Phase 1

Bicycle and Pedestrian Connectivity and Livability Study

Fall 2011

Old Colony Planning Council
70 School Street
Brockton, MA 02301

Prepared under MassDOT Contracts

#0052455 and #69649

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The views and opinions of the Old Colony Planning Council expressed herein do not necessarily state or reflect those of the U. S. Department of Transportation.

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Executive Summary

A critical component for understanding walking and bicycling conditions in the region is to first understand the existing environment and provision of accommodations for non-motorized users. As part of this study, a comprehensive inventory of existing and proposed on and off road bicycle and pedestrian facilities within the region was undertaken. Currently, the region has few mixed-use developments and concentrations of development that can make walking and bicycling more feasible options for reducing today's automobile trips throughout the region. Over the last several years, there have been efforts to increase mixed-use developments and Transportation Oriented Developments in the Old Colony Region. As a result, many communities are exploring land use decisions with consideration being made to meet the walking and bicycling needs of the population.

Citizens and stakeholders involved in this process revealed that there is a funding need for sidewalk and bikeway improvements in the region, and it is unlikely that these will be met in the future due to limited funding opportunities. For this reason, the Old Colony Planning Council has made the effort to allocate transportation planning funding to define the existing bicycle and pedestrian infrastructure conditions during Phase-One of this study. Phase-Two will focus on an in-depth infrastructure analysis where short, medium, and long-term recommendations will be matched up with potential funding opportunities. In the meantime, the Old Colony Planning Council has made available to the communities, a total of $200,000 of federal funding for bicycle parking facilities in public areas during FFY 2012 to 2015. As part of the Council's ongoing commitment to bicycle and pedestrian access, the Council is assisting communities in applying for Federal grants that will assist with trail protection, construction of bicycle and pedestrian facilities, and maintenance of existing facilities. Furthermore, OCPC is examining the possibility of how unofficial trails could be part of an integrated system.

Working with the local communities, businesses, non-profit organizations, and the public, the Old Colony Planning Council will use the Regional Bicycle and Pedestrian Connectivity and Livability Study as a mechanism to foster a better understanding of bicycle and pedestrian needs within the region. One of the goals of the Old Colony Planning Council is to improve the quality of life in our communities by integrating transit, bicycle, and pedestrian amenities into residential and commercial/industrial developments. This goal can be achieved by distributing burdens and benefits fairly in the region, promoting public and private collaboration with meaningful community participation, creating partnerships with agencies that have similar goals and objectives, and by providing equitable access to transportation choices for all. Communities, neighborhoods, and downtowns with high levels of pedestrian and bicycle activity are often seem as places that are livable, prosperous, and inviting. This study provides guidance for policies, programs, and investments intended to maximize such results by expanding opportunities for greater walking and bicycling activities in the Old Colony Region now and in the future.

Why a Regional Plan

A Study for the Old Colony Region

The regional Bicycle and Pedestrian Connectivity and Livability Study is intended to establish a strategic vision for improving walking and bicycling opportunities in the Old Colony Region. This strategic vision will feed into the Old Colony Metropolitan Planning Organization's (MPO's) overall Regional Transportation Plan and provide the basis by which future funding priorities of the MPO are established for bicycle and pedestrian accommodations within Abington, Avon, Bridgewater, Brockton, East Bridgewater, Easton, Halifax, Hanson, Kingston, Pembroke, Plymouth, Plympton, Stoughton, West Bridgewater, and Whitman.

The Benefits of Walking and Bicycling

Walking and bicycling are the simplest forms of transportation and afford basic mobility to all. They offer to our communities a great number of benefits that improve the quality of life beyond just transportation alone. Just a few of the greatest benefits include:

- Increased physical activity and active lifestyles are promoted by well-designed sidewalks, bikeways, and interconnected streets especially when combined with a mixture of land uses at the human-scale
- In addition to combating obesity, physical activity, such as walking and bicycling, can help prevent many other health-related problems which increase health care costs
- Walking and bicycling can directly replace short motor vehicle trips thereby reducing in driving and lessening traffic congestion. Traffic congestion causes pollution, wastes time and energy, causes driver frustration, and reduces economic productivity
- Pedestrian and bicycle accommodations promote greater use of transit by providing sidewalk and bicycle facilities between home and employment centers and public transit.
- Walking and bicycling can help residents stimulate their local economies by encouraging them to support retail merchants and restaurants near their home and workplace
- Providing multi-use trails can increase real estate value as trails are the top ranked outdoor community assets according to the National Association of Homebuilders
- Providing for pedestrians and bicyclists can be an excellent way to increase local tourism
- Businesses that promote active transportation can see an increase in productivity, improved employee health, and better customer relations, as well as a decrease in absenteeism and employee turnover
- Providing bike racks and lockers at transit stops, transfer stations, and buses can encourage more people to use public transit
- Communities, neighborhoods, and downtowns with high levels of pedestrian and bicycle activity are often seem as places that are livable, prosperous, and inviting
- Walking and bicycling can provide mobility to citizens who cannot, or who choose not to, own a car, helping them to be more productive and active members of society.

- Promoting walking and bicycling can help families cut down on the cost of driving, which includes fuel costs, maintenance, and added costs for second or third car to the monthly budget.

Plan Development Process

Developing a common set of objectives and strategies is an important part of any planning process as it is the foundation upon which policies, resources, and other actions are based. Objectives are clear, realistic, and measurable statements of action which when completed will move towards goal achievement. Objectives describe future expected outcomes or states. They provide programmatic direction and focus on ends rather than means. Strategies are the overall approach to achieving the stated objectives.

The Bicycle and Pedestrian Connectivity and Livability Study objectives and strategies were developed based on the following input components:

1. **Bicycle and Pedestrian Task Force Input (49 members):** This task force provides concise and timely reports to the JTC, MPO, and OCPC on issues regarding bicycle/pedestrian travel environment, drafts bicycle and pedestrian planning products; and carries out special bicycle and pedestrian specific projects (walking audits, Bicycle Plans, Bike/Ped Level of Service Inventory, public meetings). The relationship between land use planning, transportation, and economic development is central to this task force, which calls for urban investment, concentrated development patterns, and smart economic growth. The task force meetings are open to the public and anyone from the public can become a member.
2. **Community Interviews**: The Old Colony Planning Council staff met with engineers, planners, public works and highway staff, police and fire officials, and youth councils to discuss the issues that communities face when it comes to transportation by foot or bicycle. At these focused meetings, the potential data collection routes were defined and presented to the task force members.
3. **Public Participation and Outreach Consultation Process (nearly 300 participants)**: During the 2012 Regional Transportation Plan development, public participation was designed to ensure opportunities for the public to express its views on transportation issues and to become active participants in the regional planning and transportation decision-making process. The outreach process consisted of activities designed to build better

***Figure 1**: The Task Force meets quarterly at the OCPC office*

***Figure 2:** Meeting held in the Town of Plymouth*

***Figure 3:** An example of a bicycle outreach activity at the D.W. Field Park*

relationships with citizens that are engaged with their communities and businesses, along with individuals of "traditionally underserved" groups such as Limited English Proficiency populations, and non-profit organizations. One of the main purposes of the public participation process was to educate and inform stakeholders on new initiatives such as livability, sustainability, and climate change. The process also helped OCPC document local bicycle and pedestrian improvement needs.

4. **Online Survey during Regional Transportation Plan Update (over 150 surveys):** The survey was designed to educate the public on new initiatives and to obtain people's comments on mobility, safety and security, land use policies; and environmental protection issues. The survey was available electronically through Survey Monkey on the OCPC website and electronic newsletters. In addition, the survey was distributed to a mass email list of interest groups at the beginning of the plan update process. Hard copies of the survey were also available in the Council's office and were distributed throughout the region during the outreach campaign. In order to reach out to all ethnic groups in the region, the survey was also available in multiple languages: English, Spanish, French (creole), and Portuguese.

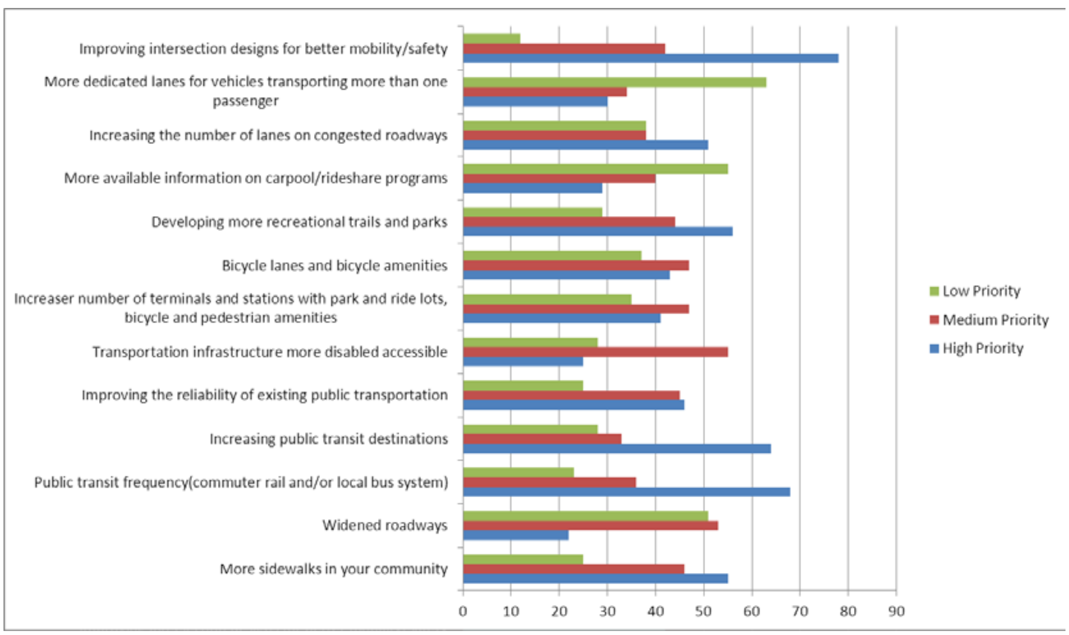


Figure 4: *Regional Mobility Needs Survey Results*

Specific mobility needs in the Old Colony region were identified as follows:

- Add bus shelters on the Massasoit Community College Campus
- Coordinate regional transit services with commuter rail schedules
- Return two way traffic to Main Street in Brockton
- Installation of a traffic signal at the corner of Route 106 and Prospect Street in Easton
- Add bicycle lanes throughout the region for increased safety
- Improve overall crosswalk system
- Enforce speed limit with traffic calming techniques

Objectives and Strategies

There were two main objectives in phase one of the 2011 Regional Bicycle and Pedestrian Connectivity and Livability Study:

1. To conduct an extensive public participation and outreach process in order to identify the areas of need for bicycle and pedestrian infrastructure improvements, and;
2. To collect the bicycle and pedestrian related data in areas identified by the communities' stakeholders groups.

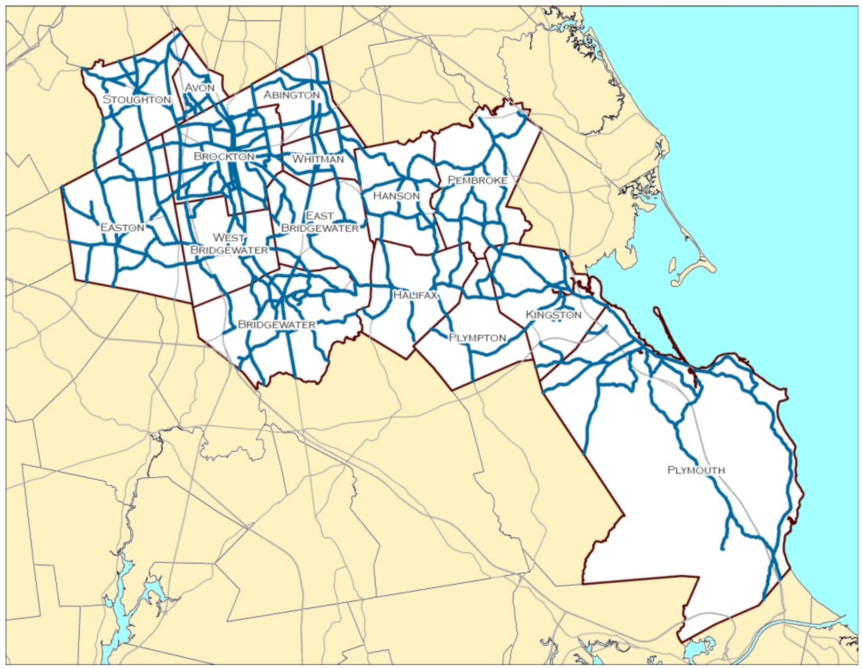


Figure 5: Bicycle and Pedestrian Data Collection *Map*

Phase two will consist of an in-depth analysis of the existing infrastructure conditions collected during phase-one. This process will be followed by a project-by-project prioritization. A list of bicycle and pedestrian short and long term infrastructure projects will be provided at the end of phase-two. By 2020, the objective of the Old Colony Planning Council is to complete 40 percent of the short-term projects using local, state and federal funding as well as private developer mitigation when applicable. In the long run, by 2035, implementing 50 percent of the identified long-term projects is the goal. These efforts will be carefully coordinated with the Old Colony Region's Bicycle and Pedestrian Task Force, which involves a diverse group of residents and agencies from different affiliations. The map above illustrates the locations identified by stakeholders and where OCPC staff conducted the data collection and analysis.

The following goals and performance measures were developed during the update of the Regional Transportation Plan. This has a direct correlation to the objectives of the Bicycle and Pedestrian Connectivity and Livability Study.

Goal 1: Enhance and Protect Regional Mobility

OUTCOMES	METRICS	PROPOSED PERFORMANCE MEASURES
1 a. Increased bicycle and pedestrian infrastructure networks and amenities in the	- Pedestrian Compatibility Index (pedestrian level of service) -Bicycle Compatibility Index	- By 2015, determine bicycle and pedestrian short and long term infrastructure projects.

region	(bicycle level of service)	- By 2020, complete 40% of short-term infrastructure projects identified in the 2011 Bicycle Connectivity Study - By 2035, implement 50% of the identified long-term bicycle and pedestrian projects
1 b. Increased multimodal transportation centers (Transit Oriented Development) that serve business, residential, and mixed-use developments	- Support the development of TODs in Kingston, Plymouth, Bridgewater, Hanson, and Easton Commuter Rail stations	- By 2035, Kingston, Plymouth, Halifax, Hanson, Whitman, and Easton Commuter Rail stations will be TOD designated

Goal 2: Foster Sustainable, Healthy, and Livable Communities

OUTCOMES	METRICS	PROPOSED PERFORMANCE MEASURES
2a. Improved networks that accommodate pedestrians and bicycles	- Pedestrian Compatibility Index (pedestrian level of service) -Bicycle Compatibility Index (bicycle level of service)	- By 2035, create a contiguous, region-wide network of sidewalks, walkways, bicycle paths, and bicycle lanes - By 2035, bring Pedestrian Level of Service B or better at intersections with high pedestrian activity
2b. Revitalized downtowns and town centers	- Additional mixed-used developments with bicycle and pedestrian amenities in downtowns and town centers	- Support local initiatives, which enact, implement and enforce laws and regulations regarding pedestrian and bicycle traffic in downtowns. - Support policies that encourage cluster development. - By 2035, Kingston, Plymouth, Hanson, Whitman, and Easton Commuter Rail stations will be in designated TODs

Goal 3: Ensure Equity and Public Participation

OUTCOMES	METRICS	PROPOSED PERFORMANCE MEASURES
3 a. Improved public participation and awareness of new initiatives and programs	- Number of active multidisciplinary task forces -Number of surveys and feedback forms during the year	-Meet quarterly with stakeholders and the public to discuss key Environmental Justice issues on Sustainability and Livability, bicycle and pedestrian, regional mobility, and climate change -Develop surveys during the year to collect public opinion on different transportation issues
3 b. Partnered with other agencies with similar goals and objectives	-List of existing and potential partners	-Extended partnerships with agencies that have similar goals and objectives

Goal 4: Improve Transportation Safety and Security

OUTCOMES	METRICS	PROPOSED PERFORMANCE MEASURES
4 a. Reduced transportation-related fatalities	-Annual crash data report -Road safety audits	- Reduce the number of transportation-related fatalities in the Old Colony region by 40 percent in 2035 compared to 2008.
4 b. Reduced transportation-related injuries	-Annual crash data report -Road safety audits	- Reduce the number of transportation-related accidents in the Old Colony region by 20 percent in 2035 compared to 2008.

Goal 5: Promote Environmental Protection and Climate Change Adaptation

OUTCOMES	METRICS	PROPOSED PERFORMANCE MEASURES
5 a. Reduced carbon emissions, improved energy efficiency, and reduced dependence on oil	-1993 to 2008 Department of Motor Vehicle (Average Vehicular Daily Miles Traveled in the Old Colony region)	- Decrease fuel consumption per vehicle-miles traveled, per passenger miles traveled, and per (net) freight ton-mile - Increase percent of transit vehicles using alternative fuels - By 2035, stop increasing greenhouse emissions -By 2035, reduce average daily miles traveled to 10% below 2008
5 b. Increased the use of environmentally sustainable practices in transportation to prevent climate change effects	- Data comparison of 2000 and 2010 US Census Journey to Work data	- By 2035, increase the use of transit by 20% compared to 2000 - Increase carpool/vanpool and non-motorized transportation modes such as bicycle and walking compared to 2000 census
5 c. Increased development of waste water treatment capacity and drainage systems	- 2011 Climate Change Roadway Drainage and Runoff Program	-By 2035, upgrade 20%of the drainage systems in areas identified as high risk in the Climate Change Study

Goal 6: Promote Policies that Ensure Economic Vitality and Sustainability

OUTCOMES	METRICS	PROPOSED PERFORMANCE MEASURES
6 a. Increased mixed use centers, re-use of existing infrastructures, and transit oriented development districts in the Old Colony region	- Number of Transit Oriented Development Studies - Number of Economic Development Studies - Number of projects under Chapter 40B of the state's affordable housing law and the 40R smart growth act -Number of Brownfield projects	- By 2035, Plymouth, Halifax, Hanson, Whitman, and Easton Commuter Rail stations will be TOD designated -By 2035, all OCPC communities will have overlay districts that encourage economic development
6 b. Pursued policies of sustainable development	-Number of communities that opt to modify their subdivision rules and regulations to require bicycle/pedestrian easements to tie into a binding adopted region-wide bicycle/pedestrian system	-Revision of local Subdivision Rules and Regulations to require bicycle/pedestrian easements and paths to adjacent property, located so as to tie into binding adopted region-wide bicycle/pedestrian system

Existing Conditions

Sidewalks

According to the Massachusetts Road Inventory File, the Old Colony region has over 390 miles of roadway with sidewalks on at least one side of the street. 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, with no sidewalks. In some cases, a worn footpath exists along the side of the roadway, and in others pedestrians share the roadway with vehicles. A complete inventory of the sidewalk network in the Old Colony Region will be compiled during phase two.

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 Standish 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 University has a network of paved footpaths connecting campus buildings, parking areas, and the Bridgewater MBTA Commuter Rail Station.

Signalized Intersections

Signalized intersections often present the best opportunity for bicyclists and pedestrians alike to cross a street as they provide ordered and predictable traffic control. Features such as crosswalks, pedestrian call buttons, pedestrian "walk" / "don't walk" signals, pedestrian countdown signals, bicycle detection loops, and accessible controls for the vision and hearing impaired are some features that further facilitate bicycle and pedestrian movements at signalized intersections. The Pedestrian maps of this report contain a complete listing of the traffic signal conditions throughout the routes selected in the region.

Intermodal Connections

There are twelve MBTA Commuter Rail Stations, two local Regional Transit Agency hubs (BAT Intermodal Centre in Downtown Brockton and PAL/GATRA Hub at Memorial Hall in Plymouth), and six Park-and-Ride (inter-city bus) stations within the Old Colony Region. Additionally, three Commuter Rail stations (South Weymouth, Holbrook/Randolph, and Middleborough/Lakeville) and two Park-and-Ride stations (Rockland, Bourne) that are located beyond the borders of the Region are also monitored in the Old Colony Congestion Management Process.

Figure 6*: Pedestrian walkway connection at MBTA Commuter Rail Station in Hanson*

All of the MBTA Commuter Rail Stations are equipped with bike racks, as is the Brockton Area Transit Intermodal Centre. Additionally, most stations are accessible to pedestrians and the disabled; however, ease of connections and distance from the main roadway vary from station to station.

Long Distance Routes

Claire Saltonstall Boston to Cape Cod Bikeway: The Claire Saltonstall Bikeway, also known as the Boston to Cape Cod Bikeway, is a 135-mile bikeway marked on signs and official maps as Bike Route 1. It starts on the Charles River Bikeway in Boston; and, travels along a network of off-road bike paths, back roads, and secondary highways to its terminus in Provincetown. Dual signs are provided along the route, one with a picture of a bicycle on a green background and the number “1” in green below the picture, and another rectangular sign with the words “Claire Saltonstall Bikeway” below. These signs were erected after the official legislative act in 1978 naming the bike route. Few of these signs, however, remain today. In order to follow the route, riders need a map detailing where the route follows. The road characteristics of the Claire Saltonstall Bikeway have changed in some sections and may no longer be a safe ride for bicyclists. Within the Old Colony Region, the Claire Saltonstall Boston to Cape Cod Bikeway travels through Avon, Brockton, East Bridgewater, Halifax, Plympton, Kingston, and Plymouth.

Bay Circuit Trail: The Bay Circuit Trail (BCT) is a two hundred mile long recreation trail connecting parks, open spaces, and waterways in eastern Massachusetts. First proposed in 1929 as an outer "emerald necklace," the route stretches from Plum Island in Newburyport on the North Shore to Kingston Bay, traversing 50 cities and towns. Approximately 150 miles of the trail have been completed. The BCT varies in surface type, from earthen hiking trails to paved shared-use trails.

In the Old Colony Region, the Bay Circuit Trail runs through Easton, West Bridgewater, Bridgewater, East Bridgewater, Hanson, Pembroke, and Kingston. Aside from a gap in Bridgewater and East Bridgewater, where a trail connection is proposed but not open, the trail creates a contiguous path from the western border of the region (the Easton/Sharon Town Line) to Kingston Bay.

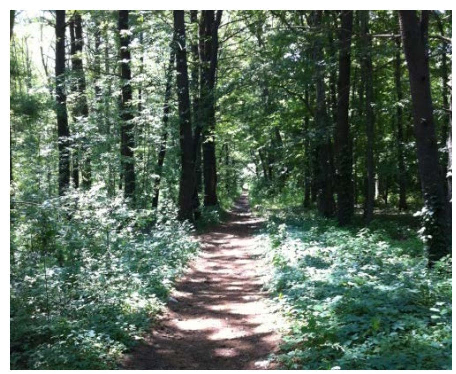


Figure 7: *An unofficial trail in East Bridgewater*

Recreational Bicycle Routes

The Seaside Bike-Rail Trail in Plymouth is a 1.5 mile long facility that runs parallel to the Plymouth seashore between Hedge Road (just south of Cordage Park) and Nelson Street (just north of Downtown Plymouth) at the Nelson Street Recreation Area.

The Myles Standish State Forest in Plymouth and DW Field Park in Brockton and Avon also offer miles of paved bike paths. The Ames Nowell State Park in Abington offers mountain biking trails, while the Borderland State Park in Easton provides both paved bike paths and mountain bike trails.

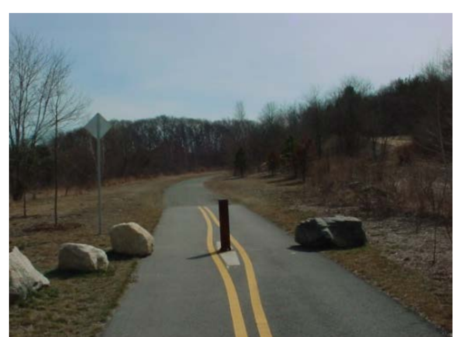


Figure 8*: The Seaside Bike Rail Trail, in Plymouth Massachusetts*

Inventory and Analysis

As part of the Bicycle and Pedestrian Connectivity and Livability Study, the Old Colony Planning Council has developed a complete inventory of Bicycle Levels of Service (BLOS), Pedestrian Levels of Service (PLOS), and Pedestrian Infrastructure Index (PII) on the state numbered route network and other roadways identified as priority routes by community representatives and/or the Regional Bicycle and Pedestrian Task Force members. OCPC Staff will maintain this inventory on a continuing basis, updating information as it becomes available and as existing infrastructure changes. By 2035, the goal is to have a contiguous, region-wide network of bicycle paths and bicycle lanes, and locally completed sidewalk system in urbanized areas. In addition, by 2035 the goal is also to improve the intersections with high pedestrian activity to pedestrian level of service B or better.

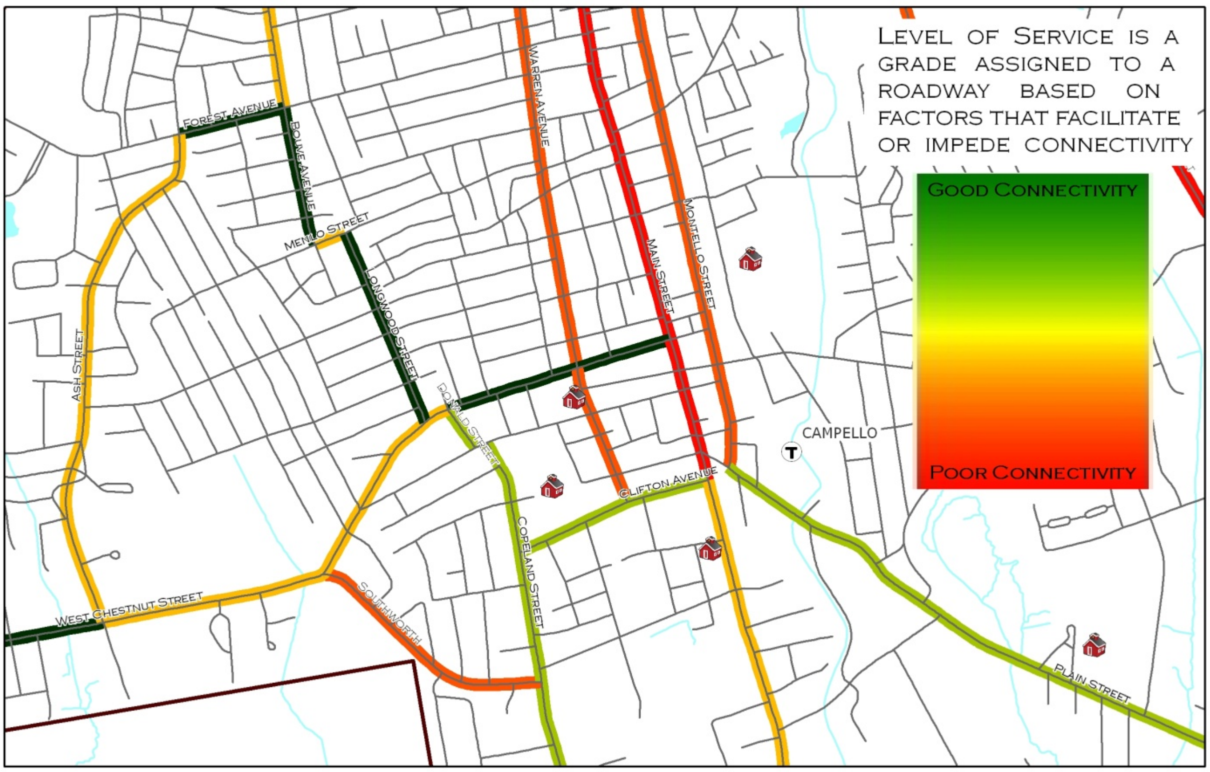


Figure 9: *Example of Bicycle and Pedestrian Level of Service Findings*

Level of Service (LOS)

The Highway Capacity Manual (HCM) defines LOS as a quantitative stratification of a performance measure or measures that represent quality of service. The measures used to determine LOS for transportation system elements are called *service measures.* Ideally, service measures should exhibit the following characteristics:

- Service measures should reflect travelers' perception (i.e., measures should reflect things travelers can perceive during their journey);
- Service measures should be useful to operating agencies (e.g., agency actions should be able to influence future LOS);
- Service measures should be directly measurable in the field (e.g., an analyst wishing to determine LOS for a two-lane highway used for recreational access can go into the field and directly measure average travel speed of cars); and
- Service measures should be estimable given a set of known or forecast conditions (e.g., a method to estimate the average travel speed for a two-lane highway, given inputs for roadway and traffic conditions).

There are six level of service gradings, ranging from A to F, for each service measure, or for the output from a mathematical model based on multiple performance measures. LOS A represents the best operating conditions from the traveler's perspective and LOS F the worst. For cost, environmental impact, and other reasons, roadways are not typically designed to provide LOS A conditions during peak periods, but rather some lower LOS that reflects a balance between individual travelers' desires and society's desires and financial resources.

The Old Colony Planning Council focused mostly on collecting field data that reflected travelers' perception. In the study area, the Old Colony Planning Council staff collected the following information: Total number of travel lanes, width of outside through-lane, bicycle lane and/or outside shoulder, proportion of on-street occupied parking, travel speed, percent of heavy vehicle traffic, average daily and peak hour traffic, presence of sidewalk, total walkway width, landscape buffer between roadway and sidewalk, spacing average of objects in buffer (e.g., trees, telephone or electric posts), and pavement conditions.

Pedestrian Mode

Approximately 9% of all trips in the United States are accomplished by walking (2001 National Travel Survey). Moreover, many automobile trips and most transit trips include at least one section of the trip where the traveler is a pedestrian. Given the presence of a network of safe and convenient pedestrian facilities, as well as the availability of potential destinations within a walking distance of one's trip origin, walking can be the first choice for a variety of shorter trips, including going to school, running errands, and recreational and exercise trips.

A pedestrian is considerably more exposed than is a motorist, in both good and bad ways. A pedestrian travels much more slowly than other modal users and can therefore pay more attention to his or her surroundings. The ability to take in one's surroundings and get exercise while doing so can be part of the enjoyment of the trip. At the same time, a pedestrian interacts closely with other modal users, including other pedestrians, with potential safety, comfort, travel hindrance, and other implications. In addition, a pedestrian is exposed to the elements. As a result, a number of environmental and perceived safety factors significantly influence pedestrians, and pedestrian flow quality is also a consideration.

Pedestrian Level of Service (PLOS) for Urban Street

Pedestrian LOS for urban streets is based on a pedestrian LOS score model that includes variables determined from research on pedestrians' perceptions of LOS. These variables relate to pedestrians' experiences walking along street segments between signalized and non-signalized intersections. Overall, pedestrian LOS is improved by the provision of sidewalks, wider sidewalks, and a greater degree of separation from traffic. Higher traffic volumes, higher traffic speeds, and wider streets all tend to reduce pedestrian LOS. Urban street segments are evaluated for each side of the street. If a sidewalk is not available for the subject side of the street, then it is assumed that pedestrians will walk in the street on that side (even if there is a sidewalk on the other side). *Appendix A* includes a detailed explanation of the data input fields for the Pedestrian and Bicycle Level of Service.

Figure 10: *This photo was taken at Massasoit Boulevard in Brockton, MA*

Location with a Low PLOS Grade

PLOS Score = 3.04 (F)

- ADT = 16,700 vehicles/day
- Two 13' lanes
- 0 paved shoulder
- 20 mph speed limit
- 0 sidewalk width
- 0 sidewalk buffer
- 0 average tree spacing

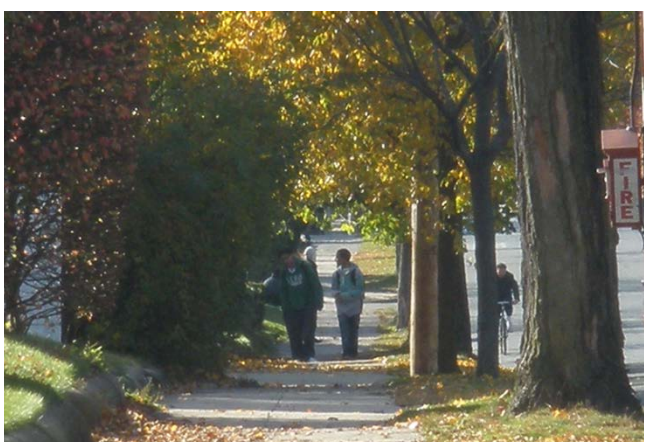


Figure 11: *This sidewalk is located at West Elm Street in Brockton*

Location with a High PLOS Grade

PLOS Score = 1.41 (A)

- ADT = 14,500 vehicles/day
- Two 12' lanes
- 2' paved shoulders
- 30 mph speed limit
- 5' sidewalk width
- 5' sidewalk buffer
- 6' average tree spacing

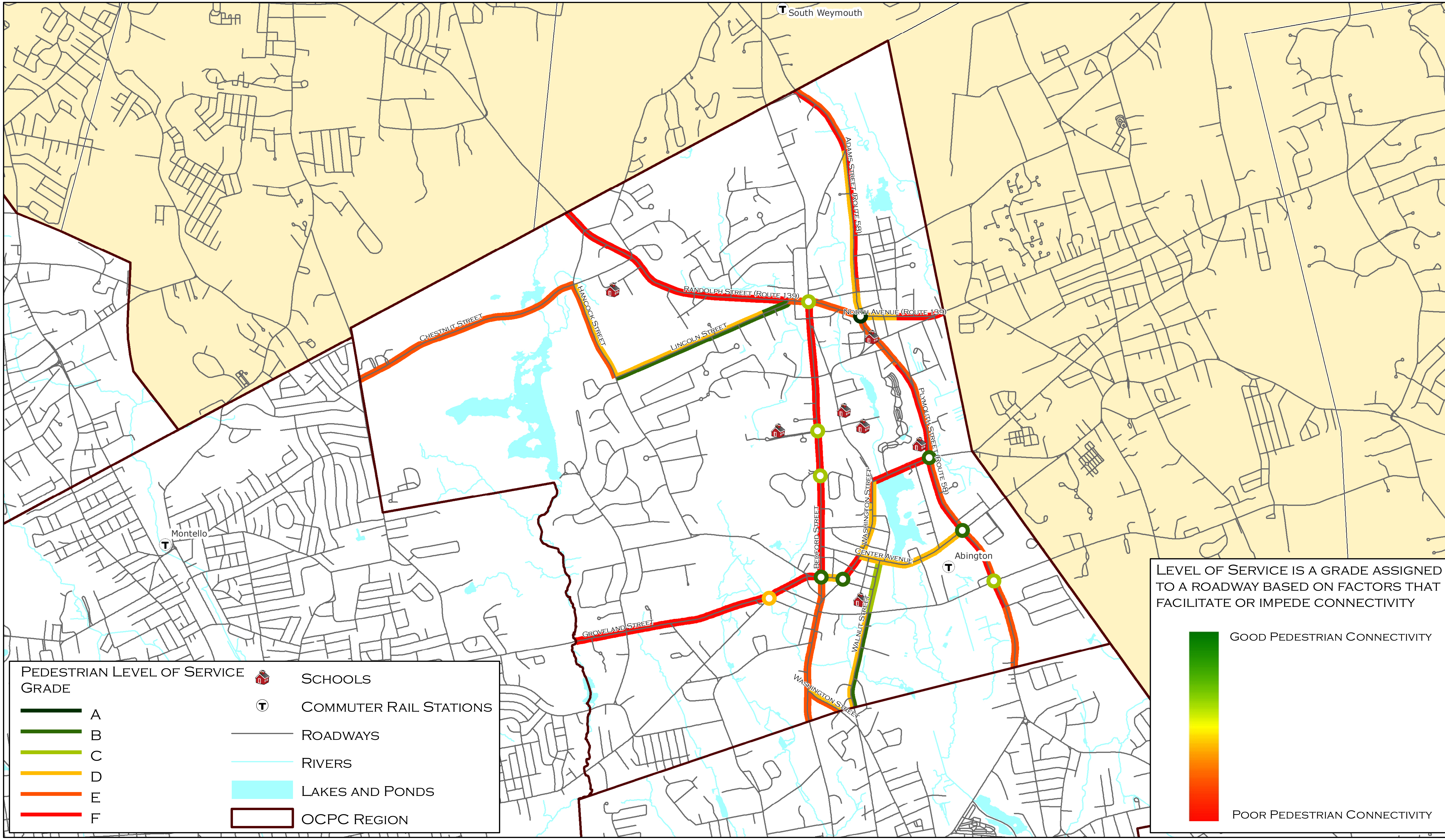
Pedestrian Infrastructure Index (PII) at Signalized Intersections

Pedestrian Infrastructure Index at signalized intersections is based on a *pedestrian* LOS score model that incorporates existing infrastructure conditions. The input variable used for this LOS score model includes: The total number of lanes at the intersection, greatest number of lanes across any road, left turn lanes, right turn channel, right on red prohibited, signal phasing, the presence of crosswalks, crosswalk type, crosswalk condition, pedestrian push buttons, accessible pedestrian buttons, pedestrian signals, sidewalks, approach grade, blocked views, ADA compliant curb cuts, ADA compliant refuge islands, turn radius, skewed/offset intersection, lighting, and other special features such as sound systems for the visually impaired. *Appendix B* includes a detailed explanation of the input variables and the scoring description.

Figure 12: *An example of an inaccessible pedestrian push button*

The following maps reflect the pedestrian infrastructure existing conditions of the areas selected in the Old Colony region. These maps include the level of service along street segments and at signalized intersections. The maps of the communities are sorted by alphabetic order.

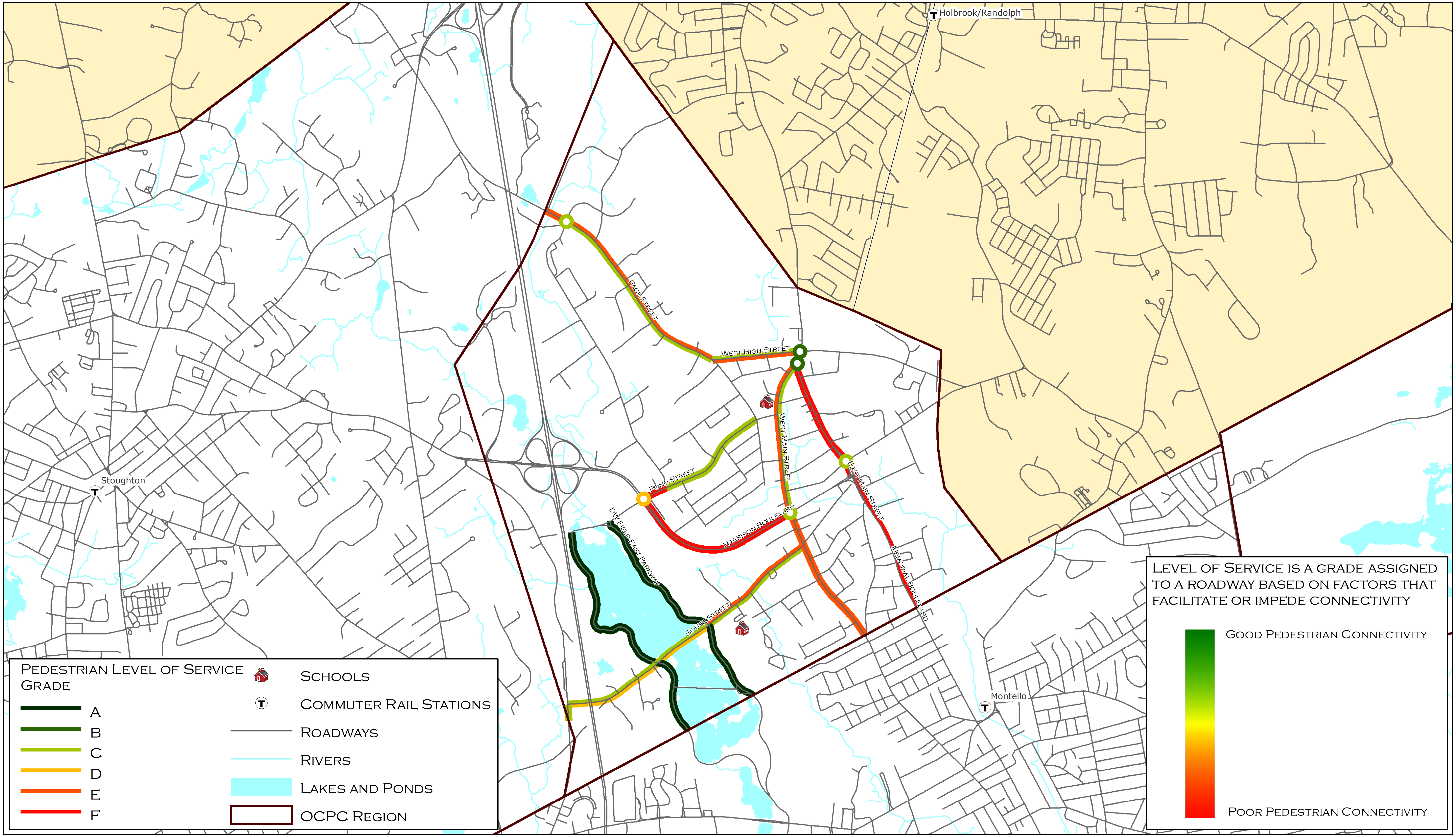
Abington Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

Avon Pedestrian Level of Service

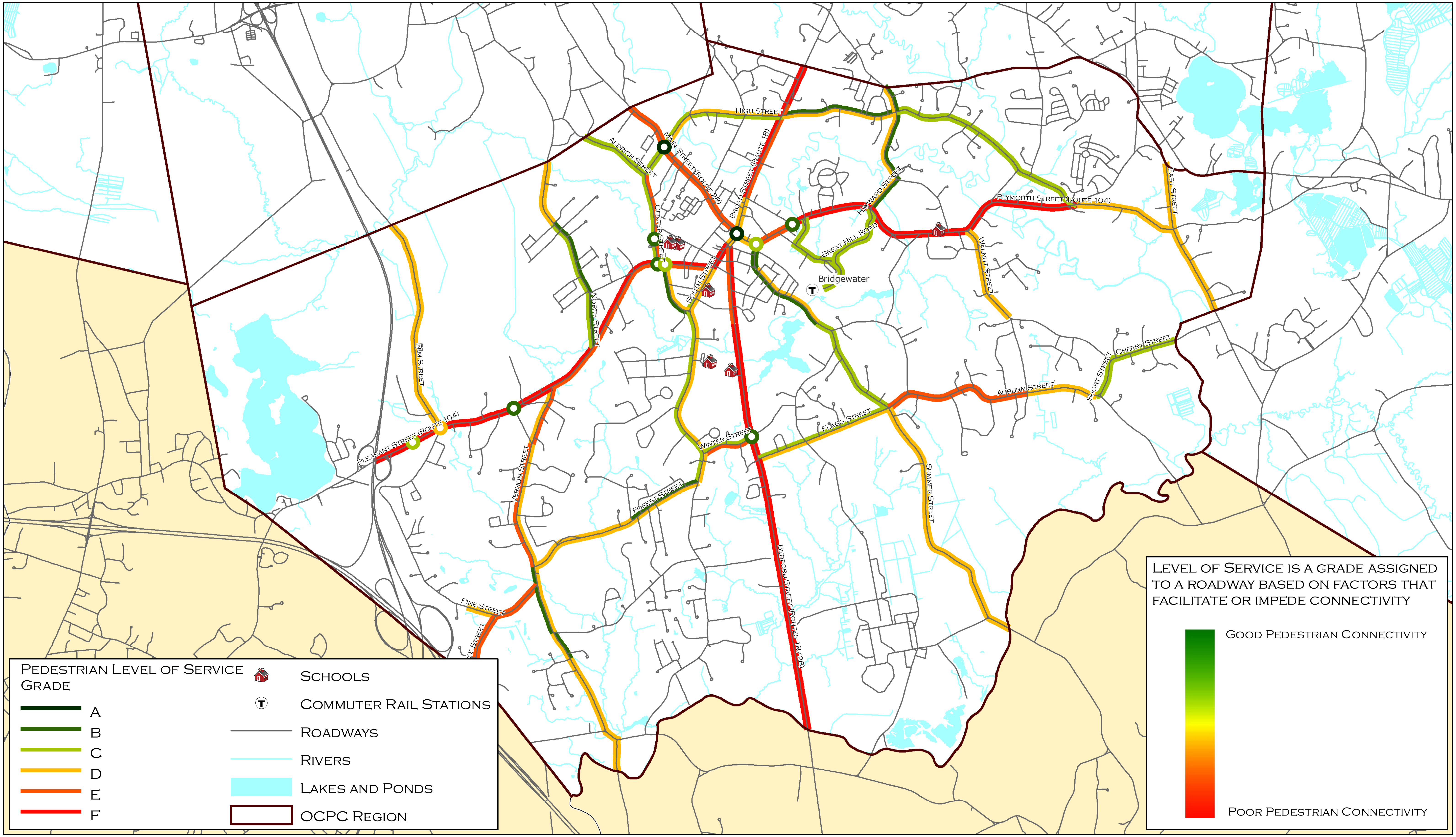


Old Colony Planning Council, 70 School Street, Brockton, MA 02301

GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

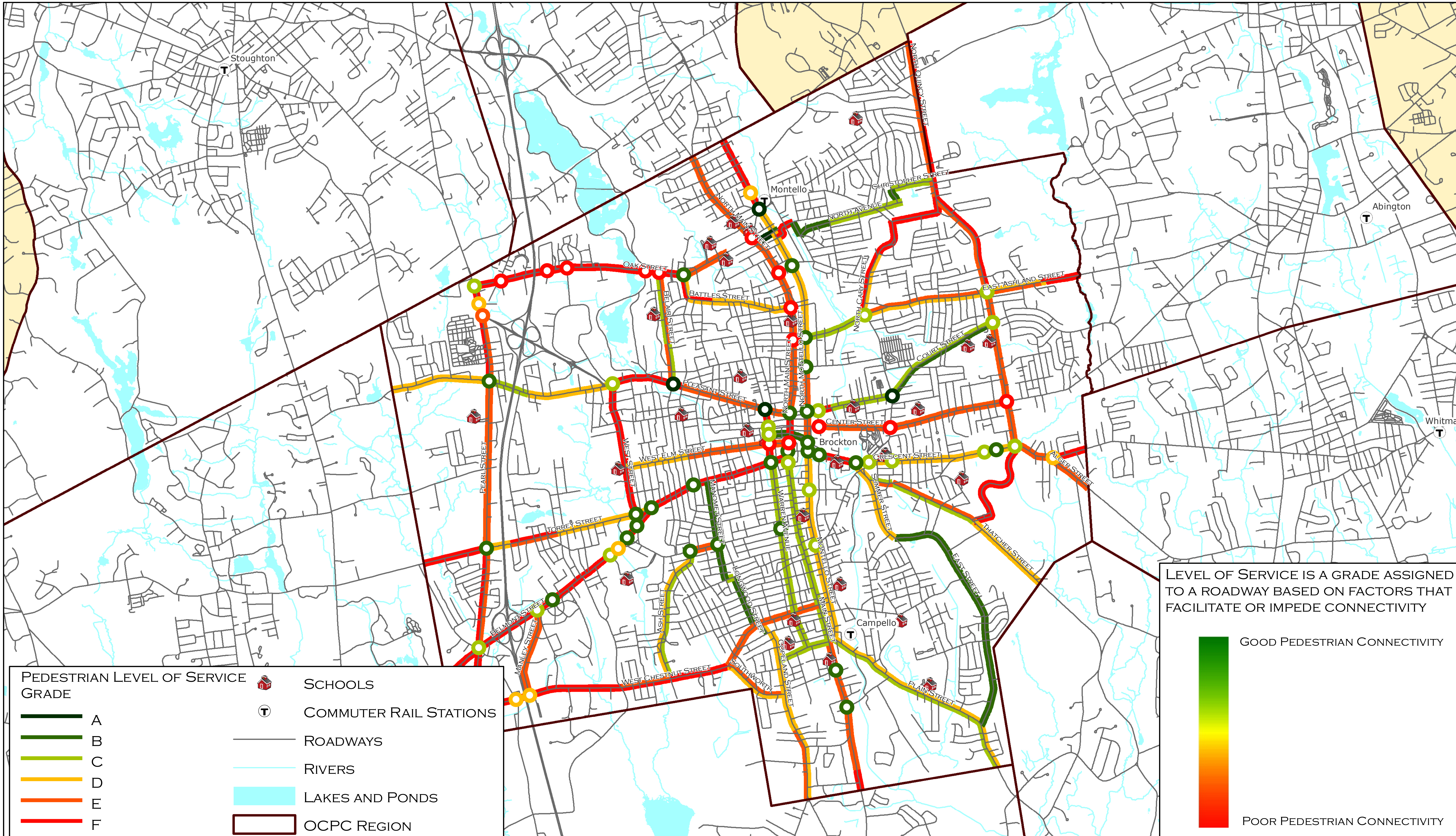
Bridgewater Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

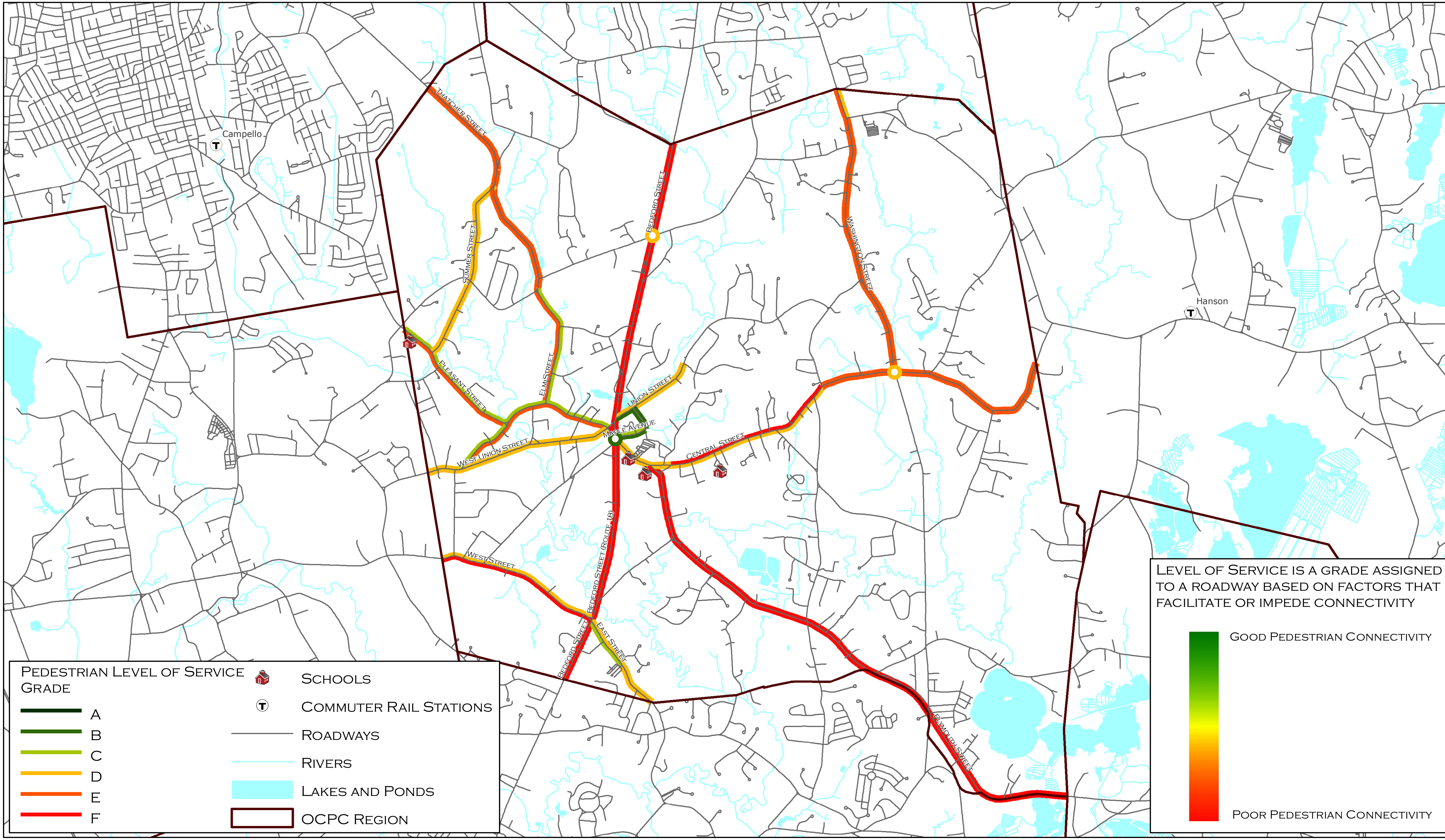
Brockton Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

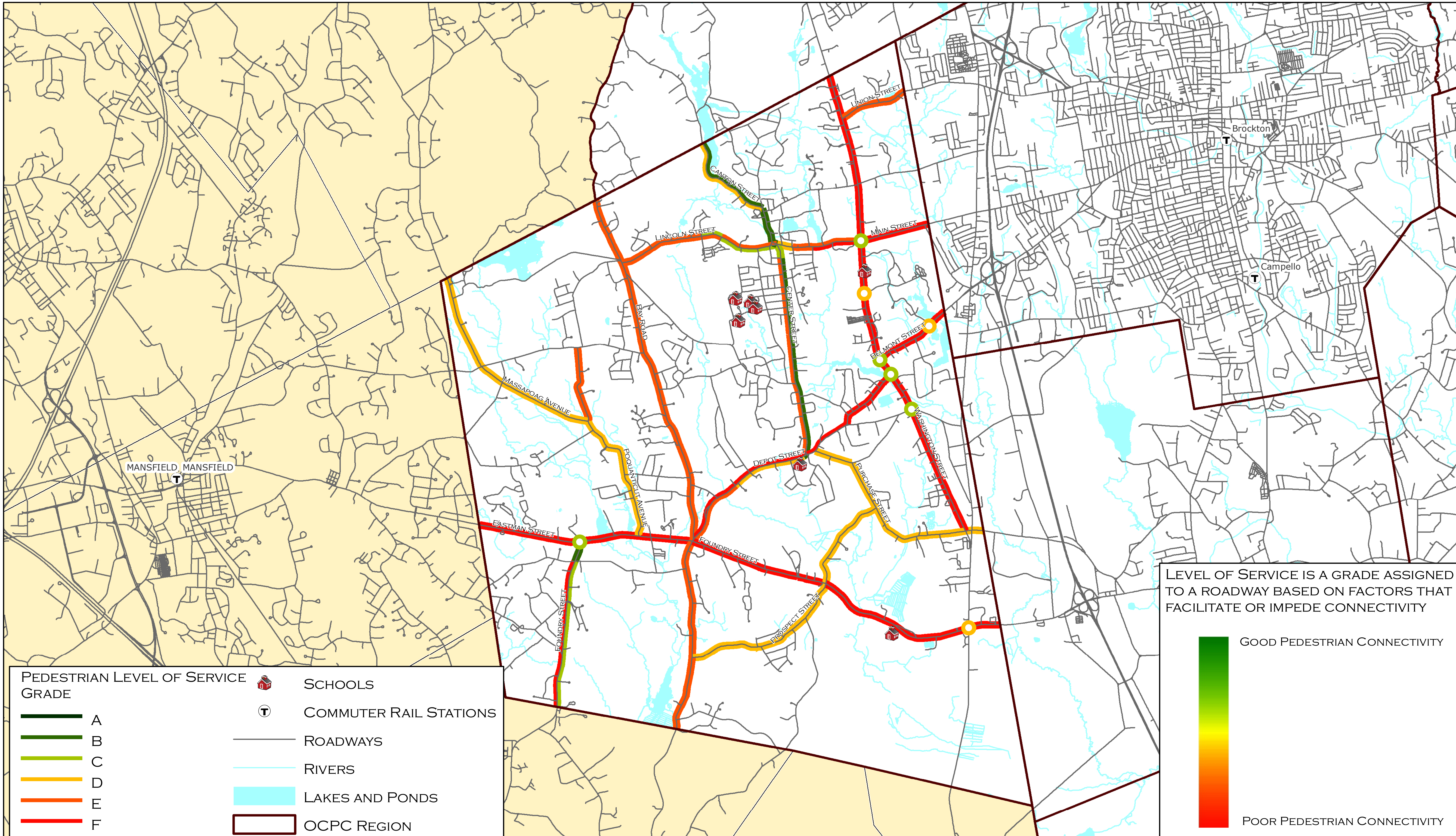
East Bridgewater Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

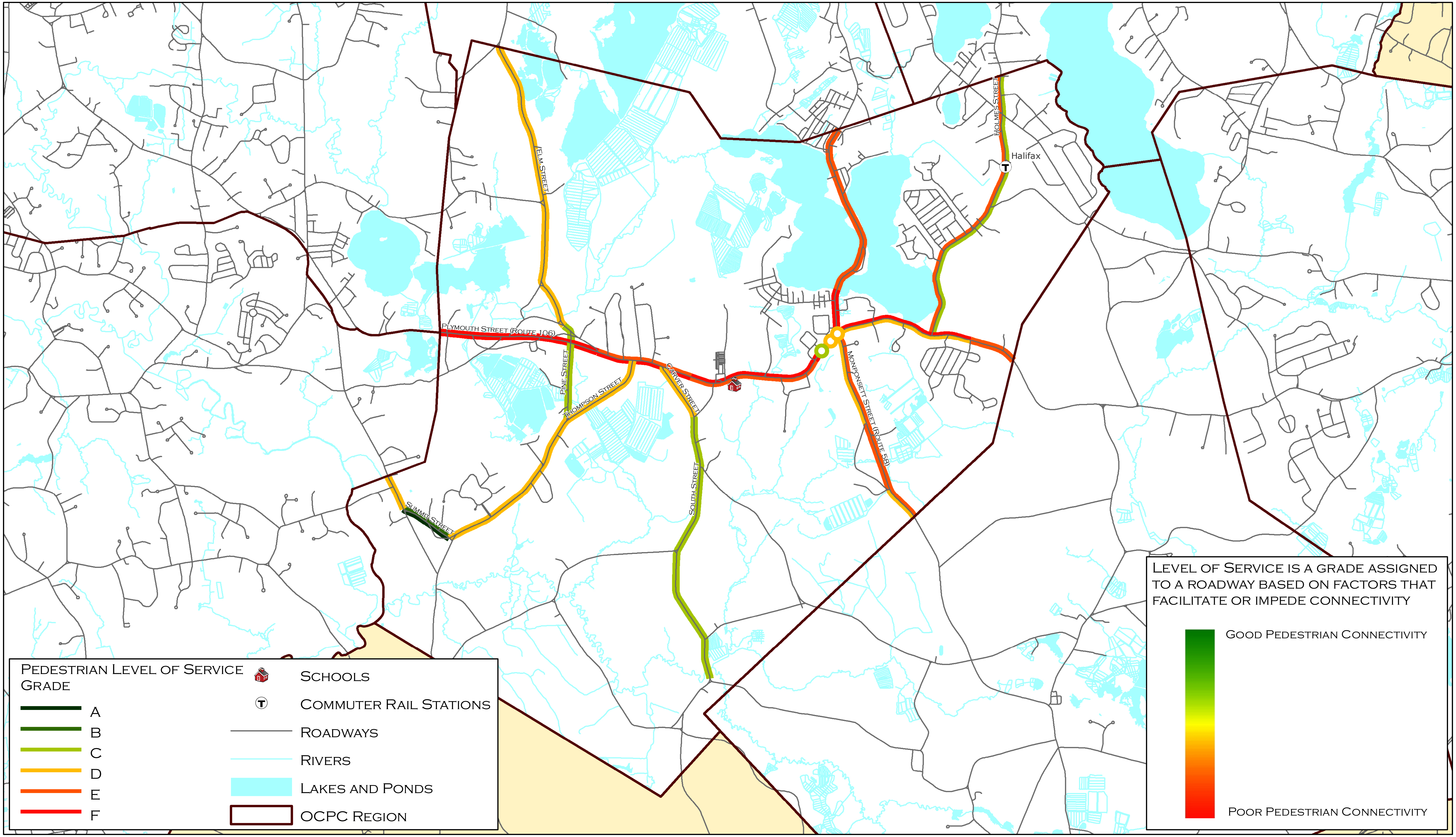
Easton Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

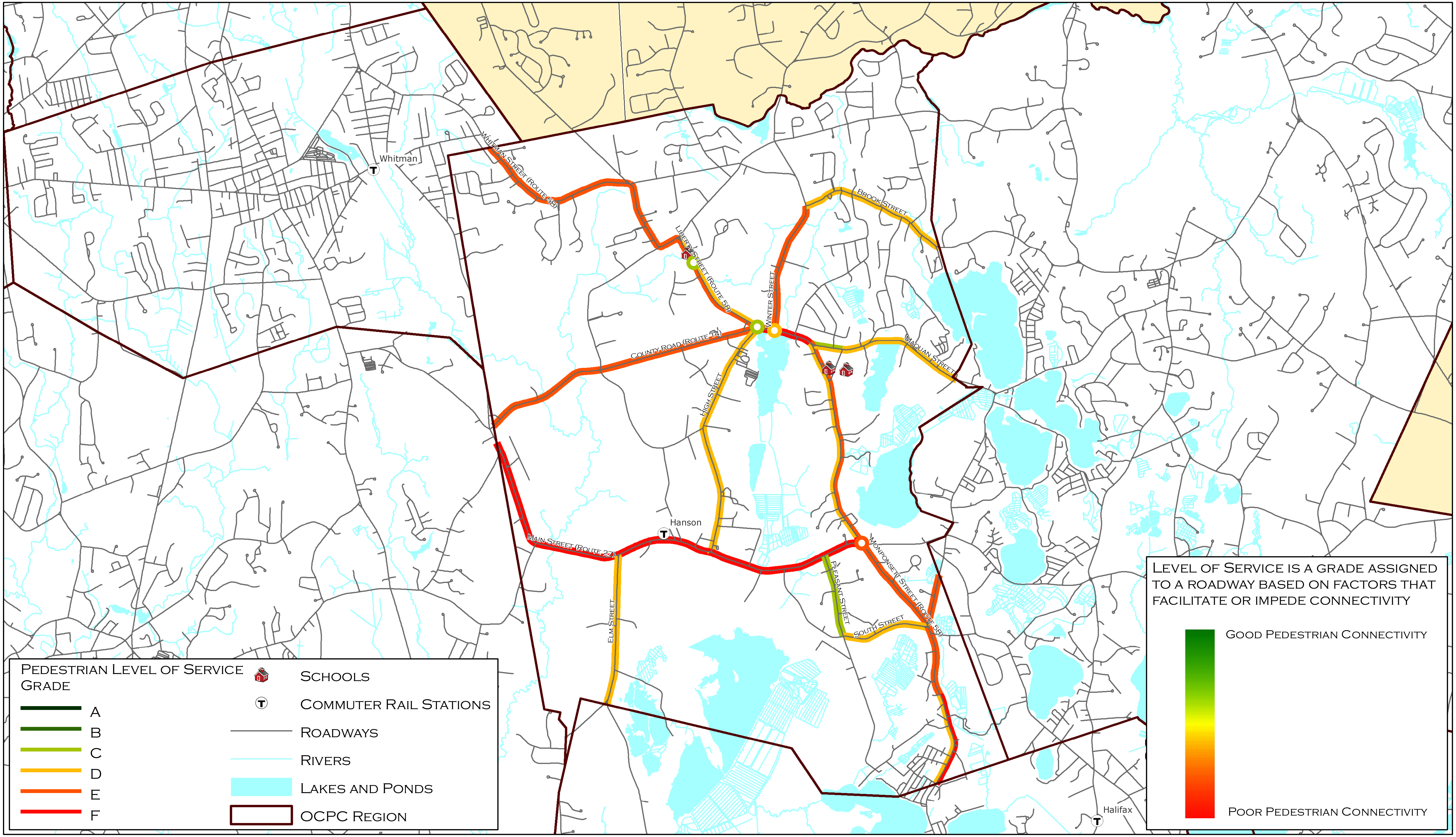
Halifax Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

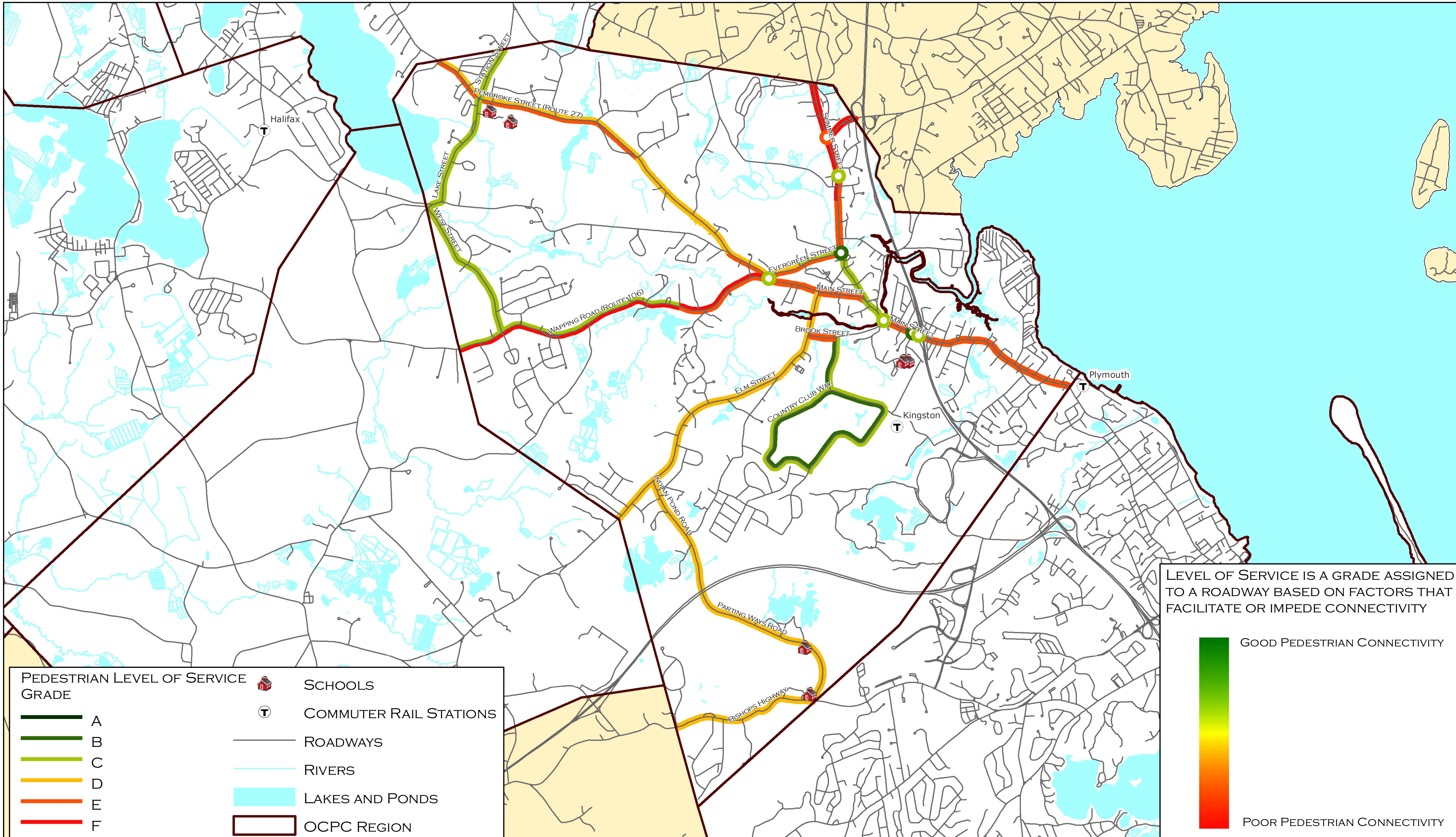
Hanson Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

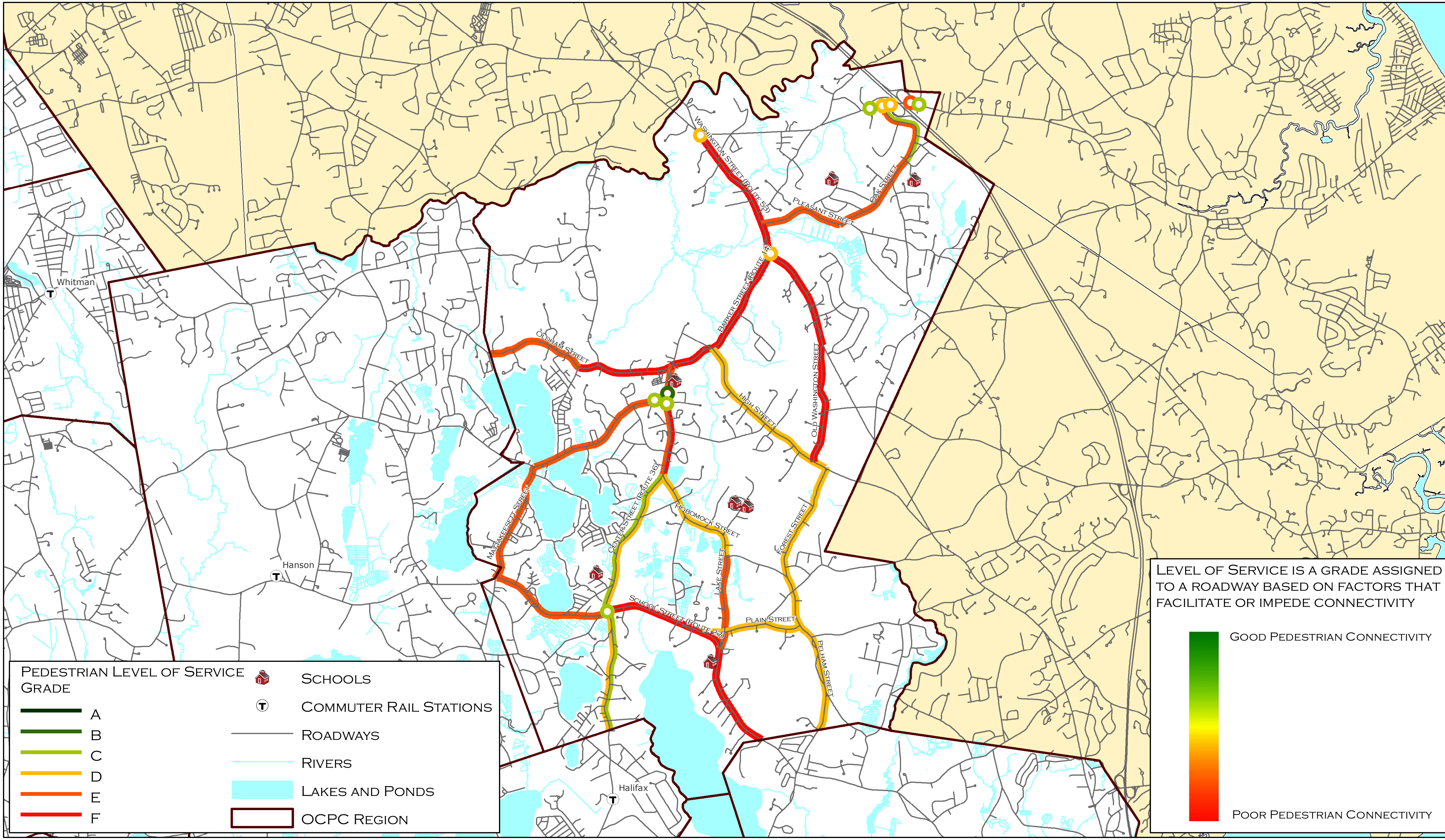
Kingston Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

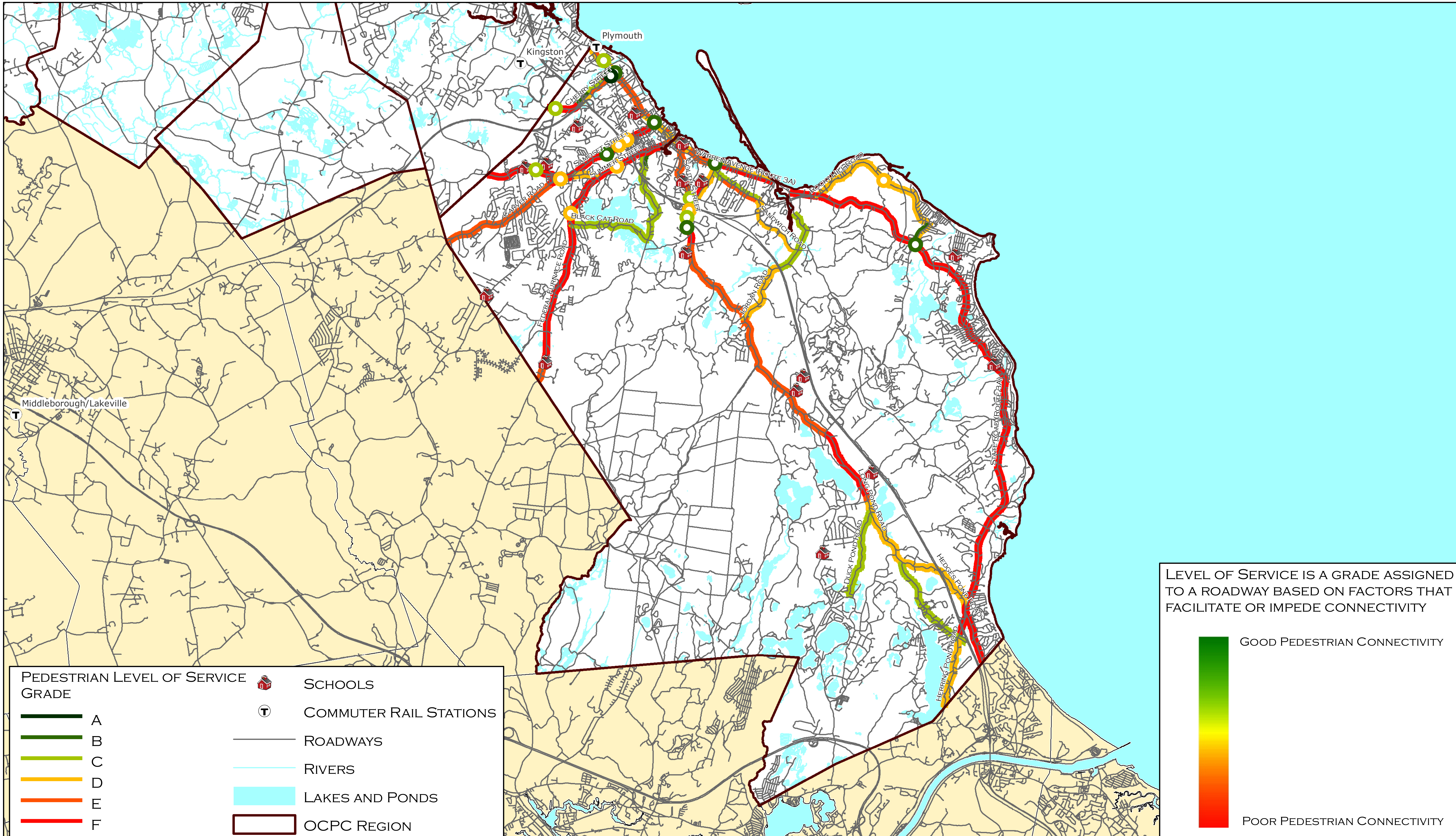
Pembroke Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

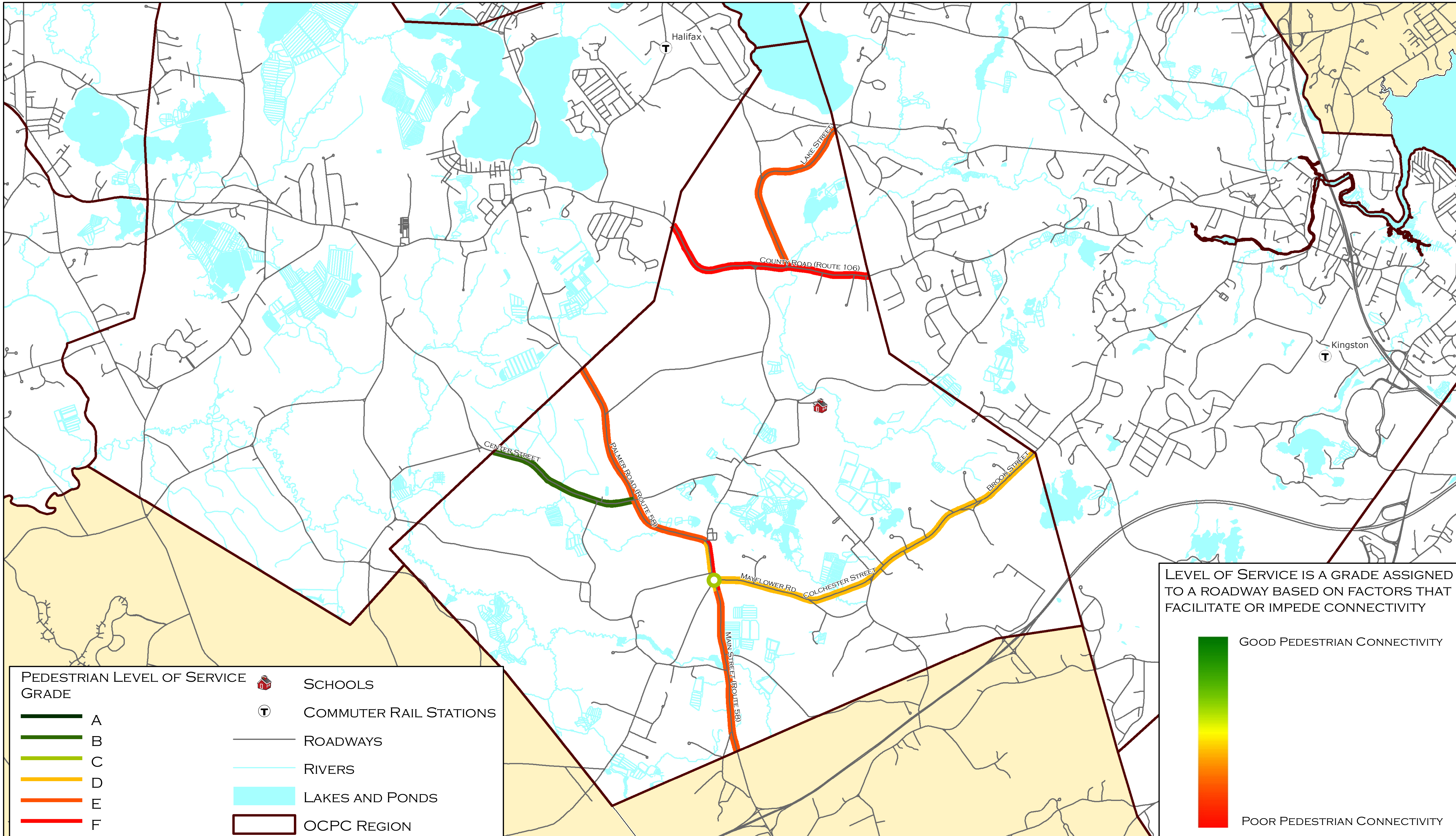
Plymouth Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

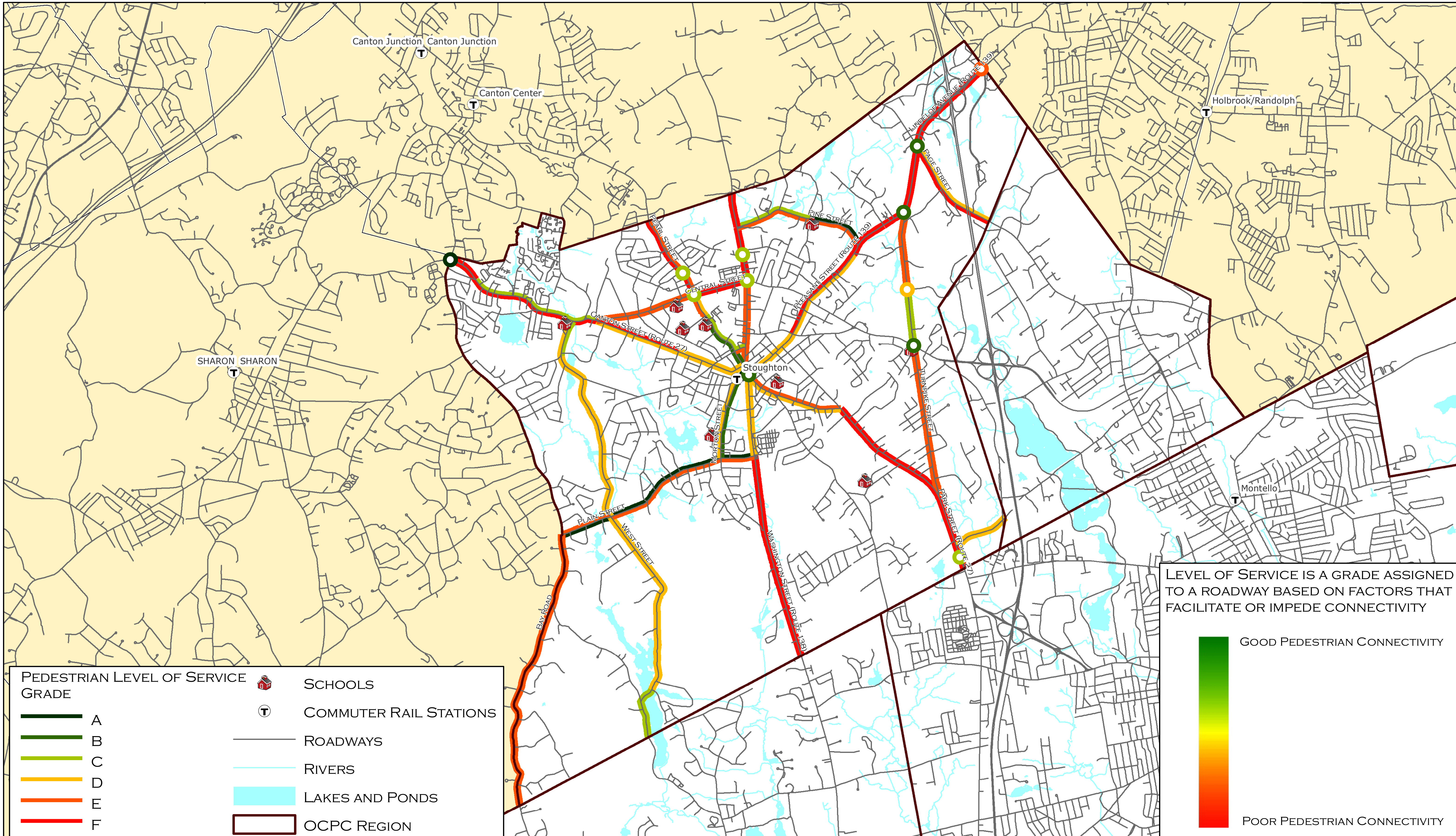
Plympton Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

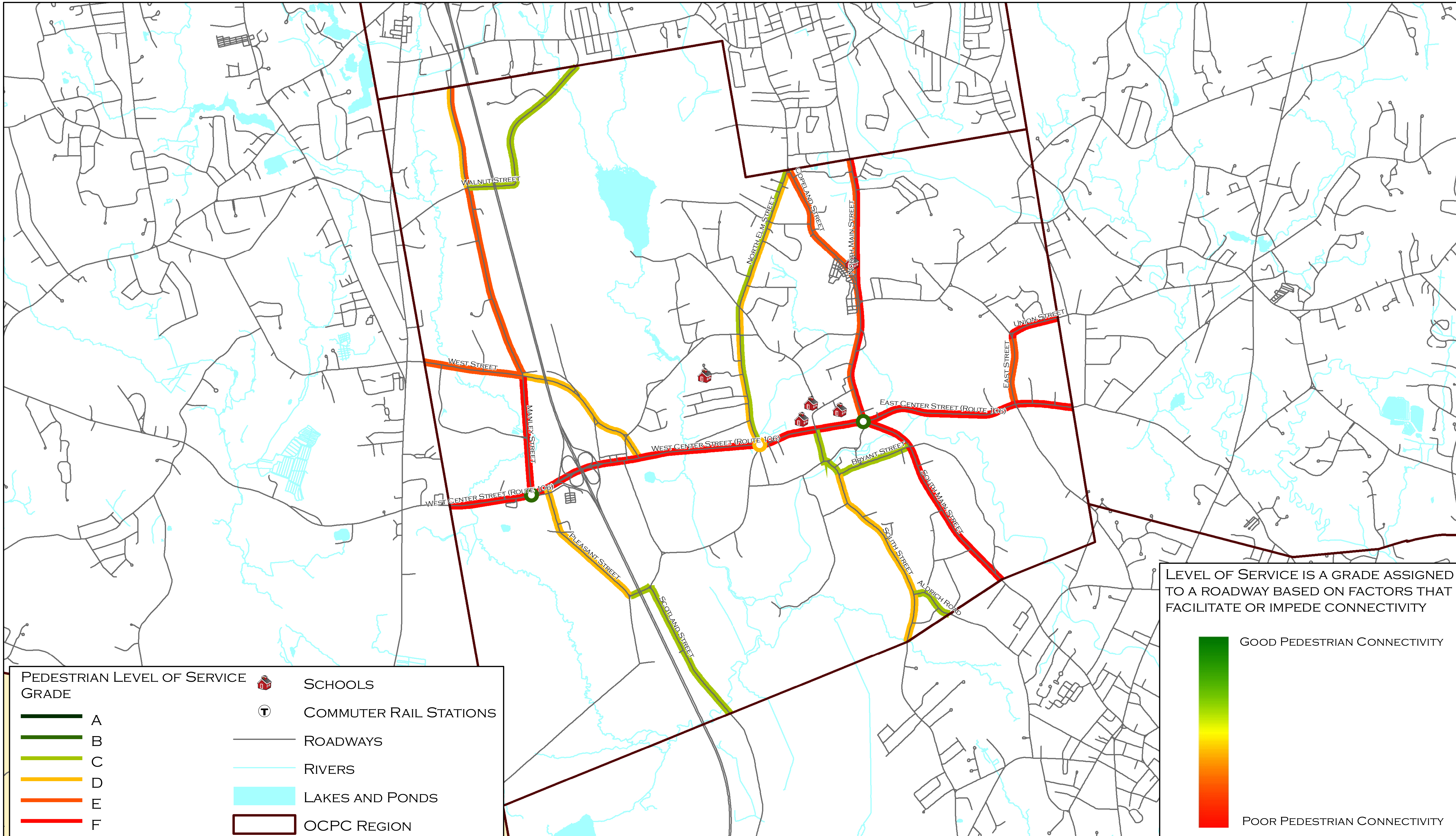
Stoughton Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

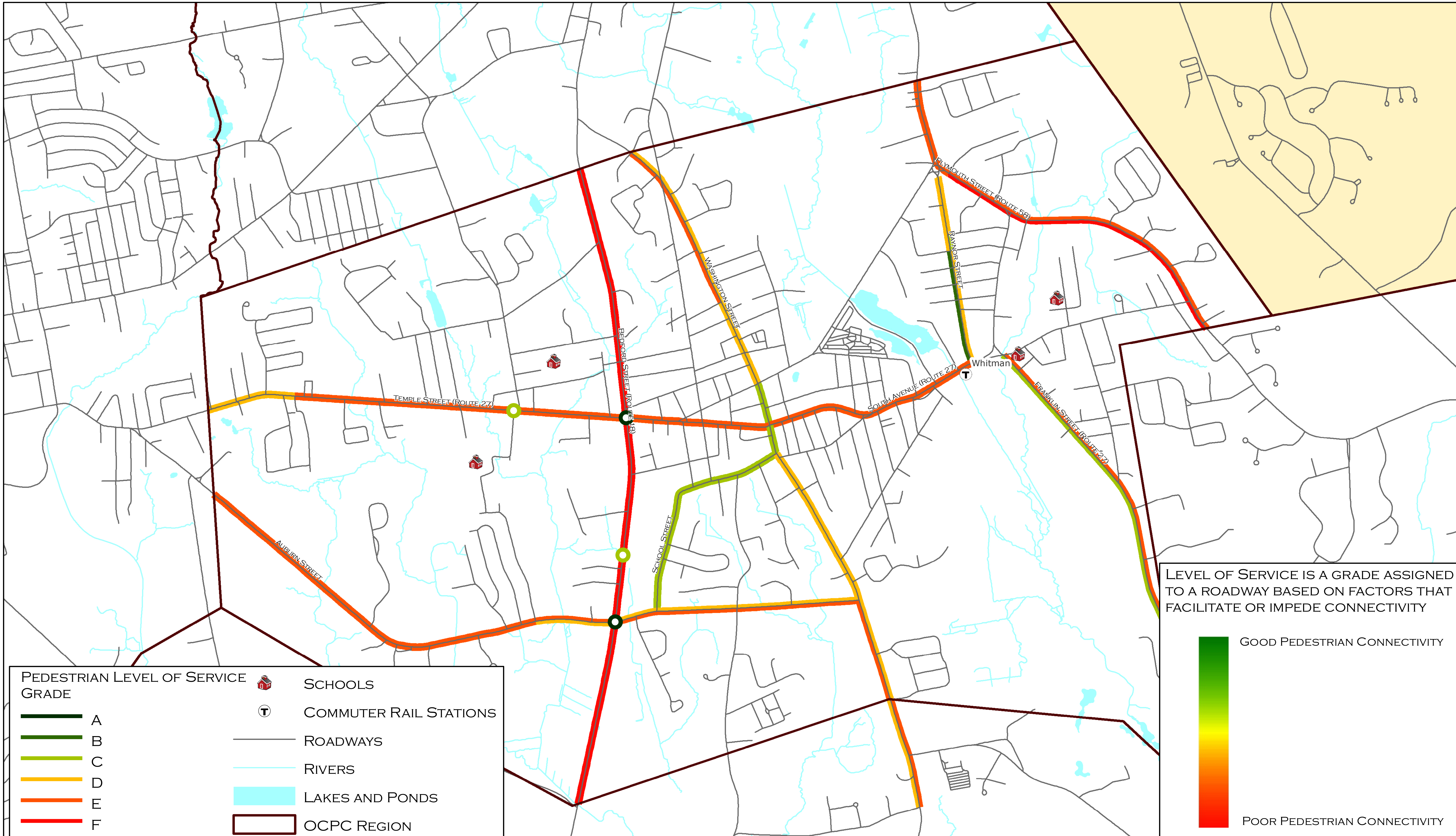
West Bridgewater Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

Whitman Pedestrian Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

Bicycle Mode

Bicycles are used to make a variety of trips, including trips for recreation and exercise, commutes to work and school, and trips for errands and visiting friends. Bicycles help extend the market area of transit service, since bicyclists can travel about five times as far as an average person walk in the same amount of time. Although bicycle trip-making in North America is lower than in the rest of the world, several large North American cities that have invested in bicycle infrastructure and programs (e.g., Portland, Oregon; Minneapolis, Minnesota; and Vancouver, Canada) have bicycle commute mode splits around 4% (2005-2007 US Census and local data). Bicycle travel demand varies by time of day, day of the week, and month of the year. Monthly variations in bicycle demands are also weather- and daylight- related.

Figure 13: *An example of a sharrow lane in the streets of Dorchester.*

Bicycle Level of Service (BLOS) for Urban Streets

Similar to the Pedestrian LOS, bicycle LOS for urban streets is based on a bicycle LOS score model that includes variables determined from research on bicycle riders' perceptions of LOS. These variables relate to bicyclists' experiences on street segments between intersections. The segment component similarly relates to comfort and perceived exposure. It is a function of separation from traffic, motorized traffic volume, traffic speeds, heavy-vehicle percentage, presence of parking, and pavement quality. Higher vehicle volumes, a greater proportion of trucks and buses, higher vehicular speeds, and presence of parking all act to decrease a bicyclist's perceived comfort and traffic exposure. Striped bicycle lanes or roadway shoulders add to the perceived sense of traffic separation and improve the LOS. Pavement quality affects bicyclists' ride comfort: the better the pavement quality, the better the LOS.

Figure 14: *This photo was taken on West Street in Brockton*

Location with a High BLOS Grade

BLOS Score = 4.64 (A)

- ADT = 21,000 vehicles/day
- Two 13' lanes
- 8' shoulders
- 2.6 heavy vehicle traffic
- 30 mph posted speed limit
- Roadway pavement conditions = 3

Figure 15: This photo was taken on South Main Street in Brockton

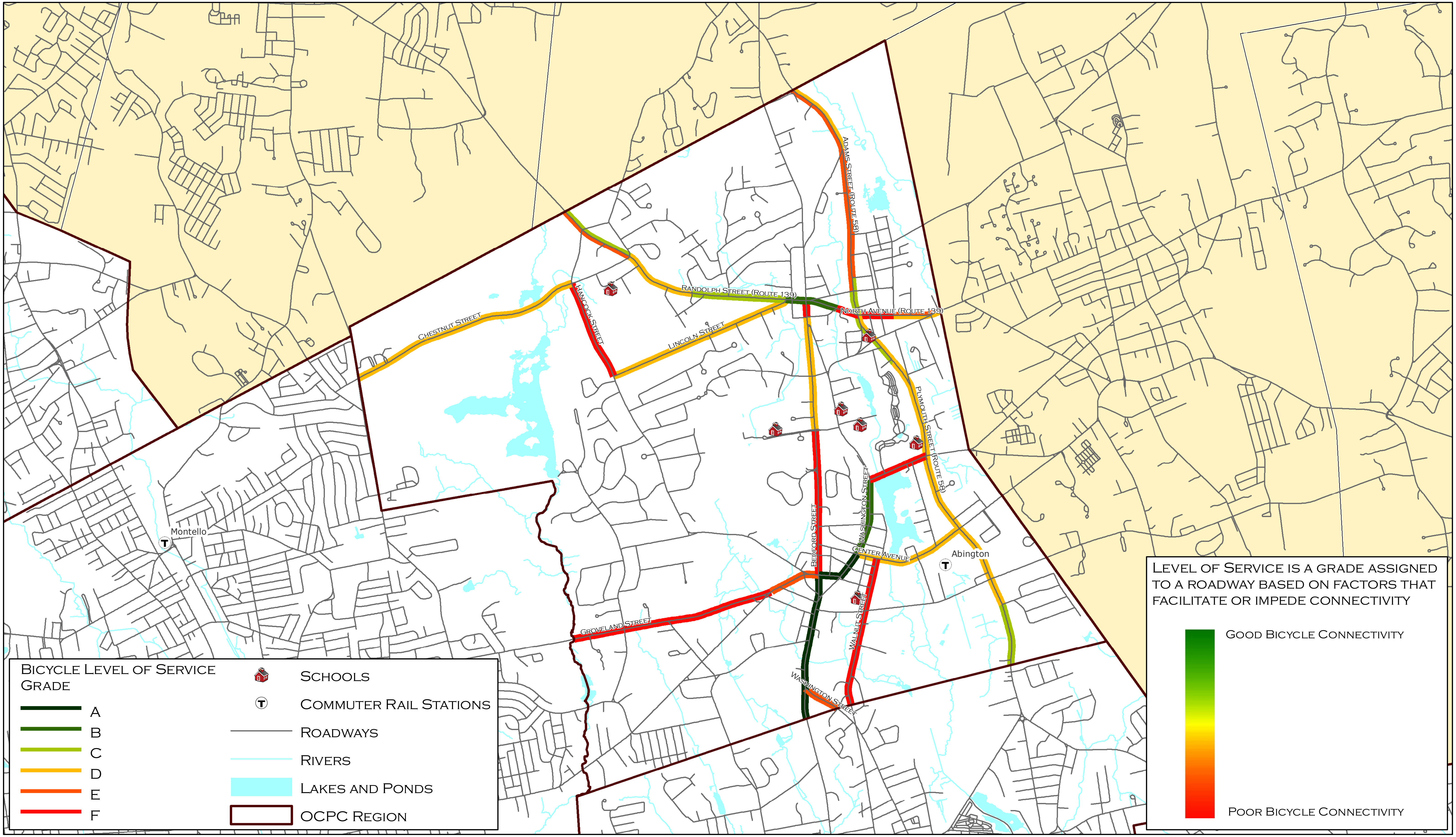
Location with a Low BLOS Grade

BLOS Score = 3.00 (F)

- ADT = 14,500 vehicles/day
- Two 12' lanes
- 9 feet street parking
- 5.6% heavy vehicle traffic
- 30 mph posted speed limit
- Roadway pavement conditions = 3

The following maps reflect the bicycle infrastructure existing conditions of the routes selected in the Old Colony Region. These maps include only the bicycle level of service along street segments between intersections. Maps of the communities are sorted by alphabetic order.

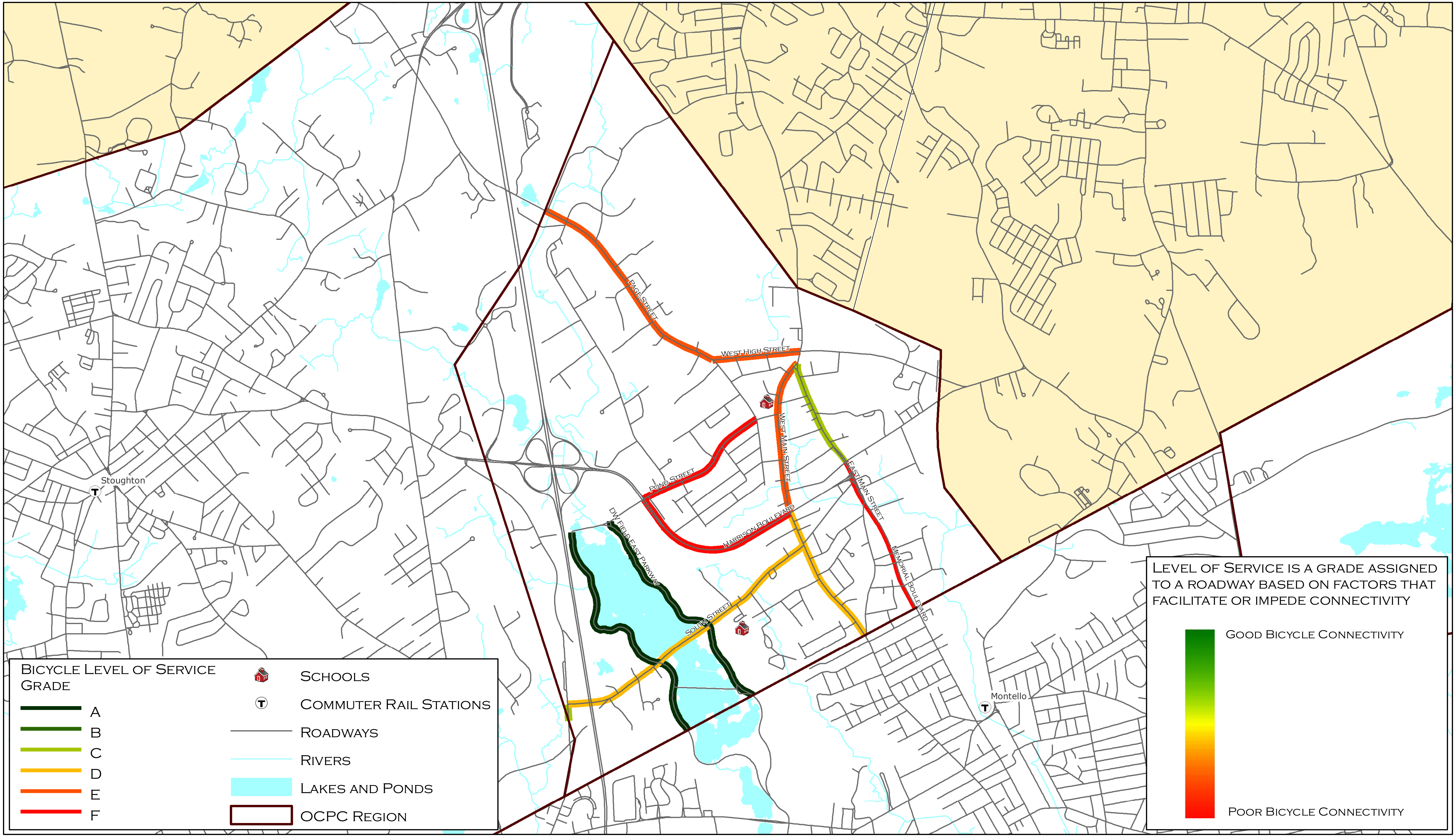
Abington Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

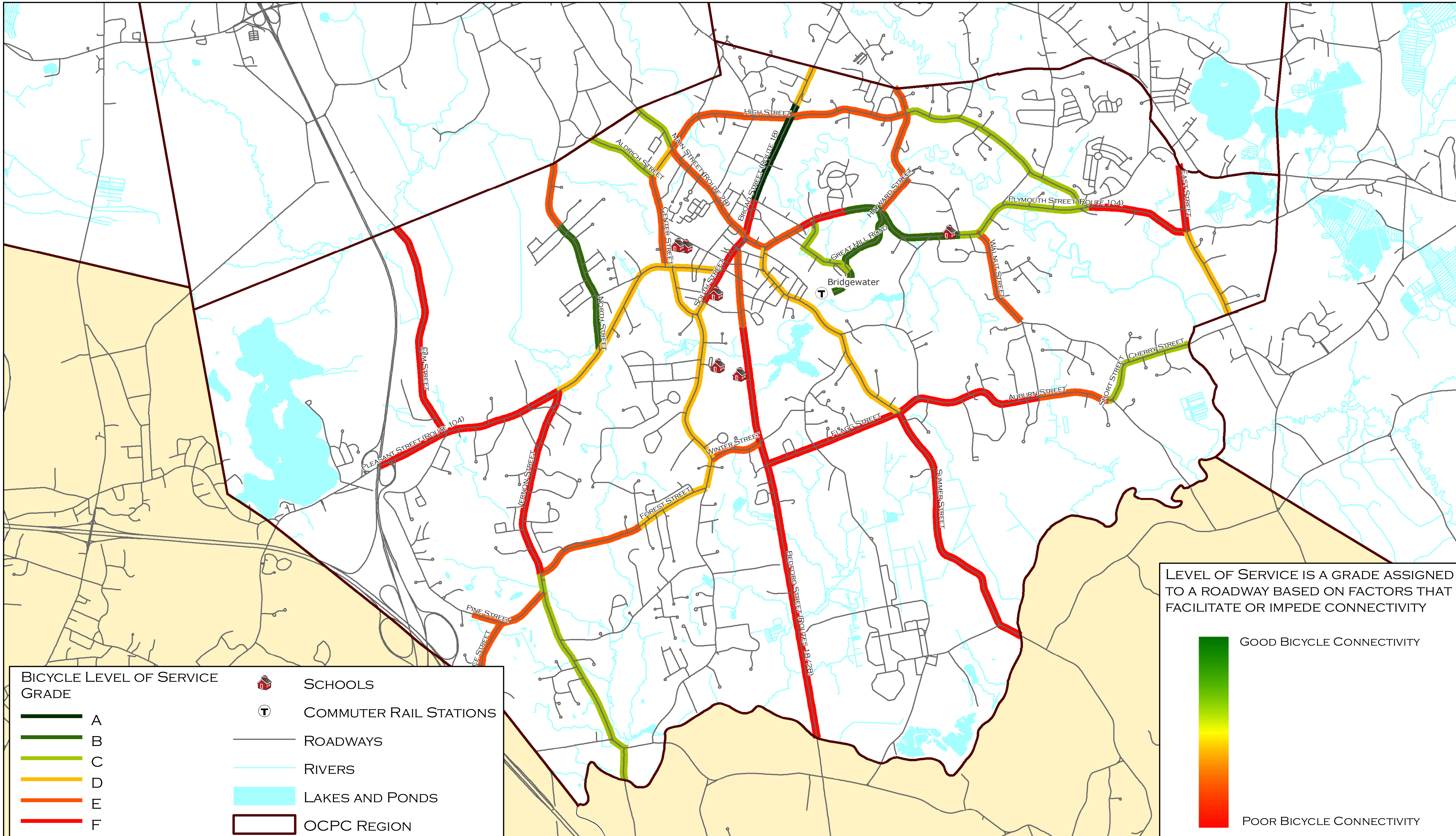
Avon Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

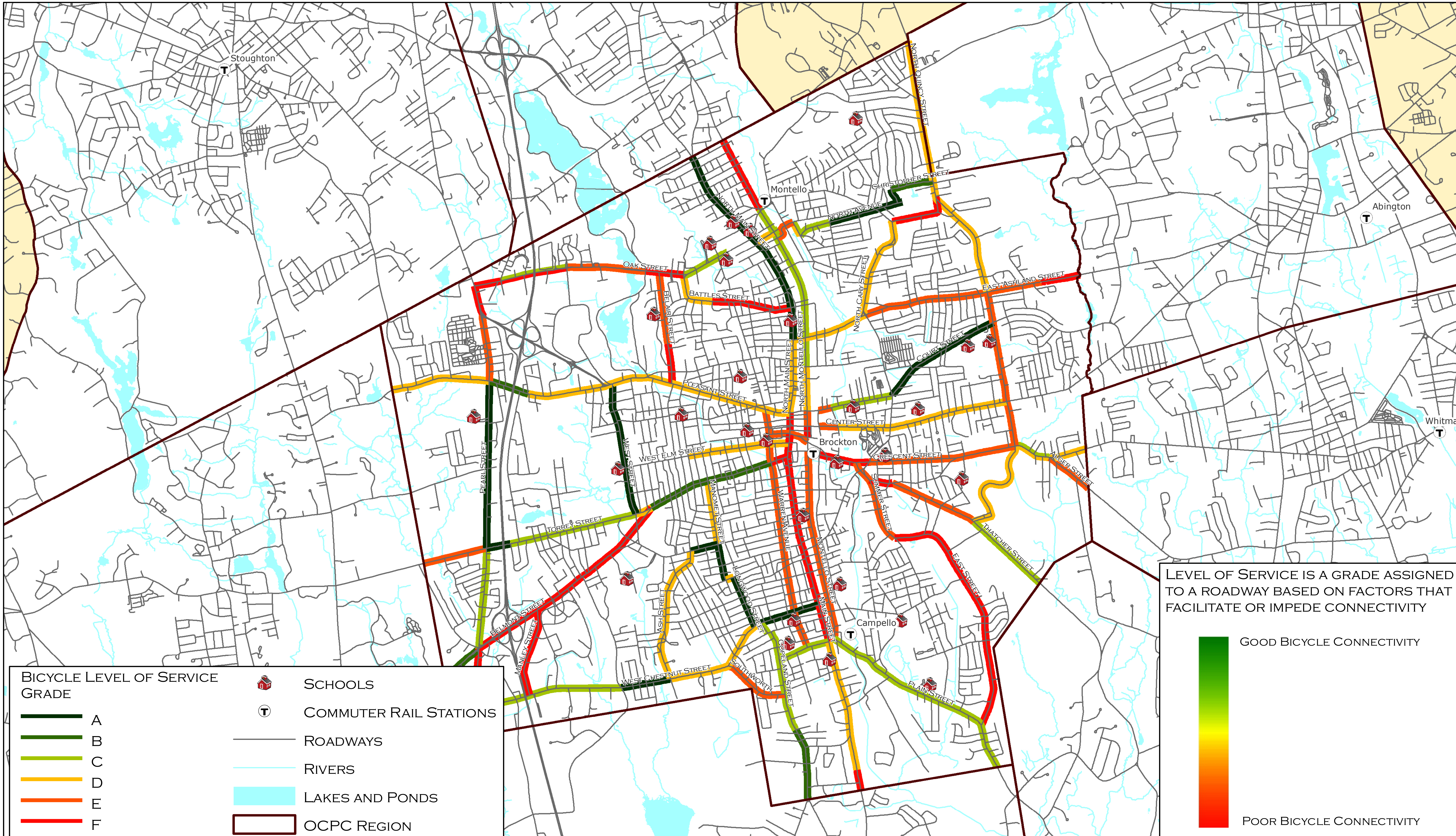
Bridgewater Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

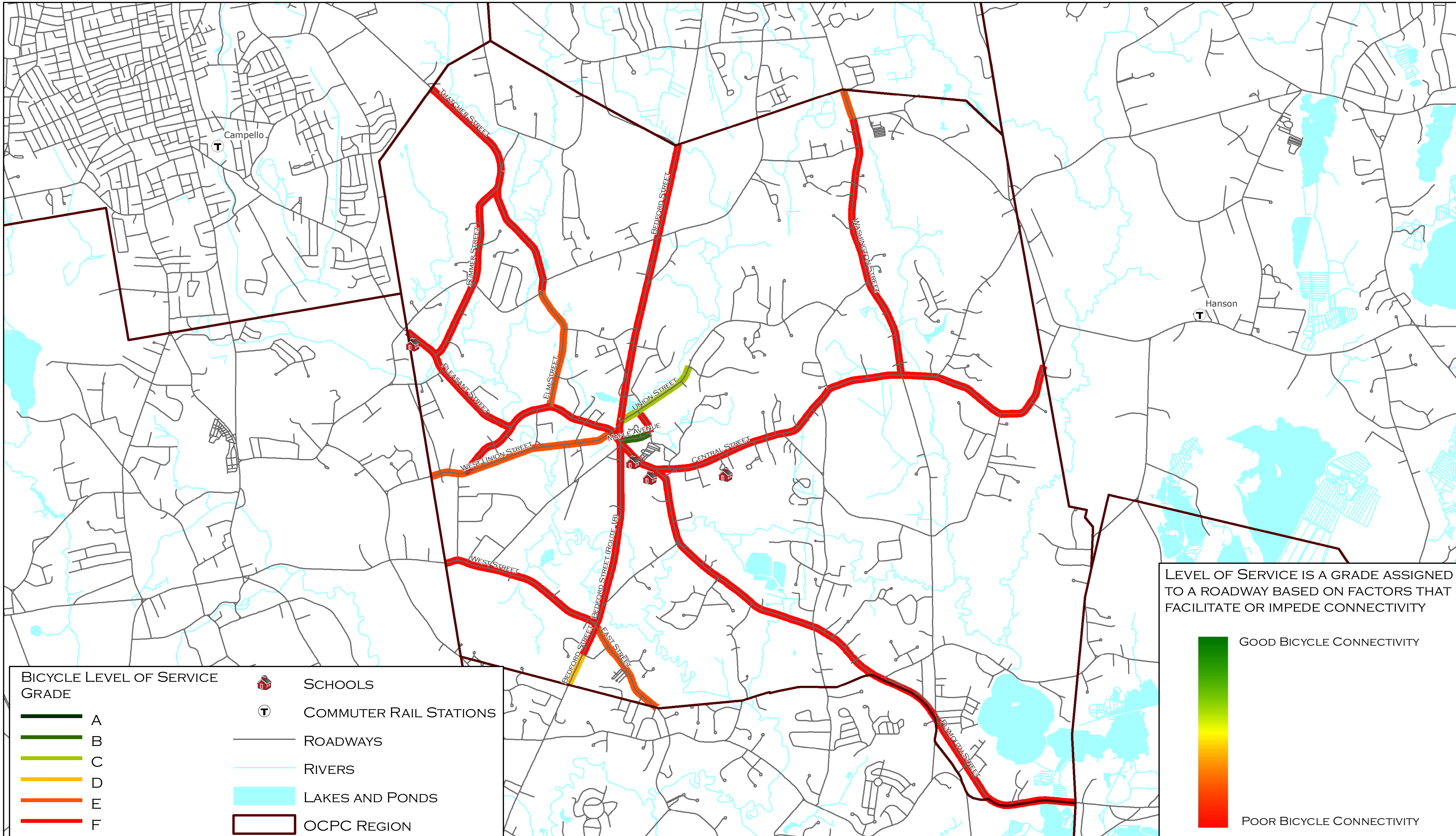
Brockton Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

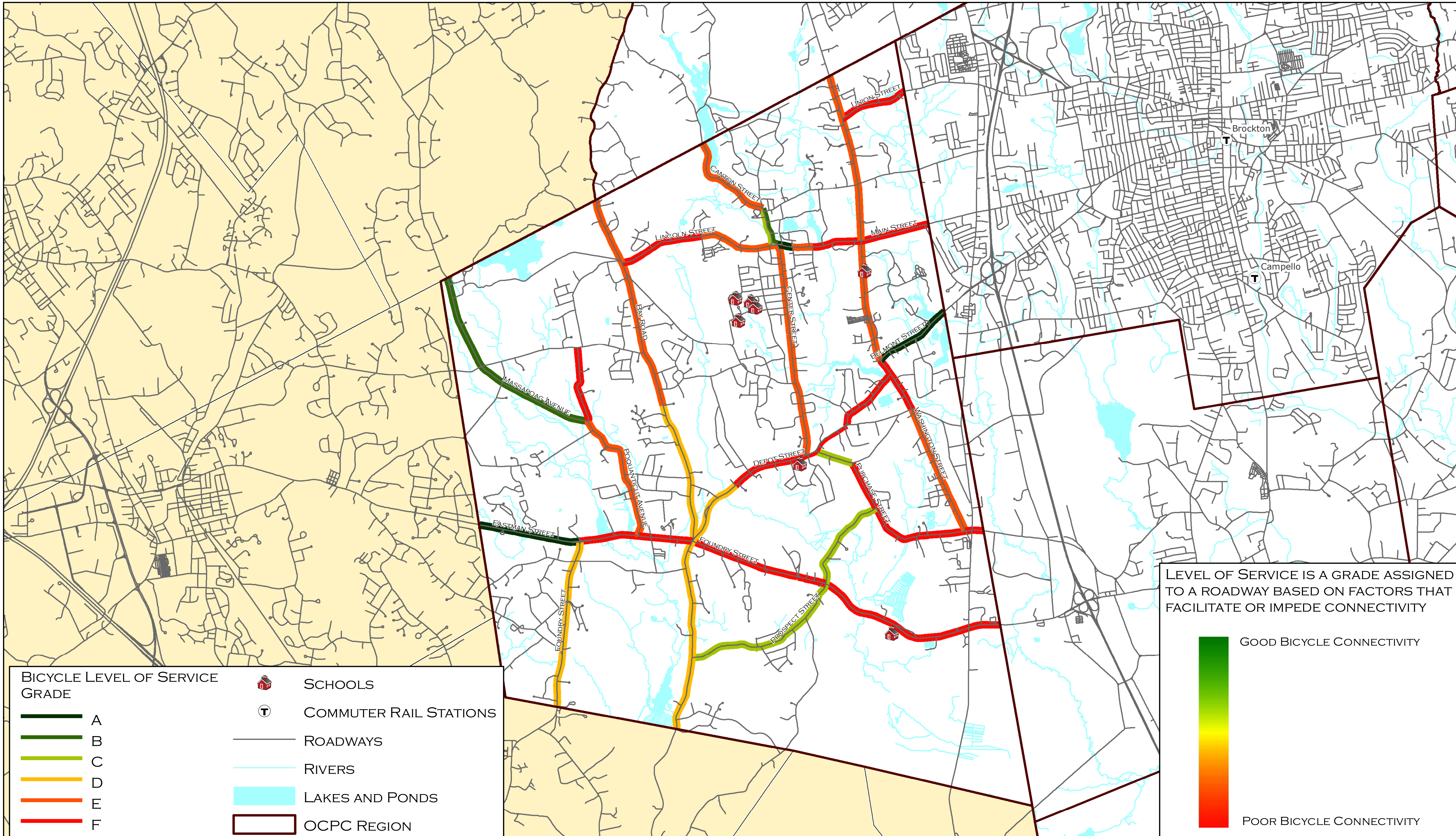
East Bridgewater Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

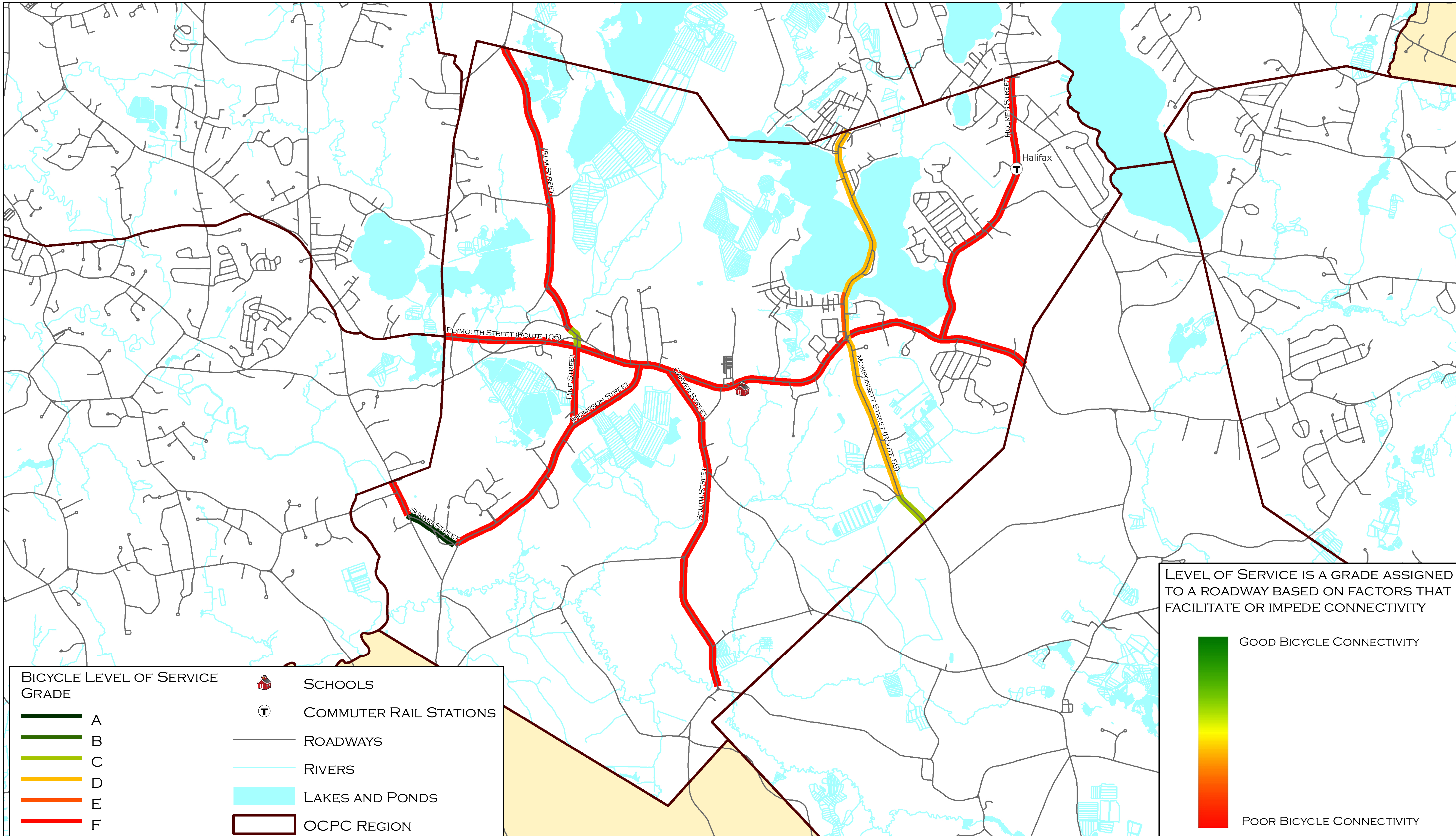
Easton Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

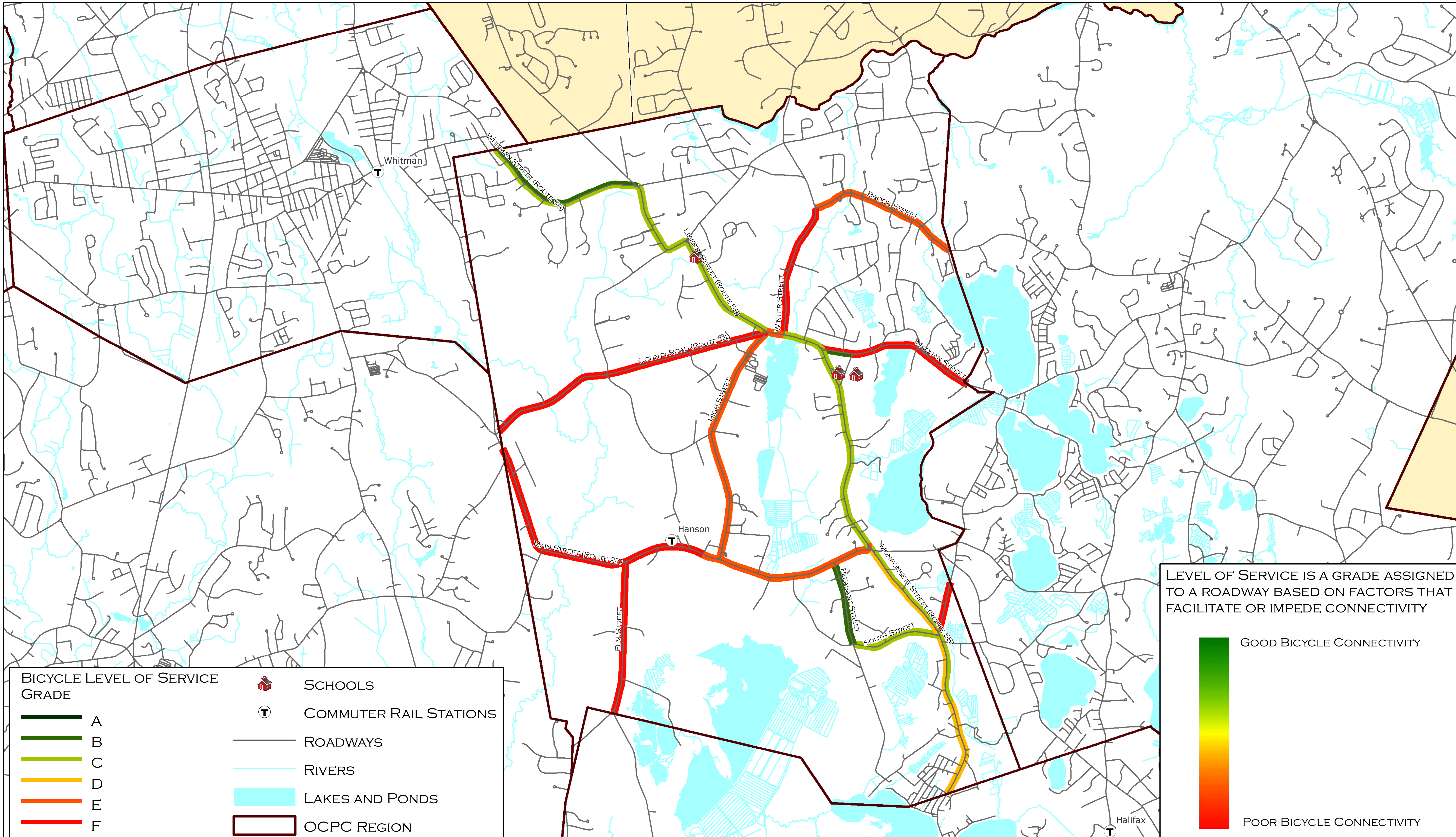
Halifax Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

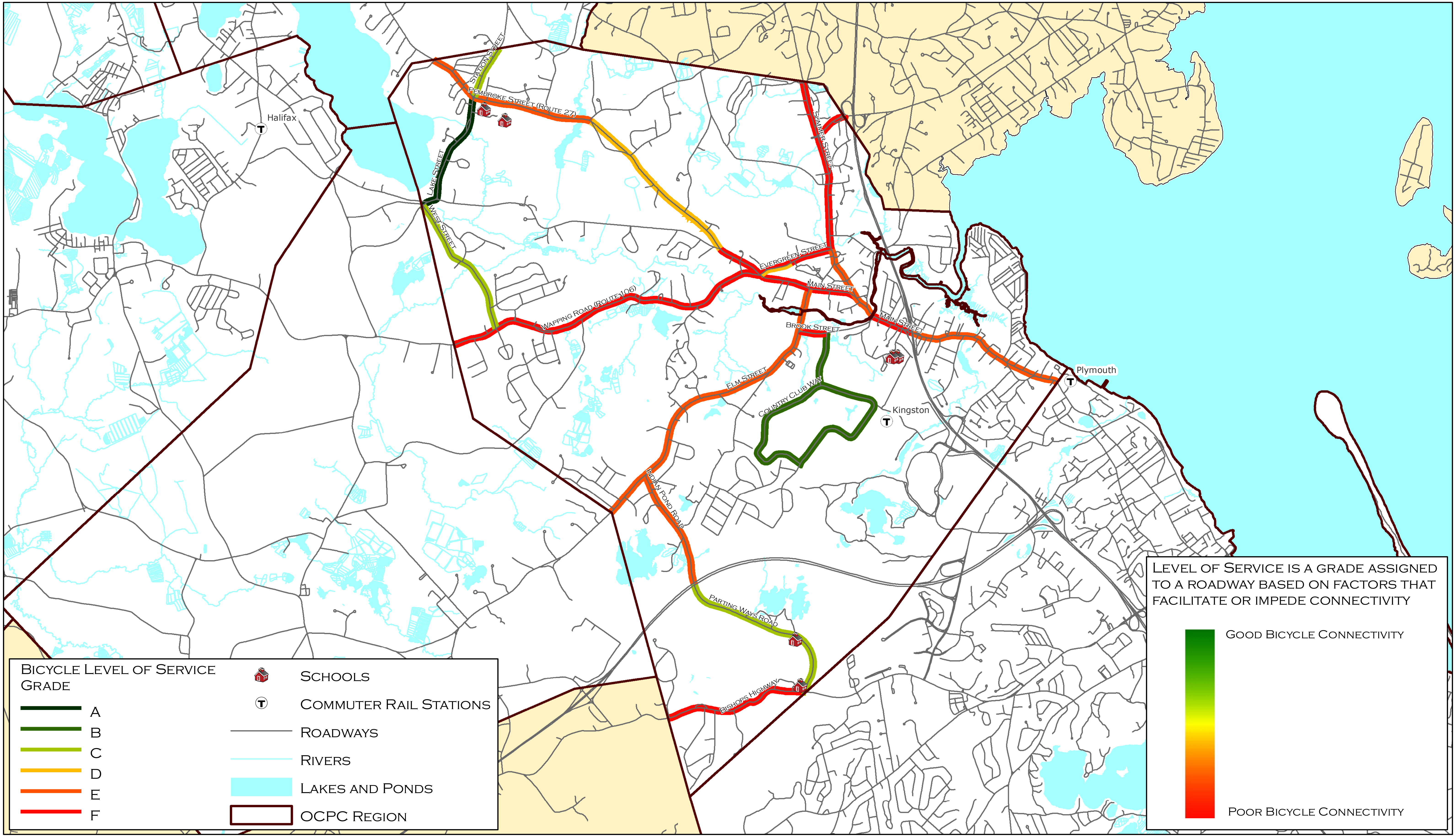
Hanson Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

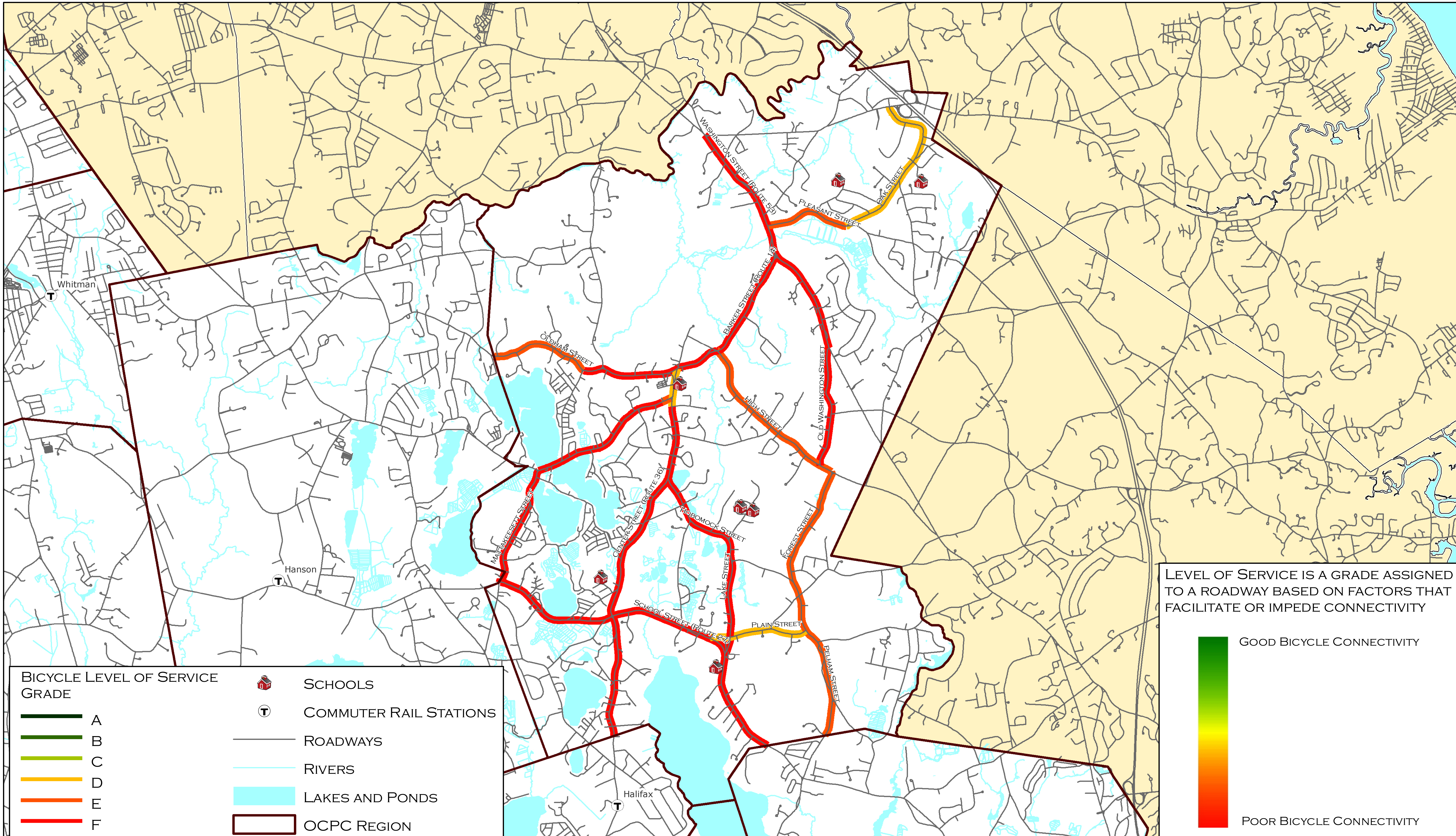
Kingston Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

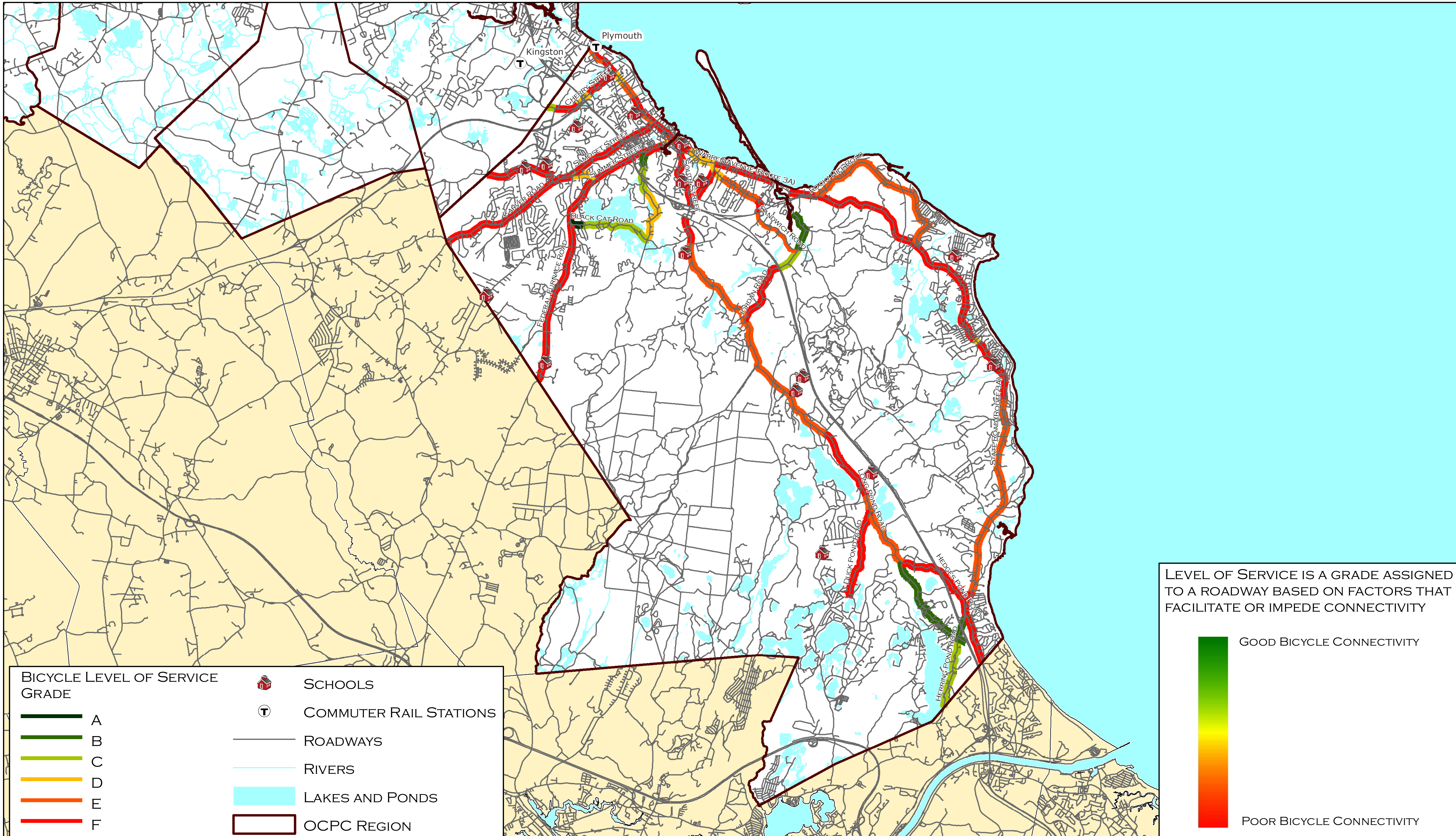
Pembroke Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

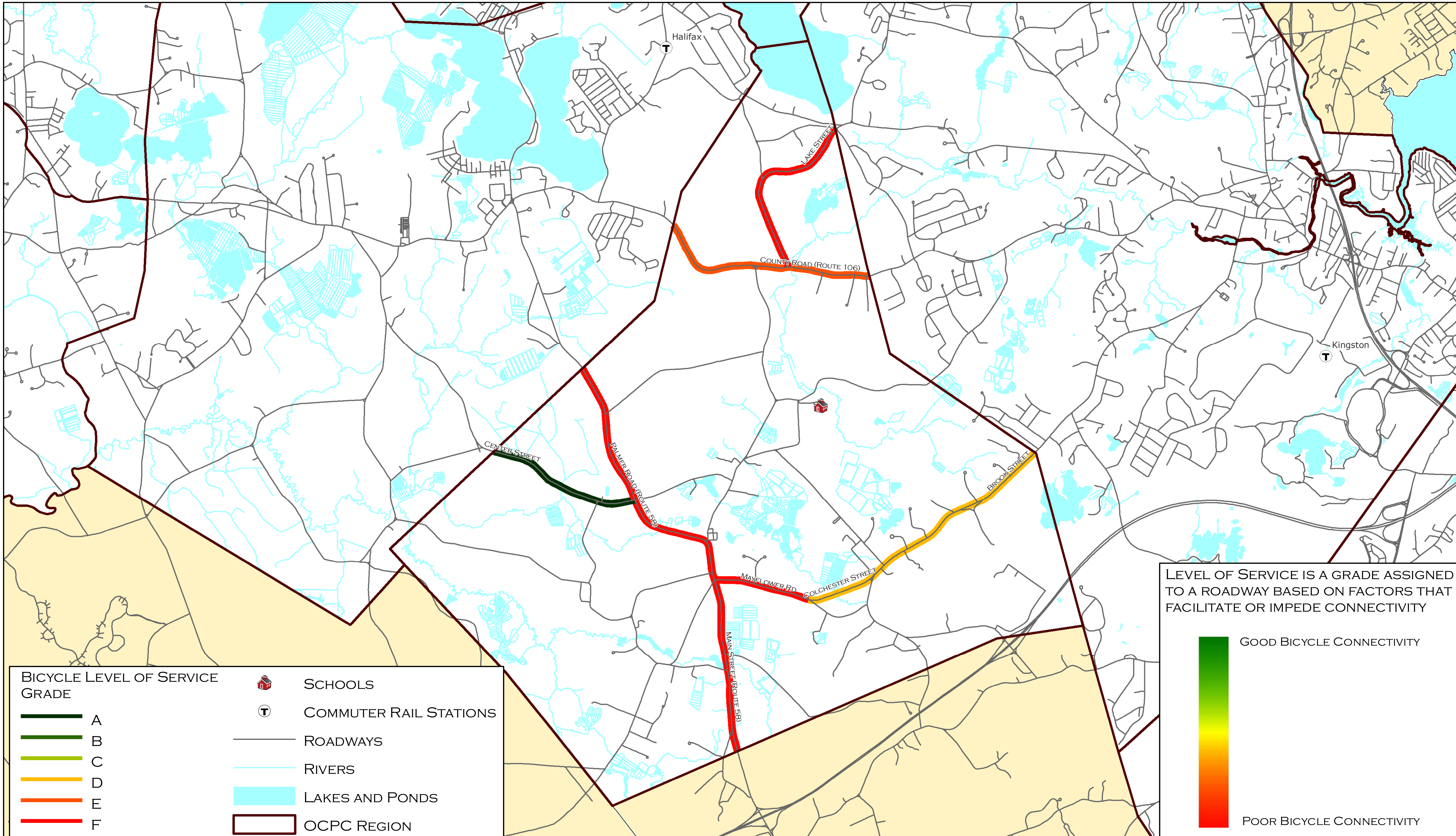
Plymouth Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

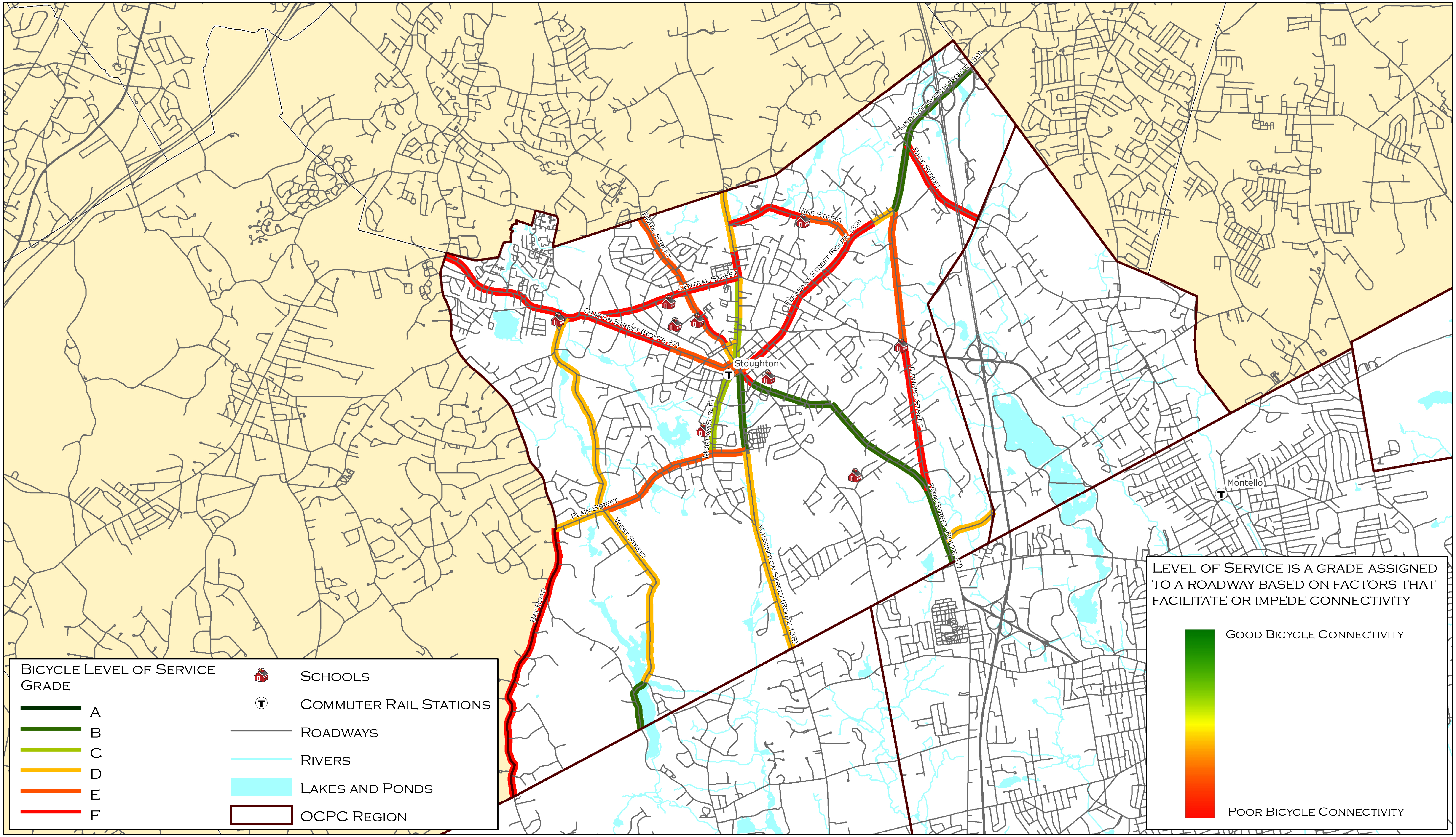
Plympton Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

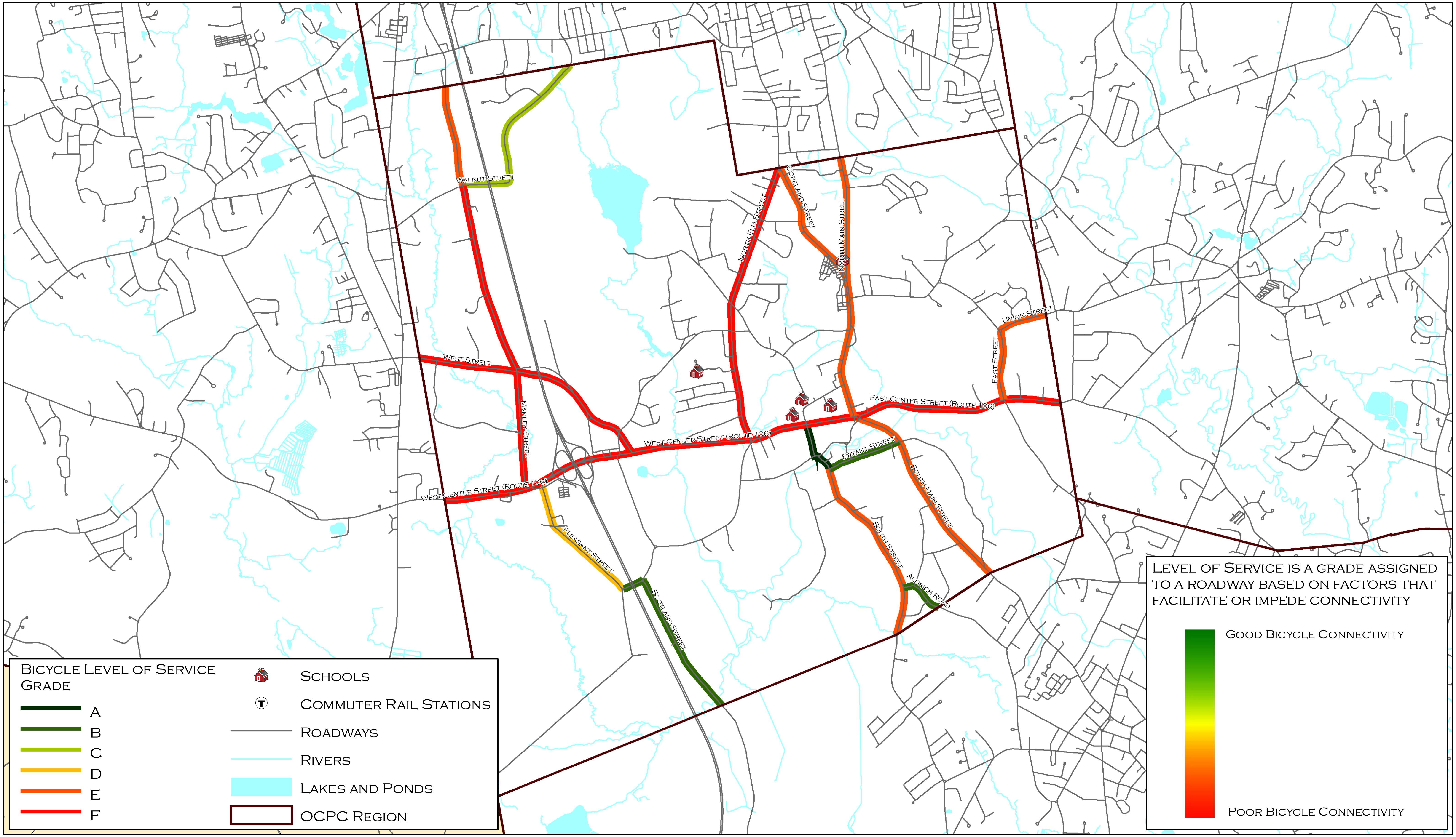
Stoughton Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

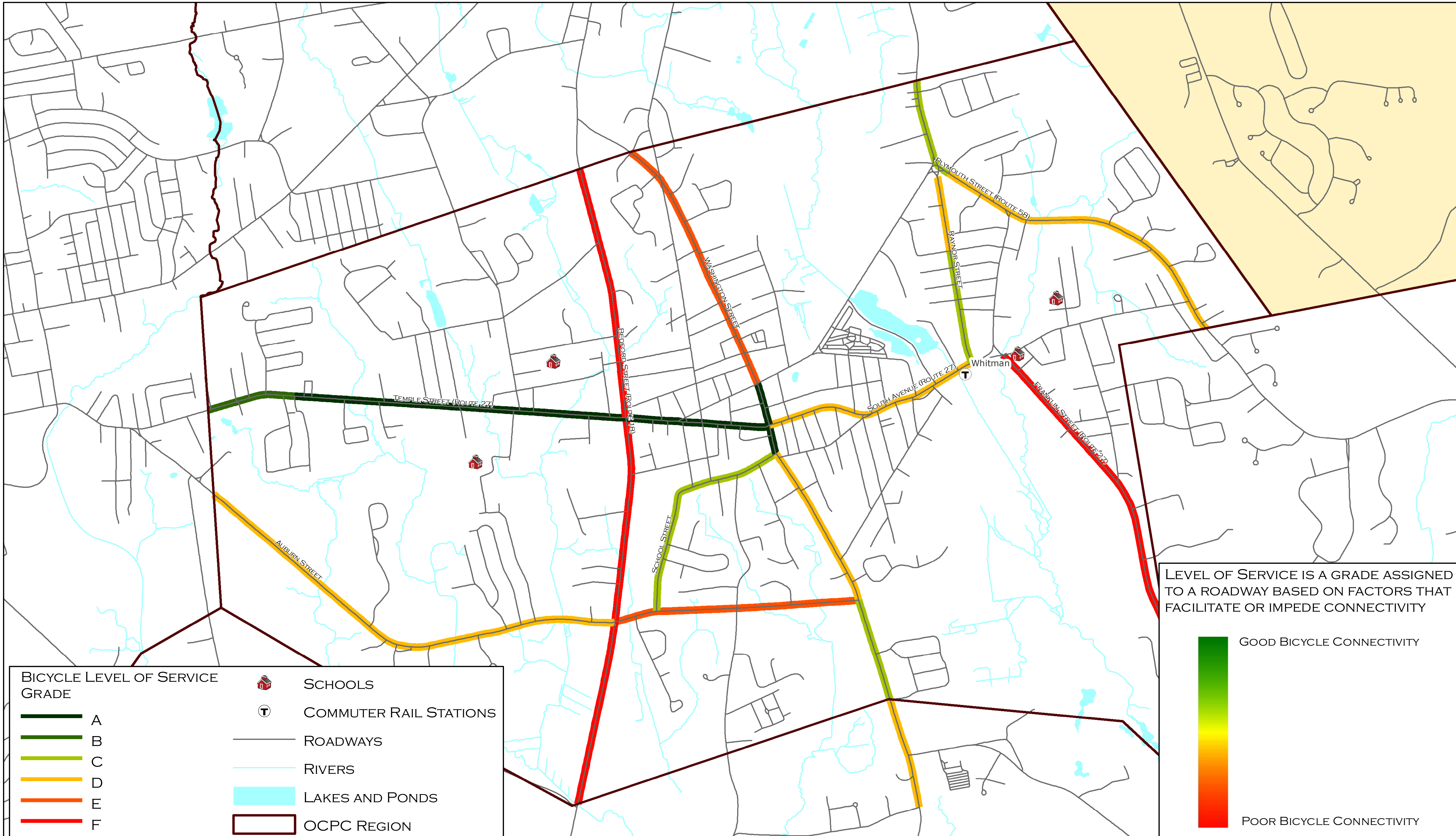
West Bridgewater Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

Whitman Bicycle Level of Service



Old Colony Planning Council, 70 School Street, Brockton, MA 02301
GIS Data Sources: MassGIS, MassDOT, OCPC

October 2011

Next Steps

This study is a culmination of 12 months of hard work by dedicated citizens, civic leaders, and governments throughout the 15 communities in the Old Colony Region. Without their help, this planning initiative would not have been possible. With the completion of phase one, phase two consists of drafting recommendations by community and listing them by priority needs. It will take the efforts of each community to pursue and implement the policies and programs herein. The guidance and tools provided by this study will provide a means for institutionalizing walking and bicycling as legitimate transportation options within the region.

As stated in the 2012 Regional Transportation Plan (RTP), this study will serve to inform its recommendations. The RTP will set the region’s transportation priorities and policies for the next twenty-five years. The completed Bicycle and Pedestrian Connectivity and Livability Study will be one component of the plan. Together they form a comprehensive vision for addressing our region’s transportation issues and ultimately our economic health and quality of life.

Appendix A: Bicycle Level of Service/Pedestrian Level of Service OS Data Input Fields

The following provides further information on the BLOS and PLOS data inputs. Roadway parameters will often change, and averaging could be done depending on the situation.

Through lanes per direction:	Do not include medians, turn lanes, or continuous-left-turn lanes.
Width of outside travel lane, to outside stripe (in feet):	Width of right-most travel lane, excluding striped paved shoulders, bike lanes, and marked parking stalls.
Paved shoulder, bike lane, OR marked parking area, outside lane stripe to pavement edge (in feet):	Besides a paved shoulder or a bike lane, this width may also be marked (striped or hashed) parking stalls. For diagonal parking, use the perpendicular distance from the end of the parking stripes to the pavement edge. This calculator does not work when there are BOTH bike lanes and parking stalls - please see the reference for this case.
Bi-directional Traffic Volume (in ADT):	Daily average. Assumed Directional factor (0.565) and Peak Hour Factor (0.091) values are used in a conversion to peak 15-minute volume.
Percentage of heavy vehicles:	As defined in the Highway Capacity Manual.
Percentage of road segment with occupied on-street parking:	Exclude driveways. Either one side or an average of both sides may be considered at a time.
Percentage of segment with sidewalks:	Again, either one side or an average of both sides may be considered.
Sidewalk width (in feet):	If a sidepath bike trail exists instead of a sidewalk, use its width.
Sidewalk buffer/parkway width (in feet):	Average distance from pavement edge to sidewalk edge. Include any gutter pan width.
Buffer/parkway average tree spacing (in feet):	Between tree trunks.

Model parameter ranges

The BLOS model was developed using roads with the following parameter ranges:

- Through lanes per direction - 1 to 3 (2 to 6 lane roads)
- Width of outside travel lane, to outside stripe - 10 to 16 feet
- Paved shoulder or bike lane, outside lane stripe to pavement edge - 0 to 10 feet (no rumble strips)
- Bi-directional traffic volume - 550 to 36,000 ADT (Average Daily Traffic)
- Posted speed limit - 25 to 50 mph
- Percentage of heavy vehicles - 0 to 10%
- FHWA's pavement condition rating - 5 (very good) to 2 (poor)

- A wide range of development types and parking conditions

(Be aware of model use outside these ranges, particularly for paved shoulders much over 6 feet and more than a few percent heavy vehicles.)

The parameter ranges used in developing the PLOS model include:

- Through lanes per direction - 1 to 2 (2 to 4 lane roads)
- Bi-directional traffic volume - 200 to 18,000 ADT (Average Daily Traffic)
- Traffic speeds - 15 to 75 mph
- Percentage of heavy vehicles - 0 to 10%
- Ranges of development types, road widths, paved shoulders and bike lanes, on-street parking percentages, sidewalk widths and sidewalk buffer widths and types

Appendix B: Pedestrian Infrastructure Index Input Variables and Scoring Criteria

Input Variable	Input Description	Scoring Description
Total # of Lanes at the Intersection	Total **number** of lanes, both approach and exit lanes for the entire intersection	Fewer than 9 lanes = 4 points 9 to 12 lanes = 3 points 13 to 16 lanes = 2 points 17 to 20 lanes = 1 point 21 or more lanes = 0 points
Greatest # of Lanes Across Any Road	Total **number** of lanes, both approach and exit lanes for the largest road	Fewer than 3 lanes = 4 points 3 lanes = 3 points 4 lanes = 2 points 5 lanes = 1 point 6 or more lanes = 0 points
Left Turn Lanes	Total **number** of dedicated left turn lanes	No left turn lanes = 4 points 1 left turn lane = 3 points 2 left turn lanes = 2 points 3 left turn lanes = 1 point 4 or more left turn lanes = 0 points
Right Turn Channel	Total **number** of separated right turn lanes	No right turn lanes = 4 points 1 right turn lane = 3 points 2 right turn lanes = 2 points 3 right turn lanes = 1 point 4 or more right turn lanes = 0 points
Right on Red Prohibited	Total **number** of approaches with "No Right On Red" signing	4 approaches or more with "no right on red" = 4 points 3 approaches with "no right on red" = 3 points 2 approaches with "no right on red" = 2 points 1 approach with "no right on red" = 1 point 0 approaches = 0 points
Signal Phasing	Single phased signal = S Multiple phased signal = M	Multi-phase signal (M) = 1 point Single phase signal (S) = 0 points
Crosswalks Present	Total **number** of crosswalks	4 crosswalks = 4 points 3 crosswalks = 3 points 2 crosswalks = 2 points 1 crosswalks = 1 point 0 crosswalks = 0 points
Crosswalk Type	Total **number** of crosswalks better than parallel white line crosswalk	4 enhanced crosswalks = 4 points 3 enhanced crosswalks = 3 points 2 enhanced crosswalks = 2 points 1 enhanced crosswalks = 1 point 0 enhanced crosswalks = 0 points
Crosswalk Condition	Good condition / highly visible = G Fairly good condition / easily visible = FG Fair condition / visible = F Poor condition / barely visible = P	Good condition (G) = 3 points Fairly good condition (FG) = 2 points Fair condition (F) = 1 point Poor condition (P) = 0 points
Pedestrian Buttons	Total **number** of pedestrian on-call buttons	7 or more buttons = 4 points 5 to 6 buttons = 3 points 3 to 4 buttons = 2 points 1 to 2 buttons = 1 point 0 buttons = 0 points
Accessible Pedestrain Buttons	Total **number** of accessible pedestrian on-call buttons	7 or more buttons = 4 points 5 to 6 buttons = 3 points 3 to 4 buttons = 2 points 1 to 2 buttons = 1 point 0 buttons = 0 points

Appendix B: Pedestrian Infrastructure Index Input Variables and Scoring Criteria

Pedestrian Signals	Total **number** of pedestrian crossing signal heads	7 or more crossing signal heads = 4 points 5 to 6 crossing signal heads = 3 points 3 to 4 crossing signal heads = 2 points 1 to 2 crossing signal heads = 1 point 0 crossing signal heads = 0 points
Sidewalks	Total **number** of crosswalk approaches at the intersection	7 or more sidewalk legs = 4 points 5 to 6 sidewalk legs = 3 points 3 to 4 sidewalk legs = 2 points 1 to 2 sidewalk legs = 1 point 0 sidewalk legs = 0 points
Approach Grade	<u>Grade of the steepest approach</u> Level grade = 4 Mild grade = 3 Sloped approach = 2	Level grade (4) = 3 points Mild grade (3) = 2 points Sloped approach (2) = 1 point Steep grade (1) = 0 points
Blocked Views	Total **number** of vehicular approaches with blocked views of pedestrian waiting to cross	No blocked sight lines = 4 points 1 blocked sight line = 3 points 2 blocked sight lines = 2 points 3 blocked sight lines = 1 point 4 blocked sight lines = 0 points
ADA Compliant Curb Cuts	Total **number** of curb cuts that are ADA compliant (proper slope, detectable warnings, contrasting materials)	7 or more curb cuts = 4 points 5 to 6 curb cuts = 3 points 3 to 4 curb cuts = 2 points 1 to 2 curb cuts = 1 point 0 curb cuts = 0 points
ADA Compliant Refuge Islands	Total **number** of curb cuts that are ADA compliant (proper slope, detectable warnings, contrasting materials)	4 pedestrian islands = 4 points 3 pedestrian islands = 3 points 2 pedestrian islands = 2 points 1 pedestrian islands = 1 point 0 pedestrian islands = 0 points
Turn Radius	<u>A radius estimate for the widest turn</u> Tight turning radius (under 10 feet) = 1 Open turning radius (10 to 20 feet) = 2 Wide turning radius (20 to 30 feet) = 3	Tight turning radius (1) = 3 points Open turning radius (2) = 2 points Wide turning radius (3) = 1 point Very wide turning radius (4) = 0 points
Skewed/Offset Intersection	Squared and aligned approach = N Angled or misaligned approach = Y	Not skewed or offset (N) = 1 point Skewed or offset (Y) = 0 points
Lighting	Total **number** of crossings with lighting	4 lighted crossings = 4 points 3 lighted crossings = 3 points 2 lighted crossings = 2 points 1 lighted crossings = 1 point 0 lighted crossings = 0 points
Special Features	Total **number** of special features (i.e., chirping signals, highly visible pedestrian crossing warning signage, countdown signals, etc.)	4 or more special features = 4 points 3 special features = 3 points 2 special features = 2 points 1 special features = 1 point 0 special features = 0 points