Analysis of Population Growth & Demand, Fire Station Locations, & the Fire Prevention Division

Jacksonville Fire & Rescue Department

Jacksonville, Florida

September 2006

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ANALYSIS OF
POPULATION GROWTH & DEMAND,
FIRE STATION LOCATIONS, &
THE FIRE PREVENTION DIVISION

Submitted to:

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Director/Fire Chief Richard Barrett , and many other chiefs, officers, firefighters and managers of Jacksonville Fire and Rescue Department were extremely cooperative, gracious and forthcoming in relation to the providing of data, the facilitation of tours of the city, various stations, and facilities, and insight into the inner workings and issues facing the department.

We would particularly like to thank Deputy Director/Assistant Fire Chief Randy White and Captain Greg Miller who acted on special assignment as the Project Manager for Jacksonville Fire and Rescue. They both efficiently and effectively handled and facilitated all of our data requests, arrangement of meetings, and keeping a strict, succinct schedule during our triage visit. The provided our team as well deep insight into the inner workings of the department, which aided greatly in the completion of this report.

While we received excellent input and cooperation from the city, the evaluation and recommendations reflected in the report are those of the TriData project team. The principal members of the team and their areas of responsibility are shown below, but this was a team effort and views were sought from multiple team members on virtually every aspect of Jacksonville Fire and Rescue report.

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EXECUTIVE SUMMARY

In February 2001, TriData completed a comprehensive study of the Jacksonville Fire & Rescue Department. Following this study, the population of Jacksonville grew substantially, outpacing the estimations made at every level of city planning. To better adapt to this change, Jacksonville FRD contracted with TriData to perform a secondary analysis to examine current station location and the improvement of response times based on new and projected population calculations and current and future development plans.

TriData worked cooperatively with the City of Jacksonville and the Fire & Rescue Department to evaluate the above aspects of the department and make recommendations that would compliment the operations of one of the world's best all-hazard response departments. The major highlights of the findings and recommendations contained in this report are presented below.

Fire Prevention

In order to best address the increasing demands on the Fire Prevention Division, a substantial shift and reorganization is needed. This reorganization should include the reclassification of both district chief's positions, the creation of four functional areas of fire prevention, each with a supervisory position that answers directly to the Fire Marshall.

Although Jacksonville has experienced unprecedented growth during the last decade, the resources allocated to the Fire Prevention Division have not matched the growth. In order to best address the increased workload, Jacksonville Fire & Rescue should consider expanding the Fire Prevention Division using either uniformed or civilian personnel.

Presently the Fire Marshall's position is a position appointed by the mayor and the individual who holds this position typically serves for the duration of the mayor's term. This is highly unusual. TriData recommends that JFRD establish the position of Fire Marshall as a non-appointed career position requiring professional certification selected by competitive process.

Jacksonville Fire & Rescue recognizes prevention and education as a core value in its mission statement, but the mission statement of the Fire Prevention Division does not recognize all aspects of fire prevention.

Develop Programs to Improve the Efficiency of Inspections **–** A substantial variance exists between the number of building plans reviewed and the number of buildings inspected. Additionally, because of a shortage of inspectors, the infrequency of building inspections provides for virtually no enforcement of the fire code.

Compile Fire Loss Data and Substantially Revise Public Education Program **–** Collection of fire loss data and public education are intrinsically linked. Fire loss data allows departments to identify at-risk communities for special life-safety education. At the present time, JFRD does not have a ready method for analyzing fire loss data.

JFRD has an urgent need to expand the department's public education efforts. Last year only 6 percent of the City of Jacksonville's population was reached by any type of fire department public education.

Risk & Demand Analysis

Risks **–** Jacksonville Fire & Rescue has a diversity of hazards within its response area.

Senior officials in the fire department were quick to point out the relative youth of the officer corps as an additional risk within the department. This type of "brain-drain" can be very troubling for any department and requires extensive mitigation efforts.

TriData recommends the creation of a program to include a mandatory 2-4 week First Line Supervisor program for all newly promoted officers.

Population **–** The population growth experienced in Jacksonville has serious implications for the fire service, as evidenced by the need for this second study. As the population grows, demand on the fire department increases. The City's population is projected to increase steadily in the coming years. By 2024, the planning department expects the population to exceed 1 million people.

Demand **–** Demand for fire department services is impacted by many factors, including the degree of urbanization, age demographics, and income level of a particular community. As Jacksonville Fire & Rescue moves forward it is critical that the department plans to expand to meet the needs in its long-term future, rather than just the immediate needs of the department.

Over the next 20 years, the number of people in Jacksonville over age 65 is expected to grow. Typically, this age group places more demand on EMS providing agencies than any other

age-based segment of the population. Therefore, one can expect a growth in demand related to the increase in population aged 65 and older.

Looking to future demand, the North region has seen the greatest growth in fire department demand, with a 4.8 percent growth rate for EMS service and a -1.8 percent growth rate for fire services. Greater Arlington ranks second in demand, with a 3.9 percent increase in EMS calls and a -1.0 increase in fire calls. The Southeast region ranked third second with 3.6 percent growth in EMS and -1.0 percent growth in fire demand, with the Southwest and Urban Core areas ranking third and fourth respectively. The Northwest region has seen the least growth in demand, with a 1.8 percent increase in demand for EMS service and a -3.2 percent demand for fire services, but has seen the largest *per capita* demand for EMS services over the last five years.

Staffing and Apparatus Overview

Rescue Units – The majority of calls that JFRD responded to last year, and in every other year in the recent past, were for EMS services. These calls made up 87 percent of the JFRD call volume in 2005. The need for EMS services has expanded every year and continues to expand rapidly. This demand requires JFRD to increase the number of rescue units to keep pace with current and future demand. Current and future demand may also require peak time demand units in certain areas of the city (the optimum locations for these type of units are most likely Stations 49 and 59).

To respond to future needs, JFRD should consider placing a rescue unit at every new station the department creates. To meet current needs and address the issue of compromised coverage areas, JFRD should place a rescue unit in service at stations 49 and 54.

Quints – Quints offer unique opportunities for departments. If units are utilized correctly, the versatility offered by these multi-function units can have a strongly positive impact on fire ground operations. JFRD should consider using quint companies at any new stations created on the perimeter of the city. Additionally, quint companies should be considered at the following stations: 48, 47, 57 and 60.

Marine Units – JFRD is the primary organization responsible for covering the entire length of the St. John's River from Naval Station Mayport to south of the Bunchman Bridge.

Because of the wide array of hazards and demands that the river creates, JFRD needs to expand its river-coverage area.

Staffing **–** JFRD continues to operate with 3-person engine companies. In 2001, TriData recommended that JFRD increase staffing to 4 people on each engine company, but efforts by the department failed to gain the approval of the City.

With continuously expanding call volumes and rapid growth of the city, these 4-person engine companies are more important now than they were before. Additionally, NFPA 1710 determines safe staffing for engine companies at 4 persons. The department should, therefore, work with the Mayor's office and the City Council to increase staffing on engine companies to four firefighters.

IT Related to Staffing **–** JFRD utilizes an automated staffing program created in-house. This program is one of the best automated staffing software programs that TriData has seen in any department. The system is a model of efficiency and a great resource for the department. It does a remarkable job of integrating all the various staffing, personnel and payroll functions required for department operations, and does so in a seamless manner. If possible, JFRD should patent and copyright this software and consider marketing it for sale. The potential exists that this program could create a major source of revenue for the department.

Response Times

Vertical response time is the measure of time between a unit's initial response and arrival of fire department personnel at a patient's side or fire scene. JFRD should begin tracking vertical response times to assess its impact on total response time in order to maintain total response time goals.

I. INTRODUCTION

The City of Jacksonville is a beautiful and diverse community, central to the economic and political life of the State of Florida. The City is home to one of the largest port areas in the southern United States and is also an area frequented by tourists.

During the past 50 years, the City of Jacksonville has grown by leaps and bounds. In the past fifteen years alone, the city has grown by more than 150,000 people. In 2001, as a result of this unprecedented growth, TriData was selected by competitive bid to undertake a comprehensive study of the Jacksonville Fire and Rescue Department. During this study, TriData made a number of recommendations for maintaining and improving the high caliber of service provided by JFRD.

Since 2001, the City has continued to grow at a rate that exceeded the expectations of even the city's most liberal projections. As a result of this unbelievable growth, the City of Jacksonville and the Jacksonville Fire and Rescue Department required additional analysis for expansion and planning. The City of Jacksonville asked to re-analyze deployment and other aspects of the fire department.

TriData, a nationally recognized consulting firm that has undertaken more than 130 studies of this nature, for cities such as Portland, OR, Washington DC, Long Beach CA, and Oklahoma City, was again chosen to perform the current re-evaluation.

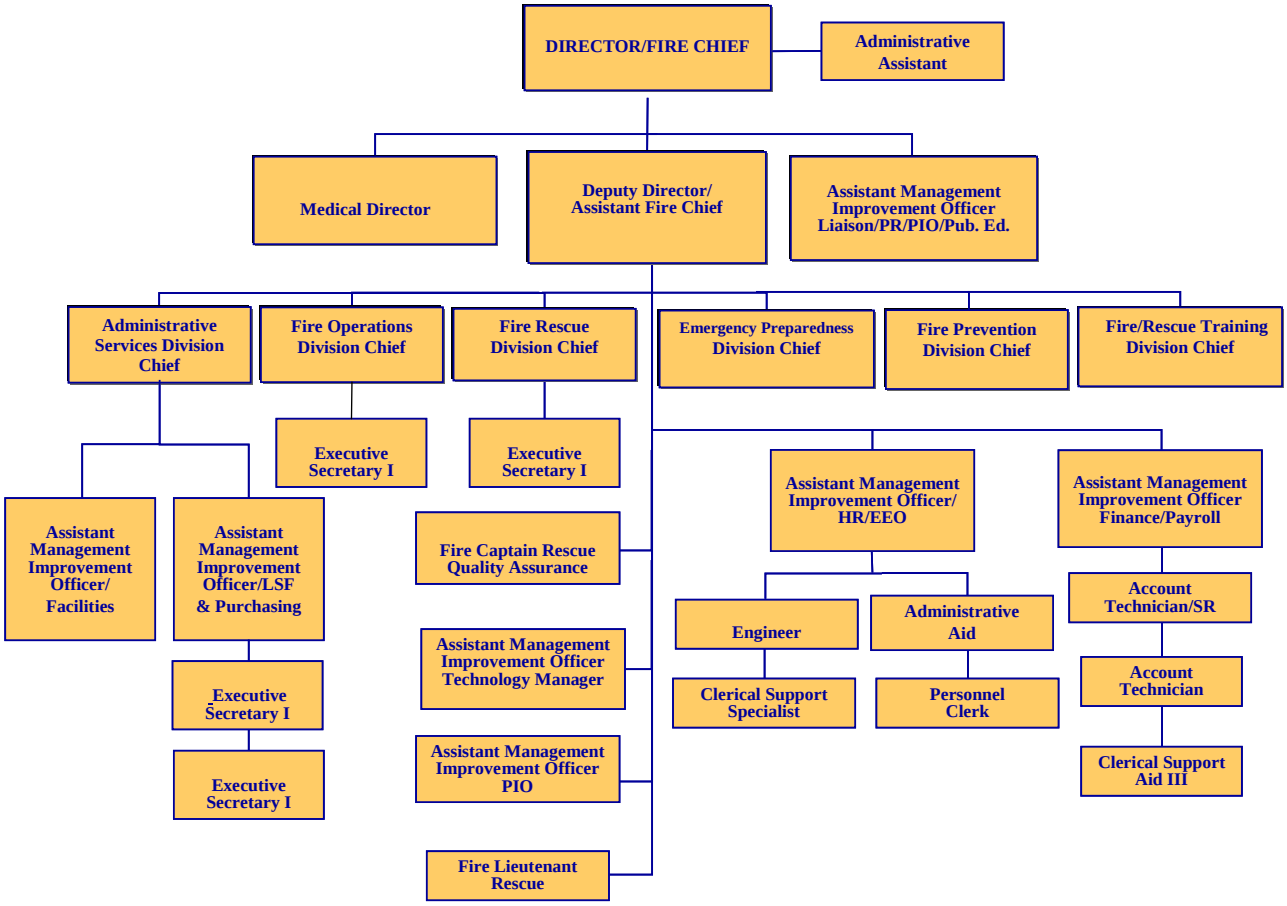
Organization and Management

JFRD is a well-run organization that the citizens of Jacksonville can be very proud of. From the very high approval ratings that the citizens of Jacksonville give to their department, it is clear that the citizens recognize the excellence with which their department consistently acts.

The Office of the Director/Fire Chief maintains open lines of communication with his entire senior staff. The relationship between the Director/Fire Chief and the Deputy Director/Assistant Fire Chief is especially effective; it exemplifies the efficient functioning of the entire department.

This is generally true of the working relationship of the entire senior staff directly under the chief. Figure 1 shows the organizational structure of the Department.

Figure 1: JFRD Organizational Chart



Jacksonville has a Mayor-council form of government. The mayor of Jacksonville is the C.E.O and wields considerable power. There is also a 19-member city council representing 14 districts and 5 at large seats. The Chief and his senior staff are appointed at the pleasure of the Mayor and he has the power to hire and fire any of these appointees.

Politically, JFRD has a very productive and positive relationship with the Mayor. The Mayor is supportive of the department, understands the challenging dynamics of the change the city is going through with relation to the growth of the city and the necessary concomitant growth of the JFRD and public service in general. The Mayor is very much pro-business and pro-development; therefore infrastructure improvements are a big initiative in his administration.

The city does seem to be in a difficult financial position. One question that came up repeatedly during TriData's triage visit was, given the phenomenal growth and the sheer volume of it, why the city was not benefiting from development fees and taxes or mileage rates.

There is legislation on the books which has cut the mileage rate 3 percent every year for the last seven years. While this may be politically expedient, it does not necessarily address the ancillary costs of the development and population increases–the need for increasing infrastructure in light of increasing demand for emergency services. Without the mileage revenue to support the phenomenal rate of expansion that the City of Jacksonville is experiencing on a daily basis, it will continue to find itself in a Catch 22 with regards to its future fiscal health.

The Department

The JFRD is a department steeped in tradition. In many ways that tradition is the overriding, abiding principle that defines this fire department. It is a progressive department that is not afraid of new ideas. The culture as a whole, however, reflects the old tradition of southern courtesy in its public service to its citizens and community.

This is also a department that we found to be heavily suppression oriented. It is an aggressive department that has a very dedicated work force. While the suppression is a very important aspect of any department, the other components of a fire department are equally important. This is especially true with regards to the fire prevention side of a fire department. The commitment to the total vision of any department is ultimately the responsibility of the Office of the Chief. Equally the fire prevention bureau of a department must have strong leadership coupled with the support and more importantly the resources to follow through on the core principles necessary for a strong fire prevention program.

Other divisions in the JFRD are more suppression related and benefit from the immediacy of the connection between suppression and the services those divisions provide. The importance and connection of fire suppression to fire prevention is inexorably tied to the number of fires department may ultimately respond to. If the fire prevention program is effective it will invariably reduce call volumes and increase productivity in the fire service. The JFRD's mission statement clearly and resoundingly lists prevention and public education as means to minimize loss of life and property, and this should truly be their focus.

Recommendation 1: Create a blue ribbon panel composed of internal management level personnel to study areas on which to focus for the overall improvement of all divisions within the department. While the department is in good shape fundamentally (especially suppression) it is important to look at improving all concomitant functions for efficiency and

greater department wide effectiveness. The panel should include a cross-section of personnel for maximum input. It should also elicit input from Local 122.

Scope

The scope of this assessment is more limited than the previous (2001) study. Where the 2001 Study was comprehensive in nature, this study focused on the following areas only:

- Population and growth assessment
- Station location and resource allocation analysis
- Response time analysis
- Fire Prevention program assessment

Some of these areas are related strongly to the recommendations of the 2001 study. There, TriData recommended the construction of eleven new stations and renovation of six existing stations. This task, which has been approved by the Mayor and City Council, requires population and risk analysis which will be provided in this report.

II. FIRE PREVENTION

The Jacksonville Fire Prevention Division (JFPD) is in need of some significant assistance and resources to adequately address the current demand in a cost effective manner while keeping injuries, deaths, and dollar losses due to fires at a low rate. The division is severely hampered because it does not have an integrated computer system to use to manage the function nor to analyze and improve productivity. A system, previously used, was abandoned in January 2003. Although plans have existed to develop a new system, other priorities have taken precedence. Funding has however been recently allocated for the development of the system and, JFRD should continue to aggressively pursue its implementation.

Scope of Prevention Assessment

The assessment of fire prevention included the review of the major aspects of prevention: the codes being used, permitting and plan review process; code enforcement inspections; public fire and safety education; and fire investigation/arson control and other aspects of the organization. We considered the logic of the organizational structure and span of control, the communications both within and outside JFRD, the training of personnel and use of data to manage prevention. We assessed the level of work actually performed to the level of work required (i.e., building activity and existing building stock for which fire inspections are required). We considered if activities could be terminated (non-mandated activities for which there is relatively low public support) and/or could be done more efficiently. We considered the targeting of public education to high-risk groups and leading fire causes.

Approach

Our approach was to recommend 'best practice' changes that would make the best use of the existing resources and thereby position prevention to continually assess performance and staffing needs. Staffing needs should be evaluated annually as part of the budgeting process and performance of individual employees and prevention functions should be address continuously—daily, weekly, monthly, and annually.

Prevention has undergone significant changes since 2002 when many inspectors retired and new inspectors were trained. The staff seems to be performing about as much work as can be done with the current level of resources and without sufficient support resources (administrative and computer). The current staffing appears to be insufficient for the current workload in all functions except fire investigations, which appears to be overstaffed.

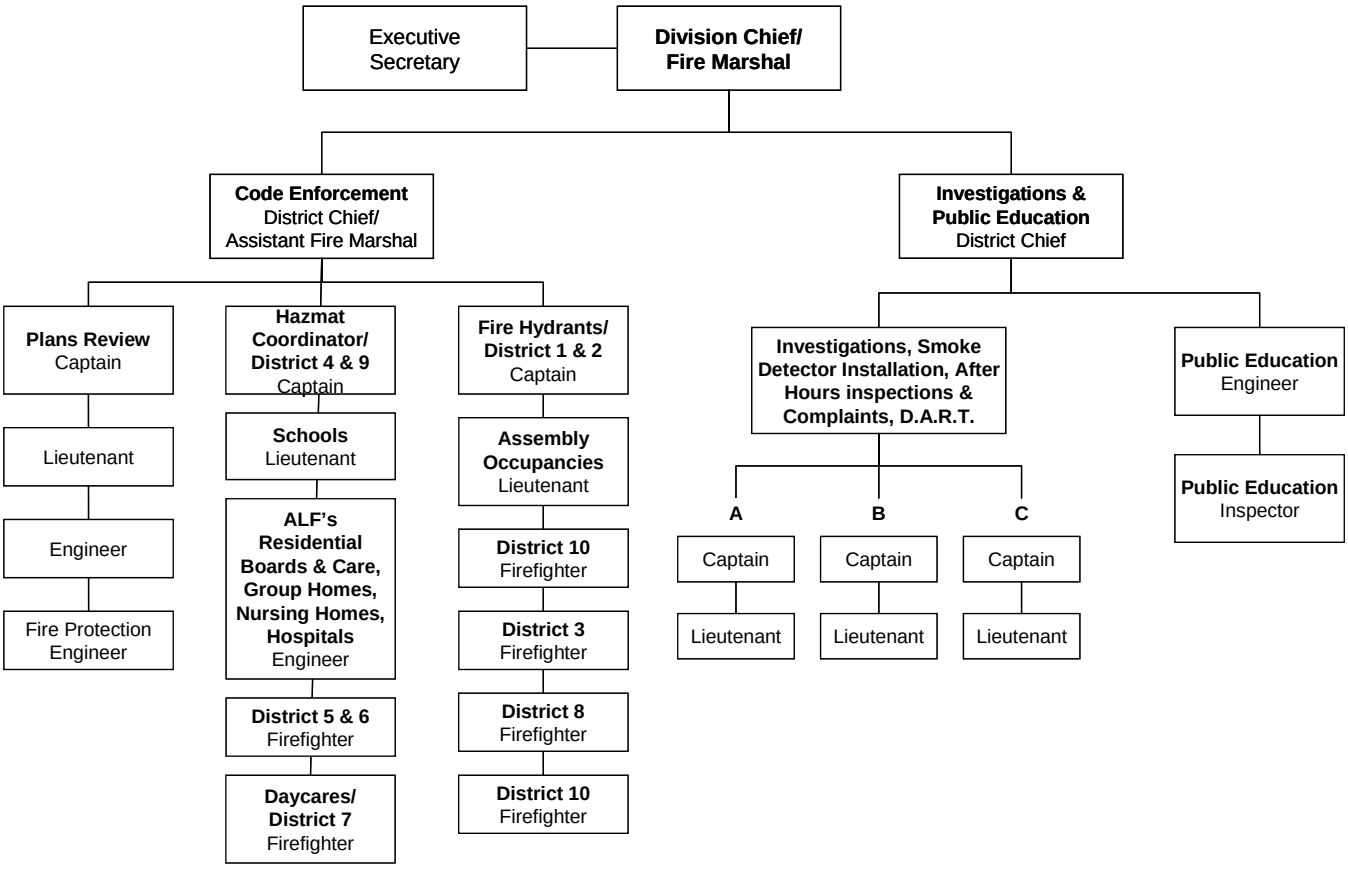
However, before the full-time staff in prevention is significantly increased, two other priorities should be achieved. First, a computer system is essential to improve productivity and provide management with the data needed to set priorities and evaluate individual as well as functional performance. Secondly, we highly recommend using line fire companies to perform many, if not most, of the inspections on existing buildings and to boost the fire and safety education capabilities by performing targeted neighborhood-based fire safety education programs. The exception to this recommendation would be to limit and/or exempt very busy stations with large call volumes from this practice. Implementing fire company inspection and education programs (whether the inspections are courtesy or code enforcement) is the most cost effective method to reduce the number of additional inspectors needed in prevention while improving the percentage of the existing building stock inspected within a reasonable inspection frequency, approximately every three years. It also helps companies become more familiarized with commercial occupancies in their respective response zones.

Organization and Staffing

The JFPD is staffed entirely with firefighters with two exceptions, a fire protection engineer in plan review and an executive secretary. In total there are 27 employees and 25 firefighters, all of whom are certified as Florida Fire Inspectors I.

Organization Chart – The JFPD is headed by a division chief who functions as the fire marshal. The fire marshal is appointed by the mayor and usually serves for the term of the administration. (It is very unusual for a fire marshal to be a political appointee.) The fire marshal currently reports to the assistant fire chief. There are two district chiefs, one of whom serves as assistant fire marshal and heads the code enforcement functions (plan review, construction inspection and existing building stock inspections) while the other heads fire investigation and public education. Figure 2 shows the current organization chart.

Figure 2: JFPD Current Prevention Organizational Chart



Fire Prevention Management Hierarchy **–** The fire marshal should be positioned at the highest management level within the fire department so that prevention is viewed as a fundamental function within the organization. As such, the fire marshal should report directly to the fire chief.

The prevention division has two district chiefs and a division chief/fire marshal for a 27 employee organization. The district chief level of hierarchy places an unnecessary level of management between the fire marshal and the primary functions of the division**:** construction code enforcement, existing building stock code enforcement, fire investigations and public safety education. Two prevention functions (fire investigations and pubic fire and safety education) do not have immediate supervisors to direct the functions. Presently, inspectors assigned to building stock code enforcement report to two captains rather than to a single supervisor. This divided reporting structure of inspectors limits the opportunity to frequently adjust work schedules and assignments to meet the most pressing needs. An alternative, more straightforward organization should be considered.

Recommendation 2: Eliminate the two district chief positions in fire prevention and create supervisory positions for each of the four primary functions of prevention that report directly to the fire marshal.

- One district chief position should be reclassified as a supervising fire protection engineer position over construction code enforcement (plans review).
- One captain position in existing building stock code enforcement should be reclassified as a working supervisor over building stock code enforcement function (annual inspection).
- The second captain position in existing building (or an equivalent civilian position) civilian stock code enforcement should be reclassified as a supervising fire and safety educator and moved to fire and safety education function.
- One captain position in fire investigations should be reclassified as a supervisor over fire investigations.

The size of the prevention staff has not kept pace with the growth in population since 1968 (the first year for which we had data). In 1968, the prevention staff was 20. In 2006 the staff is 27. This is a 35 percent increase in 38 years.[1] Population growth in Jacksonville has increased by this amount (approximately 38.4 percent) during only 23 years of this 38 year period (from 1980 to 2003).[2] Consequently, the size of prevention staff does not reflect the increase in population. In fact, over the past couple of years, the division has been reduced by three positions: two positions were eliminated and a third position has been put on 'hold' and not filled. This has created a gap in the number of personnel needed to handle the workload increase associated with the population growth.

Prevention Training – In the current organization, there are no provisions for systematic on-going training, quality assurance reviews or quality improvement programs. High quality inspections and consistently interpreted fire code enforcement across various inspectors over time is the hallmark of excellence in fire code enforcement.

Recommendation 3: Create a new senior staff position for prevention training, quality assurance and quality improvement by reclassifying the second district chief's position. This position should be at least equivalent to a senior captain and should serve as staff to the fire marshal. Responsibilities include developing prevention training and certification programs/curriculum, quality assurance methods and procedures and quality improvement

[1] Prepared by Interim Division Chief Alonzo W. McQueen, Jr., *Fire Prevention Division Overview*, Fire Inspection Facts & Fire Inspection Cycle Plan section, Fire Inspection Fact, I. Staffing, page 1.
[2] http://www.brokkings.edu/es/urban/census/whygrowth.pdf, June 3, 2006. From 1980 to 2000 (a period of only 20 years, Jacksonville experienced a growth rate of 33.2 percent in population (15.8 percent from 1990 to 2000 and 17.4 percent from 1980 to 1990).

programs for both prevention and fire suppression. This position should also serve as the liaison to district fire chief and line fire captains to develop educational standards and qualifications, quality assurance evaluation methods and assist with improving quality of line fire company prevention activities (both inspection, public education, and investigations).

As previously mentioned, fire investigations appears to the over staffed while fire and safety education and existing building stock code enforcement are understaffed. Construction code enforcement may also be understaffed, which could be remedied by the addition of the supervisory fire protection engineer which was previously recommended.

Recommendation 4: Re-assign several existing position in prevention to other prevention functions to better match current workload in each of the primary prevention functions, and reclassify the positions as necessary.

- Reduce fire investigations from six positions to four captain positions, one of which serves as the supervisory captain position for the function.
- Move two of the lieutenant positions from fire investigations to existing building stock code enforcement and reclassify them as district fire inspectors (either engineers or firefighters).
- Move the third lieutenant position from fire investigations to fire and safety education and reclassify it as a fire and safety educator.
- Move one captain position in existing building stock code enforcement to fire and safety education and reclassify it as the supervising fire and safety educator.
- Reclassify the position currently 'on-hold' as a fire and safety educator and fill the position.
- Reclassify the two positions currently in fire and safety education (one engineer and one firefighter) as fire and safety educators.

The executive secretary appears to be temporarily overloaded due to the additional workload created by implementing fees for inspection services. Hopefully, in the long run, a computer system will have invoicing capabilities that will remove the overload. In the short run, we recommend that temporary assistance be provided by other departmental administrative personnel or by hiring a temporary employee to assist until the overload is resolved.

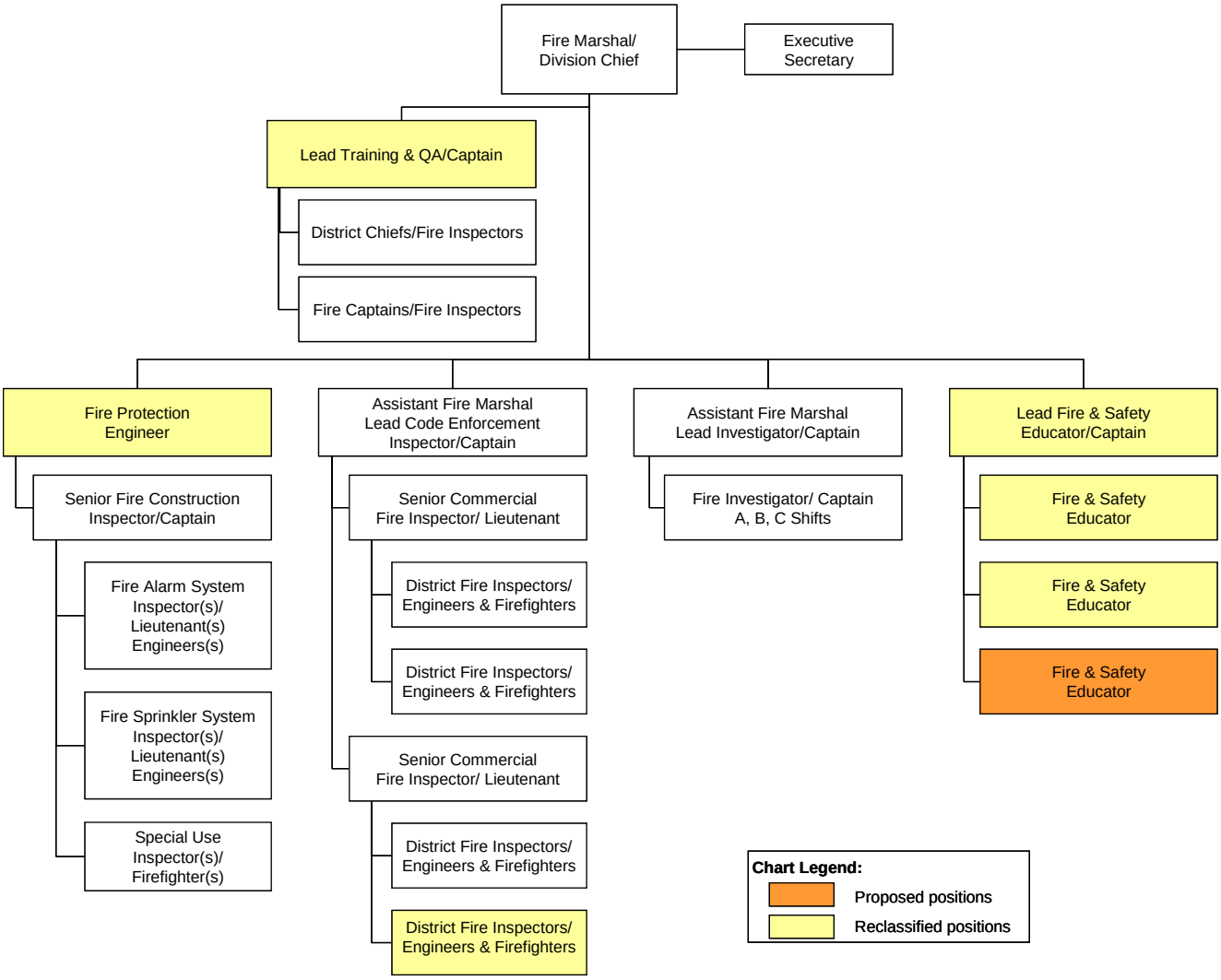
The staffing changes are summarized in the . The only net increase in prevention staff recommended at this time is to add a fourth fire and safety educator by using the vacant budgeted position that is presently 'on hold.' The shaded positions are the ones for which changes are recommended. Further rationale for these recommended changes are provided under the functional headings.

Table 1: Summary of Recommended Staffing Changes

Current Position	Proposed Position
'On hold' position	Professional Fire and Safety Educator
Fire Marshal/Division Chief	*No change*
Executive Secretary	*No change*
District Chief – Code Enforcement	Supervising Fire Protection Engineer
Captain – Plans Review	*No change*
Lieutenant – Plans Review	*No change*
Engineer – Plans Review	*No change*
Fire Protection Engineer – Plans Review	*No change*
Captain – Existing Building Enforcement	*No change*
Lieutenant – Existing Building Enforcement	*No change*
Engineer – Existing Building Enforcement	*No change*
Firefighter – Existing Building Enforcement	*No change*
Firefighter – Existing Building Enforcement	*No change*
Captain – Existing Building Enforcement	Captain – Lead Fire & Safety Educator
Lieutenant – Existing Building Enforcement	*No change*
Firefighter – Existing Building Enforcement	*No change*
Firefighter – Existing Building Enforcement	*No change*
Firefighter – Existing Building Enforcement	*No change*
Firefighter – Existing Building Enforcement	*No change*
District Chief – Investigations and Pub. Ed.	Captain – Training and Quality Assurance/Improvement
Captain – Fire Investigations	*No change*
Lieutenant – Fire Investigations	Engineer/Firefighter – Existing Building Enforcement
Captain – Fire Investigations	Lead Captain – Fire Investigations
Lieutenant – Fire Investigations	Engineer/Firefighter – Existing Building Enforcement
Lieutenant – Public Education	Captain – Fire Investigations
Lieutenant – Public Education	Supervising Fire and Safety Educator – Public Education
Engineer – Public Education	Profession Educator
Firefighter – Public Education	Profession Educator
Total Number of Prevention Positions	**28**

Figure 3 depicts the proposed organizational chart for fire prevention. The staffing changes and position reclassifications recommended above are reflected in this chart. The budgeted position, presently 'on hold', is used to add a position which raises the total staff in prevention to 28.

Figure 3: JFPD Proposed Prevention Organizational Chart



Management

Best practice ensures that the fire marshal has outstanding professional credentials through both specialized training and prevention related experience. The fire marshal should be capable of functioning as an independent advocate for strong, consistent fire code enforcement; proactive in fire and safety education; and aggressive in the investigation and prosecution of arson-related cases.

Fire Marshal Role and Qualifications – Independence is often achieved by establishing a career position of fire marshal for which competitive testing is required or having the fire marshal report to an independent board. Competitiveness is often established by requiring the highest degree of professional achievement as a certified fire inspector, certified fire investigator, certified fire instructor, certified fire educator and recognition as an expert

witness by the judicial system. In cities where the fire investigators are also sworn peace officers, the fire marshal should also be a sworn peace officer. In most cities, the fire marshal position is often limited to fire officers, but some cities have non-firefighter fire marshals with excellent professional credentials who are usually sworn peace officers. Competitiveness can also be created through examinations open to external as well as internal candidates.

Recommendation 5: Consider establishing the fire marshal position as a non-appointed career position that requires specific professional prevention qualifications and certifications and competitive testing that is open to qualified applicants both internal and external to the JFRD and, potentially, to both firefighters and non-firefighters.

Department Mission Statement – The mission statement of JFRD is "to minimize the loss of life and property resulting from fire, medical emergencies, and other disasters through prevention, education, fire suppression, emergency medical service and emergency preparedness."[3] The mission statement is good in that it recognizes prevention and education as approaches to minimize the loss of life and property.

Division Mission Statement – The mission of the JFPD "is to decrease fires in single family residences, multifamily residences and commercial buildings through public education."[4] Another main goal is also to decrease the number of arson fires through fire investigations. These statements are good goals but, as a mission statement, they are too narrow for the entire division. The mission omits any mention of fire code development and enforcement or aspects of public safety education that are not related to fires.

Recommendation 6: Revise the prevention division mission statement to include all aspects of prevention starting with reducing risk and avoiding unnecessary calls for service.

Prevention as a Core Value – The fire departments most effective in reducing losses are those that have successfully integrated prevention as a core value throughout the organization and continuously review the impact of prevention on the overall services provided by the department. There are basic approaches that can be used to insure that prevention is treated as a paramount department-wide priority.

JFRD is working on changing the requirements for promotion to reflect this valuable experiential tool. Rotating firefighters and fire officers through all fire department core services (fire suppression, EMS and prevention) is another approach. This would be a difficult undertaking currently in the JFRD, due to collective bargaining rules that prohibit cross lateral movement

[3] http://www.coj.net/Departments/Fire+and+Rescue/About+Us/default.htm, 25 May 2006.

from one core service to another. JFRD management and the City should work with Local 122 to explore alternatives to this policy. These policies limit any meaningful movement between disciplines. We do not however, recommend rotating division chiefs into the fire marshal's position every three to five years as this can create inconsistency in leadership, code interpretation and application of the fire code. When the fire marshal can not function as the 'fire code expert', a lower level employee (either a career deputy fire marshal or fire protection engineer plans examiner) must serve that function. Having the 'fire code expert' at a level lower than the fire marshal could create chain of command issues and could potentially reduce the perceived significance of code decisions.

The preferred approach to make prevention a core value is to provide comprehensive training to fire officers in all three core fire functions (suppression, EMS, and prevention). Baltimore County, Maryland, has an excellent system of promotional qualifications that protects the integrity of the promotional system. Two promotional lists are produced for each rank (a standard list and a list for the core competencies (fire, EMS, or prevention)). A promotional applicant can appear on more than one list and will fluctuate in their rankings based on their experience in a particular core competency. For example, the qualifications for a lieutenant are to be certified as the top firefighter (level II or III), fire officer I, training officer I and fire inspector I. Captain qualifications require certification levels II. Battalion or district chiefs require certification at levels III for officer, inspector and instructor and level I for fire investigator. Baltimore County also requires officer candidates to achieve the required certifications on their own time as the department does not provide the officer training.

Recommendation 7: The JFRD should consider a tiered promotional system in prevention. The one in Baltimore County, Maryland is one example of such a system. Such a system insures that those who rise to top management within the fire department have been educated in all three core competencies of the fire service.

Separativeness – The prevention division personnel feel a degree of separation from the rest of the department. This is not all that unusual, but the best fire and rescue departments embrace prevention as a core value and a treat it as high departmental priority. Line companies are integrated into the prevention efforts through neighborhood outreach initiatives such as conducting courtesy life safety and/or code enforcement fire inspections, educating business owners and citizens on safety and prevention, conducting fire drills and other public education

[4] http://www.coj.net/Departments/Fire+and+Rescue/Fire+Prevention/default.htm, 25 May 2006.

programs in neighborhoods and by constantly evaluating the results and modifying outreach efforts as warranted by events.

Promotion to fire inspector should become a choice assignment by making it more competitive. Firefighters and engineers often transfer from fire suppression into prevention because of promotional opportunities or because the work schedule is more conducive to their life style. Promotions to lieutenant, captain and district chief are then open only to those within the prevention division. This limits the competitiveness of prevention promotions and limits promotional opportunities for officers to a single core competency.

Ideally, personal drive should have been demonstrated by achieving non-standard requirements of firefighters prior to consideration for entry into the prevention division. For example, certification as a plans reviewer should be required of entry level plan reviewers. Entry level fire inspector qualifications could include certification as a Florida Fire Inspector I. Entry qualifications for fire investigator should include certification as a Florida Fire Inspector I and national or state certification as Fire Investigator I.

Recommendation 8: Entry level certifications for positions in prevention should be required. At a minimum, require certification as a Florida Fire Inspector I for all code enforcement and fire investigations positions. In addition, positions in fire investigations should be certified as Florida Fire Investigator I and positions in construction code enforcement should be certified as an NAPA Plans Reviewer I. Entry level positions for fire and safety educators should be required to be certified as Florida Public Fire and Life Safety Educator I and Florida Fire Instructor I or possess equivalent teaching credentials.

Recommendation 9: Establish career ladders within prevention that reward achieving higher levels of professional certifications. The following qualifications for promotions are suggested for consideration:

- Promotion to lieutenant in code enforcement should require prior certification as Florida Fire Inspector II, certification as a NFPA Fire Inspector II, experience as a fire code enforcement inspector for at least two to three years, certification as a Florida Public Fire and Life Safety Educator I, possibly certification as a Florida Fire Instructor I in addition to the certifications required as a JFRD fire officer.
- Promotion to captain in code enforcement should require the same certifications as the lieutenant certifications suggested above plus certification at the NFPA Fire Inspector III level and possibly certification as hazardous material technician.
- Promotion to lieutenant in plans review should require the suggested certifications for a lieutenant in code enforcement plus certification as NFPA Plan Examiner I and certification as either a fire sprinkler or fire alarm installer or designer.

- Promotion to captain in plans review should require the suggested certifications for a captain in code enforcement plus certification as NFPA Plan Examiner II. Ideally, he/she should also be certified at the highest national level of building code plan examiner and potentially certified as either a fire sprinkler or fire alarm designer.
- Promotion to captain in fire investigations should require the same certifications required of captain in code enforcement plus certification as NFPA Fire Investigator.
- Promotions in public education should require certification as a Florida Public Fire and Life Safety Educator II, possibly certification as Florida Fire Instructor II, certification at the appropriate level of NFPA Fire Prevention Education Officer for the position duties or equivalent levels of training and teaching experience.
- Supervisors in each prevention function should have job experience in the function, should have achieved the highest levels of Florida and NFPA certifications in the function and ideally should have other certifications relating to the function.

Fire Company Inspection Program – Although prevention and education are mentioned prominently in the department mission statement, prevention and public education are the sole purview of the fire prevention division. Currently, JRFD line fire companies do not perform fire inspections or courtesy life safety inspections. Best practices from other leading fire departments include fire companies being trained in the fire code, conducting fire inspection and determining fire cause and origin for most fires that are not of suspicious origin. In Ft. Worth, San Diego, Cincinnati, and Arlington County, Virginia, fire companies perform most of the fire inspections on the existing building stock. In many other cities, fire companies perform all fire inspections on specific occupancy types, usually business and/or multi-family apartment occupancies. Involving fire companies in conducting code enforcement inspections is a very cost effective approach to increase the proportion of the existing building stock inspected, to increase the frequency with which inspections are done and to increase the fire company visibility and participation in neighborhood-related prevention and education efforts. The fire companies also become more familiar with buildings in their districts and can coordinate pre-fire planning, prevention education and fire inspection services. In some cases, fire companies can also inspect occupancies during peak usage hours that are outside the normal business hours, Monday through Friday.

Recommendation 10: Develop and institute a fire company fire code enforcement or courtesy inspection program that is managed by the district chiefs and company captains and monitored by prevention training and quality assurance. This inspection program should be developed by the prevention training and quality assurance staff captain with input from fire suppression officers. The program should address the types of occupancies to be inspected, the fire codes related to these occupancy types, inspection procedures, officer training, firefighter

training, quality assurance verification procedures, periodic in-service training and performance evaluation criteria and reporting procedures for fire companies, individual officers and firefighters.

Recommendation 11: Consideration should be given to requiring all new fire officers and existing fire officer promotional applicants to become certified as a Florida Fire Inspector I prior to being eligible for promotional opportunities into or within the officer ranks. High ranking fire officers, district chiefs and above should become certified as a Florida Fire Inspector I as soon as feasible.

Recommendation 12: All firefighters should be trained as instructors in CPR, AED, fire extinguisher use, smoke detector use and installation and other fire prevention and safety education skills that can be taught in neighborhood and individual building settings.

Civilian versus Uniformed Fire Prevention Bureau Personnel – Although most fire prevention bureaus have been historically staffed with firefighters and fire officers, efforts to reduce cost and to improve career opportunities have lead many bureaus to hire civilians in some prevention positions, primarily as plan examiners, construction fire inspectors and public educators. It remains best practice to use uniform fire officers as fire investigators. Best practice also requires prevention to be established as a core value throughout the department, so a completely civilian prevention division may not be desirable. However, firefighting skills are not sufficient to provide the technical expertise needed to establish a top notch prevention division and not all firefighters are a good fit as fire inspectors. Fire inspectors should have excellent people skills, the ability to handle stress, ability as a self-starter, aggressive and have experience with independent decision making.

Civilian fire inspectors perform very successfully in other cities, such as Colorado Springs, Colorado, Phoenix and Mesa, Arizona. Many other prevention bureaus use a mix of civilians and uniform fire employees, such as Long Beach, California, Bellevue, Washington, and Ft. Worth, Texas. Some bureaus contract for plan examination services and use contract fire inspectors to augment the permanent staff during construction activity peaks. Perhaps more importantly, it is easier to recruit more varied civilian individuals, many of whom may already have experience and education in engineering, fire sprinkler and alarm installation and design, building construction, or education.

The construction code enforcement, public education, prevention training and business operations functions can be civilianized. Non-supervisory employees can be civilians with uniform officers or civilians as supervisors and managers. All positions in prevention except fire investigators could be civilianized; however, civilianization should not hinder establishing prevention as a core function of the fire department.

Recommendation 13: Consider civilianizing all or part of construction and existing building stock fire code enforcement and public fire and safety education. Develop most, if not all, job specifications to allow for eligibility by either civilian or uniformed fire personnel. Consider having fire officers supervise the code enforcement and fire investigation functions and serve as fire marshal. Fire investigations should continue to be staffed with fire officers, preferably captains until the unit grows to sufficient size to warrant the use of lieutenants.

Recommendation 14: Develop incentive pay for various levels and types of certifications so that civilians are not paid at the firefighter or fire officer levels if they have not attained these certifications.

In comparing the cost of civilian against uniform inspectors, the assumption is often made that civilian inspectors are less expensive. This is not always the case; therefore, each jurisdiction needs to make a comparison, using its own salary information. Annual salaries for civilian inspectors are often less than for trained firefighters and retirement costs are usually less because civilian retirement age is later and benefits are often lower.

Depending on the classification given to the positions, civilian inspectors can cost more. In Bellevue, Washington, two fire protection engineers serve as plan examiners. In Mesa, Arizona, inspectors are classified at the equivalent rate of fire captains, a model that would cost more than using firefighter inspectors. The project team believes a more appropriate classification would be similar to building inspectors. However, incentives should be paid or different job classifications should be developed to recognize the various levels of responsibility, experience and certifications attained.

Self-Inspections – Self-inspection programs are being introduced as a cost saving technique to reduce the need for on-site inspections by either certified fire inspectors or fire companies. When successful, self-inspection programs both educate business owners on fire safety and achieve voluntary fire code compliance. We strongly endorse these programs; however, they must be actively advocated and managed. Only occupancies that have a history of few or no hazards for a period of time should be allowed to conduct self-inspections. No charge or a very small charge should be made for this program.

Recommendation 15: Establish a self-inspection program for the lower risk businesses once a computer system is implemented that can track hazards and schedule on-site courtesy inspections by fire companies. Prevention training, fire captains and perhaps public education should be involved in developing the program. A self-inspection program could allow fire companies to focus inspection efforts on properties where fore knowledge of hazards, layout, etc. would be more advantageous to pre-fire planning rather than focusing on small business occupancies. A checklist should be given businesses who are selected for self-inspection.

Periodically, every three to five years, an on-site fire inspection could be performed by fire companies as courtesy inspections at no-charge for self-inspected occupancies. If violations are found a report could be provided the business owner at no cost. If violations are found a second time, the business should be taken off the self-inspection program.

Fees for Prevention Services – Within the past year, fees for plans review and for inspection services have been implemented. For the first three months of fiscal year 2005/2006, $212,635 was collected for plans review. Best practice is to cover the cost of the plan review and construction inspection function with fire permit fees similar to the way building permit fees cover the cost of those services. It is also good practice to set permit fees based on the size of the project—or number of sprinkler heads—as this indicates how much time is required to review the plan and conduct inspections. This approach also allows staffing to be adjusted more easily with increases and decreases in construction activity. Ideally, the prevention construction code enforcement would be classified as an enterprise fund or budgeted as such under the building code enterprise fund.

Table 2: Plans Review Fees Collected, October–December 2005

Type of Plan	# of Plans	Fees Collected
Fire Sprinkler Systems	797	$136,610
Fire Alarm Systems	247	42,450
Hood Systems	184	13,875
Tanks	58	8,700
Tents	82	4,100
Awnings	60	3,000
Paint Booths	10	1,500
FM-200 Systems	16	2,400
Totals	**1454**	**$212,635**

Fees are also charged for fire inspections. Data was not available of the amount of revenue that has been generated by this recent change. When there is an annual business license for all business, we think it is best to include the fully loaded costs of periodic fire inspections as part of this fee. In the absence of such a fee, fees for inspection services are billed when the inspections occur. Most cities do charge for fire inspection services, but public education and fire investigations services should never have fees. We endorse fees for fire inspections on existing buildings as it is an extra service provided only to a small segment of the citizens. These fees should cover the fully loaded cost of providing the fire inspections services and should be re-evaluated every two to three years as part of the budgeting process.

Fire Loss Data

Fire loss data is not analyzed by fire prevention at present, but should be. This data can be important factors for assigning inspection priorities, developing public education programs and modifying fire investigation techniques. Under the heading Public Education Program Direction in this report, we recommend establishing an Incident Evaluation Program to review results of fire incidents so that prevention programs can be adjusted quickly to address changing needs.

The following three tables present the data typically reported on the number of civilian fire deaths, civilian injuries and dollar loss. As is true in most cities, most civilian fire deaths and injuries and dollar losses in Jacksonville occur in one and two family dwellings for which fire prevention does not have authority to conduct inspections. This data should be reported monthly and an analysis should be discussed by top fire department management.

Table 3: Number of Civilian Fire Deaths by Property Use by Calendar Year

Property Use	2003	2004	2005	3 Year Average	% of Civilian Deaths
1 & 2 Family Dwellings	7	5	6	6	85.7%
Multi-Family & Other Habitats	2	0	0	.7	10.0%
Commercial, Educational & Institutional	0	0	0	0	.0%
Industrial	0	0	0	0	.0%
Vehicles	1	0	0	.3	4.3%
Outside Fires (Grass/Wildlands/Other)	0	0	0	0	.0%
Total All Fires	**10**	**5**	**6**	**7**	**100.0%**

Table 4: Number of Civilian Fire Injuries by Property Use by Calendar Year

Property Use	2003	2004	2005	3 Year Average	% of Civilian Injuries
1 & 2 Family Dwellings	25	20	15	20.00	64.5%
Multi-Family & Other Habitats	0	6	14	6.67	21.5%
Commercial, Educational & Institutional	0	0	0	0.00	.0%
Industrial	2	0	3	1.67	5.4%
Vehicles (Mobile)	2	1	3	2.00	6.5%
Outside Fires (Grass/Wildlands/Other)	0	1	1	.67	2.2%
Total All Fires	**29**	**28**	**36**	**31.01**	**100.1%**

Table 5: Fire Dollar Losses by Property Use by Calendar Year (In Millions of Dollars)

Property Use	2003	2004	2005	3 Year Average
1 & 2 Family Dwellings	$ 9.81	$11.39	$13.22	$11.47
Multi-Family & Other Habitats	1.71	2.91	2.79	2.47
Commercial, Educational & Institutional	1.49	4.13	3.99	3.20
Industrial	.93	4.54	3.19	2.89
Vehicles	.46	.03	.03	.17
Outside Fires (Grass/Wildlands/Other)	.22	.28	.34	.28
Total All Fires	**$14.62**	**$23.28**	**$23.56**	**$20.48**

Fire Loss Comparison – Duval County[5] fire incidents, dollar loss, civilian and firefighter injuries and deaths for 2004 are compared to those experienced in other large Florida counties[6] in Table 6. Duval County had fewer civilian and firefighter injuries per fire, experienced about the same dollar loss per fire but experienced a slightly higher number of civilian deaths per fire. The percentage of fires that were structure fires, vehicle fire and other fires tracked the overall average for all Florida counties.

Table 6: Duval County Compared to Other Large Florida Counties, 2004 (with more than 2,000 total fires)

County	Structure Fires	Vehicle Fires	Other Fires	Total Fires	False Alarms	Dollar Loss[7]	Civilian Injuries	Civilian Deaths	FF Injuries
Duval	1,234	929	2,028	4,255	7,399	21.74	34	11	37
% or per fire	29%	22%	48%	99%		5.1	.0080	.0026	.0087
Brevard	506	422	1,261	2,235	4,173	12.02	30	5	16
% or per fire	23%	19%	56%	98%		5.4	.0134	.0022	.0072
Broward	1,254	768	1,112	3,190	14,143	22.63	101	19	90
% or per fire	39%	24%	35%	98%		7.1	.0317	.0060	.0282
Orange	2,018	1.181	1,663	4,904	11,570	15.05	63	3	115
% or per fire	41%	24%	34%	99%		3.1	.0128	.0006	.0235
Palm Beach	930	833	1,785	3,590	13,322	24.07	42	2	8
% or per fire	26%	23%	50%	99%		6.7	.0117	.0006	.0022
Pinellas	1,137	752	1,656	3,611	7,237	19.34	152	8	145
% or per fire	32%	21%	46%	99%		5.4	.0421	.0022	.0402
All Counties	14,356	10,355	24,743	50,072	101,113	264.10	790	107	699
% or per fire	29%	21%	49%	99%		5.3	.0158	.0021	.0140

[5] Duval County data was used instead of city of Jacksonville data because the State Fire Marshal annual report was presented by county.
[6] *Florida Fires, 2004 State Fire Marshal Annual Report*, Florida Counties Fire & Non-Fire Totals table, http://www.fldfs.com/SFM/pdf/sfm2004ar.pdf, 22 May 2006.
[7] Dollar loss is in millions of dollars.

When the number of fires and dollar loss per 1,000 population are compared (in Table 7), Duval County is higher than average for Florida but about average for the US. The number of fires per capita (5.2 versus 2.8) and the dollar loss per capita ($26,477 versus $14,845) per 1,000 population is considerably higher in Duval county. When compared to the two counties with the most similar types of fires (Palm Beach and Pinellas), Duval county still appears high in the number of fires (5.2 versus 2.9 and 3.9) or the dollar loss of fires ($26,477 versus $20,814 and $14,845). With 48 percent of the fires being classified as other fires (outside fires) and only 29 percent as structure fires, the dollar loss per 1,000 population is expected to be lower (i.e., the value of undeveloped land should be less than land improved with structures). Yet the dollar loss per 1,000 population in Duval is greater than that experienced in either Broward or Orange counties where the percentage of structure fires is higher, about 40 percent of total fires. When compared to national data, Duval County appears to compare favorably. A stronger prevention program is needed.

Table 7: Comparison of Fire and Dollar Loss per 1,000 Population
Duval County Compared to Other Large Florida Counties, Florida State-Wide and the United States

County	Total Fires	2004 Estimated Population	Fires per1,000 Population	Dollar Loss per 1,000 Population
Duval	4,255	821,338[8]	5.2	26,477
Brevard	2,235	519,387[9]	4.3	23,163
Broward	3,190	1,754,893[10]	1.8	12,897
Orange	4,904	989,926[11]	5.0	15,207
Palm Beach	3,590	1,243,230[12]	2.9	19,361
Pinellas	3,611	928,537[13]	3.9	20,814
All Counties	50,072	17,789,864[14]	2.8	14,845
United States			5.3[15]	39,100[16]

[8] http://quickfacts.census.gov/qfd/states/12/12031.html, June 7, 2006.
[9] http://quickfacts.census.gov/qfd/states/12/12009.html, June 7, 2006.
[10] http://quickfacts.census.gov/qfd/states/12/12011.html, June 7, 2006.
[11] http://quickfacts.census.gov/qfd/states/12/12095.html, June 7, 2006.
[12] http://quickfacts.census.gov/qfd/states/12/12099.html, June 7, 2006.
[13] http://quickfacts.census.gov/qfd/states/12/12103.html, June 7, 2006.
[14] http://quickfacts.census.gov/qfd/states/12/12009.html, June 7, 2006.
[15] Philip Schaenman, "Perhaps the Best Fire Prevention Program in the Nation: US Navy", *Fire Chief Magazine*, March 2006 issue.
[16] Ibid.

Public Safety Education

Public safety education fills three missions: to help people avoid having emergencies in the first place, to inform them what to do when emergencies do occur, and to instruct them on when to call and when not to call 911. As population increases and with it the demand for fire and EMS services, the station units will become overloaded sooner rather than later and the city will need to add more operations units. The time when this is necessary can be delayed by a good "Make the Right Call" program and a good public safety education program which can help reduce the rate of increase in calls.

Presently, two positions are dedicated to fire and safety education. Over time, we have developed a general rule of thumb that at least one full time public fire and safety educator is needed per 100,000 in population. With a population estimated to be 773,781 in 2003, Jacksonville should have seven to eight fire and safety educators.[17] However, rather than adding six educators to the prevention staff, we recommend adding three positions (two through reclassifications of existing positions, and one through reclassification and filling of the position 'on hold') to raise the prevention fire and safety education staff to five. We also recommend reclassifying the two existing positions to public educators. (Refer to the Organization and Staffing section above for an explanation of these changes.)

The shortfall of three public educators should be made up by getting line fire companies extensively involved in neighborhood fire and safety education programs under the guidance and tutelage of the supervising educator. As the supervising educator is added and data is developed for the number of fire and safety education program hours provided by line companies, the number of fire and safety educators needed in prevention should be reassessed. If the fire companies do not perform the equivalent work load of three fire and safety educators, or if outreach proves insufficient, more educators should be added.

The public safety education programs at present are necessarily limited to requests. Lectures, videos, the fire safety house (28 foot trailer) and presentations by clown characters, 'Bootsie and Sparky', are provided to school-age children. Fire companies participate in neighborhood and school safety education programs by providing tours of fire stations and fire engines for school programs. Programs provided to senior citizens include lectures on candle safety, smoke detectors, how to avoid falls, and other home hazards such as lint in dryers, burglar bars. There is a special phone number for free smoke detectors.

[17] http://quickfacts.census.gov/qfd/states12/1235000.html, June 3, 2006.

The results of public educational programs are not assessed. Data is not gathered on the percentage of various high risk populations (such as school-aged children, elderly, poor, high density housing, etc.) reached by public safety programs and pre and post-program testing is not performed to measure the effectiveness of the educational programs. The only current data available, summarized in Table 8, was for 2004/2005 and for six months of 2005/2006. The data shows that about 600 public education programs are conducted annually, which averages about 3.7 programs a day or about 2 (1.85) programs a day per educator.[18] Two programs per day per educator are reasonable to expect.

Table 8: Public Education Activities

	1st Qtr. 04/05	2nd Qtr. 04/05	3rd Qtr. 04/05	4th Qtr. 04/05	Total 04/ 05	1st Qtr. 05/06	2nd Qtr. 05/06	Half Yr. Total 05/06
Number of Public Education Programs	166	122	171	108	**567**	235	105	340
Number of Public Education Contacts	9,860	5,892	10,744	6,085	**32,581**	15,970	7,414	23.384
Number of Smoke Detector Installations	120	217	58	21	**416**	38	83	121

The number of civilians contacted by public education programs was 32,581 in 2004/2005 and 23,384 for the first six months of 2005/2006 (an annual estimate of 46,768). If all of these contacts are assumed to be unique individuals (non-repeats), public education programs are only reaching between 4.2 percent and 6.0 percent of the population (32,581 and 46,768 divided by 773,781)—a very small fraction of the public.

A public education accomplishment cited was the reduction in fire deaths due to careless smoking from six in 1999/2000 to only two in 2000/2001.[19] The small numbers preclude making definitive statements about effectiveness, but it is encouraging. However, thus far in 2006, about eight fire deaths have occurred in two mobile home fires due to non-working smoke detectors. In a three-year period from 2003 through 2005, 86 percent of the civilian fire deaths occurred in one and two-family dwellings and another 10 percent occurred in multi-family and other habitats.[20] The fire department does not have authority to inspect one and two-family dwellings, so the only way to reach this population is through public education programs.

[18] There are 1,293 hours or 162 days per year available for productive work per inspector. When 600 programs is divided by 162, there is an average of 3.7 programs a day.
[19] http://www.coj.net/Departments/Fire+and+Rescue/Fire+Prevention/default.htm, May 25, 2006.
[20] See Table 3, Number of Civilian Fire Deaths by Property Use by Calendar Year.

A JFRD Firesetter Intervention Program is being implemented.[21] The field officer is to notify prevention when a juvenile is suspected of setting a fire. A fire investigator is to be called whenever there is evidence of arson. If the investigator determines the fire was accidental due to curiosity, negligence or experimentation, a referral is to be made to the program. Fire safety classes are held one Saturday and one Thursday night a month for children ages 3 through 7, and an afternoon class is held for youth ages 8 through 12. Families are also referred for counseling to a mental health professional when there is a severe problem with firesetting. It is most important that data from this program is analyzed and disseminated.

Jacksonville also has some very important non-fire public safety educational needs, e.g. for hurricane and wildfire readiness, family evacuation planning, railroad safety, boating safety, and water safety. Citizen training in CPR, use of extinguishers, use of automatic defibrillators (AED), 'making the right call' and other skills can improve public safety and reduce the frequency and severity of incidents.

TriData has done much research on measuring the effectiveness of prevention, especially public fire and injury education programs. We also have researched ideas for improving their effectiveness. Our reports, *Proving Public Education Works*, *Reaching the Hard to Reach*, and *Overcoming Barriers to Public Fire Education* are available for free. The effectiveness measurement concepts also are presented in a chapter on Evaluation Techniques for Fire and Life Safety Education in the NFPA 18th edition Fire Protection Handbook. The reports contain many recommendations and specific examples of successful programs, and explain how to measure performance of public education. We recommend that those measurement concepts be used to evaluate public education programs and to explain its shortcomings. The basic concept is to use a hierarchy of measures starting with outreach, then gain in knowledge, change in behaviors or environment, and, ultimately, the bottom line of fires, deaths, injuries, and dollar loss. A few suggestions of public education performance measures are made in the Workload and Performance Measurement section near the end of this chapter.

Languages – There are significant numbers of people in Jacksonville who do not speak or read English, including a large population of Hispanics. There are no public safety materials available in Spanish.

[21] JFRD Standard Operating Procedures, JFRD Firesetter Intervention Program, provided by District Chief Hayes.

Recommendation 16: Print some basic fire safety information in Spanish and other languages as significant numbers of the population demand. At a minimum, this could be one or two pages on smoke detector maintenance, calling 911, and making the right call. There are already extensive public fire education materials available for free in Spanish.

Public Education Program Direction – The direction of the public education programs must be continually re-evaluated as shifts in population composition occur and as causes of fire injuries, deaths, and property losses change. There should be a department-wide mechanism to review the causes and results of fires soon after the incident to identify the need for additional public education programs and public service announcements, changes in fire inspection priorities and other prevention activities to reach high risk population segments and fire causes with high incident rates.

Recommendation 17: Implement an Incident Evaluation Program to relate information gathered from fire incidents to public education and other prevention initiatives. A committee should be established which is comprised of the fire marshal, the supervisor of existing building code enforcement, the supervising public educator, the supervisor of fire investigation and fire operations officers. A standard operating procedure should be developed that includes performance measurements for the program. Findings of this program should be discussed at top departmental management meetings. This will help insure that more focus of fire administration is on public education and the benefits of having a top notch program.

From other fire departments we have reviewed and from personal experience, one of the most valuable lessons in fire safety can be achieved when firefighters use the site of a serious structure fire to show the results when a fire does occur. As most people have not had the opportunity to see a burned out structure or room, this can be a valuable learning experience. If a fatality has occurred, it is even more sobering and sends a compelling message.

Recommendation 18: Consider having public education and fire station personnel partner on an 'after the fire' program whereby residents are provided guided tours after a serious fire. It is our experience that most property owners are willing to let the fire department do this.[22] 'After the Fire' programs can also include a community walk where fire safety literature is handed out within the affected community. After the fire programs should be held within two or three days after the incident to be effective.

Plans Review

Codes – The city is using 2004 Florida Fire Prevention Code (FFPC) issued by the Division of State Fire Marshal and the 2004 Florida Building Code (FBC). The base documents

[22] A legal document stipulating that the property owner is not liable is typically needed and a standard form can usually be provided by the law office.

for the 2004 edition of the FFPC are the NFPA 1, Uniform Fire Code and NFPA 101, Life Safety Code, 2003 editions.[23] The JFRD JFPD is responsible for enforcing the fire prevention code and the Department of Public Works, Building Inspection Division, is responsible for enforcing the building code.

Sprinklering – The city follows the degree of sprinklering recommended in the 2004 FFPC and the FBC—but no more. There are 83 high rises in the city of which 73 are fully sprinklered, 3 condos are partially sprinklered (in the common areas only) and 7 are not sprinklered. Of the 154 public schools, 17 are fully sprinklered, 15 are partially sprinklered and 122 or 79 percent are not sprinklered. Of the 70 private schools, 5 are fully sprinklered, 3 are partially sprinklered and 62 or 89 percent are not sprinklered.

Requiring fire sprinklers in all structures is the most cost effective method to reduce fires and loss of life and property due to fires and to reduce the cost of the fire service in the long run.

Recommendation 19: The City of Jacksonville should consider requiring fire sprinklers in all new structures, residential as well as commercial.

- At a minimum, all new residential two-story, basement and large structures (5,000 square feet and more) should be required to have fire sprinkler systems.
- Fire sprinkler systems should be required for all new commercial structures and those with major renovations regardless of use.
- Consideration should be given to requiring retro-fitting of existing high rise structures with fire sprinkler systems or standpipe systems.
- Consideration should be given to requiring existing institutional occupancies for the elderly, children and prisoners to be retro-fitted with fire sprinkler systems.

The city could consider a tax rebate or other financial benefit to encourage the installation of fire sprinkler systems. In the long run, this is the most effective fire prevention program available and could have the greatest impact on reducing the long term cost of fire suppression and fire prevention.

Review Plans and Construction Code Enforcement – The JFPD is responsible for reviewing plans for any structure being built in Jacksonville. The plans review ensures that all fire code requirements adopted by the city and/or state are met before the actual structure is built.[24]

[23] http://www.fldfs.com/SFM/florida_fire_prevention_code_2004.htm.
[24] http://www.coj.net/Departments/Fire+and+Rescue/Fire+Prevention/default.htm, May 25, 2006.

There are four firefighting employees assigned to plans review and construction inspection—one captain, one lieutenant, one engineer and one firefighter. According to the current staff, it is difficult to have a plan examiner at BDI at all times. With the addition of the supervising fire prevention engineer recommended earlier, there would be sufficient staff to have a plan examiner at BDI at all times. Having fire protection engineering technical expertise is a best practice and provides the best customer service to engineers, architects, and developers and to the Building Codes Adjustment Board when variances can not be avoided.

Training and Qualifications **–** The staff assigned to plans review and construction inspections have not received training beyond being certified as Florida Fire Inspector I. In Florida, a student earning the Florida Fire Inspector I certification is eligible to be certified at the national Fire Inspector I, Fire Inspector II and Plans Examiners I levels.[25] However, none of those assigned to construction code enforcement have been certified as Plans Examiners I. According to NFPA 1031, Plans Examiners I is an individual at the first level of progression who conducts basic plan reviews and applies codes and standards.[26] A Plan Examiner II is an individual at the most advanced level of progression who conducts plan reviews and interprets applicable codes and standards.

Best practice is to have a professional fire protection engineer supervise fire construction code enforcement and serve as staff (along with the building code official) to the Building Codes Adjustment Board. In Jacksonville, the fire marshal or his designee, the chief of building and zoning inspection division and the property safety division are required to attend meetings but do not have a vote.[27] This is excellent practice. Having an engineer technical expertise to review plans, to review engineer calculations and to assess alternative construction methods provides excellent customer service. Other best practices include having licensed or degreed fire alarm and fire suppression designers and/or installers perform construction inspections on these and other fire protection systems. Plan reviewers should also have special training and education qualifications in plans reviews and are often certified as building code plans reviewers. These qualifications are not typically found among firefighters.

Two of the best construction code enforcement sections we have observed are Bellevue, Washington and Fort Worth, Texas. Bellevue construction fire code enforcement is staffed with

[25] *Florida Fires, 2004 State Fire Marshal Annual Report*, http://www.fldfs.com/SFM/pdf/sfm2004ar.pdf, May 22, 2006, page 13.
[26] *NFPA 1031, Standard for Professional Qualifications for Fire Inspector and Plan Examiner, 2003 Edition*, Chapter 3 Definitions, page 2.

all civilians. They had two fire protection engineers and licensed alarm and sprinkler specialists who performed the plan reviews and construction fire code inspections. Fort Worth had used an external engineering firm to review the plans, but was moving this function in-house using civilian plan reviewer specialists. Ft. Worth is staffed with a combination of civilian and uniformed personnel. They had uniform firefighters as alarm and sprinkler inspectors; however, they were working toward degrees as alarm and sprinkler designers or installers.

Recommendation 20: Consideration should be given to either hiring new prevention staff who are already certified as plans reviewers and fire suppression and fire protection system designers or installers or to have the current staff trained and certified in these disciplines. This is somewhat akin to having people who are already trained as paramedics to be firefighters.

Integration with Building Code Enforcement – Jacksonville has implemented some of the best practice standards by integrating the fire code construction enforcement with the Building Inspection Division (BID) building code enforcement. Fire construction permits and fees, for the most part, are issued and collected by Building Inspection Division personnel. When the new BID web-based computer system is implemented in June and July, all fire construction permits and fees will the processed by BID personnel. This is the most efficient way to structure the permitting and fee collection functions and provides the most expedient customer service.

Fire plans review and construction inspectors are co-located with BID and use the same computer system for recording plans review comments and status and inspection results. The BID system is accessible to the public via the Internet so that owners, engineers and contractors can see the status of their projects. This is outstanding integration that puts Jacksonville in the forefront of using information technology to provide excellent customer access to city-wide construction related inspections and reviews.

Recommendation 21: Fire Prevention and city information technology should reassess the need for a separate system within the current system to meet prevention. By using the same system as BID, a more complete inspection history of the building will be available to both the public and the city. Consideration should be given to modifying the maintenance inspection portion of the BID system to meet the reporting and other unique needs of fire prevention. A standalone system that is not accessible to the public via the Internet is not desirable.

Even though the fire plans reviewers and construction inspectors are co-located with BDI, we think they should keep their autonomy and not become BDI employees unless it can be

[27] http://www.coj.net/Departments/Regulatory+Boards+and+Commissions/Building+Codes+Admustment+Board/default.htm

shown that costs could be significantly reduced while not negatively impacting the quality of the fire code enforcement plan review and construction inspection. We think all aspects of the fire code enforcement should be directed by the local fire marshal in conjunction with the State Fire Marshal. Being attached to the fire department gives plans reviewers greater independence to maintain a strong public safety view.

Prior to the issuance of a building permit, plans on all proposed construction are reviewed by both the Building Department and the Fire Department. The initial fire review consists of a life safety review based on the 2004 Florida Fire Prevention Code. All information for fire protection (protection, smoke control, alarms, sprinklers, hoods, etc.) must be presented at this time. After the building permit is issued, fire reviews suppression systems, flammable liquids storage, alarm systems, and any other hazard. As a policy of plan review, JEA (a community-owned utility) performs flow tests except when private fire mains are involved. These practices are considered best practice.

Having a fire prevention engineer to do most of the plan review should free the fire inspectors to perform more inspections throughout the construction process. The intent is to identify problems as early in the process as possible in order to minimize costly rework or repairs.

Plans Review Workload – In 2004/2005 fiscal year there were 8,158 plans reviewed yet only 2,033 new construction inspections were reported (25 percent of plans reviewed). (Refer to Table 9 below.) The current practice is to review plans for all commercial buildings. Based on interviews, there did not appear to be a problem meeting turnaround goals, but actual performance should be evaluated monthly and annually against established goals.

Recommendation 22: The process of reviewing all commercial construction plans should be reviewed to quantify the benefits derived (e.g., the percentage of plans reviewed found in violation of the fire code). Also, to determine if some plans should not be reviewed or if other methods (such as reviewing a statistical sample or reviewing all assemblies regardless of size, etc.) could be developed to identify plans that need fire department review.

Table 9: Plan Review Activities, 2005–2006

Inspection Type	1st Qtr. 04/05	2nd Qtr. 04/05	3rd Qtr. 04/05	4th Qtr. 04/05	Total 04/05	1st Qtr. 05/06	2nd Qtr. 05/06	Half Yr. Total 05/06
Plans Review	1.827	2,241	2,043	2,047	**8,158**	1,777	1,341	**3,118**
New Construction Inspections	421	610	562	440	**2,033**	479	424	**903**

Construction Code Enforcement – Fire inspections throughout construction are as essential as building, plumbing and electrical inspections to insure that buildings are constructed in compliance with the approved plans. Inspections during construction can alleviate costly repairs and delays prior to the issuance of the certificate of occupancy and/or during periodic fire inspections after being added to the building stock.

According to the activity counts provided in Table 8, on-site fire code construction inspections are not always performed periodically throughout the construction process. In order to assess the construction code enforcement activities, Table 10 presents an estimate of the new construction inspection needed, based on data for the first half of the 2005/2006 fiscal year through December 31, 2005.

Table 10: Estimated Number of Construction Inspections Required (based on number of plans reviewed for first six months of 2005/2006)[28]

Type of Plan Reviewed	# of Plans Reviewed in	Estimated # of Minimum Inspections per Plan	Estimated # of Minimum Inspections Required
Fire Sprinkler Systems	797	3	2,391
Fire Alarm Systems	247	2	494
Hood Systems	185	1	185
Tanks (Aboveground)	58	1	58
Tent Plans	82	1	82
Awnings Plans	60	1	60
Paint Booths Plans	10	1	10
FM-200 Systems	16	1	16
Total	**1,455**	**N/A**	**3,296**

[28] Data was provided by Captain Floyd via e-mail on June 11, 2006 at 11:50:17 PM.

Based on the number of plans reviewed by type of plan and the estimated minimum number of inspections usually required for each type of plan, a minimum of 3,296 inspections should have been performed in six months or 6,592 in a year (vs. the 2000 plus that were done). This estimate does not include re-inspections, which can be substantial, 30 percent to 50 percent of the original inspections. With reinspections, the number of anticipated inspections would increase to between 8,570 (6,592 * 1.3) and 9,888 (6,592 * 1.3). With these assumptions, the number of inspectors needed for construction code enforcement range from six to ten. When inspectors average 860 inspections per year, ten inspectors (8,570/860=9.96) are needed and at 1,290 inspections per year, about six inspectors (8,570/1,290=6.6) are needed. (Please refer to the discussion below under the heading Expected Number of Inspections per Inspector for an explanation of how to arrive at the average number of inspections done per year per inspector.)

Although there are many assumptions and unknowns, we think the addition of the supervising fire protection engineer may provide the additional staffing needed to meet the current workload. If a staff of five proves to be too many, one of the fire inspectors should be moved to existing building stock code enforcement. If five proves to be too few for the construction activity, consideration should be given to using certified fire inspector contractors until a permanent trend rise in construction activity is confirmed and only then, hire permanent inspectors.

Recommendation 23: Fire code enforcement on-site inspections should be increased to insure that an adequate number of periodic inspections occur during the construction process. Each type of inspection performed should be defined and standard operating procedures with checklists should be developed. For example, fire sprinkler inspections may include underground, rough-in, hydrostatic tests observations and final. Estimates should be developed for the number of inspections that should be performed for each type of plan reviewed.

Inspection Workload – Inspection workload (whether construction or existing building stock inspections) is a function of the number of occupancies requiring various types of inspections (buildings, permits, etc.), complexity of the inspection (type of occupancy), expected/actual inspection time (based on the specific type of inspection: sprinkler final, certificate of occupancy, routine, second re-inspection, etc.), size of the building (square footage), travel time to the inspection site, and administrative time for documentation, scheduling, etc.

An accurate inventory of existing buildings is needed as the basis for measuring the effectiveness of inspection services; however, one is not currently available. Therefore, we developed an estimate of the inspectable building stock in the county from data provided by the Duval County Tax Assessor. Of the 303,674 buildings in Duval county, about 45,000 (15 percent

of all buildings) probably require periodic fire prevention inspection.[29] Of these, about 5,355 require annual inspections (612 are state-mandated annual inspections for licensing and another 4,743 are classified as "must do" high priorities by fire prevention).[30, 31] Inspections of the other inspectable buildings are done as time is available.

Recommendation 24: An accurate inventory of the existing building stock should be developed and updated as buildings under construction are completed. This requirement should be included in the computer system that supports prevention. The percentage of unique inspectable buildings inspected annually should be reported to evaluate the inspection frequency cycle and the resources needed (prevention inspections, fire company involvement, self-inspections and public education programs) to improve performance.

The inspection frequency on existing buildings is not sufficient to insure fire compliance code compliance and thus public safety. The number of fire inspections performed on existing buildings in fiscal year 2004/2005 was 7,122 and 3,892 for the first six months of 2005/2006 or an estimated 7,784 on an annual basis. (Refer to Table 11.) Assuming the rough estimate of the number of existing inspectable buildings (45,259) is fairly accurate, only 16 percent to 17 percent of the existing buildings are inspected in any one year. At this rate, the inspection frequency is once every six years. When the 5,355 occupancies that require annual inspections (612 state mandated and 4,743 top prevention priorities) are deducted from the number of inspections performed annually (7,122 / 7,784), only 4 percent (4.43 percent or 1,767) of all other occupancies are inspected each year. This represents an inspection frequency of about 23 years (22.57) which approaches a non-existent fire code enforcement program on the majority of existing buildings (88 percent or 39,904 buildings) in Jacksonville. This is far outside an acceptable frequency rate for an effective fire code enforcement program. Most cities attempt to inspect every commercial building at least once every three years. The expectation is that fire code violations increase when inspection frequencies increase which potentially results in more fires with greater dollar losses. As noted earlier under the Fire Loss heading, Jacksonville is experiencing more fire (5.2 versus 2.8) with greater dollar loss ($26,477 versus $20,814 to $14,845) per 1,000 population than other large Florida counties. (Refer to Table 7 for comparisons.)

[29] Refer to Appendix B, Number of Parcels and Buildings by Property Use Type, to identify the buildings that were categorized as inspectable.
[30] The occupancies included in this estimate are nursing homes, homes for aged, orphanages (261), all institutional occupancies (255), restaurants (370), night clubs/bars (156), and all educational occupancies (407) listed in Appendix A.
[31] Refer to Appendix A, Estimate of Existing Inspectable Building Stock by Occupancy Classification to identify the buildings requiring annual inspections.

It has been our experience that a full time inspector should average no less than about four to six inspections per day in an eight hour day using manual systems to schedule, perform and report inspection results. In Jacksonville, each prevention inspector has about 43 weeks (1,724 hours) of time available for inspections after about nine weeks of leave and training. This is in line with other prevention bureaus as about 42 weeks is typical. (See Appendix C for calculation of time available for inspections.) So, it is reasonable to expect that each inspector should perform, on average, about 860 to 1,290 inspections per year including re-inspections.[32]

In 2005/2006, the actual number of inspections completed in six months was 3,892 (an annual rate of 7,784). The actually experienced average of 708 annual inspections per inspector is close to the expected range cited above (860 to 1,290).

Table 11: Actual Number of Fire Inspections on Existing Buildings[33]

	1st Qtr. 04/05	2nd Qtr. 04/05	3rd Qtr. 04/05	4th Qtr. 04/05	Total 04/05	1st Qtr. 05/06	2nd Qtr. 05/06	Half Yr. Total 05/06
Existing Building Inspections	1,819	1,993	1,526	1,784	**7,122**	1,687	2,205	**3,892**

Using the only other data available, Table 12, we developed the number of inspections that should be performed by the 11 inspectors in existing building code enforcement and compared that estimate to the one and one half years of actual data for 2002 and 2003. It must be noted that 2002 was not typical because several new inspectors attended training programs and were being trained in the field by experienced inspectors. Therefore, the amount of hours available for inspection and the number of inspections performed was very low.

[32] Weeks of time available for inspections (43 weeks) multiplied by 5 days per week multiplied by 4 to 6 inspections per day equals 860 to 1,290 inspection per year per inspector.
[33] Data was obtained from quarterly Fire Prevention Activity reports beginning with the first quarter of 2004/2005 fiscal year (October 1, 2004 – December 31, 2004) which was provided by the Executive Secretary of Prevention.

Table 12: Average Number of Inspections Completed per Year per Inspector

	Actual Hours CY 2002[34]	Estimated Hours CY 2003[35]	Actual Inspections FY 2004/2005	Estimated Inspections FY 2005/2006
Total Inspection Hours	25,056	29,184	22,880[36]	22,880
Equivalent # of Fire Inspectors	**12**[37]	**14**[38]	**11**	**11**
Total Non-Inspection Hours[39]	(14,655)	(12,090)		(8,657)[40]
Total Hours Available for Inspections	10,401	17,094		14,223
Per Cent of Hours Available for Inspections[41]	41.5%	58.6%		62.2%
Average Hours per Year Available for Inspections per Inspector[42]	863	1,221		1,293
Total Inspections Completed	**3,916**	**9,344**	**7,122**	**7,784**
Average Inspections Completed per Inspector per Year[43]	**326**	**667**	**647**	**708**

Assuming a re-inspection rate in the range of 30 percent to 50 percent, the number of inspections required to complete annual inspections on the 5,355 occupancies is projected to be from 6,962 to 8,033. Using the average number of inspections, 708, per inspector for 2005/2006, between 10 (9.8) to 11 (11.3) inspectors are needed to inspect 5,355 occupancies annually. By

[34] Prepared by Interim Division Chief Alonzo W. McQueen, Jr., *Fire Prevention Division Overview*, Administrative Reports section, memorandum to Richard Barrett, Director/Fire Chief, from Alonzo McQueen, Jr., Chief, Fire Prevention Division, regarding Activity Report for 01/01/2002-12/31/2002, page 1.
[35] Prepared by Interim Division Chief Alonzo W. McQueen, Jr., *Fire Prevention Division Overview*, Administrative Reports section, memorandum not addressed regarding Activity Report for 01/01/2003-07/31/2003, page 1. Total inspection hours for the 1st 6 months of 2003 (14,592) were multiplied by 2 to estimate annual inspection hours. Total non-inspection hours were also estimated by multiplying the 6 months actual (6,045) by 2.
[36] Total inspection hours are estimated by multiplying 11 inspectors by 2,080 hours per year.
[37] Total inspection hours are divided by 2,080 hours per year to determine the equivalent number of inspectors.
[38] Total inspection hours are divided by 2,080 hours per year to determine the equivalent number of inspectors.
[39] Non-inspection hours included all leave (personal, sick, special assignment); holidays; on the job injury; training, seminar or conference; assigned to investigation; research; office duty; meetings and consultation; and public education programs.
[40] This estimate is based on 787 hours of time not available for inspections per year per inspector. See Appendix C.
[41] Hours available for inspections divided by total inspection hours is the per cent of hours available for inspections.
[42] Total annual hours per inspector (2,080) multiplied by percent of hours available for inspections equals the average hours per year per inspector available for inspections.
[43] Total inspections completed divided by the equivalent number of fire inspectors equals the average inspections completed per inspector per year.

increasing staffing in existing building code enforcement to 13, two inspectors would be available to conduct 1,416 more inspections or inspect about 1,000 unique buildings, (944 buildings at a 50 percent re-inspection rate and 1,089 at a 30 percent rate). However, this is not the solution. At this rate, only 3 percent of the 39,650 (45,000 – 5,355) non-priority occupancies would be inspected annually. This equates to a 40 year inspection frequency cycle which is not acceptable. The number of inspectors needed for existing building stock code enforcement must be reassessed after the fire companies have taken on a substantial proportion of this inspection responsibility.

Recommendation 25: Productivity of prevention inspectors needs to be increased. The number of inspections performed per inspector per year should be closely monitored on a daily, weekly, monthly, and annual basis with the goal of achieving the highest productivity possible. Without a computer system, a goal of achieving between five to six inspections per day per inspector (or annually) should be established. Everything that can be done should be done to keep inspectors in the field as much time as possible and to use supervisors to perform inspections and quality assurance reviews. This may include inspectors coming into the office once a day, schedules being prepared for inspectors, the use of cell phones and other productivity improvement devices. With a computer system, significant increases in productivity should be expected. We were told that a building inspector performs about 15 to 20 inspections per day. Of course the actual rate achieved depends on the mix of inspection types performed.

Re-Inspection Rates – The re-inspection rates appear to be very high in Jacksonville based on the re-inspection data available (Table 13). In 2002 and 2003, 87 percent and 85 percent respectively of all inspections performed were re-inspections. In other cities, re-inspection rates usually run between 30 percent and 50 percent. Several factors may contribute to the rates of re-inspections. One likely factor is the longer length of time between inspections. Problems accumulate, increasing the number of re-inspections required to resolve violations cited. If it is assumed that the new fire safety inspections are performed on unique buildings, then only 3 percent (1,374) of the estimated 45,000 inspectable buildings were inspected in 2003. At this rate, it would take about 33 years (45,000/1,374) to inspect all inspectable buildings. Allowing for the 612 state-mandated annual inspections, then only 762 (1,374 – 612) new buildings are inspected each year. At this rate, it takes about 59 years to inspect all inspectable buildings. An efficient fire prevention program should inspect each unique inspectable building once every three years.

Table 13: Fire Safety Inspections Conducted

	Actual Inspections CY 2002[44]	% of Total Inspections	Estimated Inspections CY 2003[45]	% of Total Inspections
New Fire Safety Inspections	503	12.8%	1,374	14.7%
Re-Inspections	3,413	87.2%	7,970	85.3%
Total	**3,916**	**100.0%**	**9,344**	**100.0%**
Average Re-Inspection per New Inspection[46]	6.8		5.8	

Recommendation 26: A fee for re-inspections should be instituted for the third re-inspection. The fee should cover the fully loaded cost of an inspection trip and perhaps some penalty. This should encourage compliance and reduce the number of re-inspections. The number of re-inspections should be analyzed to determine what is causing the need for so many. Consideration could be given to sending fire companies on re-inspections once training and quality assurance methods are fully implemented (an idea used in Deerfield Beach).

Investigations

Jacksonville uses sworn fire officers who are certified by the state as Florida Fire Inspector I as fire investigators. None of the investigators are sworn peace officers and none are authorized to carry guns. Currently, there are three captains and three lieutenants assigned to investigations and a district chief is in charge of fire investigations and public education. In the Organization and Staffing section of this report, we recommended reducing the staff to three captains. This level of staffing may occasionally result in time available to conduct inspections, and if so, they should do so.

About two years ago, the amount of overtime paid by the prevention division totaled $88,950. At that time, four captains, working 12 hour shifts on days one month and nights the next month, were assigned to fire investigations. In an effort to reduce the cost of overtime, two lieutenants were added to investigations and the work schedule was changed from a 40 hour week to a 56 hour shift. A team of two (a captain and a lieutenant) were assigned to one of the three fire suppression shifts (A, B, and C). Overtime was reduced by $65,000 to $55,000

[44] Prepared by Interim Division Chief Alonzo W. McQueen, Jr., *Fire Prevention Division Overview*, Administrative Reports section, memorandum to Richard Barrett, Director/Fire Chief, from Alonzo McQueen, Jr., Chief, Fire Prevention Division, regarding Activity Report for 01/01/2002-12/31/2002, page 1.
[45] Prepared by Interim Division Chief Alonzo W. McQueen, Jr., *Fire Prevention Division Overview*, Administrative Reports section, memorandum not addressed regarding Activity Report for 01/01/2003-07/31/2003, page 1. New fire safety inspections conducted were 687 and re-inspections were 3,985 for a total of 4,672 for six months. The six month actual data was doubled to estimate the number of annual inspections and re-inspections for 2003.

($88,950 in 2002/2003, $23,845.62 in 2003/2004 and $33,089 in 2004/2005) yet the base salary cost of the fire investigation unit increased by about $111,000.[47]

Recommendation 27: Reassess the total costs (salary, benefits, overtime, and all other expenses) associated with a six member fire investigation staff versus a three member staff and a 56 hour versus a 40 hour weekly or 12 hour daily work schedule. Consider assigning the district chief over fire investigations on-call rotation duty and fire investigation duty during the 40 hour work week. Minimize the number of unnecessary fire investigator call outs through better basic training of fire officers to determine cause and origin, developing standard operating procedures for call outs on vehicle fires and quality assurance reviews by officers in prevention and suppression.

Florida is unique in its approach to fire investigations. The Bureau of Fire and Arson Investigations of the Division of State Fire Marshal, Department of Financial Services, "is required to investigate any fire in which property has been damaged or destroyed and where there is probable cause to believe that the fire was the result of carelessness or design."[48] The purpose of the bureau is to investigate crimes or criminal activity related to fires.

The local fire official is supposed to request the State Fire Marshal to perform an investigation under Florida Statute, Section 633.03 when a fire or explosion results in property damage. If the local fire official determines there is no probable cause that the fire resulted from carelessness or design, the matter is not referred to the bureau.[49] However, the bureau is called when there is a death or injury of a firefighter, a civilian death or injury that may result in death, a dollar loss that exceeds $1,000,000, a suspected failure of a fire suppression or fire detection system, or the cause is not readily determined by an initial investigation.[50], [51] There are 3 to 4 investigators assigned to the Jacksonville regional office.

In Jacksonville, the initial cause and origin of a fire is determined by the fire officer or the district chief on the scene. When the fire is clearly accidental and/or the cause and origin are

[46] Re-inspections divided by new inspections equals the average of re-inspections per new inspection.
[47] Overtime costs and salary data was obtained from April Mitchell in a phone conversation on May 23, 2006. Overtime costs were $88,950 in 2002/2003, $23,845.62 in 2003/2004 and $33,089 in 2004/2005. A lieutenant's base salary at step 5 is $5,013 per month and a captain's is $5,762. The fire investigation unit staff was increased from four captains to a staff of three captains and three lieutenants. The estimated salary cost of the unit increased by $9,277 per month or $111,324 per year from $23,048 per month ($5,762 * 4 captains) to $32,325 per month (($5,762 * 3 captains=$17,286) + ($5,013 * 3 lieutenants=$15,039)).
[48] *Florida Administrative Code*, Chapter 69A, section 61.001, paragraph (1) (b).
[49] *Florida Administrative Code*, Chapter 69A, section 61.001, paragraph (5).
[50] *Florida Administrative Code*, Chapter 69A, section 61.001, paragraph (9).
[51] *Florida Administrative Code*, Chapter 69A, section 61.001, paragraph (10).

readily determined, the fire officer completes the fire incident report. The officer in charge of the fire scene or the sheriff's office request the JFRD duty investigator when[52]:

- There are fire-related fatalities or life threatening injuries
- There are multiple alarm incidents
- Fire losses are $200,000 or more
- Arson is suspected to structures, vessels and vehicles
- The officer in charge needs assistance in determining the cause and origin of the fire
- The fire involves a house of worship

A fire investigator may also be called to facilities where there are complaints of overcrowding.

In practice, these procedures are usually followed on structure fires. However, on vehicle fires, a JFRD fire investigator is usually called even when arson may be apparent (the vehicle on fire is abandoned in an isolated area).

Recommendation 28: Guidelines should be established and an SOP written on when a JFRD fire investigator should be called for vehicle fires. In many cases, the Jacksonville Sheriff's Office (JSO) should be called instead of a JFRD fire investigator. The JSO can then call the Bureau of Fire and Arson and potentially have the car towed to the evidence lot. Guidelines and procedures should be developed in conjunction with JFRD suppression, JSO and the Bureau of Fire and Arson Investigations of the Division of State Fire Marshal.

The purpose of the JFRD fire investigator is to determine the fire cause and origin, to obtain accurate information for the fire report and to collect, preserve and maintain the chain of custody of evidence. The basic investigation functions are to provide leadership, coordinate with other agencies, take accurate notes, conduct interviews and evidence collection, diagram the scene, conduct a safety assessment and complete an accurate fire investigation report.[53] Presently, they do not interrogate witness or gather evidence even though they can do so. They do testify in court cases as needed.

This approach has several inherent problems that should be addressed. The training in cause and origin determination and fire investigation practices (including interviewing witnesses, gathering evidence, etc.) appears to be minimal. Company officers are not trained in cause and

[52] *Jacksonville Fire Prevention Division, Fire Investigation Policies and Procedures*, Revised November 8, 2000, page 1. The standard operating guidelines to request for investigator, SOP No. 233, section 233.01, also delineates when a fire investigator should be called.
[53] *Jacksonville Fire Prevention Division, Fire Investigation Policies and Procedures*, Revised November 8, 2000, page 3.

origin determination; however, the promotional exam for district chief requires captains to study fire investigation practices. JFRD fire investigators are certified as fire inspectors not as fire investigators. Every two to three years, they complete the required 40 hours of continuing education units to maintain this certification. Ordinarily, they select fire investigation-related courses, but there is not a standard curriculum for continuing education.

Recommendation 29: Fire officers (lieutenants and captains) should be trained in basic fire cause and origin determination. District chiefs should provide quality assurance but reviews on all fire incidents to make certain that the cause and origin is identified accurately, that a fire investigator is called only when appropriate, that documentation is sufficient and that fire crews are not retained on the fire scene longer than necessary.

Recommendation 30: Jacksonville fire investigators should be certified as a Florida Fire Investigator I or II. The recommended supervising captain over fire investigations should be certified as a Florida Fire Investigator II. A continuing education curriculum should be developed for fire investigators so that all investigators receive the same and most relevant training.

Because the Bureau of Fire and Arson Investigations of the Division of State Fire Marshal conducts the criminal investigation and works with the Florida State Attorney General to prosecute arson offenders, results of the investigations are not routinely shared with Jacksonville. The bureau completes the investigation reports for state and national fire incident reporting and the results of reported annually by the State Fire Marshal on a county-wide basis.

Investigation Staffing Standards – In states other than Florida where the local fire investigators conduct the criminal investigation and assist in the preparing the prosecution, national standards exist to evaluate the investigative staff needed. A reasonable national standard for annual caseload per investigator has been found to be about 100 to 150 fires investigated when the investigation is carried through the entire process of criminal investigation and prosecution. The number of fires of suspicious or incendiary origin should be reported to evaluate the investigation weekly caseload. Again, when the investigator is responsible for the case through prosecution, a reasonable weekly caseload per investigator is about one to two a week. In Jacksonville, these standards can only be used as upper-bound guidelines since JFRD fire investigators only perform the initial investigation and the State Fire Marshal completes the investigation and prosecutes the cases. JFRD investigators may be required to testify in court.

Table 14: Number of Fires by Property Use, 2003–2005[54]

Property Use	2003	2004	2005	3 Year Avg.	% of Total Fires
1 & 2 Family Dwellings	619	785	711	705	20%
Multi-Family & Other Habitats	181	270	221	224	6%
Commercial, Educational & Institutional	59	116	117	97	3%
Industrial	53	83	84	73	2%
Vehicles	881	941	955	926	27%
Outside Fires (Grass/Wildlands/Other)	1,181	1,930	1,342	1,463	42%
Total All Fires	**2,974**	**4,125**	**3,430**	**3,488**	**100%**

Of 3,488 average annual fires per year in Table 14, fire investigators are only called to about 15 percent (269*2/3,488) (Table 15). This indicates that the call-out procedures are working well when it is assumed the investigations done by suppression are accurate.

Table 15: Number of Fire Investigations Performed by Calendar Year[55]

	2003	2004	2005
# of Fire Investigations	422	415	439

Table 16: Number of Fire Investigations Performed by Fiscal Year[56]

	1st Qtr. 04/05	2nd Qtr. 04/05	3rd Qtr. 04/05	4th Qtr. 04/05	Total 04/05	1st Qtr. 05/06	2nd Qtr. 05/06	Half Yr. Total 05/06
# of Fire Investigations	124	146	122	106	**498**	142	127	**269**

Quality assurance procedures are not in place within JFRD to insure that a fire investigator is called out when appropriate, to monitor the quality of the initial investigation or to review the closure rate of the entire investigation and prosecution process. JFRD prevention does not review fire causes to determine if public education efforts should be redirected. The closure and conviction rates which are the primary performance measures used to evaluate the quality of fire investigations by the end results are not reported back to JFRD.

[54] Table was developed from data provided by Hien Lam via e-mail on 6/5/2006 9:02:52 AM, in Microsoft Excel files summarize_03.xls, summarize_04.xls and summarize_05.xls.
[55] Table was developed from data provided by Hien Lam via e-mail on 6/2/2006 2:58:10 PM, in Microsoft Excel file named Y2004.xls; in an e-mail on 6/5/2006 9:27:50 AM in an Excel file named Y2003.xls; and in an e-mail 6/5/2006 10:30:56 AM in an Excel file named Y2005.xls.
[56] Data was obtained from quarterly Fire Prevention Activity reports beginning with the first quarter of 2004/2005 fiscal year (October 1, 2004 – December 31, 2004) which was provided by the Executive Secretary of Prevention.

Recommendation 31: Develop a monthly feedback reporting process between the Bureau of Fire and Arson Investigations and Jacksonville Fire Prevention. This process should provide Jacksonville Prevention with completed investigation reports as well as closure, conviction and case load rates. The process could include monthly meetings to discuss on-going investigations, juveniles and other suspects involved with fire incidents and investigations. National fire investigation measurements such as case loads per investigator, actual offenses as a percentage of structure fires or vehicle fires, closure rates and clearance rates (number and percentage of offences cleared by adult arrests and juvenile arrests) and prosecution rates (number and percentage of offences prosecuted that were successful in convictions).

Recommendation 32: Implement a Fire Incident Evaluation Program within JFRD that involves the fire marshal, the district chief over public education, a senior public educator, the public information officer and appropriate fire operations officers. This group should meet after a fire to discuss the ignition point, the cause and origin and the fire spread to identify public education programs and public information announcements that could help reduce the occurrence of similar fires and/or to reduce the loss due to such fires. The response time of the JFRD investigator and the Bureau of Fire and Arson investigator should be reported and reviewed to determine ways to improve response times and to reduce fire company on-scene time.

III. RISK AND DEMAND

This chapter provides an overview of the risks present in Jacksonville, past demand trends, and future project demand for emergency services provided by the Jacksonville Fire Rescue Department.

Risks

Jacksonville has many of the risks associated with a port city, which also has the additional risks of two major .naval installations within the city limits. The other physical fire department related risks are typical of any large metro city of Jacksonville's size, they include:

Chemical Plants – Jacksonville has several major chemical plants throughout the city that are based in residential areas. They all have a high potential for hazmat incidents and as explained by JFRD personnel there have been serious incidents at these facilities in the recent past.

Docks – The city is a major port city that accepts and processes containers on a daily basis from all over the world. This presents a terrorism threat as well as potential hazmat risks. Jacksonville by the way has a world-class port security system that has gained recognition, and is being emulated across the country.

Interstate Highways – The city has an intricate and vast road network that runs throughout the city. Major highways include: I-95, I-295, I-10, and 9A. The corridor is a major truck route to the south and north for the entire east coast. The potential for hazardous payloads that come through the city/county and could create major incidents is ever present. There is also the recurring incidence of potential motor vehicle accidents with or without entrapment, car fires and truck fires.

Railways – Jacksonville is home to the world headquarters of CSX Transportation. In the Northwestern part of the city, there is a major railway hub for the CSX line, which potentially has hazardous payload traversing through the city regularly. (During the tour of the city Fire Department personnel indicated that there have been a number of calls hazmat-related over the years at this hub.)

Wildfires – The state of Florida in general has been recently plagued by a spate of wildfires because of dry conditions. Jacksonville has certainly been no exception to this risk.

With vast degree of development that is occurring coupled with the remaining substantial wooded, brush and grassy areas that impinge on the residential and commercial properties, wildfires pose a substantial risk.

Hurricanes – Although the city has not been hit by a major hurricane since 1964, it is in an area that could very well be hit at any time during the hurricane season. The city has experienced hurricane or near hurricane force winds and conditions on various occasions over the years.

Additional Risks – In addition to the traditional risks factors the city faces based on geography, regional weather conditions, natural and manmade hazards, etc. Jacksonville has an additional palpable risk that was interestingly cited repeatedly by both upper and mid-level management. This risk was identified as the "brain drain" by many of the officials we spoke to. It was the primary concern of the top echelon of the department; (more so than natural and manmade risks,) because it has created an experience drain that could affect the department operationally on a short and long term basis.

The inexperience of the officer corps is not unique to the JFRD. The genesis of the exodus of experienced and seasoned officer and rank and file personnel in some departments in the fire service is based on a number of reasons. The primary reason in this department is the Deferred Retirement Option Program (DROP) which caused a mass exit of over 121 people virtually overnight. Many of the older 20+ year firefighters took advantage of the DROP benefits and retired.

Also the consolidation of the JFRD in 1968 into a countywide department that enveloped many of the volunteer companies that surrounded the inner city was also a big factor in the exodus years later.

Curiously, there is no real officer development program to address this problem in any meaningful way. We highly commend the JFRD's training division on the level of training for officers and officer candidates by offering a one of a kind bachelor of fire science degree program in collaboration with Florida Community College of Jacksonville (FCCJ). The problem is that this program is optional. The program would definitely address and provide preparation skills and training modalities to help the professional development void that exists. There is a pay incentive program for attending and this should continue to be promoted heavily. But is does not address the in-house promotional process or void thereof.

Recommendation 33: Under the auspices of the JFRD/FCCJ Bachelor of Fire Science degree program JFRD should consider creating a mandatory 2–4 week First Line Supervisors program for all newly promotional lieutenants. While this new program will not address the lack of officer management skills and development for those already promoted, it could provide a much needed in place system of professional development for all future promotions in the new leadership caused by the "brain drain". This program could also conceivably become a regional or statewide mandatory program for all newly promoted lieutenants throughout the State of Florida and pay for itself by having outside jurisdictions pay for the cost of providing the course.

Demand

Age Demographics – Studies have shown the elderly create a disproportionate level of demand for fire departments; a high percentage of most departments' medical workload comes from the population aged 65 and older. Data from the 1990 and 2000 censuses and the change in percent of the population by age range is shown in Table 17.

Table 17: Population Age Demographics, 1990 and 2000[57]

	1990		2000		Change in Percent	
Year	Number	Percent	Number	Percent	Net	Growth
Under 20 years	184,900	29%	216,744	29%	31,844	0.4%
20 to 34 years	176,883	28%	165,196	22%	-11,687	-5.4%
35 to 54 years	156,321	25%	220,222	30%	63,901	5.3%
55 to 64	49,783	8%	57,540	8%	7,757	0.0%
65 and over	67,343	11%	75,915	10%	8,572	-0.3%
Total	635,230	100%	735,617	100%	100,387	0.0%

While the entire city grew at a moderate rate, two categories contributed to a sizeable shift in age distribution. By proportion, the young adult age group (20 to 34) decreased while the number of adults aged 35 to 54 years grew by that same proportion. A continuation of this trend would likely lead to higher incident totals around 2020 as the current members of this age group mature into the aged 65 and over category. In fact, some effects of this trend will likely affect demand in the near future. However, if growth in the senior segment of the city's population falls off due to out migration or other factors, demand may increase at a slower rate.

Since the proportion of persons aged 65 and older remained relatively constant between the last two censuses, the department's workload has not yet experienced the inevitable workload increases due to aging of the population protected. This nationwide trend is due to a combination

[57] Source: 1990 and 2000 Census 100 Percent Data

of high birth rates following the Second World War and an increased life expectancy due to advances in medical technology.

Recommendation 34: The city should continue to monitor age demographics. A population's demographics can change over time. Anticipating these changes allows a provider to address the need for changes in protocol, station location, and deployment. Mitigating factors such as out-migration of the elderly to communities outside the city could reduce the department's workload and should be monitored.

Population

Jacksonville, with an estimated population of 817,210 in 2005, is the largest city in Florida. The city accounts for over 94 percent of the population of Duval County. The city is located in the far northeast corner of the state.

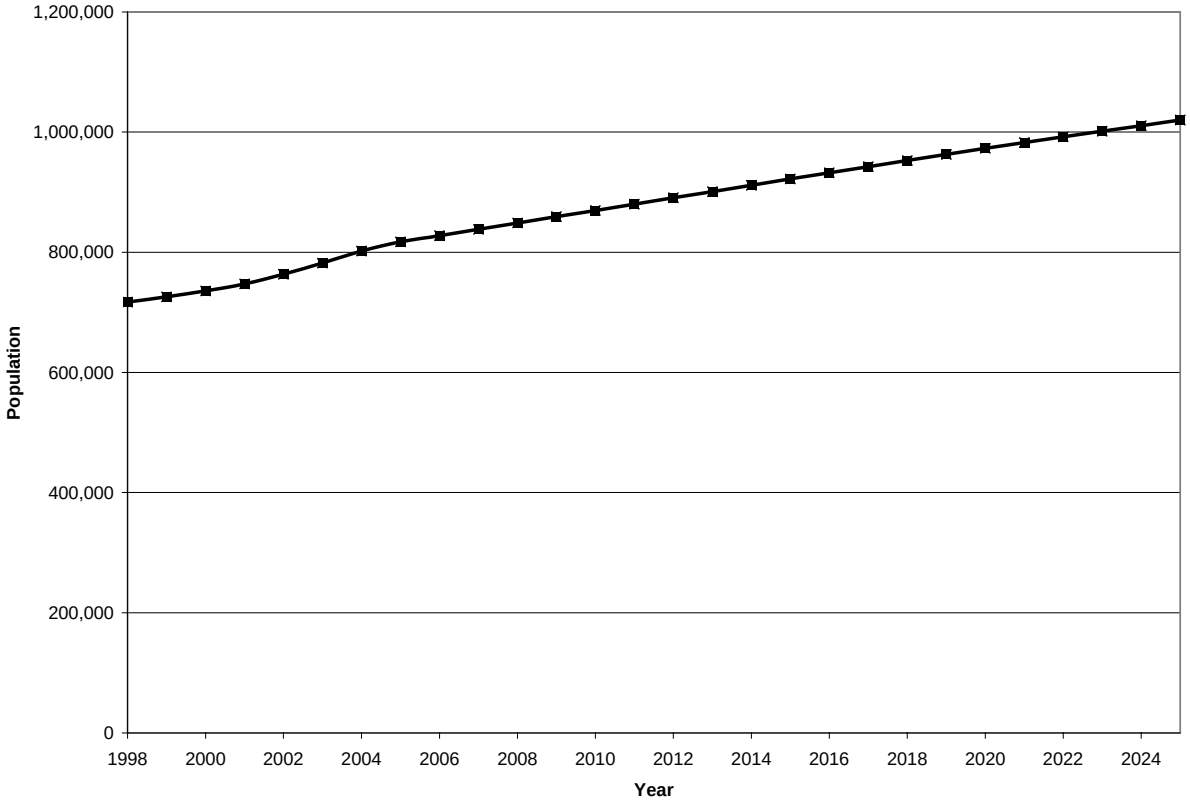
Population estimates for 1998 through 2005 were supplied by the city. The city also supplied population projections for 2010, 2015, 2020, and 2025. Years that fell between these endpoints were projected using simple linear interpolation. This can be described as low to moderate growth. Table 18 shows the estimated population of the city between 1998 and 2025.

Table 18: City Population, 1998–Projected 2025

	Year	Population
Actual	1998	717,000
	1999	726,000
	2000	735,617
	2001	747,422
	2002	763,345
	2003	782,063
	2004	801,990
	2005	817,210
Projected	2010	869,704
	2015	921,922
	2020	973,104
	2025	1020304

These totals are shown graphically in Figure 4. The population is expected to exceed 900,000 by 2013. This is a net increase of 10,478 persons per year over an eight-year period. Increases of a similar magnitude are projected to continue, bringing totals above 1,000,000 in 2024. These population increases will undoubtedly increase the department's demand in the future.

Figure 4: Jacksonville Population, 1998–2025



Demand

As noted before, the Department's long-term needs depend in a large part on the expected future demand for services and workloads of individual units. Demand is the number and types of calls for service—services provided by the entire fire department. Analysis of demand indicates which times of day and where different types of service are used the most. Results of demand analysis then allow decision-makers to determine the appropriate number and placement of resources and staffing methodologies (e.g. staffing extra units during peak demand times) for their community.

Demand for service varies between communities for a number of reasons. For example, the degree of urbanization, community income level, and overall age and health of the population impact demand. Demand also is affected by the degree to which fire and EMS services are publicized and to which the public is encouraged to call for service. Citizens will typically call for 911 services disproportionately more in a city than in rural areas with suburban communities somewhere in between.

In 2005 the department responded to 109,340 incidents with one million unit responses. The number of incidents is not to be confused with the number of unit responses. An emergency call may require the response of more than one unit, but only one incident number is generated.

Methodology – The project team used two models to forecast future demand. This projection procedure was developed over the past 24 years of conducting fire department studies. The number of incidents in a given year can be predicted to fall between the two projections with a fairly high degree of likelihood. The first method assumes that per capita demand will remain *constant*; as a result, demand will grow at the same rate as the population. Since population growth is predicted to be positive, this method produces increasing call totals for Jacksonville.

However, per capita demand has often been shown to increase over time, leveling out at some point. This increase in demand is often termed increased utilization of services. The growth is often attributed to aging of the population or an increase in the community's confidence in (or awareness of) fire/EMS service. Increased cell phone usage and many patients' preference to be admitted via emergency rooms instead of traditional hospital visits are also possible causes for increases in per capita demand on the EMS side. Therefore, the estimated demand produced by holding per capita demand constant is often lower than actual demand. Thus the second method assumes that per capita demand will continue to *grow* as it has in recent years for the foreseeable future. Although growth can be negative, this method is called the increased utilization or increased demand model. This method tends to overestimate the number of future incidents, because demand per capita is likely to level out at some point if not decrease.

Each of these models represents an extreme case - best and worst case scenarios - which are referred to throughout this report as low and high demand projections.

The aggressive totals produced by the increased utilization of services model are the result of per capita demand undergoing exponential growth. When this growth rate is slowed, a less aggressive upper bound is established.[58]

On average, the JFRD responds to over 96,000 incidents a year, of which over 75 percent are EMS or rescue in nature. The remaining 25 percent of incident totals is composed of good intent calls, false alarms, other incidents, fires, and hazardous conditions (in descending order of frequency). Finally, demand is sometimes affected by response protocols.

Past Demand –Table 19 shows demand for services divided into six categories: fires, EMS/rescue, hazardous conditions, good intent calls, false alarms, and other incidents[59]. Total incidents displayed an upward trend overall, increasing every year and exceeding the average for the time period each of the last three years. The majority of this increase is from the EMS category, which is typical nationally. Annual totals grew by nearly 20,000 incidents over the last eight years. Good intent calls, false alarms, and other incidents also grew considerably since 1998.

A single category experienced a net decrease during the period. Fires saw a high of 5,369 in 1998 and decreased every year except 2004. The final category, hazardous conditions, displayed the largest amount of variability. When the entire time period is viewed, a trend appears difficult to isolate; however, the final half of the period showed incidents of this type to be approaching a level slightly below the 8-year average.

Table 19: Jacksonville Fire and Rescue Incidents, 1998–2005[60]

Year	Fires	EMS/ Rescue	Hazardous Condition	Good Intent	False Alarm	Other	Total
1998	5,369	63,826	1,898	4,968	5,126	3,218	84,405
1999	4,736	63,825	1,727	5,504	5,633	4,101	85,526
2000	4,295	68,420	1,796	5,921	6,237	4,601	91,341
2001	4,008	70,238	2,004	6,894	6,255	4,934	94,333
2002	3,345	72,342	1,799	7,152	6,388	4,873	95,899
2003	2,974	76,042	1,823	7,307	6,352	5,171	99,669
2004	4,125	80,250	3,823	7,507	7,031	5,872	108,608
2005	3,430	83,471	1,936	7,339	6,804	6,360	109,340
Average	**4,035**	**72,302**	**2,101**	**6,574**	**6,228**	**4,891**	**96,140**
Proportion	4%	75%	2%	7%	6%	5%	100%

Each of the incident categories is further analyzed below. Incident totals tell half the story of a department's demand. The next step is to normalize incident totals by population totals to analyze per capita demand for services.

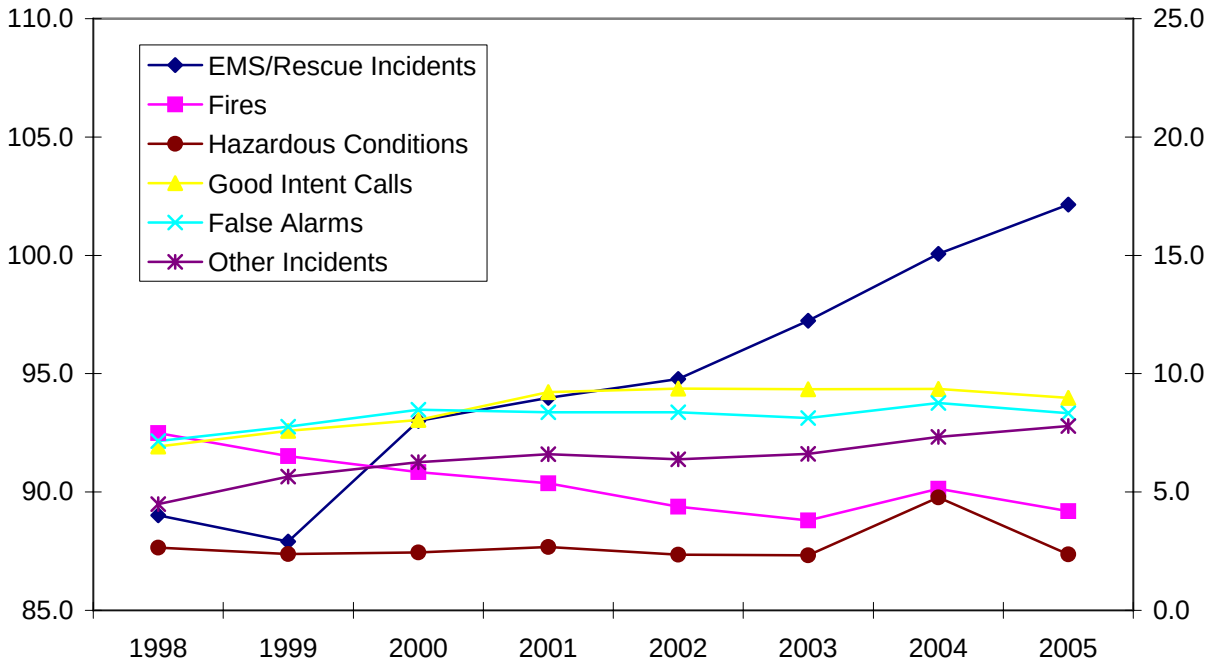
[58] Positive growth rates were slowed by a factor of one-half after seven years, and negative growth rates were slowed by a factor of one-half after five years. This is because demand is unlikely to continue to grow or fall at the observed rate for the entire 20-year period.
[59] Other incidents includes overheat or overpressure calls, service calls, miscellaneous other incidents, unclassified incidents, and incidents reported as aid given.
[60] A slight discrepancy exists in 2000 incident totals. Total reported incidents were 71 incidents higher than the sum of the categories. The lower of the two figures was chosen for this study.

Per Capita Demand – The size and relative age of the population along with past demand are essential elements required to project a department's demand for services. The logical way to combine both population and demand is demand per capita—simply put, the number of incidents divided by the size of the population yields the number of incidents per person. Demand for department services since 1998 was analyzed in order to predict future demand. Per capita demand for services is shown in Table 20 and depicted graphically in Figure 5. (Note per capita demand has been multiplied by one thousand for ease of observation in each of the incident categories. The chart depicts EMS incidents on the left-hand axis and all other incidents on the right-hand axis.)

Table 20: JFRD per 1,000 Population Demand, 1998–2005

Year	Fires	EMS/ Rescue	Hazardous Condition	Good Intent	False Alarm	Other	Total
1998	7.5	89.0	2.6	6.9	7.1	4.5	117.7
1999	6.5	87.9	2.4	7.6	7.8	5.6	117.8
2000	5.8	93.0	2.4	8.0	8.5	6.3	124.1
2001	5.4	94.0	2.7	9.2	8.4	6.6	126.2
2002	4.4	94.8	2.4	9.4	8.4	6.4	125.6
2003	3.8	97.2	2.3	9.3	8.1	6.6	127.4
2004	5.1	100.1	4.8	9.4	8.8	7.3	135.4
2005	4.2	102.1	2.4	9.0	8.3	7.8	133.8

Figure 5: JFRD per Capita Demand, 1998–2005



Two trends are readily apparent. Fires saw steady decreases; although slight, the trend in this category is towards negative growth. The decrease in fires echoes the national trend. On the other hand, EMS/Rescue and other incidents experienced strong positive growth. The other three categories displayed more complicated behavior.[61] These trends, discussed qualitatively, will be measured quantitatively in the next section and applied to determine future demand.

Recommendation 35: Monitor yearly per capita demand by category and analyze data every five years. This is an important step in targeting prevention efforts. Sustained movement against defined trends should be identified and analyzed for cause and eventual effect on workload.

Observed Growth – After calculating past demand for each category, the trend was analyzed to determine the expected trend in the future. Several mathematical measures were considered for each incident category. These measures include the mean of yearly per capita increases, the geometric mean of yearly per capita increases, and a least squares fit linear regression model applied to per capita demand.

[61] Source: fire department data, 1998-2005 (Citywide statistics).

Each incident category was individually analyzed to determine which measure best describes the observed growth rate to use in projecting future incidents. This figure, representing growth trend quantified, will be called the observed growth rate. These rates are shown in Table 21.

Table 21: Observed Growth Rates

Fires	EMS/ Rescue	Hazardous Condition	Good Intent	False Alarm	Other
-6.6	2.0	-1.6	3.9	2.4	4.3

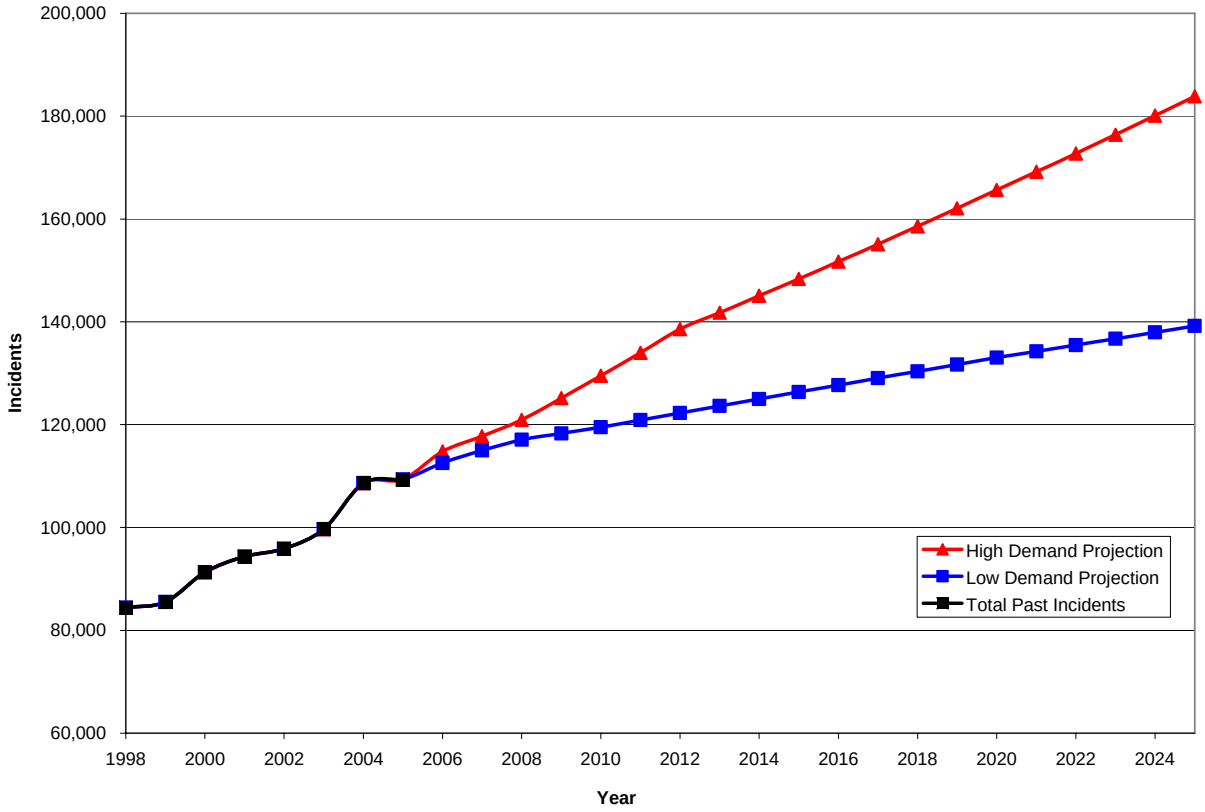
Both fires and hazardous conditions decreased during the observed period while every other incident category increased. Each of these rates can be described as moderate to large in magnitude. Each of these rates will be applied in the demand projections.

Demand Projections – Using population projections supplied by the city and the observed per capita demand growth rates discussed above, low and high demand projections through 2025 were created. Table 22 shows the projections by incident category. The low demand projection grows only as a result of projected population increases but has been supplemented by a one-time increase, which reflects the unlikelihood of zero growth in per capita demand. The best-case scenario projects department incident totals to remain below 140,000 through 2025. On the other hand, high demand could produce incident totals above 140,000 as soon as 2013. Figure 6 illustrates the low and high demand projections for total incidents.

Table 22: Low and High Demand, 2006–2025

	Fires		EMS/ Rescue		Hazardous Condition		Good Intent		False Alarm		Other		Total	
Year	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low
2006	3,358	3,250	87,965	86,237	1,945	1,930	7,736	7,582	7,058	6,974	6,727	6,581	114,789	112,554
2007	3,286	3,069	89,985	88,217	1,955	1,924	8,133	7,824	7,311	7,143	7,094	6,803	117,764	114,980
2008	3,327	2,903	92,004	90,197	1,979	1,917	8,560	7,922	7,577	7,232	7,491	6,888	120,938	117,060
2009	3,368	2,745	95,009	91,313	2,003	1,910	9,007	8,020	7,851	7,322	7,908	6,973	125,147	118,283
2010	3,410	2,595	98,097	92,428	2,028	1,903	9,477	8,118	8,134	7,411	8,348	7,058	129,493	119,515
2015	3,614	2,486	111,480	97,978	2,150	1,939	11,509	8,606	9,355	7,856	10,255	7,482	148,363	126,349
2020	3,815	2,372	123,683	103,417	2,269	1,968	13,393	9,084	10,469	8,293	12,034	7,898	165,664	133,032
2025	4,000	2,248	136,310	108,434	2,379	1,983	15,483	9,524	11,638	8,695	14,028	8,281	183,839	139,165

Figure 6: Low and High Demand, 1998–2025



Regional Population

Jacksonville is comprised of six regions – the urban core, the Greater Arlington area, the northwest, the north, the southwest, and the southeast. The city supplied population estimates for 2000 through 2005 and population projections for 2010, 2015, 2020, and 2025 for each of the regions. These totals are shown in Table 23. Again, simple linear interpolation was used to project the population between available projections.

Table 23: City Population by Regions, 2000–Projected 2025

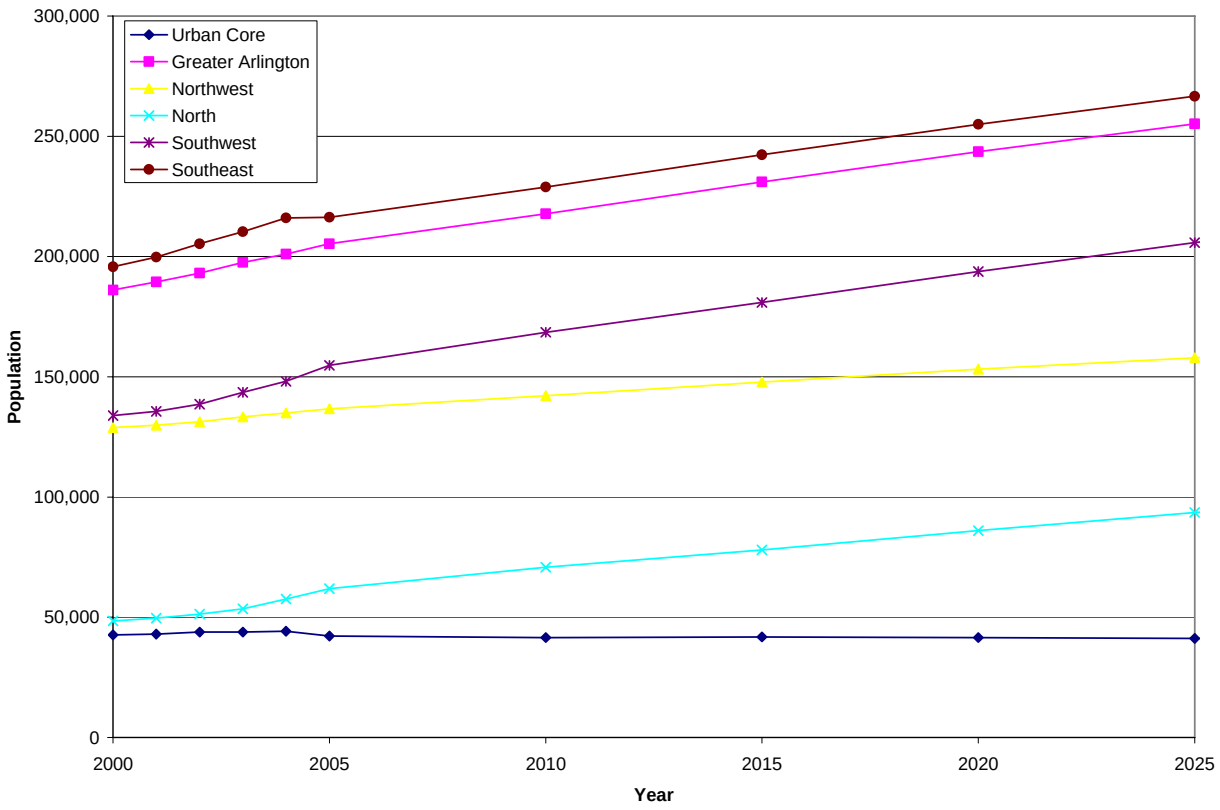
	Year	Urban Core	Greater Arlington	Northwest	North	Southwest	Southeast	Total
Actual	2000	42,635	186,072	128,848	48,474	133,867	195,721	735,617
	2001	43,009	189,499	129,888	49,622	135,609	199,795	747,422
	2002	43,789	193,070	131,283	51,319	138,568	205,316	763,345
	2003	43,850	197,579	133,352	53,508	143,487	210,287	782,063
	2004	44,181	201,062	134,999	57,595	148,110	216,043	801,990
	2005	42,193	205,341	136,712	61,887	154,747	216,330	817,210

	Year	Urban Core	Greater Arlington	Northwest	North	Southwest	Southeast	Total
	2010	41,560	217,757	142,162	70,828	168,472	228,925	869,704
Projected	2015	41,855	231,052	147,827	78,015	180,868	242,305	921,922
	2020	41,598	243,609	153,158	86,029	193,736	254,974	973,104
	2025	41,235	255,177	157,934	93,598	205,741	266,619	1,020,304

Over the last five years, the city grew at a moderate rate, 2.1 percent. During this time period, the north and southwest regions exceeded this rate with large growth rates of 5.0 and 2.9 percent, respectively. Three regions, the Greater Arlington, southeast, and northwest regions experienced slower growth than the city as a whole averaging 2.0, 2.0, and 1.2 percent growth, respectively. Finally, the urban core displayed slight negative growth over the last five years with an annual decrease of 0.2 percent from 2000 to 2005.

The city as a whole is expected to average 1.1 percent growth annually from 2005 to 2025. This is roughly half the growth rate the city experienced over the last five years. With the exception of the urban core, each region is expected to echo the same trend, growing at roughly one-half the rate they experienced between 2000 and 2005. This can be described as moderate growth. The population tallies in the urban core are expected to remain nearly constant over the projection period. Figure 4 shows population totals between 2000 and 2025 by region. These population changes will be used to project incident totals on a regional basis.

Figure 4: Jacksonville Population by Region, 2000–2025



Regional Demand

A city's demand for emergency services can vary considerably between geographic areas. For this reason, it is often desirable to track and analyze incident totals by regions. Projecting incidents for each of these regions and summing the results can often yield superior results. Incidents will be divided into EMS and fire incidents[62]. The projection method used is identical to the method used to project citywide incident totals. An upper bound is produced using an increased utilization of services model and a lower bound is developed under the assumption of fixed per capita demand.

[62] Here fire incidents includes fires, good intent calls, false alarms, service calls and any other incidents not classified as EMS. Often the observed growth rate in this incident category was between –1 and 0 percent. Where this was the case, an observed growth rate of –1 percent was used. This ensures an acceptable spread between high and low incident projections.

A second set of incident data was supplied by the department[63]. These incident totals, grouped by region, are shown in Table 24 below.

Table 24: JFRD Incidents by Region, 2000–2005

Region	Year	2000	2001	2002	2003	2004	2005
Urban Core	EMS	10,817	10,805	10,952	11,305	11,300	12,365
	Fire	2,250	2,355	2,238	2,224	2,305	2,041
	Total	13,067	13,160	13,190	13,529	13,605	14,406
Greater Arlington	EMS	10,569	11,292	12,089	12,654	13,368	14,008
	Fire	3,057	3,227	3,109	2,853	3,680	3,256
	Total	13,626	14,519	15,198	15,507	17,048	17,264
Northwest	EMS	16,145	16,785	17,168	17,742	18,868	19,647
	Fire	4,194	4,323	3,977	3,769	4,635	3,555
	Total	20,339	21,108	21,145	21,511	23,503	23,202
North	EMS	4,969	5,377	5,759	6,181	6,769	7,220
	Fire	1,522	1,579	1,556	1,590	2,105	1,663
	Total	6,491	6,956	7,315	7,771	8,874	8,883
Southwest	EMS	10,524	10,728	11,120	12,039	12,969	13,507
	Fire	2,905	3,036	2,693	2,615	3,732	2,880
	Total	13,429	13,764	13,813	14,654	16,701	16,387
Southeast	EMS	13,736	14,835	15,457	16,719	17,840	18,409
	Fire	4,914	5,138	5,063	4,813	6,036	5,254
	Total	18,650	19,973	20,520	21,532	23,876	23,663
Other	EMS	3,137	3,239	3,351	3,430	3,476	3,579
	Fire	408	483	436	440	506	426
	Total	3,545	3,722	3,787	3,870	3,982	4,005
Total	EMS	69,897	73,061	75,896	80,070	84,590	88,735
	Fire	19,250	20,141	19,072	18,304	22,999	19,075
	Total	89,147	93,202	94,968	98,374	107,589	107,810

Urban Core – The urban core is the smallest region of the city. This region saw EMS incidents reach a six-year high of 12,365 in 2005. At the same time, fires reached a five-year low of 2,041. The observed growth rates are similar—a large increase in EMS incidents and a moderate decrease in fires. These rates are shown in Table 25, and incident projections through 2025 are shown in Table 26. These growth rates were applied to produce the increased utilization of services model while the constant demand model produced the lower boundary for EMS incidents and the upper boundary for fires. This procedure is used to project each region's

[63] These incident totals differ from citywide incident totals by a relatively small percentage. Each data set was

incidents and is identical to the projection method used for citywide incident totals. Best-case scenarios project total incidents to decrease slightly through 2025[64]. The worst-case scenario projects incidents to remain beneath 20,000 until 2025.

Table 25: Urban Core Observed Growth Rates

EMS	Fire
3.1	-1.6

Table 26: Urban Core Projected Incident Totals, 2006-2005

	Year	2006	2010	2015	2020	2025
EMS	High	13,101	14,180	15,891	17,051	18,248
	Low	12,709	12,943	13,035	12,955	12,842
Fire	High	2,018	1,978	1,992	1,980	1,962
	Low	2,002	1,853	1,792	1,710	1,628
Total	High	15,120	16,158	17,882	19,030	20,210
	Low	14,711	14,796	14,827	14,665	14,470

Greater Arlington – The second largest region in the city, Greater Arlington saw total incidents increase each of the last five years. Observed growth rates are shown in Table 27. EMS incidents grew in number while fires declined in the region. This echoes the national trend as well as the citywide trend. Table 28 shows the region's incident totals projected through 2025. The aggressive upper boundary for total incidents is still beneath 30,000 through the year 2021. Incident totals are projected to remain beneath 23,000 through 2025 under the best-case scenario.

Table 27: Greater Arlington Observed Growth Rates

EMS	Fire
3.9	-1.0

evaluated and analyzed independently.

[64] This is due to the fact that the urban core is expected to undergo slight population decreases during the projection period.

Table 28: Greater Arlington Projected Incident Totals, 2006–2005

	Year	2006	2010	2015	2020	2025
EMS	High	15,306	17,989	21,836	25,358	29,257
	Low	14,731	16,037	17,016	17,941	18,793
Fire	High	3,279	3,418	3,627	3,824	4,006
	Low	3,262	3,284	3,398	3,494	3,569
Total	High	18,584	21,407	25,463	29,182	33,262
	Low	17,993	19,321	20,414	21,435	22,362

Northwest – The northwest region experienced increases in EMS incidents every year. Growth in this category also produced a positive trend in total incidents. At the same time, fire totals followed a negative trend. The observed growth rates for the northwest region and the incident projections that result are shown in Table 29 and Table 30. Like all the regions in the city, the EMS growth rate is positive and the corresponding rate for fires is negative. However, this region saw the largest rate of decline for fires and the lowest rate of increase for EMS incidents. Since this fact is combined with slow projected population growth, this region is expected to experience workload increases at a slower rate. The best-case scenario is for total incidents to remain beneath 25,000 until 2015. The worst-case scenario places total incidents above 30,000 annually as soon as 2019.

Table 29: Northwest Region Observed Growth Rates

EMS	Fire
1.8	-3.2

Table 30: Northwest Region Projected Incident Totals, 2006–2005

	Year	2006	2010	2015	2020	2025
EMS	High	20,504	22,285	24,628	26,654	28,711
	Low	20,151	21,153	21,996	22,789	23,499
Fire	High	3,525	3,577	3,719	3,853	3,974
	Low	3,468	3,135	3,004	2,868	2,725
Total	High	24,029	25,861	28,348	30,508	32,685
	Low	23,619	24,288	25,000	25,657	26,225

North – The north region is the second smallest in the city. However, the north region is also the fastest growing region in the city, experiencing 5 percent annualized population growth between 2000 and 2005. Although this rate should slow, the region is still expected to have the strongest population growth in the city (2.1 percent annually through 2025). This will undoubtedly affect incident totals in the near future. This region also saw the largest per capita

increases in EMS incidents over the last five years. At the same time, the observed growth rate for fire was negative. These factors are shown in Table 31 and projected incident totals are shown in Table 32. Even the worst-case scenario predicts incident totals to remain beneath 20,000 through the year 2021. The best-case scenario projects total incidents to remain beneath 13,000 through 2020.

Table 31: North Region Observed Growth Rates

EMS	Fire
4.8	-1.8

Table 32: North Region Projected Incident Totals, 2006–2005

	Year	2006	2010	2015	2020	2025
EMS	High	8,162	10,457	13,594	16,887	20,697
	Low	7,787	9,079	10,001	11,028	11,998
Fire	High	1,695	1,870	2,059	2,271	2,471
	Low	1,680	1,741	1,834	1,935	2,013
Total	High	9,858	12,327	15,653	19,158	23,168
	Low	9,467	10,820	11,835	12,962	14,011

Southwest – The southwest region is the third largest in the city. Like the north region, the population of the southwest region grew considerably between 2000 and 2005 and this trend is expected to continue. However, the magnitude of both of these population growth rates is considerably less than their counterparts from the north. Annualized growth from 2000 to 2005 was 2.9 percent and projected annualized growth from 2005 to 2025 is 1.4 percent. Both of these rates are second only to those corresponding to the north region. Incident growth rates are similar to those experienced in other regions of the city—a strong positive trend in EMS incidents and a slight negative trend in fires. These growth rates are shown in Table 33 and incident totals projected through 2025 are shown in Table 34. Total incidents should remain beneath 24,000 through 2015. The best-case scenario is for incidents to remain beneath 20,000 through 2015.

Table 33: Southwest Region Observed Growth Rates

EMS	Fire
3.1	-1.0

Table 34: Southwest Region Projected Incident Totals, 2006–2005

	Year	2006	2010	2015	2020	2025
EMS	High	14,623	17,162	20,536	23,778	27,296
	Low	14,178	15,642	16,793	17,988	19,103
Fire	High	2,916	3,104	3,332	3,570	3,791
	Low	2,901	2,982	3,122	3,261	3,378
Total	High	17,539	20,266	23,869	27,347	31,086
	Low	17,079	18,624	19,915	21,249	22,480

Southeast – The southeast is the largest region in Jacksonville. Incident totals are also the highest of any region in the city. Again, the trend here is strong growth in EMS incidents and a slight decline in fires. Table 35 shows the observed growth rates from 2000 to 2005 and Table 36 shows the projected incidents through 2025. Incident totals should remain beneath 40,000 through 2021. The best case scenario is for total incidents to remain beneath 30,000 through the year 2024.

Table 35: Southeast Region Observed Growth Rates

EMS	Fire
3.6	-1.0

Table 36: Southeast Region Projected Incident Totals 2006–2005

	Year	2006	2010	2015	2020	2025
EMS	High	20,003	23,292	27,952	32,189	36,834
	Low	19,301	20,924	22,147	23,305	24,370
Fire	High	5,288	5,504	5,826	6,131	6,411
	Low	5,262	5,287	5,458	5,601	5,712
Total	High	25,292	28,797	33,778	38,319	43,245
	Low	24,563	26,212	27,605	28,906	30,082

Other – Aid given to areas outside the city and incidents in undetermined locations comprise a seventh region for the purpose of our analysis. This region is labeled other.[65] A different methodology for incident projection will be used to predict future workload of this type. The ratio of EMS incidents assigned to this region against the total EMS incidents from the other six regions was calculated and this fixed rate was applied to the sum of the projected

[65] Geographic location of incidents was determined using geographic information system analysis. Obviously, the department did not respond to an unknown location. Instead, this relatively small percentage of incidents was unable to be pinpointed using these methods.

incident totals from each of the other regions.[66] In other words, the incidents from the region labeled other grow in proportion to the incidents from the six city regions. This procedure was repeated for the fires and both high and low incident boundaries were established. Table 37 shows these incident totals.

Table 37: Other Projected Incident Totals, 2006–2005

	Year	2006	2010	2015	2020	2025
EMS	High	4,114	4,727	5,583	6,367	7,226
	Low	3,987	4,297	4,531	4,756	4,963
Fire	High	436	453	478	503	526
	Low	432	425	433	439	443
Total	High	4,550	5,180	6,061	6,871	7,752
	Low	4,419	4,723	4,964	5,195	5,405

[66] The mean of the ratios of other incidents to the sum of the six regions for the years 2000-2005 is this fixed rate.

IV. STAFFING AND APPARATUS OVERVIEW

This chapter will review the staffing and apparatus deployments and policies for the JFRD.

Rescue Units

In the JFRD, 84,000 or 87 percent of the 121,000 calls in 2005 were EMS calls. Twenty five percent of the staff (257) is handling those 84,000 EMS calls. While these units do get some help from the suppression side via dual company response (an engine company), overall with respect to the expanding city growth, the EMS resources are not keeping up with the population and development growth curve. Essentially, 30 rescue units transport over 50 percent of the 84,000 calls. Hospitals in the city of Jacksonville are inundated, and units are required by law to stay in the emergency room with patients until triage occurs and a hospital bed becomes available. Unfortunately Jacksonville is not unique in this dilemma as a recent *Washington Post* article stated:

> "Emergency medical care in the U.S. is on the verge of collapse, with the nations declining number of emergency rooms dangerously overcrowded. …Long waits for treatment are epidemic …with ambulances sometimes idling for hours to unload patients. Once in the ER, patients sometimes wait up to two days to be admitted…"[67]

This causes a ripple effect in the number of on duty units that are therefore able to respond. It also creates a constant possibility that there will not be enough units available. Resources will rarely catch up with demand because demand in Jacksonville is so great and ever expanding.

Currently, rescue units are generally well deployed for the units that are in service. However, there is a dire need for more units and rescue stations to be placed and/or deployed in the north and west sections of the city most especially. There is also a lesser need, but a need nonetheless for units to be deployed on the Southside.

[67] Brown, D. "Crisis Seen in Nation's ER Care" Washington Post June 15, 2006

Both the northwest and northeast sections of town have compromised coverage due to long travel times to a potential scene, then subsequent transport to a hospital if required. The travel times for those areas respectively are in excess of 20–30 minutes.

The Southside, especially in the area of Beach and San Pablo is also in serious need of a rescue unit.

In the more southern section of the west side response times from both Station 57 and 32 is in excess of 10-12 minutes for most calls.

Engine companies do respond to EMS calls and when dispatched will generally get to a call before the rescue units. They are thereby able to evaluate calls and cut down on the low level BLS non transport call (i.e. sprains, skinned knees, etc.) and can send the ALS rescue units back to quarters.

Recommendation 36: The JFRD should consider placing a rescue unit in any new station that is opened currently or in the near future. The positioning/locations of the new stations that have opened and are scheduled to open, offer a optimum opportunity to address many of the holes in coverage that are occurring in certain section of the city.

Recommendation 37: The JFRD should seriously consider placing a rescue unit in Station 54. There is a strong need to increase the coverage in this section of town due to increasing call volumes and increasing demand.

Recommendation 38: The JFRD should seriously consider placing a unit in service in Station 49. Again, because of increasing population, increasing residential development and increasing demand it is increasingly apparent that there is a need for more ALS service in the section of the city.

Use of Quints

The question of using quints creates a fair amount of debate. The decision to buy or not buy a quint has been a difficult and complex one for many jurisdictions, and it usually comes down to the discussion of two general principles: apparatus versatility and financial constraints.

In the case of the JFRD the possible use of quints is linked to the need for more ladder related coverage on the outer rim or perimeter of the city in the northern, southwestern and southeastern sections of the city With Jacksonville we always come back to the increasingly exponential growth in population and development that thereby increases the need for ladder operations along with the basic engine company response. Quints can add to the flexibility that

the current engine companies on the outer rim can perform. Of course the use of quints would necessitate changing the current three person crews to four person crews.

There are many pros and cons to using quints. One of the main advantages is the versatility they provide. A quint is a combination fire apparatus that facilitates the performance of both engine and truck company fireground functions using one all-purpose apparatus. Because they comprise an aerial ladder, water source, hose, ground ladder, and pump, quints provide multi-functionality that the traditional pumper and ladder response cannot provide. When a quint pulls up to a working fire it has the capability to function as either type of fire apparatus depending upon the situation and can act as both in some situations if adequate manpower is available. As a result, quint production has begun to exceed standard ladder truck manufacturing and production.[68] Many communities, such as Richmond, VA, have long since gone to quints as a major component of fire apparatus fleets.

Specifications – It is extremely important to carefully choose the specifications needed for a particular district. Specific criteria must be established and evaluated by a committee of experienced fire personnel in the department who are familiar with the department's needs. The need to be "firefighter-friendly" and provide reliability and support in any and all fireground situations should also be of paramount concern.

Quints are notorious for requiring frequent maintenance and needing lots of fuel. There are many complex systems within the body of apparatus and, because of the compact nature of the many mechanical components and their proximity to each other, repair and maintenance of this type of apparatus can be problematic. Additionally, great care should be taken in developing specifications for quint construction. For instance, a tilt cab should be explored for its easy access to the engine transmission and the pump. Access paths in the cab to electrical devices in the dashboard should be considered. Compartments should be deep enough to place medical and emergency tools on the vehicle; quints traditionally have been compartment challenged because of space requirements for pump systems, hydraulic systems, ground ladders, and hose beds. Hose beds should also be scrutinized for ease of use and safety. [69]

[68] Loeb, Donald L., "It's still the same old story" Fire Chief Magazine June 1, 2001
[69] Gerner, Greg; Riter, Dave; Scaper, Frank. "21st" Century Quints" JEMS Communications, 2000

Training **–** The lack of a viable training budget must not hinder the delivery of the necessary training that is needed with the acquisition of a quint. The absence of proper operator and crew training will greatly limit the unit's effectiveness in the field. With the wrong leadership in training initiatives, there is the real possibility that the quint could become the equivalent of an overpriced engine or truck or, even worse, not have any unique use in JFRD operations at all.

The last place to assign a new or inexperienced fireground officer is to a quint. A quint demands an officer who is able to size up the many and varied fireground needs. That takes fireground experience, and experience in engine and truck company operations. It is imperative that a quint officer train a quint crew in engine and truck company operations.[70]

Part of the training should also include the teaching of specific SOPs that address when and how a quint is to be used in emergency operations. For example:

- If first due, the quint will function as an engine company.
- If second due, the quint will function as a truck company.
- If third due, the quint will function as a back-up truck.
- If fifth due, the quint will operate as an engine company.[71]

If the JFRD and the City of Jacksonville correctly prepare for the addition of a quint to the fleet, it can be of great benefit and provide added flexibility to the department for a number of reasons. As many fire departments have learned, the quint has a high degree of utility. In the case of the JFRD the quint will be one multipurpose tool in a fleet that is already dominated by engine companies and truck companies; it is not as if the JFRD will be transitioning into a total quint concept that would fundamentally change it as a department. The multiple-response SOP of apparatus to a structure fire comprises numerous possibilities for a quint. Additionally, it will more efficiently and effectively enhance the response capabilities when coupled with the recommended station location configuration in Chapter V. Addition of a quint also increases the number of aerials in the fleet, increases the ability to make rescues above the third floor, makes better use of staffing, and gives the fire department the capability of having a ladder pipe with 180 degree sweeping capabilities ready for immediate use.

Recommendation 39: JFRD should consider replacing the current engine companies and engine/ladder companies with quints at the following stations. Additionally, all future

[70] Rixner, Jake. "To buy (or not to buy) a Quint" Fire Engineering. April, 2001
[71] Ibid, pg.3

proposed stations on the perimeter of the city should add contingencies which include space for quints in their design.

- Station 47
- Station 48
- Station 49
- Station 56
- Station 58

The outer rim of city is lacking in ladder company coverage and response times into those areas for existing ladder companies in excess of ten minutes, as shown in Chapter 6. Additionally if the city decides to use quints, a provision should be added to include an additional quint to act as a reserve unit. The JFRD should also foster vigorous debate and discussions within their managerial ranks as to assessing if the use of quints is where they want to go as a department.

Marine Units

The Marine Division currently staffs two boats, Marine 1 and Marine 3. Each is staffed with 3 personnel and 2 personnel respectively. Each boat in addition to its water rescue capabilities has pumping capabilities for fire extinguishment. The Marine 1 unit has 3 pumps capacity of 6,000 GPM and the Marine 2 unit has a pumping capacity of 1,000 GPM. Marine 2 is the much faster boat. Both Marine 1 and Marine 2 are housed at Station 38.

Marine 3 which is stationed at Station 39 is the same as Marine 2 in size speed and pumping capability.

These two Marine division units are located about 6-7 miles from each other in the downtown area of Jacksonville on the St. Johns River.

Table 38 shows the average response time and number of incidents the marine units responded to in 2004 and 2005.

Table 38: Average Marine Unit Response Times, 2004 & 2005

Marine Unit	2004 Calls	2004 Average Response Time	2005 Calls	2005 Average Response Time
M1	20	10:36	19	6:48
M2	43	19:42	47	17:30
M3	100	16:10	90	10:42
M31	12	31:30	N/A	N/A

Marine Unit	2004 Calls	2004 Average Response Time	2005 Calls	2005 Average Response Time
M4	N/A	N/A	2	3:54
M40	10	12:24	11	23:48
M42	2	07:54	N/A	N/A

Over the past 25 years, cost saving measures have greatly impacted JFRD's ability to maintain the level of service that is increasingly required to maintain an acceptable level of coverage on the river and its tributaries. The marine units were often the brunt of cut backs that have occurred over those years, which have gradually compromised river response capabilities.

The St. Johns River is the longest river in the state of Florida and runs 310 miles from Indian River County to the Atlantic Ocean in Duval County or the City of Jacksonville. JFRD basically provides the bulk of fire and rescue services for the entire river from the Naval Station Mayport Navy Installation to south of the Buchman Bridge. In the past JFRD has always been able to rely on assistance from U.S. Coast Guard (USCG) and the Navy. However, in 2004 the department was informed that due to cutbacks in both those organizations that the Coast Guard, while able to provide quick assists with rescues when *available*, have no firefighting capabilities. Similarly, the Navy has some water borne firefighting equipment but it is slow and unwieldy, and response time could be in excess of two hours.

There were two additional cross-staffed (engine and marine unit coverage) marine units located at Station 13 and Station 40. The former is fairly well placed for response, while the latter is an excellent location for response in the northeastern section of the river. The problem is that both of these units have been out of service for some time, and have no impact on current call volumes and/or waterway related risks.

The risks associated with the St. Johns are many and are as follows:

- A major cruise ship terminal at Dames Point on the northeastern section of the river– 5 miles response.
- A major refit and ship building facility at Sister Creek.
- Numerous marine business and docking facilities all along the river, many of their housing high cost boats/yachts.
- High traffic during major events (as many as 400-500 craft commercial and private) in the downtown waterfront area at one time.
- There are roughly 30,000 vessels registered in Duval County.
- High traffic recreational boating and all the risks associated with same.

- NAS JAX flight path over the St. Johns River.

Recommendation 40: For the short term consider forging an agreement to use existing facilities located at NAS JAX, and form a cross-staffed engine/marine unit from Station 23. This would necessitate getting permission from the Navy to use that facility in addition to purchasing a new marine firefighting/rescue unit to house there. Travel time from Station 23 to the base marine launch has been estimated at approximately 5 minutes. This is an acceptable travel time to man the marine unit and respond to river borne calls in the southern section of the St. Johns, and thereby provide better river-borne emergency service.

Recommendation 41: Consider for the short term reinstating the cross-staffed engine/marine unit in Station 40. This station is in an excellent position to cover the northeastern section of the river, and any initiative to repair or replace a marine unit to make the cross-staffing viable is highly advisable.

Recommendation 42: In the next 5 years or less the JFRD should plan to place a cross-staffed marine unit permanently at either Station 40 or 48.

Recommendation 43: The proposed (unfunded) move of Station 42 should be a western move toward the St. Johns and should include a plan to incorporate a cross-staffed marine unit with firefighting and water rescue capabilities.

Recommendation 44: Consider forging a mutual aid agreement to use existing facilities located on NS Mayport, and form a cross-staffed unit from Station 41. This too would necessitate getting permission the Navy to use the facilities, as well as the possible purchase of the new marine unit capable of water borne firefighting and rescue.

Staffing

Jacksonville has become one of the increasingly unique metro fire departments in the country in that they have maintained for some time 3-person staffing on their engine companies. Truck companies and squads employ four-person staffing more in keeping with national and NFPA standards. This staffing configuration creates a daily minimum staffing level of 311 line personnel, that includes a 20 percent added "relief" factor of 62 line personnel that brings total minimum staffing and relief per shift of 373. The additional 62 personnel per shift is used exclusively to cover for uniformed personnel whom are off on various leaves. The station by station breakdown of personnel to companies is as follows:

Table 39: Station by Station Breakdown of Personnel

Fire Station	Engine	Ladder	Tanker	Woods	Utility/HM	Squad	Crash	Airtruck	Telesquad	Safety	Chief	Comm. Van	Fire Total
1	3	4								1	1	1	10
2	3												3
4	3	4			1						1		8
5	3							1					5
7	4				1								5
9	3	4											7
10	3	4								1	1		9
11	3												3
12	3												3
13	3												3
14	3												3
16	4						4						8
17	3												3
18	3	4									1		3
19	3												7
20	3												4
21	3	4											3
22	3										1		3
23	3												4
24	3												3
25	3		1										3
26	3												9
27	3												4
28	3	4	1								1		8
29	3		1										4
30	3	4											7
31	3		1										4
32	3			1		4							8
33	3		1										4
34	3	4	1								1		9
35	3			1									4
36	3												3
37	3												3
38	3												3
39	2												2
40	3		1										4

Fire Station	Engine	Ladder	Tanker	Woods	Utility/HM	Squad	Crash	Airtruck	Telesquad	Safety	Chief	Comm. Van	Fire Total
41	4												4
42	3		1	1									5
43	3		1	1									5
44	3	4	1										8
45	4												4
48	3												3
49	3		1										4
50	3			1									4
51	3												3
52				1					4				5
53	3			1									5
54	4												4
55	3												3
56	3												3
57	3		1										4
58	3										1		4
Total	**151**	**40**	**12**	**7**	**2**	**4**	**4**	**1**	**4**	**2**	**8**	**1**	**236**

Table 40: Rescue Station

Rescue Station	Rescue
1	2
2	2
4	2
7	2
10	2
13	2
15	2
17	2
19	2
20	2
21	2
22	2
23	2
24	2
27	2
28	2

Rescue Station	Rescue
30	2
31	2
32	2
34	2
35	2
36	2
42	2
50	2
51	2
52	2
55	2
58	2
71	2
103	1
104	1
105	1
Total	**61**

The staffing configuration JFRD uses with its engine companies does not fully conform to the standard NFPA 1710 sets. NFPA 1710, *Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*. NFPA 1710 specifically states:

- "5.2.2.1 Fire companies whose primary functions are to pump and deliver water and perform basic fire fighting at fires, including search and rescue…"
- "5.2.2.1.1 These companies shall be staffed with a minimum of four on-duty personnel."
- "5.2.2.2 Fire companies whose primary functions are to perform a variety of services associated with truck work, such as forcible entry, ventilation search and rescue, aerial operations for water delivery and rescue, utility control, illumination, overhaul, and salvage work…"
- "5.2.2.2.1 These companies shall be staffed with a minimum of four on-duty personnel."

As previously stated, the daily minimum operational staffing is 311. The department starts each shift with this number and when it falls below 311, and there are not a sufficient number of "relief" personnel, members are called back for overtime. The overtime budget for 2005 was $4.2 million.

JFRD has requested in past budgets an increase in minimum uniform personnel levels to 4-person staffing on the departments' engine companies. However due to budgeting constraints these requests have not passed in city council and the 3-person levels have remained the same. It is important to note that in TriData's 2001 report we concluded and recommended that JFRD move toward 4-person staffing modalities. The 2001 report states:

> While there is no reliable statistical data we are aware of on the cost-benefit of four-person staffing vs. three-person staffing, it is demonstrable that four-person staffing of engines and squads is more efficient and effective on the fireground than three-person staffing for non-trivial fires. One four-person unit can do as much work as two three-person units in many situations because it can be split into two two-person teams, whereas a three-person unit should not be divided for safety reasons.
>
> Another reason to consider four-person staffing on units is the "Two-In/Two-Out" rule of the Occupational Safety and Health Administration (OSHA). It requires that at least four firefighters be present to start interior fire operations unless there is a confirmed life hazard in the burning structure. Interior operations are not supposed to start until a two-person rescue team is available outside of the structure to go to the aid of the two firefighters inside. Having four personnel on the first arriving unit makes it possible to start interior operations immediately upon arrival of the first unit; a three-person unit has to wait for a second unit to arrive.[72] Fires tend to grow in size exponentially with time. The longer you wait, the larger the fire and the more resources needed to control it.
>
> The staffing per unit also affects the rapidity with which a given size force can be assembled, but the more important criterion is how fast the total team can be assembled regardless of the number of vehicles they ride on.
>
> Jacksonville has the same dilemma as other large-area Metro fire departments: whether to have a larger number of three-person units or a smaller number of four-person units for a given budget. If affordable, it would of course be preferable to staff all units with four firefighters. The decision varies with the risks to be covered, the desired response times in the outlying areas, and considerations of firefighter safety.

This aspect of the 2001 report is still relevant and equally apropos to the current situation that exists for Jacksonville today. A consideration discussed in this current report that was not addressed in the previous one is the weight of response and how that factor might affect fireground operations. The weight of response refers to the number of units responding to a

normal first alarm structure fire. A first alarm assignment for a typical structure fire is as follows:

Table 41: Structure Fire First Alarm Assignment

Number of Units	Type of Unit and/or Assignment	Number of personnel
3	Engines	9 (10)*
2	Ladders	8
1	Rescue unit (ALS)	2
1	Safety officer	1
1	Tanker**	1
2	District chiefs	2
Total		**22 (23)*** **

*This possible additional person is due to the 4-person staffing of five units

**In designated response areas

***23 with tanker response, 22 without.

It could be perceived that this weight of response could handle the OSHA 2-in/2-out requirement. However, on closer examination it is important to point out that the 2-person rescue units are on scene to monitor and respond to civilian and firefighter injuries, the safety officer is exclusively on scene to monitor exterior safety conditions and keep track (along with the two district chiefs) of personnel inside a structure. That leaves a possible 16 or 17 (if one driver stays with the engine that is the water source and the other two enter the structure, in addition to the possibility that one of the district chiefs dons turnout gear and enters) to cover firefighting personnel requirements.

Basically, JFRD is making the system work with the personnel they have. This is working for the short term, but we reiterate: with rapid growth and development that is occurring in the city it is imperative that Jacksonville consider 4-person engine crews. The increases in demand are straining the system.

Recommendation 45: The JFRD along with the Cit should seriously consider going in the direction of 4-person engine companies. The reasons are three-fold:

- 4-person crews create a more effective, efficient fireground force
- Creates more opportunities for cross-staffing throughout the system.
- The increasing call volume and demand for services.

[72] The JFRD, like many other departments nationwide, will use the pump operator as part of the "two-out" crew. This scenario is not ideal and should be avoided when possible; the pump should be monitored constantly, and the two standby rescue crews preferably should not have a major duty other than standby.

For instance, if new hires are required to have paramedic certifications one person on each engine could respond to EMS calls and relieve some of the strain placed on rescue units and ALS response in general. Additionally, the added personnel could be utilized to cross-staff marine units without compromising overall unit response, which might cause shortages via the ripple effect within the entire fire operations system.

Information Technology

JFRD has probably the best automated staffing software program we have seen anywhere in the country. It is a system that was created in-house that has the title of the JFRD Field Staffing and Resource Management System. The JFRD and City of Jacksonville is to be highly commended for the development and use of this system which has features that are unprecedented in any department we have studied.

The systems' features include:

- A database that contains all the information on all uniformed personnel including battalion, shift, time balances, etc.
- The system is linked to payroll electronically
- The system is accepted by the Jacksonville Human Resources (HR) department for payroll purposes
- A streamlined staffing and payroll process that saves time and resources.

An example of the efficiency of the system that was cited to the team involved overtime calculations for staffing during the recent Super Bowl held in Jacksonville. When calculating overtime for the event, it took the Duvall County Sheriff's Department six months to compute the hours while it took JFRD one week to compute the hours for an equal or greater number of personnel.

This is a valuable system which could be marketed and patented for profit, and if there is some way as a municipality the City of Jacksonville could package this software for sale to other jurisdictions it could become a major revenue source.

An email account is accessible to every firefighter and linked to JFRD and HR in order to put in time off requests electronically in an approved, accepted and recordable document for HR purposes.

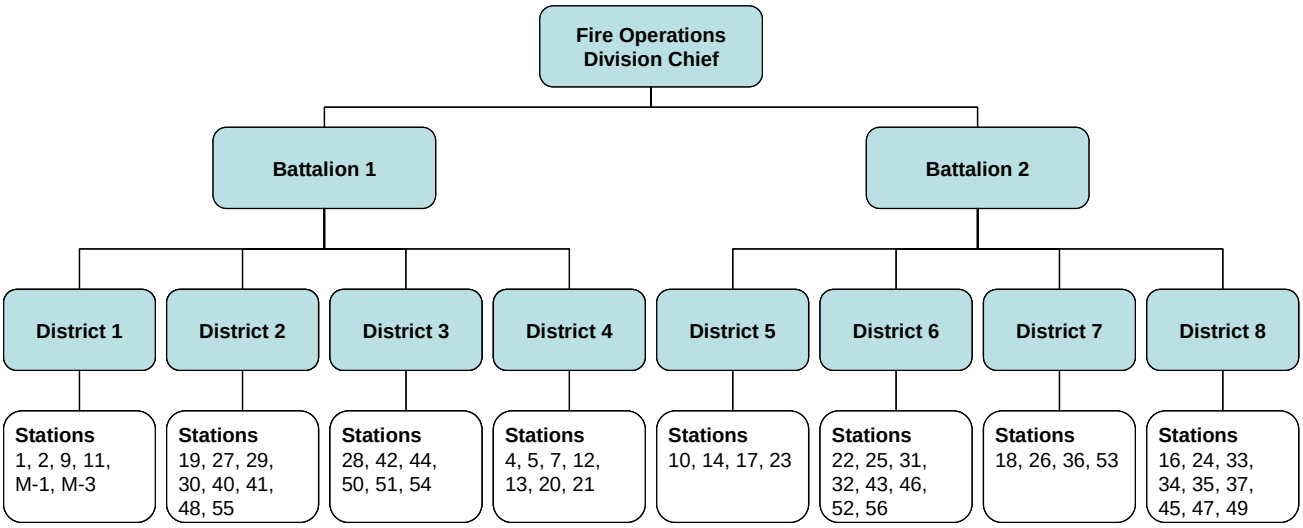
Span of Control

JFRD has a convoluted as well as an unwieldy span of control within the department. This problem is endemic to both JFRD fire operations and rescue services.

Best practices throughout the fire service dictate that a manageable span of control is optimal when managers oversee fire companies that should never exceed nine at a time. TriData has found that the fire departments throughout the county that have spans of control around five to seven companies work best and most efficiently.

The issue that compounds JFRD's span of control however is not just the high numbers of companies (stations) that are under the purview of the District Chiefs (DC), but also the imbalance and disparity between the number of companies a district encompasses versus other districts within the same system. The current configuration is confusing. Some have as few as four companies, and others have as many as nine. One indication of how confusing the system is has to do with the organization chart TriData requested for operations that was difficult for the department to produce, and when produced was not very clear. The following organization chart for Operations and Rescue are represented in Figure 7.

Figure 7: Current Fire Operations Organization Chart

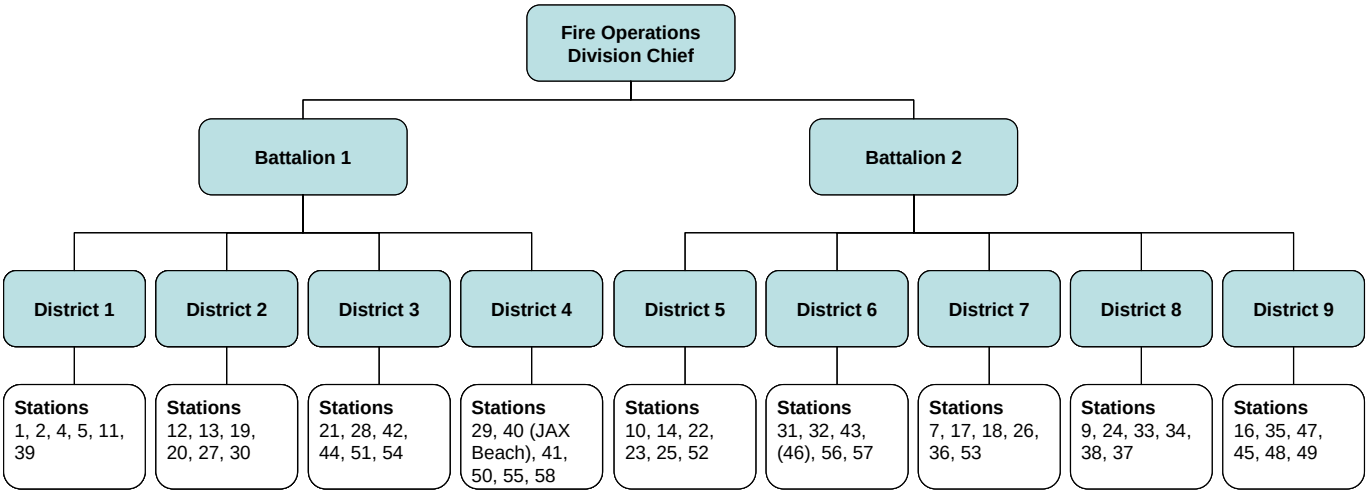


It was posited during the triage process that this disparity was based on distances and travel time. This is not a valid justification for the convolution. There needs to be more equanimity in the assignment of companies/stations within the department. Recent disciplinary problems, for instance, are exemplary of and exacerbated by the fact that deputy chiefs are taking care of so many stations in some instances, in addition to their other demanding overall duties. In the current configuration, they are spread too thin.

Recommendation 46: JFRD should seriously consider adding one district to the existing districts, thereby creating more equanimity in the organizational span of control within operations. This addition and reconfiguration of companies will make fire operations more efficient and effective and provide a greater degree of continuity in the management of the department. An additional three deputy chief positions will have to be created to facilitate the creation of an additional district.

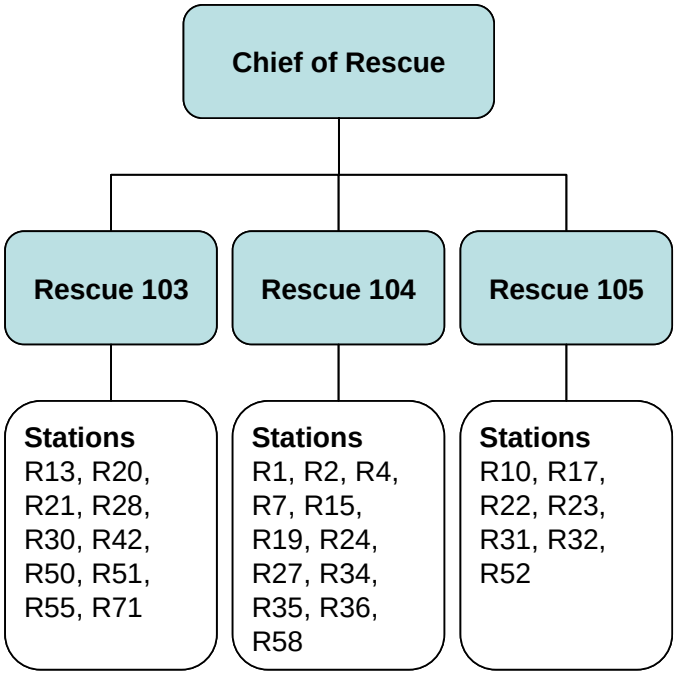
The following is the proposed organizational chart showing the possible configuration a new district:

Figure 8: Proposed Fire Operations Organization Chart



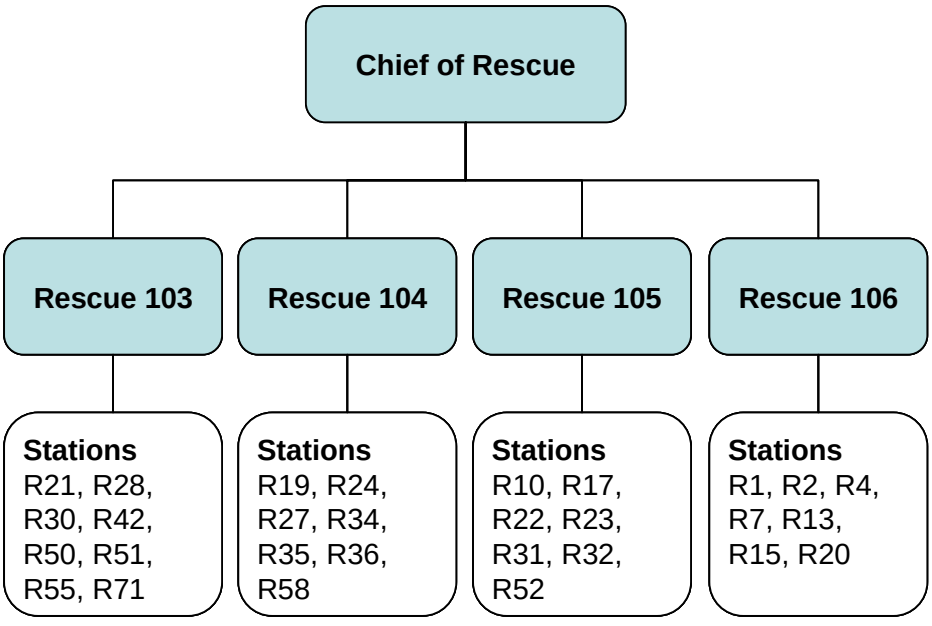
Rescue – The Rescue division also has a dangerously high span of control problem. TriData feels that the current span of control seriously places strains on a very good system that could be a much better system and increase its organizational effectiveness. Quality control is an integral component of safe and effective EMS programs. With rescue battalions that have nine to twelve units it is difficult at best to effectuate consistent quality control. Management cannot be fully effective under these conditions.

Figure 9: Current Rescue Organizational Chart



Recommendation 47: Create one additional rescue District and three new District Chief positions. Split current battalions Rescue 103 and Rescue 104 into another district paring each down to units of around seven. Leave Rescue 105 as is, as it is currently at a manageable level.

Figure 10: Proposed Rescue Organizational Chart



Staffing Factor Coverage

Another point for consideration for any fire department is to identify the actual number of people it takes to staff the emergency vehicles 24 hours a day, seven days a week. This is typically called a staffing factor or coverage factor and acknowledges that each individual will be off for vacation, sick, FMLA, worker's compensation, etc. for some portion of their regular duty hours. The JFRD currently has 373 personnel per shift to meet a daily staffing requirement of 311. The additional 20 percent of personnel assigned to each shift is to cover all types of leave that occur throughout a yearly cycle. In other words it is designed to cover those personnel that will be off and still maintain the 311 coverage. Invariably however there is still overtime generated on just about a daily basis. The overtime budget last year was in excess of $4.2 million. Consequently, time off is essentially exceeding the difference between these two, necessitating overtime. To constantly staff an engine with three people typically requires 12 to 14 people.

An example of how to compute the staffing factor is illustrated in Table 42. This analysis was originally prepared for Arlington County, Virginia, which also has a 56-hour workweek; the computations are similar for Jacksonville. The items marked in bold italics are calculated based on historical leave usage in the JFRD supplied by their Finance and Payroll department.

Table 42: Illustration of Staffing Factor Calculation (Arlington County, VA)

A	Number of Days in a Year	365
B	Number of Hours in a Day	24
C	Number of Hours in a Year (A X B)	8,760
D	Number of Shifts	3
E	Number of Hours of Scheduled Work per Employee per Year (C / D)	2,920
F	Less: Average Number of Hours of Leave Consumed Per Year	***-288***
G	Number of Productive Hours per Employee per Year (E – F)	2,632
H	Staffing Factor (E / G)	1.10
I	Number of Employees Needed per Position for 24/7 Staffing (H X D)	3.3

Applying Arlington's staffing factor to the JFRD minimum staffing requirement of 311 indicates that 1096 personnel are needed to cover the 311 positions through vacations, sick leave, etc. (3.3 *x* 311 = 1,026). JFRD currently has sufficient staffing; the operations personnel currently on staff is 1,067. When additional units are placed in service, the funds to support the constant staffing of that unit should be included. This type of analysis should be done on a regular basis, and particularly when staffing levels or leave and benefits change.

Recommendation 48: The Department should establish a staffing factor to determine the number of employees required to maintain constant staffing. This staffing factor should be utilized in funding and hiring processes. This analysis should include the leave experience of the JFRD to determine the average number of hours operational personnel are not available to staff emergency apparatus.

V. RESPONSE TIMES

Response time is the total amount of time elapsing between an individual calling 911 and emergency service personnel arriving at the scene. Response time can also be broken down into multiple segments: call processing and dispatch, turnout, travel, and vertical.

Response times are still most commonly measured as averages, perhaps more easily understood than other measures; however, averages have limitations. The average response time can be misleading because it can be affected by a few very large response times that are either actual responses or data entry errors.

Many departments are now reporting fractile response times—the percentage of calls responded to in *x* minutes. A fractile response time of *x* at the 90th percentile means that units respond in *x* minutes, or less, 90 percent of the time. The remainder beyond the compliance fractile (90^{th} percentile in this case) is the operational tolerance for the system, meaning the system is designed with the understanding that 10 percent of the calls may have response times that exceed the target. Using a fractile measurement significantly reduces the distortion found in averages when a small number of very high or very low values are present. Also, the public is interested in how fast a system responds in most cases rather than on average.

Methodology

The analysis of response times included emergency incidents only. Call processing included the first unit dispatched to each incident. Turnout, travel, and total response times included only engines, ladders, rescues, and the squad. These criteria were applied to keep the analysis in line with the standards against which times are being compared elsewhere. Response time segments were obtained from the CAD data for 2005. In some cases there were incomplete entries (no time recorded) or obvious errors (unit arrived before the call came in); these cases were excluded from the data set. Response time data was analyzed using the statistical program SPSS.

Call Processing

Call processing time includes both call processing (answering the call and taking down necessary information) and dispatch (notifying the appropriate units to respond). Most CAD systems track these two time segments together; Jacksonville records them separately.

In Jacksonville, 911 calls are received at the Jacksonville Communications Center, run by the Sheriff's Department. Fire and EMS calls are transferred to the JFRD Communications Center for processing and dispatch. Dispatch personnel then gather necessary information from the caller and dispatch units. All of this time is included in the call processing times discussed below.

In 2000, call processing plus dispatch was estimated to take 60–90 seconds compared to the recommended 50–60 seconds. In 2005, call processing plus dispatch times for the JFRD averaged 58 seconds with a 90th percentile time of 1:25. These times are slightly above the 60 seconds recommended by NFPA, but in line with the times accomplished in some other departments, as shown in Table 43.

Table 43: Comparison of 90th Percentile Call Processing Times

City	90th Percentile
Corpus Christi, Texas	01:39
Irving, Texas	01:44
Lynnwood, Washington	01:40
Jacksonville, Florida	01:25

Call processing alone was 39 seconds on average and 1:09 at the 90th percentile. The average dispatch time was 19 seconds with a 90th percentile of 21 seconds.

Table 44 shows the average and 90th percentile call processing plus dispatch times for 2005 by type of call. Both call types are processed and dispatched at about the same rate, a healthy sign.

Table 44: Jacksonville Call Processing plus Dispatch Time by Call Type

Type	Average	90th Percentile
EMS	00:58	01:24
Fire	00:58	01:30

Turnout

Turnout time is measured from when the alarm is received by personnel to when the apparatus begins driving to the incident scene. In 2000, turnout times for JFRD personnel were estimated at 30 to 60 seconds. The average turnout time in Jacksonville in 2005 was 0:32 with a 90th percentile time of 1:08, both excellent times, consistent with 2000. NFPA recommends a one-minute 90th percentile turnout time, which is essentially met.

80the percentile turnout times range from 52 seconds in the late evening (8 P.M. to 10 P.M.) to 1:24 in the middle of the night and early morning (2 A.M. to 6 A.M.). When examining the turnout times by call type, the times remain similar to the overall results: 1:07 for EMS and 1:13 for fire. Turnout times for fire and EMS are very similar despite fires requiring the donning of protective equipment. Again, this is very great performance.

Considering the different segments of response time it is often easier and less costly to improve call processing and turnout times than travel times. Travel time is typically much more difficult and expensive to improve (it requires new stations, new roads, or traffic signal interruption devices). Reducing the first two times will reduce total response times. Reduction in call processing and turnout time also permits longer travel times without increasing total response times; thus, stations can typically serve larger areas and still meet response time goals. The critical time is to dispatch the first unit; further call processing can occur simultaneously (i.e., talking more to the caller to obtain details).

However, Jacksonville has very good call processing, dispatch, and turnout times. There is little room for improvement in these areas, leaving travel time the main area for improving overall response times.

Travel Time

Travel (drive) time is the time it takes to travel from the station, or wherever the unit is, to the emergency incident. Station and apparatus placement have the biggest impact on travel time. (Apparatus are not always in the station when dispatched to an incident.) Additional factors influencing travel time include traffic, weather, traffic limiting devices (stop lights, speed bumps, etc.), and driver familiarity with the area. Weather is beyond the department and city's control; however, traffic limiting devices, driver knowledge, and the road system are not.

Because the JFRD covers a very large, diverse area, three travel time goals were recommended in 2001. These goals were 5 minutes, 7 minutes, and 9 minutes at the 80th percentile for urban, suburban, and rural areas respectively. The goals recommended in 2001 included one minute for turnout.

NFPA 1710 recommends a four-minute travel time at the 90th percentile for career departments in urban areas.

Overall travel times in Jacksonville averaged 5:18 with a 90th percentile of 9:10. However, the first arriving unit averaged 4:14 with a 90th percentile time of 7:02. These times are

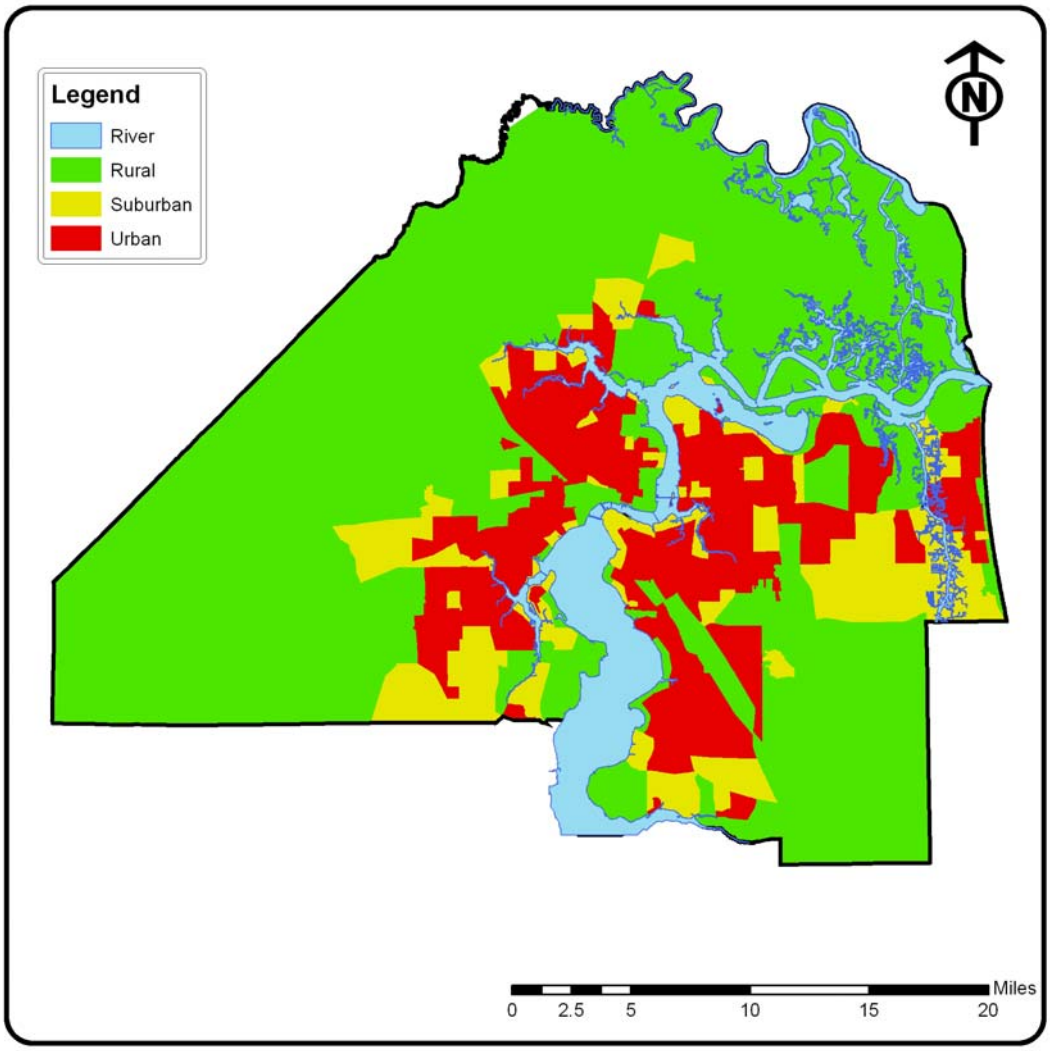
above the recommended travel times for the urban area, but good overall given the size of the city and the inclusion of suburban and rural areas.

Map 1 shows the urban, suburban, and rural areas of Jacksonville as determined by population density.[73] Map 2 shows 90th percentile travel times by fire response zone. Generally, the urban areas have 90th percentile travel times over 4 but under 6 minutes. The suburban areas have 90th percentile travel times between 4 and 8 minutes. Most areas with travel times over 8 minutes are low population density, low incident density areas.

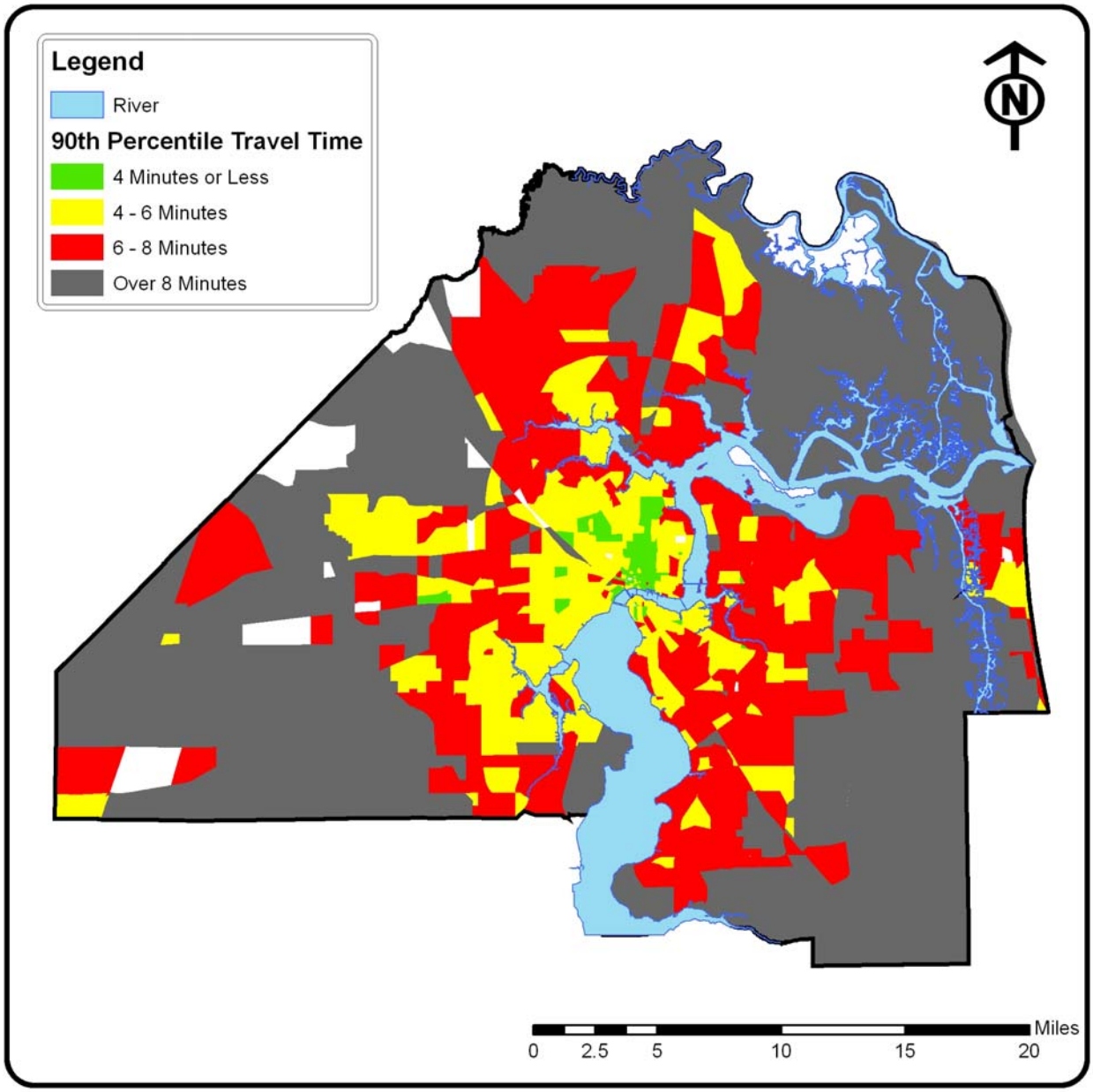
Finally, travel times throughout the day are relatively steady, ranging from a low of 6:51 between 10:00pm and midnight to a high of 7:30 between 4:00am and 6:00am. Rush-hour traffic does not delay emergency response vehicles much more than traffic throughout the day.

[73] Urban, suburban, and rural are defined by population densities: urban = 2,000+ people/sq. mile, suburban = 1,000–1,999 people/sq. mile, rural = <1,000 people/sq. mile.

Map 1: Urban, Suburban, and Rural Area Designations



Map 2: 90th Percentile Travel Times by Fire Response Zone



Vertical Response

Vertical response time is the time to get from the street to the patient's side or fire location. It includes time to dismount from the vehicle, assemble equipment, and locate the patient or fire floor. The time can be significant in areas with high-rise buildings or large properties (e.g., malls or golf courses). Vertical response time is tracked by only a few first responder departments—commendably, JFRD is one of the few.

Recommendation 49: Begin tracking vertical response times. While this time is nearly impossible to reduce, it is important to assess its impact on total response time and determine whether other components should be reduced to compensate for the vertical response component to maintain total response time goals. One method to measure and record vertical dispatch time is to require personnel to radio the dispatch center when arriving on scene and again once at the patient's side.

Total Response Time

In 2005, total response times for JFRD units averaged 5:54 for the first arriving unit to all calls with a 90th percentile total response time of 8:49. It is important to note that, for mathematical reasons, one cannot simply add the 90th percentile time components of response time to reach the total response time.

Table 45 shows the 90th percentile total response times for first arriving unit in 2005 by call type and by unit type. There is about a 30-second difference in total response time between EMS calls and fire calls. The first arriving engine has a total response time of 3 minutes less than the first arriving rescues primarily because there are far more engines than rescues in the city.

Table 45: 90th Percentile Total Response Time by Call Type and Unit Type, 2005

Type*	90th Percentile Total Response Time
EMS	08:43
Fire	09:19
Engine	09:11
Rescue	12:29
Ladder	10:59

* Response times are for the first arriving unit.

Response times in the rural areas of Jacksonville are lower than the recommended rural response time goal, which is very good. However, in the urban areas, response times are higher than recommended. Despite the urban response times not meeting the recommended goal, they are, in fact, lower than the rural response times. This is likely due to the higher concentration of stations and apparatus in the urban areas.

In order to reduce travel and thus total response times, additional stations are needed. A geographical analysis of current coverage, planned stations, and additional recommended stations is presented in the next chapter.

VI. ANALYSIS OF STATION AND APPARATUS LOCATIONS

This chapter discusses the deployment of fire stations and emergency response apparatus in Jacksonville. The goal is to consider the need for additional resources in areas with high demand and high response times. We also look for any economies such as stations that could be combined. As discussed earlier, to undertake the analysis the city was divided into six regions. Engine coverage is discussed by region while ladder and rescue coverage is discussed citywide.

The recommendations in this chapter take into account many factors, including demand for services, population, density of demand and population, size of the jurisdiction, and desired response times. These factors are the primary determinants of the appropriate number of stations, apparatus, and personnel to provide fire and EMS services to an area as well as where to place those resources.

Methodology

Before any analysis took place, project team members gathered and reviewed information related to properly locating fire stations, including but not limited to:

- Current and planned station locations
- Current apparatus deployment
- Current zoning and land use and related policies
- Response time standards
- Current and projected population (see Chapter III)
- Current and projected demand and unit workloads (see Chapters III and IV)

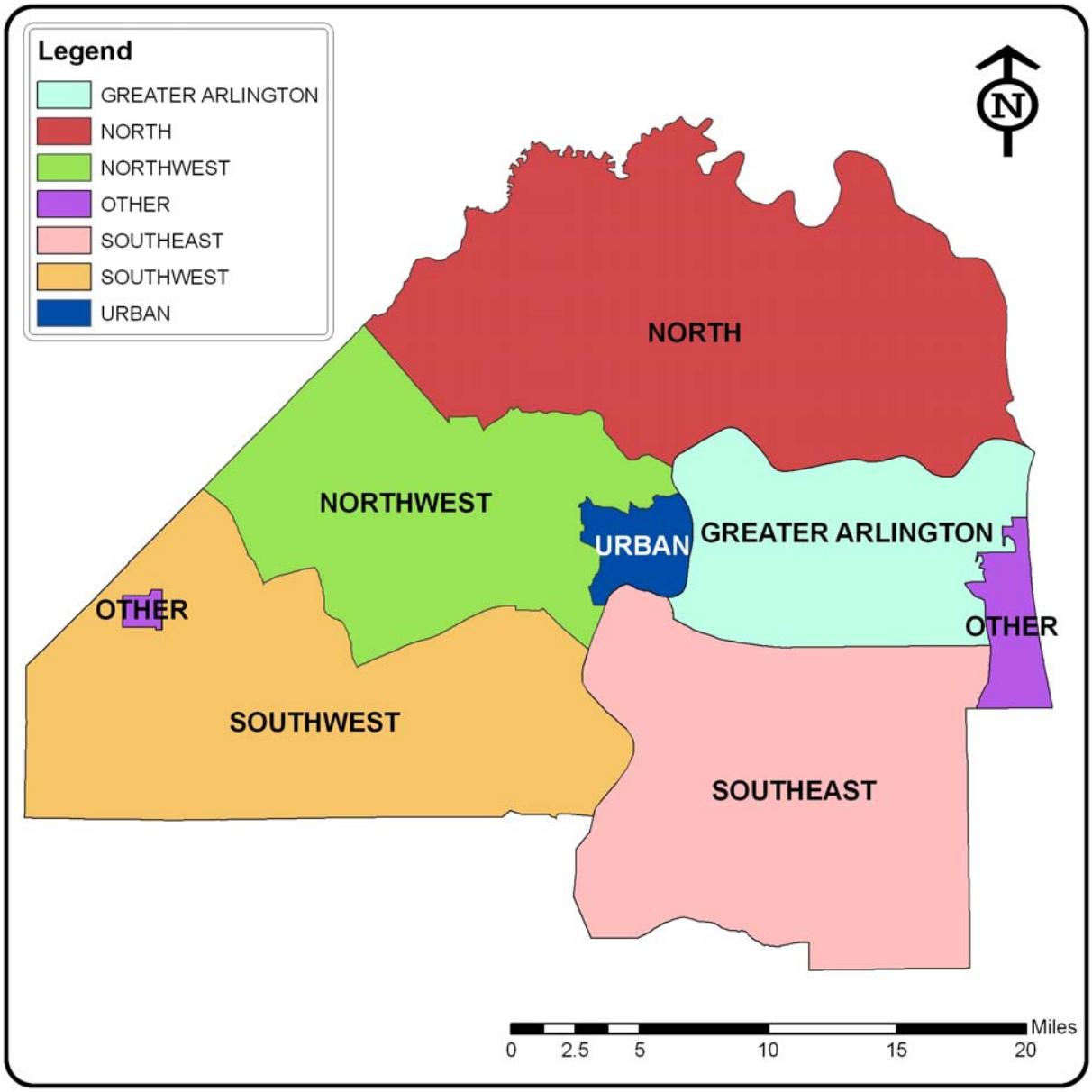
Actual incident data from 2005 was gathered from the computer aided dispatch system (CAD). Data included addresses for geocoding, type of incident, units responding, and overall

response times.[74] Geographic information system (GIS) files used for the analysis were provided by the city.

Since this study is an update to a previous study, the results of the analysis were broken down in the same way: by planning district. The six districts are shown in Map 3. The JFRD also helps protect two areas outside the city: the City of Baldwin in the Southwest Planning District and Atlantic and Jacksonville Beaches on the East.

[74] Geocoding is a process by which the street address of an emergency incident is translated into latitude and longitude so that it can be placed onto a map.

Map 3: Jacksonville Planning Districts



In addition to the response times, demand, and workload discussed up to this point, this analysis takes into account incident density based on geocoded incidents. The 2005 CAD data included 107,834 unique emergency incidents, 90,929 of which contained with complete addresses and 86,097 (95 percent) geocoded.

Response coverage of stations was estimated using the average travel speed of units in the region. Although the population density of the city shows urban, suburban, and rural areas, the suburban areas are generally intermixed with the urban areas. Thus, for this portion of the

analysis, only the urban and rural response time goals illustrated in Table 46 were used. The response time used for each station was based on the level of development near the station (Map 1 in Chapter V).

Table 46: Travel Time Goals – Station Location Analysis (minutes)

	Engines	Rescues	Ladders
Urban	4	6	6
Rural	8	8	10

The area that individual stations can cover in the 4, 6, 8, or 10 minutes were estimated using GIS software. The response goals were converted from minute range into miles using the estimated travel speeds of units in each region. To calculate the average speeds of units in each region, the distance from a station to all incidents that a specific unit responded to were calculated and matched to the corresponding travel times for that unit. All average travel speeds below 10 mph and over 60 mph were removed and the average calculated for that unit. All units of the same type were then averaged together to get the distance traveled in the allotted time. This was done for multiple units of each type in each region with the exception of ladders. Because there may be only one ladder in a region, six ladders were selected throughout the city and averaged together. The results are shown in Table 47.

Table 47: Average Travel Speeds (mph)

Region	Engines	Rescues	Ladders
Southwest	28	28	
Northwest	25	29	
North	29	29	
Greater Arlington	22	27	
Southeast	26	27	
Urban	20	17	
Citywide	25	26	26

Engines

Southwest – The southwest region covers 192 square miles and is bordered on the east by the St. John's River and the southeast region, on the south and west by Clay County, and on the north by the northwest region. The region is protected by 10 fire stations: 14, 22, 23, 25, 31, 43, 46, 52, 56, and 57.

In the southwest region, 90th percentile travel times for the first arriving unit in 2005 was 07:22. For the less developed western portion of the region, this is a very good travel time. Map 4 shows the 4 and 8-minute coverage from current stations in the southwest region. Also on the map is the density of incidents from 2005.

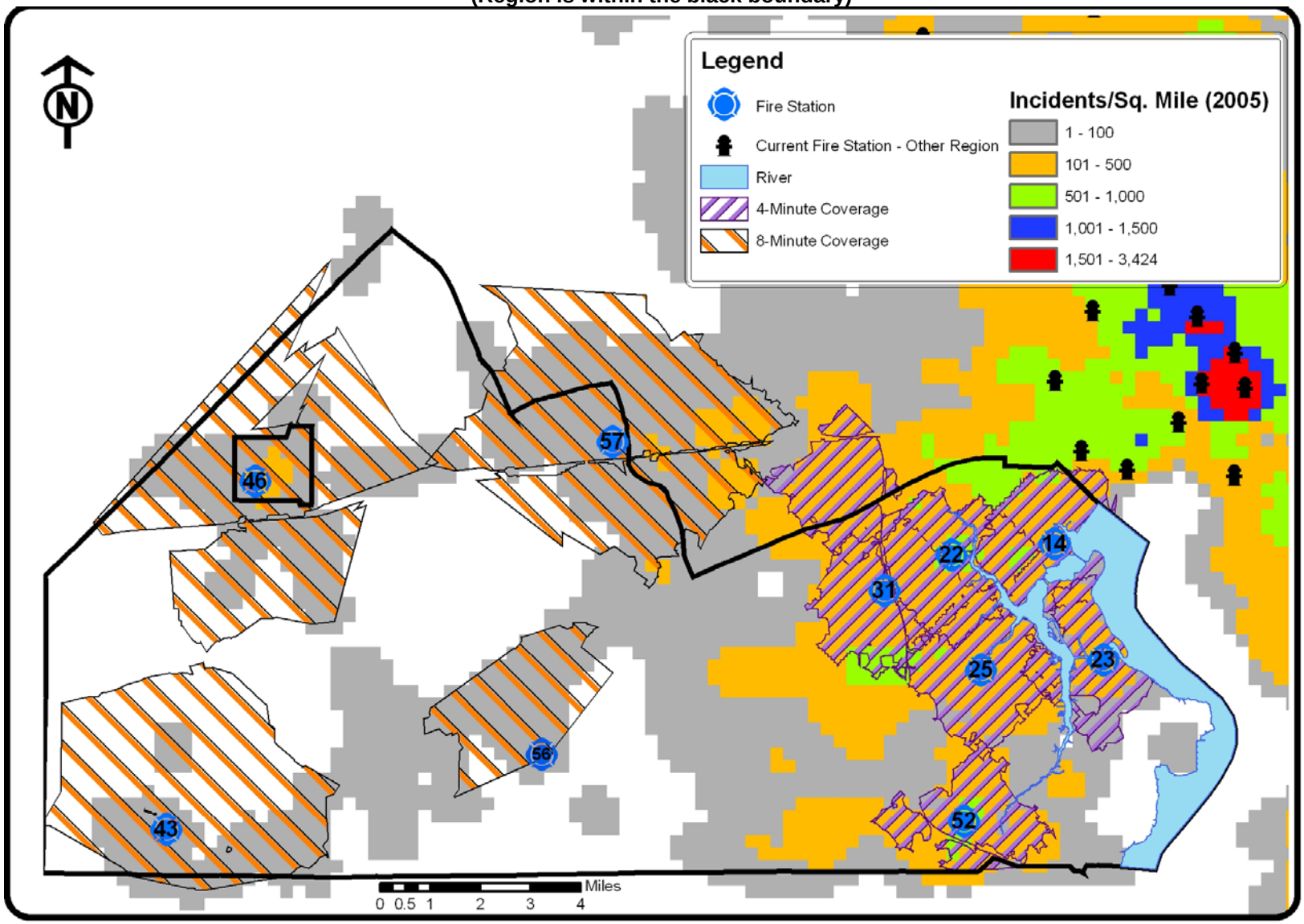
The map indicates a gap in coverage south of Station 31. It also shows a significant amount of overlap with Station 22. There are already plans under way to move Stations 25 and 31. The planned relocations and new coverage are shown in Map 5. Although there are large areas of the region that are not covered in 4 or 8 minutes, the majority of these areas are low density population and low density demand areas. The medium-density demand areas not covered in 4 minutes are covered in 6 minutes or less. In addition, all major hazards are covered in a reasonable amount of time. While additional stations will be warranted as the region continues to develop, over the next 10 years, there are areas in the city with a greater need for additional resources.

Recommendation 50: Continue with plans to move Stations 25 and 31 in the southwest region. These two moves will position resources to serve the region at acceptable levels for the next 10 years.

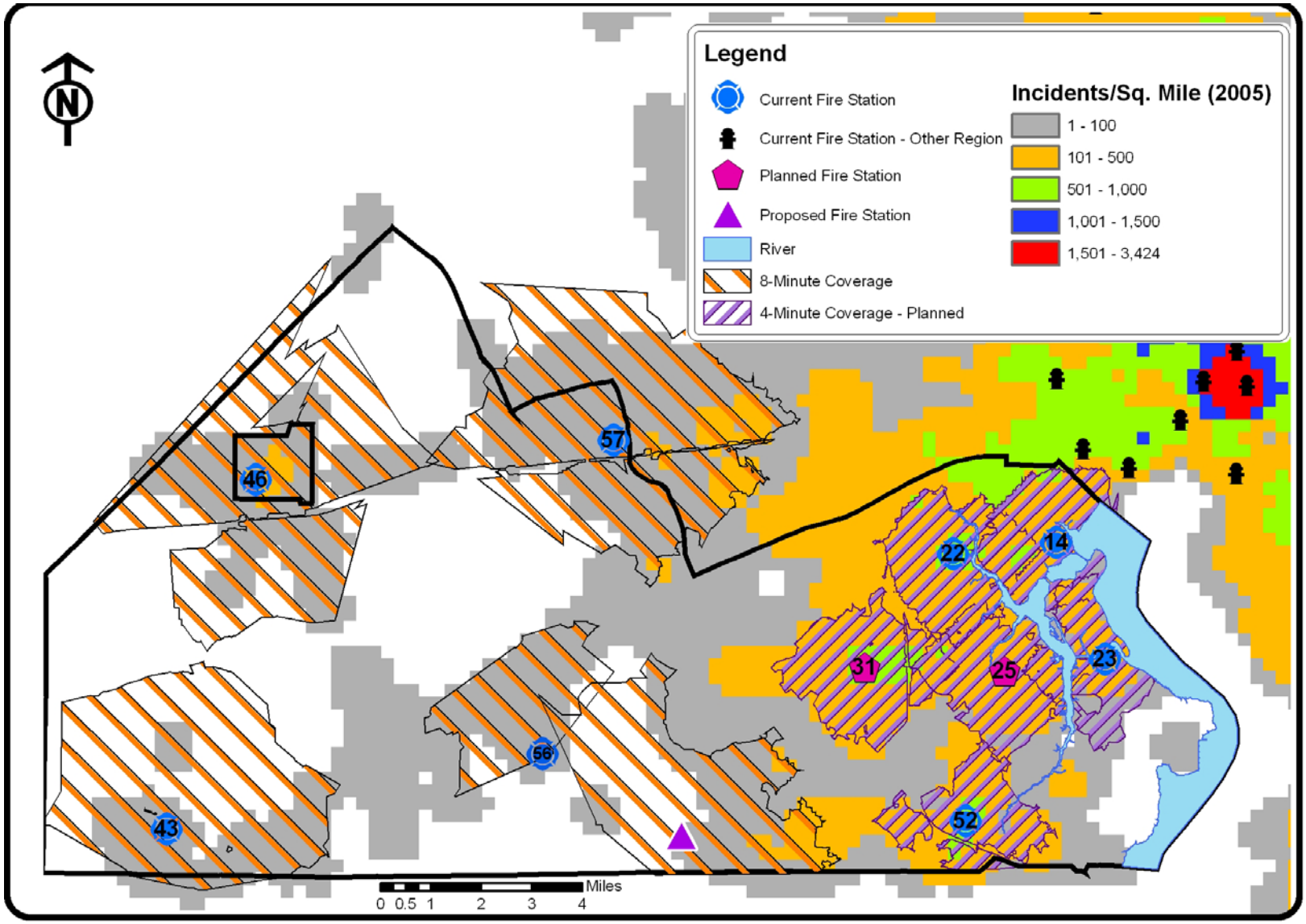
Recommendation 51: Build a connector road from the Cecil Field access road (Station 56) to Branan Field Road. This would reduce the travel distance from Station 56 to that area from almost 8 miles to less than 4 miles. The responding unit from Station 56 would require clearance from the Cecil Field Airport control tower to cross the active runway. In the case of most emergency calls the anticipated delay would be minimal. From the station, it is 1.5 miles to the Cecil Field access road and Gate 9 and an additional 1.5 miles to Branan Field Rd. Gate 9 would require an electronic operation control device to facilitate access by the apparatus. The responding unit would proceed to the incident via this route, but would return to Station 56 on the major roadways to reduce the disruption of airport operations.

Recommendation 52: Build a new station in the area of Branan Field Road and Argyle Forest Boulevard. This area is developing rapidly and current response times from Stations 52, 31, and 56 are too long. The construction of the connector road to Station 56 will help reduce response times to this area in the short term (as well as reduce costs); however, if development continues and demand increases, it will be necessary to build a new station in this area at some point within the next 10 to 15 years.

Map 4: Southwest Region Response Coverage – 2006
(Region is within the black boundary)



Map 5: Southwest Region Response Coverage – Proposed

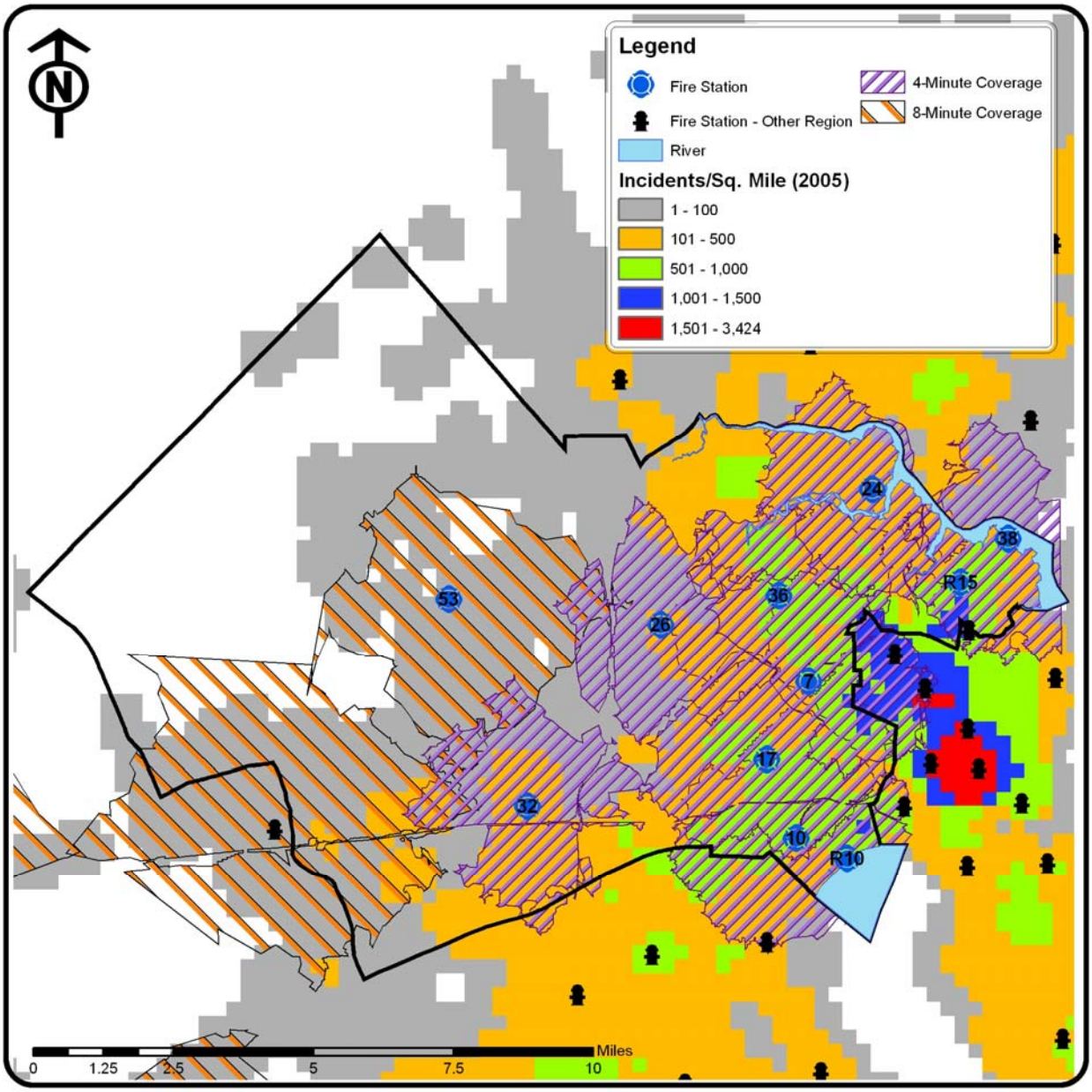


Northwest – The northwest region covers 126.5 square miles and is bordered on the east by the St. John's River and the urban region, on the south by the southwest region, on the west by Clay County, and on the north by Nassau County and the north region. The region is protected by nine fire stations: 7, 10, 17, 24, 26, 32, 36, 38, and 53.

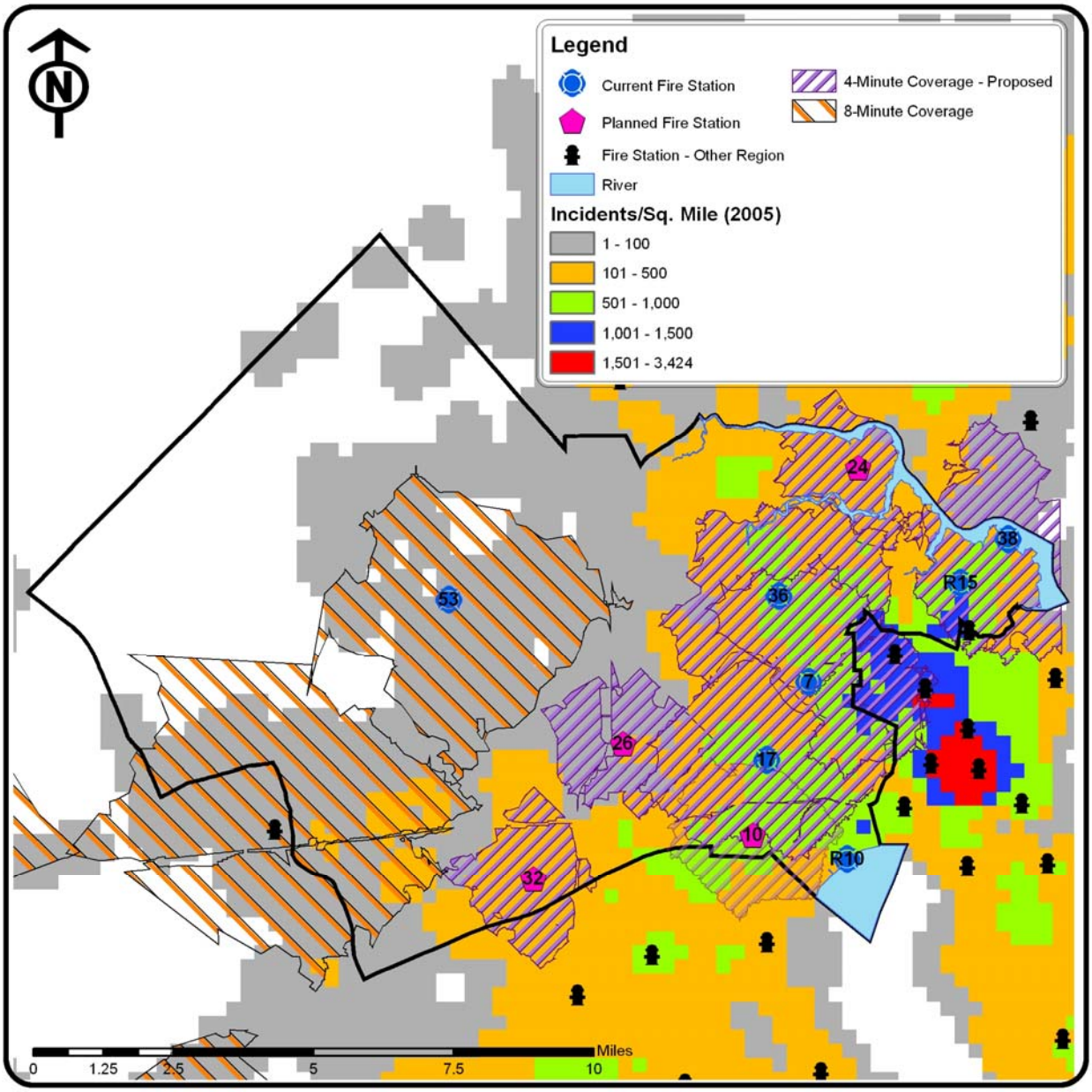
In the northwest region, 90th percentile travel times for the first arriving unit in 2005 was 06:18. Overall, this is one of the better times for the regions and is excellent given the size and diversity of the region. Map 6 shows the 4 and 8-minute coverage from current stations in the northwest region. Also on the map is the density of incidents from 2005.

The map indicates a gap in coverage south of Stations 26 and 36. There is also a gap in coverage between Stations 10 and 32 and a significant amount of overlap between Stations 10 and 17. There are already plans under way to move Stations 26 and 32. Relocating Station 10 was recommended in 2001 but has not yet been funded. The planned and proposed relocations and new coverage are shown in Map 7. As with the southwest region, the areas not covered in 4 or 8 minutes are low density population and low density demand areas.

Map 6: Northwest Region Response Coverage – Current



Map 7: Northwest Region Response Coverage – Planned

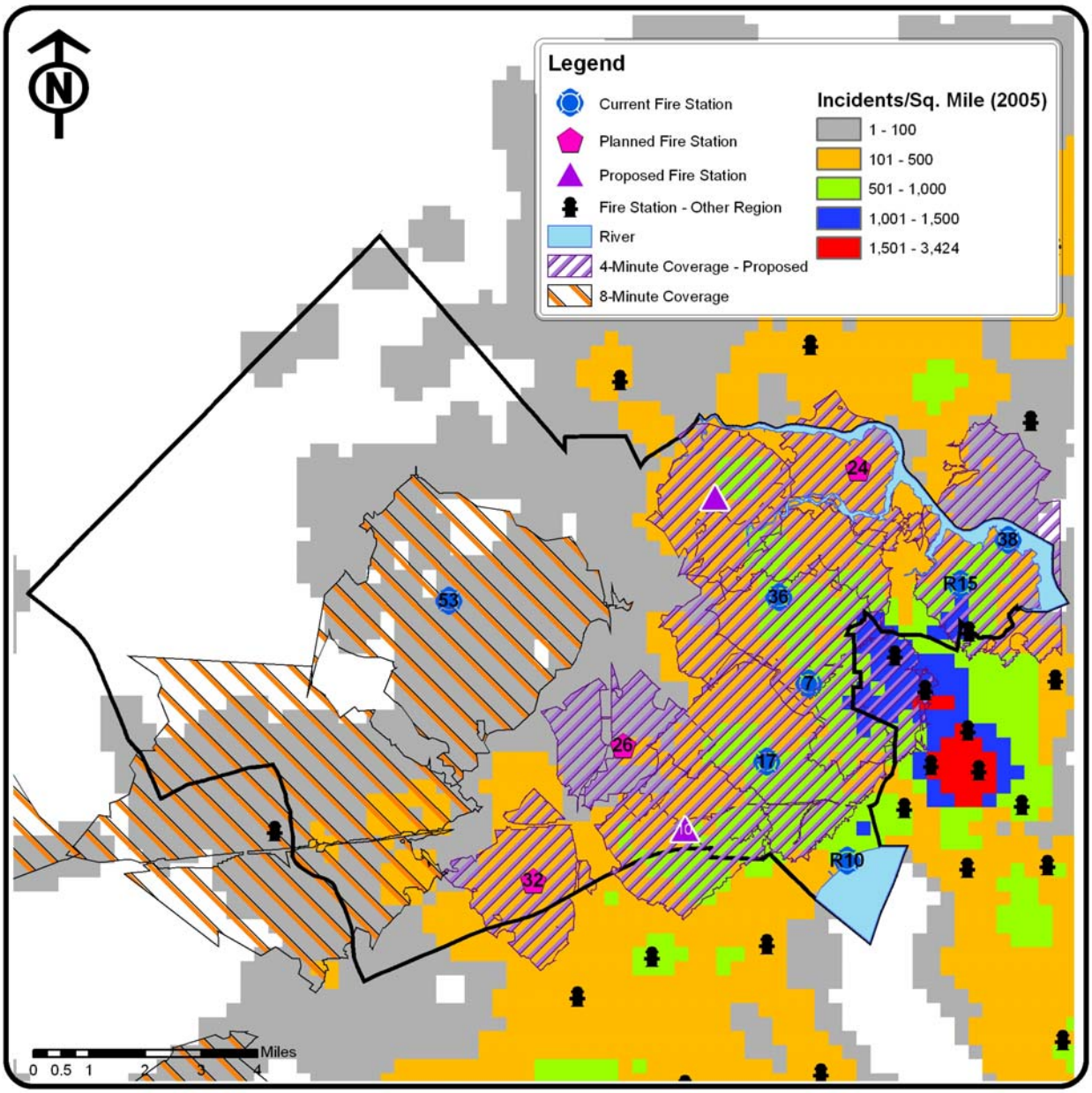


Recommendation 53: Proceed with plans to relocate Stations 26 and 32. Although the relocation of Station 32 shows a decrease in the area covered in four minutes, relocating Station 26 but not Station 32 would result in much overlap between the stations.

Since plans to relocate Station 10 have not been finalized, moving the station further west as shown in Map 8, will close the gap in coverage while continuing to cover the higher density area near Rescue 10. The gap in coverage near Rescue 10 that will result with moving Station 10 will be covered by a station from the urban region (see the Urban section below).

There is also a gap in coverage west of Station 24 that is not covered in 4-minutes even with the relocation of Station 24. A new station would close the gap in coverage in the more developed area as well as provide additional coverage in 8 minutes to the less developed area to the west, acting as a back-up to Station 53 in the northwest region and Stations 33 and 34 in the north region. This station is also shown on Map 8.

Map 8: Northwest Region Response Coverage – Proposed



Recommendation 54: Relocate Station 10 as recommended in 2001, but move the station to the area of Mamie Road and Ramona Boulevard. This is a more effective way to maximize area coverage.

Recommendation 55: Build a new station west of Station 24 in the vicinity of Fredericksburg Avenue and Sibbald Road. The addition of this proposed station will further facilitate the gaps in coverage for this area of the City. It also addresses the increasing demand for services over the next five to ten years.

North – The north region covers 230 square miles and is bordered on the east by the Atlantic Ocean, on the south by the northwest, urban, and Greater Arlington regions, and on the west and north by Nassau County. The region is protected by 10 fire stations: 16, 33, 34, 35, 37, 40, 45, 47, 48, and 49.

In the north region, 90th percentile travel times for the first arriving unit in 2005 was 08:10. Overall, this is the highest of all regions but a time that is to be expected given the largely undeveloped nature of the region. Map 9 shows the 4 and 8-minute coverage from current stations in the north region. Also on the map is the density of incidents from 2005.

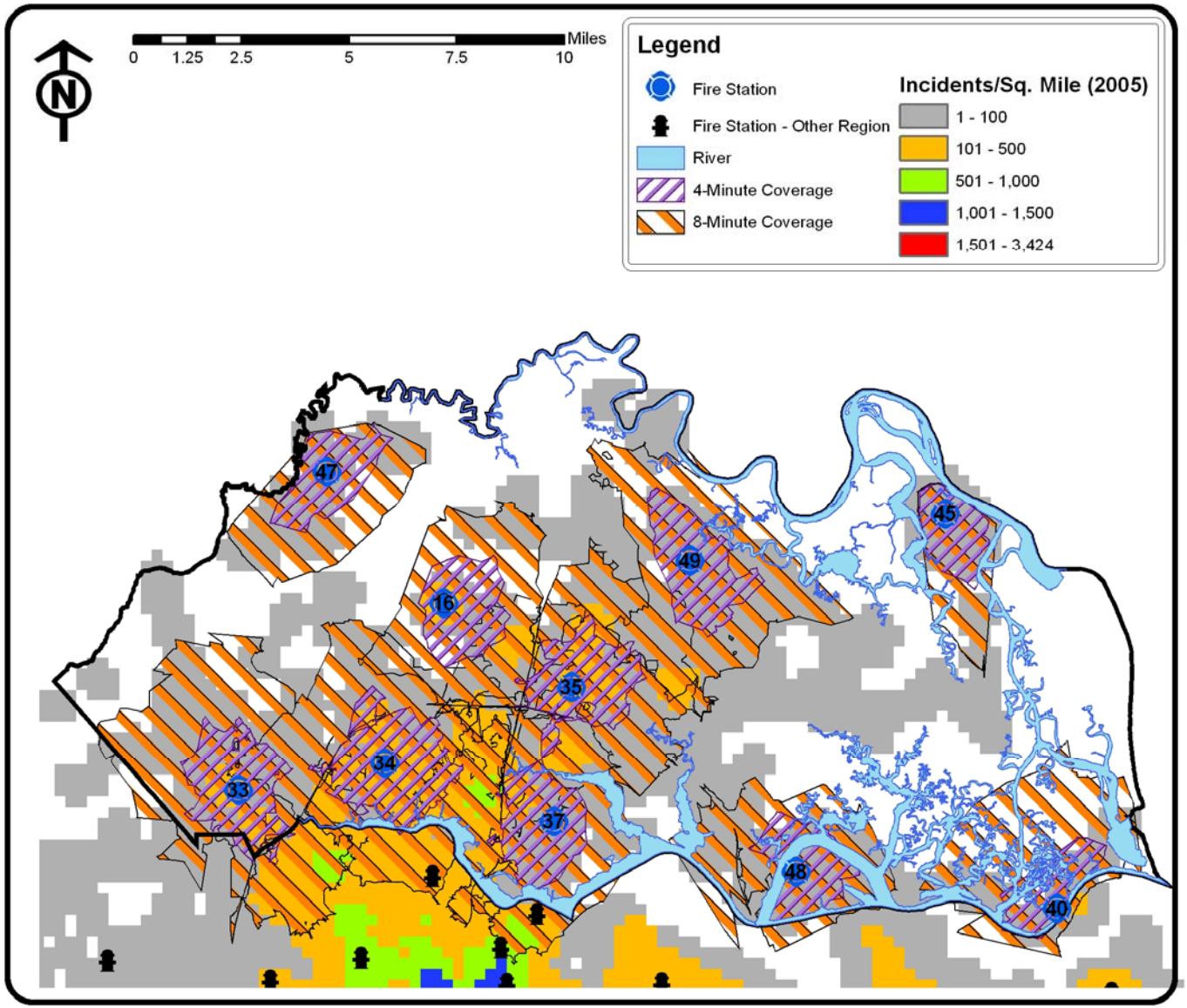
Currently, most areas in the north region are well covered for their population and emergency demand levels. There is one medium demand density between Stations 34 and 37 that is beyond the 4-minute coverage.

As with the other regions, there are some station moves already planned for the north region, including Stations 35, 40, and 47. The planned relocations and new coverage are shown in Map 10.

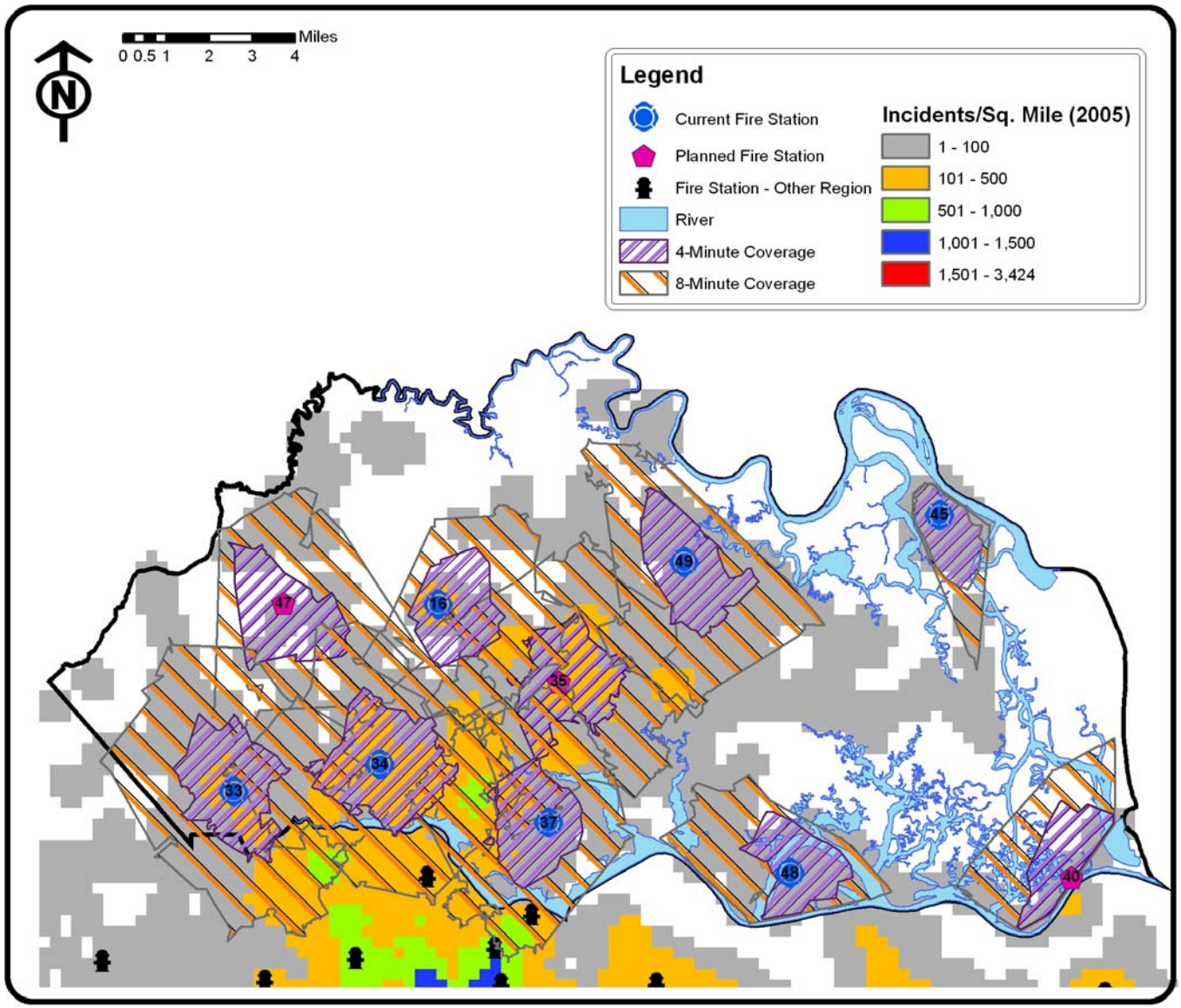
Recommendation 56: Proceed with plans to relocate Stations 35, 40, and 47.

Because Station 45 is located so close to the northern border with a limited response area due to the river, moving this station south is also recommended. In addition, to close the gap in coverage between Stations 34 and 37, a new station is needed.

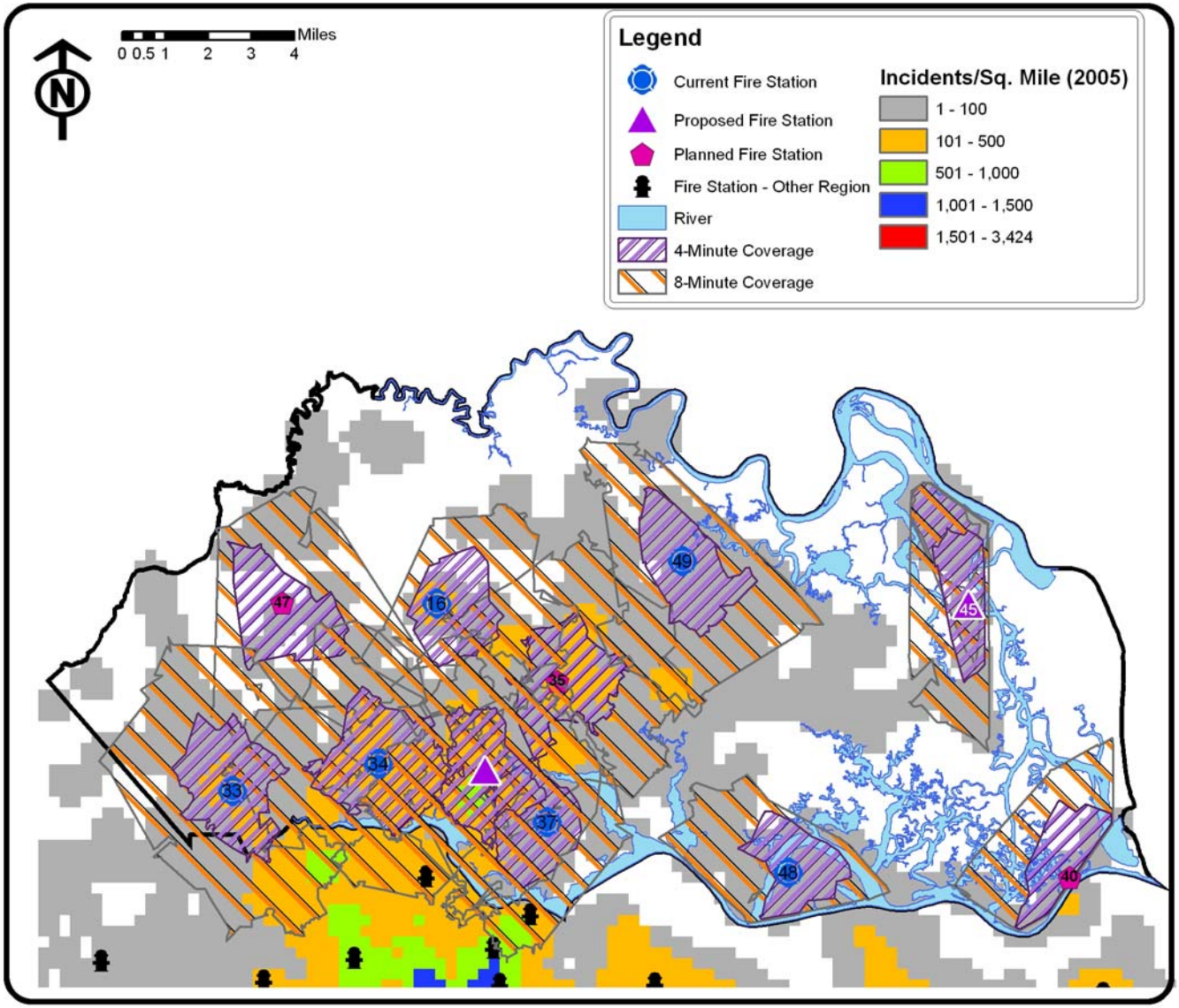
Map 9: North Region Response Coverage – Current



Map 10: North Region Response Coverage – Planned



Map 11: North Region Response Coverage – Proposed



Recommendation 57: Relocate Station 45 south to a site along Sawpit Road about half way between Cedar Point and Hurlbert Roads.

Recommendation 58: Build a new station in the vicinity of Bertha Street and Harts Road.

Greater Arlington – The Greater Arlington region covers 91.8 square miles and is bordered on the east by the Atlantic Ocean and Jacksonville and Atlantic Beaches, on the south by the southeast region, on the west by the urban region, and on the north by the north region. The region is protected by eight fire stations: 19, 20, 27, 29, 30, 41, 50, and 58.

In the Greater Arlington region, 90th percentile travel times for the first arriving unit in 2005 was 07:25. Given the highly developed nature of this region, the high travel times are disappointing. Map 12 shows the 4 and 8-minute coverage from current stations in the Greater Arlington region. Also on the map is the density of incidents from 2005.

In the Greater Arlington region, there are many high to medium density demand areas that are beyond the 4-minute response of current stations. Three key areas are:

- Between Stations 27 and 29, north of Station 30,
- Between Stations 19, 20, and 30, and
- Between Stations 30 and 58.

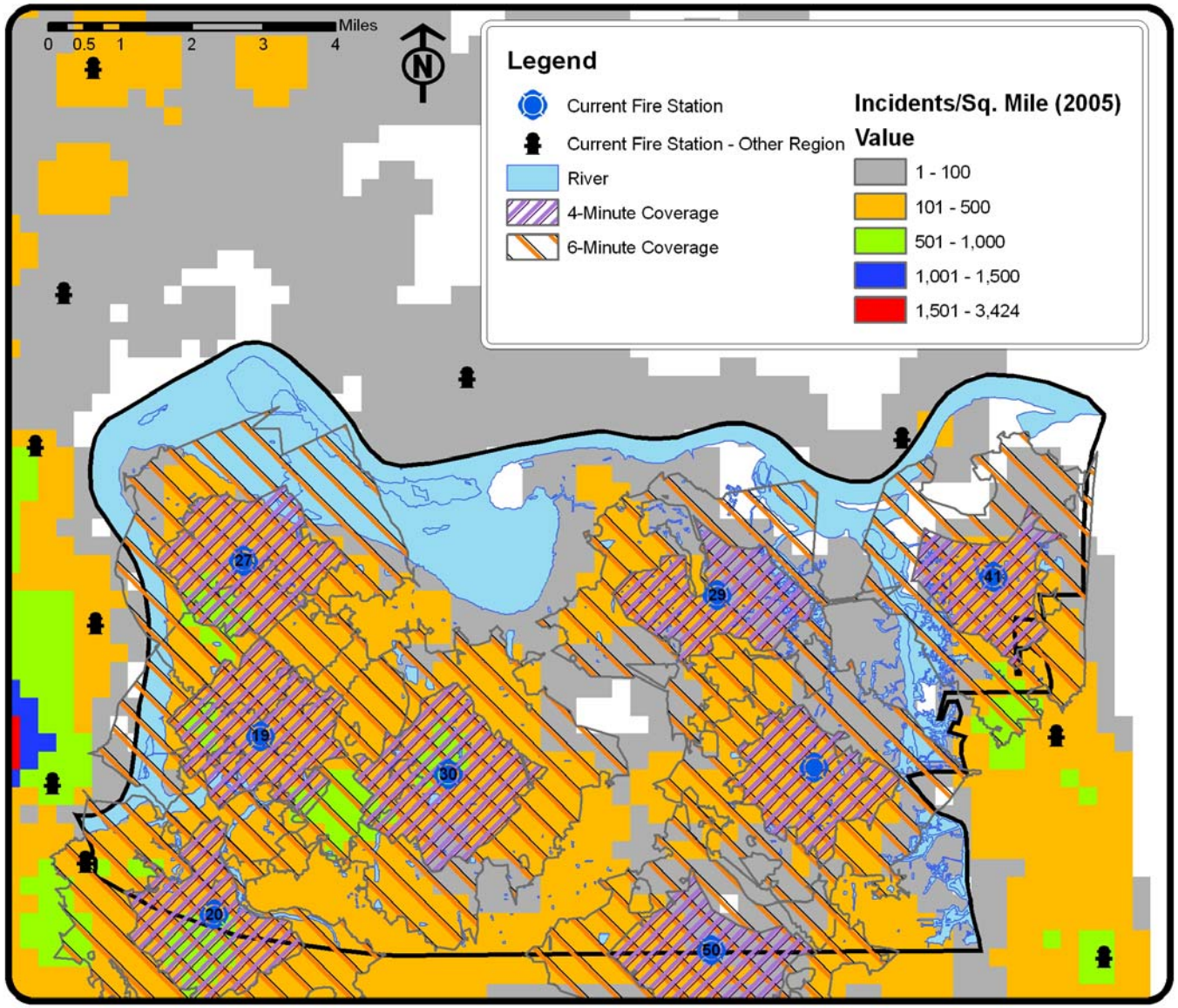
Station 58 is a new station. There are no other new stations or station relocations planned for the Greater Arlington region. To reduce response times and unit workloads, two new stations and one station relocation are recommended and shown in Map 13.

Recommendation 59: Build a new station in the vicinity of Hartsfield Road and Merrill Road.

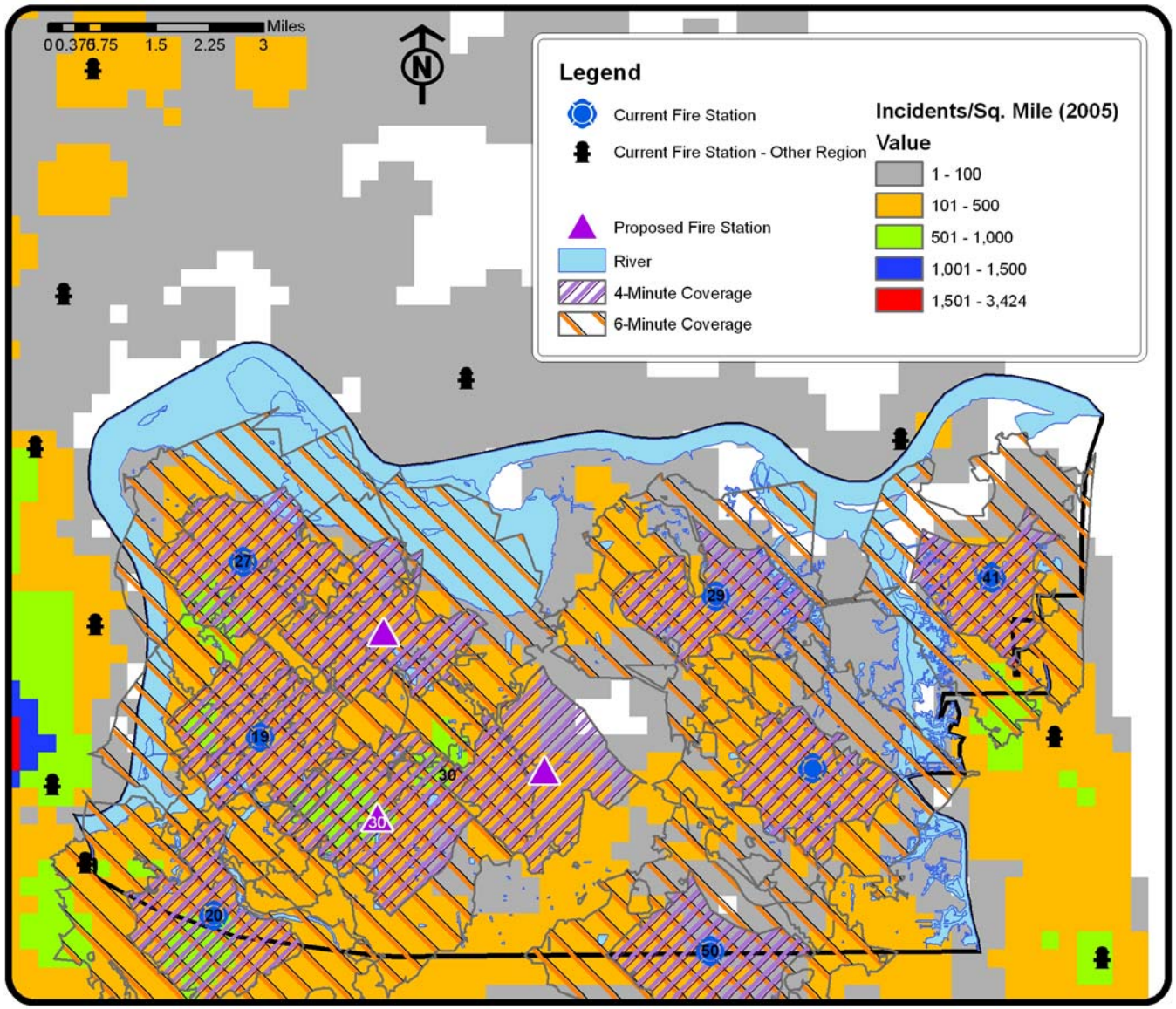
Recommendation 60: Build a new station in the vicinity of Atlantic Boulevard and St. John's Bluff Road.

Recommendation 61: Relocate Station 30 to the vicinity of Atlantic Boulevard and Corporate Square Boulevard. This move must be done in conjunction with the new station from **Error! Reference source not found.**.

Map 12: Greater Arlington Region Response Coverage – Current



Map 13: Greater Arlington Region Response Coverage – Proposed



Southeast – The southeast region covers 179.3 square miles and is bordered on the east by the Atlantic Ocean, on the south by the St. John's County, on the west by the urban region, St. John's River, and the southwest region, and on the north by the Greater Arlington region. The region is protected by eight fire stations: 12, 13, 21, 28, 42, 44, 51, and 54.

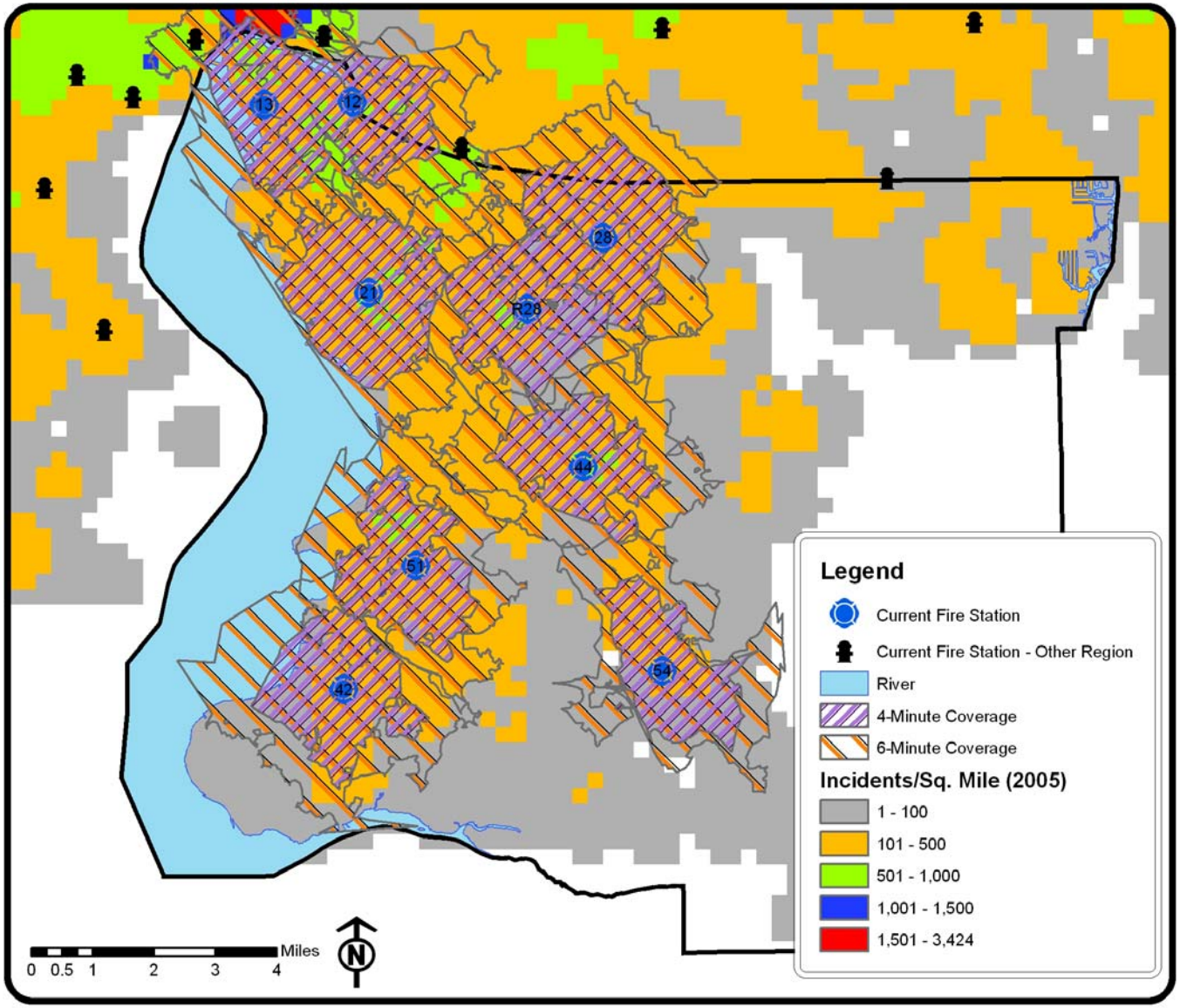
In the southeast region, 90th percentile travel times for the first arriving unit in 2005 was 07:37. This travel time is about the same as the Greater Arlington region, but the region is less developed and less densely populated. The western half of the southeast region is more densely populated and has a higher density of demand than the eastern half. Given the development of the region, the travel times of first-arriving units are reasonable. Map 14 shows the 4 and 8-minute coverage from current stations in the southeast region. Also on the map is the density of incidents from 2005.

In the southeast region, there is one large medium density demand areas that is beyond the 4-minute response of current stations but within the 8-minute response coverage of multiple stations. The area is between Stations 21, 28, 44, and 51. Part of the current gap in coverage could be covered by an engine placed at Rescue Station 28. The rest of the area is a suburban-style subdivision with winding streets that makes placing a fire station difficult.

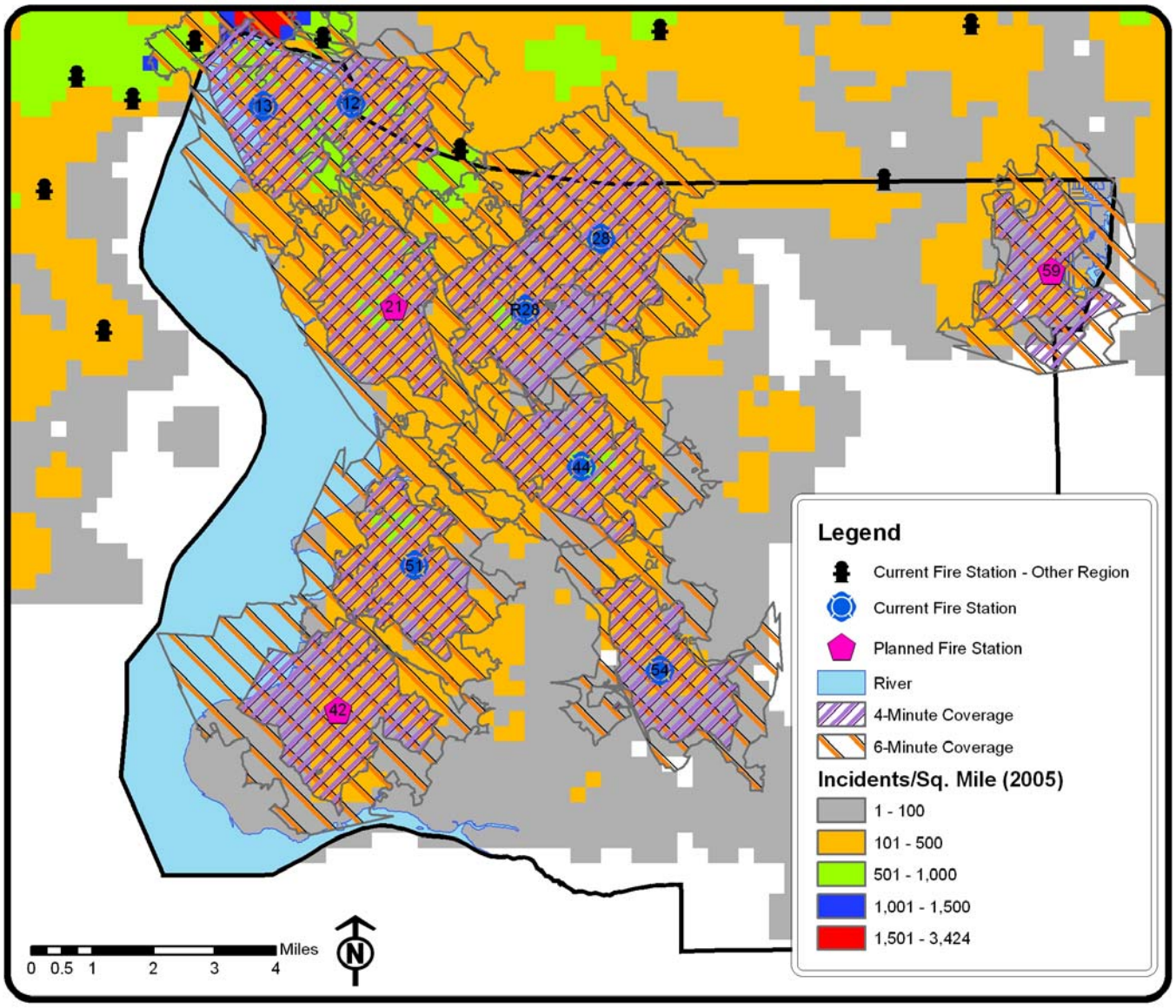
Station 21 is in the process of being relocated slightly southeast. The relocation of Station 28 was recommended in 2001 but has not yet been funded. The relocation of Station 28 as previously recommended would open a gap in coverage in an area with over 1,100 calls. The new coverage would reach only 500 incidents in four minutes.

Given the demand and workload levels in the southeast region currently and for the next 10 years, the current gaps in 4-minute coverage can remain but should be monitored to ensure response times do not increase in the more developed areas and units do not become overloaded. If response times begin to increase or units begin to become overloaded, an additional station should be placed between Stations 21, 44, and 51. Currently there are about 650 incidents in the area just north of Station 51 and west of Station 44. Additionally, Rescue Station 28 could be relocated east toward Southside Boulevard and an engine placed with it to accommodate demand.

Map 14: Southeast Region Response Coverage – Current



Map 15: Southeast Region Response Coverage – Planned



Finally, a new station (Station 59) is in the process of being built on the eastern edge of the southeast region. The new station will cover an area currently more than 4 and 6 minutes from other stations and act as a back-up to Stations 50 and 55 as well as Rescue Station 71. The currently planned reconfiguration of stations in the southeast region is shown in Map 15.

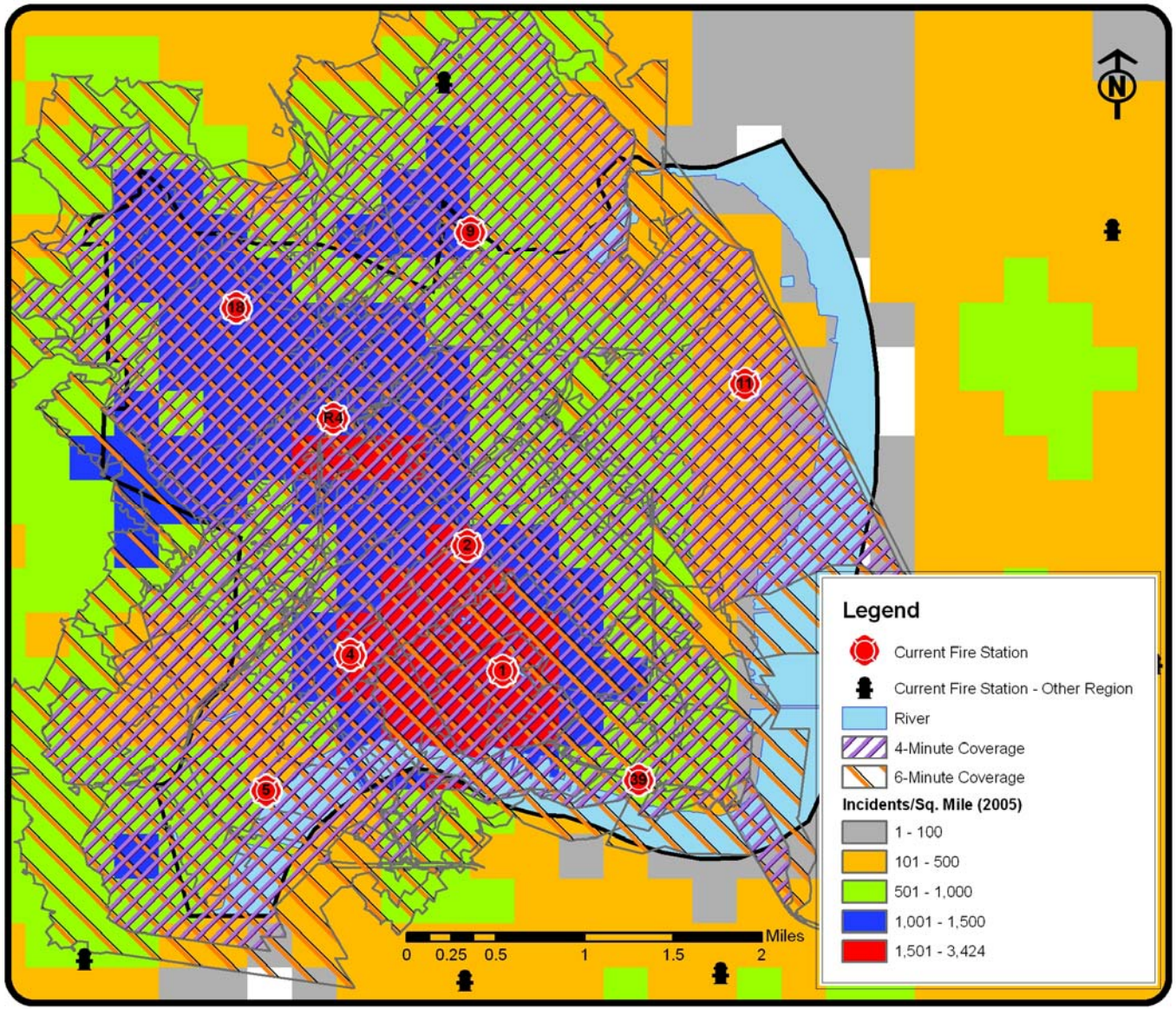
Recommendation 62: Proceed with plans to relocate Station 21 and build Station 59. JFRD's plans to relocate station 21 and build 59 continue to be sound moves, which will enhance coverage for the areas in which they are to be located.

Recommendation 63: Do not proceed with the previous recommendation to relocate Station 28. Instead with the relocation of Station 21 and the building of Station 59, coverage will be enhanced and close gaps in area coverage.

Urban – The urban region covers 14.3 square miles and is bordered on all sides by other regions and the east by the St. John's River. The region is protected by eight fire stations: 1, 2, 4, 5, 9, 11, 18, and 39. This is as many stations as regions over 10 times the size. However, this region also experiences demand densities seven times that of other regions.

In the urban region, 90th percentile travel times for the first arriving unit in 2005 was 04:09. This is an excellent travel time. Map 16 shows the 4 and 6-minute coverage from current stations in the urban region. Also on the map is the density of incidents from 2005.

Map 16: Urban Region Response Coverage – Current



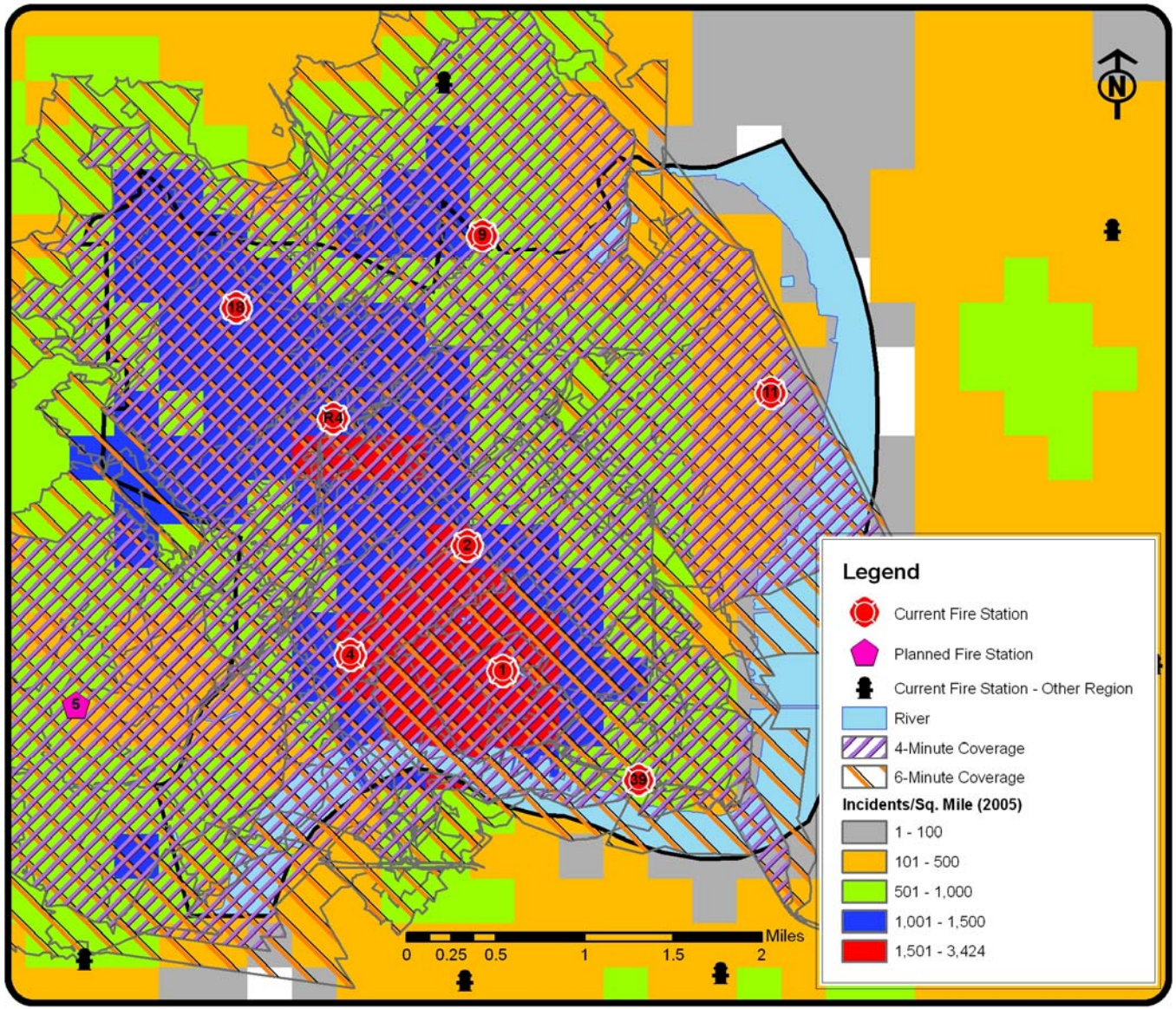
In the urban region, there are only two small areas beyond the 4-minute response of current stations. In fact, most areas are covered in 4 minutes by two or more stations. This level of overlap is necessary in a densely developed urban area to maintain response times with narrow, traffic-filled streets. The high density of units is also necessary because the urban core presents a higher risk for incidents requiring multiple units. Finally, the number of units are needed due to the overall level of demand and likelihood of overlapping (simultaneous) incidents.

Plans are currently underway to relocate Station 5 to the west, just beyond the borders of the urban region and into the northwest region. Renovations of Stations 2 and 4 were previously recommended but are not currently funded. The change in coverage from the relocation of Station 5 is shown in Map 17.

Recommendation 64: Proceed with plans to relocate Station 5.

Recommendation 65: Proceed with previous recommendations to renovate Stations 2 and 4.

Map 17: Urban Region Response Coverage – Planned

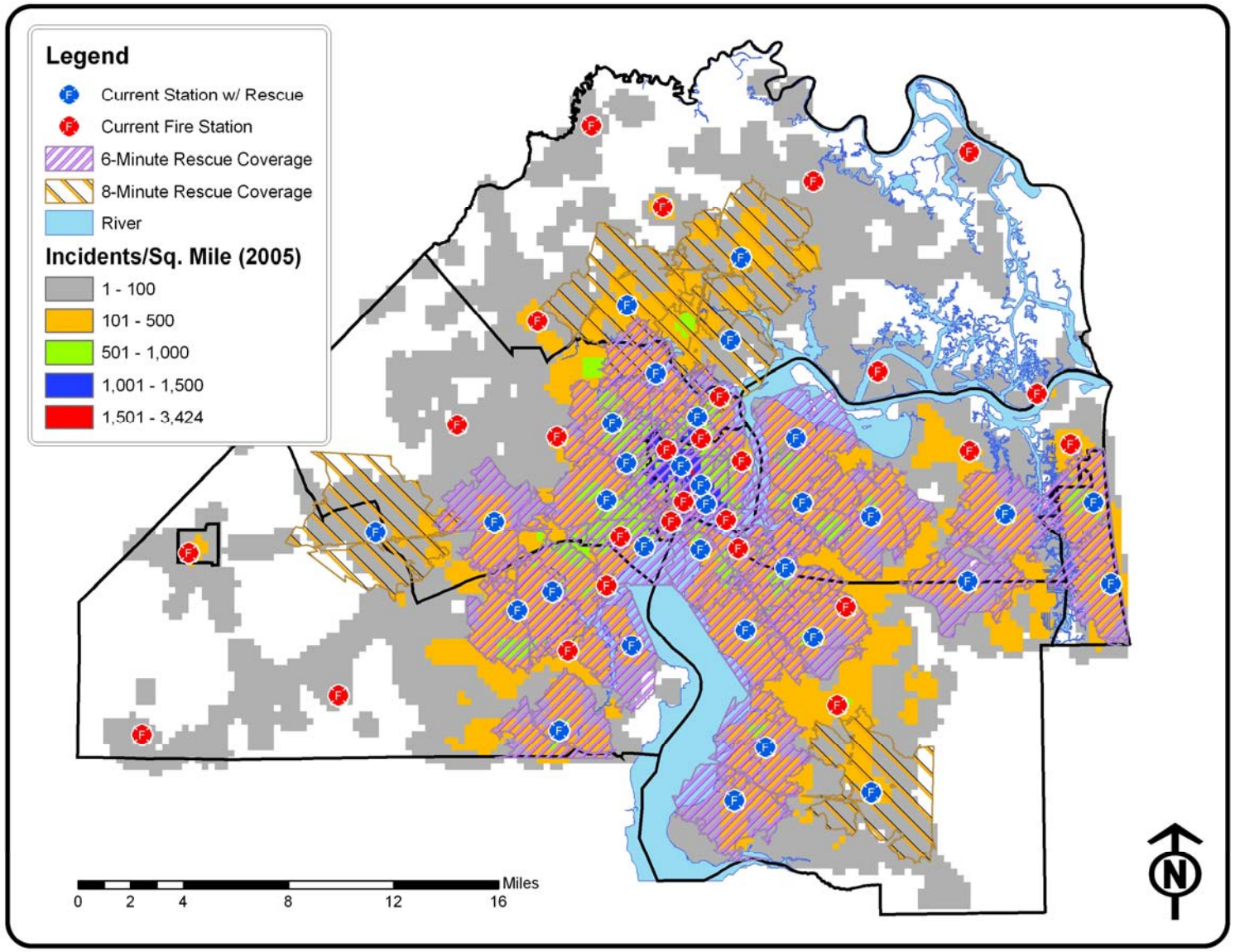


Rescues

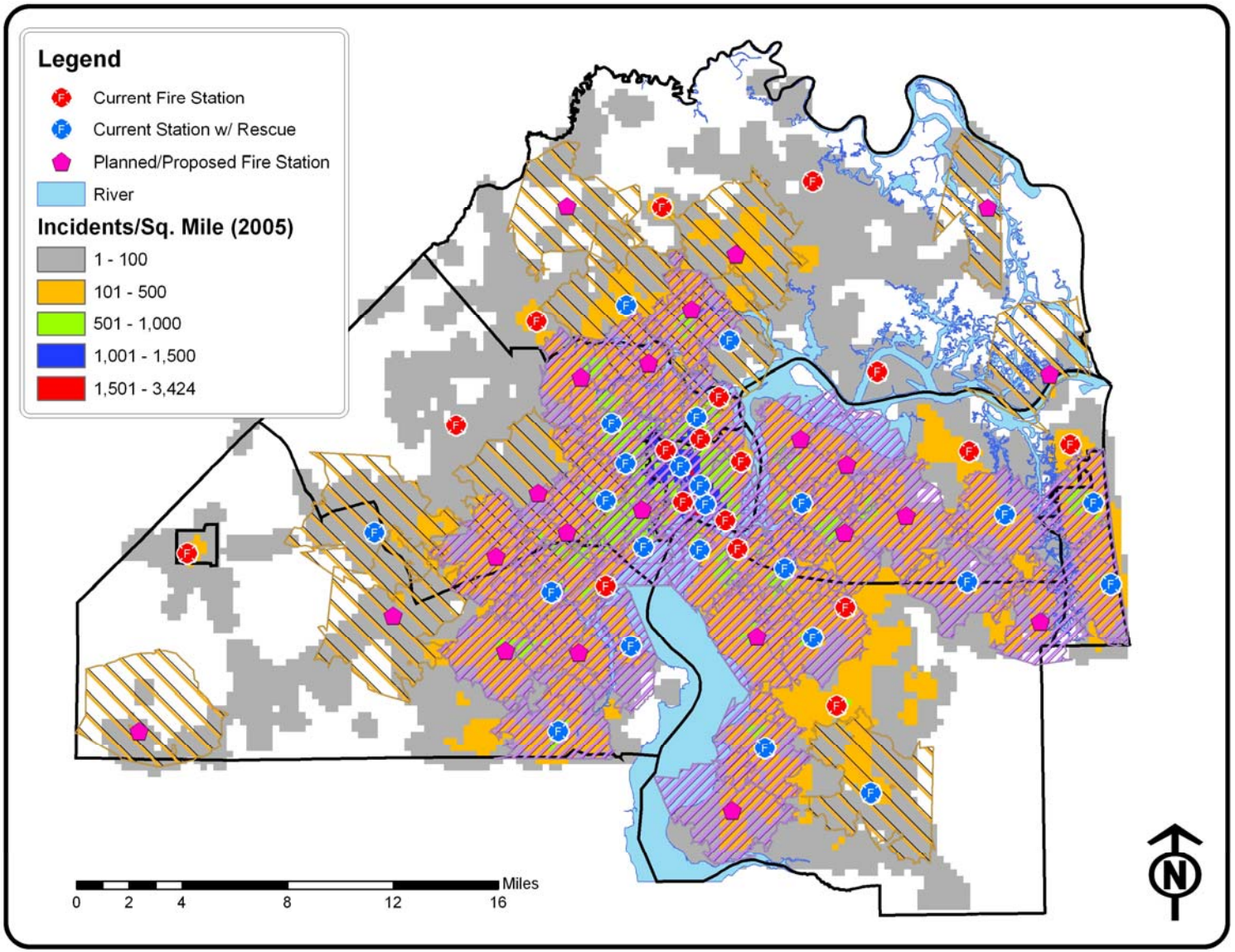
The JFRD currently operates 30 rescue units from various locations throughout the city. Map 18 shows the current 6 and 8-minute coverage for these units. The overall response reach of the rescue units is good; however, due to the demand for these units, more are needed. There is an opportunity to further increase rescue coverage with the planned and proposed stations. The JFRD should place rescue units at all new and relocated stations. At this time, there does not appear to be a need to open any additional Rescue Stations.

By placing rescue units at all new and relocated stations, the department can expand the effective coverage area for the rescues, as well as reducing response times and demand for existing units. Map 19 shows the 6- and 8-minute response reach for rescue units if all new and relocated stations have a rescue. This configuration would improve coverage in every planning area in addition to adding some needed rescue coverage in the rural areas of the city.

Map 18: Citywide Rescue Coverage – Current



Map 19: Citywide Rescue Coverage – Proposed



Recommendation 66: Consider adding rescue units to all new and relocated stations. The exception to this is to consider placing a Rescue unit at Station 16 in lieu of the relocated Station 47. Station 16 is closer to the airport and most of the EMS calls in that area are located in or near the airport.

Ladders

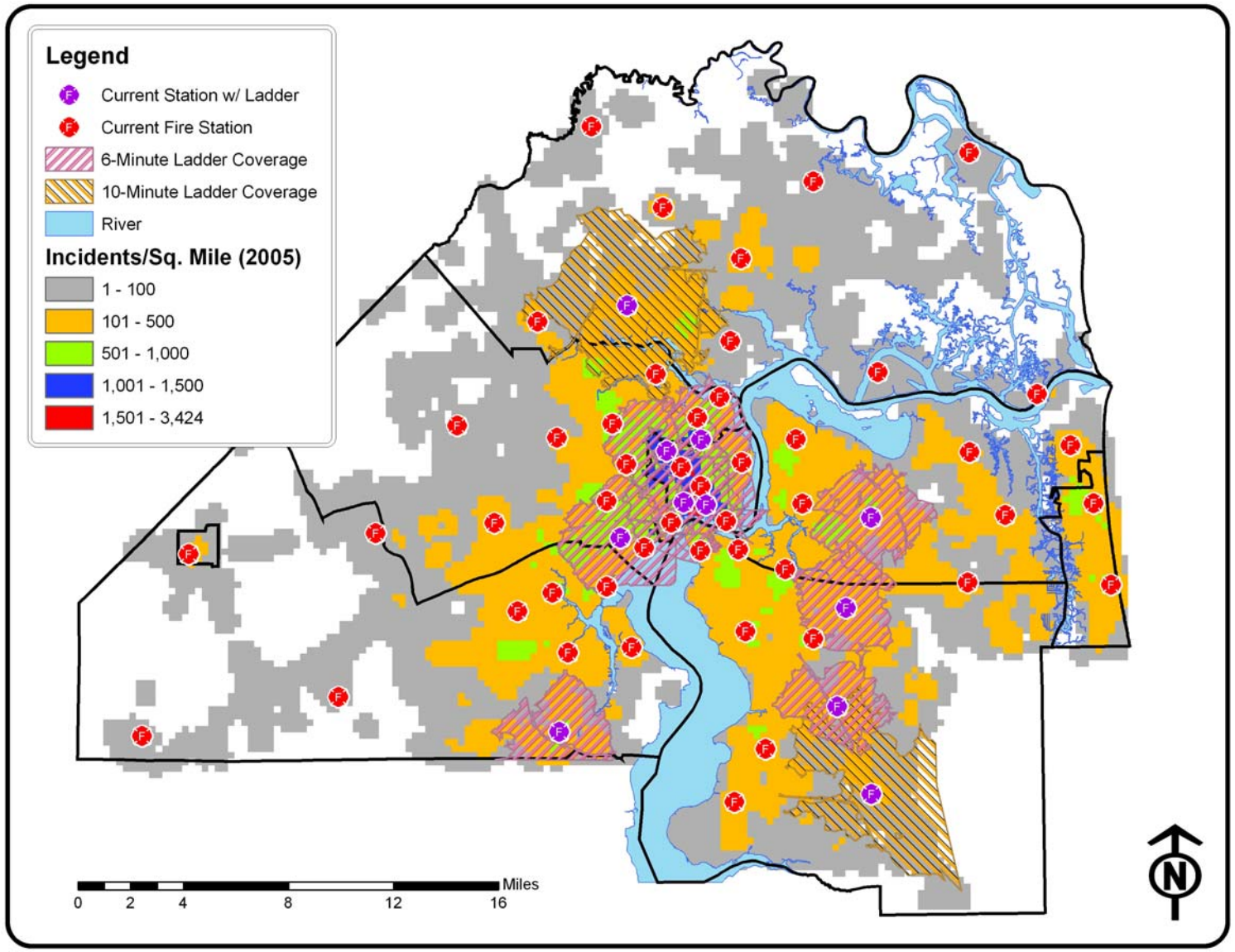
The JFRD currently operates 11 ladder units throughout the city. These are highly concentrated in the downtown area. There is a significant lack of ladder coverage in the peripheral parts of the city. This forces a unit to travel a far distance to reach an incident in the rural areas, resulting in much longer response times. The total response time for ladder units in 2005 was 10:59 at the 90th percentile compliance level. Map 20 shows the current citywide 6 and 10-minute ladder coverage.

While the concentration of ladder units in the core city is appropriate, there needs to be additional support to the outer areas of the city as well. The use of quints in four stations (43, 48, 49, and 58) would fulfill this roll without adding additional ladder companies in areas where the demand does not require a full time ladder company. Additionally, an additional ladder company should be added to Station 31 to improve coverage on the eastern side of the southwest planning area. The city should also consider ladder companies at Stations 21 and 27 when demand and/or response times increase to a level high enough to justify their deployment. Map 21 shows the proposed deployment of quints at Stations 43, 48, 49, and 58 as well as the additional proposed ladder company at Station 31.

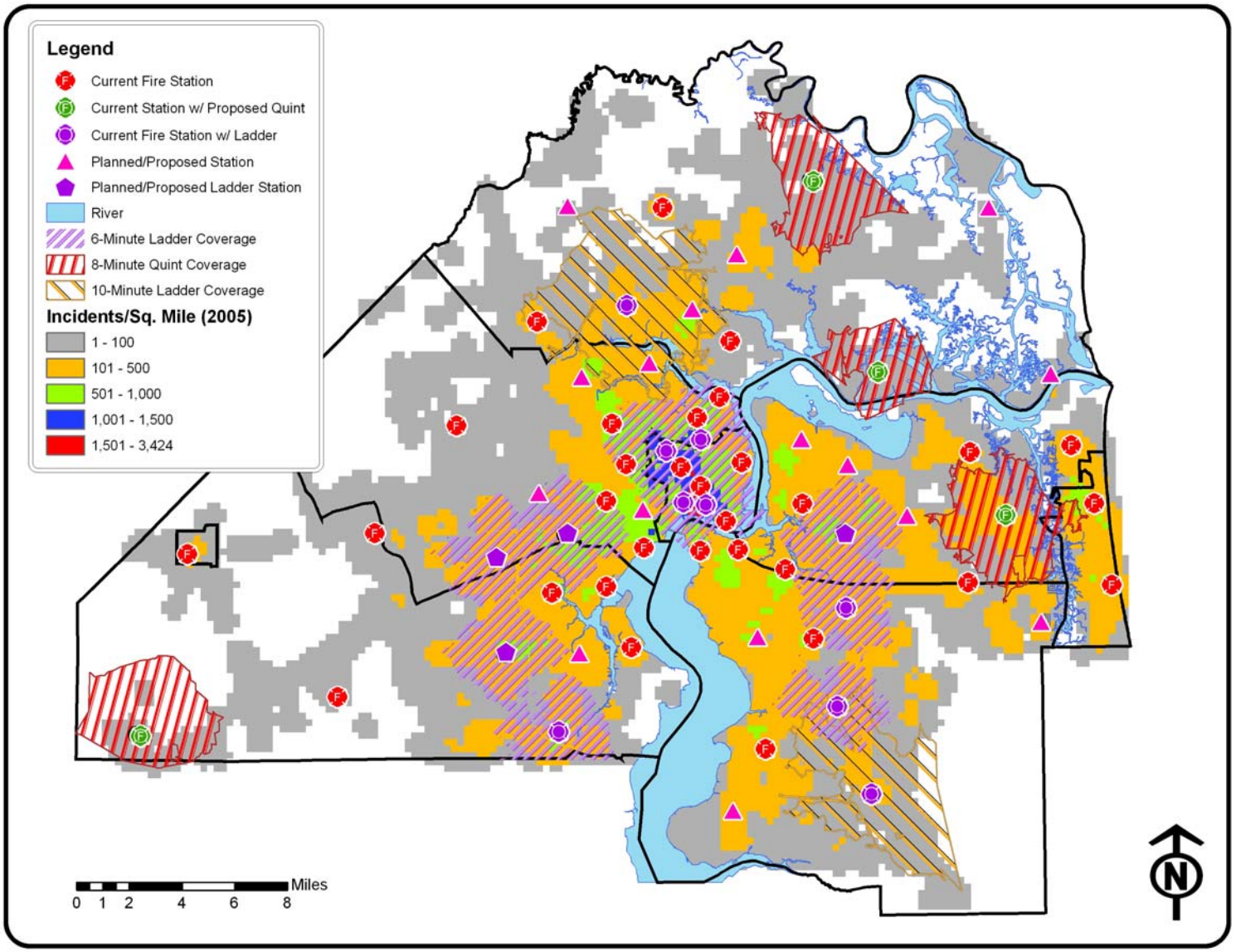
Recommendation 67: Replace the engines with quints at Stations 43, 48, 49, and 58. This will add needed ladder support to the periphery of the city without adding additional ladder companies.

Recommendation 68: Place a ladder company at Station 31. This will add additional ladder coverage to an area of the city that is rapidly developing and will reduce the response times for the ladder units responding from Stations 10 and 52.

Map 20: Citywide Ladder Coverage – Current



Map 21: Citywide Ladder/Quint Coverage – Proposed



Summary

Response times for the JFRD are currently higher than recommended. The main reason for this is extended travel times from stations having to cover large areas. There is a need for additional stations to help improve response times. There is already plans for several new and relocated stations and the locations of these are appropriate with the exception of the planned relocation of Station 28. In addition to the planned stations, there are several other reallocations needed to enhance response coverage and times.

There is a need to add additional rescue units throughout the city, and these units should be added at all new and relocated stations to improve rescue response times and workloads. Due to the growth and development currently occurring, the need for more rescue units will only increase.

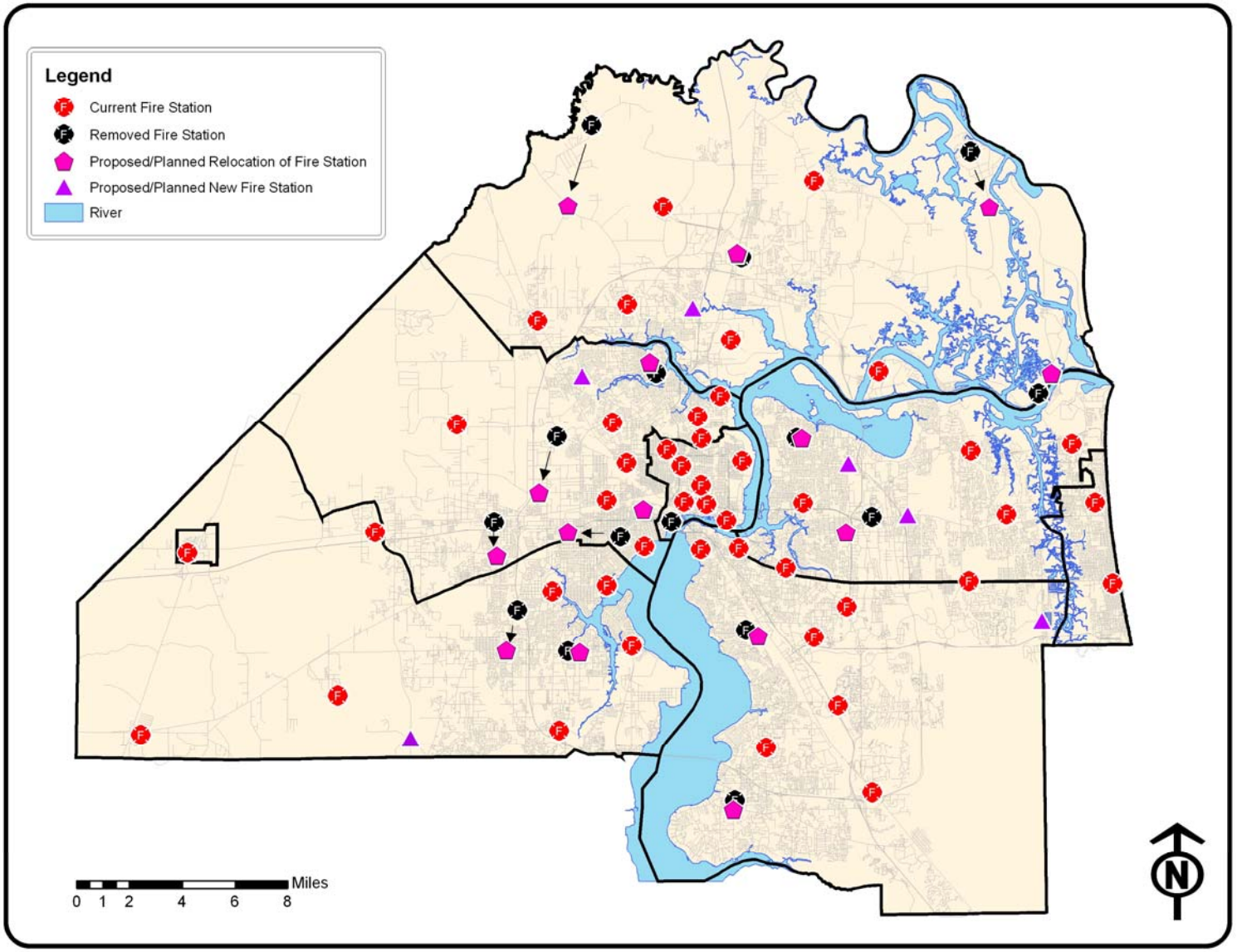
The ladder units in the city are generally well placed, however, they have extended response times because of the distances they must travel to reach incidents around the periphery of the city. By replacing the engines at several stations with quints, additional, needed ladder support can be brought to the rural areas of the city.

Table 48 shows the proposed new and relocated stations. In all, 5 new stations are proposed in addition to 16 relocated stations.

Table 48: Summary of Proposed New and Relocated Stations

Region	Proposed New Stations	Proposed Relocated Stations
Southwest	1 – New station in the vicinity of Branan Field Road and Argyle Forest Blvd	Stations 25, 31
Northwest	1 – New station in the vicinity of Fredericksburg Avenue and Sibbald Road	Stations 5 (from urban), 24, 26, 32, 10
North	1 – New station in the vicinity of Bertha Street and Harts Road	Stations 35, 40, 45, 47
Greater Arlington	1 – New station in vicinity of Harts Field Road and Merrit Road 1 – New station in the vicinity of Atlantic Boulevard and Corporate Square Boulevard	Station 27, 30
Southeast	Station 59	Station 21, 42
Urban	N/A	N/A
Citywide Total	6 New Stations	16 Relocated Stations

Map 22: Summary of Stations



APPENDIX A: ESTIMATE OF EXISTING INSPECTABLE BUILDING STOCK BY OCCUPANCY TYPE[75]

Property Use	Property Use Description	No. Of Parcels	No. Of Buildings	Sub-Total by Occupancy Type[76]
Residential	**More than 2 Dwelling Units**			**23,273**
0300	APTS 9+ UNITS	554	6,859	
0400	CONDOMINIUM	14,422	14,270	
0500	COOPERATIVE	122	122	
0691	RETIREMENT HOMES	21	246	
0893	QUADRUPLEX	936	1,068	
0894	5-9 UNIT APARTMENT	103	114	
3900	MOTEL/HOTEL	146	333	
7300	PVT HOSP/NUR HM	62	107	
7400	HOME FOR AGED	38	50	
7500	ORPHNG/NON-PROF	64	104	
A	**Assembly Occupancies**			**2,685**
2191	RESTAURANT CLASS 1	213	240	
2192	RESTAURANT CLASS 2	128	130	
2200	REST FAST FOOD	335	350	
3100	THEATRE DRIVEIN	6	53	
3200	THEATER/AUDITRM	8	9	
3300	NIGHT CLUB/BAR	138	156	
3400	BOWL/RINK/ARENA	14	15	
3500	TOURIST ATTRAC	8	13	
3700	RACETRACK	6	43	
7100	CHURCH	1,678	1,668	
7900	CULTURAL	8	8	
B	**Business Occupancies**			**6,088**
1700	OFFICE 1-2 STY	1,818	2,306	
1741	Condominium Offices 1-2	295	295	
1800	OFFICE 3+ STY	170	261	
1842	Condominium Offices 9+	23	23	
1941	OFFICE MEDICAL CONDO	687	684	
1991	OFFICE MEDICAL	473	525	
2000	TRANSIT TERM	24	72	
2300	BANK	167	172	

[75] This data is extracted from the Number of Parcel and Buildings by Property Use Type report included as (Appendix B).
[76] This is an approximation of occupancy classifications produced by Martha Word-Haley and reviewed by Chief Roseberry.

Property Use	Property Use Description	No. Of Parcels	No. Of Buildings	Sub-Total by Occupancy Type[76]
2591	SERVICE SHOP	65	88	
2592	LAUNDROMAT	14	15	
8600	COUNTY	2,341	1,066	
8700	STATE	536	75	
8800	FEDERAL	178	50	
8900	MUNICIPAL	335	141	
9000	LEASEHOLD INT	131	315	
E	**Educational Occupancies**			**414**
0693	DAYCARES	87	97	
7200	PVT SCH/COLL	242	195	
8300	PUBLIC SCHOOL	332	115	
8400	PUBLIC COLLEGE	28	7	
F	**Factory Industrial Occupancies (Some Hazardous)**			**1,705**
4100	MANUFACT LIGHT	508	954	
4200	MANUFACT HEAVY	36	324	
4300	LUMBER YD/MILL	28	122	
4500	BOTTLER/CANNERY	7	69	
4600	FOOD PROCESSING	9	47	
4700	MINERAL PROC	27	140	
7691	MORTUARY	45	49	
I	**Institutional Occupancies**			**9**
8500	PUBLIC HOSPITAL	42	9	
M	**Mercantile Occupancies**			**7,215**
1191	STORE, RETAIL	735	752	
1192	STORE,RETAIL/MULTI BLDG	123	265	
1193	STORE,RETAIL/COVERTED	75	81	
1291	STORE/OFF/RES	1,457	1,818	
1300	STORE DEPARTMT	64	83	
1491	SUPERMARKET	28	32	
1492	STORE, CONVENIENCE	395	428	
1493	STORE,CONV.PREFAB GAS	72	113	
1500	SHOP CTR REGION	10	34	
1691	SHOP CTR COMMTY	140	515	
1692	SHOP CTR NBHD	755	1,014	
2691	SERVICE STATION	117	133	
2692	CAR WASH - DRIVE-THRU	2	2	
2693	CAR WASH - FULL SERVICE	21	29	
2694	CAR WASH - SELF SERVICE	30	33	
2791	VEHICLE SHOW/SALE (NEW)	77	255	
2792	SERVICE GARAGE/VEHICLE RP	857	1,224	

Property Use	Property Use Description	No. Of Parcels	No. Of Buildings	Sub-Total by Occupancy Type[76]
2793	AUTO SERVICE CENTER	74	82	
2794	VEHICLE USED SALES/RENTAL	219	311	
2900	WHOLESALER	1	1	
3000	FLORIST	4	10	
S	**Storage Occupancies (Some Potentially Hazardous and/or High Pile Storage)**			**3,870**
4891	WAREHOUSE, TRANSIT	49	100	
4892	WAREHOUSE, DISTRIBUTION	300	495	
4893	WAREHOUSE, STORAGE	804	1,122	
4894	WAREHOUSE, MINI-STORAGE	107	939	
4895	WAREHOUSE, SHELL	51	84	
4896	WAREHOUSE, RETAIL	81	99	
4897	WAREHOUSE, PREFAB	552	834	
4899	WAREHOUSE, FLEX SPACE	103	197	
TOTAL	**INSPECTABLE PROPERTIES**			**45,259**
SUB-TOTAL	**State Mandated Annual Inspections**			**612**
SUB-TOTAL	**JFRD Prevention Annually Inspections Defined as 'Must Do'**			**4,743**
TOTAL	**REQUIRED ANNUAL INSPECTIONS**			**5,355**

LEGEND:

	Occupancy Categories
	State Mandated Annual Inspections
	Buildings Identified as 'Must Do' Annual Inspections
	Buildings Probably Requiring Fire Prevention Inspections

APPENDIX B: NUMBER OF PARCELS AND BUILDINGS BY PROPERTY USE TYPE[77]

Property Use	Property Use Description	No. Of Parcels	No. Of Buildings	Inspectible Buildings[78]	Non-Inspectible Buildings
0000	VACANT RES	19,513	15		15
0100	SINGLE FAMILY	229,397	234,142		234,142
0200	MOBILE HOME	10,017	12,015		12,015
0300	APTS 9+ UNITS	554	6,859	6,859	
0400	CONDOMINIUM	14,422	14,270	14,270	
0500	COOPERATIVE	122	122	122	
0691	RETIREMENT HOMES	21	246	246	
0693	DAYCARES	87	97	97	
0891	DUPLEX	2,963	3,466		3,466
0892	TRIPLEX	295	363		363
0893	QUADRUPLEX	936	1,068	1,068	
0894	5-9 UNIT APARTMENT	103	114	114	
1000	VACANT COMM	3,292	4		4
1191	STORE, RETAIL	735	752	752	
1192	STORE,RETAIL/MULTI BLDG	123	265	265	
1193	STORE,RETAIL/COVERTED	75	81	81	
1291	STORE/OFF/RES	1,457	1,818	1,818	
1292	RES/COMM ZONING	3,811	4,313		4,313
1293	MOBILE HOME/COMM ZONING	233	297		297
1300	STORE DEPARTMT	64	83	83	
1491	SUPERMARKET	28	32	32	
1492	STORE, CONVENIENCE	395	428	428	
1493	STORE,CONV.PREFAB GAS	72	113	113	
1500	SHOP CTR REGION	10	34	34	
1691	SHOP CTR COMMTY	140	515	515	
1692	SHOP CTR NBHD	755	1,014	1,014	
1700	OFFICE 1-2 STY	1,818	2,306	2,306	
1741	Condominium Offices 1-2	295	295	295	

[77] The *Number of Parcel and Buildings by Property Use Type* report provided by Jim Helms, Tax Roll Manager, Duval County Property Appraiser's Office, Jacksonville, Fl 32202, 904-630-1212 Ext 6756, in an e-mail forwarded to Chief Roseberry, from Kay Ehas, Chief of Administration, Duval County Property Appraiser, dated 4/25/2006 1:28:00 PM.

[78] The number of inspectable buildings was estimated by Martha Word Haley from TriData based on an approximate conversion of property use type to occupancy type.

Property Use	Property Use Description	No. Of Parcels	No. Of Buildings	Inspectible Buildings[78]	Non-Inspectible Buildings
1800	OFFICE 3+ STY	170	261	261	
1842	Condominium Offices 9+	23	23	23	
1941	OFFICE MEDICAL CONDO	687	684	684	
1991	OFFICE MEDICAL	473	525	525	
2000	TRANSIT TERM	24	72	72	
2191	RESTAURANT CLASS 1	213	240	240	
2192	RESTAURANT CLASS 2	128	130	130	
2200	REST FAST FOOD	335	350	350	
2300	BANK	167	172	172	
2591	SERVICE SHOP	65	88	88	
2592	LAUNDROMAT	14	15	15	
2691	SERVICE STATION	117	133	133	
2692	CAR WASH - DRIVE-THRU	2	2	2	
2693	CAR WASH - FULL SERVICE	21	29	29	
2694	CAR WASH - SELF SERVICE	30	33	33	
2791	VEHICLE SHOW/SALE (NEW)	77	255	255	
2792	SERVICE GARAGE/VEHICLE RP	857	1,224	1,224	
2793	AUTO SERVICE CENTER	74	82	82	
2794	VEHICLE USED SALES/RENTAL	219	311	311	
2891	PARKING LOT	944	27		27
2892	PARKING GARAGE	15	18		18
2893	MOBILE HOME PARK	121	1,465		1,465
2900	WHOLESALER	1	1	1	
3000	FLORIST	4	10	10	
3100	THEATRE DRIVEIN	6	53	53	
3200	THEATER/AUDITRM	8	9	9	
3300	NIGHT CLUB/BAR	138	156	156	
3400	BOWL/RINK/ARENA	14	15	15	
3500	TOURIST ATTRAC	8	13	13	
3600	CAMPGROUND	2	5		5
3700	RACETRACK	6	43	43	
3800	GOLF COURSE	35	80		80
3900	MOTEL/HOTEL	146	333	333	
4000	VACANT INDUS	1,597	0		0

Property Use	Property Use Description	No. Of Parcels	No. Of Buildings	Inspectible Buildings[78]	Non-Inspectible Buildings
4100	MANUFACT LIGHT	508	954	954	
4200	MANUFACT HEAVY	36	324	324	
4300	LUMBER YD/MILL	28	122	122	
4500	BOTTLER/CANNERY	7	69	69	
4600	FOOD PROCESSING	9	47	47	
4700	MINERAL PROC	27	140	140	
4891	WAREHOUSE, TRANSIT	49	100	100	
4892	WAREHOUSE, DISTRIBUTION	300	495	495	
4893	WAREHOUSE, STORAGE	804	1,122	1,122	
4894	WAREHOUSE, MINI-STORAGE	107	939	939	
4895	WAREHOUSE, SHELL	51	84	84	
4896	WAREHOUSE, RETAIL	81	99	99	
4897	WAREHOUSE, PREFAB	552	834	834	
4898	UTILITY BUILDING	114	155		155
4899	WAREHOUSE, FLEX SPACE	103	197	197	
4900	OPEN STORAGE	509	239		239
5100	CROPSOIL CLASS1	3	3		3
5300	CROPSOIL CLASS3	3	5		5
5400	TMBR SI 90+	7	5		5
5500	TMBR SI 80-89	286	70		70
5600	TMBR SI 70-79	742	213		213
5700	TMBR SI 60-69	104	24		24
5900	TMBR NOT CLSSFD	50	1		1
6100	PASTURE LAND 2	411	418		418
6600	ORCHARD GROVES	17	24		24
6700	POUL/BEES/FISH	1	1		1
6800	DAIRIES/FEEDLTS	2	1		1
6900	ORN/MISC AGRI	68	53		53
7000	VACANT INSTIT	1,066	4		4
7100	CHURCH	1,678	1,668	1,668	
7200	PVT SCH/COLL	242	195	195	
7300	PVT HOSP/NUR HM	62	107	107	
7400	HOME FOR AGED	38	50	50	
7500	ORPHNG/NON-PROF	64	104	104	
7691	MORTUARY	45	49	49	
7692	CEMETERY	88	50		50
7693	MORT/CEMETERY	5	25		25
7700	CLB/LDG/UN HALL	208	201		201

Property Use	Property Use Description	No. Of Parcels	No. Of Buildings	Inspectible Buildings[78]	Non-Inspectible Buildings
7701	HOMEOWNERS ASSOC PROPERTY	889	73		73
7900	CULTURAL	8	8	8	
8000	WATER MGMT DIST	45	0		0
8100	MILITARY	68	15		15
8200	PARK/REC	269	172		172
8300	PUBLIC SCHOOL	332	115	115	
8400	PUBLIC COLLEGE	28	7	7	
8500	PUBLIC HOSPITAL	42	9	9	
8600	COUNTY	2,341	1,066	1,066	
8700	STATE	538	75	75	
8800	FEDERAL	178	50	50	
8900	MUNICIPAL	335	141	141	
9000	LEASEHOLD INT	131	315	315	
9100	UTILITY	1,156	385		385
9300	SUBSURFACE RTS	82	0		0
9400	RIGHT-OF-WAY	842	6		6
9500	SUBMERGED LAND	144	0		0
9600	WASTE LAND	3,171	19		19
9700	CLASSIFIED PARK	102	19		19
9800	CENTRALLY ASSD	281	22		22
9900	ACRG ZONED RR OR AGR	1,594	2		2
	TOTALS:	**319,525**	**303,674**	**45,259**	**258,415**

Legend :

Properties probably not requiring Fire Prevention inspection

Properties probably requiring Fire Prevention inspection

APPENDIX C: COMPUTATION OF AVAILABLE TIME FOR PRODUCTIVE WORK FOR FIRE INSPECTORS

Description of Activities:	Hours per Year Assigned to Non-Inspection Tasks	Annual Hours Available for Productive Tasks
Employees work 40 hours per week (5 - 8 hour days for 52 weeks)		
Total Work Hours per Year		**2,080**
Less Time Off Allowed per Year:		
▪ Personal, Sick and Vacation (26 days per year * 8 hours per day) (Mid-range of years employed (10-14 years), allowed 26 days.)	(208)	
▪ Holidays (12 days per year * 8 hours per day)	(96)	
▪ Other days off estimated (4 days per year * 8 hours per day (Other days off may be for job injury, special assignments, military, union time, administrative leave, travel, etc.)	(32)	
Sub-Total of Work Hours Less Time Off Allowed Hours	**(336)**	**1,744**
Less Training Hours Required for Fire Inspector:		
▪ Fire Inspector Continuing Education Units (20 CEU hours per year)	(20)	
Sub-Total of Annual Work Hours for Fire Inspector	**(20)**	**1,724**
Estimated Productivity Factor (An allowance for unavoidable inefficiencies)	**(431)**	**.75**
Productive Hours Available per Inspector to Perform Inspections	**(787)**	**1,293**