Hernando County Fire & Emergency Services

Station Location Study

June 2022

ESCI Emergency Services Consulting International

Providing Expertise and Guidance that Enhances Community Safety

CONTENTS

EXECUTIVE SUMMARY

Background

Emergency Services Consulting International (ESCI) was contracted by Hernando County, Florida in December 2021 to produce a Station Location Study for Hernando County Fire and Emergency Services (HCFES). The purpose of this study was to provide the following information:

1. Evaluate where the organization is today.
2. Identify future service delivery needs.
3. Provide recommendations and strategies to address future needs.

Summary of Findings

Current Conditions

Hernando County Fire and Emergency Services (HCFES) is an all-hazards fire department that provides fire, rescue, EMS, technical rescue, and hazardous materials response to the citizens and visitors of Hernando County from 14 fire stations. HCFES utilizes the City of Brooksville Fire Department as Fire Station 10. HCFES is led by a fire chief, who also holds the title of Director of Public Safety.

After touring all HCFES stations, the general condition of most of the stations were either fair or good. Even though most of the facilities are in good or fair condition, many of the stations do not meet the current or future demands of the Department and Hernando County. Many of the current facilities were built to only house two or three personnel. The minimum staffing in these facilities has since grown beyond two to three and as Hernando County continues to grow there is a likelihood that additional space will be needed for more personnel and apparatus.

In 2021, HCFES responded to 38,271 emergency incidents, 71.5 % of which were EMS. With the high call volume, ESCI identified that 10 of the 12 HCFES medic units have a peak unit hour utilization (UHU) value of greater than 30%. This puts a strain on the ability of HCFES to provide EMS transport units to the community in a timely manner during daytime hours.

Hernando has an Insurance Services Office (ISO) rating of 2/2Y from their 2017 review. The first number applies to properties within five road miles of the responding fire station and 1,000 feet of a creditable water supply such as a fire hydrant, suction point, or dry hydrant. The second number is that class that applies to properties within five road miles of a fire station but beyond 1,000 feet of creditable water supply.

Total response time can be broken down into five elements. Many of these elements coincide with a National Fire Protection Association (NFPA) standard. The first element is call processing time, which is the time between when a call is answered at the 911 center to when resources are dispatched.

Hernando County had an overall 2017 to 2021 call processing time of 2 minutes, 18 seconds for. NFPA 1225 recommends the processing of the call to occur within 60 seconds, 90% of the time, therefore HCFES is over double the recommended standard. The second element is turnout time. Turnout time is defined as the time between when the unit is dispatched to the time the unit begins to respond. NFPA 1710 recommends a turnout time of 80 seconds for fire and special operation incidents and 60 seconds for all other incidents, 90% of the time. HCFES had an overall 2017 to 2021 turnout time of 2 minutes, 6 seconds for the first unit that arrived on scene. The third element is the time it takes from when the apparatus begins its response until the arrival on the scene, known as travel time. NFPA 1710 recommends a travel time of 4 minutes, 90% of the time. This element is extremely important in a fire location study because the proper placement of fire stations greatly influences travel time. HCFES had an overall 2017 to 2021 travel time of 10 minutes, 36 seconds, 90% of the time. The fourth element is often the most looked at by fire departments because it is the one they have the most control over since it does not take call processing time into account, it is known as response time. HCFES refers to response time as "Total Reflex Time" within the *HCFES 2021 Standards of Response Coverage and Community Risk Assessment* document. Response time is the sum of turnout time and travel time. There is not an NFPA standard for response time, but by adding the standards for turnout time and travel time, there is a 5 minute, 20 seconds goal for fire and special operation incidents and a 5 minute goal for all other incidents, 90% of the time. HCFES had an overall 2017 to 2021 response time of 12 minutes, 19 seconds, 90% of the time. The final element is total response time. Total response time combines call processing time, turnout time, and travel time. There isn't a standard for total response time but by combining the standard for the three elements that make up total response time there is a goal of 6 minutes, 20 seconds for fire and special operations incidents, and 6 minutes for all other incidents. HCFES is over double this goal with an overall 2017 to 2021 total response time of 13 minutes, 35 seconds, 90% of the time.

Growth and Service Demand

Hernando County is a fast-growing county. Hernando County is expected to grow to 241,500 on a medium projection to 296,800 on a high projection by 2045 based on University of Florida Bureau of Economic Business Research (BEBR) estimates. Based on these population projections, HCFES is expected to have a total call volume between 43,470 to 53,424 incidents per year by 2045. The major planned developments in Hernando County are estimated to increase the population by close to 69,000 people and add an additional 12,360 emergency incidents per year.

Recommendations

Additional Fire Stations

Over the next 15 years, ESCI recommends that HCFES utilize the criteria in this report to determine when to add fire stations. Based on planned developments throughout the County, ESCI recommends that HCFES consider adding four new fire stations.

1. Fire Station 15 located a Spring Lake Hwy and Spike Road to serve the I-75/SR PDD/Hickory Hill area.

2. Fire Station 16 located near the intersection of US 19 and Bourassa Boulevard to serve the Lake Hideway development and help with existing service demand in that area.
3. Fire Station 17 located near the intersection of Ponce De Leon Blvd and Citrus Way to serve the Northwest Center of Hernando County. This includes the developments of Quarry Preserve, World Woods, Seville West, and Seville East.
4. Fire Station 18 located near the intersection of US 19 and Thrasher Ave to serve the Northern part of US 19 and developments such as Seville West and Seville East.

Short-Range Recommendations & Strategies (1 to 3 years)

1. **Recommendation 1-A: Response Performance Objective**
   Hernando County BOCC approved a service level response performance objective for seven minutes response time on average for all calls. ESCI recommends using percentile measurements because they show that most of the data set has achieved a particular level of performance.
2. **Recommendation 1-B: Divide the County into Performance Areas**
   ESCI recommends that HCFES divide the county into two areas, 1.) Rural and 2.) Suburban and Urban.
3. **Recommendation 1-C: Ensure Hurricane Protection is Adequate at All Stations**
   HCFES should develop a plan to install hurricane rated bay doors and window shutters on all fire stations. This is critical to protect fire responders and to ensure fire stations are not damaged during storms so they can continue to deploy resources to the public during and after the storm
4. **Recommendation 1-D: Hire an Administrative Assistant/ Data Analyst**
   ESCI recommends that HCFES hire an additional administrative assistant that can perform data analyst duties. NFPA is set to release a new standard in the near future, *NFPA 1022: Standard for Fire and Emergency Services Analyst Professional Qualifications*. It is recommended that the new hire meet the qualifications set forth in this upcoming standard. Adding an additional administrative assistant can help booster a slim administrative staff.
5. **Recommendation 1-E: Add Peak Time Medic Units**
   HCFES medic units are experiencing high call volumes with many having peak UHU values of greater than 30%. It is recommended that HCFES add five peak (8:00 am to 8:00 pm) transport units over the next three years.
6. **Recommendation 1-F: Utilize Closest Unit Dispatch with the City of Brooksville**
   ESCI recommends that HCFES and the City of Brooksville utilize a closest unit dispatch for all emergencies to provide benefit to both Hernando County and the City of Brooksville.
7. **Recommendation 1-G: Add Division Chief of Operations**
   ESCI recommends adding a Division Chief of Operations to lessen the direct subordinates of the Deputy Chief.
8. **Recommendation 1-H: Develop a Plan for Aircraft Rescue and Firefighting (ARFF)**
   The Brooksville-Tamp Bay Regional Airport has plans to increase operations. ESCI recommends that HCFES work with Brooksville-Tampa Bay Regional Airport to develop a

plan to ensure effective ARFF coverage and staffing.

9. **Recommendation 1-I: Determine Ways to Reduce Components of Total Response Time**
   ESCI recommends that HCFES work with the Hernando County Sheriff's Office to increase the minimum dispatcher staffing for fire dedicated dispatchers. ESCI also recommends HCFES install television monitors throughout the stations that will display incident information and a countdown timer to help members monitor their turnout time.
10. **Recommendation 1-J: CAD Upgrades**
    ESCI recommends that HCFES explore computer-aided dispatch upgrades. This will allow both ramp-up tones and the monitors recommended in *Recommendation 1-I* to be functional.

Mid-Range Recommendations & Strategies (3 to 7 years)

1. **Recommendation 2-A: Relocate Units to Station 17 and Provide Staffing**
   ESCI recommends moving Hazmat 7 and Tender 10 to Fire Station 17 and providing staffing for one Driver/Engineer per shift. The Driver/Engineer would cross staff the newly designated Tender 17 and Hazmat 17.
2. **Recommendation 2-B: Staff an Additional Ladder Truck**
   ESCI recommendations that HCFES consider adding an additional ladder truck to its fleet. The addition of a ladder truck would help with credit towards the PPC® score. Hernando County has experienced significant growth and development regarding the types of occupancies. There is continued growth and development that is occurring in the County. Many of the recently completed and proposed projects involve moderate and high-risk occupancies with large square footage or multiple stories.
3. **Recommendation 2-C: Utilize Fire Lieutenants**
   Currently HCFES staffs every suppression unit on every shift with a captain. ESCI recommends that HCFES move to staffing two of the three shifts on each suppression unit with a fire lieutenant and the third shift with a captain. Fire lieutenants will serve as the company officer on their shift just as the current captain does now. The station captain will then be the company officer but will oversee setting policies and oversight of the station.
4. **Recommendation 2-D: Construct Reserve Unit Storage**
   ESCI recommends constructing a large storage facility on the future campus of the Fire Training Facility to house reserve units. Storing units outdoors exposes them to the elements and could impact the service life of the unit.
5. **Recommendation 2-E: Relocate Tender 12 to Station 16 / Add Peak Medic Unit at Station 12**
   ESCI recommends moving Tender 12 to Station 16 and staffing peak Medic 212 at Fire Station 12. Moving Tender 12 to Fire Station 16 will free up space in Fire Station 12 to house a peak medic. Medic 212 will be the sixth peak medic added to assist with the high EMS call volume during the hours of 8:00 am to 8:00 pm.
6. **Recommendation 2-F: Create a Staffing Officer Position**
   Currently, ensuring the department is staffed properly is handled by Battalion Chief 2. This takes a great deal of the battalion chief's duties and creates issues with three different people across three shifts handling staffing. As the department adds units, fire stations and

personnel, this task will become even more difficult. ESCI recommends that HCFES creating a staffing officer position that ensures the Department is adequately staffed.

7. **Recommendation 2-G: Add Additional Training Officer**
   With the added number of line (operational) positions throughout the recommendations, ESCI recommends adding an additional training officer to assist with training members.
8. **Recommendation 2-H: Add Additional Fire Inspector**
   ESCI calculated the average inspections from 2016 to 2019 to be 2,749 per year. 2020 and 2021 were excluded due to limitations with COVID-19. With three full time inspectors, this is 916 inspections per year per inspector when divided equally. A fourth inspector will bring HCFES within the recommended 500-750 inspections per year per inspector range and allow for the expected growth.

Long-Range Recommendations & Strategies (7 to 15 years)

1. **Recommendation 3-A: Staff a Ladder Truck in the Southeastern part of the County**
   ESCI recommends that HCFES examine the growth and the type of development in the I-75/SR PDD/Hickory Hill area to determine if a ladder (truck) company is needed and justified to be staffed at Fire Station 15 or a remodeled Fire Station 8.
2. **Recommendation 3-B: Staff a Ladder Truck at either Fire Station 16, 17, or 18**
   ESCI recommends that HCFES examine growth and the type of development along Northern US 19 and the Northern Hernando County area to determine if a ladder (truck) company is needed and justified to be staffed at Fire Station 16, 17, or 18.
3. **Recommendation 3-C: Redistribute Battalion Assignments**
   ESCI recommends that HCFES redistribute battalion assignments for better geographic coverage of command officers. The following figure shows the recommended home location of the three battalion chiefs and the fire stations assigned to each battalion.

Battalion	Home Station	Assigned Stations
1	5	1, 2, 3, 4, 5, 6
2	16	11, 12, 13, 16, 17, 18
3	7	7, 8, 9, 10, 14, 15

4. **Recommendation 3-D: Ensure Adequate Reserve Fleet**
   As HCFES expands its frontline fleet, ESCI recommends that HCFES ensure it has an adequate reserve fleet to prevent service disruption from routine maintenance or unforeseen events such as an accident or mechanical failure. ESCI recommends that HCFES have a ratio of one reserve for every three to five frontline units.
5. **Recommendation 3-E: Add Additional Training Officer**
   Even with adding a training officer in *Recommendation 2-G,* long-term there may be the need to add another training officer as well. HCFES should monitor the workload of the training staff to see if this position is justified.

6. **Recommendation 3-F: Add Additional Fire Inspector**
   Even with adding a fire inspector in *Recommendation 2-H,* long-term there may be the need to add another fire inspector as well. HCFES should monitor the inspection workload to see if this position is justified.
7. **Recommendation 3-G: Implementation of Community Paramedicine Program**
   EMS incidents accounted for 27,378 out of the 38,271 (71.5%) that HCFES responded to in 2021. There was a 20.7% increase in EMS incidents from 2017 to 2021. HCFES should consider implementing a community paramedicine program. A community paramedicine program works to correct the health concerns of individuals rather than just transporting patients to the hospital. HCFES should research successful programs and design one that fits the need of Hernando County. Additionally, HCFES should utilize public and private partnerships in an effort to design the best program while reducing costs to HCFES.

Conclusion

ESCI hopes that the analysis and recommendations will assist the County and HCFES in successfully navigating the future of the Department and that the implementation of the recommendations presented in this report will ensure the continued provision of high-quality and efficient fire department services well into the future.

ACKNOWLEDGMENTS

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…and the rest of the employees of the Hernando County Fire & Emergency Services who selflessly serve their citizens and visitors with compassion and professionalism.

INTRODUCTION

In December 2021, Hernando County, Florida retained Emergency Services Consulting International (ESCI) to conduct a Station Location Study for Hernando County Fire and Emergency Services (HCFES). The Station Location Study provides HCFES with a detailed analysis of current resource deployment as it applies to fixed facilities, including apparatus and personnel assigned to a fire or EMS station. It is designed to assist stakeholders with quantifying current service delivery, evaluating service delivery and response performance, and developing strategies with which to make facility location decisions that will meet anticipated needs and resultant future service demand.

Hernando County outlined four critical issues that the department is facing. These issues are:

1. HCFES is experiencing rapid growth in emergency services demand which has placed stress on existing response units.
2. HCFES needs an up-to-date evaluation of existing fire station locations to ensure optimum location for the future.
3. HCFES needs an evaluation of current fire and EMS units based on reliable data to plan for the addition of future units to meet the needs of the growing community.
4. HCFES needs an evaluation of current apparatus placement to ensure optimum response efficiency.

In brief, this report is designed to answer the following three questions:

1. Where is the organization today? This is achieved via a detailed evaluation of HCFES as it is currently configured, including an analysis of all other relevant comprehensive plans, land use studies, climate action plans, and the hazard mitigation plan. Further consideration was given to Insurance Services Office (ISO) reports, HCFES 2025 Strategic Plan, and HCFES 2022 Standards of Response Coverage & Community Risk Assessment.
2. Where will HCFES need to be in the future? This is based on the current status of HCFES and ESCI's analysis of past and future population growth and forecast future service demand for Hernando County.
3. How will HCFES get there? Providing short, mid, and long-range future strategies designed to address future needs.

The project consists of three components, beginning with an *Evaluation of Current Conditions*. In this step, ESCI reviews existing facilities and conducts a detailed analysis of current service delivery and response performance. These observations and findings are compared with industry standards and best practices.

The next step is the development of *Future Service Demand Forecasts*. ESCI uses a combination of

historical population data, census information, comprehensive plans, and past incident history to project anticipated future workload and identify community risk.

Finally, the report uses the information gathered to identify and evaluate *Future Recommendations and Strategies* to meet long-range needs. The approach includes modification of existing facilities, relocation of current stations, and potential locations of future stations. ESCI also included other operational and administrative recommendations and strategies.

SECTION I:
Evaluation of Current Conditions

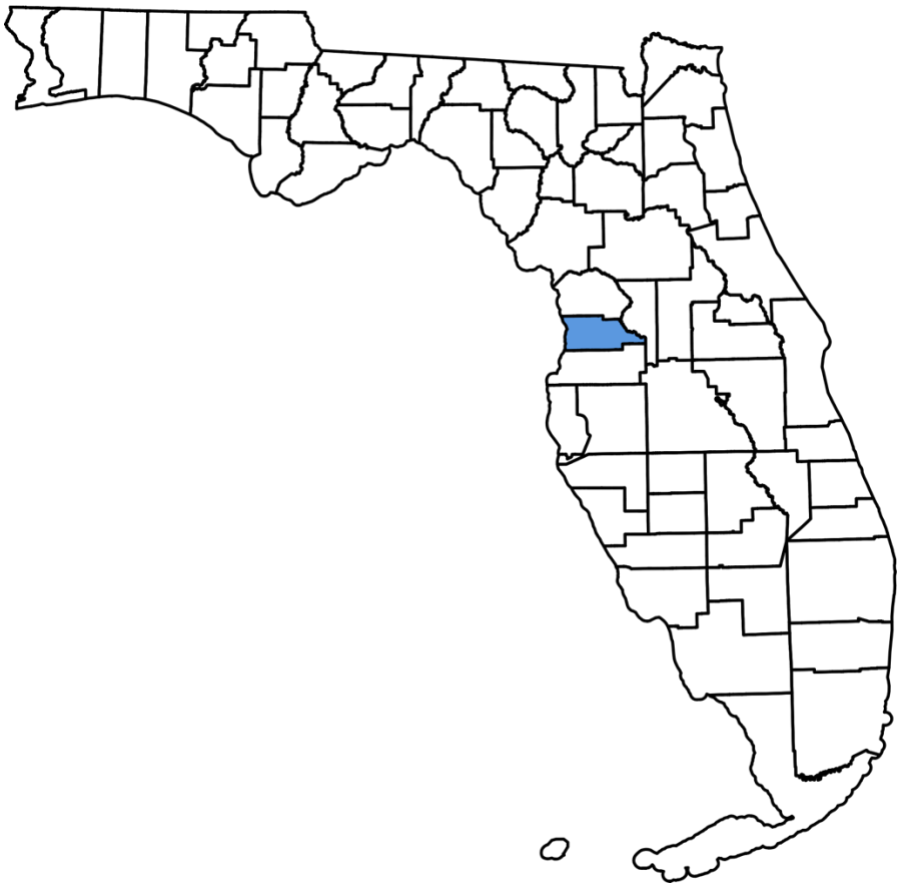
COMMUNITY & ORGANIZATIONAL OVERVIEW

Future fire station needs of a fire department will depend heavily on the make-up of the community the department serves and the current organizational structure. The following section provides an overview of Hernando County and Hernando County Fire and Emergency Services (HCFES).

Hernando County

Hernando County, Florida is located on the west coast of Florida. Hernando County is part of the Tampa-St. Petersburg-Clearwater, FL Metropolitan Statistical Area. Hernando County is bordered to the North by Citrus County, Sumter County to the East, Pasco County to the South, and the Gulf of Mexico to the West. The County is made up of 472.54 square miles of land and 116.48 square miles of water.[1] The following figure shows the location of Hernando County (shaded in blue) within the State of Florida.

Figure 1: Hernando County Location in Florida



[1] "Hernando County." http://www.usa.com/hernando-county-fl.htm

Hernando County Demographics

Demographics is the statistical study of human populations and characteristics. Demographic data can include information on population size, density, growth, and organizational groupings such as race, gender, or age.

The United States Census Bureau reported a population of 194,515 for Hernando County from the 2020 decennial census.[2] This is a 12.6% increase from the 2010 population of 172,778. The United States Census Bureau also estimates a 2021 population of 200,628 people for Hernando County.[3] The population is close to an even split of genders with 51.8% of people associating as a female. The following table shows the racial makeup of Hernando County.

Figure 2: Racial Makeup of Hernando County, 2020

Race Category	Percent
White alone	89.6%
Black of African American alone	6.1%
American Indian and Alaska Native alone	0.5%
Asian alone	1.4%
Native Hawaiian and Other Pacific Islander alone	0.1%
Two or More Races	2.3%
Hispanic or Latino	14.8%
White alone, not Hispanic or Latino	76.5%

There are 76,708 households in Hernando County with an average of 2.46 people per household. Most of the homes are owner-occupied at a rate of 79.3%. The median household income is $50,280. The average commute to work for Hernando County residents is approximately 30 minutes.

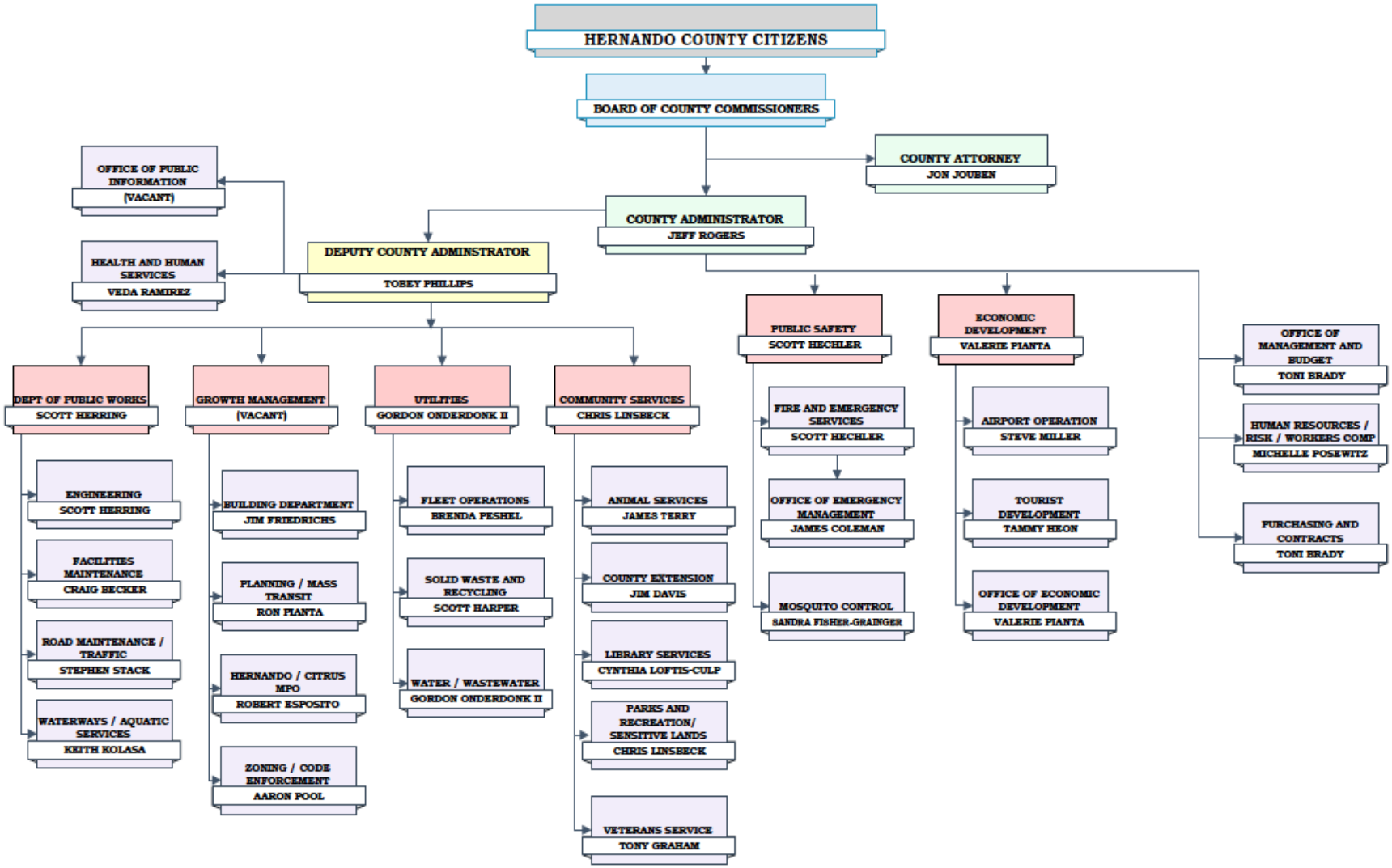
Hernando County Government

The Hernando County Board of County Commissioners are the chief legislative body for Hernando County. There are five county commissioners that are elected to four-year terms to serve the geographical area that they represent. One of the five commissioners serves as the Chairman.

A leadership team consisting of the County Administrator and the Deputy County Administrator work to carry out the goals, policies, and directives of the Board of County Commissioners. The following figure shows the Hernando County organizational chart.

[2] U.S Census Bureau. https://www.census.gov/quickfacts/fact/table/hernandocountyflorida/LND110210
[3] Ibid

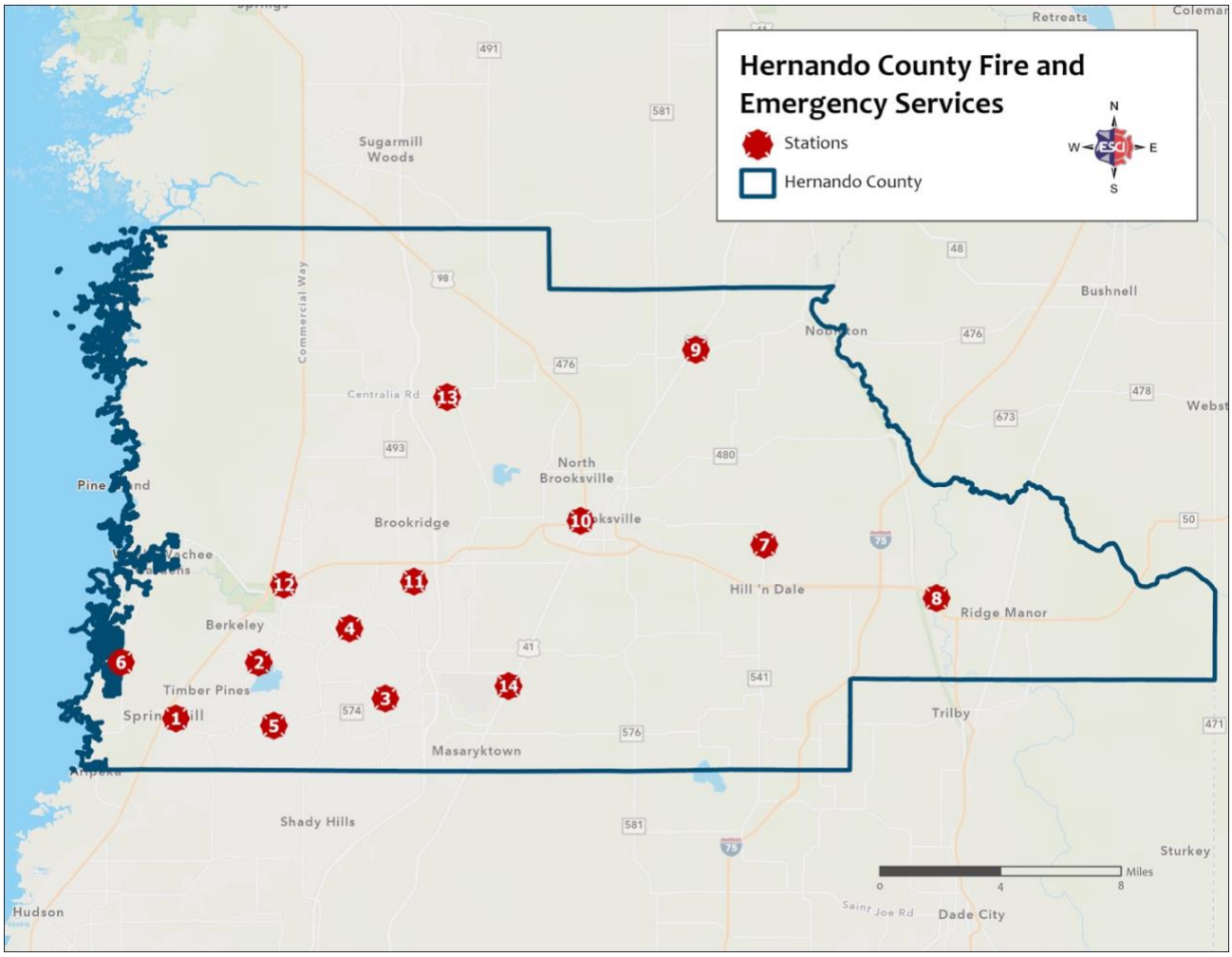
Figure 3: Hernando County Organizational Chart, 2022



Hernando County Fire & Emergency Services

Hernando County Fire and Emergency Services (HCFES) is an all-hazards fire department that provides fire, rescue, EMS, technical rescue, and hazardous materials response to the citizens and visitors of Hernando County from 14 fire stations. HCFES utilizes the City of Brooksville Fire Department Station 61 as Fire Station 10. This station is owned by the City of Brooksville and HCFES deploys units from that station. The following figure shows the locations of the 14 fire stations within the HCFES system.

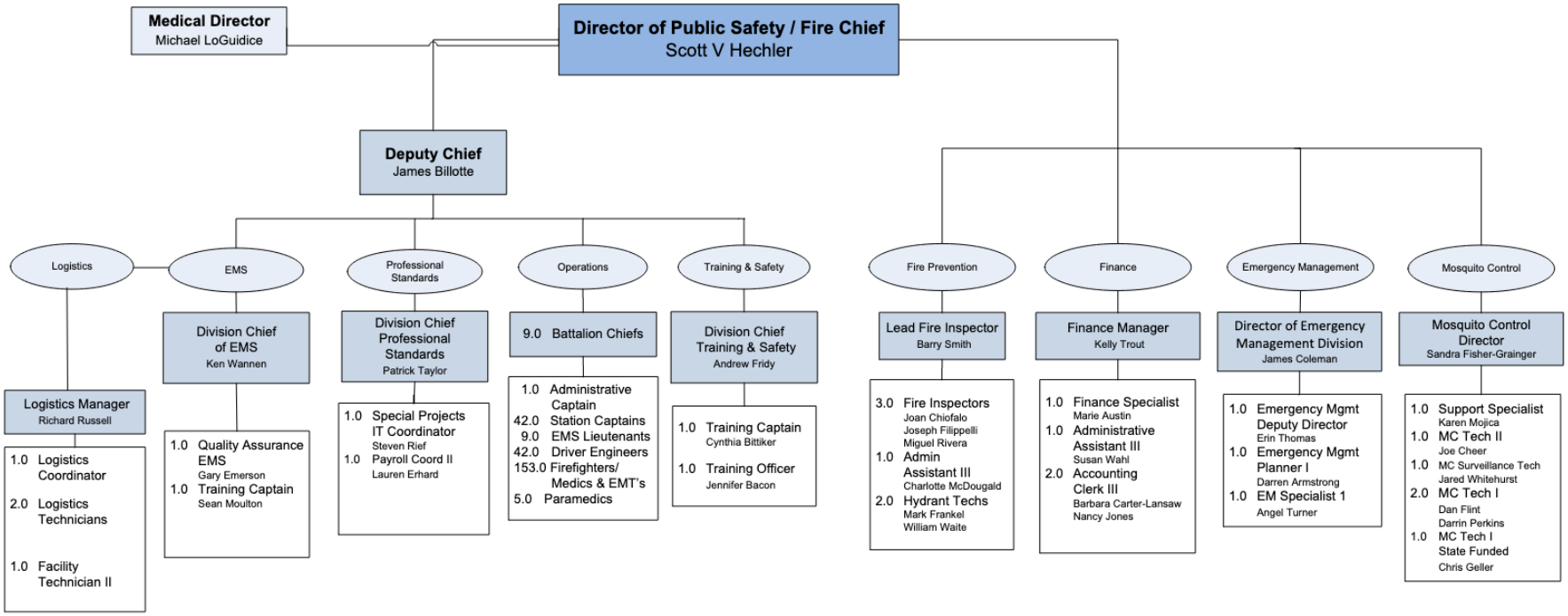
Figure 4: HCFES Fire Station Locations



Organizational Structure

Hernando County Fire and Emergency Services (HCFES) is led by a fire chief, who also holds the title of Director of Public Safety. The following figure shows the organizational structure of HCFES.

Figure 5: HCFES Organizational Chart, 2022



HCFES Organization Overview

Although the purpose of this study is to focus on fire station location decisions, it is important to discuss the staffing of HCFES. Staffing of a fire department can often be divided into two types of personnel - line personnel and staff personnel. Line personnel are often known as operational personnel because they are involved directly with providing emergency services to the community. Line personnel are those working in the fire stations responding to incidents. Staff personnel are those members that provide services to the line personnel such as management, administration, logistics, and training.

Efficient and effective staff personnel are critical to the success of a fire department. In the following figure, ESCI calculated the number of staff personnel within HCFES. Personnel assigned to fire prevention, emergency management, and mosquito control were not included as staff personnel because they have their own unique duties. Their duties are closer to that of line personnel as they serve the public directly rather than providing support services to other personnel.

Figure 6: HCFES Staff Personnel (Administrative)

Position/Rank	No. of Positions
Fire Chief	1
Deputy Chief	1
Division Chief	3
Quality Assurance EMS	1
Training Captain	2
Logistics Manger	1
Special Projects IT Coordinator	1
Payroll Coordinator II	1
Logistics Coordinator	1
Logistics Technicians	2
Facility Technician II	1
Training Officer	1
Finance Manager	1
Finance Specialist	1
Administrative Assistant III	1
Accounting Clerk III	2
Total	**21**

The following figure shows the type and number of line personnel within HCFES.

Figure 7: HCFES Line Personnel (Operational)

Position/Rank	No. of Positions
Battalion Chief	9
Station Captain	42
EMS Lieutenant	9
Driver Engineer	42
Firefighters	153
Paramedics	5
Total	**260**

It is ESCI's experience that typical effective staff (administrative) personnel for a paid fire department ranges from 10 to 15% of the agency's total line (operational) personnel. HCFES is below this at 8%. ESCI recommends that HCFES consider adding additional staff personnel to the department, especially as the Department plans to add fire stations in the future. Additional fire stations will increase the number of line personnel, which will further decrease the staff to line personnel ratio.

ESCI also analyzed the span of control for each leadership role within HCFES. Span of control is defined as the total number of direct subordinates that a manager can control or manage. In the fire service recommended span of control ranges from 1:3 to 1:7. The following figure shows the number of subordinates each leadership position within HCFES directly supervises.

Figure 8: Span of Control

Position/Rank	No. of Subordinates
Fire Chief	5
Deputy Chief	12
Division Chief of EMS	3
Division Chief of Profession Standards	2
Division Chief Training & Safety	2
Battalion Chiefs (per shift per battalion)	5 to 6
Captains (per shift)	2 to 6

ESCI recommends adding a Division Chief of Operations to lessen the direct subordinates of the Deputy Chief based on the Deputy Chief's 1 to 12 span of control. Furthermore, the Deputy Chief is also responsible for filling in for the Fire Chief in his/her absence which adds additional responsibilities to an already busy workload.

CURRENT FACILITIES & APPARATUS

The most essential equipment that are classified as capital assets for use in emergency services are facilities and apparatus (response vehicles). No matter how many highly trained firefighters are available, if they do not have access to reliable, safe, and effective equipment, their ability to mitigate emergencies rapidly and effectively will be compromised. The most essential equipment that are classified as capital assets for use in emergency services are facilities and apparatus (response vehicles). The following section is an assessment of HCFES's current fire stations and apparatus.

Fire Stations

HCFES operates from 14 fire stations located throughout the County. With the expectation of Station 10, all stations are solely operated by HCFES. Station 10 is owned by the City of Brooksville and is known as Station 61 to the City of Brooksville. Through a partnership with the City of Brooksville, HCFES deploys one medic unit and one cross staffed tender from this station.

Fire stations play an integral role in the delivery of emergency services for several reasons. A station's location will dictate, to a large degree, response times to emergencies. A poorly located station can mean the difference between confining a fire to a single room of origin and losing the structure. Fire stations also need to be designed to adequately house equipment and apparatus, as well as meet the needs of the organization and its personnel. It is important to research needs based on service demand, response times, types of emergencies, and projected population growth before making a station placement commitment.

Consideration should be given to a fire station's ability to support the Department's mission as it exists currently and into the future. The activities that take place within a fire station should be closely examined to ensure the structure is adequate in both size and function:

- Isolation of potentially hazardous substances from living areas
- The housing and cleaning of apparatus and equipment, including decontamination and disposal of biohazards
- Residential living space and sleeping quarters for on-duty personnel (all genders)
- Kitchen facilities, appliances, and storage
- Bathrooms and showers (all genders)
- Administrative and management offices; computer stations and office facilities for personnel
- Training, classroom, and library areas
- Firefighter fitness area
- Public meeting space

Appropriately designed, maintained, and properly located facilities are critical to a fire department's ability to provide services in a timely manner. ESCI evaluated the 14 fire stations within the HCFES system. An overall rating was assigned to each fire station using the criteria in the following figure.

Figure 9: Criteria Utilized to Determine Fire Station Condition

Excellent	Like new condition. No visible structural defects. The facility is clean and well maintained. The interior layout is conducive to function with no unnecessary impediments to the apparatus bays or offices. No significant defect history. Building design and construction match the building's purposes. Age is typically less than 10 years.
Good	The exterior has a good appearance with minor or no defects. Clean lines, good workflow design, and only minor wear of the building interior. Roof and apparatus apron are in good working order, absent any significant full-thickness cracks or crumbling of apron surface or visible roof patches or leaks. Building design and construction match the building's purposes. Age is typically less than 20 years.
Fair	The building appears to be structurally sound with a weathered appearance and minor non-structural defects. The interior condition shows normal wear and tear but flows effectively to the apparatus bay or offices. Mechanical systems are in working order. Building design and construction may not match the building's purposes well. Showing increasing age-related maintenance, but with no critical defects. Age is typically 30 years or more.
Marginal	The building appears to be structurally sound with a weathered appearance and moderate non-structural defects. Full-thickness cracks and crumbling of concrete on the apron may exist. The roof has evidence of leaking and/or multiple repairs. The interior is poorly maintained or showing signs of deterioration with moderate non-structural defects. Problematic age-related maintenance and/or defects are evident. May not be well suited to its intended purpose. Age is typically greater than 40 years.
Poor	The building appears to be cosmetically weathered and worn with potentially structural defects, although not imminently dangerous or unsafe. Large, multiple full-thickness cracks and crumbling of concrete on the apron may exist. The roof has evidence of leaking and/or multiple repairs. The interior is poorly maintained or showing signs of advanced deterioration with moderate to significant non-structural defects. Problematic age-related maintenance and/or major defects are evident. May not be well suited to its intended purpose. Age is typically greater than 50 years.

ESCI toured each of the HCFES fire stations. These visits combined with the information provided, produced the observations listed in the following figures.

Figure 10: HCFES Fire Station 1

Address/Physical Location:	1479 Parker Avenue, Spring Hill, FL 34606

General Description:
Station 1 was built in 1994 and currently houses Engine 1 and Medic 1. The daily minimum staffing for Station 1 is 5 personnel. The general condition of Station 1 is good.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	1994			
Hurricane Protection	Yes			
Auxiliary Power	Yes – 80 kW Emergency Generator			
General Condition	Good			
Number of Apparatus Bays	2	Drive-through bays		
Special Considerations	Non-ADA Compliant			
Square Footage	5,230			
Facilities Available				
Separate Rooms/Dormitory/Other	2	Bedrooms	5	Beds
Maximum Station Staffing Capability	6	Normal	12	Emergency Ops
Exercise/Workout Facilities	No			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	No			
Washer/Dryer	Yes	Station Wear/Linen	No	PPE
Safety & Security				
Sprinklers	Yes			
Smoke Detection	Yes			
Decontamination Area	No			
Security	Yes – Key lock doors			
Apparatus Exhaust System	Yes			

Figure 11: HCFES Fire Station 2

Address/Physical Location:	3445 Bob Hartung Court, Spring Hill, FL 34606

General Description:
Station 2 was built in 1976 and currently houses Engine 2, Ladder 2, Medic 2, and Squad 2. The daily minimum staffing for Station 2 is 8 personnel. The general condition of Station 2 is marginal. Station 2 is scheduled to be demolished and rebuilt starting in 2022.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	1976			
Hurricane Protection	No			
Auxiliary Power	Yes			
General Condition	Marginal			
Number of Apparatus Bays	2	Drive-through bays	2	Back-in bays
Special Considerations	Non-ADA Compliant			
Square Footage	5,850			
Facilities Available				
Separate Rooms/Dormitory/Other	2	Bedrooms	9	Beds
Maximum Station Staffing Capability	8	Normal	9	Emergency Ops
Exercise/Workout Facilities	No			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	No			
Shower Facilities	Yes			
Training/Meeting Rooms	No			
Washer/Dryer	Yes	Station Wear/Linen	Yes	PPE
Safety & Security				
Sprinklers	Yes			
Smoke Detection	Yes			
Decontamination Area	No			
Security	No			
Apparatus Exhaust System	No			

Figure 12: HCFES Fire Station 3

Address/Physical Location:	13240 Spring Hill Drive, Spring Hill, FL 34606

General Description:
Station 3 was built in 2007 and currently houses Engine 3, Medic 3, and HazMat 3. The daily minimum staffing for Station 3 is 5 personnel. The general condition of Station 3 is good.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	2007			
Hurricane Protection	Yes – Impact rated apparatus bay doors			
Auxiliary Power	Yes			
General Condition	Good			
Number of Apparatus Bays	3	Drive-through bays		
Special Considerations	ADA Compliant			
Square Footage	6,882			
Facilities Available				
Separate Rooms/Dormitory/Other	8	Bedrooms	8	Beds
Maximum Station Staffing Capability	5	Normal	10	Emergency Ops
Exercise/Workout Facilities	Yes			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	No			
Washer/Dryer	Yes	Station Wear/Linen	No	PPE
Safety & Security				
Sprinklers	Yes			
Smoke Detection	Yes			
Decontamination Area	No			
Security	Yes – Key lock doors			
Apparatus Exhaust System	No			

Figure 13: HCFES Fire Station 4

Address/Physical Location:	5083 Mariner Boulevard, Spring Hill, FL 34608

General Description:
Station 4 was built in 1991 and remodeled in 2019. It currently houses Engine 4, Medic 4, and Medic 204. The daily minimum staffing for Station 4 is 7 personnel. The general condition of Station 4 is good.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	1991, Remodel in 2019			
Hurricane Protection	Yes – Impact screens for windows			
Auxiliary Power	Yes			
General Condition	Good			
Number of Apparatus Bays	2	Drive-through bays		
Special Considerations	N/A			
Square Footage	5,628			
Facilities Available				
Separate Rooms/Dormitory/Other	2	Bedrooms	8	Beds
Maximum Station Staffing Capability	7	Normal	10	Emergency Ops
Exercise/Workout Facilities	Yes			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	No			
Washer/Dryer	Yes	Station Wear/Linen	No	PPE
Safety & Security				
Sprinklers	No			
Smoke Detection	Yes			
Decontamination Area	No			
Security	Yes – Key lock doors			
Apparatus Exhaust System	No			

Figure 14: HCFES Fire Station 5

Address/Physical Location: 1922 Spring Hill Drive, Spring Hill, FL 34608

General Description:
Station 5 was currently being built at the time of this study with a completion date in 2022. Station 5 will house Engine 5, Medic 5, Air Truck 5, and Battalion Chief 1. Ladder 2 will be moved to Station 5. The daily minimum staffing will be 9.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	2022			
Hurricane Protection	Yes			
Auxiliary Power	Yes			
General Condition	Excellent			
Number of Apparatus Bays	4	Drive-through bays		
Special Considerations	ADA Compliant			
Square Footage	11,588			
Facilities Available				
Separate Rooms/Dormitory/Other	12	Bedrooms	22	Beds
Maximum Station Staffing Capability	12	Normal	22	Emergency Ops
Exercise/Workout Facilities	Yes			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	Yes			
Washer/Dryer	Yes	Station Wear/Linen	Yes	PPE
Safety & Security				
Sprinklers	Yes			
Smoke Detection	Yes			
Decontamination Area	Yes			
Security	Yes – Key lock doors			
Apparatus Exhaust System	Yes			

Figure 15: HCFES Fire Station 6

Address/Physical Location:	3451 Shoal Line Boulevard, Hernando Beach, FL 34607

General Description:
Station 6 was currently being built at the time of this study with a completion date in 2022. Station 6 will house Engine 6, Brush 6, and Marine 6. The daily minimum staffing is 3 personnel.

Structure				
Construction Type	Wood Frame Structure			
Date of Construction	2022			
Hurricane Protection	Yes – Impact windows and doors			
Auxiliary Power	Yes			
General Condition	Excellent			
Number of Apparatus Bays	2	Drive-through bays		
Special Considerations	ADA Compliant			
Square Footage	3,246			
Facilities Available				
Separate Rooms/Dormitory/Other	8	Bedrooms	8	Beds
Maximum Station Staffing Capability	3	Normal	8	Emergency Ops
Exercise/Workout Facilities	Yes			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	No			
Washer/Dryer	Yes	Station Wear/Linen	Yes	PPE
Safety & Security				
Sprinklers	Yes			
Smoke Detection	Yes			
Decontamination Area	Yes			
Security	Yes – Key lock doors			
Apparatus Exhaust System	Yes			

Figure 16: HCFES Fire Station 7

Address/Physical Location:	26671 Mondon Hill Road, Brooksville, FL 34601

General Description:
Station 7 was built in 1993 and currently houses Engine 7, Medic 7, Battalion Chief 3, Brush 7, and Hazmat 7. The daily minimum staffing for Station 7 is 6 personnel. The general condition of Station 7 is fair.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	1993			
Hurricane Protection	No			
Auxiliary Power	Yes			
General Condition	Fair			
Number of Apparatus Bays	3	Drive-through bays		
Special Considerations	N/A			
Square Footage	5,869			
Facilities Available				
Separate Rooms/Dormitory/Other	3	Bedrooms	7	Beds
Maximum Station Staffing Capability	6	Normal	7	Emergency Ops
Exercise/Workout Facilities	No			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	No			
Washer/Dryer	Yes	Station Wear/Linen	Yes	PPE
Safety & Security				
Sprinklers	No			
Smoke Detection	Yes			
Decontamination Area	No			
Security	Yes – Key lock doors			
Apparatus Exhaust System	No			

Figure 17: HCFES Fire Station 8

Address/Physical Location:	32409 Cortez Boulevard, Ridge Manor, FL 33523

General Description:
Station 8 was built in 1997 and currently houses Engine 8, Medic 8, Tender 8, and Brush 8. The daily minimum staffing for Station 8 is 5 personnel. The general condition of Station 8 is fair.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	1997			
Hurricane Protection	No			
Auxiliary Power	Yes			
General Condition	Fair			
Number of Apparatus Bays	2	Drive-through bays		
Special Considerations	ADA Bathroom			
Square Footage	4,887			
Facilities Available				
Separate Rooms/Dormitory/Other	3	Bedrooms	6	Beds
Maximum Station Staffing Capability	6	Normal	10	Emergency Ops
Exercise/Workout Facilities	No			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	No			
Washer/Dryer	Yes	Station Wear/Linen	No	PPE
Safety & Security				
Sprinklers	No			
Smoke Detection	Yes			
Decontamination Area	Yes			
Security	Yes – Key lock doors			
Apparatus Exhaust System	No			

Figure 18: HCFES Fire Station 9

Address/Physical Location:	24064 Lake Lindsey Road, Brooksville, FL 34601

General Description:
Station 9 was built in 2004 and currently houses Engine 9 and Brush 9. The daily minimum staffing for Station 9 is 3 personnel. The general condition of Station 9 is fair.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	2004			
Hurricane Protection	No			
Auxiliary Power	Yes			
General Condition	Fair			
Number of Apparatus Bays	2	Back-in bays		
Special Considerations	N/A			
Square Footage	3,444			
Facilities Available				
Separate Rooms/Dormitory/Other	2	Bedrooms	4	Beds
Maximum Station Staffing Capability	4	Normal	6	Emergency Ops
Exercise/Workout Facilities	Yes			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	No			
Washer/Dryer	Yes	Station Wear/Linen	No	PPE
Safety & Security				
Sprinklers	No			
Smoke Detection	Yes			
Decontamination Area	No			
Security	Yes – Key lock doors			
Apparatus Exhaust System	No			

Figure 19: HCFES Fire Station 10

Address/Physical Location:	85 Veterans Avenue, Brooksville, FL 34601

General Description:
Station 10 is the City of Brooksville Fire Station 61. HCFES houses currently houses Medic 10, Tender 10, and spare Medic 210 at Station 10. The daily minimum staffing for HCFES personnel at Station 10 is 2 personnel. The general condition of Station 10 is good.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	1981 with a remodel in 1998			
Hurricane Protection	No			
Auxiliary Power	Yes			
General Condition	Good			
Number of Apparatus Bays	2	Drive-through bays	4	Back-in bays
Special Considerations	N/A			
Square Footage	7,158			
Facilities Available				
Separate Rooms/Dormitory/Other	4	Bedrooms	13	Beds
HCFES Staffing Capability	2	Normal	5	Emergency Ops
Exercise/Workout Facilities	Yes			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	Yes			
Washer/Dryer	Yes	Station Wear/Linen	Yes	PPE
Safety & Security				
Sprinklers	No			
Smoke Detection	Yes			
Decontamination Area	No			
Security	Yes – Key lock doors			
Apparatus Exhaust System	No			

Figure 20: HCFES Fire Station 11

Address/Physical Location:	6388 Barclay Avenue, Brooksville, FL 34613

General Description:
Station 11 was built in 1997 and currently houses Engine 11, Medic 11, Battalion Chief 2, Air Truck 2, and spare Medic 211. The daily minimum staffing for Station 11 is 6 personnel. The general condition of Station 11 is good.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	1997			
Hurricane Protection	Yes – Electric storm shutters on exterior windows			
Auxiliary Power	Yes			
General Condition	Good			
Number of Apparatus Bays	3	Drive-through bays		
Special Considerations	N/A			
Square Footage	5,869			
Facilities Available				
Separate Rooms/Dormitory/Other	3	Bedrooms	7	Beds
Maximum Station Staffing Capability	6	Normal	7	Emergency Ops
Exercise/Workout Facilities	No			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	No			
Washer/Dryer	Yes	Station Wear/Linen	Yes	PPE
Safety & Security				
Sprinklers	No			
Smoke Detection	Yes			
Decontamination Area	Yes			
Security	Yes – Key lock doors			
Apparatus Exhaust System	No			

Figure 21: HCFES Fire Station 12

Address/Physical Location:	6335 Ovenbird Road, Brooksville, FL 34613

General Description:
Station 12 was built in 1991 and currently houses Engine 12, Medic 12, Brush 13, and Tender 12. The daily minimum staffing for Station 12 is 5 personnel. The general condition of Station 12 is fair.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	1991			
Hurricane Protection	Yes – Bay door protection nets and window cases			
Auxiliary Power	Yes			
General Condition	Fair			
Number of Apparatus Bays	2	Drive-through bays		
Special Considerations	ADA ramp, bathroom, and parking			
Square Footage	4,652			
Facilities Available				
Separate Rooms/Dormitory/Other	3	Bedrooms	6	Beds
Maximum Station Staffing Capability	6	Normal	15	Emergency Ops
Exercise/Workout Facilities	Yes			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	No			
Washer/Dryer	Yes	Station Wear/Linen	Yes	PPE
Safety & Security				
Sprinklers	No			
Smoke Detection	Yes			
Decontamination Area	No			
Security	Yes – Key lock doors			
Apparatus Exhaust System	Yes			

Figure 22: HCFES Fire Station 13

Address/Physical Location:	15470 Centralia Road, Brooksville, FL 34614

General Description:
Station 13 was built in 1991 and currently houses Engine 13, Brush 13, and spare Engine 213. The daily minimum staffing for Station 13 is 3 personnel. The general condition of Station 13 is good.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	1991			
Hurricane Protection	No			
Auxiliary Power	Yes			
General Condition	Good			
Number of Apparatus Bays	2	Drive-through bays		
Special Considerations	N/A			
Square Footage	4,652			
Facilities Available				
Separate Rooms/Dormitory/Other	2	Bedrooms	3	Beds
Maximum Station Staffing Capability	3	Normal	6	Emergency Ops
Exercise/Workout Facilities	No			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	No			
Washer/Dryer	Yes	Station Wear/Linen	No	PPE
Safety & Security				
Sprinklers	No			
Smoke Detection	Yes			
Decontamination Area	No			
Security	Yes – Key lock doors			
Apparatus Exhaust System	No			

Figure 23: HCFES Fire Station 14

Address/Physical Location:	3001 Broad Street, Brooksville, FL 34604

General Description:
Station 14 was built in 1998 and currently houses Engine 14, Brush 14, Medic 14, ARFF 14, and spare Engine 214. The daily minimum staffing for Station 14 is 5 personnel. The general condition of Station 14 is good.

Structure				
Construction Type	Concrete Block Structure			
Date of Construction	1997			
Hurricane Protection	Yes – Storm Shutters			
Auxiliary Power	Yes			
General Condition	Good			
Number of Apparatus Bays	2	Drive-through bays		
Special Considerations	N/A			
Square Footage	4,887			
Facilities Available				
Separate Rooms/Dormitory/Other	2	Bedrooms	4	Beds
Maximum Station Staffing Capability	5	Normal	7	Emergency Ops
Exercise/Workout Facilities	No			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	No			
Washer/Dryer	Yes	Station Wear/Linen	Yes	PPE
Safety & Security				
Sprinklers	No			
Smoke Detection	Yes			
Decontamination Area	No			
Security	Yes – Key lock doors and security fence in rear			
Apparatus Exhaust System	No			

Fire Station Discussion

After touring and analyzing HCFES stations, the general condition of most of the stations were either fair or good. HCFES has done an excellent job with the upkeep of the stations and has worked to provide members with basic needs such as appliances, station furniture, and workout equipment. The following figure summarizes the condition of the HCFES stations.

Figure 24: Summary of the HCFES Fire Stations

HCFES Station	Age[1]	Rated Condition[2]	Daily Minimum Staffing[3]
Fire Station 1	28 Years	Good	5
Fire Station 2	46 Years	Marginal	8
Fire Station 3	15 Years	Good	5
Fire Station 4	3 Years[4]	Good	7
Fire Station 5	0 Years	Excellent	9
Fire Station 6	0 Years	Excellent	3
Fire Station 7	29 Years	Fair	6
Fire Station 8	25 Years	Fair	5
Fire Station 9	18 Years	Fair	3
Fire Station 10	24 Years[5]	Good	2
Fire Station 11	25 Years	Good	6
Fire Station 12	31 Years	Fair	5
Fire Station 13	31 Years	Good	3
Fire Station 14	25 Years	Good	5

[1] Age calculated from 2022
[2] Rated condition based on Figure 9
[3] HCFES personnel only
[4] Station 4 age based on remodel year
[5] Station 10 age based on remodel year

Even though most of the facilities are in good or fair condition, many of the stations do not meet the current or future demands of the Department and Hernando County. Many of the current facilities were built to only house two or three personnel. As shown in the previous figure, the minimum staffing in these facilities has since grown and as Hernando County continues to grow there is a likelihood that additional space will be needed for personnel and apparatus.

Personal space is an issue among most of the HCFES stations. Personal space includes separate sleeping areas, shower facilities, bathrooms, and changing areas. In almost all HCFES stations, crews

must sleep in common areas during their downtime at night. Even though this is common among many fire departments across the United States, it is not ideal for various reasons. Many departments are now designing fire stations with individual living quarters, as HCFES is doing with Stations 2, 5, and 6. Improved effective sleep is a major benefit of having individual living quarters. Firefighters work a 24-hour shift and the need for sleep to keep firefighters alert during their shift is paramount for them to be at their best when they respond to an emergency. Studies have shown that being awake for a period of 17 hours straight can impair cognitive abilities that are equivalent to a person with a blood alcohol level of 0.05 percent.[4] Individual living quarters limit sleep interruptions with proper alerting systems allowing members to only be alerted for responses for the specific unit they are assigned to during that shift. Other distractions that are found in common living quarters such as snoring and cell phones are eliminated with individual living quarters. Recent research has increased understanding of the importance of effective sleep hygiene environments relative to mental and physical health. Sleep deprivation has been linked to cardiovascular disease, cancer, Alzheimer's disease, and immune system malfunctions.[5] Ultimately, individual living quarters can help improve the ability of HCFES members to perform on emergency incidents and improve their long-term physical and mental health.

Another important reason for individual living quarters is that it provides privacy. As HCFES seeks to improve the number of women within the department, moving towards individual living quarters can help HCFES recruit and retain women firefighters to make them feel more comfortable in the workplace.[6] In an International Association of Women in Fire & Emergency Services survey, almost half of women reported that they had problems with privacy within a firehouse.[7] ESCI observed privacy issues in HCFES fire stations with common bunkrooms and limited bathroom space. ESCI did recognize that HCFES has attempted to create private areas in the common bunkrooms by using lockers to divide sleeping areas. Sharing sleeping facilities can be uncomfortable not just for women, but for all genders. Moving towards individual living quarters is the best option for HCFES and its members. A 2020 Civil Grand Jury of Santa Clara County, California report highlights the need for gender-separate accommodations in fire departments moving forward.[8]

The occupation of a firefighter is recognized as one where those working in the industry are more

[4] "EMS: Sleep-Deprived on the Job." https://www.firehouse.com/careers-education/article/12159596/ems-sleepdeprived-on-the-job

[5] "The Dangers of Sleep Deprivation - Firehouse." https://www.firehouse.com/safety-health/news/12268164/the-dangers-of-sleep-deprivation-for-emergency-workers

[6] "Breaking the 'brass ceiling': Women face unique obstacles in the fire service." https://www.firerescue1.com/leadership/articles/breaking-the-brass-ceiling-women-face-unique-obstacles-in-the-fire-service-am49Nem3qPWdEBWO/

[7] "Women in the Fire Service." https://www.powerdms.com/policy-learning-center/women-in-the-fire-service

[8] "Why Aren't There More Female Firefighters in Santa Clara County?" Civil Grand Jury of Santa Clara County. https://www.scscourt.org/court_divisions/civil/cgj/2020/Why%20Arent%20There%20More%20Female%20Firefighters%20in%20Santa%20Clara%20County.pdf

likely to be diagnosed with cancer than the general public. The danger for firefighters does not stop when the fire is extinguished but returns to the fire stations through their gear, equipment, and vehicles that were exposed and contaminated by smoke or other vapors. When contaminated gear and equipment are returned to the station via their respective response apparatus, the potential for cross-contamination occurs.

HCFES is working to protect its members from the risk of cancer. While many of the stations do not physically have apparatus exhaust systems installed within the fire stations, HCFES apparatus have the Ward Diesel No Smoke system installed. This is a filter system that is connected to the exhaust system of the vehicle to remove harmful gases from diesel exhaust.[9] HCFES is installing station exhaust systems in new firehouses as added protection for members. The International Agency for Research on Cancer rates diesel engine exhaust as a Group 1 carcinogen, which means it is known to cause cancer in humans.[10] ESCI commends HCFES for taking proper steps to reduce firefighters' exposure to diesel exhaust. HCFES is also moving to the "Clean Cab Concept" for new fire apparatus. The "Clean Cab Concept" limits cross-contamination and secondary exposure by keeping all contaminated gear and tools out of the cab.[11] Furthermore, HCFES is purchasing gear storage sheds for each fire station to keep turnout gear out of the firehouse when it is not in use, thus further reducing the chance of secondary exposure from off-gassing turnout gear. Additionally, new stations such as Station 2 and 5 are designed to have hot, warm, and cold zones to prevent carcinogens from entering the living areas of the station. HCFES meets all 11 recommended actions to mitigate the risk of cancer published in the "2021 Lavender Ribbon Report: Best Practices for Preventing Firefighter Cancer."[12]

The tones that alert firefighters of a response in the fire stations are another concern. Historically, fire departments have used a loud and quick tone to alert firefighters of the need to respond. This tone causes a tachycardic response in firefighters, which means it makes their heart rate spike. Studies have shown that ramp-up tones are better for the heart health of firefighters. Experts say ramp-up alerting could be an effective way to deal with fatigue, tachycardia, and potentially long-term physical and psychological disorders.[13] Ramp-up tones gradually increase the volume of alert tones. HCFES is installing ramp-up tones in the new fire stations - Stations 2, 5, and 6. However, this will require upgrades to computer-aided dispatch (CAD) systems to make these tones functional.

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[9] Ward Diesel. https://warddiesel.com/no-smoke-filter-systems

[10] Fire Station Design: Best Practices to Reduce Exposures. https://www.iaff.org/wp-content/uploads/FFCancer_FireStationDesign.pdf

[11] Clean Cab Concept. https://www.iaff.org/wp-content/uploads/FFCancer_CleanCab.pdf

[12] "Lavender Ribbon Report." https://www.iafc.org/docs/default-source/1vcos/iafc-lavender-ribbon-report-update.pdf

[13] "Ramp-up tones cut firefighter, paramedic rapid-heart response to station alarms." https://www.ems1.com/ems-products/fitness-mental-health-wellness/articles/ramp-up-tones-cut-firefighter-paramedic-rapid-heart-response-to-station-alarms-Z3C9s9Cbs4AuUUVC/

Fire Department Apparatus and Vehicles

Fire stations need to have apparatus assigned to the station for them to be functional to provide emergency services to the citizens and visitors of Hernando County. Although a detailed apparatus evaluation is outside of the scope of this study, ESCI has elected to provide a brief overview of HCFES's apparatus and vehicles to develop the recommendations and strategies presented later in this report.

ESCI and HCFES evaluated the condition of all HCFES's apparatus and vehicles. The condition listed is a baseline for HCFES to use and does not necessarily indicate a need for replacement. The criteria used is featured in the following figure.

Figure 25: Apparatus and Vehicle Evaluation Criteria

Evaluation Components	Points Assignment Criteria
Age:	One point for every year of chronological age, based on in-service date.
Miles/Hours:	One point for every 10,000 miles or 1,000 hours
Service:	1, 3, or 5 points are assigned based on service-type receives – routine preventive, minor, or major. The more severe the service, the higher the number of points.
Condition:	1, 3, or 5 points based on body condition, rust, interior condition, accident history, anticipated major repairs or upgrades, and similar items. The worse the condition, the higher number of points.
Reliability:	1, 3, or 5, points based on the frequency a vehicle is out of service for repair. The lower the reliability, the higher the number of points.

Point Ranges	Condition Rating	Condition Description
Under 18 points	Very Good	0-5 years of service; low mileage; no defects; and performing as intended
18–22 points	Good	6-10 years of service; moderate mileage; minor defects; and performing as intended
23–27 points	Fair	11-15 years of service; high mileage; moderate defects; and functioning, but worn
28 points or higher	Poor	16+ years of service; high mileage; minor or major defects; and not functioning as desired
28 points or higher plus a risk to safety and/or health	Critical	16+ years of service; high mileage; major defects; not functioning; risk to safety and/or health

As an example, ESCI took the current information for Engine 7 and applied the above criteria in this example. The following figure summarizes the evaluation.

Figure 26: Engine 7 Grading (Example)

Evaluation Components	Criteria	Points
Age	2020 (2 years)	2
Miles/Hours	30,000 miles	3
Service	1	1
Condition	1	1
Reliability	1	1
Points Total		**8**
Overall Condition		**Very Good**

HCFES operates various types of response vehicles to carry out the mission of the Department. The first type of response vehicles are command vehicles. Within command vehicles are the staff vehicles assigned to chief level officers. These officers are often subject to be called back to work after normal business hours due to a large-scale emergency incident. Battalion chief vehicles also fall under command vehicles. Battalion chiefs provide direction on multi-unit incidents in a command function with a primary task of ensuring incident mitigation, personnel safety, and accountability.

Figure 27: HCFES Command Vehicles

Apparatus	Manufacturer	Model	Year	Condition	Assigned to
Chief 1	Dodge	Charger	2019	Very Good	Fire Chief
Chief 2	Dodge	Charger	2019	Very Good	Deputy Fire Chief
Chief 3	Chevy	Tahoe 4 x 4	2015	Very Good	Division Chief
Chief 4	Chevy	Tahoe 4 x 4	2017	Very Good	Division Chief
Chief 5	Chevy	Tahoe 4x4	2015	Very Good	Division Chief
Battalion 1	Ford	F250 4 x 4	2017	Very Good	Battalion 1 – Station 5
Battalion 2	Ford	F250 4 x 4	2015	Good	Battalion 2 – Station 11
Battalion 3	Ford	F150 4 x 4	2022	Very Good	Battalion 3 – Station 7
Reserve Battalion	Ford	F250 4 x 4	2015	Good	Reserve

Suppression units are the second type of apparatus utilized by HCFES. Engines carry hose and water to suppress the fire. HCFES's engines carry 1,000 gallons of water. Ladder companies, also known as trucks or aerials, have a hydraulically operated aerial ladder that allows firefighters to reach high floors of buildings. Most ground ladders can't reach past the third floor of a building; therefore, ladder trucks will be needed to access higher floors. Additionally, the aerial ladder can be used as an elevated master stream for large building fires to flow large amounts of water to suppress the fire. Ladder trucks also carry specialized equipment for forcible entry, ventilation, search, and rescue. Both engines and ladder trucks within HCFES carry medical equipment to provide patient care. The following figure lists the frontline suppression units of HCFES.

Figure 28: HCFES Frontline Engines & Truck Fleet

Apparatus	Manufacturer	Model	Year	Condition
Engines				
Engine 1	E-One	Typhoon	2018	Very Good
Engine 2	E-One	Typhoon	2015	Very Good
Engine 3	Sutphen	Pumper	2020	Very Good
Engine 4	E-One	Typhoon	2015	Good
Engine 5	Pierce	Impel	2015	Good
Engine 6	Sutphen	Shield	2014	Very Good
Engine 7	Sutphen	Pumper	2020	Very Good
Engine 8	Pierce	Impel	2013	Good
Engine 9	E-One	Commercial	2018	Very Good
Engine 11	Pierce	Impel	2014	Fair
Engine 12	Sutphen	Pumper	2022	Very Good
Engine 13	Sutphen	Pumper	2021	Very Good
Engine 14	Pierce	Impel	2014	Good
Aerials/ Trucks				
Ladder 2	Pierce	Dash	2006	Fair

Medic units, also referred to as ambulances, provide medical and emergency hospital transport services to those in need. HCFES equips all medic units with Advance Life Support (ALS) personnel and equipment. The following figure lists the HCFES frontline medic units.

Figure 29: HCFES Frontline Medic Units

Apparatus	Manufacturer	Model	Year	Condition
Medic 1	Chevrolet	G4500	2020	Very Good
Medic 2	Chevrolet	G4500	2017	Good
Medic 3	Freightliner	M2106	2016	Poor
Medic 4	Chevrolet	G4500	2017	Very Good
Medic 5	Chevrolet	G4500	2017	Fair
Medic 7	Chevrolet	G4500	2017	Fair
Medic 8	Freightliner	M2106	2017	Poor
Medic 10	Chevrolet	G4500	2017	Good
Medic 11	Chevrolet	G4500	2017	Good
Medic 12	Freightliner	M2106	2016	Poor
Medic 14	Chevrolet	G4500	2020	Very Good
Medic 204	Freightliner	M2106	2017	Fair

HCFES has specialized risks that require the use of specialty apparatus. One type of specialty apparatus is tenders. Tenders are also referred to by many in the fire service profession as tankers. They bring a large amount of water to fires where hydrants are not available. For instance, Tender 12 carries 3,000 gallons of water. Hernando County has many areas without fire hydrants, as seen later in this report in Figure 63.

Brush trucks are especially necessary for areas that are prone to wildfires with access issues for fire engines. Brush trucks are smaller than fire engines and can navigate terrain better. As seen later in this report in Figure 89, Hernando County has many areas that are at risk of wildfires.

HCFES is expected to respond to and mitigate hazardous materials incidents. In order to be effective, HCFES needs apparatus to carry specialized equipment to deal with these types of incidents. HCFES has two hazmat units located strategically in the County – one on the East side and one on the West side.

Since Hernando County is home to the Brooksville-Tampa Bay Regional Airport, HCFES is responsible for aircraft rescue and firefighting (ARFF) duties. HCFES deploys an ARFF truck to handle potential emergencies involving aircraft.

HCFES recently placed a heavy rescue squad, Squad 2, in service in November 2021. This vehicle is designed to carry equipment that would be needed in specialized technical rescues such as high

angle, structural collapse, swift water, confined space, trench, and vehicle and machinery.

Another specialty apparatus used by HCFES is an air truck. During a fire, firefighters use air cylinders to allow them to breathe inside of a structure on fire. Larger fires will require the need for firefighters to use more than one air cylinder. An air truck carries extra cylinders and can refill cylinders on the scene of an incident.

The following chart displays the specialty fleet of HCFES.

Figure 30: HCFES Specialty Fleet

Apparatus	Manufacturer	Model	Year	Condition
Tanker/Tender				
Tender 8	Kenworth	T300	2003	Poor
Tender 10	International	4900 6X4	1997	Poor
Tender 12	Sutphen	114SD 6X4	2020	Very Good
Brush Trucks				
Brush 6	Ford	F550 4X4	2000	Poor
Brush 7	SFEV	F550 4X4	2020	Very Good
Brush 8	Ford	F550 4X4	2016	Very Good
Brush 9	Ford	F550 4X4	2004	Fair
Brush 11	Ford	F550 4X4	2002	Fair
Brush 12	SFEV	F550 4X4	2020	Very Good
Brush 13	Ford	F550 4X4	2002	Fair
Brush 14	Ford	F550 4X4	2000	Fair
Hazmat				
Hazmat 3	Ford	Blue Diamond	2011	Very Good
Hazmat 7	Ford	F750	2010	Very Good
Aircraft Rescue				
ARFF14	Oshkosh	Stricker	2019	Very Good
Heavy Rescue/Squad				
Squad 2	Pierce	Dash	2006	Good
Air Truck				
Air Truck 5	Pierce	Air Light	2020	Very Good

Apparatus and vehicles will often need routine and preventive maintenance to keep the unit at peak operational readiness. This maintenance will require the unit to be placed out of service (not available for emergency responses). In order to prevent a disruption to emergency services, HCFES maintains a reserve fleet of four engines and four medic units. This ratio is typical of most fire departments with having one reserve unit for every three to five frontline units. Reserve units can also be staffed by additional personnel for major events such as a natural disaster. ESCI observed that there is a lack of indoor storage space for some of the reserve units as they are kept outside. This could limit the service life of the unit with exposure to the outdoor elements.

Figure 31: HCFES Reserve Fleet

Apparatus	Manufacturer	Model	Year	Condition
Engines				
Engine 202	Pierce	Quantum	2003	Poor
Engine 206	Pierce	Quantum	2005	Poor
Engine 213	Ferrara	Intruder 2	2010	Poor
Engine 214	Pierce	Enforcer	2007	Poor
Medic Units				
Medic 206	Freightliner	M2106	2015	Poor
Medic 207	International	4300 SBA LP 4X2	2014	Poor
Medic 210	International	4300 SBA LP 4X2	2014	Poor
Medic 211	Freightliner	M2106	2015	Poor

SERVICE DELIVERY & PERFORMANCE

A vital function of an emergency services organization is the ability to deliver quick and quality service to the community that it serves. By understanding current service demands and performance, department leaders can better develop a plan for future service delivery. Data will show the time and location of where incidents most likely occur, the types and number of incidents HCFES responds to, and how HCFES response performance compares with national standards.

Service Delivery Analysis

The demand for services is the primary driver behind all emergency services organizations. The data will help HCFES leadership determine what type of resource levels are sufficient to meet the needs of the community. Especially in the case of this study, data will help determine where critical resources such as fire stations may be needed to best serve the public. Service demand analysis will also help HCFES determine when it is best to schedule non-emergency activities such as training, fire safety inspections, public education events, and vehicle maintenance to minimize service interruptions to the community.

Incident Type Analysis

The National Fire Incident Reporting System (NFIRS) has developed a classification system to assist fire departments in categorizing the types of incidents a department responds to. The following figure shows each of the nine major categories that NFIRS uses. The nine major categories are determined by the first number in the three-digit code. Within each category, incidents are then further subdivided using the final two digits of the incident code.

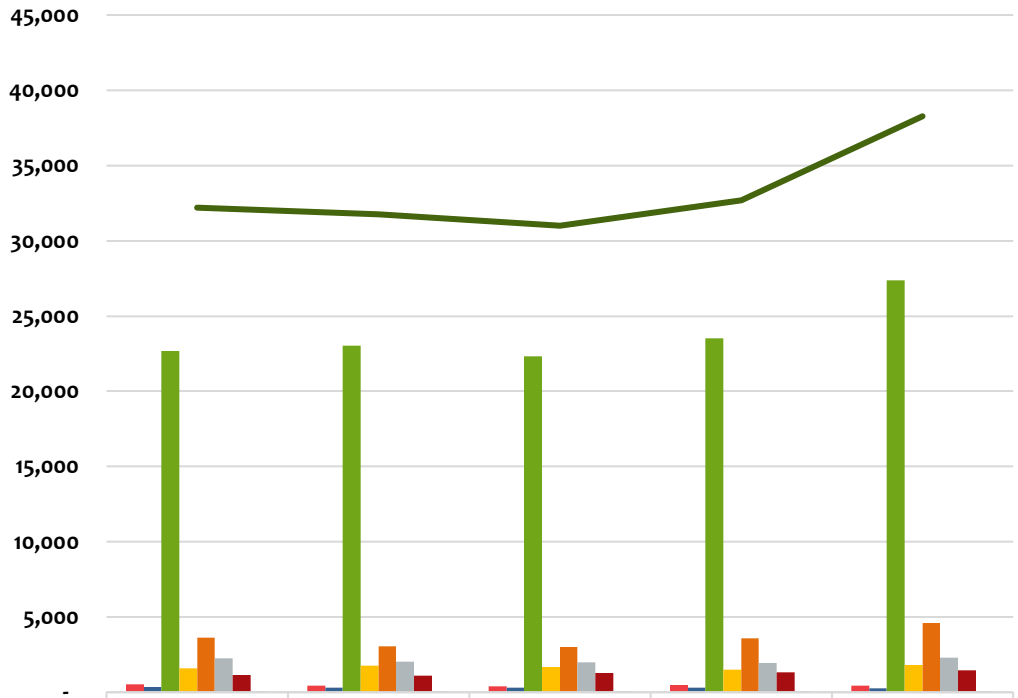
Figure 32: NFIRS Incident Types

Incident Series	Incident Heading
100-Series	Fires
200-Series	Overpressure Rupture, Explosion, Overheat (No Fire)
300-Series	Rescue and Emergency Medical Service (EMS) Incidents
400-Series	Hazardous Condition (No Fire)
500-Series	Service Call
600-Series	Cancelled, Good Intent
700-Series	False Alarm, False Call
800-Series	Severe Weather, Natural Disaster[1]
900-Series	Special Incident Type[1]

[1] Shown throughout this report as "Other" incident type

ESCI analyzed the data provided by HCFES to determine the types of incidents for service from 2017 to 2021, which is displayed in the following figure. Any incident that did not have a basic incident type code within the data provided was excluded.

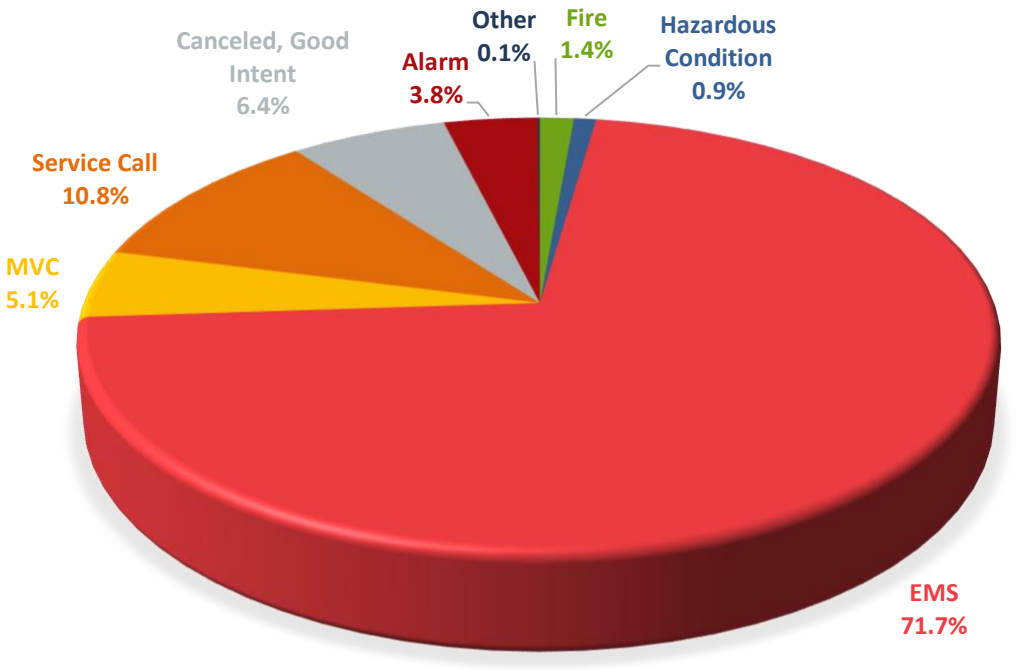
Figure 33: HCFES Annual Totals by NFRIS Incident Type, 2017-2021



	2017	2018	2019	2020	2021
Fire	525	445	401	481	429
Hazardous Condition	341	296	312	285	256
EMS	22,676	23,045	22,303	23,533	27,378
MVC	1,607	1,749	1,685	1,516	1,828
Service Call	3,628	3,047	3,012	3,567	4,589
Canceled, Good Intent	2,261	2,044	1,976	1,953	2,319
Alarm	1,138	1,106	1,284	1,320	1,447
Other	33	35	26	26	25
Total	32,209	31,767	30,999	32,681	38,271

The following figure illustrates the service demand for each type of incident over the five-year period. This chart allows HCFES to see which incident type is the greatest service demand for the department. As with most fire departments across the nation, EMS is the highest service demand accounting for 71.7% of the department's total demand for service. This is similar to national data which shows that 70% of fire department incidents are EMS.[14]

Figure 34: HCFES Service Demand by NFIRS Incident Type, 2017-2021



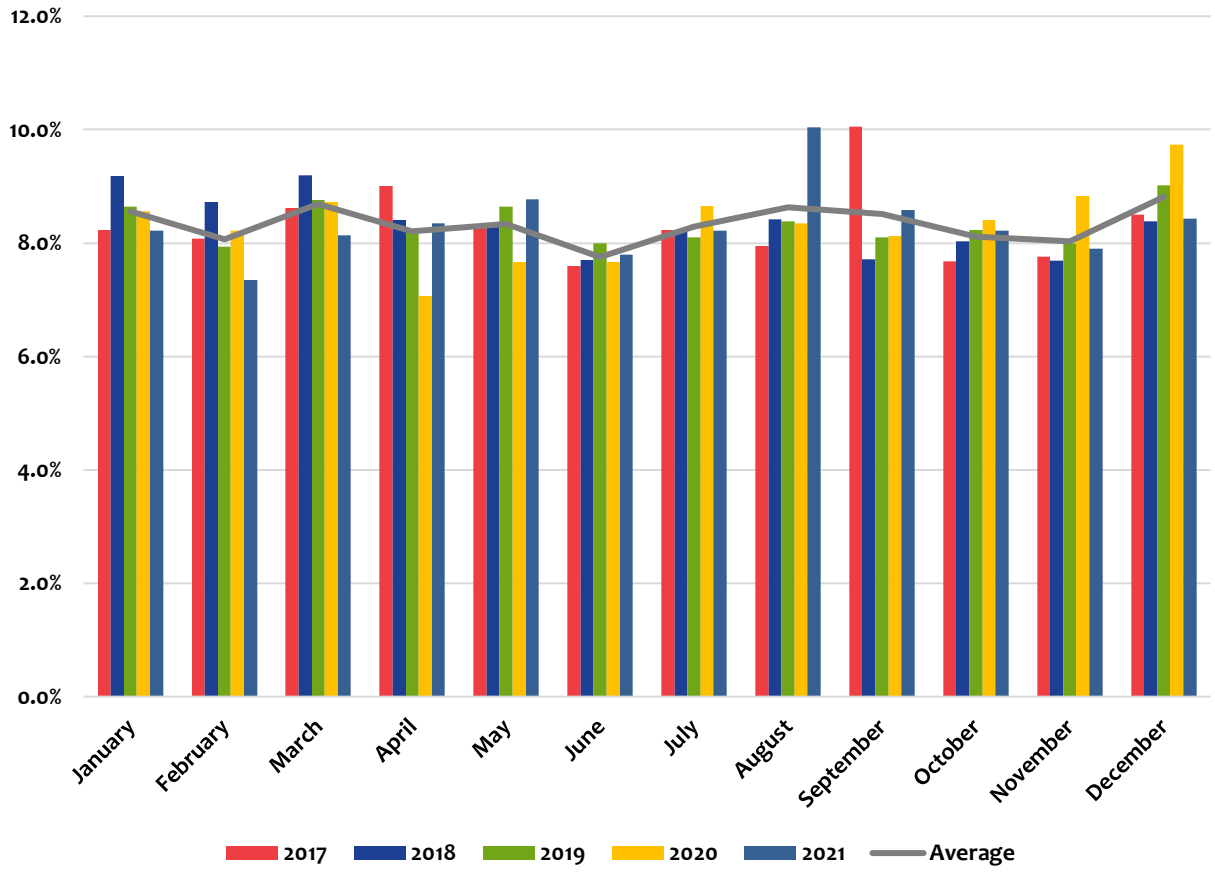
[14] "Fire Trends Report: Number of EMS calls vs. Fire Calls." https://www.eso.com/blog/ems-calls-vs-fire-calls/

Temporal Variation

Temporal variations analyze when incidents occur. This is an important facet of service demand because it allows HCFES leadership to make the best decisions based on training, equipment, and apparatus. Additionally, it allows leadership to make predictions on when to schedule non-emergency activities based on the lowest service demand. In this section, these patterns are displayed by month, day of the week, and hour to provide HCFES on changes in service demand based on historical patterns from 2017 to 2021 incident data.

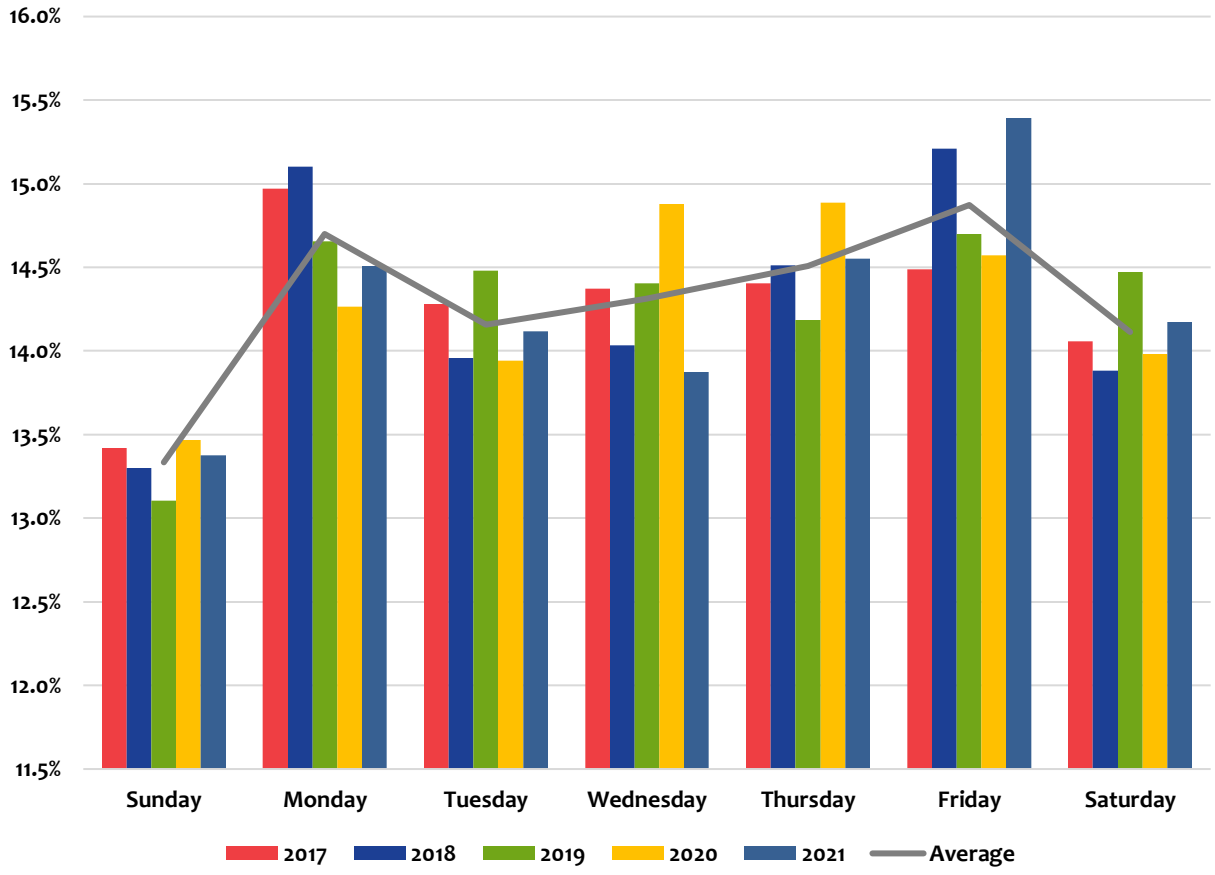
The first temporal variation analyzes service demand based on months of the year. As illustrated in the following figure, HCFES service demand average service demand is relatively consistent throughout the year, with June having the lowest level of average demand at 7.8% and December having the highest average demand at 8.8%. During the five-year period, September 2017 produced the highest service demand with 10.1% of the incidents that year. April 2020 produced the lowest service demand in the five-year period with 7.1% of incidents that year. This is commonly seen in fire departments across the country due to the early stages of the COVID-19 pandemic.

Figure 35: HCFES Service Demand by Month, 2017-2021



The second temporal variation analyzes service demand based on days of the week. As illustrated in the following figure, HCFES service demand is the lowest on Sunday with 13.3% of the incidents occurring. Then, there is a sharp increase to Monday at 14.7% which is followed by a decrease to Tuesday at 14.2%. Service demand begins to rise on Wednesday to peak on Friday at 14.9%. Since the lowest demand for service occurs on the weekend, this would be the best time to schedule non-emergency activities. If non-emergency activities must be scheduled for a weekday, Tuesdays would be best to limit service delivery interruptions.

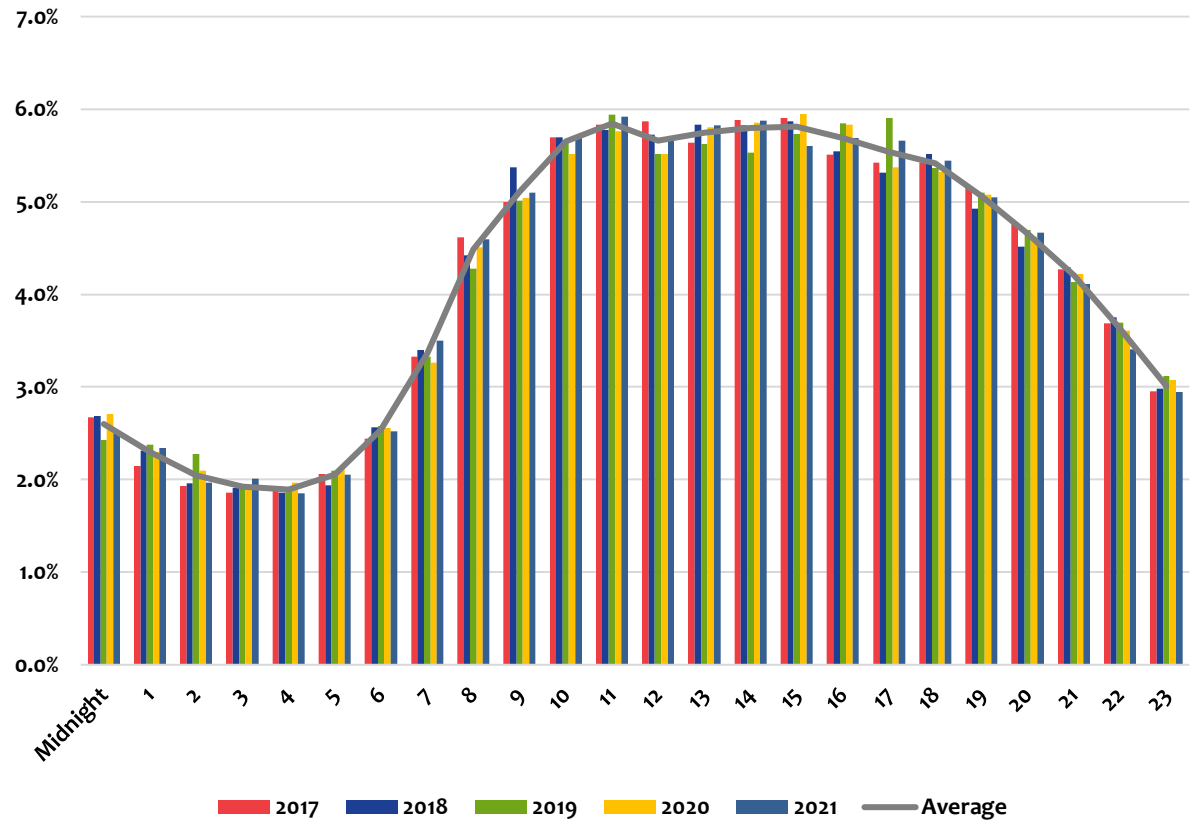
Figure 36: HCFES Service Demand by Day, 2017-2021



The final temporal variation analyzes service demand based on time of day. As illustrated in the following figure, HCFES service demand is lowest between the hours of 3:00 am and 4:00 am, with 1.9% of the total incidents occurring during this time. Starting at 5:00 am there is a steep incline through the morning hours. This steep incline coincides with the residents and visitors waking up, preparing for, and beginning to travel to their daily activities. Service demand levels out between 10:00 am and 5:00 pm, where it fluctuates between 5.7 and 5.8%. At 5:00 pm service demand begins to decrease through the evening and night.

Although this is the time of the lowest service demand, a national study analyzing data from 2014 to 2016 found that residential fatal fires were the highest between 1:00 am to 2:00 am and 4:00 am to 5:00 am. Additionally, the study found that 48% of residential fatal fires occurred in the 8-hour period of 11:00 pm to 7:00 am.[15]

Figure 37: HCFES Service Demand by Hour, 2017-2021



[15] Fatal Fires in Residential Buildings (2014-2016), Topical Fire Report Series Volume 19, Issue 1 /June 18, U.S. Department of Homeland Security, U.S. Fire Administration, National Fire Data Center.

Response Performance

From the perspective of the citizen, their judgment of the local fire department is often based on how quickly units arrive to assist when the citizen calls 911. ESCI relies on the standards identified in NFPA 1225 and 1710 to assess the response time performance for career fire departments.

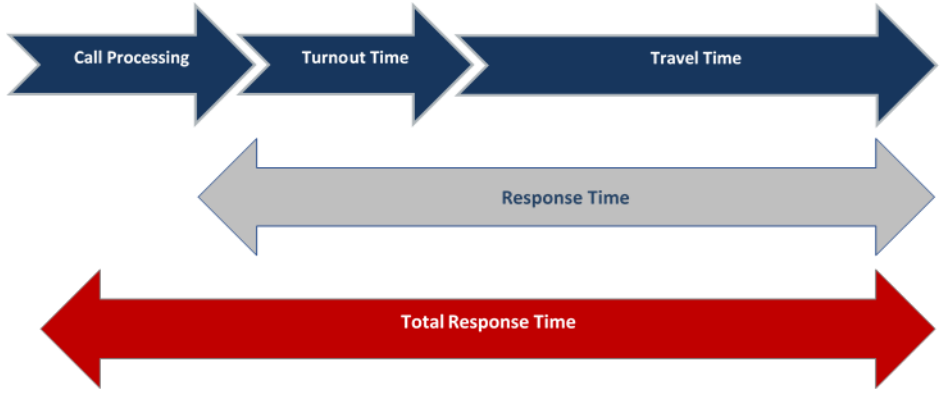
Response time performance is comprised of the following components:

- **Call Processing Time:** The amount of time between when a call is answered by the 911 Primary Public Safety Answering Point (PSAP) or dispatch center, and when resources are dispatched.
- **Turnout Time:** The time interval between when response units are notified of the incident and when the apparatus begins to respond.
- **Travel Time:** The time the responding unit spends on the road traveling to the incident until arrival at the scene. This is a function of speed and distance.
- **Response Time:** The time from initial alerting of an incident until arrival on the scene. Response Time equals the sum of "Turnout Time" and "Travel Time."
- **Total Response Time:** This is the most apparent time to the caller requesting emergency services, as the time from when the emergency call is placed until units arrive on the scene.

Tracking the individual components of response time can help HCFES identify impediments to timely response, and make operational adjustments to improve, including developing response time goals and standards that are both relevant and achievable. Fire service best practices recommend that fire service organizations monitor and report the components of Total Response Time.

The Total Response Time Continuum is comprised of the three elements described above—Call Processing, Turnout Time, and Travel Time. The components of the HCFES Response Time Continuum are evaluated in further detail in the next sections. The following figure is an illustration of the Total Response Time Continuum.

Figure 38: Total Response Time Continuum



Historically, fire departments have used the performance measurement of average response time to describe the levels of performance. The average is a commonly used descriptive statistic, also called the mean of a data set. Averages may not accurately reflect the performance for the entire data set because the average can be significantly skewed by data outliers, especially in small data sets. One extremely good or bad value can skew the "average" for the entire data set.

Percentile measurements are a better measure of performance since they show that most of the data set has achieved a particular level of performance. The 90th percentile means that 90% of responses were equal to or better than the performance identified, and that the other 10% can be attributed to data outliers, inaccurate data, or situations outside of normal operations that delayed performance. This can be compared to the desired performance objective to determine the degree of success in achieving the goal.

An important consideration when evaluating fractile performance is that the results of each category are not additive, meaning that the sum of two or more constituent metrics cannot be simply added together to find the sum. This is because each dataset is discrete and, as such, must be observed individually, particularly when data quality is an issue. If a metric, such as travel response time, possesses the majority of its data points, while turnout time is not accurately documented, a significant difference can exist between the response time calculated using the fractile descriptive and the sum of turnout time and travel time.

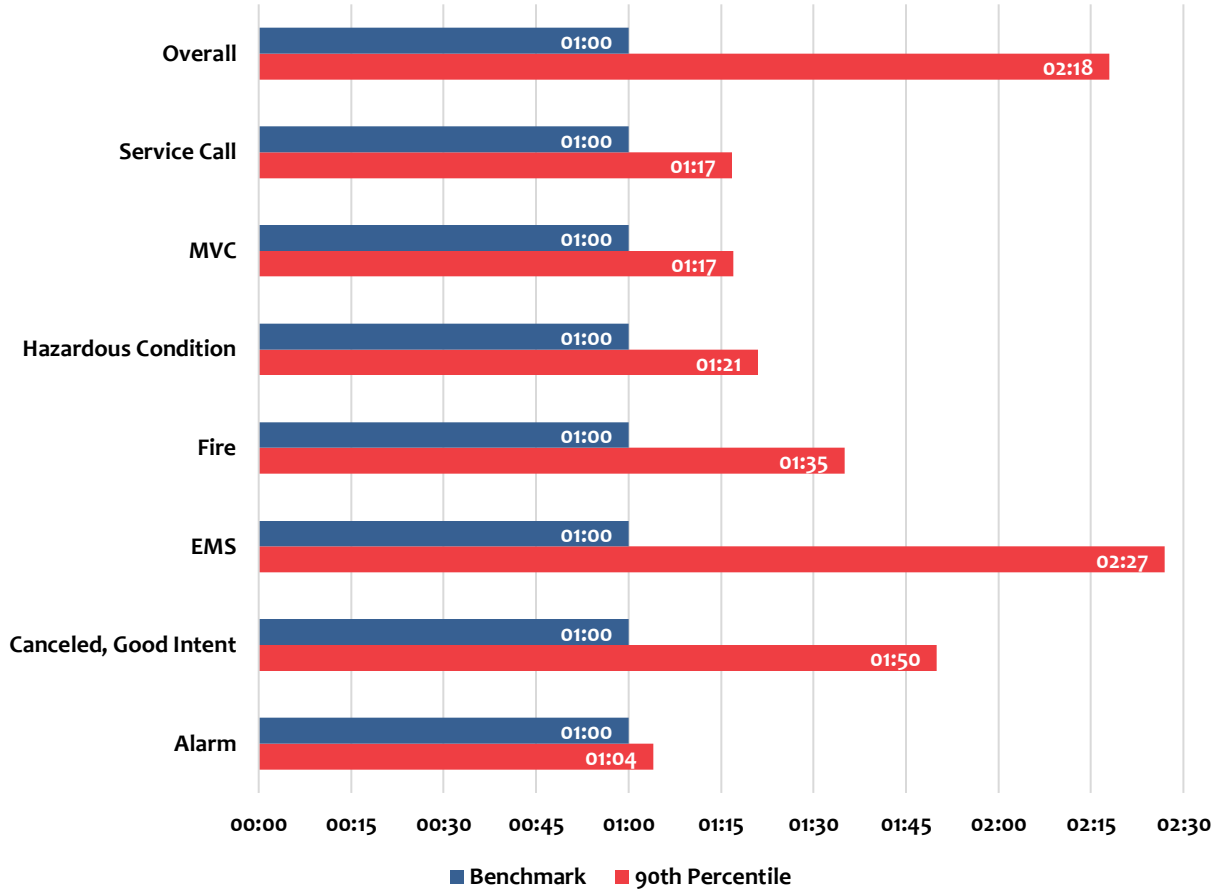
For the purpose of this analysis, ESCI analyzed each incident that HCFES responded to from January 1, 2017 to December 31, 2021. For each component, times were only used for the first arriving unit for each incident, even if multiple units were dispatched. Typically, only those incidents with an emergency response priority (lights and sirens) are utilized for the analysis. However, there was no accurate method to determine which were emergency responses from the data provided by HCFES to ESCI. ESCI did remove any call that was classified with the NFRIS type of "Other" as many times these types of incidents contained nonemergency incidents.

Call Processing Performance

The industry standard for call processing (or alarm handling) time is NFPA 1225: *Standard for Emergency Services Communication*. This standard recommends that communication centers have call processing times of not more than 60 seconds, 90% of the time.

The following figure shows that the HCFES call processing time for all incidents is more than double the NFPA standard with 2 minutes, 18 seconds. Looking at the call processing time for the various incident types, all times are above the expected standard. The range is 1 minutes, 4 seconds for alarm incidents to 2 minutes, 27 seconds for EMS incidents.

Figure 39: HCFES Call Processing, 2017 to 2021



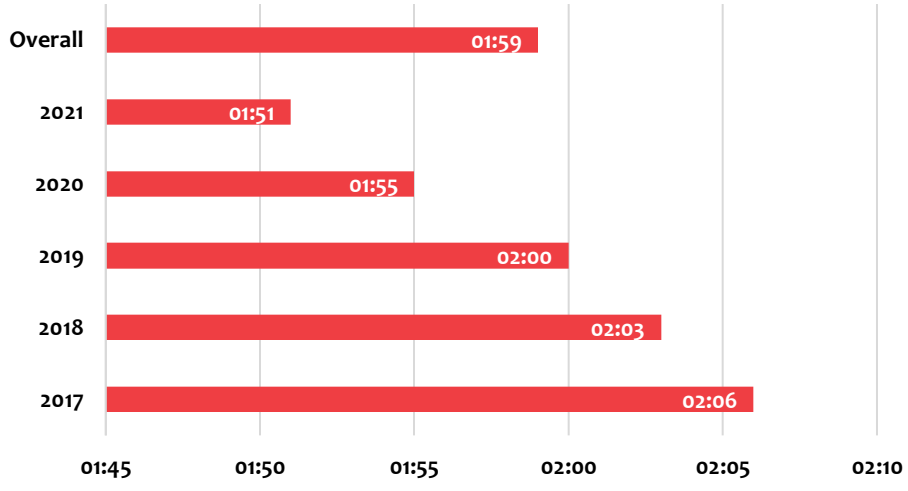
Turnout Performance

The second component of the Total Response Time Continuum, and one that is directly affected by response personnel, is turnout time performance. Turnout time is the time it takes personnel to receive the dispatch information, move to the appropriate apparatus, don necessary protective equipment, and begin responding to the incident. NFPA 1710 recommends a 90th percentile fractile turnout time of 80 seconds for fire or special operations incidents, and 60 seconds for all other incidents. The extra 20 seconds for fire or special operation incidents takes into consideration the time it takes personnel to don specific equipment for these types of incidents. Any incident that did not have an "en route" time was excluded from the data set.

ESCI performed two different turnout performance evaluations. The first evaluation only included primary staffed HCFES units. Many units within HCFES are cross staffed such as brush trucks and tenders. There could be a delay in turnout time for these units because personnel have to move their gear from one unit to another. Therefore, only engines, medic units, and battalion chiefs were included in the first evaluation. Ladder 2 was excluded because it was not permanently staffed until late 2020 then had maintenance issues throughout 2021. Also, this evaluation only included the first unit to go "en route," even if it wasn't the first unit to arrive on scene. An example of this would be if Engine 11 was in the process of handling an incident and Engine 12 was dispatched for a new incident in Engine 11's area. Engine 12 may have gone "en route" but if Engine 11 cleared their original response before Engine 12 arrived on scene, Engine 11 may take the new incident instead of Engine 12 if Engine 11 were closer. Analyzing the turnout time of the first unit arriving on scene would show an extended turnout time because it would be the time the incident was dispatched to the time Engine 11 picked the incident up for Engine 12, instead of the time Engine 12 went "en route."

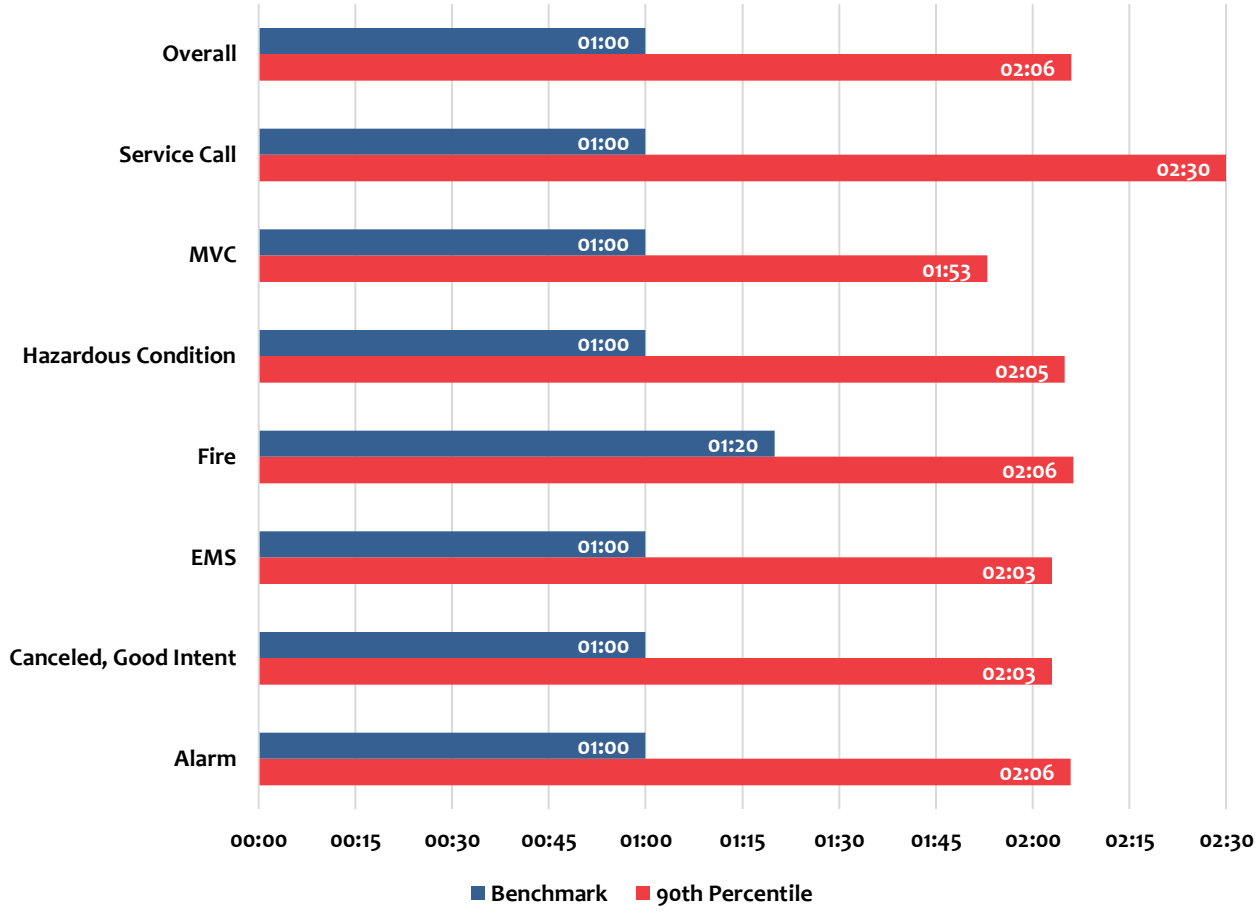
The following figure shows that HCFES turnout performance has improved each year from 2017 to 2021. The overall turnout performance for the five-year period at the 90th percentile is 1 minute, 59 seconds.

Figure 40: HCFES First "En Route" Turnout Performance, 2017 to 2021



The second evaluation of turnout performance analyzed the turnout times of the first unit that arrived on scene. All units were included in this evaluation. The following figure illustrates HCFES turnout time performance. HCFES's overall turnout performance is 2 minutes, 6 seconds. The range for incident types is 1 minutes, 53 seconds for MVC incidents to 2 minutes, 30 seconds for service call incidents. HCFES leadership should investigate the reason for extended turnout times and implement ways to improve. Areas that should be investigated are station design, station alerting systems, and how the times are recorded. Cross staffed units also contribute to longer turnout times because personnel must move gear and equipment between units.

Figure 41: HCFES First Unit Arrived Turnout Performance, 2017 to 2021

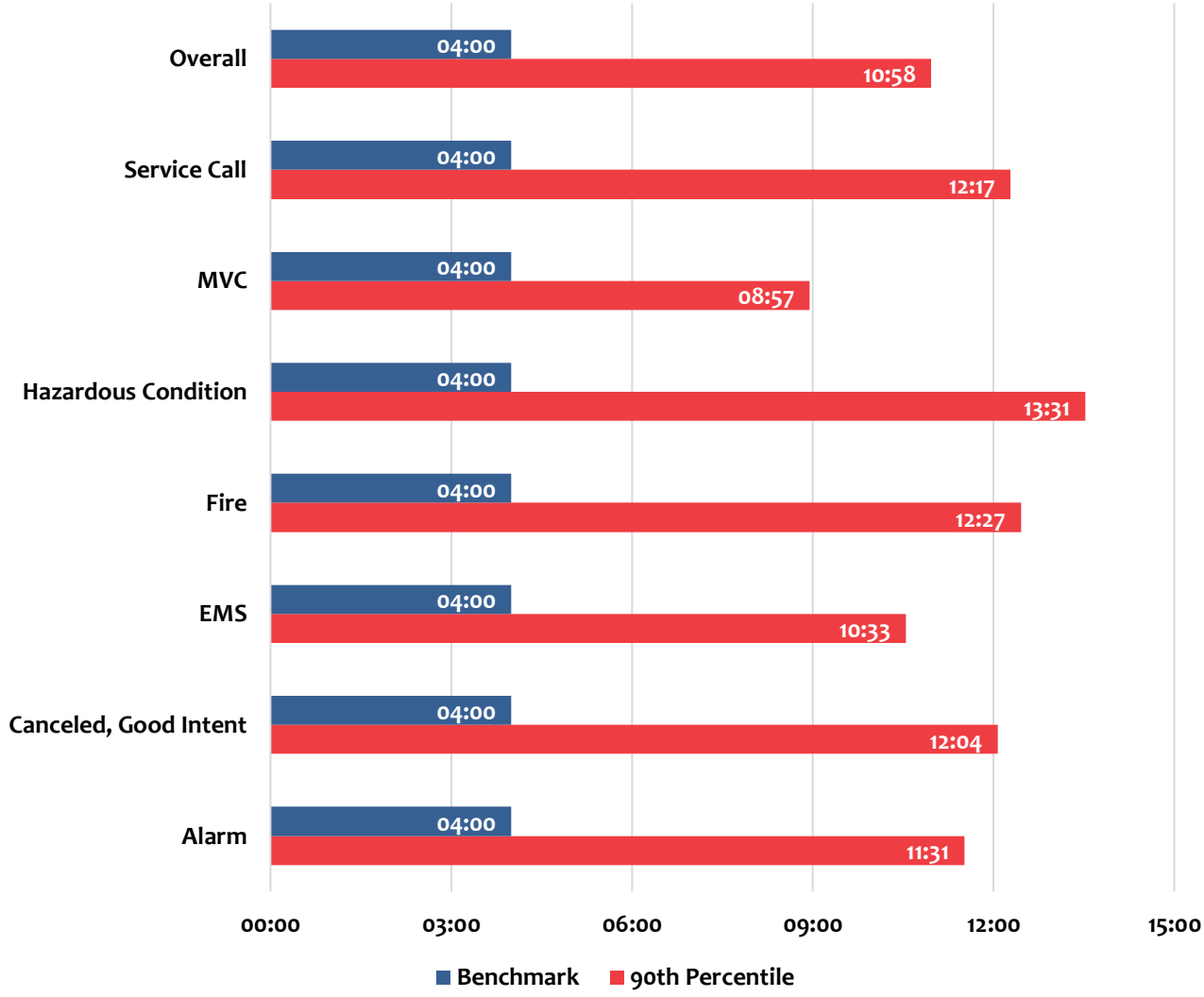


Travel Performance

The third component is the amount of time between when the apparatus departs for the call and when it arrives on-scene, known as travel time. This component is extremely important in a fire location study because the proper placement of fire stations greatly influences travel time. NFPA 1710 recommends that the first due fire or EMS unit travel and arrive on the scene within four minutes (240 seconds). For travel performance any incident without an arrival time was removed.

The following figure summarizes the HCFES travel time performance. HCFES's overall travel performance is 10 minutes, 58 seconds. The range for incident types is 8 minutes, 57 seconds for MVC incidents to 13 minutes, 31 seconds for hazardous condition incidents.

Figure 42: HCFES Travel Performance, 2017 to 2021

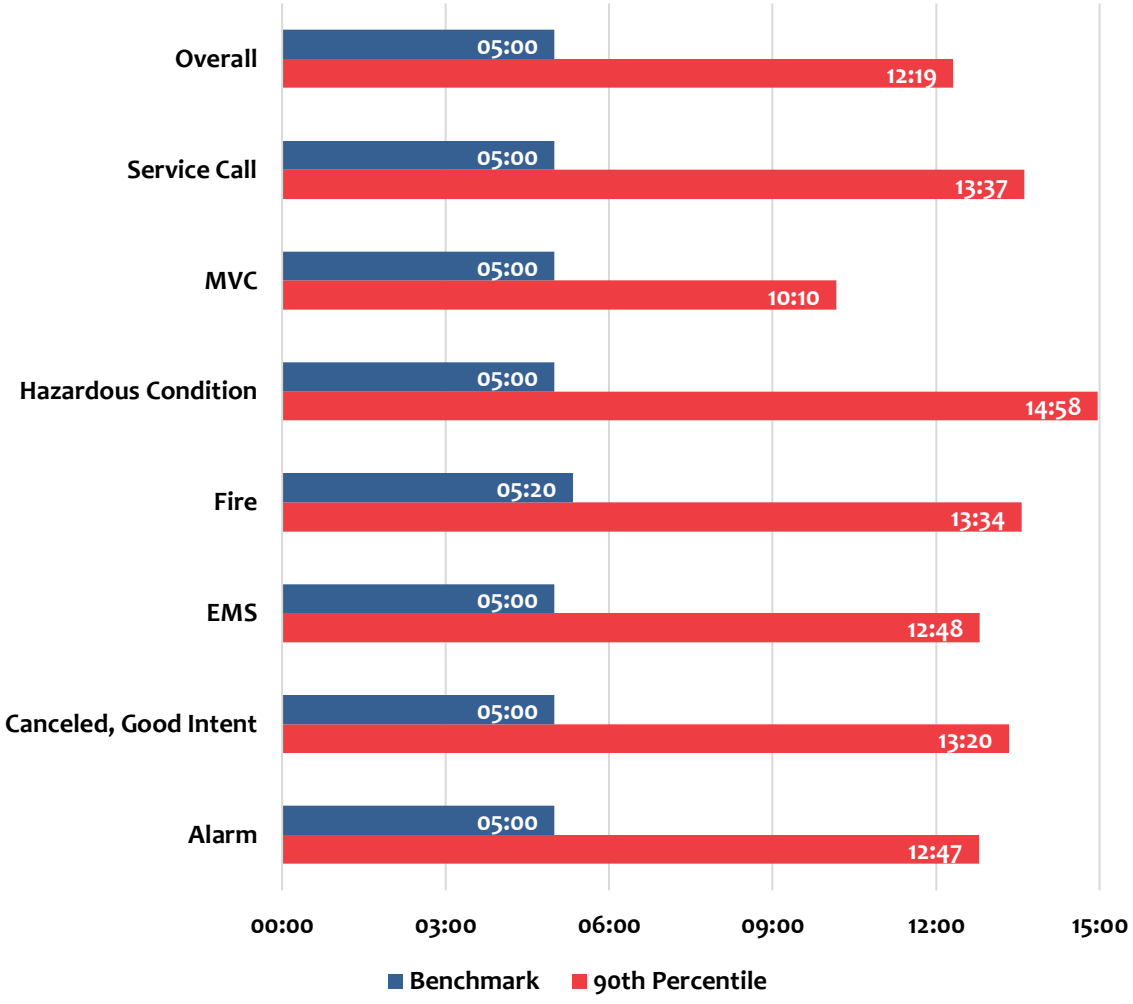


Response Time Performance

Response time is the amount of time from initial notification to the fire department until the first unit arrives on the scene. HCFES refers to response time as "Total Reflex Time" within the *HCFES 2021 Standards of Response Coverage and Community Risk Assessment* document. Response time performance is not specifically addressed by NFPA 1710, it is a combination of the turnout and travel time standards therefore it would be 5 minutes, 20 seconds (320 seconds) for fire and special operations incidents and 5 minutes (300 seconds) for all other incidents.

The following figure displays that the HCFES response time for all incidents is 12 minutes, 19 seconds. The range is 10 minutes, 10 seconds for MVC incidents to 14 minutes, 58 seconds for hazardous condition incidents. If HCFES can improve turnout time, this will improve overall response times. Response time is an important factor because it represents the components that are under direct fire department control, whereas the following component, total response time, includes call processing.

Figure 43: HCFES Response Performance, 2017 to 2021

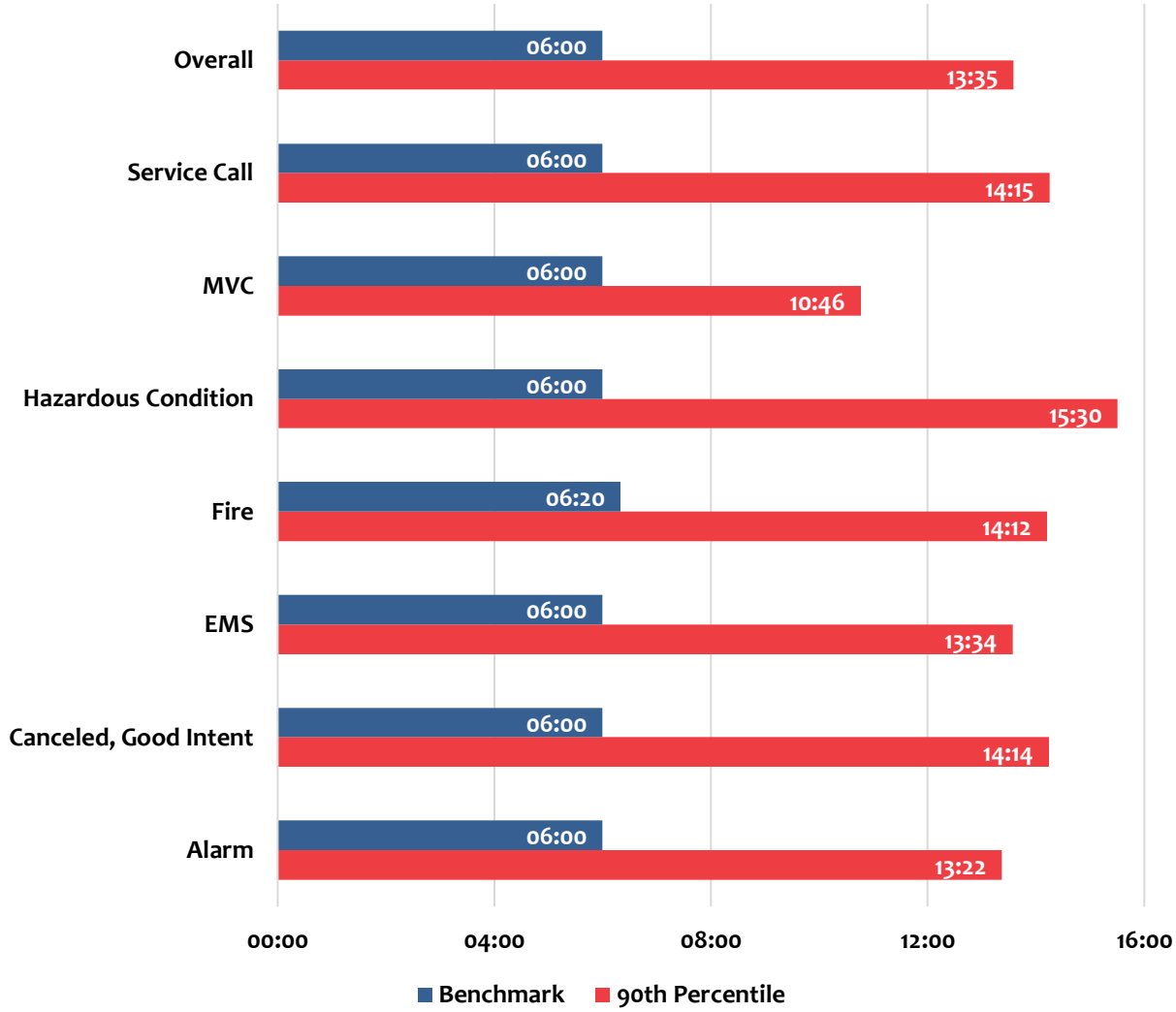


Total Response Time Performance

Total response time performance is the final part of the Total Response Time Continuum. This is the total time from the time the emergency call is received by the dispatch center to the time the first emergency unit arrives on the scene of the incident. Although there is not a national standard for total response time, an expected standard can be calculated by adding the NFPA standards for call processing time performance, turnout time performance, and travel time performance. This expected standard comes out to be 6 minutes, 20 seconds for fires and special operation incidents, and 6 minutes for all other incidents.

The following figure shows the total response time performance for HCFES. For all calls, it is more than double the expected standard at 13 minutes, 35 seconds. The range is 10 minutes, 46 seconds for MVC incidents to 15 minutes, 30 seconds for hazardous condition incidents.

Figure 44: HCFES Total Response, 2017 to 2021

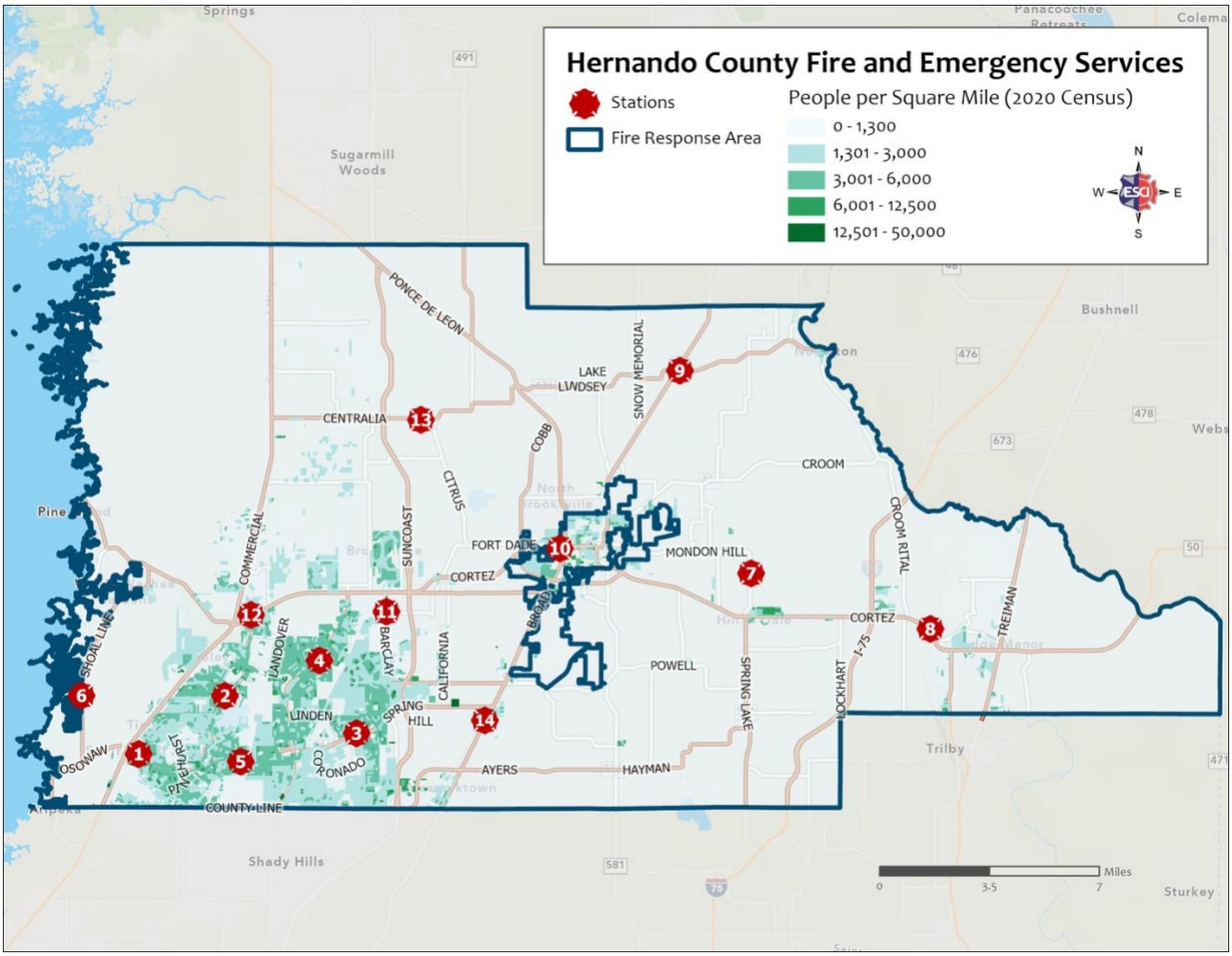


Geographic Service Demand

Since human activity is the primary cause of emergency incidents, many communities see a relationship between population density and service demand. Areas with greater population density often experience greater levels of service demand. From a logical standpoint, higher population density correlates with an increased number of people experiencing a medical emergency, the number of structures that may be involved in a fire, and the movement of vehicles that may experience an unexpected collision.

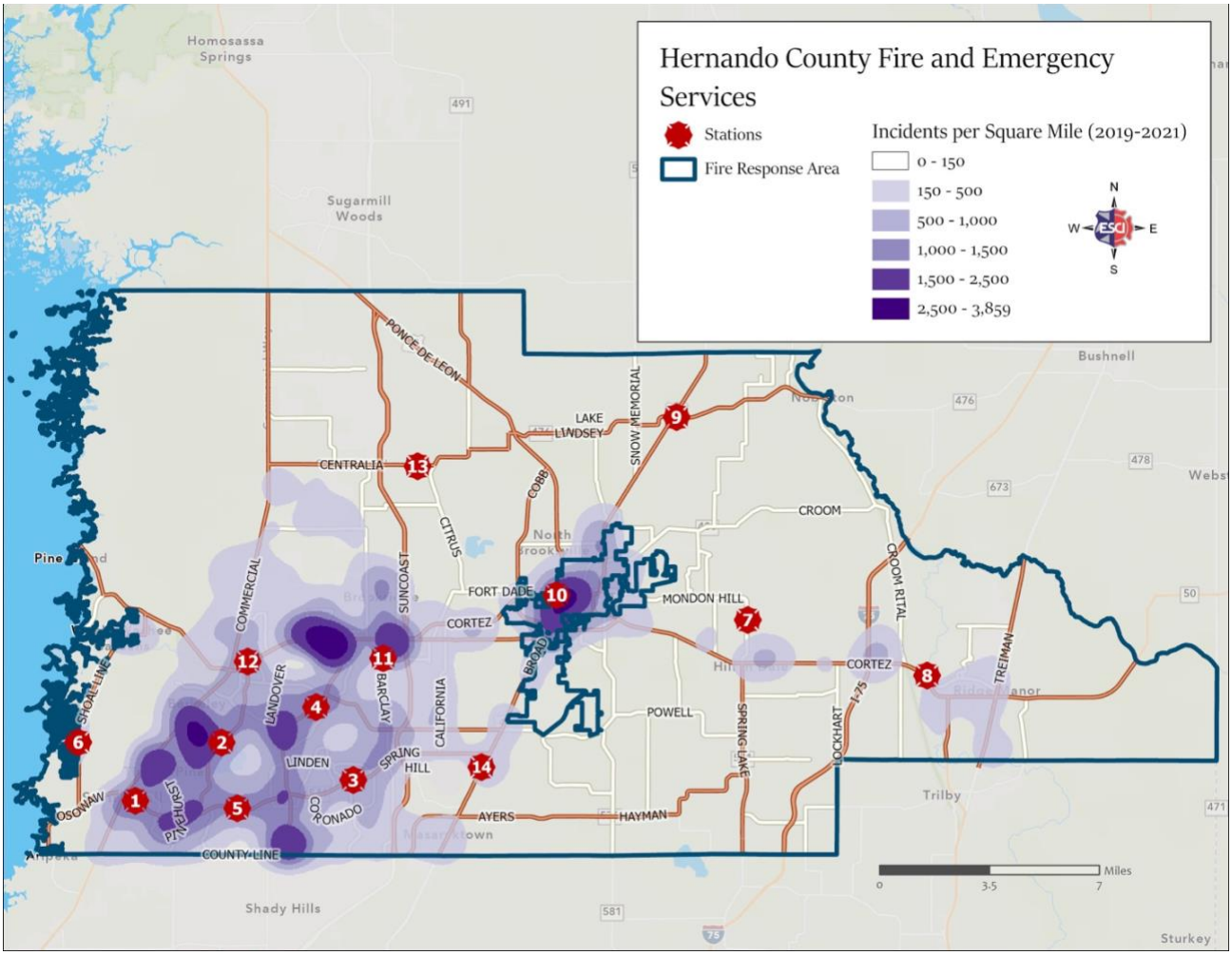
The following figure shows the population density of Hernando County. Population density is determined based on 2020 data provided by the U.S. Census Bureau from and is divided into census blocks. The majority of the population is in the Spring Hill area and around the City of Brooksville.

Figure 45: Hernando County Population Density



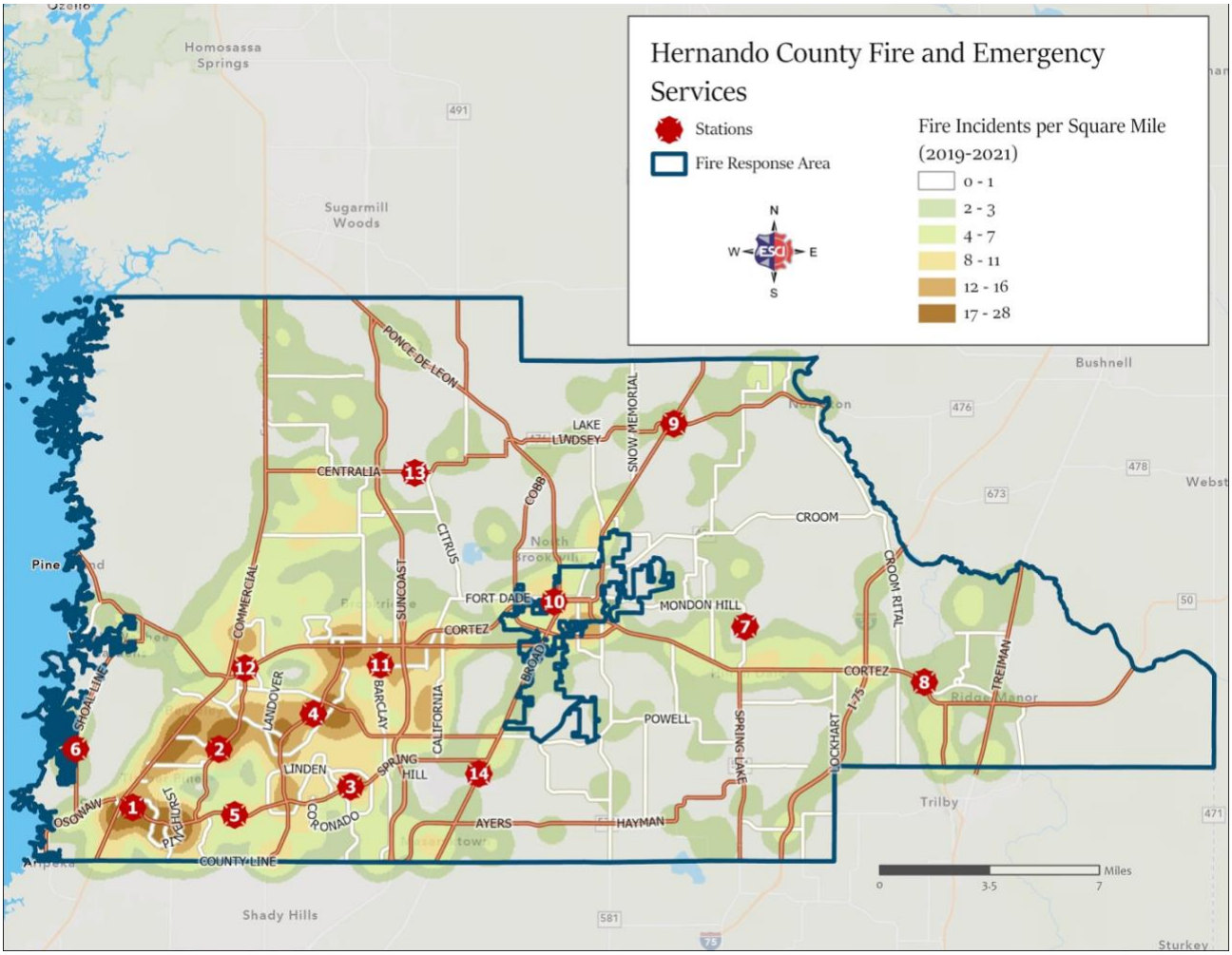
ESCI used HCFES 2019-2021 incident data to create a heat map showing incident density per square mile. As illustrated in the following figure, the majority of the incidents are located around the Spring Hill area and near the City of Brooksville. This correlates with the higher population density of the County.

Figure 46: HCFES Incident Density (All Incidents), 2019-2021



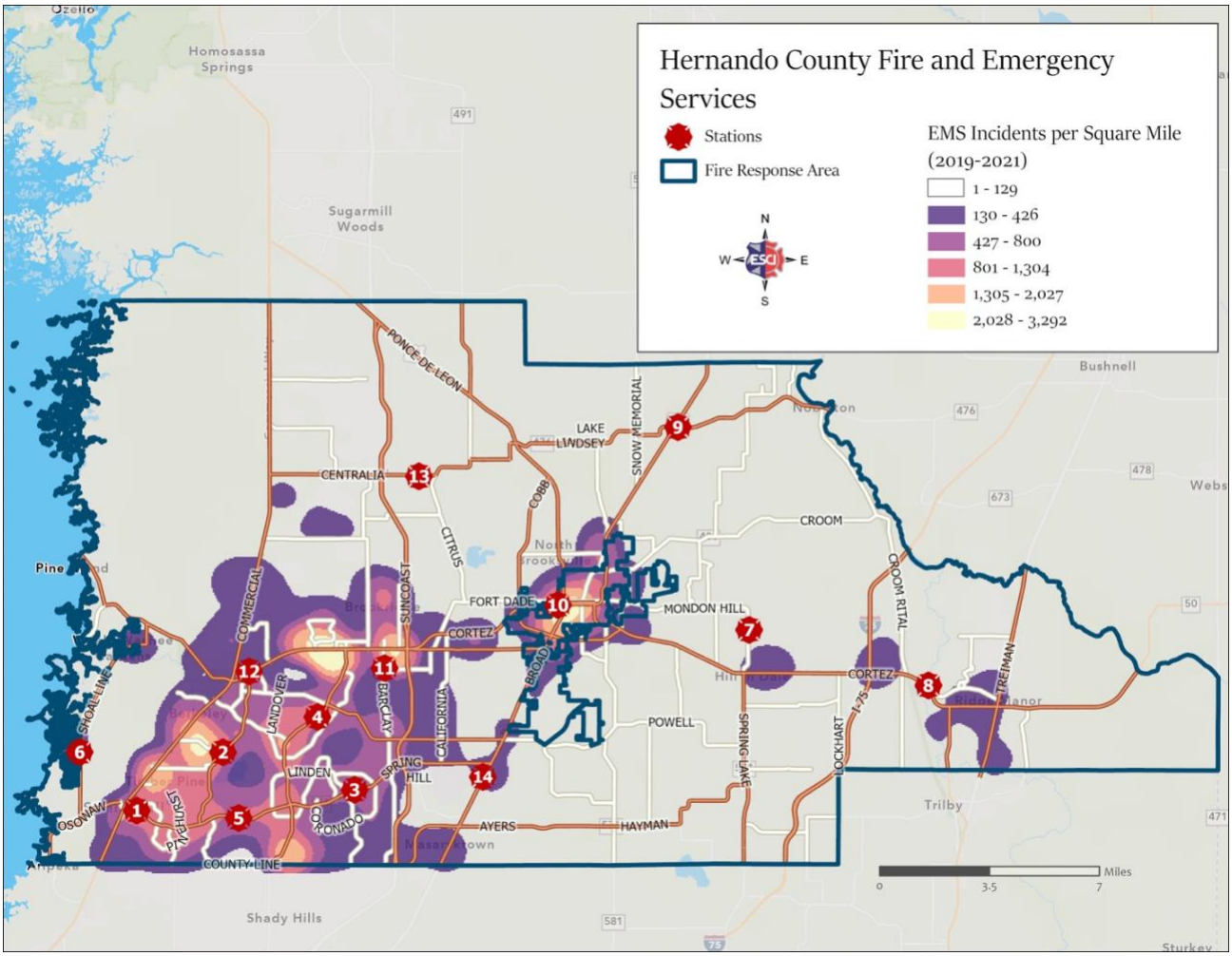
ESCI also broke the incident density down into fire and EMS incidents. The following figure shows the incident density for fire incidents from 2019 to 2021. Fire incident density has a similar pattern to total incident density. Fire Incidents included any incident that was coded in the 100-series for NFRIS. Figure 32 shows a table of the NFRIS incident types.

Figure 47: HCFES Incident Density (Fire Incidents), 2019-2021



EMS incident density also correlates to both total incident and fire incident density. The following figure shows EMS incident density for 2019 to 2021 incidents.

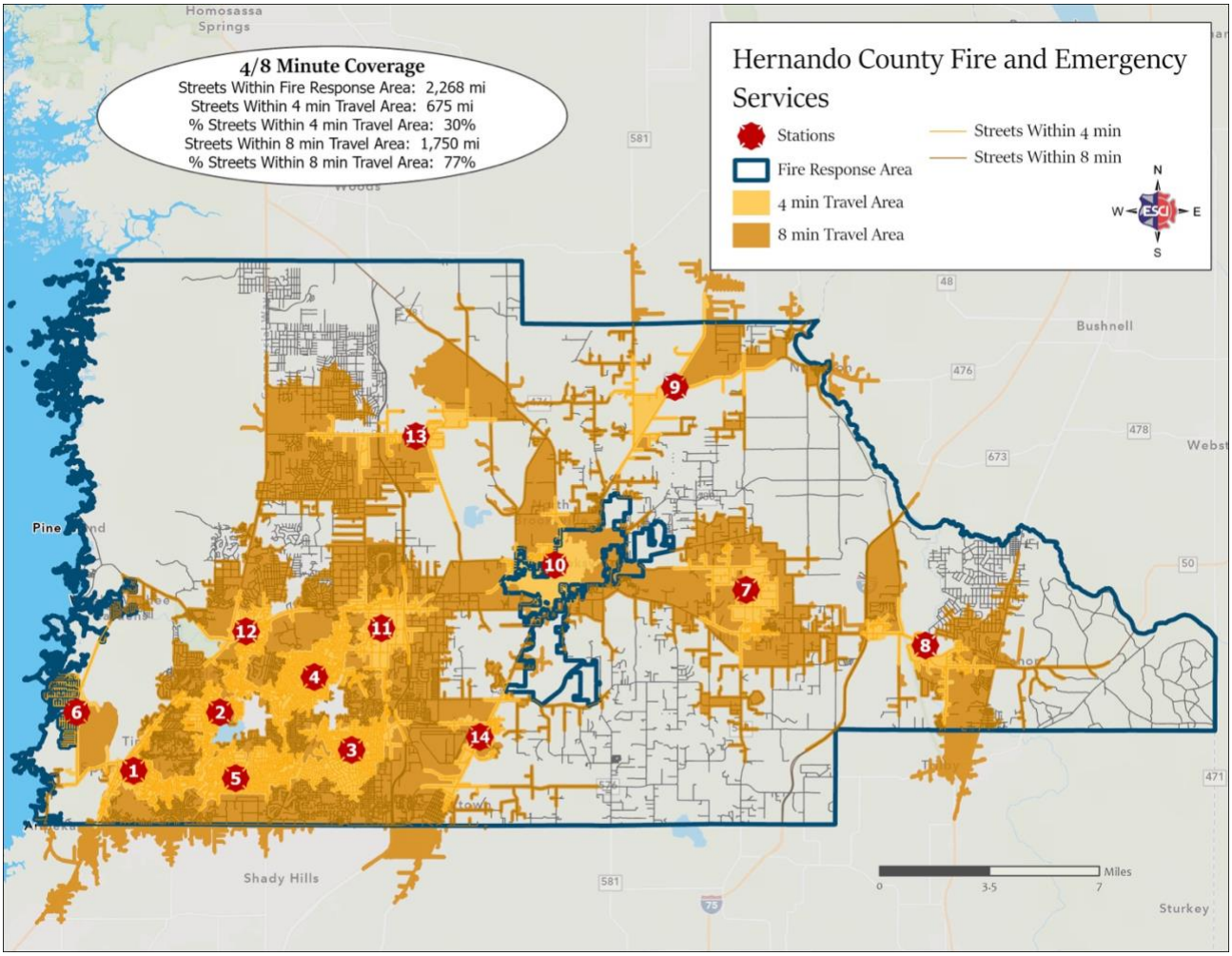
Figure 48: HCFES Incident Density (EMS Incidents), 2019-2021



NFPA Distribution

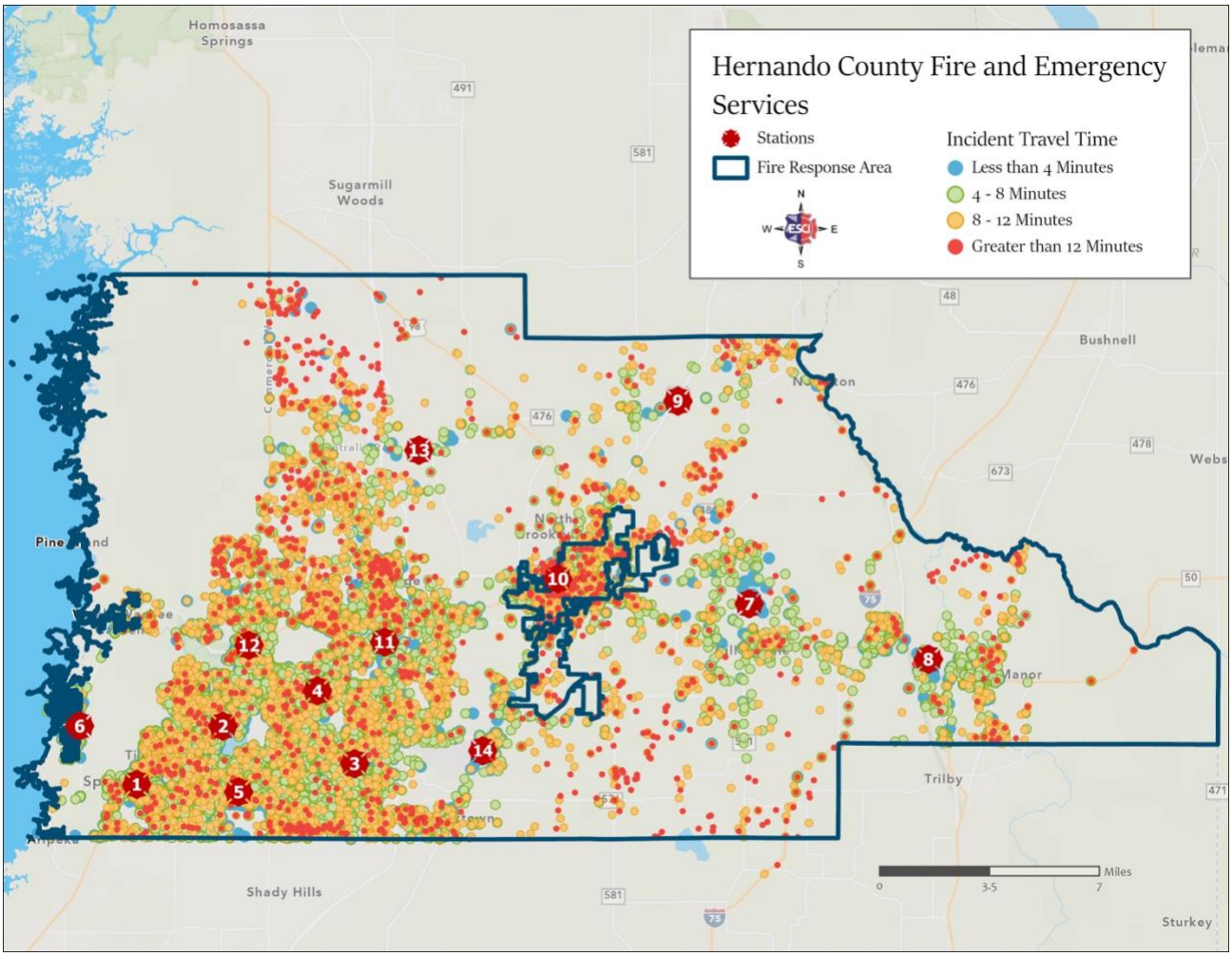
National Fire Protection Association (NFPA) is an industry trade association that develops and provides standards and codes for fire departments and emergency medical services for use by local governments. One of these standards, NFPA 1710: *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, serves as a national consensus standard for career fire department performance, operations, and safety. Within this standard, a travel time of 240 seconds, or 4 minutes, is identified as the benchmark for career departments to reach emergency calls within their jurisdiction with the first arriving unit. Additionally, the balance of the response (called the Effective Response Force) is recommended to arrive to the incident within 480 seconds, or 8 minutes. The following figure illustrates HCFES ability to meet these standards based upon predicted travel times using historical traffic data from Esri for traffic patterns at 8:00 am on Monday mornings. Unshaded pockets indicate that the area falls outside of the model's maximum extension from the road network. In Hernando County, 30% of the streets fall within 4 minutes of a fire station and 77% are within 8 minutes of a fire station.

Figure 49: HCFES NFPA 1710 4 and 8-Minute Travel



While the preceding figure illustrates the theoretical travel time, it assumes that all units are within the station at the time of dispatch. In reality, units are not always at the station and sometimes units from other stations may respond. As illustrated in the following figure, travel time to 2021 incidents for HCFES was less than 4 minutes to 20.32% of incidents, 4–8 minutes to 49.74% of incidents, 8–12 minutes to 21.58% of incidents, and greater than 12 minutes to 8.36% of incidents.

Figure 50: HCFES 2021 Incident Time Travel



Effective Response Force

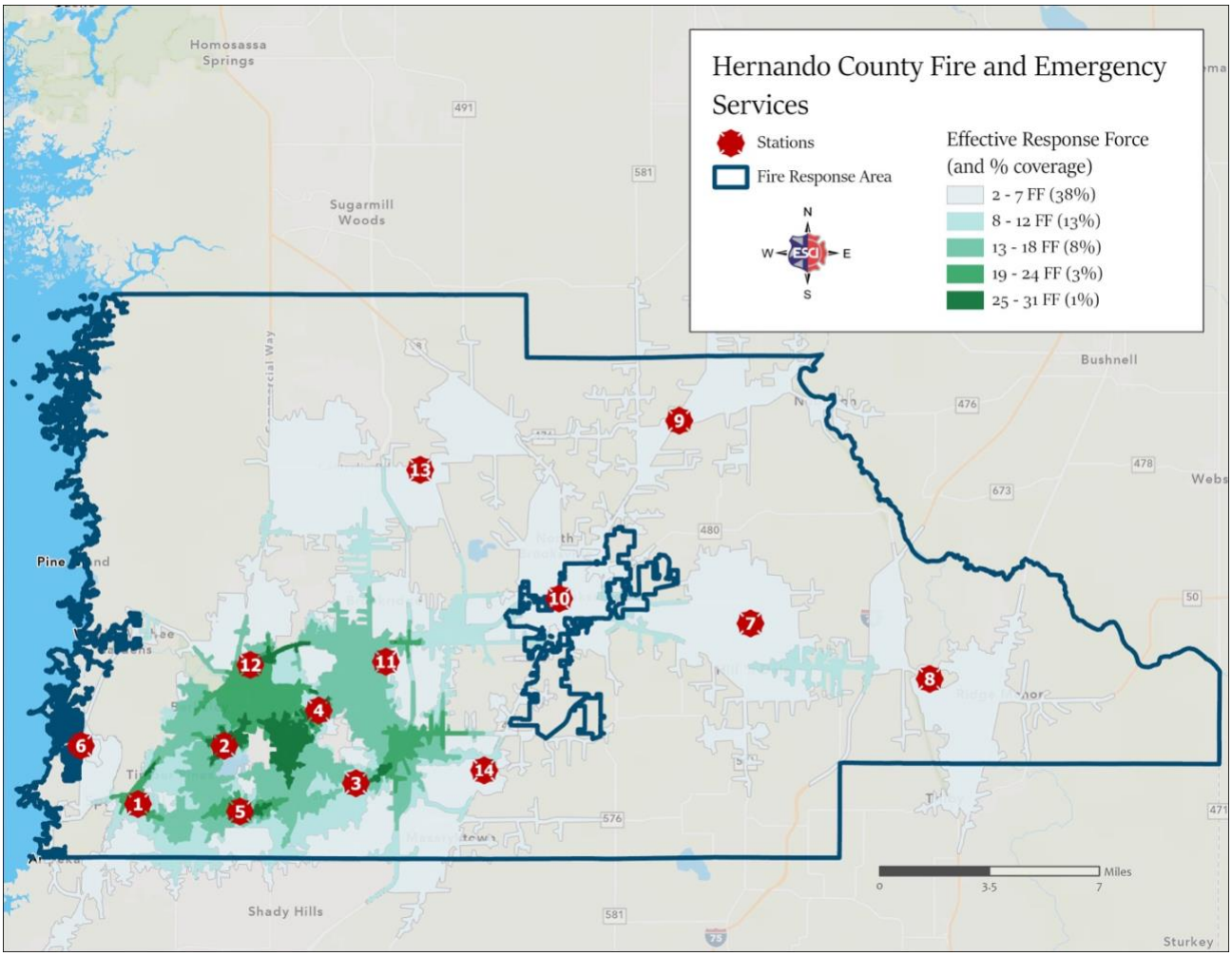
NFPA 1710 recommends that for moderate risk incidents or greater—such as a fire in a 2,000 square foot residential dwelling—the balance of the initially dispatched resources arrive on the scene within 8 minutes from the time they started to travel to the scene. ESCI evaluated the theoretical concentration of HCFES resources to determine how the spacing of multiple resources (the response apparatus within their respective fire stations) are arranged so that an initial Effective Response Force (ERF) can arrive on-scene within the time frames outlined by NFPA. NFPA defines ERF as "the minimum amount of staffing and equipment that must reach a specific emergency zone location within a maximum prescribed total response time and is capable of initial fire suppression, EMS, and/or mitigation. The ERF is the result of the critical tasking analysis conducted as part of a community risk assessment." The following figure illustrates the ERF as recommended for a range of fires based upon the size and type of the structure.

Figure 51: NFPA 1710 Recommended ERF Initial Assignment

Functions/Tasks	Single-Family Residence (2,000 SF)	Open Air Strip Shopping Center (13,000–196,000 SF)	3-Story Garden Apartment (1,200 SF)
Command	1	2	2
Apparatus Operator	1	2	2
Handlines (2 members each)	4	6	6
Support Members	2	3	3
Victim Search and Rescue team	2	4	4
Ground Ladders/Ventilation	2	4	4
Aerial Device Operator (if ladder used)	(1)	(1)	(1)
Initial Rapid Intervention Team	4	4	4
Initial Medical Care Component	N/A	2	2
Total	**16 (17)**	**27 (28)**	**27 (28)**

While Figure 49 illustrated what percent of the service area can be reached in 8 minutes, it did not examine how many personnel could be assembled to those areas in that timeframe. The following figure shows that in 8 minutes HCFES can assemble 2 to 7 firefighters to 38% of the coverage area, 8 to 12 firefighters to 13% of the coverage area, 13 to 18 firefighters to 8% of the coverage area, 19 to 24 firefighters to 3% of the coverage area, and 25 to 31 firefighters to 1% of the coverage area.

Figure 52: HCFES Effective Response Force



NFPA 1710 is a recommended standard that departments should strive for to not only provide the best chance of life safety and property conservation but also for firefighter safety. ESCI applauds HCFES for establishing first alarm assignments that meet the personnel requirement of NFPA 1710 on residential structures. However, as seen in the previous figure, outside of the Spring Hill area, HCFES has issues in getting the recommended personnel on the scene in the 8-minute time frame. The following figure shows the HCFES assignment for residential structures.

Figure 53: HCFES Residential Structure Fire Assignment

Resource	Units	Staffing
Battalion Chief	2	2
Engine Company	3	9
Aerial Truck	1	3
Medic Unit (Crossed Trained)	2	4
Total Personnel	**-**	**18**

Insurance Services Office (ISO)

The mission of the fire service is to save lives and protect property. The Insurance Services Office (ISO) is a national data analytics provider that evaluates fire protection for communities across the country. ISO has created the Fire Suppression Rating Schedule (FSRS), which is a manual containing the criteria used in reviewing the fire prevention and fire suppression capabilities of individual communities or fire protection areas. The FSRS measures the major elements of a community's fire protection system and develops a numerical grading called a Public Protection Classification (PPC®). A PPC® score ranges from ranging from 1 (best protection) to 10 (no protection).

A lower (better) PPC® score not only means a community has better fire suppression capabilities in the case of a fire, but it will also mean lower insurance premiums for residents and businesses. Hernando County's ISO rating is 2/2Y. The first number applies to properties within five road miles of the responding fire station and 1,000 feet of a creditable water supply such as a fire hydrant, suction point, or dry hydrant. The second number is that class that applies to properties within five road miles of a fire station but beyond 1,000 feet of creditable water supply.[16] Areas not within five road miles of a fire station are not eligible for a PPC® score. Hernando County's score is very good, as only 241 fire departments countrywide in 2017 had an ISO rating of 1 and of the 46,035 with an ISO score, only 1,324 had a class 2 rating. There are four components of the PPC® score and they are shown in the following figure with the points that Hernando County earned in the 2017 evaluation. There is also a divergence penalty which adjusts the total score downward when the scores for the fire department and water supply are different. This is done because the two components depend on each other. For instance, even with the best firefighting equipment and personnel, fire suppression efforts will not be effective without a plentiful water supply. This is also true on the other end of the spectrum, that a plentiful water supply will not be effective without firefighting equipment and personnel to use the water to put the fire out.

[16] "New Public Protection Classifications." https://www.isomitigation.com/siteassets/images/articles/ppc-announcement-brochure.pdf

Figure 54: PPC® Score Categories

Category	Maximum Points	Points Earned (2017)	Evaluation Criteria
Emergency Communications	10	10	• The emergency reporting system • The communications center, including the number of telecommunicators • Computer-aided dispatch (CAD) facilities • The dispatch circuits and how the center notifies firefighters about the location of the emergency
Fire Department	50	33.06	• Distribution of fire companies throughout the area • Pump tests • Engine and ladder company equipment meets NFPA 1901 • Type and extent of training provided to fire company personnel • Number of people who participate in training • Firefighter response to emergencies • Maintenance and testing of the fire department's equipment
Water Supply	40	37.74	• Fire hydrant inspections and frequency of flow testing • Number of fire hydrants no more than 1,000 feet from the representative locations
Community Risk Reduction	5.5	5.09	• Fire prevention practices and activities
Divergence	Varies	-5.65	• Penalty for the difference between fire department and water supply components
Total	**105.5**	**80.24**	

The following figure shows the PPC® score for the fire department category from the 2017 review.

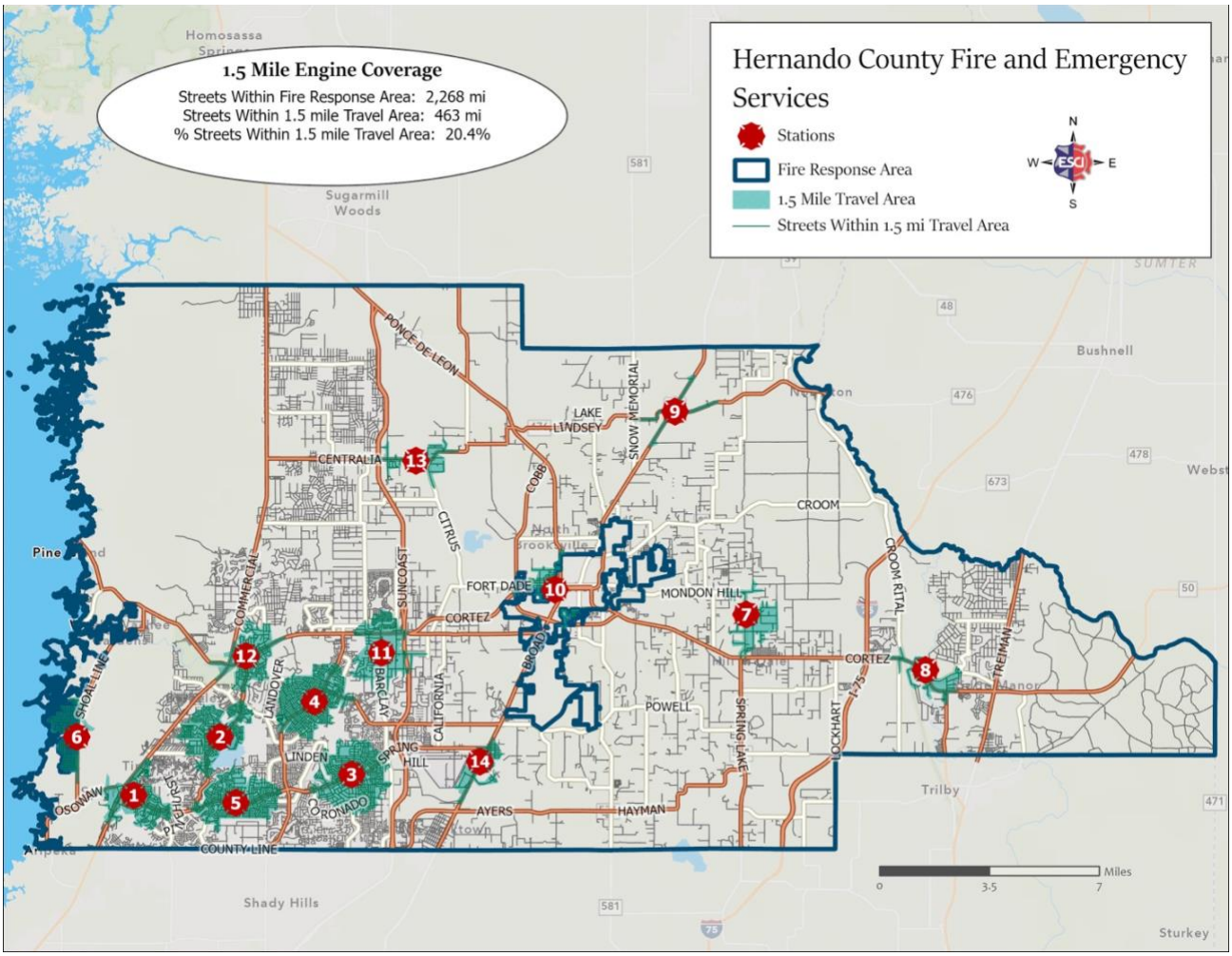
Figure 55: PPC® Score for Fire Department Category

Rating	Earned Credit	Credit Available
Engine Companies	5.99	6
Reserve Pumpers	0.49	0.5
Pumper Capacity	3.00	3
Ladder Service	0.67	4
Reserve Ladder and Service Trucks	0.02	0.5
Deployment Analysis	5.82	10
Company Personnel	8.68	15
Training	6.39	9
Operational Considerations	2	2
Total Credit for Fire Department	**33.06**	**50**

Engine Company Performance

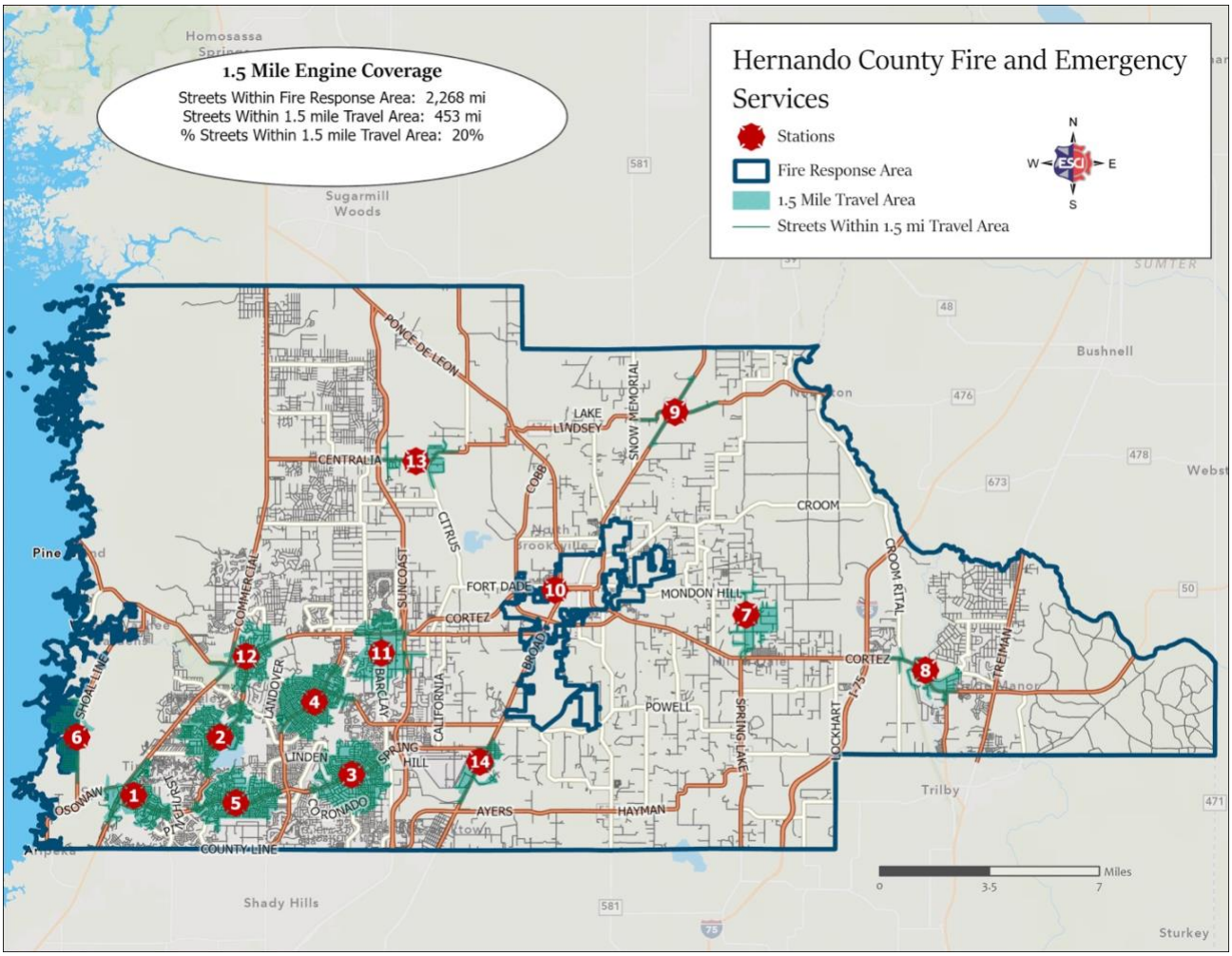
A key area of credit towards a PPC® score is the degree to which structures protected by the fire department fall within a 1.5 road mile service area of a fire station. This 1.5 road mile standard is used to estimate a 4-minute travel time for first responding units as recommended by NFPA 1710. Engine company performance is analyzed by ISO in the "Deployment Analysis" item of the PPC® score. ESCI conducted two analyses for 1.5 road mile service area. The first figure shows 1.5 road mile service area with an engine located at Fire Station 10, which shows 20.4% of the HCFES service area falls within 1.5 miles of a fire station. Currently, there is not a HCFES engine assigned to Fire Station 10, but there is a City of Brooksville engine that will respond on automatic aid on structure fire incidents. ISO does use automatic aid units within their calculations.

Figure 56: HCFES 1.5 Road Mile Travel Distance with Station 10



The following figure shows the 1.5 road mile coverage of Hernando County without Fire Station 10. There is only a 0.4% difference.

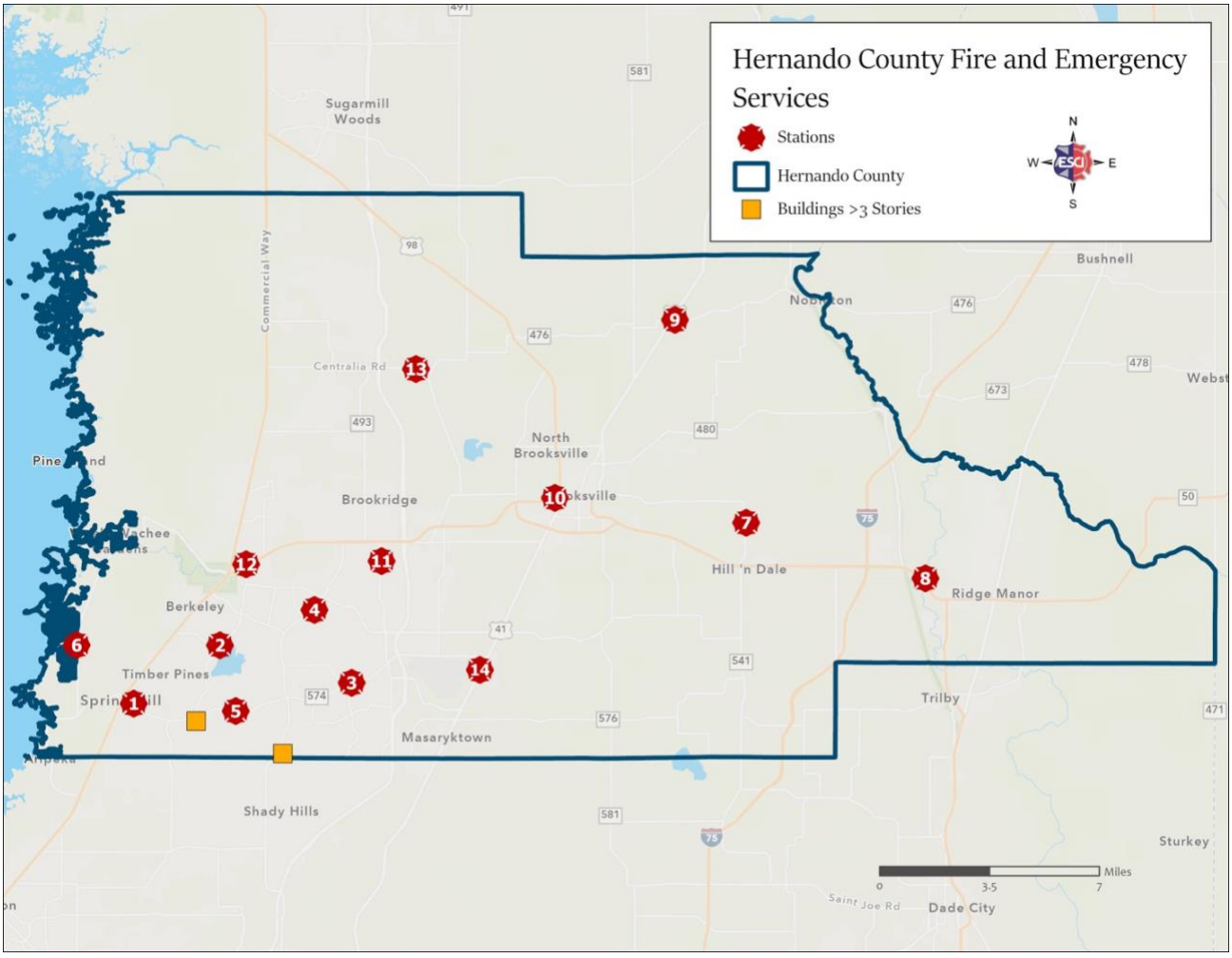
Figure 57: HCFES 1.5 Road Mile Travel Distance without Station 10



Ladder (Truck) Company Performance

Another component of the PPC® score is the credit for ladder (truck) companies within a 2.5 road-mile travel distance. This 2.5 road mile standard is used to estimate an 8-minute travel time. Within this calculation, ISO examines the number of buildings with a "Needed Fire Flow" greater than 3,500 GPM or more than three stories tall. The following figure shows the location of buildings within Hernando County that are more than three stories. This information was pulled from GIS data. ESCI believes there may be more buildings that are taller than three stories than the ones shown on the figure based on the area familiarization part during the site visit. For instance, HCA Florida Oak Hill Hospital is not shown on this map. ESCI recommends that HCFES work with the County GIS team to ensure records are up to date.

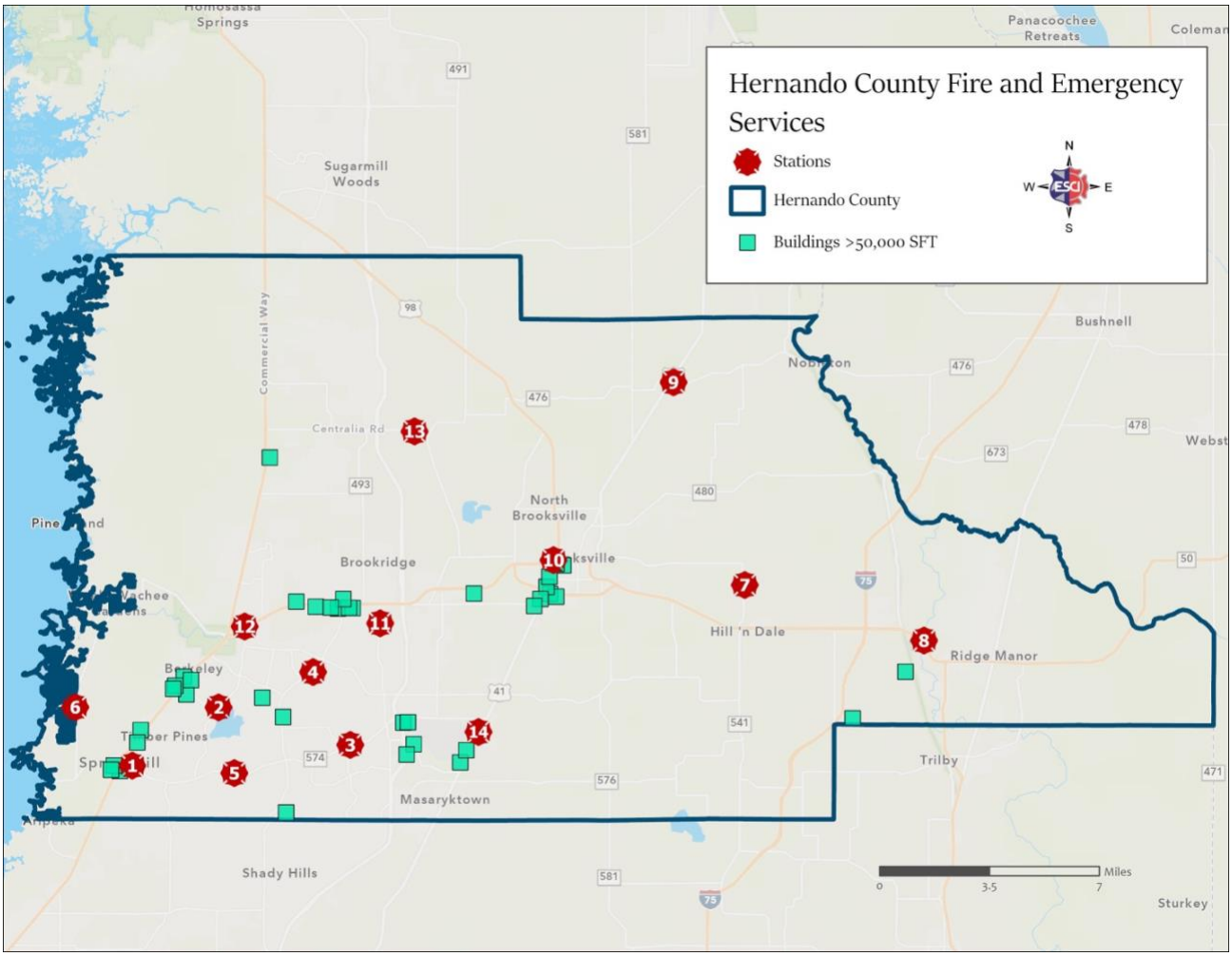
Figure 58: Hernando County Buildings Greater than Three Stories



Buildings have a "Needed Fire Flow" greater than 3,500 GPM is also calculated in the ladder company performance. Fire flow is determined by building construction type, size, building use, and the presence of automatic sprinklers. More information on how ISO calculates "Needed Fire Flow" can be found in their "Guide for Determination of Needed Fire Flow" document.[17]

ESCI selected to show buildings greater than 50,000 square feet as a baseline on the following figure. True "Needed Fire Flow" will need to be calculated on various other factors mentioned previously.

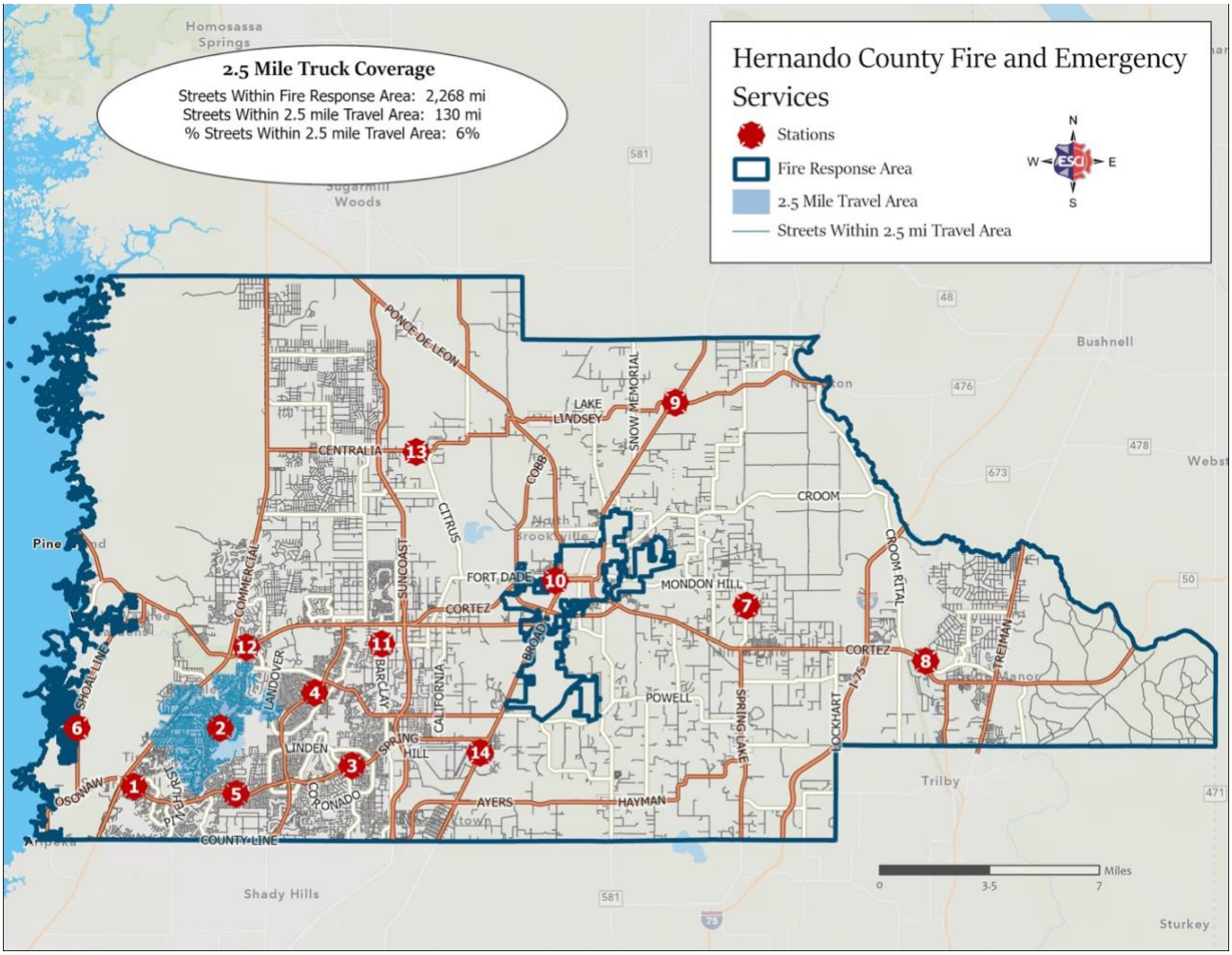
Figure 59: Hernando County Buildings Greater than 50,000 Square Feet



[17] "Guide for Determination of Needed Fire Flow." https://www.isomitigation.com/siteassets/downloads/guide-determinerequiredfireflow.pdf

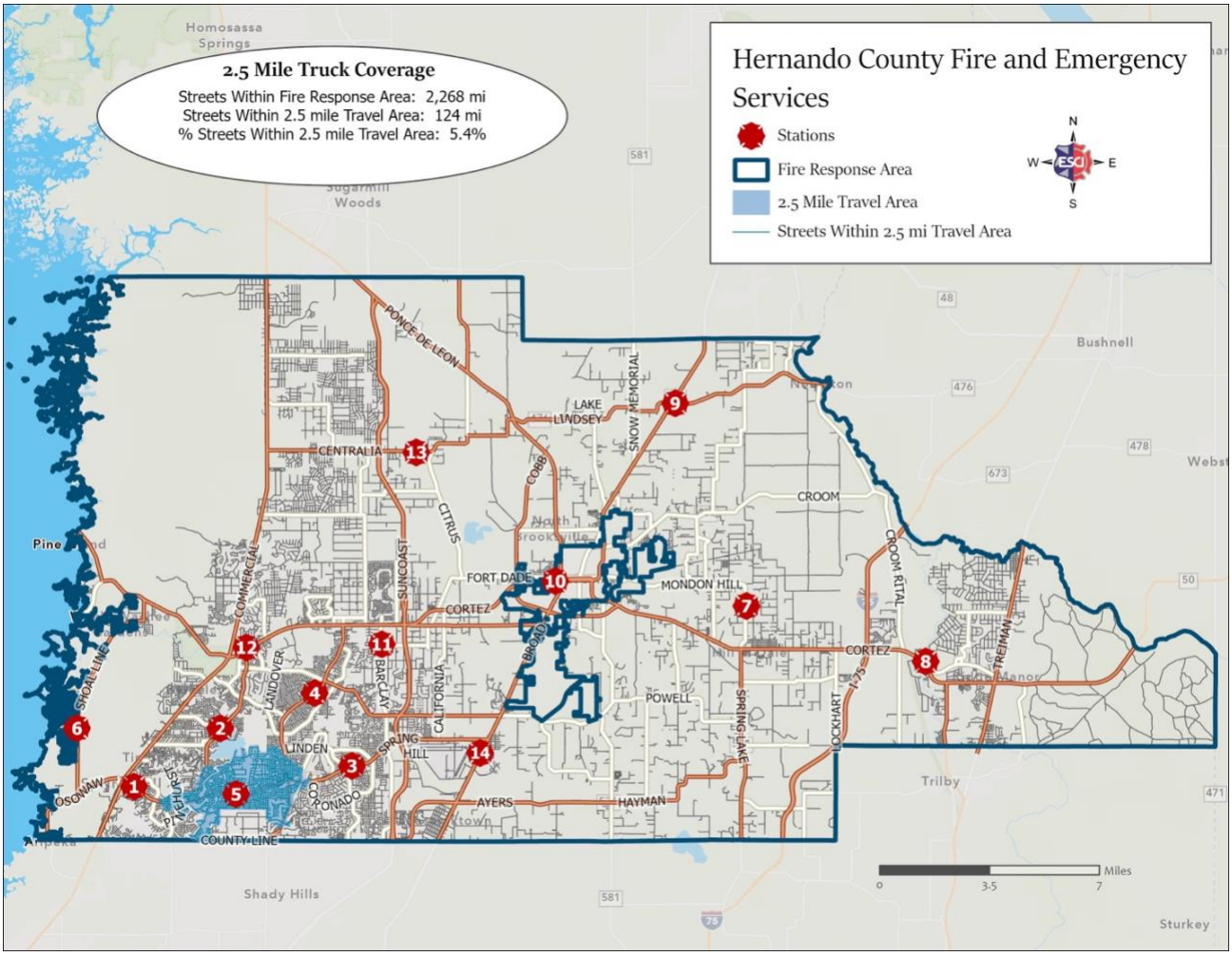
Current HCFES has one ladder (truck) company located at Fire Station 2. The plan is to move the ladder company to Fire Station 5 once it is completed. The following figure shows that 6% of the HCFES service area falls within 2.5 road miles of the ladder company when it is located at Fire Station 2.

Figure 60: HCFES 2.5 Road Mile Ladder Company Travel Distance, Station 2



The following figure shows that 5.4% of the HCFES service area falls within 2.5 road miles of the ladder company when it is located at Fire Station 5. This is a slight decline in protection from having the ladder company at Fire Station 2.

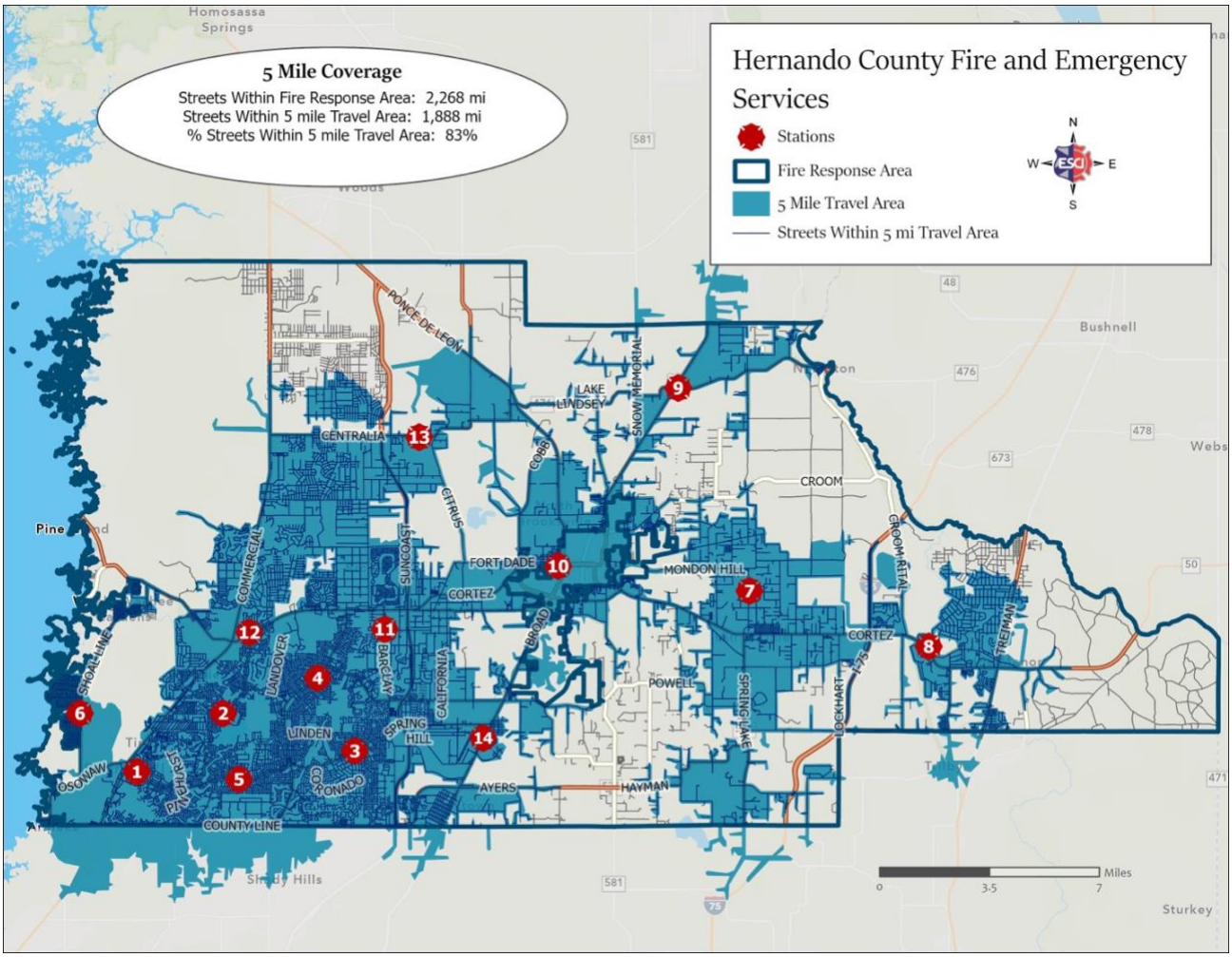
Figure 61: HCFES 2.5 Road Mile Ladder Company Travel Distance, Station 5



Fire Station Coverage

In order to receive a PPC® rating that indicates fire coverage is available from ISO, structures must generally be located within five road miles of a fire station. Areas outside of five road miles are subject to receiving a PPC® rating of 10, meaning that no fire department coverage is available. In Hernando County, 83% of the response area is within five road miles of a fire station.

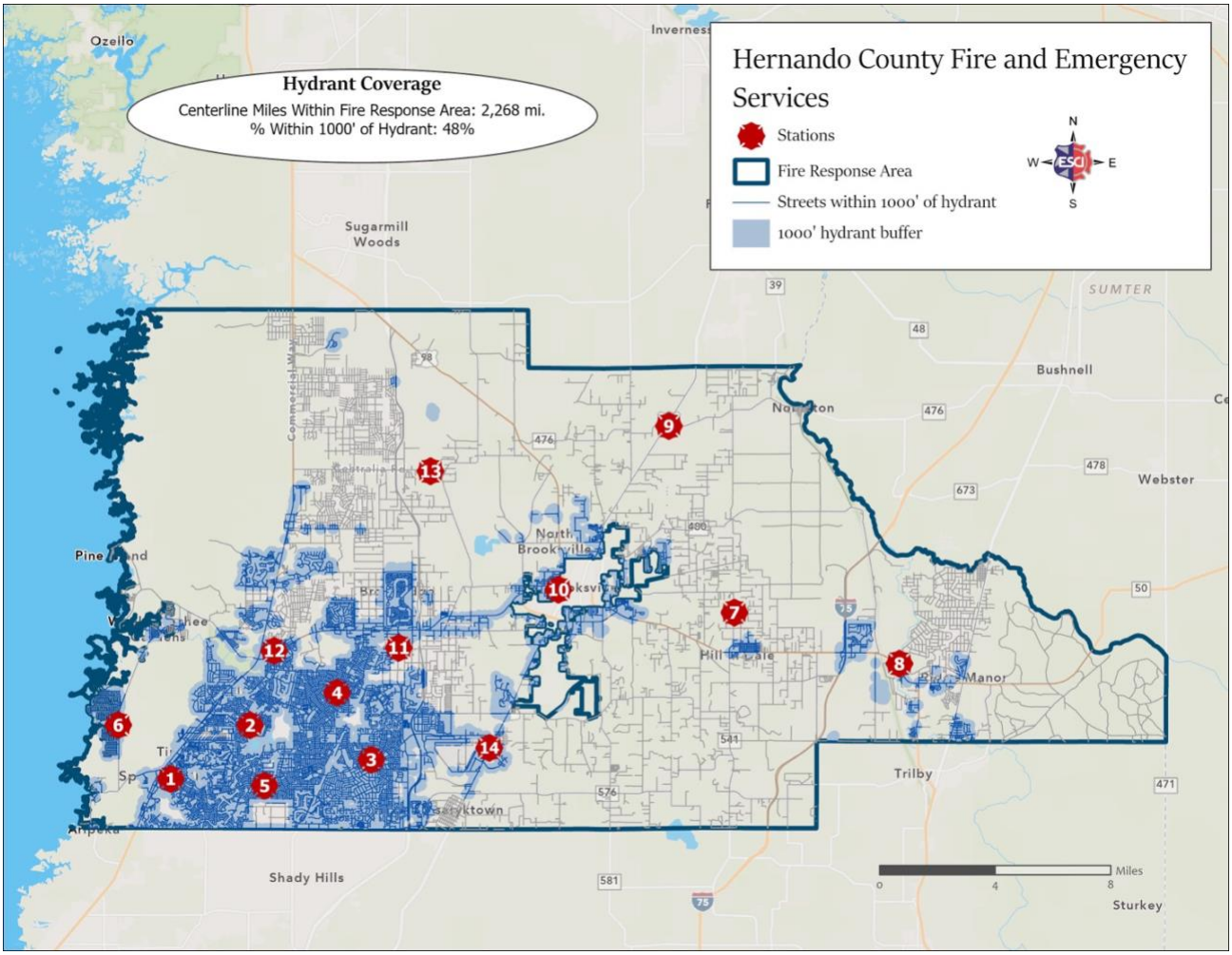
Figure 62: HCFES 5 Road Mile Fire Station Coverage



Water Supply System

ISO evaluates a community's availability of a sufficient water supply, which is critical for the extinguishment of fires. Included in this evaluation is the geographic location and distribution of fire hydrants. Structures outside a 1,000-foot radius of a fire hydrant are subject to a lower Public Protection Classification® rating than areas with adequate hydrant coverage, thus signifying limited fire protection. Exceptions are made when a fire department can show that either a dry hydrant or a suitable water tanker operation is possible to provide the needed volume of water for fire suppression activities for a specific period. HCFES utilizes tenders throughout the County in areas without a fire hydrant. As mentioned previously, HCFES deploys a water tender from Fire Stations 8, 10, and 12. The following figure illustrates that 48% of the road miles fall within 1,000 feet of a fire hydrant.

Figure 63: HCFES Hydrant Coverage



Mutual & Automatic Aid Systems

Few, if any, fire departments have all of the resources needed to mitigate all possible types of incidents. Additionally, when mutually beneficial agreements are possible, particularly when they occur at little cost to the organizations, good governance suggests that these opportunities should be seized to provide higher service levels to the communities involved. In the fire service, two types of agreements exist, mutual aid agreements and automatic aid agreements. In mutual aid agreements, two or more organizations agree that, when requested, they will supply the other agency with the requested resources if available. For emergency services, this request typically occurs through the request by responding or on-scene personnel.

The other type of agreement, automatic aid, occurs as the name implies, automatically. When the dispatch center receives an emergency call, all available resources are examined based on the appropriate unit type and their proximity to the call, typically with the closest unit responding regardless of the jurisdiction in which the incident occurred.

HCFES has mutual and automatic aid agreements with the City of Brooksville Fire Department, Pasco County Fire Rescue, Sumter County Fire and EMS, and Citrus County Fire Rescue. Automatic aid is for structure fire incidents only. Mutual aid agreements all for all other types of incidents such as reported fire alarms, medical emergencies, rescue scenarios, brush fires, and HazMat incidents.

ISO recognizes automatic aid agreements, and additional credit is awarded when automatic aid agreements are in place with organizations that can reach the service area within an 8-minute travel time.

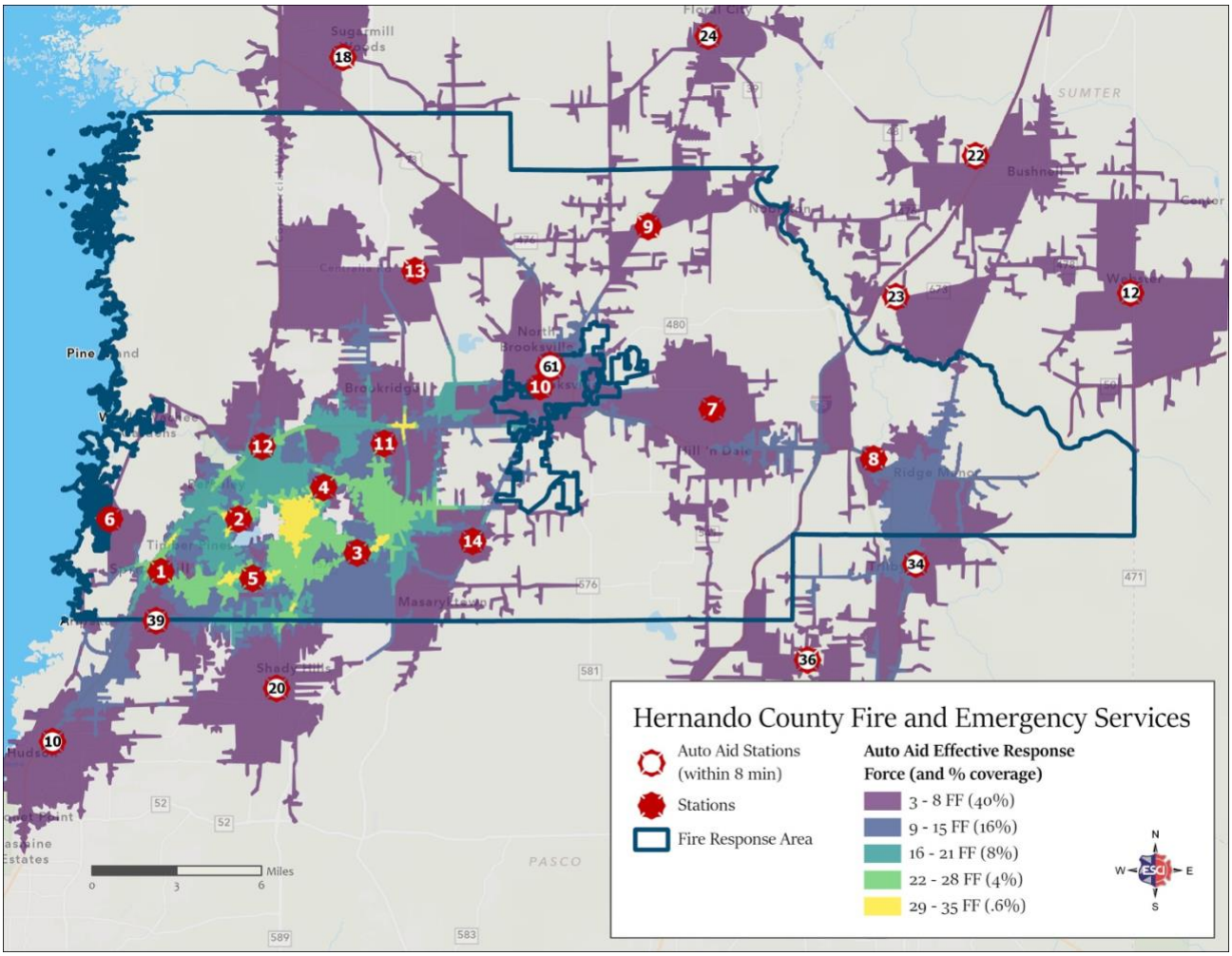
The following table shows the automatic aid stations to HCFES that are within an 8-minute response time to Hernando County. The table also shows the number of cross trained personnel assigned to each station per shift.

Figure 64: Automatic Aid Station Locations and Staffing

Station	Address	Staffing
City of Brooksville Station 61	85 Veterans Avenue Brooksville, FL 34601	5
Citrus County Station 18	5000 W. Oak Park Drive Homosassa, FL 34446	4
Citrus County Station 24	7880 East Spanish Trail Floral City, FL 34436	4
Pasco County Station 20	15900 Little Ranch Road Shady Hills, FL 34610	5
Pasco County Station 39	11630 County Line Road Hudson, Florida 34667	5
Pasco County Station 10	7918 Rhodes Road Hudson, FL 34667	5
Pasco County Station 34	38316 County Road 575 Lacoochee Florida, 33537	5
Pasco County Station 36	34516 Blanton Road, Dade City, FL 33523	5
Sumter County Station 12	2828 C-478A Webster, FL 33597	4
Sumter County Station 23	10660 SW 53rd Ter Bushnell, FL 33513	4
Sumter County Station 22	5654 CR 313 Bushnell, FL 33513	4

Emergencies don't care about jurisdictional boundary lines; therefore, it is important and beneficial to those needing assistance that jurisdictions use automatic aid so the closest units can respond. Those needing emergency services don't care about the name on the side of the apparatus, but they do care about a timely response. The following figure shows the Effective Response Force for Hernando County when automatic aid is utilized. HCFES can assemble 2 to 8 firefighters to 40% of the coverage area, 9 to 15 firefighters to 16% of the coverage area, 16 to 21 firefighters to 8% of the coverage area, 22 to 28 firefighters to 4% of the coverage area, and 29 to 35 firefighters to 0.6% of the coverage area.

Figure 65: HCFES Effective Response Force with Automatic Aid



Reliability Study

The ability for each unit to be available within its zone is referred to as response reliability and is impacted by workload and call concurrency. As call concurrency or workload increases, the availability for the primary unit to respond to additional calls for service decreases. When that primary unit is not available, other units must respond from a potentially greater distance, thus impacting the ability to provide service within a timely manner. ESCI measures reliability in two ways – workload and call concurrency.

Workload

Workload is a measure of how busy each unit within the department is and could be analyzed from a simplistic view as to the number of incidents to which it responds. However, incident responses vary greatly in length of time so while two units may respond to the same number of incidents, the actual work involved may vary greatly. The better measure of workload is referred to as unit hour utilization (UHU). With this method, the amount of time assigned to incidents is compared to the amount of time the unit is in-service and is expressed as a percentage of the whole. For instance, a UHU value of 25% means that the unit is operating on incidents 25% of the time it is in service, thus only being available for other emergencies 75%. When units from neighboring fire stations all have high UHU values, it likely means that new emergencies will have increased response times because it is highly likely that the closest, second closest, and third closest units are not available due to being on other incidents.

UHU only takes into account the time the unit is dispatched to the time the unit returns to service. It does not include the time it takes for a unit to drive back to the fire station, complete any necessary paperwork such as required patient care reports, or non-emergency activities such as training.

While there are limited formal performance measures to use as a target measure, in May 2016, Henrico County (VA) Division of Fire published an article after studying their department's EMS workload.[18] As a result of the study, Henrico County Division of Fire developed a general commitment factor scale for their department. The next figure is a summary of the findings as it relates to commitment factors.

[18] "How Busy Is Busy?" https://www.fireengineering.com/articles/print/volume-169/issue-5/departments/fireems/how-busy-is-busy.html

Figure 66: Commitment Factors as Developed by Henrico County (VA) Division, 2016

Factor	Indication	Description
16%-24%	Ideal Commitment Range	Personnel can maintain training requirements and physical fitness and can consistently achieve response time benchmarks. Units are available to the community more than 75% of the day.
25%	System Stress	Community availability and unit sustainability are not questioned. First-due units are responding to their assigned community 75% of the time, and response benchmarks are rarely missed.
26%-29%	Evaluation Range	The community served will experience delayed incident responses. Just under 30% of the day, first-due ambulances are unavailable; thus, neighboring responders will likely exceed goals.
30%	"Line in the Sand"	Not Sustainable: Commitment Threshold—community has less than a 70% chance of timely emergency service and immediate relief is vital. Personnel assigned to units at or exceeding 30% may show signs of fatigue and burnout and may be at increased risk of errors. Required training and physical fitness sessions are not consistently completed.

The following figure shows the UHU values for HCFES command units. Command units tend to have lower UHU values because the majority of their work is administrative rather than responding to emergency incidents. Additionally, when command units do respond to emergency incidents, they often only remain on the scene until the major hazards have been mitigated. Command responsibilities are then normally transferred to a lower level such as the officer of a suppression unit.

Figure 67: HCFES Command UHU

Apparatus	2019	2020	2021	% Change 19 to 21
Chief 1	0.01%	0.01%	0.01%	0.00%
Chief 2	0.09%	0.16%	0.07%	-22.22%
Chief 3	0.14%	0.04%	0.10%	-28.57%
Chief 4	0.05%	0.03%	0.08%	60.00%
Chief 5[1]	N/A	N/A	N/A	N/A
Battalion 1	1.91%	2.23%	2.25%	17.80%
Battalion 2	2.89%	3.35%	2.83%	-2.08%
Battalion 3	2.02%	1.76%	2.09%	3.47%

[1] Chief 5 added to staff the end of 2021

The following figure shows the UHU values of HCFES frontline engines and truck (ladder) companies. These are the primary suppression units for HCFES. Although all suppression units are below the "Ideal Commitment Range" of 16 to 24%, almost all units had a significant increase in UHU from 2019 to 2021. HCFES should continue to monitor suppression UHU values to ensure units have proper time to complete non-emergency activities such as training, physical fitness, station chores, and building inspections. As shown in the following figure, all units except Engine 1 had a double-digit percent change in UHU value from 2019 to 2021.

Figure 68: HCFES Engine and Truck (Ladder) UHU

Apparatus	2019	2020	2021	% Change 19 to 21
Engine 1	9.91%	10.29%	10.27%	4%
Engine 2	8.32%	8.85%	9.25%	11%
Engine 3	7.42%	7.10%	9.24%	25%
Engine 4	9.69%	10.28%	11.40%	18%
Engine 5	8.79%	8.98%	10.18%	16%
Engine 6	2.00%	2.58%	2.88%	44%
Engine 7	5.14%	5.16%	6.35%	24%
Engine 8	5.37%	5.68%	6.68%	24%
Engine 9	4.30%	4.15%	5.28%	23%
Engine 11	11.05%	11.82%	13.23%	20%
Engine 12	9.72%	10.30%	11.09%	14%
Engine 13	4.96%	5.42%	6.32%	27%
Engine 14	6.28%	6.73%	7.36%	17%
Ladder 2[1]	0.47%	0.77%	1.67%	255%

[1] Ladder 2 crossed staff with Engine 2 until dedicated staffing in 2020. Unit was out of service for maintenance the majority of 2021.

Nearly 72% of the HCFES total call volume is EMS, therefore it is not surprising that HCFES medic units have high UHU values. Normally, medic units are on incidents longer than suppression units because of hospital transport times. The following figure shows the UHU values for HCFES medic units. Based on 2021 UHU values, Medics 1 and 11 are in the "Line in the Sand" category. Medics 2, 3, 4, 5, 10, and 12, are in the "Evaluation Range" category. Medic 204 is the "System Stress" category. Medic 14 is a peak until that is service 10 hours from 8:00 am to 6:00 pm. During those hours in service, Medic 14 is in the "Line in the Sand" category.

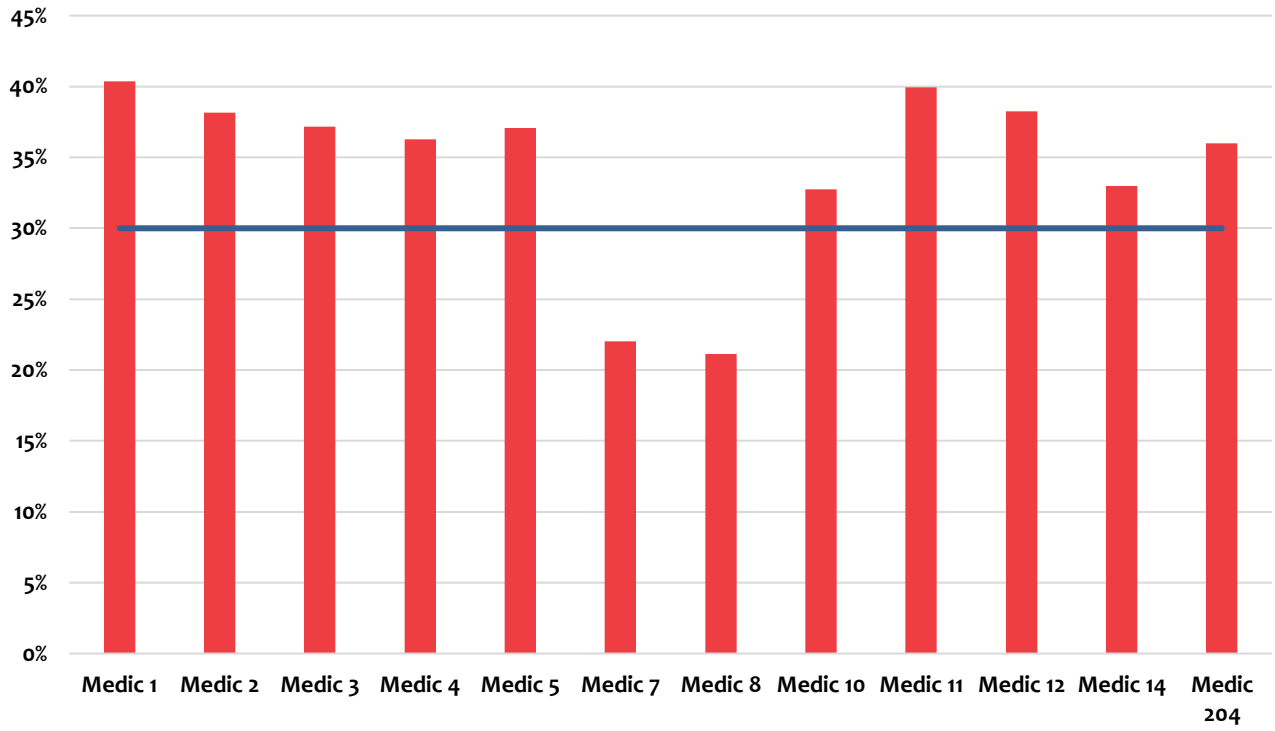
Figure 69: HCFES Medic Unit UHU

Apparatus	2019	2020	2021	% Change 19 to 21
Medic 1	23.28%	24.57%	30.37%	30%
Medic 2	24.00%	23.36%	28.67%	19%
Medic 3	21.94%	22.50%	28.65%	31%
Medic 4	18.55%	20.38%	26.17%	41%
Medic 5	22.43%	23.13%	28.13%	25%
Medic 7	14.28%	15.05%	17.88%	25%
Medic 8	12.73%	13.01%	16.74%	32%
Medic 10	25.26%	26.26%	28.37%	12%
Medic 11	23.34%	27.12%	32.32%	38%
Medic 12	23.64%	24.99%	29.18%	23%
Medic 14[1]	0.0%	2.39%	32.98%	N/A
Medic 204	18.31%	19.68%	25.72%	40%

[1] Medic 14 added the end of 2020 as a 10-hour peak unit, 8:00 am to 6:00 pm. Therefore, Medic 14 is only in service 10 hours, so UHU is based on 10 hours for Medic 14

The following figure shows the UHU values for HCFES medic units for calls dispatched between 8:00 am and 8:00 pm for 2021. This is known as peak UHU values. When analyzing peak UHU values, Medics 1, 2, 3, 4, 5, 10, 11, 12, and 204 are in the "Line in the Sand" category. Medic 14's UHU value is based on 10 hours, 8:00 am to 6:00 pm, and is in the "Line in the Sand" category for those hours. The "Line in the Sand" benchmark is marked on the graph at 30%. This puts a strain on the ability of HCFES to provide EMS transport units to the community in a timely manner during daytime hours.

Figure 70: HCFES Medic Unit Peak UHU, 8:00 am to 8:00 pm



Call Concurrency

Call concurrency refers to the number of incidents occurring simultaneously within the service area. As the number of concurrent incidents increases, the ability to respond to additional calls for service decreases. As illustrated in the following figure, concurrency of greater than one incident occurs frequently for HCFES. Over the five years analyzed, HCFES handled more one incident on average 81.5% of the time.

Figure 71: HCFES Call Concurrency, 2017–2021

Concurrent Incidents	2017	2018	2019	2020	2021	Average
Single Incident	15.5%	21.2%	21.5%	19.7%	14.6%	18.5%
Two Incidents	24.3%	30.0%	30.6%	28.9%	24.8%	27.7%
Three Incidents	22.8%	23.9%	24.2%	24.6%	24.4%	24.0%
Four Incidents	16.4%	13.9%	13.7%	15.1%	17.8%	15.4%
Five Incidents	10.5%	6.6%	6.5%	7.3%	10.2%	8.2%
Six Incidents	5.6%	2.8%	2.4%	3.0%	4.9%	3.7%
Seven Incidents	2.9%	1.1%	0.8%	1.0%	2.2%	1.6%
More than Seven Incidents	2.0%	0.5%	0.3%	0.4%	1.1%	0.9%

SECTION II:
Future System Demand Forecasts

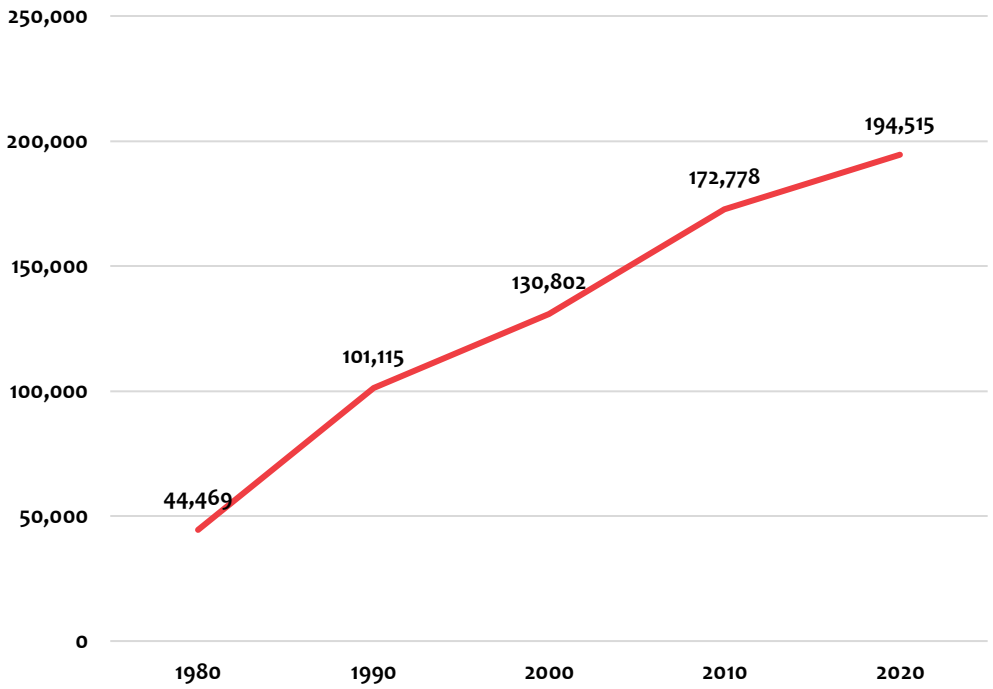
POPULATION GROWTH PROJECTIONS

Since human activity is a primary driver of emergency service demand, it is essential to have a population-based projection of the future size of the County. It is impossible to determine the exact population of the future, but an educated prediction can be determined by analyzing population history, census-based population growth predictions, and future land use.

Population History

Analyzing population history is helpful when determining future population projections. The following figure shows the population history of Hernando County from 1980 to 2020 using the U.S. Census Bureau decennial census statistics.

Figure 72: Census-Based Population Growth Projections



The largest percent of change in population growth over the last 40 years occurred from 1980 to 1990 when the population increased by 127%. The population increased 13% from 2010 to 2020. The following figure shows the percent of change between each decennial census from 1980 to 2020.

Figure 73: Decennial Census Percent of Change, 1980 to 2020

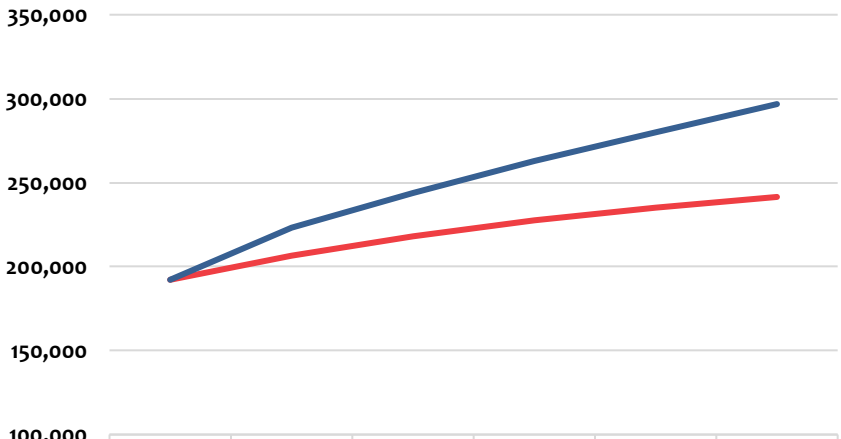
Years	Percent of Change
1980 to 1990	127%
1990 to 2000	29%
2000 to 2010	32%
2010 to 2020	13%

Census-Based Population Growth Projections

ESCI utilized the University of Florida Bureau of Economic Business Research (BEBR) data to assist with census-based population growth projections. The latest projections were published in April 2021 in the Volume 54, Bulletin 189 publication.[19] The projections used a 2020 estimated population of 192,186 because the 2020 U.S. Census data was not yet available. As mentioned earlier in this report the actual 2020 U.S. Census population statistic was 194,515. The 2020 estimated statistic used by BEBR is only a 1.2% difference from the actual population statistic reported by the U.S. Census Bureau.

BEBR performs various statistical estimates that yield 11 estimates for each county. From these estimates, BEBR calculates three population projections – low, medium, and high. The medium is believed to provide the most accurate projections. The following graph shows the medium and high estimates of population projections in five-year intervals through 2045 for Hernando County. ESCI did not include the low estimates as the low 2045 estimate was 197,000. ESCI does not believe the population will remain nearly consistent through 2045 as the BEBR low estimate predicts because of the impact of planned developments within the County.

Figure 74: Census-Based Population Growth Projections



	2020	2025	2030	2035	2040	2045
Medium	192,186	206,400	218,200	227,500	235,000	241,500
High	192,186	223,100	244,000	263,100	280,100	296,800

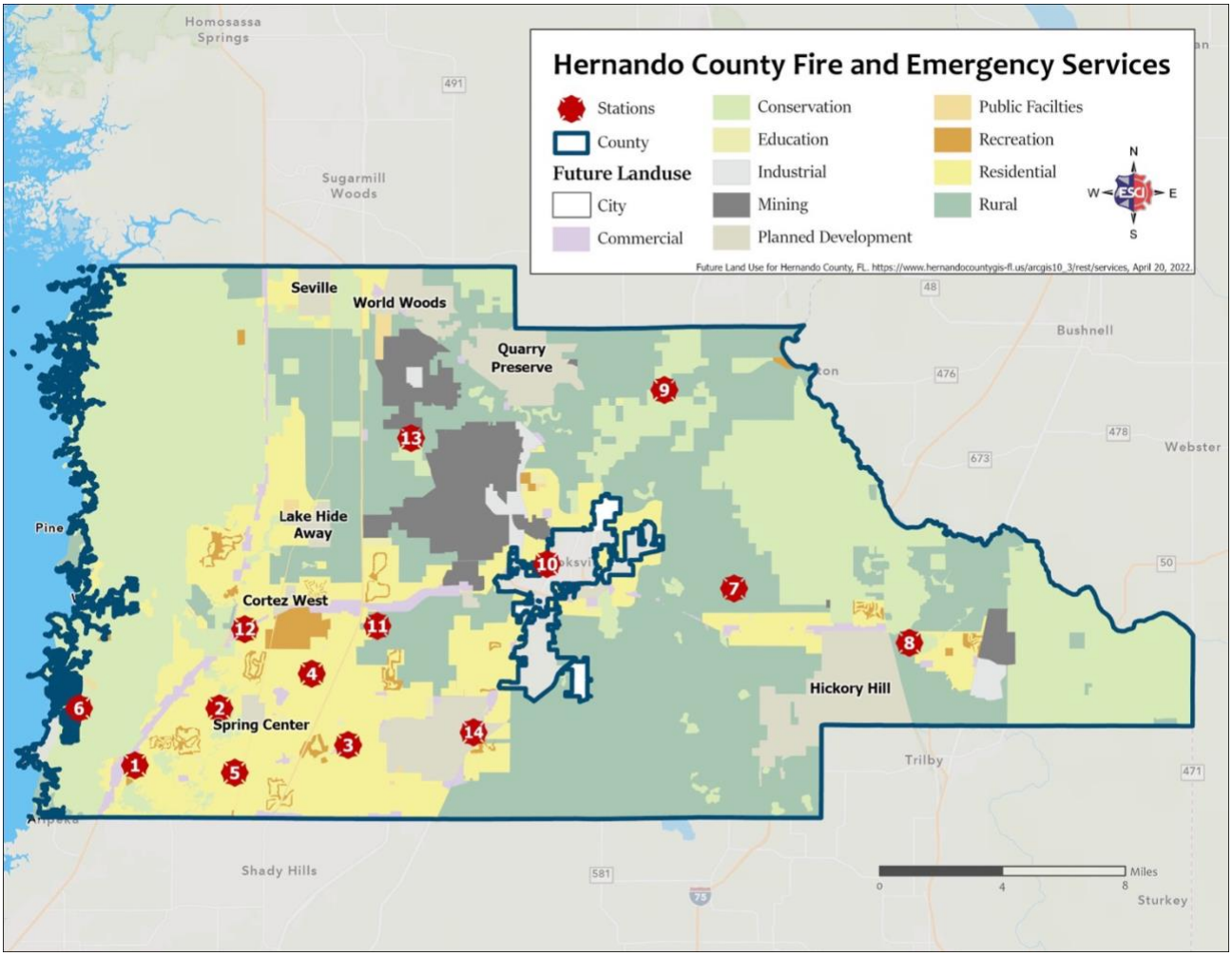
As seen in the previous figure, the population of Hernando County is expected to grow to 241,500 on a medium projection to 296,800 on a high projection by 2045 based on BEBR estimates.

[19] "Projections of Florida Population by County, 2025–2045, with Estimates for 2020." https://www.bebr.ufl.edu/sites/default/files/Research%20Reports/projections_2021.pdf

Community Planning-Based Population Growth Projections

Utilizing future land use data can help determine population projections. The following figure shows the future land use in Hernando County with the location of the future developments.

Figure 75: Future Land Use



The following figure shows the dwelling units, estimated population, and nonresidential area that each of the future developments will bring to Hernando County. The estimated population for the future developments was calculated from the U.S. Census Bureau estimate of 2.46 people per household within Hernando County. The planned developments are estimated to bring nearly 69,000 additional residents to Hernando County and add approximately 2.7 million square feet of nonresidential area. Using the U.S. Census Bureau 2021 population estimate of 200,628, the planned developments will increase the population of the county by over 30%.

Figure 76: Planned Development Population Impact

Development Name	Dwelling Units	Estimated Population[1]	Nonresidential Area
Lake Hideaway	3,700	9,102	200,000 sq. ft.
Seville East	726	1,786	800,000 sq. ft.
Seville West	3,085	7,589	54,000 sq. ft.
Quarry Preserve	5,800	14,268	1,165,000 sq. ft.[2]
World Woods	1,026	2,524	N/A
I-75/SR 50 PDD/Hickory Hill[3]	9,600	23,616	465,000 sq. ft.
Spring Center	3,000	7,380	N/A
Cortez	980	2,411	N/A
Total	**27,917**	**68,676**	**2,684,000 sq. ft.**

[1] Estimated calculated using U.S. Census Bureau average of 2.46 people per household
[2] Includes 850,000 sq. ft. business park
[3] PDD = Planned Development District, Includes Sunrise

Population Projections Discussion

Population projections should be analyzed at often to determine changes. HCFES should continue to work with the Hernando County Planning and Zoning Departments to determine if additional planned developments are approved or if changes are made to the existing plans. ESCI concluded the following based on the current population, BEBR analysis, and planned development information:

1. The population of Hernando County will continue to grow and HCFES should be prepared for the additional service demand that will result from this increase.
2. ESCI recommends that HCFES should prepare for the BEBR high estimated population projection of 296,800 by year 2045. Current planned developments are expected to increase the population to over 268,000. There is the potential for additional planned developments to be added by 2045.
3. HCFES needs to be prepared for different population density areas. Historically the Spring Hill area has created a high demand for service due to the high population density in the area as seen in Figure 45: Hernando County Population Density and Figure 46: HCFES Incident Density (All Incidents), 2019-2021. With the 10,000 dwelling units planned in the Northwest Center of Hernando County, this area could create a new demand for high service. There is also a business park that is planned which could attract other future residential and commercial development in this area. Also, the I-75/SR 50 PDD/Hickory Hill area could also create a new service demand area as well with 9,600 dwelling units planned.

SERVICE DEMAND PROJECTIONS

In evaluating the deployment of resources and staffing, it is imperative consideration be given to potential changes, such as population change, demographics, and economic activity, which can directly affect emergency workload. Changes in service demand might require changes and adjustments in the deployment of staffing, apparatus, and stations in order to maintain acceptable levels of performance.

Future population and the activity of that population are significant predictors of future service demand. All requests for EMS service are people driven. The National Fire Protection Association (NFPA) reports that approximately 70% of all fires are the result of people doing either something they should not do (i.e., illegal burning, misuse of an ignition source) or not doing something they should have (i.e., failure to maintain equipment).[20] It is reasonable to use future population change to predict future service demand.

Service Demand Projection Analysis

The current service demand per 1,000 population is determined by taking the annual number of responses from 2017 to 2021 and dividing it by the population numbers in thousands. Looking at the 2020 U.S. Census Bureau population of 194,515, the rate of total service demand is about 171 incidents per 1,000 population. ESCI increased this number to 180 incidents per 1,000 due to the low call volume many departments experience in 2020 from CVOID-19 and the fact that the 2021 call total was 5,000 more than the other four years analyzed. HCFES 2022 call volume is trending closer to the 2021 number. Therefore, this increase from 171 to 180 incidents per 1,000 people provides a better estimate for future service demand. Two models were created, one using the BEBR medium estimates and one using the BEBR high estimates. The following figures illustrate service demand projections for HCFES. Figure 77 shows the total projected annual incidents using BEBR medium population estimates and Figure 78 shows the incidents broken down by incident type. Figure 79 illustrates the total projected annual incidents using BEBR high population estimates and Figure 80 shows the incidents broken down by incident type.

[20] "Home Structure Fires." https://www.nfpa.org//-/media/Files/News-and-Research/Fire-statistics-and-reports/Building-and-life-safety/oshomes.pdf

Figure 77: Total Service Demand Projections, 2025-2045 from BEBR Medium Growth

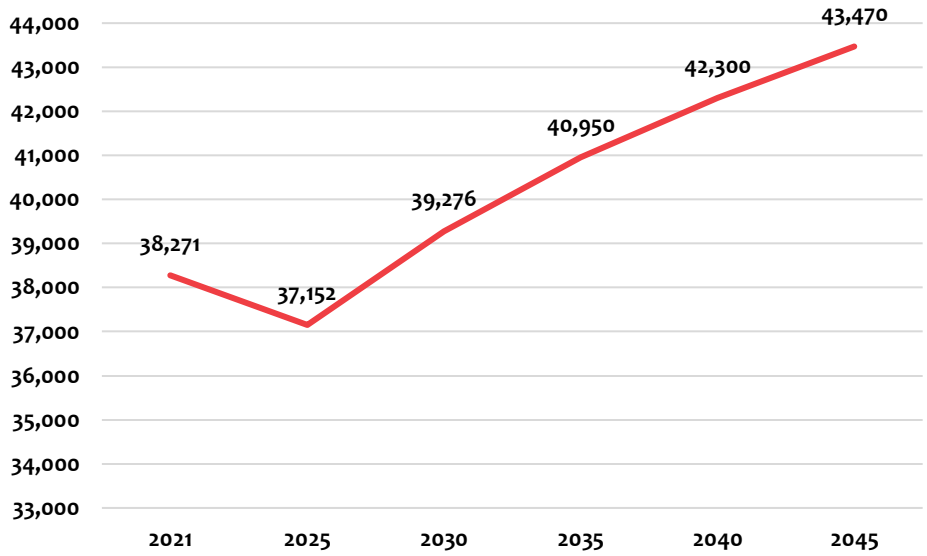
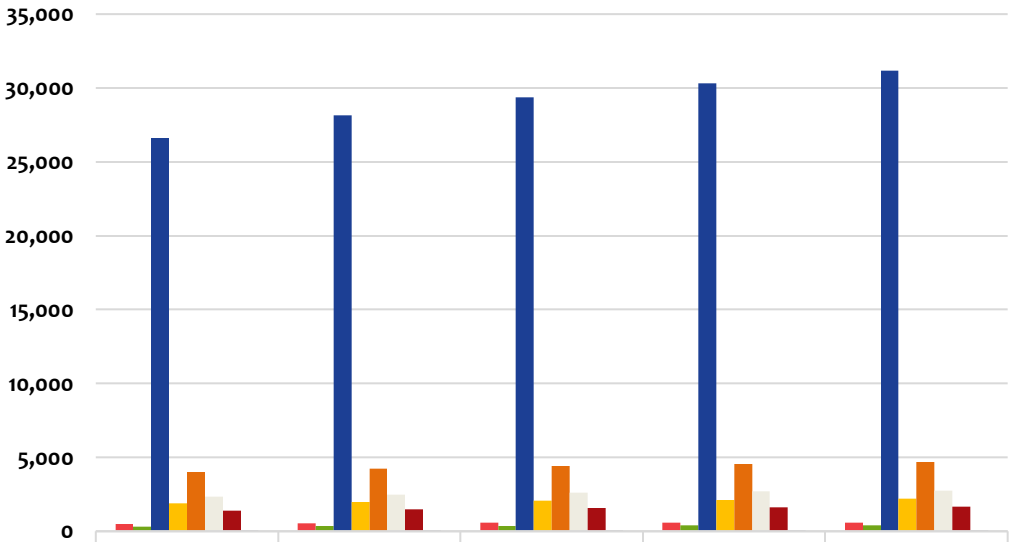


Figure 78: Service Demand Projections by Incident Type, 2025-2045 from BEBR Medium Growth



	2025	2030	2035	2040	2045
Fire	511	540	563	581	598
Hazardous Condition	334	353	368	380	390
EMS	26,630	28,153	29,353	30,320	31,159
MVC	1,877	1,985	2,069	2,138	2,197
Service Call	3,995	4,224	4,404	4,549	4,675
Canceled, Good Intent	2,363	2,498	2,604	2,690	2,765
Alarm	1,409	1,490	1,554	1,605	1,649
Other	32	34	36	37	38

Figure 79: Total Service Demand Projections, 2025-2045 from BEBR High Growth

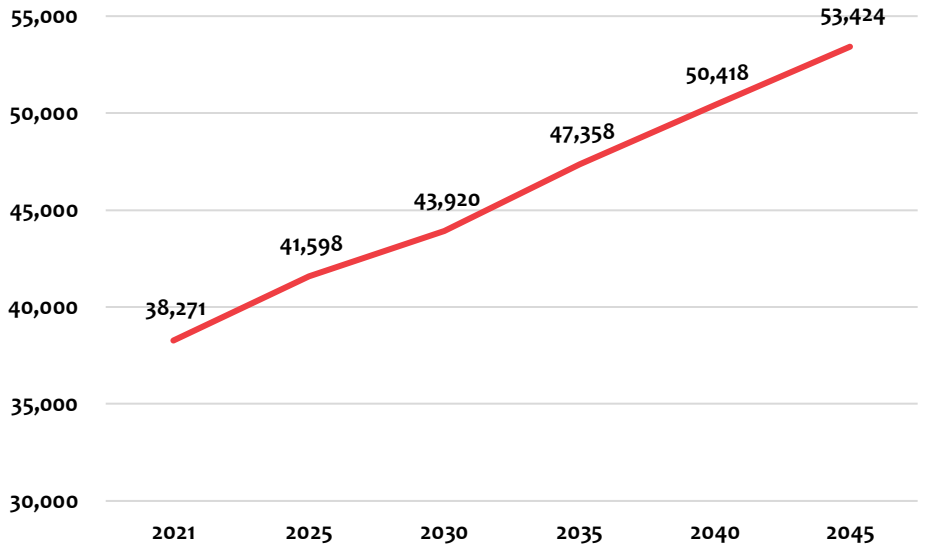
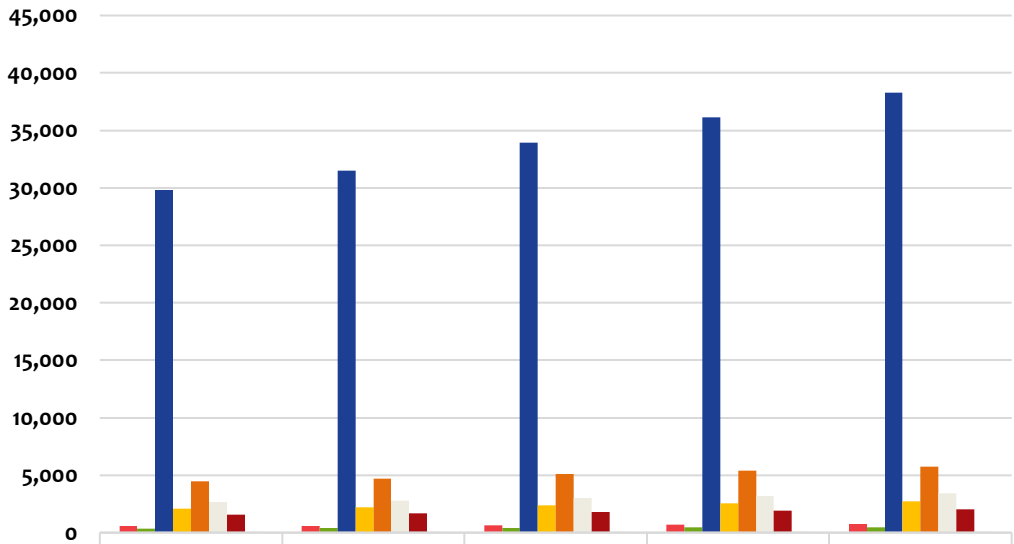


Figure 80: Service Demand Projections by Incident Type, 2025-2045 from BEBR High Growth



	2025	2030	2035	2040	2045
Fire	572	604	651	693	734
Hazardous Condition	374	394	425	453	480
EMS	29,817	31,481	33,946	36,139	38,294
MVC	2,102	2,219	2,393	2,548	2,700
Service Call	4,473	4,723	5,093	5,422	5,745
Canceled, Good Intent	2,646	2,793	3,012	3,207	3,398
Alarm	1,578	1,666	1,797	1,913	2,027
Other	36	38	41	44	47

Impact of Planned Developments

The following figure estimates the projected annual incidents that each of the planned developments will add to the HCFES call volume. ESCI utilized 180 incidents per 1,000 people. Using the 2021 totals incidents of 38,271, the planned urban developments are estimated to add 12,360 incidents per year, pushing the HCFES annual call volume over 50,000 incidents per year.

Figure 81: Planned Development Service Demand Impact

Development Name	Dwelling Units	Estimated Population[1]	Projected Incidents/ Year
Lake Hideaway	3,700	9,102	1,638
Seville East	726	1,786	321
Seville West	3,085	7,589	1,366
Quarry Preserve	5,800	14,268	2,568
World Woods	1,026	2,524	454
I-75/SR 50 PDD/Hickory Hill[2]	9,600	23,616	4,251
Spring Center	3,000	7,380	1,328
Cortez	980	2,411	434
Total	**27,917**	**68,676**	**12,360**

[1] Estimated calculated using U.S. Census Bureau average of 2.46 people per household

[2] PDD = Planned Development District, Includes Sunrise

Impact of Aging Population on Service Demand

The previous method produces the potential number of calls in the future; however, it does not consider demographic changes. The existing population will likely continue to age in place. The increasing number of elderly populations will increase the demand for emergency medical services as the elderly population is a disproportionately greater user of these services. National medical industry studies suggest that patients over 65 years of age are three times more likely to access local emergency services than other age groups.[21] Also, Florida is a top retirement spot due to its warm climate and the lack of state income tax. Therefore, many of Hernando County's new residents may be those over the age of 65. It is reasonable to assume that demand for emergency medical services in this age group will increase proportionally with the increase in size of the aging population.

[21] "Trends in Hospital Emergency Department Visits by Age and Payer." https://www.hcup-us.ahrq.gov/reports/statbriefs/sb238-Emergency-Department-Age-Payer-2006-2015.jsp

COMMUNITY RISK ANALYSIS

Every community is unique in the types of risks present that potentially threaten people and property. ESCI has identified and evaluated community risks specific to the Hernando County area based on the population and demographics, local land use and development, and the geography and natural hazards of the area. Mitigation of these risks affects the number of resources (personnel, equipment, and apparatus) necessary to improve the response, recovery, and resilience of the community.

Characterizing Risk

A community risk assessment (CRA) is "the identification of potential and likely risks within a particular community and the process of prioritizing those risks." This concept is consistent with the FEMA concept of "whole community" and shared responsibility for emergency preparedness.[22] Thus, CRA is a critical component of the core capabilities, or phases, of emergency management—prevent, prepare, respond, recover, and mitigate as shown in the following figure.

Figure 82: CRA and the Core Capabilities of Emergency Response

- **Prevention** focuses on preventing human hazards, primarily from potential natural disasters or terrorist (both physical and biological) attacks.
- **Preparation** is a continuous cycle of planning, organizing, training, equipping, exercising, evaluating, and taking corrective action.

[22] National Planning Frameworks, U.S. Department of Homeland Security, FEMA, 2018. https://www.fema.gov/whole-community.

- **Response** is the coordination and management of resources in an all-hazards approach with measures taken for life/property/environmental safety.
- **Recovery** is the group of activities to restore critical community functions and begin to manage stabilization efforts.
- **Mitigation** is the effort to reduce the loss of life and property by lessening the impact of disasters and emergencies.

Every community has risks that are unique to that community. These include natural hazards associated with climate and topography, population and demographics, technological and human-caused hazards, types of structures and their intended uses, and the type of service and transportation infrastructure. Hernando County and HCFES acknowledges there are hazards in the community, that these hazards pose a risk to life and property, that these hazards vary in likelihood and impact, both on the community and the agency, and that these risks directly influence the fire department planning and response activities. ESCI commends Hernando County for producing the "Hernando County Local Mitigation Strategy" to lessen the human, economic, and environmental impacts from hazards.[23]

Hazard Classification

Hernando County is susceptible to a variety of hazards, which can be grouped into one of two categories:

1. **Natural hazards**: Result from acts of nature.
2. **Technological/Human-caused hazards**: Result from accidents or failures of systems and structures; or from the actions of people, both accidental and intentional.

The demographics of the population can affect the amount of service demand and the nature of risk within a community.

History of Hazards and Vulnerabilities

Since 1953, there have been 28 federally declared disasters in Hernando County. The cause for each of these declarations is shown in the following figure.

[23] "Hernando County Local Mitigation Strategy." https://www.hernandocounty.us/home/showpublisheddocument/7242/637650444836030000

Figure 83: Federally Declared Disasters, 1953 to 2021

Type	Number	Percentage
Hurricane/Tropical Storm	13	46%
Severe Storms(s)	6	21%
Freezing	3	11%
Biological	2	7%
Fire	2	7%
Flood	1	4%
Tornado	1	4%
Total	**28**	**100.0%**

Natural Hazards

There are various types of natural hazards that could affect Hernando County. Even though human activity is the primary driver for service demand, natural hazards will also increase service demand. As seen in Figure 83, some of these natural hazards have impacted Hernando County in the past. The following figure shows the natural hazards and their hazard priority ranking according to the "Hernando County Local Mitigation Strategy."[24] ESCI will cover the high-risk hazards in greater depth.

Figure 84: Natural Hazards

Type	Priority Ranking
Flood	High-Risk
Tropical Cyclone (Hurricane)	High-Risk
Wildfire	High-Risk
Serve Storms	Moderate-Risk
Geological	Moderate-Risk
Extreme Heat	Moderate-Risk
Drought	Moderate-Risk
Winter Storms	Low-Risk
Erosion	Low-Risk
Seismic Events	Low-Risk
Tsunami	Low-Risk

[24] "Hernando County Local Mitigation Strategy." https://www.hernandocounty.us/home/showpublisheddocument/7242/637650444836030000

Flooding

Flooding is one of the highest priority natural hazards in Hernando County. There are various risks associated with flooding. It is essential therefore that communities in flood zones and areas prone to flooding be informed of the risks. Before the flood and as part of the planning process, HCFES must consider station location and relocations as they relate to flood zones. The current locations of Station 6, 8, and 9 are located in or near designated flood zones. The elevated design of new Station 6 took this into consideration to limit the impact to emergency response and damage to the station in the event of a flood.

During a flooding event, HCFES will be called upon to assist in evacuations and rescues. These evacuations may include facilities with large numbers of people requiring EMS resources. Rescue and emergency evacuations may involve flowing water and require specially trained technical rescue teams to intervene.

After a flood, as the residents begin recovery, EMS related incidents will increase as injuries and medical conditions occur. Public education can help the community prepare for the recovery process as well. The following figure lists the flood zone areas according to FEMA found in Hernando County.[25]

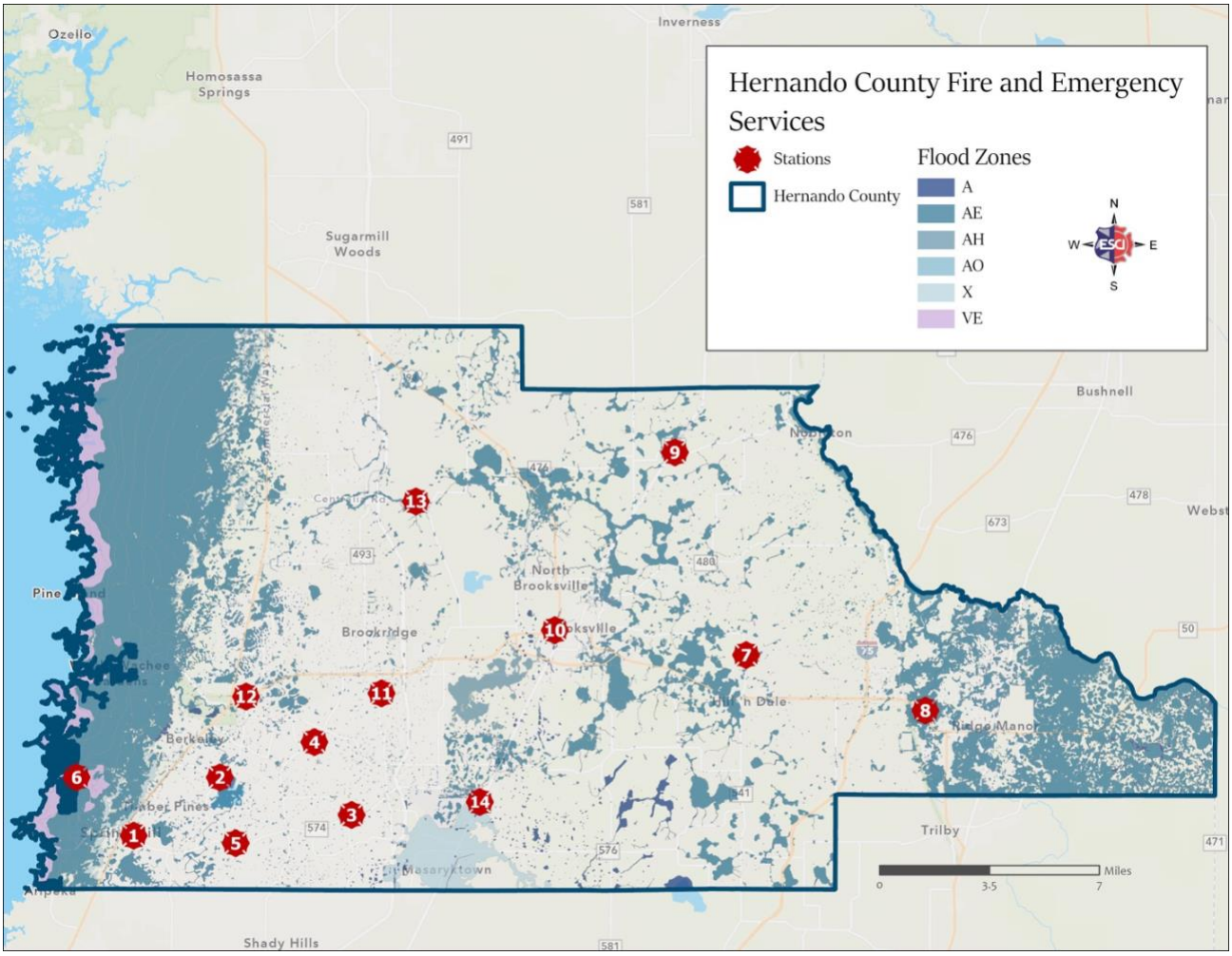
Figure 85: Flood Zone Designations

Designation	Definition	Risk
Zone A	Area inundated by the Base Flood with no Base Flood Elevations determined.	High-Risk
Zone AE	Area inundated by the Base Flood with Base Flood Elevations determined.	High-Risk
Zone AH	Area inundated by the Base Flood with flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.	High-Risk
Zone AO	Area inundated by the Base Flood with flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities are also determined.	High-Risk
Zone VE	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.	High-Risk
Zone X	Areas determined to be outside the 0.2% annual chance floodplain	Moderate-to-Low risk

[25] "FEMA Flood Zone Definitions." https://pw.lacounty.gov/wmd/floodzone/docs/FZD_Legend.pdf

The following map shows the location of the flood zones within Hernando County.

Figure 86: Hernando County Flood Zone Locations



Tropical Cyclone

A second high natural hazard priority for Hernando County is tropical cyclones. Hurricanes fall within tropical cyclones, but tropical cyclones also include tropical storms and tropical depressions. The following figure defines a tropical cyclone and the different categories within from the National Hurricane Center (NHC).[26]

Figure 87: Typical Cyclone Definitions

Type	Definition
Tropical Cyclone	A warm-core non-frontal synoptic-scale cyclone, originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation about a well-defined center. Once formed, a tropical cyclone is maintained by the extraction of heat energy from the ocean at high temperature and heat export at the low temperatures of the upper troposphere.
Hurricane	A tropical cyclone in which the maximum sustained surface wind (using the U.S. 1-minute average) is 64 kt (74 mph or 119 km/hr) or more. The term hurricane is used for Northern Hemisphere tropical cyclones east of the International Dateline to the Greenwich Meridian.
Tropical Storm	A tropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1-minute average) ranges from 34 kt (39 mph or 63 km/hr) to 63 kt (73 mph or 118 km/hr).
Tropical Depression	A tropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1-minute average) is 33 kt (38 mph or 62 km/hr) or less.

Florida and Hernando County are tropical cyclone prone. The high winds associated with these types of storms can result in widespread damage to buildings, downed trees, and power outages. Due to the high likelihood of tropical cyclones, ESCI recommends that all HCFES have hurricane protective measures installed at all fire stations. The following figure shows the Saffir-Simpson Hurricane Wind Scale. It displays the category of hurricanes and the type of damage that is common with each.[27]

[26] "NHC Terms." https://www.nhc.noaa.gov/aboutgloss.shtml#TROPCYC
[27] "Saffir-Simpson Hurricane Wind Scale." https://www.nhc.noaa.gov/aboutsshws.php

Figure 88: Saffir-Simpson Hurricane Damage Scale

Scale	Wind Estimate MPH	Typical Damage
Cat 1	74–95	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to the roof, shingles, vinyl siding, and gutters. Large branches of trees will snap, and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
Cat 2	96–110	Extremely dangerous winds will cause extensive damage: Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power outage.
Cat 3 (Major)	111–129	Devastating damage will occur: Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
Cat 4 (Major)	130–156	Catastrophic damage will occur: Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted, and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
Cat 5 (Major)	157 or Higher	Catastrophic damage will occur: A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

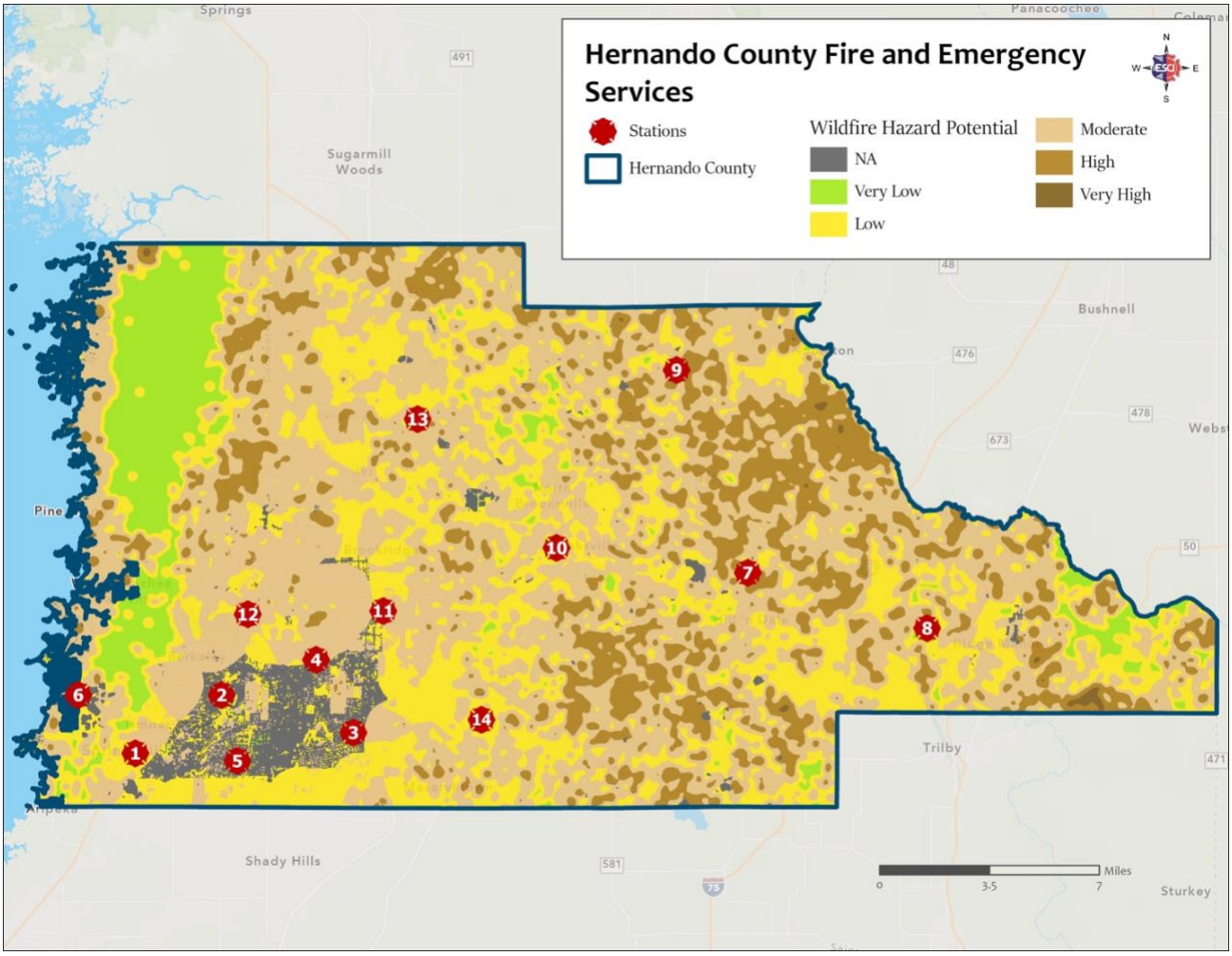
Wildfires

Another high priority for natural hazards in Hernando County is wildfires. Wildfire risk is the potential for a wildfire to adversely affect things that residents value - lives, homes, or ecological functions and attributes. Human activities, weather patterns, wildfire fuels, values potentially threatened by fire, and the availability (or lack) of resources to suppress a fire all contribute to wildfire risk. Increased chance of wildfires occurs when there is low rainfall, high temperatures, low humidity, thunderstorms, high winds, and lightning. The U.S. Forest Service's Fire Modeling Institute developed a Wildfire Hazard Potential map based on the assessment of wildfire risk.[28]

[28] "Wildfire Hazard Potential." https://www.firelab.org/project/wildfire-hazard-potential

The following map shows the Wildfire Hazard Potential for Hernando County.

Figure 89: Hernando County Wildfire Hazard Potential



Hernando County has a moderate to high Wildfire Hazard Potential in the Eastern end of the County and a moderate potential along the US 19 corridor in the Northern part of the County. HCFES understands the risk of wildfires to the County and ensures personnel have the resources and training to handle these emergencies. HCFES deploys brush trucks from Stations 6, 7, 8, 9, 11, 12, 13, and 14. HCFES personnel receive training on proper techniques to control and extinguish wildfires.

Technological/Human-Caused Hazards

Technological or human-caused hazards result from accidents or failures of systems and structures, or the actions of people, either accidental or intentional. Human-caused incidents result from the intentional actions of an adversary, such as a threatened or actual chemical attack, biological attack, or cyber incident. Intentional acts are always deliberate, with varying levels of intent. Accidental acts are careless or reckless, or poorly planned or executed, with the outcome having unintended consequences. The following figure shows the technological/human-caused hazards ranking according to the "Hernando County Local Mitigation Strategy."[29] As shown in the figure, there are no high-risk technological/human-caused hazards to Hernando County.

Figure 90: Technological/Human-Caused Hazards

Type	Priority Ranking
Hazardous Materials	Moderate-Risk
Cyber Incident	Moderate-Risk
Terrorism	Moderate-Risk
Biological Incident	Low-Risk

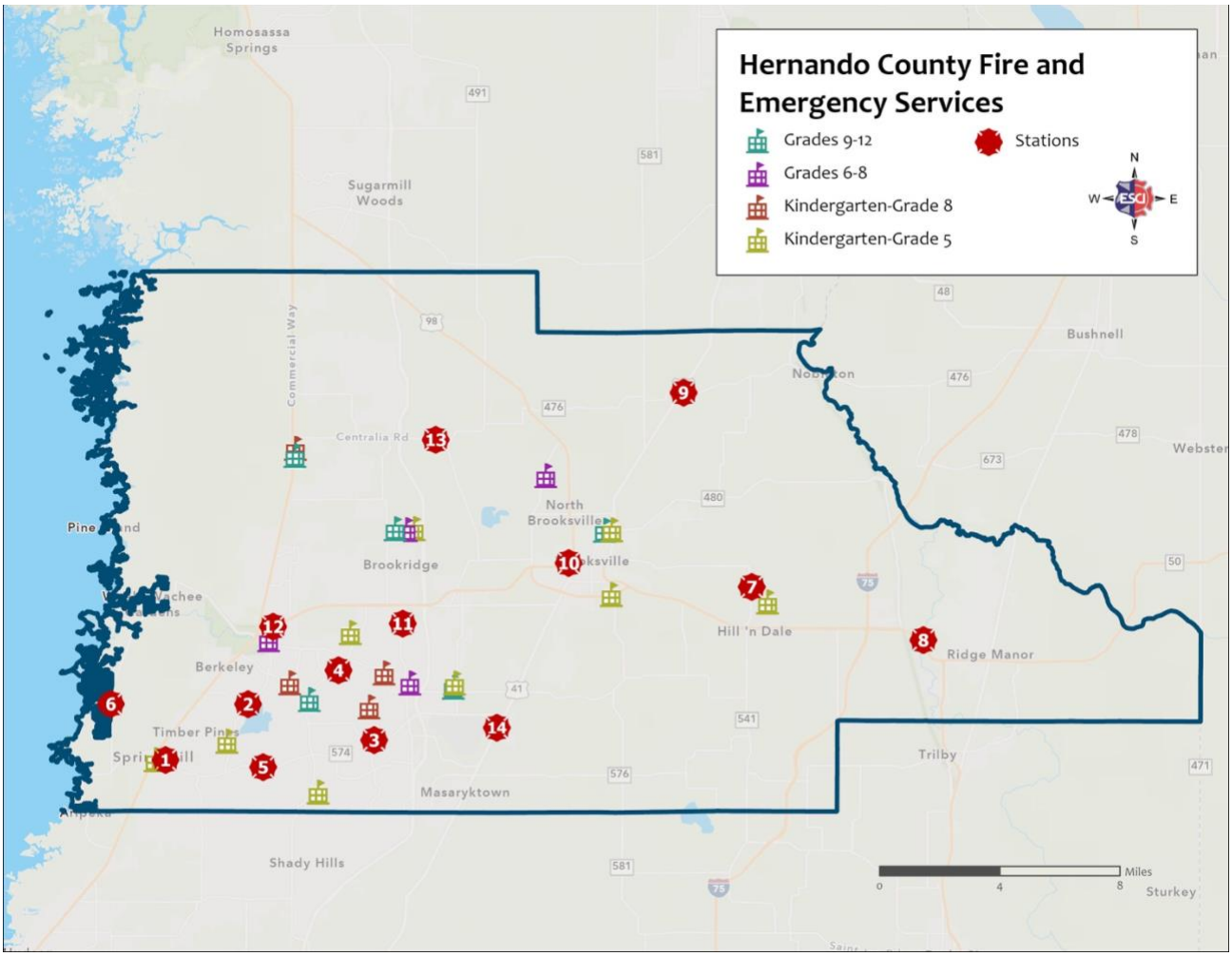
HCFES has a Hazardous Materials Response Team that is trained to handle hazardous materials emergency incidents. HCFES will be relied upon heavily for any terrorism or biological incidents such as the COVID-19 pandemic.

[29] "Hernando County Local Mitigation Strategy." https://www.hernandocounty.us/home/showpublisheddocument/7242/637650444836030000

Schools

Schools are part of critical infrastructure that could be the target of a technological/human-caused hazard incident, especially a terrorist attack or a mass casualty incident. The following figure shows the location of schools within Hernando County.

Figure 91: Hernando County School Locations



At-Risk Populations

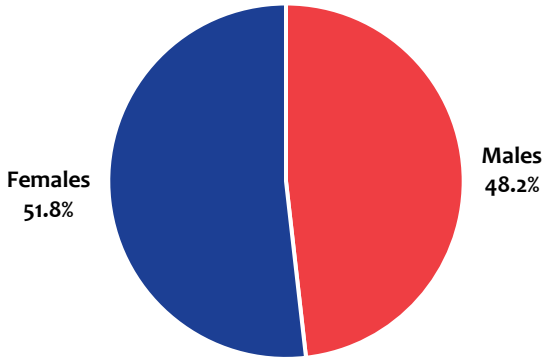
The Journal of General Internal Medicine defines "Populations at Risk" very broadly.[30] The definition includes the poor, frail, disabled, economically disadvantaged, homeless, racial, and ethnic minorities, as well as people with low literacy. The U.S Fire Administration and NFPA have identified the groups that face a higher risk of being injured or killed in a fire as:[31, 32]

- Males
- Children under 5 years of age
- Adults over the age of 65 years
- Persons with disabilities
- Persons with language barriers
- Persons in low-income communities

Males

Males, especially those under 25 years old, are more prone to engage in risky activities and may require higher levels of emergency response. This is somewhat, but not completely, offset by complications during pregnancy. The gender divide in population of Hernando County is very close to being even according to the U.S. Census Bureau.[33]

Figure 92: Hernando County Gender Breakdown



[30] "Populations at Risk: A New Section for JGIM." https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1495434/

[31] "Fire Risk in 2015," U.S. Fire Administration, September 2017, Volume 18, Issue 6; Retrieved from https://www.usfa.fema.gov/downloads/pdf/statistics/v18i6.pdf?utm_source=website&utm_medium=pubsapp&utm_content=Fire Risk in 2015&utm_campaign=RID

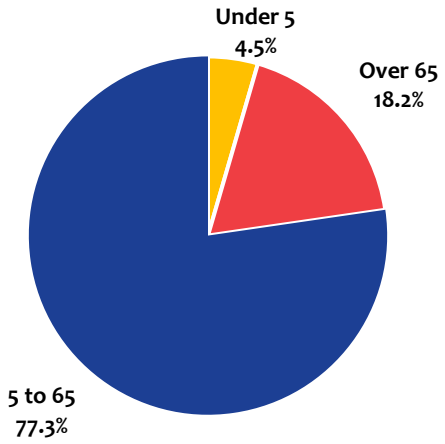
[32] "Urban Fire Safety Project." https://www.nfpa.org/-/media/Files/Public-Education/By-topic/Urban/Urban-Task-Force/urbanreport.ashx

[33] U.S. Census Bureau. https://www.census.gov/quickfacts/fact/table/hernandocountyflorida/LND110210

Age

Based on 2020 U.S. Census Bureau Data, nearly 23% of the total population in Hernando County fall within the at-risk population age groups (children under 5 years of age and adults over the age of 65).[34] The following figure shows the breakdown.

Figure 93: Hernando County Age Breakdown



The very young represent a vulnerable population, as they may have limited mobility and ability to escape a structure fire as well as their susceptibility to serious medical ailments such as asthma, traumatic events, choking, or injury from vehicular accidents. On the other side of the age spectrum, there is an increase in demand for service as the community population ages and a corresponding increase in community risk, especially in the use of EMS services. Quality of life issues and increased reliance on assisted living could affect service delivery and the number of resources required due to an increase in service demand for emergency medical services.

Disabilities

People living with a disability may have difficulty or be incapable of self-preservation during an emergency. Thus, they may require a higher level of fire-rescue and EMS responses. The U.S. Census Bureau reports the percentage of people under the age of 65 years old with a disability. Hernando County has an estimated 13.3% of the population under 65 with a disability, according to the U.S. Census Bureau.[35]

People Without Health Insurance

Although access to health insurance is not included in the NFPA at-risk categories, it is well documented and known that persons without health insurance do not seek treatment promptly. Therefore, they are more susceptible to developing chronic health conditions and/or a dependence on emergency services. According to the U.S. Census Bureau, 15.6% of the population under the age

[34] U.S. Census Bureau. https://www.census.gov/quickfacts/fact/table/hernandocountyflorida/LND110210
[35] Ibid.

of 65 in Hernando County do not have health insurance.[36]

Language Barrier

People may have cultural differences or language barriers that decrease the likelihood they would call for service or may affect their ability to communicate needs and concerns effectively. According to the NFPA, "Language barriers, cultural differences, and inexperience with unfamiliar home technologies are factors that mark the challenges of helping newcomers live safely from the threat of fire in the home."[37] By itself, speaking a language other than English at home does not directly contribute to difficulties in communicating with others; however, if a person has difficulty speaking English, it may contribute to negative outcomes during an emergency. The U.S. Census Bureau reports that 11.4% of Hernando County's population speak a language other than English at home.[38]

Low-Income

People living in poverty experience an increased risk from fire or medical conditions due to age or condition of housing level, inability to pay for routine medical care, lack of medical insurance, and general health conditions. Sometimes, the lack of access to transportation leads to an increased use of care and transport. Those living below the poverty line are the most at-risk. The low-income category is often combined with other factors such as education, disability, and work status. In rural communities such as the Eastern part of Hernando County, residents may live far from treatment centers and require extended response times. According to the U.S. Census Bureau, 12.5% of the population is below the poverty level.[39]

[36] U.S. Census Bureau. https://www.census.gov/quickfacts/fact/table/hernandocountyflorida/LND110210

[37] Serving immigrant and refugee populations, National Fire Protection Association, 2017. https://www.nfpa.org/Public-Education/Campaigns/Fire-Prevention-Week/Teaching-FPW/Serving-immigrant-and-refuge-populations.

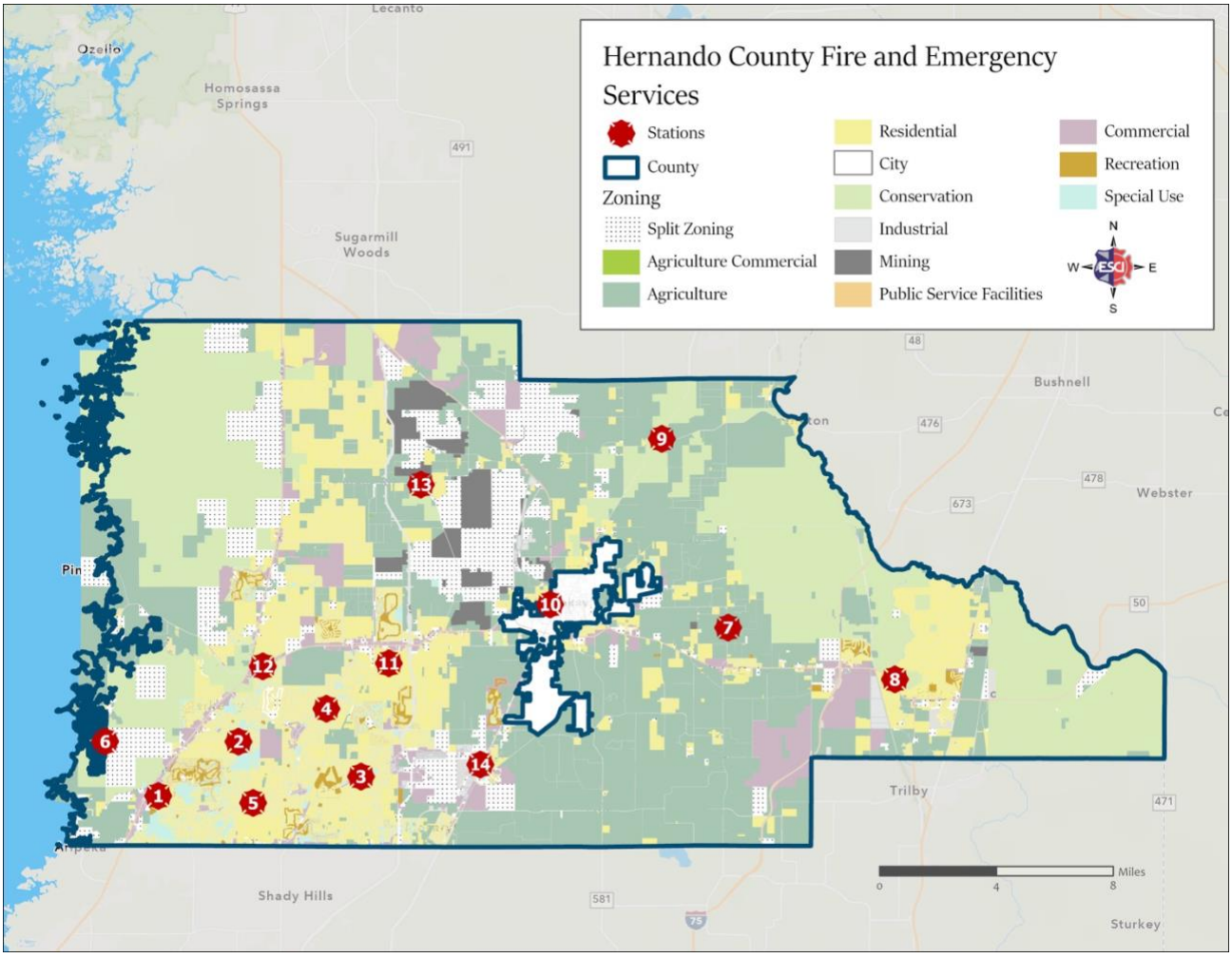
[38] U.S. Census Bureau. https://www.census.gov/quickfacts/fact/table/hernandocountyflorida/LND110210

[39] Ibid.

Community Land Use

As the population of Hernando County grows, future infrastructure will be necessary to sustain the growth. Infrastructure will include roads, bridges, sewers, water, fire hydrants, hospitals, schools, and fire stations. When examining the zoning of a jurisdiction, additional considerations are the impacts that new development and changes to existing structures may have on emergency response capabilities. The following figure shows the current zoning within Hernando County.

Figure 94: Hernando County Current Land Zoning



The following table shows the breakdown of existing land use from the "Hernando County 2040 Comprehensive Plan."[40]

Figure 95: Current Land Use

Land Use	Acres	Percent of Total Land
Agriculture	79,199	24.4%
Commercial	2,146	0.7%
Conservation	97,626	30.1%
Education	1,187	0.4%
Industrial	836	0.3%
Mining	6,314	1.9%
Mobile Homes	14,192	4.4%
Multi-Family	569	0.2%
Private Institutional	2,554	0.8%
Publicly Owned	4,325	1.3%
Recreation	6,935	2.1%
Right of Way	16,643	5.1%
Single Family	39,010	12.0%
Utilities	1,918	0.6%
Vacant	35,139	10.8%
Water/Wetlands	15,338	4.7%
Total	**323,961**	**100%**

Activities occurring within a building or on an undeveloped property can often be used to begin the process of risk classification. Zoning maps provide permitted use information for each parcel identified by land use designation. Vacant lots and open land are often identified as a much lower risk than commercial or industrial occupancies as open areas lack the people and processes associated with emergency incidents. Fires in commercial occupancies often lead to higher dollar loss than many residential properties, and the long-term income loss affects the people employed by the business when it is destroyed.

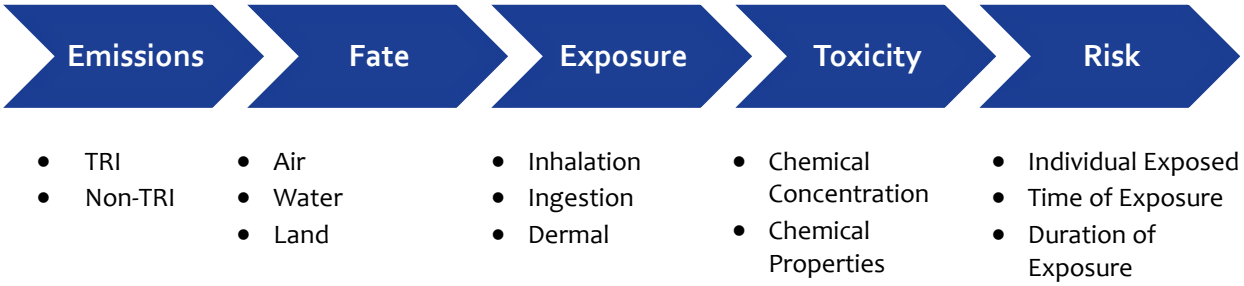
[40] "Hernando County 2040 Comprehensive Plan." https://www.hernandocounty.us/home/showpublisheddocument/5183/636828106161270000

Hazardous Substances and Processes

A federal law called the Emergency Planning and Community Right to Know Act (EPCRA) requires facilities in certain industries which manufacture, process, or use significant amounts of toxic chemicals, to report annually on their releases of these chemicals. The U.S. Environmental Protection Agency (EPA) maintains this information in a database called the Toxics Release Inventory (TRI). The toxic release files on the National Library of Medicine's® (NLM) Toxicology Data Network (TOXNET®) come from TRI. The reports contain information about the types and amounts of toxic chemicals that are released each year to the air, water, land, and by underground injection, as well as information on the quantities of toxic chemicals sent to other facilities for further waste management. Facilities with ten or more full-time employees that process more than 25,000 pounds in aggregate or use greater than 10,000 pounds of any one TRI chemical, are required to report releases annually. Industries and businesses use chemicals to make products such as pharmaceuticals, computers, paints, clothing, and automobiles. Most chemicals are included on the Toxic Release Inventory (TRI) chemical list managed by industrial facilities to minimize releases into the environment; however, releases still occur as part of business operations. It is the right of citizens to know what TRI chemicals are being used in Hernando County as well as the management of, amounts released into the environment, and whether such quantities are increasing or decreasing over time.

The following figure shows the many factors that determine the human health risks resulting from exposure to chemicals.

Figure 96: Overview of Factors that Influence Risk



Florida ranks 23 out of 56 states/territories nationwide for the number of total releases per square mile.[41] Hernando County has three TRI facilities. They are shown in the following figure.

Figure 97: Hernando County TRI Facilities

Name	Classification	Address
Cemex Construction Materials FL LLC	Nonmetallic Mineral Product	10311 Cement Plant Road Brooksville, FL 34601
ICTC USA	Computers and Electronic Products	16090 Flight Path Drive Brooksville, FL 34604
Cemex Cobb Road	Nonmetallic Mineral Product	10206 Cobb Road Brooksville, FL 34601

[41] Environmental Protection Agency TRI National Analysis. https://enviro.epa.gov/triexplorer/tri_factsheet.factsheet?pParent=TRIQ1&pDataset=TRIQ1&pstate=FL&pcounty=Hernando&pFips=12053&pyear=2020

SECTION III:
Future Strategies

FUTURE DELIVERY SYSTEM MODELS

ESCI evaluated the HCFES service delivery system regarding current station location and system performance metrics gathered during the evaluation to determine if the current system is poised to be able to handle the future expected service demands. As with any emergency services system, the ability to provide current service needs and prepare for future community needs becomes a delicate balancing act for government officials who ultimately are trusted with community funds generated for such purposes. These funds are all too often torn between competing priorities. Fire departments are faced with systems that often experience fewer fires than previous generations but still require an appropriate level of preparedness "just in case" to prevent catastrophic results of potential emergencies.

It is imperative that a fire department administration takes advantage of nationally established consensus standard metrics to justify and ensure they have the needed proof and back up to support their requests for the needed people, tools, and time to deliver these components of the system. The key components of any system are listed in the following figure.

Figure 98: Measuring System Effectiveness

There is a direct relationship between available personnel and equipment, and the timing of their application in an emergency on fire department effectiveness. Increasing or decreasing one or more of these components can have a significant effect on the overall ability of the system to mitigate an emergency incident efficiently, safely, and effectively.

When a Fire Station or Response Resource is Needed

HCFES has changed significantly since the construction of many of the firehouses. In fact, many of the firehouses were located based on the previous fire departments that provided coverage to the Hernando County service area. The locations of the existing firehouses were not chosen based on the current road networks, population, target hazards, service delivery demand, and community needs.

New developments along with increased target hazards creates the need for additional fire stations and/or response units. Policymakers must determine when and why to add fire stations or response units and at what cost is a desired level of service to be achieved. Although this question has been answered by any community with more than one fire station or response unit. The problem comes in finding a quantifiable threshold to determine that point for each specific situation, because it varies from community to community and even within a specific jurisdiction. The overall answer is part financial and part professional judgment. In fact, in the literature of the fire service today, there is very little definitive guidance on how this should be accomplished.

There are several steps that can be identified. They consist of:

1. Identifying areas with minimum coverage
2. Identifying feasible locations for a new facility or response resource
3. Evaluating those locations using specific criterion

The description in this document is based upon a growing body of knowledge acquired by ESCI and aimed at quantifying this process. Unfortunately, there is no universally acceptable algorithm. The process is a continuous analysis as it requires reviewing incident location data, response times, road networks, traffic patterns, and development plans.

One form of measurement is to assess the road and transportation network to ascertain the percentage of road mileage that theoretically is covered by the time criterion. This is done using computer-based modeling that will create a polygon that describes the areas of coverage. This process will also identify gaps and deficiencies where response time is not adequate. This is dynamic because it will change as road networks are updated. In addition, as more people move to the County, the number of cars on Hernando County roads will create additional traffic issues. Even though emergency vehicles are equipped with lights and sirens, additional traffic will slow response times. Furthermore, new development will bring new roads and road networks that have not yet been built and cannot be measured.

As growth and development extend beyond the range of travel time of the existing fire stations, the percentage of calls that exceed the performance requirement should begin to increase. This means it will take longer to get emergency service recourses to those that need assistance. It should be noted that growth, in and of itself, does not create an instantaneous demand. New construction has the

advantage of better codes and a higher level of ownership interest.

A more subtle difference in today's fire service is the fact that community demand for emergency medical services is increased almost from day one of occupancy. This is especially true in Hernando County which is attractive for retirees. When demand for service begins, it will be based upon two factors – the nature of the occupancy and hazards that are present.

Incident increases may first appear as a change in the performance of an existing fire station in the annual analysis of emergency calls. For example, if a fire station has 1,000 alarms and a 90% compliance rate with the response standard, there would be about 100 alarms per year that were beyond the goal. This would be the baseline for existing response performance. If the following year, the number of alarms was 1,200 and the percentage dropped to 85%, this would indicate that the department is losing ground on response performance. It is important to analyze the location of incidents and call concurrency. A drop in performance may indicate more resources are needed at one firehouse, rather than building a new firehouse.

Based upon actual response time analysis, one threshold that needs to be considered is the increase in alarms and the percent of calls handled under the criterion adopted. Anything more than a 10% increase in calls and a 10% reduction in performance is a signal to evaluate the level of service being provided.

In larger departments, most practitioners are factoring out non-emergency calls and for actual incident performance, only looking at core or true emergencies. The definition of core emergencies can be made locally based on risk and importance to the community, but they are usually structure fires and moderate to severe status EMS calls.

In general, if more than one measure is slipping, an evaluation of all standards of coverage factors, along with the reason why the data is slipping, is required. A one-year snapshot may not be valid if HCFES had a big storm event, a catastrophic weather event, a major wildland fire, or a stacked large volume of calls for just a month of the year or in the case of COVID-19 a decrease that can be explained and attributed to the event but is expected to return to normal or higher levels. ESCI recommends analyzing trends in three-year snapshots to create a better picture of response performance.

The incident analysis approach depends upon having emergencies, which does not address what is at risk. That is where the mapping technology applies. As structures and different types of fire problems are constructed on the ground, they may represent additional lives and property that are at risk that deserve equity in protection. One of the elements for creating a governmental entity is to control land use and to create mechanisms for collecting taxes and determining ownership.

Furthermore, these same individuals and properties are paying the taxes, fees, and permits for the

level of services provided. In one sense, when growth occurs, the new properties are usually safer than the older part of the community because they are constructed to a higher standard. However, they may bring new hazards to firefighters such as lightweight building construction materials. It is clear to almost any community that being slightly out of the response standard range does not trigger a new facility or additional response unit from an existing facility. New facilities and additional response units are costly, so they must be justified.

Assessed valuation or increased revenues in the form of benefit assessment or mitigation fees provide an incentive for new fire stations to be constructed and/or additional units staffed when the fire department can afford them. One threshold that needs to be carefully monitored is the revenue stream that accrues from development. That revenue stream should provide a threshold when different elements of future fire stations or additional response units can be determined. For example, it takes several years to evolve a location into a fire station site as HCFES has experienced. As the revenue stream proceeds, funds could be available for site acquisition, initial plans and specifications, site treatment, and construction. This is normally a multi-year process. HCFES has helped the process by having two standardized station designs.

One industry threshold for additional response capabilities should be to provide a new fire station or additional response unit into the appropriate zone in the jurisdiction outside the coverage area of current stations that has more than 35 to 50% of its parcels developed. Some of the secondary measures currently being used are an increase in 400 to 700 incidents per year (1 to 2 additional calls per day) for any individual unit. Also, an increase in service population of 5,000 in an area, which would bring an additional 900 estimated annual incidents (based on 180 incidents per 1,000 people).

The following criterion grid illustrates a series of measures that may be useful in deciding when a new fire station or additional response unit should be deployed within a jurisdiction. In developing the following figure ESCI used the seven-minute response time goal set forth by Hernando County.

Figure 99: Criterion for Fire Station and Resource Need Determination

Action Choices	Travel Distance	Criterion		
		Response Time Parameter	Out of Area Calls	Building/Risk Inventory
Maintain Status Quo	All risks within 2 miles from existing fire station	1st arriving unit is within 7 minute response time, 90% of the time	100% in first due area	Existing inventory and infill
Temporary Facilities and Minimal Staffing	Risks 2 to 3 miles from existing fire station	1st arriving unit exceeds 7 minute response time 10% of the time, but never exceeds 12 minutes	More than 10% of calls are in outlying area	New area has 25% of same risk distribution as in initial area
Permanent Fire Station Needed	Risk locations exceeding 5 miles from the fire station	1st due arriving unit exceeds 7 minute response time 15–20% of the time, 0 to 5% calls > 12 minutes	More than 15–20% of calls are in outlying area	New area has 35% of same risk distribution as in initial area of coverage
Permanent Fire Station Essential	Outlying risk locations exceeding 5 miles from the 1st due fire station	1st due arriving unit exceeds 7 minute response time 25% of the time; > 5% calls > 12 minutes	More than 25% of calls are in outlying area	New area has 50% of same risk distribution as in initial area

The decision process has to be placed into the context of staffing pattern decisions. It is not uncommon to have a fire station constructed and have the staffing patterns utilizing alternative response options evolve over years from one system to another. In the case of a fire station or alternative response resource under consideration, it should be anticipated that a policy decision needs to be made with respect to the staffing system to be used as soon as possible. Conversely, a fully staffed unit has a significant, associated price tag.

ESCI's experience has been that it takes multiple elements of the standards of coverage to be out of balance along with having additional economic resources to justify an additional unit, fire station, or staffing increase on one or more companies.

Response Standards and Targets

The establishment of fire and EMS response time standards and targets is a process that is undertaken by the local jurisdiction, based on their assessment of community risk, citizen expectations, and HCFES capabilities. As consultants, ESCI's role is not to set response standards for the community, but rather help with data analysis and comparison to industry standards to assist HCFES in developing service delivery goals.

ESCI emphasizes the importance of establishing and regularly monitoring performance metrics for the deployment of resources. These metrics serve as the foundation for determining whether the organization is meeting the expectations of the community that it serves. Without regular and consistent performance evaluation, it is impossible to set and achieve goals established to meet community expectations. HCFES does an excellent job with analyzing data such as UHU values.

Response standards established by the HCFES must originate from the community served to create a balance between what it desires and what it can afford. Because of this, ESCI cannot establish baseline and benchmark performance metrics for the HCFES, or any given organization for that matter. However, recommendations based upon the analysis conducted throughout this report may help serve as a starting point for these discussions with the community served or may serve as a reevaluation tool for the organization's current standards. ESCI believes that the current response performance objective of seven minutes countywide is a good start. However, ESCI believes this standard should be examined based on the information provided in this report.

Response standards are individual to each organization. Multiple factors such as staffing, financial constraints, size of the service area, and politics will influence each department's ability to set achievable goals and objectives for response. Based upon a review of call data, the response for all calls from the initial report to arrival on the scene by the first unit is 12 minutes, 9 seconds, 90% of the time for the 5-year time period of 2017-2021. This shows that HCFES is well above the seven-minute response performance objective. Using Figure 99 as a guide, HCFES is in need of additional units and fire stations. Both of these will be addressed in the *Recommendations & Strategies* section of the report.

For a fire department to plan effectively and make appropriate decisions regarding the deployment of resources, it needs to use clearly identified criteria, response performance objectives (targets), and quantifiable means of measuring actual response relative to targeted objectives.

To do so, ESCI advises that performance objectives and measures be developed using the "SMART" acronym, meaning that targets should be:

- ✓ **S**pecific
- ✓ **M**easurable
- ✓ **A**ttainable

- ✓ **R**elevant
- ✓ **T**ime-Bound

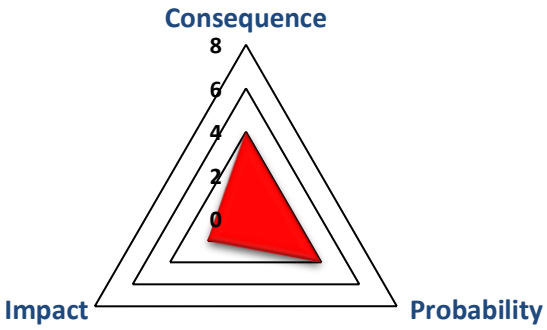
When examining the HCFES response performance objective that "the totality of calls countywide is seven-minute response time average", almost all components of "SMART" are included. The only component that is missing is time-bound. Time-bound refers to how often the performance objective is measured, not the seven-minute recommendation. The objective should include the time frame that the performance measure will be measured such as weekly, monthly, or annually.

Critical Tasks, Risk, and Staffing Performance

The goal of any fire service organization is to provide adequate resources within a period of time to reasonably mitigate an emergency event. However, all emergency events inherently carry their own set of special circumstances and will require varying levels of staffing based on factors surrounding the incident. Properties with high fire risk often require greater numbers of personnel and apparatus to mitigate the fire emergency effectively. HCFES should make staffing and deployment decisions with consideration of the level of risk involved.

Risks are classified as low, moderate, high, or maximum where the department gages threats considering the probability of occurrence, and hazard, danger, or loss and measures it in consequence. These risk categories are based on a three-axis risk calculation method. This method allows an agency to assign a numeric value to each axis, which represents Probability, Consequence, and Impact. The surface of the area of the triangle helps to determine the magnitude of the risk. The higher the surface area the greater the risk score. The next figure is an example of a medium risk score—moderate risk.

Figure 100: Three-Axis Calculation Method Example



Moderate Risk Example

The Three-Axis Calculation Method assesses community risks based on the preceding model. Specifically, the three factors as defined below:

1. **Probability:** What is the likelihood that an incident will occur at the location?
2. **Community Consequence:** What is the level of impact on the community an incident would have if the property were destroyed or deemed unusable? The consequence to the community is based on the loss of life or debilitating injury, the financial loss to the community, and the effect on community infrastructure.
3. **Agency Impact:** What would be the potential impact of an incident at this location against the available operational forces of the fire department based on the critical tasks associated with the incident? Specifically, would an incident require a greater number of resources

because of the property's characteristics, use, or location, and would this affect the department's ability to fulfill its mission in other areas?

The following figure is an example of the staffing needs based on the risk presented based on fire risk classification.

Figure 101: Example of Critical Task Staffing Analysis (Firefighters Needed) Based on Risk[42]

Task	Structure Maximum Risk	Structure High Risk	Structure Moderate Risk	Non-Structure Low Risk
Attack Line	4	4	2	2
Back-Up Line		2	2	(2)
Support for Hose Lines/Water Supply		3	2#	
Ventilation	4	2	2	
Search and Rescue	4	2	2	
Forcible Entry/Support		2	2	
Standby/Rapid Intervention Team	4	2	2	
Driver/Pump Operator	1	1	1	1
2nd Apparatus/Ladder Operator		1		
Command	2	1	1	1#
Communications/Safety	1	1	1	
Accountability		1		
Rehabilitation	2			
Building Fire Pump Monitor	(1)			
Attack Line—Floor Above the Fire	2			
Evacuation Management Teams	4			
Elevator Operations Manager	1			
Lobby Operations	1			
Transport Equipment to Staging	2			
EMS Crews	4			
Division/Group Supervisors	4			
Total	**40–41**	**22**	**16–17**	**3–6**

( ) indicates tasks may not be required at all incidents.

# Indicates task may be completed concurrently with others.

[42] Adapted from "Community Risk Assessment and Standards of Cover," 6th edition; Center for Public Safety Excellence.

As a comparison—the next figure is from NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* and illustrates the critical staffing for tasks associated with various types of structural fires.

Figure 102: Example of Tasks and Staff Required as defined from NFPA 1710[43]

Task	Single-Family Dwelling[1]	Open-Air Strip Mall[2]	Apartments[3]	High-Rise[4]
Command	1	2	2	2
Apparatus Operator	1	2	2	1
Handlines (2 members on each)	4	6	6	4
Support Members	2	3	3	
Victim Search & Rescue Team	2	4	4	4
Ground Ladders/Ventilation	2	4	4	
Aerial Operator (if ladder used)	(1)	(1)	(1)	
Initial Rapid Intervention Team[5]	4	4	4	
Initial Medical Care Component		2	2	
Building Fire Pump Monitor (if equipped)				(1)
Hoseline—Floor Above Fire				2
Rapid Intervention Team				4
Accountability Officers (fire floor & floor above)				4
Evacuation Management Teams				4
Elevator Operations Manager				1
Incident Safety Officer				1
Interior Staging Manager				1
Member Rehabilitation				2
Vertical Ventilation Crew				4
Lobby Control				1
Transport Equipment				2
External Base Operations				1
EMS Crews with Transport[6]				4
Total Required:	**16 (17)**	**27 (28)**	**27 (28)**	**42 (43)**

[1] Typical 2,000 ft., two-story single-family dwelling without a basement and no exposures.
[2] Typical open-air strip mall/shopping center ranging from 13,000–196,000 feet.
[3] Typical 1,200-foot apartment within a three-story, garden-style apartment building.
[4] Building with the highest floor greater than 75 feet above the lowest level of fire department vehicle access.

[43] NFPA 1710: Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments, 2020.

[5] At a minimum, an initial rapid intervention crew (IRIC) assembled from the initial attack crew and, as the initial alarm response arrives, a full and sustained rapid intervention crew (RIC) established.
[6] For Single-Family Dwellings: When the incident escalates beyond an initial full alarm assignment, or when significant risk is present to the members due to the magnitude of the incident, the Incident Commander shall request an EMS crew consisting of a minimum of two members to provide treatment and transport for injured members and civilians.

The first 15 minutes is the most crucial period in the suppression of a fire. How effectively and efficiently firefighters perform during this period has a significant impact on the overall outcome of the event. This general concept applies to fire, rescue, and medical situations. Critical tasks must be conducted promptly to control a fire or to treat a patient.

Distribution Performance Criterion

A fire department's distribution is essentially the location of resources to ensure an initial intervention within the specific time frame identified in the community's performance goals.

Tasks that must be performed at a fire can also be broken down into two key components: life safety and fire flow. First responder's base life safety tasks on the number of building occupants; and their location, status, and ability to take self-preservation action. Life safety-related tasks involve search, rescue, and evacuation of victims. The fire flow element involves delivering enough water to extinguish the fire and create an environment within the building that allows entry by firefighters.

The number and types of tasks needing simultaneous action will dictate the minimum number of firefighters required to combat different types of fires. In the absence of adequate personnel to perform concurrent action, the commanding officer must prioritize the tasks and complete some in chronological order, rather than concurrently. These tasks include:

- Command
- Scene Safety
- Search and Rescue
- Fire Attack
- Salvage
- Water Supply
- Pump Operation
- Ventilation
- Backup/Rapid Intervention
- Environmental Protection

Critical Tasking

Critical tasks are those activities that must be conducted promptly by firefighters at emergency incidents to control the situation, to stop-loss, and to perform necessary tasks required for a medical emergency. HCFES is responsible for ensuring those responding resources are capable of performing all of the described tasks in a prompt, efficient, and safe manner. Critical tasking defines the minimum number of personnel needed by incident type. More personnel will be needed for incidents of increased complexity or size.

When reviewing the charts listed in Figure 101 and Figure 102 and comparing them with the daily minimum staffing listed in Figure 103 employed by HCFES it is easy to see that there is a daily minimum staffing to handle the risk shown in the previous tables. However, the time it will take to assemble those resources to higher risk incidents will be significant and will greatly affect HCFES from providing emergency services for additional incidents.

Figure 103: HCFES Daily Minimum Staffing

Unit Type	Number	Staffing / Unit	Total Staffing
Battalion Chief	3	1	3
Engines	13	3	39
Ladder (Truck)	1	3	2
Medics[1]	10	2	20
Total			**64**

[1] Medic 14 staffing not included as unit is only in service during the day and does not include cross staffed personnel

The following figures show the critical tasking of HCFES for a residential and commercial structure.

Figure 104: HCFES Residential/Commercial Structure Fire Critical Tasking

Resource	Personnel
Command	1
Water Supply	1
Primary Attack Handline	2
Safety Officer	1
Support Tasks	2
Rapid Intervention Team	2
Back-up Handline	2
Search and Rescue	2
Ladders and Ventilation	2
Aerial Operations	1 (2)
Total	16(17)

Dynamics of Fire in Buildings

Most fires within buildings develop predictably unless influenced by highly flammable materials. Ignition, or the beginning of a fire, starts the sequence of events. It may take several minutes or even hours from the time of ignition until a flame is visible. This smoldering stage is very dangerous, especially during times when people are sleeping, since large amounts of highly toxic smoke may be

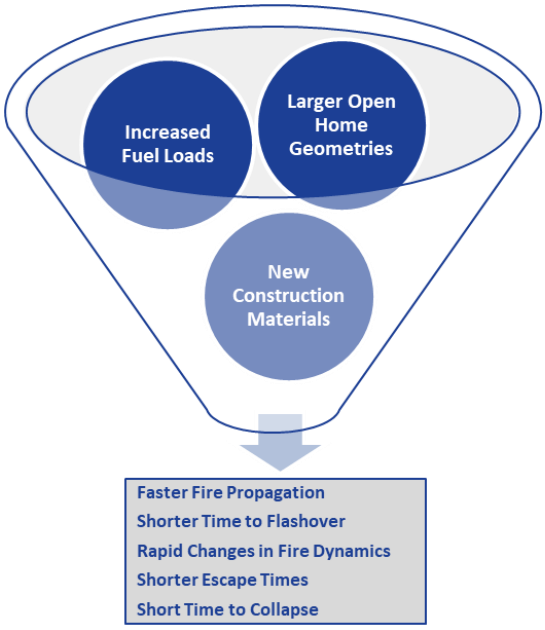
generated during this phase.

Once flames do appear, the sequence continues rapidly. Combustible material adjacent to the flame heat and ignite, which in turn heats and ignites other adjacent materials if sufficient oxygen is present. As the objects burn, heated gases accumulate at the ceiling of the room. Some of the gases are flammable and highly toxic.

The spread of the fire from this point continues quickly. Soon the flammable gases at the ceiling as well as other combustible material in the room of origin reach ignition temperature. At that point, an event termed "flashover" occurs; the gases and other material ignite, which in turn ignites everything in the room. Once flashover occurs, damage caused by the fire is significant, and the environment within the room can no longer support human life.

There have been changes in the residential fire environment over the past several decades. These changes include larger homes, different home geometries, increased synthetic fuel loads, and changing construction materials.[44]

Figure 105: Changes in the Fire Environment & Effect on Fire Dynamics



Since flashover has such a dramatic influence on the outcome of a fire event, the goal of any fire agency is to apply water before flashover occurs.

Although modern codes tend to make fires in newer structures more infrequent, today's energy-

[44] Stephen Kerber, Analysis of Changing Residential Fire Dynamics, and their Implications on Firefighter Operational Timeframes. Underwriters Laboratories.

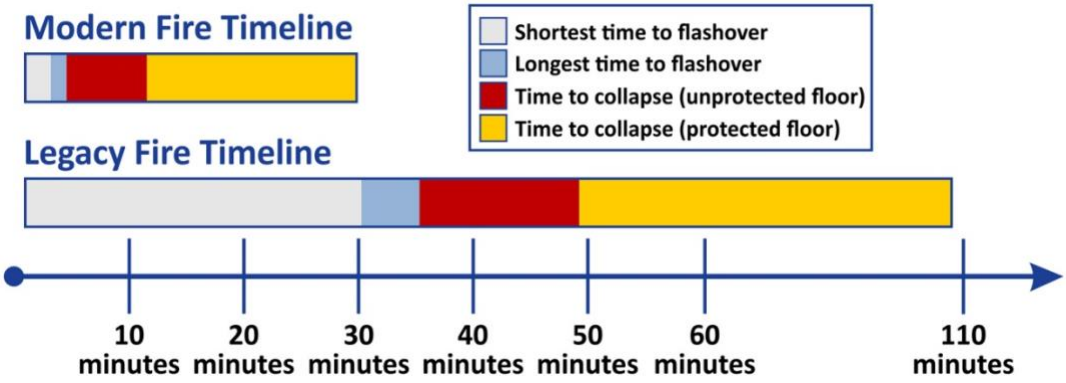
efficient construction (designed to hold heat during the winter) also tends to confine the heat of a hostile fire. In addition, research has shown that modern furnishings generally ignite more quickly and burn hotter (due to synthetics).

In the 1970s, scientists at the National Institute of Standards and Technology found that after a fire broke out, building occupants had about 17 minutes to escape before being overcome by heat and smoke. Today, that estimate is as short as three minutes. The necessity of effective early warning (smoke alarms), early suppression (fire sprinklers), and firefighters arriving on the scene of a fire in the shortest span of time is more critical now than ever.

Perhaps as important as preventing flashover is the need to control a fire before it does damage to the structural framing of a building. Materials used to construct buildings today are often less fire-resistive than the heavy structural skeletons of older frame buildings. Roof trusses and floor joists are commonly made with lighter materials that are more easily weakened by the effects of fire. "Lightweight" roof trusses fail after five to seven minutes of direct flame impingement. Plywood I-beam joists can fail after as little as three minutes of flame contact. This creates a dangerous environment for firefighters. Lightweight construction is common within new construction in Hernando County.

Additionally, the contents of buildings today have a much greater potential for heat production than in the past. The widespread use of plastics in furnishings and other building contents rapidly accelerates fire spread and increases the amount of water needed to control a fire effectively. These factors make the need for early application of water essential to a successful fire outcome. Several events must take place quickly to make it possible to achieve fire suppression before flashover. The next figure illustrates the sequence of events with a comparison of modern materials vs. legacy materials.

Figure 106: Fire Growth vs. Reflex Time[45]



[45] Stephen Kerber, Analysis of Changing Residential Fire Dynamics, and their Implications on Firefighter Operational Timeframes. Underwriters Laboratories.

As is apparent by this description of the sequence of events, the application of water in time to prevent flashover is a serious challenge for any fire department. It is critical, though, as studies of historical fire losses can demonstrate.

The National Fire Protection Association found that fires contained to the room of origin (typically extinguished prior to or immediately following flashover) had significantly lower rates of death, injury, and property loss when compared to fires that had an opportunity to spread beyond the room of origin (typically extinguished post-flashover). As shown in the following figure, fire losses, casualties, and deaths rise significantly as the extent of fire damage increases.

Figure 107: Loss Rates by Fire Spread, Home Structure Fires (2012–2016)[46]

Flame Spread	Rate Per 1,000 Fires		Average Dollar Loss
	Civilian Deaths	Civilian Injuries	
Confined fire or fire spread confined to origin	0.4	11.1	$1,200
Confined to room of origin, including confined fire and fire confined to object	1.8	23.8	$4,000
Spread beyond the room of origin but confined to floor of origin	16.2	76.3	$35,000
Spread beyond the floor of origin	24.6	55.0	$65,900

Emergency Medical Event Sequence

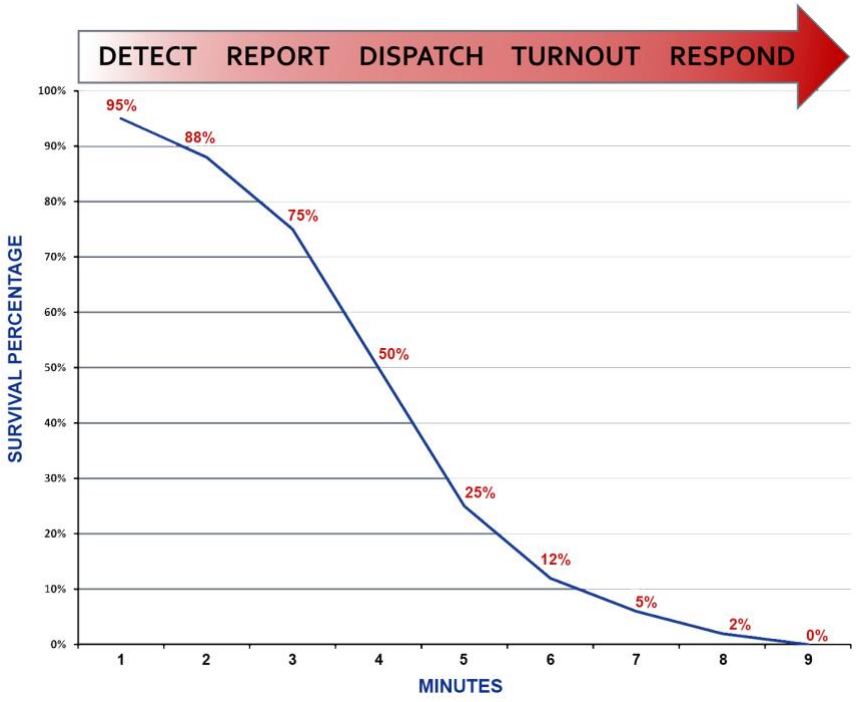
Cardiac arrest is the most significant life-threatening medical event in emergency medicine today. A victim of cardiac arrest has mere minutes in which to receive lifesaving care if there is to be any hope for resuscitation.

The American Heart Association (AHA) issued a set of cardiopulmonary resuscitation guidelines designed to streamline emergency procedures for heart attack victims and increase the likelihood of survival. The AHA guidelines include goals for the application of cardiac defibrillation to cardiac arrest victims. Cardiac arrest survival chances fall by 7 to 10% for every minute between collapse and defibrillation. Consequently, the AHA recommends cardiac defibrillation within five minutes of cardiac arrest.

As with fires, the sequence of events that lead to emergency cardiac care can be graphically illustrated, as in the following figure.

[46] Term "home" includes one- & two-family homes, manufactured homes, & apartments or other multi-family housing, regardless of ownership. Source: National Fire Protection Association Standard 1710, 2020 Edition.

Figure 108: Cardiac Arrest Event Sequence



The percentage of opportunity for recovery from cardiac arrest drops quickly as time progresses. The stages of medical responses are very similar to the components described for fire responses. Research stresses the importance of immediate CPR, rapid cardiac defibrillation, and administration of certain medications as a means of improving the opportunity for successful resuscitation and survival. HCFES can increase survival rates by educating citizens on how to do CPR or hands-only CPR.

Response Standards for People, Tools, & Time

Time matters a great deal in the achievement of an effective outcome to an emergency event. Time, however, is not the only factor. Delivering sufficient numbers of properly trained and appropriately equipped personnel within the critical time period completes the equation.

For medical emergencies, this can vary based on the nature of the emergency. Some medical emergencies are not time critical. However, for serious trauma, cardiac arrest, strokes, or conditions that may lead to cardiac arrest, a rapid response is essential.

Equally critical is delivering enough personnel to the scene to perform all the concurrent tasks required to deliver quality emergency care. For a cardiac arrest, this can be up to six personnel; two to perform CPR, two to set up and operate advanced medical equipment, one to record the actions taken by emergency care workers, and one to direct patient care. HCFES deploys five personnel to cardiac arrest incidents – one suppression unit and one medic unit.

Thus, for a medical emergency, the real test of performance is the time it takes to provide the personnel and equipment needed to deal effectively with the patient's condition, not necessarily the time it takes for the first person to arrive.

Fire emergencies are even more resource critical. Again, the true test of performance is the time it takes to deliver sufficient personnel to initiate the application of water to a fire. This is the only practical method to reverse the continuing internal temperature increases and ultimately prevent flashover. The arrival of one person with a portable radio does not provide fire intervention capability and should not be counted as "arrival" by the fire department. In all of the following examples provided HCFES should use the national consensus standards and examples provided in this report to guide policy decisions and balance the needs of the community with the financial cost to provide those services.

Call Processing Performance Criterion

Based on NFPA 1225 standards, call processing time—the time between when the call is answered and when the call is dispatched to responding units—should be less than 60 seconds, 90% of the time for high acuity incidents. Currently, HCFES has a call processing performance of 2 minutes, 18 seconds at the 90th percentile. This is over double the performance recommended in NFPA 1225. The following is an example of a call processing goal:

> For 90% of all calls for service received annually, the communications center will notify and dispatch the appropriate units in less than 60 seconds (high acuity calls). Call intake and dispatch personnel will continue to receive and relay vital information until all instructions have been issued or the initial unit arrives on the scene.

Turnout Time Performance Criterion

Turnout time is one area that the fire department can significantly impact with creative approaches. Turnout time, or the time between when the call is received by the response units (dispatched) and when the unit is enroute to the scene (responding), can have dramatic effects on overall response times. Reducing this single response time component reduces total response time.

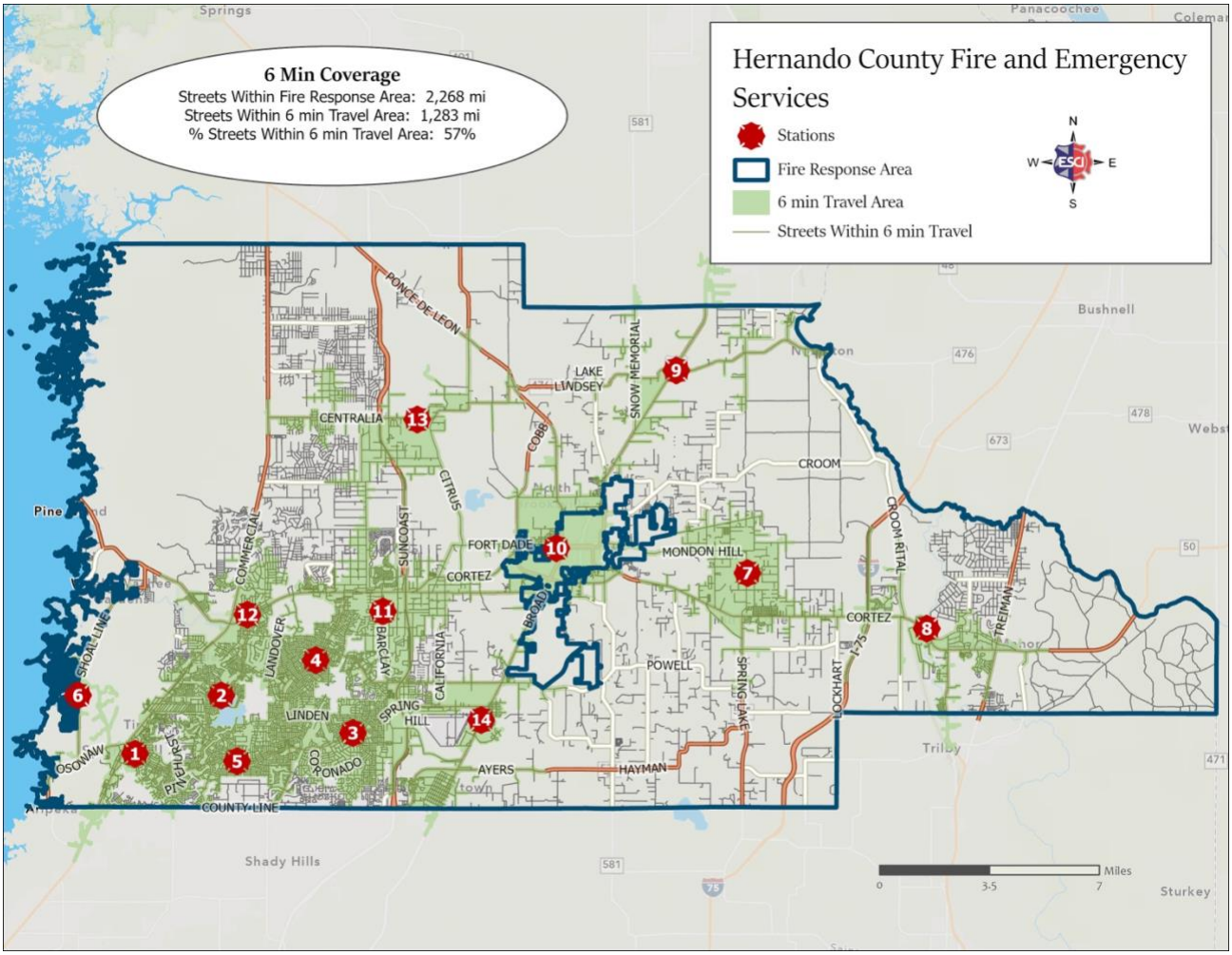
NFPA 1710 recommends a turnout time performance of 60 seconds for EMS incidents and 80 seconds for fire and special operations incidents at the 90th percentile. Currently, HCFES has an overall turnout time performance of 2 minutes, 6 seconds at the 90th percentile. If HCFES can improve turnout time, response time will be improved. The following is an example turnout time performance goal is provided below:

> HCFES will achieve an annual turnout time of 60 seconds for EMS incidents and 80 seconds for fires and special operations incidents at the 90th percentile.

Distribution Performance

A fire department's distribution is essentially the location of resources to ensure an initial intervention within the specific time frame identified in the community's performance goals. With effective distribution of resources, a department should be able to achieve the following response time goals for the first arriving engine on a fire, the first arriving medical unit on an EMS emergency, the first arriving water rescue technician at a water rescue incident, and hazardous materials operations certified personnel to a hazardous materials incident. HCFES is striving for the first unit to arrive on all emergencies within seven minutes from the time units are dispatched. ESCI created a six-minute travel map for HCFES based on this, as one minute was utilized for turnout time. This map shows that with the current station locations and current road networks, HCFES can reach 57% of the street miles within the service area in 6 minutes.

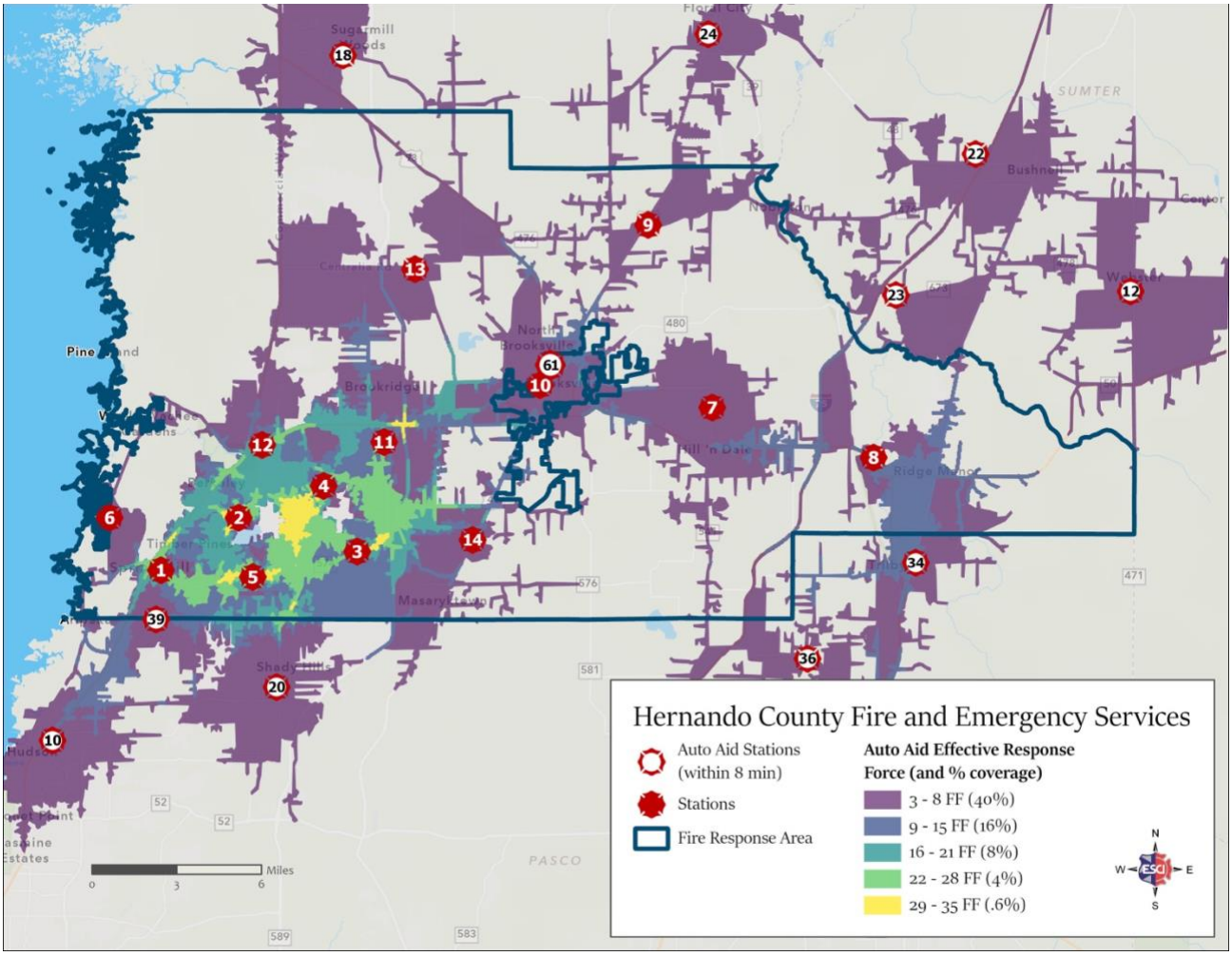
Figure 109: HCFES 6-Minute Travel Time Map



Concentration Performance

A fire department's *concentration* is the spacing of multiple resources close enough together so that an initial "Effective Response Force" (ERF) for a given risk can be assembled on the scene of an emergency within the specific time frame identified in the community's performance goals for that risk type. An initial effective response force is defined as that which will most likely be enough to stop the escalation of the emergency. HCFES deploys 16-17 personnel for structure fire assignments. Based on the data analysis, in eight minutes this can only be achieved in 8% of the service area. For visual purposes, Figure 65: HCFES Effective Response Force with Automatic Aid, is shown again below as Figure 110.

Figure 110: HCFES Effective Response Force with Automatic Aid (2)



RECOMMENDATIONS & STRATEGIES

The result of the preceding analysis helps shape the following recommendations and strategies for HCFES. The analysis has undeniably confirmed that HCFES is in need of adding additional resources in both terms of new fire stations and units to meet the service demand of the growing population.

HCFES should use this plan as a guide but should keep in mind that the future is dynamic. The recommendations and strategies were based on current data available and predicted plans of growth. These recommendations are to improve emergency response coverage to the citizens and visitors of Hernando County, enhance firefighter safety and effectiveness, and improve overall fire department operations. Extensive financial modeling of options is not included as it is beyond the scope of this study. Rough costs were provided for most recommendations and strategies. ESCI recommends that HCFES perform a more detailed financial analysis before following through with the recommendations.

Many of the analyses available must be measured in road miles to be able to determine response times from travel performance. Since Hernando County is growing future road networks have not yet been established. Therefore, statistically quantifying the recommendations of adding additional fire stations is skewed on the lower side and instead justified through future development data.

Recommendations and strategies are broken down into four categories:

1. Fire Station Recommendations
2. Short-Range – 1 to 3 years
3. Mid-Range – 3 to 7 years
4. Long-Range – 7 to 15 years

The order of many of the recommendations and strategies will depend on new fire stations. For instance, some recommendations listed in the mid-range may not be practical until the long-range timeframe due to when a facility is constructed.

Fire Station Recommendations

Fire station recommendations were broken down into three categories: renovations/reconstruction of existing fire stations, relocation of existing fire stations, and additional fire stations.

The following figures show the floor plan designs for future HCFES fire stations. HCFES has created a standard design for both a three-bay and a four-bay station. The standard design is a state-of-the-art facility that protects responders from carcinogens using control zones. Also, the design includes separate sleeping quarters, adequate office space, gender neutral private bathrooms, a large training/community room with the ability to sleep additional responders, and ample storage space. ESCI recommends that HCFES conduct a survey with those responders at Fire Station 2 and 5 one year after the opening of the respected facilities to determine operational deficiencies or issues that

should be adjusted in future station designs. Although the design looks great on paper, design issues may be brought to light once responders occupy the functioning facility.

Figure 111: HCFES Three Bay Station Floor Plan

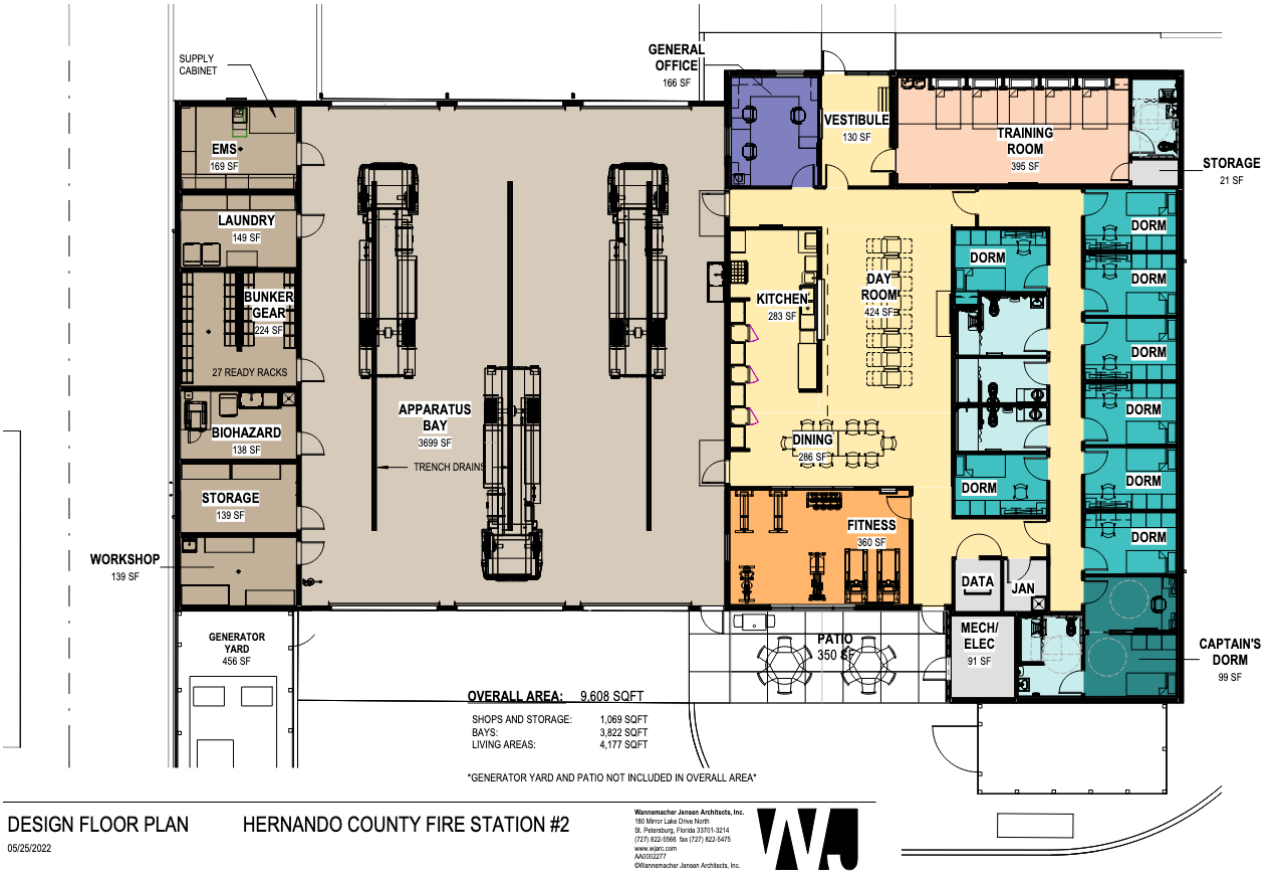
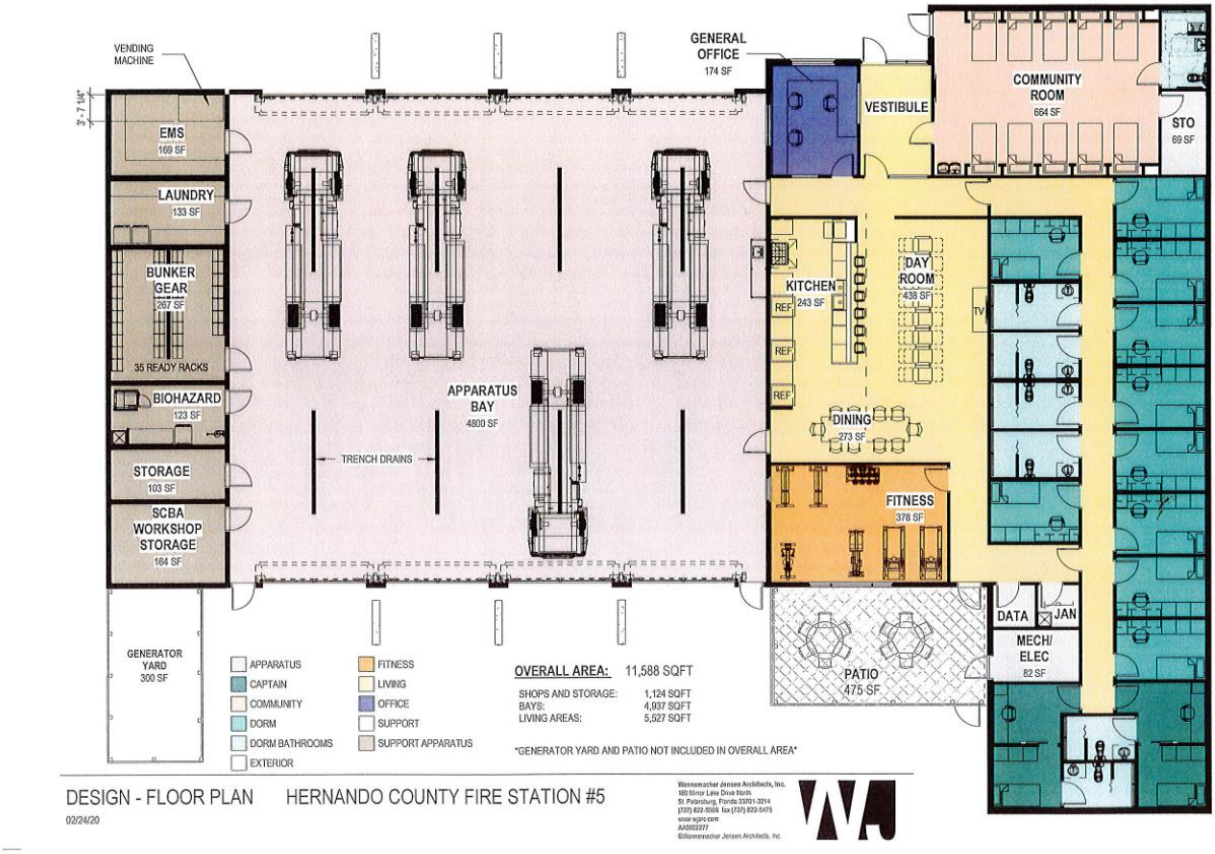


Figure 112: HCFES Four Bay Station Floor Plan



Renovations/Reconstruction of Existing Fire Stations

The makeup of Hernando County and the fire department has changed dramatically since many of the fire stations were constructed. As mentioned earlier in this report, many of the fire stations were built to house only two or three members and now exceed that. Even though the facilities are in good condition, they are not meeting the current demands of HCFES or they lack features that should be included in a modern firehouse. Many of the current facilities lack private sleeping areas, adequate bathroom and shower facilities, physical fitness space, office space, and enough parking. Furthermore, the current facilities were not built with firefighter health in mind such as cancer protection measures and ramp-up tones as HCFES is utilizing in Fire Stations 2, 5, and 6.

If funding were not an issue, ESCI would recommend that HCFES rebuild all fire stations to include the features of Fire Stations 2 and 5. However, this would require a huge financial undertaking. For instance, nearby Polk County, Florida is investing $68 million for 17 fire stations and Hillsborough

County is investing $18 million to rebuild three firehouses.[47, 48]

ESCI does recommend that HCFES develop a long-term plan to replace all existing fire stations. ESCI also recommends and encourages HCFES to apply annually for the Assistance to Firefighter Grants (AFG) Program and Staffing for Adequate Fire and Emergency Response (SAFER) Grants.

Since many of the needs for modern fire stations would require extensive structural modifications, the cost of renovations most likely would be very close to the cost to build a new fire station. If HCFES should feel this is an option, they should weigh the cost differences between the various options.

Another factor HCFES needs to consider when reconstructing existing fire stations is whether the current location is the best spot. Moving a fire station requires there to be available land for the County to purchase and the benefit of the move must be justified for this cost. Furthermore, moving fire stations will cause concerns among members of the community. Those community members who feel as though the new fire station location is further from their residence, may feel upset from the potential increase in response times. ESCI provides further discussion on fire station locations in the *Fire Station Optimization Model* section.

Additional Fire Stations

Over the next 15 years, ESCI recommends that HCFES utilize the criteria in Figure 99 to determine when to add fire stations. Based on planned developments throughout the County, ESCI recommends that HCFES consider adding four new fire stations. The cost to build, equip, staff, and maintain a fire station is expensive, ESCI recommends looking at trends in data in future years before purchasing land and constructing these facilities.

In order to model where fire stations should be placed using GIS software, a dataset must be selected for use. Many times this dataset is incident data such as the location of a prior year's incidents or population density. An issue with Hernando County is that there is planned developments in both the Northern part and Eastern part of the County, where there is currently not a high population density or call volume. ESCI analyzed the location of the planned developments and the ability for HCFES to reach these areas using current road networks to recommend the location of four additional firehouses – Fire Station 15, 16, 17, and 18. ESCI used a six-minute travel time in the analysis as this correlates with the seven-minute response time when a one-minute

[47] "Polk County invests $68 million on new fire stations that protect from cancer." https://www.abcactionnews.com/news/region-polk/polk-county-invests-68-million-on-new-fire-stations-that-protect-from-cancer

[48] "Hillsborough County to use $18M in American Rescue Plan funds to rebuild three firehouses." https://www.wtsp.com/article/news/local/hillsboroughcounty/hillsborough-county-american-rescue-plan-funds-firehouses/67-03531458-429f-48cd-b443-e3c9439e41e5

turnout time is factored in.

HCFES has plans and locations for Fire Station 15 and 16. ESCI recommends that HCFES monitor the growth in the I-75/SR PDD/Hickory Hill to determine if Fire Station 15 or Fire Station 16 should be constructed first. Currently based on Figure 46: HCFES Incident Density (All Incidents), 2019-2021 and Figure 50: HCFES 2021 Incident Time Travel, the need for Fire Station 16 is justified ahead of Fire Station 15 since there is already incident demand and extend travel times in that area. However, rapid growth in the I-75/SR PDD/Hickory Hill area could quickly produce a service demand to justify Fire Station 15 before Fire Station 16. Building and staffing both facilities around the same time would be extremely costly, therefore may not be realistic. One recommended solution would be utilizing a temporary facility at the location of Fire Station 15. Another option would be to only staff Fire Station 15 with an engine crew initially. Since HCFES utilizes ALS on all suppression units, this would deliver ALS members to any medical emergency and firefighters to any suppression incident within the I-75/SR PDD/Hickory Hill area. Nearby Medic 7 and Medic 8 have UHU values that are acceptable to handle transport needs in this area until service demand increases to justify the need for Medic 15.

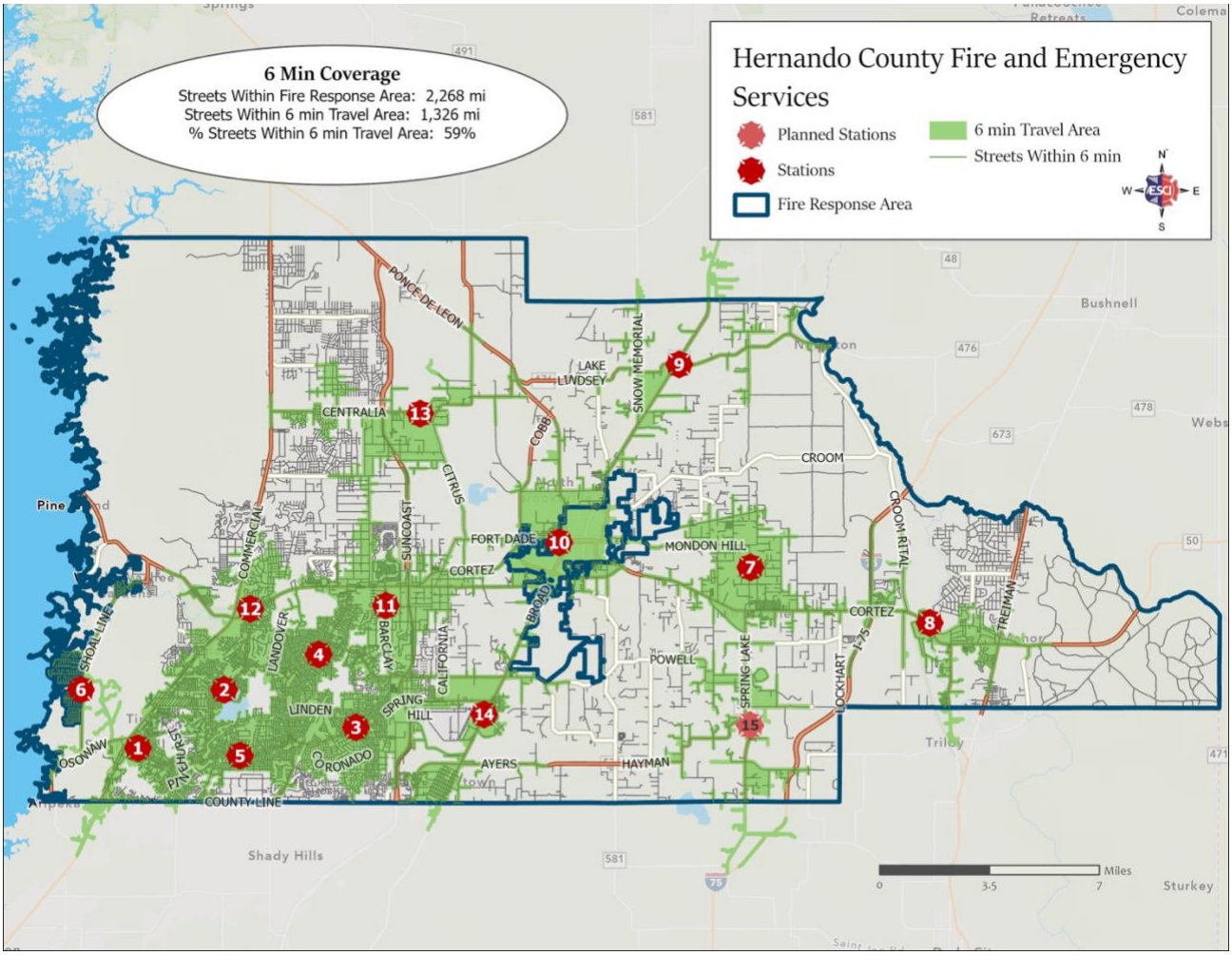
Fire Station 15

Land for Fire Station 15 has been purchased at Spring Lake Hwy and Spike Road. Land cost and availability is a major factor when deciding where to build a new fire station. Since the area that Fire Station 15 will serve is the I-75/SR PDD/Hickory Hill, which is estimated to have 9,600 dwelling units. This development could bring in 23,616 people when using the average of 2.46 people per household. Then using the 180 incidents per 1,000 people, this area could increase the annual HCFES call volume by 4,250 responses.

Further analysis of Figure 50: HCFES 2021 Incident Time Travel shows that there were responses with a travel time of 8 to 12 minutes and greater than 12 minutes in this area already. This will only increase as the development in the area takes place and more residents begin to occupy the area.

The following figure shows the six-minute travel time with the addition of Fire Station 15. There is only a 2% increase in coverage due to many of the streets that Fire Station 15 will serve are not yet constructed and therefore not included in the current road network. This will increase once these road networks are constructed.

Figure 113: HCFES 6-Minute Travel Time Map with Station 15



Fire Station 15 is scheduled for construction in FY2023-2024 and FY2024-2025. The Hernando County FY2022-2026 Capital Improvement Plan allocates $4,058,750 to Fire Station 15.[49] ESCI recommends that HCFES ensure that this is enough to complete the project with rising building material costs and inflation.

The following figure shows the estimated annual added personnel costs for placing Engine 15 in service with a captain, driver / engineer, and firefighter per shift. Using a 1.3 relief factor, Engine 15 will add an estimated $1.5 million to annual personnel costs.

[49] "Hernando County Capital Improvement Plan Fiscal Year 2022-2026." https://www.hernandocounty.us/home/showpublisheddocument/7310/637686824788600000

Figure 114: Estimated Engine 15 Personnel Costs

Position	Average Costs[1]	Number of Positions Needed[2]	Total Costs
Captain	$143,710	4	$574,840
Driver / Engineer	$125,130	4	$500,520
Firefighter Medic	$105,911	4	$423,644
Total			**$1,499,044**

[1] Includes Salary and Benefits
[2] Includes a relief factor of 1.3

The following figure shows the estimated annual personnel costs Medic 15 will be $847,288 when staffing with two firefighter/medics per shift and a relief factor of 1.3.

Figure 115: Estimated Medic 15 Personnel Costs

Position	Average Costs[1]	Number of Positions Needed[2]	Total Costs
Firefighter Medic	$105,911	8	$847,288

[1] Includes Salary and Benefits
[2] Includes a relief factor of 1.3

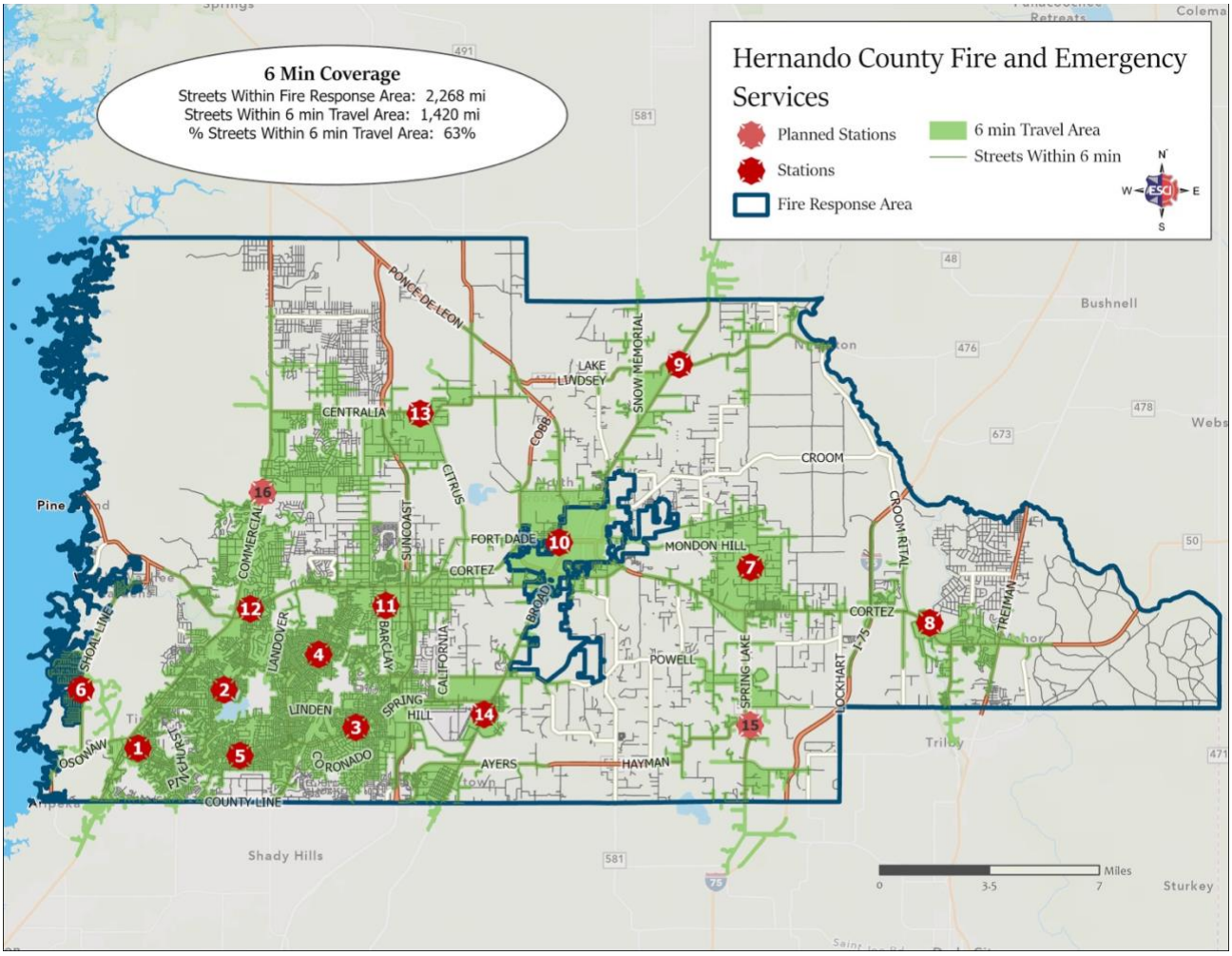
Fire Station 16

Land for Fire Station 16 has been negotiated with the Lake Hideaway planning development to construct a fire station near the intersection of US 19 and Bourassa Boulevard. There are 3,700 dwelling units planned for the Lake Hideaway development. This development could bring an estimated 9,102 people and create an additional 1,600 emergency responses per year.

Further analysis of Figure 46: HCFES Incident Density (All Incidents), 2019-2021, Figure 48: HCFES Incident Density (EMS Incidents), 2019-2021, and Figure 50: HCFES 2021 Incident Time Travel show that there is already a demand for service in this area even before the completion of the Lake Hideaway development, further justifying the need for a fire station at this location.

The following figure shows that adding Fire Station 16 will increase the six-minute travel time coverage from 59% to 63%. The analysis is based on Fire Station 15 being operational and only includes streets in the current road network.

Figure 116: HCFES 6-Minute Travel Time Map with Stations 15 and 16



The following figure shows the expected cost to build Fire Station 16 using the $5.8 million price of Fire Station 2 with 5% inflation costs year each. ESCI considered that this station may be needed between FY2024-2025 to FY2028-2029.

Figure 117: Fire Station 16 Cost

2022 Costs	FY2024-2025	FY2025-2026	FY2026-2027	FY2027-2028	FY2028-2029
$5,800,000	$6,714,225	$7,049,936	$7,402,433	$7,772,555	$8,161,182

HCFES should consider staffing Fire Station 16 with 1 engine, 1 medic unit, and 1 tender. There could also be the need for a ladder (truck) company at Fire Station 16 depending on the size and height of the buildings planned along US 19. Also, in *Recommendation 3-D*, ESCI recommends moving Battalion Chief 2 to Fire Station 16. If HCFES determines that a need for a ladder (truck) company at Fire Station 16 then a four-bay fire station is recommended.

The following figure shows the estimated annual added personnel costs for placing Engine 16 in service with a captain, driver / engineer, and firefighter per shift. Using a 1.3 relief factor, Engine 16 will add an estimated $1.5 million to annual personnel costs.

Figure 118: Estimated Engine 16 Personnel Costs

Position	Average Costs[1]	Number of Positions Needed[2]	Total Costs
Captain	$143,710	4	$574,840
Driver / Engineer	$125,130	4	$500,520
Firefighter Medic	$105,911	4	$423,644
Total			**$1,499,044**

[1] Includes Salary and Benefits
[2] Includes a relief factor of 1.3

The following figure shows the estimated annual personnel costs Medic 16 will be $847,288 when staffing with two firefighter/medics per shift and a relief factor of 1.3.

Figure 119: Estimated Medic 16 Personnel Costs

Position	Average Costs[1]	Number of Positions Needed[2]	Total Costs
Firefighter Medic	$105,911	8	$847,288

[1] Includes Salary and Benefits
[2] Includes a relief factor of 1.3

Fire Station 17

There are over 10,000 dwelling units planned in the Northwest Center of Hernando County. This includes the developments of Quarry Preserve, World Woods, Seville West, and Seville East. Additionally, these developments are bringing commercial and business space as well. Using the U.S. Census Bureau statistic of 2.46 people per household, the Northwest Center of Hernando County could see a population increase of over 26,000 people. Based on 180 incidents per 1,000 people this area could experience a call volume of 4,680 incidents.

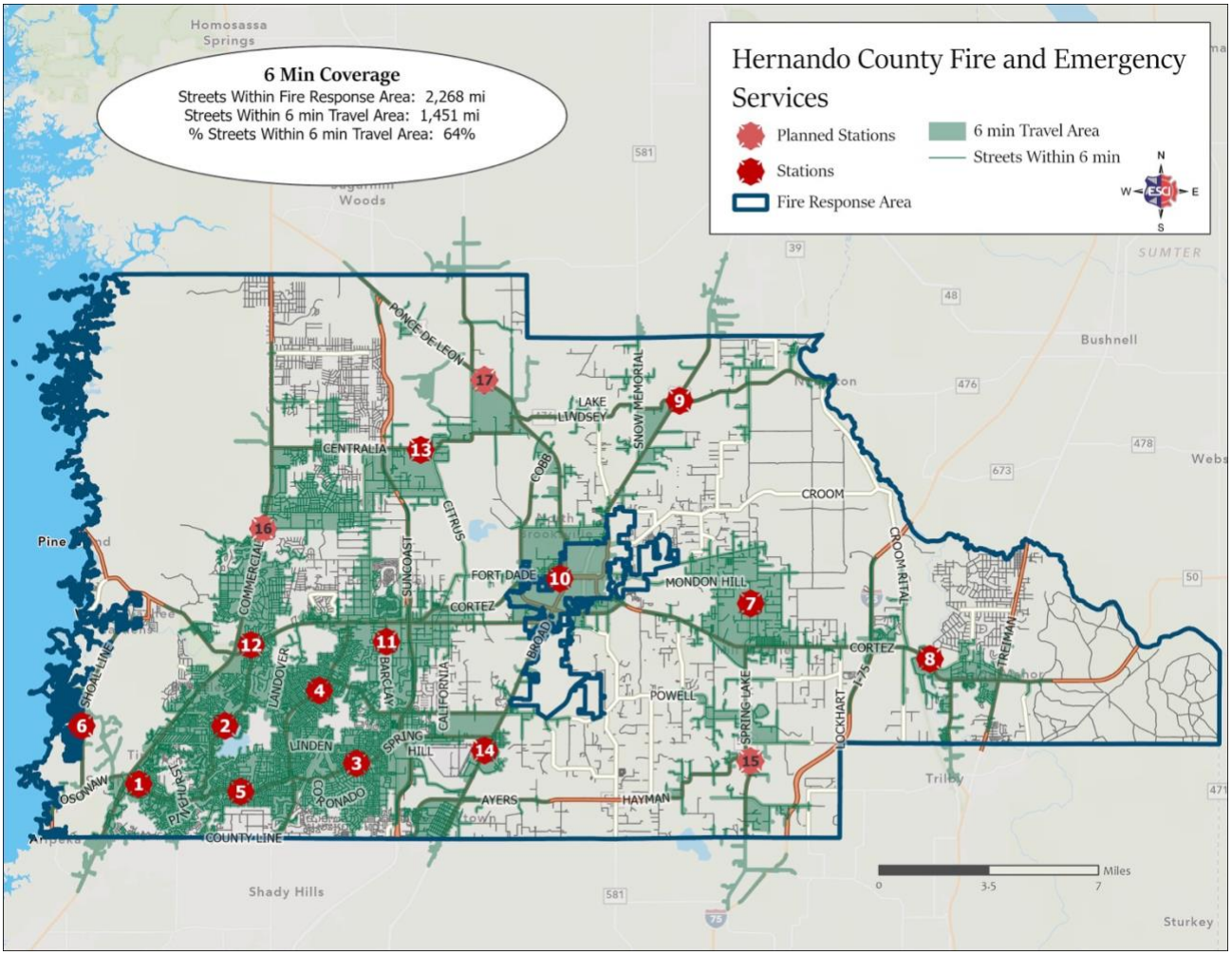
Current HCFES fire stations would not be able to reach this area within a six-minute travel time (seven-minute response time with a one-minute turnout time). Fire Station 13's limit would reach the intersection of Ponce De Leon Blvd and Citrus Way.

As these developments are completed there is an expected service delivery need in that area that will require the addition of at least one new fire station. The ideal location of a new fire station should be strategically located to serve the entire Northwest Center area.

According to Strategy 1.05F(1) in the 2040 Hernando County Comprehensive Plan the planned development district of Quarry Preserve includes recreation, institutional, and public use facilities as needed for the new town and as approved by the County.[50] If Quarry Preserve is selected to be the location of a new firehouse, the location should be on the Western end of the development. A recommended location would be at the intersection of Ponce De Leon Blvd and Citrus Way. Figure 128 and Figure 129 shown later in this report further justify this recommendation location.

The following figure shows that adding Fire Station 17 will increase the six-minute travel time coverage from 63% to 64%. The analysis is based on Fire Station 15 and 16 being operational and only includes streets in the current road network.

Figure 120: HCFES 6-Minute Travel Time Map with Stations 15, 16 and 17



[50] "2040 Hernando County Comprehensive Plan." https://www.hernandocounty.us/departments/departments-n-z/planning/comprehensive-plan

The following figure shows the expected cost to build Fire Station 17 using the $5.8 million price of Fire Station 2 with 5% inflation costs year each. ESCI considered that this station may be needed between FY2026-2027 to FY2030-2031.

Figure 121: Fire Station 17 Cost

2022 Costs	FY2026-2027	FY2027-2028	FY2028-2029	FY2029-2030	FY2030-2031
$5,800,000	$7,049,936	$7,402,433	$7,772,555	$8,161,182	$8,569,242

HCFES should consider staffing Fire Station 17 with 1 engine, 1 medic unit, 1 brush truck, and 1 tender. There could also be the need for a ladder (truck) company at Fire Station 17 depending on the size and height of the buildings planned for Quarry Preserve, World Woods, Seville West, and Seville East.

ESCI recommends building a four-bay fire station for Fire Station 17 based on the recommended apparatus and to accommodate *Recommendation 2-A* of moving Hazmat 7 to Fire Station 17. This recommendation is discussed in further detail later in this report.

The following figure shows the estimated annual added personnel costs for placing Engine 17 in service with a captain, driver / engineer, and firefighter per shift. Using a 1.3 relief factor, Engine 17 will add an estimated $1.5 million to annual personnel costs.

Figure 122: Estimated Engine 17 Personnel Costs

Position	Average Costs[1]	Number of Positions Needed[2]	Total Costs
Captain	$143,710	4	$574,840
Driver / Engineer	$125,130	4	$500,520
Firefighter Medic	$105,911	4	$423,644
Total			**$1,499,044**

[1] Includes Salary and Benefits
[2] Includes a relief factor of 1.3

The following figure shows the estimated annual personnel costs Medic 17 will be $847,288 when staffing with two firefighter/medics per shift and a relief factor of 1.3.

Figure 123: Estimated Medic 17 Personnel Costs

Position	Average Costs[1]	Number of Positions Needed[2]	Total Costs
Firefighter Medic	$105,911	8	$847,288

[1] Includes Salary and Benefits
[2] Includes a relief factor of 1.3

Fire Station 18

ESCI has identified the Northern part of US 19 near the Citrus County line as a need for an additional fire station with current response times not being adequate and planned development in Northern Hernando County that was discussed in the Fire Station 17 recommendation.

Due to this area being on the border with Citrus County, a regional partnership could be utilized to help with the cost of the station including construction and operation costs since this new station will also provide a benefit to Citrus County. As there are several options for this potential partnership, the following are two options:

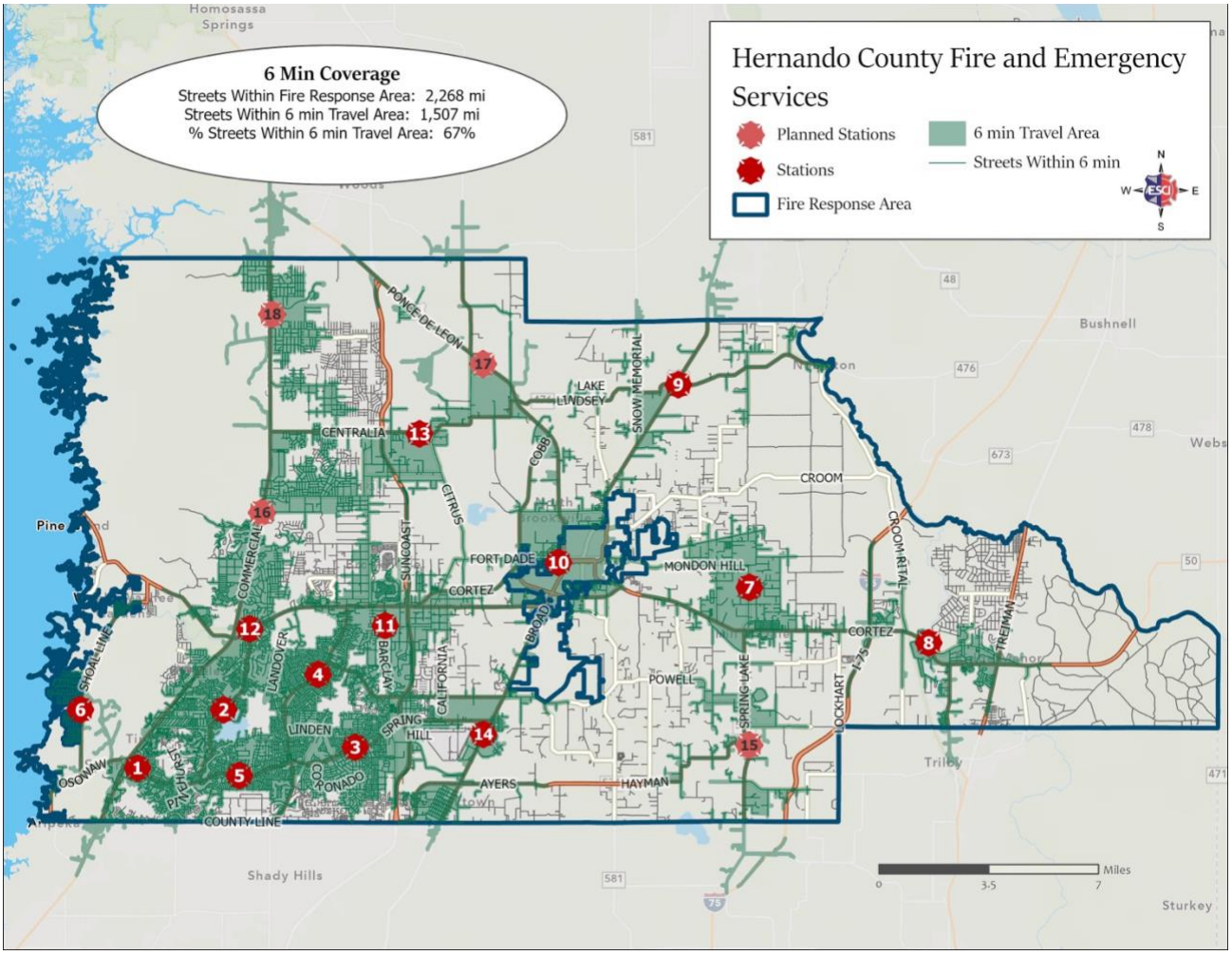
1. Both jurisdictions share the cost of the construction and operation of the station. The station could house units from both jurisdictions. This would be similar to the HCFES Station 10 and City of Brooksville Station 61 agreement.
2. Hernando County pays for the construction, equipment, and annual operating costs (not including staffing). Staffing costs are then shared between the agencies with a percentage calculated based on the service needs of each jurisdiction. An example of this is between two cities in Iowa, Clive and Urbandale.[51]

ESCI cautions that some conflicts and limitations can be caused by these types of agreements. ESCI encourages HCFES to analyze experiences with working with the City of Brooksville as a baseline when considering partnering with Citrus County.

A recommended location would be at the intersection of US 19 and Thrasher Ave. Figure 128 and Figure 129 shown later in this report further justify this recommendation location. The following figure shows that adding Fire Station 18 will increase the six-minute travel time coverage from 64% to 67%. The analysis is based on Fire Station 15, 16, and 17 being operational and only includes streets in the current road network.

[51] "City's collaboration with the City of Urbandale on Station 43." https://www.cityofclive.com/financial_center/city_s_collaboration_with_the_city_of_urbandale_on_station_43.php

Figure 124: HCFES 6-Minute Travel Time Map with Stations 15, 16, 17, and 18



The following figure shows the expected cost to build Fire Station 18 using the $5.8 million price of Fire Station 2 with 5% inflation costs year each. ESCI considered that this station may be needed between FY2033-2034 to FY2037-2038.

Figure 125: Fire Station 18 Cost

2022 Costs	FY2033-2034	FY2034-2035	FY2035-2036	FY2036-2037	FY2037-2038
$5,800,000	$10,415,967	$10,936,765	$11,483,603	$12,057,783	$12,660,673

HCFES should consider staffing Fire Station 18 with 1 engine, 1 brush truck, and 1 medic unit. There could also be the need for a ladder (truck) company at Fire Station 18 depending on the size and height of the buildings planned for Northern US 19, World Woods, Seville West, and Seville East.

The following figure shows the estimated annual added personnel costs for placing Engine 18 in

service with a captain, driver / engineer, and firefighter per shift. Using a 1.3 relief factor, Engine 18 will add an estimated $1.5 million to annual personnel costs.

Figure 126: Estimated Engine 18 Personnel Costs

Position	Average Costs[1]	Number of Positions Needed[2]	Total Costs
Captain	$143,710	4	$574,840
Driver / Engineer	$125,130	4	$500,520
Firefighter Medic	$105,911	4	$423,644
Total			**$1,499,044**

[1] Includes Salary and Benefits
[2] Includes a relief factor of 1.3

The following figure shows the estimated annual personnel costs Medic 18 will be $847,288 when staffing with two firefighter/medics per shift and a relief factor of 1.3.

Figure 127: Estimated Medic 18 Personnel Costs

Position	Average Costs[1]	Number of Positions Needed[2]	Total Costs
Firefighter Medic	$105,911	8	$847,288

[1] Includes Salary and Benefits
[2] Includes a relief factor of 1.3

Fire Station Optimization Model

ESCI used GIS optimization tools to predict the best possible location for fire stations based on service demand inputs for maximizing coverage. The following requirements were entered to conduct the analysis:

1. Which fire stations are to remain?
   In Figure 128, ESCI required only Fire Stations 5 and 6 to remain in place as these are newly constructed facilities. In Figure 129, ESCI required Fire Stations 5, 6, 10, and 14 to remain in place. Fire Station 10 was required to remain in place because it is not owned by Hernando County and HCFES cannot move it. Fire Station 14 was left in place because the of the importance of keeping a fire station close to the airport.

2. What locations that are potential candidates for new stations?
   The County was divided into 100-acre grid squares. All squares that fell with conservation land areas were removed. A point was generated from the center of each square and if this point was not within 200 feet of a street it was removed. All existing fire station locations were also added as points. This created 803 potential locations.

3. What is the service demand input?
   The 2021 incident locations were used as the service demand. Additionally, the projected annual incidents for each planned development were added in a 100-acre grid within the footprint for each planned development. The projected annual incidents are shown in Figure 81.

4. What is the cutoff for travel time?
   The optimized station must be able to provide service to a demand point within x number of minutes. In this analysis six minutes was used based on the county wide seven-minute response time and allowing a one-minute turnout time.

5. What is the number of fire stations to consider having?
   Since ESCI is recommending four fire stations to be added, ESCI used 18 fire stations.

These models can be ran multiple different times changing variables such as which stations to keep in place and how many fire stations the Department should have. It is important to use these models as one of the many tools when determining where fire stations should be located.

Figure 128: Station Optimization Map - Current Fire Stations 5 and 6 Locations Static

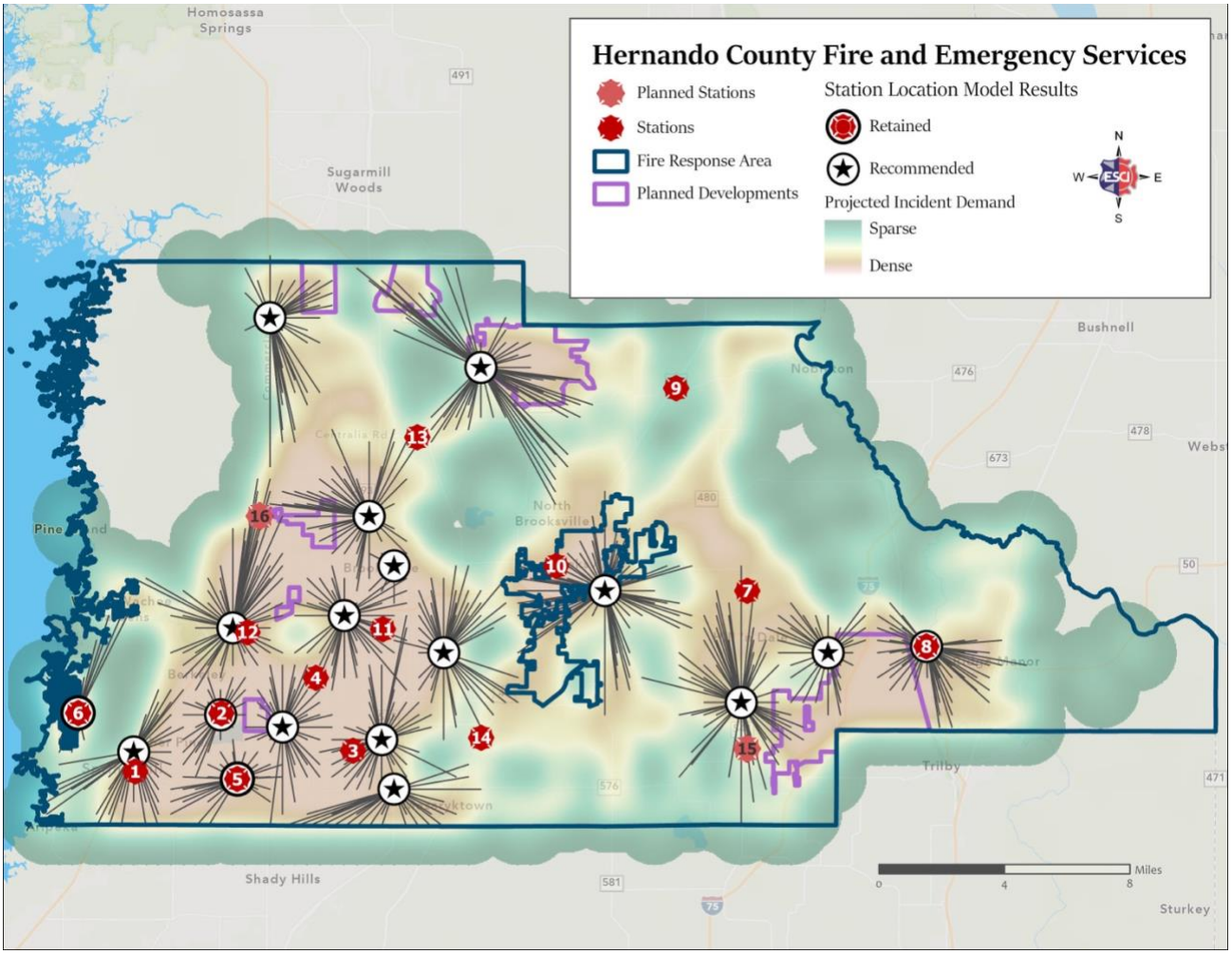
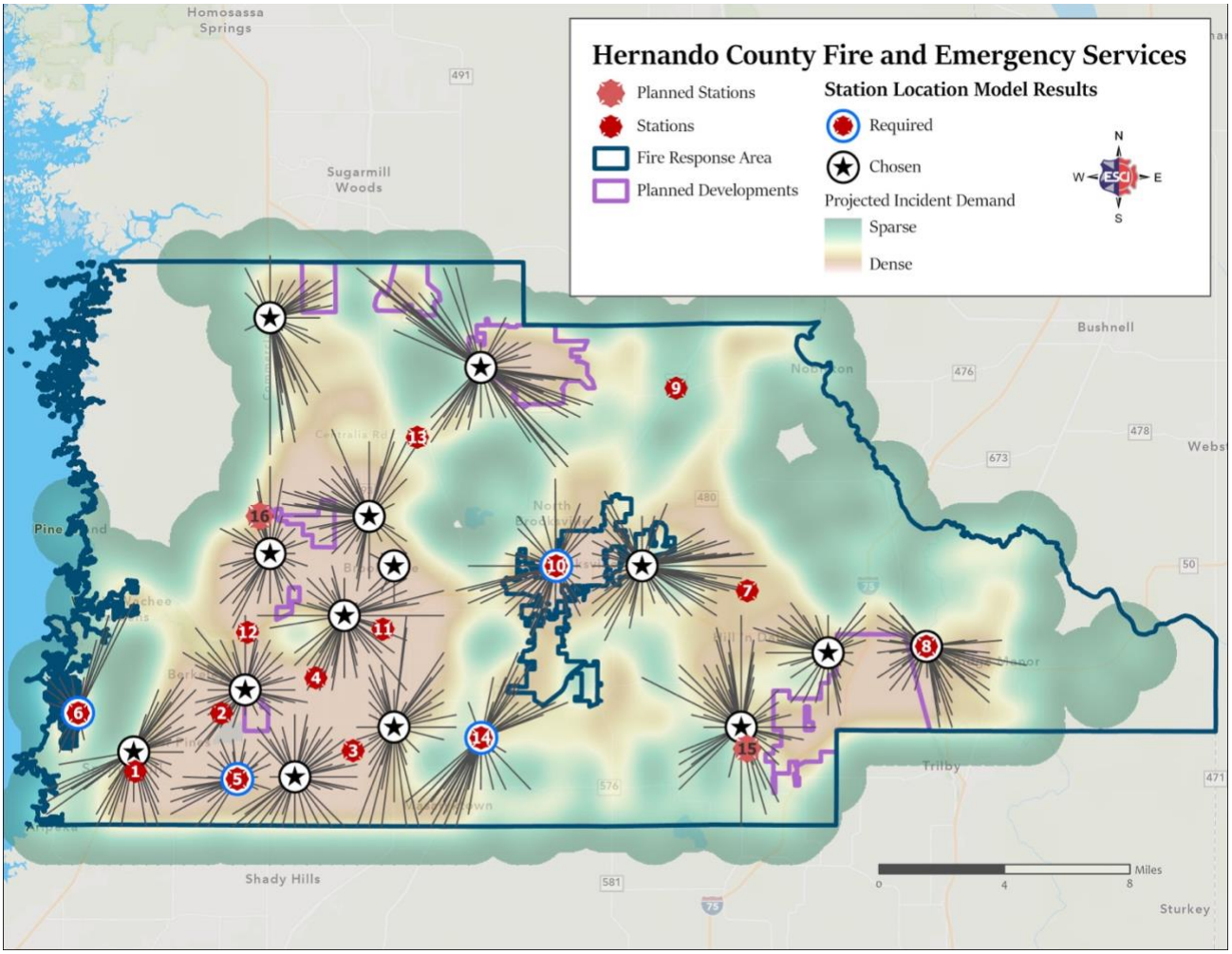


Figure 129: Station Optimization Map - Current Fire Stations 5, 6, 10, and 14 Locations Static



Station Optimization Model Discussion

As mentioned previously, a station optimization model is just one of the many tools HCFES should utilizing when considering where to build new stations or where to relocate current stations.

Both models confirmed that location of Fire Station 2 is well suited and should be built at its current location. Both models justify the location of Fire Station 15. The recommended location of Fire Station 15 in both models is within an acceptable range of the planned location. The model showed the need for both Fire Station 17 and Fire Station 18. This is based on the planned developments being 100% completed. Both models show the need for a fire station near the planned development of Lake Hideaway. ESCI believes the chosen location of Fire Station 16 at US 19 and Bourassa Boulevard is acceptable and valid based on available data.

There are many drawbacks and limitations with station optimization models. One of the major drawbacks is the model requires a demand input. ESCI utilized 2021 incident locations and projected

service demand that each planned development is estimated to have. Therefore, areas with a low service demand will likely not produce a spot for a recommended station location. As seen in both Figure 128 and Figure 129, a gap is created in the Eastern part of the County where Fire Station 7 and 9 currently are located. Another drawback is that the model depends on current street networks. For instance, the model cannot predict travel distance on streets that are not yet constructed. The model will not choose to locate a station inside a planned development area because of the lack of streets.

In both models the locations of Fire Station 1 and 8 are justified to remain where they are currently located based on 2021 incidents and the current road networks. Other fire stations in the Spring Hill area are shown to have some variation on recommended locations. One reason for this is both models are pulling an additional one of the 18 stations to the I-75/SR PDD/Hickory Hill area. This is causing redistribution of the other stations throughout the County. This is likely being done because the road network of the 75/SR PDD/Hickory Hill area is not yet established.

Relocation of Fire Station 13

In both Figure 128 and Figure 129, the models are recommending Fire Station 13 to be moved to the Southern part of Fire Station 13's area. Reasons for this maybe include:

1. A higher call volume and demand in the Spring Hill and City of Brooksville area as shown in Figure 46: HCFES Incident Density (All Incidents), 2019-2021.
2. The addition of Stations 16, 17, and 18 to provide coverage in the Northern part of Hernando County as shown in Figure 124.

One potential option is to relocate Fire Station 13 to the Fire Training Facility. A fire training facility often requires components that also required in a fire station such as:

- Physical Fitness Areas
- Decontamination Areas
- PPE Washer and Dryers
- Standard Washer and Dryers
- Bathroom and Locker Facilities
- Kitchen Facilities
- Training Areas
- Turnout Gear Storage

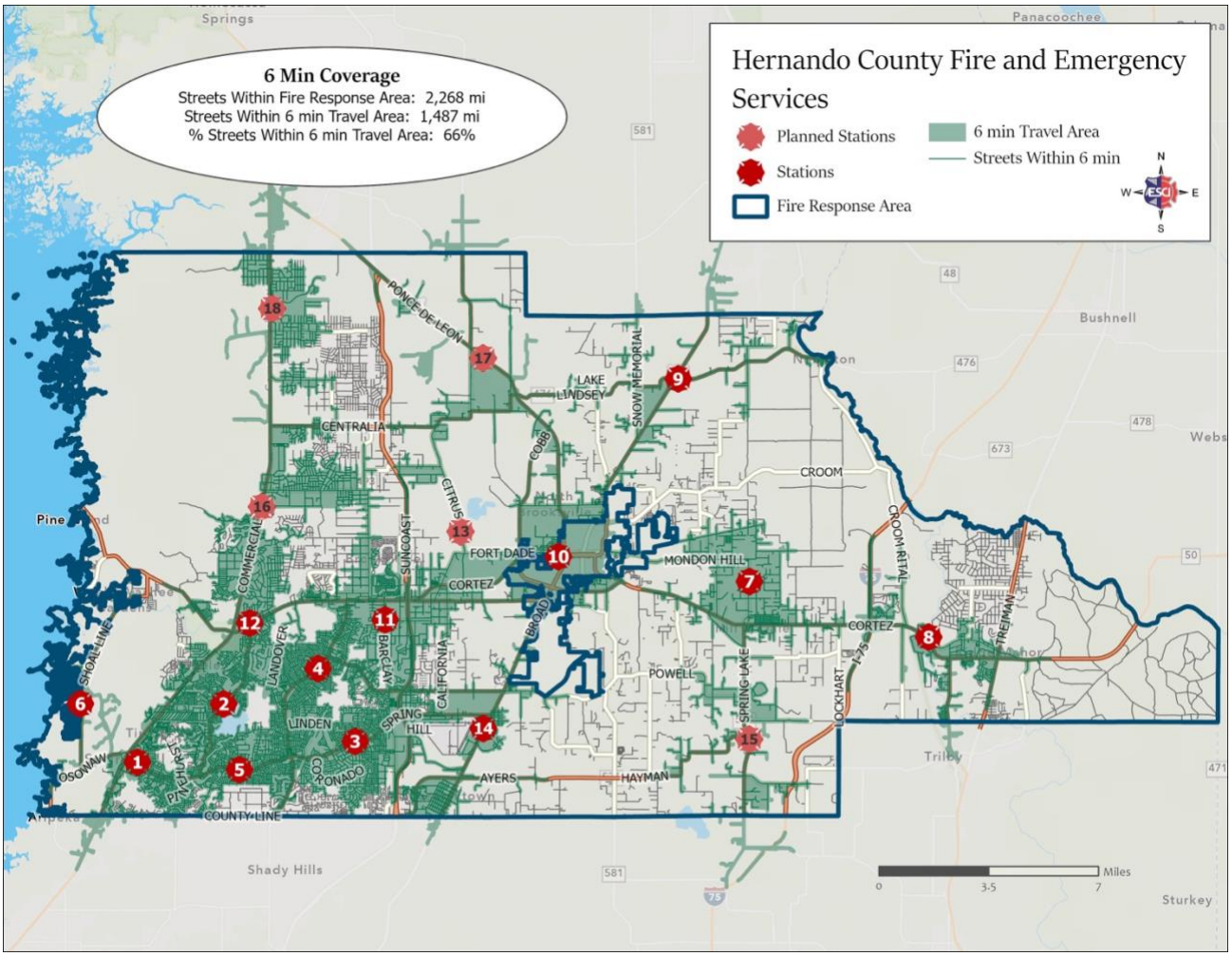
By pairing a fire station and fire training facility together would allow these components to be shared among personnel working at Fire Station 13 and at the Fire Training Facility. This could provide a cost savings to HCFES. For example, having to furnish and equip one exercise area rather than two.

Furthermore, *Recommendation 2-D: Construct Reserve Unit Storage* mentioned later in this report discusses adding reserve unit storage on the campus of the Fire Training Facility. Personnel assigned

to Fire Station 13 could be tasked with daily apparatus and vehicle checks of the reserve units.

The following figure shows that moving Fire Station 13, the six-minute travel time coverage decreases 1% from 67% to 66%. The analysis is based on Fire Station 15, 16, 17, and 18 being operational and only includes streets in the current road network. HCFES leadership would have to compare the benefits of having personnel at the Fire Training Facility 24/7 and the cost savings of combining the two facilities with a 1% decrease in coverage. Furthermore, future road networks may actually create an increase if this analysis is performed in the future.

Figure 130: HCFES 6-Minute Travel Time Map of Relocated Station 13 with Stations 15, 16, 17, and 18



Short-Range Recommendations & Strategies

Short-range recommendations and strategies are ones the HCFES should attempt to put into practice within the next one to three years.

Recommendation 1-A: Response Performance Objective

Hernando County BOCC approved a service level response performance objective for seven minutes response time on average for all calls. ESCI commends Hernando County for establishing this performance objective. ESCI encourages HCFES to analyze through percentile measurements rather than average. As mentioned previously in this report, using average for performance standards may not accurately reflect the performance for the entire data set and may be skewed by outliers, especially in small data sets. One extremely good or bad value can skew the average for the entire data set.

ESCI recommends using percentile measurements because they show that most of the data set has achieved a particular level of performance. For instance, ESCI recommends that HCFES change their performance standard to meet a response time (total reflex time) of seven minutes for 90% of the incidents annually. This means that only 10% of incidents will have a response time of more than seven minutes. The seven minutes previously mentioned is just an example and is based on Hernando County's current response performance objective.

Recommendation 1-B: Divide the County into Performance Areas

Hernando County has both urban, suburban, and rural demand zones. Demand zones are defined in the following figure.

Figure 131: Demand Zones[52]

Demand Zone	Definition
Rural	An area with fewer than 500 people per square mile.
Suburban	An incorporated or unincorporated area with a population between 500 people and 1,000 people per square mile.
Urban	An incorporated or unincorporated area with a population of over 30,000 people and/or a population density over 1,000 people per square mile, but less than 2,999.
Dense Urban	An incorporated or unincorporated area with a population of over 200,000 people and/or a population density over 3,000 people per square mile.

[52] Demand Zones. https://www.nfpa.org/-/media/Files/Membership/member-sections/Metro-Chiefs/2018-conference/MetroWednesday1710Proposals.ashx

ESCI recommends that HCFES divide the county into two areas:

1. Rural
2. Suburban and Urban

Response performance objectives should be established based on these areas. An example would be to utilize a 6-minute response performance standard for suburban and urban areas and a 10-minute response performance standard for rural areas. ESCI recommends dividing zones based on zip codes to easily filter call locations when performing data analysis.

Recommendation 1-C: Ensure Hurricane Protection is Adequate at All Stations

The high hazard risk of tropical cyclones for Hernando County is highlighted in the *Community Risk Analysis* section of this report. During ESCI's site visits, not all fire stations had proper hurricane protection. HCFES is in the process of installing emergency generators at all fire stations that will include a start-up switch inside the building to keep first responders from having to go out in the elements to turn on the generator. Furthermore, some fire stations had hurricane net systems for bay doors that requires first responders to go out in the elements to apply and remove the nets when wind speeds reach a certain threshold. This practice increases the firefighters' chance of injury.

HCFES should develop a plan to install hurricane rated bay doors and window shutters on all fire stations. This is critical to protect fire responders and to ensure fire stations are not damaged during storms so they can continue to deploy resources to the public during and after the storm. All new fire stations should be built to include these features.

Recommendation 1-D: Hire an Administrative Assistant/ Data Analyst

As mentioned throughout the report, determining if, when, and where to add additional resources and/or fire stations will be heavily dependent on response performance data. Members of the HCFES command staff currently pull and analyze data regularly but this takes time away from other necessary job functions. Furthermore, all members of the command staff currently share the same administrative assistant.

ESCI recommends that HCFES hire an additional administrative assistant that can perform data analyst duties. NFPA is set to release a new standard in the near future, *NFPA 1022: Standard for Fire and Emergency Services Analyst Professional Qualifications*. It is recommended that the new hire meet the qualifications set forth in this upcoming standard. Adding an additional administrative assistant can help booster the slim staff level personnel mentioned in the *HCFES Organization Overview* section of this report.

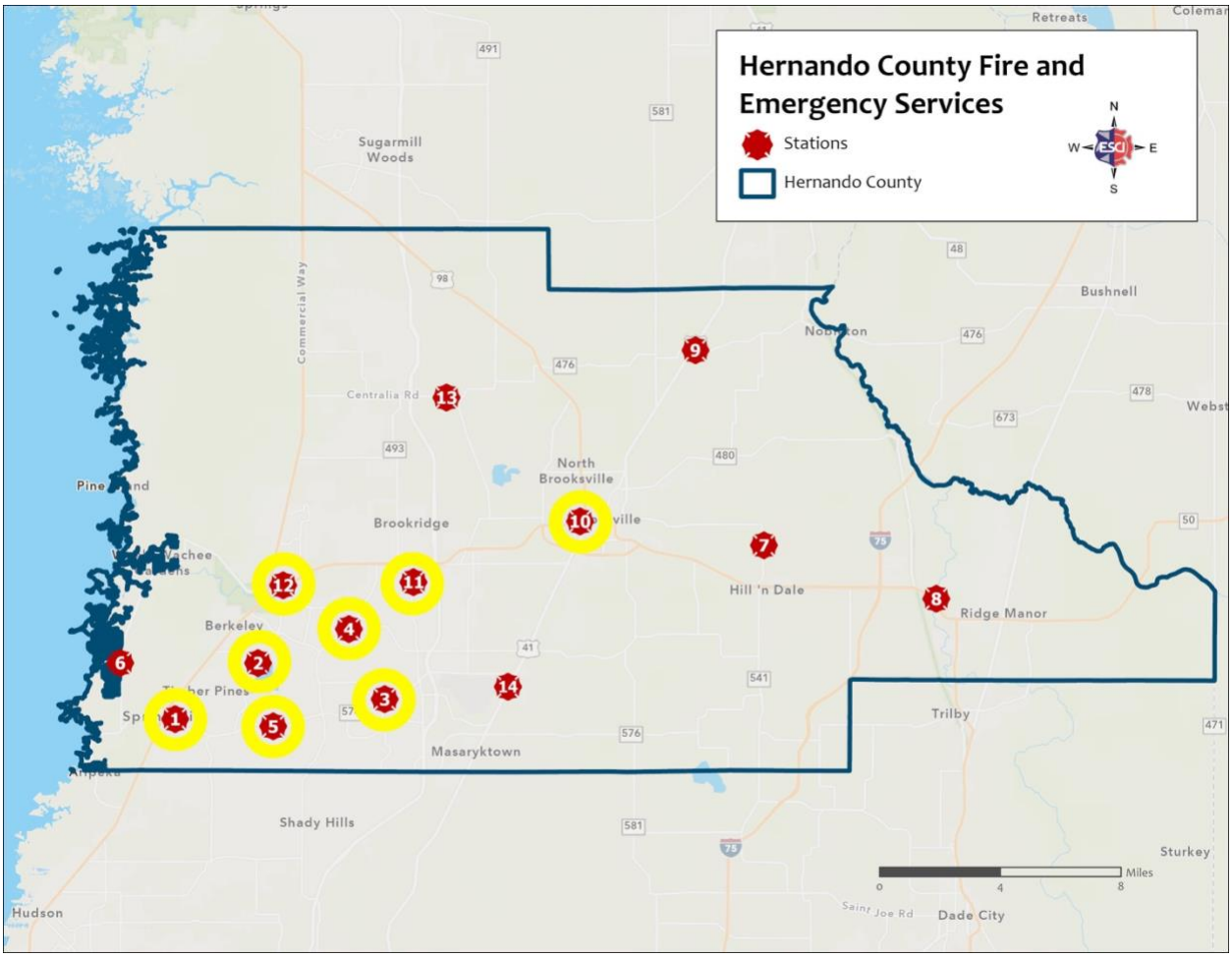
Based on salary information on Glassdoor, the total pay, including benefits for a Fire Data Analyst in the United States is about $73,371 per year.[53]

[53] Fire Analyst Salaries. https://www.glassdoor.com/Salaries/fire-analyst-salary-SRCH_KO0,12.htm

Recommendation 1-E: Add Peak Time Medic Units

HCFES medic units are experiencing high call volumes with many having peak UHU values of greater than 30%. The following figure shows the locations of fire stations where medic units with a 30% or greater 2021 peak (8:00 am to 8:00 pm) UHU value are assigned. These stations are circled in yellow in the following figure. Medic 14 has a UHU value of over 30% for the 10 hours it is in service from 8:00 am to 6:00 pm. Station 14 is not circled because Medic 14 is deployed from Station 10 during those hours the unit is in service. Station 4 houses both Medic 4 and Medic 204.

Figure 132: Peak Medic Unit "Line in the Sand" Locations



This recommendation is based on the current peak unit, Medic 14, remaining in service. If HCFES follows through with the recommended 12-hour schedule of 8:00 am to 8:00 pm for peak units, it is recommended to transition Medic 14 to this schedule as well. ESCI recommends continue deploying Medic 14 from Station 10 until the proposed M210 is added. Once M210 is implemented, HCFES should then determine where to best deploy Medic 14 by analyzing EMS incident density and travel time data. A potential option would be to deploy Medic 14 from Station 14 to be in a position to handle Zone 14 calls, the Southern Brooksville area, and the Eastern Spring Hill area.

It is recommended that HCFES add five peak (8:00 am to 8:00 pm) transport units over the next three years.

Figure 133: Proposed Schedule to Add Peak Time Units

Fiscal Year	Start Date	Number of Units	Suggested Location
FY2022-2023	October 1, 2022	2	Station 5 and 11
FY2023-2024	October 1, 2023	1	Station 3
FY2024-2025	October 1, 2024	1	Station 2
FY2025-2026	October 1, 2025	1	Station 10

In an effort to provide an illustration of the potential benefits of the additional units, ESCI took the total hours of the 10 units with a 30% or greater peak UHU value in 2021 and divided by 10 to provide a per unit value. Then by dividing the same total by 12 units (equivalent of original units plus the 2 proposed units for 2022) calculated a new per unit value. A 5% increase (average increase in EMS UHU values per year from 2017 to 2021) was added to all the units 2021 total to calculate a new 2022 total after the new per unit value was subtracted. This was repeated each year changing the number of units in service based on the recommendation. The percentage of change resulting from this calculation shows that each unit would experience up to a significant reduction in unit hour utilization as illustrated in the following figure. It should be noted that this is an approximation of impact as each unit may actually take on additional workload from other surrounding zones.

Figure 134: Potential Reduction in UHU by Adding Additional Units

Unit	2021 Original	2022 Theoretical	2023 Theoretical	2024 Theoretical	2025 Theoretical	% Change
M1	40.37%	35.93%	35.12%	34.53%	34.12%	-15.48%
M2	38.14%	33.59%	32.66%	31.95%	31.41%	-17.65%
M3	37.16%	32.56%	31.58%	30.81%	30.22%	-18.68%
M4	36.27%	31.63%	30.60%	29.78%	29.14%	-19.66%
M5	37.08%	32.48%	31.49%	30.72%	30.12%	-18.77%
M10	32.73%	27.91%	26.70%	25.69%	24.83%	-24.14%
M11	39.96%	35.50%	34.67%	34.06%	33.62%	-15.87%
M12	38.27%	33.73%	32.81%	32.10%	31.57%	-17.51%
M14[1]	32.98%	28.17%	26.97%	25.97%	25.14%	-23.77%
M204	36.01%	31.35%	30.31%	29.48%	28.82%	-19.97%
M205	N/A	32.28%	31.29%	30.51%	29.90%	N/A
M211	N/A	32.28%	31.29%	30.51%	29.90%	N/A
M203	N/A	N/A	31.29%	30.51%	29.90%	N/A
M202	N/A	N/A	N/A	30.51%	29.90%	N/A
M210	N/A	N/A	N/A	N/A	29.90%	N/A

[1] 2021 original UHU for M14 is based on 10 hours, 8:00 to 6:00 pm, instead of 12 hours

Estimated Costs

Fire stations were chosen based on their potential to house an additional medic unit without major modifications. There would be minimal costs to upgrades to the buildings for the additional personnel, especially since additional bunkroom space is not needed for personnel assigned to the peak time shifts.

Using the provided information to ESCI by HCFES, ESCI used the average cost of a "Single Cert Medic" to estimate a member's salary which is $73,102 per year. HCFES should determine which shift schedule would work best for its personnel. One recommendation is that these members work four 12-hour shifts (8:00 am to 8:00 pm) followed by four days off. Thus, this would require two shifts of personnel. Furthermore, having these members start their shifts the same time as the rest of HCFES operation personnel would allow for better staffing solutions. For instance, if an ALS is member is needed, one could be detailed to the peak unit from a suppression unit for the first 12 hours of their 24-hour shift and the suppression vacancy back filled with a BLS firefighter. The previously mentioned salaries are based on a 40-hour work week (2,080 hours annually) and the recommended schedule would be a 42-hour work week (2,190 hours annually). Therefore, HCFES would have to adjust the salaries based on the increase in hours worked. HCFES also needs to ensure they are operating within Fair Labor Standard Act (FLSA) requirements. In the following figure, a relief factor of 1.3 was used in determining staffing. A relief factor is the number of positions needed to fill one position when employee leave is taken into consideration. This is an example relief factor based on averages from fire departments that are similar in size to Hernando County.

Figure 135: Cumulative Estimated Personnel Costs

Fiscal Year	FY2022-2023	FY2023-2024	FY2024-2025	FY2025-2026
Number of Personnel	8	12	16	20
Number of Personnel w/ 1.3 Relief Factor	10	16	20	26
Salary[1]	$74,644	$74,563	$76,054	$77,575
Total Personnel Costs	**$731,010**	**$1,193,008**	**$1,521,086**	**$2,016,960**

[1] 2% cost of living adjustment added per year

As seen in the previous figure the addition of five peak units is estimated to add $2.02 million in personnel costs. The previous figure includes staffing all peak units with two ALS members. ESCI presents the potential option of staffing the peak units with one BLS trained member and one ALS trained member. Since HCFES utilizes ALS on all suppression units, there is an option to upgrade if a specific incident requires more than one ALS provider. Furthermore, it is tougher for fire departments to recruit and hire ALS personnel over BLS personnel. In addition, the staffing costs of one BLS and one ALS member on each unit is lower than two ALS members.

ESCI recommends that HCFES purchase six medic units for this recommendation. This will add five to the fleet for the new units and enable HCFES to increase the reserve medic fleet from four to five. The following figure shows the unit costs that will need to be added to each fiscal year. ESCI estimates that a medic unit will cost approximately $375,000 which includes equipment.

Figure 136: Estimated Equipment Costs

Fiscal Year	FY2022-2023	FY2023-2024	FY2024-2025	FY2025-2026
Medic Unit Costs[1]	$375,000	$393,750	$413,438	$434,109
Number of Medic Units	2	2[1]	1	1
Total per Year	**$750,000**	**$787,500**	**$413,438**	**$434,109**

[1] 5% inflation added per year
[2] Additional unit will replace another frontline unit and move that frontline to reserve status

The following figure shows the estimated total impact that this recommendation will have for each fiscal year. Maintenance and other expenses are not included.

Figure 137: Recommendation Costs

Fiscal Year	FY2022-2023	FY2023-2024	FY2024-2025	FY2025-2026
Increase in Personnel Costs	$731,010	$1,193,008	$1,521,086	$2,016,960
Yearly Equipment Costs	$750,000	$787,500	$413,438	$434,109
Yearly Budget Impact	**$1,481,010**	**$1,980,508**	**$1,934,524**	**$2,451,069**

This recommendation is further justified by analyzing Figure 50: HCFES 2021 Incident Time Travel. There are many incidents that are within the Spring Hill area that had an 8 to 12 minute and greater than 12 minute travel time. This is due to call concurrency which was shown in Figure 71, that HCFES is almost always handling more than just one incident at a time. Therefore, the closest and even the second closest units are not available to respond. Additional units in this area will help reduce the overall response times. Also, the addition of the Spring Center and Cortez developments in the Spring Hill area will further justify the need for additional resources in the area.

Recommendation 1-F: Utilize Closest Unit Dispatch with the City of Brooksville

Currently, HCFES and the City of Brooksville do not utilize the closest unit dispatch. As mentioned previously in this report, emergencies occur without respect to jurisdictional boundaries. There are times when HCFES units are responding past the City of Brooksville Station 61 (Station 10) to reach an emergency incident while the City of Brooksville units are in service and in quarters.

HCFES and the City of Brooksville already utilize a similar agreement for structure fire incidents. Utilizing this for all emergencies would be beneficial to both Hernando County and the City of Brooksville. Hernando County would benefit because there are areas to the North and East outside the City of Brooksville where a City of Brooksville unit would be the closest even though the incident is not within city limits. The City of Brooksville would benefit because there are areas in the Southern area of the City of Brooksville city limits where HCFES Engine 14 would be the closest unit.

Recommendation 1-G: Add Division Chief of Operations

ESCI recommends adding a Division Chief of Operations to lessen the direct subordinates of the Deputy Chief. The Deputy Chief is also responsible for filling in for the Fire Chief in his/her absence which adds additional responsibilities to an already busy workload. The following figure shows the span of control before and after the recommended addition of a Division Chief of Operations.

Figure 138: Span of Control Before and After Division Chief of Operations

Position/Rank	No. of Subordinates (Before)	No. of Subordinates (After)
Fire Chief	5	5
Deputy Chief	12	5
Division Chief of Operations	N/A	9
Division Chief of EMS	3	3
Division Chief of Profession Standards	2	2
Division Chief Training & Safety	2	2
Battalion Chiefs (per shift per battalion)	5 to 6	5 to 6
Captains (per shift)	2 to 6	2 to 6

The current division chief's maximum salary is $120,057.60. This cost does not include benefits and the candidate hired into that position may be closer to the $104,000 starting range due to time in grade.

Recommendation 1-H: Develop a Plan for ARFF

The Brooksville-Tamp Bay Regional Airport has plans to increase operations. Such an increase may require Brooksville-Tamp Bay Regional Airport to go through the certification requirements listed in Title 14 of the Code of Federal Regulations with the Federal Aviation Administration.[54] ESCI recommends that HCFES work with Brooksville-Tampa Bay Regional Airport to develop a plan to ensure effective ARFF coverage and staffing.

This may include relocation of the ARFF truck to ensure required response times or dedicated

[54] "Airport Certification." https://www.faa.gov/airports/airport_safety/part139_cert/

staffing of the ARFF truck. The code does not take into consideration the number of staff required but does state, "Sufficient rescue and firefighting personnel are available during all air carrier operations to operate the vehicles, meet the response times, and meet the minimum agent discharge rates required by this part."[55] This may be accomplished with one member per shift dedicated to staff ARFF 14.

ESCI also recommends that HCFES refer to *NPFA 402: Guide for Aircraft Rescue and Fire-Fighting Operations*, *NFPA 403: Standard for Aircraft Rescue and Fire-Fighting Services at Airports, NFPA 414: Standard for Aircraft Rescue and Fire-Fighting Vehicles,* and *NFPA 1003: Standard for Airport Fire Fighter Professional Qualifications* when exploring potential changes and options.

Recommendation 1-I: Determine Ways to Reduce Components of Total Response Time

The first aspect of the Total Response Time Continuum is call processing. Figure 39 shows that the HCFES call processing time for all incidents is more than double the NFPA standard with 2 minutes, 18 seconds. Hernando County Emergency Communication Operations Center is operated by the Hernando County Sheriff's Office. Currently, the minimum staffing for dispatch staffing is two dispatchers to handle fire calls. HCFES had 38,271 incidents in 2021, this equates to an average of 105 incidents per day. Furthermore, referring to Figure 71: HCFES Call Concurrency, 2017–2021, there is almost always more than one incident for dispatchers to handle.

ESCI recommends that HCFES work with the Hernando County Sheriff's Office to increase the minimum dispatcher staffing for fire dedicated dispatchers. It is recommended that the staffing be increased to at least three during daytime hours. Additionally, it is recommended to add a fire dispatch supervisor 24/7 to provide supervisory duties and to provide additional coverage for dispatching when needed, thus having four personnel during the day and three at night.

The second aspect of the Total Response Time Continuum is turnout time. Figure 41 shows that HCFES overall turnout performance is 2 minutes, 6 seconds. Although all emergencies are important, it is human nature for emergency personnel to prioritize emergency incidents and move quicker for some than others. For instance, responders will most likely turnout faster for a structure fire or cardiac arrest rather than alarm bells. ESCI recommends HCFES install television monitors throughout the stations that will display incident information and a countdown timer to help members monitor their turnout time.

Recommendation 1-J: CAD Upgrades

ESCI recommends that HCFES explore computer-aided dispatch upgrades. This will allow both ramp-up tones and the monitors recommended in *Recommendation 1-I* to be functional.

[55] "Aircraft rescue and firefighting: Operational requirements." https://www.law.cornell.edu/cfr/text/14/139.319

Mid-Range Recommendations & Strategies

Mid-range recommendations and strategies are those the HCFES should attempt to put into practice within the next three to seven years.

Recommendation 2-A: Relocate Units to Station 17 and Provide Staffing

As mentioned in the *Fire Station Recommendations* section, ESCI encourages HCFES to build Fire Station 17 utilizing the four-bay apparatus station design that was used in the construction of Fire Station 5. Once Fire Station 17 is completed, ESCI recommends moving Hazmat 7 and Tender 10 to Fire Station 17 and providing staffing for one Driver/Engineer per shift. The Driver/Engineer would cross staff the newly designated Tender 17 and Hazmat 17.

Currently, Tender 10 is crossed staffed with Medic 10 personnel. Medic 10 had a 2021 UHU value of 28.37%. This means that those personnel are only available to staff Tender 10 a little over 70% of the time. Also, staffing Tender 10 would require taking Medic 10 out of service. Removing a medic unit from service would tax an already strained EMS system.

The newly staffed Tender 17 could provide a response to much of the Northern part of Hernando County which as shown in Figure 63 lacks fire hydrants. Furthermore, permanent staffing does not take personnel off a fire suppression unit, which limits those personnel available for fire suppression as cross staffing does. HCFES dispatches two tenders on every countywide rural structure fire incident and based on the location of Fire Station 17, there is a high probability that Tender 17 will be dispatched to most rural structure fire incidents.

Relocating Hazmat 7 to Fire Station 17 provides hazardous materials response coverage to the Northern part of the County. It also moves hazardous materials response units closer to two of the three TRI facilities listed in Figure 97. Currently, HCFES divides hazardous materials response coverage by having Hazmat 7 in the East and Hazmat 3 in the West. This new deployment strategy would divide the county into North and South sections with Hazmat 17 in the North and Hazmat 3 in the South.

The following figure shows the additional personnel costs this position would add. ESCI used the average cost of a Driver/Engineer, which includes salary and benefits. ESCI did not factor in a relief factor as it would be recommended to fill vacancies in this position with overtime rather than add a fourth Driver/Engineer to one of the three shifts to satisfy a 1.3 relief factor.

Figure 139: Estimated Additional Driver / Engineer Costs

Average Driver /Engineer Costs[1]	Number of Positions Needed	Total Costs
$125,130.68	3	$375,392.04

[1] Includes Salary and Benefits

Recommendation 2-B: Staff an Additional Ladder Truck

Hernando County has experienced significant growth and development regarding the types of occupancies. There is continued growth and development that is occurring in the County. Many of the recently completed and proposed projects involve moderate and high-risk occupancies with large square footage or multiple stories with large square footage. Firefighting activities exponentially get more difficult with every story of height experienced.

Ladder truck company operations include search, rescue, forcible entry, ventilation, aerial ladder operations, and elevated master stream operations. Currently, HCFES operates only one ladder truck. ESCI recommendations that HCFES consider adding an additional ladder truck to its fleet. The addition of a ladder truck would help with credit towards the PPC® score.

Recommendation 2-C: Utilize Fire Lieutenants

Currently HCFES staffs every suppression unit on every shift with a captain. Recently HCFES created a lieutenant position for EMS staffing, precepting new providers, and oversight.

ESCI recommends that HCFES move to staffing two of the three shifts on each suppression unit with a fire lieutenant and the third shift will have a captain. Fire lieutenants will serve as the company officer on their shift just as the current captain does now. The station captain will then be the company officer but will be in charge of setting policies and oversight of the station. This recommendation will help with the rank structure of the department by balancing ranks. Also, it will allow the station captain to make decisions regarding fire station matters without conflict between two other captains.

The following table shows the cost savings based on staffing each unit with two lieutenants and one captain. ESCI used the average costs of the captain positions that were provided which was $143,710. ESCI calculated the average cost of a fire lieutenant to be $125,000 based on current Driver/Engineer costs along with analyzing nearby and similar jurisdictions. Cost includes salary and benefits.

Figure 140: Fire Lieutenant Costs

Unit	Shift A	Shift B	Shift C	Total
Engine 1	$143,710	$125,000	$125,000	$393,710
Engine 2	$125,000	$143,710	$125,000	$393,710
Ladder 2/5	$125,000	$125,000	$143,710	$393,710
Engine 3	$143,710	$125,000	$125,000	$393,710
Engine 4	$125,000	$143,710	$125,000	$393,710
Engine 5	$125,000	$125,000	$143,710	$393,710
Engine 6	$143,710	$125,000	$125,000	$393,710
Engine 7	$125,000	$143,710	$125,000	$393,710
Engine 8	$125,000	$125,000	$143,710	$393,710
Engine 9	$143,710	$125,000	$125,000	$393,710
Engine 11	$125,000	$143,710	$125,000	$393,710
Engine 12	$125,000	$125,000	$143,710	$393,710
Engine 13	$143,710	$125,000	$125,000	$393,710
Engine 14	$125,000	$143,710	$125,000	$393,710
Total	**$1,843,550**	**$1,843,550**	**$1,824,840**	**$5,511,940**

Staffing a captain on every shift on every engine and ladder truck costs $6,035,820 per year. The recommendation would cost $5,111,940 which would save $523,800 in personnel costs per year. This only includes the suppression units in service at the time of this report. Savings would be realized further as HCFES adds additional units and fire stations. ESCI does not recommend demotions and recommends that this plan be accomplished through attrition.

Recommendation 2-D: Construct Reserve Unit Storage

During ESCI's site visits, it was observed that many reserve apparatus had to be stored outdoors due to the lack of indoor storage. Storing units outdoors exposes them to the elements and could impact the service life of the unit. ESCI recommends constructing a large storage facility on the future campus of the Fire Training Facility to house reserve units.

Recommendation 2-E: Relocate Tender 12 to Station 16 and add Peak Medic Unit at Station 12

Once Fire Station 16 is completed, ESCI recommends moving Tender 12 to Station 16 and staffing peak Medic 212 at Fire Station 12. Moving Tender 12 to Fire Station 16 will free up space in Fire Station 12 to house a peak medic. Medic 212 will be the sixth peak medic added to assist with the high EMS call volume during the hours of 8:00 am to 8:00 pm.

Recommendation 2-F: Create a Staffing Officer Position

Currently, ensuring the department is staffed properly is handled by Battalion Chief 2. This takes a great deal of the battalion chief's duties and creates issues with three different people across three shifts handling staffing. As the department adds units and fire stations, this task will become even more difficult. ESCI recommends that HCFES creating a staffing officer position that ensures the Department is adequately staffed. Even with using a software scheduling program, there is the still the need to build rosters and adjust staff accordingly. The recommended staffing officer position would work Monday through Friday 8:00 am to 4:00 pm. Any emergency staffing needs after those hours and on weekends would be handled by the on-duty Battalion Chiefs.

A potential option would be to utilize a captain who is approved to act as a battalion chief. Since major incidents in Hernando County such as structure fires require the response from two of the three shift battalion chiefs, the staffing officer could provide coverage to give the County two Battalion Chiefs in the event of a concurrent major incident during normal business hours. The average cost of a 40 hour per week captain including benefits is $108,671.

Recommendation 2-G: Add Additional Training Officer

With the added number of line (operational) positions throughout the recommendations, ESCI recommends adding an additional training officer to assist with training members. The total annual salary of a training officer including benefits is $69,188.

Recommendation 2-H: Add Additional Fire Inspector

The growth in Hernando County will require additional buildings to be inspected thus increasing the workload of fire inspectors. Recent fire prevention staffing studies suggest that the ideal annual workload for full-time fire inspectors should be about 500-750 fire inspections of all types — new construction, existing structures, complaints, and code compliance follow-ups.[56] This ideal capacity includes the time required for travel between inspections, to conduct and document the inspection, to research code issues, to conduct follow-up and compliance activities, and to testify in code interpretation and correction hearings or court cases. ESCI calculated the average inspections from 2016 to 2019 to be 2,749 per year. 2020 and 2021 were excluded due to limitations with COVID-19. With three full time inspectors, this is 916 inspections per year per inspector when divided equally. A fourth inspector will bring HCFES within the recommended 500-750 range and allow for the expected growth. The total annual salary of a fire inspector including benefits is $63,798.

[56] "Fire Prevention Caseload and Resource Requirements", by M. Montgomery and K. Kistner for the Harris County (TX) Fire Marshal's Office, 2016; "Risk-Based Inspection Programs: How to Calculate Staffing Needs", M. Montgomery, 2019; and others.

Long-Range Recommendations & Strategies

Long-range recommendations and strategies are those the HCFES should attempt to put into practice within the next 7 to 15 years.

Recommendation 3-A: Staff a Ladder Truck in the Southeastern part of the County

ESCI recommends that HCFES examine the growth and the type of development in the I-75/SR PDD/Hickory Hill area to determine if a ladder (truck) company is needed and justified to be staffed at Fire Station 15 or a remodeled Fire Station 8.

Recommendation 3-B: Staff a Ladder Truck at either Fire Station 16, 17, or 18

ESCI recommends that HCFES examine growth and the type of development along Northern US 19 and the Northern Hernando County area to determine if a ladder (truck) company is needed and justified to be staffed at Fire Station 16, 17, or 18.

Recommendation 3-C: Redistribute Battalion Assignments

If HCFES elects to build all 4 proposed stations, ESCI recommends that HCFES redistribute battalion assignments for better geographic coverage of command officers. The following figure shows the recommended home location of the three battalion chiefs and the fire stations assigned to each battalion.

Figure 141: Proposed Battalion Assignments

Battalion	Home Station	Assigned Stations
1	5	1, 2, 3, 4, 5, 6
2	16	11, 12, 13, 16, 17, 18
3	7	7, 8, 9, 10, 14, 15

Recommendation 3-D: Ensure Adequate Reserve Fleet

As HCFES expands its frontline fleet, ESCI recommends that HCFES should ensure it has an adequate reserve fleet to prevent service disruption from routine maintenance or unforeseen events such as an accident or mechanical failure. ESCI recommends that HCFES have a ratio of one reserve for every three to five frontline units.

Recommendation 3-E: Add Additional Training Officer

Even with adding a training officer in *Recommendation 2-G*, long-term there may be the need to add another training officer as well. HCFES should monitor the workload of the training staff to see if this position is justified.

Recommendation 3-F: Add Additional Fire Inspector

Even with adding a fire inspector in *Recommendation 2-H,* long-term there may be the need to add another fire inspector as well. HCFES should monitor the inspection workload to see if this position is justified.

Recommendation 3-G: Implementation of Community Paramedicine Program

EMS incidents accounted for 27,378 out of the 38,271 (71.5%) that HCFES responded to in 2021. There was a 20.7% increase in EMS incidents from 2017 to 2021. HCFES should consider implementing a community paramedicine program. A community paramedicine program works to correct the health concerns of individuals rather than just transporting patients to the hospital. By correcting and addressing individuals' health concerns, they are less likely to need 9-1-1 which reduces the stress on the EMS system. Paramedicine programs are to EMS what fire prevention programs are to fire suppression. It is estimated nationally that 15% of individuals transported to emergency rooms could be treated safely in non-urgent settings.[57] Multiple agencies across the country are using paramedicine programs to reduce their EMS calls and ultimately improve the health of their community. HCFES should research successful programs and design one that fits the need of Hernando County. Additionally, HCFES should utilize public and private partnerships in an effort to design the best program while reducing costs to HCFES.

[57] https://www.umaryland.edu/news/archived-news/february-2019/newspressreleaseshottopics/umb-partners-launch-mobile-integrated-health--community-paramedicine-program-.php

FUTURE APPARATUS PLACEMENT

If HCFES decides to follow through with all recommendations in this report the following chart shows the apparatus that will be staffed at each station.

Figure 142: Future Apparatus Placement

Fire Station	Apparatus
Fire Station 1	Engine 1, Medic 1
Fire Station 2	Engine 2, Squad 2[a], Medic 2, Medic 202[b]
Fire Station 3	Engine 3, Medic 3, Medic 203[b], Hazmat 3[a]
Fire Station 4	Engine 4, Medic 4, Medic 204
Fire Station 5	Engine 5, Ladder 5[c], Air Truck 5[a], Medic 5, Medic 205[a], Battalion Chief 1
Fire Station 6	Engine 6, Brush 6[a]
Fire Station 7	Engine 7, Medic 7, Brush 7[a], Battalion Chief 3
Fire Station 8	Engine 8, Medic 8, Tender 8[a], Brush 8[a]
Fire Station 9	Engine 9, Brush 9[a]
Fire Station 10	Medic 10, Medic 210[b]
Fire Station 11	Engine 11, Ladder 11[d], Medic 11, Medic 211[b]
Fire Station 12	Engine 12, Medic 12, Medic 212[b], Brush 12[a]
Fire Station 13	Engine 13, Brush 13[a]
Fire Station 14	Engine 14, Medic 14[b], ARFF 14[a], Brush 14[a]
Fire Station 15	Engine 15, Ladder 15, Medic 15, Brush 14[a]
Fire Station 16[e]	Engine 16, Medic 16, Tender 16[a], Battalion Chief 2
Fire Station 17[e]	Engine 17, Medic 17, Brush 17[a], Tender 17, Hazmat 17[f]
Fire Station 18[e]	Engine 18, Medic 18, Brush 18[a]
Total	**17 Engines, 4 Ladder Trucks, 1 Squad, 14 24/7 Medic Units, 7 Peak Medic Units, 10 Brush Trucks, 3 Tenders, 2 Hazmat Units, 1 ARFF Unit, 1 Air Truck, 3 Battalion Chiefs**

[a] Designates Cross Staffed with Engine Personnel
[b] Designated Peak Medic 8:00 am to 8:00 pm
[c] Ladder 2 moved to Ladder 5
[d] Ladder Truck from Recommendation 2-B. Fire Station 11 would need to be rebuilt/renovated to accommodate
[e] Fourth Ladder Truck to be assigned at Fire Station 16, 17, or 18 depending on need
[f] Driver / Engineer Staffs Tender 17 and Hazmat 17

CONCLUSION

The ESCI project team began collecting information concerning HCFES in January 2022. It takes a forward-thinking government and organization not afraid to question current policies and processes to truly achieve continuous improvement. The services provided by HCFES are exceptional. The challenges faced by Hernando County and HCFES are not unique to their jurisdiction and mimic discussions being held around the country. Measuring the effectiveness of services balanced with cost efficiencies are very important discussions. Policy decisions often require very tough conversations and even tougher decisions. Hernando County obviously takes this seriously, and ESCI appreciates the ability to provide a data-driven document to assist with those deliberations.

ESCI team members recognize that this report contains a large amount of information, and ESCI would like to thank all those involved in this project for their efforts in bringing this report to fruition. ESCI would also like to thank the various individuals for their input, opinions, and candid conversations throughout this process. It is ESCI's sincere hope the information contained in this report is used to its fullest extent and the emergency services provided to the citizens and visitors of Hernando County will continue to receive top notch service from HCFES.

SECTION IV: Appendices

APPENDIX A: STATION OBSERVATIONS

The following appendix includes observations made during station visits by ESCI. Some of these issues cannot be addressed without a new fire station. HCFES has done a great job ensuring the fire stations are well maintained.

Figure 143: Fire Station Summary of Issues

Fire Station	Issues
Fire Station 1	• No PPE washer • Limited bathroom and shower space for personnel • EMS supply area decreased workout area • Drains on apparatus floor not adequate
Fire Station 2	Did not tour due to expected reconstruction
Fire Station 3	• Busy road and blind spots when responding onto Spring Hill Drive • Switch to activate flashing warning light is in the dayroom, creating issues if personnel are not in the dayroom when alerted for a response (outside for apparatus checks, training, returned from another incident)
Fire Station 4	• No ventilation in bathrooms • Limited parking during shift change • Limited outlets in bunkroom, thus personnel are using extension cords and power strips • Issues with hard water for dishwasher and laundry • Only one computer for the 7 personnel • No PPE washer • Bunkroom is tight for 7 people • Limited bathroom and shower space for personnel but does have 2 private showers • Ice machine located in apparatus bays
Fire Station 5	Did not tour due to new facility opening soon
Fire Station 6	New fire station to be operational soon
Fire Station 7	• Residential kitchen appliances • Limited bathroom and shower space for personnel • Workout equipment located in the apparatus bays • Ice machine located in apparatus bays • Drive-through bays not functional because of apparatus
Fire Station 8	• Narrow apparatus bays • Generator does not have auto start so personnel must go outside in elements to start • Residential kitchen appliances • Limited bathroom and shower space for personnel • Access issues with busy road and lack of traffic light • Sewage issue – septic was only designed for two members • Limited parking during shift change • Window blinds are see-through creating privacy issues • Drains on apparatus floor not adequate

Fire Station	Issues
Fire Station 9	• Limited bathroom and shower space for personnel • Limited water supply • Septic issue when raining • Generator does not have auto start so personnel must go outside in elements to start • No drains on the apparatus floor
Fire Station 10	• Recommend mold test from issue with air conditioner
Fire Station 11	• Workout equipment located in the apparatus bays • Outside of Battalion Chief 2's bathroom there is only 1 shower, 1 sink, and 1 toilet for all personnel • Limited refrigerator space • No drains on the apparatus floor • Gear space is limited • Limited outlets in bunkroom, thus personnel are using extension cords and power strips • Limited parking during shift change
Fire Station 12	• Residential kitchen appliances • Air conditioning in station is not adequate • Generator does not have auto start so personnel must go outside in elements to start • Limited bathroom and shower space for personnel • Office lacks space for officer to have private meetings with crew members • Reserve engine stored outside • Cracks on front apron
Fire Station 13	• Residential kitchen appliances • Limited bathroom and shower space for personnel • Workout area is small and located with HVAC equipment • Windows do not open limiting ability to ventilate station • Narrow apparatus bays • Limited parking during shift change • Air conditioning in station does not cool evenly • Generator does not have auto start so personnel must go outside in elements to start
Fire Station 14	• Potholes on the font ramp • Limited parking during shift change • Gear space is limited • Residential kitchen appliances • Workout equipment located in the apparatus bays • No drains on the apparatus floor • Unable to use drive-through bay because of the airport gate

APPENDIX B: TABLE OF FIGURES