St. Johns County Fire Rescue

Saint Augustine, Florida

Fire Rescue Master Plan

January 2021

ESCI Emergency Services Consulting International

Providing Expertise and Guidance that Enhances Community Safety

CONTENTS

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…and all of the members of St. Johns County Fire Rescue who daily serve their community with honor and distinction!

EXECUTIVE SUMMARY

St. Johns County Fire Rescue (SJCFR) engaged Emergency Services Consulting International (ESCI) to provide a Master Plan for the delivery of emergency services within the County. The comprehensive report that follows evaluates the current conditions within SJCFR and projects future growth, development, and service demand, while also providing recommendations to enhance the effectiveness and efficiency of the current services or to provide an equal level of service over the next 5-plus years.

This document describes St. Johns County Fire Rescue's Master Plan. The current conditions of components such as management, capital assets, staffing, fire protection, community risks, response resources, deployment strategies, and service levels have been evaluated in this study. Recommendations are then provided to enhance the effectiveness and efficiency of the current components or to provide an equal level of service over future years.

St. Johns County Fire Rescue (SJCFR) is a county fire department located on the east coast of Florida. SJCFR provides fire suppression, fire prevention, public education, emergency management, marine rescue, urban search and rescue, hazardous materials response, and emergency medical services to its community. The department's service area encompasses all unincorporated areas of St. Johns County with mutual aid agreements with neighboring communities. SJCFR also provides EMS transport services to the municipalities of St. Augustine and St. Augustine Beach.

SJCFR serves an estimated resident population of 250,000 within a total of 609 square miles. SJCFR operates 17 fire stations (as of June 2020) with a 2020 approved budget of $80,897,062. SJCFR employs 43 Administrative and Support Staff personnel and 283 Operational Staff personnel.

The Insurance Services Office (ISO) reviews the fire protection resources within communities and provides a Community Fire Protection Rating system from which insurance rates are often based. The rating system evaluates three primary areas: the emergency communication and dispatch system, the fire department, and the community's water system. The overall rating is then expressed as a number between 1 and 10, with 1 being the highest level of protection and 10 being unprotected or nearly so. As of the latest survey, ISO provided SJCFR with a split rating of Class 3, 3x, or 10 depending on a property's distance from a fire station and fire hydrant.

Mission and Values

Mission

Dedicated to the highest standard of professionalism in public safety and life-saving services with the commitment to serve, ability to perform, and the courage to act.

Values

St. Johns County Fire Rescue's core values are:

- Professional Excellence
- Communications
- Health & Safety
- Community
- Integrity
- Diversity & Respect
- Teamwork & Leadership
- Innovation

Service Delivery and Performance

The analysis completed during this study revealed several important delivery and performance findings. These include:

- The total response workload has increased 23.03% over the past six years.
- 66.4% of all responses are requests for emergency medical services.
- EMS patient transports increased 11.47% over the past six years, with 73.88% of all EMS responses resulting in the transport of a patient.
- Service demand is relatively consistent throughout the year, with May being the busiest month of the year and Friday being the busiest day of the week.
- Service demand is busiest between the hours of 9:00 a.m. and 6:00 p.m., with the highest service demand at 1:00 p.m.
- Engine 14 is the busiest fire unit in SJCFR, with a 12.42% unit hour utilization rate in 2019.
- Engines 6, 14, 15, 16, and 18 have unit hour utilization rates above 20% since 2017.
- Rescue 12 is the busiest rescue unit in SJCFR, with a 15.17% unit hour utilization rate in 2019.
- Rescues 5, 12, 18, and 41 have unit hour utilization rate increases above 20% since 2017.
- SJCFR does not meet the NFPA performance recommendations on turnout, travel, and response times.
- The assembly of an effective response force for structure fires is delayed based on current performance and deployment.

Financial Analysis

SJCFR's revenues can be divided into recurring and non-recurring sources. Recurring revenues are those such as ad valorem taxes, fees for service (ambulance charges), contracts, permit fees, and investment/interest income that are reasonably predictable in many cases and are expected to continue on a year-to-year basis. Non-recurring revenues include items such as grant funds, donations, sales of surplus property and equipment, impact fees, and bond or loan proceeds. On average, recurring revenues have accounted for approximately 92% of SJCFRs funds and have increased by 39.5% since FY 15. Recurring revenues totaled $43,650,701 for FY 19 with non-recurring revenues adding an additional $3,426,831 for a total of $47,077,532.

SJCFR's expenses can also be divided into recurring and non-recurring costs. Recurring expenses are those such as employee salaries and benefits and other operating costs that are reasonably predictable and expected to continue from year-to-year. Non-recurring expenses, on the other hand, are more sporadic in nature and may be difficult to predict, such as land acquisition, facility construction and major facility renovation, and large-scale equipment or apparatus purchases. Recurring expenses for SJCFR have increased by 32.4% since FY 15, with non-recurring expenses also increasing over the same time period. Rising at an average annual rate of 7.3%, recurring expenses totaled $47,198,742 for FY 19 with non-recurring expenses adding an additional $9,909,104 for a total of $57,107,846.

Future Funding Strategies

While the rapid development and rising property values have allowed SJCFR to keep pace with needs, any slowing of new construction or a drop in property values could have a significant negative effect on the Fire District's revenue. In order to account for this, diversification of revenues is recommended with the following potential strategies.

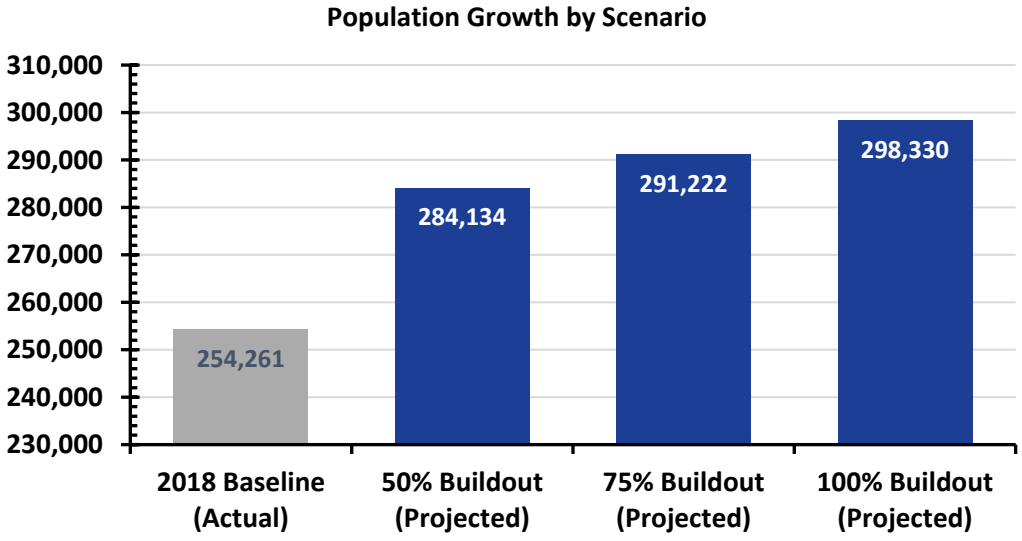
- ESCI recommends that the County investigate the addition of non-ad valorem assessments as an additional revenue stream. There are fire districts in the state that have effectively adopted this multi-stream funding model. The County should review the legal parameters of the process and requirements specific to SJCFR.
- Another consideration would be for the county to investigate the implementation of a dedicated Public Safety Sales tax. Currently, the local sales tax rate is 0.5%, in addition to Florida's 6.0% tax rate for a total of 6.5%. According to the Fiscal Year 2020 Financial Plan, the existing half-cent sales tax is projected to generate $16,057,513.

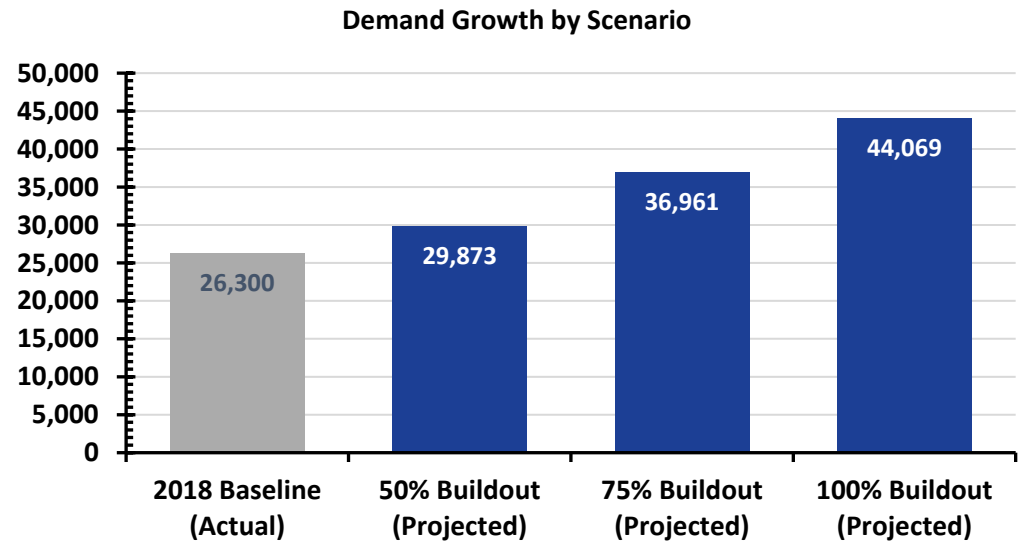
In addition, SJCFR should annually review its needs and compare those needs to available grant funding. Some examples of Fire and EMS grants include the *Assistance to Firefighter Grants* (AFG), *Fire Prevention & Safety* (FP&S) Grants, *Staffing for Adequate Fire and Emergency Response* (SAFER) Grants, *Florida Emergency Medical Services* (EMS) *Matching Grants*, and *Florida Legislature Local Project Requests*.

Future System Demand Projections

Future system demand projections are based largely on the population projections of a community. In counties that are experiencing rapid development such as St. Johns County, system demand projections can be significantly more challenging due to factors effecting development such as regional, national, and international economics, social factors, and unexpected events such as the COVID-19 epidemic. In order to account for all the possible development scenarios, a prediction of the form "when X% of the planned buildout is complete, service demand will be Y" is more valid than one of the form "service demand will be X in year Y."

The next chart illustrates population and service demand, respectively, projected by the model for each development scenario, compared against a 2018 baseline (the latest for which both incident demand and Census data were available).





Future Fire Rescue Station Locations

Due to the rapid development occurring in St. Johns County, SJCFR must continually monitor performance indicators such as volume, response times, and unit hour utilization. These indicators will alert SJCFR of the need for additional resources and the general location of such. Once determined, attention should be focused on the ISO recommendation of having an engine company located within every 1.5 miles throughout the service area. Currently, the percentage of 1.5-mile coverage for engine companies is 17.7% of the county road network.

Recommendations

ESCI has provided several short-term, mid-term, and long-term recommendations at the end of this report. The following is a brief review of these recommendations for SJCFR.

Service Delivery

The formal adoption of response time standards and targets should be prioritized with specific efforts directed at improving turnout time performance. Improving response deployment and effective response force should be the focus when examining additional resources and future station locations.

Planning

Succession planning efforts ensuring the continued ability to provide effective and efficient service delivery should be accomplished and communicated through all ranks of SJCFR.

Facilities

The development, adoption, and funding of a facilities plan focusing on the health and safety of firefighters in accordance with NFPA 1581 and other applicable best practices is critical for SJCFR long-range planning efforts.

Insurance Services Office

Multiple areas of focus, including communications, apparatus coverage, staffing, and water supply, should be examined in an effort to improve service delivery and obtain an enhanced ISO Public Protection Classification rating. Communication efforts should be in accordance with NFPA 1221, and staffing should be in accordance with NFPA 1710.

Fire Prevention/Public Education/Fire Investigations

The rank structure within fire prevention should be evaluated to enhance effectiveness and efficiency. Public education efforts should ensure all demographics of the community are reached with multilingual campaigns along with hazard-specific programs, including juvenile firesetter and wildland interface. Fire investigators should receive proper training in accordance with State of Florida and ISO requirements.

Communications

In addition to ensuring compliance with NFPA 1221, association with the Public-Safety Communications Official (APCO) International's Agency Training Program Certification should be explored.

Staffing

In addition to ensuring compliance with NFPA 1710, staffing levels should be increased by 32 FTE to achieve proper relief factors based on current service levels. This will not account for increases in service demand or efforts to enhance performance indicators.

Apparatus

The replacement schedule and funding strategy for both apparatus and support equipment should be a priority of long-range planning efforts. An apparatus-specific committee should be involved in planning efforts.

Agency Updates

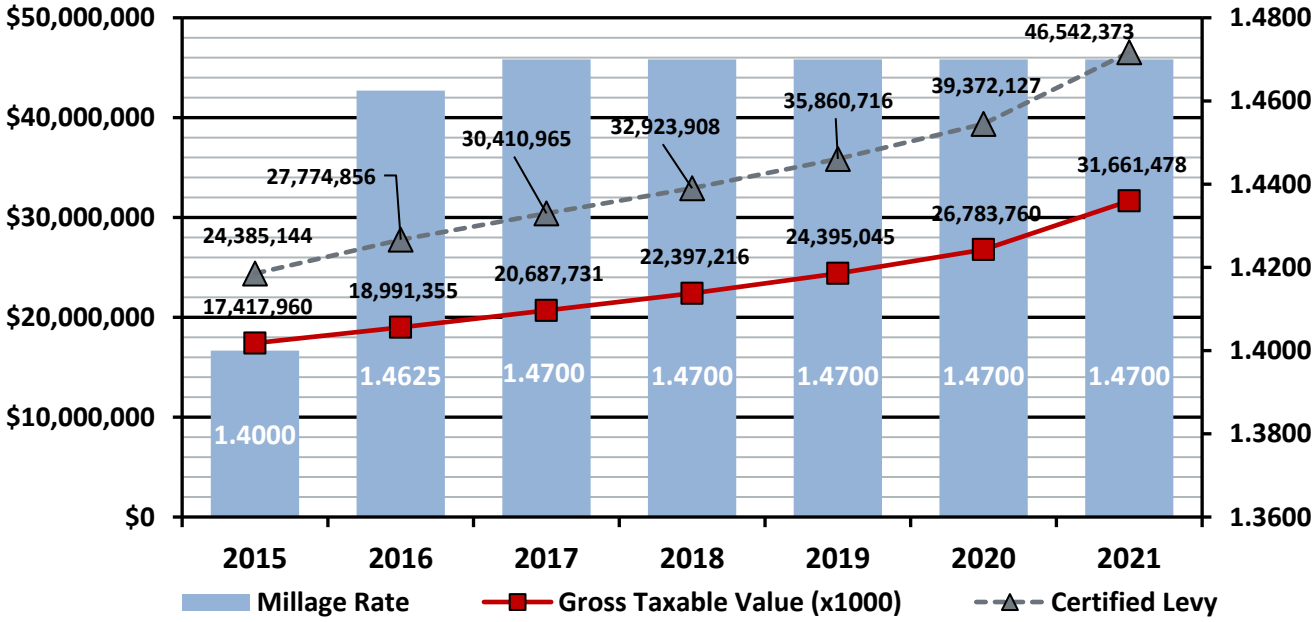
This Emergency Services Master Plan will assist SJCFR in future planning and provisions of comprehensive emergency services for the citizens and visitors of the county. Like many fire departments, the SJCFR continues to improve and change over time. This report is a snapshot of the SJCFR at the time the information was gathered. While ESCI developed the report over several months, it was not possible to capture all changes that may have been made during the report's development. Therefore, noteworthy changes that have occurred during the time the report was being developed are summarized as follows.

Adoption of Rolled-Back Rate for Fire Fund—SJCFR

The District has an ad valorem revenue stream that is 100% dedicated to SJCFR expenditures. The following figure shows how gross taxable values (real and personal property) in the District have increased linearly by approximately 9% each year. The increase between FY 20 and FY 21 was significantly higher. The mill rate used to produce the ad valorem revenue increased slightly between FY 15 and FY 16 by just over 6/100th of a mill and then very slightly to its current 1.47 mill rate in FY 17. The certified levy has increased correspondingly, growing from $24.4 million in FY 15 to $35.9 million in FY 19, a 47.1% increase for the period, or approximately 10% per year.

Had gross taxable values continued to increase at the historically observe rate of 9% per year through FY 21 and the millage rate remained at 1.47 mills, the projected revenue would have been $42,606,117 in FY 21. Given the increased growth rate in taxable value between FY 20 and FY 21, the actual estimated revenue generated by the 1.47 mills would be $46,542,373 for a difference of $3.94 million. The County Commission adopted a Fire District rolled-back rate of 1.38 mills for FY 21 beginning 1 October, which will result in an estimated ad valorem revenue stream of $43,692,840.

Fire District Taxable Value, Mill Rate and Certified Levy (FY 15 Actual–FY 21 Projected)

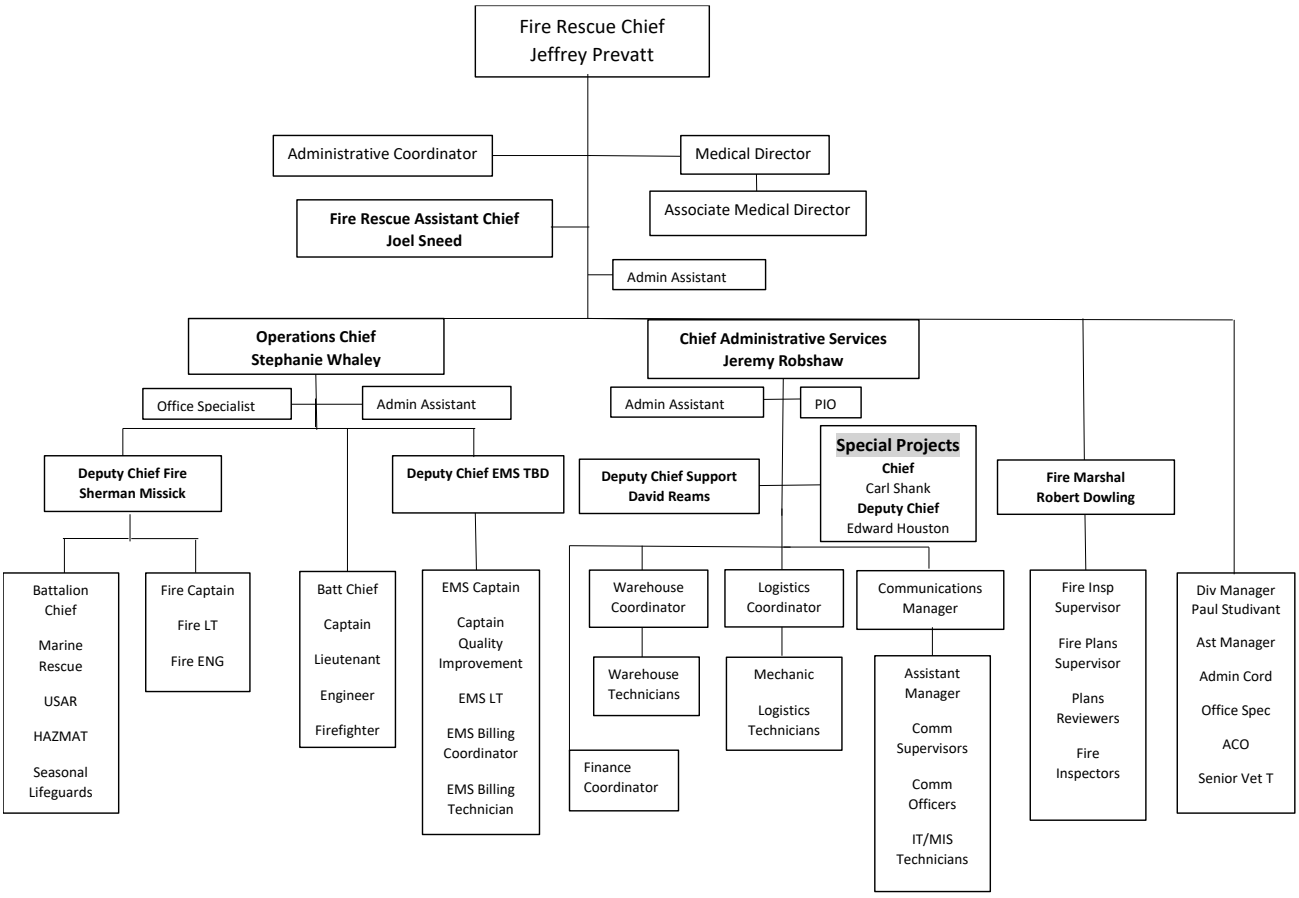


The status quo projection in the master plan uses an assumed future taxable value growth rate of 9% and assumes that the millage rate will remain at 1.47 mills for the Fire District. The projected ad valorem tax revenue in the forecast was $42,948,318, which is almost $750,000 less than the FY 21 adopted ad valorem revenue at the rolled-back millage rate.

Organizational Chart Changes

A revised organizational chart was put into place in June 2020. The updated chart is provided in the next figure.

SJCFR Revised Organizational Chart
June 2020



STAKEHOLDER FEEDBACK

During the week of December 9, 2019, ESCI team members came on-site to validate the information provided by the SJCFR staff. Additionally, a series of stakeholder interviews were conducted to determine internal, external, and policy-maker expectations of the fire department. Internal stakeholder groups included a broad cross-section of the Department, including staff from administration, fire prevention, communications, labor, beach safety, maintenance, firefighters, paramedics, and their supervisors. County Commissioners were interviewed individually, and two separate external stakeholder meetings were conducted. The external groups included citizens and various County partners.

ESCI conducted interviews with leaders from partner organizations that were identified by the Department. For the citizens' group, ESCI held public input meetings on the evenings of December 10 and 11, 2019. Invitation to the public input meetings was provided through various means—including a directed press release and publication in a local newspaper as well as through social media. Figure 1 summarizes the stakeholders participating in the interviews or meetings and the feedback process utilized to acquire information.

In addition to the two public meetings facilitated by ESCI, SJCFR used the same feedback tools at a homeowner group meeting that had requested an opportunity to provide input. This input is also captured in this report, but it is separate from the two public meetings that ESCI conducted.

Figure 1: Participants in the Stakeholders Feedback Process

Participant(s)	Feedback Process
Internal Stakeholders	
Paul M. Waldron, Commissioner	One-on-One Interview
Jeb Smith, Commissioner	One-on-One Interviews
James K. Johns, Commissioner	One-on-One Interview
Henry Dean, Commissioner	One-on-One Interview
Jeremiah Ray Blocker, Commissioner	One-on-One Interview
Joy Andrews, Assistant County Administrator	One-on-One Interview
Darrell Locklear, Assistant County Administrator	One-on-One Interview
Jeffrey Prevatt, Fire Chief	One-on-One Interview
Dr. George Woodward and Dr. Kerry Bachista, Medical Directors	Group Interview
Deputy Chief Jeremy Robshaw	One-on-One Interview
Deputy Chief Edward Houston	One-on-One Interview
Deputy Chief David Reams	Group Interview
Special Projects Chief Carl Shank	One-on-One Interview
Sample Shift Members Chief Officers (7)	Group Interview
Sample Shift Members Company Officers (8)	Group Interview
Sample Shift Members Special Teams (8)	Group Interview
Sample Shift Members FF/EMT/PMs (7)	Group Interview
Training Chief (2)	Group Interview
Training Staff (4)	Group Interview
Lt. Michael Keener	One-on-One Interview
Human Resources (1)	One-on-One Interview
Finance (1)	One-on-One Interview
Disaster Recovery (1)	One-on-One Interview
Growth Management (1)	One-on-One Interview
External Stakeholders—Partner Agencies	
Carlos Aviles, Fire Chief, City of St. Augustine	One-on-One Interview
External Stakeholders—Public	
Public Input Meetings (2) – Received 40 Surveys with Feedback	Public Meetings

The stakeholders, both internal and external, recognize the massive growth facing the County and the need to match service delivery with service demand.

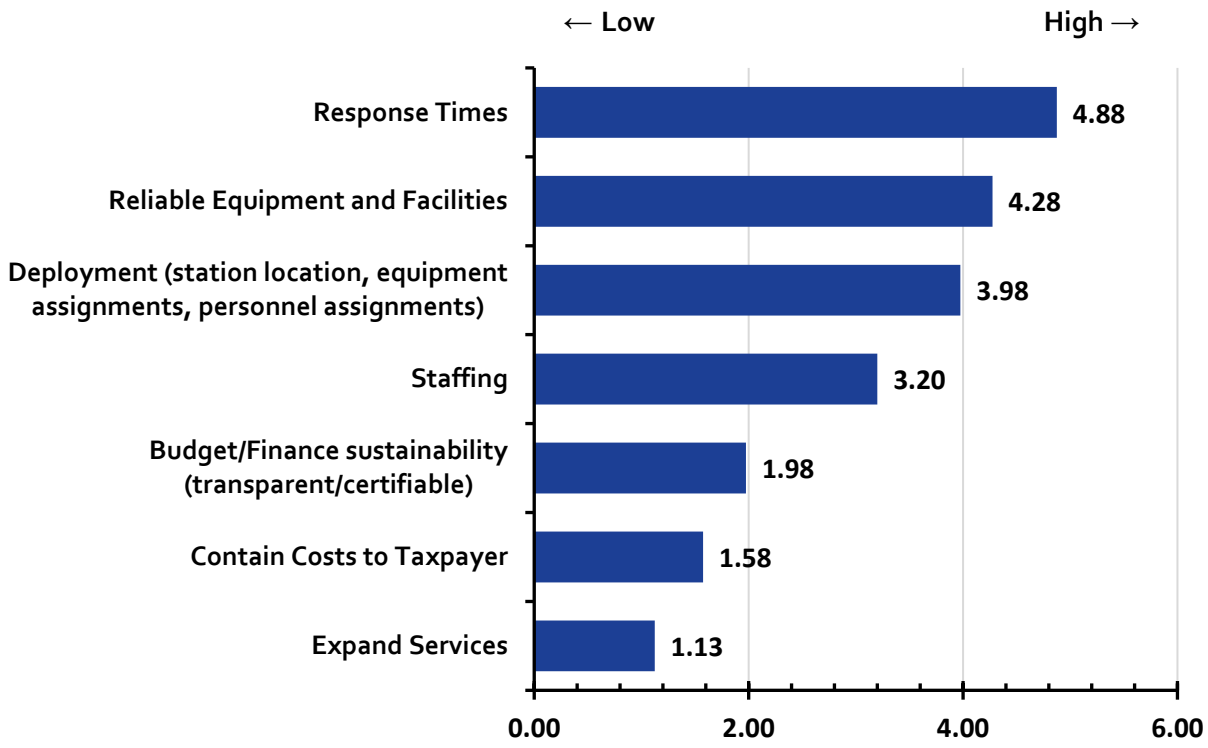
Public Input Forums

After a presentation about the fire department by the Fire Chief, ESCI facilitators led the external groups through a structured external stakeholder survey. A total of 40 people attended one of the meetings and submitted a completed survey. The public request survey consisted of four sections: community planning priorities, service priorities, an opinion poll, and public comment.

Community Planning Priorities

The first section, referred to as the community planning priorities, gave the participants seven planning considerations to weigh. This section was a forced-choice selection process whereby the respondent compared a single element to each of the other elements, selecting the one he/she believed is the highest priority element (e.g., Improve Response Time versus Reliable Equipment and Facilities versus Contain Costs to Taxpayer, etc.). This process, reflected in Figure 2, is a relative ranking of the planning priorities for each participant.

Figure 2: Community Planning Priorities



External stakeholder responses reflected in Figure 2 indicate that the citizens surveyed prioritized improving response time over every other planning element, followed by having reliable equipment and facilities. Deployment was the number three concern and is somewhat related to improvement in response time and will be dependent on growth in service demand. There was a lower desire to expand the existing services provided by SJCFR, and low concern about containing costs to taxpayers as compared to the improvement of response time, equipment and facilities, and deployment. This ranking appears to reflect a recognition that to improve response times, an investment in infrastructure and personnel must be made.

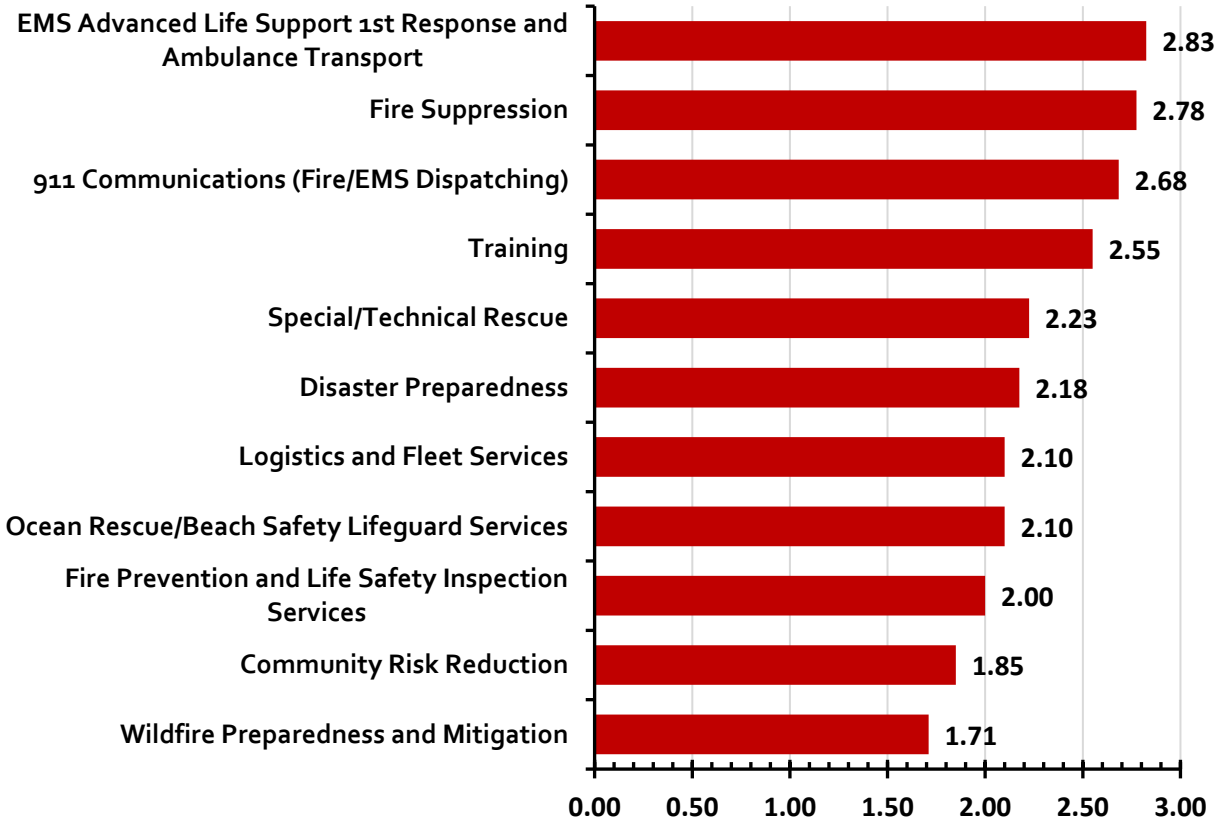
Service Priorities

The next portion of the survey focused on service priorities, with a list of 11 of the services currently provided by SJCFR as follows:

- EMS Advanced Life Support 1st Response and Ambulance Transport
- Fire Prevention and Life Safety Inspection Services
- Ocean Rescue/Beach Safety Lifeguard Services
- 911 Communications (Fire/EMS Dispatching)
- Wildfire Preparedness and Mitigation
- Community Risk Reduction
- Special/Technical Rescue
- Disaster Preparedness
- Fire Suppression
- Logistics and Fleet Services
- Training

After describing the service priority elements and the scoring mechanism for this section, the participants completed this portion of the survey. Distinct from the previous scoring section, this section allows the respondents to score each element with a three (3), a two (2), or a one (1). A three reflects a critical priority in the opinion of the respondent, a two reflects an important priority, and a one reflects a low priority. Figure 3 illustrates the results.

Figure 3: Community Service Priorities



The respondents were allowed to assign as many 3s, 2s, or 1s as they wished, and were also allowed to strike through any service they felt the fire department should not be providing, or add a service the individual respondents believed was missed from what should be provided by the fire department. Two participants struck through Wildfire Preparedness and Mitigation, and one wrote in animal control and struck it out. Several participants wrote in additional priorities. These are summarized below:

- Once a month, blood pressures taken at Publix outside (manual bp)
- Be out in the community more doing blood pressure checks
- Combined dispatch center—public safety
- Animal control—give to the SJCSO (Sheriff's Office)
- LifeFlight (aeromedical patient transport)

Aside from wildfire preparedness/mitigation and community risk reduction, the group average for all services fell above the important priority category. Community risk reduction and wildfire preparedness/mitigation did not rise to the level of an important priority with averages of 1.85 and 1.71, respectively. The group prioritized EMS advanced life support 1st response and ambulance transport and fire suppression as the most critical services offered by SJCFR. These responses were followed closely by 911 Communications (Fire/EMS Dispatching).

Opinion Poll

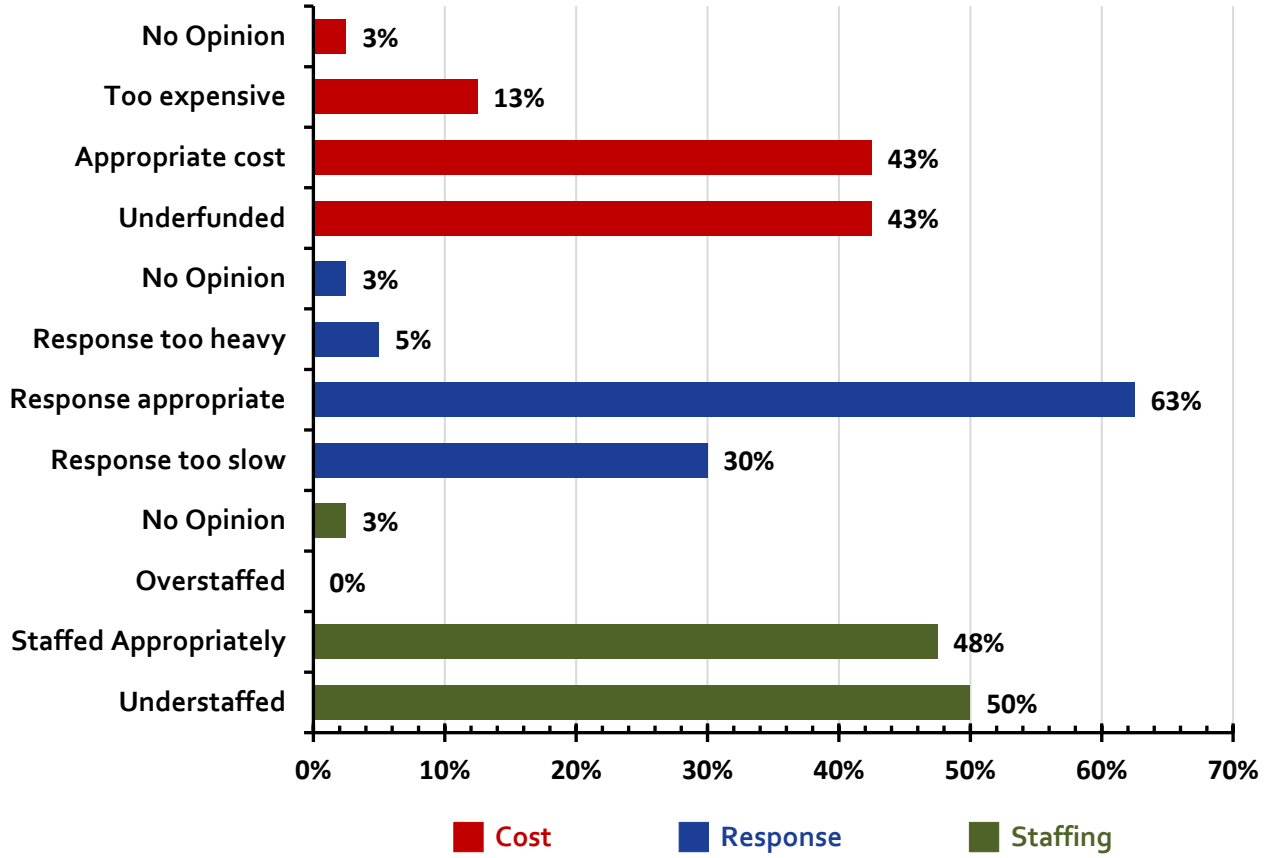
Finally, the respondents were given an opinion poll, where they were asked to check one box under each of the three headings in Figure 4.

Figure 4: Staff/Response/Cost Opinion Options

Cost of Service	Response Performance	Staffing
□ Too expensive	□ Response too heavy	□ Overstaffed
□ Appropriate	□ Response appropriate	□ Staffed appropriately
□ Underfunded	□ Response too slow/light	□ Understaffed

Figure 5 displays the results.

Figure 5: Community Staff/Response/Cost Opinion Poll Results



For each of the three categories, between 40 and 50% of the participants felt that the cost, response, and staffing were appropriate. Fifty percent felt the department was understaffed, 30% believe the response is too slow, and 43% felt the department was underfunded. No one responded that the department is overstaffed, while 3% thought the cost was too expensive, and 5% felt that the response too heavy.

After responding to the previous questions, attendees were asked to provide any other input they had on the Department and its services. These comments—as written—are summarized as follows:

- Given an 80/20 mix with EMS and Fire related calls, is there a need to staff more rescue units in the county, particularly in the north where hospitals are located out of the county?
- I am proud of our fire/rescue service, and I feel fortunate to live in St. Johns County.
- Why did the County get rid of volunteer firefighters/EMS?

These results should not be considered statistically valid; instead, they should be viewed as a potential indicator of the general leanings of the public represented at the meeting. Strategies to address most of the concerns expressed by the various stakeholders are provided later in this report.

Riverdale Community Meeting

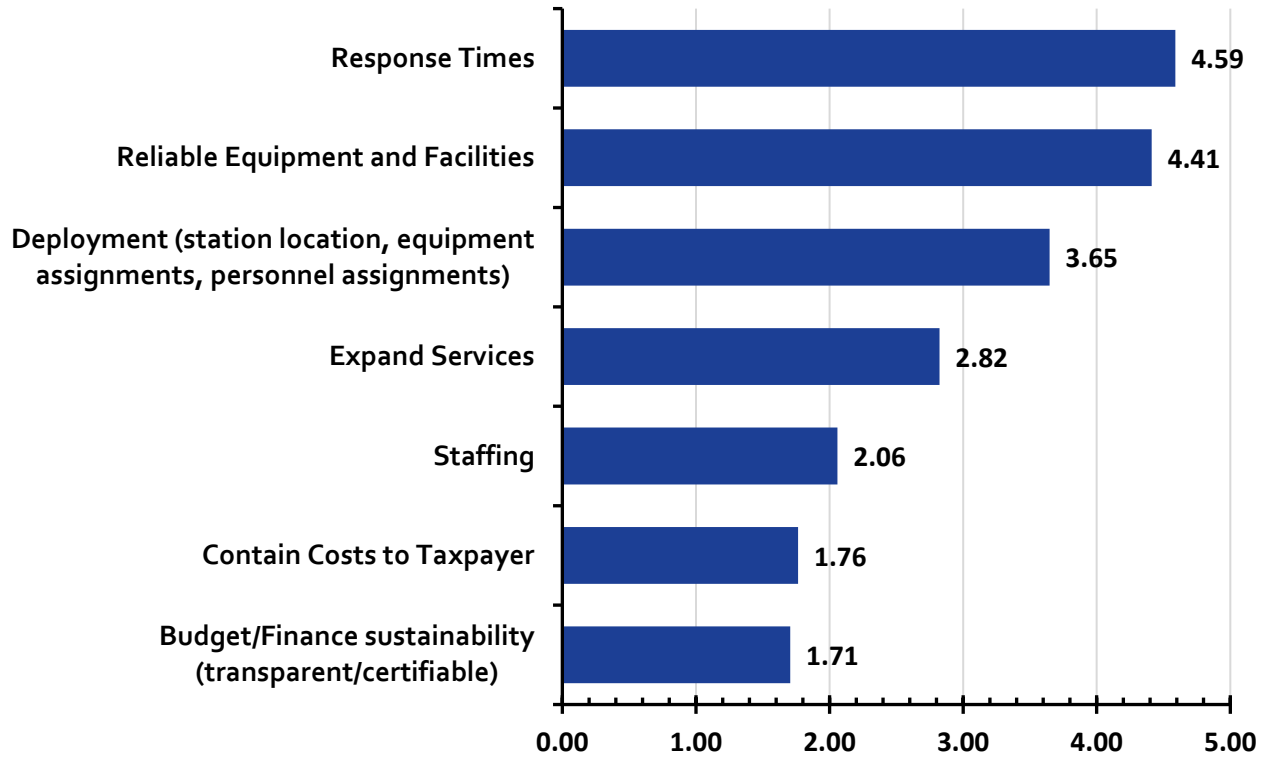
This meeting consisted of a very specific long-standing population group that lives along a rural corridor of the St. Johns River, which is the western border of St. Johns County. The current response comes from Fire Rescue Station 8. This community is currently more than five miles from an existing fire station and does not have any public or private water system (fire hydrants). As such, they typically have higher ISO ratings (which translates to higher annual insurance costs) and can experience higher call response times.

This area was served by a volunteer fire station prior to St. Johns County Fire Rescue, but this building has not ever housed career staff due to the location and low call volume of the area. The residents of this area are very proactive and are seeking an improvement in emergency services coverage for their area.

As a structured means to obtain feedback from this group, the same questionnaire that was used at the broader public meetings was utilized. The following is a summary of the seventeen responses generated from this meeting.

Figure 6 shows the community planning priorities results.

Figure 6: Community Planning Priorities—Riverdale Community Meeting

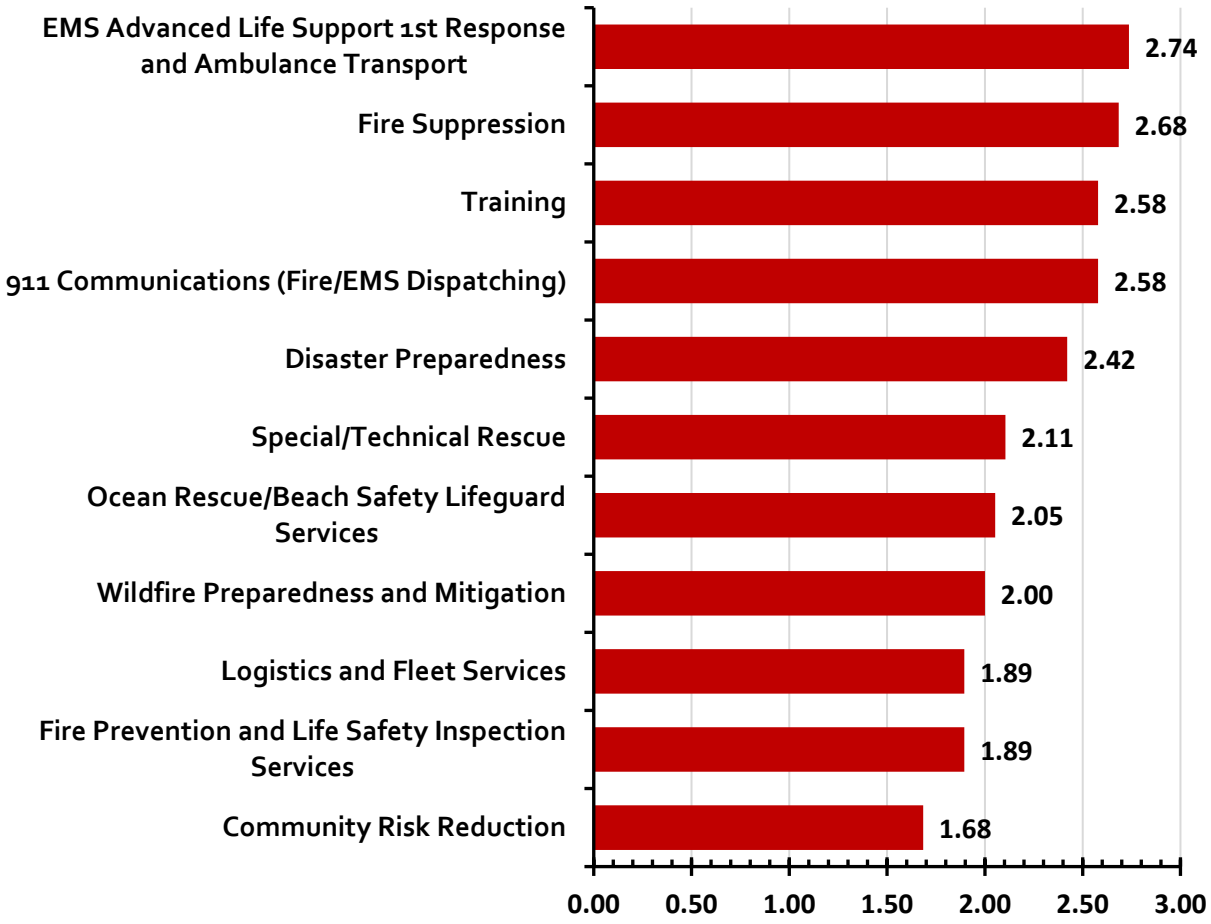


Like the participants at the other public meetings, the Riverdale group prioritized improving response time over every other planning element, followed by having reliable equipment and facilities. Deployment was the number three concern. There was a higher desire to expand the existing services provided by SJCFR than was found in the public input meetings.

Service Priorities

Figure 7 illustrates the Riverdale Community service priorities.

Figure 7: Community Service Priorities—Riverdale Community Meeting

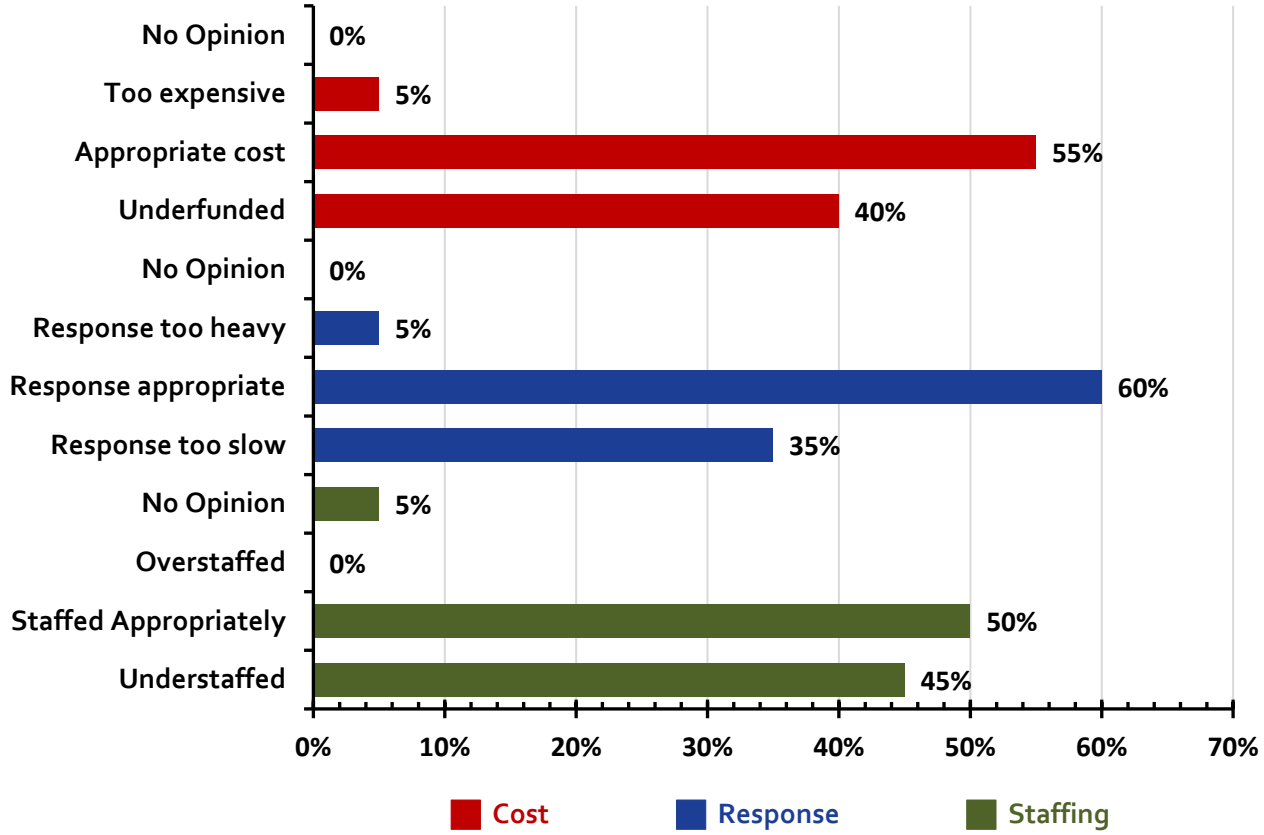


As shown, the top four priorities were the same between the public input meetings and the Riverdale meeting. The other seven were similar, with slight movement in the ranking. Six participants wrote in additional priorities. These are summarized below:

- More stations
- River Rescue (4)
- Revised dispersal of response facilities

Figure 8 summarized the community staff/response/cost opinion poll results from the Riverdale community meeting.

Figure 8: Community Staff/Response/Cost Opinion Poll Results—Riverdale Community Meeting



For each of the three categories, 50% or more of the Riverdale Community participants felt that the cost, response, and staffing were appropriate. Between 35 and 45% felt the department was understaffed, the response too slow, and was underfunded. No one responded that the department is overstaffed, and almost no one felt that the cost is too expensive or the response too heavy. No additional comments were received.

These results should not be considered statistically valid; instead, they should be viewed as a potential indicator of the general leanings of the public represented at the Riverdale Community meeting.

ORGANIZATIONAL OVERVIEW

The Organizational Overview component provides a summary of agency composition, configuration, and services provided. Data provided by the administrative and management staff of St. Johns County Fire Rescue were evaluated. In addition, interviews with line personnel, bargaining unit representatives, supervisory and administrative staff, County administration, and allied governmental agencies were combined with information collected in the course of ESCI's fieldwork to develop the following overview.

The purpose of this section is two-fold. First, it verifies the accuracy of baseline information along with ESCI's understanding of the SJCFR's composition. This provides the foundation from which the Emergency Services Master Plan is developed. Secondly, the overview serves as a reference for the reader, who may not be fully familiar with the details of the SJCFR's operations. Where appropriate, ESCI includes recommended modifications to current observations based on industry standards and best practices.

Service Area Population and Demographics

St. Johns County is located in the State of Florida. According to the Environmental Systems Research Institute (ESRI), the current population of St. Johns County is 255,148. The County seat is St. Augustine, the largest incorporated city within the County. St. Johns County is part of the Jacksonville Metropolitan Statistical Area as determined by the Federal Office of Management and Budget, and includes Duval County, Clay County, Nassau County, and Baker County. The County covers a total area of 609 square miles, 52 square miles of water, and is surrounded by beaches and riverfront.[1]

St. Johns County is bordered by Duval County to the North, Flagler County to the South, with Clay and Putnam Counties making up the western border. The Atlantic Ocean makes up the entirety of the County's eastern border. St. Johns has a relatively flat topography with an average elevation of approximately 15 feet. It is unique in that it has what is purported to be one of the longest shorelines in the state, covering an estimated 42 miles along the Atlantic Ocean. St. Johns County is in the northeast region of Florida, and in addition to the Atlantic Ocean on the east, it has the distinction of being home to large stretches of the Intercoastal Waterway and St. Johns River on its western border.

St. Johns County is a coastal county, residing directly on the shore of the Atlantic Ocean. Because of this, hurricanes pose the highest natural risk for causing financial disaster and loss of life. St. Johns County has been affected by major hurricanes impacting the area since the 1500s. Hurricane Matthew in October 2016 and Hurricane Irma in September 2017 caused extensive, costly damage throughout the County.[2] Given the tremendous historical and projected growth within St. Johns County, hurricanes will continue to pose the greatest natural risk to the community. To a lesser degree, St. Johns County is susceptible to tornadoes and flooding associated with the St. Johns River, Intercoastal Waterway, and their tributaries.

[1] *St. Johns County Comprehensive Emergency Management Plan.*
[2] *The St. Augustine Record, "A look back at some of the major hurricanes to hit St. Johns County," August 31, 2019.*

The County's land mass is predominately classified as either residential or agricultural. Many residential pockets surrounding the City of St. Augustine and the communities of Nocatee, Palm Valley, Sawgrass, Fruit Cove, and Flagler Estates are either defined as suburban, urban, or approaching that designation with their current population densities. As of 2019, the County's diverse projected population stood at 255,148 with an annual growth rate of 3.4% since the 2010 U.S. Census. The County population density is 424.8 per square mile.[3] The County is divided into urban, suburban, and rural areas with the following density breakdown: 48% urban (> 2,000 people/square mile); 16.5% suburban (1,000–1,999 people/square mile), and 35.5% rural (< 1,000 people/square mile). There are 100,186 households in St. Johns County, and according to the U.S. Census Bureau, there were 110,825 housing units in 2018. The average number of persons per household is 2.52. Additionally, St. Johns County has 9,773 total businesses within its County limits.

The racial makeup of the County is 88.8% White; 5.5% Black or African American; 0.3% American Indian and Alaska Native; 3.2% Asian; 0.01% Native Hawaiian and other Pacific Islander; 2.1% two or more races; 7.2% Hispanic or Latino; 82.3% White alone, not Hispanic or Latino.[4]

The age distribution of the County population was estimated in 2018 as follows: 4.9% under the age of 5 years, 21.7% under the age of 18, 53.2% between the ages of 18 and 64, and 20.2% aged 65 years or older. As of July 1, 2018, the number of St. Johns County residents age 65 or older was 51,361. The 2019 median age for residents in St. Johns County is 43.3 years young. In 2019, the median household income was $76,509; however, 6.6% of St. Johns County residents live in poverty. These demographics represent the external customers served by St. Johns County Fire Rescue (SJCFR).

County Governance and Structure

St. Johns County Fire Rescue is a department of County government, accountable to a County Administrator, five (5) elected commissioners, and more than 255,000 residents, all with various perspectives. Department leaders approach stakeholders with immediacy, believing that when citizens have easy access to information, they can lead healthier, safer lives. SJCFR also provides EMS transport services to the entire County, including the municipalities of St. Augustine and St. Augustine Beach.

The Board of County Commissioners (Board) is the primary legislative and policy-making body for St. Johns County. Each Commissioner represents one of the five districts in which he/she resides. They are elected by all County voters to serve a four-year term. The Board elects a chairperson and vice-chair each year.

The Board of County Commissioners' overall operating budget includes the County Administrator and 13 departments, various divisions and offices funded through general County ad valorem taxes and other revenue sources. Ad valorem taxes are also used to fund the elected constitutional officers, state-mandated programs such as Medicaid, and various other programs.

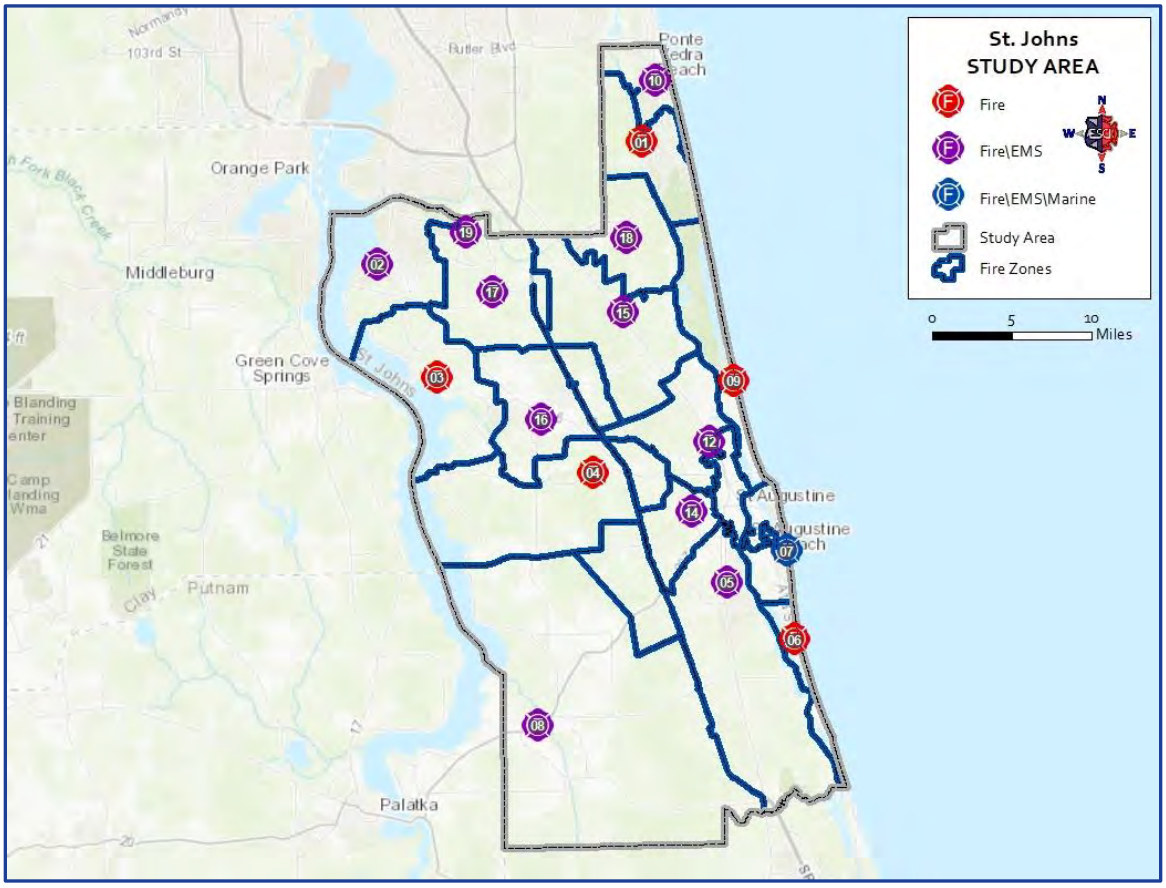
[3] *ESRI Population projections.*
[4] *U.S. Census Bureau, Populations Estimates, July 1, 2018.*

Additionally, each County Commissioner appoints citizens to participate on one of its 23 citizen advisory boards and committees. Each board is created by state statute, County ordinance, or resolution by the Board of County Commissioners and is tasked with reviewing and researching a topic, hearing appeals, or making recommendations.

The County Administrator position is the top administrative post in the County government. The Administrator is responsible for implementing and executing Commission policies and directives, leading the preparation of the County budget, and overseeing daily operations for 13 departments, all divisions, and offices. Furthermore, the Administrator manages all County-owned public facilities, as well as their maintenance and safety.

Figure 9 reflects the service area of St. Johns County Fire Rescue.

Figure 9: Service Area Map



St. Johns County Fire Rescue History and Structure

St. Johns County is one of Florida's oldest political jurisdictions, established on July 21, 1821, only days after the acquisition of the Florida territory by the United States. St Johns County's history is inextricably tied to its County seat, St. Augustine, the Nation's oldest city.[5] St. Johns County and Escambia County were Florida's first two original counties spanning the entire State of Florida. Florida would be subsequently divided into 67 counties, all of which originally resided within the jurisdictional boundaries of St. Johns and Escambia County.

Prior to 1974, fire service within unincorporated St. Johns County was provided by ten independent volunteer fire departments to service areas greater than ten miles from the municipal boundaries of the City of St. Augustine. Within ten miles of the City, service was provided by St. Augustine to County residents through an interlocal agreement. The present-day structure of St. Johns County Fire Rescue began to take form with the creation of a taxing district established to provide funding for the provision of fire services to the unincorporated areas of the County. The revenue would provide limited operational and capital funding to the volunteer departments.

While the volunteer fire departments were filling the County's fire protection needs, St. Johns County Emergency Medical Services (EMS) provided for citizens' emergency medical needs. In the early 1980s, St. Johns County EMS consisted of 14 full-time personnel and two full-time ambulances. It would grow over time and is considered the true precursor of St. Johns County Fire Rescue.

In 1995, as population and demand continued to increase, the County commissioned a study to assess the current state of fire and emergency services and chart a course to establish the fire and emergency services resources needed to meet the demands of the growing community.

In 1997, the 48 St. Johns County EMS paramedics cross-trained as firefighters and joined seven career firefighters, establishing the County's first career firefighting staff. In 2001, with increasing demands and regulations impacting the viability of the volunteer departments, the current structure of St. Johns County Fire Rescue was established. In a relatively short period, St. Johns County Fire Rescue has become a recognized, well-respected, all-hazards emergency response provider.[6]

St. Johns County Fire Rescue (SJCFR) is a progressive, professional fire-rescue department dedicated to health, safety, and well-being of the community, providing excellent service, education, and prevention in partnership with the citizens of St. Johns County.

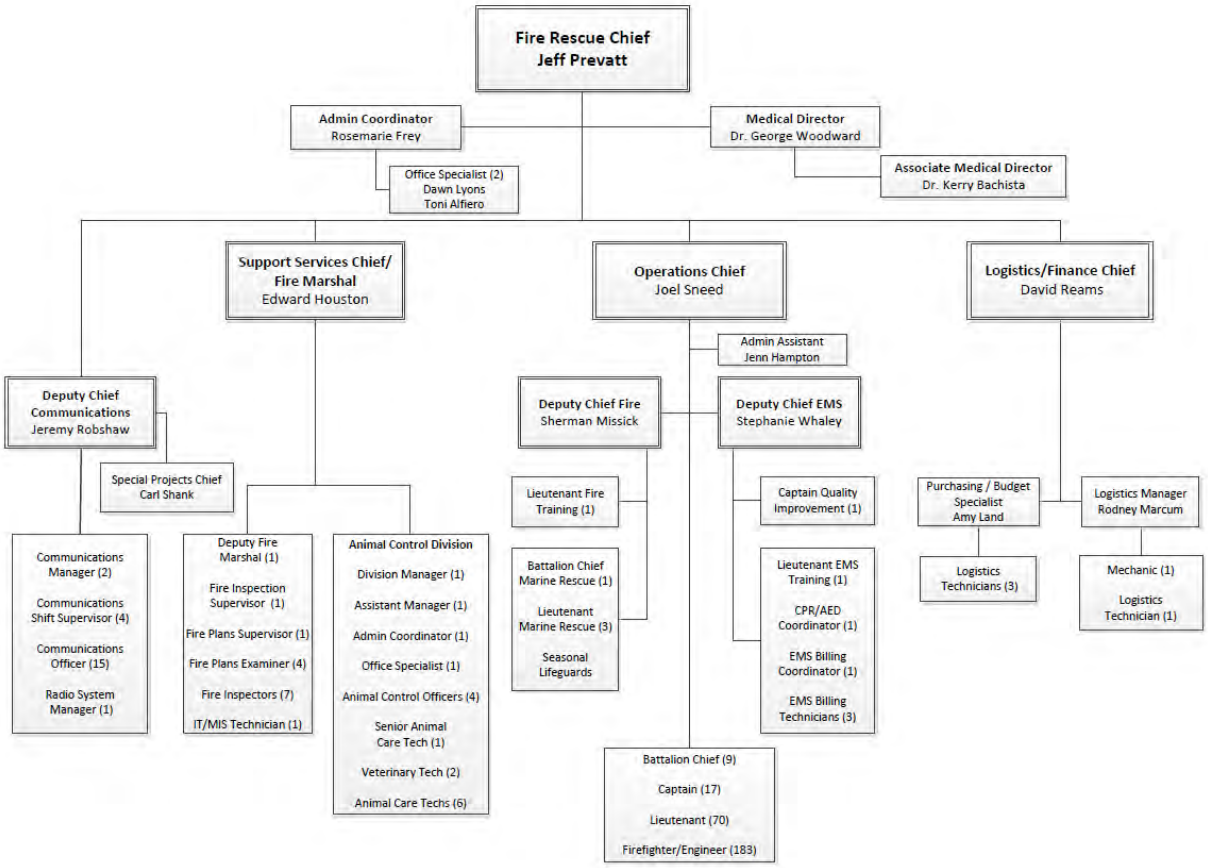
[5] *The Historical Development of St. Johns County, Florida, with the Development Patterns and Periods of Building Construction.*
[6] *St. Johns County Department History document.*

SJCFR is one of the largest fire service organizations in Northeast Florida with more than 350 employees, a 2020 budget of $80,897,062, and 17 fire stations. The department's full-time state certified firefighter/paramedics and firefighter/EMTs faithfully and professionally serve the varied needs of the citizens and visitors of the County, responding to an approximate average of 75 emergency responses per day.

SJCFR is a separate County Department reporting to an Assistant County Administrator. It is led by the Fire Chief, who is an appointed, at-will employee. The current Chief was appointed in March 2019. The Fire Chief and Human Resources Director share responsibility for hiring and/or termination of employees. There is an appeal process dictated through policy, administrative code, and the collective bargaining agreement. Legal counsel is available to the Fire Chief through the County Attorney, and personnel advice is available from the Human Resources Director.

The St. Johns County Fire Rescue organization chart is reflected in Figure 10.

Figure 10: Organizational Chart



The uniformed professionals filling the various operational positions within the SJCFR have the skills and equipment to respond to structure, brush, and vehicle fires; medical emergencies involving cardiac arrest, respiratory distress, and trauma; vehicle accidents requiring extrication; hazardous materials incidents; technical rescue; natural disasters; and many other emergencies.

When not responding to 9-1-1 calls, SJCFR firefighters train for the worst-case scenarios; they perform other duties such as hydrant and hose testing, and conduct pre-incident planning (ISO Compliance), conduct public education activities, and give back to the community by supporting charitable projects. They host an annual toy drive during the holidays, support breast cancer awareness, and host special events that raise money for local families during their time of need.

St. Johns County Fire Rescue has two collective bargaining agreements. The first covers the "Rank and File" defined as Firefighter/EMT, Firefighter Engineer, and Firefighter/Lieutenant; the second covers supervisory personnel, defined as Firefighter/Battalion Chief and Firefighter/Captains. The SJCFR operates on a three platoon/shift system (A, B, & C shifts), each reporting to the Operations Chief, from 17 fire stations. When the Operations Chief, who works a 40-hour work week, departs for the night, responsibility for the shift is placed on the Battalion Chief.

SJCFR has six mutual aid agreements with surrounding jurisdictions, including Clay County Fire Rescue, Flagler County Fire Rescue, Jacksonville Fire Rescue, Putnam County Fire Rescue, and the St. Augustine Fire Department. Additionally, SJCFR provides services to the City of St. Augustine Beach via an interlocal agreement. In addition to St. Johns County Fire Rescue Administration, which houses the department's logistical supplies, the department is supported by a separate Fire Communications Building, and a Marine Rescue Headquarters located within the County. Furthermore, the Training Division conducts operations at Fire Station 5 and at the First Coast Technical College, both of which have an array of training props, burn facilities, and a drill tower. SJCFR is an active participant in the State Emergency Response Plan, amongst other participative initiatives.

Public Protection Classification: Insurance Services Office—Rating Bureau

As of 2018, SJCFR has a Public Protection Classification (PPC) rating of Class 3/3Y from the Insurance Services Office (ISO). This rating is what many insurance companies base premiums on for privately insured properties. The higher the PPC class, the greater the likelihood that individual property insurance premiums will increase, especially for commercial properties. PPC also provides fire departments with a valuable benchmark and is used by many departments as a valuable tool when planning, budgeting, and justifying protection improvements. The ISO rates four major areas: Emergency Communications—10% (emergency reporting, telecommunications, dispatch circuits); Fire Department—50% (engine companies, reserve pumpers, pumper capacity, ladder service, reserve ladder and service trucks, deployment analysis, company personnel, training, and operational considerations); Water Supply—40% (supply system, hydrants, inspection, and flow testing); and provides extra credit for Community Risk Reduction.

ESCI has provided both short- and mid-term strategies later in this report to assist SJCFR in improving its PPC rating to a Class 2.

FINANCIAL ANALYSIS

Financial analysis is an important part of determining the long-term financial health and sustainability of the St. Johns County Fire Rescue to achieve and maintain an acceptable level of service. To this end, a financial model was developed for the SJCFR budget(s), which was designed to fairly represent the monetary policies and practices of the department in a consistent manner. Modeling is designed to neutralize the normal differences usually found in unilateral fiscal practices and account for any financial peculiarities. This approach allows an estimation of the total public cost of the department's operation and provides a means for the financial evaluation of sustainability under status quo conditions and various service level modifications. The modeled budget yields a baseline estimate of the total cost of external and internal services provided by the department. In addition, the methodology facilitates the projection of various service level changes in the future.

The following section provides background information on the historical and current financial condition of the SJCFR. Understanding of fire service financial resources and costs begins with an overview of the various revenue and expenditure budgets within the County, which support the fire-rescue department and its operations across all programs. This includes a multi-year historical review of revenues and expenses followed by a status quo financial forecast from FY 21 through FY 25 utilizing historical trend data and key assumptions about future trajectory. This analysis relies on extensive financial documentation provided by the department, including the actual and adopted budget documents from FY 15–20 and St. Johns County's comprehensive annual financial reports (CAFRs) and budget documents through FY 20 as adopted.

Fund Accounting

Local governments use an accounting system organized around a series of discrete funds to ensure appropriate accountability and segregation of revenues and expenses related to specific activities. The Governmental Accounting Services Board (GASB) is an independent organization that develops and adopts standards of accounting and reporting for all levels of government and defines a fund as "…a fiscal and accounting entity with a self-balancing set of accounts recording cash and other financial resources, together with all related liabilities and residual equities or balances, and changes therein, which are segregated for the purpose of carrying on specific activities or attaining certain objectives in accordance with special regulations, restrictions or limitations."[7] In other words, a fund exists to capture all revenue, expense, and fund balance activity related to a specific function or set of activities.

[7] *GASB Codification Section 1300; www.gasb.org.*

There are three major fund types: *Governmental*, which account for most governmental functions, such as ambulance transport, fire suppression, and rescue services; *Proprietary* or *Enterprise*, which account for business-type activities (Solid Waste, Utilities, etc.); and *Fiduciary*, which account for assets held by the government as an agent (typically pension funds). Fire department primary and supporting functions are typically found in Governmental funds, which is the case with St. Johns County Fire Rescue. Fire department activities may, and often are, found in several different major and minor funds, which may relate to how revenue is generated.[8] Some of these funds may be wholly dedicated to fire department functions, such as the Fire District Fund, or they may comprise several different functions, which may include some fire department functions, such as the County General Fund, the Beach Services Fund, and several of the capital projects funds. The analysis that follows compiles data from all pertinent funds to the extent that they contribute to and support the overall mission and various operations of the fire department.

The St. Johns County Fire Rescue is comprised of several programs existing wholly or partially in multiple funds and budgets, including the County General Fund (GF) and/or various Special Revenue and Capital Improvement Funds as shown in the following figure. Those fire department functions that share in the County General Fund (GF) with other governmental functions, such as Emergency Medical Services, do not have their own fund balance and rely on program-specific and other County general revenues to fund annual operating and capital expenditures. For example, although considered a County General Revenue, ambulance billing revenue is specific to a program offered by SJCFR (patient treatment and transport by the EMS division) and is considered a department-specific revenue source for the purposes of this study.

The SJCFR operates three programs within the County General Fund, including; Communications or dispatch (GF expenditure budget 40), Emergency Medical Services (EMS) or ambulance service (GF expenditure budget 48), and the Interoperable Radio System & Towers supporting public safety (GF expenditure budget 106). Fire department-specific revenues supporting these GF public safety programs, including ambulance transport billing revenues, are found within the GF revenue budget (0001). Expenses not fully covered by fire-department generated revenues are funded through other County general revenues such as property taxes. Only department-specific revenues are shown in this analysis.

[8] *Major funds are those shown separately within the County CAFR such as the General and Fire District Funds. Minor funds are those not considered separately in the County CAFR but rather are shown in aggregate. For example, Special Revenue Funds such as the Fire/EMS Impact Fee, Beach Services and Communications Surcharge Fund are shown in aggregate.*

Figure 11: Funds Comprising SJCFR Revenues/Expenditures

Fund	Expenditure Budget	Revenue Budget
General Fund		
General	40 Communications	1 General Fund
	48 Emergency Medical Services	
	106 Interoperable Radio System & Towers	
Special Revenue Funds		
Fire/EMS Impact Fee	1172 Fire/EMS Impact Fee	1152 Fire/EMS Impact Fee
Fire District	1224 Fire Rescue	1171 Fire District
	1230 Fire District Transfer (Reserves)	
Beach Services	1136 Lifesaving Corps	1113 Beach Services
Communications Surcharge	1503 Communications Surcharge Projects	1120 Communications Surcharge
Capital Improvement Funds		
15 Sales Tax Const Projects	3405 Public Facilities-Safety Projects	3400 Public Facilities
16 Public Facilities Projects	3427 Series 2015: Fire Rescue	3425 Series 2015 Sales Tax Bond

General Fund is the County's largest and most diverse fund, accounting for most of the revenue and expense for the various constitutional officers as well as operation of the general County government, including both internal and external services such as EMS. The largest GF revenue source is ad valorem or property tax.

Special Revenue Funds account for revenues legally restricted or otherwise restricted by policy for specified purposes, and the name typically indicates the restricted purpose. There are four Special Revenue Funds associated with SJCFR, which include the following:

- The **Fire District Fund** accounts for revenue and expenditures used to provide administrative and operational support for all programs and services related to fire protection and control in the County, including the management of seventeen career-staffed fire stations. This fund is wholly dedicated to services provided by SJCFR.
- The **Beach Services Fund** accounts for revenue and expenditures related to the operation, maintenance, and safety of St. Johns County beaches. This includes the provision of lifeguards and lifesaving/marine rescue services offered under the auspices of SJCFR. This fund is only partly dedicated to services provided by SJCFR.
- The **Fire Protection & Emergency Medical Services Impact Fee Fund** is one of five County Impact Fee Funds and is collected countywide on all new construction. The fees can only be used for capital expenditures used to offset increased service demand driven by new growth. This fund is wholly dedicated to capital projects supporting services provided by SJCFR.
- The **Communications Surcharge Fund** accounts for an additional $12.50 levied on all moving violations cited in the County. Revenue in this fund is used to offset costs of the intergovernmental radio program managed by SJCFR.

Capital Improvement Project Funds are used to account for the acquisition and construction of major capital facilities outside of the various Enterprise Funds (none of which include public safety functions referred to in this study). Projects using revenue from these funds are found in the County Capital Improvement Plan (the CIP), often span several years and utilize revenue from more than one County fund, including bonded debt or commercial loans and funding shown as capital expenditures in various other funds identified in the previous figure.

- The 15 Sales Tax Construction Projects Fund is one of several capital improvement project funds. This fund was established in FY 15 to account for various County CIP projects, including a new combined fire station (combination of existing Fire Stations 5 and 11). This fund was also used to acquire a hazardous materials trailer. Funding used for projects in this fund included $17.5 million in loan proceeds in addition to the 15 Sales Tax Refunding Bonds.
- The 16 Public Facilities Projects Fund is another capital improvement project fund established in FY 17 and included additional funding to complete the new combined fire (Stations 5 and 11 mentioned above).

The County uses a current financial resources measurement focus and a modified accrual basis for budgeting and accounting in Governmental Funds. The County fiscal year runs from October 1 through September 30 of the following year. All County budgets are adopted during a final public hearing in September each year.

Since the SJCFR department operates from multiple budgets in a variety of funds, as discussed above, the following analysis presents revenue and expense by fund. It then shows a composite intended to illustrate to the reader total department-specific revenue and total expense for the department in one table. To facilitate a full understanding of revenue and expense, individual budgetary line items were combined or grouped. A separate budget line item crosswalk table is provided in the footnotes for revenue and expense showing which line item account codes are included in the terms used by ESCI for the following analysis.[9,10]

[9] *Crosswalk for St. Johns County Revenue line item account codes to ESCI terms used in the financial analysis.*

ESCI Revenue Categories	St. Johns County Line Item Account Codes
Recurring Sources	
Ambulance Fees	34261, 34262
Communications Surcharge	34262
Interest/Investment	36102, 36113, 36121, 36122, 36124, 36127, 36128, 36130, 36101, 36102, 36121, 36122, 36124, 36127, 36128, 36130
Ad Valorem Tax	31101, 31193
Fire Protection Fees	32201, 34220, 34226, 34259, 34266, 34901
Supplemental Comp	33520
Non-Recurring Sources	
Impact Fees	36302, 36305
Grants	33120, 33122, 33420, 33429, 33720
Surplus Sales	36400
Insurance Proceeds	36402
Miscellaneous	33750, 36603, 36901, 36904

[10] *Crosswalk for St. Johns County Expense line item account codes to ESCI terms used in the financial analysis.*

ESCI Expenditure Categories	St. Johns County Line Item Account Codes
Personnel Services	
Salaries/Wages - Regular	51200, 51300, 51302,51501
Salaries/Wages - Overtime	51400
Benefits	52100, 52200, 52202, 52300, 52313, 52400, 52500, 52900
Operating	
Property Appraiser/Tax Collector	53122, 53123
Central Service Allocated Costs	53401
Facility Operating	54300, 54600
Equipment Operating	54601
Vehicle Operating	54602, 55201
Grant Expense	55304, 55305, 55306
Other Operating	53120, 53150, 53180, 53190, 53201,53400, 53403, 53404, 54000, 54100, 54110, 53403, 53404, 54000, 54100, 54110, 54402, 54400, 54500, 54603, 54618, 54622, 54700, 54801, 55100, 55102, 55103, 55200, 55202, 55208, 55214, 55400, 55401, 55405, 55801, 58100, 59301

Historical Revenue and Expense

The following snapshot of historical financial results and the status quo projection for the department—assuming no changes in organizational structure and working conditions—sets the stage for modeling various alternatives to the status quo. The status quo projection utilizes a series of revenue and expenditure assumptions based upon historical trajectory and known or expected future conditions in the County.

Revenue

The following figure shows actual revenues specific to the fire department by fund. Revenue can be divided into recurring and non-recurring sources. Recurring revenues are those such as ad valorem taxes, fees for service (ambulance charges), contracts, permit fees, and investment/interest income that are reasonably predictable in many cases and are expected to continue on a year-to-year basis. Non-recurring revenues, on the other hand, are more sporadic in nature and difficult to predict, such as grant funds, donations, and sales of surplus property and equipment. Impact fees, while reasonably steady in a high growth environment, are based on new construction and are considered a non-recurring source used to offset non-recurring capital expenditures caused by new growth. Bond or loan proceeds, when applicable, are also considered non-recurring revenue sources.

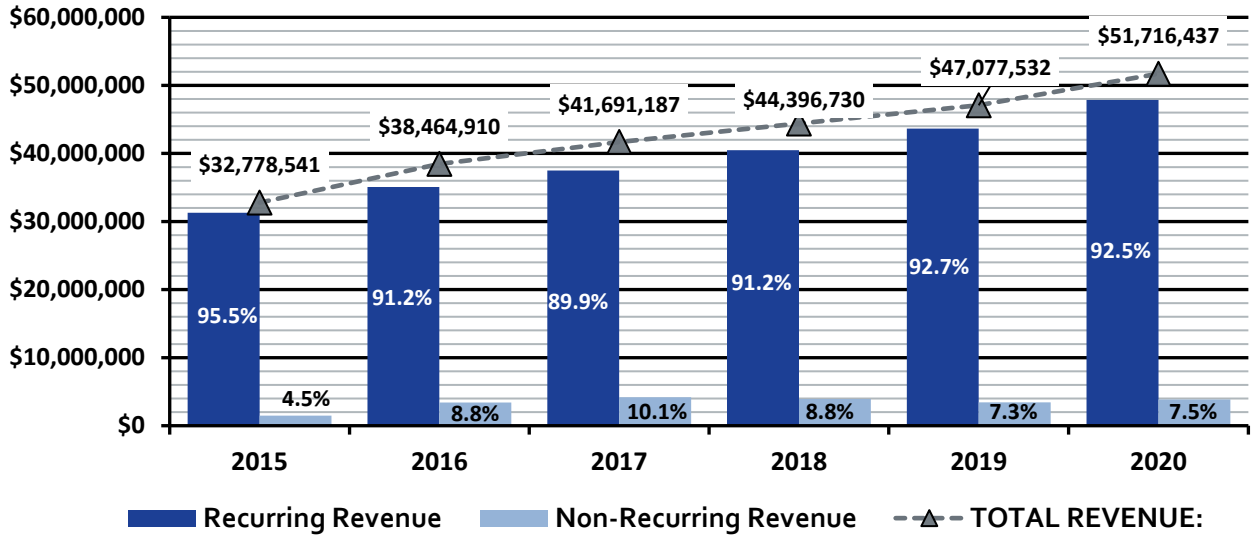
Transfers	
Transfers to Other Funds	59100, 59101
Capital	
Land	56100
Buildings	56102, 56200, 56300
Improvements O/T Buildings	56301
Equipment	56400, 56403, 56420
Vehicles/Apparatus	56415

Figure 12: SJCFR Revenues (FY 15–FY 19 Actual; FY 20 Adopted)

Revenue	2015 Actual	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Adopted
General Fund						
Amb./EMS Fees	6,882,648	7,326,972	7,339,075	7,478,758	7,386,753	7,535,000
Communications Surcharge Fund						
Comms Surcharge	162,897	147,848	153,740	147,253	147,827	148,000
Interest/Invest.	943	3,473	2,769	5,667	9,876	500
Fire District Fund						
Ad Valorem Tax	23,530,431	26,811,732	29,367,169	31,787,922	34,554,556	39,402,127
Fire Protect. Fees	396,677	433,428	349,145	654,414	697,494	550,600
Interest/Invest.	200,157	213,818	156,264	267,593	710,521	96,000
Suppl. Comp	122,322	129,701	132,565	136,244	143,674	130,000
Recurring Revenue	**31,296,075**	**35,066,972**	**37,500,727**	**40,477,851**	**43,650,701**	**47,862,227**
Fire/EMS Impact Fee Fund						
Impact Fees	1,356,501	2,383,434	2,486,096	3,115,284	2,695,268	2,584,994
Interest/Invest.	11,188	17,424	24,526	62,128	218,930	3,500
Fire District Fund						
Grants	17,336	910,213	1,484,912	665,344	458,688	1,265,716
Surplus Sales	-	65,400	-	-	-	-
Insur. Proceeds	96,930	21,467	193,435	75,949	2,500	-
Misc. Income	511	-	1,491	174	51,444	-
Non-Recurring Rev.	**1,482,466**	**3,397,939**	**4,190,460**	**3,918,879**	**3,426,831**	**3,854,210**
TOTAL REVENUE:	**$32,778,541**	**$38,464,910**	**$41,691,187**	**$44,396,730**	**$47,077,532**	**$51,716,437**

Total department-specific recurring revenue, shown relative to non-recurring and total revenue in the following figure, has increased $12.35 million or 39.5% from $31.3 million in FY 15 to almost $43.7 million in FY 19. As a percentage of total department-specific revenue, recurring revenue has generally averaged approximately 92%.

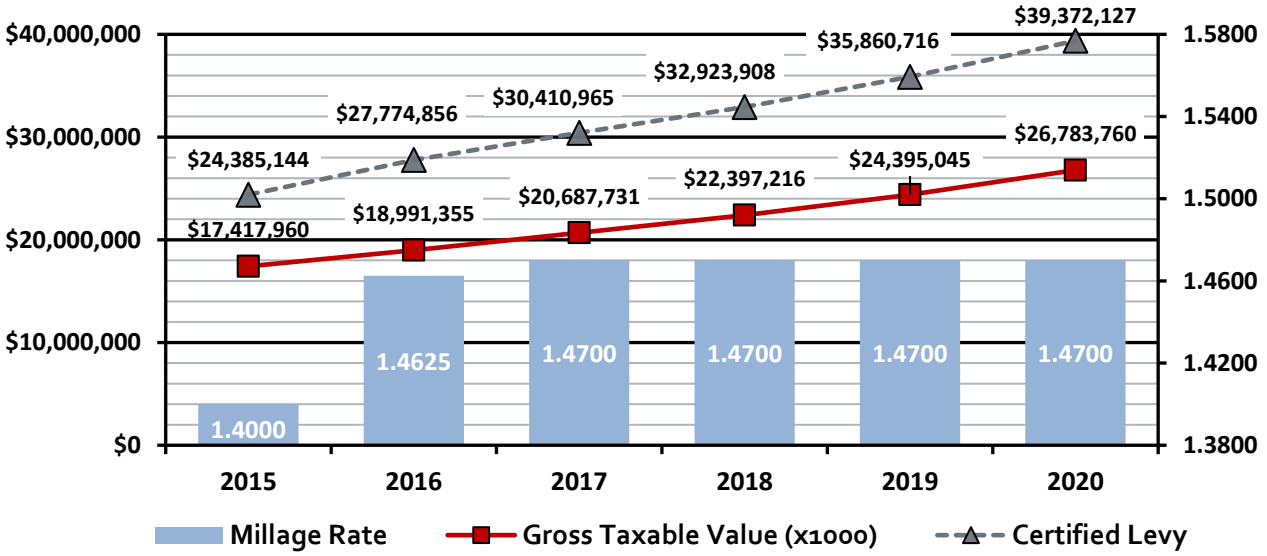
Figure 13: Recurring, Non-Recurring versus Total Revenue (FY 15–FY 19 Actual; FY 20 Adopted)



The increase in recurring revenue between FY 15 and FY 19 represents an average annual rate of increase of 8.6% and comes from several sources outlined in the following:

- **Ambulance/EMS Fees**—found within the County GF have increased slowly over the period from $6,882,648 in FY 15 to $7,386,753 in FY 19; an increase of 7.3% over the period, which represents an average annual increase of 1.8%. This represents the actual revenue received and does not include past due accounts. This revenue stream includes both the actual treatment fee as well as the mileage charges for patient transports.
- **Communications Surcharge**—revenue derived from a fixed fee of $12.50 on moving violations will fluctuate with the annual amount of citations issued. This source, after dropping from a period high of just under $163,000 in FY 15, has fluctuated slightly around an average of just under $150,000 annually since FY 15. This revenue source is maintained within its own fund, and interest has averaged just under $4,000 annually.
- **Ad Valorem Tax**—although the GF provides a portion of its millage rate to support some SJCFR department programs, most notably EMS expenditures not covered by ambulance billing revenue, it is not a fire department specific revenue source and is not shown here. Rather, the Fire District ad valorem revenue is shown, which is 100% dedicated to SJCFR expenditures. The following figure shows how gross taxable values (real and personal property) in the District have increased linearly by approximately 9% each year. The mill rate used to produce the ad valorem revenue increased slightly between FY 15 and FY 16 by just over 6/100th of a mill and then very slightly to its current 1.47 mill rate in FY 17. The certified levy has increased correspondingly, and actual revenue, shown in Figure 12, has grown from $23.5 million in FY 15 to $34.55 million in FY 19, a 46.9% increase for the period or approximately 11% per year.

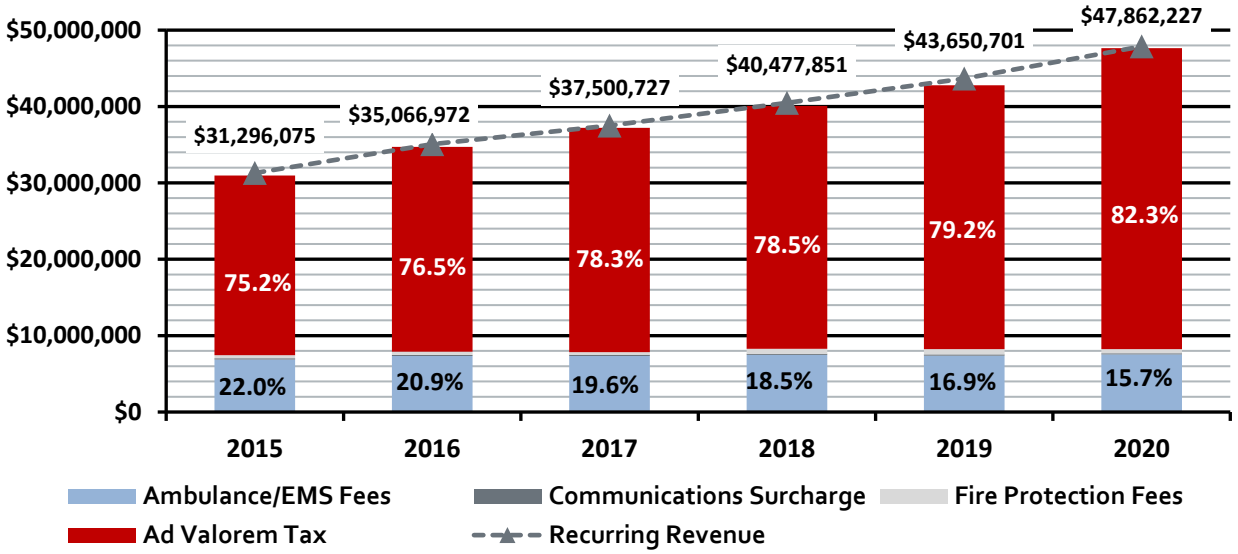
Figure 14: Fire District Taxable Value, Mill Rate, and Certified Levy (FY 15–FY 19 Actual; FY 20 Adopted)



- **Fire Protection Fees**—are comprised of various plan, technical review, and inspection fees, as well as activity fees such as standby and CPR class fees. The total revenue from these sources, although fluctuating over the period, has generally increased from $396,667 in FY 15 to $697,494 in FY 19, an average annual increase of approximately 15.2%.
- **Interest Earnings**—in the Fire District Fund have generally averaged near $200,000 per year between FY 15 and FY 18 before jumping considerably to $710,521 in FY 19. The department has estimated receiving a much lower amount of $96,000 in the FY 20 adopted budget.
- **Supplemental Compensation**—is revenue received from the State of Florida for firefighters who have received various academic degree levels. This revenue source, passed along as part of total compensation to employees, has increased annually from $122,322 in FY 15 to $143,674 in FY 19 for an average annual increase of approximately 4%.

The following figure illustrates the major components of the department-specific recurring revenue stream over the historical period. Not included is the GF millage/other revenue component, which also helps fund EMS program expenditures. The two largest components are clearly the Fire District ad valorem at 75–80% of the total, followed by ambulance fees at 17–22%. When the GF ad valorem tax component of recurring revenue is considered, it is clear that property taxes are the major recurring funding source for the department, and a long-term view of taxable value growth and real growth is important to maintaining sufficient operating revenue.

Figure 15: Major Components of Recurring Revenue (FY 15–FY 19 Actual; FY 20 Adopted)



Non-recurring revenue for the department is a relatively minor component at less than 10% of the department-specific revenue stream (less when GF millage support is considered) and, as expected, has varied considerably from a low of $1.48 million in FY 15 to a high of $4.19 million in FY 17. The largest component of non-recurring revenue is impact fee revenue followed by various grants. Non-recurring revenue sources are outlined as follows:

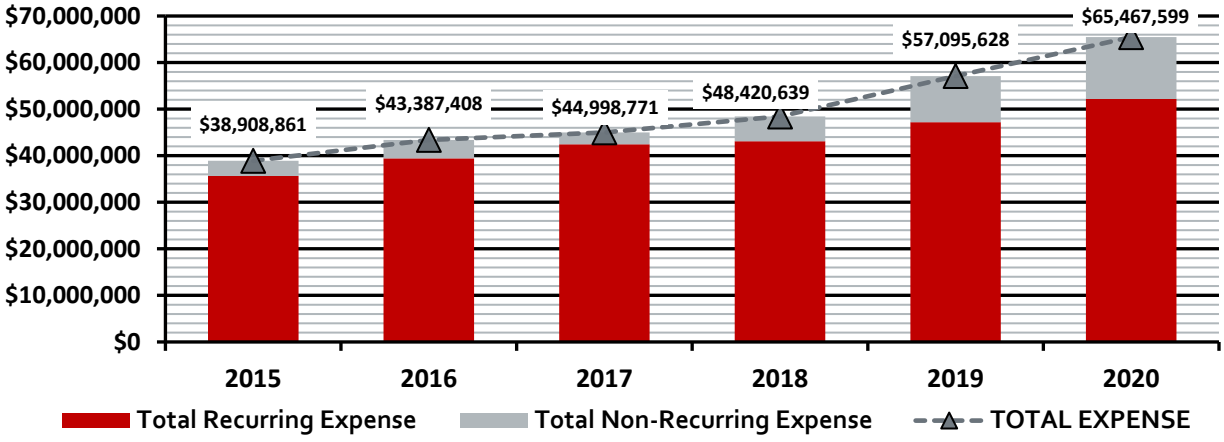
- **Impact Fees**—from new construction have varied from a low of $1,356,501 in FY 15 to a high of $3,115,284 in FY 18 before dropping back to just under $2.7 million in FY 19. Following a large increase of $1.1 million between FY 15 and FY 16, impact fees have been relatively stable, averaging $2.65 million annually when FY 20 adopted is considered. Impact fee revenue considered here includes interest/investments in this fund, which have ranged from a low of $11,000 in FY 15 to a high of $218,930. This varies depending upon the timing of various impact fee funded projects versus cash balance in the fund.
- **Grant Revenue**—has varied widely from a low of $17,336 in FY 15 to a high of $1,484,912 in FY 17 as the department aggressively pursued various state and federal programs such as the Fire Act and SAFER grants used to hire additional firefighters.
- **Surplus Property**—have been minor and only contributed $65,400 to the department's revenue stream in FY 16.
- **Insurance Proceeds**—have fluctuated considerably from a low of $2,500 in FY 19 to a high of $193,435 in FY 17.
- **Miscellaneous Income**—has varied considerably from $0 in FY 16 to a high of $51,444 in FY 19 and is a very minor revenue source.

Expense

The following discussion focuses on expenditures used to support various fire department programs and operations. To better understand the long-term cost implication of various service levels on the taxpayer, it is important to separate annual expenditures into those that are recurring each year and those that are one-time or finite in nature. Recurring expenses are those such as employee salaries and benefits and other operating costs that are reasonably predictable and expected to continue from year-to-year. These other operating costs have been grouped by ESCI into Property Appraiser/Tax Collector Fees, Central Services Allocated costs, Facility/Equipment/Vehicle Operating costs, Grant expenses, and Other Operating costs. A detailed listing of individual County line items included in each of these categories is provided in the footnotes. Transfers from the Fire District to support 50% of the GF Communications program and landscaping costs are considered recurring. In some cases, larger fire departments have such a large fleet that they can spend a predictable, uniform amount each year on apparatus and equipment replacement. Typically, they consider this a recurring cost and can budget such with an offsetting recurring revenue.

Non-recurring expenses, on the other hand, are more sporadic in nature and may be difficult to predict, such as land acquisition, facility construction and major facility renovation, and large-scale equipment or apparatus purchases. In this analysis, all capital expenditures, including apparatus and equipment replacement, are shown as non-recurring. The department does, however, maintain and utilize a five-year Capital Improvement Plan (CIP).

Figure 16: Relationship of Recurring to Non-Recurring Expenses (FY 15–FY 19 Actual; FY 20 Adopted)



The previous figure compares the combined department recurring, non-recurring, and total expense from all relevant funds from FY 15 through FY 19 actual and FY 20 adopted. The combined recurring expense for the department has increased from $35.64 million in FY 15 to $47.18 million in FY 19, or 32.4% over the historical period. This represents an average annual increase of approximately 7.3%. The non-recurring expense for the department has also generally increased over time from $3.27 million in FY 15 to $9.91 million by FY 19 and is budgeted even higher at $13.29 million in FY 20. Total department expenditures increased at a linear rate of approximately 7.6% per year from FY 15 through FY 18 before the growth rate more than doubled in FY 19 through FY 20 as adopted. The growth occurs in both recurring and non-recurring expenses.

The following figure shows recurring expenditures first by individual fund and then as a composite department total for the period FY 15 through FY 19 actual and FY 20 as adopted. This is followed by an additional similar figure showing non-recurring fire department expenditures by fund and as a department total for the same period.

Figure 17: SJCFR Recurring Expenses by Fund and Department Total (FY 15–FY 19 Actual; FY 20 Adopted)

Recurring Expenses	2015 Actual	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Adopted
Fire District Fund—Fire Division						
Personnel Services	**19,255,973**	**21,012,250**	**23,169,612**	**23,719,169**	**26,543,110**	**28,531,363**
Salaries/Wages - Regular	*11,885,913*	*12,877,366*	*13,018,810*	*13,715,428*	*14,903,351*	*16,248,024*
Salaries/Wages - Overtime	*1,257,329*	*1,451,455*	*2,311,802*	*1,702,498*	*2,388,820*	*2,100,000*
Benefits	*6,112,731*	*6,683,429*	*7,839,001*	*8,301,243*	*9,250,939*	*10,183,339*
Operating	**4,660,694**	**5,175,923**	**5,951,764**	**5,819,710**	**5,510,765**	**7,376,177**
Prop Appraiser/Tax Collector	*885,187*	*952,781*	*1,061,545*	*1,120,142*	*1,190,991*	*1,257,527*
Central Service Allocation	*1,210,643*	*1,210,643*	*1,210,643*	*1,367,685*	*1,367,685*	*1,367,685*
Facility Operating	*284,624*	*287,387*	*246,248*	*212,905*	*217,069*	*263,972*
Equipment Operating	*618,439*	*700,135*	*851,158*	*752,526*	*686,864*	*763,304*
Vehicle Operating	*260,041*	*209,534*	*254,036*	*275,326*	*287,950*	*351,927*
Grant Expense	*2,307*	*372,029*	*674,661*	*474,875*	*69,780*	*360,000*
Other Operating	*1,399,452*	*1,443,414*	*1,653,473*	*1,616,250*	*1,690,426*	*3,011,762*
Transfers	**947,618**	**963,054**	**717,763**	**692,538**	**737,373**	**789,087**
Transfers to Other Funds	*947,618*	*963,054*	*717,763*	*692,538*	*737,373*	*789,087*
General Fund—EMS Division						
Personnel Services	**6,298,019**	**6,972,041**	**7,791,409**	**7,887,713**	**8,855,987**	**9,198,429**
Salaries/Wages - Regular	*3,927,986*	*4,318,580*	*4,463,802*	*4,617,940*	*4,939,569*	*5,266,060*
Salaries/Wages - Overtime	*395,456*	*441,829*	*711,462*	*539,411*	*795,556*	*665,000*
Benefits	*1,974,577*	*2,211,632*	*2,616,145*	*2,730,362*	*3,120,863*	*3,267,369*
Operating	**1,375,626**	**1,670,701**	**1,491,568**	**1,465,245**	**1,642,864**	**1,722,569**
Facility Operating	*143,688*	*137,386*	*146,852*	*123,172*	*155,270*	*164,309*
Equipment Operating	*1,837*	*694*	*1,008*	*3,226*	*1,319*	*2,952*
Vehicle Operating	*389,317*	*405,468*	*405,440*	*396,496*	*425,004*	*437,960*
Grant Expense	*4,990*	*40,349*	*-*	*23,306*	*17,449*	*-*
Other Operating	*835,794*	*1,086,805*	*938,268*	*919,045*	*1,043,822*	*1,117,348*
General Fund—Communications Division						
Personnel Services	**1,007,367**	**1,133,764**	**1,224,898**	**1,233,701**	**1,434,792**	**1,449,129**
Salaries/Wages - Regular	*633,941*	*735,667*	*735,103*	*772,223*	*869,192*	*899,760*
Salaries/Wages - Overtime	*103,309*	*93,897*	*137,009*	*119,217*	*182,918*	*145,000*
Benefits	*270,117*	*304,200*	*352,786*	*342,261*	*382,682*	*404,369*
Operating	**24,737**	**20,734**	**28,998**	**22,187**	**56,832**	**98,790**
Facility Operating	*5,229*	*4,913*	*5,359*	*5,157*	*4,913*	*6,335*

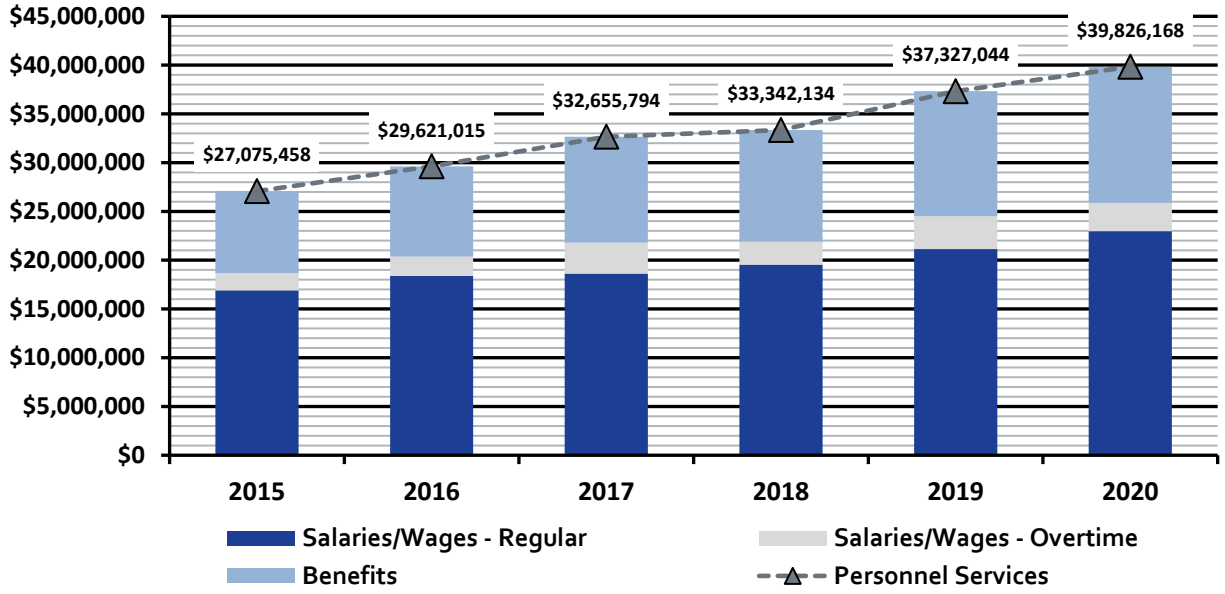
Recurring Expenses	2015 Actual	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Adopted
Equipment Operating	*189*	*-*	*3,774*	*-*	*2,384*	*3,600*
Other Operating	*19,319*	*15,820*	*19,865*	*17,030*	*49,536*	*88,855*
Fire/EMS Impact Fee Fund						
Operating	**33,999**	**14,074**	**15,276**	**158,793**	**169,334**	**410,516**
Facility Operating	*-*	*-*	*-*	*-*	*12,218*	*-*
Other Operating	*33,999*	*14,074*	*15,276*	*158,793*	*157,116*	*410,516*
Transfers	**624,644**	**521,612**	**762,840**	**762,132**	**732,928**	**636,792**
Transfers to Other Funds	*624,644*	*521,612*	*762,840*	*762,132*	*732,928*	*636,792*
Beach Services Fund—Lifesaving Corps						
Personnel Services	**410,094**	**395,722**	**359,396**	**386,556**	**371,732**	**520,730**
Salaries/Wages - Regular	*377,331*	*360,753*	*325,135*	*345,052*	*330,995*	*461,080*
Benefits	*32,763*	*34,969*	*34,261*	*41,505*	*40,736*	*59,650*
Operating	**74,960**	**112,961**	**98,324**	**107,615**	**100,118**	**113,740**
Facility Operating	*4,408*	*4,440*	*4,189*	*5,449*	*5,744*	*5,690*
Equipment Operating	*3,809*	*6,176*	*6,009*	*6,765*	*8,984*	*7,005*
Vehicle Operating	*18,471*	*21,269*	*21,455*	*39,303*	*24,778*	*39,930*
Other Operating	*48,271*	*81,076*	*66,670*	*56,098*	*60,612*	*61,115*
General Fund—Interoperable Radio System & Towers						
Personnel Services	**104,005**	**107,721**	**114,947**	**114,995**	**123,783**	**126,517**
Salaries/Wages - Regular	*81,099*	*84,042*	*84,233*	*88,433*	*93,289*	*97,618*
Overtime	*-*	*483*	*4,469*	*-*	*2,359*	*-*
Benefits	*22,906*	*23,196*	*26,245*	*26,562*	*28,135*	*28,899*
Operating	**698,740**	**1,053,986**	**734,116**	**721,489**	**816,394**	**1,200,697**
Facility Operating	*84,463*	*80,260*	*95,252*	*85,364*	*109,839*	*101,625*
Equipment Operating	*-*	*-*	*-*	*69*	*-*	*8,000*
Vehicle Operating	*1,086*	*937*	*2,018*	*2,810*	*2,287*	*1,970*
Grant Expense	*-*	*316,137*	*-*	*-*	*-*	*-*
Other Operating	*613,190*	*656,653*	*636,847*	*633,246*	*704,268*	*1,089,102*
Communications Surcharge Projects Fund						
Operating	**-**	**268,116**	**-**	**-**	**102,730**	**-**
Other Operating	*-*	*268,116*	*-*	*-*	*102,730*	*-*
Transfers	**120,000**	**-**	**-**	**-**	**-**	**-**
Transfers to Officers	*120,000*	*-*	*-*	*-*	*-*	*-*
SJCFR Department Total						
Personnel Services	**27,075,458**	**29,621,498**	**32,660,263**	**33,342,134**	**37,329,404**	**39,826,168**
Salaries/Wages - Regular	*16,906,270*	*18,376,408*	*18,627,083*	*19,539,076*	*21,136,395*	*22,972,542*
Salaries/Wages - Overtime	*1,756,094*	*1,987,663*	*3,164,742*	*2,361,127*	*3,369,653*	*2,910,000*
Benefits	*8,413,094*	*9,257,426*	*10,868,437*	*11,441,932*	*12,823,355*	*13,943,626*

Recurring Expenses	2015 Actual	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Adopted
Operating	**6,868,755**	**8,316,495**	**8,320,046**	**8,295,038**	**8,386,820**	**10,922,489**
Prop Appraiser/Tax Collector	*885,187*	*952,781*	*1,061,545*	*1,120,142*	*1,190,991*	*1,257,527*
Central Service Allocation	*1,210,643*	*1,210,643*	*1,210,643*	*1,367,685*	*1,367,685*	*1,367,685*
Facility Operating	*522,413*	*514,386*	*497,900*	*432,046*	*505,052*	*541,931*
Equipment Operating	*624,275*	*707,005*	*861,949*	*762,586*	*699,551*	*784,861*
Vehicle Operating	*668,915*	*637,208*	*682,949*	*713,936*	*740,019*	*831,787*
Grant Expense	*7,297*	*728,515*	*674,661*	*498,181*	*87,229*	*360,000*
Other Operating	*2,950,026*	*3,565,957*	*3,330,399*	*3,400,462*	*3,808,511*	*5,778,698*
Transfers	**1,692,262**	**1,484,666**	**1,480,603**	**1,454,670**	**1,470,301**	**1,425,879**
Transfer to Other Funds	*1,692,262*	*1,484,666*	*1,480,603*	*1,454,670*	*1,470,301*	*1,425,879*
Recurring Expense	**35,636,475**	**39,422,176**	**42,460,911**	**43,091,842**	**47,198,742**	**52,174,536**

As shown in the figure, recurring expenses for the department have increased significantly over the period, rising at an average annual rate of 7.3% between FY 15 and FY 19, driven primarily by increases in personnel costs. Major recurring expense categories are described as follows:

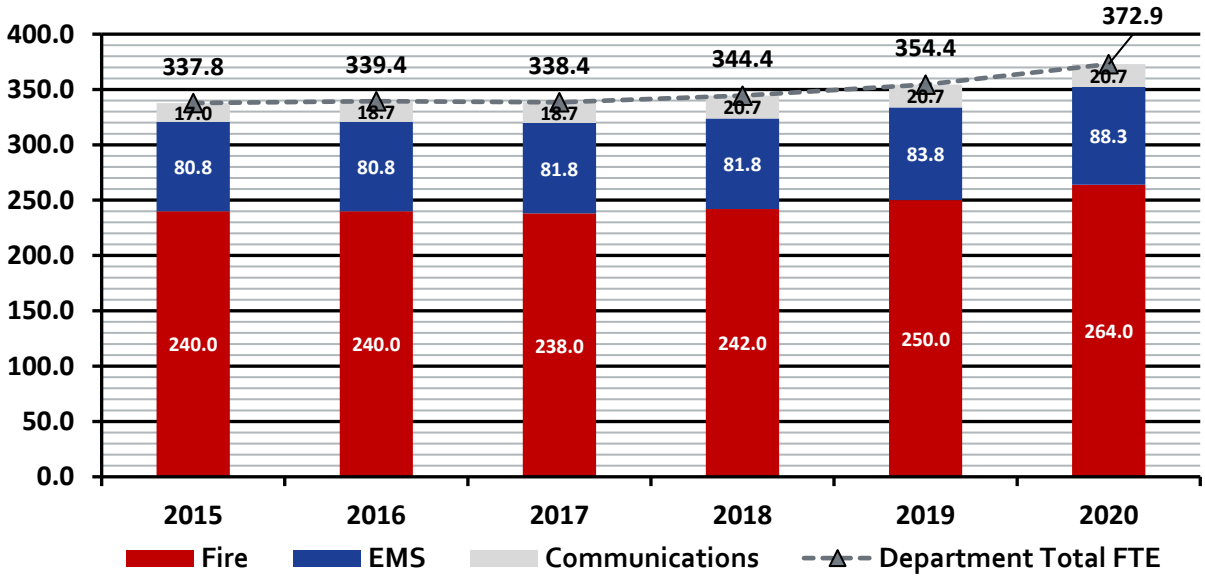
- **Personnel Services**—in total have increased as shown in the following figure from $27.08 million in FY 15 to $37.33 million by FY 19 for an increase of 37.9% over the period, which represents an average annual increase of approximately 8.4%. This increase, except for the addition of 16.7 FTE as discussed below, primarily represents increases in wages and benefits due to a variety of reasons. When the FY 20 adopted budget is considered, the combined departmental personnel services budget increased significantly from FY 17 actual through FY 20 adopted as more positions were added or planned for addition (6 in FY 18, 10 in FY 19, and 18.5 as adopted in FY 20).
  - **Overtime costs** (sick/vacation and other operational coverage) as a percentage of wages have varied during the same period from an average of 10.6% in FY 15 and FY 16 to an average of 15% between FY 17 and FY 19, while salaries and wages increased from $16.9 million to $21.1 million or an average of 5.8% per year. Again, this rate of increase is driven in part by the addition of staff (see following discussion) and is not reflective of actual employee wage increases.
  - **Benefits** as a percent of total compensation have increased slightly from an average of 31.2% in FY 15 and FY 16 to an average of 34% between FY 17 and FY 19.

Figure 18: Personnel Services Cost Breakdown (FY 15–FY 19 Actual; FY 20 Adopted)



- The following figure shows budgeted, full-time department total staff count (FTE) by major division (total shown also includes Radio System program with 1 FTE throughout the period) which has increased from 337.8 FTE in FY 15 to 354.4 FTE in FY 19, a 4.9% staffing increase over the historical period. This increase occurred primarily in FY 18–19 with the addition of 12 FTE in the Fire, 2 FTE in the EMS, and 2 FTE in the Communications programs. Further, the adopted FY 20 budget includes 14 more planned FTE in the Fire and 4.5 more FTE in the EMS programs.

Figure 19: Full-Time Staff Count Budgeted by Major Category (FY 15 Actual–FY 20 Adopted)



- In order to assess the financial impact of staff additions versus increases due solely to salary and benefit increases, the FY 19 compensation costs of the added positions must be subtracted from the actual totals as shown in the following figure for each fund and then the department as a whole. The difference between this adjusted total (FY 19 Adjusted column in the figure) and the FY 15 actual amounts is then approximately reflective of compensation increases for whatever reason.

Figure 20: FY 19 Personnel Costs Adjusted for Addition of New Positions

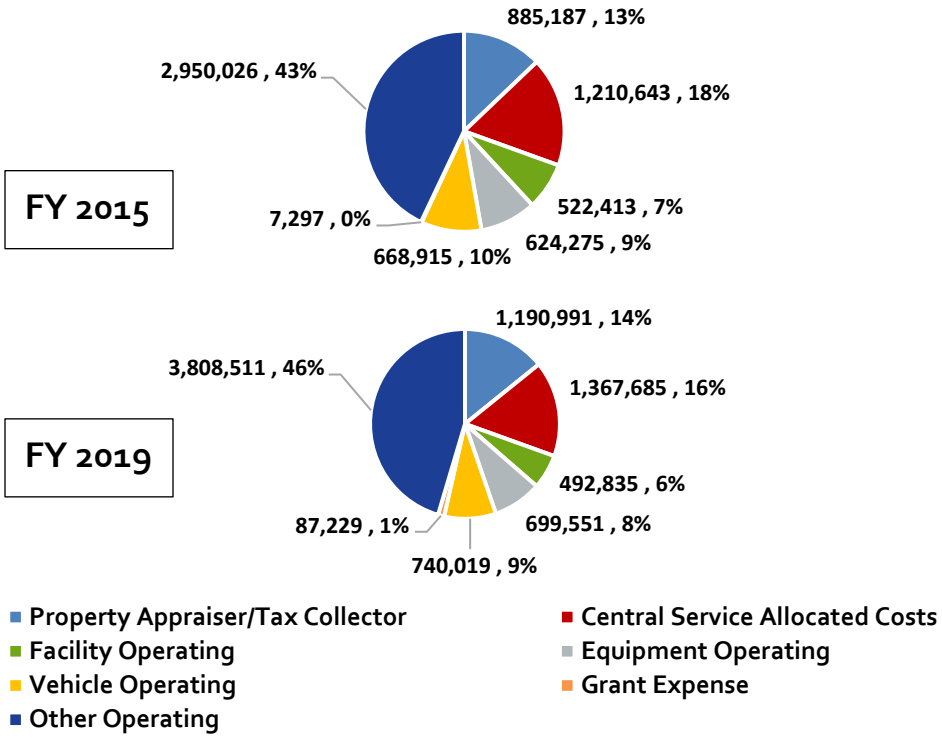
Adjusted Expenses	2019 Actual	2019 Adjusted	2015 Actual	Adjusted Increase	Adjusted Avg Annual Increase
Fire District Fund—Fire Division					
Personnel Services	26,543,110	25,481,385	19,255,973	32.33%	7.30%
Salaries/Wages—Regular	*14,903,351*	*14,307,217*	*11,885,913*	*20.37%*	*4.70%*
Salaries/Wages—Overtime	*2,388,820*	*2,293,267*	*1,257,329*	*82.39%*	*16.20%*
Benefits	*9,250,939*	*8,880,902*	*6,112,731*	*45.29%*	*9.70%*
General Fund—EMS Division					
Personnel Services	8,855,987	8,537,172	6,298,019	35.55%	7.30%
Salaries/Wages—Regular	*4,939,569*	*4,761,744*	*3,927,986*	*21.23%*	*7.90%*
Salaries/Wages—Overtime	*795,556*	*766,916*	*395,456*	*93.93%*	*4.90%*
Benefits	*3,120,863*	*3,008,512*	*1,974,577*	*52.36%*	*18.00%*
General Fund—Communications Division					
Personnel Services	1,434,792	1,179,399	1,007,367	17.08%	4.00%
Salaries/Wages—Regular	*869,192*	*714,476*	*633,941*	*12.70%*	*3.00%*
Salaries/Wages—Overtime	*182,918*	*150,359*	*103,309*	*45.54%*	*9.80%*
Benefits	*382,682*	*314,565*	*270,117*	*16.46%*	*3.90%*
Beach Services Fund—Lifesaving Corps					
Personnel Services	371,732	371,732	410,094	-9.35%	-2.50%
Salaries/Wages—Regular	*330,995*	*330,995*	*377,331*	*-12.28%*	*-3.20%*
Benefits	*40,736*	*40,736*	*32,763*	*24.34%*	*5.50%*
General Fund—Interoperable Radio System & Towers					
Personnel Services	123,783	123,783	104,005	19.02%	4.50%
Salaries/Wages—Regular	*93,289*	*93,289*	*81,099*	*15.03%*	*3.60%*
Salaries/Wages—Overtime	*2,359*	*2,359*	-		
Benefits	*28,135*	*28,135*	*22,906*	*22.83%*	*5.30%*
SJCFR Department Total					
Personnel Services	37,329,404	35,693,471	27,075,458	31.83%	7.10%
Salaries/Wages—Regular	*21,136,395*	*20,207,721*	*16,906,270*	*19.53%*	*4.60%*
Salaries/Wages—Overtime	*3,369,653*	*3,212,901*	*1,756,094*	*82.96%*	*16.40%*
Benefits	*12,823,355*	*12,272,849*	*8,413,094*	*45.88%*	*9.90%*

- Between FY 15 and FY 19, 10 positions were added to the Fire program, which represents approximately 4% or $1.06 million of the total FY 19 compensation.[11] Three positions were added to the EMS program, which represents approximately 3.6% or $320,000 of the total FY 19 compensation. A total of 3.7 positions were added to the Communications program, representing approximately 17.8% or $255,000 of that compensation budget in FY 19. The Radio program staff remained constant over the period; therefore, no adjustments for added staff are needed for the FY 15 to FY 19 comparison.
- Comparing the adjusted FY 19 amounts to the actual FY 15 amounts provides the approximate average annual increases (last column in the previous figure) due to various wage and benefit adjustments, whether through collective bargaining agreements, reclassifications, or salary changes due to other personnel changes or changes in benefits (retirement contributions, health insurance increases, workers' compensation experience, or other changes). Different programs in the various funds contributing to total department expenditures have experienced different rates of increase. In total, excluding the new positions, the department has seen average annual increases in the salaries/wages line of 4.6%, while overtime has increased at an average rate of 16.4%, and benefits have increased at 9.9%.

- **Operating Costs**—in total, jumped from $6.87 million in FY 15 to $8.32 million in FY 16, an increase of 21.1%, but have remained relatively flat since then, averaging just over $8.3 million and only increasing $70,000 between FY 16 and FY 19. Operating items have been grouped into several major categories for purposes of this analysis as follows: Property Appraiser/Tax Collector fees, Central Services Allocated costs, Facility, Equipment and Vehicle Operating costs, Grant Expenses, and all Other Operating costs. As mentioned above, a crosswalk of County budget line items and these categories is provided in the footnotes at the beginning of this section. The following figure shows that, while there have been some changes, the relative proportion of these categories to each other has remained relatively static between FY 15 and FY 19.

[11] *This percentage will only approximate the total compensation increase due to the staff additions. For a truly accurate figure, the exact FY 2019 compensation amounts for each position would need to be considered.*

Figure 21: Comparison of Major Department Operating Costs between FY 15 and FY 19



- The $2.5 million Operating Expense increase between the FY 19 actual and FY 20 adopted is due primarily to a $270,000 increase in grant expenses and an almost $2 million increase in Other Operating expenses. This increase in Other Operating costs is found in three funds: $1.3 million or 67.1% in the Fire District Fund, $250,000 or 12.9% in the Fire/EMS Impact Fee Fund, and $380,000 or 19.5% in the General Fund for the Interoperable Radio System and Tower program. Of the $1.3 million increase in the Fire District, almost 80% of the increase is due to an increase in Contractual Services (37%), Maintenance Public Safety (8.5%), and Uniforms (31.8%). Of the increased Fire/EMS Impact Fee spending, the increase is due to professional fees for capital facilities projects (Northwest Fire Station project). Lastly, the increased GF Radio System and Tower program costs are due to increased Contractual Services costs.

The following figure shows non-recurring expenditures first by the individual fund and then as a composite department total for the period FY 15–19 actual and FY 20 as adopted. As mentioned previously, non-recurring expenses for the department have increased over the period from $3.27 million in FY 15 to $9.91 million by FY 19 and are budgeted even higher at $13.29 million in FY 20.

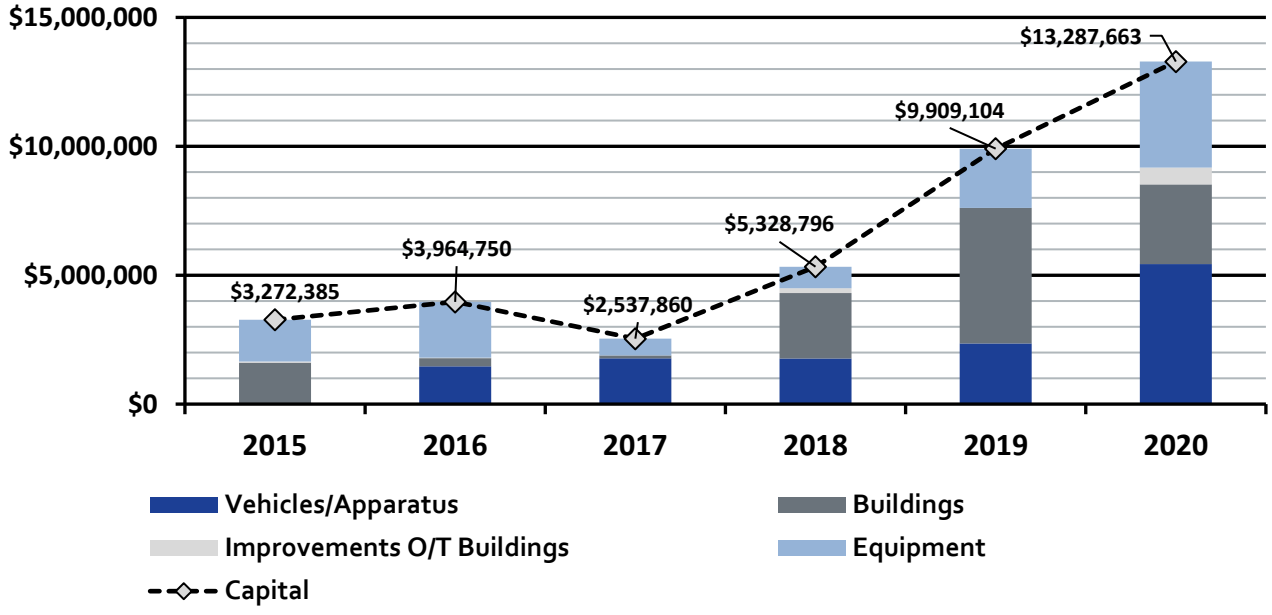
Figure 22: SJCFR Non-recurring Expenses by Fund & Department Total (FY 15–FY 19 Actual; FY 20 Adopted)

Non-Recurring Expenses	2015 Actual	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Adopted
Fire District Fund—Fire Division						
Capital	558,849	1,751,011	1,160,396	1,794,536	3,487,525	6,070,345
Buildings	*37,042*	*4,334*	*25,818*	*2,316*	*45,626*	-
Improvements O/T Buildings	-	-	-	*185,436*	-	*230,000*
Equipment	*521,807*	*337,838*	*373,525*	*305,255*	*1,622,847*	*3,493,462*
Vehicles/Apparatus	-	*1,408,839*	*761,053*	*1,301,529*	*1,819,052*	*2,346,883*
General Fund—EMS Division						
Capital	290,013	838,020	1,143,749	1,183,620	1,226,701	1,080,042
Buildings	-	-	*14,589*	*206,942*	*114,479*	*34,861*
Improvements O/T Buildings	-	-	-	-	*2,610*	-
Equipment	*290,013*	*783,800*	*113,110*	*506,520*	*615,945*	*214,781*
Vehicles/Apparatus	-	*54,220*	*1,016,050*	*470,158*	*493,668*	*830,400*
General Fund—Communications Division						
Capital	57,174	846,637	-	-	6,731	18,100
Equipment	*57,174*	*846,637*	-	-	*6,731*	*18,100*
Fire/EMS Impact Fund						
Capital	2,280,641	90,500	3,500	-	822,521	5,325,010
Land	-	-	*3,500*	-	-	-
Buildings	*1,564,952*	-	-	-	*818,606*	*3,000,945*
Improvements O/T Buildings	*2,439*	-	-	-	-	-
Equipment	*713,250*	*90,500*	-	-	*3,915*	*72,615*
Vehicles/Apparatus	-	-	-	-	-	*2,251,450*
Beach Services Fund—Lifesaving Corps						
Capital	-	3,900	73,928	19,575	26,525	85,484
Equipment	-	*3,900*	*73,928*	*19,575*	*26,525*	*85,484*
General Fund—Interoperable Radio System & Towers						
Capital	-	24,990	-	5,567	75,253	311,182
Buildings	-	-	-	-	*32,000*	*57,682*
Improvements O/T Buildings	-	-	-	-	-	*212,500*
Equipment	-	*24,990*	-	*5,567*	*2,858*	*41,000*
Vehicles/Apparatus	-	-	-	-	*40,395*	-
Communications Surcharge Fund						
Capital	81,535	93,822	88,108	-	17,675	397,500
Improvements O/T Buildings	*41,041*	*14,249*	-	-	-	*212,500*
Equipment	*40,494*	*79,574*	*88,108*	-	*17,675*	*185,000*
15 Sales Tax Construction Projects Fund						
Capital	4,174	315,870	71,330	849,814	4,009,551	-
Buildings	*4,174*	*315,870*	*71,330*	*849,814*	*4,009,551*	-

Non-Recurring Expenses	2015 Actual	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Adopted
16 Public Facilities Projects Fund						
Capital	-	-	350	1,475,685	236,621	-
Buildings	-	-	*350*	*1,475,685*	*236,621*	-
SJCFR Department Total						
Capital	**3,272,385**	**3,964,750**	**2,537,860**	**5,328,796**	**9,909,104**	**13,287,663**
Buildings	*1,606,167*	*320,204*	*112,086*	*2,534,757*	*5,256,883*	*3,093,488*
Improvements O/T Buildings	*43,480*	*14,249*	-	*185,436*	*2,610*	*655,000*
Equipment	*1,622,738*	*2,167,238*	*648,671*	*836,916*	*2,296,496*	*4,110,442*
Vehicles/Apparatus	-	*1,463,059*	*1,777,103*	*1,771,687*	*2,353,115*	*5,428,733*
Total Non-Recur Expense	**3,272,385**	**3,964,750**	**2,537,860**	**5,328,796**	**9,909,104**	**13,287,663**

As shown in the following figure, the increase in non-recurring costs has been largely driven by fire station construction projects in FY 18 through FY 20 as budgeted. In addition, equipment and apparatus acquisition costs have increased significantly with the adoption of FY 20. Prior to the FY 20 budget, the department has averaged close to $1.5 million in equipment and vehicle/apparatus costs each year, respectively, and spread over several of the funds. For a department of the size of SJCFR, this is not an inconsistent target for annual replacement funding.

Figure 23: Department Capital Expenses by Category (FY 15–FY 19 Actual; FY 20 Adopted)



Net Impact on Fund Balance/Other Revenues

As discussed previously, several fire department programs reside wholly within their own funds and carry their own fund balance. Thus, annual revenue and expense both impact the ending fund balance, and it is important to understand this interaction to estimate the funds financial trajectory. The following discussion focuses on the major self-contained fire department funds—the Fire District and Fire/EMS Impact Fee Funds. However, even though several fire department programs do not fall within self-contained funds and other non-fire department programs also impact those fund balances, it is still instructive to review their impact on their respective funds. Specifically, the EMS program in the General Fund is a major fire department program with a related revenue stream, and its impact on the General Fund is significant and is discussed below.

The County follows the provisions of GASB 54, which outlines how fund balances are defined and reported.[12] The Fire District fund balance falls into two major categories, non-spendable and spendable. Spendable fund balance can be further sub-divided depending upon various external and internal requirements. The following figure shows the historical ending fund balance by category for the period FY 15 through FY 18 as derived from annual District audits, unaudited period 13 estimates for FY 19 and estimates for FY 20 adopted.

The District had no un-spendable fund balance during the historical period, which is defined as amounts that are either not in spendable form or which legally or contractually are required to be maintained intact. This category generally includes those items not expected to be converted to cash, for example, inventories, deposits, and prepaid items. On the other hand, spendable fund balance falls into several categories which are shown in the following figure, only two of which are used in the Fire District Fund. Restricted reserves are those used for a specific purpose and are generally constrained by external requirements. This source has fluctuated around an average of $7.6 million for the period, ranging from a low of $6.9 million in FY 16 to a high of $8.5 million in FY 18.

The only other reserve in this fund is the Assigned Reserve, which has grown steadily from $3.2 million in FY 15 to $5.4 million in FY 19 (unaudited) and is expected to increase in FY 20 to $5.5 million. This reserve has grown an average of 13.9% annually between FY 15 and FY 19. Fund balance is assigned based upon the County's intent to use it for specific purposes as identified in the County Administrative Code adopted by Resolution 2006-128.

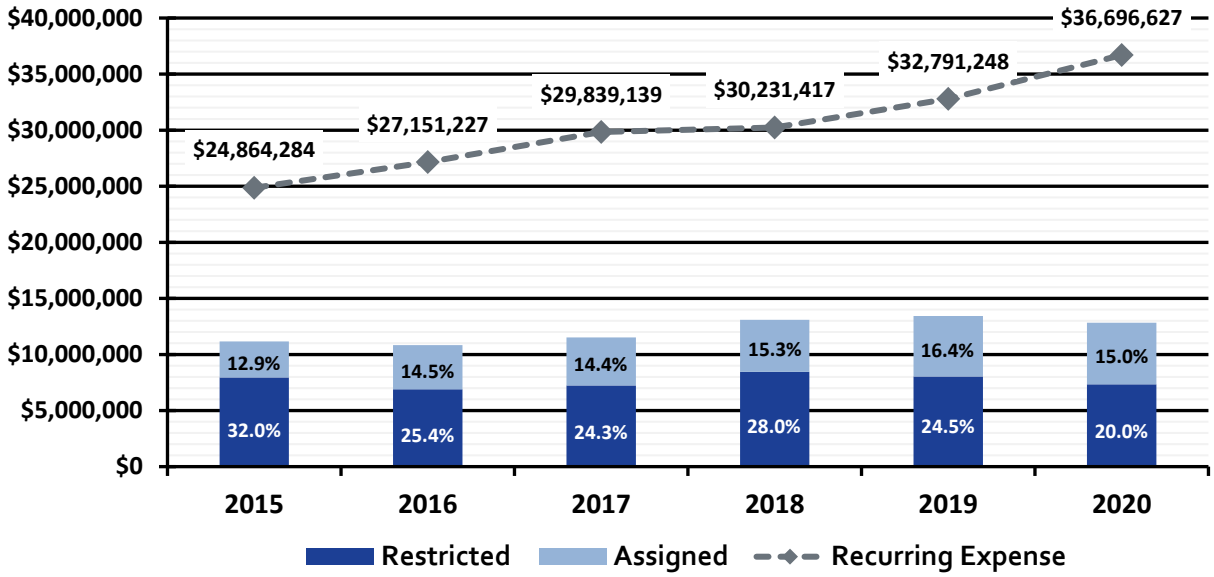
[12] *St. Johns County, Florida Comprehensive Annual Financial Report for the Fiscal Year Ended September 30, 2018.*

Figure 24: Fire District Ending Fund Balance by Category (FY 15–FY 19 Actual; FY 20 Adopted)

Fund Balance Category	2015 Actual	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Adopted
Non-Spendable	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
Restricted	*$7,953,821*	*$6,903,229*	*$7,237,786*	*$8,455,757*	*$8,034,973*	*$7,337,341*
Committed	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
Assigned	*$3,204,267*	*$3,938,380*	*$4,289,270*	*$4,632,986*	*$5,393,873*	*$5,489,873*
Unassigned	*$0*	*$0*	*$0*	*$0*	*$0*	*$0*
Ending Fund Bal	**$11,158,088**	**$10,841,609**	**$11,527,056**	**$13,088,743**	**$13,428,846**	**$12,827,214**

The following figure shows recurring expenses for the Fire District and the restricted plus assigned reserve amounts along with their respective percentage of recurring expenses. It is good financial practice to maintain a cash reserve equal to or in excess of 2–2.5 months (17–21%) of recurring expenses. The Government Financial Officers Association (GFOA) provides guidance on how to account for fund balance and how much is recommended for various purposes.[13] Specifically, GFOA recommends that governments maintain at least two months or just under 17% of operating revenues or expenditures at a minimum depending upon fiscal year and timing of tax revenue collection and cash flow. The County had maintained its Fire District Assigned Reserve at slightly less than the GFOA recommendation but has grown it from just under 13% in FY 15 to 16.4% in FY 19. The Fire District continues to maintain an appropriate fund balance.

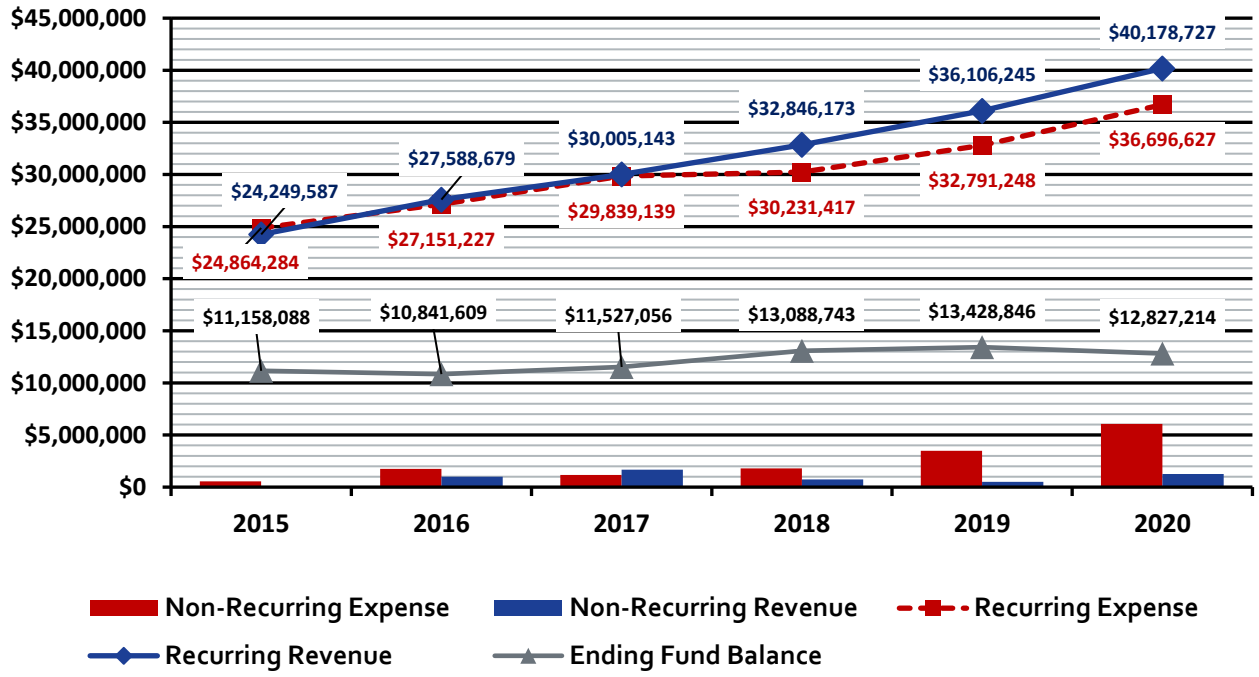
Figure 25: Fire District Recurring Expense vs. Restricted/Assigned Fund Balance (FY 15–FY 19 Actual; FY 20 Adopted)



[13] *http://www.gfoa.org/fund-balance-guidelines-general-fund.*

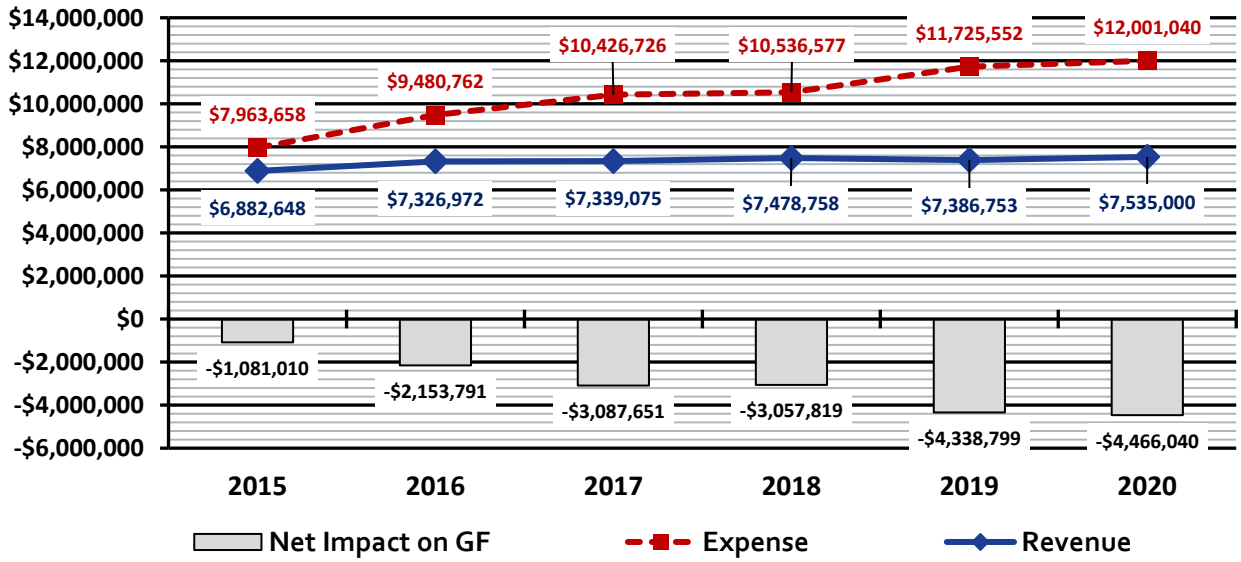
The following figure shows both recurring (blue line) and non-recurring revenue (blue bars), recurring (red line) and non-recurring expense (red bars), and ending fund balance (grey line) for the Fire District from FY 15 through FY 19 actual and FY 20 as adopted. If total expense exceeds total revenue in any given year, then the net loss is covered using reserve funds, and the ending fund balance decreases. From FY 15 through FY 17, recurring revenue was very close to recurring expense but thereafter increasingly exceeded recurring expense with the net effect of increasing ending fund balance to a high of $13.4 million by FY 19. The cumulative difference between non-recurring expense and non-recurring revenue has not appreciably affected the fund balance until FY 19. The net effect of the significant increase in non-recurring expense, which has not been offset by non-recurring revenues has been, and will be, a reduction in overall fund balance. The County has been very careful in balancing recurring revenue with both recurring and non-recurring expense in order to maintain a healthy fund balance which has positioned the Fire District Fund well going into FY 20.

Figure 26: Relationship of Fire District Recurring/Non-Recurring Revenue/Expense & Ending Fund Balance (FY 15–FY 19 Actual; FY 20 Adopted)



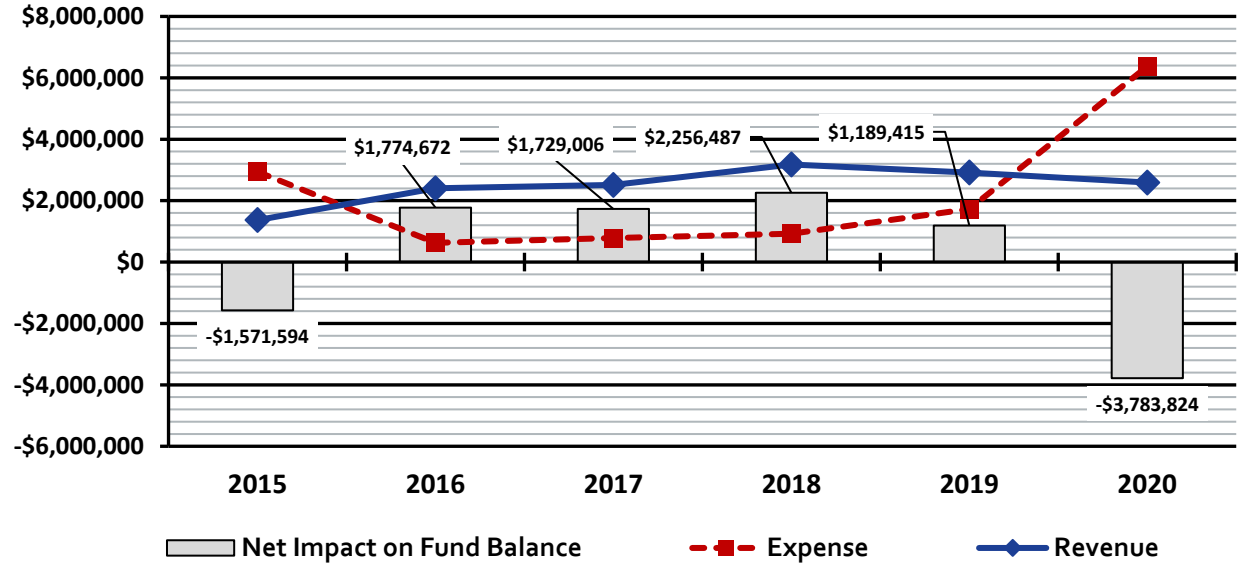
As mentioned, the SJCFR EMS program revenue and expenditure budget is housed within the County General Fund and has a significant impact on that fund. The following figure shows total program-specific revenue (ambulance billing) and expense from FY 15 actual through FY 20 adopted and the net impact on the General Fund. Expenditures have risen from just under $8 million in FY 15 to $11.7 million by FY 19 while program revenue has only risen from $6.9 million to $7.4 million. The net demand on other GF revenue sources to fund this program has increased from $1.08 million in FY 15 to $4.34 million by FY 19, an increase of approximately 300% over the period or an average annual increase of 41.5%. The County will need to monitor this trend and balance this increasing demand on GF revenues against other County programs in the General Fund.

Figure 27: Net Impact of EMS Program Revenue/Expense on General Fund (FY 15–FY 19 Actual; FY 20 Adopted)



Another major fire department program that lies within its own fund is the Fire/EMS Impact Fee program. The following figure shows the annual expenditures in red, the annual revenues in blue, and the net impact on fund balance as grey bars. As with the Fire District Fund, when expenses exceed revenues in any given year, as in FY 15 actual and FY 20 as adopted, there is a negative impact on fund balance, and ending fund balance is decreased. In FY 16 through FY 19, revenues exceeded capital projects funded, and fund balance grew. The County continues to monitor this fund and maintains a positive fund balance.

Figure 28: Net Impact on Fire/EMS Impact Fee Fund Balance of Annual Program Revenues/Expenses (FY 15–FY 19 Actual; FY 20 Adopted)



Status Quo Projection

ESCI evaluated the historical information provided by the department, as well as the adopted FY 20 budget to prepare a status quo forecast. The forecast relies on trends previously developed through the historical review period along with forecast information available from the department when available, to understand potential anomalies due to personnel changes, apparatus acquisitions, and other major events. Certain assumptions were made about revenue and expenses. These assumptions are described in each section. The projection assumes no change to service level, including any staff additions or deletions.

Revenue Assumptions

The revenue assumptions used in the SJCFR forecast are described in the next figure.

Figure 29: SJCFR Revenue Forecast Assumptions (FY 21–25)

Revenue Source	Assumptions
Ambulance/EMS Fees	Have slowly increased at an average annual rate of 1.8% from FY 15 through FY 19. This represents actual revenue received and does not include past due accounts. The forecast assumes a 1.8% annual increase in this revenue stream using the adopted FY 20 amount as the basis for the projection.
Communications Surcharge	Depends on the annual volume of moving violations and has averaged $150,000 from FY 15–19. Interest has averaged $4,000 annually. The forecast assumes $150,000 in surcharges and $4,000 in interest each year.
Ad Valorem Tax	District gross taxable value increased linearly an average of 9% annually between FY 15 and FY 19. The forecast assumes that the current mill rate of 1.47 mills will be maintained and that values will continue to increase at 9% annually. FY 20 estimated revenue is used as the basis for the projection.
Fire Protection Fees	Historically these fees in total have increased an average of 15.2% annually as the community has grown. The forecast assumes the FY 20 amount as the basis for the projection and that these fees will continue to keep pace with growth at the historical rate of 15.2%.
Fire District Interest	Has averaged approximately $200,000 annually between FY 15 and FY 19. The forecast assumes annual interest earning of $200,000.
Supplemental Compensation	Tracks with formal education degree level of personnel and has increased an average of 4% annually throughout the historical period. Forecast assumes a continued annual increase of 4% using FY 19 actual as a basis for the projection.
Impact Fees and Interest	Have been relatively consistent, averaging $2.65 million from FY 16 through FY 20 as adopted. The forecast assumes growth will continue to generate impact fees but at a more conservative average rate of $2.5 million annually and that interest generated, while fluctuating, will average $50,000 annually.
Grant Revenue	Has varied widely during the historical period. The forecast assumes no additional grant funding.
Surplus Property	Very minor during the historical period and the forecast assumes no revenue from this source.
Insurance Proceeds	Has varied considerably over the historical period. The forecast assumes no revenue from this source.
Miscellaneous Income	Has varied considerably over the period and the forecast assumes no revenue from this source.

The following figure is the status quo revenue forecast for the SJCFR department for the period FY 20 adopted through FY 25 based upon the assumptions listed in the previous figure.

Figure 30: SJCFR Department Revenue Forecast by Fund/Program (FY 20 Adopted–FY 25)

Revenue	2020 Adopted	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast
Ambulance/EMS Fees	7,535,000	7,670,630	7,808,701	7,949,258	8,092,345	8,238,007
Comms Surcharge	148,000	150,000	150,000	150,000	150,000	150,000
Interest/Investment	500	4,000	4,000	4,000	4,000	4,000
Ad Valorem Tax	39,402,127	42,948,318	46,813,667	51,026,897	55,619,318	60,625,056
Fire Protection Fees	550,600	634,291	730,703	841,770	969,719	1,117,117
Interest/Investment	96,000	200,000	200,000	200,000	200,000	200,000
Supplemental Comp	130,000	149,421	155,398	161,613	168,078	174,801
Recurring Revenue	**47,862,227**	**51,756,660**	**55,862,469**	**60,333,539**	**65,203,460**	**70,508,981**
Impact Fees	2,584,994	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000
Interest/Investment	3,500	50,000	50,000	50,000	50,000	50,000
Grants	1,265,716	-	-	-	-	-
Surplus Sales	-	-	-	-	-	-
Insurance Proceeds	-	-	-	-	-	-
Misc. Income	-	-	-	-	-	-
Non-Recurring Rev	**3,854,210**	**2,550,000**	**2,550,000**	**2,550,000**	**2,550,000**	**2,550,000**
TOTAL REVENUE:	**$51,716,437**	**$54,306,660**	**$58,412,469**	**$62,883,539**	**$67,753,460**	**$73,058,981**

Expense Assumptions

The expense assumptions used in the SJCFR forecast are described in the following figure. The capital expenses represent an estimate based upon past CIP spending. Major expenditure categories are discussed in the figure, but for each category, the average annual rates of increase forecast and starting points may differ by program and fund as observed in the historical analysis. Individual program/fund rates of increase will impact the department totals in each category.

Figure 31: SJCFR Recurring Expenditure Forecast Assumptions (FY 21–25)

<table>
<tr><th>Expense Source</th><th>Assumptions</th></tr>
<tr><td>Personnel Services</td><td>During the period FY 15–19, when the impact of newly added positions is removed from each program and fund contributing to fire department operations, the average annual rates of increase for Regular Salaries/Wages, Overtime Salaries/Wages, and Benefits for each Fund and program were:
<table>
<tr><th rowspan="2">Line Item</th><th rowspan="2">Fire District Fund</th><th colspan="3">General Fund</th><th rowspan="2">Beach Fund LifeSav Corps</th></tr>
<tr><th>EMS</th><th>Comms</th><th>Radio System</th></tr>
<tr><td>Salaries/Wages-Regular</td><td>4.70%</td><td>7.90%</td><td>3.00%</td><td>3.60%</td><td>-3.20%</td></tr>
<tr><td>Salaries/Wages-Overtime</td><td>16.20%</td><td>4.90%</td><td>9.80%</td><td>0.00%</td><td>0.00%</td></tr>
<tr><td>Benefits</td><td>9.70%</td><td>18.00%</td><td>3.90%</td><td>5.30%</td><td>5.50%</td></tr>
</table>
Except for the Life Saving Corps program in the Beach Safety Fund, the forecast assumes the above-average annual rates of change will continue for each program in each respective fund. The forecast assumes a 3% annual increase in Regular Salaries/Wages for the Lifesaving Corps.</td></tr>
<tr><td>Property Appraiser/Tax Collector Fees</td><td>Combined, these fees charged to the Fire District have increased at an average annual rate of 7.7% from FY 15–19. This is based upon a percentage of revenue generated and is forecast to continue increasing at the same rate based upon the forecast growth rate for Fire District millage. FY 20 is used as a basis for the projection.</td></tr>
<tr><td>Central Services Allocation</td><td>The allocated costs charged to the Fire District by the General Fund for various services provided to the District are based upon a cost allocation analysis and have grown historically at an average of 3.1% annually between FY 15 and FY 19. The forecast assumes that this rate of increase will continue and uses FY 20 as the basis for the projection.</td></tr>
<tr><td>Facility Operating Costs</td><td>While having grown slightly for several programs during the historical period, they have generally fluctuated around an average for each program in each respective fund. The forecast assumes the historical average for each program in each fund every year of the projection.</td></tr>
<tr><td>Equipment Operating Costs</td><td>While having grown slightly for several programs during the historical period, equipment operating costs have generally fluctuated around an average for each program in each respective fund. The forecast assumes the historical average for each program in each fund every year of the projection.</td></tr>
</table>

Expense Source	Assumptions
Vehicle Operating Costs	Although variable, vehicle operating costs have generally been escalating historically at varying rates by program. Average annual rates of increase for the Fire, EMS, Lifesaving Corps, and Radio System programs have been 6.2%, 2.2%, 7.5%, and 20.4%, respectively. These rates are used in the forecast with the FY 20 amounts as the basis for the projection.
Grant Expense	The forecast assumes no additional grants will be received beyond the expiration of the current grants. Therefore, the forecast also assumes no additional grant expense will be incurred.
Other Operating Costs	Average annual rates of increase have varied significantly across funds and programs, but these costs have generally risen except for the Fire/EMS Impact Fee and Communications Surcharge Funds. The Fire/EMS Impact Fee Fund has averaged $24,500 annually prior to professional fees being included with major construction projects. The forecast assumes an average annual expenditure of $24,500. The Communications Surcharge Fund has averaged $62,000 annually, although spending has been quite variable. The forecast assumes average annual spending of $62,000. Average annual rates of increase for the Fire, EMS, Communications, Lifesaving Corps, and Radio programs have been 4.8%, 5.7%, 26.4%, and 5.7%, respectively. The forecast assumes these rates will continue and uses FY 20 as the basis for the projection in each case.
Transfers	The Fire District Fund saw a decrease in transfers to other funds from an average of $955,000 in FY 15–16 to an average of $710,000 from FY 17–18, with a gradual increase to just under $800,000 in the FY 20 adopted budget. The forecast assumes an average annual transfer of $800,000 each year. The Fire/EMS Impact Fee Fund saw an increase in transfers to other funds from an average of $570,000 in FY 15–16 to an average of $750,000 from FY 17–19. The forecast assumes an average annual transfer of $670,000. The forecast assumes no additional transfers from the Communications Surcharge Projects Fund.

The following figure is the status quo recurring expenditure forecast for the SJCFR by fund and program for FY 20 adopted through FY 25 forecast.

Figure 32: SJCFR Recurring Expense Forecast by Fund & Department Total (FY 20–FY 25)

Recurring Expenses	2020 Adopted	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast
Fire District Fund—Fire Division						
Personnel Services	**28,531,363**	**30,623,004**	**32,901,464**	**35,386,653**	**38,100,907**	**41,069,315**
Salaries/Wages—Regular	*16,248,024*	*17,011,681*	*17,811,230*	*18,648,358*	*19,524,831*	*20,442,498*
Salaries/Wages—Overtime	*2,100,000*	*2,440,200*	*2,835,512*	*3,294,865*	*3,828,634*	*4,448,872*
Benefits	*10,183,339*	*11,171,123*	*12,254,722*	*13,443,430*	*14,747,443*	*16,177,944*
Operating	**7,376,177**	**7,276,513**	**7,599,187**	**7,939,955**	**8,299,915**	**8,680,237**
Prop Appraiser/Tax Collector	*1,257,527*	*1,354,357*	*1,458,642*	*1,570,957*	*1,691,921*	*1,822,199*
Central Service Allocation	*1,367,685*	*1,410,083*	*1,453,796*	*1,498,863*	*1,545,328*	*1,593,233*
Facility Operating	*263,972*	*252,000*	*252,000*	*252,000*	*252,000*	*252,000*
Equipment Operating	*763,304*	*730,000*	*730,000*	*730,000*	*730,000*	*730,000*
Vehicle Operating	*351,927*	*373,746*	*396,919*	*421,528*	*447,662*	*475,418*
Grant Expense	*360,000*	-	-	-	-	-
Other Operating	*3,011,762*	*3,156,327*	*3,307,830*	*3,466,606*	*3,633,003*	*3,807,387*
Transfers	**789,087**	**800,000**	**800,000**	**800,000**	**800,000**	**800,000**
Transfers to Other Funds	*789,087*	*800,000*	*800,000*	*800,000*	*800,000*	*800,000*
General Fund—EMS Division						
Personnel Services	**9,198,429**	**10,235,159**	**11,412,214**	**12,751,324**	**14,277,858**	**16,021,456**
Salaries/Wages—Regular	*5,266,060*	*5,682,079*	*6,130,963*	*6,615,309*	*7,137,918*	*7,701,814*
Salaries/Wages—Overtime	*665,000*	*697,585*	*731,767*	*767,623*	*805,237*	*844,693*
Benefits	*3,267,369*	*3,855,495*	*4,549,485*	*5,368,392*	*6,334,702*	*7,474,949*
Operating	**1,722,569**	**1,775,432**	**1,852,598**	**1,933,818**	**2,019,315**	**2,109,326**
Facility Operating	*164,309*	*145,000*	*145,000*	*145,000*	*145,000*	*145,000*
Equipment Operating	*2,952*	*1,800*	*1,800*	*1,800*	*1,800*	*1,800*
Vehicle Operating	*437,960*	*447,595*	*457,442*	*467,506*	*477,791*	*488,302*
Grant Expense	-	-	-	-	-	-
Other Operating	*1,117,348*	*1,181,037*	*1,248,356*	*1,319,512*	*1,394,724*	*1,474,224*
General Fund—Communications Division						
Personnel Services	**1,449,129**	**1,506,102**	**1,565,893**	**1,628,686**	**1,694,680**	**1,764,093**
Salaries/Wages—Regular	*899,760*	*926,753*	*954,555*	*983,192*	*1,012,688*	*1,043,068*
Salaries/Wages—Overtime	*145,000*	*159,210*	*174,813*	*191,944*	*210,755*	*231,409*
Benefits	*404,369*	*420,139*	*436,525*	*453,549*	*471,238*	*489,616*
Operating	**98,790**	**119,313**	**148,963**	**186,442**	**233,814**	**293,693**
Facility Operating	*6,335*	*5,300*	*5,300*	*5,300*	*5,300*	*5,300*
Equipment Operating	*3,600*	*1,700*	*1,700*	*1,700*	*1,700*	*1,700*
Other Operating	*88,855*	*112,313*	*141,963*	*179,442*	*226,814*	*286,693*

Recurring Expenses	2020 Adopted	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast
Fire/EMS Impact Fee Fund						
Operating	**410,516**	**26,500**	**26,500**	**26,500**	**26,500**	**26,500**
Facility Operating	-	*2,000*	*2,000*	*2,000*	*2,000*	*2,000*
Other Operating	*410,516*	*24,500*	*24,500*	*24,500*	*24,500*	*24,500*
Transfers	**636,792**	**670,000**	**670,000**	**670,000**	**670,000**	**670,000**
Transfers to Other Funds	*636,792*	*670,000*	*670,000*	*670,000*	*670,000*	*670,000*
Beach Services Fund—Lifesaving Corps						
Personnel Services	**520,730**	**537,843**	**555,552**	**573,878**	**592,845**	**612,478**
Salaries/Wages—Regular	*461,080*	*474,912*	*489,160*	*503,835*	*518,950*	*534,518*
Benefits	*59,650*	*62,931*	*66,392*	*70,043*	*73,896*	*77,960*
Operating	**113,740**	**119,023**	**125,925**	**133,278**	**141,112**	**149,460**
Facility Operating	*5,690*	*5,000*	*5,000*	*5,000*	*5,000*	*5,000*
Equipment Operating	*7,005*	*6,500*	*6,500*	*6,500*	*6,500*	*6,500*
Vehicle Operating	*39,930*	*42,925*	*46,144*	*49,605*	*53,325*	*57,325*
Other Operating	*61,115*	*64,599*	*68,281*	*72,173*	*76,287*	*80,635*
General Fund—Interoperable Radio System & Towers						
Personnel Services	**126,517**	**131,563**	**136,816**	**142,287**	**147,983**	**153,914**
Salaries/Wages—Regular	*97,618*	*101,132*	*104,773*	*108,545*	*112,452*	*116,501*
Overtime	-	-	-	-	-	-
Benefits	*28,899*	*30,431*	*32,043*	*33,742*	*35,530*	*37,413*
Operating	**1,200,697**	**1,223,892**	**1,263,829**	**1,305,245**	**1,348,209**	**1,392,796**
Facility Operating	*101,625*	*93,000*	*93,000*	*93,000*	*93,000*	*93,000*
Equipment Operating	*8,000*	*1,300*	*1,300*	*1,300*	*1,300*	*1,300*
Vehicle Operating	*1,970*	*2,372*	*2,856*	*3,438*	*4,140*	*4,984*
Grant Expense	-	-	-	-	-	-
Other Operating	*1,089,102*	*1,127,221*	*1,166,673*	*1,207,507*	*1,249,770*	*1,293,512*
Communications Surcharge Projects Fund						
Operating	**-**	**62,000**	**62,000**	**62,000**	**62,000**	**62,000**
Other Operating	-	*62,000*	*62,000*	*62,000*	*62,000*	*62,000*
Transfers	**-**	**-**	**-**	**-**	**-**	**-**
Transfers to Officers	-	-	-	-	-	-

Recurring Expenses	2020 Adopted	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast
SJCFR Department Total						
Personnel Services	**39,826,168**	**43,033,671**	**46,571,940**	**50,482,828**	**54,814,273**	**59,621,256**
Salaries/Wages—Regular	*22,972,542*	*24,196,557*	*25,490,681*	*26,859,238*	*28,306,839*	*29,838,399*
Salaries/Wages—Overtime	*2,910,000*	*3,296,995*	*3,742,092*	*4,254,433*	*4,844,625*	*5,524,974*
Benefits	*13,943,626*	*15,540,119*	*17,339,167*	*19,369,156*	*21,662,809*	*24,257,883*
Operating	**10,922,489**	**10,600,673**	**11,077,002**	**11,585,237**	**12,128,866**	**12,712,012**
Prop Appraiser/Tax Collector	*1,257,527*	*1,354,357*	*1,458,642*	*1,570,957*	*1,691,921*	*1,822,199*
Central Service Allocation	*1,367,685*	*1,410,083*	*1,453,796*	*1,498,863*	*1,545,328*	*1,593,233*
Facility Operating	*541,931*	*500,300*	*500,300*	*500,300*	*500,300*	*500,300*
Equipment Operating	*784,861*	*741,300*	*741,300*	*741,300*	*741,300*	*741,300*
Vehicle Operating	*831,787*	*866,638*	*903,361*	*942,077*	*982,919*	*1,026,029*
Grant Expense	*360,000*	-	-	-	-	-
Other Operating	*5,778,698*	*5,727,995*	*6,019,603*	*6,331,739*	*6,667,098*	*7,028,951*
Transfers	**1,425,879**	**1,470,000**	**1,470,000**	**1,470,000**	**1,470,000**	**1,470,000**
Transfer to Other Funds	*1,425,879*	*1,470,000*	*1,470,000*	*1,470,000*	*1,470,000*	*1,470,000*
Total Recurring Exp	**52,174,536**	**55,104,345**	**59,118,942**	**63,538,065**	**68,413,139**	**73,803,268**

The County has a five-year Capital Improvement Plan for FY 19 that extends through FY 24 and includes "Candidate" projects which are not scheduled but have been identified by various departments submitting projects for inclusion in the plan. The following figure shows the CIP projects in the plan that are either partial (joint communications center with SJC Sheriff's Office) or fully supportive of the SJCFR mission. Those projects listed in the FY 19 CIP as candidate projects are shown in the following figure in FY 24–25 as potential projects that might be included in future County CIPs. The current CIP only extends to FY 23.

To correlate the County's FY 19 CIP with the ESCI study, ESCI has reviewed the County plan and used it to extend various CIP projects into FY 24 and FY 25 to compare to the ESCI status quo forecast. For example, the County uses a 2% inflation factor for ambulance and engine replacement. The County estimated replacement amount for FY 23 in the FY 19 CIP has been extended in the following figure using the 2% inflation factor for the ambulance and engine replacement plans. Beside each project in the figure listed below, the funding source is shown in parentheses. For example, the ambulance replacement plan proposed uses general revenues found in the County General Fund (GF), while the engine replacement program is principally planned for funding from the Fire District Fund (FDF). The IMFF or Fire/EMS Impact Fee Fund is planned as the funding source for new engines that are due to growth and currently carried in the FY 19 CIP as a candidate project.

Figure 33: SJCFR FY 19 CIP Projects

FY 19 Capital Improvement Plan						
Category	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Vehicles/Apparatus						
Amb. Replacement (GF)[1]	*407,388*	*415,536*	*423,846*	*432,323*	*440,969*	*449,789*
New Ambulance (IMFF)[3]					*416,666*	
Engine Replacement (FDF)[2]	*1,206,864*	*1,231,001*	*1,255,621*	*1,280,734*	*1,306,349*	*1,332,476*
New Engines (IMFF)[3]					*850,000*	
High Water Vehicle x2 (FDF)[3]					*600,000*	
Buildings						
Flagler Estates Sub-station (FDF)[3]					*600,000*	
NW CR223 Station (Other)[3]					*3,200,000*	
St. Aug. Beach Station (Other)[3]					*4,183,146*	
Station #10 Improve (FDF)[3]					*1,062,000*	
Joint Comm Center (GF)[3]					*3,804,250*	

[1]Reflects SJCFR plan to replace two ambulances per year with 2% inflation. FY 24 and FY 25 estimated using County plan/inflation factor.

[2]Reflects SJCFR plan to replace two engines per year with 2% inflation. FY 24 and FY 25 estimated using County plan/inflation factor.

[3]This project is shown as a "Candidate" project in the FY 19 CIP and is shown here in FY 24–25.

To the extent that the fire department has identified projects in the County FY 19 CIP as shown above, these have been compared to the ESCI status quo projection that follows to ensure that the amounts in the CIP and projection are comparable. The ESCI forecast uses slightly different assumptions as discussed in the next figure in order to more closely approximate actual historical department spending on capital in all major categories within each fund and program supporting the department. For example, since no buildings have been shown (other than as candidate projects) in the FY 19 CIP, historical average expenditures have been used to forecast future non-recurring spending on buildings. Further, ESCI's experience with capital fire and EMS apparatus is that an inflation factor of 4% rather than 2% is closer to actual industry practice. A similar approach is taken to the other major non-recurring categories.

Figure 34: SJCFR Non-Recurring Expenditure Forecast Assumptions (FY 21–25)

Buildings	The forecast assumes no additional capital facility projects constructed using Capital Improvement Funds (for example, the 15 Sales Tax Construction Project Fund or the 16 Public Facilities Projects Fund). The department has spent (including FY 20 adopted) an annual average on buildings in the Fire District, General and Fire/EMS Impact Fee Funds of approximately $20,000, $77,000, and $900,000, respectively. The projection forecasts these amounts as an average annual expenditure each year increasing by the Southern Region CPI-U of approximately 1.3% for all items as determined by the U.S. DOL Bureau of Labor Statistics.[14]
Improvements Other Than Buildings	The forecast assumes additional spending only in those funds/programs that have historically spent significant amounts. Specifically, the Fire District Fund, General Fund (Radio Program), and Communications Surcharge Fund have had average annual expenditures of approximately $70,000, $35,000, and $45,000, respectively. The forecast assumes that these funds/programs will continue to spend at this average rate, increasing by the Southern Region CPI-U.
Equipment	The department has spent (including FY 20 adopted) an annual average on equipment in the Fire District Fund, General Fund, Fire/EMS Impact Fee Fund, Beach Services Fund and Communications Surcharge Fund of approximately $1,110,000, $588,000 ($421,000 on EMS program, $155,000 on communications program and $12,000 on Radio System), $147,000, $35,000 (Lifesaving Corps program), and $68,000, respectively. The forecast assumes that these funds/programs will continue to spend at this average rate, increasing by the Southern Region CPI-U.
Vehicles/Apparatus	The department has spent (including FY 20 adopted) a significant annual average amount on vehicles and apparatus in the Fire District Fund, General Fund, and Fire/EMS Impact Fee Fund of approximately $1,270,000, $477,000 (EMS program), and $375,000, respectively. The forecast assumes that these funds/programs will continue to spend at this average rate, increasing by 4% annually, an inflation factor observed nationally by ESCI for apparatus.

The following figure is the status quo non-recurring expenditure forecast for the SJCFR by fund and program for FY 20 adopted through FY 25 forecast.

[14] *https://www.bls.gov/regions/southeast/cpi-summary/consumerpriceindex_summary_southeast.pdf.*

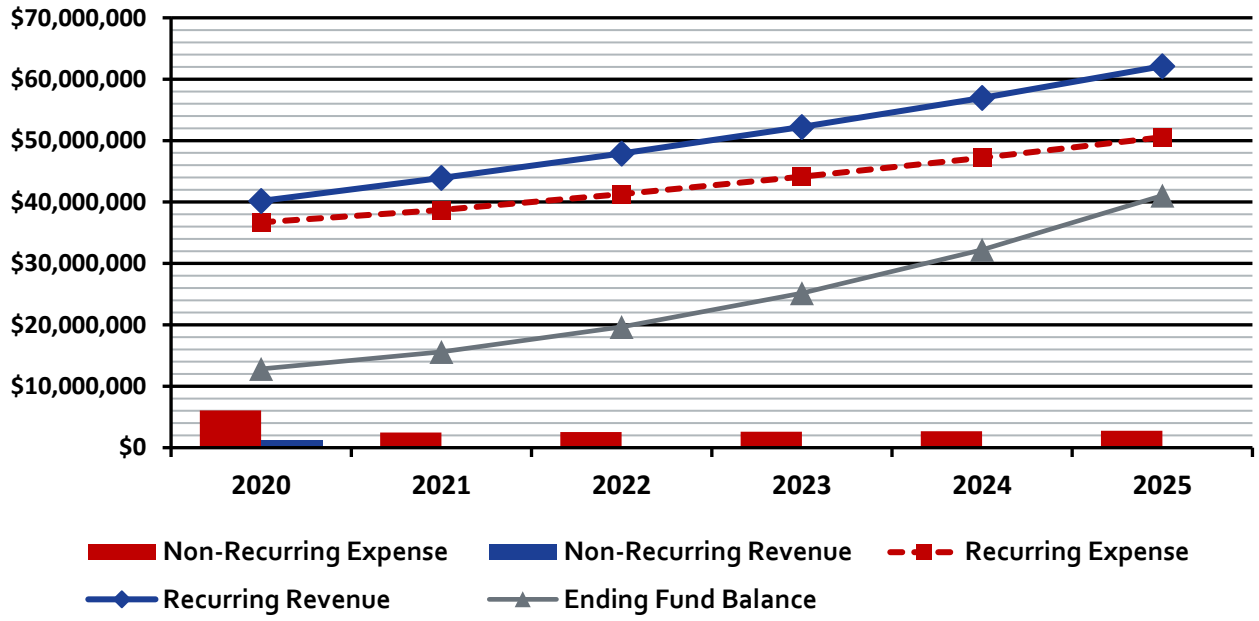
Figure 35: SJCFR Non-Recurring Expense Forecast by Fund and Department Total (FY 20–FY 25)

Non-Recurring Expenses	2020 Adopted	2021 Forecast	2022 Forecast	2023 Forecast	2024 Forecast	2025 Forecast
Fire District Fund—Fire Division						
Capital	**6,070,345**	**2,470,000**	**2,536,400**	**2,605,035**	**2,675,988**	**2,749,348**
Buildings	*-*	*20,000*	*20,260*	*20,523*	*20,790*	*21,060*
Improvements O/T Buildings	*230,000*	*70,000*	*70,910*	*71,832*	*72,766*	*73,712*
Equipment	*3,493,462*	*1,110,000*	*1,124,430*	*1,139,048*	*1,153,855*	*1,168,855*
Vehicles/Apparatus	*2,346,883*	*1,270,000*	*1,320,800*	*1,373,632*	*1,428,577*	*1,485,720*
General Fund—EMS Division						
Capital	**1,080,042**	**960,000**	**985,359**	**1,011,563**	**1,038,643**	**1,066,633**
Buildings	*34,861*	*62,000*	*62,806*	*63,622*	*64,450*	*65,287*
Equipment	*214,781*	*421,000*	*426,473*	*432,017*	*437,633*	*443,323*
Vehicles/Apparatus	*830,400*	*477,000*	*496,080*	*515,923*	*536,560*	*558,023*
General Fund—Communications Division						
Capital	**18,100**	**155,000**	**157,015**	**159,056**	**161,124**	**163,219**
Equipment	*18,100*	*155,000*	*157,015*	*159,056*	*161,124*	*163,219*
Fire/EMS Impact Fund						
Capital	**5,325,010**	**1,422,000**	**1,450,611**	**1,479,999**	**1,510,190**	**1,541,212**
Buildings	*3,000,945*	*900,000*	*911,700*	*923,552*	*935,558*	*947,721*
Equipment	*72,615*	*147,000*	*148,911*	*150,847*	*152,808*	*154,794*
Vehicles/Apparatus	*2,251,450*	*375,000*	*390,000*	*405,600*	*421,824*	*438,697*
Beach Services Fund—Lifesaving Corps						
Capital	**85,484**	**35,000**	**35,455**	**35,916**	**36,383**	**36,856**
Equipment	*85,484*	*35,000*	*35,455*	*35,916*	*36,383*	*36,856*
General Fund—Interoperable Radio System & Towers						
Capital	**311,182**	**62,000**	**62,806**	**63,622**	**64,450**	**65,287**
Buildings	*57,682*	*15,000*	*15,195*	*15,393*	*15,593*	*15,795*
Improvements O/T Buildings	*212,500*	*35,000*	*35,455*	*35,916*	*36,383*	*36,856*
Equipment	*41,000*	*12,000*	*12,156*	*12,314*	*12,474*	*12,636*
Communications Surcharge Fund						
Capital	**397,500**	**113,000**	**114,469**	**115,957**	**117,465**	**118,992**
Improvements O/T Buildings	*212,500*	*45,000*	*45,585*	*46,178*	*46,778*	*47,386*
Equipment	*185,000*	*68,000*	*68,884*	*69,779*	*70,687*	*71,606*
SJCFR Department Total						
Capital	**13,287,663**	**5,217,000**	**5,342,115**	**5,471,148**	**5,604,242**	**5,741,545**
Buildings	*3,093,488*	*997,000*	*1,009,961*	*1,023,090*	*1,036,391*	*1,049,864*
Improvements O/T Buildings	*655,000*	*150,000*	*151,950*	*153,925*	*155,926*	*157,953*
Equipment	*4,110,442*	*1,948,000*	*1,973,324*	*1,998,977*	*2,024,964*	*2,051,288*
Vehicles/Apparatus	*5,428,733*	*2,122,000*	*2,206,880*	*2,295,155*	*2,386,961*	*2,482,440*
Total Non-Recurring Exp.	**13,287,663**	**5,217,000**	**5,342,115**	**5,471,148**	**5,604,242**	**5,741,545**

Status Quo Forecast

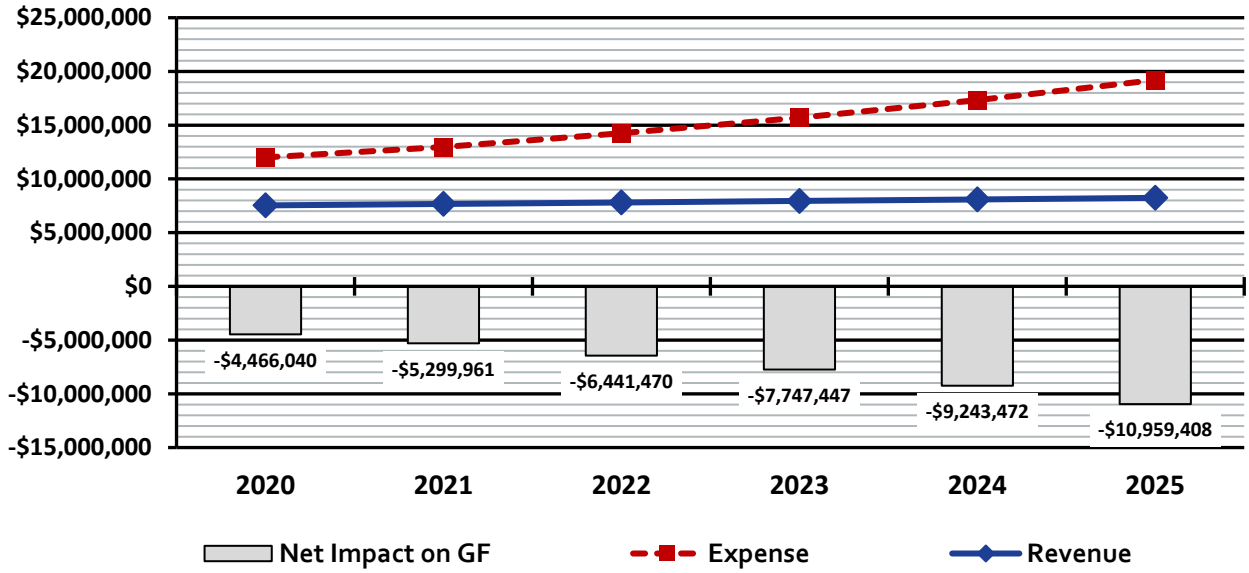
The following discussion focuses on the status quo forecast for the major self-contained fire department funds; the Fire District and Fire/EMS Impact Fee Funds, as well as the status quo forecast for the General Fund EMS program and its impact on the General Fund. The following figure shows both forecast recurring (blue line) and non-recurring revenues (blue bars), forecast recurring (red line) and non-recurring expenses (red bars), and ending fund balance (grey line) for the Fire District from FY 20 adopted through FY 25 as forecast. With no addition of staff or major changes in current operations and assuming steady growth in the County over the next five years, recurring revenue will continue to exceed recurring expense at greater rates. Even with non-recurring expense between $2.5–3 million annually, the ending fund balance is estimated to grow from $12.8 million in FY 20 to $41 million by FY 25. This trend suggests that sufficient capacity exists to provide for service level improvements that will add to recurring expense, such as the addition of more personnel as new apparatus and stations are added to address growing communities in the County and overall response time improvements.

Figure 36: Relationship of Fire District Recurring/Non-Recurring Revenue/Expense & Ending Fund Balance (FY 20 Adopted–FY 25 Forecast)



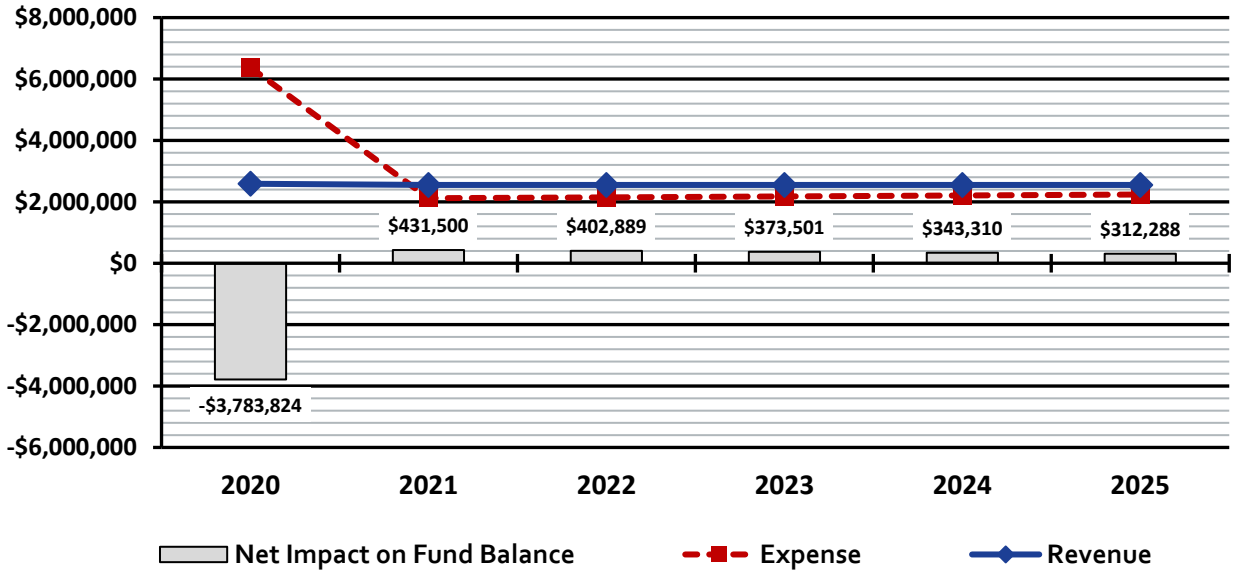
As previously discussed, the SJCFR EMS program is housed within the County General Fund and has a significant impact on that fund. The following figure shows total program-specific revenue (ambulance billing) and expense as forecast from FY 20 adopted through FY 25 as forecast and the net impact on the General Fund. Expenditures will continue to rise at a rapid rate from $12 million in FY 20 to $19.2 million by FY 25. In comparison, program revenue will only increase from $7.5 million to $8.2 million. The net demand on other GF revenue sources to fund this program will increase from $4.47 million in FY 20 to just under $11 million by FY 25, an increase of approximately 145% over the period or an average annual increase of almost 20%. The County will need to monitor this trend and balance this increasing demand on GF revenues against other County programs in the General Fund.

Figure 37: Net Impact of EMS Program Forecast Revenue/Expense on General Fund (FY 20 Adopted–FY 25 Forecast)



The following figure shows the annual forecast expenditures (in red), revenues (in blue), and the net impact on fund balance (grey bars) for the Fire/EMS Impact Fee Fund. As with the Fire District Fund, when expenses exceed revenues in any given year, as in FY 20 as adopted, there will be a negative impact on fund balance, and the ending fund balance is decreased. However, as forecast under a status quo scenario, revenues will exceed capital projects funded, and fund balance will grow. This suggests that the County will have the capacity to fund several of the new fire station projects identified as candidate projects in the FY 19 CIP that are directly tied to continued County growth.

Figure 38: Net Impact on Forecast Fire/EMS Impact Fee Fund Balance of Annual Program Revenues/Expenses (FY 20 Adopted–FY 25 Forecast)



MANAGEMENT COMPONENTS

Effective fire and EMS organizational management is a complicated and expanding challenge for fire service leaders. With increasing complexity comes increased cost. Today's organization must address management complexities that include an effective organizational structure, setting and measuring levels of service, staying abreast of new technologies and methods, evaluation and maintenance of a qualified workforce, staff development for effective succession planning, and financial sustainability for the future. While this section will discuss the various components of management, it should be noted that good management alone will not guarantee an efficient and effective organization.

Mission, Vision, Strategic Planning, Goals, and Objectives

To be an efficient and effective organization, management must be based on several components. These include a clearly stated *mission* (the fundamental purpose of an organization); a *vision* for the future (where is the organization going); and the *core values* or *guiding principles* (how will the organization treats its members as it navigates from its current state to its desired future). These fundamental elements allow organizations to evaluate the current environment in which they operate and establish strategic initiatives, goals, and objectives necessary to move forward progressively. St. Johns County Fire Rescue (SJCFR) has established and communicated the following fundamental elements.

Mission Statement

Through the following mission statement, the SJCFR and its members are:

> *Dedicated to the highest standard of professionalism in public safety and life-saving services with the commitment to serve, ability to perform, and the courage to act.*

This broad mission statement allows SJCFR the flexibility to utilize a wide range of tactics in responding to the needs of the citizens and visitors of St. Johns County. The development of a mission statement is only one component of ensuring success. The mission statement must be communicated to internal and external stakeholders, which SJCFR accomplishes by placing the statement in the lobby of all fire stations and fire administration areas, and on all fire rescue buildings.

Vision Statement

Vision statements are commonly a declaration of an organization's objectives to achieve a state of continuous improvement. This is an important foundational component because it shows that an organization recognizes that they are not necessarily where they would like to be and are willing to set goals to reach their objectives. It should be noted that adopting a vision does not necessarily indicate that an organization is broken but rather a declaration that they could be better and refuse to settle for the status quo.

SJCFR has not developed and adopted a vision statement. Based on the identified differences between an organization's mission, vision, and core values, it is recommended that SJCFR next develop a vision statement. With the imminent completion of this organizational master plan, SJCFR has an excellent opportunity to formulate this vision to help achieve its desired future culture of continuous improvement.

Core Values

The core values of SJCFR are:

Professional Excellence – Integrity – Communications – Diversity & Respect – Health & Safety – Teamwork & Leadership – Community – Innovation

The rationale for adopting organizational core values is to support the vision and shape the culture in a manner that accurately reflects what an organization values, which should be aligned with community values and expectations. SJCFR's core values are simple, easy to understand, and accomplish the overall objectives of the department. SJCFR takes this one step further and explains each of the identified values and the impacts that each one makes with internal and external stakeholders.

SJCFR has a current strategic plan in place, which has been adopted by their elected officials. The plan is published, periodically reviewed, and the presentation originally made in 2018 is available for all stakeholders. In general, a current strategic plan should be available, establishing timelines to accomplish goals and objectives and assigning appropriate personnel to each. This process allows for goals and objectives to be prioritized, ensures that timelines stay on track, and holds personnel accountable to complete respective assigned tasks while consistently working towards the organizational mission, vision, and core values. Follow-up is critical, as with any project, to ensure boxes are not just being checked but that truly meaningful improvements are being obtained.

Regulatory, Policy, and Guidance Documents

The rapidly changing environment and circumstances typically associated with emergency services require a standardized set of rules, regulations, and policies to guide appropriate behavior and accountability. These guiding documents are vital for success in all phases of fire department operations and are critical for an effective and efficient organization.

SJCFR has established a set of regulatory documents, including Standard Operating Procedures (SOPs). Once established, training should be provided to all personnel, which SJCFR incorporates into the annual fire and EMS training requirements. SJCFR updates and reviews SOPs for consistency and legal mandates but lacks a defined timetable to review and make changes. SJCFR should ensure that SOPs are fully reviewed and revised at least every three years, leading to a goal of one-third of the department's SOPs reviewed annually. SOPs are utilized during all training evolutions, with several specific examples referenced in other sections of this report.

Internal Assessment of Critical Issues and Future Challenges

Similar to the need for guiding documents in the rapidly changing environment of emergency services, analysis and understanding of critical issues and emerging challenges facing the department is critical for organizational leaders and their success. No single leader should address these issues and challenges alone and must engage and involve the numerous talented and capable members of their organization at all levels. SJCFR's Fire Chief has identified the five most critical issues that are currently faced by the organization. This is illustrated in Figure 39.

Figure 39: Identified Critical Issues

Priority	Fire Chief's Perspective
First	Rapid Growth
Second	Staffing
Third	Facilities
Fourth	Equipment/Apparatus
Fifth	Officer Development/Leadership

The rapid growth currently occurring within St. Johns County was also identified as a critical issue by other internal stakeholders during site visits and by external stakeholders during public input meetings. Rapid growth is affected by the addition of both permanent residents and increased transient populations and is a contributing factor to the identified staffing issues. These staffing issues center largely on shortages and span both operational and administrative personnel. Issues with equipment and apparatus were also identified by multiple internal stakeholders, with reserve apparatus and vehicle maintenance being the most common concerns. Officer development, including internal succession planning was identified by multiple internal stakeholders as a critical issue within SJCFR.

In addition to the Fire Chief's pre-identified critical issues, internal stakeholders commonly identified technology, logistics, and training facilities as concerns. Technology issues included the usability of the County's MIS software, availability of operational pre-plans for fire incidents, and concerns with the mobile data terminals (MDTs) in SJCFR apparatus. Logistics concerns revolved largely on operational issues and overall access to needed items. Finally, the lack of a department-specific centralized training facility meeting the requirements of ISO was identified as a critical concern by several operational groups within the organization.

These issues will require the engagement of all associated parties to develop strategies to address and mitigate them. Doing so will not only improve the efficiency and effectiveness of SJCFR and their service to the community but could likely result in an improved ISO Public Protection Class (PPC) rating, which can lower some insurance premiums within the community. Regardless, many of these issues will need to be the primary focus for SJCFR leaders as the community of St. Johns County continues to grow, and SJCFR's responsibilities increase.

Internal and External Communication Processes

Communication within an organization and the external environment is a critical factor in achieving an effective and efficient organization. Organizations that lack effective communication can have difficulty in reaching their ultimate potential. The following describes both internal and external communications within SJCFR.

Internal

SJCFR utilizes multiple avenues of internal communication. Fire department administrative staff meetings are held but not on a regular schedule. All department members have email addresses and access to a department intranet site, which can be utilized to disseminate information to all personnel in addition to the use of written memos. While member newsletters and member forums (all-hands meetings) are not utilized, the Fire Chief has an open-door policy for informal conversations with personnel, and there is a vertical communications path clearly identified through a chain-of-command.

External

SJCFR also accomplishes external communications through multiple avenues. The primary source of external communication is provided by the department's website and social media accounts. The SJCFR Facebook account has approximately 16,000 followers, and its Twitter account has approximately 14,000 followers. No community newsletter is utilized, nor is there a community advisory committee in place; however, the department does have a formal complaint process in place.

Reporting and Recordkeeping

Documentation of activities is of paramount concern in any organization. Quality data is required to ensure that sound management decisions are made to support the effective and efficient operation of the organization.

SJCFR currently utilizes Zoll software for documenting both fire and EMS incident response data. Computers are available in all fire stations to access the Zoll software. In addition to incident response data, records are maintained for personnel exposures. Self-contained breathing apparatus (SCBA), hose, ladder, and pump testing records are maintained by SJCFR. Vehicle maintenance records are retained by the logistics department. Gas monitors are calibrated internally by the department's HazMat technicians, and records are maintained.

SJCFR has implemented processes for documentation control. A process for public records access is in place. Hard copy files are protected by a secured entry in locked cabinets. All computer files are backed up and secured on-site and off-site via the County's MIS.

Reports are generated for elected officials relating to finance, management, and operations. An annual report is also generated, including an analysis of incident data, and distributed electronically with a limited amount of hard copy versions available.

Document Control and Security

Facilities, equipment, and records are all critical elements to any fire and EMS organization, representing a significant investment of public dollars. Due to these factors and many others, securing these elements through proper precautions is critically important. SJCFR secures all buildings and facilities with electronic locks, combination locks, or key locks. Administrative offices are secured with either card readers or fingerprint access. Staff vehicles and apparatus are secured with typical key locks. In addition, all department computers are secured by multiple firewalls, and servers are managed by the County's IT department.

CAPITAL ASSETS AND CAPITAL IMPROVEMENT PROGRAMS

Regardless of an emergency service agency's financing, if appropriate capital equipment is not available for use by responders, a fire department cannot deliver services effectively. Two primary capital assets essential to the provision of emergency response are facilities and apparatus (response vehicles). In this section of the report, ESCI provides a review and analysis of St. Johns County Fire Rescue's capital assets and infrastructure. Because of the expense of these assets, planning must be developed to address replacement, refurbishment, and maintenance. The funding of these elements is difficult to absorb for most agencies in a single year; thus, a multi-year funding strategy or funding source must be identified. The replacement or refurbishment must be planned far enough ahead of actual expense to allow the agency time to acquire the funds necessary to implement the plan.

Facilities

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 seventeen fire stations operated by the SJCFR. The results of that evaluation follow.

The visit/assessment included a building review focusing on construction, building condition, building amenities, and visible problems or concerns. Each fire station visited varied broadly from relatively new and in good condition to others that are aging and or in need of repair and/or renovation. Some of the stations observed are nearing or have already reached their maximum capacity in terms of room for future expansion as workload and service demand increase. Stations range in age from 1 to 61 years. As a result, SJCFR has significant facility sustainment and refurbishment costs that will need to be addressed soon. In long-range master planning, it is important to consider future service demand growth and how the agency's fixed facilities are configured for future expansion, when needed.

Many of the stations currently utilized for crews were former volunteer fire stations acquired over time and out of necessity. As such, they were updated to accommodate around the clock coverage, though never designed to house full-time firefighters and EMS transport personnel. This is evident in the current configurations of many of the fire stations, which have very little room for crews and apparatus. Many of the buildings do not meet ADA requirements and are not in compliance with recommendations from the National Fire Protection Association's (NFPA) standard for life safety initiatives. Some examples are a lack of smoke detection and sprinkler systems, portable fire extinguishers, and emergency exits and lighting. Another concern is the ability to properly decontaminate employees and their equipment in accordance with NFPA 1581: *Standard on Fire Department Infection Control Program*. Current configurations do not provide adequately for the decontamination of equipment and clothing separately from cooking, eating, and other living spaces.

ESCI recommends that each station have a thorough evaluation for structural integrity and regulatory compliance. After the service delivery and performance recommendations are reviewed, then consideration can be given to the need for newly constructed or renovated fire stations that are capable of appropriately housing the necessary staff to meet future needs and that meet applicable standards as well as provide the appropriate response coverage for the service area. Two new stations have been built in 2019 and could be used as a blueprint moving forward. These stations have acceptable configurations. ESCI's evaluation should not be considered an inspection but rather a general overview and initial impression. Further inspection and analysis by appropriate professionals is warranted to determine improvement and refurbishment needs in a prioritized manner. The full inventory of the SJCFR stations is included in Appendix A.

County Facilities Management currently provides for routine maintenance of SJCFR fire stations, and SJCFR does not have staff capacity to take on this role. During the ESCI site visit, a discussion with the SJCFR Fleet Manager indicated that it would take additional FTE (general laborers) to take over routine maintenance of the fire stations. The process now for routine work is that a repair order is prepared and sent to the County Facilities Management Department, which then completes the work order. Currently, there is no long-range facilities master plan.

Over the past few years, the fire service has become increasingly concerned with the issue of firefighter cancer and cancer-prevention practices. One such practice is to limit firefighter exposure to products of combustion, as well as minimizing/eliminating exposure to diesel fumes/soot (from fire apparatus). One preventative measure is to limit/reduce firefighter exposure to toxic products of combustion which occur *after the fire* (aka, off-gassing). Specific to reducing exposure, there are (at least) three primary industry "best practices" to be considered. To this end, ESCI recommends that SJCFR continue to enact cancer prevention measures and consider incorporating cancer prevention strategies in future fire station renovation projects.

Facility recommendations are included in the *Short and Mid-Term Strategies* section, and the full inventory of the St. Johns County Fire Rescue's facilities is included as Appendix A of this plan.

Apparatus/Vehicles

The SJCFR maintains a sizeable fleet of response vehicles that are generally new and well maintained. Generally, the apparatus fleet of the SJCFR is sufficient to meet departmental services needs and demands. As with any mechanical device, a fire apparatus possesses a finite life. Often, when a frontline apparatus reaches a certain threshold regarding age or wear and tear, or begins to require increasing maintenance costs, it is moved to reserve status or decommissioned. The decision to move an apparatus to reserve status or decommission it is a local decision and no definitive industry standards exist to make this determination. Typically, apparatus replacement is based on multiple factors such as age, mileage or engine hours, increased need for maintenance, or financial considerations. Annex D of NFPA 1901: *Standard for Automotive Apparatus* (2016) suggests the following:

The safety improvements addressed in the most recent edition of NFPA 1901 are so significant that the standard suggests that apparatus more than 15 years old should be refurbished to meet current standards or removed from service; however, the standard acknowledges that apparatus can continue to be serviceable far beyond the 15-year threshold, depending on maintenance, wear and tear, service demands, and driver training programs. Finally, 1901 recommends that apparatus over 25 years in age should be replaced.

Apparatus replacement within the SJCFR is primarily based on the age of apparatus, with apparatus being moved to reserve status on a case-by-case basis. Engine (pumpers) are scheduled for replacement when they reach 25 years of age, and tower or ladder trucks are replaced at 30 years. While recognizing that the decision to replace or downgrade the status of an apparatus is a local one and based on local use and service demands, a 25-year (engine) and 30-year (tower ladder) replacement cycle may be considered excessive and beyond the service life for a department with a similar workload and call volume.

The full inventory of the SJCFR's apparatus is included as Appendix B of this plan.

The National Fire Protection Association's (NFPA) Standards 1901, 1911, and 1912 are the applicable standards for the purchase, refurbishment, maintenance, and retirement of fire apparatus. ESCI supports Annex D of these standards as they relate to replacement schedules for heavy fire apparatus (engines, tankers, and ladder trucks). Generally, the annex recommends a maximum of fifteen years of frontline service followed by a maximum of ten years in reserve status, followed by retiring the unit from service. However, as mentioned previously, an apparatus's usage can have a significant effect and impact on the resource role during its life expectancy. Figure 40 provides a useful guide for SJCFR by providing a formulaic approach to apparatus replacement.

Figure 40: Apparatus Replacement Guide

Evaluation Components	Points Assignment Criteria
Age	One point for every year of chronological age, based on in-service date.
Miles/Hours	One point for each 10,000 miles or 1,000 hours of operation.
Service	1, 3, or 5 points are assigned based on the type of service unit. For instance, fire pumpers would be given a 5 because they are classified as severe duty service.
Condition	This category takes into consideration body condition, rust, interior condition, accident history, anticipated repairs, etc. The better the condition, the lower the points assigned.
Reliability	Points are assigned as 1, 3, or 5 depending on the frequency that a vehicle is in the shop for repair. For example, a 5 would be assigned to a vehicle in the shop two or more times per month on average, while a 1 would be assigned to a vehicle in the shop an average of once every three months or less.

Point Ranges	Condition Rating	Condition Description
Under 18 points	Condition I	Excellent
18–22 points	Condition II	Good
23–27 points	Condition III	Consider Replacement
28 points or higher	Condition IV	Immediate Replacement

In general, the SJCFR apparatus are in good to excellent shape and appear to be well-maintained. The fleet division conducts regular preventative maintenance on fire apparatus and the same maintenance on rescues based on mileage. SJCFR's front-line staffed apparatus (engines, trucks, and rescues) range in age from one to eleven years, with an average age of four years. The oldest frontline units are Engine 6 (2007), Ladder 5 (2004), and Rescue 10 (2013), which will be replaced in 2020.

Figure 41 provides an inventory of front-line fire and EMS apparatus, including configuration and conditions, while

Figure 42 is a list of reserve apparatus not evaluated by ESCI staff.

Figure 41: SJCFR Frontline Response Units

Apparatus	Type	Make/Model	Tank/ Pump Capacity	Year	Mileage	Condition
Engines/Pumpers						
Engine 2	Pumper	Pierce	1250GPM/750g	2019	20,131	Excellent
Engine 3	Pumper	Pierce	1250GPM/1500g	2013	75,011	Good
Engine 6	Pumper	Pierce	1250GPM/750g	2007	143,638	Good
Engine 7	Pumper	Pierce	1250GPM/750g	2006	129,148	Good
Engine 8	Pumper	Pierce	1500GPM/750g	2017	46,521	Excellent

Apparatus	Type	Make/Model	Tank/ Pump Capacity	Year	Mileage	Condition
Engine 9	Pumper	Pierce	1250GPM/750g	2006	12,9375	Good
Engine 10	Pumper	Pierce	1500GPM/750g	2015	56,918	Excellent
Engine 12	Pumper	Pierce	1500GPM/750g	2017	48,448	Excellent
Engine 14	Pumper	Pierce	1500GPM/750g	2019	19,572	Excellent
Engine 15	Pumper	Pierce	1250GPM/750g	2009	151,840	Good
Engine 16	Pumper	Pierce	1250GPM/750g	2010	111,784	Good
Engine 18	Pumper	Pierce	1500GPM/750g	2016	52,997	Excellent
Aerial (Trucks) Apparatus						
Ladder 1	Truck 105'	Pierce	2000GPM/500g	2018	31,619	Excellent
Ladder 5	Truck 105'	Pierce	1500GPM/500g	2004	102,917	Fair
Squads, Tankers, and Brush Vehicles						
Squad 4	Rescue/Pumper	Pierce	1250GPM/750g	2012	63,494	Good
Squad 5	Rescue/Pumper	Pierce	1250GPM/500g	2018	24,846	Excellent
Squad 17	Rescue/Pumper	Pierce	1250GPM/750g	2006	6,279	Fair
Tanker 3	Tanker	Pierce/Freightliner	500GPM/2500g	2002	39,986	Fair
Tanker 4	Tanker	Pierce/Kenworth	750GPM/2500g	2006	158,898	Good
Tanker 8	Tanker	Pierce/Freightliner	750GPM/2500g	2008	22,308	Good
Tanker 14	Tanker	Pierce/Freightliner	500GPM/2500g	2002	43,381	Fair
Tanker 15	Tanker	Pierce/Kenworth	750GPM/2500g	2006	93,161	Good
Wildland 8	Wildland/Urban	Pierce/Freightliner 6x6	750GPM/500g	2017	2,836	Excellent
Wildland 15	Wildland/Urban	Pierce/Freightliner 6x6	750GPM/500g	2015	5,951	Excellent
Brush 3	Brush	Ford F-550	N/A	2008	41,239	Good
Brush 5	Brush	Ford F-550	N/A	2008	28,117	Good
Brush 8	Brush	American Gen.	1300g	1993	31,284	Fair
Brush 17	Brush	American Gen.	1300g	1993	14,836	Fair
Rescues (Ambulances)						
Rescue 2	Ambulance	Braun/Dodge	N/A	2018	48,111	Excellent
Rescue 5	Ambulance	Braun/Freightliner	N/A	2018	40,912	Excellent
Rescue 7	Ambulance	Braun/International	N/A	2015	129,148	Good
Rescue 8	Ambulance	Braun/Dodge	N/A	2016	75,534	Excellent
Rescue 10	Ambulance	Braun/International	N/A	2013	142,593	Good
Rescue 12	Ambulance	Braun/Dodge	N/A	2017	109,152	Excellent
Rescue 14	Ambulance	Braun/International	N/A	2013	162,168	Good
Rescue 15	Ambulance	Braun/International	N/A	2013	134,229	Good
Rescue 16	Ambulance	Braun/Dodge	N/A	2016	122,672	Good
Rescue 17	Ambulance	Braun/International	N/A	2012	213,857	Fair
Rescue 18	Ambulance	Braun/Dodge	N/A	2015	101,017	Good

Apparatus	Type	Make/Model	Tank/ Pump Capacity	Year	Mileage	Condition
Staff, Command, and Support Vehicles						
Battalion 1	North Command	Chevrolet Suburban 4X4	N/A	2018	38,022	Good
Battalion 2	Central Command	GMC Yukon 4X4	N/A	2015	84,282	Good
Battalion 3	South Command	Ford F-250 Crew 4X4	N/A	2019	12,965	Excellent
Battalion	Reserve	GMC Yukon	N/A	2013	124,062	Fair
Battalion	Reserve	Chevrolet Suburban	N/A	2011	165,634	Fair
County 1	Staff	Ford Explorer	N/A	2017	20,182	Excellent
County 2	Staff	Chevrolet Tahoe 4X4	N/A	2006	135,059	Fair
County 3	Staff	Ford Explorer 4x4	N/A	2015	48,265	Excellent
County 4	Staff	Ford Explorer 4x4	N/A	2016	30,562	Good
County 5	Staff	Ford Explorer 4x4	N/A	2018	18,236	Excellent
County 6	Staff	Ford F-150 4X4	N/A	2017	39,920	Excellent
County 7	Staff	Ford Explorer 4x4	N/A	2013	90,707	Good
County 8	Staff	Ford F-150 4X4	N/A	2019	3,252	Excellent
County 9	Staff	Ford F-150 4X4	N/A	2017	27,563	Good
FM 1	Staff	Ford F-150 4X4	N/A	2018	28,686	Excellent
Training 1	Staff	Ford F-150 4X4	N/A	2017	26,556	Good
Training 2	Staff	Ford F-150 4X4	N/A	2017	33,870	Good
Training 3	Staff	Ford F-150 4X4	N/A	2017	45,440	Good

Figure 42: Reserve Apparatus Not Evaluated by ESCI Staff

Apparatus	Type	Make/Model	Tank/ Pump Capacity	Year	Mileage	Condition
Engines/Pumpers						
Tower 20	Pumper	Pierce	2000GPM/300g	1999	57,103	Fair
Squad 22	Rescue/Pumper	Pierce	1250GPM/500g	2006	148,452	Fair
Engine 23	Pumper	Pierce	1250GPM/750g	2004	39,216	Poor
Engine 24	Pumper	Pierce	1250GPM/750g	2006	189,205	Fair
Engine 26	Pumper	Pierce	1250GPM/750g	2003	153,000	Poor
Engine 27	Pumper	Pierce	1250GPM/750g	2004	68,956	Poor
Engine 29	Pumper	Pierce	1250GPM/750g	2007	154,810	Fair
Rescues (Ambulances)						
Rescue 20	Ambulance	Freightliner	N/A	2002	181,001	Fair
Rescue 21	Ambulance	Horton International	N/A	2014	171,915	Fair
Rescue 23	Ambulance	Horton International	N/A	2010	236,611	Fair
Rescue 24	Ambulance	Horton International	N/A	2015	97,022	Fair
Rescue 25	Ambulance	International/Med Tec	N/A	2008	246,368	Fair
Rescue 26	Ambulance	International/Med Tec	N/A	2008	349058	Fair

STAFFING AND PERSONNEL MANAGEMENT

An organization's greatest asset is its people. It is important that special attention be paid to managing human resources in a manner that achieves maximum productivity while ensuring a high level of job satisfaction for the individual. Consistent management practices combined with a safe working environment, equitable treatment, the opportunity for input and recognition of an individual's commitment, and sacrifice are key components impacting job satisfaction.

The size and structure of an organization's staffing are dependent upon the specific needs of the organization. These needs must directly correlate to the needs of the community, and a structure that works for one entity may not necessarily work for another. This section provides an overview of the SJCFR's staffing configuration.

Fire department staffing can be divided into two distinctly different groups. The first group is what citizens typically recognize, the emergency response personnel, commonly known as the operations unit. The second group, the administrative section, typically works behind the scenes to provide the support needed by operations personnel to deliver effective emergency response. SJCFR is not unique in that some administrative staff positions are still required to perform operationally if the need arises during a normal day.

Staffing levels at SJCFR are an integral part of the master plan. As the County's population has increased, so has the demand for service. In this section, ESCI explores the department's current staffing levels and evaluates them against the mission, identifying potential gaps and or efficiencies that might be gained.

Administrative and Support Staffing

One of the primary responsibilities of the administrative section is to ensure that the operational section has the ability and means to respond to and mitigate emergencies in a safe, efficient, and timely manner. An effective administrative and support services system is critical to the success of SJCFR.

Like any other part of a municipal fire department, administrative and support functions need appropriate resources to operate properly. By analyzing the administrative and support positions within an organization, an agency can achieve a common understanding of the relative resources committed to this function compared to industry best practices and similar organizations. The appropriate balance of administration and support compared to operational resources and service levels is critical to the department's success in accomplishing its mission and responsibilities.

Typical responsibilities of the administrative and support staff include planning, organizing, directing, coordinating, and evaluating the various programs within the department. This list of functions is not exhaustive, and other functions may be added. It is also important to understand these functions do not occur in a linear fashion and can more often occur simultaneously. This requires the Fire Chief and administrative support staff to focus on many different areas at the same time.

Figure 43 reviews the administrative and support organizational structure of SJCFR.

Figure 43: SJCFR Administrative and Support Staffing

Position Title	Number of Positions	Hours Worked/Week	Work Schedule
Career Admin/Support Staff (full-time & part-time)	*Individuals considered full-time or part-time staff primarily assigned to manage, plan, or support the activities of the agency and its programs.*		
Fire Chief	1	40	M–F
Deputy Chief	3	40	M–F
Assistant Chief	3	40	M–F
Administrative Captain	3	40	M–F
Administrative Lieutenant	4	40	M–F
Fire Inspector	6	40	M–F
Plans Reviewers	5	40	M–F
Information Technology Technician	1	40	M–F
Executive Assistant	1	40	M–F
Administrative Assistant	2	40	M–F
Billing Specialist/Assistant	4	40	M–F
Others: Office Specialist, Project Spec	3	40	M–F
Others: AED Training Coord	1	40	M–F
Others: Logistics Tech and Mechanic	6	40	M–Th
Total Administrative and Support Staff FTEs	**43**	-	-
Total Department FTEs	**350.5**	-	-

ESCI notes that the current level of administrative and support staffing represents roughly 12% of the SJCFR total staffing. It is our experience that effective administrative staffing totals for a fire department operation typically range up to 12 to 15% of agency totals. After reviewing the functions and responsibilities assigned to this group, ESCI concludes that the number of full-time equivalents (FTE) assigned by SJCFR is at the lower end normally encountered and expected to appropriately support the range of administrative and support services required for a department of this size. Furthermore, several of these administrative positions are also tasked with operational duties in some situations. Inappropriately staffing the administrative and support functions creates a situation in which important organizational activities are at best delayed but in worst-case scenarios get completely missed. When administrative members are engaged in operational duties, their administrative duties are placed on hold during an emergency.

Administration

The main administrative function within the Department is established with the position of the Fire Chief and three Assistant Chiefs. One Assistant Chief is assigned to support services and is the Fire Marshal, another Assistant Chief handles operational needs and coordination for the department, while the third Assistant Chief handles logistics and finance. Some of the typical responsibilities of the Fire Chief include planning, organizing, directing, and budgeting for all aspects of the department's operations. The current number of positions assigned to this activity is barely sufficient to meet expectations as the daily operational workload can detract from administrative focus. These duties remove the Fire Chief and his administrative chiefs from the office, along with their ability to consistently focus quality time on planning, organizing, directing, and budgeting needs while committed elsewhere. This arrangement is typical of smaller departments across the United States.

Emergency Response Staffing

It takes an adequate and properly trained staff of emergency responders to put the appropriate emergency apparatus and equipment to its best use in mitigating incidents. Insufficient staffing at an emergency scene decreases the effectiveness of the response and increases the risk of injury to all individuals involved, members and the public alike. This subject is further analyzed in the section *Review of Response Standards and Targets*.

Figure 44 depicts the emergency staffing employed by SJCFR.

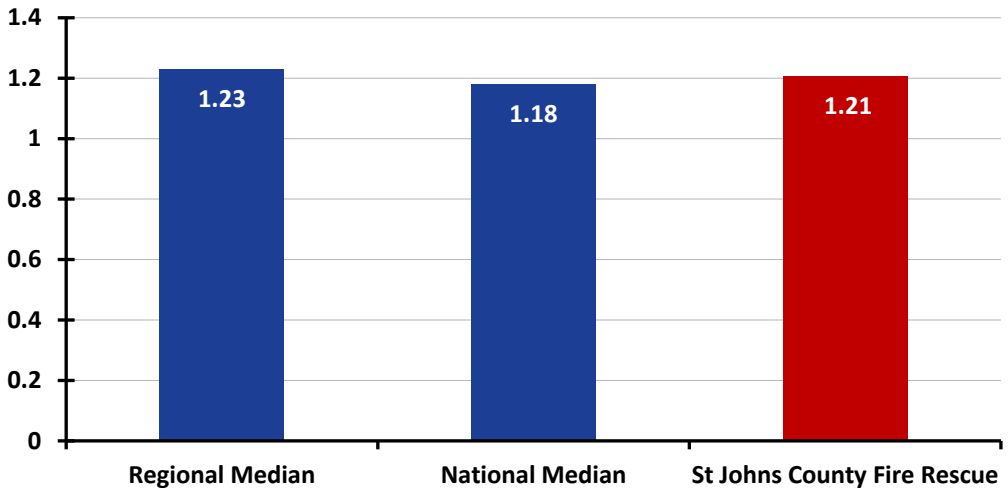
Figure 44: SJCFR Total Emergency Response Staffing

Position Title	Number of Positions	Hours Worked/Week	Work Schedule
Career Operational Staff (full-time & part-time)	*Individuals considered full-time or part-time employees, primarily assigned to provide emergency services at the operational level.*		
Battalion Chief	10	56	24/48
Captain	19	56	24/48
Lieutenant	75	56	24/48
Engineers	97	56	24/48
FF	40	56	24/48
FF/Paramedic	42	56	24/48

A baseline overview of the staffing model, staffing levels, and relief factors provides an opportunity to review and analyze the current staffing patterns, shifts, and options to increase efficiency, effectiveness, and capabilities. The current Battalion Chief (10 FTE), Captain (19 FTE), and Lieutenant (75 FTE) to firefighter (179 FTE) ratio for full-time positions within SJCFR operations is at 58%.

A means of comparison, also used on a national basis, is that of measuring the number of firefighters on staff per 1,000 population of the service area. Figure 45 illustrates the current comparison of SJCFR's staffing with both national and regional norms.

Figure 45: Comparison of Firefighters Personnel per 1,000 Population



The 2016 National Fire Experience Survey indicates the national median rate of firefighters per 1,000 population is 1.18, and regionally, the number of firefighters per 1,000 population is 1.23. Within SJCFR, the ratio of firefighters per 1,000 citizens is 1.21. These comparisons do not consider the area covered and are general comparisons by populations served. Large geographical areas with sparse populations often require a greater number of firefighters to achieve safe and effective service levels. This comparison, in and of itself, does not indicate a necessary change in staffing, but it serves as a point of reference for analysis of current operational endeavors.

SJCFR uses a three-platoon (shift) system working shift rotations of 24 hours on-duty followed by 48 hours off-duty, which yields a 56-hour workweek for shift operations. Each shift is led by three Battalion Chiefs (10 total) that serve as the senior officers on the shift. These Battalion Chiefs answer directly to one Assistant Chief of Operations who is on a weekly 40-hour schedule and assumes an operational role as needed. These individuals are responsible for all aspects of the shift operations and serve as the Fire Chief's representative at significant incidents.

The department operates with a Captain assigned to manage each fire station. Lieutenants are assigned to engines, ladder trucks, and rescue vehicles on opposite shifts. The department also uses apparatus operators as the individual responsible for all aspects of maintaining and operating fire engines and aerial units. This position is filled as needed, depending on the availability of daily staffing. Career firefighters staff each fire station on a daily basis. When fully staffed, one officer, one engineer, and several firefighters staff each of the sixteen fire stations depending on the type and number of apparatus at that fire station. This is rarely the case due to vacancies, and more likely, SJCFR can expect a mixture of acting officers, engineers, and firefighters assigned to an engine, ladder truck, or rescue. This represents a total shift staffing of 88, not including the Fire Chief and Assistant Chiefs, with a total staffing of 283 budgeted FTEs across all shifts. Occupational Health and Safety Administration (OSHA) established guidelines and regulations in OSHA 29 CFR 1910.134(g)(4)(i) require two firefighters outside the hazard area while two firefighters are inside the hazard area. On most days, dispatching a single fire engine or ladder does not meet the requirements of the "two-in/two-out" rule, and additional apparatus must respond.

As shown in Figure 46, the SJCFR Standard Operating Procedures (SOPs) directs the following first alarm assignment for structure fires.

Figure 46: SJCFR Initial 1st Alarm, 2,000 ft² Residential Structure Fire

Responding Unit	Number	Total Staff
Battalion Chief	2	2
Engines	3	9
Ladder	1	3
Tanker	1	1
Squad	1	3
Rescue	1	2
Total Minimum Units and Personnel	**9**	**20**

The on-duty minimum staffing for a first alarm, while adequate for a routine house fire, is insufficient for a strip shopping mall or an apartment building unless there is fire protection built into these structures. This type of fire is likely within the jurisdiction and represents a higher level of risk than the typical medium-sized residential dwelling. Because SJCFR staffs most response units with a minimum of three firefighters, an initial full alarm force necessary for commercial or apartment fires could commit nearly one-half of the on-duty staffing to one incident. Furthermore, due to the geographical size of the jurisdiction, it is not reasonable to expect or plan on this as a means of providing coverage for such an event and still provide required services to the remainder of the jurisdiction.

Staff Allocation of Various Functions

SJCFR allocates its career staff to sixteen fire stations currently with a seventeenth opening in June of 2020. These stations are allocated based on the specific geographic requirements and service level needs of the area. As well as a fire engine (pumper), some of the stations are also equipped with a ladder truck, water tanker, and brush truck, and not all of these additional apparatuses are routinely staffed. When a fire station receives a call for service, the firefighters respond in the appropriate apparatus based upon the nature of the call. For example, a fire call would require the fire engine, whereas a brush fire would require a brush truck. If required to respond in either of these apparatuses, staff must move from their current assigned apparatus and relocate to the required or requested apparatus. The Battalion Chiefs are located at Fire Stations 5, 12, and 18 to provide necessary command and control coverage during incidents and manage the administrative duties for the shift. This allocation of staff across the stations and units is a typical staffing model found across the United States for career organizations. The minimum total daily staffing available in the department could be as low as 88 personnel.

Staff Scheduling Methodology

SJCFR utilizes a traditional rotating three platoon system to staff each 24-hour position with career personnel. The total number of positions required becomes a policy decision based on the needs of the jurisdiction. The jurisdiction also establishes the number of employees needed above the minimum to allow for vacancies due to vacation, sick, and other types of leave. This staff requirement above the minimum yields a total number of full-time employees required to ensure necessary daily minimum staffing is achieved according to policy.

The minimum daily unit staffing for SJCFR is three firefighters per engine company, squad company, or ladder company. All SJCFR rescue units are staffed with two except the rescue unit at Fire Station 5, which has three firefighters assigned per shift. The staffing methodology used by SJCFR is very common across the United States for firefighters working on a 24-hour shift schedule and proves effective for agencies with moderate workloads. Large agencies with heavy workloads have implemented different staffing models to avoid employee fatigue. Staffing for a 24-hour period reduces the number of crew changes that occur in a given period.

A common industry practice to achieve optimal staffing and efficiency is to determine the appropriate minimum staffing factor and then the relief factor based on the needed coverage for sick, vacation, and other unplanned leave. SJCFR does not have an established relief factor.

Minimum Staffing Factor Determination

The starting point for the following analysis was to determine the minimum number of personnel needed to fill the minimum 88 daily staffing positions for fire operations and avoid overtime for unscheduled hours.

Minimum Staffing

- 365 days per year x 24 hours per day = 8,760 hours per year per position.
- 8,760 hours per year x 88 minimum positions daily = 770,880 hours per year that must be staffed for 24/7 coverage.
- 56-hour workweek equals 2,912 scheduled hours per position annually: 770,880/2,912 = 264.7 (265) FTE for minimum staffing (assuming no leave).
- SJCFR currently has 283 FTE budgeted for fire suppression staffing.

Fifty-Six-Hour Relief Factor

The next staffing factor to be analyzed is the "relief factor" or the amount of additional FTE positions needed to reasonably cover "off time" including, leave of various types, training, vacancies, etc. The following is an industry-accepted methodology used to determine a relief factor to adequately cover paid leave, training time off, and vacancies for 24-hour fire department shifts. Determining the relief factor is outlined in the following:

- The total average leave taken by SJCFR personnel in FY2017–19, which includes firefighter paid leave, time off for training, unscheduled time off, and position vacancies, was 123,780 hours annually.

- 123,780 hours = 5,158 days/shifts that need to be filled to account for leave or vacancies annually.
- 5,158 days/shifts divided by the 265 minimum staffing number of 56-hour FTE determined above = an average of 19 days (24-hour shifts) of leave per employee (FTE) per year.
- Subtract the average 19 days/shifts of leave from the 121 scheduled shifts for a 56-hour week employee (2,912/24) = 102 on-duty shifts annually available per SJCFR FTE.
- Divide 121 scheduled shifts for a firefighter FTE by the 102 on-duty shifts actually experienced by SJCFR FTE on average = a relief factor of 1.19 or 50 FTE positions over minimum staffing levels necessary to cover the average utilized leave by the department's operational staff.

Current Staffing vs. Current Budgeted FTE for SJCFR

SJCFR needs a total of 315 budgeted, uniformed FTE personnel to achieve the 1.19 relief factor and currently has 283 budgeted, uniformed FTE available. Therefore, SJCFR has a shortfall of 32 budgeted FTE based on average annual leave and vacancy usage to cover operational staffing during the last three years just to meet current service levels. It is important for departments to conduct these staffing exercises annually to determine if the actual time used by employees is covered by budgeted FTE. Lack of sufficient personnel to cover leave will often manifest itself in increased overtime expenditures. When this situation is encountered, the department must first determine the cause for this increase and then implement appropriate cost effective strategies to reduce expenditures and staff fatigue due to excessive overtime.

Deployment Methods and Staffing Performance for Incidents

Typical fire department responses across the nation include structure fires, vehicle fires, wildland fires, vehicle accidents, hazardous materials responses, technical rescue responses, general calls for service, and emergency medical calls. The latter is the most frequent reason for activating the 911 system.

Emergency Fire Incidents

The current daily operational staffing is roughly 94 individuals per shift starting at 0800 hours. It is important to note that this staffing level is only realized when all personnel are on-duty and is slightly above the current minimum daily staffing requirement of 88 per shift. Traditional vacation and sick leave regularly negatively effect on-duty numbers. This number does not include the Fire Chief and administrative staff. Fully staffed, this equates to a force capable of meeting the response needs of the community. Fire departments across the United States typically establish a "minimum staffing" level. This number reflects the minimum number of personnel a department will have on duty before beginning to hire overtime.

SJCFR has established 88 personnel per shift as its minimum daily staffing level. SJCFR's current staffing provides the ability to consistently and effectively respond with an appropriate number of personnel to mitigate small to moderate size incidents without the assistance of mutual aid companies. Because SJCFR uses a minimum staffing of three per engine company there are times when the on-scene staff is not sufficient to begin interior firefighting operations in accordance with NFPA and OSHA. These standards require a "two-in/two-out" rule for firefighter numbers prior to entering an immediately dangerous to life and health atmosphere (IDLH). When the water tanker is responded, it further breaks down the crew's ability to begin immediate interior operations. This tanker requires a firefighter/pump operator to remain with the truck and decreases the number of staff available to assemble the effective response force (ERF) for firefighting activities at the scene. The periods when a fire station is unable to respond to emergency calls within its assigned area is an issue of response reliability and is covered in detail later in this report.

Emergency Medical Incidents

SJCFR provides Advanced Life Support (ALS) transport services for the citizens and visitors to the County. Fourteen units are staffed to conduct daily operations. All of these units, except Rescue 5 which is staffed with three, are staffed with two employees. Across the nation, most emergency systems provide some sort of first responder care until advanced life support resources can arrive if the agency does not provide those services. Currently, all SJCFR engines, ladders, and squads provide ALS services until a transport unit arrives. The water tankers provide BLS services when needed.

Special Operations Incidents

SJCFR provides a hazardous materials response team. The team is comprised of 30 technicians and can assemble a level "A" entry within one hour. All members of the department are operations level trained. They provide initial response and scene size up to determine the need for assistance from their team. Hazardous materials incidents by their physical nature prove difficult to mitigate, more so with limited staff. NFPA 472: *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents* describes these operations.

Special operations incidents can pose complicated rescue situations. Technical Rescue incidents are equally as challenging as hazardous materials incidents and require a completely different skill set to mitigate. SJCFR has a technical rescue team to handle these types of calls which require their own standards for operations, NFPA 1006: *Standard for Technical Rescuer Professional Qualifications* and NFPA 1670: *Standard for Operations and Training for Technical Search and Rescue Incidents.* These incidents could include vehicle machinery rescue, rope rescue, confined space rescue, trench and excavation rescues, water rescues, and structural collapse rescue incidents. SJCFR is located so far from other resources that these teams become very valuable to the daily staffing for handling mitigation of these types of incidents. There is a complete detailed analysis of both special operations teams located in the *Hazardous Materials Response Capabilities and Technical Rescue Response Capabilities* section.

Wildland Firefighting

In recent years, many people across the nation have come to understand the dangers and damaging effects that wildland fires cause across the country, and those dangers are no different in St. Johns County. Wildland fires pose challenges, including expense and extensive time and resources to mitigate and bring under control. Outside resources are sometimes required and bring associated increased costs for special equipment such as air support and fire retardants.

Responsibilities and Activity Levels of Personnel

In every fire department, there exist activities accomplished that are outside of "regular" emergency incident response. These typically involve general maintenance of self-contained breathing apparatus (SCBA), hose testing, air monitor calibration, EMS quality assurance, and various technical committees. SJCFR relies upon individuals who have an interest in these additional areas to accomplish the necessary tasks. In addition to the benefit of completing these tasks, the additional responsibilities serve to develop further knowledge, skills, and abilities of the participating individuals. These individuals learn project management, time management, and budgeting skills that prepare them for future promotional opportunities.

The continuing test for SJCFR will be to make the most prudent staffing and facility placement decisions based on weighing multiple considerations, including risk exposure, response times, access challenges, deployment, community expectations, and response capacity. Those decisions are difficult with financial constraints and service demand increases.

Personnel Management

Although the delivery of emergency services to the citizens and visitors of a community is critical, effective management and organization of an emergency services agency are just as critical to its success. The personnel that deliver those services are the backbone of the system. However, without the proper administrative and support personnel to handle supervision, command, and control, operational personnel may not be able to perform satisfactorily.

It is commonly understood that an organization's greatest asset is its people. While the purchase of capital equipment can appear to be expensive when viewed as a one-time expense, the reality is that personnel expenses typically account for more than 80% of an organization's recurring expenses. It is important that special attention be given to managing human resources in a manner that achieves maximum productivity while ensuring a high level of job satisfaction for the individual. Consistent management practices combined with a safe working environment, equitable treatment, the opportunity for input, and recognition of the workforce's commitment and sacrifice are key components impacting job satisfaction.

Policies, Rules and Regulations, and Guidelines

The SJCFR Policy Manual, which includes extensive procedures and standard operating guidelines (SOGs), is up to date and is updated regularly. The County also has an Administrative Code that applies to non-uniformed County employees. SOGs are arranged in a way that they can be easily referenced for review. SJCFR does not use a committee to review SOPs and SOGs; however, the Chief selects various members of the rank and file to review them when needed. A good way to ensure consistent review is to have a committee of SJCFR members review one-third of the guidelines each year and recommend changes. There should also be a process to trigger changes of a guideline that has been modified due to a new method or a technology change.

Position Descriptions

SJCFR employs several different job descriptions that are not unlike other agencies of similar size and organization. The department currently employs the positions of Firefighter, Lieutenant, Captain, Battalion Chief, Fire Code Inspector, Deputy Chief, Assistant Chief, and Fire Chief. A review of current position descriptions is available through County Human Resources. These position descriptions are reviewed for accuracy by the Fire Chief in conjunction with Human Resources personnel.

Personnel Reports and Recordkeeping

The County Human Resources department is responsible for maintaining personnel records. This is done using various software systems. These records are archived for future reference. The records maintained include performance evaluations, injury and accident reports, health records, and exposure reports.

Compensation

An agency's ability to attract, hire, and retain employees has a direct impact on its ability to effectively and efficiently provide the desired services. SJCFR is no different. Agencies should provide periodic reviews of current compensation structures, market competitiveness, and County compensation philosophies. These internal and external comparisons of equitable positions and workloads ensure the agency can attract and retain an effective workforce. SCJFR is bound by negotiated compensation outlined in the Collective Bargaining Agreement with Local 3865.

Disciplinary Process

Under the existing organizational configuration, personnel-related decisions are made at different levels. The Fire Chief can hire, discharge, and promote. Discipline can be issued at several levels of the organization based on the severity of the infraction. The policy is outlined in the progressive discipline process in the policy manual, administrative code, and bargaining unit agreement. Personnel related decisions can, and often do, subject an organization to potentially extensive liability exposure. Risk is presented that can result from a hiring mistake, improperly processed disciplinary process, wrongful termination claims, and more. Access to legal counsel can reduce this liability. The employees are afforded an appeal process through the established grievance policy.

Counseling Services

Our nation's firefighters are faced with emotional needs that are quite different and unique to the occupation. A national study of 1,000 firefighters by researchers from Florida State University (FSU) reveals nearly half of the respondents say they had suicidal thoughts at one or more points in their firefighting career. Furthermore, approximately 15% reported one or more suicide attempts.[15] As these symptoms occur, employees need support systems in place that are readily accessible and provide access to someone who is qualified and truly understands the employee's circumstances.

First responders have unique stressors. For EAP providers to fully understand and become more effective, a Clinician Awareness Program has been developed by the Florida Firefighters Safety & Health Collaborative.[16] The two-day full immersion course is designed for clinicians and providers who desire to learn more about the unique first responder stressors to be more effective in connecting and treating first responders. The class provides an extensive understanding of first responder culture, lingo, lifestyle, and details about the unique stressors the job entails. Training includes classroom learning, engaging in realistic scenarios, immersion in fire stations, communications centers, and other first responder facilities, and interacting with first responders.

Several programs can assist: critical incident stress management, employee assistance programs, and intervention programs, to name a few. The SJCFR offers an Employee Assistance Program and a Critical Incident Stress Management peer team. This program should be communicated to make each member aware of the availability of resources.

Application, Recruitment, and Retention Process

SJCFR periodically advertises on its website and social media accounts, and sends notifications to localities and affiliations to advertise openings within the department. The Human Resources department performs qualification checks, reference checks, and background checks on potential candidates. There is a physical standard established using the Candidate Physical Ability Test for new recruits, and an interview is conducted. No written knowledge testing is required. A medical exam is required after a conditional job offer is made.

Performance Reviews, Testing, Measurement, and Promotional Process

SJCFR provides annual performance reviews for full-time employees that include a comprehensive analysis of employee performance goals and objectives. The department uses annual physical fitness evaluations and provides periodic performance reviews of knowledge, skills, and abilities. Promotional testing is done on an as-needed basis to fill open positions for Engineer, Lieutenant, Captain, and Battalion Chief.

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[15] *https://www.everyonegoeshome.com/2015/09/09/new-suicide-study/.*
[16] *https://www.floridafirefightersafety.org/mental-wellness/clinician-awareness-program.*

Health and Safety

NFPA 1500: *Standard on Fire Department Occupational Safety and Health Program* is the industry standard for the development and administration of a fire department safety program. At the time of this report, SJCFR has a safety committee in place. The establishment and empowerment of a safety committee can be one of the best tools to increase the safety of firefighters. ESCI strongly encourages the department to ensure all activities of the safety committee are in alignment with Chapter 4 of NFPA 1500. To be effective, safety committees must be diverse in their representation from across the department, ensuring representation by shift, rank, function, and interest, and including representation from non-uniformed and staff members as well. SJCFR should ensure and evaluate the diversity of representation within the safety committee.

The committee meets monthly and includes in its mission raising awareness and modifying member behaviors that will result in a safe work environment. Additionally, the committee should review all accidents, injuries, near-miss incidents, and workplace safety suggestions. The committee should analyze the information before them and report the findings to the Fire Chief. As opposed to being reactionary through the development of additional rules, it is recommended that the committee should work to implement member safety education programs and encourage members' safety self-awareness. The committee should maintain regular and open meeting times and locations; minutes of the meetings should be recorded and posted for all members of the department to review. ESCI underscores the importance of maintaining a functioning safety committee.

SERVICE DELIVERY AND PERFORMANCE

The most important aspect of any emergency services agency is its ability to deliver services when requested. Each of the following components impacts this ability and should be included in performance monitoring and planning. This section of the report evaluates the current and historical service delivery elements of:

- Service Demand
- Resource Distribution
- Resource Concentration
- Response Reliability
- Mutual and Automatic Aid System

Levrum Data Technologies, Inc.

As part of this project, Levrum Data Technologies, Inc. was retained to help with future event projects and deployment modeling. Specifically, Levrum's role in this project was threefold: (1) obtaining, validating, and importing data; (2) generating predictive future incident datasets modeling anticipated growth in St. Johns County; and (3) supporting ESCI consultants in performing deployment analyses, including customizing the Code3 Strategist application.

For this, the *Service Delivery and Performance* section focus was on data acquisition, validation, and import. Specifically, raw data was acquired, data gaps and errors were identified, and to the extent possible, corrected. County planning data was analyzed and transformed to generate routable street grids for new areas, as well as hypothetical locations for future incidents. This analysis was used in the future event modeling stage as described in that section of the report.

Data Gaps and Corrections

The provided incident files had data anomalies that could have caused issues in later steps. This section provides an overview of the changes that were made.

Coordinate Correction

A portion of the responses had locations that did not match the address that was included. The magnitude of which they were off varied widely, sometimes placing incidents in other cities around Florida. It was determined that the coordinates needed to be fixed, and that was accomplished in several steps.

- Lookup into the existing address file
- After analysis of the existing address file (a000000009 address site), the locations were established as accurate
- Matches were made for 95.3% of the incidents
  - Geocoding
- Any incidents that did not have a match in the address file were geocoded using Google's geocoder
- 4% of the remaining addresses that geocoded outside of St. Johns County were removed

Incident ID Correction

Some of the incidents had IDs that did not match the format of the other incidents. For example, the first calls in 2014 and 2015 were both 0000001 vs. 16-0000001 for 2016. Due to the problems having multiple calls sharing the same ID would cause, this issue had to be fixed. The resolution was to append the year to any calls that did not already have it. After the fix, the calls from the examples above became 14-0000001 and 15-0000001.

Timestamp Correction

The provided timestamps only included times with no dates included. There was a date field for the time the incident started, but just appending that to the timestamp would not work due to calls that started one day but ended the next. To resolve this, a formula was created that would append the date and add an extra day if the incident spanned midnight.

Service Demand Study

Incident Type Analysis

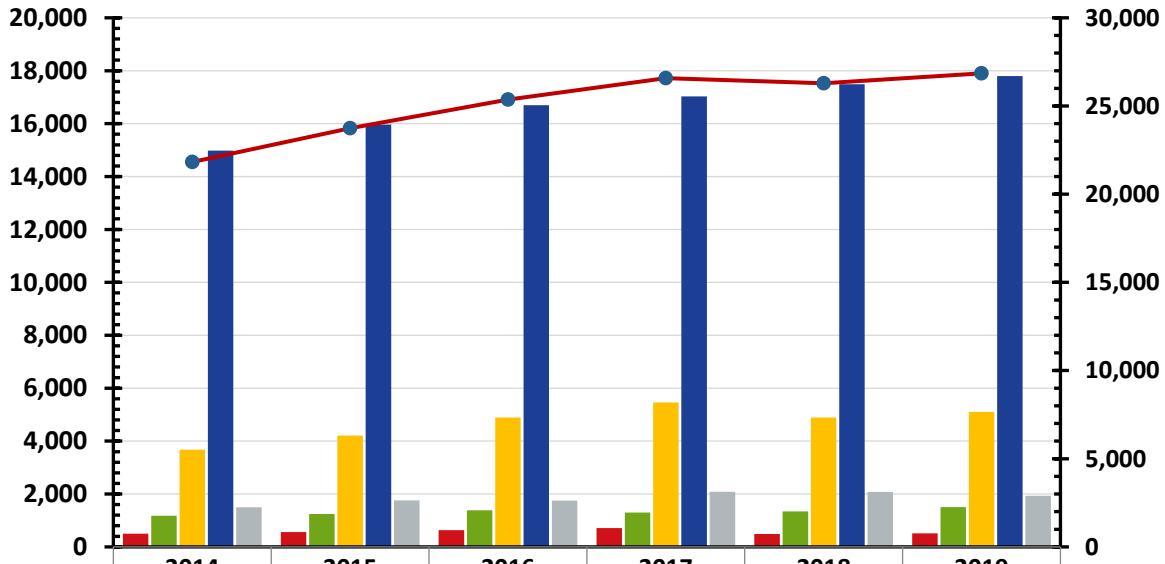
In an effort to have fire departments analyze and report data in a consistent manner throughout the nation, the National Fire Incident Reporting System (NFIRS) was developed. This system classifies incidents into various categories and subcategories, which allows department leadership to analyze the nature of service demand within their jurisdiction effectively. The incident type data—by itself—can provide insight as to what equipment, apparatus, training, and other needs the department may have to meet the demand for service. The codes within NFIRS are three digits, which are grouped into a series by the first digit, as illustrated in Figure 47.

Figure 47: National Fire Incident Reporting System

Incident Series	Series 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	Canceled, Good Intent
700-Series	False Alarm, False Call
800-Series	Severe Weather, Natural Disaster
900-Series	Special Incident Type

Figure 48 illustrates a historical overview of incidents for SJCFR for the period 2014–2019, based upon the NFIRS incident classification. From 2014 to 2019, there was an overall increase in service demand of 23%—with an average annual increase of 4.3%. The greatest change occurred from 2014 to 2015, with an increase of 8.8%, and the lowest change occurred from 2017 to 2018, with a decrease of 1.1%. Over the study period, fires increased annually from 2014 through 2017 and then dropped significantly in 2018, averaging around 500 in 2018–2019. Alarm incidents increased by 28%, emergency medical incidents by 19%, and motor vehicle collision incidents by 29%. Other incidents increased by 39% in the period 2014–2019.

Figure 48: SJCFR Service Demand by Incident Type, 2014–2019[17]

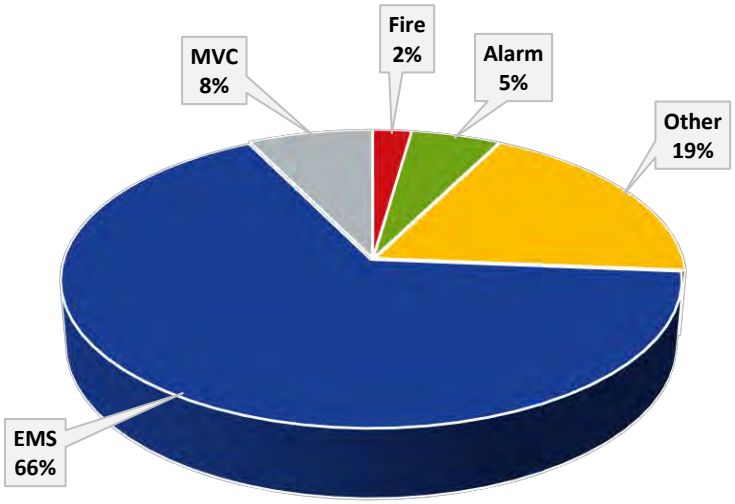


	2014	2015	2016	2017	2018	2019
Fire	499	562	636	712	489	515
Alarm	1,178	1,243	1,386	1,296	1,341	1,506
Other	3,673	4,208	4,894	5,457	4,889	5,102
EMS	14,978	15,967	16,697	17,030	17,492	17,797
MVC	1,497	1,758	1,754	2,087	2,078	1,931
Total	21,825	23,738	25,367	26,582	26,289	26,851

While Figure 48 illustrates the overall trend of service demand over time, it is also important to consider the type of service demand as it compares to the whole. Figure 49 illustrates that the greatest demand for service is for emergency medical incidents at 66.4%. Motor vehicle incidents account for 7.4%, alarm incidents for 5.3% of incidents, fire incidents for 2.3%, and the remaining 18.7% are other incidents.

[17] *Total call volume is indicated in the scale to the right of the figure while call volume by type is indicated by the scale to the left of the figure.*

Figure 49: SJCFR Service Demand by Incident Type, 2014–2019



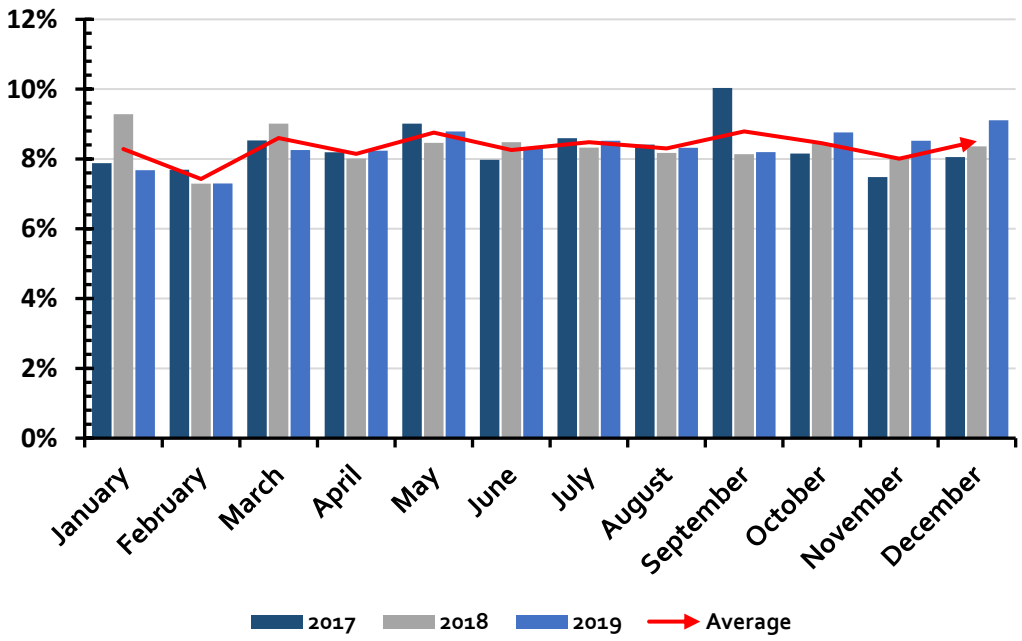
Temporal Analysis

The prior section provides leadership with information about the type of service demand that occurs and the linear change in service demand over time. To effectively plan, department leadership should also consider how that service demand is impacted by time—the time of day, day of the week, and month of the year. Consideration of these temporal components enables the department to more effectively staff for incident response and plan for non-incident activities such as pre-incident planning, training, apparatus maintenance, hydrant testing, and hose testing. Each temporal component is presented as a percentage relative to the total service demand that occurred during the study period.

Service Demand by Month

The first temporal component analyzes the service demand by month. When possible, the department should consider scheduling non-incident activities during the slower months. This will provide an opportunity to complete the tasks with decreased interruption by incident responses. As illustrated in Figure 50, service demand is relatively flat throughout the year. The lowest demand for service occurs in February, and the greatest demand occurs in May. Based on the minimal workload variation observed month-to-month, SJCFR can consider performing non-incident activities spread uniformly across the year without any staffing changes.

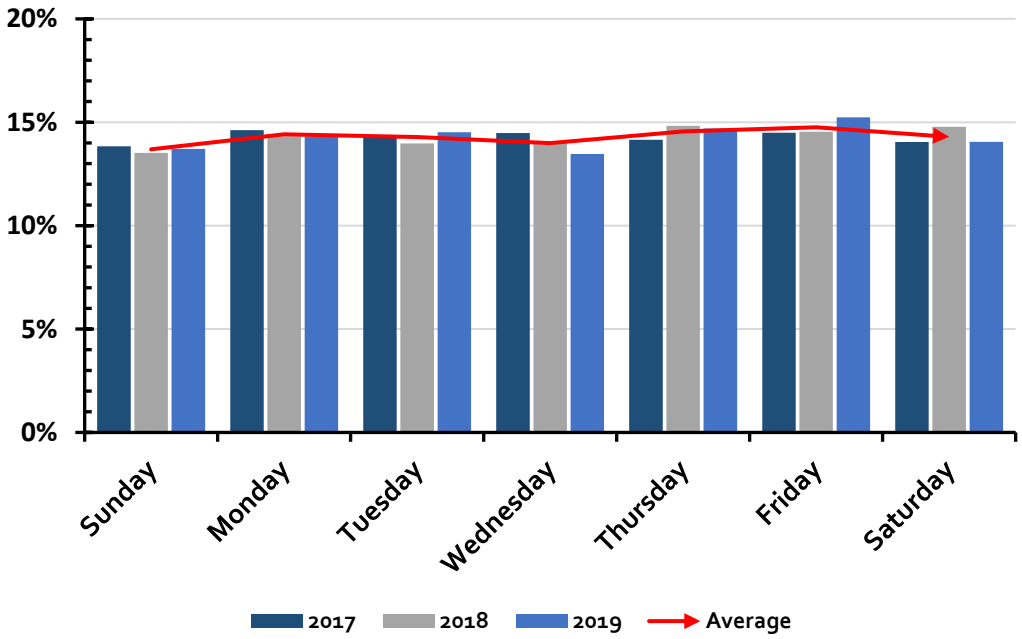
Figure 50: SJCFR Service Demand by Month, 2014–2019



Service Demand by Day of the Week

The second temporal component analyzes service demand throughout the week. As with the service demand by month, this component provides leadership with information to better schedule non-incident activities. As illustrated in Figure 51, there is relatively little variation, although the lowest demand for service occurs on Sunday and increases on Monday. The following two days decrease before beginning an upward trend again, reaching the highest demand on Friday. After Friday, it decreases again. Similar to the findings for service demand by month, the overall minimal variation throughout the week provides an opportunity to uniformly schedule non-incident activities on any day of the week with no staffing changes in staffing required.

Figure 51: SJCFR Service Demand by Day of Week, 2014–2019

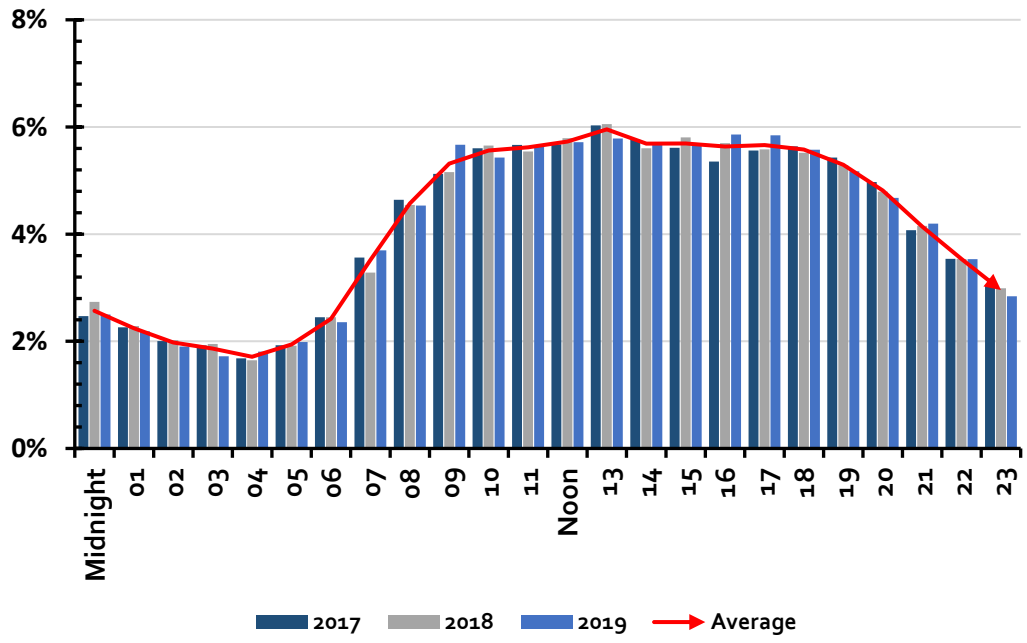


Service Demand by Time of the Day

The final temporal component is the time of day when incidents occur. Not only does this analysis assist leadership with the scheduling of non-incident activities, but it also provides leadership with information to assist with staffing and resource needs. Figure 52 illustrates that demand for service begins increasing at 5 a.m. and follows a sharp upward trend until 9 a.m. This generally coincides with the movement of the population from their homes to their daytime activities such as work, shopping, and recreation. There continues to be an upward trend until the demand for service reaches its peak at 1 p.m. Throughout the afternoon, there is some fluctuation until the decrease in demand begins at 6 p.m. Consistent with the movement of the population back to their homes, the demand for service continues to decrease throughout the evening—reaching the lowest level at 4 a.m.

At first glance, this data would seem to show that staffing levels could be decreased during those hours where service demand is lowest. However, it is important to note that fatal residential fires occur most frequently late at night or early in the morning. Based on findings in the report Fatal Fires in Residential Buildings, from 2014 to 2016, fatal residential fires were highest between 1:00 a.m. to 2:00 a.m. and 4:00 a.m. to 5:00 a.m. The 8-hour peak period (11:00 p.m. to 7:00 a.m.) accounted for 48% of fatal residential fires.[18] Based on this, SJCFR should ensure they have sufficient staffing levels to provide for that component of service demand and may consider the need to add increased staffing during the greater peak period of 10 a.m. until 6 p.m.

Figure 52: SJCFR Service Demand by Time of Day, 2014–2019



[18] 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.

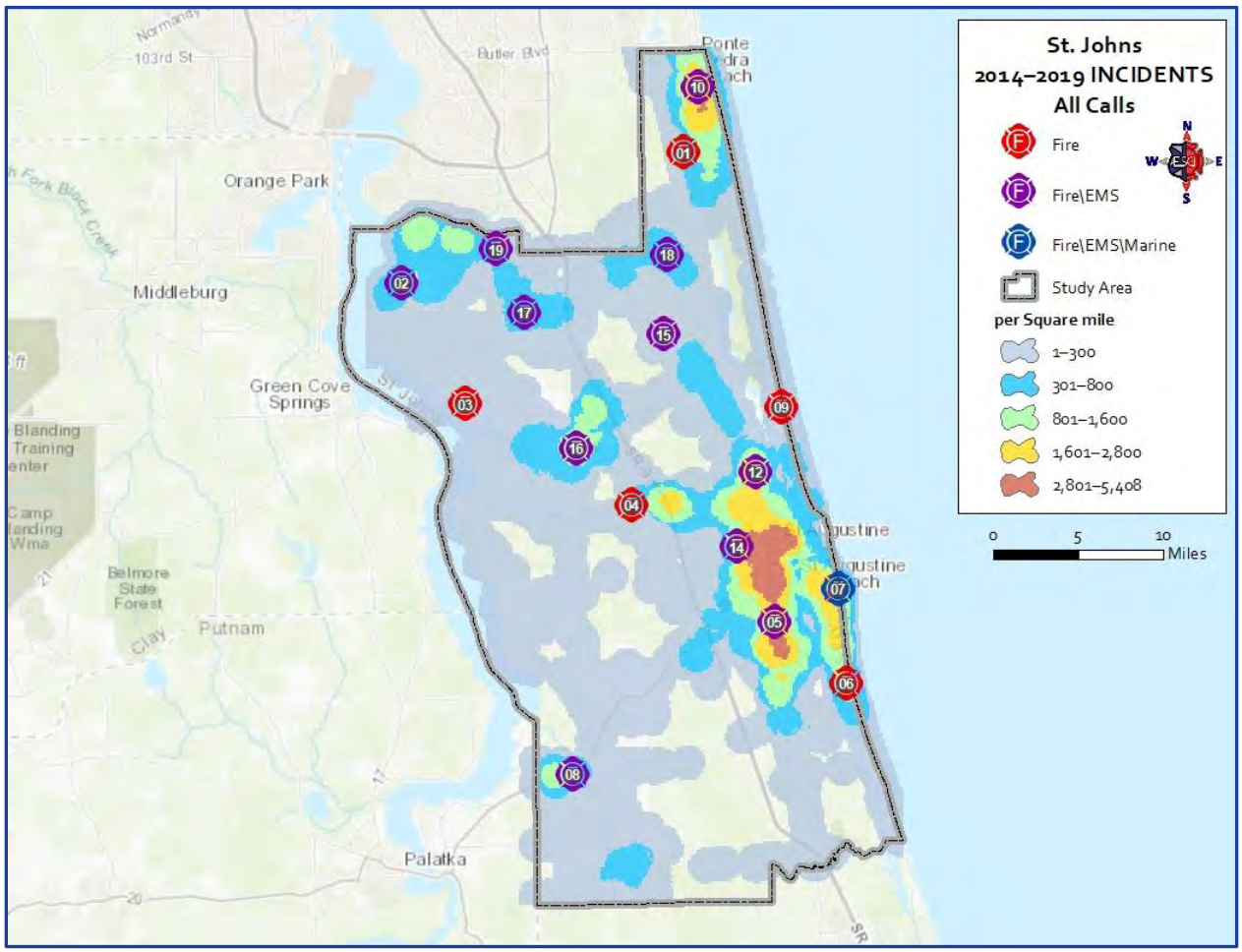
Resource Distribution Study

To provide a timely and adequate response to requests for service, a department must consider the geographical location of resources. This section provides an analysis of SJCFR resource distribution as compared to national standards.

Geographic Service Demand

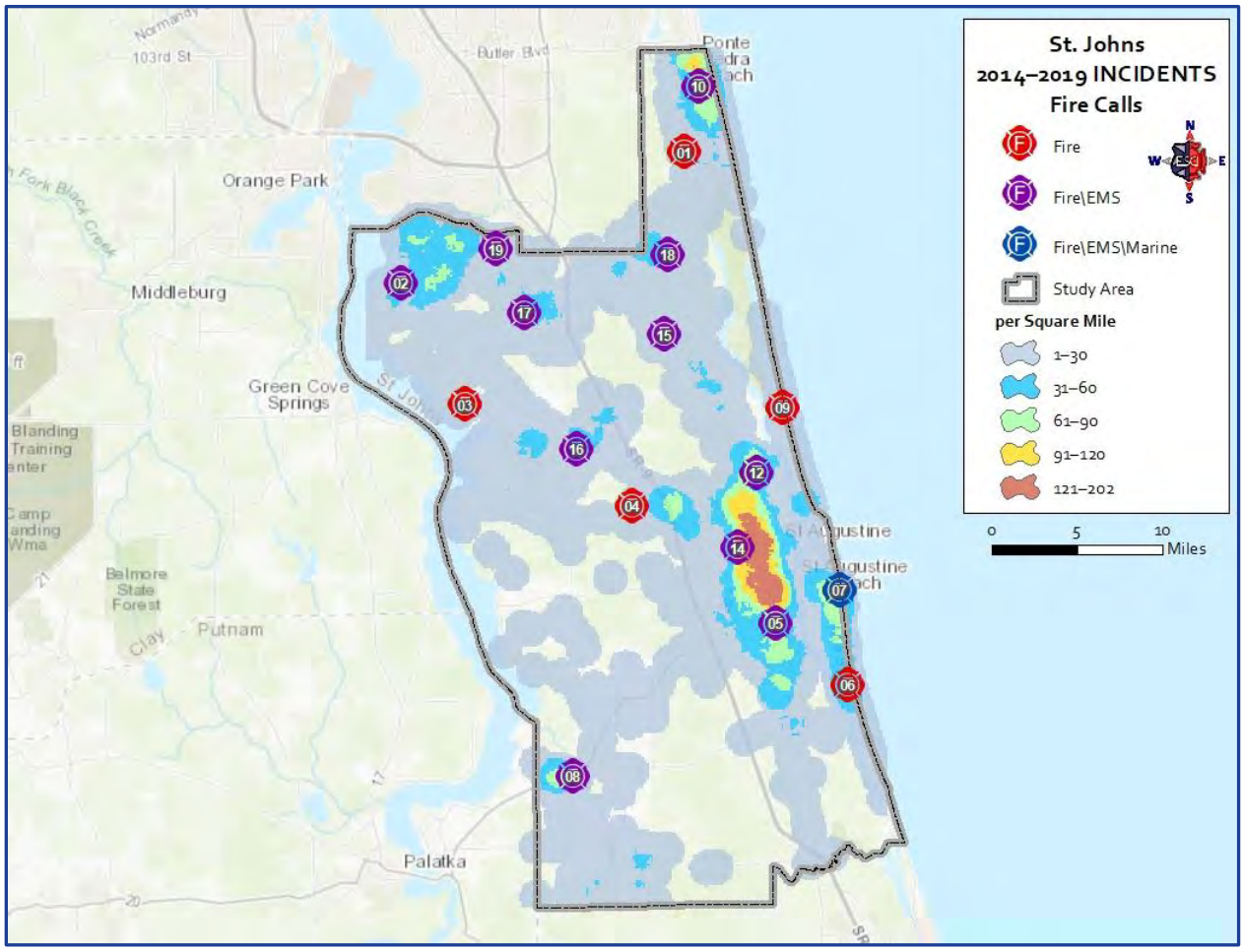
Before comparing SJCFR to the national standards, it is valuable to analyze the location of actual service demand within the jurisdiction. ESCI uses geographic information systems software (GIS) to plot the location of incidents within the study area from 2014 to 2019 and calculates the mathematical density of incidents (incidents per square mile) in the study area. Figure 53 shows that there are several central areas of higher service demand, with decreasing demand radiating out from those centers. The greatest density center is near Stations 5/14 (St. Augustine) and the second-highest near Station 10 (Ponte Vedra Beach). Two other centers, of lesser density, are near Station 2 and Station 16. These areas of service demand coincide with areas of higher population density. Overall, it appears that SJCFR stations are located in the geographic areas that correspond to the greatest demand for service.

Figure 53: SJCFR Geographic Service Demand, 2014–2019 (All Incidents)



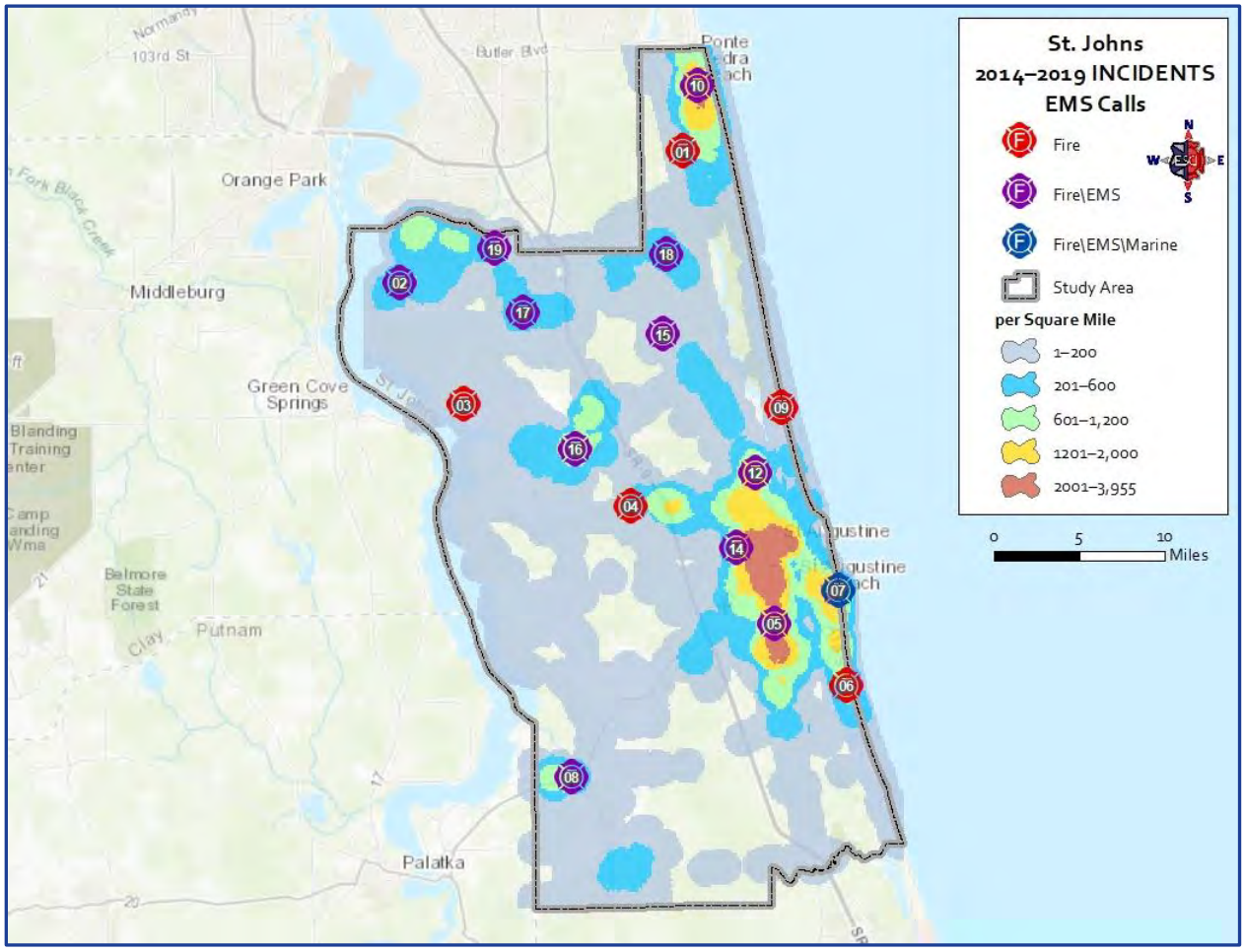
Separating fire incidents from all incidents provides a very similar distribution, as illustrated in Figure 54.

Figure 54: SJCFR Geographic Service Demand, 2014–2019 (Fire Incidents)



Separating emergency medical incidents from total incidents also provides a very similar distribution, as illustrated in Figure 55.

Figure 55: SJCFR Geographic Service Demand, 2014–2019 (EMS Incidents)



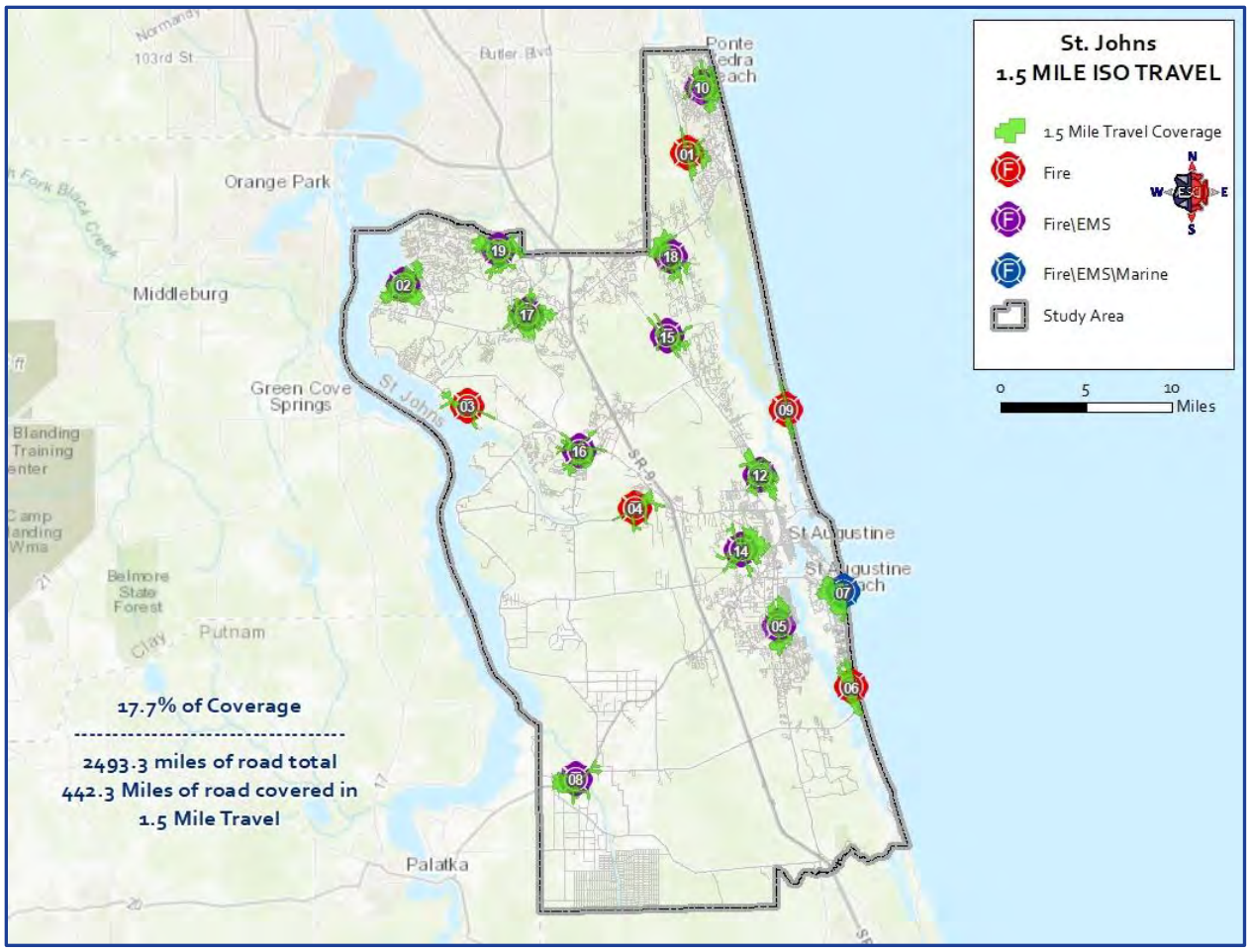
ISO Distribution

A community's ISO rating is an important factor when considering fire station and apparatus concentration, distribution, and deployment due to its effect on the cost of fire insurance for the residents and businesses. To receive maximum credit for station and apparatus distribution, ISO evaluates the percentage of the community (contiguously built upon area) that is within specific distances of fire stations, central water supply access (fire hydrants), engine/pumper companies, and aerial/ladder apparatus.

Travel Distance from a Fire Station

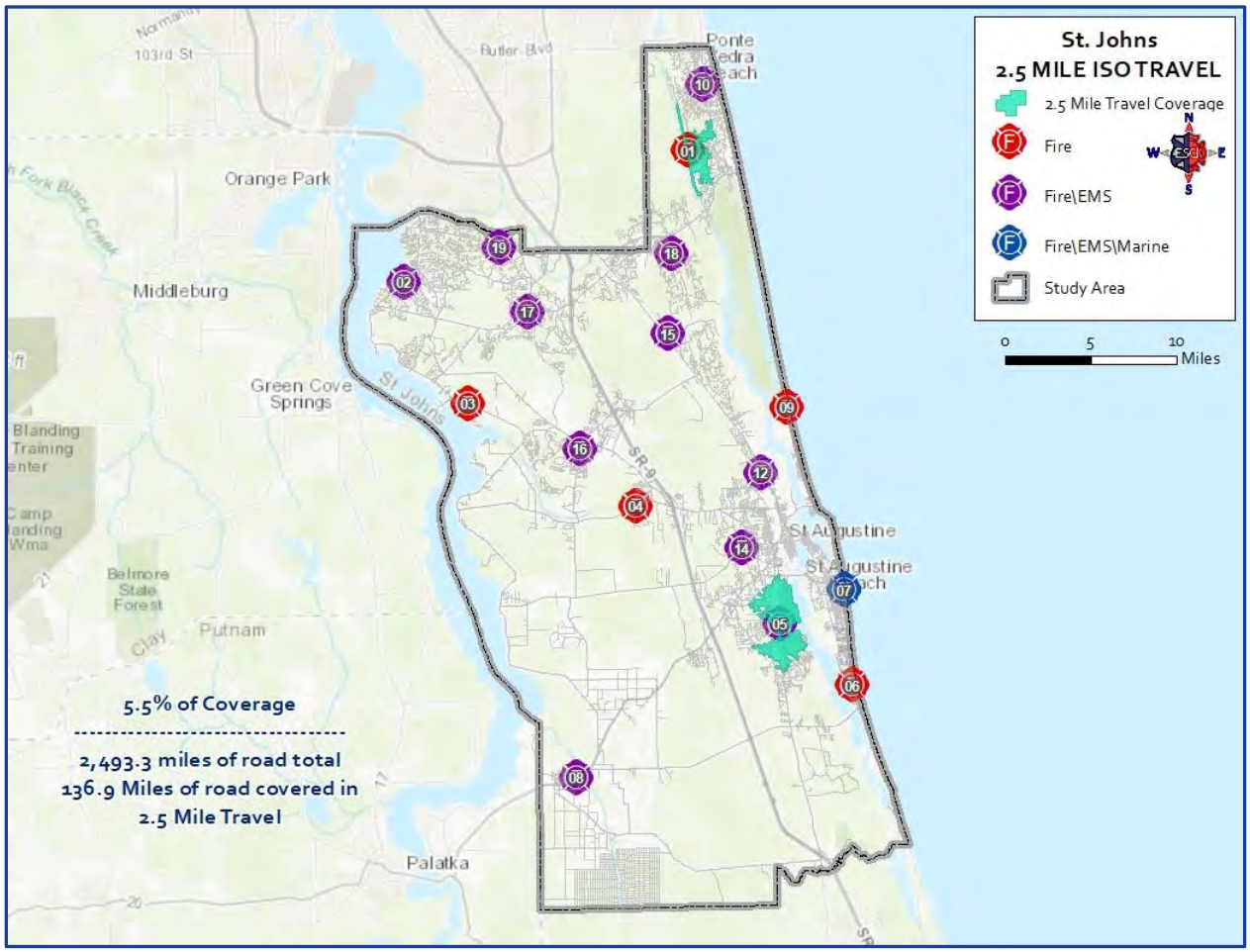
The first component of travel evaluated by ISO analyzes the percentage of the service area that falls within 1.5 miles of a staffed fire station. As illustrated in Figure 56, only 17.7% of the built-on service area falls within the 1.5-mile travel distance.

Figure 56: SJCFR 1.5-Mile Travel Distance per ISO Criteria



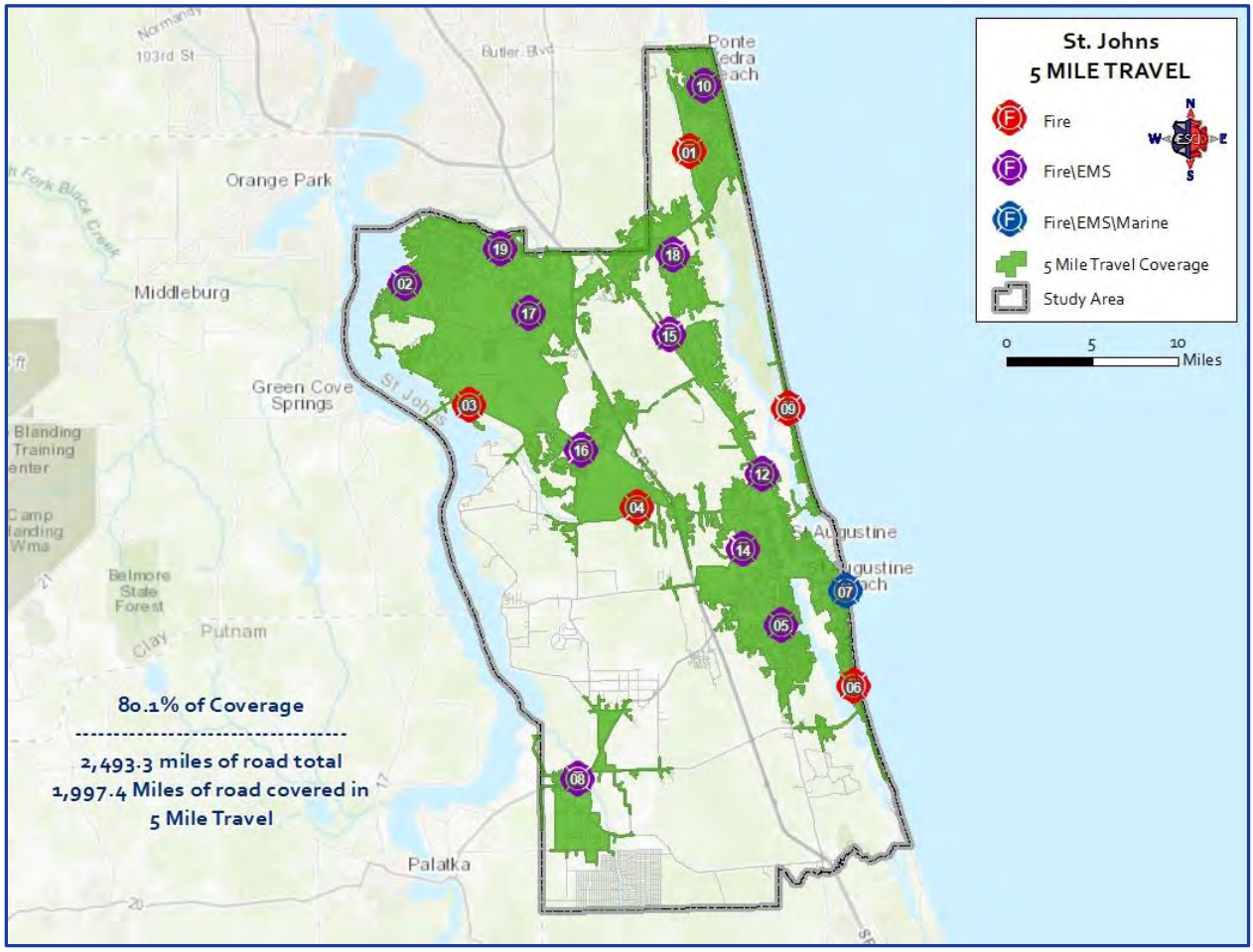
The second component of travel evaluated by ISO analyzes the percentage of service area that falls within 2.5 miles of an aerial apparatus. As Figure 57 illustrates, only 5.5% of the build-on service area falls within the 2.5-mile travel distance.

Figure 57: SJCFR 2.5-Mile Travel Distance per ISO Criteria



The final component of travel evaluated by ISO is the percentage of the service area that falls within 5 miles of a fire station. Figure 58 shows that 80.1% of the service area falls within the 5-mile travel distance.

Figure 58: SJCFR 5-Mile Travel Distance per ISO Criteria

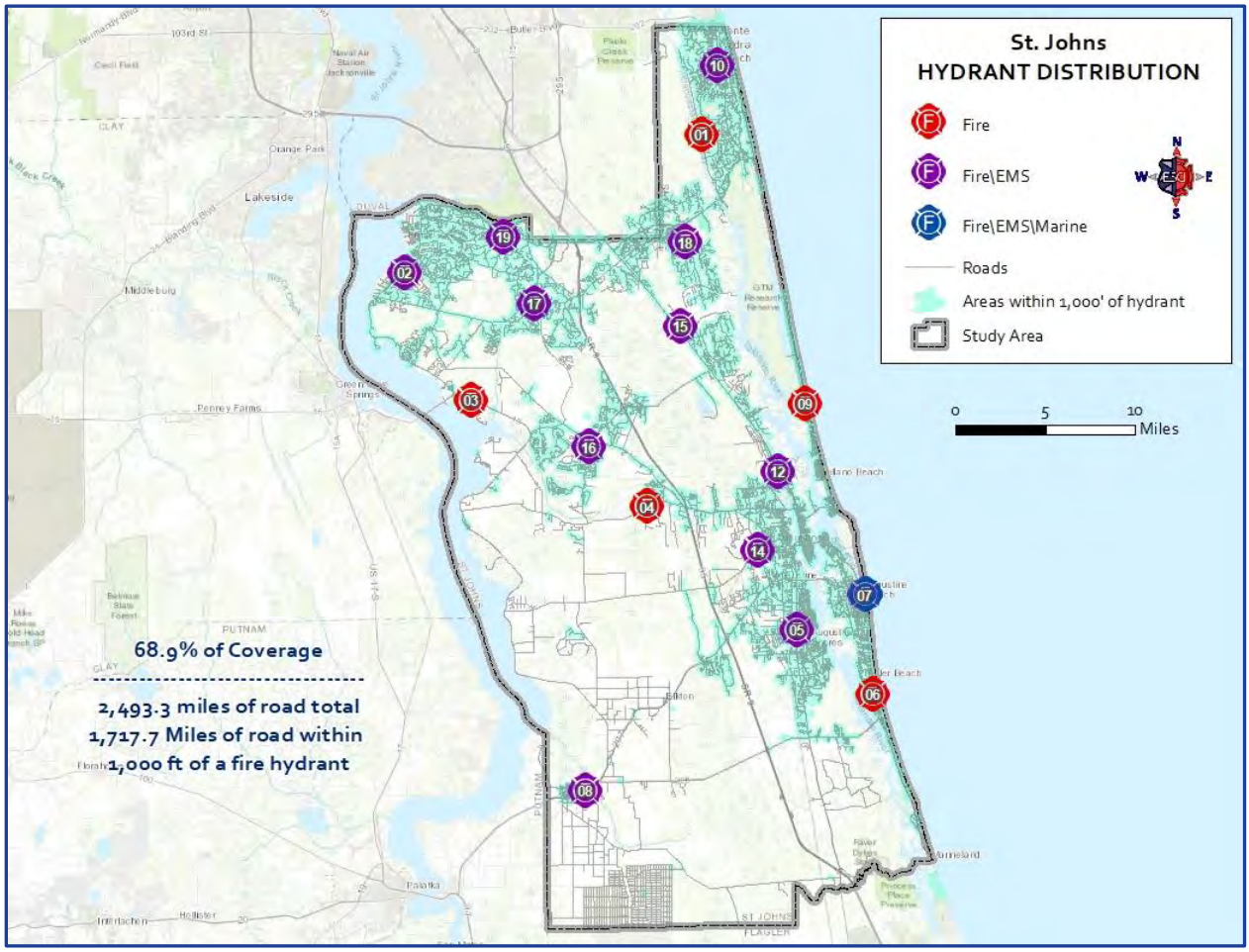


This analysis often initiates a discussion with many components. To meet this standard, SJCFR would have to add a significant number of stations and resources throughout the service area. While that would meet the distance measure, it is often cost-prohibitive to do so relative to improved values, and the risk profile and actual service demand density may not be sufficient to justify those resources. SJCFR should work closely with policymakers to determine the best balance towards meeting these measures versus the cost of increasing resources.

Water Supply Distribution

ISO also evaluates a community's availability of a sufficient water supply, which is critical for the extinguishment of fires. Included in this evaluation are 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. As Figure 59 shows, 68.9% of the service area falls within 1,000 feet of a fire hydrant. SJCFR should continue to create a balance between increasing hydrant coverage and the ability to provide sufficient mobile water supply to meet fire flow demands.

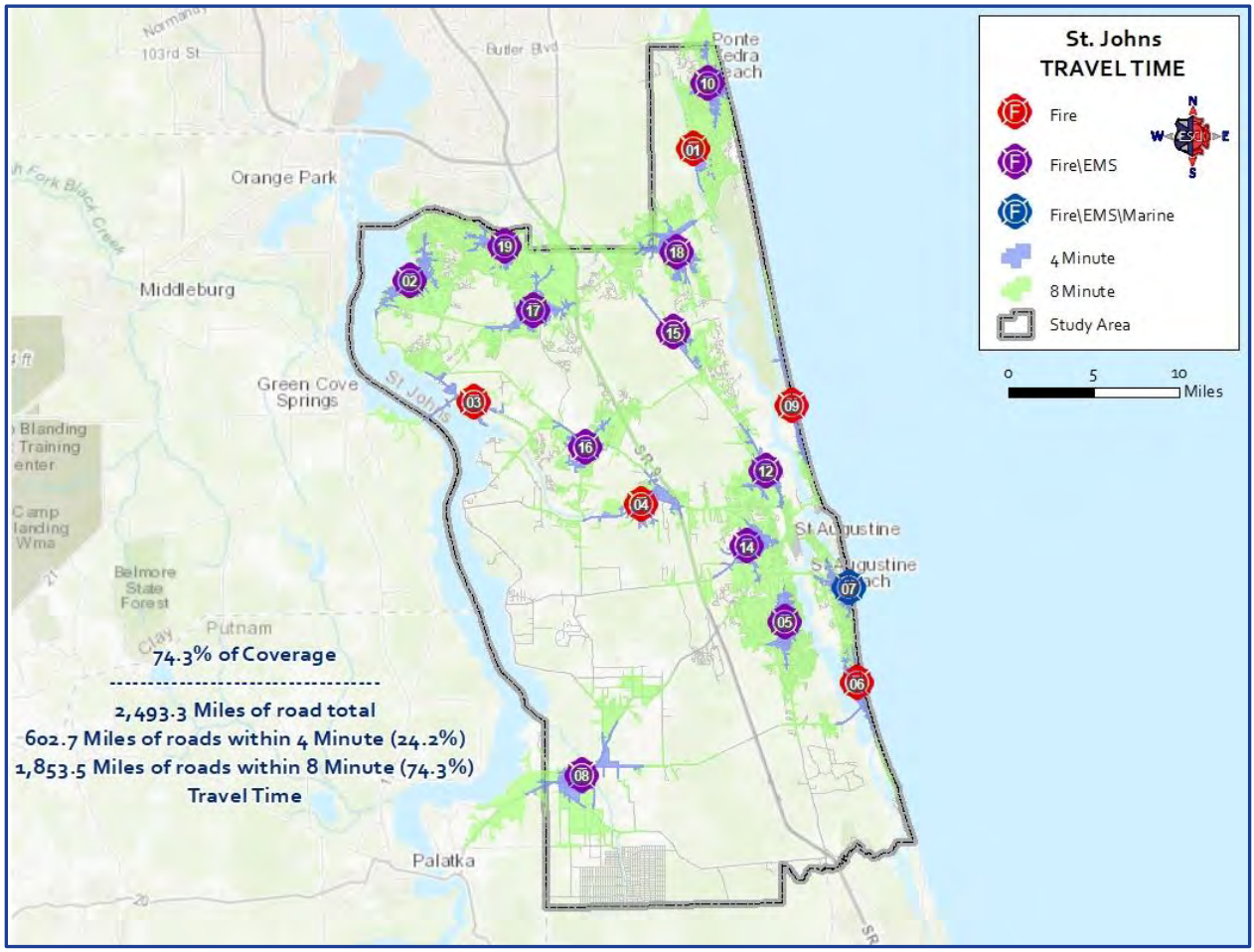
Figure 59: SJCFR Hydrant Coverage per ISO Criteria



NFPA Distribution

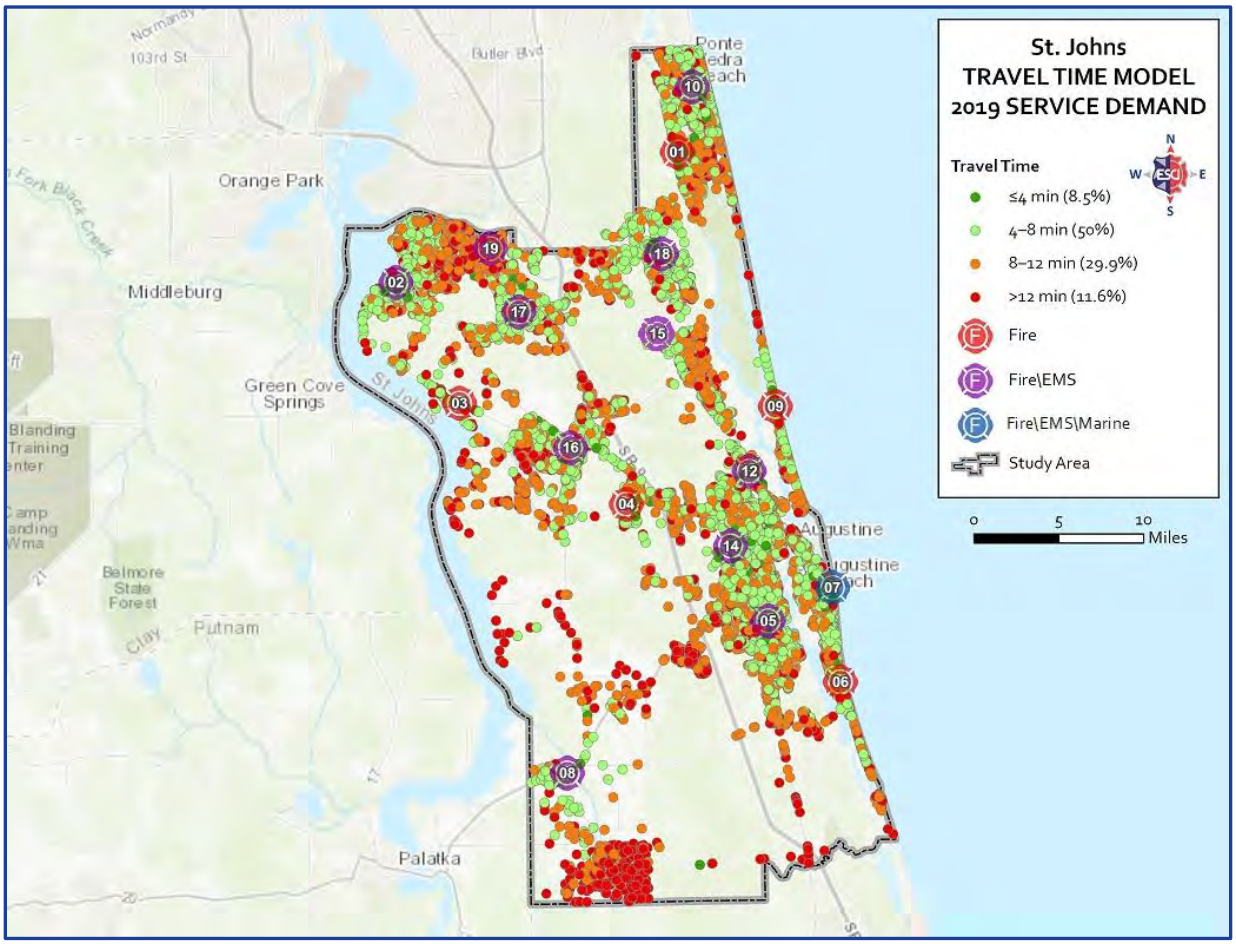
National Fire Protection Association (NFPA) standards and the Center for Public Safety Excellence (CPSE) accreditation of fire departments both evaluate response time criteria to analyze resource distribution. For low/medium hazard incidents, the first unit should arrive within 4 minutes, and the full assignment should arrive within 8 minutes. Travel time is calculated using the posted speed limit and adjusted for negotiating turns, intersections, and one-way streets. Figure 60 illustrates that 24.2% of the service area is within 4 minutes, and 74.3% is within 8 minutes travel time. As previously discussed, SJCFR should work with policymakers to determine what additional resources are most appropriate for their community. This is a balance between the cost of additional resources to meet this standard versus the necessity of those resources to effectively manage actual workload and service demand.

Figure 60: SJCFR 4-Minute/8-Minute Travel Time per NFPA Criteria



While the prior figure illustrates the projected travel time, Figure 61 illustrates the actual travel time for incidents that occurred in 2019—8.5% were under 4 minutes, 50% were between 4–8 minutes, 29.9% were between 8–12 minutes, and 11.6% were greater than 12 minutes.

Figure 61: SJCFR Actual Travel Time, 2019



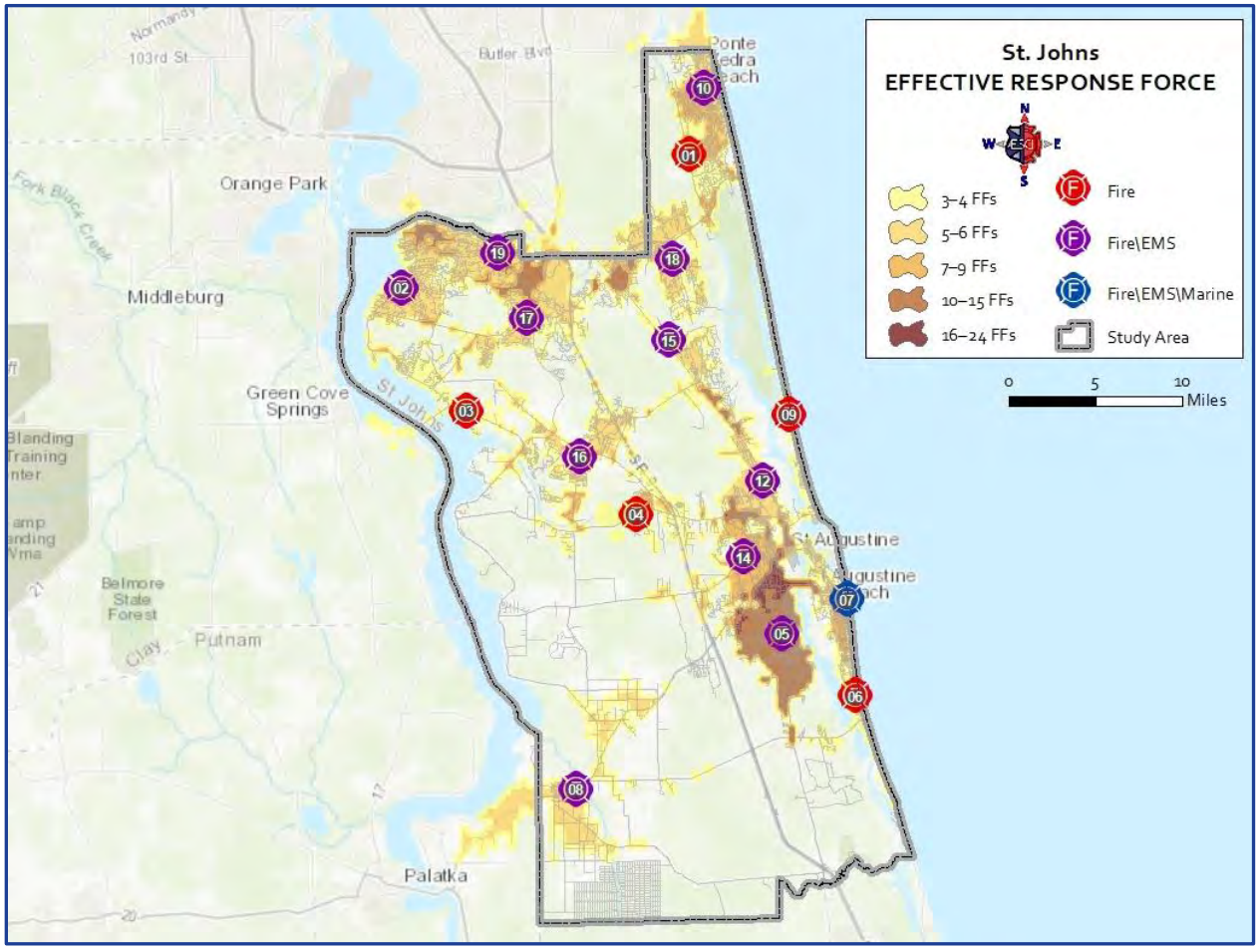
Resource Concentration Study

Accepted firefighting procedures call for the arrival of the entire initial assignment (sufficient apparatus and personnel to effectively deal with an emergency based on its level of risk) within a reasonable amount of time.[19] This ensures that enough people and equipment arrive soon enough to safely control a fire or mitigate any emergency before there is substantial damage or injury.

[19] 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 the Commission on Fire Accreditation (CFAI) Standards of Cover, 6th Edition.

The effective response force for the SJCFR service area is illustrated in Figure 62. This represents only personnel from SJCFR and does not include resources responding from their automatic aid and mutual aid agencies. Using this methodology, SJCFR can assemble 3–4 firefighters within 7.9% of the service area, 5–6 firefighters within 31.3% of the service area, 7–9 firefighters within 10.9% of the service area, 10–15 firefighters within 12.1% of the service area, and 16–24 firefighters within 1.5% of the service area in the requisite time frame. This means that for a significant portion of the service area, SJCFR may encounter difficulty in assembling the recommended effective response force within eight minutes for a single-family residential structure fire. For larger structures involved in a fire, SJCFR may need to rely on automatic aid and mutual aid agencies for the additional personnel. Or, additional SJCFR personnel may arrive outside of the eight-minute response time. As SJCFR continues to add additional resources into the system, there will be an improvement in its ability to assemble sufficient personnel. This may be through additional units within existing stations or the addition of new stations.

Figure 62: SJCFR Predicted Effective Response Force in Eight Minutes



Response Reliability Study

While the geography of a service area, location of resources, and similar factors have a measurable impact on the ability to provide service, two other key components also impact this ability—workload and call concurrency. Workload analysis evaluates the amount of work each response unit incurs within a specific time period, and call concurrency analysis evaluates the number of incidents occurring at the same time within the service area.

Unit Hour Utilization

When analyzing workload, there are two primary methods—the number of incidents per unit or the amount of time each unit is committed. Since some incidents may take minutes and others may take hours, the evaluation by number of incidents does not have as much value as the second method. In contrast, the measure of time on task spent by each unit provides a more accurate representation of workload and is referred to as unit hour utilization.

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 its department's EMS workload.[20] As a result of the study, Henrico County Division of Fire developed a general commitment factor scale for its department. Figure 63 is a summary of the findings as it relates to commitment factors.

Figure 63: Commitment Factors as Developed by Henrico County (VA) Division of Fire, 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—the 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.

[20] *How Busy Is Busy?; Retrieved from https://www.fireengineering.com/articles/print/volume-169/issue-5/departments/fireems/how-busy-is-busy.html*

Figure 64, Figure 65, and Figure 66 illustrate the UHU for SJCFR units from 2017 to 2019, expressed as a percentage of the total hours in the year.

Figure 64: SJCFR Engine UHU, 2017–2019

Unit	2017	2018	2019	Percentage of Change
E02	8.07%	7.74%	8.84%	9.58%
E03	3.79%	3.55%	4.11%	8.52%
E06	0.48%	0.54%	3.57%	642.49%
E07	6.79%	6.65%	7.15%	5.32%
E08	7.55%	8.16%	7.95%	5.22%
E09	3.16%	3.22%	3.32%	4.83%
E10	7.90%	7.71%	8.18%	3.59%
E12	7.69%	8.62%	8.28%	7.61%
E14	10.23%	12.20%	12.42%	21.42%
E15	4.80%	5.52%	7.07%	47.27%
E16	7.95%	9.17%	10.26%	29.11%
E18	5.22%	5.60%	6.85%	31.10%

Figure 65: SJCFR Ladder/Squad UHU, 2017–2019

Unit	2017	2018	2019	Percentage of Change
LAD01	5.04%	7.24%	7.70%	52.85%
LAD05	N/A	N/A	3.92%	N/A
SQD04	6.72%	7.11%	7.62%	13.44%
SQD05	10.08%	9.33%	10.09%	0.07%
SQD17	6.51%	7.19%	7.60%	16.75%
Ladder 05 in service 6/2019.				

Figure 66: SJCFR Rescue UHU, 2017–2019

Unit	2017	2018	2019	Percentage of Change
R02	9.25%	9.15%	9.65%	4.25%
R05	9.60%	11.15%	11.89%	23.87%
R07	10.60%	12.65%	12.43%	17.30%
R08	5.40%	5.95%	5.90%	9.26%
R10	14.13%	12.78%	12.46%	-11.78%
R12	12.30%	14.57%	15.17%	23.36%
R14	10.75%	12.77%	12.57%	16.86%
R15	N/A	1.49%	7.14%	N/A
R16	10.52%	11.62%	11.37%	8.05%
R17	10.40%	11.41%	10.33%	-0.70%
R18	4.04%	6.15%	8.44%	108.97%
R41	11.01%	14.21%	13.94%	26.66%
R51	N/A	N/A	5.39%	N/A

R15 in service 10/2018. R51 in service 6/2019.

As illustrated in the preceding figures, none of the units are experiencing a workload that is concerning. However, SJCFR should determine its own performance measure levels and continue to monitor as multiple units are experiencing a steady annual increase in workload. As this continues, if no additional resources are added to the system, then the workload for some units may become concerning.

Call Concurrency

Another analysis that provides information for determining the response reliability is call concurrency. Call concurrency refers to the number of incidents occurring simultaneously, which decreases the number of units available to respond to additional calls for service. While there is no specific standard, each agency should monitor this measure to determine appropriate levels of resources available within the service area prior to requesting resources from automatic aid and mutual aid agencies. Not only does call concurrency impact available resources, as the number of concurrent incidents increases, the ability to meet response time standards may decrease.

As illustrated in Figure 67, the majority of the time, SJCFR has sufficient resources to meet concurrent service demand. While nearly 100% of incidents fall within the 10 or fewer concurrent incident counts, 93% fall within five or fewer. On the surface, this is positive information but should be analyzed a little deeper. Analysis of the percentage of change of concurrent incidents reveals that two or fewer incidents have decreased by 17%–45% while at the same time, four to seven concurrent incidents have increased by 21%–82%. SJCFR should continue to monitor this and include this data as part of planning for resource needs in the future.

Figure 67: SJCFR Call Concurrency, 2017–2019

Count of Concurrent Incidents	2017	2018	2019	Percentage of Change
0	0.11%	0.07%	0.06%	-45.45%
1	19.10%	15.29%	13.26%	-30.58%
2	28.23%	25.02%	23.36%	-17.25%
3	24.41%	24.72%	24.43%	0.08%
4	15.68%	17.30%	19.09%	21.75%
5	7.60%	9.97%	11.20%	47.37%
6	3.20%	4.83%	5.39%	68.44%
7	1.16%	1.91%	2.11%	81.90%
8	0.34%	0.65%	0.75%	120.59%
9	0.12%	0.16%	0.26%	116.67%
10	0.03%	0.06%	0.08%	166.67%
11	0.03%	0.03%	0.01%	-66.67%
12	0.01%	0.00%	0.00%	-100.00%

Response Performance

Perhaps the most publicly visible component of an emergency services delivery system is response performance. Policymakers and citizens want to know how quickly they can expect to receive emergency services. For policymakers and citizens to make informed decisions concerning response performance, jurisdictions must record and report the various components of its current performance.

ESCI generates percentile measurements to analyze an agency's response performance. The use of percentile measurements using the components of response time follows the recommendations of industry best practices. The best practices are derived by the Center for Public Safety Excellence (CPSE), Standard of Cover document, and the National Fire Protection Association (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*.

The "average" measure is commonly used as a descriptive statistic and is also called the mean of a data set. The most important reason for not using the average for performance standards is that it 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.

The "median" measure is another acceptable method of analyzing performance. This method identifies the value at the middle of a data set and thus tends not to be strongly influenced by data outliers.

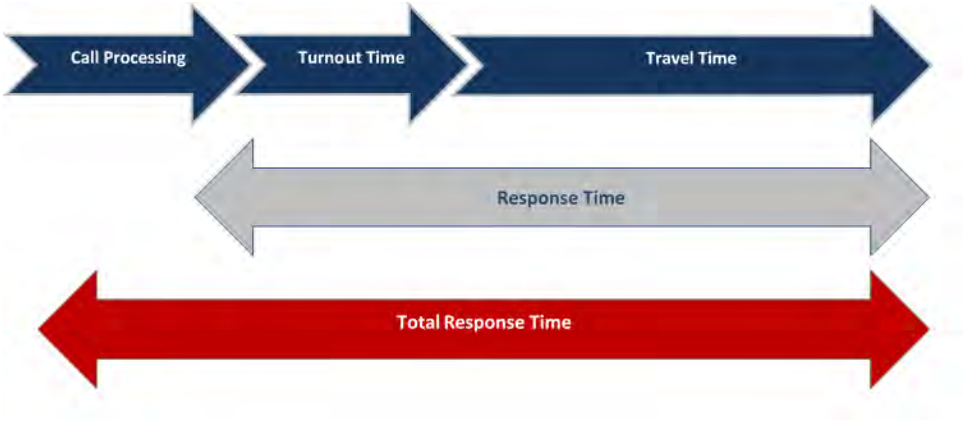
Percentile measurements are a better measure of performance because they show that most of the data set has achieved a particular level of performance. The 90th percentile means that 10% of the values are greater than the value stated, and all other data are at or below this level. This can be compared to the desired performance objective to determine the degree of success in achieving the goal.

As this report progresses through the performance analysis, it is important to keep in mind that each component of response performance is not cumulative. Each is analyzed as an individual component, and the point at which the fractile percentile is calculated exists in a set of data unto itself.

The *response time continuum*—the time between when the caller dials 911 and when assistance arrives—is comprised of several components:

- ***Call Processing Time*:** The time between a dispatcher receiving the call and the resources being dispatched.
- ***Turnout Time*:** The time between unit notification of the incident and when it is responding.
- ***Travel Time*:** The time the responding unit spends on the road to the incident.
- ***Response Time*:** A combination of turnout time and travel time, the most commonly used measure of fire department response performance.
- ***Total Response Time*:** The time from when the 911 call is answered until the dispatched unit arrives on the scene.

Figure 68: Response Time Continuum



Total response time is the amount of time a resident or business waits for resources to arrive at the scene of an emergency beginning when they first placed a 911 call. This process begins for the fire department once the appropriate unit is dispatched by the communications center. The NFPA standard for alarm handling and call processing is derived from NFPA 1221: *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems* and provides for communication centers to have alarm handling time of not more than 15 seconds, 90% of the time and not more than 20 seconds, 95% of the time. Additionally, NFPA 1221 requires the processing of the call to occur within 64 seconds, 90% of the time for high-priority incidents. Similarly, NFPA 1710 requires the call processing time to be 60 seconds or less, 90% of the time, as does ISO. Figure 69 is a summary of NFPA 1710.

Figure 69: NFPA 1710 Standards for Fire/EMS Responses

Response Interval	NFPA 1710
Call Processing	60 seconds or less at 90%
Turnout Time	60 seconds or less at 90%
Travel Time	240 seconds

Tracking the individual components of response time enables jurisdictions to identify deficiencies and areas for improvement. In addition, knowledge of current performance for the components described is an essential element of developing response goals and standards that are relevant and achievable. Fire service best practice documents recommend that fire jurisdictions monitor and report the components of total response time.[21]

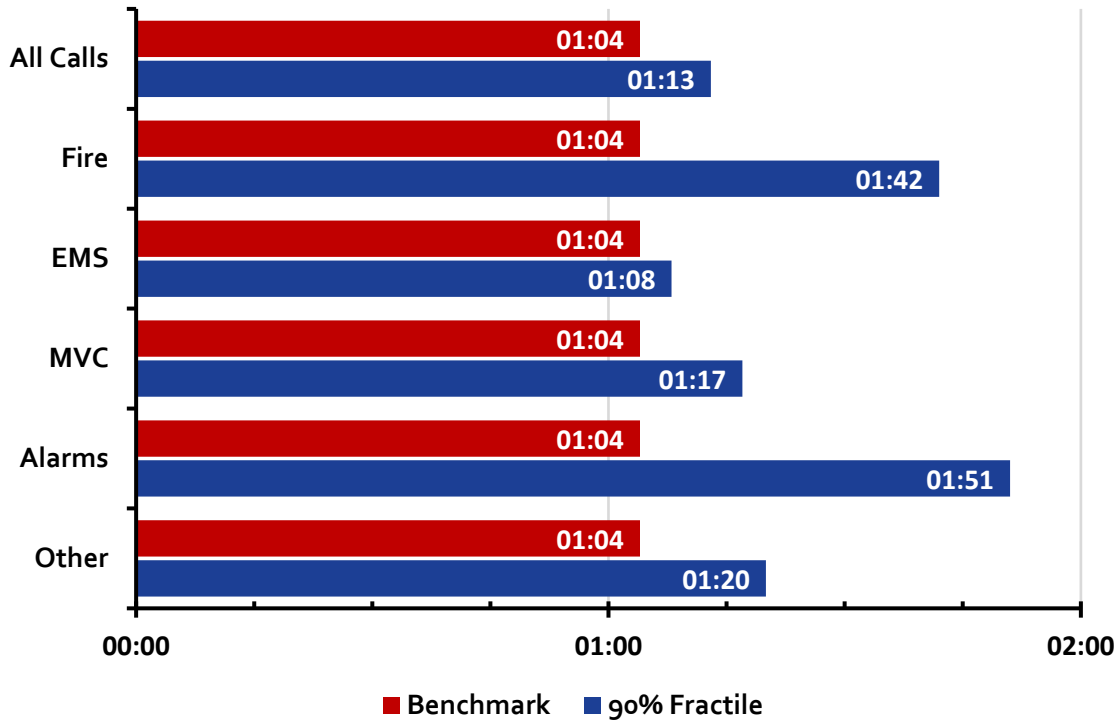
[21] *NFPA 1710: Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments, Center for Public Safety Excellence Community Risk Assessment: Standards of Cover, 6th Edition.*

ESCI worked closely with SJCFR staff to evaluate these components utilizing the data that was recorded in the NFIRS system. While the following sections illustrate the findings based on that data, it appears that there may be some data inaccuracies. Rather than timestamps in the NFIRS software being populated automatically from the computer-aided dispatch (CAD) software, these are entered manually by firefighters. SJCFR is in the process of migrating its CAD software to Motorola Premier One CAD, which will provide a more robust ability to monitor and report system performance. ESCI recommends that as part of this migration, SJCFR work with the vendors to install an interface between the CAD and the NFIRS software to transfer timestamps automatically. This type of interface will decrease inaccuracy in data entry and provide for better system monitoring.

Call Processing Performance

SJCFR operates its dispatch center, which is a secondary public safety answering point for the community. As illustrated in Figure 70, the overall call processing time performance for SJCFR is 1 minute, 13 seconds, which is 9 seconds over the expected performance. When evaluated by incident time, performance ranged from 1 minute, 8 seconds for emergency medical incidents to 1 minute, 51 seconds for alarm incidents. Based on this analysis, SJCFR should work with internal leadership over its communications center to develop a plan to improve call processing time. SJCFR should monitor this performance measure regularly to measure the goals as part of that plan and then in the long term to ensure they are maintaining compliance.

Figure 70: SJCFR Call Processing Time Performance, 2017–2019

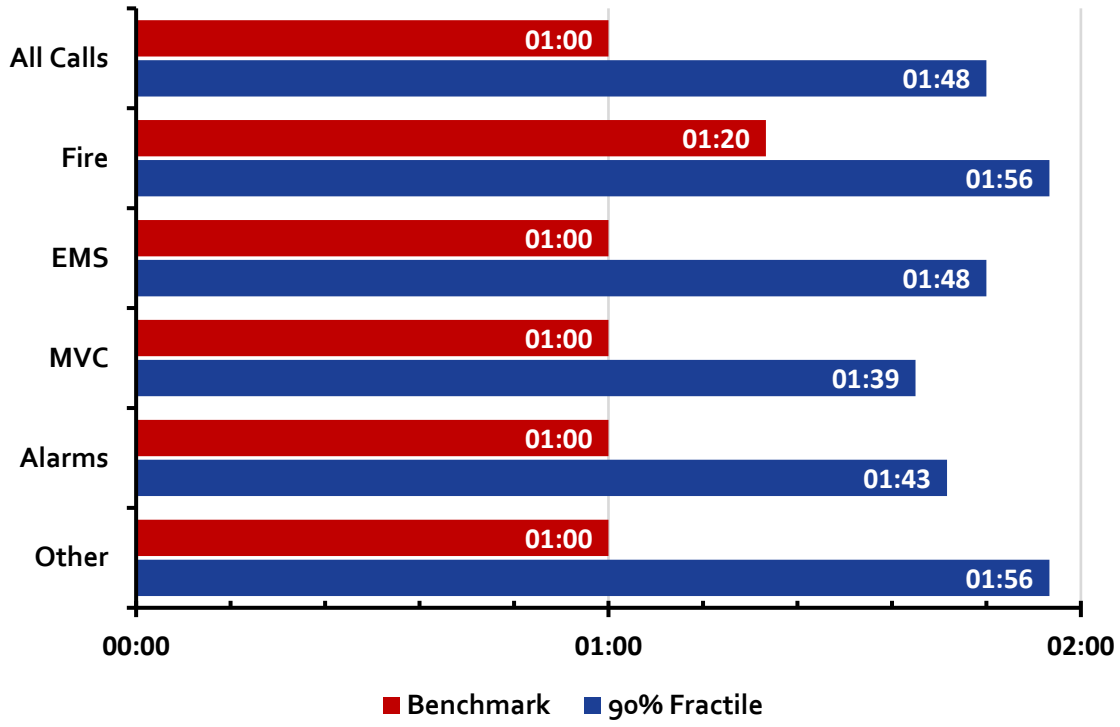


Turnout Time Performance

The second component evaluated was turnout time. Turnout time is comprised of the overall length of time it takes for personnel to receive the dispatch information, move to the appropriate response apparatus, and begin responding. NFPA 1710 specifies that turnout time performance should be less than 60 seconds (01:00), measured at the 90th percentile for incidents other than fire and special operations. For those incidents, turnout time performance should be 1 minute, 20 seconds (01:20). As illustrated in Figure 71, the overall turnout time performance for SJCFR is 1 minute, 48 seconds, which is 48 seconds over the expected performance. When evaluated by incident time, performance ranged from 1 minute, 39 seconds for motor vehicle collision incidents to 1 minute, 56 seconds for fire and other incidents. SJCFR leadership should review the various factors involved within turnout time to determine how the department may improve performance. Evaluation of factors may include:

- Station design and layout, which may increase time for the crew to move from the office/living quarters to the apparatus bays.
- Communications/Notification systems issues that may negatively impact turnout time.
- Ensuring personnel understand the expected standard and monitoring for compliance.

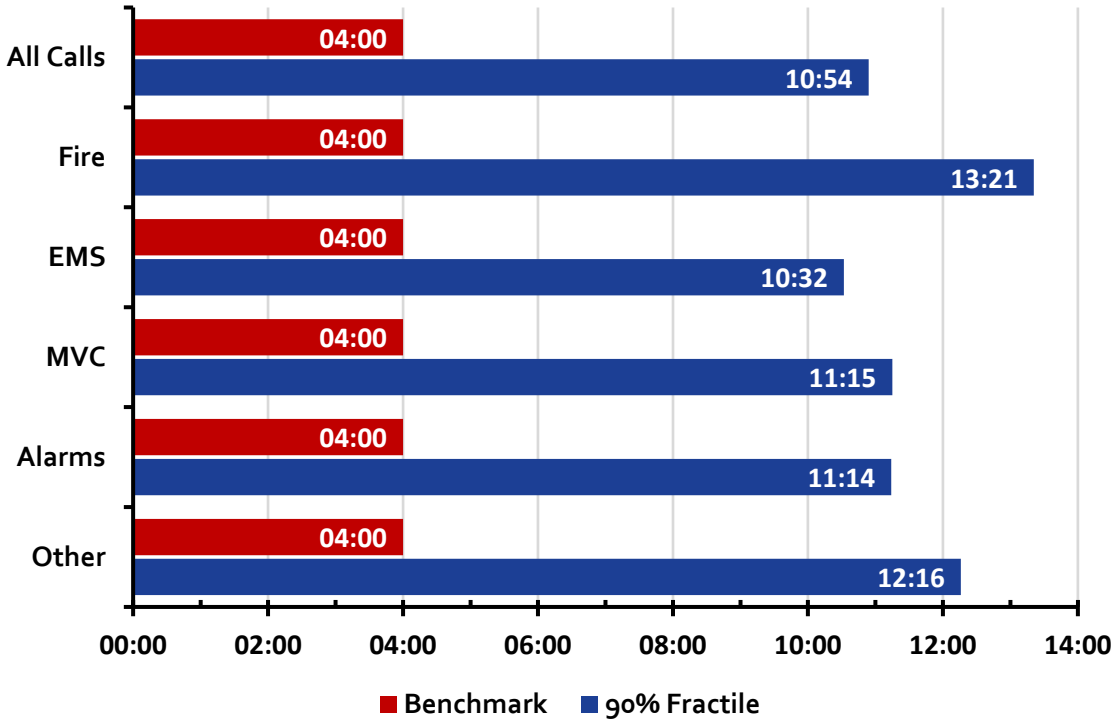
Figure 71: SJCFR Turnout Time Performance, 2017–2019



Travel Time Performance

The third component evaluated is travel time performance. Often, this component is the longest portion of total response time due to the distance from the fire station to the location of the emergency incident. It is also impacted by traffic, weather, and other factors. Figure 72 shows that the overall response time performance for SJCFR is 10 minutes, 54 seconds, which is 6 minutes, 54 seconds over the expected performance. When evaluated by incident time, performance ranged from 10 minutes, 32 seconds for emergency medical incidents to 13 minutes, 21 seconds for fire incidents. While overall performance is well outside of the expected standard, departments may often encounter difficulty meeting that standard without adding additional stations and/or staffed response units within their system. Realistically, a significant improvement to this measure might only be achieved through additional resources being placed within the community as travel time is dependent on distance to the incident. Further discussion on resource placement can be found in the *Recommendations* section of this report.

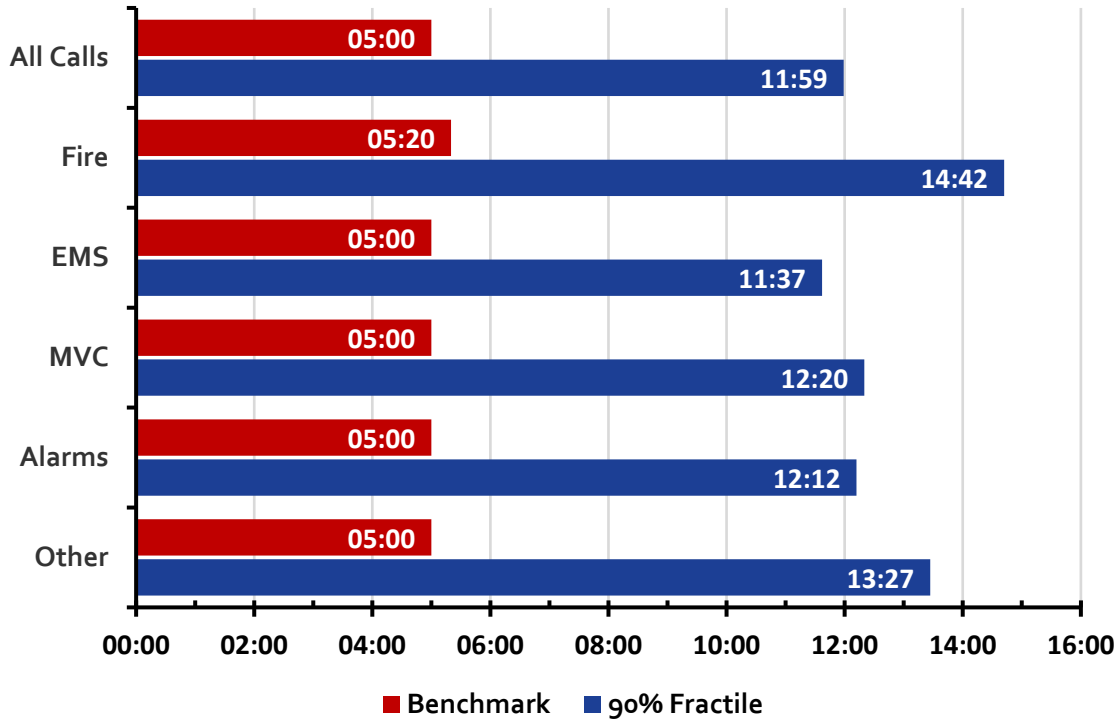
Figure 72: SJCFR Travel Time Performance, 2017–2019



Response Time Performance

The fourth component evaluated combines turnout time with travel time and is referred to as response time. This measure evaluates the length of time from notification by dispatch until arrival at the emergency incident. For many communities and departments, this is the most often tracked and reported response time performance measure. Figure 73 illustrates that the overall response time performance for SJCFR is 11 minutes, 59 seconds, which is nearly 7 minutes over the expected performance. When evaluated by incident time, performance ranged from 11 minutes, 37 seconds for emergency medical incidents to 14 minutes, 42 seconds for fire incidents. As this is impacted by both turnout time and travel time, improvement for this measure would occur as improvements are made as identified in those areas.

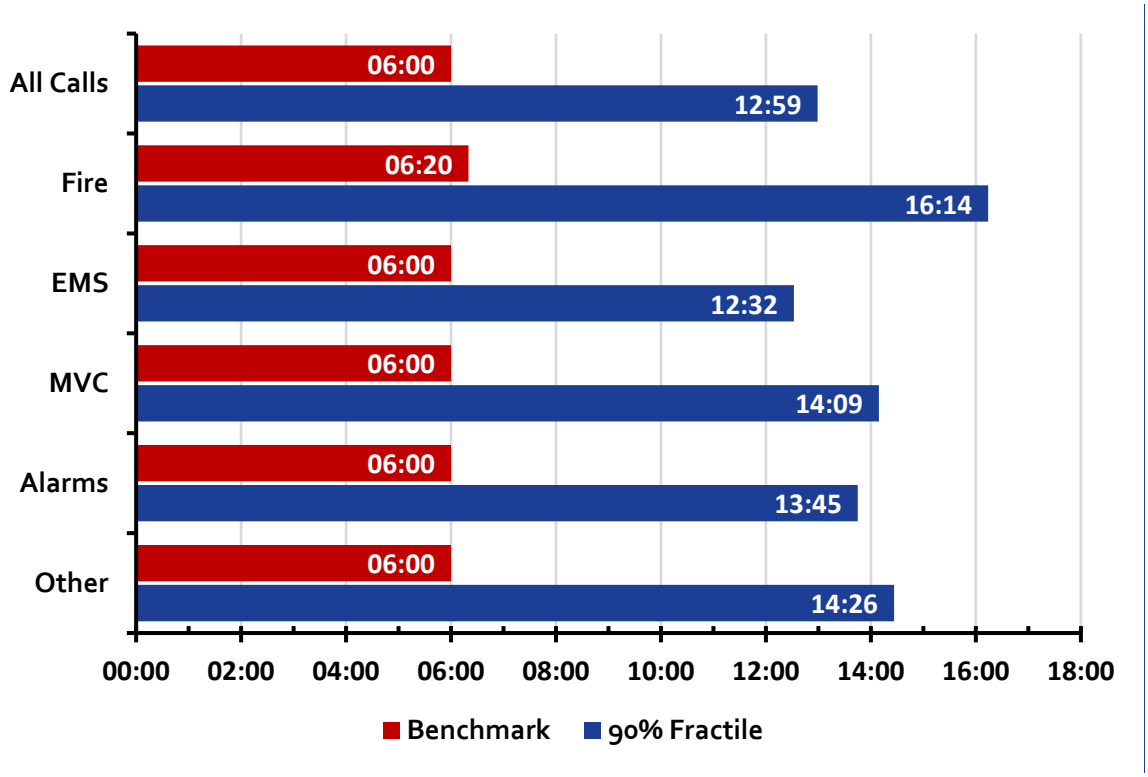
Figure 73: SJCFR Response Time Performance, 2017–2019



Total Response Time Performance

The final component evaluated provides a measure of the time from receipt of the 911 call until arrival at the emergency incident. As illustrated in Figure 74, the overall total response time performance for SJCFR is 12 minutes, 59 seconds, which is 6 minutes, 59 seconds over the expected performance. When evaluated by incident time, performance ranged from 12 minutes, 32 seconds for emergency medical incidents to 16 minutes, 14 seconds for fire incidents. Improvement in call processing performance, turnout time, and travel time will all have a positive impact on this measure as well.

Figure 74: SJCFR Total Response Time Performance, 2017–2019

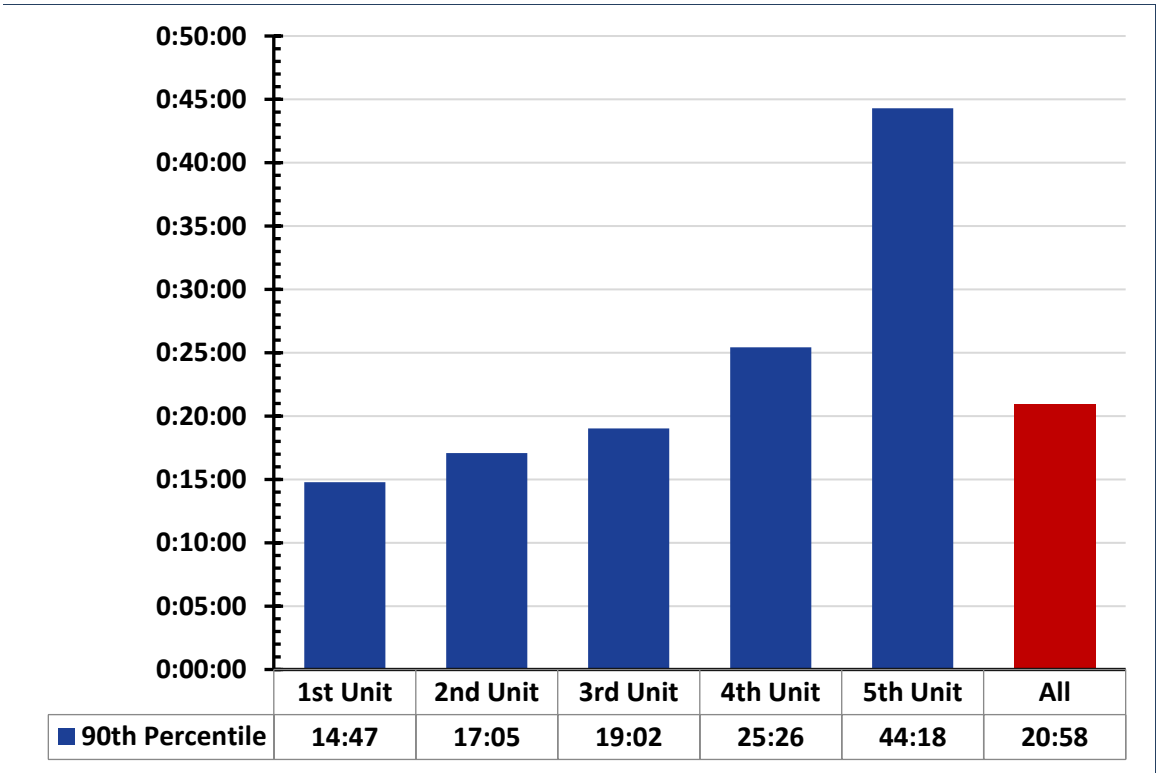


Response Time Performance for Structure Fires

Response performance for the order of arrival of the first five units arriving at structure fires was analyzed for incidents occurring between 2017 and 2019. For this analysis, only fires with an initial NFIRS coding of building or structure fire listed in the data were included. Additionally, only fire suppression units were used—Command Officers and supplemental units were not included.

To be measured, the unit had to have an on-scene timestamp. The measurement used was the response time—turnout plus travel, meaning the time from the verbal until arrival on the scene. Figure 75 depicts the results of this analysis.

Figure 75: SJCFR Structure Fire Order of Arrival, 2017–2019



	1st Unit	2nd Unit	3rd Unit	4th Unit	5th Unit	All
90th Percentile	14:47	17:05	19:02	25:26	44:18	20:58

The first unit arrived within 14 minutes, 47 seconds after notification. The fifth unit arrived at 44 minutes, 18 seconds. The overall performance for structural fires in the study area was 20 minutes, 58 seconds. These results indicate the assembly of an effective response force is delayed based on current performance and deployment. As noted in the *Recommendations* section of this report, this should be a consideration for future station locations.

Mutual and Automatic Aid Systems

Agencies often enter into agreements that are of benefit to their community and the surrounding communities. These provide circumstances where units and personnel from other agencies respond into the jurisdiction to assist in providing needed resources to mitigate a given incident. The two types of agreements are mutual aid and automatic aid, both of which are an integral part of emergency operations. Mutual aid agreements generally include the provision of units and resources only when requested by the incident commander from the agency receiving mutual aid. In contrast, automatic aid agreements provide units and resources through a predefined matrix, and the aid agency units and personnel are included in the initial dispatch to the incident concurrently with the requesting agency units and personnel.

Figure 76 lists the aid agreements for SJCFR.

Figure 76: SJCFR Automatic/Mutual Aid Agreements

Agency	Agreement Type
Putnam County Fire Rescue	Mutual Aid
Flagler County Fire Rescue	Automatic Aid
Clay County Fire Rescue	Mutual Aid
Jacksonville Fire Rescue (Includes Jacksonville Beach Fire Rescue)	Automatic Aid
St. Augustine Fire Department	Automatic Aid

Figure 77 illustrates the volume of aid given or received by SJCFR for 2014 through 2019. As illustrated, there is a much higher occurrence of aid received versus aid given.

Figure 77: SJCFR Aid Given/Received, 2014–2019

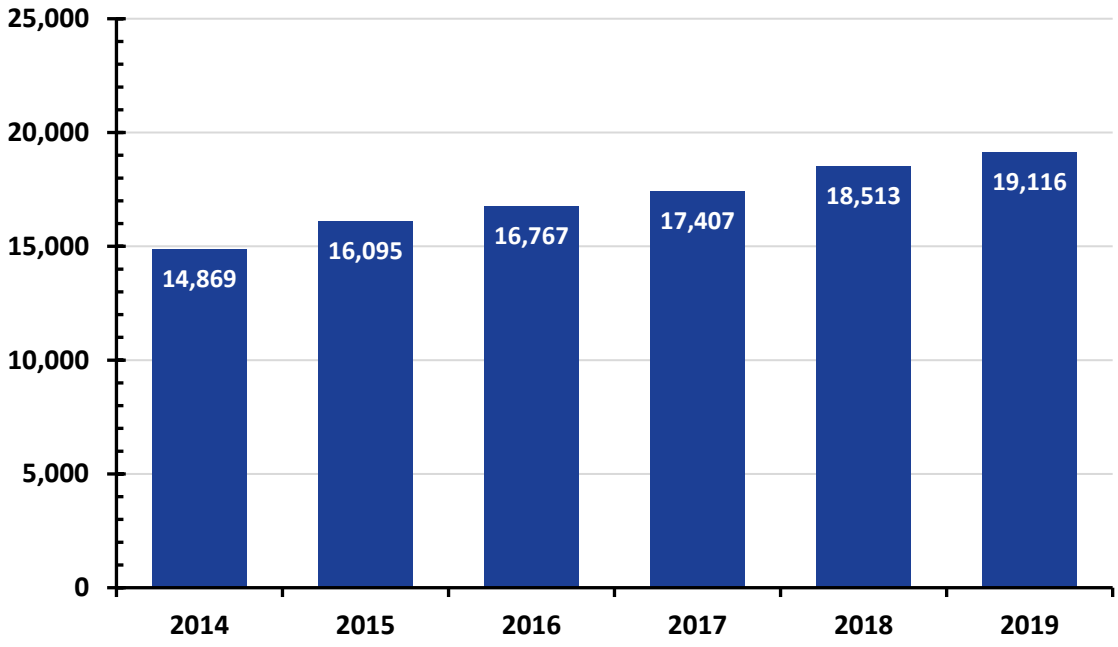
Description	2014	2015	2016	2017	2018	2019
Mutual Aid Given	93	80	71	93	77	67
Mutual Aid Received	2,719	2,960	3,119	3,133	3,168	3,126
Automatic Aid Given	1	1	4	4	1	6
Automatic Aid Received	48	78	46	59	47	65
Other Aid Given	125	89	75	73	80	77

Based on the number of agreements in place and the volume of aid received, SJCFR has been effective at leveraging the resources of its own department as well as those of neighboring agencies. This illustrates the forward-thinking of department leadership and community policymakers by sharing resources. This resource sharing decreases the overall cost to the citizens while providing a higher level of service.

Emergency Medical Services and Transport Analysis

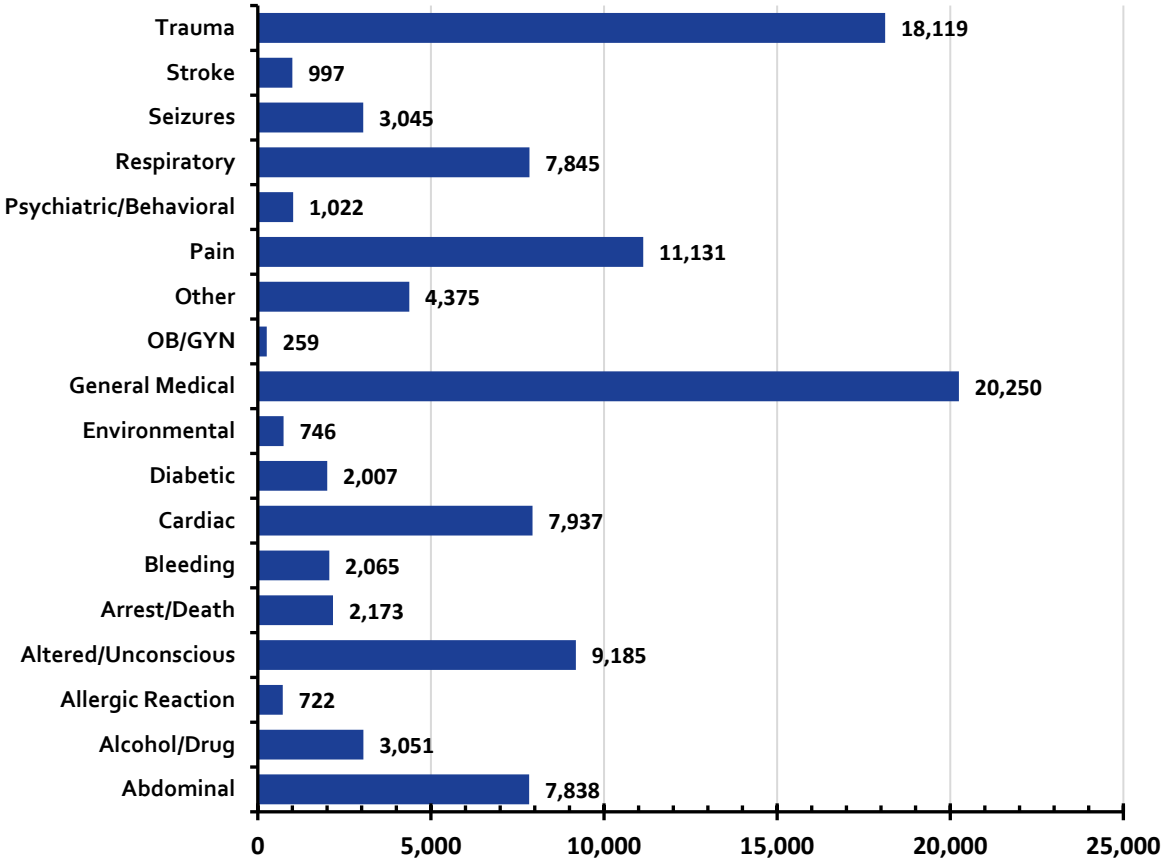
Emergency medical service incidents account for 66.4% of SJCFR service demand. With that being the greatest percentage of the main categories, it is important to evaluate that demand for service in greater depth. Figure 78 illustrates an increase in patient encounters where a primary impression was documented. Over the study period, there was an overall increase of 28.56%, with an average annual increase of 5.17%. This increase is slightly more than double the overall percentage of increase for all incidents at 13.1%, with an average annual increase of 4.3%. The greatest increase occurred from 2014 to 2015 at 8.25%. The lowest increase occurred from 2018 to 2019 at 3.26%. As the demand for services increases, the workload on those units responding will also increase. SJCFR should continue to monitor the demand increases and consider the need for additional resources over time. Consideration of resources should include the temporal components, types of incidents, and geographical location of incidents.

Figure 78: SJCFR Patient Encounters with Primary Impression, 2014–2019



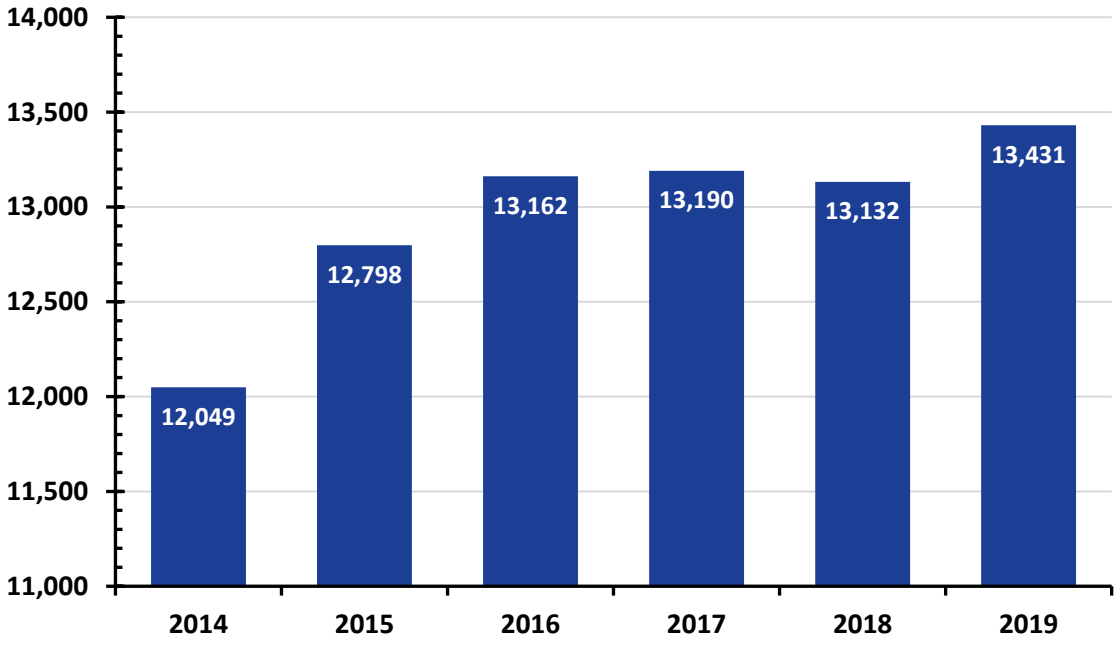
While the previous figure illustrates the overall change in service demand over the study period, Figure 79 illustrates the specific primary impression or call types compared to the whole. The five highest primary impression categories documented by the caregivers were general medical (19.70%), trauma (17.63%), pain (10.83%), altered mental status/unconscious (8.94%), and respiratory (7.63%). The five lowest primary impressions documented were obstetrical/gynecological (0.25%), allergic reaction (0.70%), environmental (0.73%), stroke (0.97%), and psychiatric/behavioral (0.99%).

Figure 79: SJCFR Incidents by Primary Impression, 2014–2019



As the demand for emergency medical services has increased, so has the number of patients transported by SJCFR. As illustrated in Figure 80, there was an overall increase of 11.47% over the study period with an average annual increase of 2.22%. The greatest increase occurred from 2014 to 2015 at 6.22%, and the lowest change occurred with a decrease of 0.44% from 2017 to 2018. Over the study period, 73.88% of all emergency medical responses resulted in the transport of a patient.

Figure 80: SJCFR Transported Patients, 2014–2019



Further analysis of patients transported compared to the available patient transport units provides a valuable view for leadership. Figure 81 illustrates the transport percentage by unit. R15, R26, and R51 had the lowest percentage of patients transported (0%).[22] R22 had the greatest percentage of patients transported (87%), and the remaining units ranged from 30% to 75%. This information provides leadership an ability to determine the types of resources to add to specific areas of the jurisdiction. For areas where transport percentages are higher, consideration should be given to adding additional transport resources (or relocating existing resources).

Figure 81: SJCFR Incident/Transport Comparison, 2014–2019

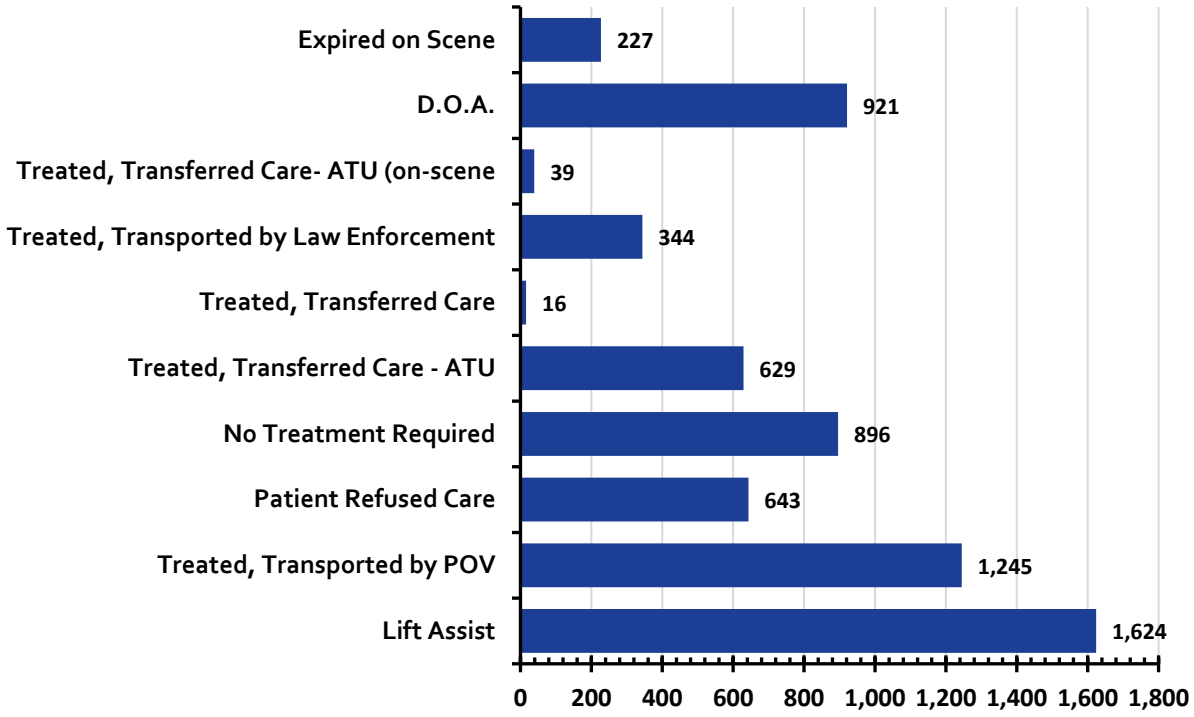
Unit[1]	EMS Incidents	Total Transports	% Transported
R01	439	331	75%
R02	6,014	2,791	46%
R05	11,433	5,939	52%
R07	10,345	5,198	50%
R08	4,798	2,368	49%
R10	8,461	4,085	48%
R11	8,372	4,520	54%
R12	10,813	5,412	50%
R14	12,893	7,215	56%
R15	986	1	0%
R16	7,438	3,617	49%
R17	6,269	3,056	49%
R18	3,794	1,377	36%
R20	137	102	74%
R21	5	2	40%
R22	15	13	87%
R23	28	16	57%
R25	19	12	63%
R26	20	0	0%
R41	6,275	1,856	30%
R51	909	0	0%

[1] R26 and R51 are spare units.

[22] *R26 and R52 are Spare Units.*

While 73.88% of all emergency medical responses resulted in the transport of a patient, Figure 82 illustrates the percentages for the remaining incident dispositions. Of the remaining dispositions, the highest two are patients who were treated and either refused transport or transport was not required.

Figure 82: SJCFR Non-Transport Dispositions, 2014–2019



The demand for emergency medical services is often greatly impacted by the age of those within the community. As illustrated in Figure 83, 52.63% of patients treated by SJCFR personnel were 60 years of age or older, although they only comprised 22.6% of the community in the 2010 Census. Department leadership should continue to track demographic trends in the population and how those trends impact the demand for services.

Figure 83: SJCFR Patients by Age, 2014–2019

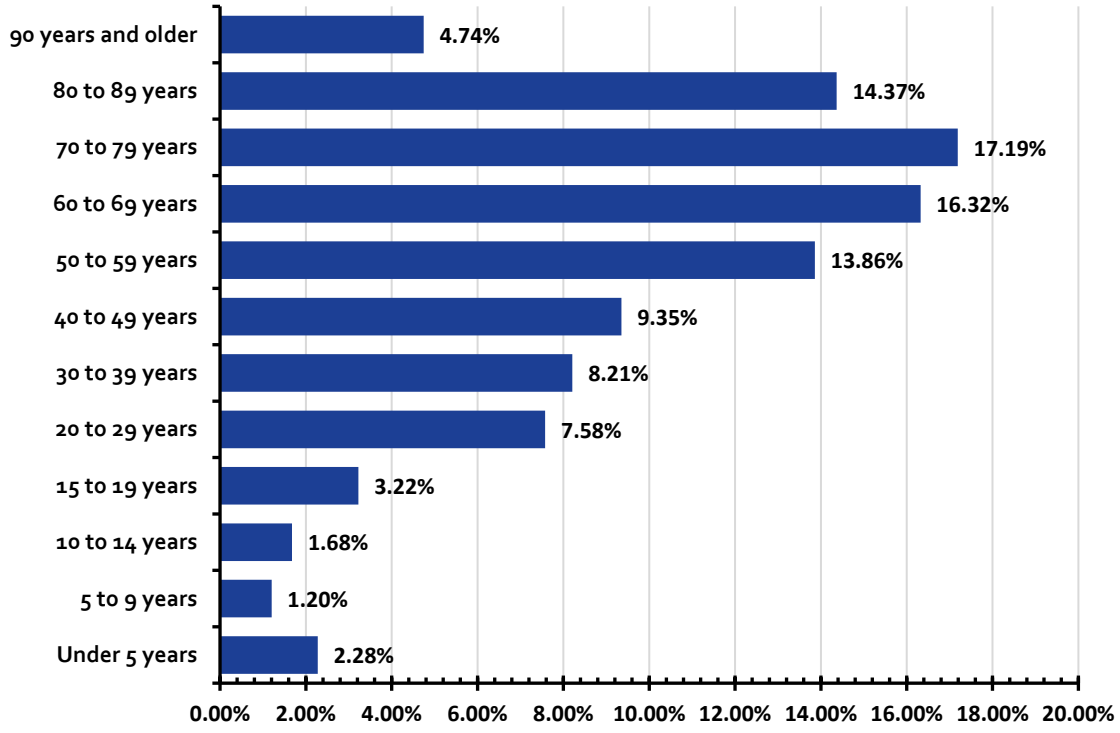
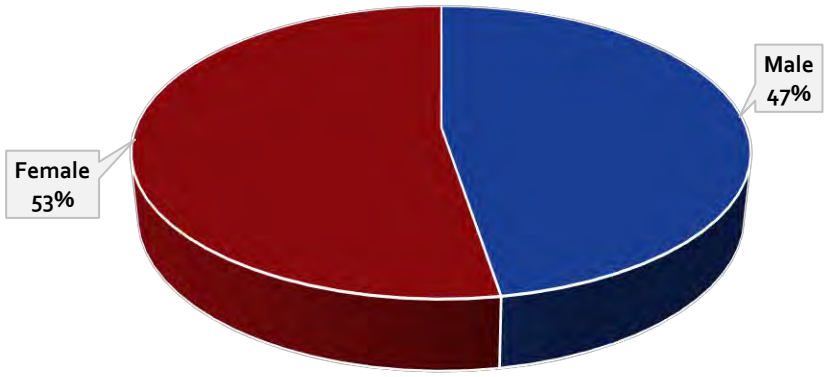


Figure 84: reveals that female patients had a greater demand for services than male patients. This is extremely close to the gender percentages of the community at large, with 51.4% female and 48.6% male during the 2010 Census.

Figure 84: SJCFR Patients by Gender, 2014–2019



PLANNING FOR FIRE PROTECTION AND EMERGENCY MEDICAL SERVICES

Fire and EMS organizations exist in a rapidly changing environment. Tools and methods used to provide service are constantly changing, increasing regulation of tasks and activities. There are new construction methods and risks to protect, and challenges that can quickly catch the unwary off guard. An organization must continuously monitor the internal and external fire protection and emergency medical services environment to stay ahead of these challenges. When change occurs, the organization must also make appropriate corrections to provide the required level of services.

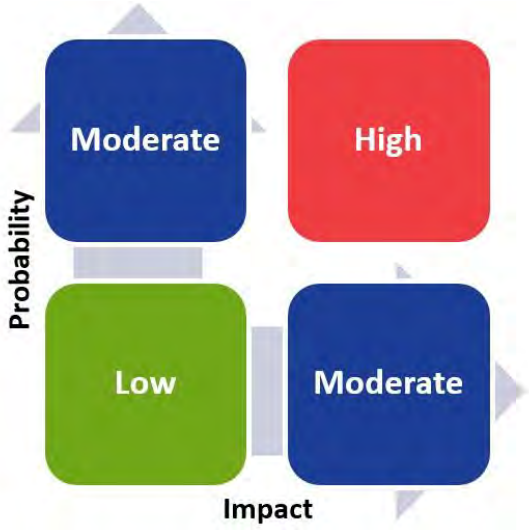
To do a better job with available resources, the organization must focus on improving services while identifying programs or activities that may no longer aid its changing needs or those of the community they serve. Through appropriate planning, a fire department can establish a vision for the future, create a framework within which decisions are made, and chart its course to the future. The quality and accuracy of the planning function determine the success of the organization.

The process of preparing for the future requires both discipline and organization. To be truly effective and efficient, an emergency services agency should consider planning on four distinct levels—tactical, operational, strategic, and master or long-range planning.

Tactical Planning

As emergency response agencies, fire departments must thoroughly understand their community's risks. These risks must be quantified. There are numerous risk/consequence or risk/probability matrices available, but regardless of the labels on the axes, they usually fall into one of the quadrants in Figure 85.

Figure 85: Risk (Impact/Probability) Matrix[23]



[23] *"Risk Impact/Probability Chart: Learning to Prioritize Risks." Risk Impact/Probability Chart. N.p., n.d. Web. 22 June 2016.*

As the risk is quantified generally into one of the four quadrants, a decision is made based on the level of risk. Communities cannot create a zero chance of a risk, which would indicate there is no risk in that community. Likewise, there cannot be 100% chance of a risk, since that would make it a certainty, not a risk. Every community must accept a certain level of risk, recognizing that it is improbable, impractical, and unaffordable to eliminate all risk in a community. Using a matrix helps fire department leaders determine approximately where the line is between an acceptable and unacceptable risk. The quadrants in the preceding figure may be defined as follows.

- Low impact/low probability—Risks in the bottom left corner are low level, with acceptable consequences if the incident occurs. These are considered **Low Risk,** which is often considered acceptable and requires no further action.

  Regardless of the impact level or probability of an incident, it is important to recognize that any incident can escalate, resulting in a greater impact on the overall community. SJCFR must still be prepared for these incidents and mitigate them in their early stages to reduce the potential for greater impact.
- Low impact/high probability—Risks in the top left corner are considered **Moderate Risk**—if the incident happens, the fire department can usually handle it with existing resources. However, effort should be given to reduce the likelihood that these incidents occur. This is where community risk reduction strategies pay significant dividends to a community.

  With EMS incidents accounting for approximately 66% of the service demand in St. Johns County, these incident types fall into the category of high probability. With a majority of these incidents resulting in a single patient contact, they also represent a low impact on the overall community. The risk of motor vehicle crashes (MVC) also represents a high probability for SJCFR due to the collection of major roadways, including Interstate 95, U.S. Highway 1, A-1-A, and Routes 13, 16, 206, and 207. While these incidents can cause major traffic issues, their durations are typically limited, presenting a low impact on the County. Finally, the vast amount of pristine shoreline within St. Johns County increases the number of tourists that visit on an annual basis and thus, places water rescue incidents within the high probability category. These incidents typically involve single patients causing a low overall impact on the community.
- High impact/low probability—Risks in the bottom right corner are significant if they do occur, but they are very unlikely to happen. Risks in this quadrant are referred to as **Moderate Risk** and are prime candidates for training and contingency planning. A fire department may spend time and energy preparing for such an incident and may even acquire specialized equipment and other non-staff resources to prepare for this risk. These risks also lend themselves well to community risk reduction strategies, such as public education, community engagement, and code enforcement.

Fire service organizations such as SJCFR have to be prepared for any and all types of incidents in which they could be called to mitigate. These days the list even includes items such as terrorism that could prove to have a significant impact on the entire community. While these events may have a low probability, the slightest risk requires substantial training and preparation. Another example of low probability events that could cause a significant impact in St. Johns County is tornadoes. While the County has only been impacted by a few between 1950 and 2015, the potential dangers of these events can be widespread and become more of a risk as population growth occurs.

While over 40% of fires responded to by SJCFR occurred in residential occupancies, the total amount of single-family residences versus high-rise structures (3 stories or greater, 35 feet or greater in height) places high-rise structures in a low probability quadrant. However, the size of these structures and the number of potential occupants present a significant risk and a high potential impact on the County and its resources. A prime example of this within St. Johns County would be the 9-story World Golf Village Renaissance St. Augustine Resort. At greater than 110 feet, SJCFR must be prepared for any potential incident occurring at this location due to the enhanced overall risk and impact that structures like this present.

- High impact/high probability—Risks toward the top right corner are critical and are viewed as **High Risk**. These should be the highest priorities for the fire department and the community. Aggressive action is required, such as staffing and equipping for these risks, and engaging the community in risk reduction and preparedness.

  One of the most obvious high impact and high probability events throughout the State of Florida is hurricanes, and St. Johns County is no different. As proven by 2016's category 5 Hurricane Matthew, St. Johns County's geographical location on the Atlantic Ocean leaves it extremely vulnerable to the effects of hurricane activity. With over 1.5 million residents across several counties under evacuation orders along with billions of dollars in damage from Matthew, hurricanes can prove to be difficult incidents for fire organizations prior to, during, and post-event.

  With over 96% of residents within SJCFR's area living in the wildland urban interface (WUI), wildfires present the potential for a high overall community impact. Even with mitigation efforts, it is estimated that 99,450 acres of the total acreage in St. Johns County are between a moderate to major impact for wildfire resulting in a high probability of occurrence. It is critical that SJCFR continues and enhances mitigation efforts while also preparing and training for these types of events.

Once the community's risks are identified and appropriately categorized, plans of action are developed consistent with their category. This consists of tactical planning, which is the practical preparation of incident strategies for potential emergency incidents typically in the form of pre-fire and emergency preparedness planning.

Emergency Preparedness Planning

Emergency planning and management are of extreme importance, especially for locations like SJCFR's response area that is at higher risks for events such as hurricanes. Emergency management, once a low priority in the mind of the public, has risen to the conscious level of everyday life. Emergency preparedness planning makes it possible to manage the entire life cycle of any potential crisis that a community may face. SJCFR currently conducts emergency preparedness planning with the availability of an Emergency Operations Plan, Emergency Action Plan, and Risk Management Plan. These planning documents are reviewed on an annual basis. The emergency plans have been adopted by elected officials and are published and available to all stakeholders.

Operational Planning

Operational planning is the preparation for ongoing organizational activities and its integration into other regional response networks. Operational planning includes establishing minimum staffing policies, standardized response protocols, regional incident command planning, mutual aid, automatic aid planning (locally and regionally), resource identification and planning, and disaster planning.

Within an organization, operational plans should be in place that ensure adequate numbers and appropriate types of resources are deployed to an emergency. To accomplish this goal, the following criteria should be addressed:

- Identification of potential risk types.
- Determination of resources needed to mitigate an incident affecting the particular risk type.
- A methodology of ensuring that adequate resources are dispatched to an incident via the 911 centers protocols.

Looking outside of an organization's own resources, operational plans need to address the timely implementation of mutual and automatic aid. SJCFR currently has mutual aid agreements with the following organizations:

- Putnam County Fire Rescue
- Flagler County Fire Rescue
- Jacksonville Beach Fire Rescue
- Clay County Fire Rescue
- Jacksonville Fire Rescue
- St. Augustine Fire Department

In addition, automatic aid agreements are in place with the following organization:

- St. Augustine Fire Department

Strategic Planning

Strategic planning supports the organization's mission and sets and prioritizes short-term internal goals. A strategic plan typically involves a three- to five-year planning window. Community involvement in the process is critical as the strategic plan should be customer-oriented while accomplishing the following:

- Development of a mission statement giving careful attention to the services currently provided and which logically can be provided in the future.
- Development of a vision statement of the agency moving forward.
- Establishment of the values of the members.
- Identification of the strengths, weaknesses, opportunities, and challenges of the agency.
- Determination of the community's service priorities.
- Understanding of the community's expectations of the agency.
- Establishment of realistic goals and objectives for the future.
- Identification of implementation tasks and responsible parties for each objective.
- Definition of service outcomes in the form of measurable performance objectives and targets.

SJCFR currently has a completed strategic plan in place that was published and presented in 2018. While this plan is periodically reviewed, due to the list of recommendations and guidance for changes and new initiatives contained in master planning documents, an updated strategic plan should be developed. This is critical as strategic plans are the most effective way to prioritize and plan for the implementation of master plan findings.

Long-Range Master Planning and other Planning Efforts

Long-Range Master Planning

Master or long-range planning is preparation for the organization's future service delivery effectiveness based on projections of the future service delivery environment. Long-range master planning focuses on the big picture perspective and distant future needs of the fire rescue service. This type of planning is particularly important in an organization that is experiencing substantial growth, such as SJCFR. The need for stronger planning processes is communicated regularly by members of the fire service and the community members they serve. Fire service organizations that engage in a long-range master planning process will be able to utilize this valuable information to answer the following three questions:

- Where is the organization today?
- Where will the organization need to be in the future?
- How will this organization get there?

SJCFR has proactively recognized the need for this planning effort by undertaking this master planning process. The master plan will give the department a clear idea of where it is today based on an evaluation of current conditions. The master plan will also project the future needs of SJCFR and provide the strategies to meet them. This master plan is designed to provide a view of the organization in a 15-year time frame.

Capital Assets Planning

Capital assets planning is another critical element of any organization's administrative planning process. Funding mechanisms for CIP items are allocated during the budget process and include the use of impact fees. SJCFR has a current Apparatus Replacement Plan in place that spans the timeframe of 2010–2020. This plan is funded through the budget process and includes the use of impact fees. Additional details on these administrative plans are found in the *Capital Assets and Capital Improvement Programs* section of this report.

Succession Planning

Succession planning is the identification and development of new leaders within an organization who can replace current leaders once they end their employment. This process increases the availability of experienced and capable organizational members that are prepared to assume leadership roles as they become available. Because of the complexity and highly skilled necessities of their jobs, this planning component is critical for fire service organizations as they look to replace outgoing leaders. Currently, SJCFR does maintain internal conversations at the executive level related to succession planning, but a formal succession plan has not been developed or released. This was identified as an organizational weakness by multiple internal stakeholders but is not uncommon amongst fire service organizations. Regardless, programs such as professional/officer development training should be considered to ensure continued efficient and effective emergency services operations.

SUPPORT PROGRAMS

Training

Providing safe and effective fire and emergency services requires a well-trained workforce. Training and education of personnel are critical functions for SJCFR. Without quality, comprehensive training programs, emergency outcomes are compromised, and emergency personnel are at risk.

> *One of the most important jobs in any department is the thorough training of personnel. The personnel have the right to demand good training and the department has the obligation to provide it.*[24]

Initial training of newly hired firefighters is essential, requiring a structured recruit training and testing process. Beyond introductory training, personnel need to be actively engaged and tested regularly to ensure skills and proficiencies are maintained. To accomplish this task, agencies must either have enough instructors within their own organization or be able to access those resources elsewhere. Training sessions should be formal, frequent, and consistent while following prescribed lesson plans that meet specific objectives. In addition, a Safety Officer should be dedicated to all training sessions that involve manipulative exercises.

The U.S. Fire Administration's National Professional Development Model for training and education, as shown in Figure 86, illustrates how the four pillars of professional development influence a firefighter's career. These four pillars include training, academic education, relevant experience, and continuing education. This model can form a road map to guide firefighters through the various levels of an organization such as SJCFR.

[24] *Klinoff, Robert. Introduction to Fire Protection and Emergency Services, Jones and Bartlett, 2013. Burlington, MA.*

Figure 86: USFA National Professional Development Model

In this section, SJCFR's training practices are reviewed and compared to national standards and best practices, and recommended modifications are suggested, where appropriate. Specific information for SJCFR was provided by staff and ESCI field visits.

General Training Competencies

For a training program to be effective and efficient, it should be based on established standards. The National Fire Protection Association (NFPA) provides several documents in this regard, including NFPA 1001: *Standard for Fire Fighter Professional Qualifications* and NFPA 1410: *Standard on Training for Emergency Scene Operations.* In addition, the Florida State Fire Marshal's Bureau of Fire Standards and Training (BFST) provides criteria, certification, and regulation of fire departments within the state, including personnel and training facilities.

From a training evolution safety perspective, accountability procedures and general training policies and procedures are in place. SJCFR's SOP Chapter 110 specifically states that all training will be conducted in a safe manner. This includes being under the direct supervision of a lead instructor that is a state-certified training instructor when possible but no less than an officer/engineer or Battalion Chief. SJCFR currently has 32 personnel who hold at least a fire service instructor certification. The SOP also requires the correct instructor/student ratio in accordance with NFPA guidelines.

New hires to SJCFR receive their pre-employment training from external recruit academies based on BFST requirements, with the closest training center being located at First Coast Technical College. Once hired, SJCFR personnel receive an additional 6-week orientation process in which they will be assigned a Probationary Task Book (PTB), which is managed by the Training Division. In addition, some personnel may be trained in specialized rescue operations such as high-angle, TRT, and vehicle extrication. Regardless, all personnel engage in vehicle extrication training every Wednesday as part of the daily training schedule. In regard to hazardous materials response, SJCFR has advanced trained personnel as part of its special operations team. Wildland firefighting certifications (S-130, S-190, & S330) have also been obtained by many SJCFR personnel. As a requirement of employment, personnel are trained in Emergency Vehicle Driving Training (EVDT) with defensive driving training conducted annually.

Initial Paramedic (PM) and Emergency Medical Technician (EMT) training are accomplished through external college programs or other state-certified training centers. Other required medical training includes Basic Life Support (BLS), Advanced Cardiac Life Support (ACLS), and a minimum of 32 hours of recertification training as required by the state's Department of Health (DOH). Additional EMS related training is offered through a mix of local and regional hospitals and First Coast Technical College.

Training Administration

To function efficiently and effectively, a training program needs to be managed. Administrative program support is vital to program success and at times suffers due to budgetary constraints or competing organizational priorities. Within SJCFR, the administration has identified training as a high priority. An additional element of effective administration is the development of program guidance in the form of training planning, goals, and defined objectives. These goals and objectives should be clearly communicated to all levels of the organization for program awareness, input, feedback, and support. While challenging in any organization, consistent messaging across the SJCFR is critical to success.

SJCFR utilizes a Deputy Chief of Fire and a Deputy Chief of EMS both of whom report to the Operations Chief to manage the overall training program for these two disciplines. In addition, a Captain and two Lieutenants have recently been added to both the fire and EMS sides to aid in overall program delivery. A training committee comprised of operational personnel advises management in areas including specific lesson plans for quarterly and monthly training.

Training Schedule

There are necessary resources and tools to deliver efficient and effective training and education to fire and EMS personnel. In addition to tools, effective methodologies must be employed if delivery is to be sufficient to meet needs. This can be challenging in a department such as SJCFR that is made up of seventeen stations spread across a large geographic area. Based on these factors, clear and consistent training can be difficult to accomplish and was identified as both a weakness and opportunity for improvement by internal stakeholders.

Training Program Planning

A structured program planning process is a critical element to any training program. To be fully efficient and effective, training delivery should be based on:

- Periodic training needs assessments.
- Defined annual program goals, based on a needs assessment.
- Specific delivery objectives, addressing program goals.
- A process of performance measuring and monitoring.
- Periodic re-evaluation and modification.

ESCI recommends that an annual training plan be developed or modified based on the preceding criteria, including clearly defined program goals and objectives. The current SJCFR training committee would be the most likely group to be tasked with this project.

Training Facilities

In order to be effective and efficient, any modern-day fire organization should have a centralized training facility that complies with industry standards, such as NFPA 1402: *Guide to Building Fire Service Training Centers*, of having classrooms, practice grounds, training tower, live-fire building, and training props. SJCFR is currently utilizing a contractual agreement with First Coast Technical College to complete facility training on its campus. In addition, SJCFR has built a limited training facility on the property of Station 5. SJCFR training props include items such as a forcible entry prop and a digital fire simulator. Computer fire simulations are also available via Fire Studio software. An emergency vehicle driving course is also a component available on the campus of First Coast Technical College. Specific EMS-related training props are also available.

Training Procedures, Manual, and Protocols

A department's training manual, procedures, and protocols are the foundation upon which the delivery of educational content is based. In the absence of this kind of document, personnel will tend to train however everyone decides rather than in a manner that is consistent with the department's established operational practices and standards. Development and adherence to these documents are critical for any successful training program. SJCFR has many documents that are directly related to training, including SOP-10, SOP-101, and SOP-110.

Training Delivery Methodology: Competency-Based Training

The industry standard for the amount of training delivered is typically based on contact hours. The fundamental objective is to deliver 240 hours of training annually per firefighter, a measure used by the Insurance Services Office (ISO) for purposes of fire department ratings. Other minimums are in place, including those related to state certification maintenance and specialized functions such as driver training, officer training, and hazardous materials response training. SJCFR currently has an hours-based approach for both fire and EMS training which is tracked utilizing Target Solutions software. Figure 87 illustrates the results of this hours-based approach for the period listed. The category listed as other includes training topics such as marine rescue, USAR, ARFF, wildland, HazMat, extrication, and ICS.

Figure 87: SJCFR Training Hours (8/31/2018–8/31/2019)

Trained	Measure
Number of Personnel Trained	337
Fire-related Training Hours	71,114
EMS-related Training Hours	8,914
Other Training Hours	18,907
Total Training Hours Delivered	**98,935**

An hours-based approach is appropriate and generally effective. However, the shortcoming of the methodology is that sometimes training will be delivered simply to meet minimum hour requirements when, in fact, the individuals receiving the training are already fully versed in the subject matter. Time in this instance would be better spent by subjecting the students to a skills performance demonstration, and once competency in the skill area is demonstrated, use the remaining time to address new skills or subject areas.

Under a competency-based system, an evaluation of skill performance is conducted at scheduled intervals to determine if the person being evaluated can perform the tasks in accordance with pre-determined standards. Those skills that are performed well require no additional training. Those skills not performed well are practiced until the standard is met. This approach maximizes the time used for effective training. Further, it ensures that members are performing at an established level. Specialty skills can be evaluated in the same manner, with further training provided as needed. Ideally, the competency-based training approach is used on an ongoing basis. For example, each quarter different skills are evaluated on an individual basis.

To institute a competency-based approach to training, all the department's established and needed skills must be documented to describe the standard of performance expected. This would include all skills such as hose handling, apparatus operation, EMS procedures and protocols, use of equipment and tools, forcible entry, ventilation, tactics and strategy, and others.

In general, SJCFR performs task-specific practical skills training utilizing monthly proficiency drills. In addition, SJCFR has adopted an annual physical abilities training scenario that is completed while utilizing an SCBA on air. This scenario mimics movements that would be done on the fire ground. Lesson plans, with course title, description, objectives, and equipment/supplies needed, are utilized in accordance with SOP-110, section 13, which is supplied to all personnel for their review prior to the training. Night drills, multi-agency drills with mutual aid departments, and inter-station drills are both conducted as required by ISO and department policies. SJCFR participates in coordinated EOC drills annually and airport disaster drills every three years. Post-incident analyses are completed as required.

Training Records

Regarding training reports and records, ESCI recommends that any program follows the guidelines set in NFPA 1401: *Recommended Practices for Fire Service Training Reports and Records*. This information is critical for providing an overall evaluation of the organization's training program and becomes valuable when an agency is undergoing a review by ISO.

SJCFR maintains individual training files, daily training records, and company training records for all personnel within the Target Solutions program, which are the responsibility of personnel above the rank of lieutenant. Entry for these records can also be accomplished by personnel above the rank of Lieutenant. Training assignments assigned through Target Solutions are automatically tracked upon completion by the software. Everyone has access to their file, which would include any certifications, including fire and EMS.

Life Safety Services (Fire Prevention)

Fire Prevention should be the cornerstone for all activities performed by a fire department. The prevention of fire and loss of life, human suffering (injuries to civilians and firefighters), environmental harm, and property damage is the optimum return on investment for fire agencies. Proactive involvement in construction, code enforcement, educating the public to prevent destructive fires, and training the public to survive them is the best accomplishment of fire prevention.

Seven fundamental components together work to create an effective fire prevention program:

- Code enforcement activities
- New construction inspection and involvement
- General inspection program
- Fire and Life-Safety public education programs
- Fire investigation programs
- Pre-incident planning
- Statistical collection and analysis

Code Enforcement & General Inspection Program

The most effective way to combat fires is to prevent them from occurring in the first place. A strong fire prevention program, based on locally identified risk and relevant codes and ordinances, reduces the loss of property, life, and the personal and community-wide disruption that accompanies a catastrophic fire.

SJCFR has established and adopted the 6th Edition of the Florida Fire Prevention Code (FFPC) and Florida Specific Amendments per Florida Administrative Code (FAC) 69A3.012. Currently, SJCFR has an ordinance establishing that the prevention section allows SJCFR to write citations (Ordinance 2016-29).

Fire code enforcement and administration are the responsibility of the Support Services Division with the Fire Prevention Manager holding the Deputy Chief/Fire Marshal title. A summary of the staffing assigned to fire prevention is provided in Figure 88.

Figure 88: Fire Prevention Staffing

Title	Number
Deputy Chief/Fire Marshal	1
Fire Inspector Supervisor	1
Fire Safety Inspectors	7
Fire Safety Supervisor	1
Total	**10**

Fire Safety Inspectors primarily focus their inspections on new growth and occupancies as well as the required annual inspections per NFPA and the FFPC. Routine inspections are completed based on staff availability and a request basis due to reported violations.

Violations of the Florida Fire Prevention Code are written as misdemeanor citations and sent to the County Court for processing and hearings. SJCFR's fire inspections are recorded in the FireRMS software program. A fire inspector will attend County Court if a violator takes their citation to court. Most offenders pay the fine by mail. SJCFR states that if a citation is written, the cost is $54.00 plus court costs that the judge sets.

Currently, there are over 14,000 existing occupancies in St. Johns County that require inspections in a timely fashion, according to the Insurance Service Office (ISO). The existing occupancy inspection program saw little forward momentum prior to 2018 due in part to lack of staffing, the program was regulated to a compliant driven initiative. With the addition of two fire inspectors added in mid-2018 by the Board of County Commissioners (BoCC), the Fire Prevention division saw a 132 % increase in existing occupancy inspections.

New Construction Inspection and Involvement

Plan reviews and permitting for a new development or building in St. Johns County is the responsibility of the County's Fire Prevention Division. Once constructed, the County will have the responsibility to protect the structure and building. As a result, the County and SJCFR have an interest and fiduciary duty to ensure that development and building construction meets adopted fire and life safety codes.

SJCFR has four plan reviewers and a supervisor assigned. Plan review is completed on new construction, proposed occupancy changes, and proposed tenant improvements only if permitted. Additionally, plan review is performed on all permitted fire and life safety plans.

Certificates of Occupancy (COs) are required as part of the final approval for new construction which is completed by a fire inspector. St. Johns County charges for annual/license inspections and plans reviews per a fee schedule. Inspectors perform existing occupancy inspections for all classifications. The complete fire rescue fee schedule, which includes fire prevention fees, can be found in Appendix C.

St. Johns County has seen a significant rise in County-wide population that has coincided with the increase in residential communities built within the last ten years. Consequently, with the increase in residential building permits being issued, and the need for commercial occupancies to follow, SJCFR has seen an upturn in requested fire plans review by 48%.

As commercial properties get approved and development begins, SJCFR has noted an increase in requests for underground/as-built inspections and new commercial fire inspections. This has produced a 114% increase from FY 17 to FY 19. Additionally, licensed facilities requiring annual inspections have seen an explosive 161% increase during this same timeframe. The increase was caused by a change in requirements after a fatality in a nursing home in South Florida from a power outage caused by Hurricane Irma and the lack of a generator.

Fire and Life-Safety Public Education Programs

The purpose of public fire and life safety education is to minimize the number of emergencies and training the community in the appropriate actions to take should an emergency occur. Fire and life safety education provides the best chance for minimizing the effects of fire, injury, and illness to the community. Additionally, public education can correlate to firefighter safety. As an example, arriving at the scene of a house fire, the first arriving Fire Officer finds that the residents have all evacuated safely, and are accounted for in a meeting location. Their actions have accomplished the first priority of the fire department, life safety, and the firefighters can concentrate on fire suppression.

Public fire and life safety can be simple or an in-depth program covering a variety of topics. Example topics include fire extinguisher training, smoke detector education and installation, CPR, first aid courses, fall prevention, home fire safety, fire prevention materials in several languages, fire brigade training for businesses, and many others. Even the largest departments cannot cover all fire and life safety topics and so a fire department needs to decide where to direct resources based on local needs.

Fire Safety and Public Education in SJCFR is conducted by a civilian who is tasked as the Life Safety Educator. The public education services that are offered by SJCFR are as follows:

- Exit drills in the home (EDITH) Information
- Smoke detector program
- Fire Safety (electrical and cooking)
- Injury prevention (burns)
- Fire extinguisher use
- Elderly care and safety
- Curriculum used in schools—Fire Safety Training House with full safety drill operations and education, which includes fire truck tours
- CPR courses and blood pressure (BP) checks—citizens are welcome to stop by any SJCFR station for a BP check
- Fire safety publications are available, but bilingual information is not readily available

Fire Investigation Programs

According to NFPA 921, there are four determinations when investigating the cause of a fire.

- Accidental fire cause
- Natural fire cause
- Incendiary fire cause
- Undetermined fire cause

Accurately determining the cause of fires often provides clues to preventing future incidents. Identifying fires that are set intentionally (incendiary), along with the identification and/or prosecution of the responsible parties, can prevent additional fires. If the cause of a fire is natural or accidental, it is also of great value to know and understand its origin. It is of value in identifying where to direct fire prevention and public education efforts to reduce or prevent re-occurrences.

SJCFR has one full-time fire investigator and four part-time investigators. The fire investigators are a separate unit comprised of certified firefighters, all with their Florida Fire Investigator I state certification.

SJCFR's process for handling juvenile suspects is done by St. Johns County Sheriff's Office (SJSO). SJCFR investigators have a positive working relationship with the Sheriff's Office. Fire scene control has been established in SJCFR's SOPs/SOGs, and the Fire Investigator uses a camera to document all fire scenes or utilizes a Crime Scene Tech from SJSO. All investigators have the appropriate equipment to use on the scene.

The Fire Investigator utilizes SJSO's Crime Scene Tech to collect evidence. In accordance with Florida's Public Records law, all fire investigation reports are released when the investigation has been completed. All files, records, and evidence are handled by the St. Johns County Sheriff's Office.

Pre-incident Planning

Pre-incident plans give firefighters information on specific structures and processes and are a tool for firefighters to engage in strategy and tactical discussions before an emergency occurs. Pre-incident planning involves evaluating protection systems, building construction, contents, and operating procedures that may influence emergency operations.

A firefighter typically works in an alien environment of heat, darkness, confusion, and extreme danger. Often, a firefighter's first visit to a building is when he or she is summoned to an emergency at the facility; the very time that the internal environment of the structure may be at its worst. Contrary to Hollywood's portrayal of the inside of a building on fire, visibility is likely to be zero due to smoke. A lack of familiarity with the layout of a structure can easily cause a firefighter to become disoriented and subsequently suffer injury.

It is important that firefighters and command staff have accurate information readily at hand to identify hazards, direct tactical operations, and understand the proper use of built-in fire-resistive features of structures. This is accomplished by routinely touring structures, developing pre-incident plans, and conducting tactical exercises—either on-site or tabletop. The standards set forth in NFPA 1620: *Standard for Pre-Incident Planning*, guide the development of pre-incident plans. To have value, pre-incident plans need to be current. Pre-plans should be distributed to all mutual/automatic aid partners.

SJCFR utilizes a key-box entry program by Fail Safe.

An ideal pre-incident planning system uses standardized forms and protocols. Data is collected in a consistent format and presented in a manner that permits commanders and emergency workers to retrieve data quickly and easily. All require consistent methods for collection, verification, storage, presentation, and update of emergency plans.

Pre-incident plans are performed by SJCFR operations personnel for occupancies assigned in their zones. SJCFR utilizes a standard fillable PDF form pre-plan document to capture the information. Currently, SJCFR has not completed a community risk assessment nor a community risk reduction plan.

Statistical Collection and Analysis

The U.S. Fire Administration states that "A compelling reason for documenting fire and EMS incidents is a legal requirement. Insurance companies, victims, regulatory agencies, and others may require documentation of the facts surrounding an incident.

Incident reports of fire responses can yield a bevy of insight. Proffering elementary data in fire department annual reports is common. However, the details can be beneficial to fire departments by yielding information into the origin of fires, how people are injured, and the geographic locations where events are occurring in a jurisdiction, among other evidence.

SJCFR utilizes FireRMS as its Emergency Reporting System for recording fire incident data in compliance with NFIRS. Analysis of response data occurs in-house. Reports can be made depending on the request and distributed as requested. All hydrant flow records are maintained in Fire RMS as well. A better analysis of data is discussed in the *Service Delivery* section.

Communications

Communications center operations represent one of the most critical support functions of any fire department; the system is relied upon as the first link in the emergency services process for a community. A dispatch center's performance directly impacts critical emergency response times, service level, overall service delivery, and customer satisfaction. Given the direct correlation between response times, survivability, mitigating property damage, and overall outcomes, a properly staffed and functioning dispatch center ensures fire department resources can respond promptly while providing pre-arrival information that enhances first responder safety and effectiveness.

Alarm Systems and Communications Infrastructure

The St. Johns County Sheriff's Office (SJCSO) serves as the primary Public Safety Answering Point (PSAP) for all emergency services (police, fire, and medical) in St. Johns County. SJCFR serves at the secondary PSAP. SJCFR Communications Center provides dispatch services for the St. Augustine Fire Department and St. Johns County Animal Control. The St. Augustine Police Department is the third-tier backup PSAP, and there is a mutual aid (PSAP) connection with an automatic rollover to Jacksonville Fire Rescue Department or Clay County in the event of a system failure. The St. Johns County Emergency Communications Center (SJCECC) has adopted the Association of Public-Safety Communications Officials (APCO) Emergency Medical Dispatch Program (EMDP) as the Emergency Medical Dispatch (EMD) standard for the County. The system is based on the National Highway Traffic Safety Administration's curriculum for EMD. Adherence to these established protocols supports responders, ensures consistency, and limits organizational liability.

The St. Johns County Emergency Communications Center is located at 100 EOC Drive, St. Augustine, Florida. The communications center is a gated campus limited to authorized staff. Card readers and monitored security cameras ensure unauthorized personnel do not have access without signing in and receiving an escort. The center operates an in-house developed Computer Aided Dispatch system with APCO Emergency Medical Dispatch (EMD) IntelliComm, an infrastructure that provides an integrated approach to emergency response system management. APCO IntelliComm mirrors current guide cards for EMD, fire response, and includes the most up-to-date National Center for Missing and Exploited Children (NCMEC) and Emergency Response Guide (ERG) manuals. The CAD was implemented in October 2007. The Motorola Premier One CAD buildout is in progress, with a go-live date in September 2020. The power supply for the system and the building has an emergency back-up power supply in the form of a generator and an uninterruptible power supply (UPS) battery back-up that ensures continued service to the community during power outages. The existing communications building is in a flood zone designated for mandatory evacuations; therefore, a new center is already planned for and expected to be completed in April of 2021. It has been designed to highest hurricane resistance and will be able to withstand hurricanes rated as CAT 5.

The St. Johns County Emergency Communications Center has a dedicated line item for communications in the operating budget. Figure 89 illustrates The St. Johns County Emergency Communications Center operating budget for the current and last two fiscal years.

Figure 89: Communications Center Operating Budget

FY 17–18	FY 18–19	FY 19–20
$ 1,332,787	$ 1,451,266	$ 1,566,019

Public Safety Answering Point and Dispatch Center Capabilities and Methods

All communications operators serve as call-taker/dispatchers and are certified through completion of the 232-hour Florida Public Safety Telecommunicator course. The SJCECC is EMD Accredited through Florida but not a standalone agency. They participate in the SJCSO accreditation through APCO. SJCECC operators are trained to provide services in adherence to departmental standard operating procedures. Training is conducted using both internal and external resources.

SJCFR Communications is directed by the Deputy Chief of Communications. The Communications Center operates under the supervision of one Communications Center Manager and one Assistant Manager. Four shift supervisors report to the Communications Center Manager and Assistant Manager.

The shift supervisors are in a leadership position with full accountability for Communications Operations while on duty. The shift supervisors will assist the Communications Center managers in conducting daily SJCECC operations by performing all duties as assigned. The Communications Shift Supervisor is charged with exhibiting professional behavior, following directives issued to them, possessing the ability to issue directives to supervised personnel, make command decisions, and require compliance with all Policies and Procedures of SJCFR and County Administration.

Quality Assurance (QA) is completed each month for all Emergency Communications Center personnel. Shift Supervisors will conduct Quality Assurance reviews for all personnel assigned to their shift, using the Hindsight G3 software. The goal of the QA program is to identify opportunities to evaluate and improve the performance of personnel and the system, to resolve identified problems by initiating immediate remedial programs to correct deficiencies, and to verify the validity of current Communications Standard Operating Procedures.

The emergency workload for SJCECC is significant, but still within industry norms. The SJCECC received 26,394 calls for SJCFR during 2019. Figure 90 depicts the total calls received in the SJCECC for the last three years.

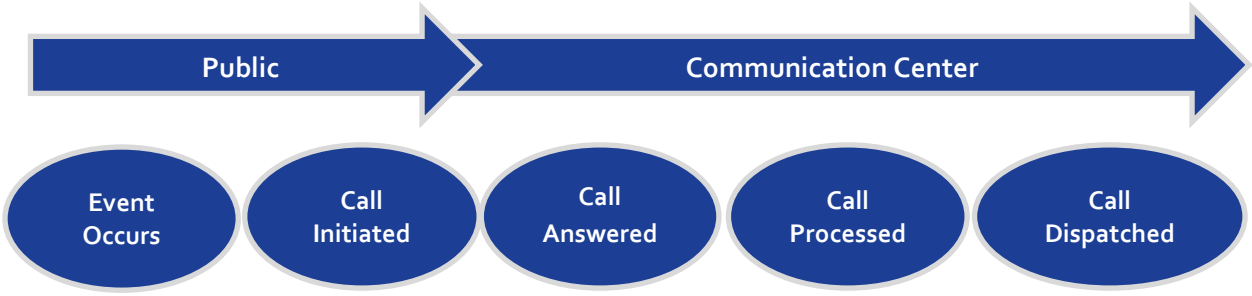
Figure 90: Incoming 911 Calls

	2017	2018	2019
911 Calls	25,034	26,024	26,394

Wireless callers make up most of the emergency calls received within communications centers. In the SJCECC, over the last three years, emergency activation from cell phones has steadily increased, representing 70% of all calls received. This is significant given that St. Johns County is a coastal community and disasters occurring in the SJCFR service area may damage or destroy cellular towers, which could impact a reporting party's ability to call for help or report an emergency.

The National Fire Protection Association has established NFPA 1221: *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems* as a guiding document for agencies' operating communications centers relative to facilities, call processing times, staffing, testing, and data security. It is important to understand that NFPA 1221 is not a standard specific to fire department operations but applies to all emergency communications centers. *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* also identifies emergency communication performance standards. Figure 91 illustrates the timeline for incident dispatch.

Figure 91: Timeline for Incident Dispatch



In addition to NFPA 1221, the SJCECC uses the Association of Public-Safety Communications Officials EMDP as the Emergency Medical Dispatch protocols to process medical emergencies, triage call types, dispatch appropriate units, and provide pre-arrival instructions to the reporting party. Compliance with standards is enforced; calls within each discipline are randomly pulled for quality assessment and feedback.

The standard for call answering time is 90% of incoming 911 calls answered in under 10 seconds. According to the Standard Operating Procedure, SJCECC operators are required to answer incoming calls within this standard. Based on the data provided, SJCECC operators answer incoming calls within 10 seconds, 98.51% of the time.

NFPA 1221 establishes the communication center call processing performance criteria for fire departments from the initiation of a 911 call to the dispatching of the appropriate resources. According to these standards, response resources shall be notified of a priority incident within 60 seconds from receipt of the call at the dispatch center 90% of the time, except as follows:

- Calls requiring emergency medical dispatch questioning.
- Calls requiring language translation.
- Calls requiring the use of TTY/TTD devices.
- Calls of criminal activity.
- Hazardous materials and technical rescue incidents.

In these exceptions, the call types shall be processed and dispatched within 90 seconds, 90% of the time. The SJCECC utilizes emergency medical dispatch questioning; thus, the majority of its 911 calls fall into the exception standard of 90 seconds, 90% of the time. According to the adopted APCO standard, all EMD calls must be dispatched within 60 seconds or less, starting from the time the SJCECC operator answers the call to the time tones are set off for Fire and Rescue. The SJCECC performance is provided in the *Service Delivery and Performance* section of this report.

Another critical area of communications operations is the transfer of calls between primary and secondary Public Safety Answering Points (PSAP). NFPA 1221, in Section A7.4.1(b), outlines a call transfer time of less than or equal to 30 seconds when the primary is other than the dispatching communications center.

EMERGENCY MEDICAL SERVICES SUPPORT AND SYSTEM OVERSIGHT

As illustrated in the *Service Delivery and Performance* section, a significant amount of the service demand (66%) is related to emergency medical services (EMS) incidents. This is consistent with the percentage of service demand found in other communities like St. Johns County. The ability of SJCFR to provide effective, quality care to the citizens and visitors of St. Johns County is impacted by several key components that must be present.

In 1973, the Florida Legislature encouraged the development and maintenance of a total delivery system of emergency medical services for protecting and enhancing the health, welfare, and safety of all citizens of the state. Emergency Medical Services in Florida operate under the authority of Chapter 401 (Florida Statutes) and Chapter 64J-1 (Florida Administrative Code). The State of Florida requires licensure of all EMS systems (except BLS non-transport, which has no license requirement) in the state. As part of the licensure process—the EMS provider must obtain a certificate of public convenience and necessity (COPCN) from each county in which the system will operate. The COPCN is approved and issued by the governing body of the respective county which will consider the recommendations of municipalities within its jurisdiction. St. Johns County, therefore—through the COPCN process—has control over who provides emergency medical services within the County.

Emergency medical services in St. Johns County were initially provided by funeral homes and then Associated Ambulance. In 1976, this shifted from Associated Ambulance to a hospital-based ambulance service, which continued until 1980. In 1980, St. Johns County assumed responsibility for emergency medical services and provided it through a standalone ambulance service as part of the County government. In 1998, this standalone agency was merged into SJCFR and continues under that organization today.

SJCFR was originally licensed as an EMS agency by the State of Florida on August 9, 1993, and the current license is valid through August 8, 2021. As required by Statute and Rule, SJCFR must meet all requirements, which include oversight by a Medical Director who is a licensed Florida physician; registration for medications through the Department of Justice Drug Enforcement Administration; liability insurance; trauma transport protocols; an approved radio communication system; appropriate staffing; and more.

The EMS Division for SJCFR is under the direction of the Deputy Chief of EMS Operations. The Deputy Chief is assisted in completing EMS related functions by a Captain assigned to Quality Assurance and both a Captain and two Lieutenants assigned to Training.

Staffing

SJCFR staffs 35 apparatus of various types with a total of 299 personnel scheduled across the three shifts. Of the 299 personnel, 204 hold Florida certifications as an EMT-Paramedic, and the remaining 95 hold Florida certifications as an EMT-Basic. These personnel, other than those assigned to Marine Rescue, work a schedule of 24 hours on-duty followed by 48 hours off-duty. The Marine Rescue staff work a schedule of four 10-hour days. Minimum staffing requirements are outlined in Florida Statutes based upon the service level of each apparatus.

Basic Life Support (BLS) Non-Transport

This level of unit is not specifically regulated by the state. SJCFR currently staffs two tankers within this level with a single emergency medical technician. Since the emergency medical services component of this unit's workload is non-primary, this is sufficient to provide service when emergency medical service is needed while already on the scene of a fire incident.

Advanced Life Support (ALS) Non-Transport

SJCFR currently operates 17 apparatus holding an ALS non-transport permit. While minimum requirements for staffing are one paramedic and one emergency medical technician (with at least one meeting the driver requirements), SJCFR staffs these units with three personnel to meet the firefighting staffing model. In this instance, there are two paramedics and one emergency medical technician.

Advanced Life Support (ALS) Transport

SJCFR currently operates 13 rescues holding an ALS Transport permit. While minimum requirements for staffing are one paramedic and one emergency medical technician (with at least one meeting the driver requirements), SJCFR staffs each of its units with two paramedics. The ability to staff each unit with two paramedics—instead of the paramedic/emergency medical technician model—enables a better balance of workload for providing patient care and completion of patient care documentation throughout the shift. One of the 13 rescues, Rescue 5, operates with a three-person crew. This is a new deployment model currently used by SJCFR in a zone where the ladder is the primary non-transport response unit. With three personnel on the rescue, there is no longer a need to dispatch the ladder to lower priority EMS incidents. This leaves the ladder available for additional responses since the third person on the rescue can provide the additional hands needed on-scene.

Advanced Life Support (ALS) Quick Response

SJCFR currently operates with three Battalion Chiefs on-duty each day. These units are not specifically permitted but are staffed with a single paramedic and carry minimal equipment at the advanced life support level. (jump bag, cardiac bag, monitor, narcotics). As these are considered supervisory type units, the State does not set forth any staffing requirements.

Logistical Support Services

A critical component of providing emergency medical services is the ability to provide crews with the appropriate equipment, supplies, and medications. Each of these requires a strong level of inventory control to ensure proper distribution and use. Crews are required to inspect their apparatus at the beginning of every shift to ensure all required supplies and equipment are at appropriate inventory levels and functional.

Florida Administrative Code provides a specific minimum equipment list, and currently, SJCFR units exceed those minimum requirements. As demonstrated by the 2015 and 2017 inspections performed by the Florida Department of Health, Bureau of EMS staff, SJCFR has consistently shown they meet all requirements. The inspector only found extremely minor issues that were corrected during the inspection.

While there is a variety of supplies and equipment, a greater portion of funding is directed towards those items that are capital purchases. Figure 92Figure 92: Capital EMS Equipment Inventory provides a listing of the various pieces of capital equipment that are used for providing emergency medical care.

Figure 92: Capital EMS Equipment Inventory

Description	Quantity
Zoll Cardiac Monitor (with 12-lead, SpO_2, $etCO_2$, CO, and blood pressure monitoring)	45
Stryker Power Pro Stretcher	14
Stryker Power Pro Bariatric Stretcher	6
Stryker Performance Load Stretcher	2
Stryker Stair Pro	27
Continuous Positive Airway Pressure (CPAP)	20
Res-Q-CPR Device	45
Zoll Automated External Defibrillator (AED)	20
Lucas Compression Device	14
King Vision Video Laryngoscope	35

SJCFR maintains service agreements with an authorized representative of the manufacturer of each type of equipment. Through these agreements, equipment is inspected at least annually, as illustrated in Figure 93.

Figure 93: EMS Equipment Inspection Information

Description	Key Inspection Components
Zoll Cardiac Monitor	• Full inspection • Installation of required updates • Function test • Immediate repair of any deficiencies
Stryker Stretchers (All Versions)	• Full inspection • Function test (including vehicle-mounted load system) • Immediate repair of any deficiencies
Stryker Stair Pro	• Full inspection • Function test (including vehicle-mounted load system) • Immediate repair of any deficiencies
Continuous Positive Airway Pressure (CPAP)	• Full inspection • Function test • Immediate repair of any deficiencies
Res-Q-CPR Device	• Daily inspection at the station level

Description	Key Inspection Components
Zoll Automated External Defibrillator (AED)	• Full inspection • Installation of required updates • Function test • Immediate repair of any deficiencies
Lucas Compression Device	• Full inspection • Function test • Immediate repair of any deficiencies
King Vision Video Laryngoscope	• Daily inspection at the station level

Medical supplies, essentially those non-capital items that are either reusable (i.e., long spine boards, splints, etc.) or single-patient use (i.e., bandages, medications, etc.), are provided throughout the service area in supply rooms at the stations. Crews restock from these supply rooms which are maintained at a minimal level and are restocked from central supply every two weeks.

One category of medication requires a much higher focus on inventory control and documentation of use, waste, etc. This category is that of controlled substances—those medications specifically regulated by the federal Drug Enforcement Agency (DEA)—which may include morphine, fentanyl, valium, versed, and others. SJCFR has a process in place to ensure inventory control of these types of medications. At central supply, there is a room with double locking mechanisms where controlled substances are stored.

Each unit that is advanced life support (ALS) carries a limited quantity of controlled substances for providing care to the patients. Each Battalion Chief carries a larger quantity as they are a resupply point for the ALS units. At all locations where there are controlled substances, a daily inventory is completed at the beginning of a shift. This inventory is performed with the off-going paramedic and the oncoming paramedic both present and is documented on a controlled substance log. Both paramedics sign to verify the key points of the inventory (quantity, vials/ampules are unaltered, expiration dates, and clarity of fluid). If the controlled substance is used, the administering paramedic documents this in the patient care report and then has additional paper forms to complete to document the replacement number and the waste of any unused medication (waste must have a witness signature).

Medical Control and Oversight

The primary Medical Director for SJCFR is scheduled to retire in October 2020. He has already reduced his hours of direct involvement and relies on the associate medical director to handle the overall oversight.

The Associate Medical Director currently works full time for Baptist Medical Center (in the emergency departments of South Campus and Downtown Campus) and part-time at UF Health Jacksonville (Level 1 Trauma Center). He also serves as the Medical Director for the St. Johns County Sheriff's Office SWAT Team. He has been a physician since 2005 and is Board Certified in Emergency Medicine and EMS with a passion for educating paramedics and helping them provide quality patient care. Upon the retirement of the Medical Director, it is anticipated that the Associate Medical Director will move into a full-time position with SJCFR, which provides a Monday through Friday type of schedule as his primary employment. The Associate Medical Director has been incredibly involved, as illustrated by these activities, and currently puts in at least 30–40 hours per week.

- Hosting online conferences.
- Face-to-face training at stations.
- Drive through training at emergency departments within the community.
- Hosting three consecutive EMS Expos.
- Providing emergency medical technicians and paramedics opportunities to perform low-frequency/high-risk training with various hands-on skills events.
- Responding to multiple calls on a daily basis.

Both the Medical Director and the Associate Medical Director are under contract with SJCFR to provide medical direction. These contracts require them to participate in protocol development, online medical control, clearance of new employees and new paramedics, training of employees, and field observation of crews.

As with similar agencies across the nation, SJCFR paramedics operate under a set of medical protocols—which are a form of off-line medical control. These protocols, as written by the Medical Director, provide common actions to be taken in a wide variety of different situations and types of patients. SJCFR has historically updated its protocols on an annual basis. With the upcoming change in Medical Director, SJCFR is currently in the process of a full review and rewrite of the protocols. It has been approximately six years since the last full revision, and this should have been completed by October 2020.

Quality Assurance and Quality Improvement

Quality assurance and quality improvement are the various methods used by an agency to evaluate the current delivery of patient care. Quality assurance generally relates to the actions taken to ensure that the patient care delivered meets the current level of performance expected by the Medical Director. Florida Administrative Code requires that the Medical Director develop and implement a patient care quality assurance system. This system should include, but is not limited to, prompt review of patient care records, direct observation, and comparison of performance standards for medications, equipment, system protocols, and procedures.

SJCFR has established key performance indicators, which include the return of spontaneous circulation (ROSC) in cardiac arrest victims; on-scene time for high priority incidents such as cardiac arrest, stroke, trauma, etc.; utilization of air transport units for stroke alerts and trauma alerts; duration of time from arrival on-scene until the appropriate alert is called; and more. There are staff specifically assigned to monitor these indicators and report on a monthly basis to the Deputy Chief and Medical Director.

As specific topics of concern are identified through the quality assurance processes, they may be categorized into three main areas—protocol-related issues, equipment-related issues, or personnel-related issues. Once categorized, the agency implements change to increase compliance and then re-evaluates to determine if the changes made have resulted in the expected compliance measure.

Another key component of quality assurance in which SJCFR participates is a quarterly review of patients with the local trauma centers. This enables the department to ascertain the accuracy of trauma alert designations by its paramedics as compared to final diagnosis and outcomes found by the medical staff at the trauma centers. This type of mutual review provides the opportunity for improvement for both groups and thus improve patient outcomes, where possible.

Quality improvement generally refers to the actions taken to move an agency to a higher level of performance or quality. These actions focus on system or process changes rather than improving compliance with existing policies or protocols. For example, research of the patient care report data may reveal certain types of patient conditions that could be improved by implementing additional protocols.

SJCFR has established policies and procedures to provide continuous quality improvement by review of selected patient care reports, as illustrated in Figure 94:.

Figure 94: SJCFR Patient Care Review Process

Description	Target
100% Review	• Air Transport Utilization • Cardiac/Respiratory arrests • Cricothyroidotomy • Dead-on-arrival (DOA) • Expired at Scene • Use of TXA and tourniquets • Drowning and diving injuries • Needle thoracentesis • Advanced airway • Pediatric patients • Refusals and no transport • STEMI alerts • Stroke alerts • Trauma alerts • Trauma arrests
10% Review	Remaining patient care reports.
Other	As determined by the Quality Improvement Officer.

As reviews are conducted, deficiencies in either patient care or documentation may be encountered. Figure 95: illustrates how SJCFR handles deficiencies that have been identified.

Figure 95: SJCFR Error Process

Error Level	Actions Taken
Non-Critical Errors	• Monitored and recorded by the QI Officer. • May require document correction, error analysis, evidence gathering, or remediation. • Battalion Chief may be notified.
Critical Errors	• On-duty notification to Battalion Chief, Administrator On-Call, Fire Rescue Chief, QI Officer, and Medical Director. • If identified by QI Officer, notification to Fire Rescue Chief and/or Deputy Chief, and Medical Director. • Immediate analysis which may result in paramedic to be administratively reassigned to ascertain the cause of the error and determine need for remediation.

While review of patient care reports is an essential part of the program, SJCFR utilizes the following additional measures to ensure quality patient care delivery.

- Measure and assess the performance of system personnel.
- Measure and assess the performance of EMS delivery of care.
- Measure and trend patient outcomes.
- Acquire data and manage its application to the QI process.
- Perform data analysis and develop and track trends.
- Apply the information developed to enhance and promote the overall quality of pre-hospital care rendered in St. Johns County.
- Remediation of knowledge deficits and discovery of system wide measures in need of improvement.

The ability to record the data necessary for these types of trending and analyses relies heavily upon appropriate patient care software. To assist agencies in this endeavor—and to provide for greater consistency of data—the federal government developed the National EMS Information System (NEMSIS). Florida then adopted this national standard and developed the Florida Prehospital EMS Tracking and Reporting System (EMSTARS). Through a voluntary program, data is submitted by the agency to EMSTARS, who then, in turn, submits to NEMSIS.

SJCFR has installed Zoll TabletPCR (current version 6.5.0.779) for recording patient care encounters and providing the database for quality assurance and quality improvement activities. Patient care is entered by the paramedic on a mobile device and synchs to the main database server. A significant advantage of the most recent versions of this software is that immediately upon completion of the patient care report, the data that has been synched to the main server is also immediately uploaded to EMSTARS.

Another component related to the data is the ability to integrate with local hospitals through a health information exchange (HIE). This type of interface provides the hospital with the patient care report directly into its electronic health record and includes the actual electronic data. The benefit to the EMS agency is receiving back from the hospital various information points such as admitting diagnosis, lab values, discharge diagnosis, etc. While SJCFR has had limited success in developing health information exchanges with the local hospitals, the department should continue to work with hospital leadership towards development and implementation. Currently, the only data sharing in place is through the Cardiac Arrest Registry to Enhance Survival (CARES). This is a national system that coordinates cardiac arrest data between EMS agencies and hospitals—providing the opportunity to increase survivability from cardiac arrest.

Continuing Education, Credentialing, and Skills Maintenance

The ability to ensure that emergency medical staff can perform a variety of skills—at both a basic life support level and an advanced life support level—is critical to the delivery of quality patient care. As new employees are hired (or existing employees become paramedics), this skills evaluation must be done prior to release to the field to treat actual patients. As time goes on, each agency should ensure that these same skills are monitored and maintained to keep that same level of service at all times.

SJCFR, as with similar agencies with a large geographic footprint, has developed various methods of educating, monitoring, and evaluating its personnel. A primary method of providing education over such a large geographic area is through online programs such as Target Solutions. SJCFR uses this platform to distribute materials provided by Target Solutions as well as materials prepared by SJCFR.

With newly hired personnel and newly certified paramedics, SJCFR uses a task book for evaluation and documentation of skills. While there is no specific program for annual credentialing in the various skills, SJCFR hosts an annual EMS Expo. All on-duty crews are rotated through this multi-day expo to receive education and scenario-based skills practice to include those low-frequency, high-risk skills such as advanced airway procedures. While there is not a specific test of each skill per se, instructors are monitoring throughout the scenarios, providing feedback, and identifying any weaknesses that need to be addressed.

All training requirements are monitored for successful completion by the Training Officers and Battalion Captains.

SJCFR has a field training officer program (FTO) in place but has already identified the need to update the existing program as well as promote additional staff into FTO positions. There are many advantages to having an FTO program in place, which include:

- Training and clearance of new employees and new paramedics.
- Delivery of skills training and evaluations to existing paramedics.
- Direct observation of clinical decision-making and patient care provided.
- Retraining of paramedics when there are areas identified where improvement is needed.

Public Education

SJCFR is a certified Training Center with the American Heart Association. Through this Training Center, classes are provided for the SJCFR personnel as well as the citizens within the community. Basic Life Support for Healthcare Providers (BLS CPR) and Heartsaver CPR courses are held monthly for non-employee participants. Figure 96: illustrates the volume of courses provided by SJCFR.

Figure 96: SJCFR Courses, 2019–April 2020

Course Type	Number of Classes	Number of Students
Advanced Cardiac Life Support (ACLS)	616	2,988
Basic Life Support for Healthcare Providers (BLS CPR)	1,675	8,743
Heartsaver CPR	594	3,269
Neonatal Resuscitation Provider (NRP)	2	15
Pediatric Advanced Life Support (PALS)	68	374
Other	211	2,873

Customer Service/Satisfaction

As with any agency that provides a direct service to the public, SJCFR works to ensure interactions meet the level of expected performance. This is done through two key programs/initiatives.

SJCFR participates in a local group of resources called Care Connect. This is a program operated through Flagler Hospital to help address the needs of the citizens to include frequent users of the EMS system. If SJCFR identifies that a person has become a more frequent user of services, they research to determine if they can identify specific barriers causing the frequency of use (i.e., no caregiver available, frequent falls, etc.). With patient consent, the crew completes an electronic submission of the demographics and detailed information into the Care Connect system. Care Connect then assigns a social worker to follow up directly with the patient to determine what resources may be most beneficial. While some of these resources can be brought to the patient's home, in some cases, the process results in the patient moving into a long-term care facility.

The second initiative is efficient handling of citizen/patient complaints. Complaints may originate directly with a phone call to SJCFR or through the online PRIDE system hosted by St. Johns County. Regardless of origination point, the complaint is routed to the Section Chief that is most appropriate for handling that specific type of complaint. The Section Chief then begins their fact-finding phase to determine validity of the complaint and how it should be handled. Depending on the fact-finding phase, the Section Chief may close the complaint directly or initiate a formal investigation process. Upon completion of either option, there is communication back with the complainant.

EMS Transport Billing

EMS transport billing is the process of seeking financial reimbursement for the cost of providing medically necessary ambulance transportation services. SJCFR implemented its EMS transport billing program to seek reimbursement through Medicaid, Medicare, and other private insurance policies (health, auto, homeowner) that already allow for reimbursement for the provision of transport services. The funds recovered are deposited in the General Fund.

SJCFR transport billing program's authorization can be traced back to St. Johns County Ordinance 95-17, which was replaced and updated by Ordinance 2012-20. The County Ordinance provides the framework for the operation of ambulance and rescue services within St. Johns County in accordance with Florida Statutes and specifically provides the ability to set EMS transport rates. Figure 97: illustrates a summary of the EMS transport rates.

Figure 97: EMS Transport Rates

	BLS	ALS1	ALS2	Mileage
Alachua County	$520	$625	$885	$11
City of Jacksonville	$550	$635	$740	$10
Clay County	$400	$450	$630	$12
Flagler County	$584	$690	$781.32	$11
Nassau	$500	$700	$800	$10.50
Putnam County	$375	$450	$650	$11.75
St. Johns County	$400	$500	$600	$9

These charges for medical transport services result in revenues that help offset the ever-increasing cost of providing service. Since 2014, emergency call volume with the SJCFR system has increased at an average rate of 4.3%, with total call volume exceeding 26,800 calls for service in 2019. With the increased call volume, a corresponding increased cost of providing critical fire rescue services has occurred. In 2020, the cost of training, equipping, providing for personnel, and apparatus is projected to exceed $65 million annually.

SJCFR operates as its own EMS transport billing department. As such, the in-house staff must adhere to stringent rules concerning patient confidentiality, professionalism, and courtesy in the administration of the EMS transport billing program.

The SJCFR Billing staff consists of a Billing Coordinator and three billing technicians responsible for every aspect of the billing process including processing bills within five days from the point of service, addressing denial of claims, verifying insurance, processing out of state patients, set up payment plans, and administering an associated charity program based on federal poverty guidelines. While the volume of work and corresponding revenues has increased, the staffing has remained constant over the last eight years. The billing staff has performed admirably, producing over $7.3 million in revenue with a rate of return of 56% through the established fee. The fee schedule was most recently updated in 2012 except for a fifty-dollar increase in the ALS transport fee in 2019.

Due to the increased volume of work overtime, the Billing Coordinator is required to take an active role in the billing process, rather than focusing on review and oversight of the process that could provide for system efficiencies and reduce liability. Mitigating liability is a critical task when dealing with medical records, attorney requests, and the myriad of federal and state regulations in regard to Medicaid, Medicare, and private insurance reimbursements.

SJCFR transport billing represents a significant revenue source for the General Fund but could be limited in its ability to expand beyond its traditional areas of focus and take advantage of other reimbursement programs within the State of Florida. With a single-digit Medicaid population making it not worth the staff-hours to manage such programs as the Public Emergency Medical Transportation (PEMT) Supplemental Reimbursement Program.

HAZMAT SERVICES SUPPORT AND RESPONSE CAPABILITY

Hazardous materials incidents are a part of almost every fire department's call volume. While this type of emergency response does not occur as often as some other emergency incidents, it can pose a very high risk due to the challenges and dangers of this type of incident. SJCFR has the capability to respond to hazardous materials incidents. Hazardous materials (HazMat) are defined as any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to people or the environment. In a location like SJCFR, hazardous materials may be present in various locations throughout the County. The County contains industrial and agricultural environments with significant hazardous materials release potential.

SJCFR responds and mitigates hazardous materials incidents throughout the region. Department training and training with other in-and-out of county fire departments happen periodically during the year. Most organizations utilize the NFPA 472: *Standard for Competence of Hazardous Materials/Weapons of Mass Destruction Incidents* Job Performance Requirements (JPRs) related to hazardous materials to meet the continuing education requirements for certification purposes. SJCFR utilizes this as well as the Florida State Emergency Response Commission for Hazardous Materials.

After reviewing SJCFR's incident responses during the year, the number of hazardous materials incidents the County responds to is quite small compared to the total number of calls for service SJCFR answers. However, these calls usually have a higher potential for civil disturbance based on their nature. When a hazardous materials incident occurs either in the County or anywhere in the region, and one of the hazardous materials units is requested, SJCFR is responsible for staffing the unit so it can respond to the scene. This affects the department's internal staffing capabilities to respond to other incidents that occur within the jurisdiction.

Given the significant risk hazardous materials incidents pose to SJCFR and its personnel, the County has highly prioritized its response readiness to manage an incident of this nature. The amount of hazardous materials transiting the County via aircraft, rail, and highway is substantial. However, the transportation routes are not the only risk the community faces. Industrial warehousing activities increase risk due to the handling of these raw materials. SJCFR operates a Special Operations response HazMat Unit out of Fire Station 16. This is a "level A" resource, the highest level of Hazmat response capability. To achieve level A capability, a combination of highly technical equipment is necessary, along with appropriately trained, technician-certified personnel. The department maintains additional qualified personnel throughout the rest of the County as well. Specifically, those assigned to Fire Station 4 who are cross-trained as USAR/TRT members and Hazardous Materials Technicians. This gives a total of approximately 12 personnel available on shift with a minimum total number of six cross-trained USAR/TRT and Hazardous Materials Technicians for a response each day at Fire Station 16 and Fire Station 4.

HazMat certification levels are defined by NFPA 472: *Standard for Competence of Hazardous Materials/ Weapons of Mass Destruction Incidents* and the Occupational Safety and Health Administration (OSHA) in CFR 1920.120. The highest level of certification for responders is the "Technician" level according to NFPA. Of the personnel in SJCFR, 55 are certified at the Technician level. All other employees are trained to the Operations level resulting in a considerable response capability. In addition, there are three personnel certified as Hazardous Materials Incident Commanders.

The National Fire Protection Association (NFPA) defines a Hazardous Materials Safety Officer certification level in NFPA 472: *Standard for Competence of Hazardous Materials/Weapons of Mass Destruction Incidents*. SJCFR should seek to add additional training to this certification level, which is an industry best practice. SJCFR currently provides one trained rescuer with this certification.

ESCI staff performed a comprehensive assessment based on industry standard practice and consistent with the Occupational Safety and Health Administration (OSHA), NFPA 472: *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, NFPA 473: *Standard for Competencies for EMS Personnel Responding to Hazardous Materials/Weapons of Mass Destruction Incidents*, NFPA 1710: *Standard for Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, the Florida State Emergency Response Commission for Hazardous Materials and the International Fire Service Training Association. The assessment was not a hazard-based risk analysis of the community, but instead, is based on a minimum level of capability regardless of hazardous materials incident type. The assessment mimics the Florida State Emergency Response Commission's hazardous materials assessment tool that SJCFR is familiar with and has used to meet the requirements set forth by the State of Florida. It measured four major areas. These four areas were:

1. Standard Operating Procedures, Policies, and Guidelines
2. Human Resources
3. Training
4. Equipment

Standard Operating Procedures, Policies, and Guidelines

The first area of evaluation involves the established standard operating procedures, policies, and guidelines used to manage the team. SJCFR has an Emergency Response Plan for Hazardous Materials incidents. The existence of SJCFR's Emergency Response Plan (ERP) is related to the mandate from the Occupational Safety and Health Administration (OSHA) 29 CFR 1910.120 (q)(1), which requires that employers establish emergency procedures to be followed when responding to emergencies involving hazardous materials. This plan is available online to all employees and reflects pre-planning and coordination with outside shareholders.

The Incident Command System is a standard on-site command and control system used to manage emergency incidents and planned events. SJCFR has adopted and uses the NIMS system to manage its incidents. This system defines the lines of authority, roles, and responsibilities for managing large scale incidents. Furthermore, it designates a single incident commander as well as recognizes the "Unified Command" concept. Passing of command to senior officials is recognized, and the safety officer is identified.

During hazardous materials responses, SJCFR maintains available advanced life supports services on-scene for responders during actual and potential immediately dangerous to life and health (IDLH) atmospheres inside the county. When responding outside the County to the region, the requesting or local jurisdiction will provide those services. These advanced life support personnel are specifically trained in the medical aspects of hazardous materials through local protocols. However, team leaders believe they need more personnel trained to perform these functions. The roles of the emergency medical support personnel are clearly defined. Medical treatment protocols for handling medical emergencies involving hazardous materials have been approved by the organization's Medical Director.

The Emergency Response Plan (ERP) used by SJCFR addresses safe distances and areas of refuge for responders who may require it. It further identifies the required personal protective equipment to be employed along with emergency equipment. The plan identifies site security and control as well as establishes the usage of a personal accountability system. The ERP is thorough and details the use of emergency evacuation procedures and decontamination procedures to include collection and disposal of runoff. Finally, the response plan also details the procedures for after-action reports and critiques. This ERP provides for the deployment of resources outside of the jurisdiction for local, regional, and state assistance.

The SJCFR hazardous materials team has a personal protective equipment plan or program. The team follows manufacturer guidelines to address the hazard-based selection of protective ensembles, their use and limitations, work mission duration, maintenance and storage, decontamination and disposal, training and fitting, donning and doffing, and inspection procedures. Occupational Safety and Health Administration (OSHA) in CFR 1910.120 requires the employer to implement safe work procedures for the use of personal protective equipment in the workplace as well as train workers in its use. The regulation continues to require the employer to ensure that employees are complying with the regulations. SJCFR has policies in place to ensure this happens. All personnel are required to use a minimum of positive pressure, self-contained breathing apparatus until the atmosphere has been quantified.

SJCFR has policies and procedures that reference the usage of air monitors during the emergency response. These policies include documented maintenance procedures and calibration of its air monitors. SJCFR's ERP requires the establishment of a site-specific safety plan and has policies that reference a standardized methodology for assigning incident levels to hazardous materials emergencies. The ERP does not, however, outline the specific procedures for various tasks that team members may be required to perform, such as spill or leak control.

Human Resources

Occupational Safety and Health Administration (OSHA) in CFR 1910.120 requires that employers ensure that firefighters establish teams of two or more when working and that a rescue team suitably equipped is readily available. Listed specifically in the regulations are incidents involving hazardous materials. The accepted industry standard practice, according to the Florida State Emergency Response Commission, requires seven hazardous materials technicians to facilitate a minimal entry during a hazardous materials response. These seven people must be dispatched on the initial hazardous materials emergency response once it is determined that an emergency does exist. Of these seven, one should be the designated hazardous materials safety officer trained in accordance with NFPA 472: *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*, and another the incident commander. SJCFR has a minimum staffing requirement of six hazardous materials personnel assigned for the day between Fire Stations 16 and 4 with others throughout the County. SJCFR staffs 12 personnel normally per shift between fire stations and various other locations depending on department needs for the day. Ensuring that the initial alarm assignment contains the industry best practice should continue to be a goal for the organization.

One concern from team leaders was the geographical size of the service area requiring protection. Currently, two stations are providing all of the special operations support for the County. If the Hazardous Materials Team from Fire Station 16 is busy, then services are delayed. Furthermore, the geographical size of the response area can delay the arrival of units. One option is to establish additional capacity in other geographical locations to provide hazardous materials and technical rescue services.

SJCFR has a written medical surveillance plan for personnel assigned to the hazardous materials response team. This policy requires an opinion from a physician and provides for periodic examinations as determined by the physician. The medical surveillance plan provides for a medical assessment after exposures above the permissible exposure limit (PEL). All employees receive proper fitting for respiratory protective equipment.

Training

The SJCFR hazardous materials team certifies that its members have achieved technician level training in accordance with NFPA 472: *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*. SJCFR keeps records for documenting initial and refresher training and requires the completion of job tasks for all members, and certifies all members who are required to use respiratory protection. All members have been trained to a minimum level of EMT or Paramedic. The SJCFR hazardous materials team has a plan for annual refresher training and measurement of continued competency of all team members. Team leaders have expressed that the ability to train more on these practices should be increased to raise efficiency and proficiency for rescuers in more complex rescue situations.

Equipment

An objective review of equipment available for hazardous materials response was conducted. SJCFR has an adequate supply of decontamination equipment. This equipment consists of the required containment and collection items as well as the necessary solutions for decontamination operations. Gross decontamination, as well as technical decontamination operations, were evaluated and found to be adequate for the type of operations the County may encounter.

The inherent ability of hazardous materials emergencies to progress into longer-term operations dictates the need for effective rehabilitative efforts. SJCFR has arrangements in place for the sheltering of personnel during the rehabilitation process in an area out of the heat, cold, and elements. The means by which this is accomplished can be varied. Ambulances, buses, ventilated tents, and shelters are all possible means to achieve the desired outcome. SJCFR has methods in place to obtain meals for responders during extended operations.

SJCFR has various methods for analysis and detection of hazardous materials. This includes PH paper, multi-gas monitoring equipment, radiological monitors, and colorimetric chemical detection and analysis. There are also sufficient supplies for gathering and collecting samples. SJCFR uses the Smith Detection Hazmat ID, Gas ID, IR Spectroscopy, TrueDefender to increase ability from simple detection to actual identification of specific compounds. These monitors are expensive, and SJCFR should ensure replacement plans are in place to ensure upgrades are made to keep up with technology changes.

Every member of the hazardous materials team operating on-scene should have radio communications with the safety officer and entry coordinator during entry operations. At a minimum, one portable radio must be available for every entry team member who is at any level of dress (multiple entry teams and back up teams) as well as any team member who is coordinating a function (decontamination, science, safety, group leader, etc.) SJCFR has the communication capability to do this and has made it part of its standard operating procedures.

SJCFR has an assortment of equipment to handle LPG and NG leaks, including a propane transfer pump and flaring kits. Further spill and leak capabilities are available for various other types of hazardous materials releases. SJCFR has a full array of chlorine leak kits at its disposal, including rail car chlorine kits. They also include additional gaskets for use with these kits for other toxic chemicals. Furthermore, it has a Midland Kit. Moving equipment for handling drums is also available. SJCFR stocks more than the appropriate amount of overpack drum capabilities.

SJCFR provides adequate fire protection capabilities with foam application if required. There is an adequate amount of foam on hand as well as in reserve should the need materialize as well as the equipment to operate at 250 gallons per minute during application. SJCFR has the capability for Class D metal fire extinguisher usage.

SJCFR stocks the necessary medical equipment to monitor and provide treatment for team members during entry. As discussed previously in this report, there are medical treatment providers available with hazardous materials toxicology training based on medical protocols; however, additional training is required to increase the number of personnel who can serve in this role.

SJCFR maintains an adequate number of reference materials and can provide internet capabilities for research. However, internet capabilities are limited by service connectivity. During inclement weather or post-hurricane incidents, the ability to access the internet is very limited, if not altogether impossible. Identifying hazardous materials is delayed when technicians have to search textbooks for information instead of faster internet-based search engines, which reduce time tremendously. Furthermore, the ability to communicate post-storm is limited and could be increased through satellite telephones. This is a common problem in Florida for rescuers. The addition of satellite internet and phone service could greatly enhance and prevent delays during weather-related events. SJCFR employs a weather station for immediate on-site analysis.

SJCFR carries a standard complement of protective ensembles for rescuers. These include both 60-minute SCBA bottles with sufficient reserve bottles and a cascade system to support long term operations. SJCFR also requires responders to bring their issued turnout gear to ensure each rescuer has adequate NFPA compliant protective equipment that has been sized appropriately. This reduces the amount of equipment required to be stored for deployment. Industry best practices require each person operating as part of the team to be assigned NFPA compliant firefighting protective equipment.

TECHNICAL RESCUE SERVICES SUPPORT AND RESPONSE CAPABILITY

Much like fire and EMS incidents, SJCFR needs to be prepared for technical rescue emergencies. Technical rescue includes vehicle machinery extrication, high angle rope rescue, confined space rescue, water rescue, trench, and collapse rescue categories.

SJCFR includes a special operations component, Technical Rescue Team (TRT) and Urban Search and Rescue (USAR) team, that is in place to respond to technical rescue incidents. These members are also cross-trained as Hazardous Materials Technicians. The disciplines for which the agency is prepared include structural collapse rescue, confined space rescue, rope (high angle) rescue, vehicle/machinery rescue, water rescue, and trench rescue. The technical rescue operations are well structured, and appropriate training is in place. SJCFR deploys assets that are trained in technical rescue inside the County as well as to the surrounding area as mutual aid. SJCFR operates a special operations response squad pumper out of Fire Station 4. Currently, this unit is staffed with a minimum of three personnel per day. There are members assigned to Fire Station 16 for hazardous materials response who are also cross-trained as TRT members. This provides approximately 12 personnel available on shift throughout the County with a minimum total number of six for a response, not counting day staff. Several chief level officers are also trained in technical rescue and count towards the response numbers. SJCFR has a USAR trailer for delivering equipment and supplies.

SJCFR provides a robust water rescue capability designed to address open water issues surrounding the many beaches and inlet waterways of the response area. This is provided by 20 seasonal lifeguards during the March through September season. Normal 24/48 daily staffing includes 10 operations level responders, 28 technician level responders, 6 specialist level responders, and 5 vessel operators.

ESCI staff performed a comprehensive assessment based on the current standard practices consistent with the Occupational Safety and Health Administration (OSHA) 29 CFR 1910.146, NFPA 1006: *Standard for Technical Rescuer Professional Qualifications*, NFPA 1670: *Standard on Operations and Training for Technical Search and Rescue Incidents*, NFPA 1710: *Standard for Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, and the International Fire Service Training Association. The Operations Chief was interviewed to identify strengths and weaknesses within the team or team administration. The assessment was not a hazard-based risk analysis of the community, but instead, is based on a minimum level of capability. These four areas were:

1. Standard Operating Procedures, Policies, and Guidelines
2. Human Resources
3. Training
4. Equipment

Standard Operating Procedures, Policies, and Guidelines

The first area of evaluation involves the established standard operating procedures, policies, and guidelines used to manage the team. SJCFR does not have a dedicated Emergency Response Plan (ERP) for technical rescue incidents per se. However, they use an all-hazards response plan and standard operating guidelines and procedures for incidents. This plan is available online to all employees. Non-team members are also governed by specific Standard Operating Guidelines (SOGs) and Standard Operating Procedures (SOPs) that dictate scene operations for initial company arrival.

The Incident Command System is a standard on-site command and control system used to manage emergency incidents and planned events. SJCFR has adopted and uses the National Incident Management System (NIMS) to manage its incidents. This system defines the lines of authority, roles, and responsibilities. Furthermore, it designates a single incident commander as well as recognizes the "Unified Command" concept. Passing of command to senior officials is recognized. SJCFR identifies an incident safety officer for technical rescue incidents.

During technical rescue responses, SJCFR maintains available advanced life support services on-scene for responders during actual and potential immediately dangerous to life and health (IDLH) atmospheres. Not all advanced life support personnel are specifically trained in the medical aspects of technical rescue incidents. However, the team has several members who have completed medical specialist training. This training is designed for incidents involving technical rescue. The roles of the emergency medical support personnel are clearly defined. Medical treatment protocols are in place that specifically address handling medical emergencies involving crush syndrome. Often crush syndrome is associated with technical rescue incidents. Medical Treatment Protocols are a definite benefit to advanced life support personnel. SJCFR has a progressive Medical Director who is supportive of Special Operation's needs.

The standard operating guidelines used by SJCFR address the required personal protective equipment to be employed along with emergency equipment. The plan identifies site security and control. The standard operating guidelines and procedures establish the usage of a personal accountability system. The standard operating guidelines are thorough and detail the use of emergency evacuation procedures. Finally, the plan also details the procedures for after-action reports and critiques. SJCFR has specific SOGs and SOPs for each discipline that provides further direction for personnel.

The SJCFR TRT has a personal protective equipment plan or program specific to technical rescue equipment. All personnel are required to use a minimum of positive pressure, self-contained breathing apparatus until the atmosphere has been quantified.

SJCFR TRT has established policies and procedures that reference the usage of air monitors during the emergency response. Squad 4 has a four-gas monitor that has O_2, LEL, H_2S, and CO sensors assigned. Calibration tests are done at least every month. Furthermore, they maintain documented maintenance procedures and calibration of their air monitors. SJCFR does not have a policy for developing a site safety plan. This is another general recommendation.

Human Resources

The Florida Association of Search and Rescue Resource Typing for light technical rescue teams mandates that six technical rescue technicians should be present for light technical rescue operations as an industry standard. NFPA 1710: *Standard for Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, requires that employers ensure that firefighters establish teams when working and that a suitably equipped rescue team is readily available, when firefighters are required to engage in emergency responses that require specific and advanced training and specialized equipment. SJCFR staffs 12 personnel throughout the County with a minimum of six each day.

As with hazardous materials responses, the geographical constraints of a large service area and limited numbers of specialized resources can delay services. Currently, these resources are spread between two stations, and SJCFR could enhance response by adding capacity using existing team members to staff additional resources based on geographical needs. One concept that could be employed would be to outfit current Ladder companies with cross-trained members and equipment to help address geographical Special Operation's needs. Often jurisdictions will outfit their ladder companies with equipment and staff to perform rope rescue, confined space rescue, and vehicle machinery extrication. This approach could be used by SJCFR to increase resource availability.

SJCFR has a written medical surveillance plan for all employees and not just for personnel assigned to the technical rescue team. This policy requires an opinion from a physician, and it provides for periodic examinations as determined by the physician. Because the SJCFR TRT is expected to perform rescues in confined spaces, the medical surveillance plan provides a medical assessment after exposures above the permissible exposure limit (PEL). All employees receive proper fitting for respiratory protective equipment for use during confined space entry.

Training

The SJCFR TRT certifies that its members have achieved Technician level training in accordance with NFPA 1006: *Standard for Technical Rescuer Professional Qualifications*. SJCFR keeps records for documenting initial and refresher training. The organization requires completing a task book for all members and certifies all members who are required to use respiratory protection. All members have been trained to a minimum level of an EMT or Paramedic. The SJCFR TRT has a plan for annual refresher training or measurement of the continued competency of all team members. USAR team members train with Florida Task Force 5 for continuing education and competency. Annual requirements for confined space entries are not maintained. This is a general recommendation and required by OSHA 1910.146(k)(2)(iv) to ensure that affected employees practice making permit space rescues at least once every 12 months, using simulated rescue operations in which they remove dummies, manikins, or actual persons from the actual permit spaces or representative permit spaces.

It is noted that the TRT management has identified difficulty in obtaining continued training for team members. New team members must attend a long and extensive training regimen that requires a significant commitment from the department to cover. As with many TRTs, the amount and variety of skills required to be maintained amongst the various disciplines often make it difficult to cover all of them frequently enough. Monthly training sessions are currently conducted; however, full team training would be beneficial and ensure greater proficiency and team cohesion. The team now is provided three days a year for full team training. The team also conducts shift USAR training on Tuesdays based at the company level.

The State of Florida has been affected on multiple occasions with floodwater situations from high rain, hurricanes, and tropical storm activity. The inherent dangers of rising water, swiftwater, or moving water, in general, make rescue situations very dangerous for untrained rescuers. SJCFR should take the opportunity to consider expanding the capabilities of the team and ensure adequate water rescue training is achieved.

SJCFR team leaders recognize a need for additional training in dealing with large-type automotive incidents. Buses, semi-tractor trailers, trains, and aircraft can pose unique hazards and complications for rescuers. These incidents require specific training to ensure rescuers are prepared. Training in large vehicle operations should be encouraged.

Equipment

The disciplines involved with technical rescue require an extensive amount of necessary equipment to meet the demands of the incident. SJCFR uses a well-structured mix of deployment methods to deliver the necessary resources to the scene. The ability to assemble the equipment and resources is further complicated by the expensive nature of this equipment. ESCI used an objective evaluation of SJCFR equipment used to mitigate these emergencies. SJCFR has a capital expenditure plan for addressing large ticket items.

For example, the extrication equipment employed by SJCFR will eventually need to be replaced. Older extrication equipment, with cutting forces of around 60,000 psi, struggle to be effective on the new technologies and materials used in the automotive industry. Upgrading extrication equipment to handle the newer high strength structural steel with a required cutting strength of 300,000 psi that manufacturers are using to construct today's automobiles will ensure that rescuers have the best chance of succeeding. Because this equipment is expensive and wears out over time, a replacement schedule much like those used for apparatus should be developed as well as the funding mechanisms to support it. SJCFR has this in place and has begun upgrading its rescue tools. This should be commended and continue.

Another expensive area of replacement is lifting and moving airbags. This is a valuable piece of equipment and greatly enhances the abilities of the extrication team to handle a greater variety of rescue situations. These air bags are good for a specific life span. This characteristic presents the ability to schedule replacement timelines and prepare appropriate budget considerations. This is very similar to the rope rescue replacement plan already in use by SJCFR. The main difference is the cost per item considered for replacement.

Water rescue services are provided through the use of six personal watercraft (PWC) with trailer and sled, two flood response vessels, one 29' all hazards maritime suppression vessel with trailer, one inflatable rescue boat (IRB) with trailer, and two johnboats.

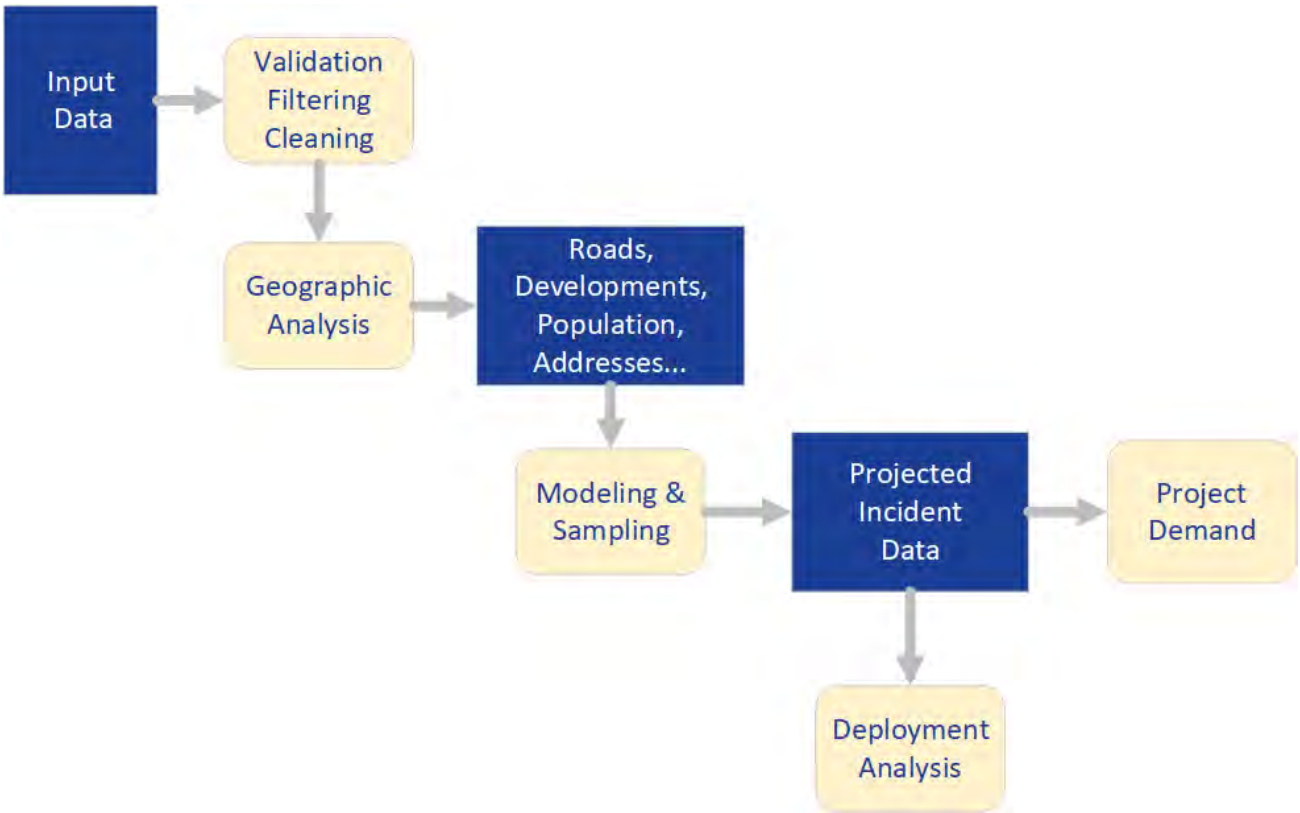
SJCFR has a strong complement of technical rescue equipment. These current capabilities can be augmented with some increased training and a dedicated capital expenditure plan for replacement items. Team leaders have identified several of these shortfalls and have already begun the process of addressing them.

FUTURE SYSTEM DEMAND PROJECTIONS

An essential component of the master planning process is a consideration for future demand projections. The explosive growth planned in St. Johns County made this process even more important. For this component of the study, Levrum's proprietary future incident modeling tools were used in conjunction with manual data-cleaning, validation, and analysis procedures. The overall objective of this portion of the study was to create predictive models tied to observable development milestones, rather than specific timeframes. This approach is necessary for two reasons. First, the magnitude of planned development in St Johns County is significant enough that it vastly outstrips the pace of "background" growth (growth not associated with development of previously undeveloped areas)—in fact, proposed development plans, if and when fully implemented, will grow the County by up to 80% of its current population. Second, development of this magnitude depends on numerous external factors that are impossible to predict, such as local, national, and international economics, social factors, competitive pressures, and unpredictable "black swan" events such as the COVID-19 pandemic. This approach provides actionable trigger milestones for planned strategic changes that are not directly dependent on unpredictable external factors.

The future incident modeling process consisted of several components, depicted in Figure 98.

Figure 98: Future Incident Modeling Process Overview



At a high level, the process involved the following components:

1. Input data was obtained from various sources as in later sections. This data included road networks, existing and planned residential developments, Census demographic data, and SJCFR emergency incident history, among other elements.
2. A process of validation, filtering, and cleaning was applied to ensure data quality and Marshal data into forms usable by the modeling process.
3. Geographic analysis pre-calculated certain attributes of existing residential land uses, development plans, and other geographic features. It also involved creating enhanced road networks with connections between generated street networks in planned neighborhoods with planned arterial linkages.
4. This resulted in a master set of data used for the modeling process.
5. Statistical models of residential service demand were developed from the master data set, using machine learning techniques.
6. These models were sampled to generate projected future incident datasets, which were subsequently used to compute statistics on projected future incident demand, and also to perform deployment analysis on strategic alternatives for handling projected growth.

Appendix D of this report provides details on the methods employed and findings developed for this process.

Projections of Population and Service Demand

As noted, new development is dependent upon numerous external factors such as regional, national and international economics, social factors and unexpected events such as the COVID-19 epidemic. In the case of extremely significant development such as that planned for St. Johns County, it is impractical and potentially misleading to make time-specific predictions of development. A prediction of the form "when X% of the planned buildout is complete, service demand will be Y" is more valid than one of the form "service demand will be X in year Y." Accordingly, projections of total population and service demand are given based upon individual buildout scenarios, rather than a fixed time scale. Figure 99 and Figure 100**Error! Reference source not found.** illustrate population and service demand, respectively, projected by the model for each development scenario, compared against a 2018 baseline (the latest for which both CFS and Census data were available).

Figure 99: Population Growth by Scenario

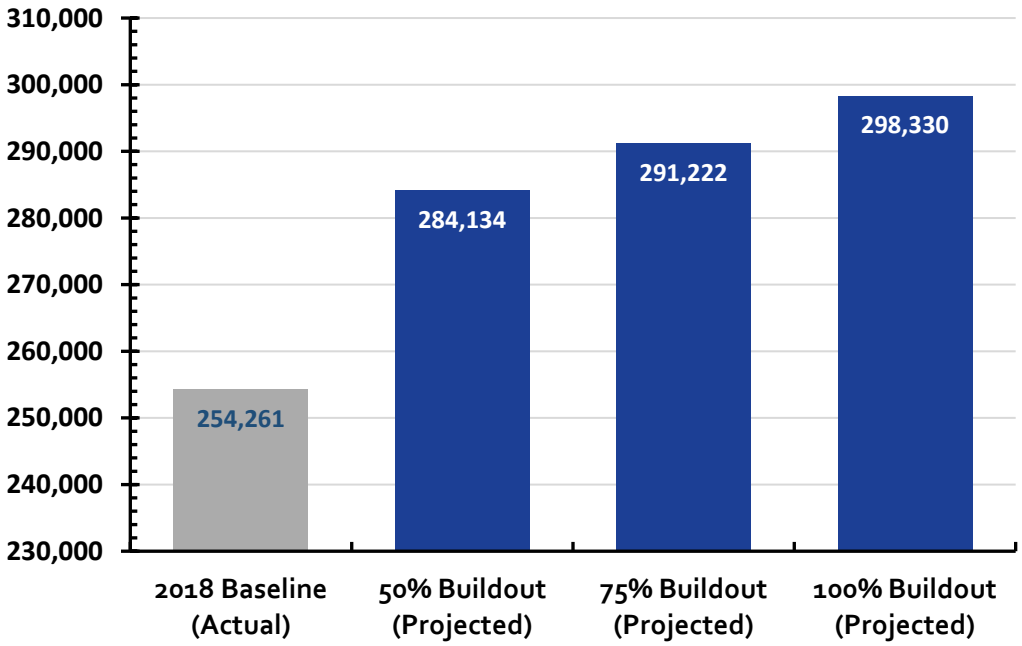


Figure 100: Demand Growth by Scenario

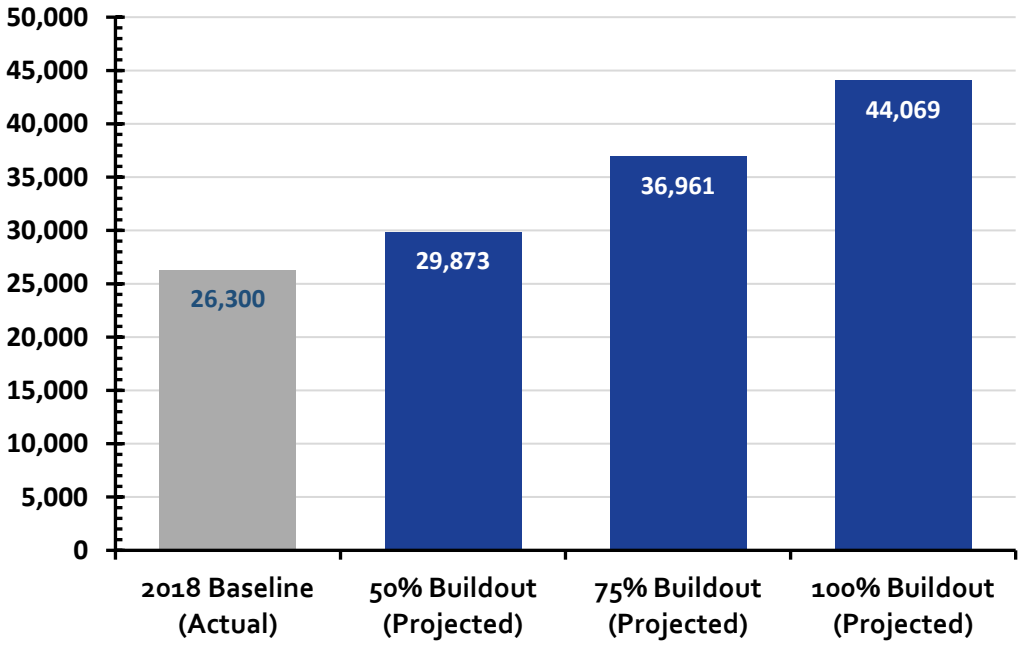
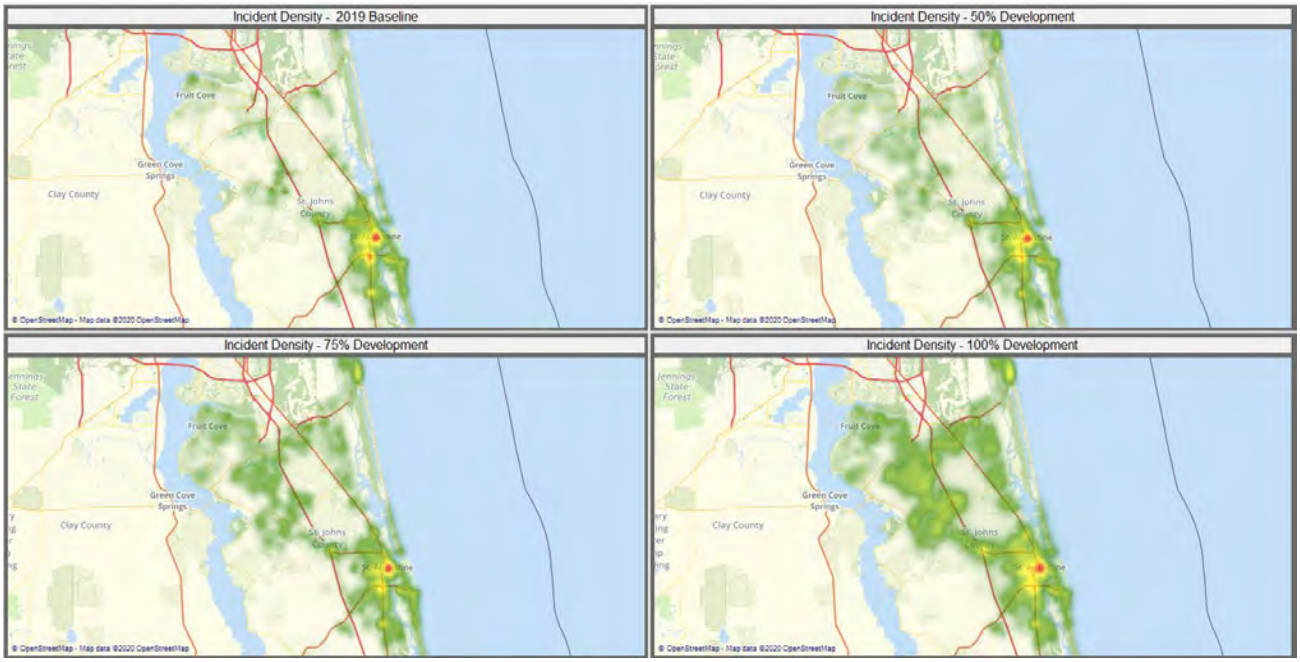


Figure 101 provides gradient density maps ("heat maps") of incident density for actual 2019 incidents, compared with densities for the 50%, 75%, and 100% buildout scenarios—along with projected background growth through 2024. The maps illustrate the increasing volume of incidents in the northwestern portion of the county, currently largely unoccupied. In the 75% and 100% scenarios, incident volume/density in the developing portions of the County becomes comparable with near-outlying areas of the City of St. Augustine.

Figure 101: Comparative Density Maps of Growth Scenarios



This data can be used to plan based on milestones, rather than timelines that are likely to fluctuate significantly based upon unpredictable external factors (e.g., "prior to 50% completion" would be preferable to "by 2023.") Implications of these scenarios for fire/EMS deployment are further explored in the section titled *Recommended Long-Term Strategies*.

Community Risk Analysis

Every community is unique in the types of risks present that potentially threaten people and property. Risks are identified and evaluated for potential impacts to the SJCFR. In this section, community risks specific to the SJCFR are presented 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. Not all hazards of individual occupancies can be considered; however, some risks are applicable within the entire County.

Community Risk Assessment is defined by the National Fire Protection Association (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* as:

> A systematic approach that identifies, assesses, categorizes, and classifies the probabilities and consequences of a community's fire and non-fire hazards and threats, taking into account all pertinent facts that increase or decrease risks *in each first-due response zone.*

Figure 102 is one sample method of identifying and analyzing risk within a community.

Figure 102: Risk Identification and Analysis Process

Step	Action
Hazard Identification	Identify hazards
	What is the probability this hazard will occur?
	Is this hazard a significant threat to your jurisdiction?
Vulnerability Assessment	For each hazard identified in the hazard identification process, consider each of the five factors: Factor 1: Danger/Destruction/Personal Harm Factor 2: Economic Impacts Factor 3: Environmental Impacts Factor 4: Social Impacts Factor 5: Political Considerations
	Score the vulnerability of this hazard
	Reconsider the priority of each hazard-based on vulnerability
Risk Rating Score	Risk Rating = Probability x Vulnerability

Population and Population Density

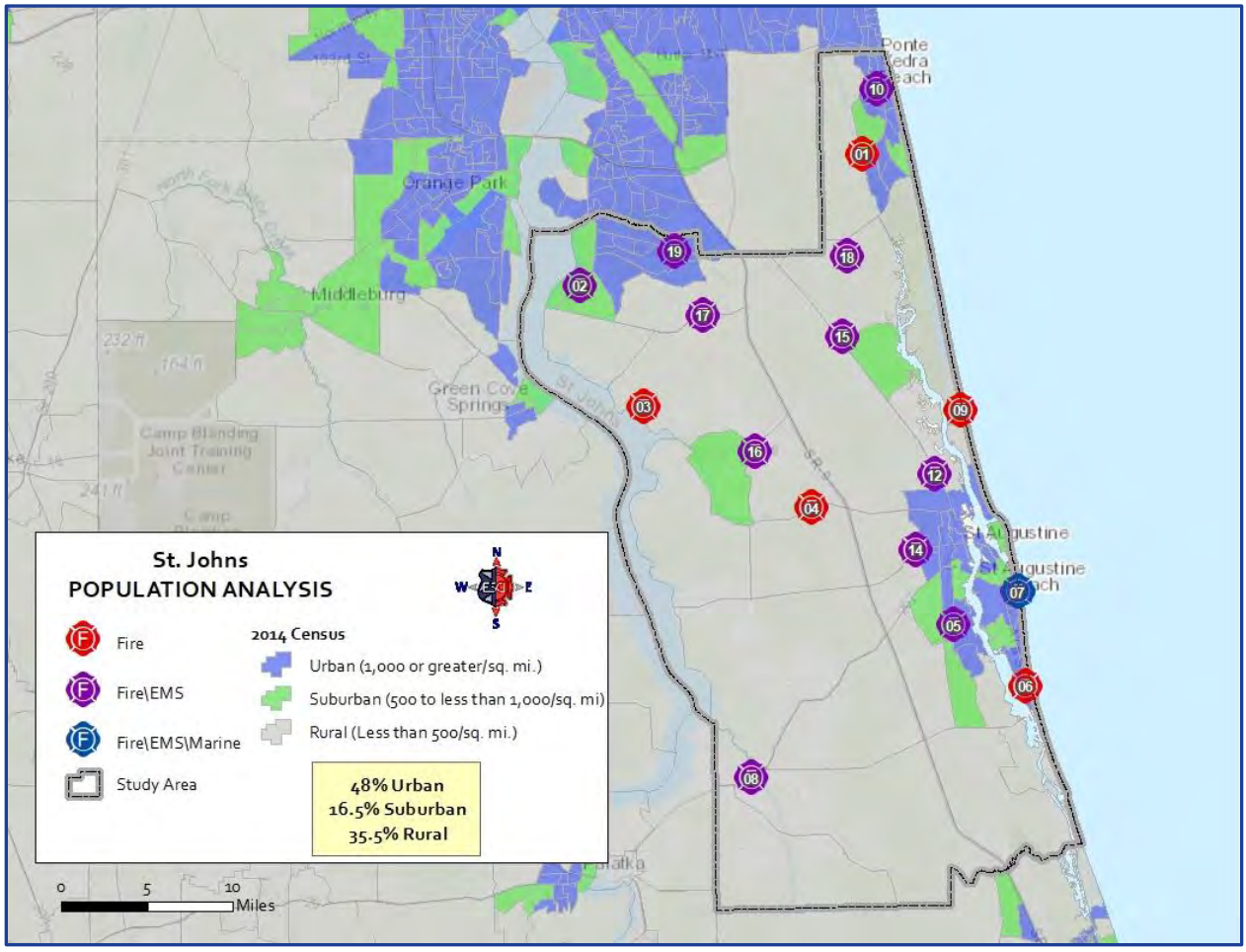
An important aspect of classifying risk is to know where the population of a community is located. Community Risk is assessed based on the total population (normal, transitional, road miles, the general, and different types of occupancies). SJCFR's current population (2019) is estimated at 255,148, and by 2024, the population is estimated to grow to 296,452. From 2010 through 2019, the population growth for SJCFR increased at a rate of 3.24%. From 2019 through 2024, the estimated annual growth will continue to rise at a rate of 3.05%.

Population increases correlate to variations in population density or the population per square mile. Population density for SJCFR is comprised of:

- Urban (> 1,000 people per square mile)
- Suburban (500–1,000 people per square mile)
- Rural (< 500 people per square mile)

Figure 103 provides population density by U.S. Census block groups, which are the smallest division used by the census. This data is from an updated 2014 ACS Census.

Figure 103: Population Density by 2014 ACS Census Block Groups



Population density varies throughout the SJCFR service area. The overall population density on the east and northwest sides of the County exceeds 1,000 persons per square mile, which meets the NFPA definition of an urban area. In addition, urban population density seen on the immediate outside boundaries northwest of SJCFR is a portion of the rapidly growing sprawl and may eventually increase that area of the County's population from suburban and rural to urban. As the population in the County increases, the Fire Department may need to re-evaluate demographic and census data, adjusting response goals to meet future service demand adequately.

Population density (2019) is estimated by ESRI to be 378.9 persons per square mile in the SJCFR. With higher than average growth rates, population density is estimated to increase to 440.2 people per square mile by 2024. Significant developments, both residential and commercial, are at present being developed on the east and west sides of the County.

Several relational factors are associated with a greater number of occupancies and residents within denser areas. Increased probabilities of emergency events or higher service demands can create reduced reliability of first-due and effective response forces. Consistent agency service will be impacted as well as travel time benchmark performance. Traffic flow constriction on major thoroughfares, especially when the tourist population is present, may create performance gaps.

Demographics

A community risk assessment includes information about the people who are impacted by, or are part of, the problem because risk is influenced by socioeconomic issues. A community demographic profile can be developed with accurate statistical data derived from the population. Causal factors and at-risk populations must be evaluated with consideration of the following:

- Social factors and cultural influences
- Economic factors
- Environmental elements
- Identification of risk factors in specific populations
- Children (age 5 & under)
- Older adults (age 65 & older)
- People with disabilities
- People living in poverty
- Populations that speak English as a second language

St. Johns County is made up of 8.8% of persons born in 1945 or earlier. Persons born between 1946 and 1964 account for 25.5% of the population, while persons born between 1965 and 1980 account for 21.0%. Persons born between 1981 and 1998 make up 19.8% of the County's population, and 22.0% are persons born between 1999 and 2016. Lastly, 2.9% of the population was born in 2017 or after. The median age of the County's population is 43.3, and the income levels are $76,509 for median household income and a median per capita income of $41,273.

The U.S. Census shows that the racial makeup of St. Johns County, in which SJCFR is located, is predominately White (88.8%), Black or African American (5.5%), American Indian (0.3%), Asian (3.2%), Native Hawaiian (0.1%), two or more races (2.1%), Hispanic or Latino (7.2%), and White alone, not Hispanic or Latino (82.3%).

St. Johns County's well-educated population contributes to lower risk factors; 29% of the population having some college education, and 45% of the population having completed a bachelor/graduate or other professional degrees. Seventy-two percent of the population is white-collar employment, with an unemployment rate of 3.4%.

Social risk factors are concentrated on population influx from seasonal/recreational/occasional housing units (110,825 units) and the risks this population adds to the demands for emergency services. Beautiful beachfront/vacation and river atmosphere bring tourists unfamiliar with the area who are not paying attention to proven safety systems endorsed and promoted by area officials.

Community Land Use Regulations

Future infrastructure requirements to sustain the growth in St. Johns County will be critical to property owners and coincides with zoning, subdivision regulations, and higher property values. Infrastructure will include roads, bridges, sewers, water, and fire hydrants. Other infrastructure St. Johns County should consider: additional police and fire stations, a larger emergency operations center, hospitals, schools, and libraries. 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.

Occupancy Types by Land Use Designation

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.

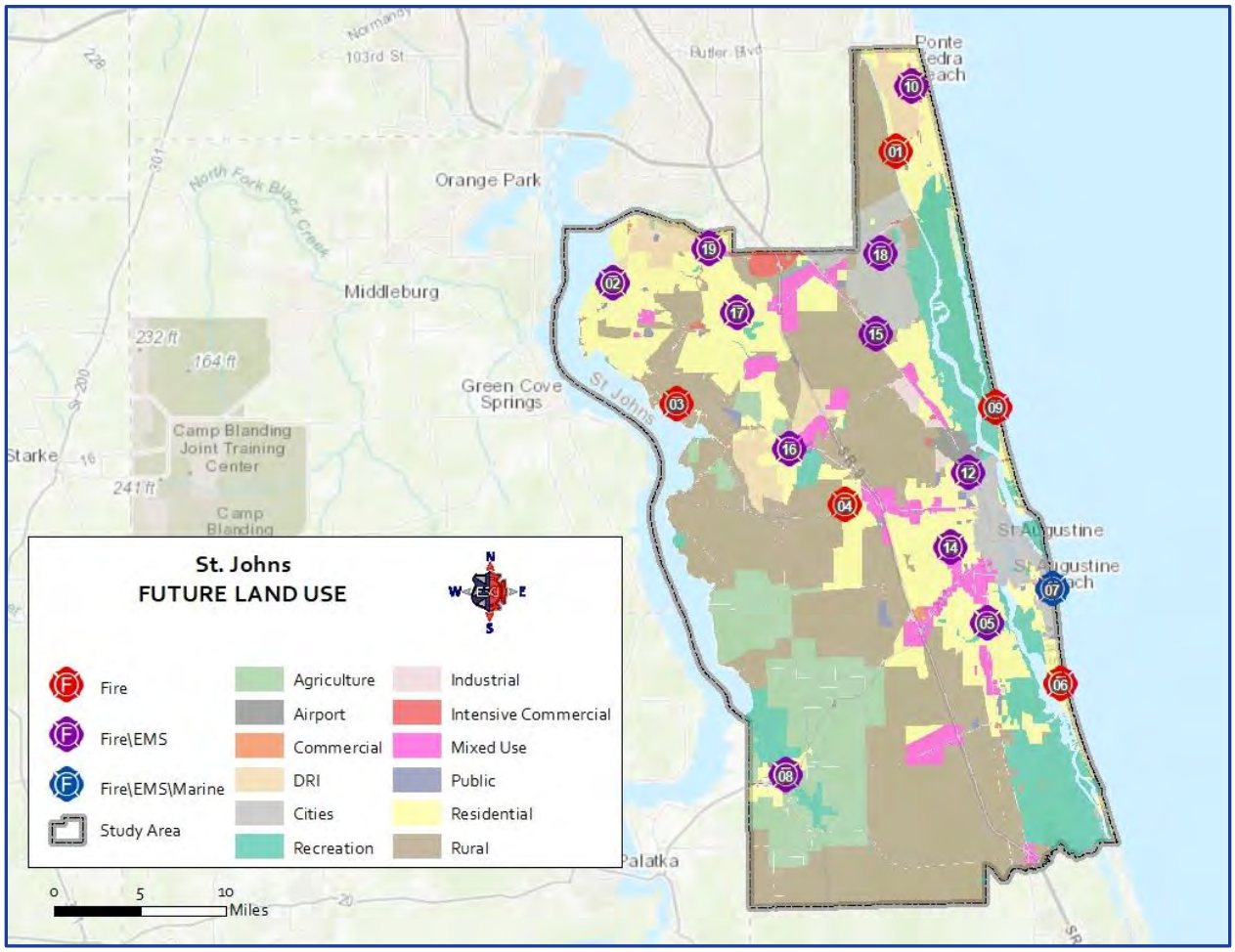
Figure 104 translates zoning to categories of relative fire and life risk.

Figure 104: Relative Fire and Life Risk

Relative Risk Category	Zoning
Low Risk	Areas zoned and used for agricultural purposes, open space, and very-low-density residential use
Moderate Risk	Areas-zoned for medium-density single-family properties, small commercial and office uses, low-intensity retail sales, and equivalently sized business activities
High Risk	Areas zoned for higher-intensity business districts, mixed-use areas, high-density residential, industrial, warehousing, and large mercantile centers

Figure 105 provides a simplified illustration of the general classes of zoning found in St. Johns County.

Figure 105: Zoning Classifications



Residential and commercial occupancies are distributed along the major routes of the County (I-95, US 1, Routes 13 and 16, and the scenic route of A-1-A). Residential and commercial areas are interwoven between agricultural and recreational land. Most of the County is comprised of low-risk properties of primarily rural areas, agriculture, or recreational areas. Moderate risk residential properties (single-family dwellings) present the second most common land use in the County. Also seen in the figure are mixed-use, intensive commercial, and industrial areas. Infrastructure changes are needed to support additional development in the rural areas.

Property Use by Incident

It is helpful when discussing community risk to examine incident data to determine the types of properties that generate demand for fire department services. Figure 106 uses the *National Fire Incident Reporting System* (NFIRS) data provided by SJCFR to display the actual property use associated with incidents from January 2017 through December 2019. Any incidents in which an NFIRS incident type or fixed property was not reported were excluded. After these exclusions, 75,635 records remained for analysis.

Figure 106: Property Use by Type of Incident (2017–2019)

NFIRS Property Use Category	Fires (NFIRS 100s)	EMS (NFIRS 300s)	Alarms (NFIRS 700s)	All Others
1—Assembly (restaurant, bar, theater, library, church, airport)	2.75%	4.33%	10.80%	2.49%
2—Educational (school, daycare center)	0.53%	1.26%	7.03%	0.50%
3—Healthcare, detention & correction (nursing home, hospital, doctor's office, jail)	0.35%	10.60%	9.09%	2.21%
4—Residential (private residence, hotel/motel, residential board)	41.43%	58.27%	56.91%	59.91%
5—Mercantile, business (grocery store, service station, office, retail)	2.69%	4.19%	12.32%	3.44%
6—Industrial, utility, agriculture, mining	11.76%	0.15%	0.48%	1.20%
7—Manufacturing	0.23%	0.09%	0.48%	0.04%
8—Storage	2.46%	2.35%	1.06%	1.27%
9—Outside property, highway, street	37.80%	18.76%	1.81%	28.92%

Two categories, in particular, 4—Residential and 9—Outside property, highway, and street, reveal the highest percentage of emergency incident response. These incidents include structure and wildfires, medical emergencies, and vehicle accidents and fires. Of particular note was the high response rates of 56.91% for alarms to residential properties.

Property Use Type by Zone

ESCI further discusses community risk by examining the demand for emergency services specific to each geographic sub-area or zone in a community. Staffing and deployment resource allocation by station can then be determined based on identifiable criteria. Figure 107 uses the *National Fire Incident Reporting System* (NFIRS) data provided by SJCFR to display the actual property use response per Zone associated with incidents from January 2017 through December 2019. Any incidents in which a zone or fixed property was not reported were excluded, as were incidents that occurred in the City of St. Augustine. After these exclusions, 72,300 records remained for analysis.

Figure 107: Property Use by Zone (2017–2019)

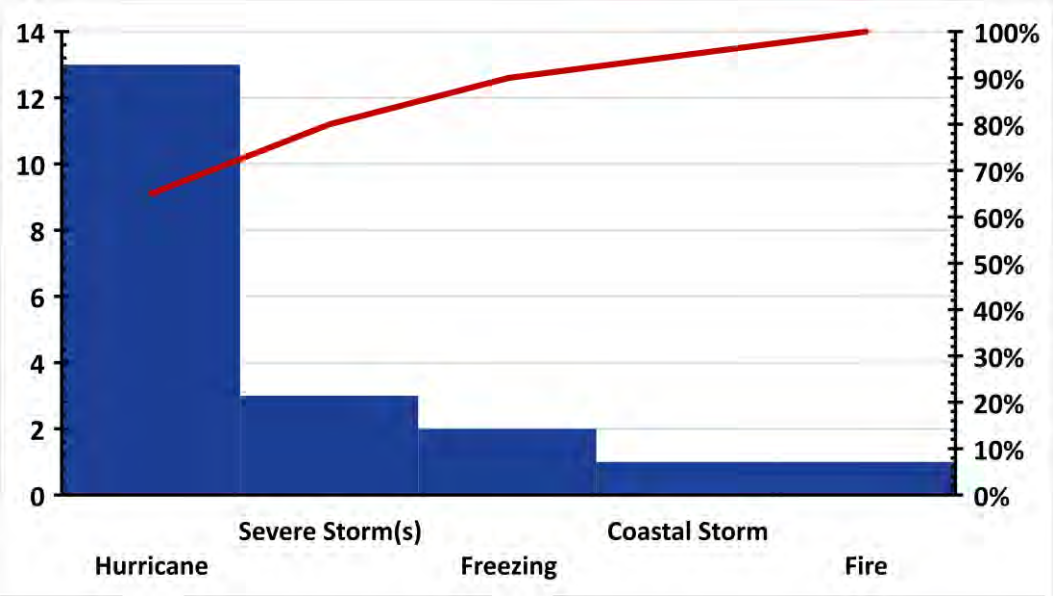
NFIRS Property Use Category	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9
1—Assembly (restaurant, bar, theater, library, church, airport)	7.14%	4.28%	2.80%	4.57%	3.68%	2.53%	6.43%	1.67%	4.72%
2—Educational (school, daycare center)	2.14%	2.09%	2.11%	0.71%	0.60%	0.18%	0.21%	0.38%	0.13%
3—Healthcare, detention & correction (nursing home, hospital, doctor's office, jail)	6.62%	10.77%	0.07%	2.03%	18.17%	1.61%	7.72%	1.14%	0.26%
4—Residential (private residence, hotel/motel, residential board)	62.97%	64.04%	65.62%	52.67%	46.98%	69.11%	63.61%	66.78%	64.07%
5—Mercantile, business (grocery store, service station, office, retail)	3.91%	3.07%	0.89%	8.50%	7.54%	1.61%	2.74%	2.81%	2.36%
6—Industrial, utility, agriculture, mining	0.48%	0.64%	1.91%	0.91%	0.36%	0.23%	0.11%	1.46%	0.38%
7—Manufacturing	0.04%	0.00%	0.00%	0.68%	0.07%	0.00%	0.00%	0.09%	0.00%
8—Storage	1.37%	1.45%	1.91%	2.98%	0.88%	1.61%	1.77%	5.79%	2.36%
9—Outside property, highway, street	15.33%	13.67%	24.69%	26.95%	21.70%	23.11%	17.42%	19.87%	25.72%
NFIRS Property Use Category	**Zone 10**	**Zone 11**	**Zone 12**	**Zone 14**	**Zone 15**	**Zone 16**	**Zone 17**	**Zone 18**	**Zone 20**
1—Assembly (restaurant, bar, theater, library, church, airport)	5.20%	1.36%	3.73%	5.53%	2.72%	3.30%	3.31%	4.39%	5.37%
2—Educational (school, daycare center)	0.69%	1.12%	3.10%	1.32%	3.39%	1.64%	3.70%	2.38%	2.07%
3—Healthcare, detention & correction (nursing home, hospital, doctor's office, jail)	16.21%	10.11%	7.56%	8.01%	3.29%	11.03%	4.52%	8.99%	1.65%
4—Residential (private residence, hotel/motel, residential board)	61.24%	65.88%	60.70%	55.51%	61.19%	56.82%	52.47%	60.13%	9.92%
5—Mercantile, business (grocery store, service station, office, retail)	3.30%	3.74%	4.44%	4.63%	3.85%	4.04%	6.68%	3.23%	1.24%
6—Industrial, utility, agriculture, mining	0.09%	0.77%	0.55%	0.70%	1.13%	0.23%	0.51%	1.63%	0.41%
7—Manufacturing	0.00%	0.20%	0.46%	0.04%	0.10%	0.23%	0.05%	0.00%	0.00%
8—Storage	2.14%	0.57%	1.77%	1.99%	1.54%	4.31%	1.96%	3.95%	14.88%
9—Outside property, highway, street	11.12%	16.23%	17.69%	22.26%	22.79%	18.41%	26.80%	15.29%	64.46%

All stations respond to calls for service in residential areas and outside properties. A review of emergency calls is Zone(s) 2, 5, 10, and 16 responses to healthcare, detention & correction (nursing home, hospital, doctor office, jail) was at 38% and Zones 4 and 5 responses to mercantile, businesses were at 8%.

Geographic and Weather-Related Risks

The number and frequency of federal disaster declarations affecting St. Johns County paint a picture of the risks that natural hazards pose to the region. Figure 108 highlights the frequency of major natural disaster declarations in St. Johns County.

Figure 108: Summary of Federal Disaster Declarations in St. Johns County by Type, 1970–2020



While the past does not predict the future, it can provide a relative comparison for planning purposes.

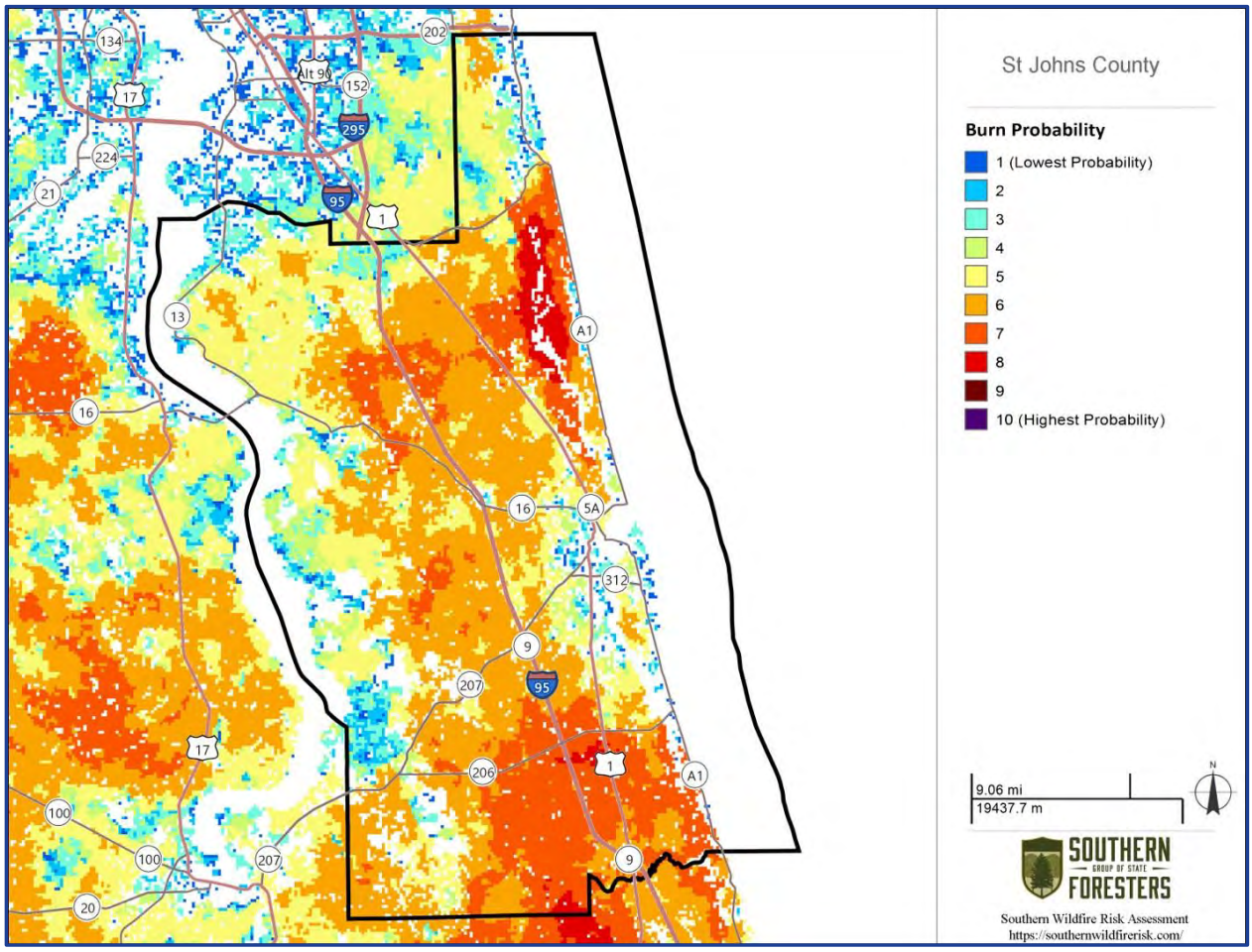
Wildfire Risk

Wildland urban interface (WUI) fires describe an area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth substantially increases the risk of wildfire. According to the Southern Group of State Foresters *Southern Wildfire Risk Assessment Summary Report* (February 2020), in a recent study of SJCFR's area, an estimated 182,440 people, or 96.1% of the total project area population (189,904), live within the WUI.

Wildland fires are a year-round concern in the St. Johns County area, even though wildfire season is February through June. The level of wildfire risk is dependent upon several factors, including climate, vegetation, and topography. County planning codes require residents to plant natural vegetation around new construction because it is less expensive; however, the natural vegetation is very flammable and allows wildland fires to increase in size and move quickly. In many cases, no buffer of fuel exists between commercial/residential areas and forestry areas, as many residents enjoy the woods being near their homes. State Forestry Service officials have been working with County planning and code enforcement officials for the last 4 to 5 years to change codes for natural vegetation planting.

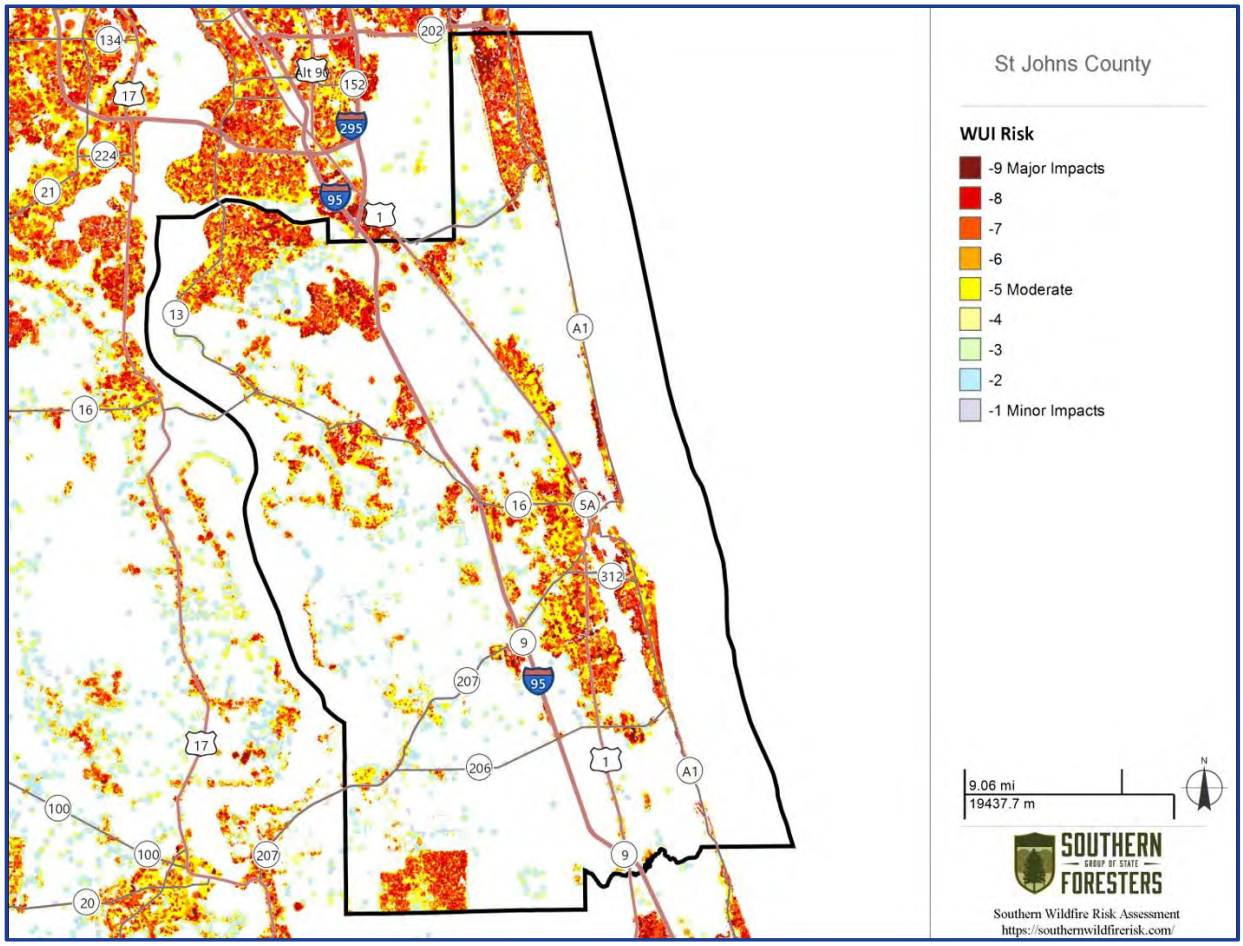
Burn Probability (BP) map layering is a planning tool used for the assessment of wildfire risks and mitigation. Burn Probability (BP) layering depicts the probability of an area burning given current landscape, conditions, percentile weather, historical ignition patterns, and past fire prevention and suppression efforts. Burn Probability rating is shown from the lowest probability of 1 to the highest of 10. Figure 109 shows that St. Johns County is rated from a 1 to 8 probability. The Burn Probability Index map also reveals that there is a high possibility for wildfire risk throughout most of St. Johns County.

Figure 109: Burn Probability Index for SJCFR



Another indicator of wildland risk is the wildland urban interface (WUI) risk index. The WUI risk index is a rating of the potential impact of a wildfire on people and their homes. WUI reflects housing density (house per acre). WUI risk rating is calculated using the WUI housing density data combined with flame length data and response functions. Figure 110 shows the WUI Risk Index for St. Johns County.

Figure 110: WUI Risk Index for SJCFR



The figure indicates that 99,450 acres of the acreage in St. Johns County are between a moderate to major impact for wildfire.

Figure 111 summarizes the SJCFR responses to vegetation related fires from 2017 through 2019, according to the National Fire Incident Reporting System (NFIRS) data provided by SJCFR.

Figure 111: Types and Number of Vegetation Fires, 2017–2019

Type of Fire	Count
Brush or brush-and-grass mixture fire	312
Cultivated vegetation, crop fire, Other	6
Forest, woods, or wildland fire	121

Both the SJCFR and the Florida Forest Service have recognized areas prone to wildland fires and have targeted public education efforts together. Specifically, public education discusses the need for a defensive space during a wildfire through the NFPA Firewise USA® program. SJCFR also disseminates controlled burn information through social media, mainstream media, and community partner websites. The constant flow of media information has reduced calls for assistance during controlled burns.

Weather Risks

St. Johns County is a humid subtropical climate, typical of the Gulf and South Atlantic states. The low latitude and coastal location give the County a mostly warm and sunny climate. Like much of Florida, St. Johns County enjoys a high number of sunny days, averaging 2,900 hours annually. Unlike much of the contiguous United States, St. Johns County's driest time of year is winter. The hot and wet season extends from May through October, while the cool and dry season extends from November through April.

In the hot season, average daytime highs are in the upper 80s to low 90s °F (26 to 33°C), and average nighttime lows are in the low 70s °F (21 °C). The Bermuda High pumps in hot and unstable tropical air from the Bahamas and Gulf of Mexico, which help create the daily thundershowers that are typical in summer months. Intense but very brief downpours are common in mid-summer. Fall and spring are warm and sunny with highs in the 75 to 80 °F (21 to 24 °C) range and overnight lows in the 50s to low 60s °F (10 to 17 °C).

In the dry winter season, St. Johns County generally has mild and sunny weather typical of the Florida peninsula. The coolest months are from December through February, with average daytime highs that range from 65 to 70 °F (18 to 21 °C) and nighttime lows in the 46 to 49 °F (8 to 10 °C) range. From November through April, St. Johns County often has long periods of rainless weather. Early spring (April) can see near drought conditions with brush fires and water restrictions in place. St. Johns County averages six touches of frost per year. Hurricanes occasionally impact the region; however, like most areas prone to such storms, St. Johns County rarely suffers a direct hit by a major hurricane. The last direct hit by a major hurricane to the County was Hurricane Dora in 1964.

While it is impossible to predict or prevent risks from environmental events accurately, it is possible to identify these factors based on historical data and apply mitigation strategies to reduce the level of impact. SJCFR has several weather-related and environmental risks of concern. These include wildland urban interface (WUI) fires and weather-related risks (hurricanes, flooding, and tornadoes).

Hurricanes

Hurricanes are a high weather-related risk for SJCFR. St. Johns County is surrounded by water and is highly susceptible, putting the area at risk for hurricane-related damage from wind, flooding, and storm surge damage. Florida hurricanes from 2000 to the present have been marked by several devastating hurricanes, including Hurricane Matthew in 2016 that caused major flooding in St. Augustine even though it stayed offshore of St. Johns County.

Hurricanes are measured on a Saffir-Simpson Hurricane Wind Scale. Figure 112 illustrates the categories and typical damage associated with wind speeds.

Figure 112: Saffir-Simpson Hurricane Wind Scale

Scale	Wind Estimate	Typical Damage
Category 1	74–95	Very dangerous winds will produce some damage: Well-constructed frame homes could have damage to 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.
Category 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 loss.
Category 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.
Category 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 to months.
Category 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 uninhabitable for weeks to months.

Hurricanes have many days of warning before the effects of the storm are encountered. The County has time to prepare before the storm. Damage from a hurricane can be widespread and affect each area of the County differently (storm surge, wind, tornado, flooding, etc.).

First responders must have a planned response for hurricanes, including facilities that withstand the effects of winds and flooding and additional staffing to handle long operational working hours. First responders must be placed in protected areas during the hurricane's impact. After the storm, SJCFR resources must be available to begin rescue efforts.

Flood Risk

Flooding is another moderate weather-related risk in St. Johns County. Most flooding results from slow-moving thunderstorms or heavy rains associated with tropical events such as tropical storms or hurricanes. The east side of St. Johns County is the Atlantic Ocean and to the west is the St. Johns River.

Residents living in flood zones should be informed of the risks. During the planning process, SJCFR must consider station location and relocations in relation to flood zones. Flood zone and flood insurance information should be part of the public education process to ensure flood awareness and actions residents need to take to ensure readiness.

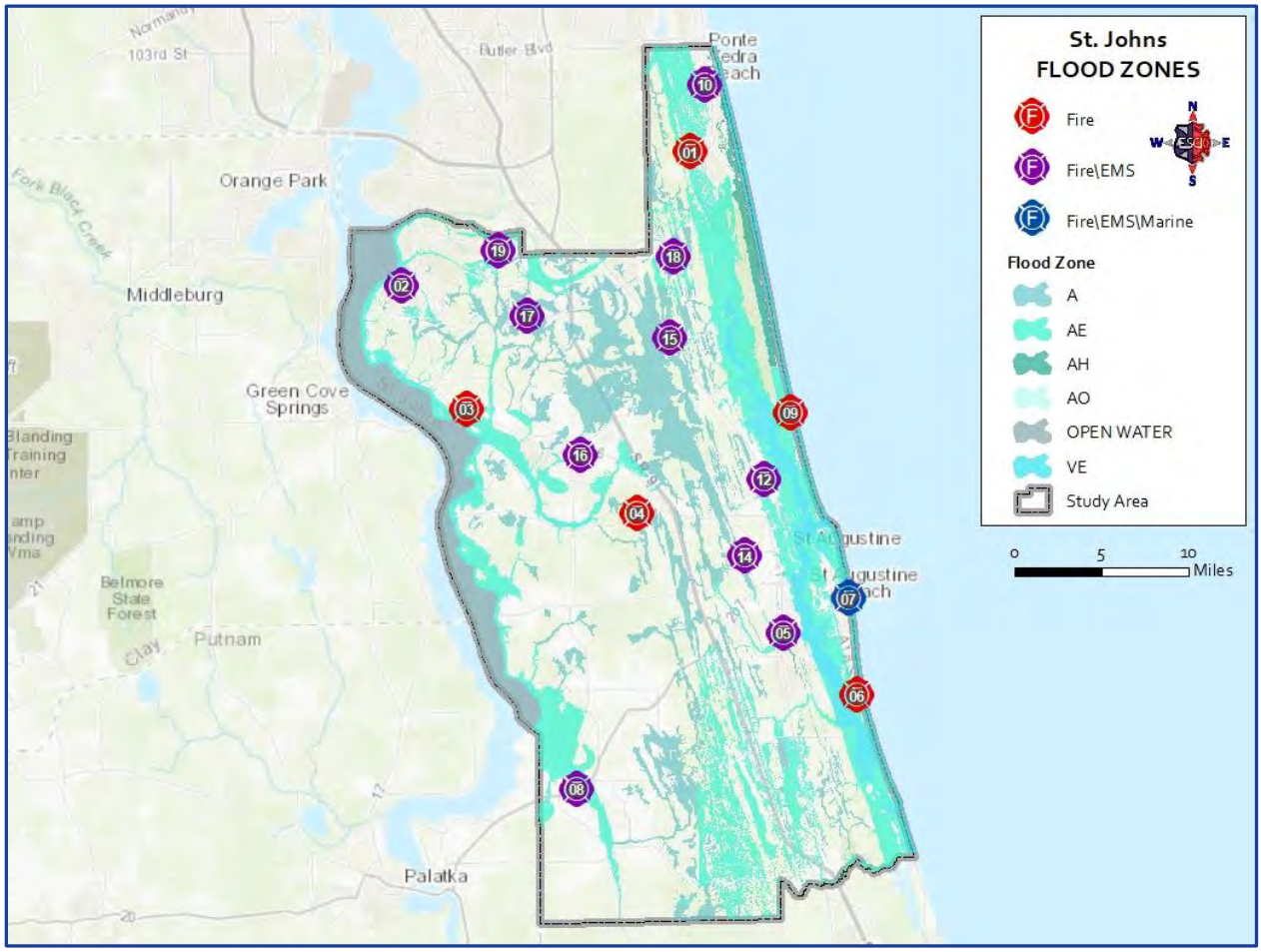
During a flood event, SJCFR personnel may respond to incidents that may involve water, possibly requiring intervention by specialty-trained technical rescue teams. In addition, after the flood, EMS-related incidents will increase as injuries and medical conditions occur. Figure 113 is a summary of flood zone risks.

Figure 113: Summary of Flood Zone Risks

Zone	Risks
A Zone **AE Zone** **AO Zone**	• High Special Flood Hazard Area (SFHA) • Flood-prone building codes apply • Flood insurance is mandatory for most mortgage holders • **A Zone:** 100-year floodplain, with no Base Flood Elevations (BFEs) determined • **AE Zone:** 100-year floodplain, with Base determined • **AO Zone:** 100-year floodplain with sheet flow, BFEs determined
VE Zone, V1-V30	• High Special Flood Hazard Area (SFHA) • Flood-prone building codes apply • 100-year floodplain with wave action, no base flood elevation determined

Figure 114 illustrates the flood zones in St. Johns County. Much of the County is in a high special flood hazard, namely A, AE, AO, and VE flood zones.

Figure 114: Flood Zones in St. Johns County



Tornadoes

Tornadoes can create winds over 300 mph, which will cause a significant threat to life and property. Tornado intensity is measured on the Enhanced Fujita Tornado Scale with an intensity range from EF-0 to EF-5. The Enhanced Fujita Scale or EF scale became operational on February 7, 2007, and is used to assign a rating based on estimated wind speeds and related damage. The EF Scale was revised from the original Fujita Scale, developed in 1971, to reflect tornado damage better. Figure 115 is a summary of the damage associated at the various levels.

Figure 115: Tornado Intensity, Enhanced Fujita Scale

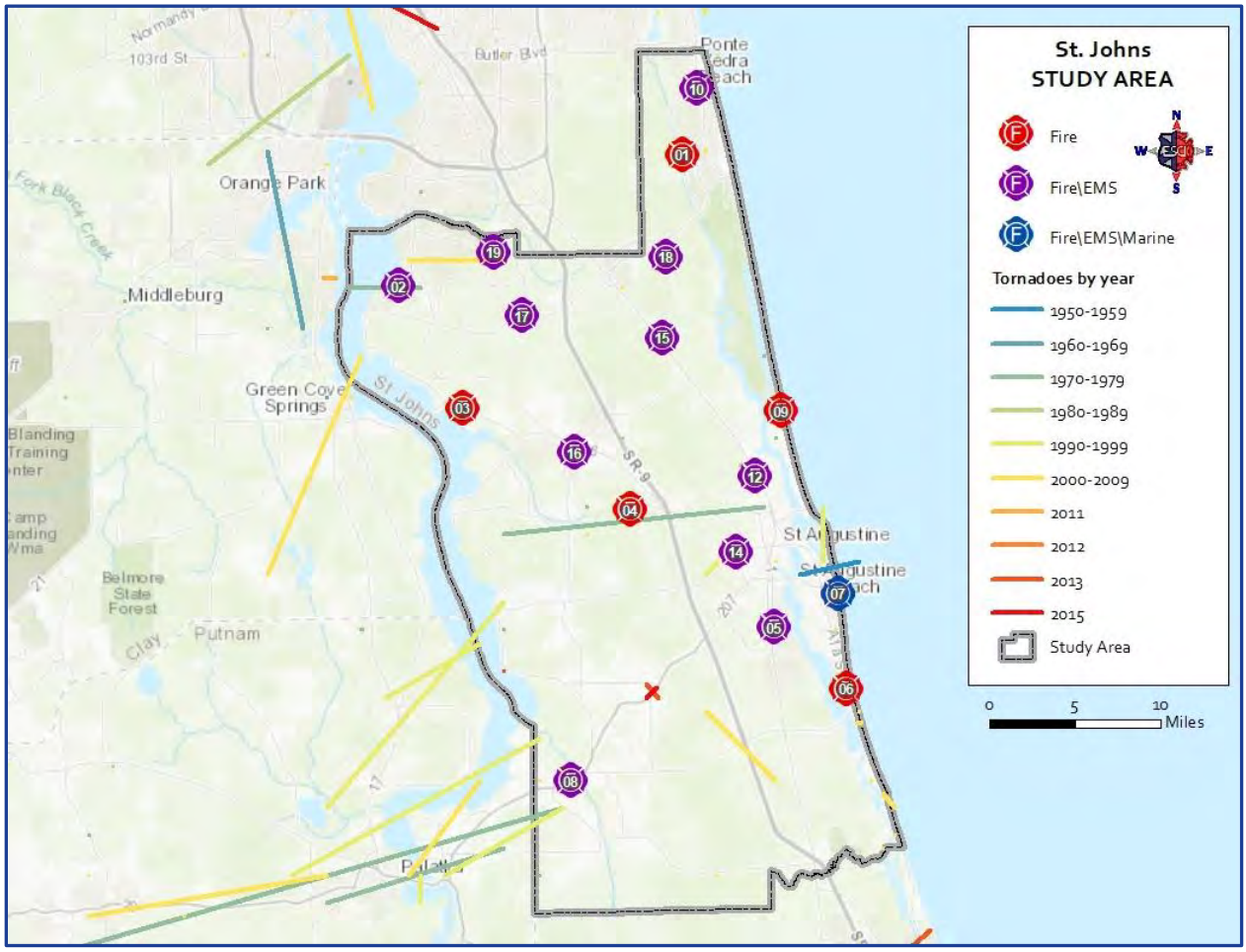
Designation	Wind Speed, mph	Typical Damage[25]
EF-0	65–85	**Minor or no damage.** Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF-0.)
EF-1	86–110	**Moderate damage.** Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
EF-2	111–135	**Considerable damage.** Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off the ground.
EF-3	136–165	**Severe damage.** Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations are badly damaged.
EF-4	166–200	**Devastating damage.** Well-constructed and whole frame houses completely leveled; cars and other large objects thrown and small missiles generated.
EF-5	> 200	**Extreme damage**. Strong-framed, well-built houses leveled off foundations are swept away; steel-reinforced concrete structures are critically damaged; tall buildings collapse or have severe structural deformations; some cars, trucks, and train cars can be thrown approximately 1 mile (1.6 km).

While ranges of winds are listed on the Enhanced Fujita Scale, the wind estimate is not exact or verified in science and engineering. Different wind speeds may cause similar damage from place to place and even from building to building.

[25] *Retrieved from: https://en.wikipedia.org/wiki/Enhanced_Fujita_scale.*

Overall, there is a low probability of future occurrences. Preventing a tornado is not possible, and one can occur with little or no warning. As the population increases, the potential danger to lives and property from tornadoes will also increase. Figure 99 shows the paths of tornadoes in the past in or near St. Johns County area between 1950 and 2015.

Figure 116: St. Johns County Tornado Tracks, 1950–2015



Although this section discusses geographic and weather-related risks to the extent that information is available, SJCFR officials also should consider developing a Community Risk Assessment: Standards of Cover plan to identify critical infrastructure, buildings with substantial value to the community, and other facilities that, if damaged or destroyed, would have a significant negative impact on the community.

Transportation Risks

There are several transportation corridors and various modes of transportation in the area of SJCFR. The major roadways are: Interstate 95; US Highway 1; A-1-A (which cover north-south); Routes 13, 16, 206, and 207 (which cover east-east) travel.

Roadways have the potential for motor vehicle crashes, vehicle fires, medical emergencies, brush fires, or hazardous materials spills/leaks. Each incident is not only a risk to the community but to the first responders who can potentially be struck by vehicles while operating near moving traffic.

Major roadways in St. Johns County are shown in Figure 117.

Figure 117: Major Roadways in St. Johns County

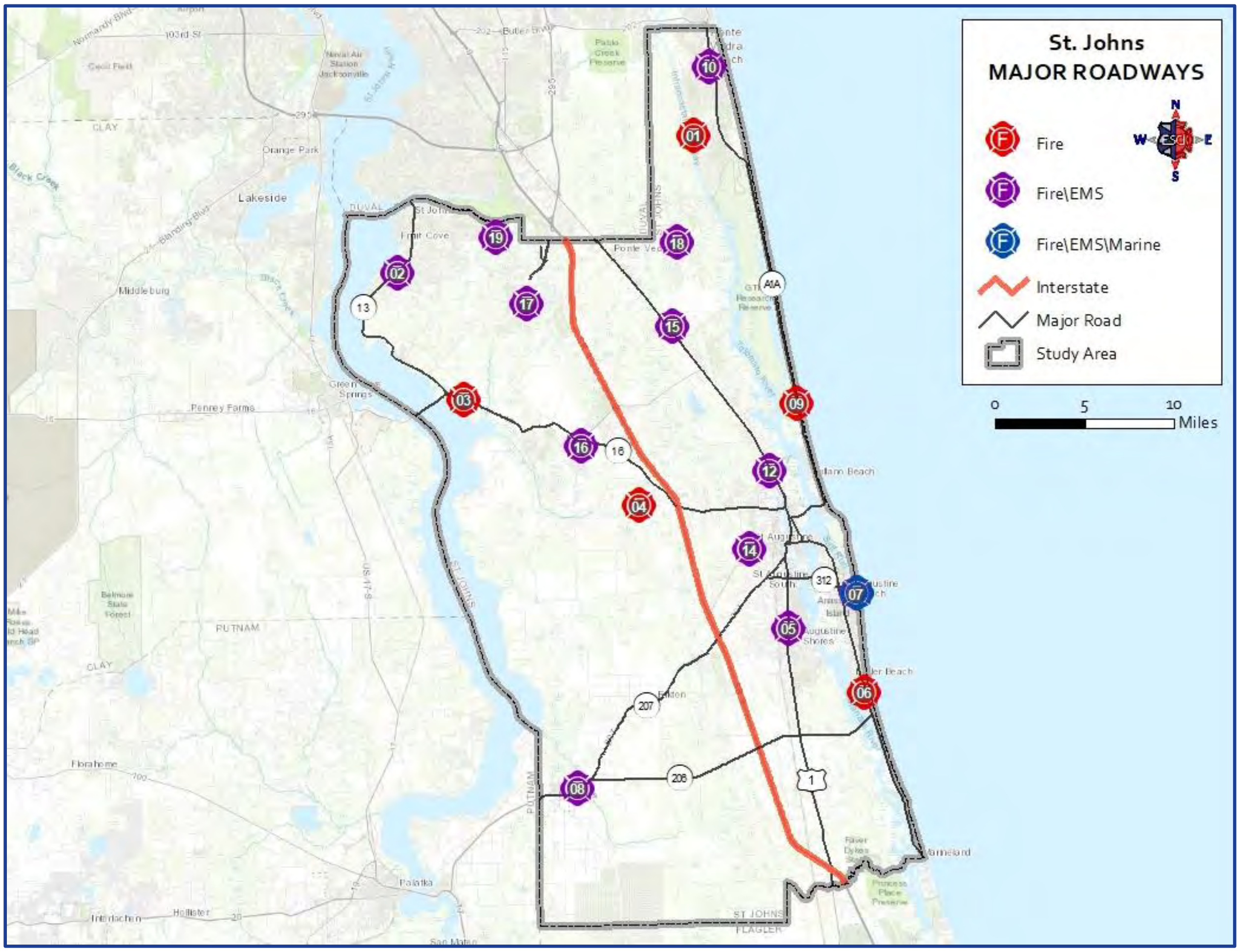
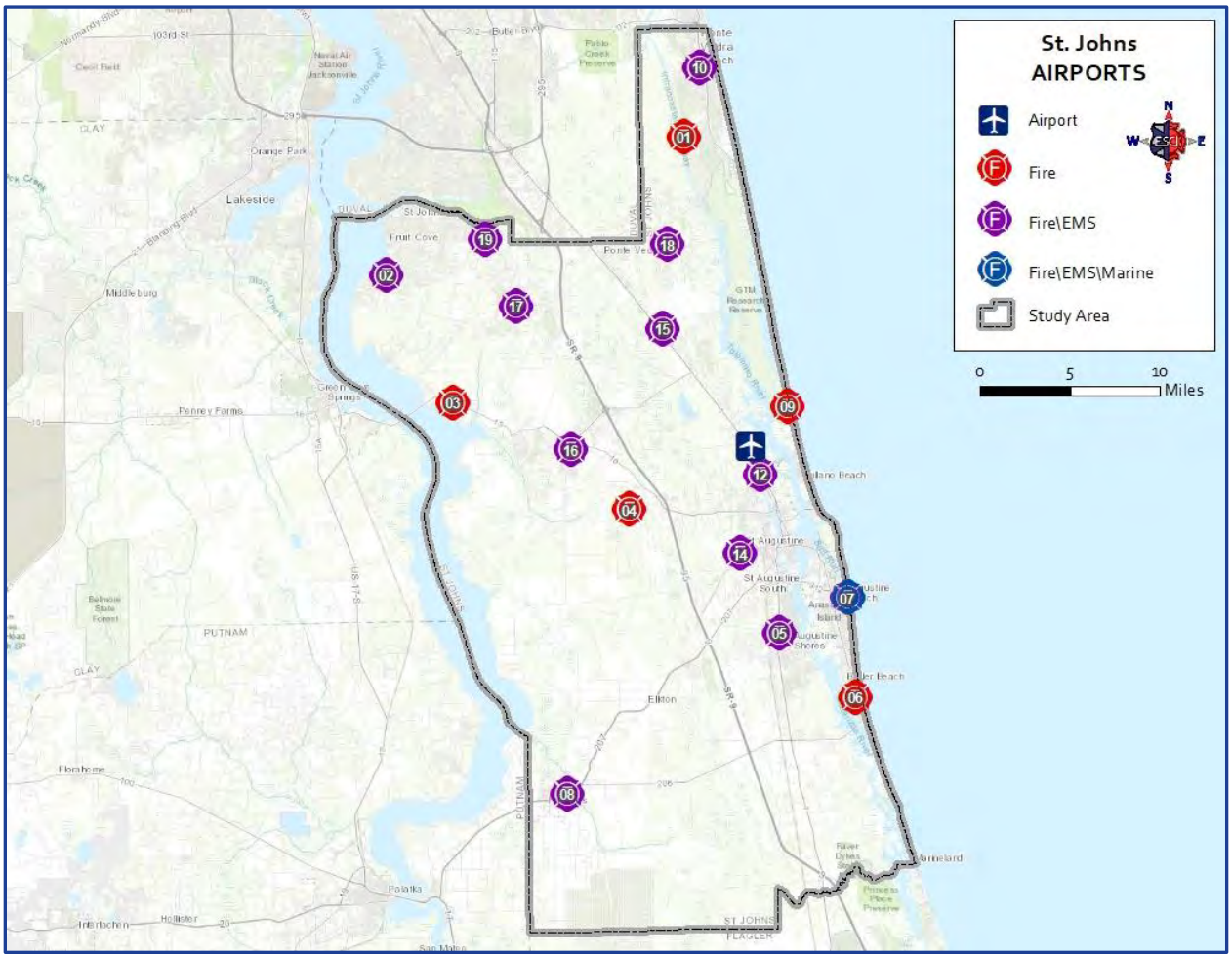


Figure 118 shows the Northeast Florida Regional Airport (NFRA), which is a public airport located just a few miles north of historic St. Augustine, and serves as a key connection point for air travel in Northeast Florida. NFRA is operated by the St. Augustine - St. Johns County Airport Authority on behalf of the citizens of St. Johns County and serves a gateway market of 4.4 million passengers within a 2-hour drive to the facility.

Regardless of the type of airport, there are risks associated with aircraft landing and departing, as well as aircraft and fuel storage at the airport itself.

Figure 118: Northeast Florida Regional Airport in St. Johns County

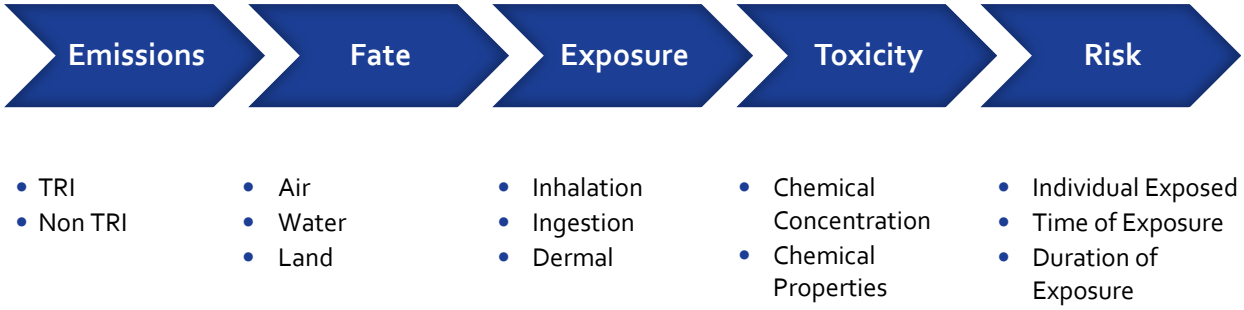


Hazardous Substances and Processes

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 St. Johns County as well as the management of, amounts released into the environment, and whether such quantities are increasing or decreasing over time. Under the Emergency Planning and Community Right-to-Know Act (EPCRA), facilities must report to EPA details about their releases of TRI-listed chemicals.

Figure 102 shows the many factors that determine the human health risks resulting from exposure to chemicals.

Figure 119: Overview of Factors that Influence Risk



Florida ranks 19 out of 56 states/territories nationwide for the number of total releases per square mile.

Other Critical Infrastructure

Buildings

Many buildings in the County are used for purposes that create more risk than others during an emergency incident. High occupancy buildings, facilities providing care to vulnerable populations, and other buildings may require a greater number of emergency response personnel and other resources during an emergency.

Numerous buildings lie within the SJCFR service area in which large numbers of people gather for entertainment, worship, and other similar events. A variety of nightclubs, theaters, and other entertainment venues also exist.

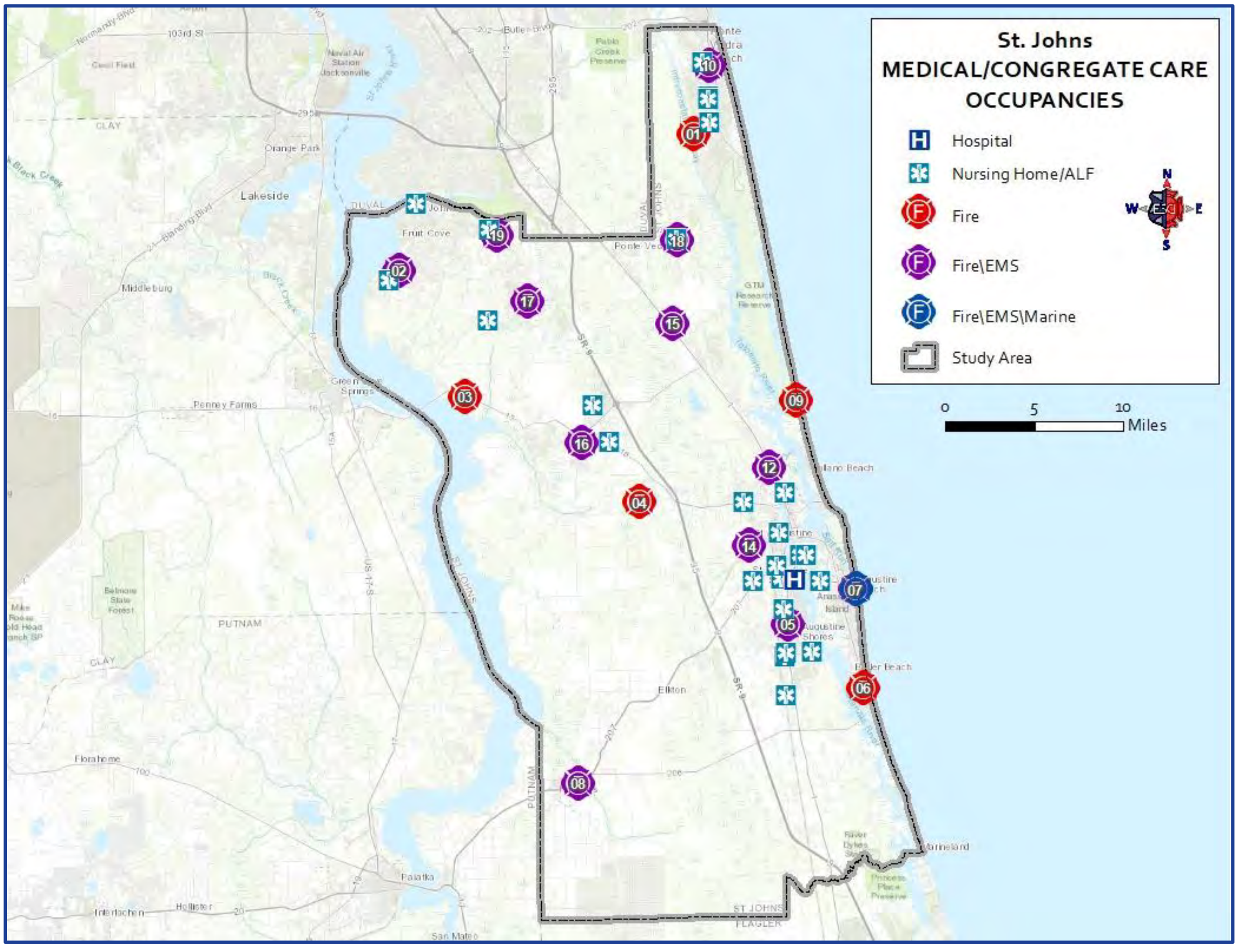
Medical and Congregate Care Facilities

Medical and congregate care facilities, particularly hospitals and nursing homes, provide care for and house vulnerable, often non-ambulatory occupants. Although these facilities have fire inspections and are generally built of fire-resistive construction with built-in fire suppression, emergencies still occur that require occupants to be quickly moved away from the hazard. These types of facilities require high resource levels, often for long periods, and will strain fire department capabilities.

Currently, there are twenty-three Nursing Homes/Assisted Living Facilities (ALFs) within St. Johns County. Evacuation plans for hurricanes are in place according to Florida State Regulations; however, evacuations will take longer as the population increases in the areas. EMS service capabilities will need to consider department benchmark performance impacts during evacuations and peak time periods, as population growth may increase call volume.

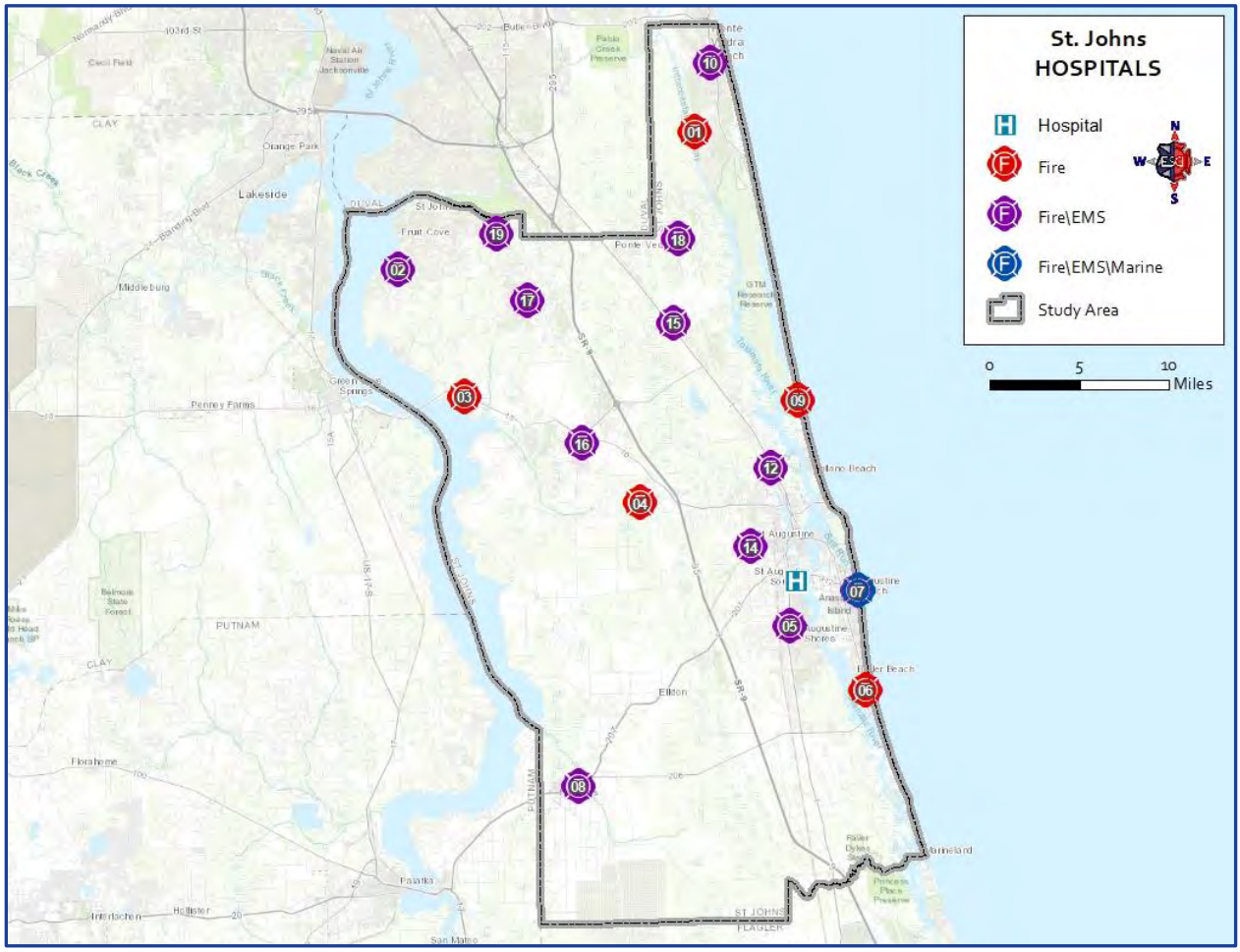
Figure 120 shows the locations of the Nursing Homes/ALFs located in St. Johns County.

Figure 120: Nursing Home/Assisted Living Facilities (ALFs)



There is only one hospital located in the County, which is in St. Augustine. Figure 121 shows the location of the only hospital in the County.

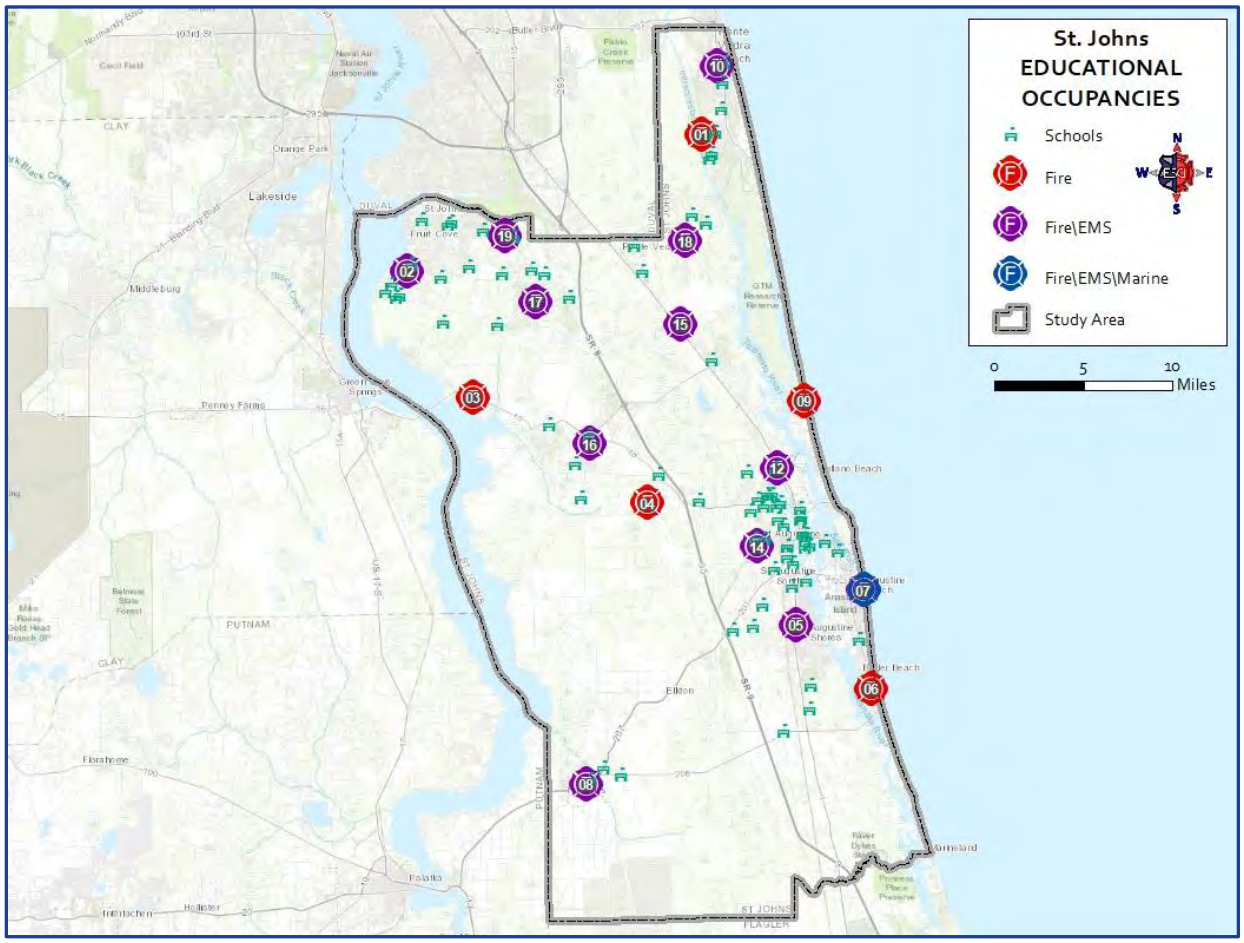
Figure 121: Hospital Location in the County



Educational Occupancies

The NFPA states that a facility where six or more people up to grade 12 receive instruction for four or more hours a day is considered an educational occupancy. Florida educational facilities are mandated through adopted NFPA Fire Code (NFPA 1) and Life Safety Code (NFPA 101) through Florida statutes to formulate policies and procedures for emergency drills and actual emergencies concerning fires, natural disasters active shooter, hostage situations, and bomb threats. In addition, an emergency action plan must be developed for each facility, according to NFPA1 to include fire and security safety. SJCFR provides effective prevention and safety programs during the school year to reduce risk factors through education. Figure 122 shows the educational occupancies throughout the County.

Figure 122: Educational Occupancies in the County



Assembly Occupancies

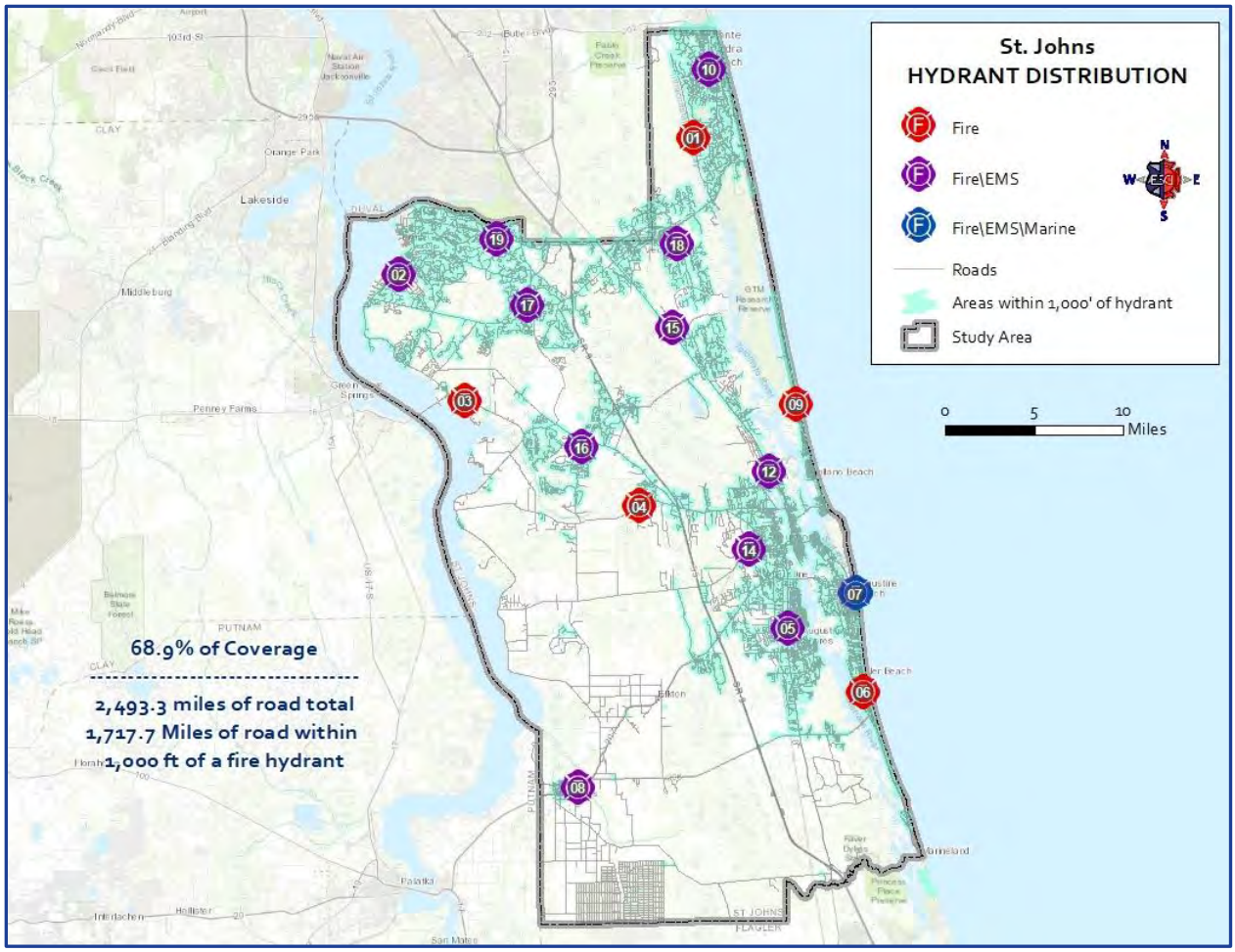
An assembly occupancy id defined by the National Fire Protection Association (NFPA) as an occupancy used for gathering 50 or more persons for deliberation, worship, entertainment, eating, drinking, amusement, awaiting transportation, or similar uses or used as a special amusement building, regardless of occupant load.

According to the NFPA, fires in assembly occupancies have shown to be deadly when the proper features, systems, and construction materials were not present. SJCFR can reduce life safety and fire risk to these properties through NFPA code provisions requiring a combination of multiple safeguards and features. Basic requirements include control of unintentional ignition sources, furnishings, and contents, as well as requiring fire alarm and sprinkler systems and the proper number of exits for the occupancy load calculated by the SJCFR life safety division.

Water System

Figure 123 shows the fire hydrant system in the County and hence the water supply system. Critical to fire suppression operations, a failure of the water system is a risk of which SJCFR must be aware.

Figure 123: Fire Hydrant Distribution in St. Johns County



Energy

Without a stable energy supply, the health and welfare of the St. Johns County community are threatened, and the economy cannot function. Energy is uniquely critical to the community because it is an "enabling function" across all critical infrastructure in St. Johns County. Communication services can be greatly compromised during a power outage, rendering technology-based equipment and communications inoperable. Energy loss is a planning consideration for response and readiness requiring system redundancy development to reduce risk.

Terrorism

St. Johns County can be a potential target for terrorism. All types of buildings and venues are at risk as a target for such activity. Public gathering events during the year are also considered targets. SJCFR needs to be vigilant in its training and preparedness in the event one of the more coordinated acts of terror occur in the region.

FUTURE DELIVERY SYSTEM MODELS

Review of Response Standards and Targets

For a fire and EMS organization 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.

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**imely

It is critical to emphasize the importance of establishing response performance metrics by every fire service organization. Once established, these standards result in measurable goals for service delivery, forming the foundation upon which the planning for deployment of resources is based. Absent these processes, the organization cannot determine where it needs to go, nor is it able to know when it is achieving its goals and meeting the community's expectations.

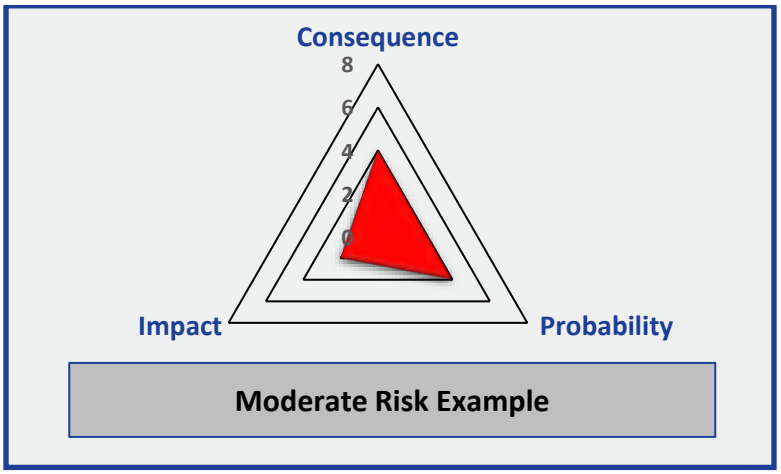
Critical Tasks, Risks, and Staffing Performance

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

Expanding on the Risk (Impact/Probability) Matrix presented in the *Tactical Planning* section of this report, risks are classified as low, moderate, high, or maximum where the fire department gages threats considering the probability of occurrence and hazard, danger, or loss and measure it in consequence. These risk categories are based on a three-axis risk calculation method. This method allows an organization to assign a numerical value to each axis which represents Probability, Consequence, and Impact. The surface area of the triangle then determines the magnitude of the risk, with a higher surface area equating to a greater risk score.

Figure 124 shows a moderate risk example with a medium risk score.

Figure 124: Three-Axis Calculation Method Example



A community assesses its risks based on the preceding model. Specifically, the three relevant factors are defined below.

- **Probability**: What is the likelihood that an incident will occur at the location?
- **Community Consequence**: What is the magnitude or 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.
- **Agency Impact**: What would the potential impact on the fire department's operational forces be for an incident at this location based on the critical tasks associated with the incident. Specifically, would an incident require a greater amount of resources because of the property characteristics, use, or location, and would this affect the department's ability to fulfill its mission in other areas?

Figure 125 is an example of the staffing needs based on the risk presented based on fire risk classification.

Figure 125: Example of Critical Task Staffing Analysis Based on Risk[26]

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**

As a comparison,

Figure 126, taken from NFPA 1710, illustrates the critical staffing for tasks associated with various types of structural fires.

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

Figure 126: Example of Tasks & Staff Required as Defined in NFPA 1710[27]

Task	Single-Family Dwelling[A]	Open-Air Strip Mall[B]	Apartments[C]	High-Rise[D]
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[E]	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 [F]				4
Total Required:	**16 (17)**	**27 (28)**	**27 (28)**	**42 (43)**

[A]Typical 2,000 ft., two-story single-family dwelling without a basement and exposures.

[B]Typical open-air strip mall/shopping center ranging from 13,000–196,000 feet.

[C]Typical 1,200-foot apartment within a three-story, garden-style apartment building.

[D]Building with the highest floor greater than 75 feet above the lowest level of fire department vehicle access.

[E]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 inter-vention crew (RIC) established.

[F]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.

[27] *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).*

The first 15 minutes are the most crucial 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 is applicable to fire, rescue, and medical situations.

SJCFR must conduct critical tasks promptly, whether combatting a fire or treating a medical patient. Three emergency scenarios commonly encountered by fire departments are routinely utilized when conducting field validation and critical tasking: a moderate risk structure fire, a traffic collision with a trapped victim, and a cardiac arrest. Each scenario is conducted using standard operating procedures and realistic response times based on actual system performance. Each scenario is normally run multiple times with a variety of fire companies to validate and verify observations and times.

To further validate the analysis process, results are compared with records from actual working fires and similar incidents from previous years. Overall results are reviewed to determine if the actions taken within the early minutes of an incident resulted in a stop loss or not, and if additional resources were required. The critical task analysis process demonstrates the rate at which the current deployment plan results in stopping loss a high percentage of time within initial critical time goals.

All Risk Critical Resource Tasking

Fire departments respond to many incidents other than structure fires, including hazardous materials (dangerous goods) releases, motor vehicle collisions, basic and advanced life support medical emergencies, and non-structural fires. Personnel responding to these types of incidents should be assigned tasks in a manner similar to structure fires.

The following figures are provided as an example for these types of incidents, although it is recommended that SJCFR conduct its own field validation exercises with its crews to verify the critical tasking analysis provided. After field validation is complete, SJCFR may find that the critical tasking can be adjusted appropriately upward or downward for each incident type.

Figure 127: Sample Non-Structure Fire Critical Tasking

Task	Personnel
Command	1
Pump Operator	1
Primary Attack Line	2
Total	**4**

Figure 128: Sample Hazardous Materials Incident Critical Tasking

Task	Personnel
Command	1
Pump Operator	1
Primary Attack Line	2
Total	**4**

Figure 129: Sample Motor Vehicle Collision with Entrapment Critical Tasking

Task	Personnel
Command	1
Pump Operator	1
Primary Attack Line	2
Extrication	3
Patient Care	2
Total	**9**

The above minimum staffing criteria should be used in setting specific service level objectives for each of the incident types, with specific numbers determined by field validation.

Distribution Performance Criterion

A fire department's *distribution* is essentially the location of resources to assure 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. Fire department's base life safety tasks on the number of building occupants and their location, status, and ability to take self-preserving action. Life safety-related tasks involve the search, rescue, and evacuation of victims. The fire flow component 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 simultaneously. 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. SJCFR is responsible for ensuring that responding companies are capable of performing all of the described tasks in a prompt, efficient, effective, 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. Figure 130 is a critical tasking summary provided by SJCFR.

Figure 130: SJCFR Critical Tasking

Tasks	Number of Personnel
Structure Fire (Hydranted) Tasks	
Command	1
Safety	1
Pump Operations	2
Attack Line	3
Back-Up Line	3
Search And Rescue	3
Ventilation	3
Rit	3
Other (Hydrant)	1
Total:	**20**
Structure Fire (Non-Hydranted) Tasks	
Command	1
Safety	1
Pump Operations	2
Attack Line	3
Back-Up Line	3
Search And Rescue	3
Ventilation	3
Rit	3
Water Tanker Operator	2
Total:	**21**
Wildland Fire: High Risk	
Command	1
Pump Operations/Lookout	2
Attack Line	2
Exposure Lines	2
Structure Protection	2
Total:	**9**
Wildland Fire: Low Risk	
Command	1
Attack Line	2
Total:	**3**

Tasks	Number of Personnel
Aircraft Emergency	
Command/Safety	2
Aircraft Fire Suppression	3
Pump Operations	2
Attack Line	3
Back-Up Line	3
Rescue	4
Emergency Medical Care	4
Water Supply	3
Total:	**24**
Hazardous Materials: High Risk	
Command/Safety	2
Aircraft Fire Suppression	3
Pump Operations	2
Attack Line	3
Back-Up Line	3
Total:	**13**
Hazardous Materials: Low Risk	
Command	1
Decontamination	3
Research/Support	2
Entry Team And Back-Up Team	4
Total:	**10**
Emergency Medical Services	
Patient Management	3
Patient Care	3
Total:	**6**
Motor Vehicle Collision: No Entrapment	
Scene Management/Documentation	1
Patient Care/Extrication	4
Total:	**5**
Motor Vehicle Collision: With Entrapment	
Command	1
Patient Care	2
Extrication	4
Pump Operator/Suppression Line	2
Total:	**9**

Tasks	Number of Personnel
Major Medical Response	
Incident Command	2
Safety	1
Triage	8
Patient Care	12
Transportation Manager	2
Documentation	2
Total:	**27**
Technical Rescue: Water	
Command/Safety	2
Rescue Team	4
Patient Care	2
Total:	**8**
Technical Rescue: Rope (First Responding-All Not USAR)	
Command/Safety	2
Rescue Team	3
Back-Up Team	2
Patient Care	3
Rope Tender	3
Total:	**13**
Technical Rescue: Confined Space (First Responding-All Not USAR)	
Command/Safety	2
Rescue Team	4
Back-Up Team	4
Patient Care	4
Rope Tender	3
Total:	**17**
Technical Rescue: Trench Rescue (First Responding-All Not USAR)	
Command/Safety	2
Rescue Team	2
Back-Up Team	2
Support Team	2
Patient Care	2
Shoring	7
Total:	**17**

Dynamics of Fire in Buildings

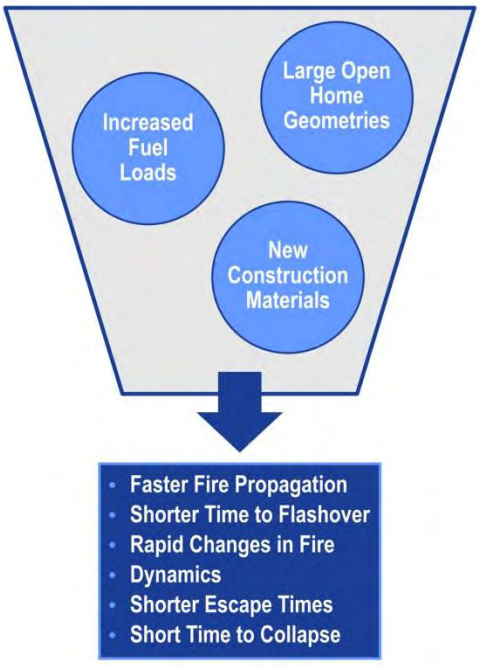
Most fires within buildings develop predictably unless influenced by highly flammable material. Ignition, or the beginning stage of a fire, starts the sequence of events. It may take several minutes or even hours from the time of ignition until a flame is visible. This smoldering stage is very dangerous, 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 heats and ignites, 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 materials 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.[28] Figure 131 illustrates these changes and the challenges they present to the fire service.

Figure 131: Changes in the Fire Environment and the Effect on Fire Dynamics



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

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-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).

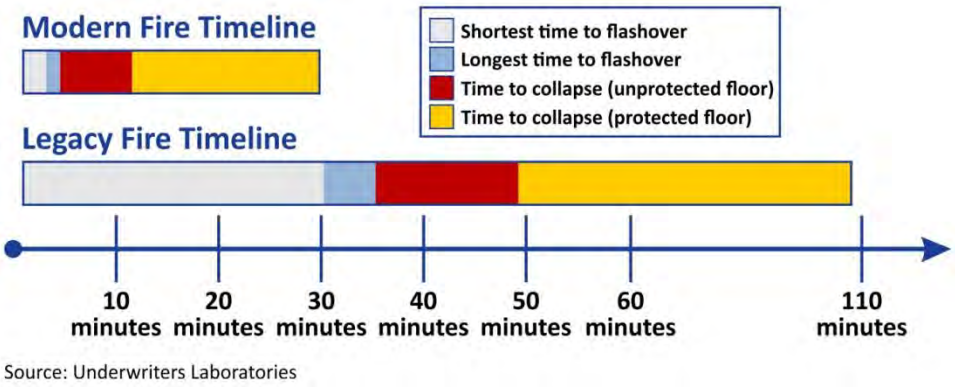
In the 1970s, scientists at the National Institute of Standards and Technology (NIST) found that after a fire broke out, building occupants had about 17 minutes to escape before being overcome by heat and smoke. Today, that estimate is as short as three minutes. The necessity of effective early warning (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.

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 accelerate fire spread and increase 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 prior to flashover. Figure 132 illustrates the sequence of events with a comparison of modern materials vs. legacy materials.

Figure 132: Fire Growth vs. Reflex Time[29]



Source: Underwriters Laboratories

[29] *Stephen Kerber, Analysis of Changing Residential Fire Dynamics and its Implications on Firefighter Operational Timeframes, Underwriters Laboratories*

As is apparent by this description of the sequence of events, 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 evidenced in the next figure, fire losses, casualties, and deaths rise significantly as the extent of fire damage increases.

Figure 133: Loss Rates by Fire Spread in 2012–2016 Home[1] Structure Fires[2]

Flame Spread	Rate Per 1,000 Fires		Average Dollar Loss Per Fire
	Civilian Deaths	Civilian Injuries	
Confined Fire or fire spread confined to object 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

[1]*The term "home" includes one- and two-family homes, manufactured homes, and apartments or other multi-family housing, regardless of ownership.*

[2]*Source: National Fire Protection Association Standard 1710, 2020 Edition.*

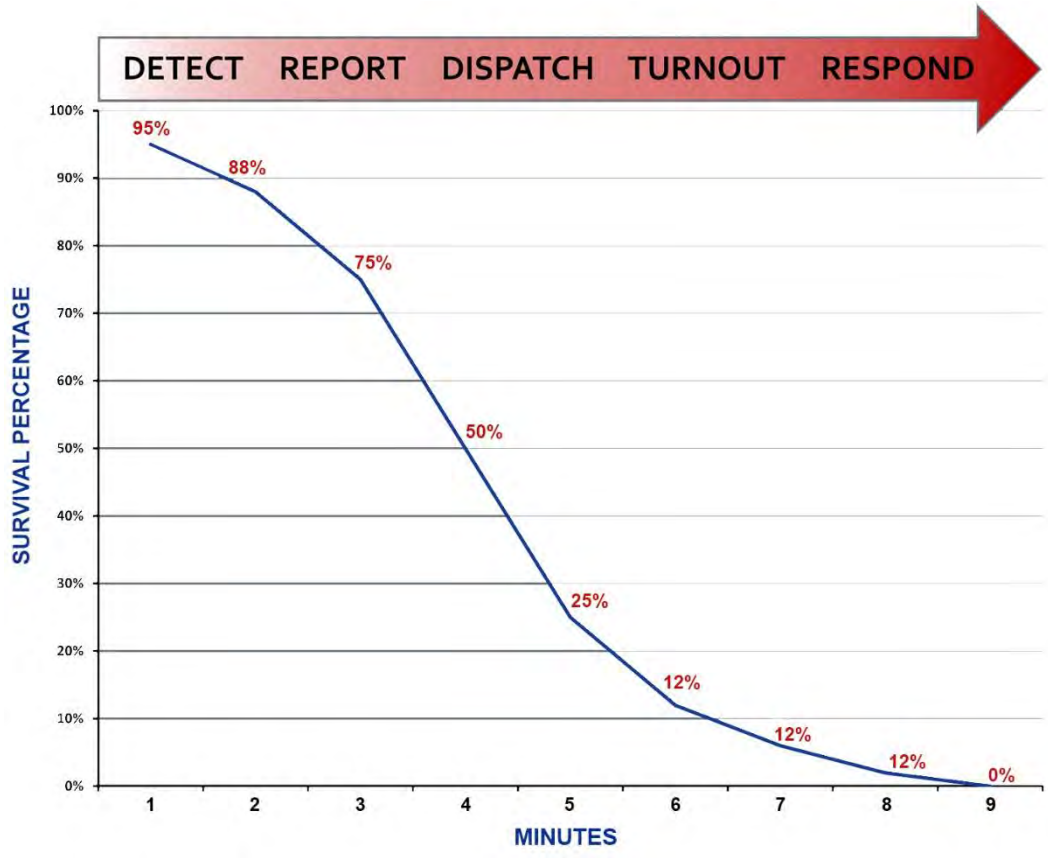
Emergency Medical Event Sequence

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 to increase the likelihood of survival. The AHA guidelines include goals for the application of defibrillation to cardiac arrest victims. Cardiac arrest survival chances fall by seven to ten percent 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**Error! Reference source not found.**.

Figure 134: Cardiac Arrest Event Sequence



The percentage of opportunity for recovery from cardiac arrest quickly drops as time progresses. The stages of medical response are very similar to the components described for fire response. 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.

People, Tools, and 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, properly trained, appropriately equipped personnel within the critical time period completes the equation.

For medical emergencies, this can vary based on the nature of the emergency. Many 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.

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.

Alarm Assignments

First alarm response assignments are developed to ensure that sufficient personnel and apparatus are dispatched to an emergency event with the ability to meet the established critical tasking elements. In Figure 135, the first alarm response assignments have been established for SJCFR. "Total Staffing Needed" is the number identified in the previous Critical Tasking Analysis. The number of personnel and apparatus required to mitigate an active and complex working incident will require additional resources above and beyond the numbers listed.

Figure 135: SJCFR Alarm Assignments

Unit Type	Number of Units	Dept. Staff	Total Dept. Personnel
LOW-RISE STRUCTURE FIRE (HYDRANTED)			
Engine	3	3	9
Squad	1	3	3
Ladder	1	3	3
Battalion Chief	2	1	2
Tanker/Tender	1	1	1
Medic Unit/Rescue	1	2	2
Total Staffing/Units Provided:			**20**
Total Staffing/Units Needed:			**20**
Gap/Deficit:			**0**
LOW-RISE STRUCTURE FIRE (NON-HYDRANTED)			
Engine	3	3	9
Squad	1	3	3
Tanker/Tender	2	1	2
Ladder	1	3	3
Battalion Chief	2	1	2
Medic Unit/Rescue	1	2	2
Total Staffing/Units Provided:			**21**
Total Staffing/Units Needed:			**21**
Gap/Deficit:			**0/0**

Unit Type	Number of Units	Dept. Staff	Total Dept. Personnel
HIGH-RISE STRUCTURE FIRE (75+ feet) (NFPA Recommendation)			
Engine	4	3	12
Squad	1	3	3
Ladder	1	3	3
Air Supply	1	1	1
Battalion Chief	2	1	2
Tanker/Tender	2	1	2
Medic Unit/Rescue	2	2	4
Total Staffing/Units Provided:			**27**
Total Staffing/Units Needed:			**42/43**
Gap/Deficit:			**15/16**
MODERATE-RISK COMMERCIAL STRUCTURE FIRE (NFPA 1710 Recommendation)			
Engine	3	3	9
Squad	1	3	3
Ladder	1	3	3
Air Supply	1	1	1
Battalion Chief	2	1	2
Tanker/Tender	1	1	1
Medic Unit/Rescue	1	2	2
Total Staffing/Units Provided:			**21**
Total Staffing/Units Needed:			**27/28**
Gap/Deficit:			**6/7**
WILDLAND FIRE: HIGH RISK			
Engine	2	3	6
Grass Unit	1	1	1
Battalion Chief	1	1	1
Tanker/Tender	1	1	1
Total Staffing/Units Provided:			**9**
Total Staffing/Units Needed:			**9**
Gap/Deficit:			**0**
WILDLAND FIRE: LOW RISK			
Engine	1	3	3
Total Staffing/Units Provided:			**3**
Total Staffing/Units Needed:			**3**
Gap/Deficit:			**0**

Unit Type	Number of Units	Dept. Staff	Total Dept. Personnel
AIRCRAFT EMERGENCY			
Engine	3	3	9
Squad	1	3	3
Ladder	1	3	3
ARRF	1	1	1
Battalion Chief	2	1	2
Hazardous Materials Unit	1	1	1
USAR	1	1	1
Tanker/Tender	2	1	2
Medic Unit/Rescue	1	2	2
Total Staffing/Units Provided:			**24**
Total Staffing/Units Needed:			**24**
Gap/Deficit:			**0**
HAZARDOUS MATERIALS: HIGH RISK			
Engine	2	3	6
Ladder	1	3	3
Battalion Chief	1	1	1
Hazardous Materials Unit	1	1	1
Medic Unit/Rescue	1	2	2
Total Staffing/Units Provided:			**13**
Total Staffing/Units Needed:			**13**
Gap/Deficit:			**0**
HAZARDOUS MATERIALS: LOW RISK			
Engine	1	3	3
Medic Unit/Rescue	1	2	2
Total Staffing/Units Provided:			**5**
Total Staffing/Units Needed:			**10**
Gap/Deficit:			**5**
EMERGENCY MEDICAL SERVICES (LIFE-THREATENING)			
Engine, Ladder, or Squad	1	3	3
Medic Unit/Rescue	1	2	2
Battalion Chief or EMS BC	1	1	1
Total Staffing/Units Provided:			**6**
Total Staffing/Units Needed:			**6**
Gap/Deficit:			**0**

Unit Type	Number of Units	Dept. Staff	Total Dept. Personnel
MOTOR VEHICLE COLLISION: NO ENTRAPMENT			
Engine, Ladder, or Squad	1	3	3
Medic Unit/Rescue	1	2	2
Total Staffing/Units Provided:			**5**
Total Staffing/Units Needed:			**5**
Gap/Deficit:			**0**
MOTOR VEHICLE COLLISION: WITH ENTRAPMENT			
Engine	1	3	3
Squad	1	3	3
Battalion Chief	1	1	1
Medic Unit/Rescue	1	2	2
Total Staffing/Units Provided:			**9**
Total Staffing/Units Needed:			**9**
Gap/Deficit:			**0**
MAJOR MEDICAL RESPONSE (10+ PATIENTS)			
Engine	3	3	9
Squad	1	3	3
MCI Trailer	1	1	1
Battalion Chief	2	1	2
Medic Unit/Rescue	6	2	12
Command Staff	1	1	1
Total Staffing/Units Provided:			**28**
Total Staffing/Units Needed:			**28**
Gap/Deficit:			**0**
TECHNICAL RESCUE: RISING OR SWIFT WATER			
Engine	1	3	3
Boat	1	2	2
Battalion Chief	1	1	1
Medic Unit/Rescue	1	2	2
Total Staffing/Units Provided:			**8**
Total Staffing/Units Needed:			**8**
Gap/Deficit:			**0**

Unit Type	Number of Units	Dept. Staff	Total Dept. Personnel
TECHNICAL RESCUE: ROPE			
Engine	1	3	3
Ladder	1	3	3
Squad	1	3	3
USAR	1	1	1
Battalion Chief	1	1	1
Medic Unit/Rescue	1	2	2
Total Staffing/Units Provided:			**13**
Total Staffing/Units Needed:			**13**
Gap/Deficit:			**0**
TECHNICAL RESCUE: CONFINED SPACE			
Engine	1	3	3
Squad	1	3	3
USAR	1	1	1
Battalion Chief	1	1	1
Hazardous Materials Unit	1	1	1
Medic Unit/Rescue	1	2	2
Total Staffing/Units Provided:			**11**
Total Staffing/Units Needed:			**17**
Gap/Deficit:			**6**
TECHNICAL RESCUE: TRENCH RESCUE			
Engine	2	3	6
Squad	1	3	3
USAR	1	1	1
Battalion Chief	1	1	1
Hazardous Materials Unit	1	1	1
Medic Unit/Rescue	1	2	2
Total Staffing/Units Provided:			**14**
Total Staffing/Units Needed:			**17**
Gap/Deficit:			**3**

Response Standards

Call-Handling Performance Criterion

Based on NFPA 1221 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, SJCFR has a call handling performance of 1 minute, 53 seconds at the 90th percentile. An ***example*** call processing goal is provided next.

> **For 90% of all calls for service received, the communications center will notify and dispatch the appropriate units in less than 64 seconds. 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 en-route 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, SJCFR has an overall turnout performance of 1 minute, 46 seconds at the 90th percentile. An ***example*** turnout time performance goal is provided next.

> **SJCFR will achieve a turnout time goal 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 the 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. An ***example*** first due performance goal is provided next.

> **For 90% of all emergency incidents, the first due unit shall arrive within 5 minutes from the time SJCFR units are dispatched for medical emergencies and 5 minutes, 20 seconds for fire emergencies. The first due unit shall be capable of advancing an initial hose line for fire control or providing at least basic life support for medical incidents.**

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. The ERF for a moderate (typical) structural fire risk in St. Johns County is programmed for 20 personnel on 3 engines, 1 squad, 1 ladder truck, 1 medic unit/rescue, and 2 Battalion Chiefs. Based on the data analysis, the 5th suppression unit arrived on the scene in 44 minutes, 19 seconds or less, 90% of the time. An ***example*** ERF performance goal is provided next.

> **For a moderate risk incident, SJCFR shall assemble an Effective Response Force (ERF) within 10 minutes, 90% of the time. This ERF shall be able to establish command and fire attack for fire incidents; or be able to handle a multiple casualty emergency medical incident.**

RECOMMENDATIONS

The preceding sections of this report presented a detailed description of the existing management and operational components of SJCFR. They provided a clear picture of the current conditions of the department and its role as an emergency services provider, as well as the various support services it relies upon to deliver these services. In addition, future drivers of increased service demand were evaluated, including population growth and community development and their likely impact on SJCFR moving forward. Based on this analysis, ESCI makes the following short- and long-term recommendations to enhance the effectiveness and efficiency of SJCFR.

Short- and Mid-Term Strategies

Service Delivery

- Formally adopt response time standards and targets.
- Implement processes to reduce call processing time when the new CAD is implemented.
- Improve turnout time performance.

Planning

- Communicate succession planning efforts and ongoing plan.

Facilities

- Store turnout gear in a well-ventilated room to prevent additional firefighter exposure to off-gassing chemicals absorbed into turnout gear during a fire.
- Reduce exposure to diesel soot and/or limit the potential for exposure of personnel and turnout gear to diesel fumes/soot.
- Enact policies that prohibit turnout gear from entering the "*living quarters*" and "*dormitory areas*" of the station.
- Establish a decontamination plan (washer/extractor) for contaminated turnout gear post-fire.
- Properly decontaminate employees and their equipment in accordance with NFPA 1581: *Standard on Fire Department Infection Control Program*.
- Remove ice machines from apparatus bays.
- Develop, adopt, and fund a long-range facilities plan for the fire department.
- Evaluate the addition of an additional FTE assigned to Fleet to exclusively handle facility inspections and maintenance.
- Provide adequate ability to decontaminate equipment and clothing separately from cooking, eating, and living spaces.
- Conduct a needs analysis and for the centralized fire training facility.

Insurance Services Office Public Protection Classification

- Ensure that all fire stations have primary and secondary dispatch circuits with appropriate emergency power supply, in accordance with NFPA 1221: *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*.
- Increase aerial apparatus service to areas of the County that contain buildings that are three stories or greater, 35 feet or greater in height, or have a needed fire flow of 3,500 gallons per minute.
- Increase staffing to improve response compliance with 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*.
- Evaluate the frequency and methodology used to inspect and test hydrants.

Special Teams

Hazardous Materials

- Develop a training plan that includes the handling of more complex incidents.
- Provide additional Hazardous Materials Toxicology training.
- Provide hazardous materials safety officer training in accordance with NFPA 472: *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents*.
- Explore options to establish additional capacity in geographical locations to provide hazardous materials and technical rescue services.
- Ensure replacement plans are in place to upgrade costly hazardous materials monitoring equipment, particularly to remain abreast of technology changes.

Technical Rescue

- Provide additional training for medical personnel in technical rescue-specific emergencies and injuries.
- Annual requirements for confined space entries are not maintained. Each member is required to perform a permit required confined space entry each year in accordance with OSHA 1910.146.
- Develop a personal protective equipment plan for technical rescue.
- SJCFR should develop a policy for a site safety plan.
- Enhance response by adding capacity using existing team members to staff additional resources based on geographical needs. One concept that could be employed would be to outfit current Ladder companies with cross-trained members and equipment to help address geographical special operation's needs.
- Monthly training sessions are currently conducted on shift; however, increased full team training would be beneficial and ensure greater proficiency and team cohesion.
- Consider providing SJCFR team members with swiftwater rescue training.
- Provide large vehicle machinery extrication training.
- Because rescue equipment is expensive and wears out over time, a replacement schedule, with appropriate funding, much like those used for apparatus should be developed for all big-ticket items.

Fire Prevention

- Develop rank structures for inspectors and plan reviewers such as Fire Inspector I/II, Lieutenant, or Captain.

Public Education

- Develop fire safety education pamphlets in several languages and ensure that they are readily available.
- Establish a juvenile firesetter program.
- Establish a wildland interface educational program.
- Obtain data on exactly how many people SJCFR reaches each year.

Fire Investigations

- Ensure that all fire investigators receive Fire Investigator II classes and are certified and Florida Fire Investigator IIs.

Pre-Incident Planning

- Investigate software programs for pre-incident planning that can be uploaded to MDTs or to iPads.
- Ensure that operations personnel do tactical surveys on new construction.
- Conduct a Community Risk Assessment.
- Develop a Community Risk Reduction Plan.

Communications

- Seek Association of Public-Safety Communications Officials (APCO) International's Agency Training Program Certification.
- Enter into a service level agreement with the SJCSO outlining transfer of call performance standards.

Data Collection and Analysis

- Develop a quality assurance process for the data collection and analysis processes.

EMS Billing

- Review current billing rates versus surrounding EMS providers.
- Seek reimbursement through the State of Florida Public Emergency Medical Transportation (PEMT) Supplemental Reimbursement Program.
- Consider staffing enhancements to align with increased work volume and allow for review and oversite of the EMS billing program.

Recommended Long-Term Strategies

Staffing

- SJCFR needs 315 budgeted, uniformed FTE personnel to achieve the 1.19 relief factor and currently has 283 budgeted, uniformed FTE available. Therefore, SJCFR has a current shortfall of 32 budgeted FTE based on average annual leave and vacancy usage to cover operational staffing during the last three years. This shortfall is before any additional increase in service demand or response time upgrades are considered and only addresses the existing service level.

Service Delivery

- Improve Response Deployment and Effective Response Force (ERF) assembly.
- Consider additional station locations based on current and future demand as well as the ISO requirements for 1.5-mile distance for engine coverage. Ongoing analysis will be required to prioritize needs and station locations.

Facility Changes or Additions

- Establish initiatives to address and correct vehicle exhaust capture systems, smoke detection and sprinkler systems, portable fire extinguishers, and emergency exit and lighting.
- Renovate key facilities to meet ADA requirements and comply with recommendations from the National Fire Protection Association Standard for life safety initiatives.
- Develop, adopt, and fund plan to renovate key stations to accommodate additional career personnel and modern apparatus.
- Renovation and refurbishment plans should include providing separate fitness areas for personnel for hygiene purposes and protection of electronic fitness equipment.
- After the needs analysis is completed, design and construct a centralized fire training facility.

Primary Apparatus Changes or Additions

- Expand the apparatus replacement schedule and funding strategy beyond 2020.
- Develop replacement schedule and funding strategy for support equipment.
- Establish an apparatus specification committee with a chief officer, fleet representative along with several experienced apparatus operators.

Additional Future Fire Rescue Station Locations

Currently, the percentage of 1.5-mile coverage for Engine Companies is 17.7% of the County road network, initial response time performance at the 90th percentile is 11 minutes, 59 seconds, and the assembly of an ERF for structural fires is 44 minutes, 18 seconds, at the 90th percentile. Additionally, as described in previous sections, the population of St. Johns County is rapidly increasing. This will increase the demand for services in the future.

To identify areas of the County with extended response times, computer modeling was done to create a heat map for the area that had a high concentration of incidents with response times of over four minutes. These are shown in Figure 136.

Figure 136: Travel Time Greater than Four Minutes for Incidents in 2019

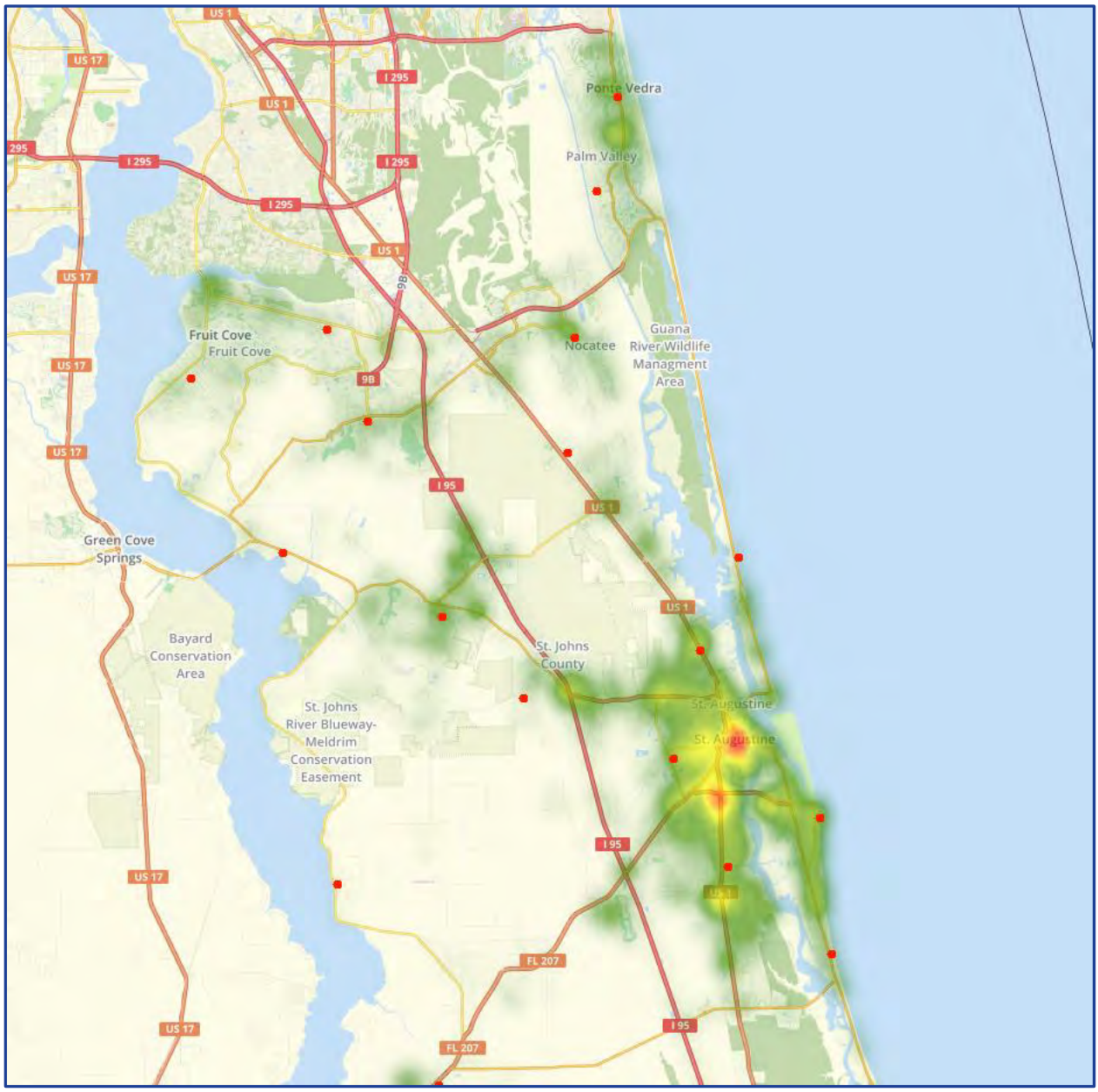


Figure 137 illustrates predicted incidents that will be greater than four minutes of travel time at 50% buildout with a population of 284,134 and service demand of 29,873 predicted.

Figure 137: Travel Time Greater than Four Minutes Predicted at 50% Build Out

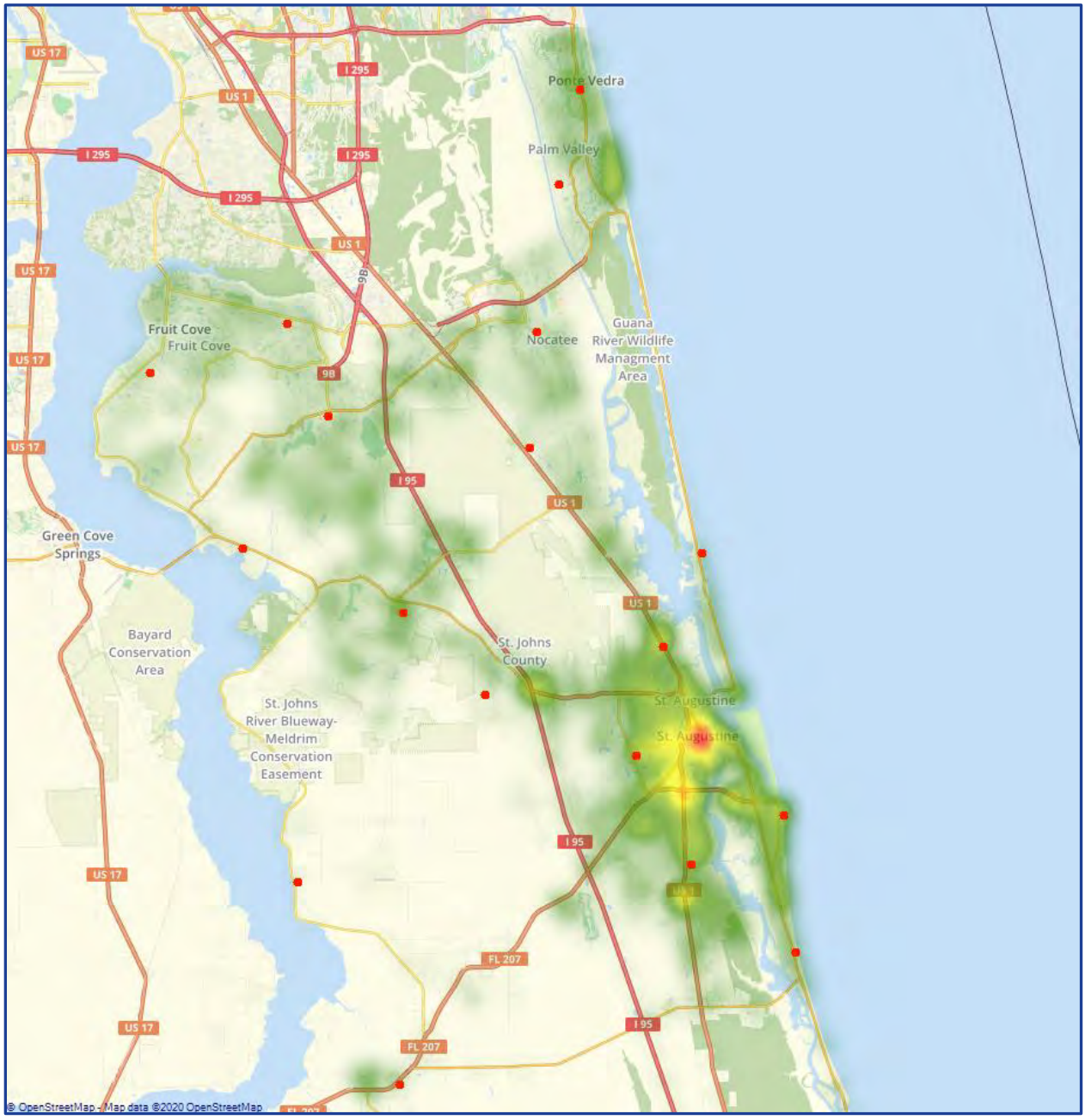
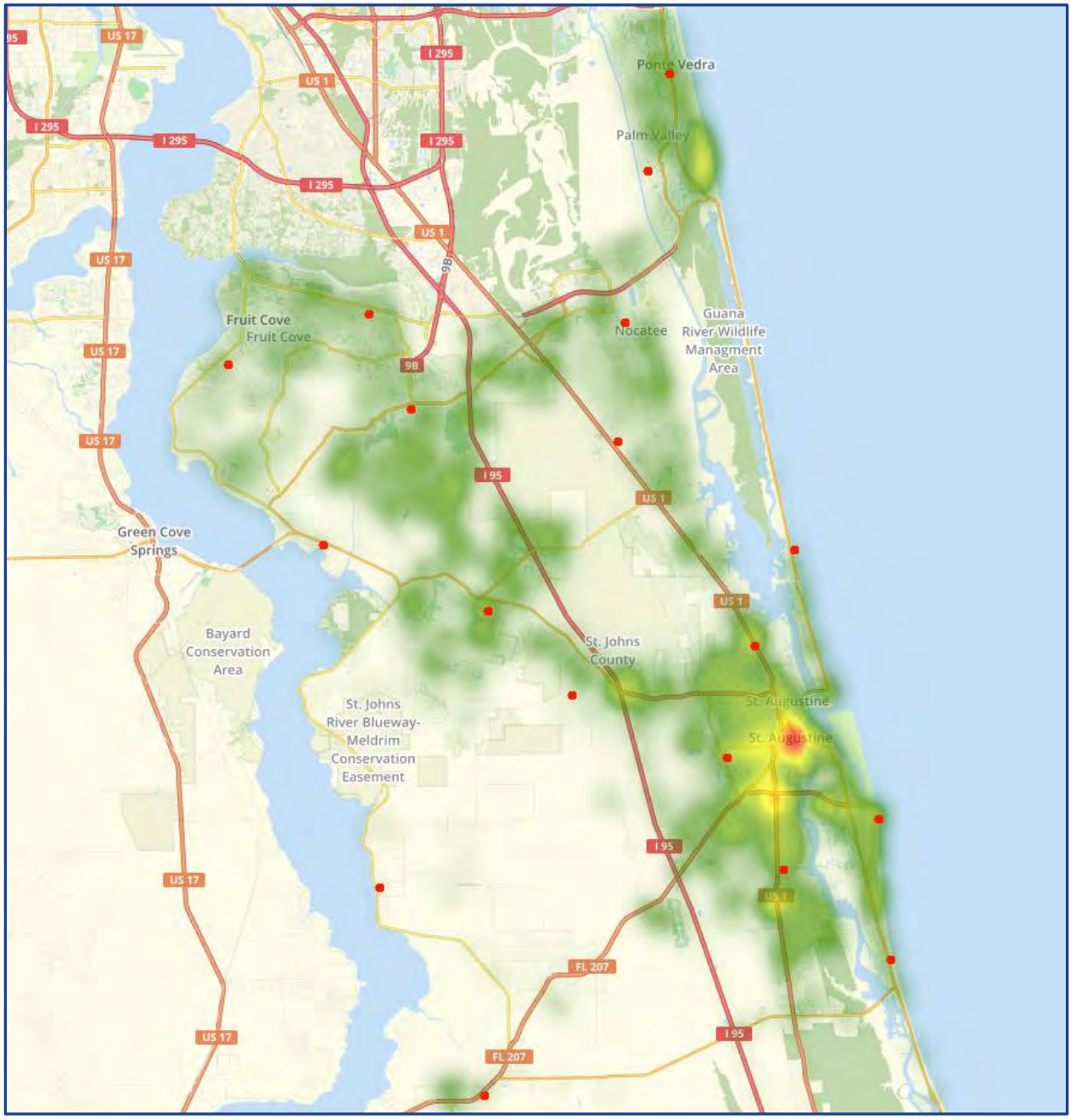


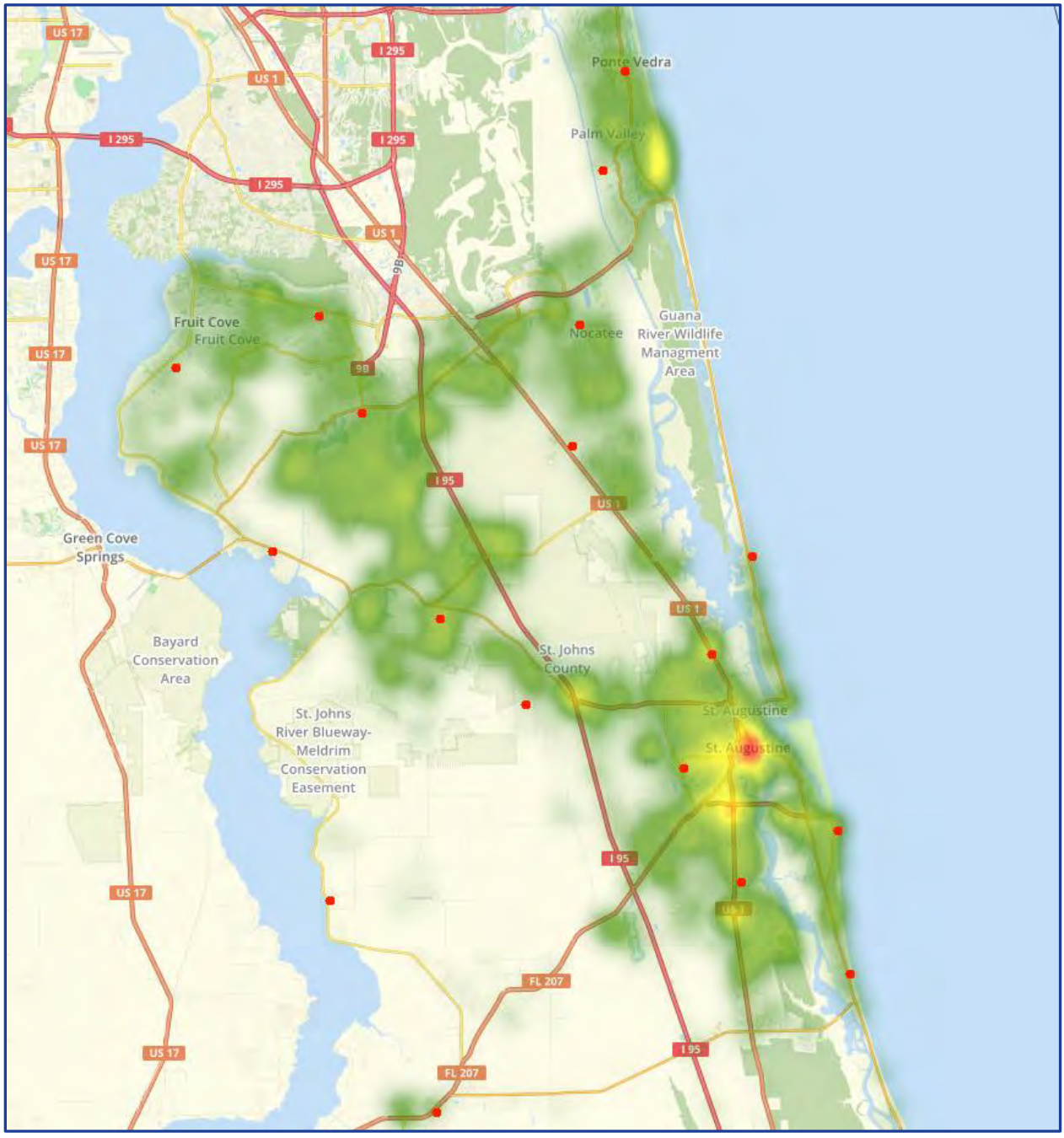
Figure 138 illustrates predicted incidents that will be greater than four minutes of travel time at 75% buildout with a population of 291,222 and service demand of 36,961 predicted.

Figure 138: Travel Time Greater than Four Minutes Predicted at 75% Buildout



Lastly, Figure 139 illustrates predicted incidents that will be greater than four minutes of travel time at 100% buildout with a population of 298,330 and service demand of 44,068 predicted.

Figure 139: Travel Time Greater than Four Minutes Predicted at 100% Buildout



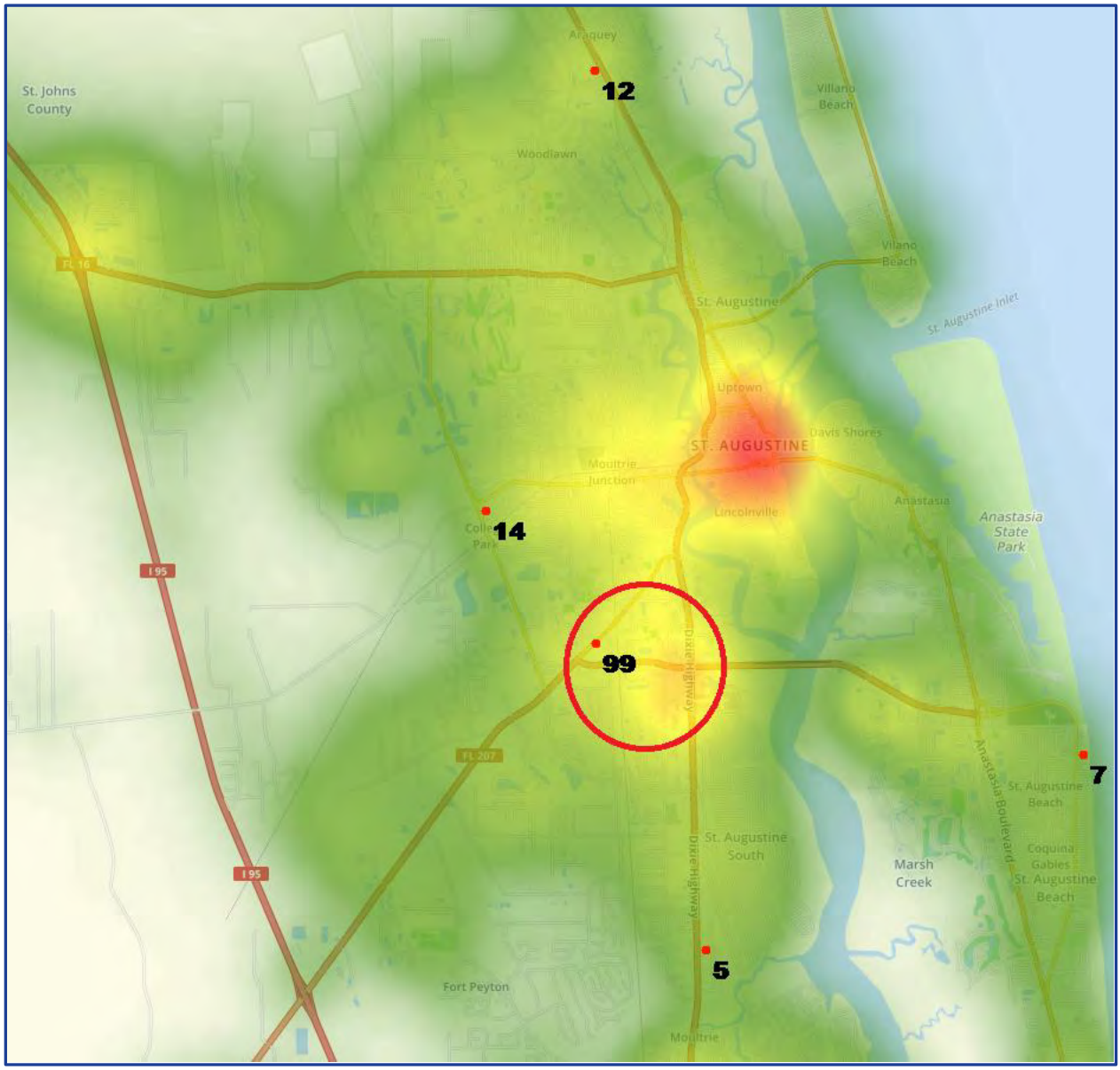
ESCI discusses the financial assumptions and impact of adding a station in the *Cost Projections* section.

Example of Adding an Engine and Rescue

The following narrative and illustrations are included to step through a process that could be used to determine needs and locations for adding resources. The example is based on the predicted 100% build-out model for workload, as well as travel time and distance. This example is not to be construed as a recommendation but instead to show a process and outcome, based upon increased workload as new development occurs over some future timeline.

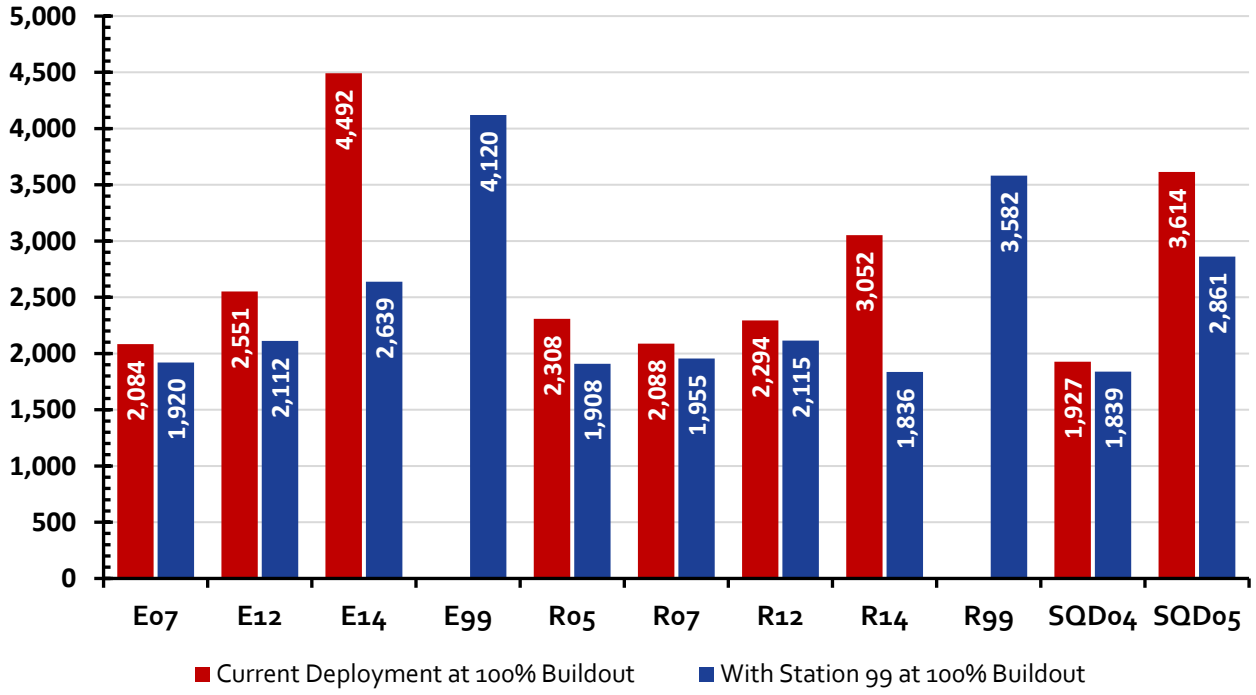
Using the greater than four-minute predicted travel time heat map at 100% build-out, a possible fire station need for additional capacity is identified in the area illustrated with the red circle in Figure 140.

Figure 140: Example Area (Hotspot) of Incident over 4 Minute Predicted at 100% Build-Out



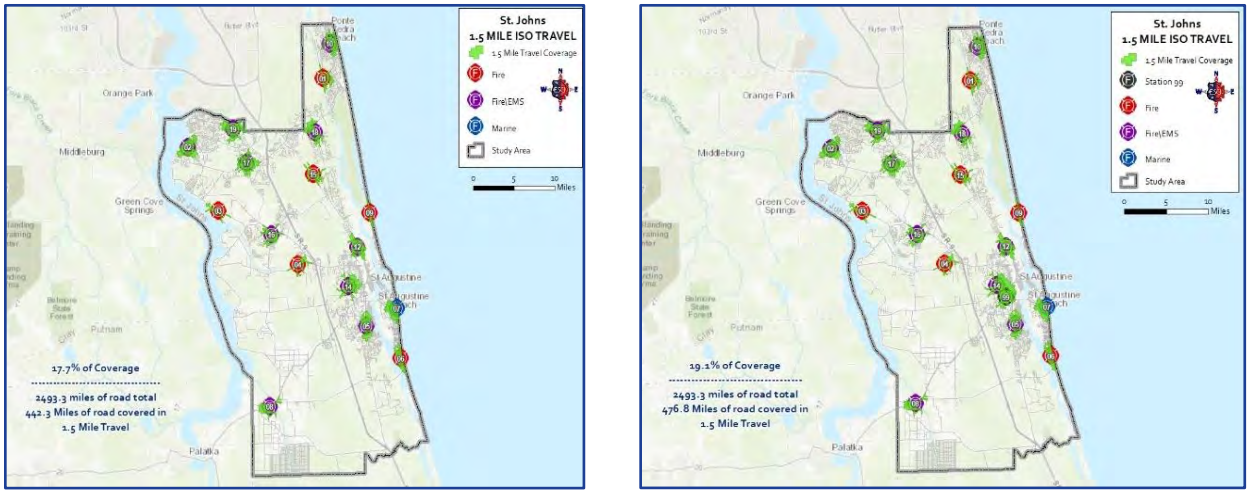
The area of need is generally between Stations 14 and 5. For illustrative purposes, we identified a location on a major road that was close to the midway point between these two stations. Using the predictive analysis, ESCI examined the workload if no station was added and the workload if a new Station 99 was added. This comparison is shown in Figure 141.

Figure 141: Predicted Workload at 100% Build Out with Current Deployment vs. with Station 99



Additionally, the changes in 1.5-mile engine company coverage were also examined with the additional station. The coverage increased from 17.7% to 19.1%, as shown in Figure 142.

Figure 142: ISO 1.5 Mile Engine Coverage with Station 99



The next section provides a fiscal analysis of potential changes and additions of resources.

Cost Projections

Staff and Facility Changes or Additions

As the County evaluates any of the recommendations that are associated with a cost, sustainability must be considered. In Figure 143 through Figure 148, estimated costs are provided for a number of changes. These costs—including the future projected costs—can be applied to the status quo revenue and expense forecasts for the Fire District Fund, EMS Program in the General Fund, and Fire Rescue Impact Fee Fund presented previously in this report and again provided for reference in Figure 143 through Figure 151. Position title, salary, and benefits data are taken from the SJCFR pay plan and reflect costs in FY 19–20. Figure 110 shows current compensation, while Figure 111 shows estimated position costs if positions are added to increase service level in FY 20. The Firefighter/Paramedic position is shown at the average salary based on the assumption that this would be a more experienced person meriting a base salary above the starting rate for the position, whereas the Firefighter/EMT would be an entry-level person.

Figure 143: Current Compensation—Pay Plan, FY 19–20

Position	Starting Annual Salary	Average Annual Salary	Benefits	Total Compensation
Firefighter/EMT	$38,834	$41,793	$21,530	$63,323
Firefighter/Paramedic	$45,204	$48,573	$25,022	$73,595
Engineer/App Operator	$43,957	$51,964	$26,769	$78,733
Lieutenant	$54,159	$63,539	$32,732	$96,271
Captain	$63,734	$77,593	$39,972	$117,565
Battalion Chief	$80,044	$98,501	$50,743	$149,244

Figure 144: Estimated Position Cost, FY 20

Position	Base[1] Salary	Benefits	Position Cost FY 20	Position Cost w/ Relief Factor
Firefighter/EMT	$38,834	$21,530	$60,364	$75,455
Firefighter/Paramedic	$48,573	$25,022	$73,595	$91,994
Engineer/App Operator	$51,964	$26,769	$78,733	$98,417
Lieutenant	$63,539	$32,732	$96,271	$120,339
Captain	$77,593	$39,972	$117,565	$146,956
Battalion Chief	$98,501	$50,743	$149,244	$186,555

[1]Model assumes FF/EMT is a new hire at starting salary while other positions are experienced staff and at the average for the position.

Figure 145: Single Resource Estimated Personnel Costs, FY 20

Position	FTE	Unit Cost	Total Cost[1]
Firefighter/EMT	3.75	$60,364	$226,364
Firefighter/Paramedic	3.75	$73,595	$275,983
Driver/App Operator	3.75	$78,733	$295,250
Lieutenant	3.75	$96,271	$361,017
Captain	3.75	$117,565	$440,869
Battalion Chief	3.00	$159,065	$447,732

[1] *Total cost and FTE count provides for assumed relief factor of 1.25 except for Battalion Chiefs.*

Figure 146: Estimated ALS Engine, Truck, or Squad Company Personnel Costs, FY 20

Position	FTE	Unit Cost	Total Cost[1]
Firefighter/Paramedic	3.75	$73,595	$275,983
Engineer/App Operator	3.75	$78,733	$295,250
Lieutenant	3.75	$96,271	$361,017
Total			$932,250

[1] *Total cost and FTE count provides for assumed relief factor of 1.25.*

Figure 147: Estimated Ambulance Company Personnel Costs, FY 20

Position	FTE	Unit Cost	Total Cost[1]
Firefighter/EMT	3.75	$60,364	$226,364
Firefighter/Paramedic	3.75	$73,595	$275,983
Total			$502,347

[1] *Total cost and FTE count provides for assumed relief factor of 1.25.*

Figure 148: Forecast Total Costs for Various Changes (Operational)

Description	Operations Personnel Recurring Costs[1]					
	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25
Firefighter/EMT	$226,364	$243,085	$261,041	$280,323	$301,030	$323,266
Firefighter/Paramedic	$275,983	$296,369	$318,261	$341,770	$367,015	$394,126
ALS Eng/Trk/Sqd Co	$932,250	$1,001,113	$1,075,062	$1,154,473	$1,239,751	$1,331,327
ALS Amb Company	$502,347	$539,454	$579,302	$622,093	$668,045	$717,392
Captain	$440,869	$473,435	$508,406	$545,961	$586,289	$629,597
Battalion Chief	$447,732	$480,804	$516,320	$554,459	$595,415	$639,397
Description	**Operations Personnel On-Boarding Costs[2]**					
	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25
Firefighter/EMT	$28,125	$28,491	$28,861	$29,236	$29,616	$30,001
Firefighter/Paramedic	$28,125	$28,491	$28,861	$29,236	$29,616	$30,001
ALS Eng/Trk/Sqd Co	$84,375	$85,472	$86,583	$87,709	$88,849	$90,004
ALS Amb Company	$56,250	$56,981	$57,722	$58,472	$59,233	$60,003
Captain	$28,125	$28,491	$28,861	$29,236	$29,616	$30,001
Battalion Chief	$22,500	$22,793	$23,089	$23,389	$23,693	$24,001
Description	**Capital Apparatus (Equipped) Cost[3]**					
	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25
Engine	$603,432	$627,569	$652,672	$678,779	$705,930	$734,167
Ambulance	$203,694	$211,842	$220,315	$229,128	$238,293	$247,825
Quint (Ladder)	$850,000	$884,000	$919,360	$956,134	$994,380	$1,034,155
Command Vehicle	$65,000	$67,600	$70,304	$73,116	$76,041	$79,082
Description	**Capital Facility (Initial and Recurring) Cost[2, 4]**					
	FY 20	FY 21	FY 22	FY 23	FY 24	FY 25
Construction	$3,712,000	$3,879,040	$4,053,597	$4,236,009	$4,426,629	$4,625,827
Operating	$200,000	$202,600	$205,234	$207,902	$210,605	$213,342

[1] Cost increase based upon projected historical annual total compensation increase of 7.4%; includes sufficient FTE to cover 1.25 relief factor.
[2] Cost increase based upon Southern Region CPI-U 2019 1.3 % as of October 2019.
[3] Cost increase based upon industry average annual increase of 4%.
[4] Cost increase based upon historical non-residential construction cost increase over the last four years of 4–5%.

Figure 149: Relationship of Fire District Recurring/Non-Recurring Revenue/Expense and Ending Fund Balance (FY 20 Adopted–FY 25 Forecast)

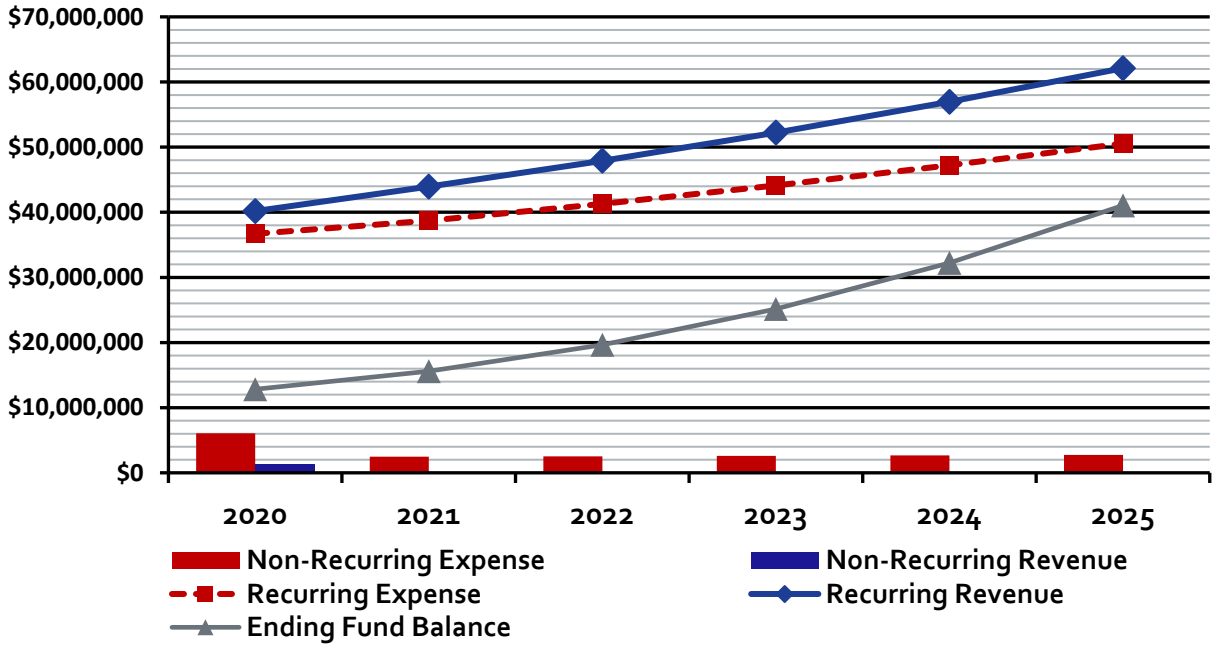


Figure 150: Net Impact of EMS Program Forecast Revenue/Expense on General Fund (FY 20 Adopted–FY 25 Forecast)

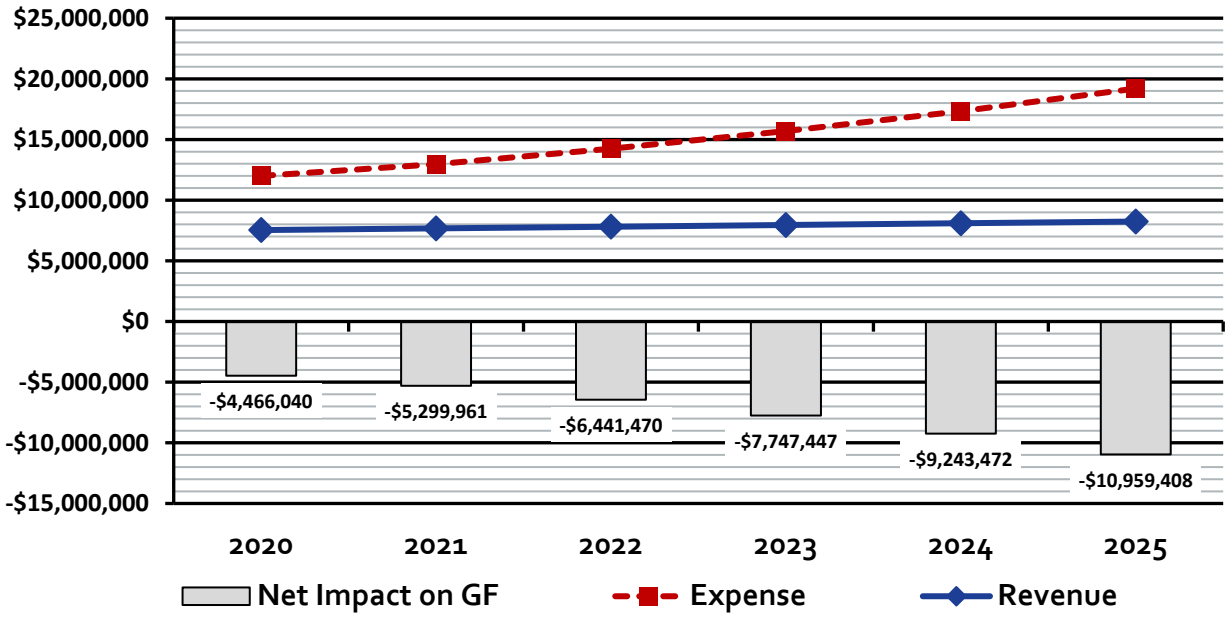
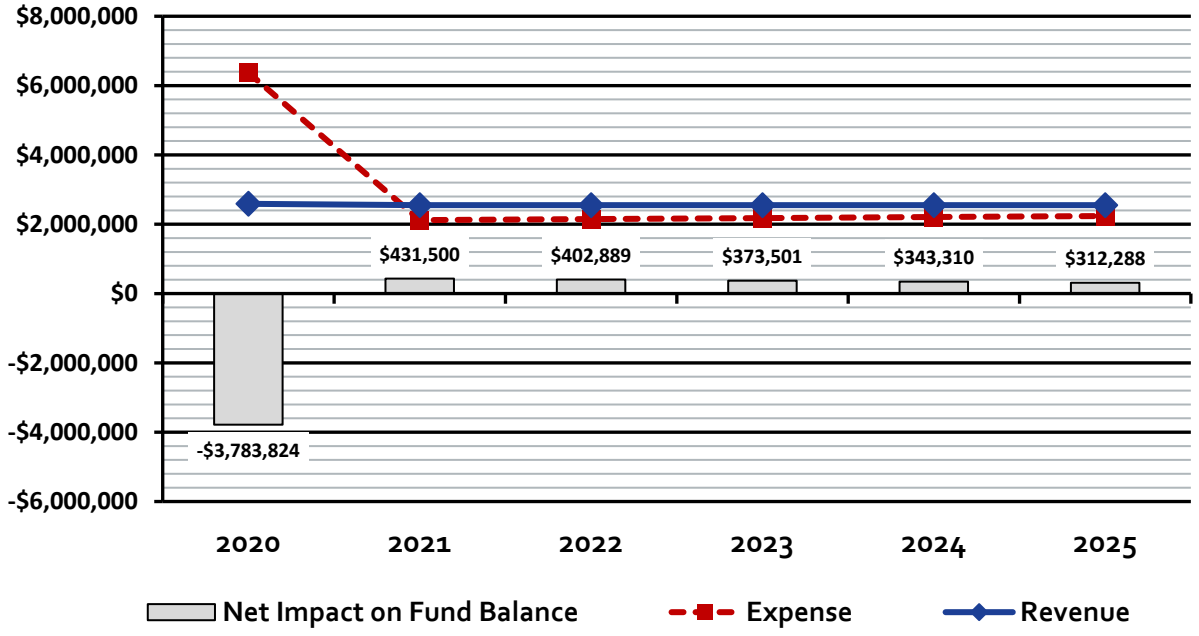


Figure 151: Net Impact on Forecast Fire/EMS Impact Fee Fund Balance of Annual Program Revenues/Expenses (FY 20 Adopted–FY 25 Forecast)



Future Funding Strategies

Diversification of Revenue

The Fire District is currently operating on an ad valorem millage. Growth and rising property values have resulted in an increase in ad valorem revenue from $23.5 million in FY 15 to $34.55 million in FY 19, a 46.9% increase for the period, or approximately 11% per year. While this growth and assessed value increase have allowed Fire District funding to keep pace with needs, any slowing of new construction or a drop in property values could have a significant negative effect on the SJCFR's revenue.

1. ESCI recommends that the District investigate the addition of non-ad valorem assessments as an additional revenue stream. There are fire districts in the state that have effectively adopted this multi-stream funding model. The County should review the legal parameters of the process and requirements specific to SJCFR.
2. Another consideration would be for the County to investigate the implementation of a dedicated Public Safety Sales tax. Currently, the local sales tax rate is 0.5% in addition to Florida's 6.0% tax rate for a total of 6.5%. According to the Fiscal Year 2020 Financial Plan, the existing half-cent sales tax is projected to generate $16,057,513.

Cost Avoidance

3. As noted previously, SJCFR would need 315 budgeted, uniformed FTE personnel to achieve the 1.19 relief factor calculated to meet current service level staffing needs. Currently, SJCFR has 283 budgeted, uniformed FTE available. The shortfall of 32 budgeted FTE may be having a negative impact on overtime costs, which have increased at an average rate of 16.4% from FY 15 to FY 19. Further analysis should be undertaken to determine the amount of overtime that may be avoided if staffing levels were increased.

Grants

4. Annually the SJCFR should review the needs and compare those needs to available grants. Some examples of Fire and EMS grants include:
    a. *Assistance to Firefighters Grants* (AFG) to enhance the safety of the public and firefighters concerning fire-related hazards by providing direct financial assistance to eligible fire departments.
    b. *Fire Prevention & Safety (*FP&S) Grants are part of the Assistance to Firefighters Grants program and support projects that enhance the safety of the public and firefighters from fire and related hazards.
    c. *Staffing for Adequate Fire and Emergency Response* (SAFER) Grants were created to provide funding directly to fire departments and volunteer firefighter interest organizations to help them increase the number of trained frontline firefighters available in their communities.
    d. *Florida Emergency Medical Services (EMS) Matching Grants*.
    e. *Florida Legislature Local Project Requests* are funding requests through the Local Legislative Delegation Bill Process.

APPENDIX A: FIRE STATIONS

Station Name/Number:	**Station 1 – Palm Valley**
Address/Physical Location:	130 Canal Blvd, Ponte Vedra Beach, FL 32082

General Description:
Like many of SJCFR's fire stations, this facility originated as a volunteer station and was refurbished in 1998 to house career personnel around the clock. Storage challenges necessitate storage in the apparatus bays that expose the equipment to weather, emissions and limited the "drive-through' feature of the bays.

Structure						
Construction Type	Cinder Block					
Date of Construction	1998					
Seismic Protection	N/A					
Auxiliary Power	Yes					
General Condition	Fair					
Number of Apparatus Bays	3	Drive-through bays		Back-in bays		
Special Considerations (ADA, etc.)	ADA Compliant					
Square Footage	7,610					
Facilities Available						
Separate Rooms/Dormitory/Other	3	Bedrooms	8	Beds	8	Beds in dormitory
Maximum Station Staffing Capability	8					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes					
Security	Yes					
Apparatus Exhaust System	Yes – Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Ladder 1	3	
B 1	-	As needed
Total Minimum Station Staffing:	3	

Station Name/Number:	**Station 2 – Switzerland**
Address/Physical Location:	1120 Sheffield Road, St. Johns, FL 32259

General Description:
Like many of SJCFR's fire stations, this facility originated as a volunteer station and was refurbished in 1998 to house career personnel around the clock. Storage challenges necessitate storage in the apparatus bays that expose the equipment to weather, emissions and limited the "drive-through' feature of the bays.

Structure						
Construction Type	Cinder Block					
Date of Construction	1998					
Seismic Protection	N/A					
Auxiliary Power	Yes					
General Condition	Fair					
Number of Apparatus Bays	3	Drive-through bays				Back-in bays
Special Considerations (ADA, etc.)	ADA					
Square Footage	7,638					
Facilities Available						
Separate Rooms/Dormitory/Other	3	Bedrooms	8	Beds		Dormitory Beds
Maximum Station Staffing Capability	8 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	No-water well					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes-Bio-Hazard pick up contracted					
Security	Yes					
Apparatus Exhaust System	Yes – Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Engine 2	3	
Rescue 2	2	
Total Minimum Station Staffing:	5	

Station Name/Number:	**Station 3 – Orangedale**
Address/Physical Location:	6010 State Road 13 N, St. Augustine, FL 32092

General Description:
Like many of SJCFR's fire stations, this facility originated as a volunteer station and was refurbished in 1998 to house career personnel around the clock. Storage challenges necessitate storage in the apparatus bays that expose the equipment to weather and emissions, such as turnout gear, ice machines, fitness equipment, and refrigerators.

Structure				
Construction Type	Cinder Block			
Date of Construction	2000			
Seismic Protection	N/A			
Auxiliary Power	Yes			
General Condition	Fair			
Number of Apparatus Bays	3	Drive-through bays		Back-in bays
Special Considerations (ADA, etc.)	ADA			
Square Footage	7,524			
Facilities Available				
Separate Rooms/Dormitory/Other	2	Bedrooms	8 Beds	Dormitory Beds
Maximum Station Staffing Capability	8 daily			
Exercise/Workout Facilities	Yes			
Kitchen Facilities	Yes			
Individual Lockers/Storage Assigned	Yes			
Shower Facilities	Yes			
Training/Meeting Rooms	Yes			
Washer/Dryer	Yes			
Safety & Security				
Sprinklers	No-water well			
Smoke Detection	Yes			
Decontamination/Biohazard Disposal	Yes			
Security	Yes			
Apparatus Exhaust System	Yes– Active emission capture system			

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Engine 3	3	
Tanker 3	-	As needed
Brush 3	-	As needed
Total Minimum Station Staffing:	3	

Station Name/Number:	Station 4 – Bakersville
Address/Physical Location:	3400 County Road 208, St. Augustine, FL 32092

General Description:
Training Conex boxes designed as a technical rescue prop are located behind this facility. Storage challenges necessitate storage in the apparatus bays that expose the equipment to weather and emissions, such as turnout gear, ice machines, fitness equipment, and refrigerators.

Structure						
Construction Type	Metal siding/steel framing					
Date of Construction	2005					
Seismic Protection	N/A					
Auxiliary Power	No					
General Condition	Good					
Number of Apparatus Bays	2	Drive-through bays			Back-in bays	
Special Considerations (ADA, etc.)	ADA					
Square Footage	6,350					
Facilities Available						
Separate Rooms/Dormitory/Other	2	Bedrooms	8	Beds	X	Dormitory Beds
Maximum Station Staffing Capability	8 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	No, water well					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes					
Security	Yes					
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Squad 4	3	
Tanker 4	1	
USAR 4	-	As needed
Total Minimum Station Staffing:	4	

Station Name/Number:	**Station 5 – St. Augustine South**
Address/Physical Location:	3360 US1 South, St. Augustine, FL 32086

General Description:
Joint-use facility that shares space with St. Johns County Sheriff's office. Modern and enclosed workout facility with a three-story training tower attached.

Structure						
Construction Type	Cinder Block					
Date of Construction	2019					
Seismic Protection	N/A					
Auxiliary Power	Yes					
General Condition	Excellent					
Number of Apparatus Bays	4	Drive-through bays				Back-in bays
Special Considerations (ADA, etc.)	ADA					
Square Footage	Fire Rescue Residential 7,500/Fire Rescue Bays and Storage 7,300 – Sheriff's Building 8,200 Total 23,000					
Facilities Available						
Separate Rooms/Dormitory/Other	6	Bedrooms	18	Beds		Dormitory Beds
Maximum Station Staffing Capability	18					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes-Bio-Hazard pick up contracted					
Security	Yes					
Apparatus Exhaust System	Yes– Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Ladder 5	3	
Squad 5	3	
Rescue 5	3	
Rescue 51	2	
Battalion 2	1	
Total Minimum Station Staffing:	12	

Station Name/Number:	**Station 6 – Crescent Beach**
Address/Physical Location:	5865 A1A South, St. Augustine, FL 3208

General Description:
Station was recently refurbished after severe storm surge flooding from Hurricane Matthew in 2016. Storage challenges necessitate storage in the apparatus bays that expose the equipment to weather and emissions, such as turnout gear, fitness equipment, and refrigerators. Proximity to Ocean and Intercoastal Waterway makes this facility vulnerable to salt spray and moisture.

Structure						
Construction Type	Cinder Block					
Date of Construction	1988					
Seismic Protection	N/A					
Auxiliary Power	No					
General Condition	Fair					
Number of Apparatus Bays	3	Drive-through bays				Back-in bays
Special Considerations (ADA, etc.)	ADA					
Square Footage	7,672					
Facilities Available						
Separate Rooms/Dormitory/Other	2	Bedrooms	6	Beds		Dormitory Beds
Maximum Station Staffing Capability	6 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes					
Security	Yes					
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Engine 6	3	
Marine Rescue 6	-	As needed
Total Minimum Station Staffing:	3	

Station Name/Number:	Station 7 – St. Augustine Beach
Address/Physical Location:	370 A1A Beach Blvd , St. Augustine, FL 32080

General Description:
SJCFR's oldest fire station, received damage in 2016 from Hurricane Matthew. SJCFR's Surf Rescue Division is located next door. Plans are underway to possibly relocate this station to another county property approximately ¼ mile away.

Structure						
Construction Type	Cinder Block					
Date of Construction	1968					
Seismic Protection	N/A					
Auxiliary Power	No					
General Condition	Fair					
Number of Apparatus Bays	1	Drive-through bays	1	Back-in bays		
Special Considerations (ADA, etc.)	ADA					
Square Footage	4,052					
Facilities Available						
Separate Rooms/Dormitory/Other	2	Bedrooms	6	Beds		Dormitory Beds
Maximum Station Staffing Capability	6 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	No					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes, Bio-Hazard pick up contracted					
Security	Yes					
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Engine 7	3	
Rescue 7	2	
Merv 7	-	As needed
Total Minimum Station Staffing:	5	

Station Name/Number:	Station 8 – Hastings

Address/Physical Location:	7985 Morrison Road, Hastings, FL 32145

General Description:
Storage challenges necessitate storage in the apparatus bays that expose the equipment to weather and emissions, such as turnout gear, ice machines, fitness equipment, and refrigerators.

Structure						
Construction Type	Cinder Block					
Date of Construction	2002					
Seismic Protection	N/A					
Auxiliary Power	Yes					
General Condition	Good					
Number of Apparatus Bays	3	Drive-through bays				Back-in bays
Special Considerations (ADA, etc.)	ADA					
Square Footage	7,632					
Facilities Available						
Separate Rooms/Dormitory/Other	2	Bedrooms	8	Beds		Dormitory Beds
Maximum Station Staffing Capability	8 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes, Bio-Hazard pick up contracted					
Security	Yes					
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Engine 8	3	
Rescue 8	2	
Tanker 8	-	As needed
Wildland 8	-	As needed
Brush 8	-	As needed
Total Minimum Station Staffing:	5	

Station Name/Number:	**Station 9 – South Ponte Vedra**
Address/Physical Location:	2998 South Ponte Vedra Blvd. Ponte Vedra Beach, FL 32082

General Description:
Station 9 is located directly across the street from the Atlantic Ocean. Salt air and moisture requires more rigorous maintenance of this facility. Storage challenges necessitate storage in the apparatus bays that expose the equipment to weather and emissions, such as turnout gear, ice machines, and fitness equipment. The lack of drive-through bays and warning system makes deploying and returning apparatus on the roadway challenging.

Structure						
Construction Type	Cinder Block					
Date of Construction	2007					
Seismic Protection	N/A					
Auxiliary Power	No					
General Condition	Fair					
Number of Apparatus Bays		Drive-through bays	2	Back-in bays		
Special Considerations (ADA, etc.)	ADA					
Square Footage	6,444					
Facilities Available						
Separate Rooms/Dormitory/Other	2	Bedrooms	8	Beds		Dormitory Beds
Maximum Station Staffing Capability	8 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes					
Security	Yes					
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Engine 9	3	
Marine Rescue 9	-	As needed
Total Minimum Station Staffing:	3	

Station Name/Number:	**Station 10 – Ponte Vedra**
Address/Physical Location:	155 Library Drive, Ponte Vedra Beach, FL 32082

General Description:
Like many of SJCFR's fire stations, this facility originated as a volunteer station and was refurbished in 1993 to house career personnel around the clock. Storage challenges necessitate storage in the apparatus bays that expose the equipment to weather, emissions and limited the "drive-through" feature of the bays.

Structure						
Construction Type	Cinder Block					
Date of Construction	1993					
Seismic Protection	N/A					
Auxiliary Power	No					
General Condition	Fair					
Number of Apparatus Bays	3	Drive-through bays			Back-in bays	
Special Considerations (ADA, etc.)	ADA					
Square Footage	6,172					
Facilities Available						
Separate Rooms/Dormitory/Other	2	Bedrooms	7	Beds		Dormitory Beds
Maximum Station Staffing Capability	7 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes, Bio-Hazard pick up contracted					
Security	Yes					
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Engine 10	3	
Rescue 10	2	
Marine Rescue 10	-	As needed
Total Minimum Station Staffing:	5	

Station Name/Number:	**Station 12 – St. Augustine (North City)**
Address/Physical Location:	4505 Avenue A #B, St. Augustine, FL 32095

General Description:
This facility was originally co-located with County EMS before themerger with SJCFR. Storage challenges necessitate storage in the apparatus bays that expose the equipment to weather, emissions and limited the "drive-through" feature of the bays.

Structure						
Construction Type	Cinder Block					
Date of Construction	1996					
Seismic Protection	N/A					
Auxiliary Power	No					
General Condition	Good					
Number of Apparatus Bays	2	Drive-through bays	1	Back-in bays		
Special Considerations (ADA, etc.)	ADA					
Square Footage	9,349					
Facilities Available						
Separate Rooms/Dormitory/Other	2	Bedrooms	7	Beds		Dormitory Beds
Maximum Station Staffing Capability	7 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes, Bio-Hazard pick up contracted					
Security	Yes					
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Engine 12	3	
Rescue 12	2	
Battalion 3	1	
Total Minimum Station Staffing:	6	

Station Name/Number:	**Station 14 – West King**
Address/Physical Location:	1255 W. King Street, St. Augustine, FL 32084

General Description:
Like many of SJCFR's fire stations, this facility originated as a volunteer station and was refurbished in 1994 to house career personnel. Storage challenges necessitate storage in the apparatus bays that expose the equipment to weather and emissions. Growth and expansion of services has placed a space capacity limit on the current configuration of many of these stations

Structure						
Construction Type	Cinder Block					
Date of Construction	1994					
Seismic Protection	N/A					
Auxiliary Power	Yes					
General Condition	Good					
Number of Apparatus Bays	3	Drive-through bays		Back-in bays		
Special Considerations (ADA, etc.)	ADA					
Square Footage	7,240					
Facilities Available						
Separate Rooms/Dormitory/Other	3	Bedrooms	9	Beds		Dormitory Beds
Maximum Station Staffing Capability	9 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes, Bio-Hazard pick up contracted					
Security	Yes					
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Engine 14	3	
Rescue 14	2	
Rescue 41	2	
Tanker 14	-	As needed
Total Minimum Station Staffing:	7	

Station Name/Number:	**Station 15 – Pine Island**
Address/Physical Location:	220 Pine Island Road, St. Augustine, FL 32084

General Description:
Built in 2011, Growth and expansion have placed a space utilization limit on this facility. Storage challenges necessitate storage in the apparatus bays that expose the equipment to weather, emissions and limited the "drive-through" feature of the bays.

Structure						
Construction Type	Cinder Block					
Date of Construction	2011					
Seismic Protection	N/A					
Auxiliary Power	Yes					
General Condition	Good					
Number of Apparatus Bays	3	Drive-through bays				Back-in bays
Special Considerations (ADA, etc.)	ADA					
Square Footage	9,350					
Facilities Available						
Separate Rooms/Dormitory/Other	3	Bedrooms	13	Beds		Dormitory Beds
Maximum Station Staffing Capability	13 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes, Bio-Hazard pick up contracted					
Security	Yes					
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Engine 15	3	
Rescue 15	2	
Tanker 15	1	
Wildland 15	-	As needed
Total Minimum Station Staffing:	6	

Station Name/Number:	Station 16 – World Golf Village
Address/Physical Location:	235 Murabella Parkway, St. Augustine, FL 32092

General Description:
Storage challenges necessitate storage in the apparatus bays that expose equipment to weather, emissions and limited the "drive-through" feature of the bays. Space utilization for fitness equipment and equipment storage should be addressed.

Structure						
Construction Type	Cinder Block					
Date of Construction	2007					
Seismic Protection	N/A					
Auxiliary Power	Yes					
General Condition	Good					
Number of Apparatus Bays		Drive-through bays	3	Back-in bays		
Special Considerations (ADA, etc.)	ADA					
Square Footage	8,182					
Facilities Available						
Separate Rooms/Dormitory/Other	3	Bedrooms	13	Beds		Dormitory Beds
Maximum Station Staffing Capability	13 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes, Bio-Hazard pick up contracted					
Security	Yes					
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Engine 16	3	
Rescue 16	2	
Haz Mat-16	-	As needed
Total Minimum Station Staffing:	5	

Station Name/Number:	**Station 17 – Sampson**
Address/Physical Location:	10001 Cartwheel Bay Avenue, St. Johns, FL 32259

General Description:
Like many of SJCFR's fire stations, this facility originated as a volunteer station and was refurbished in 1992 to house career personnel around the clock. Storage challenges necessitate storage in the apparatus bays that expose the equipment to weather and emissions. The drive-through capability of the bays cannot be utilized at this station and moisture issue in sleeping quarters should be addressed.

Structure						
Construction Type	Cinder Block/Metal/Steel frame					
Date of Construction	1992					
Seismic Protection	N/A					
Auxiliary Power	Yes					
General Condition	Fair					
Number of Apparatus Bays		Drive-through bays	3	Back-in bays		
Special Considerations (ADA, etc.)	ADA					
Square Footage	6,432					
Facilities Available						
Separate Rooms/Dormitory/Other	3	Bedrooms	8	Beds		Dormitory Beds
Maximum Station Staffing Capability	8 daily					
Exercise/Workout Facilities	No					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes, Bio-Hazard pick up contracted					
Security	Yes					
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Squad 17	3	
Rescue 17	2	
Brush 17	-	As needed
Total Minimum Station Staffing:	5	

Station Name/Number:	**Station 18 – Nocatee**
Address/Physical Location:	1055 Crosswater Parkway, Ponte Vedra, FL 32081

General Description:
One of SJCFR newest facilities, this station is laid out well and has adequate storage space to allow equipment such as turnout gear, fitness equipment, ice machine and other items to be stored in secured areas to free up apparatus bay space and increase the safe operation of the physical plant.

Structure						
Construction Type	Cinder Block					
Date of Construction	2015					
Seismic Protection	N/A					
Auxiliary Power	Yes					
General Condition	Excellent					
Number of Apparatus Bays	3	Drive-through bays				Back-in bays
Special Considerations (ADA, etc.)	ADA					
Square Footage	8,920					
Facilities Available						
Separate Rooms/Dormitory/Other	4	Bedrooms	14	Beds		Dormitory Beds
Maximum Station Staffing Capability	14 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes, Bio-Hazard pick up contracted					
Security	Yes					
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Engine 18	3	
Rescue 18	2	
Battalion 1	1	
Total Minimum Station Staffing:	6	

Station Name/Number:	Station 19 – Racetrack
Address/Physical Location:	Racetrack Rd/Veterans Parkway (Durban Crossing)

General Description:
Currently under construction during ESCI site visit in December 2019. Will service growing northwest portion of the county that borders Duval County to the north. Apparatus and staffing have not been determined as yet. Schedule opening, March 2020.

Structure						
Construction Type	Cinder Block					
Date of Construction	Opening 3/2020					
Seismic Protection	N/A					
Auxiliary Power	Yes					
General Condition	Excellent					
Number of Apparatus Bays	3	Drive-through bays			Back-in bays	
Special Considerations (ADA, etc.)	ADA					
Square Footage	8,882					
Facilities Available						
Separate Rooms/Dormitory/Other	6	Bedrooms	11	Beds		Dormitory Beds
Maximum Station Staffing Capability	11 daily					
Exercise/Workout Facilities	Yes					
Kitchen Facilities	Yes					
Individual Lockers/Storage Assigned	Yes					
Shower Facilities	Yes					
Training/Meeting Rooms	Yes					
Washer/Dryer	Yes					
Safety & Security						
Sprinklers	Yes					
Smoke Detection	Yes					
Decontamination/Biohazard Disposal	Yes, Bio-Hazard pick up contracted					
Security						
Apparatus Exhaust System	Yes, Active emission capture system					

Assigned Apparatus/Vehicles

Apparatus Call Sign	Minimum Staffing*	Comments
Truck 19	*	
Rescue 19	*	
Total Minimum Station Staffing:	*TBD	

APPENDIX B: APPARATUS AND VEHICLES

Apparatus	Type	Make/Model	Tank/ Pump Capacity	Year	Mileage	Condition
Engines/Pumpers						
Engine 2	Pumper	Pierce	1250GPM/500g	2019	20,131	Excellent
Engine 3	Pumper	Pierce	1250GPM/1500g	2013	75,011	Good
Engine 6	Pumper	Pierce	1250GPM/750g	2007	143,638	Good
Engine 7	Pumper	Pierce	1250GPM/750g	2006	129,148	Good
Engine 8	Pumper	Pierce	1599GPM/750g	2017	46,521	Excellent
Engine 9	Pumper	Pierce	1250GPM/750g	2006	129,375	Good
Engine 10	Pumper	Pierce	1500GPM/750g	2015	56,918	Excellent
Engine 12	Pumper	Pierce	1500GPM/750g	2017	48,448	Excellent
Engine 14	Pumper	Pierce	1500GPM/750g	2019	19,572	Excellent
Engine 15	Pumper	Pierce	1250GPM/750g	2009	151,840	Good
Engine 16	Pumper	Pierce	1250GPM/750g	2010	111,784	Good
Engine 18	Pumper	Pierce	1500GPM/750G	2016	52,997	Excellent
Aerial (Trucks) Apparatus						
Ladder 1	Truck 105'	Pierce	2000GPM/500g	2018	31,639	Excellent
Ladder 5	Truck 105'	Pierce	1500GPM/500g	2004	102,917	Fair
Squads, Tankers, and Brush Vehicles						
Squad 4	Rescue/Pumper	Pierce	1250GPM/750g	2012	63,494	Good
Squad 5	Rescue/Pumper	Pierce	1250GPM/500g	2018	24,846	Excellent
Squad 17	Rescue/Pumper	Pierce	1250/GPM/750g	2006	6,279	Fair
Tanker 3	Tanker	Pierce/Freightliner	500GPM/2500g	2002	39,986	Fair
Tanker 4	Tanker	Pierce/Kenworth	750GPM/2500g	2006	158,898	Good
Tanker 8	Tanker	Pierce/Freightliner	750GPM/2500g	2008	22,308	Good
Tanker 14	Tanker	Pierce/Freightliner	500GPM/2500g	2002	43,381	Fair
Tanker 15	Tanker	Pierce/Kenworth	750GPM/2500g	2006	93,161	Good
Wildland 8	Wildland/Urban	Pierce/Freightliner 6x6	750gpm/500g	2017	2,836	Excellent
Wildland 15	Wildland/Urban	Pierce/Freightliner 6x6	750GPM/500g	2015	5,951	Excellent
Brush 3	Brush	Ford F-550	N/A	2008	41,239	Good
Brush 5	Brush	Ford F-550	N/A	2008	28,117	Good
Brush 8	Brush	American Gen.	1300g	1993	31,284	Fair
Rescues (Ambulances)						
Rescue 2	Ambulance	Braun/Dodge	N/A	2018	48,111	Excellent
Rescue 5	Ambulance	Braun/Freightliner	N/A	2018	40,912	Excellent
Rescue 7	Ambulance	Braun/International	N/A	2015	106,197	Good
Rescue 8	Ambulance	Braun/Dodge	N/A	2016	75,534	Excellent
Rescue 10	Ambulance	Braun/International	N/A	2013	142,593	Good
Rescue 12	Ambulance	Braun/Dodge	N/A	2017	83,014	Excellent

Apparatus	Type	Make/Model	Tank/ Pump Capacity	Year	Mileage	Condition
Rescue 14	Ambulance	Braun/International	N/A	2013	19,572	Good
Rescue 15	Ambulance	Braun/International	N/A	2013	134,229	Good
Rescue 16	Ambulance	Braun/Dodge	N/A	2016	122,672	Good
Rescue 17	Ambulance	Braun/International	N/A	2012	213,857	Fair
Rescue 18	Ambulance	Braun/Dodge	N/A	2015	101,017	Good
Staff, Command, and Support Vehicles						
Battalion 1	North Command	Chevrolet Suburban 4X4	N/A	2018	38,022	Good
Battalion 2	Central Command	GMC Yukon 4X4	N/A	2015	84,282	Good
Battalion 3	South Command	Ford F-250 Crew 4X4	N/A	2019	12,965	Excellent
Battalion	Reserve	GMC Yukon	N/A	2013	124,062	Fair
Battalion	Reserve	Chevrolet Suburban	N/A	2011	165,634	Fair
County 1	Staff	Ford Explorer	N/A	2017	20,182	Excellent
County 2	Staff	Chevrolet Tahoe 4X4	N/A	2006	135,059	Fair
County 3	Staff	Ford Explorer 4x4	N/A	2015		Excellent
County 4	Staff	Ford Explorer 4x4	N/A	2016	30,562	Good
County 5	Staff	Ford Explorer 4x4	N/A	2018	18,236	Excellent
County 6	Staff	Ford F-150 4X4	N/A	2017	39,920	Excellent
County 7	Staff	Ford Explorer 4x4	N/A	2013		Good
County 8	Staff	Ford F-150 4X4	N/A	2019	3,252	Excellent
County 9	Staff	Ford F-150 4X4	N/A	2017	27,563	Good
FM 1	Staff	Ford F-150 4X4	N/A	2018	28,686	Excellent
Training 1	Staff	Ford F-150 4X4	N/A	2017	26,556	Good
Training 2	Staff	Ford F-150 4X4	N/A	2017		Good
Training 3	Staff	Ford F-150 4X4	N/A	2017	45,440	Good
Specialty Operations & Watercraft						
USAR 4	Fleet	Ford F-550/2007 Trailer	N/A	2006	25,919	Good
HM 16	Station 16	Freightliner/2015 Trailer	N/A	2016	11,131	Good
MR 3	Station 3	Ford Expedition	N/A	2007	121,395	Fair
MR 6	Station 6	Chevrolet Suburban	N/A	2004	143,653	Fair
MR 7	Station 7	Polaris PWC	N/A	2017	N/A	Good
MR 9	Station 9	Chevrolet Suburban	N/A	2005	224,790	Fair
MR 10	Station 10	Ford Explorer	N/A	2008	113,582	Fair
MR 12	Station 12	SAFE Boat	N/A	?	N/A	Good
MCI	Fleet	Cargo Mate Trailer	N/A	2013	N/A	Good
Fire Boat	Public Safety Docking Facility	?	?	?	N/A	Good

Apparatus	Type	Make/Model	Tank/ Pump Capacity	Year	Mileage	Condition
Reserve Engines/Pumpers						
Tower 20	Pumper	Pierce	2000GPM/200g	1999	57,103	Fair
Squad 22	Rescue/Pumper	Pierce	1250GPM/500g	2006	148,452	Fair
Engine 23	Pumper	Pierce	1250GPM/750g	2004	39,216	Poor
Engine 24	Pumper	Pierce	1250GPM/750g	2006	189,205	Fair
Engine 26	Pumper	Pierce	1250GPM/750g	2003		Poor
Engine 27	Pumper	Pierce	1250GPM/750g	2004	68,596	Poor
Engine 29	Pumper	Pierce	1250GPM/750g	2007	154,810	Fair
Reserve Rescues (Ambulances)						
Rescue 20	Ambulance	Freightliner	N/A	2002	181,001	Fair
Rescue 21	Ambulance	Horton International	N/A	2014	171,915	Fair
Rescue 23	Ambulance	Horton International	N/A	2010	236,611	Fair
Rescue 24	Ambulance	Horton International	N/A	2015	97,022	Fair
Rescue 25	Ambulance	International Med-Tec	N/A	2008	246,368	Fair
Rescue 26	Ambulance	International Med-Tec	N/A	2008	349,058	Fair

APPENDIX C: FEE SCHEDULE

Fire Rescue Fees	FY 20 Current
Permit Issuance Fee	$25.00
Commercial/Multi-Family Structures:	
Minimum fee up to $50,000 valuation	$71.00
Additional per $1,000 valuation over min	$1.25
Minimum fee for systems with up to 50 heads	$81.00
Fee for systems with over 50 heads	$81.00 plus $1.00 per head over 50
Private Fire Service Water Mains (if permitted separately from fire suppression system)	$75.00
(Note: Above Fees include cost of review, one hydrostatic test inspection, and one final inspection.)	
Additional Hydrostatic Test Inspections	$54.00 each
Communications Towers	$21.00
Fire Pumps	$100.00
Stand pipes (Note: If permitted separately from Fire Sprinkler Systems.)	$54.00
Fire Alarm	
Minimum fee for FACP & 10 devices on the system	$54.00
Systems with a FACP & more than 10 initiating or notification devices	$54.00 plus $1.50 per device
Commercial Kitchen Exhaust Hoods	$66.00
Fire Suppression System	$68.00
Altered Locking/Latching Arrangements Review (1st Submittal)	$75.00
Each additional submittal	$25.00
Fire Inspections (for facilities required to hold a license to operate):	
0-5,000 Sq. Ft	$54.00
5,001-12,000 Sq. Ft.	$75.00
12,001-25,000 Sq. Ft.	$125.00
25,001-50,000 Sq. Ft.	$150.00
50,001-75,000 Sq. Ft.	$175.00
75,001-100,000 Sq Ft.	$200.00
100,001-250,000 Sq. Ft.	$250.00
250,001-500,000 Sq. Ft.	$300.00
500,001-750,000 Sq. Ft.	$350.00
750,001-1,000,000 Sq. Ft.	$400.00
> 1,000,000 Sq Ft.	$500.00
After 2nd Re-inspection	Original Cost of Inspection
Plans Re-Submittal fee:	

Fire Rescue Fees	FY 20 Current
First re-submittal	N/C
Second re-submittal	$107.00
Third re-submittal	4 x Original plan check fee
Minor Revised Plan Review Following Approval:	$40.00
Major Alteration	$53/hour
Review of NEW Plans after approval	$68.00
Penalty for starting work without a Fire Marshal Permit	Double the normal application fee
Fire Plans Development Review:	
Special Use Permits (Major Review)	$25.00
Zoning & Non-Zoning Variances	$25.00
Temporary Use Permits (Administrative)	$25.00
Small Scale & Comprehensive Plan Amendments	$50.00
As-Built Review	$50.00
Fire Extinguisher Training (per person)	$5.00
Fire Works – per event, prior to shoot	$54.00
Fire Engine and (3) Firefighters	$165.00 per hour
Ambulance and (2) Paramedics	$165.00 per hour
Specialized Rescue Units including (2) Firefighters and equipment	$110.00 per hour
Inspector/Investigator	$65.00 per hour
Marine 12 Safeboat with 2 Firefighters	$165.00 per hour
Incident Commander with Vehicle	$75.00 per hour
Tanker with 1 Firefighter	$85.00 per hour
Firefighter	$65.00 per hour
Re-inspection for unprepared sites:	
First re-inspection	$55.00
Each additional unprepared re-inspection	$112.00
Third party engineering	Actual cost plus 3% administrative cost
Request for walkthrough/pre-inspection	$54.00
After hours, weekend, or holiday inspection:	
Minimum fee paid in advance – 2 hours minimum	$153.00
Additional per hour fee (after initial 2 hours)	$54.00
(Note: Subject to availability.)	
Misc. Construction/Installation Permits (Tanks, Compressed Gas Systems, Pipelines, etc.)	$54.00
Permits for Operations	

Fire Rescue Fees	FY 20 Current
NOTE: Permits are required for certain operations or events as listed in Florida Fire Prevention Code, 2001 Edition (see NFPA 1, 2000 edition, section 1-16.16, as modified). Fees for construction related permits are listed above.	
The following activities require a permit and fee for each event:	
Bonfires	$54.00
Explosives (blasting operations)	$54.00
Fireworks, public displays	$54.00
Tents and Membrane structures	$54.00
Carnivals and Fairs (excludes those portions under jurisdiction of the Department of Agriculture and Consumer Services.)	$54.00
Other required event permits (Florida Fire Prevention Code)	$54.00
The following activities each require an annual permit per site:	
Storage of Calcium Carbide	$54.00/year
Storage of Cellulose Nitrate Film	$54.00/year
Storage, handling, or use of Compressed Gases	$54.00/year
Explosives (manufacture, storage, use, etc .)	$54.00/year
Sale or storage of Fireworks (retail or wholesale)	$54.00/year
Flammable or Combustible liquid storage	$54.00/year
Flammable finish application	$54.00/year
Storage of Magnesium	$54.00/year
Storage of rubber tires, over 2500 cubic feet	$54.00/year
Storage of Oxidizers and Organic peroxides	$54.00/year
Other required annual permits (Florida Fire Prevention Code)	$54.00
Fire Insurance Rating Verification Letter	$21.00
Heartsaver Classes	
Basic First Aid only	$45.00
CPR/AED only Student Workbook	$2.50
Basic First Aid Student Workbook	$2.50
First Aid/CPR/AED Workbook	$2.50
BLS Student Workbook	$15.00
Heartsaver CPR/AED	$45.00
Heartsaver First Aid/CPR/AED	$65.00
BLS (Healthcare Provider)	$50.00
ACLS Initial	$175.00
ACLS Student Workbook	$40.00
On-line Classes (On-line Part 1 Only)	
CPR/AED only (Part 1)	$25.50
Basic First Aid only (Part 1)	$31.00

Fire Rescue Fees	FY 20 Current
CPR/AED & Basic First Aid (Part 1)	$44.00
BLS for Healthcare Providers (Part 1)	$28.50
ACLS Providers (Part 1)	$132.00
On-line Skills Check	
Heartsaver Skills Check	$20.00
BLS Skills Check	$25.00
ACLS Skills Check	$30.00
Equipment Rental Fee	$35.00
Public Access Defibrillator (PAD) Incident Response	$45.00/hour
CPR Instructor Course	$125.00 per person
ACLS Instructor Course	$125.00 per person
Basic First Aid Card	$17.00
Heartsaver First Aid/CPR/AED Card	$17.00
Heartsave CPR/AED Card	$17.00
K-12 Heartsaver Card	$4.00
Replacement Basic First Aid Card	$19.00
Replacement Heartsaver First Aid/CPR/AED Card	$19.00
Replacement CPR/AED Card	$19.00
Replacement K-12 Heartsaver Card	$4.00
Replacement BLS (Healthcare Provider) Card	$6.00
Replacement CPR Card	$6.00
BLS (Healthcare Provider Card)	$4.00
ACLS Card	$6.00
Replacement ACLS Card	$8.00
HS/BLS & ACLS Instructor Card Renewal	$10.00

APPENDIX D: FUTURE DEMAND PROJECTION METHODOLOGY

The following is a detailed description of the methodology used to develop the future population and demand projections through computer modeling.

Subdivision Address Generation

Addresses were generated within the planned development regions for later use in the future incident modeling. The addresses are used to locate incidents. This section provides an overview of the process of generating those addresses. The primary data sources for this section are summarized in Figure 152.

Figure 152: Data Sources for Address Generation

Data Source	Origin/Format	Content/Usage
PUD Entitlements	SJCFR Shapefile	453 planned residential development regions with unit counts Input for grid/address generation
Address data	a000000009 site Geodatabase	St Johns County address points Identified existing/planned locations
Open Street Map™ (OSM) data	Openstreetmap.org OSM file	Open source street database Base street layer for adding planned arterials and residential development street grids

Phase 1: Geographic Data Preparation

Within the provided PUD Entitlement Shapefile, there were approximately 126,000 planned residential units. These were at varying levels of buildout. The first step was to figure out how many units were already built and how many still needed to be built. This was done by counting the existing residential addresses within each polygon and subtracting that from the total planned units.

From this, it was discovered that approximately 77,500 units were already built and included with the address table and that 48,500 units needed to be added. Additionally, all but 262 of the development polygons had already been completely built-out.

Phase 2: Placing Units/Roads

This phase consisted of generating necessary information for the future incident modeling process:

- A network of hypothetical future roads and streets, and
- A set of hypothetical geographic locations from which to place future incidents.

The first element was necessary (a) to provide a realistic geographic distribution of incident locations and (b) to ensure that generated incidents could be routed within the Code3 Strategist application.

The desire was to keep the already built out address points but also avoid generating locations/roads in previously developed areas. This was largely done manually by adjusting the polygons' boundaries. An example is shown in Figure 153.

Figure 153: Example of the existing address points, the areas that were removed (red polygons) and the final development areas (green polygons)

Once the polygons were adjusted, generated addresses/gridded roads were added via Code3 Shipshape (an internally developed utility capable of generating road grids within specific geographic areas, and merging proposed street network changes into the OpenStreetMap™ "OSM" format used by the Code3 applications). Development roads that were in the provided road layer but were not in the OSM file were also added at this stage.

Road Network Enhancements

The road network is used by Code3 Strategist for routing to incidents. Enhancements were needed to make the roads representative of what will exist in the future. This section provides an overview of the different layers and processes used to make the result. Figure 154 summarizes the data sources and their usage in the street/geography transformation process.

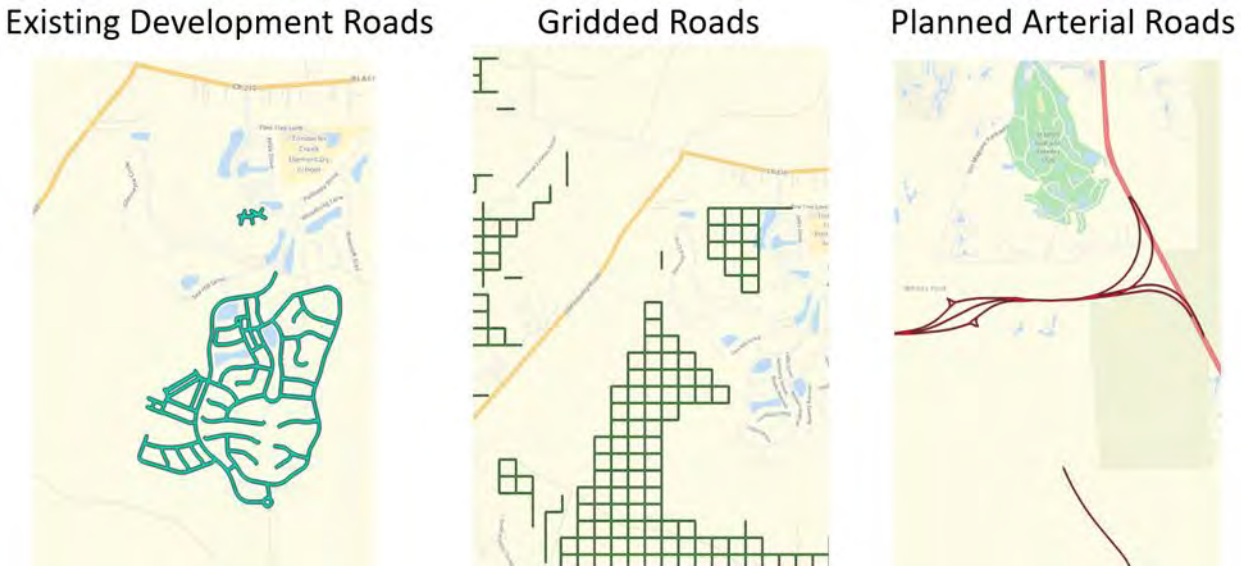
Figure 154: Street/Geography Data Sources

Data Source	Origin/Format	Content/Usage
TCI Roadway Projects	SJCFR Shapefile	Major planned roadway projects Identified planned future roads
aooooooooa Road	SJCFR Geodatabase	Existing road network Identified new roads not known to OSM
Open Street Map™ (OSM) data	Openstreetmap.org OSM file	Open source street database Base street layer for adding planned arterials and residential development street grids

Phase 1: Data Preparation

It was determined that the OpenStreetMap road network was the most complete, routable road network available. Each road network listed in the primary data sources had unique roads that were desired for the final road network. Therefore, attributes from each layer needed to be combined into the final file. This was done by manually selecting out the roads and saving them as individual files. An example is shown in the next figure.

Figure 155: Examples of Roads Added from Each Layer to the Final Road Network



Phase 2: Combining the Road Networks

The process of combining the different road network layers used a combination of automated and manual steps.

- **Code3 ShipShape (automated steps)**
  - Added intersections where roads from any of the two layers overlapped.
  - Extended roads and added intersections anywhere that one endpoint came within 40 feet of another layer's road.

- **Manual Cleanup**
  - Each added road was checked by hand to ensure an intersection existed and was placed logically.
  - Generated intersections that were illogical or unintendedly impacted the routing of the existing road network were removed.

Phase 3: Testing the Road Networks

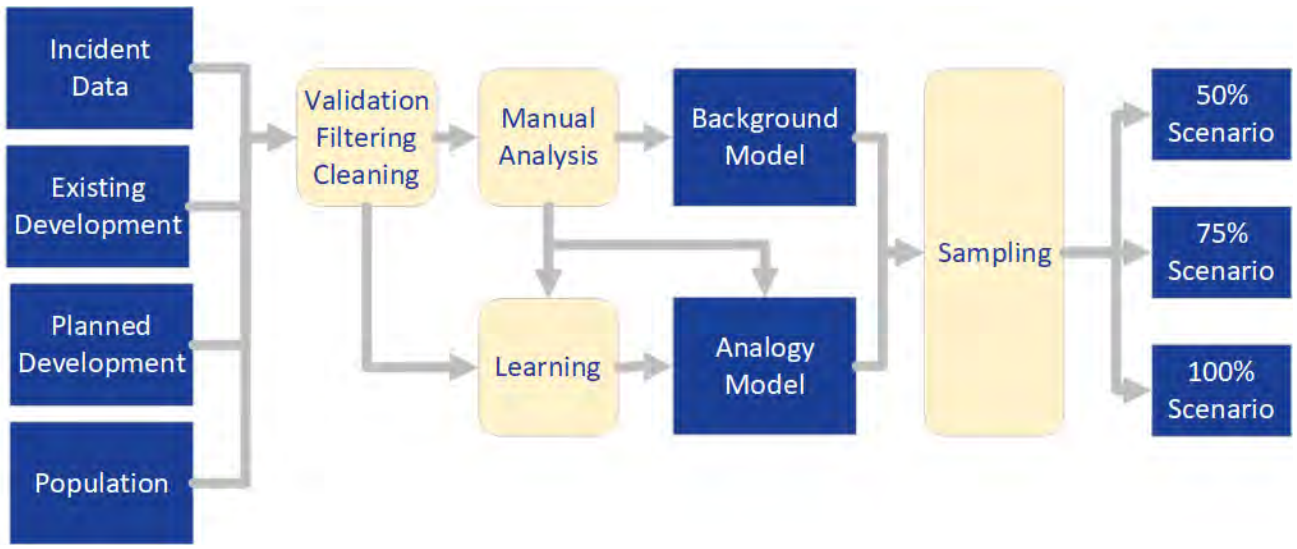
Testing of the road network was done primarily using Code3 Strategist. Every address, whether generated or existing, was routed to using Code3 Strategist. Any location that was either unrouteable or had travel distances that did not make sense was fixed in the road network. The final road network was able to route to 99.77% of addresses. Unrouteable locations were all located in low-density areas outside of the planned development regions.

Future Incident Modeling

Future incident modeling is the building of statistical model(s) to forecast future incident volume. As part of this process, simulated incident datasets are generated that can be used by Code3 Strategist to measure the effectiveness of different deployment options to address possible future conditions. This section provides an overview of the methods used to develop and employ the models to generate incident volume forecasts.

Figure 156 provides an overview of this process. Available data were validated, filtered, and cleaned as described above and later in this section. Manual and automated analysis and learning processes were applied to develop mathematical models of growth. These models were provided to the Code3 Visionary tool, which was used to generate sample incident datasets representing growth scenarios at 50%, 75%, and 100% of planned buildout. The analysis, learning, modeling, and sampling processes are described in detail in the remainder of this section.

Figure 156: Future Incident Modeling Process



Future incident modeling required various data about the County, including historical incident details consisting of incident characteristics (type, time, location), demographics, and new development information. Several of the key data sources used to acquire this data are shown in the table below. This data was transformed according to the methods described in the *Service Delivery and Performance* section. Data sources are summarized in Figure 157.

Figure 157: Future Incident Modeling Datasets Data Sources

Data Source	Origin/Format	Content/Usage
Historical incidents	Provided by SJCFR from CAD	Incident cause, location, and time/Baseline for predictive models
St Johns County zoning (shapefile)	SJCFR Shapefile	Key zoning attributes/Geographic incident classification
New development data	SJCFR Shapefile and CSV address list	New development location, number of planned units Future event modeling and sampling
Census data	https://www.census.gov	Population, demographics, household income Tuning incident generation models

Phase 1: Data Preparation

The first phase of the future incident modeling process prepared the data to be used in building the models. The data from the various sources were combined, aggregated, and filtered using the following steps:

- Zoning data was aggregated into high-level categories meaningful for incident prediction: Residential, Commercial, Industrial, and Rural.
  - This aggregation was required to ensure each zoning category contained enough data to build a model. Many of the raw zoning categories were too sparse to identify any significant trend and therefore required aggregation.
- Nature codes were aggregated into high-level categories meaningful for incident prediction: Structure Fire, Outdoor Fire, Fire (other), EMS, MVA, Service, Tech Rescue, Hazardous Condition, AFA, Weather, and Non-Incident.
  - Similar to the zoning categories, many of the raw nature codes were too sparse to identify any significant trend and thus had to be aggregated.
- A zoning attribute was added to each incident indicating the zone type in which an incident occurred.
- Incidents that occurred at new developments were removed from the historical incident data.
  - Some of the new developments had several units already constructed. The historical incidents that occurred at these partially built developments were removed to prevent the partial buildout from skewing the data.
  - Compiled a dataset of residential-zoned areas in St. Johns to use as training data for developing the prediction models.

  - Added incident count, average household income, and population density attributes to each area
  - Filtered out areas that would not be representative of the new residential developments going into St. Johns County. The applied filters included excluding areas that contain commercial buildings and excluding areas that have very low population such as some rural areas.
- The following fields were added to the new development shapefile:
  - Household income (from Census)
  - Population (from Census)
  - Population density (from Census)
  - Zoning (from aggregated zoning shapefile)

Phase 2: Prediction Model Development

The second phase developed the models used for the future incident forecasting. Challenges encountered in this phase included:

1. the sheer magnitude of development in St. Johns County. It is estimated that ¾ or more of population growth is related to the explosive annexation and development that has occurred in recent years.[30]
2. The dynamic nature of development; planning staff report that developments are often fully occupied significantly ahead of planned schedules, built to capacities significantly exceeding original plans, or both.
3. Limitations on data available for development plans: planning data received consisted only of development region polygons with planned numbers of units. Data were available only for residential development.

The customized Code3 Visionary tool combined two parallel strategies to overcome these challenges: (a) **background growth modeling** accounted for population growth in St Johns County not directly attributable to specific new development and (b) **new residential development** was modeled separately based upon analogies between existing residential developments with incident history and the scope, location, and extent of planned residential development based on available data sources.

Background Growth Modeling

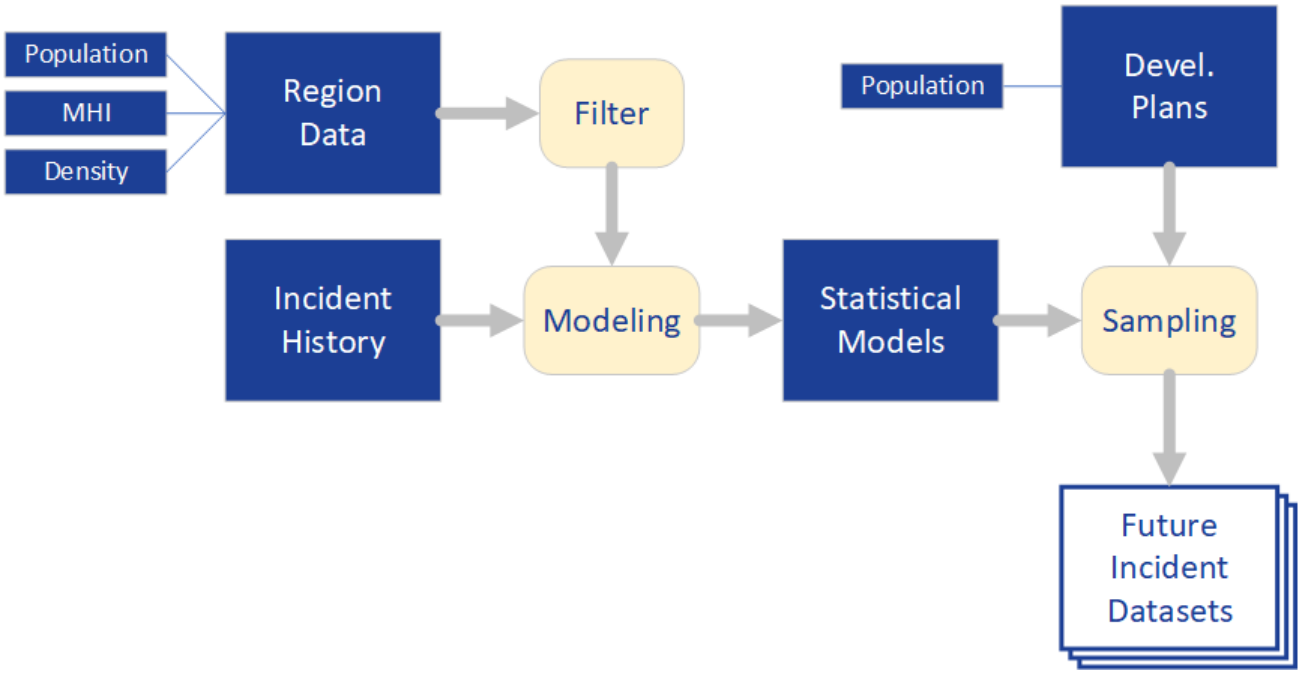
A model of "background" growth in previously built areas was built using an assumed incident volume growth rate of 1%. This assumption was based upon reviewing overall population growth in St. Johns County during 2013–2017 (3.84%) and estimating that roughly ¾ of that growth was due to new development, based on feedback from planning staff during the initial kickoff meeting.[31]

[31] *Robshaw J, Angle J, St Johns County FL Planning Staff, Baily D, Ermer S, Niedner C. (2020). 'Planned development expectations.' Minutes, St Johns Co data review 01-09-2020. [online: https://global.gotomeeting.com/join/865979677] .*

New Residential Development

New residential development was modeled using a "filtered analogy" method, shown graphically in Figure 158.

Figure 158: Filtered Analogy Workflow for Residential Development



Data experiments suggested that median household income (MHI) and population density have value in predicting incident occurrence rates in St. Johns County. However, only population figures were reliably available for new developments. Accordingly, the final model needed to be constructed using population alone. To achieve the objective using predicted population, the filtered analogy process consisted of the following operations:

1. Incident history was obtained as described above, including incident location, date/time, and nature.
2. 684 "source analogy" regions were obtained, as noted above. These regions represented existing residential developments for which significant incident history existed. They were obtained in shapefile format, and included attributes for population, MHI, and population density. Population for each region was estimated using *areal interpolation*: population was obtained for each census tract, and population was estimated for each region based on the proportion of each census tract that it occupied.[32] As a simple example, assume that Development X occupies 1.5 square miles – 1.0 square miles in Census Tract 1, which is 2.0 square miles in area and has 500 residents, and 0.5 square miles in Census Tract 2, which is 1.0 square miles and has 800 residents. Development X is estimated to have 650 residents: ((1.0/2.0)*500)+ ((0.5/1.0)*800).

[32] *American Community Survey 5-Year Data (2009-2018)." United States Census Bureau, Link to documentation: https://www.census.gov/data/developers/data-sets/acs-5year.html 02-15-2020.*

3. The source analogy regions were found to be highly heterogeneous. Since the available planning data was exclusively residential, the source analogy regions were filtered:
    a. 192 regions with invalid (zero or negative) population figures were excluded.
    b. The remaining 492 regions were sampled and visually identified by building characteristic, and characterized as "atypical residential," "non-residential," or "typical residential." Atypical residential regions (exemplified Figure 159) were clearly residential in nature, but clearly unlike the common experience of new residential developments – mostly extremely expensive properties. Non-residential regions (Figure 160) consisted of agricultural, mixed-use, or open land or had significant inclusions of these usage types. Typical residential regions (Figure 161) were devoted primarily to residential use, in single-family and multi-family configurations of varying densities.

Figure 159: Atypical Residential Region

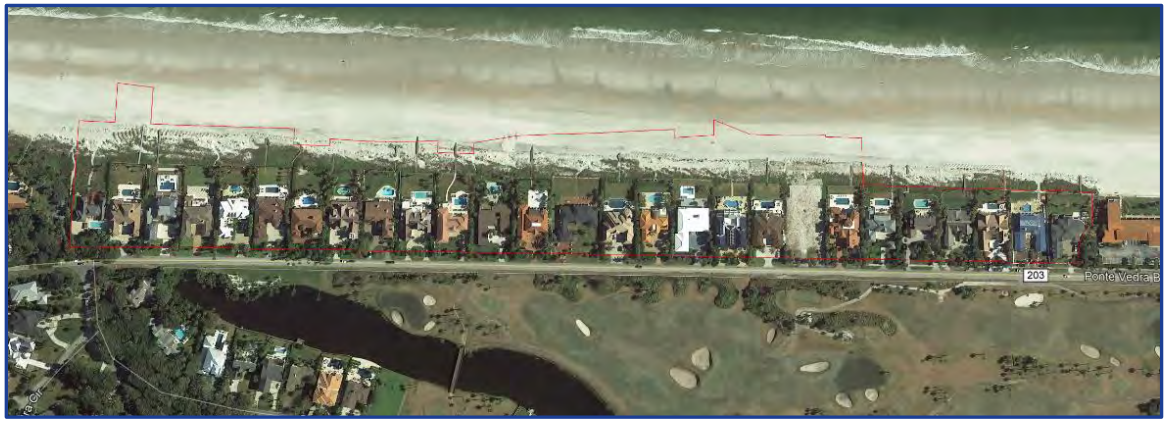


Figure 160: Non-Residential Region

Figure 161: Selected Residential Region

c. Per-capita incidence rates of calls for service (PCACFS) were calculated for the sample. PCACFS was found to be an effective classifier for the classes noted above. PCACFS between 0.09 and 0.19 effectively identified the typical residential class, resulting in 103 selected source regions. Figure 162 shows the cumulative effects of the filtering process.

Figure 162: Filtering Stages

Filtering Stage	Number of Regions	Percentage
All supplied regions	684	100%
Invalid populations excluded	492	72%
Final training set (per capita CFS criteria)	103	15%

d. A regression tree model was generated using the Cubist™ package.[33] This model identified three residential subclasses based upon population, each with a slightly different linear relation. Figure 163 summarizes the generated regression tree. Annual CFS predictions based upon population are given as linear equations in population (P).

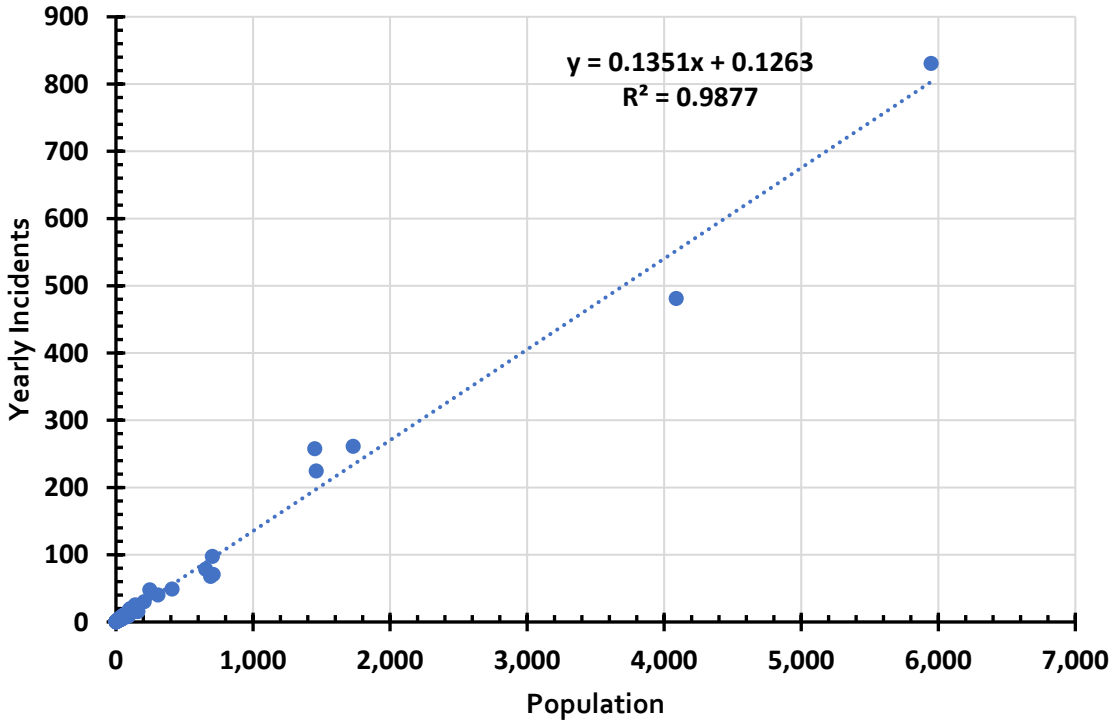
Figure 163: Learned Predictive Models

Population Class	Number of Samples	Annual CFS Prediction
Under 208	91 (89.3%)	0.132P
208–710	7 (6.8%)	0.085P + 14
Over 710	5 (4.9%)	0.125P + 44

[33] *Kuhn M and contributors. "Cubist: rule- and instance-based regression modeling." Github, 2020. Open source Web repository: https://cran.r-project.org/package=Cubist, 02-15-2020.*

e. The model was validated with a linear least square fit, as shown in Figure 164. The figure shows the annual CFS for each development selected for the model, with development population on the horizontal axis and annual CFS on the vertical axis. A wide range of developments was selected for the model: existing development populations ranged from numerous developments with just a few individuals to several developments planned to accommodate 4000-6000 individuals. The model was found to be effective, with $R^2 = 0.99$ (the model explains 99% of variability in the sample) and a small constant term. The model found an aggregate PCACFS rate of 0.13, consistent with national trends 34 35. These observations led to the conclusion that the learned model is a good predictor of annual incident volume for a given population, for typical residential areas in St. Johns County, excluding atypical residential areas such as luxury developments.

Figure 164: Model Validation



[34] ____. *"News and research: fire department calls." National Fire Protection Association, 2020. Web: https://www.nfpa.org/News-and-Research/Data-research-and-tools/Emergency-Responders/Fire-department-calls, 05-27-2020.*

[35] ____. *"United States/Population." Alphabet, Inc. Web: https://www.google.com/search?source=hp&ei=IJbOXruvLM79-gTJ4ILYCg&q=us+population&oq=us+population&gs_lcp=CgZwc3ktYWIQAzICCAAyAggAMgIIADICCAAyAggAMgIIADICCAAyAggAMgIIADICCAA6BQgAEIMBULghWN8uYIowaABwAHgAgAHQAYgBtg-SAQYwLjEyLjGYAQCgAQGqAQdnd3Mtd2l6&sclient=psy-ab&ved=0ahUKEwi7v5OSvNTpAhXOvp4KHUmwAKsQ4dUDCAg&uact=5, 05-27-2020.*

Phase 3: Performing Prediction/Generating Sample Incident Datasets

Phase three of the process employed the predictive models to generate future incident forecasts. The output of this phase was a one-year future incident file containing the incidents forecasted to occur during the first full year in which all of the new developments are complete. Each future incident was generated with a predicted nature code, date/time, and location using the following steps:

- Yearly future incident volumes were generated for new developments and existing areas using their respective predictive models.
  - Duplication was avoided by removing planned developments that are already generating significant call volume.
- Predicted nature codes were generated for each incident.
  - Partitioned historical incident data by zoning type and used the nature code distribution from the corresponding partition to sample the nature code for each future incident.
- A predicted date and time were generated for each incident.
  - Partitioned historical incident data by zoning type and nature code and used the date/time distribution from the corresponding partition to sample date/time.
  - The year was the first year in which it was predicted that all the new developments would be completed by the start of the year. This prediction was based on the population projection for the County.
- A predicted location was generated for each incident.
  - For new developments, incidents were uniformly distributed across the addresses in each new development.
  - For existing areas, the location distribution from the historical data was used to distribute incidents.
- Sample incident datasets were generated using the distributions derived from the background growth and residential development models described in the preceding section. Datasets were generated at 50%, 75%, and 100% of planned growth to support contingency planning.
- These datasets were imported into the Code3 Strategist tool for use in evaluating alternate deployment strategies against future growth scenarios as described in Projections of Population and Service Demand.

APPENDIX E: TABLE OF FIGURES