Old Colony Metropolitan Planning Organization

2007 Regional Transportation Plan

Prepared By

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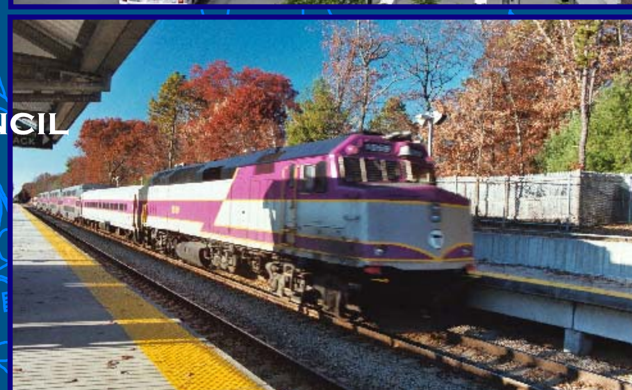

April, 2007

This document was prepared in cooperation with the Massachusetts Highway Department (#4034021), the Executive Office of Transportation, the Federal Highway Administration, and the Federal Transit Administration.

Old Colony Metropolitan Planning Organization
Endorsement of
the 2007 Regional Transportation Plan
and
Air Quality Determination

Endorsement of the 2007 Regional Transportation Plan and Air Quality Conformity Determination

In accordance with 23 CFR Part 450 Section 322 (Development and content of the Metropolitan Transportation Plan) of the March 16, 2007 Final Rules for Statewide and Metropolitan Planning, the Old Colony Metropolitan Planning Organization (MPO) for the Old Colony Region hereby endorses the 2007 Regional Transportation Plan (RTP).

Whereas the 1990 Clean Air Act Amendments (CAAA) require Metropolitan Planning Organizations within ozone non-attainment areas to perform air quality conformity determinations prior to the approval of transportation plans and transportation improvement programs, and at such other times as required by regulation.

Specifically, the Old Colony Metropolitan Planning Organization has completed its review accordance with Section 176(c) (4) of the Clean Air Act as amended in 1990 [42 U.S.C. 7251 (a)}, and hereby certifies that implementation of the Old Colony 2007 Regional Transportation Plan satisfies the conformity criteria specified in both 40 CFR Part 51 and 93 (8/15/1997) and 310 CMR 60.03 (12/30/1994). The RTP continues to include all regionally significant, non-exempt projects identified. Based on the results of the conformity analyses, the Old Colony 2007 Regional Transportation Plan is consistent with the air quality goals of, and in conformity with, the Massachusetts State Implementation Plan. Furthermore, the conformity determination is based on the air quality documentation contained in the RTP.

Signatory Certification:

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Date

for
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CHAPTER 1
INTRODUCTION

1.0 Introduction

The recently enacted Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) requires Metropolitan Planning Organizations (MPOs) to develop and adopt a financially feasible Regional Transportation Plan (RTP) every four years. According to 23 CFR 450.312 (a)(b), “The MPO in cooperation with the State and with operators of publicly owned transit services shall be responsible for carrying out the metropolitan transportation planning process. The MPO shall approve the metropolitan transportation plan and its periodic updates.” The MPO is responsible for conducting a continuing, cooperative, and comprehensive transportation planning process that results in plans and programs that consider all transportation modes and that support the metropolitan and communities’ goals. The MPO must plan for the movement of both people and goods within the Region by all modes of travel, including highways, rail, public transportation, bicycles, and foot. It also plans for the connections linking these modes.

The Regional Transportation Plan attempts to forecast an area’s mobility needs to a point in the future based on projected travel demands. These must have at least a twenty-year planning horizon. Regional transportation plans are comprised of two major components: a needs component that identifies what projects are “needed” to meet the travel demands identified over the study period, and a financially feasible component that identifies what projects an area can afford based on its projected financial resources.

1.1 Objective, Vision, and Mission

Population growth and the associated travel demand continue to place pressure on the transportation system in the Old Colony Region. The Regional Transportation Plan represents the MPO’s effort to craft a document and a process that will meet the challenges of preserving and expanding a truly intermodal transportation system. Following the directives of the law, it includes goals and policies, analyses and recommendations necessary to build and maintain an efficient, effective and affordable regional transportation system. It is the intention of the MPO to build on the current system, working to make it comprehensive and fully integrated. The goal is a balanced range of well-connected transportation options that will use the best of each travel mode: automobile, transit, rail, bicycle, pedestrian, boat, air and truck. The plan will identify the region’s transportation project needs for the next twenty years.

The primary objective of this Regional Transportation Plan is to establish the framework and guidelines for decision-makers to use when selecting among projects, programs, and facilities with different and sometimes conflicting objectives. The Regional Transportation Plan recommends studies and specific short-term and long-term project priorities that are needed to maintain the existing transportation infrastructure and produce a more balanced, safe and affordable regional transportation system.

The Vision Statement for the Regional Transportation Plan is, “A system of communities, neighborhoods, and commercial districts with unique character, desirable quality of life, and a safe, mobile, and accessible transportation system for existing and future residents, visitors, and businesses.” The Regional Transportation Plan addresses a twenty year planning horizon and includes both short and long range strategies/actions that lead to the development of an integrated intermodal transportation system that facilitates the efficient movement of people and goods. Additionally, the Regional Transportation Plan examines both current and forecasted transportation and land use conditions and trends and provides an overall framework for developing the future transportation system. Furthermore, the Regional Transportation Plan draws upon the Statewide Transportation Plan and the MassHighway Project Development and Design Guide Book. Given that framework, the mission of the Regional Transportation Plan is to provide a safe and efficient transportation system that promotes multimodalism (roads, transit, sidewalks, bicycles, etc.), supports projected growth, and addresses social, economic, and environmental impacts through effective planning/policy and local/regional coordination.

The principal way in which Regional Transportation Plan recommendations will be translated into action is through the Transportation Improvement Program (TIP). The TIP is a multimodal list of projects for which federal surface transportation funds will be used. The TIP covers a four-year period and is updated every year. It must be based on a reasonable estimate of funds that will be made available to the region.

CHAPTER 2
REGIONAL GOALS, OBJECTIVES, AND IMPLEMENTATION PROGRAMS

These goals and objectives have been developed to guide the region's transportation planning activities through the near future, along with implementation items to work towards achieving these goals and objectives. The goals and objectives include:

- Provide a transportation system that supports the economic vitality of the region and enables global competitiveness, productivity, and efficiency.
- Increase the safety of the transportation system for motorized and non-motorized users.
- Increase the security of the transportation system for motorized and non-motorized users.
- Increase the accessibility and mobility options available to all people and freight.
- Promote a transportation system that protects and enhances the environment; conserves energy; and improves the quality of life in the region.
- Enhance the integration and connectivity of the transportation system, across and between a well-balanced network of modes, for people and freight.
- Promote efficient system management and operation of the transportation system.
- Emphasize the preservation and modernization of the existing transportation system.
- Provide a transportation system that facilitates emergency response and evacuation.
- Provide a transportation system that is financially feasible and fiscally constrained.
- Support smart growth principles, provide a transportation system that is regionally coordinated and based on effective transportation, and land use planning.
- Promote public involvement in all phases of transportation planning and design.
- Maximize supplemental funding opportunities to improve self-sustainability of the transportation system.
- Support and execute a transportation network and transportation planning process that is responsive to Federal, State, Regional, and Local needs, regulations, and laws.

All of these goals have been developed through a comprehensive, continuing and cooperative effort between the Old Colony Planning Council, the Old Colony Metropolitan Planning Organization (MPO), the Joint Transportation Committee (JTC), and the stakeholders in the transportation system (the users). These goals reflect directly the planning factors prescribed in federal SAFETEA-LU legislation, and expand upon them. Additionally, these goals are consistent with the goals of the Commonwealth of Massachusetts and of the communities in the Old Colony Region.

The goals of the 2007 Regional Transportation Plan along with implementation items to achieve these goals are described on the following pages of this chapter.

Goal: Provide an aesthetic transportation system that supports the economic vitality of the region and enables global competitiveness, productivity, and efficiency.

The transportation network is critical to sustaining a thriving economy and fostering economic growth and development in the region. Employees and customers must be able to easily come and go between their homes, work, and shopping trips; and commerce and industry must be able to efficiently ship and receive goods.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Ensure that transportation system planning and programs are integrated with other planning efforts including land use, housing, open space and recreation, water and air quality, and economic development planning and implementation programs.
- Work to provide efficient, frequent, and convenient transit service to major employment and commercial centers.
- Work to provide efficient truck routes through the region, particularly in Downtown Brockton with low clearances on east-west roads.
- Support improved east/west transportation movement in the region including roads and highways, and improved transit connections between community activity centers, employment centers and commuter rail stations.
- Support and encourage the use of buses and/or commuter shuttle services between commuter rail stations, employment sites and commercial centers.
- Work with communities and other agencies and organizations to create and maintain a safe, convenient, and effective bicycle and pedestrian system that links residential, business and commercial, recreational and public uses, and transit.
- Work to improve the movement of freight, goods and services within the region and to other regions.
- Identify opportunities for cooperative efforts between public institutions and private enterprise to improve transportation services.

Goal: Increase the safety of the transportation system for motorized and non-motorized users.

It is essential that users of the transportation system are confident that their trip will be a safe one. Safety can be enhanced through careful attention to project design for construction of new facilities and improvements to the existing system. Operational safety can be enhanced through timely and effective maintenance of the system.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Maintain and enhance Safety Management System (SMS) to improve the monitoring of safety levels on the transportation network and decision-making for safety-targeted improvements.
- Support designs, projects, and programs that accommodate safe travel for all system users, regardless of mode, including designs that encourage bicyclists, motorists, transit riders, and pedestrians to share the transportation network safely.
- Work with the Executive Office of Transportation, Massachusetts Highway Department, Massachusetts Bay Transportation Authority, Brockton Area Transit, and Greater Attleboro Taunton Regional Transit Authority, and the municipalities to support design concepts that consider operational safety and efficiency of the motorist, balanced with the needs of the communities, environment, pedestrians, and bicyclists.
- Work to reduce fatality rates and overall crash rates at intersections and along corridors.
- Work to improve overall safety of railroad grade crossings.
- Increase safety and security at designated bus stops; at MBTA Commuter Rail stations (platforms, walkways, and parking lots), and at the BAT Intermodal Transportation Centre.

Goal: Increase the security of the transportation system for motorized and non-motorized users.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Identify high profile and/or vulnerable critical components of the regional transportation infrastructure, and develop strategies to enhance security and protect system.
- Work with Brockton Area Transit on enhancing security at site by hardening the BAT Intermodal Transportation Centre in Brockton.
- Work with Brockton Area Transit and Greater Attleboro Taunton Regional Transit Authority to increase onboard vehicle security and enhance security at facilities and designated bus stops at MBTA Commuter Rail stations (platforms, walkways, and parking lots), and the BAT Intermodal Transportation Centre.
- Work with the Massachusetts Bay Transportation Authority, as well as host communities to MBTA Commuter Rail stations, to increase security at Commuter Rail facilities, including platforms, walkways, and parking lots., and the BAT Intermodal Transportation Centre.

Goal: Increase the accessibility and mobility options available to all people and freight.

It is important that existing and new transportation facilities be made community-sensitive, reducing not only environmental pollutants but the aesthetic impact as well. All users and communities should be treated fairly in the provision of transportation services, and should not be inequitably burdened by transportation project impacts.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Consider the implications of an aging population on the existing transportation system and develop appropriate strategies to address current and future needs.
- Ensure during the planning and design of transportation improvements that no specific population is neither unfairly burdened nor benefited by the project.
- Ensure during the planning and design of transportation improvements that disruptions to neighborhoods and commercial districts will be minimized.
- Develop transportation solutions for people who require public transportation yet cannot be served due to gaps in the system.
- Work with transit providers to address the special travel needs of the elderly, children, handicapped, and economically disadvantaged when planning and developing transportation services.

Goal: Promote a transportation system that protects and enhances the environment; promotes energy conservation, and improves the quality of life in the region.

Clean air and water are important components of a healthy environment. Society's reliance on single-occupant vehicles results in increased congestion and in turn increased vehicle emissions into the air, and runoff into our water supply. This transportation plan recognizes the importance of reducing reliance on single-occupant vehicles and promoting alternative fuel use vehicles to improve long-term air quality, to reduce energy consumption, and to protect our natural resources.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Promote and support transportation and land use plans that support integrated, multimodal transportation strategies, including the use of transit, ridesharing, bicycling and walking.
- Support the development of neighborhood-based rideshare programs for the region.
- Support creation of an information program for commuters regarding alternatives to commuting in single-occupant vehicles, and programs available to assist commuters in using these alternatives.
- Support and encourage the use of buses and/or commuter shuttle services between commuter rail stations, employment sites and commercial centers.
- Encourage governmental agencies and institutions to consider the impacts on energy consumption, air quality, and the transportation system when evaluating potential sites for governmental and institutional offices and facilities. Whenever feasible, these offices and facilities should be sited in existing developed areas, commercial area revitalization districts, and near transit lines. Further, when feasible, the Old Colony MPO encourages the location of these offices and facilities within mixed-use developments that include commercial uses (e.g., dry cleaners, restaurants, grocery/convenience stores, etc.), childcare facilities and other uses that serve the office/facility population.
- Encourage businesses and industries to develop alternative employment policies; such as flextime and telecommuting in order to minimize traffic congestion, fuel consumption and social impacts of peak hour commuting.
- Encourage and promote bicycling and walking as viable modes of transportation.
- Work with communities and other agencies and organizations to create and maintain a safe, convenient, and effective bicycle and pedestrian system that links residential, business and commercial, recreational and public uses, and transit.
- Work with communities to encourage commercial, industrial, public and other property owners to provide bicycle lock-up and storage areas, shower and locker facilities, and other amenities as a means to encourage employees and customers to use bicycles as a transportation mode.
- Identify opportunities for and support the development of necessary infrastructure to support less polluting energy alternatives, such as compressed natural gas (CNG) fueling stations and electrified truck stops.
- Ensure that transportation improvement projects consider enhancement of aesthetics and character of neighborhoods, communities, and commercial districts.
- Ensure that impacts from transportation infrastructure on the environment are minimized, including noise pollution.

Goal: Enhance the integration and connectivity of the transportation system, across and between a well-balanced network of modes, for people and freight.

Through its Regional Transportation Plan, the Old Colony Metropolitan Planning Organization promotes a multimodal and comprehensive approach to transportation in the Region. A balanced variety of transportation modes throughout the regional network should be interconnected, and connections need to be safe, secure, and efficient to best compliment connecting modes.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Support and encourage multimodal transportation considerations in project design and development involving both new and existing residential, retail, service and employment centers.
- Support and encourage the use of buses and/or commuter shuttle services between commuter rail stations, employment sites and commercial centers.

- Support and encourage the use of Intelligent Transportation Systems (ITS) to enhance the safety, security, and efficiency of transportation network.
- Support improved east/west transportation movement in the region including roads and highways, and improved transit connections between community activity centers, employment centers and commuter rail stations.
- Encourage businesses and industries to develop alternative employment policies; such as flextime and telecommuting in order to minimize traffic congestion, fuel consumption and social impacts of peak hour commuting.
- Promote opportunities to develop and enhance transit services linking residential areas, employment centers, major shopping areas, educational facilities, major tourist and recreational destinations, commuter rail and AMTRAK.
- Identify solutions to improve efficiency of existing fixed route transit and paratransit services in the region.
- Identify opportunities and support the development of new fixed route transit and paratransit services to satisfy unmet needs of the commuting public.
- Identify opportunities, encourage the development of bicycle and pedestrian transportation infrastructure, and promote them as viable modes of transportation.
- Work with communities and other agencies and organizations to create and maintain a safe, convenient, and effective bicycle and pedestrian system that links residential, business and commercial, recreational and public uses, and transit.
- Encourage transit providers to make provision for bicycles on buses and trains and provide bicycle-parking facilities at train stations and transit centers.
- Identify opportunities for water based commuter and freight transportation from Plymouth Harbor.

Goal: Promote efficient system management and operation of the transportation system.

The Old Colony Metropolitan Planning Organization recognizes the importance of employing new technologies in reducing congestion and improving safety throughout the transportation system.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Promote and support the use of Intelligent Transportation Systems (ITS) to enhance the safety and efficiency of highway and transit operations and reduce incident response time.
- Promote and support the use of Transportation Demand Measures (carpooling, telecommuting, flex hours) to reduce peak period travel demand and congestion.
- Promote and support increased use of mixed-use development and Transit Oriented Development along major transit lines.
- Promote the expansion of transit and highway systems were warranted.

Goal: Emphasize the preservation and modernization of the existing transportation system.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Work with transit providers to maintain existing levels of service while also supporting expansion of service to meet projected needs.
- Work with the state and communities to ensure that repairs and improvements are made to roads and bridges throughout the region in order to provide for a safe, efficient and adequate transportation network for the movement of people and goods.

- Maintain and enhance Pavement Management (PMS) and Congestion Management Systems (CMS) to improve decision-making and establishing priorities in the Transportation Improvement Program (TIP) development process.
- Work with railroad companies to preserve existing rail freight service and promote extension of this service.

Goal: Provide a transportation system that facilitates emergency response and evacuation.

The Old Colony Metropolitan Planning Organization recognizes that the regional transportation network is a critical component to emergency response and operations. The system must allow for the safe and efficient evacuation of an area in the event of an emergency, as well as facilitate the response of emergency personnel and equipment to an emergency.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Promote and support the use of Intelligent Transportation Systems (ITS) technologies to enhance mobility and capacity of the existing transportation system in preparation for an emergency.
- Promote and support the use of Intelligent Transportation Systems technologies to reduce congestion along major corridors, and reduce emergency response time.
- Promote and support efficient and well-marked emergency evacuation routes from flood prone areas and the Pilgrim Nuclear Power Plant.
- Promote and support an evacuation plan for southeastern Massachusetts that incorporates all modes of transportation.

Goal: Provide a transportation system that is financially feasible and fiscally constrained.

Metropolitan Planning Organizations have an obligation to provide maximum transportation benefit using its allocated resources. The Old Colony MPO is committed to planning transportation improvements that will have the greatest benefit to its uses, and to exploring and identifying innovative financing options for transportation projects.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Provide for the development of a series of measures to gauge the effectiveness of transportation system management actions.
- Explore supplemental funding options for transportation improvements to maximize transportation funding.
- Continue to support use of evaluation criteria to ensure best use of funding avenues through Transportation Improvement Program.
- Identify opportunities for cooperative efforts between public institutions and private enterprises to improve transportation services.

Goal: Support smart growth principles and provide a transportation system that is regionally coordinated and based on effective transportation and land use planning.

Integrating transportation and land use policies can result in more efficient use of the regional transportation system, bringing jobs, housing, shopping, and services closer together, and reducing sprawl.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Ensure that transportation system planning and programs are integrated with other planning efforts including land use, housing, open space and recreation, water and air quality, and economic development planning and implementation programs.
- Encourage governmental agencies and institutions to consider the impacts on energy consumption, air quality, and the transportation system when evaluating potential sites for governmental and institutional offices and facilities. Whenever feasible, these offices and facilities should be sited in existing developed areas, commercial area revitalization districts, and near transit lines. Further, when feasible, the Old Colony MPO encourages the location of these offices and facilities within mixed-use developments that include commercial uses (e.g., dry cleaners, restaurants, grocery/convenience stores, etc.), childcare facilities and other uses that serve the office/facility population.
- Work with the MBTA, communities, property owners and developers to promote the construction of transit-oriented development adjacent to commuter rail stations.
- Work with communities and other agencies and organizations to create and maintain a safe, convenient, and effective bicycle and pedestrian system that links residential, business and commercial, recreational and public uses, and transit.
- Work with communities to ensure that circulation and site plans for development projects minimize barriers and create or improve access between uses for pedestrians, the disabled and bicyclists.

Goal: Promote public involvement in all phases of transportation planning and design.

In order to provide a transportation system that meets the needs of all groups and populations, it is essential that all users of the system have an opportunity to review proposals and voice their opinions in the transportation planning process. Public participation will continue through the Old Colony Joint Transportation Committee, the advisory committee to the Old Colony Metropolitan Planning Organization, and through other avenues as well.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Use a variety of means to reach users of the system (open houses, informational kiosks, cable access, variable message signage, world wide web, etc)
- Ensure that information is presented in easy to understand, and incorporate visualization techniques.
- Support increased efforts to reach underrepresented groups to ensure that decisions are made through an open and participatory process.

Goal: Maximize supplemental funding opportunities to improve self-sustainability of the transportation system.

The Old Colony Metropolitan Planning Organization support maximizing the use of supplemental funding and self-sustaining components of the transportation system in an effort to reduce overall dependency on traditional funding channels.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Maximize private investment in transportation improvements as mitigating measures for new developments or expansions of existing facilities.
- Explore supplemental funding options for transportation improvements to maximize transportation funding.
- Monitor existing transit services and suggest improvements as warranted to maximize efficiency.

Goal: Support and execute a transportation network and transportation planning process that is responsive to Federal, State, Regional, and Local needs, regulations, and laws.

To accomplish this goal, the Old Colony Metropolitan Planning Organization, Joint Transportation Committee, and Old Colony Planning Council will:

- Ensure that regional transportation plans are compatible with similar transportation plans from the State and Federal governments.
- Ensure early on in the planning process that transportation improvement projects are compatible with State and Federal requirements, such as CMAQ project criteria and Regional ITS Architecture.
- Ensure that regional transportation plans do not conflict with the goals and policies of the local communities.

CHAPTER 3
TRANSPORTATION PLANNING PROCESS

3.0 Introduction

The transportation planning area includes the City of Brockton and fourteen towns: Abington, Avon, Bridgewater, East Bridgewater, Easton, Halifax, Hanson, Kingston, Pembroke, Plymouth, Plympton, Stoughton, West Bridgewater, and Whitman. The planning area also includes the community service areas of Brockton Area Transit and portions of the MBTA and GATRA service areas.

3.1 General Description of the Planning Process

The transportation planning process analyzes and presents the benefits and impacts of various transportation alternatives such as new highways, changes in the transit system, and movements of goods/freight, airports, waterways, bikeways, or auto free zones. This information is used by decision makers in the selection of preferred solutions to current and anticipated problems.

The Old Colony Metropolitan Planning Organization (MPO) is the transportation planning agency and was created under state and federal laws that require the formation of MPOs in urbanized areas with populations of more than 50,000 in order for surface transportation projects to be eligible for federal Highway Trust Fund dollars.

The Old Colony MPO is responsible for conducting a continuous, cooperative, and comprehensive transportation planning process (3C) for all of the Old Colony Region. It must plan for the movement of both people and goods within the Region by all modes of travel, including highways, public transportation, bicycles, and foot. It also plans for the connections (such as airports, seaports, or bus, railroad, and pipeline terminals) linking these modes or tying the region to the rest of the world.

The Old Colony MPO sets priorities among surface transportation improvement projects within the Region for state or federal funding. In order for them to be eligible for federal funds, federal law requires that the MPO endorse a transportation improvement program identifying the projects to be implemented.

The State and the Old Colony MPO certify to the FHWA and the FTA that the "3C" Transportation Planning Process is addressing the major issues facing the area and is being developed in accordance with FTA/FHWA regulations governing the implementation of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), EPA regulations governing the implementation of the Clean Air Act of 1990 (CAAA), and fully incorporate the applicable requirements of the 1964 Civil Rights Act and the Americans with Disabilities Act of 1990 (ADA). Approval of federally aided transportation projects is contingent on there being a State/Old Colony MPO certified "3C" Transportation Planning Process in place that refers to a planning process that is "Cooperative, Continuous, and Comprehensive."

Every four years, the FTA and the FHWA make a "Certification Determination" for the transportation planning process in each urbanized area. In general, Certification means that the planning process "is being conducted in a cooperative, continuous, and comprehensive manner, and has resulted in plans and programs consistent with the comprehensively planned development of the area."

The Old Colony MPO is responsible for carrying out the urban transportation planning process and for developing and endorsing the Unified Planning Work Program (UPWP), Regional Transportation Plan (RTP), Transportation Improvement Program (TIP), and Public Participation Plan (PPP) for the region. Membership of the Old Colony MPO is as follows:

- The Secretary of the Executive Office of Transportation
- The Commissioner of the Massachusetts Highway Department
- The President of the Old Colony Planning Council
- The Administrator of the Brockton Area Transit Authority
- The Mayor of the City of Brockton
- The Chief Elected Official of Plymouth
- The Chief Elected Official from two (2) communities, other than Brockton or Plymouth, duly elected by the Old Colony Planning Council, to represent locally elected communities. No more, or less, than one representative from towns with populations of 12,000 or below (Avon, Halifax, Hanson, Kingston, Plympton, and West Bridgewater), and, no more, or less, than one representative from towns with populations over 12,000 (Abington, Bridgewater, East Bridgewater, Easton, Pembroke, Stoughton, and Whitman)

The Old Colony Planning Council at a full Council meeting elects the above cited locally elected community officials to the Old Colony MPO. The electoral process is the sole responsibility of the OCPC with full consideration to nominations recommended by the Old Colony Joint Transportation Committee (JTC). This process was approved by the Old Colony MPO in 2003 and is periodically reviewed. The term of office shall be two years. The OCPC and the JTC make every effort to provide for region-wide geographic balance of the communities represented on the Old Colony MPO.

The JTC Chairperson, and one representative each from both the FHWA and the FTA shall be considered ex-officio, non-voting members of the Old Colony MPO. Designees or alternates are typically limited to the persons who are directly responsible and accountable to the official Old Colony MPO member that they are representing.

The members of the Old Colony MPO recognize that transportation planning and programming must be conducted as an integral part of, and consistent with, the comprehensive planning and development process, and that the process must involve the fullest possible participation by state agencies, local governments, private institutions and other appropriate groups.

3.2 Functional Responsibilities of Participating Agencies and Groups

Local Representatives

The local representatives (Brockton, Plymouth, and the locally elected communities) to the Old Colony MPO are responsible for articulating a local government perspective of regional transportation problems and issues, and the needs for the community or agency that they represent, and for the Region as a whole.

Executive Office of Transportation (EOT)

The Executive Office of Transportation (EOT), has the statutory responsibility, under Chapter 6A of the General Laws, to conduct comprehensive planning for and to coordinate the activities and programs of the state transportation agencies.

The EOT assists in organizing and conducting Old Colony MPO meetings, keeping records, and reporting major statewide and inter-regional policies and issues as they develop. The EOT is responsible for making appropriate planning funds available to the OCPC by contract to assist in the implementation of the required planning work program as defined in the approved UPWP. The EOT also provides the necessary data, technical support and staff support required to assist in fulfilling the transportation planning needs of the Old Colony Region and Commonwealth of Massachusetts. The EOT is responsible for making appropriate FTA transit planning funds available to the OCPC by contract to assist in the implementation of the required planning work program as defined in the approved UPWP.

Massachusetts Highway Department (MassHighway)
The Massachusetts Highway Department has the statutory responsibility under Chapter 16 of the General Laws for the construction, maintenance, and operation of state roads and bridges, and serves as the principal source of transportation planning in the Commonwealth. MassHighway is responsible for the continual preparation of comprehensive and coordinated transportation plans and programs.

Old Colony Planning Council (OCPC)
Established by Chapter 332 of the Acts of 1967, OCPC is the regional planning agency for the metropolitan Brockton area. The Council's planning jurisdiction includes the City of Brockton and the towns of Abington, Avon, Bridgewater, East Bridgewater, Easton, Hanson, Halifax, Kingston, Pembroke, Plymouth, Plympton, Stoughton, West Bridgewater and Whitman. The policy board is composed of one delegate and one alternate appointed by a vote of the Board of Selectmen and Planning Board of each member community. In the case of the City of Brockton, the Mayor appoints the delegate and alternate. The Council is authorized to prepare and revise comprehensive plans. OCPC is recognized by the MPO as the officially designated regional planning agency for the Old Colony MPO Region, having the statutory responsibility for comprehensive planning, including transportation planning. Currently, the Council's areas of major emphasis are economic development, transportation, safety and security, water quality, land use and housing, and elder service planning and ombudsman programs.

The OCPC is responsible for comprehensive regional planning and is the transportation-planning agency for the Old Colony MPO and Old Colony Region. The OCPC maintains qualified transportation planning staff, and is principally responsible for the maintenance of the transportation planning process and for the support and operation of the Joint Transportation Committee and Old Colony MPO.

Brockton Area Transit Authority (BAT)
The Brockton Area Transit Authority, under the provisions of Chapter 161B of the General Laws, has the statutory responsibility to provide mass transportation in the area constituting the authority, and to provide mass transportation service under contract in areas outside the authority.

BAT, in addition to its statutory responsibility for providing mass transportation, assists in obtaining and ensuring input and participation in multimodal transportation planning from local elected officials and the public. BAT actively and consistently participates in the 3C transportation planning and programming process and represents the region's concern for public transportation deficiencies and for solutions to transportation demands and needs.

3.3 Functions of the MPO

The Old Colony MPO develops, reviews, and, endorses annually the Unified Planning Work Program, the Transportation Improvement Program, and, the Public Participation Plan. Additionally, the Old Colony MPO develops, reviews, and endorses, at least every four years, a Regional Transportation Plan, with a

20-year horizon; as well as such transportation plans and other products that federal and state laws and regulations may from time to time require.

The Old Colony MPO is the forum for cooperative decision-making involving allocation of federal transportation funding by chief elected officials of general-purpose local governments, regional authorities and agencies, and state agencies in the Old Colony Region.

In the resolution of basic regional transportation policy, the Old Colony MPO seeks and considers the advice of all interested parties and the JTC. The Old Colony Planning Council Transportation Staff provides the JTC with information and analysis in the form of reports, briefings, and discussions concerning their plans, programs, and priorities so that they can carry out their functions in a timely fashion.

The Old Colony MPO appoints the committees it determines necessary to accomplish its business. Committees may consist of Old Colony MPO members, their designees, the JTC, and transportation providers as appropriate. The Old Colony MPO assigns duties to the committees, as warranted.

3.4 Operation of the Old Colony MPO

The Old Colony MPO meets in the Region at least twice per year and usually more often as may be requested by any one of the Signatories.

The Secretary of EOT or Designee chairs the Old Colony MPO. In the absence of the Chairman, the Vice-Chairman shall chair the meeting. A Vice-Chairman of the Old Colony MPO is elected for a term of two years and shall be elected from among the non-state permanent members of the Old Colony MPO (City of Brockton, Town of Plymouth, Brockton Area Transit Authority, Old Colony Planning Council, and the two locally elected communities). The Old Colony MPO elects other officers as deemed necessary.

Votes of the Old Colony MPO, including those on all certification documents (i.e. TIP, UPWP, RTP, and PPP), Air Quality Conformity Determinations, and compliance with the Americans with Disabilities Act) are by a simple majority vote of those members present and voting, provided that one of the state agencies shall be included in the majority vote.

3.5 Transportation Advisory Group

In order to accomplish the objectives of the 3C process, the Old Colony MPO established a committee known as the Joint Transportation Committee (JTC) to serve as the Transportation Policy Advisory Group for the Old Colony Region, in accordance with earlier agreements. The Old Colony MPO periodically reviews the membership on the Joint Transportation Committee, to provide for a widely representative viewpoint, and to ensure a balanced consideration of transportation issues. Consistent with the provisions of the Memorandum of Understanding, the Joint Transportation Committee adopts by-laws and other procedures as may be necessary to govern its operation. The functions of the JTC are:

- To advise the Old Colony MPO and OCPC on matters of policy affecting the conduct of the 3C transportation planning and programming process for the Region.

- To advise the Old Colony MPO and OCPC on such regional transportation documents as may from time to time be required by state or federal laws and regulations (RTP, TIP, UPWP, and PPP their related adjustments and amendments).
- To provide maximum public participation in the transportation planning and programming process by providing a forum to bring the Old Colony MPO together with other public agencies, elected and appointed officials of cities and towns, and citizens concerned with the transportation planning and programming process; thereby facilitating, wherever possible, the consistency of transportation plans and programs for the Old Colony Region with the policies, priorities, and plans of affected state and regional agencies, local communities, private groups, and individuals within the Old Colony Region.

The JTC includes representatives from each OCPC community, whom are appointed by the Board of Selectmen/Mayor in the community. Membership is open to any interested resident, representative from a transportation provider, or interested group. The JTC meets on the second Thursday of each month at the OCPC office.

The Old Colony MPO provides complete information, timely public notice, and full public access to decisions and documents. It supports early and continuing public involvement in the development and review of its plans and programs. It especially tries to seek out and consider the interests of people whose needs may be not be well served by the existing transportation system, such as low income and minority households and persons with limited personal mobility. To assist with this, OCPC maintains a Transportation Advisory Network (TAN). The TAN is a mailing list of individuals and organizations that have an interest in local transportation issues. The TAN provides a broad community resource for the formation and review of transportation plans, policies and strategies. This network provides key contact persons for outreach efforts, dissemination of information, and informal review and comment to ensure sensitivity to varied community needs, concerns, and interests.

3.6 The 3C Process

The Old Colony MPO is responsible for conducting a cooperative, continuous, and comprehensive (3C) transportation planning process for all of the Old Colony Region. The 3C process is "a Cooperative, Continuous, and Comprehensive" transportation planning and programming process resulting in plans and programs consistent with the comprehensive planning objectives of the Old Colony Region.

The 3C process is cooperative, requiring effective coordination among public officials at all levels of government, and inviting the wide participation of all parties, public or private, at all stages of the process. A key objective of the process is to resolve transportation issues by providing a forum for the resolution of issues. At the same time, the process is not intended to operate, and cannot operate, to dilute the ultimate authority or responsibility of those state, regional, or local public officials or agencies who, pursuant to statute or under contract, develop, review, and/or implement transportation plans, programs, and projects.

The 3C process is continuous, affirming the need to plan for the short and long range, emphasizing the iterative character of the progression from systems planning to project planning and programming, to implementation and the necessity for re-evaluating data and plans.

The 3C process is comprehensive, including the effective integration of the various stages and levels of transportation planning and programming for the entire Old Colony Region, and examines all modes to assure a balanced planning and programming effort. There is a simultaneous analysis of various related non-transportation elements, such as land use, economics, environmental resources, and population to assure consistency within a total comprehensive planning and programming process.

3.7 The Transportation Planning Process

The transportation planning process has four basic elements; a Unified Planning Work Program, a Regional Transportation Plan, a Transportation Improvement Program, and a Public Participation Plan. Each of these elements is reviewed by the JTC, OCPC, and is endorsed by the Old Colony MPO.

The Public Participation Plan (PPP) identifies strategies employed by the MPO to provide complete information, timely public notice, and full access to key decisions to the public prior to the adoption or amendment of the plans and programs for which the MPO is responsible. This document supports the early and continuing involvement of the public in the MPO process, as required by federal law.

The PPP assists in shaping the present and future conditions of the transportation system through the participation of and guidance of local citizens and leaders. The PPP builds upon the 1994 PPP and continues the strong public presence in the MPO planning process.

The Unified Planning Work Program (UPWP) describes and provides budgetary information for the transportation planning tasks and activities, which are to be conducted in the region during the coming year. The UPWP is a federally required certification document, which must be prepared and endorsed annually by the Old Colony MPO prior to the start of the planning program. The OCPC has the responsibility of preparing the UPWP. The planning activities are organized first by work element in a format that will allow efficient administration, management, and reporting.

The UPWP describes all the work to be accomplished by the Old Colony MPO. Each transportation planning activity is described as a procedure under specific work tasks. For each procedure, the anticipated accomplishment or product and the estimated work force resources needed are also given. For each work task, the total staffing requirements, task budget, and sources of funding are given. For convenience in management, similar work tasks are grouped into broad areas or elements as follows:

- Management and Support of the Planning Process and Certification Activities
- Data Collection and Analysis Activities
- Short Range and Long Range Transportation Planning Activities
- Other Transportation Technical Activities

The UPWP continues to expand on several major tasks that are specifically targeted to implement provisions of several pieces of federal legislations, such as the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)), the Clean Air Act Amendments of 1990, and the Americans with Disabilities Act.

The Regional Transportation Plan (RTP) is based on the principles of the Intermodal Surface Transportation Efficiency Act (ISTEA), the Transportation Equity Act for the 21st Century (TEA-21), and the requirements of Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

The RTP provides a document and a process that will meet the challenges of preserving and expanding the transportation system. Following the directives of the law, it includes goals, policies, analyses, and recommendations necessary to build and maintain an efficient, effective and affordable regional transportation system. The intention of the RTP is to build on the current system, working to make it comprehensive and fully integrated.

The RTP addresses a twenty-year planning horizon and includes both short and long-range strategies/actions that lead to the development of an integrated intermodal transportation system that facilitates the efficient movement of people and goods. Additionally, the Plan examines current and forecasted transportation and land use conditions and trends, and provides an overall framework for the future transportation system. Furthermore, the RTP draws upon the Statewide Transportation Plan and the MassHighway Project Development and Design Guide Book. The mission of the RTP is to provide a safe and efficient transportation system that promotes multimodalism (roads, transit, sidewalks, bicycles, etc.), supports projected growth, and addresses social, economic, and environmental impacts through effective planning/policy and local/regional coordination.

The short and long-range strategies/actions constitute the RTP. The long-range element addresses the long-range transportation needs of the region and identifies major changes in the transportation system and transportation policy. The long-range element establishes inter-regional and intra-regional transportation goals and objectives.

The short-range element addresses the transportation strategies/projects that will be implemented within a five-year timeframe. The purpose of the short-range element is to coordinate the different parts of a transportation system, such as highways, transit, freight, rail, and bikeways, to achieve maximum efficiency and productivity of the transportation system as a whole. Simply stated, the goal of the short-range element is to insure, through the promotion of management systems and low capital projects, that the region's transportation system is utilized and maintained fully before new facilities are added. The short-range element (five years) essentially comprises the TIP.

The transportation management systems provide a process that furnishes information on transportation system performance to decision makers for selecting and implementing cost effective strategies/actions to manage new and existing facilities so that congestion is alleviated and the mobility of persons and goods is enhanced.

The Transportation Improvement Program (TIP) is a listing of transportation projects proposed for implementation during the next five federal fiscal years. Projects listed in the TIP include those in the short-range element of the RTP. In the TIP, projects are classified under federal and non-federal funding categories and assigned a local priority. The TIP briefly describes each project as well as its projected costs and funding sources.

As part of the TIP development, current and proposed projects are evaluated using Transportation Evaluation Criteria, and recommended to the Old Colony MPO for consideration and approval. The collective staffs evaluate candidate projects for the Old Colony MPO using the Transportation Evaluation Criteria of Condition, Mobility, Safety and Security, Community Effects and Support, Land Use and Economic Development, and Environmental Effects. After the evaluations, the results are provided to the Old Colony MPO for its review and approval. Once the Old Colony MPO has reviewed and approved the evaluations, the OCPC staff then uses the evaluation results, as well as readiness information, available funding, and other pertinent information to develop a Draft TIP. As part of the development process, the Draft TIP is reviewed by the JTC, the OCPC, and the MPO, and released for a 30-Day Public Review Period. After the 30-Day Public Review Period, the Final Draft TIP is sent to the Old Colony MPO for consideration and approval.

3.8 Coordination and Consultation and Public Participation

Transportation planning is one component of the Comprehensive Planning Process that includes land use/growth management, housing, open space and recreation, economic development, historic preservation, and water quality. It is important that these potentially conflicting elements be consistent with one another in order to facilitate the efficient movement of people and goods in the region. The first step in obtaining consistency is the use of a common database, coordination, and consultation with appropriate agencies and groups. Each of the functional planning areas uses common land use, population and employment statistics, and forecasts.

<u>Coordination and Public Participation</u>

An underlying principle of the metropolitan planning process is public participation, coordination and consultation with appropriate agencies and groups. As such, a successful public participation model was developed and utilized. Legal advertisements are not a panacea for public participation. With that in mind, the staff engaged the public to the maximum extent possible. Various strategies were deployed, documented and evaluated. As all products associated with the RTP were developed, they were presented to the Old Colony JTC and Old Colony Old Colony MPO for their review, comment, and approval.

Development of public participation model. Staff utilized a diverse methodology for coordination, consultation, and engaging the public to maximum extent possible in the development of the RTP. The methodology is presented below.

- Old Colony MPO - The MPO provided oversight of the RTP development and has the responsibility of ultimately endorsing the final RTP. The MPO met multiple times during the RTP's development. Key products such as the Preliminary Draft, Draft, and Final Draft were provided to the MPO for review and comment.
- Old Colony Planning Council (OCPC) - The Old Colony Planning Council discussed the RTP updates and provided both planning and policy guidance at regularly scheduled Council meetings. Meetings took place typically during the last Wednesday of the month. As such, input and guidance occurred during the RTP's development
- Old Colony Joint Transportation Committee (JTC) - Functioning as the advisory group to the Old Colony MPO and Old Colony Planning Council, this group assisted with the identification of transportation deficiencies and provided regular input and review of RTP products. The Committee consists of superintendents and or directors of highway/ department of public works, town planners, engineers, etc. Meetings took place during the second Thursday of the month. As such, monthly input and guidance occurred.
- Transit Providers – Council staff solicited input regarding transit issues from the BAT, GATRA, MBTA, South Shore Community Action Council, as well as a private carrier (P&B).
- Coordination and consultation activities - Coordination and consultation activities took place with multiple agencies and groups. As such, these coordination and consultation activities took place with: Bridgewater State College, Brockton Area Transit Authority, Brockton 21st Century Cooperation, Cape Verdean Association of Brockton, Chief Elected Officials, Comprehensive Economic Development Strategy Committee, Conservation Commissions, Department of Environmental Protection, Departments of Public Works and Highway Departments, Environmental Protection Agency, Executive Office of Transportation (Planning and Environment), Latino Health Institute, Greater Attleboro Taunton Transit Authority, MassHighway District 5, MBTA, Metro South Chamber of Commerce, NAACP, Plymouth and Brockton (P&B), Plymouth Area Chamber of Commerce, Plymouth County Development Council Police Departments, and South Shore Community Action Council.

- Visualization Techniques - Visualization techniques such as maps, posters, flyers, computer simulations, and multi-media presentations were integrated across the multitude of RTP activities. Such techniques aim to simply and convey sometimes-complex information.
- Transportation Advisory Network (TAN) - The TAN consists of over 200 members. Members include chief elected officials, legislators, planning boards, EOT, MassHighway, FHWA, FTA, transit providers, minority groups, town clerks, and transportation officials. The objective was to provide continuing outreach to a wide network. Council staff provided announcements of product availability, upcoming events and meetings associated with the RTP to the TAN.
- A RTP Survey – A survey was developed and distributed to the Transportation Advisory Network, posted on the Old Colony Planning Council Website, and provided and multiple workshops and information sessions.
- Media Outlets and places of public convenience - Staff utilized multiple media outlets and places of public convenience to solicit public comment, advertise meetings, advertise RTP products, and solicit public comment. The media outlets and places of public convenience consisted of newspaper legal advertisements, websites (Old Colony Planning Council, the Brockton Area Transit, the Old Colony Memorial, and various communities), town and city halls, radio station spots (1460 AM WXBR and 95.9 WATD), the 25th Annual Plymouth County Transportation Breakfast, local cable access during multiple stages of RTP development (all communities with cable access), press releases, kiosks, and public information booths/ tables (Westgate Mall in Brockton, Independence Mall in Kingston, and BAT Intermodal Transportation Centre), public information workshops (Plymouth and Brockton) to solicit public comments. The regional mall outreach sessions were conducted during the Saturdays and Sundays during the mall business hours. Informational flyers were posted in most of the supermarkets in the region (Spanish and English).
- Draft RTP - Copies of the Draft RTP will be available in libraries and City/Town halls and on the OCPC website so residents from member communities will have ample opportunity to review the Draft RTP prior to attending the public information workshops. Copies of the Draft RTP shall be provided upon request.
- 30-Day Public Review Period - During the public review period for the Draft RTP, copies were available and their availability were advertised using multiple media outlets and the TAN. During the period, public meetings were held and the Council staff shall was available to discuss the Draft RTP with the public upon request.

3.9 Environmental Justice

Environmental Justice is an important part of the planning process and is considered in all phases of planning. A truly integrated and effective planning process actively considers and promotes environmental justice within projects and groups of projects, across the total plan, and in policy decisions. All reasonably foreseeable adverse social, economic, and environmental effects on minority populations and low-income populations must be identified and addressed. There are three fundamental Environmental Justice principles:

- To avoid, minimize, or mitigate disproportionately high and adverse human health or environmental effects, including social and economic effects, on minority populations and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority populations and low-income populations.

Public involvement is an integral part of transportation planning and project development decision-making. The DOT Order (5610.2) on Environmental Justice directs the provision for minority populations and low-income populations greater access to information on, and opportunities for public participation in matters that may impact human health and the environment.

Effective public involvement in the planning process and the project-development process can alert State and local agencies about environmental justice concerns so that they do not result in surprises during the project-development stage. Continuous interaction between community members and transportation professionals is critical to successfully identify and resolve potential Environmental Justice concerns.

The staff has public-involvement procedures established that provide for consideration of Environmental Justice. These procedures provide an inclusive, representative, and equal opportunity for two-way communication resulting in appropriate action that reflects this public involvement. Environmental Justice is considered in all aspects of planning and project decision-making, including the design of both the public-involvement plan and the proposed facility.

Environmental Justice analysis asks whether a proposed action or plan causes disproportionately high and adverse effects on minority populations and low-income populations, and whether these populations are denied benefits. A framework of analysis that can determine how a proposed action or plan could differentially impact different populations is important. As such, an analysis of benefits and burdens is utilized. In addition, computer mapping of Environmental Justice Areas along with past, present and future projects funded through the transportation improvement program, available transit services and their associated walking times, commuter parking facilities, pavement conditions, high crash locations, areas of congestion is utilized to measure the distribution of funding (to ensure geographic equity), to determine priorities areas of need/ and or concern.

Benefits and Burdens

Examples of the Benefits considered during the development of this RTP were:

- Mobility
- Accessibility
- Infrastructure condition
- Environment
- Reliability
- Safety
- Security
- Load factors
- Efficiency
- Consultation with riders in improving bus services to the transit-dependent

Examples of the Burdens considered during the development of this RTP were:

- Air, noise, and water pollution and soil contamination.
- Destruction or disruption of community cohesion or a community's economic vitality.
- Destruction or disruption of the availability of public and private facilities and services.
- Adverse employment effects.
- Displacement of persons, businesses, farms, or nonprofit organizations.

- Increased traffic congestion, isolation, exclusion, or separation of minority or low-income individuals within a given community or from the broader community.
- The denial of, reduction in, or significant delay in the receipt of, benefits of programs, policies, or activities.

From the examination of benefits and burdens, it is the determination that no projects implemented as a result of the RTP will result in adverse impacts to the Environmental Justice Areas in the Old Colony region.

3.10 Eight Planning Factors of SAFETEA-LU Comparison with RTP Goals

Planning Factor 1: Support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency

2007 RTP Goal: Provide a transportation system that supports the economic vitality of the region and enables global competitiveness, productivity, and efficiency. The transportation network is a critical component to sustaining a thriving economy and fostering new economic growth and development in the region. Employees and customers must be able to easily come and go between their homes, work, and shopping trips; and commerce and industry must be able to efficiently ship and receive goods as well. As such, promoting smart growth, transit oriented development, expansion of transit, and improving freight connections are all supporting efforts of this goal.

Planning Factor 2: Increase the safety of the transportation system for motorized and non-motorized users

2007 RTP Goal: Increase the safety of the transportation system for motorized and non-motorized users. It is essential that users of the transportation system are confident that their trip will be a safe one. Safety can be enhanced through careful attention to project design for construction of new facilities and improvements to the existing system, adequate and maintained signage and pavement markings, implementation of traffic calming measures, and public education. Operational safety can be enhanced through timely and effective maintenance of the system.

Planning Factor 3: Increase the security of the transportation system for motorized and Non-motorized users

2007 RTP Goal: Increase the security of the transportation system for motorized and non-motorized users. Strategies and programs focus on identifying high profile and/or vulnerable critical components of the regional transportation infrastructure, and develop strategies to enhance security and protect system, working with transit providers on enhancing security and providing site hardening, developing continuity of operations plans, identifying vulnerable populations, and incorporating enhanced surveillance equipment. Other activities include working with the MBTA, as well as host communities to MBTA Commuter Rail stations, to increase security at these stations, including platforms, walkways, and parking lots.

Planning Factor 4: Increase the accessibility and mobility options available to people and for freight

2007 RTP Goal: Increase the accessibility and mobility options available to all people and freight. It is important that existing and new transportation facilities are made community-sensitive, reducing not only environmental pollutants but the aesthetic impact as well. All users and communities should be treated fairly in the provision of transportation services, and should not be inequitably burdened by transportation project impacts.

Planning Factor 5: Protect and enhance the environment, promote energy conservation, and improve quality of life

2007 RTP Goal: Promote a transportation system that protects and enhances the environment; promotes energy conservation, and improves the quality of life in the region. Clean air and water are important components of a healthy environment. Society's reliance on single-occupant vehicles results in increased congestion and in turn increased vehicle emissions into the air, and runoff into our water supply. This transportation plan recognizes the importance of reducing reliance on single-occupant vehicles and promoting alternative fuel use vehicles to improve long-term air quality, to reduce energy consumption, and to protect our natural resources.

Planning Factor 6: Enhance the integration and connectivity of the transportation system, across and between modes, for people and freight

2007 RTP Goal: Enhance the integration and connectivity of the transportation system, across and between a well-balanced network of modes, for people and freight. Through its Regional Transportation Plan, the MPO promotes a multimodal and comprehensive approach to transportation in the Region. A balanced variety of transportation modes throughout the regional network should be interconnected, and connections need to be safe, secure, and efficient to best compliment connecting modes.

Planning Factor 7: Promote efficient system management and operation

2007 RTP Goal: Emphasize the preservation and modernization of the existing transportation system. Efforts and strategies include working with transit providers to maintain existing levels of service while also supporting expansion of service to meet projected needs, working with the state and communities to ensure that repairs and improvements are made to roads and bridges throughout the region in order to provide for a safe, efficient and adequate transportation network for the movement of people and goods, maintaining and enhancing PMS and CMP to improve decision-making and establishing priorities in the TIP development process, working with railroad companies to preserve existing rail freight service and promote extension of this service.

Planning Factor 8: Emphasize the preservation of the existing transportation system

2007 RTP Goal: Emphasize the preservation and modernization of the existing transportation system. Efforts and strategies include working transit providers to maintain existing levels of service while also supporting expansion of service to meet projected needs, working with the state and communities to ensure that repairs and improvements are made to roads and bridges throughout the region in order to provide for a safe, efficient and adequate transportation network for the movement of people and goods, maintaining and enhancing PMS and CMS to improve decision-making and establishing priorities in the TIP development process, and working with railroad companies to preserve existing rail freight service and promote extension of this service.

CHAPTER 4
REGIONAL PROFILE

4.0 Introduction

The Old Colony region consists of the following communities in Southeastern Massachusetts: Abington; Avon; Bridgewater; Brockton; East Bridgewater; Easton; Halifax; Hanson; Kingston; Pembroke; Plymouth; Plympton; Stoughton; West Bridgewater; and Whitman.

According to the 2000 U.S. Census, the Old Colony region had a population of 321,515 in 2000. This was an 8.3 percent increase over the 1990 regional population of 296,864. Between 1990 and 2000, the only community in the region to see a decrease in population was the Town of Avon. The Town of Plymouth experienced the largest growth in terms of number of people, while Kingston saw the highest growth rate.

4.1 Population and Housing

According to the U.S. Census, the region had a population of 321,515 people as of 2000 (see Table 4-1). In addition to the decennial census, the Census Bureau also releases population estimates on an annual basis, and the Census estimated the population in the region as of July 1, 2005 as 331,873.

Approximately one-third of the population resides in the northwest portion of the region in the communities of Brockton and Stoughton, where development is denser than much of the remainder or the region.

Recent Growth Trends

The introduction of commuter rail to the region in 1997 significantly influenced development and population. The greatest proportional increase from 1990 to 2000 was the 30 percent increase in Kingston, a community served by a station in the town as well as nearby stations in Plymouth and Halifax.

The region's population has consistently grown at varying rates from 141,017 residents in 1950 to 321,515 in 2000, an overall 128 percent increase. The region saw a very rapid rate of population growth through the 1950s and 60s, with a slowing but still positive trend through the 1970s and 80s. During the 1990's, population began growing at a higher rate than it had in the previous decades. Figure 4-1 graphically displays the growth trend over time. Table 4-1 contains population and growth figures for each community during each decennial census period.

From 2000 to 2005, much of the region's growth occurred in the southeastern half of the region, where many communities grew by over 6 percent. Many communities in the northwestern half experienced substantially less growth. Areas to the south have generally had more available developable land, and a substantial amount of subdivision and low-density, large-lot development has occurred.

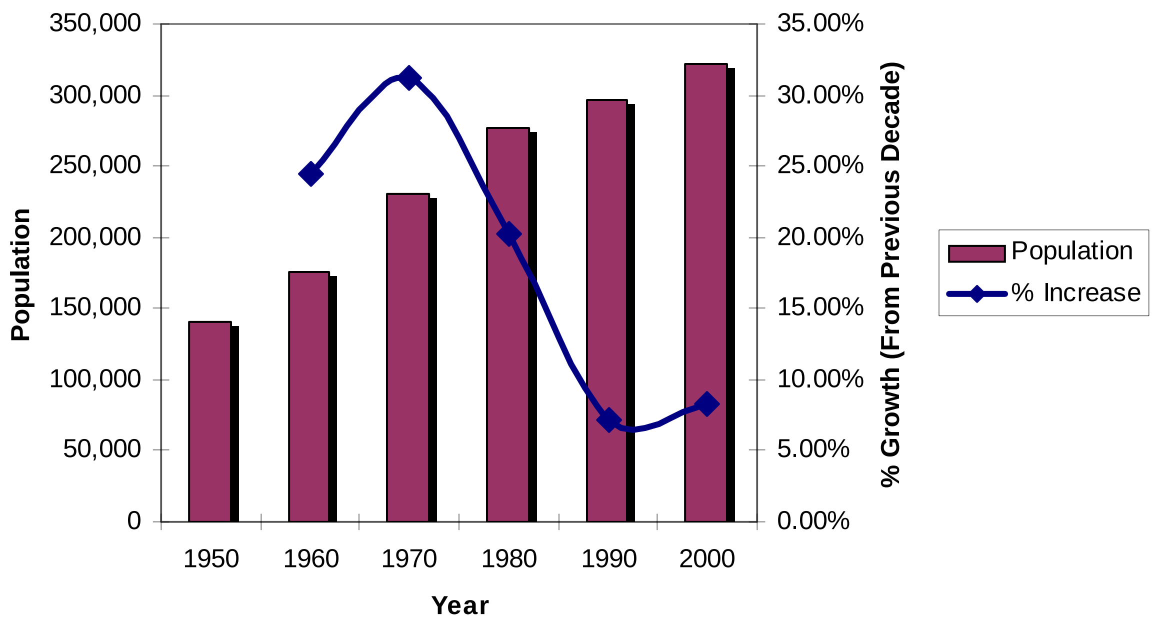
Note that Abington experienced over an 11 percent increase in population from 2000 to 2005. Much of Abington's growth can be attributed to the establishment of a transit oriented development zone and subsequent development of higher density housing around the Abington MBTA Commuter Rail Station.

Table 4-1
Regional Population and Growth, 1970-2005

	Decennial Census Population				2005	2000 - 2005 Growth	
Community	**1970**	**1980**	**1990**	**2000**	**Estimate**	**Total**	**Annual**
Abington	12,334	13,517	13,817	14,605	16,351	11.95%	2.28%
Avon	5,295	5,026	4,558	4,443	4,340	-2.32%	-0.47%
Bridgewater	12,902	17,202	21,249	25,185	25,720	2.12%	0.42%
Brockton	89,040	95,172	92,788	94,304	94,632	0.35%	0.07%
East Bridgewater	8,347	9,945	11,104	12,974	13,859	6.82%	1.33%
Easton	12,157	16,623	19,807	22,299	23,028	3.27%	0.65%
Halifax	3,537	5,513	6,526	7,500	7,809	4.12%	0.81%
Hanson	7,148	8,617	9,028	9,495	9,926	4.54%	0.89%
Kingston	5,999	7,362	9,045	11,780	12,457	5.75%	1.12%
Pembroke	11,193	13,487	14,544	16,927	18,095	6.90%	1.34%
Plymouth	18,606	35,913	45,608	51,701	54,923	6.23%	1.22%
Plympton	1,224	1,974	2,384	2,637	2,781	5.46%	1.07%
Stoughton	23,459	26,710	26,777	27,149	26,692	-1.68%	-0.34%
West Bridgewater	6,079	6,359	6,389	6,634	6,821	2.82%	0.56%
Whitman	13,059	13,534	13,240	13,882	14,439	4.01%	0.79%
Region	230,379	276,954	296,864	321,515	331,873	3.22%	0.64%
	1970-80	**1980-90**	**1990-2000**				
	Community Growth						
Abington	9.59%	2.22%	5.70%				
Avon	-5.08%	-9.31%	-2.52%				
Bridgewater	33.33%	23.53%	18.52%				
Brockton	6.89%	-2.50%	1.63%				
East Bridgewater	19.14%	11.65%	16.84%				
Easton	36.74%	19.15%	12.58%				
Halifax	55.87%	18.37%	14.92%				
Hanson	20.55%	4.77%	5.17%				
Kingston	22.72%	22.86%	30.24%				
Pembroke	20.49%	7.84%	16.38%				
Plymouth	93.02%	27.00%	13.36%				
Plympton	61.27%	20.77%	10.61%				
Stoughton	13.86%	0.25%	1.39%				
West Bridgewater	4.61%	0.47%	3.83%				
Whitman	3.64%	-2.17%	4.85%				
Region	20.22%	7.19%	8.30%				

Source: U.S. Census

Figure 4-1: Regional Population Growth Trend



With few exceptions, most of the region's communities appear to have potential for further robust growth, though a more moderate growth rate is expected over the longer run

Population Density

The northwestern portion of the region is much more densely populated than the southeastern portion. Brockton is the most densely populated community in the Region, with nearly 4400 persons per square mile. With only 7 percent of the region's total land area, it contained 29 percent of the regional population in 2000.

In 1990, nine towns (Abington, Avon, Bridgewater, Brockton, East Bridgewater, Easton, Pembroke, Stoughton, and Whitman) had population densities of 600 or more persons per square mile and two additional towns (Hanson, and Kingston) had reached this level by 2000. Table 4-2 lists the population densities of each community in the region, as well as for the region and the state as a whole. The map in Figure 4-2 indicates population density by census block group throughout the region, while Figure 4-3 compares how the communities in the Region rank in respect to population density.

Such overall densities tell little about the emerging character of a community. First, it is a community-wide figure and much land may be in other uses or vacant, while the density of actual neighborhoods is considerably higher. Secondly, new growth is often on larger lots and at lower immediate density than in the older parts of the community. However these overall figures do suggest the emerging pattern of growth throughout the region and the potential for increased inter-community trips if present trends continue.

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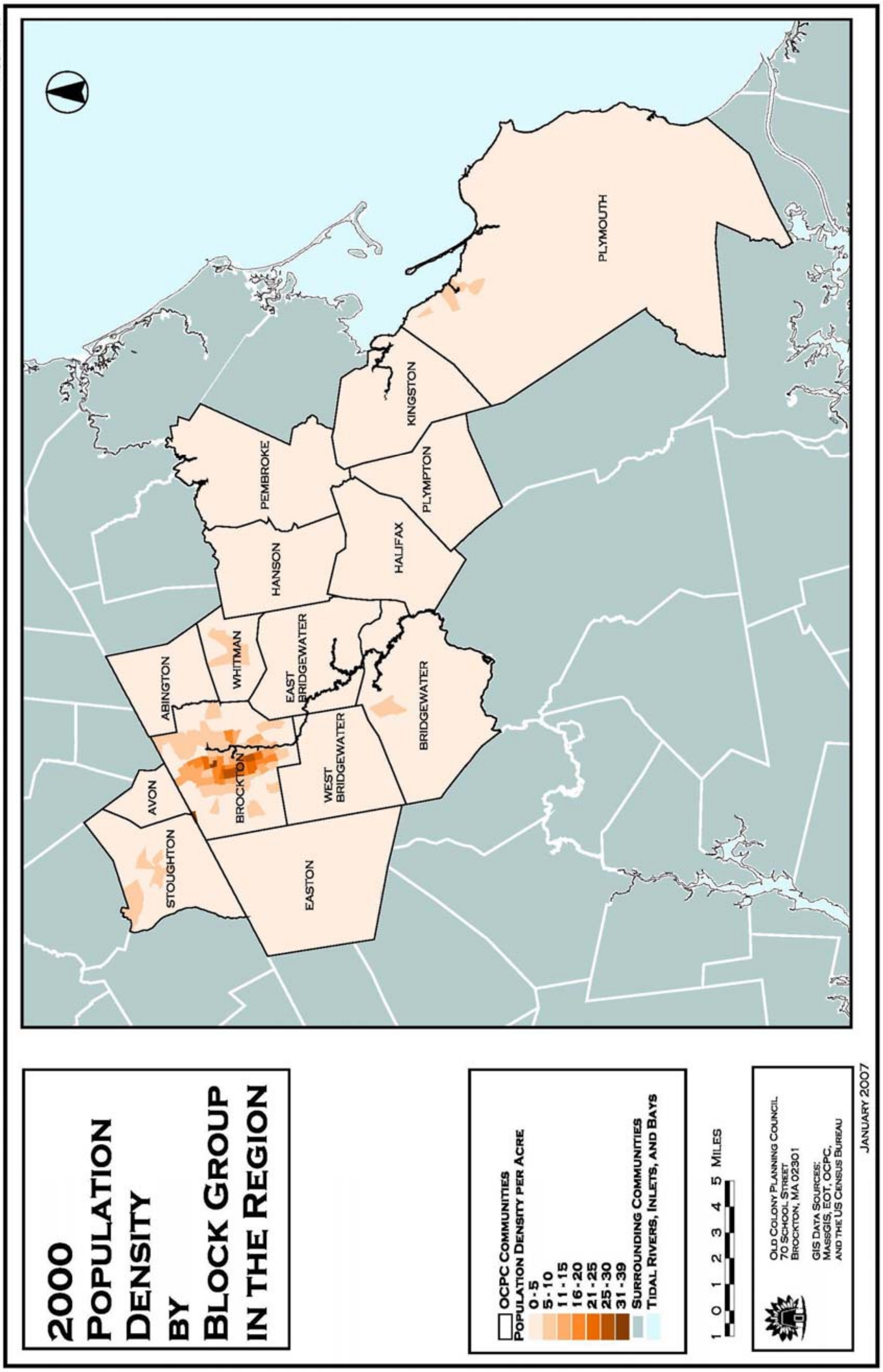
FIGURE 4-2
2000 POPULATION DENSITY BY BLOCK GROUP IN THE REGION
OCPC COMMUNITIES
POPULATION DENSITY PER ACRE
0 - 5
5 - 10
11 - 15
16 - 20
21 - 25
25 - 30
31 - 39
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
1 0 1 2 3 4 5 MILES
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
JANUARY 2007
PLYMOUTH
KINGSTON
PLYMPTON
PEMBROKE
HALIFAX
HANSON
WHITMAN
EAST BRIDGEWATER
ABINGTON
BRIDGEWATER
WEST BRIDGEWATER
BROCKTON
AVON
STOUGHTON
EASTON

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Housing Characteristics

According to the 2000 Census, the number of housing units in the region increased by 7.99 percent in the 1990s. Three communities (Bridgewater, Kingston, and Pembroke) all had greater than a 20 percent increase for housing. Table 4-3- shows the total housing units, by town in the Old Colony Region that are owner and renter occupied.

Table 4-2
Population Density

Area	2000 Population	Land Area (Sq. Miles)	Density in 2000 (Pop/ Sq. Mile)
Massachusetts	6,349,097	7,840	810
Region	321,515	330.5	973
Abington	14,605	9.9	1,475
Avon	4,443	4.4	1,010
Bridgewater	25,185	27.5	916
Brockton	94,304	21.5	4,386
East Bridgewater	12,974	17.2	754
Easton	22,299	28.4	785
Halifax	7,500	16.1	466
Hanson	9,495	15.0	633
Kingston	11,780	18.5	637
Pembroke	16,927	21.8	776
Plymouth	51,701	96.5	536
Plympton	2,637	14.8	178
Stoughton	27,149	16.0	1,697
West Bridgewater	6,634	15.7	423
Whitman	13,882	7.0	1,983
Source: U.S. Census 2000, MISER			

Figure 4-3
Population Densities, 1980-2000

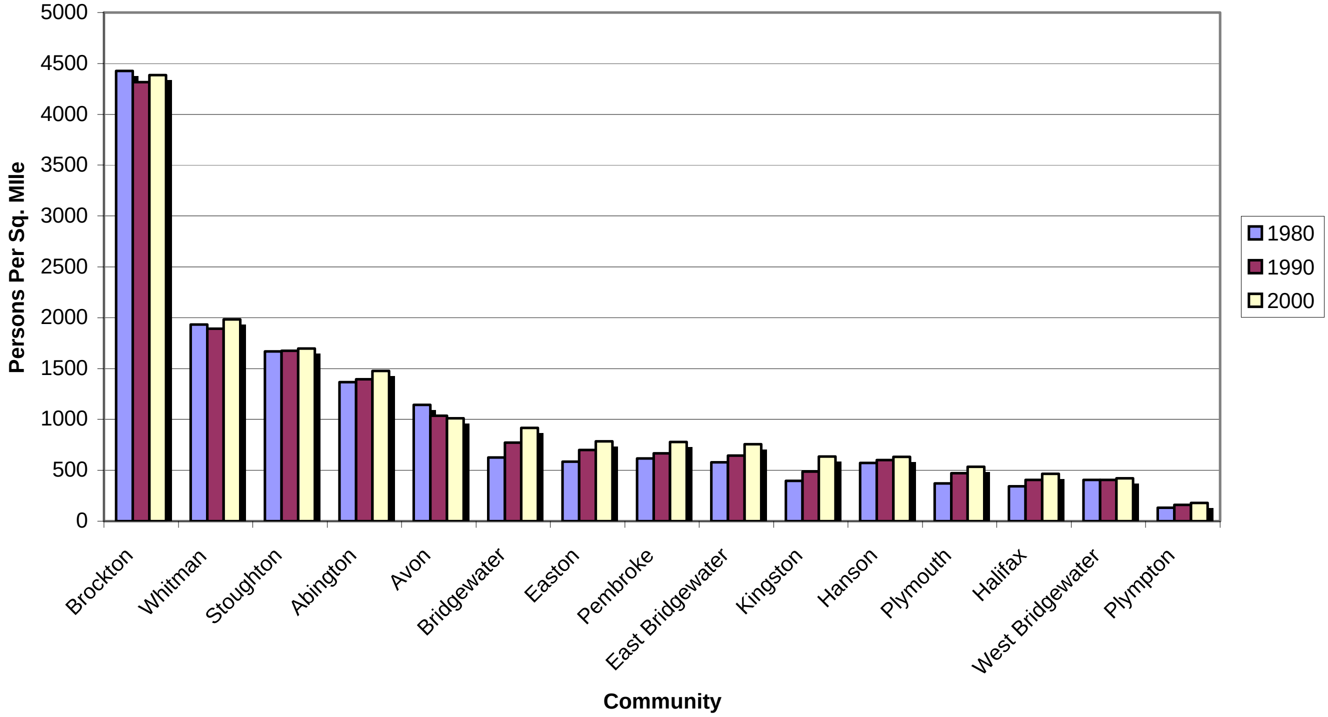


Table 4-3
Owner and Renter Occupied Housing Units

COMMUNITY	Total Housing Units 1990	2000	% Change 1990-2000	Housing Units in 2000 Owner Occupied	% Total Units	Renter Occupied	% Total Units
ABINGTON	4,955	5,348	7.93%	3,778	70.64%	1,485	27.77%
AVON	1,666	1,740	4.44%	1,305	75.00%	400	22.99%
BRIDGEWATER	6,230	7,652	22.83%	5,611	73.33%	1,915	25.03%
BROCKTON	35,376	34,837	-1.52%	18,375	52.75%	15,300	43.92%
EAST BRIDGEWATER	3,700	4,427	19.65%	3,562	80.46%	782	17.66%
EASTON	6,708	7,631	13.76%	6,113	80.11%	1,376	18.03%
HALIFAX	2,453	2,841	15.82%	2,519	88.67%	239	8.41%
HANSON	2,985	3,178	6.47%	2,779	87.44%	344	10.82%
KINGSTON	3,496	4,525	29.43%	3,473	76.75%	775	17.13%
PEMBROKE	4,881	5,897	20.82%	5,121	86.84%	629	10.67%
PLYMOUTH	19,650	21,250	8.14%	14,292	67.26%	4,131	19.44%
PLYMPTON	794	872	9.82%	819	93.92%	35	4.01%
STOUGHTON	9,754	10,488	7.53%	7,642	72.86%	2,612	24.90%
WEST BRIDGEWATER	2,302	2,510	9.04%	2,092	83.35%	352	14.02%
WHITMAN	4,596	5,104	11.05%	3,603	70.59%	1,396	27.35%
REGION	109,546	118,300	7.99%	81,084	68.54%	31,771	26.86%
Source: U.S. Census Bureau, Census 2000							

Post-2000 housing growth based on building permit data shows an increase of 3,087 single family-detached houses and of only 108 buildings holding 2 to 5+ units per structure for an overall estimated 2000-2004 growth of 3780 units or 3.2 percent. Thus the region remains characterized by relatively low-density single-family development despite pockets of multi-unit family development, largely permitted through Chapter 40B.

4.2 Demographics

The Old Colony Region is diverse with several significantly sized segments of the population from various ancestries and ethnicities. In addition to English, other languages including Spanish, French, and Portuguese are commonly spoken. The Region's population is also getting older, with baby boomers continuing to make up the largest segment of the population and beginning to transition into their elder years.

Age Composition

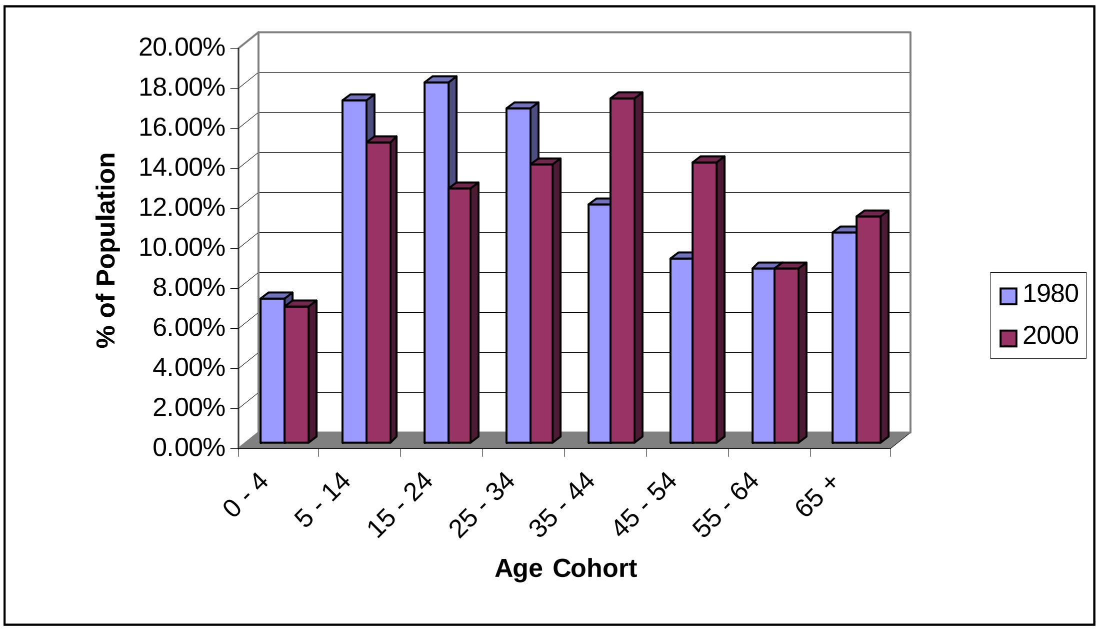
Table 4-4 shows the regional patterns in age distribution of the population over the past 40 years, and Figure 4-4 graphically compares the 20-year difference in age distribution from 1980 to 2000. The trend indicates that the region's population is getting older.

Table 4-4
Age Distribution of Population, 1970-2000

Age Group	1970	Percent of Total	1980	Percent of Total	1990	Percent of Total	2000	Percent of Total
0 - 4	22,734	10.17%	20,077	7.25%	22,387	7.54%	22,062	6.86%
5 - 14	47,968	21.45%	47,664	17.21%	41,435	13.96%	48,313	15.03%
15 - 24	34,196	15.29%	50,188	18.12%	45,642	15.37%	41,097	12.78%
25 - 34	30,294	13.55%	46,517	16.80%	52,649	17.74%	44,754	13.92%
35 - 44	24,612	11.01%	33,218	11.99%	47,428	15.98%	55,447	17.25%
45 - 54	24,394	10.91%	25,725	9.29%	31,410	10.58%	45,210	14.06%
55 - 64	18,707	8.37%	24,258	8.76%	22,331	7.52%	28,058	8.73%
65 +	20,723	9.27%	29,307	10.58%	33,582	11.31%	36,574	11.38%
Total	223,628	100.00%	276,954	100.00%	296,864	100.00%	321,515	100.00%

Source: 1970, 1980, 1990, and 2000 U.S. Census; OCPC

Figure 4-4
Age Distribution, 1980 – 2000



Elder Persons

In 1980, the largest segment of the population was that group of persons between 15 and 24 years old. Expectedly, that group had transitioned to 35 to 44 years old by 2000, and continued to comprise the largest group among the population. In 2000, over 20 percent of the population was 55 or older, a percentage that has risen consistently since 1970. Nationally, approximately one in every seven licensed drivers is 65 years of age or older. By 2030, that figure is estimated to be about 1 in 4. According to the Institute of Transportation Engineers (ITE), the average male will outlive his driving abilities by six years and the average female will outlive hers by ten years. The map in Figure 4-5 indicates where the most significant concentrations of older persons reside in the Region.

Other trends in recent years have shown many elder persons choosing to stay in their own suburban homes rather than opting for a specific community or facility that caters to their physical and social needs. Similarly, people are generally working later in life than in past generations, further emphasizing the transportation needs for this segment of the population.

The Federal Highway Administration (FHWA) in Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians cite results of a survey that identifies specific challenges faced by older Americans while driving. For example, crash analyses and observational studies indicated the following factors in intersection crashes involving older drivers:

- 27 percent had difficulty reading road signs
- 21 percent had difficulty driving across an intersection
- 20 percent had difficulty finding the beginning of a left turn lane
- 19 percent had difficulty making a left turn
- 17 percent had difficulty following pavement markings
- 12 percent had difficulty responding to traffic signals

The same study also yielded the following results of a survey given to older drivers to identify highway features more important to them for safe driving as they grow in age:

- Lighting at intersections (62 percent)
- Pavement markings at intersections (57 percent)
- Number of left turn lanes at an intersection (55 percent)
- Width of travel lanes (51 percent)
- Raised-curb channelization for turns at intersections (47 percent)
- Size of traffic signals at intersections (42 percent)

Planning for the transportation needs of the older drivers of today and tomorrow must be a priority for planners and government entities.

Environmental Justice Populations

Achieving environmental justice is a priority of the Old Colony Metropolitan Planning Organization and Old Colony Planning Council. This is achieved by taking steps to ensure the effects of all programs, policies, and activities on minority populations and low-income population, identified, and addressed in the transportation planning process. There are three fundamental environmental justice principles that are employed in the process:

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

Federal legislation requires MPOs:

- Enhance their analytical capabilities to ensure that the long-range transportation plan and the transportation improvement program (TIP) comply with Title VI.
- Identify residential, employment, and transportation patterns of low-income and minority populations so that their needs can be identified and addressed, and the benefits and burdens of transportation investments can be fairly distributed.

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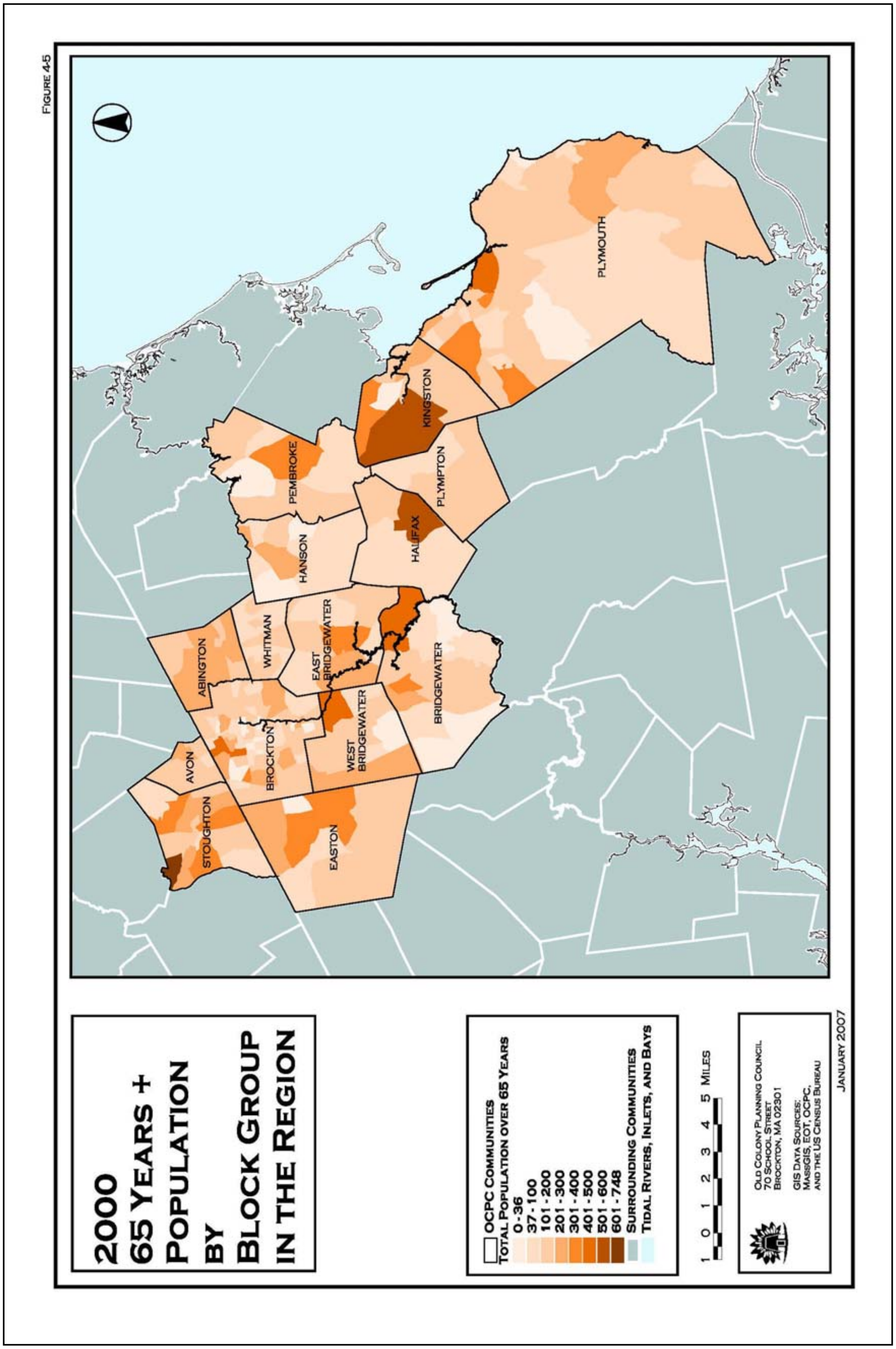

FIGURE 4-5
2000
65 YEARS +
POPULATION
BY
BLOCK GROUP
IN THE REGION
OCPC COMMUNITIES
TOTAL POPULATION OVER 65 YEARS
0 - 36
37 - 100
101 - 200
201 - 300
301 - 400
401 - 500
501 - 600
601 - 748
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
1 0 1 2 3 4 5 MILES
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
JANUARY 2007
PLYMOUTH
KINGSTON
PEMBROKE
PLYMPTON
HANSON
HALIFAX
WHITMAN
EAST BRIDGEWATER
ABINGTON
BRIDGEWATER
WEST BRIDGEWATER
BROCKTON
AVON
STOUGHTON
EASTON

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- Evaluate and - where necessary - improve their public involvement processes to eliminate participation barriers and engage minority and low-income populations in transportation decision-making.

Figures 4-6 (Non-White Population by Block Group) and 4-7 (Low Income Population by Block Group) show the environmental justice populations within the Old Colony Region.

The total regional population increased by 8.30 percent from 1990 to 2000 reaching 321,515 people while the number of whites deceased by .15 percent from 271,850 to 271,441. In contrast, the black population grew by 35.5 percent from 15,966 to 21,629; American Indians, Eskimos, or Aleuts grew by 19.5 percent from 604 to 722; and Asian and Pacific Islanders increased by 42.3 percent from 2,869 to 4,082. The total "Hispanic origin" population of all races rose by 28.7 percent from 8,265 to 10,634. In all, the region's broadly defined minority population rose to 50,074 or 15.6 percent of the total.

Table 4-5
Population by Race (1990 – 2000)

	1990	Percent of Total Pop.	2000	Percent of Total Pop.	% Change 1990-2000
White	271,850	91.57%	271,441	84.43%	-0.15%
Black	15,966	5.38%	21,629	6.73%	35.47%
American Indian and Alaskan Native	604	0.20%	722	0.22%	19.54%
Asian & Pacific Islander	2,869	0.97%	4,082	1.27%	42.28%
Other Race	5,575	1.88%	23,641	7.35%	324.05%
Total Population	296,864	100.00%	321,515	100.00%	8.30%
Hispanic Origin Population	8,265	2.78%	10,634	3.31%	28.66%
Source: 1990 & 2000 U.S. Census					

The City of Brockton is the most diverse area in the region, with 38.5 percent of the total population being other than in the non-Hispanic "White alone" category. While Brockton has by far the largest minority population (36,315), there is some minority population in every community, with major concentrations in Plymouth, Stoughton and Bridgewater. In all, 13,759 minority persons, 27.5 percent of the total, live outside of the City. In Brockton, there was some minority population in every census tract but very few tracts were more than 50 percent minority and none were over 64 percent minority, as of the 2000 Census. Thus the Old Colony Region is much more integrated that many parts of the Greater Boston metropolitan area.

Income levels influence transportation choices in a variety of ways. By whatever measure (median household income, median family income, per capita income or discretionary income), a person or family's income influences the number and kind of vehicle trips they generate. Income also influences a person's need for and use of public transportation. Table 4-7 shows the median household income, median family income, and per capita income for the Old Colony region by community, as well as for the state using1999 income data.

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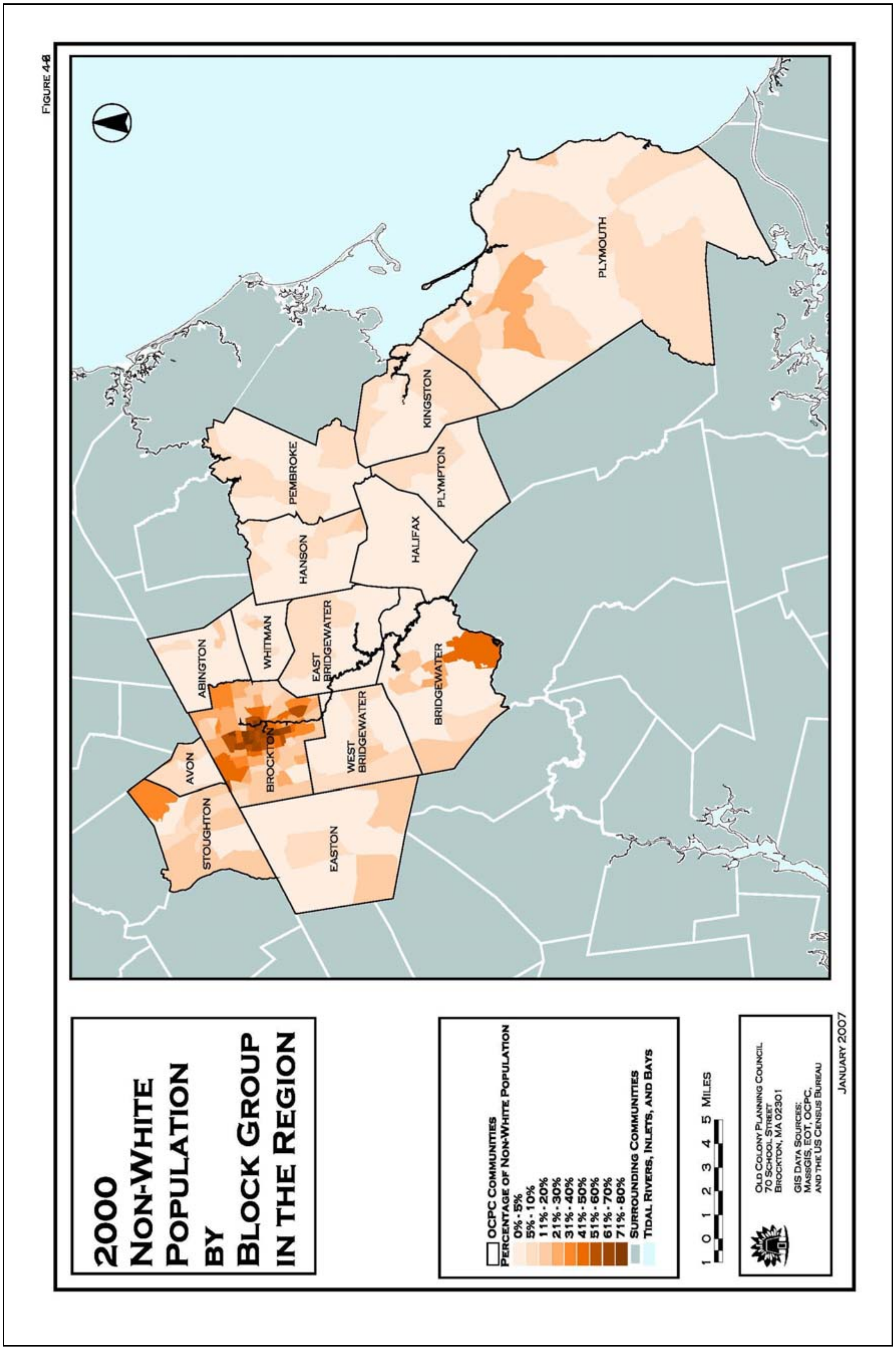
FIGURE 4-8
2000 NON-WHITE POPULATION BY BLOCK GROUP IN THE REGION
OCPC COMMUNITIES
PERCENTAGE OF NON-WHITE POPULATION
0% - 5%
5% - 10%
11% - 20%
21% - 30%
31% - 40%
41% - 50%
51% - 60%
61% - 70%
71% - 80%
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
0 1 2 3 4 5 MILES
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
JANUARY 2007
PLYMOUTH
KINGSTON
PEMBROKE
PLYMPTON
HALIFAX
HANSON
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ABINGTON
EAST BRIDGEWATER
BRIDGEWATER
WEST BRIDGEWATER
BROCKTON
AVON
STOUGHTON
EASTON

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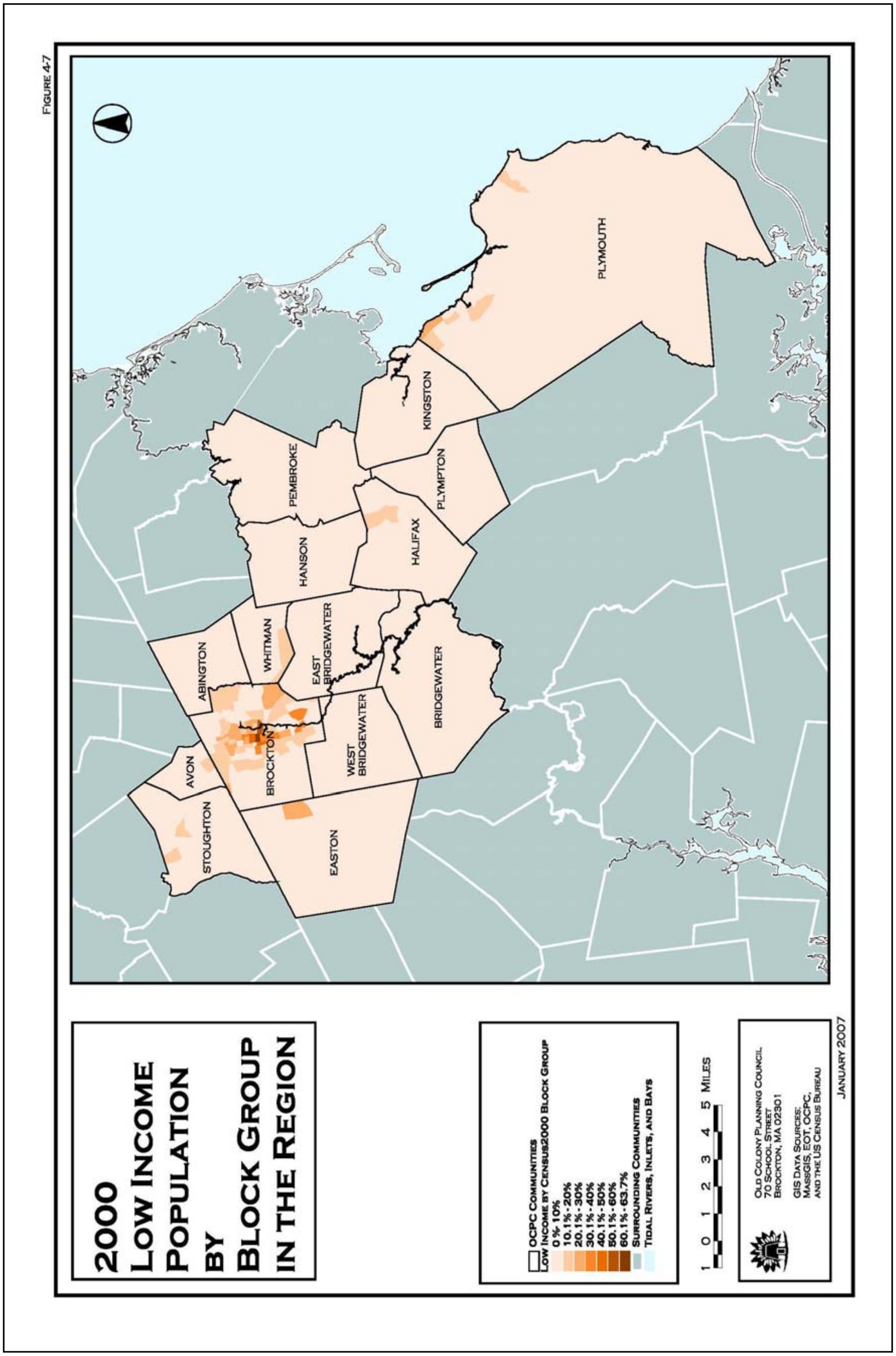
FIGURE 4-7
2000
LOW INCOME
POPULATION
BY
BLOCK GROUP
IN THE REGION
OCPC COMMUNITIES
LOW INCOME BY CENSUS2000 BLOCK GROUP
0% - 10%
10.1% - 20%
20.1% - 30%
30.1% - 40%
40.1% - 50%
50.1% - 60%
60.1% - 63.7%
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
1 0 1 2 3 4 5 MILES
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
JANUARY 2007
PLYMOUTH
KINGSTON
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ABINGTON
WHITMAN
EAST BRIDGEWATER
BRIDGEWATER
WEST BRIDGEWATER
AVON
BROCKTON
STOUGHTON
EASTON

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The Median Household Income in the Old Colony Region increased by 38.13 percent from 1990 to 2000, (using an un-weighted average of community figures) and exceeded the statewide increase by approximately 1.5 percent. Similarly, the region's Median Family Income grew by 42.43 percent, exceeding the statewide increase of 38.98 percent. However, the region's 43.81 percent increase in Per Capita income lagged behind the state increase of 50.67 percent, suggesting families and households with many relatively low paid workers.

Table 4-6
Population by Race and Hispanic Origin 2000

Area Name	Total Persons	Subtotal (One Race)	White Alone	Black or African American Alone	American Indian and Alaska Native Alone
Massachusetts	6,349,097	6,203,092	5,367,286	343,454	15,015
Abington	14,605	14,484	14,237	111	17
Avon	4,443	4,405	4,152	166	12
Bridgewater	25,185	24,903	21,982	1,017	59
Brockton	94,304	86,966	57,989	16,811	338
East Bridgewater	12,974	12,833	12,573	129	22
Easton	22,299	22,096	20,501	354	10
Halifax	7,500	7,441	7,360	23	2
Hanson	9,495	9,391	9,176	105	22
Kingston	11,780	11,665	11,427	113	14
Pembroke	16,927	16,802	16,569	85	12
Plymouth	51,701	50,937	49,022	988	131
Plympton	2,637	2,619	2,554	26	16
Stoughton	27,149	26,530	24,017	1,548	28
West Bridgewater	6,634	6,550	6,395	63	17
Whitman	13,882	13,726	13,487	90	22
Region Totals	321,515	311,348	271,441	21,629	722

Area Name	Asian Alone	Native Hawaiian & Other Pacific Islander Alone	Some Other Race Alone	Persons of Two or More Races	Persons of Hispanic Origin (of any race)
Massachusetts	238,124	2,489	236,724	146,005	428,729
Abington	71	1	47	121	103
Avon	41	0	34	38	64
Bridgewater	271	5	1,569	282	693
Brockton	2,066	34	9,728	7,338	7,552
East Bridgewater	62	4	43	141	97
Easton	309	2	920	203	352
Halifax	20	0	36	59	41
Hanson	33	0	55	104	65
Kingston	51	1	59	115	88
Pembroke	86	2	48	125	90
Plymouth	295	20	481	764	870
Plympton	9	0	14	18	11
Stoughton	580	13	344	619	419
West Bridgewater	45	0	30	84	67
Whitman	59	2	66	156	122
Region Totals	3,998	84	13,474	10,167	10,634

Source: U.S. Census Bureau, Census 2000, Redistricting Data Summary File
Massachusetts Institute for Social and Economic Research (MISER)

Table 4-7
Income Statistics by Community

Community	Median Household Income 1989	Median Household Income 2000	Median Household Income % Change	Median Family Income 1989	Median Family Income 2000	Median Family Income % Change	Per Capita Income 1989	Per Capita Income 2000	Per Capita Income % Change
Abington	$42,730	$57,100	33.63%	$48,889	$68,826	40.78%	$16,379	$23,380	42.74%
Avon	$43,214	$50,305	16.41%	$49,565	$60,625	22.31%	$16,786	$24,410	45.42%
Bridgewater	$41,933	$65,318	55.77%	$50,080	$73,953	47.67%	$21,414	$23,105	7.90%
Brockton	$31,712	$39,507	24.58%	$38,544	$46,235	19.95%	$13,455	$17,163	27.56%
East Bridgewater	$42,614	$60,311	41.53%	$47,458	$67,307	41.82%	$15,056	$23,532	56.30%
Easton	$50,647	$69,144	36.52%	$56,790	$82,190	44.73%	$19,016	$30,732	61.61%
Halifax	$37,197	$57,015	53.28%	$42,955	$65,461	52.39%	$15,233	$23,738	55.83%
Hanson	$45,515	$62,687	37.73%	$50,236	$68,560	36.48%	$18,412	$23,727	28.87%
Kingston	$40,782	$53,780	31.87%	$45,386	$65,101	43.44%	$17,596	$23,370	32.81%
Pembroke	$46,932	$65,050	38.60%	$51,033	$74,985	46.93%	$16,531	$27,066	63.73%
Plymouth	$39,886	$54,677	37.08%	$45,212	$63,266	39.93%	$15,889	$23,732	49.36%
Plympton	$46,151	$70,045	51.77%	$41,715	$75,000	79.79%	$17,150	$24,344	41.95%
Stoughton	$42,044	$57,838	37.57%	$47,492	$69,942	47.27%	$17,313	$25,480	47.17%
West Bridgewater	$40,613	$55,958	37.78%	$47,863	$64,815	35.42%	$16,214	$23,701	46.18%
Whitman	$40,779	$55,303	35.62%	$45,871	$63,706	38.88%	$14,206	$23,002	61.92%
Region*	$42,183	$58,269	38.13%	$47,273	$67,331	42.43%	$16,710	$24,032	43.82%
Brockton PMSA	$37,403	$52,058	39.18%	$43,845	$60,890	38.88%	$16,422	$21,654	31.86%
Massachusetts	$36,952	$50,502	36.67%	$44,367	$61,664	38.99%	$17,224	$25,952	50.67%

***Regional Figures are the average of community income figures, not the median**

Source: U.S. Census 2000

Brockton PMSA includes: Brockton, Abington, Avon, Bridgewater, East Bridgewater, Easton, Halifax, Hanson, Lakeville, Middleboro, Plympton, Raynham, West Bridgewater, and Whitman

As mentioned previously, migration trends reflect both housing opportunities and employment opportunities and lead to the growing role of the region's communities as bedroom suburbs for people working in the Boston/Cambridge and Route 128 employment centers. People moving into the area from Metropolitan Boston typically remain employed outside the region and other residents look toward Metropolitan Boston for higher paying jobs.

Incomes vary greatly by community. As of the 2000 Census, median household incomes (reflecting 1999 earnings) ranged from $39,507 in Brockton to $70,045 in Plympton, with the Brockton PMSA median of $52,058 exceeding the $50,502 statewide figure. At the same time, median family incomes ranged from $46,235 in Brockton to $75,000 in Plympton. At an un-weighted average of $67,331, the region exceeded the statewide figure of $61,664 while the PMSA lagged slightly with median of $60,890.

During the period from 1990 to 2000 the median household income in Brockton increased by only 21.42 percent while the region grew by an unweighted average of $38.13 percent and the PMSA figure increased by 39.18 percent. Since Brockton has over 29 percent of region's population its lower figure reflects the low incomes of a sizable population.

As of 2000, 4-7 percent of the region's residents had incomes below the poverty level. In Brockton, 14-5 percent of Brockton's residents had incomes below the poverty level. As of 2006 the Federal Poverty level for the contiguous US states is $20,000 for a family or household of four while it is $23,000 in Hawaii and $25,000 in Alaska.

People with such low incomes particularly depend on public transportation or on being within walking distance of work and services. The map in Figure 4-7 reveals where concentrations of low-income residents reside in the region. To see this data and other environmental justice criteria displayed along with existing transit options, please refer to the transit chapter of this plan.

Automobile Ownership

Car ownership or availability is quite high with less than 1 licensed driver per vehicle and only 1.23 persons per registered vehicle region-wide as of 1999. The persons per vehicle range from .83 in Avon to 1.51 in Brockton. Compared to the rest of the region, Brockton has a relatively large low-income population, a well-developed public transportation system, and a relatively high proportion of residents working within the community (40.1 percent in 1990 versus 18.4 percent in Pembroke for example).

4.3 Land Use

This section addresses the location and character of major land uses throughout the region, along with applicable state, regional, and local land use regulations and policies. The continuing pattern of low-density residential development of outlying areas and the scattering of non-residential uses (commonly referred to as "sprawl") causes a variety of negative impacts on the region, including:

- Increased consumption of land
- Additional trips on the transportation network, contributing to increased congestion and pollution
- Increased demand for transportation improvements
- Decreased feasibility of mass transit

The most recent land use data is summarized in Table 4-8. The data is interpreted from the 1999 Mass GIS Aerial Orthophotos. The MacConnell program mapped the state in 1952, 1972, 1985, 1991, 1995, and 1999 to show changing forest cover and land use patterns. The tabulation is based on 21-category system that combines uses in ways that can mask major activities. For example the Urban Open Area category includes cemeteries, parks, undeveloped land and institutions. Major institutions such as hospitals and colleges often cannot be distinguished from open land, thereby understating the land in institutional use and overstating undeveloped land. In addition, being based on leaves-on photography, the maps combine wooded swamp with other forest, thereby understating wetlands. Some communities reportedly have been interpreted by an expanded system distinguishing more types of urban land uses, identifying large tracts of institutionally held open land, and distinguishing wooded swamp from wooded uplands. However the present data must be supplemented with information from sources such as the United States Geologic Survey Maps which are based on leaves-on flights and do show wooded swamp.

Land use patterns from 1972, 1985, and 1999 are displayed in Figures 4-8 through 4-10, and the continuous trend of land consumption, much by low-density development, from 1972 through 1999.

The region's greatest concentration of population and economic activity is at its northern end. Brockton itself (2000 US Census population of 94,304) is the most developed community with 29.3 percent of the region's 2000 total population and 30.5 percent of its commercial and industrial activity. Combined with the adjacent towns of Abington, Avon, Stoughton and Whitman, the area contained 48.0 percent of the region's 2000 population and 51.9 percent of its employment.

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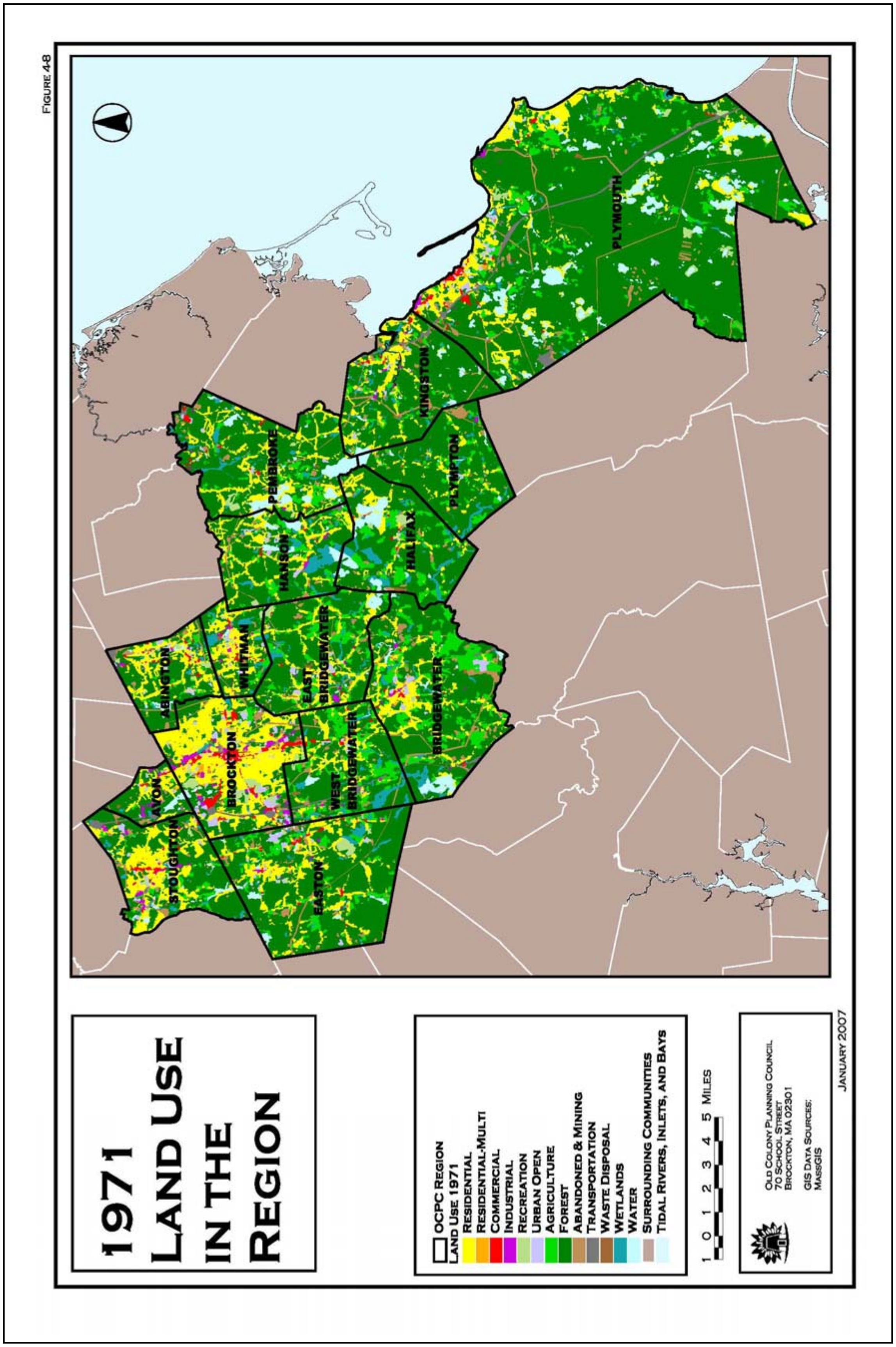

Figure 4-8
1971 Land Use in the Region
OCPC Region
Land Use 1971
Residential
Residential-Multi
Commercial
Industrial
Recreation
Urban Open
Agriculture
Forest
Abandoned & Mining
Transportation
Waste Disposal
Wetlands
Water
Surrounding Communities
Tidal Rivers, Inlets, and Bays
1 0 1 2 3 4 5 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS
January 2007
Stoughton
Avon
Brockton
Abington
Whitman
Easton
West Bridgewater
East Bridgewater
Bridgewater
Hanson
Halifax
Pembroke
Plympton
Kingston
Plymouth

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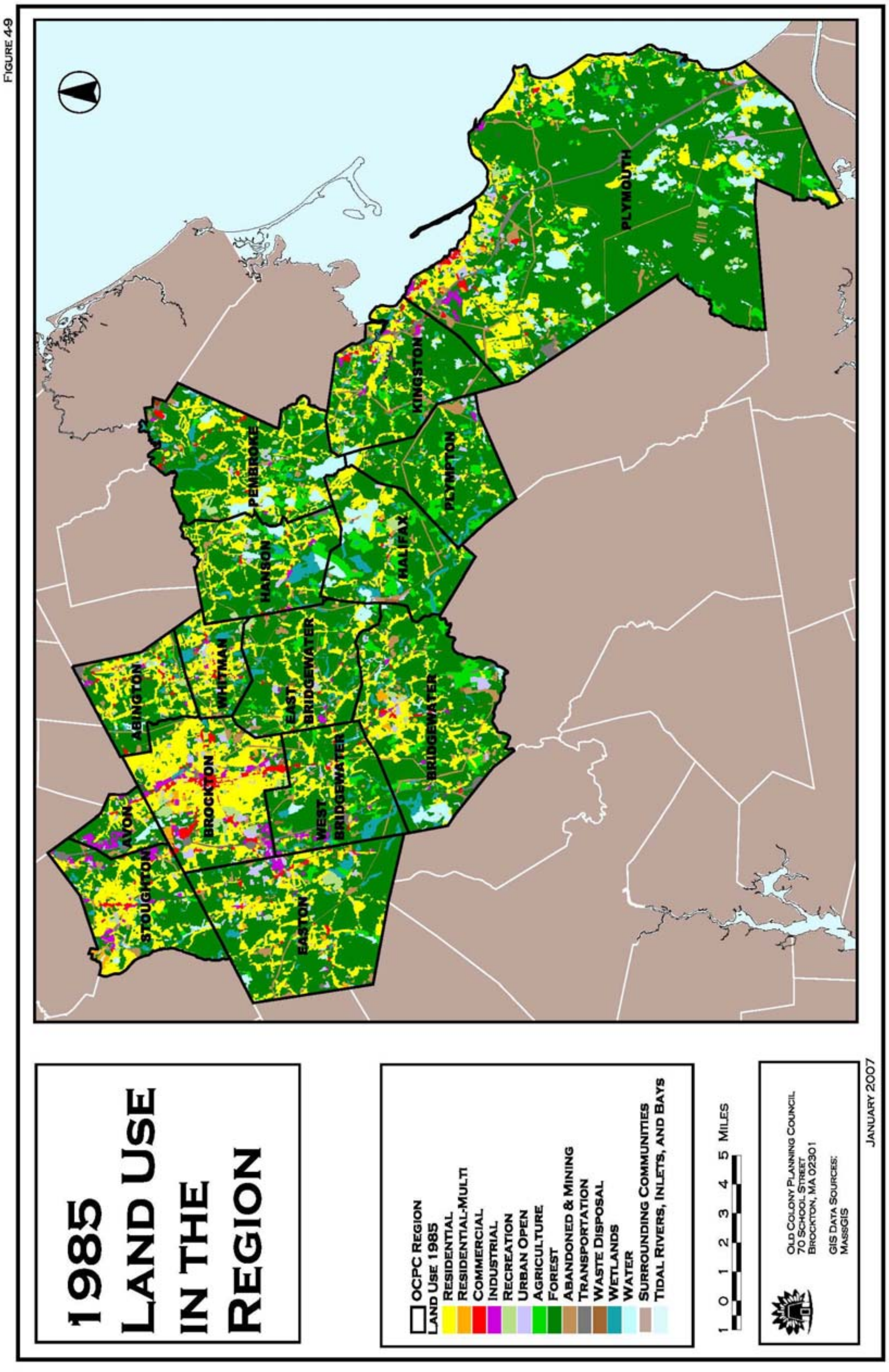
FIGURE 4-9
1985 LAND USE IN THE REGION
OCPC REGION
LAND USE 1985
RESIDENTIAL
RESIDENTIAL-MULTI
COMMERCIAL
INDUSTRIAL
RECREATION
URBAN OPEN
AGRICULTURE
FOREST
ABANDONED & MINING
TRANSPORTATION
WASTE DISPOSAL
WETLANDS
WATER
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
0 1 2 3 4 5 MILES
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS
JANUARY 2007
STOUGHTON
AVON
BROCKTON
ABINGTON
WHITMAN
EASTON
WEST BRIDGEWATER
EAST BRIDGEWATER
BRIDGEWATER
HANSON
PEMBROKE
HALIFAX
PLYMPTON
KINGSTON
PLYMOUTH

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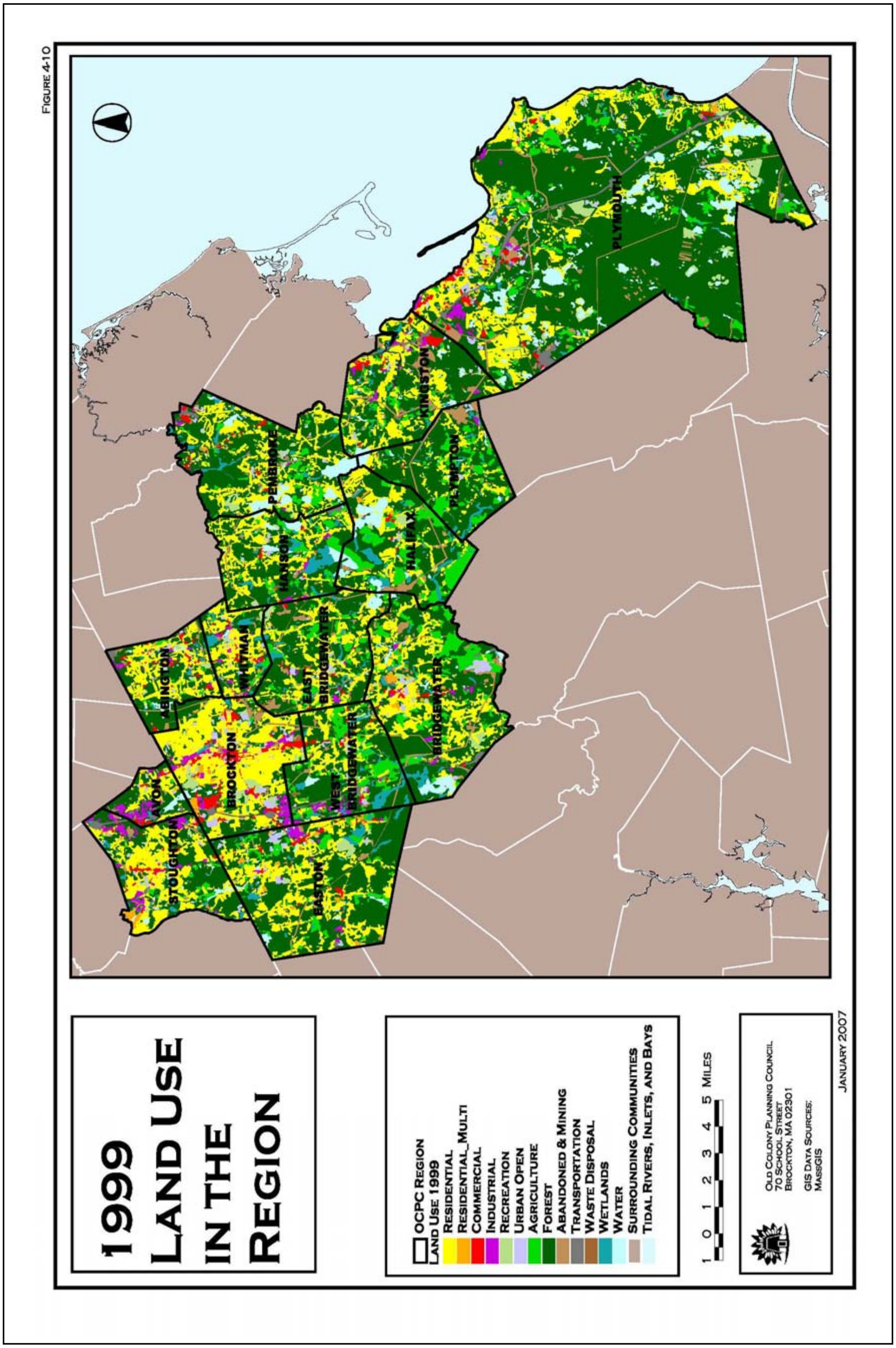
Figure 4-10
1999 Land Use in the Region
OCPC Region
Land Use 1999
Residential
Residential_Multi
Commercial
Industrial
Recreation
Urban Open
Agriculture
Forest
Abandoned & Mining
Transportation
Waste Disposal
Wetlands
Water
Surrounding Communities
Tidal Rivers, Inlets, and Bays
1 0 1 2 3 4 5 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS
January 2007
Plymouth
Kingston
Pembroke
Plympton
Halifax
Hanson
East Bridgewater
Whitman
Abington
Brockton
Avon
Stoughton
Easton
West Bridgewater
Bridgewater

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To the southeast, Plymouth (2000 Census population, 51,701) has 16.1 percent of the Old Colony region's population. It also has 18,919 jobs for 15.3 percent of the regions employment, making it the second largest concentration of population and employment. The absolute and proportional increase in employment particularly demonstrates the growth of this outlying area. The intervening communities are much smaller, giving the region its asymmetrically bi-nodal character. These are largely bedroom communities with limited, scattered non-residential uses, and considerable room for development.

The northern end of the region, essentially the original Brockton Standard Metropolitan Statistical Area, generates considerable traffic into and out of Brockton, but even this area is not self-contained. Instead, much employment-related traffic is into, out of, and through the region from elsewhere, rather than between points within the region. As far back as 1990 barely 50 percent of the work trips starting in the region were to points within it. Thus, the Old Colony region's land uses generate only a portion of its traffic, and the region functions as part of the Greater Boston/ Southeastern Massachusetts area.

Brockton itself has many central place functions and contains a large amount of regional retail, service, distribution, manufacturing, governmental, and institutional activity, including a college and several hospitals. Generally, the other communities' non-residential uses are in proportion to their population. However, there are exceptions such as the concentration of industrial and commercial uses in Avon, and recent commercial development (a major mall) in Kingston.

While some of the smaller communities are under-served and rely on facilities elsewhere, these towns have relatively little land in non-residential use and generate many trips to larger communities. In all 1.71 percent of the region's land was in broadly defined commercial uses in 1999. Commercial land in individual communities ranged from .22 percent in Plympton and .66 percent in Halifax, to 7.65 percent in Brockton.

One important trend is the creation of new mixed-use developments at various scales. At one end is creation of individual mixed-use commercial/residential/institutional buildings in existing centers such as Abington and Whitman and potentially in Pembroke and West Bridgewater through various forms of Central Business District zoning. A mid-range is creation of multi-use developments with many single-use or mixed-use buildings as proposed at the former Hingham Shipyard by special permit and in Hanson, Plymouth, and Brockton through possible Chapter 40R overlay districts. At the largest scale is creation of essentially a balanced new community, as with “Southfield” now planned at the former South Weymouth Naval Air Station.

Southfield includes land in the Town of Abington along with Weymouth and Rockland, though most development will be in Weymouth with the land in Abington committed to open space and recreation. The project is to include 2,855 units of sales and rental housing, 1,500,000 square feet of commercial and bio-tech space, and 300,000 square feet of retail and office space along with an hotel and conference center and civic uses, and over 1000 acres of open space and recreation land. There will also be extensive trails, sidewalks, bike path, and an internal shuttle connecting Southfield’s facilities to each other and to the adjacent MBTA commuter rail station. The intent is to allow people to live, work, shop and play in Southfield so that as many as 45 percent of the trips generated by the development would remain in the development.

Table 4-8
Land Use by Category (In Acres)

	Abington	Avon	Bridgewater	Brockton	East Bridgewater	Easton	Halifax	Hanson	Kingston
Cropland	88.5	0.0	1,482.2	96.1	533.2	360.2	1,126.7	154.6	64.7
Pasture	21.1	5.0	618.6	38.5	233.2	576.5	158.5	51.6	80.1
Forest	2,999.0	1,106.8	8,115.3	2,685.2	5,500.8	10,121.4	4,945.7	4,877.4	6,072.7
Non-Forested Wetland	94.8	35.1	459.4	129.7	450.4	522.1	593.1	695.0	293.5
Mining, Sand, & Gravel	10.7	20.6	131.9	22.0	121.2	36.3	8.6	15.6	407.5
Open Land	230.4	87.7	712.5	584.0	626.3	443.6	498.3	197.8	491.1
Recreation, Participation	122.4	11.0	307.2	526.5	155.1	316.7	160.8	80.2	66.9
Recreation, Spectator	0.0	0.0	0.0	78.6	0.0	0.0	5.6	0.0	6.3
Recreational Beaches, Marinas	0.0	0.0	6.0	2.7	2.3	22.3	0.0	1.4	1.1
Residential, Multi - Family	44.7	17.3	152.8	329.6	32.9	263.9	55.0	16.2	21.3
Residential, High Density	287.7	41.9	98.0	2,092.2	28.7	317.8	278.6	130.6	156.6
Residential, Medium Density	1,756.9	639.6	2,802.4	4,170.8	2,253.0	2,602.7	666.4	1,532.2	1,180.5
Residential, Low Density	151.2	115.9	1,590.3	272.3	572.9	1,866.3	803.2	951.0	1,542.0
Salt Marsh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	111.5
Commercial	216.5	117.5	156.8	1,055.2	123.7	263.8	69.8	69.3	272.3
Industrial	92.5	328.8	194.8	614.3	84.8	241.0	4.0	84.9	153.7
Urban Open	144.4	43.8	416.4	708.0	130.0	361.1	66.5	114.0	125.4
Transportation	92.1	171.2	225.6	220.1	2.9	17.9	4.1	59.7	150.8
Waste Disposal	0.0	3.5	69.2	56.4	62.0	9.5	10.9	22.0	27.0
Open Water	155.6	151.1	563.1	89.6	162.7	276.0	803.2	480.7	331.3
Orchard, Nursery, Cranberry Bog	1.5	6.2	77.6	22.7	158.7	90.9	253.3	529.1	587.3
Not Classified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
City/Town Totals	**6,509.9**	**2,903.1**	**18,180.1**	**13,794.4**	**11,234.7**	**18,709.7**	**10,512.2**	**10,063.4**	**12,143.4**
City/Town % of OCPC by Area	**2.97%**	**1.32%**	**8.28%**	**6.29%**	**5.12%**	**8.53%**	**4.79%**	**4.59%**	**5.53%**

Table 4-8 Continued
Land Use by Category (In Acres)

	Pembroke	Plymouth	Plympton	Stoughton	West Bridgewater	Whitman	OCPC Totals	Percent of OCPC
Cropland	81.7	437.6	313.7	83.7	1,170.2	77.5	6,070.7	3%
Pasture	72.0	177.8	278.9	184.6	358.0	56.6	2,910.8	1%
Forest	7,284.7	40,929.6	5,689.0	4,158.3	4,567.5	1,601.4	110,654.9	50%
Non-Forested Wetland	560.5	409.0	323.7	224.1	674.0	345.5	5,810.0	3%
Mining, Sand, & Gravel	17.6	418.9	267.1	68.0	11.3	0.0	1,557.3	1%
Open Land	274.3	1,974.2	207.5	300.0	364.9	187.6	7,180.3	3%
Recreation, Participation	264.9	1,338.8	7.0	129.5	171.8	99.8	3,758.5	2%
Recreation, Spectator	0.0	0.0	0.0	0.0	1.6	0.0	92.1	0%
Recreational Beaches, Marinas	1.2	171.2	0.0	0.0	0.0	0.0	208.1	0%
Residential, Multi - Family	58.0	212.7	0.0	217.7	4.3	28.5	1,454.8	1%
Residential, High Density	116.8	461.7	0.0	240.9	57.9	141.3	4,450.7	2%
Residential, Medium Density	2,377.9	6,439.1	46.9	2,813.5	1,132.0	1,396.7	31,810.7	14%
Residential, Low Density	1,601.6	3,276.0	1,251.2	773.1	531.5	136.5	15,434.9	7%
Salt Marsh	0.0	266.4	0.0	0.0	0.0	0.0	377.8	0%
Commercial	225.4	587.0	21.5	273.8	180.8	116.6	3,750.2	2%
Industrial	61.9	422.4	23.3	522.8	241.8	111.7	3,182.6	1%
Urban Open	192.5	745.8	108.3	210.7	177.3	96.5	3,640.6	2%
Transportation	130.1	1,088.2	0.0	127.0	193.6	8.5	2,491.6	1%
Waste Disposal	18.2	46.1	4.1	22.0	25.3	9.0	385.0	0%
Open Water	1,187.6	4,148.9	233.5	177.7	145.3	21.3	8,927.6	4%
Orchard, Nursery, Cranberry Bog	548.0	2,108.1	868.8	3.6	20.6	12.7	5,289.0	2%
Not Classified	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%
City/Town Totals	**15,074.9**	**65,659.5**	**9,644.4**	**10,530.8**	**10,029.7**	**4,447.5**	**219,437.8**	**100.00%**
City/Town % of OCPC by Area	**6.87%**	**29.92%**	**4.40%**	**4.80%**	**4.57%**	**2.03%**	**100.00%**	

Residential Land Use

Regional growth continues to decentralize the population and to consume land at an increasingly high rate. Overall, housing grew from 31,706 acres in 1971 (10.5% of the region) to 39,433 acres in 1985 (17.99 percent of the region), on to 47,607 acres in 1991 (21.64% of the region), and to 53,151 acres in 1999 (24.22% of the region). This is a 68 percent increase in residential land from 1971 to 1999. Yet, the population grew by only 40 percent (from 230,379 in 1970 to 321,515 in 2000).

As an example of increasing land consumption, in Bridgewater residential lots on new subdivisions increased by an estimated 1,422 units, or 22.8 percent (1990 to 2000) while the land used grew by 929 acres, or 25.0 percent. The ratio of land consumption to housing development would have been more like 2.5/1 except that 623 new units for persons over 55 were built on unusually small 7000 sq. ft. lots. The gain in needed housing is very significant, but the fact that the rate of land consumption is far greater threatens the town's ability to plan its own future.

Residential densities can be discussed in terms of persons per square mile, or in terms of gross or net housing units per acre. The persons per square mile figures are useful for overall comparisons between communities. However they do not indicate the character of typical neighborhoods or corridors since it reflects a community's total population and its total area, no matter how much of the land is undeveloped or in non-residential uses.

Table 4-9 shows trends in population density in the fifteen communities of the Old Colony region. For 2000 this ranged from 178 persons per square mile in Plympton to 4,392 in Brockton, with a regional average of 974 persons per square mile. With the year 2030 population projected by the Executive Office of Transportation and Old Colony Planning Council, the population density will reach 422 persons per square mile in Plympton and 4,726 in Brockton, with a regional average of 1,365.

The densities of residential neighborhoods are shown in Table 4-10 on the next page. The residential density is calculated by dividing the number of housing units by the number of acres in residential use on the MacConnell maps. The maps distinguish single-family and multi-family uses but the resulting multi-family area is quite small leading to improbably high multi-family densities. The analysis probably interpreted some two and three-family houses as single-family dwellings, thereby understating the area in multi-family uses. The resulting year 2000 neighborhood densities range from .7 units/acre in Plympton to 2.6 in Stoughton and 5.1 units/acre in Brockton. These would be gross densities (including streets) since the areas considered to be in residential use include the local street surface.

Table 4-9
Population Density and Growth Trends

Community	*Land Area Sq. Miles*	*1990 Census Population*	*1990 Census Density*	*2000 Census Population*	*2000 Census Density*	*2005 Estimate Population*	*2005 Estimate Density*	*2030 Projection Population*	*2030 Projection Density*
Abington	9.95	13,817	1,389	14,605	1,468	16,351	1,643	18,540	1,863
Avon	4.38	4,558	1,041	4,443	1,014	4,340	991	5,100	1,164
Bridgewater	27.49	21,249	773	25,185	916	25,720	936	45,250	1,646
Brockton	21.47	92,788	4,322	94,304	4,392	94,632	4,408	101,460	4,726
East Bridgewater	17.24	11,104	644	12,974	753	13,859	804	17,950	1,041
Easton	28.44	19,807	696	22,299	784	23,028	810	40,510	1,424
Halifax	15.87	6,526	411	7,500	473	7,809	492	11,070	698
Hanson	15.02	9,028	601	9,495	632	9,926	661	18,410	1,226
Kingston	18.53	9,045	488	11,780	636	12,457	672	17,130	924
Pembroke	21.85	14,544	666	16,927	775	18,095	828	23,180	1,061
Plymouth	96.48	45,608	473	51,701	536	54,923	569	84,210	873
Plympton	14.79	2,384	161	2,637	178	2,781	188	6,240	422
Stoughton	16.04	26,777	1,669	27,149	1,693	26,692	1,664	27,310	1,703
West Bridgewater	15.74	6,389	406	6,634	421	6,821	433	13,470	856
Whitman	6.96	13,240	1,902	13,882	1,995	14,439	2,075	17,670	2,539
Region	**330.25**	**296,864**	**899**	**321,515**	**974**	**331,873**	**1,005**	**447,500**	**1,355**

Density: Persons Per Square Mile of Land Area

Sources: Mass. Department of Housing and Community Development; U.S. Census; Executive Office of Transportation

Table 4-10
Residential Densities by Community

Community	**Total Units**	**Residential Acres**	**Units Per Acre**
Abington	5,348	2,240	2.4
Avon	1,740	815	2.1
Bridgewater	7,652	4,644	1.6
Brockton	34,837	6,865	5.1
East Bridgewater	4,427	2,888	1.5
Easton	7,631	5,051	1.5
Halifax	2,841	1,803	1.6
Hanson	3,178	2,630	1.2
Kingston	4,525	2,900	1.6
Pembroke	5,897	4,154	1.4
Plymouth	21,250	10,390	2.0
Plympton	872	1,298	0.7
Stoughton	10,488	4,045	2.6
West Bridgewater	2,510	1,726	1.5
Whitman	5,104	1,703	3.0
Totals	**118,300**	**53,152**	**2.2**

Sources: 2000 U.S. Census
1991, 1999 McConnell Maps and Tables
* Single Family Units include Mobil Homes

As of 1999, the inventory of all existing uses found the following distribution of land in single-family detached residential use by broad density ranges:

Table 4-11
Regional Single Family Housing Densities

Density Type	Size	Acres (Regional Total)	% of Regional Land Use
Low Density	< 2 units per acre	15,435	7.03%
Medium Density	2-4 units per acre	31,811	14.50%
High Density	> 4 units per acre	4,451	2.03%

The land use inventory also lists multi-unit housing, i.e. that having more than one unit per lot, regardless of lot size and density. Such housing occupied 1,455 acres (.66% of the region) in 1999 compared to 1,376 acres in 1991, but it is not directly comparable to the above categories.

<u>Recent Trends and Projections</u>

Residential development in recent years for the most part has come in the form of low to moderate density single-family home development on relatively large lots. This lower-density development combined with the cul-de-sac nature of many subdivisions and the typical scattering of public and commercial uses, increases local travel demands.

Some communities have had a wave of multi-family development. This tends to be near town centers or, quite often, on commercially zoned major highways in outlying areas. As a result, even these concentrations of population are often too remote to walk to schools, stores or jobs, and too scattered to support local bus service. However, many of the new multi-family developments are quite close to highway interchanges, making them convenient for persons commuting a distance by car.

Most of the region's housing is at a low to moderate community-wide densities (< 1.5 housing units per gross acre, to about 3.5 units per gross acre) and very little is at high densities (> 3.5 units per gross acre). East Bridgewater (1.5), Easton (1.5), Hanson (1.2), Pembroke (1.4), Plympton (0.7), and West Bridgewater (1.5) are all at or below the low density ceiling, and only Brockton (5.1) exceeds the "high density" standard. A much greater range exists within portions of individual communities, particularly within the more mature and diverse communities such as Brockton, Stoughton, and Whitman.

Allowing 20 percent for streets and facilities, the "low" gross density of 1.5 units per acre (960 units per square mile) is equivalent to single-family houses on 23,000 square-foot lots. This is smaller than the smallest lot now allowed in seven of the region's communities. Thus future single-family development will be at increasingly low-densities with accelerated land consumption and loss of community focus.

The "high" gross density of 3.5 units per acre is equivalent to single-family houses on lots just under 10,000 sq. feet. For comparison, three-deckers on such lots would be equivalent to 10.5 units per acre. Brockton's present R-2 and R-3 zoning in older, central neighborhoods allows new single-family houses on 7,500 sq. ft. lots, two-family houses on 10,000 sq. ft. lots, and 3-deckers on 12,000 sq. ft. lots, for gross densities of 4.6, 6.9 and 8.7 units per acre respectively.

These allowed densities are considerably less than exist in many of the city's older neighborhoods. (The City's former demolition program lowered densities dramatically in many older neighborhoods, but without incorporating the cleared land in house lots or public facilities. Thus, the net density (per lot) remains high though vacant lots abound. The R-3 district allows units beyond three at an additional 2,000 square feet per unit. Thus a 16-unit building would require 38,000 sq. ft., the equivalent of 18.3 housing units per net acre. This density is achieved only in mid-rise apartment buildings.

The densities of new neighborhoods will continue to drop and land consumption per unit will continue to rise as long as communities increase the area requirements on undeveloped land to an acre or more. This trend is occasionally countered by pockets of higher-density development done through Comprehensive Permits under Chapter 40B. Similar development is beginning to be pursued though locally chosen areas rezoned for higher density as-of- right development under the new Chapter 40R. This requires allowing densities of >20 units/ net acre for multi-family housing, >12 units /net acre for 2-3 family houses, and >eight units /net acre for single-family houses. Communities of fewer than 10,000 may seek approval of lower density developments based on environmental hardships such as potential pollution.

Residential growth is expected region-wide, with the EOT 2030 projections showing the eight communities with fewer than 750 people per square mile in 2000 growing by approximately 48.3 percent, for a total gain of about 57,766 persons. At the same time, the seven densest communities are expected to grow by only 21.9 percent, for an increase of approximately 44,209 persons. The region is expected to grow 31.7 percent by 2030. This suggests a gradual leveling of densities outside of Brockton, but the projected changes in the structure of the region by 2030 are slight.

Commercial Land Use

Based on aerial photo interpretation, commercial land use continued to increase in 1999, but at a relatively slower pace than previous years. Commercial land occupied about 3,750 acres or 1.7 percent of the region in 1999, compared to 3,473 acres or 1.6 percent of the region in 1991; 2,551 acres in 1985; and 2,039 acres in 1971. This small proportion of all uses belies the prominence of commercial uses and their great significance for employment, access to needed goods and services, traffic generation, and community character.

In 1999, 28.1 percent of the region’s commercial land (1,055 acres) was in Brockton followed by 15.7 percent (587 acres) in Plymouth; 7.3 percent (273 acres) in Stoughton; 7.3 percent (272 acres) in Kingston; 7.0 percent (264 acres) in Easton; 6.0 percent (225 acres) in Pembroke; and an estimated 5.8 percent (216 acres) in Abington.

The major historic concentrations of retail activity are in the central portions of Brockton, Stoughton, and Plymouth with some continued smaller concentrations in the centers of Whitman, Easton and Bridgewater. While some complementary land uses (court and county offices) are relocating away from Downtown Plymouth to areas closer to Route 3, the Downtown area has benefited with the addition of transit access from the Plymouth Area Link service.

Brockton's land in commercial use grew from 920 acres in 1971 to 1,055 acres in 1999 though its share of the region fell from 45.1 percent to 28.1 percent. General merchandise shopping has declined in most traditional town centers and is greatly reduced in downtown Brockton while it is growing in shopping centers located along arterial streets.

The Region contains two regional shopping malls, in Brockton and Kingston, and several big-box retail and other shopping centers located along or near major roadway.

New retail development continues to be dispersed beyond traditional centers and away from transit. While such growth is generally along high-capacity roads, one big box stores are tending to cluster, rather than be very freestanding, thus offering greater convenience to customers and slightly reducing total trips.

The dispersed pattern of current retail development puts some facilities within reach of most of the population, but requires driving. At the same time, the single-purpose nature of most new retail development requires more land dedicated to parking, generates more local trips, and fragments activity patterns. This suggests that towns seize on opportunities to create strong multi-purpose mixed-use centers as described above. Such traditional centers require accommodating varied uses but they can reduce single-purpose trips and greatly enrich community life.

Later in this Plan it is recommended that growing communities seek to guide new or expanding public, commercial, and high-density residential uses to create such centers. Similarly, larger communities with failed shopping centers could adopt Planned Unit Development regulations aimed at redeveloping such sites with diverse complementary uses. Such mixed-use centers might also be developed under the new Chapter 40R Smart Growth Overlay Zoning that includes major financial incentives to communities. While such scattered higher-density mixed use developments would not change overall regional travel patterns, the incremental benefits of reduced local trips could be significant.

Industrial Land Use

Once upon a time, the region's industry was concentrated along railroad lines and near town centers, often within walking distance of workers homes. Many interrelated firms (e.g., those making shoe components, shoeboxes and finished shoes) located near one another, thus minimizing delivery times and costs. More recently firms have depended less on rail freight, have sought workers and customers from the greater region, and have preferred convenient one-story plants. As a result, many firms have moved to industrial parks or freestanding sites near highway interchanges. This can be seen in the extensive development of the highway-oriented Brockton, Avon and Easton Industrial Parks and along Manley St. in West Bridgewater.

Industrial uses occupied 3,183 acres or 1.5 percent of the region's area in 1999, (up from 1,186 acres in 1971, 2,204 acres in 1985 and 2,907 acres in 1991). About 614 acres of this space (19.3 % of the region) is in Brockton, followed by 523 acres (16.4%) in Stoughton, 422 acres (13.3%) in Plymouth, an estimated 329 acres (10.3%) in Avon, 242 acres (7.6%) in West Bridgewater, 241 acres (7.6%) in Easton, 195 acres (6.1%) in Bridgewater and 154 acres (4.8%) in Kingston.

The largest concentration of industrial land is in the region's industrial parks listed on Table 4-15. Most of these are near major highways. The major parks are in Brockton, Avon, Easton and Stoughton near Route 24, and in Pembroke, Plymouth and Kingston near Route 3. In contrast, Brockton’s Oak Hill Way Park is in the south central portion of the city near the railroad and close to the city's traditional industrial areas. It houses a number of distribution and trucking activities in new buildings.

In addition to the industrial parks, major concentrations of industrial activity include a series of mills along the railroad in Brockton and other mill space near the centers of old industrial communities such as Whitman, Bridgewater, Stoughton, Abington, Easton and Plymouth. Much of this space is now inactive or under-used.

Brockton's major traditional industrial corridor runs nearly the length of the City from north to south, generally on the east side of the railroad tracks that bisect the city. There are older mills within the area and extensive open areas suitable for new industrial space. Two of these are sites of the previously proposed Freight Yards and FootJoy Industrial Parks. The corridor includes a series of Economic Opportunity Areas designated under the state's Economic Target Area program of financial incentives for economic development and public improvements.

Unfortunately, the corridor has a discontinuous local road system. The City has considered acquiring land, constructing new segments and improving others to create a 'North-South Industrial Road'. This would serve existing firms, connect the proposed parks and remove industrial traffic from other streets, but at the cost of some residential displacement and possible wetlands alterations. Further study of ways to realign and construct this road with minimum neighborhood impacts is recommended.

Other industrial activity is found in scattered, freestanding complexes. In the older communities, these are often near residential areas and remain grandfathered uses or spot-zoned industrial areas. They can offer nearby employment to residents, but they also attract commuter and truck traffic and can have varied impacts. Careful planning, regulation, selective modification of traffic patterns and lighting, addition of noise control, and creation of landscaped buffers may be required to ensure that such uses are compatible with nearby residences.

4.4 Employment and Economy

The labor force of individuals 16 years and older in the region totaled 170,954 in 2005, a 1.2 percent decrease from the 172,956 of 2003. The total number of employed persons dropped negligibly from 162,758 in 2003 to 162,524 in 2005. The number of unemployed persons dropped 15.9 percent from 10,198 in 2003 to 8,671 in 2005, similarly, the regional unemployment rate dropped from 5.9% to 4.8%.

As with most of the state's older metropolitan areas, economic data indicates the Old Colony area has experienced three trends from 1990 to 2000; 1) a decline in manufacturing employment; 2) an increase in retail and service employment; and 3) an overall dispersion of employment opportunities. As Table 4-12 shows, employment in manufacturing decreased by 12.87 percent from 1990 to 2000, while non-manufacturing employment grew by 17.87 percent and government jobs grew by 13.89 percent. Overall, the region saw an 11.2 percent increase in total jobs from 111,321 in 1990 to 123,739 in 2000.

According to the Massachusetts Division of Workforce Development, the region had 126,564 jobs in 2005. Not surprisingly, Brockton is by far the largest employment center in the region accounting for over 39,000 jobs, approximately one-third of the region's total. The second largest employment center is Plymouth where nearly 22,000 jobs are located, and Stoughton was the third largest employment center in the region with 12,135 jobs in 2005.

While the product has changed over time, there is still a strong manufacturing sector within the Old Colony region. Today the industrial sector specializes in areas such as scientific instrumentation, electrical machinery, rubber products, and computer supplies.

Table 4-12
Changes in Manufacturing and Non-Manufacturing Jobs, 1990 – 2000

	Manufacturing Jobs			Non-Manufacturing Jobs			Government Jobs			Total by Community	
			% Change			% Change	Government		% Change		
Community	1990	2000	1990-2000	1990	2000	1990-2000	1990	2000	1990-2000	1990	2000
Abington	566	432	-23.67%	2,334	3,227	38.26%	406	544	33.99%	3,306	4,203
Avon	1,338	1,003	-25.04%	5,448	5,651	63.89%	189	204	7.94%	6,975	6,858
Bridgewater	506	308	-39.13%	1,978	4,269	115.82%	2,577	2,614	1.44%	5,061	7,191
Brockton	4,154	3,580	-13.82%	27,486	26,164	-4.81%	6,944	7,993	15.11%	38,584	37,737
East Bridgewater	935	516	-44.81%	2,027	2,336	15.24%	371	566	52.56%	3,333	3,418
Easton	470	1,066	126.81%	4,448	7,387	66.07%	937	891	-4.91%	5,855	9,344
Halifax	n/a	n/a	n/a	500	800	60.00%	115	268	72.90%	615	1,068
Hanson	296	458	54.73%	1,008	1,245	23.51%	402	136	-66.17%	1,706	1,839
Kingston	232	287	23.71%	3,918	4,500	14.85%	506	531	4.94%	4,656	5,318
Pembroke	595	665	11.76%	2,926	4,251	45.28%	311	364	17.04%	3,832	5,280
Plymouth	1,856	1,500	-19.18%	11,782	14,378	22.03%	2,416	3,041	25.87%	16,054	18,919
Plympton	273	12	-95.60%	125	148	18.40%	Conf.	99	N/A	398	259
Stoughton	2,081	1,730	-16.87%	10,098	9,566	-5.27%	1,002	1,156	15.37%	13,181	12,452
West Bridgewater	713	661	-7.29%	3,964	5,968	50.55%	245	273	11.43%	4,922	6,902
Whitman	607	522	-14.00%	1,774	1,835	3.44%	462	594	28.57%	2,843	2,951
Region Totals	**14,622**	**12,740**	**-12.87%**	**79,816**	**91,725**	**17.87%**	**16,883**	**19,274**	**13.89%**	**111,321**	**123,739**
Source: OCPC; Mass Department of Employment and Training; Employment and Wages/Cities and Towns 1990-2000											

Table 4-13
Regional Employment Figures, 2003 & 2005

Community	Year	Laborforce	Employment	Unemployment	Unemployment Rate
Abington	**2003**	8,985	8,530	455	5.10%
	2005	9,030	8,606	424	4.70%
Avon	**2003**	2,316	2,169	147	6.30%
	2005	2,276	2,149	127	5.60%
Bridgewater	**2003**	13,037	12,375	662	5.10%
	2005	12,986	12,381	605	4.70%
Brockton	**2003**	45,259	41,968	3,291	7.30%
	2005	44,442	41,732	2,710	6.10%
East Bridgewater	**2003**	7,336	6,950	386	5.30%
	2005	7,272	6,937	335	4.60%
Easton	**2003**	13,110	12,479	631	4.80%
	2005	13,014	12,484	530	4.10%
Halifax	**2003**	4,221	3,984	237	5.60%
	2005	4,201	3,984	217	5.20%
Hanson	**2003**	5,430	5,134	296	5.50%
	2005	5,410	5,140	270	5.00%
Kingston	**2003**	6,254	5,942	312	5.00%
	2005	6,260	5,993	267	4.30%
Pembroke	**2003**	9,770	9,263	507	5.20%
	2005	9,683	9,263	420	4.30%
Plymouth	**2003**	28,541	26,959	1582	5.50%
	2005	28,509	27,124	1,385	4.90%
Plympton	**2003**	1,584	1,493	91	5.70%
	2005	1,575	1,501	74	4.70%
Stoughton	**2003**	15,269	14,363	906	5.90%
	2005	14,988	14,266	722	4.80%
West Bridgewater	**2003**	3,535	3,342	193	5.50%
	2005	3,505	3,329	176	5.00%
Whitman	**2003**	8,114	7,654	460	5.70%
	2005	8,018	7,621	397	5.00%
OCPC Total	**2003**	**172,761**	**162,605**	**10,156**	**5.90%**
	2005	**171,169**	**162,510**	**8,659**	**4.80%**
Source: Division of Workforce Development					

Retail employment in the region has increased by 3,947 jobs or 10.97 percent from 1990 to 2000. Eleven of the fifteen OCPC communities gained retail employment.

The other major economic growth sector in the region has been in services. The number of service jobs grew from 24,436 to 34,578 (+41.5%) between 1990 and 2000. Again, Brockton has been the leader in service-related jobs, with 12,464 or 36 percent of the region's total. One of the major reasons for the growth in service jobs is the growth of Brockton's hospitals, the Veteran's Administration Medical Center, Brockton Hospital, and the Good Samaritan Medical Center.

Table 4-14
Employment within Communities by Community

	Abington		Avon		Bridgewater		Brockton		E.Bridgewater		Easton		Halifax		Hanson	
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
Total Jobs	3,306	4,203	6,975	6,858	5,061	7,191	38,584	37,737	3,333	3,418	5,855	9,344	615	1,068	1,706	1,839
Agriculture	49	102	0	7	27	66	94	108	45	45	118	111	Conf.	43	59	59
Government	406	544	189	204	2,577	2,614	6,944	7,993	371	566	937	891	115	268	402	136
Construction	120	364	2,160	327	235	458	736	722	213	219	610	986	9	46	118	78
Manufacturing	566	432	1,338	1,003	506	308	4,154	3,580	935	516	470	1,066	Conf.	Conf.	296	458
TCPU	287	215	431	796	56	161	2,711	2,300	Conf.	79	186	194	28	42	6	23
Retail	1,125	1,726	2,490	3,587	1,124	1,816	10,953	9,588	1,314	1,317	1,959	2,598	308	466	652	737
FIRE	205	229	36	51	175	215	2,203	982	59	51	277	281	31	38	42	41
Services	548	591	331	883	361	1,553	10,789	12,464	396	625	1,298	3,217	124	165	131	307
	Kingston		**Pembroke**		**Plymouth**		**Plympton**		**Stoughton**		**W.Bridgewater**		**Whitman**		**Region**	
	1990	**2000**	**1990**	**2000**	**1990**	**2000**	**1990**	**2000**	**1990**	**2000**	**1990**	**2000**	**1990**	**2000**	**1990**	**2000**
Total Jobs	4,656	5,318	3,832	5,280	16,054	18,919	398	259	13,181	12,452	4,922	6,902	2,843	2,951	111,321	123,739
Agriculture	22	53	36	39	253	190	7	30	64	86	61	141	29	16	864	1,096
Government	506	531	311	364	2,416	3,041	Conf.	99	1,002	1,156	245	273	462	594	16,883	19,274
Construction	93	187	207	427	562	702	38	45	697	1,116	240	312	120	208	6,158	6,197
Manufacturing	232	287	595	665	1,856	1,500	273	12	2,081	1,730	713	661	607	522	14,622	12,740
TCPU	806	95	99	230	1,551	1,480	Conf.	Conf.	724	502	611	405	123	96	7,619	6,618
Retail	2,413	3,060	1,519	1,766	3,890	4,255	35	29	4,888	4,352	2,344	3,737	979	906	35,993	39,940
FIRE	116	146	88	171	1,023	472	Conf.	8	345	340	33	154	113	117	4,746	3,296
Services	468	959	977	1,618	4,503	7,279	45	36	3,380	3,170	675	1,219	410	492	24,436	34,578

Source: Commonwealth of Massachusetts
TCPU: Transportation, Communication, and Public Utilities
Fire: Finance, Insurance, and Real Estate
Conf.: Data suppressed due to confidentiality

An additional growth sector in the area, as in other regions of Massachusetts, is government employment. (Functionally these are often service jobs in education, public safety, transportation etc. but they are categorized separately.) In 2000, the Old Colony region had 19,274 government-related jobs accounting for 16 percent of all regional employment and this sector grew by 14.16 percent in the past decade.

Industrial Parks

Table 4-15 lists the industrial parks located throughout the region. Industrial and office parks not only serve as major trip generators for those commuting to and from the employment centers; they are major commercial heavy vehicle trip generator.

Table 4-15 – Industrial and Commercial Technology Parks

	Business Park	Street	Total Acres	Acreage Available	Bldg Space Available (Sq. Ft)	Number of Firms	Utilities/Service Rail	Water	Sewer	Gas	Optics
Avon											
1	Avon Industrial Park	Bodwell Street	300	12.5	10,000	123		x		x	
2	Avon Merchants Park	Stockwell Drive	147	None	None	15		x		x	
Bridgewater											
3	Bridgewater Industrial Park	Elm Street	56	17	None	10		x		x	
4	Scotland Industrial Park	Pleasant Street	105	15	None	9		x		x	
5	Lakeshore Center	Pleasant Street	140	130	None	4		x		x	
Brockton											
6	Brockton Business Center	Liberty Street	195	21	None	140		x	x	x	x
7	Oak Hill Way Industrial Park	Oak Hill Way	70	40	None	20	x	x	x	x	x
8	AMB Industrial Park	Manley Street	18	None	None	6		x	x	x	x
9	Northeast Industrial Park	Harrison Blvd.	40	N/A	None	40		x	x	x	x
Easton											
10	Easton Industrial Park	Belmont Street	150	5	10,000	52		x		x	
Halifax											
11	Halifax Industrial Park	Plymouth Street	21	18	None	1		x			
Hanson											
12	Casoli Industrial Park	Main Street	14	5	None	3		x			
13	Hanson Commerce Center	Industrial Blvd.	34	25	5,000	10		x			
14	Station Street Industrial Park	Station Street	16	12	None	2		x			
Kingston											
15	Jones River Industrial Park	Wapping Road	8	None	None	9		x		x	x
16	Kingston Industrial Park	Gallen Road	400	60	None	18		x		x	
17	South Shore Commuter Rail Park	Marion Drrive	135	135	None	0		x		x	x

SOURCE:
Field Observation, Industrial Realtors, Town Officials
Updated 3/06 BH

Table 4-15 – Industrial and Commercial Technology Parks, con't

	Business Park	Street	Total Acres	Acreage Available	Bldg Space Available (Sq. Ft)	Number of Firms	Utilities/Service				
							Rail	Water	Sewer	Gas	Optics
Pembroke											
18	Corporate Park	Oak Street	80	22	10,000	25		x		x	
19	North River Commercial Park	Oak Street	34	5	None	9		x		x	
20	Pembroke Business Center	Oak Street	118	118	None	0		x		x	
Plymouth											
21	Airport Industrial Park	South Meadow Road	150	100	None	12		x			
22	Camelot Industrial Park	Long Pond Road	110	70	None	52		x			
23	Cooks Pond Industrial Park	Long Pond Road	30	28	None	1		x			
24	Plymouth Industrial Park	W. Cherry Street	450	80	20,000	75		x		x	
Plympton											
25	Plympton Industrial Park	Spring Street	130	130	None	0					
Stoughton											
26	AMB Business Park	Turnpike Street	85.6	None	10,000	12		x	x	x	x
27	Metro South Corp. Center	Technology Center Dr.	287	50	None	3		x	x	x	x
28	Qual-Craft Corporate Center	Central Street	5	None	None	8		x	x	x	
29	Shawmut Mills Industrial Park	Canton Street	10	None	2,500	6		x	x	x	
30	Tosca Drive Industrial Park	Canton Street	45	None	5,000	32		x	x	x	
31	Campanelli Commerce Park	Page Street	40	30	None	1		x	x	x	x
West Bridgewater											
32	W. Bridgewater Business Park	Manley Street	48.3	None	427,000	3		x		x	x
Whitman											
33	Whitman Industrial Park	Industrial Way	6	1	None	8		x	x	x	

SOURCE:
Field Observation, Industrial Realtors, Town Officials,
Updated 3/06 BH

Journey to Work

The "Journey-to-Work" has become the core of the daily practice for commuters of the Commonwealth. Recent research indicates that the type and length of the journey to work influences where people choose to live. Massachusetts, a state with just over 6 million people and home to one of the largest public works project in decades, deals with an inexhaustible supply of commuting issues on a daily basis. This report will emphasize the commuting patterns of the 15 communities in the Region.

According to the 1990 & 2000 U.S. Census data, the population of the Region increased by 24,651 people from 1990 to 2000 (see Table 4-11). In 2000, the city of Brockton remained the most populated community (94,304) and Plympton remained the smallest (2,637). The towns of Plymouth, Bridgewater, Kingston, Easton, and Pembroke had the *five largest increases* respectively, while Brockton, West Bridgewater, Plympton, Stoughton, and Hanson had the *five smallest increases*. The town of Avon was the only community, which decreased in population. Table 4-16 details the population changes for the region from 1990 to 2000.

Table 4-16: OCPC 1990 & 2000 Population Comparison

COMMUNITY	TOTAL POPULATION 1990	TOTAL POPULATION 2000	GAIN/LOSS (+/-)	% CHANGE
ABINGTON	13,817	14,605	788	5.70%
AVON	4,558	4,443	-115	-2.50%
BRIDGEWATER	21,249	25,185	3,936	18.50%
BROCKTON	92,788	94,304	1,516	1.60%
EAST BRIDGEWATER	11,104	12,974	1,870	16.80%
EASTON	19,807	22,299	2,492	12.60%
HALIFAX	6,526	7,500	974	14.90%
HANSON	9,028	9,495	467	5.20%
KINGSTON	9,045	11,780	2,735	30.20%
PEMBROKE	14,544	16,927	2,383	16.40%
PLYMOUTH	45,608	51,701	6,093	13.40%
PLYMPTON	2,384	2,637	253	10.60%
STOUGHTON	26,777	27,149	372	1.40%
WEST BRIDGEWATER	6,389	6,634	245	3.80%
WHITMAN	13,240	13,882	642	4.80%
REGIONAL TOTAL	**296,864**	**321,515**	**24,651**	**8.30%**
SOURCE: 1990+2000 U.S. CENSUS				

Many individual communities that grew rapidly were sparsely populated, while the more densely settled areas; having much less buildable land, experienced a much slower rate of increase. The region grew by in-migration because of its proximity to Boston, and large amounts of developable land.

The region gained 8,112 jobs from 1990 to 2000. The five largest increases in total jobs occurred in Easton, Plymouth, Avon, Bridgewater, and Kingston respectively. The trend suggests that the jobs are flowing outward from the city environment (Brockton) into the rural areas either following the workforce or taking advantage of developable land. Table 4-17 lists the communities in the region and details the employment changes from 1990 to 2000.

Table 4-17: OCPC 1990 & 2000 Employment Comparison

COMMUNITY	TOTAL JOBS		GAIN/LOSS	% CHANGE
	1990	2000	(+/-)	
ABINGTON	3,569	3,989	420	11.8%
AVON	4,880	6,786	1,906	39.1%
BRIDGEWATER	6,806	8,398	1,592	23.4%
BROCKTON	37,446	34,132	-3,314	-8.9%
EAST BRIDGEWATER	3,272	3,288	16	0.5%
EASTON	6,194	8,780	2,586	41.8%
HALIFAX	1,092	1,007	-85	-7.8%
HANSON	2,203	2,376	173	7.9%
KINGSTON	4,237	5,666	1,429	33.7%
PEMBROKE	3,910	4,912	1,002	25.6%
PLYMOUTH	16,153	18,516	2,363	14.6%
PLYMPTON	471	418	-53	-11.3%
STOUGHTON	13,904	12,678	-1,226	-8.8%
WEST BRIDGEWATER	4,673	5,939	1,266	27.1%
WHITMAN	3,093	3,130	37	1.2%
REGIONAL TOTAL	**111,903**	**120,015**	**8,112**	**7.2%**
SOURCE: 1990+2000 U.S. CENSUS				

The towns of Halifax, Plympton, and Stoughton, along with the City of Brockton were the only communities within the region to record losses in total jobs. Brockton and Stoughton, two of the three largest employment centers in 1990, observed the two largest decreases between 1990 and 2000. According to the Comprehensive Economic Development Strategy Annual Reports, produced by the Old Colony Planning Council, the City of Brockton lost nearly 1,400 jobs and the Town of Stoughton lost more than 500 jobs from 1995 to 2000, due to plant or office closings. In addition, people traveling to Boston seeking a higher wage and more employment opportunities may be another explanation for the losses in employment.

Tables 4-18 & 4-19 show the number of **residents** working either _inside_ or _outside_ *(export)* the region. The term "export" was used to describe the number of residents that are leaving the region in order to find employment. This trend is reasonable for the region considering its shape, road network, and metro economy.

Tables 4-20 & 4-21 show the number of local jobs held by **workers** living _inside_ *and* _outside_ (imported) of the region. The total number of workers commuting from cities and towns *outside* the region represent the "import" figure.

Table 4-18: OCPC Residents Working *Inside* the Region

COMMUNITY	# OF RESIDENTS WORKING *INSIDE* OCPC REGION		% OF TOTAL IN OCPC	% OF TOTAL IN OCPC	GAIN/LOSS	% CHANGE
	1990	**2000**	**1990**	**2000**	**(+/-)**	
ABINGTON	2,451	2,455	3.4%	3.5%	4	0.2%
AVON	970	821	1.4%	1.2%	-149	-15.4%
BRIDGEWATER	5,649	6,292	7.9%	8.9%	633	11.4%
BROCKTON	23,003	20,170	32.2%	28.7%	-2,886	-12.3%
EAST BRIDGEWATER	3,425	3,476	4.8%	4.9%	51	1.5%
EASTON	5,156	5,492	7.2%	7.8%	336	6.5%
HALIFAX	1,662	1,670	2.3%	2.4%	8	0.5%
HANSON	1,844	1,982	2.6%	2.8%	138	7.5%
KINGSTON	2,333	2,578	3.3%	3.7%	245	10.5%
PEMBROKE	2,541	2,726	3.6%	3.9%	185	7.3%
PLYMOUTH	11,970	12,837	16.7%	18.3%	874	7.2%
PLYMPTON	630	646	0.9%	0.9%	16	2.5%
STOUGHTON	4,902	4,468	6.9%	6.4%	-434	-8.9%
WEST BRIDGEWATER	2,096	1,809	2.9%	2.6%	-287	-13.7%
WHITMAN	2,815	2,912	3.9%	4.1%	97	3.4%
REGIONAL TOTAL	**71,447**	**70,334**	**100%**	**100%**	**-1,113**	**-1.6%**
SOURCE: 1990+2000 U.S. CENSUS						

Table 4-19: OCPC Residents Working *Outside* the Region (Exported)

COMMUNITY	# OF RESIDENTS WORKING *OUTSIDE* OCPC REGION		% OF TOTAL IN OCPC	% OF TOTAL IN OCPC	GAIN/LOSS	% CHANGE
	1990	**2000**	**1990**	**2000**	**(+/-)**	
ABINGTON	4,673	5,398	6.7%	6.2%	725	15.5%
AVON	1,315	1,381	1.9%	1.6%	66	5.0%
BRIDGEWATER	3,962	5,971	5.6%	6.8%	2,009	50.7%
BROCKTON	18,411	21,353	26.2%	24.5%	2,942	16.0%
EAST BRIDGEWATER	2,153	3,135	3.1%	3.6%	982	45.6%
EASTON	5,283	6,734	7.5%	7.7%	1,451	27.5%
HALIFAX	1,549	2,182	2.2%	2.5%	633	40.9%
HANSON	2,736	3,018	3.9%	3.5%	282	10.3%
KINGSTON	2,151	3,099	3.1%	3.6%	948	44.1%
PEMBROKE	4,769	6,013	6.8%	6.9%	1,244	26.1%
PLYMOUTH	9,012	12,474	12.8%	14.3%	3,462	38.4%
PLYMPTON	588	815	0.8%	0.9%	227	38.6%
STOUGHTON	8,890	9,686	12.7%	11.1%	796	9.0%
WEST BRIDGEWATER	1,133	1,510	1.6%	1.7%	377	33.3%
WHITMAN	3,638	4,495	5.2%	5.2%	857	23.6%
REGIONAL TOTAL	**70,263**	**87,264**	**100%**	**100%**	**17,001**	**24.2%**
SOURCE: 1990+2000 U.S. CENSUS						

Table 4-20: Local Jobs Held by Workers Living *Inside* the OCPC Region

COMMUNITY	# OF LOCAL JOBS HELD BY WORKERS LIVING *INSIDE* OCPC REGION		% OF TOTAL IN OCPC	% OF TOTAL IN OCPC	GAIN/LOSS	% CHANGE
	1990	2000	1990	2000	(+/-)	
ABINGTON	2,079	2,713	2.9%	3.9%	634	30.5%
AVON	2,372	2,713	3.3%	3.9%	341	14.4%
BRIDGEWATER	3,554	4,594	5.0%	6.5%	1,040	29.3%
BROCKTON	25,623	21,434	35.9%	30.5%	-4,189	-16.3%
EAST BRIDGEWATER	2,399	2,235	3.4%	3.2%	-164	-6.8%
EASTON	3,950	4,746	5.5%	6.7%	796	20.2%
HALIFAX	702	722	1.0%	1.0%	20	2.8%
HANSON	1,679	1,703	2.3%	2.4%	24	1.4%
KINGSTON	2,870	3,657	4.0%	5.2%	787	27.4%
PEMBROKE	2,153	2,756	3.0%	3.9%	603	28.0%
PLYMOUTH	11,293	11,914	15.8%	16.9%	621	5.5%
PLYMPTON	352	307	0.5%	0.4%	-45	-12.8%
STOUGHTON	7,320	5,625	10.2%	8.0%	-1,695	-23.2%
WEST BRIDGEWATER	2,765	3,230	3.9%	4.6%	465	16.8%
WHITMAN	2,336	1,985	3.3%	2.8%	-351	-15.0%
REGIONAL TOTAL	**71,447**	**70,334**	**100%**	**100%**	**-1,113**	**-1.6%**
SOURCE: 1990+2000 U.S. CENSUS						

Table 4-21: Local Jobs Held by Workers Living *Outside* the OCPC Region (Imported)

COMMUNITY	# OF LOCAL JOBS HELD BY WORKERS LIVING ***OUTSIDE*** OCPC REGION		% OF TOTAL IN OCPC	% OF TOTAL IN OCPC	GAIN/LOSS	% CHANGE
	1990	2000	1990	2000	(+/-)	
ABINGTON	1,490	1,276	3.7%	2.6%	-214	-14.4%
AVON	2,508	4,073	6.2%	8.2%	1,565	62.4%
BRIDGEWATER	3,252	3,804	8.0%	7.7%	552	17.0%
BROCKTON	11,823	12,698	29.2%	25.6%	875	7.4%
EAST BRIDGEWATER	873	1,053	2.2%	2.1%	180	20.6%
EASTON	2,244	4,034	5.5%	8.1%	1,790	79.8%
HALIFAX	390	285	1.0%	0.6%	-105	-26.9%
HANSON	524	673	1.3%	1.4%	149	28.4%
KINGSTON	1,367	2,009	3.4%	4.0%	642	47.0%
PEMBROKE	1,757	2,156	4.3%	4.3%	399	22.7%
PLYMOUTH	4,860	6,602	12.0%	13.3%	1,742	35.8%
PLYMPTON	119	111	0.3%	0.2%	-8	-6.7%
STOUGHTON	6,584	7,053	16.3%	14.2%	469	7.1%
WEST BRIDGEWATER	1,908	2,709	4.7%	5.5%	801	42.0%
WHITMAN	757	1,145	1.9%	2.3%	388	51.3%
REGIONAL TOTAL	**40,456**	**49,681**	**100%**	**100%**	**9,225**	**22.8%**
SOURCE: 1990+2000 U.S. CENSUS						

Residents from the region occupied nearly 60 percent of the 120,015 jobs in 2000. Residents of communities outside the region occupied the remaining 40 percent. The people who traveled to the OCPC region for employment represent the total **imported** workforce. This figure grew from 40,456 people in 1990 to 49,681 people in 2000. While nearly 10,000 additional non-OCPC residents held jobs inside the region in 2000, the total number of jobs held by OCPC residents (70,334) was still far greater. Avon and Stoughton were the only communities to have more local jobs held by non-OCPC residents than OCPC residents were. Tables 4-19 and 4-20 show the number of local jobs held by both OCPC residents and people living outside the region. Close examination of the data shows that OCPC residents held more local jobs in 2000; however, the region as an employment destination drew more people in from areas outside the region. The maps showing the change in employment destinations and employment import for each community of the region help display the longer commuting time pattern.

The number of Old Colony Planning Council residents that traveled to areas outside the region represented the **exported** workforce. An increase from 141,710 employed people in 1990, to 157,598 employed people in 2000, meant that almost 16,000 residents were added to the total workforce. In 2000, of the 157,598 OCPC residents in the workforce, 45 percent (70,334) of those found jobs inside the region, while 55 percent (87,264) found jobs outside the region. In 2000, eleven of the fifteen communities of the region had a larger percentage of residents finding jobs outside rather than inside the region. Clearly, the residents of the region are finding more jobs outside the region rather than inside.

Possible reasons for this trend might be:

- Need for a higher income (inside Route 128 beltway) in order to support a decentralized suburban lifestyle
- A desire to live in a quiet environment rather than in a city
- Decreasing numbers of manufacturing jobs found in smaller towns
- The emergence of the high tech and scientific fields found primarily in the inner cities
- Size and shape of the region – elongated shape with east/west delineation

The data collected from the 1990 & 2000 U.S. Census illustrates the fact that the majority of the residents living in the region are traveling out of the region for employment. The distance and overall direction of which will be covered in the following sections of this report.

The definitions supplied below illustrate the differences between the two figures used to determine overall economic standing.

- Per Capita Income – the mean (average) income computed for every man, woman, and child in a geographic area. It is derived by dividing the total income of a particular group by the total population in that group.
- Median Household Income – the mid-value number of money income received in a calendar year by all household members 15 years old and over, including household members not related to the householder, people living alone, and other nonfamily household members.

The region recorded increases in both the Per Capita Income and Median Household Income from 1990 to 2000. This trend helps explain the willingness of the residents in the region to travel longer distances to work with longer commute times. The community with the largest increase in Per Capita Income was the Town of Easton ($11,716) and the smallest was the City of Brockton ($3,708). Meanwhile, the community that recorded the largest increase in Median Household Income was the Town of Plympton ($23,894) and the smallest was again the City of Brockton ($7,795). Table 4-22 illustrates the increase in both the Per Capita Income and Median Household Income for the region and the individual communities for the years 1990 and 2000.

Table 4-22: OCPC 1990 & 2000 Per Capita & Median Household Income Comparison

COMMUNITY	**PER CAPITA INCOME ($)**		GAIN/LOSS	% CHANGE	**MEDIAN HOUSEHOLD INCOME ($)**		GAIN/LOSS	% CHANGE
	1990	**2000**	**(+/-)**		**1990**	**2000**	**(+/-)**	
ABINGTON	$16,379	$23,380	$7,001	42.7%	$42,730	$57,100	$14,370	33.6%
AVON	$16,176	$24,410	$8,234	50.9%	$43,214	$50,305	$7,091	16.4%
BRIDGEWATER	$14,088	$23,105	$9,017	64.0%	$41,933	$65,318	$23,385	55.8%
BROCKTON	$13,455	$17,163	$3,708	27.6%	$31,712	$39,507	$7,795	24.6%
EAST BRIDGEWATER	$15,056	$23,532	$8,476	56.3%	$42,614	$60,311	$17,697	41.5%
EASTON	$19,016	$30,732	$11,716	61.6%	$50,647	$69,144	$18,497	36.5%
HALIFAX	$15,233	$23,738	$8,505	55.8%	$37,197	$57,015	$19,818	53.3%
HANSON	$15,701	$23,727	$8,026	51.1%	$45,515	$62,687	$17,172	37.7%
KINGSTON	$16,647	$23,370	$6,723	40.4%	$40,872	$53,780	$12,908	31.6%
PEMBROKE	$16,531	$27,066	$10,535	63.7%	$46,932	$65,050	$18,118	38.6%
PLYMPTON	$17,150	$24,344	$7,194	41.9%	$46,151	$70,045	$23,894	51.8%
PLYMOUTH	$15,882	$23,732	$7,850	49.4%	$39,886	$54,677	$14,791	37.1%
STOUGHTON	$17,313	$25,480	$8,167	47.2%	$42,044	$57,838	$15,794	37.6%
WEST BRIDGEWATER	$16,214	$23,701	$7,487	46.2%	$40,613	$55,958	$15,345	37.8%
WHITMAN	$14,206	$23,002	$8,796	61.9%	$40,779	$55,303	$14,524	35.6%
MEDIAN	**$16,176**	**$23,727**	**$8,167**	**50.9%**	**$42,044**	**$57,100**	**$15,974**	**37.6%**

Note: According to the Consumer Price Index (CPI) inflation calculator, the inflation rate from January 1990 to January 2000 was 32.50 percent.

The communities of the region as a whole experienced an increase for people driving alone to work by 10,560 people over the ten years from 1990 to 2000. The number of people who used the public transit system to commute to work also increased (4,399 people). This was the only other category to record increases. The remaining groupings: Carpooled, Motorcycle, Bicycle, and Walked all registered losses during the ten-year period from 1990 to 2000. Figures 4-11 & 4-12 illustrate the data for the region regarding mode of travel for the years of 1990 and 2000.

Figure 4-11: OCPC Region: 1990 Mode of Travel

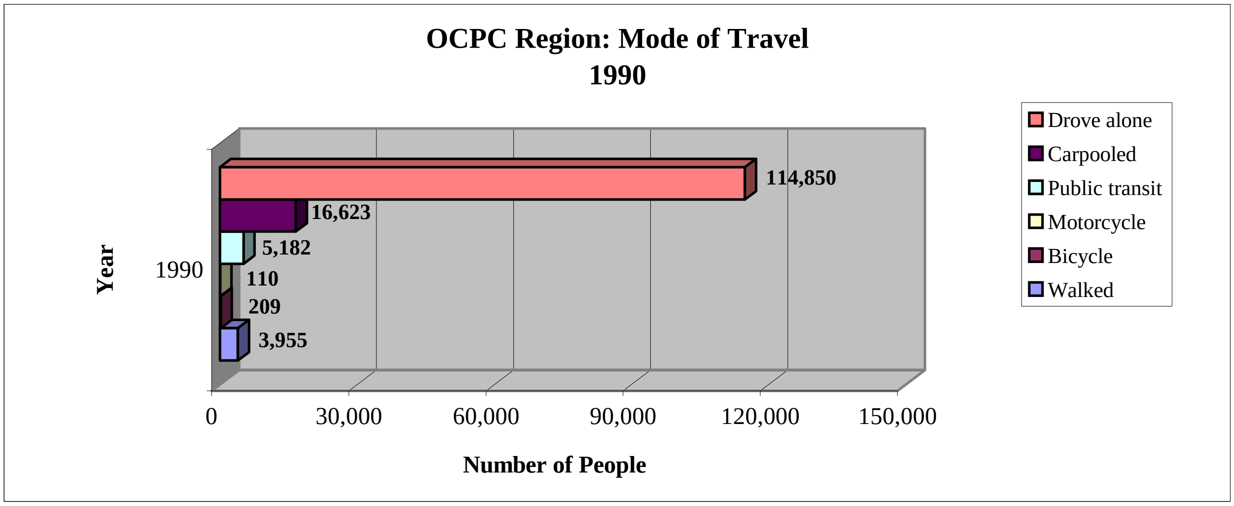
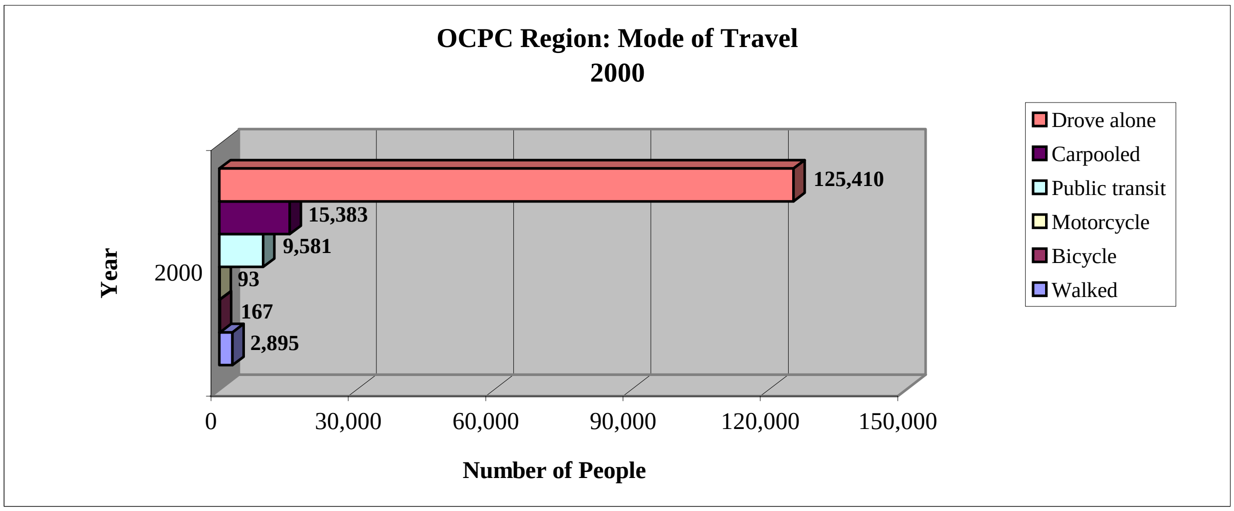


Figure 4-12: OCPC Region: 2000 Mode of Travel



The residents of the region-increased usage of the private automobile and public transit, while Massachusetts as a whole increased usage of the private automobile, public transit and bicycling. The increase in bicycle use is related to the dense development of major cities such as Boston and Cambridge, while the region does not have that characteristic.

While the number of people driving alone and commuting via public transit increased, the length of commuting times also increased within the region. The top four commute time increases were observed in the categories greater than 35 minutes. The remainder of the commute time groupings all registered decreases, with the one exception being the "< 10" minute category. Overall, the average commute time to work increased *for the region* from 25.7 minutes in 1990 to 31.8 minutes in 2000. Figures 4-13 & 4-14 demonstrate the increases in travel time to work for the region from the years 1990 to 2000.

Figure 4-13: OCPC Region: 1990 Travel Time

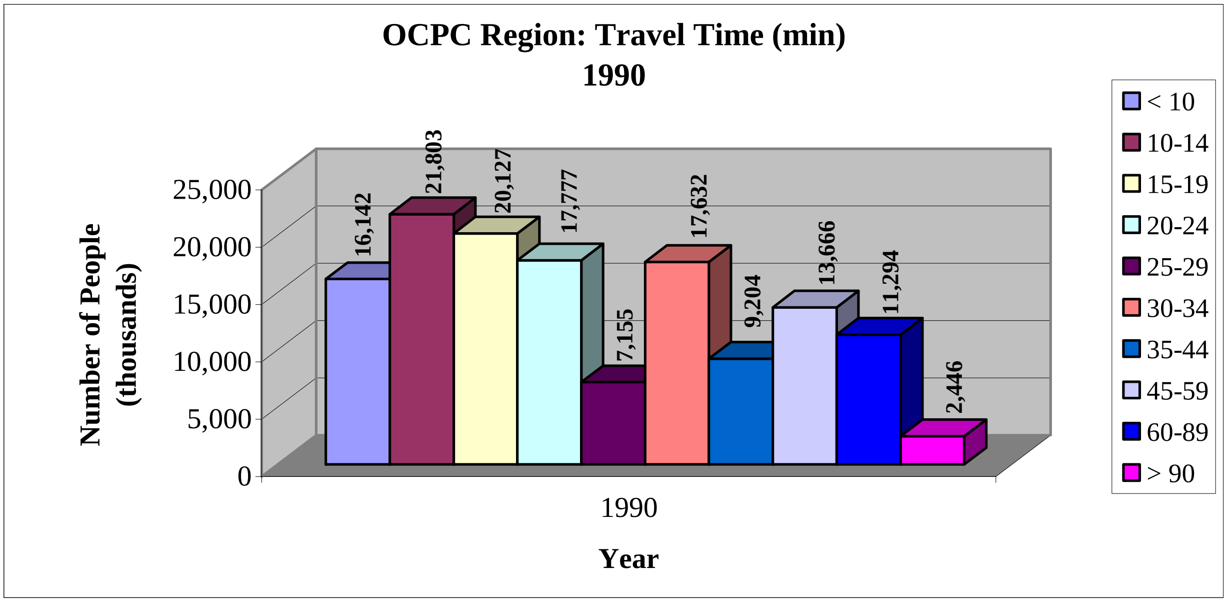
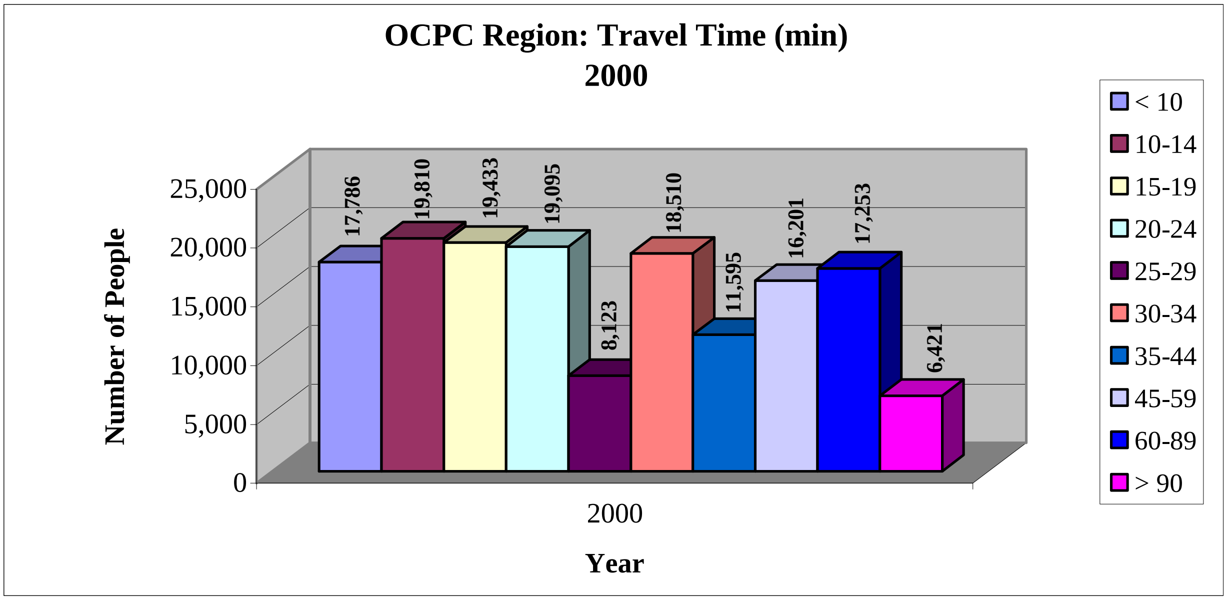


Figure 4-14: OCPC Region: 2000 Travel Time



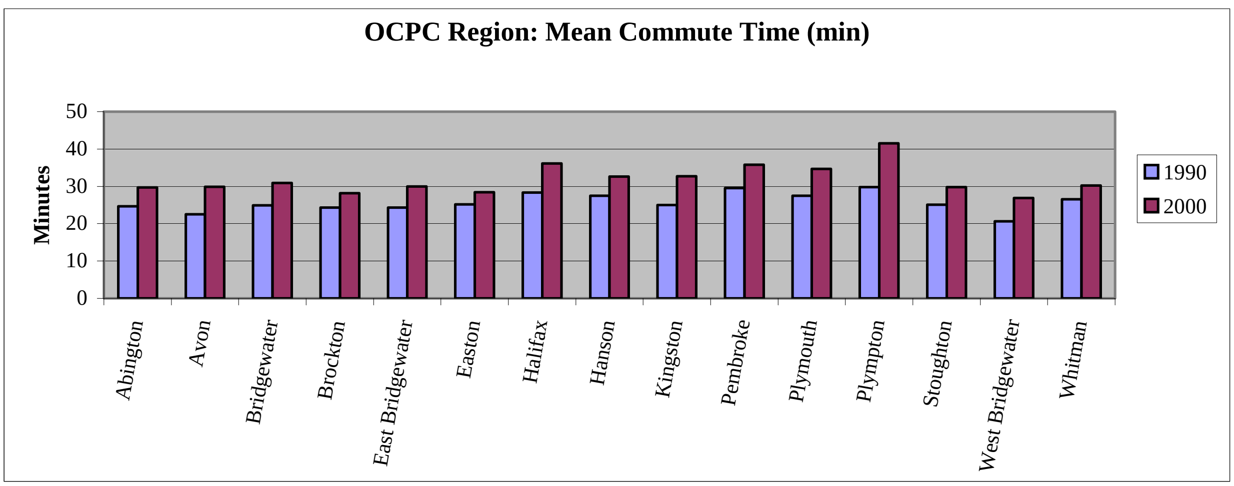
As previously mentioned, this increase in travel times may be a factor of the shape, size, and orientation of the region. The major north/south highways that run through the region do so very briefly and carry thousands of vehicles every day. The sheer volume of traffic and relative congestion on those highways attribute to the longer commute times. In addition, with the advent of commuter rail service with its one-hour trip time from both the Kingston and Middleborough/Lakeville termini to South Station also contribute to the longer travel times.

There was an increase in the average commuting time to work in the region from 25.7 minutes in 1990 to 31.8 minutes in 2000. The 15 member communities are ranked below by the added time {minutes} spent commuting to work from 1990 to 2000.

1.	Plympton	{11.7}
2.	Halifax	{7.8}
3.	Kingston	{7.7}
4.	Avon	{7.4}
5.	Plymouth	{7.2}
6.	Pembroke	{6.3}
7.	West Bridgewater	{6.3}
8.	Bridgewater	{6.0}
9.	East Bridgewater	{5.7}
10.	Hanson	{5.1}
11.	Abington	{5.0}
12.	Stoughton	{4.7}
13.	Brockton	{3.9}
14.	Whitman	{3.7}
15.	Easton	{3.2}

Figure 4-15 shows the OCPC communities and their respective mean (average) commute times for both 1990 and 2000. The Town of Plympton recorded the largest average commute time at 41.5 minutes in 2000.

Figure 4-15: OCPC Region: Mean Commute Time



The Commonwealth's average commute time was 27 minutes in 2000, compared to the 31.8-minute average commute time of the region. The rapid population increases, addition of the MBTA commuter rail service, and the volume of traffic on the local transportation network, all contribute to the longer average commute time for the region.

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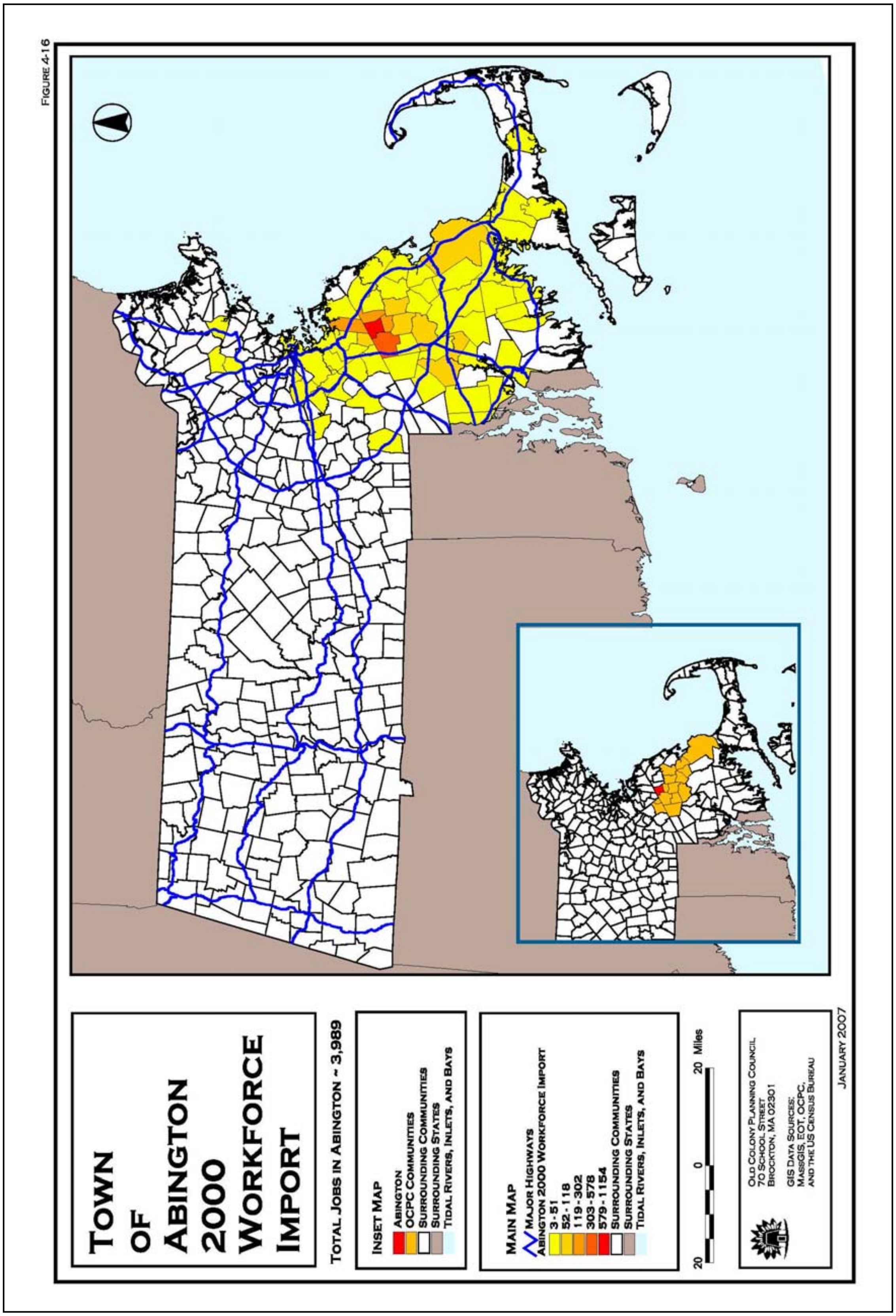
FIGURE 4-16
TOWN OF ABINGTON 2000 WORKFORCE IMPORT
TOTAL JOBS IN ABINGTON ~ 3,989
INSET MAP
ABINGTON
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
ABINGTON 2000 WORKFORCE IMPORT
3 - 51
52 - 118
119 - 302
303 - 578
579 - 1154
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
JANUARY 2007

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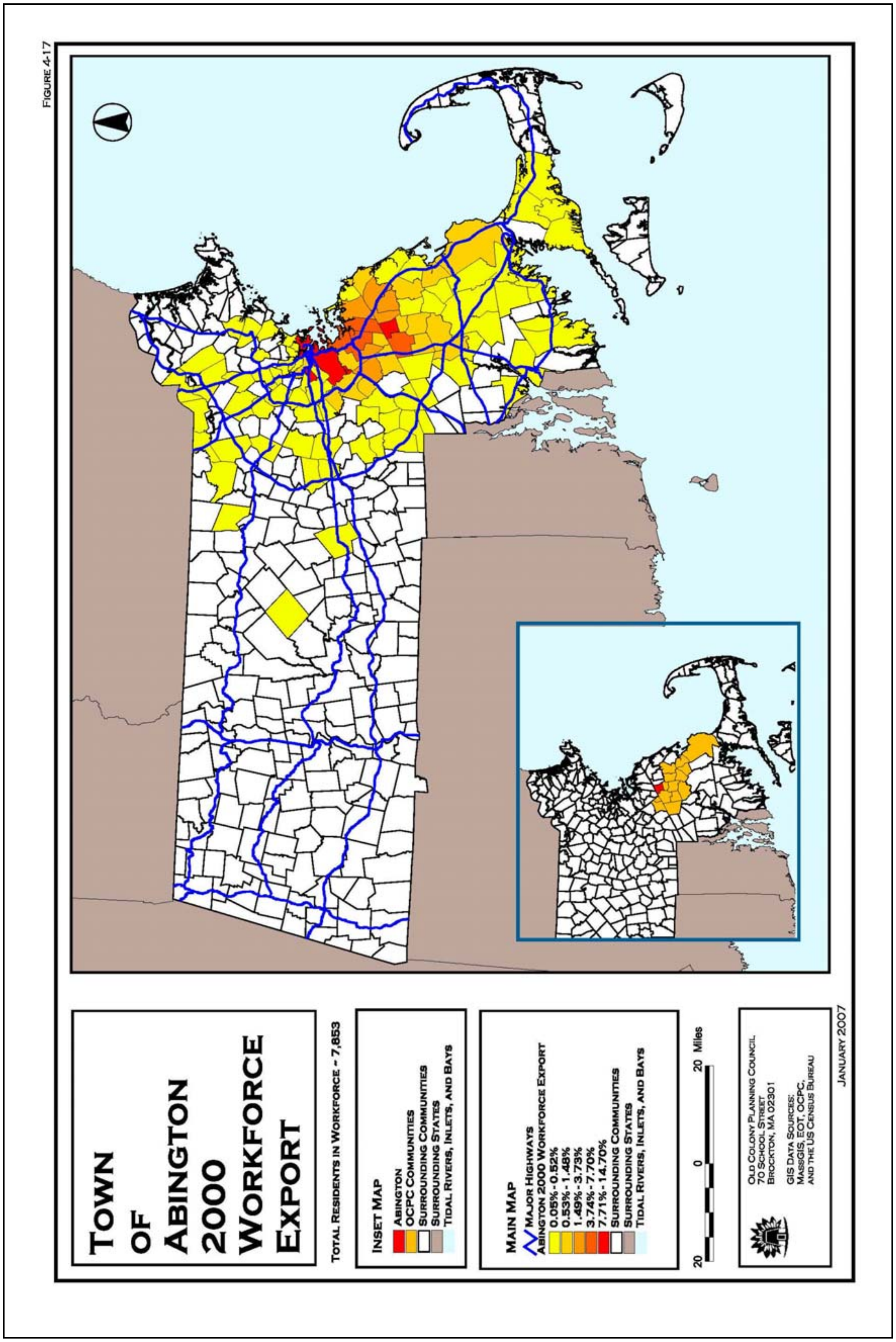
FIGURE 4-17
TOWN OF ABINGTON 2000 WORKFORCE EXPORT
TOTAL RESIDENTS IN WORKFORCE - 7,853
INSET MAP
ABINGTON
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
ABINGTON 2000 WORKFORCE EXPORT
0.05% - 0.52%
0.53% - 1.48%
1.49% - 3.73%
3.74% - 7.70%
7.71% - 14.70%
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
JANUARY 2007

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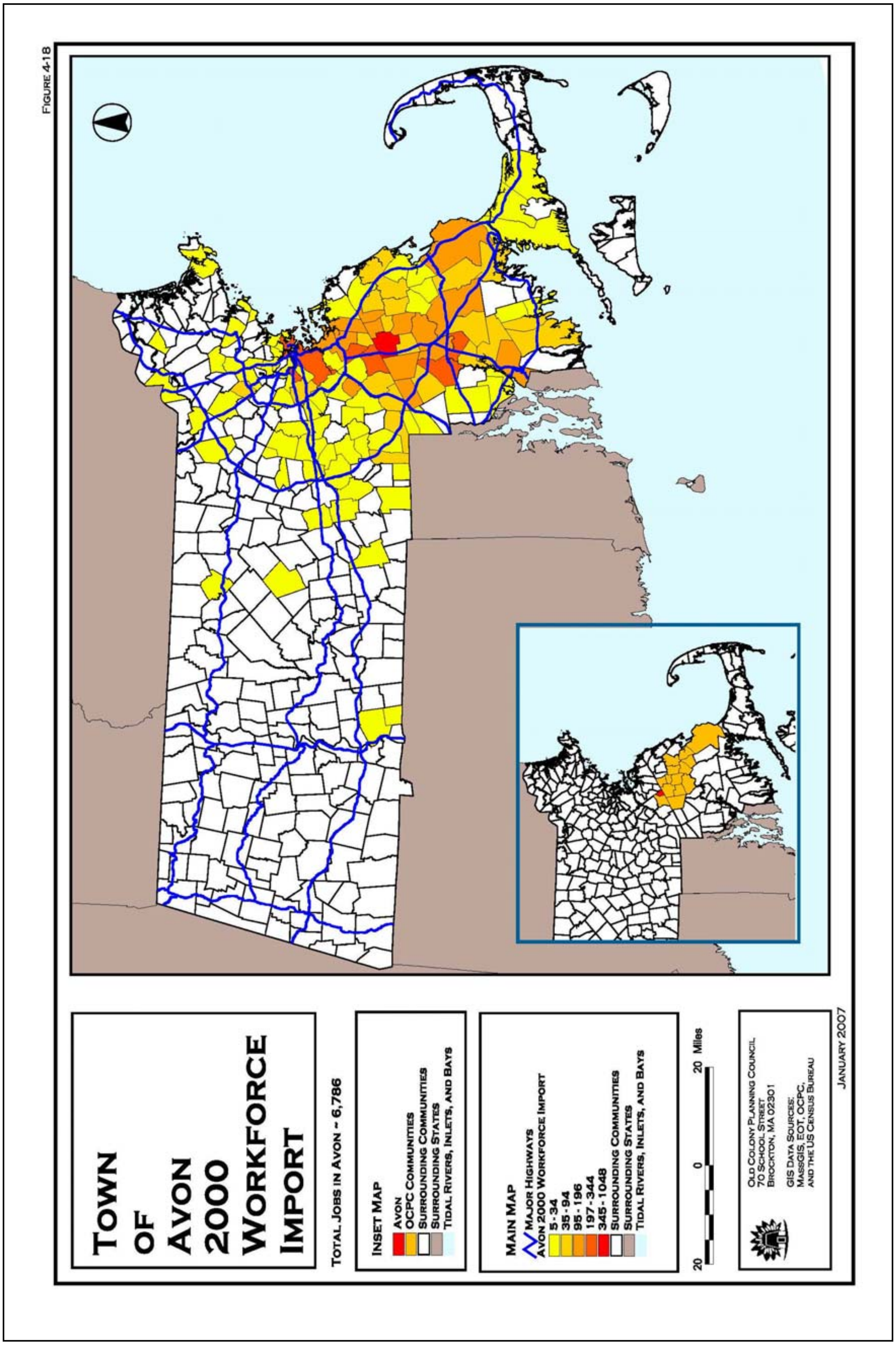
FIGURE 4-18
TOWN OF AVON 2000 WORKFORCE IMPORT
TOTAL JOBS IN AVON - 6,786
INSET MAP
AVON
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
AVON 2000 WORKFORCE IMPORT
5 - 34
35 - 94
95 - 196
197 - 344
345 - 1048
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
JANUARY 2007

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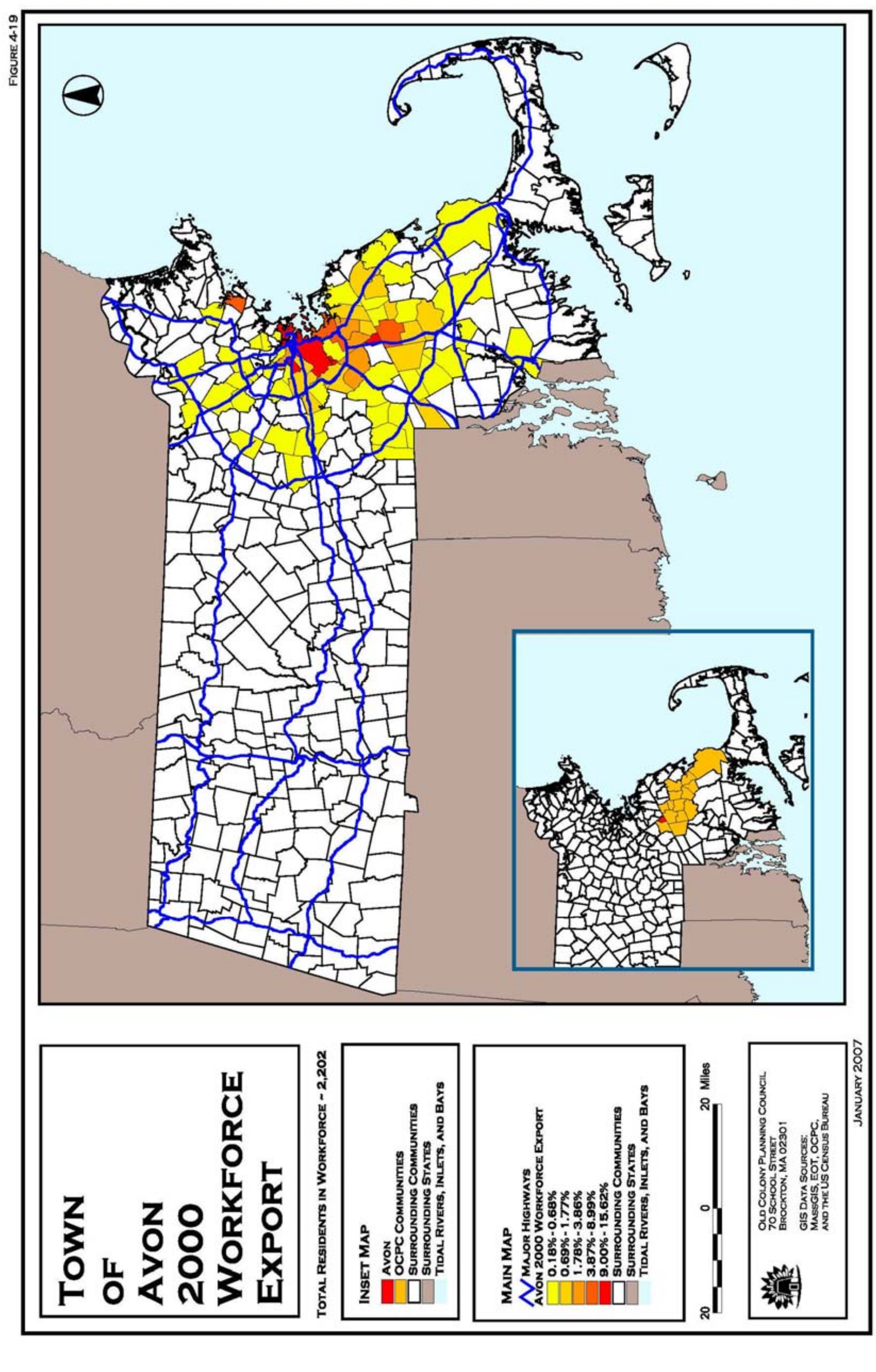
Figure 4-19
Town of Avon 2000 Workforce Export
Total Residents in Workforce - 2,202
Inset Map
Avon
OCPC Communities
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
Main Map
Major Highways
Avon 2000 Workforce Export
0.18% - 0.68%
0.69% - 1.77%
1.78% - 3.86%
3.87% - 8.99%
9.00% - 15.62%
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
20 0 20 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, OCPC,
and the US Census Bureau
January 2007

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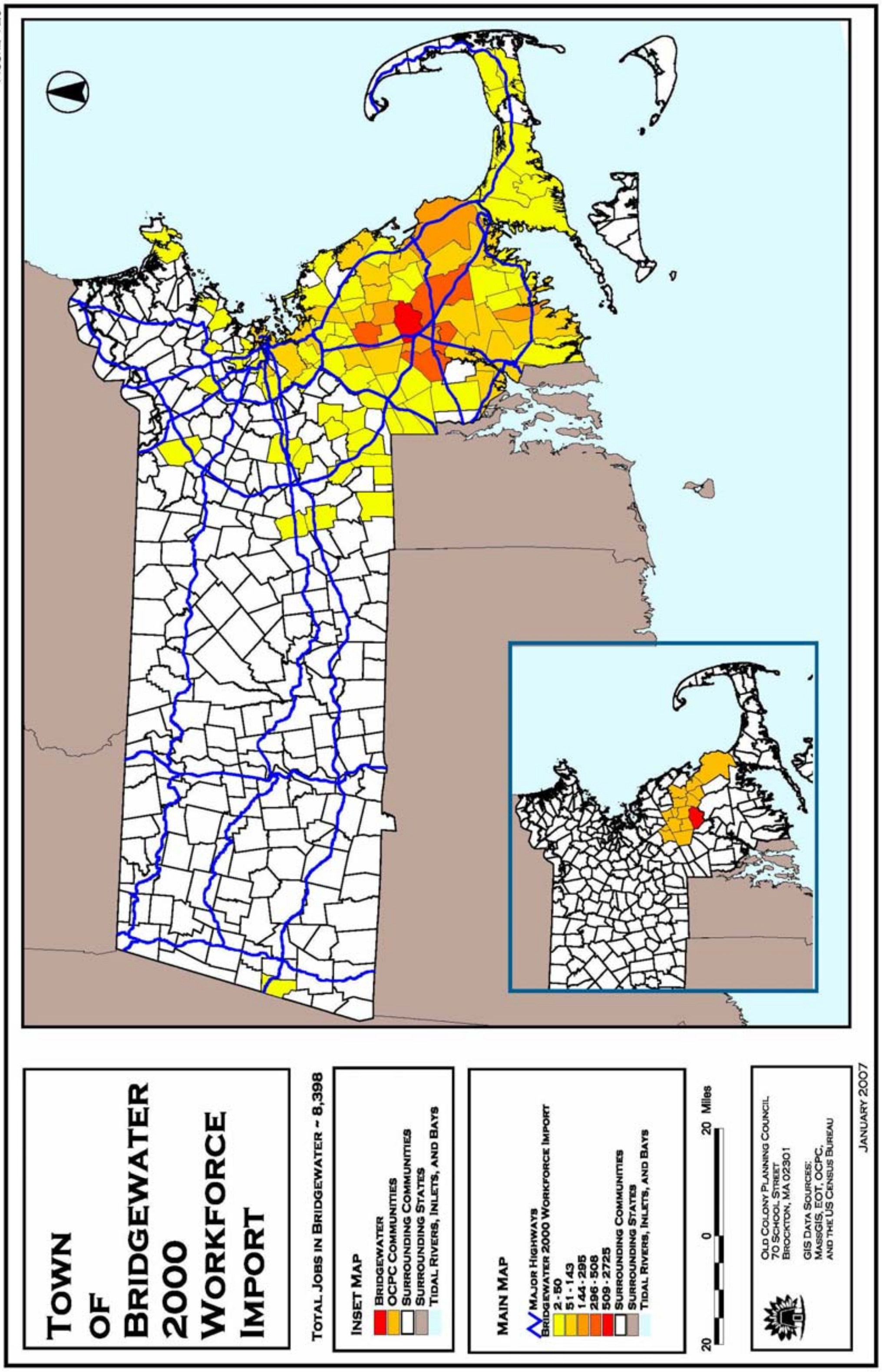
FIGURE 4-20
TOWN OF BRIDGEWATER 2000 WORKFORCE IMPORT
TOTAL JOBS IN BRIDGEWATER - 8,398
INSET MAP
BRIDGEWATER
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
BRIDGEWATER 2000 WORKFORCE IMPORT
2 - 50
51 - 143
144 - 295
296 - 508
509 - 2725
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
JANUARY 2007

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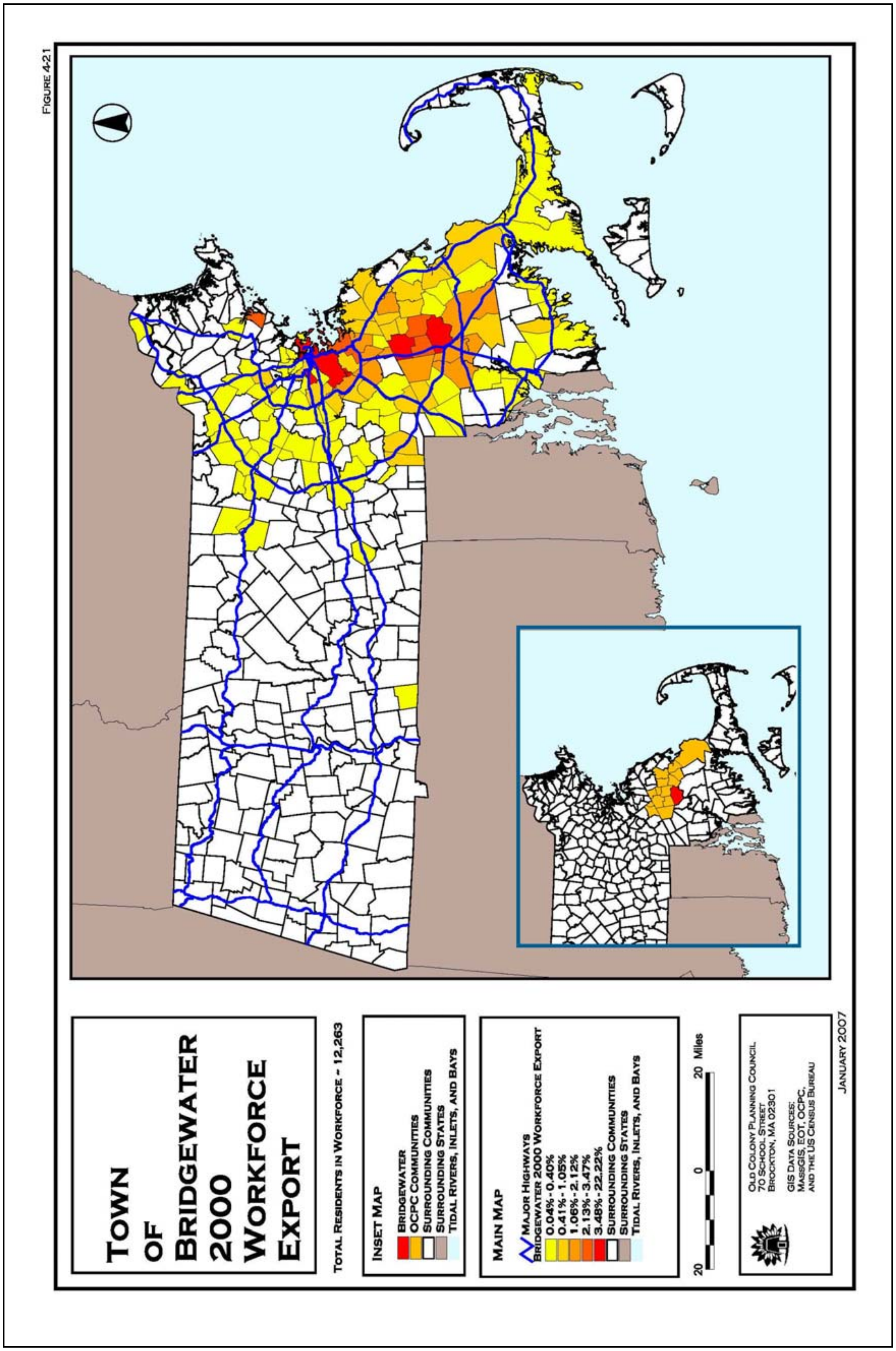
FIGURE 4-21
TOWN OF BRIDGEWATER 2000 WORKFORCE EXPORT
TOTAL RESIDENTS IN WORKFORCE - 12,263
INSET MAP
BRIDGEWATER
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
BRIDGEWATER 2000 WORKFORCE EXPORT
0.04% - 0.40%
0.41% - 1.05%
1.06% - 2.12%
2.13% - 3.47%
3.48% - 22.22%
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
JANUARY 2007

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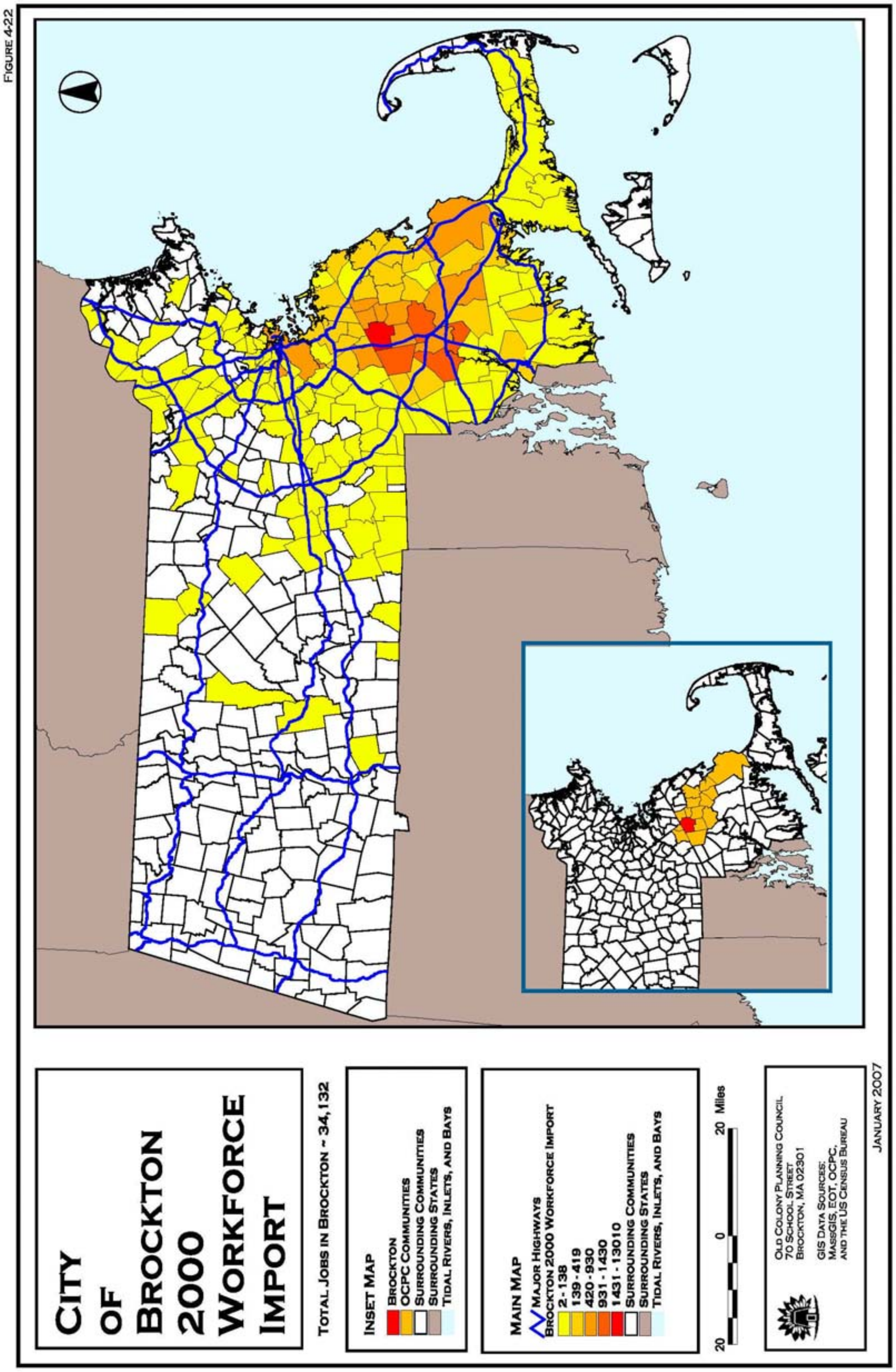
FIGURE 4-22
CITY OF BROCKTON 2000 WORKFORCE IMPORT
TOTAL JOBS IN BROCKTON ~ 34,132
INSET MAP
BROCKTON
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
BROCKTON 2000 WORKFORCE IMPORT
2 - 138
139 - 419
420 - 930
931 - 1430
1431 - 13010
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20
0
20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
JANUARY 2007

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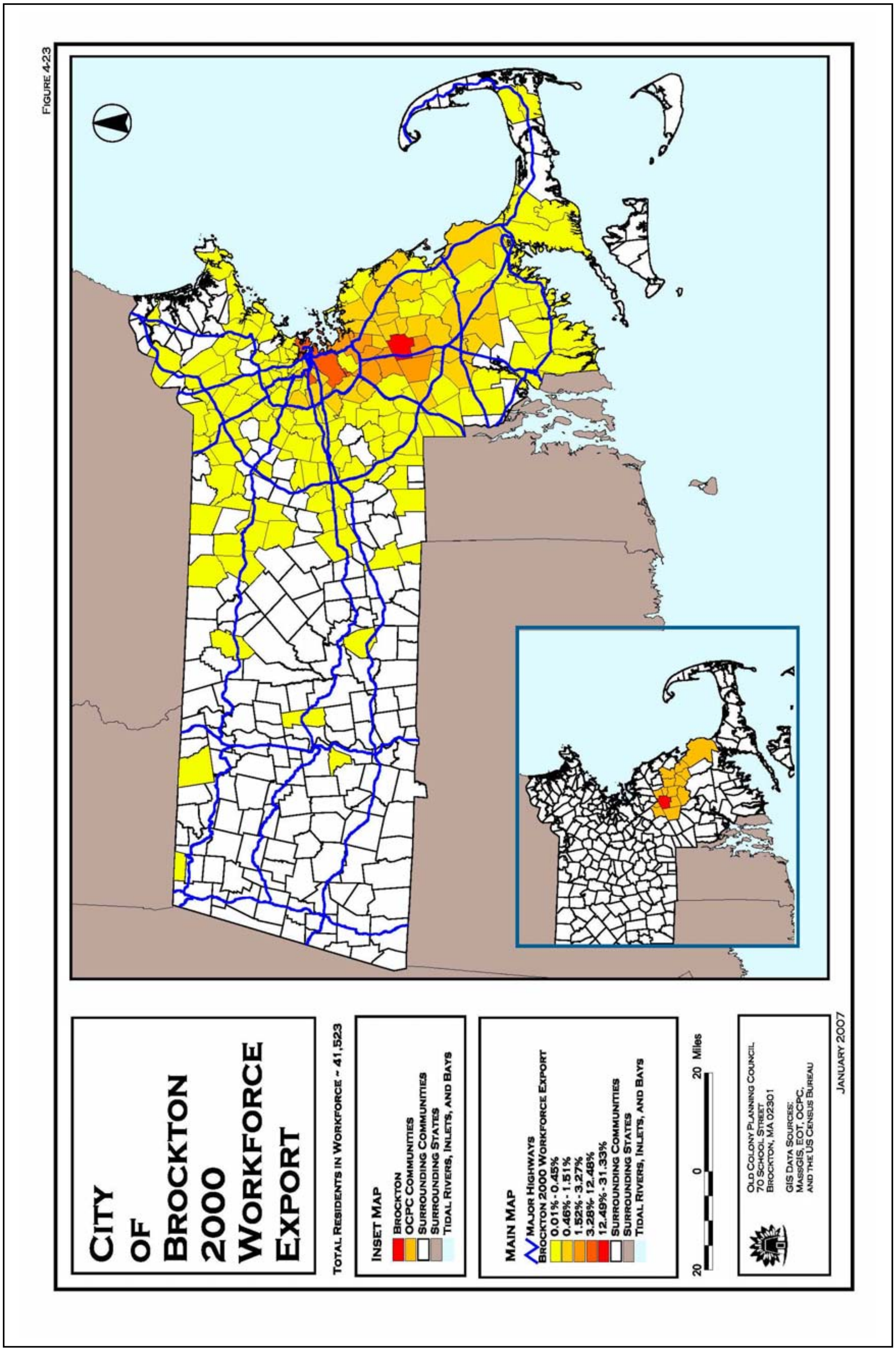
Figure 4-23
City of Brockton 2000 Workforce Export
Total Residents in Workforce - 41,523
Inset Map
Brockton
OCPC Communities
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
Main Map
Major Highways
Brockton 2000 Workforce Export
0.01% - 0.45%
0.46% - 1.51%
1.52% - 3.27%
3.28% - 12.48%
12.49% - 31.33%
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
20 0 20 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, OCPC,
and the US Census Bureau
January 2007

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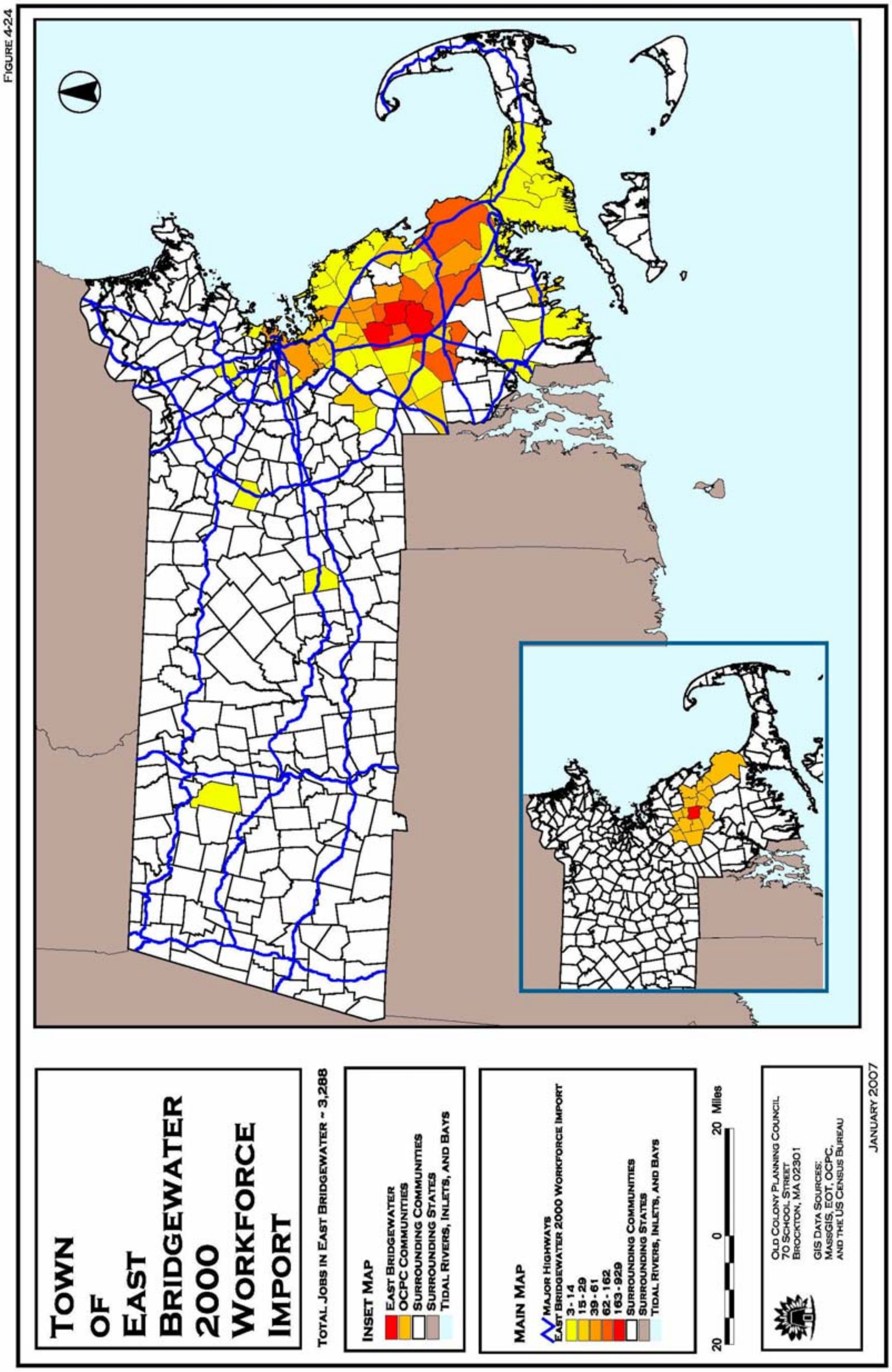

Figure 4-24
Town of East Bridgewater 2000 Workforce Import
Total Jobs in East Bridgewater - 3,288
Inset Map
East Bridgewater
OCPC Communities
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
Main Map
Major Highways
East Bridgewater 2000 Workforce Import
3 - 14
15 - 29
39 - 61
62 - 162
163 - 929
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
20 0 20 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, OCPC,
and the US Census Bureau
January 2007

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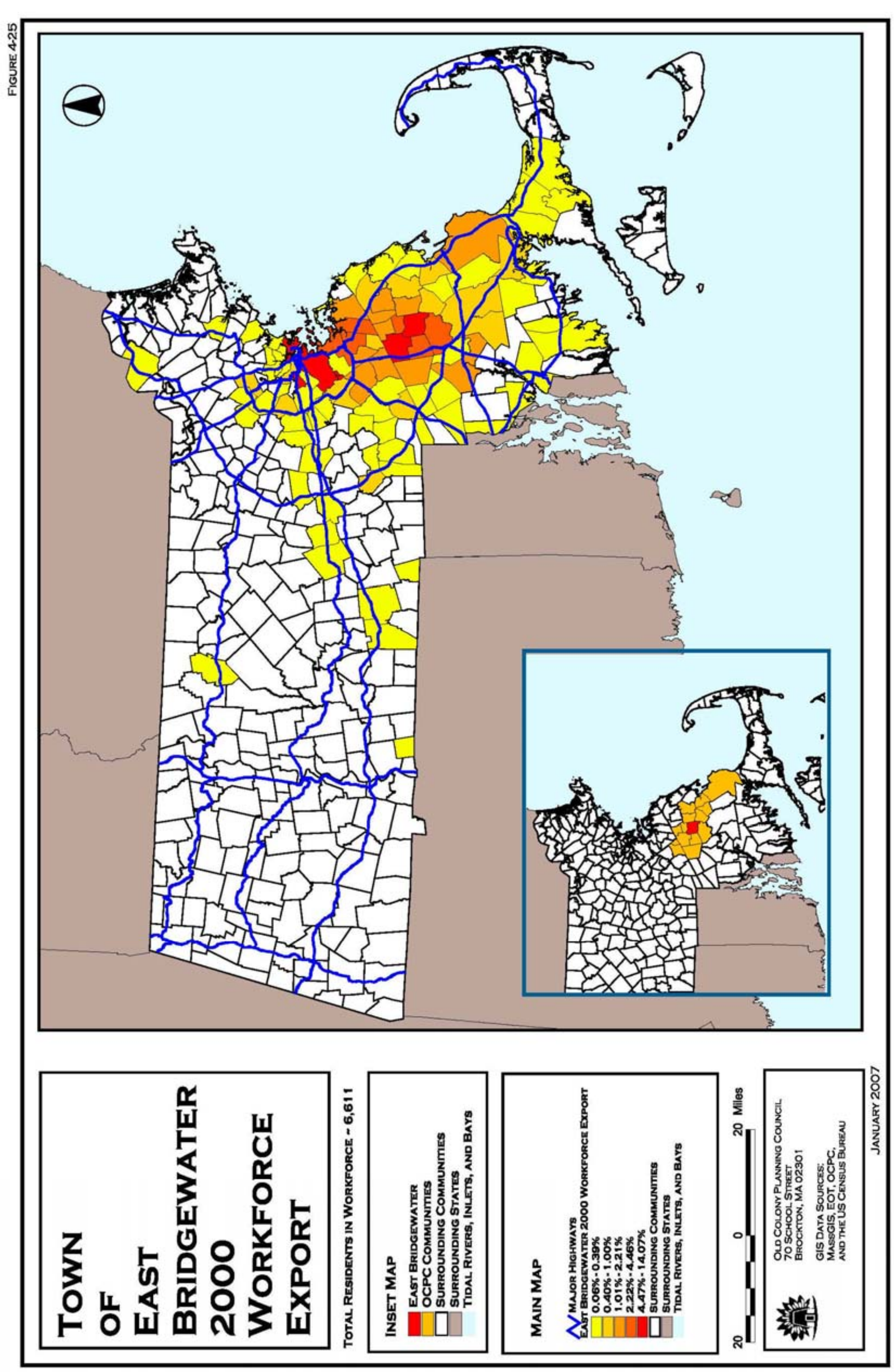

FIGURE 4-25
TOWN OF EAST BRIDGEWATER 2000 WORKFORCE EXPORT
TOTAL RESIDENTS IN WORKFORCE - 6,611
INSET MAP
EAST BRIDGEWATER
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
EAST BRIDGEWATER 2000 WORKFORCE EXPORT
0.06% - 0.39%
0.40% - 1.00%
1.01% - 2.21%
2.22% - 4.46%
4.47% - 14.07%
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
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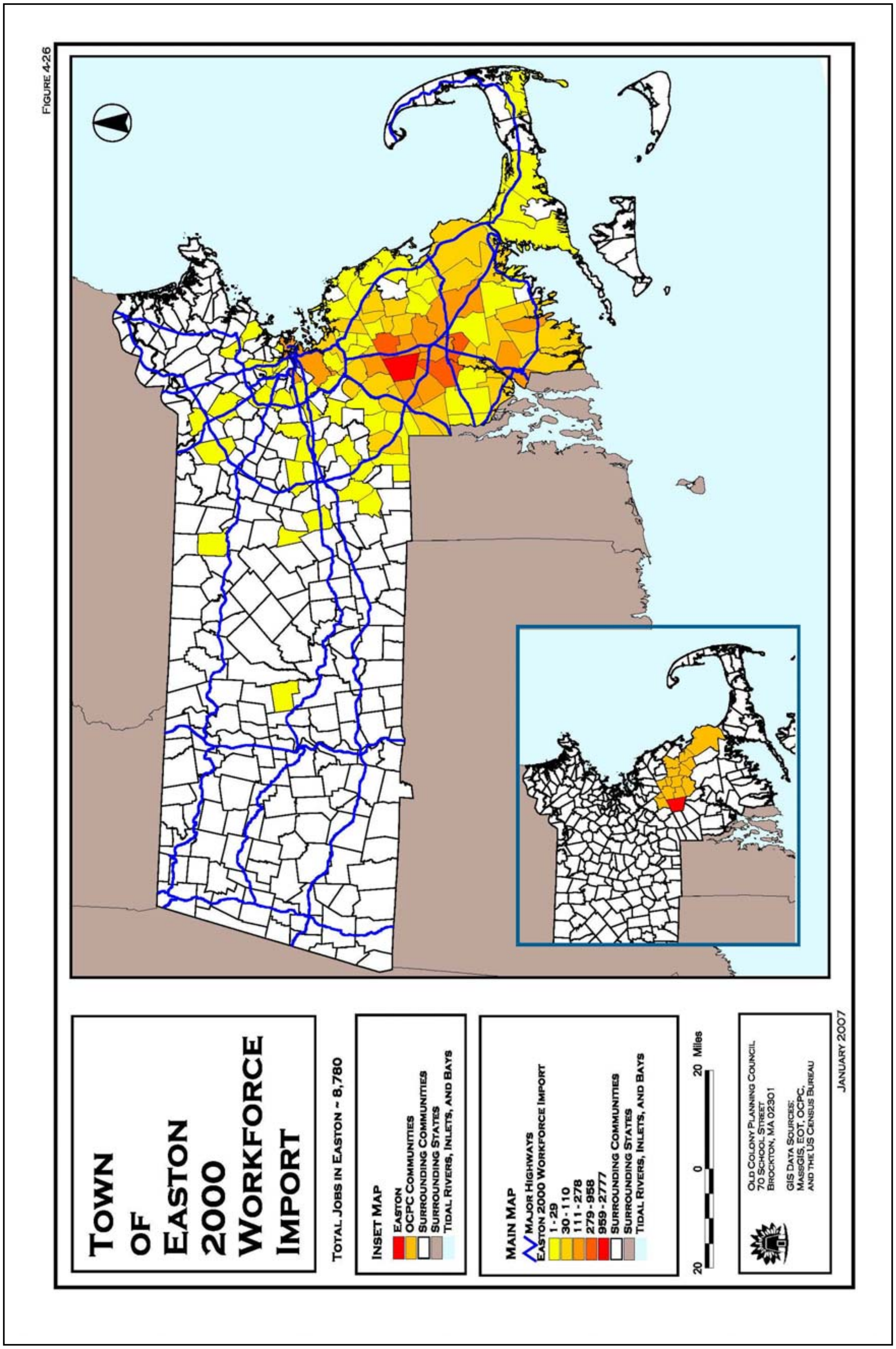
Figure 4-26
Town of Easton 2000 Workforce Import
Total Jobs in Easton ~ 8,780
Inset Map
Easton
OCPC Communities
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
Main Map
Major Highways
Easton 2000 Workforce Import
1 - 29
30 - 110
111 - 278
279 - 958
959 - 2777
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
20 0 20 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, OCPC,
and the US Census Bureau
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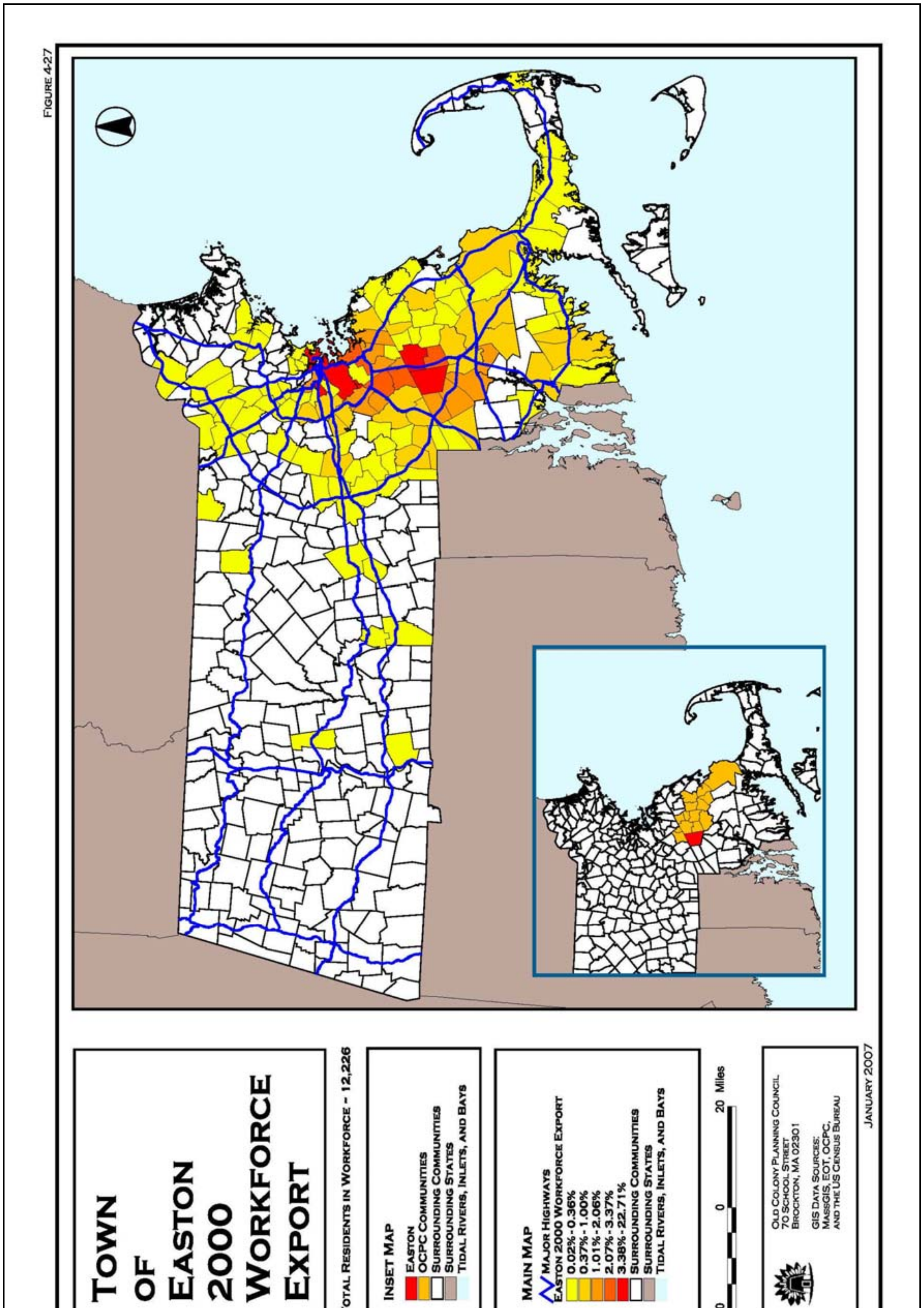
FIGURE 4-27
TOWN OF EASTON 2000 WORKFORCE EXPORT
TOTAL RESIDENTS IN WORKFORCE - 12,226
INSET MAP
EASTON
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
EASTON 2000 WORKFORCE EXPORT
0.02% - 0.36%
0.37% - 1.00%
1.01% - 2.06%
2.07% - 3.37%
3.38% - 22.71%
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
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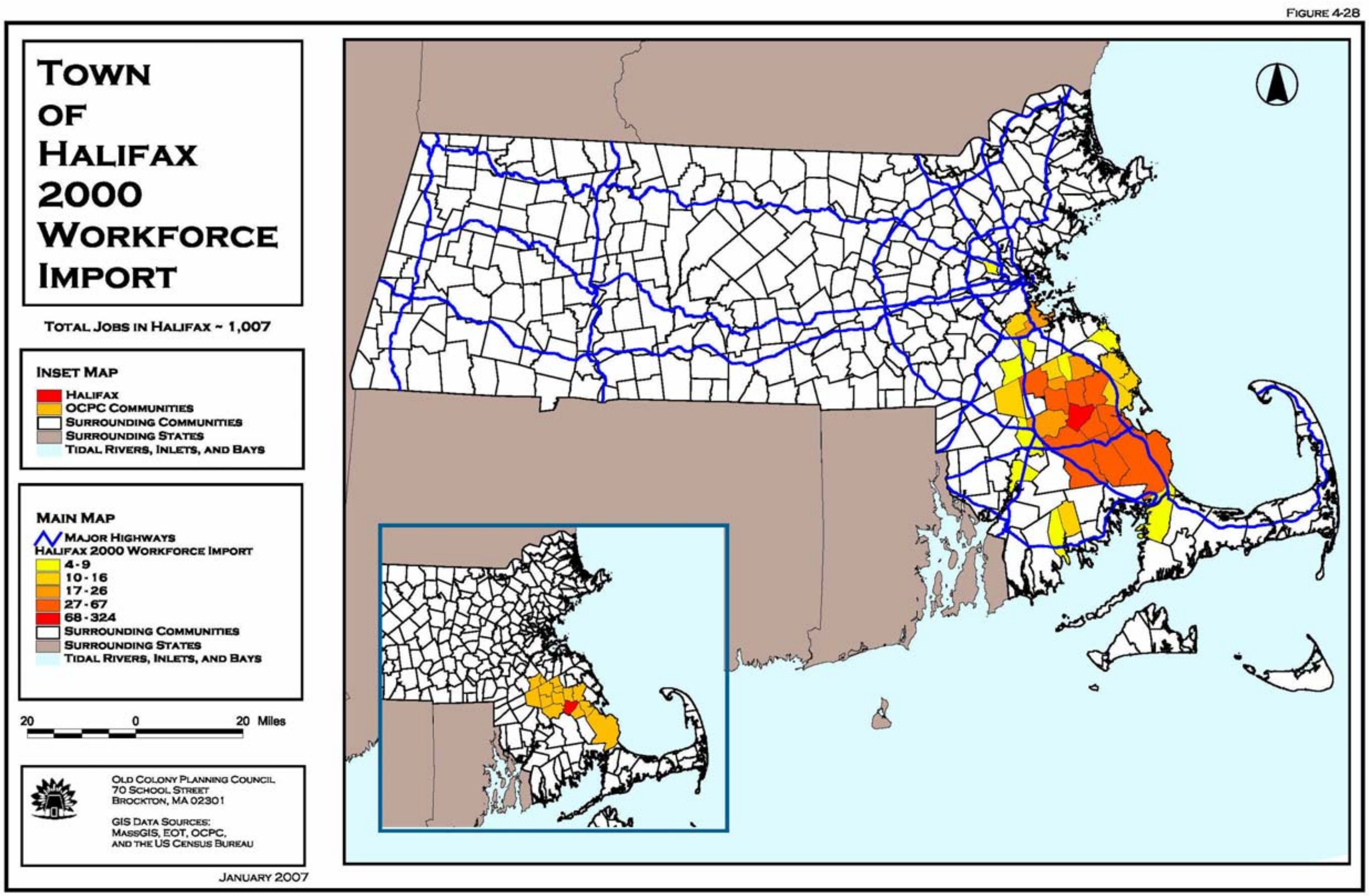
FIGURE 4-28
TOWN OF HALIFAX 2000 WORKFORCE IMPORT
TOTAL JOBS IN HALIFAX ~ 1,007
INSET MAP
HALIFAX
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
HALIFAX 2000 WORKFORCE IMPORT
4 - 9
10 - 16
17 - 26
27 - 67
68 - 324
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20
0
20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
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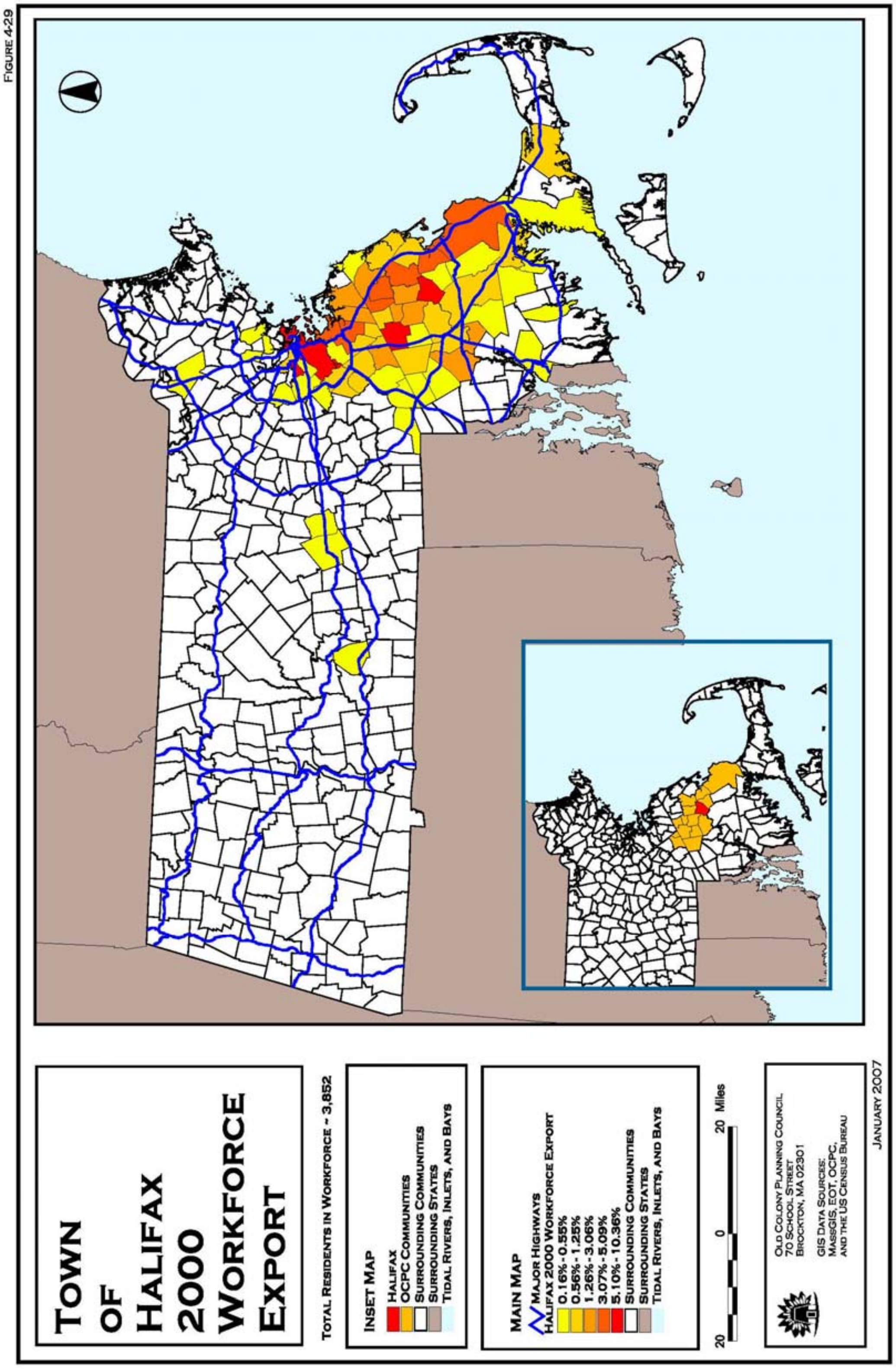
FIGURE 4-29
TOWN OF HALIFAX 2000 WORKFORCE EXPORT
TOTAL RESIDENTS IN WORKFORCE ~ 3,852
INSET MAP
HALIFAX
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
HALIFAX 2000 WORKFORCE EXPORT
0.16% - 0.55%
0.56% - 1.25%
1.26% - 3.06%
3.07% - 5.09%
5.10% - 10.36%
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20
0
20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
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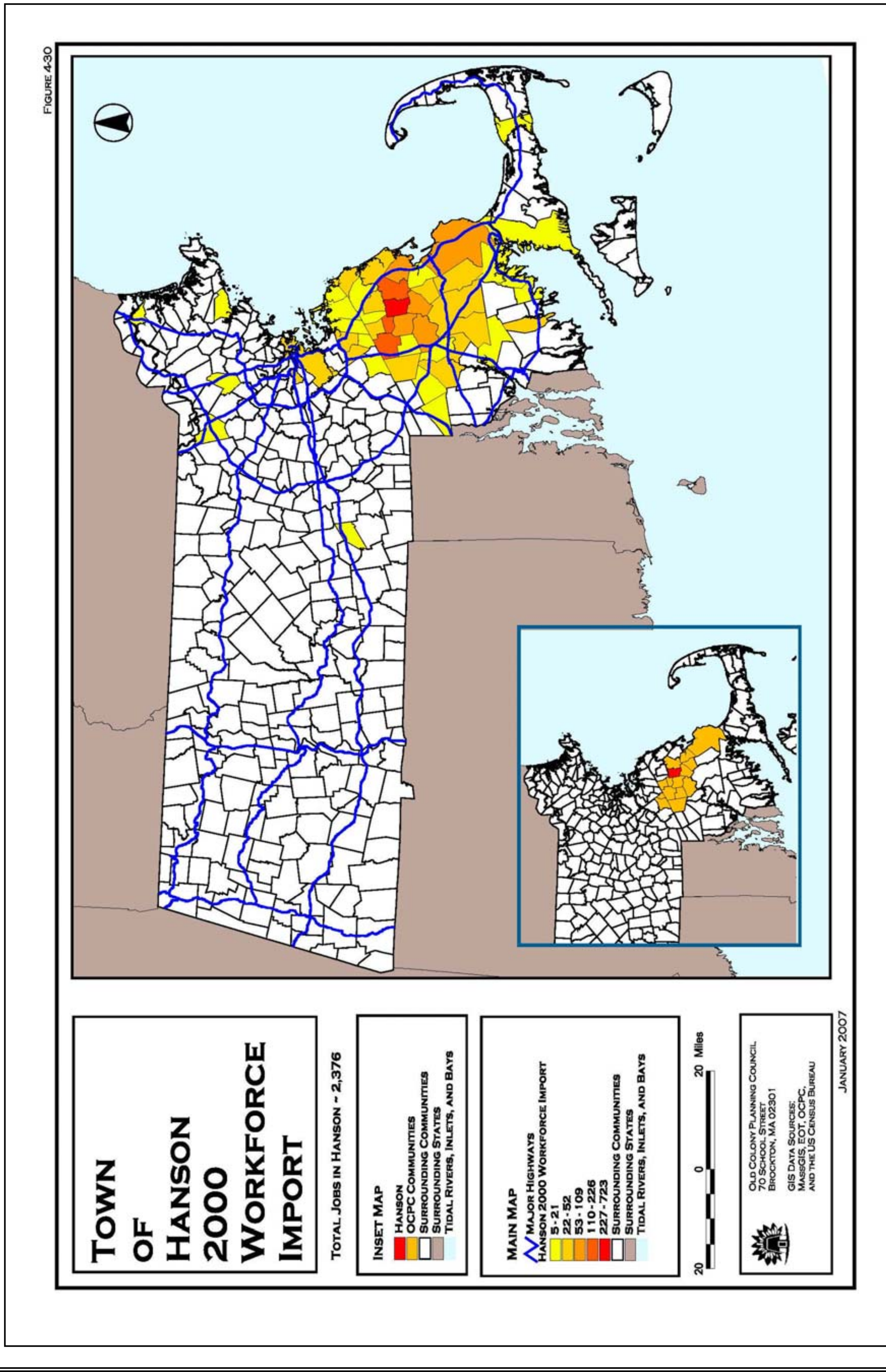
Figure 4-30
Town of Hanson 2000 Workforce Import
Total Jobs in Hanson - 2,376
Inset Map
Hanson
OCPC Communities
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
Main Map
Major Highways
Hanson 2000 Workforce Import
5 - 21
22 - 52
53 - 109
110 - 226
227 - 723
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
20 0 20 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, OCPC,
and the US Census Bureau
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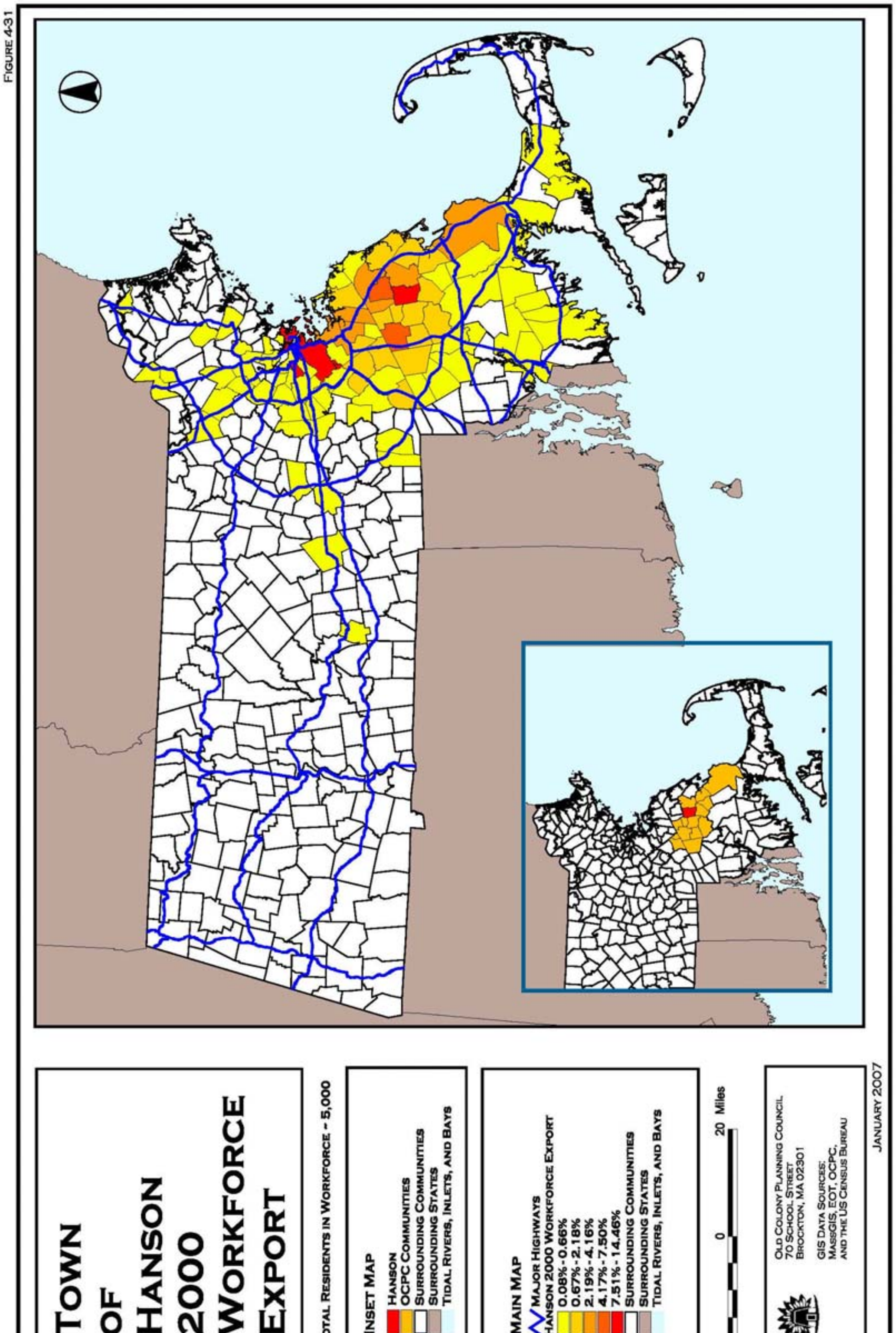
Figure 4-31



Town of Hanson 2000 Workforce Export
Total Residents in Workforce - 5,000
Inset Map
Hanson
OCPC Communities
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
Main Map
Major Highways
Hanson 2000 Workforce Export
0.08% - 0.66%
0.67% - 2.18%
2.19% - 4.16%
4.17% - 7.50%
7.51% - 14.46%
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
20
0
20 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, OCPC,
and the US Census Bureau
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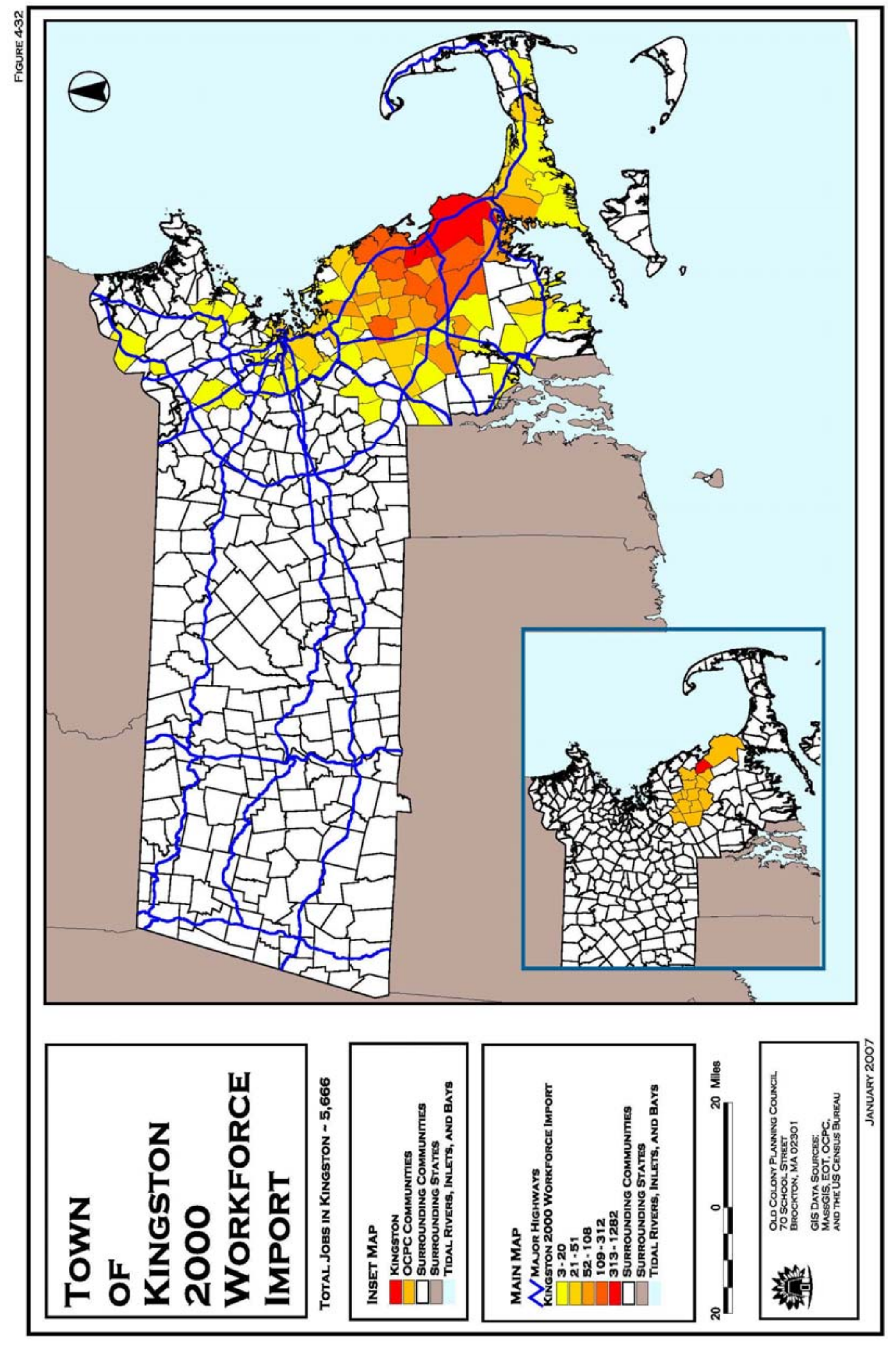
FIGURE 4-32
TOWN OF KINGSTON 2000 WORKFORCE IMPORT
TOTAL JOBS IN KINGSTON - 5,666
INSET MAP
KINGSTON
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
KINGSTON 2000 WORKFORCE IMPORT
3 - 20
21 - 51
52 - 108
109 - 312
313 - 1282
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
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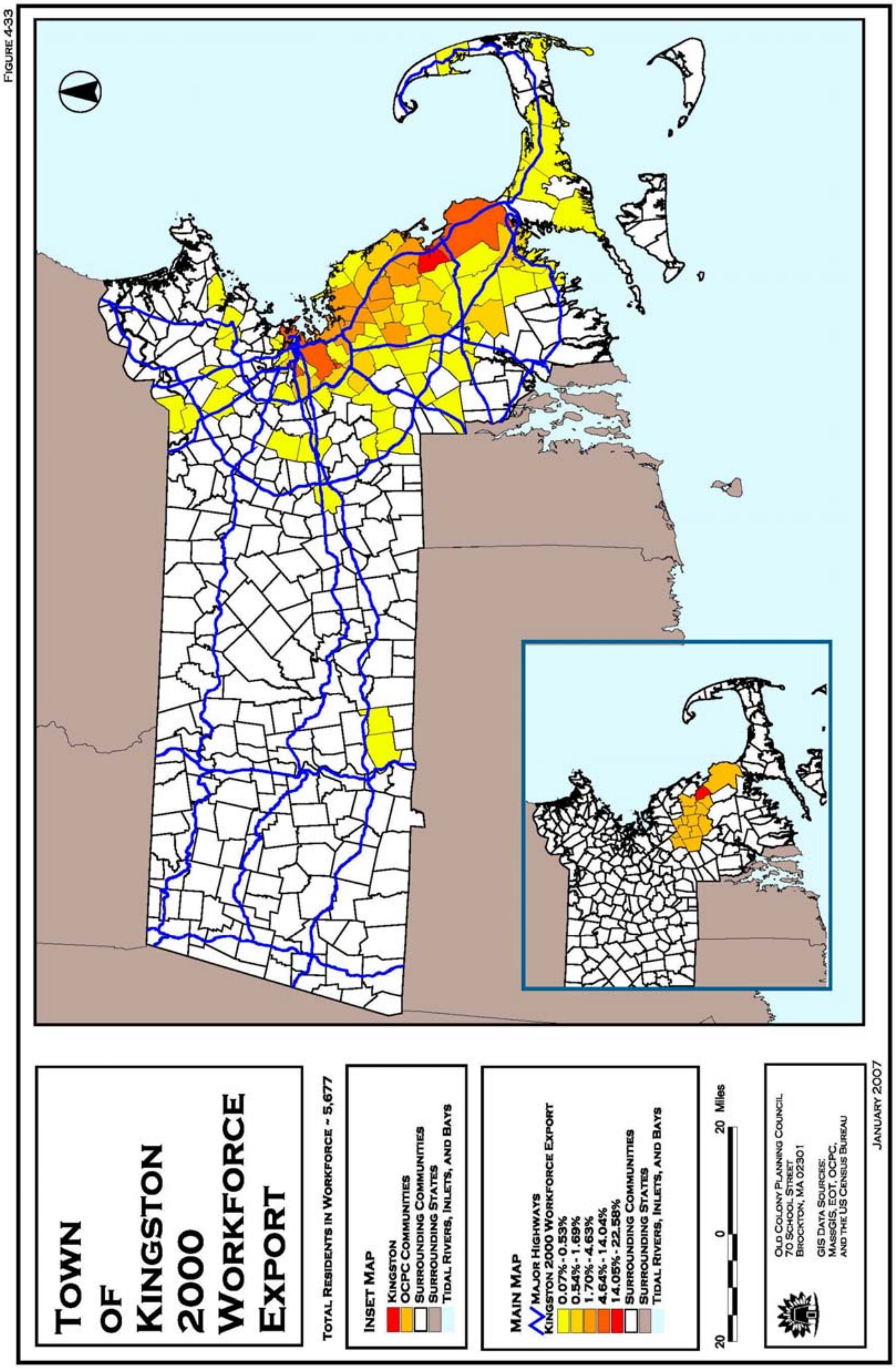
FIGURE 4-33
TOWN OF KINGSTON 2000 WORKFORCE EXPORT
TOTAL RESIDENTS IN WORKFORCE - 5,677
INSET MAP
KINGSTON
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
KINGSTON 2000 WORKFORCE EXPORT
0.07% - 0.53%
0.54% - 1.69%
1.70% - 4.63%
4.64% - 14.04%
14.05% - 22.58%
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
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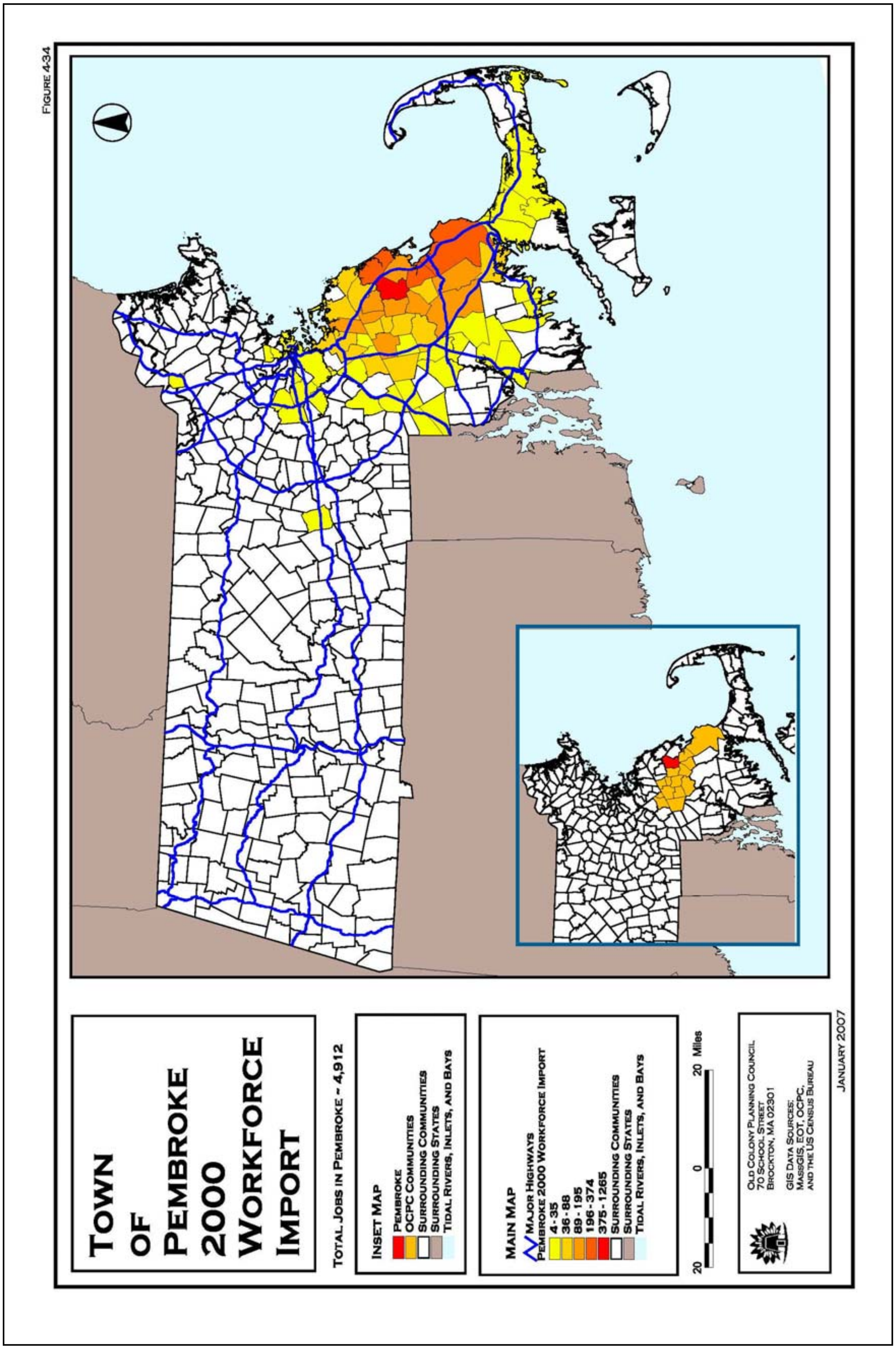
FIGURE 4-34
TOWN OF PEMBROKE 2000 WORKFORCE IMPORT
TOTAL JOBS IN PEMBROKE - 4,912
INSET MAP
PEMBROKE
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
PEMBROKE 2000 WORKFORCE IMPORT
4 - 35
36 - 88
89 - 195
196 - 374
375 - 1265
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20
0
20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
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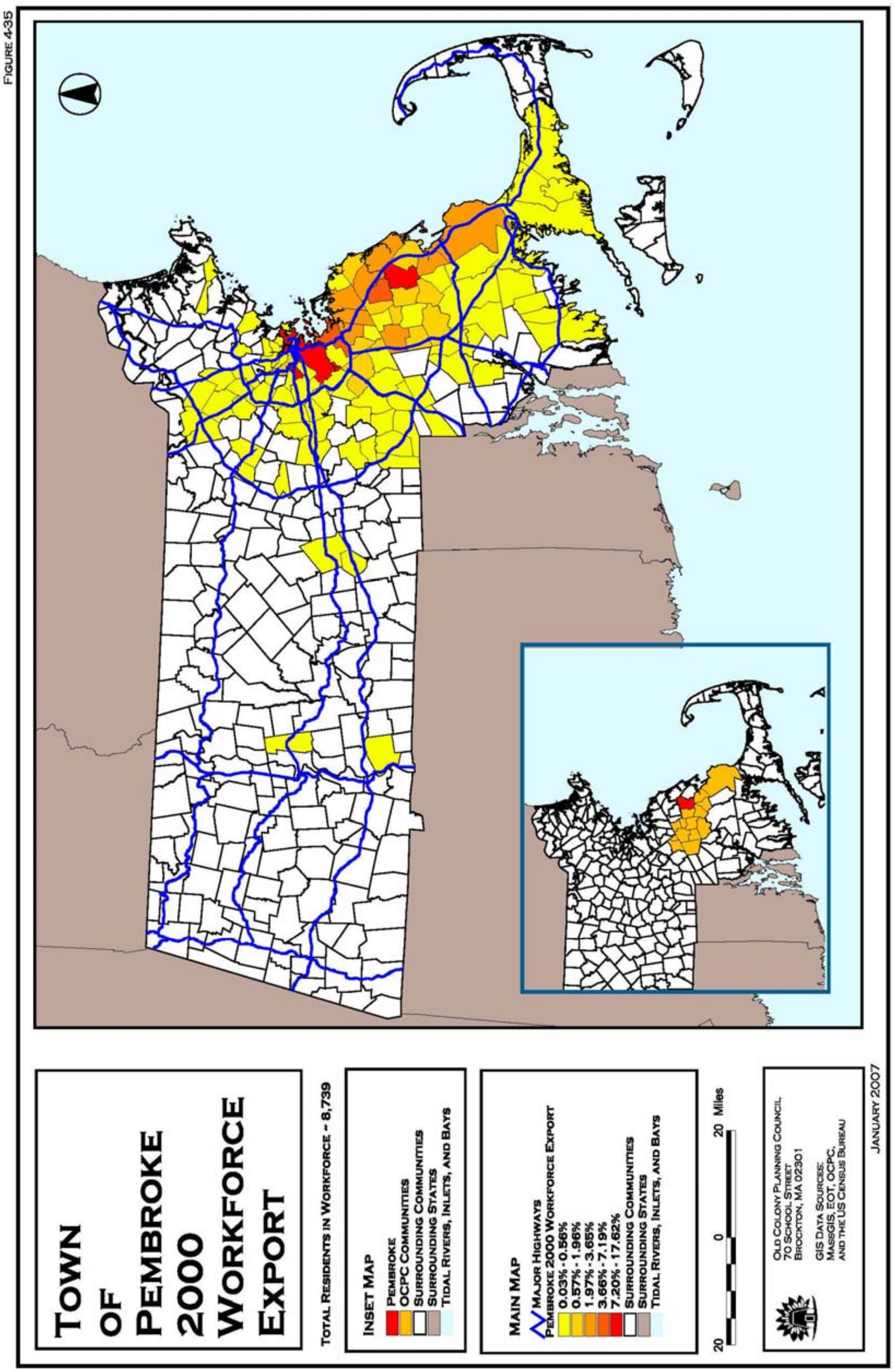
Figure 4-35
Town of Pembroke 2000 Workforce Export
Total Residents in Workforce - 8,739
Inset Map
Pembroke
OCPC Communities
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
Main Map
Major Highways
Pembroke 2000 Workforce Export
0.03% - 0.56%
0.57% - 1.96%
1.97% - 3.65%
3.66% - 7.19%
7.20% - 17.62%
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
20 0 20 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, OCPC,
and the US Census Bureau
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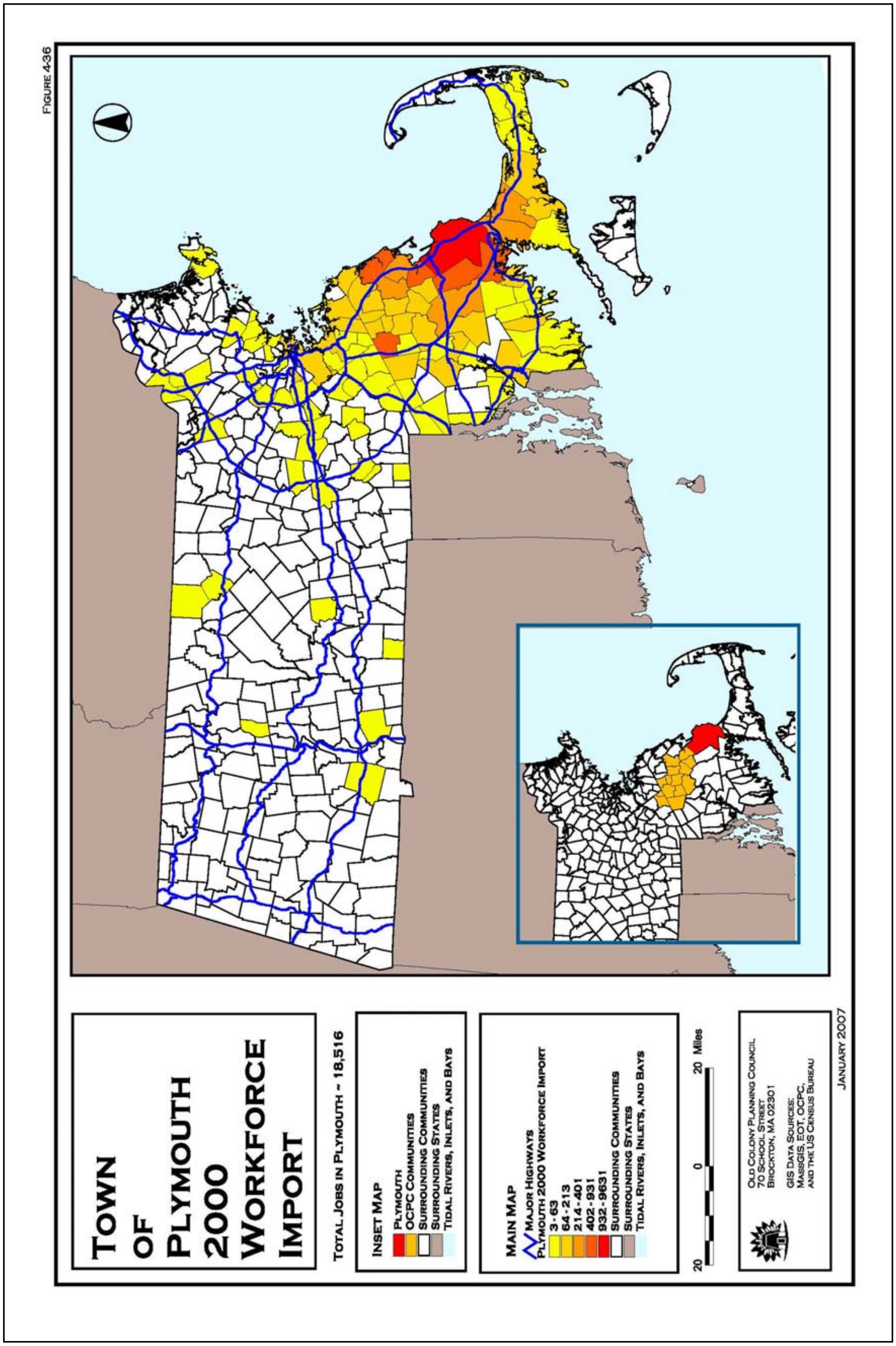
FIGURE 4-36
TOWN OF PLYMOUTH 2000 WORKFORCE IMPORT
TOTAL JOBS IN PLYMOUTH ~ 18,516
INSET MAP
PLYMOUTH
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
PLYMOUTH 2000 WORKFORCE IMPORT
3 - 63
64 - 213
214 - 401
402 - 931
932 - 9631
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20
0
20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
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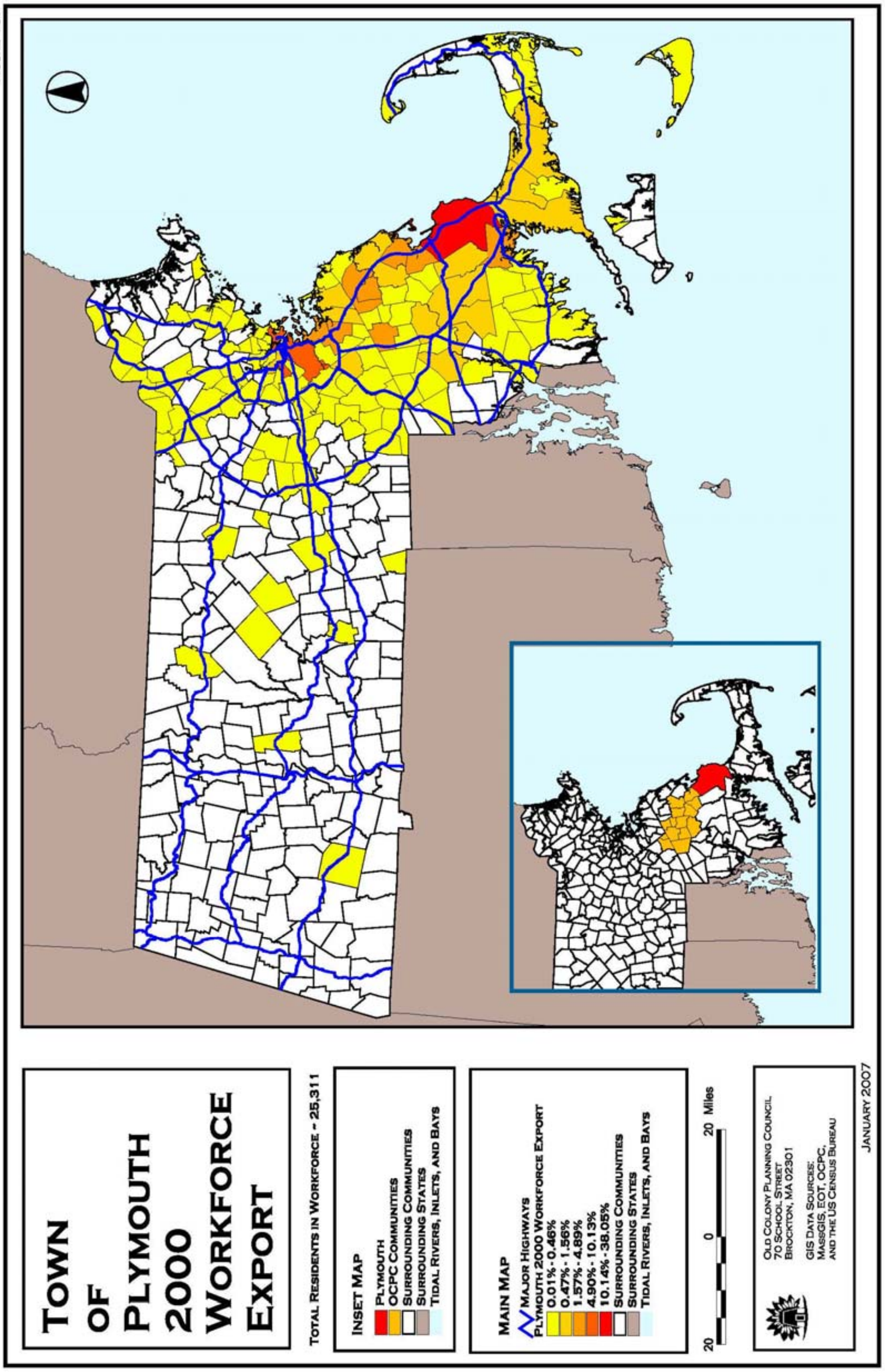
FIGURE 4-37
TOWN OF PLYMOUTH 2000 WORKFORCE EXPORT
TOTAL RESIDENTS IN WORKFORCE - 25,311
INSET MAP
PLYMOUTH
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
PLYMOUTH 2000 WORKFORCE EXPORT
0.01% - 0.46%
0.47% - 1.56%
1.57% - 4.89%
4.90% - 10.13%
10.14% - 38.05%
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
JANUARY 2007

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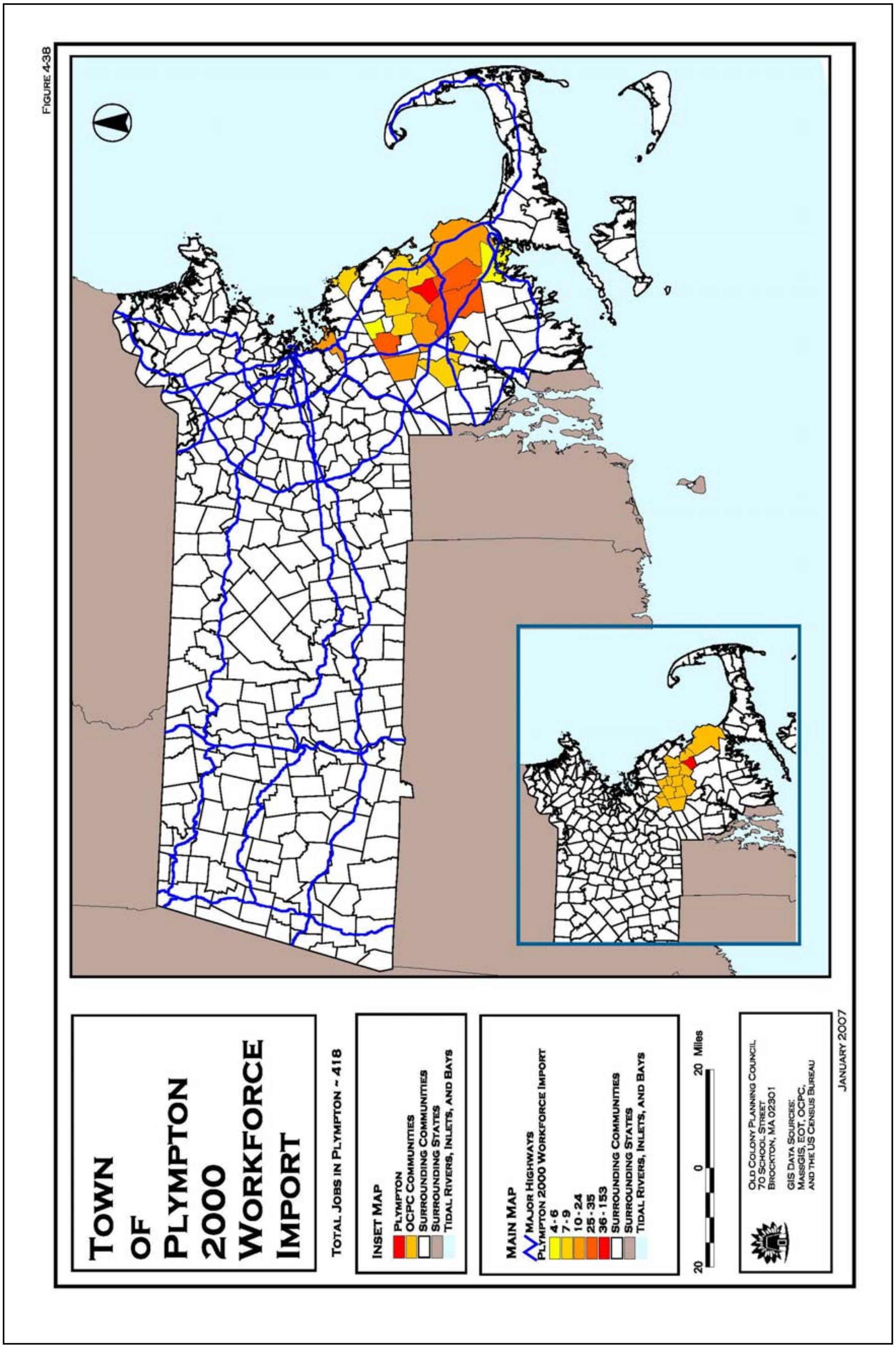

Figure 4-38
Town of Plympton 2000 Workforce Import
Total Jobs in Plympton ~ 418
Inset Map
Plympton
OCPC Communities
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
Main Map
Major Highways
Plympton 2000 Workforce Import
4 - 6
7 - 9
10 - 24
25 - 35
36 - 153
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
20
0
20 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, OCPC,
and the US Census Bureau
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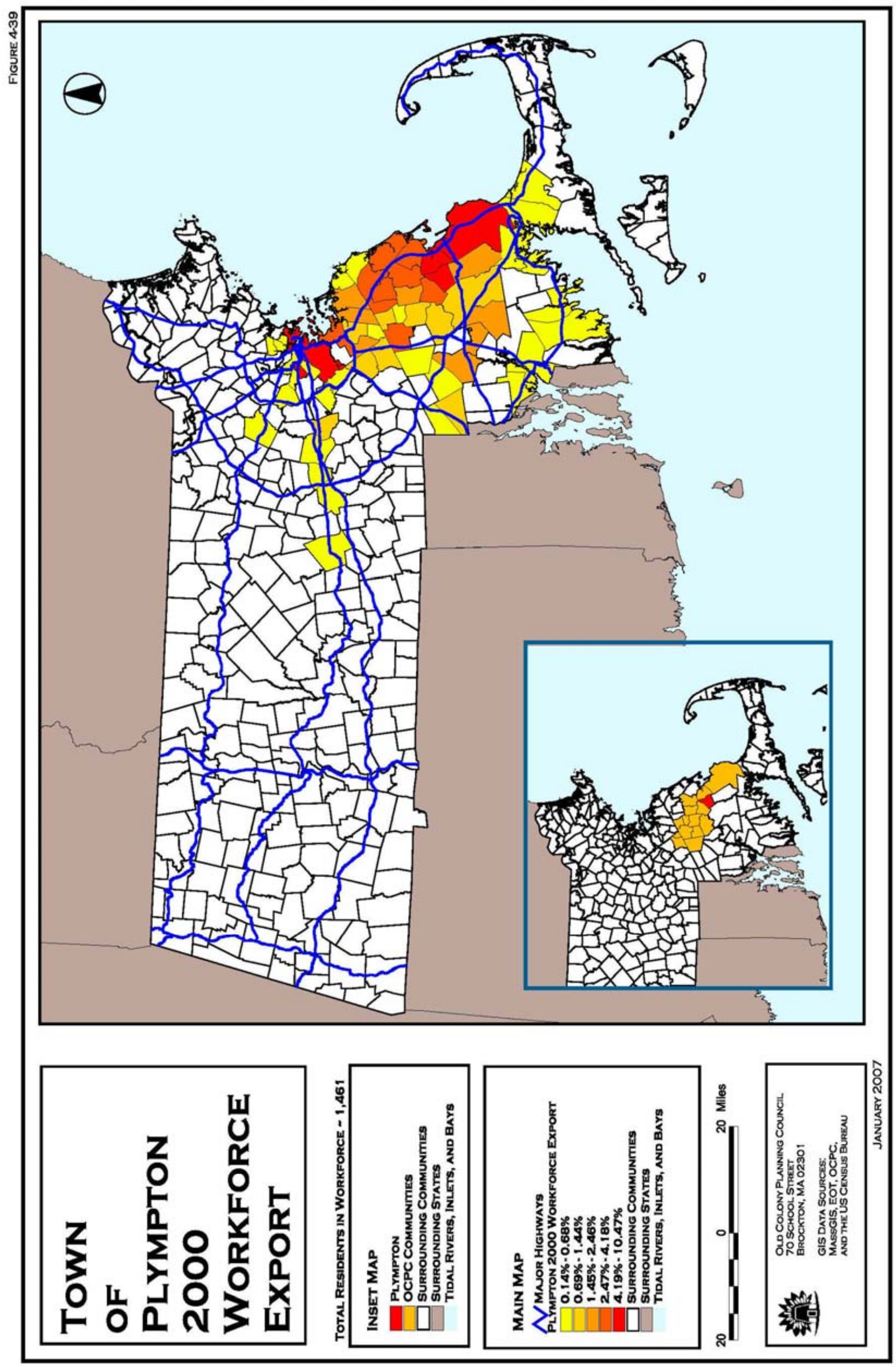
FIGURE 4-39
TOWN OF PLYMPTON 2000 WORKFORCE EXPORT
TOTAL RESIDENTS IN WORKFORCE - 1,461
INSET MAP
PLYMPTON
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
PLYMPTON 2000 WORKFORCE EXPORT
0.14% - 0.68%
0.69% - 1.44%
1.45% - 2.46%
2.47% - 4.18%
4.19% - 10.47%
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
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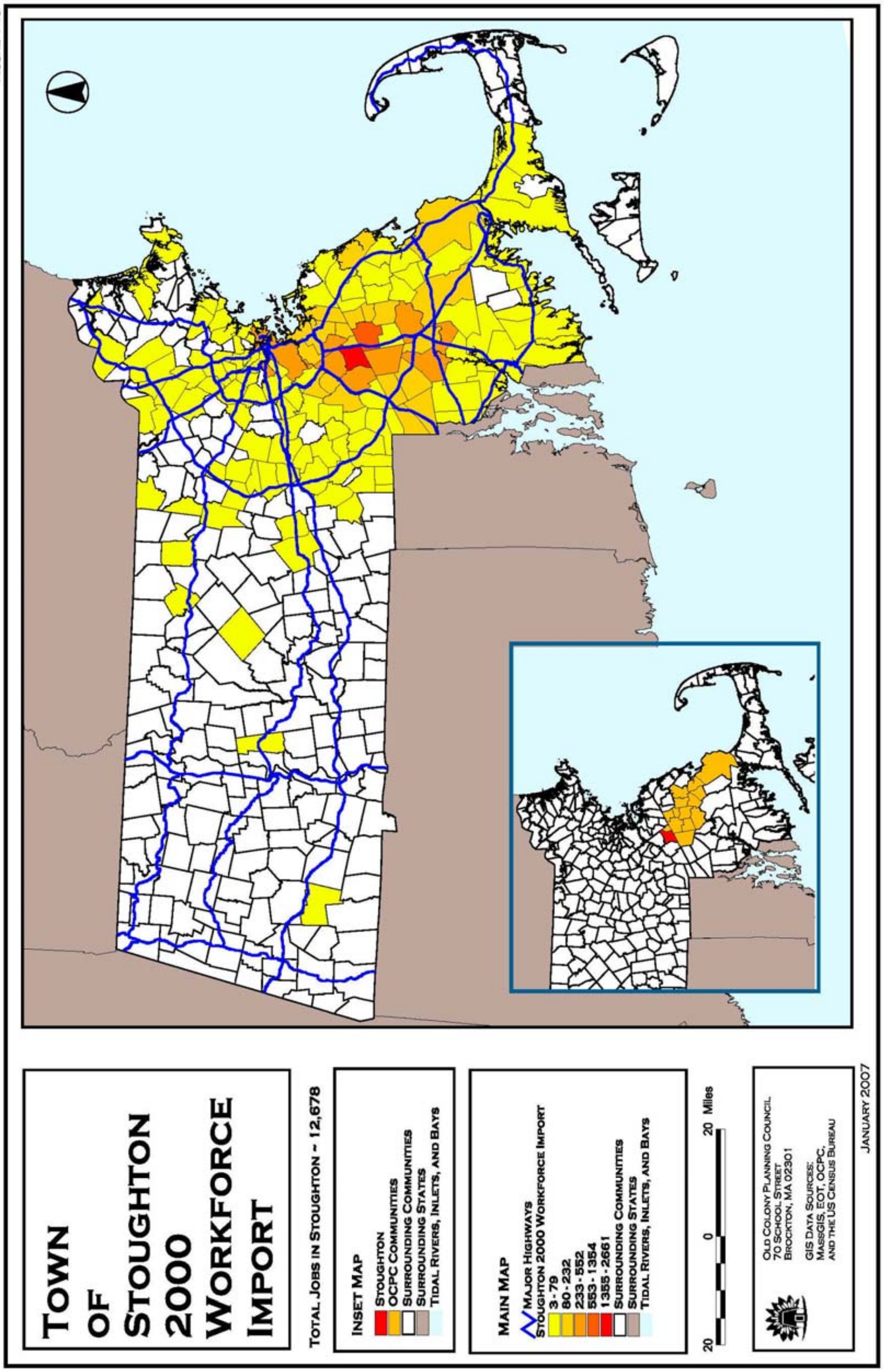
FIGURE 4-40



TOWN OF STOUGHTON 2000 WORKFORCE IMPORT
TOTAL JOBS IN STOUGHTON - 12,678
INSET MAP
STOUGHTON
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
STOUGHTON 2000 WORKFORCE IMPORT
3 - 79
80 - 232
233 - 552
553 - 1354
1355 - 2661
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
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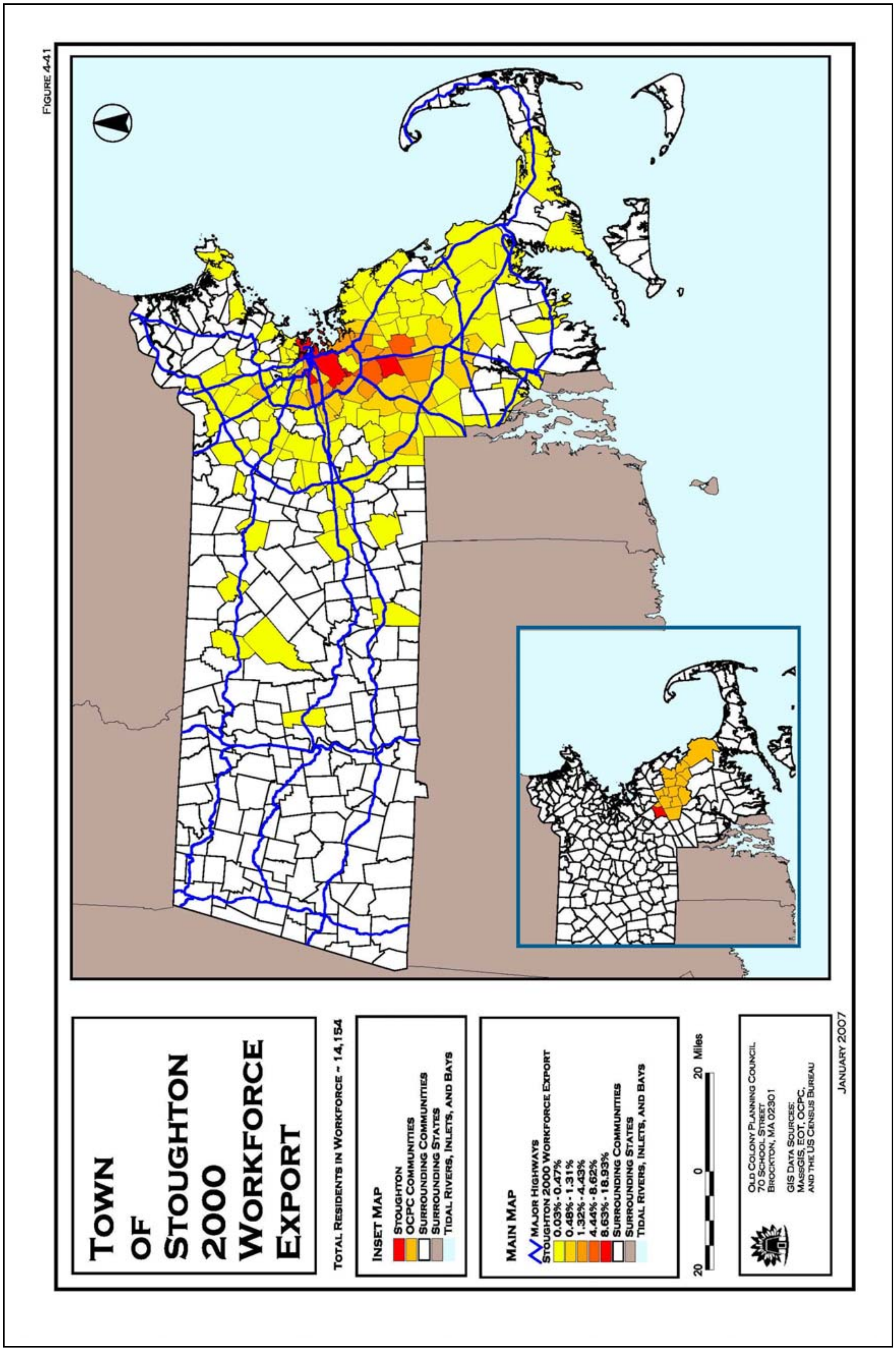
Figure 4-41
Town of Stoughton 2000 Workforce Export
Total Residents in Workforce ~ 14,154
Inset Map
Stoughton
OCPC Communities
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
Main Map
Major Highways
Stoughton 2000 Workforce Export
0.03% - 0.47%
0.48% - 1.31%
1.32% - 4.43%
4.44% - 8.62%
8.63% - 18.93%
Surrounding Communities
Surrounding States
Tidal Rivers, Inlets, and Bays
20 0 20 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, OCPC,
and the US Census Bureau
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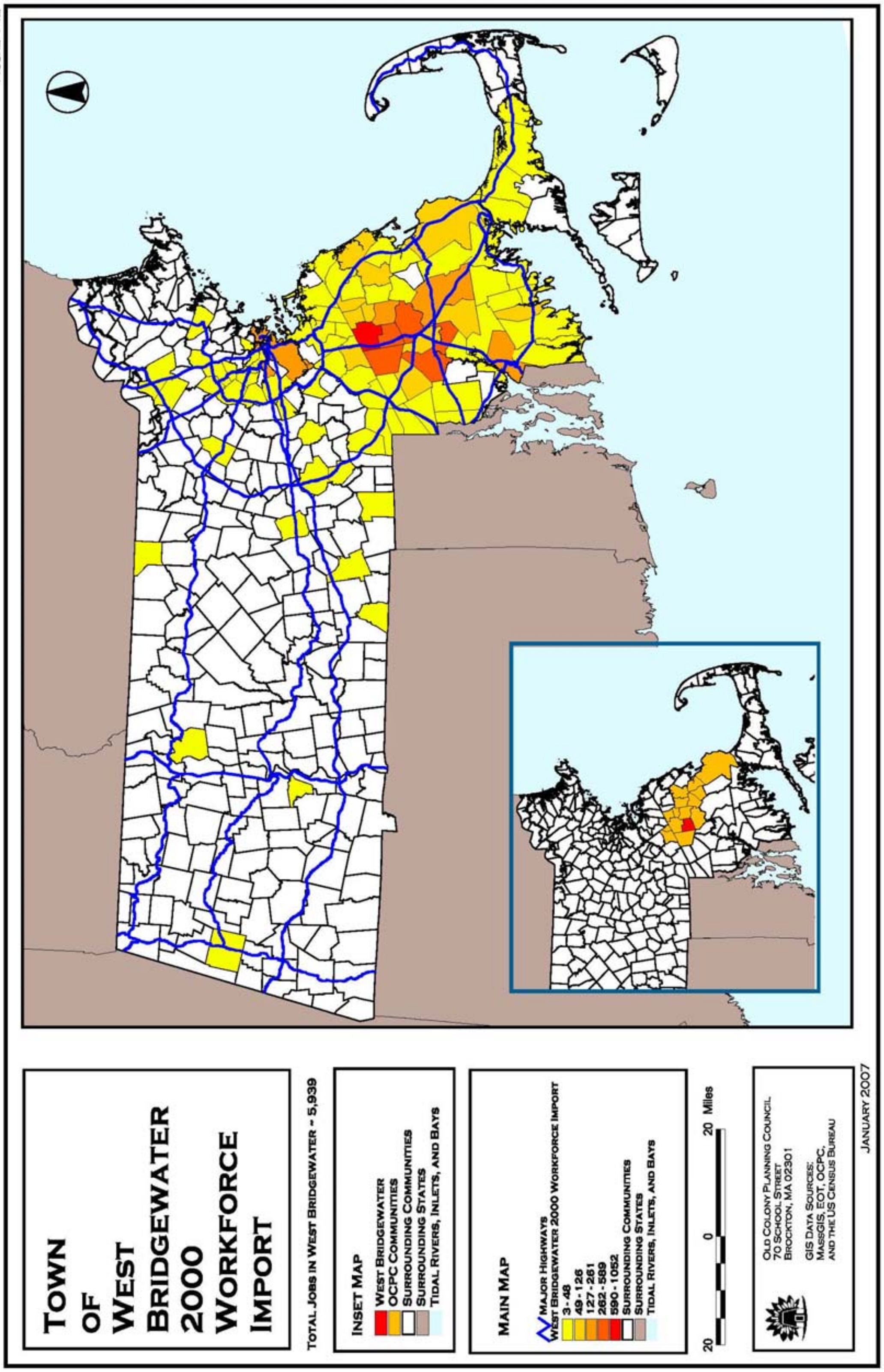
FIGURE 4-42
TOWN OF WEST BRIDGEWATER 2000 WORKFORCE IMPORT
TOTAL JOBS IN WEST BRIDGEWATER - 5,939
INSET MAP
WEST BRIDGEWATER
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
WEST BRIDGEWATER 2000 WORKFORCE IMPORT
3 - 48
49 - 126
127 - 261
262 - 589
590 - 1052
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
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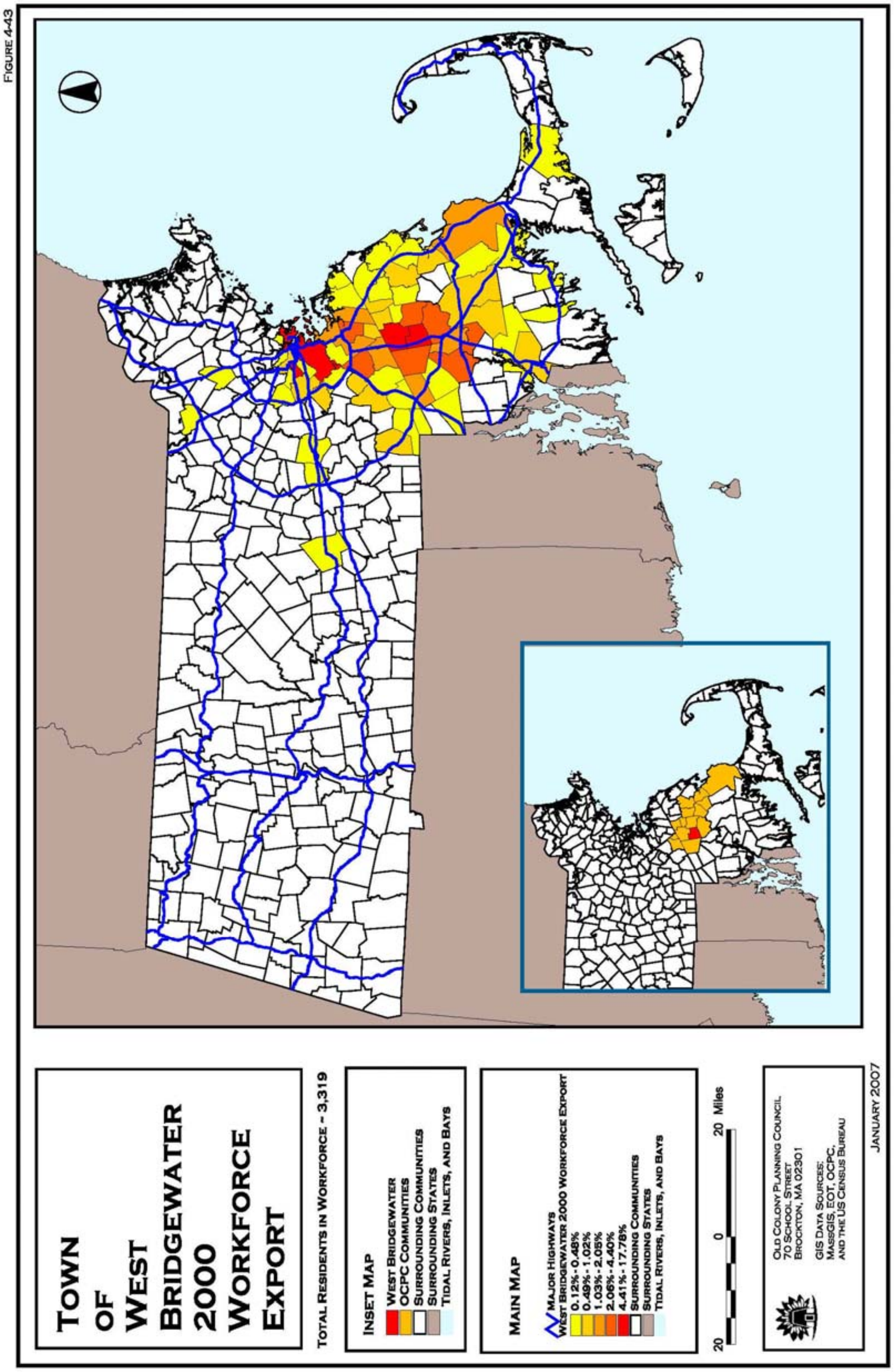
FIGURE 4-43
TOWN OF WEST BRIDGEWATER 2000 WORKFORCE EXPORT
TOTAL RESIDENTS IN WORKFORCE - 3,319
INSET MAP
WEST BRIDGEWATER
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
WEST BRIDGEWATER 2000 WORKFORCE EXPORT
0.12% - 0.48%
0.49% - 1.02%
1.03% - 2.05%
2.06% - 4.40%
4.41% - 17.78%
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
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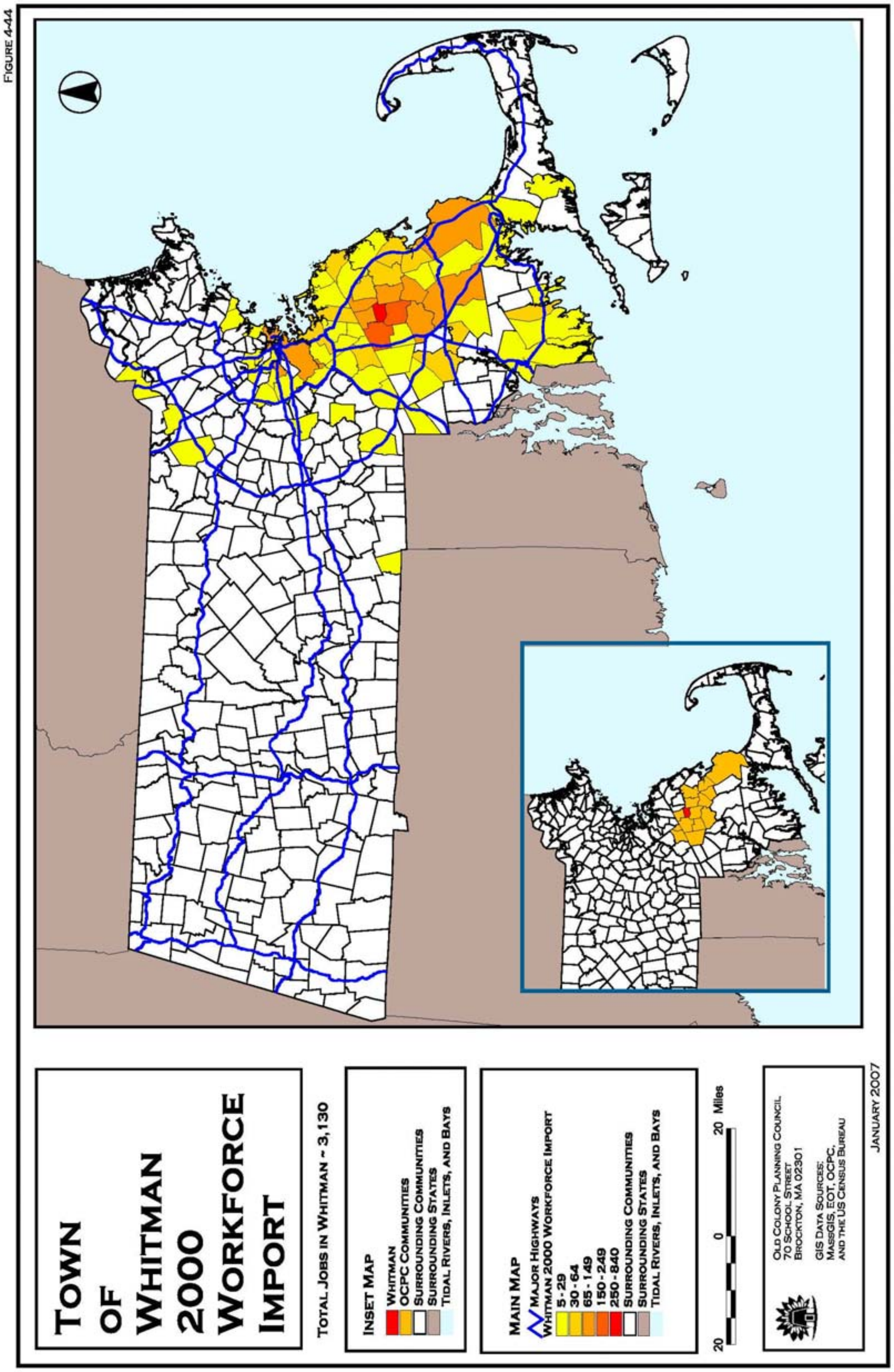

FIGURE 4-44
TOWN OF WHITMAN 2000 WORKFORCE IMPORT
TOTAL JOBS IN WHITMAN ~ 3,130
INSET MAP
WHITMAN
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
WHITMAN 2000 WORKFORCE IMPORT
5 - 29
30 - 64
65 - 149
150 - 249
250 - 840
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
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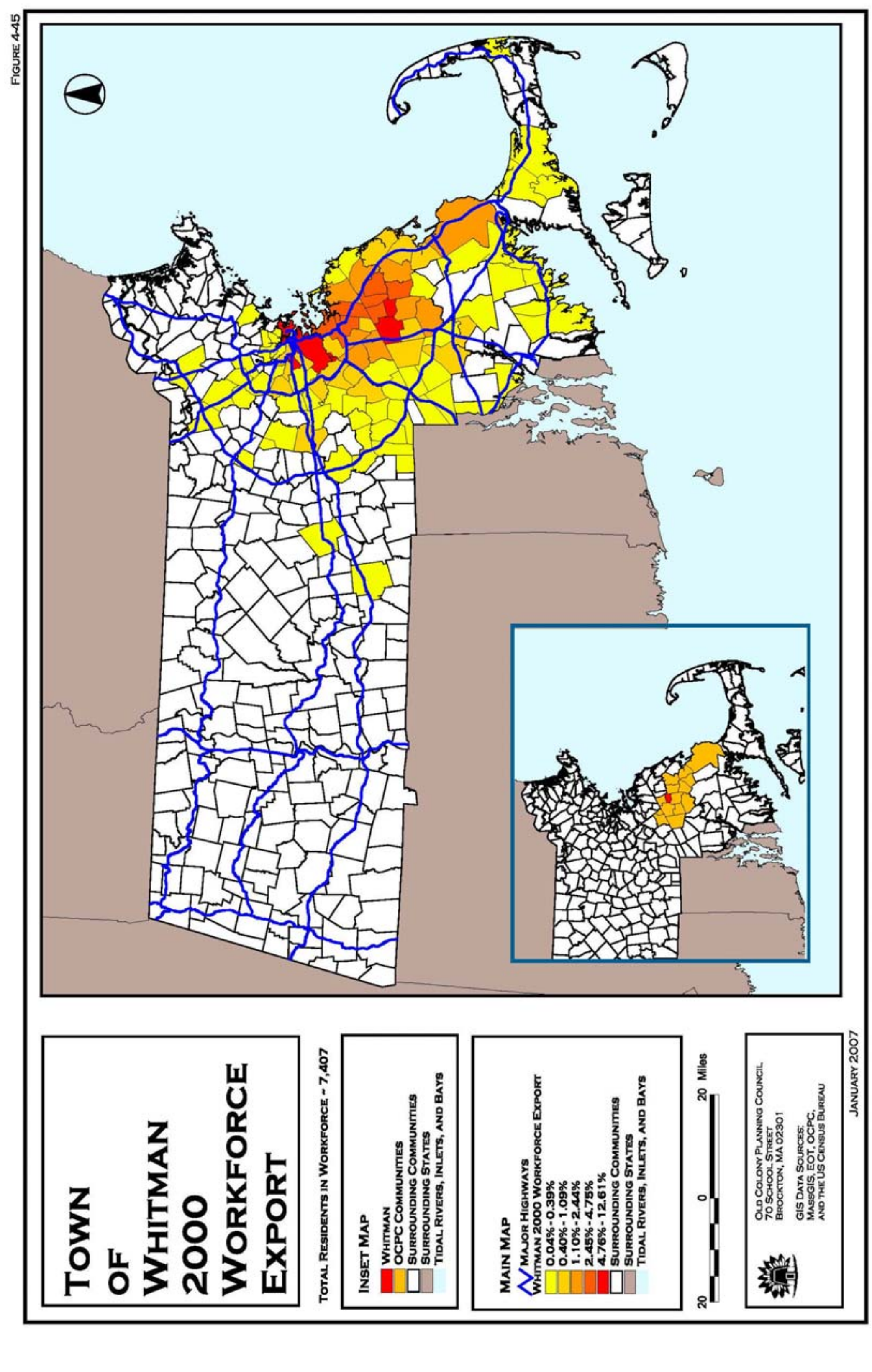
FIGURE 4-45
TOWN OF WHITMAN 2000 WORKFORCE EXPORT
TOTAL RESIDENTS IN WORKFORCE - 7,407
INSET MAP
WHITMAN
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
MAIN MAP
MAJOR HIGHWAYS
WHITMAN 2000 WORKFORCE EXPORT
0.04% - 0.39%
0.40% - 1.09%
1.10% - 2.44%
2.45% - 4.75%
4.76% - 12.61%
SURROUNDING COMMUNITIES
SURROUNDING STATES
TIDAL RIVERS, INLETS, AND BAYS
20 0 20 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC,
AND THE US CENSUS BUREAU
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4.5 Future Growth and Development

By projecting future growth based on current trends and land patterns in the region, we are able to plan for the population needs of the region through 2030.

Population Growth and Forecasts

Because of the region's accessibility to Boston; availability of vacant, developable land; and extensive community resources, its population has grown rapidly. Much of this growth has been the result on migration from communities to the north. Before eventually moderating, rapid growth is forecast to continue throughout the region in the near future. In order to adequately manage and accommodate growth, communities need to anticipate probable growth given continuation of present conditions and policies. OCPC has worked with the Executive Office of Transportation to prepare population forecasts that are based on past trends and the availability of resources for growth. These projections are contained within Table 4-23

Table 4-23
Population Projections Through 2030

	Census	EOT & OCPC Projections			
Town	**2000**	**2007**	**2010**	**2020**	**2030**
Abington	14,605	15,530	15,131	16,882	18,540
Avon	4,443	4,500	4,450	4,734	5,100
Bridgewater	25,185	28,800	33,138	39,022	45,250
Brockton	94,304	95,000	89,945	95,367	101,460
East Bridgewater	12,974	13,840	14,202	16,097	17,950
Easton	22,299	26,600	30,017	34,887	40,510
Halifax	7,500	8,330	8,805	9,825	11,070
Hanson	9,495	11,400	13,728	15,719	18,410
Kingston	11,780	12,200	13,255	15,238	17,130
Pembroke	16,927	18,030	18,246	20,831	23,180
Plymouth	51,701	61,890	66,640	73,633	84,210
Plympton	2,637	2,950	3,558	5,208	6,240
Stoughton	27,149	27,330	26,037	26,039	27,310
West Bridgewater	6,634	7,400	8,521	11,438	13,470
Whitman	13,882	14,000	13,728	16,080	17,670
Regional Total	**321,515**	**347,800**	**359,400**	**401,000**	**447,500**

There are a number of indicators of potential population growth that support the overall projections. These include:

- Good highway access to Metropolitan Boston and surrounding regions via Routes 3, 24, 44, 128, and 495.
- Commuter rail service on the Old Colony Railroad (Plymouth, Middleboro), and the forthcoming service on the Greenbush Line.
- The availability of public transit provided by the Brockton Area Transit Authority, the Massachusetts Bay Transportation Authority, and the Greater Attleboro Transit Authority - providing local service over several routes in Plymouth with connections to the Independence Mall and the MBTA Commuter rail station in Kingston - and several private operators.
- Extensive areas of developable land, some served by sewers and others relying on on-site sewage treatment and disposal.

- Concentrations of old multi-story industrial buildings in Brockton and other communities with an increasingly realized potential for transit-oriented residential use.
- Increased opportunities for higher-density mixed residential and commercial development according the to Smart Growth Principles, particularly in Transit Oriented Development (TOD) projects near commuter rail stations. Such projects, most notably the Village Center Plan for the former South Weymouth Naval Air Station, can reduce regional automobile trips by grouping probable trip origins and destinations and by offering nearby transit service.

None-the-less several other factors suggest that regional population growth over the next thirty years will continue at a more moderate rate than the high levels of the 1950-1980 period. These include

- A declining birth rate first evident in the region between 1970 and 1980 and reflective of present national trends.
- More restrictive local land use controls including increases in the required minimum residential lot size.
- A decline in the construction of multi-family structures because of restrictive zoning partially offset by the opportunities offered under of Chapter 40B and Chapter 40R.
- Changing attitudes toward growth by local officials and residents favoring conservation of the region's rural and suburban characteristics.
- Municipal water supplies that may not be sufficient to meet projected 2025 demands if present day practices are left unchecked.

<u>Land Use and Build Outs</u>

The Executive Office of Environmental Affairs (EOEA) performed build out analyses for all the communities of the Commonwealth to understand and calculate the potential affects if the communities grew to their full potential based on current trends and zoning. Table 4-23 summarizes the results of this build out analysis for the communities of the region.

<u>Housing Growth and Forecasts</u>

Table 4-25 contains projections for households in the Old Colony Region through 2030. Regional projections were developed by the Executive Office of Transportation and the regional figure was then distributed into the fifteen communities accordingly based on factors such as past trends and existing development patterns.

Through 2030, the number of households in the region should continue to decentralize from the Brockton core and expand into southern areas of the region where much development has occurred in recent years and there is developable land available.

Table 4-24
Household Projections Through 2030

Town	Census 2000	EOT & OCPC Projections 2007	2010	2020	2030
Abington	5,263	5,790	6,017	6,434	7,150
Avon	1,705	1,900	1,784	1,784	1,910
Bridgewater	7,526	7,880	8,611	9,765	11,000
Brockton	33,675	36,760	35,490	35,496	38,090
East Bridgewater	4,344	4,780	4,971	5,636	6,340
Easton	7,489	8,250	8,572	11,269	13,020
Halifax	2,758	3,030	3,756	4,672	5,500
Hanson	3,123	3,440	4,225	5,634	6,690
Kingston	4,248	4,670	4,854	5,634	6,370
Pembroke	5,750	6,340	6,680	6,681	7,340
Plymouth	18,423	20,290	21,234	29,357	34,250
Plympton	854	1,600	2,489	3,287	4,190
Stoughton	10,254	10,540	9,902	9,903	10,380
West Bridgewater	2,444	3,430	4,695	5,025	6,070
Whitman	4,999	5,500	5,821	5,822	6,400
Regional Total	**112,855**	**124,200**	**129,100**	**146,400**	**164,700**

Employment and Economic Forecasts

Employment in the region has increased approximately 2.65 percent from 2001 to 2005. The Executive Office of Transportation data indicates projected 2030 166,000 jobs in the region.

The projections show 96,620 (58%) of the Year 2030’s 166,600 total jobs to be in the top three communities of Brockton, Plymouth, and Stoughton. The fact that many of the region’s jobs are concentrated in communities with some degree of transit service is positive, though many jobs in those communities are remote from transit routes. More the fact that the rest of the growth is expected to be scattered throughout the region suggests that present patterns of dispersed growth will continue to generate increased traffic in outlying areas even if the proportion of the total jobs in the central communities increases slightly. In addition there are an increasing number of trips to the growing supply of jobs outside of the region.

Table 4-25
Employment Projections Through 2030

Town	Census 2000	EOT & OCPC Projections 2007	2010	2020	2030
Abington	4,551	4,540	4,718	5,094	5,330
Avon	7,426	7,490	7,500	7,600	7,800
Bridgewater	7,808	7,890	8,197	8,784	9,200
Brockton	40,864	42,740	44,422	48,541	51,400
East Bridgewater	3,701	3,460	3,597	3,943	4,080
Easton	10,118	9,370	9,741	10,424	10,700
Halifax	1,189	1,130	1,179	1,261	1,300
Hanson	1,991	1,980	2,053	2,239	2,340
Kingston	5,758	6,350	6,582	7,128	7,610
Pembroke	5,717	5,270	5,474	5,914	6,080
Plymouth	20,683	21,310	22,145	23,971	25,250
Plympton	289	290	490	857	1,000
Stoughton	13,483	15,800	16,610	18,411	19,970
West Bridgewater	7,474	9,030	9,391	9,934	10,740
Whitman	3,195	3,450	3,500	3,600	3,800
Regional Total	**134,247**	**140,100**	**145,600**	**157,700**	**166,000**

4.6 Conclusion and Recommendations

Land use patterns and trends are well established throughout the region. As a result, most transportation investments are in maintaining and improving present infrastructure. Such investments are more likely to support present land use patterns and trends than to reverse them, or to lead to a major redirection of growth. On the other hand, the present patterns and trends include a major tension between the long established focus of employment and services in Boston and Brockton, and the continuing outward movement of population and activity known as sprawl.

In this situation some investments, such as commuter rail restoration, reinforce the Boston focus by keeping it the most accessible place in the metropolitan area. Improvements to the BAT system and the Plymouth Area Link system strengthen the respective downtowns as the most accessible places in the Old Colony Region while also giving limited auto-free access to the commuter rail lines and to the Plymouth and Brockton buses to Boston.

While commuter rail service facilitates compact transit oriented development around stations, it also makes it easier to live farther out and thus facilitates exurban residential growth while focusing dense commercial and industrial activity in the urban core. This focus helps to maintain the concentration of activity needed to make transit feasible by other, closer-in modes; rapid transit, light rail, bus and boat.

If allowed by local planning and zoning, the combined radial/circumferential highway system facilitates much less focused development. The existing highway system supports further scattering of all activities. Highway construction like the relocated Route 44 and the upgrading of Route 3 can attract low-density growth if permitted by local communities.

Approaches To Regional Land Use Planning

Current-endorsed “Smart Growth” and “Sustainable Development” movements encourage putting relatively high density development near existing centers and in areas with well established infrastructure and doing so in ways which minimum energy consumption.

Smart Growth principles are intended to be the antithesis of sprawl, but they can be applied at a great range of scales from individual projects up to the region. The effect on travel patterns and modal choices can vary with the scale of action. Thus successful smart growth policies over a region would lead to a greater concentration of growth in regional centers allowing a greater use of mass transit and a largely radial, center-focused road system. In outlying areas Smart Growth can also support local transit use and reduce local trips by concentrating local or sub regional destinations but will not greatly change overall travel patterns. At the local level Smart Growth in the form of cluster development can reduce paving and runoff and preserve particularly valuable open space, but it does not necessarily strengthen the community’s structure or reduce trips if sited at the edge of town.

The Smart Growth / Sustainable Development Principles.

The formal adoption of these approaches reflects the results of the Growth Management Program of the Office of State Planning during the first Dukakis administration. This drew on the findings of many local Growth Management Committees reviewing ongoing trends and identifying options and concluded in the 1978 Report “City and Town Centers -A Program of Growth” that

> Either we stand by and continue to tolerate the loss of decent homes and jobs in our city and town centers, the random dispersal of sprawl development, the waste of existing public facilities and the exorbitant costs of providing new public facilities, the loss of thousands of acres of prime farm land every year, and the needless degradation of fragile natural resources and of the unique character of individual regions and communities or we come to grips with the fundament choices that must be made if this state of affairs is be changed.

The report notes some “natural and appropriate” reasons for post-war suburban sprawl when “many people had no choice but to leave neighborhoods which had little room for so many new, growing families and inexpensive home financing and improved highways made the transition more convenient but there are “problems that flow from having too much of a good thing.”

The report notes that while growth is needed, there is a desire to protect the distinctive character of communities and regions, “Villages don’t want to become suburbs; suburbs don’t want to be cities; and cities don’t want to become wastelands.” This led to 35 recommendations to strengthen community centers and neighborhoods, guide growth, encourage building reuse, protect resources, and use state investment and facility sitting to meet related goals.

Subsequently (but 18 years later) the Weld administration released Executive Order 385 in 1996. This noted the need to reconcile conflicts between needed economic growth and crucial resource protection “through proactive and coordinated planning oriented towards both resource protection and sustainable economic activity.” It declared policies of encouraging economic growth “supported by adequate infrastructure,” expanding infrastructure designed to minimize impacts of growth on the environment; and pursuing the “dual objectives of resource protection and sustainable development” though interagency coordination, state assistance to public and private entities, and streamlining regulations in support of environmentally sound economic activity.

The Order then instructed state agencies to:

- Change “regulations, policies, plans and practices” in support of these concerns and in consideration of local and regional growth management plans
- To support reuse of existing infrastructure, sites, and facilities in preference to new construction in [outlying] areas of environmental value;
- To “actively engage” in regional infrastructure planning and interagency coordination as part of any planning, funding, permitting or building any facilities for purposes such as transportation, water supply, and waste water and solid waste management.
- To minimize unnecessary environmental harm as part of citing, designing, funding, building or permitting major public or private projects, to include a finding of consistency with this Order, to consider such consistency in any MEPA reviews, and to report annually on the effectiveness of its compliance with this order.

More recently, the State’s new Office of Commonwealth Development (OCD) issued Smart Growth Evaluation criteria for state-supported projects based on a set of Principles for Sustainable Development. In summary it said that “New development will ideally utilize existing infrastructure and be located near transit, in or around downtowns, village centers, areas of concentrated development or destinations of frequent uses” or offer other features that increase sustainability, in harmony with the original Growth Management report.

The Principles, spelled out on the following summary table from OCD, are to

- **Redevelop First** Focus on existing centers and facilities, not on outlying areas
- **Concentrate Development** Save land and create walkable multi-use centers
- **Be Fair Share** the benefits and burdens of development, promote regional equity**.**
- **Restore and Enhance the Environment**
- **Conserve Natural Resources**
- **Expand Housing Opportunities**
- **Provide Transportation Choice**
- **Increase Job Opportunities**
- **Foster Sustainable Businesses** Encourage natural resource-based businesses; and affordable energy
- **Plan Regionally Foster** projects with regional or multi-community benefits

The Smart Growth Evaluation Criteria require that an approvable project must comply with the over-arching principal of “Redevelop First” or be consistent with five other principles including “Concentrate Development” or “Restore and Enhance the Environment”

Unfortunately the effect is weakened by the increasingly diffuse standard that the “Redevelop First” principle may also be met by a project that “contributes to the revitalization of a town center or neighborhood and/or is walkable to transit; the downtown; a village center; a school; a library; a retail, services or employment center; or is in a municipally-approved growth center.” There are also provisions for Community Development Action Grant (CDAG) - supported projects outside of existing centers and not consistent with the principles to explain the location and to note how the project or other actions will benefit the city or town center.

Despite this softening of the Principles, the continuing state support of Growth Management, Planning for Growth, Sustainable Development, and/or Smart Growth combined with effective local planning and regulation could marginally strengthen town centers. One example is the reported success of the city of Pittsfield in persuading a major big box store to come to its downtown rather than to highway location. However, many recent private and public decisions have been in the other direction as with recent relocation of banks, destination stores, and major public facilities from downtown Brockton, Bridgewater Center and downtown Plymouth to suburban or highway-oriented sites. An optimum response to Smart Growth Principles could lead to:

- Retention of remaining downtown financial institutions
- Retention / addition of new office and service operations the region's downtowns
- Infill and adaptive reuse creation of new housing in existing centers such as the new SO CO lofts in downtown Brockton near the multi-modal transportation center (BAT bus terminal, MBTA commute rail station and MBTA commuter rail station.
- Protection of significant amount of otherwise developable peripheral open space
- An increased proportion of commercial development in concentrated development growth centers, e.g., major malls
- Slowed growth in outlying suburban/rural areas
- A slight increase in low-cost housing in suburban / rural areas

Transportation-related impacts of these changes would include:

- A slight increase in BAT and GATRA and MBTA Rail ridership
- A slight reduction in single purpose auto trips

Transportation-Specific Planning Recommendations

Increase accessibility at the neighborhood scale. One approach is to use the Subdivision Rules and Regulations to encourage pedestrian and bicycle ways to connect cul-de-sacs and local streets in subdivisions to one another and to nearby schools, stores and other destinations.

Increase accessibility to the Avon Merchants Park and the proposed Stoughton Industrial Park. The present and potential problems caused by the cul-de-sac nature of the parks could be resolved by connecting their main roads, thereby creating a service road through the two parks and between the Harrison Blvd. and Route 139 interchanges with Route 24.

Develop healthier and more varied centers. Therefore, doing would increase opportunities available in compact settings, and reduce trips by concentrating local destinations and strengthening community character. Communities should seek means to guide public, commercial and high- density residential investment to selected multi-purpose centers. Larger communities with failed shopping centers should adopt Planned Unit Development regulations or other tools for redeveloping such sites with diverse complementary uses.

Develop a North-South industrial access and service road through Brockton's discontinuous central industrial corridor. The City should study ways of acquiring land, constructing new segments and improving others between Court St. and Spark St. with minimum neighborhood impacts.

Continue to study the implications of major development projects. Even after MEPA review and local approval, many large and complex projects can have ill-defined impacts or significant changes in major factors, particularly involving actions not requiring State permits. It is important to have the capacity to continue reviewing major traffic-generating projects such as the reuse of the South Weymouth Naval Air Station and the Pine Hills project in Plymouth.

Increase transit accessibility to nearby, unserved, employment centers. Put high priority on extending fixed-route service and on encouraging growth in industrial areas whose location and configuration fit such service, but be open to limited demand-responsive service where required to give residents needed employment opportunities.

Respond to the potential impacts of major highway and rail projects potentially encouraging continued overall sprawl development. Southeastern Massachusetts remains a "Region at Risk" due to the impacts of unplanned growth and change. There is a need to continue exploring issues raised by the Southeastern Massachusetts Vision 20/20 project examining and publicizing alternatives to current trends, refining goals and objectives, developing a plan implementation effort; and working for region-wide acceptance of the program and meaningful commitments to it.

Strengthen downtown Plymouth and increase convenient service to nearby high-density neighborhoods by seeking extension commuter rail service from Cordage to Downtown and more frequent peak hour service. Though difficult given scheduling to the Kingston station, space requirements, and possible use conflicts, this expanded KPP study recommendation would partially complete the originally planned system and greatly strengthen downtown Plymouth and give the town a more fitting level of service.

Modify transportation improvement projects and priorities to encourage the compact close-in development patterns envisioned in the Plan's Goals and Objectives. Take actions ranging from improving the flexibility of minor arterials, major collectors and minor collectors, to improving ease of pedestrian/ bicycle movement in and between neighborhoods and facilities and within the downtown. Examples in Brockton would be restoring the stairs at the Downtown Rail station, which allowed direct movement from the platform toward most downtown destinations and reopening the recently blocked 100-year old pedestrian underpass between Lincoln Street and the Post Office.

Use traffic calming and other roadway alterations to protect neighborhoods in mixed residential/industrial areas. Study opportunities to lessen industrial impacts on neighborhoods by rerouting truck traffic, creating safe pedestrian ways, and working with firms to lessen impacts from noise, lighting, odors and vibration.

Develop new build out analysis based on most recent data and trends to better understand impacts of development and continued growth.

CHAPTER 5
REGIONAL HIGHWAY SYSTEM

5.0 Introduction

The Old Colony region is served mainly by three limited access highways, Route 24, Route 3, and Route I-495. Route 24 and Route 3 are limited access state highways that provide north-south access. I-495, which runs concentrically around Boston and the Route 128 ring, skirts Bridgewater in the southwest of the region, and provides access to the southeast to Cape Cod and to the northwest to I-90 (the Massachusetts Turnpike.) I-495 becomes Route 25 in south Plymouth as it approaches the Bourne Bridge for access to Cape Cod. Route 24 provides access to the south to Fall River and New Bedford and to points north including Route I-93 to Boston. Route 3 provides access to the south to Cape Cod and connects north to Route I-93 to Boston. In addition, north-south travel is served by Routes 3A, 18, 28, and 138, which offer alternatives to the limited access routes during times of congestion. These state-route corridors are mainly two-lane highways that traverse suburban and rural areas connecting community and urban centers. Retail and commercial land uses are interspersed throughout these two-lane highway corridors, especially in the vicinity where these state routes connect to the limited access highways.

The east-west highways in the region are mainly two-lane state routes. Routes 27 and 106 are important east-west highways in the region with Routes 44, 14, 104, 123, and 139 also serving as east-west routes. The reconstruction and relocation project for Route 44, which was completed in 2005, has added a limited access, high-speed connection (with increased capacity) between Route 3 and Route 24. Other planned projects, such as the widening of Route 106 in West Bridgewater and Route 104 in Bridgewater, will also improve east-west travel in the region.

Figure 5-1 shows the major roadway system in Southeastern Massachusetts and the regional highway network within the Old Colony region.

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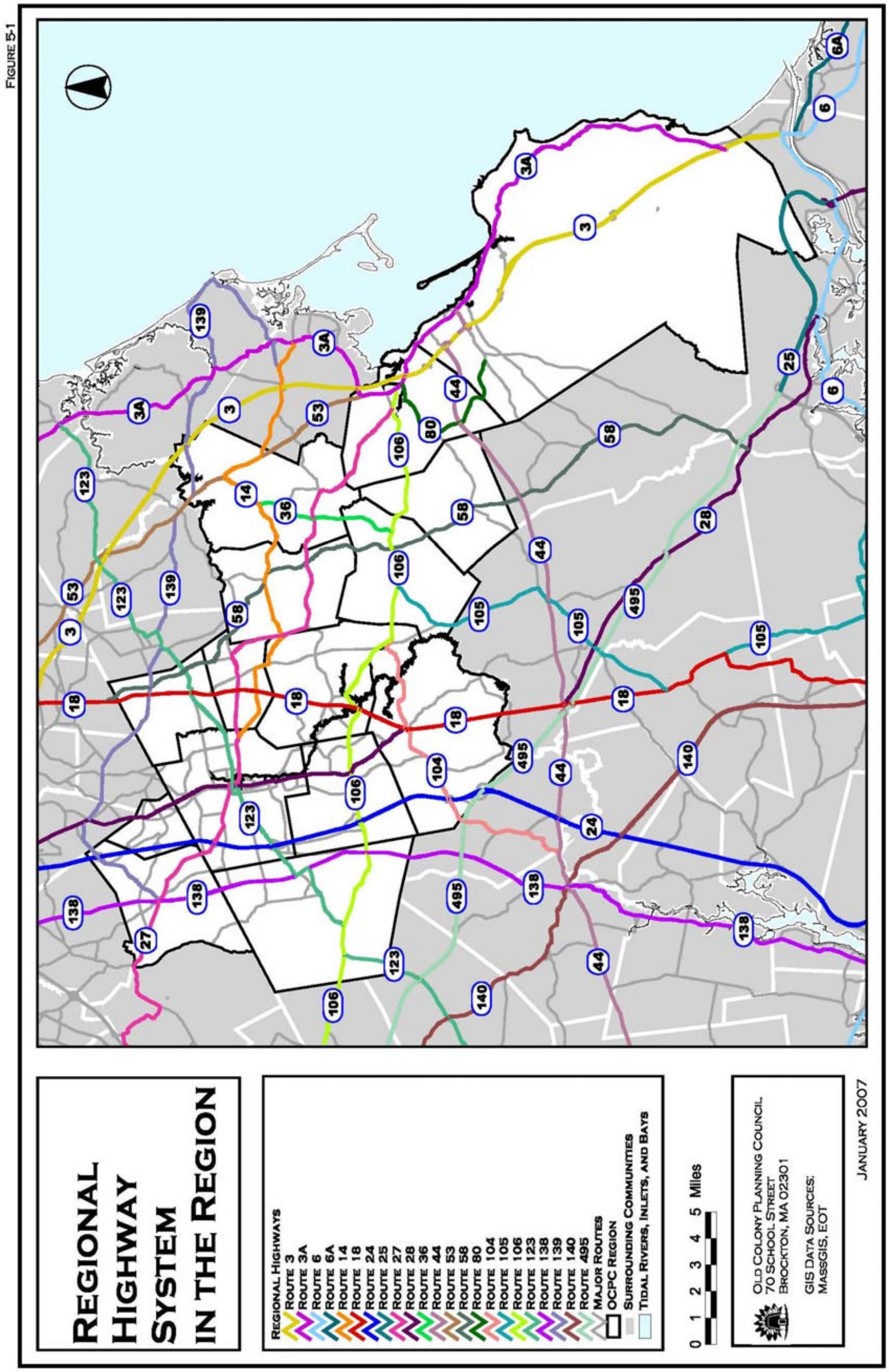
FIGURE 5-1
REGIONAL HIGHWAY SYSTEM IN THE REGION
REGIONAL HIGHWAYS
ROUTE 3
ROUTE 3A
ROUTE 6
ROUTE 6A
ROUTE 14
ROUTE 18
ROUTE 24
ROUTE 25
ROUTE 27
ROUTE 28
ROUTE 36
ROUTE 44
ROUTE 53
ROUTE 58
ROUTE 80
ROUTE 104
ROUTE 105
ROUTE 106
ROUTE 123
ROUTE 138
ROUTE 139
ROUTE 140
ROUTE 495
MAJOR ROUTES
OCPC REGION
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
0 1 2 3 4 5 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT
JANUARY 2007

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5.1 Existing Conditions

5.1.1 Corridors

<u>The Functional Classification of Roads</u>

The Federal-Aid Highway Act of 1973 required the use of a functional highway classification as a mechanism to update the Federal-Aid Highway system. This statute classified roads as criteria for federal aid eligibility. The Inter-Modal Surface Transportation Efficiency Act (ISTEA) and the subsequent re-authorizing statutes, the Transportation Equity Act for the 21st Century (TEA-21) and the Safe Accountable Flexible Efficient Transportation Act a Legacy for Users (SAFTEA-LU), re-structured the federal aid classification scheme. ISTEA created the National Highway System (NHS), which designated highways eligible under the NHS program, and a second tier eligibility status for roads under Surface Transportation System Program (STP) funding. The inventories based on these statutes make up the criteria for funding eligibility for our nation's roadway network. Functional classification can also be applied in highway planning system development, jurisdiction responsibility determination, and fiscal planning.

In 1992, under the direction of the Massachusetts Highway Department (MassHighway), the Council began the reclassification process to update the federal aid network in the Old Colony region. This effort was completed in 1993. The National Highway System was formally adopted late in 1995, thus defining the NHS and STP roads that are eligible for federal funding in the region.

The following classification definitions are based on the FHWA's descriptions of roadway functional classifications:

- Interstate System: The Interstate System consists of all presently designated freeway routes (limited access highways) meeting the FHWA defined interstate geometric and construction standards for future traffic, except for portions in Alaska and Puerto Rico. The Interstate System is the highest classification of arterial roads. It provides the highest level of mobility, at the highest speed, for a long uninterrupted distance.
- Other Arterials: These consist of limited access freeways, multi-lane highways, and other important highways supplementing the Interstate System that connect, as directly as practicable, the Nation's principal urbanized areas, cities, and industrial centers; serve the national defense; and connect at suitable border points with routes of continental importance.
- Collectors: The collectors provide land access service and traffic circulation within residential neighborhoods, commercial and industrial areas, and downtown city centers. Collectors connect local roads and streets with arterials, and provide less mobility than arterials at lower speeds, and for a shorter distance.
- Locals: The local roads and streets provide a high level of access to abutting land but limited mobility.

The road classification scheme considers density and types of adjacent land use; density of the street and highway network; traffic volumes, the nature of travel patterns; and, the manner in which all of these elements are related to the definition of highway function. Additionally, the urban or rural designation is taken into account. Under the classification scheme, the urban and rural designation of a road may be used in the same town. A road can be classified as: Urban City (Brockton is an example); Urban Town (typically small urban places, as designated by the Bureau of the Census as having a population of 5,000 or greater and are not within any urbanized area); or Rural Town (comprises the area outside the boundaries of small urban and urbanized areas). A town may be designated as partially urban and partially rural.

Table 5-1 provides a summary of roadway mileage for each member community by functional classification. Table 5-2 summarizes the mileage eligible for federal aid within the region by town and for the entire region as a whole. Federal aid roads include Interstate (Urban and Rural), Urban Arterial, Urban Collector, and Rural Arterial. Rural Minor Collector roads are eligible for federal aid funds; however, the state can only dedicate 15 percent of its STP funding toward these roads. Local roads (Urban or Rural) are not eligible for federal aid funds.

Table 5–1
Functional Classification of Mileage by Community

	URBAN ROADS				RURAL ROADS				TOTAL
Community	**Interstate**	**Arterial**	**Collector**	**Local**	**Interstate**	**Arterial & Major Collector**	**Minor Collector**	**Local**	**Mileage**
Abington	0.00	14.31	11.32	41.09	0.00	0.00	0.00	0.00	66.72
Avon	0.00	11.60	3.53	18.53	0.00	0.00	0.00	0.00	33.66
Bridgewater	1.30	29.41	12.78	82.38	0.00	0.00	0.00	0.00	125.87
Brockton	0.00	55.68	30.22	198.33	0.00	0.00	0.00	0.00	284.23
East Bridgewater	0.00	24.90	9.49	61.92	0.00	0.00	0.00	0.00	96.31
Easton	0.00	26.43	17.74	84.52	0.00	0.00	0.00	0.00	128.69
Halifax	0.00	9.90	4.56	27.09	0.00	0.00	5.77	10.78	58.10
Hanson	0.00	16.24	12.18	33.86	0.00	0.00	0.00	0.00	62.28
Kingston	0.00	18.50	14.55	62.15	0.00	2.06	2.00	0.50	99.76
Pembroke	0.00	21.60	18.12	69.27	0.00	0.00	0.00	0.00	108.99
Plymouth	0.00	54.65	50.83	275.07	0.00	1.53	3.45	95.19	480.72
Plympton	0.00	0.66	1.48	2.05	0.00	0.57	17.94	12.86	35.56
Stoughton	0.00	23.68	18.36	81.72	0.00	0.00	0.00	0.00	123.76
West Bridgewater	0.00	23.84	5.68	25.82	0.00	0.00	0.00	0.00	55.34
Whitman	0.00	14.29	5.29	34.56	0.00	0.00	0.00	0.00	54.14
TOTALS	**1.30**	**345.69**	**216.13**	**1,098.36**	**0.00**	**4.16**	**29.16**	**119.33**	**1,814.13**

Source: MHD 2005 Road Inventory Year End Report - 2005 MHD Road Inventory Database

Table 5–2
Federal Aid Eligible Mileage by Community

Community	**Total Miles**	**Eligible Miles**	**Percent Eligible**
Abington	66.72	25.64	38.43%
Avon	33.66	15.13	44.95%
Bridgewater	125.87	43.84	34.83%
Brockton	284.23	85.95	30.24%
East Bridgewater	96.31	34.39	35.71%
Easton	128.69	44.17	34.32%
Halifax	58.10	15.45	26.59%
Hanson	62.28	28.42	45.63%
Kingston	99.76	38.04	38.13%
Pembroke	108.99	39.72	36.44%
Plymouth	480.72	107.01	22.26%
Plympton	35.56	12.11	34.06%
Stoughton	123.76	42.39	34.25%
West Bridgewater	55.34	29.52	53.34%
Whitman	54.14	19.58	36.17%
TOTALS	**1,814.13**	581.36	32.05%

Source: MHD 2005 Road Inventory Year End Report - 2005 MHD Road Inventory Database

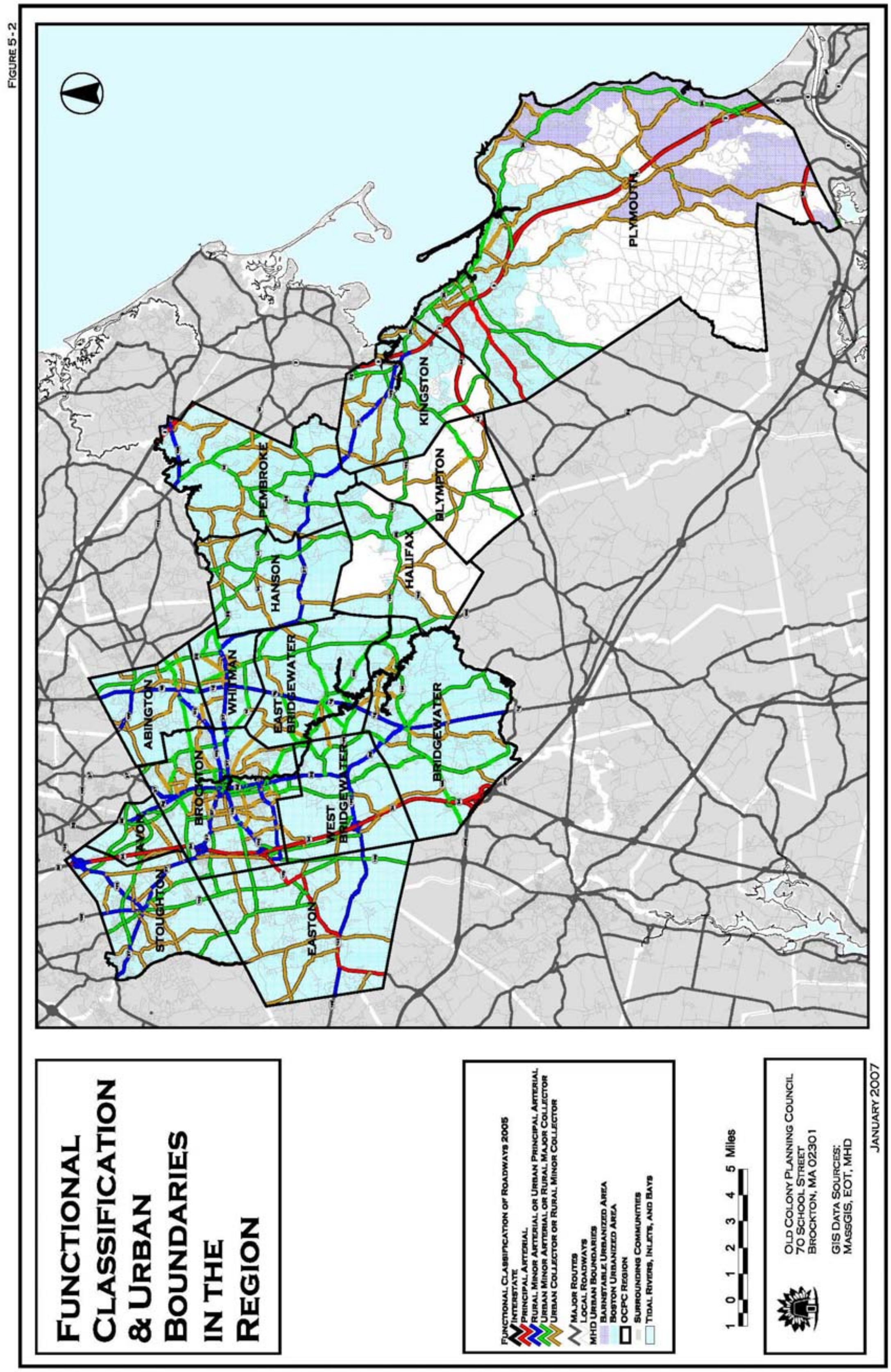
FIGURE 5-2
FUNCTIONAL CLASSIFICATION & URBAN BOUNDARIES IN THE REGION
FUNCTIONAL CLASSIFICATION OF ROADWAYS 2005
INTERSTATE
PRINCIPAL ARTERIAL
RURAL MINOR ARTERIAL OR URBAN PRINCIPAL ARTERIAL
URBAN MINOR ARTERIAL OR RURAL MAJOR COLLECTOR
URBAN COLLECTOR OR RURAL MINOR COLLECTOR
MAJOR ROUTES
LOCAL ROADWAYS
MHD URBAN BOUNDARIES
BARNSTABLE URBANIZED AREA
BOSTON URBANIZED AREA
OCPC REGION
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
0 1 2 3 4 5 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, MHD
JANUARY 2007
PLYMOUTH
KINGSTON
PEMBROKE
PLYMPTON
HALIFAX
HANSON
WHITMAN
ABINGTON
EAST BRIDGEWATER
BRIDGEWATER
WEST BRIDGEWATER
BROCKTON
AVON
STOUGHTON
EASTON

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Traffic Volumes

Approximately 200 automatic traffic recorder counts per year are conducted on the region's highways and roads. Each traffic count is conducted over a forty-eight hour period and then averaged to determine a weekday twenty-four hour period. The resultant daily average is referred to as the "Average Daily Traffic" or "ADT." The counts are conducted as part of the Unified Planning Work Program and contract with the Massachusetts Highway Department. Each traffic count is added to an archive, which currently contains over 3,000 individual traffic counts. The count locations are updated every three years, although some locations inevitably are updated less frequently due to weather and priority restraints.

The traffic count locations are based upon specific requests by the Massachusetts Highway Department, specific requests by member communities, and as part of routine surveillance of traffic conditions throughout the road network. Traffic count requests from the Massachusetts Highway Department and from member communities receive the highest priority. Traffic counts are conducted throughout the year, primarily in the summer, and are limited during winter months due to snow and ice on the road, which hamper the placement of road tubes across a road's surface. Traffic count requests by member communities are conducted typically within two weeks, or at a time specifically requested by the community.

Collecting traffic volumes throughout the road network is a critical component of planning. Knowledge of both current and historic volumes allows planners and engineers to calculate the rate of traffic growth. Accurate traffic counting also allows planners and engineers to make calculations regarding vehicle emissions. Successful safety planning also relies on traffic counts.

Traffic volumes in the Old Colony region are heaviest on state-numbered routes. These routes usually provide the most direct connections between communities. The volumes on the north-south roadways are, on average, higher than the volumes on the east-west roadways, due mainly to the region's north-south orientation. Tables 5-3 and 5-4 list the average daily traffic volumes recorded for the major state-numbered routes in the area. The ADT volumes in these tables are based on the latest available traffic counts from the traffic count archives and data available from MassHighway. Figure 5-3 shows the average daily traffic volumes on major highways within the Old Colony region.

Figure 5-4 shows the trends in traffic on Routes 25, 3, and 24. These highways show a steady increase in volumes since the late 1990s. Routes 25 and 24 show a steeper incline than Route 3, although Route 3 showed a sharp increase from 1999 to 2001.

Table 5-3
Traffic Volumes on East-West Highways

Route	Community	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average Annual Growth Rate
Route 14 - at Duxbury town line	Pembroke	2,109	*2,150*	*2,191*	*2,233*	*2,276*	2,747	*2,800*	2,410	*2,456*	1.92%
Route 27 - West of Phillips Street	Hanson	11,539	*11,695*	11,900	*12,060*	11,900	11,300	13,100	12,673	13,300	1.79%
Route 27- East of RT 18	Whitman	13,800	*12,827*	9,600	17,000	14,350	11,700	8,900	*8,273*	13,200	-0.25%
Samoset West of Route 80	Plymouth	16,100	*16,802*	*17,535*	16,600	*17,324*	20,392	20,800	*21,707*	*22,654*	4.36%
Route 104 - East of Central Sq	Bridgewater	*16,385*	*16,521*	16,658	*16,741*	*16,824*	17,075	*17,160*	*17,245*	*17,330*	0.50%
Route 106 at Halifax town line	E. Bridgewater	10,751	*16,521*	*16,560*	*16,600*	*16,640*	*16,679*	12,169	12,150	10,958	0.24%
Route 106 - East of RT 138	W. Bridgewater	*19,189*	19,400	*19,612*	*19,826*	20,043	*20,262*	*20,483*	18,100	17,661	-0.45%
Route 123 - South of Torrey ST	Brockton	13,500	18,200	15,800	17,300	16,000	16,700	17,500	*17,580*	14,000	0.46%
Route 123 - East of Route 18	Abington	*8,618*	*9,420*	*10,296*	*11,253*	12,300	13,900	14,700	*16,070*	*17,568*	9.32%
Route 139 - at Rockland town line	Abington	*15,045*	*15,271*	15,500	17,000	16,400	16,200	*16,353*	*16,508*	16,400	0.95%
Route 25 east of I-195	Wareham	*40,200*	*39,500*	38,800	*42,053*	*45,580*	*49,402*	*53,544*	62,800	62,900	8.39%

Note: Italicized numbers are estimated based on growth rates.

Table 5-4
Traffic Volumes on North-South Highways

Route	Community	1997	1998	1999	2000	2001	2002	2003	2004	2005	Average Annual Growth Rate
Route 3 - at Bourne line	Plymouth	31,843	32,873	32,990	33,381	34,417	38,508	38,288	34,306	33,382	0.59%
Route 3 - at Duxbury line	Kingston	*50,875*	52,300	38,600	*39,649*	62,400	*64,096*	60,200	65,100	63,100	2.72%
Route 3 - North of RT 18	Weymouth	116,300	116,700	*118,855*	137,419	137,188	139,386	*141,959*	138,392	134,629	1.85%
Route 3A - South of Hedges Pond Rd	Plymouth	*11,848*	12,452	*13,092*	*13,764*	*14,471*	17,177	*18,059*	16,817	*17,681*	5.14%
Route 18 - at Whitman line	E. Bridgewater	17,800	17,600	17,100	17,200	16,600	18,900	17,600	18,189	17,300	-0.16%
Route 18 - at Weymouth line	Abington	19,016	*19,084*	*19,152*	*19,220*	*19,289*	*19,357*	*19,426*	*19,496*	19,565	0.36%
Route 24 - North of Route 44	Raynham	55,861	59,259	61,872	59,415	*61,886*	*64,460*	68,400	74,300	*77,390*	4.16%
Route 24 - South of New Pond ST	Avon	98,000	93,200	*94,471*	*95,760*	*97,067*	*98,391*	106,300	*107,750*	*109,220*	1.36%
Route 28 - South of Harrison Blvd.	Avon	*21,347*	*22,179*	23,044	*23,946*	*24,884*	*25,858*	25,960	27,922	*29,015*	3.91%
Route 28 - South of RT 123	Brockton	13,900	12,516	*12,378*	12,300	*12,165*	*12,031*	13,100	12,865	*12,724*	-1.10%
Route 28 - South of RT 106	W. Bridgewater	16,647	16,734	*16,809*	*16,885*	*16,961*	*17,037*	17,581	17,178	*17,255*	0.45%
Route 36 - North of RT 106	Halifax	*5,886*	5,980	*6,074*	6,284	*6,383*	*6,483*	6,464	*6,565*	*6,668*	1.57%
Route 53 - at Duxbury line	Pembroke	6,026	*5,970*	*5,914*	*5,859*	*5,805*	*5,751*	6,096	5,644	*5,591*	-0.93%
Route 58 - at Plympton line	Halifax	5,395	*5,446*	*5,497*	*5,548*	*5,600*	5,882	*5,937*	5,873	5,813	0.94%
Route 58 at Whitman line	Hanson	7,626	*7,755*	*7,886*	*8,019*	7,924	*8,058*	*8,194*	*8,333*	8,720	1.69%
Route 80 - North of Samoset Street	Plymouth	7,721	*8,392*	*9,121*	*9,913*	*10,774*	11,710	*12,727*	*13,833*	*15,034*	8.69%
Route 105 - South of Plymouth ST	Halifax	*1,659*	*1,794*	*1,939*	2,096	*2,265*	*2,448*	2,645	*2,858*	*3,089*	8.06%
Route 138 - at Canton line	Stoughton	*22,039*	*21,948*	*21,858*	*21,769*	*21,679*	*21,591*	21,502	24,370	21,328	-0.41%

Note: Italicized numbers are estimated based on growth rates.

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Figure 5-3

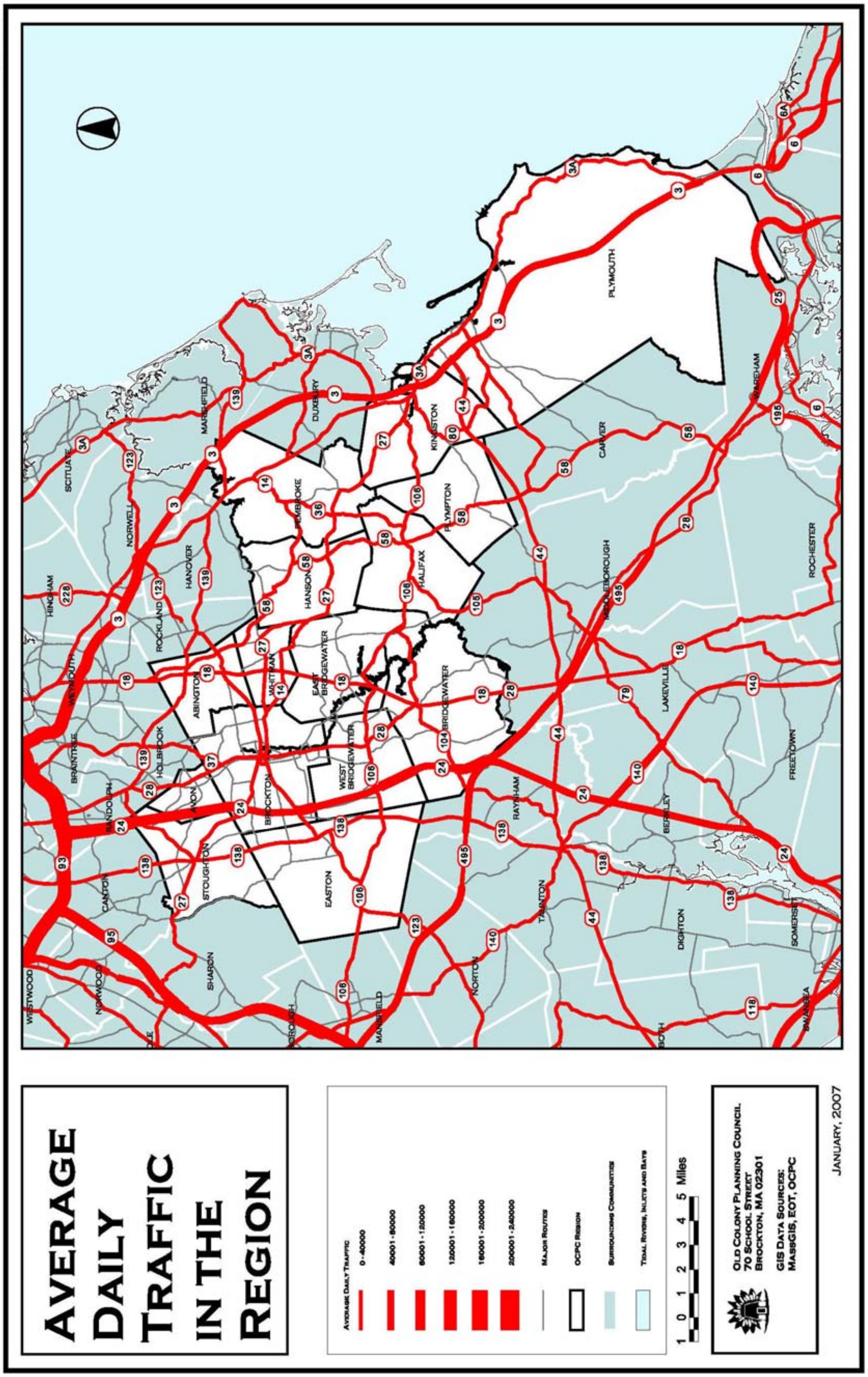
Average Daily Traffic in the Region
Average Daily Traffic
0 - 40000
40001 - 80000
80001 - 120000
120001 - 160000
160001 - 200000
200001 - 240000
Major Routes
OCPC Region
Surrounding Communities
Tidal Rivers, Inlets and Bays
1 0 1 2 3 4 5 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, OCPC
January, 2007

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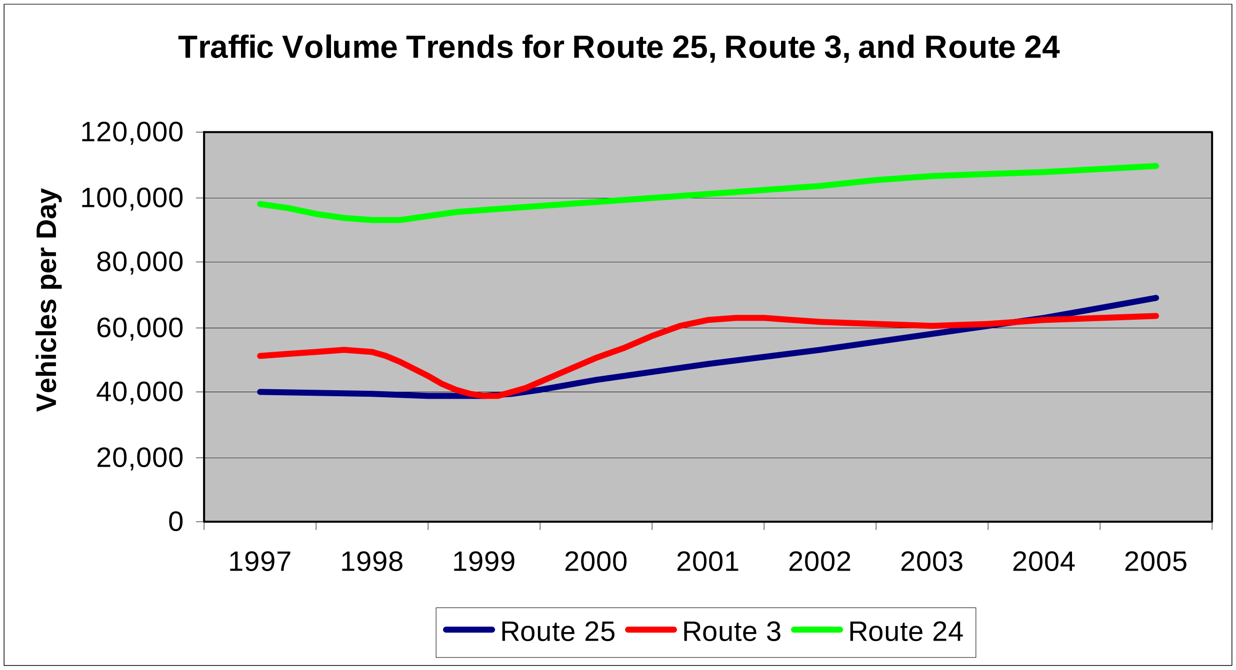
Figure 5-4



<u>Traffic Growth Trends</u>

Regional traffic growth varies considerably from route to route. Differences in growth rates among routes can be attributed to the influences of the land use adjacent to highway corridors (usually commercial or retail), as well as growth in specific residential areas. Fluctuations in traffic volumes are tied to fluctuations in the economy, which influence job growth or job losses. In addition, other influences on auto use, such as a recent spike in the price of gasoline, can cause a shift in mode choice, which causes some commuters switch to transit, carpooling, or telecommuting. The highest annual growth rate for the region was determined to be 9.32 percent on Route 123 in Abington. The lowest annual growth rate occurred on Route 28 south of Route 123 in Brockton (-1.10 percent.)

Route 80 and Route 3A (Hedges Pond Road) in Plymouth show high growth rates in traffic. Route 105 in Halifax also shows significant increases in traffic. Route 3 and Route 24, which are important routes for the Boston commute, show steady annual growth between 2.72 percent and 1.36 percent.

<u>Pavement Conditions</u>

The Massachusetts Highway Department (MassHighway) is responsible for the management and operation of approximately 2,800 miles of roadways throughout the state. About 1,600 linear miles of this total are classified as urban roadways, while the remainder is classified as rural. The interstate system consists of approximately 400 miles of highway. The statewide road network represents a large state and federal infrastructure investment that began with the widespread use of the automobile in the 1950s and continues today. Preservation and management of these facilities ensures that the Commonwealth of Massachusetts remains economically competitive with other states, as this infrastructure facilitates the movement of goods, services, and people statewide.

MassHighway's statewide network is comprised of roads within the National Highway System (NHS) and the Surface Transportation Program (STP). Both categories of roads are maintained through a combination of state and federal resources. MassHighway is responsible for all NHS facilities. The responsibility for maintenance for STP roads is shared between the state and municipalities. MassHighway utilizes its resources and fulfills its mandate by resurfacing and rebuilding the roads under its jurisdiction as the need and opportunity become apparent. MassHighway regularly inspects the statewide network to ensure that roads are repaired and resurfaced at the appropriate time.

The Executive Office of Transportation (EOT) contracted with the Regional Planning Agencies (RPAs) in the state to develop a statewide Pavement Management System (PMS) in order to fulfill requirements of federal aid statutes, ISTEA, TEA-21, and SAFETEA-LU. Mass Highway assumed responsibility for inspecting the majority of NHS facilities and the RPAs were responsible for inspecting all STP facilities and some NHS roads within their respective regions.

Regular meetings have been held between the RPAs and MassHighway to develop uniform standards for inspection and long-range maintenance of the road system. The Road Manager software program, which includes a pavement deterioration curve that demonstrates the rate of deterioration of pavement and the implications for cost of maintenance, is used to calculate Pavement Condition Index (PCI) scores for the surveyed road segments. This differs somewhat from the Pavement Serviceability Index (PSI) used by MassHighway in evaluating the condition of NHS roads, although MassHighway uses the same deterioration curve. Road Manager assigns a PCI to each road or road segment based on the condition surveys of the roads performed by OCPC staff. The condition surveys are based on the severity and extent of specific surface condition criteria including: potholes and patching, alligator cracking, distortion, rutting, weathering/block cracking, transverse and longitudinal cracking, bleeding/polished aggregate, surface wear and raveling, and corrugations, shoving, and slippage. The information on road surface conditions obtained in the field via a windshield survey is entered into Road Manager software, which assigns a PCI and recommends a repair and associated cost for each road and road segment. Each road or road segment is placed in a condition category based on the PCI, which includes "Poor" (PCI = 64 to 0), "Fair" (PCI = 65 to 84), "Good" (PCI = 85 to 94), and "Excellent (PCI = 95 to 100).

Condition surveys for federal aid roads have been updated for the region. Figure 5-5 shows the pavement conditions in the region. Table 5-5 shows the PCI for the region's federal eligible road mileage, based on the latest available survey data (surveys completed in 2005 and 2006.) Table 5-6 shows cost estimates calculated utilizing Road Manager for the federal aid eligible roads in the region. Based on the estimated repair costs made by Road Manager in Table 5-6, the bulk of the road repair budget (67.84 percent) is for roads in the "poor" category. Table 5-6 shows that the roads in the "Fair" category require 30.83 percent of the budget for repair and construction, and roads in the "Good" category require 1.33 percent of the budget for repair or maintenance. Tables 5-5 and 5-6 show that although only 35 percent of the federal aid roads fall into the "Poor" category, they require 67.84 percent of the repair budget. This occurs because roads in the "poor" category require more extensive repairs to the sub-surface that are associated with higher construction costs compared to roads in the "Good" or "Fair" categories that might require less expensive work to maintain or repair the bituminous surface only. Figures 5-5a and 5-5b show the comparison between the percentage of road in each condition category and the percent of the required budget for each category. Early maintenance on bituminous roads adds more service years to a road and avoids sub-surface damage that is expensive to repair. Good road management should include early maintenance to avoid the situation whereby the bulk of roads enter the "Poor" expensive category, thereby requiring large budgets for reconstruction.

Table 5-5
PCI Mileage by Function Classification

Condition PCI Score (Functional Class)	Excellent 100 to 95	Good 94 to 85	Fair 84 to 65	Poor 64 to 0	Total
Collectors	58	93	109	142	402
Arterials	28	28	36	46	138
Total	86	121	145	188	540
Percent of Total	16%	22%	27%	35%	100%

Source: OCPC Pavement Management System

Table 5-6
Pavement Maintenance and Repair Costs

	Excellent 100 to 94	Good 94 to 85	Fair 84 to 65	Poor 64 to 0	Totals
Collectors	$0	$1,594,924	$33,701,796	$87,529,293	$122,826,013
Arterials	$0	$1,036,462	$27,392,492	$46,892,590	$75,321,544
Totals	$0	$2,631,386	$61,094,288	$134,421,883	$198,147,557
Percentage	0.0 %	1.33%	30.83%	67.84%	100%

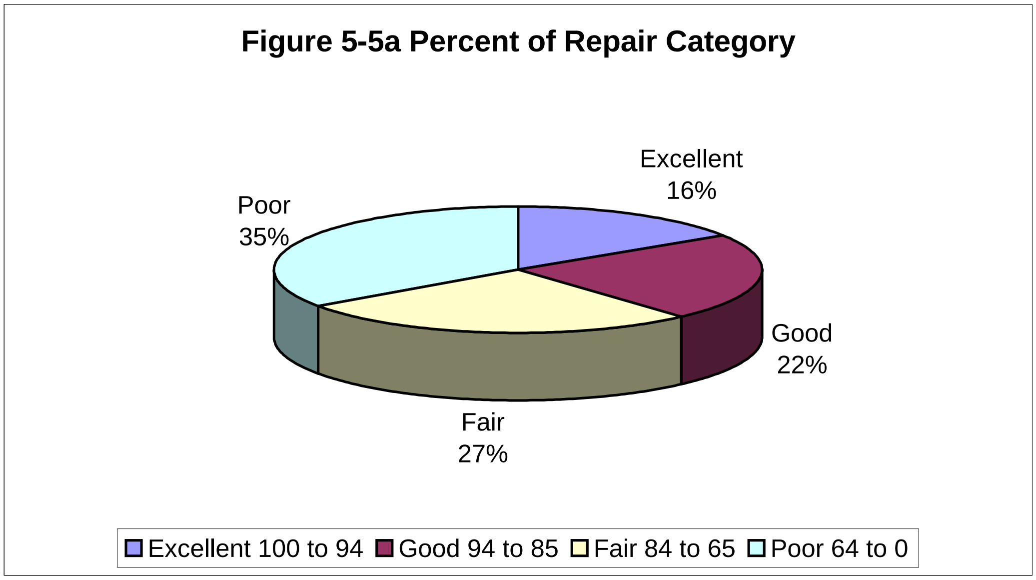


Figure 5-5a Percent of Repair Category
Excellent
16%
Poor
35%
Good
22%
Fair
27%
Excellent 100 to 94
Good 94 to 85
Fair 84 to 65
Poor 64 to 0

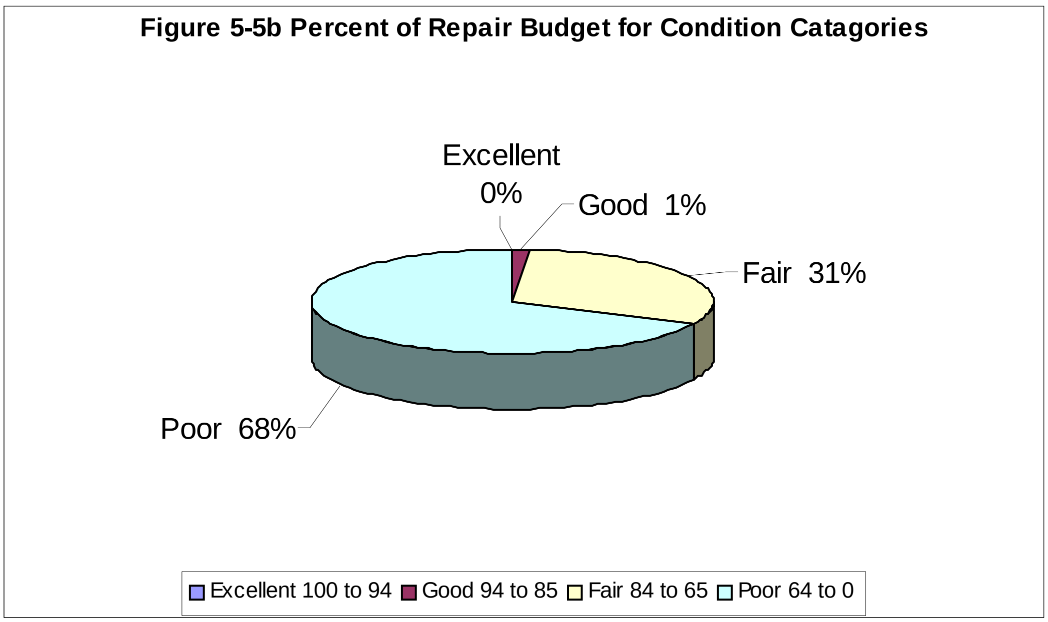


Figure 5-5b Percent of Repair Budget for Condition Catagories
Excellent
0%
Good 1%
Fair 31%
Poor 68%
Excellent 100 to 94
Good 94 to 85
Fair 84 to 65
Poor 64 to 0

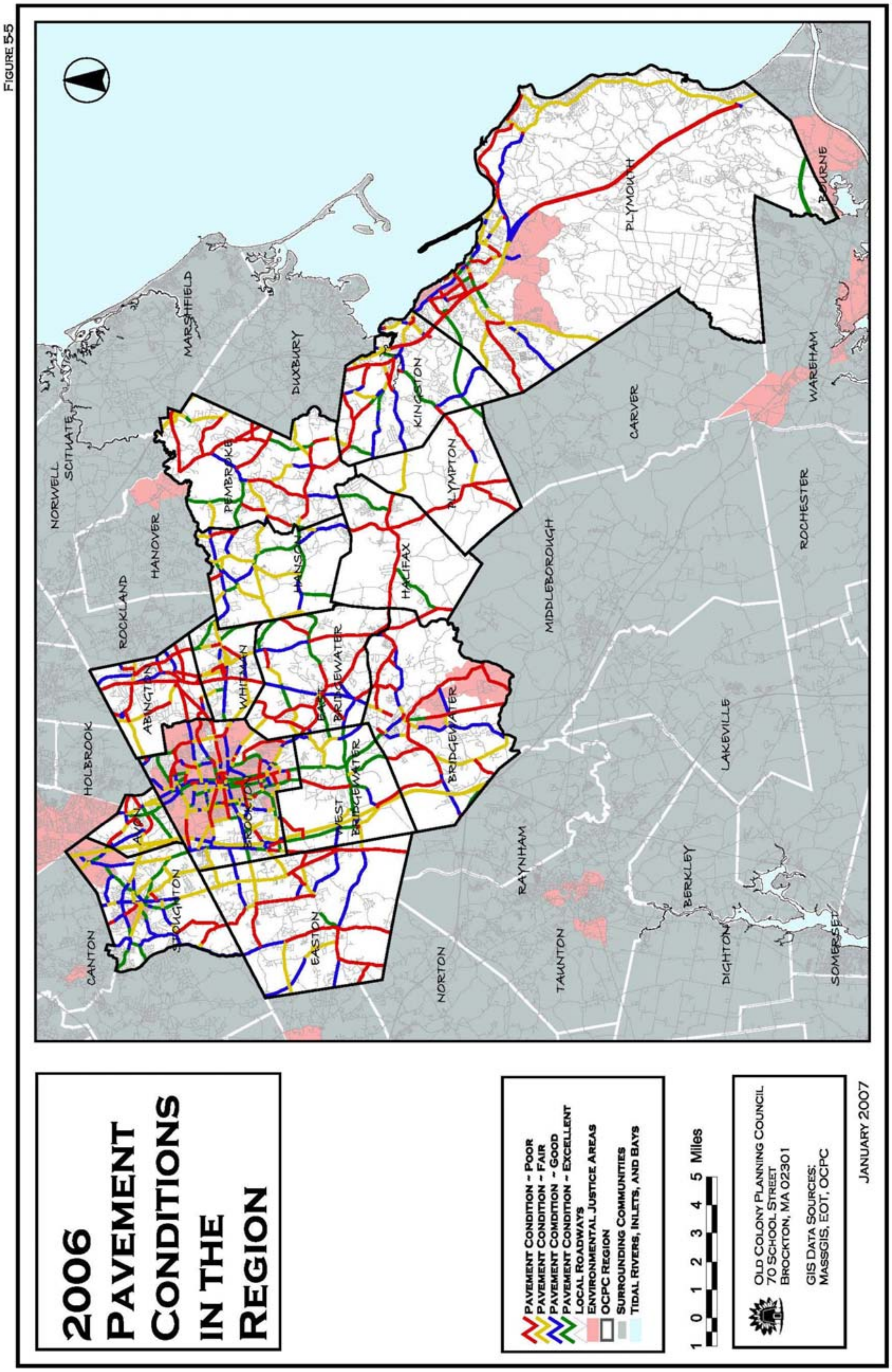


FIGURE 5-5
2006 PAVEMENT CONDITIONS IN THE REGION
PAVEMENT CONDITION - POOR
PAVEMENT CONDITION - FAIR
PAVEMENT CONDITION - GOOD
PAVEMENT CONDITION - EXCELLENT
LOCAL ROADWAYS
ENVIRONMENTAL JUSTICE AREAS
OCPC REGION
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
1 0 1 2 3 4 5 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC
JANUARY 2007
CANTON
HOLBROOK
ROCKLAND
HANOVER
NORWELL
SCITUATE
MARSHFIELD
DUXBURY
PLYMOUTH
BOURNE
WAREHAM
CARVER
ROCHESTER
MIDDLEBOROUGH
LAKEVILLE
RAYNHAM
BERKLEY
TAUNTON
NORTON
DIGHTON
SOMERSET
STOUGHTON
AVON
BROCKTON
ABINGTON
WHITMAN
EAST BRIDGEWATER
WEST BRIDGEWATER
BRIDGEWATER
EASTON
HANSON
PEMBROKE
HALIFAX
PLYMPTON
KINGSTON

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Freight

Trucking remains the primary mode of transportation for the movement of goods in the region. The primary trucking routes include the limited access highways in the region, Route 24, Route 3, and Interstate 495, as well as other important state numbered routes in the region including Route 44, Route 104, Route 106, Route 123, Route 27, Route 28, and Route 18. Others roads that are considered truck routes are minor arterials, major collectors, or other roadways that connect with industrial areas and/or shopping centers. The roads in the region that are not truck routes are largely roads in residential areas or other roads excluded to trucks.

In September 2002, Old Colony Planning Council completed the 2002 Heavy Vehicle Route Identification Study. The objective of this study was to assemble background data, discern freight/truck movement patterns, and to identify deficiencies in the existing trucking route system with regard to residential impacts and traffic flow issues. The 2002 Heavy Vehicle Route Identification Study incorporated a trucking industry Heavy Vehicle Survey in order to discern the transportation needs of truck movement in the Old Colony region. The study included a compilation of data collected by Old Colony transportation staff.

In order to inventory existing truck operations, the transportation staff surveyed trucking companies within the Old Colony region. In May 2002, 125 surveys were mailed to trucking companies in the region with questions relating to the heavy commercial vehicle industry. The mailing consisted of a cover letter explaining the purpose of the survey. The survey included eleven questions, and a self-addressed stamped envelope was included with each letter for returning the survey. The survey asked the following questions:

- Number of trucks (by weight category)?
- What type of service do you provide (For-Hire or Private)?
- Number of employees?
- Number of drivers?
- What commodities do you transport?
- How many trips do the trucks average per day?
- How many stops on a trip (average)?
- What are your Origins-Destinations?
- What are your most frequently traveled routes (top 3)?
- Name any deficiencies in the existing truck route system.
- What are your recommendations for improvement in the road system?

Sixteen percent of the surveys were returned. Questions 10 and 11 on the survey asked the respondents to name deficiencies in the existing truck route system and to make recommendations for improvement. The most frequent recommendations made by respondents in the survey are summarized as follows:

- Signalized intersections require signal timing adjustments for reduced delays on main roads
- A number of intersections require better alignment and radii to accommodate truck turns, especially in the Route 28 corridor in Brockton
- Delays at Stoughton Center are excessive
- Roadway surfaces on major corridors need to be upgraded and maintained in good condition (including road/paint markings)
- Traffic flow issues on many of the truck routes need to be addressed including Route 24, Route 106, and Route 123
- An East-West Truck Route through Brockton is needed (major concerns include lack of overhead clearance at the railroad underpasses, and tight turns throughout Brockton, especially downtown)

- Main Street in Brockton needs to return to a 2-way system
- Several of the respondents replied that truck parking is critical and there is great need for truck stops
- Lack of deceleration and acceleration lanes on exits and entrances onto major highways
- Route 24 should be widened as well as Route 3 south of Exit 18 to the Sagamore Bridge

Overall, the suggestions are designed to improve the existing truck routes, allowing the trucking companies to remain competitive, efficient, and able to meet the demands of the marketplace. The impact, or perceived impact, of trucks on neighborhoods is an important issue in regards to the movement of goods in the region. OCPC receives numerous requests from communities to assist in the development of heavy commercial vehicle exclusion reports (HVCE), in order to help minimize the residential impacts while maintaining the efficiency of goods movement. MassHighway maintains sole jurisdiction over the granting of these exclusions, and grants the exclusions based upon specific criteria. The impact of freight movement via truck through neighborhoods remains an issue with the growth of both residential and commercial development within the region.

5.1.2 Intersections

Traffic Signals

Traffic signals serve to facilitate the flow of traffic and to ensure safety at intersections. There are approximately 224 signalized intersections and flashing-beacon locations in the region. Flashing beacons are special signals used at intersections or locations where a full signal is not warranted, but conditions warrant alerting the driver to use extra caution when proceeding through the area.

The Manual on Uniform Traffic Control Devices (MUTCD), developed by the Federal Highway Administration (FHWA), presents the industry standard in determining the need for and design of traffic control devices. The manual specifies eight warrants that test whether an intersection merits the installation of a traffic signal. These warrants represent the minimum standards by which the need for a traffic signal should be judged. While the MUTCD does not suggest that any intersection meeting one or more warrants requires a signal, it emphasizes that no signal should be constructed at an intersection that does not meet any of the eight warrants. The MUTCD recommends that a comprehensive traffic engineering study be conducted before the decision is made to install traffic signals at an intersection. The inventory of signals for the region is updated continuously. Traffic signals in the Old Colony region are listed in Table 5-5.

Table 5-7 Traffic Signals

Town	Major Street	Intersecting Street	Other Streets	Type
Abington	North Avenue (Route 139)	Adams Street (Route 58)		Full
Abington	Bedford Street (Route 18)	Ames Plaza		Full
Abington	Bedford Street (Route 18)	Brockton Avenue (Route 123)		Full
Abington	Bedford Street (Route 18)	Fire Station		Emergency
Abington	Bedford Street (Route 18)	Lincoln Blvd		Full
Abington	Bedford Street (Route 18)	Randolph Street (Route 139)	North Avenue	Full
Abington	Hancock Street	Chestnut Street		Flashing Beacon
Abington	Centre Avenue (Route 123)	Plymouth Street (Route 58)		Full
Abington	Plymouth Street (Route 58)	Central Street		Full
Abington	Plymouth Street (Route 58)	Summer Street		Full
Abington	Centre Avenue (Route 123)	Stop and Shop		Full
Abington	Brockton Avenue (Route 123)	Wal-Mart		Full
Abington	Summer Street	Walnut Street		Flashing Beacon
Abington	Brockton Avenue (Route 123)	Washington Street	Thaxter Avenue	Full
Abington	Centre Avenue (Route 123)	Washington Street	Orange Street	Full
Abington	Brockton Avenue (Route 123)	Groveland Street	Vernon Street	Full
Avon	Page Street	Bodwell Street	Bodwell Street Ext	Full
Avon	E Main Street (Route 28)	E/W Spring Street	W Spring Street	Flashing Beacon
Avon	E Main Street (Route 28)	Harrison Boulevard		Full
Avon	Main Street (Route 28)	W Main Street	Main Street	Full
Avon	N Main Street (Route 28)	E/W High Street	N Main Street	Full
Avon	Memorial Drive (Route 28)	Wal-Mart		Full
Avon	Harrison Boulevard	Pond Street	Harrison Blvd	Full
Avon	New Pond Street	Stockwell Drive	Dykeman Street	Full
Avon	Harrison Boulevard	W Main Street		Full
Bridgewater	Bedford Street (Route 18)	School Street		Emergency
Bridgewater	Bedford Street (Route 18)	Winter Street		Full
Bridgewater	Broad Street (Route 18)	High Street		Flashing Beacon
Bridgewater	Broad Street (Route 18)	Central Square	Central Sq	Full
Bridgewater	Broad Street (Route 18)	Spring Street		Full
Bridgewater	Center Street	High School		Controlled Full
Bridgewater	Pleasant Street (Route 104)	Elm Street	Old Pleasant Street	Full
Bridgewater	Pleasant Street (Route 104)	Center Street		Full
Bridgewater	Main Street (Route 28)	High Street	Center Street	Full
Bridgewater	Pleasant Street (Route 104)	Prospect Street		Full
Bridgewater	South Street (Route 104)	Central Square		Emergency
Bridgewater	Plymouth Street (Route 104))	Spring Street		Full
Bridgewater	Plymouth Street (Route 104))	Summer Street		Full
Bridgewater	Pleasant Street (Route 104)	Vernon Street		Full
Brockton	Crescent Street (Route 27)	Alger Street (Route 14)		Full
Brockton	Belmont Street (Route 123)	Ash Street		Full
Brockton	Forest Avenue	Ash Street		Full
Brockton	Pleasant Street (Route 27)	Belair Street		Full

Table 5-7 Traffic Signals Continued

Town	Major Street	Intersecting Street	Other Streets	Type
Brockton	Belmont Street (Route 123)	Torrey Street		Full
Brockton	Belmont Street (Route 123)	West Street		Full
Brockton	Belmont St (Route 123)	Forest Avenue	Shaws Plaza Ent	Full
Brockton	Oak Street	Madrid Square		Full
Brockton	Oak Street	Campanelli Ind Dr	Chatham West Ent	Full
Brockton	Centre Street (Route 123)	Cary Street	Lyman Street	Full
Brockton	Court Street	Cary Street	Provost Street	Full
Brockton	Centre Street (Route 123)	Commercial Street		Full
Brockton	Court Street	Commercial Street		Full
Brockton	Crescent Street (Route 27)	Commercial Street	Perkins Street	Full
Brockton	School Street	Commercial Street		Full
Brockton	Crescent Street (Route 27)	Wendell Street		Full
Brockton	Oak Street	DW Field Park		Full
Brockton	Crescent Street (Route 27)	East Plaza		Full
Brockton	W Chestnut Street	Linwood Street		Flashing Beacon
Brockton	Crescent Street (Route 27)	Lyman Street		Full
Brockton	Summer Street	Lyman Street	Grove Street	Full
Brockton	N Main Street	Battles Street		Full
Brockton	Belmont Street (Route 123)	Main Street		Full
Brockton	Main Street (Route 28)	Brookside Avenue	BAT Bus Garage	Full
Brockton	Centre Street (Route 123)	Main Street		Full
Brockton	Crescent Street (Route 27)	Main Street		Full
Brockton	Main Street (Route 28)	Maple Avenue		Full
Brockton	Main Street (Route 28)	Plain Street		Full
Brockton	Main Street	Pleasant Street (Route 27)		Full
Brockton	Main Street (Route 28)	Sargents Way		Full
Brockton	Main Street	School Street		Full
Brockton	Main Street	Perkins Avenue		Full
Brockton	Main Street	W Elm Street	VFW Parkway	Full
Brockton	Belmont Street (Route 123)	Manley Street		Full
Brockton	Forest Avenue	Bouve Avenue		Full
Brockton	Centre Street (Route 123)	Montello Street (Route 28)		Full
Brockton	Montello Street (Route 28)	Court Street		Full
Brockton	Crescent Street (Route 27)	Montello Street (Route 28)		Full
Brockton	Montello Street (Route 28)	Grove Street		Full
Brockton	Montello Street (Route 28)	Lawrence Street		Full
Brockton	***Pleasant Street (Route 27)***	***Fire Station 1***		***Flashing Beacon***
Brockton	***Main Street***	***Fire Station 2***		***Flashing Beacon***
Brockton	***N Main Street***	***Fire Station 3***		***Flashing Beacon***
Brockton	Montello Street (Route 28)	Perkins Avenue		Full
Brockton	Montello Street (Route 28)	School Street		Full
Brockton	E Ashland Street	N Cary Street		Full
Brockton	N Main Street	E Ashland Street		Full

Table 5-7 Traffic Signals Continued

Town	Major Street	Intersecting Street	Other Streets	Type
Brockton	N Main Street	Oak Street		Full
Brockton	N Montello Street (Route 28)	Ames Street		Full
Brockton	N Montello Street (Route 28)	E Ashland Street		Full
Brockton	N Montello Street (Route 28)	Elliot Street		Full
Brockton	N Montello Street (Route 28)	Howard Street		Full
Brockton	N Pearl Street	Good Samaritan Hospital		Full
Brockton	N Pearl Street	Oak Street Ext		Full
Brockton	Reynolds Memorial Hwy (Route 27)	N Pearl Street		Full
Brockton	N Quincy Street	E Ashland Street		Full
Brockton	N Quincy Street	N Cary Street		Flashing Beacon
Brockton	N Warren Avenue	Prospect Street		Flashing Beacon
Brockton	Oak Street	Belair Street		Full
Brockton	Oak Street	Westgate Pavilion		Full
Brockton	Belmont Street (Route 123)	Pearl Street		Full
Brockton	Pearl Street	Pleasant Street		Full
Brockton	Pearl Street	Torrey Street		Full
Brockton	Centre Street (Route 123)	Plymouth Street		Flashing Beacon
Brockton	Centre Street (Route 123)	Quincy Street		Full
Brockton	Crescent Street (Route 27)	Quincy Street		Full
Brockton	Pleasant Street (Route 27)	Reynolds Hwy (Route 27)		Full
Brockton	Reynolds Memorial Hwy (Route 27)	Westgate Pavilion		Full
Brockton	Belmont Street (Route 123)	Stop and Shop		Full
Brockton	Crescent Street (Route 27)	Summer Street		Full
Brockton	Belmont Street (Route 123)	VA Hospital Ent		Full
Brockton	Belmont Street (Route 123)	Warren Avenue		Full
Brockton	Warren Avenue	Forest Avenue		Full
Brockton	Warren Avenue	High Street		Full
Brockton	Warren Avenue	Legion Pkwy		Full
Brockton	Pleasant Street (Route 27)	Warren Avenue		Full
Brockton	Warren Avenue	W Elm Street		Full
Brockton	Belmont Street (Route 123)	West Street		Full
Brockton	Pleasant Street (Route 27)	West Street		Full
Brockton	West Street	Torrey Street		Full
Brockton	***West Street***	***West Elm Street***		***Full***
Brockton	West Chestnut	Manley Street	Liberty ST	Full
East Bridgewater	Bedford Street (Route 18)	Central Street		Full
East Bridgewater	Bedford Street (Route 18)	Highland Street		Full
East Bridgewater	Bedford Street (Route 18)	West Street (Route 106)		Full
East Bridgewater	Bedford Street (Route 18)	Whitman Street (Route 106)		Full
East Bridgewater	Washington Street	Central Street		Full
East Bridgewater	***Oak Street Route 14***	***Franklin St Route 27***	***W. Washington***	***Full***
Easton	Foundry Street (Route 106)	Depot Street (Route 123)		Full
Easton	***Foundry Street (Route 106)***	***Eastman Street (Route 123)***		***Full***

Table 5-7 Traffic Signals Continued

Town	Major Street	Intersecting Street	Other Streets	Type
Easton	Belmont Street (Route 123)	Stonehill College		Full
Easton	Foundry Street (Route 106)	Turnpike Street (Route 138)		Full
Easton	Turnpike Street (Route 138)	Purchase Street		Flashing Beacon
Easton	Washington Street (Route 138)	Belmont Street (Route 123)		Full
Easton	Washington Street (Route 138)	Central Street		Full
Easton	Washington Street (Route 138)	Depot Street (Route 123)		Full
Easton	Washington Street (Route 138)	Main Street		Full
Easton	Washington Street (Route 138)	Stonehill College		Full
Easton	Washington Street (Route 138)	Roche Brothers		Full
Halifax	Plymouth Street (Route 106)	Monponsett Street (Route 58)		Full
Halifax	Plymouth Street (Route 106)	Wal-Mart		Full
Halifax	***Plymouth Street (Route 106)***	***Stop and Shop***		***Full***
Hanson	W Washington Street (Route 14)	Holmes Street		Flashing Beacon
Hanson	Liberty Street (Route 58)	County Road (Route 14)		Full
Hanson	Main Street (Route 27)	Indian Head Street (Route 58)		Full
Hanson	W Washington Street	Spring Street		Flashing Beacon
Hanson	Liberty Street (Route 58)	Winter Street		Full
Kingston	Bishops Hwy (Route 80)	Parting Ways		Flashing Beacon
Kingston	Main Street (Route 3A)	Brook Street (Route 80)		Full
Kingston	Elm Street	North of Jones River Crossing		Full
Kingston	Main Street (Route 3A)	Hilltop Avenue		Full
Kingston	Main Street (Route 106)	Pembroke Street (Route 27)	Evergreen Street	Full
Kingston	Independence Mall Way	Cranberry Road		Full
Kingston	Smiths Lane	Independence Mall Ent		Full
Kingston	Smiths Lane	RT 3 Northbound Ramps		Full
Kingston	Summer Street (Route 53)	Tremont Street (Route 3A)		Full
Pembroke	Center Street (Route 14)	High Street		Flashing Beacon
Pembroke	Center Street (Route 36)	Fire Station		Emergency Signal
Pembroke	Center Street (Route 36)	Mattakeeset Street (Route 14)		Full
Pembroke	Center Street (Route 36)	School Street (Route 27)		Full
Pembroke	Church Street (Route 139)	Oak Street		Full
Pembroke	Church Street (Route 139)	Union Street		Full
Pembroke	School Street (Route 27)	Mattakeeset Street		Flashing Beacon
Pembroke	Church Street (Route 139)	RT 3 NB Ramp		Full
Pembroke	Church Street (Route 139)	RT 3 SB Ramp		Full
Pembroke	Church Street (Route 139)	North River Plaza		Full
Pembroke	Washington Street (Route 53)	Barker Street (Route 14)		Full
Pembroke	Washington Street (Route 53)	Congress Street (Route 14)		Flashing Beacon
Pembroke	Washington Street (Route 53)	Schoosett Street (Route 139)		Full
Pembroke	***School Street (Route 27)***	***Union/Mattakeeset Street***		***Full***
Plymouth	Court Street (Route 3A)	Cherry Street		Full
Plymouth	Samoset Street (Route 44)	Court Street (Route 3A)		Full
Plymouth	Rocky Hill Road	Edison Access		Full

Table 5-7 Traffic Signals Continued

Town	Major Street	Intersecting Street	Other Streets	Type
Plymouth	Long Pond Road	RT 3 NB Interchange		Full
Plymouth	Long Pond Road	RT 3 SB Interchange		Full
Plymouth	***Long Pond Road***	***Camelot Drive***		***Full***
Plymouth	***Long Pond Road***	***Shops at 5***		***Full***
Plymouth	***Long Pond Road***	***Home Depot***		***Full***
Plymouth	***Commerce Way***	***Plympton Rd. (Route 80)***		***Full***
Plymouth	***Commerce Way***	***Wal-Mart Colony Place***	***Resnik***	***Full***
Plymouth	***Commerce Way***	***McAullife Way***		***Full***
Plymouth	***Commerce Way***	***Route 44 Eastbound Ramps***		***Full***
Plymouth	***Commerce Way***	***Enterprise Drive***	***Cherry Street***	***Full***
Plymouth	Main Street (Route 3A)	Leyden Street		Full
Plymouth	Samoset Street	Pilgrim Hill Rd		Full
Plymouth	Summer Street	Pilgrim Hill Rd		Full
Plymouth	Samoset Street	Route 3 SB		Full
Plymouth	Warren Avenue (Route 3A)	Sandwich Street		Full
Plymouth	Samoset Street	Fire Station		Emergency Signal
Plymouth	Samoset Street	Carver Road	Seven Hills Rd.	Full
Plymouth	Long Pond Road	Obery Street	South Street	Full
Plymouth	Cherry Street	Standish Avenue		Full
Plymouth	Samoset Street	Standish Avenue		Flashing Beacon
Plymouth	Samoset Street	RT 3 NB Interchange	Westerly Road	Full
Plymouth	Carver Road	Plympton Rd. Route 80		Full
Plymouth	State Road (Route 3A)	White Horse Road	Beaver Damn Rd	Full
Plympton	Palmer Road (Route 58)	Main Street		Full
Stoughton	Sharon Street (Route 27)	Bay Road		Full
Stoughton	Central Street	Lincoln Street		Full
Stoughton	Prospect Street	Park Street		Flashing Beacon
Stoughton	Central Street	Pearl Street		Full
Stoughton	Pearl Street	Ralph Mann Drive		Full
Stoughton	Pearl Street	School Street		Flashing Beacon
Stoughton	Plain Street	Morton Street		Flashing Beacon
Stoughton	Pleasant Street (Route 139)	Central Street		Full
Stoughton	Lindelof Avenue (Route 139)	Technology Center Drive	Kay Way	Full
Stoughton	Central Street	Turnpike Street		Full
Stoughton	Pleasant Street (Route 139)	Turnpike Street		Full
Stoughton	Turnpike Street (Route 139)	Page Street		Full
Stoughton	Washington Street (Route 138)	Central Street		Full
Stoughton	Washington Street (Route 138)	Stop and Shop		Full
Stoughton	Turnpike Street	IKEA Way		Full

Table 5-7 Traffic Signals Continued

Town	Major Street	Intersecting Street	Other Streets	Type
West Bridgewater	East Center Street (Route 106)	East Street		Flashing Beacon
West Bridgewater	West Center Street (Route 106)	North Elm Street	South Elm Street	Full
West Bridgewater	West Center Street (Route 106)	North Main Street (Route 28)	River Street	Full
West Bridgewater	West Center Street (Route 106)	Manley Street		Full
Whitman	Bedford Street (Route 18)	Auburn Street (Route 14)		Full
Whitman	Bedford Street (Route 18)	Stop and Shop		Full
Whitman	Bedford Street (Route 18)	Temple Street (Route 27)		Full
Whitman	Temple Street (Route 27)	Corthell Avenue		Full
Whitman	Temple Street (Route 27)	Washington Street	South Avenue (Route 27)	Flashing Beacon
Whitman	Auburn Street (Route 14)	Washington Street		Flashing Beacon
Whitman	Auburn Street (Route 14)	Harvard Street		Flashing Beacon
Whitman	Washington Street	West Street	Park Avenue	Flashing Beacon

Interchanges

Three limited access highways serve the region. Route 24 and Route 3 run north south through the region, with Route 24 serving the Brockton area and Route 3 serving Kingston and Plymouth along the coast. In addition, I-495 is in close proximity to the region. It enters the southwest edge of Bridgewater at its interchange with Route 24. I-495 runs southeast just south of the region from Bridgewater to Route 25, which enters south Plymouth and provides direct access to the Bourne Bridge to Cape Cod. In 1998, MassHighway completed a study to examine the geometric improvements necessary, along with the estimated costs, for the reclassification of Route 24 to an interstate highway. The study stated that Route 24 was constructed in the 1950s to the design standards of that time, although some reconstruction has occurred since then to improve deficiencies. Route 24 does not meet the stricter standards associated with an interstate highway. According to the MassHighway study, the Route 24 design deficiencies are associated with acceleration and deceleration lanes on ramp exits and entrances. In addition, there are deficiencies associated with shoulder width and vertical clearance requirements on Route 24. In general, improving Route 24 to interstate standards involves widening shoulders for safety, replacing overpass bridges to accommodate higher vertical clearances, and reconstructing ramp entrances and exists to higher acceleration and deceleration design standards. Likewise, Route 3 in Kingston and Plymouth was also not constructed to interstate design standards, although recently completed construction at the Route 3/Route 44 merge includes updated standards as well as a widening of Route 3 from 4 to six lanes at this junction.

In addition to antiquated interchange design standards, both Route 24 and Route 3 have experienced high commercial and residential growth along the secondary arterials and collectors that provide access to these limited access highways. These conditions have resulted in congestion and high traffic volumes at the Route 24 and Route 3 interchanges. Tables 5-6, 5-7 show the levels-of-service, traffic volumes for 2007, and the projected 2030 volumes for the connecting highways at Route 24 and Route 3 interchanges based on MassHighway's traffic model.

Table 5-8
LOS and Traffic Volumes at Route 24 Interchanges

	2007	2007				2030		
Route 24 Corridor	**Number of Lanes**	**Average Daily Traffic**	**Peak Hour LOS**	**V/C**	**Number of Lanes**	**Average Daily Traffic**	**Peak Hour LOS**	**V/C**
Route 139 - Stoughton	4	31,115	B	0.60	4	39,295	C	0.75
New Pond ST – Avon	4	41,000	C	0.78	4	51,780	D	0.99
Route 27 – Brockton	4	36,840	C	0.70	4	44,830	C	0.86
Route 123 – Brockton	4	34,900	C	0.66	4	44,000	C	0.84
Route 106 – W. Bridgewater	2	29,700	E	1.40	2	37,500	F	1.80
Route 104 - Bridgewater	2	24,300	E	1.18	4	30,690	B	0.58

Table 5-9
LOS and Traffic Volumes at Route 3 Interchanges

	2007	2007			2030	2030		
Route 3 Corridor	**Number of Lanes**	**Average Daily Traffic**	**Peak Hour LOS**	**V/C**	**Number of Lanes**	**Average Daily Traffic**	**Peak Hour LOS**	**V/C**
Route 3A - Kingston	2	29,550	F	1.44	2	37,300	F	1.80
Samoset ST Route 44 - Plymouth	4	42,100	C	0.80	4	53,200	D	1.02
Long Pond Rd./South ST – Plymouth	2	23,800	E	1.16	2	30,060	E	1.45
Clark Rd. - Plymouth	2	10,000	C	0.48	2	12,630	C	0.61
Herring Pond Rd. – Plymouth	2	15,295	D	0.75	2	19,300	D	0.94

<u>Rail Crossings</u>

Approximately 900 deaths occur every year at rail highway grade crossings in the US. The Federal Railroad Administration uses the "three E" approach (Education, Enforcement, and Engineering) to reduce such fatalities. This effort has reduced fatalities at rail highway crossings by 46 percent since 1994. Informing the public about how to be safe at highway-rail crossings and the importance of not trespassing along railroad rights-of-way is vital to improving safety. The FRA has worked alongside the rail industry, state and local governments, and other transportation organizations in outreach efforts at schools and workplaces in communities to spread the word about rail safety. The FRA also provides data and statistics on the FRA website for public use. Table 5-8 shows the number of vehicle/train crashes within the region based on the FRA's database, and the number of fatalities in the region since the Old Colony Line was restored in 1997. Figure 5-6 shows the at grade highway rail crossings within the region for both freight and commuter rail lines.

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FIGURE 5-6

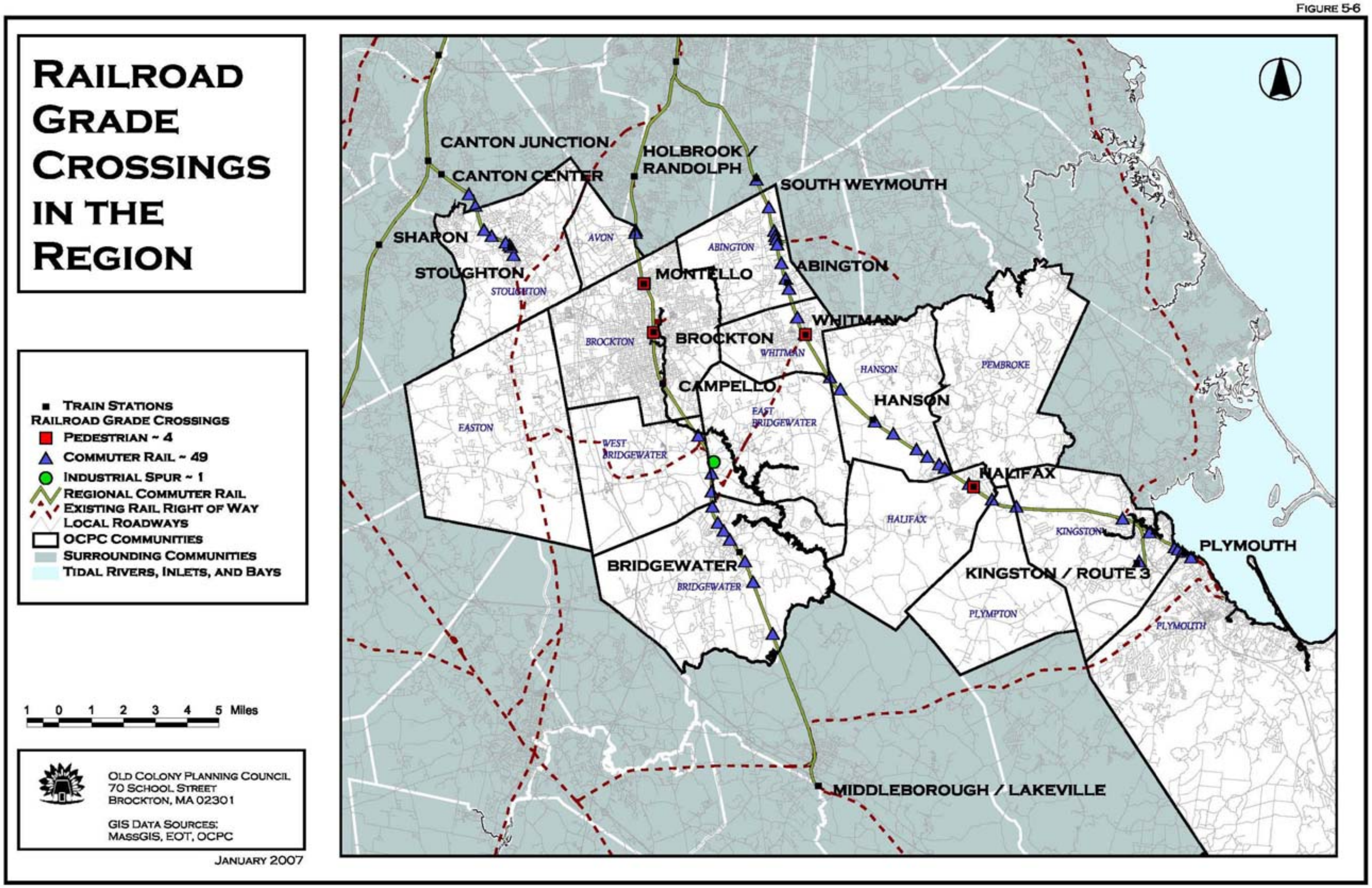
RAILROAD GRADE CROSSINGS IN THE REGION
TRAIN STATIONS
RAILROAD GRADE CROSSINGS
PEDESTRIAN ~ 4
COMMUTER RAIL ~ 49
INDUSTRIAL SPUR ~ 1
REGIONAL COMMUTER RAIL
EXISTING RAIL RIGHT OF WAY
LOCAL ROADWAYS
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
1 0 1 2 3 4 5 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC
JANUARY 2007
CANTON JUNCTION
CANTON CENTER
SHARON
STOUGHTON
HOLBROOK / RANDOLPH
SOUTH WEYMOUTH
ABINGTON
MONTELLO
BROCKTON
WHITMAN
CAMPELLO
HANSON
HALIFAX
BRIDGEWATER
KINGSTON / ROUTE 3
PLYMOUTH
MIDDLEBOROUGH / LAKEVILLE
STOUGHTON
AVON
BROCKTON
ABINGTON
WHITMAN
HANSON
PEMBROKE
EASTON
WEST BRIDGEWATER
EAST BRIDGEWATER
HALIFAX
KINGSTON
PLYMPTON
PLYMOUTH
BRIDGEWATER

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Table 5-10
Train Crashes at Grade Crossings Since 1997

Community	Road Crossing	Date	Cause	Whistle Ban?	Number of Fatalities	Railroad
Abington	Plymouth Street	12/9/04	Stopped on crossing	No	0	MBTA
Abington	Birch Street	11/7/05	Stopped on crossing	No	1	MBTA
Abington	Birch Street	8/16/04	Drove around gates	No	0	MBTA
Abington	North Ave	1/23/04	Drove around gates	No	0	MBTA
Abington	North Ave	12/14/03	Stopped on crossing	No	0	MBTA
Bridgewater	Route 104–Plymouth St	5/6/02	Hit Pedestrian	No	1	MBTA
Hanson	Pleasant Street	1/17/00	Hit Pedestrian	No	1	MBTA
Hanson	Route 27 Main Street	5/4/00	Stopped on crossing	No	0	MBTA
Stoughton	Wyman Street	1/03/00	Driver did not stop	No	0	AMTRAK

<u>Other Intersection Types – Roundabouts, Non-conventional Intersections</u>

Conventional intersections typically include three or four approach legs, with alignments that are at approximately ninety degrees. Traffic control is usually more easily conveyed to the motorist, sight distances are more easily discernable by motorists, and safety and traffic flow are typically more easily managed at these conventional alignments. Many intersections within the Old Colony region can be classified as “non-conventional” types. This is due mainly to the fact that the origin of New England’s road system can be traced to pre-automobile times. Overland travel in the 18th and 19th centuries was by foot, horse, or oxen. Roads and paths in these times developed based on the natural topography, along areas that were relatively flat, and where the natural soils were relatively stable. These roads and paths were further packed due to use, which added to the stability of the road. The paved road network in use today is based upon this pre-automobile network, which contains a great deal of intersections that are not properly aligned for motor vehicle use and which also include non conventional 5-way intersections.

Important intersections within the region with heavy traffic volumes that can be classified as unconventional include Stoughton Center, East Bridgewater Center, West Bridgewater Center (at the intersection of Route 106 and Route 28), and the intersection of Howard Street/North Montello Street (Route 28)/Albion Street in Brockton. Other intersections that that have poor alignment, which creates safety hazards, include:

- Route 106 at Route 3A in Kingston
- Washington Street at Bedford Street (Route 18) in Abington
- Canton Street (Route 27) at Central Street in Stoughton
- Route 139 at Page Street in Stoughton
- Route 106 at Washington Street in East Bridgewater
- Turnpike Street at Washington Street (Route 138) in Easton

Roundabouts reduce crashes and injuries at intersections significantly over conventional stop controlled and traffic signal controlled intersections. Studies, cited in the FHWA’s publication <u>Roundabouts: An Informational Guide</u>, have shown that roundabouts can provide a 71 percent reduction in personal injury crashes and a 32 percent reduction in crashes with property damage only over conventional intersections. These studies have shown that roundabouts can provide a 51 percent reduction in overall crashes over conventional intersections.

The roundabout option for an at grade, intersection offers a number of advantages including:

- Safety – The severity of a crash is determined by the speed of the vehicles. Roundabouts greatly improve safety at intersections because they require traffic to slow down to 20 miles per hour. Crashes are less likely to result in injury or fatality due to collisions in the 20 miles per hour range. Roundabouts reduce the number of conflict points from 32 to eight over a conventional 4-way intersection.
- Operational Efficiency – Roundabouts process peak hour traffic as efficiently as traffic signals and offer high capacity and minimal delays for all modes including trucks.
- Aesthetics and Geometric Flexibility – Roundabouts offer better aesthetics than conventional traffic signals. The designs can vary in shape and size to conform to right-of-way constraints.

There are three roundabouts within the region; Route 58 Plymouth Street/Essex Street/Raynor Ave. in Whitman, Water Street at Park Avenue in Plymouth, and Stockwell Drive and the IKEA Furniture store entrance. The roundabout in Whitman lacks splitter islands at the approaches, and a truck apron around the center island. Splitter islands create “deflection,” which requires vehicles entering the roundabout to slow down. Despite the lack of splitter islands, and a central truck apron, the Whitman roundabout is compact in design with enough room around the center island for tractor-trailers to maneuver. It operates efficiently and processes approximately 1,300 vehicles during the peak hour with acceptable average delays. The roundabout on Stockwell Drive in Avon was constructed to mitigate additional traffic generated by the IKEA store. Congestion has been problematic at this roundabout, especially on Saturdays and Sundays due to the popularity of the IKEA store. This roundabout has two approach lanes northbound into the circle, but only one lane southbound to Access Drive and Stockwell Drive, which make up the west and south leg of the intersection. An additional right turn only slip lane southbound to Access Road, which is signed to provide quick access to the Route 24 interchange at Route 139 in Stoughton, can improve the efficiency of the roundabout. Traffic consultants for IKEA continue to monitor congestion at this location.

Freight

The main issues in regards to heavy vehicles traversing intersections cited in the 2002 Heavy Vehicle Route Identification Study included excessive delays at Stoughton center, a need for signal timing adjustments to reduced delays on main roads, and a need for better alignment and turning radii at a number of intersections to better accommodate truck turns. Limited turning radii at intersections is especially problematic in Brockton in the Route 28 and Main Street corridors in Brockton. Another important intersection in the region with limitations in turning radii is the intersection of Route 28 at Route 106 in West Bridgewater center.

5.1.3 Bridges

The Massachusetts Highway Department maintains a database of all bridges in the Commonwealth of Massachusetts that span roadways, bodies of water, and railroad tracks. The database contains descriptions of the bridges, including the name of the roadway that contains the bridge, the impediment that is spanned, the year the bridge was built, the most recent reconstruction if applicable, and the conditions rating of the bridge, which is based on the American Association of State and Highway Transportation Officials (AASHTO) bridge rating. The Massachusetts Highway Department personnel regularly inspect and rate all bridges in Massachusetts.

This bridge condition data has been collected for every bridge in the nation using consistent federal standards for bridge decks, superstructures, substructures, retaining walls, deck geometries, and roadway approach alignments. The rating system (developed by AASHTO) uses a scale of 0 to 100, with 100 being the best. The aim of this Bridge Management System (BMS) is to use models to predict failures and make improvement recommendations. The BMS is designed to provide the means by which appropriate policies and programs can be considered for all bridges under state or local jurisdiction.

The bridge database includes a determination for each bridge as to whether the bridge is either structurally deficient or functionally obsolete. If the bridge-deck, pavement, or supporting structure (superstructures and substructures) of a bridge fail to meet AASHTO standards, then a bridge is considered to be structurally deficient. Bridges in the Old Colony region and bridge ratings are summarized in the appendix to this report. Weight restrictions or closings are imposed on bridges deemed structurally deficient. As of 2006, there were 11 bridges (7.4%) in the Old Colony region identified as structurally deficient. Four of these structurally deficient bridges are slated for replacement in the Old Colony 2007-2010 TIP.

Functionally obsolete bridges are older structures built with design standards that are different from the current design standards. Additional factors used to determine a bridge as functionally obsolete are deck geometry, under clearance, and approach roadway alignment. Functionally obsolete bridges generally cannot accommodate the volume and nature of vehicle traffic due to insufficient vertical clearances and/or inadequate widths. As of 2006, there were forty-one bridges (27.5%) in the Old Colony region classified as functionally obsolete. Six of these functionally obsolete bridges are slated for construction in the Old Colony 2007-2010 TIP. Figure 5-7 shows the locations of bridges in the region. Tables 5-9 and 5-10 summarize the number of bridges and the age of bridges within the Old Colony region.

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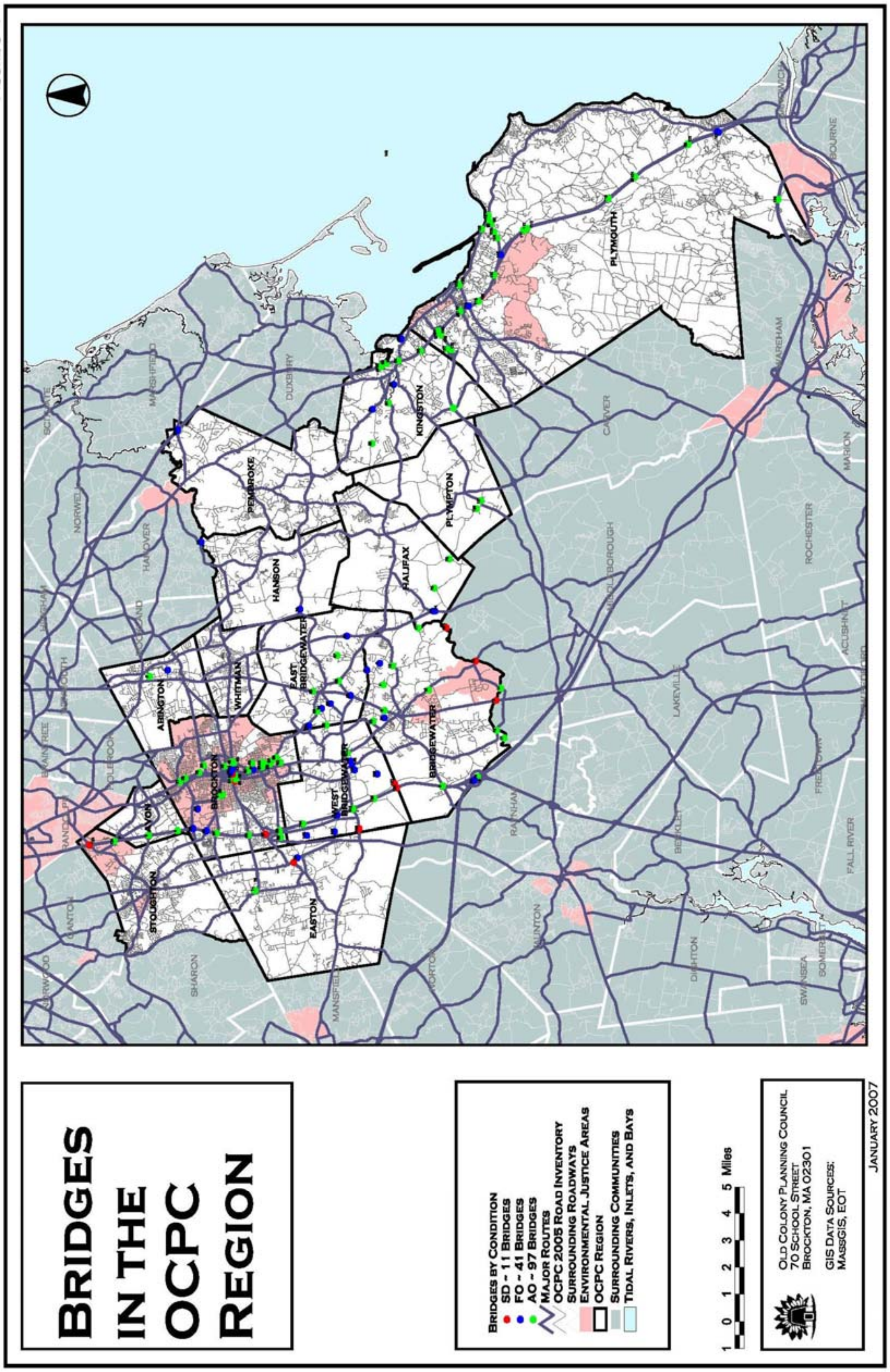
FIGURE 5-7
BRIDGES IN THE OCPC REGION
BRIDGES BY CONDITION
SD - 11 BRIDGES
FO - 41 BRIDGES
AO - 97 BRIDGES
MAJOR ROUTES
OCPC 2005 ROAD INVENTORY
SURROUNDING ROADWAYS
ENVIRONMENTAL JUSTICE AREAS
OCPC REGION
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
0 1 2 3 4 5 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT
JANUARY 2007
PLYMOUTH
KINGSTON
PLYMPTON
PEMBROKE
HALIFAX
HANSON
EAST BRIDGEWATER
WHITMAN
ABINGTON
BROCKTON
WEST BRIDGEWATER
BRIDGEWATER
AVON
STOUGHTON
EASTON

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Table 5-11
Summary of Bridges

	Bridges Over Highway	Bridges Over Water	Bridges Over Railroad	All Bridges
Number of Bridges	55	79	15	149
Percent	37%	53%	10%	100%
Average Age (Years)	32	50.5	22	41
Average AASHTO Rating	83.83	74.42	84.57	78.92

Table 5-12
Age of Bridge Structures

	125 + Years	100 to 124 Years	75 to 99 Years	50 to 74 Years	25 to 49 Years	New- Under 25 Years
Roadway Span	0	0	0	19	20	16
Water Span	2	2	17	21	19	18
Railroad Span	0	0	0	1	5	9
Total	2	2	17	41	44	43
Average AASHTO Rating	76.95	50.10	67.15	73.67	80.76	88.10

5.1.4 Safety

<u>SAFETEA-LU and SHSP</u>

The highway re-authorization bill, SAFETEA-LU of 2005, places greater focus on transportation safety than its predecessors ISTEA and TEA-21. Although improvements in the fatality rates on our highways have been achieved, the overall yearly number of fatalities remains unacceptable. Approximately 43,000 people lose their lives each year on U.S. roads. In addition, there is the high economic impact of all the motor vehicle crashes each year. Saving lives is the number one priority of SAFETEA-LU. Our transportation systems also face significant challenges in the areas of homeland security as well as overall safety, congestion, and inter-modal connectivity.

SAFETEA-LU created a new stand-alone program for funding safety projects. This program, Highway Safety Improvement Program (HSIP), is designed to provide states with funds to institute programs that reduce the fatalities and injuries that occur annually on the highway system; reinforce the Federal Highway Administration's (FHWA's) safety partnerships; and complement National Highway Traffic Safety Administration (NHTSA) and the Federal Motor Carrier Safety Administration (FMCSA) safety programs.

The HSIP program requires that states have a process in place to analyze highway safety problems, identify opportunities for prevention of hazardous conditions, and produce a list of projects to be funded based upon the analysis and opportunities identified. The FHWA will formulate programmatic guidelines for states including the following components:

- Adoption of strategic and performance-based goals for the Highway Safety Improvement Program (HSIP) that address all roadways within the state and focus on areas of greatest need
- Advancement of the states' capabilities in traffic records data collection, analysis, and integration with other sources of safety data
- Provide flexibility to the states to address existing and potential highway safety problems
- Requirement that states establish an evaluation process to assess the results of safety improve projects and use the results to set priorities for future projects
- States are to report their progress in implementing safety improvement projects and the effectiveness of the improvements to the Secretary of Transportation

Massachusetts has adopted the following policies and procedures in response to HSIP implementation, although FHWA programmatic guidelines for HSIP are currently pending.

- A proposed improvement project for a specific intersection must meet certain criteria thresholds to be eligible as a safety project
- The intersection must appear on the state's top 1000 intersection crash list and experience an above average crash rate or the crash rate must exceed the critical crash rate
- The project should reduce the number of crashes at the subject intersection location

In addition, the state has adopted the following policies and procedures:

- The Top 1000 Crash List is based on the state crash records system and is updated periodically
- Average crash rates are based on a compilation of information from a wide-array of intersections from around the Commonwealth (currently 0.87 crashes/million entering vehicles (C/MEV) for signalized and 0.66 C/MEV for un-signalized)
- Critical Crash Rate, the rate at which an intersection is considered a high crash location, is based on the Rate Control Quality Method [$xp = xc + k * (xc/m)^{0.5} - 1/(2m)$] yielding 1.77 C/MEV for signalized and 1.38 C/MEV for un-signalized intersections

Ongoing state efforts to improve the HSIP include:

- Refining the Top 1000 Crash List to segregate by location type
- Improving the crash location data by working with the Governor's Highway Safety Bureau (GHSB), law enforcement, and Registry of Motor Vehicles (RMV)
- Improving of the timeliness of crash data records
- Completing the crash data system interface with Geographic Information Systems (GIS) and the Road Inventory File (RIF)
- Expanding current roadway volume data
- Developing of crash rates for location type
- Establishing an evaluation process of crash reduction factors (pre- and post-improvement crash analyses) and cost-benefit ratio of improvement

In response to the requirements of SAFETEA-LU, MassHighway has undertaken the development of the Strategic Highway Safety Plan (SHSP). The SHSP will enable MassHighway to fulfill the component requirements of the HSIP process. States that adopt and implement an SHSP are provided additional flexibility to use federal Highway Safety Improvement Program (HSIP) funds for public awareness, education, and enforcement activities otherwise not eligible under this program. SAFETEA-LU states that in order to qualify for flexible safety funding, the state SHSP must be based on a collaborative process that includes the State DOT, the Governor's Representative for Highway Safety, and other major

State and local safety stakeholders, including: engineering, education, enforcement, and emergency services. The plan must also include an effective analysis of State crash data.

In order to initiate the development of the Massachusetts SHSP, MassHighway established the Massachusetts Strategic Highway Safety Plan Executive Leadership Committee. This committee is an interagency, intergovernmental committee with a membership from the following: Commissioner, Massachusetts Highway Department; Director, EOT - Office of Transportation Planning; Director, Governor's Highway Safety Bureau; Colonel, Massachusetts State Police; Registrar, Registry of Motor Vehicles; Commissioner, Department of Public Health; President, Massachusetts Chiefs of Police Association; Co-Chairs of the Joint Transportation Committee; Executive Director, Massachusetts Association of Regional Planning Agencies; and Division Administrators of Federal Highway Administration and Federal Motor Carrier Safety Administration; Regional Administrator, National Highway Traffic Safety Administration. On January 19, 2006, MassHighway hosted meetings of the Executive Leadership and the Steering/Advisory Committee, which was established to oversee the development of the plan. The Steering/Advisory Committee drafted a mission statement, a vision, and goals to guide the development of the plan. The members of the Executive Leadership Committee agreed to support MassHighway in its efforts to achieve the Mission, Vision, and Goals. The following Mission, Vision, and Goals have been established:

MISSION: Develop, promote, implement, and evaluate data-driven, multi-disciplinary strategies to maximize safety for users of the roadway system.

VISION: Provide the safest roadway system in the country and promote its safe use.

GOALS: Reverse the increasing trend of traffic-related fatalities and injuries upon implementation of the Massachusetts SHSP (towards zero fatalities and injuries).

- Achieve a 20% reduction from 476 (2004) lives lost in traffic-related fatal crashes by 2010.
- Achieve a 20% reduction from 5,554 (2004) in non-fatal traffic-related injuries requiring hospitalizations by 2010.

Six potential emphasis areas were established to serve as the major components of the Plan. Under each of these areas, multiple safety issues will be examined. The goal of this process is to have a multi-disciplinary team of stakeholders who have knowledge, interest, and experience in addressing the relevant issues of each emphasis area. The action teams are responsible for identifying, evaluating, and recommending strategies to address the following emphasis areas:

- Data Systems (including crash records, EMS data, etc.)
- At Risk Driver Behavior (including impaired driving, speeding, and occupant protection)
- Infrastructure (including lane departure crashes and intersection crashes)
- Public Education and Media (including how to "market" safety in Massachusetts)
- Leadership (safety program management, including legislative support)
- Vulnerable Transportation System Users (including young drivers, older drivers, mobility needs of diverse populations, pedestrians, bicyclists, and motorcyclists)

<u>Corridors</u>

In order to present, an opportunity for safety agencies at all levels of government to coordinate plans and efforts in saving lives on the road and highway network, the Old Colony Joint Transportation Committee (JTC) sponsored a presentation, and subsequent discussion, on September 14, 2006 by MassHighway safety analysts on lane departure crashes. Lane departure crashes are crashes where the vehicle leaves the roadway but does not strike another moving vehicle, or collides with a parked vehicle, or collides head on with another vehicle. The purpose of the discussion was to identify some of the "hot spot" crash locations in the region and to identify potential strategies to reduce and eliminate crashes at these locations. MassHighway provided OCPC with maps and data on lane departure crashes within the region. Invitations to participation at the meeting were extended to local highway officials, planners, boards of selectmen, local police, and state police. The overall goal of the initiative was to better understand the nature of lane departure crashes and to develop strategies to reduce these crashes. MassHighway presented their data on lane departures in the region and led the discussion at the meeting, which was attended by state police, local police, and highway officials. MassHighway will perform safety audits at the specific problem locations cited by the participants. OCPC staff will finalize the information, when feedback is collected from all OCPC communities, and will then submit the priorities on lane departure locations to MassHighway. Currently, the following corridors have been cited as priorities for lane departure crashes within the region:

- Route 24 - Including Route 24 in all OCPC communities: Stoughton, Avon, Brockton, West Bridgewater, and Bridgewater
- Thatcher Street - In Brockton and East Bridgewater
- The intersection of Prospect Street at North Main Street in Brockton
- Oak Street in Brockton
- Route 123 in Easton
- Route 138 in Easton
- Route 106 in Easton
- The intersection of Depot Street at Turnpike Street at the Easton/West Bridgewater line
- The intersection of Route 106 at Route 36 in Halifax
- The intersection of Route 58 and East Washington Street in Hanson
- Barker Street in Pembroke
- The Route 3A corridor in Kingston and Plymouth

<u>Intersections</u>

The Massachusetts Highway Department maintains a database of crashes occurring in Massachusetts based on crash reports submitted to the Massachusetts Registry of Motor Vehicles. MassHighway compiles a report annually on the top 1000 crash locations in the Commonwealth, as part of its HSIP development. The top 1000 crash locations list is based on a weighted average, with higher weights given to fatal crashes and injury crashes. This data is obtained from the Registry of Motor Vehicles and is based on local and state police crash reports.

The crash data provides information about each crash, including: the time of day the crash occurred; the number of people injured; the number of people killed; the direction of travel of vehicles involved; weather and lighting conditions at time of crash; the type of crash; and other pertinent location information. OCPC uses this data to discern trends in crashes and to develop a list of top 100 crash locations for the region. The frequency of types of crashes and the frequency of crashes at certain locations provides insight into crash exposure and helps to determine safety needs.

The weighted crash average is calculated to reflect the severity of crashes at intersections. The Weighted Crash Average is a numeric calculation derived by assigning a value of one for all crashes involving property damage only, 5 for all crashes, which involve personal injury, and 10 to all crashes, which result in a fatality.

Table 5-11 summarizes the crash histories in each community of the region for the years 1996 through 2005. This table includes the total number of crashes, the number of crashes involving personal injury, and the percentage of all crashes that resulted in personal injury. The furthest column to the right indicates the average annual change for both the total number of crashes and number of crashes involving injury in each community. Additionally, the bottom of the table contains the information for the region collectively, and shows the percent change in number of crashes from year to year.

Table 5-12 summarizes the top 100 high crash locations in the region based on MassHighways' crash database. This list of hazardous intersections is prioritized by the highest weighted average, utilizing the same weighted methodology used by MassHighway. Table 5-12 is based on the latest available data for the region (years 2003, 2004, and 2005). The latest available MassHighway Top 1000 High Crash Locations Report, which includes OCPC intersections, uses data from 1999, 2000, and 2001; therefore, OCPC researched the MassHighway database independently to derive the top 100 hazardous locations in the region in order to use more up to date crash data for this report. Figure 5-8 shows the locations of the top 100 high crash locations in the region.

Table 5-13
Regional Crash Data Trends, 1996-2005

		1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	1996 - 2005	Annual Growth
	Crashes	489	480	507	553	518	547	493	451	505	518	5,061	0.64%
	W/Injury	185	185	200	227	237	222	164	125	151	144	1,840	-2.75%
Abington	% W/Injury	37.83%	38.54%	39.45%	41.05%	45.75%	40.59%	33.27%	27.72%	29.90%	27.27%	36.36%	
	Crashes	271	294	290	286	269	265	197	187	184	243	2,486	-1.20%
	W/Injury	108	128	115	118	117	113	77	68	87	85	1,016	-2.63%
Avon	% W/Injury	39.85%	43.54%	39.66%	41.26%	43.49%	42.64%	39.09%	36.36%	47.28%	34.98%	40.87%	
	Crashes	592	455	476	529	456	580	546	501	556	563	5,254	-0.56%
	W/Injury	192	155	157	173	159	189	162	139	188	163	1,677	-1.80%
Bridgewater	% W/Injury	32.43%	34.07%	32.98%	32.70%	34.87%	32.59%	29.67%	27.74%	33.81%	28.95%	31.92%	
	Crashes	3,211	3,395	3,424	3,440	3,644	3,728	3,138	3,052	2,991	3,180	33,203	-0.11%
	W/Injury	1,436	1,582	1,602	1,585	1,701	1,616	1,353	1,254	1,300	1,298	14,727	-1.12%
Brockton	% W/Injury	44.72%	46.60%	46.79%	46.08%	46.68%	43.35%	43.12%	41.09%	43.46%	40.82%	44.35%	
	Crashes	327	568	289	300	313	330	310	285	268	311	3,301	-0.56%
	W/Injury	128	234	129	122	128	132	93	109	76	72	1,223	-6.19%
E Bridgewater	% W/Injury	39.14%	41.20%	44.64%	40.67%	40.89%	40.00%	30.00%	30.25%	28.36%	23.15%	37.05%	
	Crashes	561	591	492	549	593	527	478	480	458	512	5,241	-1.01%
	W/Injury	211	200	170	173	187	177	154	159	149	125	1,705	-5.65%
Easton	% W/Injury	37.61%	33.84%	34.55%	31.51%	31.53%	33.59%	32.22%	33.13%	32.53%	24.41%	32.53%	
	Crashes	101	90	102	92	134	110	96	113	109	104	1,051	0.33%
	W/Injury	42	33	45	35	51	37	45	41	34	43	406	0.26%
Halifax	% W/Injury	41.58%	36.67%	44.12%	38.04%	38.06%	33.64%	46.88%	36.28%	31.19%	41.35%	38.63%	
	Crashes	175	165	140	141	186	206	141	178	191	197	1,720	1.32%
	W/Injury	70	56	53	59	76	73	28	38	42	27	522	-10.04%
Hanson	% W/Injury	40.00%	33.94%	37.86%	41.84%	40.86%	35.44%	19.86%	21.35%	21.99%	13.71%	30.35%	
	Crashes	406	369	408	429	440	348	303	404	373	362	3,842	-1.27%
	W/Injury	29	119	145	123	141	99	104	118	130	111	1,119	16.08%
Kingston	% W/Injury	7.14%	32.25%	35.54%	28.67%	32.05%	28.45%	34.32%	29.21%	34.85%	30.66%	29.13%	
	Crashes	462	469	428	466	430	449	382	373	439	417	4,315	-1.13%
	W/Injury	152	173	160	157	154	162	123	130	137	124	1,472	-2.24%
Pembroke	% W/Injury	32.90%	36.89%	37.38%	33.69%	35.81%	36.08%	32.20%	34.85%	31.21%	29.74%	34.11%	
	Crashes	1,402	1,391	1,356	1,440	1,612	1,603	1,291	1,198	1,106	1,276	13,675	-1.04%
	W/Injury	419	428	391	395	432	412	369	370	367	370	3,953	-1.37%
Plymouth	% W/Injury	29.89%	30.77%	28.83%	27.43%	26.80%	25.70%	28.58%	30.88	33.18%	29.00%	28.91%	
	Crashes	69	75	53	48	77	59	65	53	45	69	613	0.00%
	W/Injury	17	24	18	23	22	21	19	15	16	22	197	2.91%
Plympton	% W/Injury	24.64%	32.00%	33.96%	47.92%	28.57%	35.59%	29.23%	28.30%	35.56%	31.88%	32.14%	
	Crashes	1,151	1,041	961	903	1,019	1,008	744	731	795	891	9,244	-2.80%
	W/Injury	427	365	349	314	333	299	239	202	223	221	2,972	-7.06%
Stoughton	% W/Injury	37.10%	35.06%	36.32%	34.77%	32.68%	29.66%	32.12%	27.63%	28.05%	24.80%	32.15%	
	Crashes	350	343	406	329	375	343	385	310	258	341	3,440	-0.29%
	W/Injury	136	142	155	118	147	143	148	120	97	133	1,339	-0.25%
W Bridgewater	% W/Injury	38.86%	41.40%	38.18%	35.87%	39.20%	41.69%	38.44%	38.71%	37.60%	39.00%	38.92%	
	Crashes	275	248	259	275	255	304	149	235	265	270	2,535	-0.20%
	W/Injury	88	86	81	90	70	67	37	61	78	74	732	-1.91%
Whitman	% W/Injury	32.00%	34.68%	31.27%	32.73%	27.45%	22.04%	24.83%	25.96%	29.43%	27.41%	28.88%	
	Crashes	9,842	9,974	9,591	9,780	10,321	10,407	8,718	8,551	8,543	9,254	94,981	-2.530%
	% Increase		1.34%	-3.84%	1.97%	5.53%	0.83%	-16.23%	-1.92%	-0.09%	8.32%		
	W/Injury	3,640	3,910	3,770	3,712	3,955	3,762	3,115	2,949	3,075	3,012	34,900	-4.590%
Region	% W/Injury	36.98%	39.20%	39.31%	37.96%	38.32%	36.15%	35.73%	34.49%	35.99%	32.55%	36.74%	

Table 5-14 Most Hazardous Intersections in the Region, 2003-2005

Rank	City/Town	Intersection	Number of Crashes	*Traffic Control	Property Damage Only	Injury Crashes	Fatal Crashes	Avg.
1	Brockton	West Elm Street / Ash Street	61	SS	25	36	0	**205**
2	Brockton	West Elm Street / Belmont Avenue	48	SS	13	34	1	**193**
3	Brockton	Crescent Street (Route 27) / Lyman Street	48	S	19	28	1	**169**
4	Brockton	West Elm Street / Newbury Street	53	SS	25	28	0	**165**
5	Brockton	North Main Street / Oak Street / Howard Street	54	S	27	27	0	**162**
6	Brockton	Reynolds Memorial Highway (Route 27) / Westgate Drive	62	S	38	24	0	**158**
7	Brockton	Belmont Street (Route 123) / Manley Street	48	S	23	25	0	**148**
8	East Bridgewater	Bedford Street (Route 18) / West Street (Route 106) / East Street	59	S	37	22	0	**147**
9	Brockton	Pleasant Street (Route 27) / Warren Avenue / North Warren Avenue	61	S	41	20	0	**141**
10	Brockton	North Montello Street (Route 28) / Howard Street (Route 37) / Albion Street	53	S	33	20	0	**133**
11	Brockton	Centre Street (Route 123) / Legion Parkway (Route 123) / Main Street	46	S	25	21	0	**130**
12	Brockton	Belmont Street (Route 123) / Pearl Street	48	S	28	20	0	**128**
13	Brockton	Court Street (Route 27) / Main Street / Pleasant Street (Route 27) / North Main Street	38	S	16	22	0	**126**
14	Brockton	Belmont Street (Route 123) / Belmont Avenue / Manomet Street	34	SS	11	23	0	**126**
15	Brockton	Centre Street (Route 123) / Quincy Street	47	S	29	18	0	**119**
16	Brockton	Main Street / Nilsson Street	46	SS	28	18	0	**118**
17	Brockton	North Montello Street (Route 28) / East Ashland Street	42	S	23	19	0	**118**
18	Brockton	North Main Street / East Ashland Street / West Ashland Street	40	S	21	19	0	**116**
19	Brockton	North Pearl Street (Route 27) / Oak Street Extension	43	S	25	18	0	**115**
20	Brockton	Belmont Street (Route 123) / West Street	33	S	13	20	0	**113**
21	Abington	Bedford Street (Route 18) / Brockton Avenue (Route 123)	44	S	27	17	0	**112**
22	Stoughton	Washington Street (Route 138) / Central Street	58	S	45	13	0	**110**
23	Pembroke	Washington Street (Route 53) / Columbia Road (Routes 53 & 139) / Schoosett Street (Route 139)	36	S	19	16	1	**109**
24	Brockton	Warren Avenue / West Elm Street	36	S	18	18	0	**108**
25	Abington	Bedford Street (Route 18) / North Avenue (Route 139) / Randolph Street (Route 139)	67	S	57	10	0	**107**
26	Plymouth	Long Pond Road / South Street / Pilgrims Highway (Route 3)	36	S	19	17	0	**104**
27	Brockton	Montello Street (Route 28) / Centre Street (Route 123)	38	S	23	15	0	**98**
28	Brockton	Montello Street (Route 28) / Court Street (Route 27) / North Montello Street (Route 28)	38	S	24	14	0	**94**
29	Brockton	North Montello Street (Route 28) / Field Street / Livingston Road	29	SS	13	16	0	**93**
30	Stoughton	Canton Street (Route 27) / School Street	41	SS	28	13	0	**93**
31	Whitman	Bedford Street (Route 18) / Auburn Street (Route 14)	47	S	37	9	1	**92**
32	East Bridgewater	Franklin Street (Route 27) / Oak Street (Route 14) / West Washington Street (Route 14)	43	SS	31	12	0	**91**
33	Avon	Harrison Boulevard / West Main Street	26	S	10	16	0	**90**
34	Brockton	Centre Street (Route 123) / Plymouth Street	34	FB	20	14	0	**90**
35	Plymouth	Samoset Street / Pilgrims Highway (Route 3) / Samoset Street (Route 44)	34	S	20	14	0	**90**
36	Brockton	Belmont Street (Route 123) / AmVets Memorial Highway (Route 24)	34	Yield	20	14	0	**90**
37	Brockton	Montello Street (Route 28) / Grove Street	25	S	9	16	0	**89**
38	Brockton	North Cary Street / East Ashland Street	37	S	24	13	0	**89**
39	Brockton	Pleasant Street (Route 27) / Ash Street / North Ash Street	31	SS	17	14	0	**87**
40	Easton	Eastman Street (Route 106) / Foundry Street (Route 123)	39	S	27	12	0	**87**
41	Brockton	Oak Street / Reservoir Street / Oak Street Extension	22	S	6	16	0	**86**
42	Bridgewater	Pleasant Street (Route 104) / AmVets Memorial Highway (Route 24)	30	None	16	14	0	**86**
43	Brockton	Belmont Street (Route 123) / Linwood Street	34	SS	21	13	0	**86**

Table 5-14 Most Hazardous Intersections in the Old Colony Region, 2003-2005 Continued

Rank	City/Town	Intersection	Number of Crashes	*Traffic Control	Property Damage Only	Injury Crashes	Fatal Crashes	Avg.
44	Brockton	Forest Avenue / Bouve Avenue / Manomet Street	32	SS	19	13	0	**84**
45	Stoughton	Lindelof Avenue (Route 139) / Technology Center Drive / Kay Way	35	S	23	12	0	**83**
46	Brockton	Pleasant Street (Route 27) / Reynolds Memorial Highway (Route 27)	29	S	17	11	1	**82**
47	Abington	Plymouth Street ((Route 58)) / Central Street	30	S	17	13	0	**82**
48	Brockton	Belmont Street (Route 123) / Forest Avenue	30	S	17	13	0	**82**
49	Whitman	Bedford Street (Route 18) / Temple Street (Route 27)	45	S	36	9	0	**81**
50	Easton	Foundry Street (Route 106) / Turnpike Street (Route 138)	32	S	20	12	0	**80**
51	Brockton	Montello Street (Route 28) / Lawrence Street	20	S	5	15	0	**80**
52	Brockton	Court Street / Cary Street / North Cary Street / Provost Street	19	S	4	15	0	**79**
53	Brockton	Pleasant Street (Route 27) / West Street	34	S	23	11	0	**78**
54	Brockton	Oak Street / Battles Street	24	S	12	11	1	**77**
55	Brockton	Pleasant Street (Route 27) / Belmont Avenue / Augusta Avenue	29	SS	17	12	0	**77**
56	Brockton	West Chestnut Street / Liberty Street	24	S	11	13	0	**76**
57	Brockton	North Quincy Street / East Ashland Street	24	SS	11	13	0	**76**
58	Stoughton	Pleasant Street (Route 139) / Central Street	35	S	25	10	0	**75**
59	Brockton	Ash Street / Forest Avenue	22	S	9	13	0	**74**
60	Kingston	Main Street (Route 106) / Summer Street (Route 3A)	34	FB	24	10	0	**74**
61	West Bridgewater	North/South Main Street (Route 28) / East/West Center Street (Route 106)	34	S	24	10	0	**74**
62	Pembroke	Church Street (Route 139) / Oak Street	26	S	14	12	0	**74**
63	Brockton	Pearl Street / West Chestnut Street	21	SS	9	11	1	**74**
64	Brockton	Main Street / Perkins Avenue / South Street	25	S	13	12	0	**73**
65	Brockton	Warren Avenue / Forest Avenue	27	S	16	11	0	**71**
66	Avon	East Main Street (Route 28) / East Spring Street / West Spring Street	27	FB	16	11	0	**71**
67	Brockton	Crescent Street (Route 27) / Quincy Street	31	S	21	10	0	**71**
68	Kingston	Duxbury Road (Route 3A) / Summer Street (Route 53)	22	S	11	10	1	**71**
69	Stoughton	Central Street / Pearl Street	39	S	31	8	0	**71**
70	Brockton	Belmont Street (Route 123) / Clinton Avenue / Cottage Street	19	SS	6	13	0	**71**
71	Whitman	Washington Street / Park Avenue / West Street	26	FB	15	11	0	**70**
72	Brockton	North Montello Street (Route 28) / East Battles Street	25	SS	14	11	0	**69**
73	Plymouth	Court Street (Route 3A) / Samoset Street (Route 44) / North Park Avenue	25	S	14	11	0	**69**
74	Brockton	Reynolds Memorial Highway (Route 27) / North Pearl Street (Route 27)	29	S	19	10	0	**69**
75	Stoughton	Turnpike Street (Route 139) / Page Street	33	S	24	9	0	**69**
76	Bridgewater	Broad Street (Route 18) / Main Street (Route 28) / Summer Street (Route 104) / Central Square	33	S	24	9	0	**69**
77	Brockton	Warren Avenue / Legion Parkway / Highland Street	21	S	9	12	0	**69**
78	Brockton	Belmont Street (Route 123) / Warren Avenue	24	S	13	11	0	**68**
79	Brockton	West Street / West Elm Street	27	S	18	8	1	**68**
80	Brockton	West Elm Street / Moraine Street	20	SS	8	12	0	**68**
81	Brockton	North Main Street / Battles Street / East Battles Street	23	S	12	11	0	**67**
82	East Bridgewater	Bedford Street (Route 18) / Whitman Street (Route 106)	27	S	17	10	0	**67**
83	Easton	Washington Street (Route 138) / Purchase Street	22	SS	11	11	0	**66**
84	Brockton	Warren Avenue / West Chestnut Street	22	SS	11	11	0	**66**
85	Pembroke	School Street (Route 27) / Center Street (Route 36)	25	S	16	8	1	**66**
86	Brockton	Commercial Street (Route 27) / Perkins Street / Crescent Street (Route 123)	26	S	16	10	0	**66**
87	Brockton	Bartlett Street / Fuller Street	14	SS	1	13	0	**66**

Table 5-14 Most Hazardous Intersections in the Old Colony Region, 2003-2005 Continued

Rank	City/Town	Intersection	Number of Crashes	*Traffic Control	Property Damage Only	Injury Crashes	Fatal Crashes	Avg.
88	Bridgewater	Pleasant Street (Route 104) / Elm Street / Old Pleasant Street	21	S	10	11	0	**65**
89	Brockton	Centre Street (Route 123) / Sheridan Street / Gladstone Street	17	SS	5	12	0	**65**
90	Stoughton	Central Street (Route 27) / Island Street	28	SS	19	9	0	**64**
91	Brockton	North Quincy Street / Chestnut Street / Boundary Avenue	19	SS	9	9	1	**64**
92	Brockton	Warren Avenue / Market Street	23	SS	13	10	0	**63**
93	East Bridgewater	Plymouth Street (Route 106) / Washington Street / Old Plymouth Street	23	SS	13	10	0	**63**
94	Brockton	Grove Street / Clinton Street / Curve Street	19	SS	8	11	0	**63**
95	Brockton	North Main Street / Wyman Street	17	SS	6	11	0	**61**
96	Brockton	North Warren Avenue / Spring Street	17	SS	6	11	0	**61**
97	Brockton	Torrey Street / West Street	21	S	11	10	0	**61**
98	Kingston	Cranberry Road / Independence Mall Way / Pilgrim Highway (Route 3)	24	S	15	9	0	**60**
99	Kingston	Duxbury Road (Route 3A) / Pilgrim Highway (Route 3)	28	Yield	20	8	0	**60**
100	Brockton	Warren Avenue / Nilsson Street	19	SS	9	10	0	**59**

*S = Signal, SS = Stop Sign, FB = Flashing Beacon
** This data relies on only crashes reported and defined by severity*
DATA SOURCE: MassHighway Traffic Operations, and Safety Management Unit

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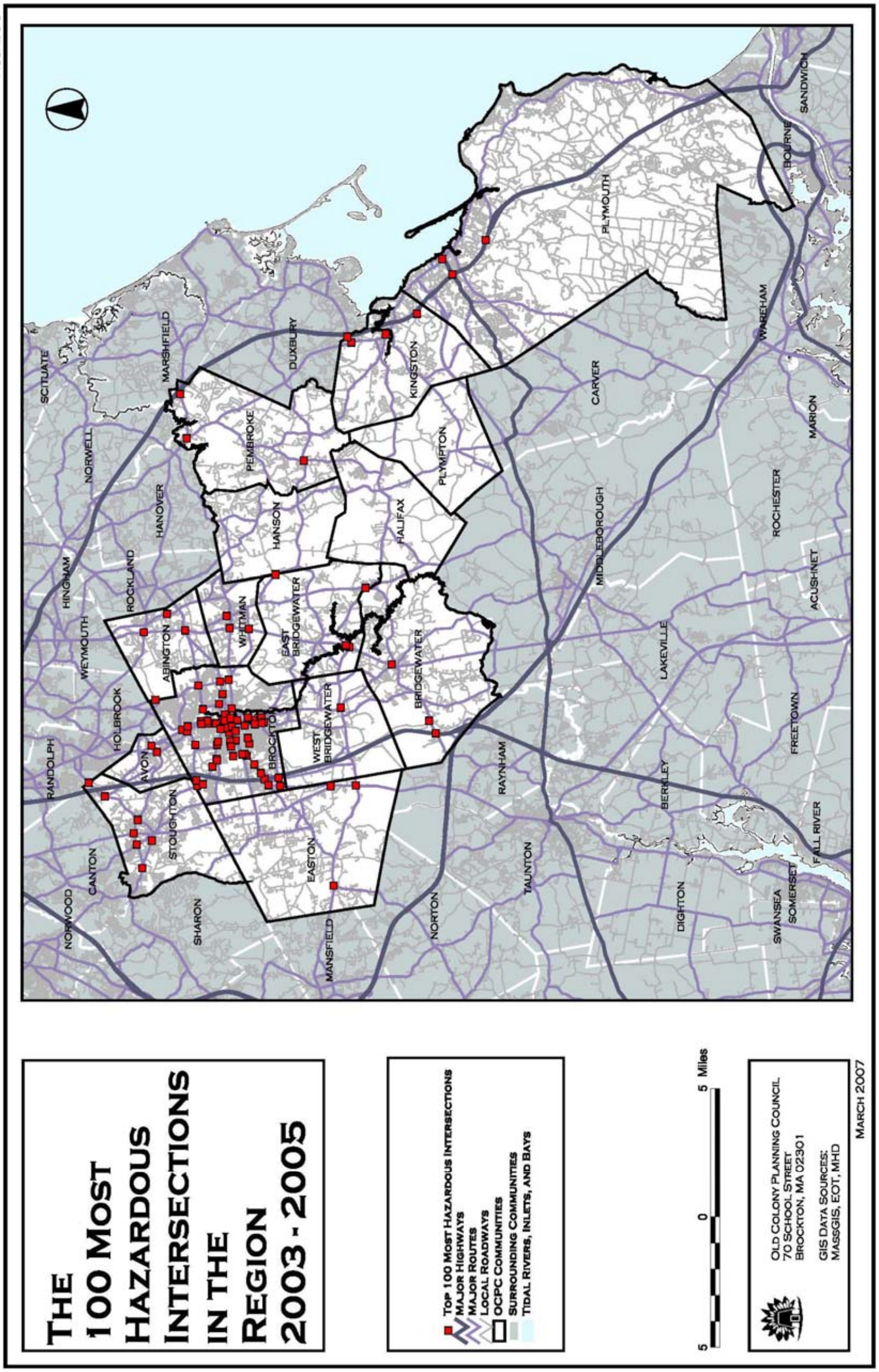
The 100 Most Hazardous Intersections in the Region 2003 - 2005
Top 100 Most Hazardous Intersections
Major Highways
Major Routes
Local Roadways
OCPC Communities
Surrounding Communities
Tidal Rivers, Inlets, and Bays
5
0
5 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, MHD
March 2007
Scituate
Marshfield
Duxbury
Norwell
Pembroke
Kingston
Plymouth
Hanover
Hanson
Halifax
Plympton
Carver
Hingham
Rockland
Whitman
East Bridgewater
Weymouth
Abington
Holbrook
Brockton
West Bridgewater
Bridgewater
Middleborough
Randolph
Avon
Stoughton
Easton
Canton
Norwood
Sharon
Mansfield
Norton
Taunton
Raynham
Lakeville
Berkley
Dighton
Swansea
Somerset
Fall River
Freetown
Acushnet
Rochester
Marion
Wareham
Bourne
Sandwich

Figure 5-8

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Information on fatal crashes in the region was compiled from MassHighway crash data. The information compiled from the data was specific to discern, as much as possible, the types, locations, and circumstances concerning the crashes, with the purpose of finding the root causes of fatal crashes. It is expected that an understanding of these causes will lead to specific improvements that can prevent future fatalities in motor vehicle crashes in the region. Table 5-13 shows the number of fatal crashes in OCPC communities for the period between 1990 and 2005.

Table 5-15
Fatal Crashes in the Region, 1990 - 2005

Community	Angle	Bicycle	Head On	Pedestrian	Rear End	Ran off road	Side swipe	Unknown	Total
Abington	5	0	5	2	1	7	0	1	21
Avon	3	0	3	3	2	1	1	1	14
Bridgewater	7	0	3	3	0	12	0	0	25
Brockton	32	1	11	22	2	41	1	8	118
East Bridgewater	3	0	2	4	0	2	0	1	12
Easton	3	0	8	1	0	16	0	1	29
Halifax	1	0	1	1	1	5	0	0	9
Hanson	1	0	3	2	0	7	0	1	14
Kingston	2	0	3	3	2	9	0	1	20
Pembroke	3	2	6	2	0	12	0	0	25
Plymouth	11	1	9	5	4	35	0	2	67
Plympton	2	0	1	0	0	2	0	1	6
Stoughton	9	2	0	7	2	10	2	0	32
West Bridgewater	3	0	1	5	1	9	0	0	19
Whitman	0	0	2	5	0	1	1	0	9
Totals	**85**	**6**	**58**	**65**	**15**	**169**	**5**	**17**	**420**

The City of Brockton experienced the most crashes that resulted in fatalities within the study time-period with 118 crashes. Plymouth had the second highest with 67 fatal crashes. Stoughton had 32, the third most highest, followed by Easton with 29, and Pembroke and Bridgewater each with 25. Abington had 21 fatal crashes, Kingston had 20, and West Bridgewater had 19 fatal crashes within the study period. Hanson and Avon each had 14 fatal crashes, followed by East Bridgewater with 12. Halifax and Whitman each had nine fatal crashes and Plympton had the least with six within the study time-period. In all, the OCPC communities experienced 420 fatal crashes between 1990 and 2005. Some of these crashes resulted in multiple deaths, therefore there were 445 fatalities that occurred due to the 420 crashes between 1990 and 2005.

Table 5-13 shows that there were 169 ran off the road type crashes that resulted in fatalities, 85 angle fatal crashes, 65 vehicle crashes that resulted in pedestrian deaths, and 58 fatal head-on collisions during the study period. There were 17 fatal crashes that were reported as unknown, 15 rear-end fatal collisions, six fatal collisions with a bicyclist, and five sideswipe collisions.

Figure 5-9 shows the locations of the fatal crashes within the region for the 1990 through 2005 study period.

Communities with major arterials, including Route 24 and Route 3, experienced higher numbers of fatal crashes, since many of the crashes occurred along these limited access highways, and on the ramps that connect them to the roadway system, due to higher speeds and higher volumes, which lead to higher exposure. Arterials and collectors that serve rural and suburban areas also experience high numbers of fatalities due to “ran off the road” type crashes that occur due to winding curves and limited sight distances. Some of these roads such as Route 106 in Kingston, Turnpike Street in West Bridgewater, North Cary Street in Brockton, and Bay Road in Easton, which were in existence before the prevalent use of the automobile, are not able to provide for safe travel at higher speeds due to limitations in the geometric design. These hazardous situations become amplified in those cases where driving conditions are slippery or the driver is impaired due to alcohol or lack of sleep. Pedestrian fatalities occurred in either urban situations, such as Brockton, or suburban situations whereby pedestrians were attempting to cross major high-speed, high-volume arterials.

Brockton led the OCPC communities regarding pedestrian fatalities with 22, Stoughton was second with seven, and Plymouth, West Bridgewater, and Whitman each had five pedestrian fatalities within the study area time period. All OCPC communities experienced pedestrian fatalities within the fifteen-year period except for Plympton. Some of these deaths were due to pedestrians being struck on high speed, limited access facilities such as Route 3 and Route 24 in Pembroke, Brockton, and West Bridgewater; however, most of the pedestrian fatalities occurred on facilities through urbanized areas, and on major arterials that have experienced commercial and residential growth. These facilities, such as Route 28 in Avon and Washington Street and Turnpike Street in Stoughton, combine higher speed through traffic (35 to 50 miles per hour) with increased commercial and residential activities. Although the preferred mode of choice along these routes is the automobile, pedestrian activity has increased and, in general, there are no pedestrian amenities such as sidewalks, crosswalks, or pedestrian signals available to accommodate pedestrian activity on these types of roads.

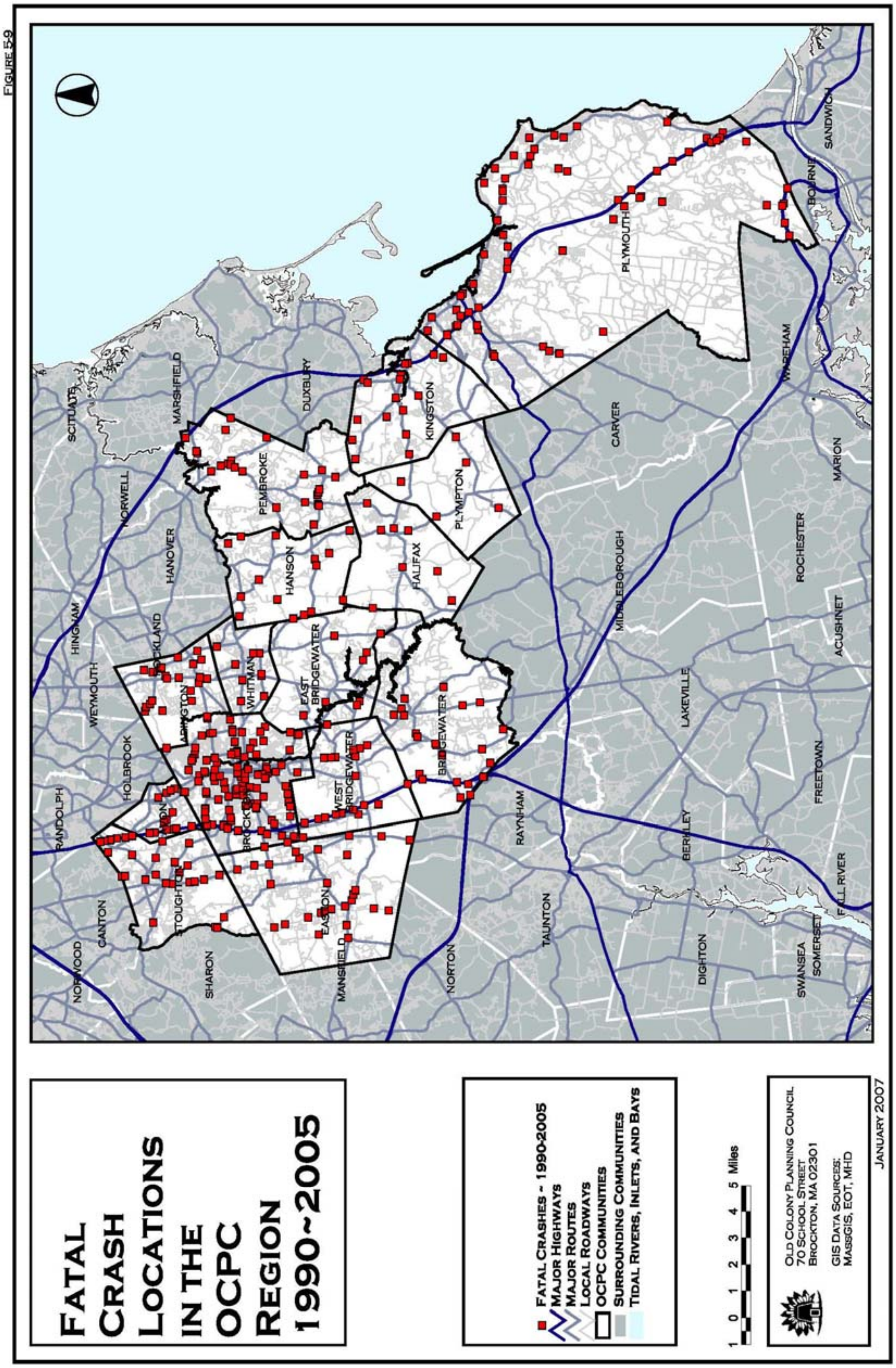
FIGURE 5-9
FATAL CRASH LOCATIONS IN THE OCPC REGION 1990~2005
FATAL CRASHES - 1990-2005
MAJOR HIGHWAYS
MAJOR ROUTES
LOCAL ROADWAYS
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
0 1 2 3 4 5 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, MHD
JANUARY 2007
PLYMOUTH
KINGSTON
DUXBURY
MARSHFIELD
SCITUATE
PEMBROKE
PLYMPTON
HALIFAX
HANSON
HANOVER
NORWELL
HINGHAM
ROCKLAND
WEYMOUTH
ABINGTON
WHITMAN
EAST BRIDGEWATER
BRIDGEWATER
WEST BRIDGEWATER
BROCKTON
HOLBROOK
RANDOLPH
AVON
STOUGHTON
CANTON
NORWOOD
SHARON
EASTON
MANSFIELD
NORTON
TAUNTON
RAYNHAM
MIDDLEBOROUGH
CARVER
WAREHAM
BOURNE
SANDWICH
MARION
ROCHESTER
ACUSHNET
LAKEVILLE
FREETOWN
BERKLEY
DIGHTON
SOMERSET
SWANSEA
FALL RIVER

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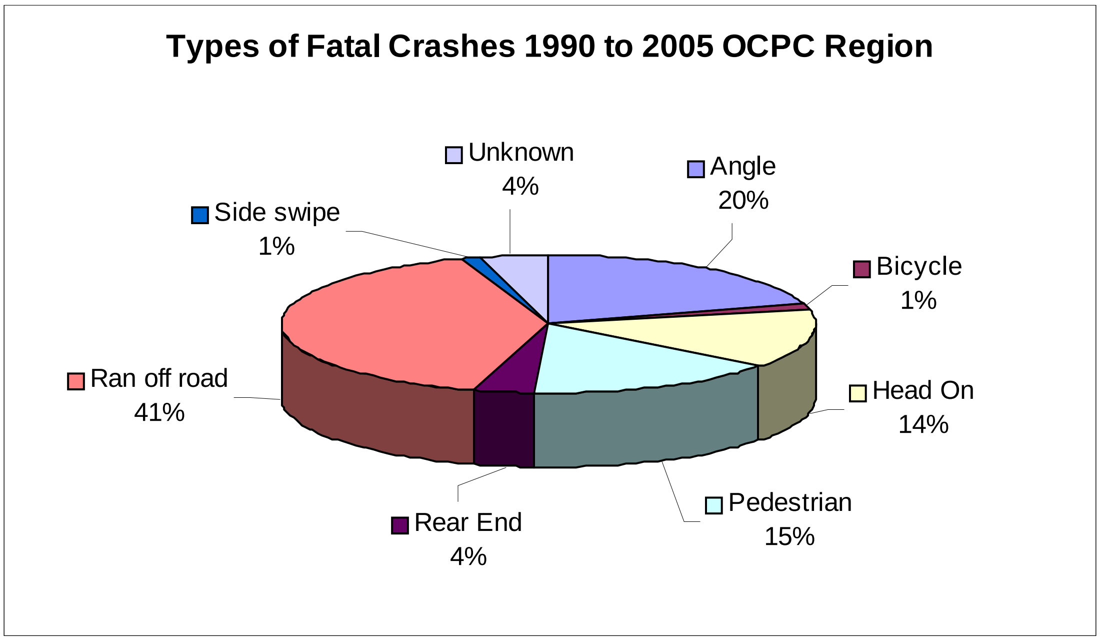
Figure 5-10 shows the types of fatal crashes in the OCPC region. Figure 5-10 shows that lane departure crashes (ran of the road, sideswipe, and head-on) make up the highest percentage of fatal crashes (total 56 percent.) Angle type crashes, which usually occur at intersections, but sometimes occur along a roadway at curb cuts, make up the second highest percentage of crashes (20 percent.) Crashes involving pedestrians also account for a significant percentage of fatal crashes with 15 percent of all fatalities involving a motor vehicle collision with a pedestrian. There were four percent rear-end fatal type crashes and four percent fatal crashes reported with unknown crash type occurring within the study time period. Bicycle fatalities make up the least percentage of fatal crashes in the region with one percent occurring in the study time-period.

Figure 5-10



5.1.5 Congestion Mitigation Process (CMP)

Introduction

The major function of the roadway system is to facilitate the movement of people and goods in an efficient and safe manner. The quality of life and the viability of the economy are affected by the design and layout of the local roadway system, the physical condition and safety of the system, the behavior of users on the system, the inter-connectivity between alternative modes, and the volume of traffic and operational conditions within the system.

Federal regulations define congestion on a transportation facility as a level of performance that is deemed unacceptable due to traffic interference. The acceptable level of performance varies from state to state. In addition, the types of transportation modes and links also vary from place to place. Therefore, the regulations require an effective CMP that provides information on enhancing performance and identifies effective congestion reducing strategies that meet the needs of the particular region.

In general, the root causes of congestion can be summarized into two main categories:

1. **Too much traffic exists on a facility for the available physical capacity to handle –** There is a limited amount of traffic that can be moved on a roadway for a given time, or only so many transit patrons that can be accommodated in a given number of buses or trains. This is considered the physical capacity of the system. Bottlenecks occur at locations where the physical capacity is restricted, with flows from upstream sections (with higher capacities) being funneled into smaller downstream segments. When traffic flow breaks down to stop-and-go conditions, capacity is actually reduced. Bottlenecks can be very specific chokepoints in the system, such as a poorly functioning freeway-to-freeway interchange, or an entire highway corridor where a "system" of bottlenecks exists, such as a closely spaced series of interchanges with local streets. Physical capacity can be reduced by the addition of "intentional" bottlenecks, such as traffic signals and tollbooths. Bottlenecks can also exist on long upgrades and can be created by "surges" in traffic, as experienced around resort areas, or due to specific events (sports events, parades, etc.).[1]

2. **Traffic Incidents** – In addition to the physical capacity, external events can have a major effect on traffic flow. These include traffic incidents such as crashes and vehicle breakdowns; work zones; inclement weather; special events; and poorly timed traffic signals. When these events occur, their main impact is to subtract physical capacity from the roadway. Events also may cause changes in traffic demand by causing travelers to rethink their trips (e.g., snow and other types of severe weather). The level of congestion on a roadway is determined by the interaction of physical capacity with events that are taking place at a given time. The effect of a traffic incident depends on how much physical capacity is present. Consider a traffic crash that blocks a single lane on a freeway. That incident has a much greater impact on traffic flow if only two normal lanes of travel are present than if three lanes are present. Therefore, strategies that improve the physical capacity of bottlenecks also lessen the impacts of roadway events such as traffic incidents, weather, and work zones.[2]

[1] Cambridge Systematics, July 2004 (for FHWA) Traffic Congestion and Reliability: Linking Solutions to Problems Page ES-5.
[2] Cambridge Systematics, July 2004 (for FHWA) Traffic Congestion and Reliability: Linking Solutions to Problems Page ES-5, ES-6.

Specific issues that contribute to congestion include:

- Interchange spacing too short on limited access highways
- Inadequate acceleration/deceleration lanes
- Poor access control on arterials
- Lack of incident management plan
- Poor signal timing
- Lack of signal coordination
- Special events/other
- Inclement weather
- Low vehicle occupancy
- Work zones
- Bottlenecks due to too many trips occurring within a narrow time frame
- Adjacent land use development inconsistent with the transportation system
- Crashes
- Driver behavior/distractions
- Lack of adequate roadway, transit, and or parking capacity

The cost of congestion can be measured in dollars as well as time. There is a direct link between transportation investment, travel conditions (congestion and reliability), and economic productivity. Two key trends have a substantial impact on the total cost of moving freight:

- As congestion spreads into the midday, which is typically the peak travel period for trucks, more direct costs will be incurred.
- Reliability – For trucks, the ability to hit delivery windows predictably will decrease and will add even more costs as firms struggle to optimize delivery schedules. This is especially a problem for truckers who must meet "just-in-time" delivery schedules set by shippers, manufacturers, and retailers.

In decades past, the region's commuting patterns have had a strong north-south orientation. Based on OCPC's monitoring program that north-south orientation is still prevalent; however, commuting patterns have gradually become more dispersed due to the dispersion of both residential growth and employment centers in eastern and southeastern Massachusetts. Despite this, a substantially higher proportion of the work force residing in the Old Colony region commutes to Boston and Cambridge than do their counterparts from north and west of Boston. Access to Boston remains an important priority because of the area's strong population growth and the heavy reliance on Boston and points north for employment. Reduced commuter travel time, increased transit availability to more communities, and a reduction in highway congestion present significant benefits for South Shore residents. Nevertheless, access to Boston is not the only focus of the region's planning efforts to improve the transportation system. Recent census trends have shown an increase in the development of large employment centers in the outlying suburbs of metropolitan Boston. Corporations attracted by land availability and lower costs are locating office centers in suburban areas such as Stoughton, Avon, Norwell, Rockland, and Foxborough. This increase in the dispersal of employment opportunities has created an increase in suburb-to-suburb trips. In contrast, the changing land patterns in the region and the redevelopment of industrial properties, which have been adapted for other mixed uses such as residential, commercial, and office, provide unique opportunities to reduce the length and number of auto trips and also to make better use of transit and inter-modal connections.

Corridor Congestion

The volume to capacity ratio (V/C) has been an important attribute in determining the inclusion of facilities in the CMP. It is based on the relationship between a facility's theoretical capacities and the actual volumes utilizing the system. The capacity of a road or facility can be thought of as its ability to process traffic, measured in both the physical space available and in time, or the speed at which vehicles can travel (how quickly, measured in time, the vehicle traverses the facility). Traffic volumes are the primary indicator of the demand for roadway travel. Congestion (when demand exceeds supply) can be measured by comparing traffic volumes to roadway capacity. The higher the volume to capacity (V/C) ratio, the more congestion exists (in actual traffic operations, V/C ratios do not exceed 100 percent, but higher values generally indicate that congestion spreads beyond the typical rush hours into other parts of the day). A V/C ratio of 0.80 or above is used as a threshold for screening congested facilities.

Roadway travel time (including travel speeds), based on real-time observations from field data, shows delay and congestion through road corridors. Travel time studies are a direct measure of congestion and are readily understood by non-technical and technical audiences. Average travel speeds are used to evaluate the quality of traffic movement along a route. Average speeds are useful in determining the locations, types, and extents of re-occurring traffic delays. The Highway Capacity Manual (HCM) uses travel speed as a measure of performance for a roadway segment. Levels-of-service for urban arterials and freeways are defined by the HCM in terms of average travel speeds.

The data collection effort for the CMP has focused on both traffic volumes and travel time and delay studies to monitor congestion within the highway system. The data collection effort includes travel time and delay studies, automatic traffic recorder counts (24-hour counts), and manual, peak hour turning movement counts. The data collection procedures and techniques are based on industry standards published by the Institute of Transportation Engineers (ITE) in their publication, Manual of Traffic Engineering Studies. The floating car technique was used for travel delay data collection, whereby a technician travels the route going with traffic, records the stop time at intersections (or other locations), and records the time he/she passes through the intersection.

All roadways that the regional travel demand model (both the state model and the OCPC model) has identified as congested (based on a V/C $\geq$ 0.80), as well as those that are observed directly as congested are included in the Old Colony Congestion Management Process. Traffic congestion (V/C $\geq$0.80) in the region is shown in Figure 5-11 and is summarized as follows:

Route 3 From Plymouth/Bourne Town Line To Pembroke/Hanover Town Line - As traffic volumes continue to grow on this highway, additional capacity will be required. Currently, South Shore commuters encounter pockets of moderate to heavy congestion during the morning and afternoon peak hours in Plymouth, Kingston, and Pembroke. Traffic on Route 3, north of Exit 12 in Pembroke, experiences chronic congestion during the morning and afternoon peak hours. This congestion extends to I-93. Although the recorded average daily traffic volume in 2005 at the Bourne town line on Route 3 was 36,000 vehicles per day (vpd), the volume was over 79,000 vpd fifteen miles to the north on Route 3 north of Smiths Lane. The number of vehicles per day on this highway increases twofold over a fifteen-mile stretch.

A corridor needs study completed by MassHighway concluded that by the year 2020, level of service "F" conditions, which indicate facility breakdown or forced flow, will extend back from I-93 to Duxbury on Route 3. Based on this study, Route 3 will be considered at capacity, or at level of service, "E" conditions back through Kingston and Plymouth by the year 2020.

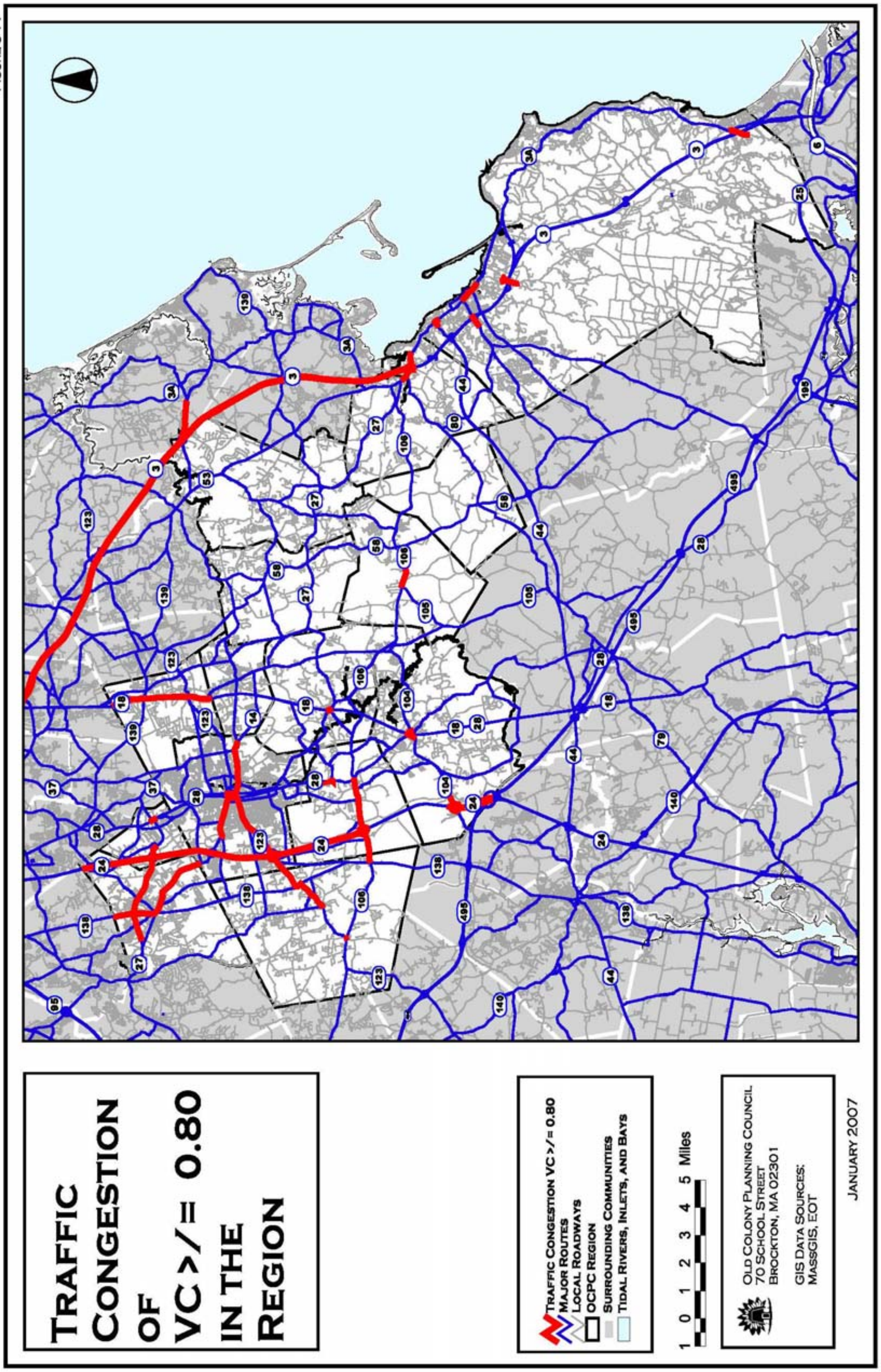


FIGURE 5-11
TRAFFIC CONGESTION OF VC >/= 0.80 IN THE REGION
TRAFFIC CONGESTION VC >/= 0.80
MAJOR ROUTES
LOCAL ROADWAYS
OCPC REGION
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
0 1 2 3 4 5 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT
JANUARY 2007

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The widening of Route 3 has been a top priority for the Old Colony Planning Council for a number of years. The recently completed relocation project for Route 44 represents a major capital investment in the area. The newly relocated Route 44 opened to traffic in 2005. Route 3 between exits 6 and 7, has been widened to six lanes in order to accommodate the Route 44 relocation project. Recent large-scale residential development in southern Plymouth will also have a major impact on traffic commuting to and from Boston via Route 3. The Wareham Road mixed use development will add 1,285 housing units to Plymouth and the Pine Hills Development will add approximately 2,000 housing units to Plymouth. It is expected that both of these major developments will affect traffic on Route 3.

Route 3A in Kingston and Plymouth – Chronic congestion exists within this corridor in Plymouth and Kingston. In Kingston, there are specific congestion points at Route 3A and Route 53, Route 3A at Evergreen Street in the vicinity of the railroad crossing in the downtown, and on the section of Route 3A from Spring Street to Route 106.

Heavy volume during the peak period, the existence of on-street parking, and frequent intersections with busy side streets all contribute to congestion along Route 3A in both Kingston and Plymouth. The downtown Plymouth section and the local business center in Kingston generate a great deal of entering and exiting traffic, which substantially slows traffic flow. This corridor is also very close to major tourist activity, especially in summer months. The Route 3A Plymouth downtown corridor experiences congestion in the vicinity of Samoset Street (Route 44), south through the downtown to the Water Street/Route 3A intersection. In addition, Route 3A experiences congestion in the Cedarville area in south Plymouth at the Route 3A (Herring Pond Road) interchange with Route 3.

An in-depth study of this corridor is currently underway by OCPC, and will be completed in 2007. The continued growth and expansion of the population and seasonal tourist economy; the newly completed Route 44, and the Route 3 widening contribute towards the increased congestion problems already experienced within this corridor.

Route 18 From The Weymouth/Abington Town Line to the Abington/Whitman Town Line – Route 18 is the major North-South route in Abington. Major congestion occurs on Route 18 beginning in Weymouth and extending south into Abington. Congestion has become increasingly problematic between Route 123 and Randolph Street (Route 139) during peak periods, at off-peak times, and during the weekends. Long delays occur at the Brockton Avenue (Route 123) intersection and at the Randolph Street (Route 139) intersection. The re-use of the South Weymouth Naval Air Station is expected to have a major impact on Route 18 traffic, although this project is located in South Weymouth just north of the Abington town line. Improvements to Route 18 in anticipation of the Naval Air Station re-use plan include the widening of Route 18 in Abington from Route 139 to Highland Place in Weymouth. This project is presently in the design phase. Recent completed projects on Route 18 in Abington include the reconstruction of Route 18 south from the Route 139 intersection to the Whitman town line and improvement to traffic signals at Route 18 and Route 139.

Route 24 From Raynham/ Bridgewater Town Line To Stoughton/ Canton Town Line –
Route 24 is a six-lane, limited access highway (within the OCPC region) that provides north south access between I-93 and Route I-495. Route 24, within the OCPC region, is over capacity during the morning and afternoon peak hours due to extremely heavy traffic volumes. The V/C ratio for Route 24 is above 0.80 in the sections between I-495 and Route 104 in Bridgewater, and in Brockton and Avon from the Route 27 interchange north. In addition to chronic congestion, frequent incidents due to crashes and curiosity cause long delays within this corridor resulting in back-ups for several miles. Capacity enhancements within this corridor were recommended in previous Regional Transportation Plans, along with designating this highway as an interstate. As part of the interstate designation, shoulder widths and

acceleration and deceleration lanes would have to be improved to conform to interstate standards. Improvements to travel conditions during peak periods within the corridor can be realized through capacity enhancement (possibly by adding HOV lanes) and the development of incident management techniques.

Route 27 Stoughton, Brockton, and East Bridgewater - The Route 27 corridor totals approximately 16.5 miles, contains eighteen (18) signalized intersections, and crosses the MBTA commuter rail lines at three (3) separate grade crossings. Considerable delays occur at most signalized intersections along this corridor. The longest delays occur at intersections in and around Brockton. Most of the average speeds fall below 20 miles per hour and some even below 10 miles per hour causing major delays during the peak periods. The volumes on Route 27 in Stoughton and Brockton range between 20,000 and 25,000 vehicles per day.

A number of intersection and roadway improvements for Route 27 are programmed in the Transportation Improvement Program. Route 27 is currently being reconstructed in East Bridgewater and Hanson. This project includes the realignment and signalization of Route 27 at Route 14 in East Bridgewater just west of the Hanson town line. Mass Highway recently completed the reconstruction and widening of the Route 27 (North Pearl Street)/Oak Street intersection in Brockton.

Route 28 Avon, Brockton, West Bridgewater, and Bridgewater - The Route 28 corridor, within the OCPC region, runs north to south from Avon to Bridgewater. Route 28 runs parallel to Route 24 and I-495 through most of southeastern Massachusetts. The highway intersects several major east west corridors in the region (Route 37, Route 123, Route 27, Route 106, and Route 104) and is often used as an alternative to Route 24 and Route 138 due to congestion on those roadways. Major land uses along Route 28 include Bridgewater State College, MCI Bridgewater, county, state, and federal courthouses in downtown Brockton, MBTA and BAT stations in Brockton, and numerous commercial and industrial facilities. Route 28 includes two and four lane sections in Avon and north Brockton, a narrow two-lane section through downtown Brockton, two and four lane sections in south Brockton, two lane sections through West Bridgewater to Bridgewater Center, and a high-speed, two lane section through Bridgewater south of the center as Route 28 merges with Route 18. The highest daily volumes within the corridor are located at Bridgewater Center (30,000 vehicles per day) and in Avon just south of Harrison Boulevard (28,300 vehicles per day). The average daily traffic (ADT) through Brockton downtown ranges between 9,900 and 15,500 vehicles per day. The ADT through West Bridgewater ranges from 13,400 to 17,500 vehicles per day. The ADT on Route 28 south of Bridgewater center is about 16,800 vehicles per day and about 13,400 vehicles per day at the Middleborough town line

A study of the Route 28 corridor study, recently completed by OCPC showed that there are a number of congestion hot spots at several locations within this corridor. In Avon, the signalized Harrison Boulevard/Route 28 intersection currently operates under acceptable levels of service during the peak hours; however, the un-signalized East/West Spring Street intersection with Route 28, which is located just north of the Harrison Boulevard intersection, experiences long delays and queuing on the side street approaches due to heavy Route 28 volumes. There are insufficient gaps within the Route 28 traffic stream during the peak hours, which causes long delays for side street traffic attempting to enter Route 28. This problem is exacerbated due to the heavy left turn movements from East Spring Street to Route 28, which then go right on Harrison Boulevard for access to Route 24 in the morning peak. This movement is reversed from Harrison Boulevard to Route 28 and East Spring Street during the afternoon peak. The installation of signals at the Route 28/East/West Spring Street intersection coordinated with the Harrison Boulevard signals would improve peak hour flows at this location.

Although the peak hour levels of service at a series of intersections in Downtown Brockton are within acceptable ranges, the cumulative delays at Court Street, Crescent Street, School Street, and Centre Street create a bottleneck for peak hour traffic flows. The upgrade and coordination of traffic signals in the Brockton downtown will improve flows in this segment. The traffic signals at Route 28 and Perkins Avenue in Brockton are antiquated and are pre-timed. These signals, along with the signals at the Main Street/Perkins Avenue intersection, are the oldest in the city and should be updated and coordinated.

Congestion problems along the Route 28 corridor in West Bridgewater occur at the Matfield Street intersection and at the town center where Route 28 intersects Route 106. Peak hour traffic is police controlled at the Matfield Street intersection due to the lack of sufficient gaps in the mainstream traffic, which causes long delays for side street traffic turning on to the major road. The installation of signals will improve the overall safety and operation at this intersection. The Route 28/Route 106 intersection in West Bridgewater is a major bottleneck location for both highway corridors. Long delays and queuing at this location are due mainly to heavy peak hour volumes. This intersection also requires alignment modifications for safety improvement.

The Route 28 corridor traverses Central Square in Bridgewater forming a signalized intersection with Route 18 and the town center oval at the northern end of the square. The southern end of the town oval is yield controlled for vehicles entering from South Street and Route 28 (Bedford Street). Analyses of peak hour flows for the Route 28 Corridor Study showed that the vehicles in the oval northbound experienced long delays and queuing at the signalized Route 28/ Route 18 intersection. These vehicles queue back into the oval during the afternoon peak and block the yield approaches at South Street and Route 28 (Bedford Street) thereby creating forced flow conditions at the oval.

Current improvements in traffic flow programmed for the Route 28 corridor include: the reconstruction of the Route 28/Route 37 intersection in Brockton (nearly complete), reconstruction of the Route 28 and Keith Avenue and Plain Street intersection (presently under design), reconstruction of the Route 106/Route 28 intersection at West Bridgewater center (under design), and installation of traffic signals at Winter Street and Route 28 in Bridgewater (presently under design).

Future actions to help improve traffic flow and safety within the Route 28 corridor include implementing access management strategies and improving signs, traffic channeling, pavement markings, sidewalks, and intersection alignment.

<u>Carver Street/Samoset Street in Plymouth</u> - Samoset Street, west of Route 3 (formerly Route 44), was reconstructed in the late 1990s. Since then, congestion has been limited to the junction of Route 3A and Route 44 and the junction of Route 3 and Route 44. The Average Daily Traffic west of Route 3, in 2002 was 40,112. These volumes are indicative of increased commercial and residential growth in this corridor over the past decade. The newly constructed Route 44, which is presently open to Route 3, is expected to significantly decrease traffic volumes along the old Route 44 corridor. Traffic conditions will be closely monitored by OCPC as the transition in traffic continues from the old Route 44 to the new relocated Route 44.

<u>Route 106 in Easton and West Bridgewater</u> - Route 106 between Route 24 and Route 28 is highly utilized by commuters for access to Route 24 from the Easton, East Bridgewater, and West Bridgewater area. Route 106 intersects Route 138 in Easton, Route 28 in West Bridgewater, and Route 18 in East Bridgewater, and provides access to and from Route 24 for these important regional arterials. In Easton, the average daily traffic on Route 106 is approximately 20,000 vehicles per day east of Route 138. The average daily traffic volume on Route 106 east of Route 24 in West Bridgewater is 34,600 vehicles per day. The average daily traffic on Route 106 at the East Bridgewater/West Bridgewater town line is 15,400 vehicles per day. Congestion within this corridor occurs in the vicinity of the Route 24 interchange in West Bridgewater. Route 106 tapers from two lanes at Route 24 to one lane immediately

east of this location. The intersections of Manley Street/Route 106 and Route 106/North Elm Street also experience delays during the peak period.

Reconstruction of the Route 28 and Route 106 intersection and the widening of Route 106 between Route 28 and the Easton Town Line are currently programmed in the Transportation Improvement Program. Both projects are currently in the design stage. Route 106 is among the most important east-west roadways in the Old Colony region, ranking in importance with Route 27 and Route 44, and improvements to the corridor are very important for improvement in the overall quality of transportation in southeastern Massachusetts, especially with increasing commercial development within this corridor.

<u>Route 106 in Halifax and East Bridgewater</u> – Increases in residential development in East Bridgewater and Halifax have added to the commuter traffic demand on this important east west arterial in the OCPC region. Route 106 is used as an alternative to Route 44 for east west access between the Brockton area and the Kingston/Plymouth area. In addition, increased commercial development along Route 106 in Halifax is transforming the function of Route 106. In addition to carrying through traffic, Route 106 is becoming a commercial corridor as well, with traffic accessing adjacent land uses through multiple driveways. The average daily traffic in this corridor ranges from 12,000 to 15,700 vehicles in East Bridgewater and Halifax. One of the major problems, especially in the commercial corridor in Halifax, is the lack of sufficient gaps within the Route 106 traffic stream to allow traffic from the side streets or commercial curb cuts to enter the mainstream traffic flow, especially during the peak hours. The application of access management techniques, such as the consolidation of curb cuts and the use of service roads, will help prevent delays on Route 106 and enhance safety by reducing turning movement conflicts from side streets and driveways with through traffic.

<u>Route 123 in Easton and Brockton</u> - This east west corridor is approximately 10.85 miles. There are twenty signalized intersections in the eastbound direction and eighteen in the westbound direction within the corridor. Route 123, within the corridor, has two lanes with some segments providing four lanes of travel. Average Daily Traffic on Route 123 ranges from 13,400 to 28,000 vehicles. Major delays occur on Route 123 in the vicinity of the Route 24 interchange in Brockton just east of the Easton town line, on Route 123 just east of Route 24 to Linwood Street (in the vicinity of the Brockton Veteran's Affairs Health Center), and between Warren Avenue and Commercial Street in downtown Brockton. Average speeds during the peak period range from about 5 to 15 miles per hour, in this section, and speeds average only about 25 miles per hour throughout the remainder of the corridor. The alignment of the corridor is disjointed at intersection locations in Easton (as it crosses Route 138) and in the Brockton downtown, which adds to the delays along the route. Although roadway improvements and intersection upgrades have occurred along the corridor in recent years, areas of severe congestion remain. There is increased demand within this corridor due to its use as an alternative route for access between Route 24 and I-495, especially when these limited access highways are congested.

<u>Route 138 From The Canton/ Stoughton Town Line To Junction Of 138 / 27 / 139 In Stoughton -</u> This corridor is approximately 1.6 miles in length. This corridor experiences heavy volumes during the average weekday and during the morning and afternoon peak hours. This corridor runs parallel to Route 24 and is used as an alternative to Route 24 during the morning and afternoon peak hours. The average daily traffic in this section reaches about 22,400 vehicles per day.

<u>Route 139 From The Junction Of Route 139/53 In Pembroke To The Pembroke/Marshfield Town Line</u> - The congestion on this facility occurs generally during the peak afternoon commute time. Average daily traffic volumes in 2000 on Route 139 were 31,756 at the Marshfield Town Line and 24,850 west of the Oak Street intersection. On Route 139, just east of the Route 53 intersection, the recorded traffic volume in 2002 was 17,185. The heaviest volumes and worst congestion problems occur in the vicinity of the Route 3 interchange. The large volumes exiting and entering the Route 3 Interchange, coupled with the

extensive commercial development along the corridor, contribute toward the congestion problems of this facility.

Harrison Boulevard/Central Street In Avon And Stoughton (between Route 28 and Route 27) - Harrison Boulevard provides an important urban arterial providing east west connection between the Route 28 corridor and Route 24 in Avon. Harrison Boulevard continues west from Avon into Stoughton as Dykeman Way and Central Street. Central Street in Stoughton intersects Route 139 and Route 138, which serve as north south alternatives to Route 24. In addition, Central Street connects to Route 27 in west Stoughton. The Town of Avon has several major traffic generators that impact this corridor including the Avon Industrial Park, located along Bodwell Street between Pond Street and Wales Avenue. This industrial park is the home of several major employers and trucking facilities that generate approximately 8,000 trips on a typical weekday. On Route 28, Wal-Mart, along with numerous other small businesses along the route, contributes to the heavy volumes along the Harrison Boulevard/Central Street corridor. A major retail center is located on Stockwell Drive just west of Route 24 interchange 19. Stockwell Drive features a number of large retailers such as Home Depot, Staples, Ikea Furniture, Jordan's Furniture, and Christmas Tree Shops that generate large volumes of traffic in both Stoughton and Avon along this corridor.

The road capacity varies along this corridor. The western portion of the route, from the Stoughton town line to Pond Street, is a four-lane highway providing higher speeds of travel with limited access. A raised concrete median with guardrails divides this section, allowing higher capacity and greater travel speeds. The central portion, from Pond Street to Route 28, also has limited access and transitions into a two-lane undivided highway at Pond Street. Major intersections in Avon include Harrison Boulevard at West Main Street and Harrison Boulevard at Pond Street. Recent improvements in the corridor include the reconstruction of the West Main Street/Harrison Boulevard intersection, which is currently under construction. The average daily traffic ranges from 20,000 vehicles per day on Harrison Boulevard to 23,000 vehicles per day on Central Street east of Turnpike Street.

Main Street / North Main Street In Brockton From Plain Street To Avon Town Line - Congestion in the Main Street corridor in Brockton Downtown is centered between the West Elm intersection and the Pleasant Street intersection. This section is presently one-way in the northbound direction. Parking within this section is allowed and parking maneuvers, along with pedestrian activity, contribute to the overall delay. In addition, congestion occurs further north of the downtown on North Main Street with bottlenecks at major signalized intersections such as the Howard Street intersection. The Brockton Central Area Traffic Study included the study of Main Street in Downtown Brockton with several alternative recommended circulation patterns. The current Old Colony TIP contains a project for the re-introduction of two-way traffic on Main Street in the downtown. This project will require a number of signal and intersection upgrades. The City of Brockton is currently updating the 1999 Feasibility Study.

Intersections

The Congestion Management Process (CMP) is designed to identify key intersections that demonstrate congestion, excessive delays, and circulation problems. The CMP identifies these congested facilities through studies completed by OCPC and other agencies and organizations, and through the ongoing monitoring of facilities. Standard operating procedures have been adopted for data collection that allows the monitoring of intersections within the region specifically targeted due to congestion.

The CMP has identified congested intersections, based on a threshold of LOS "D" or less, within the Old Colony region. Table 5-14 lists these intersections, their deficiencies, and potential improvements (potential improvements are discussed further under section 5.3 System Improvements):

Crash rates, expressed in crashes per million entering vehicles (MEV), are included in Table 5-14. The crash rate helps discern crash exposure at specific intersection locations. The crash rate is calculated in a given year by dividing the total number of crashes by the combined average daily traffic (ADT) on all approaches to the intersection over the course of 365 days, expressed in millions. The number of crashes per MEV is effective in determining if the number of crashes is excessive in comparison to volume. The statewide average crash rates are 0.87 for signalized intersections and 0.66 for un-signalized intersections.

Table 5-16 Congested Intersections in the Region

Community	Intersection	Traffic Control	Crash Rate	Alignment - Sight Distance	Congestion	Improvements
Abington	Route 18 at Route 123	signal	0.83 MEV		LOS D AM and PM peak hours	
Abington	Route 58 at Route 123	signal	2.27 MEV		LOS C AM and LOS C PM	
Abington	Route 58 at Central Street	signal	1.29 MEV		LOS D am peak hour	
Abington	Route 58 at Summer Street	signal	0.84 MEV		LOS D am peak hour	
Abington	Route 139 at Lincoln Street	stop sign			LOS F am peak and LOS D pm peak	
Abington	Route 139 at Hancock Street	stop sign			LOS F am peak and LOS F pm peak	
Avon	Memorial Dr (RT 28) at East and West Spring Street	stop sign	Crash rate 1.30 cross movements are problematic		LOS F and F for vehicles trying to enter from the minor Spring St approaches	Install traffic signals and coordinate the signals with the existing signals at the Route 28/Harrison Boulevard intersection.
Avon	Harrison Blvd. at Pond ST	signal			Very long queues and long delays for eastbound left turns into Pond Street	
Brockton	Route 28 Montello at East Battles St	stop sign	Crash rate 1.78 cross movements are problematic		LOS F and F for vehicles trying to enter from the minor street approaches	Install traffic signals
Brockton	RT 28 at East Nilsson St	stop sign	Crash rate 1.651 cross movements are problematic		LOS F for the PM peak vehicles trying to enter from the minor street approaches	Install traffic signals

Community	Intersection	Traffic Control	Crash Rate	Alignment - Sight Distance	Congestion	Improvements
Brockton	Route 28 at Plain St	stop sign	Crash rate 0.858 cross movements are problematic		LOS F and F for vehicles trying to enter from the stop sign approach	Install traffic signals
Easton	Washington St (RT 138) at Union Street	stop sign	Crash rate 0.867 cross movements are problematic	Poor sight distances on the Union St approach	LOS F for vehicles entering from Union St	Recommendations include installing a traffic signal and adding southbound left turn lane storage
Easton	Washington St (RT 138) at Elm Street	stop sign	Crash rate 0.928 cross movements are problematic	Poor sight distances on the Elm ST approaches and poor intersection alignment on the Elm St westbound approach	LOS F for vehicles entering from Elm St	Recommendations include installing a traffic signal and improving intersection alignment
Easton	Washington St (RT 138) at Stonehill College	signal	Crash rate 0.926 cross movements and rear end collisions are problematic	Poor visibility on the Washington Street approaches		Add warning signs signal ahead for northbound and southbound traffic to improve signal visibility.
Easton	Washington St (RT 138) at Belmont St (RT 123)	signal	Crash rate 1.847 cross movements are problematic		LOS D PM peak	Recommendations include adding separate eastbound protected phase, adding southbound left turn storage lane, and extending the westbound traffic island to remove cross movements at adjacent curb cuts
Easton	Washington St (RT 138) at Plymouth Dr Easton Indust. Park	stop sign	Crash rate 1.110 cross movements are problematic		LOS E and F for vehicles entering Washington St from Plymouth Dr	
Easton	Washington St (RT 138) at Depot St (RT 123)	signal				Planned Resurfacing Project Info Number 601337
Easton	Washington St (RT 138) at Purchase St/West St	stop sign	Crash rate 1.710 cross movements are problematic		LOS F for vehicles entering Washington St from Purchase St	Recommendations include installing traffic signals

Community	Intersection	Traffic Control	Crash Rate	Alignment - Sight Distance	Congestion	Improvements
Easton	Washington St (RT 138) at Turnpike St	stop sign		Poor intersection alignment	LOS E and F for vehicles entering Washington St from Turnpike St	MassHighway plans to improve alignment Project Info Number 604098, also main street gaps for entering from the side street should improve with the signalization of Washington at Purchase
Easton	Turnpike St at West St/Purchase St	stop sign		Sight distances limited on side streets, high speeds on Turnpike St	LOS D and F	Speeds on Turnpike Street should decrease with the realignment of Turnpike at Washington
Easton	Turnpike St (RT 138) at Foundry St/West Center St (RT 106)	signal	Crash rate 1.675 cross movements are problematic			MassHighway plans to resurface Project Info Number 601333, also pavement markings necessary to channelize traffic to prevent cross movement crashes
Easton	FIVE CORNERS Foundry St (RT 106) at Depot (RT 123)	signal	Crash rate 1.452 cross movements are problematic		LOS E and E	Intersection re-alignment and widening improvements planned 2008/2009 Project Info Number 604658
Easton	Foundry St (RT 106) at Poquanticut Ave	stop sign			LOS E and F	
Easton	Foundry St (RT 106) at Prospect St	stop sign	Crash rate 1.498 cross movements are problematic		LOS C and F	Signalization recommended
Easton	Depot St (RT 123) at Bay Rd (north of 5 Corners)	stop sign			LOS F	Intersection re-alignment 2008/2009 Project Info Number 604658
Easton	Foundry St (RT 123) at Highland St	stop sign			LOS E and D	Reconstruct, widen, add shoulders, add sidewalks 2009 Project Info Number 601332
Easton	Depot St (RT 123) at Cross Street	stop sign			LOS F and F	Resurface Project Info Number 600398

Community	Intersection	Traffic Control	Crash Rate	Alignment - Sight Distance	Congestion	Improvements
Easton	EASTON CENTER Depot St (RT 123) at Center St	stop sign			LOS F and F	Resurface Project Info Number 601337
Easton	Depot St (RT 123) at Purchase St	stop sign			LOS F and F	Resurface Project Info Number 601337
Easton	Depot St (RT 123) at Central Street	stop sign			LOS F	Resurface Project Info Number 601337
Easton	RT 123 Belmont St at Bristol (Industrial Prk)	stop sign			LOS D and F	
Easton	Foundry St (RT 123) at Old Foundry St	stop sign			LOS D and D	Reconstruct, widen, add shoulders, add sidewalks 2009 Project Info Number 601332
Plymouth	Sandwich ST at Main St (Route 3A)	stop sign			LOS F for vehicles trying to enter from the stop sign approach	
Plymouth	Sandwich ST (Route 3A) at Water ST	stop sign			LOS F for vehicles trying to enter from the stop sign approach	
Kingston	Summer ST (RT 3A at Cranberry Crossing	Stop sign		Insufficient gaps in major street traffic for side street egress	LOS F am peak and LOS F pm peak	
Kingston	Summer ST RT 3A at Main Street and Linden	Stop sign	2.083 MEV	Insufficient gaps in major street traffic for side street egress	LOS F am peak and LOS D pm peak	
Kingston	Main ST RT 3A at Landing Road	Stop sign	0.429 MEV	Insufficient gaps in major street traffic for side street egress	LOS F am peak and LOS F pm peak	
Plymouth	Court ST RT 3A at Samoset ST RT 44	Signal			LOS F pm peak hour	
Plymouth	Main ST RT 3A at Summer St	Stop sign	0.418 MEV		LOS F pm peak hour	
Plymouth	Sandwich ST RT 3A at Water Street	Stop sign	0.485 MEV		LOS F pm peak hour	
Plymouth	Sandwich Street RT 3A at Lincoln Street	Stop sign	0.319 MEV	Insufficient gaps in major street traffic for side street egress	LOS E pm peak hour	
Plymouth	Sandwich Street RT 3A at South Street	Stop sign	1.011 MEV		LOS F pm peak hour	

Community	Intersection	Traffic Control	Crash Rate	Alignment - Sight Distance	Congestion	Improvements
Plymouth	State Road RT 3A at Powerhouse Rd	Stop sign	0.18 MEV		LOS E am peak and LOS E pm peak	
Plymouth	State Road RT 3A at Herring Pond Road	Stop sign	3.58 MEV		LOS F am peak and LOS F pm peak	
Plymouth	State Road RT 3A at Hedges Pond Road	Stop sign	0.8 MEV		LOS F am peak and LOS F pm peak	
Stoughton	Canton ST at School ST	stop sign			LOS F for vehicles trying to enter from the stop sign approach	Install traffic signals
West Bridgewater	Route 28 at Copeland Street	stop sign	0.536 MEV	Poor sight distance due to poor alignment.	LOS D during the PM Peak	Reconstruct and re-align the intersection at right angle with Route 28
West Bridgewater	Route 106 at Howard ST	stop sign			LOS F for vehicles trying to enter from the stop sign approach	Install traffic signals
West Bridgewater	Route 28 at Matfield St	stop sign	0.206		LOS F for vehicles trying to enter from the stop sign approach	Install traffic signals

In addition to the intersection locations listed in Table 5-10, there are a number of specific community centers in the region including the Brockton Downtown, Bridgewater Center (Central Square), West Bridgewater Center, and Stoughton Center that experience chronic congestion and circulation problems requiring on-going efforts to improve traffic flow and reduce delays.

Downtown Brockton – There are three state numbered routes in Brockton's downtown including Route 27, Route 123, and Route 28. Route 123 and Route 27 traverse east west through the downtown and Route 28 traverses north south. Travel on Route 28 through Brockton downtown occurs along a direct north south route along Montello Street, however; travel on Route 27 and Route 123 through the downtown is circuitous due to a one-way street system. Signing for State Routes 27 and 123 in the downtown results in excessive vehicle circulation and creates confusion for motorists due to the one-way system. Total daily entering vehicles on the state numbered routes in the downtown is 48,100 vehicles per day, with 5.35 percent of this volume classified as heavy vehicles.

An evaluation of the circulation benefits derived from a two-way street system was undertaken as part of the Brockton Central Area Traffic Study that was completed in 1999 (this study was completed by an engineering consultant.) This comprehensive study examined the possibilities of re-implementing two-way traffic in the downtown area. A two-way street system was developed that could provide acceptable levels-of-service, more direct access to Main Street and downtown businesses, and better access to and from state numbered routes in the downtown. A brief summary of the major study recommendations includes: convert Main Street, Warren Avenue, Spring Street, West Elm Street, and Belmont Street from one-way to two-way in the downtown; upgrade traffic signals and pedestrian signals; upgrade state route designation signs; restrict parking in the vicinity of major intersections; evaluate and eliminate “no right turn on red” signs in the downtown; and complete a hardwire interconnect and closed loop traffic control system in the downtown.

Stoughton Square – Congestion represents the major impediment to traffic circulation in Stoughton Square. The traffic deficiencies stem from inadequate roadway space, weaving patterns, cross movements (due to side street traffic), and traffic operations. Vehicle flows in Stoughton Square have been typified as forced flow during the peak periods and as unstable throughout most of the day. The square accommodates a large amount of heavy vehicles (2,427) over the course of an average day, and over 34,300 vehicles enter the square on a daily basis. An analysis of traffic operations in Stoughton Square was included in a Route 138 Corridor Study completed by the Boston MPO in 2000. The study concluded that traffic congestion and crash rates were problematic, especially during the morning and afternoon peak hours. Contributing factors to the traffic problems in the square include heavy north and south through movements, which cause long delays for vehicles turning left from the square or into the square from the side streets, and weaving movements within the square that result in chaotic conditions. Rear-end and angle collisions are common due to stop and go traffic and confusion regarding traffic control and left turn prohibitions that are in effect during certain periods of the day.

The traffic study divided the square into three sections: the north at Route 27, Route 139, and Pearl Street; the middle at the intersection of Wyman Street; and the south at the intersection of Route 27, Route 138, and Route 139. The recommendations from the study took into account the fact that changes or improvements at one section of the square could impact operations at another section. The recommendations include upgrading the crosswalks at the north section of the square (and throughout Stoughton Square as a whole) and prohibiting left turns from Wyman Street eastbound during the morning peak (these movements are already prohibited during the afternoon peak.) In addition, the study made a number of alternative recommendations for the south end of the square. These included:

- The installation of a traffic signal at the south end of the square. A signal will improve peak hour safety and level of service at this location, but only if the southbound left turns to Route 139 were prohibited. Although this would improve traffic operations at this location, any red signal on the southbound approach could create queuing back into the square and gridlock within the square. In addition, the peak volumes for left turns to Route 139, if prohibited, would seek alternative routes through streets that parallel the square.
- The reconfiguration of the south end of the square making Walnut Street a one-way street eastbound for Route 138 traffic entering the square would greatly reduce vehicle conflicts at the Route 138/Route 27 intersection. The addition of a raised median at the south end would prevent vehicles from Route 27 turning left to Route 138. Route 138 would be one-way southbound from the square to Walnut Street.
- A strategy to redirect traffic volumes away from Stoughton Square was examined. This strategy called for Stoughton to petition Mass Highway to re-route Route 27 and Route 139 away from the square. In this scheme, Route 27 would follow Turnpike Street north to Central Street following a path that circumvents the downtown. Route 139 would be redirected west onto Central Street terminating at the Route 138 intersection. Route 139 presently terminates at Stoughton Square. This strategy would be more effective in re-routing motorists unfamiliar with the area around Stoughton Square, although those drivers familiar with the present road network will most likely continue taking a direct route through Stoughton Square.

Most recently, in November of 2006, traffic signals have been installed at both the south end and north end of the square, as part of a Public Works Economic Development Project (PWED). The improvements included reconstruction of traffic islands for pedestrian refuge, installation of pedestrian button actuation, and crosswalks. OCPC will be performing turning movement counts and automatic traffic recorder counts as part of its yearly counting program and congestion management process.

West Bridgewater Square - Route 106 (East and West Center Street) and Route 28 (North and South Main Street) form a major intersection at the West Bridgewater Town Center. These two major routes form a five-way intersection with River Street, which is one-way southbound away from the intersection. This intersection carries heavy commuter volumes during the morning and afternoon peak hours providing access to Route 24 to the west via Route 106, and providing a north south alternative to Route 24 via Route 28. The heaviest volumes through the intersection are on the east west through movements (Route 106), the north south through movements (Route 28), the eastbound right turn movements (Route 106 eastbound to Route 28 southbound), and the northbound left turn movements (Route 28 northbound to Route 106 westbound). In addition, the intersection alignment is such that the Route 28 south leg is not aligned opposite the Route 28 north leg. Instead, River Street, which is one-way southbound from the intersection, intersects with Route 28 and Route 106 to form a modified five-way intersection.

Level-of-service analysis performed for this intersection for the Route 28 Corridor Study (recently completed by OCPC), shows that the intersection operates at forced flow conditions with long delays (LOS "F") during the afternoon peak hour period. Long queues and delays occur on the Route 106 eastbound and westbound approaches and on the Route 28 northbound approach. The average daily traffic entering this intersection is approximately 36,1000 vehicles per day.

This intersection has been the subject of a number of traffic studies and planning level studies over the past 15 years. A town center plan completed by the Conway School of Landscape Design for the town proposed three concepts for the re-alignment of the intersection. Two of these concepts consisted of re-routing Route 28 via River Street to form a conventional four-way intersection. The third concept consisted of a roundabout traffic design for the town center. The four-way concept, with widened approaches on the heavy volume movements to allow for multiple lanes, and the roundabout concept were tested in the OCPC Route 28 Corridor Study utilizing SYNCHRO software. The analysis concluded that a roundabout concept would most likely operate under failed conditions during peak hour operations. However, a four-way concept with additional storage lanes on the Route 106 eastbound and westbound approaches, and on the Route 28 northbound approach, would operate under acceptable conditions during peak hour operations with a reduction of queuing and delays over the existing conditions. The roundabout concept and the four-way concepts will require right-of-way takings. A high priority project to implement improvements at this intersection is included in the Old Colony 2006-2010 TIP. The project is presently in the design stage. As part of the design process, the design consultant has recently presented a number of concept designs to the town selectmen. The concepts included adding turning lanes and/or reconfiguring the intersection with River Street as a two-way. All of the concepts require right-of-way takings.

Central Square in Bridgewater - The principal shortcomings identified in Central Square pertain to traffic congestion and safety. The signalized intersection of Route 28 (Main Street)/Route 18 (Broad Street)/Route 104 (Summer Street) at the north end of the town oval was identified in the OCPC Route 28 Corridor Study as currently operating at a poor level-of-service (LOS) during the afternoon peak hour. Congestion is also present at the south entrances to the Central Square traffic oval, which are yield sign controlled for vehicles entering the town center. Bridgewater center carries approximately 40,100 vehicles per day. Traffic safety problems are related to both intersection alignment problems at the signalized Route 28/Route 18/Route 104 intersection and the angle parking allowed within the central oval. Traffic weaving within the oval, as it enters from South Street and Bedford Street from the south, also contributes to safety and congestion at this location. During the afternoon peak hour, vehicles on the northbound approach to the signalized Route 28/Route 18/Route 104 intersection back up into the oval due to delays. These queues prevent vehicles on the yield approaches on South Street and Bedford Street from entering the oval and in turn cause queuing on these northbound approaches. Improvements to the signal timing and phasing at the Route 28/Route 18/Route 104 intersection that clear out vehicles on the northbound approach would improve traffic operations at the center overall by facilitating movement into and through the town center oval.

East Bridgewater Center - Route 18 intersects Central Street and Spring Street at East Bridgewater Town Center to form a five-way intersection. This intersection is signalized; however, the intersection is preemptively controlled by a police officer, utilizing an electronic control at the control box, during the peak hours. There are approximately 28,000 vehicles per day traversing through this intersection on an average weekday. Each of the intersection approaches provides only one approach lane, with the exception of the Route 18 southbound approach, which provides a through right turn shared lane and an exclusive left turn lane.

5.1.6 Environmental Justice

The objective of Environmental Justice is to ensure that there is equity in the distribution of transportation resources and services for low income and minority communities and neighborhoods. As part of this objective, Metropolitan Planning Organizations (MPO's) required to provide full and fair participation for all socio-economic groups throughout their planning and decision-making processes. All groups should realize the benefits of transportation projects and bear equally any adverse impacts from them as well. The Old Colony MPO actively supports and encourages minority and low-income populations and/or communities to participate in the 3C planning process through the Joint Transportation Committee (JTC) and through the Public Participation Plan.

The U.S. Environmental Protection Agency (EPA) defines Environmental Justice as follows: *"The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including racial, ethnic, or socio-economic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies."*

Environmental Justice compliments and strengthens the provisions found in Title VI of the Civil Rights Act of 1964:

"No person in the United States shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance."

Title VI prohibits discriminatory practices in programs, policies, and activities receiving federal funds. To further enhance application of Title VI, President Clinton issued Executive Order 12898. This executive order entitled, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations," stated that *"Each Federal agency shall make achieving Environmental Justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." – Executive Order 12898*

The vision of the Old Colony Planning Council is to develop compact, livable communities that allow residents to walk, drive, or use transit. These communities will have a mix of uses, offer a range of housing types, provide a sufficient employment base, and will meet the diverse needs of the population. The Council seeks to provide infrastructure and encourage a land use pattern that supports a variety of mode choices. Low-income persons often have difficulty affording automobiles or shouldering maintenance costs. This plan addresses alternative transportation and inter-modal connectivity. OCPC supports projects that will facilitate access to population and employment centers, improve safety at specific intersections and on specific highways, improve air quality, and enhance the quality of life in its member communities. Such projects include enhancing capacity or resurfacing roads, improving safety and traffic flow at intersections, enhancing bicycle facilities, and constructing and enhancing inter-modal facilities. The regional transportation system continues to provide a range of mode choices and services that have been expanded to meet the ever-evolving needs of the population.

The location of recommended system roadway improvements, are shown in Figure 5-12 with Environmental Justice Areas. Analysis concludes that the future projects are equitably distributed throughout the region and serve a variety of neighborhoods, from the more affluent areas to low-income areas. This finding is consistent with the equitable distribution of projects programmed in the Transportation Improvement Program.

5.2 Future Demand

Future traffic forecasts for the region's highways and roads are based on historic trends in traffic growth. The Old Colony Traffic Volumes Report (August of 2006) calculates an average growth factor of 1.02 percent per year for the region's state numbered routes. This average annual growth rate is used to forecast future traffic for the years 2007, 2010, 2020, and 2030. Tables 5-15 and 5-16 compare the forecasted highway traffic volumes on the region's road network, along with the associated levels-of-service, for major north south and east west routes, respectively. Tables 5-17, 5-18, and 5-19, show a comparison of the 2007 traffic volumes, with associated levels-of-service, to forecasts for traffic in the years 2010, 2020, and 2030 for Route 24, Route 3, and Route 106, respectively.

Table 5-17
Traffic Forecasts East-West Highways

Route	2007	LOS 2007	2010	LOS 2010	2020	LOS 2020	2030	LOS 2030
Route 14 - at Duxbury town line - Pembroke	2,506	B	2,584	B	2,860	B	3,165	B
Route 27 - West of Phillips Street Hanson	13,573	D	13,992	D	15,487	D	17,141	D
Route 27- East of RT 18 - Whitman	13,471	D	13,887	D	15,370	D	17,012	D
Samoset Street - at Route 80 - Plymouth 4 lanes	23,118	C	23,833	C	26,379	C	29,196	C
Route 104 - East of Central Sq - Bridgewater	17,685	C	18,232	E	20,179	E	22,335	E
Route 106 at Halifax town line - East Bridgewater	11,183	C	11,528	C	12,760	C	14,123	D
Route 106 - East of RT 138 - West Bridgewater	18,023	D	18,580	E	20,565	E	22,761	E
Route 123 - South of Torrey St - Brockton	14,287	C	14,729	C	16,302	C	18,043	C
Route 123 - East of Route 18 - Abington	17,928	D	18,482	E	20,457	E	22,642	E
Route 139 - at Rockland town line - Abington	16,736	D	17,254	D	19,097	E	21,136	E
Route 25 East of RT 195 - Wareham	64,190	C	66,174	C	73,242	C	81,065	D

Table 5-18
Traffic Forecasts North-South Highways

Route	2007	LOS 2007	2010	LOS 2010	2020	LOS 2020	2030	LOS 2030
Route 3A - South of Hedges Pond Rd - Plymouth	18,044	D	18,601	E	20,588	E	22,787	E
Route 18 - at Whitman town line - East Bridgewater	16,634	D	17,148	D	18,980	E	21,007	E
Route 18 - at Weymouth town line - Abington	19,966	E	20,583	E	22,782	E	25,215	F
Route 28 - South of Harrison Blvd. - Avon	29,610	C	30,525	C	33,786	D	37,394	E
Route 28 - South of RT 123 – Brockton	12,985	D	13,386	D	14,816	D	16,399	D
Route 28 - South of RT 106 - West Bridgewater	17,609	D	18,153	E	20,092	E	22,238	E
Route 36 - North of RT 106 – Halifax	6,805	C	7,015	C	7,764	C	8,594	C
Route 53 - at Duxbury town line - Pembroke	5,706	B	5,882	B	6,510	B	7,206	C
Route 58 - at Plympton town line - Halifax	5,932	B	6,116	B	6,769	B	7,492	C
Route 58 at Whitman town line - Hanson	8,899	C	9,174	C	10,154	C	11,238	C
Route 80 - North of Samoset St - Plymouth	15,342	D	15,817	D	17,506	D	19,376	E
Route 105 – South of Plymouth St - Halifax	3,152	B	3,250	B	3,597	B	3,981	B
Route 138 - at Canton town line - Stoughton	21,765	E	22,438	E	24,835	E	27,487	F

Table 5-19
Traffic Projections and Level of Service for Route 24

RT 24 Location	2007	LOS 2007	2010	LOS 2010	2020	LOS 2020	2030	LOS 2030
RT I-93 to RT 139	138,616	F	142,901	F	158,165	F	175,058	F
RT 139 to Pond Street	108,658	F	112,017	F	123,982	F	137,225	F
Pond Street to RT 27	100,102	E	103,196	E	114,219	F	126,419	F
RT 27 to RT 123	96,540	E	99,524	E	110,154	F	121,920	F
RT 123 to RT 106	94,397	D	97,315	E	107,709	F	119,214	F
RT 106 to RT 104	88,682	D	91,423	D	101,188	E	111,996	F
RT 104 to I-495	95,978	D	98,945	E	109,513	E	121,211	F
I-495 to RT 44	76,597	C	78,965	C	87,399	D	96,734	E

Table 5-17 shows that Route 24 operates at LOS “E” and “F” conditions in 2007 with long delays beginning at the segment just north of Route 27 in Brockton and extending to Route I-93. Under 2007 conditions, the segment of Route 24 between Route 104 and I-495 to Route 123 in Brockton operates under LOS "D" conditions with long delays. Table 5-17 shows that by the year 2020, Route 24 will be operating at LOS "E" and "F" conditions in the segment between Route I-93 and I-495 in Bridgewater.

Table 5-20
Traffic Projections and Level of Service for Route 3

Route 3 Location	2007	LOS 2007	2010	LOS 2010	2020	LOS 2020	2030	LOS 2030
Union St to RT 18 - Weymouth	137,389	F	141,637	F	156,765	F	173,509	F
RT 18 to Derby St - Hingham	107,010	F	110,318	F	122,101	F	135,143	F
Derby St to Pond St - Rockland	107,008	F	110,316	F	122,099	F	135,141	F
RT 53 to RT 139 - Pembroke	93,810	F	96,710	F	107,040	F	118,473	F
RT 139 to RT 14 - Duxbury	75,904	F	78,251	F	86,609	F	95,859	F
RT 14 to RT 3A - Duxbury/Kingston	68,425	E	70,540	F	78,075	F	86,414	F
RT 3A to Main St RT 3A - Kingston	64,394	E	66,384	E	73,475	F	81,323	F
RT 3A to Smiths Lane - Kingston	73,400	E	75,669	E	83,751	F	92,697	F
Smiths Lane to RT 44 – Plymouth*	63,608	C	65,574	C	72,578	C	80,331	C
RT 44 to Samoset St – Plymouth*	65,363	C	67,384	C	74,581	C	82,547	D
Samoset St to Long Pond Rd - Plymouth	64,700	E	66,700	E	73,824	F	81,710	F
Long Pond Rd to Plantation Hwy - Plymouth	58,863	D	60,682	D	67,164	E	74,338	F
Plantation Hwy to Clark Rd - Plymouth	50,821	C	52,392	C	57,988	D	64,182	E
Clark Rd to Herring Pond Rd - Plymouth	38,968	C	40,173	C	44,463	C	49,213	C
Herring Pond Road to the Sagamore Bridge	34,169	B	35,225	B	38,987	C	43,151	C

* Currently at a six-lane cross-section yielding higher LOS.

Table 5-18 shows the forecasted traffic and levels-of-service expected on Route 3 for the years 2010, 2020, and 2030. Route 3 from the I-93 split in Braintree to the Sagamore Bridge provides a four lane cross section with two lanes for each direction of travel, except for the section between Smiths Lane to Route 44 and from Route 44 to Samoset Street in Plymouth. These portions of Route 3 in Plymouth provide a six-lane cross section with three lanes for each direction of travel, and therefore yield higher levels-of-service despite higher traffic volumes than some of the other four lane sections of Route 3. Table 5 – 18 shows that Route 3 operates at LOS "F" with forced flow conditions from the I-93 split in Braintree to Route 14 in Duxbury under 2007 conditions. These forced flow conditions are expected to occur in Plymouth by 2020.

Table 5-21
Traffic Projections and Level of Service for Route 106

RT 106 Location	2007	LOS 2007	2010	LOS 2010	2020	LOS 2020	2030	LOS 2030
RT 138 to RT 24 SB ramps	18,023	D	18,580	D	20,565	E	22,761	E
RT 106 over RT 24 (SB ramps to NB ramps)*	36,800	C	37,938	C	41,990	C	46,475	D
RT 24 SB ramps to North Elm Street	26,600	F	27,422	F	30,351	F	33,593	F
North Elm St to RT 28	29,600	F	30,515	F	33,774	F	37,382	F
RT 28 to RT 18	16,820	D	17,340	D	19,192	E	21,242	E

*This segment of Route 106 is a four-lane cross section

Table 5-19 shows the projected volumes for 2007, along with the level-of-service, and the projected traffic volumes and levels-of-service expected on Route 106 for the years 2010, 2020, and 2030. The segment of Route 106 from Route 138 in Easton to the Route 24 ramps in West Bridgewater operates under LOS “D” conditions in 2007 and 2010. This segment will operate under LOS “E” conditions in 2020 and 2030. Route 106 between Route 24 and Route 28 operates under LOS “F” conditions, except for the segment over Route 24, which operates under LOS “C” conditions. Route 106 provides a six lane cross-section as it traverses over Route 24 and operates under a higher level-of-service at this location. However, as the road merges back to a two lane cross-section, just east of the northbound on and off ramps, capacity is constrained and the road operates under congested (LOS “F”) conditions east of Route 24 to Route 28. Route 106 operates under LOS “D” conditions east of Route 28 to Route 18; however, based on the traffic projections, the road in this section is expected to reach LOS “E” conditions in the year 2020.

5.3 System Improvements

Maintaining and improving the transportation system is the Old Colony Planning Council’s (OCPC) top priority. The transportation system in the Old Colony region represents an irreplaceable asset essential for the economic well being of the region as well as for the quality of life for the region’s residents. Maintaining and improving the system by utilizing resources in the most efficient, effective, and safe manner possible is a prime objective of the OCPC.

Projects that do not add new major facilities or components to the existing highway system can be considered maintenance and/or improvement projects. These projects represent the vast majority of all projects implemented throughout the OCPC region, as well as in the rest of the Commonwealth. Listed below are some types of projects that fall within this category:

- Resurfacing, rehabilitation, and reconstruction of roadways including full depth reconstruction to federal standards.
- Replacement or rehabilitation of an existing bridge, culvert, or viaduct.
- Existing intersection realignments, improvements to lane use, signal updates, and/or signalization.
- Maintenance of the existing sign networks throughout the region, including sign replacement.

These projects originate from local sources as well as from MassHighway. It is the intent of this plan to see that they are developed and implemented in a timely manner based upon need, financial constraint, and in conformance with the 2006 Edition of the *Massachusetts Highway Department Project*

Development and Design Guidebook (for those projects in which the guidebook applications are required). Some of the sources from which these projects originate are as follows:

- Congestion Management Process
- Massachusetts Highway Department (MassHighway)
- Local Highway Officials
- Old Colony Planning Council Traffic Studies
- Crash Data Analysis, and
- Previous Transportation Plans and Transportation Improvement Programs

The sources of project origination provide the scope of projects and/or demonstrate project need. The OCPC highway system maintenance project implementation recommendations are determined from the Pavement Management System and Bridge Management System, as well as individual project studies. Determining the proper combination and scheduling of regional transportation improvement projects is an on-going process. This process, which is known as the 3C Process (Continuing, Comprehensive, and Cooperative), is led by the Old Colony Joint Transportation Committee, with oversight from the Old Colony Metropolitan Planning Organization (MPO.) OCPC has identified short-range and long-range projects for maintaining and improving the existing highway system.

The following general recommendations address the planning process based on continued cooperation between OCPC, OCPC communities, transportation agencies, and state agencies:

- Continue the support of management systems. The Commonwealth of Massachusetts should continue to support the management systems.
- Enhance town center circulation. Advocate for the initiation of improvement strategies for enhancing town center circulation. Implement the recommendations of Downtown Brockton Circulation Study by re-establishing two-way traffic flow.
- Mitigate congestion along corridors. Support the mitigation of corridor segments currently experiencing congestion problems.
- Improve safety and traffic flow at intersections. Support the initiation and continuation of an intersection analysis program as a means to improve safety and traffic flow.
- Install rumble strips on all divided highways. Support installation of rumble strips on all divided highways in the region.
- Continue to support the Traffic Monitoring System for Highways. Support actively maintaining and participating in coordinated Traffic Monitoring System for Highways.
- Continue monitoring/evaluating pavement distresses along the federal aid eligible roadways toward the development of both maintenance and budgetary strategies, which produce increased efficiency in terms of utilization of federal and state money.
- Pavement Management Systems should address municipal program requirements. Pavement management should include provisions for policies, which address the developing crisis of the growing maintenance queues experienced by municipal highway officials who must maintain increasingly deteriorating local roadway with fewer fiscal resources.
- Encourage the provision of adequate parking and traffic mitigation at the Old Colony Rail Line facilities. It is imperative that local officials confer with MBTA planners and engineers to determine that the impacts of access and egress to/from station sites are properly mitigated.
- Large employers should be encouraged to form Transportation Management Associations (TMAs), which marshal business resources to manage employee transportation needs on an area-wide basis. A TMA can provide assistance that match employees who wish to carpool, vanpool, etc. Demand for costly long-term parking can be managed by encouraging shared-ride commuting through preferential parking incentives or special discounts for employees.

- Conduct additional studies concerning the movement of goods/materials within and through the region. These would address concerns such as the movement of hazardous materials, the identification and designation of regional and local truck routes, the identification of additional inter-modal facilities, and the overall enhancement of the efficient movement of freight.
- Conduct studies to improve east-west access in the region. This should also include further study of the widening of Route 106 from Route 24 to just east of Route 28 in West Bridgewater.
- Implement access management at the local level through a number of avenues (Master Plans, Zoning Ordinances, and Subdivision regulations and site plan reviews).
- Place stronger focus on maintenance of local bridges. Support increased emphasis on the rehabilitation needs of locally maintained bridges.
- Continue support of bridge management. The Commonwealth should continue its support of the Bridge Management System.
- Accommodate for bridges along the planned or new commuter rail system. Bridges or underpasses should be a consideration at the grade crossings of the commuter rail system currently under construction.
- Accommodate pedestrians in all bridge maintenance and construction. Addition of sidewalks and bike lanes or shared bi-ways where appropriate, should be a considered whenever bridges are replaced or rehabilitated.
- Promulgate policy to address the need for raising bridge clearances to accommodate double stacking of containers in railroad freight hauling operations. This policy is essential to promoting increased inter-modal opportunities in the movement of goods within and across state and international borders. In addition, expeditious movement of imported and exported goods serves to increase profitability and job creation in the end.
- Include roundabouts in the analysis of improvement alternatives that focus on the development of solutions to traffic hazards and traffic congestion.

5.3.1 Short-Term Improvements (0-5 years)

Short-range and long-range projects have been identified for maintaining and improving the existing highway system. The short-term improvements consist of projects that can typically be implemented within a five-year period. Long-term improvements are improvements that are implemented, through reconstruction, equipment upgrades, or long-term policies, over a longer period, beyond five years, due to logistical or financial constraints. Although this plan lists a number of short-term improvement projects that address improvements at specific intersections and locations, it is not possible to discern all the needs at all locations within the fifteen communities within the region. There are potential projects and improvements that have yet to be identified. These future projects will be added to the recommendations described within this section as the need arises.

Maintenance

In addition to improving transportation safety, maintenance of the existing transportation system is a top priority. Short and long-range project lists for maintenance to the existing highway system have been identified. These projects are included in the 2007-2010 Transportation Improvement Program (TIP), although some projects have not yet been approved by the Project Review Committee.

Recommended Projects

Recommended projects are divided into three categories: projects approved and programmed in the 2007-2010 Transportation Improvement Program (TIP), projects approved in the TIP but not yet assigned to a funding category, and projects that have not yet been submitted to the Project Review Committee. Table 5-20 lists those projects currently approved for programming in the TIP, Table 5-21 shows those projects approved in the TIP but not assigned to a funding category, and Table 5-22 lists projects not yet submitted to the Project Review Committee.

Table 5-22
Approved TIP Projects

Project	Community	Project ID	Total Cost	Fiscal Year	Funding
RT 18 - Broad ST @ High ST Signal Installation	Bridgewater	603660	$400,000	2008	CMAQ
RT 27, Pleasant, West and Westgate Drive Roadway Realignment and related improvements	Brockton	604431	$6,300,000	2007	STP CMAQ HPP
RT 27/ Belair/ Moraine Signal and Geometry Upgrade	Brockton	604595	$1,200,000	2007	CMAQ
Design and construct downtown roadway and streetscape improvements	Brockton	n/a	$1,665,650	2007-2009	TI
Bartlett ST Bridge replacement (B-25-060)	Brockton	601393	$411,000	2008	BR
RT 27 - Pleasant St Rehabilitation/Resurface and related (Pleasant – West to Main)	Brockton	600365	$3,100,000	2010	STP CMAQ
Winter ST - Howard ST to North Cary St	Brockton	601347	$2,280,000	2010	STP
RT 123 (Belmont ST) @ V.A. Hospital Traffic Signal Update	Brockton	602606	$400,000	2010	STP
Bridge Replacement Central ST over Queset Brook (BR# E-06-002&E-06-030)	Easton	602836	$1,617,990	2006	NFA
RT 123 - Norton TL to RT 106 Foundry	Easton	601332	$4,100,000	2008	STP
RT 27 – Pembroke ST Resurface/Reconstruction	Kingston	600413	$12,200,000	2007-2009	STP
RT 3A @ RT 53 Intersection Update and geometrics at Kingsbury Plaza	Kingston	600865	$400,000	2010	CMAQ
Herring Brook Valley Boardwalk (Enhancement)	Pembroke	604284	$100,000	2007	STP E
Signal/ Roundabout RT 3A @ Manomet Point RD/ Strand Ave	Plymouth	603468	$400,000	2008	CMAQ
RT 58 from Halifax TL to Carver TL Reconstruction	Plympton	602337	$4,510,081	2006	STP
Bridge Preservation Deck Replacement, BR# S-28-009, RT 139 Over RT 24	Stoughton	600772	$4,074,520	2006	NHS
Bridge Replacement, BR# W-18-003, South ST Over Town River	West Bridgewater	130200	$1,000,000	2006	BR
RT 28 @ RT 106 Traffic Signal update and geometrics	West Bridgewater	603457	$3,500,000	2009	CMAQ HPP

Table 5–23
Projects approved by PRC, but funding to be determined

Project	Community	Project ID	Design	Total Cost	Funding
3 R on Linwood ST (Access to State Land Acc. #6033-8868)	Abington	602577	0%	$1,800,000	TBD
RT 139 Reconstruction (Weymouth TL to Rockland TL)	Abington	602576	0%	$3,360,000	TBD
RT 18 Reconstruction from RT 139 to Highland PL (Listed in Boston MPO TIP)	Abington	601630	0%	$14,000,000	TBD
Intermodal Transportation Pathway Network	Bridgewater		0%	$153,150	TBD
Oak ST Bridge over Town River	Bridgewater	53430	0%	$800,000	TBD
Replace Auburn ST Bridge @ Taunton River	Bridgewater	601278	75%	$690,326	TBD
RT 18/28 - Bedford ST from BW Center to Middleboro TL	Bridgewater	601104	0%	$2,700,000	TBD
BCAT Downtown Brockton Circulation Project	Brockton	603675 603676	0%	$6,500,000	TBD
Court ST - Main to North Cary	Brockton	601342	0%	$675,000	TBD
Field ST - Montello to Winter	Brockton	601639	0%	$700,000	TBD
Forest AV - Warren to Belmont	Brockton	601344	0%	$900,000	TBD
Intersection improvements - 2 locations West Elm @ Ash ST and Lawrence @ Montello ST	Brockton	600003	0%	$250,000	TBD
ITS revenue collection equipment	Brockton		0%	$500,000	TBD
Longwood - West Chestnut to Menlo ST	Brockton	601646	0%	$500,000	TBD
Lyman ST - Crescent to Center	Brockton	601647	0%	$500,000	TBD
Perkins AV - Summer to Main	Brockton	601642	0%	$500,000	TBD
Quincy ST Resurfacing and related work (Centre to East Ashland)	Brockton	601645	0%	$500,000	TBD
RT 123 Centre ST - Montello to Cary	Brockton	601346	0%	$570,000	TBD
RT 123 over RT 24 Bridge Betterment	Brockton	604747	0%	$2,800,000	TBD
RT 28/Main/Keith AV Signal Upgrade	Brockton	604741	25%	$400,000	TBD
West Elm ST - Warren to West	Brockton	601644	0%	$890,000	TBD
Widen RT 123 from West St to Easton TL (includes signal at Linwood)	Brockton	180510	0%	$4,000,000	TBD
Washington - WH TL to Central & Oak - Washington to Hanson TL	East Bridgewater	601414 601415	25%	$3,745,190	TBD
RT 106 (Foundry St) from Morse RD to West Bridgewater TL	Easton	601333	0%	$500,000	TBD
RT 123 Depot ST - Foxridge RD to RT 138	Easton	601337	25%	$1,506,500	TBD
RT 138 at Turnpike ST Intersection improvements and geometrics	Easton	604098	0%	$400,000	TBD
RT106/123 - 5 Corners Intersection Improvements/signalization update (Foundry @ Bay)	Easton	604658	0%	$500,000	TBD
Elm ST Bridge over Jones River (K-01-002)	Kingston	24090	0%	$400,000	TBD

Table 5–23
Projects approved by PRC, but funding to be determined

Project	Community	Project ID	Design	Total Cost	Funding
Howlands Lane Bridge over MBTA	Kingston	602337	25%	$771,000	TBD
Intersection reconstruction and geometric RT 3A and Green ST	Kingston	602858	0%	$400,000	TBD
RT 106 (Main Street) Reconstruction	Kingston	601164	0%	$1,250,000	TBD
RT 53 - Duxbury TL to RT 3A & RT 3A - Duxbury TL to Plymouth TL	Kingston	114908	0%	$5,000,000	TBD
Smith Lane Extension to RT 3A	Kingston	601397	0%	$425,000	TBD
Reconstruction of RT 14 (part II of 600381)	Pembroke	600381	0%	$1,160,000	TBD
Reconstruction of RT 27 (part II of 600382)	Pembroke	600382	0%	$1,015,000	TBD
RT 36 from RT 27 to RT 14 resurfacing and related work	Pembroke	600380	0%	$1,211,000	TBD
RT 3 Resurfacing and related work	Plymouth	604223	0%	$1,000,000	TBD
RT 44 - Samoset ST and North Park AV Reconstruction	Plymouth	600426	0%	$1,500,000	TBD
Taylor Ave Reconstruction	Plymouth	604596	0%	$1,300,000	TBD
Reconstruction, RT 138 Station 45+00 to Station 61+33.51 (.5KM)	Stoughton	602717	0%	$500,000	TBD
Resurface RT138 - Canton TL to Thomas ST	Stoughton	601109	0%	$500,000	TBD
Train Station Stabilization (Enhancement)	Stoughton		0%	$204,000	TBD
Reconstruct RT 106 from Easton TL to East Bridgewater TL	West Bridgewater	603456	0%	$10,000,000	TBD
RT 18 Cold Planing and Resurfacing	Whitman	604160	100%	$1,200,000	TBD

Table 5–24
Projects that require PRC approval and/ or more data

Description	Community	Project ID	Design	Total	Funding
RT Capacity Enhancement from RT 139 to RT 14	Abington/ Whitman	Pre-PRC	0%	$3,000,000	TBD
Install Signals at RT 28 (East Main ST) at East/West Spring ST	Avon	Pre-PRC	0%	$400,000	TBD
W Main ST Reconstruction (Harrison BLVD to RT 28	Avon	Pre-PRC	0%	$500,000	TBD
Install signals at South ST@ RT 104	Bridgewater	Pre-PRC	0%	$400,000	TBD
Reconstruction North ST (Pleasant to Birch)	Bridgewater	Pre-PRC	0%	$850,000	TBD
Signal Upgrade (RT 28 @ High/ Center ST)	Bridgewater	Pre-PRC	0%	$400,000	TBD
Intersection Improvement Main ST at Forest Avenue	Brockton	Pre-PRC	0%	$400,000	TBD
Pedestrian/ Bikeway connections to the Intermodal Transportation Centre	Brockton	Pre-PRC	0%	$300,000	TBD
Reconstruction of N Main ST from Prospect to Court WY	Brockton	Pre-PRC	0%	$1,500,000	TBD
Reconstruction of RT 28 from East Ashland ST to Plain ST	Brockton	Pre-PRC	0%	$2,500,000	TBD
Resurfacing/Reconstruction of Main ST from White AV to Hayward AV	Brockton	Pre-PRC	0%	$2,000,000	TBD
RT 106 Reconstruction Whitman ST to Halifax TL	East Bridgewater	Pre-PRC	0%	$1,500,000	TBD
Foundry @ Eastman Reconstruction	Easton	Pre-PRC	0%	$400,000	TBD
Resurfacing Central ST - From Washington to Depot	Easton	Pre-PRC	0%	$550,000	TBD
RT 106 - Eastman ST, Mansfield TL to RT 123	Easton	Pre-PRC	0%	$280,715	TBD
RT 106 - Foundry ST, Bay RD to Morse RD	Easton	Pre-PRC	0%	$1,689,350	TBD
RT 106 - Foundry ST, Eastman ST to Bay RD	Easton	Pre-PRC	0%	$1,400,000	TBD
RT 106 Reconstruction (RT 105 to BW TL)	Halifax	Pre-PRC	0%	$1,000,000	TBD
RT 58 Reconstruction (RT 106 to Hanson TL)	Halifax	Pre-PRC	0%	$1,000,000	TBD
Resurfacing Elm ST	Hanson	Pre-PRC	0%	$177,500	TBD
Resurfacing Spring ST	Hanson	Pre-PRC	0%	$90,300	TBD
Resurfacing West Washington St	Hanson	Pre-PRC	0%	$190,000	TBD
Resurfacing on RT 80	Kingston	Pre-PRC	0%	$390,000	TBD
Bike Lane and Sidewalk Improvements	Plymouth	Pre-PRC	0%	$2,500,000	TBD
Brewster ST Rail Car Project	Plymouth	Pre-PRC	0%	$3,000,000	TBD
Intermodal Transportation Center	Plymouth	Pre-PRC	0%	$11,000,000	TBD
Jenny Grist Mill/ Billington Sea Walkway	Plymouth	Pre-PRC	0%	$1,500,000	TBD
Long Pond Road Reconstruction (Drew RD to Clark RD)	Plymouth	Pre-PRC	0%	$5,000,000	TBD
Nelson ST to Stevens Field Pedestrian Connection	Plymouth	Pre-PRC	0%	$3,000,000	TBD
Signalization Carver RD/Summer St/Federal Furnace/Sleepy Hollow RD	Plymouth	Pre-PRC	0%	$400,000	TBD

Table 5–24
Projects that require PRC approval and/ or more data

Description	Community	Project ID	Design	Total	Funding
Signalization of RT 3A Main ST @ Water ST	Plymouth	Pre-PRC	0%	$300,000	TBD
Signalization RT 3A at South ST	Plymouth	Pre-PRC	0%	$400,000	TBD
Signalization Samoset ST @ Marc DR/ Mobile Home Estates	Plymouth	Pre-PRC	0%	$500,000	TBD
Town Pier Boardwalk (Nelson to Burial Hill)	Plymouth	Pre-PRC	0%	$300,000	TBD
Town Wharf Pedestrian and Roadway Improvements	Plymouth	Pre-PRC	0%	$750,000	TBD
Water ST Reconstruction (RT 3A to Nelson ST	Plymouth	Pre-PRC	0%	$1,500,000	TBD
Intersection Improvements Canton (RT 27)/Tosca/Central	Stoughton	Pre-PRC	0%	$500,000	TBD
Resurfacing on Turnpike and Central STS	Stoughton	Pre-PRC	0%	$522,000	TBD
RT 27 Canton & School ST Signalization	Stoughton	Pre-PRC	0%	$400,000	TBD
Stoughton Square Resurfacing/Improvements	Stoughton	Pre-PRC	0%	$300,000	TBD
Bridge Rehabilitation Arch ST	West Bridgewater	Pre-PRC	0%	$400,000	TBD
Bridge Rehabilitation Belmont ST	West Bridgewater	Pre-PRC	0%	$400,000	TBD
Bridge Rehabilitation West ST	West Bridgewater	Pre-PRC	0%	$400,000	TBD
Resurfacing on South ST	West Bridgewater	Pre-PRC	0%	$300,000	TBD
Signalization of RT 106 @ Howard ST	West Bridgewater	Pre-PRC	0%	$400,000	TBD
Signalization of RT 28 @ Matfield ST	West Bridgewater	Pre-PRC	0%	$400,000	TBD
Signalization RT 106 @ East Street	West Bridgewater	Pre-PRC	0%	$400,000	TBD
Resurfacing South AV	Whitman	Pre-PRC	0%	$300,000	TBD

Access Management

Access Management is defined as the planning of the design, location, and operation of driveways, median openings, interchanges, and street connections. Access management provides two important advantages when applied to a roadway corridor:

- Improved Safety
- Improved Capacity

These advantages are achieved through Access Management techniques that seek to obtain the following results:

- Limit the number of conflict points in turning movements
- Separate conflict areas
- Remove turning vehicles from through traffic lanes
- Reduce conflicting volumes

- Improve roadway operations
- Improve driveway operations

Access management goals are typically accomplished over the long term; however, specific techniques can be implemented immediately to begin a process that will cumulatively result in the advantages of improved safety and the preservation of roadway capacity. Examples of typical access management applications along a commercial corridor include:

1. Access Spacing

Limit the number of access points to properties
Consolidate redundant, low-volume drives
Establish a minimum distance between drives
Limit the width of access points based on the site use

2. Turning Lanes

Establish minimum turning radii to slow traffic in high traffic pedestrian areas
Improve corner clearance
Establish deceleration/acceleration lanes
Add Two-Way Turning Lanes

3. On-Site Remedies

Share drives between sites
Add longer "throat lengths" to internal driveways in lots
Connect adjacent commercial properties
Construct service roads with multiple drives but fewer access points on the arterial

4. Median Treatments

Add Medians and turning lanes

Intelligent Transportation Systems

Intelligent Transportation Systems (ITS) are applications of advanced technology in the field of transportation, with the goals of increasing operation efficiency and capacity, improving safety, reducing environmental costs, and enhancing personal mobility.

The Old Colony Planning Council advocates the consideration of Intelligent Transportation Systems solutions for transportation problems as a routine part of the transportation planning process. As a stakeholder in the Metropolitan Boston Regional ITS Architecture and the Southeastern Massachusetts Regional ITS Architecture, the Old Colony Planning Council is committed to continuing an active role in these ITS systems. This includes maintaining channels of communication between the Council and other stakeholders, including but not limited to: the Massachusetts Highway Department; the Southeastern Regional Planning and Economic Development District (SRPEDD); the Central Transportation Planning Staff (CTPS) and Metropolitan Area Planning Council (MAPC); the Cape Cod Commission, and Brockton Area Transit (BAT).

A regional ITS architecture is a framework that defines component systems and their interconnections. Successful ITS deployment requires an approach to planning, implementation, and operations that emphasizes collaboration between relevant entities and compatibility of individual systems. The regional architecture is a mechanism design to ensure this collaboration and compatibility occurs.

Inputs into ITS systems can involve any variety of collection devices, including:

- Loop detectors in the pavement and sophisticated ground level radar systems that are able to collect real time traffic volume and speed data.
- Video equipment is often used to monitor the transportation system. This is useful in allowing system operators to immediately detect areas of congestion that may be forming. It is also used to detect incidents such as crashes and disabled vehicles, in turn accelerating emergency dispatch and the overall incident management process. Video surveillance is also a useful tool for security and incident management in transit vehicles and around stops and terminals.
- Automatic vehicle locators (AVL) on board transit vehicles, emergency response vehicles, and roadside assistance vehicles allow operators to know where vehicles are in real time that allows for more efficient dispatch and adjustment of traffic controls if necessary.
- Automated Fare Payment Systems that allow riders on transit systems to pay electronically using a "smart card" (prepaid balance) or in the future conventional credit/debit cards rather than cash.
- Transmitters onboard transit and emergency vehicles alike are used to pre-empt traffic signals ahead or to alert travelers at a transit stop that the vehicle is approaching.
- Remote weather stations and Doppler radar provide real time weather conditions occurring throughout the transportation network, and provide alerts regarding events such as icing or flooding that may be occurring.

These are some of the technological applications that can be utilized for managing the regional transportation network. All of this information travels over both hard-wired and wireless communication systems to systems that manipulate the data and distribute it to users of the transportation system. End users of ITS system and the output media include:

- Transit Operation Centers that monitor the transit system through video feed, radio communications, and AVL signals, allowing operators to make improved decisions regarding security, dispatch, and incident management.
- Traffic Operation Centers that monitor the roadway system through reports from systems like loop detection and video feed, allowing operators to make improved decisions regarding congestion management, incident management, security, and maintenance management.
- Traveler Information Services such as the national 511 System or SmarTraveler locally, which receive traffic data from traffic and transit operations centers and distribute it to users via hard line and wireless communications.
- Variable Message Signage that allows operators from traffic and transit operation centers to instantly relay messages to users on the system.
- Kiosks that receive information from transit operation centers and transit vehicles, relaying it to users of the transit system.

MassHighway owns and operates several permanent variable message signs and a large fleet of portable variable message signs throughout the Commonwealth. While there are not any permanent locations within the boundaries of the OCPC region, two are located just outside of the region: on Route 24 in Randolph and on Route 3 in Weymouth. These permanent stations are used to alert drivers to major events affecting the Route 128 belt and Interstate 93, as well as the tunnels.

Portable variable message sign trailers are located throughout the state and may be dispatched to locations wherever and whenever needed. Often they are used for a major local event, such as a road race or sidewalk carnival. They can also be dispatched for major unplanned events, such as a chemical spill that forces an extended closure of a highway. All variable message signs are controlled from the MassHighway Traffic Operations Center in South Boston.

The Massachusetts Highway Department is using automated vehicle locators on their snow removal and highway maintenance fleet, increasing the efficiency of dispatch of resources to where they are needed.

Travelers are able to obtain real time traffic conditions for highways in the Commonwealth, including locally Routes 3 and 24 as well as the Cape Cod Canal bridges, through SmartRoutes phone and web links. These systems will soon be available through a statewide 511 system and the MassHighway website.

5.3.2 Long-Term improvements (greater than 5 years)

While the transportation system in the Old Colony region represents an irreplaceable asset that needs to be maintained constantly, its capacity remains static while its demand is in a constant state of flux. The region is constantly changing, placing new and greater needs on the existing transportation system. Thus, modifications are needed to address these ever increasing demands. Long-term improvements are improvements that are implemented, through reconstruction, equipment upgrades, or long-term policies, over a longer period, beyond five years, due to logistical or financial constraints.

<u>Maintenance</u>

Identifying all of the maintenance projects needed in the next twenty years is not completely possible due to the dynamic nature of the system and the extent of the forecast period. OCPC has compiled a list of maintenance projects that will need to be implemented, but recognizes that this list might be incomplete. Further, the listing of a project in the long-range maintenance project list does not constitute design approval, future acceptance to the TIP, or any guarantee that the project will be implemented. The identification of long-range maintenance projects serves to provide the citizens and communities with a list of potential projects.

- Resurface Route 24 between the Stoughton Canton line and I-495
- Resurface Route 138 in Easton between the Stoughton line and the Raynham town line
- Resurface Route 106 Foundry Street in Easton between Eastman Street and Depot Street
- Resurface Route 3A State Road in Plymouth from Bartlett Road to the Bourne line

<u>Capacity Expansion</u>

Projects that add to the existing system, unlike maintenance projects, are considered major capital improvements to the system. These projects tend to be large-scale construction projects geared to alleviating problems with the existing system. These projects also tend to have a direct effect on the air quality analysis for the region, whereas maintenance projects do not. The Council has identified a number of projects that fit this category. Recommended projects that will expand the existing system are shown on Figure 5-12 and are summarized as follows:

<u>Improvements to Route 3</u>

The widening of Route 3 from Hingham to Route 44 has been and continues to be a priority for the region. The recently completed relocation project for Route 44 was a major capital investment in the area of Kingston and Plymouth. The final phase in the relocation of Route 44 opened to traffic in 2005. Route 3, between exits 6 and 7, has been widened to six lanes in order to accommodate the Route 44 relocation project. An efficient Route 3 is key to the total success of improving east-west traffic via the new Route

44. A large amount of traffic flows between the two highways. Recent large-scale residential development in southern Plymouth will also have a major impact on traffic commuting to and from Boston via Route 3. The Wareham Road mixed use development (Makepeace project) will add 1,285 housing units to Plymouth, and the Pine Hills Development will add approximately 2,000 housing units to Plymouth. It is expected that both of these major developments will affect traffic on Route 3, along with extensive commercial development on Commerce Way at the new Route 44 junction with Route 3 in Plymouth.

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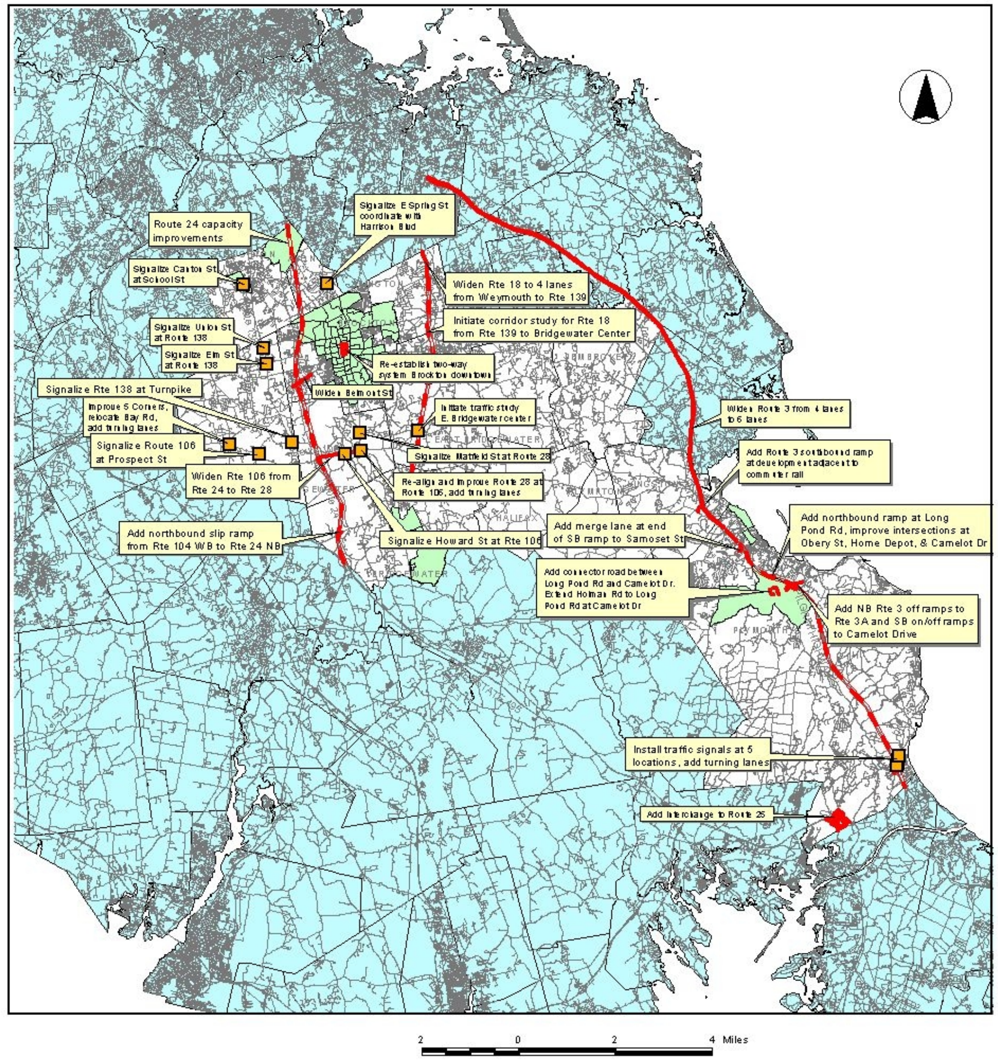
Figure 5-12
Recommended Improvements



Roadway improvements

Intersection Improvements

OCPC Communities

Community Boundaries

Environmental Justice Areas

Old Colony Planning Council
70 School Street
Brockton, MA 02301

GIS Data Sources:
MassGIS, EOT

January 2007

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In 1989, MassHighway submitted a Draft Environmental Impact Report for the widening of Route 3 from Exit 16 in Hingham south to Duxbury just south of Exit 12 in Pembroke. This would be achieved by adding a third lane in each direction of travel to the median. No land takings are anticipated for the completion of this project. Improvements to Route 3 interchanges 12, 13 and 14, will be addressed under separate related projects. MassHighway has submitted several Notices of Project Change for this widening project. The needs analyses in these studies show that capacity problems have existing within this section of Route 3 and will continue to grow in future years. These needs analyses show that congestion will extend further south on Route 3 to Exit 7 in Plymouth.

Through the MEPA process, a Route 3 Land Development Task Force was created to coordinate strategies for preserving livability in Route 3 communities in coordination with the widening of Route 3. A report on the meetings and conclusions of the task force was completed in 2001. The most significant conclusion of the task force was that additional analysis was needed for the project. The task force concluded that a more comprehensive study is necessary for the project that will include the impacts of the newly reconstructed Route 44 and the impacts of major residential and commercial developments (such as the Pine Hills and Makepeace development). The task force also concluded that the impacts of the condition of the Braintree split should be included in the study.

Recommendations for Route 3 include the following:

- Address congestion problems on Route 3 from Plymouth to Route I-93 and develop improvement strategies that include the enhancement of capacity within the Route 3 corridor.
- In Kingston, construct a Route 3 southbound ramp from Cranberry Drive near the Kingston commuter rail station (initiated by a developer for mitigation of traffic from a new mixed-use development adjacent to the Kingston commuter rail station.) This development will add 730 new homes (condominiums and single-family), 250,000 square feet of office space, and 50,000 square feet of retail space. The developer has proposed to provide the necessary funds for the construction of this ramp.
- Conduct a traffic study to define the operational deficiencies at Route 3 Exit 6 in Plymouth, and to analyze the potential improvement concept of constructing an acceleration lane at the bottom of the southbound ramp to Samoset Street. Under existing peak hour conditions, traffic exiting Route 3 southbound at Exit 6 to Samoset Street westbound backs up on the exit ramp onto Route 3 southbound. These backups are due to delays at the end of the ramp as vehicles wait for sufficient gaps in the westbound Samoset traffic stream. The widening of Samoset Street with an additional lane with sufficient length that would allow vehicles to merge into Samoset westbound traffic will prevent vehicles from backing up this ramp and onto the Route 3 southbound travel lanes. The right of way in this section of Samoset is 80 feet according to the latest MassHighway road inventory.
- Recommended improvements at Exit 5 are based upon a traffic study completed for the Town of Plymouth. The recommendations include the addition of a northbound slip ramp at Exit 5 that will allow traffic direct access from Long Pond Road. At present, the loop ramp at Exit 5 requires vehicles to turn left from Long Pond Road to access Route 3 for northbound access. This causes back-ups on Long Pond Road as vehicles making this movement wait for sufficient gaps in through traffic to make their move. A southbound slip ramp has already been added from Long Pond Road to Route 3 at Exit 5. In addition to the ramps, other improvements proposed at Exit 5 include adding a connector road between Long Pond Road and Camelot Drive and extending Holman Road to Long Pond Road to form the eastbound leg of a four-way intersection with Camelot Drive and Long Pond Road.
- Construct a Route 3 Exit 4 (northbound) off-ramp to Plymouth Plantation Highway. In addition, a ramp to Route 3 will be added at the end of Camelot Drive. This Camelot Drive on-ramp would

split and extend to Plantation Highway southbound. Northbound off ramps would be added at Exit 4 to Plantation Highway to the east and Camelot Drive to the west. The cost of improvements at Camelot Drive is estimated at $ 23,400,000.

Route 3A at Route 3 Exit 2 between Hedges Pond Road and Herring Pond Road in Plymouth

This segment of the Route 3A corridor in Plymouth has experienced rapid growth in commercial and residential growth in the recent decade. In addition to heavy volumes within the Route 3A corridor near the Route 3 interchange at Exit 2, because of rapid growth; the Route 3A corridor also contains numerous curb cuts that add excess turning movements. As part of the Cedarville Commons retail development mitigation, the proponent of the project has proposed to widen Route 3A to a four lane cross section between the Herring Pond Road intersection and the Hedges Pond Road/Old County Road intersection. The developer has proposed the installation of traffic signals at four locations: at the Route 3A/Hedges Pond Road/Old County Road intersection, at the Route 3A retail drive intersection, at the Herring Pond Road/State Road intersection, and at the Route 3 northbound ramps/Herring Pond Road intersection. The plan calls for the coordination the signals to minimize vehicle stops and maximize progression along the major road.

Route 24 Widening and Improvements

In 1997, OCPC conducted a study entitled, The Route 24 Traffic and LOS Projections Study. This study was conducted to examine the potential need to add capacity to Route 24. As part of the study, OCPC derived forecast traffic volumes and level of service analyses for the years of 1996, 1999, 2010, and 2020. The traffic forecast methodology included utilizing the OCPC regional travel demand model and linear regression forecasts. The plan recommended capacity improvements to the Route 24 interchanges and the re-designation of Route 24 as an interstate. In 1998, MassHighway prepared a study to evaluate the conversion of Route 24 to interstate standards. The study included an inventory of existing conditions, traffic volumes, design criteria and considerations, proposed geometric improvements, and estimates of construction costs. The study included improvements required to bring the facility up to interstate standards such as widening shoulders, raising overpasses, and reconstructing ramps. It did not include capacity expansion such as adding lanes.

Table 5- 23 summarizes the peak hour level-of-service summary from the 1997 Route 24 study. This table identified peak hour level-of-service deficiencies for Route 24, study, that are expected to occur by the years 1999, 2010, and 2020. The LOS for Route 24 will be within the “E” and “F” range between Route I-93 and Route 27 in Brockton by 2010. The LOS for Route 24 between Route 27 in Brockton and Route 44 in Raynham is expected to be in the LOS “D” range by 2010. Route 24 is expected to be at capacity (within the LOS “E” and “F” range) in at least one direction during the morning or afternoon peak between Route I-93 and Route 44 by the year 2020. Table 5-24 shows the updated traffic projections and expected levels-of-service for Route 24.

Table 5–25
Route 24 Level of Service Summary

Location		1996 Peak LOS		1999 Peak LOS		2010 Peak LOS		2020 Peak LOS	
		NB	SB	NB	SB	NB	SB	NB	SB
RT I-93 to RT 139 – Stoughton	AM Peak	D	B	D	C	F	C	F	D
	PM Peak	C	D	C	E	D	F	E	F
Route 139 to Pond Street – Avon	AM Peak	D	B	D	B	B	C	F	C
	PM Peak	C	D	C	D	C	F	D	F
Pond Street to Route 27 – Brockton	AM Peak	C	B	D	B	D	C	E	C
	PM Peak	C	D	C	D	C	E	C	F
Route 27 to Route 123 – Brockton	AM Peak	C	B	C	B	D	C	E	C
	PM Peak	B	D	C	D	C	E	C	F
Route 123 to Route 106 – W. Bridgewater	AM Peak	C	B	C	B	D	B	D	C
	PM Peak	B	C	B	C	C	D	C	E
Route 106 to Route 104 – Bridgewater	AM Peak	C	B	C	B	D	B	D	C
	PM Peak	B	C	B	C	C	D	C	E
I-495 to Route 44 - Raynham	AM Peak	C	B	C	B	D	B	E	C
	PM Peak	B	C	B	C	C	D	C	E

Table 5-26
Traffic Projections and Updated Levels of Service for Route 24

RT 24 Location	2007	LOS 2007	2010	LOS 2010	2020	LOS 2020	2030	LOS 2030
RT I-93 to RT 139	138,616	F	142,901	F	158,165	F	175,058	F
RT 139 to Pond Street	108,658	F	112,017	F	123,982	F	137,225	F
Pond Street to RT 27	100,102	E	103,196	E	114,219	F	126,419	F
RT 27 to RT 123	96,540	E	99,524	E	110,154	F	121,920	F
RT 123 to RT 106	94,397	D	97,315	E	107,709	F	119,214	F
RT 106 to RT 104	88,682	D	91,423	D	101,188	E	111,996	F
RT 104 to I-495	95,978	D	98,945	E	109,513	E	121,211	F
I-495 to RT 44	76,597	C	78,965	C	87,399	D	96,734	E

Encroaching development adjacent to the ramp system along intersecting arterials has amplified congestion problems within the Route 24 corridor. In Stoughton, on Route 139, the close proximity of Page Pointe retail development to the Route 24 ramps will result in impacts to traffic weaving onto the southbound ramps and will require mitigation to those ramps by the proponent. In addition, IKEA and other retail development on Stockwell Drive in Avon have added higher traffic volumes on and off Exit 20 at Route 139 in Stoughton and Exit 19 on Harrison Boulevard/Dykeman Way in Avon. One solution that has been discussed has been the addition of a southbound ramp directly to Route 24 from the end of Stockwell Drive behind the IKEA store. In addition to higher volumes on Harrison Boulevard west of Exit 19 due to Merchants Plaza, traffic generation due to Avon Industrial Park east of Exit 19 results in long queues due to left turns into Pond Street, especially during the morning peak hour.

Other conceptual improvements to the Route 24 ramp system that have been considered by MassHighway include the reconstruction of Exit 15 to and from Route 104 in Bridgewater. This concept would place the northbound on and off ramps in the northeast quadrant of the interchange. MassHighway has received authorization from the state legislature to acquire the necessary right of way for these ramps through a land swap with the adjacent landowner. The parcel will be acquired via a land swap with the adjacent commercial landowner.

In April of 2006, the Boston Metropolitan Planning Organization began a study of the Route 24/I-93 Interchange. The primary study area includes Route 24 from the I-93 Interchange south to Interchange 20 at Route 139 in Stoughton. In November of 2006, the study area was lengthened to include operations at the Route 24 Harrison Blvd. interchange in Avon. The Boston MPO has included OCPC in the advisory task force for the study. The main purpose of the study is to evaluate alternative improvements, including adding a fourth lane on Route 24 southbound, adding an HOV northbound, and other safety and operational improvements such as redesigning merges and weaving. Presently, the merge requires that traffic entering Route 93 south from Route 24 north merge from two lanes on the Route 24 ramp to the high speed left lane on Route 93 south. Conversely, traffic exiting Route 93 northbound to Route 24 southbound merges into the Route 24 right lane southbound and the middle lane. The middle lane carries traffic from Route 93 southbound to Route 24 southbound. These merges, which do not allow for proper acceleration and deceleration, along with delays on I-93 at interchanges north and south of the Route 24 merge, create long back-ups and long delays on Route 24. In addition, the high volumes of traffic at the merge, along with the weaving deficiencies cause a high incident rate in crashes, which create congestion and delays, especially during the peak hours.

MassHighway is planning the reconstruction of I-95/93 (Route 128 Add-a-Lane project). This project consists of approximately five miles of I-95/93 (Route 128) roadway construction, beginning at Route 24 (Randolph) to the MBTA Franklin Rail Road Line Bridge in Westwood, just north of the East Street Rotary. An additional 12-foot travel lane and 10-foot shoulder will be constructed toward the median in both directions. Construction is scheduled to begin in August of 2007. As part of this construction, longer acceleration lanes and longer weaving areas will be added to the merge from the Route 24 northbound ramp to I-93 (Route 128 northbound).

Previous studies of Route 24, along with an analysis of forecasted traffic volumes based on MassHighway's traffic model, have identified existing and future traffic flow deficiencies on Route 24 in the region. Table 5–23, which shows the results of the MassHighway traffic demand model, shows that capacity enhancement is necessary to address long delays and congestion that currently exist under 2007 conditions. Based on the forecasted traffic in Table 5-23, capacity enhancement will be necessary by 2020 to accommodate future demand that is expected to reach beyond current highway capacity.

OCPC recommends that the congestion problems on Route 24 be addressed through the development of strategies that enhance the capacity of Route 24 by 2020. In the interim, the development of incident management techniques will be advantageous in preserving existing capacity.

Route 18

The re-development of the South Weymouth Naval Air Station will have a major impact on Route 18 traffic in Abington, although the project access points will be located in South Weymouth just north of the Abington town line. Improvements to Route 18 in anticipation of the redevelopment plan include the widening of Route 18 in Abington from Route 139 to Highland Place in Weymouth, which is currently in the design phase.

In addition to the redevelopment of the South Weymouth Naval Air Station, other significant impacts to traffic within the Route 18 corridor in Abington and throughout the Route 18 corridor in Bridgewater, East Bridgewater, and Whitman include cumulative traffic growth due to the residential and commercial development. It is recommended that close monitoring of traffic growth within this corridor continue within the Towns of Abington, Whitman, East Bridgewater, and Bridgewater along with continued communication and discussion with town officials regarding the development of access management applications and specific congestion improvement projects. OCPC recommends that a comprehensive study of the Route 18 Corridor in the Towns of Abington, Whitman, East Bridgewater, and Bridgewater be undertaken. The purpose of the study will be to discern the impacts of cumulative traffic growth due to development, and to ensure that each of the towns has developed a vision for road and intersection improvements and future growth within the corridor. The study should include an analysis of existing and future traffic operations at East Bridgewater Center, and an analysis of future alternative recommended improvements to address operational deficiencies at this location.

Route 104 Bridgewater

Although the Route 104 corridor at Route 24 Exit 15 is not as developed commercially as the Route 106 corridor at Route 24 Exit 16, Route 104 carries approximately 27,650 vehicles per day. Unlike Route 106, which has a cross section of four lanes as it traverses over Route 24, the Route 104 corridor in Bridgewater has two-lanes. In addition, the Town of Bridgewater is considering zoning changes that will encourage future commercial growth along this corridor near the Route 24 interchange. Similar to the Route 106 corridor in West Bridgewater, high through volumes on Route 104 with multiple drives and side streets create congested conditions especially during the peak period. A proposal to widen Route 104 to a four lane cross section from the Route 24 ramps to Elm Street has been submitted by the owners of Bridgewater Place Shopping Center, to be located on the north side of Route 104, adjacent to Route 24. The improvements include consolidating curb cuts at a common drive, adding traffic signals to the Route 24 northbound and southbound ramps at Route 104, adding a signal at the site drive. In addition, MassHighway has determined that the addition of an on ramp in the northeast quadrant carrying Route 104 westbound traffic to Route 24 northbound will improve traffic flow on Route 104, and relieve back-ups on Route 24 that currently occur due to vehicles waiting to turn onto the ramps under the current configuration. The proponent of the Bridgewater Place Shopping Center has entered in an agreement for a land swap that will enable MassHighway to relocate this northbound ramp to the northeast quadrant of the Exit 15 interchange. The construction of this ramp is recommended by OCPC; however, it is recommended that monitoring of the corridor continue and that future studies regarding this corridor consider the widening of Route 104 to Bridgewater center.

Route 123 from Route 24 to Linwood Street Brockton

Route 123 within this corridor has four lanes of travel; however, the lane widths and shoulder are substandard for the speeds and traffic volumes on this road. Average Daily Traffic on Route 123 within this section is approximately 30,000 to 35,000 vehicles. Major delays occur on Route 123 east of the Route 24 interchange in Brockton due to delays at the Route 123/Manley Street intersection. This intersection carries heavy right turns from Route 123 to Manley Street southbound, and heavy left turn movements from Manley Street to Route 123 westbound during the peak hours. The addition of an exclusive right turn lane on Route 123 to Manley Street will help prevent delays and long queues on eastbound approach. It is recommended that further studies be conducted in order to discern the impacts of lane widening and other potential improvements at specific intersections within this corridor. According to MassHighway's latest road inventory, the right of way on Route 123 is constrained from the Route 24 ramps to the Brockton Veteran's Affairs Health Center. The width of the right of way in this section is 50 feet. The width of the right of way on Route 123 from the Veteran's Health Center to Torrey Street is 55 feet. Right of way takings will most likely be necessary if Route 123 is widened from the northbound Route 24 ramps eastward. The right of way on Route 123 west of the northbound ramps is 100 feet in width to the Easton town line.

Route 25 Interchange in Plymouth

The construction of an additional Route 25 interchange in the Town of Plymouth, before Exit 1 has been considered as a long-term possible improvement to offset the impacts of developmental growth by the Plymouth Area Chamber of Commerce. This exit would most likely be connected to Bourne Road in Plymouth. The construction of this interchange would most likely require right of way takings in Plymouth and possibly in Wareham.

Brockton Downtown Two-Way Circulation

The recommendations from the Brockton Downtown Two-Way Circulation Study, completed in 1999, include a number of major changes to Brockton downtown traffic circulation. These included: converting Main Street, Warren Avenue, Spring Street, West Elm Street, and Belmont Street from one-way to two-way in the downtown; upgrading traffic signals and pedestrian signals; upgrading state route designation signs; restricting parking in the vicinity of major intersections; evaluating and eliminating “no right turn on red” signs in the downtown; and completing a hardwire interconnect and closed loop traffic control system in the downtown. The 2007-2010 TIP includes a feasibility study that will update the 1999 study and provide funding for the design and implementation of these circulation changes. MassHighway has approved funding for a consultant contract for the completion of the study update.

Canton Street at School Street Stoughton

OCPC completed a traffic signal warrant analysis in response to a request from the Town of Stoughton in February of 2006. Based on the analysis of traffic data collected at the Canton Street (Route 27) and School Street intersection, geometric improvements and full signalization of this intersection was recommended. Upgrading the intersection with traffic signals was recommended based on a number of factors. The intersection has a crash rate of 2.46 crashes per million entering vehicles; a rate over three times higher (318%) than the MassHighway District 5 average crash rate (0.59) for un-signalized intersections. According to Registry of Motor Vehicles (RMV) crash records, thirty-seven (37) crashes occurred during the three-year period from January 1, 2002 through December 31, 2004. Of the 37 crashes, 17 (46 percent) involved personal injury. The majority of these crashes (31 of 37) were cross movement collisions between conflicting vehicle movements from perpendicular approaches. In addition, this intersection experiences very heavy delays on the School Street approaches during both the morning and afternoon peak hours with a poor level-of-service (LOS F). Four of the eight warrants for traffic signals from the 2003 Manual On Uniform Traffic Control Devices (MUTCD) are satisfied for this intersection: the Eight-Hour Vehicular Volumes Warrant (Warrant 1); the Four-Hour Vehicular Volumes Warrant (Warrant 2); Crash Experience Warrant (Warrant 7); and the Roadway Network Warrant (Warrant 8).

Route 106 in West Bridgewater

Route 106 provides two lanes of travel within the corridor between Route 138 in Easton and Route 28 in West Bridgewater, with the exception of a short four-lane section over Route 24 between the Route 24 ramps. Very heavy through moving traffic combined with multiple high traffic generating land uses in the area (gas stations, convenience stores, and fast food establishments) creates congested conditions with long delays especially just east and west of the Route 24 ramps. This road currently operates under LOS "F" conditions, especially during the morning and afternoon peak hours. It carries approximately 36,400 vehicles per day east of the Route 24 ramps. These vehicles merge from two lanes eastbound to one lane eastbound just east of the Route 24 ramps. Vehicles on the through lanes waiting to make left turns into side driveways, along with vehicles turning out of side drives, create blockages and hazardous conditions due to turning movement conflicts. The heaviest volumes on Route 106 occur between Route 28 and Route 24. This is also the area with the densest commercial development. Widening Route 106 between Route 24 and Route 28, which has the support of the West Bridgewater Highway Department, along with the application of access management such as consolidating access drives, will improve traffic flow, and improve safety within this corridor. One of the major constraints to widening Route 106 from two to four lanes from the Route 24 ramps to Route 28 is the limitation in right of way. The right of way for Route 106 from the Easton town line to Route 24 is 50 feet, according to the latest MassHighway road inventory. This would leave only one foot on each side of the road for shoulders if the cross section were widened to four twelve foot lanes. An alternative widening of Route 106, to include a three lane cross section, two travel lanes for each direction of travel and a center two-way turning lane (TWTL), should be considered. This alternative can be used to avoid costly right of way takings while providing an additional lane for traffic on Route 106 that will not block the through lane as vehicles turn left into adjacent drives or side streets.

Route 106 at Route 28 West Bridgewater

Improvements to the intersection of Route 106 (East and West Center Street) and Route 28 (North and South Main Street) at the West Bridgewater Town Center should take into account the future vision that the Town of West Bridgewater has for its town center. Although this intersection carries heavy commuter volumes during the morning and afternoon peak hours, providing access to Route 24 to the west via Route 106, and providing a north south alternative to Route 24 via Route 28, it also lies at the center of the Town of West Bridgewater.

This intersection operates under forced flow conditions with long delays (LOS "F") during the peak hours. Improvement concepts require widening the Route 106 eastbound and westbound approaches, along with the realigning the Route 28 approaches in order to improve the level-of-service. A high priority project to implement improvements at this intersection is included in the Old Colony 2007-2010 TIP. The project is presently in the design stage. The design consultant has recently presented a number of concept designs to the town selectmen, as part of the design process. The concepts included adding turning lanes and/or reconfiguring the intersection with River Street as a two-way. All of these concepts require right-of-way takings.

Route 28 at Matfield Street West Bridgewater

Based on the Route 28 Corridor Study, which was completed by OCPC in 2006, Matfield Street at Route 28 in West Bridgewater operates under forced flow conditions (LOS "F) during the morning and afternoon peak hours. Currently, this intersection is stop controlled at the Matfield approach, with police officers controlling traffic during the peak hours. The volume of traffic on Route 28 is such that there are few sufficient gaps on Route 28 for side street traffic from Matfield Street to safely enter the traffic flow. The plan to install traffic signals at this intersection requires MassHighway approval for TIP programming. Signal warrant analysis shows that this intersection satisfies the MUTCD Warrant 2, Four-Hour Vehicular Volume. Level-of-service analyses for future 2010 peak hour conditions show that this intersection will operate at LOS "C" during the morning and afternoon peak hours under signalized operation. The crash data compiled for this study shows that there has been one fatality at this intersection within the past ten years.

Route 106 at Howard Street West Bridgewater

The Route 106/Howard Street intersection, which is currently under stop sign control, is located just west of the Route 106/Route 28 intersection at the town center. Traffic on the Route 106 corridor in this section is so heavy that vehicles entering the Route 106 major street from the side streets experience very long delays, especially during the peak hours. Recent retail development on Howard Street will add vehicles entering and exiting Howard Street from Route 106. The signalization of this intersection is necessary to mitigate impacts from development and allow safe efficient access to and from Route 106.

Route 106 at Depot Street and Bay Road in Easton

Improvements at this intersection, which include relocating Bay Road at a "T-type intersection further north on Depot Road, signal upgrades, and adding additional turning lanes on Route 106, have been recommended in a traffic study completed for the Town of Easton.

Route 138 at Union Street in Easton

The installation of traffic signals at this intersection has been recommended in the Easton State Numbered Routes Corridor Study conducted by OCPC. The traffic on Route 138 is such that there are few sufficient gaps for side street traffic from Union Street safely enter traffic flow.

Route 138 at Elm Street in Easton

A study of operations at this intersection by OCPC for the Town of Easton concluded that deficiencies exist due to poor alignment and heavy peak hour traffic flow on the major street, Route 138, which prevents sufficient gaps for side street traffic to enter the major street. The study recommended the installation of a traffic signal at this intersection.

Route 106 at Prospect Street in Easton

OCPC conducted a study of traffic operations at this intersection for the Town of Easton, which recommended the installation of a traffic signal in order to mitigate the inconsistency of sufficient gaps in the major street, Route 106, traffic flow that would allow side street traffic to enter the major street safely. The signal would also improve safety at this intersection due to a lack of sight distance at the side street, Prospect Street, approaches.

Access Management

A commonality throughout the most of the arterial corridors, within the OCPC communities, is the lack of control, placement, spacing, and width of curb cuts that provide access to adjacent properties. These conditions, which are prevalent whether in urban or rural and suburban settings have led to situations in which safety and traffic flow have been compromised. In some situations, the degree of compromise is more severe than at other locations. Never the less, access management is important throughout highway corridors.

Commercial and retail activities are extremely important within certain highway segments in the region. Although some access management techniques include limiting the number of curb cuts, adding medians, and reducing turning movements, studies show that well planned access management design and modifications do not negatively impact businesses. Access Management applications result in reduced blocking of driveways by queues, better access between neighborhoods and businesses, and safer overall driving conditions. All of these attributes are important to both retailers and the customers they serve.

The prevailing conditions along some corridors are such that much of the land adjacent to the road has already been developed, especially in the more urbanized areas. Development along the corridor sometimes results in the redevelopment of parcels that were abandoned or are in transition between uses. The techniques applied to these segments will involve retrofitting access management to existing curb cut access, which sometimes requires the consolidation of access points.

The goals of access management include conserving highway corridor capacity and improving safety. Areas within the region in which access management techniques should be a prime focus include:

- Route 28 (Memorial Drive) in Avon from Harrison Boulevard south to Route 37 (Howard
- Street) in north Brockton.
- Route 123 Belmont Street east and west of Route 24 in Brockton
- Route 123 in Brockton east of the downtown to Abington
- Route 28 through the Brockton downtown (between Route 37 and Plain Street)
- Route 28 in south Brockton (Main Street)
- Route 28 in West Bridgewater (North Main Street and south Main Street)
- The Route 28 (Bedford Street) Route 18 corridor south of Bridgewater center
- Route 138 north of Stoughton Center
- Route 138 in Easton
- Route 106 east of Route 138 in Easton to West Bridgewater Center
- Route 104 east of Route 24 in Bridgewater
- Route 18 in Abington
- Route 3A in Kingston and Plymouth
- Samoset Street in Plymouth

Access management can be implemented at the local level through a number of avenues:

1. Master Plan

- The master plan is the responsibility of the Planning Board and outlines policies for development

2. Zoning Ordinance

- The zoning ordinance codifies land-use regulations

3. Subdivision regulations and site plan review

- Regulates parcel subdivision and access
- Encourage developers to include Access Management strategies
- Reviewing projects for consistency with the word and spirit of local provisions

Intelligent Transportation Systems

There are a number of ITS initiatives proposed for the long-term within the OCPC region.

Downtown Brockton: Several ITS components are included in the recommended improvements for Downtown Brockton in the Brockton Central Area Traffic Study completed in 1999. Traffic signal preemption is recommended for emergency vehicles at all signalized intersections in the downtown area. In addition, it is recommended that all traffic signals be connected within a closed loop system, with a connection to a central monitoring system. Video surveillance at critical downtown area locations is also recommended. Although not specifically recommended in the study, a Traffic Operations Center (TOC) would also be recommended in order to provide a mechanism for managing these systems.

Town of Plymouth: The Regional ITS Architecture for Southeastern Massachusetts contains provisions for a traffic management center in Plymouth. The traffic management center would be used to monitor and control the Town's traffic signals, traffic sensors, and variable message signage. The TMC would interface with a variety of equipment and departments, including the Plymouth Police Department; Plymouth Department of Public Works; the Massachusetts Highway Department; GATRA; Plymouth & Brockton Street Railway Company, and other agencies.

Information Kiosk at Route 3 Exit 5 in Plymouth: There are many opportunities for the application of Intelligent Transportation Systems at the new MassHighway Rest Area at Exit 5 on Route 3 in Plymouth. This Rest Area includes a tourist information center, food services, and a terminal for the Plymouth and Brockton Street Railway Company (P&B). Automated kiosks can be used for transit fare sales for P&B, MBTA, and Steamship Authority routes. Variable message signs can be used to inform visitors of traffic conditions on lower Route 3, Routes 6 and 6A, and the Cape Cod Canal bridges. Since the P&B terminal provides connections to Logan Airport, systems informing travelers of flight and gate information, including delays, could be useful.

Brockton Traffic Operations Center: Many cities are beginning to develop Traffic Operations Centers (TOCs) to monitor and manage traffic conditions on their roadways, particularly in downtown areas. These TOCs can be operated either full time or on a part-time, as needed basis. A combination of loop detection and video surveillance systems is used to monitor and assess conditions on the transportation network. The operator can respond to situations with a variety of options depending on the type and severity, including adjusting traffic signal phasing, operating variable message signage, and dispatching resources such a highway maintenance and emergency services as needed. For example, if a crash on Route 27 is causing heavy congestion, an operator from a traffic operations center could place a message on a variable message sign at the Whitman town line to avoid Route 27 and use Route 123 instead. A Brockton TOC could also be very useful in monitoring and managing parking in the downtown area, monitoring the occupancy of parking areas and informing travelers of parking conditions via variable message signage.

Local DPW Maintenance and Construction Vehicle AVL: Many public works and emergency services departments around the country are installing automated vehicle locator systems on their equipment. The systems consist of GPS receivers and transmitters on vehicles that allow the tracking of vehicle activity. Not only are the systems very useful for administrative purposes, but also they exist as an invaluable asset for dispatch efficiency.

5.4 Recommendations

Adequately maintain and operate the highway and bridge network of the region. This includes, but is not limited to, supporting, implementing and funding projects such as ongoing and/ or project review committee approved reconstruction, rehabilitation, preservation, and intersection improvement projects.

Continue the support of management systems. The Commonwealth of Massachusetts and the regional planning agencies should continue to support the management systems. Such systems are examples of how transportation planning and asset management can be effectively integrated.

Enhance town center circulation. Advocate for the initiation of improvement strategies for enhancing town center circulation. Implement the recommendations of Downtown Brockton Circulation Study by re-establishing two-way traffic flow.

Mitigate congestion along corridors. Support the mitigation of corridor segments currently experiencing congestion problems.

Improve safety and traffic flow at intersections. Support the initiation and continuation of an intersection analysis program as a means to improve safety and traffic flow. Conduct before and after intersection analyses to determine the effectiveness of implemented safety improvements. Support legislation for Red Light Running Camera enforcement.

Utilize regional access management polices, guidelines, and techniques to reduce arterial crashes.

Install rumble strips on all divided highways. Support installation of 'rumble strips' on all divided highways in the region.

Continue to support the Traffic Monitoring System for Highways. Support actively maintaining and participating in coordinated Traffic Monitoring System for Highways.

Continue operation of pavement management systems that involve monitoring/evaluating pavement distresses along the federal aid eligible roadways toward the development of both maintenance and budgetary strategies, which produce increased efficiency in terms of utilization of federal and state money.

Pavement Management Systems should address municipal program requirements. Pavement management should include provisions for policies, which address the developing crisis of the growing maintenance queues experienced by municipal highway officials who must maintain increasingly deteriorating local roadway with fewer fiscal resources.

Encourage the provision of adequate parking and traffic mitigation, and direct pedestrian access from nearby neighborhoods at the Old Colony Rail Line facilities. It is imperative that local officials confer with MBTA planners and engineers to determine that access and egress to/from station sites are properly mitigated.

Encourage large employers to form Transportation Management Associations (TMAs), which marshal business resources to manage employee transportation needs on an area-wide basis. MassRides for example, is available to provide TMA assistance that match employees who wish to carpool, vanpool, etc. Demand for costly long-term parking can be managed by encouraging shared-ride commuting through preferential parking incentives or special discounts for employees.

Conduct additional studies concerning the movement of goods/materials within and through the region. Additional studies should be undertaken which address the movement of goods and materials, such as the movement of hazardous materials, the identification and designation of regional and local truck routes, the identification of additional intermodal facilities, and the overall enhancement of the efficient movement of freight.

Conduct studies to improve east-west access in the region. This should also include further study of the widening of Route 106 from Route 24 to just east of Route 28 in West Bridgewater.

Implement access management at the local level through a number of avenues (Master Plans, Zoning Ordinances, Subdivision regulations and site plan reviews).

Place stronger focus on maintenance of local bridges. Support increased emphasis on the rehabilitation needs of locally maintained bridges.

Continue support of bridge management. The Commonwealth should continue its support of the Bridge Management System.

Accommodate grade separation for pedestrian and vehicular bridges or underpasses along the planned or new commuter rail system. Bridges or underpasses should be a consideration at the grade crossings of existing or proposed commuter rail system currently under construction.

Accommodate pedestrians in all bridge maintenance and construction. Addition of sidewalks and bike lanes or shared bi-ways where appropriate, should be a considered whenever bridges are replaced or rehabilitated.

Promulgate policy to address need for raising bridge clearances to accommodate double stacking of containers in railroad freight hauling operations. This policy is essential to promoting increased intermodal opportunities in the movement of goods within and across state and international borders. In addition, expeditious movement of imported and exported goods serves to increase profitability and job creation in the end.

Continue to work with local and state agencies to rehabilitate and reconstruct the bridges in the region that are remaining in the structurally deficient category, or will enter into that category during the next 23 years.

Resurface Route 24 between the Stoughton Canton line and I-495.

Resurface Route 138 in Easton between the Stoughton line and the Raynham town line.

Resurface Route 106 Foundry Street in Easton between Eastman Street and Depot Street.

Resurface Route 3A State Road in Plymouth from Bartlett Road to the Bourne line.

Utilize Access Management techniques throughout the region. Areas within the region in which access management techniques should be a prime focus include.

- Route 3A in Kingston and Plymouth
- Route 18 in Abington
- Samoset Street in Plymouth
- Route 28 (Memorial Drive) in Avon from Harrison Boulevard south to Route 37 (Howard Street) in north Brockton
- Route 28 through the Brockton downtown (between Route 37 and Plain Street)
- Route 28 in south Brockton (Main Street)
- Route 28 in West Bridgewater (North Main Street and south Main Street)
- Route 28 (Bedford Street) Route 18 corridor south of Bridgewater center
- Route 123 Belmont Street east and west of Route 24 in Brockton

- Route 123 in Brockton east of the downtown to Abington
- Route 104 east of Route 24 in Bridgewater
- Route 106 east of Route 138 in Easton to West Bridgewater Center
- Route 138 north of Stoughton Center
- Route 138 in Easton

Study, analyze, and integrate Intelligent Transportation Systems. Opportunities for such technologies include:

- Downtown Brockton - Several ITS components are included in the recommended improvements for Downtown Brockton in the Brockton Central Area Traffic Study completed in 1999. Traffic signal preemption is recommended for emergency vehicles at all signalized intersections in the downtown area. In addition, it is recommended that all traffic signals be connected within a closed loop system, with a connection to a central monitoring system. Video surveillance at critical downtown area locations is also recommended. Although not specifically recommended in the study, a Traffic Operations Center (TOC) would also be recommended in order to provide a mechanism for managing these systems.

- Town of Plymouth - The Regional ITS Architecture for Southeastern Massachusetts contains provisions for a traffic management center in Plymouth. The traffic management center would be used to monitor and control the Town's traffic signals, traffic sensors, and variable message signage. The TMC would interface with a variety of equipment and departments, including the Plymouth Police Department; Plymouth Department of Public Works; the Massachusetts Highway Department; GATRA; Plymouth & Brockton Street Railway Company, and other agencies.

- Information Kiosk at Route 3 Exit 5 in Plymouth - There are many opportunities for the application of Intelligent Transportation Systems at the new MassHighway Rest Area at Exit 5 on Route 3 in Plymouth. This Rest Area includes a tourist information center, food services, and a terminal for the Plymouth and Brockton Street Railway Company (P&B). Automated kiosks can be used for transit fare sales for P&B, MBTA, and Steamship Authority routes. Variable message signs can be used to inform visitors of traffic conditions on lower Route 3, Routes 6 and 6A, and the Cape Cod Canal bridges. Since the P&B terminal provides connections to Logan Airport, systems informing travelers of flight and gate information, including delays, could be useful.

- Local DPW Maintenance and Construction Vehicle AVL - Many public works and emergency services departments around the country are installing automated vehicle locator systems on their equipment. The systems consist of GPS receivers and transmitters on vehicles that allow the tracking of vehicle activity. Not only are the systems very useful for administrative purposes, but also they exist as an invaluable asset for dispatch efficiency.

ROUTE 3 CORRIDOR

- Support the capacity enhancement project for Route 3 (from Route 18 to Route 14).

- Initiate a multi-agency Comprehensive Management Plan for the entire Route 3 corridor building upon past work to discern impacts of growth, and future highway deficiencies.

- Construct a southbound ramp to Route 3 from Cranberry Road for mitigation of traffic from a new mixed-use development adjacent to the Kingston commuter rail station.

- Conduct a traffic study to define the operational deficiencies at Route 3 Exit 6 in Plymouth, and to analyze the potential improvement concept to construct an acceleration lane at the bottom of the southbound ramp to Samoset Street.

- Implement improvements to Exit 5 Long Pond Road in Plymouth. Add a northbound slip ramp from Long Pond Road to Route 3 northbound to allow traffic direct access from Long Pond Road.

- Implement improvements to Route 3 Exit 4 in Plymouth that include a off-ramp from Route 3 northbound to Plimouth Plantation Highway eastbound.

ROUTE 18 CORRIDOR

- Improvements to Route 18 in anticipation of the redevelopment of the former Weymouth Naval Air Station include the widening of Route 18 in Abington from Route 139 to Highland Place in Weymouth, which is currently in the design phase.

- Close monitoring of traffic growth within this corridor should continue within Abington, Whitman, East Bridgewater, and Bridgewater along with continued discussion with town officials regarding access management applications and specific congestion improvement projects. A comprehensive study of the Route 18 Corridor in Abington, Whitman, East Bridgewater, and Bridgewater should be undertaken to discern the impacts of cumulative traffic growth due to development. The study should include an analysis of existing and future traffic operations at East Bridgewater Center, and an analysis of future alternative recommended improvements to address operational deficiencies at this location.

ROUTE 24 WIDENING AND IMPROVEMENTS

- Support interstate conversion and capacity enhancement for the Route 24 Corridor.

- Develop a comprehensive Corridor Management Plan (CMP). The CMP should be a joint effort that includes affected regional planning agencies, state agencies, local officials, and interested parties.

- Provide a northbound slip ramp from Route 104 in Bridgewater westbound to Route 24 northbound. This would place the northbound on and off ramps in the northeast quadrant of the interchange.

ROUTE 25

- Provide a Route 25 interchange in Plymouth to Bourne Road as an access and egress improvements to mitigate impacts of developmental growth. The construction of this interchange would most likely require right of way takings.

- Implement improvements to Route 3A at Route 3 Exit 2 between Hedges Pond Road and Herring Pond Road in Plymouth. As part of the developer mitigation, the proponent of the project has proposed to widen Route 3A to a four-lane cross section between the Herring Pond Road intersection and the Hedges Pond Road/Old County Road intersection. The developer has proposed the installation of traffic signals at four locations: at the Route 3A/Hedges Pond Road/Old County Road intersection, at the Route 3A retail drive intersection, at the Herring Pond Road/State Road intersection, and at the Route 3 northbound ramps/Herring Pond Road intersection. The plan calls for the coordination the signals to minimize vehicle stops and maximize progression along the major road.

ROUTE 27 CANTON STREET AT SCHOOL STREET STOUGHTON

- Based on analysis of operations at the Canton Street (Route 27) and School Street intersection, geometric improvements and full signalization of this intersection is recommended.

ROUTE 28 AT MATFIELD STREET WEST BRIDGEWATER

- Based on the Route 28 Corridor Study, the traffic on Route 28 is such that there are few sufficient gaps on Route 28 for side street traffic from Matfield Street to safely enter traffic flow. The installation of traffic signals at this intersection was recommended.

RESTORE BROCKTON DOWNTOWN TWO-WAY TRAFFIC CIRCULATION

- These changes will convert Main Street, Warren Avenue, Spring Street, West Elm Street, and Belmont Street from one-way to two-way in the downtown.

ROUTE 104 BRIDGEWATER

- A development project to widen Route 104 to a four-lane cross section from the Route 24 ramps to Elm Street is slated for the near term. MassHighway has determined that the addition of an on ramp in the northeast quadrant carrying Route 104 westbound traffic to Route 24 northbound will improve traffic flow on Route 104, and relieve back-ups on Route 24 that currently occur due to vehicles waiting to turn onto the ramps under the current configuration. The proponent of the development project has entered in an agreement for a land swap that will enable MassHighway to relocate this northbound ramp to the northeast quadrant of the Exit 15 interchange. The construction of this ramp is recommended, however, it is recommended that monitoring of the corridor continue and that future studies regarding this corridor consider the widening of Route 104 to Bridgewater center.

ROUTE 106 AT DEPOT STREET AND BAY ROAD IN EASTON

- Improvements at this intersection, which include relocating Bay Road at a "T: type intersection further north on Depot Road, signal upgrades, and adding additional turning lanes on Route 106, are recommended.

ROUTE 106 AT PROSPECT STREET IN EASTON

- OCPC conducted a study of traffic operations at this intersection for Easton, which recommended the installation of a traffic signal in order to add needed gaps in the major street, Route 106, traffic flow that would allow side street traffic to enter the major street safely. The signal would also improve safety at this intersection due to a lack of sight distance at the side street, Prospect Street, approaches.

ROUTE 106 IN WEST BRIDGEWATER

- Widening Route 106 between Route 24 and Route 28, which has the support of the West Bridgewater, along with the application of access management such as consolidating access drives, will improve traffic flow and safety. One of the major constraints to widening Route 106 from two to four lanes is the limited right of way, which is 50 feet within this Route 106 section (based on MassHighway's 2005 Road Inventory). A study should be conducted that discerns the impacts of alternative widening plans including the use of a Two-Way Turning Lane (TWTL).

ROUTE 106 AT ROUTE 28 WEST BRIDGEWATER

- Improvements to the intersection of Route 106 (East and West Center Street) and Route 28 (North and South Main Street) at the West Bridgewater Town Center should take into account the future vision that the West Bridgewater has for its town center. This intersection operates under forced flow conditions with long delays (LOS "F") during the peak hours. Improvement concepts require widening the Route 106 eastbound and westbound approaches, along with the realigning the Route 28 approaches in order to improve the level-of-service. A high priority project to implement improvements at this intersection is included in the Old Colony 2007-2010 TIP. The project is presently in the design stage. The concepts included adding turning lanes and/or reconfiguring the intersection with River Street as a two-way. All of these concepts require right-of-way takings.

ROUTE 106 AT HOWARD STREET WEST BRIDGEWATER

- Traffic on the Route 106 corridor in this section is so heavy that vehicles entering the Route 106 major street from the side streets experience very long delays, especially during the peak hours. Recent retail development on Howard Street will add vehicles entering and exiting Howard Street from Route 106. The signalization of this intersection is necessary to mitigate impacts from development and allow safe efficient access to and from Route 106.

ROUTE 123 FROM ROUTE 24 TO LINWOOD STREET BROCKTON
- The lane widths and shoulder are substandard for the speeds and traffic volumes on this road. Delays occur on Route 123 east of the Route 24 interchange in Brockton due to congestion at the Route 123/Manley Street intersection. Although the width of the right of way in this section is 50 feet, it is recommended that further studies be conducted in order to discern the impacts of lane widening and other potential improvements at specific intersections within this corridor.

ROUTE 138 AT UNION STREET IN EASTON
- The installation of traffic signals at this intersection has been recommended in the State Numbered Routes Corridor Study. The traffic on Route 138 is such that there are few sufficient gaps for side street traffic from Union Street safely enter traffic flow.

ROUTE 138 AT ELM STREET IN EASTON
- A study of operations at this intersection concluded that deficiencies exist due to poor alignment and heavy peak hour traffic flow on the major street, Route 138 allows insufficient gaps for side street traffic to enter the major street. The study recommended the installation of a traffic signal at this intersection.

Utilize Access Management to reduce conflicts and improve safety. The goals of access management include conserving highway corridor capacity and improving safety. Access management is important throughout highway corridors in order to manage the placement, spacing, and width of curb cuts that provide access to adjacent properties. Areas within the region in which access management techniques should be a prime focus, at a minimum, include:
- Route 28 (Memorial Drive) in Avon from Harrison Boulevard south to Route 37 (Howard Street) in north Brockton.
- Route 123 Belmont Street east and west of Route 24 in Brockton
- Route 123 in Brockton east of the downtown to Abington
- Route 28 through the Brockton downtown (between Route 37 and Plain Street)
- Route 28 in south Brockton (Main Street)
- Route 28 in West Bridgewater (North Main Street and South Main Street)
- The Route 28 (Bedford Street) Route 18 corridor south of Bridgewater center
- Route 138 north of Stoughton Center
- Route 138 in Easton
- Route 106 east of Route 138 in Easton to West Bridgewater Center
- Route 104 east of Route 24 in Bridgewater
- Route 18 in Abington
- Route 3A in Kingston and Plymouth
- Samoset Street in Plymouth

CHAPTER 6
REGIONAL TRANSIT SYSTEMS

6.0 Introduction

The Region offers a variety of transit services, such as bus transportation, paratransit services, council on aging services, commuter rail, airport and air services, commuter bus service, highway, water freight services and rail freight facilities. Although modes are discussed independently through this chapter, they work together as parts of an ever-evolving intermodal system. For information such as maps, schedules, fares and other service please refer to the *Transportation Resource Directory for the Old Colony region*, or the individual transit providers for the most current and up to date information.

Transportation systems cannot be overlooked as a catalyst in shaping land use patterns and affect on the quality of life of local residents. Concepts such as the placement of transportation services or the frequency of service are among the deciding factors in whether or not the residents use transit. The Region faces many of the challenges found across the nation, such as the increasing demand for transit capacity across all modes, the increased costs of operations; and the increased demand for paratransit services and the coordination of human service transportation efforts. All these challenges are faced with the biggest challenge of them all; funding sources for public transit are shrinking.

Perhaps the greatest long-term effect that an efficient mass transit system can have on a region is the potential for effective growth management. Focusing development around transit stations can lead to a more sensible form of growth in which higher density; mixed-use neighborhoods provide more enjoyable and convenient living environments. By taking advantage of modes such as commuter rail, commuter bus and fixed route transit system, communities can come up with smarter alternatives to the inefficient "sprawl" development, which has characterized development in this region for too long. Using Smart Growth Principles communities can develop safe walkable communities with convenient transit and surrounded by both housing and retail services.

This chapter discusses the current transportation networks in the region and potential future networks. The chapter concludes with recommendations that would enhance the transportation network of the region and affect the quality of life of residents in the region. Figure 6-1 is an overview of the transportation networks in the region.

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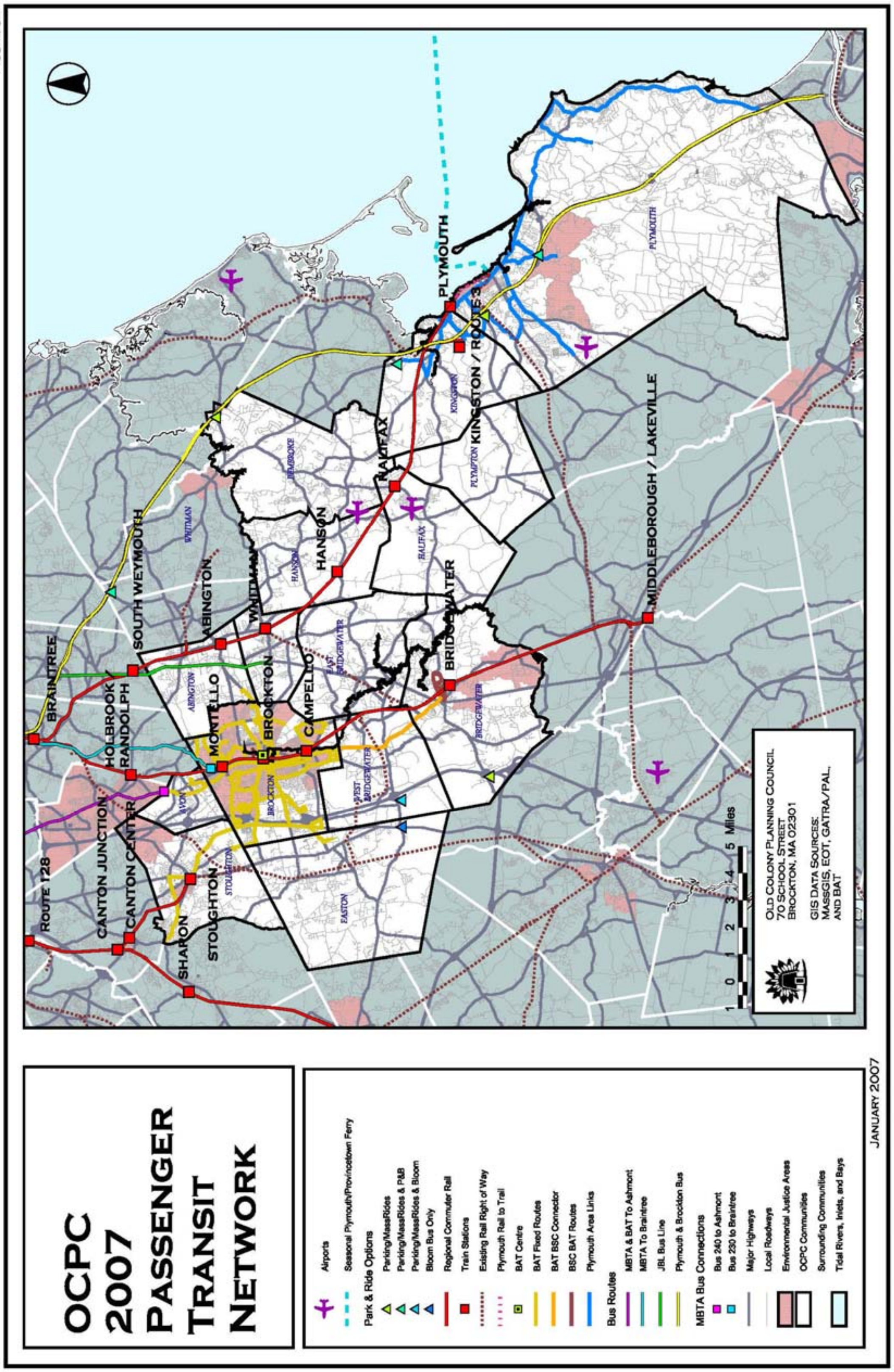
Figure 6-1


OCPC 2007 Passenger Transit Network
Airports
Seasonal Plymouth/Provincetown Ferry
Park & Ride Options
Parking/MassRides
Parking/MassRides & P&B
Parking/MassRides & Bloom
Bloom Bus Only
Regional Commuter Rail
Train Stations
Existing Rail Right of Way
Plymouth Rail to Trail
BAT Centre
BAT Fixed Routes
BAT BSC Connector
BSC BAT Routes
Plymouth Area Links
Bus Routes
MBTA & BAT To Ashmont
MBTA To Braintree
JBL Bus Line
Plymouth & Brockton Bus
MBTA Bus Connections
Bus 240 to Ashmont
Bus 230 to Braintree
Major Highways
Local Roadways
Environmental Justice Areas
OCPC Communities
Surrounding Communities
Tidal Rivers, Inlets, and Bays
January 2007
Route 128
Canton Junction
Canton Center
Sharon
Stoughton
Holbrook / Randolph
Braintree
South Weymouth
Abington
Montello
Brockton
Campello
Whitman
Hanson
Halifax
Bridgewater
Kingston / Route 3
Plymouth
Middleborough / Lakeville
0 1 2 3 4 5 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, GATRA/PAL, and BAT

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6.1 Current Transit Systems in the Old Colony Region

BAT

The Brockton Area Transit (BAT) was formed on September 30, 1974 in accordance with the provisions of Massachusetts General Laws, Chapter 161B. BAT is the largest provider of fixed route and paratransit in the region, providing fixed route service to six communities and paratransit service to nine communities in the region. In 2006, BAT completed the BAT Centre and Intermodal Transit Facility, offering parking, administrative services, a connection to bus and taxi service and is in close proximity to the commuter rail.

Fixed route bus service is provided in the region to: Abington, Avon, Brockton, Bridgewater, Easton, and Stoughton. The service in Bridgewater is provided by BAT through the Bridgewater State College (BSC) Transportation Services, which focus on the college community and follows the academic calendar. The BAT system provides transportation to locations such as schools, medical facilities, shopping centers and industrial parks, in addition to intermodal opportunities including commuter rail stations and the MBTA red line. The FY 2006 Fixed Route Ridership Analysis for BAT found that approximately 2,747,922 passengers were transported on its fixed route bus service that year.

Table 6-1
BAT Routes

Route Number	Area/Description
1	Montello via North Main Street
2	South Plaza/Campello via Main Street
2A	South Plaza via Grafton & Copeland
3	VA Hospital via Belmont
4	Westgate Mall via Pleasant
4A	Westgate Mall via North Warren
5	Brockton Hospital via Centre
6	Massasoit via Crescent
8	Southfield via Warren and Plain Street
9	Pearl via West Elm and Torrey Street
10	Lisa & Howard via N Quincy St & Court St
11	Cary Hill & the Village
12	Ashmont
14	Stoughton
MM	Mini-Maller
BSC	Bridgewater State College Routes

BAT provides service on sixteen fixed routes. These routes operate generally from 6:00 A.M. to 9:20 P.M. Monday through Friday and with reduced hours and routes on Saturday and Sunday. Operating 7 days a week, the BAT Centre features access to the MBTA Commuter Rail and the Downtown Brockton Station. Utilizing a pulse system, most of the BAT routes depart from the downtown location of the BAT Centre, allowing riders to transfer from one route to another without significant wait. This method allows a time sensitive system to operate effectively for the system riders. Exceptions to this are: The MM (Mini-Maller), BSC (Bridgewater State College) and Route 14, which operates from the Westgate Mall to Cobbs Corner in Stoughton. However, Route 14 does have four round trips to the BAT Centre Monday thru Saturday. BAT's most popular route is Route 12 (Ashmont); it had a 2006 average daily ridership of 1,705 riders. Table 6-1 is a summary of the BAT routes. Figure 6-2 is a map of the transit services provided by BAT. For up to date information on BAT's operations and schedules visit www.ridebat.com.

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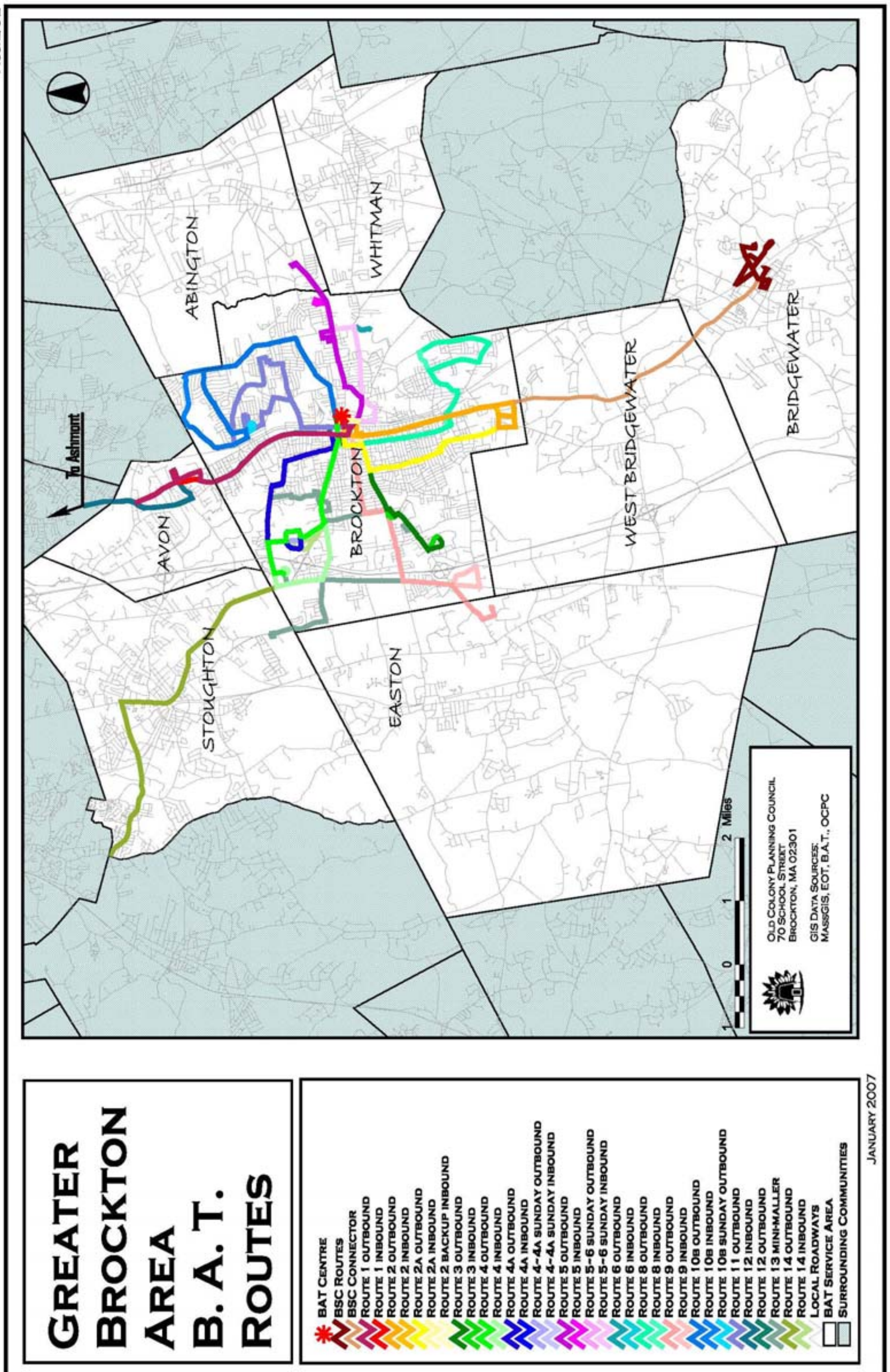
FIGURE 6-2


GREATER BROCKTON AREA B. A. T. ROUTES
BAT CENTRE
BSC ROUTES
BSC CONNECTOR
ROUTE 1 OUTBOUND
ROUTE 1 INBOUND
ROUTE 2 OUTBOUND
ROUTE 2 INBOUND
ROUTE 2A OUTBOUND
ROUTE 2A INBOUND
ROUTE 2 BACKUP INBOUND
ROUTE 3 OUTBOUND
ROUTE 3 INBOUND
ROUTE 4 OUTBOUND
ROUTE 4 INBOUND
ROUTE 4A OUTBOUND
ROUTE 4A INBOUND
ROUTE 4-4A SUNDAY OUTBOUND
ROUTE 4-4A SUNDAY INBOUND
ROUTE 5 OUTBOUND
ROUTE 5 INBOUND
ROUTE 5-6 SUNDAY OUTBOUND
ROUTE 5-6 SUNDAY INBOUND
ROUTE 6 OUTBOUND
ROUTE 6 INBOUND
ROUTE 8 OUTBOUND
ROUTE 8 INBOUND
ROUTE 9 OUTBOUND
ROUTE 9 INBOUND
ROUTE 10B OUTBOUND
ROUTE 10B INBOUND
ROUTE 10B SUNDAY OUTBOUND
ROUTE 11 OUTBOUND
ROUTE 12 INBOUND
ROUTE 12 OUTBOUND
ROUTE 13 MINI-MALLER
ROUTE 14 OUTBOUND
ROUTE 14 INBOUND
LOCAL ROADWAYS
BAT SERVICE AREA
SURROUNDING COMMUNITIES
JANUARY 2007
To Ashmont
ABINGTON
WHITMAN
AVON
BROCKTON
WEST BRIDGEWATER
BRIDGEWATER
STOUGHTON
EASTON
0 1 2 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, B.A.T., OCPC

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GATRA

The Greater Attleboro Taunton Regional Transit Authority (GATRA) is an authority made up of seventeen communities of which Kingston and Plymouth are in the OCPC region. The Plymouth Area Link or PAL system is run under contract by the Plymouth & Brockton bus company for GATRA and consists of four routes, which operate seven days a week from 6:20 AM to 6:10pm Monday- Friday and 8:20AM to 6:10PM on Saturday and Sunday. Refer to Figure 6-3 for GATRA's PAL routes and connections to the Plymouth and Kingston Commuter Rail Stations.

GATRA has intermodal connections with the Plymouth and Brockton commuter buses at Exit 5 on route 3. This connects the local service with an intercity carrier that travels both north to Boston and south to Cape Cod. The GATRA PAL system carried 66,352 passengers in 2005. Table 6-2 is a breakdown of ridership for the PAL service in 2005. GATRA also connects with MBTA Commuter Rail Service in Kingston.

Table 6-2
GATRA PAL Service

GATRA/ PAL Service					
	Freedom	**Liberty**	**Mayflower**	**Puritan**	**Total**
January	1,510	1,414	664	480	4,068
February	1,740	1,636	723	590	4,689
March	1,724	1,659	987	678	5,048
April	1,920	1,778	930	654	5,282
May	1,997	2,077	974	656	5,704
June	2,378	2,148	1,010	637	6,173
July	2,174	2,120	1,228	615	6,137
August	2,169	2,011	1,200	697	6,077
September	2,106	1,999	1,053	597	5,755
October	2,168	2,144	893	622	5,827
November	1,891	1,984	1,044	672	5,591
December	2,174	2,332	896	599	6,001
Total	**23,951**	**23,302**	**11,602**	**7,497**	**66,352**

MBTA Bus

MBTA bus routes 230, 238 and 240 operate in the region. The MBTA also contracts for provision of demand-responsive service for elderly and disabled passengers in their service region. The MBTA 230 bus serving the Montello station and connects to BAT route 10, the bus runs to the Braintree Red Line station, Quincy Adams Station and then proceeds to the Quincy Center station. MBTA bus 238 starts in Avon and connects with BAT route 12 and the Red line at both Quincy Adams Station and Quincy stations. The MBTA 240 bus runs from Avon Center to the Ashmont Red Line station via Crawford Square in Randolph. It operates on the same route as BAT's Ashmont service, route 12. The routes operate seven days a week and on all holidays with more frequent service Monday-Friday.

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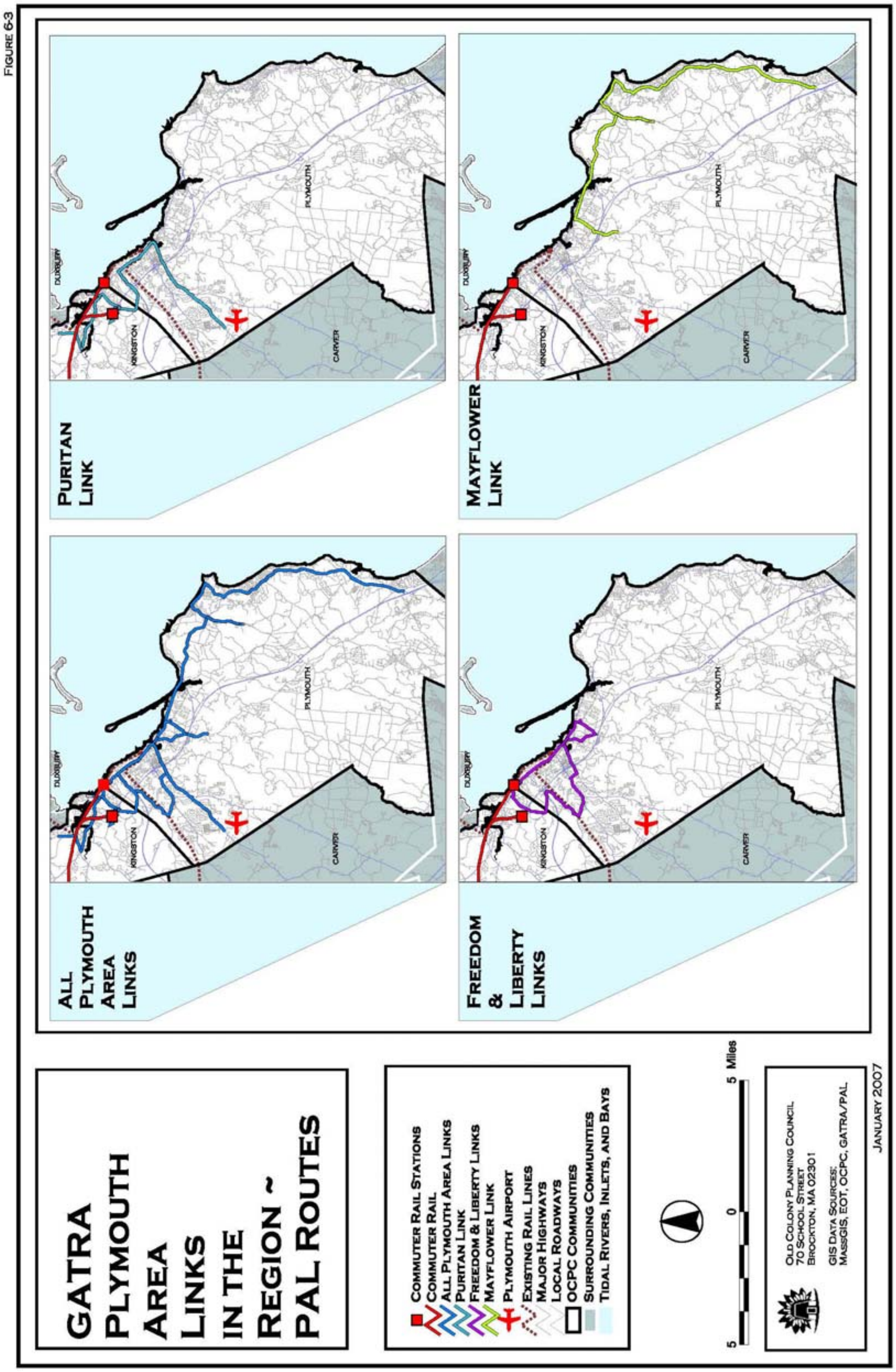
FIGURE 6-3
GATRA PLYMOUTH AREA LINKS IN THE REGION ~ PAL ROUTES
COMMUTER RAIL STATIONS
COMMUTER RAIL
ALL PLYMOUTH AREA LINKS
PURITAN LINK
FREEDOM & LIBERTY LINKS
MAYFLOWER LINK
PLYMOUTH AIRPORT
EXISTING RAIL LINES
MAJOR HIGHWAYS
LOCAL ROADWAYS
OCPC COMMUNITIES
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
5 0 5 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, OCPC, GATRA/PAL
JANUARY 2007
ALL PLYMOUTH AREA LINKS
PURITAN LINK
FREEDOM & LIBERTY LINKS
MAYFLOWER LINK
KINGSTON
DUXBURY
PLYMOUTH
CARVER

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Paratransit

Paratransit service means “parallel” service to fixed route, it runs in the proximity of the fixed routes and has the same operating hours. BAT, GATRA offer paratransit services, which is supported by additional human services trips, provided by BAT, GATRA, South Shore Community Action Council and several local Councils on Aging. In accordance to the *Americans with Disabilities Act* BAT and GATRA provides service within ¾ of a mile of fixed transit routes. The MBTA provides service in communities within their region; however, the MBTA does not provide paratransit service in the Region. Figure 6-4 displays the paratransit services area in the Region.

Currently, BAT and GATRA provide pertinent services to local area hospitals for medical patients that require blood dialysis. Additionally, local contract transportation companies also provide paratransit service. Bridgewater State College also offers paratransit service for on campus trips during school hours.

DIAL-A-BAT

Paratransit service is provided to the elderly (over 65 years of age) and all individuals, regardless of age, who fall within the guidelines, set forth by the Americans with Disability Act (ADA) of 1990. Transportation to Human Service Agencies is also provided and may be arranged through contracting with the Authority. *DIAL-A-BAT* transports approximately 16,000 passengers per month in subscription and dial-a-ride service, using 35 mini-buses specially designed for transporting the elderly and disabled. All buses are equipped with two-way radios and wheelchair lifts.

Table 6-3
DIAL-A-BAT Service Hours

Community	Monday - Friday
Brockton	9:00 A.M. - 6:00 P.M.
Abington	9:30 A.M. - 5:00 P.M.
Avon	9:30 A.M. - 4:00 P.M.
Bridgewater	9:30 A.M. - 5:00 P.M.
East Bridgewater	9:30 A.M. - 5:00 P.M.
West Bridgewater	9:30 A.M. - 5:00 P.M.
Whitman	9:30 A.M. - 5:00 P.M.

The *DIAL-A-BAT* program does not have any restrictions on trip purpose and may be used for shopping, medical, social/recreational or service needs. The only restriction in the program is that trips must start or end in Brockton, Abington, Avon, Bridgewater, East Bridgewater, West Bridgewater, Whitman or parts of Stoughton. *DIAL-A-BAT* also provides service to nearby medical facilities including Good Samaritan Medical Center, Park Medical Associates and West Bridgewater Medical Center. Additionally, *DIAL-A-BAT* provides limited service to Boston’s medical facilities for treatment not available in the Brockton area. *DIAL-A-BAT*’s regular hours of operation are in Table 6-3.

This ¾-mile ADA Paratransit buffer is outlined on Figure 6-4. ADA eligible riders have access to *DIAL-A-BAT* service in the City of Brockton and sections of Abington, Avon, Easton, Stoughton and Whitman. Table 6-4 is a schedule is for DIAL-A-BAT ADA service hours.

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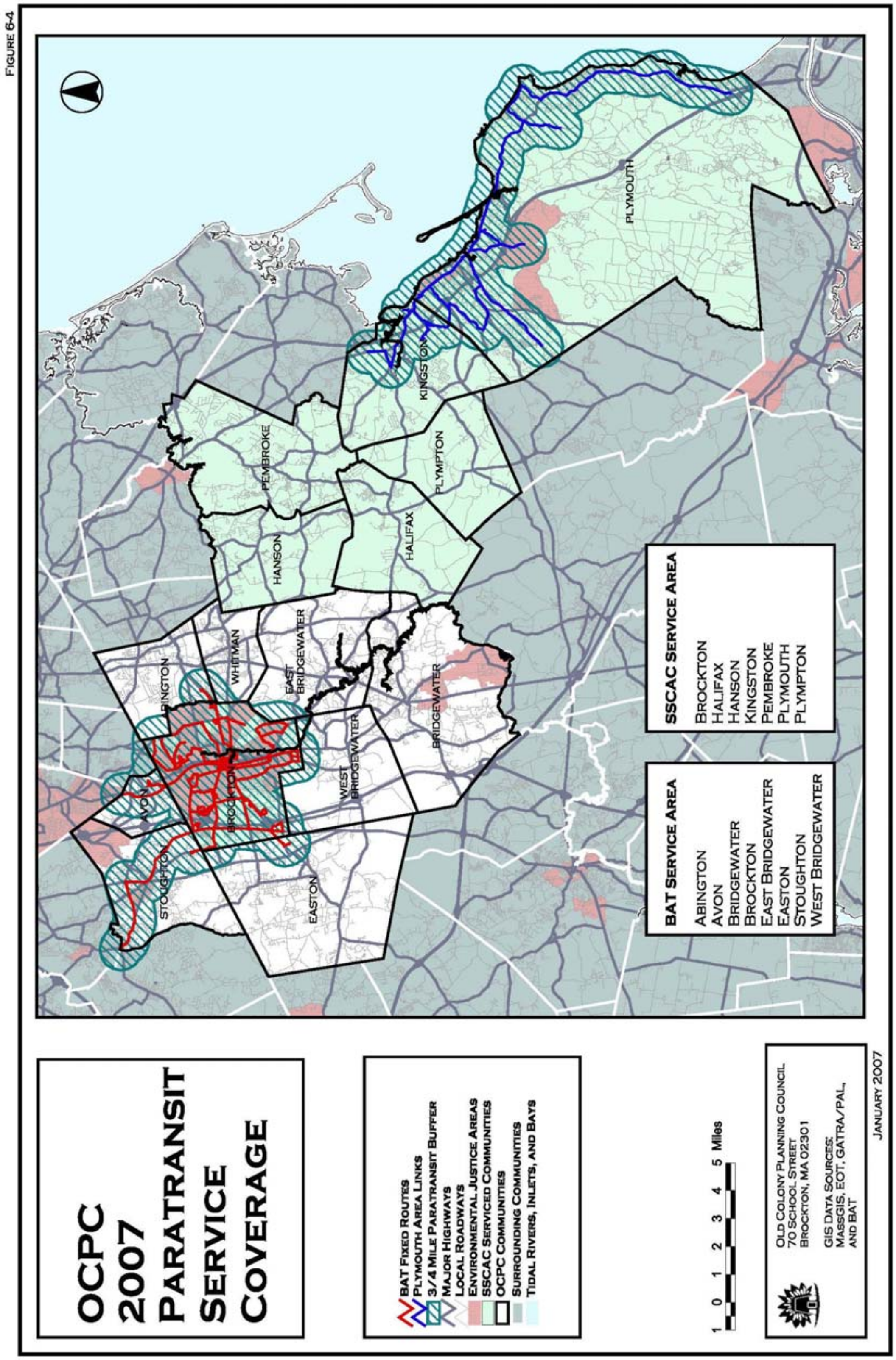

Figure 6-4
OCPC
2007
Paratransit
Service
Coverage
BAT Fixed Routes
Plymouth Area Links
3/4 Mile Paratransit Buffer
Major Highways
Local Roadways
Environmental Justice Areas
SSCAC Serviced Communities
OCPC Communities
Surrounding Communities
Tidal Rivers, Inlets, and Bays
1 0 1 2 3 4 5 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT, GATRA/PAL,
and BAT
January 2007
BAT Service Area
Abington
Avon
Bridgewater
Brockton
East Bridgewater
Easton
Stoughton
West Bridgewater
SSCAC Service Area
Brockton
Halifax
Hanson
Kingston
Pembroke
Plymouth
Plympton
Stoughton
Avon
Brockton
Easton
West Bridgewater
Bridgewater
East Bridgewater
Whitman
Hanson
Halifax
Pembroke
Plympton
Kingston
Plymouth

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Table 6-4
ADA Service Hours

Community	Monday - Friday	Saturday	Sunday
Brockton	6:00 A.M. - 9:00 P.M.	7:20 A.M. - 6:00 P.M.	11:20 A.M. - 6:25 P.M.
Abington	6:00 A.M. - 9:00 P.M.	7:20 A.M. - 6:00 P.M.	11:20 A.M. - 6:05 P.M.
Avon	6:00 A.M. - 5:35 P.M.	7:20 A.M. - 6:00 P.M.	11:20 A.M. - 6:05 P.M.
Easton	6:20 A.M. - 6:00 P.M.	NONE	NONE
Stoughton	6:00 A.M. - 5:50 P.M.	6:00 A.M. - 5:30 P.M.	NONE
Whitman	6:00 A.M. - 9:00 P.M.	7:20 A.M. - 6:00 P.M.	11:20 A.M. - 6:05 P.M.

DIAL-A-BAT offers three types of shared ride service designed to maximize utilization of vehicles, reducing costs. All service is door-to-door and, if necessary, the driver assists riders between the vehicle and the door of the entrance to the destination. The types of service similar but fall into three categories depending on the distribution of the service, these services are DIAL-A-RIDE, Subscription, Out-of-Town**.**

GATRA

GATRA provides Dial-a-Ride service for the towns of Kingston and Plymouth. In the town of Plymouth, Churchill transit has contracted this service since July 2005. Individualized service provides curb-to-curb transportation for individuals ages 60 years and older, those who are disabled, and for authorized trips by clients of participating agencies. For further information about service, refer to www.GATRA.org.

Councils on Aging
Councils on Aging (COA) provide a variety of services to citizens in their community, one of which is transportation programs of various forms. Councils on Aging have their own vans that are run between one and five days a week or through special arrangements. Some councils work with citizens in arranging for transportation when it is beyond the council's ability.

South Shore Community Action Council (SSCAC)

The South Shore Community Action Council, a private non-profit community service agency, began providing elderly and disabled transportation in February 1976, as a one-year demonstration program. Following this one-year program, the SSCAC formed its own transportation department, which has been providing transportation to clients in an expanding number of communities. The SSCAC provides service that cannot be provided by paratransit or COA service. They may serve community members who need a trip to the doctor outside their region, or a disable child that needs to get a school beyond the reach of the local transportation network. The SSCAC funds its operations out of fare box revenue using 16 vans a day for service. The SSCAC provided approximately 65,000 rides last year, covering an area that extends well beyond the region.

Hours of operation are generally 6:00 A.M. to 6:00 P.M., Monday through Friday and on Saturday 6:00 A.M. to 6:00 P.M. for medical necessity only. The SSCAC's service area includes the following towns: Abington, Bourne, Bridgewater, Brockton, Carver, Duxbury, Halifax, Hanover, Hanson, Hingham, Holbrook, Kingston, Lakeville, Marion, Marshfield, Mattapoisett, Middleboro, Pembroke, Plymouth, Plympton, Rockland, Taunton, and Wareham.

Commuter Rail

Three MBTA Commuter Rail lines operate in the Region, Middleborough/ Lakeville, Kingston/ Plymouth, and Providence/ Stoughton lines. The Commuter Rail lines are highlighted in Figure 6-1. The current Commuter Rail lines in the Region handle approximately 11,000 one-way transit trips per day. The Middleborough/ Lakeville and Kingston/ Plymouth lines were restored to service in the fall of 1997 and have become a popular choice for commuters who work in Boston.

The Providence/ Stoughton line offers service to Stoughton and points north, with service Monday-Friday. The Middleborough/ Lakeville line offers service through the OCPC communities of Brockton and Bridgewater. The Kingston/Plymouth line serves the OCPC communities of Abington, Whitman, Hanson, Halifax, Kingston and Plymouth. The Old Colony lines have seven day a week service including all holidays. For more information on the MBTA Commuter Rail, see their website at www.mbta.com or call 617-222-3200

Commuter Bus

Plymouth and Brockton Street Railway Company (P&B), JBL and Bloom bus companies provide commuter bus services in the region. P&B serves park and ride locations in Sagamore, Plymouth, Kingston and Rockland with its final destination downtown Boston and Logan airport. P&B has service leaving Plymouth heading towards Boston as early as 4:05 am, with 30 minute service running for the bulk of the bulk of the day. Schedules that are more detailed can be found at www.p-b.com. Table 6-5 is an illustration of P&B's ridership numbers in and around the region for the year 2005.

Table 6-5
P&B Commuter Bus Ticket Sales in and around the Region

	Sagamore	**Plymouth**	**Kingston**	**Duxbury/ Marshfield**	**Rockland**	**Total**
January	9,009	4,417	1,857	870	6,230	22,383
February	7,521	2,642	1,483	821	6,244	18,711
March	9,243	4,218	2,166	942	7,271	23,840
April	8,692	4,779	1,838	713	6,390	22,412
May	9,049	3,727	1,959	791	6,713	22,239
June	9,225	4,348	1,822	724	6,673	22,792
July	8,693	4,005	1,612	687	5,728	20,725
August	9,171	3,794	1,733	869	6,852	22,419
September	9,549	4,410	1,898	915	6,694	23,466
October	9,330	4,560	1,754	831	6,757	23,232
November	9,178	3,974	1,645	773	6,508	22,078
December	8,151	3,878	1,386	810	6,123	20,348
Total	**106,811**	**48,752**	**21,153**	**9,746**	**78,183**	**264,645**

Bloom serves Easton and a park and ride facility in West Bridgewater. JBL provides Boston commuter service for the towns of Whitman and Abington. The service is generally from points south of Boston to a final destination in Downtown Boston or Logan Airport.

Bloom Bus took assumed operations of the former Interstate Coach in 2004. Interstate Coach provided service from Middleborough, Bridgewater, and West Bridgewater to Boston. Service to the park and ride locations is most frequent in the peak travel periods. Bloom currently serves the West Bridgewater park and ride on Route 106 next to Route 24. Bloom also has a stop in Easton at the corner of Routes 106 and 138. The Bloom service to Boston will also stop at the Westgate Mall in Brockton by request only. Additionally Bloom and Dattco offer daily shuttle service from some of the park and ride lots in the region to the casinos in Connecticut.

Table 6-6 displays the park and ride locations and facilities and services provided.

Table 6-6
Summary of Park and Ride Services

Town	Park and Ride Locations	Transportation Services Provided
Bridgewater	Route 104 @ Route 24	Carpool/Vanpool, Free Parking
Easton	Route 106 @ Route 138	Bloom Bus Service, No Parking
Kingston	Route 3A @ Route 53	Carpool/Vanpool, P & B Bus Service, Free Parking
Pembroke	Route 3 @ Route 139	Carpool/Vanpool, Free Parking
Plymouth	Route 3 exit 5 @ Long Pond Rd	Carpool/Vanpool, P & B Bus Service, Free Parking
Plymouth	Route 3 @ Commerce Way	Carpool/Vanpool, Free Parking, Bloom & Dattco Service
W. Bridgewater	Route 24 @ Route 106	Carpool/Vanpool, Bloom Bus Service, Free Parking

Water Transit

One passenger ferry operates in the Region. It provides summer seasonal service from Downtown Plymouth to Provincetown from May 20th to September 4th with a single roundtrip daily from June 17th to September 4th and weekend only service from May 20th to June 16th. The ferry service is run by Captain John Boats. The town of Plymouth recently sponsored a study looking into the feasibility of a commuter ferry from Plymouth to Boston. This study will be discussed further later in this chapter. Other ferries close to the region provide service to Boston and Logan International Airport. Additionally, there are ferries that operate from New Bedford to Martha’s Vineyard.

6.2 Current Transit Capacity and Service Standards

Regional Transit Agencies and MBTA Bus

Two regional transit agencies provide most of the fixed routes service in the region. BAT operates sixteen fixed routes in the Brockton area and GATRA operates the Plymouth Area Link with four routes in Plymouth and Kingston. MBTA also offers limited bus service to the region. Current passenger buses used in the BAT system are listed in Table 6-7.

Table 6-7
BAT Fixed Route Fleet Specifications

Bus Series Year	Height	Weight	Length	Width	Seating
1991	119"	36000lbs	35'	102"	35
1996	119"	38500lbs	40'	102"	44
1996	119"	36000lbs	35'	102"	35
2005	122"	39600lbs	40'	102"	32
2006	122"	39600lbs	40'	102'	32
Trolleys	134"	33000lbs	34'	96"	41

The service capacity for the two regional transit systems is measured using average daily passengers per route divided by the seating capacity of the vehicles used on those routes. For BAT, the 2006 series service vehicles with 32 seats per bus are used to measure the seating capacity. Table 6-8 shows this calculation for the BAT system in 2006. The current service level across the system is level A. If the system were to fall to a level D, service needs would not be met and BAT would need to consider adding capacity or finding another way to address the issue. The service standard grade is assigned relative to the seating capacity being used.

TABLE 6-8
BAT Weekday Level of Service

Route	Average Daily Passengers	Daily Seats	Passengers Per Seat Per Day	Level of Service for Day
1	608	1664	0.37	A
2	935	1952	0.48	A
2A	112	960	0.12	A
3	895	1952	0.46	A
4	914	1920	0.48	A
4A	803	1952	0.41	A
5	632	1952	0.32	A
6	553	1920	0.29	A
8	605	1920	0.32	A
9	354	1024	0.35	A
10	230	1312	0.18	A
11	197	1056	0.19	A
12	1705	3740	0.46	A
14	200	896	0.22	A

*The table represents an entire weekday of service and does not indicate specific run conditions

Commuter Rail

The restored Old Colony Commuter Rail lines have been operating in the region since 1997. The lines have proven to be popular alternatives to other forms of transportation available**.** However, one effect of the popularity of the rail lines has been on the availability of parking and seating on the trains. In October 2005, OCPC conducted a boarding and alighting survey to gauge the current capacity of the peak period Commuter Rail lines. The survey used staff members to count the boarding and alighting of passengers at each station along the rail lines during peak weekday A.M. and P.M. travel periods.

Commuter Rail service by the three branches and stops served in the region is under capacity as of October 2005. Additional boarding and alighting studies are planned in the coming years to monitor the changes in ridership along the three lines. The Stoughton branch was surveyed at the Stoughton station only and does not reflect capacity restraints beyond the Stoughton station. The capacity of the Middleborough/Lakeville line and the Kingston/Plymouth line is least congested at the end of the lines. The congestion builds as the train makes more stops heading towards Boston. This is a result of the majority of ridership being bound for Boston.

Figure 6-5
Old Colony Lines and Stoughton Branch AM Level of Service

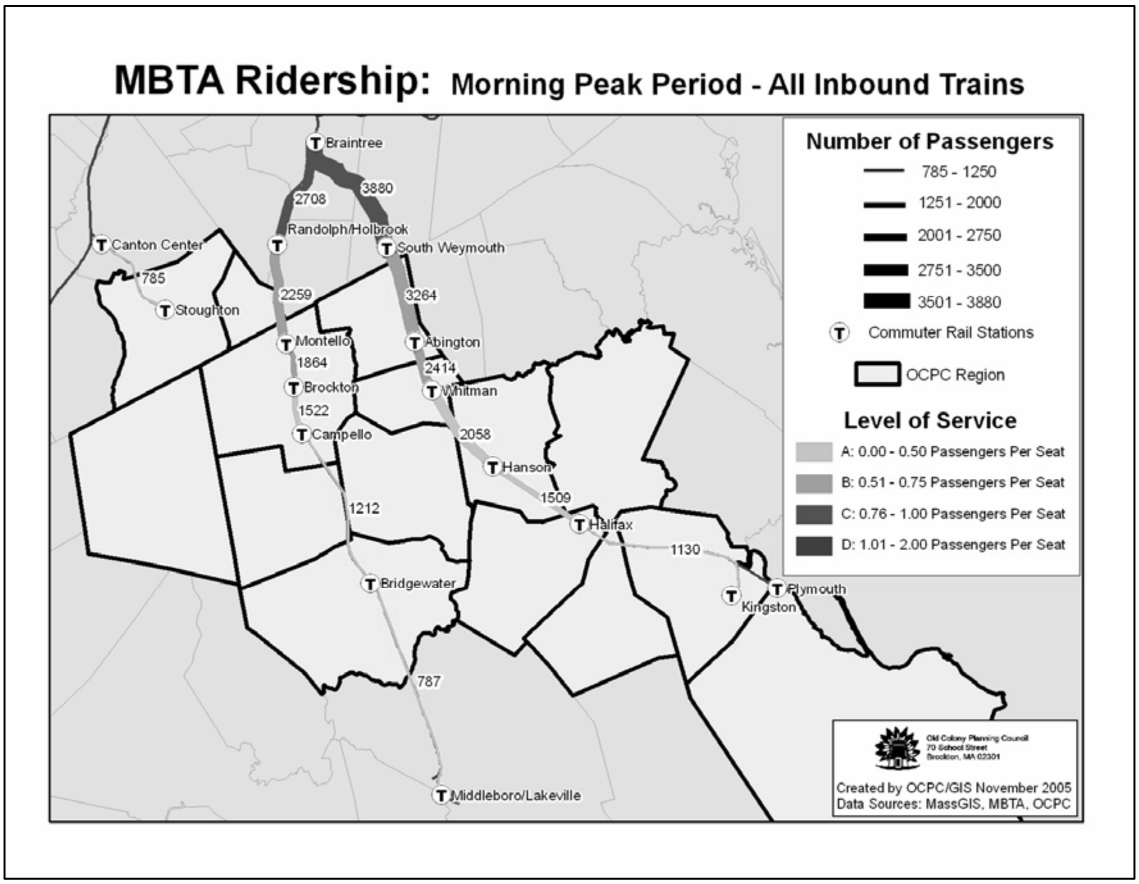
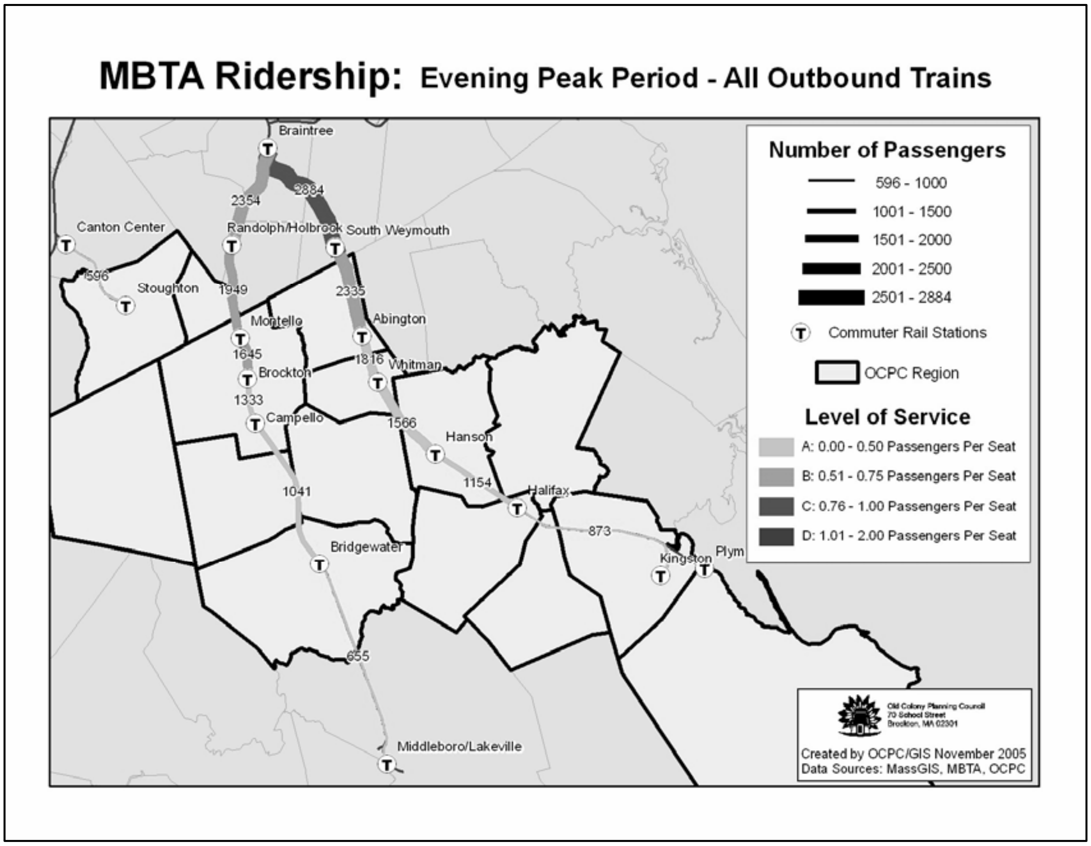


Figure 6-6
Old Colony Line and Stoughton Branch PM Level of Service



The lowest level of service was reached north of the South Weymouth station and the Holbrook/Randolph station. The level of service D indicates that all of the seats on the train are occupied and that standees are present along the segment. The highest levels of service occurred near the terminus stations on each of the three lines. Stoughton station sees a level of service A. One way to improve the level of service is to improve capacity by using more two level passenger cars.

In conjunction with the commuter rail are the parking lots used by many of the people who ride the train. Most of these lots are owned by the MBTA with exceptions being the parking garage at the Brockton station owned by BAT and the parking lot at the Stoughton station owned by the town of Stoughton.

The Table 6-9 shows lot utilization figures for commuter rail parking lots. The ITE publication, Transportation Planning Handbook, describes the effective supply of a lot as the level of occupancy for optimum operating efficiency. The handbook states that a parking facility can be perceived as full at a level that is less than its actual capacity (number of spaces), which is at a range of 85 to 95 percent. Utilizing 85 percent as the threshold for capacity allows for unusual peaks in activity and loss of spaces due to snow cover and/or other special circumstances. The table indicates that nine of the fourteen lots in the region are at or beyond an acceptable capacity.

Table 6-9
Commuter Rail Parking Lot Utilization Rate

Location	Capacity	Utilization Rate								
		May-02	May-04	Jul-04	Apr-05	Jul-05	Oct-05	Apr-06	Jul-06	Oct-06
Stoughton Branch										
Stoughton	441	73.4%	79.3%	72.5%	72.5%	75.4%	91.8%	85.0%	100.5%	104.8%
Kingston/Plymouth										
South Weymouth	538	107.0%	85.1%	78.4%	98.7%	92.2%	102.2%	101.5%	96.3%	104.8%
Abington	400	101.0%	90.3%	92.8%	96.0%	91.0%	100.5%	89.0%	93.0%	104.5%
Whitman	200	95.5%	88.5%	94.0%	96.5%	84.0%	112.0%	97.5%	95.0%	99.5%
Hanson	420	96.0%	86.4%	84.3%	88.6%	73.3%	91.7%	91.7%	87.6%	92.1%
Halifax	410	89.0%	73.4%	76.3%	82.2%	70.3%	75.6%	75.9%	77.6%	85.4%
Kingston	1,020	83.2%	64.7%	67.3%	73.1%	72.7%	76.1%	77.2%	77.2%	74.9%
Plymouth	96	8.0%	6.3%	0.0%	1.0%	12.0%	0.0%	0.0%	2.1%	6.3%
Total Plymouth Line	**3,084**	**82.8%**	**75.4%**	**75.7%**	**83.1%**	**77.1%**	**85.8%**	**83.7%**	**82.8%**	**87.2%**
Middleborough/Lakeville										
Holbrook/Randolph	364	90.0%	78.8%	76.6%	79.9%	74.1%	94.2%	81.6%	80.2%	94.8%
Montello (Brockton)	420	59.9%	55.7%	45.5%	51.4%	47.6%	59.5%	53.6%	50.5%	58.8%
Downtown (Brockton)	266	62.1%	39.1%	35.3%	50.8%	60.9%	50.4%	59.8%	51.5%	52.3%
Campello (Brockton)	545	52.5%	41.8%	37.4%	45.0%	39.6%	43.3%	44.6%	39.4%	42.0%
Bridgewater	500	91.2%	86.0%	68.6%	70.2%	63.0%	76.6%	88.0%	71.8%	91.6%
Middleborough/Lakeville	852	88.5%	69.8%	74.2%	78.1%	69.8%	77.9%	73.8%	92.5%	81.5%
Total Middleborough Line	**2,947**	**74.0%**	**63.7%**	**59.1%**	**64.6%**	**59.5%**	**68.2%**	**67.6%**	**68.0%**	**71.7%**
TOTAL All LINES	**6,472**	**80.9%**	**70.4%**	**67.9%**	**74.7%**	**69.0%**	**78.2%**	**76.5%**	**77.3%**	**81.3%**

Commuter Bus

Commuter bus operations in the Region provide service to passengers as alternative transit means along the major arterials leading into Boston and Logan airport. Most of the passenger traffic on the commuter bus lines occurs during the morning and evening peak periods. However, the P&B lines see more midday and weekend passengers due to the service to Logan airport.

Some of the commuter bus pick-ups are from MassHighway Park & Ride lots in the region. Plymouth & Brockton Street Railway Company runs service from three of the park and ride lots: Rockland at Routes 3 and 228, Kingston at Routes 3 and 3A/53 and Plymouth at Route 3 and Long Pond Road. Additionally, H&L Bloom bus offers service from the West Bridgewater lot at Routes 24 and 106. Three lots without bus service, the Bridgewater lot has the highest percentage of use. This lot used to have bus service but service was cut when demand diminished because of the addition of the commuter rail to the community, though it is still being used for carpool/ vanpool purposes. Table 6-10 provides the lot utilization rate for the park and rides with in the region.

TABLE 6-10
MassHighway Park & Ride Utilization

Location	# of Spaces	Jan-03	May-04	Jul-04	Apr-05	Jul-05	Oct-05	Apr-06	Jul-06	Oct-06
		Spaces Utilized								
Route 3 Corridor										
Rockland - Route 3 @ Route 228	440	N/A	64%	61%	76%	60%	63%	80%	63%	70%
Pembroke - Route 3 @ Route 139 *	90	3%	Closed	Closed	0%	0%	0%	3%	7%	6%
Kingston - Route 3 @ Rats 3A/53	84	46%	105%	54%	60%	90%	87%	96%	60%	85%
Plymouth - Route 3 @ Long Pond Rd	200	42%	53%	50%	71%	74%	69%	71%	57%	61%
Plymouth - Route 3 @ Commerce Way	520	N/A	0%	0%	1%	1%	0%	2%	2%	3%
Corridor Total	**1,334**	**9%**	**36%**	**31%**	**40%**	**37%**	**37%**	**44%**	**34%**	**39%**
Route 24 Corridor										
Bridgewater - Route 24 @ Route 104	60	57%	77%	73%	70%	80%	68%	83%	65%	77%
W. Bridgewater - Route 24 @ Route 106	140	79%	89%	88%	105%	107%	104%	106%	127%	112%
Corridor Total	**200**	**72%**	**86%**	**84%**	**95%**	**99%**	**94%**	**99%**	**109%**	**102%**
Totals	**1,534**	**18%**	**42%**	**38%**	**47%**	**45%**	**44%**	**51%**	**44%**	**47%**

** Pembroke Lot closed at time of data collection due to the construction of Lowe's, open in April 2005. There are no signs designating the lot as park and ride or guiding motorists to site.*

Most of the MassHighway Park & Ride lots lack abundant signage, such as current bus schedules, the type of service, signage guiding commuters to the lot, shelters, and lighting could benefit the commuters.

<u>Water Transit</u>

Currently, the region's only passenger ferry operates on a seasonal basis. Captain John's Boats in Plymouth operate the ferry. There are no plans to expand this service. However, there are proposals to add new Boston bound ferry service from Plymouth. The plan is discussed in further detail later in this chapter.

<u>Congestion Management Process</u>

Old Colony staff currently maintains a database of commuter rail, park and ride, and regional transit ridership and capacity data. These data are compared on a regular basis to the capacities of commuter rail equipment, parking area capacity, and bus capacity. From the comparison of data, staff is able to monitor as well as recommend capacity improvements to specific areas of the regional transit system. Old Colony works closely with the transit agencies in the region to coordinate these efforts. One example is the *2005 Commuter Rail Boarding and Alighting Survey*, of which the results were previously highlighted in Figures 6-5 to 6-7.

6.3 Current Transit Safety Systems and Intelligent Transportation Systems. (ITS)

<u>Regional Transit Agencies and MBTA Bus</u>

Safety and security are concerns that affect everyone in the region. The text, *Urban Transit: Operations, Planning and Economics,* outlines concerns about safety and security that are applicable to the region. Items to consider in the safe operation of fixed route transit are: Vehicle performance, bus body design and strength, fire prevention and resistance, driver training and performance, conditions along the routes, bus stop design and operations, communication with control centers, and the utilization of ITS. Fixed route transit providers keep many of these topics in mind when planning for the safety and security of their operations.

Vuchic also outlines guidelines for security of transit operations, which can be summarized as passenger security, employee security and the protection of revenues, which includes external theft, internal theft and fare evasion. BAT has a philosophy similar to Vuchic, believing safety and security are to protect employees, passengers, assets and revenues. BAT carries this philosophy out through various mechanisms such as employee training, participation in emergency and pandemic drills, the development of continuity of operations plans; uniformed and plain clothes transit patrols, the review of trends on complaints and physical damage so they can be informed and up to date on trends in the system.

Human Resource Protection and Safety

BAT and GATRA provide extensive service in the region. BAT and GATRA both operate with human resources to include employees and passengers. For these agencies, the protection and safety of their passengers is the first priority in their operations.

BAT and GATRA have contingency plans and local interagency agreements to coordinate emergency and disaster response plans. Examples include meeting evacuation requirements for local elderly populations and blood dialysis operations. The agencies also plan to have an important role in the Pilgrim Nuclear Power Plant emergency response plan.

BAT's Intermodal Centre represents a confluence of transportation resources, such as busses, trains, taxis and parking, at a single location. The safety and security of the passengers at the Intermodal Centre and along BAT routes in the communities of Avon, Abington, Brockton, Easton, and Stoughton is a great responsibility. This responsibility is passed to the employees and riders of BAT through an active passenger education program. Programs such as Transit Watch encourage both passengers and employees to become aware of their surroundings and report suspicious behavior or activity. Additional employee-training programs are updated annually through the BAT safety and training manager.

Education

BAT's education efforts primarily focus on employee training. Efforts include the distribution of emergency preparedness training materials, safety education classes and classes on the handling of passenger during an emergency or disturbance.

Local Community Training

BAT provides evacuation services to the local communities in its service area as well as services to the Pilgrim Power Plant in Plymouth. Training on equipment familiarity is conducted with local fire departments within the fixed route service area. Fire department personnel are trained in responding to bus accidents and to medical emergencies aboard fixed route and paratransit vehicles.

Physical Resource Protection and Safety

BAT's physical resources include over one hundred vehicles, three buildings, one parking structure and several bus shelters along fixed transit routes in Brockton. The safety of passengers at these facilities requires vigilance and protective actions to reduce the likelihood of incidents harming passengers and employees alike. Police patrols the BAT Intermodal Centre.

BAT has also hosted the National Transit Institutes Terrorist Activity and Recognition and the Workplace Safety and Security classes for its employees.

Intelligent Transportation Systems

ITS systems used by BAT include surveillance equipment on buses and property, talking buses (2005 and 2006 series buses), smart parking pay cards used at the parking facility, monthly local and Ashmont passes and reduced fare passes, in addition to the exploration of new technologies such as AVL and signal priority.

Commuter Rail

Urban Transit Operations, Planning and Economics outlines some key components to focus on for safety when it comes to rail transportation. These components are:

- Fully protected right of ways to help prevent collisions with vehicles or pedestrians
- Track signals that ensure fully protect paths for trains through switches and conflict points
- "Dead man" safety device on trains
- Vehicles that can withstand high impact collisions and provide protection to passengers
- Up to date communication systems, and continually supervised operations

Massachusetts Bay Commuter Railroad runs the commuter rail lines for the MBTA. As the operator, they work in cooperation with MBTA to ensure that these safety guidelines are being met.

Transit Police

The Massachusetts Bay Transportation Authority maintains a Transit Police force for its service area. The Transit Police actively patrol, investigate and prevent crime. The Transit Police work with local police on identifying concerns of safety and security.

Transit Police are also responsible for responding to incidents along the right of way involving property or equipment of the MBTA. Local police departments respond as well. Due to the proximity to the incidents, local police departments respond to a majority of incidents.

Education

Education efforts include training local community resource police officers and Operation Lifesaver training outreach efforts. Operation Lifesaver focuses on protecting the public from the dangers of railroading. Efforts include education of K-12 students on how to act at railroad grade crossings, and the railroad right of way. The training also includes lessons for motor vehicle operators, and local police and fire officials. It can be accomplished by requesting an Operation Lifesaver instructor or by volunteering to teach the courses through the website at www.oli.org/index.php.

Local Community Training

Local community training efforts can be accomplished through coordination with the MBTA Railroad Operations Department through accident response and disaster response training. The exercises allow local law enforcement officials, emergency services coordinators and local fire officials to coordinate response plans with the MBTA. For example, an exercise held in Kingston in October of 2006 simulated the response necessary for a collision causing derailment and injury to customers and causing a fuel spill requiring hazardous material response as well. Further exercise can be coordinated through the MBTA's Railroad Operations Department at 617-293-9127.

Physical Resource Protection and Safety

The safety of the railroad right of way, employees, passengers, property and equipment is critical to maintaining fluid operations. The MBTA Commuter Rail operates over large lengths of relatively unprotected right of way. The Transit Police Department patrols the right of way on a regular basis. However, many local police departments report and enforce safety laws around the right of way. Figure 5-6 displays the locations of railroad and pedestrian grade crossings in the Region.

All of the crossings are equipped with audible and visual warning systems for motorists and pedestrians. However, the pedestrian crossings within the stations and a single crossing in East Bridgewater do not have physical barriers to protect vehicles or pedestrians. The single crossing in East Bridgewater is an unused spur that serves the former Shaw's warehouse and is not owned by the MBTA. The pedestrian grade crossings are located at the Montello, Brockton, and Whitman and Halifax stations. An example of a typical commuter rail grade crossing design can be found in Figure 6-10.

Other physical barriers include fencing, soundproofing, jersey barriers and gates to reduce the potential for right of way intrusions. Examples of fencing and soundproofing can be found in Figures 6-11 and 6-12. These barriers require regular upkeep to maintain their ability to deter unauthorized activates along the right of way. The MBTA stations and layover yards are lighted during times of darkness with additional security protection added to the layover yards.

Figure 6-7 Commuter Rail Grade Crossing Design

Figure 6-8
Commuter Rail Sound Proofing

Figure 6-9
Commuter Rail Protective Fencing

Intelligent Transportation Systems

Intelligent Transportation Systems are an active part of present day Commuter Rail operations. Examples of ITS include passenger message signs indicating transportation information to waiting passengers, *1 for cell phone users which transfers to the smartraveler travel information system, and the MBTA transit updates website at www.mbta.com.

Commuter Bus & Water Transit

Human Resource Protection and Safety

P&B, JBL, Bloom all provides driver training for emergency scenarios. P&B participated in a disaster drill at the Kingston Commuter Rail station in October 2006. The drill involved a simulated bus accident with injured passengers. The training involved the MBTA, several local fire and police departments and P&B. Training exercise provide opportunities for employees and management to learn how to respond to unexpected events. The training scenarios also provide for better passenger safety and security by enhancing the employees' understanding of safety related issues affecting the transit services.

P&B is a component of local emergency plans. Service maybe needed for an evacuation of the area and P&B is part of the response team for that. P&B is also part of the system to help the area deal with pandemic situations, transporting people either to a central location to receive help, or by using the buses in a central location, as in the dispersal of vaccines.

Education

P&B, JBL and Bloom have active employee safety programs. These programs provide up to date education efforts to improve employee knowledge of safety and security related matters. For example, P&B runs programs yearly with a mixture of new topics and fresher courses. Training could be on topics such as customer service, ADA, safety and security, new technologies, idling, and sensitivity training.

6.4 Present Freight Transportation Network

Rail Freight System

The current rail freight network includes CSX Transportation and Bay Colony Railroads. The CSX Transportation Company operates along the Middleborough Secondary and the Bay Colony Railroad along the Plymouth branch. Each of the railroads has operating rights but the Massachusetts Bay Transportation Authority owns the right of way. CSX also operates along the Stoughton Branch, serving a lumberyard as required from the Readville Yard in Boston.

Freight operations consist of a single roundtrip local train that serves customers in Brockton and Avon. The train originates from the Middleborough Yard and operates to Braintree five days per week. It interchanges with the Quincy Bay Terminal Railroad to pickup fertilizer from the Massachusetts Water Resources Authority Plant in Quincy.

Water Freight System

Water freight operations in the region are limited. Operations are out of the port of Plymouth and consist of fish products. Between 1972 and 1977, the total tonnage of waterborne freight utilizing local facilities declined significantly, but has stabilized since. The stability of total tonnage exhibited in recent years stems directly from the expanded volume of dogfish and shellfish passing through the port. Reliable Fish Company operating on the town wharfs largely purchases the fish products. Much of the fish and shellfish are ultimately exported overseas. In addition, another three or four companies come onto the pier to truck fish and lobster.

Current Freight Capacity and Service Standard

There is limited freight service demand in the region. Some examples of the rail fright you will find in the region would be Cohenno, Inc on the Stoughton branch, which currently receives carloads of building materials from around the nation and Canada. Other examples on the Middleborough/Lakeville Branch, Browning-Ferris Industries (BFI) in Brockton ship carloads of bailed recyclables from their recycling center on Mulberry Street; National Grid receives carloads of electric light poles from the South; Bay State Gas receives carloads of liquefied propane from New York, and Canada at their siding off of Oak Hill Way; and, Trojan Recycling on Forest Avenue in Brockton uses freight rail to ship out trash and demolition material. Champion City Recovery in Brockton receives wood waste from presorted construction and demolition (C & D) debris by tractor/trailer, then they use rail to ship the waste out of the location.

There are no container or truck piggyback (COFC/TOFC) facilities in the region. Cohenno, Inc. in Stoughton and Massachusetts Electric receive freight by rail for regional and local shipment by truck. BFI in Brockton receives truckloads of bailed recyclables for shipment by rail. Containers on flatcars are loaded with pelletized fertilizer, which is produced at the Massachusetts Water Resources Authority's (MWRA) sludge-to-fertilizer facility at the Fore River Staging Area (formerly the Quincy Shipyard). Pellets are shipped by rail to several locations within the continental United States. The Quincy Bay Terminal Company (QBT) a short line freight railroad provides the freight rail transportation services between Quincy Point and South Braintree where QBT interchanges with CSXT and continues on the Middleborough/Lakeville corridor on their way to the South.

Current Freight Safety Systems and Intelligent Transportation Systems

Rail Grade Crossing Safety

Since the restoration of the Old Colony Commuter Rail lines in the region, freight transportation has been able to benefit from the upgrades in facilities that were necessary with the reintroduction of frequent passenger service from the area. Many of the graded crossings in the area were upgraded and enhanced, in addition to pedestrian walkways and secured fencing to discourage people from crossing.

Operation Lifesaver

The Old Colony lines are also part of Operation Lifesaver, a non-profit organization promoting railroad safety to the public. Operation Lifesaver is a national, non-profit education and awareness program dedicated to ending collisions, fatalities, and injuries at highway-rail grade crossings and on railroad rights of way. To accomplish its mission, Operation Lifesaver promotes "the three Es:"

- Education**:** Operation Lifesaver strives to increase public awareness about the dangers around the rails. The program seeks to educate both drivers and pedestrians to make safe decisions at crossings and around railroad tracks.
- Enforcement: Operation Lifesaver promotes enforcement of traffic laws relating to crossing signs and signals and private property laws related to trespassing.
- Engineering: Operation Lifesaver encourages continued engineering research and innovation to improve the safety of railroad crossings

Nearly ten years have passed since the restoration of the Old Colony line and Operation Lifesaver remains active in the region. Teachers and safety officers in the area do currently educational outreach and audiences range from young to old. Operation Lifesaver customizes presentations to the group and will even run specialized training sessions for groups such as an emergency response team, or school bus drivers. Anyone who is interested in running training sessions can do so after some training with operation Lifesaver. For more information, please refer to www.oli.org.

Right of Way Security Measures

Freight traffic has been able to benefit from the enhancements to the right of way with the reintroduction of the Old Colony Commuter Rail. Enhancements such as security fencing and soundproofing make the operation of rail in the area safer for both the train operators and the members of the communities that the rail operates in.

6.5 Present Air Transportation Network

Air Passenger System

Within the Region, there are three airports. Aviation services are provided at the Plymouth Municipal Airport and two private airports: Halifax and Hanson (refer to Figure 6-1 for locations). The region's airports are a vital component of the overall transportation network serving personal, business and recreational purposes, and serve as an important factor in the region's economic development efforts.

Five other municipally owned airports are located in communities adjacent to the region: Mansfield, Marshfield, New Bedford, Norwood, and Taunton. Only New Bedford has scheduled passenger service and none of the facilities have scheduled freight service, although helicopters based at Norwood Airport are utilized for the delivery of FedEx packages to various destinations. One other facility, the South Weymouth Naval Air Station, is closed and the reuse plan excludes plans for aviation activities.

In this section, the existing conditions of the region's airports are discussed, as well as future development, adjacent airport facilities and recommendations.

Plymouth: Municipal

Plymouth's airport is the only publicly owned airfield in the region. The Town of Plymouth owns the facility with no scheduled passenger or freight service. The airport functions as a general aviation facility serving private operators and individuals. The travel accommodated by the field consists predominantly of recreational and business trips. In addition, three charter services operate out of the field. The facility contains 40 hangars and aviation fuel and repair services. In addition, the airport is the headquarters to the Massachusetts State Police Air Wing and the Plymouth County Fire plane. Boston Medflight helicopters is also an active tenant of the airport with a average of about 4-6 flights per day to support the emergency medical needs of Plymouth area residents. The airport recently completed an extension of its two paved runways to a size of 4350’ x 75’ and 3350’ x 75’ respectively to better accommodate corporate aircraft.

Halifax: Monponsett Seaplane Base

This is a seasonal facility and is close in proximity to Hanson’s Cranland Airport, which supplies services to the seaplane base. Halifax utilizes the waters of the Monponsett Pond the seaplanes land on an unmarked area on the pond. Dock space and mooring facilities are available, as is flight instruction. Emergency-only fuel and repair services are also available from Cranland. Recreational trips are served at this facility. There is no scheduled freight or passenger service and air traffic growth is minimal. The facility has no expansion or improvement plans at this time.

Hanson: Cranland Airport

The nearly adjacent Hanson airport is privately owned and publicly accessible. It provides one non-illuminated asphalt runway 1,760 x 60 feet in length. The facility contains seven hangars and emergency-only aviation fuel and repair services. This general aviation facility serves recreational trips. There is no scheduled freight or passenger service. There are no plans for expansion of services or capital improvements at this time.

New Bedford: Regional

Owned by the City of New Bedford, there is scheduled passenger service, but no scheduled freight service. Two paved runways each measure approximately 5,000’ x 150’. A proposed project to expand one of the paved runways an additional 3,000’ is currently undergoing the environmental review and permitting process. Sewer and natural gas infrastructure was recently installed around the airport and the terminal was recently renovated. Passenger flights depart hourly for the islands and the airport hopes to provide regular passenger service to and from New York City and scheduled freight service in the future. New Bedford reports a sharp increase in use of its facilities over the past few years. Cape Air is the primary commercial operator at the airfield. The U.S. Customs Service operates on an on-call basis for any international flight operations.

Taunton: Municipal

Owned by the City of Taunton, there is no scheduled passenger or freight service. The airport recently extended its gravel and turf runway from 1,550’ x 150’ to 2,000’ x 150’. The 3,500’ x 75’ paved runway was repaved in 1998. A security project is underway to enclose the perimeter of the facility with fencing. A new flight school opened at the airport in 1999, which serves Bridgewater State College’s aviation program. More than $3 million in improvements have been completed since 1996.

Weymouth: South Weymouth Naval Air Station

A reuse plan is in place for the development of the former base, the federal government in 1996 officially closed the aviation function of the base. The base was closed in 1997 and the U.S. Navy is in the process of transferring the land to stakeholders. The reuse plan does not include aviation activities or services.

Air Freight System

Currently there are no airfreight services available in the Region.

Current Air Transportation Capacity and Service Standard

Plymouth Municipal Airport is the largest in the region and is a midsize airport compared to other airports in the state of Massachusetts. The airport is open to the public and is municipally owned; the airport has no passenger or freight service. The airport has about 75,000 movements a year; approximately 50% of that traffic is from the flight schools. The Plymouth Airport has gradually increased in traffic. The airport commission takes care in selecting expansion opportunities to ensure that they will fit in with the profile of the neighborhood. The airport currently has 40 hangers on premises; they are leased out to a mix of aviation and non-aviation related business. Airport officials report a steady increase in demand, particularly with regard to hangar space, over the past few years.

Current Air Transportation Safety Systems and Intelligent Transportation Systems

Plymouth Airport has implemented the safety and security measures as required by the Massachusetts Aeronautics Commission (MAC). The airport has an emergency preparedness plan and is currently working on updating its master plan. The airport is home to Boston Med flight, Massachusetts State Police Air Wing and the Plymouth County Fire Plane, all of which provide vital services to the area in terms of safety and security. The airport premises are secured by fencing and the airport utilizes employee badges to identify employees of the airport and the business that are part of the facility. Eighty percent of planes are in hangers, which enhances the security of the airport. Many of the hangers are equipped with security systems.

6.6 Future Passenger Transit Network Potential

Transportation is not a static feature in the OCPC region. As demands increase or changes so does the transportation needs of the regions communities. Figure 6-10 outlines some of the OCPC region's future potential transit networks.

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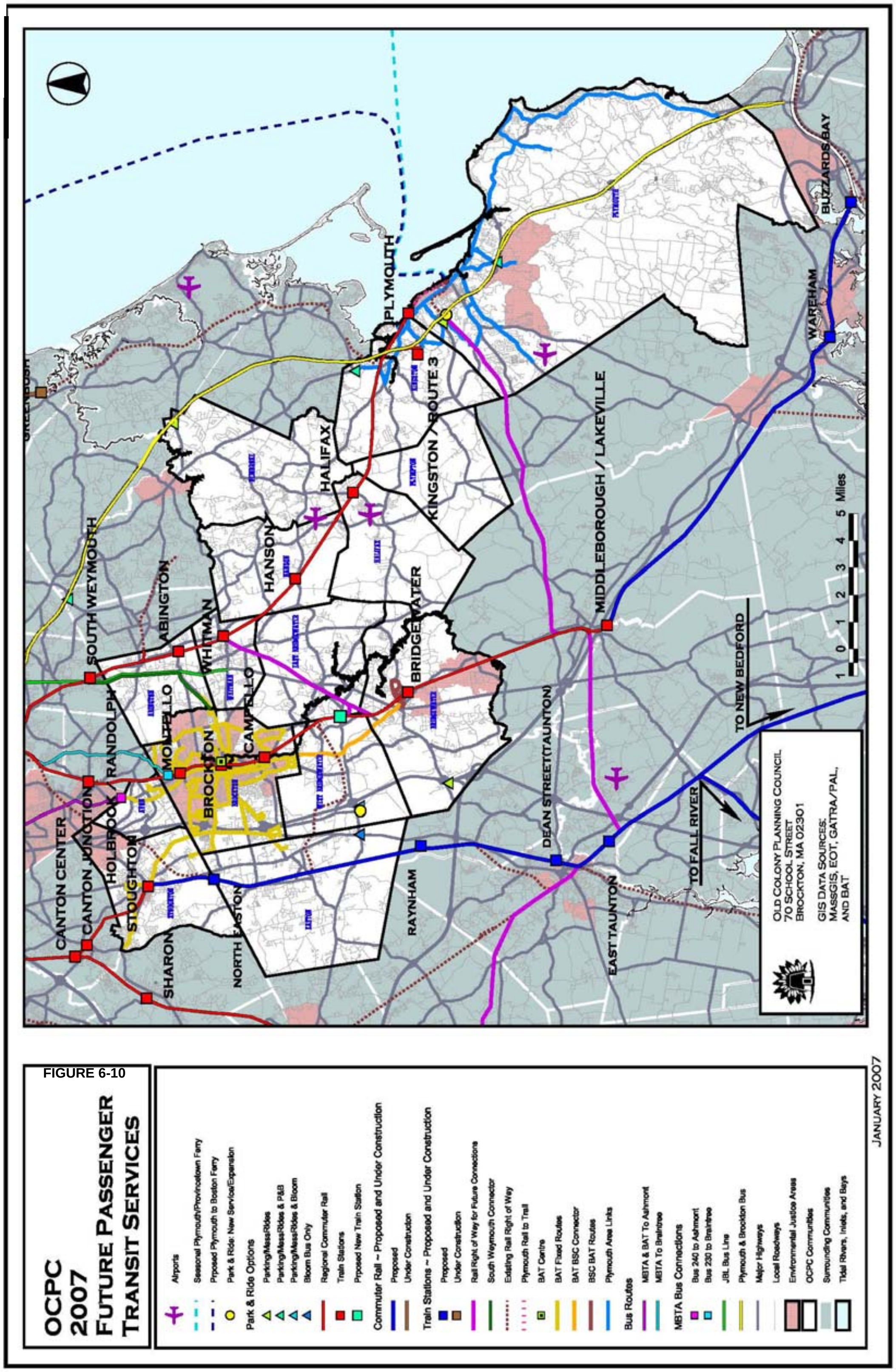
FIGURE 6-10
OCPC
2007
FUTURE PASSENGER
TRANSIT SERVICES
Airports
Seasonal Plymouth/Provincetown Ferry
Proposed Plymouth to Boston Ferry
Park & Ride: New Service/Expansion
Park & Ride Options
Parking/MassRides
Parking/MassRides & P&B
Parking/MassRides & Bloom
Bloom Bus Only
Regional Commuter Rail
Train Stations
Proposed New Train Station
Commuter Rail -- Proposed and Under Construction
Proposed
Under Construction
Train Stations -- Proposed and Under Construction
Proposed
Under Construction
Rail Right of Way for Future Connections
South Weymouth Connector
Existing Rail Right of Way
Plymouth Rail to Trail
BAT Centre
BAT Fixed Routes
BAT BSC Connector
BSC BAT Routes
Plymouth Area Links
Bus Routes
MBTA & BAT To Ashmont
MBTA To Braintree
MBTA Bus Connections
Bus 240 to Ashmont
Bus 230 to Braintree
JBL Bus Line
Plymouth & Brockton Bus
Major Highways
Local Roadways
Environmental Justice Areas
OCPC Communities
Surrounding Communities
Tidal Rivers, Inlets, and Bays
JANUARY 2007
GREENBUSH
SOUTH WEYMOUTH
ABINGTON
WHITMAN
HANSON
HALIFAX
PLYMOUTH
KINGSTON
ROUTE 3
MIDDLEBOROUGH / LAKEVILLE
BRIDGEWATER
CAMPELLO
BROCKTON
MONTELLO
RANDOLPH
HOLBROOK
CANTON CENTER
CANTON JUNCTION
STOUGHTON
SHARON
NORTH EASTON
RAYNHAM
DEAN STREET(TAUNTON)
EAST TAUNTON
WAREHAM
BUZZARDS BAY
TO NEW BEDFORD
TO FALL RIVER
1 0 1 2 3 4 5 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT, GATRA/PAL,
AND BAT

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6.7 Transit Connectivity Opportunities

Human Services Transportation Coordination

SAFETEA-LU requires MPO regions along with regional transit agencies and human service providers to coordinate human service plans in order to be funding eligible for certain funding programs. The plan must be in place to receive Federal Transit Administration funding in sections 5310 (Elderly Individuals and Individuals with Disabilities Program), 5316 (Job Access and Reverse Commute or JARC), 5317 (New Freedom Program).

A coordinated human services plan helps the region to prepare for the future; a few statistics to consider:

- According to the American Association of Retired Persons (AARP) in the next 15 years the population of people aged 50-60 will increase by 21% and the population of people older than 65 will increase by 33%.
- Ten states will have more Medicaid eligible seniors than school aged children.
- In 2003, about one in seven licensed drivers was 65 and older. By 2029 when the last of the baby boomer generation turns 65, the proportion will be closer to one in four.
- The average male will outlive his driving abilities by six years and the average female will outlive hers by 10 years.
- Nearly three-quarters of people surveyed aged 50-74 relied mostly on driving, but that figures dropped significantly after age 75.
- Persons who are dependant on transportation are six times more likely to miss doing something they would have liked to do because they do not have transportation.
- Sixty percent of seniors said that there was no public transportation within a 10-minute walking distance of their homes.

The human services transportation coordination provisions of SAFETEA-LU aim to improve transportation services for persons with disabilities, older adults, and individuals with lower incomes by ensuring that communities coordinate the transportation resources provided through multiple federal programs. Coordination between organizations such as BAT, GATRA, MBTA, local Councils on Aging, the South Shore Community Action Council, and other local human service providers in the Region will enhance transportation access, minimize duplication of services, and facilitate the most appropriate cost-effective transportation possible with available resources. The plan is to be developed by a process that includes representatives of public, private and nonprofit transportation and human services providers and participation by the public.

The focus of the plan should involve the centralization of human transportation service centers to provide a seamless one-stop system for human service customers. Currently, there are several methods for obtaining human service transportation services. For example, a single call center with a single outreach element will enhance the ability of a growing elderly and disabled population to access fair and equitable transportation services.

Community Transportation Association of America has outlined guidelines to consider when making a human services coordinated plan:

- Assess transportation needs for individuals with disabilities, older adults and persons with limited income.
- Inventory available services to identify areas of redundant service and gaps in service.
- Develop strategies to address the identified gaps in service.

- Identification of coordination actions to eliminate or reduce duplication in services and strategies for more efficient utilization and recourses.
- Prioritization of implementation strategies.

As a starting point Table, 6-11 is a summary of transportation options in the area, including human services transportation.

Table 6-11 Summary of Human Services Related Transit Resources in the Region

Community	Services	Notes about services	# Of vans for COA	Notice needed to schedule COA/ Paratransit rides	Fixed Route Services	Commuter Rail Station
Abington	DIAL-A-BAT, COA, Fixed Route, Commuter Rail	Uses DIAL-A-BAT first, then COA vans for all other things, such as shopping trips, and other trips in Abington and surrounding towns. The town has a commuter rail station with no fixed route service to the station.	1 van	1 day	Limited, BAT Route 5 to Wal-Mart in Abington	YES
Avon	DIAL-A-BAT, COA, Fixed Route	Uses COA van first then DIAL-A-BAT, trips to Avon and surrounding towns and a sat morning church trip.	1 van	1 day	Limited, BAT Route 1 to Wal-Mart in Avon, Route 12 to Ashmont	NO
Bridgewater	DIAL-A-BAT, COA, Fixed Route, Commuter Rail	DIAL-A-BAT for most trips, COA van is for prearranged group trips and transportation to the Tuesday luncheon. Commuter Rail station is serviced by BSC transportation but it is not open year round.	1 van	Not available for individual rides	BSC operates about 9 months out of the year.	YES
Brockton	DIAL-A-BAT, SSCAC, Fixed Route, Commuter Rail	DIAL-A-BAT is the primary provider of trips for both recreation and medical purposes. All three commuter rail stations are services, the Brockton station is adjacent to the BAT Intermodal Centre		1 day	Extensive BAT coverage	YES (3 stations)
East Bridgewater	DIAL-A-BAT, COA	DIAL-A-BAT for most trips, COA van is for prearranged group trips	1 van	Not available for individual rides	NO	NO
Halifax	COA, SSCAC, Commuter Rail	Trips for individual and prearranged group trips, destinations in town and surrounding communities and trips to Boston for medical purposes. Also, wed morning church trip. The commuter rail station has no fixed route service to it.	2 vans	As soon as possible	NO	YES
Hanson	COA, SSCAC, Commuter Rail	Trips are to support programs at the center and adult day care programs, because of limited resources the COA depends on surrounding COA's for support. The commuter rail station has no fixed route service to it.	1 van	Not available for individual rides	NO	YES

Table 6-11 Summary of Human Services Related Transit Resources in the Region Continued

Community	Services	Notes about services	# Of vans for COA	Notice needed to schedule COA/ Paratransit rides	Fixed Route Services	Commuter Rail Station
Kingston	GATRA (paratransit & Fixed), SSCAC, Commuter Rail	Service can be used for individual trips from shopping to medical appointments, to visiting a friend. The commuter rail station has fixed route service available to it on a limited frequency.	2 vans	ASAP, currently booked a week ahead	Limited, GATRA service to commuter rail station	YES
Easton	COA, Fixed Route	Medical, shopping, trips around town and surrounding communities.	3 vans	1 day for shopping 2 days for medical	Limited, BAT Route 9 to Easton Industrial Park	NO
Pembroke	COA, SSCAC	Trips for food shopping, lunch, activities, mall, medical	2 vans	1 weeks notice shopping, 3 days medical	NO	NO
Plymouth	GATRA (paratransit & Fixed), SSCAC, Commuter Rail	Shopping trips, medical trips, ADA rides, Plymouth and up to Tremont st in Duxbury. M-S service available for medical trips. The commuter rail station has non-peak train service and fixed route service available to it on a limited frequency.	3 vans	1 day	GATRA service 4 routes, wide coverage, limited frequency	YES (4 daily non peak trains)
Plympton	SSCAC	Plympton is currently trying to find a way to get cost effective service to their senior population.	No vans	N/A	NO	NO
Stoughton	DIAL-A-BAT, COA, Fixed Route, Commuter Rail	Service to Stoughton and surrounding towns, medical, shopping trips on Tuesday	4 vans	2 days	Limited, BAT Route 14 & Mini Maller	YES
West Bridgewater	DIAL-A-BAT, COA. Commuter Rail	DIAL-A-BAT for most trips, in town 1 van will take people to destinations just in Bridgewater, medical or shopping trips. West Bridgewater would like a commuter rail station.	1van	1 day	NO	NO
Whitman	DIAL-A-BAT, COA	DIAL-A-BAT for medical and individual trips, COA will arrange group trips to different shopping areas and senior activities the COA van is not for individual trips	2 vans	1 day	NO	NO

COA = Council on Aging

SSCAC = South Shore Community Action Council

In addition to the challenges of coordinating human services in the region, there is also the challenge of getting individuals that have been independent all of their lives to surrender their licenses and embrace the public transit options around them. In developing a coordinated plan; attention will need to be given to these people and as this population grows the demands that they will require on transportation services. Finding solutions that provide these individuals with the flexible transit options, maintaining their own independence, but keeping them and the community safe should be the ultimate goal.

Improved RTA Funding

In a climate of raising fuel costs, human resource costs, and increased demand for safety and security, regional transit authorities (RTA) in Massachusetts have been challenged to maintain the same level of service on the road. Systems across the state, such as BAT and GATRA, have had to make hard choices between reducing service and raising fares to cover the increased costs. In addition, the RTA's fund their operational costs by borrowing the money to operate for the year and then receiving money at the end of the fiscal year from the state to pay for the services already run. There are two problems with this. One is that the RTA's may receive less money than expected to pay for service already provided. The second is an inefficient use of state funds. Since the RTA borrow money to run operations in addition to paying for the cost of operations, state and federal money is used to pay the interest on that loan. This could be avoided by forward funding the RTA has and eliminate the cost of debt service. As the RTA's struggle to survive on the same dollar value they received in 2001, they lose the ability to best serve their customers since they have to cut service and raise fares.

In June of 2005,Massachusetts Association of Regional Transit Authorities (MARTA) completed the *Five Year Transit Service and Capital Plan for the Massachusetts Regional Transit Authorities.* The plan outlined steps the RTA's and state can take to help restore service cuts and increase service in order to most efficiently meet the demands and the needs of the area. Two RTA's in this report are in the Region; BAT and GATRA.

According to the report, an increase of 33,321 service hours is needed to bring BAT to the most efficient level. This included enhancements to service during the weekday and more specifically to the morning and evening commute times. Additionally it also included enhancements to weekend service, improved multimodal connections to the MBTA commuter rail stations, and turning the operations of DIAL-A-BAT back over to BAT from the contractor that currently runs the weekend service. Compared to many other urban transit systems in Massachusetts BAT required the least amount of additional service hours to bring the system back to its most efficient levels of service. The system should be recognized in its ability to maintain a high level of service in a challenging financial climate.

GATRA would need to add an additional 187,101 hours to its current operations to bring operations to most efficient level to service demand. This would include 84,240 hours to improve weekday frequency to 30 minutes and 23,660 hours to add service to Saturday and Sunday. Additional enhancements would include restoring canceled service and adding service to major trip generators like Silver City Galleria, Emerald Square Mall, Taunton Industrial Park and the Attleboro County Industrial Park. The final suggestion from the plan is for GATRA is to enhance the connectivity with other transit authorities; this would include connections to the MBTA commuter rail stations, BAT, SRTA and Rhode Island Public Transit Authority and service to Providence.

Car Sharing

Another way to increase the connectivity of transit modes is by adding car-sharing program like Zip Car or Flexcar. Areas such as downtown Brockton, Bridgewater State College and Stonehill College are communities that would really be enhanced by a car-sharing program. Generally, a person needs to be 21 and over to use the service, but both Flexcar and Zip Car have undergraduate programs, geared for college communities. In addition, colleges can benefit from such a program because they can offer cars to their students, faculty and staff at a reasonable cost and the programs require little administration from the college.

Areas with downtown residential growth will benefit from the option of car sharing to supplement public transit. One of the benefits of the car-sharing program in contrast to the typical rental car program is that you can use the car by the hour, day or longer periods if necessary. Car sharing gives people the flexibility that is much like owning your car and many areas that already have the program have seen it work successfully.

Common Fare Card

A common fare card would enhance connectivity among the local RTAs and the MBTA. An enhanced fare structure that could come with a card would also offer more flexibility in pricing for BAT and GATRA, much like what the MBTA has recently implemented with the Charlie Card. Currently there is no fare connectivity between the commuter rail and the fixed route or paratransit options in the region. Efficiency, in both fiduciary and physical connections, between the modes of transportation benefits commuters in the region. Local RTA's could be compatible with the MBTA system, while being able to maintain and manger their own system.

East-West Connectivity

Overall, the region has disconnectivity for travel via mass transit in the east-west direction. The commuter rail lines run through the region north to south, one reason being that Boston, the final destination, is a major employment center for residents in the region. Some areas of the region have radial local coverage, such as the city of Brockton. The centrally located BAT Centre and the use of the pulse system allow BAT to cover Brockton in the most efficient manner. The pulse begins with vehicles leaving the Centre on a run out to the edges of the city and come back to the Centre, where passengers may transfer to another bus. Using this system, most locations in the city can be reached by no more than one transfer.

The challenge with mobility via transit is travel to points east west region as there are few options connecting communities across the region. Additionally many stations lack the intermodal connectivity to promote transit use in its many forms. There is limited or no service to bring people in and out of the commuter rail stations. Therefore, if a rider is not with in walking distance, they must drive their car to utilize the system.

Sites such as the BAT Centre is a great example of intermodal connectivity between rail and fixed route bus and should be an example of what communities in the region should think about when trying to coordinate services. Additionally, intercity coach travel could be one way to bridge the connect the RTA's

Intermodal Focal Points

The establishment of intermodal connections is an important factor in public transportation. Links between different forms of transportation lead to situations where different modes support one another, and lead to greater mobility. Mobility through intermodal transit connections affects not only the commuting public but also the economic competitiveness of a region. The cost of doing business in the Region is affected by the transportation system that is in place.

Bus Service

The BAT intermodal transportation facility accomplishes an important goal in the improvement of public transportation in the Region. The facility establishes a clear center for transportation in the Brockton area. The intermodal facility encompasses commuter buses, a taxi stand, bicycle facilities, and commuter parking. The Old Colony commuter rail station is also located across the street from the intermodal facility.

BAT provides direct service to MBTA rapid transit (red line) at Ashmont, access to bus transit run by the MBTA (bus 230, 238, 240), and service to four commuter rail stations directly (one through Bridgewater State College service which runs seasonally). Enhancement of the intermodal connections between MBTA and BAT would benefit people transferring between systems, specifically at the Montello station, in addition to exploring an interagency agreement that would bring the MBTA 238 and 233 buses all the way into the BAT Centre in downtown Brockton.

Plymouth Area Link (PAL) a service provided by the Greater Attleboro -Taunton Regional Transit Authority (GATRA) offers intermodal connectivity with service to the Kingston and Plymouth commuter rail stations and links from them to Plymouth Center. The service is on a one hour to two-hour frequency, so it would need to increase frequency to better serve the commuting population.

The Town of Plymouth is in the concept phase of developing an intermodal center. There are two locations with the most interest the first being Cordage Park, which has fixed route bus service (GATRA, and commuter rail service in addition to a bike trail leading to downtown Plymouth. An intermodal station here would look to enhance the connections rail, bus and bike. Additionally since it is right along the water there could either be connections by boat also, by the addition of service or if the seasonal services were to move docking locations.

The other location is downtown Plymouth, where the town is exploring the idea of a building a parking garage downtown that would also connect with fixed route bus (GATRA) and with a proximity to water ferry connections. The construction of an intermodal center in Plymouth would certainly enhance the public transit system for the benefit of both residents and the many visitors that they town receives every year.

In addition to developing an intermodal concept, GATRA is currently looking at modifying the PAL routes. Part of this is to improve connections to public transportation and places visitors want to go. One option is to modify the current routes in town, and such modification may benefit visitors and residents of the area as well.

Commuter Rail

Commuter rail service represents a more recent and popular form of intermodal transportation in the Region. At the main terminal in South Station, travelers have access to MBTA rapid transit, commuter rail, Amtrak and bus service throughout the nation, Central Boston, and the Greater Boston area. South Station also connects with the new Silver Line allowing direct access Logan International Airport.

The newest addition to the commuter rail line, the Greenbush Line after long delays is scheduled to open for revenue service in 2007. Commuter rail service may be expanding in the future should the MBTA's plans for extensions to New Bedford/Fall River lead to construction. Many of the commuter rail parking lots that serve the train stations are at or close to capacity. A study into ways to increase parking lots size is needed to understand how to handle this capacity problem and may lead to enhancements in intermodal connections at the stations.

Park-and-Ride Facilities

There are six facilities maintained by the Massachusetts Highway Department south of Boston. These facilities provide intermodal connections for commuters who drive automobiles, walk, or bicycle, and wish to access commuter buses, car/van pools, rapid transit, and commuter rail and/or water shuttles. Park-and-Ride lots can be a viable alternative to automobile commuting and can lead to decreased traffic congestion and improved air quality. Refer to Table 6-5 for a list of the lot locations and what kind service can be utilized there.

Transit and Land Use

Smart Growth is a set of policies that govern transportation and planning to benefit communities and preserve the environment. Smart Growth polices in Massachusetts have been developed by the Office of Commonwealth Development based of the 10 Sustainable Development Principles. Those principles are:

- Redevelop First: revitalizing existing neighborhoods does not require expensive new infrastructure or consume forest and fields and dins new uses for historic buildings and underutilized Brownfield sits.
- Concentrate Development: compact development conserves land and fosters vibrant and walkable districts. According to the Lincoln Institute, development that is more compact could save the public sector in the Northeast $40 billion over 25 years.
- Be Fair: all should equitably share the benefits and burdens of development. Transparent and predictable permitting will result in cost-effective and fair outcomes.
- Restore and Enhance the Environment: the conservation, protection and restoration of water, land and cultural resources provides a high quality of life and ecological health.
- Conserve Natural Resources: renewable energy and efficient use of building materials and water contribute to a healthier environment, limit waste, and are cost-effective.
- Expand Housing Opportunities: expanding the number, affordability, and diversity of housing units will ensure that people of all abilities, income levels, and ages have appropriate housing options.
- Provide Transportation Choice: opportunities for public transit, walking and biking should be expanded.
- Increase Job Opportunities: connecting people with jobs in their communities and close to homes and transportation infrastructure will expand our economy.
- Foster Sustainable Businesses: great potential exists for new innovated industries and for resource-based industries to contribute to the social, economic, and environmental health of our state.
- Plan Regionally: economic development, water, transportation, and housing are regional in nature they do not stop at the town boundary. Regional planning recognizes this and results in inter-municipal coordination and better outcomes.

Utilizing these principles in the planning process for the region will enhance the region and increase multimodal and cross functionality of new and renovated areas, from road improvements to retail and residential developments, to bike and pedestrian enhancements and increased mass transit coverage.

Bicycle Storage Facilities

Bicycle storage facilities will enhance transit network and intermodal connections in the OCPC region by giving commuters more options. Some people may live too far from a bus stop or commuter rail station to walk but would be interested in biking if the facilities are provided. Bike storage facilities would assist in keeping bikes locked up in an appropriate way and encourage the use of bicycling as a mode of transportation. Additionally the potential for bike racks on fixed route vehicles could help to enhance intermodal opportunities.

6.8 Transit Service Area Expansion Opportunities

South Shore Transit Options Study

Published in November 2003, Brockton Area Transit and Greater Attleboro-Taunton Regional Transit Authority developed a transit plan for the south shore region. This ten-town study included: Duxbury, Halifax, Hanover, Hanson, Kingston, Marshfield, Pembroke, Plympton, Rockland, and Scituate. The towns of Halifax, Hanson, Kingston, Plympton, Pembroke, are in the region.

The communities represented in the study area are primarily along the Route 3 corridor. The area has experienced a considerable amount of growth but transportation in the area has not grown at the same rate. Boston remains a major destination for medical and employment related trips. In addition, the study area has experience significant growth in industry and population that has created a need for increased transportation infrastructure with in the local area, especially in communities such as Brockton, Attleboro and Plymouth.

The Route 3 corridor has developed in many ways to become a self-sufficient area with retail, commercial and medical services available. These regionally based services create local options for people in the study area. Along with this, the population has experienced aging issues similar to the remainder of the country, increasing demand for public transit and paratransit services. These factors, coupled with overall population growth, have created a need for transportation services as part of the overall infrastructure. In addition to MBTA commuter rail to Boston, bus service in the Greater Attleboro and Greater Brockton areas are few of the limited service options for South Shore residents.

The study was to recommend routes to extend “lifeline” services to the transportation dependant and others in the area. Information for the study was gathered through community involvement including local stakeholder interviews, community meetings and local working group meetings to determine transit strategy development. These public forums, as well as intensive research and study team knowledge of rural transportation provided the key elements for a plan to address transit need and feasibility in this area.

Study results were the recommendation of two types of service. The first is a flex route service that can provide the flexibility in route deviation needed in a rural population while providing the dependability and cost effectiveness of a fixed route service. The first of the two routes proposed would go from the Independence Mall in Kingston to the Hanover Mall in Hanover using routes 3A, 139, and 53 and serve Duxbury and Marshfield. The second route would run from the Hanover Mall to the Brockton Hospital. The two new routes would use the Hanover Mall as a central transfer point. The Brockton Hospital would be a transfer point for passengers wanting to move further in Brockton via the BAT system and the route could be integrated with the PAL service in Kingston at the Independence Mall.

The second type of service suggested by the study was the provision of demand response service in eight communities. Those communities are: Duxbury, Halifax, Hanover, Hanson, Marshfield, Plympton and Scituate. The total estimated cost for these services in 2003 was $529,397.

Commuter Rail Expansion

Fall River/ New Bedford

The New Bedford/ Fall River Commuter Rail Project Expanded Feasibility Study, prepared in March of 1997, explore projected ridership, costs, operational issues, and potential environmental impacts of each alternative. Complete rebuilding of the New Bedford and Fall River Secondary Track is required for all alternatives.

The MBTA's analysis outlined the three alternatives for the commuter rail system: the Attleboro, Stoughton and Middleborough Lines. The study concluded that the preferred Transportation Alternative, the Stoughton Alternative would attract the highest ridership, be most cost-effective and have the least environmental impact. However, difficulties remain due to environmental concerns and protests by officials in towns along the right-of-way.

In October 1998, state and local officials broke ground for initial reconstruction work on four bridges. In July 2000, the MBTA submitted a Supplemental Draft Environmental Impact Report (SDEIR) for the New Bedford/Fall River Commuter Rail Project in response to the requirements of the Massachusetts Environmental Policy Act (MEPA) Certification on the DEIR. This document provides the detailed analysis and reporting on the environmental impacts of the Stoughton Alternative.

The Final EIR was submitted in April of 2002. This document selects the Stoughton Alternative as the only viable option. It lists the Hockomock Swamp as the primary area of environmental concern. In August of 2002, the State Secretary of Environmental Affairs concluded that the Stoughton route was the most feasible and that it meets most environmental hurdles except for the Hockomock Swamp that will require an elevated trestle. The project now needs to pass the federal regulation process to be cleared.

The Old Colony Planning Council has been participating in the Southeastern Massachusetts Commuter Rail Task Force since 2002. Currently, the New Bedford / Fall River line is in construction phase 1. This phase includes design and construction to support the extension of service to New Bedford and Fall River. Present efforts include the rehabilitation of Bridges in New Bedford and Fall River. There are also plans to rehabilitate bridges in Taunton as outlined in the MBTA Capital Investment Program.

Phase II construction is currently in the discussion stage at the regional, local, and state level. This phase would include the full rebuilding of the rail extension from Stoughton to New Bedford and Fall River.

New Bedford and Fall River via the Stoughton Line -

The Stoughton Alternative would provide commuter rail service from South Station to New Bedford and Fall River by extending the Stoughton Line. From the Stoughton Station, the train will follow the existing inactive Stoughton Line through Cotley Junction to Myrick's Junction where it would split to the New Bedford Main Line and Fall River Secondary.

This Alternative would require the reconstruction of 14 miles of inactive and abandoned track from Stoughton to Taunton. The railroad right-of-way between Stoughton and Dean Street in Taunton was taken out of service in 1959 and was formally abandoned in 1966.

New stations on the Stoughton Line would be located in North Easton, Raynham, Taunton (Dean Street) and East Taunton. The New Bedford Main Line station would be in New Bedford and the Fall River Branch would locate new stations in Freetown, Fall River and Battleship Cove.

New Bedford and Fall River would be served by 36 weekday daily trains. Sixteen of these trips would serve New Bedford (eight inbound, eight outbound) and 16 trips would serve Fall River; four trips originate/terminate at Taunton (Dean Street.) The travel time from New Bedford and Fall River to South Station is projected to be approximately 1 hour and 20 minutes.

The Preferred Stoughton Alternative will provide the highest total ridership and the greatest number of transit trips. It is estimated that this alternative will attract 4,280 daily inbound riders. Three other alternatives studied, out of several total, included enhanced bus services, extending the Middleborough line via Taunton and using the existing Attleboro secondary via the Northeast Corridor.

As part of the process for commuter rail expansion, the MBTA needs to continue negotiations with CSX to secure and enhance the right of way necessary for the rail line expansion to New Bedford/ Fall River. Currently the line is owned by CSX and is used for freight.

Wareham/ Buzzards Bay

In January 2007, the Boston Metropolitan Planning Organization published the draft final study to look at the feasibility of reestablishing commuter rail services to Buzzards Bay. In 1996, a similar study was performed, but no action was taken. With renewed interest from elected officials and community leaders in the area, in addition to new census data, and new observations from the reestablishment of the Middleborough line the idea of commuter service to Buzzards Bay is back on the table. The Buzzards Bay Commuter Feasibility Study included forecasts of demand, capital cost estimates, operating cost and revenue estimates, and some analysis of the environmental impacts of such an extension. For full details, please refer to the study.

The services would be an extension of the MBTA commuter rail service from Middleborough to the town of Bourne and would use an existing rail line known as the Buzzards Bay Secondary Track. This line runs from Middleborough through the northeast corner of the town of Rochester, to the center of Wareham, to Bourne. Currently, the line is used for freight service operated by the Bay Colony Railroad, mainly trash trains that come up from the Cape Cod area. There were three methods proposed for the train service. The first and the preferred method, is simply to extend the current Middleborough/ Lakeville line down to Buzzards Bay, this would require additional train sets to provide the same service currently advertised on the existing portion of the line. The other two methods were to run the trains express through stops beyond the extension, or to run a shuttle service along the extension, requiring a longer platform in Middleborough where the passengers would exit one train and board a second train heading to Boston.

The study's proposed route and stations, with the understanding that station siting may change based on the community need and the availability of land for parking and access roads, are Rock Village, Country Road, Wareham and Buzzards Bay. Approximately 2,045 additional passengers would be added to the line because of the four additional stations. Some of these passengers would not be new to the service but are shifting from other rail stations.

Upgrades to infrastructure would be necessary to run the service. The rail line is in good shape but would likely need to be replaced either before or shortly after the services were to begin. Additional stations and platforms would need to be constructed at the estimated cost of $2.5 million dollars each, in addition to adjacent parking facilities. In addition to taking cars off the road and reducing environmental effects like emissions, it is also estimated that about 8% of the auto traffic that heads into metro Boston through the Braintree split would be eliminated.

Expanding Commuter Rail Service to Plymouth

Plymouth currently has commuter rail service four times a day; these trains do not serve the station at peak commuter times and the station is currently under utilized. Many Plymouth residents drive to the Kingston Station to catch a train at peak commute times. Increasing the amount of train service in Plymouth would not only alleviate some of the parking congestion at the Kingston station but it would also generate some reverse commute trips during the summer, Plymouth's peak tourism time. It is estimated that 750,000 people visit Plymouth annually making tourism an important part of Plymouth's economy and a potential to tie that into the current regional transportation infrastructure.

Adding a Station in West Bridgewater along the Middleboro/Lakeville Line

The town of West Bridgewater has expressed interested to the MBTA in getting a station along the Middleboro/ Lakeville Commuter Rail Line. Currently the train passes through the town and thus the town pays an assessment to the MBTA. A station could provide convenient accessibility to the commuter rail for residents of both East and West Bridgewater. Additionally, access to rail service could have a positive effect on decreasing the traffic on route 106.

Plymouth Water Ferry Study

The town of Plymouth conducted a water transportation study published in November of 2006. The purpose of this study was to look at the feasibility of creating a water transportation service linking Plymouth to Boston. Other routes explored were service to Provincetown, Hull, Quincy and Hingham. The study focused on existing market conditions, available sites and potential intermodal services and concluded with a recommended service and facility. Because of funding, the study is general and if the region and the town of Plymouth are interested in pursuing this idea further, study is needed.

Railbanking to Preserve Rail Right of Way

Railbanking is a way to preserve rail rights of way for future transportation expansions. One way of accomplishing this task is by turning the rights of way into multi use trails for recreation and commuting purposes. Generally, a multipurpose trail would welcome non-motorized forms of transportation, such as bikes, roller blades, walking and equestrian. Using a rail bank will preserve the easement, rather than let the land revert to the original owners and close transportation options.

Unmet Transit Service Needs

Unmet transit needs for the regional transit authorities is partially addressed by the *Five Year Transit Service and Capital Plan for the Massachusetts Regional Transit Authorities* report addressing the need to acquire additional funding for the RTAs so they can restore canceled service and expand service to the most efficient service level for the area. In addition, reflecting national trends, there will be an increased demand on human service transportation as the region population is increasing in age.

6.9 Transit Safety and Intelligent Transportation Systems

Signal Priority

Signal Priority is a technology that can be utilized beyond transit, as the same technologies can be used to give different levels of priority to other vehicles. For example, emergency service vehicles have what is called preemption. This interrupts the light cycle to let the emergency vehicle through, where as for transit, the system can extend or truncate light cycles, in varying degrees, and to allow eased movement of transit vehicles.

A technology such as signal priority would have many benefits for BAT, as the BAT Centre is located in an area with signalized intersections and competing vehicle traffic. In addition, vehicles leaving the Centre on a pulse can be stuck in light cycles from north and south movements, whereas the bus is ultimately going east to west. Having signal priority even in just the immediate area around the Centre would greatly enhance the on time performance. Studies in areas where transit priority has been implemented show that there is little to no impact on other traffic, which is why the feasibility of this technology for BAT should be explored.

Rail Right of Way Security

When the Old Colony Commuter Rail line was restored in 1997, the MBTA did enhancements all along the rail right of way. This included security fencing to keep people off the rail lines. MBTA needs to have a schedule of routine maintenance and system checks to make sure this fencing is still intact and doing its job. Fencing needs repair and replacement over time continues to protect resources.

Bus Security Enhancements

BAT has made great strides in its efforts to improve safety and security not only of its vehicles but also of its employees and infrastructure. Recent site hardening techniques and employee training efforts are the start of these efforts. BAT currently plans to continue to enhance weak points in the system and to up grade technologies as they improve in order to maintain and enhance the safety and security measures that both internal and external customers have come to expect.

Training Opportunities

Training at all, levels can better prepare the region for emergencies just as interagency collaborative training can sustain preparedness as a whole. Transit networks do not operate independently of each other but work interdependently, emphasizing the importance of tabletop drills and interagency agreements. Times of emergency will call for support beyond a sole agency's capacities and this interagency collaboration will absolutely make the difference in the delivery of services to those in need.

Individual agencies need to maintain and to enhance their individual employee safety and security training programs. Programs like Transit Watch work now, and will continue to be effective through the proper training of current and new employees.

Operation Lifesaver

Operation Lifesaver is a program that a community can use to enhance its relationship with rail service. Operation Lifesaver depends on the bulk of its message being delivered by presenters, which anyone can become one once they satisfy the Operation Lifesaver criteria. Presenters can distribute the information in places like, but not limited to, schools and senior centers. In addition to presenters, Operation Lifesaver has information available on the web and through Operation Lifesaver associates. This resource is an effective and efficient use of resource available to Old Colony communities to keep their residents best informed on how to behave near railroad crossings.

Pedestrian Enhancements

Some of the commuter rail stations in the region lack adequate pedestrian infrastructure. For example, pedestrians trying to access the Montello Station along the Middleboro/ Lakeville line often have difficulty crossing the street along North Montello Street in order to get to the station. Further study and inventory should be taken of not only the commuter rail stations, but also any location with a high transit and pedestrian impact and its surrounding area. Specifically a study should be done to look at the area surrounding the Montello Station to develop a solution to enhance pedestrian safety.

Continuity of Operations Planning (COOP)

The Continuity of Operations Plan is a plan to establish a framework of management and operations procedures to sustain the essential functions of BAT in an emergency. In addition, the plan lays out steps to maintain mission critical functions while potentially moving BAT operations from its normal location. This may require the assistance of local RTAs such as GATRA, located in Taunton, and SRTA, located in Fall River and New Bedford.

The COOP also includes a procedure of testing, training and exercises. This ensures that systems are fully functional and that management is up to date on the options available to them in a variety of situations. Most of the testing, training and exercises are to be done once a year but some systems require a quarterly test. The procedure is explained in detail in the plan for management to implement.

Legal Risk and Protection

Protecting your transportation systems from a legal aspect is often over looked. Litigation can be costly to a transit network and the taxpayers that help fund it. The book *Urban Transit: Operations, Planning and Economics* offer some key components to help keep litigation to a minimum. The first is to keep the public informed; give them periodic reminders about safe practices and habits to keep them safe while they use the transit system. Another component is to intensify the review of facilities and operating practices with respect to their impacts on passenger safety. A review of transportation systems will help identify safety needs before they become safety concerns or worse. The last guideline was to improve record keeping and collection of information that is applied in the case of accidents. Information is power, and having ample data can help you in many ways. It may protect the organization being questioned from litigation or you may be able to develop training scenarios out of the incident. The transportation providers in the region may be currently following some of these guidelines, but in order to protect all our transit networks, all transportation providers, public and private should look to incorporating these guidelines into their daily operations.

6.10 Future Freight and Air Transportation Network

Rail Freight Systems, Capacity Expansions and Enhancements

Rail Freight in the region has some obstacles to overcome if service is to expand. Commuter rail service uses the same lines as freight rail and there could be competing interests on the lines. If the demand was present for the service, CSX certainly could meet that need by the addition of a second track, as much of the rail lines that run through the region are on a single track. Currently some trains, usually freight, have to wait for other trains to pass. The addition of a double tracking the Old Colony rail line from end to end would benefit both passenger and freight rail allowing rail traffic to flow mores smoothly.

Water Freight Systems, Capacity Expansions and Enhancements

Plymouth has been an active and viable port city. Even though it is no longer a designed port, it still handles water freight. If Plymouth were interested in expanding water freight capabilities infrastructure would have to be improved. Cordage Park in North Plymouth was once a busy port but now it is a collection of abandoned buildings. If Cordage Park were to be expanded, the port channel would need to redredgeding and infrastructure would have to be improved, in addition to the intermodal freight transportation facilities developed by either rail or truck. Currently there are no plans in the region to develop this area to be used as a freight intermodal site.

Air Freight and Air Passenger Systems, Capacity Expansions and Enhancements

The Plymouth Municipal Airport does not currently have passenger or freight service; even so, the airport is an important part of the region because it is home to many vital regional emergency services. Currently the Plymouth Airport does not have any plans for future investment or upgrades to the facilities to accommodate air passenger or freight services. The airport has seen an increased amount of corporate jet activity over the last ten years and currently eight corporate jets are based there. This trend in corporate jet use is expected to continue and the airport does have plans to expand the use of the airport for both general aviation and complementary non-aviation uses.

Future Freight and Air Transportation Safety Systems and Intelligent Transportation Systems

Rail freight security and ITS enhancements made on commuter rail in the region can also benefit rail freight because of the shared rail lines. Enhancements to Right of Way security, training such as Operation Lifesaver, or physical infrastructure can benefit both passenger and freight rail.

Water freight is small part of the transportation networks. Ensuring these products are handled in a safe and controlled manner will keep harm from those products. The fish products handled through the ports are subject to the safety and health concerns of the end consumers, so ensuring the safety and security in transport is important.

The air transportation network in the region does not anticipate exponential growth in the near future, but does anticipate the growth of corporate jets utilizing the airport. Currently the Plymouth Airport is working on updating the Master Plan that will help guide the growth of the facility over the next year. In addition to that, the airport is going to continue to expand its safety and security efforts to protect their own assets and the communities around them.

6.10 Recommendations

<u>Transit Connectivity Opportunities</u>

Increase use of smaller general aviation airports. Municipal Airports in the region, such as the facility in Plymouth, have experienced marked growth in the numbers of take-offs and landings in recent years. Both runways at Plymouth Airport have been expanded to increase capacity and promote greater safety.

Support additional service. In 1999, BAT implemented Sunday service on both fixed and paratransit routes. This much-needed service provides access for residents of the BAT member communities to weekend jobs and shopping. Support such new programs, as well as the continuation of existing programs that support economic development in the region.

Maintain productivity and cost effectiveness. BAT contracts out transportation services to a variety of private carriers. Support this method of maintaining productivity and cost effectiveness.

Meet operations needs. BAT annually seeks FTA 49 U.S.C. Section 5307 grants to finance support equipment and operations costs. BAT should continue to seek this method of funding to meet operations needs, for as long as such funding is available.

Maintain capital planning for BAT's paratransit services. BAT continues to seek funding each fiscal year through the Mobility Assistance Program for the replacement of paratransit vehicles as needed. This policy should be maintained so that BAT may replenish its rolling stock that is considered "beyond its useful life."

Support the development of a Human Services Coordinated Plan for the region. This is a requirement of the federal SAFETEA-LU legislation. This coordinated effort can enhance and improve human services in the region as a coordinated effort and merging of resources.

Improve mass transit linkages. Every effort should be made to promote improved linkages between mass transit and other modes of transportation. One example would be a public private relationship utilizing private carriers to connect localized RTA's.

Increase intermodal connections at the Montello Station. Currently an MBAT route, a BAT route, and passenger rail to Boston is serviced by the station. Coordinating the fixed routes there and making the station a mini –intermodal center will enhance the transportation options for the people in the area and using the station.

Encourage the development of a Plymouth Intermodal Center. Plymouth is interested in building an Intermodal center that would enhance both commuters and tourist transportation experiences.

Continue commuter rail operations funding. Support the funding of commuter rail operations in the Commonwealth through a statewide funding mechanism.

Provide feeder service to Old Colony commuter rail stations. Intercity bus carriers, such as P&B and JBL Bus Lines, Inc. should consider altering and/or adding routes, to serve as feeder routes to Old Colony commuter rail stations.

Encourage adequate parking and traffic mitigation at station sites. It is imperative that local officials confer with MBTA planners and engineers to determine that access and egress to/from station sites are properly mitigated.

Encourage increased use and expansion of commuter parking facilities. The MASSHIGHWAY should continue to promote existing commuter parking facilities and develop additional spaces, where needed, for intermodal uses.

Develop additional park-and-ride facilities. OCPC transportation staff should interact with MASSHIGHWAY in determining potential new sites for the construction of park-and-ride facilities to augment existing facilities.

Support creation of HOV lanes on congested highways leading into Boston. Intercity bus carriers throughout the region maintain that the creation of genuine High Occupancy Vehicle (HOV) lanes would reduce their commuting time into Boston, making commuter bus lines more competitive with commuter rail. In addition, HOV lanes would make commuter bus lines a more acceptable alternative to individuals who drive automobiles (primarily alone) into Boston, thereby reducing congestion.

Study the feasibility of HOV lanes for buses, carpools and vanpools. As was mentioned earlier, HOV lanes installed along Principal Arterials such as the one on Interstate 93 would improve commuting times into Boston, reduce congestion and improve air quality. A feasibility study should be conducted to determine the potential for HOV lanes along Principal Arterials in the OCPC region.

Support alternative means of funding mass transit. Support initiatives to determine dedicated sources of revenue, such as the fuel tax and Senate Bill 2315, which could fund transit operations throughout the Commonwealth.

Consider development of additional public moorings in Plymouth Harbor. The development of additional public moorings would better serve recreational and visiting boaters. Support such an initiative.

Consider expansion of North Plymouth Harbor. Such a development could potentially derive additional economic development as well as tourism benefits by instituting a water shuttle between Cordage Park and Town Wharf or State Pier.

Increase parking capacity in downtown Stoughton. The town-owned and MBTA-owned lots are at capacity on a daily basis. The MBTA should study the feasibility of constructing a multi-level parking garage in Downtown Stoughton adjacent to the station.

Develop park-and-ride facilities to maximize a multimode transportation system. Park-and-Ride facilities should be sited adjacent to major interchanges/arterials, rapid transit and passenger rail stations.

<u>Transit Service Area Expansion Opportunities</u>

Determine potential for regional airports to accommodate tilt-rotor aircraft. New tilt-rotor services could co-exist with fixed wing operations at existing airports, or operate directly out of additional capacity to the traveling public. The potential for regional airports to accommodate these services should be investigated.

Preserve abandoned railroad rights-of-way by use of Rail Banking. Support preservation abandoned railroad rights-of-way having the potential for construction of future transportation projects.

Support efforts to operate a full weekday schedule on holidays on which most retail stores are open--Martin Luther King Day, President's Day, Columbus Day and Veteran's Day. Increasing the amount of service would provide access for both patrons and employees to businesses that do not observe those holidays**.**

Support the guidelines recommended by MARTA to bring service at BAT and GATRA to its most efficient levels. Service has been cut across the state over the last couple of years to complete with raising fuel and employee benefit costs. When service is cut and fares are raised to compensate for this, the transit riding public is put at a disadvantage. The proposal set out by the MARTA study would restore those cuts and bring transit up to a level that could best serve the community.

Study the feasibility of BAT expanding its service area.

Encourage interagency agreements to enhance passenger service. For example, currently the MBTA 230 bus ends at the Montello Station, but extending that service to the Bat Centre, would enhance passenger connections.

Continue current outreach programs. BAT should continue its outreach program to the elderly and disabled communities.

Encourage private sector participation in public transit operations. BAT is encouraged to continue joint development initiatives with private sector concerns when feasible.

Support expanding the reach of fixed route transit as identified in the Route 3 Corridor Transit Options Study.

Study expansion of intercity bus service. Studies should be performed to consider the feasibility of implementing intercity bus service between Brockton and Plymouth, Taunton and Brockton.

Expand commuter services by private commuter carriers. In order to better meet mass transit needs in the region, the expansion of commuter services by private carriers is encouraged in areas where there is a demand for such services.

Support extension of commuter rail to Fall River and New Bedford.

Support extension of commuter rail to Buzzards Bay.

Support installation of a commuter rail station in West Bridgewater along Old Colony Commuter Rail Line.

Encourage staggered work hour initiatives. Where feasible, encourage large employers to stagger their work hours to offset emissions from high concentrations of automobiles during peak hours.

Support employer-based transportation programs. Large employers should be encouraged to form Transportation Management Associations (TMAs), which marshal business resources to manage employee transportation needs on an area-wide basis. As well, managing demand for costly long-term parking by encouraging shared-ride commuting through preferential parking incentives or special discounts for employees. MassRides is a great first resource for an employer looking to establish commuter programs for their employees.

Support legislative initiatives affecting corporate commuter services program. Under the Massachusetts General Laws, Chapter 63, Section 31D, corporations doing business in Massachusetts are allowed a tax credit amounting to 30% of the cost of purchasing or leasing a commuter van for their employees to use in their daily work trips. This legislation also waives registration fees, creates a special license plate for commuter vans and established insurance requirements for participating vehicles. Corporations are encouraged to implement commuter services programs that provide incentives through the above legislative initiatives.

Encourage the use of Transit Tax Credits. Currently the federal government will allow employees to use up to 110 dollars of month pretax to pay for transit passes. In the state of Massachusetts, a similar benefit is extended only to the MBTA. The utilization of the federal benefit and the extension of a Massachusetts transit income tax benefit would benefit both employees and employers.

Enforce Massachusetts's rideshare regulation. To comply with Massachusetts's environmental regulation (310 CMR 7.16), employers with more than 250 employees at a single location must implement commuter programs geared to reducing drive alone commuting by 25%. Program options include instituting a transit pass program, creating incentives for bicycle commuting, posting transit schedules and maps, and promoting carpooling. In addition, companies with more than 1000 employees at one facility must implement a vanpool program.

Develop a plan for senior transition from personally operated vehicles to public transportation. Seniors as they lose their mobility and the reaction necessary to drive maybe more will to move to public transportation if they can achieve some level of flexibility while retaining their independence. A plan should be developed to enhance and encourage this transition.

Support Car Sharing. Car sharing programs like Zipcar and Flexcar can be a great way to offers residents flexible transportation options. Areas that would be great candidates in the OCPC region are Bridgewater State College, Stonehill College and the developing area around the BAT intermodal Centre.

Encourage the application of Smart Growth Principles to development in the region.

Support redevelopment of the former Weymouth Naval Air Station. Support mixed transit focused reuse of the land occupied by the former Weymouth Naval Air Station.

Transit Safety and Intelligent Transportation Systems

Support BAT's bus replacement program and system preservation to ensure a state of good repair. BAT should continue to seek funding to update its fixed route bus fleet and allied equipment on an as needed basis.

Support the Development of Transit Safety Plans As technologies improve so will the need to keep our safety and security systems up to date. Some steps are as simple as the cooperation amongst RTAs to develop a continuity of operations plan (COOP). This is a great first step. The next step, making sure that the entire key stakeholders understand what is involved when the plan is invoked will be the key to its success.

Support the integration of technologies across modes of transportation. Examples of this would be a regional fare card or integrated AVL systems to improve transit connections across systems.

Support the use of Rail Education programs like Operation Life Saver Regional efforts to increase safety can come from many levels, for example the continuation of educational programs like operation lifesaver is important to communities that have to live with frequent rail traffic in there community.

Support transportation improvements save energy. Transportation improvements in the region should be undertaken with consideration to energy conservation. Support should be developed for increased promotion of ridesharing, HOV lanes, employer sponsored trip reduction plans and the use of alternative forms of energy.

Support the use of new technologies for transit vehicles. Hybrid and hydrogen technology on buses can reduce fuel consumption and pollution and AVL technology for DIAL-A-BAT and BAT can improve safety and efficiency for the service.

Study the use of Signal Priority in the BAT service area. Signal priority for the BAT system especially near the BAT Centre would increase efficiency and on time performance. The same technology can be employed at intersections to the benefit of emergency services vehicles as well.

Develop park-and-ride facilities, which support and enhance state air quality goals and commitments. Facilities should serve as many alternative High-Occupancy Vehicle (HOV) modes as possible. Public and private transit operators should be encouraged to serve park-and-ride facilities. Site selection criteria should include consideration of bicycle and/or pedestrian accessibility to reduce the number of cold starts by vehicles.

Support the improvement of pedestrian safety around transit stations. For example, the streets surrounding the Montello station do not promote pedestrian safety and pedestrians are often forced to choose unsafe routes to the station.

Freight and Air Transportation Transit Networks

Investigate potential of municipal airports' ability to serve as freight terminals. Currently, there is no scheduled freight service at any of the municipal airports throughout Southeastern Massachusetts. A feasibility study should be considered by the Massachusetts Aeronautic Commission to determine whether there is potential for any of the municipal airports to serve as airfreight terminals. Depending upon the type of freight, such a facility could serve intermodal purposes.

Accommodate freight and passenger railroad operations. Old Colony commuter rail operations could affect existing freight train services by reducing the flexibility available to CSX and Bay Colony Railroad. However, the low frequency of operation of the Old Colony lines during off-peak periods, coupled with the provision of a modern signaling system, centralized traffic control and passing sidings at strategic locations would permit freight operations during the midday periods. Consideration of freight and passenger railroad impacts is encouraged.

Increase the level of freight/goods movement by rail on the Old Colony and Stoughton lines. Support such initiatives, which would serve to reduce truck traffic congestion, particularly if the double stacking of containers in railroad freight hauling operations is implemented in the near future.

Allow for freight rail operations and the Old Colony commuter rail service to co-exist. Coordination should be encouraged between the MBTA and the two railroad freight operators in the region: CSX (Middleboro Line) and Bay Colony Railroad (Plymouth Line). Although freight railroad service in the region generally should not conflict with the restored passenger rail service during its peak operating periods in the A.M. and P.M., contingencies will need to be addressed such as the installation of updated switching equipment and passing siding.

CHAPTER 7
BICYCLE AND PEDESTRIAN TRANSPORTATION

7.0 Introduction

Facilities for safe, convenient, and efficient bicycle and pedestrian transportation are key components of a well-balanced regional transportation network. Additionally, these facilities support the implementation of several of the goals and objectives discussed in Chapter 2, including:

- Providing a transportation system that supports the economic vitality of the region.
- Increasing the safety of the transportation system for motorized and non-motorized users.
- Increasing the security of the transportation system for motorized and non-motorized users.
- Increasing accessibility and mobility options for all people.
- Promoting a transportation system that protects and enhances the environment; promotes energy conservation; and improves the quality of life in the region.
- Enhancing the integration and connectivity of the transportation system, across and between a well-balanced network of modes, for people and freight.
- Supporting smart growth principles and provide a transportation system that is regionally coordinated and based on effective transportation and land use planning.

<u>Federal Policies</u>

Section 217 of Title 23 of the U.S. Code calls for the integration of bicycling and walking into the transportation mainstream. More importantly, it enhances the ability of communities to invest in projects that can improve the safety and practicality of bicycling and walking for everyday travel.

In 1991, Congress passed landmark transportation legislation, the Intermodal Surface Transportation Efficiency Act (ISTEA) that recognized the increasingly important role of bicycling and walking in creating a balanced, intermodal transportation system.

The National Bicycling and Walking Study, published by the U.S. Department of Transportation in 1994, translated this renewed interest in non-motorized travel into two specific goals: to double the percentage of trips made by foot and bicycle while simultaneously reducing the number of crashes involving bicyclists and pedestrians by 10 percent.

Subsequent legislation provides the funding, planning, and policy tools necessary to create more walkable and bicycle-friendly communities.

A bicycle transportation facility is "a new or improved lane, path, or shoulder for use by bicyclists and a traffic control device, shelter, or parking facility for bicycles." The definition of a pedestrian includes not only a person traveling by foot but also "any mobility impaired person using a wheelchair." 23 USC Section 217 (j) (1)

Bicyclists and pedestrians must be given due consideration in the planning process (including the development of both the Regional Transportation Plan and TIP) and bicycle facilities and pedestrian walkways shall be considered, where appropriate, in conjunction with all new construction and reconstruction of transportation facilities except where bicycle use and walking are not permitted. Transportation plans and projects must also consider safety and contiguous routes for bicyclists and pedestrians. Safety considerations may include the installation of audible traffic signals and signs at street crossings. 23 USC Section 217 (g)

State Policies

In 1998, the Commonwealth of Massachusetts through MassHighway developed the Massachusetts Statewide Bicycle Transportation Plan and the Massachusetts Pedestrian Transportation Plan in an effort to provide a vision and strategic action plan for enhancing and maintaining the State's existing infrastructure and developing new infrastructure.

The Massachusetts Pedestrian Transportation Plan serves as a guide to state, regional, and local transportation planning in order to better serve walkers on the transportation network. The Plan's extensive list of recommendations aimed at developing a more pedestrian-focused transportation system throughout the state through government and private sector actions.

Similarly, the Massachusetts Statewide Bicycle Transportation Plan was developed to put forth policies and practices designed to improve conditions for bicycling in the Commonwealth. The Plan consisted of four major components: a vision for the state; current and future demand; opportunities and needs; and recommendations for project and policy implementation.

In 2006, the Executive Office of Transportation began an update of the 1998 bicycle plan. The EOT executed an extensive survey of existing facilities across the state to update its inventory, and created a public participation component that established public forums across the state for residents to review the State's plans and provide input. The update to the Statewide Bicycle Plan is expected to be released in 2007.

7.1 Bicycle Transportation

The bicycle mode of transportation offers personal mobility featuring door-to-door access; often at speeds comparable to auto travel in high-density areas. Transportation is supplied at a relatively inexpensive cost. In recent years, the bicycle has become an increasingly popular alternative means of travel. More individuals have begun to employ bicycles for other than recreational use, including trips to school and work.

The principal drawbacks to reliance on the bicycle for transportation pertain to their unsuitability for travel during inclement weather, and the potential safety problems of traffic situations. The shared use of a roadway can significantly increase the hazards faced by both modes of travel. In addition, the lack of sufficient parking or storage facilities inhibits the effective use of bicycles for other than recreational travel.

While it is only a fraction of the total number of commuters in the region, Census data indicates over 150 people used a bicycle as their mode of travel to work. Table 7-1 lists the number of commuters in each community bicycling to their jobs in 2000. Note that the communities, which had relatively high percentages of those using bikes (Bridgewater, Easton, and Halifax), are communities where development is not quite as dense, motor vehicle traffic volume isn't quite as high, and therefore conditions are somewhat more accommodating to lesser skilled cyclists.

Table 7-1: Biking To Work In the Region, Census 2000

	Bike To Work	Total Commuters	% Commute Biking
Abington	11	7,738	0.14%
Avon	0	2,140	0.00%
Bridgewater	33	12,040	0.27%
Brockton	46	40,747	0.11%
East Bridgewater	8	6,444	0.12%
Easton	29	11,692	0.25%
Halifax	19	3,760	0.51%
Hanson	6	4,823	0.12%
Kingston	0	5,401	0.00%
Pembroke	0	8,533	0.00%
Plymouth	8	24,534	0.03%
Plympton	0	1,377	0.00%
Stoughton	7	13,758	0.05%
West Bridgewater	0	3,265	0.00%
Whitman	0	7,277	0.00%
Region	167	153,529	0.11%

Safe, convenient, and well-designed facilities are essential to encourage bicycle use. Roads designed to accommodate bicyclists with moderate skills will meet the needs of most users, according to MassHighway. Young children are primarily the bicyclists who may require special consideration, particularly on neighborhood streets, in recreational areas, and close to schools. Moderate skilled bicyclists are best served by:

- Extra operating space when riding on the roadway such as bicycle lanes, useable shoulders, or wide curb lane.
- Low speed streets (where cars and bicyclists share travel lanes).
- A network of designated bicycle facilities (bicycle lanes, side-street bicycle routes, and shared use paths).

Existing Long Distance Routes

The Boston to Cape Cod Bikeway ("Claire Saltonstall Bikeway") is the major bike route in both the Old Colony region and Massachusetts. This facility is approximately 65 miles from Boston to the Cape Cod Canal, and then runs to both Provincetown (about 70 miles from the canal) and Woods Hole (about 20 miles from the canal). Principally, it accommodates long distance recreational trips.

The Bikeway traverses existing roadways with the bike route marked by road signs. This facility was developed to utilize low volume back roads as much as possible. In addition, the bikeway provides bicyclists with considerable opportunities to visit points of interest such as historical sites, shopping districts, and parks. In the years since the bikeway was planned, some of the roads, such Long Pond Road in Plymouth, have had large increases in traffic volume, and significantly more conflict between bicyclists and motorists could be occurring now. The conflicts are more likely on narrow, country-type roadways.

Table 7-2: Boston to Cape Cod Bikeway

Current Alignment of Streets in the region: Boston to Cape Cod Bikeway	
Avon - from Randolph to Holbrook	***Continues from left column***
North Main Street	Old Plymouth Street
East High Street	Plymouth Street
Holbrook - from Avon to Brockton	Carver Street
High Street	South Street
Spring Street	Franklin Street
South Street	**Plympton - from Halifax to Kingston**
Linwood Street	Center Street
Brockton - from Holbrook to East Bridgewater	Palmer Road
Boundary Street	Main Street
North Quincy Street	Mayflower Street
Quincy Street	Colchester Street
Crescent Street	Brook Street
West Crook Street	**Kingston - from Plympton to Plymouth**
Alger Street	Elm Street
East Bridgewater - from Brockton to Halifax	Bishops Highway
Winter Street	**Plymouth - from Kingston to Plymouth**
Summer Street	Plympton Road
Elm Street	Carver Road
North Central Street	Summer Street
Central Street	Main Street
Chestnut Street	South Street
Bridge Street	Long Pond Road
Crescent Street	Hedges Pond Road
Washington Street	Route 3A
Pond Street	**Bourne - from Plymouth to Cape Cod Canal**
Halifax - from East Bridgewater to Plympton	Route 3A
Pond Street	Scusset Beach Road
Elm Street	
Source: OCPC	

Existing Local Routes

Several shorter-distance, more localized bikeways are located throughout the Old Colony region. Most of these marked bike paths reside within local or state park lands, such as D.W. Field Park in Avon and Brockton; Myles Standish State Forest in Plymouth; and Ames Nowell State Park in Abington.

Abington is the home of Ames Norwell State Park and several town owned parks that encourage off-road bicycling on a network of off-road paths. The town also has many back ways that offer recreational riding. A portion Route 18 in Abington is in the process of being rebuilt to current standards for roadway width; thus, allowing for increased bicycle safety along the major throughway. Abington is interested in the pursuit of a bicycle route connecting Borderland State Park to D.W. Field Park to Ames Norwell State Park in Abington.

Bridgewater has an extensive bicycle route network that is mapped and is available on the town's official web page. The route system covers many of the major roads in the town. It also includes a marked bike path that originates at Old Pleasant Street and terminates at Vernon Street.

Brockton offers intermodal transportation opportunities and is a major employment center for the region. However, the city is also heavily congested with traffic on narrow roads. The City has several parks that provide biking opportunities.

Easton has developed a signed local bike route. This signed facility links the Five Corners area (Route 123 and Route 106) with the town center via Bay Road, Summer, Center, Depot, Purchase, and Washington Streets (Route 138) to Main Street.

From Purchase Street in Easton, a bike route also extends southeasterly through West Bridgewater along West, Lincoln, South Elm and Scotland Streets into Bridgewater. The route continues along Elm Street in Bridgewater, then Pleasant, Prospect and Vernon Streets into Middleboro. Another bicycle route in Bridgewater extends easterly from Vernon, Forest, South, Winter, Conant and Auburn Streets into Middleboro.

Plymouth has recently seen tremendous growth. The town's roadway network has seen major expansion and redevelopment. A recently completed Enhancement Project funded through the Transportation Improvement Program is the Plymouth Seaside Bike Trail, along the right of way from Nelson Street to Plymouth center near the harbor.

West Bridgewater has a comprehensive, community-based bicycle route system. It includes segments on roads and also separate bicycle paths. It could potentially connect with other facilities in Easton and Bridgewater. The bikeway connects the town center with numerous destinations around the town, and crosses the barrier posed by Route 24 (source: massbike.org). West Bridgewater also has the opportunity to improve its center of town through a major intersection reconstruction that is scheduled for the intersection of Route 106 and 28.

7.2 Pedestrian Transportation

All travelers are pedestrians at some point in their trip, and pedestrians are part of every roadway environment. In some cases pedestrians are regular users of the roadway while in others, pedestrians may be using the roadway in emergency circumstances such as a breakdown. Pedestrian facilities include sidewalks, paths, crosswalks, stairways, curb cuts and ramps, and transit stops. In some areas, particularly in suburban and rural communities, pedestrians may be sharing the roadway itself or its shoulders.

It is important to understand that there is no single "design pedestrian" and that the transportation network needs to accommodate a variety of pedestrians, including those with disabilities. For example, children perceive their environment differently from adults and are not able to judge how drivers shall behave. Children typically walk more slowly, have a shorter gait, and have lower eye height than adults. On the opposite end of the spectrum, older adults may require more time to cross a street, desire more predictable surfaces, benefit from handrails in steep areas, and may require places to rest along their route. People who are blind or have limited sight require audible and tactile cues to safely navigate sidewalks and crosswalks. People with limited cognitive abilities may rely on symbols and take longer to cross the street. People using wheelchairs and scooters may be able to cross the street more quickly than someone walking, but may be more difficult to see by a seated driver in a vehicle. It is important to recognize pedestrians exhibit a wide range of physical, cognitive, and sensory abilities, but they all comprise the pedestrians that roadway design needs to accommodate.

As Table 7-3 indicates, nearly two percent of the commuters in the Region walked to work in 2000. The communities with large student populations (Easton and Bridgewater) and those with dense urban development (Brockton) had the highest overall percentage of commuters walking to work.

Table 7-3: Walking To Work In The Region, Census 2000

	Walk To Work	Total Commuters	% Commute Walking
Abington	105	7,738	1.36%
Avon	28	2,140	1.31%
Bridgewater	467	12,040	3.88%
Brockton	956	40,747	2.35%
East Bridgewater	40	6,444	0.62%
Easton	463	11,692	3.96%
Halifax	14	3,760	0.37%
Hanson	13	4,823	0.27%
Kingston	28	5,401	0.52%
Pembroke	56	8,533	0.66%
Plymouth	313	24,534	1.28%
Plympton	12	1,377	0.87%
Stoughton	232	13,758	1.69%
West Bridgewater	64	3,265	1.96%
Whitman	104	7,277	1.43%
Region	2,895	153,529	1.89%

Existing Sidewalks

According to the Massachusetts Road Inventory File, the Old Colony region has over 390 miles of roadway with a left and/or right sidewalk. Most of the main roadways in the region have a sidewalk on at least one side. However, there are many smaller roadways, particularly in more rural areas, where sidewalks are not present. In some cases a worn footpath exists and in others pedestrians share the roadway with vehicles. For existing sidewalks, width, surface type and conditions, and curbing conditions vary. In some cases, sidewalks are in disrepair from weathering and vegetation.

Existing Walking Paths and Trails

Several parks, nature areas, and recreation areas throughout the region feature walking and shared use paths. These areas include:

- Ames Nowell State Park, Abington.
- Borderland State Park, Easton.
- D.W. Field Park, Brockton and Avon.
- Myles Standing State Forest, Plymouth.

In addition to these major areas, several smaller parks and conservation areas exist in each of the towns, many providing pedestrian trails and paths.

Bridgewater State College has a network of paved footpaths connecting campus buildings, parking areas, and the Bridgewater MBTA Commuter Rail Station.

7.3 Pedestrian Activity Centers

Pedestrian accommodations are a critical component to healthy, vibrant business districts, city downtowns and town centers, and transit oriented development areas. Areas where visitors are able to safely and easily navigate from one business to another are more conducive to the vitality of the district. In contrast, districts with large parking areas separating businesses from one another and the street, or areas that do little to slow motor vehicle traffic and make pedestrian access safer, are likely to become a fragmented area with little neighborhood cohesion.

Through a combination of field observations, historical accounts, and input from the public, several significant pedestrian activity centers in the Region were identified during the development of this Regional Transportation Plan. These are areas that have historically served as central business districts to their respective communities, or have been designated as transit oriented development areas. In the case of Bridgewater and Easton, they are education centers with large populations of resident students, many without cars. These are areas where enhancement of pedestrian infrastructure has been identified as a priority.

<u>Abington TOD</u>

The Town of Abington has created a Transit Oriented Development (TOD) around its MBTA Commuter Rail station and the Town's central business district to encourage the development of uses that complement both the existing rail line and the surrounding residential areas. The district encompassed thirty acres around the Commuter Rail station.

The Town of Abington experienced impressive growth between 2000 and 2005 (see Table 4.1 in Chapter 4), and with new medium and high-density residential development occurring, the Town has the potential to become one of the larger communities in the region. The Abington MBTA Station has the potential to become a major intermodal transportation center serving the increasing population and economy of Abington and the surrounding towns by containing the following features:

- Commuter Rail (Existing).
- Medium Capacity Parking Facility (Existing 400+ Lot).
- Enhanced Walkways between Station, Housing, and Central Business District (Existing and Potential).
- Enhanced Pedestrian Amenities at area signalized intersections (Potential).
- Bicycle Lockers (Potential).
- Fixed Route Bus Service by Brockton Area Transit (Potential).

Enhancing pedestrian facilities (well-maintained and lighted sidewalks, pedestrian countdown signals at intersections) between the Target Shopping Center on Route 123, the Abington MBTA Station and TOD Zone, and the Central Business District on Washington Street would, in all likelihood, foster and strengthen high-density development around the Station.

<u>Downtown Bridgewater</u>

Downtown Bridgewater is a transportation hub in the region, with the intersection of Routes 18, 28, and 104, as well as the nearby location of the Bridgewater MBTA Commuter Rail Station. Development patterns in the area feature a New England Village style town center, with a mix of housing, local businesses, and services. Traffic flows around the center in an oblong roundabout-like facility.

Bridgewater State College abuts the town center, and is a major generator of pedestrian traffic. Many students living in nearby off-campus housing commute to class by way of walking or biking, and similarly many on-campus students commute to nearby businesses on foot or bike.

Several municipal buildings, including the Town Hall and Public Library are also located within the center and generate pedestrian and bicycle trips. Due to the scarcity of parking, in some cases automobile borne visitors to the center park some distance away from there destination, and travel from their parking spot to the destination on foot.

Bridgewater is the fourth most populous community in the region with nearly 26,000 residents. Bridgewater State College has consistently grown for the past several years, and conceptual plans have been discussed by officials for the college to become a university- a transition that would likely foster even more growth. Like any college town, Bridgewater has a significant population of people that do not have access to cars and are dependant upon walking, bicycling, and transit to get around. High traffic volumes and congestion in the Downtown Brockton area presents a direct conflict and challenge to the high volume of pedestrians and bicyclists.

The area can be greatly served by enhanced pedestrian amenities, including pedestrian countdown signals at signalized intersections and raised crosswalks at major crossing points. Bicycle lanes may also be considered on the major roadways leading to and from the college, as the college has a significant population of students and faculty alike that live in nearby housing and may be well served by the option to safely bike to the school. The Bridgewater MBTA Station should be included in all bicycle and pedestrian improvements involving the college.

Downtown Brockton

Brockton is the largest city in the Old Colony region, and is a center of housing, commerce, industry, and government. The Downtown Brockton area contains all of these types of land use within a tight, concentric high-density core that extends between Court Street and Belmont Street from north to south, and Commercial Street and Warren Avenue from east to west.

The Downtown contains apartments and condominiums; numerous small businesses, banks, restaurants, and bars; Brockton City Hall, Police Headquarters, Post Office, and county, state, and federal government offices; industrial uses; large employment centers; Brockton Area Transit's Intermodal Transportation Centre; and the Brockton MBTA Commuter Rail Station. A very large amount of pedestrian trips occur within Downtown Brockton.

Brockton has completed several state funded projects to enhance the downtown area along with the Intermodal Transportation Centre such as sidewalks and pedestrian amenities and condominium projects located near the Centre.

While much has been done already in the Downtown Brockton area, additional facilities could serve to increase safety and security of pedestrians and bike riders in the Downtown area, including:

- Pedestrian countdown signals at Downtown Intersections.
- Better lighting of sidewalks and streetscapes.
- Raised crosswalks on Commercial Street, between the Brockton MBTA Station & BAT Intermodal Centre, and in front of the Post Office.

- Well maintained, brightly painted crosswalks at other locations.
- Bicycle Lockers at Brockton MBTA Station, BAT Intermodal Centre, and various locations downtown.

Downtown Stoughton

Stoughton Center is a densely developed area around the intersection of Routes 27, 138, and 139. The Stoughton MBTA Commuter Rail Station is also located at Stoughton Center. Development around the Center features a mix of small, local shops; services; municipal facilities; and housing.

Like the Abington MBTA Station, the Stoughton MBTA Station also has the potential to develop into a major intermodal transportation center serving the population and economy of Stoughton and the surrounding towns by containing the following features:

- Commuter Rail (Existing)
- High Capacity Parking Facility (Existing 400+ Lot, Potential for Garage)
- Enhanced Walkways between Station, Housing, and Central Business District (Existing and Potential)
- Enhanced Pedestrian Amenities at area signalized intersections (Potential)
- Bicycle Lockers and Bike Racks (Potential)
- Fixed Route Bus Service by Brockton Area Transit and MBTA (Potential)

Downtown Plymouth

Downtown Plymouth is less defined than some of the other downtown areas in the region, but generally extends north to south along the waterfront from Samoset Street (Route 44) to Lincoln Street. In addition to the traditional mix of commercial, residential, and municipal uses, the Downtown area of Plymouth also features historic sites and major tourist destinations such as Plymouth Harbor, Plymouth Rock; Pilgrim Hall Museum; and the Mayflower II.

Plymouth Harbor provides seasonal water borne transportation options to Provincetown, and also serves as an operational fishing port.

Plymouth has a parking management system in the Downtown that directs visitors to park at any one among a network of surface parking lots throughout the area, pay for parking, and walk to their destination.

Safe and efficient pedestrian amenities are critical to the vitality of Downtown Plymouth, as many businesses, tourist attractions, and government offices do not have on-site or readily available nearby street parking. The majority of visitors to and employees in Downtown Plymouth must park their cars at satellite municipal parking lots and walk the remainder of the trip to their destination.

The area could be greatly served by the following amenities:

- Bicycle Lockers and Bike Racks around the Downtown.
- Pedestrian countdown signals at signalized intersections.
- Raised Crosswalks at major mid-block crossing points.
- Increased lighting on side streets and alleyways that connect Main Street to Water Street.

Stonehill College and Route 138

Stonehill College, located on Route 138 in Eason, contains a relatively large on-campus population, and generates some commuting student traffic as well. Immediately to the south of Stonehill College, Route 138 is highly developed with many restaurants, convenience stores and services, and other businesses. This commercial retail generates a large amount of pedestrian traffic originating at Stonehill College, and most of these trips travel back and forth on Route 138.

Safety and security along Route 138 can be enhanced for pedestrians and bicycle riders by:

- Creation of Bicycle Lanes along Route 138 between Stonehill College and through business district.
- Enhancement of traffic signals along corridor.
- Well-lighted walkways and streetscapes.

7.4 Bicycle and Pedestrian Safety

Bicycle Crashes

In 2003, 622 bicyclists were killed and an additional 46,000 were injured in traffic crashes in the United States. Cyclists accounted for 1 percent of all traffic fatalities and 2 percent of all persons injured in crashes in the United States in 2003. In Massachusetts, the percent of cyclists among all traffic fatalities is higher than the national average: 2.4 percent, or 1.71 cyclist fatalities per million in population. Perhaps a major reason for the higher rate in Massachusetts is the urban nature of development in the state, particularly in the eastern half. According to the National Highway Traffic Safety Administration (NHTSA), cyclist fatalities occurred much more frequently in 2003 in urban areas (69 percent urban areas verse 31 percent elsewhere).

While the average age of cyclists killed in the nation is increasing (35.8 years in 2003 vs. 27.8 in 1993), still over one-fifth of cyclists killed in 2003 were children between the ages of 5 and 15 years old.

Locally within the region, cyclists suffered 1.4 percent of traffic fatalities between 1990 and 2005.

Crashes Involving Pedestrians

In 2003, 4,749 pedestrians were killed in traffic crashes in the United States, an average of one pedestrian killed every 111 minutes. In addition, 70,000 pedestrians were injured in traffic crashes that same year, an average of a pedestrian hurt in a traffic crash every 8 minutes. Eighty-six (86) of those 4,749 pedestrians killed in 2003 occurred in traffic crashes on Massachusetts roads. Overall, 18.6 percent of the State’s traffic fatalities in 2003 were pedestrians.

Like cyclists fatalities, pedestrians are much more likely to be killed in urban areas. Seventy-two (72) percent of pedestrian fatalities in 2003 occurred in an urban area, and 79 percent occurred away from intersections. Approximately one-forth of pedestrians killed in 2003 were children between 5 and 9 years old, and one-fifth were under 16 years old.

Within the Old Colony region, 65 of the 420 (15.5 percent) persons killed in traffic crashes between 1990 and 2005 were pedestrians.

Bicycle Transportation Design

Paths for bicyclists (which generally also serve other non-motorized users) supplement the roadway network. Roadway design should consider these factors to best accommodate bicyclists:

- Providing width sufficient for motorists to pass bicyclists without changing lanes or crossing the centerline on high speed and/or high volume roads.
- Removing roadway obstacles that could cause bicyclists to crash.
- Directing bicyclists to scenic and low traffic routes by guide signs and/or pavement markings.
- Providing signalized crossings of major roadways when warranted for those who are not comfortable making left turns in heavy traffic.

When bicycles are used on public streets and roads, bicyclists are subject to the same traffic laws as motor vehicle operators with some exceptions as noted in the Massachusetts General Laws.

Road construction projects in the Old Colony region should be designed and constructed in accordance to the MassHighway Project Development and Design Guide, and controls built to standards set forth in the Manual On Uniform Traffic Controls, to best accommodate bicyclists.

Pedestrian Transportation Design

Road construction projects in the Old Colony region should be designed and constructed in accordance to the MassHighway Project Development and Design Guide, and controls built to standards set forth in the Manual On Uniform Traffic Controls, to best accommodate pedestrians of all types.

Safe Routes To School

The Massachusetts Safe Routes to School program promotes healthy alternatives for children and parents in their travel to and from school. The SRTS program educates students, parents and community members on the value of walking, bicycling, carpooling, and taking public transit and the school bus for travel to and from school.

The Safe Routes to School program elements, education, encouragement, enforcement, engineering, and evaluation ensure a comprehensive and successful program to increase walking and bicycling to and from school.

- Education Teaching children and parents about the broad range of transportation choices, instructing them in important lifelong bicycling and walking safety skills, creating awareness among drivers near schools, and improving the health benefits of our children through regular exercise.
    - Physical Health
    - Environmental Health
    - Safety

- Encouragement Using events and activities to promote healthy transportation alternatives.
  - Walking
  - Bicycling
  - Multi-family carpooling
  - Riding the bus

- Enforcement Partnering with local law enforcement to ensure traffic laws are obeyed in the vicinity of schools (this includes enforcement of speeds, yielding to pedestrians in crossings, and proper walking and bicycling behaviors), and initiating community enforcement such as crossing guard programs.
  - Creating awareness
  - Changing driver behavior
  - Offering safety training

- Engineering Creating operational and physical improvements to the infrastructure surrounding schools that lower speeds, reduce potential conflicts with traffic, and establish safer and fully accessible crossings, walkways, trails, and bikeways.
  - Improvement to physical environments
  - Safer routes for children

- Evaluation Monitoring outcomes and documenting trends through data collection before and after Safe Routes activities.
  - Student Hand Survey
  - Parent Survey
  - Walkability Checklist
  - Bikability Checklist

7.5 Bicycle and Pedestrian Infrastructure Financing

A crucial component of studying and designing proposed bicycle and pedestrian infrastructure projects involves identifying funding for the study of feasibility, planning, design, and construction. The Financial Plan chapter of this document discusses in detail the funding mechanisms for the design and construction of all transportation projects.

Under the SAFETEA-LU federal transportation bill, funding has been made available for bicycle and pedestrian facilities. State and federal funds for the study, design, construction, or improvement of bicycle and pedestrian facilities include the following resources:

- **Transportation Enhancement Program**: Funds are available for the provision of facilities for bicyclists and pedestrians and the reservation of abandoned railway corridors including the use thereof for pedestrian and bicycle trails. Projects should be primarily transportation oriented and be part of a route that connects urban employment centers and other major trip generators. These projects should be listed in the Transportation Improvement Program (TIP), and be consistent with the goals and objectives of the Regional Transportation Plan and the state in order to be eligible for this type of funding. It should be noted, however, that compliance with the above-mentioned conditions does not guarantee that a project will be funded. Projects listed in the TIP compete for funding against all other projects, and all projects are evaluated on a standardized criteria evaluation program.

- **Surface Transportation Program (STP)**: This program may be used for construction of bicycle and pedestrian facilities or for safety-related non-construction activities such as maps and brochures. Activities must be primarily transportation oriented (as opposed to recreation oriented) and consistent with the plans of the Region and the State.
- **Highway Safety Improvement Program (HSIP)**: This program makes available funds for projects that improve the safety of bicyclists and pedestrians.
- **Congestion Mitigation and Air Quality Improvement Program (CMAQ)**: This program is available in Massachusetts since the State has not yet attained the clean air standards established under the Clean Air Act. Funds from this program may be used for activities aimed at increasing the use of non-motorized modes of transportation including bicycle and pedestrian facilities. Activities must be transportation-oriented and consistent with the plans of the Region and State. Activities seeking funding must also demonstrate a projected reduction in airborne pollutants (CO, NOx, VOCs) directly related to the proposed activity.
- **National Highway System Funds**: These funds may be used to construct bicycle and pedestrian facilities adjacent to any highway on the National Highway System. Activities under this program must be primarily for transportation purposes and consistent with the plans of the Region and State.
- **Scenic Byways Program**: Funds from this program may be used for bicycle and pedestrian facilities directly related to the program's purpose of supporting and developing state and national scenic byways.
- **Recreational Trails Program**: Funds from this program are for recreation-oriented trails. Thirty (30%) percent of these funds must be used for non-motorized trails, while another forty (40%) is discretionary, and the remaining thirty (30%) for motorized trails. Though administered by the Department of Conservation and Recreation (DCR), proposals are subject to review by the Massachusetts Recreational Trails Board. Activities proposed under this program must be consistent with the Statewide Comprehensive Outdoor Recreation Plan (SCORP).
- **Transportation, Community, and System Preservation Program (TCSP)**: Funds from this program may be made available to bicycle and pedestrian projects.
- **Section 402 Highway Safety Program**: This program addresses the State and community highway safety grant funds. The priority status of safety programs for bicyclists and pedestrians expedites the approval process of for these funds. A program guideline (available through the Federal Highway Administration) has been developed to offer states guidance in developing and managing a statewide bicycle and pedestrian safety program.
- **Alternative Transportation in Parks and Public Lands Section 3021**: Funds are available through the Federal Transit Administration to promote alternative transportation modes in or around federally managed parks, recreation areas, or refuges. Alternative transportation modes include all non-automobile forms of transportation.
- **Safe Routes to School (SRTS) Program**: As discussed earlier in this chapter, these funds may be used for infrastructure projects on non-infrastructure projects that enable and encourage children to walk and bike to school.
- **Federal Transit Administration Transit Enhancements Program**: The funds may be used for bicycle and pedestrian improvements related to accessing transit as well as for bicycle parking facilities, shelters in proximity to transit stops, and bicycle storage on mass transit vehicles.
- **Job Access and Reverse Commute (JARC) Grants**: These funds are available to support projects designed to transport welfare recipients and eligible low-income individuals to and from employment. Projects can include bicycle related services.
- **DCR Greenways and Trails Demonstration Grants Program**: The Department of Conservation and Recreation (DCR) awards grants between $1,000 and $5,000 for projects that create and promote greenways and trails in Massachusetts (requests up to $10,000 are

considered for regional projects). Special consideration is given to projects that involve community youth, highlight river greenways, and feature historic corridors.

- **Local State Aid Chapter 90 Program**: These funds can be used for bike path engineering and right-of-way acquisition, and may be applied as the local match to funding under several of the above-mentioned programs).

7.5 Conclusion and Recommendations

Routinely review project proposals through the MEPA process and other review opportunities to assure that provisions for bicyclists and pedestrians are incorporated into design plans.

Plymouth MBTA Commuter Rail Station and Seaside Rail Trail: Construction of new connections and enhancements to existing ones should be made between the Plymouth Station, the Plymouth Seaside Trail, and the Historic Plymouth Waterfront and Downtown Plymouth. Currently there is some degree of disconnect between these three components to this underutilized transportation corridor.

Develop a Regional Bicycle and Pedestrian Transportation Plan. A Regional Bicycle and Pedestrian Transportation Plan will examine the existing infrastructure in the region that supports bicycle and pedestrian transportation, and identify strengths and weaknesses in the system. The Plan will identify key areas to address for the creation of a contiguous, region-wide network of sidewalks, walkways, bicycle paths, and bicycle lanes, as well as identify strategies to accomplish the goals of the plan.

Encourage/promote bicycle riding as a viable alternative to automobile commuting and as a means to improve air quality. Where feasible, bicycling to work or to transit facilities instead of driving would reduce "cold starts," which inject high levels of toxic emissions into the atmosphere with the starting and shutting off automobile engines. A coordinated effort of local officials, the Massachusetts Highway Department, Regional Planning Agencies and interest groups, should encourage and promote the use of existing designated bicycle routes as a viable alternative to automobile commuting through public information and awareness efforts.

Encourage/promote safe bicycle riding, and reduce the number of injuries and fatalities associated with bicycle crashes. To help ensure safe travel habits and reduce the number of bicycle crashes, education programs for all road users should be implemented. Coordination of municipalities with the Department of Education, Registry of Motor Vehicles and transportation agencies should be a part of this effort.

Support bicycle riding as a part of intermodal travel. Coordination between different modes of transportation should include the improvement of bicycle access to public transportation. This includes, but is not limited to, permits to allow bicycles on train cars; external racks to carry bicycles on buses as done in Portland and San Francisco, and bicycle lockers at park-and-ride lots, train stations and bus terminals

Identify, designate and implement additional bicycle paths and routes to be used for both commuting and recreation. Local officials, in concert with state and regional planners, should investigate the development of additional bicycle paths and routes which could safely serve the commuting public. This includes, but is not limited to, the development of abandoned railroad rights-of-way as bicycle paths, and bikeways that connect industrial/business parks, shopping centers, schools and other key destinations.

Coordinate efforts to improve bicycle facilities with surrounding municipalities and regional agencies. To help form a more complete and contiguous network of bicycle facilities in the region and southeastern Massachusetts, local agencies should coordinate efforts with agencies and organizations outside the region. This includes, but is not limited to, researching the existing bicycle facilities of surrounding towns before formalizing new bikeways, and coordinating public outreach programs to help minimize the cost of these efforts.

Support local, regional, and state initiatives and legislation that create or maintain bicycle infrastructure and safety. To best serve the greater good and needs of the public for a safe and secure transportation system, support and endorsement will be provided to all initiatives and legislation (local/regional/state/federal) that result in the implementation of bicycle facilities, ease congestion, promote recreation, and increase safety and security for bicycle users.

Enhance bicycle facilities at intermodal facilities (MBTA Stations, BAT Centre, Park and Ride). The potential for MBTA Stations, the BAT Centre, and MassHighway Park and Ride lots to serve as true intermodal facilities can be maximized by enhancing bicycle facilities, including but not limited to: installation of external bike racks on buses that serve these facilities; the installation of bicycle lockers; and bicycle lanes and paths entering and exiting facilities.

Continue bicycle and pedestrian transportation safety efforts in Safety Management System. The Safety Management System promotes and plans for safety improvements throughout all modes on the transportation network.

Promote the installation of bicycle detection loops at actuated signalized intersection to increase safety for entering bicyclists. Noting that roadways serve both drivers of motorized vehicles and users of bicycles, actuated traffic signals should include detection loops for bicycles to maximize safety for bicycle riders.

Enhance pedestrian consideration during the planning and design phases. Too often municipalities over look the safety and access of pedestrians in areas with high volumes of automobiles. Only as an afterthought, safety amenities are added or design conditions are changed. A coordinated effort of planners, engineers, and local officials, should encourage pedestrian needs to be of higher priority during the initial design process.

Support local initiatives, which enact, implement and enforce laws and regulations regarding pedestrian traffic. The responsibility for pedestrian safety ultimately lies with the local jurisdiction. Communities should utilize safety officers to enforce laws/regulations that promote increased pedestrian safety, with emphasis around high activity areas such as transit facilities, schools, and commercial centers. Participants in the process should include police departments, traffic engineers, school and legal system representatives.

Install physical barriers, pavement marking, and other amenities where needed to maximize pedestrian safety. Marked crosswalks, safety islands, street lighting, pedestrian underpasses/overpasses, sidewalks, traffic signals and signage all constitute useful techniques to separate pedestrians from hazardous vehicular traffic. Particular attention should be given to high activity areas such as transit facilities, schools, and commercial centers.

Continue to study/identify additional pedestrian facilities. Continue to conduct studies in the region as needed to identify, designate, and implement additional pedestrian facilities. These facilities should improve linkages between existing pedestrian walkways, transit facilities, activity areas, and residential neighborhoods, and provide a safe and accessible means of short distance travel and recreation.

Promote/encourage pedestrian ways as a viable alternative to automobile commuting and means of improving air quality. Where feasible, walking to work or to transit facilities instead of driving would reduce "cold starts," which inject high levels of toxic emissions into the atmosphere with the starting and shutting off automobile engines. Support of this alternative includes, but is not limited to, the creation of pedestrian walkway connections between residential areas, transit facilities, industrial parks, shopping centers, schools and other key destinations.

Promote Installation of Pedestrian Countdown Signals at Signalized Intersections. A Pedestrian Countdown Signal consists of a standard pedestrian signal with standard shapes and color, with an added display that shows the countdown of the remaining crossing time. Studies have shown that these types of signals dramatically decrease pedestrian-vehicle conflicts and increases safety for crossing pedestrians. By viewing the numeric countdown display, pedestrians gain a new level of self-protection by the ability to determine how long it takes them to cross a street, and knowing precisely how much time exists on the current signal phase before the "Don't Walk" alert comes on and the signal proceeds into its next phase. According to a January 2006 article in the ITE Journal, San Francisco experienced a 52 percent reduction in pedestrian injury collisions at the 700 intersections it had retrofitted with the countdown equipment. The Regional Planning Agency and Metropolitan Planning Organization should work with the City of Brockton and other towns in the Region to retrofit signalized intersection with pedestrian countdown signals. Pedestrian countdown signals should be considered with all new signalization projects.

Promote Safer Pedestrian Access Designs in Parking Lots. Pedestrian consideration is often overlooked in design for parking areas of retail, entertainment, and employment centers. Often the pressure to provide as many parking spots as possible or the minimums for zoning regulations eliminates safe pedestrian accommodations from the design process. Once parked and out of the vehicle, pedestrians are often forced to share driveways with motor vehicles. With the boom in popularity of Sport Utility Vehicles and large profile trucks during the 1990's and early 2000's, often-exiting drivers have very little, if any, visibility of the driveway approaches, making pedestrians virtually invisible. Dedicated pathways between the parking area(s) and building(s) should be provided for pedestrian access. Facility owners should also consider the use of pavement markings, textured surfaces, and other traffic calming devices to further enhance pedestrian safety in parking areas.

Promote Use of Crossing Islands and Medians in Wide Cross-Sections. According to the MassHighway Project Development and Design Guide, fifty feet is generally the longest uninterrupted crossing a pedestrian should encounter at a crosswalk although islands and medians are also appropriate for shorter distances as well. Many multiple lane roadways exceed fifty feet in cross-section width. Raised medians provide the following benefits to pedestrians on the roadway network:

- Allow pedestrians to cross few lanes at a time, reducing exposure time.
- Provide a refuge so slower pedestrians (older persons, physically disabled, etc) can wait for a break in the traffic stream.
- Allow pedestrians to focus on one direction of traffic at a time.
- Reduce the total distance over which pedestrians are exposed to conflicts with motor vehicles.
- May provide easily accessible location for pedestrians signal call buttons.
- May also further enhance safety by functioning as a traffic-calming device, forcing drivers to reduce speed on approach to the crossing area.

Promote Pedestrian Level of Service D or Better at Intersections With High Pedestrian Activity. Pedestrian level of service is defined by the delay experienced by the pedestrian at an intersection, with guidance provided for by the Highway Capacity Manual (HCM). At Level of Service grades A and B, the likelihood of risk taking behavior (accepting dangerously small traffic gap, ignoring signals, etc) in evaluated as "Low" by the HCM. The likelihood of risky behavior increases to "Moderate" at Level of

Service grades C and D. At level of service E, the likelihood of risky behavior increases to “High”. All reasonable efforts should be exercised in planning, design, and construction of pedestrian facilities at intersections to minimize the potential risk taking behavior by pedestrians at intersections.

CHAPTER 8
ENVIRONMENTAL QUALITY, HAZARDS, AND ENERGY

8.0 Introduction

The Old Colony region contains many areas of environmental and historical value and the Old Colony Metropolitan Planning Organization (MPO) is dedicated to protecting those rich areas. This chapter describes the characteristics of the natural environment in the Old Colony Metropolitan Planning Organization region; provides a map series of those characteristics; identifies federal and state policies put in place to protect, preserve, and maintain vulnerable areas; and discusses potential environmental mitigation measures that may assist these policies in protecting environmental quality. In addition, this chapter identifies natural hazards that could endanger the citizens and wildlife of the region and discusses various available energy alternatives, which enhance environmental quality throughout the Commonwealth.

The Old Colony Metropolitan Planning Organization has developed a set of goals and objectives to guide its transportation planning activities through the near future. The following goals and objectives apply directly to the content of this chapter:

- Promote a transportation system that protects and enhances the environment; promotes energy conservation; and improves the quality of life in the region.
- Promote efficient system management and operation of the transportation system.
- Emphasize the preservation and modernization of the existing transportation system.
- Support smart growth principles, provide a transportation system that is regionally coordinated and based on effective transportation, and land use planning.

The Old Colony MPO realizes the continual need to maintain and preserve the transportation infrastructure in the region and fully supports the Commonwealth's "Fix it First" policy. Fix it First is a statewide commitment to repair and maintain the existing transportation infrastructure in order to avoid unnecessary environmental impacts.

As required by SAFETEA-LU, this chapter also incorporates results of discussions with federal, state, and local agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation.

8.1 Environmental Quality

8.1.1 Air Quality

<u>Existing Conditions</u>

The Commonwealth of Massachusetts is classified as nonattainment for ozone, and is divided into two nonattainment areas. The Eastern Massachusetts ozone nonattainment area includes Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester counties. Berkshire, Franklin, Hampden, and Hampshire counties comprise the Western Massachusetts ozone nonattainment area. With this nonattainment classification, the 1990 Clean Air Act Amendments (CAAA) required the Commonwealth to reduce its emissions of volatile organic compounds (VOCs) and nitrogen oxides (NOx), the two major precursors to ozone formation to achieve attainment of the ozone standard.

The CAAA also required Metropolitan Planning Organizations (MPOs) within nonattainment areas to perform conformity determinations prior to the approval of their Regional Transportation Plans (RTPs) and Transportation Improvement Programs (TIPs). The most recent conformity determination occurred on June 15, 2005, when the Federal Highway Administration (FHWA) – in consultation with the Environmental Protection Agency (EPA New England) and the Massachusetts Department Of Environmental Protection (DEP) – confirmed that all 13 of the RTPs for the year 2003 in Massachusetts (and their updates in some cases) were in conformity with the Massachusetts State Implementation Plan (SIP). A brief summary of major conformity milestones in recent years is as follows:

In September 2002, DEP submitted to EPA a revision to the Massachusetts SIP that included a revised one-hour ozone attainment demonstration for Eastern Massachusetts. This SIP revision included a 2007 mobile source emission budget for the Eastern Massachusetts Ozone Nonattainment Area. EPA found this emission budget adequate for conformity purposes under the one-hour standard in December 2002, and it became effective in January 2003.

In 2003, air quality analyses were conducted on behalf of all the 2003 Regional Transportation Plans (RTPs), the purposes of which were to evaluate the RTPs' air quality impacts on the SIP. Conformity determinations were performed to ensure that all regionally significant projects were included in the RTPs. The Massachusetts Executive Office of Transportation found the emission levels from the 2003 Regional Transportation Plans to be in conformance with the SIP. Each MPO had certified (and continues to certify) that all activities outlined in its Plan and its TIP:

- will not cause or contribute to any new violation of any standard in any area.
- will not increase the frequency or severity of any existing violation of any standard in any area.
- will not delay the timely attainment of any standard or any required interim emission reductions or other milestones in any area.

In 2004, two eight-hour ozone non-attainment area designations for Massachusetts – classified as "moderate" – went into effect on June 15th, and were geographically identical to those of the previous one-hour standard: the Boston-Lawrence-Worcester (Eastern Massachusetts) Area, and the Springfield (Western Massachusetts) Area. Concurrent with those designations, EPA announced that the 1-hour ozone standard would be revoked as of June 15, 2005.

In 2005, updated air quality conformity analyses for the eight-hour ozone standard were performed for the 2003 RTPs and FFY 2005-2009 regional TIPs. This was required to avoid a conformity lapse and a resulting potential delay or loss of federal transportation funding. On June 15, 2005, FHWA – in consultation with EPA New England and DEP – made a positive conformity finding for the eight-hour standard.

In July 2005, the Boston Region MPO proposed in their 2006-2010 TIP a reprogramming of several projects across analysis years. This action required a new conformity analysis to be undertaken. Note: Only the emission totals for the Boston Region MPO and the Eastern Massachusetts Nonattainment area have changed. In March 2007, new emissions analyses were performed with updated emissions factors, and the results are being used to demonstrate conformity for the Old Colony MPO and all other MPO regions in the Eastern Massachusetts Nonattainment Area.

The 2007 Old Colony Regional Transportation Plan continues to include all regionally significant, non-exempt projects have been included in the air quality analyses for the conforming RTP.

Timely Implementation of Transportation Control Measures

Transportation Control Measures (TCMs) have been required in the SIP in revisions submitted to EPA in 1979 and 1982. All SIP TCMs have been accomplished through construction or through implementation of the following ongoing programs:

- Park and Ride Lots
- Traffic Flow Improvements
- On Street Parking Restriction

DEP submitted to EPA its strategy of programs to show Reasonable Further Progress of a 15% reduction of VOCs in 1996 and the further 9% reduction of NOx toward attainment of the National Ambient Air Quality Standards (NAAQS) for ozone in 1999. Within that strategy, there are no specific TCM projects. The strategy does call for traffic flow improvements to reduce congestion and; therefore, improve air quality. Other transportation-related projects that have been included in the SIP control strategy are listed below:

- Enhanced Inspection and Maintenance Program
- California Low Emission Vehicle Program
- Reformulated Gasoline for On- and Off-Road Vehicles
- Stage II Vapor Recovery at Gasoline Refueling Stations
- Tier I Federal Vehicle Standards

Air Quality Conformity Analysis

The conformity test is to show consistency with the motor vehicle emissions budgets set forth in the SIP. The motor vehicle volatile organic compounds (VOC) and nitrogen oxide (NO_x) emissions for the Eastern Massachusetts Ozone Nonattainment Area include all the following MPOs:

- Cape Cod MPO
- Central Massachusetts MPO
- Merrimack Valley MPO
- Boston MPO
- Montachusett Region MPO
- Northern Middlesex MPO
- Old Colony MPO
- Southeastern Region MPO
- Martha's Vineyard Commission*
- Nantucket Planning and Economical Development Commission*

* These regions are considered to be MPOs for planning purposes.

Horizon years for transportation model and emissions analysis have been established following 40 CFR 93.106(a) of the Federal Conformity Regulations. The years for which the model(s) were run are shown below:

- <u>2007</u> - This year is currently being used by the statewide travel demand model as the base year for calculation of emission reductions of VOCs and NOx.
- <u>2010</u> - Milestone Year – Attainment year
- <u>2020</u> - Milestone Year
- <u>2030</u> - Horizon Year – last forecast year of transportation plan

Conformity is demonstrated by showing consistency with the mobile source emission budget for the Eastern Massachusetts Ozone Non-attainment Area.

The Executive Office of Transportation, Office of Transportation Planning calculated the emissions estimates for VOC and NOx for all areas and all MPOs (emissions for the Boston Region was estimated by MPO staff and were included in the final totals). The VOC mobile source emission budget for 2007 for the Eastern Massachusetts One-Hour Ozone Nonattainment Area has been set at 86.700 tons per summer day and the 2007 mobile source budget for NOx is 226.363 tons per summer day. As shown in Tables 1 and 2, the results of the air quality analysis demonstrate that the VOC and NOx emissions from all Action scenarios are less than the VOC and NOx emissions budgets for the Eastern Massachusetts Ozone Nonattainment Area* and therefore demonstrates air quality conformity.

TABLE 8-1
VOC Emissions Estimates for the Eastern Massachusetts Ozone Nonattainment Area
(all emissions in tons per summer day)

Year	**Old Colony Region Action Emissions**	**Eastern MA Action Emissions**	**Budget**	**Difference (Action – Budget)**
2000	n/a	166.545	n/a	n/a
2007	3.9996	61.957	86.700	-24.743
2010	3.2053	49.718	86.700	-36.982
2020	1.6902	29.805	86.700	-56.895
2030	1.6873	28.714	86.700	-57.986

TABLE 8-2
NOx Emissions Estimates for the Eastern Massachusetts Ozone Nonattainment Area
(all emissions in tons per summer day)

Year	**Old Colony Region Action Emissions**	**Eastern MA Action Emissions**	**Budget**	**Difference (Action – Budget)**
2000	n/a	287.877	n/a	n/a
2007	10.4589	174.098	226.363	-52.265
2010	7.8783	129.201	226.363	-97.162
2020	2.0784	45.439	226.363	-180.924
2030	1.4778	34.744	226.363	-191.619

Problems or Threats

Air Pollution

Driving cars and trucks; burning coal, oil, and other fossil fuels; and manufacturing chemicals pollute the air humans and wildlife breathe. Air pollution can even come from smaller, everyday activities such as dry cleaning, filling your car with gas, and degreasing and painting operations. These activities add gases and particles to the breathable air. When these gases and particles accumulate in the air in high enough concentrations, they can cause harm to humans, wildlife, and our environment. More people in cities and surrounding counties means more cars, trucks, industrial and commercial operations, and generally means more pollution. Many air pollutants, such as those that form urban smog and toxic compounds, remain in the environment for long periods and are carried by the winds hundreds of miles from their origin. Millions of people live in areas where urban smog, very small particles, and toxic pollutants pose serious health concerns. People exposed to high enough levels of certain air pollutants may experience burning in their eyes, an irritated throat, or breathing difficulties. Long-term exposure to air pollution can cause cancer and long-term damage to the immune, neurological, reproductive, respiratory systems, and in extreme cases, it can even cause death.

Particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead are identified by the U.S. Environmental Protection Agency as the six most common air pollutants in the United States. These pollutants can harm human health, the environment, and cause property damage. Of the six pollutants, particle pollution and ground-level ozone are the most widespread health threats.

Noise Pollution

Noise pollution from sounds that cause a nuisance, could injure public health, or unreasonably interfere with the comfortable enjoyment of life, property, or the conduct of business. Noise emanates from a wide variety of transportation facilities and related sources including, but not limited to: vehicle engines, emergency vehicle sirens, train car wheels, and construction equipment. Highway traffic noise tends to be a dominant source of noise in an urban environment. Excessive noise can impair sleep, interfere with concentration and conversation and, in extreme cases, damage hearing. Types of sounds that may cause noise include: "Loud" continuous sounds from industrial or commercial activity, demolition, or highly amplified music; Sounds in narrow frequency ranges such as "squealing" fans or other rotary equipment; and Intermittent or "impact" sounds such as those from pile drivers, jackhammers, slamming truck tailgates, public address systems, etc.

The Old Colony MPO recognizes the issues of air and noise pollution and

Air Quality Mitigation Programs

Congestion Mitigation and Air Quality Improvement (CMAQ) Program

The Congestion Mitigation and Air Quality Improvement (CMAQ) Program was created under the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, continued under the Transportation Equity Act for the 21st Century (TEA-21), and reauthorized by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005.

SAFETEA-LU placed a renewed focus on advancing cost-effective transportation projects that improve air quality. Specifically, the bill highlighted diesel engine retrofits as a priority for CMAQ expenditures, due to the cost-effective emissions reduction benefits that can be achieved through many retrofit technologies. SAFETEA-LU also established priority-funding consideration for cost-effective congestion mitigation activities that improve air quality. The goals of the CMAQ program support this initiative in three main ways: promoting operational and technological improvements, targeting major freight bottlenecks, and relieving urban congestion.

The purpose of the CMAQ program is to fund transportation projects or programs that will contribute to attainment or maintenance of the national ambient air quality standards (NAAQS) for ozone, carbon monoxide (CO), and particulate matter (PM). The main goal of the CMAQ program is to reduce emissions in nonattainment and maintenance areas and to mitigate congestion. Congestion relief can contribute to improvements in air quality by reducing travel delays, engine idle time and unproductive fuel consumption.

Since congestion relief projects also reduce idling, the negative emissions affects of “stop and go” driving, and the number of vehicles on the road, they have a corollary benefit of improving air quality. Based on their emissions reductions, these types of projects, including investments in improved system pricing and operations, are eligible for CMAQ funding.

Eligible projects and programs include:

- Transportation Control Measures (TCMs)
- Extreme Low-Temperature Cold Start Programs
- Alternate Fuels and Vehicles
- Congestion Reduction & Traffic Flow Improvements
- Transit Improvements
- Bicycle and Pedestrian Facilities and Programs
- Travel Demand Management
- Public Education and Outreach Activities
- Transportation Management Associations
- Carpooling and Vanpooling
- Freight/Intermodal
- Diesel Engine Retrofits & Other Advanced Truck Technologies
- Idle Reduction
- Training
- Inspection/Maintenance (I/M) Programs
- Experimental Pilot Programs

Noise Mitigation

Noise reduction is best addressed at its source. Mitigation strategies where source reduction is not feasible may be desirable and appropriate in some areas. Increased insulation and special windows can offer added protection to home and building occupants; noise barriers along railways and busy highways can be effective in shielding nearby properties where noise levels exceed reasonable limits.

Along major highway systems, noise barriers provide effective noise reduction. According to the U.S. Department of Transportation (USDOT), noise barriers are solid obstructions built between the highway and the homes along a highway. They do not *completely* block all noise; they only reduce overall noise levels. Effective noise barriers typically reduce noise levels by 5 to 10 decibels (dB), cutting the loudness of traffic noise by as much as one half. For example, a barrier, which achieves a 10-dB reduction, can reduce the sound level of a typical tractor-trailer pass-by to that of an average automobile. Barriers can be formed from earth mounds or "berms" along the road, from high, vertical walls, or from a combination of earth berms and walls. Earth berms have a very natural appearance and are usually attractive; however, earth berms can require a lot of land to construct, especially if they are very tall. Walls require less space, but they are usually limited to eight meters (25 feet) in height for structural and aesthetic reasons. Noise barriers are present along the new Route 44 between the Route 58 and Spring Street Interchanges.

Local planning or zoning boards are usually the first line of defense against these and other nuisance conditions; however, all levels of government need to share the burden to protect the environmental quality of the Commonwealth. The planning and zoning boards can require mitigation measures during the design review stage of a particular project and ensure that the proponent implements those mitigation techniques. Community and regional planning is a key component in mitigating the effects of noise and air pollution caused by transportation projects. Implementation of prudent land use control today can help to prevent many future traffic noise and air problems. Such controls need not prohibit development, but rather can require among other considerations, reasonable distances between buildings and roads and buffer zones of dense vegetation. As such, the Old Colony MPO ensures that transportation system planning and programs are integrated with other planning efforts including land use, housing, open space and recreation, water and air quality, and economic development planning and implementation programs.

National Environmental Policy Act (NEPA)

The National Environmental Policy Act (NEPA) requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed actions and reasonable alternatives to those actions. To meet this requirement, federal agencies prepare a detailed statement known as an Environmental Impact Statement (EIS). The U.S. Environmental Protection Agency reviews and provides comments on the EISs prepared by other federal agencies, maintains a national filing system for all EISs, and assures that its own actions comply with NEPA.

The NEPA process consists of an evaluation of the environmental effects of a federal undertaking including its alternatives. There are three levels of analysis depending on whether or not an undertaking could significantly affect the environment. These three levels include categorical exclusion determination; preparation of an environmental assessment/finding of no significant impact (EA/FONSI); and preparation of an environmental impact statement (EIS).

At the first level, an undertaking may be categorically excluded from a detailed environmental analysis if it meets certain criteria, which a federal agency has previously determined as having no significant environmental impact. A number of agencies have developed lists of actions that are normally categorically excluded from environmental evaluation under their NEPA regulations. At the second level of analysis, a federal agency prepares a written environmental assessment (EA) to determine whether a federal undertaking would significantly affect the environment. If the answer is no, the agency issues a finding of no significant impact (FONSI). The FONSI may address measures that an agency will take to reduce (mitigate) potentially significant impacts. If the EA determines that the environmental consequences of a proposed federal undertaking may be significant, a more detailed evaluation (EIS) of the proposed action and alternatives is prepared. The public, other federal agencies and outside parties may provide input into the preparation of an EIS and then comment on the draft EIS when it is completed. If a federal agency anticipates that an undertaking may significantly affect the environment, or if a project is environmentally controversial, a federal agency may choose to prepare an EIS without having to first prepare an EA. After a final EIS is prepared and at the time of its decision, a federal agency will prepare a public record of its decision addressing how the findings of the EIS, including consideration of alternatives, were incorporated into the agency's decision-making process.

Massachusetts Environmental Policy Act (MEPA)

The Massachusetts Environmental Policy Act (MEPA) requires that state agencies study the environmental consequences of their actions, including permitting and financial assistance. MEPA further requires that state agencies "use all practicable means and measures to minimize damage to the environment," by studying alternatives to the proposed project, and developing enforceable mitigation commitments, which will become permit conditions for the project if and when it is permitted.

MEPA applies to projects above a certain size that involve some state agency action. That is, they either are proposed by a state agency or are proposed by municipal, nonprofit or private parties and require a permit, financial assistance, or land transfer from state agencies.

MEPA review is not a permitting process. MEPA requires public study, disclosure, and development of feasible mitigation for a proposed project. It does not pass judgment on whether a project is environmentally beneficial, or whether a project can or should receive a particular permit. Those decisions are left to the permitting agencies. MEPA review occurs before permitting agencies act, to ensure that they know the environmental consequences of their actions.

The MEPA Office is the staff of the Secretary of Environmental Affairs responsible for day-to-day implementation of the MEPA review process. Its job is to solicit comments from the public and agencies, represent the Secretary at the public consultation sessions on projects, coordinate project review with the proponent, consultants, and interested agencies and citizens, and make a recommendation to the Secretary regarding the need for - and adequacy of - environmental documentation submitted for a project.

MEPA provides the mechanism through which this information collection and mitigation mandate is executed. The primary mechanism is known as an Environmental Impact Report - EIR. MEPA empowers the Secretary of Environmental Affairs to oversee the review process. The process is public and encourages comments from the public and from state, regional and local agencies.

Smart Growth Techniques

Smart Growth is a principle of land development that emphasizes mixing land uses, increases the availability of range of housing types in neighborhoods, takes advantage of compact design, fosters distinctive and attractive communities, preserves open space, farmland, natural beauty and critical environmental areas, strengthens existing communities, provides a variety of transportation choices, makes development decisions predictable, fair and cost effective and encourages community and stakeholder collaboration in development decisions. Using elements such as compact design and providing transportation choices promotes better air quality by reducing vehicle trips, especially single occupant trips.

As required by SAFETEA-LU, this section was prepared and strengthened by discussions with representatives of the U.S. Environmental Protection Agency, Massachusetts Department of Environmental Protection, Massachusetts Environmental Policy Act Unit, Executive Office of Transportation, MassHighway, and many other environmental groups or agencies.

8.1.2 Land Management

<u>Existing Conditions</u>

Areas of Critical Environmental Concern (ACECs)

Areas of Critical Environmental Concern (ACECs) are places in Massachusetts that receive special recognition because of the quality, uniqueness and significance of their natural and cultural resources. Areas are identified and nominated at the community level and are reviewed and designated by the state's Secretary of Environmental Affairs. ACEC designation creates a framework for local and regional stewardship of critical resources and ecosystems.

Areas of Critical Environmental Concern in the Old Colony Region are:

- Canoe River Aquifer and Associated Areas – officially designated in 1991
    - Size: 17,200 acres
    - Location: Easton, Foxborough, Mansfield, Norton, Sharon, Taunton
- Hocomock Swamp – officially designated in 1990
    - Size: 16,950 acres
    - Location: Bridgewater, Easton, Norton, Raynham, Taunton, West Bridgewater
- Herring River Watershed – officially designated in 1991
    - Size: 4,450 acres
    - Location: Bourne and Plymouth
- Ellisville Harbor – officially designated in 1991
    - Size: 600 acres
    - Location: Plymouth

Potential developments in ACEC areas are subject to guidelines that are more stringent in order to protect the quality of the area. The Massachusetts Environmental Policy Act Office is responsible for reviewing and protecting the ACEC areas for which potential developments are proposed.

Protected Open Space

The Statewide Comprehensive Outdoor Recreation Plan (SCORP), *Massachusetts Outdoors 2000!*, identified a statewide open and recreational space inventory and is the Commonwealth's official Open Space and Recreation Plan. According to the plan, the agencies within the Massachusetts Executive Office of Environmental Affairs (EOEA) control the majority of the Commonwealth's open space resources. Municipalities and Private Non-profit agencies rank second and third respectively regarding control of open space. These parcels of land may include, but are not limited to: parks, easements, trails, and agricultural land and are important to preserve, maintain, and protect. See figures 8-1 & 8-4 for geographical representations of Land Management and Challenges to Development in the Old Colony MPO region.

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Figure 8-1

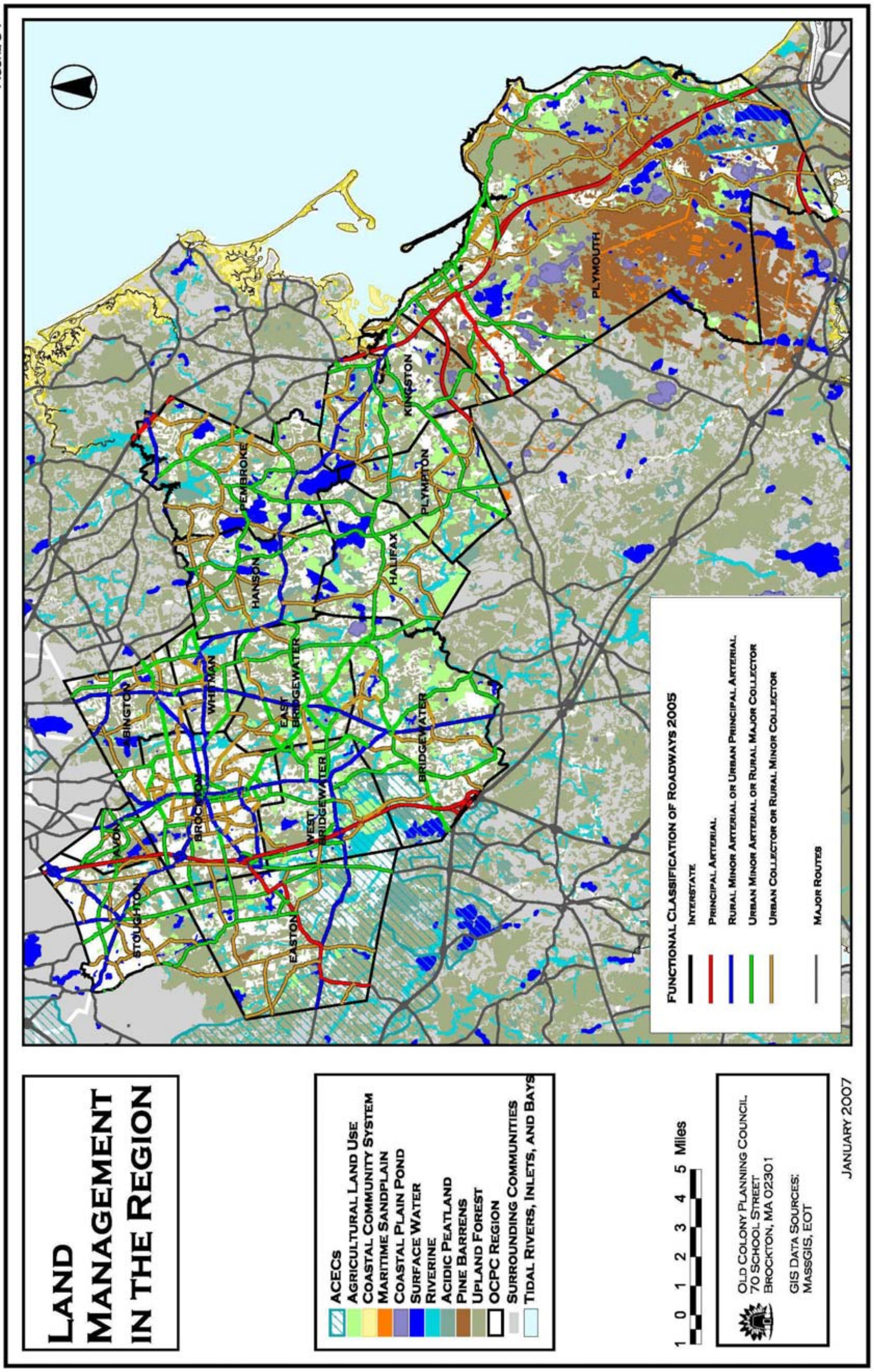
Land Management in the Region
ACECs
Agricultural Land Use
Coastal Community System
Maritime Sandplain
Coastal Plain Pond
Surface Water
Riverine
Acidic Peatland
Pine Barrens
Upland Forest
OCPC Region
Surrounding Communities
Tidal Rivers, Inlets, and Bays
0 1 2 3 4 5 Miles
Old Colony Planning Council
70 School Street
Brockton, MA 02301
GIS Data Sources:
MassGIS, EOT
January 2007
Functional Classification of Roadways 2005
Interstate
Principal Arterial
Rural Minor Arterial or Urban Principal Arterial
Urban Minor Arterial or Rural Major Collector
Urban Collector or Rural Minor Collector
Major Routes
Plymouth
Kingston
Plympton
Pembroke
Halifax
Hanson
Whitman
Abington
East Bridgewater
Bridgewater
West Bridgewater
Brockton
Avon
Stoughton
Easton

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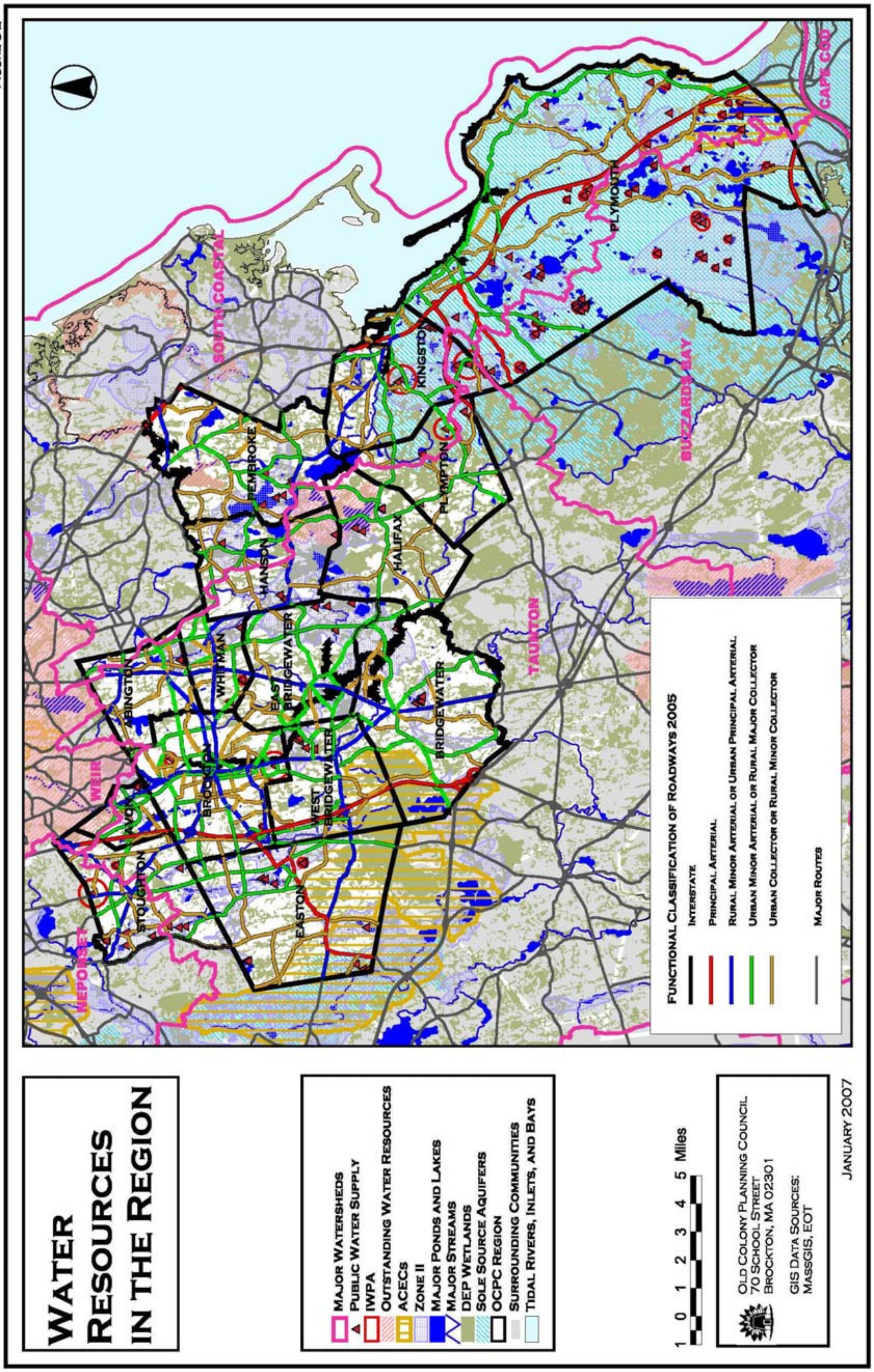
FIGURE 8-2


WATER RESOURCES IN THE REGION
MAJOR WATERSHEDS
PUBLIC WATER SUPPLY
IWPA
OUTSTANDING WATER RESOURCES
ACECS
ZONE II
MAJOR PONDS AND LAKES
MAJOR STREAMS
DEP WETLANDS
SOLE SOURCE AQUIFERS
OCPC REGION
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
1 0 1 2 3 4 5 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT
JANUARY 2007
FUNCTIONAL CLASSIFICATION OF ROADWAYS 2005
INTERSTATE
PRINCIPAL ARTERIAL
RURAL MINOR ARTERIAL OR URBAN PRINCIPAL ARTERIAL
URBAN MINOR ARTERIAL OR RURAL MAJOR COLLECTOR
URBAN COLLECTOR OR RURAL MINOR COLLECTOR
MAJOR ROUTES
SOUTH COASTAL
BUZZARDS BAY
TAUNTON
WEIR
NEPONSET
CAPE COD
PLYMOUTH
KINGSTON
PLYMPTON
PEMBROKE
HANSON
HALIFAX
WHITMAN
EAST BRIDGEWATER
BRIDGEWATER
ABINGTON
AVON
BROCKTON
STOUGHTON
EASTON
WEST BRIDGEWATER

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Problems or Threats

Residential Land Use

Regional growth continues to decentralize the population and to consume land at an increasingly high rate. Overall, housing grew from 31,706 acres in 1971 (10.5% of the region) to 53,151 acres in 1999 (24.22% of the region). From 2000 to 2005, much of the region's growth occurred in the southeastern half of the region, where many communities experienced over 6 percent growth during the time. Many communities in the northwestern half experienced substantially less growth. Areas to the south have generally had more developable land, and residential development in recent years for the most part has come in the form of low to moderate density single-family home development on relatively large lots. This lower-density development combined with the cul-de-sac nature of many subdivisions and the typical scattering of public and commercial uses, increases local travel demands.

Some communities have had a wave of multi-family development. This tends to be near town centers or, quite often, on commercially zoned major highways in outlying areas. As a result, even these concentrations of population are often too remote to walk to schools, stores or jobs, and too scattered to support local bus service. However, many of the new multi-family developments are quite close to highway interchanges, making them convenient for persons commuting a distance by car.

The densities of new neighborhoods will continue to drop and land consumption per unit will continue to rise as long as communities increase the area requirements on undeveloped land to an acre or more. This trend is occasionally countered by pockets of higher-density development done through Comprehensive Permits under Chapter 40B. Similar development is beginning to be pursued though locally chosen areas rezoned for higher density as-of- right development under the new Chapter 40R. This requires allowing densities of >20 units/ net acre for multi-family housing, >12 units /net acre for 2-3 family houses, and >eight units /net acre for single-family houses. Communities of fewer than 10,000 may seek approval of lower density developments based on environmental hardships such as potential pollution.

Increased development pressures in the southeastern Massachusetts region put the environmentally sensitive areas in jeopardy. As such, many communities are encouraged to allow large commercial developments in an effort to offset the burden that local residents face in property taxes to provide funding for local services. This becomes a regional problem when these large developments generate large amounts of trips to and from the facility, thus increasing the exposure of the environmentally sensitive areas to pollutants.

Commercial Land Use

Based on aerial photo interpretation, commercial land use continued to increase in 1999, but at a relatively slower pace than previous years. Commercial land occupied about 3,750 acres or 1.7% of the region in 1999, compared to 3,473 acres or 1.6% of the region in 1991; 2,551 acres in 1985; and 2,039 acres in 1971. This small proportion of all uses belies the prominence of commercial uses and their great significance for employment, access to needed goods and services, traffic generation, and community character.

The major historic concentrations of retail activity are in the central portions of Brockton, Stoughton, and Plymouth with some continued smaller concentrations in the centers of Whitman, Easton and Bridgewater. While some complementary land uses (court and county offices) are relocating away from Downtown Plymouth to areas closer to Route 3, the Downtown area has benefited with the addition of transit access from the Plymouth Area Link service.

The Region contains two regional shopping malls, in Brockton and Kingston, and several big-box retail and other shopping centers located along or near major roadway. New retail development continues to be dispersed beyond traditional centers and away from transit. While such growth is generally along high-capacity roads, one big box stores are tending to cluster, rather than be very freestanding, thus offering greater convenience to customers and slightly reducing total trips.

The dispersed pattern of current retail development puts some facilities within reach of most of the population, but requires driving. At the same time, the single-purpose nature of most new retail development requires more land dedicated to parking, generates more local trips, and fragments activity patterns. This suggests that towns seize on opportunities to create strong multi-purpose mixed-use centers as described above. Such traditional centers require accommodating varied uses but they can reduce single-purpose trips and greatly enrich community life.

Larger communities with failed shopping centers could adopt Planned Unit Development regulations aimed at redeveloping such sites with diverse complementary uses. Such mixed-use centers might also be developed under the new Chapter 40R Smart Growth Overlay Zoning that includes major financial incentives to communities. While such scattered higher-density mixed use developments would not change overall regional travel patterns, the incremental benefits of reduced local trips could be significant.

Industrial Land Use

Once upon a time, the region's industry was concentrated along railroad lines and near town centers, often within walking distance of workers homes. Many interrelated firms (e.g., those making shoe components, shoeboxes and finished shoes) located near one another, thus minimizing delivery times and costs. More recently, firms have depended less on rail freight, have sought workers and customers from the greater region, and have preferred convenient one-story plants. As a result, many firms have moved to industrial parks or freestanding sites near highway interchanges. This can be seen in the extensive development of the highway-oriented Brockton, Avon and Easton Industrial Parks and along Manley St. in West Bridgewater.

Other industrial activity is found in scattered, freestanding complexes. In the older communities, these are often near residential areas and remain grandfathered uses or spot-zoned industrial areas. They can offer nearby employment to residents, but they also attract commuter and truck traffic and can have varied impacts. Careful planning, regulation, selective modification of traffic patterns and lighting, addition of noise control, and creation of landscaped buffers may be required to ensure that such uses are compatible with nearby residences.

Land use patterns and trends are well established throughout the region. As a result, most transportation investments are in maintaining and improving present infrastructure. Such investments are more likely to support present land use patterns and trends than to reverse them, or to lead to a major redirection of growth. On the other hand, the present patterns and trends include a major tension between the long established focus of employment and services in Boston and Brockton, and the continuing outward movement of population and activity known as sprawl.

If allowed by local planning and zoning, the combined radial/circumferential highway system facilitates much less focused development. The existing highway system supports further scattering of all activities. Highway construction like the relocated Route 44 and the upgrading of Route 3 can attract low-density growth if permitted by local communities.

Land Management Mitigation Programs

The Old Colony MPO recognizes the threat to environmentally sensitive areas and works with communities to make environmentally and economically sound land use decisions. The Old Colony MPO promotes and supports transportation and land use plans that support integrated, multimodal transportation strategies, including the use of transit, ridesharing, bicycling, and walking. The Old Colony MPO also works to ensure that transportation improvement projects consider enhancement of aesthetics and character of neighborhoods, communities, and commercial districts.

The current-endorsed “Smart Growth” and “Sustainable Development” movements encourage putting relatively high-density development near existing centers and in areas with well-established infrastructure and doing so in ways that avoid additional energy consumption, minimize the effect on natural resources, and mitigate unavoidable impacts on environmental quality.

Smart Growth principles are intended to be the antithesis of sprawl, but they can be applied at a great range of scales from individual projects up to the region. The effect on travel patterns and modal choices can vary with the scale of action. Thus successful smart growth policies over a region would lead to a greater concentration of growth in regional centers allowing a greater use of mass transit and a largely radial, center-focused road system. In outlying areas, Smart Growth can also support local transit use and reduce local trips by concentrating local or sub regional destinations but will not greatly change overall travel patterns. At the local level, Smart Growth in the form of cluster development can reduce paving and runoff and preserve particularly valuable open space, but it does not necessarily strengthen the community’s structure or reduce trips if sited at the edge of town.

The Commonwealth, through the Office of Commonwealth Development promotes the following ten sustainable development principles:

- Redevelop First
- Concentrate Development
- Be Fair
- Restore and Enhance the Environment
- Conserve Natural Resources
- Expand Housing Opportunities
- Provide Transportation Choice
- Increase Job Opportunities
- Foster Sustainable Businesses
- Plan Regionally

These ten principles provide a framework for development throughout the Commonwealth in an effort to minimize the affect on the environment. The following practices are examples of Smart Growth techniques available to communities of the Commonwealth.

Transit Oriented Development (TOD)

Transit-oriented development (TOD) is compact, mixed-use, walkable development centered on transit stations, and generally includes a mix of uses such as housing, shopping, employment, and recreational facilities. TOD projects are designed with transit and pedestrians as high priorities. TOD represents an opportunity for communities all across Massachusetts to enhance their quality of life. With TOD, parking lots and underutilized land near public transportation can be turned into vibrant mixed-use districts, diverse housing, and lively public places. This type of development reduces the impacts to the environment by concentrating usages to one particular area, thus decreasing the amount of daily vehicle trips to and around the site.

Brownfield Redevelopment

The U.S. Environmental Protection Agency defines a brownfield as “real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.” EPA's Brownfields Program provides funds and technical assistance to states, communities, and other stakeholders in economic redevelopment to work together to prevent, assess, safely clean up, and sustainable reuse brownfields.

In 1998, Governor Cellucci signed into law the “Brownfields Act” which created financial incentives and liability relief for parties undertaking brownfields cleanup projects. The Brownfields Act provided agencies at the state level with $50 million dollars to administer programs targeted towards the cleanup and reuse of contaminated property. Massachusetts DEP brownfields program incentives are available to buyers, and sometimes sellers, of contaminated property provided there is a commitment to cleanup and redevelopment. Brownfields properties are often located where there is an existing infrastructure, workforce and other amenities. State incentives can help parties identify risk, limit liability, and fund the cleanup of brownfields sites enabling their reuse for industry, housing and other purposes.

The Brockton Brightfield, a 425-kilowatt (kW) photovoltaic (PV) solar energy system located on a 3.7 acre environmentally remediated brownfield in Brockton, Massachusetts is the largest solar energy plant in New England, and the largest brightfield transformed into a solar energy generating station in the nation.

Transfer of Development Rights

Transfer of Development Rights program represents an innovative way to direct growth away from lands that should be preserved to areas well suited to higher density development. Areas that may be suited to higher density development include pre-existing village centers or other districts that have adequate infrastructure to service larger amounts of development. The Town of Plymouth is utilizing this program to create a more compact, mixed-use development that will result in permanent protection of open space.

Low Impact Design

Low Impact Development (LID) uses an integrated approach to site design, stormwater management, and water conservation to protect the natural terrain and hydrology. Low Impact Development (LID) is a more sustainable land development pattern that results from a site planning process that first identifies critical natural resources, then determines appropriate building envelopes. LID also incorporates a range of best management practices (BMPs) that preserve the natural hydrology of the land.

40 R

In order to encourage housing production in the Commonwealth consistent with the concept of smart growth the Legislature passed and the Governor signed into law Chapter 40R. Chapter 40R provides financial rewards to communities that adopt special zoning districts allowing as-of-right high-density residential development.

Eligible locations: Smart growth zoning districts can be in one of three locations:

- Areas near transit stations, including rapid transit, commuter rail, and bus and ferry terminals;

- Areas of concentrated development, including town and city centers, other existing commercial districts in cities and towns, and existing rural village districts; or
- Areas that by virtue of their infrastructure, transportation access, existing underutilized facilities, and/or location make highly suitable locations for residential or mixed-use smart growth zoning districts.

Executive Order 418

The goal of Executive Order 418 is to promote balanced local, state, and regional planning. It is designed so that communities consider affordable housing sites and quantities while also creating plans for economic development, transportation improvements, and environmental protection. Goal setting is an essential element of good planning, and communities are asked to remember the following themes:

- Develop a community-based planning process with broad citizen participation Promote regional cooperation
- Protect the character and individuality of Massachusetts communities
- Protect environmentally sensitive areas, conserve open space, and preserve the historic built environment
- Promote sustainable economic development
- Provide for transportation that focuses on the movement of people and goods rather than automobiles

Coastal Smart Growth Program

The Coastal Smart Growth Program, run by the Massachusetts Office of Coastal Zone Management, works to promote Green Neighborhoods: Open Space Residential Design (OSRD). It is a method of planning residential development that conserves open space in a new subdivision. The same number of homes that would be permissible in a conventionally zoned subdivision is allowed using the Open Space Residential Design.

Massachusetts Environmental Policy Act (MEPA)

The Massachusetts Environmental Policy Act (MEPA) requires that state agencies study the environmental consequences of their actions, including permitting and financial assistance. MEPA further requires that state agencies "use all practicable means and measures to minimize damage to the environment," by studying alternatives to the proposed project, and developing enforceable mitigation commitments, which will become permit conditions for the project if and when it is permitted. More information regarding the MEPA unit is discussed under the Air Quality Mitigation Programs.

MassHighway Project Development and Design Guidebook

The newly revised 2006 MassHighway Project Development and Design Guidebook promotes an integrated multimodal approach to roadway planning and design, ensures that context sensitivity is integrated into the planning, design, and construction process, and provides a clear project development process. New chapters in the guidebook include: Project Development; Drainage and Erosion Control; Bridges; Shared Use Paths and Greenways; Intermodal Facilities and Rest Areas; Landscape and Aesthetics; Wildlife Accommodation; Access Management; Traffic Calming; and Work Zone Management. These new chapters ensure that all details of a proposed project are properly evaluated before the project can be programmed.

Specifically, the Project Development chapter encourages early coordination with environmental agencies or groups to ensure that environmental issues are addressed early on in the process. Public outreach in the design and environmental process is essential to maintain public support for the project and to seek meaningful input on the design elements. This effort can also shape a more environmentally responsive and sustainable design. The designer, in coordination with the MassHighway Environmental Section, is responsible for determining the appropriate MEPA and NEPA project category, while identifying and complying with all other applicable federal, state and local environmental laws and requirements.

Community Preservation Act

The Community Preservation Act (CPA) was signed into law by former Governor Paul Cellucci and Lt. Governor Jane Swift on September 14, 2000 and has been amended five times since then, with the last occurring in September 2006.

The Community Preservation Act (CPA) is an innovative tool for communities to address important community needs and finance specific community preservation acquisitions and initiatives. The CPA allows communities to create a local Community Preservation Fund to raise money through a surcharge of up to 3% of the real estate tax levy on real property for open space protection, historic preservation and the provision of affordable housing. The act also creates a significant state matching fund, which serves as an incentive to communities to pass the CPA.

Once adopted locally, the Community Preservation Act requires the legislative body to annually appropriate, or reserve for future appropriation, at least 10% of the estimated annual fund revenues for acquisitions or initiatives in each of the following three categories of allowable community preservation purposes: open space (excluding recreational uses), historic resources, and community housing. This allows the community flexibility in distributing the majority of the money for any of the three categories as determined by the community.

As required by SAFETEA-LU, this section was prepared and strengthened by discussions with representatives of the U.S. Environmental Protection Agency, Massachusetts Department of Environmental Protection, Massachusetts Environmental Policy Act Unit, Executive Office of Transportation, MassHighway, and many other environmental groups or agencies.

8.1.3 Water Resources

Existing Conditions

Massachusetts' lakes, rivers and coastal waters are valuable natural resources that provide wildlife habitat, recreation, fishing, and shellfishing. In order to protect these natural resources, the State of Massachusetts established water quality protection policies and practices to ensure compliance with the federal Clean Water Act, Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990, the Massachusetts Environmental Policy Act, Coastal Zone Management Consistency Review, and Chapter 91 of the Massachusetts General Laws.

Public Water Supplies

As stated in 310 CMR 22.02, a Public Water System is defined as a system for the provision to the public of piped water for human consumption if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days of the year.

Zone IIs & Interim Wellhead Protection Areas (IWPA)

Wellhead protection areas are important for protecting the recharge area around public water supply (PWS) groundwater sources. A Zone II is a wellhead protection area that has been determined by hydro-geologic modeling and approved by the Massachusetts Department of Environmental Protection's (DEP) Drinking Water Program (DWP). An Interim Wellhead Protection Area (IWPA) is established, based on DEP DWP well pumping rates or default values, where hydro-geologic modeling studies have not been performed and there is no approved Zone II area. Certain land uses may be either prohibited or restricted in both approved (Zone II) and interim (IWPA) wellhead protection areas.

Watersheds

Watersheds are defined as those land areas that catch rain or snow and drain to specific marshes, streams, rivers, lakes, or to ground water. Watersheds provide critical natural services that sustain or enrich our daily lives: they supply our drinking water, critical habitat for plants and animals, areas of natural beauty, and water bodies for recreation and relaxation. Federal, state, local agencies, and the public must work together to ensure that watershed areas are protected.

Taunton River Watershed

The Taunton River Watershed is the second largest watershed in the state at 562 square miles and contains 94 square miles of wetlands, 221 lakes or ponds and includes all or most of 43 communities in the southeastern region of Massachusetts. It stretches from Avon and Brockton to the north; Foxboro and Wrentham to the west; Fall River and Somerset to the south; and Plymouth and Carver to the east.

The Taunton River, the first Heritage River in the state, starts in the Town of Bridgewater and receives discharge waters from 18 river systems as it courses through ten communities before ending at the State of Rhode Island's Mount Hope Bay, which is part of Narragansett Bay. Tidal influences reach 18.0 miles inland and a salt-water intrusion reaches 12.6 miles inland, providing unique habitat for fresh and salt-water aquatic, terrestrial, and biological species.

South Coastal Watersheds

The South Coastal Watersheds consist of 14 coastal river watersheds with a total drainage area of approximately 240.7 square miles that span over all or part of 19 municipalities. The major coastal watersheds include the North and South Rivers (combined drainage area 105 square miles), the Jones River (30 square miles), and the Gulf/Bound Brook (16 square miles). It is also one of eleven watersheds in eastern Massachusetts that discharge directly to the ocean. The South Coastal Watersheds contain numerous wetlands, many of which are used to cultivate cranberries. The South Coastal Watersheds are biologically significant because they are home to one of the state's largest assemblages of rare and endangered species, particularly so in Plymouth's coastal ponds.

Buzzards Bay Watershed

The Buzzards Bay Watershed encompasses all or part of 15 municipalities including the entire City of New Bedford, which is consistently one of the largest revenue-producing fishing ports in the United States. It contains approximately 432 square miles of land, including lakes, rivers, streams, and wetlands. Buzzards Bay is approximately 228 square miles in size and has a coastline, which stretches over 280 miles, offering a wealth of diverse habitats including 5,000 acres of salt marsh, 10,500 acres of eelgrass beds, and 5,000 acres of tidal flats. Buzzards Bay was designated an Estuary of National Significance in 1988.

Sole Source Aquifers

A Sole Source Aquifer (SSA) is an aquifer designated by the US Environmental Protection Agency as the 'sole or principal source' of drinking water for a given aquifer service area; that is, an aquifer, which is needed to supply 50% or more of the drinking water for that area. EPA guidelines also require that these areas have no alternative drinking water sources, which could physically, legally, and economically supply water to all who depend on the aquifer for drinking water. After a Sole Source Aquifer is designated, no commitment for federal financial assistance may be provided for any project, which the EPA determines, may contaminate the aquifer through its recharge area so as to create a significant hazard to public health.

Plymouth / Carver Sole Source Aquifer

The Plymouth / Carver Sole Source Aquifer is a 199.0 square mile aquifer located in eight communities of southeastern Massachusetts. Primarily in Plymouth County, it includes the entire area of the Towns of Plymouth, Bourne and Sandwich north of the Cape Cod Canal, most of the Towns of Carver and Wareham, substantial portions of Kinston and Plympton, and a small section of the Town of Middleborough. The 199 square mile Plymouth / Carver aquifer is the second largest aquifer in the Commonwealth, containing more than 500 billion gallons of fresh water.

Canoe River Sole Source Aquifer

The Canoe River Aquifer sub basin is approximately 25 square miles in area, and encompasses portions of the towns of, Easton, Foxborough, Mansfield, Norton, and Sharon. The Canoe River begins its headwaters south of Massapoag Lake in Sharon and flows in a southerly direction through Foxborough, Mansfield, Easton, and Norton to Winnecunnet Pond in Norton.

Wetlands

Wetlands help clean drinking water supplies, prevent flooding and storm damage, and support a variety of wildlife. Coastal wetlands are directly adjacent to the ocean and include beaches, salt marshes, dunes, coastal banks, rocky intertidal shores, and barrier beaches. Inland wetlands are areas where water is at or just below the surface of the ground. Although these wetlands can appear dry during some seasons, they contain enough water to support certain plants and soils. Inland wetlands include marshes, wet meadows, bogs, and swamps.

Wetlands protection is important to the preservation of wildlife habitat, protection of public and private water supplies, flood prevention and attenuation, lessening of storm damage and prevention of groundwater contamination. Wetlands have sensitive, complex ecosystems, which can easily be adversely influenced by transportation facilities. See figure 8-2 for a geographical representation of Water Resources in the Old Colony MPO region.

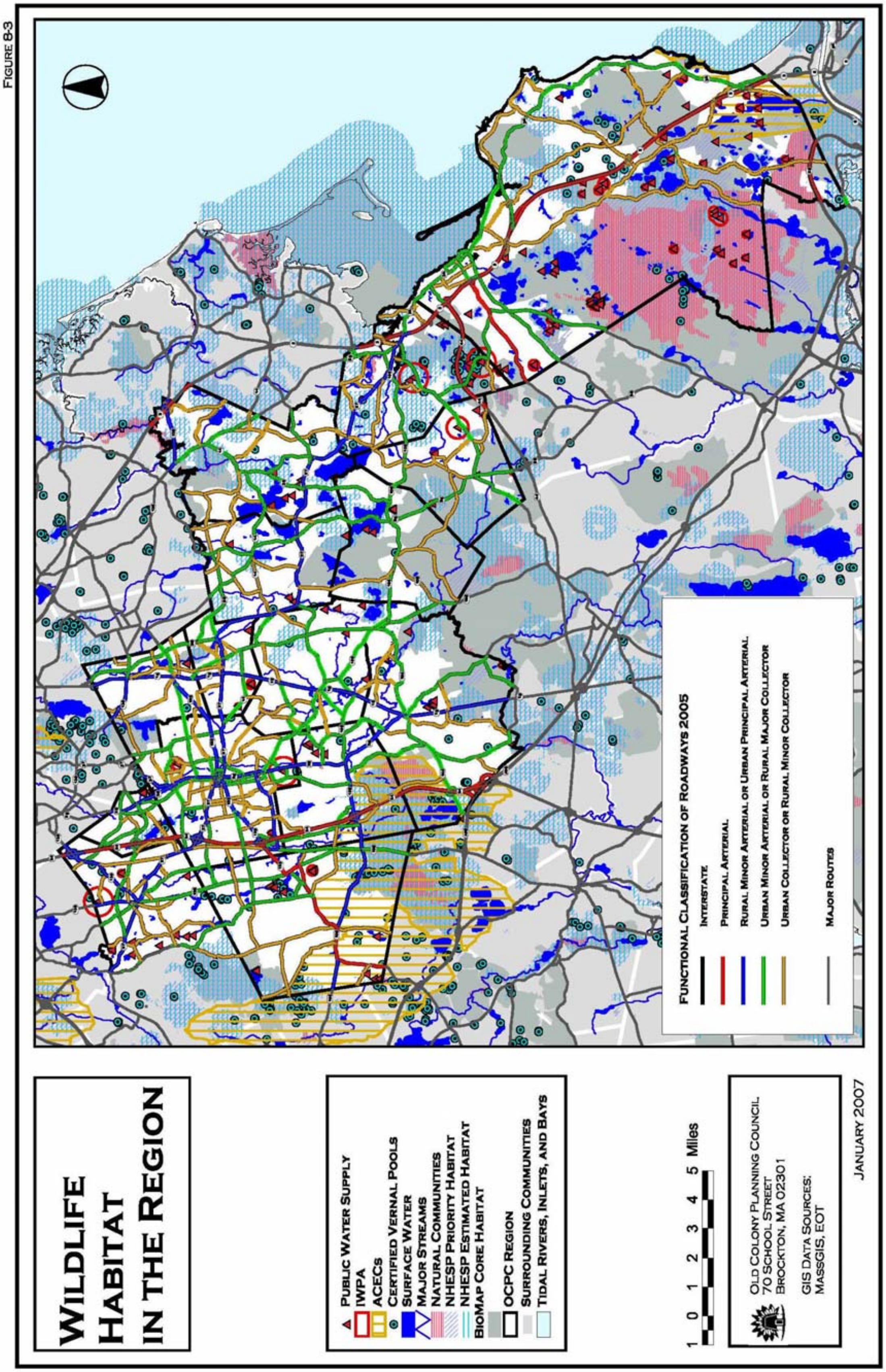

Figure 8-3
Wildlife Habitat in the Region
Public Water Supply
IWPA
ACECs
Certified Vernal Pools
Surface Water
Major Streams
Natural Communities
NHESP Priority Habitat
NHESP Estimated Habitat
BioMap Core Habitat
OCPC Region
Surrounding Communities
Tidal Rivers, Inlets, and Bays
1 0 1 2 3 4 5 Miles
Old Colony Planning Council
70 School Street
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GIS Data Sources:
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Interstate
Principal Arterial
Rural Minor Arterial or Urban Principal Arterial
Urban Minor Arterial or Rural Major Collector
Urban Collector or Rural Minor Collector
Major Routes

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Problems or Threats

Stormwater

Stormwater becomes a transportation system for pollutants. Soil that erodes from a construction site, cigarette butts and other litter from parking lots, antifreeze and oil dripped from cars, fertilizers and pesticides from turf management, and grit and salt left from de-icing operations on roadways can be deposited untreated into waterways. Water can contain and transport sediments, metals (copper, cadmium, chromium, lead, zinc), nutrients (nitrates, phosphates, ammonia), salt, petroleum products and coliform bacteria among other materials. Overall, stormwater pollutants originate from nutrients, solids, pathogens, metals, hydrocarbons, organics and salt.

Stormwater runoff occurs as a result of rainfall and melting snow and ice from roadways, bridges and parking lots. Rain or snow that falls soaks into the ground to become groundwater, evaporates, or flows off over the land surface. The overland flow is called runoff or stormwater and is the primary water source for vernal pools, wetlands, streams, rivers, lakes, and water-supply reservoirs. Stormwater washes along or dissolves some of the materials in its path. Vegetative surfaces slow the flow, filter out sediments, and can break down or trap pollutants in the root zone. In contrast, buildings, roads, parking areas, and exposed bedrock increase the volume and speed of stormwater runoff since none can soak in and the hard surfaces present little resistance to flow. To prevent flooding and protect property in developed areas, stormwater drainage systems collect stormwater runoff and carry it away from roadways and structures to a discharge point; however, most discharges are into natural waters. Stormwater drainage systems consist of curbs, gutters, storm drains, channels, ditches, pipes, and culverts and do not treat the stormwater.

In addition, wet weather discharge needs consideration. Wet weather discharges refer collectively to point source discharges that result from precipitation events, such as rainfall and snowmelt. Wet weather discharges include stormwater runoff, combined sewer overflows (CSOs), and wet weather sanitary sewer overflows (SSOs). Stormwater runoff accumulates pollutants such as oil and grease, chemicals, nutrients, metals, and bacteria as it travels across land. CSOs and wet weather SSOs contain a mixture of raw sewage, industrial wastewater and storm water, and have resulted in beach closings, shellfish bed closings, and aesthetic problems. In Massachusetts, polluted stormwater runoff and discharges in urbanized areas cause serious water-quality problems. Polluted runoffs to waterbodies have affected aquatic plant and animal life in streams and lakes, closed shellfish beds, reduced recreational activities such as boating and swimming, and increased existing flooding conditions caused by natural events. The untreated runoff poses a major threat to water quality and is identified as a major source of nonpoint source pollution (NPS). Nonpoint source pollution or "polluted runoff" - which enters our water bodies from septic systems, agricultural uses and runoff from roads, parking lots, construction sites, lawns and other locations - is now the dominant cause of water quality problems to our lakes, rivers and coastal areas. Point sources still have significant impacts in certain water bodies, but across the state nonpoint, source pollution affects more total miles and acres of water. Although these pollution sources are lumped under the single heading of nonpoint sources, in fact there are a huge variety of nonpoint sources from farms to parking lots, which result from a similarly wide range of activities, from cars with leaking oil to construction of new structures. It is easier and less costly to prevent problems from occurring than it is to fix them after they occur.

Both Massachusetts Department of Environmental Protection (DEP) and U.S. Environmental Protection Agency (EPA) regulate stormwater in Massachusetts. In addition, municipalities may have local drainage, wetland, or other ordinances that regulate stormwater, as granted by home-rule legislation. EPA believes that wet weather discharges should be addressed in a coordinated and comprehensive fashion to reduce the threat to water quality, reduce redundant pollution control costs, and provide State and local governments with greater flexibility to solve wet weather discharge problems.

The Massachusetts Department of Environmental Protection (DEP) developed Volume 1 and Volume 2 of the Stormwater Management Policy Handbook. This handbook provides guidance for minimizing the impacts of increased stormwater runoff and nonpoint source pollution resulting from site development. After further coordination with DEP, it was decided that MassHighway would develop guidance under separate cover to focus specifically on implementing the DEP Stormwater Policy for roadway improvements as roadway improvement projects differ from other types of development. In May 2004, MassHighway published a *Storm Water Handbook for Highways and Bridges*. The handbook was approved by both MassHighway and DEP and signed by both Commissioners with wide distribution to those responsible for the design, construction and maintenance of the highway system in Massachusetts. The handbook represents the culmination of a cooperative effort undertaken by the Commonwealth's environmental and transportation agencies to manage stormwater from the states roadway's and facilities. The handbook offers guidance for roadway designers to manage stormwater to the greatest extent practicable, with all project types in mind. In addition, MassHighway has taken a number of steps to reduce the environmental impact from winter sanding and salt practices on state highways; including the reduction of sand applied during storms, use of liquid and flake calcium chloride to reduce sodium levels in runoff; construction of covered facilities for sand and salt storage and establishment of certain zones where reduced salt is used, in order to protect groundwater aquifers, fish and other aquatic organisms, in addition to protecting human health. Each of these steps, and many others, are discussed in MassHighway's Snow and Ice Control Generic Environmental Impact Report (GEIR).

The U.S. EPA has issued a National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (MS4s). As part of the permit, EPA has developed Stormwater Phase II Communities based on Urbanized Areas calculated from 2000 Census. The MS4s of these towns are automatically designated as regulated by the general permit and the towns must comply within the Urbanized Areas. All OCPC communities fall under Phase II, as well as MassHighway Department and other non-traditional MS4s. The communities of Abington, Brockton and Whitman are wholly in an Urbanized Area, while the remaining 12 are partially within the Urbanized Area.

The MassHighway Storm Water Management Program (SWMP), developed to summarize the programs MassHighway is implementing to meet the NPDES Phase II General Permit, includes several programs that involve cooperation with the surrounding municipalities. MassHighway staff is inventorying storm water outfalls along their roads within urbanized area and has received some drainage outfall information from municipalities. The outfall inventory within the towns included in the Old Colony MPO will occur between March 2007 and March 2008. MassHighway is currently developing a method for sharing outfall inventory with municipalities. Similarly, MassHighway is developing a formal program for municipalities to notify MassHighway when storm water issues (e.g., potential illicit discharges, drainage tie-ins, flooding problems) are identified. MassHighway expects that this program will provide a better method of tracking concerns/ issues and identifying solutions. Finally, MassHighway is drafting a new program that will regulate drainage system tie-ins. In the rare cases where tie-ins are permitted, the program will ensure their compliance with the Phase II General Permit.

The Smart Growth Toolkit recently produced by the Massachusetts Executive Office of Environmental Affairs (EOEA) on behalf of the Office for Commonwealth Development (OCD) also includes information on rain gardens, vegetated swales, and other recharge techniques in the Toolkit section on Low Impact Development.

The pollution of the marine environment, as a result of roadway runoff, can affect coastal resources and economies. Protecting water resources is important for a better quality of life, economic development, recreational activities, wildlife and plant protection, and public/private water supplies. The Old Colony MPO recognizes the importance of these issues/concerns and is committed to the protection of these resources.

Water Resources Mitigation Programs

Federal Clean Water Act Section 404

The Federal Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States. The statute employs a variety of regulatory and non-regulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. Section 404 of the Clean Water Act established a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Wetlands subject to Clean Water Act Section 404 are defined by the U.S. Environmental Protection Agency as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." Activities in waters of the United States regulated under this program include fill for development, water resource projects, infrastructure development and mining projects. Section 404 requires a permit before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404 regulation. The U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service and National Marine Fisheries Service, and individual States all have a role in Section 404 permit applications and decisions.

Massachusetts Wetlands Protection Act

In response to rapid loss of wetlands, Massachusetts adopted the nation's first wetlands protection laws in the early 1960s. The Wetlands Protection Act [Massachusetts General Laws (MGL) Chapter 131, Section 40] protects wetlands and the public interests they serve, including flood control, prevention of pollution and storm damage, and protection of public and private water supplies, groundwater supply, fisheries, land containing shellfish, and wildlife habitat. The law protects wetlands and other resource areas, such as land subject to flooding (100-year floodplains), the riverfront area (added by the Rivers Protection Act), and land under water bodies, waterways, salt ponds, fish runs, and the ocean. The Massachusetts Department of Environmental Protection (DEP) oversees administration of the act, develops regulations and policies, and provides technical training to local conservation commissions. DEP also hears appeals of decisions made by these commissions.

At the local level, the community's conservation commission administers the Wetlands Protection Act. The commission is a volunteer board of three to seven members appointed by the selectmen or city council. The conservation commission ensures that proposed activities will not alter resource areas and the public interests they provide by reviewing projects on a case-by-case basis according to regulations [310 Code of Massachusetts Regulations (CMR) 10.00].

The regulations describe how each type of resource area provides one or more of the public interests. The regulations also spell out the type and extent of work allowed in resource areas. Proposed work must meet these standards. This information helps landowners and developers plan their work and helps commissions apply the law to specific projects. The law regulates many types of work in resource areas, including vegetation removal, regarding, and construction of, roads, sidewalks, bikeways, driveways, and commercial, industrial, or residential buildings.

Massachusetts Water Policy

In 2004, the Massachusetts Executive Office of Environmental Affairs launched the Massachusetts Water Policy, setting out a blueprint that cuts across all aspects of water policy and builds upon prior policy-setting activities, including the 1996 Water Supply Policy, the Interim Infiltration and Inflow Policy, the Wetlands Protection Act, the Rivers Protection Act, the Stormwater Management Policy, the Water Management Act, and the Interbasin Transfer Act.

Water resource management principles of the Massachusetts Water Policy are:

- Keep water local and live within municipal water budgets by addressing issues from a watershed perspective;
- Protect clean water and restore impaired waters;
- Protect and restore fish and wildlife habitat; and
- Promote development strategies consistent with sustainable water resource management.

The Water Policy recommendations include development and refinement of planning tools and strategies to promote efficient use of water, measures to promote proper infrastructure maintenance, wastewater reuse and recharge, stormwater recharge, water supply development, resource protection and restoration strategies, and permit streamlining. Sustainable water use and effective pollution control strategies (such as addressing non-point source pollution) will require more active pursuit of sustainable development practices - in essence, protection of critical resource areas, targeted resource restoration, higher-density growth, and more up-to-date designs and landscaping. These strategies will be important as areas of the state undergoing heavy development in the coming years are faced with significant water resource, habitat, and dam issues. Recognizing that current utilization patterns of the Commonwealth's water resources are frequently not sustainable and that the Commonwealth's economic growth and quality of life depend on a sustainable water supply, a key Water Policy goal is a more effective partnership with municipalities. Working with localities, the policy includes recommendations on planning and design innovations, fix-it-first strategies to encourage compact development and the revitalization of cities and towns, and proactive protection of future water supplies and critical water resources. The Massachusetts Water Policy supports the Federal Clean Water Act mandate that each state maintain, safeguard and restore the physical, chemical, and biological integrity of its waters. The Water Policy underscores the significance of natural hydrologic cycles, establishes a method to prioritize watersheds in need of restoration, and better integrates science into resource management decisions.

MassHighway Salt Remediation Program

MassHighway acknowledges that application of road salt for snow and ice operations may have a negative affect on public and private drinking water supplies. Elevated levels of sodium greater than 20 parts per million (ppm) in drinking water could present a health issue for hypertensive individuals. To investigate road-salting impacts on drinking water supplies in a cooperative effort with stakeholders, MassHighway has administered a Salt Remediation Program since 1986. At the conclusion of the investigation, and when necessary, MassHighway will implement an appropriate remedial effort, including but not limited to, a reduced salt zone. Other program initiatives have included increased training of both union and privatized forces to increase awareness on the effects of road salting within environmentally sensitive areas

Wetland Mitigation Banks

New initiatives for the state that are planned or underway include the development of best management practices for drainage work and wetlands replication. MassHighway is also participating in a multi-agency effort to explore the potential of wetlands banking, including the formulation of a way to trade or earn credits for the creation of wetland areas, as mitigation for those requires replication due to loss resulting from construction.

The Taunton River Pilot Wetlands Mitigation Bank Project in Hanson, is an example of the wetlands replication program. Section 89 of Chapter 291 of the Massachusetts Acts of 2004, enacted on August 10, 2004, directed the Executive Office of Environmental Affairs to establish a pilot wetlands mitigation bank in the Taunton River watershed. A wetlands mitigation bank is a wetlands restoration, creation, or enhancement project that is undertaken in order to compensate for losses to wetlands resources in a defined geographic area, such as the Taunton River watershed, by providing compensatory mitigation for adverse impacts to wetlands that are permitted by local, state or Federal regulatory agencies. The bank sells “credits” created through the bank’s restoration efforts and purchasers use these credits to offset impacts to wetlands from transportation, public works and/or private development projects requiring wetlands variances and orders of conditions within the watershed. This is done when mitigation on site would not be effective, is otherwise impractical due to the small size of the mitigation area, or when there is a lack of a viable mitigation site.

Massachusetts Environmental Policy Act (MEPA)

The Massachusetts Environmental Policy Act (MEPA) requires that state agencies study the environmental consequences of their actions, including permitting and financial assistance. MEPA further requires that state agencies "use all practicable means and measures to minimize damage to the environment," by studying alternatives to the proposed project, and developing enforceable mitigation commitments, which will become permit conditions for the project if and when it is permitted. More information regarding the MEPA unit is discussed under the Air Quality Mitigation Programs.

As required by SAFETEA-LU, this section was prepared and strengthened by discussions with representatives of the U.S. Environmental Protection Agency, Massachusetts Department of Environmental Protection, Massachusetts Environmental Policy Act Unit, Executive Office of Transportation, MassHighway, and many other environmental groups or agencies.

8.1.4 Wildlife Habitats

<u>Existing Conditions</u>

Priority Habitat

Priority Habitat is the known geographical extent of habitat for all state-listed rare species, both plants and animals, and is codified under the Massachusetts Endangered Species Act. Habitat alteration within Priority Habitats may result in a take of a state-listed species, and is subject to regulatory review by the Natural Heritage & Endangered Species Program. Estimated Habitats are a sub-set of the Priority Habitats that show the geographical extent of the habitat of state-listed rare wildlife and is codified under the Wetlands Protection Act, which does not protect plants. State-listed wetland wildlife species are protected under the Massachusetts Endangered Species Act as well as the Wetlands Protection Act.

Vernal Pools

Vernal pools are unique wildlife habitats best known for the amphibians and invertebrate animals that use them to breed. Vernal pools, also known as ephemeral pools, autumnal pools, and temporary woodland ponds, typically fill with water in the autumn or winter due to rising ground water and rainfall and remain ponded through the spring and into summer. Vernal pools dry completely by the middle or end of summer each year, or at least every few years. Occasional drying prevents fish from establishing permanent populations and many amphibian and invertebrate species rely on breeding habitat that is free of fish predators. Some vernal pools are protected in Massachusetts under the Wetlands Protection Act regulations, as well as several other federal and state regulations, and local bylaws. The NHESP serves the important role of officially "certifying" vernal pools that are documented by citizens.

Natural Communities

Natural communities are assemblages of species that occur together in space and time. These groups of plants and animals are found in recurring patterns that can be classified and described by their dominant physical and biological features. Red Maple swamp and Pitch Pine/Scrub Oak are examples of natural communities found in the Commonwealth. Natural communities are not discrete units with neat boundaries; there is overlap among and between communities in their composition, structure, and physical characteristics. Large animals often make use of multiple communities. Natural communities may be restricted or widespread in their distribution across the state. Conservation priority should be given to: natural communities with limited distribution across eco-regions within the state, those with restricted global distribution, and those common types for which the best-documented examples occur in Massachusetts.

The Natural Heritage & Endangered Species Program (NHESP) is responsible for the conservation and protection of Massachusetts' biodiversity. Their highest priority is the approximately 178 species of vertebrate and invertebrate animals and 264 species of native plants and their habitats that are officially listed as endangered, threatened or of special concern under the Massachusetts Endangered Species Act. See figure 8-3 for a geographical representation of Wildlife Habitats in the Old Colony MPO region.

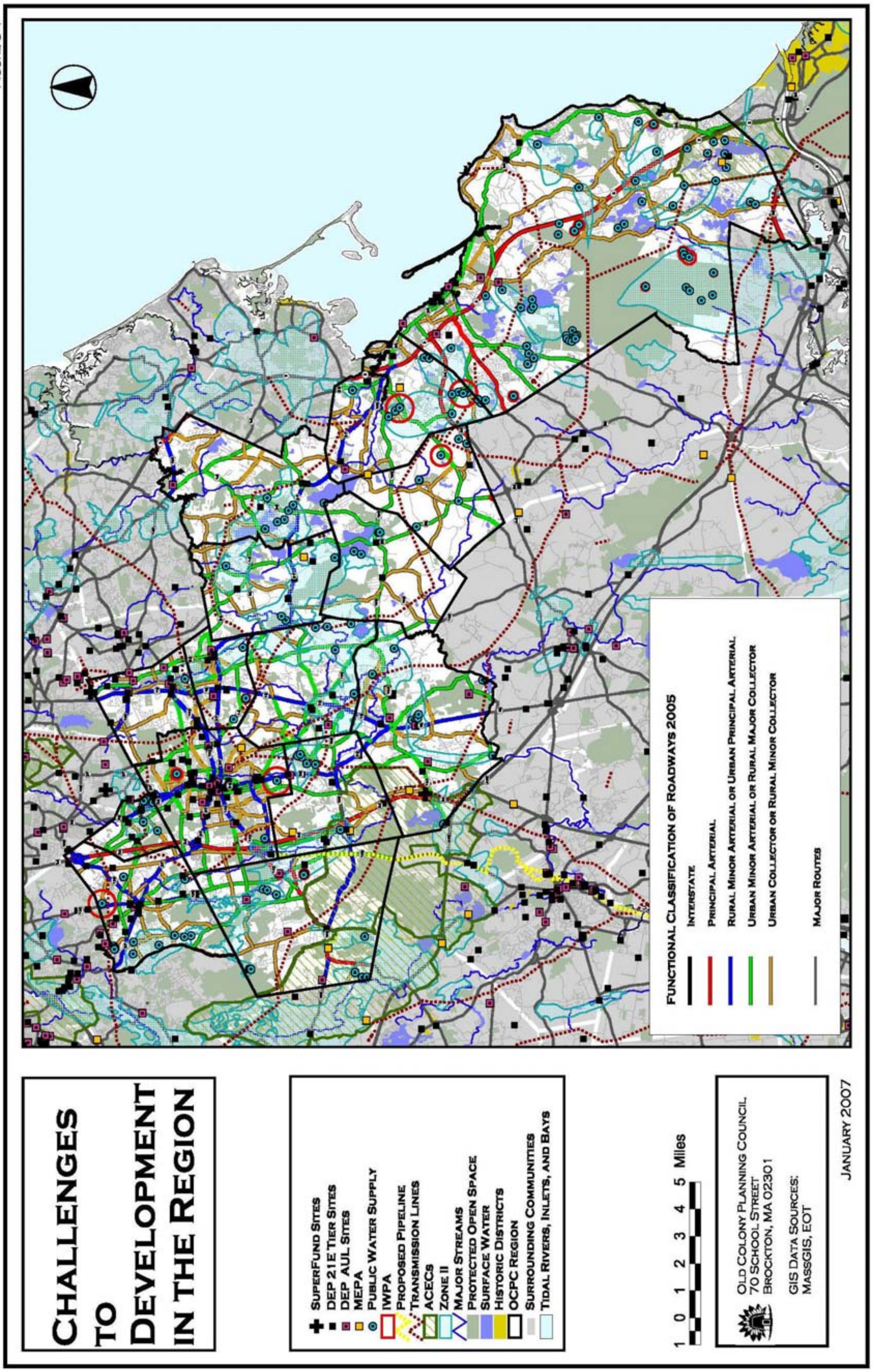
FIGURE 8-4
CHALLENGES TO DEVELOPMENT IN THE REGION
SUPERFUND SITES
DEP 21E TIER SITES
DEP AUL SITES
MEPA
PUBLIC WATER SUPPLY
IWPA
PROPOSED PIPELINE
TRANSMISSION LINES
ACECS
ZONE II
MAJOR STREAMS
PROTECTED OPEN SPACE
SURFACE WATER
HISTORIC DISTRICTS
OCPC REGION
SURROUNDING COMMUNITIES
TIDAL RIVERS, INLETS, AND BAYS
1 0 1 2 3 4 5 Miles
OLD COLONY PLANNING COUNCIL
70 SCHOOL STREET
BROCKTON, MA 02301
GIS DATA SOURCES:
MASSGIS, EOT
JANUARY 2007
FUNCTIONAL CLASSIFICATION OF ROADWAYS 2005
INTERSTATE
PRINCIPAL ARTERIAL
RURAL MINOR ARTERIAL OR URBAN PRINCIPAL ARTERIAL
URBAN MINOR ARTERIAL OR RURAL MAJOR COLLECTOR
URBAN COLLECTOR OR RURAL MINOR COLLECTOR
MAJOR ROUTES

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Problems or Threats

Transportation infrastructure can lead to wildlife-vehicle collisions, habitat loss, and habitat fragmentation. Wildlife-vehicle collisions are a dangerous phenomenon that injure or kill many animals on an annual basis. Collisions with large mammals such as deer, moose, and black bear can also result in human injury or even loss of life. Habitat loss is the result of developing an area previously providing cover, shelter, food, or breeding habitat. Habitat fragmentation is the separation of a landscape into various land uses (e.g., development, agriculture, etc.), resulting in numerous small, and disconnected habitat patches left for use by wildlife. Additionally, the small habitat patches resulting from fragmentation often do not provide the food and cover resources for many species that do attempt to use them, thus resulting in an increased risk of death by predation or automobile conflicts.

Stormwater runoff from newly developed areas, fill or degradation of wetlands from development, and air emissions from additional vehicle miles traveled are also environmental impacts associated with growth. The Old Colony MPO is dedicated to protecting environmental quality by supporting smart growth principles such as Low Impact Design, Transfer of Development Rights, and Transit Oriented Developments.

Wildlife Habitat Mitigation Programs

Federal Endangered Species Act

In 1966, Congress passed the Endangered Species Preservation Act. This law allowed listing of only native animal species as endangered and provided limited means for the protection of species. The Departments of Interior, Agriculture, and Defense were tasked with protecting listed species and preserving the habitats of such species. Land acquisition for protection of endangered species was also authorized. The Endangered Species Conservation Act of 1969 was passed to provide additional protection to species in danger of "worldwide extinction". Import of such species was prohibited, as was their subsequent sale within the United States. Subsequently, the Endangered Species Act was passed in 1973, combining and considerably strengthening the provisions of its predecessors. Since that time, many amendments have been made to the original act but the protection of endangered species is still remains paramount.

Transportation Enhancement Program

The Federal Transportation Enhancements (TE) program funds 12 different types of transportation related activities. Activity 11, known in law as “Environmental Mitigation to address water pollution due to highway runoff or reduce vehicle caused wildlife mortality while maintaining habitat connectivity,” allows communities to decrease the negative impacts of roads on the natural environment, such as water pollution and wildlife habitat fragmentation. Projects funded in this category seek to reduce these environmental impacts by controlling surface runoff and improving wildlife habitat connectivity with wildlife passages. Since the TE program began in 1992, approximately 1 percent of available TE funds have been programmed for “Environmental Mitigation” projects.

Working within Federal Highway Administration (FHWA) guidelines, each state Department of Transportation determines the eligibility of TE projects for funding. Examples of projects that may be considered eligible include:

- Projects that address water pollution due to highway runoff:
- Wetlands acquisition and restoration;
- Detention and sediment basins;

- Water pollution studies;
- Channel stabilization, storm drain stenciling and river clean-ups;
- Wildlife under or overpasses, including bridge extensions to provide or improve wildlife passage and habitat connectivity;
- Monitoring and data collection on habitat fragmentation and vehicle-caused wildlife mortality.

Massachusetts Environmental Policy Act (MEPA)

The Massachusetts Environmental Policy Act (MEPA) requires that state agencies study the environmental consequences of their actions, including permitting and financial assistance. MEPA further requires that state agencies "use all practicable means and measures to minimize damage to the environment," by studying alternatives to the proposed project, and developing enforceable mitigation commitments, which will become permit conditions for the project if and when it is permitted. More information regarding the MEPA unit is discussed under the Air Quality Mitigation Programs.

MassHighway Project Development and Design Guidebook

As mentioned in the Land Management section, the newly revised 2006 MassHighway Project Development and Design Guidebook included a variety of new chapters that ensure that all details of a proposed project are properly evaluated before the project can be programmed. Chapter 14 of the Guidebook, entitled “Wildlife Accommodation” describes the potential effects of roads on wildlife, includes descriptions of wildlife accommodations that can be incorporated along new and existing roadways, and details wildlife crossing structure guidelines.

The Guidebook suggests the following six policy initiatives that should be considered as goals and guidelines to address wildlife issues:

- Conduct landscape-based analyses to identify important “connectivity zones” and set priorities for mitigation.
- Evaluate road-stream crossings for their barrier effects and prioritize structures for replacement.
- Perforate road corridors for frequent wildlife and water crossings to reduce the road-barrier effect and habitat fragmentation.
- Depress roads and use soil berms and vegetation to reduce traffic disturbance and noise effects on wildlife and adjacent residential areas.
- Collect and consolidate traffic, including trucks, and channel it into primary roads to reduce the dispersion of both noise and barrier effects on lower classification roadways.
- Improve engineering designs or road surfaces, tires, motors, and vehicles (aerodynamics) to reduce the ecological effects of noise.
- Use cleaner fuel and “life cycle” vehicular materials (by designing vehicle parts to be recycled) to reduce greenhouse gases as well as pollutants of soil, water, and air.
- Consider exclusion fencing to keep wildlife off high-volume roadways.

Measures to mitigate potential infrastructure impacts, by altering wildlife behavior, include: installing vegetated berms, modified Jersey barriers, or “living fences”; incorporating native plantings along rights-of-way; constructing wildlife crossing structures or underpasses; and enhancing or creating habitat near roads through means such as wetland replication. Mitigation techniques that attempt to alter human behavior include signage, animal detection technology, public education and awareness, roadway lighting and reduced speed limits. The Old Colony MPO and MassHighway recognize the importance of reducing wildlife impacts associated with transportation infrastructure and improving habitat connectivity, while providing safe and efficient transportation for motorists, bicyclists, and pedestrians.

As required by SAFETEA-LU, this section was prepared and strengthened by discussions with representatives of the U.S. Environmental Protection Agency, Massachusetts Department of Environmental Protection, Massachusetts Environmental Policy Act Unit, Executive Office of Transportation, MassHighway, and many other environmental groups or agencies.

8.2 Hazards & Evacuation

New England weather is proverbially variable and sometimes dramatic; and the drama can evolve into danger. Late summer hurricanes, major winter blizzards, and summer droughts are all part of life in Southeastern Massachusetts, but most are at a manageable level. Blizzards can be very destructive, as we know from the Blizzard of 1978, which dropped more than 25 inches of snow and resulted in dramatic snowdrifts. Other threats, such as, earthquakes, landslides, and major fires are less common. In 1957, a wildfire burned from the western end of Plymouth to the sea. Local fires in Plymouth's Uncle Brances Road and Clark Road areas early in 2005 also resulted in massive destruction. These events can have disastrous effects on natural features, our fabricated communities, and transportation infrastructure. The communities of Plymouth and Kingston have extensive coastlines, which are susceptible to flooding as a result of powerful hurricanes or rain events.

8.2.1 Natural Hazards

Flood

Southeastern Massachusetts is particularly susceptible to flooding, with approximately 275 miles of coastline and 1,800 miles of major rivers in the region. Within the Old Colony Region, there are approximately 49.3 miles of shoreline, and the roughly 44 miles of the Taunton River, the longest river in the region. The Taunton River, with its tributaries (approximately 20 named lesser brooks, streams and rivers) drain most of the region.

Floods are caused by stream flows exceeding the watershed's storage capacity, a stream's carrying capacity, or coastal surges overflowing low-lying developed areas. These conditions occur during major rain sources, such as hurricanes, nor'easters, blizzards and severe thunderstorms. They are exacerbated by factors such as increased impervious areas, loss of safely floodable floodplains or other natural stormwater retention areas, seasonal frozen ground, and monthly high tides in coastal areas. The combination of high tides and wind-driven water in storm surges, generally during hurricanes, nor'easters or blizzards, causes flooding of coastal areas and estuaries. The threat is greatest during the highest tides of the month when the sun and moon are opposite one another and their tidal influences are combined.

The effect in estuaries can be compounded when flood flows from rain and /or snowmelt meet high tides and storm-driven seawater. The effect is reduced behind barrier beaches, which take the brunt of the waves, but high waters can still damage shoreline properties. In the greater southeastern Massachusetts region, 17% of the land is in the one-hundred year flood plain and an additional 4% is in the five hundred year floodplain. These are determined by the U.S. Army Corps of Engineers to have a respective 1% or 2% probability of flooding in any given year. Most of the region's undeveloped land within the 100-year to 500-year flood plain is regulated by local flood protection zoning as required under the National Flood Insurance Program, some local bylaws include the 500-year flood plain, and some is within the minimum 100 foot band absolutely protected under the Massachusetts Rivers Act. Under the flood plain zoning, the various residential, commercial or institutional uses allowed by the basic zoning may generally be done only if the proponent can demonstrate that the site is not actually flood plain, or that done according to applicable regulations, the project will not increase risks, diminish flood storage or passage, or otherwise create problems there or downstream.

Hurricanes

The areas that are susceptible to hurricane-related flood damage are described as SLOSH (Sea and Lake Overland Surges from Hurricanes) zones. The phenomenon is measured by a model that uses topography, tides, and past hurricane behavior to predict the areas that would be inundated by hurricanes. The zones are related to the intensity of the storm, according to the Saffir-Simpson Scale and by the tide at the time of the storm. The probable SLOSH areas are the low-lying inlets or coastal ponds in Plymouth; Ellisville Harbor, Center Hill Pond, Ship Pond and White Horse Beach/Bartlett Pond; Plymouth Beach; a thin strip along Plymouth Harbor; the thinly settled, low-lying part of Kingston along the Jones River and the Jones River Marshes east of Rocky Nook to the Duxbury line, and along the Jones River about 2500' west of Route 3A.

Nor'easters

The Massachusetts Hazard Mitigation Plan reports that while hurricanes strike with more force than Nor'easters, Nor'easters cause more damage because they are so frequent, with one or two every winter in New England. They bring high winds and sustained rains, and last longer – 12 hours to 3 days, versus 6 to 12 hours for hurricanes. Many southeastern Massachusetts communities have flooding following these heavy rains, particularly when melting snow and ice add to the flow, or when chunks of ice clog drains and increase local flooding of roadways and buildings.

Blizzards

Blizzards combine large amounts of snow and wind, often leading to crippling snowdrifts. On average, the coastal areas of Plymouth and the southern edge of Kingston receive the least amounts of snow, approximately 24.1 to 36.00 inches; most of the region receives between 36.1 to 48 inches; and the extreme inland northernmost portions of Avon and Stoughton get 48.1 to 72 inches. The total is important for potential flood-inducing snowmelt in a warm spell, but the greater concern is the intensity of individual storms or closely linked storms. According to the National Oceans and Aeronautic Administration (NOAA), the greater Boston area covering much of southeastern Massachusetts has a 33% chance of having at least one 12-inch storm out of a probable 10.33 snowstorms annually. Major storms can block roads and generally cripple activity, particularly when heavy wet snow combines with rain and ice to damage trees, power lines and other critical facilities.

Fire

Wildfires are a natural part of the southeastern Massachusetts ecosystem. They keep the forest clean of debris, encourage the growth of grasses that serve as wildlife feed, and allow for new growth of fire-dependent plant communities like Pine Barrens and Scrub Pine /Scrub Oak communities that might otherwise be succeeded by other trees. These forests are primarily pitch pine with an understory of scrub oak and black huckleberry. They are very flammable and the ecosystem requires dependant plant communities like pine barrens and scrub pine/scrub oak communities that might otherwise periodic fire to perpetuate the barrens. Whether set or natural, cyclically recurring isolated fires recycle nutrients and maintain diverse natural habitats.

This increasingly dangerous Wildlands/Urban Interface is visible in Plymouth and other communities bordering the 15,000-acre Myles Standish State Forest, as well as in the out-of-region Fall River Bioreserve/Freetown State Forest, and the 1,500-acre Massasoit State Forest. According to the State Fire Suppression staff, Southeastern Massachusetts is the 3rd most hazardous wildfire / interface area in the country with fires able to spread over 40 acres in a minute.

The resiny and waxy Pitch pine/scrub oak vegetation is the region's most flammable vegetation. It is widespread in the western portion of Plymouth and in some areas east of Pilgrim Highway (Route 3). Other areas east of Pilgrim Highway (Route 3) have mixed deciduous and coniferous cover with scattered pockets of pitch pine and scrub oak, and with deciduous trees dominating in the easternmost areas. The dramatic pattern in the west may obscure hazards elsewhere. For example, the rapidly developing Pine Hills area also has some patches of Scrub Oak and Pitch Pine and, as its name suggests, considerable cover by other coniferous trees along with many deciduous trees that can be seen in aerial photographs. It reportedly reflects very little use of recommended protective practices. These other vegetative covers in Plymouth County have an under-story of inflammable mountain laurel, as well as a mix of Juniper and Atlantic Cedar.

More broadly, wildfires reflect three major factors: weather, topography, and fuel. Weather, especially long droughts, lightening, and winds, encourage and influence fires, and hazards are generally higher in the spring and fall when it is dry and/or windy. Topography influences fires as steep slopes and gullies act as flues. Most basic is vegetation, supplying fuel from trees, shrubs and branches, though cultural supplies like wood roofs, firewood piles, etc. can add risks and shape the resulting fire.

Southeastern Massachusetts is generally flat so the overall topography does not encourage high-speed wildfires. However, local slopes combined with the summer's prevailing west winds may accelerate and direct a fire. Given the worst combination of temperature, wind, humidity, and topography, a wildfire can burn at a rate of 30+ acres per minute, though in flat areas the Bureau of Fire Control expects speeds of up to 20 acres per minute. While these factors influence the course of fires, the Bureau reports that nearly 98% of Massachusetts' fires result from human carelessness. By far the largest fires have been in and adjacent to Myles Standish State Forest in Plymouth and Carver, but the size of fires has dropped from the 18,000 acres of 1957 to 1,350 acres in from 1991 to 1995. After such fires, there is the potential for increased erosion, hydrophobic soils, and major shifts in habitat, depending on the severity and speed of the burn.

Major needs in controlling fires once they start are good access to the areas and sufficient water. Old cart paths or logging roads cross most of the region's woods but only the heavy-duty, specially equipped, woods trucks ("breaker trucks") can get reasonably close to the more remote fires.

One of the communities with considerable pockets of Pitch Pine and other coniferous trees interspersed with housing, Plympton, has no public water system. In such communities, and away from water lines in other communities, fire fighters must rely on water tankers and ponds, and homes are likely to be lost.

As with hurricanes, a major risk factor is a low sense of danger from inexperience. Nearly 50 years have passed since the large Plymouth fire that burned through the pine-barrens to the shore and many new homes are in these highly flammable areas, and homeowners are unaware of the risk.

Pre-Disaster Mitigation Planning

Pre-Disaster Planning is very important because it identifies the vulnerable areas, establishes a network of help, and discusses how the transportation infrastructure can be utilized. The Old Colony MPO recognizes the importance of Pre-Disaster Mitigation Planning and promotes further funding for updating existing plans.

8.2.2 Sensitive Facilities

Plymouth Shores Nuclear Power Plant

The U.S. Nuclear Regulatory Commission is responsible for assuring that nuclear power plants operate safely and meet federal regulations. NRC inspectors work full-time at Entergy Nuclear plants, reviewing day-to-day activities and programs. Additional inspectors conduct several special inspections of specific areas and programs each year. Changes in plant design and operation are reviewed to assure they meet safety standards and comply with NRC regulations.

Wastewater Treatment Facilities

Wastewater treatment plants range in size and complexity from satellite plants treating sanitary wastewater from homes to large regional facilities treating millions of gallons a day of sanitary and industrial wastewater. New pollution problems have placed additional burdens on wastewater treatment systems. Today's pollutants, such as heavy metals, chemical compounds, and toxic substances, are more difficult to remove from water and rising demands for water supply only exacerbate the problem. Wastewater treatment facilities are critical to protecting and maintaining the environmental quality of the Commonwealth.

Public Water Supplies

Source water is untreated water from streams, rivers, lakes or underground aquifers that is used to provide public drinking water, as well to supply private wells used for human consumption. Some water treatment is usually necessary, so public utilities treat most of the drinking water before it enters the home. Protecting source water from contamination can reduce the cost of this treatment, as well as the risks to public health. The U.S. Environmental Protection Agency, other federal agencies, states, local communities, businesses and citizens all play a role in ensuring that drinking water is protected.

<u>Mitigation Planning</u>

Approximately 10 miles around the Pilgrim Nuclear Power Plant is called the Emergency Planning Zone. Communities within the 10-mile area include: Plymouth, Kingston, Duxbury and portions of Carver and Marshfield. Major arterials and collector roadways in the region are designated as evacuation routes and each sub-area of the EPZ have specific receiving points to limit confusion during an event.

In 2005, the Massachusetts Emergency Management Agency, Massachusetts Department of Public Health, and Entergy Nuclear Northeast's Pilgrim Nuclear Power Station provided an important emergency public information calendar to the neighbors of the station. The calendar provided useful emergency information, such as, contact numbers, emergency alert radio stations, evacuation routes, emergency bus routes, and reception centers. The Taunton High School, Braintree High School, and Bridgewater State College are designated receiving points for citizens of southeastern Massachusetts evacuating the area near the Plymouth Shores Nuclear Power Plant. This type of planning will help maintain an orderly system of evacuation if such an event is to occur.

8.3 Energy & Emissions

8.3.1 Renewable Energy

One of the unique features of Massachusetts is its diversity of clean energy resources. The state boasts an abundant bio-energy stock, excellent wind potential in a number of areas, existing hydropower facilities and infrastructure, and sufficient solar energy for widespread solar photovoltaic installations. The actual amount of clean energy that could be developed in the state is far greater than what is currently being utilized.

Solar Power

Solar photovoltaic technology, or "PV" for short, uses solar energy to produce electricity. PV is one of the most environmentally friendly technologies available and is very easy to install on a building or property. While cost can be a barrier to some installations, there are many incentives available for PV and over 400 systems installed in Massachusetts today - more installations than any other source of electricity. Solar photovoltaic (PV) panels can be installed around Massachusetts at a variety of sites, most often on the rooftops of buildings. Because solar energy is an unlimited resource, the potential for PV development in the state depends more on the number of sites where these can be installed without being shaded or damaged.

An example of solar power at work in the Old Colony MPO region is the Brockton Brightfield, a 425-kilowatt (kW) photovoltaic (PV) solar energy system located on a 3.7 acre remediated brownfield in Brockton. It is the largest solar energy plant in New England and the largest brightfield transformed into a solar energy generating station in the nation.

Wind Power

Wind turbines provide significant amounts of energy using only the natural power of the wind. In fact, wind power is one of the fastest growing and most commercially viable forms of clean energy. Because it produces no emissions and can be installed locally, it is a growing energy choice for everyone from residential customers to communities and municipalities to entire nations. Approximately 3.5% of Massachusetts land has sufficient average wind speeds and available land for the installation of utility-scale wind turbines. This number excludes areas that have already been developed or identified as environmentally sensitive. Because wind farms do not require significant areas of land, at most only 0.35% of the 3.5% of available land would be taken up by turbines and associated structures. The wind turbine project in Hull, MA is a nice example of forward thinking, as it provides electricity for the local street and traffic lights.

Biomass

Bio-energy can be produced using a variety of materials that include wood, crops like corn and soybeans, and waste from consumer, municipal, industrial, and agricultural processes. Each of these materials are sources of fuels that can be burned to produce energy. Massachusetts has an abundant natural stock of bio-energy fuels, making it a clean energy source with great potential for the state. However, recovery of some types of biomass is expensive and not economically feasible at present, so the true role of biomass in local energy production may end up being smaller than projected. Liquid biofuels like ethanol, biodiesel, and bio-oil can be used to power cars and other transportation.

Hydropower

Rivers, streams, and other flowing waters can be used to generate electricity through hydropower. Hydroelectric facilities represent the largest source of clean energy in the United States and around the world. A handful of massive hydro plants accounts for a significant percentage of this energy in Massachusetts. Development of hydropower in Massachusetts will likely be limited to the upgrade or repair of existing dams, as new river construction is heavily regulated. If all the potential hydropower sites that meet these regulations were developed, they could produce 4% of the state's energy consumption.

8.3.2 Alternate Fuels

President George W. Bush and Massachusetts Governor Deval Patrick have stressed the importance of transitioning away from foreign fossil fuel reliance while encouraging the research and usage of alternate fuels. The Old Colony MPO supports programs aimed at encouraging the use of alternate fuels and consistently works with local, regional, and statewide partners to further that endeavor.

Reformulated Gasoline (RFG)

Reformulated gasoline (RFG) is gasoline blended to burn cleaner and reduce smog-forming and toxic pollutants in the air we breathe. The Clean Air Act of 1990 requires those metropolitan areas with the worst smog problems to participate in the reformulated gasoline program. In addition, many communities and states also have voluntarily chosen to participate in the RFG program to meet pollution reduction goals of the Clean Air Act. The federal RFG program was introduced in 1995; RFG is currently used in 17 states and the District of Columbia and approximately 30 percent of gasoline sold in the U.S. is reformulated. Between 1995 and 1999, it cut smog-forming pollutant levels by about 17 percent compared to conventional gasoline in communities where 75 million people live and work. Phase II, which began January 1, 2000, took another step toward cleaner air. It reduces smog-forming pollutants 27 percent more than conventional gasoline.

Electric Vehicles

Electric Vehicles (EVs) do not produce tailpipe emissions, but generators producing the electricity used to charge EV batteries do emit pollutants. Electricity for EVs is produced by power plants, which send it to substations through transmission lines and then to homes and businesses through distribution systems. An EV’s electric motor converts electricity—usually from a battery pack—into mechanical power that runs the vehicle. Electric vehicle batteries must be recharged after a certain limited vehicle driving range.

Ethanol

E85 is the term for motor fuel blends of 85 percent ethanol and just 15 percent gasoline. E85 is an alternative fuel as defined by the U.S. Department of Energy. Besides its superior performance characteristics, ethanol burns cleaner than gasoline; it is a renewable, domestic, environmentally friendly fuel that enhances the nation's economy and energy independence. Government tests have shown that E85 vehicles reduce harmful hydrocarbon and benzene emissions when compared to vehicles running on gasoline. E85 can also reduce carbon dioxide (CO2), a harmful greenhouse gas and a major contributor to global warming. Although CO2 is released during ethanol production and combustion, it is recaptured as a nutrient to the crops that are used in its production. Ethanol also degrades quickly in water and, therefore, poses much less risk to the environment than an oil or gasoline spill.

Biodiesel

Biodiesel is a domestically produced, renewable fuel that can be manufactured from vegetable oils, animal fats, or recycled restaurant greases. Biodiesel is safe, biodegradable, and reduces serious air pollutants such as particulates, carbon monoxide, hydrocarbons, and air toxics. Blends of 20% biodiesel with 80% petroleum diesel (B20) can generally be used in unmodified diesel engines. It can be used in compression-ignition (diesel) engines with little or no modifications. Biodiesel can also be used in its pure form (B100), but it may require certain engine modifications to avoid maintenance and performance problems and may not be suitable for wintertime use. Biodiesel is simple to use, biodegradable, nontoxic, and essentially free of sulfur and aromatics. Since it is made in the USA from renewable resources such as soybeans, its use decreases our dependence on foreign oil and contributes to our own economy.

Natural Gas

Natural gas is domestically produced and readily available to end-users through the utility infrastructure. It is also clean burning and produces significantly fewer harmful emissions than reformulated gasoline or diesel when used in natural gas vehicles. In addition, commercially available medium- and heavy-duty natural gas engines have demonstrated over 90% reductions of carbon monoxide (CO) and particulate matter and more than 50% reduction in nitrogen oxides (NO_x) relative to commercial diesel engines. Natural gas can be stored onboard a vehicle as compressed natural gas (CNG) either at 3,000 or 3,600 psi or as liquefied natural gas (LNG) at typically 20-150 psi.

Hydrogen Fuel Cell

Although they are still in development, hydrogen vehicles represent an attractive option for reducing petroleum consumption and improving air quality. Hydrogen vehicles are powered by fuel cells that produce no air pollutants and few greenhouse gases. If fueled with pure hydrogen, fuel cells emit only heat and water as a byproduct. Hydrogen fuel cell vehicles are not yet commercially available. However, they are currently being demonstrated in light- and heavy-duty applications in fleets throughout the country. For example, Honda has placed several prototype light-duty FCX fuel cell vehicles city fleets, and California transit agencies are demonstrating fuel cell buses in revenue service.

8.3.3 Vehicle Emissions

Corporate Average Fuel Economy (CAFE) Standards

In response to the 1973-74 Arab oil embargo, Congress enacted the “Energy Policy Conservation Act,” into law in 1975, adding Title V, “Improving Automotive Efficiency,” to the Motor Vehicle Information and Cost Savings Act and established Corporate Average Fuel Economy (CAFE) standards for passenger cars and light trucks. The Corporate Average Fuel Economy (CAFE) standard is the sales weighted average fuel economy, expressed in miles per gallon (mpg), of a manufacturer’s fleet of passenger cars or light trucks with a gross vehicle weight rating (GVWR) of 8,500 lbs. or less, manufactured for sale in the United States, for any given model year. Fuel economy is defined as the average mileage traveled by an automobile per gallon of gasoline (or equivalent amount of other fuel) consumed as measured in accordance with the testing and evaluation protocol set forth by the Environmental Protection Agency (EPA).

The National Highway Traffic Safety Administration (NHTSA) is responsible for establishing and amending the CAFE standards; promulgating regulations concerning CAFE procedures, definitions and reports; considering petitions for exemption from standards for low volume manufacturers and establishing unique standards for them; enforcing fuel economy standards and regulations; responding to petitions concerning domestic production by foreign manufacturers and all other aspects of CAFE, including the classification of vehicle lines as either cars or trucks; collecting, recording and cataloging Pre- and Mid-model year reports; adjudicating carry back credit plans; and providing program incentives such as credits for alternative fueled vehicle lines. The U.S. Environmental Protection Agency (EPA) is responsible for calculating the average fuel economy for each manufacturer.

Congress did not specify a target for the improvement of light truck fuel economy. Instead, it provided that light truck standards be set at the maximum feasible level for model year 1979 and each model year thereafter. Unlike for the passenger car fleet, there is no default standard established for light trucks. NHTSA must set the standard for each model future model year. Light truck fuel economy standards have been established by NHTSA for MY 1979 through MY 2007. On March 31, 2003, NHTSA issued new light truck standards, setting a standard of 21.0 mpg for MY 2005, 21.6 mpg for MY 2006, and 22.2 mpg for MY 2007. The penalty for failing to meet CAFE standards recently increased from $5.00 to $5.50 per tenth of a mile per gallon for each tenth under the target value times the total volume of those vehicles manufactured for a given model year.

Massachusetts Enhanced Emissions & Safety Test

In compliance with the federal Clean Air Act of 1990, the Massachusetts Enhanced Emissions & Safety Test has been in effect since October 1999 for all motor vehicles registered in the Commonwealth, including buses and trucks. The inspection is part of a comprehensive plan to reduce air pollution and its impact on the health of Massachusetts' residents, particularly those with lung and respiratory ailments.
The Inspection and Maintenance (I/M) program is a way to check whether the emission control system on a vehicle is working correctly. All new passenger cars and trucks sold in the United States today must meet stringent pollution standards, but they can only retain this low-pollution profile if the emission controls and engine are functioning properly. The I/M program encourages proper vehicle maintenance and discourages tampering with emission control devices through periodic vehicle checks and required repairs for vehicles that fail the test. Substantial reductions in vehicle emissions are necessary for many areas to attain clean air. Depending on the sophistication of the program, I/M can reduce vehicle-related hydrocarbon and carbon monoxide emissions by 5 percent to more than 30 percent. A comprehensive I/M program can also yield reductions in nitrogen oxide emissions of up to 10 percent.

Environmentally Friendly Transportation Programs

Best Workplaces for Commuters Program

Best Workplaces for Commuters is an innovative, voluntary business-government program, sponsored by the U.S. Environmental Protection Agency and the U.S. Department of Transportation that distinguishes and provides national recognition to employers offering outstanding commuter benefits such as free or low cost bus passes, strong telework programs, carpooling matching and vanpool subsidies. Through partnerships with public and private sector employers, Best Workplaces for Commuters is demonstrating that alternatives to drive-alone commuting such as transit, carpools, and teleworking are economically beneficial, yielding value to workers, employers, and our environment.

Carl Moyer Program

The Carl Moyer Program complements California’s regulatory program by providing incentives to obtain early or extra emission reductions, especially from emission sources in environmental justice communities and areas disproportionately impacted by air pollution. A voluntary accelerated vehicle retirement (VAVR) program, also known as a scrap or old vehicle buy back program, provides monetary or other incentives to a vehicle owner to **voluntarily** retire their older, more polluting vehicle. A primary goal of the VAVR program is to encourage a more timely removal of higher emitting vehicles from California roadways to be replaced with newer, cleaner vehicles or alternative transportation options.

Clean Cities Program

Clean Cities is a deployment activity within the U.S. Department of Energy's FreedomCar and Vehicle Technologies (FCVT) Program. Clean Cities deploys the technologies developed through FCVT and advances the economic, environmental, and energy security of the United States by supporting local decisions to adopt practices that contribute to the reduction of petroleum consumption in the transportation sector. Clean Cities carries out this mission through a network of more than 80 volunteer coalitions, which develop public/private partnerships to promote alternative fuels and vehicles, fuel blends, fuel economy, hybrid vehicles, and idle reduction. Since its inception in 1993, Clean Cities has grown to almost 90 coalitions and 4,800 stakeholders across the country, put close to 1 million alternative fuel vehicles (AFVs) on the road, and displaced approximately 1 billion gallons of gasoline. In 2004 alone, Clean Cities displaced 237 million gallons of gasoline through the use of alternative fuels, AFVs, idle reduction technologies, fuel economy measures, and hybrid vehicles.

SmartWay Transport Partnership Program

SmartWay Transport is a voluntary partnership between various freight industry sectors and the U.S. Environmental Protection Agency that establishes incentives for fuel efficiency improvements and greenhouse gas emissions reductions. By 2012, this initiative aims to reduce between 33 - 66 million metric tons of carbon dioxide (CO_2) emissions and up to 200,000 tons of nitrogen oxide (NO_x) emissions per year. At the same time, the initiative will result in fuel savings of up to 150 million barrels of oil annually. There are three primary components of the program: creating partnerships, reducing all unnecessary engine idling, and increasing the efficiency and use of rail and intermodal operations.

Partnerships with companies and organizations are the foundation of the SmartWay Transport Program. EPA welcomes any company or organization that will improve the environmental performance of their freight operations. Key Partners are companies that ship products and the truck and rail companies that deliver these products. Partners commit to measure and improve the efficiency of their freight operations, using EPA-developed tools that quantify the benefits of a number of fuel-saving strategies. Reducing unnecessary idling improves air quality, saves fuel and saves companies money. Another component of the SmartWay Transport Partnership is to eliminate unnecessary truck and rail idling by developing a nationwide network of idle-reduction options along major transportation corridors - truck stops, travel centers, distribution hubs, rail switch yards, borders, ports, and even along the side of the road. A third component of the SmartWay Transport Partnership is to highlight practical opportunities where rail can be better utilized and to encourage more efficient rail operations and technical innovation.

Congestion Mitigation and Air Quality (CMAQ) Program

SAFETEA-LU placed a renewed focus on advancing cost-effective transportation projects that improve air quality. Specifically, the bill highlighted diesel engine retrofits as a priority for CMAQ expenditures, due to the cost-effective emissions reduction benefits that can be achieved through many retrofit technologies. SAFETEA-LU also establishes priority funding consideration for cost-effective congestion mitigation activities that improve air quality. The goals of the CMAQ program support this initiative in three main ways: promoting operational and technological improvements, targeting major freight bottlenecks, and relieving urban congestion. Since congestion relief projects also reduce idling, the negative emissions affects of “stop and go” driving, and the number of vehicles on the road, they have a corollary benefit of improving air quality. Based on their emissions reductions, these types of projects, including investments in improved system pricing and operations, are eligible for CMAQ funding.

Transit Bus Diesel Retrofit Program

As part of the CMAQ program, this proposed program would provide funds to retrofit up to 600 transit buses in Massachusetts with Diesel Particulate Filters (DPFs).

Diesel Particulate Filters (DPFs) are ceramic devices that collect PM in the exhaust stream. They can be installed in new or used buses, but must be used in conjunction with ultra-low sulfur diesel fuel with a sulfur content of less than 15 parts per million, which is mandated by EPA for all on-road diesel vehicles as of October 15, 2006. The use of such DPFs can significantly reduce emissions of carbon monoxide (CO), hydrocarbons (HC), volatile organic compounds (VOC), and particulate matter (PM), all by 85%.

The use of DPFs, a more expensive technology, is justified in transit buses due to the constant operation of the vehicles in highly populated urban areas. The increased exposure risks necessitate the increased air quality benefits that the DPFs provide in order to protect the concentrated populated areas where the buses are located.

	Pollutant	**% Reduction**	**Annual reduction (kg)**	**Cost-effectiveness ($/kg for first year)**
TRANSIT BUS - DPF (600 vehicles)	CO	85%	153,000	$29
	HC / VOC	85%	7,650	$588
	NOx	n/a	n/a	n/a
	PM	85%	8,354	$539

Description provided by the Executive Office of Environmental Affairs & Department of Environmental Protection. Total Project Cost: 600 vehicles / $4,500,000

School Bus Diesel Retrofit Program

This proposed program would provide Diesel Oxidation Catalysts (DOCs) and Crank Case Filters (CCFs) for up to 7846 school buses in Massachusetts. This number would include all school buses in Massachusetts in order to ensure that by 2010 all school buses in the Commonwealth will be retrofitted.

Recent research has shown a significant risk of in-cabin exposure on school buses. Given this new research and the fact that children are a highly sensitive population, retrofitting school buses with technologies that address both external and in-cabin exposure provides significant benefits at relatively low cost. The use of both DOCs and CCFs can significantly reduce emissions of carbon monoxide (CO) (80%), hydrocarbons (HC) (80%), and particulate matter (PM) (25%).

	Pollutant	**% Reduction**	**Annual reduction (kg)**	**Cost-effectiveness ($/kg for first year)**
SCHOOL BUS - DOC (7846 vehicles)	CO	80%	602,573	$30
	HC	80%	30,129	$597
	NOx	n/a	n/a	n/a
	PM	25%	1,998	$9,011

Description provided by the Executive Office of Environmental Affairs & Department of Environmental Protection. Total Project Cost: 7846 vehicles / $18,000,000

Public-Private Financing

The FHWA encourages States and MPOs to creatively address their air quality problems and to experiment with new services, innovative financing arrangements, public-private partnerships, and complementary approaches that use transportation strategies to reach clean air goals.

8.4 Conclusions and Recommendations

8.4.1 Conclusions

The Old Colony Metropolitan Planning Organization (MPO) region is a rich and diverse area that is favorable to development and protection. The map series included in the chapter provides a visual component for better understanding of the environmental characteristics of the Old Colony MPO region. The Old Colony MPO is dedicated to protecting, preserving, and maintaining the environmental quality of the region.

Environmental Mitigation

Transportation projects in the Commonwealth of Massachusetts, which occur in environmentally sensitive areas, are subject to stringent review, commonly by federal, state and local agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation. These agencies include but are not limited to: the U.S. Environmental Protection Agency, the Massachusetts Department of Environmental Protection, the Massachusetts Environmental Policy Act Office, and the Massachusetts Historical Commission. The mitigation techniques discussed in this chapter are ways in which the reviewing agencies minimize the environmental impacts associated with transportation infrastructure projects.

The proposed expansion of the Fall River/New Bedford Rail Service is an example of a project that was reviewed by many environmental groups on the federal, state, and local levels. The impacts associated with this project were identified as well as mitigation measures to reduce the impact to the environment. Examples of such mitigation included but were not limited to: providing wildlife underpasses/tunnels as practical; utilizing appropriate best management practices for construction erosion and sedimentation control; providing electric block heaters at layover facilities to eliminate overnight idling; and providing various intersection and roadway improvements along the proposed project corridor.

Additional proposed projects in the Old Colony MPO that will be subject to extensive review by federal, state and local agencies responsible for land use management, environmental protection, conservation, and historic preservation include but are not limited to: Route 24 Interstate Conversion, Commuter Rail Extension to Buzzards Bay, Route 3 Capacity Enhancements, and the West Bridgewater Commuter Rail Station proposal.

8.4.2 Recommendations

Environmental Quality

Strive to reduce vehicle emissions. Encourage research and technology development to find new solutions to air pollution problems created by motor vehicles.

Strive to reduce single occupancy vehicle travel. Support programs, which encourage means to reduce single occupancy automobile travel. Examples are flexible working schedules, preferential parking for ridesharing, and incentives for transit use. MassRides program offers employers and their employee's benefits of carpooling and ridesharing.

Encourage the use of non-motorized alternatives. Encourage and support non-polluting modes of transportation, such as bicycling and walking as described in the Bicycle and Pedestrian component of this Plan.

Make maximum use of existing facilities and programs. The Massachusetts Environmental Policy Act Unit is responsible for reviewing large-scale development projects and should be allowed to maximize their influence to help protect the quality of the environment. The MassHighway Project Development and Design Guidebook can be extremely helpful in the protection and preservation of the environment as it promotes an integrated multimodal approach to roadway planning and design, ensures that context sensitivity is integrated into the planning, design, and construction process, and provides a clear project development process.

Encourage coordination between municipalities, federal, state, and regional agencies. Coordination between all interested parties is important to reduce the negative impacts to the environment. Improving air, land, water, and wildlife quality begins with a team approach and is successful with all voices recognized.

Support programs that mitigate water resource shortages. The Taunton River Desalinization Plant in Dighton (Aquaria project) will help meet the water demand of the Old Colony MPO region.

Reduce nonpoint source pollution. Support the development of new and improved designs and Best Management Practices (BMP) to reduce the contamination of water resources from transportation facilities and projects.

Minimize the use of road salt and sand. Studies have shown that road salt can have negative effects on some roadside vegetation and aquatic life. Accumulated amounts of sand can be hazardous to both the natural environment (air, land, and water) as well as to the traveling public. MassHighway has taken a number of steps to reduce the environmental impact from winter sanding and salt practices on state highways; including the reduction of sand applied during storms, use of liquid and flake calcium chloride to reduce sodium levels in runoff; construction of covered facilities for sand and salt storage and establishment of certain zones where reduced salt is used.

Support programs that reduce transportation related litter. The MassHighway Adopt-A-Highway program is a public service program that utilizes volunteer teams to pick up litter along the roadways.

Develop solutions for controlling transportation related noise. Transportation-related noise impacts can be minimized through improved facility design, compatible land uses, and enforcement of noise regulations. Encourage all regional and local transportation-planning efforts deal with noise problems as a normal step in the planning process.

Work to reduce/prevent light and noise impacts. Develop solutions for controlling transportation-related noise. Include noise mitigation through improved facility design, compatible land uses, enforcement of noise regulations, and selective use of sound barriers. Relate takings and designs to the sensitivity of adjacent habitats and neighborhoods. Design/install highway lights and street lights to be directed down away from houses or other sensitive receptors or the sky.

Encourage Brownfield Redevelopment. Brownfields properties are often located where there is existing infrastructure, workforce and other amenities and therefore, are attractive for potential new business. Reuse of these facilities cleanses the existing site and eliminates the need to clear cut forest for more development. Fostering the cleanup and re-use of contaminated properties is a priority for the state and the Old Colony MPO and is consistent with the Sustainable Development Principles established by the Massachusetts Office of Commonwealth Development.

Encourage Smart Growth Development Strategies. Support the smart growth initiatives resulting in cluster and condensed development. These strategies aim to reduce vehicle trips and vehicle dependency, therefore, resulting in benefits to air quality and reduction of foreign fossil fuel dependency.

Encourage the formation of Transportation Management Associations (TMAs). Transportation Management Associations (TMAs) are private, non-profit, member-controlled organizations that provide transportation services in a particular area, such as a commercial district, mall, medical center or industrial park. MassRides offers carpooling, vanpooling, parking management, and other techniques allow employees to diversify their trips to and from work, thereby reducing congestion and improving air quality.

Promote the use of Corridor Management Plans. The Office of Transportation Planning through the Executive Office of Transportation is developing a Route 44 Plymouth-Taunton Corridor Management Plan. This type of planning is vital to the Southeastern Massachusetts region, as it encourages collaboration between corridor municipalities, the Commonwealth, and other agencies and identifies potential growth and transportation management strategies for the corridor.

Encourage the use of parking garage structures. As more development occurs along major transportation infrastructure, the pressure to make parking lots larger to accommodate more residents, shoppers, and visitors increases. Parking garage structures allow the impact of vehicle parking to happen on a smaller footprint, thus reducing the amount of impervious pavement.

Encourage the proper design and use of High Occupancy Vehicle (HOV) lanes. High Occupancy Vehicle lanes should be designed for and only used by buses carrying large amounts of people to and from their destinations. These lanes would make commuter bus lines a more acceptable alternative to individuals who drive automobiles, thereby reducing congestion and improving air quality.

Support "Intermodalism." Promote using "intermodalism" to better integrate all transportation modes such as: Automobile, Motorcycle, Transit, Rail, Bus, Water, Air, Walking, and Bicycling. Providing a hub that supports all transportation modes attracts more people and increases efficiency.

Hazards & Evacuations

Encourage pre-disaster planning. Many communities have participated in a multi-hazard pre-disaster planning effort, which focused on natural disasters and how the region's citizens will respond.

Reduce the loss of life, property, infrastructure, and cultural resources from natural disasters. A coordinated response to a natural disaster will reduce the loss of life, property, infrastructure and cultural resources. Visible evacuation routes will also eliminate congestion on major routes.

Make maximum use of existing facilities and programs. Programs and facilities that are established to mitigate damage to transportation infrastructure, property, and cultural resources should be maintained and utilized to their greatest potential.

Increase the number of communities using Hazard Mitigation Grants or Pre-Disaster Mitigation Grants.

Improve pre-disaster planning and communication/coordination between federal, state, regional, county, municipal, private, and non-profit agencies and major firms and institutions, especially prisons, colleges, and concentrations of population and employment.

Energy & Emissions

Reduce dependency on foreign fossil fuels. Promote research, development and implementation of standards, policies, and programs to reduce fuel consumption and the increase investments in alternative fuels.

Conserve Natural Resources. The southeastern portion of Massachusetts has seen substantial growth over the past decade. Water demand will be the limiting factor in terms of growth in the region and that water resource must be protected.

Encourage the use of Renewable Energy. Promote the use of renewable energies throughout the Commonwealth, such as solar and wind. Using these sources in place of fossil fuels and nuclear energy reduces the depletion of natural resources and the creation of both toxic and non-toxic wastes.

Promote the increase and enforcement of Corporate Average Fuel Economy (CAFEE) Standards for passenger car and light truck fleets. Automobile manufacturers should be required to meet and exceed CAFE standards for passenger and light truck fleets and should be recognized for doing so.

Continue to enforce the emissions standards set by the Commonwealth. Enforcing the emissions standards for all vehicles of the Commonwealth plays a large role in improving the air quality of the State.

Promote new and forward thinking "green" technologies. The Carl Moyer Program in California is a prime example of how Massachusetts can encourage drivers to replace their old automobiles with newer and less polluting vehicles.

CHAPTER 9
SAFETY

9.0 Introduction

Traveling safety is one of the public's highest expectations from the transportation system. Ongoing coordination among all agencies is necessary to cover the many factors related to maintaining and improving safety, such as, drive skill level, driver impairment, the use of safety equipment, vehicle condition, and road and weather conditions. Incorporating safety into transportation planning often means integrating safety into all aspects of an agency's operations.

9.1 Highway

Although improvements in the fatality rates on our highways have been achieved, the overall yearly number of fatalities remains unacceptable. Approximately 43,000 people lose their lives each year on U.S. roads. In addition, there is the high economic impact of all the motor vehicle crashes each year.

<u>SAFETEA-LU and SHSP</u>

The highway re-authorization bill, SAFETEA-LU of 2005, places greater focus on transportation safety than its predecessors ISTEA and TEA-21. Saving lives is the number one priority of SAFETEA-LU. Our transportation systems also face significant challenges in the areas of homeland security as well as overall safety, congestion, and inter-modal connectivity.

SAFETEA-LU created a new stand-alone program for funding safety projects. This program, Highway Safety Improvement Program (HSIP), is designed to provide states with funds to institute programs that reduce the fatalities and injuries that occur annually on the highway system; reinforce FHWA's safety partnerships; and complement National Highway Traffic Safety Administration (NHTSA) and the Federal Motor Carrier Safety Administration (FMCSA) safety programs.

The HSIP program requires that states have a process in place to analyze highway safety problems, identify opportunities for prevention of hazardous conditions, and produce a list of projects to be funded based upon the analysis and opportunities identified. The FHWA will formulate programmatic guidelines for states including the following components:

- Adoption of strategic and performance-based goals for the Highway Safety Improvement Program (HSIP) that address all roadways within the state and focus on areas of greatest need.
- Advancement of the states' capabilities in traffic records data collection, analysis, and integration with other sources of safety data.
- Provide flexibility to the states to address existing and potential highway safety problems.
- Requirement that states establish an evaluation process to assess the results of safety improve projects and use the results to set priorities for future projects.
- States are to report their progress in implementing safety improvement projects and the effectiveness of the improvements to the Secretary of Transportation.

Massachusetts has adopted the following policies and procedures in response to HSIP implementation, although FHWA programmatic guidelines for HSIP are currently pending.

- A proposed improvement project for a specific intersection must meet certain criteria thresholds to be eligible as a safety project.
- The intersection must appear on the state's top 1000 intersection crash list and experience an above average crash rate or the crash rate must exceed the critical crash rate.
- The project should reduce the number of crashes at the subject intersection location.

In addition, the state has adopted the following policies and procedures:

- The Top 1000 Crash List is based on the state crash records system and is updated periodically.
- Average crash rates are based on a compilation of information from a wide-array of intersections from around the Commonwealth (currently 0.87 crashes/million entering vehicles (C/MEV) for signalized and 0.66 C/MEV for un-signalized).
- Critical Crash Rate, the rate at which an intersection is considered a high crash location, is based on the Rate Control Quality Method [$xp = xc + k * (xc/m)^{0.5} - 1/(2m)$] yielding 1.77 C/MEV for signalized and 1.38 C/MEV for un-signalized intersections.

Ongoing state efforts to improve the HSIP include:

- Refining the Top 1000 Crash List to segregate by location type.
- Improving the crash location data by working with the Governor's Highway Safety Bureau (GHSB), law enforcement, and Registry of Motor Vehicles (RMV).
- Improving of the timeliness of crash data records.
- Completing the crash data system interface with Geographic Information Systems (GIS) and the Road Inventory File (RIF).
- Expanding current roadway volume data.
- Developing of crash rates for location type.
- Establishing an evaluation process of crash reduction factors (pre- and post-improvement crash analyses) and cost-benefit ratio of improvement.

In response to the requirements of SAFETEA-LU, MassHighway has undertaken the development of the Strategic Highway Safety Plan (SHSP). The SHSP will enable MassHighway to fulfill the component requirements of the HSIP process. States that adopt and implement an SHSP are provided additional flexibility to use federal Highway Safety Improvement Program (HSIP) funds for public awareness, education, and enforcement activities otherwise not eligible under this program. SAFETEA-LU states that in order to qualify for flexible safety funding, the state SHSP must be based on a collaborative process that includes the State DOT, the Governor's Representative for Highway Safety, and other major State and local safety stakeholders, including: engineering, education, enforcement, and emergency services. The plan must also include an effective analysis of State crash data.

In order to initiate the development of the Massachusetts SHSP, MassHighway established the Massachusetts Strategic Highway Safety Plan Executive Leadership Committee. This committee is an interagency, intergovernmental committee with a membership from the following: Commissioner, Massachusetts Highway Department; Director, EOT - Office of Transportation Planning; Director, Governor's Highway Safety Bureau; Colonel, Massachusetts State Police; Registrar, Registry of Motor Vehicles; Commissioner, Department of Public Health; President, Massachusetts Chiefs of Police Association; Co-Chairs of the Joint Transportation Committee; Executive Director, Massachusetts Association of Regional Planning Agencies; and Division Administrators of Federal Highway Administration and Federal Motor Carrier Safety Administration; Regional Administrator, National Highway Traffic Safety Administration. On January 19, 2006, MassHighway hosted meetings of the Executive Leadership and the Steering/Advisory Committee, which was established to oversee the development of the plan. The Steering/Advisory Committee drafted a mission statement, a vision, and goals to guide the development of the plan. The members of the Executive Leadership Committee agreed to support MassHighway in its efforts to achieve the Mission, Vision, and Goals. The following Mission, Vision, and Goals have been established:

MISSION: Develop, promote, implement, and evaluate data-driven, multi-disciplinary strategies to maximize safety for users of the roadway system.

VISION: Provide the safest roadway system in the country and promote its safe use.

GOALS: Reverse the increasing trend of traffic-related fatalities and injuries upon implementation of the Massachusetts SHSP (towards zero fatalities and injuries).

- Achieve a 20% reduction from 476 (2004) lives lost in traffic-related fatal crashes by 2010.
- Achieve a 20% reduction from 5,554 (2004) in non-fatal traffic-related injuries requiring hospitalizations by 2010.

Six potential emphasis areas were established to serve as the major components of the Plan. Under each of these areas, multiple safety issues will be examined. The goal of this process is to have a multi-disciplinary team of stakeholders who have knowledge, interest, and experience in addressing the relevant issues of each emphasis area. The action teams are responsible for identifying, evaluating, and recommending strategies to address the following emphasis areas:

- Data Systems (including crash records, EMS data, etc.).
- At Risk Driver Behavior, (including impaired driving, speeding, and occupant protection).
- Infrastructure (including lane departure crashes and intersection crashes).
- Public Education and Media (including how to "market" safety in Massachusetts).
- Leadership (safety program management, including legislative support).
- Vulnerable Transportation System Users (including young drivers, older drivers, mobility needs of diverse populations, pedestrians, bicyclists, and motorcyclists).

Corridors

In order to present, an opportunity for safety agencies at all levels of government to coordinate plans and efforts in saving lives on the road and highway network, the Old Colony Joint Transportation Committee (JTC) sponsored a presentation, and subsequent discussion, on September 14, 2006 by MassHighway safety analysts on lane departure crashes. Lane departure crashes are crashes where the vehicle leaves the roadway but does not strike another moving vehicle, or collides with a parked vehicle, or collides head on with another vehicle. The purpose of the discussion was to identify some of the "hot spot" crash locations in the region and to identify potential strategies to reduce and eliminate crashes at these locations. MassHighway provided OCPC with maps and data on lane departure crashes within the region. Invitations to participation at the meeting were extended to local highway officials, planners, boards of selectmen, local police, and state police. The overall goal of the initiative was to better understand the nature of lane departure crashes and to develop strategies to reduce these crashes. MassHighway presented their data on lane departures in the region and led the discussion at the meeting, which was attended by state police, local police, and highway officials. MassHighway will perform safety audits at the specific problem locations cited by the participants. OCPC staff will finalize the information, when feedback is collected from all OCPC communities, and will then submit the priorities on lane departure locations to MassHighway. Currently, the following corridors have been cited as priorities for lane departure crashes within the region:

- Route 24 - Including Route 24 in all OCPC communities: Stoughton, Avon, Brockton, West Bridgewater, and Bridgewater
- Thatcher Street - In Brockton and East Bridgewater
- The intersection of Prospect Street at North Main Street in Brockton
- Oak Street in Brockton
- Route 123 in Easton
- Route 138 in Easton
- Route 106 in Easton
- The intersection of Depot Street at Turnpike Street at the Easton/West Bridgewater line
- The intersection of Route 106 at Route 36 in Halifax
- The intersection of Route 58 and East Washington Street in Hanson
- Barker Street in Pembroke
- The Route 3A corridor in Kingston and Plymouth

Intersections

The Massachusetts Highway Department maintains a database of crashes occurring in Massachusetts based on crash reports submitted to the Massachusetts Registry of Motor Vehicles. MassHighway compiles a report annually on the top 1000 crash locations in the Commonwealth, as part of its HSIP development. The top 1000 crash locations list is based on a weighted average, with higher weights given to fatal crashes and injury crashes. This data is obtained from the Registry of Motor Vehicles and is based on local and state police crash reports.

The crash data provides information about each crash, including: the time of day the crash occurred; the number of people injured; the number of people killed; the direction of travel of vehicles involved; weather and lighting conditions at time of crash; the type of crash; and other pertinent location information. OCPC uses this data to discern trends in crashes and to develop a list of top 100 crash locations for the region. The frequency of types of crashes and the frequency of crashes at certain locations provides insight into crash exposure and helps to determine safety needs.

The weighted crash average is calculated to reflect the severity of crashes at intersections. The Weighted Crash Average is a numeric calculation derived by assigning a value of 1 for all crashes involving property damage only, 5 for all crashes that involve personal injury, and 10 to all crashes that result in a fatality.

Table 9-1 summarizes the top 100 high crash locations in the region based on MassHighways' crash database. This list of hazardous intersections is prioritized by the highest weighted average, utilizing the same weighted methodology used by MassHighway. Table 9-1 is based on the latest available data for the region (years 2003, 2004, and 2005). The latest available MassHighway Top 1000 High Crash Locations Report, which includes OCPC intersections, uses data from 1999, 2000, and 2001; therefore, OCPC researched the MassHighway database independently to derive the top 100 hazardous locations in the region in order to use more up to date crash data for this report.

Table 9-1 Most Hazardous Intersections in the Old Colony Region (2003-2005)

Rank	City/Town	Intersection	Number of Crashes	*Traffic Control	Property Damage Only	Injury Crashes	Fatal Crashes	Avg.
1	Brockton	West Elm Street / Ash Street	61	SS	25	36	0	**205**
2	Brockton	West Elm Street / Belmont Avenue	48	SS	13	34	1	**193**
3	Brockton	Crescent Street (Route 27) / Lyman Street	48	S	19	28	1	**169**
4	Brockton	West Elm Street / Newbury Street	53	SS	25	28	0	**165**
5	Brockton	North Main Street / Oak Street / Howard Street	54	S	27	27	0	**162**
6	Brockton	Reynolds Memorial Highway (Route 27) / Westgate Drive	62	S	38	24	0	**158**
7	Brockton	Belmont Street (Route 123) / Manley Street	48	S	23	25	0	**148**
8	East Bridgewater	Bedford Street (Route 18) / West Street (Route 106) / East Street	59	S	37	22	0	**147**
9	Brockton	Pleasant Street (Route 27) / Warren Avenue / North Warren Avenue	61	S	41	20	0	**141**
10	Brockton	North Montello Street (Route 28) / Howard Street (Route 37) / Albion Street	53	S	33	20	0	**133**
11	Brockton	Centre Street (Route 123) / Legion Parkway (Route 123) / Main Street	46	S	25	21	0	**130**
12	Brockton	Belmont Street (Route 123) / Pearl Street	48	S	28	20	0	**128**
13	Brockton	Court Street (Route 27) / Main Street / Pleasant Street (Route 27) / North Main Street	38	S	16	22	0	**126**
14	Brockton	Belmont Street (Route 123) / Belmont Avenue / Manomet Street	34	SS	11	23	0	**126**
15	Brockton	Centre Street (Route 123) / Quincy Street	47	S	29	18	0	**119**
16	Brockton	Main Street / Nilsson Street	46	SS	28	18	0	**118**
17	Brockton	North Montello Street (Route 28) / East Ashland Street	42	S	23	19	0	**118**
18	Brockton	North Main Street / East Ashland Street / West Ashland Street	40	S	21	19	0	**116**
19	Brockton	North Pearl Street (Route 27) / Oak Street Extension	43	S	25	18	0	**115**
20	Brockton	Belmont Street (Route 123) / West Street	33	S	13	20	0	**113**
21	Abington	Bedford Street (Route 18) / Brockton Avenue (Route 123)	44	S	27	17	0	**112**
22	Stoughton	Washington Street (Route 138) / Central Street	58	S	45	13	0	**110**
23	Pembroke	Washington Street (Route 53) / Columbia Road (Routes 53 & 139) / Schoosett Street (Route 139)	36	S	19	16	1	**109**
24	Brockton	Warren Avenue / West Elm Street	36	S	18	18	0	**108**
25	Abington	Bedford Street (Route 18) / North Avenue (Route 139) / Randolph Street (Route 139)	67	S	57	10	0	**107**
26	Plymouth	Long Pond Road / South Street / Pilgrims Highway (Route 3)	36	S	19	17	0	**104**
27	Brockton	Montello Street (Route 28) / Centre Street (Route 123)	38	S	23	15	0	**98**
28	Brockton	Montello Street (Route 28) / Court Street (Route 27) / North Montello Street (Route 28)	38	S	24	14	0	**94**
29	Brockton	North Montello Street (Route 28) / Field Street / Livingston Road	29	SS	13	16	0	**93**
30	Stoughton	Canton Street (Route 27) / School Street	41	SS	28	13	0	**93**
31	Whitman	Bedford Street (Route 18) / Auburn Street (Route 14)	47	S	37	9	1	**92**
32	East Bridgewater	Franklin Street (Route 27) / Oak Street (Route 14) / West Washington Street (Route 14)	43	SS	31	12	0	**91**
33	Avon	Harrison Boulevard / West Main Street	26	S	10	16	0	**90**
34	Brockton	Centre Street (Route 123) / Plymouth Street	34	FB	20	14	0	**90**
35	Plymouth	Samoset Street / Pilgrims Highway (Route 3) / Samoset Street (Route 44)	34	S	20	14	0	**90**
36	Brockton	Belmont Street (Route 123) / AmVets Memorial Highway (Route 24)	34	Yield	20	14	0	**90**
37	Brockton	Montello Street (Route 28) / Grove Street	25	S	9	16	0	**89**
38	Brockton	North Cary Street / East Ashland Street	37	S	24	13	0	**89**
39	Brockton	Pleasant Street (Route 27) / Ash Street / North Ash Street	31	SS	17	14	0	**87**
40	Easton	Eastman Street (Route 106) / Foundry Street (Route 123)	39	S	27	12	0	**87**
41	Brockton	Oak Street / Reservoir Street / Oak Street Extension	22	S	6	16	0	**86**
42	Bridgewater	Pleasant Street (Route 104) / AmVets Memorial Highway (Route 24)	30	None	16	14	0	**86**
43	Brockton	Belmont Street (Route 123) / Linwood Street	34	SS	21	13	0	**86**

Table 9-1 Most Hazardous Intersections in the Old Colony Region (2003-2005)(continued)

Rank	City/Town	Intersection	Number of Crashes	*Traffic Control	Property Damage Only	Injury Crashes	Fatal Crashes	Avg.
44	Brockton	Forest Avenue / Bouve Avenue / Manomet Street	32	SS	19	13	0	**84**
45	Stoughton	Lindelof Avenue (Route 139) / Technology Center Drive / Kay Way	35	S	23	12	0	**83**
46	Brockton	Pleasant Street (Route 27) / Reynolds Memorial Highway (Route 27)	29	S	17	11	1	**82**
47	Abington	Plymouth Street ((Route 58)) / Central Street	30	S	17	13	0	**82**
48	Brockton	Belmont Street (Route 123) / Forest Avenue	30	S	17	13	0	**82**
49	Whitman	Bedford Street (Route 18) / Temple Street (Route 27)	45	S	36	9	0	**81**
50	Easton	Foundry Street (Route 106) / Turnpike Street (Route 138)	32	S	20	12	0	**80**
51	Brockton	Montello Street (Route 28) / Lawrence Street	20	S	5	15	0	**80**
52	Brockton	Court Street / Cary Street / North Cary Street / Provost Street	19	S	4	15	0	**79**
53	Brockton	Pleasant Street (Route 27) / West Street	34	S	23	11	0	**78**
54	Brockton	Oak Street / Battles Street	24	S	12	11	1	**77**
55	Brockton	Pleasant Street (Route 27) / Belmont Avenue / Augusta Avenue	29	SS	17	12	0	**77**
56	Brockton	West Chestnut Street / Liberty Street	24	S	11	13	0	**76**
57	Brockton	North Quincy Street / East Ashland Street	24	SS	11	13	0	**76**
58	Stoughton	Pleasant Street (Route 139) / Central Street	35	S	25	10	0	**75**
59	Brockton	Ash Street / Forest Avenue	22	S	9	13	0	**74**
60	Kingston	Main Street (Route 106) / Summer Street (Route 3A)	34	FB	24	10	0	**74**
61	West Bridgewater	North/South Main Street (Route 28) / East/West Center Street (Route 106)	34	S	24	10	0	**74**
62	Pembroke	Church Street (Route 139) / Oak Street	26	S	14	12	0	**74**
63	Brockton	Pearl Street / West Chestnut Street	21	SS	9	11	1	**74**
64	Brockton	Main Street / Perkins Avenue / South Street	25	S	13	12	0	**73**
65	Brockton	Warren Avenue / Forest Avenue	27	S	16	11	0	**71**
66	Avon	East Main Street (Route 28) / East Spring Street / West Spring Street	27	FB	16	11	0	**71**
67	Brockton	Crescent Street (Route 27) / Quincy Street	31	S	21	10	0	**71**
68	Kingston	Duxbury Road (Route 3A) / Summer Street (Route 53)	22	S	11	10	1	**71**
69	Stoughton	Central Street / Pearl Street	39	S	31	8	0	**71**
70	Brockton	Belmont Street (Route 123) / Clinton Avenue / Cottage Street	19	SS	6	13	0	**71**
71	Whitman	Washington Street / Park Avenue / West Street	26	FB	15	11	0	**70**
72	Brockton	North Montello Street (Route 28) / East Battles Street	25	SS	14	11	0	**69**
73	Plymouth	Court Street (Route 3A) / Samoset Street (Route 44) / North Park Avenue	25	S	14	11	0	**69**
74	Brockton	Reynolds Memorial Highway (Route 27) / North Pearl Street (Route 27)	29	S	19	10	0	**69**
75	Stoughton	Turnpike Street (Route 139) / Page Street	33	S	24	9	0	**69**
76	Bridgewater	Broad Street (Route 18) / Main Street (Route 28) / Summer Street (Route 104) / Central Square	33	S	24	9	0	**69**
77	Brockton	Warren Avenue / Legion Parkway / Highland Street	21	S	9	12	0	**69**
78	Brockton	Belmont Street (Route 123) / Warren Avenue	24	S	13	11	0	**68**
79	Brockton	West Street / West Elm Street	27	S	18	8	1	**68**
80	Brockton	West Elm Street / Moraine Street	20	SS	8	12	0	**68**
81	Brockton	North Main Street / Battles Street / East Battles Street	23	S	12	11	0	**67**
82	East Bridgewater	Bedford Street (Route 18) / Whitman Street (Route 106)	27	S	17	10	0	**67**
83	Easton	Washington Street (Route 138) / Purchase Street	22	SS	11	11	0	**66**
84	Brockton	Warren Avenue / West Chestnut Street	22	SS	11	11	0	**66**
85	Pembroke	School Street (Route 27) / Center Street (Route 36)	25	S	16	8	1	**66**
86	Brockton	Commercial Street (Route 27) / Perkins Street / Crescent Street (Route 123)	26	S	16	10	0	**66**
87	Brockton	Bartlett Street / Fuller Street	14	SS	1	13	0	**66**

Table 9-1 Most Hazardous Intersections in the Old Colony Region (2003-2005)(continued)

Rank	City/Town	Intersection	Number of Crashes	*Traffic Control	Property Damage Only	Injury Crashes	Fatal Crashes	Avg.
88	Bridgewater	Pleasant Street (Route 104) / Elm Street / Old Pleasant Street	21	S	10	11	0	**65**
89	Brockton	Centre Street (Route 123) / Sheridan Street / Gladstone Street	17	SS	5	12	0	**65**
90	Stoughton	Central Street (Route 27) / Island Street	28	SS	19	9	0	**64**
91	Brockton	North Quincy Street / Chestnut Street / Boundary Avenue	19	SS	9	9	1	**64**
92	Brockton	Warren Avenue / Market Street	23	SS	13	10	0	**63**
93	East Bridgewater	Plymouth Street (Route 106) / Washington Street / Old Plymouth Street	23	SS	13	10	0	**63**
94	Brockton	Grove Street / Clinton Street / Curve Street	19	SS	8	11	0	**63**
95	Brockton	North Main Street / Wyman Street	17	SS	6	11	0	**61**
96	Brockton	North Warren Avenue / Spring Street	17	SS	6	11	0	**61**
97	Brockton	Torrey Street / West Street	21	S	11	10	0	**61**
98	Kingston	Cranberry Road / Independence Mall Way / Pilgrim Highway (Route 3)	24	S	15	9	0	**60**
99	Kingston	Duxbury Road (Route 3A) / Pilgrim Highway (Route 3)	28	Yield	20	8	0	**60**
100	Brockton	Warren Avenue / Nilsson Street	19	SS	9	10	0	**59**

*S = Signal, SS = Stop Sign, FB = Flashing Beacon

** This data relies on only accidents reported and defined by severity*

DATA SOURCE: MassHighway Traffic Operations, and Safety Management Unit

Information on fatal crashes in the region was compiled from MassHighway crash data. The information compiled from the data was specific to discern, as much as possible, the types, locations, and circumstances concerning the crashes, with the purpose of finding the root causes of fatal crashes. It is expected that an understanding of these causes will lead to specific improvements that can prevent future fatalities in motor vehicle crashes in the region. Table 9-2 shows the number of fatal crashes in OCPC communities for the period between 1990 and 2005.

Table 9-2
Fatal Crashes in the Region 1990 - 2005

Community	Angle	Bicycle	Head On	Pedestrian	Rear End	Ran off road	Side swipe	Unknown	Total
Abington	5	0	5	2	1	7	0	1	21
Avon	3	0	3	3	2	1	1	1	14
Bridgewater	7	0	3	3	0	12	0	0	25
Brockton	32	1	11	22	2	41	1	8	118
East Bridgewater	3	0	2	4	0	2	0	1	12
Easton	3	0	8	1	0	16	0	1	29
Halifax	1	0	1	1	1	5	0	0	9
Hanson	1	0	3	2	0	7	0	1	14
Kingston	2	0	3	3	2	9	0	1	20
Pembroke	3	2	6	2	0	12	0	0	25
Plymouth	11	1	9	5	4	35	0	2	67
Plympton	2	0	1	0	0	2	0	1	6
Stoughton	9	2	0	7	2	10	2	0	32
West Bridgewater	3	0	1	5	1	9	0	0	19
Whitman	0	0	2	5	0	1	1	0	9
Totals	85	6	58	65	15	169	5	17	420

The City of Brockton experienced the most crashes that resulted in fatalities within the study time-period with 118 crashes. Plymouth had the second highest with 67 fatal crashes. Stoughton had 32, the third most highest, followed by Easton with 29, and Pembroke and Bridgewater each with 25. Abington had 21 fatal crashes, Kingston had 20, and West Bridgewater had 19 fatal crashes within the study period. Hanson and Avon each had 14 fatal crashes, followed by East Bridgewater with 12. Halifax and Whitman each had nine fatal crashes and Plympton had the least with six within the study time-period. In all, the OCPC communities experienced 420 fatal crashes between 1990 and 2005. Some of these crashes resulted in multiple deaths, therefore there were 445 fatalities that occurred due to the 420 crashes between 1990 and 2005.

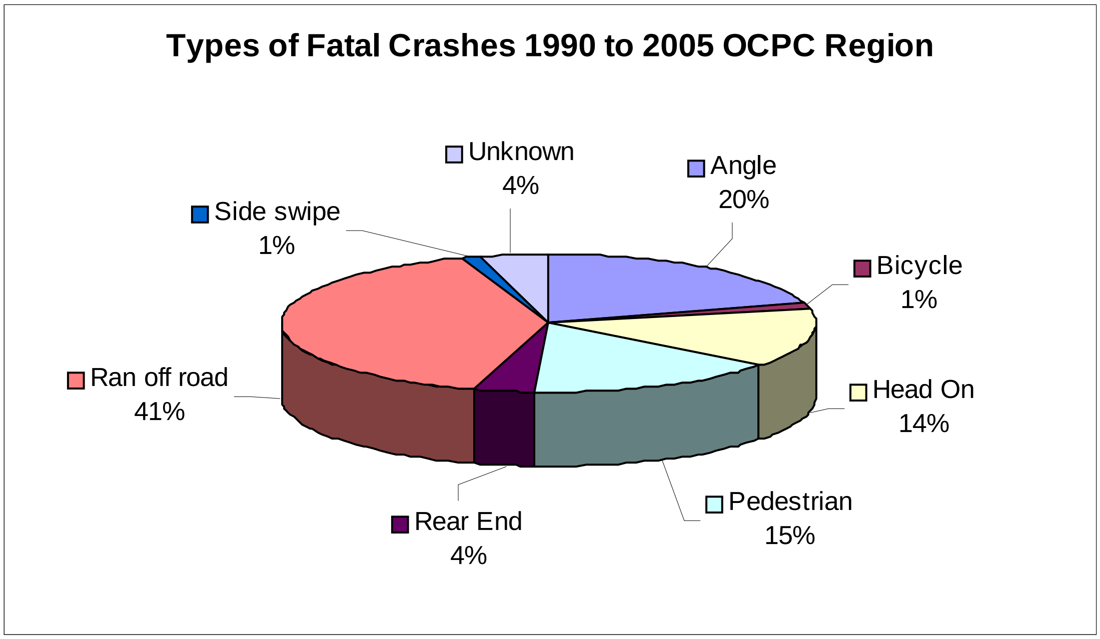
Table 9-2 shows that there were 169 ran off the road type crashes that resulted in fatalities, 85 angle fatal crashes, 65 vehicle crashes that resulted in pedestrian deaths, and 58 fatal head-on collisions during the study period. There were 17 fatal crashes that were reported as unknown, 15 rear-end fatal collisions, six fatal collisions with a bicyclist, and five sideswipe collisions.

Communities with major arterials, including Route 24 and Route 3, experienced higher numbers of fatal crashes, since many of the crashes occurred along these limited access highways, and on the ramps that connect them to the roadway system, due to higher speeds and higher volumes, which lead to higher exposure. Arterials and collectors that serve rural and suburban areas also experience high numbers of fatalities due to “ran off the road” type crashes that occur due to winding curves and limited sight distances. Some of these roads such as Route 106 in Kingston, Turnpike Street in West Bridgewater, North Cary Street in Brockton, and Bay Road in Easton, which were in existence before the prevalent use of the automobile, are not able to provide for safe travel at higher speeds due to limitations in the geometric design. These hazardous situations become amplified in those cases where driving conditions are slippery or the driver is impaired due to alcohol or lack of sleep. Pedestrian fatalities occurred in either urban situations, such as Brockton, or suburban situations whereby pedestrians were attempting to cross major high-speed, high-volume arterials.

Brockton led the OCPC communities regarding pedestrian fatalities with 22, Stoughton was second with seven, and Plymouth, West Bridgewater, and Whitman each had five pedestrian fatalities within the study area time period. All OCPC communities experienced pedestrian fatalities within the fifteen-year period except for Plympton. Some of these deaths were due to pedestrians being struck on high speed, limited access facilities such as Route 3 and Route 24 in Pembroke, Brockton, and West Bridgewater; however, most of the pedestrian fatalities occurred on facilities through urbanized areas, and on major arterials that have experienced commercial and residential growth. These facilities, such as Route 28 in Avon and Washington Street and Turnpike Street in Stoughton, combine higher speed through traffic (35 to 50 miles per hour) with increased commercial and residential activities. Although the preferred mode of choice along these routes is the automobile, pedestrian activity has increased and, in general, there are no pedestrian amenities such as sidewalks, crosswalks, or pedestrian signals available to accommodate pedestrian activity on these types of roads.

Figure 9-1 shows the types of fatal crashes in the region. Lane departure crashes (ran of the road, sideswipe, and head-on) make up the highest percentage of fatal crashes (total 56 percent.) Angle type crashes, which usually occur at intersections, but sometimes occur along a roadway at curb cuts, make up the second highest percentage of crashes (20 percent.) Crashes involving pedestrians also account for a significant percentage of fatal crashes with 15 percent of all fatalities involving a motor vehicle collision with a pedestrian. There were four percent rear-end fatal type crashes and four percent fatal crashes reported with unknown crash type occurring within the study time period. Bicycle fatalities make up the least percentage of fatal crashes in the region with one percent occurring in the study time-period.

Figure 9-1



<u>Evaluation Criteria</u>

An evaluation process to prioritize transportation projects included in the Transportation Improvement Program (TIP) was implemented several years ago. Among the criteria utilized as part of the effort, are safety and security.

<u>Highway Safety Patrols</u>

The term "highway safety patrols" is traditionally referring to state troopers patrolling state highways. However, in Massachusetts, that term also refers to the MassHighway's CaresVans program. Specially equipped vehicles patrol four different routes along 332 miles of interstate and express highways in the Boston region to aid motorists with disabled vehicles.

9.2 Transit

The Commonwealth's regional transit authorities and the Massachusetts Bay Transportation Authority (MBTA) maintain rigorous programs to ensure the safety of employees, passengers, and the general public. These programs range Because of safety concerns, EOT discourages the establishment of any new at-grade rail crossings in the state. EOT is also seeking to reduce the number of at-grade crossings by working with towns to consolidate crossings that are in close proximity to each other.

Due to the nature of safety and security for the MBTA's transit system, many safety initiatives also have a security aspect to them. The reverse relationship is, of course, true as well. Security cameras, as an example, could also be called safety cameras, because they provide both safety from an assailant in an isolated area of a train station, as well as provide security from a would-be terrorist on a train platform or a bus.

All of the grade crossings are equipped with audible and visual warnings systems for motorists and pedestrians. However, the pedestrian crossings at the stations and a single crossing in East Bridgewater do not have physical barriers to protect vehicles or pedestrians. The single crossing in East Bridgewater is an unused spur that serves the former Shaw's warehouse and is not owned by the MBTA. The pedestrian grade crossings are located at the Montello, Brockton, Whitman and Halifax stations.

Other physical barriers include fencing, soundproofing, jersey barriers and gates to reduce the potential for right of way intrusions. These barriers require regular upkeep to maintain their ability to deter unauthorized activates along the right of way. The MBTA stations and layover yards are lighted during times of darkness with additional security protection added to the layover yards.

MBTA Police Department

Through a combination of approximately 250 uniformed and plainclothes police officers, the MBTA Police Department carries out its primary mission of maintaining safety within the MBTA transit system. The MBTA police accomplish this through mobile, line, and canine patrol teams on both scheduled and random patrols, all of which serve to maintain a high degree of visibility within the system. 115 police officers, four police substations, and 15 police kiosks are assigned to the Blue, Green, Orange, and Red Lines, while additional surface patrols provide support to buses and commuter rail.

The three primary components of its safety operations are:

- Community Policing Patrol Plan
- Investigation and Prosecution (arrests and trials)
- Police Community Relations (public outreach)

MBTA Safety Department

The primary role of the MBTA Safety Department is to ensure the safety of its employees, its customers, and members of the general public throughout the MBTA system. In order to accomplish this, the MBTA Safety Department designs, implements, supports, and monitors safe work practices for and among its employees, whether they are working in MBTA vehicles and facilities or on MBTA property and rights-of-way. These safe practices are outlined in the MBTA's System Safety Program Plan and their Safety Policies and Procedures Manual.

Examples of the types of activities conducted by the MBTA Safety Department include:

- Right-of-Way Safety Training
- Tracking Accidents
- Operation Lifesaver
- Safety Audits
- Safety Hazard Correction
- Safety Drills

MBTA Security Cameras

The MBTA will increase the number of surveillance and security cameras in the subway system by an additional 186, bringing the total number operating in the subway system to 488. This will provide a security camera in every subway station in the entire system. The cameras will be monitored from a number of different locations, including the MBTA Operations Control Center, the Transit Police Department, and the Massachusetts Emergency Operations Center in Framingham.

In addition, the MBTA has embarked upon a program of installing security cameras in new buses. There is also a strong surveillance component to the MBTA's Station Management Program, which includes the

Automated Fare Collection System Project, the Hub Stations Project, and the Wide Area Network Project. The Hub Stations and Wide Area Network Projects surveillance components consist of closed-circuit television cameras and the fiber optic cable required connecting them to their monitors.

Grade Crossing Redesign

Improving grade crossing safety has long been one of the top priorities of the Federal Railroad Administration. From 1995 to 2004, the number of grade-crossing collisions declined by 3%, the frequency of such collisions per million train miles decreased by 42%, and the number of fatalities fell by 36%. During the first 11 months of 2005, grade crossing collisions were down 5.1%, and fatalities declined 5.3% compared to the same period of 2004. In Massachusetts, funding exists under the Section 130 Program of MGL Chapter 160 for the upgrading and improving of railroad crossings.

Advanced Warning Techniques

The Commonwealth of Massachusetts, the MBTA, and a majority of those in the railroad industry agree that the use of locomotive horns helps to promote safety at highway-rail grade crossings. Although the custom in Massachusetts is for trains to blow their horns at highway-rail grade crossings, horn bans have been created by the legislature in many communities. The MBTA complies with these bans within those communities. Like other transit property owners across the United States, the MBTA continues to await the implementation of Federal Railroad Administration regulations on the use of train locomotive horns at highway-rail grade crossings.

Meanwhile, the MBTA has taken steps to improve safety at its 200 public highway-rail grade crossings. Included among these steps is an investment in automatic warning systems, such as crossing gates, both two-way and four-way, flashing lights, and warning bells, to be installed on almost all of the public grade crossings used by the MBTA. A MBTA demonstration project was recently completed for the Federal Transit Administration using four-quadrant gates and motor vehicle detection systems at grade crossings on the Old Colony Line.

Communications Interoperability

One of the issues facing the MBTA in its safety emergency response planning is that of interoperability. Interoperability is defined as the ability of radio equipment belonging to one department’s emergency first responders to communicate with that of another department’s first responders. Currently, radio coverage inside MBTA subway system tunnels does not meet these operational standards. This affects the response capabilities of not only the Boston and Cambridge Fire Departments, but both cities’ police departments, emergency medical services, and the MBTA Police Department. Interoperability affects nearly every community in the Commonwealth. The MBTA is working with other members of the State Interoperability Committee to explore this issue and develop solutions to improve radio communications.

Operation Lifesaver

Operation Lifesaver is an educational program created to stop deaths, injuries, and crashes at railroad grade crossings and along railroad rights-of-way. Crashes between trains and trucks are especially harmful, as they typically result in mass-casualty scenarios. As so much of the hazardous material transported in the United States is moved by truck, the reduction of grade crossing collisions for this type of vehicle is especially important.

9.3 Bicycle and Pedestrian Safety

Bicycle Crashes

In 2003, 622 bicyclists were killed and an additional 46,000 were injured in traffic crashes in the United States. Cyclists accounted for 1 percent of all traffic fatalities and 2 percent of all persons injured in crashes in the United States in 2003. In Massachusetts, the percent of cyclists among all traffic fatalities is higher than the national average: 2.4 percent, or 1.71 cyclist fatalities per million in population. Perhaps a major reason for the higher rate in Massachusetts is the urban nature of development in the state, particularly in the eastern half. According to the National Highway Traffic Safety Administration (NHTSA), cyclist fatalities occurred much more frequently in 2003 in urban areas (69 percent urban areas verse 31 percent elsewhere).

While the average age of cyclists killed in the nation is increasing (35.8 years in 2003 vs. 27.8 in 1993), still over one-fifth of cyclists killed in 2003 were children between the ages of 5 and 15 years old.

Locally within the region, cyclists suffered 1.4 percent of traffic fatalities between 1990 and 2005.

Crashes Involving Pedestrians

In 2003, 4,749 pedestrians were killed in traffic crashes in the United States, an average of one pedestrian killed every 111 minutes. In addition, 70,000 pedestrians were injured in traffic crashes that same year, an average of a pedestrian hurt in a traffic crash every 8 minutes. Eighty-six (86) of those 4,749 pedestrians killed in 2003 occurred in traffic crashes on Massachusetts roads. Overall, 18.6 percent of the State’s traffic fatalities in 2003 were pedestrians.

Like cyclists fatalities, pedestrians are much more likely to be killed in urban areas. Seventy-two (72) percent of pedestrian fatalities in 2003 occurred in an urban area, and 79 percent occurred away from intersections. Approximately one-forth of pedestrians killed in 2003 were children between 5 and 9 years old, and one-fifth were under 16 years old.

Within the Old Colony region, 65 of the 420 (15.5 percent) persons killed in traffic crashes between 1990 and 2005 were pedestrians.

Bicycle Transportation Design

Paths for bicyclists (which generally also serve other non-motorized users) supplement the roadway network. Roadway design should consider these factors to best accommodate bicyclists:

- Providing width sufficient for motorists to pass bicyclists without changing lanes or crossing the centerline on high speed and/or high volume roads.
- Removing roadway obstacles that could cause bicyclists to crash.
- Directing bicyclists to scenic and low traffic routes by guide signs and/or pavement markings.
- Providing signalized crossings of major roadways when warranted for those who are not comfortable making left turns in heavy traffic.

When bicycles are used on public streets and roads, bicyclists are subject to the same traffic laws as motor vehicle operators with some exceptions as noted in the Massachusetts General Laws.

Road construction projects in the Old Colony region should be designed and constructed in accordance to the MassHighway Project Development and Design Guide, and controls built to standards set forth in the Manual On Uniform Traffic Controls, to best accommodate bicyclists.

Pedestrian Transportation Design

Road construction projects in the Old Colony region should be designed and constructed in accordance to the MassHighway Project Development and Design Guide, and controls built to standards set forth in the Manual On Uniform Traffic Controls, to best accommodate pedestrians of all types.

Safe Routes To School

The Massachusetts Safe Routes to School program promotes healthy alternatives for children and parents in their travel to and from school. The SRTS program educates students, parents and community members on the value of walking, bicycling, carpooling, and taking public transit and the school bus for travel to and from school.

The Safe Routes to School program elements, education, encouragement, enforcement, engineering, and evaluation ensure a comprehensive and successful program to increase walking and bicycling to and from school.

- Education Teaching children and parents about the broad range of transportation choices, instructing them in important lifelong bicycling and walking safety skills, creating awareness among drivers near schools, and improving the health benefits of our children through regular exercise.
    - Physical Health
    - Environmental Health
    - Safety

- Encouragement Using events and activities to promote healthy transportation alternatives.
    - Walking
    - Bicycling
    - Multi-family carpooling
    - Riding the bus

- Enforcement Partnering with local law enforcement to ensure traffic laws are obeyed in the vicinity of schools (this includes enforcement of speeds, yielding to pedestrians in crossings, and proper walking and bicycling behaviors), and initiating community enforcement such as crossing guard programs.
    - Creating awareness
    - Changing driver behavior
    - Offering safety training

- Engineering Creating operational and physical improvements to the infrastructure surrounding schools that lower speeds, reduce potential conflicts with traffic, and establish safer and fully accessible crossings, walkways, trails, and bikeways.
    - Improvement to physical environments
    - Safer routes for children

- Evaluation Monitoring outcomes and documenting trends through data collection before and after Safe Routes activities.

- Student Hand Survey
- Parent Survey
- Walkability Checklist
- Bikability Checklist

To assist with implementing this program, OCPC has been distributing program materials to the communities in the planning region. Recipients (over 175) of the materials include chief elected officials, planners, police chiefs, school superintendents, principals, school committees, planning boards. Presentations by MassRides have been provided at meetings of the Joint Transportation and Metropolitan Planning Organization.

9.4 Recommendations

Reduce the rates of motor vehicle, bicycle, and pedestrian fatalities by incorporating engineering, enforcement, education, and emergency response into the planning process.

Support the increase of safety of highway & railroad grade crossings and other locations where modes intersect.

Support the increase and improvement of safety of services, vehicles and facilities for transit, and for the transportation disadvantages.

Support the implementation of emergency response and evacuation plans in cooperation with emergency management agencies.

Continue to utilize safety performance measures in the planning process.

Broaden the awareness of safety issues through dissemination of messages o the public and elected officials.

Identify top lane departure and crash location and work at the local and regional levels to develop and implement location specific strategies to mitigate the deficiencies.

Expand the Safe Routes to School Program.

Support the increase of seat belt use in the State.

Increase the awareness of the dangers of speeding.

CHAPTER 10
SECURITY

10.0 Introduction

Securing the transportation system from threats and disruptions is an overarching concern for all transportation providers. Traditionally, the greatest threats to the safety of these networks were the vehicles operating within the transportation systems themselves. Intricate infrastructure systems and standards have been adopted to prevent accidents, mitigate unsafe weather conditions, allow for safe handling of hazardous materials and otherwise provide a safe, efficient transportation network that is available to all.

According to the Federal Transit Administration, transit security refers to measures taken to protect a recipient's employees and the public against any intentional act or threat of violence or personal harm, either from a criminal or terrorist act. These actions include, but are not limited to, deploying surveillance technology and security personnel along routes and at stations, implementing security training programs for employees and security awareness programs for the public, and conducting inspections of facilities and passengers. Decisions to provide a greater level of security at some but not all of a recipient's fixed guideway stations in its area or along some but not all of a recipient's transit routes should be based on neutral criteria such as an assessment of security threats to facilities, data showing higher levels of criminal activity at certain facilities or in vehicles traveling along certain routes, or objective information that leads officials to believe that certain facilities or routes are more likely to be at risk. Policies associated with observing suspicious activity should ensure that suspicious activity is observed without regard to race, color, or national origin.

Safety and security are concerns that affect everyone on the region. Vukan R Vuchic in his book *Urban Transit: Operations, Planning and Economics* outlines some concerns about safety and security that are applicable to the region. Items to consider in the safe operation of fixed route transit are: Vehicle performance, bus body design and strength, fire prevention and resistance, driver training and performance, conditions along the routes, bus stop design and operations, communication with control center, and the utilization of ITS. Fixed route transit providers keep many of these topics in mind when planning for the safety and security of their operations.

Vuchic also outlines guidelines for security of transit operations, which can be summarized as passenger security, employee security and the protection of revenues, which includes external theft, internal theft and fare evasion. BAT's has a philosophy similar to Vuchic, believing safety and security is to protect employees, passengers, assets and revenues. BAT carries this philosophy out through various mechanisms such as employee training, participation in emergency and pandemic drills, the development of continuity of operations plans; uniformed and plain-clothes transit patrols, and, the review of trends on complaints and physical damage so they can be informed and up to date on trends in the system.

10.1 Security Practices at the Regional Transit Authorities

The Regional Transit Authorities (RTAs) have moved forward with their security planning, developing both preemptive and prescriptive programs. Ranging from active discussions at security roundtables to applications for federally funded grant programs, the RTAs have taken an active role in the joint effort by transportation providers to protect the Commonwealth. Key areas that Brockton Area Transit focuses on include the protection and security of passengers, employees, assets, and revenues. National Incident

Management (NIM) training been undertaken by several employee in an approach to prepare for emergency situation where coordination among multiple agencies and departments will be essential.

In 2007, the RTAs continued the "See Something, Say Something" program. This statewide program, which is consistent with the MBTA's Transit Watch described above, distributed 120,000 educational brochures explaining procedures that passengers should undertake if they see suspicious activities. Agencies also performed driver awareness exercises and broadcast messages to improve passenger responsiveness should an incident occur.

Another important element of the security integration involves the help that can be provided by its customers through such programs as Transit Watch. Through a broad-based public outreach effort, Transit Watch seeks to increase the security awareness of the public and includes regular station announcements, advertisements on buses and trains, and pamphlets distributed to riders that inform the public how they can work with transit employees to contribute to a safer transportation system.

In addition, through a federal grant each RTA received a "Go Kit" containing emergency equipment to be used in case a safety or security event occurs. Each of the RTAs also developed a Continuity of Operations Plan for reactive procedures should a safety and security event occur. The plans included procedures for RTAs to implement their administrative offices are deemed unusable, including communication chains to ensure coordination of efforts.

10.2 Human Resource Protection and Safety

BAT and GATRA provide extensive service in the Old Colony Region. BAT and GATRA both operate with human resources to include employees and passengers. For these agencies, the protection and safety of their passengers is their first priority.

BAT and GATRA have contingency plans and local interagency agreements to coordinate emergency and disaster response plans. Examples include evacuation requirements for local elderly populations and blood dialysis operations. The agencies also plan an important safety role for the Pilgrim Nuclear Power Plant emergency response plan.

BAT's Intermodal Centre represents a confluence of transportation resources at a single location. The safety and security of the passengers at the Intermodal Centre and along BAT routes in the communities of Avon, Abington, Brockton, Easton, and Stoughton is a great responsibility. This responsibility is passed to the employees and riders of BAT through an active passenger education program. Programs such as Transit Watch encourage both passengers and employees to become aware of their surroundings and report suspicious behavior or activity. Additional employee-training programs are updated annually through the BAT safety and training manager.

10.3 Education

BAT's education efforts primarily focus on employee training. Efforts include the distribution of emergency preparedness training materials, safety education classes and classes on the handling of passengers during an emergency or disturbance.

10.4 Local Community Training

BAT provides evacuation services to the local communities in its service area as well as services to the Pilgrim Power Plant in Plymouth. Training on equipment familiarity is conducted with local fire departments within the fixed route service area. Fire department personnel are trained in responding to bus accidents and medical emergencies aboard fixed route and paratransit vehicles.

10.5 Physical Resource Protection and Safety

BAT's physical resources include over one hundred vehicles, three buildings, one parking structure and several bus shelters along fixed transit routes in Brockton. The safety of passengers at these facilities requires vigilance and protective actions to reduce the likelihood of incidents harming passengers and employees alike. The BAT Intermodal Centre is patrolled regularly by a police detail hired to protect the Centre. The detail also provides onboard route protection based on the conditions.

BAT has also hosted the National Transit Institutes Terrorist Activity and Recognition and the Workplace Safety and Security classes for its employees.

<u>Massachusetts Bay Transportation Authority</u>

Last year, the MBTA and the Kingston Fire Department conducted an emergency response training exercise at the Kingston Commuter Rail Station. This full scale emergency response exercise involved a simulated collision causing a derailment and injuries to customers. The simulated collision also caused a diesel fuel tank to rupture thus presenting a hazardous materials condition. Such exercises are conducted to ensure an efficient and professional operational response to an emergency.

The MBTA, in its Fiscal Years 2007-2012 Capital Investment Program, states, "Transit security is an essential aspect of ensuring a safe environment throughout the transit system."

Transit system security is a regional concern. Issues to be addressed in planning for transit security are the age of the system, the types of structures comprising the system, the vulnerability of those structures, the lack of redundant and/or alternate system components and/or capacity, and the increased requirements (over and above personal safety requirements) to provide for anti-terrorism security.

The Secure Stations Initiative is one of the MBTA's programs to enhance its system wide operational security by improving its communications and security systems. This is a requirement of both the Massachusetts State Homeland Security Strategy and the Regional Transit Security Strategy. The Regional Transit Security Strategy was developed by the Regional Transit Security Working Group and is discussed below.

Any new construction, reconstruction, enhancement, or modernization project will include installation or upgrades to the following communications systems:

- closed-circuit television
- public address
- variable message sign
- security intrusion detection
- burglar alarm
- fire alarm
- police call box

One of the issues facing the MBTA in its security emergency response planning is that of interoperability. Interoperability is defined as the ability of radio equipment belonging to one department's emergency first responders to communicate with that of another department's first responders.

<u>Massachusetts Emergency Management Agency</u>

The Massachusetts Emergency Management Agency's Operations Division manages and coordinates emergency response efforts for the Commonwealth. It also operates the state Emergency Operations Center (EOC), where it monitors emergencies statewide on a twenty-four hour per day, seven-day per week basis. The EOC serves as the command and control center for the Commonwealth during an emergency.

Massachusetts Statewide Anti-Terrorism Unified Response Network

The Massachusetts Statewide Anti-Terrorism Unified Response Network (SATURN) is an information-sharing and first-responder network that enhances existing public security delivery systems. SATURN is a first-of-its kind initiative that brings together fire, emergency management, and police officers from every Massachusetts community, and provides them with a process for receiving and exchanging information in the face of a terrorist threat.

Commonwealth Fusion Center

The Commonwealth of Massachusetts maintains a fusion center inside of the State Police General Headquarters located in the Town of Framingham. A fusion center is defined by the Global Justice Information Sharing Initiative as "a collaborative effort of two or more agencies who provide resources, expertise and /or information to the center with the goal of maximizing the ability to detect, prevent, apprehend and respond to criminal and terrorist activity." The Commonwealth Fusion Center (CFC) operates 24 hours per day, seven days per week providing terrorist-related intelligence and public safety and security-related information among the state's local, state, and federal public safety agencies and private organizations involved with safety and security.

10.6 Evaluation Criteria

An evaluation process to prioritize transportation projects included in the Transportation Improvement Program (TIP) was implemented several years ago. Among the criteria utilized as part of the effort are safety and security.

10.7 Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems (ITS) technologies are applied to vehicles and roadways that perform communications, data processing, traffic control, surveillance, navigation, sensing, and various other functions that aid in the management of the security process. ITS elements, such as traffic cameras, signal preemption devices and variable message signs (VMS), would provide timely responses for emergency vehicles and the ability to monitor evacuations during times of natural, or other disasters.

The MassHighway's Statewide Traffic Operations Center (STOC) is located in South Boston. The STOC's primary mission is traffic incident management on state-controlled roadways throughout the Commonwealth of Massachusetts. The STOC is the headquarters for the application of ITS around the state. From the STOC, reports on traffic incidents are relayed to the involved MassHighway district office, which assigns the necessary personnel and equipment, required to abate the incident.

10.8 Recommendations

Foster communication and cooperation between federal, state, regional, and local agencies for the planning, practice, and implementation of emergency scenario plans.

Support the forum for cooperation between the different transportation agencies in the state on security concerns through the Regional Homeland Security Councils.

Incorporate intelligent transportation systems, such as variable message signs, into the emergency response system.

Increase surveillance and security efforts at transportation facilities throughout the region.

Continue other security improvements at the public use airports, such as the installation of security fencing, gates, and access control and video monitoring systems.

Facilitate comprehensive evacuation planning and coordination procedures between state and local agencies.

Designate and indicate, through road signs, emergency evacuation routes, and shelters

Support enforcement of state and local traffic laws.

Continue to implement "Transit Watch" and the station improvement program of the MBTA, including station monitors and the new communications system.

CHAPTER 11
FINANCE PLAN

11.0 Introduction

The federal SAFTEA-LU requires that the Regional Transportation Plan include a financial component that demonstrates how the projects and improvements it identifies can be implemented. In addition, the statutory language directs that the Plan be financially constrained to revenues expected to be reasonably available to carry out the Plan. The Regional Transportation Plan must be cost feasible. The costs of planned improvements and maintenance must be balances with revenues that can be reasonably expected.

Historical data on transportation spending and allocation within the region are key indicators of probable future spending levels over the period of this document. It is also assumed that federal and state-funding commitments will continue beyond the life of SAFETEA-LU with future federal and state legislation. In addition, this section includes a description of federal and state funding programs, and highway and transit financing.

11.1 Historical Spending Trends

Estimating the amount of funds available in the future is an inexact science at best. One approach is to chart past funding experience and attempt to discern a trend. This trend could then be extrapolated to future years.

The potential issue with such an approach is that funding levels are not as constant as we would like. The amount of money available changed dramatically between 1991 and 1992 when ISTEA replaced its predecessor, Surface Transportation and Uniform Relocation Assistance Act (STURAA). While there is no certain reason to think that similar changes in funding are likely at the end of the SAFETEA-LU period, that change illustrates the variability of the system and the tentativeness of any long term financial projections.

In addition to uncertainties at the federal level, the future amount of funding that will be available from the state for transportation is indeterminate. State dollars for transportation come from the following sources: gasoline tax, license/registration fees; bond proceeds, sales tax; tolls; fares; annual appropriation; and local assessment. Furthermore, the distribution of both federal and state funds among the thirteen regions of the Commonwealth does not adhere to a strict formula. The Old Colony region could receive a bigger or smaller share of the statewide total depending on a number of factors.

Table 11-1 summarizes both federal and non-federal construction spending in the Old Colony Region, from 1992 to 2006. The historical data illustrate that a total of approximately $205.5 million dollars was spend in the fourteen-year period averaging approximately $13.7 million dollars annually.

Table 11-1
Summary of Construction Spending in the Region

YEAR	Sum of Advertised Project Amounts	
1992	$	20,246,117
1993	$	39,417,562
1994	$	10,045,153
1995	$	29,362,750
1996	$	15,738,263
1997	$	36,942,432
1998	$	8,594,745
1999	$	1,869,334
2000	$	1,800,000
2001	$	3,358,460
2002	$	7,225,538
2003	$	4,276,801
2004	$	5,712,046
2005	$	9,971,410
2006	$	10,967,000
Total	**$**	**205,527,611**
Annual Average	**$**	**13,701,841**

11.2 Transportation Funding Programs

The transportation network is financed through federal and state revenue sources. These sources are described below.

Federal Funding

Massachusetts receives transportation funds from the federal government. The major sources are the Federal Highway Administration (FHWA), Federal Transit Administration (FTA) and the Federal Aviation Administration (FAA). The United States Congress authorizes funding for these transportation projects through federal legislation. For highways and mass transportation, the most recent authorization was the SAFETEA-LU (2005). Federal funding received from SAFETEA-LU is allocated to different funding programs. Some of these programs are listed below.

Highway Funding Programs

National Highway System (NHS) consists primarily of existing Interstate routes and portions of the Primary System. The program was established to focus federal resources on roads that are the most important to interstate travel and national defense, roads that connect with other modes of transportation, and others that are essential for international commerce.

Interstate Maintenance (IM) includes resurfacing, restoration and rehabilitation as eligible activities for maintaining Interstate facilities. Reconstruction is also eligible if it does not add capacity. However, high-occupancy-vehicle (HOV) and auxiliary lanes can be added.

Surface Transportation Program (STP) is a block grant program that may be used for any roads (including NHS) that are not functionally classified as local or rural minor collectors. These roads are collectively referred to as federal-aid eligible roads. Bridge projects paid for with STP funds are not restricted to federal-aid roads but may be on any public road. Transit capital projects are also eligible under this program.

Congestion Mitigation and Air Quality Improvement Program (CMAQ) directs funds toward transportation projects in Clean Air Act non-attainment areas for ozone and carbon monoxide. These projects will contribute to meeting the attainment of national ambient air quality standards. The state receives funds based on its share of the population of air quality non-attainment areas weighted by degree of air pollution.

Bridge Replacement and Rehabilitation Program provides funds for rehabilitation and replacement of any bridge on a public road. Bridges on the federal-aid system or off the federal-aid system are eligible for these funds. Newly eligible are bridge painting, seismic retrofitting and calcium magnesium applications.

Other Federal Aid includes projects that received federal funding outside the federal-aid program. Funds in this category are generally approved as line items appended to various pieces of federal legislation. Projects in this category are generally intended to improve public safety within a specified region that might not qualify for funding through other sources.

<u>Transit Funding Programs</u>

49 U.S.C. Section 5307 provides capital, preventative maintenance, and operating assistance to transit systems in urbanized areas.

49 U.S.C. Section 5309 provides funding for the construction or extension of new transit service projects, modernization of existing rail systems, and major bus purchases and related facilities.

49 U.S.C. Section 5310 is the Elderly and Persons with Disabilities program, which provides capital assistance to private non-profit service carriers.

49 U.S.C. Section 5311 provides funding capital and operating assistance to transit systems in non-urbanized areas (Rural Transit).

49 U.S.C. Section 5316 provides funding for transportation services designed to transport welfare recipients and low income individuals to and from jobs and to develop transportation services for residents of urban centers and rural and suburban areas to suburban employment opportunities.

49 U.S.C. Section 5317 provides funding to encourage service and facility improvements to address the transportation needs of persons with disabilities that go beyond those required by the Americans with Disabilities Act.

<u>State Funding</u>

State funds are also a key component for transportation purposes. State funding programs are listed below.

<u>Highway Funding Programs</u>

Non-Federal Aid (NFA) contains all projects not receiving federal funds. Various categories of state funding are included in this group such as bikeways, State Aid (Chapter 90) and highway construction and maintenance (Chapter 497).

Public Works Economic Development (PWED) projects are funded entirely with state funds and are often part of state grant projects targeting downtown revitalization.

<u>Transit Funding Program</u>

Mobility Assistance Program (MAP) is a state funded program similar to Section 5310, but provides capital assistance to public non-profit service carriers. MAP funds are intended for use by public agencies, such as Councils on Aging, South Shore Community Action Council, and the Brockton Area Transit Authority (BAT), to provide van service to elderly and disabled persons.

11.3 Highway Financing

<u>Federal</u>

Table 11-1 provides a summary of the amounts spent on highway construction projects in the region over the last fourteen years.

In September 2000, the state and its MPOs executed a Memorandum of Understanding of the Task Force of the State and Regional Officials to Define, Develop, and Monitor a Statewide Road and Bridge Program (Statewide Road and Bridge MOU). The Statewide Road and Bridge MOU commits MassHighway to expend no less than $400 million per year on transportation projects for the remaining years of the Central Artery, through state fiscal year 2005. Given the recent and historic trends concerning payouts and for previously obligated projects, an expenditure of $400 million per year translate into an annual advertising program of approximately $20-$25 million.

For programming and planning purpose, the Massachusetts Association of Regional Planning Agencies (MARPA) has developed targets to apportion highway funding between MPOs. Under the MARPA Target, the Old Colony MPO assumes that it will receive approximately 4.56 % of all available highway funds. Table 11-2 shows that based on that assumption and EOT's expectations regarding the, the region can expect to receive approximately $890,584,759 million for highway and bridges between FY 2007 and FY 2030. Furthermore, the estimated transit revenue is $458,999,159.

The Executive Office of Transportation has developed revenue estimates for the 23 years of the Regional Transportation Plan. To supplement these estimates, reasonable estimates of Chapter 90 Allocations were have been added to the Executive Office of Transportation revenue forecasts.

The estimates from the Executive Office of Transportation are based on the following assumptions: Federal and state matching funding (core programs plus High Priority Project amounts) for the period of 2007 – 2010 reflect current allocations and are inflated three percent per year thereafter, beginning in 2011.

- All figures provided are based upon an assumed obligation amount of 85%.
- Consistent with FHWA STIP guidance, $25 million in redistributed obligation authority is assumed each year.

- Deductions for statewide items that cannot be allocated individually to the MPOs -- Central Artery GANs repayment, Planning, and Extra Work Orders/Cost Adjustments -- are taken from total available funding, leaving the amount for the available federal funding to be allocated in the regional plans.
- Major infrastructure project funding for the first four years is as reflected in the current STIP. From 2011 to 2014, funding availability is estimated to approximately equal an inflation-adjusted current STIP amount. After 2015, because the Central Artery GANs payments end in 2014, it is estimated that major infrastructure funding availability is approximately equal to an inflation-adjusted NHS amount (annual apportionment constrained by obligation authority). In addition, beginning in 2011, an assumption is made that half of the assumed federal earmarks will be available for such projects.
- Similarly, Interstate Maintenance funding availability for the first four years is based upon the existing STIP for 2007 – 2010. From 2011 to 2014, such funding availability is estimated to be approximately equal to an inflation-adjusted STIP amount. Once the Central Artery GANs are paid off, beginning in 2015, such needs are approximately equal to an inflation-adjusted IM amount (apportionment constrained by obligation authority).
- Funding availability for bridges is based upon the Commonwealth's commitment to a Statewide Bridge Program of $200 million per year. The bridge program has two components: federal aid and non-federal aid. Beginning in 2011, this program is annually adjusted by a 3% inflation factor.
- The Non-Federal Aid Program is based upon the existing program and held constant at current STIP amounts for 2007 - 2010. Beginning in 2011 and thereafter, NFA funding is adjusted by a 3% annual inflation factor.
- With the exception of funds for the IM and Bridge Programs, the estimated funding is allocated among the MPOs based upon the existing MARPA TIP targets.
- Funding assumed for the IM Program is allocated based upon the regional share of Interstate lane mileage, exclusive of the Massachusetts Turnpike.
- Amounts assumed for the Bridge Program are allocated based upon each region's percentage of federal-aid eligible bridges.
- The estimated MPO allocations for IM and bridges are included to provide order-of-magnitude guidance.

<u>State</u>

SAFETEA-LU is not the sole source of funding for transportation projects in the Commonwealth. State funds are also a key component in the financing mix for highway projects. State funds are used to "match" federal dollars to pay for the state share of federally aided projects, to undertake other projects not eligible for federal funding, and to assist cities and towns in maintaining and improving local roadways (Chapter 90 funding).

State funding for highway projects are raised from a variety of sources. As in most states, the gasoline tax is the major source of user fee revenues for transportation. Massachusetts started collecting a tax on gasoline in 1928. Since 1991, the gasoline tax has been steady at 21 cents per gallon, just slightly higher than the nationwide average of 18.6 cents. A percentage of the gasoline tax revenues is distributed to the State Highway Fund (for local use, roadway and bridge projects, etc.), to the General Fund (for mass transportation) and to a variety of environmental funds. The percentage of gasoline tax that is deposited into the Highway Fund is mandated for local use in all 351 Massachusetts cities and towns.

In addition, the Commonwealth finances most of its capital improvement program, including transportation, through bond sales. The Transportation Bond Bill (TBB) authorizes and directs the MHD to expend moneys for transportation projects such as reconstruction, resurfacing, relocation or improvements of highways, bridges, and parking facilities.

In summary, the cumulative dollars estimated to be apportioned to the region during fiscal years 2007 to 2030 is shown in Table 11-2.

Local

Local funding has historically been used to help design and engineer highway projects. Many of these costs are reimbursable to the communities with Chapter 90 funds once the project has received final state and federal clearances.

11.4 Transit Financing

As with highway projects, transit projects in the Old Colony region have historically been financed with a combination of federal, state and local funds. Brockton Area Transit Authority (BAT) generates its funding from a number of sources that are described below.

Federal

Federal funding under the Surface Transportation Program (STP), Congestion Mitigation/Air Quality (CMAQ) and, to a limited degree, the National Highway System (NHS) programs under SAFETEA-LU may be used for transit purposes. By allowing states to use some SAFETEA-LU funds interchangeably for highways, transit or intermodal purposes, regions can determine the appropriate mix of projects to most efficiently attain their transportation goals.

Brockton Area Transit Authority (BAT) receives the vast majority of its federal capital and operating assistance through the 49 U.S.C Section 5307 funding program. These formula grants are distributed annually on a percentage basis. In addition to funds from 49 Section 5307 of the United States Code, funds are also made available from Sections 5309, 5310, 5311, 5316, and 5317. Estimated Federal funding for transit is outlined on Table 11-2.

State

The Commonwealth provides the Brockton Area Transit Authority (BAT) with financial assistance (through transportation bond issues and annual appropriations).

Under the Mobility Assistance Program (MAP), BAT requests annually 3-6 accessible mini-buses and vans each year, as part of their paratransit vehicle replacement program.

Local

Communities within the Brockton Area Transit Authority (BAT) service area are assessed annually for transportation services.

Direct Income

Farebox revenues generate direct income. The Executive Office of Transportation developed revenue estimates for the 23 years of the Regional Transportation Plan. To supplement these estimates, reasonable estimates of farebox, revenue, Mobility Assistance Program and Section 5309 capital assistance were added to the Executive Office of Transportation revenue forecasts.

The estimates from the Executive Office of Transportation are based on the following assumptions:

- The federal numbers for 2007 through 2009 are from SAFETEA-LU.
- The federal numbers for 2010 are the same as 2009 assuming that the new SAFETEA-LU will not yet be enacted and the State will be operating under a continuation of SAFETEA-LU.
- The federal numbers beyond 2010 are increased each year by 3%.
- The Section 5310 numbers come from the State and were distributed is region based on Elderly and Disabled population. This is for planning purposed only.
- The State Capital Investment numbers for the years 2007 through 2009 were taken from information received from the RTAs and for 2010 and beyond represent 25% of the 5307 and 5309 reported funding.
- State Contract Assistance for the RTAs was taken from the RTA Program Preview forms for the years 2007 through 2009 and increased 2.5% annually beyond that point.
- No determination has been speculated on how the JARC and New Freedom funding will be distributed.

Table 11-2
2007-2030 Estimated Available Revenues

Highway and Bridge		
Major Infrastructure Projects	$	134,226,000
Bridge Projects	$	189,719,000
Interstate Maintenance	$	6,697,000
Operations and Maintenance	$	435,059,000
Chapter 90	$	124,883,759
Subtotal	**$**	**890,584,759**
Transit		
Urbanized Area Formula (5307)	$	90,647,597
Section 5309 Capital Assistance	$	46,965,580
Elderly and Disabled (5310)	$	8,678,772
Non-Urbanized Area Formula (5311)	$	1,200,000
State Capital Investment	$	30,193,792
State Contract Assistance for Operations	$	170,601,799
Mobility Assistance Program	$	14,950,000
Local Share	$	37,801,619
Farebox Revenue	$	57,960,000
Subtotal	**$**	**458,999,159**
Competitive UZA Federal Funding		
Elderly and Disabled (5310)	$	97,295,647
Non-Urbanized Area Formula (5311 and 5340)	$	109,906,548
JARC (5316)	$	53,483,821
New Freedoms (5317)	$	46,021,157
Total Estimated Available Revenue*	**$**	**1,349,583,918**

**Does not include Competitive UZA Federal Funding*

11.5 Fiscal Constraint Analysis

Roadway and transit service operations and maintenance (Table 11-4), as well as capital improvements (Table 11-3) outlined in the Regional Transportation Plan, are estimated to cost approximately $1.2 billion dollars as shown in Table 11-5 for the 23-year period (2007 to 2030). In order to have a financially constrained plan, resources of an equal amount must be identified. These resources are shown in Table 11-2.

Because surface transportation legislation must be renewed for the federal fiscal year beginning October 1, 2007, the Regional Transportation Plan (2007 to 2030) represents a large and uncertain time span for financial planning purposes. During these 23 years, many things may or may not occur and could seriously change any financial forecast made today. For instance, state match requirements can change, flexible-funding categories can be increased, reduced or eliminated, or overall federal funding levels can be substantially changed in response to budget decisions made by Congress.

Despite these and other uncertainties, assumptions associated with Table 11-2 include that the amounts similar to those programmed under SAFETEA-LU will be provided for local transportation needs by the federal appropriations process throughout the life of the Regional Transportation Plan. The amounts from local and state sources are also assumed to remain at approximately the same levels throughout the life of the Regional Transportation Plan.

The funding available has allocated to operating, maintaining, and improving the highway, bridge and transit transportation system. The financial capacity from federal, state and local sources has been examined by comparing projected revenues to transportation needs as outlined in Table 11-6. As a result, we find that the Regional Transportation Plan is financially constrained according to the definition in the Federal Register 23 CFR Part 450.

Table 11-3
Capital Improvements

Location	Project	Air Quality Status	Cost	Air Quality Analysis Year
Regionally Significant Capital Projects For Fiscal Constraint Analysis				
Bridgewater	Route 24 On Ramp From Route 104 Westbound	Exempt	$ 3,330,147	2020
Brockton	Downtown Brockton Circulation	Non-Exempt	$ 6,500,000	2007
Brockton Area Transit	BAT Intermodal Transportation Centre Improvements	Exempt	$ 5,750,000	
Brockton Area Transit	Ongoing Paratransit Bus Replacement	Exempt	$ 13,241,726	
Brockton Area Transit	Ongoing Fixed Route Bus Replacement, Hybrid Buses & Technologies, AVL, Farebox	Exempt	$ 50,865,580	
Brockton Area Transit	Ongoing Commuter Coach Replacement	Exempt	$ 4,729,188	
Plymouth	Long Pond Road Bridge Capacity Enhancement	Recommended for Study	$ 12,924,301	2020
Plymouth	Route 3 Exit 4 Northbound Off-ramp to Plimouth Plantation Highway	Recommended for Study	$ 3,000,000	2010
Plymouth	Route 3 Northbound Slip Ramp from Long Pond Road Westbound	Recommended for Study	$ 3,500,000	2010
Plymouth	Route 3A at Herring Pond Rd Geometric Improvements and Signalization	Exempt	$ 1,000,000	2010
Old Colony Region	Route 24 Conversion to Interstate Standards	Exempt	$ 244,177,728	2020
SSCAC	Ongoing Maxivan Replacement	Exempt	$ 10,026,846	
West Bridgewater	Route 106 Capacity Enhancement	Non-Exempt	$ 11,248,640	2010
West Bridgewater	West Bridgewater Central Square	Exempt	$ 3,937,024	2010
		Regionally Significant Capital Projects For Fiscal Constraint Analysis	**$ 374,231,179**	
Illustrative Projects (Funding not Identified at this time)				
Brockton	Transit Orientated Development - Brockton	Exempt		
Hanson	Transit Orientated Development - Hanson	Exempt		
Plymouth	Plymouth Intermodal Transportation Center	Recommended for Study	$ 11,000,000	
Plymouth	Route 25 Interchange at Bourne Rd	Recommended for Study	$ 15,000,000	
Randolph to Bridgewater	Route 24 Capacity Enhancement	Recommended for Study		
Kingston	Transit Orientated Development - Kingston	Exempt		
Region	Intelligent Transportation Systems	Exempt		
Region	Municipal Airports	Recommended for Study		
Region	Potential Use of Out of Service Railroad Rights of Way	Recommended for Study		
Stoughton	Transit Orientated Development - Stoughton	Exempt		
Other Regionally Significant Capital Projects (Funded by Others) for Informational				
Kingston	Route 3 On Ramp from Cranberry Road (Developer Mitigation)	Non-Exempt	$ 2,474,701	2010
MBTA	Commuter Rail Extension to Fall River & New Bedford (MBTA)	Non-Exempt	$ 800,000,000	2010
MBTA	Commuter Rail Extension to Buzzard's Bay (MBTA)	Non-Exempt	$ 103,500,000	2010
Plymouth	Long Pond Rd Jug Handle (Developer Mitigation)	Non-Exempt	$ 328,983	2010
Plymouth	Route 3A and vicinity improvements (Cedarville) (Developer Mitigation)	Exempt	$ 4,000,000	2010
Plymouth	Long Pond Road and Holman Road Access Roads (Developer Mitigation)	Non-Exempt	$ 5,821,658	2030
Plymouth	Long Pond Road and Holman Road and Home Depot Connector Access Roads (Developer Mitigation)	Non-Exempt	$ 5,827,757	2020
West Bridgewater	West Bridgewater Park N' Ride Expansion (EOT)	Exempt	$ 400,000	2007
West Bridgewater	West Bridgewater Commuter Rail Station (MBTA)	Non-Exempt	$ 5,000,000	2010
Weymouth	South Weymouth NAS Access Improvements (Developer Mitigation)	Non-Exempt	$ 3,000,000	2007
Weymouth and Abington	Route 18 Capacity Enhancement (Boston MPO)	Non-Exempt	$ 14,000,000	2007
Weymouth to Duxbury	Route 3 Capacity Enhancement (Route 18 to Route 14) (Boston MPO)	Non-Exempt	$ 427,000,000	2020
		Other Regionally Significant Capital Projects (Funded by Others) Sub Total	**$ 1,371,353,099**	
		Total of All Capital Projects	**$ 1,745,584,278**	

Table 11-4
Operations and Maintenance

Project			Cost
Ongoing Recon/Resurf/Rehab (Fed-Aid Roads)			
$8,300,000 per year for 23 Years		$	198,200,000
Ongoing Recon/Resurf/Rehab (Local Roads)			
$4,500,000 per year for 23 Years		$	103,500,000
Ongoing Intersection Improvements/Safety			
$1,500,000 per year for 23 Years		$	34,500,000
Ongoing Infrastructure (Signage, Guardrails, Etc)			
$1,000,000 per year for 23 Years		$	23,000,000
Ongoing Bridge Replacements/Repair/Inspections			
$8,250,000 per year for 23 Years		$	189,750,000
Ongoing Enhancement Projects			
$100,000 per year for 23 Years		$	2,300,000
Ongoing Transit Operating and Maintenance			
$12,597,814 per year for 23 Years		$	289,749,726
Highway and Bridge Sub Total		**$**	**551,250,000**
Transit Sub Total		**$**	**289,749,726**
Total Operations and Maintenance Needs		**$**	**840,999,726**

Table 11-5
Comparison of Operations and Maintenance and Capital Projects

Project			Cost	
Capital Improvements - Highway and Bridge		$	289,617,840	
Capital Improvements - Transit		$	84,613,339	
	Sub Total	**$**	**374,231,179**	**30.8%**
Operations and Maintenance - Highway and Bridge		$	551,250,000	
Operations and Maintenance - Transit		$	289,749,726	
	Sub Total	**$**	**840,999,726**	**69.2%**
Total Financial Need		**$**	**1,215,230,905**	

Table 11-6
Estimated Needs vs. Estimated Available Revenues

Total Funds Available To Region (23 Years)	**$1,349,583,918**
Highway and Bridge	$890,584,759
Transit	$458,999,159
Total Financial Need of Region (23 Years)	**$1,215,230,905**
Highway and Bridge	$840,867,840
Transit	$374,363,065
Sub Total Differences	
Highway and Bridge	$49,716,920
Transit	$84,636,094
Total Difference	**$134,353,014**

11.6 Conclusions and Recommendations

Preserve and maintain transportation assets for future generations.

Adequately maintain all elements of the transportation system to protect the public's investment.

Increase the efficiency of the transportation system using appropriate technologies.

Discuss, analyze, and incorporate, as deemed appropriate, the recommendations of the Transportation Finance Commission.

Support the increase of the annual Chapter 90 statewide total amount to at least $250 million.

Assist communities in preparing and updating their road inventories to ensure that they reflect accurate mileage amounts for publicly accepted roads.

Continue to review, develop, and analyze supplemental funding resources. Such resources could include increased user fees, transit mitigation banks, and concurrency management systems. Concurrency is the growth management concept intended to ensure that the necessary public facilities are available concurrent with the impacts of development.

Implement fare and revenue policies that grow with inflation.

Establish and dedicate transit funding from sources that grow with inflation.

Support congestion improvements and the reward for regional approaches to coordinating and interconnecting signalized intersections and corridors.

Support and enhance asset management capabilities to perform the appropriate type of improvement at the right time.

Support the establishment of a RTA service fund to restore and enhance service.

Support the changing of RTA financing from retroactive reimbursement to current financing (forward funding).

CHAPTER 12
CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 4 – REGIONAL PROFILE

Increase accessibility at the neighborhood scale. One approach is to use the Subdivision Rules and Regulations to encourage pedestrian and bicycle ways to connect cul-de-sacs and local streets in subdivisions to one another and to nearby schools, stores and other destinations.

Increase accessibility to the Avon Merchants Park and the proposed Stoughton Industrial Park. The present and potential problems caused by the cul-de-sac nature of the parks could be resolved by connecting their main roads, thereby creating a service road through the two parks and between the Harrison Blvd. and Route 139 interchanges with Route 24.

Develop healthier and more varied centers. Therefore, doing would increase opportunities available in compact settings, and reduce trips by concentrating local destinations and strengthening community character. Communities should seek means to guide public, commercial and high- density residential investment to selected multi-purpose centers. Larger communities with failed shopping centers should adopt Planned Unit Development regulations or other tools for redeveloping such sites with diverse complementary uses.

Develop a North-South industrial access and service road through Brockton's discontinuous central industrial corridor. The City should study ways of acquiring land, constructing new segments and improving others between Court St. and Spark St. with minimum neighborhood impacts.

Continue to study the implications of major development projects. Even after MEPA review and local approval, many large and complex projects can have ill-defined impacts or significant changes in major factors, particularly involving actions not requiring State permits. It is important to have the capacity to continue reviewing major traffic-generating projects such as the reuse of the South Weymouth Naval Air Station and the Pine Hills project in Plymouth.

Increase transit accessibility to nearby, unserved, employment centers. Put high priority on extending fixed-route service and on encouraging growth in industrial areas whose location and configuration fit such service, but be open to limited demand-responsive service where required to give residents needed employment opportunities.

Respond to the potential impacts of major highway and rail projects potentially encouraging continued overall sprawl development. Southeastern Massachusetts remains a "Region at Risk" due to the impacts of unplanned growth and change. There is a need to continue exploring issues raised by the Southeastern Massachusetts Vision 20/20 project examining and publicizing alternatives to current trends, refining goals and objectives, developing a plan implementation effort; and working for region-wide acceptance of the program and meaningful commitments to it.

Strengthen downtown Plymouth and increase convenient service to nearby high-density neighborhoods by seeking extension commuter rail service from Cordage to Downtown and more frequent peak hour service. Though difficult given scheduling to the Kingston station, space requirements, and possible use conflicts, this expanded KPP study recommendation would partially complete the originally planned system and greatly strengthen downtown Plymouth and give the town a more fitting level of service.

Modify transportation improvement projects and priorities to encourage the compact close-in development patterns envisioned in the Plan's Goals and Objectives. Take actions ranging from improving the flexibility of minor arterials, major collectors and minor collectors, to improving ease of pedestrian/ bicycle movement in and between neighborhoods and facilities and within the downtown. Examples in Brockton would be restoring the stairs at the Downtown Rail station, which allowed direct movement from the platform toward most downtown destinations and reopening the recently blocked 100-year old pedestrian underpass between Lincoln Street and the Post Office.

Use traffic calming and other roadway alterations to protect neighborhoods in mixed residential/industrial areas. Study opportunities to lessen industrial impacts on neighborhoods by rerouting truck traffic, creating safe pedestrian ways, and working with firms to lessen impacts from noise, lighting, odors and vibration.

Develop new build out analysis based on most recent data and trends to better understand impacts of development and continued growth.

CHAPTER 5 – REGIONAL HIGHWAY SYSTEM

Adequately maintain and operate the highway and bridge network of the region. This includes, but is not limited to, supporting, implementing and funding projects such as ongoing and/ or project review committee approved reconstruction, rehabilitation, preservation, and intersection improvement projects.

Continue the support of management systems. The Commonwealth of Massachusetts and the regional planning agencies should continue to support the management systems. Such systems are examples of how transportation planning and asset management can be effectively integrated.

Enhance town center circulation. Advocate for the initiation of improvement strategies for enhancing town center circulation. Implement the recommendations of Downtown Brockton Circulation Study by re-establishing two-way traffic flow.

Mitigate congestion along corridors. Support the mitigation of corridor segments currently experiencing congestion problems.

Improve safety and traffic flow at intersections. Support the initiation and continuation of an intersection analysis program as a means to improve safety and traffic flow. Conduct before and after intersection analyses to determine the effectiveness of implemented safety improvements. Support legislation for Red Light Running Camera enforcement.

Utilize regional access management polices, guidelines, and techniques to reduce arterial crashes.

Install rumble strips on all divided highways. Support installation of 'rumble strips' on all divided highways in the region.

Continue to support the Traffic Monitoring System for Highways. Support actively maintaining and participating in coordinated Traffic Monitoring System for Highways.

Continue operation of pavement management systems that involve monitoring/evaluating pavement distresses along the federal aid eligible roadways toward the development of both maintenance and budgetary strategies, which produce increased efficiency in terms of utilization of federal and state money.

Pavement Management Systems should address municipal program requirements. Pavement management should include provisions for policies, which address the developing crisis of the growing maintenance queues experienced by municipal highway officials who must maintain increasingly deteriorating local roadway with fewer fiscal resources.

Encourage the provision of adequate parking and traffic mitigation, and direct pedestrian access from nearby neighborhoods at the Old Colony Rail Line facilities. It is imperative that local officials confer with MBTA planners and engineers to determine that access and egress to/from station sites are properly mitigated.

Encourage large employers to form Transportation Management Associations (TMAs), which marshal business resources to manage employee transportation needs on an area-wide basis. MassRides for example, is available to provide TMA assistance that match employees who wish to carpool, vanpool, etc. Demand for costly long-term parking can be managed by encouraging shared-ride commuting through preferential parking incentives or special discounts for employees.

Conduct additional studies concerning the movement of goods/materials within and through the region. Additional studies should be undertaken which address the movement of goods and materials, such as the movement of hazardous materials, the identification and designation of regional and local truck routes, the identification of additional intermodal facilities, and the overall enhancement of the efficient movement of freight.

Conduct studies to improve east-west access in the region. This should also include further study of the widening of Route 106 from Route 24 to just east of Route 28 in West Bridgewater.

Implement access management at the local level through a number of avenues (Master Plans, Zoning Ordinances, Subdivision regulations and site plan reviews).

Place stronger focus on maintenance of local bridges. Support increased emphasis on the rehabilitation needs of locally maintained bridges.

Continue support of bridge management. The Commonwealth should continue its support of the Bridge Management System.

Accommodate grade separation for pedestrian and vehicular bridges or underpasses along the planned or new commuter rail system. Bridges or underpasses should be a consideration at the grade crossings of existing or proposed commuter rail system currently under construction.

Accommodate pedestrians in all bridge maintenance and construction. Addition of sidewalks and bike lanes or shared bi-ways where appropriate, should be a considered whenever bridges are replaced or rehabilitated.

Promulgate policy to address need for raising bridge clearances to accommodate double stacking of containers in railroad freight hauling operations. This policy is essential to promoting increased intermodal opportunities in the movement of goods within and across state and international borders. In addition, expeditious movement of imported and exported goods serves to increase profitability and job creation in the end.

Continue to work with local and state agencies to rehabilitate and reconstruct the bridges in the region that are remaining in the structurally deficient category, or will enter into that category during the next 23 years.

Resurface Route 24 between the Stoughton Canton line and I-495.

Resurface Route 138 in Easton between the Stoughton line and the Raynham town line.

Resurface Route 106 Foundry Street in Easton between Eastman Street and Depot Street.

Resurface Route 3A State Road in Plymouth from Bartlett Road to the Bourne line.

Utilize Access Management techniques throughout the region. Areas within the region in which access management techniques should be a prime focus include.

- Route 3A in Kingston and Plymouth
- Route 18 in Abington
- Samoset Street in Plymouth
- Route 28 (Memorial Drive) in Avon from Harrison Boulevard south to Route 37 (Howard Street) in north Brockton

- Route 28 through the Brockton downtown (between Route 37 and Plain Street)
- Route 28 in south Brockton (Main Street)
- Route 28 in West Bridgewater (North Main Street and south Main Street)
- Route 28 (Bedford Street) Route 18 corridor south of Bridgewater center
- Route 123 Belmont Street east and west of Route 24 in Brockton
- Route 123 in Brockton east of the downtown to Abington
- Route 104 east of Route 24 in Bridgewater
- Route 106 east of Route 138 in Easton to West Bridgewater Center
- Route 138 north of Stoughton Center
- Route 138 in Easton

Study, analyze, and integrate Intelligent Transportation Systems. Opportunities for such technologies include:

- Downtown Brockton - Several ITS components are included in the recommended improvements for Downtown Brockton in the Brockton Central Area Traffic Study completed in 1999. Traffic signal preemption is recommended for emergency vehicles at all signalized intersections in the downtown area. In addition, it is recommended that all traffic signals be connected within a closed loop system, with a connection to a central monitoring system. Video surveillance at critical downtown area locations is also recommended. Although not specifically recommended in the study, a Traffic Operations Center (TOC) would also be recommended in order to provide a mechanism for managing these systems.

- Town of Plymouth - The Regional ITS Architecture for Southeastern Massachusetts contains provisions for a traffic management center in Plymouth. The traffic management center would be used to monitor and control the Town's traffic signals, traffic sensors, and variable message signage. The TMC would interface with a variety of equipment and departments, including the Plymouth Police Department; Plymouth Department of Public Works; the Massachusetts Highway Department; GATRA; Plymouth & Brockton Street Railway Company, and other agencies.

- Information Kiosk at Route 3 Exit 5 in Plymouth - There are many opportunities for the application of Intelligent Transportation Systems at the new MassHighway Rest Area at Exit 5 on Route 3 in Plymouth. This Rest Area includes a tourist information center, food services, and a terminal for the Plymouth and Brockton Street Railway Company (P&B). Automated kiosks can be used for transit fare sales for P&B, MBTA, and Steamship Authority routes. Variable message signs can be used to inform visitors of traffic conditions on lower Route 3, Routes 6 and 6A, and the Cape Cod Canal bridges. Since the P&B terminal provides connections to Logan Airport, systems informing travelers of flight and gate information, including delays, could be useful.

- Local DPW Maintenance and Construction Vehicle AVL - Many public works and emergency services departments around the country are installing automated vehicle locator systems on their equipment. The systems consist of GPS receivers and transmitters on vehicles that allow the tracking of vehicle activity. Not only are the systems very useful for administrative purposes, but also they exist as an invaluable asset for dispatch efficiency.

ROUTE 3 CORRIDOR

- Support the capacity enhancement project for Route 3 (from Route 18 to Route 14).

- Initiate a multi-agency Comprehensive Management Plan for the entire Route 3 corridor building upon past work to discern impacts of growth, and future highway deficiencies.

- Construct a southbound ramp to Route 3 from Cranberry Road for mitigation of traffic from a new mixed-use development adjacent to the Kingston commuter rail station.

- Conduct a traffic study to define the operational deficiencies at Route 3 Exit 6 in Plymouth, and to analyze the potential improvement concept to construct an acceleration lane at the bottom of the southbound ramp to Samoset Street.

- Implement improvements to Exit 5 Long Pond Road in Plymouth. Add a northbound slip ramp from Long Pond Road to Route 3 northbound to allow traffic direct access from Long Pond Road.

- Implement improvements to Route 3 Exit 4 in Plymouth that include a off-ramp from Route 3 northbound to Plimouth Plantation Highway eastbound.

ROUTE 18 CORRIDOR

- Improvements to Route 18 in anticipation of the redevelopment of the former Weymouth Naval Air Station include the widening of Route 18 in Abington from Route 139 to Highland Place in Weymouth, which is currently in the design phase.

- Close monitoring of traffic growth within this corridor should continue within Abington, Whitman, East Bridgewater, and Bridgewater along with continued discussion with town officials regarding access management applications and specific congestion improvement projects. A comprehensive study of the Route 18 Corridor in Abington, Whitman, East Bridgewater, and Bridgewater should be undertaken to discern the impacts of cumulative traffic growth due to development. The study should include an analysis of existing and future traffic operations at East Bridgewater Center, and an analysis of future alternative recommended improvements to address operational deficiencies at this location.

ROUTE 24 WIDENING AND IMPROVEMENTS

- Support interstate conversion and capacity enhancement for the Route 24 Corridor.

- Develop a comprehensive Corridor Management Plan (CMP). The CMP should be a joint effort that includes affected regional planning agencies, state agencies, local officials, and interested parties.

- Provide a northbound slip ramp from Route 104 in Bridgewater westbound to Route 24 northbound. This would place the northbound on and off ramps in the northeast quadrant of the interchange.

ROUTE 25

- Provide a Route 25 interchange in Plymouth to Bourne Road as an access and egress improvements to mitigate impacts of developmental growth. The construction of this interchange would most likely require right of way takings.

- Implement improvements to Route 3A at Route 3 Exit 2 between Hedges Pond Road and Herring Pond Road in Plymouth. As part of the developer mitigation, the proponent of the project has proposed to widen Route 3A to a four-lane cross section between the Herring Pond Road intersection and the Hedges Pond Road/Old County Road intersection. The developer has proposed the installation of traffic signals at four locations: at the Route 3A/Hedges Pond Road/Old County Road intersection, at the Route 3A retail drive intersection, at the Herring Pond Road/State Road intersection, and at the Route 3 northbound ramps/Herring Pond Road intersection. The plan calls for the coordination the signals to minimize vehicle stops and maximize progression along the major road.

ROUTE 27 CANTON STREET AT SCHOOL STREET STOUGHTON

- Based on analysis of operations at the Canton Street (Route 27) and School Street intersection, geometric improvements and full signalization of this intersection is recommended.

ROUTE 28 AT MATFIELD STREET WEST BRIDGEWATER

- Based on the Route 28 Corridor Study, the traffic on Route 28 is such that there are few sufficient gaps on Route 28 for side street traffic from Matfield Street to safely enter traffic flow. The installation of traffic signals at this intersection was recommended.

RESTORE BROCKTON DOWNTOWN TWO-WAY TRAFFIC CIRCULATION

- These changes will convert Main Street, Warren Avenue, Spring Street, West Elm Street, and Belmont Street from one-way to two-way in the downtown.

ROUTE 104 BRIDGEWATER

- A development project to widen Route 104 to a four-lane cross section from the Route 24 ramps to Elm Street is slated for the near term. MassHighway has determined that the addition of an on ramp in the northeast quadrant carrying Route 104 westbound traffic to Route 24 northbound will improve traffic flow on Route 104, and relieve back-ups on Route 24 that currently occur due to vehicles waiting to turn onto the ramps under the current configuration. The proponent of the development project has entered in an agreement for a land swap that will enable MassHighway to relocate this northbound ramp to the northeast quadrant of the Exit 15 interchange. The construction of this ramp is recommended, however, it is recommended that monitoring of the corridor continue and that future studies regarding this corridor consider the widening of Route 104 to Bridgewater center.

ROUTE 106 AT DEPOT STREET AND BAY ROAD IN EASTON

- Improvements at this intersection, which include relocating Bay Road at a "T: type intersection further north on Depot Road, signal upgrades, and adding additional turning lanes on Route 106, are recommended.

ROUTE 106 AT PROSPECT STREET IN EASTON

- OCPC conducted a study of traffic operations at this intersection for Easton, which recommended the installation of a traffic signal in order to add needed gaps in the major street, Route 106, traffic flow that would allow side street traffic to enter the major street safely. The signal would also improve safety at this intersection due to a lack of sight distance at the side street, Prospect Street, approaches.

ROUTE 106 IN WEST BRIDGEWATER

- Widening Route 106 between Route 24 and Route 28, which has the support of the West Bridgewater, along with the application of access management such as consolidating access drives, will improve traffic flow and safety. One of the major constraints to widening Route 106 from two to four lanes is the limited right of way, which is 50 feet within this Route 106 section (based on MassHighway's 2005 Road Inventory). A study should be conducted that discerns the impacts of alternative widening plans including the use of a Two-Way Turning Lane (TWTL).

ROUTE 106 AT ROUTE 28 WEST BRIDGEWATER

- Improvements to the intersection of Route 106 (East and West Center Street) and Route 28 (North and South Main Street) at the West Bridgewater Town Center should take into account the future vision that the West Bridgewater has for its town center. This intersection operates under forced flow conditions with long delays (LOS "F") during the peak hours. Improvement concepts require widening the Route 106 eastbound and westbound approaches, along with the realigning the Route 28 approaches in order to improve the level-of-service. A high priority project to implement improvements at this intersection is included in the Old Colony 2007-2010 TIP. The project is presently in the design stage. The concepts included adding turning lanes and/or reconfiguring the intersection with River Street as a two-way. All of these concepts require right-of-way takings.

ROUTE 106 AT HOWARD STREET WEST BRIDGEWATER

- Traffic on the Route 106 corridor in this section is so heavy that vehicles entering the Route 106 major street from the side streets experience very long delays, especially during the peak hours. Recent retail development on Howard Street will add vehicles entering and exiting Howard Street from Route 106. The signalization of this intersection is necessary to mitigate impacts from development and allow safe efficient access to and from Route 106.

ROUTE 123 FROM ROUTE 24 TO LINWOOD STREET BROCKTON

- The lane widths and shoulder are substandard for the speeds and traffic volumes on this road. Delays occur on Route 123 east of the Route 24 interchange in Brockton due to congestion at the Route 123/Manley Street intersection. Although the width of the right of way in this section is 50 feet, it is recommended that further studies be conducted in order to discern the impacts of lane widening and other potential improvements at specific intersections within this corridor.

ROUTE 138 AT UNION STREET IN EASTON

- The installation of traffic signals at this intersection has been recommended in the State Numbered Routes Corridor Study. The traffic on Route 138 is such that there are few sufficient gaps for side street traffic from Union Street safely enter traffic flow.

ROUTE 138 AT ELM STREET IN EASTON

- A study of operations at this intersection concluded that deficiencies exist due to poor alignment and heavy peak hour traffic flow on the major street, Route 138 allows insufficient gaps for side street traffic to enter the major street. The study recommended the installation of a traffic signal at this intersection.

Utilize Access Management to reduce conflicts and improve safety. The goals of access management include conserving highway corridor capacity and improving safety. Access management is important throughout highway corridors in order to manage the placement, spacing, and width of curb cuts that provide access to adjacent properties. Areas within the region in which access management techniques should be a prime focus, at a minimum, include:

- Route 28 (Memorial Drive) in Avon from Harrison Boulevard south to Route 37 (Howard Street) in north Brockton.
- Route 123 Belmont Street east and west of Route 24 in Brockton
- Route 123 in Brockton east of the downtown to Abington
- Route 28 through the Brockton downtown (between Route 37 and Plain Street)
- Route 28 in south Brockton (Main Street)
- Route 28 in West Bridgewater (North Main Street and South Main Street)
- The Route 28 (Bedford Street) Route 18 corridor south of Bridgewater center
- Route 138 north of Stoughton Center
- Route 138 in Easton
- Route 106 east of Route 138 in Easton to West Bridgewater Center
- Route 104 east of Route 24 in Bridgewater
- Route 18 in Abington
- Route 3A in Kingston and Plymouth
- Samoset Street in Plymouth

CHAPTER 6 – REGIONAL TRANSIT SYSTEM

Transit Connectivity Opportunities

Increase use of smaller general aviation airports. Municipal Airports in the region, such as the facility in Plymouth, have experienced marked growth in the numbers of take-offs and landings in recent years. Both runways at Plymouth Airport have been expanded to increase capacity and promote greater safety.

Support additional service. In 1999, BAT implemented Sunday service on both fixed and paratransit routes. This much-needed service provides access for residents of the BAT member communities to weekend jobs and shopping. Support such new programs, as well as the continuation of existing programs that support economic development in the region.

Maintain productivity and cost effectiveness. BAT contracts out transportation services to a variety of private carriers. Support this method of maintaining productivity and cost effectiveness.

Meet operations needs. BAT annually seeks FTA 49 U.S.C. Section 5307 grants to finance support equipment and operations costs. BAT should continue to seek this method of funding to meet operations needs, for as long as such funding is available.

Maintain capital planning for BAT's paratransit services. BAT continues to seek funding each fiscal year through the Mobility Assistance Program for the replacement of paratransit vehicles as needed. This policy should be maintained so that BAT may replenish its rolling stock that is considered "beyond its useful life."

Support the development of a Human Services Coordinated Plan for the region. This is a requirement of the federal SAFETEA-LU legislation. This coordinated effort can enhance and improve human services in the region as a coordinated effort and merging of resources.

Improve mass transit linkages. Every effort should be made to promote improved linkages between mass transit and other modes of transportation. One example would be a public private relationship utilizing private carriers to connect localized RTA's.

Increase intermodal connections at the Montello Station. Currently an MBAT route, a BAT route, and passenger rail to Boston is serviced by the station. Coordinating the fixed routes there and making the station a mini –intermodal center will enhance the transportation options for the people in the area and using the station.

Encourage the development of a Plymouth Intermodal Center. Plymouth is interested in building an Intermodal center that would enhance both commuters and tourist transportation experiences.

Continue commuter rail operations funding. Support the funding of commuter rail operations in the Commonwealth through a statewide funding mechanism.

Provide feeder service to Old Colony commuter rail stations. Intercity bus carriers, such as P&B and JBL Bus Lines, Inc. should consider altering and/or adding routes, to serve as feeder routes to Old Colony commuter rail stations.
Encourage adequate parking and traffic mitigation at station sites. It is imperative that local officials confer with MBTA planners and engineers to determine that access and egress to/from station sites are properly mitigated.

Encourage increased use and expansion of commuter parking facilities. The MassHighway should continue to promote existing commuter parking facilities and develop additional spaces, where needed, for intermodal uses.

Develop additional park-and-ride facilities. OCPC should interact with MassHighway in determining potential new sites for the construction of park-and-ride facilities to augment existing facilities.

Support creation of HOV lanes on congested highways leading into Boston. Intercity bus carriers throughout the region maintain that the creation of genuine High Occupancy Vehicle (HOV) lanes would reduce their commuting time into Boston, making commuter bus lines more competitive with commuter rail. In addition, HOV lanes would make commuter bus lines a more acceptable alternative to individuals who drive automobiles (primarily alone) into Boston, thereby reducing congestion.

Study the feasibility of HOV lanes for buses, carpools and vanpools. As was mentioned earlier, HOV lanes installed along Principal Arterials such as the one on Interstate 93 would improve commuting times into Boston, reduce congestion and improve air quality. A feasibility study should be conducted to determine the potential for HOV lanes along Principal Arterials in the OCPC region.

Support alternative means of funding mass transit. Support initiatives to determine dedicated sources of revenue, such as the fuel tax and Senate Bill 2315, which could fund transit operations throughout the Commonwealth.

Consider development of additional public moorings in Plymouth Harbor. The development of additional public moorings would better serve recreational and visiting boaters. Support such an initiative.

Consider expansion of North Plymouth Harbor. Such a development could potentially derive additional economic development as well as tourism benefits by instituting a water shuttle between Cordage Park and Town Wharf or State Pier.

Increase parking capacity in downtown Stoughton. The town-owned and MBTA-owned lots are at capacity on a daily basis. The MBTA should study the feasibility of constructing a multi-level parking garage in Downtown Stoughton adjacent to the station.

Develop park-and-ride facilities to maximize a multimode transportation system. Park-and-Ride facilities should be sited adjacent to major interchanges/arterials, rapid transit and passenger rail stations.

<u>Transit Service Area Expansion Opportunities</u>

Determine potential for regional airports to accommodate tilt-rotor aircraft. New tilt-rotor services could co-exist with fixed wing operations at existing airports, or operate directly out of additional capacity to the traveling public. The potential for regional airports to accommodate these services should be investigated.

Preserve abandoned railroad rights-of-way by use of Rail Banking. Support preservation abandoned railroad rights-of-way having the potential for construction of future transportation projects.

Support efforts to operate a full weekday schedule on holidays on which most retail stores are open. Increasing the amount of service would provide access for both patrons and employees to businesses that do not observe those holidays**.**

Support the guidelines recommended by MARTA to bring service at BAT and GATRA to its most efficient levels. Service has been cut across the state over the last couple of years to complete with raising fuel and employee benefit costs. When service is cut and fares are raised to compensate for this, the transit riding public is put at a disadvantage. The proposal set out by the MARTA study would restore those cuts and bring transit up to a level that could best serve the community.

Study the feasibility of BAT expanding its service area.

Encourage interagency agreements to enhance passenger service. For example, currently the MBTA 230 bus ends at the Montello Station, but extending that service to the Bat Centre, would enhance passenger connections.

Continue current outreach programs. BAT should continue its outreach program to the elderly and disabled communities.

Encourage private sector participation in public transit operations. BAT is encouraged to continue joint development initiatives with private sector concerns when feasible.

Support expanding the reach of fixed route transit as identified in the Route 3 Corridor Transit Options Study.

Study expansion of intercity bus service. Studies should be performed to consider the feasibility of implementing intercity bus service between Brockton and Plymouth, Taunton and Brockton.

Expand commuter services by private commuter carriers. In order to better meet mass transit needs in the region, the expansion of commuter services by private carriers is encouraged in areas where there is a demand for such services.

Support extension of commuter rail to Fall River and New Bedford.

Support extension of commuter rail to Buzzards Bay.

Support installation of a commuter rail station in West Bridgewater along Old Colony Commuter Rail Line.

Encourage staggered work hour initiatives. Where feasible, encourage large employers to stagger their work hours to offset emissions from high concentrations of automobiles during peak hours.

Support employer-based transportation programs. Large employers should be encouraged to form Transportation Management Associations (TMAs), which marshal business resources to manage employee transportation needs on an area-wide basis. As well, managing demand for costly long-term parking by encouraging shared-ride commuting through preferential parking incentives or special discounts for employees. MassRides is a great first resource for an employer looking to establish commuter programs for their employees.

Support legislative initiatives affecting corporate commuter services program. Under the Massachusetts General Laws, Chapter 63, Section 31D, corporations doing business in Massachusetts are allowed a tax credit amounting to 30% of the cost of purchasing or leasing a commuter van for their employees to use in their daily work trips. This legislation also waives registration fees, creates a special license plate for commuter vans and established insurance requirements for participating vehicles.

Corporations are encouraged to implement commuter services programs that provide incentives through the above legislative initiatives.

Encourage the use of Transit Tax Credits. Currently the federal government will allow employees to use up to 110 dollars of month pretax to pay for transit passes. In the state of Massachusetts, a similar benefit is extended only to the MBTA. The utilization of the federal benefit and the extension of a Massachusetts transit income tax benefit would benefit both employees and employers.

Enforce Massachusetts's rideshare regulation. To comply with Massachusetts's environmental regulation (310 CMR 7.16), employers with more than 250 employees at a single location must implement commuter programs geared to reducing drive alone commuting by 25%. Program options include instituting a transit pass program, creating incentives for bicycle commuting, posting transit schedules and maps, and promoting carpooling. In addition, companies with more than 1000 employees at one facility must implement a vanpool program.

Develop a plan for senior transition from personally operated vehicles to public transportation. Seniors as they lose their mobility and the reaction necessary to drive maybe more will to move to public transportation if they can achieve some level of flexibility while retaining their independence. A plan should be developed to enhance and encourage this transition.

Support Car Sharing. Car sharing programs like Zipcar and Flexcar can be a great way to offers residents flexible transportation options. Areas that would be great candidates in the OCPC region are Bridgewater State College, Stonehill College and the developing area around the BAT intermodal Centre.

Encourage the application of Smart Growth Principles to development in the region.

Support redevelopment of the former Weymouth Naval Air Station. Support mixed transit focused reuse of the land occupied by the former Weymouth Naval Air Station.

Transit Safety and Intelligent Transportation Systems

Support BAT's bus replacement program and system preservation to ensure a state of good repair. BAT should continue to seek funding to update its fixed route bus fleet and allied equipment on an as needed basis.

Support the Development of Transit Safety Plans As technologies improve so will the need to keep our safety and security systems up to date. Some steps are as simple as the cooperation amongst RTAs to develop a continuity of operations plan (COOP). This is a great first step. The next step, making sure that the entire key stakeholders understand what is involved when the plan is invoked will be the key to its success.

Support the integration of technologies across modes of transportation. Examples of this would be a regional fare card or integrated AVL systems to improve transit connections across systems.

Support the use of Rail Education programs like Operation Life Saver Regional efforts to increase safety can come from many levels, for example the continuation of educational programs like operation lifesaver is important to communities that have to live with frequent rail traffic in there community.

Support transportation improvements save energy. Transportation improvements in the region should be undertaken with consideration to energy conservation. Support should be developed for increased promotion of ridesharing, HOV lanes, employer sponsored trip reduction plans and the use of alternative forms of energy.

Support the use of new technologies for transit vehicles. Hybrid and hydrogen technology on buses can reduce fuel consumption and pollution and AVL technology for DIAL-A-BAT and BAT can improve safety and efficiency for the service.

Study the use of Signal Priority in the BAT service area. Signal priority for the BAT system especially near the BAT Centre would increase efficiency and on time performance. The same technology can be employed at intersections to the benefit of emergency services vehicles as well.

Develop park-and-ride facilities, which support and enhance state air quality goals and commitments. Facilities should serve as many alternative High-Occupancy Vehicle (HOV) modes as possible. Public and private transit operators should be encouraged to serve park-and-ride facilities. Site selection criteria should include consideration of bicycle and/or pedestrian accessibility to reduce the number of cold starts by vehicles.

Support the improvement of pedestrian safety around transit stations. For example, the streets surrounding the Montello station do not promote pedestrian safety and pedestrians are often forced to choose unsafe routes to the station.

Freight and Air Transportation Transit Networks

Investigate potential of municipal airports' ability to serve as freight terminals. Currently, there is no scheduled freight service at any of the municipal airports throughout Southeastern Massachusetts. A feasibility study should be considered by the Massachusetts Aeronautic Commission to determine whether there is potential for any of the municipal airports to serve as airfreight terminals. Depending upon the type of freight, such a facility could serve intermodal purposes.

Accommodate freight and passenger railroad operations. Old Colony commuter rail operations could affect existing freight train services by reducing the flexibility available to CSX and Bay Colony Railroad. However, the low frequency of operation of the Old Colony lines during off-peak periods, coupled with the provision of a modern signaling system, centralized traffic control and passing sidings at strategic locations would permit freight operations during the midday periods. Consideration of freight and passenger railroad impacts is encouraged.

Increase the level of freight/goods movement by rail on the Old Colony and Stoughton lines. Support such initiatives, which would serve to reduce truck traffic congestion, particularly if the double stacking of containers in railroad freight hauling operations is implemented in the near future.

Allow for freight rail operations and the Old Colony commuter rail service to co-exist. Coordination should be encouraged between the MBTA and the two railroad freight operators in the region: CSX (Middleboro Line) and Bay Colony Railroad (Plymouth Line). Although freight railroad service in the region generally should not conflict with the restored passenger rail service during its peak operating periods in the A.M. and P.M., contingencies will need to be addressed such as the installation of updated switching equipment and passing siding.

CHAPTER 7 - BICYCLE AND PEDESTRIAN TRANSPORTATION

Routinely review project proposals through the MEPA process and other review opportunities to assure that provisions for bicyclists and pedestrians are incorporated into design plans.

Plymouth MBTA Commuter Rail Station and Seaside Rail Trail: Construction of new connections and enhancements to existing ones should be made between the Plymouth Station, the Plymouth Seaside Trail, and the Historic Plymouth Waterfront and Downtown Plymouth. Currently there is some degree of disconnect between these three components to this underutilized transportation corridor.

Develop a Regional Bicycle and Pedestrian Transportation Plan. A Regional Bicycle and Pedestrian Transportation Plan will examine the existing infrastructure in the region that supports bicycle and pedestrian transportation, and identify strengths and weaknesses in the system. The Plan will identify key areas to address for the creation of a contiguous, region-wide network of sidewalks, walkways, bicycle paths, and bicycle lanes, as well as identify strategies to accomplish the goals of the plan.

Encourage/promote bicycle riding as a viable alternative to automobile commuting and as a means to improve air quality. Where feasible, bicycling to work or to transit facilities instead of driving would reduce "cold starts," which inject high levels of toxic emissions into the atmosphere with the starting and shutting off automobile engines. A coordinated effort of local officials, the Massachusetts Highway Department, Regional Planning Agencies and interest groups, should encourage and promote the use of existing designated bicycle routes as a viable alternative to automobile commuting through public information and awareness efforts.

Encourage/promote safe bicycle riding, and reduce the number of injuries and fatalities associated with bicycle crashes. To help ensure safe travel habits and reduce the number of bicycle crashes, education programs for all road users should be implemented. Coordination of municipalities with the Department of Education, Registry of Motor Vehicles and transportation agencies should be a part of this effort.

Support bicycle riding as a part of intermodal travel. Coordination between different modes of transportation should include the improvement of bicycle access to public transportation. This includes, but is not limited to, permits to allow bicycles on train cars; external racks to carry bicycles on buses as done in Portland and San Francisco, and bicycle lockers at park-and-ride lots, train stations and bus terminals

Identify, designate and implement additional bicycle paths and routes to be used for both commuting and recreation. Local officials, in concert with state and regional planners, should investigate the development of additional bicycle paths and routes which could safely serve the commuting public. This includes, but is not limited to, the development of abandoned railroad rights-of-way as bicycle paths, and bikeways that connect industrial/business parks, shopping centers, schools and other key destinations.

Coordinate efforts to improve bicycle facilities with surrounding municipalities and regional agencies. To help form a more complete and contiguous network of bicycle facilities in the region and southeastern Massachusetts, local agencies should coordinate efforts with agencies and organizations outside the region. This includes, but is not limited to, researching the existing bicycle facilities of surrounding towns before formalizing new bikeways, and coordinating public outreach programs to help minimize the cost of these efforts.

Support local, regional, and state initiatives and legislation that create or maintain bicycle infrastructure and safety. To best serve the greater good and needs of the public for a safe and secure transportation system, support and endorsement will be provided to all initiatives and legislation (local/regional/state/federal) that result in the implementation of bicycle facilities, ease congestion, promote recreation, and increase safety and security for bicycle users.

Enhance bicycle facilities at intermodal facilities (MBTA Stations, BAT Centre, Park and Ride). The potential for MBTA Stations, the BAT Centre, and MassHighway Park and Ride lots to serve as true intermodal facilities can be maximized by enhancing bicycle facilities, including but not limited to: installation of external bike racks on buses that serve these facilities; the installation of bicycle lockers; and bicycle lanes and paths entering and exiting facilities.

Continue bicycle and pedestrian transportation safety efforts in Safety Management System. The Safety Management System promotes and plans for safety improvements throughout all modes on the transportation network.

Promote the installation of bicycle detection loops at actuated signalized intersection to increase safety for entering bicyclists. Noting that roadways serve both drivers of motorized vehicles and users of bicycles, actuated traffic signals should include detection loops for bicycles to maximize safety for bicycle riders.

Enhance pedestrian consideration during the planning and design phases. Too often municipalities over look the safety and access of pedestrians in areas with high volumes of automobiles. Only as an afterthought, safety amenities are added or design conditions are changed. A coordinated effort of planners, engineers, and local officials, should encourage pedestrian needs to be of higher priority during the initial design process.

Support local initiatives, which enact, implement and enforce laws and regulations regarding pedestrian traffic. The responsibility for pedestrian safety ultimately lies with the local jurisdiction. Communities should utilize safety officers to enforce laws/regulations that promote increased pedestrian safety, with emphasis around high activity areas such as transit facilities, schools, and commercial centers. Participants in the process should include police departments, traffic engineers, school and legal system representatives.

Install physical barriers, pavement marking, and other amenities where needed to maximize pedestrian safety. Marked crosswalks, safety islands, street lighting, pedestrian underpasses/overpasses, sidewalks, traffic signals and signage all constitute useful techniques to separate pedestrians from hazardous vehicular traffic. Particular attention should be given to high activity areas such as transit facilities, schools, and commercial centers.

Continue to study/identify additional pedestrian facilities. Continue to conduct studies in the region as needed to identify, designate, and implement additional pedestrian facilities. These facilities should improve linkages between existing pedestrian walkways, transit facilities, activity areas, and residential neighborhoods, and provide a safe and accessible means of short distance travel and recreation.

Promote/encourage pedestrian ways as a viable alternative to automobile commuting and means of improving air quality. Where feasible, walking to work or to transit facilities instead of driving would reduce "cold starts," which inject high levels of toxic emissions into the atmosphere with the starting and shutting off automobile engines. Support of this alternative includes, but is not limited to, the creation of pedestrian walkway connections between residential areas, transit facilities, industrial parks, shopping centers, schools and other key destinations.

Promote Installation of Pedestrian Countdown Signals at Signalized Intersections. A Pedestrian Countdown Signal consists of a standard pedestrian signal with standard shapes and color, with an added display that shows the countdown of the remaining crossing time. Studies have shown that these types of signals dramatically decrease pedestrian-vehicle conflicts and increases safety for crossing pedestrians. By viewing the numeric countdown display, pedestrians gain a new level of self-protection by the ability to determine how long it takes them to cross a street, and knowing precisely how much time exists on the current signal phase before the "Don't Walk" alert comes on and the signal proceeds into its next phase. According to a January 2006 article in the ITE Journal, San Francisco experienced a 52 percent reduction in pedestrian injury collisions at the 700 intersections it had retrofitted with the countdown equipment. The Regional Planning Agency and Metropolitan Planning Organization should work with the City of Brockton and other towns in the Region to retrofit signalized intersection with pedestrian countdown signals. Pedestrian countdown signals should be considered with all new signalization projects.

Promote Safer Pedestrian Access Designs in Parking Lots. Pedestrian consideration is often overlooked in design for parking areas of retail, entertainment, and employment centers. Often the pressure to provide as many parking spots as possible or the minimums for zoning regulations eliminates safe pedestrian accommodations from the design process. Once parked and out of the vehicle, pedestrians are often forced to share driveways with motor vehicles. With the boom in popularity of Sport Utility Vehicles and large profile trucks during the 1990's and early 2000's, often-exiting drivers have very little, if any, visibility of the driveway approaches, making pedestrians virtually invisible. Dedicated pathways between the parking area(s) and building(s) should be provided for pedestrian access. Facility owners should also consider the use of pavement markings, textured surfaces, and other traffic calming devices to further enhance pedestrian safety in parking areas.

Promote Use of Crossing Islands and Medians in Wide Cross-Sections. According to the MassHighway Project Development and Design Guide, fifty feet is generally the longest uninterrupted crossing a pedestrian should encounter at a crosswalk although islands and medians are also appropriate for shorter distances as well. Many multiple lane roadways exceed fifty feet in cross-section width. Raised medians provide the following benefits to pedestrians on the roadway network:

- Allow pedestrians to cross few lanes at a time, reducing exposure time.
- Provide a refuge so slower pedestrians (older persons, physically disabled, etc) can wait for a break in the traffic stream.
- Allow pedestrians to focus on one direction of traffic at a time.
- Reduce the total distance over which pedestrians are exposed to conflicts with motor vehicles.
- May provide easily accessible location for pedestrians signal call buttons.
- May also further enhance safety by functioning as a traffic-calming device, forcing drivers to reduce speed on approach to the crossing area.

Promote Pedestrian Level of Service D or Better at Intersections With High Pedestrian Activity. Pedestrian level of service is defined by the delay experienced by the pedestrian at an intersection, with guidance provided for by the Highway Capacity Manual (HCM). At Level of Service grades A and B, the likelihood of risk taking behavior (accepting dangerously small traffic gap, ignoring signals, etc) in evaluated as "Low" by the HCM. The likelihood of risky behavior increases to "Moderate" at Level of Service grades C and D. At level of service E, the likelihood of risky behavior increases to "High". All reasonable efforts should be exercised in planning, design, and construction of pedestrian facilities at intersections to minimize the potential risk taking behavior by pedestrians at intersections.

CHAPTER 8 - ENVIRONEMTNAL QUALITY, HAZARDS, AND ENERGY

Environmental Quality

Strive to reduce vehicle emissions. Encourage research and technology development to find new solutions to air pollution problems created by motor vehicles.

Strive to reduce single occupancy vehicle travel. Support programs, which encourage means to reduce single occupancy automobile travel. Examples are flexible working schedules, preferential parking for ridesharing, and incentives for transit use. MassRides program offers employers and their employee's benefits of carpooling and ridesharing.

Encourage the use of non-motorized alternatives. Encourage and support non-polluting modes of transportation, such as bicycling and walking as described in the Bicycle and Pedestrian component of this Plan.

Make maximum use of existing facilities and programs. The Massachusetts Environmental Policy Act Unit is responsible for reviewing large-scale development projects and should be allowed to maximize their influence to help protect the quality of the environment. The MassHighway Project Development and Design Guidebook can be extremely helpful in the protection and preservation of the environment as it promotes an integrated multimodal approach to roadway planning and design, ensures that context sensitivity is integrated into the planning, design, and construction process, and provides a clear project development process.

Encourage coordination between municipalities, federal, state, and regional agencies. Coordination between all interested parties is important to reduce the negative impacts to the environment. Improving air, land, water, and wildlife quality begins with a team approach and is successful with all voices recognized.

Support programs that mitigate water resource shortages. The Taunton River Desalinization Plant in Dighton (Aquaria project) will help meet the water demand of the Old Colony MPO region.

Reduce nonpoint source pollution. Support the development of new and improved designs and Best Management Practices (BMP) to reduce the contamination of water resources from transportation facilities and projects.

Minimize the use of road salt and sand. Studies have shown that road salt can have negative effects on some roadside vegetation and aquatic life. Accumulated amounts of sand can be hazardous to both the natural environment (air, land, and water) as well as to the traveling public. MassHighway has taken a number of steps to reduce the environmental impact from winter sanding and salt practices on state highways; including the reduction of sand applied during storms, use of liquid and flake calcium chloride to reduce sodium levels in runoff; construction of covered facilities for sand and salt storage and establishment of certain zones where reduced salt is used.

Support programs that reduce transportation related litter. The MassHighway Adopt-A-Highway program is a public service program that utilizes volunteer teams to pick up litter along the roadways.

Develop solutions for controlling transportation related noise. Transportation-related noise impacts can be minimized through improved facility design, compatible land uses, and enforcement of noise regulations. Encourage all regional and local transportation-planning efforts deal with noise problems as a normal step in the planning process.

Work to reduce/prevent light and noise impacts. Develop solutions for controlling transportation-related noise. Include noise mitigation through improved facility design, compatible land uses, enforcement of noise regulations, and selective use of sound barriers. Relate takings and designs to the sensitivity of adjacent habitats and neighborhoods. Design/install highway lights and streetlights to be directed down away from houses or other sensitive receptors or the sky.

Encourage Brownfield Redevelopment. Brownfields properties are often located where there is existing infrastructure, workforce and other amenities and therefore, are attractive for potential new business. Reuse of these facilities cleanses the existing site and eliminates the need to clear-cut forest for more development. Fostering the cleanup and re-use of contaminated properties is a priority for the state and the Old Colony MPO and is consistent with the Sustainable Development Principles established by the Massachusetts Office of Commonwealth Development.

Encourage Smart Growth Development Strategies. Support the smart growth initiatives resulting in cluster and condensed development. These strategies aim to reduce vehicle trips and vehicle dependency, therefore, resulting in benefits to air quality and reduction of foreign fossil fuel dependency.

Encourage the formation of Transportation Management Associations (TMAs). Transportation Management Associations (TMAs) are private, non-profit, member-controlled organizations that provide transportation services in a particular area, such as a commercial district, mall, medical center or industrial park. MassRides offers carpooling, vanpooling, parking management, and other techniques allow employees to diversify their trips to and from work, thereby reducing congestion and improving air quality.

Promote the use of Corridor Management Plans. The Office of Transportation Planning through the Executive Office of Transportation is developing a Route 44 Plymouth-Taunton Corridor Management Plan. This type of planning is vital to the Southeastern Massachusetts region, as it encourages collaboration between corridor municipalities, the Commonwealth, and other agencies and identifies potential growth and transportation management strategies for the corridor.

Encourage the use of parking garage structures. As more development occurs along major transportation infrastructure, the pressure to make parking lots larger to accommodate more residents, shoppers, and visitors increases. Parking garage structures allow the impact of vehicle parking to happen on a smaller footprint, thus reducing the amount of impervious pavement.

Encourage the proper design and use of High Occupancy Vehicle (HOV) lanes. High Occupancy Vehicle lanes should be designed for and only used by buses carrying large amounts of people to and from their destinations. These lanes would make commuter bus lines a more acceptable alternative to individuals who drive automobiles, thereby reducing congestion and improving air quality.

Support "Intermodalism." Promote using "intermodalism" to better integrate all transportation modes such as: Automobile, Motorcycle, Transit, Rail, Bus, Water, Air, Walking, and Bicycling. Providing a hub that supports all transportation modes attracts more people and increases efficiency.

<u>Hazards & Evacuations</u>

Encourage pre-disaster planning. Many communities have participated in a multi-hazard pre-disaster planning effort, which focused on natural disasters and how the region's citizens will respond.

Reduce the loss of life, property, infrastructure, and cultural resources from natural disasters. A coordinated response to a natural disaster will reduce the loss of life, property, infrastructure and cultural resources. Visible evacuation routes will also eliminate congestion on major routes.
Make maximum use of existing facilities and programs. Programs and facilities that are established to mitigate damage to transportation infrastructure, property, and cultural resources should be maintained and utilized to their greatest potential.

Increase the number of communities using Hazard Mitigation Grants or Pre-Disaster Mitigation Grants.

Improve pre-disaster planning and communication/coordination between federal, state, regional, county, municipal, private, and non-profit agencies and major firms and institutions, especially prisons, colleges, and concentrations of population and employment.

<u>Energy & Emissions</u>

Reduce dependency on foreign fossil fuels. Promote research, development and implementation of standards, policies, and programs to reduce fuel consumption and the increase investments in alternative fuels.

Conserve Natural Resources. The southeastern portion of Massachusetts has seen substantial growth over the past decade. Water demand will be the limiting factor in terms of growth in the region and that water resource must be protected.

Encourage the use of Renewable Energy. Promote the use of renewable energies throughout the Commonwealth, such as solar and wind. Using these sources in place of fossil fuels and nuclear energy reduces the depletion of natural resources and the creation of both toxic and non-toxic wastes.

Promote the increase and enforcement of Corporate Average Fuel Economy (CAFEE) Standards for passenger car and light truck fleets. Automobile manufacturers should be required to meet and exceed CAFE standards for passenger and light truck fleets and should be recognized for doing so.

Continue to enforce the emissions standards set by the Commonwealth. Enforcing the emissions standards for all vehicles of the Commonwealth plays a large role in improving the air quality of the State.

Promote new and forward thinking "green" technologies. The Carl Moyer Program in California is a prime example of how Massachusetts can encourage drivers to replace their old automobiles with newer and less polluting vehicles.

CHAPTER 9 - SAFETY

Reduce the rates of motor vehicle, bicycle, and pedestrian fatalities by incorporating engineering, enforcement, education, and emergency response into the planning process.

Support the increase of safety of highway & railroad grade crossings and other locations where modes intersect.

Support the increase and improvement of safety of services, vehicles and facilities for transit, and for the transportation disadvantages.

Support the implementation of emergency response and evacuation plans in cooperation with emergency management agencies.

Continue to utilize safety performance measures in the planning process.

Broaden the awareness of safety issues through dissemination of messages o the public and elected officials.

Identify top lane departure and crash location and work at the local and regional levels to develop and implement location specific strategies to mitigate the deficiencies.

Expand the Safe Routes to School Program.

Support the increase of seat belt use in the State.

Increase the awareness of the dangers of speeding.

CHAPTER 10 - SECURITY

Foster communication and cooperation between federal, state, regional, and local agencies for the planning, practice, and implementation of emergency scenario plans.

Support the forum for cooperation between the different transportation agencies in the state on security concerns through the Regional Homeland Security Councils.

Incorporate intelligent transportation systems, such as variable message signs, into the emergency response system.

Increase surveillance and security efforts at transportation facilities throughout the region.

Continue other security improvements at the public use airports, such as the installation of security fencing, gates, and access control and video monitoring systems.

Facilitate comprehensive evacuation planning and coordination procedures between state and local agencies.

Designate and indicate, through road signs, emergency evacuation routes, and shelters

Support enforcement of state and local traffic laws.

Continue to implement "Transit Watch" and the station improvement program of the MBTA, including station monitors and the new communications system.

CHAPTER 11 – FINANCE

Preserve and maintain transportation assets for future generations.

Adequately maintain all elements of the transportation system to protect the public's investment.

Increase the efficiency of the transportation system using appropriate technologies.

Discuss, analyze, and incorporate, as deemed appropriate, the recommendations of the Transportation Finance Commission.

Support the increase of the annual Chapter 90 statewide total amount to at least $250 million.

Assist communities in preparing and updating their road inventories to ensure that they reflect accurate mileage amounts for publicly accepted roads.

Continue to review, develop, and analyze supplemental funding resources. Such resources could include increased user fees, transit mitigation banks, and concurrency management systems. Concurrency is the growth management concept intended to ensure that the necessary public facilities are available concurrent with the impacts of development.

Implement fare and revenue policies that grow with inflation.

Establish and dedicate transit funding from sources that grow with inflation.

Support congestion improvements and the reward for regional approaches to coordinating and interconnecting signalized intersections and corridors.

Support and enhance asset management capabilities to perform the appropriate type of improvement at the right time.

Support the establishment of a RTA service fund to restore and enhance service.

Support the changing of RTA financing from retroactive reimbursement to current financing (forward funding).