KINGSPORT, TENNESSEE

Fire Protection Management Study

June 2011

The University Institute for Public Service
Municipal Technical Advisory Service

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Introduction and Scope of Work

This study was conducted at the request of City of Kingsport Board of Mayor and Aldermen. The purpose of the study was to answer the following four specific questions:

1. Should Engine 12, currently located at Station 1, be redeployed to Station 8?
2. Should the City purchase a second ladder truck as currently provided in our Capital Improvement Plan?
3. What is the most efficient and cost-effective way to respond to medical and accident calls? Should the City operate an EMS?
4. What is the best way to integrate our efforts with those of the Kingsport Life Saving Crew?

It is possible to refocus the four questions into one problem statement: What is the most efficient and cost effective way for the Kingsport Fire Department to provide an all-hazards service delivery program that addresses community risks and needs?

A letter dated March 16, 2011 from Vice-Mayor Mallicote authorized MTAS to conduct an official fire department study.

Background

The City of Kingsport is located in Sullivan County in Northeast Tennessee 22 miles west of Bristol and 24 miles north of Johnson City. Fire protection and staffing is a local policy issue, and a community must balance local resources against acceptable risk. The City of Kingsport enjoys an Insurance Services Office (ISO) Public Protection Classification of 3, which places Kingsport in the top 3.4% of communities nationwide in terms of fire protection and indicates that Kingsport has made good decisions in planning for community fire protection. In addition, KFD is one of only three accredited Fire Departments in the State of Tennessee.

The Kingsport Fire Department is a career municipal fire department supported by the City of Kingsport and recognized by the State of Tennessee. The fire department operates seven fire stations housing eight engine companies and one ladder truck. Annexation and growth have occurred and the city is opening an eighth fire station this year to serve an area that was annexed in 1991

The Kingsport Fire Department is a busy department, averaging over 19 calls per day for 2010. According to the Tennessee Municipal Benchmarking Project report for 2009, the Kingsport Fire Department answered 6,518 calls for service, which is higher than the survey mean of 4,478 calls and above the median of 3,144 calls for all ten cities reporting. Of these responses, 1,809 were fire calls, which is higher than the mean of 580 and the median of 495. Of these 1,809 fire calls, 77 were structure fires, which is below the mean of 89 and above the median of 55. The department's response time is

5:59, which is just above the mean of 5:52 and at the median of 5:59. The department has 106 fire fighters, and the study mean is 94, and at the median of 106. The number of fire fighters per thousand population is certainly strong at 2.43 - the study mean is 1.57, and the median is 2.17. With this in mind, we do find that the Kingsport Fire Department is staffed sufficiently to provide a variety of manpower options with sufficient flexibility in terms of when, where, and how manpower is allocated. Another noteworthy statistic from the Benchmarking project is Kingsport's overtime compensation ratio, which was the second highest in the benchmarking report at 2.5%.

All engines have a minimum staffing level of three personnel: a captain, an engineer, and a fire fighter. The ladder truck has one fire fighter. The standard structure fire response is 3 engines and the ladder, plus a deputy chief, which is 10 fire fighters plus a command officer. Per the department's Standard of Cover, approximately 800 addresses in the City require a 4-engine and ladder truck response because of high risk or needed fire flow that exceeds 3,500 gallons per minute. The majority of these addresses are located within Zones 1 and 2.

Community Risk – General Overview

Kingsport covers 50.23 square miles and has a population of 49,205. The city's urban growth boundary is 107 square miles, so considerable growth is likely for years to come. Engine 12 responds from Station 1, which is one of two fire stations located in the downtown area. Stations 1 and 2 are 1.5 road miles apart, and the close proximity of these two stations is questioned occasionally, but the greatest risk to the community, and the greatest call volume, are located within or bordering Zones 1 and 2, so the continued operation of both stations is justified. City staff estimated that 80% of government structures are within Zones 1 and 2 along with approximately 40% of Kingsport's tax base.

Approximately 10% of the occupancies in Kingsport are industrial, and this presents a greater than average fire and life safety risk to the community. In addition to fire and medical, the community is also at risk for other hazards. The 2009 Risk Assessment and Standard of Cover identified the top ten risks to the community, in declining order of impact, as severe summer storm, fire, hazardous substance incidents, railway incidents, underground pipeline incidents, major highway incidents, power failure, severe winter storm, explosion, and flash flood. These risks require that the fire department be prepared to respond with the proper equipment, specialized tools, training, and manpower necessary to resolve the incident successfully and minimize the threat of injury, death, and property damage. The fire department provides specialized services including a hazardous materials (Hazmat) response team, an urban search and rescue (USAR) team, mass casualty response capability, and heavy rescue/vehicle extrication response capability. By recognizing and planning for these risks through adequate resources and staffing, the city minimizes negative impacts to the social, environmental, and economic sustainability of the community.

Commercial occupancies include many industrial companies which are located predominately in the central portion of the city. Two of the city's largest companies are located in Zones 1 and 2. With about 6,700 employees, Eastman Chemical Company is one of Tennessee's largest employers, and operates a complex plant covering 1200 acres that has significant life and property risks, including hazardous materials. Some of this risk is mitigated since Eastman has a plant fire department with an engine staffed by Eastman personnel. In addition to staffing they have invested in excellent fire suppression equipment, a fire loop surrounding most of their plant, and a strong commitment to implementation of a quality safety program. The Eastman fire brigade responds to in-plant incidents and when they do, Eastman requests an engine company from the Kingsport Fire Department respond to the plant and stand-by until the Eastman engine can return to service. When this happens, Engine 12 responds and stands by inside the plant and cannot leave until the Eastman engine returns to service. In 2010, a Kingsport fire engine responded to Eastman 4 times and spent a total of 7.5 hours inside the plant. As of May 4, 2011, the fire department had responded to Eastman twice for a total committed time of 4 hours, 50 minutes. It is worthwhile to note that while engine 12 has served as the back-up engine for these situations, any other engine could provide the same service.

Domtar Inc. is a large complex employing over 370 people and housing paper making equipment that uses the only sulfur-free pulping process in the United States. The plant was recently upgraded to include modern fire protection systems. However, a recent fire in the plant was not fully extinguished by the fire protection system, and Kingsport fire fighters responded, quickly extinguishing the fire and assisting the company in getting the plant back in operation as quickly as possible. It should be noted the Kingsport Fire Department has regularly trained the Domtar Fire Brigade.

The downtown area is being redeveloped, and approximately 600,000 square feet of a former industrial plant is being renovated to include medical offices, retail, a farmer's market, and mixed use occupancies. The fire department also protects approximately 22,000 housing units, plus many business and commercial occupancies throughout the city. Approximately 428 new businesses opened in Kingsport in the period May 2010 through April 2011, and 54 building permits valued at $5,552,096 were issued in April 2011, so the value of the community, and the risk to the community, is increasing. Although there are more businesses in the City today and although significant investment has been made in the downtown area, it should be noted that all new construction has been subject to modern fire codes, and today many commercial buildings are sprinkled.

Fire Department Staffing

The question of how many fire fighters are needed to protect the community's risks is decided at the local level as a balance of risk versus resources, but outside forces influence that decision. Fire departments must comply with the U.S. Occupational Safety and Health Administration's (OSHA) two-in/two-out rule (CFR 29 1910.134(g)(4)1-3), a federal unfunded mandate, which automatically commits a

minimum of two of the total responding fire fighters to a rapid intervention team (RIT). A RIT is a team of two or more fire fighters dedicated to search and rescue of other fire fighters in distress. A RIT team is not allowed to have any other duties at the incident while fire personnel are actively engaged in resolving the incident. An incident in a large building, or a multiple alarm fire, many require several RIT teams. With Kingsport's standard first alarm response of 10 fire fighters, 2 must be committed to a RIT team in compliance with OSHA regulations, which leaves 8 fire fighters to perform search and rescue, fire attack, establishment of a water supply, ventilation, and all other fire ground tasks.

There is considerable debate on how many fire fighters should respond on a given engine company or ladder truck. Again, the decision is made at the local level but guidelines exist to help policy makers answer this question. Every fire incident has as its first priority the protection of life, followed by the protection of exposures and the minimization of property damage, so a sufficient number of fire fighters must arrive quickly to be able to assemble a search and rescue team while providing a water supply, manning an attack line, and complying with OSHA's 2-in/2-out rule. The size of the incident is also a factor. The first alarm resource requirements for a fire in a 1,500 square foot dwelling are significantly different than the first alarm requirements at a large industrial occupancy or a multi-family dwelling or large hotel. There are tasks that must be performed at every fire, which include but are not limited to forcible entry, search and rescue, establishment of a water supply, pump operations, staffing a RIT team, fire attack, ventilation, control of utilities, and salvage and overhaul, plus incident command, safety, and accountability. All of these tasks must be completed, but being able to complete them simultaneously rather than sequentially leads to a more positive outcome, especially in the area of lives and property saved.

For a single-family dwelling, 13 fire fighters may be sufficient, while a fire in a multi-family, commercial, or industrial occupancy could require 40 or more fire fighters, and these are first alarm staffing numbers. This discrepancy in numbers highlights the resource differences which are dependent on a variety of factors, including type of incident, the risk to life, the size of the structure, the value of property at risk, location, etc. If the fire is of sufficient size and duration, crews will need to be rotated so additional alarms will be required, which can double or triple the number of fire fighters needed to mitigate a large incident. Dennis Compton and John Granito state in the ICMA book *Managing Fire and Rescue Services* that "If about 16 trained firefighters are not operating at the scene of a working fire within the critical time period, then dollar loss and injuries are significantly increased, as fire is spread." They further state that studies have found five-person companies 100-percent effective, four-person companies 65-percent effective, and three-person companies 38-percent effective. Although these statements may represent "ideal" staffing levels, and in fact may be true in certain cases, again staffing requirements are highly dependent on type of incident, the risk to life, the size of the structure, the value of property at risk, location, and other factors. According to the 2010 Benchmark Survey for Cities Similar to Kingsport, the Kingsport Fire Department sends an average of 11 fire fighters to a fire call, which was the lowest number of fire fighters sent to a fire of the 9 cities responding (low=11,

high=18, mean=14.3, mode=14). However, the department sends more pieces of equipment with three men apiece to provide the number of fire fighters needed for the response.

The fire department is currently staffed with 106 personnel distributed as shown in Table 1.

Current Department Strength	
Position	**Number**
Chief	1
Assistant Chief	1
Training Officer	1
Executive Secretary	1
Sr. Office Assistant	1
Fire Marshal	1
Inspectors	3
Public Ed. Officer	1
Deputy Chief	3
Senior Captain	3
Captain	21
Driver	27
Firefighter	42
TOTAL	106
Color Key	
Administration	5
Prevention	5
Suppression (shifts)	96
TOTAL	106

Table 1 – Current Department Strength

Even though the chief and several other administrative personnel are fire fighters and respond to major incidents, this report focuses on shift staffing since shift staffing comprises the first alarm response. There are currently 96 personnel assigned to three 24-hour shifts, which equals 32 personnel per shift. The minimum staffing levels for each company and shift are shown in Table 2 on the next page.

Existing Minimum Shift Staffing by Company				
Unit	**A Shift**	**B Shift**	**C Shift**	**Total**
E1	3	3	3	9
E12	3	3	3	9
E2	3	3	3	9
E3	3	3	3	9
E4	3	3	3	9
E5	3	3	3	9
E6	3	3	3	9
E7	3	3	3	9
L1	1	1	1	3
Chief	1	1	1	3
TOTAL	26	26	26	78
Assigned	32	32	32	96
Difference	6	6	6	18

Table 2 – Existing Minimum Staffing by Company

Current staffing practices dictate a minimum on- duty strength of 26 personnel, and 32 personnel are assigned to each shift, providing 6 personnel to assist in maintaining minimum staffing to allow for paid leave and other absences. When fewer than 6 fire fighters are off-duty, the available personnel are used as additional manpower on the ladder company.

The city has received a SAFER grant to hire 6 additional personnel, but has not yet hired them. There are also 4 positions funded in the current fiscal year budget but the personnel have not been hired due to delays in the opening of Station 8. These 10 positions are allocated for staffing the 24-hour shifts. When these 10 people are hired, the number of shift personnel will increase to 106.

Status of Engine 12

The first question asked was, “Should Engine 12 (E12), currently located at Station 1, be redeployed to Station 8?” Redeploying is a misnomer as the physical E12 will be parked at a fire station as a reserve and a new engine that is already on order will be used as Engine 8, so E12 will cease to exist. To answer this question one must look at the role E12 serves. E12 responds from Station 1 and is the second engine company in that station. Though it is called an engine, it is used for more functions than just a district engine company (i.e. E1).

- E12 is used as a move-up engine for other stations when the other stations are on calls, such as when an outlying station is out of their district on a call.

- E12 responds to Eastman as standby when the Eastman fire brigade is working an incident in the plant.
- E12 responds to working fires for manpower.
- E12 has specialized rescue equipment and runs as a “crash truck” (rescue truck) on motor vehicle crashes (see Table 3).
- E12 serves as the second engine in the Hazmat response plan.
- E12 is part of the technical rescue response unit – swift water, technical rescue, etc.

For 2010, 18.9% of Engine 12’s responses were to other districts, but the number of blank entries in the district field in the database (449 blank entries, or 27.5% of the total) makes this statistic questionable. For the period January 1 through April 18, 2011, 28.9% of Engine 12’s responses are to other districts, which is more in line with the information collected from the meetings with Kingsport staff. It is clear that E12’s value lies in its flexibility to be deployed throughout the city to augment staffing at working fires, to respond to motor vehicle crashes, and to provide technical rescue expertise. Units that perform similar functions in other departments are sometimes called flying squads (denoting a city-wide response) to recognize the specialized role they serve. E12 is more like a flying squad than an engine company.

Engine 12 Extrication Responses (Code 352, 357, 350) for 2010				
Date	**Incident No.**	**Incident Description**	**Total Time**	**Zone**
07-Jan-10	10-0000128	Extrication of victim(s) from machinery	1:12:23	
01-Apr-10	10-0001817	Extrication, rescue, Other	1:25:55	1
21-Apr-10	10-0002259	Extrication of victim(s) from vehicle	1:49:32	1
25-Apr-10	10-0002338	Extrication of victim(s) from vehicle	1:36:16	5
26-Apr-10	10-0002344	Extrication of victim(s) from vehicle	0:43:49	
13-May-10	10-0002705	Extrication of victim(s) from vehicle	1:51:15	1
24-Jul-10	10-0004218	Extrication of victim(s) from vehicle	1:17:02	1
31-Aug-10	10-0005058	Extrication of victim(s) from vehicle	1:10:18	1
12-Oct-10	10-0005865	Extrication of victim(s) from vehicle	1:24:42	3
05-Nov-10	10-0006324	Extrication of victim(s) from machinery	1:21:39	4
10-Dec-10	10-0007071	Extrication of victim(s) from vehicle	1:05:11	7
		Average Time on Scene	1:22:00	

Table 3 – Engine 12 Extrication Responses for 2010

The current approach to the use of Engine 12 is but one in a number of alternatives for using the manpower, equipment, and financial resources of the department. The true annual cost of Engine 12 is in the range of $500,000. A key question is, “Is this the best recurring use of $500,000 for the department at this time?”

Over the past few years a number of things have changed which beg a re-examination of the continued use of E12 in its current location. For example, technologies are now in

place which allow for better defined responses to medical calls. In addition, the capacity for response by the Kingsport Lifesaving Crew has come into question. As discussed below, we are now in an era when volunteer staffing of this crew cannot be guaranteed, and thus E12 has increasingly played an important role in this regard. These and other factors allow for a new and more creative approach to the distribution of these resources.

Data supplied by the Kingsport Fire Department shows E12 to have responded to 1,634 calls in 2010. Of these it is estimated that only 924 were necessary calls for which the engine should have responded. Of the 1,444 calls responded with E1 (the first engine in station 1), only 817 are estimated to be necessary calls requiring a response. This is because the percent of unnecessary medical calls is significant, and is discussed in detail below. Thus together engines 1 and 12 responded to 1,741 necessary calls in 2010 (this number represents all non-medical calls as well as all advanced life support type medical calls). This is approximately the volume of the single E12. This being the case it is easy to see that one engine should be capable of adequately responding to all calls from Station 1. The need to have E12 in zones 1 and 2 is further questioned when examining data showing E12 to have responded to nearly 20% of its calls outside of zone 1.

All of this brings into question the continued need for E12 at station 1. It becomes apparent that E2 is capable of providing back-up when E1 is responding in either zone 1 or 2. However, this analysis and the implications therein are highly dependent on two factors: an ability to significantly reduce the number of non-emergency medical calls and the capacity to utilize the Kingsport Life Saving Crew as a “flying squad”, (as discussed below) and to provide adequate staffing on the truck. Given a realistic addressing of these issues the staffing of E12 should be capable of moving to station 8 without a diminution of service to zones 1 and 2.

Purchase of Second Ladder Truck

The second question asked was, “Should the City purchase a second ladder truck as currently provided in our Capital Improvement Plan?” ISO reviewed Kingsport’s fire protection in 2005 and determined that a second ladder truck and a ladder service truck were needed because of the method of operation. ISO allows one ladder truck to serve an area with a radius of 2.5 miles, which is approximately 19 square miles. Kingsport covers over 50 square miles, so the size of the area served indicates the need for a second ladder truck. The fire department makes over 7,300 total responses annually, of which approximately 2,900 overlap. The volume of calls indicates the need for a second ladder truck to be available for response when the first ladder truck is committed to an incident. The industrial facilities present significant challenges to deliver large volumes of water quickly to the seat of the fire. Aerial ladders are ideal for these types of operations as they can flow thousands of gallons of water with significant reach inside a structure to effect extinguishment. Finally, there are many multistory buildings in the city that present a rescue problem for people trapped on upper floors. For these reasons, a second ladder truck is recommended.

Response to Medical Calls

The third question asked was, “What is the most efficient and cost-effective way to respond to medical and accident calls? Should the City operate an EMS?” Forty-three members of the fire department are paramedics and the rest are emergency medical technicians (EMTs), which enables the fire department to have at least one paramedic on every engine company every day. The fire department provides advanced life support (ALS) first responder service, which means the department responds an engine company to every emergency medical call in the city and that patient transport is provided by Sullivan County EMS as the exclusive provider of 911 ambulance service in most of Sullivan County. The theory behind a first responder service is that a fire engine with paramedics and advanced life support equipment at 8 locations arrives faster than an ambulance (housed at 3 locations), and that fire department paramedics treat and stabilize the patient for transport. Under this system, the response time of the ambulance can be slightly longer since patient care is initiated before the arrival of the ambulance. When necessary for advanced life support calls, this is a very cost effective system since the city does not have to purchase and operate an ambulance service. However, the city does not have control over things such as the number of ambulances available, the geographic placement of the ambulances, or the personnel working on the ambulances. As long as the service received from the third-party ambulance service is of good quality, this is a very cost effective system (for advanced life support calls), but it is not as efficient as it could be, especially given the nature of most medical calls (as discussed below).

The fire department staffs every engine company with paramedics and advanced life support equipment and medications, which means every engine company is capable of handling most of the serious types of emergency medical calls. However, many of the emergency medical calls the fire department responds to <u>are not life threatening</u> emergencies and can be classified as basic life support (BLS) calls. BLS calls can be handled by emergency medical technicians (EMTs) and a fast response time is not as critical to positive patient outcome as in an ALS call. In 2010, the fire department responded to 5,172 EMS calls. Interviews with the fire chief and fire fighters indicate that the fire department responds on every medical call no matter the severity. While this practice will get help on the scene in an average of 6 to 7 minutes, it is not the best use of resources and is inefficient. The system can be more efficient with the use of a recognized system for prioritizing EMS calls by medical severity, as discussed below.

An emergency medical incident priority dispatch system is used to screen and classify calls for medical emergencies by severity and to dispatch the most appropriate resources. The concept of prioritized dispatch was developed by Dr. Jeff Clawson in the mid-70s to “send the right thing to the right person in the right way at the right time.” Priority dispatch works by having the dispatcher ask the caller reporting a medical emergency a series of questions that are used to determine the severity of the medical emergency, and the dispatcher classifies the call in a range from minor to life-threatening. The system can determine whether basic life support is appropriate, or whether advanced life support is required, and can also recommend that the response

by emergency personnel be non-emergency (no lights and siren) or emergency (lights and siren). The system has pre-arrival instructions that the dispatcher gives to the caller to actually begin some level of care before emergency personnel arrive on the scene. Dr. Clawson's system is called the Medical Priority Dispatch System™, but there are other systems on the market that provide the same capability of classifying calls. The key is using a priority dispatch system is to find one that is medically approved and to get approval from the department's medical director to use the system, something that has already been done in Kingsport.

The fire department is dispatched by the Kingsport Police Department, and the dispatch office has a prioritized dispatch system called ProQA, but the system is not being used to its full potential. ProQA is a product of, and is based on, the Medical Priority Dispatch System™ and offers a proven method for a dispatcher to classify a call as basic life support or advanced life support and, once classified, to dispatch only those resources necessary for the given medical emergency. The fire chief desires to respond engine companies to advanced life support calls and not to basic life support calls. Full use of the ProQA system would achieve this goal, which would reduce the number of first responder calls made by the fire department. This reduction would save money in fuel and maintenance costs, and keep engine companies in service for true emergency calls. In terms of what call reduction level could be expected, a detailed study by the Germantown Fire Department of 1,600 EMS responses for 2009 showed that approximately 60% of the medical calls the Germantown Fire Department responded to could be properly handled at the basic life support level. Applying similar prioritization criteria to the 5,172 EMS responses made in 2010 to the reason the engine crew was dispatched showed a 47% reduction in the number of first responder responses by a fire engine, which is approximately 2,427 fewer medical calls each year (Table 4). However, applying the same criteria to the provider impression for each run, which is what the paramedic determines is the patient's actual medical problem after examining the patient, showed a 76% reduction in the number of first responder calls, which are 3,931 fewer calls annually (Table 5). Averaging these two methodologies together shows that approximately 38% of medical calls are ALS and should be responded to by the fire department. The remaining approximately 62% of medical calls do not warrant such a response. What this indicates is that the dispatchers are not using the ProQA system to prioritize calls or gather information to further classify a call to the actual medical emergency. Once ProQA was used properly and regularly, the department would see a huge reduction in the number of first responder calls, which would increase availability of fire apparatus for other responses, provide more time for training and other duties, and would be efficient and cost-effective while providing good emergency medical care. The actual reduction would depend upon the protocols set by the department's medical director and the actual types of calls where a first responder unit would not be sent. Thus the 62% reduction estimate can only be realized if an active and aggressive management of the system were established. Otherwise this will be an overly optimistic projection.

The savings to the department once ProQA is properly implemented will be significant. It has the potential to reduce the department's call volume from approximately 7,400 to

somewhere in the range of 4,100 (this reduction is an average of the twoestimate methods described above and is documented on the tables below). This is a 45% reduction in the number of responses the Department will make. With this will come enormous efficiencies, which play into recommendations for manpower allocation as well as the use of Engine 12 (discussed below). This will also affect equipment by lowering maintenance costs, fuel costs, and extending equipment life. Finally, with these changes the opportunity for improved coordination between the Kingsport Fire Department and Sullivan County EMS will be significant.

EMS Responses for 2010	
Number	**Dispatched For**
73	Abdominal Pain
2	Acute Migraine
13	Airway Obstruction
3	Alcohol poisoning
35	Allergic Reaction
285	Altered Consciousness
4	Animal Bite
25	Assault
23	Atraumic Bleeding
36	Attempted Suicide
25	Back Pain
19	Behavioral Emergency
6	BURNS
4	C.H.F.
12	C.O.P.D.
143	C.V.A.
81	Cardiac Arrest
57	Cardiac Emergency
836	Chest Pain
6	Controlled Bleeding
10	D.O.A.
157	Diabetic
938	Difficulty Breathing
7	Domestic Disturbance
7	Environmental Emergency
449	Fall
1	Fire call
15	Gastro-Intestinal
157	General Sickness

25	General weakness
2	Gunshot
13	Head Injury
3	Hypertension
10	Laceration
18	Medical Assist
471	Motor Vehicle Accident
2	Neck & Back Pain
20	OB / Gyn
126	Overdose
2	Penetrating Trauma
18	Person down
2	Poison
6	Possible stroke
232	Seizure
95	Seizures
27	Semi-conscious
30	Sick
1	Smoke Inhalation
3	Sting / Bite
92	Stroke
75	Syncope
129	Traumatic Incident
14	Unconscious
47	Uncontrolled Bleeding
124	Unknown Patient Code
148	Unresponsive
2	Withdrawals
6	Blank
5,172	Total
Note: Yellow highlighting indicates EMS calls where a first responder company would be dispatched.	

Table 4 – EMS Response by Reason Dispatched

EMS Response by Provider Impression		
Number	**Code**	**Description**
241	00	Impression/assessment, other
122	10	Abdominal pain
11	11	Airway obstruction
22	12	Allergic reaction, excludes stings & venomous bite
331	13	Altered level of consciousness
122	14	Behavioral - mental status, psychiatric disorder
3	15	Burns
66	16	Cardiac arrest
41	17	Cardiac dysrhythmia
563	18	Chest pain
148	19	Diabetic symptom
12	20	Do not resuscitate
3	21	Electrocution
671	22	General illness
86	23	Hemorrhaging/bleeding
8	24	Hyperthermia
5	25	Hypothermia
15	26	Hypovolemia
38	28	Obvious death
95	29	Overdose/poisoning
14	30	Pregnancy/OB
4	31	Respiratory arrest
436	32	Respiratory distress
208	33	Seizure
9	35	Sting/bite
96	36	Stroke/CVA
137	37	Syncope, fainting
610	38	Trauma
717		Blank
338	NN	None/no patient or refused treatment
5,172	TOTAL	
Note: Yellow highlighting indicates EMS calls where a first responder company would be dispatched.		

Table 5 – EMS Responses by Provider Impression

Integration with the Kingsport Life Saving Crew

The fourth question asked was, “What is the best way to integrate our efforts with those of the Kingsport Life Saving Crew?” The Kingsport Life Saving Crew was organized in 1948 and was the first established rescue squad in Tennessee. For many years the crew has been a very well equipped, well supported, well trained rescue squad. The lifesaving crew responds to motor vehicle crashes and technical rescue calls in all of Sullivan County. The Kingsport Life Saving Crew has excellent equipment including extrication and specialized rescue equipment and receives outside funding for equipment. This is a benefit to the city as the Kingsport Fire Department can use the equipment but doesn’t have the expense of purchasing the equipment or insuring the equipment.

The Kingsport Fire Department has a hazardous materials response unit, a tactical rescue unit, and responds to motor vehicle crashes to perform extrication of trapped occupants. The department has 48 personnel trained as Hazardous Materials Technician/Specialists, and 21 personnel trained as Technical Rescue Technicians. Fire department members have the knowledge, skills and ability to use the equipment carried on the Kingsport Life Saving Crew apparatus (which is significantly better than that carried on Engine 12).

There is an excellent working relationship between the Kingsport Life Saving Crew and the Kingsport Fire Department, and the Life Saving Crew station is located adjacent to Fire Station 2. Several fire department employees are members of the Kingsport Life Saving Crew, and the fire department sometimes staffs the Kingsport Life Saving Crew truck if no Kingsport Life Saving Crew member is there to respond with the truck.

Over the years the Kingsport Life Saving Crew membership has dropped. There are an estimated 60 to 70 members on the roster now, and the number of Kingsport Life Saving Crew members who pull duty is low, about 15 at most. Kingsport Life Saving Crew members are supposed to work 12 hour shifts staffing the trucks, but sometimes the shifts are vacant. Sometimes crew members show up for a 12 hour shift but don’t work the full 12 hours, which leaves the truck unstaffed or understaffed. If the shift is vacant and the truck is needed, a fire department fire fighter responds with the truck which takes a crewmember off of the engine company. Friday and Saturday nights are the times when the crew truck is most likely to have full staffing. Training levels are inconsistent, and sometimes crew members arrive on the scene with the equipment but do not have the technical skills to use it for the given situation. E12 is sometimes called to the scene to use the equipment brought by the Kingsport Life Saving Crew when the crew members are not able to use the equipment or the Kingsport Life Saving Crew truck arrives with just one person.

The most efficient way to integrate with the Kingsport Life Saving Crew would be to have two fire department personnel staff the truck 24/7. If a Kingsport Life Saving Crew member was present, then one fire fighter would be the second person on the crash truck and the other fire fighter could be deployed to provide a fourth fire fighter on

Engine 2, or used in another manner that best serves the needs of the community. This arrangement means that the truck and the equipment would always be available for response throughout the city with trained personnel and could also respond to fire calls to provide search and rescue capabilities and serve as the RIT team, in effect using the Kingsport Life Saving Crew as a flying squad.

Recommendations

The most efficient and cost effective way for the Kingsport Fire Department to provide an all-hazards service delivery program that addresses community risks and needs is in the following recommendations, which also answers the four individual questions.

1. Hire the 4 personnel in the current fiscal year budget and hire the 6 personnel approved under the SAFER grant. Once these 10 personnel are hired, the fire department will have a staffing level of 116 personnel with 106 assigned to work 24-hour shifts (see table 5).
2. Purchase the second ladder truck as currently provided for in the Capital Improvement Plan. A 100-foot platform with a 2,000 gpm pump (a quint) is recommended based on the community risk, the size of the area served, the reach provided by a 100-foot ladder over a 75-foot ladder, and the features and safety offered in a platform over a straight aerial ladder. The CIP budget may need to be increased accordingly. The 2,000 gpm pump will help with meeting the ISO required on-scene pump capacity for target hazards having needed fire flows in excess of 3,500 gpm. The pump will allow the truck the flexibility to pump its own aerial device or supply additional hand lines depending upon the situation.
3. Use the existing ProQA program to implement priority medical dispatch and respond the fire department to advanced life support calls only, not to every EMS call received.
4. Continue to provide advanced life support first responder service through the fire department with ambulance transport provided by Sullivan County EMS. Create a working committee of Sullivan County EMS, Kingsport Fire Department, and, and Kingsport Life Saving Crew command staff to discuss options for joint operations and improving the efficiency and effectiveness of EMS in Kingsport.
5. Discuss with Sullivan County EMS the possibility of their placing another ambulance in service in Kingsport, possibly at the Holston Valley Medical Center, which would increase the number of ambulances in the city from 5 to 6 and improve the availability of ambulances. At the very least the City should work with the Sullivan County EMS to consider geographic redistribution of ambulance locations.
6. Redeploy personnel to staff response apparatus as shown in Table 6. This achieves adequate staffing, establishes a minimum staffing level of 2 fire fighters on the ladder trucks, a minimum staffing level of 2 personnel on the Kingsport Life Saving Crew truck, and the Kingsport Life Saving Crew truck assumes the role of the flying squad that Engine 12 provided.

7. Allocate personnel to achieve a minimum staffing level of 2 fire fighters on each ladder truck 24/7. Ladder trucks are highly specialized apparatus, and the functionality and benefits of a truck are compromised if there are not enough fire fighters on the scene to operate the truck safely and effectively.
8. Address the overtime situation in the Department. It appears to be excessive, and strategies to reduce or control overtime should be developed.

Department Strength After Hiring New Personnel	
Position	**Number**
Chief	1
Assistant Chief	1
Training Officer	1
Executive Secretary	1
Sr. Office Assistant	1
Fire Marshal	1
Inspectors	3
Public Ed. Officer	1
Deputy Chief	3
Senior Captain	3
Captain	21
Driver	27
Firefighter	52
TOTAL	116
Color Key	
Administration	5
Prevention	5
Suppression (shifts)	106
TOTAL	116

Table 6 – Department Strength After Hiring New Personnel

Staffing by Company After Hiring and Redeployment of Personnel				
	A Shift	**B Shift**	**C Shift**	**Total**
E1	3	3	3	9
E2	3	3	3	9
E3	3	3	3	9
E4	3	3	3	9
E5	3	3	3	9
E6	3	3	3	9
E7	3	3	3	9
E8	3	3	3	9
L1	2	2	2	6
L2	2	2	2	6
K.L.S.C.	2	2	2	6
Chief	1	1	1	3
TOTAL	31	31	31	93
Assigned	35	35	36	106
Difference	4	4	5	13

Table 7 – Staffing by Company After Redeployment

Summary

Fire protection and staffing is a local policy issue, and a community must balance local resources against acceptable risk to provide appropriate staffing resources on the initial alarm to effectively and safely complete the primary objectives of life safety, incident stabilization, and property conservation. The ISO Class 3 rating shows that Kingsport has made good decisions in planning for community fire protection. Taking Engine 12 out of service and assigning the positions to open Fire Station 8 changes the dynamics in response to incidents in Zones 1 and 2, but the use of a priority dispatching system, adequate staffing of the Kingsport Lifesaving Crew truck, and the response of outlying engine companies to provide sufficient manpower to perform essential tasks and meet ISO pump capacity requirements, results in an efficient balance of emergency resources to meet the objectives of life safety, incident stabilization, and property conservation.

Proper utilization of the medical priority dispatch system will dramatically reduce the EMS call volume for the department, which will increase the availability of other fire engines to make the calls in Zones 1 and 2 that Engine 12 made. Since Engine 12 was used as more than just a fire engine, it is important that the community not lose this flying squad specialized rescue capability. By integrating fire fighter staffing with the Kingsport Life Saving Crew, the fire department has access to excellent technical rescue equipment and the ability to respond quickly anywhere in Kingsport. Fire fighters on the scene of motor vehicle crashes will know that when the Kingsport Life

Saving Crew truck arrives the crew will be capable of performing rescue and extrication duties. The fire fighters on the Kingsport Life Saving Crew truck can serve as the RIT team on working fires which leaves all responding engines free to function as engine companies. The second ladder truck is needed and will provide truck capabilities to a larger portion of the city and help the city maintain the Class 3 ISO rating. The redeployment of personnel assures a minimum of 2 fire fighters on each ladder truck, which increases the safety of the truck during an emergency response and helps with on scene operations.

Maintaining the first responder system with transport provided by Sullivan County EMS is efficient and cost effective, and a working committee of all three partner agencies will ensure quality service. The use of priority dispatching will dramatically decrease the annual number of responses made by the fire department. This should not be viewed as a negative. The use of priority dispatching results in costs savings in fuel and maintenance and increases the availability of fire resources for true emergencies. This reduction in call volume should not be seen as a decrease in workload as the time gained will be used for training and other non-emergency but essential activities, and reflects on the progressive nature of the fire department.

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