

Fire and EMS Integration and Consolidation Study

BERLIN, NEW HAMPSHIRE

FINAL DRAFT REPORT



March 2019

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1 Introduction and Executive Summary

The Matrix Consulting Group was retained to conduct an integration and consolidation study for the City of Berlin Fire Department and the Berlin Emergency Medical Services, Inc. This document is the report of the project teams' work that includes an analysis of staffing, response capabilities, financial resources, and operational readiness related to the emergency medical services delivery.

1. Study Scope of Work

Government organizations should periodically review the services that they deliver to identify resource requirements, operational efficiencies, management and that customer services goals are met. Public safety operations are not exempt from this need. The focus of this study is the feasibility of integrating the emergency medical services into the Berlin Fire Department. As a result, the scope of this project was comprehensive and included:

- Response capabilities;
- Response time analysis;
- Financial resources;
- Staffing and manpower;
- Training and education.

This assessment is intended to provide analysis and clearly illustrate the choices for the viability of the integration of emergency medical services to be more effective in response to calls for service and the financial viability of the endeavor.

2. Methodology Used in the Study

To understand and evaluate service level issues facing the City, the project team undertook an assessment of both entity's operations. The principal approaches utilized by the project team in this study included, but were not limited to, the following:

- **Internal Interviews** – members of the project team individually interviewed numerous management and supervisory staff of the Berlin Fire Department, the City of Berlin, and Berlin EMS as part of this study.
- **Data Collection** – the project team collected a wide variety of external and internal

data documenting the structure, operations and organization, including:

- Department staffing and scheduling
- Documentation reflecting operations management
- Numerous output data reflecting services provided
- Various other performance information

This data was summarized in a 'descriptive profile' of both the City of Berlin Fire Department and Berlin EMS (private agency), which was reviewed by the staff of both entities to ensure we had a factual foundation for the study. This approach ensured that the project team had an appropriate understanding of their operations.

Data was collected over the past several months and presented in interim deliverables. Throughout this process, the project team reviewed facts, findings, and conclusions through these interim deliverables with the agencies.

3. Summary of Recommendations

This report focuses on the integration of emergency medical services delivery into the Fire Department. Throughout the process of evaluating the emergency medical services integration into the Fire Department there are additional recommendations that should be implemented. The table below provides a summary list of all the recommendations, appearing in sequential order, in this report.

COMMUNICATIONS

Dispatching of emergency services for the City of Berlin should be consolidated into a single point of notification at the police department to ensure the units are dispatched efficiently and the accuracy of the information for the call is captured.

With the consolidation of the dispatch services, at the police department, establish call processing benchmark performance objectives of 64 seconds for emergency calls.

PERFORMANCE OBJECTIVES

Establish turnout benchmark performance objectives of 60 seconds for emergency medical calls and 90 seconds for fire and special operations calls 90% of the time for stations and units that are staffed with career personnel.

Establish travel time baseline performance objectives of 6 minutes 30 seconds 90% of the time for the suburban areas of Berlin.

Establish travel time baseline performance objectives of 13 minutes 90% of the time for the rural areas of Berlin.

INTEGRATION OF EMERGENCY MEDICAL SERVICES

Increase the administrative staffing of the Fire Department to include a Captain to oversee and manage the Emergency Medical Services section of the Fire Department at an initial cost of \$92,576 for salary and benefits.

Increase overall staffing of the Fire Department by five (5) personnel to achieve a daily staffing of six (6) personnel per shift, with a minimum staffing of five (5) per shift and work toward training a total of (12) state licensed paramedics to provide each shift with three (3) paramedics and a minimum staffing of two (2) paramedics per shift at an initial cost of \$428,553.

Acquire the services of a physician that meets the requirements of the State to serve as the Medical Director for the emergency medical services system. This should be a local physician that is willing to donate their time to provide the service.

Provide training and education for the newly hired paramedics to be certified as Firefighter II in the State at a cost of \$1,500 per employee before the start of emergency medical services operations. There will also be salary and overtime costs to cover shifts while personnel are in training.

Begin the process of training the existing staff to the level of emergency medical technician – basic at a cost of \$1,300 per employee.

The City should acquire bids to purchase the apparatus and equipment necessary to provide advanced life support services to the community at a cost in the range of \$125,000 to \$150,000 per apparatus including the cost for the equipment.

Purchase any additional equipment necessary to meet the State requirements for the provision of advanced life support services to the City at a cost in the range of \$20,000 to \$35,000.

Establish an apparatus replacement program for apparatus to contain benchmarks and measurable components for the planned replacement of apparatus along with a funding mechanism.

Lease space to house two (2) ambulances and personnel until such time as the new facilities are ready at a cost of \$1.00 per square foot or about \$2,400 per month for 2,400 square feet.

Begin construction of apparatus space to house at least two (2) ambulances for an estimated cost of \$250,000.

The City of Berlin should contract with a third-party company to handle their billing and collections for services. Cost for the service is estimated at approximately \$11,000 annually using 1.5% of collections.

The table below illustrates a proposed timeline to integrate the emergency medical services into the Fire Department and be operational by July 1, 2021, if the consolidation effort began in July of 2019.

Proposed Implementation Schedule							
Months	1-4	5-8	9-12	13-15	16-19	20-24	25+
Hiring a Captain							
Hiring a Medical Director							
Acquiring Vehicles							
Acquiring Medical Equipment							
State Licensing and Certifications							
Hiring Paramedics							
Basic Firefighter Training							
Training existing personnel to EMT-B							
Begin construction of apparatus bays							

As illustrated above, the integration of the emergency medical services will require several steps, many of which can be done simultaneously. This integration will take a minimum of 24 months to complete.

2 Overview of the Current Service Environment

This chapter provides summary information regarding the current organization and operation of the Berlin Fire Department (BFD) and the Berlin Emergency Medical Services, Inc. (BEMS) and serves as the context for the analysis of emergency services. The various types of data were developed through interviews with management and personnel, tours of stations and the response areas of the Departments, review of available documents and records, as well as access to computerized records and data sets. The organization of this chapter is as follows:

- Background and Overview
- Financial Resources
- Organizational Structure
- Overview of the Departments
- Operations

Berlin is located in Coos County in northern New Hampshire and is the northernmost city in New Hampshire. The Androscoggin River flows through the City along with the Dead River. Gorham and Randolph are south of the City and Milan is to the north. The White Mountains are to the south of the City with Mt. Forist to the west. The area was originally settled in the mid 1700's and the City was incorporated in 1897. The City has an area of 62.5 square miles of which 61.5 square miles is land. The US Census Bureau estimates the population of the City is 10,225 people resulting in a population density of about 166 person per square mile.

The Fire Department provides fire suppression and medical first responder services to the City while Berlin EMS provides emergency medical response, transport and transfer services.

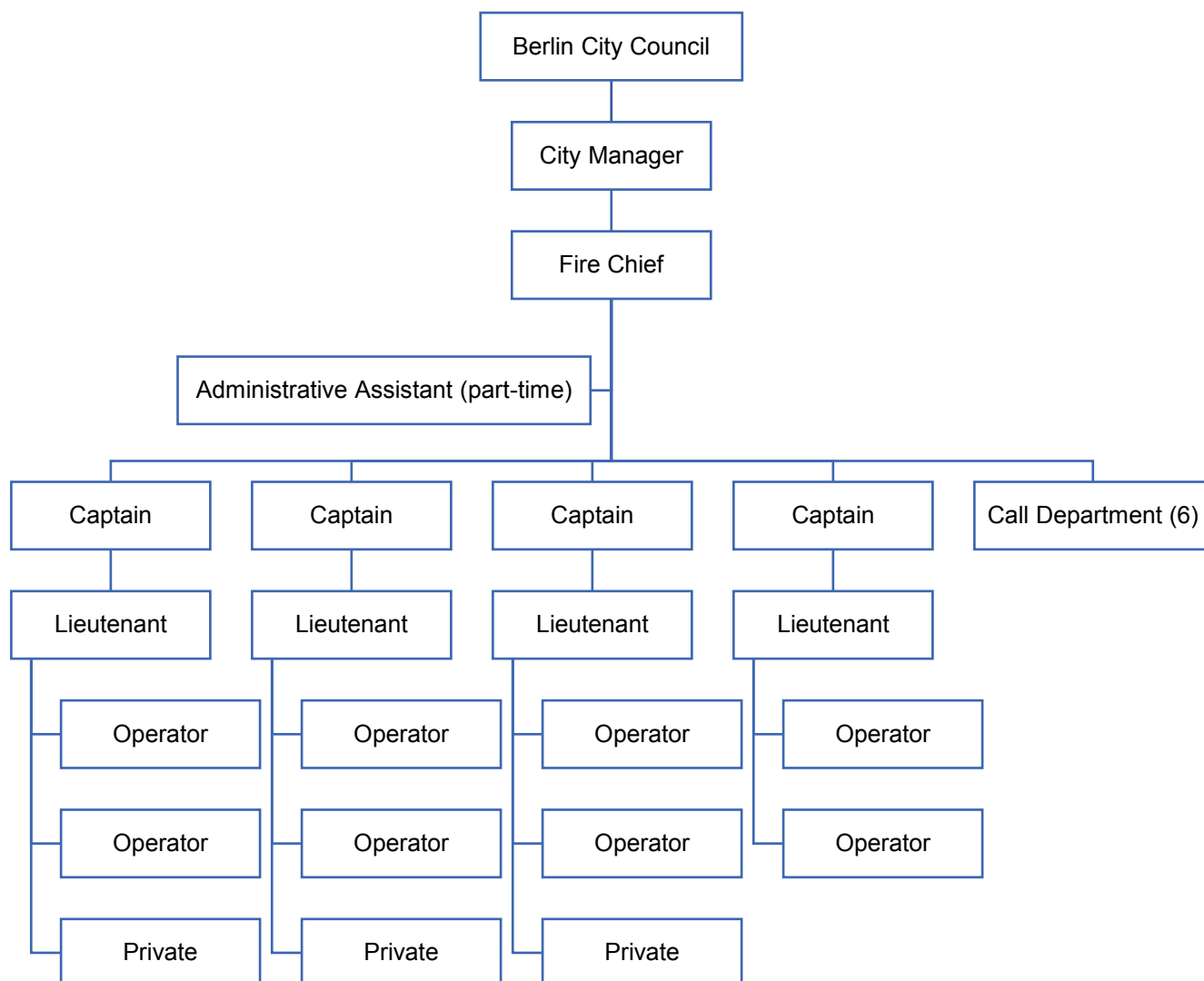
The following sections of this chapter explore the budgets, staffing and organizational structure and workload information of the BFD and BEMS.

1. Berlin Fire Department

The Berlin Fire Department (BFD) is established in Chapter 2 Section 3-301 of the City Code of Ordinances with further duties as assigned in Chapter 6. The Fire Chief is appointed by the City Manager in accordance with the City Charter Section 14h. The BFD is responsible for fire suppression, fire prevention, medical first responder responses, and training of personnel.

(1) Organizational Structure

The organizational chart for the BFD is shown on the next page.



(2) Financial Resources

The BFD is financially supported through the general fund of the City which is supported largely through property taxes and fees and licenses. In addition, there are revenue sources that are specific to the Fire Department and are shown in the table below.

Berlin Fire Department					
	2014 Actual	2015 Actual	2016 Actual	2017 Budget	2018 Budget
Revenues					
Fire Protection Contract	\$0	\$3,000	\$3,000	\$3,000	\$3,000
Miscellaneous Revenue	\$600	\$157	\$419	\$0	\$500
Fire Alarm User Fees	\$13,425	\$13,838	\$11,775	\$12,150	\$12,150
Inspection Fees	\$16,416	\$18,071	\$16,015	\$24,000	\$17,000
Outside Detail	\$0	\$5,367	\$13,393	\$6,000	\$14,000
CDBG Wren Feasibility Study	\$0	\$3,415	\$0	\$0	\$0
CDBG Notre Dame	\$0	\$6,512	\$0	\$0	\$0
NH Charitable Fund Leadership Program	\$0	\$10,950	\$0	\$0	\$0
CDBG Ahead Northern Lights	\$0	\$141	\$0	\$0	\$0
FEMA Assistance to FF Grant	\$0	\$0	\$3,681	\$0	\$0
Hazard Mitigation Plan	\$0	\$0	\$3,850	\$0	\$0
FEMA Safer Grant	\$0	\$0	\$174,436	\$492,012	\$0
Total Revenues	\$30,441	\$61,452	\$226,569	\$537,162	\$46,650
Expenditures					
Salaries	\$1,182,557	\$1,238,016	\$1,226,883	\$1,137,806	\$1,275,843
Employee Benefits	\$294,701	\$300,690	\$297,623	\$249,969	\$300,075
Workers Compensation	\$86,365	\$56,560	\$60,778	\$58,517	\$62,439
Retirement	\$333,322	\$337,206	\$356,506	\$324,157	\$386,284
Social Security/MCR	\$17,961	\$17,938	\$18,920	\$17,902	\$19,548
Unemployment Compensation	\$1,580	\$1,225	\$888	\$692	\$1,571
Total Personnel Cost	\$1,916,486	\$1,951,636	\$1,961,598	\$1,789,042	\$2,045,761
Operational Expenditures					
Subscriptions and Periodicals	\$29	\$29	\$21	\$60	\$100
Computer Maintenance	\$550	\$1,400	\$0		
Dues and Subscriptions	\$1,049	\$424	\$434	\$1,400	\$1,900
Conference Expenses	\$50	\$0	\$0	\$500	\$500
Training	\$2,417	\$4,015	\$5,235	\$7,500	\$17,000
Fire Prevention	\$0	\$1,813	\$2,046	\$3,050	\$3,500
Physical Exams	\$0	\$3,252	\$2,079	\$8,750	\$8,750
Clothing Allowance	\$9,400	\$8,460	\$8,460	\$10,340	\$10,340
Laundry	\$0	\$0	\$7	\$300	\$300
Telephone/Internet	\$2,870	\$3,402	\$3,347	\$4,115	\$4,175
Postage	\$763	\$746	\$488	\$1,000	\$1,000
Radio	\$2,882	\$1,857	\$599	\$2,380	\$3,580
Plectron Allowance	\$780	\$750	\$660	\$960	\$960
Office Supplies	\$2,110	\$2,198	\$1,265	\$2,630	\$2,000
Custodial Services	\$1,143	\$871	\$1,801	\$1,600	\$1,600
Building Maintenance	\$1,714	\$1,452	\$1,575	\$3,500	\$3,500
Medical Supplies	\$0	\$487	\$0	\$300	\$1,300
Equipment Supplies	\$5,484	\$5,490	\$3,269	\$6,060	\$5,986
Gasoline and Oil	\$9,754	\$8,110	\$6,193	\$8,220	\$8,385
Vehicle Repair	\$25,739	\$16,913	\$22,296	\$20,000	\$22,280

Berlin Fire Department					
	2014 Actual	2015 Actual	2016 Actual	2017 Budget	2018 Budget
Electricity	\$6,721	\$7,391	\$6,814	\$8,783	\$8,783
Fuel and Oil	\$17,908	\$16,740	\$9,278	\$11,587	\$11,818
Fire Alarm	\$12,542	\$14,085	\$2,466	\$9,000	\$5,000
New Equipment	\$10,124	\$5,772	\$16,774	\$19,888	\$12,138
Total Operating Expenditures	\$114,030	\$105,658	\$95,106	\$131,923	\$134,896
Total Expenditures	\$2,030,516	\$2,057,294	\$2,056,704	\$1,920,966	\$2,180,658

In the 2017 Actual column of the table, these numbers represent the first half of the fiscal year. For the past 5 years the budget has remained steady at about \$2 million.

(3) Operations

The BFD employs twenty (20) full-time personnel, one (1) part-time, and six (6) on-call personnel. Operationally there are three (3) shifts with five (5) personnel and one (1) shift with four (4) personnel. Minimum staffing is four (4) personnel. Shift schedules include on-duty for two (2) ten (10) hour days, off-duty for twenty-four (24) hours, on-duty for two (2) fourteen (14) hour nights, then off-duty for four (4) days. The table below displays the physical resources available to the Department.

Central Station Facility Location: 263 Main Street					
Description of Use	Serves as Headquarters and includes Administration, Fire Prevention, Training, and provides fire suppression coverage for the City.				
Apparatus Space	Three bays				
Assigned Apparatus	Unit ID	Year	Description	Type	Staffing
	E1	2006	Pierce Dash	Type 1 Engine	2
	L1	1996	Simon LTI	Aerial Ladder	1
	E2	1988	Pierce Arrow	Type 1 Engine	
	E3	1979	Pierce International	Type 1 Engine	
	E4	1999	Freightliner	Type 1 Engine	1
	Tanker 1	1984	Chevrolet	Water Tender	
	ATV	2015	Polaris Ranger	Rescue	

(4) Workload

This section illustrates the calls for service workload of the Berlin Fire Department. The information is compiled from the records management data received from the Fire Department. Response times would be contained in this section, however due to the nature of the dispatching system, reliable data is not available.

BFD Calls for Service					
	2015	2016	2017	Total	Pct.
Assist Law Enforcement	2	4	5	11	0.7%
Auto Accident	14	36	31	81	4.9%
Debris Fire	11	14	17	42	2.6%
Fire Alarm - False	3	14	11	28	1.7%
Fire Alarm - Malfunction	12	26	52	90	5.5%
Fire Alarm - Unintentional	30	58	59	147	9.0%
Hazardous Conditions	43	87	144	274	16.7%
Hazardous Materials	1	3	1	5	0.3%
Medical Calls	10	47	90	147	9.0%
Mutual Aid - Station Cover	3	19	4	26	1.6%
Other Fire	7	9	11	27	1.6%
Rescue Calls	14	50	54	118	7.2%
Service Calls	93	152	323	568	34.7%
Smoke Scare	1	4	1	6	0.4%
Structure Fire	6	12	18	36	2.2%
Vegetation Fire	1	17	9	27	1.6%
Vehicle Fire	1	3	1	5	0.3%
Total	252	555	831	1,638	

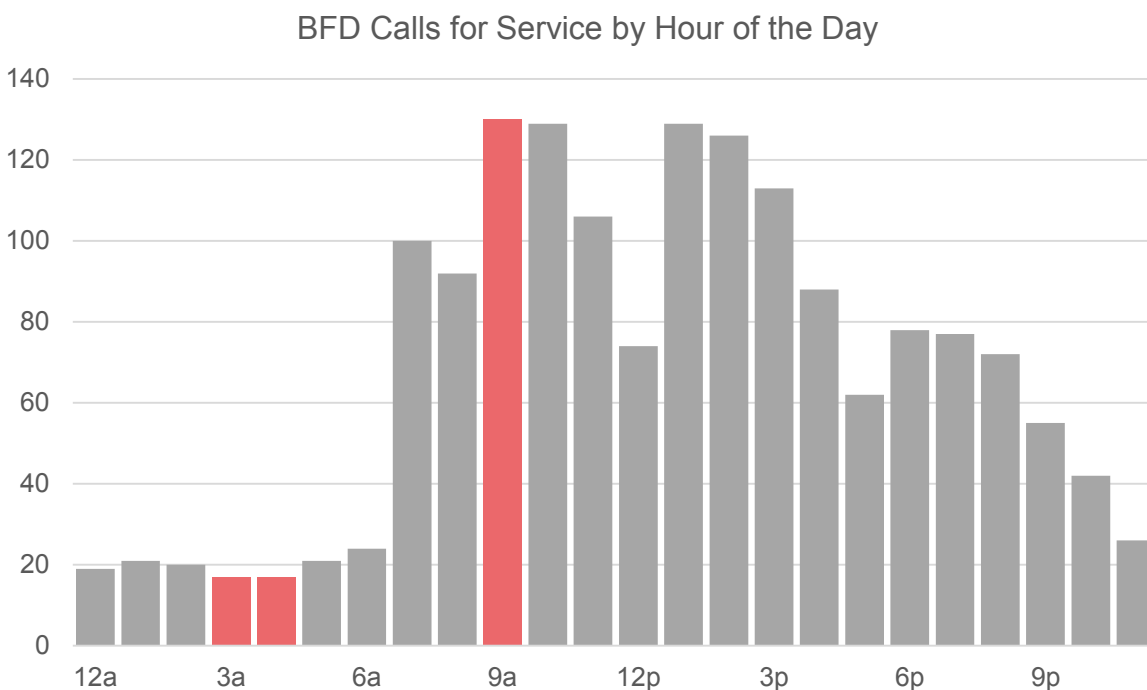
As shown above, service calls represent 34.7% of the BFD Calls for Service with hazardous conditions accounting for 16.7% of the call volume. Also, it is important to note that calls for service have steadily increased over the past three years, particularly in terms of service calls.

The following table displays the total number of calls for service handled by the Fire Department by each hour and day of the week from 2015 to 2017.

BFD Calls for Service by Hour and Weekday								
	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
12 am	3	4	3		4	2	3	19
1 am	4	5	4	1	2	4	1	21
2 am	5	2	3	2	3	5		20
3 am	2	6		4	2	1	2	17
4 am	1	6	1	2	3	3	1	17
5 am	2	7	1	1	1	4	5	21
6 am	3	6	6	5	1	1	2	24
7 am	4	26	11	23	16	14	6	100
8 am	10	24	10	22	10	6	10	92
9 am	6	22	31	20	24	17	10	130
10 am	15	18	33	23	15	15	10	129
11 am	7	12	20	14	14	27	12	106
12 pm	11	7	12	13	13	8	10	74
1 pm	8	17	16	29	31	18	10	129
2 pm	8	18	15	25	25	24	11	126
3 pm	10	19	19	23	12	13	17	113
4 pm	11	7	10	22	18	9	11	88
5 pm	6	6	9	14	7	12	8	62
6 pm	8	12	11	14	10	12	11	78
7 pm	13	11	13	12	6	10	12	77
8 pm	3	9	11	9	16	12	12	72
9 pm	12	4	7	11	8	6	7	55
10 pm	4	3	8	5	5	9	8	42
11 pm	8	1	1	6	4	3	3	26
Total	164	252	255	300	250	235	182	1,638

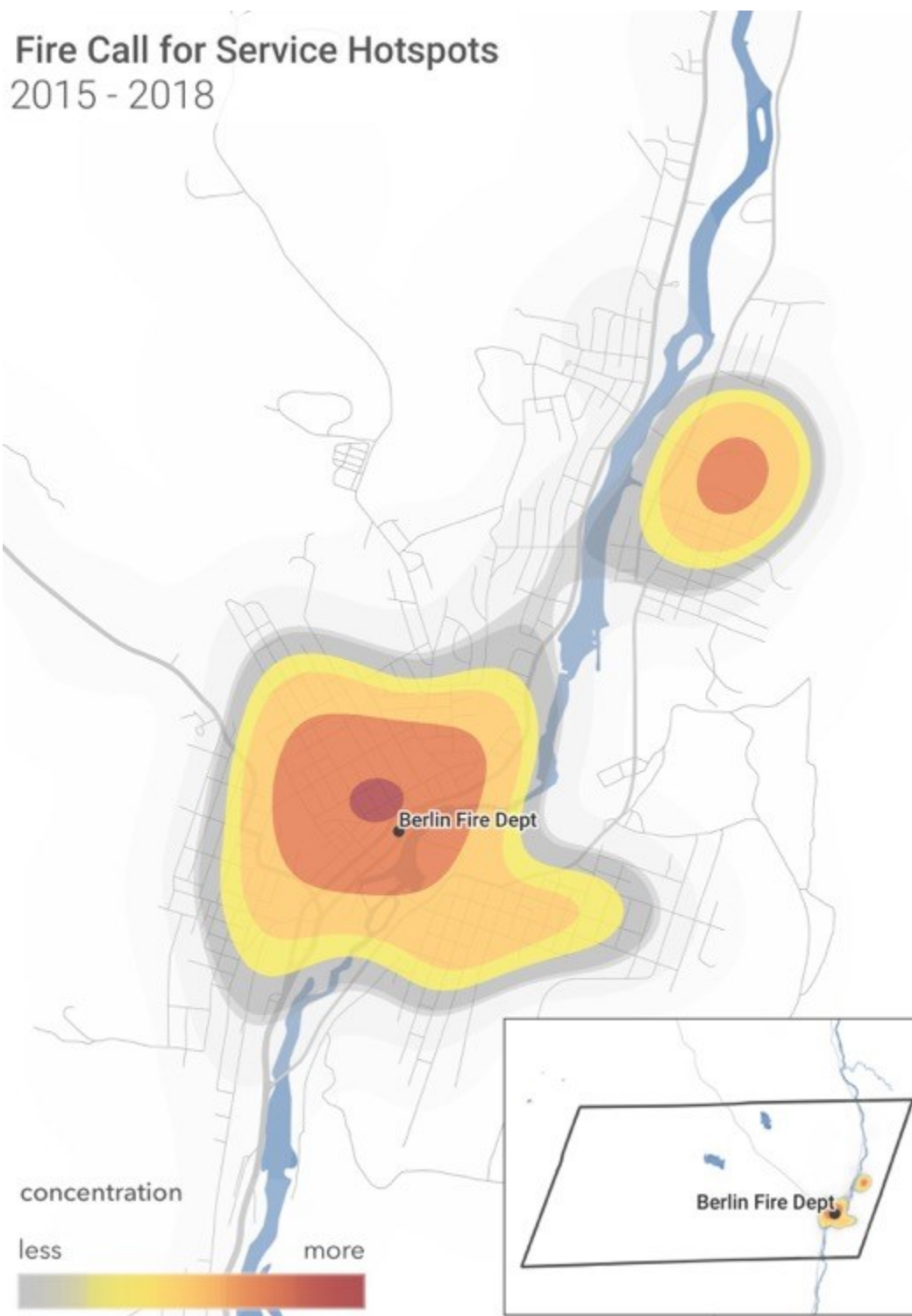
Overnight the calls for service are very low with a spike at 7 am and continues at that level until about the 3 pm hour when the calls begin to slow. Interestingly, the noon hour has a significant drop in calls. The busiest time of the day is 9 am while the slowest is during the 3 and 4 am hours. The busiest day of the week is Wednesday with Sunday being the slowest in terms of call demand.

The following chart further illustrates the calls for service by hour of the day for 2015 – 2017.



As noted previously the call for service spike at the 7 am hour and continue through the day beginning to decline at about the 4 pm hour. The busiest hour of the day is 9 am with the 3 and 4 am hours being the slowest hours of the day.

The map which follows illustrates the call using GIS technology to outline where many of the calls are occurring in the City. The inset shows the entire City while the overall view concentrates on the core population area. As expected, the call volume is predominately in the central section of the City.



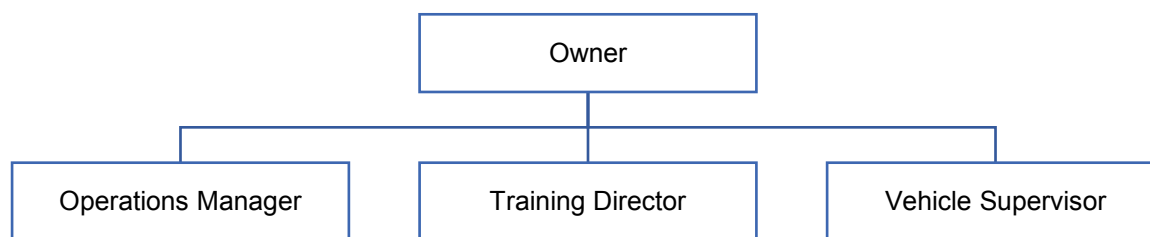
2. Berlin Emergency Medical Services

The Berlin Emergency Medical Services (BEMS) is a privately held company that provides treatment and transportation services to the City of Berlin. The services are provided through an exclusive contract between BEMS and the City. According to the agreement the BEMS will maintain two ambulances in the City and the City will provide a monthly payment of \$27,416.66 with adjustments as outlined in the agreement.

Berlin EMS was formed in 1981 to provide service to the City. The police department handled these responsibilities prior to 1981. The organization provides mutual aid to Milan and Dummer north of the City, however there is always a unit in the City. Gorham provides backup service to the City should the need arise.

(1) Organizational Structure

The organizational chart for the BEMS is shown below.



(2) Financial Resources

The BEMS is financially supported through user fees that are billed and a subsidy from the City of Berlin. The table on the next page illustrates the revenues and expenditures for the past two years.

Berlin Emergency Medical Services, Inc.		
	2016 Actual	2017 Actual
Revenues		
Fees – Private	\$224,588	\$331,418
Fees - Medicare	\$356,037	\$368,426
Fees - Medicaid	\$8,510	\$2,691
Fees Subsidy	\$328,777	\$332,500
Total Revenues	\$917,912	\$1,035,035
Expenditures		
Salaries and Wages	\$628,603	\$634,393
Payroll Taxes	\$48,980	\$49,419
Retirement	\$15,530	\$16,199
Total Personnel	\$693,113	\$700,011
Operational Expenditures		
Uniforms and Meals	\$11,337	\$13,094
Advertising	\$0	\$0
Medical Supplies	\$32,697	\$46,883
Vehicle Expenses	\$27,690	\$24,086
Equipment Repairs and Rental	\$1,751	\$4,706
Office and Postage	\$3,876	\$6,451
Professional Fees	\$43,313	\$48,141
Dues and Licenses	\$1,114	\$144
Contributions	\$0	\$0
Telephone	\$10,437	\$9,990
Insurance	\$42,228	\$59,319
Training	\$415	\$2,311
Electricity	\$4,380	\$3,914
Property Taxes	\$1,961	\$1,961
Maintenance	\$5,902	\$8,353
Utilities	\$4,278	\$8,702
Business Enterprise Tax	\$4,661	\$4,714
Total Operational Expenditures	\$196,040	\$242,769
Total Expenditures	\$889,153	\$942,780

The fee schedule is displayed below showing the fees charged as part of the services provided to the City.

Berlin EMS Fee Schedule

	Resident	Non-Resident
Airway Adjunct	\$125	\$150
ALS Non-Transport	\$200	\$200
ALS2 (advanced)	\$950	\$1,000
Basic Life Support Emergency Transport	\$600	\$650
Cardiac Monitor	\$125	\$150
Defibrillation	\$100	\$125
Emergency ALS	\$750	\$800
Inter-Osteo Bone Drill Disposable Part Replacement	\$100	\$120
IV Access	\$150	\$175
Mileage Rate	\$13	\$16
Non-Emergency ALS	\$650	\$700
Non-Emergency Transport	\$525	\$575
Oxygen	\$100	\$125
Paramedic Intercept	\$325	\$350
Specialty Care	\$1,050	\$1,150

(3) Operations

BEMS employs three (3) full-time and one (1) part-time paramedic working twenty-four (24) hour shifts. Two ambulances are staffed, one is advanced life support and the other is basic life support. One of the two ambulances is staffed for interfacility transfers and use on-call personnel to staff this unit. The table below displays the physical resources available to the Department.

Berlin EMS Facility Location: 182 East Mason Street					
Description of Use	Serves as the primary station for the Ambulance Service and houses the administrative areas as well as living quarters and apparatus bays.				
Apparatus Space	Three bays				
Assigned Apparatus	Unit ID	Year	Description	Type	Staffing
	Med 1	2013	Ford	Box Style	2
	Med 2	2017	Ford 4x4	Box Style	2
	Med 3	2011	Ford	Van Style	

(4) Workload

This section illustrates the calls for service workload of the Berlin Emergency Medical Services. The information is compiled from the records management data received from the ambulance service. The data included in the tables that follow is from January 1, 2016 through June 2018. Response times would be contained in this section, however due to the nature of the dispatching system reliable data is not available. As well, the data did not include the location of the call so there is no map illustrating the calls for service hotspots.

BEMS Calls by Response Request		
	2016 - May 2018	Pct.
Emergency Response (Primary Coverage Area)	2,611	78.9%
Interfacility Transfer (BLS/AEMT)	241	7.3%
Medical Transport (Non-Acute, Minimal BLS Care)	206	6.2%
Interfacility Transfer (PIFT/Paramedic)	180	5.4%
Emergency Response (Mutual Aid)	36	1.1%
Public Assistance/Other not Listed	12	0.4%
Standby	12	0.4%
ALS Intercept	5	0.2%
Interfacility Transfer (CCT/AMT)	5	0.2%
Bariatric Transport / Special Equipment Delivery	3	0.1%
Total	3,311	

BEMS Calls by City		
	2016 - May 2018	Pct.
Berlin	3,193	96.4%
Milan	50	1.5%
Gorham	25	0.8%
Dummer	14	0.4%
Lebanon	14	0.4%
Littleton	6	0.2%
Errol	3	0.1%
Success	2	0.1%
Conway	1	0.0%
Hanover	1	0.0%
Newry	1	0.0%
Randolph	1	0.0%
Total	3,311	

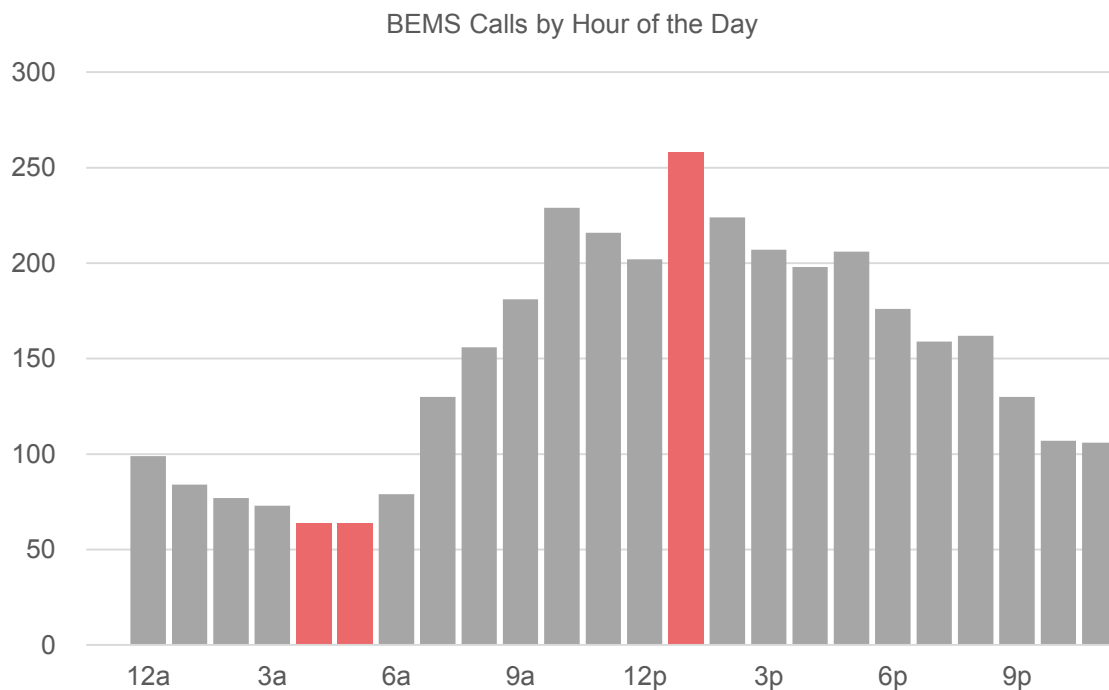
For the past two and a half years 78.9% of the calls were emergency responses in the primary coverage area. Just over 96% of those calls were in the City of Berlin.

The following table illustrates the calls for service by day of the week and time of day for 2016 – July 2018.

Berlin EMS Calls by Hour and Weekday								
Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
12 am	16	15	5	13	15	21	14	99
1 am	14	14	10	10	8	18	10	84
2 am	6	13	11	11	8	15	13	77
3 am	14	11	12	10	4	11	11	73
4 am	11	8	7	12	12	9	5	64
5 am	12	10	9	7	9	10	7	64
6 am	7	12	14	10	14	15	7	79
7 am	10	20	18	18	18	27	19	130
8 am	18	20	15	28	29	21	25	156
9 am	18	29	31	32	24	26	21	181
10 am	26	26	33	38	39	36	31	229
11 am	32	24	36	37	29	32	26	216
12 pm	18	22	26	41	28	38	29	202
1 pm	31	34	44	32	45	40	32	258
2 pm	19	29	36	40	33	43	24	224
3 pm	36	30	32	31	27	19	32	207
4 pm	20	37	35	31	22	28	25	198
5 pm	28	37	26	29	28	33	25	206
6 pm	23	29	29	21	28	26	20	176
7 pm	25	20	23	21	26	18	26	159
8 pm	28	18	15	23	23	25	30	162
9 pm	18	19	19	14	22	18	20	130
10 pm	20	15	14	17	12	15	14	107
11 pm	23	19	8	19	15	12	10	106
Total	473	511	508	545	518	556	476	3,587

There is a sharp increase at the 7 am hour that peaks in the early afternoon with the 1 pm hour being the busiest. Friday is the busiest day of the week with Saturday and Sunday being the slowest days of the week.

The following chart further illustrates the calls for service by hour of the day for 2016 – July 2018.



At about 7 am the calls have a sharp increase that continues through the 5 pm hour when it begins to decline with the 1 pm hour being the busiest hour during the daytime. The slowest period of the day is between the 4 am and 6 am hours. Friday is the busiest day of the week with Sunday and Saturday shown as the slowest days of the week.

3 Analysis of Fire and EMS Operations

In making decisions about the emergency services, it is important for the leadership of Berlin to understand the science behind the location of resources and the deployment strategies of those resources. For many years the Insurance Services Office (ISO) had set the standard for deployment through their Public Protection Classification system. This system was designed to provide insurers a basis for setting insurance rates and to limit their exposure to large losses and catastrophic events. While these efforts provided a good starting point, there is much more for the leadership to know while making decisions about the emergency services in Berlin.

1. Service Level Definition within Emergency Services

Nationwide, a great deal of effort and research has been put into developing performance objectives for the delivery of fire and EMS services. This effort is critical for agencies making decisions about deployment and location of emergency resources. The objectives promoted for fire/rescue and EMS have their basis derived from research that has been conducted in these two critical issues:

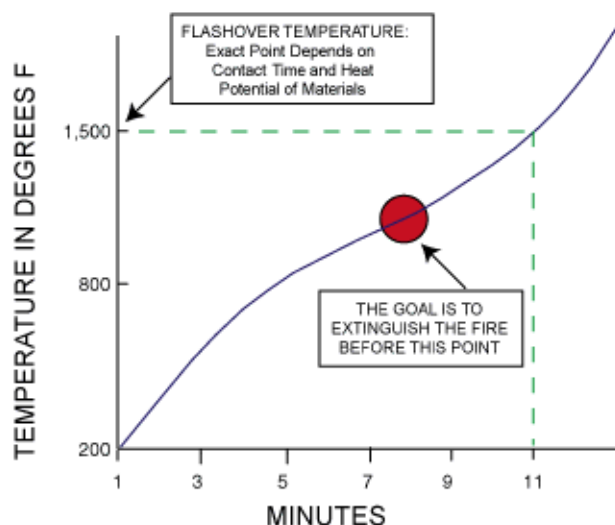
- What is the critical point in a fire's "life" for gaining control of the blaze while minimizing the impact on the structure of origin and on those structures around it?
- What is the impact of the passage of time on survivability for victims of cardiac arrest?

The following sections describe these factors.

(1) Fire Protection Services

The chart that follows, shows a typical "flashover" curve for interior structure fires. The point in time represented by the occurrence of "flashover" is critical because it defines when all the contents of a room become involved in the fire. This is also the point at which a fire typically shifts from "room and contents" to a "structure" fire – involving a wider area of the building and posing a potential risk to the structures surrounding the original location of the fire.

Generalized Flashover Curve



Note that this illustration depicts a fire from the moment of inception – not from the moment that a fire is detected or reported. This demonstrates the importance of early detection and fast reporting as well as rapid dispatch of responding units. This also shows the critical need for a rapid (and sufficiently staffed) initial response – by quickly initiating the attack on a fire, “flashover” can be averted. The points below describe the major changes that occur at a fire when “flashover” occurs:

- It is the end of time for effective search and rescue in a room involved in the fire. It means the likely death of any person trapped in the room – either civilian or firefighter.
- After this point in a fire is reached, portable extinguishers can no longer have a successful impact on controlling the blaze. Only larger hand-lines will have enough water supply to affect a fire after this point.
- The fire has reached the end of the “growth” phase and has entered the fully developed phase. During this phase, every combustible object is subject to the full impact of the fire.
- This also signals the changeover from “contents” to “structure” fire. This is also the beginning of collapse danger for the structure. Structural collapse begins to become a major risk at this point and reaches the highest point during the decay stage of the fire (after the fire has been extinguished).

It should be noted that not every fire will reach flashover – and that not every fire will “wait”

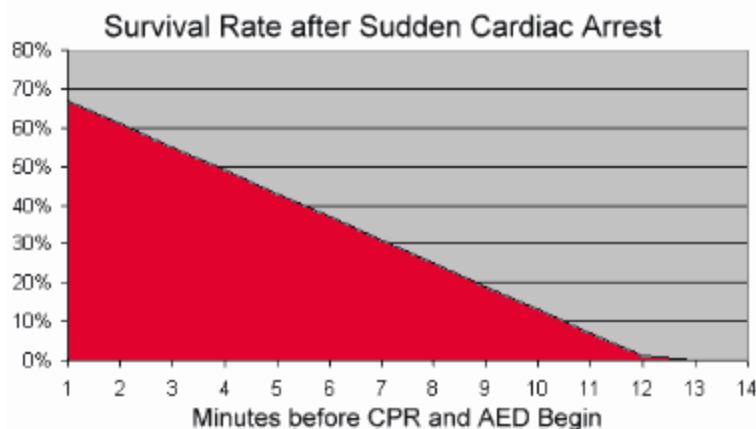
for the 8-minute mark to reach flashover. A quickly responding fire crew can do things to prevent or delay the occurrence of flashover. These options include:

- Application of portable extinguisher or other “fast attack” methodology.
- Venting the room to allow hot gases to escape before they can cause the ignition of other materials in the room.
- Not venting a room – under some circumstances this will stifle a fire and prevent flashover from occurring.

Each of these techniques requires the rapid response of appropriately trained fire suppression resources that can safely initiate these actions. In the absence of automatic fire suppression systems, access to interior fires can again be limited by a safety requirement related to staffing levels. OSHA and related industry standards require the presence of at least 2-firefighters on the exterior of a building before entry can be made to a structure in which the environment has been contaminated by a fire. In the absence of a threat to life demanding immediate rescue, interior fire suppression operations are limited to the extent a fire service delivery system can staff, to assuring a minimum of 4-people actively involved in firefighting operations.

(2) Emergency Medical Services

The second issue to consider is the delivery of emergency medical services. One of the primary factors in the design of emergency medical systems is the ability to deliver basic CPR and defibrillation to victims of cardiac arrest. The graph below, demonstrates the survivability of cardiac patients as related to time from onset:



This graph illustrates that the chances of survival of cardiac arrest diminish approximately 10% for each minute that passes before the initiation of CPR and/or defibrillation. These dynamics are the result of extensive studies of the survivability of patients suffering from cardiac arrest. While the demand for services in EMS is wide ranging, the survival rates for full-arrests are often utilized as benchmarks for response time standards as they are more readily evaluated because of the ease in defining patient outcomes (a patient either survives or does not). This research results in the recommended objective of provision of basic life support within 4-minutes of notification and the provision of advanced life support within 8 minutes of notification.

Considering the response time continuum, the response time goal for emergency services is to provide BLS within 6 minutes of the onset of the incident (including detection, dispatch and travel time) and ALS within 10 minutes. This is often used as the foundation for a two-tier system where fire resources function as first responders with additional (ALS) assistance provided by responding ambulance units and personnel.

Additionally, recent research is beginning to show the impact and efficacy of rapid deployment of automatic defibrillators to cardiac arrests. This research – conducted in King County (WA), Houston (TX) and as part of the OPALS study in Ontario, Canada – shows that the AED can be the largest single contributor to the successful outcome of a cardiac arrest – particularly when accompanied by early delivery of CPR. It is also important to note that these medical research efforts have been focused on a small fraction of the emergency responses handled by typical EMS systems – non-cardiac events make up the large majority of EMS and total system responses and this research does not attempt to address the need for such rapid (and expensive) intervention on these events.

The results of these research efforts have been utilized by communities and first responders, often on their own with no single reference, to develop local response time

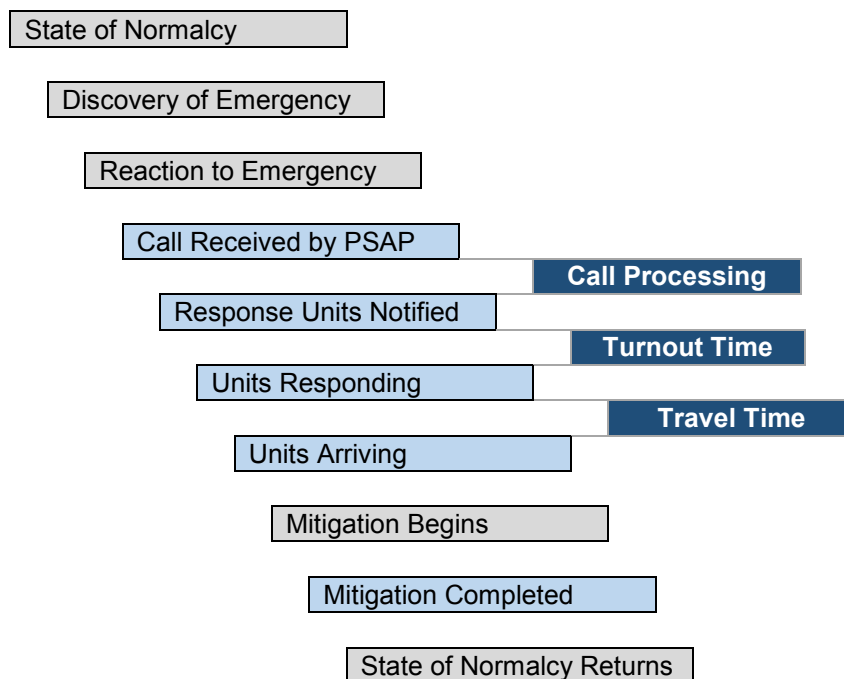
and other performance objectives. However, there are now three major sources of information to which responders and local policymakers can refer when determining the most appropriate response objectives for their community:

- The Insurance Services Office (ISO) provides basic information regarding distances between fire stations. However, this “objective” does little to recognize the unique nature of every community’s road network, population, calls for service, call density, etc.
- The National Fire Protection Association (NFPA) promulgated a document entitled: “NFPA 1710: Objective for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.” This document (NFPA 1710) was published in 2001 and generated a great deal of dialogue and debate – which is still ongoing.
- The Commission on Fire Accreditation International (CFAI) in its “Objectives of Coverage” manual places the responsibility for identifying “appropriate” response objectives on the locality. These objectives should be developed following a comprehensive exercise in which the risks and hazards in the community are compared to the likelihood of their occurrence.

The next section examines the issue of response times.

2. Response Time Goals and Objectives

Response time to an emergency or call for assistance has been broken down into measurable and non-measurable segments. The response time continuum begins when the state of normalcy changes to a recognizable emergency. The following chart outlines the cascade of events that occurs once an emergency starts or is recognized. Those highlighted points represent hard data or that which is quantitative versus soft data or that which is subjective and unknown.

Response Time Continuum

The National Fire Protections Association (NFPA), Center for Public Safety Excellence (CPSE), and the Insurance Services Office (ISO) offered reference points for communities to follow relative to fire service responses, however, only NFPA 1710 offers any specificity. It is important to note that the performance objectives (in terms of response times) provided in the NFPA 1710 document are derived from the basic research previously described. These include the following (all are taken from section 4.1.2.1.1 of NFPA 1710):

- One minute four seconds (64 seconds) for the processing of an incoming emergency phone call, including the completion of the dispatching of fire response units.
- “One minute twenty seconds (80 seconds) for turnout time for fire related incidents.” This is also called reflex time, reaction time, “out-the-chute” time, etc. This is the time that elapses between dispatch and when the units are actively responding.
- “One minute (60 seconds) for turnout time for emergency medical incidents.” This is also called reflex time, reaction time, “out-the-chute” time, etc. This is the time that elapses between dispatch and when the units are actively responding.
- “Four minutes (240 seconds) or less for the arrival of the first arriving engine company at a fire suppression incident and / or 8 minutes (480 seconds) or less

for the deployment of a full first-alarm assignment at a fire suppression incident.”

- “Four minutes (240 seconds) or less for the arrival of a unit with first responder or higher-level capability at an emergency medical incident.”
- “Eight minutes (480 seconds) or less for the arrival of an advanced life support unit at an emergency medical incident, where this service is provided by the fire department.”
- In section 4.1.2.1.2, NFPA 1710 goes on to state: “The fire department shall establish a performance objective of not less than 90 percent for the achievement of each response time objective specified in 4.1.2.1.1”

It is important to note the “and / or” found in the initial response objective statement. This indicates that a system would meet the intent of the standard if it can reasonably plan to deliver either the single unit, 4-minute travel time standard, the first alarm, 8-minute travel time standard, or both. It should also be noted that it is implied that the total time allotted is additive with each successive event. For example, a system which arrived on-scene in 6-minutes or less 90% of the time (from time of dispatch) would be in compliance – even if the turnout time was longer than a minute (though that should clearly be improved).

It is also critical to note that these time objectives apply to emergency calls for service – there is nothing in NFPA 1710 (nor in any other objective) that suggests that communities cannot establish a differential response to calls for service determined to be non-emergency in nature.

Until 2017, the Center for Public Safety Excellence had defined benchmark and baseline response times for each of the three components. They have since determined they are not a standard making organization and decided to leave the establishment of response time standards to others. They are, however, an accrediting body for fire departments and have established numerous best practices for departments to follow in order to achieve accredited status.

The Center for Public Safety Excellence (CPSE) uses a population and density component to determine what the performance of the fire department should be to meet best practices and does not require a set number of personnel per piece of apparatus, but rather that an effective response force can be delivered to an emergency scene in a timely manner.

The table below defines the population demographics as it relates to the delivery of emergency services.

Demographic Risk Categories	
Risk Category	Definition
Urban	An area with a population density greater than 1,000 people per square mile
Suburban Area	An area with a population density of 500 - 1,000 people per square mile
Rural Area	An area with a population density of less than 500 people per square mile
Remote Area	Travel Distance greater than 8 miles.

The western sections of the City are largely uninhabited with the area along the Androscoggin River forming the population center of the City. The map below illustrates the population densities based on the U.S. Census data concentrating on the population center of the City.



3. Response Time Data

Response time data collected from the Fire Department and the Emergency Medical Services is not reliable and could not be used for evaluation and analysis. This is due to the current dispatch system within Berlin. Calls to 911 are answered by the Department of Safety in Concord then transferred to the appropriate local agency, in Berlin the calls are routed to the police department dispatch center, the Fire Department and Berlin EMS, each separately. The police department, fire department and Berlin EMS each have separate 7-digit emergency phone lines available for use by the residents as well. Any incoming calls are answered by the on-duty crews with the information being recorded by whomever answers the phone. When the Fire and EMS personnel are out of the station, the calls are re-routed to the Police Department for dispatching. The reliability of the data is questionable as the time of receipt, enroute and on-scene are subject to being recorded from different devices such as watches and clocks that are not necessarily synced and rounded to the nearest minute, which does not provide true detail of the time elements. In interviews with the police department dispatch personnel they indicated a willingness to assume dispatch services for both fire and EMS services if they were provided by the City.

While there are no time elements to allow evaluation of call processing performance or turnout times, as there are no time stamps for when the call was received and enroute times are the same as the notification time, the data did allow analysis of travel time performance. The following table illustrates the performance for Engine 1 responses from July 1, 2015 – June 30, 2018 based on the records management system data provided to the project team.

Travel Time Performance Engine 1

Year	FY 15-16	FY 16-17	FY 17-18	3 Yr. Avg.
Average	4:44	4:03	3:41	3:58
90 th Percentile	7:00	8:00	7:00	7:15

Recommendation:

Dispatching of emergency services for the City of Berlin should be consolidated into a single point of notification at the police department to ensure the units are dispatched efficiently and the accuracy of the information for the call is captured.

The information contained herein is presented for informational purposes and to assist in setting benchmark and baseline performance objectives.

The expression of response time has changed. In years past the measurement was

expressed as an average of time. This essentially represents how the system or department is performing 50% of the time and is not a true reflection of how a department is performing. With the research that has been performed in developing performance standards and practices the use of fractal time has become the best practice in the measurement and presentation of response time components. Fractal response time measures how often (as a percent of calls) a department can perform within each response time component. The NFPA and CPSE use the 90th percentile as the standard to meet for benchmark and baseline criteria.

4. Call Processing

The police department, fire department and Berlin EMS each have separate 7-digit emergency numbers for the public to call when services are needed. 911 calls in New Hampshire are routed to the State Department of Safety in Concord. NFPA 1221 Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems establishes the call processing benchmarks as outlined in the table below. This information is to allow development of performance measures at a later time to allow measurement of the performance of a consolidated center.

NFPA 1221 Time Requirements		
Component	Target	Performance
Calls Answered	Within 15 seconds	95%
	Within 40 seconds	99%
Call Processing	Within 64 seconds	90%
	Within 106 seconds	95%
Call Processing for:		
* EMD	Within 90 seconds	90%
* Language Translation		
* TTY/TDD Device Services	Within 120 seconds	99%
* Hazardous Materials		
* Technical Rescue		
* Text Message		
* Unable to Determine Location		

Additionally, NFPA 1710: Objective for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments in section 4.1.2.1.1 provides a benchmark call processing time: One minute four seconds (64 seconds) for the processing of an incoming emergency phone call, including the completion of the dispatching of fire response units.

Discussions with the Berlin Police Department dispatch personnel indicated there would

be no immediate need for additional staff if they assumed fire and EMS dispatch responsibility. If staff were needed at a later date, there should be cost sharing between the fire and police departments for the service based on workload generated by the departments on the center.

Recommendation:

With the consolidation of the dispatch services at the police department, establish call processing benchmark performance objectives of 64 seconds.

5. Turnout Time

Turnout time is a measurable time segment that begins when the emergency service receives the call and is on the apparatus responding (wheels rolling) to the call. NFPA 1710: Objective for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments in section 4.1.2.1.1 provides the following performance objectives for turnout time:

- “One minute twenty seconds for turnout time for fire and special operations.”
- “One minute (60 seconds) for turnout time for emergency medical services.”

As noted previously, the response data is not reliable, so an evaluation and analysis are not able to be performed.

Recommendation:

Establish turnout benchmark performance objectives of 60 seconds for emergency medical calls and 90 seconds for fire and special operations calls 90% of the time for stations and units staffed with career personnel.

6. Resource Distribution and Travel Time

Travel time is the third measurable performance component for the emergency services that should be continuously analyzed to ensure they are providing effective and efficient service to the community. Travel time begins when the apparatus is responding (wheels rolling) and ends with the apparatus arriving at the scene (wheels stopped). Distribution is the measure of getting initial resources to an emergency to begin mitigation efforts. This is measured in a variety of ways including percentage of square miles, percentage of road miles and travel time. The Insurance Services Office (ISO) has used road miles for many years. With the advent of GIS technology, the use of travel time is another more accurate measure for the distribution of resources.

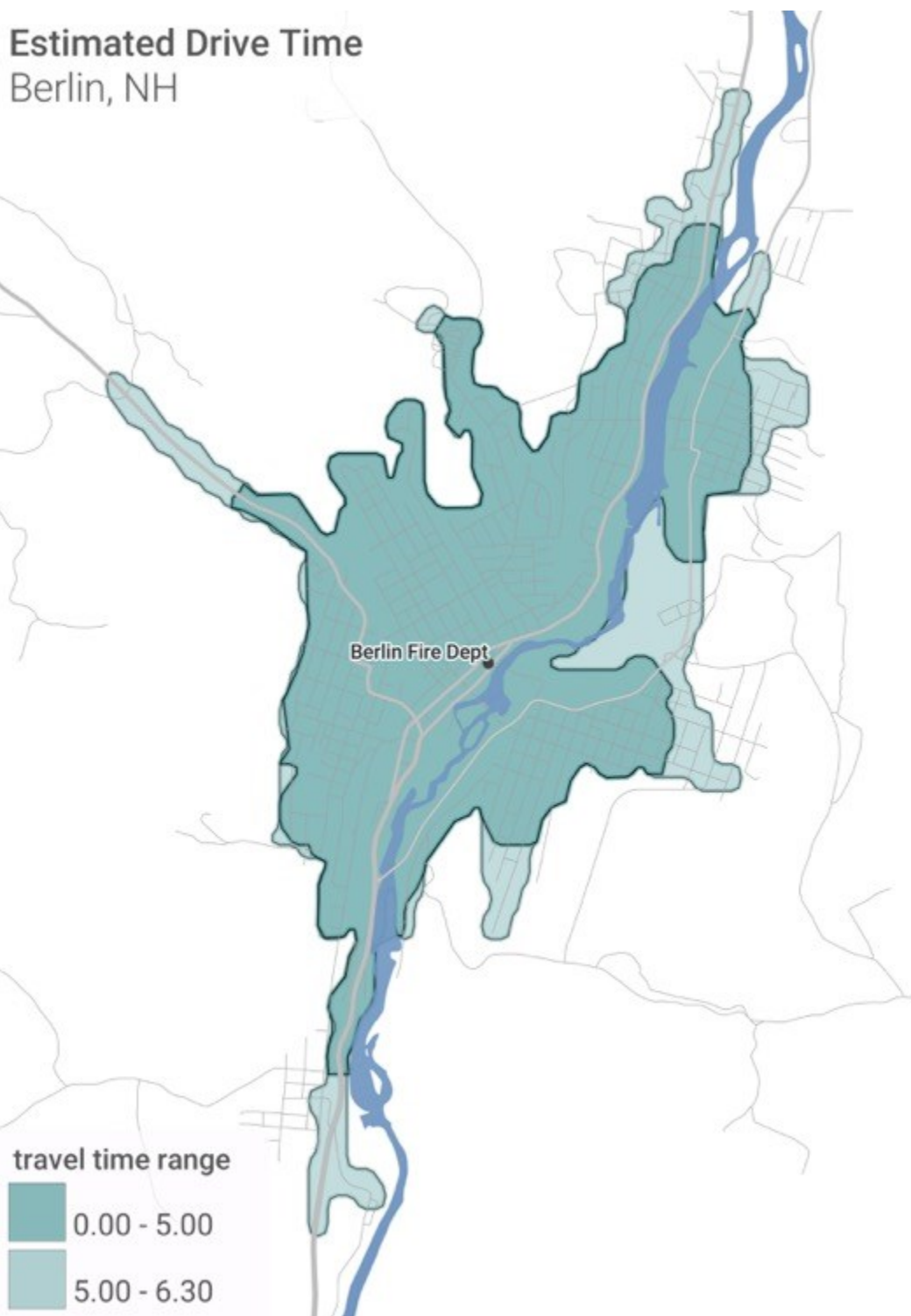
Based on the U.S. Census Bureau data, Berlin is mostly rural with a population center near the river being more suburban in nature.

Service Area / Population Density Response Travel Time Standards

Suburban: Population density between 1,000 and 2,000 per square mile				
	1st Unit	2nd Unit	1st Alarm Balance	Performance
Benchmark	5 minutes	8 minutes	10 minutes	90%
Baseline	6 minutes/30 seconds	10 minutes/24 seconds	13 minutes	90%
Rural: Population density of less than 1,000 per square mile				
Benchmark	10 minutes	14 minutes	14 minutes	90%
Baseline	13 minutes	18 minutes/12 seconds	18 minutes/12 seconds	90%

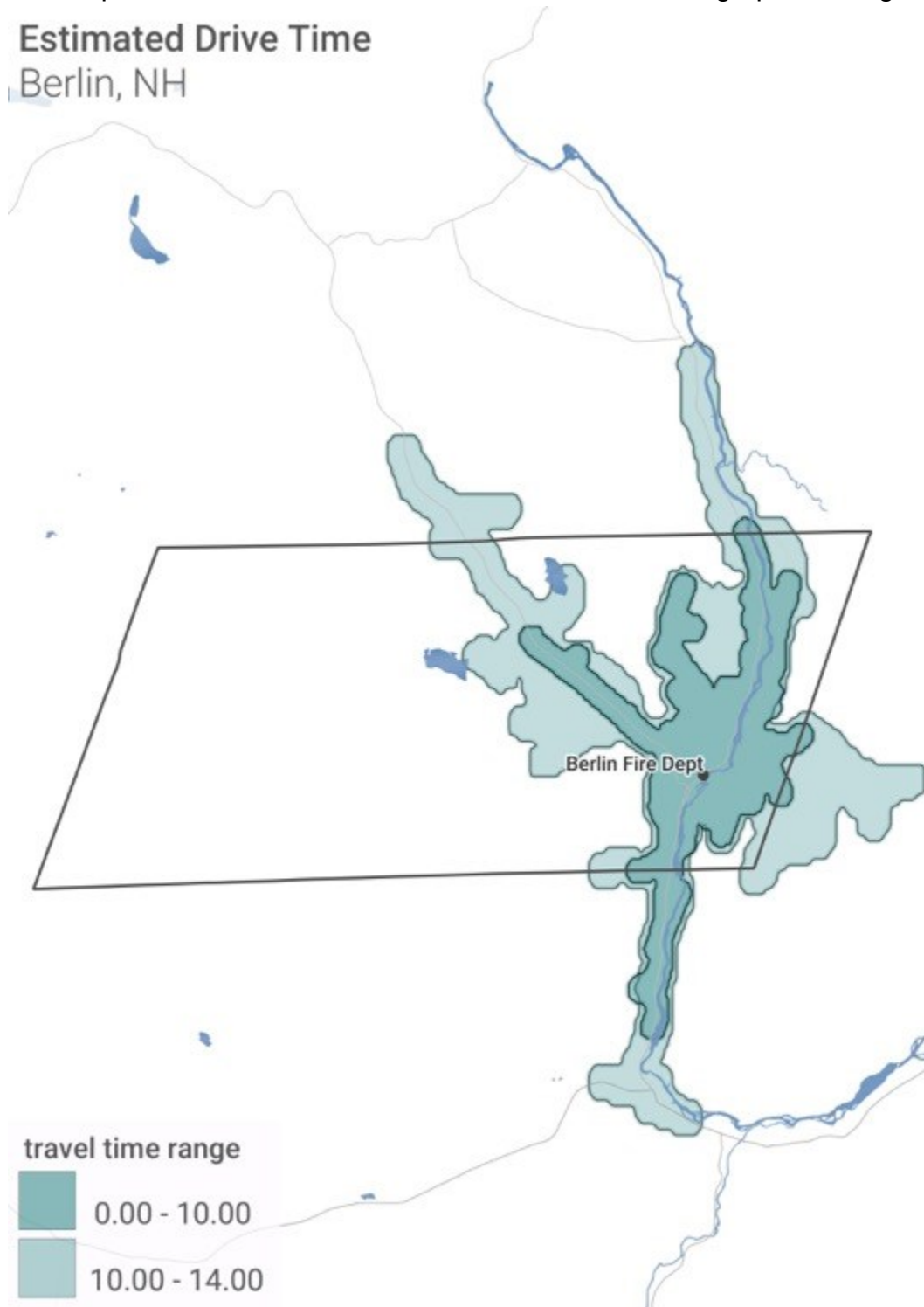
The benchmark time is typically described as the standard or industry best practice. The baseline time is generally described that which is acceptable by the community. These standards are for illustrative purposes to allow the fire department to implement performance standards as the capture of response time data becomes more reliable.

As noted previously response data is not reliable, however through the use of GIS technology travel time can be illustrated. The map below illustrates the travel time based on the suburban demographic.



As illustrated, the core section of Berlin is reachable within the 5 minutes travel time with small areas on the fringe of the core area outside the 5-minute travel time but within the baseline travel time of 6 minutes 30 seconds.

The map below shows the travel time based on rural demographics using GIS technology.



Within the rural demographic most of the populated areas are within the benchmark and baseline travel time. Areas to the far west are very sparsely populated and have a very limited roadway network. This is considered a remote area and travel time, based on NFPA 1720, is calculated as 1.7 times the distance plus 0.65. For example, if the distance

is 9 miles the travel time is about 16 minutes and if the distance is 12 miles the travel time is about 21 minutes.

Recommendation:

Establish travel time baseline performance objectives of 6 minutes 30 seconds 90% of the time for the suburban areas of Berlin.

Establish travel time baseline performance objectives of 13 minutes 90% of the time for the rural areas of Berlin.

7. Concentration of Resources and Staffing

Concentration is generally described as the ability of the fire department to get the appropriate number of personnel and resources to the scene of an emergency in a prescribed time to effectively mitigate the incident. There are two parts to this concentration component which is an effective response force and the amount of time to get the resources in place.

(1) Effective Response Force

There are several tasks, which must occur simultaneously to adequately combat different types of fires. The absence of adequate personnel to perform these tasks requires each task to be prioritized and completed in chronological order. These fire ground tasks include command, scene safety, search and rescue, water supply, fire attack, pump operations, ventilation, back up, and rapid intervention.

An initial full alarm assignment for any structural fire incident should be able to provide personnel to accomplish the following tasks:

- Establish incident command outside of the hazard area. This will allow coordination and direction of the incoming emergency response personnel and apparatus. A minimum of one person should be dedicated to this task.
- Establish an uninterrupted water supply of at least 400 gallons per minute for 30 minutes. Once established the supply line can be maintained by the pump operator to ensure uninterrupted water supply. A minimum of one person is assigned to this task that can then assume support role.
- Establish an effective water flow rate of 300 gallons per minute. This will be supplied to a minimum of two hand lines each operating at a minimum flow of 100 gallons per minute. Each hand line must have two individuals assigned with one serving as the attack line and the other as a back-up line.

- Provision of one support person to handle the hydrant hookup, utility control, forcible entry, and assist in deploying fire hose lines.
- Establish a search and rescue team. Each team will consist of a minimum of two personnel.
- Establish a ventilation team. Each team will consist of a minimum of two personnel.
- Establish an initial rapid intervention team (RIT). Each RIT team shall consist of a minimum of two properly trained and equipped personnel.

Critical tasking will vary depending on the size and nature of the incident. The Center for Public Safety Excellence (CPSE) provides a suggestive list of tasks that need to be completed at a fire situation based on the risk. A similar list is provided within the NFPA 1710 document. The CPSE analysis, from the 8th edition, is summarized in the table on the following page, showing the minimum required personnel to mitigate the initial emergency response requirements by occupancy risk:

Critical Tasks for the Effective and Efficient Control of Structural Fires				
Critical Task	Maximum Risk	High Risk	Moderate Risk	Low Risk
Attack Line	4	4	4	2
Search and Rescue	4	2	2	0
Ventilation	4	2	2	0
Backup Line	2	2	2	2
Rapid Intervention	2	2	0	0
Pump Operator	1	1	1	1
Water Supply	1*	1*	1*	1*
Support (Utilities)	1*	1*	1*	1*
Command	1	1	1	1
Safety Officer	1	1	1	1
Salvage/Overhaul	2	0	0**	0
Command Aid	1	1	0	0
Operations Chief	1	1	0	0
Logistics	1	0	0	0
Planning	1	0	0	0
Staging Officer	1	1	0	0
Rehabilitation	1	1	0	0
Division Supervisors	2	1	0	0
High-rise Evacuation	10	0	0	0
Stairwell Support	10	0	0	0
Total Personnel	50-51	21-22	14-15	8-9

*Tasks can be performed by the same individual

**Task can be performed by the attack crew

Occupancy risks in the table above are generally defined as:

- Low Risk – Small out-buildings or single car detached garages. These are generally less than 500 square feet.
- Moderate Risk – Single family homes of wood frame construction generally 2,000 square feet in size.
- High Risk – Apartment buildings, offices, mercantile and industrial occupancies.
- Maximum Risk – Schools, nursing homes hospitals or other high life hazard occupancies. Explosive plants and high-rise buildings are also included in this category.

It is interesting to note that the four-person companies discussed in some areas of NFPA 1710 are not maintained in the description of primary tasks to be accomplished on the fire ground – recognition that the requirements of the response in the field are dynamic and do not fit neatly into size and shape of any particular response configuration. These objectives apply to the initial and follow-up response for reported structure fires. The

document does not suggest that this response be mounted for all incidents.

A task analysis for emergency medical calls analyzes three different types of calls or patient conditions. These three types of calls usually require the most effort on the part of the response team. Other calls or patient types can generally be handled with two or three personnel. Many times, especially in trauma calls, there are multiple patients. The table below outlines the tasks for handling these critical patients and the number of responders it may require for a successful outcome.

Critical Tasks for Effective Patient Care

Critical Task	Cardiac Arrest	Stroke	Multi-System Trauma
Patient Assessment	2 per patient	2 per patient	2 per patient
Airway Management/Intubation	2 per patient	2 per patient	2 per patient
Cardiac Defibrillation	1	N/A	N/A
CPR	1	N/A	N/A
EKG Monitoring	1	1	1
IV/Pharmacology	1	1	1
Splint/Bandage/Immobilization	N/A	N/A	1
Patient Lifting/Packaging	2 – 4	2 – 4	2 – 4
Medical Information Collection	1	1	1

It is incumbent upon a fire agency to have a response plan in place to ensure a sufficient number of personnel are on scene to accomplish the stated critical tasks in a timely fashion. Structure fires are very labor-intensive incidents with any number of factors, such as weather, making the task that much more difficult.

(2) First Alarm Assignment Travel Time

The second part to the concentration model is the travel time for the remainder of the first alarm assignment. The concentration of resources is necessary to ensure the effective response force arrives in a timely manner. Much like the distribution of resources, the concentration is dependent on the population density. It is not reasonable or financially possible for a rural area to have the same concentration of resources that is in an urban setting.

The following table illustrates the travel time benchmarks and baselines for the various population densities.

Service Area / Population Density Response Travel Time Standards				
Urban: Population density of over 2,000 per square mile				
	1st Unit	2nd Unit	1st Alarm Balance	Performance
Benchmark	4 minutes	8 minutes	8 minutes	90%
Baseline	5 minutes/12 seconds	10 minutes 24 seconds	10 minutes/24 seconds	90%
Suburban: Population density between 1,000 and 2,000 per square mile				
Benchmark	5 minutes	8 minutes	10 minutes	90%
Baseline	6 minutes/30 seconds	10 minutes/24 seconds	13 minutes	90%
Rural: Population density of less than 1,000 per square mile				
Benchmark	10 minutes	14 minutes	14 minutes	90%
Baseline	13 minutes	18 minutes/12 seconds	18 minutes/12 seconds	90%

As shown above, the utilization of performance measures based on population density will allow Berlin to evaluate when standards need to change as rural areas of the City develop and move into suburban or urban categories.

The response time data was not sufficient enough to evaluate the response time for the first alarm assignment and the arrival of those resources. The above information is illustrative to allow the department to implement performance measures as response time data becomes more reliable.

4 Integration of Emergency Medical Services

This chapter explores and presents the project team's analysis of the integration of emergency medical services into the fire department.

The New Hampshire Bureau of Emergency Medical Services (NHBEMS) is a bureau of the Division of Fire Standards and Training and Emergency Medical Services. The bureau is established by Revised Statute Annotated (RSA) Chapter 21-P:12-b and is further described in Chapter 153-A. Pursuant to these chapters, the Commissioner is permitted to establish administrative rules for the enforcement of the provisions contained in the statutes. The rules established are contained in Chapter Saf-C 5900 of the administrative section. Rules of Saf-C 5900 are referenced in the following sections where appropriate.

1. Overview of Service Demands

Emergency medical services are an essential function of the healthcare network in the community providing the initial response to medical emergencies. As such it is important to ensure there are sufficient resources available to respond using the demand for services as the basis.

The table below illustrates the calls for service from January 1, 2016 through May 31, 2018.

BEMS Calls by Response Request		
	2016 - May 2018	Pct.
Emergency Response (Primary Coverage Area)	2,611	78.9%
Interfacility Transfer (BLS/AEMT)	241	7.3%
Medical Transport (Non-Acute, Minimal BLS Care)	206	6.2%
Interfacility Transfer (PIFT/Paramedic)	180	5.4%
Emergency Response (Mutual Aid)	36	1.1%
Public Assistance/Other not Listed	12	0.4%
Standby	12	0.4%
ALS Intercept	5	0.2%
Interfacility Transfer (CCT/AMT)	5	0.2%
Bariatric Transport / Special Equipment Delivery	3	0.1%
Total	3,311	

BEMS Calls by City		
	2016 - May 2018	Pct.
Berlin	3,193	96.4%
Milan	50	1.5%
Gorham	25	0.8%
Dummer	14	0.4%
Lebanon	14	0.4%
Littleton	6	0.2%
Errol	3	0.1%
Success	2	0.1%
Conway	1	0.0%
Hanover	1	0.0%
Newry	1	0.0%
Randolph	1	0.0%
Total	3,311	

For the past two and a half years 78.9% of the calls were emergency responses in the primary coverage area. Just over 96% of those calls were in the City of Berlin. It should be noted those calls outside the normal response area are typically residents of the Berlin being transported to and from medical facilities in those areas.

Data from Berlin EMS annual reports provides call volumes for the past five years based on a different response type than previously shown. Berlin EMS attributed the significant increase in call volume from 2013 to 2014 to the opening of the federal prison and the completion of an apartment complex. The table below illustrates the calls for the past five years.

Berlin Medical Calls						
	2013	2014	2015	2016	2017	Avg. Annual Increase
Emergency	1,038	1,196	1,181	1,135	1,224	3.6%
Non-Emergency	162	233	232	201	182	2.5%
No Transports	306	279	335	385	365	3.9%
Total	1,506	1,708	1,748	1,721	1,771	3.5%
Avg. Calls per Day	4.1	4.7	4.8	4.7	4.9	

In the past five years there has been an increase in the call volume of about 17.6% for an average annual increase of 3.5%. The largest increase is in the no transport calls for service at 3.9% over the past five years. There has been a steady increase in the daily average calls for service from 4.1 calls in 2013 to 4.9 calls in 2017. Based on the average

annual increases for calls for service, the table below illustrates the number of calls for the next five years.

Berlin Medical Calls Projection								Avg. Annual Increase
	2017	2018	2019	2020	2021	2022	2023	
Emergency	1,224	1,268	1,313	1,360	1,409	1,460	1,512	3.6%
Non-Emergency	182	186	191	196	201	206	211	2.5%
No Transports	365	379	394	409	425	441	458	3.9%
Total	1,771	1,833	1,898	1,965	2,034	2,106	2,181	3.5%
Avg. Calls per Day	4.9	5.0	5.2	5.4	5.6	5.8	6.0	

The calls for service will likely continue to increase to an average daily call volume of 6 calls per day in 2023.

Response time and call duration is an important segment for future considerations in establishing ambulance staffing and the number of apparatus needed. The current data is not reliable or comprehensive enough to provide an analysis. However, with emergency medical calls the receiving hospital or destination of the transfer can dictate the duration of the call. Mapping tools allow for the measurement of travel time to these destinations. The table below displays the top destinations in 2017, the city in which that destination is located, the number of calls, and the one-way mileage and travel time from Berlin.

2017 EMS Calls by Destination				
Destination	City	Number of Calls	Mileage One-Way	Travel Time One-Way
Androscoggin Valley Hospital	Berlin	1,034		
Unknown / Not Reported		372		
Dartmouth-Hitchcock Medical Center	Lebanon	103	126	2 hours 15 minutes
Saint Vincent DePaul	Berlin	83		
Coos County Nursing Home	Berlin	43		
Catholic Medical Center	Manchester	42	131	2 hours 15 minutes
Home Residence	Berlin	34		
Other Healthcare Facility	Unknown	10		2 hours
Healthcare Facilities outside Berlin		72		2 hours 30 minutes

There are several destinations in Berlin, such as Androscoggin Valley Hospital and Saint Vincent DePaul Healthcare Facility. These destinations are not as critical for impacts to staffing as a unit could respond to another call from these locations if the need arises. Those calls to Dartmouth-Hitchcock Medical Center and the Catholic Medical Center

presents a different issue. For example, a call that has a destination of Dartmouth-Hitchcock is a two hour and fifteen minute one way trip over 126 miles. Considering about 30 minutes for the transfer of the patient to take place, an ambulance could easily be out of the City for five hours. There are 72 calls transporting to healthcare facilities outside Berlin that only occurred once or twice during the year. For example, one transport to Boston Childrens Hospital, two transports to Central Maine Medical Center , and four transports to Littelton Regional Hospital. The time shown in the table above provides an average one way travel time. In 2017 there were 261 calls with destinations that are outside the City of Berlin or appear to be outside the City of Berlin. Based on the number of calls and allotting the time shown in the above table, 1,231 hours were spent for these transports or an average of 3.4 hours per day.

2. Human Resources and Training

This section examines the human resource and training needs for an emergency medical services system to be effective and efficient. Regulations from the NHBEMS will influence the staffing and training of personnel.

(1) Recruitment

There are reports from across the country of a shortage of paramedics and emergency medical technicians. Reports cite pay, training, and the stress of the position as reasons for the shortage. Berlin EMS reports they are having difficulties in staffing their organization citing many of the same reasons for their struggles.

Creating full-time positions and the potential for a stable work environment may assist in recruiting new employees. One area that may be of assistance to the City is the current emergency medical services organization. By integrating Berlin EMS into the Berlin Fire Department, the City may be able to mitigate some of the difficulty in recruiting by obtaining several employees from Berlin EMS and offering a clear and rewarding career path. There are three full-time paramedics and several full-time and part-time emergency medical technicians that may provide a nucleus to start the process of hiring new personnel.

(2) Staffing

Chapter Saf-C 5903.04 requires that each vehicle be staffed with at least two personnel that are licensed by the State with at least one attending the patient. The level of service being provide will dictate the license requirements of the personnel.

The call volume from the past five years indicates the daily average of calls for service has been steadily increasing from 4.1 calls to 4.9 calls. The projection indicates the daily calls for service will increase to about 6 calls per day in the next five years. With the requirements of the State and the current call volume one staffed ambulance with two personnel should be enough to provide service to the City of Berlin. However, long-distance transfers should be handled by a second crew using overtime to staff the units as needed. This could be re-evaluated once reliable data from the combined dispatch center can be analyzed.

To provide the staffing for the ambulance, 8.87 personnel will be needed. The table below illustrates the staffing calculation.

10 / 14 Schedule	
Single Position	
184	Shifts for one Position
10	Sick Days
8	Vacation days
166	Shifts Available to Work
1.11	Personnel to cover 184 shifts
Single Shift	
1	Number of Ambulances
2	Minimum Manning per Ambulance
2.22	Number Assigned per Shift for Ambulances
Department	
1	Number of Ambulances to Cover
2	Minimum Manning per Ambulance
8.87	People to cover - 24 / 7 / 365

Paid time off was calculated based on the current labor agreement. Vacation was calculated at the minimum of two weeks and sick time was calculated at 10 days per year. Both items could be slightly different depending on seniority and the use of sick days.

The NHBEMS requires that two providers are required to staff an ambulance during transportation. Both providers must be licensed by the State at one of the following levels:

- First Responder;
- Emergency Medical Technician – Basic;
- Emergency Medical Technician – Intermediate or;
- Emergency Medical Technician – Paramedic.

The regulations do not stipulate the levels need to be the same for both providers. For example, a crew could be an EMT and a Paramedic or an Intermediate EMT and a Paramedic. However, the provider responsible for patient care may only provide care that is within the scope of their license.

Operationally there are four (4) shifts in the Fire Department. Shift schedules include on-duty for two (2) ten (10) hour days, off-duty for twenty-four (24) hours, on-duty for two (2) fourteen (14) hour nights, then off-duty for four (4) days. Based on the previous table it will require 1.1 persons to cover one position or 2.2 persons per shift. With four shifts that will require 8.8 persons or 9 persons to cover the 4 shifts. In order to reduce the amount of overtime and other scheduling conflicts, one (1) additional person on three (3) shifts and two (2) additional persons on the third shift or five (5) personnel will be used to fill the positions necessary to operate a single ambulance. This will allow staffing of one engine and one ambulance each shift, allowing for one person off before overtime is needed. On call and part-time personnel will also be used to fill vacancies. If a concurrent EMS call occurs, the engine company personnel can cross staff the second ambulance, provided they have the appropriate EMS certification. The table below illustrates the cost for one person to fill a position and the total cost to fill all 5 positions for the first five years. It is recommended that as funding permits, an additional Firefighter/Paramedic should be added to each shift.

Salaries and Benefits to Staff One Ambulance						
Year	Salary	Benefits	Turnout Gear	Total Cost	Number of Personnel	Total Cost
2019	\$45,940	\$37,671	\$2,100	\$85,711	5	\$428,553
2020	\$47,076	\$38,602	\$0	\$85,678	5	\$428,390
2021	\$47,757	\$39,161	\$0	\$86,919	5	\$434,593
2022	\$48,098	\$39,441	\$0	\$87,539	5	\$437,694
2023	\$48,780	\$39,999	\$0	\$88,779	5	\$443,897
2024	\$49,439	\$40,540	\$0	\$89,978	5	\$449,892

The salary was calculated using the current labor agreement beginning at the Firefighter Probationary B (5-9 months) with the total including automatic overtime. Benefits is a

product of the percentage between the salaries and benefits for the 2018 fiscal year which is about 82% of salaries. In as much as the focus is on the emergency medical services, turnout gear is included as these individuals would be trained as firefighters and responding to fire incidents. The costs shown in 2019 is for a full year. With the Berlin EMS contract ending in June 2019, it is possible the costs could be somewhat less depending on the timing of the emergency medical services integration into the Fire Department.

In addition to the staffing of an ambulance, there will need to be a position to provide oversight to the program. Among the duties that will require consistent oversight is the medical supplies, billing for services, quality control of patient care and reporting, training, and scheduling of transfers and personnel. Some of these items could be handled by on duty personnel, however, some of these items will require constant and consistent oversight. For example, the quality control and billing will require constant oversight whereas the medical supplies may not. Placing a Captain in charge of the program would fit well into the organizational chart and place this part of the organization at the same level as the shifts. This position would work a 40-hour week like the Chief position. In this manner, this position could ensure the program is consistently operated and be available for those business items such as billing and scheduling. The cost for this position is illustrated in the table below.

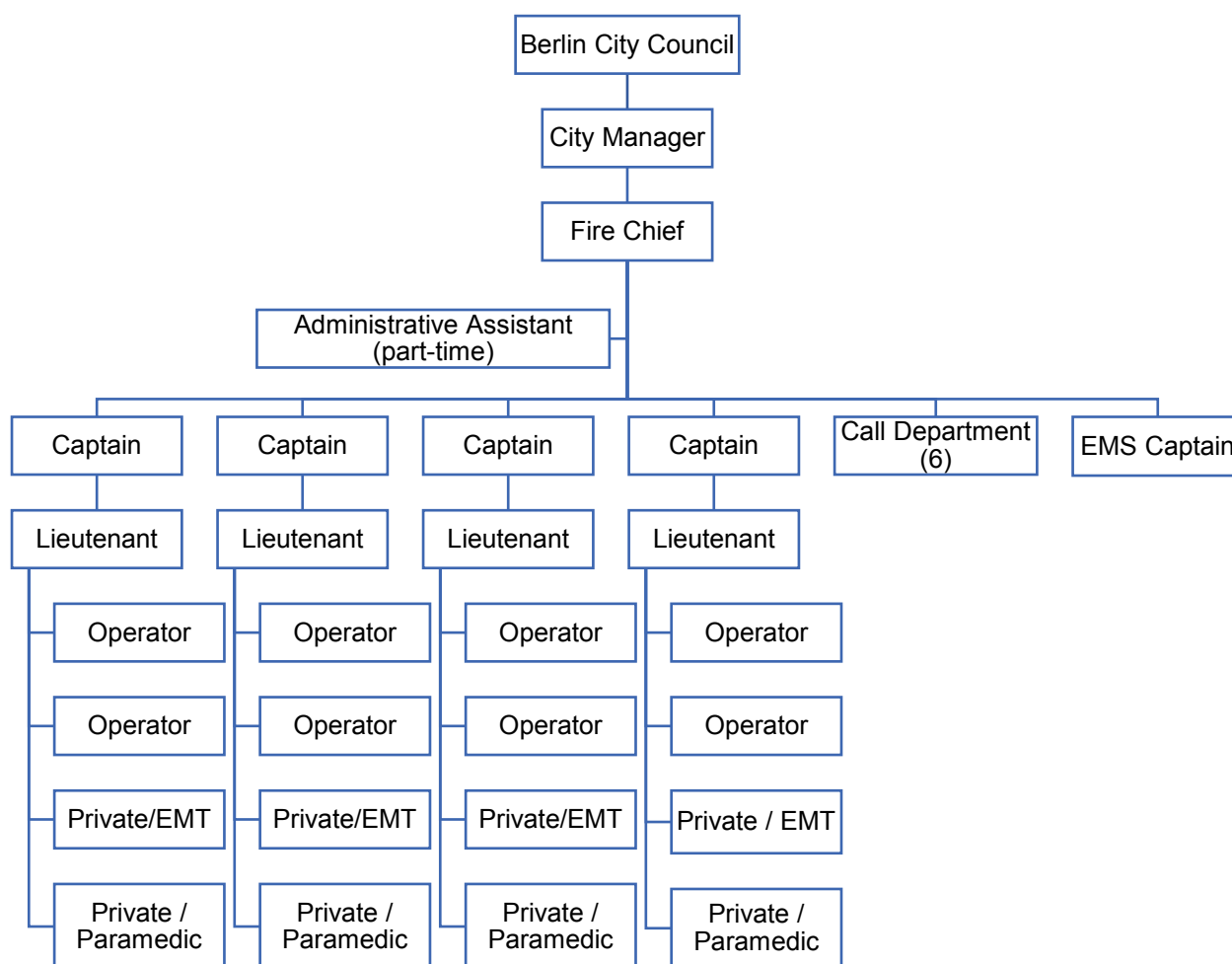
Salaries and Benefits for EMS Oversight				
Year	Salary	Benefits	Turnout Gear	Total Cost
2019	\$49,712	\$40,764	\$2,100	\$92,576
2020	\$51,917	\$42,572	\$0	\$94,489
2021	\$51,917	\$42,572	\$0	\$94,489
2022	\$51,917	\$42,572	\$0	\$94,489
2023	\$51,917	\$42,572	\$0	\$94,489
2024	\$51,917	\$42,572	\$0	\$94,489

The salary was calculated using the current labor agreement beginning at the Junior Captain level for the first year, then to the Senior Captain for subsequent years. Benefits is a product of the percentage between the salaries and benefits for the 2018 fiscal year which is about 82% of salaries. In as much as the focus is on the emergency medical services, turnout gear is included as this individual would be trained as a firefighter and potentially responding to fire incidents.

To operate an emergency medical service the State requires a Medical Director. This position will have oversight of education, leadership, advice, critiques, performance improvement, medications, and treatment modalities and protocols. This position should

also have a connection to the medical resource hospital which provides medical control to the emergency medical system.

The following organizational chart illustrates how the integrated Fire and EMS Department will be structured:



Recommendations:

Increase the administration staffing of the Fire Department to include a Captain to oversee and manage the Emergency Medical Services section of the Fire Department at an initial cost of \$92,576.

Increase overall staffing of the Fire Department by five (5) personnel to achieve a daily staffing of six (6) personnel per shift, with a minimum staffing of five (5) per shift and work toward training a total of (12) state licensed paramedics to provide each shift with three (3) paramedics and a minimum staffing of two (2) paramedics per shift at an initial cost of \$428,553.

Acquire the services of a physician that meets the requirements of the State to serve as the Medical Director for the emergency medical services system. This should be a local physician that will donate time to provide the service.

(3) Training and Education

Training hours and coursework for any certifications and licenses to operate in the fire and emergency medical services is regulated by the New Hampshire Department of Safety and more specifically the Division of Fire Standards and Training and Emergency Medical Services.

Course requirements for the paramedic license in New Hampshire requires over 1,340 hours of training, education, and practical experience. The first step is be a licensed emergency medical technician – basic. This requires 140 hours of coursework and will need 4 to 6 months to complete. These classes are held in various parts of the state typically sponsored by a local fire department or EMS agency. Granite State EMS Training Center also offers the emergency medical technician – basic course at their campus in Concord at a cost of \$1,300.

Paramedic training and education is offered by the New England EMS Institute located in Manchester. Their program is 1,200 hours in length and will require 16 months to complete. Tuition for the program is \$10,500 plus \$1,425 for various testing fees and books. This program also requires a touch screen mobile tablet capable of displaying modern web pages and viewing PDF files. Listed below are their prerequisites to enter the program:

- Licensed Emergency Medical Technician – Basic or Emergency Medical Technician – Intermediate
- Possess a high school diploma or GED

- Documentation of 50 emergency medical calls
- Letter of recommendation from the Director of the Service
- Letter of recommendation from the Medical Director
- Complete the paramedic entrance assessment
- Complete a pre-admission interview

For continuing education and the recertification process, the State of New Hampshire follows the guidelines of the National Registry of Emergency Medical Technicians (NREMT). For the emergency medical technician- basic the continuing education requirement is 40 hours over a two-year cycle. At the emergency medical technician – paramedic level the requirement is 60 hours over a two-year cycle. In both instances, the NREMT organization outlines topics and the number of hours in each of those topics that are required to achieve recertification. These classes may be held in the station or at other venues depending on the subject to be taught and the availability of instructors.

The City of Berlin should consider hiring a minimum of seven (7) licensed paramedics for these positions, to ensure there are two paramedics available to staff each shift, which will ensure a paramedic is available if the other is on leave. In this manner the newly formed emergency medical services can be operational more quickly and, with two paramedics per shift, staffing will be less complicated. The remaining EMT certified personnel can drive the ambulance and be trained to the paramedic level as desired by the Department. The table below illustrates the current emergency medical licenses of the Fire Department personnel.

Fire Department Medical Training	
Type	Number
No Medical Training	7
First Responder	6
Emergency Medical Technician - Basic	5
Emergency Medical Technician – Advanced	1
Emergency Medical Technician - Paramedic	1

There are thirteen personnel that are below the emergency medical technician – basic level of certification. Using the tuition cost of Granite State EMS Training Center of \$1,300 per student, it would cost \$18,200 in tuition to train these fourteen personnel and would take 4 to 6 months to complete. Travel to the class is an issue as the Granite State facility

is in Concord. Another alternative would be to sponsor a class in Berlin. There may be interest from Gorham and Milan to provide additional support to sponsoring a class. Sponsoring the class locally may reduce the overall cost but that will be dependent on the instructor, the number of students, and participants outside the department.

New Hampshire requires career firefighters to be trained to a Firefighter II level certification. A total of 328 hours is required to complete the course and practice testing segments. The training is held at the New Hampshire Department of Safety facilities in Concord or Bethlehem. The cost of this training is approximately \$1,500 plus the cost for books. Each student must supply their own turnout gear and self-contained breathing apparatus. These courses may be available to be sponsored locally with enough students in the class. Like the emergency medical courses, instructor availability and the number of students will dictate any cost savings.

Recommendations:

Provide training and education for the newly hired paramedics to be certified as Firefighter II in the State at a cost of \$1,500 per employee before the start of emergency medical services operations. There will be salary and overtime costs associated with training these personnel to backfill shifts when needed.

Begin the process of training the existing staff to the level of emergency medical technician – basic at a cost of \$1,300 per employee. There will be salary and overtime costs associated with training these personnel to backfill shifts when needed.

3. Physical Resources

Establishing an emergency medical service will require physical resources in addition to personnel. These resources include ambulances and equipment in the ambulances as well as facilities to house the ambulances and personnel.

(1) Vehicles and Equipment

There are two ways to acquire the vehicles and equipment necessary to operate an emergency medical service. The current Berlin EMS organization has three ambulances an option for the City is to negotiate the purchase of these ambulances and the current equipment and medical supplies used by Berlin EMS. The table below lists these vehicles.

Berlin EMS Apparatus				
Unit ID	Year	Description	Type	Mileage
Med 1	2013	Ford	Box Style	114,583
Med 2	2017	Ford 4x4	Box Style	NR

Med 3 2011 Ford Van Style 162,998

In many instances, it is financially viable to remount the patient compartment “box” on a new chassis. Med 2 is a remount using a 2017 Ford chassis.

The other option is to purchase new ambulances, equipment and supplies. The cost for a new ambulance is assumed to range from \$125,000 to \$150,000 depending on the style and any options that may be installed. The exact cost will depend on how the purchases is negotiated. Type 1 ambulances are those that are on a truck chassis, such as a Ford F450 or Chevrolet K3500, are in the upper range of \$150,000. Type 3 ambulances are those that are on van style chassis, such as a Ford E450 or Chevrolet G4500, and are in the lower range of \$125,000. These prices do not include any equipment or other appurtenances necessary to function in a medical response.

The NHBEMS has a list of required equipment and supplies that each ambulance must carry depending the level of care to be provided. Equipment to be carried and other items such as emergency medical supplies, cots and related small equipment will cost in the range of \$20,000 to \$35,000 per ambulance if purchased new. The table below presents a partial list of higher cost equipment with typical pricing to provide a sense of the equipment cost.

Typical Equipment	
Item	Cost
Cot	\$8,995
12 Lead EKG	\$13,595
Airway Management Kit	\$800
Stair Chair	\$995
Scoop Stretcher	\$450

Recommendations:

The City should acquire bids to purchase the apparatus and equipment necessary to provide advanced life support services to the community at an estimated cost in the range of \$125,000 to \$150,000 per apparatus including the cost for the equipment.

Purchase any additional equipment and supplies necessary to meet the State requirements for the provision of advanced life support services to the City at an estimated cost in the range of \$20,000 to \$35,000.

One of the more difficult tasks facing municipalities is the replacement of apparatus due in large part to available funding, the timing of when to replace and what should be replaced first. As the apparatus ages, it becomes more difficult to maintain and less parts are available for replacement. Like the distribution and concentration of resources, a one

size fits all approach does not work well with apparatus. Some vehicles and apparatus do not last as long as others. This could be due to higher call volumes, extreme wear and tear and preventive maintenance measures.

The maintenance of ambulances will not adversely affect Public Works in Berlin if they were to handle the maintenance of these newly acquired vehicles. According to industry standards, ambulances have a vehicle equivalent rating (VEU) of 8, which means they take 8 times the effort to maintain and repair as a typical car. Each VEU requires 15 hours per year in maintenance, therefore, each ambulance will require 120 hours per year of labor for a total of 360 hours of labor for public works or the .17 full time equivalent for a mechanic. Based on the shop rate at public works for a mechanic this equals \$13,111 impact in salaries and benefits for public works. Another option is to outsource the maintenance of the ambulances.

An effective apparatus replacement program will have benchmarks established to drive the replacement schedule. These benchmarks should establish a replacement guideline to categorize the various units and their target replacement date, definitions for the determination of the condition of the vehicle and other criteria to be used in the evaluation of the vehicle. The table below outlines a suggested set of life-cycle benchmarks to begin the process.

Life Cycle Anticipated Benchmarks

Vehicle Type	Anticipated Front Line Life Cycle	Anticipated Reserve Life Cycle	Anticipated Mileage
Ambulances	7 - 10 years		150,000 – 200,000
Engines	10 years	3 to 5 years	
Aerials	15 years	3 to 5 years	

This establishes the expected life for purposes of depreciation and the funds that will be available for the eventual replacement.

The replacement guideline uses a point system to determine when the unit should be replaced. It utilizes a variety of factors to score the apparatus.

The table below identifies those factors and the recommended point system to use.

Replacement Guidelines

Factor	Points
Age	One point for each year of chronological age.
Mileage / Engine Hours	One point for each 10,000 miles or 1,000 engine hours.
Type of Service	Points are based on severity of service 5 points - Engine Company 3 Points - Aerial Ladders / Specialty Units 1 Point - Administrative Vehicles
Reliability	Points are based on the frequency a vehicle is in the garage for repair 5 points - Two or more times per month (average) 3 Points - Two times every three months (average) 1 point - Once every three months (average)
M & R Costs	Maintenance and repair costs on the total life of the vehicle, excluding accident damage. 5 points – M & R costs equal to or greater than original purchase price 4 points – M & R costs 75% to equal to the original purchase price. 3 points – M & R costs 50% to 75% of the original purchase price 2 points – M & R cost 20% to 50% of the original purchase price.

Replacement Guidelines

Factor	Points
	1 point – M & R costs 20% or less than original purchase price.
Condition	Consideration given to body condition, rust, interior condition, accident history, anticipated repairs, etc.
	5 points - Poor Condition
	4 points - Fair Condition
	3 points - Good Condition
	2 points - Very Good Condition
	1 point - Excellent Condition

This system uses the major components typically considered in evaluating vehicles and then puts a numeric value to the vehicle. It can be adjusted to fit the local perspective. For example, if the maintenance costs are a more important factor then adjusting the percentage to the original cost will provide a higher weight to that category.

The table below outlines the total score and the expected outcome of that score.

Replacement Guideline Scoring

Point Range	Condition
Fewer than 18 points	Condition I - Excellent
18 to 22 points	Condition II - Good
23 to 27 points	Condition III - Qualifies for Replacement
28 points and above	Condition IV - Needs Immediate Consideration

Another component to this type of system is the collaboration between the Fire Department and the fleet mechanic. Both should discuss the results of the vehicle score to determine the needs of the apparatus in terms of mechanical issues. It is possible there is a unit or units that will need major repairs that would influence the decision to replace the apparatus.

The investment in apparatus is a significant endeavor for any community. Changes in the standards by which they are built and the performance standards by which they are tested continue to evolve and has resulted in rapidly increasing costs for apparatus. As previously noted, ambulances can cost in the range of \$125,000 to \$150,000 or higher depending on the style and options available. Many communities will borrow the funds to purchase the apparatus while others will have set funds aside based on the depreciation of the current apparatus and planned replacement schedule. Without an effective program for planned replacement of apparatus, the City could very easily and quickly find itself in a position of having to replace several units at once and relying on apparatus that older and unreliable.

Recommendation:

Establish an apparatus replacement program for apparatus to contain benchmarks and measurable components for the planned replacement of apparatus along with a funding mechanism.

(2) Buildings and Stations

The current fire station is not designed or capable of increasing the apparatus stored at the station. It will require two additional apparatus bays to house two ambulances plus additional areas for storage and work space. Ambulances available on the market today range in size from twenty-two (22) feet to twenty-five (25) feet in length and are in standard widths of nine (9) feet. It is recommended the apparatus bays have sufficient space around the vehicles for work space, typically three (3) feet on the sides and front and then seven (7) to ten (10) feet in the rear of the vehicle. For emergency medical services there will need to be additional storage space for equipment and a secured storage space for drugs and other medical supplies that may require additional security. Two ten (10) foot by ten (10) foot storage spaces should be planned to allow for storage and potential expansion.

Apparatus bays for ambulances should be fifteen (15) feet wide and about thirty-eight (38) feet deep to allow for workspace around the vehicle. This will require 1,140 square feet for apparatus space. The additional storage space is about 200 square feet. The renovation and addition to the fire station will require 1,340 square feet. Current construction costs will be approximately \$250,000 depending on site work and other construction issues that may arise.

Construction of the additional apparatus bays will likely extend beyond the proposed start date. As such, the City may need to arrange an agreement to use the existing building from Berlin EMS until such time as the new quarters are completed. Commercial warehouse style facilities were used for comparison of lease costs in the area and are shown in the table below.

Commercial Leasing			
Location	Square Footage	Monthly Rent	Rent per Sq. Foot
Laconia, NH	11,246	\$5,000	\$2.25
Belmont, NH	5,500	\$2,600	\$2.12
Ossipee, NH	3,600	\$2,200	\$1.64
Littleton, NH	3,800	\$1,425	\$2.67
Average	6,037	\$2,806	\$2.15

The average cost to lease commercial warehouse space is about \$2.15 per square foot. However, with the relationship between Berlin EMS and the City, the current space in Berlin could be leased for about \$1.00 per square foot. The existing Berlin EMS building is approximately 2,400 square feet resulting in a monthly lease of about \$2,400.

Recommendations:

Lease space to house two (2) ambulances and personnel until such time as the new facilities are ready at a cost of \$1.00 per square foot or about \$2,400 per month for 2,400 square feet.

Begin construction of apparatus space to house at least two (2) ambulances for an estimated cost of \$250,000.

4. Financial Resources

There are financial considerations for the operation of an emergency medical service for revenues and expenditures. The Berlin Emergency Medical Services insurance and collection revenues are shown in the table below and will be used to project future potential revenues.

Berlin Emergency Medical Services, Inc.					
Revenues	2016 Actual	2017 Actual	Total	Pct. Of Total	Annual Increase
Fees - Private	\$224,588	\$331,418	\$556,006	43.0%	47.6%
Fees - Medicare	\$356,037	\$368,426	\$724,463	56.1%	3.5%
Fees - Medicaid	\$8,510	\$2,691	\$11,201	0.9%	-68.4%
Total Revenues	\$589,135	\$702,535	\$1,291,670		
Number of Calls	1,336	1,406	2,742		
Revenue per Call	\$440.97	\$499.67	\$471.07		

As illustrated private insurance payments represent 43% of the revenue and Medicare represents about 56.1% of the revenues for the past two years. Additionally, the annual increase for private insurance payments is almost 48% while the Medicare increase is 3.5%. It should be noted the annual increase is based on two years of financial information and may not represent an accurate or sustainable increase for financial projections.

Upon accepting Medicare payments, the payee accepts that payment as payment in full. There is no recourse to bill or accept payment for the balance of any services from the patient. Typically, the Medicare payment is not sufficient to cover the actual cost of the

service as the rates are set by the Medicare system and applied based on the region in the United States.

Projecting revenues for emergency medical services uses the number calls for service as the basis. Unfortunately, the calls for service data does not differentiate between private insurance or Medicare. Using the revenue as a percentage of the total provides a mechanism to determine the calls for each type of payor. For example, for the past two years private insurance has provided 43% of the collected revenue therefore 43% of the calls are attributable to private insurance payors.

The table below illustrates the call volume projection based on payor type and the revenue projection based on current collections.

Berlin Medical Calls Projection									
	2017	2018	2019	2020	2021	2022	2023	2024	Payor Pct.
Billable Calls	1,406	1,454	1,504	1,556	1,610	1,666	1,725	1,785	
Private Insurance Calls	605	625	647	669	692	717	742	768	43.0%
Medicare Calls	789	816	844	873	903	935	968	1,001	56.1%
Medicaid Calls	13	13	14	14	14	15	16	16	0.9%
Medical Revenue Projection based on Call Volume									
Fees - Private	\$284,800	\$294,522	\$304,650	\$315,184	\$326,122	\$337,536	\$349,350	\$361,577	
Fees - Medicare	\$371,564	\$384,249	\$397,462	\$411,205	\$425,475	\$440,367	\$455,780	\$471,732	
Fees - Medicaid	\$5,961	\$6,164	\$6,376	\$6,597	\$6,826	\$7,065	\$7,312	\$7,568	
	\$662,324	\$684,936	\$708,489	\$732,985	\$758,423	\$784,967	\$812,441	\$840,877	

As previously noted, the increase in collections between 2016 and 2017 may not represent an accurate or sustainable increase for revenue projections. Therefore, the average per call revenue of \$471.07 was used to calculate the projection which is the reason the 2017 revenue total is slightly different than that of the previous table. No increases in collections were considered in the projection as the Medicare rates will likely remain stable and represent a higher portion of the overall revenue stream. Using the average collection amount of \$471.07 presents a more conservative approach to potential revenues.

Berlin EMS reports they are billing about \$1.8 million per year and in 2017 collecting \$702,535. This translates to a collection rate of about 39% for the billing of services. The collection rate is related to the payor mix. As previously noted, Medicare has a set rates and likely will not cover the entire cost of the service. The rise in Medicare payments will affect the collection rate and the amount necessary to subsidize the emergency medical services system

The expenditures for the emergency medical system is mostly personnel related however, there are some operational costs associated with the emergency medical services. Overtime has been increased to ensure appropriate funding for backfilling shifts and personnel attending training. The table below illustrates the additional cost associated with integrating the emergency medical services into the Fire Department.

Berlin Fire Department - EMS Integration Expenditure Projection						
	2019	2020	2021	2022	2023	2024
Salaries	\$279,412	\$287,297	\$290,702	\$292,407	\$295,817	\$299,112
Employee Benefits	\$229,118	\$235,584	\$238,376	\$239,774	\$242,570	\$245,272
OT Transport Calls	\$37,336	\$38,260	\$38,813	\$39,090	\$39,644	\$40,179
OT Training/Backfill	\$19,559	\$20,111	\$20,349	\$20,468	\$20,707	\$20,938
Turnout Gear	\$12,600	\$0	\$0	\$0	\$0	\$0
Total Personnel Cost	\$578,025	\$581,251	\$588,240	\$591,739	\$598,738	\$605,501
Operational Expenditures						
Medical Supplies	\$50,000	\$51,500	\$53,045	\$54,636	\$56,275	\$57,964
Training	\$13,000	\$13,390	\$13,792	\$14,205	\$14,632	\$15,071
Basic Fire Training	\$18,000	\$0	\$0	\$0	\$0	\$0
Basic EMS Training	\$18,200	\$0	\$0	\$0	\$0	\$0
Vehicle Maintenance	\$20,000	\$20,600	\$21,218	\$21,855	\$22,510	\$23,185
Equipment Maintenance	\$8,000	\$8,240	\$8,487	\$8,742	\$9,004	\$9,274
Utilities (Electric, Phone, etc.)	\$18,000	\$18,540	\$19,096	\$19,669	\$20,259	\$20,867
Building Lease	\$28,800	\$28,800	\$28,800	\$0	\$0	\$0
Medical Malpractice Insurance	\$55,000	\$56,650	\$58,350	\$60,100	\$61,903	\$63,760
Billing Contract	\$10,627	\$10,995	\$11,376	\$11,775	\$12,187	\$12,613
Fuel and Oil	\$11,818	\$12,173	\$12,538	\$12,914	\$13,301	\$13,700
Total Operating Expenditures	\$251,445	\$220,887	\$226,702	\$203,896	\$210,071	\$216,434
Total Expenditures	\$829,470	\$802,139	\$814,941	\$795,635	\$808,809	\$821,935

In the previous table, the pay scale used from the contract began at the Firefighter Probationary B level and progressed through to Firefighter 1st Class B. Benefits were calculated at 59.9% of the salaries. Overtime for transport calls is based on the 1,231 hours per year at an overtime rate for the new paramedics. Other operational expenses were based on the financial experiences of the Berlin EMS such as medical supplies and malpractice insurance. The utilities are based on the expenses of the Berlin EMS and using their existing building until such time as an addition can be completed. These expenses should be lower than shown once the addition is complete. Equipment maintenance for medical equipment are typically maintenance agreements that are two to three-year agreements. Training was calculated using the overtime rate and the number of hours of required continuing education per year for each paramedic. Projections of the operating expenses include a 3% annual increase as the consumer price index is at 2.7% for August 2018.

The table below combines the projected revenues and the projected operating expenditures.

Berlin Fire Department - EMS Integration Revenue/Expenditure Comparison						
	2019	2020	2021	2022	2023	2024
Revenues	\$708,489	\$732,985	\$758,423	\$784,967	\$812,441	\$840,877
Expenditures	\$829,470	\$802,139	\$814,941	\$795,635	\$808,809	\$821,935
	(\$120,981)	(\$69,154)	(\$56,519)	(\$10,667)	\$3,632	\$18,942

The projection indicates the City would experience a deficit the first year of operation, but fully recover all costs associated with assuming EMS transport services in later years. The revenues are increasing at a rate of about 3.1% per year and attributable to the increase in the number of billable calls. The revenue projection also maintains the same payor mix of 56.1% being Medicare and 43% being private insurance. Large changes in the payor mix will alter the projections shown. For the operating expenditures, the overall increase is about 1% per year.

The current contract with Berlin EMS provides for an automatic increase of \$6,000 per year or about 1.7%. Further, the agreement stipulates any increases or decreases in Medicare or Medicaid rates greater than 5% will also trigger an increase or decrease in the subsidy. Using the contract with the Berlin EMS as a base, the table below compares the stipend paid to Berlin EMS with the projected supplemental funds needed to operate a Fire Department based system.

Berlin Fire Department - EMS Integration Contract Comparison						
	2019	2020	2021	2022	2023	2024
Projected	(\$120,981)	(\$69,154)	(\$56,519)	(\$10,667)	\$3,632	\$18,942
Contract	\$347,000	\$353,000	\$359,000	\$365,000	\$371,000	\$377,000
	\$226,019	\$283,846	\$302,481	\$354,333	\$374,632	\$395,942

When the current contract costs are factored in, the Fire Department will see a reduction in current cost to the City of \$226,019 in 2019, compared to contracting with BEMS and this trend will continue for the next five to six years. Included in the higher amount for 2019 is the initial training and associated overtime costs. Revenues used in this projection are based on the payor mix of 56.1% Medicare and 43% private insurance with a collection rate of about 39%. Changes in the payor mix could have a negative impact on the financial aspects of the system.

Vehicle and equipment acquisition can be done in one of two ways; purchasing new items or acquiring the existing assets of Berlin Emergency Medical Services. The table below provides a comparison of the cost between the two methods.

Berlin Fire Department - EMS Integration Capital Improvement Projection						
	2019	2020	2021	2022	2023	2024
Acquiring New Vehicles and Equipment						
Vehicles	\$300,000	\$0	\$0	\$0	\$0	\$0
Facilities	\$250,000	\$0	\$0	\$0	\$0	\$0
Equipment	\$60,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000
Total	\$610,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000
Acquiring Existing Vehicles and Equipment						
Med 1 - 2013 Ford	\$50,000	\$0	\$0	\$0	\$150,000	\$0
Med 2 - 2017 Ford 4x4	\$150,000	\$0	\$0	\$0	\$0	\$0
Med 3 - 2011 Ford	\$30,000	\$0	\$150,000	\$0	\$0	\$0
Equipment	\$40,000	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000
Facilities	\$250,000	\$0	\$0	\$0	\$0	\$0
Total	\$520,000	\$15,000	\$165,000	\$15,000	\$165,000	\$15,000

Values for the vehicles shown in the existing equipment was obtained from used ambulance dealers using similar vehicles with similar mileage. However, the overall mechanical condition of these vehicles may dictate a different value. Acquiring the existing fleet would also require replacement of these vehicles sooner than if new vehicles were purchased, Potential replacement at ten years of age was used in this projection as a reference point for those replacements. It is possible the replacements may need to occur sooner than what is shown in the table, due to actual use and maintenance needs. The equipment cost is also based on similar refurbished equipment on the higher priced items within the emergency medical services.

Berlin EMS uses a third-party company to handle their billing system as does many fire departments and ambulance services across the country. With the detail and intricacies necessary to ensure billing is correctly coded and to ensure the follow up is handled properly, these companies offer their services for a percentage of the collections. Fees collected by these agencies range from 1.5% to 3.0% depending on the area and the contract negotiations. Third-party companies will also ensure the billing and collections are legally handled.

Recommendation:

The City of Berlin should contract with a third-party company to handle their billing and collections for services. Cost for the service is estimated at approximately \$11,000 annually using 1.5% of collections.

5. Implementation Plan

The current contract with Berlin EMS expires on June 30, 2019, but should be extended to allow a smooth integration between the two agencies. The implementation plan would get a program established and fully operational by July 1, 2021. The first steps can be implemented simultaneously.

The table below illustrates a proposed timeline to fully integrate the emergency medical services into the Fire Department and be operational by July 1, 2021, if the consolidation effort began in July of 2019.

Proposed Implementation Schedule							
Months	1-4	5-8	9-12	13-15	16-19	20-24	25+
Hiring a Captain							
Hiring a Medical Director							
Acquiring Vehicles							
Acquiring Medical Equipment							
State Licensing and Certifications							
Hiring Paramedics							
Basic Firefighter Training							
Training existing personnel to EMT-B							
Begin construction of apparatus bays							

As illustrated above, the full integration of the emergency medical services will require several steps, many of which can be done simultaneously. This integration will take a minimum of 24 months to complete.

(1) Emergency Medical Services Manager

One of the first steps is to put into place a Captain to manage the emergency medical services program. In the first few months this individual would be responsible for acquiring the necessary licenses, equipment, vehicles, and personnel to operate the program. Following the initial set-up of the program, this position would transition to managing the daily operations.

The Department of Safety has regulatory control over the emergency medical services delivery system as outlined in Title XII Public Safety and Welfare Chapter 153-A. Through these regulations, the Department of Safety through the Bureau of Emergency Medical Services have adopted rules and regulations regarding the delivery of emergency medical services. Among these rules and regulations are the requirements for vehicles and supplies, licensing of the service, and certifications and licensing of personnel. These regulations must be followed to properly and legally operate an emergency medical service.

The Medical Director will need to be involved in the process of establishing the emergency medical services system. This position will assist in the development of protocols, the acquisition of equipment and supplies, and dealing with the State regulations. In most small communities a local physician donates their time to serve as the Medical Director and there is no charge associated for the service as it only requires a few hours per month for meetings and quality assurance.

(2) Apparatus and Equipment

With the placement of the Emergency Medical Services manager, the process to purchase apparatus and medical equipment should begin. The financial analysis in the previous sections used pricing for new apparatus. Purchasing used apparatus may be a viable option for the City. Berlin EMS has apparatus that may be useable. This will depend on the mechanical condition and the price for the ambulances. The cost to purchase used apparatus would be somewhat less than new apparatus but may increase the maintenance cost.

Medical equipment will need to be purchased as well. These items would include heart monitor/defibrillators, airway management equipment, cots, stair chairs, and other medical supplies. As with the apparatus, the financial analysis in the previous sections used new equipment pricing. Used equipment may be available from the Berlin EMS organization which will reduce the cost to the City.

(3) Shift Staffing

The hiring process for the shift staffing should begin in February with a start date in April 2019. Due to the time required to complete paramedic training, the Fire Department should hire licensed paramedics to fill the five positions needed to begin operations. This will allow the program to begin operations in July 2019. Starting the new employees in April provides the time necessary to have all five complete the Firefighter II certification training. This training is 328 hours and at 40 hours per week will take about 8 weeks to complete. As well, starting the new employees in April will permit the training to be completed without using overtime pay.

6. Regional Consolidation

Berlin EMS reported the Gorham EMS added another ambulance to their operation with a focus on the transfers that in turn reduced the number of transfers handled by Berlin. Additionally, Milan Ambulance has been undergoing changes in their senior management. According to Berlin EMS, Milan has been able to cover most of their requests for service, however, Berlin has been assisting with those calls in Milan and Dummer. The current EMS service environment is designed to handle medical calls, including emergency calls, non-emergency calls, mutual aid calls and interfacility transfers. With the type of services that have been provided in the past years, integration into the fire department will need to consider these services as well. When an ambulance is needed to assist in Gorham or Milan, revenue is only generated if there is a patient transported to the hospital and the bill for service is paid. If the City were to assume EMS service responsibility, it should enter into a formal automatic or mutual aid agreement with Gorham and Milan, which could stipulate a financial agreement for non-transport calls or those where the patient is unable to pay the bill for service.

At present there is no interest from Milan or Gorham to consolidate services. Both agencies reported to be satisfied with their systems and as long as they are stable there is no interest in having another agency provide services. However once the City of Berlin assumes responsibility for providing emergency medical transport services and has a fully operational system, there may be an opportunity to further discuss regionalization of EMS services in the area.