White House Fire Department

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Comprehensive Study Report

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Municipal Technical Advisory Service

Municipal Technical Advisory Service
INSTITUTE FOR PUBLIC SERVICE

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Introduction and Scope of Work

The staff of the University of Tennessee Municipal Technical Advisory Service (UT-MTAS) strives daily to meet its consensus mission. As an agency of the University of Tennessee and in collaboration with the Tennessee Municipal League, MTAS leverages the resource of the university to improve the lives of the people of Tennessee with technical consulting, research, and training for municipal governments. This study works toward UT-MTAS's mission and was conducted at the request of Chief Rico Bryson, Fire Chief for the City of White House, Tennessee. Information provided as a part of this study was drawn from a UT-MTAS survey completed by Chief Bryson and through an in-person visit to the city and department.The purpose of this study is to evaluate the adequacy of fire department administration, current fire station locations, apparatus deployment, and fire staffing.

The University of Tennessee Municipal Technical Advisory Service (UT-MTAS) will provide the final version of this report to the City of White House, Tennessee, in an electronic as well as a physical hardcopy binder.

Background

The City of White House is located in northern middle Tennessee in the Nashville-Davidson–Murfreesboro–Franklin, Tennessee Metropolitan Statistical Area. The City of White House is located in both Robertson and Sumner Counties. White House is located approximately 25 miles north of Nashville, Tennessee and approximately 20 miles south of the Tennessee/Kentucky state line. A Mayor-Alderman form of government governs the city. The City of White House's Board of Mayor and Aldermen consists of an at-large mayor and four aldermen who are elected by ward from Robertson County or Sumner County.The five-members of the board of alderman includes the mayor, vice-mayor/alderman, and three alderman. The Mayor and Board of Alderman sets policy and the strategic direction for the city and department directors.

Fire protection and public safety is a local policy issue. A community must balance available local resources against what is determined to be acceptable risk. Data provided for this study was provided via a UT-MTAS questionnaire survey completed by White House Fire Chief Rico Bryson and by data collected at in person visits to the city. The City of White House provides fire services to an estimated population of just over 11,000 residents, based on the United States census. From a historical perspective, White House is on the move; growing in population annually. Since 2010,

the city has grown an estimated 53%. The White House Fire Department is a career professional fire department recognized by the State of Tennessee and funded by general fund allocations of the City of White House.

Fire Department-Current Description

Organizational Structure

The fire department is led by a credentialed fire chief utilizing the dedicated service of 16 full-time, 9 part-time, and 1 volunteer fire staff operating out of two fire stations. Each full time fire suppression member is assigned to a 24-hour on duty with 48-hours off duty recurring schedule. Part time members of the department are assigned as needed to meet minimum staffing and/or other staffing needs within the department.

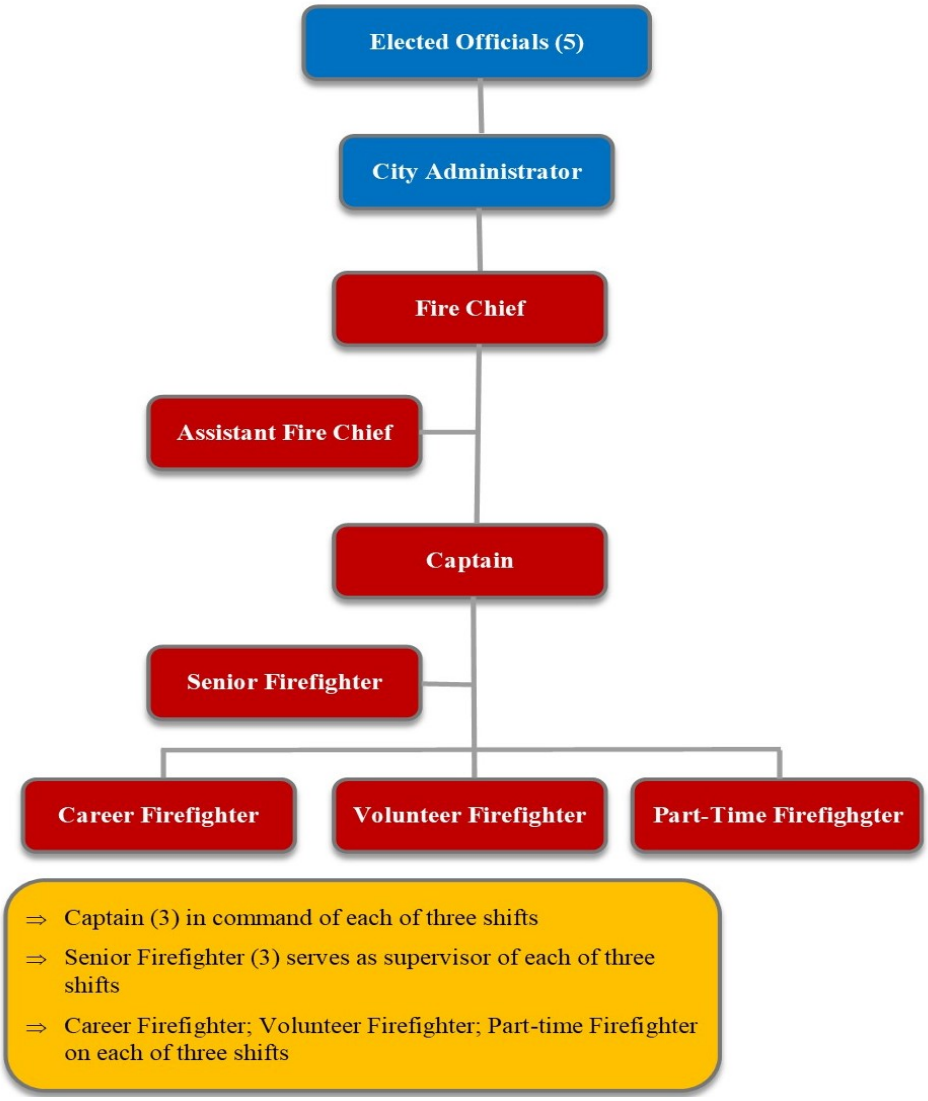


Table 1 - White House Organization

The fire department maintains a fleet of two front line engine/pumper apparatus, one aerial apparatus, and one reserve engine/pumper apparatus deployed from two fire station, located within the approximate 10.5 square miles city boundary. See Table 2.

White House Fire Department Stations, Vehicles, and Apparatus		
District	**Equipment**	**Address**
1	Fire Station 1	416 Highway 76, White House, TN 37188
1	R-1	416 Highway 76, White House, TN 37188
1	Engine 2	416 Highway 76, White House, TN 37188
2	Fire Station 2	120 Business Park Drive, White House, TN 37188
2	Car 1	120 Business Park Drive, White House, TN 37188
2	Car 2	120 Business Park Drive, White House, TN 37188
2	Support	120 Business Park Drive, White House, TN 37188
2	Brush Truck	120 Business Park Drive, White House, TN 37188
2	Squad 1	120 Business Park Drive, White House, TN 37188
2	Engine 3	120 Business Park Drive, White House, TN 37188
2	Ladder 1	120 Business Park Drive, White House, TN 37188
Table 2 – White House Department Stations and Apparatus 2019		

White House's fire apparatus data is as follows. Apparatus in red have exceeded their NFPA lifespan, those in yellow are within two years of their NFPA lifespan, and those in black are greater than two years from their NFPA lifespan. See Table 3 below.

Station	Apparatus	Type	Apparats Age	Pump Capacity	Aerial Ladder Length in Feet
1	R-1	Rescue	20	N/A	N/A
1	Engine 2	Engine	14	1,750	N/A
2	Car 1	Staff/Command	6	N/A	N/A
2	Car 2	Staff/Command	10	N/A	N/A
2	Support	Support	16	N/A	N/A
2	Brush Truck	Brush Rig	12	N/R	N/A
2	Squad 1	Pickup Truck	0	N/A	N/A
2	Engine 3	Engine	2	1,500	N/A
2	Ladder 1	Quint	3	1,500	75
	Notes:				
	An engine is a fire apparatus that is equipped with a fire pump, water tank, and minimum ground ladders.				
	A quint is a fire apparatus that has a fire pump, water tank, hose bed, full set of ground ladders, and an aerial ladder mounted to the truck frame.				
	Table 3 – White House Fire Department Vehicles and Apparatus 2019				

ISO Public Protection Classification

White House's Insurance Services Office (ISO) Public Protection Classification (ISO rating) is a classification of Class 3/3x. The Class 3/3x ISO rating places White House in the top tier of the percentages of communities in Tennessee as well as well as in the top tier percentage of communities in Tennessee (Figure 2) in terms of fire protection and indicates that White House has made good decisions in the past; there are opportunities to improve in planning for community fire protection.

Figure 1 – Public Protection Classification (ISO Rating) in Tennessee

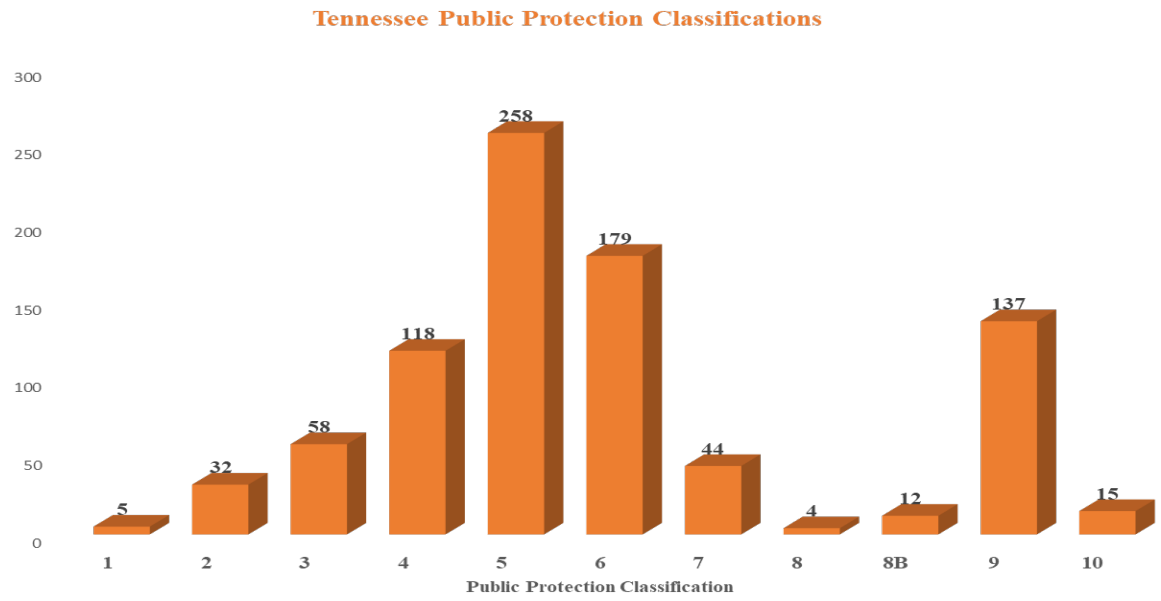
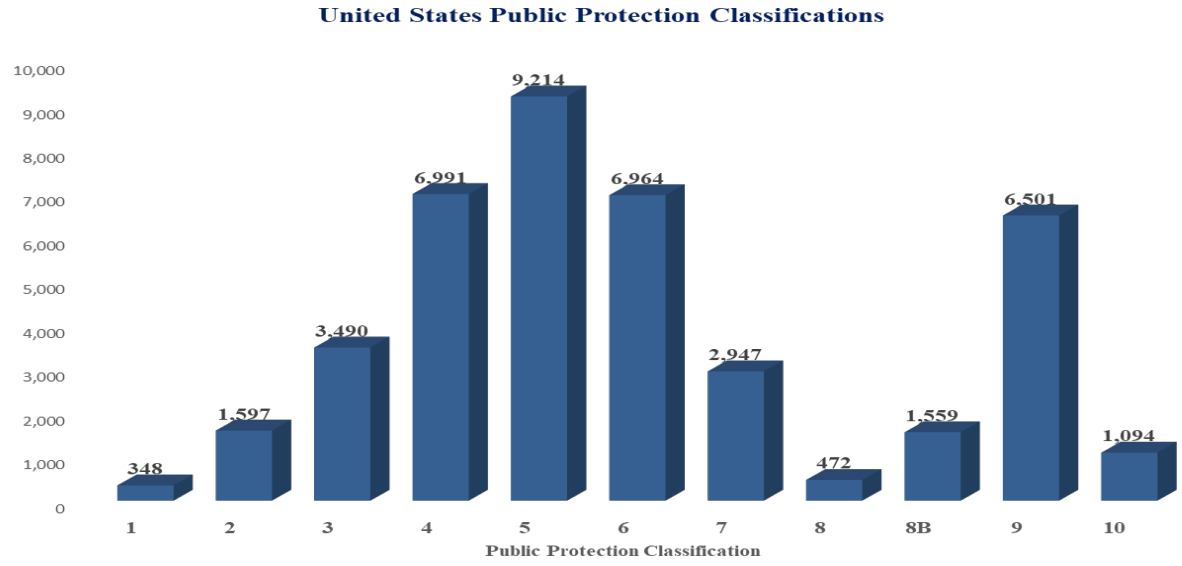


Figure 2 – Public Protection Classification (ISO Rating) in the US



Training and Certification Program

The White House Fire Department has an established departmental training program that leads its members to earning Tennessee Fire Commission Educational Incentive pay and IFSA/ProBoard fire commission certification. This is evident by the number of certifications that members of the department have earned.

Firefighter II	20	Fire Officer II	1
Pump Driver Operator	18	Fire Officer III	0
Aerial Apparatus Operator	10	Fire Officer IV	0
Fire Apparatus Operator	18	Incident Safety Officer	0
Instructor I	12	Fire Inspector	3
Instructor II	1	Fire Investigator	1
Fire Officer I	11		

Table 4 – White House Fire Commission Certifications

Fire Department and Utility Providers

The White House Fire Department is an all-hazards fire department and is alerted to respond to emergency incidents in all locations inside White House's corporate limits. The department is considered an all-hazards fire department. What this means to the community is that the fire department responds to any emergency call for service the citizens and visitors have.

The White House Utility District provides high quality water and sewer services to the community. The White House Utility District provides potable water for public consumption and attempts to meet needed fire flow requirements for fire suppression operations. The adequacy of the water utility to provide fire flow requirements for fire suppression operations were not studied as a part of this study. Electric utilizes are provided by the Cumberland Electric Membership Corporation (CEMC). CEMC provides electricity to the region by purchasing electricity from the Tennessee Valley Authority at wholesale price and distributing to individual customers at retail rates. The electric grid and/or its adequacy or vulnerability was not a scope of this study.

Community Risk – General Overview

White House covers approximately 10.5 square miles and has a population of approximately 11,000 based on estimated census. The city's urban growth boundary is larger than its current boundaries and historical growth over the past twenty years has been tremendous, so additional growth is likely due to the geographic location and the economy of the region.

From 2000 to 2010, White House's population increased greatly by about 42.0% in population. It is estimated that since 2010 census, that White House has a population has increased by another 11.0%. White House's population has a median age of 34.9 years old, as compared to the state median age of 38.6 years. Statistically, the older the population segment the more they tend to use EMS services more than other population segments. White House Fire Department has a history of answering approximately 1,400 emergency calls for assistant annually.

Approximately 3.9% of the housing stock available in White House is vacant. Of the approximately 4,133 houses in White House, approximately 3,971 occupied with approximately 3,326 being owner occupied and approximately 645 being renter occupied.These numbers does not include houses in foreclosure, which means that the percentage of vacant homes and buildings is probably 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.

The City of White House has a diverse base of employment opportunities in the city. Management occupations (18%), sales and related occupations (9%), office and office administration occupations (8%), and construction and related occupations (7%) are the top employment categories for White House.

It is predicable that White House will continue to grow because of its geographic location, ease of commuting and distance to larger cities, convenience to areas in other states, nearby airports, community services, and entertainment attractions. White House is an attractive city with aesthetic design and has sufficient undeveloped land for planned residential and commercial growth. Its location adjacent to the major transportation routes of Interstate 65, Highway 76, and Highway 31 makes commuting convenient for those who want to work in a different city in Tennessee and/or Kentucky. White House is also located within 25 miles of Nashville International Airport which makes regional as well as international travel for business or pleasure very convenient.

Review of the White House Fire Department, indicates that the leadership has made good decisions and planned for the future. However, existing fire service staffing has not kept pace to provide needed emergency services within the parameters recommended by the National Fire Protection Association 1710 consensus standard.

Current and Future Needs

Strip annexation proceeding along the limited assess Interstate 65 corridor has created the need to provide fire services quite a distance from the central more densely populated areas of White House. The annexation of this corridor off of Webster Road at North Swift Road (see Figure 3) will most likely increase the need for fire and emergency services in this area. Currently, Fire Station #2 is the first due fire crews to this area of the city. Emergency responses from Station #2 to this area of the city are extended due to the travel distances, normal daily traffic, and road network that must be negotiated to travel to the location. There are several target hazards in the area with large manufacturing facilities and a five story White House Retirement Center.

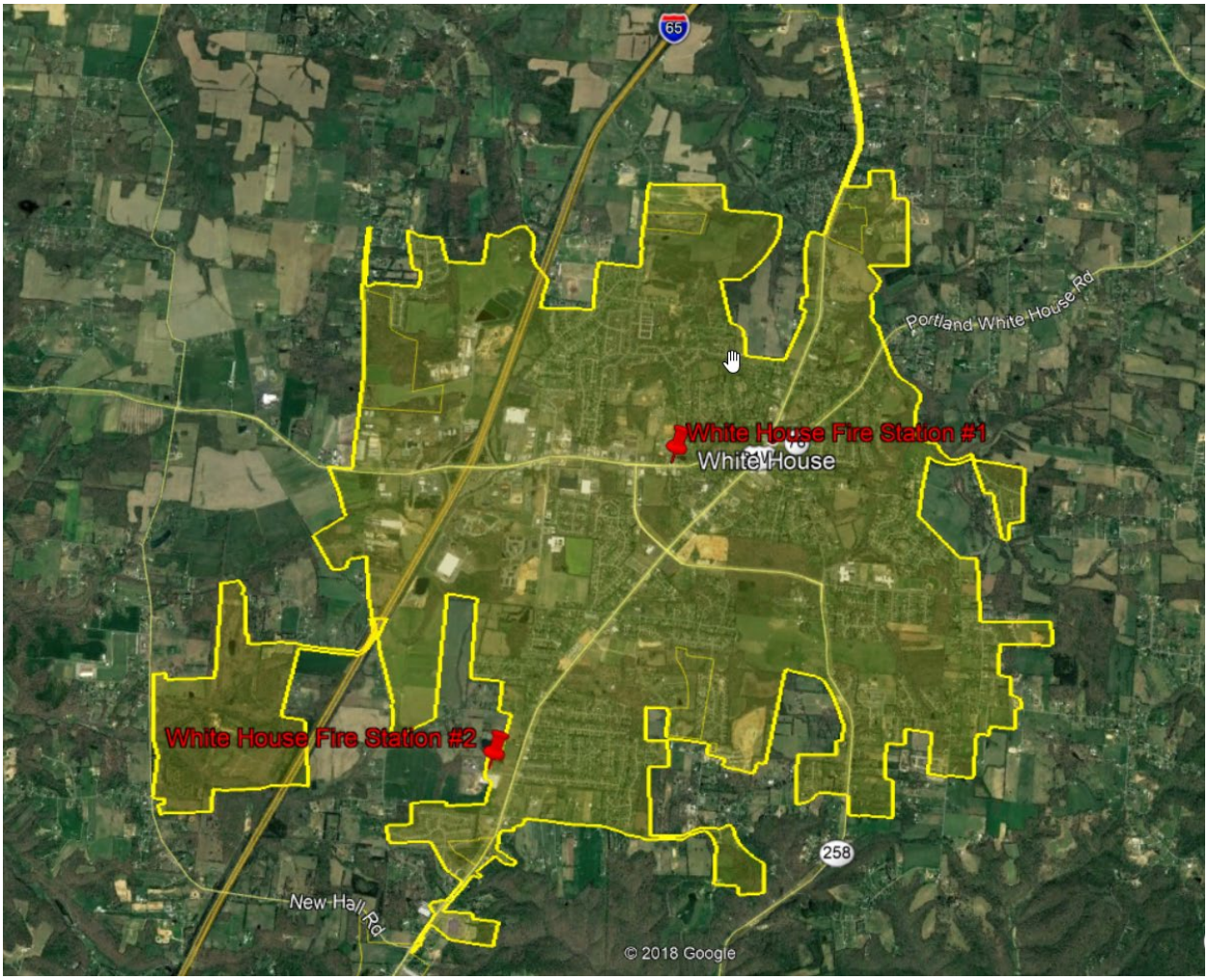


Figure 1 – White House City Limits

It is predictable that White House should expect to see residential, commercial, and industrial development throughout its urban growth boundary. Therefore, the city must plan proactively for future public safety needs to meet the current needs as well as future needs of the city.

How Many Fire Stations/Engine Companies Does White House Need?

To answer the question of how many fire stations White House needs now, one can look at several sources for guidance. The first is the Insurance Services Office (ISO) Fire Suppression Rating Schedule. Section 561 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 for an Engine Company response zone is approximately 4.0 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 10.5 square mile service area, a travel distance of 1½-miles, and assuming all engine companies are evenly distributed (which they are not) White House needs 2.7 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 approximately 12.0 square miles. Based upon a 10.5 square mile service area, a travel distance of 2½-miles, and assuming all ladder companies are evenly distributed (which they are not) White House needs just one Ladder Company 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 UT-MTAS recommends basing community fire protection more toward the 1.5-mile travel distance rather than extending it to the maximum travel distance that will receive any credit of 5-miles.

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 10.5 square mile service area, a travel-time-calculated travel distance of 1.97 miles, and assuming all engine companies are evenly distributed (which they are not) White House needs 2.6 fire stations right now, and White House currently has two stations. However, the city is not evenly distributed, has geographic barriers that fire apparatus sometimes cannot navigate, and strip annexation has extended the corporate limits far beyond what the existing fire stations can cover adequately.

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 513 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-sprinkled properties in the community, and then the fifth highest is considered the basic fire flow for the community. For White House, the basic fire flow is predicted to be 3,500 gallons-per-minute or greater. A strong fire 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 properties equipped with fire sprinkler systems reduce the fire risk in the community. White House has adopted model codes that require automatic fire sprinklers in certain types of buildings. White House should consider adopting a more restrictive sprinkler ordinance to reduce risk to the community.

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 4, flashover can occur within 3 to 5 minutes of the start of a fire. Locating fire stations to provide a total response time of three to four 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 grossly inadequate.

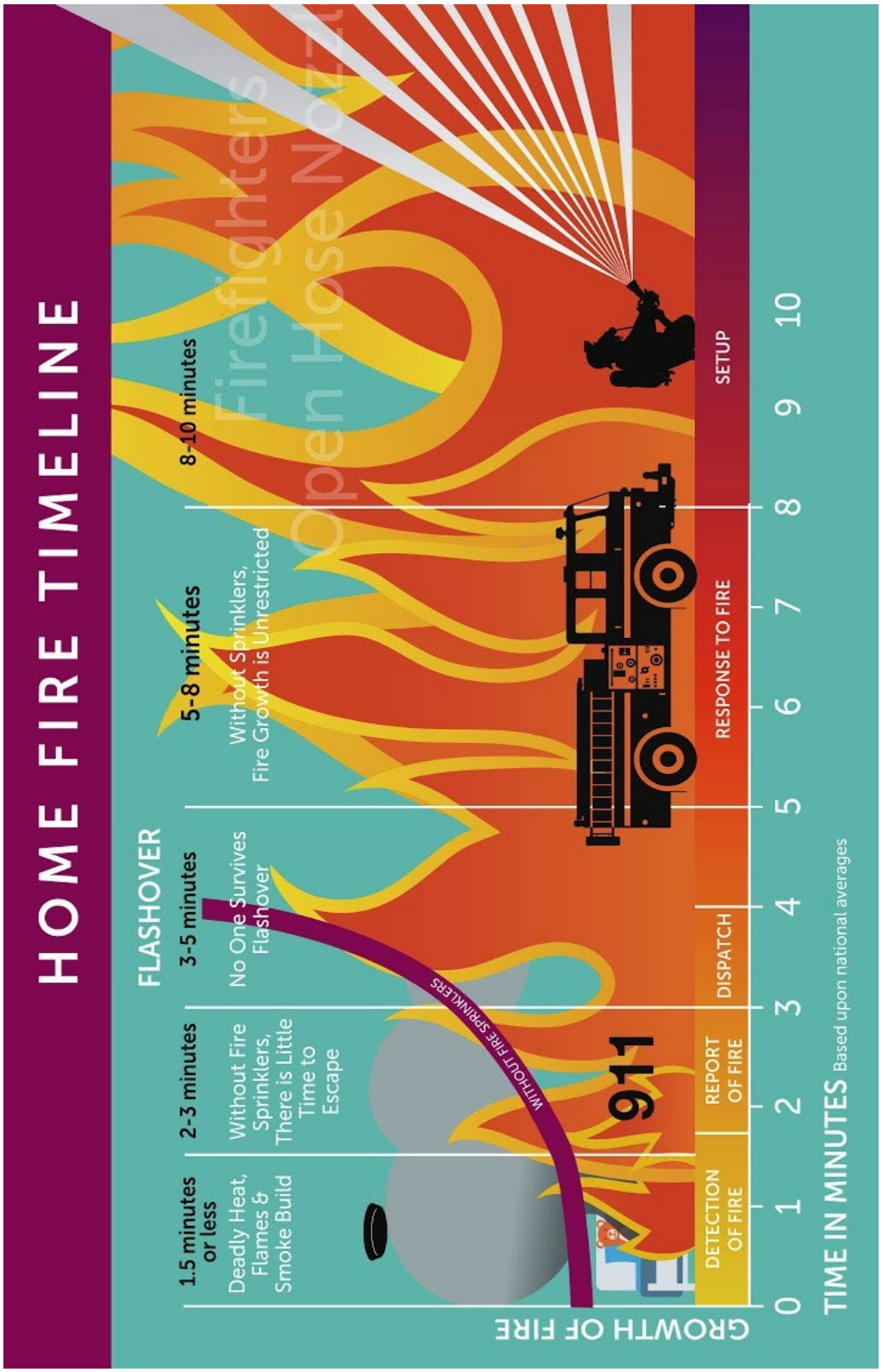


Figure 2 – Home Fire Timeline

Figure 5 depicts the current 1.5 mile coverage area for both Station 1 and Station 2. The polygon areas represent 1½-mile travel distances, or approximately 3:12 minutes/seconds travel times. Looking at this map, it is apparent that White House has areas that fall outside of the 1½-mile coverage area of an engine company. Specifically, Station #1 has a 4.0 square miles response coverage area with all of this area being contained within the corporate limits. Station #2, due to being geographically located on the edge of the city limits as well as limited assess and roadway networks, has only a 3.3 square miles response district. This being said, it is further noted that approximately 1.25 square miles of the coverage area is located outside the corporate limits of the city.

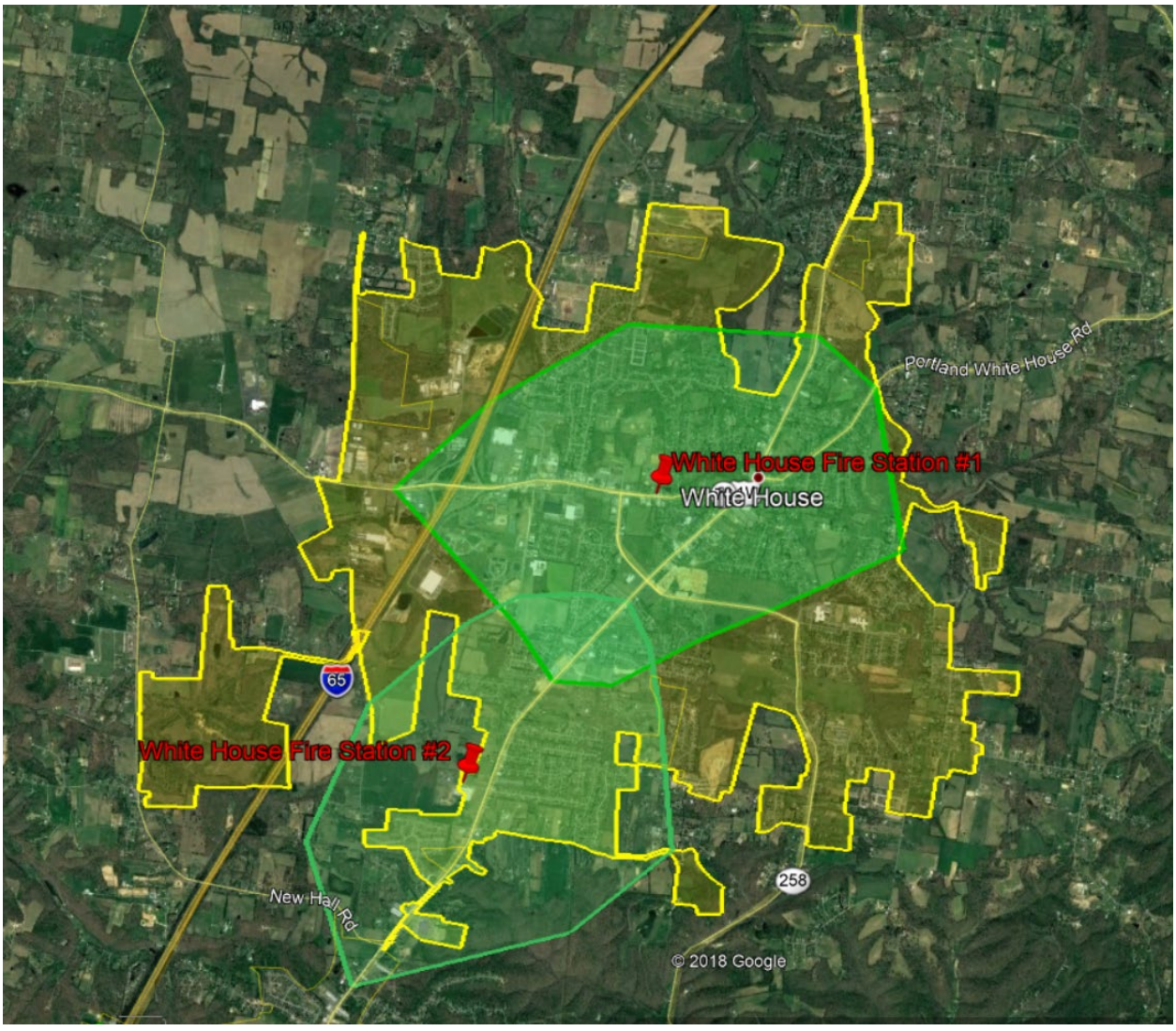


Figure 3 – White House Fire Stations with 1½ Mile Engine Response Areas

Taking into consideration the accepted methods to determine proper fire station distribution across a city and using existing station locations to reduce capital expenditures, in order to provide adequate fire coverage for the city, White House should continually monitor growth patterns and proactively plan the future growth of the city.

The current Station 1 facility is located in a strategic location but should be upgraded to facilitate the necessary fire apparatus, fire staff, and support needs. The current Station 2 is a modern facility with adequate facilities to support the staff and apparatus. This station is located on the edge of the city limits so the city cannot take advantage of its entire capabilities for response area. As the city grows, plans should be made to add fire stations, apparatus, and staff to continue to provide for public safety of the citizens and visitors to White House.

Fire stations are complex facilities. Each should be planned, designed, and constructed with the not just the current needs of the city but take into account for future needs of the community and the scope of services provided by the fire department in mind. This planning process should take into consideration collaboration with other city departments, internal/external customer needs, anticipated apparatus deployment, ancillary support equipment, staffing, call volume, population growth, applicable National Fire Protection standards, life safety codes, and building codes.

Figure 6 demonstrates the fire station engine company coverage that could be obtained by the addition of fire station #3 and fire station #4. These stations would be proposed if and when future growth and population density of the city can support these capital upgrades. It appears that the city potentially will grow to the west more quickly than other directions. A station located in the area depicted "WHFD West Station Future" will provide better service to the west side of Interstate 65. In addition, a fire station on the west side of the interstate will give White House better coverage should something happen to the current travel route(s) from the east side of the interstate.

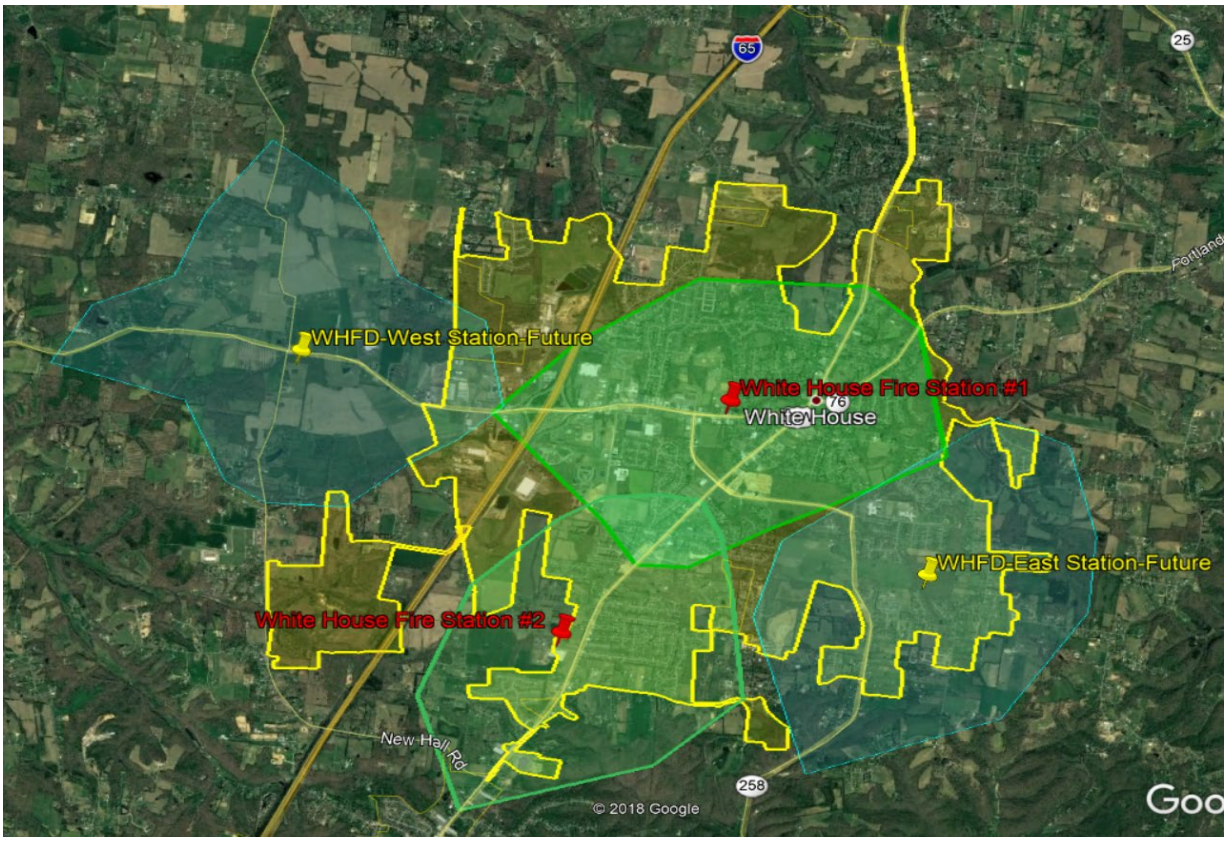


Figure 4 – White House Future Fire Stations

How Many Engine Companies Does White House Need?

A community needs an apparatus credited as an engine company in each fire station. Fire stations should be planned with 1½ mile polygon service areas to earn maximum credit. This can be accomplished by deployment of a pumper apparatus or of a quint apparatus. Quint apparatus receive full engine credit as well as ½ aerial credit when deployed as a single company house. Figure 7 shows the current engine company deployment and their corresponding 1½-mile coverage areas. White House needs more than two but less than three engine companies. White House's current deployment model has two engine apparatus; one engine apparatus deployed from both fire station #1 and fire station #2. See Figure 7.

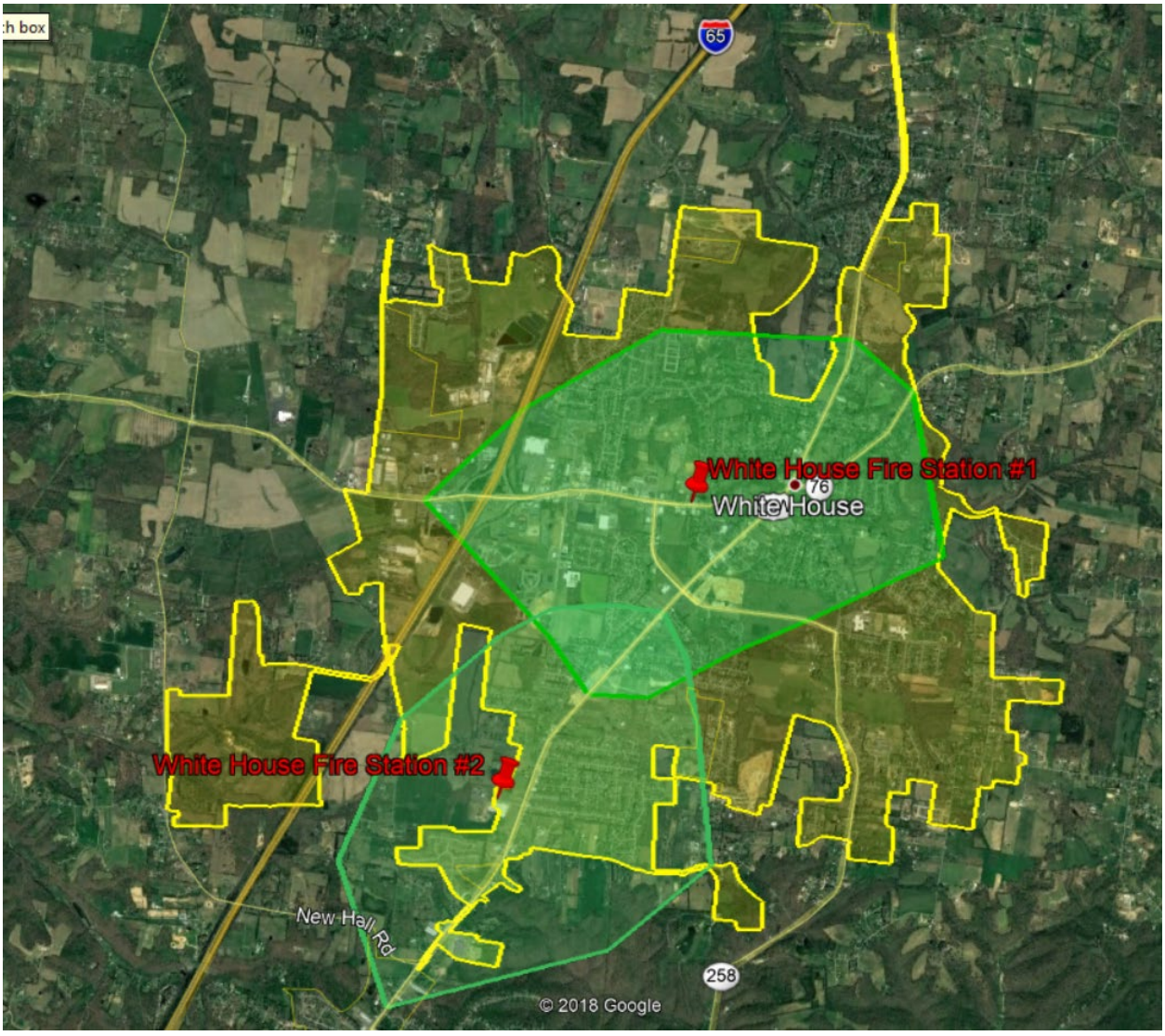


Figure 7 – White House Recommended Engine/Engine-Quint Coverage

How Many Ladder/Truck Companies Does White House Need?

A community needs a ladder/truck company when it has at least five buildings that are three stories, five buildings more than thirty-two feet in height, five buildings with a needed fire flow of 3,500 gallons per minute, or any combination thereof. White House has buildings that meet these criteria scattered throughout the city. Figure 8 shows the current ladder/truck company deployment and its corresponding 2½-mile coverage areas. Since the existing ladder/truck company is a quint apparatus and it's housed in a double company house with an engine, the existing ladder/truck company is credited for truck company credit and can cover 2.5 road miles in every direction from its station. White House needs more than one but less than two ladder companies. In figure 8, it is noted on the map that one truck company could almost cover the entire city with exception of parts of the city that have been annexed in a way to create an island but not from its current deployment location.

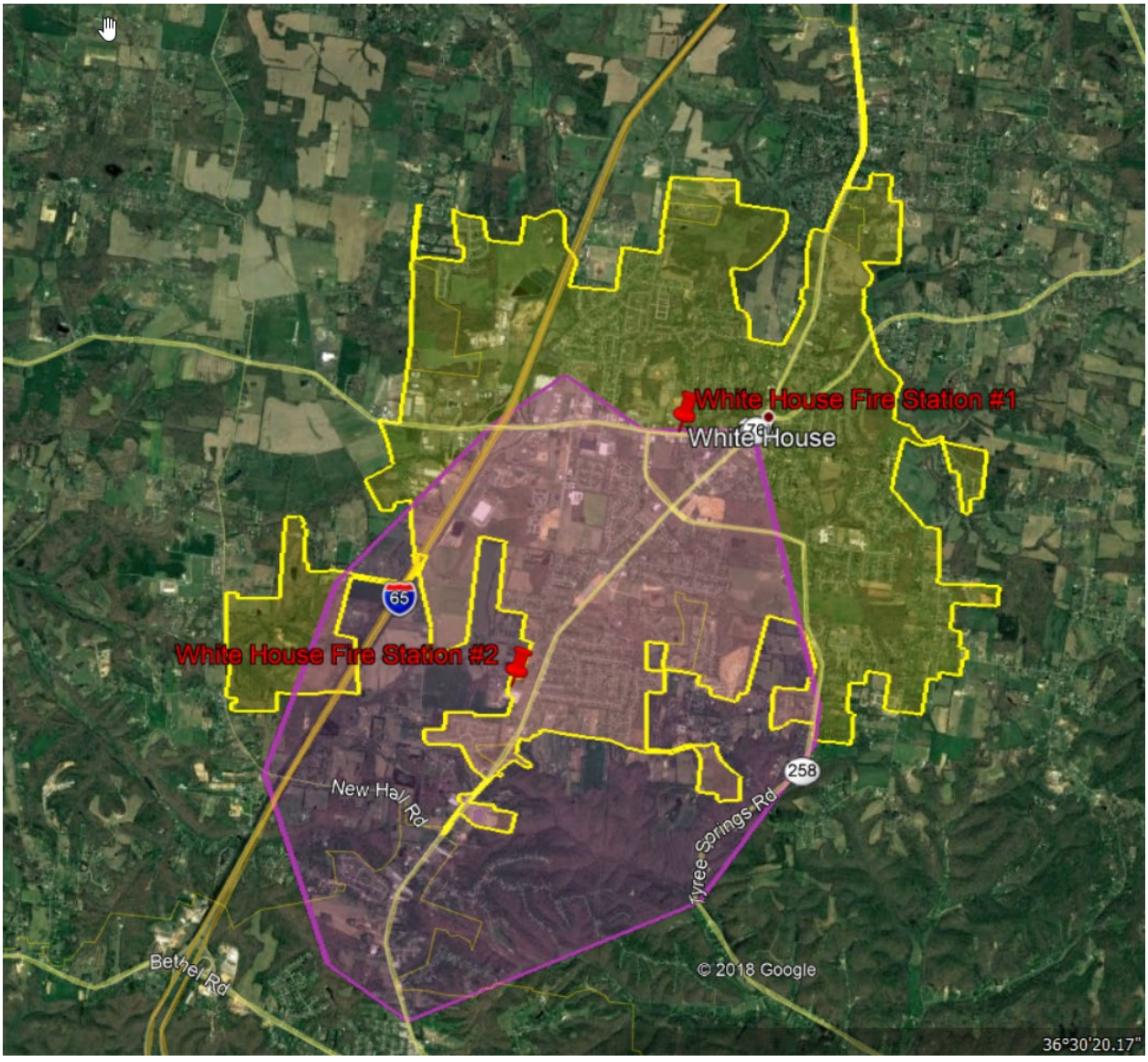


Figure 8 – Existing Ladder/Truck Company Deployment

As mentioned previously, based on accepted methods to determine proper ladder/truck company distribution across a city and using the existing station location to reduce capital expenditures, in order to provide adequate ladder/truck company coverage for the city, White House does not need, as of this time, two standalone truck/ladder companies stationed with an engine apparatus. White House should consider a deployment of one ladder company in a station with an engine company and one quint apparatus in a station without an engine company.

The department uses a quint apparatus, which is an engine that has a pump, water tank, and carries all of the equipment required for an engine company, plus carries equipment required for a ladder company and has an aerial ladder. The use of quint apparatus is cost effective as the city can receive up to full credit for an engine company and half credit for a ladder company (credit depends upon the size of the aerial ladder, the equipment inventory, and required pump, hose, and ladder tests). See figure 9 for recommended truck/ladder deployment and response zones.

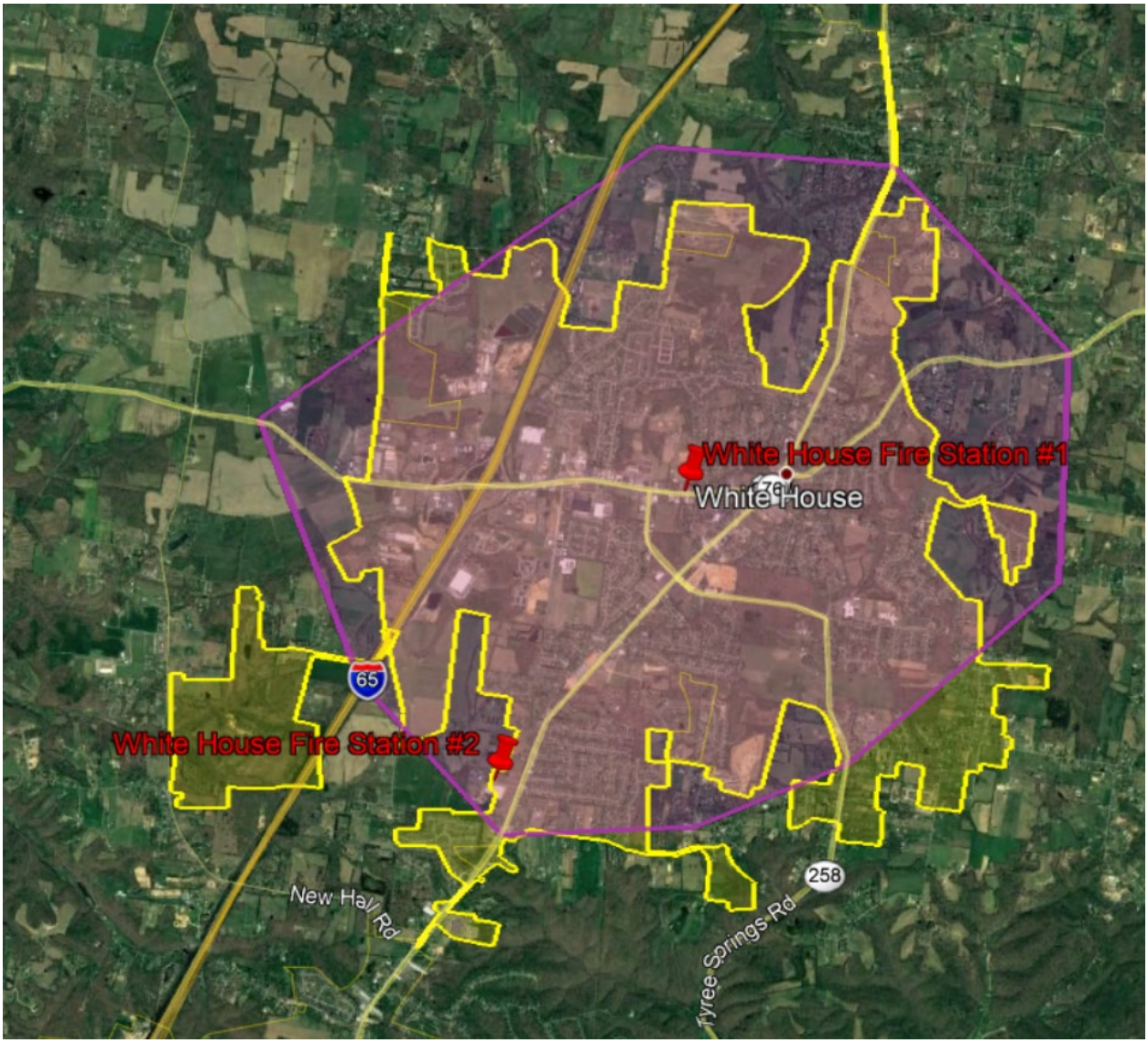


Figure 9 – Recommended Ladder/Truck Company Station 1 Deployment

White House Fire Apparatus

Currently, White House Fire Department maintains a fleet of three pumper/engine apparatus and one 75' aerial ladder apparatus as front-line emergency response and reserve apparatus. An analysis of the current front-line and reserve apparatus was conducted determining that of the two front line engine apparatus, both of the apparatus are currently within their National Fire Protection Association (NFPA) recommended life span for a front-line apparatus; that of the one front-line ladder apparatus, it is within its NFPA recommended life span for front line apparatus. Engine #2 is within one year of its NFPS front line reserve service life span.

Figure 10, below, identifies the apparatus that need to be considered for reserve or surplus. Those with "Age" in black are current, those in gold are within three years of replacement, and those in red have exceeded their NFPA recommended life span.

> NFPA 1710 Appendix D states: It is recommended that apparatus more than 15 years old that have been properly maintained and that are still in serviceable condition be placed in reserve status, be upgraded in accordance with NFPA 1912, and incorporate as many features as possible of the current fire apparatus standard (see Section D.3). This will ensure that, while the apparatus might not totally comply with the current editions of the automotive fire apparatus standards, many of the improvements and upgrades required by the current editions of the standards are available for the firefighters who use the apparatus.
>
> Apparatus that were not manufactured to the applicable NFPA fire apparatus standards or that are over 25 years old should be decommissioned and taken out of service.

White House should continue to address the replacement of fire apparatus through a Capital Equipment Replacement Program. This program will allow the department to budget dollars annually to replace outdated apparatus with less impact on the economics of the municipality.

Station	Apparatus	Type	Apparats Age
1	R-1	Rescue	20
1	Engine 2	Engine	14
2	Support	Support	16
2	Brush Truck	Brush Rig	12
2	Engine 3	Engine	2
2	Ladder 1	Quint	3

Table 5 – Apparatus Age Analysis

White House Company Staffing

White House Fire Department should develop a staffing strategy that provides for a minimum staffing of fire apparatus policy per National Fire Protection Standard (NFPA) 1710. NFPA 1710 recommends each fire company be staffed with four members including an officer. It is important to note that NFPA does not require a compensation of firefighters. This opens the door to alternative staffing initiatives to meet these needs. If firefighters are on duty at the station and are signed in on a roster, they are considered as staff. If firefighters respond from a place other than the fire station, it take three firefighters to equal one firefighter equivalent. In addition, all fire departments are required to follow the National Incident Management System (NIMS). NIMS states that the number of individuals a supervisor should be responsible for (span of control) should be between the ratios of 1:3 to 1:7 with 1:5 being the optimal ratio.

White House should develop a plan to address the current and future needs of the city while working to meet the recommendations provided by NFPA 1710 and the National Incident Management Systems (NIMS). Based on NFPA 1710, each company should have four members to include a qualified officer/supervisor assigned. The absence of or weak leadership or command presence is routinely identified as one of the primary root causes of firefighter injuries and line-of-duty death. Internal and external customer safety and professional service delivery depend on strong leadership and adequate staffing.

Recommendation Implementation

To provide for firefighter safety, excellence in customer service, while making efforts to maintain or improve White House's Class 3 ISO Public Protection Classification rating, White House should consider the recommendations of this study and develop a comprehensive plan to implement each recommendation. The recommendations made, in this report, will require considerable resources and must be planned for accordingly. Consideration must be made for the initial capital outlay as well as annual sustainability.

Summary

Growth has occurred in White House without the needed growth in fire department resources. White House's fire station #1 is strategically located to provide good coverage to the most densely populated portions of the city with minimal coverage overlap with station 2 to meet ISO's requirements. Fire station #1 facility itself may need some upgrades to be adequate for a fire station with the scope of services provided and apparatus deployment. The department leadership must continue to demonstrate a priority on firefighter safety. Fire stations must provide for decontamination, rehabilitation, and training of firefighters. The facility should meet the adopted fire codes and provide for a safe work environment.

The department's full-time, part-time, and volunteer fire suppression staffing model may be able to keep pace with the city's growth and best practices identified in national standards. Providing all-hazards fire department services for a city such as White House is complex and must be planned for accordingly.

It is never advisable for a municipality to make significate changes to the organization in order to just chase an ISO Public Protection Class rating. What we find is that when departments have a practice of proactively planning and operating based on national standards, the firefighting forces are safer and operate more efficiently. This usually means the ISO rating will usually follow suit.

Based on the scope and findings of this study, White House should implement as many of the recommendations made in this report as feasible. This action will greatly improve firefighter safety, provide for quick and efficient emergency services to the public, and could improve but surely prevent a possible future reduction (worsening) of White House's Class 5 ISO rating. It is important to note that a worsening of the ISO by 1 classification most likely would lead to an increase in insurance premiums for residents of one and two family dwellings.

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Recommendations

The most efficient and cost effective way for the City of White House to provide for an all-hazards fire service delivery program that addresses community risks and needs is addressed in the following recommendations. These recommendations also satisfy the three components of this study: fire station locations, fire staffing analysis, and fire apparatus deployment analysis.

1. Adopt a comprehensive automatic fire sprinkler ordinance for all new construction and incentives for retrofit of existing buildings. Use resources like the National Fire Sprinkler Association as a resource as you plan for this step. It is worth noting that buildings equipped with fire sprinkler systems are much safer and occupants are more likely to survive if a fire occurs. Also, when determining the basic fire flow for a community, ISO does not consider properties protected by a code complaint automatic fire sprinkler system. In a sprinkled 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-sprinkled building. This will help provide greater safety for the citizens/visitors to the community as well as help ensure a steady revenue stream for the city.

    - 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 to require automatic fire sprinkler systems is a proactive community risk reduction rather than reactive fire response and suppression.

2. Adopt a response time standard for the community. White House Fire Department is a perpetual organization that will outlast current leaders, and this study looks at current and anticipated future needs. Once adopted, the response time standard will serve as a planning guide for future leaders. This study recommends a response time standard of a maximum 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, and travel time: maximum 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.

3. Fire Department Staffing: White House Fire must always be analyzing staffing needs of the organization. The department's rank and responsibility structure should provide for competent leadership on each fire company and provide for a manageable span of control for the officers thus meeting NFPA and NIMS recommendations and requirements.

    - White House's current shift staffing model of a Captain and four firefighters per shift to staff three apparatus does not appear to be adequate thus may not meet guidance provided by NFPA 1710 consensus standard.

    - White House should develop a recruitment and retention program along with a volunteer shift staffing program as an alternative to obtain sufficient staff to move the department toward meeting the staffing component of the NFPA 1710 standard. This will provide a safer environment for firefighters to serve as well as much more efficient service for the community.
        i. The department must assign a competent officer/supervisor to each apparatus. NFPA 1710.
        ii. Each apparatus should be staffed with four personnel, including the officer/supervisor. NFPA 1710
            1. NFPA 1710 does not stipulate full-time, part-time, or volunteer staffing.
        iii. Based on current staffing model, fire crews must routinely delay interior fire suppression operations until backup personnel arrive and assemble OSHA two-in/two-out allowing entry on structure fire or other immediately dangerous to life and health (IDLH) atmosphere.
        iv. Potential Staffing Options
            1. Developing a roster and shift staffing plan that would bring minimum crew staffing to three members. This would allow each crew to at minimum afford a confirmed rescue entry with two fire suppression members while backup personnel arrive to assemble the two-out safety team.
            2. Developing a roster and shift staffing plan that would bring minimum crew staffing to four members. This would allow each crew to arrive at an emergency incident and without delay start interior fire suppression operations while meeting OSHA two-in/two-out entry on a structure fire or other incident with an IDLH atmosphere.

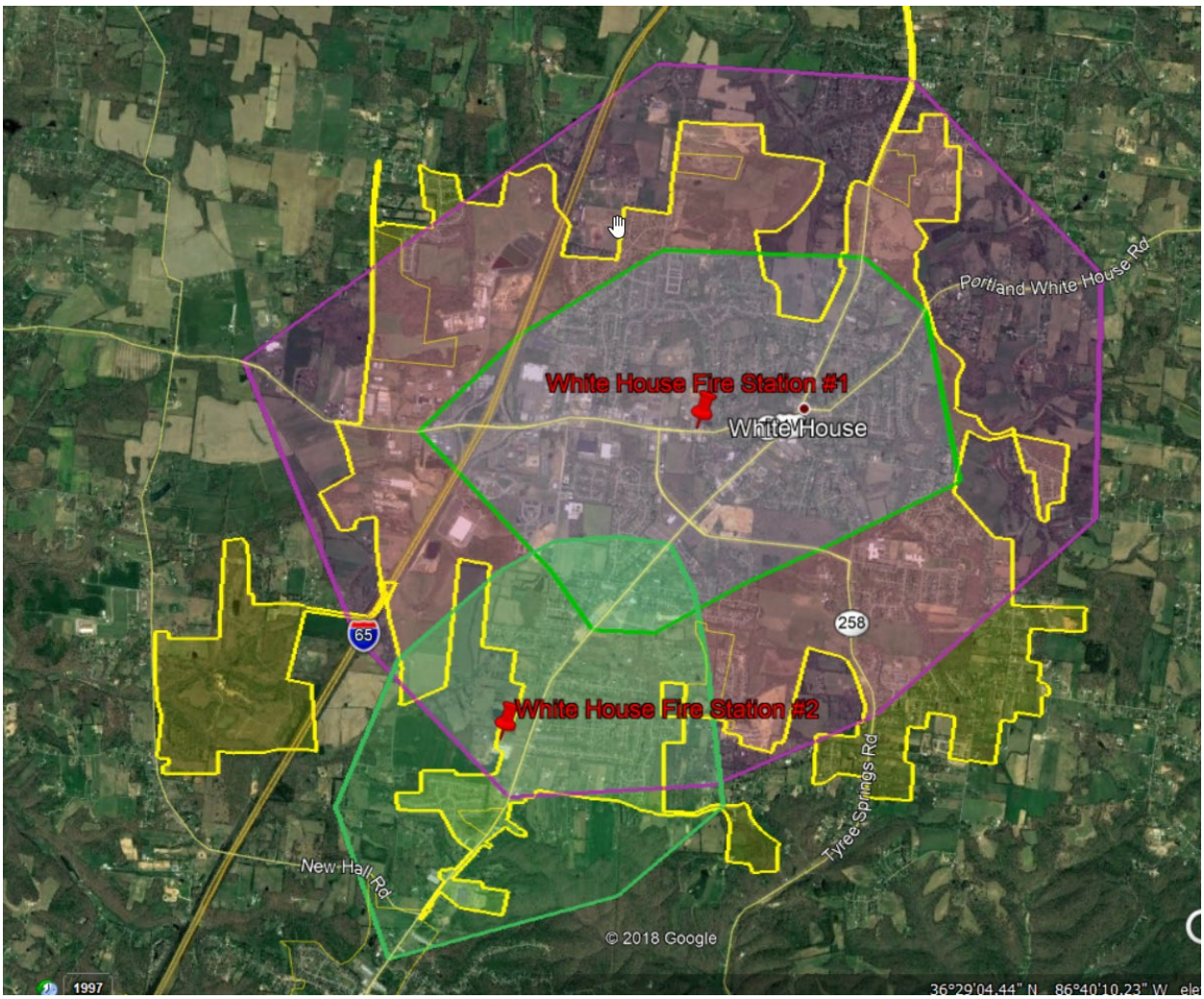
4. Fire Stations: White House Fire has good fire station coverage but must address maintaining adequate fire facilities. The department currently operates out of two fire stations. The city should consider a capital project to remodel the current fire station #1. This would provide adequate facilities for the scope of services provided by the department.

5. Fire Apparatus: Continue to revise, fund, and manage a comprehensive capital equipment replacement program (CERP) for the department. The CERP should be developed based on NFPA 1710 Appendix D referenced earlier in this report. Departments with a funded CERP experience less resistance to replacing outdated substandard equipment due to proactive planning. Planning ahead for these large purchases impact the fiscal stability of the municipality less.
    - Current Apparatus Needs
        i. Station #1 (1-Engine; 1-Ladder ISO credit)
            1. Engine 3 to Station 1 and designated as Engine #1
            2. Ladder 1 to Station 1 and designated as Ladder #1
            3. Engine 2 status moved to reserve apparatus
        ii. Station #2 (1-Engine; ½ Ladder ISO credit)
            1. Acquire Ladder 2
            2. Acquire new Rescue designated as R-2
            3. Rescue 1 status moved to reserve rescue
        iii. Total apparatus deployment credit 2-Engines; 1 ½ Ladders.
    - Future Apparatus Needs
        i. Continue to plan and fund CERP for apparatus replacement to meet future needs.

6. Adopt a comprehensive Community Risk Reduction Program. This will assist the fire department in identifying fire service related risks posed throughout the city. As a comprehensive program, the intent would be to have a team of leaders from all areas of government to identify risks posed at all levels of government and then systematically mitigate these risks. This practice will pay huge dividends in providing for safety and livability of the city.
    - Adopt and enforce the current fire code.
    - Investigate the cause of all fires.
    - Conduct pre-incident planning on all non-residential occupancies across the city.
    - Provide public education programing to meeting the needs of the community.

Appendix

Proposed Apparatus Deployment Coverage



- Yellow polygon-Depicts the corporate city limits of White House.
- Green polygons-Engine apparatus coverage provided by Engine 1 deployed from Station 1 and Ladder 2 deployed from Station 2. This provides the city with 2.0 engine companies.
- Purple polygon-Ladder apparatus coverage provided by Ladder 1 deployed from Station 1. The quint proposed for station 2 will have a response zone like an engine company but also earn ½ ladder credit from this one apparatus. This provides the city with 1.5 ladder companies.
- Total coverage: 2-Engines and 1 ½ Ladders.

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ICS Glossary - FEMA Training
https://training.fema.gov/emiweb/is/icsresource/assets/icsglossary.pdf

City Data: http://www.city-data.com/city/White House-Tennessee.html

US Census Bureau Quick Facts: http://quickfacts.census

Wikipedia. White House, Tennessee information: https://en.wikipedia.org/wiki/White House, Tennessee

Vision 20/20 Community Risk Reduction: https://strategicfire.org/crr