the salaries.

TABLE A-2
OPINION OF PROBABLE COST

Lowell and Dracut Consolidated Communication Center
Annual Salary Expenses
Option 2 - A

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Dracut	18%	\$ 387,200.00
Lowell	82%	\$ 1,754,100.00
TOTAL	100%	\$ 2,141,300.00

Table A –3 shows the probable annual cost to each community to cover operations and maintenance expenses.

TABLE A-3
OPINION OF PROBABLE COST
Lowell and Dracut Consolidated Communication Center
Annual Operations & Maintenance
Option 2 - A

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Dracut	18%	\$ 15,700.00
Lowell	82%	\$ 71,100.00
TOTAL	100%	\$ 86,800.00

Table A-4 shows AECOM’s opinion of what the probable annual changes will be for each community under this participation scheme. This takes the estimated savings due to grant funding into account.

TABLE A - 4
OPINION OF PROBABLE COST
Lowell and Dracut Consolidated Communication Center
Annual Change
Option 2 - A

USER AGENCY	2011 BUDGET	ANNUAL ASSESSMENT	NEW GRANT FUNDING	ANNUAL CHANGE
Dracut	\$ 476,655.00	\$ 402,900.00	\$ 129,100.00	\$ (202,855.00)
Lowell	\$ 1,294,118.00	\$ 1,825,200.00	\$ 584,900.00	\$ (53,818.00)
TOTAL	\$ 1,770,773.00	\$ 2,228,100.00	\$ 714,000.00	\$ (256,673.00)

B – Billerica, Tewksbury, and Chelmsford

This scenario consolidates the dispatch operations of communities of Billerica, Tewksbury, and Chelmsford only into a single dispatch center/PSAP. The other communities in NMCOG are not addressed by the scenario. None of the existing centers has sufficient space or equipment to accommodate the new consolidated center; therefore new space and equipment would be required. The required characteristics of this particular center are as shown below:

Number of positions	6
Required Space	5,399 square feet (construction covered by grant)
Number of employees	27
Expected Salaries	\$ 1,674,800.00
Capital Expenses	(covered by grant)
Operations & Maintenance	\$ 73,700.00

The participation ratio for this center would be based on the population and call volume of the communities and are shown in Table B-1.

TABLE B -1
OPINION OF PROBABLE COST

Participation Ratio

Billerica, Tewksbury and Chelmsford Consolidated Communication Center

USER AGENCY	CALL VOLUME	POPULATION	PARTICIPATION RATIO
Billerica	9,301	40,243	39%
Chelmsford	7,331	33,802	32%
Tewksbury	7,343	28,961	29%
TOTAL	23,975	103,006	100%

In order to have 5 fully staffed dispatch positions and 1 fully staffed supervisor position, 20 dispatchers and 5 supervisors are required, as well as one director, and one administrator, as detailed above. B -2 shows the probable annual salary cost for these employees, including fringes. Opinions on salary costs are based on the current salaries paid by the communities. B – 2 shows the probable cost per community for the salaries.

TABLE B-2
OPINION OF PROBABLE COST

Billerica, Tewksbury and Chelmsford Consolidated Communication Center

Annual Salary Expenses

Option 2 - B

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Billerica	39%	\$ 652,000.00
Chelmsford	32%	\$ 530,900.00
Tewksbury	29%	\$ 491,900.00
TOTAL	100%	\$ 1,674,800.00

Table B – 3 shows the probable annual cost to each community to cover operations and maintenance expenses.

**TABLE B-3
OPINION OF PROBABLE COST**

BillERICA, Tewksbury and Chelmsford Consolidated Communication Center
Annual Operations & Maintenance
Option 2 -B

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
BillERICA	39%	\$ 28,700.00
Chelmsford	32%	\$ 23,400.00
Tewksbury	29%	\$ 21,600.00
TOTAL	100%	\$ 73,700.00

Table B-4 shows AECOM's opinion of what the probable annual changes will be for each community under this participation scheme. This takes the estimated savings due to grant funding into account.

**TABLE B - 4
OPINION OF PROBABLE COST**

BillERICA, Tewksbury and Chelmsford Consolidated Communication Center
Annual Change
Option 2 - B

USER AGENCY	2011 BUDGET	ANNUAL ASSESSMENT	NEW GRANT FUNDING	ANNUAL CHANGE
BillERICA	\$ 488,800.00	\$ 680,700.00	\$ 172,500.00	\$ 19,400.00
Chelmsford	\$ 627,477.00	\$ 554,300.00	\$ 140,500.00	\$ (213,677.00)
Tewksbury	\$ 536,208.00	\$ 513,500.00	\$ 130,200.00	\$ (152,908.00)
TOTAL	\$ 1,652,485.00	\$ 1,748,500.00	\$ 443,200.00	\$ (347,185.00)

C – Pepperell, Dunstable, Tyngsborough, and Groton

This scenario consolidates the dispatch operations of communities of Pepperell, Dunstable, Tyngsborough, and Groton only into a single dispatch center/PSAP. The other communities in NMCOG are not addressed by the scenario. None of the existing centers has sufficient space or equipment to accommodate the new consolidated center; therefore new space and equipment would be required. The required characteristics of this particular center are as shown below:

Number of positions	5
Required Space	4,566 square feet (construction covered by grant)
Number of employees	23
Expected Salaries	\$ 1,441,500.00
Capital Expenses	(covered by grant)
Operations & Maintenance	\$ 67,200.00

The participation ratio for this center would be based on the population and call volume of the communities and are shown in Table C-1

TABLE C -1
OPINION OF PROBABLE COST

Participation Ratio

Pepperell, Dunstable, Tyngsborough, and Groton Consolidated Communication Center

USER AGENCY	CALL VOLUME	POPULATION	PARTICIPATION RATIO
Groton	1,426	477	17%
Dunstable	0	3,179	6%
Pepperell	1,381	11,497	37%
Tyngsboro	1,673	11,292	40%
TOTAL	4,480	26,445	100%

In order to have 4 fully staffed dispatch positions and 1 fully staffed supervisor position, 16 dispatchers and 5 supervisors are required, as well as one director, and one administrator, as detailed above. C -2 shows the probable annual salary cost for these employees, including fringes. Opinions on salary costs are based on the current salaries paid by the communities. C – 2 shows the probable cost per community for the salaries.

TABLE C -2
OPINION OF PROBABLE COST

Pepperell, Dunstable, Tyngsborough, and Groton Consolidated
Communication Center

Annual Salary Expenses

Option 2 - C

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Groton	39%	\$ 562,300.00
Dunstable	7%	\$ 93,900.00
Pepperell	26%	\$ 378,600.00
Tyngsboro	28%	\$ 406,700.00
TOTAL	100%	\$ 1,441,400.00

Table C – 3 shows the probable annual cost to each community to cover operations and maintenance expenses.

**TABLE C-3
OPINION OF PROBABLE COST**

Pepperell, Dunstable, Tyngsborough, and Groton Consolidated
Communication Center
Annual Operations & Maintenance
Option 2 - C

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Groton	39%	\$ 26,200.00
Dunstable	7%	\$ 4,400.00
Pepperell	26%	\$ 17,600.00
Tyngsboro	28%	\$ 19,000.00
TOTAL	100%	\$ 67,200.00

Table C-4 shows AECOM's opinion of what the probable annual changes will be for each community under this participation scheme. This takes the estimated savings due to grant funding into account.

**TABLE C-4
OPINION OF PROBABLE COST**

Pepperell, Dunstable, Tyngsborough, and Groton Consolidated Communication Center
Annual Change
Option 2 - C

USER AGENCY	2011 BUDGET	ANNUAL ASSESSMENT	NEW GRANT FUNDING	ANNUAL CHANGE
Groton	\$ 335,463.00	\$ 588,500.00	\$ 54,500.00	\$ 198,537.00
Dunstable	\$ 64,000.00	\$ 98,300.00	\$ 9,100.00	\$ 25,200.00
Pepperell	\$ 312,867.00	\$ 396,200.00	\$ 36,700.00	\$ 46,633.00
Tyngsboro	\$ 372,808.00	\$ 425,700.00	\$ 39,400.00	\$ 13,492.00
TOTAL	\$ 1,085,138.00	\$ 1,508,700.00	\$ 139,700.00	\$ 283,862.00

D – Lowell, Billerica, and Tewksbury

This scenario consolidates the dispatch operations of communities of Lowell, Billerica, and Tewksbury only into a single dispatch center/PSAP. The other communities in NMCOG are not addressed by the scenario. None of the existing centers has sufficient space or equipment to accommodate the new consolidated center; therefore new space and equipment would be required. The required characteristics of this particular center are as shown below:

Number of positions	12
Required Space	10,397 square feet (construction covered by grant)
Number of employees	51
Expected Salaries	\$ 3,074,700.00
Capital Expenses	(covered by grant)
Operations & Maintenance	\$ 113,000.00

The participation ratio for this center would be based on the population and call volume of the communities and are shown in Table D-1.

**TABLE D-1
OPINION OF PROBABLE COST**

Participation Ratio

Lowell, Billerica, and Tewksbury Consolidated Communication Center

USER AGENCY	CALL VOLUME	POPULATION	PARTICIPATION RATIO
Billerica	9,301	40,243	22%
Lowell	28,508	106,519	62%
Tewksbury	7,343	28,961	16%
TOTAL	45,152	175,723	100%

In order to have 11 fully staffed dispatch positions and 1 fully staffed supervisor position, 44 dispatchers and 5 supervisors are required, as well as one director, and one administrator, as detailed above. D -2 shows the probable annual salary cost for these employees, including fringes. Opinions on salary costs are based on the current salaries paid by the communities. D-2 shows the probable cost per community for the salaries.

**TABLE D-2
OPINION OF PROBABLE COST**

Lowell, Billerica, and Tewksbury Consolidated Communication Center

Annual Salary Expenses

Option 2 - D

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Billerica	22%	\$ 668,800.00
Lowell	62%	\$ 1,902,500.00
Tewksbury	16%	\$ 503,400.00
TOTAL	100%	\$ 3,074,700.00

Table D –3 shows the probable annual cost to each community to cover operations and maintenance expenses.

**TABLE D -3
OPINION OF PROBABLE COST**

Lowell, Billerica, and Tewksbury Consolidated Communication Center
Annual Operations & Maintenance
Option 2 - D

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Billerica	22%	\$ 24,600.00
Lowell	62%	\$ 69,900.00
Tewksbury	16%	\$ 18,500.00
TOTAL	100%	\$ 113,000.00

Table D-4 shows AECOM’s opinion of what the probable annual changes will be for each community under this participation scheme. This takes the estimated savings due to grant funding into account.

**TABLE D-4
OPINION OF PROBABLE COST**

Lowell, Billerica, and Tewksbury Consolidated Communication Center
Annual Change
Option 2 - D

USER AGENCY	2011 BUDGET	ANNUAL ASSESSMENT	NEW GRANT FUNDING	ANNUAL CHANGE
Billerica	\$ 488,800.00	\$ 693,400.00	\$ 199,800.00	\$ 4,800.00
Lowell	\$ 1,294,118.00	\$ 1,972,400.00	\$ 568,500.00	\$ 109,782.00
Tewksbury	\$ 536,208.00	\$ 521,900.00	\$ 150,400.00	\$ (164,708.00)
TOTAL	\$ 2,319,126.00	\$ 3,187,700.00	\$ 918,700.00	\$ (50,126.00)

E – Chelmsford, Westford, and Tyngsborough

This scenario consolidates the dispatch operations of communities of Chelmsford, Westford, and Tyngsborough only into a single dispatch center/PSAP. The other communities in NMCOG are not addressed by the scenario. None of the existing centers has sufficient space or equipment to accommodate the new consolidated center; therefore new space and equipment would be required. The required characteristics of this particular center are as shown below:

Number of positions	5
Required Space	4,566 square feet (construction covered by grant)
Number of employees	23
Expected Salaries	\$ 1,441,400.00
Capital Expenses	(covered by grant)
Operations & Maintenance	\$ 62,700.00

The participation ratio for this center would be based on the population and call volume of the communities and are shown in Table E-1

TABLE E -1
OPINION OF PROBABLE COST

Participation Ratio

Chelmsford, Westford, and Tyngsborough Consolidated Communication Center

USER AGENCY	CALL VOLUME	POPULATION	PARTICIPATION RATIO
Chelmsford	7,331	33,802	49%
Tyngsboro	1,673	11,292	14%
Westford	6,207	21,951	37%
TOTAL	15,211	67,045	100%

In order to have 4 fully staffed dispatch positions and 1 fully staffed supervisor position, 16 dispatchers and 5 supervisors are required, as well as one director, and one administrator, as detailed above. E -2 shows the probable annual salary cost for these employees, including fringes. Opinions on salary costs are based on the current salaries paid by the communities. E-2 shows the probable cost per community for the salaries.

TABLE E - 2
OPINION OF PROBABLE COST

Chelmsford, Westford, and Tyngsborough Consolidated Communication Center

Annual Salary Expenses

Option 2 - E

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Chelmsford	49%	\$ 710,700.00
Tyngsboro	14%	\$ 200,700.00
Westford	37%	\$ 530,100.00
TOTAL	100%	\$ 1,441,400.00

Table E – 3 shows the probable annual cost to each community to cover operations and maintenance expenses.

TABLE E-3
OPINION OF PROBABLE COST
Chelmsford, Westford, and Tyngsborough Consolidated
Communication Center
Annual Operations & Maintenance
Option 2 - E

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Chelmsford	49%	\$ 33,100.00
Tyngsboro	14%	\$ 9,400.00
Westford	37%	\$ 24,700.00
TOTAL	100%	\$ 67,200.00

Table E-4 shows AECOM’s opinion of what the probable annual changes will be for each community under this participation scheme. This takes the estimated savings due to grant funding into account.

TABLE E - 4
OPINION OF PROBABLE COST
Chelmsford, Westford, and Tyngsborough Consolidated Communication Center
Annual Change
Option 2 - E

USER AGENCY	2011 BUDGET	ANNUAL ASSESSMENT	NEW GRANT FUNDING	ANNUAL CHANGE
Chelmsford	\$ 627,477.00	\$ 743,800.00	\$ 138,100.00	\$ (21,777.00)
Tyngsboro	\$ 372,808.00	\$ 210,100.00	\$ 39,000.00	\$ (201,708.00)
Westford	\$ 385,872.00	\$ 554,800.00	\$ 103,000.00	\$ 65,928.00
TOTAL	\$ 1,386,157.00	\$ 1,508,700.00	\$ 280,100.00	\$ (157,557.00)

F – Lowell, Dracut, and Tyngsborough

This scenario consolidates the dispatch operations of communities of Lowell, Dracut, and Tyngsborough only into a single dispatch center/PSAP. The other communities in NMCOG are not addressed by the scenario. None of the existing centers has sufficient space or equipment to accommodate the new consolidated center; therefore new space and equipment would be required. The required characteristics of this particular center are as shown below:

Number of positions	8
Required Space	7,065 square feet (construction covered by grant)
Number of employees	35
Expected Salaries	\$ 2,141,400
Capital Expenses	(covered by grant)
Operations & Maintenance	\$ 83,600.00

The participation ratio for this center would be based on the population and call volume of the communities and are shown in Table F-1.

TABLE F - 1
OPINION OF PROBABLE COST

Participation Ratio
Option 2 - F

USER AGENCY	CALL VOLUME	POPULATION	PARTICIPATION RATIO
Dracut	4,833	29,457	17%
Lowell	28,508	106,519	77%
Tyngsboro	1,673	11,292	6%
TOTAL	35,014	147,268	100%

Table F – 2 shows the probable annual cost to each community to cover operations and maintenance expenses.

TABLE F-2
OPINION OF PROBABLE COST

Lowell, Dracut, and Tyngsborough Consolidated Communications
CenterFull Regional Consolidated Communication Center
Annual Operations & Maintenance

Option 2 - F

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Dracut	17%	\$ 14,100.00
Lowell	77%	\$ 64,300.00
Tyngsboro	6%	\$ 5,200.00
TOTAL	100%	\$ 83,600.00

In order to have 8 fully staffed dispatch positions and 1 fully staffed supervisor position, 28 dispatchers and 5 supervisors are required, as well as one director, and one administrator, as detailed above. F-3 shows the probable annual salary cost for these employees, including fringes. Opinions on salary costs are based on the current salaries paid by the communities. F - 3 shows the probable cost per community for the salaries.

**TABLE F-3
OPINION OF PROBABLE COST**

Lowell, Dracut, and Tyngsborough Consolidated Communications
CenterFull Regional Consolidated Communication Center
Annual Salary Expenses
Option 2 - F

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Dracut	17%	\$ 362,000.00
Lowell	77%	\$ 1,646,100.00
Tyngsboro	6%	\$ 133,300.00
TOTAL	100%	\$ 2,141,400.00

Table F-4 shows AECOM's opinion of what the probable annual changes will be for each community under this participation scheme. This takes the estimated savings due to grant funding into account.

**TABLE F-4
OPINION OF PROBABLE COST**

Lowell, Dracut, and Tyngsborough Consolidated Communications CenterFull Regional Consolidated
Communication Center
Annual Change
Option 2 - F

USER AGENCY	2011 BUDGET	ANNUAL ASSESSMENT	NEW GRANT FUNDING	ANNUAL CHANGE
Dracut	\$ 476,655.00	\$ 376,100.00	\$ 83,666.91	\$ (184,221.91)
Lowell	\$ 1,294,118.00	\$ 1,710,400.00	\$ 380,522.37	\$ 35,759.63
Tyngsboro	\$ 372,808.00	\$ 138,500.00	\$ 30,802.71	\$ (265,110.71)
TOTAL	\$ 2,143,581.00	\$ 2,225,000.00	\$ 494,992.00	\$ (413,573.00)

G – Lowell, Dracut, Tyngsborough, and Chelmsford

This scenario consolidates the dispatch operations of communities of Lowell, Dracut, Tyngsborough, and Chelmsford only into a single dispatch center/PSAP. The other communities in NMCOG are not addressed by the scenario. None of the existing centers has sufficient space or equipment to accommodate the new consolidated center; therefore new space and equipment would be required. The required characteristics of this particular center are as shown below:

Number of positions	9
Required Space	7,300 square feet (construction covered by grant)
Number of employees	39
Expected Salaries	\$ 2,374,700.00
Capital Expenses	(covered by grant)
Operations & Maintenance	\$ 90,200.00

The participation ratio for this center would be based on the population and call volume of the communities and are shown in Table G-1

TABLE G - 1
OPINION OF PROBABLE COST

Participation Ratio
Option 2 - G

USER AGENCY	CALL VOLUME	POPULATION	PARTICIPATION RATIO
Chelmsford	7,331	33,802	18%
Dracut	4,833	29,457	14%
Lowell	28,508	106,519	63%
Tyngsboro	1,673	11,292	5%
TOTAL	42,345	181,070	100%

Table G-2 shows the probable annual cost to each community to cover operations and maintenance expenses

TABLE G-2
OPINION OF PROBABLE COST

Communications Center Full Regional Consolidated Communication Center

Annual Operations & Maintenance

Option 2 - G

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Chelmsford	18%	\$ 16,200.00
Dracut	14%	\$ 12,500.00
Lowell	63%	\$ 56,900.00
Tyngsboro	5%	\$ 4,600.00
TOTAL	100%	\$ 90,200.00

In order to have 9 fully staffed dispatch positions and 1 fully staffed supervisor position, 32 dispatchers and 5 supervisors are required, as well as one director, and one administrator, as detailed above. G-3 shows the probable annual salary cost for these employees, including fringes. Opinions on salary costs are based on the current salaries paid by the communities. G- 3 shows the probable cost per community for the salaries.

**TABLE G-3
OPINION OF PROBABLE COST**

Lowell, Dracut, Tyngsborough, and Chelmsford Consolidated
Communications Center Full Regional Consolidated Communication Center
Annual Salary Expenses
Option 2 - G

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Chelmsford	18%	\$ 427,200.00
Dracut	14%	\$ 328,700.00
Lowell	63%	\$ 1,497,800.00
Tyngsboro	5%	\$ 121,000.00
TOTAL	100%	\$ 2,374,700.00

Table G-4 shows AECOM’s opinion of what the probable annual changes will be for each community under this participation scheme. This takes the estimated savings due to grant funding into account.

**TABLE G-4
OPINION OF PROBABLE COST**

Lowell, Dracut, Tyngsborough, and Chelmsford Consolidated Communications Center Full Regional
Consolidated Communication Center
Annual Change
Option 2 - G

USER AGENCY	2011 BUDGET	ANNUAL ASSESSMENT	NEW GRANT FUNDING	ANNUAL CHANGE
Chelmsford	\$ 627,577.00	\$ 443,400.00	\$ 99,038.94	\$ (283,215.94)
Dracut	\$ 476,655.00	\$ 341,200.00	\$ 76,195.91	\$ (211,650.91)
Lowell	\$ 1,294,118.00	\$ 1,554,700.00	\$ 347,239.27	\$ (86,657.27)
Tyngsboro	\$ 372,808.00	\$ 125,600.00	\$ 28,040.87	\$ (275,248.87)
TOTAL	\$ 2,771,158.00	\$ 2,464,900.00	\$ 550,515.00	\$ (856,773.00)

6.3 Option 3 Establish One Regional RECC

Section 6.3 considers the costs all communities consolidate into one Regional Emergency Communications Center.

6.3.1 Capital Equipment Expenses

Table 6-3-1 shows AECOM’s opinion of the capital costs necessary to fully equip the RECC for use by all nine communities. This amount covers the equipment and furniture for 12 dispatcher positions, one supervisor position, two training positions, and other necessary equipment. This does not include the cost of the building itself. The Commonwealth has indicated they will cover the capital costs incurred in this effort; therefore the costs are not addressed in later tables, except to calculate expected maintenance costs, and given here for information only.

TABLE 6-3-1
OPINION OF PROBABLE COST

Full Regional Consolidated Communication
Capital Equipment Expenses
Option 3

COST ELEMENT	COST OPINION
TELEPHONE EQUIPMENT	\$ -
CAD SYSTEMS	\$ 2,011,200
RADIO CONSOLE	\$ 632,700
DISPATCH CONSOLE FURNITURE	\$ 173,500
VOICE LOGGER	\$ 200,000
VENDOR SERVICES	\$ 754,400
SPARES - FIXED	\$ 60,300
CONTINGENCY	\$ 301,700
TOTAL	\$ 4,133,800

6.3.2 Capital Equipment Loan

If the capital expenses for the RECC are not covered by grant as has been indicated by the Commonwealth, it may be necessary to take out a loan to fully fund the consolidation. Table 6-3-2 shows the annual cost, per community, if the capital cost expressed in the previous section is paid for with a 10 year loan with an assumed government interest rate of 1.5%. Participation ratios are used to split the cost between communities, as explained above. Again this table is shown for information purposes only.

TABLE 6-3-2
OPINION OF PROBABLE COST

Full Regional Consolidated Communication Center
Annual Expenses for 10 Year Loan for Equipment @ 1.5%
Option 3

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Billerica	14%	\$ 61,400.00
Chelmsford	11%	\$ 50,000.00
Dracut	9%	\$ 38,500.00
Dunstable	1%	\$ 2,400.00
Lowell	40%	\$ 175,500.00
Pepperell	3%	\$ 13,300.00
Tewksbury	11%	\$ 46,400.00
Tyngsboro	3%	\$ 14,200.00
Westford	8%	\$ 37,300.00
TOTAL	100%	\$ 439,000.00

6.3.3 Salary Expenses

In order to have 12 fully staffed dispatch positions and 1 fully staffed supervisor position, 48 dispatchers and 5 supervisors are required, as well as one director, and one administrator, as detailed above. Table 6-3-3

shows the probable annual salary cost for these employees, including fringes. Opinions on salary costs are based on the current salaries paid by the communities.

TABLE 6-3-3
OPINION OF PROBABLE COST

Full Regional Consolidated Communication Center
Annual Salary Expenses
Option 3

COST ELEMENT	COST OPINION
DISPATCH STAFF	\$ 2,799,900.00
SUPERVISION	\$ 364,600.00
ADMINISTRATION	\$ 143,600.00
TECHNICAL	\$ -
TOTAL	\$ 3,308,100.00

6.3.4 Salary Expenses per Community

Table 6-3-4 shows the probable cost per community for the salaries in Table 6-3-3.

TABLE 6-3-4
OPINION OF PROBABLE COST

Full regional Consolidated Communication Center
Annual Salary Expenses
Option 3

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Billerica	14%	\$ 463,100.00
Chelmsford	11%	\$ 377,000.00
Dracut	9%	\$ 289,900.00
Dunstable	1%	\$ 18,300.00
Lowell	40%	\$ 1,322,300.00
Pepperell	3%	\$ 100,600.00
Tewksbury	11%	\$ 349,400.00
Tyngsboro	3%	\$ 106,700.00
Westford	8%	\$ 280,800.00
TOTAL	100%	\$ 3,308,100.00

6.3.5 Operations and Maintenance

Table 6-3-5 shows the breakdown in Operations and Maintenance costs.

TABLE 6-3-5
OPINION OF PROBABLE COST
Full Regional Consolidated Communication Center
Annual Operations & Maintenance Expenses
Option 3

COST ELEMENT	COST OPINION
FACILITY OPERATIONS	\$ 44,900
EQUIPMENT MAINTENANCE	\$ 75,400
TOTAL	\$ 120,300

6.3.6 Operations and Maintenance per Community

Table 6-3-6 shows the probable annual cost to each community to cover operations and maintenance expenses.

TABLE 6-3-6
OPINION OF PROBABLE COST
Full Regional Consolidated Communication Center
Annual Operations & Maintenance
Option 3

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Billerica	14%	\$ 16,800.00
Chelmsford	11%	\$ 13,700.00
Dracut	9%	\$ 10,500.00
Dunstable	1%	\$ 700.00
Lowell	40%	\$ 48,100.00
Pepperell	3%	\$ 3,700.00
Tewksbury	11%	\$ 12,700.00
Tyngsboro	3%	\$ 3,900.00
Westford	8%	\$ 10,200.00
TOTAL	100%	\$ 120,300.00

6.3.7 Total Annual Cost per Community

Table 6-3-7 shows AECOM's opinion of what the probable annual cost will be for each community under a full participation scheme. This cost includes salaries, operations and maintenance. As the Commonwealth has proposed to cover the capital costs the costs for any loan as shown in Table 6-3-2 are not included.

TABLE 6-3-7
OPINION OF PROBABLE COST
Full Regional Consolidated Communication Center
Annual Expenses Participation
Option 3

USER AGENCY	PARTICIPATION RATIO	ANNUAL ASSESSMENT
Billerica	14%	\$ 479,900.00
Chelmsford	11%	\$ 390,700.00
Dracut	9%	\$ 300,400.00
Dunstable	1%	\$ 19,000.00
Lowell	40%	\$ 1,370,400.00
Pepperell	3%	\$ 104,300.00
Tewksbury	11%	\$ 362,100.00
Tyngsboro	3%	\$ 110,600.00
Westford	8%	\$ 291,000.00
TOTAL	100%	\$ 3,428,400.00

6.3.8 Total Annual Cost per Community

Table 6-3-8 shows AECOM's opinion of what the probable annual changes will be for each community under a full participation scheme. This takes the estimated savings due to grant funding into account. This budget excludes the \$2.2 million in capital expenditures from the 2011 budgets.

TABLE 6-3-8
OPINION OF PROBABLE COST
Full Regional Consolidated Communication Center
Annual Change
Option 3

USER AGENCY	2011 BUDGET	ANNUAL ASSESSMENT	NEW GRANT FUNDING	ANNUAL CHANGE
Billerica	\$ 488,800.00	\$ 479,900.00	\$ 209,100.00	\$ (218,000.00)
Chelmsford	\$ 627,477.00	\$ 390,700.00	\$ 170,300.00	\$ (407,077.00)
Dracut	\$ 476,655.00	\$ 300,400.00	\$ 130,900.00	\$ (307,155.00)
Dunstable	\$ 64,000.00	\$ 19,000.00	\$ 8,300.00	\$ (53,300.00)
Lowell	\$ 1,294,118.00	\$ 1,370,400.00	\$ 597,200.00	\$ (520,918.00)
Pepperell	\$ 312,867.00	\$ 104,300.00	\$ 45,400.00	\$ (253,967.00)
Tewksbury	\$ 536,208.00	\$ 362,100.00	\$ 157,800.00	\$ (331,908.00)
Tyngsboro	\$ 372,808.00	\$ 110,600.00	\$ 48,200.00	\$ (310,408.00)
Westford	\$ 385,872.00	\$ 291,000.00	\$ 126,800.00	\$ (221,672.00)
TOTAL	\$ 4,558,805.00	\$ 3,428,400.00	\$ 1,494,000.00	\$ (2,624,405.00)

7.0 Conclusions and Recommendations

As has been described in previous sections, the participants in this study are facing complex decisions as to how to proceed with their public safety dispatching operations. During the course of this study, we examined several different alternatives. The advantages and disadvantages of each alternative were identified in Section 5. This section of the report is designed to present AECOM's recommendations and to answer the specific questions the study participants asked in the Request for Proposals.

The nine community members of the Northern Middlesex County Council of Governments have a rich history of providing service to their residents and visitors. The protection of life and property is a high priority for all levels of government in the United States. Based on the needs of their communities, each of the localities involved in this study has developed a public safety system to meet the needs of their community. Each locality has been diligent in its effort to provide service to their respective communities, and all are to be commended for their efforts.

The City of Lowell was founded as a planned industrial center in the late nineteenth century and is an urban center. The City has a substantial minority population and a higher than average percentage of residents living below the poverty line. In addition, the City has experienced an influx of immigrants. The language and cultural differences have created unique challenges for the City and its public safety agencies. As a result, the City of Lowell uses a different business model than do the other study participants.

The eight towns evolved from their roots as agricultural areas into suburban communities in a major metropolitan area. Because of their proximity to both Boston and Lowell, the towns are closely linked to both areas. The urban/suburban differences in the nature of the communities has had a significant impact on the nature of the public safety services currently being provided as well as any proposed consolidation of dispatch services. Thirty-seven percent of the study population resides in the City of Lowell. Each of the eight towns has significantly less population with the largest of the towns (Chelmsford) having less than forty percent of the City of Lowell's population. The relatively small population base and the character of the towns means that services, especially police services are delivered differently than they are in Lowell. Police and fire dispatch services are provided differently in Lowell than they are in the towns. In general, the services are being provided in a satisfactory way. However, government in general, and local government, in particular are experiencing unprecedented financial challenges. As a result, the City and Towns are being forced to explore methods of providing services in a more efficient way. The differences between the City and the Towns creates an added layer of complication in developing a satisfactory solution to providing high quality public safety services in the most cost-effective and efficient way.

7.1 How does the current 911 system and police/fire services work within each NMCOG community and across the region?

As described in more detail in Section 3 of this report, eight of the nine localities involved in this study operate public safety dispatch centers. These dispatch centers function as primary public safety answering points (PSAP), directly receiving incoming wireline and VoIP 9-1-1 calls. The Town of Dunstable does not operate a dispatch center. Instead 9-1-1 calls for Dunstable are answered by the Groton Police Department. Wireless 9-1-1 calls originating in all of the localities are answered by the State Police, and then transferred to the locality as appropriate.

Each of the localities' dispatch centers dispatch that locality's police department. In Billerica, Dracut, and Westford, the Town's fire department maintains and operates a separate dispatch center. Those dispatch centers function as secondary PSAPs, receiving 911 calls that are transferred from the primary PSAP. The Dunstable Police Department is dispatched by the Groton Police Department, and the Dunstable Fire Department is dispatched by the Pepperell Communications Center. The Pepperell Communications Center is a separate agency of Town government. The

seven other primary PSAPs are a part of that locality's police department. The dispatch centers also dispatch resources for non-public safety agencies, especially after normal business hours.

Public safety communications centers generally provide four functions for the agencies and communities they serve:

- Public Access which is the way the public accesses the public safety agencies.
- Command and Control Support which is communication within a particular agency in support of operations.
- Interagency Coordination which involves communications with other agencies and departments.
- Information Systems Access which provides access to the various local, regional, state, and national information systems.

With the exception of the City of Lowell and the Town of Dunstable, each of the town dispatch center personnel performs a significant amount of additional duties. One of the more significant of these collateral duties is staffing the police department front desk and serving those people that come to the department on an around-the-clock basis. The Massachusetts Safe Haven Act of 2004 allows people to drop off newborn infants at any hospital, police department, or manned fire station. Typically any infant drop offs are handled by the front desk/dispatch personnel. The front desk/dispatch personnel also monitor court-ordered custody exchanges. Lowell dispatch personnel do not staff the police department's front desk. The Dunstable Police Department is only open on a limited basis during the day.

The primary purpose of a public safety communications center is to get the correct assistance to the people who need it in the shortest amount of time. Numerous studies have shown the benefits of a prompt response by public safety agencies in true emergencies. Based on those studies, a number of standards focusing on response time have been developed. The National Fire Protection Association (NFPA) *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (NFPA 1710) establishes time objectives for responses to emergencies that should be met ninety percent of the time for both fire and medical emergencies. Career Fire Departments should arrive on the scene within five minutes of receiving the dispatch of a fire or medical emergency ninety percent of the time. In addition NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems* stipulates that ninety-five percent of emergency dispatching shall be completed within 60 seconds. That time is from the time the call is answered until the dispatch is complete. While response time standards are less defined for law enforcement agencies, numerous studies at least as far back as the *President's Commission on Law Enforcement and the Administration of Justice* in 1967 found a direct correlation between the response time of police officers and the solvability of the crime.

The 911 system and the 911 Customer Premises Equipment (CPE) as well as a logging recorder are provided by State 911 Department. Each department has installed and operates its own Computer Aided Dispatch system (CAD) and Records Management System (RMS). The CAD systems are not interconnected. Each department has installed its own radio system including dispatch consoles.

Again with the exception of the City of Lowell and the Town of Dunstable, each of the dispatch centers is normally staffed with one or two personnel. The centers are all in the beginning stages of Emergency Medical Dispatch, with some being farther along than others.

Each of the police and fire departments, with the exception of Dunstable, operate on separate radio channels. There are mutual aid channels available for both the police and fire departments. Several of the dispatch centers operate a Public Emergency Alarm System for receiving fire alarms from protected premises. Some of the dispatch centers receive the alarms by dedicated, town owned cable; others use radio alarms exclusively, and several receive alarms using both methods.

7.2 How well do the fire and police departments work together within each community in addressing 911 and dispatch issues?

The localities work collaboratively with each other and provide a high level of service to the communities they serve. Each of the dispatch centers has operated as a self-sufficient entity for a long time. Because each of the localities functions independently, each center has followed a diverse path to meet the needs of their respective communities and its citizens. This diversity presents some challenges in consolidating services.

The systems, networks, and dispatch centers generally meet the routine day-to-day needs of the communities. However, the centers can quickly become overloaded during busy periods. Public safety systems must function under all conditions. When unusual events occur, the issues and concerns highlighted in this section often significantly limit the ability of the public safety agencies involved in this study to respond as effectively as they need to in such a situation.

Section 4 of this report detailed the issues and concerns we identified as we assessed the current situation.

7.2.1 Should a consolidation take place?

A public safety Emergency Communications Center (ECC) functions as both the interface between the public and the public safety agencies of the community and provides coordination and support to those public safety agencies. An important part of the coordination and support an ECC provides to a given public safety agency is coordination with other agencies and responders. Any situation requiring more than one public safety responder requires coordination. That is true whether the responders are from the same or different agencies. More responders require more coordination. Coordination cannot occur without communications. A number of the participants in this study indicated that the lack of overall situational awareness of events occurring in neighboring jurisdictions and the lack of readily available interoperability between agencies were significant problems being encountered in the region. Bringing the existing dispatch centers into the same room will result in significant enhancements to the interagency coordination that is required when more than one agency is responding to an emergency.

A shared communications center, with proper implementation, also offers significant service improvements to all of the participants. By establishing high standards of performance, consistently assuring that those standards of service are achieved and further assuring that the center is properly organized, adequately staffed, responsive to the public safety providers and citizens, and well managed, the service provided to the citizens of the region will improve significantly. The goal must be the creation of an efficient, high-performing, customer-friendly organization.

A shared ECC will also allow improved, specialized support. Currently, support of the various systems used in the dispatch centers is provided by a number of individuals at each center as part of their many duties. These support duties are only a part of their duties. The same is true for training and quality assurance. The proposed staffing for the shared ECC will provide improved systems support as well as coordinated and improved training and quality assurance.

- **AECOM recommends that a shared regional emergency communications center be created.**

7.2.2 Who should participate in the Regional Emergency Communications Center?

As described above, AECOM explored a number of alternatives from no consolidation to full consolidation. Several different combinations of departments into smaller, regional centers were explored as was the concept of establishing a regional PSAP. After considerable analysis and discussion, AECOM makes the following recommendations:

- **AECOM recommends that the City of Lowell and the Towns of Billerica, Chelmsford, Dracut, Pepperell, Tyngsborough, Tewksbury, and Westford form a Regional Emergency Communications**

Center (RECC). We further recommend that the Town of Groton, a non NMCOG member and the Town of Dunstable join the RECC.

- **AECOM recommends that the three separate fire alarm offices/dispatch centers (Billerica, Dracut, and Westford) be incorporated into the RECC. In conjunction with that, all wired public emergency fire alarm systems be converted to wireless only.**

7.3 What training needs do each of these departments have and what resources are available at the state or federal levels to address these needs?

The State 911 regulations (560 CMR) were recently amended to change the training required for new 911 personnel. New personnel now must successfully complete the two day 911 equipment and basic training offered by the State 911 Department, forty hours of Department-approved basic telecommunicator training, and sixteen hours of Department-approved continuing education annually. Existing personnel must complete sixteen hours of Department-approved continuing education annually.

The State 911 Department has greatly expanded the amount and variety of training available. There is a wide variety of both on-line and class room training available through professional organizations, such as the APCO Institute and NENA, and private training providers.

7.4 If 911 services in Greater Lowell were regionalized, what would it cost and where would the RECC be located? What cost savings and service efficiencies, if any, would be realized if the service were regionalized and what collective bargaining issues would need to be addressed?

During the course of this study, we examined several different alternatives. After analysis by AECOM and discussions with NMCOG users, the following were identified as the most feasible:

- No Consolidation – Maintain Existing Situation
- Partial Consolidations
 - A – Lowell and Dracut
 - B – Billerica, Tewksbury, and Chelmsford
 - C – Pepperell, Dunstable, Tyngsborough, and Groton
 - D – Lowell, Billerica, and Tewksbury
 - E – Chelmsford, Westford, and Tyngsborough
- Establish One Regional RECC

The advantages and disadvantages of each alternative were identified in Section 5.

The costs of each alternative were outlined in Section 6 and summarized in TABLE 7-1

**Table 7-1
Localities Budget**

Locality	2011 Budget	No Consolidation	Partial Consolidation	Full Consolidation
Billerica	\$ 423,262.00	\$ 423,262.00	\$ 493,600.00	\$ 270,800.00
Chelmsford	\$ 627,477.00	\$ 627,477.00	\$ 97,559.13	\$ 220,400.00
Dracut	\$ 493,445.00	\$ 493,445.00	\$ 273,800.00	\$ 169,500.00
Dunstable	\$ 64,000.00	\$ 64,000.00	\$ 82,200.00	\$ 10,700.00
Lowell	\$ 3,494,118.00	\$ 3,494,118.00	\$ 1,240,300.00	\$ 773,200.00
Pepperell	\$ 312,867.00	\$ 312,867.00	\$ 359,500.00	\$ 58,900.00
Tewksbury	\$ 536,208.00	\$ 536,208.00	\$ 383,300.00	\$ 204,300.00
Tyngsborough	\$ 372,808.00	\$ 372,808.00	\$ 97,559.13	\$ 62,400.00
Westford	\$ 385,872.00	\$ 385,872.00	\$ 451,800.00	\$ 164,200.00
Total	\$ 6,710,057.00	\$ 6,710,057.00	\$ 3,479,618.26	\$ 1,934,400.00

It must be emphasized that the costs, as presented in TABLE 7-1, do not include the costs of staffing the front desk at any of the police departments. Each community will have to decide if they want to staff the desk on a twenty-four hour basis or for some period of reduced hours.

7.4.1 RECC Location

A public safety Emergency Communications Center (ECC) functions as both the interface between the public and the public safety agencies of the community and provides coordination and support to those public safety agencies. An important part of the coordination and support an ECC provides to a given public safety agency is coordination with other agencies and responders. Any situation requiring more than one public safety responder requires coordination. That is true whether the responders are from the same or different agencies. More responders require more coordination. Coordination cannot occur without communications. A number of the participants in this study indicated that the lack of overall situational awareness of events occurring in neighboring jurisdictions and the lack of readily available interoperability between agencies were significant problems being encountered in the region. Bringing the existing dispatch centers into the same room will result in significant enhancements to the interagency coordination that is required when more than one agency is responding to an emergency.

A shared communications center, with proper implementation, also offers significant service improvements to all of the participants. By establishing high standards of performance, consistently assuring that those standards of service are achieved and further assuring that the center is properly organized, adequately staffed, responsive to the public safety providers and citizens, and well managed, the service provided to the citizens of the region will improve significantly. The goal must be the creation of an efficient, high-performing, customer-friendly organization.

It must be noted, however, that each of the communities must make some difficult decisions about participating in any consolidation. Participating in a shared center would require the departments to change their service delivery model. As noted above, the current model generally is working satisfactorily. The question becomes one of being able to afford to continue to operate as each town does now.

There have been a number of successful creations of consolidated emergency communications centers throughout the country. The Center for Public Management- Maxine Goodman Levin College of Urban Affairs at Cleveland State University recently released the report *Consolidated Dispatch Center Feasibility: Case Studies*². The report provides information on the experience of a number of consolidations from across the country.

None of the existing centers has sufficient space to accommodate a shared center. We received informal information that the Middlesex County Sheriff may be amenable to using vacant land at the County Jail complex for the construction of a RECC. A multitude of factors influence the selection of the most appropriate site for a new PSAP. These factors must be understood at the outset so that clear decisions can be made by the governing authorities and for the citizens that the center will serve. The factors generally fall into five major categories: Functional, Natural Conditions, Man-Made Threats, Cost Issues, and Technological.

The process for selection is obviously one which involves rational criteria but may be influenced by political processes. Recognizing this, the relative risks and strengths of each site may be evaluated and adapted to the final site and building design. For example, a piece of property may be owned by a jurisdiction and therefore attractive from a cost perspective but may have inherent risks nearby such as a heavily traveled freight train route. Additional measures which might be required to protect the facility for this increased threat

² Cleveland State University. (2011) *Consolidated Dispatch Center Feasibility: Case Studies*. Retrieved from http://www.urban.csuohio.edu/publications/center/center_for_public_management/CaseStudiesFinal081811.pdf

may offset the cost savings for the relatively free site. For this reason, it is recommended that an evaluation matrix be developed and include weighted criteria for all factors including cost and availability.

Functional criteria is the first overall category to be reviewed and may include such evaluation factors such as accessibility, convenience, multiple access points, site size, closeness to redundant facilities, and overall facility diversity/distribution. It is important in this criterion that the idealized site size be determined. This should include both the size of the facility and the site features such as parking, clearances and equipment. Depending on the facility overall size, this may include an early exploration of two-story vs. one story concepts. A site located on a primary road may be scored higher than one located on a secondary route, provided the primary road is easily accessible from a traffic perspective. Routes with frequent traffic jams are generally not desirable. Special events (such as major sporting events, which do not allow access to the site) should also be considered; even if they are not on the final criteria. The location should also be evaluated for the convenience to the employees in terms of commute distance. Locations on primary roads allow the possibility that employees may mass transit. The convenience of location next to population centers and businesses should be evaluated in relation to site visibility and security. Multiple access points are considered important so that there can be a separation of public and private vehicular traffic as well as a secondary means to enter/exit the site in emergencies. Sufficient space is needed to provide for adequate set-back for security purposes. Where feasible critical facilities should be set-back a minimum of twenty-five meters, (eighty-three feet) from public roadways. Zoning laws should be reviewed so that any restrictions such as tower height and building size and type might be identified. This can be a major hurdle if not identified early in the process.

Natural conditions include all features which impact the site utilization and/or are risks to the continuous operation of a critical facility. Natural waterways particularly navigable waterways or shipping lanes pose risk as a result of the potential for accidental spills, or catastrophic fire or explosion. For these reasons a buffer zone is usually assigned to this feature with a ranking related to the relative distance from the buffer.

Most standards for PSAP's today include criteria intended to discourage locations within flood prone areas. The standard is based on the United States Geological Services (USGS) designated 500-year flood zone designation. In general, no critical facility should be located in this zone and similarly should not be located in basement locations which can be subject to localized flooding. Wetlands pose a similar threat and hazard, while impacting the environmental conditions in the area. This impact can be mitigated but will cause additional site development costs.

Localized drainage patterns are perhaps the most important feature to review in the site selection process. Sites that have poor drainage and or have major surface drainage features like ditches or natural swales would be considered less desirable than sites with high spots and naturally occurring drainage away from the major building location. Adjacent roadways should be lower than the proposed building location.

Wind hazards are hard to evaluate on a localized basis except in rare cases. Hurricanes and tornados effect whole regions and therefore should be identified for mitigation and protection rather than for individual site selection. For example, for facilities designed in Atlantic coastal regions, the maximum wind speed recorded is usually the design condition required for structural and component hardening.

Man-made threats are easily identified and usually impact the selection of sites the most in terms of overall risk. These factors include roadways (particularly interstate highways), freight rail lines, chemical plants (or other industrial manufacturing facilities which handle toxic or explosive products) and military installations. The relative risks and subsequent buffer areas for each of these factors are usually identified by the local emergency management agency.

Interstate highways and freight line railways pose similar hazards and thus are usually assigned similar buffer zones (usually one mile on either side). Evaluation criteria can be weighed on relative distance from the

buffer zones to the proposed site. The recommended protective action zone for some chemicals can exceed ten miles. Sites near nuclear plants are ranked according to the location either inside or outside the evacuation zone. Likewise chemical or other industrial facilities should have a ranking relative to the assigned buffer zone.

The location of potentially hazardous utilities to the project site (such as high voltage electric transmission lines, cross country gas or oil transmission lines) would tend to lower the desirability of the proposed site for a PSAP.

One criterion which is related to an earlier discussion of convenience and accessibility is the fact that these facilities generally should not be highly visible. Due to the critical nature of the function, public access is not crucial and visibility may lead to potential targeting. Likewise, locations next to regular special events or public target buildings should be avoided.

Costs are always a factor when consider prospective sites. This ranges from the acquisition, utilities availability and extension requirements, overall site grading and physical development and offsite improvements including upgrades and provision of redundancies.

Sites that are already owned are usually preferred and often the first evaluated. On the other end of the spectrum here is a site that requires all the acreage to be acquired through condemnation process, resulting in delays and additional service fees. Other options here include property that is donated but may include tax liabilities or restrictive covenants.

Higher ranking for economy is reserved for sites with all utilities including storm water, sanitary sewer, water, power, gas and data/telecommunications already located at or close by the project site. The availability of redundant utilities should also figure into the evaluation criteria. For example, it is desirable to have redundant feeds following diverse routes from the telephone company central office (CO) or from high speed fiber-optic lines provided either by the utility or the locality. Additionally, power availability from two different substations or two separate utilities is desirable. Utilities which must be extended to provide the required redundancy factors for the site are extremely costly and therefore are added to most cost factor evaluations.

Site development costs include overall grading, roads and parking areas. If there is a large amount of site clearing (tree removal) or leveling required to prepare the site for a building pad then costs can escalate. Generally, steep wooded sites fall into this higher cost category. Critical facilities can be constructed on these sites but costs are higher.

Sites for PSAPs should be evaluated on several technological factors. As mentioned earlier in the cost section, diversity of power and data/telecommunications is required for all these sites. If this is not possible then other means must be devised to overcome the redundancy issues. This may include additional generators, or microwave communication links. On site utilities such as well water and septic fields may be provided for remote sites. Finally, the site should be evaluated for the line of sight to adjacent structures or natural features which may have microwave towers or transmission sites.

The final analysis (due diligence) for completing the site selection for a PSAP may include a Phase One Environmental Site Assessment. This includes a data search for any jurisdictional wetlands and site specific archeological or historical significance. This review may require an option on the property, so that physical access to the site may be permitted. A complete analysis may also include soil test borings on the site to determine geologic and soil conditions on the site. For example, if the site has large rock outcroppings just below the surface, excavation costs will be higher to level the site for a building pad. Soil borings may also reveal conditions which may require supplemental foundations such as pilings or drilled piers.

It is clear that the process of selecting a site for a new PSAP should be carefully considered. It is recommended that each criterion be weighted and ranked in a collaborative forum so that an objective scoring can be made for each potential site. This ranking can then be presented to the local governing authority knowing that all factors have been considered and the decision process can move forward.³

In addition to determining the location of the RECC, there are several other steps that will need to be taken before construction can begin. First is the Pre-Design Phase, which involves the development of the building program (space planning and functionality requirements), and the conceptual design. The Design Phase follows including Schematic Design, Design Development, and the creation of construction documents. The construction phase follows.

In addition to the primary PSAP, there will need to be a fully functional back-up center. That back-up center needs to be sufficiently geographically separated so that the same event is unlikely to impact both centers. There will also need to be a designated alternate. The Alternate PSAP receives 9-1-1 calls in the event the primary PSAP doesn't answer.

The design of Emergency Communications Centers and Emergency Operating Centers is a specialized field. Most architectural and engineering firms are not familiar with the unique requirements for a fully functioning ECC. AECOM is well experienced in ECC/EOC design.

7.4.2 Personnel Issues

Personnel issues are another significant issue that must be dealt with if a consolidation is to occur. The personnel of the existing centers are all members of different collective bargaining units. There will be some contention over who is selected to represent the employees of the RECC. Since it will be a new, independent entity, if our recommendations are followed, the employees will need to decide if they want to be represented and by whom, then a new collective bargaining unit will need to be negotiated. Some of the issues will include:

Displacement Concerns:

In response to concerns expressed by current dispatchers about their future employment, it can be presumed that many of them will have the opportunity to transfer to the new organization. In addition, there will be a need for some positions to be retained at the employees' current departments for the collateral duties now currently being handled by the dispatch staff.

Rehiring & Seniority:

The ECC Director should be responsible for hiring the staff. The Director should give preference to dispatchers currently working in the participating entities. The standards for hiring new personnel will be set out in the directives that govern the communication centers. The board should decide compensation for the staff.

Tenure and seniority for dispatchers who have been displaced by the reorganization of a central communications center should remain (e.g., a dispatcher with 10 years of service at a particular department, should maintain his or her 10 years of service at a new center).

Existing dispatch employees of the involved agencies at the time of consolidation will also have the opportunity to apply for a position within their existing entity depending on their qualifications. The salary and benefits will be determined by the position the individual applies for.

³ Steven Loomis and Nathan McClure. *Selecting the Best Location for a New PSAP*, Emergency Number Professional Magazine. April 2007.

Compensation & Benefits:

There should be one compensation and benefits package equal to that of the highest paid dispatcher within the current grouping (e.g., if one entity offers the best compensation package to its dispatchers, then the board should offer a comparable package to all of its dispatch staff). The compensation package should include health and retirement benefits.

7.5 What administrative entity would need to be established in order for all communities to feel that their emergency needs would be addressed in an even-handed and equitable manner?

No two public safety agencies are identical. This is true not just in Massachusetts, but nationwide and worldwide as well. While there are many similarities, each agency has evolved based on its own, local situation. There are many factors that have contributed to the current state of each agency. The creation of a shared emergency communications center will result in significant changes in the operations of each of the participating public safety agencies. It is critically important that the process of creating the shared center be focused on making positive improvements to all aspects of the delivery of public safety services to all of the citizens of and visitors to Massachusetts.

One of the first issues that must be resolved if a shared center is created is the governance structure of the shared center. There are a number of models for the governance of a consolidated center. One possibility is for one of the existing agencies to absorb the dispatch operations of the other participants. Another model would be for eight of the agencies to contract with the ninth agency. The third involves co-location of dispatch centers. Each co-located center operates independently of the other co-located centers. Facilities are shared, but operations are separate. The fourth alternative is an independent center, where a single department or agency provides the dispatch services for all of the participating agencies. These organizational alternatives were discussed in Section 5.

The model that would best serve the City and all of the towns is to create an independent agency focused on the provision of public safety communications services for the study participants. The separate entity has been the model of choice in most successful consolidations that we have studied. We envision that the Emergency Communications Center would be a separate governmental authority. We recommend that a two-tiered governance structure be established to provide oversight of the agency. This would be a Board of Directors and a User Advisory Committee.

7.5.1 Regional Emergency Communications Center Board of Directors

The Board of Directors for the dispatch authority should be comprised of eight members. One member would be appointed by each participating governmental entity as members of the Board of Directors. It is recommended that the appointments be made from senior appointed officials, such as the Town Manager. The selection, however, shall be the individual decision of each participating entity. This board should be the general policy making authority for the dispatch operations. Its functions should include:

- Entering into contracts
- Acquiring, holding, or disposing of property
- Approval of authority's annual budget and expenditures
- Hiring, employing and terminating dispatch management staff
- Adopting and revising bylaws for its operations as well as the operations of the user advisory committee

7.5.2 User Advisory Committee

The second part of the governance structure is the User Advisory Committee. The User Advisory Committee should consist of senior representatives of the agencies service.

The function of the User Advisory Committee is to provide guidance and input to the Board of Directors and the Emergency Communications Center Director on operational and other appropriate issues. It is envisioned that the User Advisory Committee would work with the dispatch manager to develop appropriate standards

and procedures concerning ECC performance, personnel selection and training, and other technical and operational issues as directed by the Board of Directors.

7.5.3 Emergency Communications Center Director

The Regional Emergency Communications Center Director should be appointed by the Board of Directors, subject to the advice and consent of the User Advisory Committee. The Director should be responsible for many of the above duties initially established for the Board. For purposes of efficiency and consistency in management, many of the duties are outlined to the Board should be delegated to the Director. However, the Board should reserve the right of review and oversight.

The Director should be subject to the following standards:

- The Director should be responsible for managing the day-to-day operations of the center. The bylaws written by the Board should outline the powers bestowed upon the Director.
- Those powers should include, but not be limited to, the rights to hire, terminate, discipline, and manage personnel. However, the Board should reserve the right of review and to overrule a decision by the Director for serious personnel actions.
- The bylaws should specify when the Director may be involuntarily dismissed.

The rules governing the RECC should be laid out in a set of Standard Operating Procedures (SOP). The RECC Director and the User Advisory Committee should develop the SOP jointly. The SOP should be subordinate to any contradictory local ordinance, Massachusetts Statutes, the Board by laws or any current labor agreement or one subsequently adopted. The Commission on Accreditation of Law Enforcement Agencies (CALEA) in conjunction with the Association of Public Safety Communications Officials (APCO) has developed an accreditation program for communications centers. Two hundred eighteen standards have been developed as a part of the program. These standards are organized into six topic areas:

- Organization
- Direction and Authority
- Human Resources
- Recruitment and Selection
- Training
- Operations

The standards represent the best professional requirements and practices and describe what the agency should be doing, not how they should be doing it. While we recommend that the ECC pursue CALEA Communications Center Accreditation, the standards are a useful guide to the establishment of policies and procedures regardless of whether accreditation is sought or not.

As noted elsewhere, significantly fewer people will need to be assigned to dispatch duties than are now currently. With the exception of the City of Lowell, the dispatch personnel have significant additional, non-dispatch duties. Each town will need to decide how they are going to handle these collateral duties when the RECC becomes operational.

As part of the policy and procedure development discussed below, employment standards and procedures will need to be established. Once that process is complete, recruitment and selection of the RECC dispatch staff can begin. Existing dispatch employees of the participating agencies should be encouraged to apply. Some may choose to remain with their existing agency. Others may choose to retire or seek other employment.

- **AECOM recommends that the Regional Emergency Communications Center Authority be established as an independent governmental agency.**

- **The RECC should be governed by a Board of Directors consisting of representatives of the participating localities.**
- **There should also be a User Advisory Committee consisting of senior representatives of the participating agencies.**
- **The Emergency Communications Center Director should be hired by the Board of Directors.**

7.5.4 Dispatch Staff

As noted elsewhere, significantly fewer people will need to be assigned to dispatch duties than are now currently. With the exception of the City of Lowell and the Town of Dunstable, the dispatch personnel have significant additional, non-dispatch duties. Each town will need to decide how they are going to handle these collateral duties when the RECC becomes operational.

As part of the policy and procedure development discussed below, employment standards and procedures will need to be established. Once that process is complete, recruitment and selection of the RECC dispatch staff can begin. Existing dispatch employees of the participating agencies should be encouraged to apply. Some may choose to remain with their existing agency. Others may choose to retire or seek other employment.

If a sufficient number of existing dispatch employees apply, then the selection process can begin. We suggest that open applications only be sought if sufficient qualified people cannot be found in the pool of current employees.

The selection process should be completed no later than the four months prior to the RECC start-up date so that the employees can begin training. In addition to being trained on the new policies and procedures, the employees will need to become familiar with the operation of each of the participating agencies as well as the geography served by the RECC.

7.5.5 How should policies be made and changed?

The rules governing the RECC should be laid out in a set of Standard Operating Procedures (SOP). The RECC Director and the User Advisory Committee should develop the SOP jointly. The SOP should be subordinate to any contradictory local ordinance, Massachusetts Statutes, the Board by laws or any current labor agreement or one subsequently adopted. The Commission on Accreditation of Law Enforcement Agencies (CALEA) in conjunction with the Association of Public Safety Communications Officials (APCO) has developed an accreditation program for communications centers. Two hundred eighteen standards have been developed as a part of the program. These standards are organized into six topic areas:

- Organization
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The standards represent the best professional requirements and practices and describe what the agency should be doing, not how they should be doing it. While we recommend that the ECC pursue CALEA Communications Center Accreditation, the standards are a useful guide to the establishment of policies and procedures regardless of whether accreditation is sought or not.

- **AECOM recommends that the RECC Director and the User Advisory Committee should jointly develop a Standard Operating Procedure Manual, modeled on the CALEA Communications Center Accreditation Standards.**

7.6 Staffing Requirements and Personnel Issues

7.6.1 Administrative Staff

The RECC Director should have an administrative staff to help manage the centers. The administrative staff should consist of an Operations Supervisor, and a Technical Support Coordinator. The Operations Manger would be responsible for the day-to-day operation of the center, including staffing, training, and quality assurance. The Technical Support Coordinator would be responsible for keeping the system and equipment in the dispatch center up to date and functioning properly as well as maintaining the various data bases used by that center. We also suggest a full-time administrative assistant would be an important part of the administrative staff.

7.6.2 Operations Staff

As discussed in Section 5 of this report, AECOM recommends that there be a Shift Supervisor on duty in the ECC twenty-four hours a day. The shift supervisors would be experienced staff members who would be available to provide assistance and support to the staff in the event of questions as well as assure the smooth running of the ECC on an around-the clock basis.

The Director should develop standard operating procedures that ensure sufficient answering of incoming emergency calls. Even during peak periods of the day, staff at the communication centers should strive to answer at least 90% of incoming emergency calls within two rings (ten seconds) and complete 95% of emergency dispatching within sixty seconds.

Adequate staffing, as determined by the board and director, should be provided to ensure that those calls are answered in a timely fashion. We recommend a total of fifty-three full-time dispatchers and shift supervisors be hired in order to adequately staff the center in addition to the administrative staff.

7.6.3 Personnel Issues

Displacement Concerns:

In response to concerns expressed by current dispatchers about their future employment, it can be presumed that many of them will have the opportunity to transfer to the new organization. In addition, there will be a need for some positions to be retained at the employees' current departments for the collateral duties now currently being handled by the dispatch staff.

Rehiring & Seniority:

The ECC Director should be responsible for hiring the staff. The Director should give preference to dispatchers currently working in the participating entities. The standards for hiring new personnel will be set out in the directives that govern the communication centers. The board should decide compensation for the staff.

Tenure and seniority for dispatchers who have been displaced by the reorganization of a central communications center should remain (e.g., a dispatcher with 10 years of service at a particular department, should maintain his or her 10 years of service at a new center).

Existing dispatch employees of the involved agencies at the time of consolidation will also have the opportunity to apply for a position within their existing entity depending on their qualifications. The salary and benefits will be determined by the position the individual applies for.

Compensation & Benefits:

There should be one compensation and benefits package equal to that of the highest paid dispatcher within the current grouping (e.g., if one entity offers the best compensation package to its dispatchers, then the board should offer a comparable package to all of its dispatch staff). The compensation package should include health and retirement benefits.

7.7 What information systems would need to be upgraded, improved or replaced in order to ensure the rapid and compatible transmission of data, messages and information? What equipment would need to be replaced to ensure interoperability?

The five major equipment systems in a modern emergency communications center include the 9-1-1 system, the Computer Aided Dispatch (CAD)/Records Management System (RMS), the radio consoles, the logging recorder, and the workstation furniture. The public safety radio system is an essential element that extends beyond the RECC. Each of the PSAPs has installed a PlantCML VESTA Pallas 9-1-1 system provided by the state 9-1-1 department. While the systems are relatively new and employ current technology, new 9-1-1 CPE should be installed in the RECC. By the time the RECC becomes operational, the existing equipment will be nearing its recommended replacement date. A new system will also ease cutover. In addition, the VESTA Pallas system is sized to handle smaller PSAPs. The proposed RECC will be close to the system's capacity. Since the 911 system and the logging recorder are provided by the State 911 Department, the RECC will need to work with the State to obtain the new 911 equipment. As noted above, each of the departments operates a stand-a-lone CAD and RMS system. Multiple software vendors provide the systems. Of the systems currently in use, only the system used by the City of Lowell has sufficient functionality to adequately serve a RECC. New radio consoles would be required as would new workstation furniture. Serious consideration should be given to migrating to a regional radio system that would enhance interoperability and interagency situational awareness. The following contains AECOM's recommendations for each of these key systems.

7.7.1 9-1-1 Customer Premises Equipment (CPE)

Each of the PSAPs has installed a PlantCML VESTA Pallas 9-1-1 system provided by the state 9-1-1 department. While the systems are relatively new and employ current technology, new 9-1-1 CPE should be installed in the RECC. By the time the RECC becomes operational, the existing equipment will be nearing its recommended replacement date. A new system will also ease cutover. In addition, the VESTA Pallas system is sized to handle smaller PSAPs. The proposed RECC will be close to the system's capacity.

- **AECOM recommends that new 9-1-1 CPE be provided for the RECC.**

7.7.2 Computer Aided Dispatch/Records Management

Each of the PSAPs as well as two of the fire dispatch centers currently has their own separate CAD and RMS systems. A variety of software providers are used. Of the systems in use, only the system used by the City of Lowell has sufficient multi-agency functionality to serve a regional center. We suggest that the participants review the desired functionality and select a system that meets the needs of the RECC

- **AECOM recommends that a new CAD/RMS system be purchased. The system must have sufficient functionality and capacity to meet the RECC requirements. Consideration should be given to expanding the City of Lowell's system for the RECC.**

7.7.3 Radio Consoles

The radio console serves as the interface between the telecommunicator or dispatcher and the radio system. As with the other systems in the ECC, radio consoles are increasingly computer-based. In Section 7.6.6 below, we recommend implementation of a new regional radio system. The system installed may have a significant impact on which radio consoles are installed. While standards-based radio systems, such as APCO P25, are frequently being implemented, console systems are not yet standards based. As a result, consoles from one vendor may not work with another vendor's radio system infrastructure. The selection of the radio console system will need to be coordinated with the selection of the radio system vendor.

- **AECOM recommends that a new radio console system be implemented in conjunction with the radio system upgrade.**

7.7.4 Logging Recorder

In recent years the technology used in recording the telephone and radio traffic in dispatch centers has also changed significantly. Digital Voice Recorders, using computer based system are the standard in the industry. A new digital voice recording system with sufficient capacity to record and store the appropriate radio and telephone messages will be needed. The State 9-1-1 Department will provide the logging recorder as part of the 9-1-1 CPE package.

- **AECOM recommends that a new digital voice recording system with sufficient capacity to record and store the appropriate radio and telephone messages be installed in the RECC.**

7.7.5 Dispatch Workstation Furniture

As with the evolution of the various systems used in the Emergency Communications Centers, significant changes have occurred in the furniture used in the dispatch center. Gone is the traditional desk with radios sitting on top. Gone too are the massive metal cabinets replete with switches and buttons. Now the typical dispatch position is equipped with multiple large monitors, multiple keyboards, and multiple computer mice. Each workstation typical has three or more personal computers. Cable management is a significant issue. Electrical requirements are extensive. Heat dissipation has significant impact on the heating ventilating, and cooling systems. These changes have lead to a redefinition of the workstation. The change in the way work is done, has also led to increased attention to ergonomics or human factors engineering. Most dispatch workstation furniture is user adjustable to accommodate the differences in sizes of the personnel using it. In addition, the workstations must be capable of withstanding the around the clock usage by a variety of users. Experience has shown that even top-of-the-line office furniture cannot withstand the around-the-clock usage.

- **AECOM recommends that specifications be developed for the purchase of the specialized dispatch workstations.**

7.7.6 Regional Radio System

As noted previously in this report, each jurisdiction has installed and maintains its own radio system or systems to serve its public safety agencies. These systems use three different frequency bands and two different technologies. Many of the systems do not provide the full coverage necessary for effective public safety operations.

The participants in the RECC have a unique opportunity to implement a regional radio system that more fully meets the needs of the participating towns, the fire district, and the university. A new radio system is eligible for funding under the State 9-1-1 Department's RECC Incentive and Development Grant Programs.

AECOM has extensive experience in the design and implementation of regional radio systems. Over the past twenty-five years, we have been involved in a large number of similar systems. We have developed a project methodology to bring the implementation of a new radio system to a successful conclusion.

- **AECOM recommends that a new regional radio system be implemented.**

7.8 What principal coordination issues would need to be addressed in order for a regional 911 system to work?

The creation of a Regional Emergency Communications Center is a complex and challenging project. One of the first issues that will need to be addressed is participation. Many of the police and fire agencies are not convinced that an RECC is the best alternative. Because this is a contentious issue and will require major changes in existing policies in each community, it will take a significant effort and fairly long period of time to get agreement on participation from each community. While not all of the communities will have to have made their final decision before the project can proceed, a sufficient number of the communities must have made the determination so that the proposed center can be sized and so forth. ECC design and construction will be another issue requiring coordination as will the purchase of the various systems and equipment, personnel selection, policy and procedure development as well as financial policies. In short, it is anticipated that the project will take several years to bring to implementation.

7.9 How Should the Shared Center Be Funded

The recommended creation of a Regional Emergency communications Center will include significant capital expenditures as part of the start-up of operations. While the amount required is significant, and the first year of operation will require the expenditure of more funds than the combined cost of operating the six dispatch centers independently, the long term cost of the consolidation will result in cost savings for each of the jurisdictions. Not only will the personnel and operating costs be reduced, by combining the dispatch centers, the jurisdictions will not need to each purchase the items of capital equipment.

The State 9-1-1 Department has two grant programs that provide significant inducements to join a Regional Emergency Communications Center. The first of these is the Regional and Regional Secondary PSAP and Regional Emergency Communication Center Development Grant program, which supports the development and startup of regional and regional secondary PSAPs and regional emergency communication centers including facility construction and the equipment needed. Second is the PSAP and Regional Emergency Communication Center Support and Incentive Grants which assists PSAPs and regional emergency centers in providing enhanced 9-1-1 service and to encourage the development of regional PSAPs, regional secondary PSAPs and regional emergency communication centers. Each of the PSAPs currently receives some funding through this program. The amount of funding for a RECC is significantly higher. Included in the items eligible for reimbursement under this program are the following:

- 9-1-1 Telecommunicator Personnel Costs
- HVAC Equipment
- Computer Aided Dispatch systems
- Radio Consoles
- Console Furniture
- Fire Alarm Receiving and Alerting Equipment
- Public Safety Radio Systems
- Other Equipment and Related Maintenance

Currently the eight PSAPs that receive funding receive between eight and ten percent of their dispatch budget from the State 9-1-1 grants. Under the RECC incentive grants, it can be reasonably anticipated that the amount of funds provided will be significantly greater. At this point it is not possible to provide more specific numbers on the amount of grant funding that will be provided. The amount of the grants is determined based on a formula that includes the population served and the 9-1-1 call volume. Under the incentive grant program, not only is the initial purchase of the equipment eligible for funding, so too is the replacement of the equipment. While a new grant application will need to be submitted each year, it is reasonable to anticipate that the grant funds will continue at or above initial levels.

There are twenty-six federal grant-making agencies and over 900 separate federal grants-in-aid programs. There are fifteen (15) different types of federal assistance. These include seven financial types of assistance and eight non-

financial types of assistance. This paper focuses on two of the seven types of financial assistance: Formula Grants and Project Grants. Formula grants allocate funds to states or local governments according to a distribution formula prescribed by federal law. The State Homeland Security Grant Program and the Law Enforcement Prevention of Terrorism grant program are two examples of formula grants. The amount appropriated by Congress is distributed to the states on the basis of population. Other formula grant programs use more complex formulas to distribute the grants. Block grants are a subcategory of formula grants. Block grant programs often have a wide range of eligible activities typically covering a general problem area. Two examples of block grants are the Community Development Block Grant and the Byrne Memorial Justice Assistance Program. The COPS Interoperable Communications grant program is an example of a project grant program. Project grants are also referred to as discretionary grants. Funding is provided for specific projects for a fixed period of time. Often there is a competitive process among the grant applicants.

There is a good possibility that grants will cover most of the cost of the equipment needed to initiate the consolidated operation. With some exceptions, grants generally will not cover the cost of the facility.

While grant funding will be a significant source of revenue for the Regional Emergency Communications Center, the participating towns, the fire district, and the university will have to provide funding as well. A formula will need to be devised to allocate the funding requirements among participating entities. There are numerous examples of funding formulas available. Some use only one metric, such as 9-1-1 calls, radio transmissions, and so forth. The cost estimates in Section 6 are based on the number of 9-1-1 calls, as an example. Others use multiple factors. Central Operations for Police Services in Muskegon County, Michigan uses a formula that includes population, equalized property values, and system usage. The Charlottesville, Albemarle County, University of Virginia Joint Dispatch Center uses a formula including population, index crime, and calls for service. These are just two of many examples. Here are some other examples:

Orange County, FL

Orange County primarily utilized impact fees to fund their radio system. They attached a \$500 radio assessment fee to each single-family residential building permit in the County under the justification that it was the growth in the County that was causing the degradation of the system coverage and the need for an expanded radio system. The assessments are proportionally higher for larger commercial permits.

Cobb County, GA

Cobb County sold County owned property to finance the radio system upgrades. This property primarily came from the deaths of residents, as well as asset forfeitures under the RICO Act (where people convicted of certain acts forfeit all ill-gotten gains, including interest in any business gained through a pattern of "racketeering activity"). The County also added an impact fee of \$15/ticket for traffic violations to fund the radio system.

San Bernardino County, CA

San Bernardino County is preparing to pursue a five zone simulcast, P25 trunked and conventional radio system covering over 20,000 square miles. They are leaning towards a monthly user fee of between \$50 and \$75 per radio to fund acquisition, operation and maintenance of their system.

Muskegon, MI

Muskegon charged local jurisdictions a monthly user fee based on a formula containing the jurisdiction population, the tax base, the number of calls for service, and the number of CJIS checks requested of the 9-1-1 center (for law enforcement agencies). They also utilized funds from the 9-1-1 surcharges. The initial financing for construction of the system was obtained through a lease/purchase program managed by a local bank. Tax-exempt financing was provided at 70% of the prime rate. A dedicated millage was subsequently enacted to provide for continuing technological updates.

Commonwealth of Virginia

The Commonwealth of Virginia is building a statewide network for the Virginia State Police and other state agencies called STARS. The system will have approximately 130 sites and initial cost estimates were \$330 million. They received general legislature funding for system.

State of Illinois

The State of Illinois received an initial \$25 million federal grant to purchase new radio equipment for their new 146 site, statewide system constructed, owned and operated by Motorola through a public/private partnership. State and local jurisdictions lease airtime based on the number of radios approved for operation on the network.

Pima County, AZ

Pima County is planning to construct a wide-area, Project 25 (P25) trunked, simulcast 700/800 MHz two-way radio communications system covering over 10,000 square miles and designed to serve twenty fire departments and districts, eleven law enforcement agencies, and the Pima County Office of Emergency Management and Homeland Security. The County is utilizing a bond issued for the purpose, and already approved by the citizens through a special ballot. The County, in partnership with the City of Tucson, is also seeking supplemental funding through public grant programs from the U.S. Department of Homeland Security. The grant monies will be used to offset some of the acquisition costs, especially as they relate to specific equipment classifications covered by the federal grant.

Tomkins County, NY

Tomkins County is planning to build a ten (10) site, digital, trunked 800 MHz simulcast Land Mobile Radio (LMR) system with a connected microwave ring. This \$15-20 million radio project will be primarily funded by local bonds. The infrastructure, such as towers, equipment shelters, and site work will be bonded for 20 years. Other types of equipment will be bonded for up to 10 years, commensurate with the expected useful lifespan of the technology and hardware. Two public safety grants relating to the project, of approximately \$500,000 each, have been received through the efforts of local congressmen.

Allegany County, MD

Allegany County, MD, has found a way to provide its first response agencies with advanced telecommunications services, such as enhanced interoperability, mobile high-speed data terminals and more, by using an innovative public/private partnership.

The Allegany County Network, AllCoNet2, is a carrier class communication network that provides high quality communication services to public safety, government, educational, commercial and residential users. AllCoNet was originally developed by the Allegany School System to bridge the "Digital Divide" in a cost effective manner to improve educational opportunities. As AllCoNet2 evolved over time, additional government agencies such as the libraries, City and County government and public safety agencies adopted it as a cost-effective, reliable solution to the need for interoperable communications including voice, data and video. Construction and operational costs are thus shared among a number of groups, rather than being borne entirely by Allegany County's public safety agencies.

Their outstanding public/private partnership received the 'Smart Practice' designation from the Federal Emergency Management Administration (FEMA) in 2006. This proven network has been the only municipal network to receive this designation and has been in operation since 2003. For more information on the principles behind their network, see the next section on Cambria County, which adopted a similar plan.

Cambria County, PA

Cambria County has initiated a project known as "Cambria Connected", which will fund their radio system through a unique and creative way based on a proven example from Allegany County, MD. This project will allow Cambria County to offer some of the benefits of their public safety communications system upgrade to the community, by providing services such as high-speed internet, IP telephone, mobile data communications, and video monitoring to public safety agencies, local businesses, and even private citizens.

Costs for the initial radio and emergency center upgrades were estimated by the County at \$4.5 million. Looking to avoid the bond and tax issues for funding, they decided to overbuild the network for approximately \$10 million and develop a public/private cooperation to lease the excess capacity.

The County pursued the system through a no-bid, lease-purchase, tax exempt plan financed through an area bank. The expectation is that the project will be able to pay off their 15 year, \$10 million acquisition loan in approximately 7 years. Revenue potential is expected to reach the neighborhood of \$300,000 per month.

They have actively sought out partners from around the County and State who could potentially receive benefit from their high capacity network. For example, the Commonwealth of Pennsylvania traded tower space with the County to reduce their fees for leased lines connecting the PENDOT road signs by over \$10,000/month. The network will also provide free video monitoring and internet for Forestry and other State agencies.

Cambria County issued a contract to CONXX to build and maintain a high-capacity (OC3 - 155.52 Mbps currently, with plans upgrade to OC12 - 622.08 Mbps) SONET ring network around the County. The ring connects the 15 County radio sites, along with other commercial entities, to provide a telecommunication-grade infrastructure with advanced security features and architecture that enables the network to safely and effectively provide a variety of services to a diverse user community.

The CONXX Carrier Communication Platform™ is a telecommunication-grade infrastructure deployed wirelessly. It provides traditional T1 and frame relay connections for phone systems, data networks, and metropolitan LAN connections to link government and businesses across the County. It provides high-quality connections to tie the public safety two-way radio system together and mobile communications to provide high-speed networks between police, fire and other government agencies. Schools are able to connect at up to 20 times existing speeds allowing IP voice, high definition school security systems and "on-demand" multimedia access in classrooms.

The project involves a revenue sharing plan, with Cambria County and CONXX splitting the revenue from entities that join the network. Currently, the County receives 70% of the revenue and CONXX receives the other 30%. Those percentages will change over time, based on certain milestones, with a final ratio of 50/50 when the network is mature. The County owns the microwave network, but CONXX operates and maintains it for a negotiated annual fee of approximately \$300,000. Since CONXX would like to expand its customer base (and hence, increase its revenue stream), they have taken responsibility for all marketing, advertising and sales activities.

The County commissioners also want to improve broadband Internet access for residents. To promote social inclusion, the network will provide high-speed broadband access to many areas of the County that previously had no access. The network includes plans for the deployment of metro Wi-Fi (with technology from Wavion) in several communities where traditional DSL and cable have not been available in the past. Where Wi-Fi will not be available, residential and business customers can still gain access to the network through fixed wireless connections.

The County will be able to eliminate most of its own monthly communication costs, and at the same time create opportunities for economic development and better government and public safety services. For instance, the new system is allowing the County to drop Verizon as their mobile data provider at a savings of over \$150,000 per year. Internet service to the County is now available free from four local internet service providers, in exchange for access to the County network. For \$30 per month, many Cambria County residents can obtain high speed internet service, from which the County receives \$5 per month in revenue. Additionally, because of the economics, the County has the ability to provide free (or at a very low cost) broadband access to the homes of children who qualify for subsidized lunch programs at school.

As part of the development of the joint powers agreement for the creation of the RECC, a consensus will need to be reached on the specific formula that will be used.

Appendix A of this report contains a comparison of the operating budget for the Regional Center versus the cost of continuing the current operations for the next twenty years.

- **AECOM recommends that the RECC develop a funding formula to cover those costs not funded by other means.**

7.10 Implementation Plan

The implementation of the Regional Emergency Communications Center is a significant, multi-faceted project. There will need to be close coordination between all of the activities in order to make certain that all of the activities occur in a timely manner. We suggest thinking of the project in four elements that must come together: the governance structure; dispatch facility and equipment, radio system, personnel selection and training, and policy and procedure development.

7.10.1 Governance Structure

- **Commitment to Participate:** Before any other activities occur, and as expeditiously as possible, each of the towns, the university, and the fire district should formally commit to participate in the RECC. We suggest this be accomplished by June 30, 2012.
- **Draft Intergovernmental Agreement:** As soon as the involved entities have committed to the consolidation project, legal counsel for the entities should prepare the intergovernmental agreement and present it for adoption. All involved entities should adopt the agreement no later than December 31, 2012.
- **Recruit, select, and hire the Emergency Communications Center Director**

The creation of a RECC is a challenging undertaking. Finding the right person to lead that consolidation is a critical early step in the consolidation process. We recommend that the proposed scope of the consultant discussed above be modified to include the development of a job task analysis and job descriptions for all the proposed positions. As soon as the job task analysis and job description development is complete, efforts should begin to recruit, select and hire the director. It is important that the director be brought on board as early in the process as feasible. The additional dispatch administrative positions recommended should be phased in over the next twelve months.

The administrative staff will have much to do in order to get the new facility and consolidated dispatch center in operation. It may be advisable to augment the staff with outside assistance.

7.10.2 Facility Development

Typically, the construction of a new public safety communications center takes a minimum of eighteen months from the start of the design phase until the completion of construction. Installation and burn-in of the new equipment adds another forty-five to sixty days on to the substantial completion of construction. The RECC has received a RECC Development grant for the design of a new facility. The actual design of the facility should begin as soon as the commitment to participate is received from the entities involved. It should begin no later than May 1, 2010. As noted above, the design of public safety communications centers and emergency operations centers is a specialized field. It is important to the success of this that a firm with the appropriate experience be selected.

The following tasks are part of the development of the new facility:

- | | |
|--------------------------------------|--------------------|
| • Subproject start | January 1, 2013 |
| • Complete Space Planning for RECC | March 31, 2013 |
| • Complete Dispatch Center Design | September 30, 2013 |
| • Begin Dispatch Center Construction | January 1, 2014 |

- Dispatch Center Substantial Completion December 31, 2014
- Cutover to Consolidated Center March 2, 2015
- **AECOM recommends that the RECC begin the design and development of new facility no later than January 1, 2013 and begin the procurement process for new 9-1-1 CPE, a new CAD system, radio consoles, and specialty furniture in a timely manner to allow the installation as soon as the new dispatch facility is substantially completed.**

Detailed functional specifications, based on the specific needs of the user agencies, will need to be developed, requests for proposals issued, proposals received and reviewed, negotiations conducted with the successful respondents, and the system implemented in close coordination with the building schedule. In order to achieve the coordination, the procurement process for this specialized equipment should begin shortly after the building contractor is selected. This process should begin about the time the construction of the facility starts.

7.10.3 Radio System Development and Implementation

Through years of producing successful and effective communications solutions, AECOM's team developed a number of highly effective technical and management processes. These processes are embodied in our four-phase methodology:

- **Phase 1 Systems Definition** - The Systems Definition begins with you providing AECOM a notice to proceed, and concludes upon provision of the final documentation to you. It includes gathering data and background information, assimilating the information into a Conceptual System Design, and documenting the process and the cost information. This phase normally takes approximately three months.
- **Phase 2 Functional Specifications Development** - The Specifications phase begins upon you providing AECOM notice to proceed and concludes upon delivery of the final specifications or procurement documentation to you. This phase also takes approximately three months.
- **Phase 3 Procurement** - The Procurement Phase entails the period beginning with the issuance of the system specifications, and concludes with the signing of the contract between the RECC and the system supplier. The procurement process will have been defined prior to issuing the procurement documentation, and should be carefully and strictly followed in order to mitigate the risk of vendor protest. This phase typically takes about four and one-half months.
- **Phase 4 Implementation** - The Implementation Phase entails the period beginning immediately after the signing of the contract between RECC and the contracted vendor (Contractor), and concludes with the acceptance of the project after cutover. Typically this process takes approximately twelve months.

The radio system subproject schedule is summarized below:

- Subproject start January 1, 2013
- Systems Definition Complete June 30, 2013
- Specification Development Complete November 1, 2013
- Procurement Phase Complete March 1, 2014
- System Implementation Complete March 1, 2015

- **AECOM recommends that the RECC begin the design and implementation of a regional radio system no later than May 1 2010.**

7.10.4 Policy and Procedure Development

A comprehensive, well thought out uniform set of written directives, including standard operating procedures and policies will be a critical part of the operation of the shared communications center. Work to develop these directives should begin immediately after the director is brought on board with the goal of having them completed well before cutover.

- **AECOM recommends that the RECC Director be selected and hired no later than June 30, 2013.**

- **AECOM recommends that the development of the comprehensive policy and procedure manual be completed no later than January 1, 2015.**
- **AECOM recommends that the RECC dispatch staff be selected and begin training on the policies and procedures no later than January 1, 2015.**

7.11 Project Management

The establishment of a Regional Emergency Communications Center is a complex and significant project. Successful implementation of the RECC will require an innovative staff comprising a combination of high technical expertise, demonstrated management capability, and a strong commitment to quality, schedule, and cost-control.

AECOM has overseen the procurement and implementation of numerous communications projects. Some clients desire a hands-off approach where the project is under control of the Land Mobile Radio (LMR) vendor to deliver a turnkey radio system. Other clients prefer to expend the effort to manage the process, perhaps manage several vendors, and in the process, receive the system they wanted at significantly reduced cost. We believe that the RECC fits in the latter category, and with AECOM's help, can construct the recommended system in an affordable manner.

AECOM is committed and proficient to the core processes of successful project management: project integration management, project scope management, project time management, project quality management, project communications management, project risk management, and project cost management.

The entities participating in this study face significant challenges as each seeks to provide high quality services to its citizens and visitors. The implementation of a Regional Emergency Communications Center is an opportunity to provide improved services while reducing the long-term costs to each community. This is made even more advantageous by the grant programs of the State Department. The implementation of a RECC is not only feasible, it is strongly recommended.

ⁱ Greater Lowell Comprehensive Economic Development Strategy, 2009-2013

ⁱⁱ *Pre-Disaster Mitigation Plan for the Northern Middlesex Region*

ⁱⁱⁱ Ibid

^{iv} Ibid

^v Ibid

^{vi} Ibid

^{vii} Ibid

^{viii} Ibid

^{ix} Adapted from Kavanagh, Donal D. *The Application of 900 MHz Band to Law Enforcement Communication*. Superintendent of Documents, US Government Printing Office, Washington, D.C. 1978.

^x Steven Loomis and Nathan McClure. *Selecting the Best Location for a New PSAP*, Emergency Number Professional Magazine. April 2007.

About AECOM

AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental, energy, water and government. With approximately 54,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and collaborative technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. A Fortune 500 company, AECOM serves clients in more than 100 countries and has annual revenue in excess of \$6.3 billion.

www.aecom.com/technologysolutions

Cheryl Giggetts
20715 Timberlake Road, Suite 106
Lynchburg, Virginia 24502
USA
434 239 9200
cheryl.giggetts@aecom.com