CITY OF WILMINGTON
NORTH CAROLINA

Fire Department Assessment

2006

Emergency Services Consulting inc.

City of Wilmington

Fire Department Assessment

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Wilmington, NC

2006 Fire Department Assessment

~ **FINAL** ~

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Executive Summary

Purpose of the Report

This report details the study of fire protection services in Wilmington, North Carolina. The report provides a thorough and detailed evaluation of the agency, its management,, assets, operations, and service delivery. The report provides observations and findings, as well as strategies and recommendations for changes or improvements in the overall operation of the fire department.

ESCi wishes to thank the staff and elected officials of the City and the Wilmington Fire Department for the excellent cooperation we received. All involved were candid in their comments and provided a large amount of information and data in a short amount of time.

Methodology

The approach used by ESCi in performing the evaluation includes utilization and analysis of statistics, review of documents, interviews with key staff and various agency representatives, and direct observation of facilities and apparatus. Information was collected on a variety of important topics pertaining to the quality fire and emergency services.

This information was used to develop specific recommendations for the City and its department. The recommendations represent opportunities to improve the quality of service provided to the community.

Contrary to popular belief, these types of evaluations are not normally conducted on organizations that are suffering serious problems. Instead, evaluations of this type are primarily directed at organizations that may be experiencing growing pains or are looking for creative and innovative ways to handle the challenges of the future. Such is the case for the Wilmington Fire Department.

Background Information

This report includes a detailed review of the fire department and its various programs. The agency evaluation is arranged by the ten survey objectives shown below:

- Community Baseline and Organizational Overview

- Management Components
- Planning for Fire and Emergency Services
- Personnel Management
- Staffing
- Capital Assets; facilities, apparatus, and equipment
- Service Delivery and Performance
- Training Program
- Fire Prevention Program
- Community Fire Protection Ratings

The criterion used to evaluate the department have been developed over many years. These include relevant National Fire Protection Association standards, national accreditation criteria, health and safety requirements, federal and state mandates relative to fire protection, fire protection standards of the property insurance industry, and generally accepted practices within the fire and emergency services.

Each survey objective provides the reader with general information about that element, as well as specific observations and analysis of any significant issues or conditions that are pertinent. Observations are supported by data collected as part of the survey and interview process.

Finally, specific recommendations are included to resolve identified issues and concerns or to take advantage of opportunities that may exist.

In addition to these evaluation objectives, the City requested that ESCi assess the overall morale and organizational culture of the Wilmington Fire Department. This process was conducted through nearly 100 interviews of employees, the public, and others who regularly observe the department's operations. Discussion of the findings are included in this study in the eleven evaluation objectives.

Summary of Significant Recommendations

The most significant recommendations developed as a result of this study include the following. A list of all recommendations can be found in the back of this report.

- The WFD should completely revise its Standard Operating Guidelines and make significant additions in the areas of emergency operational procedures, non-emergency procedures, and safety procedures.
- Design and implement a pre-promotion training program for all candidates for promotion and acting promotions.
- WFD, in conjunction with HR, should immediately pursue the revision of its personnel regulations and operational policies and procedures. This includes discontinuing any "management by memo" practices and confirming compliance with DOL, the State of North Carolina, and other regulatory agencies.
- A full-time IT support position for the fire department should be considered. This individual should be adequately trained in the use of the department's unique records management system in order to relieve the Assistant Chief from these functions not critical to his division.
- A complete overhaul of the WFD pre-incident planning program should be undertaken with consistency on data collection, plan preparation, site plan drawings, ease of retrieval and use, as well as a continual training emphasizing its use.
- The City should conduct or contract for a fresh salary and benefits survey with an agency specifically familiar with and experienced in fire service pay structures.
- Conduct initial and ongoing officer training in disciplinary processes and conflict resolution.
- Establish an annual skills competency and physical ability test for all fire suppression personnel to assess on-going capabilities of performing the basic, critical tasks of the firefighter.
- Conduct a formal performance evaluation for all employees at least annually utilizing the new evaluation system designed by HR. Areas needing improvement should be reviewed quarterly between the employee and his / her first-line supervisor.
- The WFD is critically short of the Administrative and Support personnel needed to handle the administrative work load of a Department its size. Several new clerical positions should be created to enhance this capability and better serve the growing needs of the department.

- The City's elected officials should adopt a basic service philosophy and response time performance standard for the area served by the Wilmington Fire Department.
- Regularly measure overall response time performance against established response time objectives.
- Regularly measure overall turnout time performance against nationally recognized turnout time objectives.
- The department should formally assign the responsibility for oversight of the delivery of first responder emergency medical services to a program manager.
- Develop and implement a comprehensive departmental training plan.
- Increase the training staff to be commensurate with the department's training mandates including a job analysis of the two incumbents to determine if they are working within their current job descriptions.
- The City of Wilmington should consider the development and maintenance of a progressive organizational culture to be the direct responsibility of its department heads and senior management and should require accountability if the organizational culture becomes a detriment to the development of an efficient, committed, and motivated workforce.
- WFD, in conjunction with HR, should implement a fresh approach to the fire department promotional process to ensure the objective promotion of the best qualified candidates.

A complete listing of all recommendations is found at the back of the report, listed by relative priority and impact to successful operation of the department.

Fire Department Assessment

Objective One – Organization and Community Overview

The Wilmington Fire Department is the operating department of the City of Wilmington designated to provide fire protection and emergency medical response. The department's jurisdiction encompasses the entire municipal limits of the City. The response area includes densely populated urban areas as well as suburban residential areas of New Hanover County and is situated between the Cape Fear River and the Atlantic Ocean. The department began providing fire protection services in 1846.

WFD provides emergency services to a population of 95,476[1] in an area of roughly 54.3 square miles. These services are provided from ten facilities located within the jurisdiction, with an eleventh facility currently under construction. The department maintains a fleet of vehicles including eleven fire engines, three tower platforms, three rescue trucks, three wildland firefighting vehicles, two hazmat trucks (one local and one state), a tactical rescue truck, a fire boat, and an auxiliary truck and mobile air unit. Four vehicles are available in a reserve fleet, not typically used for front-line service. The department's tactical rescue truck operates as one of eleven state Urban Search and Rescue Teams (Task Force #11).

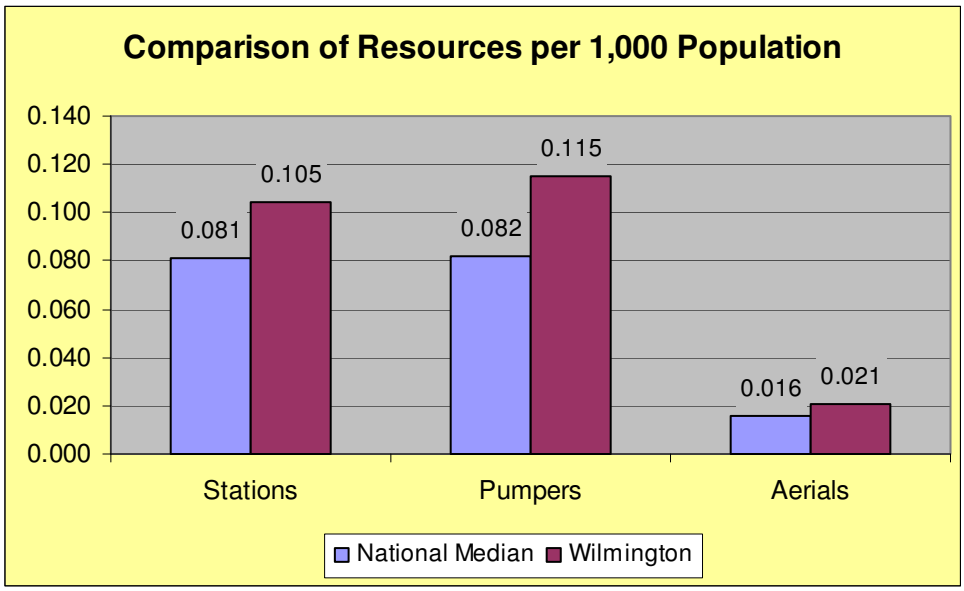
There are 217 individuals[2] involved in delivering these services to the jurisdiction. The department has a Fire Chief, Assistant Chief of Suppression, Assistant Chief of Fire and Life Safety, Assistant Chief of Support Services, Battalion Chief of Training, and Battalion Chief of Special Teams. A Training Captain, Shop Foreman, two Mechanics, and three clerical staff provide additional support services. Primary staffing coverage for emergency response is through the use of career firefighters operating on 24-hour shifts.

[1] U.S. Census Bureau, 2005 population estimates

[2] Current number at time of field research

The following figure provides an overview of the Wilmington Fire Department's fire suppression resources and compares these with the average rate of resource allocation in other communities of similar size within the same region of the United States[3].

Figure 1: Resource Allocation Comparison



The chart demonstrates that WFD has a higher than median allocation of stations for communities of its population. The department also has a higher than median number of pumpers, and a relatively normal ratio of aerial devices.

The department provides a variety of services including fire suppression, victim rescue, emergency medical first responder, technician-level hazmat response, code enforcement, and public fire safety education. A regional Hazardous Materials Response Team, sponsored by the State of North Carolina, is also operated by the department.

[3] Comparison data from the National Fire Protection Association "Fire Department Profiles 2004". This report is based upon two data sources: the annual NFPA Survey for U.S. Fire Experience, 2004, and the NFPA Fire Service Survey, 2002-2004. The annual fire experience survey is a sample survey of fire departments in the United States, which serves as the basis for making national estimates. The sample is stratified by the size of the community protected by the fire department. Survey returns in recent years have ranged from 2,800 to 3,500 departments annually. The national projections are made by weighing sample results according to the proportion of total U.S. population accounted for by communities of each size. The NFPA Fire Service Survey is a three year cycle survey which attempts to survey about one third of the states in the country each year. The survey includes questions on the number of career firefighters, the number of volunteer firefighters, length of work week, number of apparatus and stations, etc. In recent years the survey has had a response rate of about 30% from departments.

The New Hanover County Public Safety Communications Center provides emergency call receipt and dispatch service. Enhanced-911 telephone service, computer-aided dispatch, and a multi-channel radio system are in place.

Responsibilities and Lines of Authority

The City of Wilmington is a municipal corporation, formed under the laws of the State of North Carolina, and operates as a statutory City that is provided the authority to levy taxes for operating a fire protection system.

The City operates under a Council-Manager form of government, and the Council is provided with broad power and authority to govern the provision of fire protection and emergency services within the City including: organizing a fire protection system, appointing officers and members, purchasing land and equipment, entering into contracts, issuance of bonds, and levying of taxes.

The role and authority of the Council and the City Manager is further clarified within city ordinances and written policy documents describing their function and tasks. The Council maintains strictly policy-level involvement, avoiding direct management and hands-on task assignment.

The Fire Chief is an at-will employee and is not provided with a formal personal services contract. The City Manager provides an annual formal written evaluation of the Chief's services as a means of documenting performance and establishing personal objectives.

Foundational Policy

Organizations that operate efficiently are typically governed by clear policies that lay the foundation for effective organizational culture. These policies set the boundaries for both expected and acceptable behavior, while not discouraging creativity and self-motivation.

A comprehensive set of departmental operating rules and guidelines should contain at least two primary sections. The following format is suggested.

1. Administrative Rules – This section would contain all of the rules that personnel in the organization are required to comply with at all times. Administrative Rules, by definition, **require** certain actions or behaviors in all situations. The City Manager should adopt or approve the Administrative Rules since the chief is also subject to them. However, the City should then delegate authority to the chief for their enforcement on department personnel. The Administrative Rules should govern **all** members of the department: paid and civilian. Where rules and policies require different applications or provisions for different classifications of members, these differences should be clearly indicated and explained in writing. Specifically the Administrative Rules should contain sections which address:

   - Public records access and retention
   - Contracting and purchasing authority
   - Safety and loss prevention
   - Respiratory protection program
   - Hazard communication program
   - Harassment and discrimination
   - Personnel appointment and promotion
   - Disciplinary and grievance procedures
   - Uniforms and personal appearance
   - Other personnel management issues

2. Standard Operating Guidelines (SOG's) – This section should contain "street-level" operational standards of practice for personnel of the department. SOG's are different from Administrative Rules in that variances are allowed in unique or unusual circumstances where strict application of the SOG would be less effective. The document should provide for a program of regular, systematic updating to assure it remains current, practical and relevant. SOG's should be developed, approved, and enforced under the direction of the Fire Chief.

WFD operates from four primary policy manuals: WFD Rules and Regulations, WFD Policies and Procedures, WFD Standard Operating Guidelines, and City of Wilmington Personnel Policies. In addition, the department is subject to the Executive Directives promulgated from the City Manager's office.

All of the manuals were given a thorough review for quality and content. The documents are fairly well organized, and it appears that a great deal of time went into writing the various

policies and procedures in a professional and clear manner. However, there are several areas where improvement is warranted.

The City of Wilmington Personnel Policies manual includes most of the appropriate policies either required by law or focused on reducing the risk of civil liability. These include family medical leave and disciplinary policies. Other policies cover routine leave procedures, benefits, etc. The following table lists the topics for policies provided to us by the city.

Figure 2: City of Wilmington Personnel Policy Topics

City of Wilmington Personnel Policies Topics		
Leaves	Appeals of Discipline	Injury Leave
Employee Benefits	Sick Leave Bank	Military Leave
Substance Abuse	Solicitation	Leave Without Pay
Use of Public Funds	Building Sercurity	Civic Leave
Dept Directors on Cmty Boards	Safety Shoe Policy	Educational Leave
Personnel Administration	Reduction in Force	School Support Leave
General Pay Plan	General Classification Plan	Vacation Leave
Conditions of Employment	Inclement Weather	Administrative Leave
Employee Discipline	Driving Standard	Volunteer Policy
Employee Grievance	Position Status	Accident Review Standard
Personnel Records & Reports	Sick Leave	Cellular Telephone
Separation & Reinstatement	Bereavement leave	Travel Policy
	FMLA Leave	

Additional topics covered by the City Manager's Executive Directives are listed in the following table:

Figure 3: City of Wilmington Executive Directives

City of Wilmington Executive Directives Topics	
Promulgation of Departmental Policies	Hazards to the Public
City Letterhead	Removal of signs from public right of way
E-Mail Usage	Fuel Conservation
Harrassment/Discrimination Policy	

No specific policies could be located regarding violence in the workplace or protections for those reporting wrongdoing (whistleblowers). The City may wish to pursue development of policies on these topics or, if included in other policies, provide cross-indexing that permits employees to locate these topics quickly.

The City's administrative policies, while providing general employment practices, do not cover all aspects of the administration of individual departments. Thus, the Wilmington Fire Department has also established additional administrative policies specific to its operations that are located in two separate fire department manuals, the WFD Policies and Procedures and the WFD Rules and Regulations.

Little reason could be found for maintaining these two documents as separate manuals. There appeared to be no distinct pattern for which administrative policies appeared in which document. The topics in both documents were somewhat of a mixture of policies and procedures in several different categories with limited organization to their appearance.

The following tables lists the topics for WFD policies provided to us by the department.

Figure 4: WFD Policy and Regulation Manuals Topics

Wilmington Fire Department Policies and Procedures Topics		
Uniforms	Sleep time	Customer service
Administrative ositions	Minimum staffing	Child passenger safety program
Chain of command	Time off procedures	Return of equipment
Media	Training time as hours worked	Incident reports
Time swapping	Personal appearance	Probation requirements
Medical requirements	Loaning equipment	Responding to alarms
Promotional procedures	Pager and cell phones	Ride alongs
Awards programs	Special operations	Certification requirements
Outside employment	Leave time calculation	

Wilmington Fire Department Rules and Regulations Topics		
General Rules of Conduct	Smoking During Fire Operations	Reporting for Duty and Tardiness
Protective Clothing	Fire Station Routine	Telephone Use
Driver's License	Leaving the Station	Flags
Safety	Company Log Book	Engineers
Information Changes	Parking	Officers/Acting Officers
Identification Cards	Company Personnel Records	Acting Officers
Private Business	Station Reference Library	Out of Service Company

It is recommended that the two policy documents be combined, updated and codified in such a way as to enhance ease of use and ensure all relevant topics are covered. Indexing should be improved and cross-references provided where applicable. In addition, some procedural items related to field operations appear in these manuals. Such items should be removed and included in the Standard Operating Guidelines..

The WFD Standard Operating Guidelines are inadequate to fully guide safe field operations and are in need of significant expansion. Those procedures that are present are well organized, easy to understand and apply, and, where complete, seem to reflect the current industry standards and best practices. There is currently no prescribed system in place to review and update the procedures on a periodic basis. Such a system is being planned to ensure regular future updates occur. The procedures do not appear to contain adequate sections on emergency scene operations or provide field personnel with insufficient guidance on fire ground operations such as fire streams, pump operations, search procedures, evacuations, etc.

The following tables lists the topics for WFD Standard Operating Guidelines provided to us by the department.

Figure 5: WFD Standard Operating Guidelines Topics

Wilmington Fire Department Standard Operating Guideline Topics		
Two-in/two-out	Accountability	Fuel conservation
Water rescue	Terrorist acts	Rope care
Trench rescue	Emergency Ops Plan	Reserve apparatus
Confined space rescue	Foam Unit 1	Back-up radios
Hazardous materials	Atmospheric monitoring tests	Use of wheel chocks
Small attack lines	Carbon monoxide incidents	Airport emergencies
Hydrant inspection	Equipment color coding	Radio testing
	Tactical channel procedures	

Again, following the recommended format discussed earlier, the Standard Operating Guideline Manual should be expanded to include a far greater collection of guidelines for actual incident actions. The following two tables provide a listing of topics that the department should consider including in its Standard Operating Guidelines.

Figure 6: Recommended Additional SOG Topics for Field Operations

Alarms and Response Procedures	***Medical Emergencies***
Alarm Response Procedures	Operational Guidelines for Medical Aid Responses
Automatic Aid	Operations with Ambulance Personnel
Mutual Aid	Use Of Automatic External Defibrillator (AED)
Contractual Agreements	Major Medical Incidents
Fire Company Operations	Triage
Standard Company Operations	Materials
Returning Companies to Service	Vial of Life and Medic Alert Tags
Use of Civilians	Attempted Suicide
Fire Scene Investigations	Suspected Homicide
Smoke Removal Procedures	DOA (Dead on Arrival)
Personal Alert Safety Devices	Suspected Child Abuse
On-Scene Equipment Inventory	Suspected Sexual Assault
Highway Incident Safety	Hospital Disaster Notification
Command Operations	EMS Reports
General Strategic Guidelines	BLS Medical Protocols
Incident Management System	***Electrical Emergencies***
Command Post Procedures	Electrical Emergency Operations
Welfare	***Rescue Operations***
Helicopter Operations	Vehicle Rescue and Extrication
Public Health Considerations	Life Line Operations
Incident Critique	Rescue from Machinery
Area Evacuation	Escalator Emergencies
Building Evacuation	Elevator Emergencies
Firefighting	Building Collapse
Metal Fires	Rescue at Structure Fires
Structure Fires (General)	***Transportation Emergencies***
Operations in Sprinklered Buildings	Interstate Operations
On-Site Auxiliary Fire Equipment	Railroad Emergencies
High Rise Fires	***Hazardous Materials Incidents***
Wildland Fires	Flammable Fuel Spill (Liquid or Gas)
Vehicle Fires	LPG Emergencies
Fire Stream Management	Fumigation Emergencies
Industrial Dumpster Fires	Explosives and Bombs
Fire Watch Detail	PCB's
Fires in US Mailboxes	Pesticide Procedures
High Rise Pack	Radioactive Materials
Bowstring Truss Roof - Operations Procedures	Natural Gas Filled Structures - No Fire
Thermal Image Camera	Natural Gas Fed Fire - Inside Structure
Law Enforcement Liaison	Broken Natural Gas Main - Fire
Law Enforcement Liaison - General Operations	Broken Natural Gas Main - No Fire
Public Assistance Operations	
Public Assistance Alarms	

Figure 7: Recommended Additional SOG Topics for Non-Emergency Operations

Station Operations
Purchasing Procedures
Emergency Power Systems
Personal Locker Assignments
Station Libraries
Scheduling Use of Training Media
Apparatus Operations
Apparatus Maintenance
Vehicle Out of Service Procedure
Testing Apparatus Pumps
Driving Emergency Vehicles
Warning Devices
Apparatus Operational Limits
Fueling Procedure
Driver Operator - Pump Certification
Equipment Operations
Equipment Repairs
Equipment Out of Service
Radio Repair Procedure
Pressure Vessel Maintenance
Hose Maintenance
Self-Contained Breathing Apparatus (SCBA)
Preventive Maintenance - SCBA's
Respiratory Breathing Air Systems
Ladder Maintenance
Nozzle Maintenance
Fire Extinguishers
Hand Tool Maintenance
Power Tool Maintenance
Public Education
Public Relations
Procedures During Station Tours
Fire Extinguisher Demonstrations
Fire Prevention
Fire Company Fire Prevention Inspections Assistance
Pre-Fire Plans

Several model documents are available through industry trade organizations. The resulting document should be considered for publication in a pocket-sized field guide format.

Recommendation

- The City of Wilmington should publish or clarify policies on workplace violence and reporting of wrongdoing (whistleblowers).
- The WFD should combine its two administrative policy documents, revise the policies, and better codify or index the resulting document.
- The WFD should completely revise its Standard Operating Guidelines and make significant additions in the areas of emergency operational procedures, non-emergency procedures, and safety procedures.
- The WFD should consider publishing its SOG's in a pocket field guide for easier reference by operations personnel and for enhanced use in training drills and exercises.

Organizational Structure

A well-designed organizational structure should reflect the efficient assignment of responsibility and authority, allowing the organization to accomplish effectiveness by maximizing distribution of workload. The lines on an organizational chart simply clarify accountability, coordination and supervision. Thorough job descriptions should provide the details of each position and ensure that each individual's specific role is clear and centered upon the overall mission of the organization.

A review of this agency's organizational chart reveals that they are organized in a typical top-down hierarchy. The chart indicates a relatively clear chain of command and identifies distribution of responsibility and functions.

The organizational structure of the department demonstrates a clear unity of command, in which each individual member reports to only one supervisor (within the context of any given position) and is aware to whom he or she is responsible for supervision and accountability. This method of organization encourages structured and consistent lines of communication and prevents positions, tasks, and assignments from being overlooked. The overall goals and objectives of the organization can be more effectively passed down through the rank and file members in a consistent fashion.

The organizational structure is charted with clear, designated operating divisions that permit the core functions of the organization to be the primary focus of specific supervisors and assigned members. While some task-level activities may carry over from division to division, the primary focus of leadership, management, and budgeting within the division are clarified by the division's key function within the mission statement. Those individuals supervising or operating within a specific division are positively clear as to the role of the division and its goals and objectives.

The department has sufficiently analyzed its mission and functions such that a resulting set of specific agency programs have been established. Organized, structured programs permit better assignment of resources, division of workload, development of future planning, and analysis of service delivery. Those departments that have clarified their programs with titles, assigned leadership, resources, budget appropriations, performance objectives and accountability are among the most successful.

The chief executive officer (Fire Chief) appears to directly supervise three other individuals, including the three Assistant Chiefs. The Chief's span of control falls within the range typically considered normal and acceptable. This is a positive reflection on the agency's organizational structure, since many times Chief officers accept or encourage a span of control that greatly exceeds their ability to maintain good communication and leadership, often with good intentions but just as often to the detriment of the department.

The Fire Chief has been provided with the authority to issue suspensions up to 30 days, and can recommend termination, demotion, or additional suspension to City Manager. The City's Civil Service Commission is available for additional appeal.

The department maintains a thorough set of job classifications and descriptions that accurately reflect the typical responsibilities and activities of the positions. The documents adequately describe the primary functions and activities, critical tasks, levels of supervision and accountability, as well as reasonable qualifications.

Maintenance of History

The Wilmington Fire Department has significant levels of history retention programs in place. Appropriate records of all corporate or municipal meetings are maintained in accordance with the laws of the state governing various types of public meetings and decisions involving public funds.

The department maintains a "scrapbook" or file containing items of historical significance, including pictures, newspaper articles, etc. These are helpful when updating a historical perspective of the organization and the major events in its development. Training Officer Chris Nelson is currently accepting responsibility for this function.

A regularly maintained historical record serves as a valuable tool for planning and decision-making. It allows quick recollection of how the department has adapted to changes in the community. It provides valuable historical data to agencies, such as the Insurance Services Office, for evaluation purposes. It also allows for permanent memory of the people who have contributed to the success of the department in its service to the community.

A well-produced annual report can serve to satisfy this need. In addition, an annual report is a wonderful communications tool to share the efforts and activities of the department with the public. The department does not consistently publish or publicly distribute a formal annual report of activities and accomplishments.

At a minimum an annual report should include:

- Brief history of the department.
- Summary of events and activities during the report year.
- Description of major incidents handled by the department.
- Descriptions of new or improved services and programs.
- List of people who served with the department during the year.
- Awards received by the department or individuals.
- Financial summary including revenues and expenditures, grants, etc.
- Statistical analysis, with trends, of key community service level indicators.

The annual report should be printed and distributed to the community and made available at such places as the local chamber of commerce and library.

Recommendation

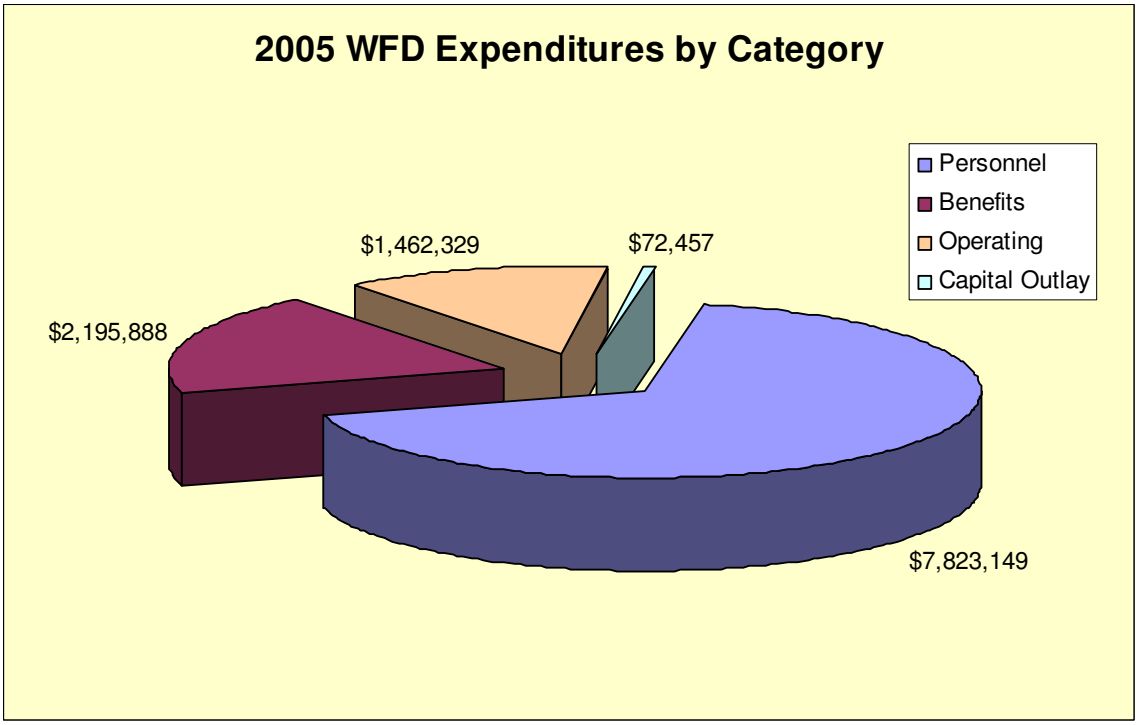
- The WFD should publish and distribute a formal annual report.

Finance

The assessed value of the City of Wilmington is $9.1 billion with a total current fiscal year tax rate for general fund operations (including fire protection) of $0.46 per $1000 assessed valuation.

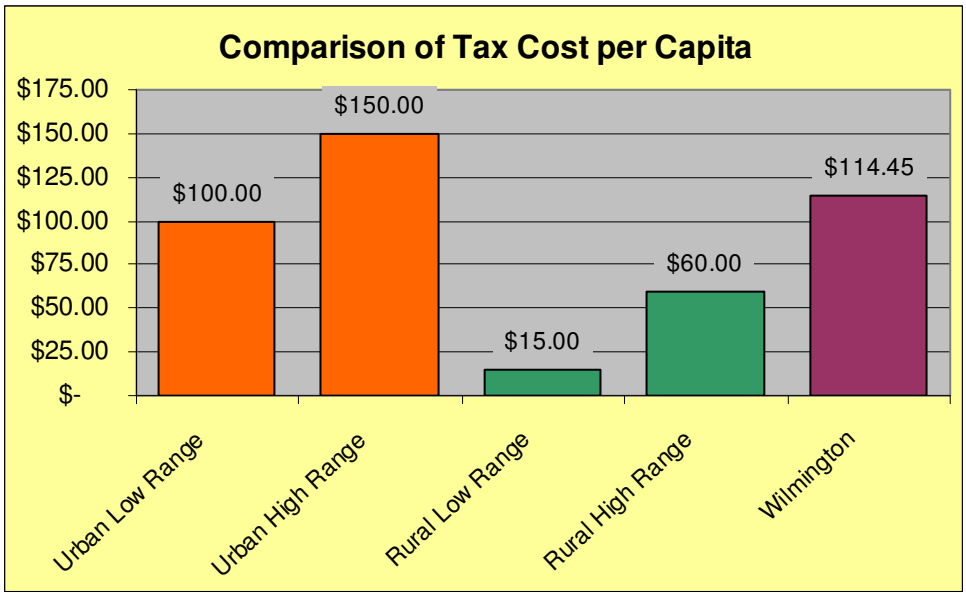
The following figures provide an overview of the 2005 fiscal year financial information for the Wilmington Fire Department. Expenditures include hydrant rental and maintenance, but do not include certain grant-funded capital expenditures.

Figure 8: Budget By Category



Given the population receiving direct services from the Wilmington Fire Department, the following chart demonstrates tax costs per person[4] and contrasts this with other smaller and larger communities..

Figure 9: Fire Service Tax Cost Per Person



The comparison figures that are provided have been developed by ESCi and, as such, represent the company's collective experience with fire service tax costs as observed during work in agency evaluations, growth management plans, staffing studies, station location studies, merger/consolidation studies and strategic planning in fire department agencies. As used in this chart, urban refers to those communities utilizing primarily career or combination staffing systems serving populations in excess of 20,000 persons or with average population densities of greater than 3,000 persons per square mile. Rural refers to those communities utilizing primarily volunteer staffing systems serving populations of less than 20,000 or with average population densities of less than 3,000 per square mile.

Since the City of Wilmington is a combination of relatively urbanized residential and commercial development, we have selected the urban cost ranges as the most appropriate benchmark. The chart above demonstrates a relatively normal cost per person within this community. However, it

[4] Department-generated revenue is deducted from expenses in order to derive the tax cost.

should be remembered that costs per capita can vary greatly based on the types of services provided in any given community when compared to another, or by the overall taxable values of property producing the revenue. Still, the figures reflect that the taxpayers are receiving services which, by comparison, are of a similar cost when compared to other communities.

Cost Recovery Efforts

For most emergency service systems, major cost recovery options are limited. Possibilities exist in the area of hazardous materials response, fire suppression response, and code enforcement.

At WFD, some revenue is currently gleaned from response to hazardous materials incidents, where "spiller pays" laws often require that departments are reimbursed for their mitigation efforts. However, this is typically limited to actual documented expenditures and, with the exception of very busy hazmat teams, provides little predictable revenue income..

Code enforcement efforts often provide the most reliable, consistent and predictable source of revenue. The City had established a fee ordinance for their code enforcement division which initiates billing for such things as routine inspections, licenses and plan review. Code enforcement fees amounted to $114,629 in revenue in 2005.

Some fire departments have initiated billing for fire suppression responses, primarily to insured structures. However, most insurance carriers provide very limited coverage for such fees, thus the revenue is rarely worth the political and public relations challenges or the administrative efforts for collection. As a result, many such efforts have begun and failed. Such an effort is not recommended for WFD at this time.

Population

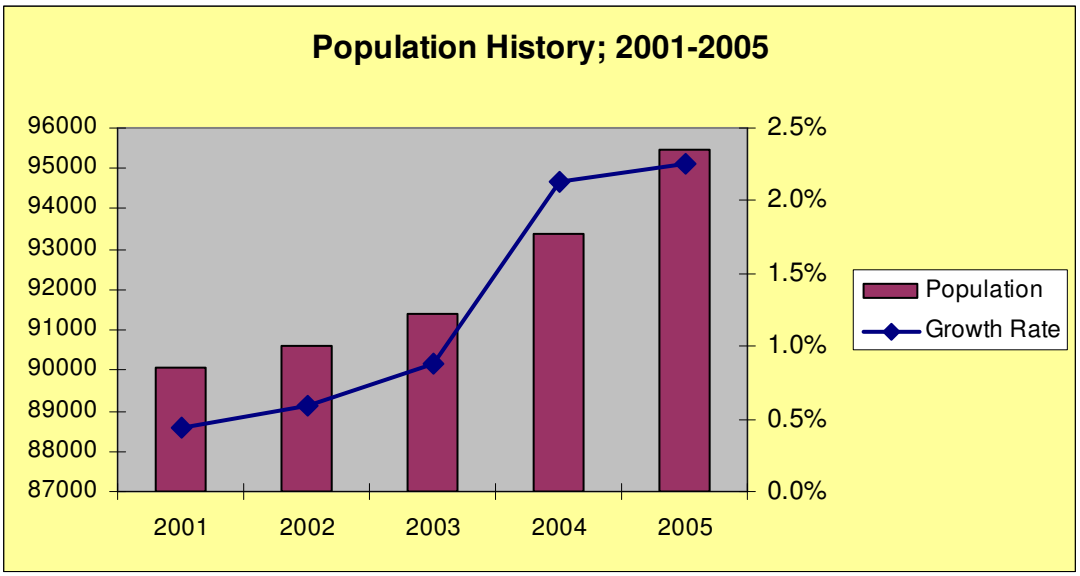
The Wilmington Fire Department provides primary fire protection services to all of the City of Wilmington in New Hanover County. The population of the City was 75,838 in the 2000 U.S. Census[5]. However, the Census Bureau has estimated some increase since the 2000 census

[5] 2000 U.S. Census Table SF-1 and SF-3.

and the City's population was estimated at 95,476 in 2005[6]. For the City, this population figure represents a significant 72% increase over the 1990 Census, when the population of the City of Wilmington was 55,530. The most significant portion of growth within the City has clearly occurred through additional housing development, since over 46% of the total housing in the City of Wilmington has been built since 1990.

The following chart provides some historical information on population for the City of Wilmington.

Figure 10: City of Wilmington Population Growth History



The following figures provide some general demographic information on population and housing for the City of Wilmington.

[6] Population estimate for 2005 was based upon a 2000 Estimate Base of 89,962, reflecting modifications to the 2000 Census official figure as documented in the Count Question Resolution program and other program revisions following the 2000 U.S. Census.

Figure 11: City of Wilmington Population by Age

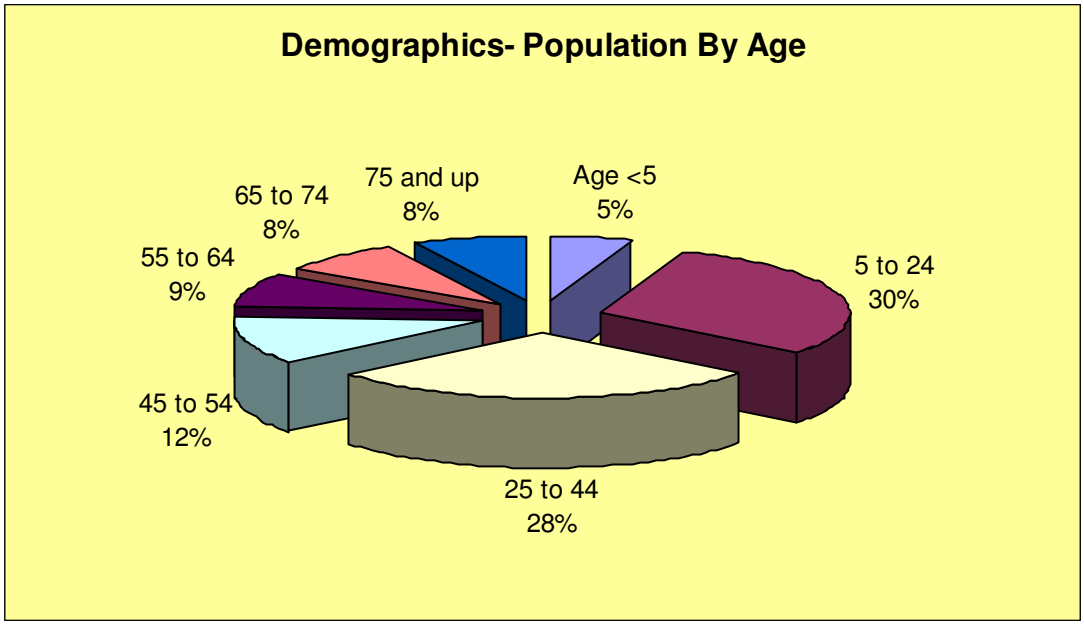


Figure 12: City of Wilmington Demographic Trends

Selected Demographic Information- 1990 to 2000								
	Total Pop	Age <5	5 to 24	25 to 44	45 to 54	55 to 64	65 to 74	75 and up
2000	75,838	4,020	22,955	21,594	9,172	6,460	5,858	5,779
1990	55,530	3,481	17,157	16,361	4,832	4,877	5,208	3,614
change	37%	15%	34%	32%	90%	32%	12%	60%

As can be seen from the figure, 15% of the population is 65 years of age or older and 5% of the population is under 5 years of age, placing a total of 20% of the area's population within the significant target age groups that pose the highest risk for fatalities in residential fire incidents. It is also worth noting that the number of residents over the age of 75 has increased by 60% since 1990, a change that can be expected to create a significant increase in service demand for emergency medical incidents

Figure 13: City of Wilmington Housing by Occupancy

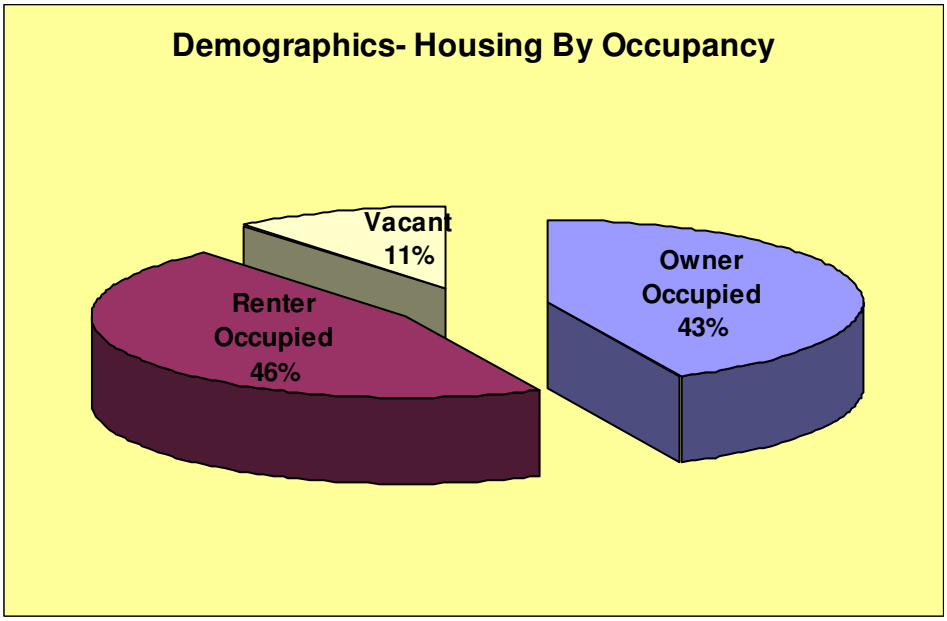


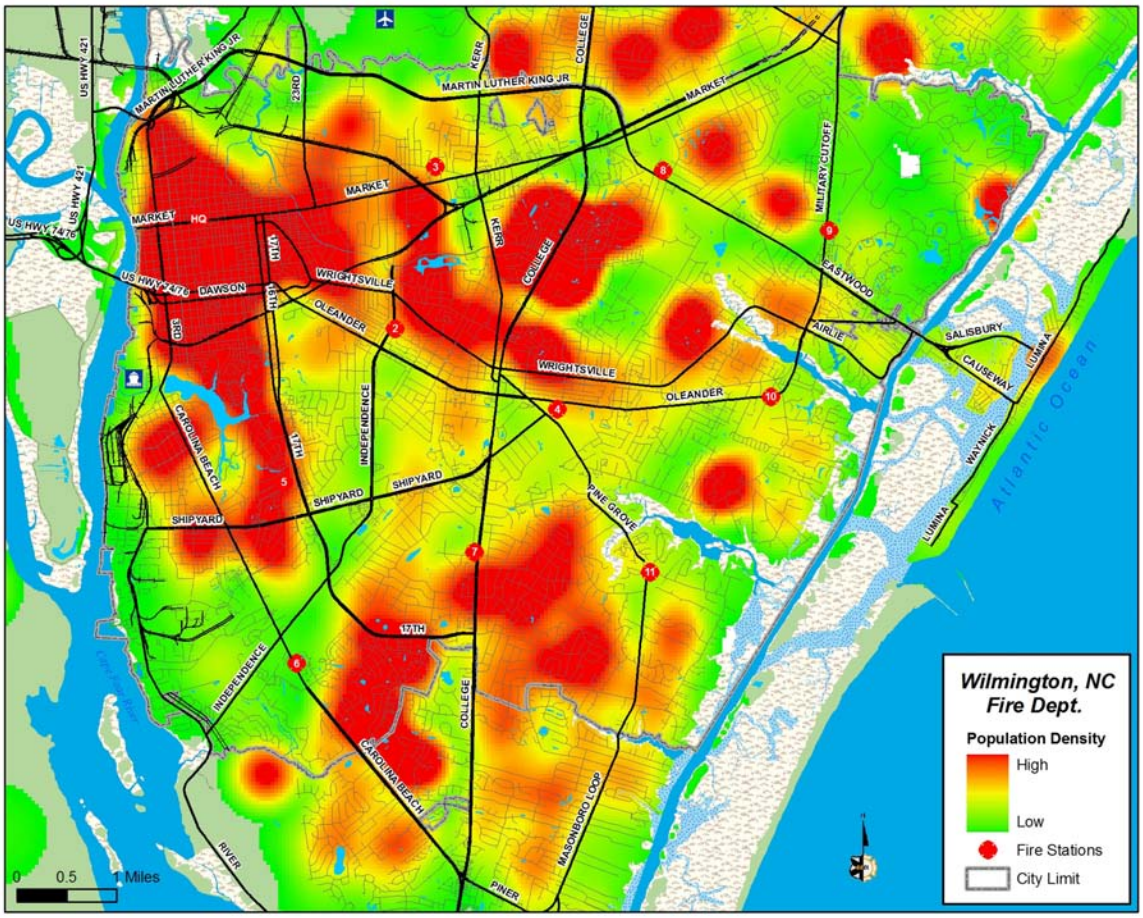
Figure 14: City of Wilmington Housing Trends

Selected Housing Information- 1990 to 2000				
	Housing Units	Owner Occupied	Renter Occupied	Vacant
2000	38769	16702	17657	4319
1990	26469	11099	12458	2912
change	46%	50%	42%	48%

From the demographic information reviewed here, it is projected that the City of Wilmington may experience a slightly higher demand for emergency services in comparison with other communities of its size.

It is also useful to assess the distribution of the population within the City of Wilmington, since there is a direct correlation between population density and service demand. The following map displays the population density of the City, based upon information from the 2000 U.S. Census.

Figure 15: City of Wilmington Population Density



Concentrated areas of population can be found closest to the downtown area, the University area, and along the southern city border. As infill development continues into the future, higher densities are expected within the central area.

Community Risk Analysis

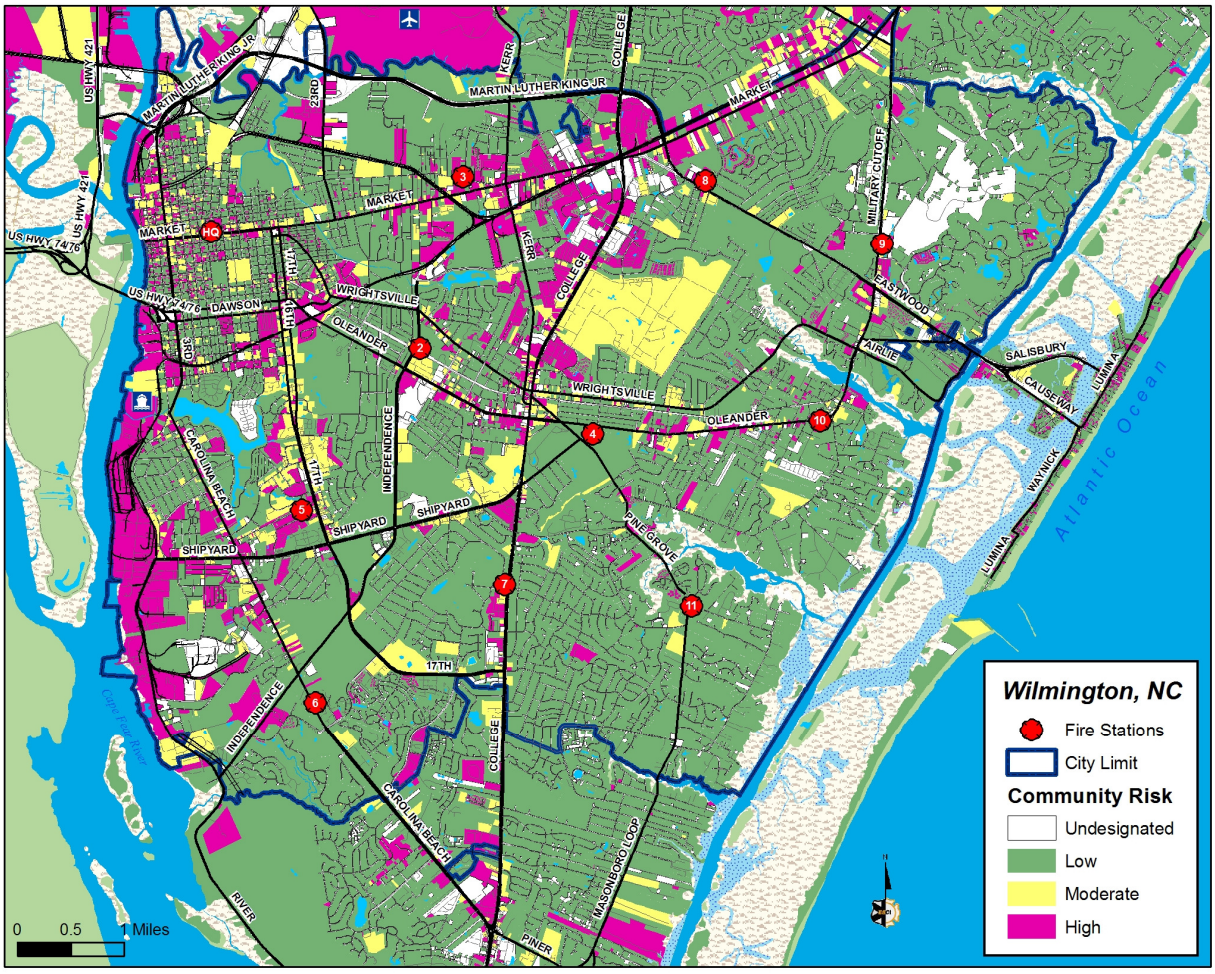
The fire service assesses the relative risk of properties based upon a number of factors. Properties with high fire and life risk often require greater numbers of personnel and apparatus to effectively mitigate a fire emergency. Staffing and deployment decisions should be made with consideration of the level of risk within geographic sub-areas of a community.

The community's risk assessment has been developed based upon the current land use within its boundaries. These uses are found in the City's development plans and zoning designations.

The following map translates land use (scale and type of development within geographic sub-areas) to categories of relative fire and life risk.

- Low risk – Areas zoned and used for agricultural purposes, open space, low-density residential, and other low intensity uses.
- Moderate risk – Areas zoned for medium-density single family properties, small commercial and office uses, low-intensity retail sales, and equivalently sized business activities.
- High risk – Higher-intensity business districts, mixed use areas, high-density residential, industrial, warehousing, and large mercantile centers.

Figure 16: Community Risk Assessment



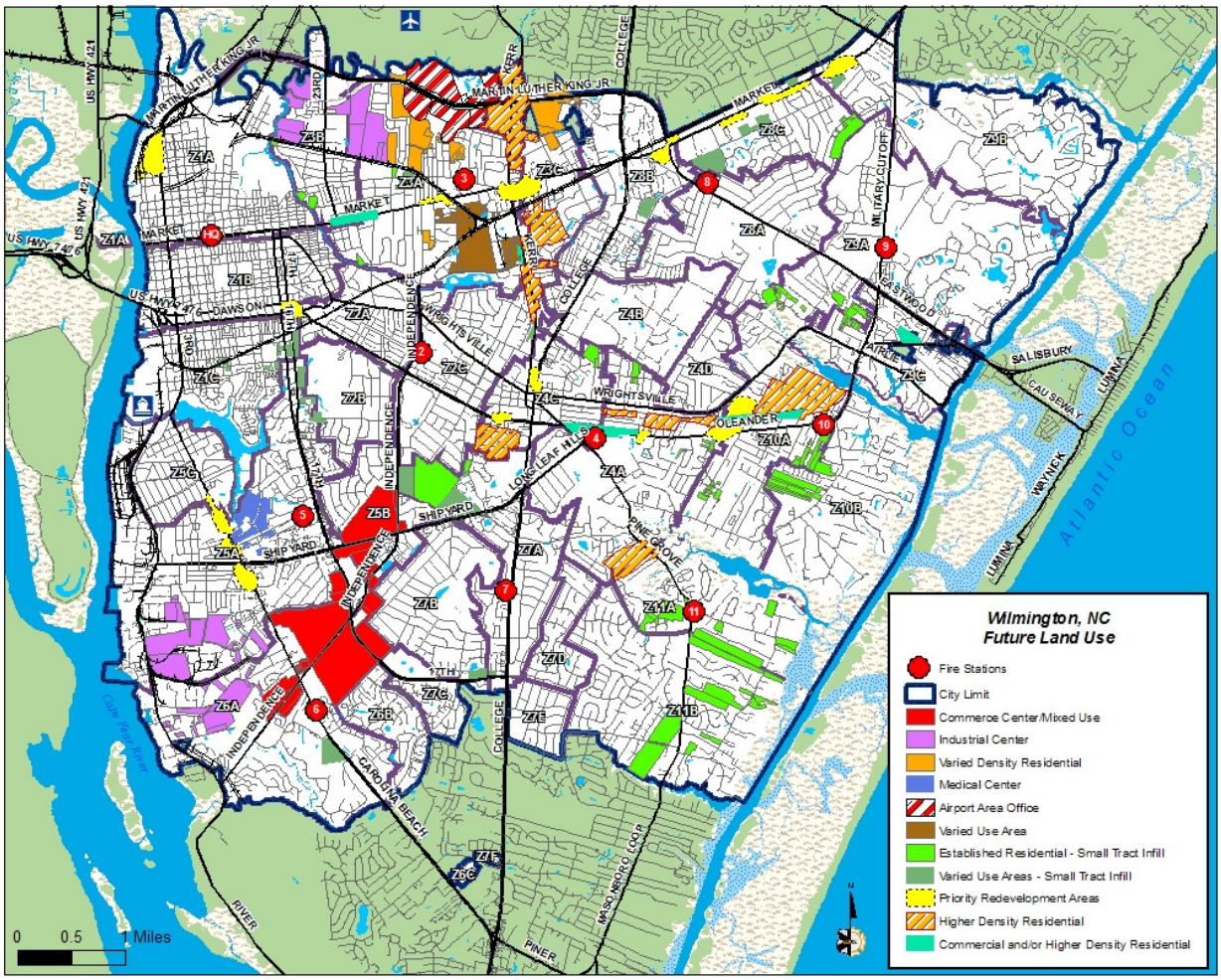
The community contains mostly low and moderate risk properties. The predominance of highest risk is located in the City's central downtown core, along the riverfront on the west side of the City, and in certain non-residential developments along Market, College, and 17th Streets. These properties include industrial, heavy commercial, mid-rise, mixed-use, institutional, and multi-family occupancies.

The City's land use patterns provide a challenge to the development of an efficient fire resource deployment configuration. Aside from the residential areas near the inter-coastal waterway, most of the higher risk properties are scattered throughout in the western half of the City rather than being concentrated in a central location.

Some additional changes may be anticipated in the community fire protection risk distribution. Though actual land uses, and thus relative fire risk, cannot be determined in advance, the following map does depict anticipated changes in land use by assigning future major land use categories[7]. These changes should be consistently taken into consideration relative to how they may alter distribution of staffing and resource deployment.

[7] Source: City of Wilmington Future Land Use Plan

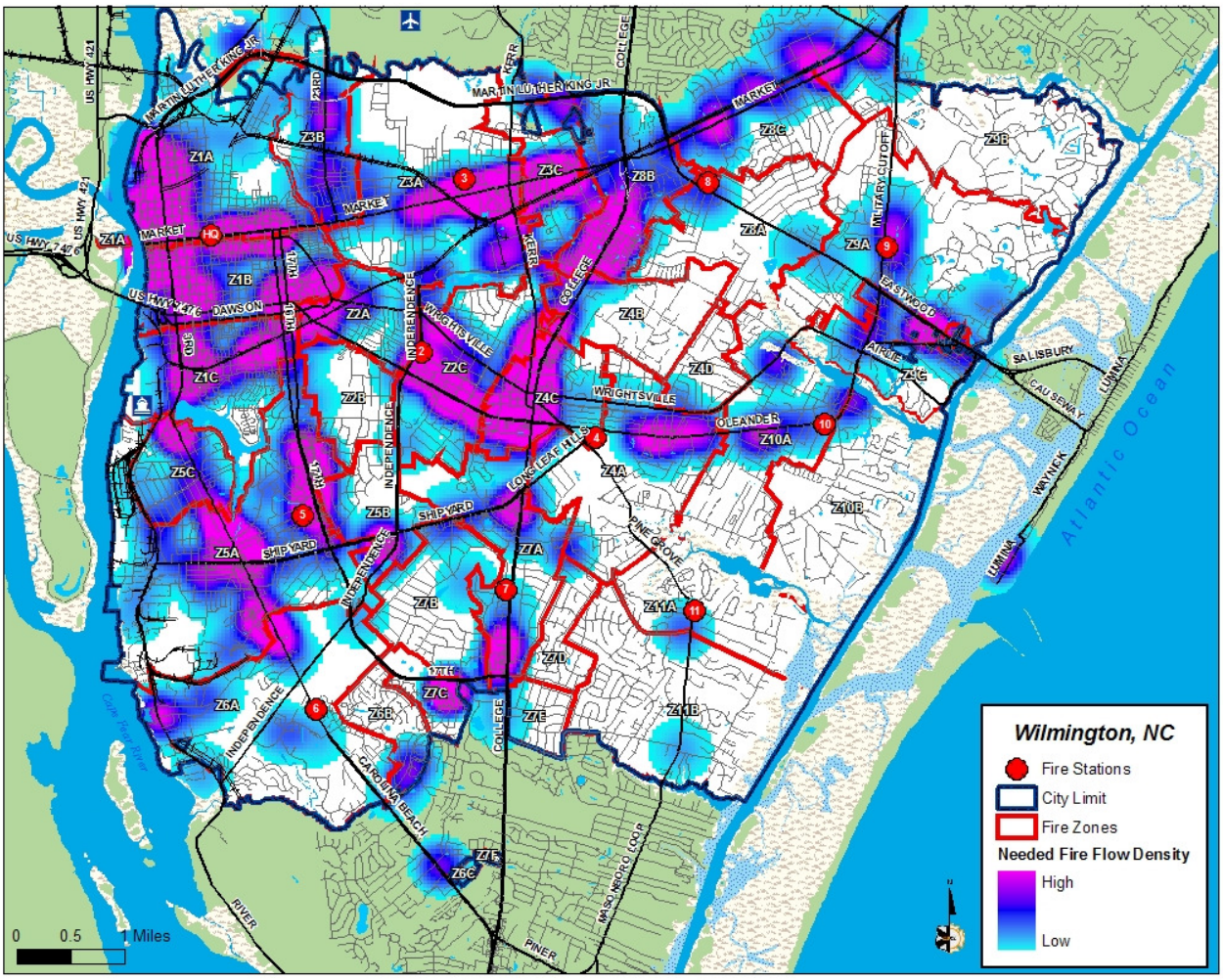
Figure 17: City of Wilmington Future Land Use



An additional risk consideration is the amount of water that is needed to control a fire in a structure. The Insurance Services Office has established a method of calculating the amount of gallons per minute needed for fire suppression, based upon a buildings construction, occupancy, exposure risks, alarms, and sprinkler systems.[8] Figure 18 indicates the density of buildings rated by the ISO or Office of the State Fire Marshal, based upon the needed fire flow rating assigned.

[8] See Insurance Services Office *Guide For Determination Of Needed Fire Flow*, edition 05-2006.

Figure 18: Wilmington Needed Fire Flow Density



Objective Two - Management Components

As with most emergency service agencies, the Wilmington Fire Department faces challenges to organizational growth and management. In addition to the continuing growth of the community and workload, the management of personnel always presents unique issues involving the consistency and adequacy of response, maintenance of competencies, and recruitment of future workforce. This section of the report examines the department's efforts in this area and preparation for the future health of the organization.

Mission, Vision, Strategic Planning, Goals and Objectives

The process of strategic planning involves clarifying an organization's mission, articulating its vision for the future, and specifying the values within which it will conduct itself.

The Wilmington Fire Department has completed a strategic planning process that involved various officers of the organization charting a clear direction for its future. The department's mission statement is valid and up-to-date, and clear values have been articulated in writing. A vision is provided by the document, enabling readers to identify where the department intends to be in the next several years.

Through its strategic planning process, the department has stated the specific goals and objectives whereby it intends to meet its vision. These goals and objectives provide clear guidance in decision-making and focus the agency's efforts on the most critical issues that will impact its success in the future. In addition, the plan provides each member with clear direction of the future and how they fit into the process.

The WFD is to be commended for its proactive efforts in this respect and should continue to maintain the Strategic Plan as a living, up-to-date document through revision meetings with its planning team at least annually.

The department may also find some benefit in widening the participation in strategic planning processes. Strategic planning is a wonderful opportunity to provide input from all ranks of the agency, including firefighters. Wherever possible, broadened participation of the internal

customers or stakeholders, as well as public input opportunities, can provide improved levels of communication, stronger buy-in for department goals, and fresh perspectives on critical issues.

Recommendation

- Consider broadening the participation in the strategic planning processes to a larger number of staff representing all aspects and ranks of the department operations and support functions.
- Consider public input opportunities as a component of strategic planning to make the process more customer-centered.

Critical Issues

It is extremely important that there be a clear understanding of critical issues facing the departments. Without such an understanding, department leadership cannot be prepared to face these issues. In addition, the enunciation of critical issues to employees and members increases their awareness of the organization's priorities and assists them in becoming focused on solutions.

The following issues should be given serious consideration for inclusion in the final list. These are items that have been identified by the officers of the departments as issues with significant potential for impacting the success of the organization and the effectiveness of its service.

1. Succession Planning: numerous top management positions are eligible for retirement within five years which will create a potential leadership vaccum.
2. Speed of Succession: personnel moving up through ranks much more quickly, not permitting individuals to "season" as supervisors
3. Recruitment and Retention of Best Qualified Members: competitive job market (salary and benefits), as well as increasing cost of living, is making it more difficult to find and retain most qualified personnel.

A further exploration of critical issues should be completed during strategic planning processes.

As with critical issues, it is important for any agency to have an appropriate level of future thinking. This permits an agency to identify what external challenges may present themselves to

the organization in the coming years. This awareness of future challenges ensures that the department does not miss out on opportunities or blindly stumble into crisis unprepared.

Again, further exploration of future challenges should be part of a complete strategic planning process, but the following items have been identified by the officers of the department as external challenges likely to be faced by the agency in the coming few years.

1. Generational Culture Differences: The department has four generations represented in its workforce creating significant generational differences in work attitudes and culture.
2. Community Growth: Service demand increases, traffic congestion impacts, rapid changes in geographical distribution of fire risks.
3. Administration and Support Challenges: Increasing operations staff and community growth generating increased workload for limited administrative and support staff.

Internal and External Communications

Quality communications is an achievable goal for any organization, but one that always seems to be most elusive. However, it is extremely important. To its credit, there are established communication processes within this department that provide opportunities for department personnel to be heard and be involved. However, more can be done.

Staff meetings involving primary management staff and officers are not consistently held in the agency. Though meetings are called as necessary, this approach encourages a crisis-mentality that does not build daily teamwork and problem-solving. Regularly scheduled meetings permit management personnel to openly exchange ideas on a regular basis, share issues/concerns, apply creative teambuilding /problem-solving and improve the overall flow of communications.

There are Battalion Chief meetings held quarterly, and some information from those meetings is disseminated by the BC's to their districts. Minutes or summaries of regular staff meetings are made available by distribution to the Battalion Chiefs for review by all members of the organization. This encourages internal communications and permits members to share ideas on departmental issues which may enhance feelings of empowerment among personnel.

Written, formal and numbered memorandums are regularly utilized for distribution of information, ensuring that all members receive critical data in an organized and consistent

fashion. This process also provides a critical written record of internal communications that are important for organizational efficiency. A systematic method for distribution of written communications is in place and is followed regularly in order to make certain that no members are left out of the information loop. When certain types of critical memos or policies are released, typically from the Human Resources Department, a system has been established for verification of the distribution to all personnel by way of individual mailing or inclusion in payroll. This system provides a record of confirmation that the information was received and improves accountability.

Opportunities such as open personnel meetings or forums are rarely held for the purpose of exchanging and discussing concerns, ideas, or issues directly with the management staff. These types of opportunities enhance the feeling of teamwork, open lines of communications, and encourage a feeling of ownership among the members. Some effort in this regard is recommended. Discussions have been held regarding the use of web-based video conferencing between stations and staff. This technology is being pursued by the City's IT department.

An employee/member newsletter has been initiated by the City and provides an excellent opportunity for distribution of city internal news and information, as well as less formal information about members such as birthdays, marriages, or personal off-duty accomplishments.

Departmental bulletin boards are adequately controlled and organized, with information being sorted and updated on a regular basis.

Departmental business e-mail addresses have been issued to all department personnel, offering an efficient and verifiable method of information distribution. Individual station/shift mailboxes are used to exchange important hard-copy documents and prevent missing or misplaced documents. Voicemail, another modern and useful means of exchanging information, has been put in place for primary staff and officers permitting other members or the external customer to efficiently and quickly leave personal contact messages. Each individual member has also been issued an alphanumeric pager that can receive emergency call-back information or routine administrative announcements.

Various efforts are currently made to communicate with the public. The City publishes a community newsletter for distribution to the public on an occasional basis. The newsletter permits the release of specific and detailed information, authored directly by a City agency, to those served by its programs and is an excellent tool for improved public relations. The Fire Department regularly participates in this newsletter.

No formal procedure has been established for handling complaints from the public. Such a policy should be established and all members should be made familiar with its contents in order to make certain such complaints are handled consistently, quickly, and with due process.

An active and useful website is currently maintained at www.wilmingtonnc.gov/firedept providing an additional means of distributing information and communicating with the public. The site is kept up to date and provides contact information for major programs operated by the department.

On occasion, the City has performed a public survey/questionnaire for the purpose of providing customer feedback on service priorities, quality issues, or performance efforts. These surveys, when utilized appropriately, can provide valuable input for organizational planning.

A "Citizen's Academy" has been established allowing citizens to sign up for in-depth orientation classes regarding City operations and individual department functions. Consideration should be given to establishing a citizen's advisory group that could meet occasionally with department management to provide a customer perspective on issues within the department and assist in planning efforts. This process encourages a close connection between agency management and the consumer of its services and also serves as an additional public relations tool.

Recommendation

- Conduct regular staff meetings and consider including representation from company-level officers when possible.
- Open forum meetings between rank and file members and command staff should be offered on occasion, either in the form of something as informal as a "Chief's Breakfast" or a more formal scheduled meeting or video conference.
- A public complaint procedure should be established and all personnel should be trained in its application.

Availability of SOG's, Rules, Regulations, and Policies

As discussed previously in this report, departmental management policies exist. Regardless of the quality or condition of such policies and guidelines, their availability and familiarity to workers is critical.

Department members indicate that administrative policies and rules and regulations are made available to members through the City's Intranet service.. This practice is encouraged, since it reinforces the importance established policies. A distribution system is also in place to confirm the receipt of revisions or additions to the documents.

Standard Operating Guidelines have also been electronically distributed via the City Intranet in support of their purpose. Members have access to the operational guidelines for reference during training sessions and drills and can study them at their leisure. This encourages the daily use and application of the guidelines and ensures that outdated ones are brought to the attention of management as early as possible.

Document Control and Security

Records management is a critical function fpr any organization. A variety of uses are made of written records and, therefore, their integrity must be protected. State law requires public access to certain fire and EMS department documents and data. Clear written procedures are currently in place which provide for public records access and media access through the City's Public Information staff.

Paper records (hard copy files) are adequately secured with passage and container locks with limited access. Important computer files are backed-up to a secure data location on a regular and consistent basis.

The Wilmington Fire Department has a significant investment in facilities, apparatus, equipment and other items, along with its financial assets. Protecting these assets is very important. Stations are reported to be consistently locked and secure from unauthorized entry. The headquarters station has experienced some security issues when public enter the building through open bay doors or the unsecured front entry when clerical staff is not present. Public access to the buildings is limited to business areas or when accompanied by an employee.

Locks are rarely changed to prevent use of orphan keys and unauthorized entry. No security alarm systems are used to provide for automatic notification of unauthorized entry or break-in. Monitored fire alarm systems in the headquarters station provides early smoke and fire detection for the building, as well as an additional life-safety measure for occupants in the event of a fire. Older stations are not equipped with monitored fire alarms, but do have local smoke detection.

Department computers are programmed with password security on sensitive file access and software to provide an additional level of security and data integrity. Firewall protection is in place for computers accessing the internet and other outside servers. The protection is adequately up to date and capable of preventing most unauthorized network intrusions. Up to date virus protection software is utilized on all incoming email and files or operating systems are regularly scanned for undetected virus infection.

The agency maintains a current inventory of capital assets whose value is in excess of a specified dollar value. A process is in place to maintain this inventory and new assets are logged and recorded at purchase. No business-related cash is routinely kept on the premises of the department, reducing or eliminating risks associated with burglary and theft. Petty cash (maximum of $125) is available for use by key managers, but even tightly controlled petty cash systems can pose problems in loss, theft, or accountability. The department may wish to eliminate this practice in favor of rapid reimbursement systems or use-controlled credit cards.

General-use credit cards, such as VISA™ or MASTERCARD™, are issued to key managers, but strict account controls, low credit limits, and zero liability fraud protection are in place. Written, formal purchasing policies and procedures are in place and are strictly enforced. Virtually all purchases require specific purchase orders (PO,s) with appropriate approval signatures and appropriation verifications.

The Health Insurance Portability and Accountability Act (HIPAA) includes regulations that require all individually-identifiable health care information be protected to ensure privacy and confidentiality when stored, maintained, or transmitted. Medical incident records do not contain protected medical information or sufficient personal information regarding the patient to create a concern over HIPAA requirements.

Recommendation

- Headquarters security should be improved and public access controlled more effectively.
- Station locks should be changed on a regular basis to prevent the use of orphan keys.
- Monitored fire and security alarm systems should be installed in all facilities. The use of security cameras should also be considered.

Reporting and Records

The department's records management system for incidents is effectively computerized. The methods used are fully compliant with NFIRS (National Fire Incident Reporting System) standards. Incident information, activity summary, and other analysis is available. Training records are not efficiently or consistently maintained on computer, prohibiting easy retrieval of accurate reports on training attendance, certification status, and subject matter without extensive processing (additional information on this issue is provided in the Training section of this report). Code enforcement activities and occupancy records are maintained in an effective database to permit analysis of prevention activities, community risks, and trends. Maintenance records for apparatus and equipment are computerized to increase the efficiency of the fleet management program.

Personnel records are complete and up-to-date, and maintained in a manner that protects private medical information. Records are maintained on employment history, discipline,

commendations, work assignments, injuries, exposures and leave time. Financial activities, including budgets, expenditures, revenues, purchase orders, and other encumbrances are kept in a financial records management software system permitting consistent and up-to-date monitoring of all financial activities and accounts.

The department uses a PC-based computer system, with Windows XP as its primary operating system, and all computers are networked to a municipal server. Fiber optic data lines are available throughout the City to all municipal facilities, with dual redundant servers. All stations also have backup data access through the cable system.

Technical support is typically provided by the City's IT department. Due to the unique nature of the fire incident records management system and the 24-hour nature of the department's operation, in-house IT support has become necessary through the use of Assistant Chief Frank Blackley. The Assistant Chief has a high degree of experience in the particular software the agency uses and was personally involved in the design of the overall system and its integration into City servers. These efforts, however, are far removed from the Assistant Chief's primary duties and responsibilities and serve to dilute his available focus on the Division of Fire and Life Safety. A technical support position assigned full time to the fire department should be a consideration.

Recommendation

- A full-time IT support position for the fire department should be considered. This individual should be trained in the use of the department's unique records management system in order to relieve the Assistant Chief from these functions not critical to his division.

Objective Three - Planning

Fire and Emergency Medical Services exist in a rapidly changing environment. Along with improvements in tools and methods used to provide service comes increased regulation of activities, new risks to protect, and other challenges that can quickly overwhelm the unsuspecting or unprepared. Only through continuous internal and external environmental awareness and periodic course corrections can an organization stay on the cutting edge. The Wilmington Fire Department has recognized the need for a stronger planning effort by pursuing this evaluation.

Organizational Planning Process

The process of planning in advance for occurrences that will take place in the future requires both discipline and organization. In order to be truly effective, an emergency services agency must consider planning on three distinct levels: tactical planning, operational planning, and master planning. Tactical planning is practical preparation of incident strategies for potential emergency incidents. Operational planning is preparation for the day-to-day activities of the agency and its integration into other regional or national response networks. Master planning (long range planning) is preparation for the future success and effectiveness of the agency in a changing environment.

There is active short-term planning occurring within the Wilmington Fire Department. The budget process is used to define the level of service that can be provided for the year involved. Day-to-day activity planning also occurs. However, the WFD fails to adequately plan for improvements in their response through Automatic Aid Agreements or for large-scale incidents requiring Mutual Aid.

The Wilmington Fire Department has used two distinct processes to help define their long-term planning. The first is a five year projection that is updated annually by each division. The second includes plans developed by the City / County Consolidation Study completed in 1999. Neither of these processes adequately integrates Automatic or Mutual Aid assets into the WFD Planning Process.

Creating a truly long-term perspective is important for the organization. The capability to conduct qualitative and quantitative analysis of level or quality of service cannot be underestimated. Developing well-defined objectives at the department level will allow the organization and policy makers to more readily identify and address future service delivery issues. Many of the WFD staff officers are looking to this report as another benchmark with which to help determine the future direction of Wilmington's Fire and Emergency Medical Services.

Whatever the catalyst, an increased emphasis must be placed on the Tactical, Operational, and Master Planning Process for the Wilmington Fire Department. The Senior Staff has not specifically assigned responsibility to any one individual for Planning, development of Standard Operating Guidelines (SOGs) and performing grant writing tasks. The current process doles out some of these areas to one of several staff officers resulting in a lack of specific accountability and lapses in Tactical and Operational levels.

Recommendation

- Specific responsibility for Planning, SOGs and Grant Writing should be assigned to a current or newly created position so that a continuous review of these dynamic documents can take place.

Tactical Planning

A firefighter's typical work area is usually quite foreign to him or her. Normally, a firefighter's first visit to a building is when the building is involved in fire or other emergency. This is also the point in time where the internal environment is at its worst. Contrary to Hollywood's portrayal of the inside of a building on fire, visibility is at or near zero due to smoke. A lack of familiarity with a building can easily lead a firefighter to become disoriented or injured by an unfamiliar internal layout, or by equipment or other hazard that might be encountered.

It is critically important that firefighters and command staff have comprehensive, accurate information readily at hand to identify hazards, direct tactical operations, the operation of built-in fire suppression systems, and structural fire resistive features. This can only be accomplished

by building familiarization tours, developing pre-incident plans, and conducting tactical exercises; on-site or tabletop simulation.

Establishing a comprehensive process to create and maintain pre-incident plans is well known to the WFD, but pre-plan information and Standard Operating Guidelines are not adequately disseminated at the company level. The department has done little in the way of preplanning and documenting structures effectively. While the SOGs that are currently in use are a start, there are many areas that need to be developed and disseminated. One example is the lack of a standard approach for Hi-Rise Building Fires. The omission of a Hi-Rise SOG fails to plan for a unified approach by multiple fire companies in a critically dangerous situation for both civilians and firefighters alike.

The list of target hazards should be regularly updated and aggressive efforts taken to ensure response crews have copies of these plans available. Target hazards are defined by:

- Buildings with large potential occupant loads.
- Buildings with populations who are partially or completely non-ambulatory.
- Buildings of large size (greater than 12,000 square feet).
- Buildings that contain process hazards such as hazardous materials or equipment.
- Buildings with significant governmental or community infrastructure responsibility.
- Buildings that exceed the capability of engine company or aerial apparatus personnel and equipment.

Again, we emphasize that Automatic Aid with New Hanover County or even the Leland Fire Department in Brunswick County could greatly strengthen the resources available to the WFD for initial response to target high-risk hazards.

Pre-incident plans should be easy to use, quick reference tools for company officers and command staff. At a minimum, a pre-incident plan should include information such as:

- Building construction.
- Occupant characteristics.
- Incorporated fire protection systems.
- Capabilities of public or industrial responding personnel.
- Water supply.

- Exposure factors.
- Facility layouts.
- Firefighter hazards.

The National Fire Protection Association (NFPA) Standard 1620 provides excellent information on the development and use of pre-incident plans and should be considered as a reference.

Once pre-incident plans are established and/or updated, training should be provided to all personnel who may respond to an incident at those locations. In addition, copies of pre-incident plans and drawings should be available on each response vehicle, either in a standard notebook or computer format.

Recommendation

- A complete overhaul of the WFD pre-incident planning program should be undertaken with consistency on data collection, plan preparation, site plan drawings, ease of retrieval and use, as well as a continual training emphasizing its use.
- Utilizing the pre-incident planning, specific tasks should be assigned each of the first responding fire companies, i.e. first-in engine secures a water source and advances an appropriate fire line, first-in truck company performs vent, enter, search. In order to effectively accomplish these tactical objectives, specific tasks can be assigned to each firefighter by the position they ride on the apparatus.
- Automatic and Mutual Aid fire departments should be included in the pre-incident planning, especially for high target locations. Joint training exercises should be held regularly to familiarize each department with its standard objectives and range of assignments in response to these locations.
- The WFD should seek the advice of other similar fire departments *(such as Orlando, FL.)* to obtain their current SOGs and then customize them for use by the WFD. Suitable model department SOG's can be found either through the networking process of students at the National Fire Academy or through various organizations such as the Southeastern Division of the IAFC.

Operational Planning

The WFD operates in an environment that generally requires it to be initially self-sufficient. WFD does not currently participate in automatic aid agreements but does have mutual aid agreements with the New Hanover County Fire Department. In addition, a statewide mutual aid agreement generically covers assistance given by one emergency entity to another during times of major disaster or large-scale incidents. Additional discussion on mutual and automatic aid can be found in the Emergency Services Delivery section of this report.

The Wilmington Fire Department is one of seven Regional Hazardous Material and Technical Rescue teams and one of eleven State urban Search and Rescue Teams that are located throughout the State of North Carolina. The Superfund Amendment and Reauthorization Act, found in Title III of the Federal Code (SARA Title III), defines requirements for the tracking of hazardous materials used in fixed facilities and establishes requirements for emergency response planning. With its regional responsibility, the WFD is represented and works closely with the Local Emergency Planning Committee (LEPC) serving the City.

The LEPC is charged with the responsibility of identifying and collecting information on the use of hazardous materials by private and public entities. Information collected includes the type of material, quantity and location at each sited. Additionally the LEPC is charged with ensuring local response plans are adequate based on potential risk.

SARA Title III requires that industries that use over a threshold limit of certain highly hazardous materials (extremely hazardous substance facilities – EHS) must develop comprehensive emergency plans for their facility. The act requires that local fire departments coordinate with the involved industry to ensure a quality response to the emergency.

The Wilmington Fire Department needs to ensure all EHS facilities within its service delivery area have been identified, ensure their local plan has been developed and that WFD operations have been coordinated with such plans..

Recommendation

- Ensure that all Extremely Hazardous Substance (EHS) facilities, as defined in SARA Title III, have been identified in the City of Wilmington. Those identified should have emergency plans coordinated with the WFD.
- The WFD must better utilize prepared mutual aid responses with New Hanover, Brunswick and Pender counties in order to provide the level of redundancy in resources to weather a major or catastrophic event.
- Interoperable communications among the WFD and its Mutual Aid departments needs to be made available at a moment's notice. Communications issues and solutions for agencies outside the City-County communications system must be pre-planned prior to needing these resources in an emergency.

Master Planning

In 1999, the City of Wilmington participated in a City / County master / land use plan to guide future community planning and development. While attempts have been made to annually adopt certain aspects of this outdated plan for use by the Wilmington Fire Department, the Fire and EMS needs of Wilmington need to be specifically addressed on a continuous basis through the Fire Department Strategic Plan. This plan should become a dynamic appendix to the Master/ Land Use Plan developed by the City of Wilmington. The health and welfare of city residents can be a significant consideration of prospective businesses and residents of Wilmington

A customer-centered strategic plan, complementing the City plan, would receive input from representative community leaders (customers) and fire department members/employees to be incorporated in the formulation of a mid-term plan for organizational development and problem-solving. A cross section of all fire department ranks and disciplines would comprise the planning team.

Establishing a customer oriented, long-term strategic plan would accomplish the following:

- Develop a new mission statement giving careful attention to the services currently provided and which logically can be provided in the future.
- Develop a vision of the future.
- Establish the values of the members of the department.

- Identify strengths of the department.
- Identify weaknesses of the department.
- Identify areas of opportunity for the organization.
- Identity potential threats to the organization.
- Define the services provided to the community.
- Establish the community's service priorities.
- Establish the community's expectations of the department.
- Identify any concerns the community may have about the organization and its services.
- Identify those aspects of the organization and its services the community views positively.
- Establish realistic goals and objectives for the future.
- Identify implementation tasks for each objective.
- Define service outcomes in the form of measurable performance objectives and targets.
- Develop organizational and community commitment to the plan.

External Customer Planning Involvement

Because the community is the recipient of services as well as the source of funding for those services, their needs and expectations must be a key consideration for selecting the type and level of emergency services to be provided. Though some effort is made to solicit these views, additional involvement tools should be considered.

Generally, the Wilmington Fire Department does not seek feedback nor conduct comprehensive community meetings to gather input or solicit community involvement.. The City of Wilmington does conduct a city-wide services survey, which has consistently rated the fire department among the highest in customer satisfaction. However, a well-crafted department-specific community input process can provide valuable information to the organization and should be considered. In the absence of a department-specific program, the City surveys should continue to be conducted periodically to ensure the WFD knowledge and perception of community expectations is current and that concerns are documented and dealt with appropriately.

The WFD may wish to consider establishing a citizen's advisory committee for the department. This committee, complementing elected officials, would be made up of representatives from a

variety of interests within the city, and would provide advice and input to the fire chief on such matters as:

- Long-term strategies.
- Staffing strategies.
- New services and programs.
- Performance objectives and targets.

Internal Customer Planning Involvement

The members and employees of the department are also customers of the organization. They depend on management and support personnel to ensure they have the tools, training and support services they need to perform their duties and be successful in providing vital community services.

At present there is no opportunity for members and employees to be involved in the day-to-day decision making process. The current Planning Process includes Chief officers and selected Captains, but does not reach down into the firefighter ranks. Recognizing that employee input is critical for the smooth operation of the WFD, the City recently scheduled 97 firefighters of all ranks who requested to be interviewed as part of this report. While another section of this report will deal in detail with those findings, it is apparent from the interviews and over one hundred emails from employees and citizens that Internal Customer Involvement must be continued to avoid a potential breakdown of the traditional chain of commend. The Senior Staff must have a mechanism to determine those areas needing attention in the eyes of employees whether perceived or real.

Technology provides one opportunity. Email, interactive web pages, and such will allow for a more liberal dissemination of information, sharing of ideas, and an opportunity for employees to provide feedback on issues of concern. A creative way to schedule staff meetings and the dissemination of all appropriate meeting minutes allow members and employees to feel more involved in departmental decisions and information. Those delivering the service often have the best ideas about how services can be improved. Effective employee involvement is a proven management strategy that is a significant opportunity for the department.

Recommendation

- Consider establishing a citizens' advisory committee to provide community input to the Fire Chief and WFD Senior Staff.
- Conduct periodic community surveys to endure the WFD priorities match those of the community.
- Develop one or more methods of seeking employee input and disseminating new information and policies directly to the individual employees to have them feel a valued part of the total system.

Objective Four - Personnel Management

An organization's people are its most valuable resource. Careful attention must be paid to managing that resource to achieve maximum productivity for the organization and maximum satisfaction for the individual. A safe working environment, fair treatment, and recognition for a job well done are key components to job satisfaction.

Personnel Policies and Rules

It is important that members of the organization know to whom they should go when they have a problem, question, or issue related to their relationship with the department. In large companies, a human resource department typically handles this function. Staff members within such a department handle questions, issues, and tasks related to appointment, benefits, performance, disciplines, promotion, or termination of employees. The City of Wilmington's HR Department provides the centralized personnel record keeping and support for the Wilmington Fire Department for such activities as hiring, promotion, discipline and salaries.

The Wilmington Fire Department places its primary responsibility for human resource management with the Assistant Chief of Suppression. This Chief officer acts as the primary liaison between the WFD and the City's HR Department on the critical issues previously mentioned, but also acts as the primary manager for such personnel issues as training and certification records, morale and internal communications.

The WFD provides employees with a primary point of contact, through the chain of command, when it comes to questions regarding their employment. Generally employees are free to contract the City's Human Resources Office directly, depending upon the matter and how it relates to their needs. However, it was repeatedly noted by Fire Department personnel, the WFD staff, and HR managers that there is reluctance for individuals to contact the HR Department due to a feeling of disconnect and lack of trust between HR and the WFD.

North Carolina is a "Right to Work" state, and as such a recognized bargaining unit does not represent WFD personnel. While the IAFF Local 129 exists, its role is limited by its lack of statutory recognition. Written policies are in place within department documents, or at the City level, that describe the appointment of employees, the salary and benefits to which they are entitled, the conditions under which leave time may be utilized, systems for evaluating personal

performance, methods of discipline for unacceptable behaviors, processes and qualifications for promotion to higher positions, and systems for termination or separation.

All fire department policies and changes are coordinated with Wilmington's HR Department to correspond or compliment HR's Citywide Policies to avoid any conflict in handling personnel issues. The City Attorney further evaluates any potential impact or conflict before a change of policy is enacted. As indicated earlier, these policies have been made available to each member individually, in manuals at the station or on the City's Intranet computer system.

Compensation and Benefits

The department uses a fully paid staff of uniformed employees and civilians to provide services. All operational response duties are assigned to career staff at the eleven fire stations.

Typical forms of compensation are provided to the full-time staff members including salary, health insurance, retirement pension, dental insurance, and vision insurance. For general reference purposes, a full-time firefighter will receive a maximum annual salary of approximately $38,873 plus overtime, with the current average salary at $ 28,126.

The purpose of this study was not to be a thorough compensation analysis. Thus, this evaluation did not attempt to perform in-depth comparisons with other agencies of similar type and makeup. However, it is important that, within the context of this emergency services evaluation, we determine whether the salary and benefit packages appear to be a strength or weakness of the organization as it affects employee morale, loyalty, and turnover.

In short, the benefit package across all ranks for members of the WFD appears to be at minimum 10 to 15 % below average when compared to other similar organizations. It appears that the compensation package is among several issues that present a potential threat to the stability and morale of the organization.

The City should conduct a fresh study of salary and benefits. The fire service compensation comparisons should be thoroughly analyzed by an agency specifically familiar with and experienced in fire service pay structures. The study should include a significant number of departments within the state and region and should include comparative analysis of:

- Salary.
- Method for calculation of hours worked (including sleep time deductions).
- Standard workweek (average hours per week).
- Work schedules.
- Health and life insurances.
- Pension benefits.
- Leave time.
- Overtime pay.
- Compensatory time off.
- Education leave.
- Education / certification pay.
- Classification differential / "ride-up" pay.
- Education reimbursement.
- Holiday pay.
- Longevity pay.
- Special Teams pay.
- Fitness incentives / reimbursement.
- Trade time cap.
- Wellness programs / employee assistance programs.

Recommendation:

- The City should conduct or contract for a fresh salary and benefits survey with an agency specifically familiar with and experienced in fire service pay structures.

Personnel Records

The WFD keeps adequate written or computerized records of its personnel. Original application materials are retained at the City's HR Department with copies at the WFD in order to create a full historical record of the member's participation in the organization, from initial appointment to separation. Additional documents and records referring to assignments, promotions, commendations, discipline and other personnel actions are kept organized and updated. Forms or other documentation pertaining to performance of the probationary member are retained for an appropriate period of time. Reports describing details of accidents or other injuries or injury-

related incidents are maintained for future reference and cumulative evaluation or analysis.

Records of health evaluations, exposures to hazardous substances or contagious diseases, and other medical records appear to be adequately maintained. All medical-related records, protected under federal privacy laws, are kept separate from routine personnel records and access is strictly limited.

Disciplinary Process

A formal progressive disciplinary process for personnel is identified in the City's written policies. The process provides for various levels of discipline focused on correcting unacceptable behaviors with the most reasonable actions considered appropriate and effective. The process for those employees who are not under the Civil Service Act is found in City Administrative Policy #214 and appears clear and unambiguous. The City's Civil Service Act clarifies the disciplinary process for employees who are Civil Service qualified, which includes police and firefighters once they have completed their 18-month probationary period, with the exception of Chiefs.

Generally, the discipline processes call for an appeal to follow the Chain of Command up to the Fire Chief who is the final appeal through any discipline under a 30-day suspension or termination. The Civil Service Commission, which is constituted under the laws of the State of North Carolina, has no jurisdiction to hear appeals concerning suspensions, with or without pay. Pursuant to Section 11.6(b) of the Civil Service Act, the City Manager has exclusive jurisdiction to hear appeals involving suspensions of a firefighter or police officer.

The Commission does, however, have jurisdiction to hear fire and police disciplinary appeals involving dismissal or demotion. The City's practice has been to allow an intermediate appeal of dismissal or demotion to the City Manager, but this does not affect the right to appeal to the Commission. WFD personnel not covered by the Civil Service Act can appeal to the City's Peer Review Committee, a group of City employees of equal rank that review the disciplinary action to see that it conforms to the established policies and procedure.

Some officers within the department have been provided limited formal training in conflict management and application of discipline, while many others have received no such training.

This should occur as a part of their preparation for their position or initial job training. Informal interviews with personnel give the impression that members feel organizational discipline practices are inconsistent and unpredictable. Some members feel favoritism sometimes interferes with equitable application of rules. Whether true or a matter of perception, issues of inconsistent application of rules and discipline are often cited as one of the leading causes of low morale and distrust in management.

Recommendation

- Conduct initial and ongoing officer training in disciplinary processes and conflict resolution.

Counseling Services

Emergency services bring otherwise ordinary people into life and death situations that sometimes end very tragically. Even though department personnel are trained responders, they do not have an impregnable shield that prevents them from being affected by traumatic events. Critical incident stress is a very real condition that affects all emergency service workers to some degree or another. It is how emergency workers deal with that stress that makes the difference. The trigger for significant psychological trauma may be a single event, or a series of events compounding on each other.

Fire and EMS departments have recognized the need to provide a support system for their personnel who are exposed to traumatic incidents. Members of the WFD can call upon the services of trained personnel to conduct critical incident stress debriefings through a regional program.

Critical incident stress interventions by this group are short-term processes only. Though normally sufficient to help emergency personnel cope with the event, on occasion longer-term support is needed. Failure to provide that support can ultimately lead to the loss of a very valuable member.

An Employee Assistance Program (EAP) has been made available to personnel of the department as a long-term stress intervention tool. The EAP provides additional support for other life problems that may affect a member's motivation and work quality such as substance

abuse, marital difficulties, financial complications, and the like. The costs are reasonable and the potential payback significant. WFD members and their dependents can receive three free visits to intervention specialists before the problem is referred to a higher professional level that is covered for the most part in the City's medical and health coverage.

Application and Recruitment Process

Recruitment of personnel is a critically important function for emergency service agencies. The community places a tremendous amount of trust in fire department personnel. The process used to select personnel should be quite comprehensive. Section 11.3(a) provides that the Civil Service Commission "shall establish reasonable employment (hiring) requirements not inconsistent with State law."

The American's with Disabilities Act (ADA) prohibits discrimination against individuals with physical disabilities, but permits employees to establish the physical standards that are required to perform the primary functions of any job safely and effectively. History has shown that the most effective method of avoiding a litigation suit involving ADA is through reasonable and consistent application of job-relevant pre-employment physical ability testing. Applicants for career positions in emergency response within this department are subjected to a formal physical ability test that is job-relevant and adequately measures the applicant's ability to perform critical physical tasks and functions.

Unique to the Wilmington Fire Department is a dual entry employment list – one for candidates already state certified firefighters, and the other for non-certified personnel who require more extensive training to obtain certification as a firefighter. The certified list is used primarily when the Department has lost just a few firefighters to retirement or separation and need to quickly replace their numbers to maintain minimum staffing levels. Normally, candidates selected for employment from the certified list require only a few weeks of orientation to assimilate them into the Department and begin their Probationary Period. Candidates selected from the non-certified list must first complete a three month Rookie Class before beginning their probationary period. Traditionally, more diversity is generated from the non-certified process.

Career applicants are required to pass a pre-employment physical examination that is compliant with medical standards established in NFPA 1582. The examination is appropriately required

after a contingent offer of employment.

The department utilizes a variety of advertising methods to announce hiring and selection processes in order to obtain a large enough applicant pool to ensure that qualified applicants are selected for employment. A review of the department's processes indicates reasonable success in this regard, with a ratio of applicants to positions being filled in the normal or desirable range. The department currently has minorities represented in the workforce and has encouraged minority applicants through the use of wide public advertising or other recruitment methods.

Ongoing Competency Evaluation

Once on staff, personnel should be evaluated periodically to ensure their continued ability to perform job duties safely and efficiently. Technical and manipulative skills should be evaluated on a regular basis. This provides documentation about a person's ability to perform their responsibilities and provides valuable input into the training and education development process.

Physical competency is evaluated only through casual observation of personnel in their activities. This does not provide the department with solid information as to whether an individual remains physically capable of performing the rigorous tasks involved in emergency services. Physical competency testing should be conducted at least annually. The evaluation can mirror the entry physical capacity test but should, within limits, give some consideration for an individual's age. Competency testing involving common emergency scene tasks is also a common method of evaluation.

Physical capacity testing cannot detect all potential limiting conditions of an individual's health and fitness levels. A periodic medical evaluation is necessary. National safety standards for firefighters recommend an annual medical evaluation and bi-annual physical examinations. The examination should include all the criteria included in the entry-level exam, as well as periodic stress EKGs for persons over 40 and regular blood toxicology screening. Communicable disease vaccinations can also be updated as needed during this process. The WFD currently requires a periodic medical examination for its current members, including the HazMat and Dive Team members. As with entry-level physicals, the National Fire Protection Standard on Medical Requirements for Fire Fighters (NFPA 1582) should be used as an excellent resource for

establishing the criteria for these on-going medical evaluations.

Regular evaluation and feedback for personnel is critical to behavior modification and improvement. Currently the WFD utilizes a personnel evaluation system designed strictly for the local department. There has been some criticism that the evaluation completed by the first line supervisor and the employee is modified and reduced on some employees by Staff Officers before it is forwarded to the Human Resource Department. Such a practice continues to fuel the thought that the WFD plays favorites with evaluations and promotions. A new annual performance evaluation system has been established by the City of Wilmington Human Resource Department that will be used to evaluate all employees irregardless of their department.

It has long been proven that employees and members sincerely wish to perform well and to be a contributing part of any organization. This desire to succeed is best cultivated through effective feedback that allows a member to know what he/she is doing well or what needs improvement. The honest and effective presentation of this feedback encourages the member to reinforce those talents and abilities they already excel in and to work harder to improve the areas where they fail to perform as desired.

The apparent concern with the consistency in the application of evaluation process can be overcome during the transition to new Citywide Evaluation Form. All company and chief officers should receive a periodic review of the evaluation system in an attempt to bring consistency in evaluations scores and recognition for exceptional performance. The employee and his / her first line supervisor should always discuss the final evaluation on a face to face basis, and areas needing improvement should be reviewed for progress with employee at least on a quarterly basis.

Recommendations

- Establish an annual skills competency and physical ability test for all fire suppression personnel to assess on-going capability to perform the basic, critical tasks of the firefighter.
- Conduct a formal performance evaluation for all employees at least annually utilizing the new evaluation system designed by HR. Areas needing improvement should be reviewed quarterly between the employee and his / her first-line supervisor.
- Conduct formal training for all supervisors in the use an application of the performance evaluation process.

Promotional Process

Throughout the interview process with the HR department, WFD staff officers, or individual firefighters, the promotional process was the most talked about topic with the exception of the department's salary and benefits compensation. Pros and cons to the system were discussed, and there is no doubt that there are two distinct opinions within the Department depending on which side of the issue is favored.

Since 1997, there have been standardized criteria for eligibility to sit for any promotional examination. Once the total testing scores of all candidates have been determined by the city's HR department, a list of the top fifteen candidates is submitted to the Fire Chief. In the case of a tie for the fifteen slots, all tied candidates will move forward. The Fire Chief is then empowered to promote any of the candidates from that list and in any order at his discretion. When vacancies are filled, names are then added to the list consisting of candidates who now become eligible as part of the top third with passing scores.

The HR department believes this system allows the Fire Chief to promote a more balanced officer cadre that reflects the more diverse population of the City of Wilmington. Opponents of the system believe it reflects favoritism and is a last bastion of the patronage system that plagued the City for many decades of the 20th century.

Whether pro or con, there appears to be some movement from both sides to alter the criteria to

reflect a candidate's additional formal education and fire training certifications. The fire service continues to set individual standards that move it from an occupation to a profession. The City of Wilmington and the Wilmington Fire Department would do well by reviewing what other cities use for promotional criteria especially at the Command and Staff Officer levels. Individual initiative and preparation for a career within the WFD should somehow be rewarded during the promotional process.

The WFD must move to more established criteria for their promotional process. This should include the use of standardized tests and independently administered and scored assessment centers. Until confidence returns to the promotion system, both the HR and WFD should consider an outside provider to administer the promotional process. The resulting scores should be tabulated, scores published and a promotion list developed that promotes from the top of the list on down in order. Without established criteria, the City and Department may inadvertently be stifling individual initiative and career development.

Health and Safety

Though the City maintains a safety committee that develops citywide policies across all departments, the WFD needs to champion and strengthen its own Occupational Safety and Health Committee. Safety on the fire ground is different than any other workplace environment. The fire ground frequently deteriorates the longer firefighters are in the area, and safety must remain a paramount concern for the Incident Commander throughout the emergency. Though North Carolina state law may not require it, the National Fire Protection Standard for Fire Department Safety and Health (NFPA 1500) calls for the establishment of such a group within fire departments. Representation should include, but not be limited to line firefighters, company officers and the Operations Chief or a designated Department Safety Officer. In addition, the standards provide detailed information regarding the roles and responsibilities of that board. This group should conduct regularly scheduled meetings, at least once per quarter as the standard recommends.

Currently an *Ad Hoc* Committee is reviewing policy on Rehab, Electrical Emergencies and Safety Rules. However, the scope and representation of the Committee should be expanded. The committee should be made up of a cross-section of the organization and should meet regularly to discuss safety issues and concerns. At minimum, the Committee should be

charged with:

- Reviewing safety complaints.
- Conducting safety inspections and making corrective recommendations.
- Review accidents and make recommendations to prevent future occurrences.
- Develop safety procedures.
- Research new equipment to improve safety.

The department has appointed a designated Safety Officer, whose responsibilities are in accordance with the NFPA standards. However, the Safety Officer needs to train additional personnel and company officers in this specialized training regarding health, safety, risk management or injury investigation. In addition, a properly trained Safety Officer needs to regularly respond to all working fires or other significant events, to see that SOGs are followed and functions are completed in accordance with NFPA 1501.

Recommendations

- Strengthen the role and representation of the Occupational Safety and Health. Committee in accordance with the recommendations found in NFPA Standard 1500.
- Establish a system to respond a qualified and trained Safety Officer to all working fires and major incidents.

Objective Five - Staffing

The Wilmington Fire Department uses full-time career personnel to accomplish its mission and responsibilities to the City of Wilmington. Administrative functions are generally the responsibility of staff officers with support functions provided by administrative employees. Staffing for emergency response to fire, first response emergency medical and related incidents is provided by career personnel working an average 56-hour workweek. This system calls for personnel to work approximately 24 hours on duty then 24 hours off duty for three cycles followed by 4 days off.

Administration and Support Staff

One of the primary responsibilities of the department's administration and support staff is to ensure that the operational members of the organization have the ability and means to accomplish their responsibilities on an emergency incident. Efficient and effective administration and support are critical to the success of the department. Without sufficient oversight, planning, documentation, training, and maintenance the operational entities of the department will fail any operational test. Like any other part of the department, administration and support require appropriate resources to function properly.

Analyzing the ratio of administration and support positions to the total positions of the department facilitates an understanding of the relative number of resources committed to this important function. The appropriate balance of the administration and support component to the operational component is crucial to the success of the department's mission and responsibilities.

The following figure summarizes the personnel FTEs (full-time equivalents) assigned to administration and support.

Figure 19: Administrative/Support Staffing Summary

Position Title	Number (FTEs)
Fire Chief	1.0
Assistant Chiefs	3.0
Battalion Chief	2.0
Training Captain	1.0
Shop & Maintenance	3.0
Admin. Support	3.0
TOTAL	**13.0**

The administration and support staff for the WFD is comprised of an authorized complement of 13.0 FTEs. Statistically the WFD maintains a ratio of 6.6 percent of administration and support staff to total personnel. Each organization should determine the proper ratio of administration and support staff to operational positions dependent upon local need. Based on our experience with similar organizations, however, we have determined emergency service departments usually average a 10 to 15 percent ratio for administration and support. The WFD administrative and support staffing ratio is significantly low in comparison to the common range, particularly with the shop and equipment maintenance personnel included within this category.

In reviewing the department's current administrative and support positions, we find a surprisingly low number of support positions involving clerical and administrative assistance, as well as an absence of positions focusing on information technology and computer support. Interviews supported this observation, with assistant chiefs doubling up in IT systems support and most staff performing their own clerical functions. This results in an inefficient use of some of the most expensive members of the organization for functions that could be performed by a lower wage employee. The addition of support, clerical, and IT staff would permit these officers to return their focus to the more advanced functions and managements processes for which they were appointed.

A detailed overview of the staffing practices for training and fire prevention is provided in the respective report objectives.

Field Operations Staff

It takes an adequate and well-trained staff of emergency responders to put the appropriate emergency apparatus and equipment to its best use in mitigating incidents. Insufficient staffing at an operational scene decreases the effectiveness of the response and increases the risk of injury to all individuals involved. In addition to emergency response, the department also delivers non-emergency services that are valued by the customer, such as public education, code enforcement, etc. Adequate staffing for these functions is also critical to their overall success and impact on the effort to protect the public.

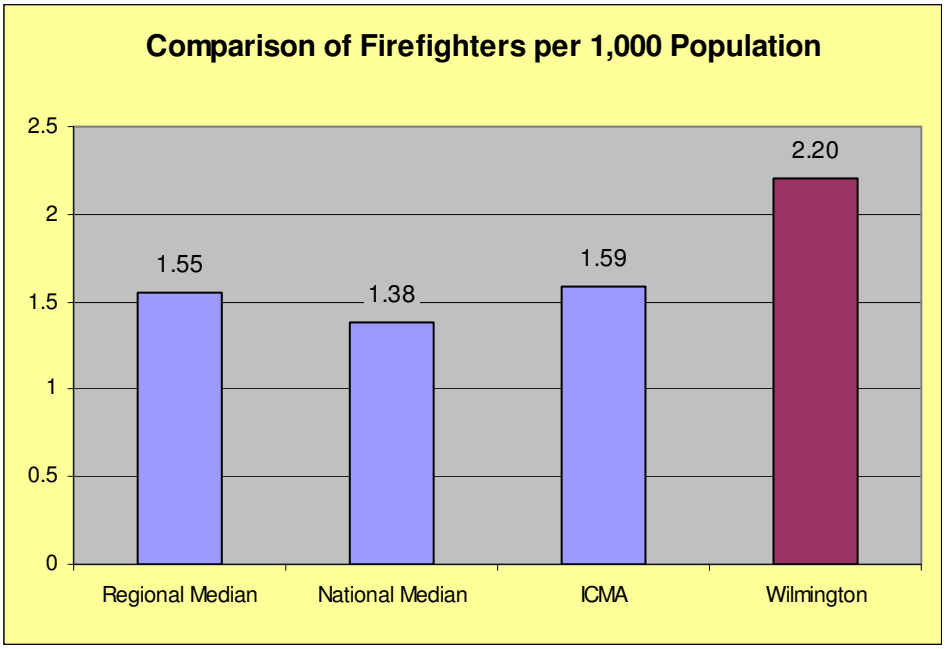
The following figures summarize the career personnel assigned to field operations and service delivery.

Figure 20: Field Operations Career Staffing Summary

Position Title	Number (FTEs)
Battalion Chiefs	6.0
Fire Captains Supp.	33.0
Lieut. Supp.	15.0
Drivers	48.0
Firefighters	96.0
Captains; Fire & Life Safety	5.0
Community Educator	1.0
TOTAL	**204.0**

An analysis of emergency service staffing begins with a comparison of available emergency service personnel to other communities of similar size and organization. The following chart, using NFPA benchmark data[3] for the southeast region, provides an overview of the staffing level of the WFD on the basis of firefighters per 1,000 population.

Figure 21: Comparison of Firefighters per 1,000 Population



The chart provides a fair indication that WFD has a higher number of emergency response staff in comparison with other jurisdictions in the region and nationally. As noted, Wilmington maintains 2.22 firefighters per 1,000 population, while the International City Manager's Association (ICMA) places the nationwide average fire department strength at 1.59 firefighters per 1,000 population. Regionally, the ratio of response personnel to 1,000 population is 1.55.

Regardless of the raw numbers of personnel available to a department, what matters most is actual numbers of emergency responders the agency is able to produce at an emergency scene. This almost always relates to the actual number of emergency responders available for immediate deployment. While the WFD career staffing system distributes up to 66 personnel on each of the 24 hour shifts city-wide, it is important to note that this number is not necessarily reflective of the actual number of personnel on-duty. Due to sick leave, vacation, injuries, and other circumstances, the actual number of on-duty personnel often falls below the number assigned to a shift. WFD policy allows the minimum shift staffing level to fall to no less than 59 personnel on duty.

WFD Personnel, assigned to operational duty, work a shift schedule comprised of 24 hours on duty, then 24 hours off duty for three cycles, followed by 4 days off. This results in an average of 56 hour per week.

The following chart summarizes the assignment of operational personnel by station and position per shift.

Figure 22: Minimum Operational Personnel by Station & Position Per Shift

Station	Shift Chief	Officer	Firefighters	Total
One	1	3	7	11
Two		2	4	6
Three		1	3	4
Four		1	3	4
Five		2	5	7
Six		1	3	4
Seven		1	3	4
Eight	1	2	4	7
Nine		1	3	4
Ten		1	3	4
Eleven		1	3	4
Shift	**2**	**16**	**41**	**59**

Incident Staffing Performance

Tasks that must be performed at a fire can be broken down into two key components - life safety and fire flow. The life safety tasks are based upon the number of building occupants, their location, status, and ability to take self-preservation action. Life related tasks involve the search, rescue, and evacuation of victims. The fire flow component involves delivering sufficient water to extinguish the fire and create an environment within the building that allows entry by firefighters. The number and types of tasks needing simultaneous action will dictate the minimum number of firefighters required to combat different types of fires. In the absence of adequate personnel to perform concurrent action, the command officer must prioritize the tasks and complete some in chronological order, rather than concurrently. These tasks include:

- Command
- Scene safety
- Search and rescue
- Fire attack
- Water supply
- Pump operation
- Ventilation
- Back-up/rapid intervention

The Commission on Fire Accreditation International of the International Association of Fire Chiefs (IAFC) has sample critical tasking analysis for the number of personnel required on scene for various levels of risk. This information is shown in the following chart.

Figure 23: Sample Critical Task Staffing Needs by Risk

Minimum Firefighting Personnel Needed Based on Level of Risk				
Critical Task	**Maximum Risk**	**High Risk**	**Moderate Risk**	**Low Risk**
Attack line	4 (16-18*)	4	2	2
Search and rescue	4	2	2	
Ventilation	4	2	2	
Back-up line	2	3	3	
Pump operator	1	1	1	1
Water supply	1	1	1	
Utilities	1	1	1	
Command/safety	2	2	1	1#
Forcible entry	*			
Accountability	1			
Salvage	*			
Overhaul	*			
Communication	1*			
Chief's aide	1	1		
Operations officer	1			
Administration	*			
Logistics	1			
Planning		1*		
Staging		1*		
Rehabilation	1			
Sector officers	1 (4*)			
High-rise evacuation	10-30*			
Stairwell support	10*			
Relief	*			
Investigation	*			
Totals	**25-65***	**17**	**13**	**3-4**

 # Can often behandled by the first due officer
** At maximum and high-risk fires, additional personnel may be needed*

The Wilmington Fire Department provides a consistent, career staffing for all assigned apparatus so it will be possible to evaluate their standard response assignments in comparison

to this sample task analysis. Engines and ladder trucks are staffed with a minimum of three and in some cases four personnel each. All 9-1-1 calls received reporting smoke or fire in a structure are answered with a response of two engines, one tower truck, one squad and one Battalion Chief; a total of 15 personnel.

Figure 24: WFD Current Standards of Response Summary

Incident Type	Risk	Critical Tasking	Engines	Trucks	Shift Chief	Squad	Responding Staff
Single-Family Dwelling Fire	Mod	15	2	1	1	1	13-16
Multi-Family Dwelling Fire	High	17	2	1	1	1	13-16
Commercial Fire	High	17	2	1	1	1	13-16
Vehicle Fire	Low	4	1				3-4
Brush Fire	Low	4	1				3-4
EMS First Response	Low	4	1			1	3-4
Vehicle Accident	Low	5	1			1	3-7
Hazardous Materials	Mod	13	2	1	1	1	13-16

Source: WFD and CFAI

It can be seen that adequate staffing for a low -risk incident is typically available from the initial response from the stations at the time of dispatch. However, current procedures do not necessarily provide consistent four-person engine company staffing at all times as outlined by NFPA Standard 1710 - *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.* Four-person companies in some instances can only be assembled by combining the crews from multiple units arriving at the incident. At WFD, however, when engine company staffing falls to three, multiple units are not consistently sent to all low-risk fire incidents. Vehicle fires are an example.

This most likely reflects a difference in evaluation of critical tasking. For example, the Wilmington Fire Department provided a critical tasking analysis of four persons for a vehicle fire, while the CFAI model recommends five. The WFD, depending on staffing levels may at times

only be able to muster three personnel to such an incident. CFAI's model may anticipate the use of SCBA due to the potential for an atmosphere considered *Immediately Dangerous to Life and Health* (IDLH). In such cases, OSHA regulations (29 CFR *Respiratory Protection* - 1910.134[g][4] *Procedures for Interior Structural Firefighting - two-in, two-out*) would require the presence of at least four persons in air packs. Based on these comparisons, the WFD may wish to reconsider its standard response guidelines to ensure that four-person companies can be assembled at the scene, particularly if SCBA use is anticipated.

According to the WFD response guidelines, insufficient staffing is currently assigned for initial critical tasking at certain types of high-risk incidents, such as multi-family dwellings and commercial structures. The staffing assignment for multi-family and commercial structure fires is also inadequate when compared to the CFAI example. In certain cases, however, an additional company may be provided through a second alarm or manual request for additional companies.

Failure to ensure adequate manpower to accomplish the critical tasks listed in the chart may result in relatively predictable outcomes of advancing fire spread, increased dollar loss, and potentially increased risk to on-scene personnel. To ensure an adequate number of personnel are ***sent*** in the standard response assignment to low-risk incidents (four firefighters) and high-risk incidents (seventeen firefighters), the department should consider adjusting its response standards for those incident types to send an additional company. To ensure that an adequate number of personnel are consistently ***available*** for response to high-risk incidents, the department should consider adding **automatic aid**, especially in the outlying areas, from the New Hanover County Fire Department. Such automatic aid is typically reciprocal, so both agencies obtain the benefit of additional fire personnel at emergency scenes without the cost of additional personnel.

Recommendations

- Currently most administrative matters of the fire department are channeled to the Assistant Chief of Operations. In addition, this Chief is also responsible for planning, grant writing and standard operating guides. A more practical approach would be to create a separate staff officer with these duties, and allow the Assistant Chief to concentrate on the regular duties associated with operations.
- The WFD is critically short of the Administrative and Support personnel needed to handle the administrative work load of a department its size. Several new clerical positions should be created to enhance this capability and better serve the growing needs of the department.
- Strong consideration should be given to utilize both automatic and mutual Aid resources from both New Hanover and Brunswick counties to strengthen the number of firefighters needed in special and high risk hazards.

Objective Six - Capital Assets and Resources

Fire departments need a balance of three basic resources to successfully carry out their emergency mission: specifically people, equipment and facilities. Because firefighting is an extremely physical pursuit, the adequacy of personnel resources is a primary concern, but no matter how competent or numerous the firefighters are, the department will fail to execute its mission if it lacks sufficient fire apparatus distributed in an efficient manner.

The Wilmington Fire Department has several million dollars worth of capital assets. These assets are necessary to provide service and must be maintained and replaced as needed. Maintenance and replacement plans should be maintained for facilities, apparatus, and other high value equipment. A funding mechanism should be established to ensure money is available to cover the cost of this effort.

Fire Departments across the country are wrestling with the question of how to address the gender issue within the boundaries of both existing and new fire stations. This appears to be a major problem with the WFD due to the design of many fire stations. Important issues to consider when designing a fire station suitable for both men and women, such as establishing department goals, bunk rooms, restrooms, locker rooms, and it appears that WFD has taken this issue into consideration in both the design of the newer stations, but not the remodeling of the some of the older stations. As with most roommates in tight quarters, tension is a common result of firefighters living and working together in the same station, that is why cubicles are a good idea when separate dorms are not possible, and WFD should consider and move forward to provided firefighters with this type of living condition.

Fire Stations and Other Facilities

While fire departments may have certain unique facility requirements, there are basic needs each fire station has to address: efficient response time, adequate living and work areas for personnel, and safe housing of apparatus and equipment. Everything else depends on a particular department's budget and needs. Fire station designs are unlike any other type of project. There are many subtle elements and specialized systems that go into a fire station.

The WFD has ten stations: the newest built in 2000, the oldest believed to have been built in 1965, an older converted volunteer fire station (Seagate), and a new station under construction.

Figure 25: WFD Fire Station Summary Table

Station Number	*Year Built*	*Square Foot of Building*	*Condition*	*General Appearance*
# 1	1999	32,000	Excellent Well Maintained	Excellent
# 2	1965	4,753	Good	Good
# 3	1972	5,308	Good	Good
# 4	1985	3,221	Good	Good
# 5	1974	5,911	Good	Good
# 6	1985	3,221	Good	Good
# 7	1999	7,403	Excellent Well Maintained	Excellent
# 8	2000	7,403	Excellent Well Maintained	Excellent
# 9	2000	7,403	Excellent Well Maintained	Excellent
# 10	Unknown	10,000	Marginal	Fair

Each fire station was given a physical on-site review for general condition, maintenance, size, efficiency, and staffing capability. Particular emphasis was placed on the ability of the station to support the mission of the department now, as well as into the future. The summary of these reviews are provided in the following tables.

Station 1

801 Market Street

Built in 1999, this 32,000 square foot facility consists of four apparatus bays. Station one is headquarters for the administration, motor maintenance and a three-company fire station. This is a new and modern facility that blends well with the surrounding community. There are few concerns related to maintenance, public access, staff facilities, safety and efficiency. Any specific issues with this facility can be classified into the following seven categories.

• **Design:**	*The size of this facility is adequate for the staffing. Inadequate parking at shift change.*
• **Construction:**	*Construction design has lead to high maintenance. Roof was reported to leak since building was opened.*
• **Safety:**	*Building not completely sprinklered. Automatic door stops are disconnected. Adequate fire extenguishers in facility. Equipped with a back up generator.*
• **Environment:**	*No problems noted.*
• **Code Compliance:**	*No problems noted. ADA compliant.*
• **Staff Facilities:**	*This modern building meets today's needs for firefighters. Designed for both genders. Adequate space for rapid response, enough space to work around apparatus. Work out room and large commercial kitchen.*
• **Efficiency:**	*HVAC reportedly has unbalanced heating and cooling. Windows are said to be drafty.*

Station 2

3403 Park Ave.

Built in 1965, this 4,753 square foot facility consists of 2 apparatus bays. This is a two company station. There is a NHRMC EMS unit based here for medical responses. This is a clean facility that blends well with the surrounding community. There are a few concerns related to maintenance, public access, staff facilities, safety and efficiency. Any specific issues with this facility can be classified into the following seven categories.

• **Design:**	*The size of this facility is not adequate for the staffing. Dorm is crowded. Inadequate parking at shift change.*
• **Construction:**	*Construction design has lead to termite problems and mold problems in the dorm. History of sewer back up. Most problems in the past have been repaired.*
• **Safety:**	*Not enough space through doors for two company response. Firefighters are hampered by closeness of apparatus. Refrigerator door blocks exit from kitchen. No automatic door stops. Cleaning supplies stored in dorm. No fire alarm or smoke detectors.*
• **Environment:**	*No apparatus exhaust removal system.*
• **Code Compliance:**	*Does not appear to be fully ADA compliant.*
• **Staff Facilities:**	*Not enough space for rapid response or to work around apparatus. FF have to take turns getting dressed. Not enough space for eating and cooking. Not adequately designed to accomodate two gender staffing No female room. Work out room combined with dorm. Deisel fumes flow nto dorm. Kitchen too small for two-company station.*
• **Efficiency:**	*HVAC problems in dorm. Cannot adequately regulate heat and air. Poor lighting in dining room.*

Station 3

3933 Princess Place Drive

Built in 1972, this 5,308 square foot facility consists of 2 apparatus bays. This is a single company station that blends in with the community. There are few concerns related to maintenance, public access, staff facilities, safety and efficiency. Any specific problems with this facility can be classified into the following seven categories.

• **Design:**	*The size of this facility is adequate for the staffing. Apparatus exit to traffic flow is challenging.*
• **Construction:**	*No problems. Some roof leaks in the past, reportedly repaired.*
• **Safety:**	*No automatic door stops.*
• **Environment:**	*No apparatus exhaust removal system. Underground propane storage tank present.*
• **Code Compliance:**	*No problems. Does not appear to be fully ADA compliant.*
• **Staff Facilities:**	*Not designed to accomodate two gender staffing, officer must give up their room for female occupancy. No female facilities. Work out room combined with training room. Large kitchen.*
• **Efficiency:**	*No problems noted.*

Station 4

310 Wallace Ave.

Built in 1984, this 3,221 square foot facility consists of 2 apparatus bays. This is a single company station located on a golf course. There are a few concerns related to maintenance, public access, staff facilities, safety and efficiency. Any specific issues with this facility can be classified into the following seven categories.

• **Design:**	*Size of this facility is adequate for its current use. Renovations include adding length to the apparatus floor. Apparatus compartment doors are close to the walls when opened.*
• **Construction:**	*Construction design with bay doors are low and not designed for newer raised cab fire engines. Paint peeling on apparatus ceiling.*
• **Safety:**	*Automatic door stops not operating properly. Pressure cylinders not stored properly, laying on floor.*
• **Environment:**	*No apparatus exhaust removal system.*
• **Code Compliance:**	*May not be fully ADA compliant.*
• **Staff Facilities:**	*Not enough adequate space for working around apparatus. Not enough space for training and company drills. Showers are small. Work out area on apparatus floor without enviroment control.*
• **Efficiency:**	*No problems noted.*

Station 5

1502 Wellington

Built in 1974, this 5,911 square foot facility consists of 2 apparatus bays. This is a two company station that blends in with the community. There are a few concerns related to maintenance, public access, staff facilities, safety and efficiency. Any specific problems with this facility can be classified into the following seven categories.

• **Design:**	*The size of this facility is not adequate for the staffing. Dorms are crowded.*
• **Construction:**	*No problems.*
• **Safety:**	*Inadequate fire alarm or smoke detectors- battery only alarms. Flammable and combustible liquids not in approved storage.*
• **Environment:**	*No apparatus exhaust removal system.*
• **Code Compliance:**	*Does not appear to be fully ADA compliant.*
• **Staff Facilities:**	*Inadequate space for cooking and eating. Inadequate space for training and company drills. No gear lockers. No radio in officer's room. Speakers OOS in workout/storage room and outside rear. Workout area off apparatus floor lacks environment control.*
• **Efficiency:**	*Reported to have drafty windows.*

Station 6

3939 Carolina Beach Road

Built in 1985, this 3,221 square foot, relatively modern facility consists of 2 apparatus bays. This is a single company station that blends in with the community. There are a few concerns related to maintenance, public access, staff facilities, safety and efficiency. Any specific problems with this facility can be classified into the following seven categories.

• **Design:**	*Size of this facility is adequate for its current use. Apparatus compartment doors are close to the walls when opened. Reported to have termite problem*
• **Construction:**	*Paint peeling on apparatus ceiling.*
• **Safety:**	*Inadequate fire alarm or smoke detectors.*
• **Environment:**	*No apparatus exhaust removal system.*
• **Code Compliance:**	*May not be fully ADA compliant.*
• **Staff Facilities:**	*Inadequate space for working in, on and around apparatus Inadequate space for training and company drills. Designed to accommodate both genders.*
• **Efficiency:**	*Air conditioning reportedly unable to keep building cooled..*

Station 7

3230 South College Road

Built in 1999, this 7,043 square foot, modern facility consists of 3 apparatus bays. Station seven is a two company fire station. This is a new facility that blends well with the surrounding community. There are few concerns related to maintenance, public access, staff facilities, safety and efficiency. Any specific problems with this facility can be classified into the following seven categories.

• **Design:**	*The size of this facility is well-designed for the staffing. Some staff have to wait for parking space in morning.*
• **Construction:**	*No problems noted.*
• **Safety:**	*Automatic door stops not operating properly - bladder type OOS. Have to run extension cords to keep computers and MTD's charged when on generator power.*
• **Environment:**	*No apparatus drain oil seperation in use.*
• **Code Compliance:**	*No problems noted. ADA compliant.*
• **Staff Facilities:**	*Speaker missing in bedrooms. Kitchen range is undersized. Workout area off apparatus floor lacks environmental control.*
• **Efficiency:**	*No problems noted.*

Station 8

601 Eastwood Road

Built in 2000, this 7,403 square foot facility consists of 3 apparatus bays. No significant problems were observed and the facility is well designed. Any specific notes for this facility can be classified into the following seven categories.

• **Design:**	*Apparatus exit to traffic flow is challenging. Vehicles have to pull out into high-speed traffic with no traffic light.*
• **Construction:**	*No problems noted.*
• **Safety:**	*No problems noted.*
• **Environment:**	*No apparatus drain oil separation in use.*
• **Code Compliance:**	*No problems noted. ADA compliant.*
• **Staff Facilities:**	*No problems noted.*
• **Efficiency:**	*No problems noted.*

Station 9

1201 Military Cut Off

Built in 2000, this 7,403 square foot facility consists of 3 apparatus bays. This facility is modern and efficient Any specific notes for this facility can be classified into the following seven categories.

• **Design:**	*Occasional problems exiting into the flow of traffic despite presence of a traffic light.*
• **Construction:**	*Lights not secured outside. No other problems noted.*
• **Safety:**	*No problems noted.*
• **Environment:**	*No apparatus drain oil separation in use.*
• **Code Compliance:**	*No problems noted. ADA compliant.*
• **Staff Facilities:**	*No problems noted.*
• **Efficiency:**	*No problems noted.*

Station 10

6102 Oleander

This 10,000 square foot facility was previously a volunteer fire station. It is unkown precisely when the facility was built, though it has been given additions through the years.. Iit consists of 5 apparatus bays. This is now a single company station that does not blend particularly well with the area. The facility was not designed for modern career fire service. There are a sveral concerns related to maintenance, public access, staff facilities, safety and efficiency. Any specific notes for this facility can be classified into the following seven categories.

• **Design:**	*Apparatus exit to traffic flow is challenging, no traffic light present. Structure is not adaptable to future needs of the department. Inadequate parking for staff and visitors. Station will need major renovation.*
• **Construction:**	*Some larger modern engines may not fit in this station. Sewers get blocked up after any heavy rain. Built in a flood prone area, signs of repeated flooding to the facility.*
• **Safety:**	*Automatic door stops not operating properly. Inadequate fire alarm or smoke detectors.*
• **Environment:**	*Suspected mold in the HVAC system due to moisture and flooding problems. No apparatus exhaust removal system. Underground propane storage tank present.*
• **Code Compliance:**	*Reports of periodic electrical problems. Does not appear to be fully ADA compliant.*
• **Staff Facilities:**	*Inadequate space for working around apparatus due to support poles. Dorm is in poor condition. Most beds are broken. Officer's dorm is not furnished. Stairs are steep to 2nd floor. Fumes enter dorm. Not designed to accomodate two gender staffing.*
• **Efficiency:**	*This facility is not adequately designed for 24-hour occupancy - it was designed as a volunteer fire station and seems poorly suited for on duty staffing.*

Station 11

Masonboro Station

Currently under construction This new facility will consists of three apparatus bays. A new modern facility that will blend well with the surrounding community. There are no concerns related to maintenance, public access, staff facilities, safety and efficiency at this time. Any specific problems with this facility can be classified into the following seven categories.

• **Design:**	*Under construction*
• **Construction:**	*Under construction*
• **Safety:**	*Under construction*
• **Environment:**	*Under construction*
• **Code Compliance:**	*Under construction*
• **Staff Facilities:**	*Under construction*
• **Efficiency:**	*Under construction*

While many of the stations we reviewed were modern and efficient, several of the older facilities are still in need of additional updates or modernization. Several were designed without adequate space for efficient housing of the number of staff now located in the facility. In particular, Station 10 has not been given any significant updating and is marginally efficient. It provides for only the basic needs of the assigned staff. Many stations appear to have problems with working house lights, an issue that should be corrected. A standardized fire and premises alarm system should be installed in all stations to keep consistency and improve safety.

This section of the report deals only with analysis of current facilities. However, we are recommending development of a full long-range facilities management plan, as well as specific plans to address any current problems.

A long-range facilities management plan should include a variety of items, such as:

- Location, timing, and cost of any new facilities.
- Identified long-term maintenance or renovation needs for existing facilities.
- Adoption of an on-going funding plan for facility upkeep.

Recommendations

- Develop and adequately fund a long-range facilities management plan in accordance with recommendation for projected service delivery for all stations or when there is annexation.
- Initiate efforts to correct existing deficiencies as indicated.
- Install automatic exhaust removal systems in the stations that currently do not have them.
- Bring all stations to ADA compliance for public areas.
- Define and establish a system where all house lights are working properly.
- Bring all stations up to two gender staffing.
- Establish a work out room where all stations have controlled environments.

Apparatus

The WFD maintains a fleet of response vehicles that is relatively modern and well maintained. About half the fleet is currently in excess of the anticipated front-line lifespan considered to be typical in the industry for each vehicle type. The average age of the current apparatus is 10 years. The average condition of vehicles is considered good. The department needs to keep apparatus replacement as a significant issue in both the short and long term to ensure continued reliability for of the emergency vehicle fleet.

The following chart lists all primary heavy apparatus used by the WFD, excluding smaller commercial-style utility or staff vehicles. It includes current age, life expectancy, and roughly estimated replacement-funding requirements.

Figure 26: Wilmington Fire Department Apparatus Replacement Funding

UNIT	YEAR	REPLACEMENT COST	ANNUAL FUND CONTRIBUTIONS	CURRENT CASH REQUIREMENTS
Squad # 1	2006	$ 140,000	$ 9,333	$ -
Engine # 1	2001	$ 335,000	$ 22,333	$ 111,667
Tower # 1	1997	$ 875,000	$ 43,750	$ 393,750
Water Rescue # 1	1988	$ 140,000	NA	$ 140,000
Tower # 2	1988	$ 875,000	$ 43,750	$ 787,500
Engine # 2	1999	$ 335,000	$ 22,333	$ 156,333
Engine # 3	2001	$ 650,000	$ 43,333	$ 216,667
Engine # 4	2000	$ 335,000	$ 22,333	$ 134,000
Mobile Air # 1	1991	$ 140,000	$ 9,333	$ 140,000
Engine / Quint # 5	1995	$ 650,000	$ 43,333	$ 476,667
Squad # 2	1999	$ 140,000	$ 9,333	$ 65,333
Engine # 6	1998	$ 335,000	$ 22,333	$ 178,667
Engine / Quint # 7	1998	$ 650,000	$ 43,333	$ 346,667
Engine # 11	1990	$ 335,000	NA	$ 335,000
Engine / Quint # 8	2001	$ 650,000	$ 43,333	$ 216,667
Squad # 3	1997	$ 140,000	$ 9,333	$ 84,000
Tactical Rescue # 1	2000	$ 140,000	$ 9,333	$ 56,000
Engine # 9	1999	$ 335,000	$ 22,333	$ 156,333
Haz- Mat # 2	1989	$ 140,000	NA	$ 140,000
Engine # 10	1989	$ 335,000	NA	$ 335,000
TOTALS			***$ 419,167***	***$ 4,470,250***

**Does Not Include Reserve Vehicles*

What this chart shows is that in order to meet apparatus replacement needs of current resources, approximately $419,167 should be contributed to a reserve fund each year. Also, based on the age and typical industry replacement schedule of apparatus in use today, there should be about $4,470,250 available in a reserve fund. This is based on a continuation of the current number and type of apparatus that WFD maintains. The WFD does not currently have this level capital funding in place for apparatus replacement.

It should be noted that the chart represents funding levels needed for a capital replacement fund that is both adequate and up to date, assuring cash is available for purchase at the expected time of replacement. This is not meant to exclude other funding methods from consideration. For instance, during time periods when the market provides low rates, municipal lease-purchase

programs can be financially efficient. It does, however, require firm commitment on the part of the elected officials toward a scheduled apparatus replacement program. It is far too common, when faced with a large capital purchase that is competing with other community needs, for districts to delay such purchases to the point where efficiency or safety are compromised. The WFD can avoid such conditions by remaining firmly committed to a reasonable and effective capital replacement program for fire apparatus.

The primary front-line apparatus of WFD was reviewed and a basic inspection was performed to determine the general condition and the life expectancy, along with any specific problems. The following chart is used to determine the condition and safety status of the fire apparatus.

Excellent:	Like new condition. No body or paint defects. Clean compartmentation. Interior, cab complete and in full working order with no modifications. No significant defect history. Age is less than 25% of life expectancy.
Good:	Body and cab have good appearance with no rust and only minor cosmetic defects or dents. Clean compartmentation with no visible rust or corrosion. Interior, cab is in full working order and good appearance. Normal maintenance history with no significant defects or high downtime. Age is less than 75% of life expectancy.
Fair:	Body and cab have weathered appearance with minor surface rust and some cosmetic defects or dents. Unimpeded compartmentation with only surface rust or corrosion. Interior, cab is in reasonable working order and appearance. Only repairable tank or plumbing leakage. Showing increasing age-related maintenance, but with no major defects or unreasonable downtime. Age is less than 100% of life expectancy.
Serviceable:	Body and cab have weathered appearance with surface corrosion, cosmetic defects or dents, and minor rust-through of non-structural metals (body panels). Unimpeded compartmentation with significant surface rust or corrosion and/or minor rust-through (not affecting use). Interior, cab is in rough, but working order, often with local repairs or modifications to compensate for problems. Occasional or intermittent tank or plumbing leakage. Showing increasing age-related maintenance, but with no major defects or unreasonable downtime. Most service parts still available. Age is greater than 100% of life expectancy.
Poor:	Body and cab have weathered appearance with surface corrosion, cosmetic defects or dents, and visible rust-through of non-structural metals (body panels). Significant rust or corrosion is present in structural or support members. Use of compartmentation is impeded with significant corrosion and rust-through. Interior, cab is in rough condition with defects impeding safe and proper use. Non-repairable tank or plumbing leakage. Problematic age-related maintenance, major defects or unreasonable downtime are evident. Service parts difficult or impossible to obtain. Age is greater than 100% of life expectancy. Vehicle exceeds its GVWR.

Each heavy piece of apparatus was given a basic review for condition and safety. The following paragraphs describe any notations made during this review.

Station # 1

Squad 1

2006 Hackney Rescue Squad

Seating Capacity: 4

Pump Capacity:

Tank Capacity:

Condition: Excellent

Additional Comments or Observations: Have to dig for equipment. Hurst power unit hard to fill with gas and tray slides in, if not on level road. Not enough portable radios for all personnel assigned to the unit.

Engine 1

2001 Sutphen Engine

Seating Capacity: 4

Pump Capacity: 1500

Tank Capacity: 500

Condition: Excellent

Additional Comments or Observations: Difficult to hear from jump seats. Not enough portable radios for all personnel assigned to the unit.

Tower 1

1997 Sutphen Aerial Platform 100'

Seating Capacity: 4

Pump Capacity: 1500

Tank Capacity: 300

Condition: Excellent

Additional Comments or Observations: No problems noted. Difficult to hear from jump seats. Not enough portable radios for all personnel assigned to the unit.

Water Rescue 1

1988 Ford 700 Dive Unit

Seating Capacity: 2

Pump Capacity: N/A

Tank Capacity: N/A

Condition: Good

Additional Comments or Observations: 8 sets of SCUBA suits and tanks. 2 spare bottles. 4 pony bottles. Not enough portable radios for all personnel assigned to the unit.

Reserve Engine 12

1987 Gruman Engine

Seating Capacity: 4

Pump Capacity: 1000

Tank Capacity: 500

Condition: Fair

Additional Comments or Observations: Reserve. Not enough portable radios for all personnel assigned to the unit.

Reserve Engine 13

1985 Quality Engine

Seating Capacity: 4

Pump Capacity: 1000

Tank Capacity: 500

Condition: Fair

Additional Comments or Observations: Not enough portable radios for all personnel assigned to the unit.

Station # 2

Tower 2

1988 Sutphen 100 Aerial

Seating Capacity: 4

Pump Capacity: 1750

Tank Capacity: 300

Condition: Good

Additional Comments or Observations: First unit to go OOS for staffing. Right and left side stabilizers replaced in 2003. Difficult to hear from jump seats. Not enough portable radios for all personnel assigned to the unit.

Engine 2

1999 Sutphen Engine

Seating Capacity: 4

Pump Capacity: 1500

Tank Capacity: 500

Condition: Excellent

Additional Comments or Observations: Vehicle struck by lightning. Electronic #2 discharge switch OOS. Knox box key shorted out. Difficult to hear from jump seats. Not enough portable radios for all personnel assigned to the unit.

Station # 3

Engine 3

2001 Sutphen Engine

Seating Capacity: 4

Pump Capacity: 1500

Tank Capacity: 500

Condition: Excellent

Additional Comments or Observations: Difficult to hear from jump seats. Not enough portable radios for all personnel assigned to the unit.

Station # 4

Engine 4

2000 Sutphen Engine

Seating Capacity: 4

Pump Capacity: 1500

Tank Capacity: 750

Condition: Excellent

Additional Comments or Observations: Has had past electrical problems, all repaired. Difficult to hear from jump seats. Not enough portable radios for all personnel assigned to the unit.

Mobile Air 1

1991 Hackney F 700 Ait Truck

Seating Capacity: 2

Pump Capacity:

Tank Capacity:

Condition: Good

Additional Comments or Observations: No problems. Not enough portable radios for all personnel assigned to the unit.

Station # 5

Engine 5

1995 Sutphen Quint

Seating Capacity: 4

Pump Capacity: 1500

Tank Capacity: 400

Condition: Excellent

Additional Comments or Observations: Difficult to hear from jump seats. Not enough portable radios for all personnel assigned to the unit.

Squad 2

1999 Freightliner Hackney Squad

Seating Capacity: 5

Pump Capacity:

Tank Capacity:

Condition: Good

Additional Comments or Observations: Congested area in officer area of cab. Wheel chocks under carriage hit ground easily. Problems with door strikers, requiring frequent replacement. Body cracked at top passenger side starting at driver side front. Not enough portable radios for all personnel assigned to the unit.

Station # 6

Engine 6

1998 Sutphen Engine

Seating Capacity: 4

Pump Capacity: 1500

Tank Capacity: 500

Condition: Excellent

Additional Comments or Observations: Personnel reported that brakes occasionally fade out on response, but brakes are fully serviced and inspected every three months or when a problem is reported. Not enough portable radios for all personnel assigned to the unit.

Station # 7

Engine 7

1998 Sutphen Quint

Seating Capacity: 4

Pump Capacity: 1500

Tank Capacity: 500

Condition: Excellent

Additional Comments or Observations: Difficult to hear from jump seats. Not enough portable radios for all personnel assigned to the unit.

Engine 11

1990 Pierce Engine

Seating Capacity: 4

Pump Capacity: 1500

Tank Capacity: 500

Condition: Fair

Additional Comments or Observations: Personnel reported that brakes occasionally fade out on response, but brakes are fully serviced and inspected every three months or when a problem is reported. Difficult to hear from jump seats. Not enough portable radios for all personnel assigned to the unit.

Station # 8

Engine 8

2001 Sutphen Quint

Seating Capacity: 4

Pump Capacity: 1500

Tank Capacity: 300

Condition: Excellent

Additional Comments or Observations: No problems. Difficult to hear from jump seats. Not enough portable radios for all personnel assigned to the unit.

Squad 3

1997 Freighter Hackney Squad

Seating Capacity: 5

Pump Capacity: N/A

Tank Capacity: N/A

Condition: Excellent

Additional Comments or Observations: No problems. Not enough portable radios for all personnel assigned to the unit.

Tactical Rescue 1

2000 Hackney Tactical Rescue

Seating Capacity: 2

Pump Capacity:

Tank Capacity:

Condition: Excellent

Additional Comments or Observations: Not enough portable radios for all personnel assigned to the unit.

Station # 9

Engine 9

1999 Sutphen Engine

Seating Capacity: 4

Pump Capacity: 1500

Tank Capacity: 500

Condition: Excellent

Additional Comments or Observations: Difficult to hear from jump seats. Not enough portable radios for all personnel assigned to the unit.

Haz-Mat 2

1989 Ford Roll Up Truck's trailer

Seating Capacity: 2

Pump Capacity: N/A

Tank Capacity: N/A

Condition: Good

Additional Comments or Observations: Not enough portable radios for all personnel assigned to the unit.

Station # 10

Engine 10

1989 Peirce/Dash Engine

Seating Capacity: 4

Pump Capacity: 1000

Tank Capacity: 500

Condition: Fair

Additional Comments or Observations: Open cab. Difficult to hear from jump seats. Not enough portable radios for all personnel assigned to the unit.

Reserve Engine 14

1979 Grumman

Seating Capacity: 4

Pump Capacity: 1000

Tank Capacity: 600

Condition: Serviceable

Additional Comments or Observations: Open cab.

Fire Boat

Wilimington Fire Boat

1979 34' Harbor Fire Boat

Crew Capacity: 3

Pump Capacity: 500

Tank Capacity: Unlimited

Beam: 11' 9"

Draft: 44"

Condition: Serviceable

Additional Comments or Observations: This unit is in the process of being replaced with a new "Fire Rescue Boat."

New Fire Boat Information

No Picture Available

Under Construction

Wilimington Fire Boat- NEW

2007 50' Firestorm

Metal Craft Marine

Crew Capacity: 3 - 4

Pump Capacity: 6000 @ 150psi

Tank Capacity: Unlimited

Cost: $1,237,584

Condition: Under Construction

Additional Comments: The new addition to Wilmington Fire Department will be a deep-V hull watercraft, constructed of welded aluminum. The pilothouse will set just forward of mid-ship and contain the helm station on center with all appropriate controls and instruments. The vessel will be equipped with a twin fire system capable of pumping a minimum of 6000 gallons per minute @ 150 psi or more. Pumps and water jet propulsion system will be powered by twin Caterpillar engines.

Fleet Maintenance

WFD handles its vehicle fleet management and maintenance program independently from the City of Wilmington's Fleet Management services. The WFD maintenance staff is responsible for all preventive maintenance and repairs for fire department vehicles as well as small equipment repairs. In total, the fleet maintenance department is responsible for over 25 front line vehicles, several support vehicles and a very large inventory of small equipment for the fire service. Currently, there are two full time mechanics who oversee the Maintenance Division.

The fire department automatically pages a mechanic on all large incidents in the event of equipment failure during a critical response. In review of their proactive efforts, this department has excelled with its maintenance operations and services.

Vehicle Maintenance Division operating functions Include:

- Prepare and develop specifications for fleet and equipment to be bid out.
- Administer a preventive maintenance program for the fleet and equipment.
- Maintain a fleet and equipment and parts inventory.
- Perform and oversee all fleet and equipment repairs.
- Perform paint and body repairs for the fleet and equipment.
- Operate and maintain two fuel records.
- Operate and maintain a small engine repairs.
- Perform and maintain fleet and equipment maintenance records.
- Prepare retired vehicles for public auction.

The Fire Maintenance Division implemented a revised Preventive Maintenance Program for the fire department. The goal of the program is to have all vehicles in the fire department's inventory receive preventive maintenance (PM) service at least three times a year. In addition, specific standards are implemented detailing turn around time for PM based on vehicle type.

The emergency service has always ensured that response and rescue personnel are trained and certified to appropriate levels based on "accepted standards," such as the NFPA standards for firefighters and fire officers. Similar emphasis should be placed on establishing a maintenance training program using nationally recognized standards. Currently, WFD does not

use standards set by the Emergency Vehicle Technician Certification Commission, Inc. (EVT), but is currently working toward certification of its mechanics to these standards.

The Emergency Vehicle Technician Certification Commission, Inc. is a nonprofit corporation dedicated to improving the quality of emergency vehicle service and repairs throughout the United States and Canada. WFD does use Automotive Service of Excellence (ASE) - a nationally recognized institution that primarily certifies mechanics in automotive and commercial repairs. ASE's mission is to improve the quality of vehicle repair and service through the testing and certification of repair and service professionals. WFD should continue to pursue advancing their maintenance technicians through the certification courses of the EVT program, since these programs are specifically tailored to the emergency service industry and the unique apparatus it uses.

WFD also employs firefighters who are certified and trained to inspect, repair and certify self-contained breathing apparatus (SCBA) for the fire department. WFD does annual and routine checks on their SCBA's.

Support and Small Equipment

Small equipment can take a significant bite out of an annual budget. Small equipment can be quite expensive and has the additional challenge of having its life limited by technology improvements. A small equipment replacement plan should also be established. At this time WFD does not have such a plan. WFD does include replacement funding in their annual budget for equipment that is known to be in need of replacement, but this is not done by a scheduled replacement plan.

The plan, like facilities and apparatus, should include a schedule of equipment covered, estimated life expectancy, replacement cost and annual contributions required to replace equipment as needed. It is recommended that all equipment with a value of more than $5,000, as well as groups of equipment with an aggregate value of more than $5,000, be included in the plan. Examples include:

- Automatic external defibrillators.
- Portable and mobile radios.
- Computer equipment and systems.

- Shop diagnostic and maintenance equipment.
- Breathing apparatus.
- Computer software (major systems).

Recommendations

- Develop and fund a small equipment replacement program that anticipates replacement schedules and builds necessary funding in order to spread cost over multiple years.

Pump Testing and Hose Testing

Two necessary procedures that are required annually and must be documented are pump testing and hose testing. The life expectancy of a section of fire hose is determined by the care it receives. Hose is susceptible to mechanical injury, heat and fire damage, mold and mildew, and damage due to chemical contact and excessive pressures. Because of this, an inventory of all fire hose should be recorded along with a history of each section of hose. Our review indicates that WFD has done an excellent job in hose testing and recording keeping.

Fire pumps are one of the most critical and expensive parts of any fire apparatus. The care and routine check of a fire pump is a daily necessity and is performed at WFD by the assigned driver/operator position.

Part of the preventive maintenance program requires that all fire pumps be serviced every six months. This test includes draining and refilling the fluids in the transfer case, greasing of the bearings, lubricating all ball valves, linkage, drain valves and pressure relief valves. In addition to the above checks, the booster tank water level gauge is also inspected along with all other gauges, and pump panel lights. This test is performed every six months and an annual pump test is performed every twelve months. Our review indicates that WFD has done an excellent job in pump testing and recording keeping.

Turnout Gear Maintenance Program

The latest revisions to National Fire Protection Association standards 1500, 1581 and 1971 have addressed the health and safety risks associated with contaminated turnout gear by requiring that protective clothing be cleaned at least once every six (6) months. Based on these new requirements put into place by the standards, and similar changes being made by OSHA,

fire departments across the country are trying to find inexpensive ways to effectively comply with new standards.

The wear life of turnout gear will depend largely on the type of department, number and type of fires fought, and the aggressiveness of the standard procedures. However, proper care will enabled fire departments to lengthen their replacement cycle for new gear and reduce annual capital expenditures.

At this time, WFD does not have an acceptable means of cleaning turnout gear in each of the fire stations. Residential washers and dryers will not clean turnout gear properly. Many fire departments purchase turnout gear extraction cleaners that are designed specifically for cleaning turnout gear. Less sophisticated cleaning methods will remove dirt and perspiration, but will not remove severe contamination or hydrocarbons. This residue in the garment shortens the useful life and causes unnecessary expense of early gear retirement.

Many fire departments have realized significant savings by having gear which previously would be discarded due to heavy contamination or excessive wear and tear evaluated by certified companies that professionally clean and repair the gear. The cost of cleaning and repairing turnout gear will often result in reduced replacement cost. WFD inspects and sends turnout gear out for cleaning and repairs, but does not have a semi-annual program for all turnout gear inspection, cleaning and maintenance.

When renovations or new construction of stations takes place, WFD should consider enclosed turnout gear rooms with a separate ventilation system installed to ensure gear dries efficiently and any contaminants are kept separated from living areas until gear is adequately cleaned.

Recommendations

- Develop and fund a replacement program that anticipates replacement of turnout gear.
- Consider the purchase of a commercial extractor and mobile turnout drying rack for more stations.
- Establish a semi-annual inspection plan.
- Establish a record system for maintenance, uses and repairs of turnout gear.

Objective Seven – Emergency Services Delivery

The delivery of fire suppression and rescue services is no more effective than the sum of its parts. It requires efficient notification of an emergency, rapid response from well-located facilities in appropriate apparatus and with sufficient staffing, following a well-practiced plan of action.

This section evaluates these various components and provides observations of the elements that make up the delivery of the most critical core services provided by the Wilmington Fire Department.

Notification System

The Wilmington Fire Department is provided communications and dispatch services through the New Hanover County 911 Emergency Communications Center operated by the New Hanover County Sheriff's Department. This center functions as the dispatch point for all police, fire and EMS calls within the City and County with the exception of the Wrightsville Beach Police Department. The Communications Center is managed by a Communications Director and Shift Supervisors, and maintains a minimum of 12 on-duty dispatchers. In addition, consoles are available for the Supervisor and Training Officer to move in as back-up when necessary.

The communications center handled over 500,000 incoming telephone calls last year. Of those, it answered over 170,000 911 emergency calls. It is equipped with 12 incoming 911 lines and 6 seven-digit transfer lines along with an incoming line for voice-over-internet calls (VOIP). The dispatch center is the primary Public Safety Answering Point for the communities it serves, so call transfers are not necessary.

Computer-aided dispatch software is available to the fire dispatcher. Call processing and dispatch is handled quickly, with automated processes that must take place in order to identify the correct unit or stations to dispatch. The CAD system is manufactured by Sunguard™ OSSI and is a geo-based system running on a Windows™-based SQL server. The system relies on geographic information maintained by the County and updated at least every two weeks. CAD is currently programmed with a minimum of 9 layers of back-up alarm recommendations.

Formal call processing time standards have been established, and there is a system for quality control. The center's performance objectives include a call processing time of 45 seconds or less on 100% of all critical or high-risk calls. The establishments of performance standards and regular monitoring of dispatcher performance is as important as company response time, since the call receipt and notification process makes up the first critical component of a department's total reflex time to an incident. A report provided by the center for the month of March, 2006, provided an average call processing time for various incident categories. Most average times indicated in the report were well within normal ranges, with medical emergencies being processed in only 29 seconds.

Notification of companies takes place by "specific unit dispatch", with programmed assignment of specific apparatus quantities and types. Apparatus availability for the department is tracked automatically by the CAD system and back-up assignments are determined with assistance from the CAD software. Computer tracking of dispatch, arrival and control times is available and tracked by CAD as well.

Dispatch of apparatus within the fire stations takes place by direct line in-station printers and encoded station radios. This provides two redundant methods for transmitting alarms. Field personnel are notified by tone-encoded radio receivers.

Dispatchers are fully certified in the Emergency Medical Dispatch system, allowing them to provide pre-arrival instructions to bystanders at medical incidents. Medical priority dispatching is also utilized, ensuring that the correct resources respond in the correct manner to various types of medical emergencies, based on described conditions and symptoms.

WFD's radio system operates on trunked 800mhz frequencies from one primary tower site. The system is currently operating with 16 trunked channels. Even with approximately 1670 field units, however, dispatchers report that system "queuing" is rare.

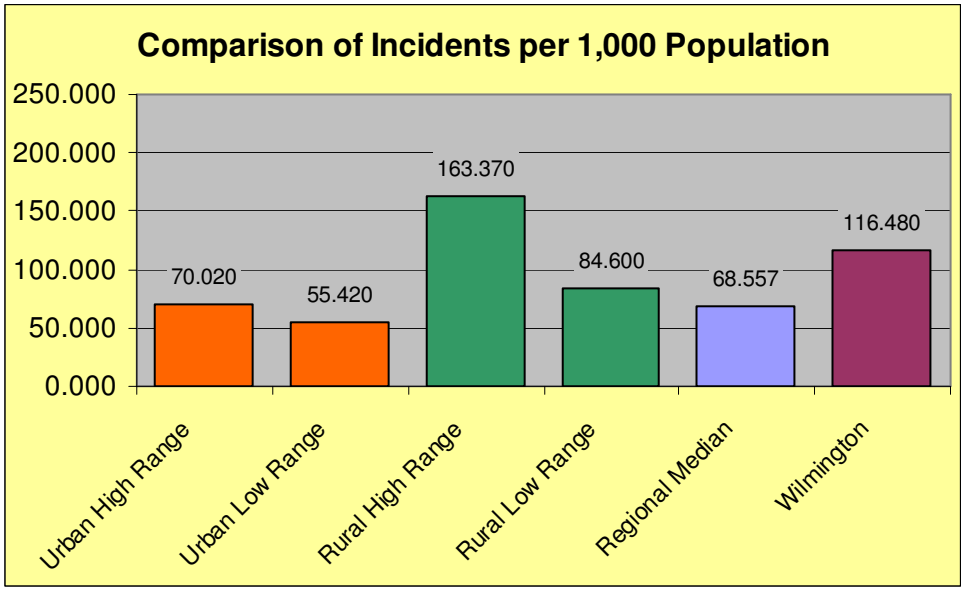
The dispatch center has adequate contingency plans for system failure. Back-up power is in place with spare consoles available. A back-up transmitter and a functionally redundant dispatch site are available. Radios are pre-programmed with one or more alternate radio systems, whose controllers are set up for redundant operation in an emergency. Evacuation and

transfer drills should be conducted at least annually to train dispatchers for emergency relocation and other system failure procedures.

Emergency Response Activity

The area served by the department has experienced an increasing number of fire department responses. In comparison to other communities of its size within the Southern region[9], the Wilmington Fire Department experiences a much higher number of emergency incident responses based on population. The following figure shows that WFD is well above the median range of incident volume per population for similar urban communities.

Figure 27: WFD Comparison of Incident Rates By Population

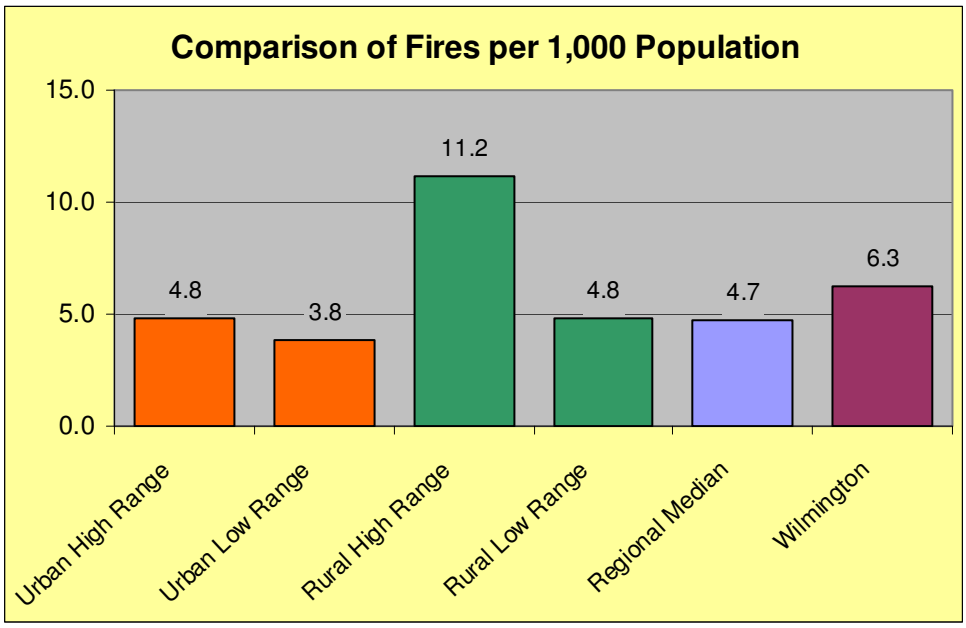


However, it should be remembered that the statistics include many communities that do not provide any type of emergency medical services through their fire department. This factor should be considered when evaluating the benchmark comparison data.

[9] Data source for this section is the National Fire Protection Association "U.S. Fire Department Profile", October 2004. This publication breaks down benchmark data into four regions: Northeast, Northcentral, South, and West. Southern regional data was selected for this report.

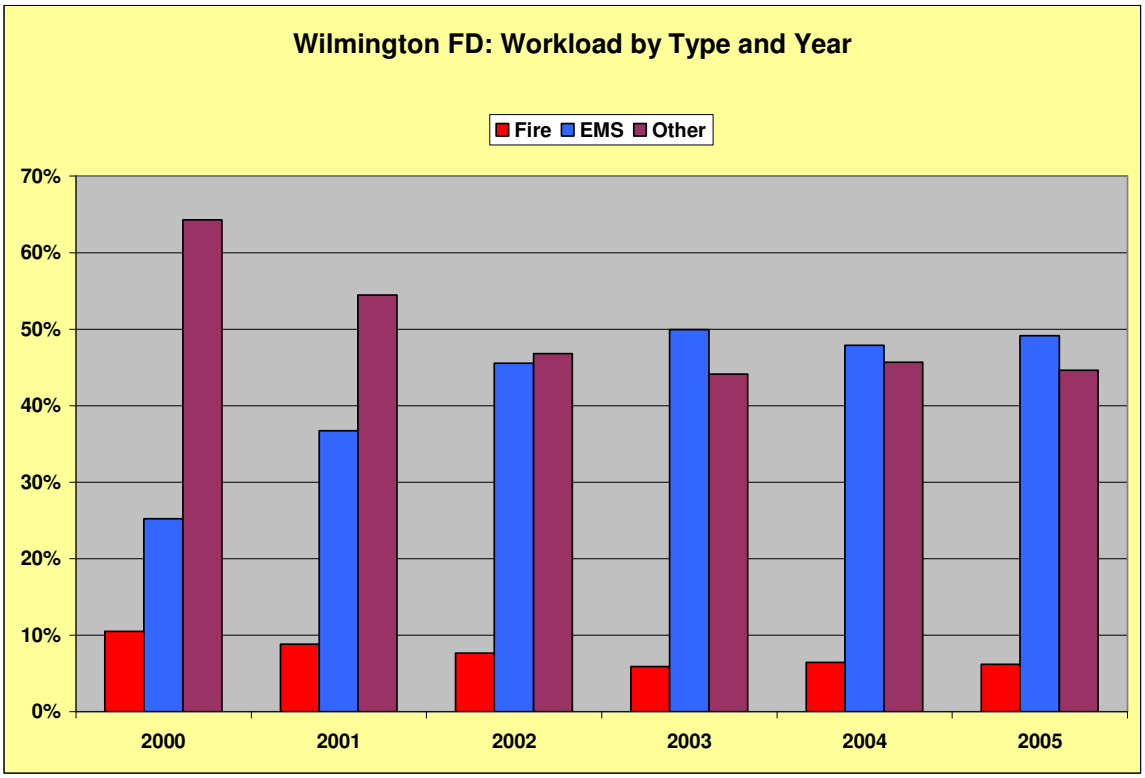
As can be seen in the following figure, WFD also experiences a higher number of fires per 1,000 population for a community of its size.

Figure 28: WFD Fires per 1,000 Population



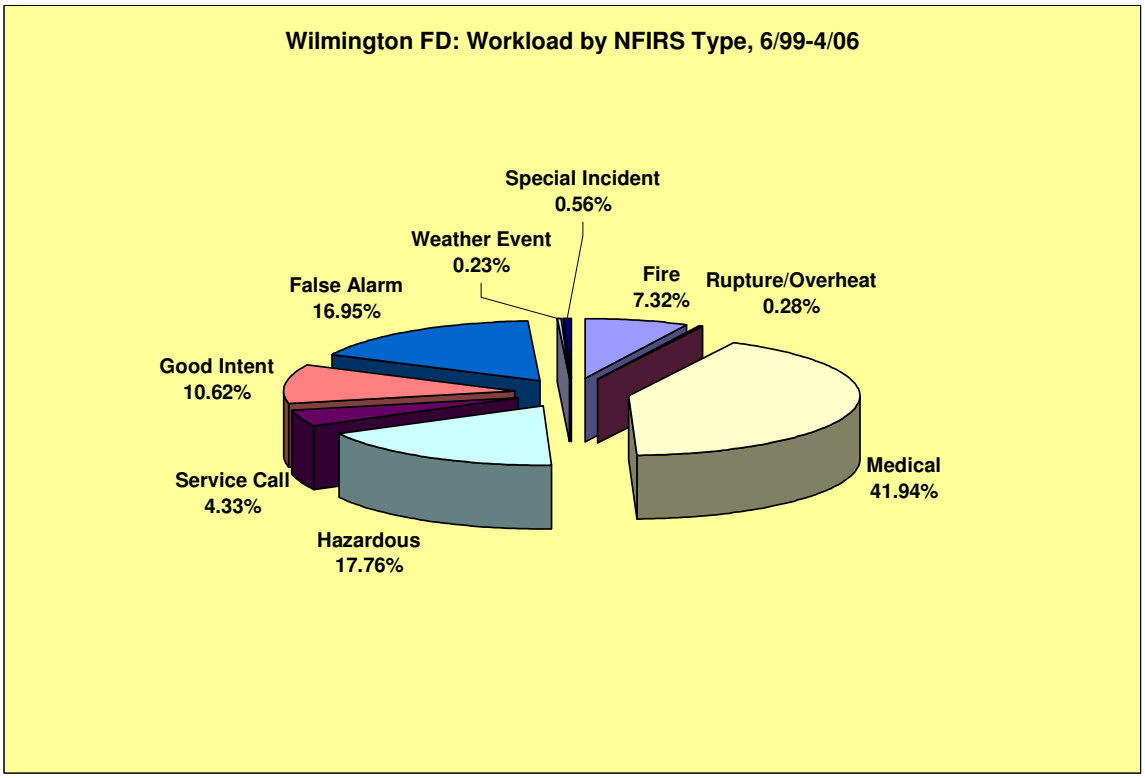
The following figures show how response volume has changed over the last five years and give an overview of the workload history of the agency.

Figure 29: WFD Workload History 2000 - 2005



By general workload categories, response to medical incidents has been growing over the last several years exceeding other types of non-fire calls for service. The workload categories can be further defined by National Fire Incident Reporting System (NFIRS) types. The following chart illustrates the workload for the past five years within these NFIRS types.

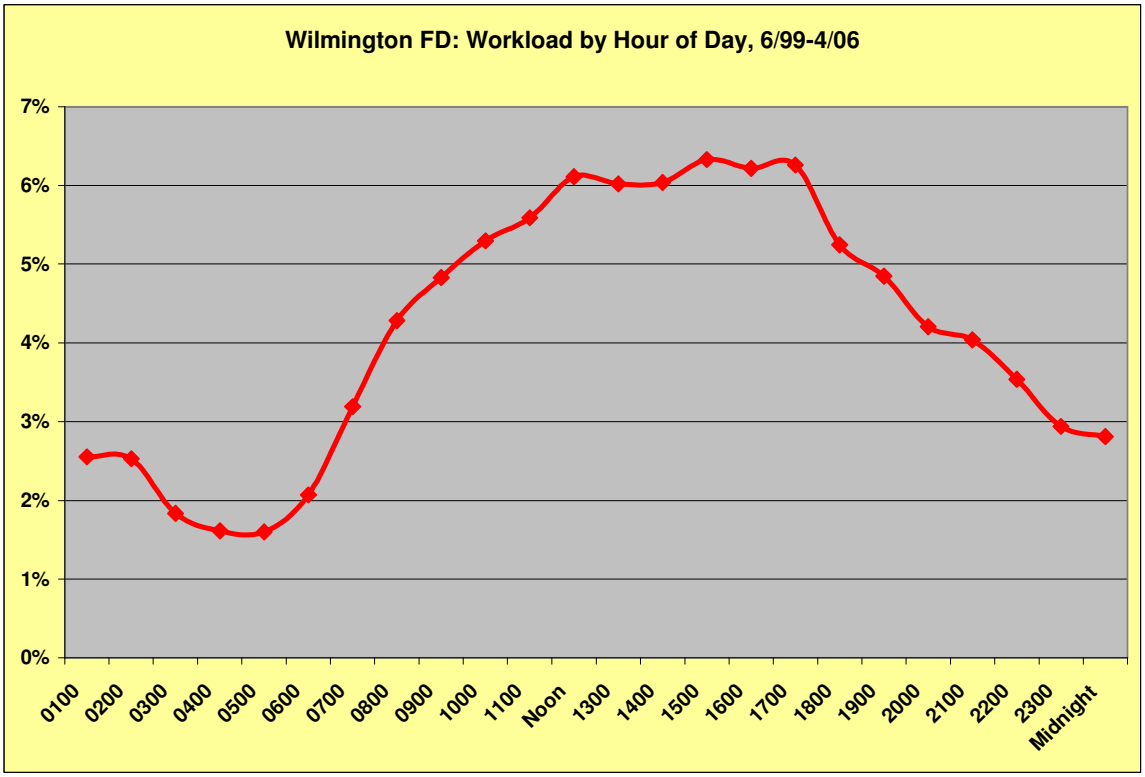
Figure 30: WFD Workload by Incident Type



The following paragraphs provide further analysis of the agency's workload.

A review of incidents by time of occurrence reveals when the greatest response demand is occurring. The following charts show how activity and demand changes for the Wilmington Fire Department based on time of day, day of week, and month of year.

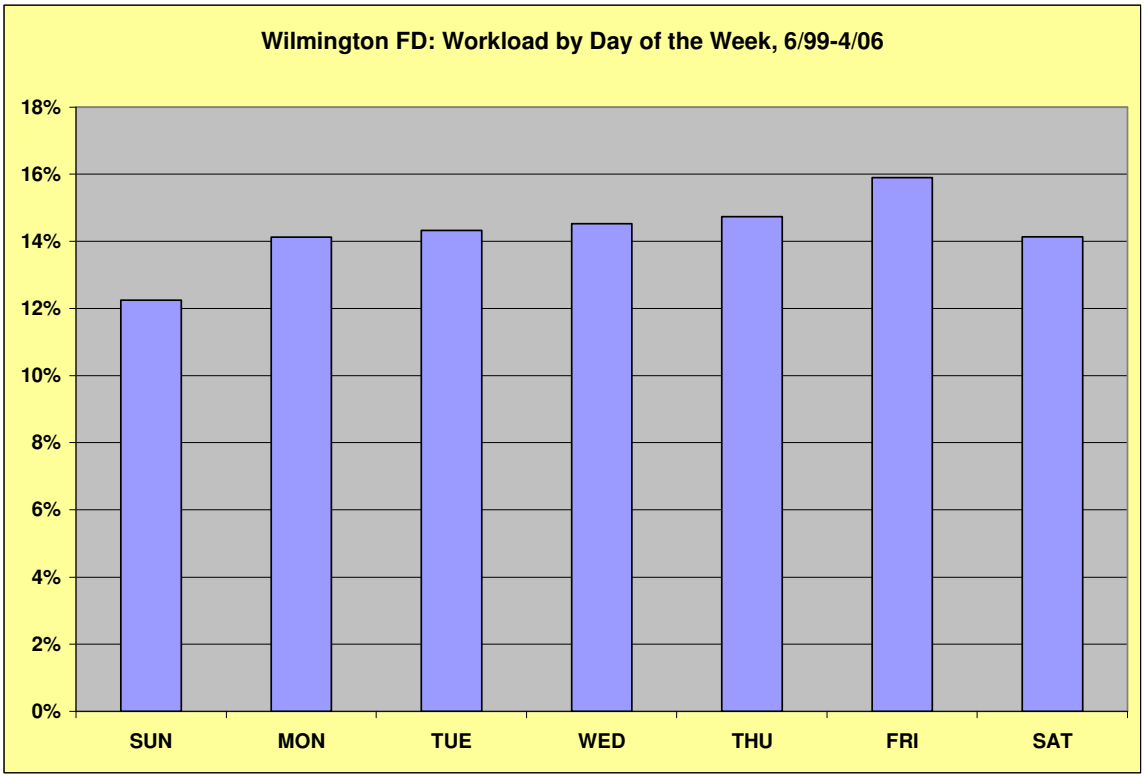
Figure 31: WFD Workload by Time of Day



Peak response activity occurs between the hours of 12:00pm and 6:00pm. This is typical of most fire agencies' experience, which usually falls between about 8:00am and 8:00pm, and reflects a higher level of activity in the community throughout the workday hours.

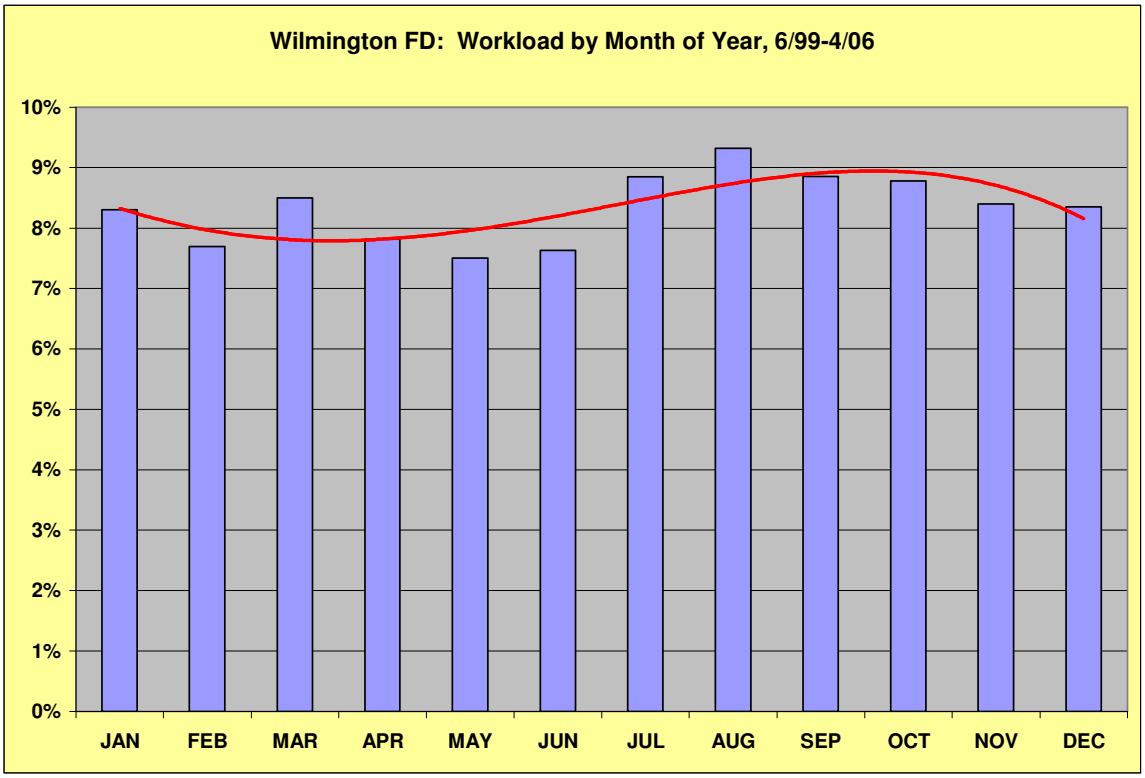
Incident volumes increase throughout the days of the week, with only a slight decrease during the weekend.

Figure 32: WFD Workload by Day Of Week



Incident volumes are relatively even throughout the months of the year, as shown in the following figure, with only a 1% to 2% increase through the late summer months and a slight decrease during the spring. The months with higher workloads are typically the months of hurricane season in the Atlantic.

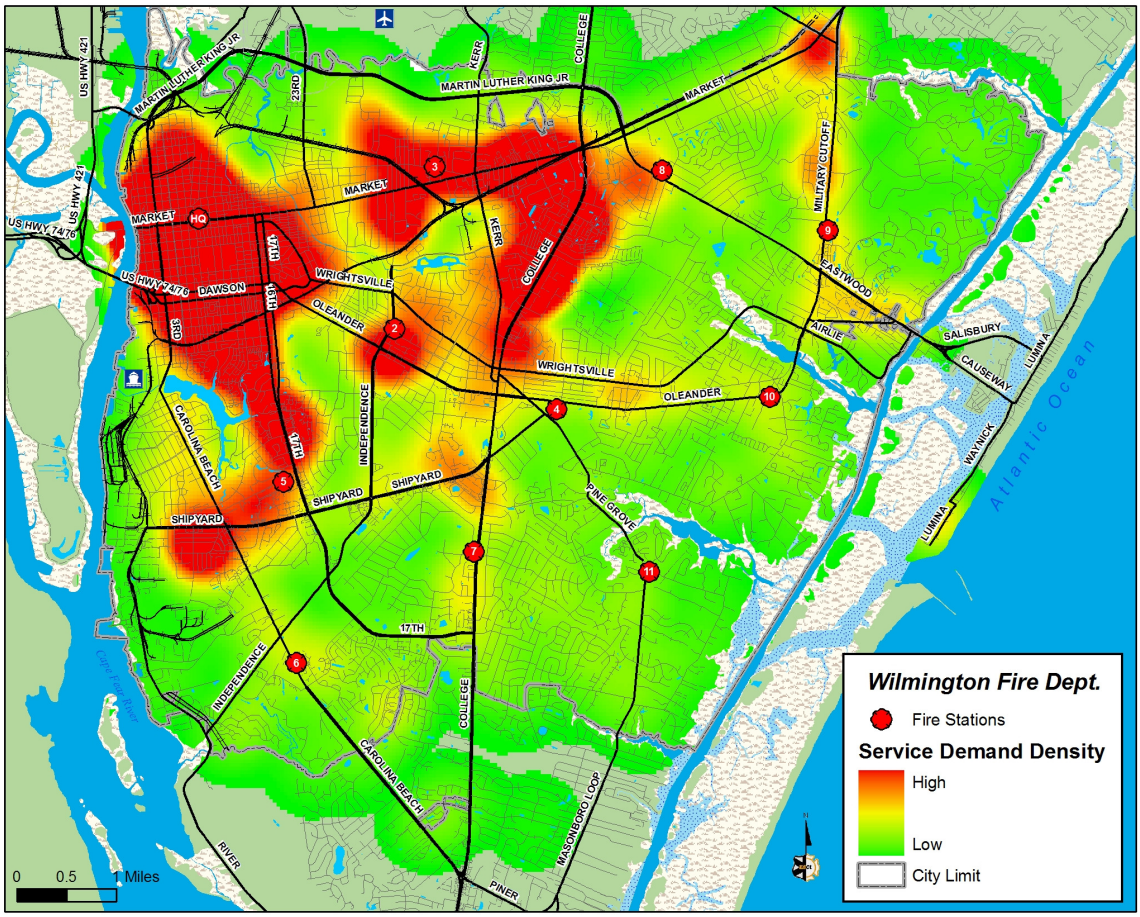
Figure 33: WFD Workload by Month Of Year



Service Demand Distribution

In order to analyze service demand, ESCi plotted the incident locations for a 12-month period on the map to demonstrate their relation to current facility locations. These graphics provide a visual demonstration of call volume and service demand by geography. Service demand for Wilmington Fire Department appears in the following figure.

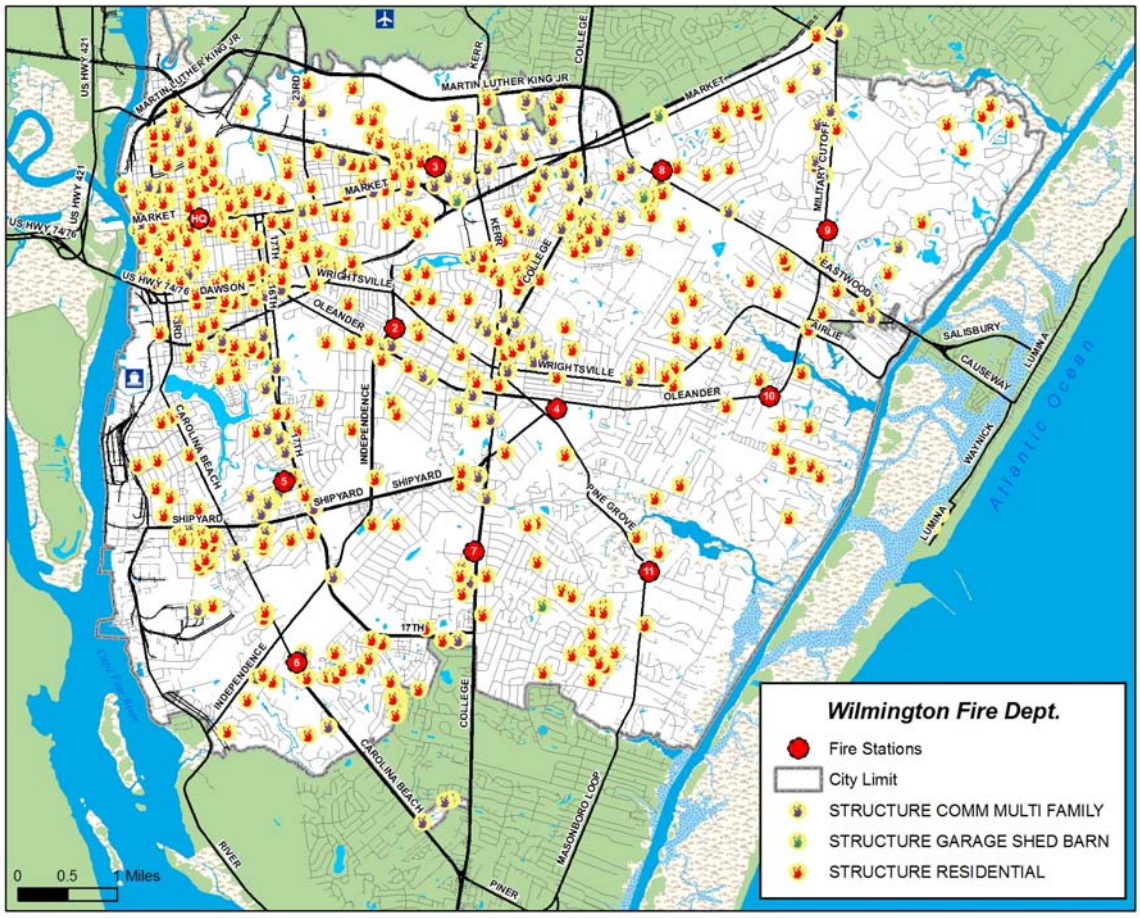
Figure 34: WFD Service Demand



The previous map demonstrates that service demand is heaviest in the urban central core of the district. This area corresponds with the area of greatest response capability overlap (resource concentration).

The following map plots the locations of structure fires only.

Figure 35: WFD Structure Fire Incidents



Again, it is relatively clear that the greatest numbers of structure fire incidents are experienced in the central urban core area of the district where resource are most concentrated.

Response Time Performance Objectives

The ultimate goal of any emergency service delivery system is to provide sufficient resources (personnel, apparatus, and equipment) to the scene of an emergency in time to take effective action to minimize the impacts of the emergency. This need applies to fires, medical emergencies, and any other emergency situation to which the fire department responds.

Before discussing the department's current performance, it is important to gain an understanding of the dynamics of fire and medical emergencies.

Dynamics of Fire in Buildings

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

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

Soon the flammable gases at the ceiling reach ignition temperature. At that point, an event termed "flashover" takes place; the gases ignite, which in turn ignites everything in the room. Once flashover occurs, damage caused by the fire is significant and the environment within the room can no longer support human life.

Flashover usually happens about five to eight minutes from the appearance of flame in typically furnished and ventilated buildings. Since flashover has such a dramatic influence on the outcome of a fire event, the goal of any fire agency is to apply water to a fire before flashover takes place.

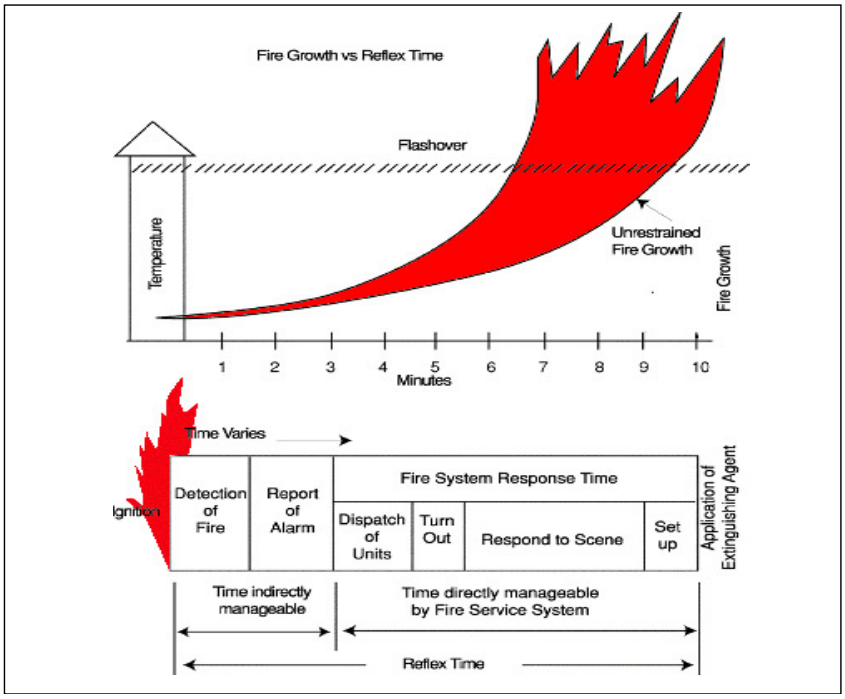
Perhaps as important as preventing flashover is the need to control a fire before it does damage to the structural framing of a building. Materials used to construct buildings today are often less fire resistive than the heavy structural skeletons of older frame buildings. Roof trusses and floor joists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

In addition, the contents of buildings today have a much greater potential for heat production than in the past. The widespread use of plastics in furnishings and other building contents rapidly accelerate fire spread and increase the amount of water needed to effectively control a

fire. All of these factors make the need for early application of water essential to a successful fire outcome.

A number of things must happen quickly to make it possible to achieve fire suppression prior to flashover. The figure below illustrates the sequence of events.

Figure 36: Fire Growth vs. Reflex Time



The reflex time continuum consists of six steps, beginning with ignition and concluding with the application of (usually) water. The time required for each of the six components varies. The policies and practices of the fire department directly influence four of the steps, but two are only indirectly manageable. The six parts of the continuum are:

1. **Detection**: The detection of a fire may occur immediately if someone happens to be present or if an automatic system is functioning. Otherwise, detection may be delayed, sometimes for a considerable period.
2. **Report**: Today most fires are reported by telephone to the 9-1-1 center. Call takers must quickly elicit accurate information about the nature and location of the fire from persons who

are apt to be excited. A citizen well trained in how to report emergencies can reduce the time required for this phase.

3. **Dispatch**: The dispatcher must identify the correct fire units, subsequently dispatch them to the emergency, and continue to update information about the emergency while the units respond. This step offers a number of technological opportunities to speed the process including computer aided dispatch and global positioning systems.
4. **Turnout**: Firefighters must don firefighting equipment, assemble on the response vehicle, and begin travel to the fire. Good training and proper fire station design can minimize the time required for this step.
5. **Response**: This is potentially the longest phase of the continuum. The distance between the fire station and the location of the emergency influences reflex time the most. The quality and connectivity of streets, traffic, driver training, geography, and environmental conditions are also a factor.
6. **Set up**: Last, once firefighters arrive on the scene of a fire emergency, fire apparatus are positioned, hose lines stretched out, additional equipment assembled, and certain preliminary tasks performed (such as rescue) before entry is made to the structure and water is applied to the fire.

As is apparent by this description of the sequence of events, application of water in time to prevent flashover is a serious challenge for any fire department.

The National Fire Protection Association studied data from residential structures occurring between 1994 and 1998 in order to analytically quantify the relationship between the growth of a fire beyond the room of origin and losses in life and property. As the figures below clearly indicate, fires contained to the room of origin (typically extinguished prior to or immediately following flashover) had significantly lower rates of death, injury, and property loss when compared to fires that had an opportunity to spread beyond the room of origin (typically extinguished post-flashover). Incidents in which a fire spreads beyond the room where it originates are likely to experience six times the amount of property loss and have almost nine times greater chance of resulting in a fatality.

Figure 37: National Data- Fire Growth to Life and Property Loss

Fire Extension in Residential Structure Fires 1994-1998			
	Rates Per 1,000 Fires		
Extension	**Civilian Deaths**	**Civilian Injuries**	**Dollar Loss Per Fire**
Confined to room of origin	2.32	35.19	$3,385
Beyond room of origin; confined to floor of origin	19.68	96.86	$22,720
Beyond floor of origin	26.54	63.48	$31,912

*Data from NFPA Annual Fire Experience Survey and USFA National Incident Reporting System

Emergency Medical Event Sequence

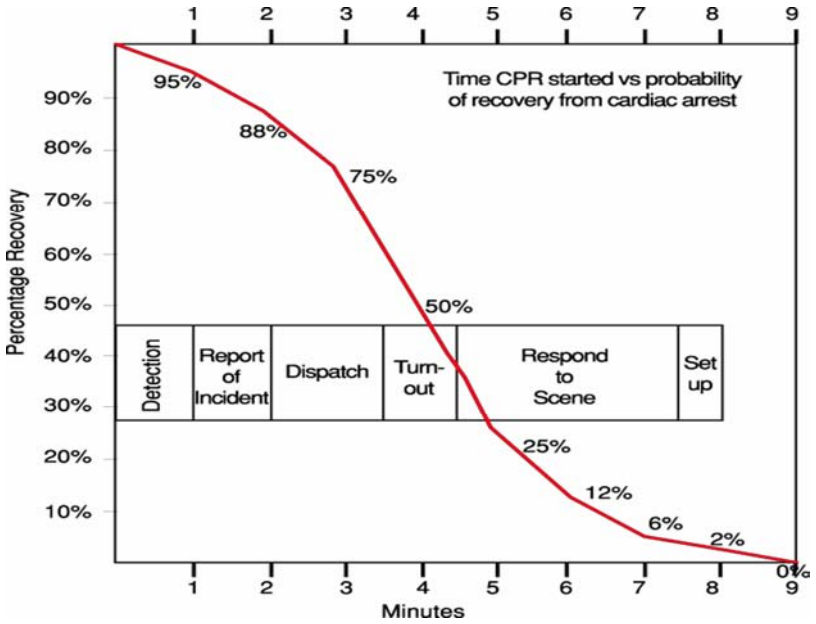
Cardiac arrest is the most significant life threatening medical event. A victim of cardiac arrest has mere minutes in which to receive definitive lifesaving care if there is to be any hope for resuscitation.

Recently, the American Heart Association (AHA) issued a new set of cardiopulmonary resuscitation guidelines designed to streamline emergency procedures for heart attack victims, and to increase the likelihood of survival. The AHA guidelines include new goals for the application of cardiac defibrillation to cardiac arrest victims.

Heart attack survival chances fall by seven to ten percent for every minute between collapse and defibrillation. Consequently, the AHA now recommends cardiac defibrillation within five minutes of cardiac arrest.

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

Figure 38: Cardiac Arrest Event Sequence



The percentage of opportunity for recovery from cardiac arrest drops quickly as time progresses. The stages of medical response are very similar to the components described for a fire response. Recent research stresses the importance of rapid cardiac defibrillation and administration of certain drugs as a means of improving the opportunity for successful resuscitation and survival. An Oregon fire department recently studied the effect of time on cardiac arrest resuscitation and found that nearly all of their "saves" were within one and one-half miles of a fire station, underscoring the importance of quick response.

People, Tools and Time

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

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

Equally critical is delivering enough personnel to the scene to perform all of the concurrent tasks required to deliver quality emergency care. For a cardiac arrest this can be up to six personnel;

two to perform CPR, two to set up and operate advanced medical equipment, one to record the actions taken by emergency care workers, and one to direct patient care.

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

Fire emergencies are even more resource critical. Again, the true test of performance is the time it takes to deliver sufficient personnel to initiate application of water on the fire. This is the only practical method to reverse the continuing internal temperature increases and ultimately prevent flashover. The arrival of one person with a portable radio does not provide fire intervention capability and should not be counted as "arrival" by the fire department.

In order to legally enter a building to conduct interior firefighting operations at least four personnel must be on scene. The initial arrival of effective resources should be measured at the point in time when at least four personnel, properly trained and equipped, have assembled at the fire.

Emergency service agencies should have clearly defined response performance objectives established to allow evaluation of capability and service delivery. An organization's performance objectives should clearly state both the current and desired emergency service capabilities in very measurable terms. For emergency response, performance objectives should define response performance using both time and resource criteria. For example:

- *Provide for the arrival of adequate resources to initiate basic emergency medical services at the scene of any medical emergency within "X" minutes following dispatch, 90% of the time.*
- *Provide for the arrival of adequate resources to initiate interior fire suppression operations at the scene of any fire within "X" minutes following dispatch, 90% of the time.*

With specific performance criteria a fire department can develop deployment methodologies to achieve desired levels of performance, and can quickly identify when conditions in the environment degrade performance.

NFPA 1710

The National Fire Protection Association (NFPA) has issued a response performance standard for career staffed fire departments. This standard, among other things, identifies a target response time performance objective for fire departments and a target staffing standard for structure fires. Though not a legal mandate, NFPA 1710 does provide a useful benchmark against which to measure the fire department's performance.

NFPA 1710 contains time performance standards for structure fire response as well as emergency medical response. Each will be discussed individually.

NFPA 1710 recommends that the first company arrive at the scene of a structure fire within five minutes of dispatch, 90% of the time. NFPA uses the 90th percentile rather than average. This allows an evaluation of a department's performance on the vast majority of its incidents.

The standard establishes that a response "company" consists of four personnel. The standard does not require that all four be on the same vehicle, but does expect that the four will operate as a single functioning unit once on scene. The NFPA 1710 response time standard also requires that all four personnel be on scene within the recommended five minutes, 90% of the time.

There is another reason the arrival of four personnel is critical for structure fires. As mentioned earlier, current safety regulations require that before personnel can enter a building to extinguish a fire at least two personnel must be on scene and assigned to conduct search and rescue in case the fire attack crew becomes trapped. This is referred to as the "two-in, two out" rule. The only exception to this regulation is if it is known that victims trapped are inside the building.

Given WFD's typical staffing of engines, the time it takes for the second unit to arrive becomes very important to achievement of the NFPA standard. If additional help is a considerable amount of time away the fire will continue to grow rapidly contributing to significantly more damage to the property.

Finally, the NFPA standard calls for the arrival of the entire initial assignment (sufficient apparatus and personnel to effectively combat a fire based on its level of risk) within nine minutes of dispatch, 90% of the time. This is to ensure that enough people and equipment arrive soon enough to be effective in controlling a fire before substantial damage occurs.[10]

NFPA 1710 describes the following performance as meeting the structure fire response criteria of the standard:

- *Turnout time within one minute, 90% of the time*
- *Arrival of the first "company" within five minutes of dispatch, 90% of the time,* ***or***
- *Arrival of the entire initial response assignment (all units assigned to the call) within nine minutes of dispatch, 90% of the time*

There are three time standards within the NFPA 1710 Standard for emergency medical responses. They are:

- *Turnout time within one minute, 90% of the time*
- *Arrival of a unit with first responder or higher level of capability (basic life support) within five minutes of dispatch, 90% of the time*
- *Arrival of an advanced life support unit, where this service is provided by the fire department, within nine minutes of dispatch, 90% of the time*

Wilmington Fire Department Response Time Performance Objective

Wilmington Fire District has established a response time objective for its emergency services of five minutes or less to 90% of all emergency incidents, so there will be a reasonable target against which to compare current performance. This response time objective is intended to include call processing time and firefighter turnout time.

As previously discussed, the NFPA 1710 Standard sets response time performance for first arriving fire apparatus at five minutes or less, 90% of the time. The 1710 standard does not include call processing time, which is covered in other related NFPA standards that call for a performance of one minute or less for this activity. Thus, we can see that the Wilmington performance objective is consistent with the NFPA 1710 standard and is based on nationally accepted scientific data regarding the effect of time on fire growth, life and property outcomes, and medical crisis survivability.

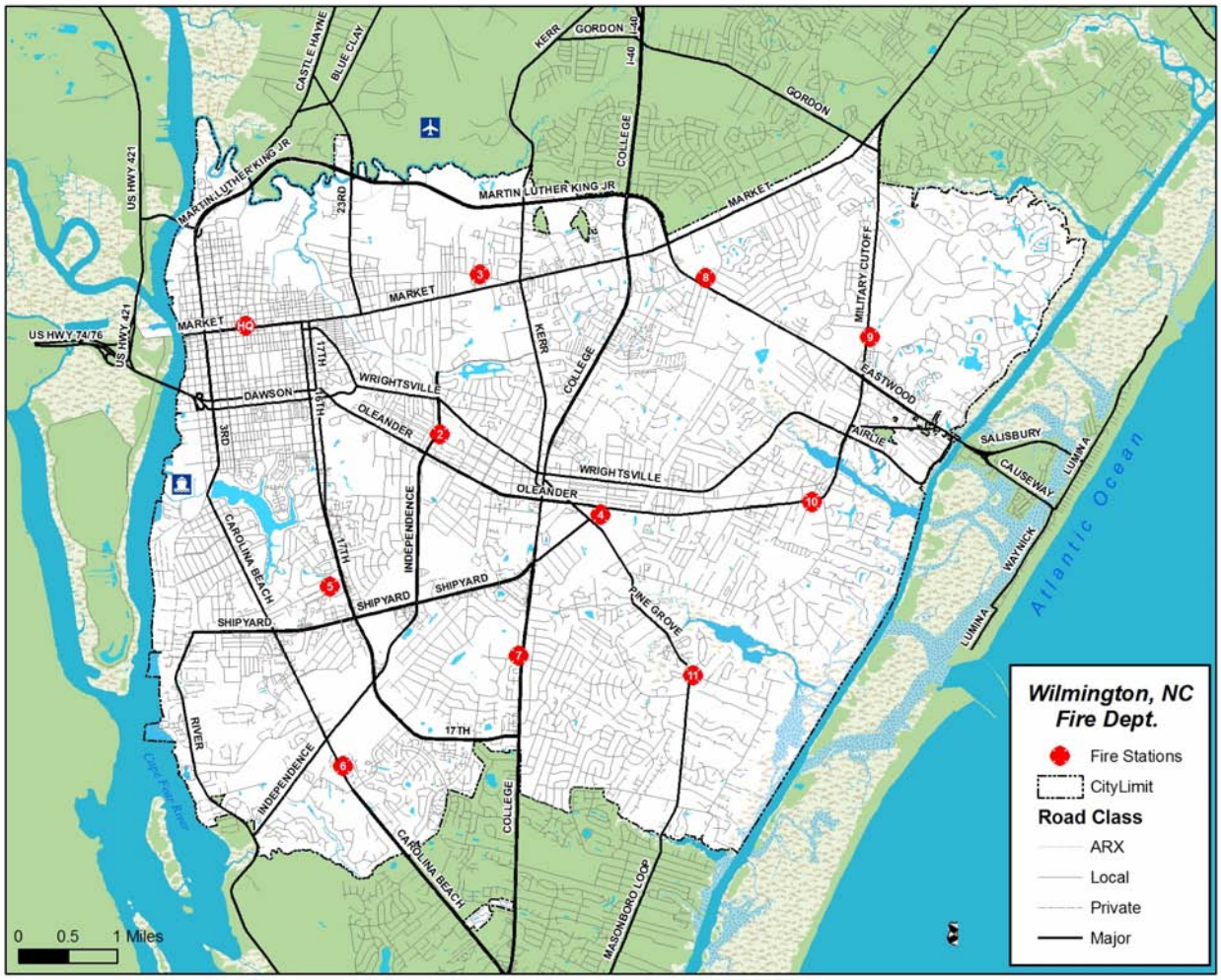
[10] See previous discussion about the "time/temperature curve" and the effects of flashover.

Resource Distribution

The Wilmington Fire Department is providing services from ten locations. An eleventh location is under construction at this time and all analysis in this section of the report will include the future location. Coverage of the current service area is considered very good for an urban fire protection system.

The following map displays the current deployment of stations for the Wilmington Fire Department.

Figure 39: WFD Current Facility Deployment



There are several ways to approach fire station deployment analysis. Insurance Services Office(ISO) standards define ideal coverage as having a fire engine within one and one-half

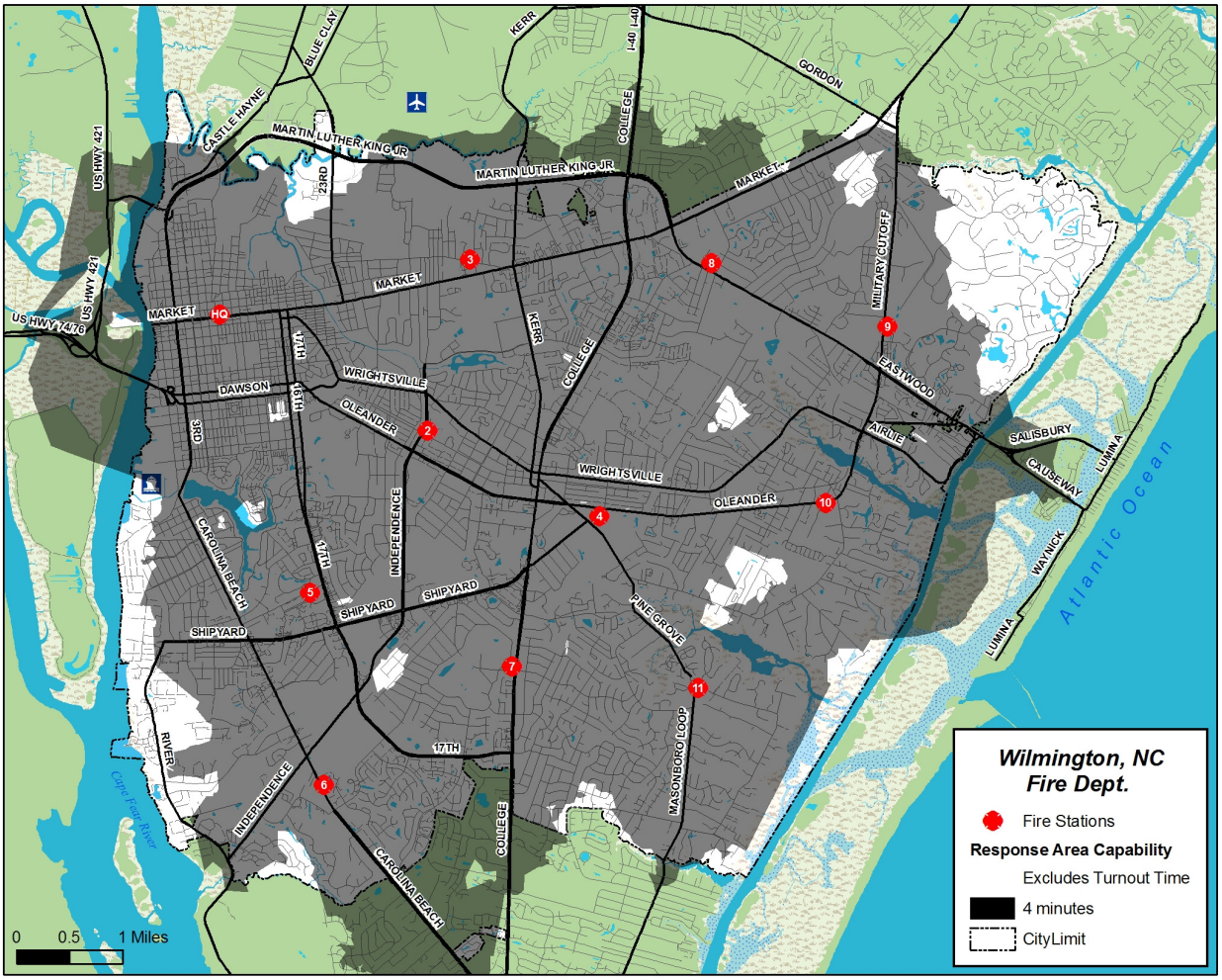
miles of any "built upon" area. In addition, the ISO standards consider any developed area greater than five miles from a fire station as being "unprotected"[11]. Such areas are often subjected to a Class 10 insurance rating, making insurance difficult or expensive to obtain. We began our analysis by examining the city road network and confirming that there were no road segments that are greater than five miles from an existing fire station and, thus, subject to an "unprotected" classification and fire insurance rating.

With that established, we move on to an analysis of the WFD's facility deployment for initial response. The map in the following figure demonstrates the current geographic-based coverage of WFD's eleven fire stations by plotting their four-minute travel time footprint. Since these response time footprints are calculated on actual modeled travel time, the four-minute response footprint is slightly larger than the 1.5 mile travel zone used by the Insurance Services Office (ISO) for optimum community fire protection scoring.

The street segments that can be reached in four minutes of travel time are shaded in black. It should also be noted that, as a career staffed agency, WFD can be expected to experience about a one-minute time period for firefighter turnout before apparatus leaves the station and travel time to the incident begins. Thus, the figure could also be looked at as a depiction of a five minute total response time capability of the current deployment.

[11] The North Carolina Office of the State Fire Marshal will extend protected class up to six road miles from a fire station. OSFM has inspection and rating authority for communities up to 100,000 population.

Figure 40: WFD Current Deployment- Four Minute Travel Polygons



What is visually evident from the map in this figure is that most of the developed streets within the current limits of WFD's response area are within a five-minute response time of a fire station. However, the figure also demonstrates evidence of small capability gaps in the northeastern and extreme western portions of the response area. Both areas experience extremely low service demand.

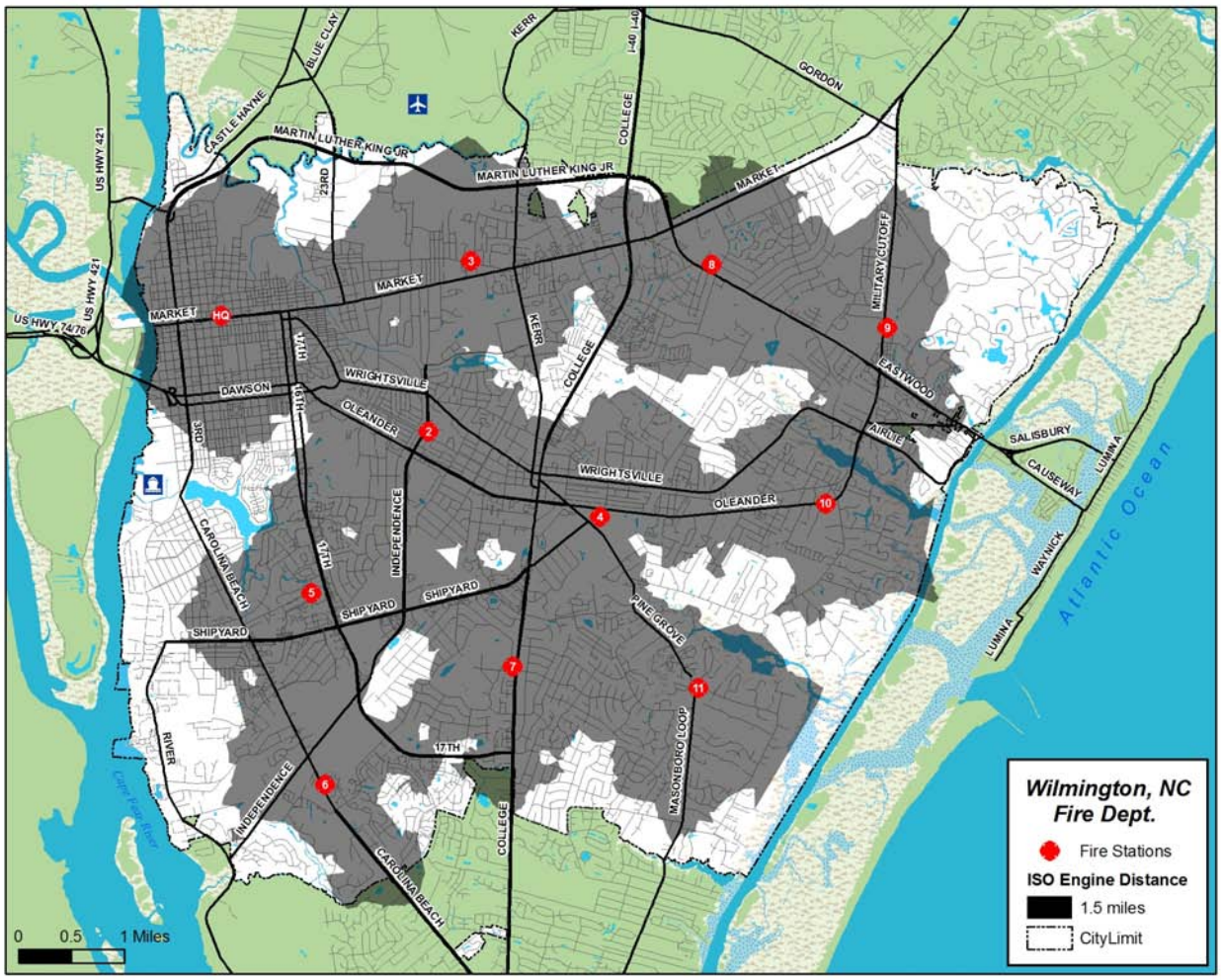
In order to achieve optimum credit, ISO[12] reviews the response areas of each existing station and identifies the number of fire hydrants within those response areas. ISO then analyzes

[12] In North Carolina, the Office of the State Fire Marshal may conduct this analysis instead of ISO for communities up to 100,000 population.

whether there are additional geographic areas of the district outside of the existing station response areas where at least 50% of the number of hydrants served by the largest existing response area could be served by the addition of a new station.. If so, additional engine company deployment is recommended. For ISO review purposes, the response area of a station is measured at 1.5 miles of travel distance on existing roadways. Our analysis indicates that WFD operates a sufficient number of engine companies at this time. This is further validated by the Improvement Statements report issued by OSFM that stated *"For maximum credit, 11 engine companies are needed in your City"*.

The following map depicts the location of the current engine companies as well as their 1.5 mile coverage polygons. Though hydrant locations were not available in a data file for analysis, it appears that WFD has a distribution of engine companies that may fall slightly short of the ISO standards for full distribution credit due to service gaps in the northeast and far western edges of the district. However, it should be remembered that overall credit for distribution is only 4 points out of a total of 50 points available to the fire department in its scoring categories. The City has currently received 3.15 out of 4 points in engine company distribution. Additions to the engine company distribution would not be the most cost-effective means to achieve additional rating points. As an example, simply improving the department's training program could achieve up to 3.15 additional credit points.

Figure 41: ISO 1.5 Mile Response Areas for Engine Companies

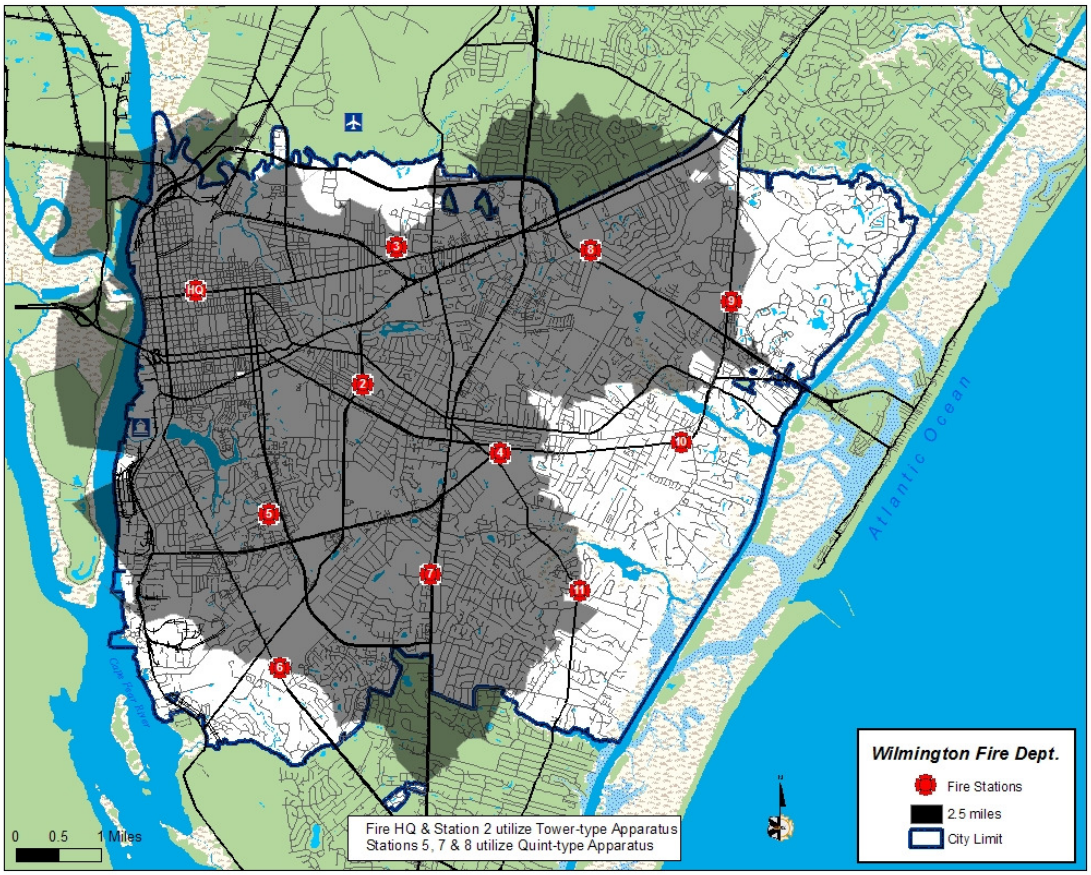


The department's pumpers appear to be very well equipped, though none received 100% point credit for equipment in the last rating. Although this may have been improved since that time, a complete inventory should be performed to assure maximum point values for all vehicles during any future ISO rating reviews.

It is unclear precisely how much of the department's protection area would meet the necessary requirements for aerial trucks (ladder companies). In order to receive full credit, these should be located within 2.5 mile distribution of all buildings that would meet the three story height and square footage limits. Other areas can receive credit for a service company without the requirement of an elevated aerial device.

The following map depicts the location of the current aerial devices as well as their 2.5 mile coverage polygons. This can be used by local personnel to evaluate whether the tallest and largest square footage buildings are located primarily within these coverage areas. It does appear that some areas of the downtown industrial core (an area with high service demand) are not within the 2.5 mile coverage of the truck companies. However, the Improvement Statements report issued by OSFM stated *"For maximum credit, 4 ladder companies are needed in your City"*.

Figure 42: WFD Ladder Coverage at 2.5 Miles



It should be noted that Station 5, Station 7 and Station 8 are included in the above figure since these stations operate quint-type apparatus. This type of apparatus receives partial credit under ISO rules in lieu of a full truck company and, indeed, they were so credited in the last OSFM inspection. However it must be remembered that these are also engine companies and that the staff level does not change on the apparatus.

It appears that WFD has a distribution of ladder/service companies that may fall slightly short of the ISO standards for full distribution credit due to service gaps. However, it should again be remembered that overall credit for distribution is only 4 points out of a total of 50 points available to the fire department in its scoring categories. The City has currently received 3.15 out of 4 points in company distribution. Additions to the ladder company distribution would not be the most cost-effective means to achieve additional rating points and is not recommended.

Recommendations

- The City's elected officials should adopt a basic service philosophy and response time performance standard for the area served by the Wilmington Fire Department.
- Long-term facility deployment plans should be adopted to meet the service philosophy of the community should growth and annexation continue.

Resource Concentration

The Wilmington Fire Department defines a successful concentration network as one in which the system is capable of responding a sufficient number of personnel, with the correct apparatus and equipment to accomplish the following objectives:

- Stopping the emergency from continued escalation.
- Providing for the safety and security of citizens and emergency responders.
- Completing all critical tasks in a timely manner.
- Providing for effective incident management.

These objectives go beyond the capability of a single engine company. Concentration deals with the ability to place additional resources on scene within a time frame that permits effective intervention.

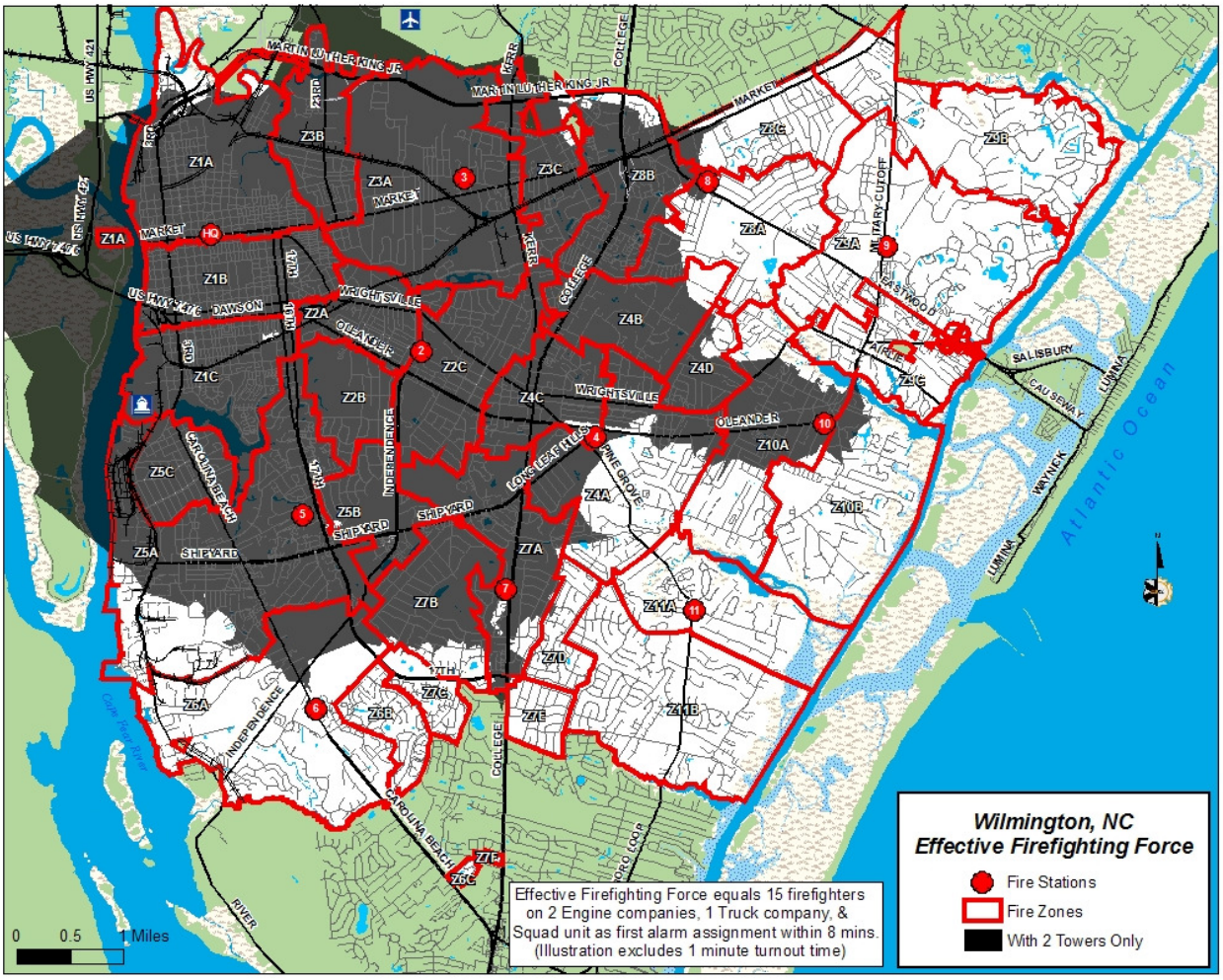
The initial step in the analysis of concentration is an understanding of the critical tasks that must be accomplished to successfully control and incident. By identifying these critical tasks, a department is better able to quantify necessary staffing and apparatus assignments, as well as response time performance of those resources, which will be necessary for an effective outcome.

As described in other sections of this report, the NFPA standard calls for the arrival of the entire initial assignment (sufficient apparatus and personnel to effectively combat a fire based on its level of risk) within eight[13] minutes, 90 percent of the time. This is to ensure that enough people and equipment arrive soon enough to be effective in controlling a fire before substantial damage occurs.[14] In Wilmington, this 'effective firefighting force' includes 15 firefighters typically deployed on two engines, one truck company and a squad unit, along with a Battalion Chief.

The following map illustrates the extent geographically to which this is possible in Wilmington, assuming a one-minute turnout time and a computer modeled seven-minute travel time.

[13] One minute is provided for firefighter turnout time, seven minutes for travel, leaving a total response time of eight minutes from point of dispatch.
[14] See previous discussion about the *time/temperature curve* and the effects of flashover.

Figure 43: Effective Firefighting Force- Current Deployment



It can be seen that there are areas in which this assemblage of manpower and equipment may exceed this time frame. A redeployment of apparatus or additional apparatus will be needed to modify the capability of the range of the currently deployed resources.

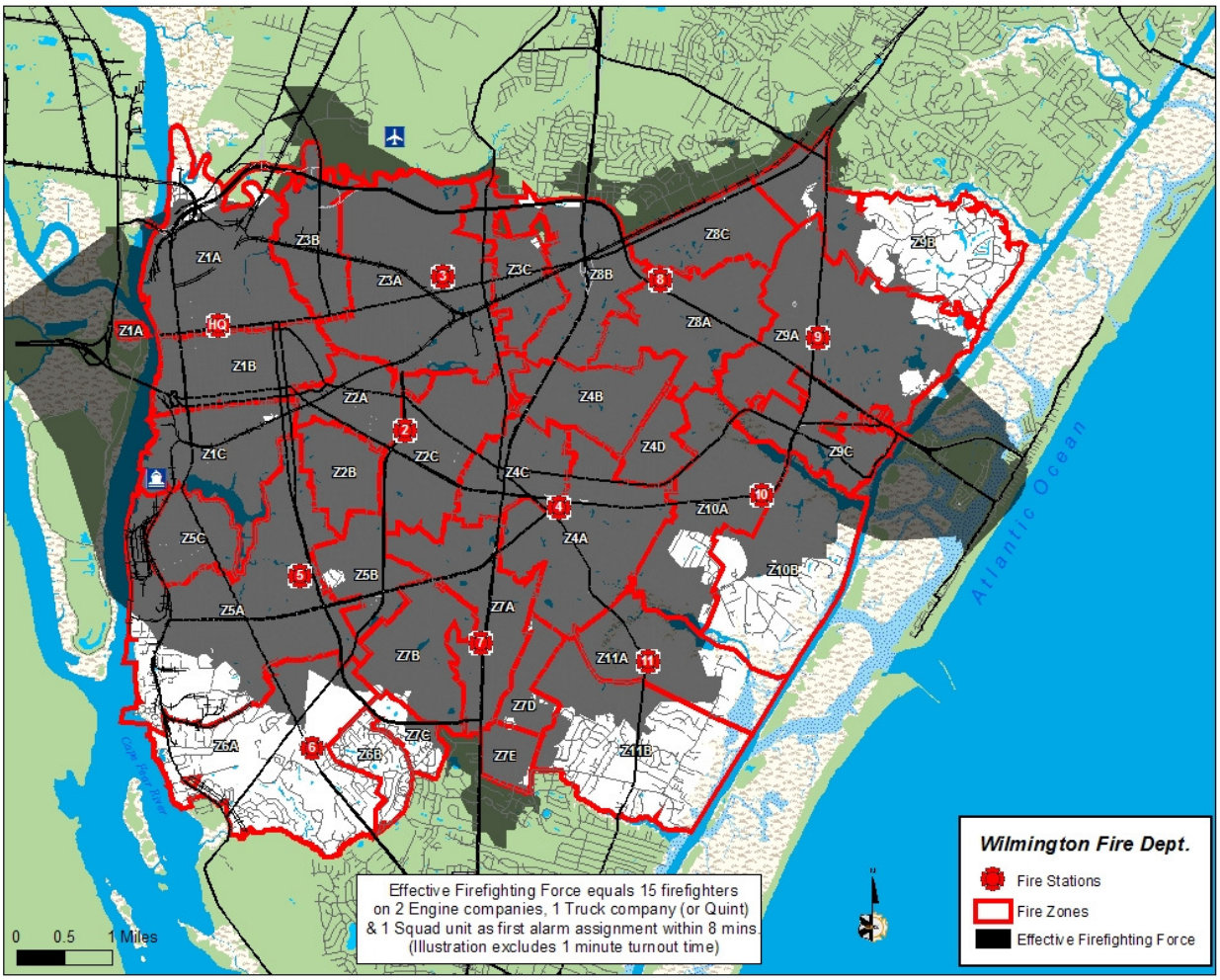
The task for this analysis becomes a process of determining what elements of the effective firefighting force, or initial alarm assignment, must be modified to achieve improvement. The initial consideration, then, is the presence of only two ladder companies that are currently dispatched as trucks in the system. The analysis noted that any effort to achieve an eight-minute response time city-wide from only two such units would be unlikely.

Given the presence of three other aerial devices (quints[15]) that are operating within the system as engines, the next analysis took into account how the effective firefighting force response capability would alter when those three units are utilized to respond as a truck company in certain geographic areas as part of the initial alarm assignment. In order to evaluate this, the model must replace those quints with another engine in any area where they would be the first due truck. These areas include Station 5, Station 7 and Station 8 which operate the quint-type apparatus. Thus, the model will not permit the unit to be counted as both an engine and a truck, but rather counts the unit as a truck only when it is the closest aerial unit to the scene.

The following figure displays the effective firefighting force response capability with Engine 5, Engine 7 and Engine 8, the three quints, permitted to respond as the required truck company in those areas where this would be most advantageous. It also takes into account the planned redeployment of Squad 2 from Station 5 to Station 7 once Engine 11 operates out its own station.

[15] A **quint**, or quintuple combination pumper, is a fire apparatus that serves the dual purpose of an engine and a ladder truck. The name *quint* is derived from the Latin prefix quinque-, meaning five, and refers to the five functions that a quint provides: pump, water tank, fire hose, aerial device, and ground ladders.

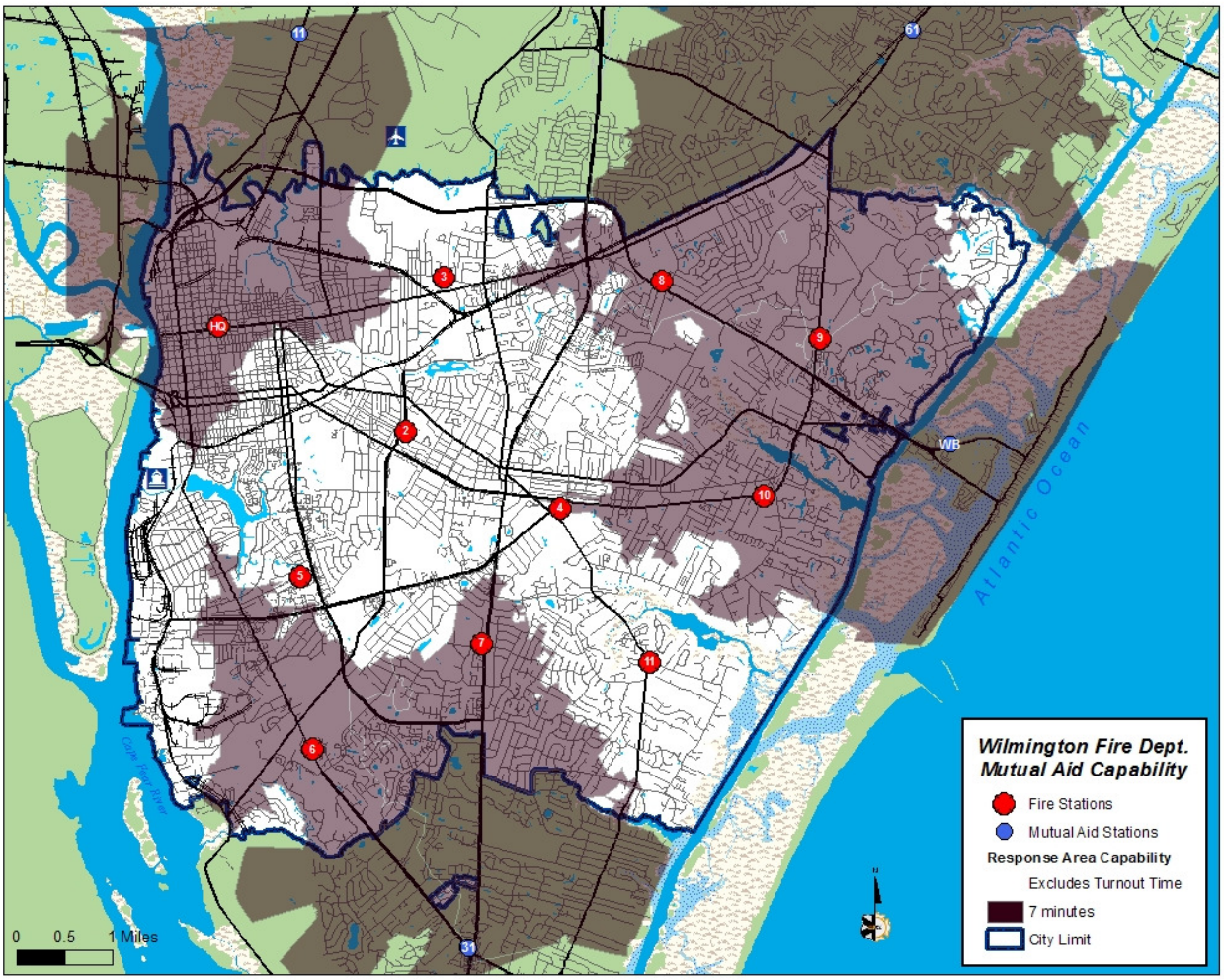
Figure 44: Effective Firefighting Force- Quints at 5, 7 & 8 Used as Trucks



Significant improvement can be seen in the eight-minute capability of the effective firefighting force under this deployment scenario, which is currently the practice within the City.

Some additional improvement in EFF may also be possible through the use of Auomatic Aid agreements with New Hanover County Fire Services and the City of Wrightsville Beach. The eight-minute response capability of these agencies is provided in the following figure.

Figure 45: Adjoining Agency Capabilities for Eight-Minute Response Time



As can be seen from this map, units from New Hanover County's Wrightsboro Station 11[16], Ogden Station 61, Myrtle Grove Station 31, and the City of Wrightsville Beach all have the capability to reach significant portions of the City of Wilmington within the eight-minute response time in WFD's effective firefighting force objective. Both Ogden Station 61 and Myrtle Grove Station 31 have ladder companies housed there as well. This analysis indicates that these stations, if used in Automatic Aid, could have a positive effect on the effective firefighting force response capability for the City of Wilmington. Mutual aid from these stations is currently used during periods of resource drawdown in the City. Additional discussion on mutual aid systems is found in a later section of this report.

[16] Wrightsboro station is Station 11 in the new Hanover County Fire Services numbering system.

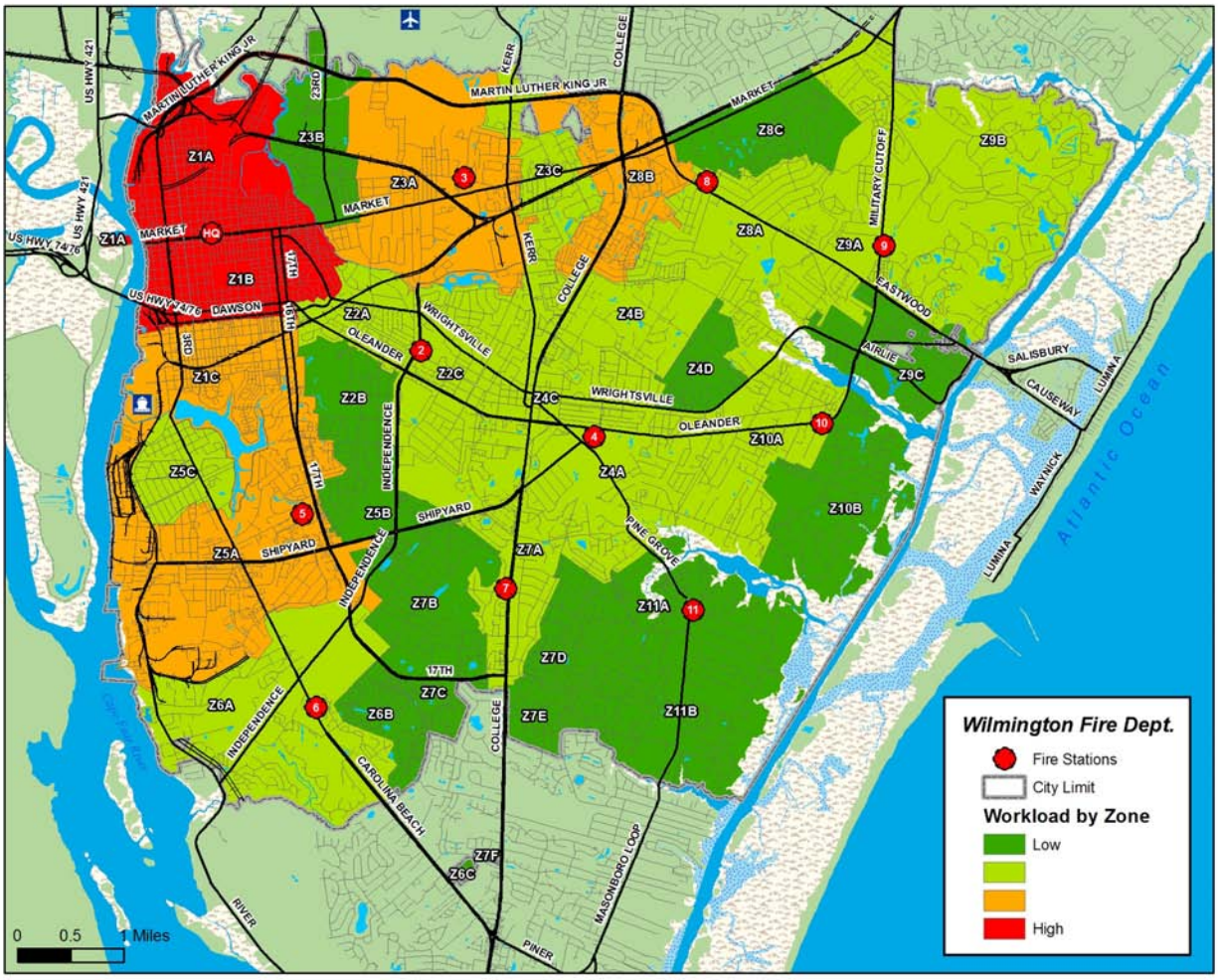
Recommendations:

- WFD can improve its effective firefighting force response capability and avoid resource drawdown through the effective use of Automatic Aid with neighboring departments.

Resource Reliability, Utilization, and Drawdown

The workload on emergency response units can also be a factor in response time performance. The busier a given unit, the less available it is for the next emergency. If a response unit is unavailable, then a unit from a more distant station must respond, increasing overall response time. A cushion of surplus response capacity above average values must be maintained due to less frequent, but very critical times, when atypical demand patterns appear in the system. Multiple medical calls, simultaneous fires, multi-casualty events, or multiple alarm fires are all examples. The following map illustrates the workload within each station's response zones.

Figure 46: WFD Workload by Station Response Zone



The heaviest workload is predominately downtown and spreading south and east from this area. This matches the population density, as well as the development pattern of commercial and industrial properties. For these reasons, priority for four-person companies should be on companies located in stations 1, 2, 3, 5 and 8.

The following chart shows response activity by unit. This chart describes total response activity for each unit for the 12 month period of data supplied. Total unit responses exceed total incidents for the year since many calls for service require more than one unit to respond. Using the total time on incident, unit hour utilization is also calculated for WFD response units.

Figure 47: Total Responses by Unit – 4/1/05-3/31/06

Unit	Calls	Total Time	UHU
ENG1	1662	32058.00	0.06
ENG2	1395	22533.37	0.04
ENG3	1824	28921.23	0.06
ENG4	1185	20274.47	0.04
ENG5	793	12535.77	0.02
ENG6	578	9781.58	0.02
ENG7	930	14612.88	0.03
ENG8	1172	20237.00	0.04
ENG9	936	16679.37	0.03
ENG10	508	8656.65	0.02
ENG11	406	6316.55	0.01
SQD1	2286	33494.98	0.06
SQD2	1287	18864.77	0.04
SQD3	1377	22309.90	0.04
TWR1	589	7505.10	0.01
TWR2	679	10080.55	0.02

Unit hour utilization is an important workload indicator. It describes the amount of time a unit is not available for response since it's already committed to an incident. The larger the number, the greater it's utilization and the less available it is for assignment to an incident. Recommended unit hour utilization (UHU) maximums for fire department units are typically around 0.20 with some studies indicating that unit failure rates[17] at this workload will begin to hit 10%. All WFD response units are currently well below recommended targets, indicating unit workload is not likely a factor in achieving improved response times.

Another way to look at resource workload is to examine the amount of time multiple calls happen within the same time frame on the same day. We examined the data for the last full year to find the frequency that WFD apparatus is handling multiple calls within any time frame. This is important because more calls occurring at one time can stretch available resources and extend response times from distant responding available apparatus. This is especially important since the majority of dispatch protocols send multiple apparatus from one or more stations.

[17] The unit failure rate is the percentage of calls for which a unit is unavailable due to handling an existing call where it otherwise would have been dispatched as the primary unit.

Figure 48: Call Concurrency Table

	All	Structure Fires
Single Calls	67.96%	93.14%
2 Concurrently	21.90%	5.49%
3 Concurrently	6.47%	1.07%
4 Concurrently	1.91%	0.30%
5 Concurrently	0.80%	
6 Concurrently	0.36%	
7 Concurrently	0.21%	
8 Concurrently	0.13%	
9 Concurrently	0.07%	
10 Concurrently	0.07%	

As in most communities, the majority of calls happen singularly. However, as communities grow the propensity for concurrent calls increase. When the concurrency reaches a level to which it stretches resources to near capacity, response times begin to extend. Concurrency correlates directly with workload levels, so that the busier times of day in the busier areas have higher frequency of concurrency.

Wilmington experiences two simultaneous calls in about 22% percent of its workload and three simultaneous calls in about 6.5% of its workload. However, the vast majority of these incidents are low-risk single or two-company responses. If we assume that an unacceptable drawdown of resources for low-risk incidents would be a level at which insufficient resources were available for a structure fire response, then the likelihood of an unacceptable drawdown of resources for low-risk incidents has less than a one percent chance of occurring.

When considering only medium or high-risk structure fires involving multiple resources, Wilmington experiences two such simultaneous call in about 5.5% of its structure response workload. Given the number of resources in the city, this should not result in an unacceptable drawdown of available resources sufficient to affect assembly of an effective firefighting force. Even if it were to delay the assembly of an effective firefighting force beyond the nine-minute response time (dispatch to arrival), it would still not do so beyond 10 percent of the time, allowing the department to continue to achieve the objective at the 90th percentile.

Wilmington experiences three simultaneous structure fire calls about one percent of the time. Assuming all three were structure fire responses, resources would still be adequate, but this

could result in drawdown of resources such that a sufficient number of companies may no longer be available for an additional structure fire response. Still, the percentage of occurrences should permit the department to achieve its performance objectives at the 90th percentile.

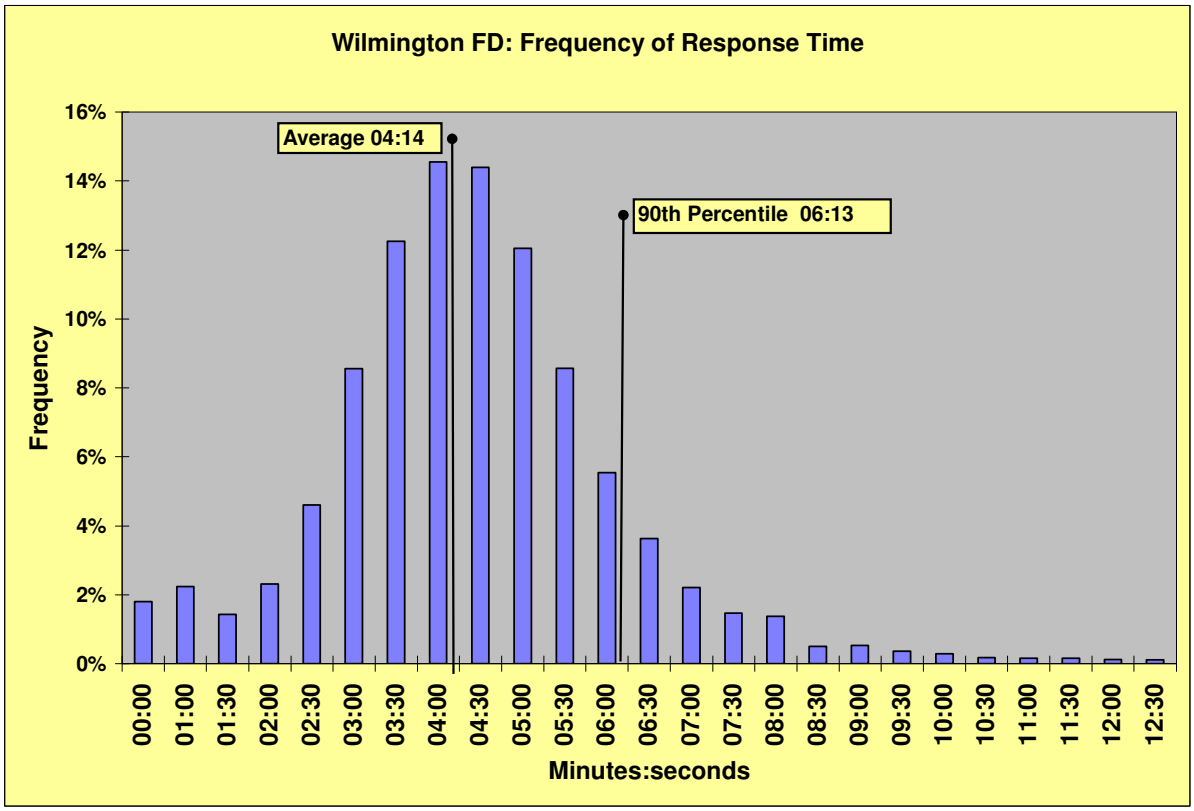
Simultaneous structure fire incidents beyond three could result in a lack of resources. Service equipment carried on engine companies would need to be utilized until additional ladder or service companies were freed up or responded from mutual aid. The probability of this occurring is less than a half percent, based on historical workload analysis.

Based on this analysis, ESCi determined that the department can handle the resource drawdown of three structure fire commitments, along with two to four other low-risk incidents simultaneously. At this point, the department's resources would be unable to adequately provide for an additional full structure fire response, and may be unable to handle additional low-risk responses or requests for additional apparatus at the structure fires. Mutual aid would be advisable at that point. This appears to be an acceptable and reasonable level of drawdown for a department of this size, given the availability of a significant number of resources, many of which are staffed, in the surrounding fire departments available for mutual aid.

Recorded Response Time Performance

Response data for twelve months were provided which was used as the bases for a response time analysis. The dates of the data set began 4/1/05 and concluded on 3/31/06. The overall average response time of the department within its primary jurisdiction was **4 minutes and 14 seconds**. These response times do include firefighter turnout, but DO NOT include call processing time in the dispatch center. The following figure illustrates the frequency of recorded response times over the 12 month period.

Figure 49: Frequency of Response Times

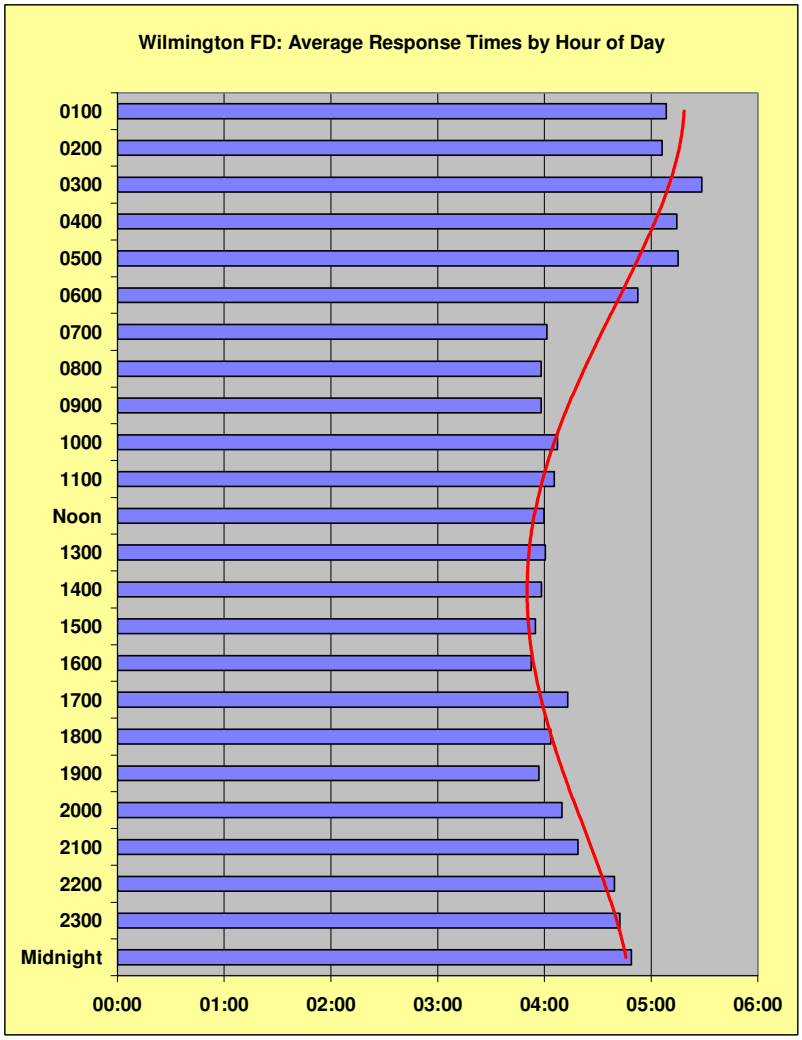


The *average* response time for those incidents[18] occurring within the primary response area of WFD during the 12 month period ranged from a hourly high average of 6 minutes and 7 seconds for calls between the hours of 4:00am and 5:00am, to a low average of 4 minutes and 29 seconds for incidents between the hours of 8:00pm and 9:00pm.

[18] Non-emergency and mutual aid incidents were not used in the calculation of response times, to the extent these calls could be identified. Response time is for first arriving apparatus.

The following figure provides the average response times for the Wilmington Fire Department, broken out by hour of day, for 2002 through 2004.

Figure 50: WFD Average Response Time Analysis by Hour of Day

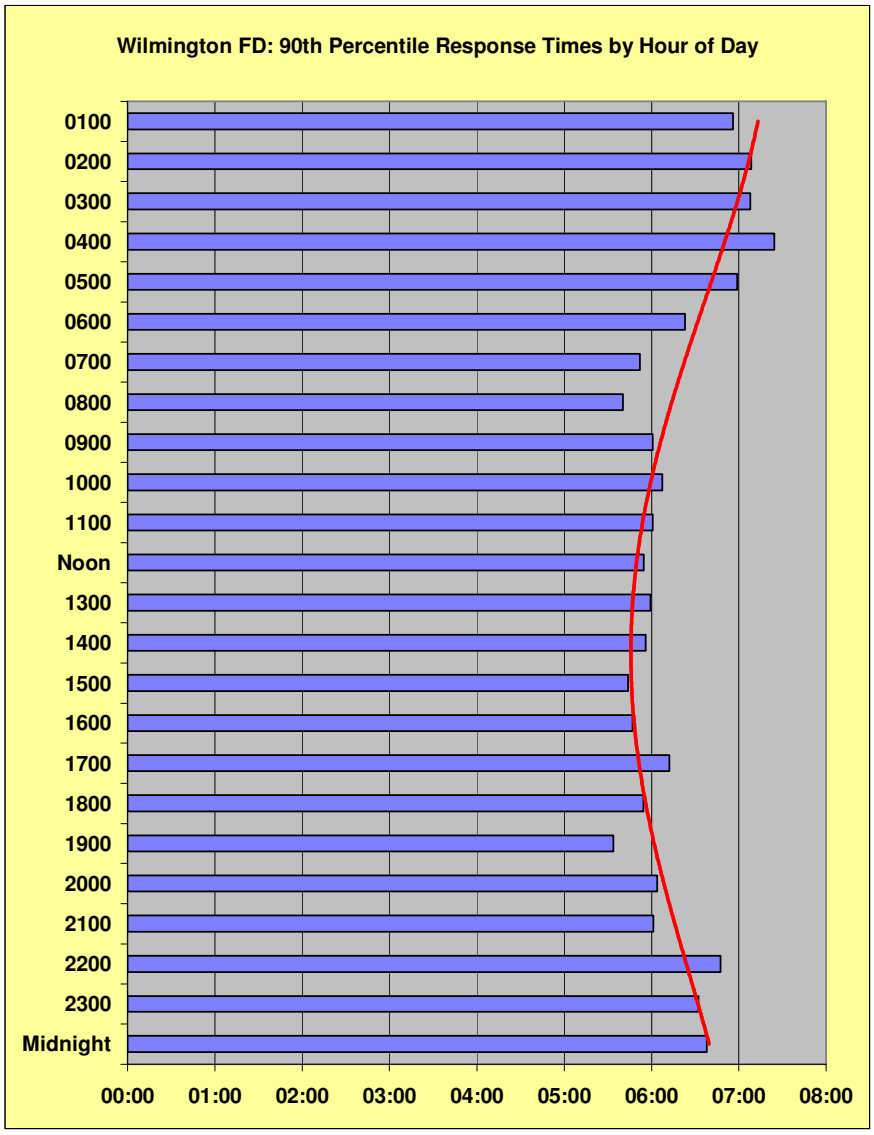


Of more significance is how well the emergency response demand is being serviced. One useful way to determine how well "demand-based" coverage is achieved is by determining maximum response time to a majority of incidents; in this case we will use 90%. As was indicated earlier, the 90th percentile is the manner in which the majority of performance standards for emergency services are set, including the Wilmington Fire Department standard.

The *90th percentile* response time for all incidents occurring within the primary response area of WFD was **six minutes and thirteen seconds**. Again, this figure DOES NOT include call processing time in the dispatch center. If we were to assume that the dispatch center's call processing performance could be maintained within their stated standard of 45 seconds, then we can see that the Wilmington Fire Department's current response time performance at the 90th percentile is **six minutes and fifty-eight seconds**.

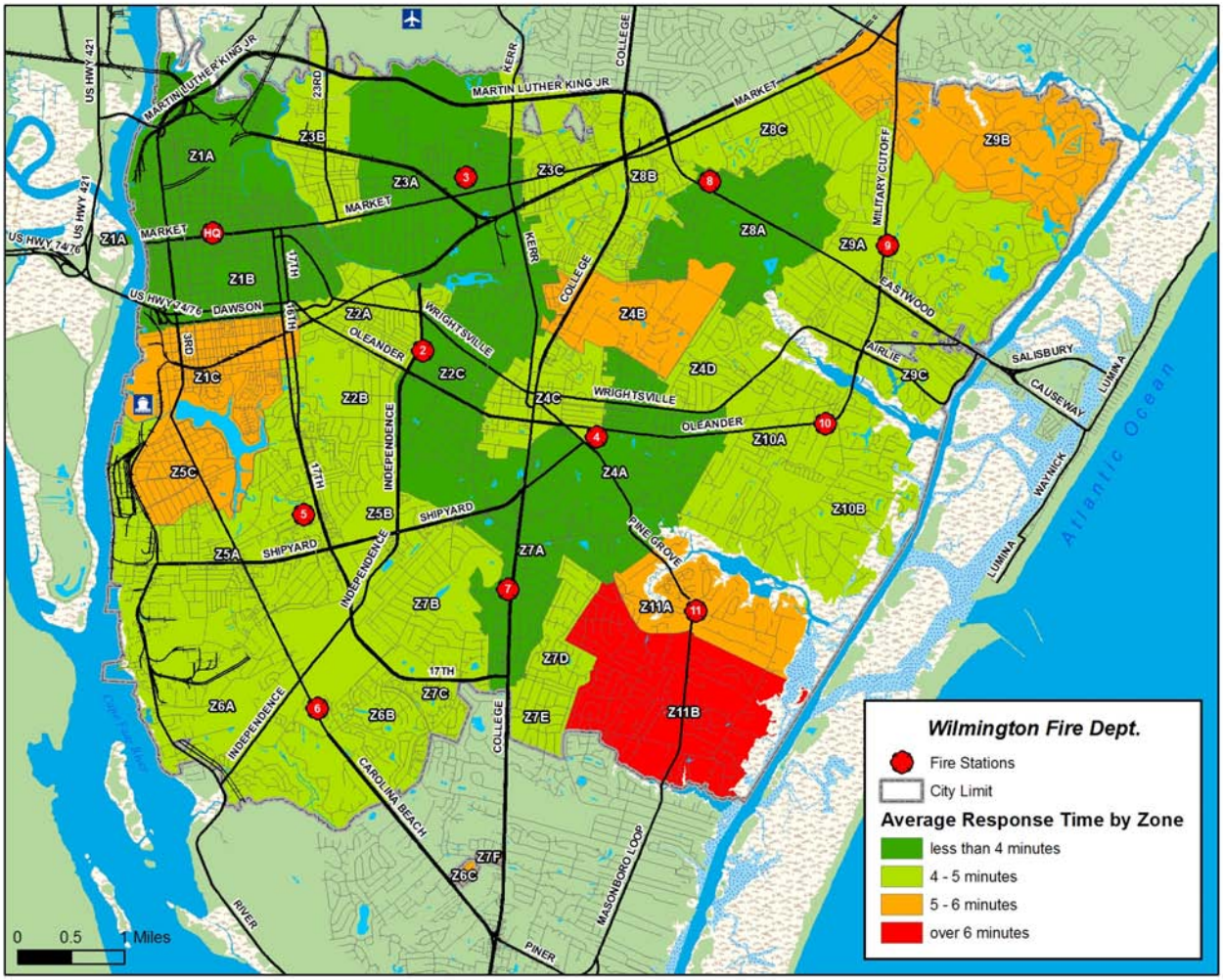
The following figure provides the 90th percentile response times for the Wilmington Fire Department, broken out by hour of day, for the 12 month period.

Figure 51: WFD 90th Percentile Response Time Analysis by Hour of Day



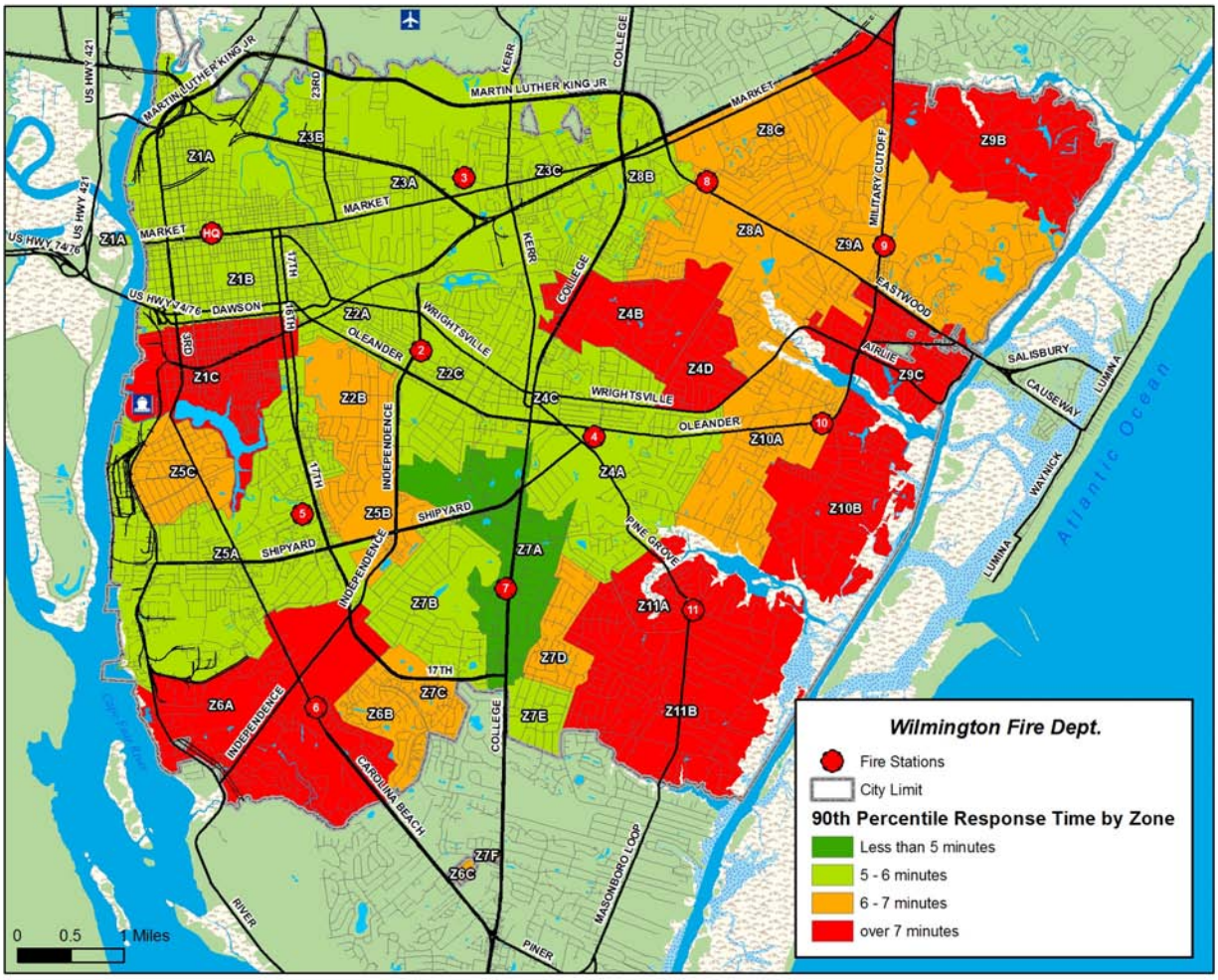
The following figures provides both the average and the 90th percentile first unit response times for the Wilmington Fire Department, broken out by each fire station's response zones.

Figure 52: WFD Average Response Time Analysis by Station Response Zones



When measured by the average response time per each response zone, the majority of the city benefits from a less than 5 minute response time. However, when response times are measured on a fractile basis, it can be seen that there are areas in which response time performance exceeds the NFPA five-minute response time benchmark.

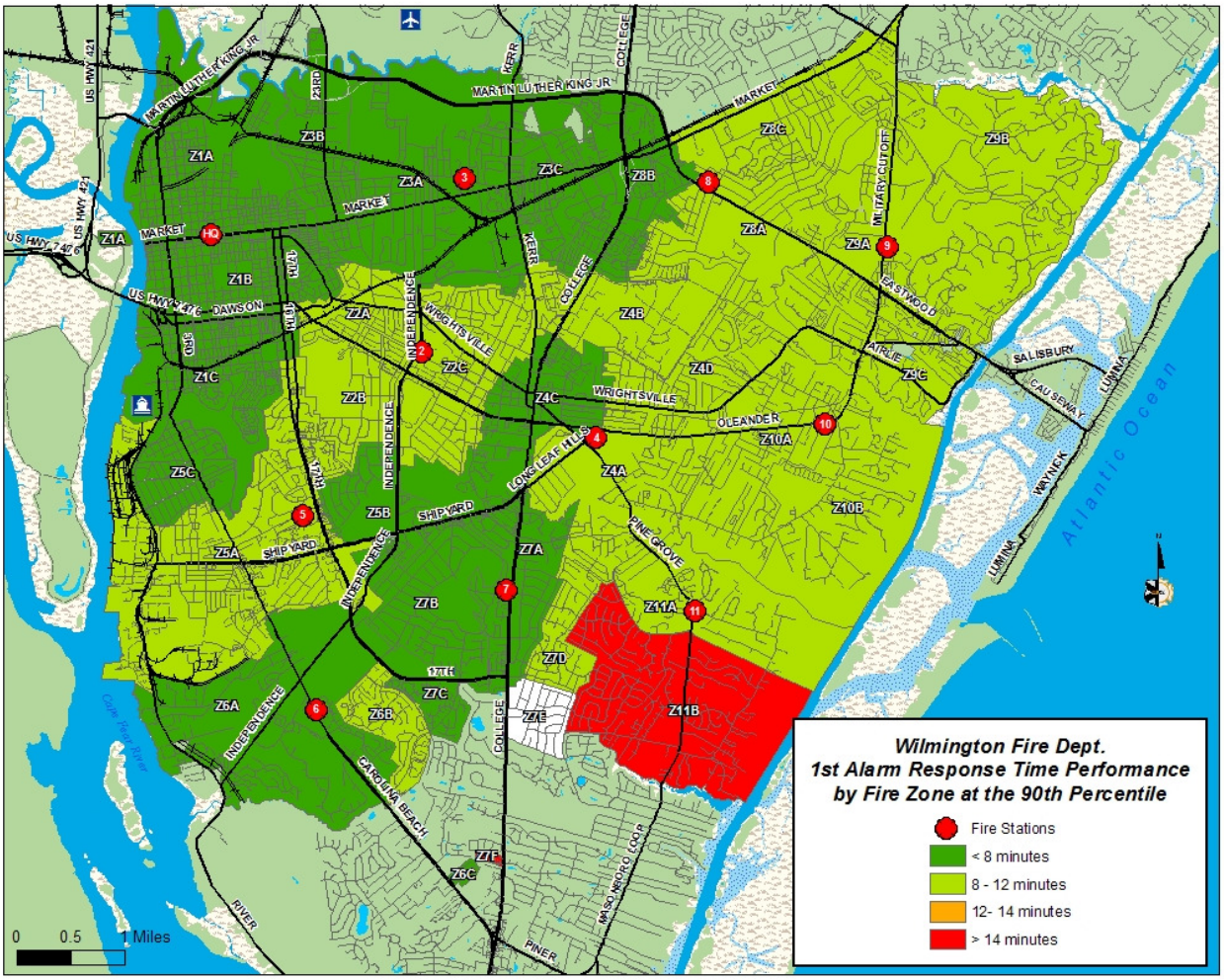
Figure 53: WFD 90th Percentile Response Times by Station Response Zones



The analysis of first unit response time performance data reveals that, if the department seeks to maintain an initial unit response time objective of five minutes or less to 90% of the calls in WFD's area, improvement will need to be made in reducing overall response times across all hours of the day and at all fire stations.

As indicated earlier, first unit response time is not the sole performance measure used to evaluate a system. The time it takes to assemble a full effective firefighting force is also a predictor of successful outcome. The following figure provides the 90th percentile effective firefighting force response times for the Wilmington Fire Department, broken out by each fire station's response zones.

Figure 54: WFD 90th Percentile Full 1st Alarm Response Times by Station Response Zones



The analysis of effective firefighting force response time performance data reveals that, if the department seeks to maintain an EFF response time objective of nine minutes or less to 90% of the calls in WFD's area, improvement will be needed.

Response Time Reduction Strategies

Response time in this report is comprised of two components, turnout time and travel time. Turnout time, as mentioned previously, is the elapsed time from initial dispatch to the apparatus going enroute to the scene. Travel time is the amount of time it takes to travel from the point of dispatch to the scene.

The location of a company at point of dispatch is not recorded in the record and the assumption is that the majority of time this point would be the assigned fire house. However, this is not always the case, such as when back-to-back assignments occur or when other ancillary duties are performed.

Little can be done by the fire department to control travel time. When assigned an emergency call, every effort is made to respond as rapidly and safely as possible, but certain factors can impede travel time. Variables that can affect travel time are as follows:

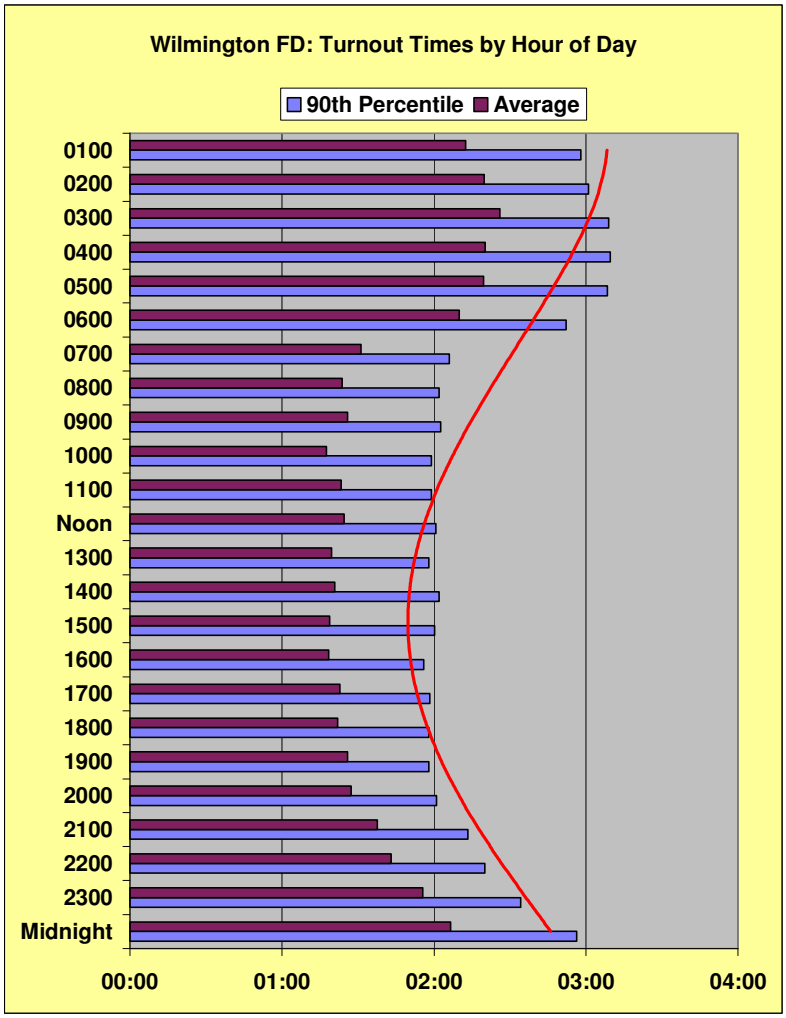
- Traffic volume
- Weather
- Calls on the edge of the response area or in neighboring districts
- Responding from a call or inspection duty in which passing the vicinity of the fire house is necessary. (Out of position)
- Traffic calming devices such as speed bumps, circles/roundabouts, or 4-way stop signs
- Narrow streets
- Double parking
- Construction/closed streets
- Lack of connectivity due to use of cul-de-sac developments or gated communities.

The City of Wilmington may have the capability of controlling some of these factors. By considering the effect on emergency vehicle responses by such issues as overloaded thoroughfares, traffic calming devices and narrow streets, or lack of connectivity, planners may be able to avoid conditions that will detract from emergency response performance.

The City may also wish to consider traffic preemption systems for certain thoroughfares used most often by emergency vehicles. Research has indicated such systems have reasonably good success in urban areas in particular for reducing response delays caused by traffic blocking intersections when an emergency vehicles is approaching.

The element of response time that the fire departments can control is the turnout time. Operational policies and facility design can help remove obstacles which extend turnout time. The following is the WFD's overall turnout time performance for the 12 month period by hour of day.

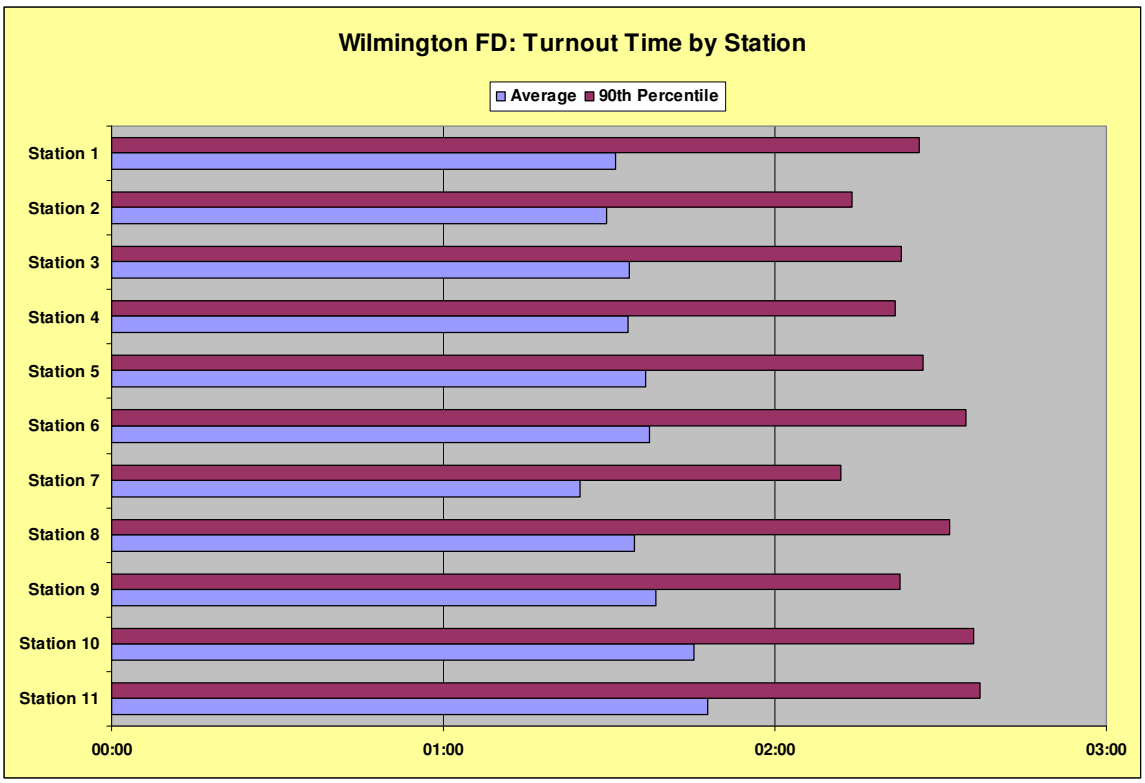
Figure 55: Turnout Time Performance by Hour of Day



Longer turnout times during the overnight hours are typical for firefighters which work 24 hour shifts and must awaken to don equipment. As stated previously, NFPA 1710 stipulate a turnout time objective of one-minute, 90% of the time, by carrer staffed departments. The *average* turnout time for the department is **one minute and thirty four seconds** while the *90th percentile* turnout time is **two minutes and twenty-five seconds,** which is more than twice the national standard.

Turnout performance varies only slightly by station district. The following figure provides the turnout time analysis by specific fire district.

Figure 56: WFD Turnout Time Performance by Fire Response District



In some cases, ESCi has found patterns in turnout performance by specific call type. This can be helpful in assisting the department in identifying processes, procedures or even attitudes that interfere with rapid turnout times. ESCi performed this analysis for Wilmington, but found very little variation by type of call and no indication that a pattern of lengthy turnout times was attributable to any specific attitude regarding the type of call being to which a response was being made.

With turnout times, awareness is often the key to improvement. Lengthy turnout times can be sometimes be the result of the method by which response timestamps are generated in the dispatch center and recorded by the CAD system. In such cases, dispatcher training and quality assurance programs can lead to more accurate data capture. Likewise, when firefighters and company officers are provided consistent information about turnout time performance, by station and shift, improvement is often seen as a result.

Recommendations

- Regularly measure overall response time performance against established response time objectives.
- Regularly measure overall turnout time performance against nationally recognized turnout time objectives.
- WFD should consider any potential facility changes intended to decrease turnout time.
- The Emergency Communications Center should regularly evaluate the method used to capture enroute timestamps in the CAD system to ensure integrity of the turnout time analysis.
- As turnout time performance analysis becomes more reliable, station officers should be made accountable for unexplained lengthy turnout time performance by their companies.
- Record location when dispatched to evaluate deployment and out of position responses.
- Consider installing global positioning system (GPS) units to track apparatus location in order to send the closest unit by location rather than district.
- The City should consistently consider emergency response times when evaluating street congestion, road network connectivity, traffic calming obstructions, parking and other controllable factors.
- Consideration should be given to use of traffic preemption systems to reduce intersection delays during emergency response.

Emergency Medical Services

The WFD provides emergency medical services at the First Responder or Basic Life Support care level. Their service does not include transport of patients to an emergency facility, a service provide by another agency. The department has initiated its Emergency Medical

Services program through the appropriate certification and approval of state and regional authorities governing the EMS system.

A physician with adequate experience in emergency medical care provides medical oversight for the department through an agreement to serve as its Medical Director. New Hanover Regional EMS currently fills this important role. In addition to other oversight, an EMS Advisory Committee has been established and participates in reviewing the role and operations of the department in EMS delivery, as well as providing input on medical guidelines. However, WFD has not been an active and consistent participant in the regional committee.

The department's Emergency Medical Services are not managed by any specified individual who has responsibility for its effective operation, legal certification, coordination with other agencies, and adequate oversight. Instead, several individuals share this responsibility on a case-by-case basis as decisions arise in their particular area of responsibility. The department would benefit greatly by formally appointing an officer to oversee EMS operations. This individual should be provided with a reasonable and adequate level of authority to make decisions regarding the service, direct the activities of personnel providing EMS services, and provide input into system planning, budgeting, and service levels.

The department does not have an adequate information management system for EMS. A system for adequately capturing, storing, and analyzing EMS system data, including patient care procedures, should be initiated and appropriate reports should then be produced and reviewed regularly to provide input to the program director and/or medical director.

No formal Medical Protocols have been put in place to guide decision-making in the field. Personnel are expected to rely on their training and understanding of industry best practices. As with Standard Operating Guidelines for fire suppression, the department could benefit from formal Medical Protocols. The Medical Protocols should be kept up to date and a system for regular review should be established.

The department has initiated a formal Infection Control Program that appears to be compliant with federal and state guidelines. Personnel are trained on infection exposure procedures and adequate supplies are available for decontamination of equipment and clothing. Exposure

reporting procedures are clear and follow-up is conducted in a timely fashion. The Training Chief and the City Safety Officer are currently assigned as the agency's Infection Control Officers.

NHREMS has established a formal quality assurance program in which incidents are reviewed for purposes of identifying problems or issues with protocols, procedures, field command, medical control, training, supplies, equipment, etc. Rather than just one individual, a committee has been assigned to participate in this process. This assures that the process remains unbiased, objective and fair, as well as spreading out the workload for quality assurance and keeping the process fresh. Currently, WFD is not an active and consistent participant in this process.

Regionally, mutual aid is available from surrounding EMS agencies and a plan or system is in place to achieve additional resources for major incidents quickly without undue pressure on incident commanders in the field. Training drills are conducted periodically in the handling and management of mass casualty incidents. This enhances the performance of EMS personnel in the field when faced with unusual incidents with high patient counts. Triage procedures and supplies are adequate and available and hospital coordination is a critical component of the process. When needed, a medical transport helicopter may be called to the scene of a medical emergency for more rapid transport of patients.

Recommendations

- The department should formally assign the responsibility for oversight of the delivery of first responder emergency medical services to a program manager.
- WFD should formally adopt a set of medical protocols to guide patient care. The protocols should be developed by, or in cooperation with, the Medical Director of the New Hanover Regional EMS.
- Additional capture of patient care information and data in the records management system for all emergency medical incidents should be pursued in order to develop a reliable database from which to evaluate program effectiveness.
- As a primary initial component of the emergency medical services delivery program in the City, WFD should actively and consistently participate in regional EMS Advisory Committee and Quality Assurance meetings.

Incident Management

WFD uses standardized response assignments based on the type of call dispatched. These assignments are intended to provide the quantity and type of apparatus needed for the incident, as well as the correct number of staff to accomplish the critical tasks necessary to mitigate the emergency. Though the full critical task analysis used by the department to develop its standard of cover was informal, it appears that the response protocols provide a reasonable level of apparatus and manpower for the incident types when apparatus staffing is at target level.

WFD indicates that district maps are available in all department apparatus through the application of mapping software on the mobile data terminals. Pressurized hydrants and water main sizes are identified on maps available to an Incident Commander. No static water points have been mapped, nor have any pre-designated water shuttle plans been prepared in the event of water system failure.

The department maintains a Battalion Chief system, ensuring that two individuals designated for incident command will be available 24 hours a day. The agency also reports that the Incident Command System is used on all calls.

The department has worked to adapt its incident command system to the new National Incident Management System (NIMS). This system integrates effective practices in emergency

preparedness and response into a comprehensive national framework for incident management. The NIMS will enable responders at all levels to work together more effectively and efficiently to manage domestic incidents no matter what the cause, size or complexity, including catastrophic acts of terrorism and disasters.

The NIMS system will eventually involve:

- Standardized organizational structures, processes and procedures;
- Standards for planning, training and exercising, and personnel qualification standards;
- Equipment acquisition and certification standards;
- Interoperable communications processes, procedures and systems;
- Information management systems; and
- Supporting technologies – voice and data communications systems, information systems, data display systems and specialized technologies.

Because NIMS will soon become a standard that must be met to secure certain federal funds and grants, the department was wise to complete the basic training, adoption, and transition.

A fireground accountability system is in place for the department. However, interviews provided conflicting information as to the extent of compliance that is achieved on various incidents. Most reports indicated the system is primarily implemented in alarms involving significant incidents.

Thermal imaging units are available on the three squads and three of the engines.

Mutual Aid Systems

There are numerous mutual aid agreements, both formal and informal, in place between fire, police, and emergency medical agencies in New Hanover County and surrounding areas. Mutual aid is typically employed only on an “as needed” basis where units are called for and specified one by one through an Incident Commander. Unlike the mutual aid box alarm systems (MABAS) found in many other states, the system in WFD fails to provide for pre-designated mutual aid responses to a variety of call types based on incident severity and is not programmed or coordinated through any regional communications center. No systems for automatic aid for certain alarms have been established between fire departments. Interviews indicated that mutual aid is sometimes inhibited by political or cultural issues between fire

departments, though this situation is said to have improved significantly over the last several years.

The map in figure 45 indicates that several stations are within a geographic proximity that provides potential advantages to the City of Wilmington. Most of these stations are staffed either part-time of full-time by paid firefighters and have many additional personnel on call. In addition to the benefits already discussed regarding the ability of WFD to achieve effective firefighting force, some ISO distribution credit may be available where written Automatic Aid agreements are in place. ISO apparatus credit for these agreements would only be given to the extent the other apparatus met ISO criteria and staffing credit would only be given for unit staffing that those units could consistently provide. To be most effective, any such agreements should specify the exchanged apparatus involved and the minimum equipment carried on board, minimum qualifications of responding personnel, and minimum staffing for the unit. Where reasonable turnout times could not be maintained due to the use of on-call responders by mutual aid departments, the programs would not perform as indicated in figure 45 and may not be worth pursuing.

According to interviews, multi-agency training is relatively rare, with greatest attention focused on interoperability of specialty team. For the most effective mutual and automatic aid programs, as well as maximum credit in the ISO Fire Protection Rating system, multi-agency drills should be scheduled regularly. Ideally, these should occur at least once per quarter and be recorded as multi-agency training in all agency records. In addition to the ISO credit, these trainings will naturally lead to enhanced working relationships, more regional thinking, and perhaps cooperative planning, policy, and procedural development.

From a formal standpoint, WFD regularly interacts with the City's police agency. Interviews indicated that this relationship is effective and efficient with no problems or issues cited by either fire or police officials. In many cases, police agencies are even responding to fire or EMS calls and assisting with traffic and other needs, underscoring the quality of the relationships between fire and police.

Recommendation

- WFD should work as a regional leader toward the establishment of a pre-designated mutual aid box alarm system that establishes programmed responses for large-scale incidents based on severity and geography.
- WFD should reconsider its decision not to promote the use of automatic aid. Agreements between communities for pre-designated automatic response to initial alarm assignments are successfully used in many communities to improve effective firefighting force response times and even improve ISO rating scores.
- WFD should establish multi-agency drills and trainings at least quarterly to enhance mutual aid operations and improve relationships and planning efforts.

Hazardous Materials Response

All WFD engine companies are trained and equipped to provide hazardous materials response at the "Operations" level. This level permits defensive operations for purposes of containment, but does not permit aggressive forward tactical efforts focused on corrective action, clean-up, or handling of hazardous substances (with a few exceptions)[19]. Some limited equipment for purposes of containment and decontamination, as authorized at the Operations level, is carried on engine companies.

Technician-level hazardous materials response is provided by the WFD Hazardous Materials Unit. By contract, WFD is also the host agency and provider of a Regional Hazardous Materials Team (RRT-2) coordinated through the State of North Carolina, one of seven such teams in the State. Technician-level response personnel provided by the department respond with significant resources when called. The city-owned unit is placed in service when the state unit responds out of the area. This system provides effective and consistent hazardous materials response planning and mitigation.

Technical Rescue Response

Wilmington Fire Department is also an active participant in various technical rescue programs, some of which are formally regionalized. WFD, in conjunction with New Hanover County Fire

[19] OSHA CFR 1910.120(q)(6)(ii)

Services, operates one of eleven state-sponsored Urban Search and Rescue Teams (TF-11). The technical rescue team can provide high-angle, trench collapse, confined space, and below-grade technical rescue operations.

WFD also operates a Dive Rescue Team which has equipment support from a Dive Equipment Truck that responds to meet both on-duty and off-duty divers when a dive rescue incident is dispatched.

Homeland Security Integration

Fire departments are considered "First Responders" in the national systems for homeland defense and security. Recent changes in the structure of the federal government have placed even the United States Fire Administration (USFA) under the umbrella of the Department of Homeland Security. Given this status, emergency service agencies should continue to assess their capabilities for response and integration into larger incidents involving acts of terrorism or threats to national defense.

Due to its status as a busy east coast shipping port, Wilmington's response area could be considered a potential target for an act of terror by foreign threats. It should also be remembered that acts of domestic terror can also have significant and far-reaching effects on even small communities, and that acts of international terrorism can go awry, as in the case of rural Pennsylvania on September 11, 2001.

From the standpoint of the First Responders, the results of an act of domestic or international terrorism will typically fall into one or more categories:

- Large fire and/or explosion accompanied by fire.
- Mass Casualty Incident (MCI).
- Hazardous Substance Release.
- Secondary threat (timed or triggered event following arrival of first responders).

Emergency agencies are, to some degree, trained to respond and mitigate the first three categories in this list. However, this statement is not intended to oversimplify the challenges. The resulting incident caused by an act or terror can be much larger, more complex, and more demanding than most local incidents that might fall into these same major categories. Still, the

agencies must rely on the same training, procedures, command structures, and strategies that are taught for such incidents.

The primary key to success will be familiarity with response plans for such incidents, practice, and integration with other agencies at the regional, state, and federal level.

Wilmington has at least some level of planning and procedure in place for large fires, mass casualty incidents, and hazardous substance releases. Additional training on the recognition and response to incidents with likely secondary threats to first responders will continue to help prepare personnel. And, of course, the agency should continue to seek out additional, advanced training on the following areas:

- Explosions and threats.
- Conflagration fire incidents.
- Mass casualty incidents.
- Radiation response strategies.
- Large-scale quarantine, containment and decontamination.
- Hazardous substance response, evacuation, containment, and decontamination.
- Regional and federal incident command strategies.

The cost of establishing and maintaining capability for full response to incidents involving weapons of mass destruction (WMD) is extremely high and best handled through the development of regional, state, or federal programs. This regionalized approach is also encouraged by those federal and state agencies responsible for distribution of grant funding for homeland security programs. Wilmington should encourage and support any additional efforts at regionalization of first responder training and preparation in homeland security issues. In addition, the department should aggressively seek out and respond to grant opportunities afforded to local communities for first responder equipment and supplies.

Objective Eight - Training

Providing quality and safe fire and emergency services requires a well-trained force. Training and education of department personnel are critical functions for the Wilmington Fire Department. Without quality, comprehensive training programs, emergency outcomes are compromised and departmental personnel are at risk.

> "One of the most important jobs in any department is the thorough training of personnel. The personnel have the right to demand good training and the department has the obligation to provide it.[20]"

General Training Competencies

In order to ensure quality training is provided it should be based on established standards of good practice. There are a variety of sources available for training standards. In concert with the State of North Carolina, WFD has selected the International Fire Service Training Association (IFSTA) and National Fire Protection Association (NFPA) as its main source of standards and materials for fire rescue training.

WFD maintains several special teams: the hazardous materials team, the technical rescue team and the dive team. Hazardous material training is provided to the Operations Level for all members and Technician Level for team members. The department's Urban Search and Rescue Team members participate in the state USAR training held in Charlotte. All officers are certified to NIEMS I-200.

Training Facilities

Quality "hands-on" training occurs when simulations are available that closely mimics real life emergencies. WFD designates three formal training areas within the department. The fire headquarters building is utilized for recruit training, the water rescue team and training for WFD Area One. The facility has a formal classroom with standard AV equipment, computer projection capability and a basic library. Station #7 is utilized by the hazardous materials team and WFD Area Two. Station #8 is utilized by the technical rescue team and WFD Area Three. Each training area can accommodate up to 30 students. Most training occurs at the station level. The

[20] Klinoff, Robert. "Introduction to Fire Protection," Delmar Publishers. 1997. New York, NY

department plans to complete the installation of a IP-based video conferencing system for video training programs within the next year.

Additionally, the department maintains a field training facility located at 2144 Lake Shore Drive. This facility provides a drill tower, a training pad and a drafting pit. The department anticipates the tower facility will be torn down in the near future to provide for the expansion of the Legion Stadium. WFD has entered into an agreement with other local jurisdictions to participate in a $12 million training facility planned for the Cape Fear Community College North Campus.

First responder emergency medical training, continuing education and recertification is conducted at the local community college under the protocols of the New Hanover Regional Medical Center EMS Department's medical director.

Providing smoke and live burn exercises and training continues to be a challenge for the department. In the past, acquired structures were more easily attainable for in-service personnel and recruit classes. Currently, acquired structures are a rare occurrence. Wrightsville Beach Fire Department's smoke house is available, but logistics and "back-fill" overtime is a burden. In-service personnel rarely have the opportunity for live fire training and recruit classes are assigned to their duty stations after recruit school, some having never experienced a live fire training scenario.

Students are provided with all required reference materials for training programs and manuals are maintained at fire headquarters library. Training equipment and props are generally inventoried and a check-out procedure is in place through the training officer.

Training Staff

WFD assigns a battalion chief and a captain to their training program under the department's Support Division. The battalion chief of training serves as the department's training officer and safety officer. The battalion chief responsible for specialty teams provides a training liaison between the training officer and the department's specialty teams. Certification and recertification are conducted through coordination of the WFD Training Division, using instructors from WFD and/or the Cape Fear Community College, and is certified through the State of North Carolina. Clerical assistance for the training program is not routinely available.

The department's primary skills maintenance training program is conducted by the station officers. With some exception, officers are typically certified to the Instructor II level.

Due to annexations and increased workload, the department staff, has continued to grow during the last decade. The training program staff, however, has not grown to keep pace with these expansions. The two officers assigned to the training section find themselves overwhelmed with the duties and responsibilities placed upon them. More than half of their time appears to be spent on matters not directly related to training.

In addition to the duties required due to the vacant Support Division Chief position, the training staff is burdened with a portion of the department's information technology (IT) workload, the administration of the department's new performance appraisal program and many other duties "as assigned." In comparison with other departments of this size, the training program is currently unstructured and left with little consistent oversight.

Entry Level Training

Prior to being considered for full-time employment by WFD, non-certified applicants must meet minimum requirements prescribed by the department. To qualify, an applicant must:

- Possess a high school diploma or GED.
- Be at least 21 years of age.
- Have a satisfactory driving record for the past three years.
- Acquire a NC driver's license within 30 days.
- Successfully complete the City's:
  - Aptitude Test.
  - Strength and Agility Test.
  - Background Investigation.
  - Oral Interview.
  - Driving and Criminal Standard.

Certified applicants are required to meet all the previous minimums, as well as:

- Possess Firefighter I and II certification.
- Possess Medical First Responder certification.

- Possess Hazardous Materials Operations certification.

Employees are provided with a pre-employment and recurring medical evaluation. The department uses the NFPA Standard 1582 to guide these evaluations.

WFD facilitates a fifteen week recruit school from its headquarters station. The department provides state certified instructors commensurate with the subject matter on an ancillary, overtime basis. Successful candidates graduate from the school achieving:

- Firefighter II.
- Hazardous Materials – Operations Level.
- Medical First Responder.
- Rescue Technician.
- Marine Firefighting for Land Based Firefighters.

Ongoing Skills Maintenance Training

Once assigned to a response unit, personnel must routinely be provided with refresher training and continuing education to avoid degradation of skills learned during entry-level training and certification. Additionally, training and education must be provided to deal with emerging risks and changing service demands.

During CY2005 WFD personnel documented 8,517 individual training experiences resulting in 21,177.27 total man-hours of training. In addition to ongoing skills maintenance or "in-service" training, these totals include pertinent college courses, certifications and re-certifications, specialty team training, code application and enforcement training.

Included in these documented totals are hours of participation in the inventory of equipment, maintenance, battalion chief and officer meetings, committee meetings and time as a move-up officer [acting]. Conservatively deducting the hours documented for the topics generally not formally associated with fire department training resulted in 6,548 individual training experiences totaling 17,097.24 documented man-hours of training for CY2005. Individual training records were documented for 199 department personnel resulting in an average of 32.90 training experiences and 85.92 training hours per individual for the year.

WFD specialty teams enjoy numerous outside training opportunities based on recertification mandates and funding provided by the State of North Carolina. Opportunities for participation by other shift personnel in outside training are limited and generally unfunded by outside sources. This initiates the perception that specialty team members are favored for outside training and conferences. The department should consider exploring options and opportunities for additional outside training for shift personnel where possible.

The 17,097.24 training hours provided by the WFD addressed the following topics during CY2005:

Administrative Procedures	Hose, Streams & Appliances
Aerial Maintenance	Incident Command
Anatomy	Incident Planning
Apparatus & Equipment Practice	Inspections & Maintenance
Apparatus Check Procedures	Inspector Information
Apparatus Maintenance	Ladders
Blood Borne Pathogens	Land Search Rescue
Building Construction	Leadership
Building Familiarization	Marine Firefighting
Child Passenger Safety Seat	Medical Responder
Communications	NC Building Code
Computers	NC Fire Prevention Code
Conferences	NFA Executive Development
Confined Space	NIMS IS-700
Critiques	Open Water Rescue
Draeger Tech Upgrade	Overhaul
Driver Training	Performance Based Planning
Educational Methodology	Personal Protective Equipment
Electrical Safety	Physical Fitness
Emergency Medical Services	Plans Review for Inspectors
EMS Legal Responsibilities	Portable Fire Extinguishers
EOC Simulation	Pre-Fire Planning
Extrication	Pump Hydraulics
“Firehouse” Software	Pump Operations
“FireView” Software	Qualified Instructor Upgrade

Fire Alarms & Communications	Qualified Training Session & Test
Fire Behavior	Rescue
Fire Boat	Rescue Equipment
Fire Control	Rescue Equipment Maintenance
Fire Department Organization	Rescue Rigging
Fire Inspector Level I	Ropes & Knots
Fire Inspector Level II	Salvage
Fire Inspector Level III	SCBA
Fire Prevention School	SCBA Fit Testing
Fire Protection Systems	Self Study
Fire Science	Severe Weather
Fire Streams	Specialized Tools & Equipment
Firefighter Safety	Sprinkler & Standpipes
First Responder	Strategy & Tactics
Foam Streams	Streets
Forcible Entry	Structural Collapse
General Fire Prevention	Terrorism
Hazardous Materials – Awareness	Testing Fire Service Apparatus
Hazardous Materials – Operational	Trench Rescue
Hazardous Materials – Technician	Ventilation
Helicopter Transport	Victim Management
High Angle	Water Rescue
Hose Loads & Lays	Water Supply

A regional disaster training session is conducted annually with the ILM International Airport. Other regional disaster training occurs informally, although not on a regular basis. WFD typically does not participate in multi-agency training although multi-station and night training occurs several times per year. Post-incident analysis is informally conducted by incident commanders for major or controversial incidents.

A safety officer for manipulative hands-on training sessions is not consistently designated as outlined in NFPA Standard 1500. Having a safety officer monitoring hazards and conditions during all hands-on training is critically important as a measure of risk management, both from a safety standpoint and liability standpoint.

The department provides physical fitness training equipment in the stations and permits physical training by employees after the "business day." Employees desire a change in this practice to allow them to participate in physical training at the beginning of their shift. Physical fitness of firefighters is critical to their effectiveness in emergency situations that require strength and stamina and fitness must not be considered optional. Since the department's own medical standards require a high level of fitness, every effort should be made to encourage and facilitate firefighter health, wellness and fitness. The International Association of Fire Chiefs (IAFC) and the International Association of Fire Fighters (IAFF) publishes a Joint Fitness and Wellness Initiative providing excellent guidance in developing such a program.

All Wilmington Fire Department Company Officers are certified to teach through the North Carolina Department of Insurance, Office of the State Fire Marshal. Each certified instructor receives all the teaching outlines for all Firefighter I and Firefighter II subject matter. Monthly training topics are distributed by the Training Division and the Company Officers are to cover the objectives as prescribed in the instructor's outlines.

Career Development Training

Industry best practices suggest that personnel demonstrate the skills and knowledge required of a more responsible position prior to being promoted within the organization. Pre-promotional training is often provided by progressive organizations to ensure candidates for promotion meet the minimum educational and certification requirements for the position. Then the promotional process is used to select the most qualified individual based on a demonstration of proficiency.

WFD does not formally provide organized pre-promotional training to potential or aspiring officers using a standardized curriculum or evaluation system. The National Fire Protection Association has standards for fire rescue service positions and specialty skills. The fire officer standard is NFPA 1021.

Personnel are assigned to "move-up" to an acting officer responsibility without being formally trained for the task. Driver/operators (engineers), for example, must simply be in-rank for 365 days and they are automatically utilized as "move-up" acting company officers. Company officers are also expected to "move-up" to battalion chief with no formal training.

Pre-promotion training programs should be developed and completion by personnel should be required prior to application for promotion. This kind of training is best performed in an academy setting, with consistency in instruction and ample opportunity for student/instructor interaction. Officers at the station can provide some of this training, but the majority should be in a more formalized program. As discussed earlier, the promotional process should effectively evaluate applicants to determine who best demonstrates the proficiency in skills and use of the knowledge gained in the classroom that is required of the position.

Training Program Planning

Like any other activity, training and education of personnel should be conducted under a comprehensive plan. The plan should include a clear definition of the goals and objectives of the training program department-wide, and should include a schedule and process to achieve them.

Ideally, a comprehensive department training plan would include:

- Departmental training goals and objectives.
- Performance standards for all personnel.
- Scheduled training on appropriate topic to prevent skills degradation.
- Remedial skills improvement training.
- Outside training opportunities.
- A process for monitoring learning accomplishments.
- Centralized, department-wide training data collection and standard reporting.
- Monitoring of individual certification, continuing education, and re-certification requirements.

WFD has not designated a departmental training committee to coordinate fire, specialty team, or EMS first responder training. This objective is administered by the training battalion chief and the training captain as assisted by the battalion chief responsible for special teams. The goals and objectives of the department's training program are structured around the following departmental training guideline with emphasis on achieving training hours prescribed by the Insurance Service Office:

Figure 57: Annual Training Plan

Wilmington Fire Department Annual Training Plan	
Subject	Hours/Firefighter
General Firefighter Training	240
Officer Training	12
Driver/Operator	12
Hazardous Materials Ops	8
Hazardous Materials Tech*	24
Water Rescue/Recovery*	24
Medical Responder	24
Tactical Rescue*	24

Source: WFD Training Bureau

*Team Members

This plan or guideline represents a mandate of more than 284 hours of training for each firefighter and 296 hours of training for each officer annually; not including specialty team requirements. As outlined above, each WFD member received an average of 85.92 hours of training last year. This average includes all training received, including certifications and re-certifications and falls significantly short of the department's goal.

WFD should appoint a training committee to determine the departmental training goals and objectives and a plan for achieving them. This committee should be comprised of representatives from all disciplines and ranks across the department to provide for the input needed for an effective, department-wide approach to training.

Competency Based Training

Ongoing training should follow an identified plan based for demonstrated training needs. Such a plan is best developed as a result of periodic evaluation of the current skill levels of members (competency-based training).

Under a competency based system, an evaluation of skill performance is conducted at scheduled intervals to determine if the person being evaluated can perform the task in

accordance with pre-determined standards. Those skills that are performed well require no additional training. Those skills not performed well are practiced until the standard is met.

This approach maximizes the time used for training. Further it ensures that personnel are performing at an established level. Specialty skills can be evaluated in the same manner with further training provided as needed. Ideally, the competency based training approach is used on an ongoing basis. For example, each quarter different skills are evaluated on an individual-by-individual basis.

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

WFD utilizes an informal, hybrid competency based training instrument. The training officer transmits a "Performance Based Standards" form for certain predetermined practical evolutions, based on the "Essentials" manual, to the company officers. The company officer requires his/her company personnel to complete the appropriate evaluation criteria and documents the level of performance of each company member for submittal to the training office.

To operate an effective ongoing training program, even under the competency based approach, sufficient resources must be available to conduct skill evaluations and to assist with performance improvement training.

Training Records and Reports

Computer training records are maintained by the training officer. Company officers, training officers and instructors submit data for personnel completing a training experience, continuing education session, or training course. A quarterly report is compiled and provided to the battalion chiefs by the training officer.

Due to the lack of direction and oversight, training data is submitted in an inconsistent, redundant manner. Numerous officers completing the same monthly in-service training session, for example, may input the training data into multiple different categories and/or topics.

A centralized, consistent, automated, departmental training database should be maintained with routine accountability and oversight, and regular reporting frequencies, all commensurate with current confidentiality requirements.

Recommendations:

- Develop and implement a comprehensive departmental training plan.
- Implement a comprehensive, structured skills maintenance training program for all employees.
- Provide for live fire training evolutions for all recruits prior to assignment to their duty stations and annually for existing personnel.
- Implement a formal, mandated physical fitness and wellnes training program for all employees.
- Consider implementing a formal competency-based approach to the department's training program.
- Require lesson plans for all training sessions.
- Increase the training staff to be commensurate with the department's training mandates including a job analysis of the two incumbents to determine they are working within their current job descriptions.
- Staff the Support Division Chief vacancy as soon as practical to relieve the training officers of ancillary support functions.
- Immediately implement the requirement for an assigned safety officer in attendance at all manipulative training sessions.
- Design and implement a pre-promotion training program for all candidates for promotion and acting promotions.
- Develop and implement a centralized, consistent, training data collection and reporting data base under direct oversight of the training officer.

Objective Nine - Fire Prevention

An aggressive risk management program, through active fire prevention, is a fire-rescue department's best opportunity to minimize the losses and human trauma associated with fire. Robert Klinoff, author of Introduction to Fire Protection, 2003, outlines the perspective as follows:

> *"One of the true measures of a fire department's effectiveness is the amount of loss experienced in the community or jurisdiction. If hazards and unsafe acts can be reduced, there will be a resultant reduction in the area's fire experience…in order to reduce the losses due to fires, effective, focused fire prevention effort must take place."*

A fire-rescue department should actively promote fire resistive construction, built-in warning and fire suppression systems, educate the public to minimize their exposure to fire and health challenges and to respond effectively when faced with an emergency.

Code Enforcement

The North Carolina Fire Prevention Code, as adopted by the North Carolina Building Code Council, is applicable and enforced within the corporate limits of the City of Wilmington. The listed standards and publications which comprise a part of the Fire Prevention Code, includes the 2003 edition of the International Fire Code and the National Fire Protection Association Life Safety Code 101 with specific amendments.

The Fire Prevention Code is enforced by the Wilmington Fire Department, Division of Fire and Life Safety under the supervision of the Fire Chief. The Fire Chief, with the approval of the city manager, designates an officer or member of the fire department to serve as Chief of the Division of Fire and Life Safety.

The Fire Chief may detail members of the fire department as fire prevention inspectors as necessary. Inspectors are required to be certified by the state. The Chief of the Division of Fire and Life Safety and the fire prevention inspectors are designated as "fire officials" for the purpose of enforcing the provisions of the code.. This includes the duty to issue orders to correct violations and to initiate legal action.

Appeals to the Fire Prevention Code may be submitted to the Fire Chief within ten working days of the receipt of the notice of violation . The ruling or order may be stayed pending the outcome of the review unless the Chief of the Division of Fire and Life Safety certifies to the Fire Chief that there is a distinct fire hazard to life or property. The Fire Chief must respond to the appeal within ten working days. The Chief is responsible for making a determination as to whether the order will be upheld, rescinded or modified.

Appeals to the ruling of the Fire Chief may be submitted within ten working days to the City Manager. The City Manager must set a time and place for a conference to review the determination of the Fire Chief within thirty days of receipt. The City manager may uphold, rescind or modify the ruling of the Fire Chief. The determination of the City Manager is final.

The Wilmington Fire Department, Division of Fire and Life Safety maintains its offices at the headquarters fire station and is staffed with an Assistant Chief, four inspector/investigator Captains, one inspector/investigator Lieutenant; one administrative support technician and one half-time community life and fire safety educator. The four Captains are North Carolina certified Inspector III and the Lieutenant is certified as Inspector II. Three members of the Division are certified fire investigators.

The New Hanover County Building Official provides additional office space at their facility for Division of Fire and Life Safety personnel to conduct plan reviews and participate in their “one-stop-shop” permit process. With the exception of the life safety educator working half-time with WFD and half-time with New Hanover County, division personnel are assigned to a 40 hour per week schedule. A rotating duty schedule is in place for fire investigation response.

The Division of Fire and Life Safety is responsible for inspections, plans review, public education, tests, pre-emergency plans and fire investigations. In-service station personnel do not participate in inspection/code enforcement activities.

Chapter IX, Fire Department Fees and Permits, of the City Code, enables the Division of Fire and Life Safety to assess fees for issuing permits under Chapter III. Section 1 addresses the storage, operation, use, handling and construction of hazardous facilities and activities. Section 2 addresses hazardous materials and substance abatement, and Section 3 addresses charges

for special tests, inspections and other services provided by the fire department. These fee schedules were recently updated and appear to be comparable to services rendered and activities inspected. The updated fees will go into effect for FY06/07.

New Construction Review

The Division of Fire and Life Safety enjoys a good working relationship with the New Hanover County Building Official. Building plans for new construction in the City of Wilmington are accepted and registered at the New Hanover County Building Department's intake counter. Five sets of plans are required at submittal and must include prior approvals from the City of Wilmington's planning and zoning offices. The New Hanover County building official does not issue applicable permits in the City of Wilmington without fire department approval. The Division requires that approved plans be on site before completing inspections and tests.

Fire detection and suppression system plans are submitted directly to the Division of Fire and Life Safety by contractors and installers. The following figure identifies the WFD Division of Fire and Life Safety plans review activity for new construction:

Figure 58: WFD Plan Review Activity

Plan Reviews FY02-05			
	FY02/03	FY03/04	FY04/05
Fire Sprinkler	57	112	134
Fire Alarm	64	103	211
Commercial	449	553	698
Site	28	44	68
Total	598	812	1,111

Source: WFPB

Acceptable "turn-around time" for completing plan reviews by the Division of Fire and Life Safety continues to be a challenge for a number of reasons. First, the ever increasing plan review workload as identified in the figure above. These totals represent a 36 to 37 percent increase in plan submittals annually. Second, the limited number of personnel assigned to the Division of Fire and Life Safety required to complete plan reviews, inspections, fire investigations and other

related duties. And finally,insufficient work space. Considering the Division's required office space, storage requirements and the fact that there is no space available to appropriately open a set of plans, the office space allotted to the Division in the headquarters fire station is inadequate.

The Division has realized some relief from the provision of plan review space at the New Hanover County building official's facility. This allows Division personnel to review plans in an area designed for such purpose while simultaneously operating in a "one-stop shop" environment.

WFD should review the personnel, capital, and operating resources needed to address the continuously increasing workload in the Division of Fire and Life Safety. Many jurisdictions in other regions of the country have utilized contractors to assist with maintaining acceptable plan review "turn-around" times. The division is one of the few entities in the fire department with the capability of assessing fees to offset its expenses.

Automatic Fire Sprinklers

Earlier in this report the dynamics of fire in a building were described as they relate to response time. While excellent response time performance by the fire department is vitally important, the most effective method to protect lives from fire is the fire sprinkler system. Fire service resources cannot be provided to match the level of protection provided by this technology. The cost would simply by too high. The best opportunity to apply water to a fire prior to flashover is through the use of built-in fire sprinkler systems. Their advantage is that they not only detect the fire, but also apply water before flashover. The Wilmington Fire Department should consider pursuing legislation to require the installation of approved fire sprinkler systems in all new structures including residential.

Fire Safety Inspections

The primary purpose of code enforcement is to decrease community risk. This means eliminating potential sources of ignition, minimizing fire spread and assuring proper and safe egress for occupants in the event of an emergency. Property inspections, to find and eliminate potential fire hazards, are also an important part of the overall fire protection system. These

efforts can only be effective when completed on a scheduled fequency by individuals having the proper combination of training, experience, and motivation.

The following Figure reflects the inspection and violation activity accomplished by the Division of Fire and Life Safety for three fiscal years. The Division has documented an initial inspection increase of 18 to 19 percent annually.

Figure 2: WFPB Inspection & Violation Activity

Inspections/Violations FY02-05			
	FY02/03	FY03/04	FY04/05
Inspections	2,492	2,966	3,495
Re-Inspections	1,005	1,468	1,611
Total	3,497	4,434	5,106
Violations Noted	3,136	4,074	4,245
Violations Corrected	2,584	3,467	3,760

Source: WFPB

The recommended frequency of public/commercial fire safety inspections varies by the type of occupancy. Generally they are classified by the type of hazard. The table below summarizes the various hazard classes and the National Fire Protection Association's optimum recommended frequency for fire safety inspections.

Figure 3: Recommended Inspection Frequency Based on Risk

Hazard Classification	*Example Facilities*	*Recommended Inspection Frequency*
Low	Apartment common areas, small stores and offices, medical offices, storage of other than flammable or hazardous materials.	Annual
Moderate	Gas stations, large (>12,000 square feet) stores and offices, restaurants, schools, hospitals, manufacturing (moderate hazardous materials use), industrial (moderate hazardous materials use), auto repair shops, storage of large quantities of combustible or flammable material.	Semi-annual
High	Nursing homes, large quantity users of hazardous materials, industrial facilities with high process hazards, bulk flammable liquid storage facilities, an facility classified as an "extremely hazardous substance" facility by federal regulations	Quarterly

Source: N.F.P.A.

While the above charted inspection frequency may be a challenge for many fire departments to maintain, it does serve to point out the accepted national practice of classifying occupancies by hazard (risk) and establishing inspection frequencies.

The WFD Division of Fire and Life Safety identifies the number of inspectable properties (buildings, structures, and processes subject to the Fire Prevention Code) to be approximately 6,800. The department has established an inspection frequency goal for the City commensurate with State of North Carolina general statutes as follows:

Figure 59: North Carolina Inspection Frequencies

Inspection Frequencies Based on North Carolina General Statutes	
Annually	Hazardous, Institutional, High Rise, Assembly, And Residential Except One And Two Family Dwellings And Only Interior Common Areas Of Dwelling Units Of Multi-Family Occupancies
Every Two Years	Industrial And Educational (Except Public Schools)
Every Three Years	Business, Mercantile, Storage, Churches And Synagogues, Assembly With Less Than 50 Occupants.

Considering the 3,495 initial inspections completed by the Division during FY04/05 and the more than 6,800 inspectable properties in the City of Wilmington, the inspection frequency goal outlined in the North Carolina General Statutes may have been met. However, only 51.4 percent of the total properties in the City were inspected that year.

Application of the previously cited nationally recommended frequency would require that additional inspections be conducted by WFD. Low hazard property inspections would be completed annually, moderate hazard property hazard inspections would be completed semi-annually and high hazard property inspections would completed every three months. This would significantly increase the City's inspection mandate.

In addition to the obvious life safety risk implications for citizens and firefighters due to not completing a city-wide inspection program based on risk, this omission could present a significant liability should a questionable fire scenario present itself in a property that has not been inspected or that had not been inspected in a long period of time.

The most immediate resolution to this challenge is the utilization of on-shift suppression personnel in the department's fire safety inspection program. The certification and recertification of company officers, not already possessing Fire Inspector certification/training could be incorporated into the department's training program.

Shift personnel could more frequently update pre-incident planning and building familiarization activities into the inspection program. Public relations opportunities are immeasurable.. This would ensure detection/suppression systems were operational and exit systems were maintained.

In-service personnel could accomplish many of the less complicated inspections leaving the more high-risk, more complex inspections to the Division of Fire and Life Safety.

Often, reluctance by shift personnel to participate in an in-service fire safety inspection program comes when the program is improperly planned and/or managed. Operational personnel must clearly understand what is expected of them, be properly trained to give them confidence to accomplish the program, and be provided clear instruction on knowing "what to do when they don't know what to do."

Another approach to accomplishing the City's inspection frequency, based on risk, is providing additional full-time inspectors. With more than 6,800 inspectable properties and considering the fact that these properties would be divided into a frequency of quarterly, semi-annual, and annual based on their particular risk, the department could expect to have to accomplish more than 10,000 property inspections per year.

There are limited resources available as a guideline for the number of inspectors required to accomplish a given workload for a jurisdiction. The State of Texas has added an addendum to their Insurance Services Office grading schedule to give credit for accomplishing fire safety inspections. This "Texas Addendum to the Fire Suppression Rating Schedule" provides a significant guideline regarding staffing resources needed to complete an effective fire safety inspection program. According to the Texas Addendum, one full-time inspector can be expected to complete approximately 480 inspections per year. Their computation is based on two-inspections per day, times 20 work days/month X 12 months.

Wilmington Fire Department has the potential of more than 10,000 inspections per year based on risk, divided by 480 or twenty-one (20.83) inspectors required. This staffing mandate could be addressed by an increase in the number of full time inspectors, utilizing in-service suppression personnel and/or a combination of both options.

The Figure below represents the collateral activities accomplished by the WFPD. These activities are generally in addition to the "standard" life and fire safety education, inspection,

plan review, fire investigation duties typically associated with a fire prevention division. These activities obviously require the time and attention of DFLS staff and administration as well.

Figure 60: Collateral WFD Fire and Life Safety Activity

Collateral Division Activity FY02-05			
	FY02/03	FY03/04	FY04/05
Fire Drills	5	5	8
Burn Permits	8	18	8
Media Interviews	18	10	14
Complaints Addressed	51	31	46
Gas Leaks	15	17	12
Citations Issued	17	9	17
Reinspection Fees	0	0	23
False Alarm Citations	16	21	47
Smoke Detectors Installed	31	7	128
CO Detectors Installed	14	8	6

Source: WFPB

Of importance to this study is whether staffing levels are sufficient for the workload. It is imperative that records that would define level of service and accomplishments be maintained and evaluated regularly. At a minimum, the Division should maintain, evaluate, and publish records that describe the:

- Number of existing occupancies classified by type and risk.
- Number of inspections complete.
- Frequency of inspections by type and risk.
- Duration of inspections by type and risk.
- Re-inspection visits by type and risk.
- Number of new construction and system plan reviews completed.
- Average turnaround time for plan reviews.
- Fire incidents ratio to type of occupancy.

The WFPB does an admirable of job of collecting and utilizing data associated with its duties and responsibilities.

Fire Investigation

The investigation of fires, explosions, and related emergencies is an integral part of providing life and fire safety to a community.

The Division of Fire and Life Safety is responsible for conducting fire investigations for the Department. DFLS personnel are regularly assigned to a four day, 40 hour per week schedule. Each staff person is assigned a "take-home" vehicle and participates in a weekly standby rotation to insure an investigator is available on a 24/7/365 basis. Take-home vehicles are stocked with basic cause and origin equipment and the Division maintains a 4X4 pick-up truck with a more comprehensive fire investigation equipment inventory. Suppression personnel,, request the services of the on-duty investigator as prescribed by department policies.

Three of the five DFLS fire investiagtion staff members are certified fire investigators. The division has an esblished goal to achieve certification for all five members. Cause and origin investigations are completed by the certified personnel. When a suspicious or intentional fire cause is determined the case is turned over to the Wilmington Police Department (WPD) for potential prosecution. The WPD has two detectives assigned to fire investigations.

The State Bureau of Investigation is notified when their accelerant dog is required. The Bureau of Alcohol, Tobacco and Firearms (ATF) is available to assist WFD with an initial response of two certified fire investigators and an expanded resource when needed. A regional fire investigation task force, comprised of city, county, state and federal agencies, is available to assist during significant incidents.

The Division provides assistance in juvenile firesetter intervention on an informal basis when requested by the WPD or the local judicial system.

The following figure outlines the WFD fire investigation activity.

Figure 61: WFD Fire Investigation Activity

Fire Investigations FY02-05			
	FY02/03	FY03/04	FY04/05
Accidental	26	35	31
Undetermined	14	8	15
Incendiary	16	13	12
Total	56	56	58

Source: WFPB

Public Safety Education

Providing fire and life safety education to the public is a major responsibility of the fire department.. Prevention and education provide the best chance for minimizing the effects of hostile fire and health emergencies.

The life and fire safety program for WFD is centered on their Community Fire and Life Safety Educator. This position is jointly funded with New Hanover County Fire Services. Prior to the creation of this position the WFD life and fire safety program was addressed on an "as requested" basis. Recognizing the importance of this effort approximately three years ago, the WFD greatly enhanced the priority of the program. The educator is employed by the City of Wilmington with input from both jurisdictions included in setting goals and objectives and accomplishing annual performance evaluations.

The Community Fire and Life Safety Educator oversees and coordinates fire and life safety education activities city and county-wide. The Educator is responsible for the development and presentation of educational programs, lesson plans, public service announcements, displays and print materials. The educator accomplishes the compilation of data and reports on fire incidents, educational activities, pre & post intervention evaluations and grant writing. Additionally, the Educator maintains the inventory of educational and public relations materials and coordinates the planning and execution of National Fire Prevention Week programs.

The CY2006 City of Wilmington and New Hanover County goals for the Community Fire and Life Safety Educator are as follows:

Goal One	Coordinate fire education county-wide.
Goal Two	Expand Risk Watch in the New Hanover County schools.
Goal Three	Evaluate need and impact for/or public education efforts.
Goal Four	Plan and execute National Fire Prevention Week.
Goal Five	Achieve FLSE Certification I and CPS Instructor.
Goal Six	Inventory/organize all public education and community relations materials.
Goals even	Seek funding via grants and donations
Goal Eight	Regularly present/facilitate programs in the community.

The Educator currently provides the NFPA "Risk Watch" program in six elementary schools in the city/county. This should increase to seven elementary schools and two middle schools next year. She is working with local Boy and Girl Scout troops to institute a "Risk Watch" merit badge program and intends to expand the program to the local YMCA and YWCA. The New Hanover County Health Department has secured a $25,000 "Risk Watch" grant for which the Community Fire and Life Safety Educator has helped to implement.

Other life and fire safety programs provided or coordinated by the educator include:

- Fire station tours.
- Staff evacuation training.
- Fire extinguisher training.
- Senior Citizen "Remember When…" and "Meals on Wheels" smoke detector checks.
- Local shopping mall Hurricane Expo.
- Car Seat Installations and training (Station #9 and HQ).
- Fire Prevention Week.

The following Figure identifies the number of public contacts achieved through the life and fire safety programs provided by WFD.

Figure 62: WFD Life and Fire Safety Education Activity

Fire and Life Safety Education Activity FY02-05			
Contacts	***FY02/03***	***FY03/04***	***FY04/05***
By Educator			***4,759***
By Station Personnel	***3,945***	***1,955***	***3,395***
Total	***3,945***	***1,955***	***8,884***

Source: WFPB

All segments of the population should receive education appropriate to their age and issues they face. Providing sufficient resources for delivery of safety education is necessary to ensure an effective program. Others will need to support the effort through program delivery. On-duty station personnel and the firefighter's associations are excellent resources for program delivery. There is also an opportunity to expand program delivery resources through the use of community volunteers.

Finally, there should be some way to measure results of the efforts. This would include, among other factors, expanding information tracked on each emergency incident report to record whether human behavior was a contributing factor to the emergency and whether citizens present took appropriate action when faced with an emergency

Data Collection and Analysis

The primary purpose of maintaining a record of emergency responses is to evaluate the effectiveness of fire/rescue programs and performance. This effort includes deployment strategies, training requirements, and the effectiveness of fire prevention, code enforcement, fire investigation, and life safety education programs.

WFD maintains a good automated data system that provides a valuable interface of information from all disciplines of the organization (suppression, fire prevention, training, maintenance, etc) as it relates to the community. WFD has used multiple modules of "Fire House" software across the department since 1999. Inspectors are now using a web based version on "tablets."

Incident records may be used to determine, as an example, what types of incidents are occurring most frequently, the types of properties most often involved in fire, causes of ignition

and other facts to assist with targeting fire and accident prevention efforts of the department and future department resource needs.

The "fire problem" in a community is addressed by a "cycle" of resources provided by the authority having jurisdiction (the Wilmington Fire Department.) These resources include: **public education** so the citizen is aware of hazards, how to prevent them, and what to do should they occur; **engineering/code enforcement** so fire and life safety is an inherent part of the community infrastructure and where there is a violation, compliance is achieved; **fire suppression** so that when there is a failure in the education, engineering/code enforcement part of the cycle the emergency can be resolved; and **fire investigation** where the incident is documented, the cause determined accidental or intentional and steps taken so it will not happen again.

The results of fire investigations suggest public education needs and results, the need for code modifications and changes, fire department training, resources and deployment, and identification of the community's "fire problem."

The Wilmington Fire Department appears to manage the "cycle." WFD Public education, code enforcement, fire suppression, and fire investigation entities operate in relative cooperation through a compatible data system for analysis and planning.

Recommendations:

- Consider shift personnel and/or additional full-time inspectors to implement a program to accomplish the inspection of all existing inspectable occupancies on a frequency determine by risk/hazard.
- The DFLS should confirm the number of "inspectable properties" in the City as soon as practical.
- Consider pursuing legislation to require the installation of approved fire sprinkler systems in all new structures including residential.
- Explore increasing resources to deliver life and fire safety education programs to all population segments of the City of Wilmington
- WFD should review the personnel, capital, and operating resources needed to address

the continuously increasing workload in the Division of Fire and Life Safety.

- WFD should consider utilizing contractors to maintain acceptable plan review "turn-around" times.

Objective Ten – Community Fire Protection Rating Discussion

The Office of the State Fire Marshal (OSFM) performs fire insurance protection class ratings for communities under 100,000 population in the State of North Carolina. The agency uses the ISO protection class rating system for communities achieving rate classes of 1 through 9 and its own rating for communities achieving a a rate class of 9s. OSFM last rated the Wilmington Fire Department in 2004. The OSFM assigned the city a class 2 rating.

The ISO uses a 1 – 10 rating scale with class 1 being the best level of service (and lowest fire insurance premium cost) and class 10 being no service at all. The ISO reviews fire protection in three major categories. These categories, and the credit received for the city rating, are shown below.

Communication (10%) – This evaluates the function and reliability of the dispatch service. The City received 8.20% out of a possible 10% in this category.

Water Supply (40%) – This evaluates the community's ability to deliver firefighting water in sufficient volumes to combat fires in buildings. The city received 37.71% out of a possible 40%.

Fire Department – (50%) – This evaluates the capability of the fire department to effectively respond to and extinguish a fire. Items reviewed include apparatus, staffing, training, and station locations. The city received 37.93% out of a possible 50%. The primary areas of deficiency included insufficient on-duty staffing (9.53 out of 15) and an insufficient training program (5.85 out of 9).

The total percentage credit received was 80.16%[21]. In order to achieve a protection rating of Class 1, the city would need at least 90 percentage points of credit.

The ISO rating can be important to a community. Many property insurance companies base the fire risk portion of property insurance premiums on the community's ISO rating. The charts below show two examples of how fire insurance rates for homes change based on the ISO rating assigned.

[21] ISO subtracts points when the quality of the fire department and the quality of the water system are significantly different (divergence). In the 2004 survey 3.68% was subtracted for divergence.

Figure 63: Example Premiums Based on ISO Ratings

FIRE DEPARTMENT CLASS RATE VERSUS INSURANCE PREMIUM COSTS								
Fire Rating	Annual Premiums based on home value (home values in thousand dollars) (source: Survey of insurance companies in southeast United States)							
	100	150	200	250	300	350	400	500
10	894	1358	1856	2341	2826	3311	3844	4918
9	806	1224	1674	2112	2549	2986	3468	4436
7	430	652	892	1125	1359	1592	1848	2365
6	399	607	829	1046	1262	1479	1717	2196
5	373	566	774	976	1179	1380	1603	2051
4	373	566	774	976	1179	1380	1603	2051
3	373	566	774	976	1179	1380	1603	2051

Fire Department Protection Class Versus Insurance Premium Cost Annual fire insurance premiums based on home value (source: Oregon premium survey)				
Amount of coverage	Protection Class			
	2-6	7-8	9	10
$100,000	$322	$435	$885	$1,046
$150,000	$416	$562	$1,144	$1,352
$200,000	$549	$740	$1,509	$1,782
$250,000	$691	$934	$1,901	$2,247

As the ISO class improves, fire insurance rates decrease dramatically until class 5 for homes. Businesses generally benefit from further reductions down to class 1[22].

While there is little to be gained in insurance premium savings for homeowners by improving the rating (currently class 2) there could be some opportunity for additional savings in premium for commercial and industrial properties. However, it must also be remembered that most such properties with built-in suppression systems, such as fire sprinklers, are individually rated anyway and may not necessarily improve through a lower protection class.

Many communities have learned that the pursuit of a Class 1 protection rating is an extremely expensive endeavor. As with any fractile performance measure, the last few percentage points

[22] A similar chart is not available for commercial properties. Property use affects the premium and many are individually rated.

are always the most expensive. This is because the incremental cost of apparatus and facility distribution to cover the smallest and most remote pockets of geography and service demand are proportionally more expensive based on the overall community benefits.

The City of Wilmington should pursue the continuation of its current rating. This would best be accomplished by concentrating on significant improvements in its training and preplanning inspection program, improving its apparatus scores through fully equipping existing equipment to ISO standards and maintaining consistent pump and ladder testing, maintaining its target for on-duty staffing by limiting reductions caused by leave time, and ensuring that its water system maintains its capacity to continue its past rating scores.

Objective Eleven – Fire Department Organizational Culture

Emergency Services Consulting, inc. (ESCi) routinely includes the input from the many stakeholders involved in the formulation of a fire department's agency evaluation. The stakeholders range from elected and appointed officials to a representative cadre of rank and file firefighters.

After the initial and subsequent on-site conversations with the Mayor, a number of City Council Members, the Human Resources Director, and the Deputy City Manager, ESCi learned that rank and file firefighters and their spouses had been regularly approaching these officials with a number of concerns about the Wilmington Fire Department.

In response to these concerns, the Deputy City Manager conducted a fact gathering mission by making herself available to fire department personnel during each of their three rotating shifts. She determined that fire department personnel felt that a representative cadre of rank and file personnel providing input to the department's agency evaluation would not be satisfactory to accomplish the accurate and informative communication of their concerns.

During her fact gathering mission, the Deputy City Manager agreed that any and all fire department personnel would be afforded an opportunity to speak with representatives of ESCi, and that ESCi would be requested to conduct two public hearings on the matter. ESCi agreed to the requests and the contract was modified accordingly.

ESCi conducted individual interviews with 97 employees of the Wilmington Fire Department on May 24, 25, and 26, 2006 at the Martin Luther King Center. Group sessions were conducted each afternoon as well. Public hearings were scheduled and advertised by the City of Wilmington and were conducted by ESCi at the Downtown Main Library at 6:00 p.m. on May 23, 2006 and at the Halyburton Park Building at 6:00 p.m., May 25, 2006. Approximately 18 individuals attended the first public hearing and 38 attended the second hearing. The majority of those attending the public hearings were employees of the Wilmington Fire Department and their families.

The 97 Wilmington Fire Department employees interviewed presented a number of comments, concerns, perceptions, criticisms, complaints, and suggestions. Most employees were careful to

explain that there are many positive and efficient aspects of the fire department such as hard working, dedicated employees, new facilities, new apparatus, and positive peer camaraderie, to name a few. They believed these attributes, however, were offset by a culture of retaliation and a dysfunctional approach to training, employee health, safety and well-being, compensation and benefits, the working environment and an autocratic demeaning administrative and operational senior management style.

An overview of these comments, concerns, perceptions, criticisms, complaints, and suggestions are outlined below. ESCi wishes to stress that these are concerns voiced by members of the department, often in their own words, and do not necessarily represent conditions confirmed by observation of our project team.

Training

- There is no formal, effective in-service training program.
- Neighboring volunteer firefighters have more hands-on, operational training than Wilmington Fire Department.
- Progressive officers must accomplish comprehensive training on their own, with little support from the training division.
- The training division is understaffed. The department's roster has increased two-fold with the same training staff. Training staff spend most of their time addressing matters not associated with training.
- Training topics are transmitted from the training officer to the stations with no oversight or accountability for completion. In-station training is conducted by station captains without the benefit of lesson plans, as interpreted by each captain at each station on each shift.
- Training topics, procedures, and policies are cut and pasted from neighboring fire departments and distributed. A recent training topic document was actually photocopied and distributed with the letterhead of another local department.
- Training reports are completed and transmitted by station captains without accountability or oversight. It is perceived that emphasis is placed on the number of hours completed to accomplish "ISO fluff," which promotes "pencil whipping, rather than accomplishing meaningful, appropriate training."
- Lawn and station maintenance routinely supersedes training activity.

- Station personnel are afforded limited opportunities for training outside of the City. The perception is outside training is limited to the special teams.
- There is no officer training.
- Drivers and officers are asked to act in higher ranks without preparatory training. For example, engineers must be in-rank for 365 days and are automatically assigned as acting company officer with no orientation or training.
- There is no live structural firefighting training. All training is simulated. Recruits experience hostile fire conditions at their first emergency fire response.
- "We don't train with other companies; they keep us hidden."
- Personnel assigned to rescue and tower units do not receive specialty training pertinent to their assignment. Their training is simply "hard knocks," "OJT," and based on call by call experience.

Health, Safety, and Well-being

- The department does not have a formal exposure reporting system. There is no policy to follow-up on treated patients having communicable diseases.
- The department does not provide for cleaning blood borne pathogens and other contamination from individual clothing at each station.
- There is no formal physical training program. Employees must wait until after hours to voluntarily participate in physical training.
- Protective clothing is not provided and/or maintained commensurate with National Fire Protection Association standards.
- Line of duty injuries are administered and managed in a negative, demeaning manner.
- Recruits are issued used, sometimes damaged, protective clothing.
- Replacement protective clothing is difficult to obtain.
- Maternity policies and associated leave procedures are viewed negatively by management and are not implemented in an employee friendly manner. WFD has not modified the city's FMLA maternity policies to address fire department scheduling and staffing.
- Hose testing procedures are inconsistent, unsafe, and not conducted commensurate with industry standards.

- Accident investigation and/or resolution is not processed in a consistent manner. It is perceived to depend on "who you are."
- Free-lancing on emergency scenes is rampant.
- There are only two hand-held radios per response unit that are normally assigned to the officer and the engineer. Personnel enter hazardous situations without communications with one another.
- The work order process to initiate repair of apparatus, tools, and appliances is inconsistent. Drivers are told "don't worry about it, we'll fix it later," "drive it until it breaks." The perception is "the problem must get so bad that they have to fix it."

Compensation and Benefits

- Employees are subjected to policies that subvert compensation for working out of classification. Generally, "move-up" or working out of classification pay may be earned after an employee has been in a "move-up" status for more than 15 consecutive assignments. Management will move an employee off the "move-up" assignment for one shift to circumvent the requirement to compensate.
- The compensation plan completed in CY1999 was not implemented.
  - The plan was four years behind "market-rate"
  - Merit raises, Cost of Living (COL) raises, and step raises are arbitrarily awarded, withheld, and/or substituted for one another.
  - The fire department compensation plan suffers from salary compression.
- Subsequent to a recent promotional process a ten percent promotion raise was implemented without considering the impact on the current compensation plan.
  - This action further exacerbated the salary compression issue of the current plan.
  - Significant numbers of employees are now being compensated at a rate less than their subordinates who have served for less time.
  - In some cases, the disparity is more than $1,000.00.
  - Senior staff's response to this action was "There's only a few dollars difference," and "you'll make it up at your next promotion."
  - Employees complained that HR's response to this action was "This is the way the real world works."
- There needs to be a new compensation plan for the fire department that relates to the current cost of living.

- Employees are required to carry a pager without compensation.
- Employees must wait 30 days to receive overtime compensation. If the employee takes time off, overtime is voided.
- The department requires employees to maintain a Class "B" drivers license and wear shoes within a certain specification without reimbursement.
- There is little or no recognition for participating on special teams and the compensation is limited to $50 for certain teams as provided by the state.
- Educational salary differential is not provided for the fire department. The city recognizes the benefit of this program by virtue of its implementation in the Wilmington Police Department.
- Employees must request days off 30 days ahead of time.
- The City is implementing a time-clock system for the fire department as a result of losing time and attendance challenges in the recent past. This city-wide "one size fits all" approach to time and attendance presents challenges when applied to public safety. For example:
  - There have been discussions about the possibility that firefighters would have to "punch the clock" before leaving the station for emergency responses, thus extending response times.
  - Implementation as described would require, among other things, the off going shift to respond to all calls until the official end of their shift as opposed to allowing early relief by the in-coming shift. This would result in the off-going shift responding to incidents on an overtime basis, minutes before punching-out, while the in-coming stood in the station and watch them leave.
  - Human Resources personnel were quoted as saying "this is ridiculous, but we're going to do it."

Retaliation

- Senior management, on multiple occasions, was quoted as saying "you will not be promoted due to speaking out."
- Most of the more than 100 interviewees described subtle and overt retaliation experiences with senior staff.
- Submitting a grievance is considered career suicide.

- Employees do not have the expectation of confidentiality when working with Human Resources' staff. The fire chief is made aware of these occurrences and retaliation is anticipated depending upon the topic involved.
- Fire department employees consider their relationship with the Human Relations Director and the Human Relations Department adversarial.

Working Environment

- Female employees are not permitted to work in all stations due to inadequate facilities. Male employees are transferred out of certain regular duty stations that have adequate facilities, an action which creates animosity toward females over a matter for which they have no control.
- A majority of employees believe they work in a hostile work environment.
- Employees, spending a third of their time at work, are not afforded input into station construction or facility modification decisions.
- Many station captains routinely curse at subordinates.
- Station 10 presents deplorable working conditions
- Headphones are not provided in the cabs of emergency apparatus. Personnel must yell at each other over engine noise while responding and radios must be kept at high volumes.
- It is perceived that supervisors are fearful of formulating employee evaluations reflecting proper recognition and positive performance of subordinates because it initiates a negative reaction by senior management that ultimately influences the supervisor's evaluation.
- Management needs to improve upon cultural, racial, and gender diversity across the department. Terms like "fireman" rather than "firefighter," for example, are routinely used.
- Many station assignments and transfers appear random, arbitrary, illogical, subjective, punitive, retaliatory, and/or inefficient.

Management Style

- Senior staff members are reported to routinely exercise an autocratic, demeaning administrative and operational management style.

- Senior staff members, during recruit welcoming and orientation sessions, regularly use negative comments and ultimatums. For example, "you were hired at your starting pay and if you were to work here for thirty years and never got a raise, the City of Wilmington had fulfilled its obligation to pay you what it said it would; anything else you make above your starting salary was 'icing on the cake'."
- Rules, regulations, and policies emphasize minutia. For example, the department has a ten page appearance policy, but there are no company operations, rapid intervention, respiratory, or high rise operations policies in place.
- Memorandums are used to circumvent the policy and procedure formulation and review process. Currently, employees are accountable to hundreds of memorandums. These memorandums contradict current policies, contradict previous memorandums, and are not codified. It is difficult for employees to know what rules are in effect.
- Employees have been told to "bring their letter of resignation" when they ask to meet with senior staff regarding a question or concern about the department.
- Many employees have been told "Wal-Mart is hiring everyday" or "if you don't like it you can leave" when questions or concerns are voiced to senior staff.
- There is a prevailing feeling among employees that senior staff manages by fear and intimidation.
- Senior staff does not rotate personnel that are perceived to be friends of the Chief from headquarters station.
- Senior staff projects a "do as I say, not as I do" mentality. They were quoted on numerous occasions as saying "I don't have to follow the policies, I'm a chief, I write the policies."
- Battalion Chiefs routinely micro-manage operational and administrative tasks. Rather than oversight and command, they usurp company officer task and responsibilities.
- A formal incident command system is not utilized.
- Depending upon an individual's position in the perceived informal pecking order, there is no accountability for actions on an emergency scene. It is perceived that all improprieties or errors are blamed on subordinates. Allegedly, a number of officers will not enter burning buildings.

- It is perceived that department growth (annexation) has passed-by the department's management.
- Fire department management appears to be reactive rather than proactive.
- Operations personnel are not aware of new properties, facilities, and structures until they are called upon to respond to them.
- Department management does not openly communicate with the police department, the EMS provider, or the public.
- There have been no communication meetings between senior staff and the rank and file employees in recent times. The current meetings began when the agency evaluation and report was imminent. Employees anticipate these meetings will cease upon completion of this project.
- Employees perceive that senior staff is threatened by educated, trained, experienced, progressive personnel. Because they are threatened, they do not endorse, promote, and/or support programs encouraging these programs.
- Senior staff does not understand that their employees are their most important resource.
- Leave of absence and rehire policies are perceived as being implemented and enforced in an inconsistent and/or unfair manner.
- It appears that senior management will not consider the rehiring of personnel that have left, even in a positive manner, due to a negative experience when an individual was rehired many years ago. This informal policy of bypassing qualified applicants is questioned, due to the current attrition and staffing shortages.
- The department invests significant time, money, and effort in promotional processes, the results of which are not used in determining who will be promoted.
    - Senior staff, using the rule of one-third and other justifications, manipulates the promotional eligibility list to arbitrarily and subjectively promote their personal selections.
    - The promotional process, changed three times in the last year, is used as a disciplinary or retaliation instrument, rather than a process for selecting the best qualified candidates for a position.

There is wide agreement among those involved in teaching leadership and management that organizational culture refers to a system of shared meaning held by members that distinguishes the organization from other organizations. Organizational culture may be defined as "a common perception held by the organization's members; a system of shared meaning.[23]"

Researchers have identified seven characteristics that, taken together, capture the essence of an organization's culture[24]:

1. *Individual autonomy*: The degree of responsibility, independence, and opportunities for exercising initiative that individuals in the organization have.
2. *Structure*: The number of rules and regulations and the amount of direct supervision that is used to oversee and control employee behavior.
3. *Support*: The degree of assistance and warmth provided by managers to their subordinates.
4. *Identification*: the degree to which members identify with the organization as a whole, rather than with their particular work group or field of professional expertise.
5. *Performance-reward*: The degree in which reward allocations (i.e., salary increases, promotions) in the organization are based on performance criteria.
6. *Conflict tolerance*: The degree of conflict present in relationships between peers and work groups, as well as the willingness to be honest and open about differences.
7. *Risk Tolerance:* The degree to which employees are encouraged to be aggressive, innovative, and risk seeking.

Additionally, the following determinations may be utilized to confirm whether or not an organization possesses a weak organizational culture[25]:

1. They have no clear values or beliefs about how to succeed in their business.
2. They have many beliefs as to how to succeed, but cannot agree on which are most important.

[23] Robbins, Stephen P., Organizational Behavior, Prentice Hall, Englewood Cliffs, NJ 1996.

[24] Ibid

[25] Rue & Byers, Management Skills and Applications, Irwin Publishing, Chicago, IL 1995.

3. Different parts of the organization have fundamentally different beliefs about how to succeed.
4. Those that personify the culture are destructive or disruptive and don't build on any common understanding about what is important.
5. The rituals of day-to-day organizational life are disorganized and/or working at cross purposes.

The collection, review, and analysis of the information presented through the individual interview process, group sessions, and public hearings, coupled with candid observations, when compared to the determinations above, reveal a weak, dysfunctional organizational culture within the Wilmington Fire Department.

While the scope of this study did not afford the pursuit and/or verification of the numerous individual experiences and scenarios explained by the more than 100 fire department employees, the frequency and repetition of their common concerns lead ESCi to acknowledge a level of validity that should be a concern to the leadership of the fire department and the City of Wilmington.

There is a tendency for the leadership to dismiss these concerns as the product of a few trouble makers; however, the feelings of more than 100 employees should not be ignored. This is especially true when a perceived fear of retaliation prevailed when signing up for the individual interviews. Conducting interviews off fire department property was a direct result of this concern. Whether or not the all of the employee's concerns are perceived or factual, the old adage applies in organizational culture…"perception is reality."

The promotional processes, compensation methodologies, and inter-personal skill applications implemented and exercised by Human Resources and fire department leadership have served to hold the fire department to management and administrative practices that were abandoned by progressive, efficient organizations decades ago. Modern and progressive personnel practices serve to retain and value employees, encourage involvement and upward mobility, and promote a cohesive workforce. This is in direct conflict to what is perceived as an autocratic, demeaning, self-serving approach in the current Wilmington Fire Department and human resources' organizational management and administration styles.

The resources available to the City of Wilmington from within the current WFD workforce are innumerable, and only a small fraction of these resources have been cultivated and encouraged to the benefit of all concerned.

The leadership of the City of Wilmington and the Wilmington Fire Department has a number of options available to them regarding the issues identified in this employee input process. It should be acknowledged, as well, that the decision to facilitate this process, in concert with a fire department agency evaluation, was an admirable one. The results of this input, coupled with the recommendations of the agency evaluation, provides an objective, third-party perspective that may be used as a tool to assist the fire department in implementing changes that will improve relations and enhance service delivery.

***Recommendations*:**

- The City of Wilmington should consider the development and maintenance of a progressive organizational culture to be a direct responsibility of its department heads and senior management and should require accountability where the organizational culture becomes a detriment to developing an efficient, committed, and motivated workforce.
- WFD should immediately resolve any outstanding matters affecting the safety of employees.
- WFD should immediately pursue the completion of a customer centered strategic plan including representatives from the department's internal and external customers.
- The City of Wilmington should complete a comprehensive compensation/pay study for the fire department in concert with the current local cost of living. This process should include removing the salary compression factors currently in place as soon as practical.
- WFD, in conjunction with HR, should implement a fresh approach to the fire department promotional process to ensure the objective promotion of the best qualified candidates.
- WFD should revise the department's promotional process to mandate that battalion chiefs be appointed through an objective, comprehensive, competitive promotional process that would cause the promotion of the best qualified candidates.
- WFD should consider the requirement of having all chief officers achieve National Fire

Academy Executive Fire Officer Certification

- WFD, in conjunction with HR, should immediately pursue the revision of its personnel regulations and operational policies and procedures. This includes discontinuing any "management by memo" practices and confirming compliance with DOL, the State of North Carolina, and other regulatory agencies.

Summary of Recommendations

After completing the eleven-objective evaluation of the Wilmington Fire Department, ESCi assembled the list of recommendations for improving current functions of the agency. Individual narrative text describing the issues associated with these recommendations may be found in the appropriate sections of this report.

Methods for Prioritization of Recommendations

While it may seem as if this list of recommendations is long, the content of the recommendations varies from rather insignificant issues that are easily and quickly dealt with to major organizational changes that will take some time to accomplish. A system of prioritizing the various recommendations may be useful.

ESCi considers the following criteria when rating the priority and relative significance of the recommendation. Priorities are listed from greatest to least.

1. **Issues potentially affecting safety**

   The objective deals with an improvement or initiative that solves an issue that has the potential to affect the safety of firefighters and/or other City personnel or the public. These are not matters that simply make it easier to do a particular function, but in fact make a potentially unsafe situation safe.

2. **Issues presenting legal or financial exposure**

   This objective resolves a situation that is creating, or has the potential to create, the opportunity for legal action against the City or its members. It also may be a situation that could subject the City to a significant expense.

3. **Issues that correct a potential deficiency**

   The objective addresses a situation that, while it doesn't create an immediate safety risk to personnel or the public, it does affect the City's ability to deliver service in accordance with its standards of performance. For example, adding a response unit to compensate for a growing response workload, or delivering training needed to allow personnel to deal effectively with emergency responses already being encountered.

4. **Issues that enhance delivery of a external or internal services**

   The objective improves the delivery of a particular service. For example, relocating a fire station to improve response times to a particular part of town, or adding a piece of equipment that will improve the delivery of a service.

5. **Issues representing best practices or "a good thing to do"**

   The objective doesn't fit within any of the above priorities, but is still worth doing.

The following is the compiled list of recommendations found throughout this study, with an associated prioritization rating for each.

Issues Potentially Affecting Safety	
1	The WFD should completely revise its Standard Operating Guidelines and make significant additions in the areas of emergency operational procedures, non-emergency procedures, and safety procedures.
2	Establish a system to respond a qualified and trained Safety Officer to all working fires and major incidents.
3	Provide for live fire training evolutions for all recruits prior to assignment to their duty stations and annually for existing personnel.
4	Immediately implement the requirement for an assigned safety officer in attendance at all manipulative training sessions.
5	WFD should immediately resolve any outstanding matters affecting the safety of employees.
Issues Presenting Legal or Financial Exposure	
6	The City of Wilmington should publish or clarify policies on sexual harassment, workplace violence, and reporting of wrongdoing (whistleblowers).
7	Headquarters security should be improved and public access controlled more effectively.
8	Station locks should be changed on a regular basis to prevent the use of orphan keys.
9	WFD should formally adopt a set of medical protocols to guide patient care. The protocols should be developed by, or in cooperation with, the Medical Director of the New Hanover Regional EMS.
10	Design and implement a pre-promotion training program for all candidates for promotion and acting promotions.
11	WFD, in conjunction with HR, should immediately pursue the revision of its personnel regulations and operational policies and procedures. This includes discontinuing any "management by memo" practices and confirming compliance with DOL, the State of North Carolina, and other regulatory agencies.

Issues That Correct A Current Deficiency	
12	A public complaint procedure should be established and all personnel should be trained in its application.
13	A full-time IT support position for the fire department should be considered. This individual should be adequately trained on the department's unique records management system in order to relieve the Assistant Chief from these functions not critical to his Division.
14	A complete overhaul of the WFD pre-incident planning program should be undertaken with consistency on data collection, plan preparation, site plan drawings, ease of retrieval and use, as well as a continual training emphasizing its use.
15	Utilizing the pre-incident planning, specific tasks should be assigned each of the first responding fire companies, i.e. first-in engine secures a water source and advances an appropriate fire line, first-in truck company performs vent, enter, search. In order to effectively accomplish these tactical objectives, specific tasks can be assigned to each firefighter by the position they ride on the apparatus.
16	Automatic and Mutual Aid fire departments should be included in the pre-incident planning, especially for high target locations. Joint training exercises should be held regularly to familiarize each department with its standard objectives and range of assignments in response to these locations.
17	The WFD must better utilize prepared mutual aid responses with New Hanover, Brunswick and Pender counties in order to provide the level of redundancy in resources to weather a major or catastrophic event.
18	The City should conduct or contract for a fresh salary and benefits survey with an agency specifically familiar with and experienced in fire service pay structures.
19	Conduct initial and ongoing officer training in disciplinary processes and conflict resolution.
20	Establish an annual skills competency and physical ability test for all fire suppression personnel to assess on-going capability to perform the basic, critical tasks of the firefighter.
21	Conduct a formal performance evaluation for all employees at least annually utilizing the new evaluation system designed by HR. Areas needing improvement should be reviewed quarterly between the employee and his / her first-line supervisor.
22	Conduct formal training for all supervisors in the use an application of the performance evaluation process.
23	Currently most administrative matters of the fire department are channeled to the Assistant Chief of Operations. In addition, this Chief is also responsible for Planning, Grant Writing and Standard Operating Guides. A more practical approach would be to create a separate Staff Officer with these duties, and allow the Assistant Chief to concentrate on the regular duties associated with Operations.
24	The WFD is critically short of the Administrative and Support personnel needed to handle the administrative work load of a Department its size. Several new clerical positions should be created to enhance this capability and better serve the growing needs of the Department.
25	Initiate efforts to correct existing deficiencies as indicated.
26	Install automatic exhaust removal systems in the stations that currently don't have them.

27	Bring all stations to ADA compliance for public areas.
28	Define and establish a system where all house lights are working properly.
29	The City's elected officials should adopt a basic service philosophy and response time performance standard for the area served by the Wilmington Fire Department.
30	Long-term facility deployment plans should be adopted to meet the service philosophy of the community should growth and annexation continue.
31	Regularly measure overall response time performance against established response time objectives.
32	Regularly measure overall turnout time performance against nationally recognized turnout time objectives.
33	WFD should consider potential facility improvements that may decrease turnout time.
34	The Emergency Communications Center should regularly evaluate the method used to capture enroute timestamps in the CAD system to ensure integrity of the turnout time analysis.
35	As turnout time performance analysis becomes more reliable, station officers should be made accountable for unexplained lengthy turnout time performance by their companies.
36	Record location when dispatched to evaluate deployment and out of position responses.
37	The department should formally assign the responsibility for oversight of the delivery of first responder emergency medical services to a program manager.
38	WFD should establish multi-agency drills and trainings at least quarterly to enhance mutual aid operations and improve relationships and planning efforts.
39	Develop and implement a comprehensive departmental training plan.
40	Implement a comprehensive, structured skills maintenance training program for all employees.
41	Require lesson plans for all training sessions.
42	Increase the training staff to be commensurate with the department's training mandates including a job analysis of the two incumbents to determine they are working within their current job descriptions.
43	Staff the Support Division Chief vacancy as soon as practical to relieve the training officers of ancillary support functions.
44	The WFD should confirm the number of "inspectable properties" in the City as soon as practical.
45	WFD should review the personnel, capital, and operating resources needed to address the continuously increasing workload in the Bureau of Fire and Life Safety.
46	The City of Wilmington should consider the development and maintenance of a progressive organizational culture to be a direct responsibility of its department heads and senior management and should require accountability where the organizational culture becomes a detriment to developing an efficient, committed, and motivated workforce.
47	The City of Wilmington should complete a comprehensive compensation/pay study for the fire department in concert with the current local cost of living. This process should include removing the salary compression factors currently in place as soon as practical.
48	WFD, in conjunction with HR, should implement a fresh approach to the fire department promotional process to ensure the objective promotion of the best qualified candidates.

49	WFD should revise the department's promotional process to mandate that battalion chiefs be appointed through an objective, comprehensive, competitive promotional process that would cause the promotion of the best qualified candidates.
Issues That Enhance Delivery Of External Or Internal Services	
50	The WFD should combine its two administrative policy documents, revise the policies, and better codify or index the resulting document.
51	Conduct regular staff meetings and consider including representation from company-level officers when possible.
52	Open forum meetings between rank and file members and command staff should be offered on occasion, either in the form of something as informal as a "Chief's Breakfast" or a more formal scheduled meeting or video conference.
53	Specific responsibility for Planning, SOGs and Grant Writing should be assigned to a current or newly created position so that a continuous review of these dynamic documents can take place.
54	Ensure that all Extremely Hazardous Substance (EHS) facilities, as defined in SARA Title III, have been identified in the City of Wilmington. Those identified should have emergency plans coordinated with the WFD.
55	Interoperable communications among the WFD and its Mutual Aid departments needs to be made available at a moment's notice. Communications issues and solutions for agencies outside the City-County communications system must be pre-planned prior to needing these resources in an emergency.
56	Strengthen the role and representation of the Occupational Safety and Health Committee in accordance with the recommendations found in NFPA Standard 1500.
57	Strong consideration should be given to utilize both Automatic and Mutual Aid resources from both New Hanover and Brunswick Counties to strengthen the number of firefighters needed in special and high risk hazards.
58	Develop and adequately fund a long-range facilities management plan in accordance with recommendation for projected service delivery for all stations or when there is annexation.
59	Develop and fund a small equipment replacement program that anticipates replacement schedules and builds necessary funding in order to spread cost over multiple years.
60	Develop and fund a replacement program that anticipates replacement of turnout gear.
61	Consider installing global positioning system (GPS) units to track apparatus location in order to send the closest unit by location rather than district.
62	The City should consistently consider emergency response times when evaluating street congestion, road network connectivity, traffic calming obstructions, parking and other controllable factors.
63	Consideration should be given to use of traffic preemption systems to reduce intersection delays during emergency response.
64	WFD can improve its effective firefighting force response capability and avoid resource drawdown through the effective use of Automatic Aid with neighboring departments.
65	Additional capture of patient care information and data in the records management system for all emergency medical incidents should be pursued in order to develop a reliable database from which to evaluate program effectiveness.

66	As a primary initial component of the emergency medical services delivery program in the City, WFD should actively and consistently participate in regional EMS Advisory Committee and Quality Assurance meetings.
67	WFD should work as a regional leader toward the establishment of a pre-designated mutual aid box alarm system that establishes programmed responses for large-scale incidents based on severity and geography.
68	WFD should reconsider its decision not to promote the use of automatic aid. Agreements between communities for pre-designated automatic response to initial alarm assignments are successfully used in many communities to improve effective firefighting force response times and even improve ISO rating scores.
69	Implement a formal, mandated physical fitness and wellnes training program for all employees.
70	Consider implementing a formal competency-based approach to the department's training program.
71	Develop and implement a centralized, consistent, training data collection and reporting data base under direct oversight of the training officer.
72	Consider shift personnel and/or additional full-time inspectors to implement a program to accomplish the inspection of all existing inspectable occupancies on a frequency determine by risk/hazard.
73	WFD should consider utilizing contractors to maintain acceptable plan review "turn-around" times.
74	WFD should consider the requirement of having all chief officers achieve National Fire Academy Executive Fire Officer Certification
Issues That Represent Best Practices	
75	The WFD should consider publishing its SOG's in a pocket field guide for easier reference by operations personnel and for enhanced use in training drills and exercises.
76	The WFD should publish and distribute a formal annual report.
77	Consider broadening the participation in the strategic planning processes to a larger number of staff representing all aspects and ranks of the department operations and support functions.
78	Consider public input opportunities as a component of strategic planning to make the process more customer-centered.
79	Monitored fire and security alarm systems should be installed in all facilities. The use of security cameras should also be considered.
80	The WFD should seek the advice of other similar fire departments (such as Orlando, FL) to obtain their current SOGs and then customize them for use by the WFD. Suitable model department SOG's can be found either through the networking process of students at the National Fire Academy or through various organizations such as the Southeastern Division of the IAFC.
81	Bring all stations up to two gender staffing.
82	Establish a work out room where all stations have controlled environments.
83	Consider the purchase of a commercial extractor and mobile turnout drying rack for more stations.
84	Establish a semi-annual turnout gear inspection plan.
85	Establish a record system for maintenance, uses and repairs of turnout gear.

86	Consider pursuing legislation to require the installation of approved fire sprinkler systems in all new structures including residential.
87	Explore increasing resources to deliver life and fire safety education programs to all population segments of the City of Wilmington.
88	WFD should immediately pursue the completion of a customer centered strategic plan including representatives from the department's internal and external customers.

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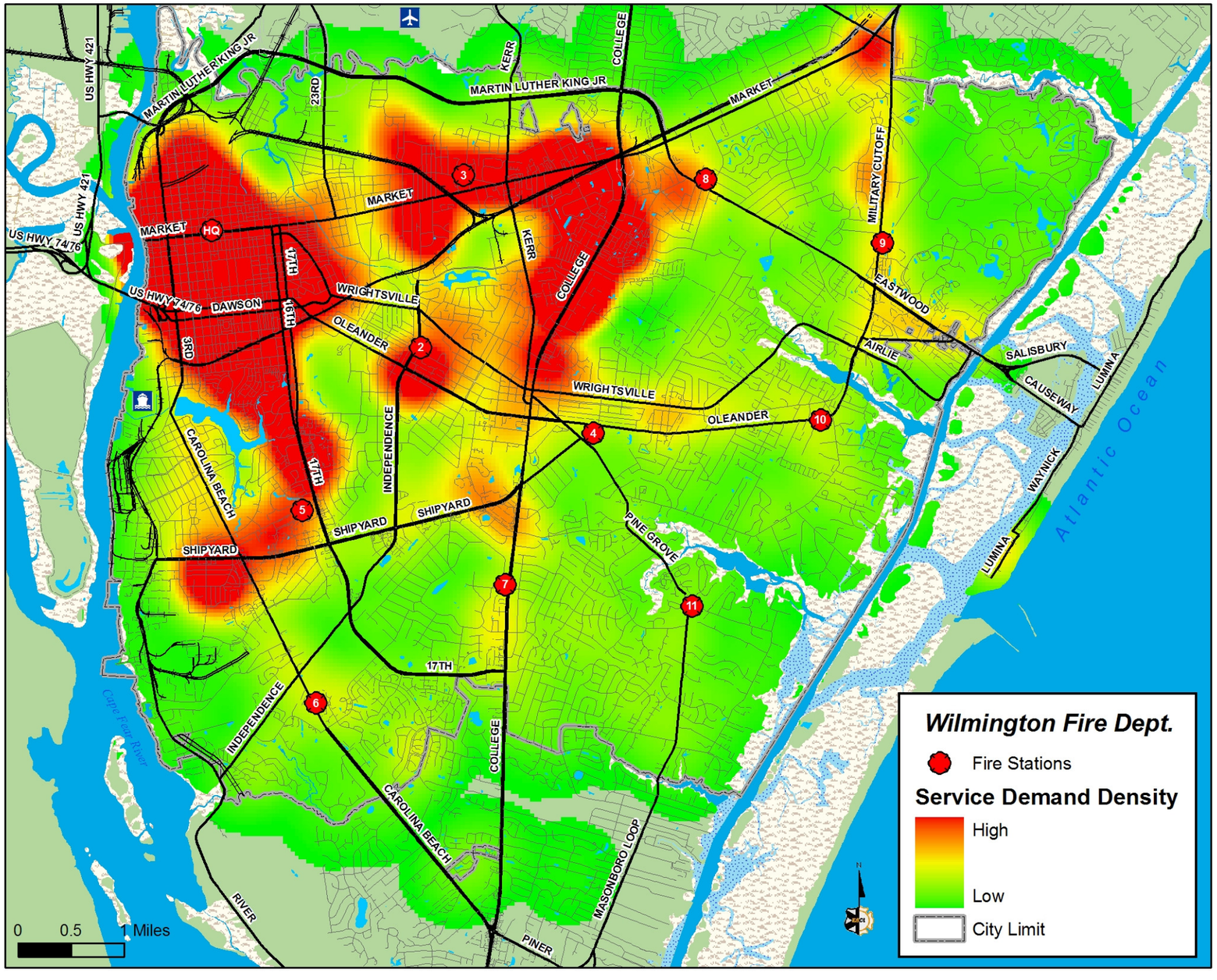
Appendices

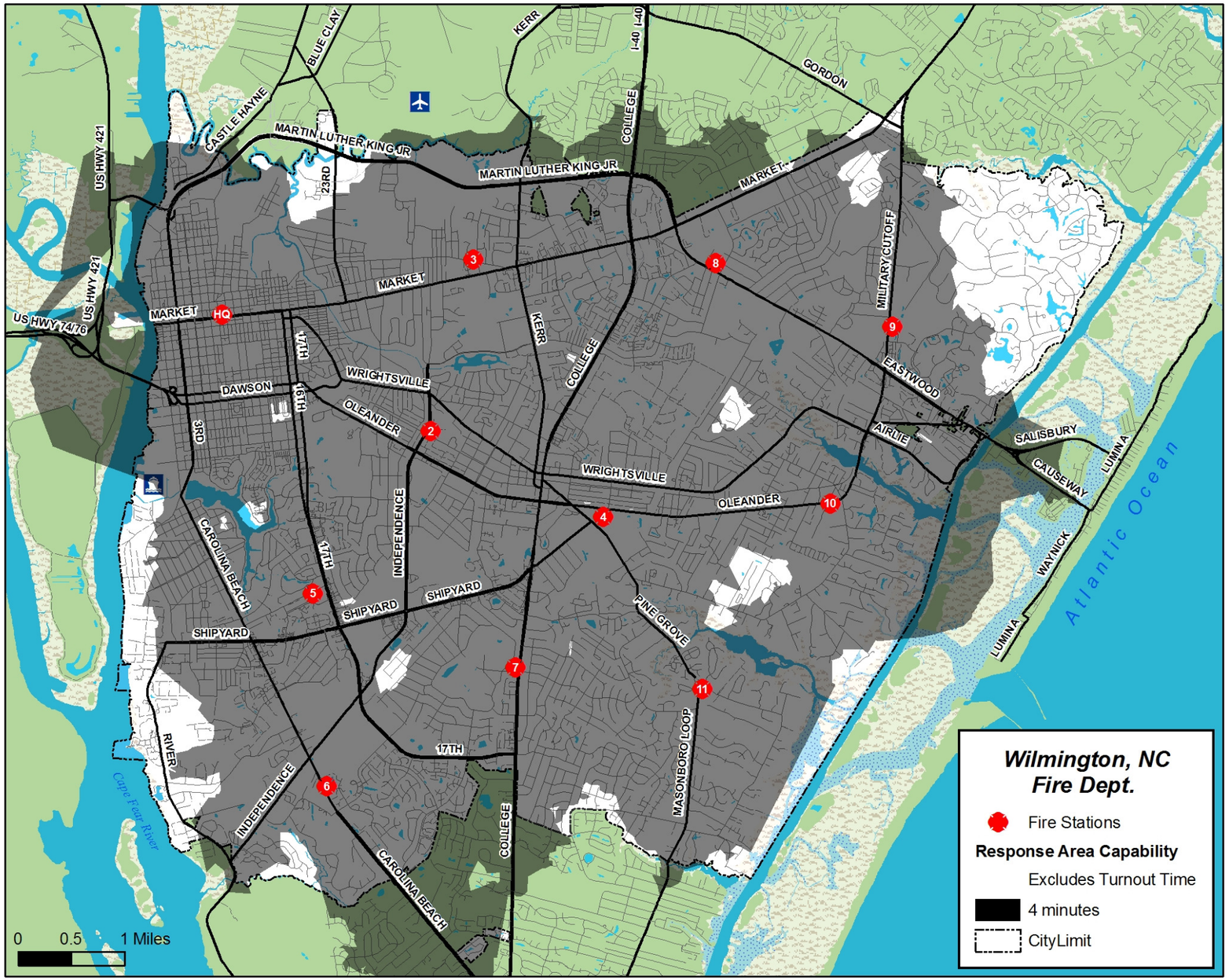
Report Maps

Report maps will be added before the final draft of this report.

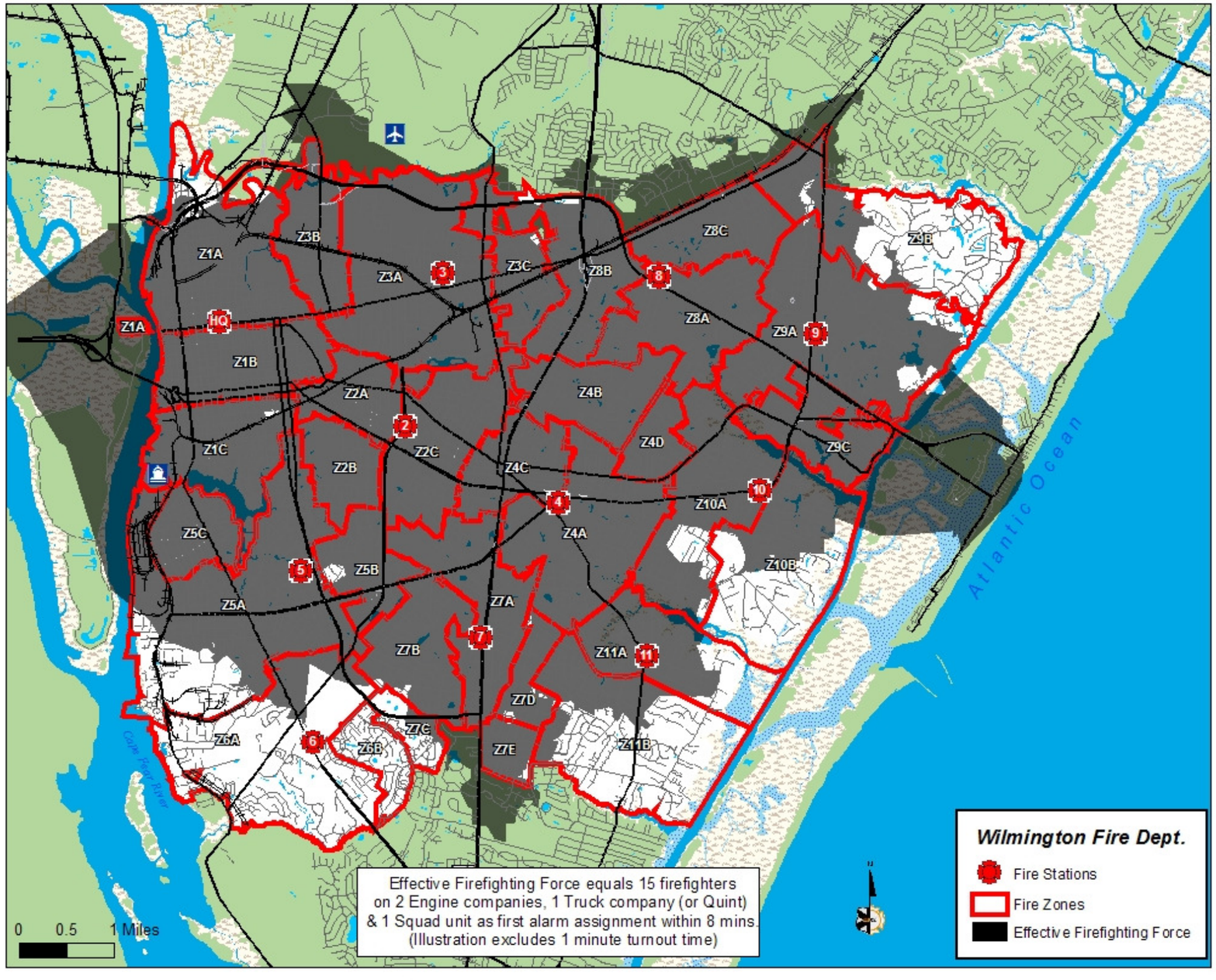
Service Demand



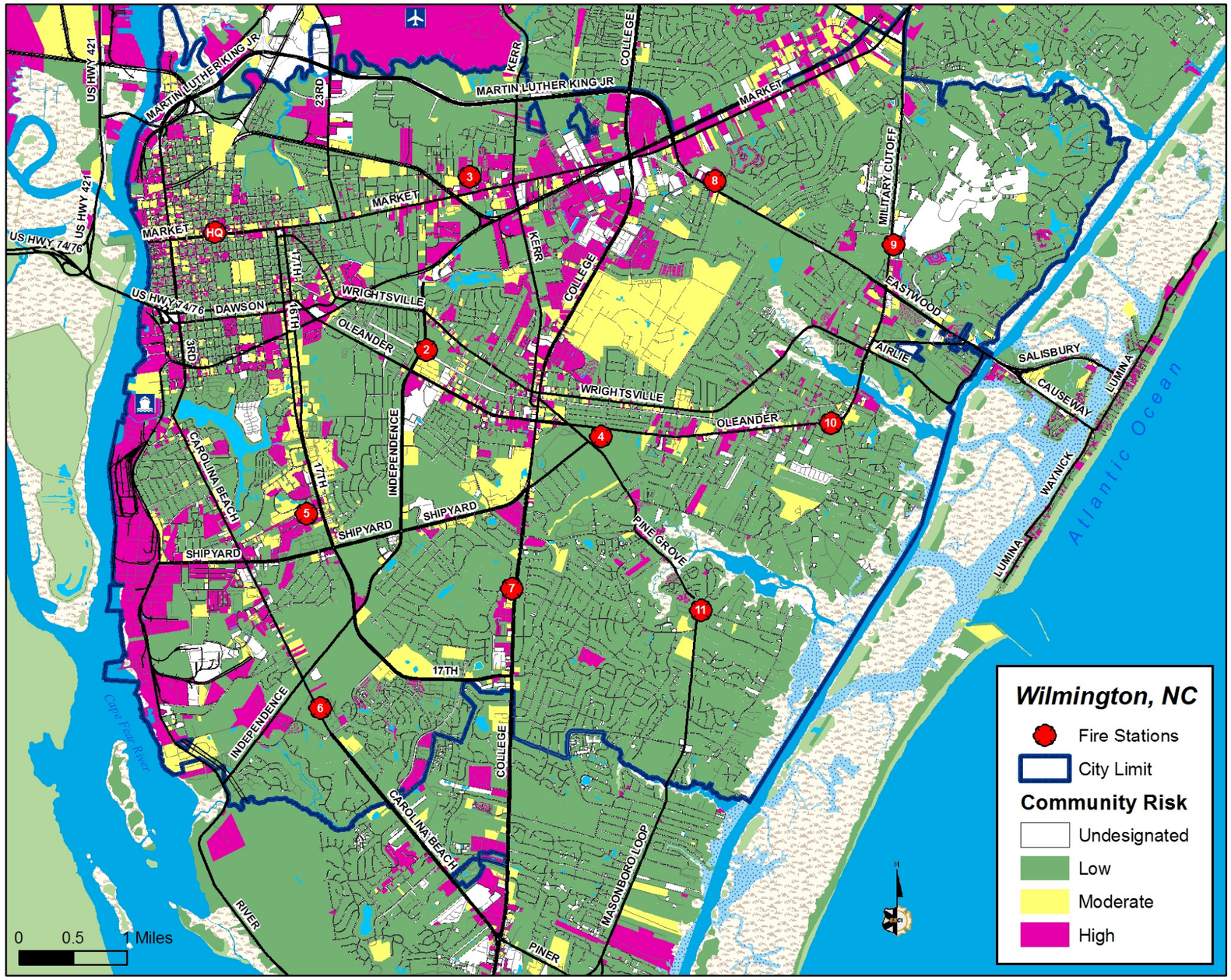
Facility Distribution and Four-Minute Travel Capability



Effective Firefighting Force Eight-Minute Assembly Capability



Community Risk



Risk Areas with Concentration of Highest Needed Fire Flows