THE UNIVERSITY of TENNESSEE

MUNICIPAL TECHNICAL ADVISORY SERVICE

RIPLEY, TENNESSEE

Fire Station Location Study

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Dennis Wolf, Fire Management Consultant
The University of Tennessee, Institute for Public Service
Municipal Technical Advisory Service

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Introduction and Scope of Work

MTAS conducted this study at the request of Ms. Donna Buckner, City Recorder for the City of Ripley. The study's purpose is to answer three questions:

1. Ripley desires to relocate its fire station to a piece of city-owned property. Is this a good location for a fire station?
2. Where should Ripley place its next fire station(s)?
3. What is the current status of fire protection in Ripley?

Background

The City of Ripley is located in, and is the county seat of, Lauderdale County in West Tennessee, near the cities of Henning, Gates, and Halls. Ripley is approximately 22 miles from both Covington and Brownsville, and about 50 miles from both Memphis and Jackson. A Mayor-Alderman form of government governs the city. The seven-member board, which includes the mayor, sets policy and evaluates the management of the city. The mayor oversees all operational activities.

Fire protection and staffing is a local policy issue, and a community must balance local resources against acceptable risk. The City of Ripley provides fire services to 8,445 residents through a municipal fire department organized under Section 15(45) and Section 18 of the city charter. The fire chief is a city department head and serves at the will and pleasure of the Board of Mayor and Aldermen. The Ripley Fire Department is a combination fire department recognized by the State of Tennessee and funded by the City of Ripley. The fire department operates three engine companies, a tanker, and a rescue/mini-pumper from a single fire station (Table 1). All Ripley engines have a minimum staffing level of at least one person (Table 1). Ripley's Insurance Services Office (ISO) Public Protection Classification (ISO rating) is Class 5. The Class 5 ISO rating, received in 1993, places Ripley in the top 31% of communities nationwide (Figure 1) and in the top 30% in Tennessee (Figure 2) in terms of fire protection and indicates that Ripley has made good decisions in planning for community fire protection.

Apparatus	Type	Pump Capacity (gpm)	Aerial Ladder Length	Maximum Daily Staffing	Minimum Daily Staffing
2001	Engine	1,250	n/a	2	2
2002	Engine	1,250	n/a	1	1
2003	Engine	1,000	n/a	0	0
2004	Tanker	n/a	n/a	0	0
2010	Rescue/ Mini-pumper	175	n/a	2	2
63282	Ladder	1,250	55	n/a	n/a

Table 1 – Ripley Fire Department Apparatus

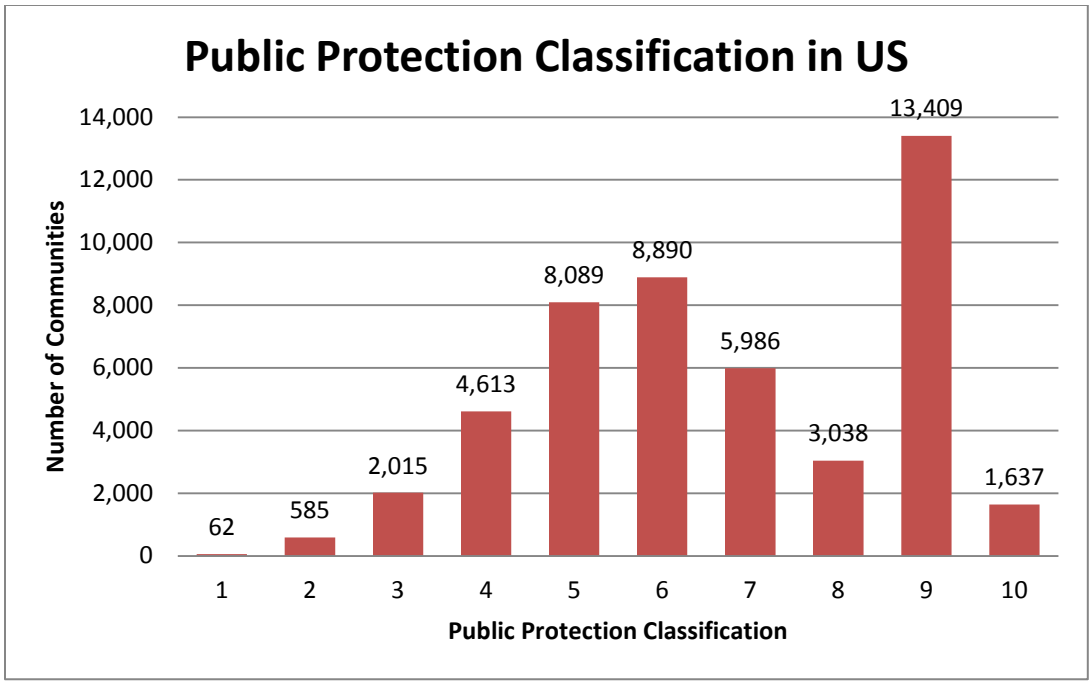

Figure 1 – Public Protection Classification (ISO Rating) in the US

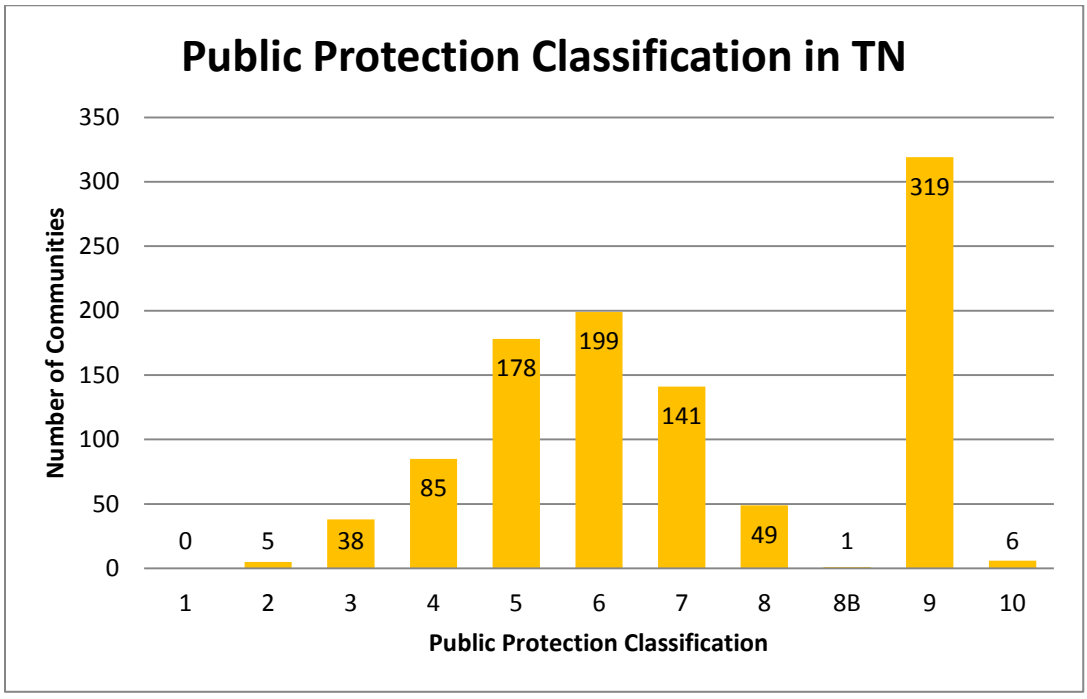

Figure 2 – Public Protection Classification (ISO Rating) in Tennessee

The Lauderdale County E-911 office receives calls for emergency fire and medical services for locations inside Ripley's corporate limits and dispatches the appropriate emergency resources.

Ripley Gas, Water & Wastewater provides water for public consumption and fire suppression. The water plant can produce three million gallons of potable water per day (MGD). Elevated storage capacity is 2.4 million gallons. Daily usage averages about 1.8 MGD. The water pressure and the gallons-per-minute fire flows needed for fire suppression operations are adequate to protect most properties at risk in the areas protected by fire hydrants.

Fire Department Overview

The fire department is well-managed with a mission statement that reflects the needs of the community. The city has an ordinance that establishes the Ripley Fire Department, places the fire chief in charge of the department, delineates the chain of command, establishes a code of ethics, sets policy, and establishes standard operating guidelines. The department has adequate job descriptions for all positions. The fire chief serves as the Assistant to the Commissioner of Commerce and Insurance for the city. The city has an ordinance that adopts the 1994 edition of the Standard Fire Prevention Code. This code is outdated, and Ripley needs to adopt a more recent edition of a model code. The department maintains fire incident reporting records, training records, and pre-fire planning records but does not have a comprehensive computer based records management system.

The fire department participates in the Tennessee Fire Incident Reporting System (TFIRS) and incident reporting is current. The department has response time data and can track individual components of response time. The department's average response time is three to four minutes, and the first fire department unit arrives on the scene within six minutes, 35 seconds (6:35) on 99% of calls. Although the fire department collects data and reports to TFIRS, the department does not use performance measures to assist in management and decision-making.

The City of Ripley funds the fire department. The operating budget for FY11 was $1,055,120. Fire apparatus principal and interest payments and part of the city's debt service are not included in the operating budget. The city takes care of all purchasing and payroll for the department following generally accepted accounting principles. The city has a formal capital improvement program for the replacement of fire apparatus and other capital items.

The department has sixteen full-time career firefighters, five part-time firefighters, and one volunteer. The Ripley Fire Department is the only fire department in Lauderdale County with full-time firefighters. Fire department personnel work 24-hour shifts on a three-platoon system, and each shift has five personnel assigned. The department has one fire station, and the city has plans to add a fire station within the next two years.

The city performs maintenance and repair on the fire apparatus and maintains maintenance records. The department operates three first-line engines, a tanker, and a rescue/mini-pumper. Of the three engines, Unit 2001, a 2008 model, is the newest. Unit 2002 is fourteen years old, and Unit 2003 is twenty-five years old. Unit 2004, the

tanker, is twelve years old. Unit 2010, the rescue/mini-pumper, is the newest addition to the fleet, and is one year old. The department's one reserve, Unit 63282, is twenty-two years old. NFPA recommends that fire apparatus that is fifteen years or older be placed in reserve service, and apparatus more than twenty-five years old not be used for emergency response. Units 2001, 2002, and 2003 have pump and hose test records going back three years, as required by ISO. Unit 2010 is new and therefore does not have an established pump test record. Unit 63282, the reserve, lacks pump test records for the past three years.

In addition to fire suppression, the fire department provides these essential services:

- Pre-fire planning
- Public fire education (Head Start, primary school program)
- First responder (EMS) to assist Lauderdale County Ambulance
- Vehicle extrication with state certified technicians
- Hazardous materials (Hazmat) response
- Confined space rescue
- Fire safety inspections
- Smoke alarm distribution and installation
- Special event participation/protection detail
- CPR training
- Home safety checks/inspections upon request

Minimum daily staffing for the shift is five fire personnel. The department responds with two pumpers and a rescue unit on structure fires. Two personnel staff the first engine, one person staffs the second engine, and two personnel staff the rescue unit.

On a 5-year average, the department responds to approximately 760 calls per year. Approximately 111 calls are fire related, and of those approximately 40 are structure fires. Nearly 60% of the department's responses are emergency medical first responder calls. Table 2 shows the breakdown of response by type for the past five years.

Type Incident	2007	2008	2009	2010	2011
Structure Fires	55	43	32	27	45
Vehicle Fires	17	15	20	19	15
Other Fires	45	57	43	75	50
Ruptures, Explosions	6	4	3	4	6
EMS	586	589	485	491	387
Hazardous Condition	14	9	7	11	7
Service Calls	11	21	19	23	14
Good Intent	21	67	35	40	29
Special/Unknown	1	2	1	0	4
False alarms	79	56	53	72	86
Total Responses	835	863	698	762	643

Table 2 – 5-Year Response History

For the past five years, the city has averaged an annual property loss of approximately $788,200. This seems high when compared to the 2009 mean housing price of $120,784 for a detached, single-family home since this loss amount represents the comparative value loss of approximately six homes per year. Table 3 shows the annual property loss for the past five years. The department's rate for investigating and determining the cause of fires is low at approximately 10%. For 2011, the cause of 87.1% of the fires in Ripley was listed as "unknown," and these fires accounted for $943,504 (85.7%) of the structure fire dollar loss for 2011.

Year	Dollar Loss
2007	$749,475
2008	$844,110
2009	$615,600
2010	$631,830
2011	$1,100,004
Total Dollar Loss	$3,941,019

Table 3 – Annual Property Loss

The ability of the fire department to respond quickly with adequate resources and personnel directly affects property loss. The fire department's average response time is quick, averaging just over five minutes. The apparatus resources seem to be adequate in number, as the department responds two engines and a rescue unit. However, the number of firefighters is not sufficient for an efficient and effective response to a structure fire. NFPA recommends a minimum response of seventeen personnel to a residential structure fire, with even more firefighters as the size of the structure and associated risk (life, high hazard occupancies, etc.) increases. ISO looks for a minimum response of nineteen personnel to a structure fire. These agencies know that it takes

firefighters to put out fires. Table 4 shows that for the past five years the fire department averaged 6.54 personnel per structure fire. This lack of personnel limits the department's ability to make an aggressive interior attack and perform needed firefighting tasks quickly and efficiently, which affects property loss rates.

TFIRS CODE	DESCRIPTION	COUNT	PERCENT	AVG # SUPPR PERS	AVG # EMS PERS	AVG # OTHER PERS	AVG # SUPPR APPR	AVERAGE MAN HOURS	TOTAL MAN HOURS
111	Building fires	99	79.20 %	4.38	0.39	1.84	1.65	10.01	990.98
112	Fires in structures other than in a building	13	10.40 %	5.00	0.38	1.77	1.85	10.40	135.17
114	Chimney or flue fire, confined to chimney or flue	3	2.40 %	2.00	1.33	3.00	1.33	7.22	21.67
115	Incinerator overload or malfunction, fire confined	1	0.80 %	4.00	0.00	0.00	2.00	1.40	1.40
120	Fire in mobile property used as a fixed structure, other	1	0.80 %	3.00	2.00	1.00	2.00	5.30	5.30
121	Fire in mobile home used as fixed residence	7	5.60 %	3.57	0.71	0.86	1.00	4.79	33.53
123	Fire in portable building, fixed location	1	0.80 %	1.00	2.00	1.00	1.00	3.87	3.87
	Totals	125	100.00 %	4.30	0.46	1.78	1.62	9.54	1,191.92
	Mutual Aid Given Incidents	46							

Table 4 – 5-Year Average Personnel Response for Structure Fires

The fire department is aware of NFPA Standard 1500, Standard of Fire Department Occupational Safety and Health and NFPA Standard 1501, Standard for Fire Department Safety Officer requirements. The fire department has an employee safety policy in place for personal protective equipment (PPE). The fire station has sufficient space for maintenance, repair, and storage of equipment, spare hose, and other supplies. Any flammable liquids stored in the station are stored in approved flammable liquid cabinets. Every firefighter has a personal alert safety system (PASS) device. Every firefighter entering a hazardous area has a portable radio. The department has three thermal imaging cameras to assist firefighters in locating victims, hidden fire, and to maneuver inside a burning structure. The department has and enforces a two-in/two-out rule that complies with OSHA 1910.134(g)(4). The department has a blood borne pathogen plan that complies with OSHA 1910.1030. The department has a respiratory protection plan that complies with OSHA 1910.134 and uses the qualitative fit test protocol.

The department provides to all personnel turnout gear/personal protective equipment (PPE) that meets NFPA and OSHA requirements. The department has and enforces policies requiring the wearing of all PPE. The department inspects PPE monthly for wear and tear and repairs or replaces any damaged or defective equipment. The department provides self-contained breathing apparatus (SCBA) to all personnel. The

department has a breathing air compressor to refill the empty SCBA air cylinders and the department tests the quality of the air quarterly as required by NFPA Standard 1989.

While the department is doing many things to provide for employee safety, there is room for improvement. The department should establish a personal accountability system and use the system on every call. The fire department should establish a plan to create and use Rapid Intervention Teams (RIT) on working structure fires. The fire department should appoint a qualified individual to serve as the department's safety officer. Ripley plans to build a new station, so retrofitting the old station with a vehicle exhaust system is not practical, but all new stations should have vehicle exhaust systems. The department should install carbon monoxide warning signs in the existing station and all new stations. The department should track and maintain records on job-related injuries and use this information as a resource for reducing job-related injuries. For safety, the department should test all ground ladders annually following NFPA 1932 standards.

The fire department has good written job descriptions for all positions. The city conducts background checks on new firefighters. Firefighters are required to complete the state fire school and complete Firefighter I certification. The department maintains personnel records, keeps personal medical information separate as required by law, and verifies that all personnel who drive fire department or city vehicles have a valid driver license. Personnel must be at least 21 years of age to drive fire apparatus. Personnel driving a fire department vehicle involved in an accident must take an immediate drug screen. There have been no accidents involving fire department vehicles within the last three years.

The department maintains inventory records on apparatus and equipment. Firefighters inventory hand tools and equipment carried on fire apparatus daily using a check-off sheet and inspect the equipment for excessive wear or damage. Damaged equipment is repaired or replaced. The first out and reserve apparatus do not carry all of the equipment listed on the ISO equipment inventory sheet. The department performs an annual pump test meeting NFPA Standard 1911 requirements on all apparatus equipped with a rated fire pump and has test records dating back at least three years. The department performs an annual hose test meeting NFPA Standard 1962 requirements on fire hose and has test records dating back at least three years. For safety, the department should test the 55-foot aerial ladder annually following NFPA 1911 standards.

The department maintains training records on all personnel, and fire personnel train weekly. In 2011, the department conducted two training drills of at least 3-hours duration, which is significantly less than the eight drills ISO requires. ISO places emphasis on drills, and requires at least eight drills per year, two of which must be at night, and four drills per year with other fire departments that provide mutual aid. The department's training program is hampered by lack of access to a local or regional training facility that includes a burn building. The department has a training library, but it lacks seven of the eleven items ISO looks for in a library. The department does not have a pump cut-a-way or a fire hydrant cut-a-way to use for training. Last year the

department did not conduct hazardous materials training, officer training, or new driver training. The recruit training program for new firefighters is 86 hours, which is less than the 240 hours required by ISO. All personnel have first responder training.

The department performs annual pre-fire planning inspections on all commercial properties in Ripley. All personnel participate in the pre-fire planning inspections or train on each occupancy using the pre-fire plans created by the fire department.

Community Risk – General Overview

Ripley covers 13.78 square miles. The city has an urban growth boundary, so additional major growth is possible once the economy improves. However, significant growth is not expected within the next ten years.

From 2000 to 2010, Ripley's population increased by 7.7%. Ripley's population is graying, with 14.0% of the population age 65 or older, as compared to the state average of 13.4%. In addition, 12.9% of all households have someone who is 65 or older living alone. Statistically, older population segments tend to use EMS services more than other population segments. Approximately 61% of the Ripley Fire Department's responses for 2011 were for emergency medical calls.

Approximately 8.7% of the housing stock is vacant. This number does not include houses in foreclosure, which means that the percentage of vacant homes and buildings could be higher. Research by the National Fire Protection Association (NFPA) has shown that the incidence of fires in vacant buildings increases when the economy is weak, and that the risk to neighborhoods is greater as fires in vacant buildings are more likely to spread to adjacent homes than fires in occupied homes. Nationwide, almost half of all fires in vacant buildings are arson fires, but Ripley has not had many arson fires.

Over 35% of the homes in Ripley were built before 1950, 51% of the homes were built between 1960 and 1999, and 15.5% of the homes were built after 2000. Older homes may lack modern construction features, such as fire stopping, use fuses instead of circuit breakers, the amperage capacity of the electrical wiring may be smaller than required by current code, and there may be fewer electrical outlets, which can contribute to the use of extension cords. Older homes tend to be more fire prone than newer homes.

The Canadian National Railroad tracks bisect the city and can affect response times to some areas occasionally.

One finds commercial occupancies distributed throughout Ripley that include retail, business, and manufacturing uses. Manufacturing, health care, educational services, construction, and retail trade are the largest industries in Ripley. Marvin Windows and Doors, Komatsu America, SRG Global, Pierce Distribution, and American Greetings are the five largest employers, collectively employing more than 1,700 people. Some of

these employers have large facilities that pose significant challenges to firefighters regarding search and rescue, advancing hose lines, ventilations, etc. in the event of a fire in the building.

Ripley is at risk for natural disasters. Ripley is located on the southeastern edge of the New Madrid seismic zone and is in a high-risk area for earthquakes. Ripley has a higher than average risk for tornados. The USA.com calculated tornado Index for Lauderdale County is 269.41, which is significantly higher than the risk for Tennessee (175.74) and the U.S. (136.98). The risks for natural disasters are storms, floods, tornados, high/straight line winds, and winter/ice storms. The fire department is a critical resource in disaster situations.

Ripley City Park includes a swimming pool with three water slides, playground equipment, pavilions, grills, an athletic field complex, lighted tennis courts, a 1.1 mile walking trail, and large grassy areas. The park is a great community amenity for residents, and visitors from the surrounding area visit and use the park facilities as well.

The Interstate 69 (I-69) project is a transcontinental interstate that, upon completion, will connect Canada and Mexico. Across the county, the route is in various stages of study, construction, and completion. One of the two route options under consideration for the section between Dyersburg and Millington (the West Corridor or Red alternative) goes through Ripley. If selected, the West Corridor of proposed Interstate 69 (I-69), which will connect Dyersburg to Millington, will pass through Ripley.

There is no doubt that the City of Ripley will continue to grow. Major growth will probably not occur for the next ten years, which gives Ripley time to plan for and budget for improvements in fire protection. For people who want to live in a small town community and be near a major and/or larger city, Ripley is within easy commuting distance of Memphis and Jackson, and very convenient to Covington and Brownsville. In 2010, Ripley completed the downtown revitalization project in and around the town square and adjacent areas, and the results are beautiful and attractive. Ripley has retail businesses that offer convenient access to goods and services for area residents, and community services and attractions. Ripley has sufficient undeveloped land for planned residential and commercial growth. Major transportation routes include US Highway 51, State Highways 19 and 209, and I-40 and I-55 are within 20 miles, and this makes commuting convenient for those who want to work in a larger city like Memphis but live in a smaller community. Existing fire services are not adequate for the size of the area served.

Future Needs

Ripley expects to see residential and commercial development throughout its urban growth boundary, but the current economy precludes immediate growth. Therefore, the city must plan for future fire service needs to accommodate future growth.

The Class 5 ISO rating is very good, but Ripley needs to plan for an additional fire station to avoid placing its Class 5 ISO rating at risk. Distribution is the term ISO uses to measure the number of fire stations needed in a community. For maximum credit, ISO looks for an engine company to be within 1½ miles of every structure and a truck or service company to be within 2½ miles of every structure. Ripley has one fire station.

How Many Fire Stations Does Ripley Need?

To answer the question of how many fire stations Ripley needs now, one can look at several sources for guidance. The first is the Insurance Services Office (ISO) Fire Suppression Rating Schedule. Section 560 of the schedule covers distribution of companies and states: "The built-upon area of the city should have a first-due engine company within 1½-miles and a ladder-service company within 2½-miles."

Using an "as the crow flies" radius of 1½-miles to draw a circle does not adequately represent the geographical area that a single fire station can cover. Studies have shown that a polygon better represents the ISO required response area, and that the average size of the polygon is 4.5 square miles. Two caveats: the polygon model assumes the even distribution of resources throughout the area, which is generally not the case, and the formula does not allow for geographical barriers, such as rivers and railroads, but the formula is useful as a reference. Based upon a 12.8 square mile service area, a travel distance of 1½-miles, and assuming all engine companies are evenly distributed (the station is centrally located) Ripley needs 2.8 fire stations right now for adequate coverage.

One can use the polygon model to determine the number of needed ladder trucks or service companies based upon ISO's maximum travel distance of 2½-miles for a ladder or service company. The average size of a polygon for a ladder or service company is 12.3 square miles. Based upon a 12.8 square mile service area, a travel distance of 2½-miles, and assuming all ladder companies are evenly distributed (which they are not) Ripley needs 1.04 ladder companies right now.

The ISO standard for distribution is 1½-miles for an engine and 2½-miles for a truck company, but ISO will extend a community's fire protection rating as far as five miles from a fire station provided there is adequate water available for fire protection. There is a caveat for basing fire protection on this five-mile distance, and that is the risks associated with extended response times. Travel time, measured as the time from when the fire department resource starts to roll until it arrives on the scene, is just one component of response time (see Appendix A). At 1½-miles, the travel time for a fire engine is approximately 3:12 (time expressed as minutes:seconds). At five miles, the travel time is approximately 9:09. The response time, which includes ring time, call answering, call processing, turnout, and travel time, is much longer. Thus, a total response time of six or seven minutes for stations based on 1½ mile distribution increases to twelve or thirteen minutes (or longer if call processing and turnout times exceed NFPA recommendations) based on five-mile distribution. As stated earlier in

this report, the level of fire protection provided in a community is a local decision, but MTAS does not recommend basing community fire protection on this maximum five-mile distance.

The second resource is the National Fire Protection Association (NFPA). NFPA addresses the number of fire stations needed in an indirect way based on minimum response times. NFPA Standard 1710 Section 5.2.4.1.1 allows a 240 second (4 minute) travel time for the first arriving engine company. Using an empirical model called the piece-wise linear travel time function, based upon studies done by the Rand Institute estimating the average response speed of fire apparatus at 35 mph, one can determine that the distance a fire engine can travel in 4 minutes is approximately 1.97 miles. A polygon based on a 1.97 mile travel distance covers on average 7.3 square miles. Based upon a 12.8 square mile service area, a travel-time-calculated travel distance of 1.97 miles, and assuming all engine companies are evenly distributed, Ripley needs 1.75 fire stations right now, and Ripley currently has one station.

The previous two examples are based upon time and distance to be covered. A third resource is the ISO Fire Suppression Rating Schedule's determination of needed engine companies based upon the community's basic (needed) fire flow. Section 510 of the schedule requires one engine company for a basic fire flow of 500 to 1,000 gpm, two engine companies for a basic fire flow of 1,250 to 2,500 gpm, and three engine companies for a basic fire flow of 3,000 to 3,500 gpm. Basic fire flow is determined by determining the needed fire flow for all non-sprinklered properties in the community, and then the fifth highest is considered the basic fire flow for the community. For Ripley, that is 3,500 gallons-per-minute. A strong commercial and residential sprinkler ordinance can limit significantly community risk, as ISO does not consider properties protected by automatic sprinkler systems when determining the basic fire flow, and sprinklered properties reduce the fire risk in the community. Ripley has adopted model codes that require fire sprinklers in certain types of buildings, but Ripley should consider adopting a more restrictive sprinkler ordinance for commercial properties to reduce risk to the community. For example, an ordinance requiring a sprinkler system for all commercial properties that exceed 5,000 square feet would reduce community risk and limit fire growth.

Finally, city leaders must consider the phenomenon known as flashover. As a fire grows in size, it gives off heat that heats other objects in the vicinity of the fire. At some point in the time-temperature curve, all of the objects in the fire room reach their ignition temperature and ignite. The entire room bursts into flames, and the temperature rises to a point where no person can survive, including firefighters. This is called flashover. The NFPA Fire Protection Handbook states: "During flashover, however, the temperature rises very sharply to such a level that survival of persons still in the room at that stage becomes unlikely. Thus the time interval between the start of the fire and the occurrence of flashover is a major factor in the time that is available for safe evacuation of the fire area." The development of fire conditions to reach the point of flashover is a function of temperature rise over time. Therefore, a sufficient number of fire stations strategically located to provide quick response times can reduce the incidence of

flashover, thus saving lives and property. As shown in the graph in Figure 3, flashover can occur within 9 to 11 minutes of the start of a fire. Locating fire stations to provide a total response time of six to seven minutes is advantageous, as firefighters need time after arrival to setup, lay fire hose, and gain access to the seat of the fire before they can actually begin to search for trapped occupants or extinguish the fire. This is where the five-mile distribution of fire stations proves to be inadequate.

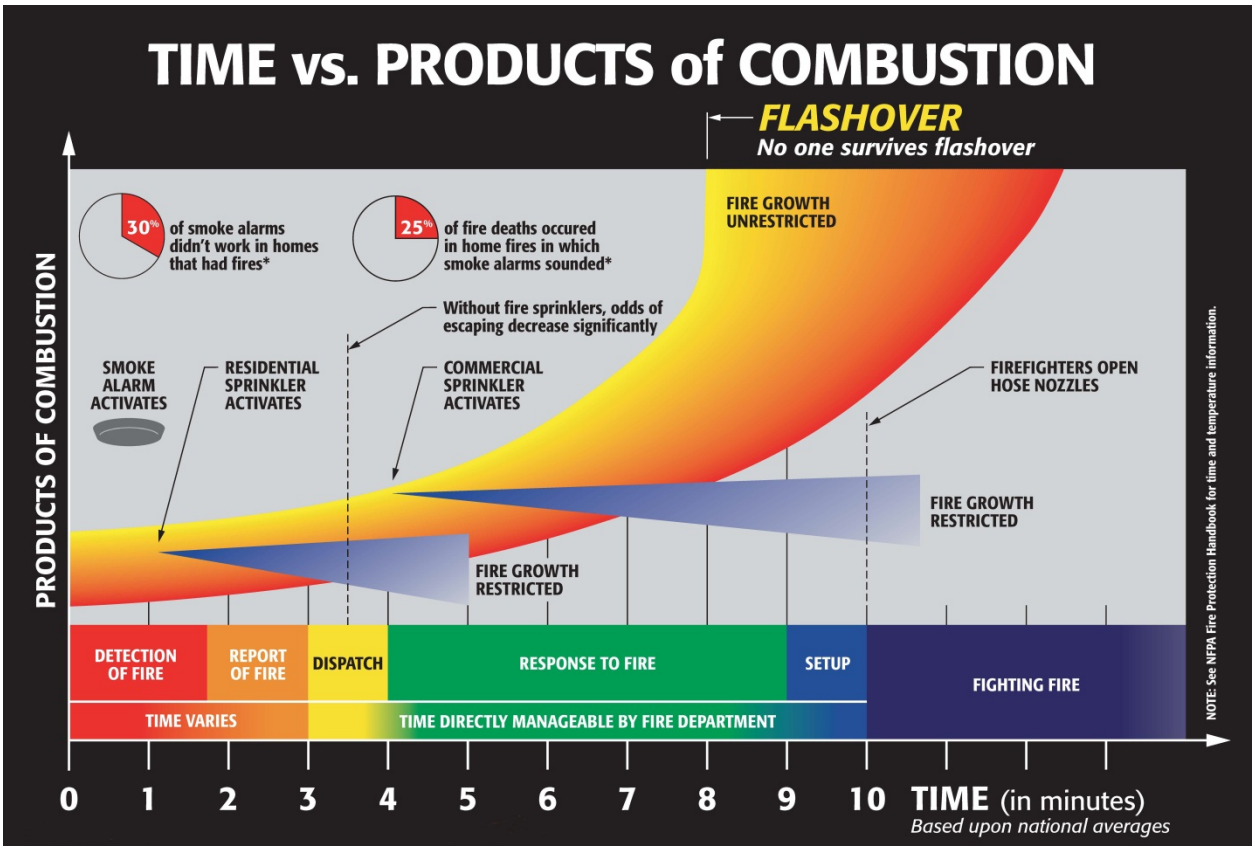

Figure 3 – Time versus Products of Combustion

Figure 4 shows the current coverage area for the existing station and for the proposed location of the relocated fire station. The polygon areas represent 1½-mile travel distances, or approximately 3:12 travel times. The software program used to create the map is not capable of providing significant street details at this scale, but the major roads and the railroad, along with the marked location of existing fire station, serve as landmarks for orientation. Looking at this map, it is apparent that Ripley has some areas that fall outside of the 1½-mile coverage area of an engine company.

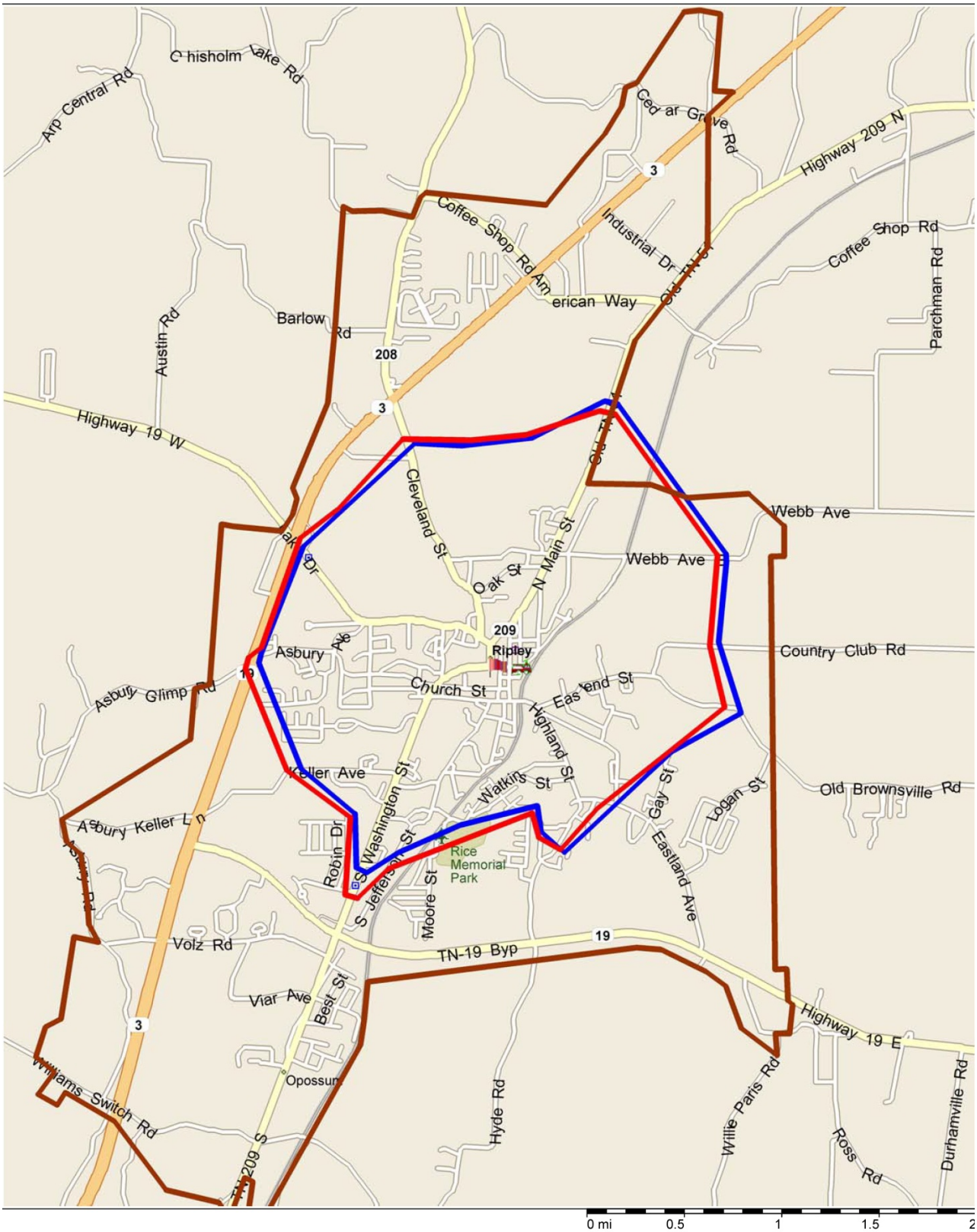

Figure 4 – Ripley Fire Station with 1½ Mile Response Area

Key: Blue = existing station, Red = proposed station, Brown = city limits.

ISO will extend the community's ISO rating as far as fire miles from a fire station provided property risks in the area are within 1,000 feet of a fire hydrant. The map in Figure 5 shows the five-mile coverage area, outlined in yellow, of the existing fire station overlaid on the current and proposed 1½ mile response areas and city limits. MTAS does not recommend basing community fire protection on this five-mile model.

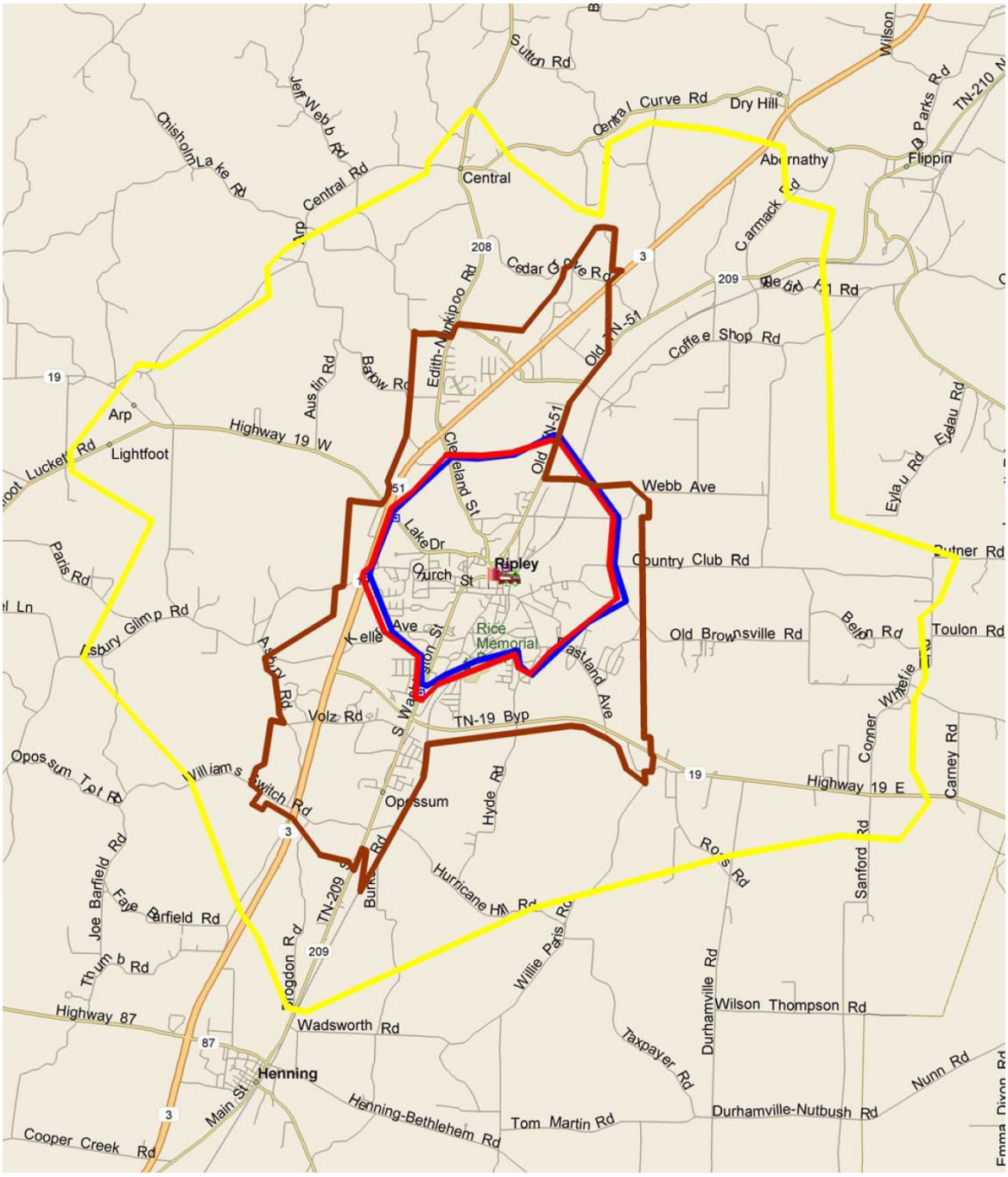

Figure 5 – Five-mile Travel Distance From the Fire Station

How Many Ladder Companies Does Ripley Need?

A community needs a ladder company when it has at least five buildings that are three stories or more than thirty-five feet in height, or at least five buildings with a needed fire flow exceeding 3,500 gallons-per-minute (gpm), or a combination of five buildings meeting either criteria. According to information supplied by the fire department, Ripley does not have a sufficient number of buildings meeting this criteria, so Ripley does not need a ladder truck to meet ISO requirements. This does not mean, however, that an aerial ladder truck is not needed to meet local needs. An aerial ladder with an elevated stream device can supply large volumes of water requiring just one person to operate the truck once it is set up.

If Ripley does not need an aerial ladder truck to meet ISO requirements, ISO does require that Ripley have a service company. A service company carries the tools, equipment, and ground ladders required to be carried on an aerial ladder truck, it just does not have the aerial ladder. An aerial ladder truck can serve as and receive ISO credit for a service company.

As mentioned previously, based on ISO's requirements for distribution, according to the polygon model, Ripley needs one service company, and the existing aerial ladder truck receives credit as the needed service company.

Areas of Ripley not covered by a ladder company must have a service company. A service company carries the same tools and equipment as a ladder company but does not carry an aerial ladder. The truck lacks much of the equipment required by NFPA and ISO, so Ripley should consider purchasing equipment to bring the truck up to NFPA and ISO standards.

Plan Implementation

The City of Ripley enjoys a Class 5 ISO split rating. The Class 5 rating places the city in the top 31% of communities nationwide in terms of fire protection. Because of the Class 5 rating, residents and business owners enjoy favorable insurance rates. Ripley's existing fire station is centrally located to provide the maximum coverage possible to meet ISO's requirements. One fire station is sufficient to provide coverage that meets ISO's criteria of extending the ISO rating to structures within five miles of the station provided the structures are within 1,000 feet of a fire hydrant. ISO bases credit for distribution on a 1½ miles travel distance as measured over roads, and credit is reduced when this distance is exceeded. The single station no longer provides adequate coverage to Ripley. Without improving distribution, Ripley could see a future reduction (worsening) of its Class 5 ISO rating and an increase in insurance premiums for residents and business owners.

One fire station serves Ripley now. The station, built in the 1930s, is small, and has some physical issues. Ripley is preparing to build a new fire station a short distance away from the existing station. The new station will be larger and have modern building

infrastructure, and the new location will not change the response time significantly. Ripley should proceed with construction of the new station and relocation of the fire department to the new station.

Ripley needs a second fire station now. However, response volume, averaging 2.08 calls per day, and 3.3 structure fire responses per month, is not excessive. There is minimal new development, so Ripley has time to plan and budget for a second fire station.

Ripley needs to increase fire department staffing. A staffing level of five paid firefighters per day is not sufficient for a working structure fire. Ripley should look at ways to increase the number of trained firefighters that respond to structure fires. Examples of ways to do this include adding more full-time personnel, which is expensive, adding more part-time personnel, which is slightly less expensive, adding volunteer firefighters, which still requires an investment in training and turnout gear, and signing automatic aid agreements with other fire departments. Recruiting and retaining volunteer firefighters is a formidable job, and to be successful the city should look at some incentive programs for volunteers, and the fire department should appoint a volunteer coordinator to manage recruitment and retention. The least expensive solution is to increase volunteer levels and sign an automatic aid agreement with neighboring departments.

Finally, this report contains recommendations for improvements in the operation of the department. The city should review and prioritize these recommendations to meet local needs, and then provide funds and other resources necessary to implement them.

Recommendations

The most efficient and cost effective way for the City of Ripley to provide an all-hazards service delivery program that addresses community risks and needs is in the following recommendations, which also answers the questions posed by the city.

1. Adopt a response time standard for the community. Ripley is a perpetual organization that will outlast current leaders, and this study looks towards build out, which is 20-plus years in the future. Once adopted, the response time standard will serve as a planning guide for future leaders. This study recommends a response time standard of 6:35 (six minutes, 35 seconds) for 90% of all responses, which is based upon recommendations found in NFPA Standard 1710, Standard for the Organization and Deployment of Fire Suppression Operations. The 6:35 breaks down as follows: ring time – 15 seconds, call processing time – 60 seconds, firefighter turnout time – 80 seconds, travel time – 240 seconds. Using this standard, planners would look for fire station locations to maintain a 4 minute travel time to as much of the area to be protected as possible.
2. Adopt a sprinkler ordinance for all new commercial construction. When determining the basic fire flow for a community, ISO does not consider properties protected by a code complaint automatic sprinkler system. In a sprinklered building, the amount of time between the occurrence of a fire and reopening for business can be as little as a few hours or days versus months, years or even never rebuilding for a non-sprinklered building.
3. Research and consider adopting a residential sprinkler ordinance to require residential sprinklers in all new residential construction. Tennessee's fire mortality rate for civilians has been among the highest in the nation. During 2002-2010, the time period for the Tennessee Fire Mortality Study, the national fire mortality rate declined, but the rate in Tennessee increased. Residential structure fires account for about three-fourths of all civilian fire deaths in the state. Residential sprinklers save money and lives and are a good investment in a home, but they are controversial in many communities which is why this study recommends research on residential sprinklers before considering adopting an ordinance. Adopting an ordinance would be proactive for community safety.
4. Build and equip a new fire station to replace the existing fire station.
5. Begin planning and budgeting for construction and staffing of an additional fire station as outlined in this report. A fire station is an essential facility and should be designed to be self-sufficient for major emergencies (power outages, ice storms, etc.) and immediately occupiable following an earthquake of a magnitude possible for the community, which is an M7.7 for Lauderdale County. Ripley is at risk for tornados, and all new stations should have a safe room for firefighters to use during tornado warnings. A fire station is a complex building, and Ripley should use professional architects, engineers, and builders who are familiar with the special needs for fire stations.
6. Ripley has a high percentage of vacant properties. Vacant properties have a higher incidence of arson fires than occupied properties. Consider the adoption

of a vacant building ordinance and the establishment of a vacant properties task force. Resources for creating an ordinance to address this issue can be found at this website: http://www.interfire.org/features/vacantbuildings.asp.

7. Adopt a current fire code. Tennessee Code Annotated § 68-120-101(B)(5)(A) requires that the code a community enforces must be within 7 years of the most current published edition of the model code adopted by the state fire marshal's office, and the fire marshal's office has adopted the 2012 edition of the International Fire Code. Ripley can adopt a different model code, but the edition adopted must be at least a 2007 edition.
8. Create and use performance standards for budgeting, planning, and monitoring and improving service delivery. The city should consider joining the Tennessee Municipal Benchmarking Project. Information on the benchmarking project is available through MTAS.
9. Establish an apparatus replacement program that follows the guidelines found in NFPA 1710. Because of their age, Engine 2002 should be moved to reserve service, and Engine 2003 should be retired from emergency response service. Plan to replace Engine 2004 (the tanker) in three years.
10. Begin completing annual pump tests on Unit 63282. The apparatus is a 1990 model, and if the apparatus has mechanical issues that prevent the unit from passing a pump test, have the unit inspected and repaired if practical.
11. Begin an active fire investigation program. Send one or more personnel to classes in fire cause determination. Aggressively investigate all fires to determine cause. Tennessee Code Annotated § 68-102-111(a) protects investigators from civil liability in fire cause determination so long as they act in good faith and without malice. Use the fire cause information to create educational or other programs to prevent these types of fires.
12. Improve the safety program by implementing the following:
    a. Establish and use a personal accountability system for all incidents
    b. Establish a Rapid Intervention Team (RIT) on all working structure fires, and consider using automatic or mutual aid to do so
    c. Appoint a fire department safety officer and send him to safety officer training
    d. Include a vehicle exhaust system in all new stations
    e. Place carbon monoxide warning signs in the current and all new stations
    f. Track and analyze on-the-job injuries for lessons learned to reduce future injuries
    g. Test ground ladders annually per NFPA 1932
    h. Test the aerial ladder annually per NFPA 1911
13. Improve the training program by implementing the following:
    a. Conduct eight 3-hour drills annually, with at least two of the drills being held at night
    b. Through an interlocal agreement, consider forming a county or regional cooperative training association to provide access to more training resources and training props
    c. Add the items to the library that ISO requires and use them in training

d. Acquire large, poster size cut-a-way diagrams of a fire hydrant and fire pump and use them for training. These are usually available at no charge from fire pump and fire hydrant manufacturers.
e. Drill with mutual aid companies four times a year
f. Provide twelve hours of officer training that meet NFPA 1021 requirements to all officers on the department
g. Provide forty hours of driver training to newly appointed drivers
h. Provide eight hours of hazardous materials training annually
i. Increase the recruit training program from 86 to 240 hours, or send all new recruits to the state fire academy for recruit training
j. Provide funding for advanced training programs and classes outside the fire department

14. Increase the number of firefighters responding to structure fires. NFPA recommends a minimum response of seventeen firefighters to a structure fire. The increase in response may be accomplished by a combination of options identified in the body of this report.
15. The fire department has some standard operating procedures (SOP) but these need to be updated. In addition, the department should review current practices and service levels and add SOPs where appropriate. It is not necessary to have the local governing body adopt SOPs for the SOPs to still be applicable.

Appendix A – Estimated Travel Times and Total Response Time in Minutes

Distance To Travel in Miles	Estimated Travel Time	Ring Time	Call Processing Time	Fire Dept. Turnout Time	Total Response Time
0.25	1.08	0.25	1.00	1.33	3.66
0.38	1.30	0.25	1.00	1.33	3.88
0.50	1.50	0.25	1.00	1.33	4.08
0.75	1.93	0.25	1.00	1.33	4.51
1.00	2.35	0.25	1.00	1.33	4.93
1.25	2.78	0.25	1.00	1.33	5.36
1.50	3.20	0.25	1.00	1.33	5.78
1.75	3.63	0.25	1.00	1.33	6.21
2.00	4.05	0.25	1.00	1.33	6.63
2.25	4.48	0.25	1.00	1.33	7.06
2.50	4.90	0.25	1.00	1.33	7.48
2.75	5.33	0.25	1.00	1.33	7.91
3.00	5.75	0.25	1.00	1.33	8.33
3.25	6.18	0.25	1.00	1.33	8.76
3.50	6.60	0.25	1.00	1.33	9.18
3.75	7.03	0.25	1.00	1.33	9.61
4.00	7.45	0.25	1.00	1.33	10.03
4.25	7.88	0.25	1.00	1.33	10.46
4.50	8.30	0.25	1.00	1.33	10.88
4.75	8.73	0.25	1.00	1.33	11.31
5.00	9.15	0.25	1.00	1.33	11.73
5.25	9.58	0.25	1.00	1.33	12.16
5.50	10.00	0.25	1.00	1.33	12.58
5.75	10.43	0.25	1.00	1.33	13.01
6.00	10.85	0.25	1.00	1.33	13.43
6.25	11.28	0.25	1.00	1.33	13.86
6.50	11.70	0.25	1.00	1.33	14.28
6.75	12.13	0.25	1.00	1.33	14.71
7.00	12.55	0.25	1.00	1.33	15.13

Notes:

- Travel time was calculated using the Rand formula of T = 1.7(D) to estimate travel time, where T is time and D is the distance to be covered expressed in miles.
- The 15-second ring time, 60-second call processing time, and 80-second turnout time are based on recommendations found in NFPA Standard 1710.
- Minutes expressed as decimal minutes: to compute seconds, multiply the decimal number by 60. For example, 3.66 decimal minutes equals 3:40 (3 minutes, forty seconds).

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