



# Supporting the Lewes Fire Department Strategic Plan (2010–2030)

December 2009

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College of Agriculture & Natural Resources  
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and  
College of Earth, Ocean & Environment



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## **Preface**

As Director of the Institute for Public Administration (IPA) at the University of Delaware, I am pleased to provide this report, *Supporting the Lewes Fire Department Strategic Plan (2010–2030)*. This report represents data collection, mapping, analysis, and training support for the development of a strategic plan for the Lewes Fire Department. The work has been funded through a grant from the Coastal Community Enhancement Initiative (CCEI), a multi-college program that seeks to focus scientific and policy-related research on Delaware’s southernmost county.

The report summarizes the efforts of IPA to catalog GIS-compatible data and analysis to assist in the production of a capacity plan for the Lewes Fire Department, which will help it address the challenges of a rapidly changing county and a tightened fiscal reality. Their strategic plan will ultimately ensure provision of timely fire and emergency services for this coastal community, a service that bears directly on the welfare of the inhabitants, both physically and economically.

Jerome R. Lewis, Ph.D.

Director, Institute for Public Administration

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## **Institute for Public Administration**

The Institute for Public Administration prepared this report. A unit within the College of Education & Public Policy at the University of Delaware, IPA provides planning and policy assistance to governments and organizations in Delaware, the Delaware Valley, and along the Eastern Seaboard through direct staff support, research projects, and training programs and policy forums. This support is provided as an outgrowth of the University's land grant mission of public service, education, and research across the state of Delaware.

Andrew Homsey performed much of the data analysis for the report and was largely responsible for its drafting. Nicole Minni collected the data, created and prepared the map atlas, provided training for the contractor and the Lewes Fire Department, and assisted in the drafting of the report.

### **Institute Director**

Jerome R. Lewis, Ph.D.

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## **Acknowledgments**

Sincere appreciation is extended to the coordinators of the University of Delaware's Coastal Community Enhancement Initiative (CCEI)—Bill McGowan from the College of Agriculture & Natural Resources, Jim Falk from the College of Earth, Ocean & Environment, and Bernie Dworsky from the College of Education & Public Policy—for supporting the efforts that went into the development of this project summary. Additional thanks go to Jim Richmann, who authored the strategic plan for the Lewes Fire Department and with whom the authors of this report have worked closely in the course of this project. The collaboration that went into this study produced information useful to the Lewes Fire Department's comprehensive-planning efforts and will assuredly have a positive impact on all those living in the Lewes fire district and beyond.

*The Coastal Community Enhancement Initiative is funded through a grant from the state of Delaware to the University of Delaware to work with coastal communities and jurisdictions on growth and development issues. The program is a University of Delaware joint partnership among three colleges—the College of Earth, Ocean & Environment, the College of Agriculture & Natural Resources, and the College of Education & Public Policy—and their affiliated outreach, extension, and public service programs.*

## Introduction

### *Sussex County in Transition*

Sussex County is a vibrant, dynamic coastal region in Delaware that has undergone dramatic changes in recent years. The county lies completely within the sandy coastal plain physiographic region, but it varies geographically east to west. The eastern portion is characterized by environmentally sensitive wetlands and estuaries, as well as densely developed resort communities. The central portion of the county has been



Figure 1. NASA Landsat imagery of Sussex County, Del.

traditionally agrarian and less developed, while the west includes farmland and many of the county’s larger towns, positioned along the US Route 13 and main north-south railways. The west has also been traditionally the county’s agricultural and industrial core.

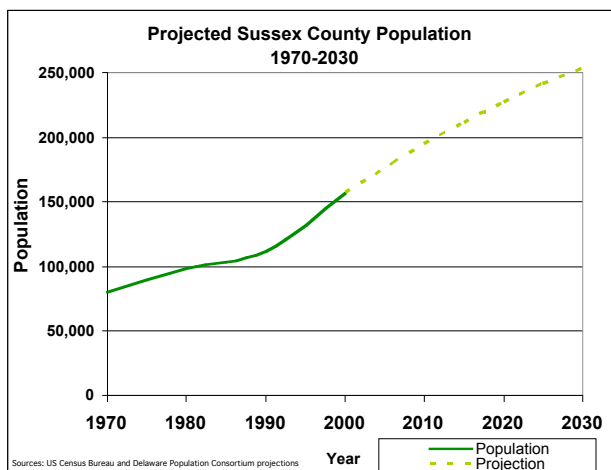


Figure 20 Population projections for Sussex County. Source: U.S. Census Bureau and Delaware Population Consortium.

The population in the county has in recent years been increasing dramatically, and projections indicate that this trend will increase (see Figure 2). Concomitantly, there has been a population shift toward the eastern portion of the county, as the number of seasonal visitors and permanent residents there has soared. There has also been a demographic shift toward a more elderly population. The relaxed

way of life, low property taxes, and abundance of cultural and recreational amenities in

the eastern portion of the county has attracted people from outside as well as from within the state, particularly retirees. Figure 3 presents the projected changes in population age characteristics through 2030.

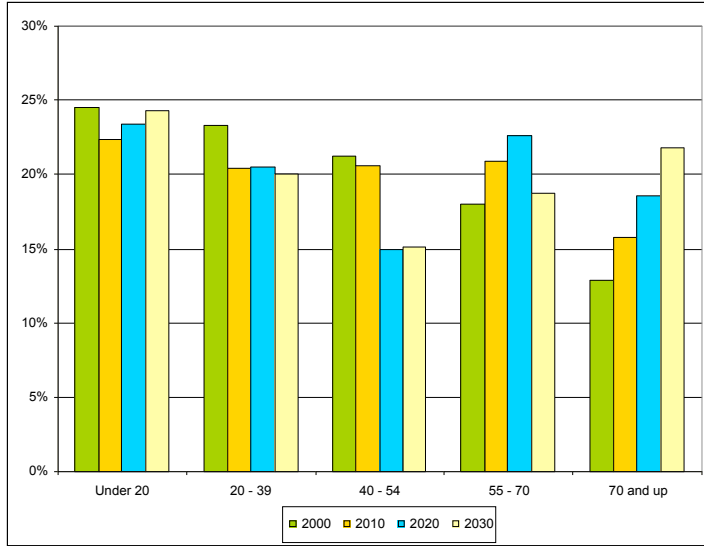


Figure 30 Population projections by age group for the years 2000–2030.

As more people have moved to the coastal portion of Sussex County over the past several decades, property values have increased dramatically. One of the results of this has been a westward movement of middle- and lower-income families, particularly young people. Increasingly scattered suburban development has been encroaching on the traditionally rural, agrarian, and sparsely

populated countryside of central and western Sussex County.

***Effects on Infrastructure and Provision of Services***

The growth of the eastern, coastal portion of the county has reinforced the area’s economic importance to the state. After poultry production, tourism is the county’s largest industry, and the resort areas of Sussex County are the predominant source of tourism revenue and jobs within the state (see Figure 4). The recent boom in population has coincided

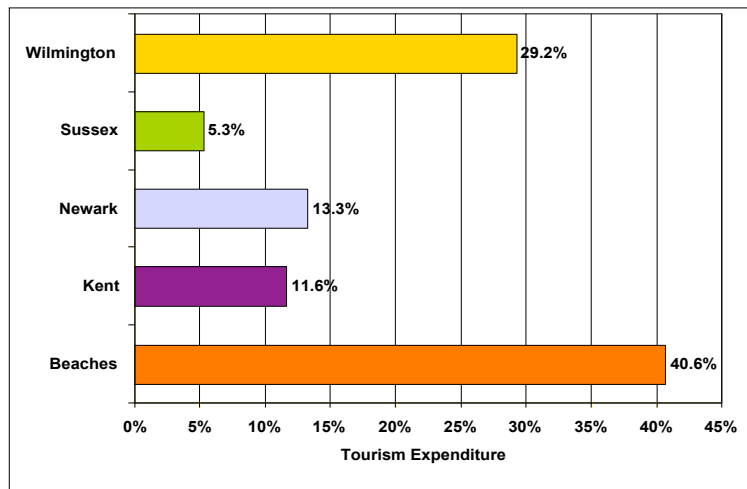


Figure 4. Tourism Expenditures throughout Delaware.



Figure 5. “Five Points” photos. Left photo: Courtesy of DelDOT’s traffic cam. Right photo: Aerial view of the “Five Points” intersection.

with an economic boom driven by marked, dense residential and commercial development, particularly in the eastern section of the county. Economic development and growth, however, come at a cost. As more people live in and visit the area strains on the provision of public services also increase. With more people come more demands on services such as public roads (see Figure 5, a busy intersection near Lewes), utilities (e.g., water, sewer, and electric service), schools, and fire and ambulance services. These services typically are not expanded gradually, but rather periodically require large inputs of capital expenditure. For instance, when a school is pushed beyond its capacity, a new school must be built to meet the community’s needs, a prospect that can cost in the tens of millions of dollars. Similar levels of investment are likewise required to upgrade most public utilities and services when a threshold of demand is exceeded. Like schools, roads, and utilities, fire and emergency medical services (EMS) are not optional, but required, to fulfill the needs of the health and welfare of the community.

Some services, such as schools and EMS are also influenced by the age characteristics of the populace, and are, therefore, sensitive to demographic changes such as shifting age patterns. Therefore, it is important for those responsible for the provision of these various services to be aware of likely short- and long-term changes and trends, so that they may ensure that provision of the services is not impaired. By analyzing trends and planning for future needs, the financial, physical, and political groundwork can be prepared, and valuable services can avoid future disruptions.



## The Lewes Fire Department

Since the provision of fire, rescue, and EMS is so critical to the welfare of the community it serves, the Lewes Fire Department (LFD), Inc., has undertaken the development of a strategic plan to assist in anticipating current and future needs and expenditures.

This report summarizes the findings associated with the development of this plan by the University of Delaware’s Institute for Public Administration (IPA), under contract through the University’s Coastal Community Enhancement Initiative, in support of these strategic-planning efforts. Using GIS mapping and analysis, IPA has compiled a series of base-layer information that can help inform planning decisions by the Lewes Fire Department. IPA has also analyzed current and future demographic trends, from 2000 to 2030, within Sussex County, which will have a profound impact on the provision of service by LFD (see Figure 6 for the district boundaries and fire station locations). The

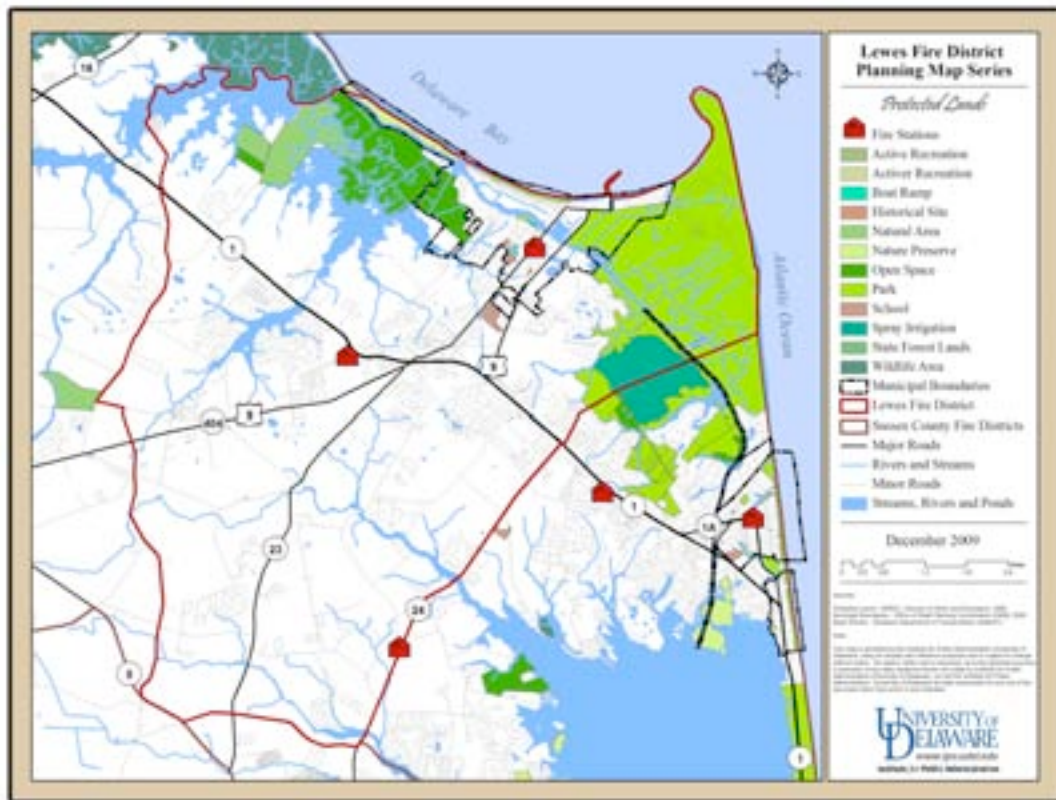


Figure 6. Map showing Lewes Fire Stations, 1, 2 and 3, in relation to natural resources that encompass the area.

homes of all LFD volunteers were also geo-coded and mapped. Additionally, an analysis of recent incidents, their locations, and the associated response times was undertaken. Such mapping and analysis help determine where potential issues such as limitations on service provision or other problems may occur. This information can assist LFD in decision-making related to the allocation of resources (e.g., purchase of fire, rescue, and EMS equipment). In this way LFD’s core mission will be advanced: “[t]he overarching need of the Department, now and in the future, is to continue to meet its public safety mission of protecting lives, property and natural resources.”

To ensure that fire departments meet the needs of the public, the National Fire Protection Association (NFPA) has issues standards relating to response times. For instance, NFPA standard 1720 requires that, for places of densities greater than 1,000 people per square mile, 90 percent of all response times must be nine minutes or less. The strategic plan identifies several challenges LFD faces in its effort to meet this requirement in the coming years through 2030. Such challenges include the need to ensure adequate service to a growing and aging population with an all-volunteer force, the fact that demographic trends indicate an increasingly urbanized service area, and the outreach and education that will be required to inform the public, politicians, and policymakers about future financing demands. The plan provides specific recommendations to help address these challenges, including the identification of specific capital expenditures on fire and EMS equipment, personnel, and improvements to fire stations. Based on the GIS and demographic analysis, it was determined that it is unlikely that a new fire station will be needed before 2030.

## **Study Area**

The Lewes Fire Department’s district encompasses the City of Lewes and environs, including Cape Henlopen and the Cape May–Lewes Ferry terminal, extending westward along State Route 9, and north and south along State Route 1, approximately halfway to Milton and Rehoboth Beach, respectively. The district centers around the “Five Points” intersection, which roughly divides the district into several sections, and which represents a common transportation nexus in the area. The district is diverse, with areas of historic,



Figure 7. District in relation to Route 1, Route 9 and the “Five Points” intersection.

high-density residential and commercial use, areas of institutional, industrial, and heavy marine uses, beach communities, areas of extensive wetland and dune complexes, retirement and vacation communities, suburban subdivisions, and agricultural land. The map in Figure 7 depicts the district boundaries.

## Scope of Work

The focus of effort undertaken by IPA for the Lewes Fire Department (LFD) has been the production of maps and data relevant to the creation of a strategic plan for LFD. Data layers—building footprints, roads, environmental features, land use, and other cultural features—are a key component of these data sets. Additional data, including demographic projections and models, incident mapping, and geo-location of LFD volunteers are also of critical importance to planning efforts. Additionally, a series of meetings with LFD and its representatives was undertaken to present the data, demonstrate its use, and address questions and concerns. Six-hours-worth of hands-on training was conducted to enable ongoing maintenance and proper use of the data and maps.

## Methods and Results

### *Data Compilation*

The following is a list of the data compiled to assist LFD in its strategic planning efforts.

- Framework data (municipal boundaries, communities, parcel boundaries, hydrology, protected lands, roads, and railroads, geographic names, elevation, aerial imagery, geodetic control points)
- Fire districts (county-wide)
- County-wide demographic information
- Age and other demographic information for the years 2010-2030
- Building footprints
- 100-acre grid

- Modified grid (based on DelDOT’s Traffic Analysis Zones)
- Fire station locations
- Sussex County’s future land use
- 2007 land use/land cover
- Environmentally sensitive areas
- 2004 *Strategies for State Policies and Spending* investment zones
- Response-time curves, as provided by LFD

### ***Demographic Projections***

To determine the demographic characteristics within the Lewes Fire District, several datasets were used. Census information from the U.S. Census Department was used as the “baseline” for age-categorized data at the census-block level. The Delaware Population Consortium (DPC) demographic data based on Modified Grid geography was also used to determine predicted population densities across the District. Each Modified Grid unit comprises one or more block units as defined by the U.S. Census Department. DPC tabular information from 2008, which predicts county-wide population by age category for each year from 2000 to 2030, was used as a basis to model projected age characteristics, based on the baseline census data. The Modified Grid geographic layer was altered for the purposes of this investigation by removing uninhabited areas, which include public lands, wetlands, and open water. This was done so that all subsequent density calculations would be based on habitable areas only. An initial investigation was also made using a 100-acre grid as the basis for demographic analysis. This layer was generated for use with this project, and the population values were calculated on a prorated basis. It was decided that the Modified Grid geographic unit was preferable to the 100-acre grid, since the data were originally compiled at the former geography and, further, Modified Grids relate to existing standardized census-block units. Therefore, analysis based on the 100-acre geographic unit is not considered in this investigation.

### ***Gross Population Estimates***

Initially, population across the District was depicted using the Modified Grid data, for which projected total population values had been provided through the year 2030. The four maps in the Figure 8 depict the population densities for four years—2000, 2010,

2020, and 2030—based on DPC projections. The Appendix presents the full series of maps of population densities, including those for the years 2000, 2005, 2010, 2015, 2020, 2025, and 2030.

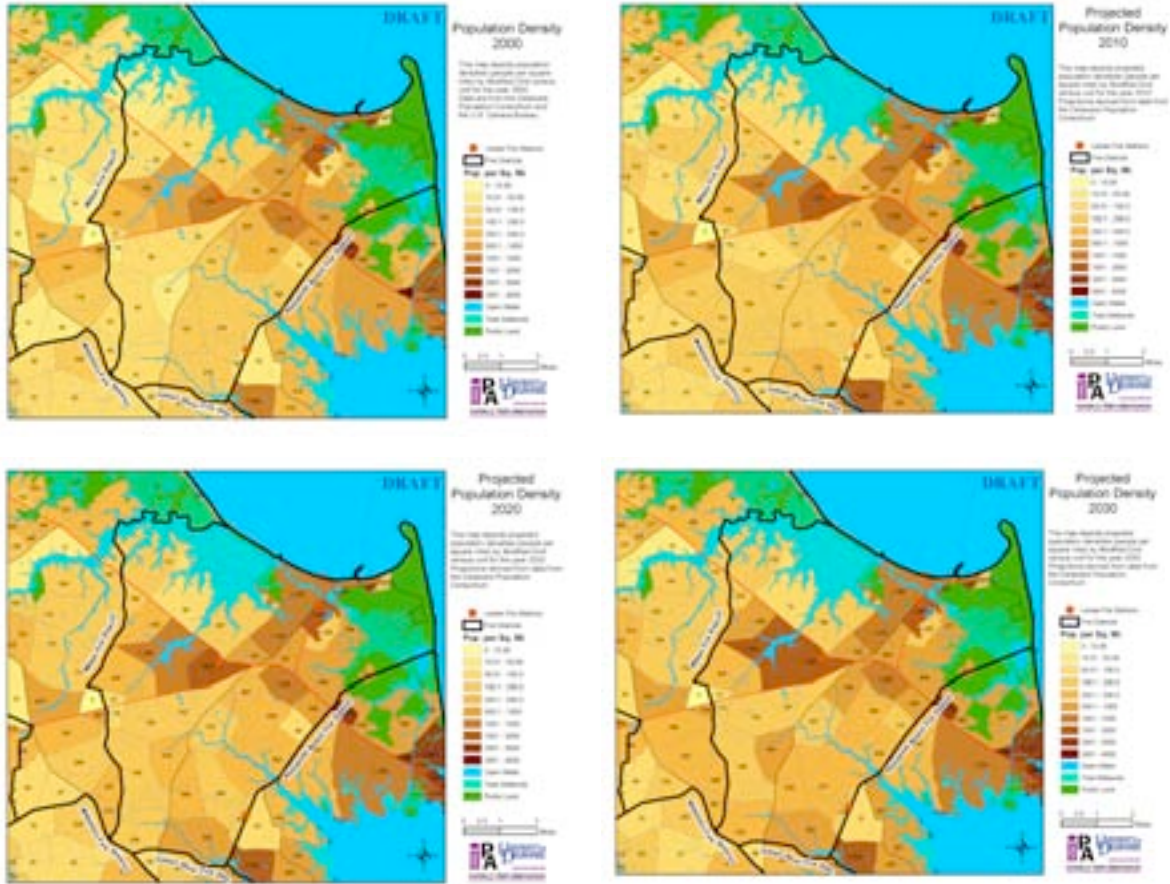


Figure 8. Population densities in the Lewes Fire District based on Delaware Population Consortium projections, 2000-2030. See the Appendix for the complete map series.

Population projections indicate that there will be a moderate increase across the area, with particular development occurring along the western edge of the District, and in the areas along State Route 1 (SR1), to the northwest of fire station #2 (represented by a dot near the center of the district). Figure 9 summarizes the population changes within the Lewes Fire District. From a population of 13,376 in 2000, it is projected that the 2030 population will be 23,039, an increase of 72 percent.

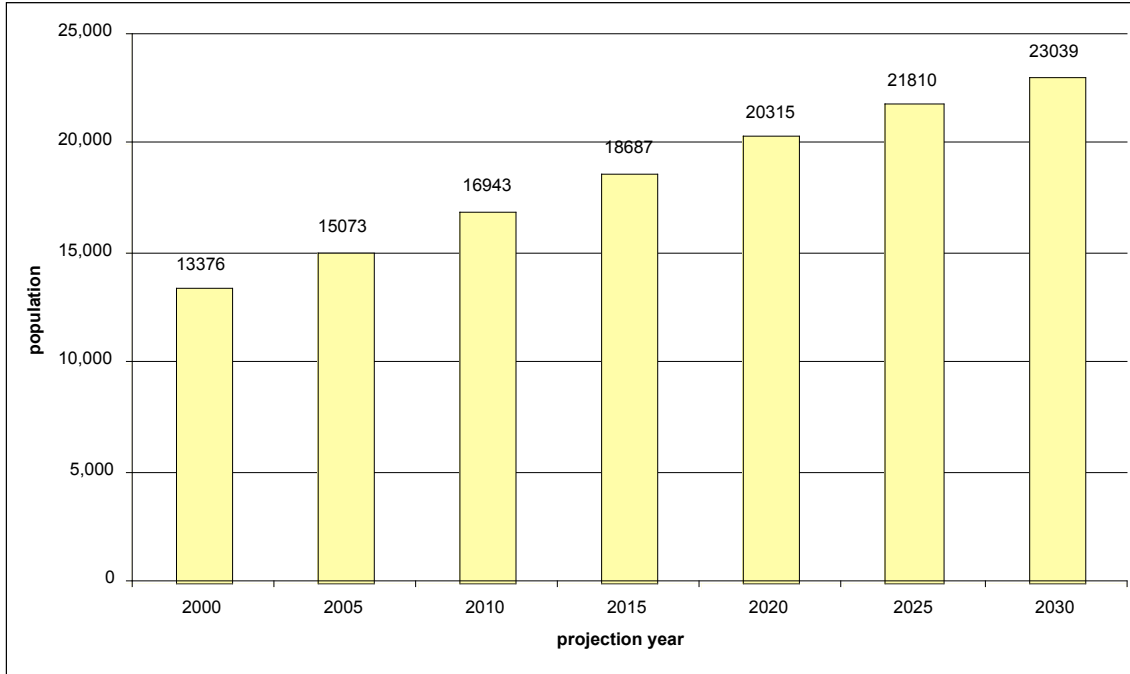


Figure 9. Projected population change within the Lewes Fire District, 2000 to 2030. Source: Delaware Population Consortium, small-area projections

### ***Age-Profile Modeling***

DPC population projections for the years 2000 to 2030 are based on the Modified Grid geographic unit; however, detailed age characteristics are given only at larger units of aggregation. For Sussex County, age-profile data are compiled at the county-wide level. Since provision of fire and EMS services, in particular, are highly dependent on age of the target population (with those 65 years old and above requiring many more emergency service calls), detailed age characteristics at the Modified Grid scale were modeled. Age categories were based on the following ranges: 0 to 4 years, 5 to 9 years, 10 to 14 years, 15 to 19 years, 20 to 24 years, 25 to 29 years, 30 to 34 years, 35 to 39 years, 40 to 44 years, 45 to 49 years, 50 to 54 years, 55 to 59 years, 60 to 64 years, 65 to 69 years, 70 to 74 years, 75 to 79 years, 80 to 84 years, and 85 and up.

An initial (“time 0”) age distribution was calculated using block-level census data from the 2000 decennial census, which were then aggregated to the Modified Grid mapping level. This aggregation is possible since Modified Grids are conterminous with one or several census blocks. The relative distribution among age categories for year 2000

census-block data was calculated based on normalized Z-score (or *standard score*), which assigns a value equal to the number of standard deviations above or below the county-wide mean for a given age category, for each block group<sup>1</sup>.

The following formula is used for calculating the Z-Score (z) for a given age category.

$$z = (x - \mu)/s$$

where:

**x** is the total number of people of a given age category in a census block, within Sussex County

**μ** is the mean of all census blocks within Sussex County for that age category

**s** is the standard deviation within an age category for all census blocks within Sussex County

Using the Z-score, and assuming a relatively consistent distribution over time, it is then possible to estimate the pro-rated populations within an age group for any year that has projected population data (yearly from 2000 to 2030, in this case). It is necessary to know the standard deviation to back-calculate the population from the Z-score; since the distribution of population for projected years is unknown, the standard deviation from the year 2000 data for each age category was used as an approximation.

Using projected data obviously limits the accuracy of the population's age distribution within the Lewes Fire District, which results in less accurate numbers and values derived from those projections. The assumption is that the relative distributions within each Modified Grid unit remain static over the study period. Thus, to apportion the projected population into age categories, a consistent distribution is applied to the total projected population to determine the number of people in each age category. Since the age-distribution curve will not remain constant, there is a discrepancy between the total population as predicted by the DPC and the total population calculated in the age-

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<sup>1</sup> Note that calculation of the Z-score assumes a near-normal distribution within age groups across the county's blocks.

distribution model. This discrepancy results in an over-prediction of population, relative to the DPC values, of approximately five percent in 2030, across Sussex County.

Using information at the Modified Grid level, projected to the year 2030, it is possible to determine where populations at particular risk and that may require a high level of emergency-service provision are likely to reside in future years. Figure 10 summarizes the number and proportion of those of age 65 and above residing within the Lewes Fire District. Between 2000 and 2030, it is expected that the population of those 65 and older will increase from 3,312 to 6,483, or from 24 to 28 percent of the total projected population. The Appendix presents a map series of projected percentages of those aged 65 and older, based on Modified Grid mapping unit.

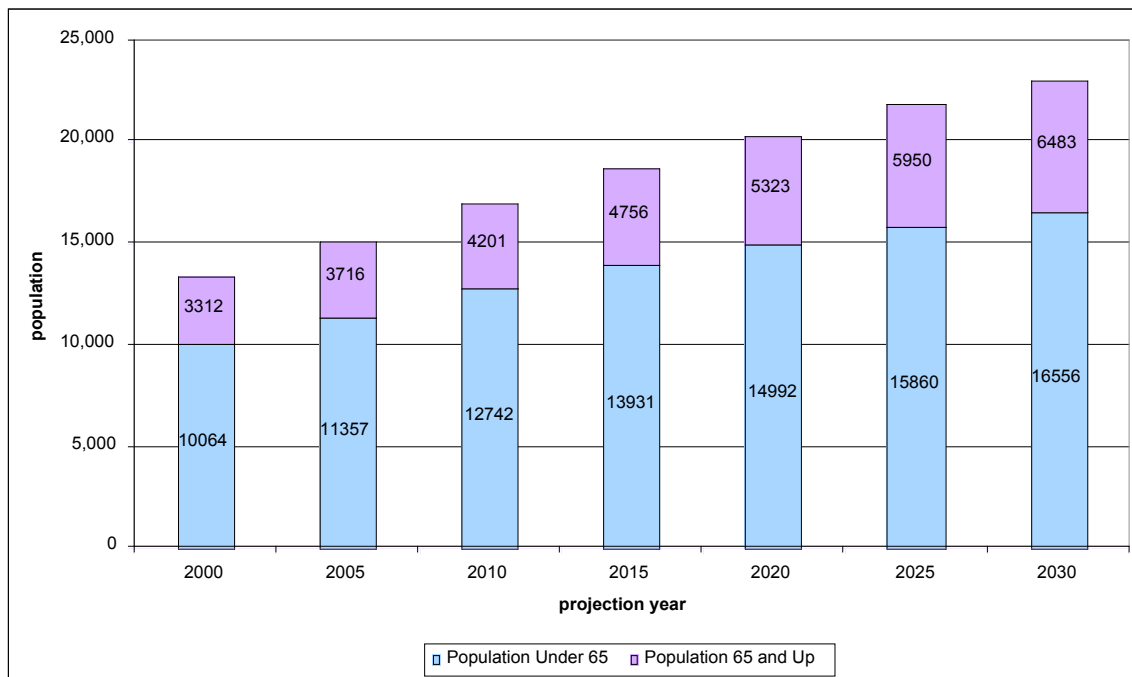


Figure 10. Proportion of those aged 65 and older within the Lewes Fire District, based on DPC population projections and U.S. Census data.

### ***Incidents and Volunteers***

A critical component of capacity planning for LFD’s future needs is an understanding of the geographic distribution of the incidents to which it responds, the nature of each emergency call, the location of the responding station, and the locations of the homes of the volunteers who respond to the call. Potential logistical problems can thus be



identified and addressed when planning for capital expenditures, staffing needs, and asset allocation. This information, in conjunction with an understanding of the likely demographic trends within the district, enhances the likelihood that LFD will be able to meet current and future demands and fulfill the requirements set forth by the NFPA.

### Incident Mapping

Using a spreadsheet of incidents to which the LFD responded in the year 2007, a GIS layer of points was created from the latitude and longitude of each incident.<sup>2</sup> To determine how long it took responders to arrive at the scene, the time elapsed between the point at which the 911 dispatcher contacts the fire station (“first unit assigned”) and the point at which the first vehicle arrives on the scene (“first unit arrived”) was calculated. For the purposes of NFPA regulations, this is defined as the response time.

LFD maintains three separate fire stations—Station 1 (headquarters) is in downtown Lewes, Station 2 is near “Five Points” (the intersection of State Route 1 and State Route 9), and Station 3 lies at the boundary with the Rehoboth Beach Fire Department, and is shared by both departments.

Using information about which vehicle, or unit, responded to an incident, the station that responded was determined. Also, incidents that involved EMS response were separated from those that entailed fire-equipment response.

The figures in this section illustrate the locations incidents from 2007, color-coded based on response times for each station, as well as EMS-related calls requiring

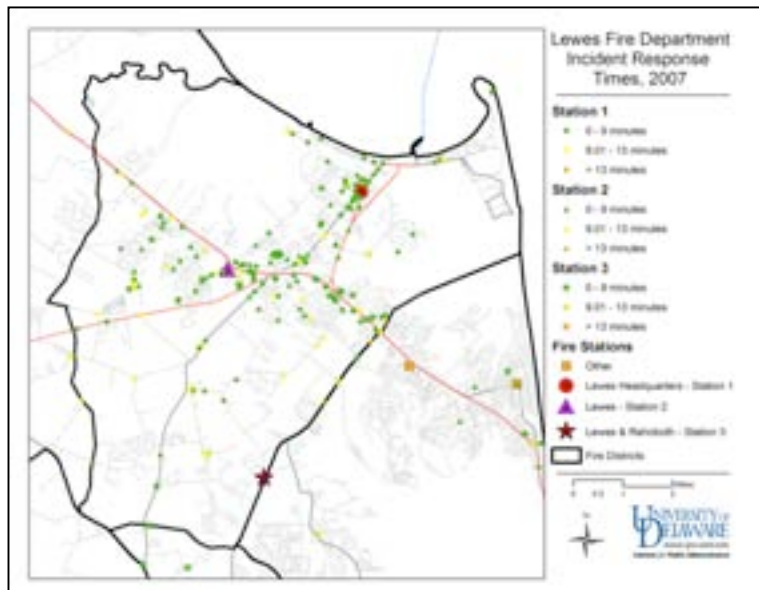


Figure 11. Response times for three Lewes Fire Department

<sup>2</sup> A spreadsheet for incident data from 2008 was not used, as it was determined to be incomplete.

ambulance service (these are not specific to one particular station). Figure 11 illustrates fire-equipment response times for Stations 1, 2, and 3, for the year 2007. Figure 12 illustrates response times for incidents requiring EMS units only.

### Volunteer mapping

For a volunteer fire department such as LFD, the mapping of incident locations represents only part of the picture. In order to plan comprehensively for adequate capacity, the location of volunteers who respond to calls is also an important

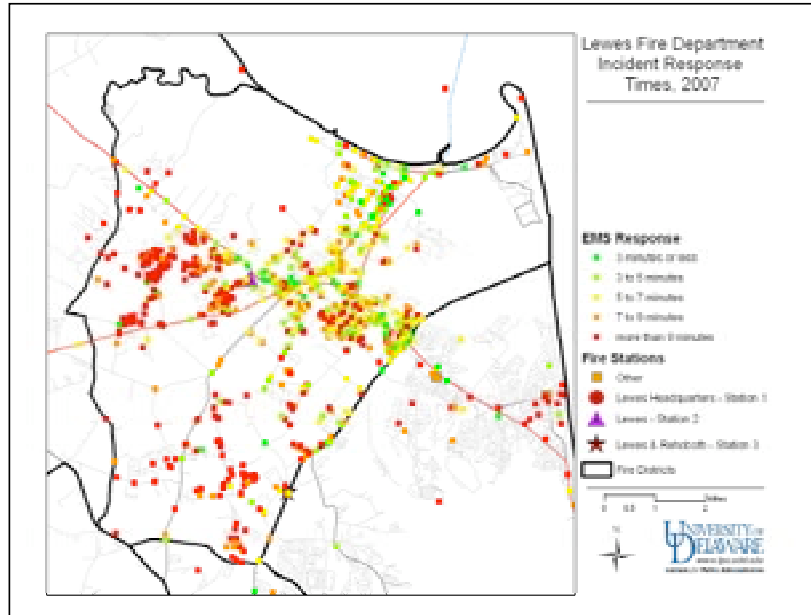


Figure 12. EMS response times for the Lewes Fire Department, 2007.

consideration. The time required for responders to arrive at the fire station is an additional factor in determining the total time of response. Knowing where volunteers currently reside and are likely to reside, has a profound impact on LFD's ability to continue to provide service to the district. Factors such as planned changes in infrastructure, additional traffic loads, trends in housing prices and age structures, among others, will affect who volunteers, where those volunteers live in relation to their corresponding stations, and how quickly the volunteers can travel from home to station.

To gain an understanding of current patterns, the addresses of current volunteers were geo-coded using DelDOT street information to create a map layer of LFD's volunteer force. Figure 13 illustrates the locations of current volunteers in the LFD.



Figure 13. Map showing Lewes Fire Stations, 1, 2 and 3, with fire department members represented as points. Green stars are active members, yellow triangles are career members, and dark blue stars are life members. The golden color represents Sussex County communities.

Note that volunteers tend to be clustered in residential areas surrounding each station. Changes in residential development patterns, and the availability of affordable housing will likely have an effect on future locations of volunteers. Another concern for LFD will be the age profile of the volunteer corps, recruitment of younger volunteers, and the issue of significant increases in population, particularly in those over the age of 65. The recent dramatic increase in housing costs in the coastal areas of

Sussex County, in conjunction with the likelihood of fewer active volunteers among the increasingly elderly population could precipitate a shortage of volunteers who can locate close enough to the existing fire stations to allow for continued provision of service at current funding levels.

## Implications and Future Directions

Several implications are suggested by the current study. First, it is clear that significant changes have been, and will probably continue, occurring in Sussex County. Many of these changes will have impacts on the Lewes Fire Department and its ability to provide continued service at present levels to the district as a whole. Demographic, economic, and structural changes in the district and the region represent challenges to LFD's core mission. Even as funding for fire and emergency services is becoming scarcer, a growing and aging population, increased development, particularly of large residential communities outside the traditional zones of growth, a significant and growing seasonal

population, and increased traffic flows will put more pressure on the LFD and others in the county and region to increase and enhance their level of service.

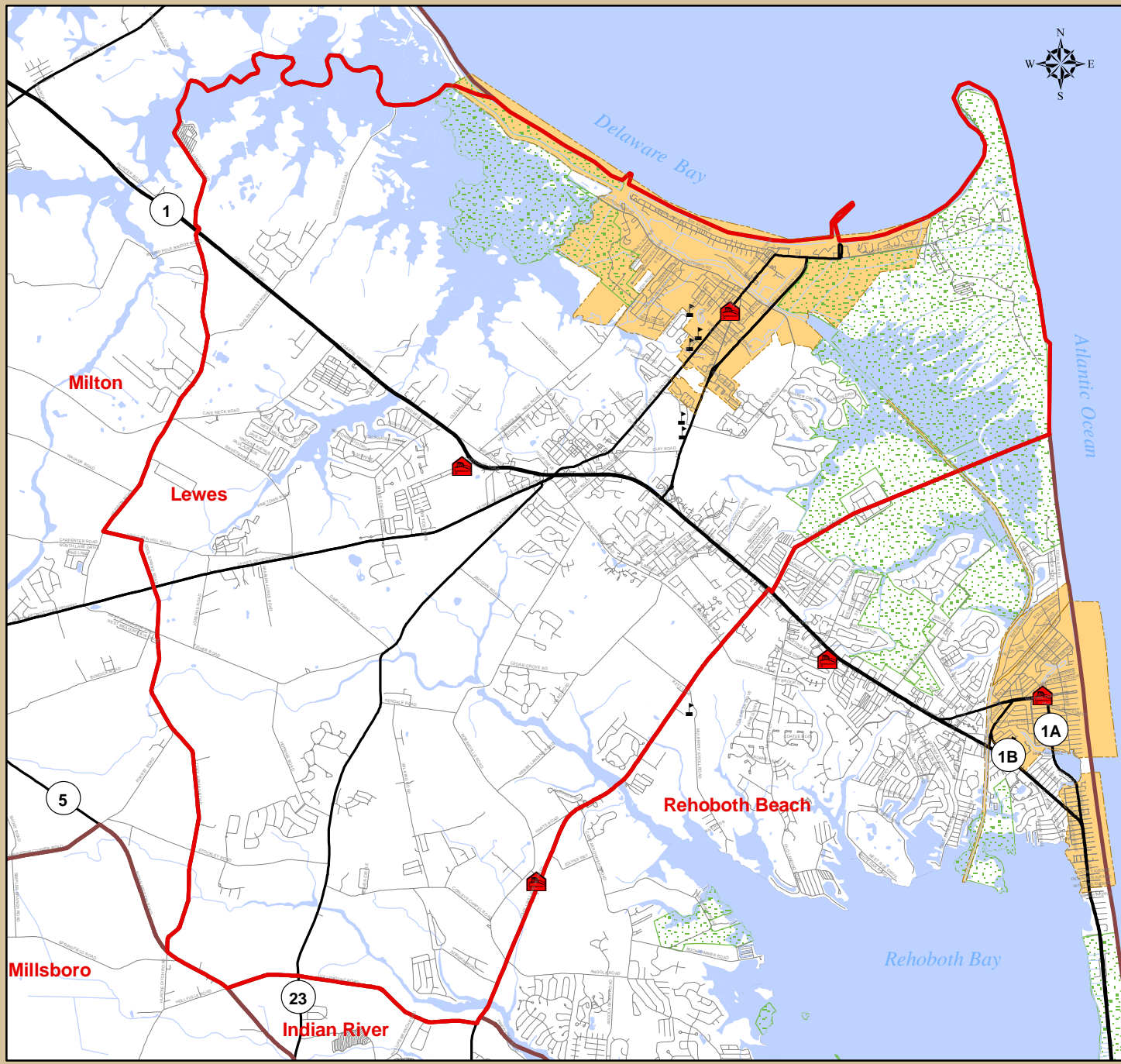
Second, a capacity-planning effort must be comprehensive, addressing all issues related to continued provision of service. Therefore, such a study must recognize the need for communication and collaboration among all fire districts in the region. Changes that affect all of Sussex County will necessarily require a coordinated response among districts, many of which are facing similar challenges. It is recommended that communication among fire departments in Sussex County be enhanced, so that planning efforts such as that being undertaken by LFD may assist others in addressing their own, and the region's, evolving issues.

IPA has gathered and analyzed much of the data presented in this report for the entire county. Making best use of this information requires a commitment from individual departments to use it in comprehensive capacity-planning efforts. The strategic plan for LFD identifies specific challenges faced in coming years, including identification of funding sources, likely future demands, impending capital investments, and retention and recruitment of volunteers. These concerns will be best addressed at the county and regional level to enable coordination of service, minimize duplication, and avoid wasteful spending. By doing so, the fire and emergency-services community can best ensure adequate coverage to the area now and in the future. Below are some additional tasks and considerations that may be worth pursuing in the future.

- Map the incident locations based on the seasonal changes of the Lewes/Rehoboth Beach area.
- Develop procedures for updating the data once the 2010 census data is available.
- Coordinate the reporting and gathering of incident-location data, so it can easily be mapped and analyzed within a GIS, or other, application.
- Develop data standards and practices for LFD that could then be replicated for other departments in the state.

## **Appendix. Maps**

- **Base Map**
- **Firefighter Members Close-up View**
- **Firefighter Members**
- **State Strategies for Policies & Spending**
- **Preliminary Land Use Service (PLUS) Projects**
- **2007 Land Use / Land Cover**
- **Groundwater-Recharge Potential and Wellhead-Protection Areas**
- **Floodplains**
- **Historic Resources**
- **Protected Lands**
- **Wetlands and Watersheds**
- **Sussex County Fire Districts and Stations**



# Lewes Fire District Planning Map Series

## Base Map

- Lewes Fire District
- Sussex County Fire Districts
- Municipal Boundaries
- State Parks
- Public Schools
- Fire Stations
- Major Roads
- Minor Roads

December 2009



Sources:  
 Fire Station Locations - Water Resources Agency, University of Delaware, 2008.  
 Municipal Boundaries - Office of State Planning Coordination (OMB), 2009.  
 Major Routes - Delaware Department of Transportation (DelDOT).

Note:  
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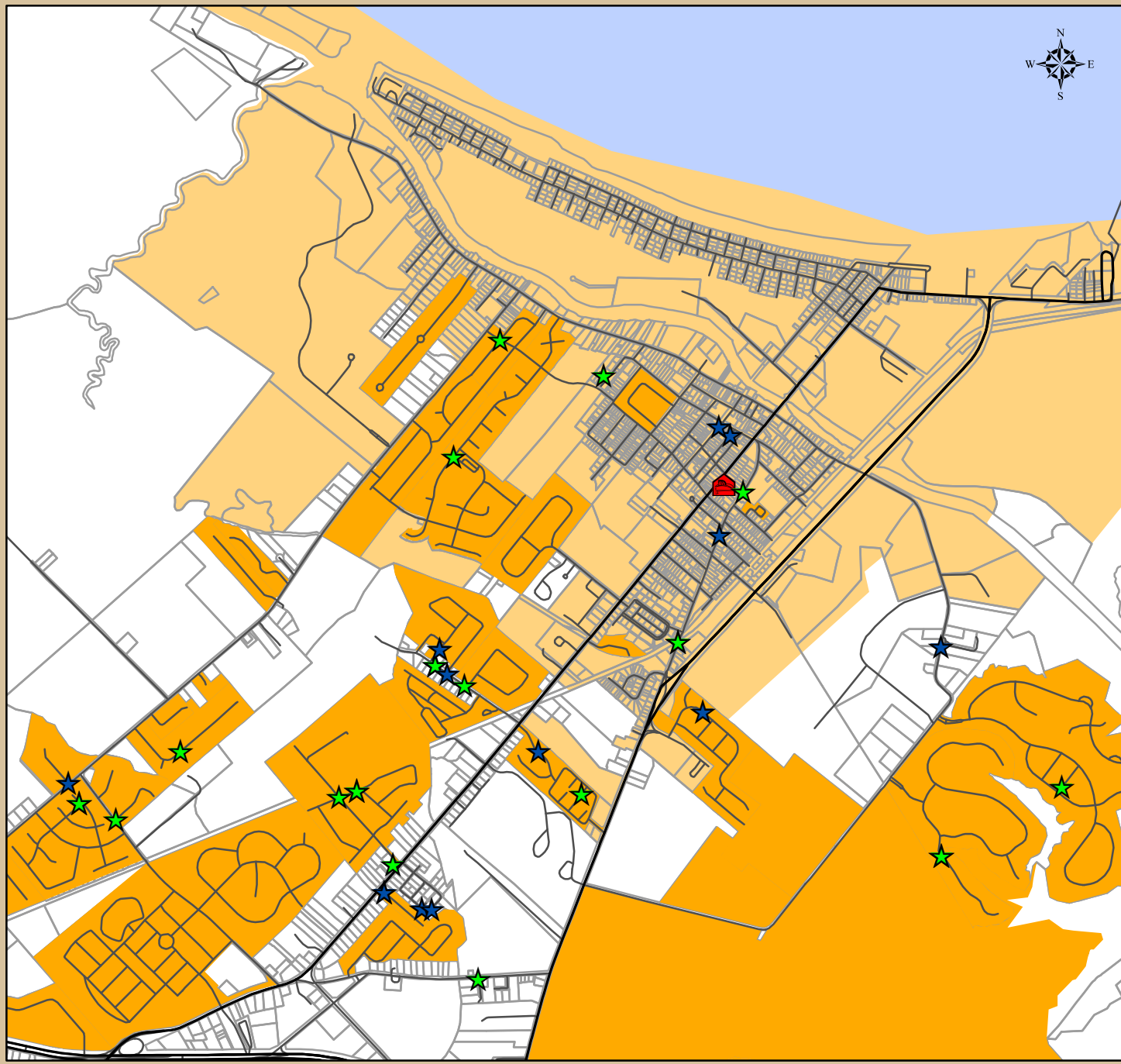


# Lewes Fire District Planning Map Series

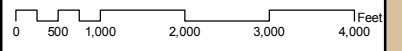
## *Fire Fighter Members Closeup View*

### Members

-  Active
-  Career
-  Life
-  Fire Stations
-  Roads
-  Communities
-  Municipal Boundaries



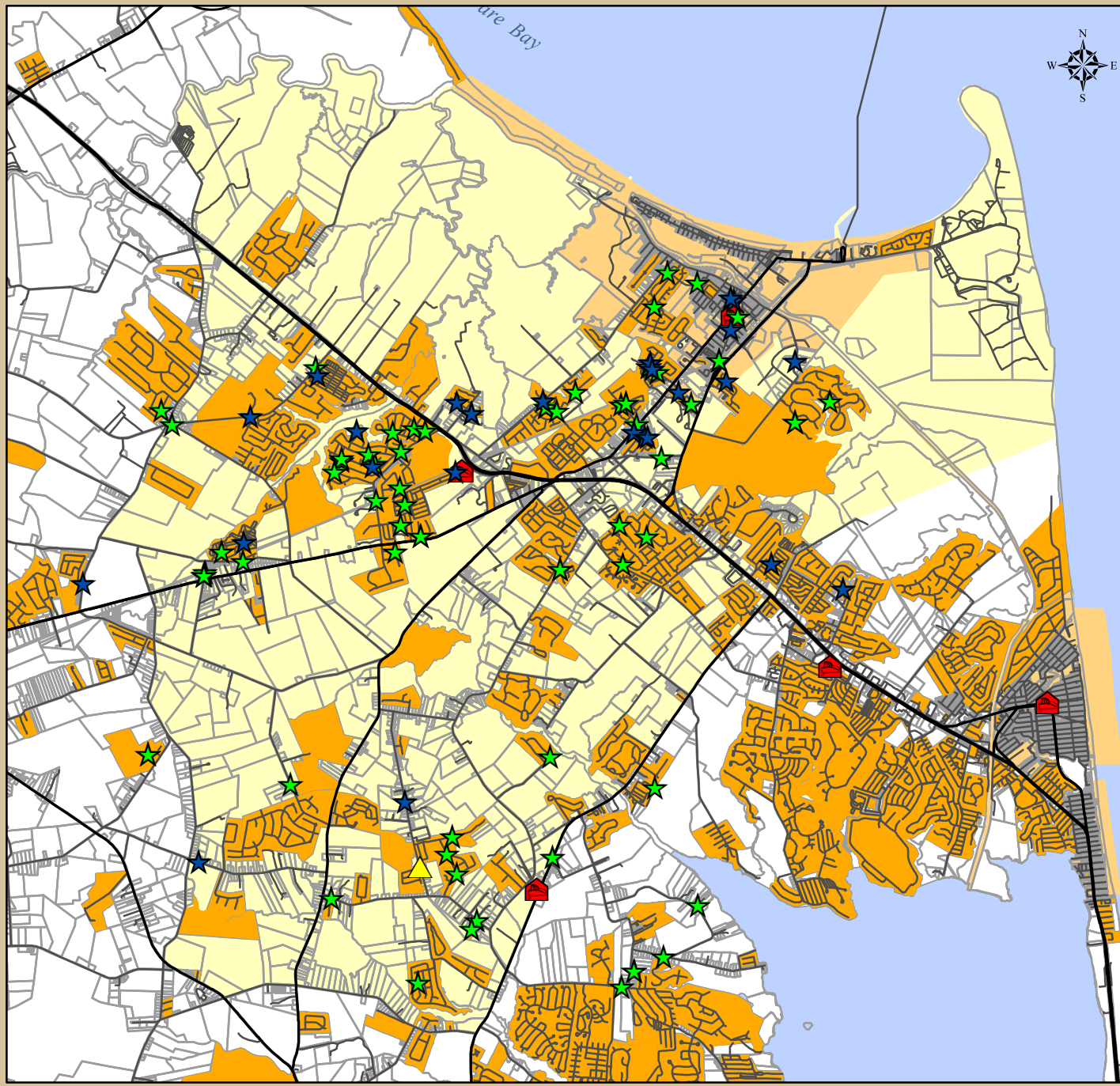
December 2009



Sources:  
Fire Station Locations - Water Resources Agency, University of Delaware, May 2009.  
Fire Station Members - created by geocoding home address locations with the TeleAtlas Roads, May 2009.  
Municipal Boundaries - Office of State Planning Coordination (OMB), 2009.  
Parcel Boundaries - Sussex County Mapping & Addressing Department, 2009.  
Major Routes - Delaware Department of Transportation (DelDOT).

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# Lewes Fire District Planning Map Series

## *Fire Fighter Members*

### Member Status

- ★ Active
- ▲ Career
- ★ Life
- Fire Stations
- Lewes Fire District
- Roads
- Communities
- Municipal Boundaries

December 2009



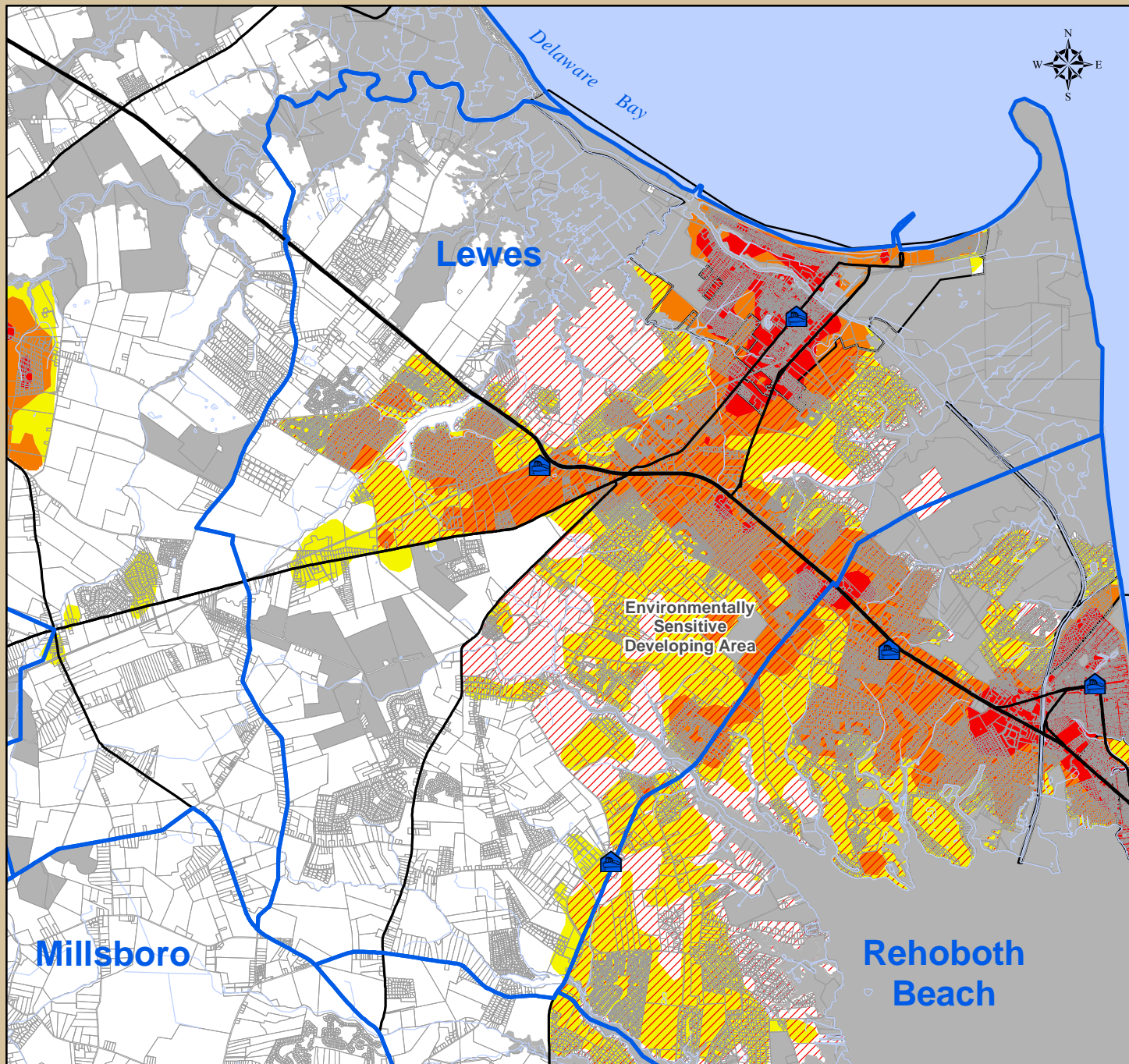
#### Sources:

Fire Station Locations - Water Resources Agency, University of Delaware, May 2009.  
 Fire Station Members - created by geocoding home address locations with the TeleAtlas Roads, May 2009.  
 Municipal Boundaries - Office of State Planning Coordination (OMB), 2009.  
 Parcel Boundaries - Sussex County Mapping & Addressing Department, 2009.  
 Major Routes - Delaware Department of Transportation (DelDOT).

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# Lewes Fire District Planning Map Series

*State Strategies for Policies & Spending*

- Fire Stations
- Sussex County Fire Districts
- Parcel Boundaries
- Out of Play
- Overlays**
- Area of Dispute
- Area of Study
- Env. Sens. Dev. (Sussex)
- Strategy Level**
- Level 1
- Level 2
- Level 3
- Level 4

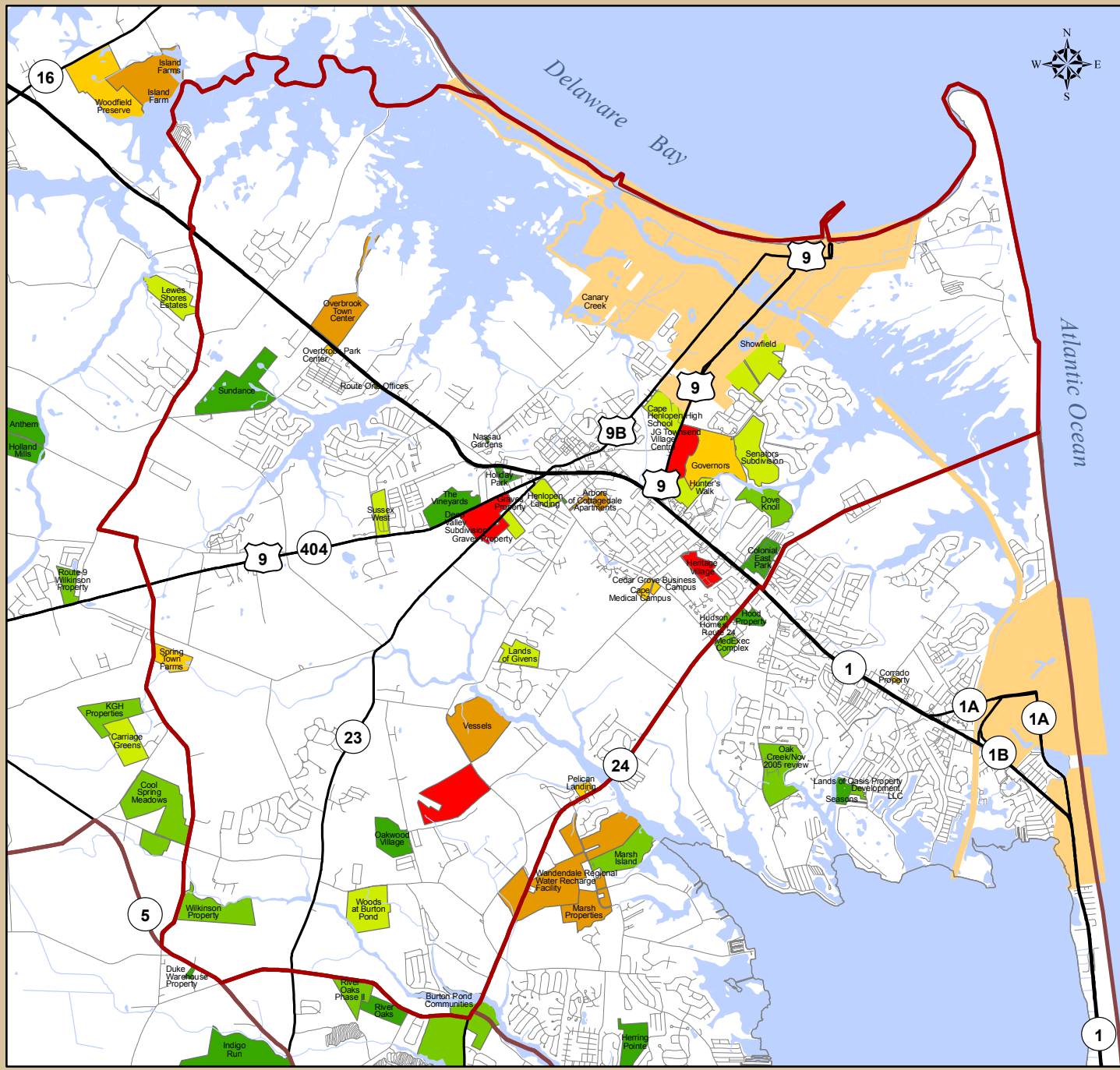
December 2009



Sources:  
 Fire Station Locations - Water Resources Agency, University of Delaware, 2008.  
 Fire Districts - Census  
 State Strategies for Policies & Spending - Office of State Planning Coordination (OMB), 2004.  
 Municipal Boundaries - Office of State Planning Coordination (OMB), 2009.  
 Parcel Boundaries - Sussex County Mapping and Addressing Department, March 2009.  
 Major Routes - Delaware Department of Transportation (DelDOT).

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## Lewes Fire District Planning Map Series

*Preliminary Land Use  
Service (PLUS) Projects*

### PLUS Projects

- 2004
- 2005
- 2006
- 2007
- 2008
- 2009

- Lewes Fire District
- Sussex County Fire Districts
- Municipal Boundaries
- Major Roads
- Minor Roads
- Streams, Rivers and Ponds
- Rivers and Streams

December 2009



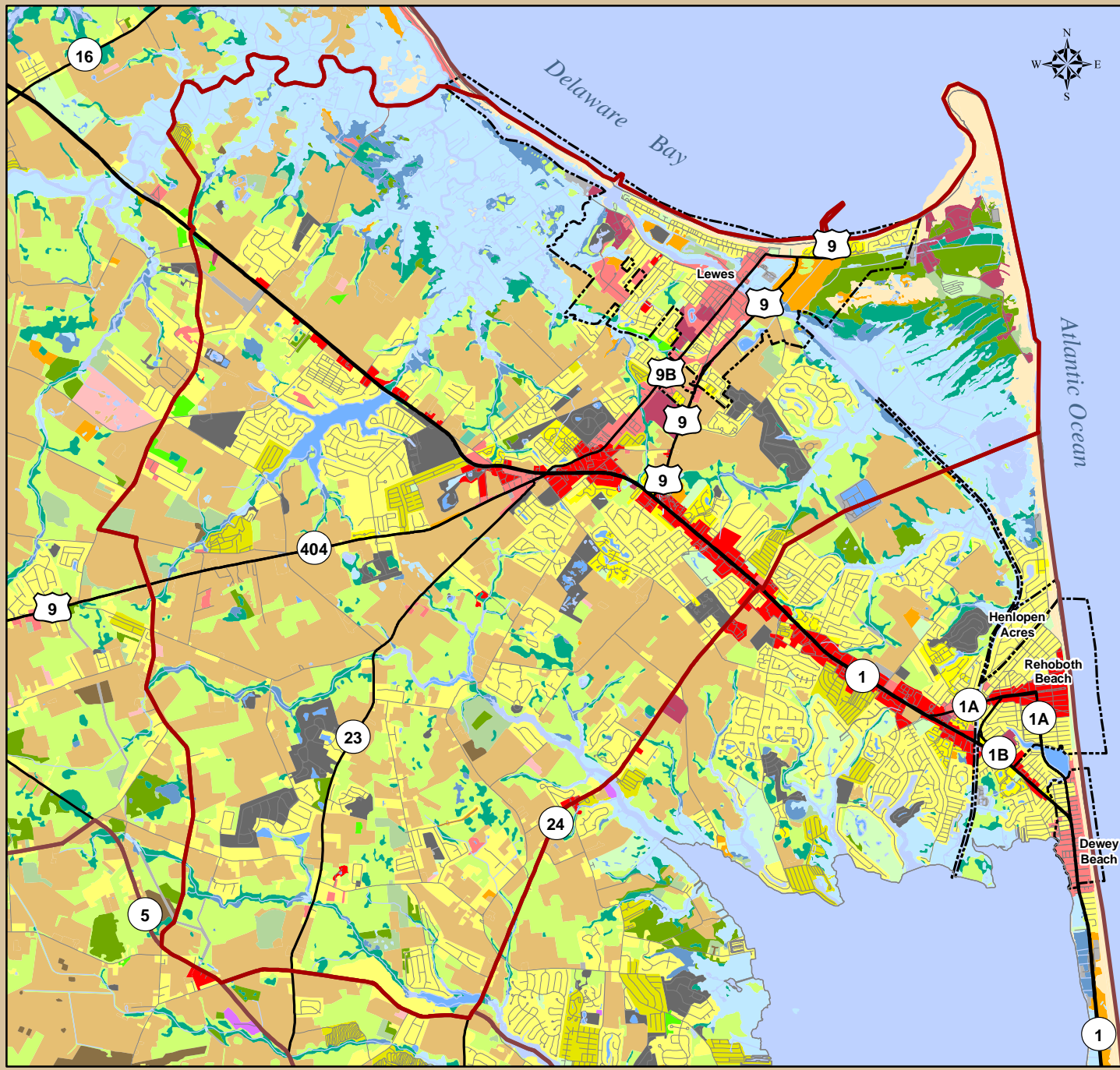
Sources:

Preliminary Land Use Service (PLUS) - Office of State Planning  
Coordination (OMB), downloaded December 2009  
Municipal Boundaries - Office of State Planning Coordination (OMB), 2009.  
Major Routes - Delaware Department of Transportation (DelDOT).

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## Lewes Fire District Planning Map Series

### 2007 Land Use / Land Cover

- Single Family Dwellings
- Multi-Family Dwellings
- Mobile Home Parks/Courts
- Commercial
- Industrial
- Transportation/Communication/Utilities
- Mixed Urban/Built-up
- Institutional/Governmental
- Recreational
- Farms, Pasture, Cropland
- Confined Animal Feeding Operations
- Rangeland
- Orchards/Nurseries/Horticulture
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Brush Rangeland
- Clear-cut
- Man-made Reservoirs and Impoundments
- Marinas/Port Facilities/Docks
- Open Water
- Emergent Wetlands - Tidal and Non-tidal
- Forested Wetlands - Tidal and Non-tidal
- Scrub/Shrub Wetlands - Tidal and Non-tidal
- Sandy Areas and Shoreline
- Extraction and Transitional

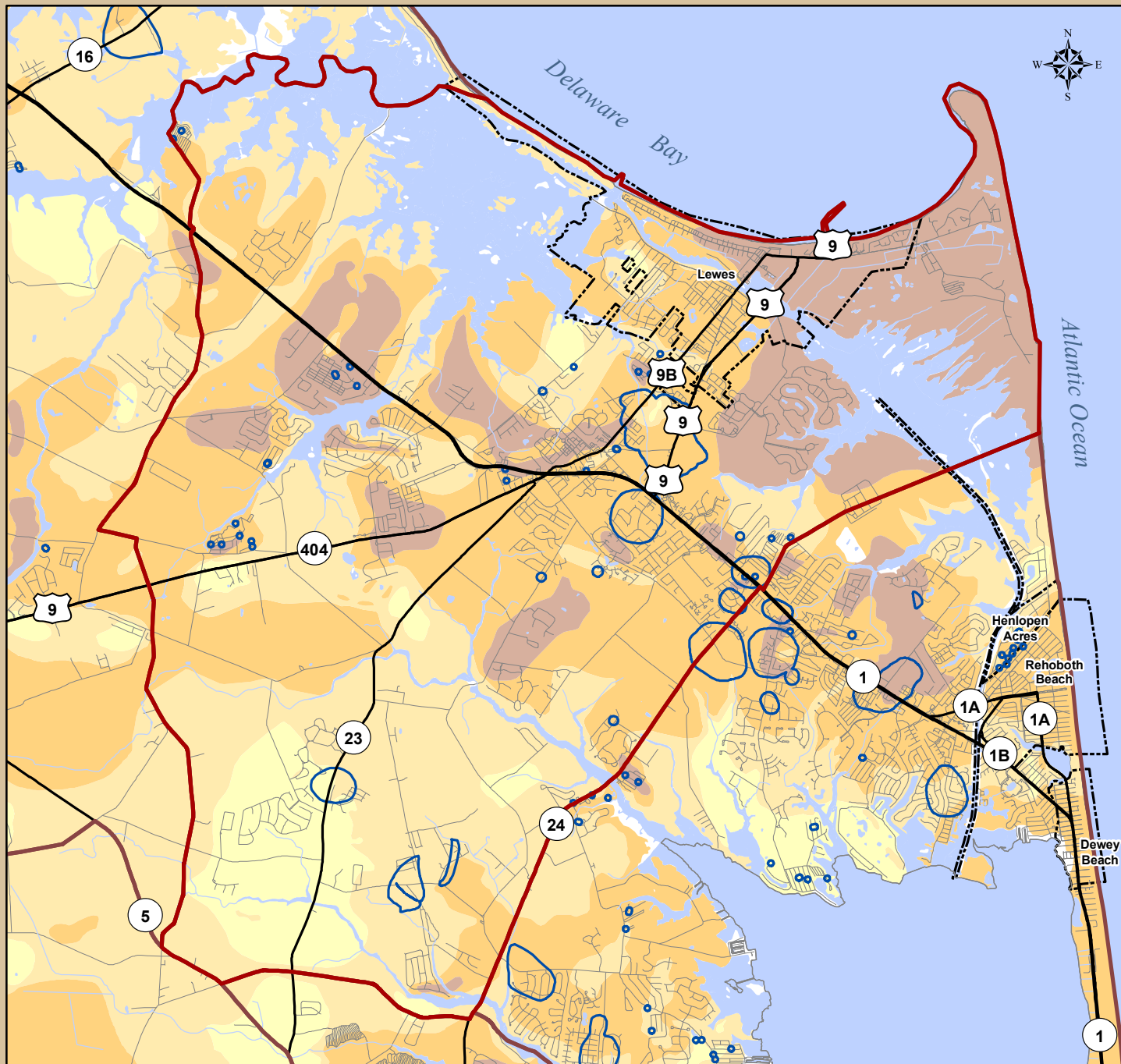
December 2009



Sources:  
 2007 Land Use / Land Cover - derived from the 2007 Aerial Photography.  
 Municipal Boundaries - Office of State Planning Coordination (OMB), 2009.  
 Major Routes - Delaware Department of Transportation (DelDOT).

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## Lewes Fire District Planning Map Series

### *Groundwater Recharge Potential and Wellhead Protection Areas*

- Groundwater Recharge Potential
- excellent
  - good
  - fair
  - poor
  - Wellhead Protection Areas
  - Lewes Fire District
  - Sussex County Fire Districts
  - Major Roads
  - Minor Roads
  - Rivers and Streams
  - Streams, Rivers and Ponds

December 2009



Sources:

Groundwater Recharge Potential - Delaware Geological Survey, 2002.  
 Wellhead Protection Areas - DNREC, Division of Water Resources  
 Municipal Boundaries - Office of State Planning Coordination (OMB), 2009.  
 Major Routes - Delaware Department of Transportation (DelDOT).

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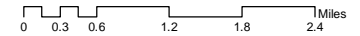


# Lewes Fire District Planning Map Series

## Floodplains

- 500 Year Floodplain
- 100 Year Floodplain
- Fire Stations
- Sussex County Fire Districts
- Communities
- Major Roads
- Minor Roads
- Rivers and Streams

December 2009

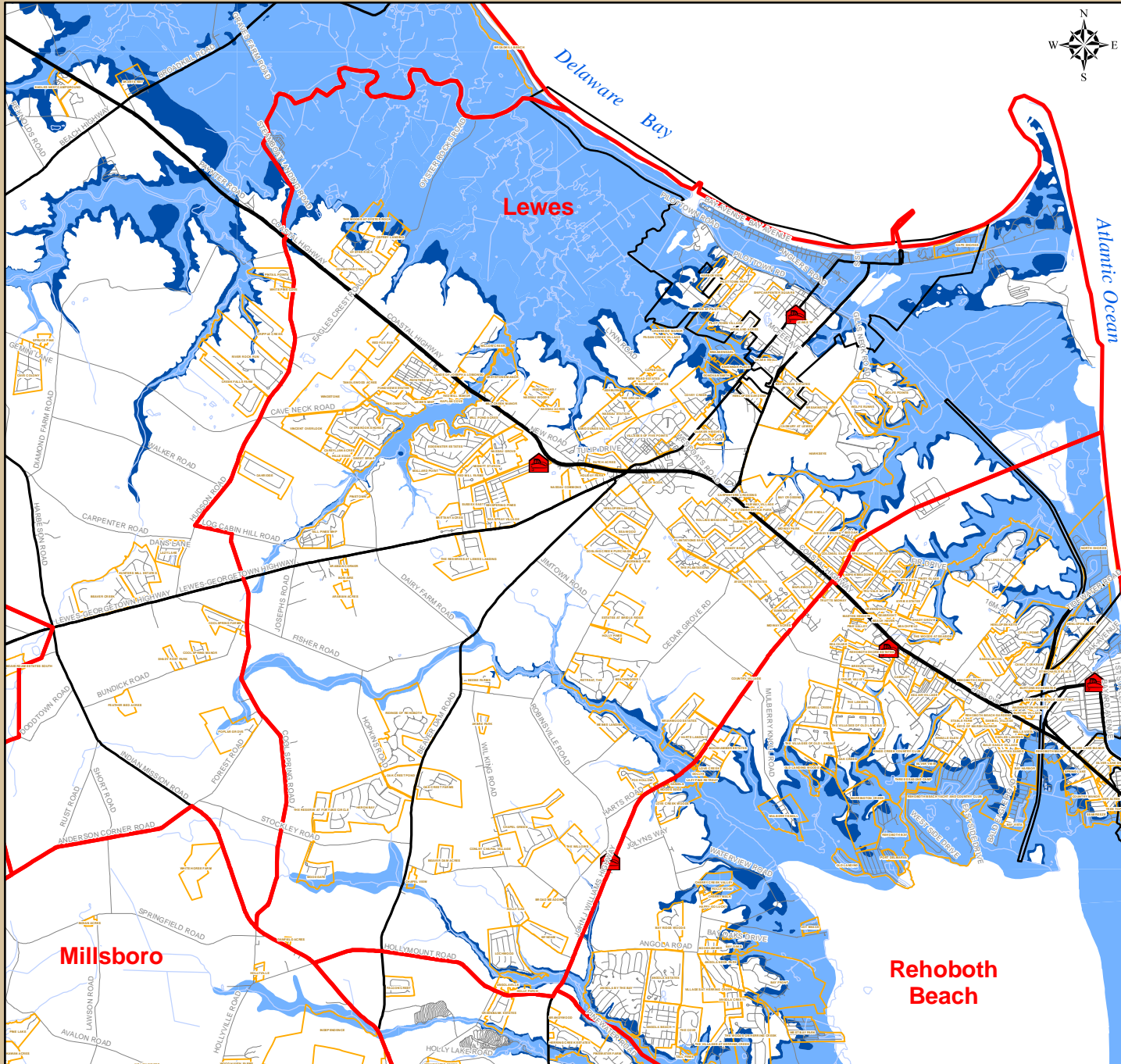


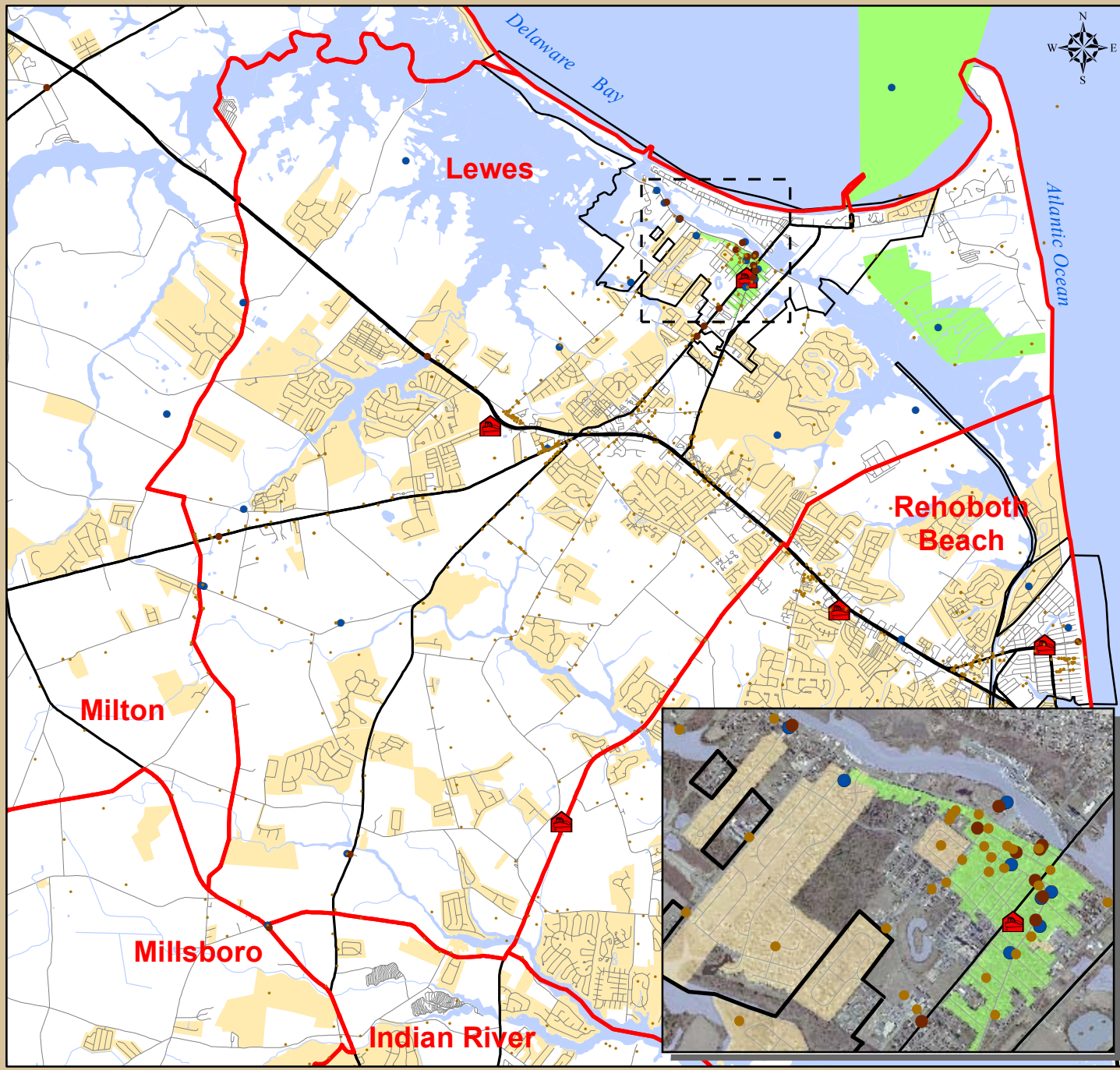
Sources:

Floodplains - FEMA floodplains.  
 Communities - Sussex County Mapping and Addressing Dept., November 2009.  
 Fire Station Locations - Water Resources Agency, University of Delaware, 2008.  
 Fire Districts - Census.  
 Municipal Boundaries - Office of State Planning Coordination (OMB), 2009.  
 Major Routes - Delaware Department of Transportation (DelDOT).

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## Lewes Fire District Planning Map Series

### *Historic Resources*

- Historic Markers
- NR of Historic Places
- Buildings over 50 yrs old
- NR of Historic Districts
- Fire Stations
- Sussex County Fire Districts
- Major Roads
- Rivers and Streams
- Minor Roads
- Communities
- Streams, Rivers and Ponds

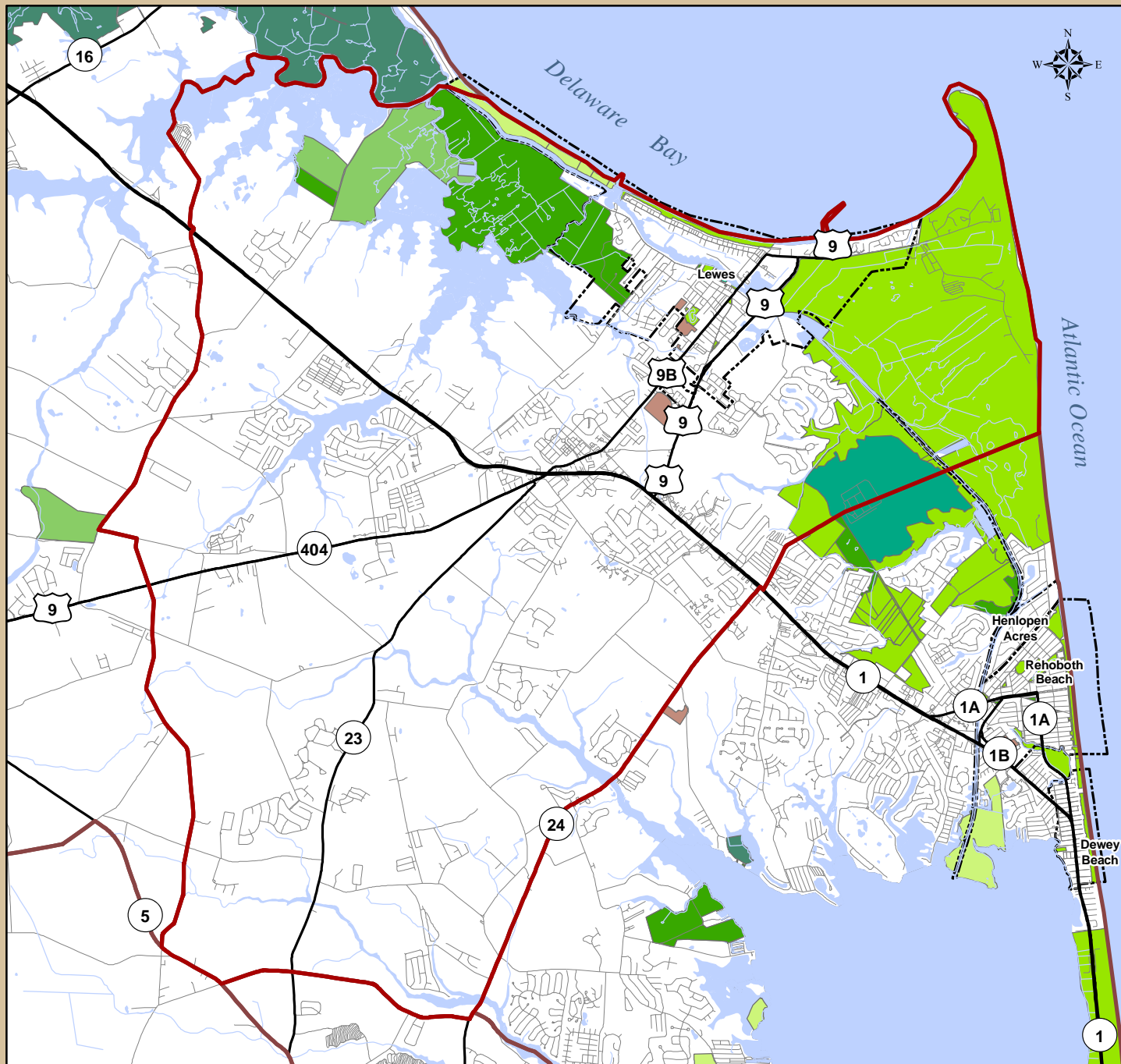
December 2009



Sources:  
 Historic Markers - Delaware Public Archives, Division of Historical and Cultural Affairs.  
 Buildings over 50 years old - compiled by the Center for Historic Architecture and Design (CHAD), UD.  
 National Register of Historic Places and National Register of Historic Districts - National Park Service, Department of the Interior.  
 Communities - Sussex County Mapping and Addressing Dept., 11/04/09.  
 Fire Station Locations - Water Resources Agency, University of Delaware, 2008.  
 Fire Districts - Census.  
 Municipal Boundaries - Office of State Planning Coordination (OMB), 2009.  
 Major Routes - Delaware Department of Transportation (DelDOT).

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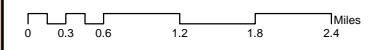


## Lewes Fire District Planning Map Series

### Protected Lands

- Active Recreation
- Activer Recreation
- Boat Ramp
- Historical Site
- Natural Area
- Nature Preserve
- Open Space
- Park
- School
- Spray Irrigation
- State Forest Lands
- Wildlife Area
- Lewes Fire District
- Sussex County Fire Districts
- Major Roads
- Minor Roads
- Rivers and Streams
- Municipal Boundaries
- Streams, Rivers and Ponds

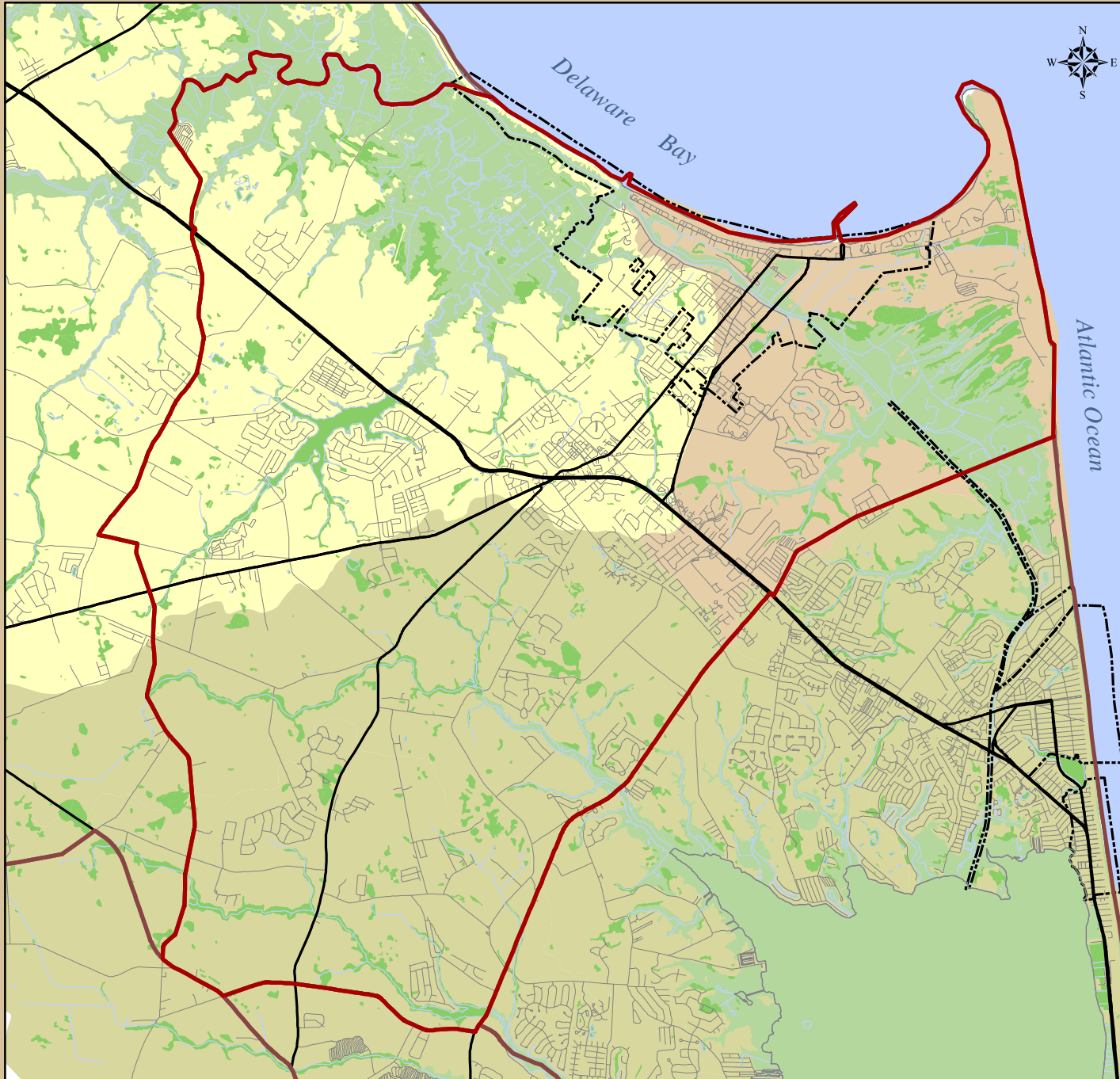
December 2009



Sources:  
 Protected Lands - DNREC, Division of Parks and Recreation, 2009.  
 Municipal Boundaries - Office of State Planning Coordination (OMB), 2009.  
 Major Routes - Delaware Department of Transportation (DelDOT).

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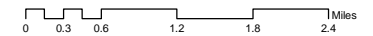


## Lewes Fire District Planning Map Series

### *Wetlands and Watersheds*

- Tidal Wetlands
- Nontidal Wetlands
- Watersheds**
- Broadkill River
- Delaware River - Lower Bay
- Rehoboth Bay
- Lewes Fire District
- Sussex County Fire Districts
- Major Roads
- Minor Roads
- Rivers and Streams

December 2009



**Sources:**

Wetlands - derived from the State-wide Wetlands Mapping Project (SWMP) data, DNREC, 2000.  
 Watershed Boundaries - Developed by the Water Resources Agency, University of Delaware, 2008.  
 Municipal Boundaries - Office of State Planning Coordination (OMB), 2009.  
 Major Routes - Delaware Department of Transportation (DelDOT).

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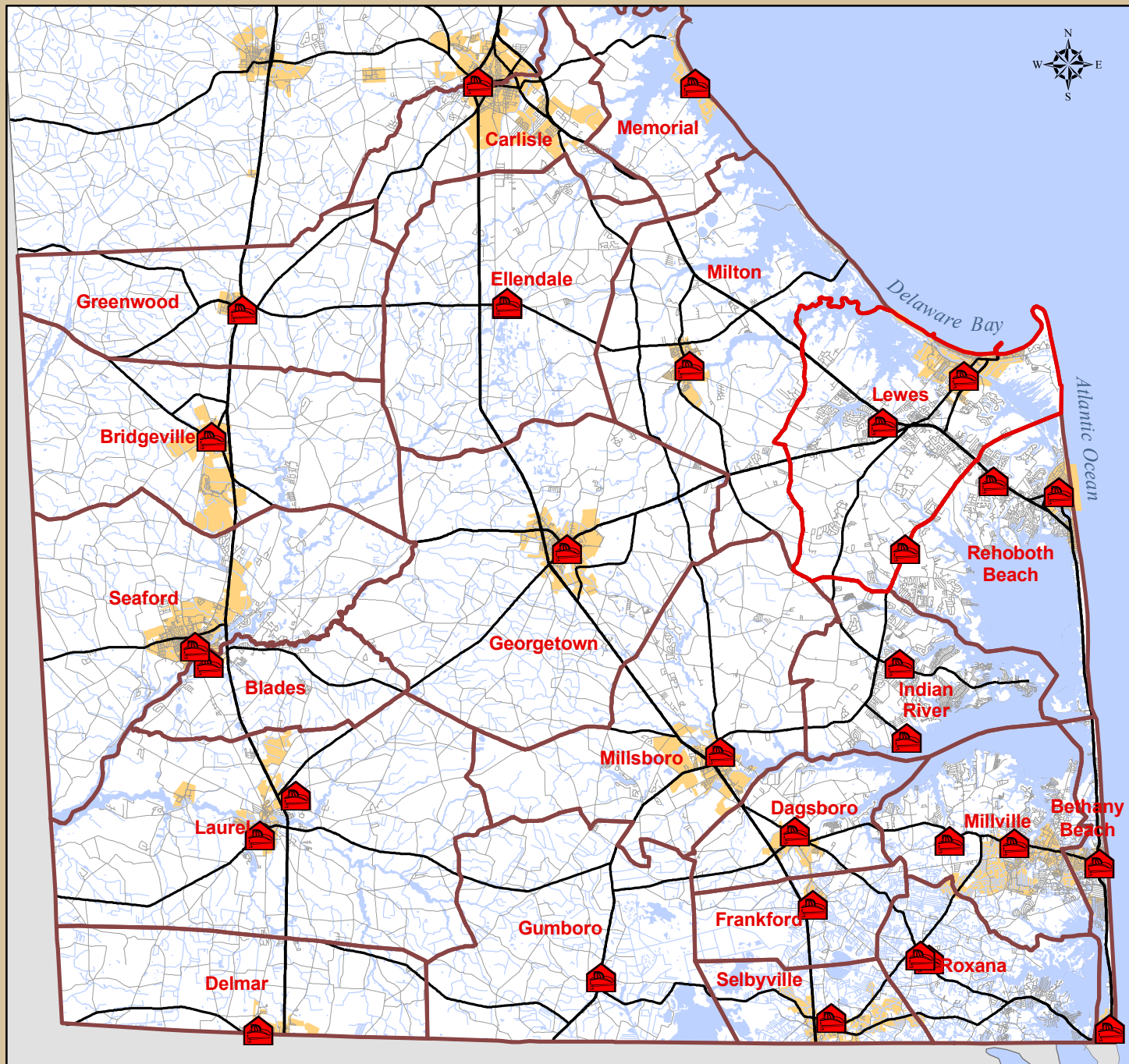




# Lewes Fire District Planning Map Series

*Sussex County  
Fire Districts and Stations*

-  Fire Stations
-  Lewes Fire District
-  Sussex County Fire Districts
-  Municipal Boundaries
-  Major Roads
-  Minor Roads



December 2009



Sources:  
 Fire Station Locations - Water Resources Agency, University of Delaware, 2008.  
 Municipal Boundaries - Office of State Planning Coordination (OMB), 2009.  
 Major Routes - Delaware Department of Transportation (DelDOT).

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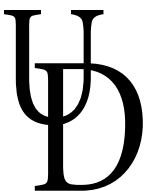


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