CAPE COD COMMISSION

Cape Cod Metropolitan Planning Organization (MPO)

Cape Cod 2016 Regional Transportation Plan

2016-2040

June 15, 2015 Public Release Version:

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Endorsement Anticipated July 20, 2015

COUNTY OF BARNSTABLE MASSACHUSETTS

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Cape Cod Metropolitan Planning Organization

Cape Cod
Regional Transportation Plan (RTP)

Federal Fiscal Years 2016

Anticipated Endorsement Date: July 20, 2015

Prepared by the

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Cape Cod Metropolitan Planning Organization
Cape Cod Regional Transportation Plan (RTP)

ENDORSEMENT, TIP

The signatures to follow certify that the Cape Cod Metropolitan Planning Organization (MPO) hereby endorses the Cape Cod Regional Transportation Plan (RTP) for Federal Fiscal Years 2016 in fulfillment of the requirements of 23 CFR Part 450.324.

CERTIFICATION:

The Cape Cod Metropolitan Planning Organization (MPO) Planning Process

The signatures to follow certify that the Comprehensive, Continuing, Cooperative Transportation Planning Process for the current local, regional, state, and federal fiscal years in the Cape Cod Metropolitan Planning Organization planning area is addressing major issues facing the region and is being conducted in accordance with the requirements of:

1. Section 134 Title 23, U.S.C., and Title 49 U.S.C. 5303, and this subpart;
2. Sections 174 and 176(c) & (d) of the Clean Air Act, as amended {42 U.S.C. 7504, 7506 (c) & (d)} and 40 CFR part 93;
3. Title VI of the Civil Rights Act of 1964, as amended {42 U.S.C. 2000d-1} and 49 CFR part 21:
4. 49 U.S.C. 5332, prohibiting discrimination on the basis of race, color, creed, national origin, sex, or age in employment or business opportunity;
5. Section 1101 (b) of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) (Pub. L. 109-59) and 49 CFR part 26 regarding the involvement of disadvantaged business enterprises (DBE) in USDOT funded projects;
6. Title 23 CRF part 230, regarding the implementation of an equal employment opportunity program on Federal and Federal-aid highway construction contracts;
7. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) and 49 CFR Parts 27, 37, and 38;
8. The Older Americans Act, as amended (42 U.S.C. 6101), prohibiting discrimination on the basis of age in programs or activities receiving Federal financial assistance;
9. Section 324 of title 23 U.S.C. regarding the prohibition of discrimination based on gender; and
10. Section 504 of the Rehabilitation Act of 1973 (29 U.S.C. 794) and 49 CFR part 27 regarding discrimination against individuals with disabilities.
11. Anti-lobbying restrictions found in 49 USC Part 20. No appropriated funds may be expended by a recipient to influence or attempt to influence an officer or employee of any agency, a Member of Congress, in connection with the awarding of any Federal contract.

The currently endorsed Unified Planning Work Program, Regional Transportation Plan, and the Cape Cod Transportation Improvement Program (TIP) for Federal Fiscal Year 2016 were developed in accordance with FHWA/FTA regulations, EPA regulations, and fully incorporate the applicable requirements of the 1964 Civil Rights Act and the Americans with Disabilities Act of 1990.

Cape Cod Metropolitan Planning Organization (MPO)

CAPE COD TRANSPORTATION IMPROVEMENT PROGRAM (TIP)

The signatures to follow certify that the Cape Cod Metropolitan Planning Organization (MPO), at their meeting on July 20, 2015, hereby approves the following action in accordance with the Comprehensive, Cooperative and Continuing transportation planning process. In accordance with the requirements of 23 CFR Part 450 Section 308(c) of Federal Regulations, the MPO for Cape Cod has completed its review and hereby endorses the Regional Transportation Plan (RTP) for Federal Fiscal Years 2016.

_____ Stephanie Pollack, Secretary/Chief Executive Officer – Massachusetts Department of	_____ Thomas Tinlin, Administrator Massachusetts Department of Transportation Transportation (MassDOT) (MassDOT) Highway Division
_____ Richard Roy Cape Cod Commission	_____ Tom Guerino, Chair Cape Cod Regional Transit Authority
_____ Leo Cakounes Barnstable County Commissioners	_____ Jessica Rapp Grassetti, President Barnstable Town Council
_____ R. Patrick Ellis Bourne, Falmouth, Mashpee, Sandwich	_____ Sheryl A. McMahon Dennis, Yarmouth
_____ Sims McGrath Brewster, Chatham, Harwich, Orleans	_____ Cedric Cromwell, Chairman Mashpee Wampanoag Tribal Council
_____ Robert Weinstein Eastham, Provincetown, Truro, Wellfleet	

Executive Summary

Cape Cod's transportation system has both shaped and been shaped by development patterns of the region. As our regional economy has evolved so too has our transportation infrastructure. From a reliance on ports and marine transport, to a steady growth by rail, and explosion of change fueled by the automobile – our region has undergone dramatic changes. All the while, our connection with our environment and our past has continued to define us. What will define our region for the next 25 years?

> *The 2016 Regional Transportation Plan (RTP) is a **community-driven**, **performance-based** plan that considers the unique **challenges and opportunities** of the region and establishes spending **priorities** to allocate available surface transportation **funding** towards transportation **infrastructure** projects for Cape Cod through 2040.*

Community-Driven

The RTP was developed through input from a wide-range of federal, state, and local agencies and organizations, and the public. In addition to over two dozen meetings including six regional public meeting and two open houses, feedback was solicited through an online survey. The online survey provided valuable input into the process including the identification of over 235 locations with transportation issues or challenges. The outreach will continue following release of the document for public comment including additional in-person public meetings, a virtual public meeting, signs on transit vehicles, and an outreach table at a major outdoor event.

Performance-Based

Consistent with new federal legislation, the RTP is built on a performance-based planning approach with a vision statement, goals, objectives, performance measures, strategies, and policies.

The RTP vision statement established the overarching vision of the document and is as follows:

> *The Cape Cod Metropolitan Planning Organization envisions a transportation system that supports the environmental and economic vitality of the region through infrastructure investment that focuses on livability, sustainability, equity, and preservation of the character that makes our special place special.*

The goals of the RTP expand on the vision statement in seven areas of emphasis. The goals are:

- **Safety**: Provide safe travel options for all users
- **Environmental and Economic Vitality**: Maintain, protect, and enhance the natural environment while strengthening the economy
- **Livability and Sustainability**: Support livable communities and village centers that strengthen the long-term sustainability of the region
- **Multimodal Options/Healthy Transportation**: Provides a variety of healthy transportation options to all users
- **Congestion Reduction:** Reduce congestion and improve travel time reliability
- **System Preservation**: Preserve, maintain, and modernize the existing transportation system
- **Freight Mobility**: Improve efficiency and reliability of freight movement

The performance measures established in the RTP are quantifiable targets that the region will work to achieve over the coming year through implementation of a series of strategies and policies.

Challenges and Opportunities

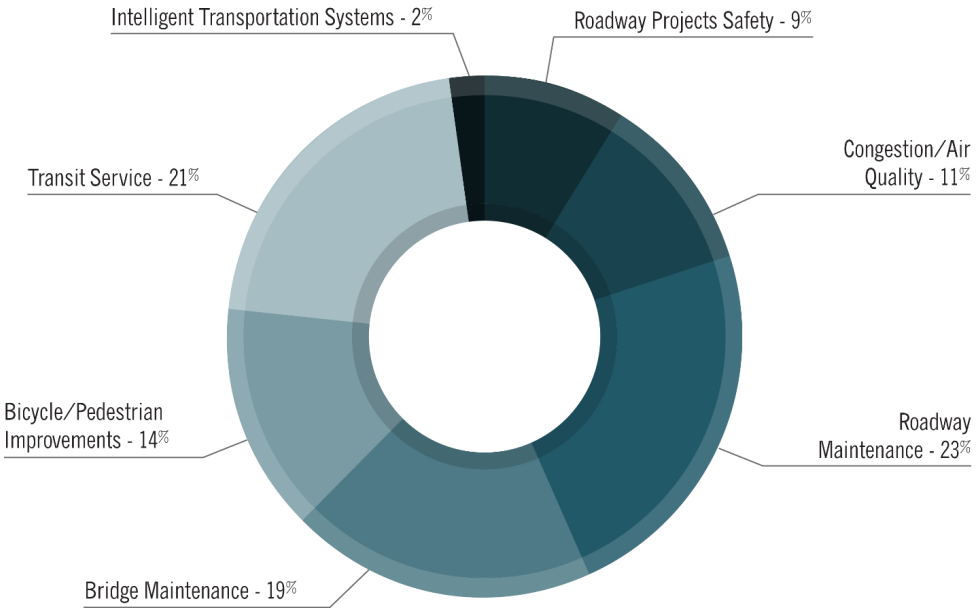
While the region faces many of the same transportation challenges as communities across the country and across the world, there are also many things that make Cape Cod unique. Developing transportation solutions for Cape Cod must take into account the things that make the region a special and desirable place to live, work, and play. Some of the challenges and opportunities for the region that are detailed in the RTP include:

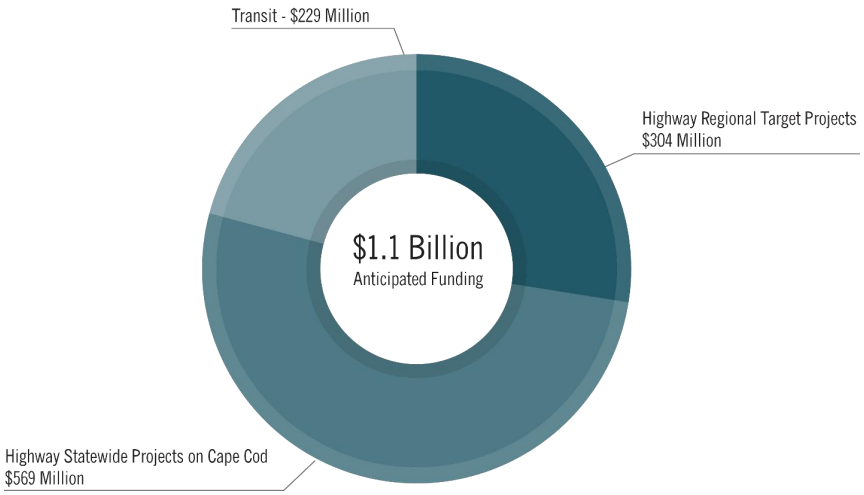
- **Historical Context:** maintaining a sense of place and recognition of history while evolving to meet the need of the next generation
- **Aging Infrastructure**: repairing or placing a significant amount of transportation infrastructure that is at or near the end of its design life
- **Safety**: identifying the locations of greatest need and implementing proven safety countermeasures to improve safety for all users
- **Security**: being prepared for extraordinary events that would threaten the people and the infrastructure of the region
- **Freight**: recognizing the importance of freight to the region while exploring a variety ways to safely and efficiently transport it
- **Bicycling, Pedestrians, and Transit**: identifying the unique needs of all users and improving options for a variety of modes of healthy transportation
- **Congestion Management**: identifying opportunities to reduce the intensity, duration, and extent of congestion for all modes of transportation
- **Stormwater Management**: identifying solutions to minimizing the contribution of nutrients and pollutants into the Cape's waterways from stormwater runoff
- **Access to Essential Services**: ensuring all users of the transportation have the same and convenient options to access essential services
- **Regional Cooperation**: ensuring that there is a cooperative and coordinated planning approach that involves all stakeholder agencies and the public

- **Economic Development**: supporting sustainable, year-round economic development opportunities through transportation infrastructure
- **Environmental Protection**: ensuring that transportation projects provide environment benefits including greenhouse gas (GHG) emissions reductions
- **Equity**: ensuring full and fair participation by communities in the transportation decision-making process, and equitable distribution of benefits and any potential burdens from transportation projects

Priorities

As a document that establishes the vision for surface transportation spending in the region, the RTP sets the framework for what will be built on Cape Cod. Based on a critical assessment of infrastructure needs, discussions at RTP development meetings, and feedback on the RTP survey, the following program of spending was developed. The overall distribution of proposed spending is shown the figure to the right.





Funding

The anticipated funding in the region over the next 25 years totals approximately $1.1 billion. This total includes spending on transit as well as highway projects (including roads, bridges, sidewalks, multiuse paths, etc) broken down as shown in the following figure to the left.

Infrastructure

Out of the $304 million in funding for highway projects identified and selected by the region, the following projects were selected balancing a number of factors including potential benefit, estimated cost, consistency with the objectives of the RTP, equity as it relates to minority, low income, Limited English Proficiency (LEP) and other protected populations, and GHG reduction potential:

- Hyannis Access Improvements (phased)
    - Route 28 at Yarmouth Road
    - Yarmouth Road
    - Iyannough Road and Airport Rotary
- Canal Area Improvements
    - Belmont Circle/Route 25 Ramp
    - Route 6 Exit 1C Reconfiguration
- Multimodal Improvements
    - Cape Cod Rail Trail Extension: S. Wellfleet to Provincetown
    - Cape Cod Rail Trail Extension: Barnstable to Cape Cod Canal
    - Shinning Sea Bikepath Extension to Cape Cod Canal Path
    - Route 28 Multimodal Improvements (various segments)
- Route 6 Outer Cape Safety Improvements
- Buzzards Buy Commuter Rail Infrastructure
- Various smaller-scale projects to be identified based on future evaluations

While many uncertainties exist about the future, the strength of the transportation infrastructure will undoubtedly be a key to Cape Cod's long-term vitality. The 2016 RTP sets forth this vision for the region and sets the framework for making smart transportation investments within the region through 2040.

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Chapter 1: Introduction and Plan Development

This 2016 Cape Cod Regional Transportation Plan (RTP) is a fiscally constrained set of transportation projects, programs, and transportation studies covering 2016 to 2040. The RTP establishes the long range view of transportation based on existing system data and needs. The RTP includes an assessment of the existing transportation system and its federal aid components—whether transit, highway, pedestrian, or other—and endeavors to improve the transportation system and its connections for better mobility for residents, commuters, and visitors. The RTP includes all modes of surface transportation throughout the 15 communities of Barnstable County.

Preparation of the document is undertaken by the Cape Cod Commission staff every four years on behalf of the Cape Cod Metropolitan Planning Organization (MPO).

This chapter includes background information on the transportation planning process, a synopsis of the public participation process, and regional survey results.

TRANSPORTATION PLANNING PROCESS

CAPE COD METROPOLITAN PLANNING ORGANIZATION (MPO)

The Cape Cod Metropolitan Planning Organization (MPO) is the regional governing body established by federal law to oversee regional transportation planning and recommend the distribution of transportation funds locally. The MPO is responsible for reviewing, guiding, and endorsing the RTP.

The MPO is made up of eleven voting members that meet five to ten times annually. The membership is outlined in Table 1. Town representation on the body is depicted in Figure 1.

TABLE 1: CAPE COD MPO MEMBERSHIP

AGENCY	MPO SIGNATORY
Massachusetts Department of Transportation (MassDOT)	Secretary of Transportation
MassDOT Highway Division	Administrator
Cape Cod Regional Transit Authority (CCRTA)	Chairman
Cape Cod Commission (CCC)	Chairman
Barnstable County Commissioners	Commissioner
Mashpee Wampanoag Tribe	Tribal Chairman
Town of Barnstable	Town Council President
Sub-region A (Bourne, Falmouth, Mashpee, Sandwich)	Selectman
Sub-region B (Dennis, Yarmouth)	Selectman
Sub-region C (Brewster, Chatham, Harwich, Orleans)	Selectman
Sub-region D (Eastham, Provincetown, Truro, Wellfleet)	Selectman

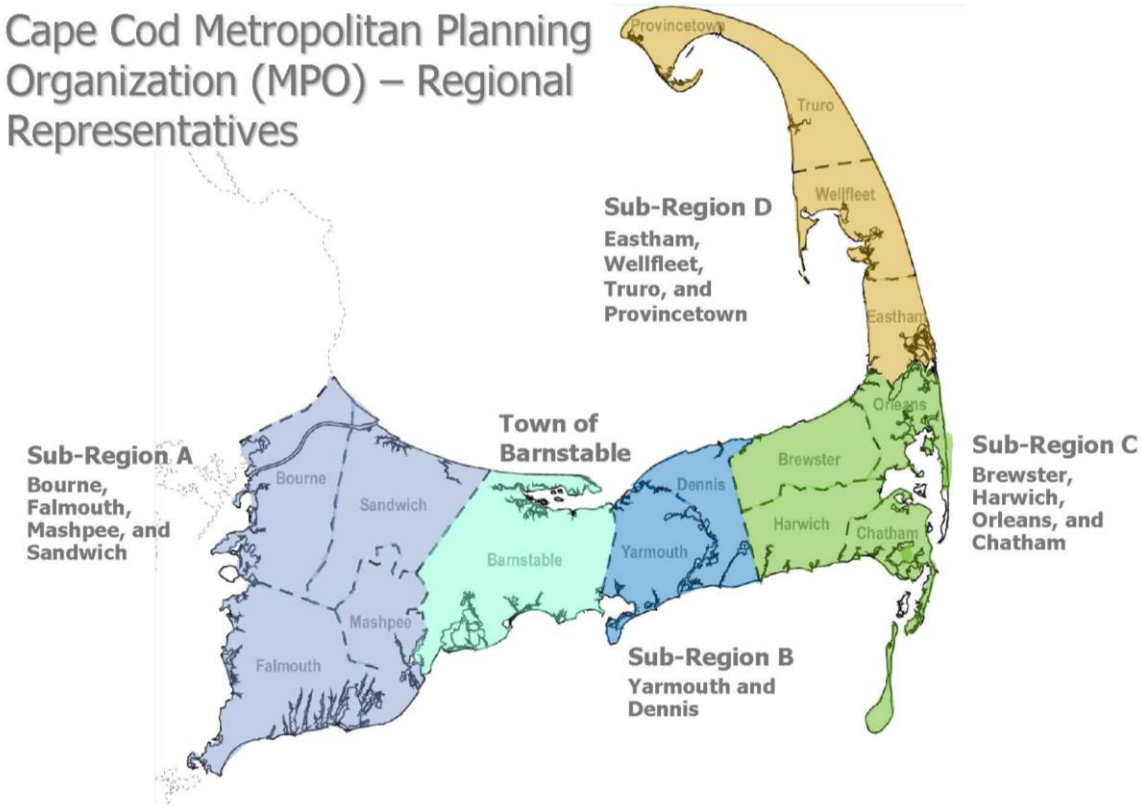

FIGURE 1. MPO REGIONAL REPRESENTATIVES

The MPO also includes non-voting Ex-Officio Members: Federal Highway Administration, Federal Transit Administration, Army Corps of Engineers, National Park Service/Cape Cod National Seashore, the Woods Hole, Martha's Vineyard and Nantucket Steamship Authority, and the Chair of the Cape Cod Joint Transportation Committee.

The MPO is served by an advisory body: the Cape Cod Joint Transportation Committee (CCJTC). The CCJTC membership includes representatives from each of Barnstable County's fifteen towns and a bicycle advocate.

Development of the RTP also includes consultation with or consideration of a wide-range of federal, state, and local agencies and organizations including:

- Barnstable County Government
- Bay Colony Railroad
- Cape Air
- Cape Cod Central Railroad
- Cape Cod Commission
- Cape Cod Joint Transportation Committee
- Cape Cod Metropolitan Planning Organization
- Cape Cod National Seashore (National Park Service)
- Cape Cod Regional Transit Authority
- Cape Cod Towns
- Federal Highway Administration
- Federal Transit Administration
- Hy-Line Cruises
- Joint Base Cape Cod

- Martha's Vineyard Commission
- Massachusetts Department of Recreation and Conservation
- Massachusetts Department of Transportation
- MassBike
- MassRides
- Nantucket Air
- Nantucket Planning and Economic Development Commission
- Old Colony Planning Council
- Freight Companies
- Peter Pan – Bonanza Bus Lines
- Plymouth and Brockton Street Railway Company
- Southeastern Regional Planning and Economic Development District
- U.S. Army Corps of Engineers
- Woods Hole, Martha's Vineyard and Nantucket Steamship Authority

The staff of the CCC, CCRTA, and MassDOT, along with staff of the local towns, participates in the process through preparation of the documents for MPO action.

FEDERAL CERTIFICATION DOCUMENTS

In addition to the RTP, the MPO is required to endorse other federal certification documents including the Transportation Improvement Program (TIP), Unified Planning Work Program (UPWP), and the Public Participation Plan (PPP).

The RTP establishes a regional vision for the transportation system, the UPWP studies investigate deficiencies in that system and identify potential solutions, and the TIP details specific transportation projects that are implemented to improve the transportation system. The PPP provides a framework to ensure public involvement and cooperative decision making throughout the transportation planning process. A summary of the primary function, time horizon, and updated timeline is presented in Table 2. The table also includes links to the Cape Cod MPO webpages that contain more detailed information on each of the documents.

TABLE 2: FEDERAL CERTIFICATION DOCUMENTS

DOCUMENT	PRIMARY FUNCTION	TIME HORIZON	UPDATE TIMELINE
Regional Transportation Plan (RTP) www.capecodcommission.org/rtp	Establishes long-range vision and goals, identifies major projects, studies, and programs	20+ years	Every 4 years
Transportation Improvement Program (TIP) www.capecodcommission.org/tip	Identifies specific transportation investments (projects)	4 years	Annually
Unified Planning Work Program (UPWP) www.capecodcommission.org/upwp	Details planning studies and tasks	1 year	Annually
Public Participation Plan (PPP) www.capecodcommission.org/ppp	Establishes plan for public participation for transportation decision-making	Ongoing	Every 5 years or more frequently as needed

TITLE VI/NONDISCRIMINATION PROGRAM

The MPO follows federal and state non-discrimination laws and seeks to ensure that all interested parties in Barnstable County have access to the MPO's activities and services and that public involvement in the MPO's decision making comes from a diverse socioeconomic group that is representative of the county's population. The MPO has developed a nondiscrimination program, in accordance with federal and state requirements, to encourage broad public participation, representation, and equity in the region's transportation planning.

TITLE VI

Title VI of the Civil Rights Act of 1964 prohibits discrimination based on race, color, or national origin.[1] Organizations that receive Federal funds are obligated to assure nondiscrimination in their programs and activities and are required to have a comprehensive Title VI enforcement program to prevent and eliminate discrimination in their federally funded programs. FHWA and FTA set forth Title VI compliance requirements for "primary" funding recipients such as MassDOT and sub-recipients such as the MPOs to follow. Effective transportation decision making depends upon understanding and properly addressing the needs of different socioeconomic groups. The MPO's Title VI program includes identifying the demographic distribution of minority and limited English proficiency populations within the region and implementing a comprehensive strategy to ensure that the MPO conducts effective outreach to encourage their involvement in and access to the transportation planning and decision-making process.

MassDOT is responsible for ensuring that the state's MPOs comply with federal program requirements. Following MassDOT's 2013 Title VI program update, the Cape Cod MPO developed and adopted a Title VI Program in 2014 (see Appendix L). The Title VI plan provides information about beneficiaries' rights, how to file a complaint, regional demographic data, maps, a public participation plan, a language access plan, and analyses of transportation spending in the region, project locations and potential impacts from projects to ensure equity in the planning and implementation process for the region.

Although Title VI is the focal point of non-discrimination law in the United States, FHWA incorporates a broader spectrum of statutes, executive orders, and regulations into its requirements for states and MPOs. For example, Section 324 of the Federal-Aid Highway Act of 1973 prohibits discrimination based on sex; Section 504 of the Rehabilitation Act of 1973 prohibits discrimination on the basis of disability status, as does the Americans with Disabilities Act of 1990; and the Age Discrimination Act of 1975 prohibits age discrimination. In addition, the Civil Rights Restoration Act of 1987 (FHWA Notice 4720.6) clarified the original intent of Congress with respect to Title VI by restoring the broad, institution-wide scope and coverage of the nondiscrimination statutes to include all programs and activities of federal-aid recipients

1 "No person in the U.S. shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under a program or activity receiving financial assistance." [Civil Rights Act 1964]

and enforcing the application of the laws that include nondiscrimination on the basis of race, color, national origin, age, gender, or disability.

ENVIRONMENTAL JUSTICE

The concept of environmental justice is part of the MPO's nondiscrimination program. Environmental justice became a federal policy initiative in 1994 under President Clinton's Executive Order 12898 that requires each Federal agency to 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." Environmental justice policy for the US DOT is based on the following three principles:

1. "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;
2. to ensure the full and fair participation by all potentially affected communities in the transportation decision-making process;
3. To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low income populations."[2]

The MPO addresses environmental justice through its Title VI/Nondiscrimination program, as discussed above. In addition to mapping demographic data that identifies areas (census blocks) in the county with higher proportions of low income and minority populations, the staff conducts analyses on the geographic distribution region's transportation spending and project construction, to ensure equity in the distribution of transportation improvements. The analysis also includes a review of potential project impacts – positive and negative – to ensure that that potentially underserved areas neither adversely impacted by, nor denied the benefits of, transportation projects. A key piece of the program is engaging such communities in the MPO's activities and decision making through expanded and targeted public outreach. The Public Participation Plan, as discussed below, establishes the MPO's public involvement goals and strategies.

PUBLIC PARTICIPATION PROCESS

To ensure an inclusive and accessible public engagement processes for development of the RTP, staff looked to the framework established in the Cape Cod MPO Public Participation Plan (PPP). Goals of the PPP are to:

1. Obtain Quality Input and Participation
2. Establish Consistent Commitment
3. Increase Diversity
4. Ensure Accessibility
5. Provide Relevance

[2] http://www.fhwa.dot.gov/environment/environmental_justice/ej_at_dot/

6. Foster Participant Satisfaction
7. Clearly Define Potential for Influence
8. Establish and Maintain Partnerships
9. Provide Opportunities to Build Consensus

The PPP in available in English and Portuguese at www.capecodcommission.org/ppp

MEETINGS

Numerous meetings have been held to discuss development of the RTP. Table 3 identifies meetings held solely for the plan, as well as meetings of various organizations at which the RTP was discussed.

TABLE 3. REGIONAL TRANSPORTATION PLAN MEETINGS

CAPE COD METROPOLITAN PLANNING ORGANIZATION MEETINGS		
Meetings beginning in December 2014 and continuing throughout the development of the RTP Generally held once per month on a Monday at 1:00 PM, Cape Cod Commission Office, Barnstable		
CAPE COD JOINT TRANSPORTATION COMMITTEE MEETINGS		
Meetings beginning in December 2014 and continuing throughout the development of the RTP Generally held once per month on a Friday at 8:30 AM, Cape Cod Commission Office, Barnstable		
PUBLIC MEETINGS **LOCATION**	**DATE**	**TIME**
Falmouth Library	Monday, April 6, 2015	1:00 PM
Harwich Community Center	Monday, April 6, 2015	6:00 PM
Barnstable Town Hall	Wednesday, April 8, 2015	2:00 PM
Bourne Veterans Memorial Community Center (Buzzards Bay)	Wednesday, April 8, 2015	6:00 PM
Environmental Consultation Meeting – Cape Cod Commission Office (Barnstable)	Thursday, April 9, 2015	10:00 AM
Provincetown Town Hall	Tuesday, April 14, 2015	9:00 AM
OPEN HOUSES **LOCATION**	**DATE**	**TIME**
Snow Library (Orleans)	Tuesday, April 7, 2015	4:00 PM – 6:00 PM
Hyannis Transportation Center	Thursday, April 9, 2015	3:00 PM – 5:00 PM
ANTICIPATED – Hyannis Father's Day Car Show (RTP Booth) – Barnstable	Sunday, June 21, 2015	8:30 AM – 2:30 PM
ANTICIPATED – Open House for comments/questions on draft RTP	TBD, June/July 2015	TBD
ANTICIPATED – Open House for comments/questions on draft RTP	TBD, June/July 2015	TBD
OTHER MEETINGS **LOCATION**	**DATE**	**TIME**
Waquoit Bay Reserve: Sea Level Rise, Storms and Cape Cod (Cape Cod Commission Presentation) – Waquoit	Thursday, March 12, 2015	9:00 AM - 4:30 PM
Multimodal Committee Meeting (RTP Presentation) – Hyannis Transportation Center	Thursday, March 12, 2015	2:00 PM – 4:00 PM
Cape Cod Commission Regional Policy Plan Update Stakeholder Meeting – Mashpee Town Hall	Tuesday, March 31, 2015	1:00 PM
OTHER MEETINGS (CONT.) **LOCATION**	**DATE**	**TIME**

Cape Cod Commission Regional Policy Plan Update Stakeholder Meeting – Chatham Community Center	Tuesday, April 1, 2015	1:00 PM
Cape Cod Commission Regional Policy Plan Update Stakeholder Meeting – Cape Cod Commission Office (Barnstable)	Tuesday, April 2, 2015	8:30 AM
Herring River (Wellfleet) Restoration Project Meeting with Environmental Agencies (Brief RTP Discussion) – Lakeville	Monday, April 6, 2015	9:30 AM – 12:30 PM
Provincetown 365 Community Group Meeting (RTP Presentation) – Provincetown	Wednesday, April 15, 2015	6:30 PM – 9:30 PM
Barnstable County Regional Emergency Planning Committee (RTP Presentation) – Barnstable County Complex (Barnstable)	Wednesday, May 6, 2015	2:00 PM – 4:00 PM

OTHER OUTREACH STRATEGIES

In addition to the traditional outreach approaches, staff utilized a number of new strategies in an effort to increase public participation. These included an expanded email outreach effort, social media effort, signs on the inside of all Cape Cod Regional Transit Authority (CCRTA) buses and paratransit vehicles, and an outreach event at the Hyannis Father's Day Car Show.

In an effort to better connect with the various groups and agencies in the region that interact in different ways with the transportation system every day, an expanded email distribution list was created to share all notices and announcements on the development of the plan. This expanded outreach list including the following groups and agencies that were identified in the region:

- Community & human services programs and providers
- Community centers
- Councils on aging
- Day care and child development programs
- English language media outlets (print and audio)
- Financial institutions
- Fire districts
- Hospitals and health centers
- Interested citizens (those who requested to be included in the list)
- lesbian, gay, bisexual, and transgender (LGBT) organizations
- Libraries
- Local and area chambers of commerce
- Local and regional housing partnerships, authorities, and groups
- Local and regional transportation providers (all modes)
- Local community-based organizations
- Local financial development corporation and economic development corporations
- Local legislators
- Local police and fire departments
- MPO and CCJTC members
- Portuguese language media (print and radio)
- Public and private educational institutions and school departments
- Religious institutions
- Town clerks, managers, departments of public works directors, town planners, and other similar town personnel
- Town councils
- Transportation consulting firms
- Veterans services

The social media outreach effort includes communications across multiple Cape Cod Commission platforms for all notices and announcements about upcoming meetings and documents releases. Links were sent out through the Cape Cod Commission's Facebook and

Twitter (with over 1,000 combined followers) and local news outlets were encourage to share links through their own social media channels. These messages and links were often picked up by other groups across the region, such as the Cape Cod Young Professionals Group, with significant numbers of followers. Announcements about the RTP survey got a particularly high number of impressions.

In addition to hosting an open house at the Hyannis Transportation Center, a regional intermodal hub, additional efforts were made to ensure that transit riders had an opportunity to participate in the development of the document. Signs (see Figure 2) were placed on all CCRTA buses and paratransit vehicles. The message on the sign is presented in both English and Portuguese.

FIGURE 2. BUS SIGNS

ANTICIPATED - The Hyannis Father's Day Car Show, one of the largest events on Cape Cod each year, typically attracts 35,000 to 50,000 people. This year the event fell during the RTP public comment period providing an opportunity to bring the document out to the community and provide an easy opportunity to comment. At the table set up for the event, a number of interactive exhibits provided opportunities for interested members of the public to learn about the transportation network on Cape Cod, transportation planning activities on Cape Cod, identify specific areas of concern on the regional transportation network, and share any ideas or visions for the region.

REGIONAL POLICY PLAN SURVEY

Every five years, the Cape Cod Commission (CCC) prepares a Regional Policy Plan (RPP) to guide development throughout Barnstable County. The Plan seeks to balance economic development with protection of the Cape's natural resources and community character. In order to produce an updated RPP that meets the needs and goals of all Cape residents, the CCC engaged the University of Massachusetts Dartmouth Donahue Institute in 2014 to conduct a survey of Cape Cod residents to solicit their views about important local issues. A key finding from the report pertained to transportation. Under the category of "Current Problems for Towns and for the Cape:"

> *"Traffic congestion, coastal erosion, the availability of jobs and economic opportunities, and the pollution of ponds and coastal waters were consistently identified as current problems facing Cape Cod and its towns."*

From a list of twenty potential problems, traffic congestion was identified by respondents as one of the most serious problem for their town (45% rated as "Serious"; 85% rated as "Serious or Moderate"). For the entire Cape, traffic congestion was also identified as the most serious problem (63% rated as "Serious"; 93% rated as "Serious or Moderate").

Respondents also identified "Future Problems for Towns and for the Cape." The top issue respondents believe will be a problem in the next five years is traffic congestion. 85% of respondents rated traffic congestion in their town as a serious problem in the next 5 years; for the entire Cape, this figure is 93%.

Regarding infrastructure development on Cape Cod, respondents were asked the extent to which they support or oppose a number of specific projects. The results of this question, along with the sample size (n), are presented in Table 4.

TABLE 4: RPP TRANSPORTATION INFRASTRUCTURE QUESTION SURVEY RESULTS

	n	STRONGLY SUPPORT	SUPPORT	UNSURE	OPPOSE	STRONGLY OPPOSE
A third automobile bridge across the Cape Cod Canal	369	25.5%	26.3%	18.2%	13.8%	16.3%
Expansion of state numbered roads (not including Rt. 6)	354	9.9%	20.6%	34.2%	22.9%	12.4%
Expansion of Rt. 6 after exit 9	359	19.2%	35.9%	19.8%	13.4%	11.7%
Expansion of Rt. 6 before exit 9	362	11.9%	25.1%	24.6%	26.0%	12.4%
A public parking garage	362	7.7%	23.5%	34.5%	23.2%	11.0%
Bike paths	368	43.2%	42.7%	7.6%	4.3%	2.2%

REGIONAL TRANSPORTATION PLAN SURVEY

To facilitate public input in the development of the RTP, and online survey was developed and advertised through a number of outreach techniques. The RTP survey was advertised at RTP and other local and regional meetings and open houses distributed through the extended email distribution list, social media platforms, and picked up by a number of local media outlets.

The survey was open from March 20, 2105 through May 10, 2105 and a total of 125 responses were received.[3] A summary of results in presented in the section of the plan with additional data presented in Appendix O.

Question 1 – Live-Work-Play

Respondents were asked to identify the town in which they live, work, and do most other activities such as visiting or shopping. All 15 Cape Cod towns were represented as well as respondents who lived, worked, and/or did most other activities outside of the region. The distribution was generally consistent with the population and employment distribution across the region with Barnstable being represented by the largest share followed by Falmouth.

Respondents were further asked to identify their primary mode of transportation. Slightly over 90% of respondents identified the personal automobile as their primary mode of transportation followed 7% and 1% traveling by bicycling and walking, respectively. The remaining respondents, 2%, indicated they use an “other” mode of transportation primarily. This would likely be transit users.

[3] Given the relatively small sample size and the potential for self-section bias, the survey results should be assumed to be necessarily representative of the overall population of Cape Cod

To understand potential differing preferences among different age groups, respondents were asked to identify the age bracket to which they belong (optional question). Table 5 presents the results of this question for those who chose to respond in comparison to the age distribution for Barnstable County.

TABLE 5: RTP SURVEY RESULTS – AGE DISTRIBUTION

YEARS OF AGE	PERCENT OF RESPONSES	2010 CENSUS DISTRIBUTION FOR BARNSTABLE COUNTY[1]
35 years or younger	12%	21%
36 to 49 years	16%	21%[2]
50 to 64 years	45%	29%
Age 65 or older	27%	29%

[1]Of residents 15 years of age or older
[2]35 to 49 Years of Age

Question 2 – Problem Identification

Question 2 was a map-based exercise where respondents were asked to identify problem locations they experience both locally and across the region. A total of 235 data points were entered as part of this exercise with good geographic distribution across the region. The greatest concentration of comments was submitted in the vicinity of the Cape Cod Canal, in downtown Falmouth, Hyannis, and Provincetown.

Figure 3 shows problem locations identified by respondents by the type of issue identified. Below is a sampling of some of the commentary responses provided along with the location identification:

- "Route 151 to North Falmouth – no sidewalk or bike trail so dangerous to ride bikes"
- "Route 6 at Main Street [Wellfleet] – Poor signal configuration"
- "Route 130 N & S – Heavy Traffic year-round"
- "Airport Rotary – Safety congestion traffic flow"
- 'Woods Hole, especially near ferry terminal – insufficient bicycle racks"
- 'All of Route 6 Eastham - too many conflicts – too many turns & curb cuts and lanes Route 6 Eastham especially Brackett Road area"
- 'On Route 28 between the [Airport] Rotary and Willow Street lights [Hyannis] – traffic backed up from rotary to Willow Street lights at times"
- '[Sagamore and Bourne] Bridges – during the summer I am trapped on the Cape"
- "Santuit-Newtown Rd/Rte 28 – difficult to enter Rte 28/safety issue"

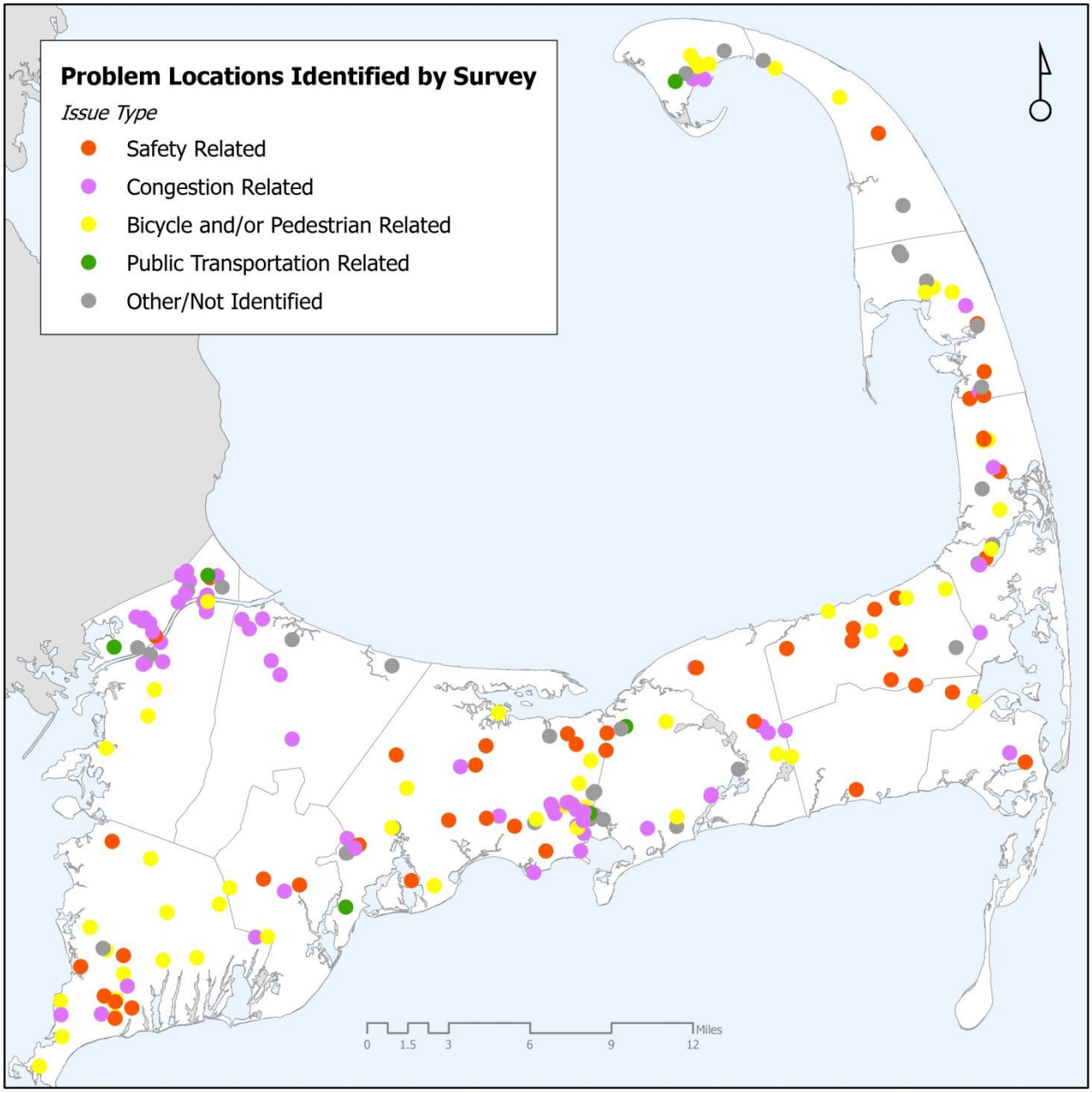

FIGURE 3. RTP SURVEY RESULTS - PROBLEM LOCATIONS IDENTIFIED

The responses to this question are being formatted into an online map that will be shared with local Departments of Public Works Departments, MassDOT, the CCRTA, and other agencies. The online map will also be made available to the general public with the opportunity to add new comments as an ongoing opportunity for public comment.

Question 3 – Goals and Objectives

Question 3 shared the draft vision statement and goals with the respondents and asked respondents for any feedback or suggestions for additional goals. Suggestions provided through

this question include suggestions for focus on economic vitality, sustainability, safety, transit, signage, consistent traffic lights, Intelligent Transportation Systems, preservation of character, bicycling and pedestrian accommodation, recognition of sensitive resources, wellness and healthy transportation, meeting the need of the Cape's demographics, mode shift, funding allocation fairness, and fiscal responsibility. All responses to this question are included in Appendix O.

Question 4 – Cape Cod Canal Crossing

Question 4 presented respondents with the following information:

> Built 80 years ago, the Bourne and Sagamore highway bridges over the Cape Cod Canal require frequent maintenance to remain in service. Both seasonal and maintenance-related congestion at the bridges and on surrounding roadways have a significant impact on safety, emergency access, and overall economic activity of the Cape Cod communities.
>
> The Massachusetts Department of Transportation is currently undertaking a 18-month Cape Cod Canal Transportation Study to identify potential improvements to the transportation system surrounding the Cape Cod Canal in Bourne and Sandwich.

Respondents were then asked a series of questions regarding a potential Cape Cod Canal crossing project. Responses are summarized in the Figure 4, with complete results and other comments offered presented in Appendix O.

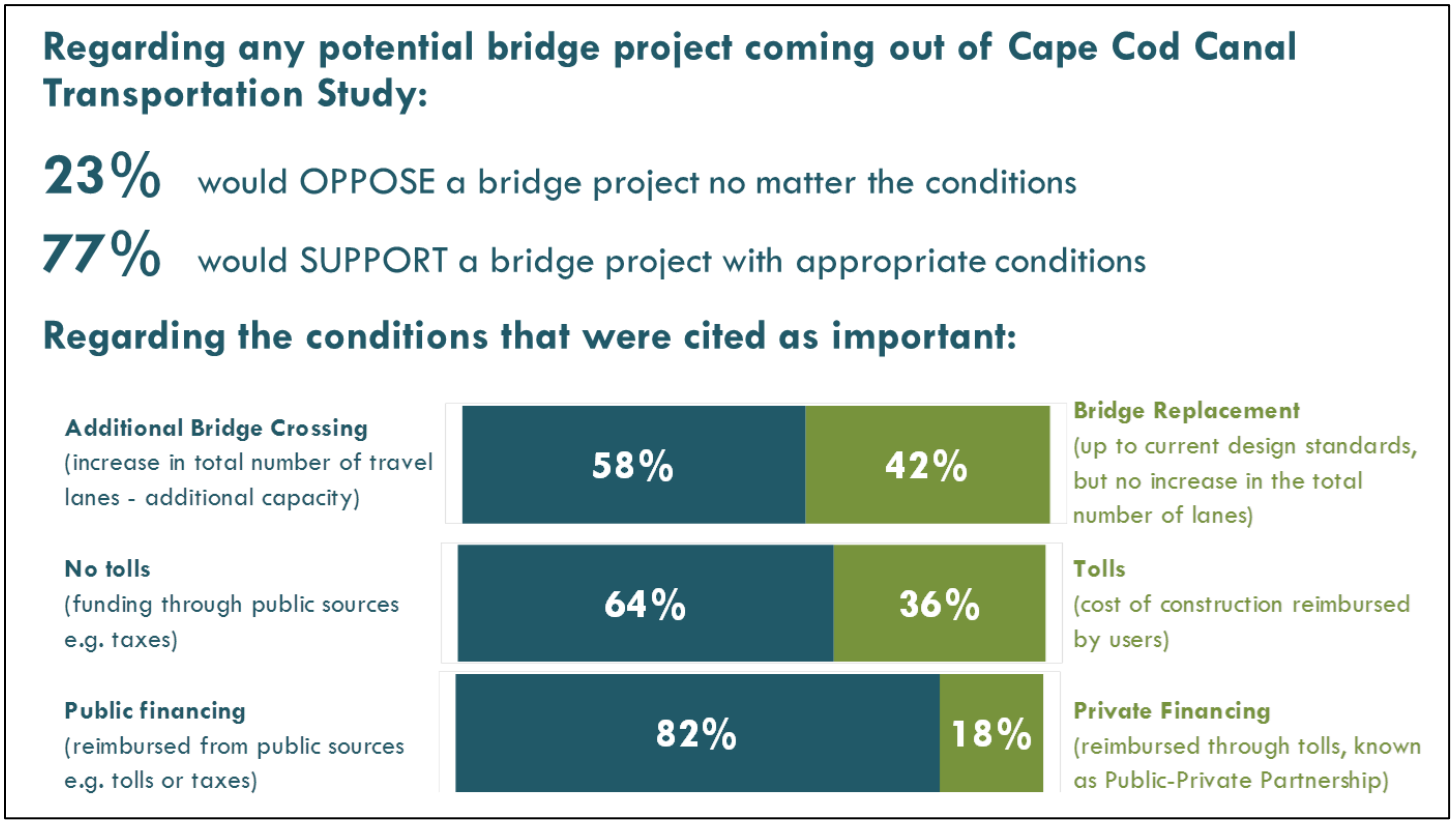

FIGURE 4. RTP SURVEY RESULTS – CAPE COD CANAL CROSSING QUESTION RESULTS

Question 5 – Projects and Policies Level of Support

Question 5 asked respondents to rate their level of support for a number of projects or polices that had been developed in previous planning efforts. Responses are summarized in Figure 6 and presented in greater detail in Appendix O.

TABLE 6: RPP SURVEY RESULTS – PROJECT AND POLICIES LEVEL OF SUPPORT

PROJECT DESCRIPTION	SUPPORT OR GREATLY SUPPORT	OPPOSE OR GREATLY OPPOSE
Route 28: Falmouth-Chatham improved bicycle accommodation (e.g., bike lanes, wider shoulders, "share the road" program)	79%	8%
Expand Cape-wide year-round bus service	77%	5%
Shining Sea Bike path: Extension to Bourne (with connection to Cape Cod Canal Path)	77%	4%
Cape Cod Rail Trail: Expansion from S. Wellfleet to Provincetown	77%	5%
Commuter Rail Service to Buzzards Bay (to/from Boston)	74%	7%
Commuter Rail Service to Hyannis (to/from Boston)	73%	10%
Cape Cod Rail Trail: Expansion from Yarmouth to Bourne	72%	6%
Yarmouth Rd/Willow St: Additional travel lanes and multi-use path	68%	5%
Bourne Rotary: replacement (similar to Sagamore Rotary project)	56%	21%
Route 6: Reconfigure Route 6 Exit 1C interchange (move westbound ramps away from Sagamore Bridge)	55%	11%
Transportation management center (facility to monitor and coordinate traffic & transit operations)	52%	16%
Route 6: Upgrade of interchanges (Exit 1C to Exit 12)	51%	12%
Barnstable Airport Rotary: replacement with underpass of major traffic flows	49%	23%
Sandwich Road (Bourne): median separation, 2 lanes in each direction	49%	11%
Falmouth Transportation Center	42%	6%
Otis Rotary: replacement	23%	23%
OTHER SUPPORT QUESTIONS	**SUPPORT OR GREATLY SUPPORT**	**OPPOSE OR GREATLY OPPOSE**
Prioritize Complete Streets projects to better accommodate all users including bicyclists and pedestrians	86%	4%
Prioritize improved stormwater treatment to help improve water quality	75%	4%
Consider roundabouts at appropriate locations as a means of improving intersection safety	59%	15%

Responses submitted as other suggested projects as part of this question are presented in Appendix O. These included paved shoulders/bike lanes on Route 6 on the Outer Cape, an Orleans park and ride lot with regular bus service, enhance summertime commuter rail service, improved drainage and stormwater treatment, safety improvements on MacArthur Boulevard, Belmont Circle, and Route 6 in Eastham and Wellfleet, and improved wheelchair/scooter access for individuals with disabilities.

Question 6 – Budget Allocation

Question 6 presented respondents with the following information:

> A limited amount of funding is available to address the transportation problems in the region. Along with Federal and State regulations, the RTP defines where transportation funding is allocated. Assuming the region receives $1 Billion between now and 2040, use the sliders below to adjust where YOU think the funding should be allocated. The sliders are initially set to funding levels generally consistent with past practice. Notice the effect of your changes below each funding category. Since the RTP must be fiscally constrained, you must make sure you keep within the overall budget available.

Table 7 presents the default funding allocation (based on recent of transportation spending[4]) the average funding allocation by survey respondents.

TABLE 7: RTP SURVEY RESULTS – BUDGET ALLOCATION

SPENDING CATEGORY	HISTORICAL ALLOCATION	RESPONDENT AVERAGE ALLOCATION	DIFFERENCE
Roadway Projects Safety	6%	7%	+1%
Congestion/Air Quality	10%	9%	-1%
Roadway Maintenance	26%	24%	-3%
Bridge Maintenance	20%	18%	-2%
Bicycle/Pedestrian Improvements	8%	13%	+5%
Transit Service	27%	27%	-1%
Intelligent Transportation Systems	2%	3%	+1%

Question 7 – Additional Question or Comments

The final question provided respondents an opportunity to provide any additional comments or suggestion. Responses, all of which are presented in Appendix O, included:

- "People come to Cape Cod for the quality of life. A sustainable transportation plan will support the unique characteristics of Cape Cod"
- ". . . create an environment where all road users can feel equal and feel safer"
- "When doing road projects make sure to include wider shoulders. . . for safer bicycle accommodation"
- 'The Bourne Rotary badly needs to be replaced by a flyover"
- "Make sure any long term plan is fully vetted through a transparent and inclusive process
- "The Flex bus should include stops at all public affordable housing complexes in order to make the Cape truly accessible to low-income residents"
- "Budget needs to be increased"

[4] Transportation Improvement Program for FFY 2011-2015

Chapter 2: Goals, Objectives, and Performance Measures

The Regional Transportation Plan (RTP) was developed through a performance-driven, outcome-based approach. This chapter details the Vision, Goals, Objectives, and Performance Measures of the RTP. This chapter also includes Policies and Strategies for reaching the targets set within the Performance Measures. Finally, this chapter provides a framework for tracking progress towards performance targets and, to the greatest extent possible with the available data, provides an assessment of the current state of the transportation system with respect to the performance targets.

PERFORMANCE-BASED PLANNING AND PROGRAMMING

Performance-based planning and programming (PBPP) refers to the application of performance management principles within the planning and programming processes of transportation agencies to achieve desired performance outcomes for the multimodal transportation system.[5]

While PBPP has been used by a variety of transportation agencies for the past two decades, recent transportation legislation has made a "performance-based approach" a requirement for the metropolitan transportation planning process. Current federal surface transportation legislation, *Moving Ahead for Progress in the 21st Century* (MAP-21), requires that "*the metropolitan transportation planning process shall provide for the establishment and use of a performance-based approach to transportation decisionmaking to support the national goals….*"[6]

The seven national performance goals for the Federal Highway programs, as established by MAP-21, are as follows:

- **Safety** - To achieve a significant reduction in traffic fatalities and serious injuries on all public roads.
- **Infrastructure Condition** - To maintain the highway infrastructure asset system in a state of good repair
- **Congestion Reduction** - To achieve a significant reduction in congestion on the National Highway System
- **System Reliability** - To improve the efficiency of the surface transportation system
- **Freight Movement and Economic Vitality** - To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development.
- **Environmental Sustainability** - To enhance the performance of the transportation system while protecting and enhancing the natural environment.

[5] Performance Based Planning Guidebook
http://www.fhwa.dot.gov/planning/performance_based_planning/pbpp_guidebook/
[6] 23 USC Section 134(h)(2); 49 USC Section 5303(h)(2)

- **Reduced Project Delivery Delays** - To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices[7]

The goals, objectives, and performance measures set forth is this RTP reflect these national goals as well as priorities for the state and our planning region.

The relationship of goals, objectives, and performance measures as well as polices and strategies are depicted in Figure 5.

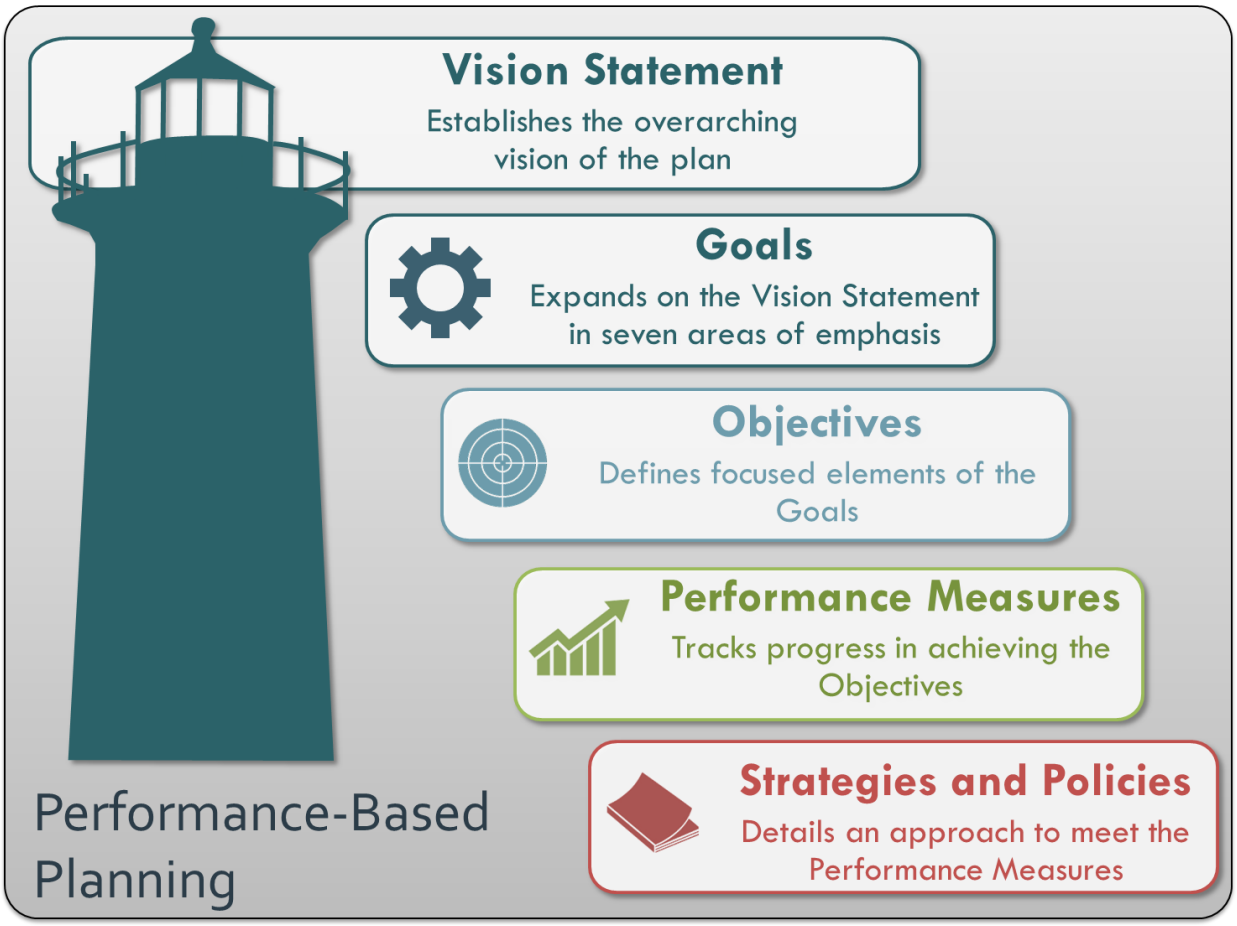

FIGURE 5. PERFORMANCE-BASED PLANNING STRUCTURE

[7] 23 USC Section 150(b)

VISION STATEMENT

The RTP vision statement establishes the overarching vision of the document. The vision statement for the 2016 RTP is as follows:

> *The Cape Cod Metropolitan Planning Organization envisions a transportation system that supports the environmental and economic vitality of the region through infrastructure investment that focuses on livability, sustainability, equity, and preservation of the character that makes our special place special.*

In support of this vision, the MPO identified the following eight goals for the 2016 RTP:

- Safety
- Environmental and Economic Vitality
- Livability and Sustainability
- Multimodal Options/Healthy Transportation
- Congestion Reduction
- System Preservation
- Freight Mobility

GOALS, OBJECTIVES, AND PERFORMANCE MEASURES

The goals, objectives, and performance measures discussed in the following sections reflect the collective vision of the MPO in consideration of the thoughtful input provided from a wide range of individuals throughout the development of the RTP.

One of the ways that the RTP most directly affects change on the transportation system is through TIP projects that are programmed consistent with the framework of the RTP. The TIP details specific transportation projects that are anticipated to be advertised for construction within the next four federal fiscal years. For each year in the TIP, there is a limited amount of regional discretionary funding from which the MPO selects what are generally referred to as "TIP target projects." Within any given year there may be additional projects from other funding sources such as statewide roadway maintenance and statewide bridge projects. These projects are generally identified through systematic statewide analysis. Both "TIP target projects" and projects from other funding sources affect change in the transportation system, but given the different level of MPO input involved in identifying each type of project, they are dealt with in slightly different manners relative to performance measures.

As our region, the state, and federal agencies gain more experience with performance measures there will likely be modification to these measures. Additionally, as the region improves its ability to capture and analyze wider datasets more robust performance measures may be possible. These performance measures however represent an important first step in in establishing a true performance-based planning approach.

SAFETY

While the number of traffic-related fatalities generally trends down nationally, it is important to recognize that any fatality is a tragic event and the public expects that all efforts will be taken to ultimately eliminate traffic-related fatalities. To that end, the Federal Highway Administration, Federal Motor Carrier Safety Administration, and National Highway Traffic Safety Administration have been actively involved in the *Towards Zero Deaths* initiative.[8]

The MPO is also supportive of the *Towards Zero Deaths* initiative and, as a step toward that ultimate vision, the first goal of the sets quantifiable measures related to safety.

Goal 1: Provide safe travel options for all users	
OBJECTIVES	**PERFORMANCE MEASURE**
Reduce the number and severity of crashes associated with all modes of transportation	**Fully program** minimum HSIP targets each TIP year and seek to program Statewide HSIP funds when available/feasible for priority safety related projects[9] Reduce crashes, serious injury crashes, fatal crashes, and crashes involving bicycles and pedestrians by **10% in 10 years**
Reduce fatality and serious injury rates associated with all modes of transportation	Reduce the fatality and serious injury rates by **10% in 10 years**

The performance measures reflect both a commitment to use available resources to improve safety as well as specific targets to track progress. The tracking of fatal crashes and serious injury crashes and rates is consistent with MAP-21 guidance and the goals of the Massachusetts Strategic Highway Safety Plan.[10] The decision to specifically analyze crashes involving bicyclists and pedestrians in addition to motor vehicle crashes reflects that region's recognition of improving safety for these vulnerable road users.

Strategies aimed at achieving the objectives under this goal include:

- ***Continuously monitor*** the condition of the transportation system to ensure that it is safe to travel on all modes throughout Cape Cod.
- Focus attention on the ***strategic emphasis areas*** identified in Massachusetts Strategic Highway Safety Plan that include: Impaired Driving, Young Drivers, Intersections, Older Drivers, Lane Departures, Pedestrians, Occupant Protection, Motorcycles, and Speeding/Aggressive Driving.[6]
- ***Identify high priority safety locations*** throughout Cape Cod and then determine measures to increase safety at those locations.
- ***Separate high- and low-speed travel modes***, so that those traveling at slower speeds, such as bicycles and pedestrians, do not conflict with those traveling at higher speeds, such as rail and automobile traffic.

[8] http://safety.fhwa.dot.gov/tzd/
[9] HSIP = Highway Safety Improvement Program, federal program aimed at achieving "a significant reduction in traffic fatalities and serious injuries on all public roads" http://safety.fhwa.dot.gov/hsip/
[10] http://www.massdot.state.ma.us/Portals/8/docs/traffic/shsp/shspSeptember2013.pdf

- Existing multilane roads (cross-sections of four or more lanes) are recommended to be modified via removal of unneeded lanes or installation of ***landscaped median dividers*** to provide a reasonable level of safety and access management.
- ***Encourage safe use*** of the transportation network through public awareness campaigns, promoting such things as seatbelts for motorists and helmet use for bicyclists.
- ***Incorporate intelligent transportation systems***, such as variable message signs and other media alerts, into the emergency response system.
- Foster ***communication and cooperation*** between federal, state, and local agencies for the planning, practice, and implementation of emergency scenario plans.
- Designate and indicate, through road signs, ***emergency evacuation routes and shelters.***
- Support enforcement of state and local **traffic laws**.
- Increase ***surveillance and security efforts at transportation facilities*** throughout Cape Cod, such as the Hyannis Transportation Center, Falmouth Bus Depot, Woods Hole port facilities, park-and-ride lots, and Cape Cod Canal Bridges.

Additionally, in support of this goal, the Cape Cod MPO supports the following policies:

- For proposed roadways with cross-sections of four or more lanes, ***landscaped median dividers shall be included*** to provide a reasonable level of safety and access management.
- To reduce injury crashes, when developing intersection improvements involving signalization of a previously unsignalized location, construction of a ***modern roundabout*** shall be considered as one of the alternatives.

ENVIRONMENTAL AND ECONOMIC VITALITY

The importance of Cape Cod's environment to its economy cannot be overstated. Any threat to Cape Cod's environment is a threat to the vitality of the Cape economy as well the quality of life of those who live on, work on, or visit the region.

Goal 2: Maintain, protect, and enhance the natural environment while strengthening the economy	
OBJECTIVES	**PERFORMANCE MEASURE**
Minimize negative impacts of the transportation system on the natural environment	**50% of TIP target projects** reduce GHG's and provide overall benefits to the natural system
Reduce Greenhouse Gas (GHGs) generated by all transportation modes	
Improve stormwater management and treatment in transportation improvement projects	**50% of TIP projects** outside of sensitive areas and **100% of TIP projects** within sensitive areas provide improved stormwater management and treatment
Improve connections between housing, job, cultural centers, and essential services within and beyond the region	Improve signal operations at **5 locations** along key corridors every **5 years** **Close 5 gaps** in the bicycle or pedestrian network every **5 years**

Strategies aimed at achieving the objectives under this goal include:

- Develop strategies to ***reduce vehicle miles traveled*** (VMTs)
- Encourage the use of ***alternative transportation*** modes that reduce air pollution, fuel consumption, and other environmental impacts such as greenhouse gas emissions.
- Pursue strategies that will get automobiles and trucks moving at ***speeds that will minimize air pollution***.
- Replace public buses and vehicles with ***fuel-efficient, hybrid, or bio-diesel*** vehicles that will reduce fossil fuel consumption.
- Design roadways to ***drain and cleanse oil and gasoline runoff*** away from aquifers and other sensitive environmental areas.
- Encourage design decisions and construction practices that **minimize resource consumption** such use of reclaimed materials in paving projects, use of energy efficient lighting fixtures, and choice of drought-tolerant, low-maintenance landscaping elements
- ***Protect drinking water*** from materials used in the design, construction, operation, and maintenance of transportation facilities, such as road salt.
- Develop a transportation system that supports ***the economic vitality of Cape Cod*** and its metropolitan areas
- Prioritize projects that are consistent with the ***economic development goals*** of the Regional Policy Plan (RPP)[11] and the ***regional priority projects*** detailed in the Comprehensive Economic Development Strategy (CEDS)[12]
- Work with the Executive Office of Housing and Economic Development to identify **Priority Development Areas** and **Priority Protection Areas** on Cape Cod

Additionally, in support of this goal, the Cape Cod MPO supports the following policies:

- To reduce emissions from idling vehicles, when developing intersection improvements involving signalization of a previously unsignalized location, construction of a ***modern roundabout*** shall be considered as one of the alternatives.
- As roadway improvement projects are developed, ***stormwater management*** techniques shall be included to manage and treat surface runoff. Stormwater Best Management Practices (BMP), including Low Impact Development (LID) where feasible, shall be followed. Stormwater treatment benefits of all TIP projects shall be quantified by the design engineer and included in the design plans.

LIVABILITY AND SUSTAINABILITY

Livability and sustainability are about supporting strong communities that people will want to live in now and in the future.

Livability is about fostering communities where coordinated transportation, housing, and commercial development give people access to affordable and environmentally sustainable transportation.[13] Incorporating livability approaches into transportation, land use, and housing policies can help improve public health and safety, lower infrastructure costs, reduce combined

[11] Available at: www.capecodcommission.org/rpp
[12] Available at: www.capecodcommission.org/ceds
[13] http://www.dot.gov/livability/101

household transportation and housing costs, reduce vehicle miles traveled, and improve air and water quality, among many other benefits.[14]

Sustainability is about incorporating environmental, economic, and societal considerations into policies, operations, investments, and research.[15]

Goal 3: Support livable communities and village centers that strengthen the long-term sustainability of the region	
OBJECTIVES	**PERFORMANCE MEASURE**
Support development in compact village centers	**25% of TIP target projects** improve access to or within village centers
Improve the transportation system's resiliency to the effects of sea level rise	Evaluate potential impacts of sea level rise for **all TIP projects** during the 25% design review and adjustments to projects are made as warranted
Develop a transportation system that is consistent with the local character of Cape Cod	**All TIP projects** provide opportunities for local input including public meeting prior to development of design plans and throughout the design process

Strategies aimed at achieving the objectives under this goal include:

- ***Support village centers*** with a broad range of transportation options, such as roadways, transit, bicycle and pedestrian facilities.
- Projects that ***improve access to or within village centers*** should be identified and prioritized.
- Focus on closing gaps in the bicycle and pedestrian network identified in previous analysis of ***connections to village centers***.
- Projects that improve the transportation ***system's resiliency*** to the effects of sea level rise should be identified and prioritized.
- All transportation projects and programs must be ***responsive to the natural and built environments*** within which they are undertaken.
- Use ***landscaping and noise barriers*** to protect communities and minimize adverse impacts.
- ***Involve community and business leaders*** in transportation projects and programs to ensure that local concerns are addressed.
- Avoid, minimize or mitigate the impact of transportation improvements on parks, recreation areas, historic sites, and other ***scenic or cultural resources*** and minimize impact on overall community character.
- Support transportation projects consistent with ***Local Comprehensive Plans***.

Additionally, in support of this goal, the Cape Cod MPO supports the following policies:

- Design of all TIP projects shall consider the ***environmental, historic, and cultural context*** in which a project they are being proposed.

[14] http://www.fhwa.dot.gov/livability/fact_sheets/benefits.pdf
[15] http://www.dot.gov/sites/dot.gov/files/docs/2014-DOT-Strategic-Sustainability-Performance-Plan.pdf

- Consistent with current MassDOT sign policy, ***business logo signs*** shall not be allowed on Route 6 east of the Cape Cod Canal. "Sponsor a highway" signs with business logos may be allowed at the discretion of the MassDOT District Office Director.
- For all TIP projects, potential ***impacts of sea level rise***, any mitigating actions to be taken, and/or reasons such actions are infeasible shall be identified by the design engineer and included in the design plans.
- All TIP projects shall provide opportunities for ***local input*** including public meetings prior to development of design plans and throughout the design process.

MULTIMODAL OPTIONS/HEALTHY TRANSPORTATION

In October 2012 MassDOT announced an ambitious Mode Shift Goal of tripling mode share by walking, bicycling, and transit by 2030.[16] In support of this goal, the Healthy Transportation Policy Directive was issued in September 2013 requiring that all MassDOT projects are designed and implemented in a way that all our customers have access to safe and comfortable healthy transportation options at all MassDOT facilities and in all the services.[17]

As a region, Cape Cod has always been supportive of varied and healthy transportation options. Whether by choice or necessity, moving around the region without a personal automobile is critical to many users of the transportation system.

Goal 4: Provides a variety of healthy transportation options to all users	
OBJECTIVES	**PERFORMANCE MEASURE**
Improve accessibility of all modes to all users	Increase the number of ADA-compliant signalized and circular intersections by **10% in 10 years**
Expand the sidewalk and bicycle network and close gaps in these networks	**Close 5 gaps** in the bicycle or pedestrian network every **5 years.**
Improve coordination between all modes	**Triple the** share of travel by bicycling, walking, and transit **by 2030**
Increase the share of travel by means other than the single occupancy vehicle	

Strategies aimed at achieving the objectives under this goal include:

- ***"Complete Streets"*** designs are encouraged to accommodate all users including pedestrians, bicyclists, persons in wheelchairs or strollers, public transportation users, and motorists.
- Sufficient ***mobility*** must be provided to ensure that individuals and freight can travel safely and efficiently among the communities of Cape Cod and their neighbors.
- ***Examine expansion of bus, rail and bicycle*** services and infrastructure to villages and town centers currently un-served by alternative transportation modes.
- ***Provide bicycle amenities***, such as racks and/or lockers, at park-and-ride lots, transit centers, and village centers that support bicycle networks.

[16] http://www.massdot.state.ma.us/Portals/0/docs/GreenDOT/finalImplementation/FinalGreenDOTImplementationPlan12.12.12.pdf

[17] http://www.massdot.state.ma.us/Portals/0/docs/GreenDOT/DirectiveHealthyTransportation.pdf

- Assess ADA compliance of signalized and circular intersections and work to increase the number of ***ADA-compliant intersections***.
- ***Coordinate public transportation*** services and schedules between regions and between providers to decrease wait times for users during connections.
- Focus on closing gaps in the bicycle and pedestrian network identified in previous analysis of ***connections to transit routes and village centers***.

CONGESTION REDUCTION

Congestion has significant adverse impacts on the movement of people and goods. Delay and poor travel time reliability negatively impact the economy and can lead to driver frustration and safety concerns. Congestion affects all modes of travel including the personal automobile, public transportation vehicles, bicycles, and pedestrians. Additionally, congestion affects other entities, such as businesses that rely on transportation access for their employees and customers. Congestion also produces more air pollution and increases greenhouse gas emissions that contribute to global warming, and decreases the overall attractiveness of the region.

The objectives and performance measures under this goal are a key part of a comprehensive Congestion Management Process (CMP) for the region.

Goal 5: Reduce congestion and improve travel time reliability	
OBJECTIVES	**PERFORMANCE MEASURE**
Reduce delay for all modes	Reduce the Cape Cod multimodal congestion by **10% in 10 years** **Triple the** share of travel by bicycling, walking, and transit **by 2030**
Improve connectivity and reliability for all modes of transportation	Increase the number of ADA-compliant bus stops by **10% in 10 years** Improve operations at **2 bottleneck locations every 5 years**
Minimize the impacts of construction delays on all users, particularly impacts of Cape Cod Canal Bridge maintenance	Implement of advanced construction techniques for Cape Cod Canal Bridge maintenance projects to **reduce construction impacts by 25%** compared to standard construction practices

Strategies aimed at achieving the objectives under this goal include:

- Consider strategies to ***address the behavioral causes*** of traffic congestion such as VMT reduction strategies as well as changes to transportation infrastructure.
- Where possible, ***incorporate the Congestion Management Process***, including new roadways, intersection improvements, park-and-ride, and transit capacity, into transportation projects and programs.
- ***Support all strategies*** for transportation demand management including, but not limited to, Transportation Management Associations, flexible hours, carpooling, bus pass programs, preferential parking, and telecommuting.

- Encourage ***transit-oriented development*** and provide alternatives to automobile travel by linking land use decisions with transit, bikeway, pedestrian, and park-and-ride investments.
- Consider the feasibility of ***congestion pricing*** on major routes on Cape Cod.
- Assess the capacity of Cape Cod's ports and harbors in accommodating ferry traffic and recommend strategies to solve existing ***ferry congestion*** or prevent future congestion.
- Examine the ***road traffic around Cape Cod's ports and harbors*** to determine the ability of the current infrastructure to accommodate ferry-related auto traffic
- Assess the capacity of Cape Cod's airports in accommodating air traffic and recommend strategies to solve existing ***air traffic congestion*** or prevent future congestion.
- Examine the ***road traffic around Cape Cod's airports*** to determine the ability of the current infrastructure to accommodate air-related auto traffic.
- ***Coordinate public transportation*** services and schedules between regions and between providers to decrease wait times for users during connections.
- Implement all feasible **advanced construction techniques** for Cape Cod Canal Bridge maintenance projects to reduce construction impacts. This should include, at a minimum, consideration of night work, 24-hour work schedules, innovative bid review and contracting practices such as incentives-disincentive clauses[18].

Additionally, in support of this goal, the Cape Cod MPO supports the following policy:

- To reduce traffic congestion and facilitate free-flowing traffic, when developing intersection improvements involving signalization of a previously unsignalized location, construction of a ***modern roundabout*** shall be considered as one of the alternatives.

SYSTEM PRESERVATION

As transportation infrastructure on Cape Cod ages, maintenance and preservation efforts will be critical to maintaining a safe and functional transportation system. Many of the elements of the transportation system are near the end of their design life meaning that significant investments will be needed to extended their useful lives or replace these elements.

A critical look at where limited funding should be spent as well as a leveraging on new and emerging technologies will be critical in meet the challenges of future generations.

[18] Work Zone Road User Costs: Concepts and Applications, December 2011, US Department of Transportation and Federal Highway Administration Publication No. FHWA-HOP-12-005, Available at: http://www.ops.fhwa.dot.gov/wz/resources/publications/fhwahop12005/fhwahop12005.pdf

Goal 6: Preserve, maintain, and modernize the existing transportation system	
OBJECTIVES	**PERFORMANCE MEASURE**
Improve the condition of all state and municipally owned bridges	**Repair or replace all** "Structurally Deficient" bridges by **in 10 years** **Repair or replace 10%** of "Functionally Obsolete" bridges **in 10 years**
Improve the pavement condition on all federal-aid eligible roadways	Increase the miles roadway in fair or better condition by **10% in 10 years**
Maintain and improve on and off road bicycle and pedestrian facilities	Increase the miles sidewalk in fair or better condition by **10% in 10 years** Increase the miles multi-use paths in fair or better condition by **10% in 10 years**
Use modern technology to improve the efficiency of the transportation system	Bring online **10 new** permanent counting station in **10 years**
Improve coordination and cooperation between agencies throughout all phases of project development and implementation for all improvement and maintenance projects	**Adoption** of an MOU between the MPO and MassDOT outlining how TIP and non-TIP work in the region (including maintenance projects) will be communicated to the MPO and how local input will be addressed by MassDOT

Strategies aimed at achieving the objectives under this goal include:

- Reserve adequate funds for the maintenance of ***alternative modes of transportation,*** such as public transportation services, sidewalks, and bicycle paths.
- As transportation services are considered for areas subject to the effects of ***sea-level rise***, new facilities shall be constructed with consideration to vulnerability.
- Create and implement asset management tools for ***monitoring*** and maintaining the existing transportation system. Include automatic traffic monitoring equipment as part of intersection upgrades.
- Support maintenance strategies and programs that ***accommodate safe travel*** throughout the transportation network, regardless of mode.
- Consider the ***use of new technologies*** that will lower costs, extend infrastructure life, lower environmental impacts, and reduce energy consumption and emissions.
- New transportation projects must consider inclusion of ***intelligent transportation system (ITS)*** elements, such as variable message signs, highway advisory radio, local television, web travel services, and smart signals that can provide travel data as well as react to changes in demand.
- Implement all feasible **advanced construction techniques** for Cape Cod Canal Bridge maintenance projects to reduce construction impacts. This should include, at a minimum, consideration of night work, 24-hour work schedules, innovative bid review and contracting practices such as incentives-disincentive clauses[19].

[19] Work Zone Road User Costs: Concepts and Applications, December 2011, US Department of Transportation and Federal Highway Administration Publication No. FHWA-HOP-12-005, Available at: http://www.ops.fhwa.dot.gov/wz/resources/publications/fhwahop12005/fhwahop12005.pdf

FREIGHT MOBILITY

Safe and efficient movement of freight is critical to the local economies. The freight industry on Cape Cod is different from most areas because of the seasonal tourist industry, abundance of waterways, and historic culture. Congestion and poor travel time reliability affect the freight industry and, by extension, the local economics. Efforts to improve the freight network on Cape Cod will support long-term economic stability.

Goal 7: Improve efficiency and reliability of freight movement	
OBJECTIVES	**PERFORMANCE MEASURE**
Reduce delays and improve travel time reliability on the freight network	Reduce the Cape Cod congestion index by **10% in 10 years**
Minimize Cape Cod Canal bridge maintenance impacts	Implement of advanced construction techniques for Cape Cod Canal Bridge maintenance projects to **reduce construction impacts by 25%** compared to standard construction practices

Strategies aimed at achieving the objectives under this goal include:

- ***Enhance the transportation of freight on Cape Cod*** to decrease travel times, increase reliability and lower costs for freight transportation providers, with minimal disruption to other transportation activities.
- Where possible, work to ***consolidate freight*** so as to move goods in the most efficient manner.
- Make available ***multiple modes for freight transportation***, with infrastructure and facilities that are designed to support quick and efficient changes in mode.

SUMMARY OF POLICIES

As a collection, the policies contained within this document are an important element of the approach needed to achieve the overall vision of the region:

- For proposed roadways with cross-sections of four or more lanes, ***landscaped median dividers shall be included*** to provide a reasonable level of safety and access management.
- When developing intersection improvements involving signalization of a previously unsignalized location, construction of a ***modern roundabout*** shall be considered as one of the alternatives.
- As roadway improvement projects are developed, ***stormwater management*** techniques shall be included to manage and treat surface runoff. Stormwater Best Management Practices (BMP), including Low Impact Development (LID) where feasible, shall be followed. Stormwater treatment benefits of all TIP projects shall be quantified by the design engineer and included in the design plans.
- Consistent with current MassDOT sign policy, ***business logo signs*** shall not be allowed on Route 6 east of the Cape Cod Canal. "Adopt a highway" signs with business logos may be allowed at the discretion of the MassDOT District 5 Highway Director.

- For all TIP projects, potential ***impacts of sea level rise***, any mitigating actions to be taken, and/or reasons such actions are infeasible shall be identified by the design engineer and included in the design plans.
- All TIP projects shall provide opportunities for ***local input*** including public meetings prior to development of design plans and throughout the design process.

TRACKING PROGRESS

In order to determine if the objectives of the RTP are being achieved, progress must be tracked in reaching the performance measure targets. By preparing and regularly updating a performance report adjustments to the approach can be made.

Table 8 presents a performance report including both system measures and process measures. Being that this is the first time the RTP has incorporated performance measures, significant effort is required in establishing baseline measurements needed to establish a performance report and tracking framework.

TABLE 8. PERFORMANCE REPORT

SYSTEM MEASURES	EXISTING	TARGETS				
		2020	2025	2030	2035	2040
Number of crashes (per year)[1,2]	4,245		3,821			
Number of serious injury crashes (per year)[1,2]	121		109			
Serious injury crash rate per 100 Million VMT[1,2]	TBD[3]		- 10%			
Number of fatal crashes (per year)[1,2]	19		17			
Fatal crash rate per 100 Million VMT[1,2]	TBD[3]		- 10%			
Bicycle and/ pedestrian crashes (per year)[1,2]	138		124			
Percent of intersections[4] that provide ADA compliant pedestrian accommodations	TBD[5]		+ 10%			
Percent of bus stops with ADA compliant access	TBD[5]		+ 10%			
Mode share - walking, bicycling, and transit	TBD[5]			X 3		
Cape Cod multimodal congestion index	TBD[5]		-10%			
Number of structurally deficient bridges	4		0			
Number of functionally obsolete bridges	45		40			
Percent of roadway mileage[6] in fair or better condition	TBD[5]		+ 10%			
Percent of sidewalk mileage[6] in fair or better condition	TBD[5]		+ 10%			
Percent of multi-use path mileage in fair or better condition	TBD[5]		+ 10%			
Number of active permanent counting stations	9		19			

PROCESS MEASURES	TARGETS				
	2020	2025	2030	2035	2040
Gaps in bicycle/pedestrian network filled[1]	5	5	5	5	5
Improvements in signal operation in key corridors [1]	5	5	5	5	5
Bottleneck locations improved [1]	2	2	2	2	2
Programming of available HSIP (safety) funding the TIP[1]	100%				
Programming of available CMAQ (congestion) funding the TIP[1]	100%				
TIP projects that reduce GHG's and provide overall benefits to the natural system[1]	50%				
TIP projects that provide improved stormwater management and treatment (inside sensitive areas)[1]	100%				
TIP projects that provide improved stormwater management and treatment (outside of sensitive areas)[1]	50%				
TIP project providing improved access to or within village centers[1]	2	2	2	2	2
TIP projects considering sea level rise[1]	100%				
TIP projects providing opportunities for local input including public meeting prior to development of design plans and throughout the design process[1]	100%				
Cape Cod Canal maintenance congestion reduction vs. standard practices	25%				
MOU adoption	1				

Notes: 1 - Based on 5-year rolling average, 2 - Existing based on most recent available data (2008-2012), 3 - Regional VMT analysis currently under development, 4 - Signalized or circular intersections, 5 - Will be inventoried as part of planned system assessments, 6 - Federal-aide eligible roads, ADA = Americans with Disabilities Act, CMAQ = Congestion Mitigation and Air Quality, HSIP =Highway Safety Improvement Program, GHG = greenhouse gases, MOU = Memorandum of Understanding, TIP = Transportation Improvement Program, VMT = vehicle miles travelled

Chapter 3: Cape Cod and Transportation: Past, Present, and Future

Cape Cod and its transportation system is a story of a continually evolving community with ever-changing transportation needs. This chapter will touch on how the region arrived where it is today, what today's transportation landscape looks like, and what are the challenges and opportunities that lie ahead. Throughout the chapter there will be references to the appendices of the document where additional detail on any particular topic can be found.

PAST - HISTORICAL CONTEXT

The first recorded European expedition to Cape Cod was led by Bartholomew Gosnold, who was credited with naming the peninsula in 1602. In 1620, the Pilgrims landed at Provincetown. This was different than previous European appearances because the Pilgrims were more interested in settling somewhere, rather than exploring and trading with the native Wampanoag tribe. Although this is how we traditionally tell the story of Cape Cod's history, it actually extends long before that.

The following sections highlight some of the key developments in the transportation network on Cape Cod with thanks to the Massachusetts Historical Commission for much of the research work.[20] Additional detail is provided in Appendix A as well as available on Cape Cod Commission Chronology viewer available at: www.capecodcommission.org/chronology/

EARLY TRAIL AND ROAD NETWORK

Contact (1500 - 1620) and Plantation (1620 - 1692) Periods

By the time the Pilgrims arrived, there was an extensive trail network stretching from one end of the region to the other as shown in Contact Period map in Figure 6. Even this far back, we can see connections that would eventually become the road network of Cape Cod. As Native Americans and Europeans used the network more extensively, trails were upgraded to cartpaths or roadways. As shown in Figure 6 portions of present day Route 6A took shape as County Road.

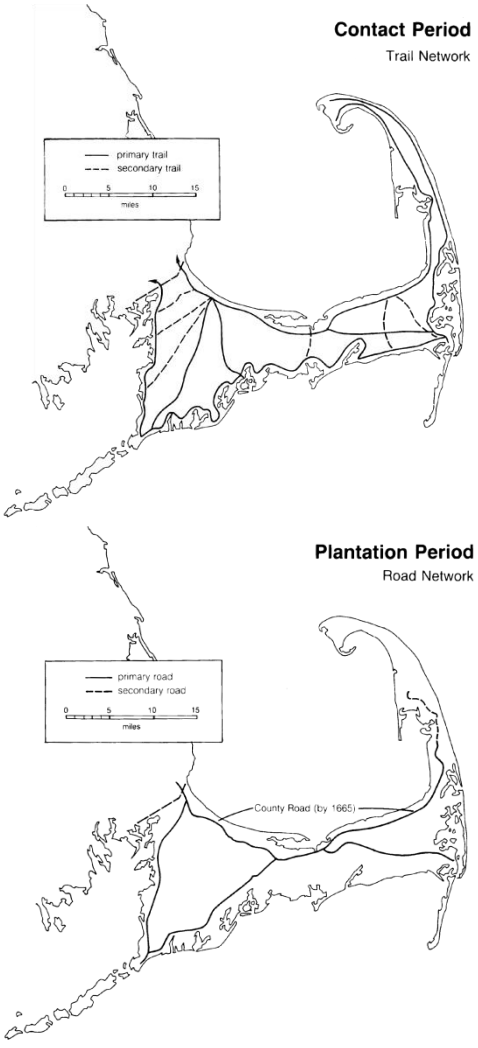

FIGURE 6. EARLY TRAIL AND ROAD NETWORK[20]

[20] *Historic & Archeological Resources of Cape Cod & the Islands*. Massachusetts Historical Commission. Originally published August 1986. PDF reprint version, 2007.

EXPANSION OF WATER ROUTES

Colonial (1692 - 1775) and Federal (1775-1830) Periods

As local transportation and commerce increased, water routes were the life blood of the region. Land routes were improved, widened, and expanded to support connection to the ports. Figure 7 shows the expansion of the road network and connection to water routes in these periods.

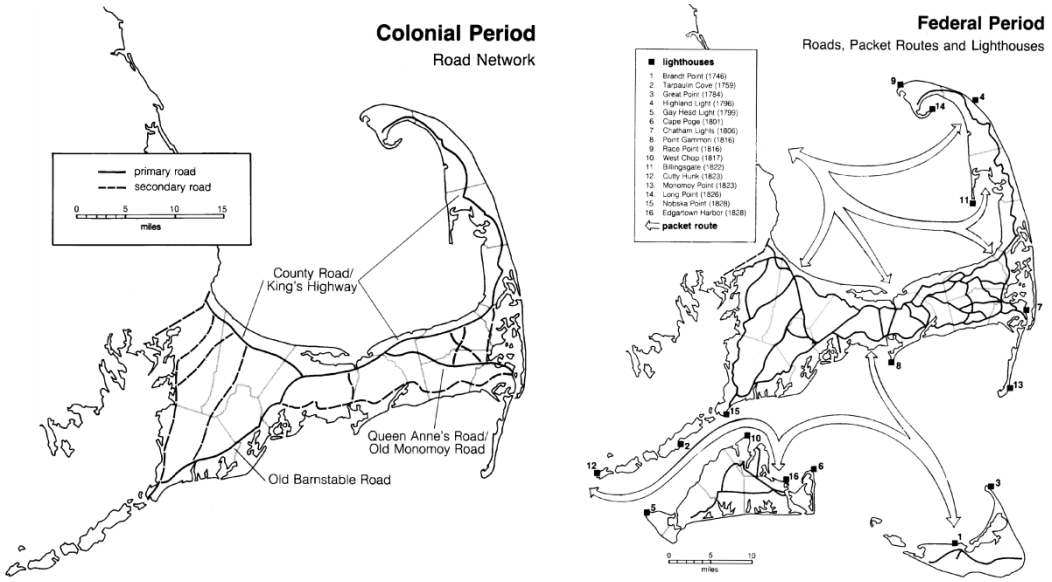

FIGURE 7. EXPANSION OF WATER ROUTES AND LAND CONNECTIONS[20]

EXPANSION OF RAILROADS

Early and Late Industrial Periods (1830-1915)

The industrial period saw the development and expansion of railroads across the region. Still tied to major ports, as shown in Figure 8, rail served both freight needs as well as the emerging tourism market.

This period saw multiple expansions of the rail network ultimately including connections to almost every town on Cape Cod. As the rail network expanded, development grew up around the train depot. These pockets of development thrived while rail transportation dominated the region. As the predominance of rail waned, some of these developments evolved to meet new needs while others did not.

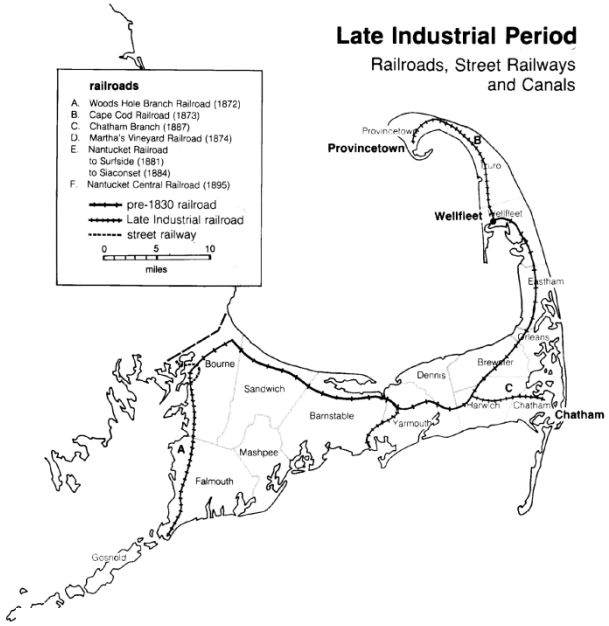

FIGURE 8. RAIL EXPANSION[20]

AGE OF THE AUTOMOBILE

Modern Period to Present Day (1915-)

The emergence of the automobile and tourism industry on Cape Cod forever changed the transportation network of the region. Construction of the Cape Cod Canal redefined the transportation landscape of the region. Expanding from the Cape Cod Canal, the transportation system was significantly expanded and modernized during the 20th century. As shown in the Table 9, some of greatest expansions occurred in the 1950's.

TABLE 9: INDUSTRIAL PERIOD RAIL EXPANSION

YEAR	MILESTONE
1935	Bourne, Sagamore, and Railroad bridges over the Cape Cod Canal
1950	Rt. 6: Sagamore Bridge to Hyannis (exit 6) – 2 lanes
1954	Rt. 6: Sagamore Bridge to Hyannis (exit 6) – 4 lanes
1955	Rt. 6: Hyannis (exit 6) to Dennis (exit 9) – 2 lanes
1956	Rt. 6: Dennis (exit 9) to Harwich/Brewster (exit 11) – 2 lanes
1958	Rt. 6: Harwich/Brewster (exit 11) to Orleans (exit 12) – 2 lanes
1959	Rt. 6: Orleans (exit 12) to Orleans/Eastham Rotary – 2 lanes
1967	Rt. 6: Hyannis (exit 6) to Yarmouth (exit 7) – 4 lanes
1971	Rt. 6: Yarmouth (exit 7) to Dennis (exit 9) – 4 lanes

Sixty five years after that great expansion, the region is struggling to face the tomorrow's challenges with an aging transportation network. While there is debate over whether we are still in the age of the automobile, it is clear that investments in all modes are required to meet the region's future transportation needs.

PRESENT – EXISTING CHALLENGES AND OPPORTUNITIES

EXISTING INFRASTRUCTURE

The transportation network on Cape Cod is made up of a wide variety of infrastructure that support travel by all modes. Summarized in this section, the existing condition of the transportation network is detailed in Appendix B.

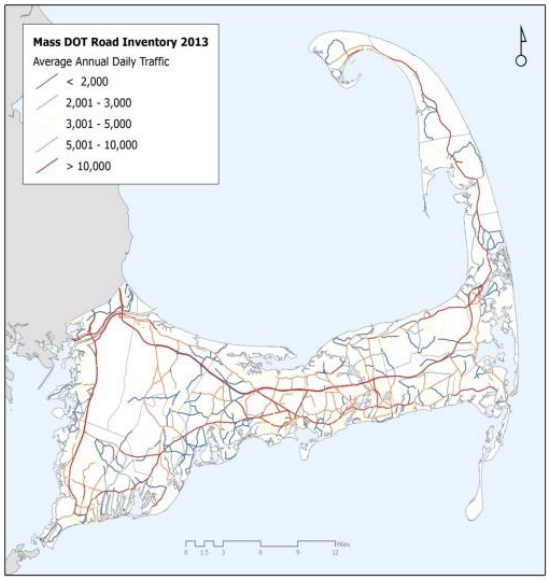

FIGURE 9. ANNUAL AVERAGE DAILY TRAFFIC

Vehicle Infrastructure

Roads: Cape Cod's three major routes, Route 6, Route 28, and Route 6A, comprise less than 6% of Cape Cod's roads by mileage. Over 80% of the roadways on Cape Cod are local roadways. The volumes of vehicles on the roadways of Cape Cod are shown in Figure 9.

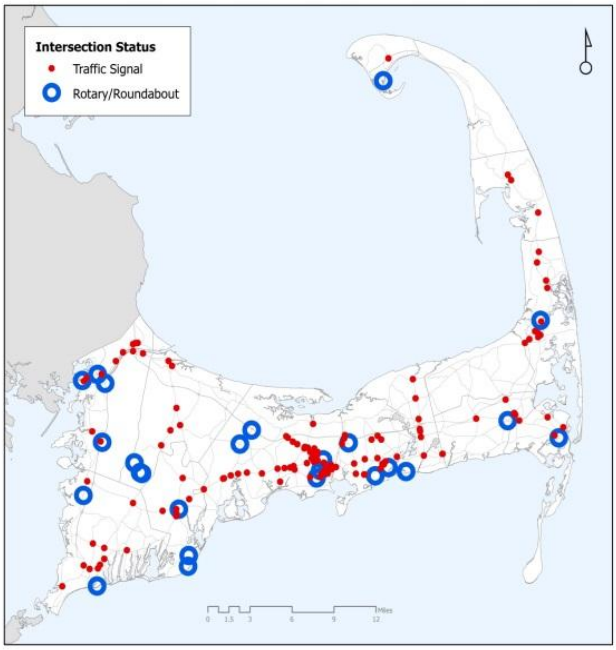

FIGURE 10. INTERSECTIONS

Intersections: As shown in Figure 10, 129 are signalized and 25 are circular on Cape Cod. Circular intersections refer to rotaries and roundabouts. Rotaries tend to be larger in diameter, and their interior travel speed is often faster than a modern roundabout. Roundabouts are identified by smaller diameters and approaches that enter at a greater angle than rotaries – encouraging slower speeds and improved safety.

Bridges: There are 102 municipal and state owned bridges on Cape Cod including bridges over roadways (49), over railways (12), and over water (41). Out of these 102 bridges, four are classified as structurally deficient and 45 are classified as functionally obsolete based on the National Bridge Inventory rating scale.[21][22]

Intelligent Transportation Systems (ITS) are an emerging aspect of infrastructure that has surfaced on Cape Cod. Along Route 6, permanent message boards display travel time to exits on the roadway. Figure 11 shows one of these roadside signs. This information is processed using Bluetooth technology to calculate drive times. This information has been effective at reducing distraction and driver confusion by presenting valuable information to automobile drivers outside of content received by cellphones or GPS devices. The project began in 2012 with signage installed on Route 3 approaching Cape Cod and plans to be statewide in 2015.

FIGURE 11. TRAVEL TIME SIGNS

Bus Infrastructure

Intermodal facilities and sites are important locations where travelers can make seamless transfers between different mode of travel including regional bus service and intercity bus service. These include the Hyannis Transportation Center, MacMillian Pier and Bus Depot, Falmouth Bus Depot, Woods Hole Steamship Authority Piers, Tedeschi Food Shop in Bourne, Sagamore Park-and-Ride Lot, Barnstable Park-and-Ride-Lot, Harwich Park-and-Ride Lot, and Hyannis Park-and-Ride Lot.

Interregional bus service transports travelers to and from Cape Cod. Some examples are bus service from Hyannis to New York City, or Boston to Provincetown. Users of interregional bus service include commuters who work in Boston, Logan Airport users, and those traveling or

[21] http://www.fhwa.dot.gov/bridge/nbi.cfm
[22] Based on 2013 bridge assessment data for state highway agency and town agency owned bridges

vacationing. Plymouth and Brockton Street Railway Company as well as Peter Pan and Bonanza Bus Lines serve Cape Cod's interregional bus service needs.

The Cape Cod Regional Transit Authority (CCRTA) is the agency in charge of operating and maintaining public transit services on Cape Cod. The CCRTA offers several types of services, including fixed route service, flexible route service, and demand-response or paratransit service. Some paratransit and demand response services are contracted services. Year-round fixed services routes include the Barnstable Villager, the Bourne Run, the Flex Route, the H2O Line, the Sandwich Line, and the SeaLine. Seasonal services include the Hyannis Shuttle, the Provincetown/Truro Shuttle, and the WHOOSH Trolley. Demand-response service includes Dial-A-Ride Transportation (DART) and ADA Paratransit Service.

The Greater Attleboro-Taunton Regional Transit Authority (GATRA) also operates one line, the Onset-Wareham Link (OWL), with stops in Bourne.

Rail Infrastructure

Railways: Cape Cod has a single rail line, the Cape Cod Line, with three branches as shown in Figure 12. Together, they form a network of rail infrastructure to serve the freight and recreational needs of Cape Cod residents and visitor.

Rail infrastructure extended the entire length of Cape Cod, from Bourne to Provincetown, in the first half of the 1900s. Service was also available along the western end, extending from Bourne to Woods Hole in Falmouth, and to Chatham. Today the expanse and usage of rail is reduced. Active rail still exists starting in Bourne and ending in three locations, Joint Base Cape Cod, Hyannis, and Yarmouth.

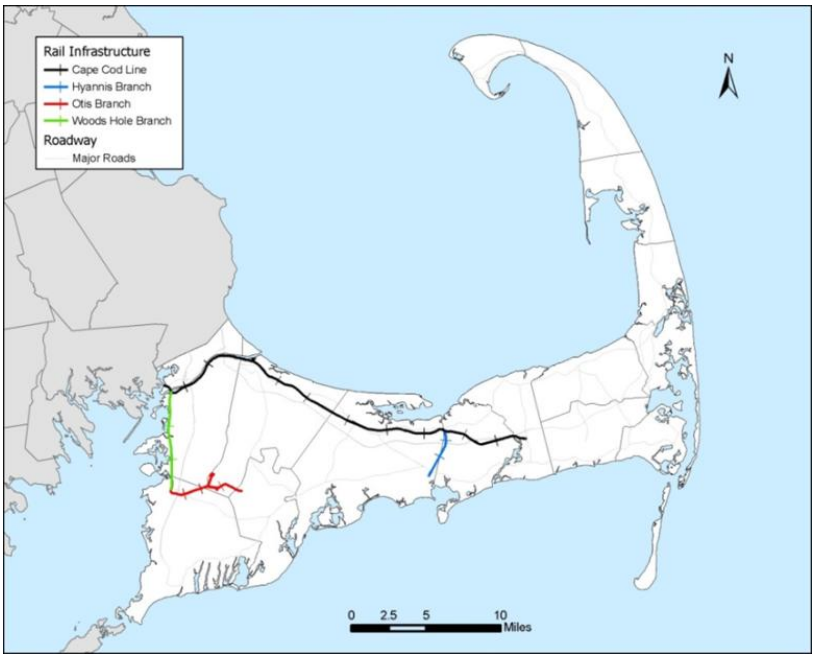

FIGURE 12. CAPE COD RAIL INFRASTRUCTURE

Road Crossings: Exclusive rights-of-way can limit the interaction of rail and other modes, making rail transportation safer and faster. However, crossing at roadways can pose problems if the intersection is not properly signed and designed. Currently on Cape Cod, there are 66 at-grade roadway intersections along active rail lines. Some, such as the railroad crossing at Route 28 in Barnstable, can actually interfere with roadway traffic and cause congestion and delays. Of those, 21 are not gated, signalized or signed. Although most of these are minor roadways, they do represent a potential for mishap. Moreover, there are 18 grade separated roadway crossings, as well as 5 bridges over waterways along active rail lines. These bridges and overpasses must be maintained in order to ensure continued use. If rail service on Cape Cod is

to be increased, further study of railroad crossings may be necessary to ensure safety and prevent interruptions to roadway traffic.

Aviation Infrastructure

For Cape Cod travelers, air transportation provides an important link from Cape Cod to Boston, New York, and the islands of Martha's Vineyard and Nantucket. Six airfields and airports serve Cape Cod as a base for air transportation (see Table 10).

TABLE 10: AIRPORTS AND AIRFIELDS OF CAPE COD

NAME	FAA IDENTIFIER	FACILITY TYPE
Barnstable Municipal Airport	HYA	Scheduled Air Carrier Service
Provincetown Municipal Airport	PVC	Scheduled Air Carrier Service
Chatham Municipal Airport	CQX	General Aviation
Falmouth Airpark	5B6	General Aviation
Cape Cod Airfield	2B1	General Aviation
Cape Cod Coast Guard Air Station	FMH	Military

The commercial service airports, Barnstable Municipal Airport and Provincetown Municipal Airport, supply data on total enplanements to the Federal Aviation Administration (FAA). In 2013, Barnstable Municipal Airport reported 87,648 enplanements and Provincetown Municipal Airport reported 11,288 enplanements.[23]

Maritime Infrastructure

Cape Cod has approximately 586 miles of tidal coastline, with many inlets and bays that provide marine access to the land. Major channels including the Cape Cod Canal, the Woods Hole Channel, and Nantucket Sounds Channels provide important connections for vessels. Major harbors including Woods Hole Harbor, Hyannis Harbor, Provincetown Harbor, Falmouth Harbor, Saquatucket Harbor (Harwich Port), Wellfleet Harbor, Stage Harbor (Chatham), Barnstable Harbor, Sandwich Marina, Red Brook Harbor (Bounre), and Sesuit Harbor (Dennis) provide connections to land-based transportation. The nine ferry routes provide connection from Falmouth (Falmouth Harbor and Woods Hole), Hyannis (Hyannis Harbor), Provincetown (Fishermans Wharf), and Harwich Port (Squatucket Harbor) to Martha's Vineyard, Nantucket, Boston, and Plymouth.

[23] 2013 Air Carrier Activity Information System data

Bicycle and Pedestrian Infrastructure

There are numerous destinations and pathways for bicyclists and pedestrians to use on Cape Cod. There are three basic types of bicycle infrastructure: paths, lanes, and routes. Paths generally have their own separated right-of-way and follow certain standards for width, grade, and accessibility. Bicycle lanes are separate lanes within roadways marked for bicycle use. Bicycle routes are roadways with wide shoulders that have been designated for bicycle use. Figure 13 shows these facilities on Cape Cod.

There are other 90 miles of multi-use paths on Cape Cod with the longest being the Cape Cod Rail Trail and Extension, Cape Cod Canal Bike Paths, Shining Sea Bike Path and Extension, and numerous paths in the Cape Cod National Seashore and Nickerson State Park.

Many bicycle routes exist on Cape Cod, some of which are better signed than others. They allow bicycle users a wide network of travel across Cape Cod. The Claire Saltonstall Bikeway, or State Bicycle Route 1, is a series of bicycle paths and on-street routes that travel from Boston to both Provincetown and Woods Hole. The Cape Cod section of the Claire Saltonstall Bikeway is 98.3 miles in length. The Bourne to Provincetown portion is about 75.4 miles long, while the Bourne to Woods Hole portion is 22.9 miles long.

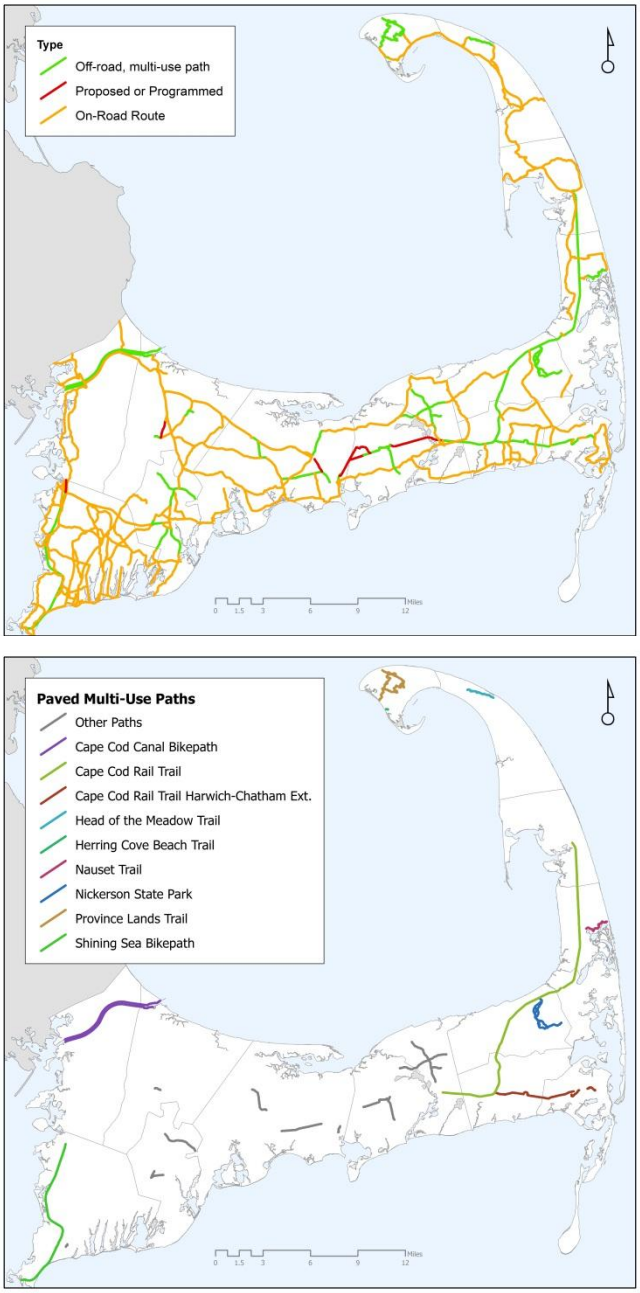

FIGURE 13. BICYCLE PATHS AND ROUTES

Pedestrians utilize shared use paths and sidewalks. Facilities of this type support village centers and local businesses, and encourage travelers to walk instead of driving. The Americans with Disabilities Act requires sidewalk curb cuts to be large enough and shallow enough for wheelchair usage. Telephone poles, road signs, and other architectural barriers must also be removed in order to create an unobstructed path for walking. In Massachusetts, bicyclists may ride on sidewalks outside business districts unless otherwise prohibited by local ordinances. As shown in Figure 14, over 90% of Cape Cod roadways do not have sidewalks.

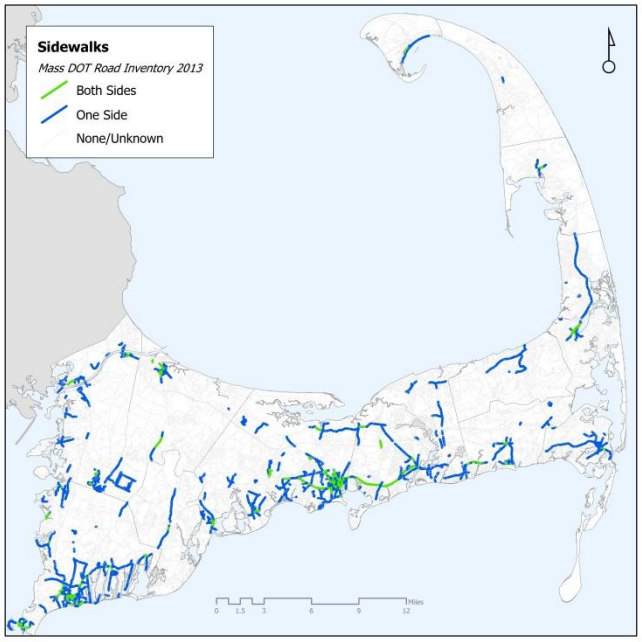

FIGURE 14. CAPE COD SIDEWALK NETWORK

The sidewalk network also includes crosswalks. Crosswalks provide a safe means for pedestrians and other sidewalk users to cross roadways. Generally, crosswalks located on lower volume roads have no traffic control devices, or a sign telling motorists to yield to pedestrians. However, many crosswalks have crossing signals that stop traffic, allow pedestrians to cross, and warn pedestrians when traffic is about to resume. Typically, crossing signals are located with traffic signals at roadway intersections.

SAFETY

The concern over safety is made clear in the first goal of the Regional Transportation Plan:

"*Provide safe travel options for all users*"

Transportation users have a right to a transportation system where their person and possessions will arrive at their destinations unharmed and undamaged. Summarized in this section, Appendix C, provides additional detail on the seasonal and year-round issues affecting transportation safety on Cape Cod.

Barnstable County High Crash Locations

In 2014, the Cape Cod Commission completed an effort to rank the top intersections of critical safety concern across Cape Cod. Base data for this analysis were provided by the Massachusetts Department of Transportation (MassDOT) in the form of geographically located crash clusters for the most recently available three years of data (2009-2011). The data provided by MassDOT included the number of reported crashes at each location and the severity of the crashes. It should be noted, however, that this dataset only includes incidents whose reports contained enough information to accurately locate them. Of the 11,987 crash reports collected by the Massachusetts Registry of Motor Vehicles, 10,935 incidents were located by MassDOT. The incidents are mapped as shown in Figure 15.

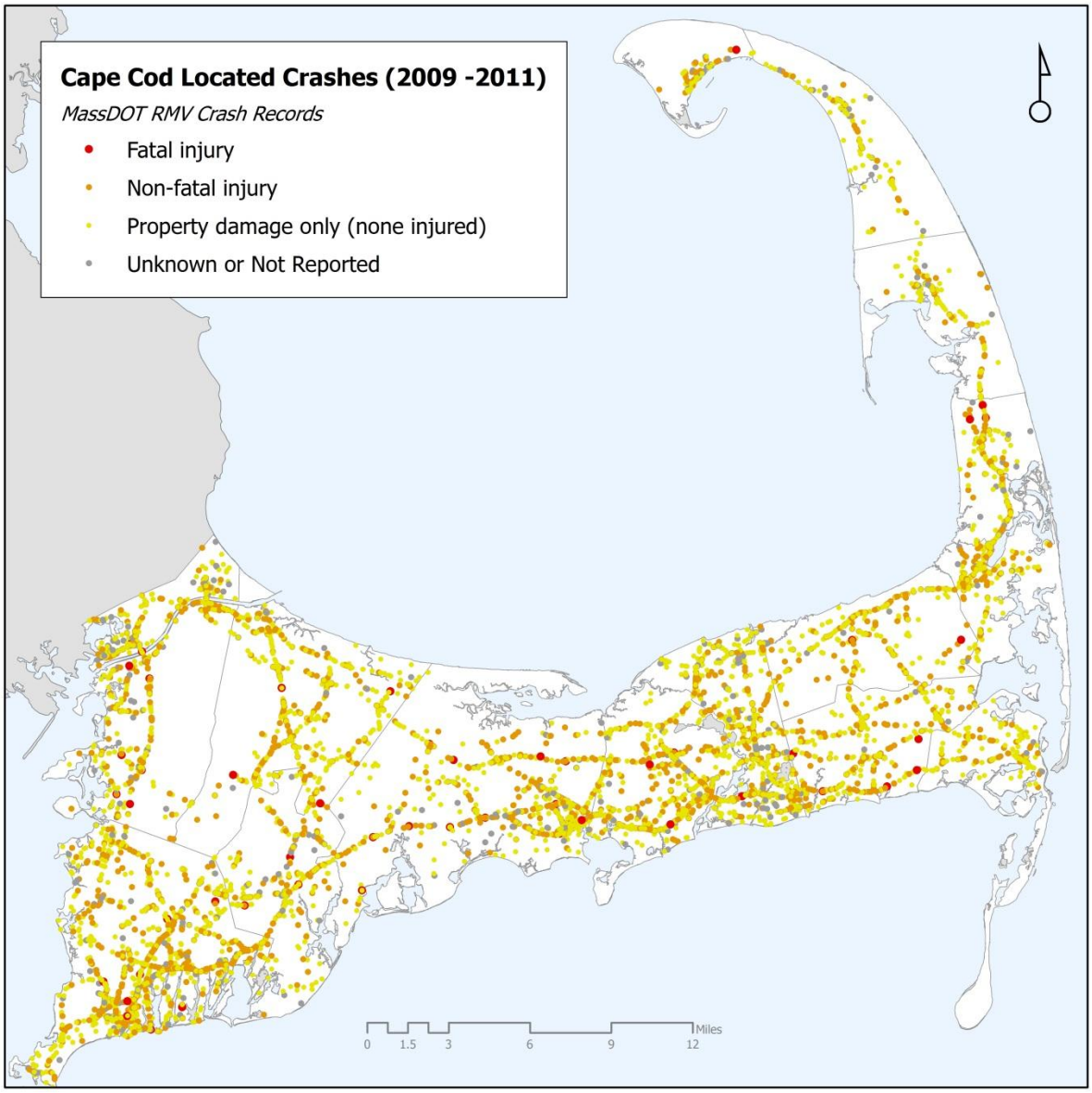

FIGURE 15. CAPE COD LOCATED CRASHES (2009-2011)

Cape Cod Drivers

The demographics of Cape Cod depict a typical year-round resident that is older than the average population in the United States. A large and increasing percentage of Cape drivers are 65 and older. According to the Census Bureau 2013 estimates, 27% or 58,320 residents of Barnstable County are aged 65 or older. This steadily increasing proportion of drivers will experience declining vision, slowed decision making and reaction times, additional difficulty in dividing attention between potential conflicts and traffic information, and reductions in strength, flexibility, and overall fitness. In many cases, these difficulties will outweigh the

additional experience that older drivers have operating an automobile. The large majority of drivers who suffer from age-related driving deficiencies are not aware that a problem exists.

Recommendations to accommodate older drivers include:

- Considering protected left turn phases at signalized intersections;
- Maintaining delineation through more frequent restriping and street cleaning;
- Improving signage standards to include larger lettering;
- Improving lighting level standards, in particular at intersections. Consider placing utilities underground and installing breakaway safety poles for lighting;
- Considering "all red" phases for signalized intersections;
- Establishing driver education programs for older drivers; and
- Providing education on other options for mobility.

On the roads with these older drivers is another group of drivers with a unique set of characteristics, younger drivers. Younger drivers are more prone to risk-taking behavior and are subject to influences of youth culture and peer pressure. Considering their exposure, young drivers involved in more fatal crashes than any other age group. There are slight differences between younger and older drivers in the types of crashes they experience. For example, young drivers have more speeding and alcohol-related crashes. Younger drivers' crashes are frequently caused by inexperience, poor judgment, and risk taking, while older drivers' crashes are more often related to reduced physical and cognitive capabilities.

Recommendations to accommodate younger driver safety issues are divided between residents and visitors:

- Increased education for local young drivers.
- Additional enforcement and warnings during the busy traffic season to reach out to young visitor drivers.
- Develop and implement an advertising campaign and roadside signage reminding drivers that traffic and drunk-driving laws are strictly enforced on Cape Cod.

Safety Analysis and Recommendations

Further analysis of crash data along with recommendations for reducing crashes on Cape Cod roadways is included in Appendix C. Additionally, analysis of bicycle and pedestrian crash and recommendations are presented in the Appendix F.

SECURITY

Security is an important consideration when discussing the region's transportation network. Summarized in this section, Appendix D includes a discussion of the ways in which the transportation system is prepared to handle threats of any nature including natural events such as hurricanes as well and man-made hazards.

The most frequently identified security concern is the threat of a weather-related event such as a hurricane. In many cases, Cape Cod residents and visitors "shelter in place," a term that refers to

staying in homes or local shelters that are supplied with food, water, etc. Residents should heed warnings of public safety officials and evacuate accordingly. A "Cape Cod Emergency Traffic Plan" has been developed by the Massachusetts State Police in cooperation with the Massachusetts Emergency Management Agency and several other agencies to facilitate the egress of a high volume of traffic from Cape Cod in the event of a hurricane, particularly during peak tourist season.

Discussions of emergency traffic planning, public transportation security, air travel security, and intelligent transportation systems are also included in Appendix D.

FREIGHT

Safe and efficient movement of freight is critical to the local economies. Recognizing the importance of freight to the regional, the Cape Cod Commission conducted regional Freight Study in 2014. Summarized in this section, Appendix E, details some of the unique challenges the movement of freight on Cape Cod faces as well as identifies potential opportunity to improve the freight network on Cape Cod identified in the Freight Study.

There are over 200 miles of designated truck routes under state authority as shown in Figure 16. Freight transportation also relies on many roadways off their freight routes to make connection to their ultimate destinations.

Freight transportation presents unique safety challenges and crashes involving commercial motor vehicles deserve special consideration. As shown in Figure 16, freight crashes occur both on and off the designated truck routes on Cape Cod.

Freight by all modes, including truck, rail, and water are covered in Appendix E along with the results of a Freight Survey conducted as part of the 2014 Freight Study.

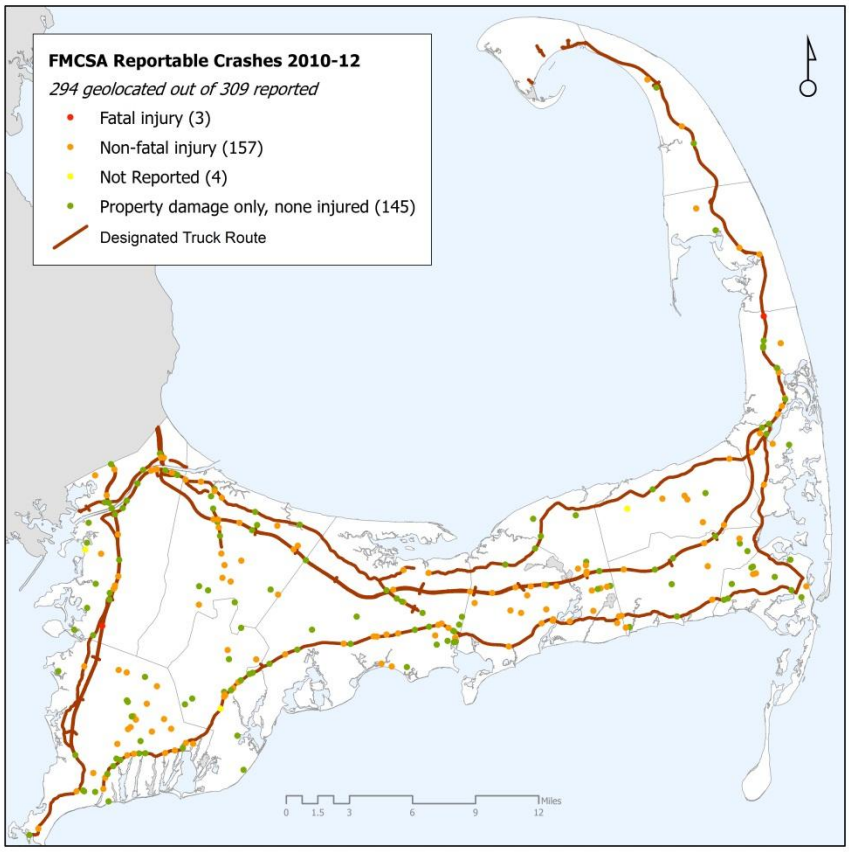

FIGURE 16. TRUCK ROUTE

Bicyclists and pedestrians while having a minimal impact on the environment are our most vulnerable users and the most in need of providing a safe transportation network. Summarized in this section, Appendix F, details crashes, road safety audits, pedestrian safety and planning studies, planning tools, and planning efforts related to bicycles and pedestrians on Cape Cod.

Cape Cod Bicyclists and Pedestrians

To varying degrees, all travelers at some point in their journey are pedestrians. This occurs in the short walking trip from a parked car to a destination (or from a parked bicycle or after disembarking from a bus).

Bicyclists are often categorized into three subsets: (A) Experienced, long-distance riders, (B) Occasional riders, and (C) beginners and children. For the type-A rider, most of their travel is made along roadways because of the higher travel speed available and the fewer obstacles (driveways etc.) encountered on alternative routes. Type B riders prefer off-road opportunities such as bike paths, but can be comfortable in bike lanes or wide shoulders. Type C riders seek out the least busy sections of bike paths and sidewalks; these riders generally do not use biking for transportation purposes.

Bicycle and Pedestrian Crashes

Bicyclists and pedestrians face a number of challenges on Cape Cod roadways. The mixture of narrow roadways, high traffic volumes, and inconsistent accommodations create a great deal of difficultly for vehicle-bicycle and vehicle-pedestrian interactions. Figure 17 shows the reported vehicle-bicycle and vehicle-pedestrian crashes that occurred on Cape Cod from 2009 through 2011. There were a total of 213 such crashes involving bicyclists and 147 such crashes involving pedestrians.[24] Additional crashes may have occurred between bicyclists and between bicyclists and pedestrians, but they often go unreported.

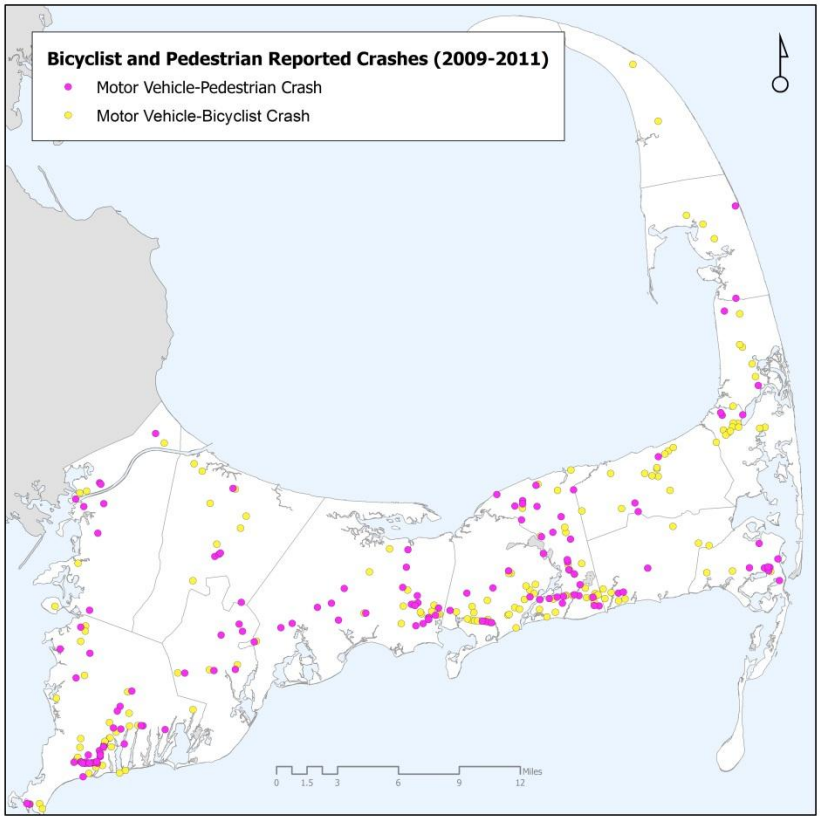

FIGURE 17. BICYCLIST AND PEDESTRIAN REPORTED CRASHES[24]

[24] MassDOT Registry of Motor Vehicle Crash Records

CONGESTION MANAGEMENT

In order to help reduce mobile source emissions and improve regional air quality, a Congestion Management Program (CMP) was developed for the Cape Cod Region as described in brief below and detailed in Appendix G.

Modeled after FHWA guidance, the Cape Cod CMP includes the following eight action items:

- Develop Regional Objectives
- Define CMP Network
- Develop Multimodal Performance Measures
- Collect Data/Monitor System Performance
- Analyze Congestion Problems and Needs
- Identify and Assess Strategies
- Program and Implement Strategies
- Evaluate Strategy Effectiveness [25]

As shown in Figure 18, both summer and annual average daily traffic (ADT) over the Bourne and Sagamore Bridges showed an overall upward trend from the early 1970's through the early 2000's, reaching a maximum in 2002. Traffic volumes, on average, dropped from 2002 to 2007 before trending slightly upward in recent years. As an indicator of travel trends for the region, these increases lead to increased demand on the regional road network. Congestion has become an occurrence that is experienced at many locations year-round across Cape Cod.

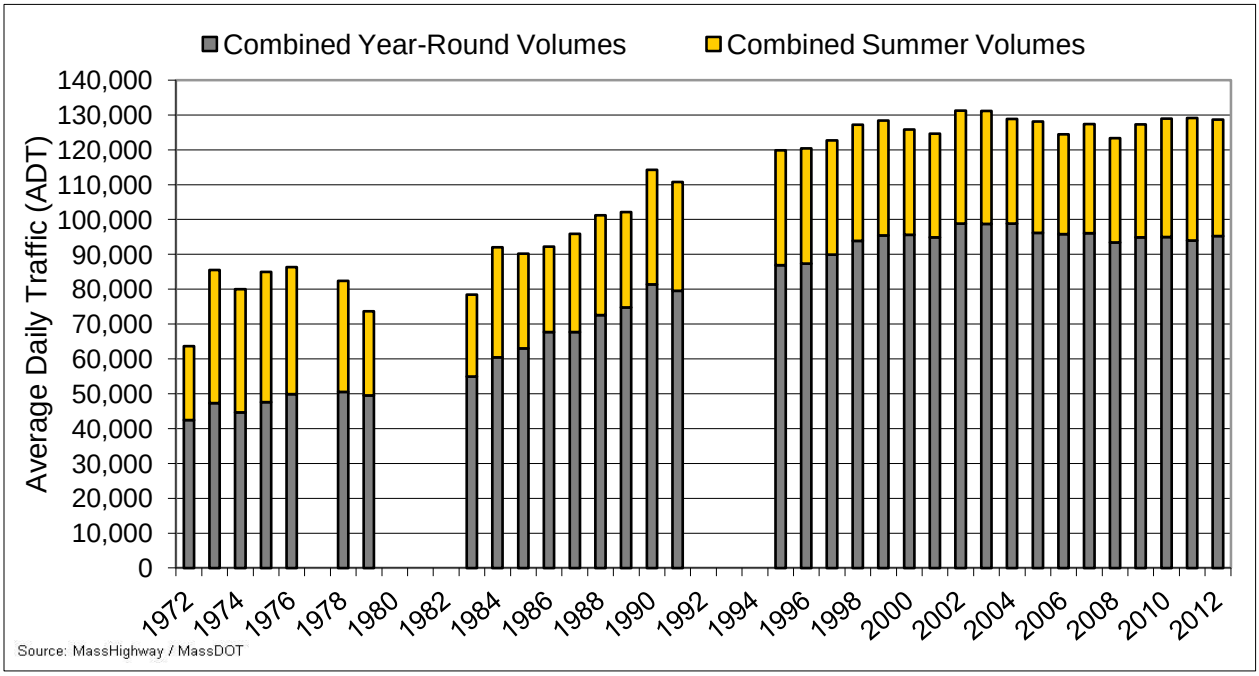

FIGURE 18. HISTORIC TRAFFIC TRENDS AT THE SAGAMORE AND BOURNE BRIDGES

[25] Congestion Management Process: A Guidebook. Federal Highway Administration. April 2011. Report No. FHWA_HEP_11_011.

As depicted in Figure 19, the nature of congestion can be characterized in three ways.[26] The intensity, duration, and extent of congestion all have effects on people's day-today activities as well as the regional economy.

Congestion affects all modes of transportation and solutions to congestion must address all modes. To that end, the performance measures for congestion in the RTP are multimodal congestion performance measures. Based on national best practices, a methodology is currently under development to quantify such measures. Each mode will be evaluated in a slightly different way with recognition of the unique characteristics of the users of each mode and the challenges they face.

Figure 20 shows an example framework from the State of Florida Department of Transportation for analyzing Level of Service (LOS) across different modes of transportation. The measures and targets need to be developed locally to be sure that the meet the unique characters and vision for the Cape Cod region.

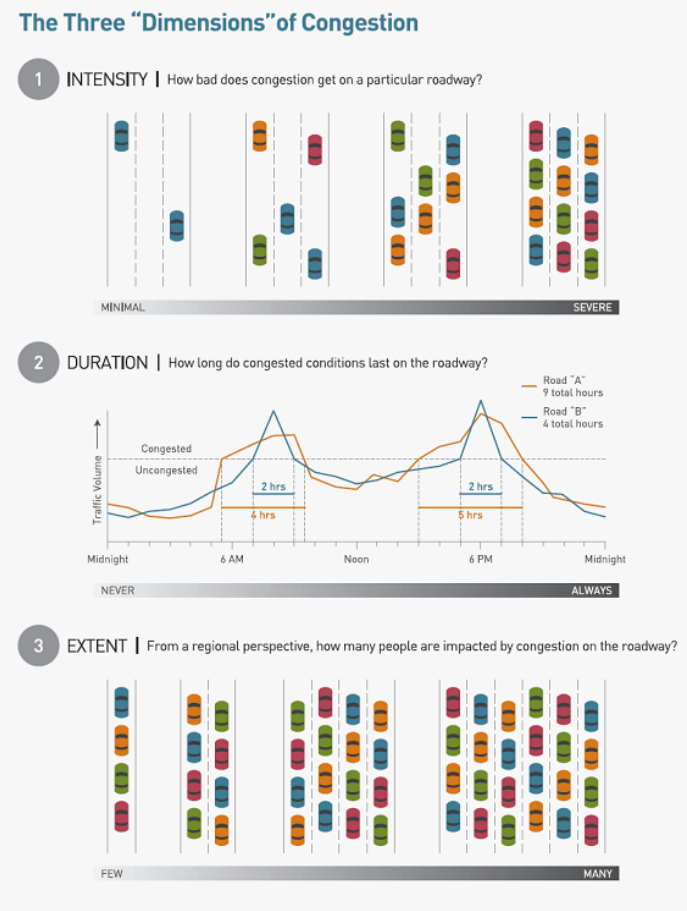

FIGURE 19. DIMENSIONS OF CONGESTION[26]

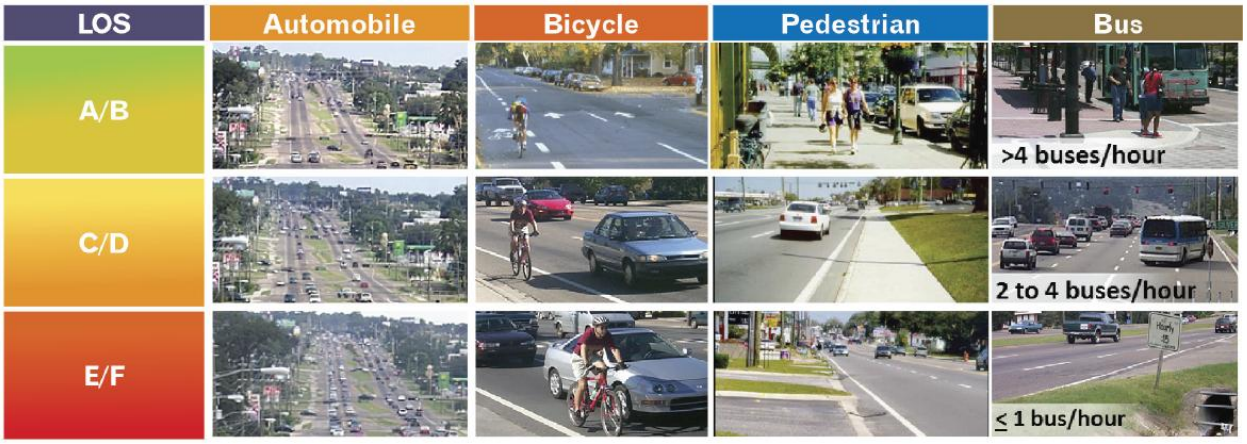

FIGURE 20. NATIONAL EXAMPLE OF MULTIMODAL PERFORMANCE MEASURE FRAMEWORK

[26] Source: Atlanta Regional Commission, Congestion Management Process, 2006 as presented in Congestion Management Process: A Guidebook. Federal Highway Administration. April 2011. Report No. FHWA_HEP_11_011.

Stormwater runoff is caused by precipitation from rain and snowmelt events which flow over land or impervious surfaces and is unable to percolate into the ground. In natural systems, precipitation may be directly infiltrated subsurface, stored in natural depressions, or reintroduced to the atmosphere through evapotranspiration. However, development such as buildings, roads, sidewalks, and paved driveways increases impervious surface area and alters natural hydrology. The increase in impervious cover that accompanies development results in two main issues related to stormwater: 1) greater volume and peak flows of runoff and 2) transportation of contaminants into water bodies.

Water Quantity

What makes Cape Cod a unique area for stormwater management is the combination of highly porous native soils left by the retreating glaciers and shallow groundwater levels, which are especially prevalent in coastal communities. Well-drained soils readily infiltrate runoff, providing excellent volume reduction of stormwater. However, the combination of highly permeable soils and a high water table results in rapid infiltration of contaminated stormwater runoff in to the groundwater leading to concerns related to water quality.

Water Quality

Where most efforts to manage stormwater focus on moving the volume of water off roadways, stormwater management on Cape Cod also requires addressing the quality of stormwater that infiltrates to the Cape's groundwater (drinking water) resources and the Cape's coastal estuaries.

Of particular concern to the coastal estuaries is the introduction of additional nitrogen that changes anoxic environments resulting in fish kills, loss of eel grass, and aesthetically unpleasant conditions. While the largest share of nitrogen entering the Cape's embabyment comes from septic systems, as shown in Figure 21, eight percent of the controllable nitrogen entering the Cape's embayments comes from stormwater runoff.

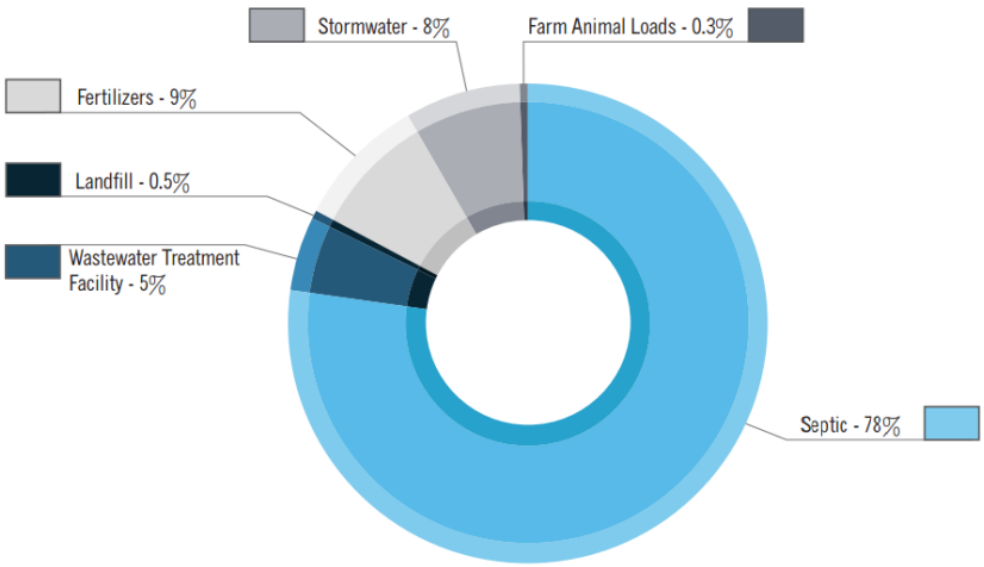

FIGURE 21. CONTROLLABLE NITROGEN BY PERCENTAGE

Also of concern in terms of stormwater quality is the impact of phosphorous and pathogens. Different resource areas on Cape Cod are sensitive to different stormwater components. Figure 22 presents resources areas' sensitivities and their associated pollutants of concern. These sensitive areas are detailed in Appendix I. Among the areas included are pond buffers, river buffers, wetlands area, and watersheds requiring nitrogen removal to meet water quality standards.

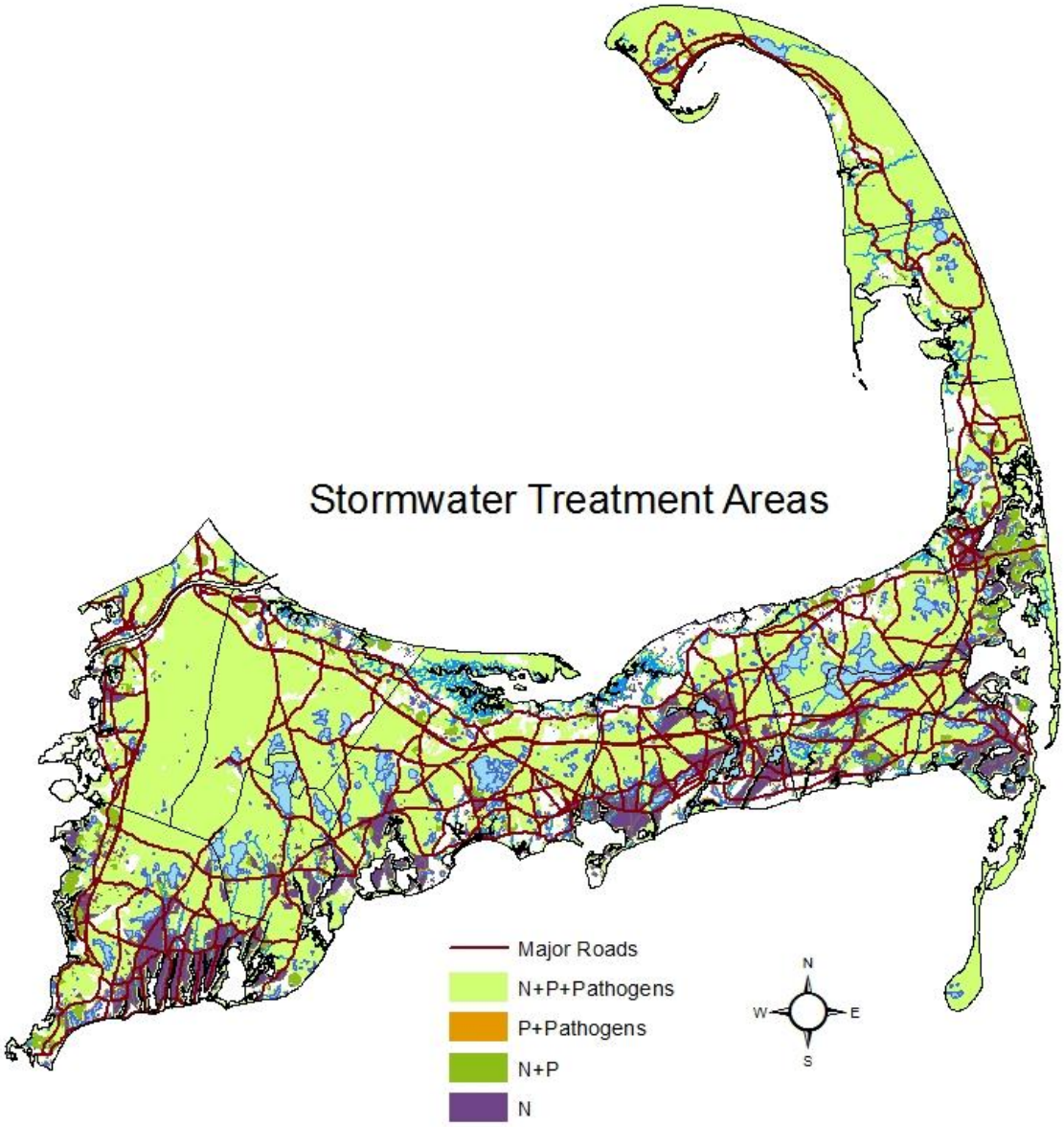

FIGURE 22. STORMWATER SENSITIVE AREAS

Low-impact Development and Stormwater Best Management Practices

Low-impact Development (LID) is a comprehensive, conservation-based approach to stormwater management systems. An LID approach is appropriate both at the site level as well as in roadway design. Environmentally sensitive roadway design involves incorporating LID techniques to prevent the generation of stormwater and non-point source pollution by reducing impervious surfaces, disconnecting flow paths, treating stormwater at its source, maximizing open space, minimizing disturbance, protecting natural features and processes, and/or enhancing wildlife habitat.

Best management practices (BMPs) are control measures to limit untreated, polluted stormwater runoff from reaching waterbodies. BMPs can be categorized in to two categories: structural and non-structural BMPs.

Non-structural BMPs include street sweeping, environmentally conscious road salting procedures, maintenance of stormwater utilities, and education and public outreach programs.

Structural BMPs that have potential applicability on the Cape's roadways include

- Porous pavement (other)
- Leaching Catch Basins (infiltration)/ Infiltration Basins (infiltration)
- Sub-surface Sediment Chambers (pretreatment + infiltration)
- Retention Pond (treatment)
- Bioretention (treatment)
- Advanced Bioretention (treatment)
- Water Quality Swales (conveyance, treatment, infiltration)
- Constructed Stormwater Wetlands (treatment)

BMP costs, removal efficiencies, and maintenance notes are presented in Appendix I.

A comprehensive approach to stormwater management and treatment both on the site level and on the Cape's roadway is essential to the long-term viability of the region's natural environment. Not only is stormwater infrastructure management a good long-term investment for the region, but it can fit seamlessly into the local character of the region. The bio-swale, shown in Figure 23 with long-maintenance ornamental grasses, provides an added green element to the streetscape. [27]

FIGURE 23. BIOSWALE/RAIN-GARDEN IN BRIDGEWATER, CT[27]

[27] Source: Bridgewater, CT

PAVEMENT MANAGEMENT

Pavement Management is the practice of planning for pavement repairs and maintenance with the goal of maximizing the value and life of a pavement network. There are distinct advantages to managing pavement condition and significant cost savings that can take place with preventative or rehabilitation measures rather than waiting until a road is in need of reconstruction (see Figure 24).

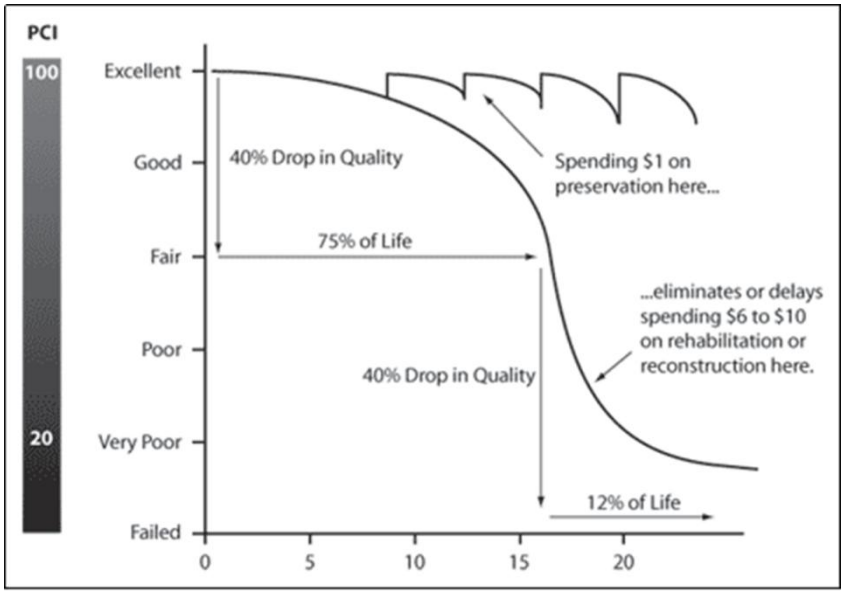

FIGURE 24. PAVEMENT DETERIORATION CURVE (FHWA)

The pavement condition of roadways under the jurisdiction of MassDOT is monitored by MassDOT. The pavement condition on municipally-owned roadways is monitored by each town following varying methodologies. Most use commercial pavement management systems while others rely on local knowledge.

To supplement any data collected by MassDOT on roads under their jurisdiction and the data collected locally, Cape Cod Commission staff conducts regional pavement analysis on the federal-aid eligible municipal road network. Covering one-third of the road mileage each year, a three-year cycle provides an overall view of the pavement condition federal-aid eligible municipal roadways on Cape Cod as shown in Table 11. Evaluation criteria procedure and evaluation criteria are presented in Appendix J.

TABLE 11: PAVEMENT CONDITION ON FEDERAL-AID ELIGIBLE MUNICIPAL ROADWAYS

TOWN	VERY GOOD TO EXCELLENT	GOOD TO VERY GOOD	FAIR TO GOOD	POOR TO FAIR	POOR	TOTALS
Barnstable	3.7	16.0	56.5	28.7	0.9	105.8
Bourne	3.6	3.5	26.3	5.7	1.0	40.1
Brewster	1.3	9.3	7.2	7.3	0	25.0
Chatham	2.6	2.8	6.3	0.4	0	12.1
Dennis	6.5	11.0	24.7	2.8	0	44.9
Eastham	0	1.9	10.4	3.9	0	16.1
Falmouth	2.8	19.5	24.0	12.2	0.1	58.5
Harwich	2.9	19.6	13.8	2.0	0	38.3
Mashpee	1.5	8.2	19.1	0.1	0	29.0
Orleans	0	5.1	6.2	5.2	0	16.4
Provincetown	0	1.1	1.4	2.8	0	5.3
Sandwich	6.0	4.1	13.4	8.7	0.8	33.0
Truro	1.2	2.1	5.0	1.7	0	10.0
Wellfleet	0	1.7	3.1	1.5	0	6.2
Yarmouth	1.2	9.4	32.1	7.2	0.6	50.6
Totals	**33.3**	**115.3**	**249.3**	**90.0**	**3.5**	**491.3**

ACCESS TO ESSENTIAL SERVICES AND REGIONAL COOPERATION

Safe and convenient access to essential housing, employment, healthcare, education, recreation and transportation services or facilities on Cape Cod are critical to the region's residents and visitors. The location and access opportunities and challenges to these services or facilities are detailed in Appendix K.

In order to improve access to and between these essential services the following will be addressed through various efforts outlined in this plan:

- Reduce congestion for all modes,
- Improve travel time reliability for all modes,
- Improve safety for all modes,
- Increase connections opportunities between different modes,
- Close gaps in the bicycle and pedestrian network, and
- Improve transit options.

As detailed in the discussion of RTP development in Chapter 1, this and other planning efforts include or consideration of a wide-range of federal, state, and local agencies and organizations. As detailed in Appendix K, the partnerships within and beyond the region are critical to ensuring that the region maintains a comprehensive and inclusive approach to transportation planning.

FUTURE – A VISION FOR 2040

Cape Cod's transportation system has both shaped and been shaped by development patterns of the region. As our regional economy has evolved so too has our transportation infrastructure. From a reliance on ports and marine transport, to a steady growth by rail, and explosion of change fueled by the automobile – our region has undergone dramatic changes. All the while, our connection with our environment and our past has continued to define us. What will define our region for the next 25 years?

As a region, Cape Cod we face a number of challenges that will have to be addressed over the coming decades. The region faces limited vacant land, a lack of housing affordability, potential loss of habitat as a result of development pressure, impaired watershed from excess nitrogen loading, tourism dependence with a lack of year-round jobs paying a living wage, automobile dependence, and increased risks of flooding. In different ways, smart transportation investment decisions can help to address these challenges facing the region.

While many uncertainties exist about the future, strength of the transportation infrastructure will undoubtedly be a key to our long-term vitality. As a region, we must establish a vision for our region's transportation system and identify our priorities for investing financing resources in maintaining and improving this system. The 2016 Regional Transportation Plan (RTP) sets forth this vision for the region and sets the framework for making smart transportation investments within the region through 2040.

Chapter 4: Livability, Coastal Resiliency, and Scenario Planning

Livability, coastal resiliency, and scenario planning are important planning concepts that are incorporated through the region's transportation planning process and directly into the Regional Transportation Plan (RTP).

LIVABILITY

Livability is about tying the quality and location of transportation facilities to broader opportunities such as access to good jobs, affordable housing, quality schools, and safer streets and roads. Livability can be supported through funding transportation related projects and sponsoring activities like Context Sensitive Solutions and public involvement that help, enable people to live closer to jobs, save households time and money, and reduce pollution.

As part of the United States Department of Transportation's (USDOT) Livability Initiative, the Federal Highway Administration (FHWA) works within the Interagency Partnership for Sustainable Communities to coordinate and leverage federal housing, transportation, water, and other infrastructure policies and investments. The Partnership for Sustainable Communities developed the following principles to guide efforts:

1. Provide more transportation choices.
2. Promote equitable, affordable housing.
3. Enhance economic competitiveness.
4. Support existing communities.
5. Coordinate policies and leverage investment.
6. Value communities and neighborhoods.[28]

Livability directly benefits people who live in, work in or visit Cape Cod, increases property values and business activity, and it can improve public health and safety. Transportation decisions can have a major impact on livability. Streetscapes that are attractive, safe and suitable for a variety of transportation modes (particularly walking) are a key factor in livability. Traffic safety, traffic noise and local air pollution, affordability, impervious surface coverage (i.e., the portion of land devoted to roads and parking), preservation of environmental and cultural structures, and opportunities for recreation are all livability factors often affected by transportation policies and practices. Transportation decisions can also affect social interactions and community cohesion. Pedestrian-friendly streets create opportunities for people to meet and interact, helping to create community networks.

Livability is incorporated into the RTP directly through the Livability and Sustainability goal and the associated objectives and performance measures discussed in Chapter 2.

[28] http://www.fhwa.dot.gov/livability/

COASTAL RESILIENCY

The Cape Cod Metropolitan Planning Organization's (MPO) approach to climate change is based on FHWA's policies on climate change, defined by a vision for improved coastal resiliency, and includes the following initiatives:

- **Adaptation** - Preparing for the impacts of global climate change on the nation's transportation infrastructure and systems;
- **Sustainability** - Ensuring that balanced choices are made among environmental, economic, and social values that will benefit current and future road users;
- **Mitigation** - Identifying strategies that reduce greenhouse gas (GHG) emissions from transportation sources.
- **Energy** - Promoting the use of alternative and renewable fuels, and vehicle technologies to reduce oil dependence, vehicle pollution and energy use.[29]

In addition to the climate change discussion in this section, see the Scenario Planning section for information on the *Interagency Transportation, Land Use, and Climate Change Pilot Project* conducted by the USDOT Volpe Center for Cape Cod.[30]

IMPACTS AND VULNERABILITIES[31]

Scientists have concluded that some level of climate change has already occurred, weather patterns are changing, and these changes are expected to continue or accelerate in the future[32]. Additionally, past weather and climate patterns appear to be much less reliable indicators of future weather and climate than in recent decades, which necessitates greater flexibility in planning and decision-making processes. As stated in the USDOT Policy Statement on Climate Adaptation, DOT shall integrate consideration of climate impacts and adaptation into the planning, operations, policies, and programs of DOT in order to ensure that taxpayer resources are invested wisely and that transportation infrastructure, services and operations remain effective in current and future climate conditions.

The DOT recognizes that climate variability and change pose potential threats to U.S. transportation systems. The range of impacts from these threats may include roadway deterioration, flooding, limited waterway access, and weakened structures. Severe conditions may reduce the life of capital assets and increase operational disruptions. Some consequences may require changes in the design, construction, and maintenance of infrastructure.

Building resilience to climate and weather related risk is common sense management to protect current and future investments and to maintain safe operational capabilities. Adaptation to climate change can include adjusting how transportation infrastructure is planned, designed,

[29] http://www.fhwa.dot.gov/environment/climate_change/
[30] http://www.volpe.dot.gov/sites/volpe.dot.gov/files/docs/ccc_action_plan.pdf
[31] Excerpt from U.S. DOT Climate Adaptation Plan: Ensuring Transportation Infrastructure and System Resilience
[32] See USGCRP, Global Climate Change impacts in the United States, particularly pp.27-40. http://www.globalchange.gov/publications/reports/scientific-assessments/us-impacts/full-report

built and operated. Making climate adaptation a standard part of agency planning can ensure that resources are invested wisely and that services and operations remain effective.

CLIMATE ADAPTATION AND RESILIENCE

Adaptation involves adjusting the way the transportation community plans, designs, constructs, operates, and maintains transportation infrastructure to protect against the impacts caused by changes in climate and extreme weather events. The President's Climate Action Plan directs federal agencies to ensure that climate risk-management considerations are fully integrated into infrastructure planning (Executive Office of the President 2013). A Presidential Executive Order issued November 1, 2013 directs federal agencies to identify opportunities to encourage more climate-resistant investments to infrastructure and to develop and provide authoritative, easily accessible, usable, and timely data, information, and decision-support-tools on climate preparedness and resilience (Executive Order No. 13653 2013).

Adaptation strategies for coping with extreme events and future climate change are most likely forms of coastal engineering and planning already utilized today[33]. However, the challenges facing today's engineers and planners may be among the greatest ever because of the on-going migration of people to coastal areas and the projected rise of sea level to elevations unprecedented in modern times. Adaptation strategies to respond to coastal infrastructure problems related to natural hazards and climate change may be categorized as follows:

- Maintain existing infrastructure for optimal performance and manage the response to extreme events through advanced preparation.
- Increase redundancy of the transportation system by ensuring that services provided by infrastructure can be supplied by other means or alternatives.
- Protect the existing system by providing physical barriers to climate stressors and extreme events.
- Accommodate by modifying or redesigning infrastructure to better coexist in a climate-stressed environment.
- Relocate infrastructure away from the coast to lessen or eliminate exposure to climate stressors.

CLIMATE ADAPTATION AND RESILIENCE ON CAPE COD

Barnstable County is a unique coastal community compared to other parts of Massachusetts because it is almost completely surrounded by water. With this geography, all 15 towns in Barnstable County have access to the coast, making the Cape a popular place to live, but it also makes Cape Cod vulnerable to the impacts of climate change, including flooding and sea level rise. Water rise from flooding events, storm surge or sea level rise is a concern because many valuable transportation assets exist close to the water's edge. Thus, it is important to understand and be actively engaged in long-range planning activities to ensure that the transportation system in Barnstable County will be resilient to the impacts of climate change.

[33] Highways in the Coastal Environment: Assessing Extreme Events, US Department of Transportation and Federal Highway Administration Publication No. FWHA-NHI-14-006, October 2014

An important initial step in preparing transportation infrastructure on Cape Cod for climate change is to identify which transportation assets are vulnerable to climate stressors. In collaboration with MassDOT and FHWA, the Cape Cod Commission conducts vulnerability assessments for transportation infrastructure in Barnstable County, consistent with the objectives outlined in FHWA's Climate Framework.

The FHWA Climate Change & Extreme Weather Vulnerability Assessment Framework[34] is a guide and collection of resources for use in analyzing the impacts of climate change and extreme weather. The three components of this framework are outlined in Figure 25.

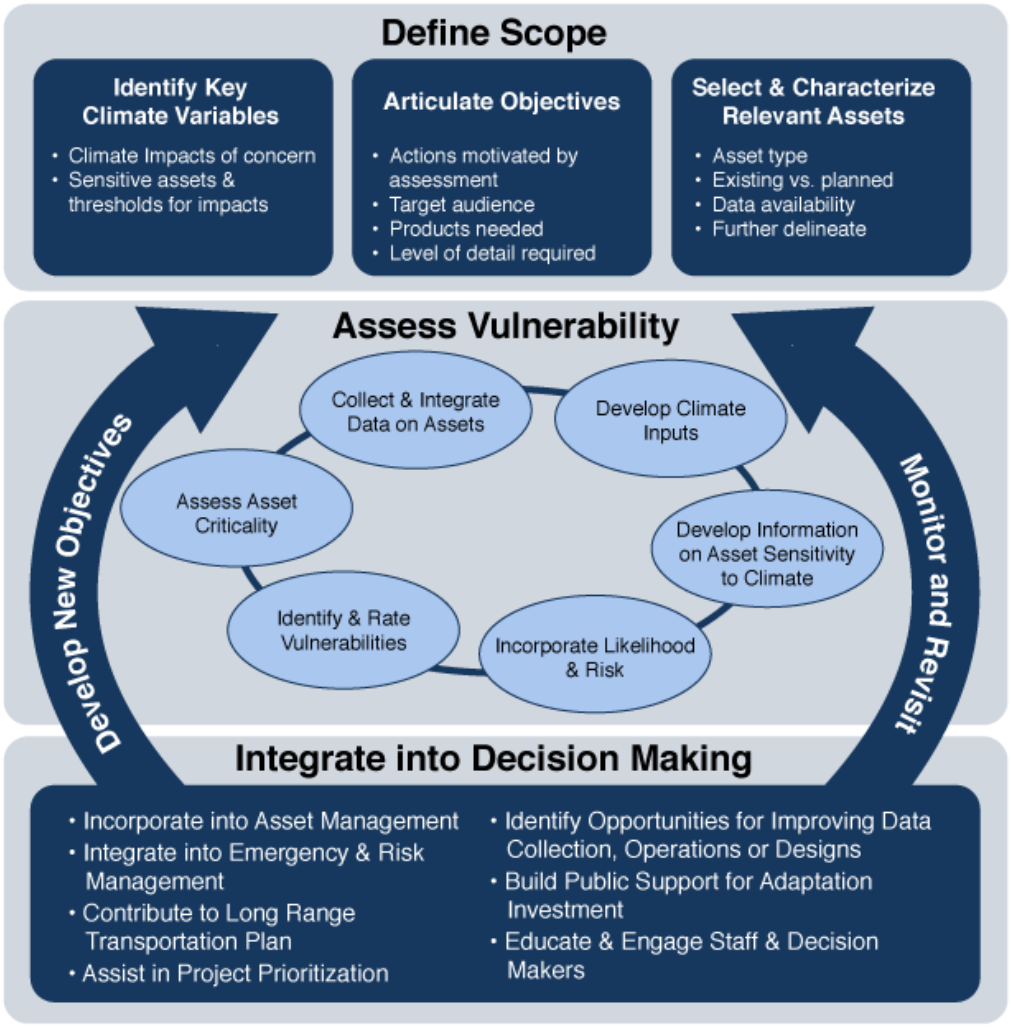

FIGURE 25. FHWA CLIMATE CHANGE & EXTREME WEATHER VULNERABILITY ASSESSMENT FRAMEWORK

Vulnerability assessments started in 2013 and will continue under the Unified Planning Work Program (UPWP). Vulnerability assessments are publically available as UPWP reports,

[34] http://www.fhwa.dot.gov/environment/climate_change/adaptation/adaptation_framework/

published on the Cape Cod Commission's website and sections of these reports are included as appendices in the Regional Transportation Plan (See Appendix H).

The first step in FHWA's Climate Change and Extreme Weather Vulnerability Assessment Framework is to define the scope of the assessment. The purpose of the vulnerability assessment project is to increase the preparedness and resiliency of the transportation network in Barnstable County. The specific goals of this work are to:

- Identify critical transportation infrastructure on Cape Cod
- Identify transportation infrastructure vulnerable to the impacts of sea level rise
- Improve vulnerability and risk assessment practices for planners and town officials
- Formulate effective adaptation strategies for Cape Cod
- Foster local support and input on climate change vulnerability assessments

Vulnerability assessments conducted from 2013-2014 involved a large interdisciplinary team of people with extensive experience in long-range planning, GIS, engineering, asset management and scenario planning. The input and expertise of stakeholders and technical staff continue to be essential to current and future vulnerability assessments. Local officials, stakeholders, and the general public are target audience for the vulnerability assessment work. Many point and route assets from all five modes of transportation are included in the vulnerability assessments; including roads, bridges, rail, large culverts, transit facilities, transit routes, port and airport infrastructure and maintenance facilities. To date, vulnerability assessments utilize large data sets including but not limited to: LiDAR (Light Detection and Ranging) remote sensing data, FEMA Flood Insurance Rate Maps (FIRM), Sea, Lake and Overland Surges from Hurricanes (SLOSH) models, and potential Sea Level Rise models.

The next step in FHWA's Climate Change and Extreme Weather Vulnerability Assessment Framework is to assess the vulnerability of the transportation system to sea level rise and other storm events. For detailed information on both vulnerability assessments conducted by the Cape Cod Commission, see Appendix H.

In the initial phase of the vulnerability assessment, the Cape Cod Commission engaged transportation stakeholders to decide which assets were critical to the region's transportation system. In the assessments conducted by the Cape Cod Commission, a "critical" transportation asset was defined as either vital to the functioning of the modal transportation network (i.e. maintains the mobility and accessibility function of the network) and important to the social and economic functioning of the community (i.e. provides access to employment centers or increases connectivity between community components). This definition of criticality is similar to the one described in a recent study conducted in the Gulf Coast[35].

In the assessments conducted in 2014, Cape Cod Commission staff used geospatial mapping to determine asset vulnerability. By combining sea level rise projections with asset location data

[35] Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: The Gulf Coast Study, Phase 2, Task 1: Assessing Infrastructure for Criticality in Mobile, AL, U.S. Department of Transportation, September 2011, FHWA-HEP-11-029

allows for identification of which assets would be submerged at specific increments of sea level rise.[36] Asset location data, sea level rise projections, and criticality rankings were then combined to generate a list of transportation assets that are both critical to the modal system and vulnerable to sea level rise (Appendix H).

It is important to monitor asset vulnerability on an on-going basis. Monitoring involves the systematic collection of information at specific time intervals. It allows new data and knowledge to steer decision-making and future planning efforts and it allows agencies and municipalities to check progress against current transportation plans. Over the next few years, more data will be collected on the vulnerability of transportation assets in Barnstable County including discussion with Department of Public Works (DPW) staff in all 15 towns. This project will be conducted in tandem with the vulnerability studies.

RESTORING RIVER AND STREAM CONTINUITY

Long before roads, rail lines, and bike paths cut across the Cape's waterways flowed freely. As the first line of defense, these waterways could absorb the impact of many of the natural events that faced the region. Bridge, culverts, and other tidal restrictions can inhibit the natural flows and become vulnerable points in storm events. By restoring river and stream crossing the region can see coastal resiliency as well as environmental benefits.

Tidal stream crossings

Culverts and bridges that are too small to pass the full tidal range are known as tidal restrictions, and their impacts can be severe. By limiting tidal flow, restrictions alter water levels and chemistry, diminish exchange of ocean nutrients, and can degrade entire upstream aquatic systems. When properly designed, replacing a tidally-restrictive crossing with a larger culvert or bridge restores the natural tidal flow needed to sustain healthy tidal wetland habitats.

Freshwater stream crossings

Undersized or improperly placed crossings impact natural stream processes and prevent fish and wildlife from moving about the watershed. Stream crossings can disrupt stream continuity and impact freshwater ecosystems in the following ways:

- Undersized crossings restrict water flow, particularly during storms. These crossings may contribute to extensive channel scour, bank erosion, flooding, and crossing failure. Undersized crossings may be too small, and the flow may be too fast, to pass fish or wildlife.
- Shallow crossings have water depths that are too shallow for fish and other aquatic life to migrate through.
- Perched crossings have an outlet that is elevated above the level of the stream bed at the downstream end. Perched crossings block fish and wildlife from moving upstream.

[36] see www.capecodcommission.org/sealevelrise

The Massachusetts Division of Ecological Restoration (MassDER)[37] leads the charge for restoring aquatic ecosystems in the Commonwealth and has been an invaluable partner to the region. In providing much of the language for this section, as well as additional analysis presented in Appendix H, MassDER is involved in numerous tidal restoration projects currently ongoing in the region.

Restoring river and stream crossing has a number of economic and community benefits and are important projects for the region. A recent MassDER study[38] found that each $1.0 million dollars spent on its restoration projects (including stream barrier removals, as well as salt marsh restoration) supported 10 to 13 jobs and $1.5 to $1.8 million in regional economic output (2009 dollars). Such projects are a particular benefit to the region when coupled with roadway improvements projects. Appendix H details a number of ongoing and potential river and stream crossing restoration projects that should be considered by the region either as part of planned transportation improvements or as standalone projects.

GREENHOUSE GASES ANALYSIS[39]

The transportation system is a critical component of the Commonwealth of Massachusetts' infrastructure; it facilitates economic development, access to goods and services, and social interaction and enrichment. While the system has numerous benefits that users depend upon daily, it also contributes over one third of the Bay State's greenhouse gas (GHG) emissions, a key cause of climate change. Sprawling development patterns and automobile dependence also contribute to physical inactivity, which is associated with various negative health outcomes, while motor vehicle pollution contaminates the air, causing respiratory and other health conditions.

Metropolitan Planning Organizations and the Global Warming Solutions Act

The Commonwealth's Global Warming Solutions Act (GWSA) of 2008 requires statewide reductions in greenhouse gas (GHG) emissions of 25 percent below 1990 levels by the year 2020, and 80 percent below 1990 levels by 2050. As part of the GWSA, the Executive Office of Energy and Environmental Affairs developed the Massachusetts Clean Energy and Climate Plan (CECP), which outlines programs to attain the 25 percent reduction by 2020 – including a 7.6 percent reduction that would be attributed to the transportation sector.

The Commonwealth's thirteen metropolitan planning organizations (MPOs) are integrally involved in helping to achieve greenhouse gas reductions mandated under the GWSA. The MPOs work closely with the Massachusetts Department of Transportation (MassDOT) and other involved agencies to develop common transportation goals, policies, and projects that would help to reduce GHG emission levels statewide. For example, one of the programs in the CECP is MassDOT's sustainability initiative known as GreenDOT. GreenDOT policy goals were developed in accordance with the GWSA, and are as follows:

[37] More information on the MassDER available at: http://www.mass.gov/eea/agencies/dfg/der/
[38] Massachusetts Division of Ecological Restoration. "The Economic Impacts of Ecological Restoration in Massachusetts." March 201.
[39] from 2014 status report for GreenDOT

- Reduce greenhouse gas (GHG) emissions
- Promote the healthy transportation modes of walking, bicycling, and public transit
- Support smart growth development

The Cape Cod MPO shares in these goals and is working to meet the specific requirements of the GWSA regulation – Global Warming Solutions Act Requirements for the Transportation Sector and the Massachusetts Department of Transportation (310 CMR 60.05). The purpose of this regulation is to assist the Commonwealth in achieving their adopted GHG emission reduction goals by:

- Requiring MassDOT to demonstrate that its GHG reduction commitments and targets are being achieved
- Requiring each MPO to evaluate and track the GHG emissions and impacts of its Regional Transportation Plan and Transportation Improvement Program
- Requiring each MPO, in consultation with MassDOT, to develop and utilize procedures to prioritize and select projects in its RTP and TIP based on factors that include GHG emissions and impacts

Meeting the requirements of this regulation will be achieved through the transportation goals and policies contained in the 2016 Regional Transportation Plan, the major projects planned in the RTPs, and the mix of new transportation projects that are programmed and implemented through the Transportation Improvement Program. The GHG tracking and evaluation processes enable the MPOs to identify the anticipated GHG impacts of the planned and programmed projects, and also to use GHG impacts as a criterion in prioritizing transportation projects. This approach by the MPO is consistent with the greenhouse gas reduction policies of promoting healthy transportation modes through prioritizing and programming an appropriate balance of roadway, transit, bicycle and pedestrian investments; as well as supporting smart growth development patterns through the creation of a balanced multi-modal transportation system. All of the MPOs and MassDOT are working toward reducing greenhouse gases with plans, actions, and strategies that include (but are not limited to):

- Reducing emissions from construction and operations
- Using more fuel-efficient fleets
- Implementing and expanding travel demand management programs
- Encouraging eco-driving
- Providing mitigation for development projects
- Improving pedestrian, bicycle, and public transit infrastructure and operations (healthy transportation)
- Investing in higher density, mixed use, and transit-oriented developments (smart growth)

Regional GHG Tracking and Evaluation in RTPs

MassDOT coordinated with MPOs and regional planning agency (RPA) staffs on the implementation of GHG tracking and evaluation in development of each MPO's 2012 RTPs, which were adopted in September 2011. This collaboration has continued for the MPO's 2016 RTPs and 2016-19 TIPs. Working together, MassDOT and the MPOs have attained the following milestones:

- Modeling and long-range statewide projections for GHG emissions resulting from the transportation sector for use before final RTP endorsement. Using the Boston MPO's regional travel demand model and the statewide travel demand model for the remainder of the state, GHG emissions will be projected for 2020 no-build and build conditions, and for 2040 no-build and build conditions. The results of this modeling will be available before the endorsement of this RTP and the MPO staff will present on the results to the MPO membership before a vote on endorsement.
- All of the MPOs will include GHG emission reduction projections in their RTPs, along with a discussion of climate change and a statement of MPO support for reducing GHG emissions as a regional goal.

MassDOT, using its statewide travel demand model, will provide the Cape Cod MPO with statewide estimates of CO2 emissions resulting from the collective list of all recommended projects in all the Massachusetts RTPs combined (and supplemented by CO2 emission reduction results for smaller, "off-model" projects supplied by the MPO). Emissions will be estimated using the new (2014) MOVES model, and also incorporate the latest planning assumptions including updated socio-economic projections for the Commonwealth.

The project mix from this RTP (and all other RTPs) – modeled for both 2020 and 2040 using an Action (Build) vs. Baseline (No-Build) analysis to determine the CO2 emissions attributed to all MPO's mix of projects and smart-growth land use assumptions – is expected to show a neutral shift toward meeting the statewide greenhouse gas emissions reduction goal of 25 percent below 1990 levels by the year 2020, and 80 percent below 1990 levels by 2050. The reason for the anticipated neutral shift is that early indicators have shown that major infrastructure projects, both individually and collectively, would not trigger a significant change in GHG emission levels.

Working closely with MassDOT, the Cape Cod MPO continues to make efforts toward progress through planning activities to meet the GHG reductions targets and complying with the requirements of the GWSA. As part of this activity, the MPO will provide further public information on the topic and will continue to advocate for steps needed to accomplish the MPO's and Commonwealth's goals for greenhouse gas reductions. More information on the anticipated GHG emissions impacts of RTP projects in detailed in Chapter 5.

ALTERNATIVE AND RENEWABLE ENERGY

Consistent with GreenDOT Policy, there are numerous projects in Barnstable County that are investing public resources to conserve energy, implement efficiency measures, and produce or purchase renewable energy, such as:

- Cape Cod Transit Authority (CCRTA) Wind Turbine, South Dennis: Cape Cod Regional Transit Authority installed a 100 kW wind turbine at its Operations Center. The turbine generates 181,000 kW hours of electricity annually, which represents about 60% of the electricity the center consumes, saving approximately $35,000 and offsetting approximately 257 tons of carbon emissions per year (GreenDOT implementation Plan)
- Energy Star Passenger Terminal at the Barnstable Municipal Airport: The new 35,000 square-foot passenger terminal building at Barnstable Municipal Airport is seeking an Energy Star rating based on its multiple energy saving design initiatives including white roofs, high performance windows, high efficient HVAC systems, point of service water heaters, and fluorescent lighting.
- Solar Collection Field at the Barnstable Municipal Airport: Nearly 25,000 photovoltaic modules were installed across 18.8 acres of airfield. Energy from the solar array will benefit the airport, the Barnstable Fire District and eventually, rate payers in Barnstable and other jurisdictions. The solar array will reduce the cost of electricity by 17% for the airport.
- Electric Car Charging Stations at the County Complex, Barnstable and other locations

SCENARIO PLANNING

Transportation and land use are inextricably linked and only with a shared vision for both can the ultimate visions of a region be achieved. Scenario planning is one way in which these disciplines can be looked at in a comprehensive way.

FHWA defines scenario planning an analytical tool that can help transportation professionals prepare for what lies ahead. Scenario planning provides a framework for developing a shared vision for the future by analyzing various forces (e.g., health, transportation, economic, environmental, land use, etc.) that affect growth.[40] This framework has been used and continues to be an important tool for the region.

CLIMATE CHANGE SCENARIO PLANNING PILOT PROJECT

In 2009, the Interagency Working Group on Transportation, Land Use, and Climate Change, a group of 13 federal agencies convened by FHWA, selected Cape Cod, Massachusetts, to facilitate and enhance integrated regional and intermodal gateway mobility planning at the state, regional, and local levels. The USDOT Volpe Center began the resulting Interagency Transportation, Land Use, and Climate Change Pilot Project (Pilot Project) in early 2010 in conjunction with FHWA, the National Park Service and the U.S. Fish and Wildlife Service. These agencies viewed the Pilot Project as an opportunity to address transportation-based GHG emissions and to consider climate change effects using scenario planning as a method for doing so. The Pilot Project resulted in a multi-agency transportation and land use development scenario for Cape Cod. This scenario was developed through a process of data collection, scenario development by a consultant and by regional and local government representatives during a workshop, and scenario assessment and refinement.[41]

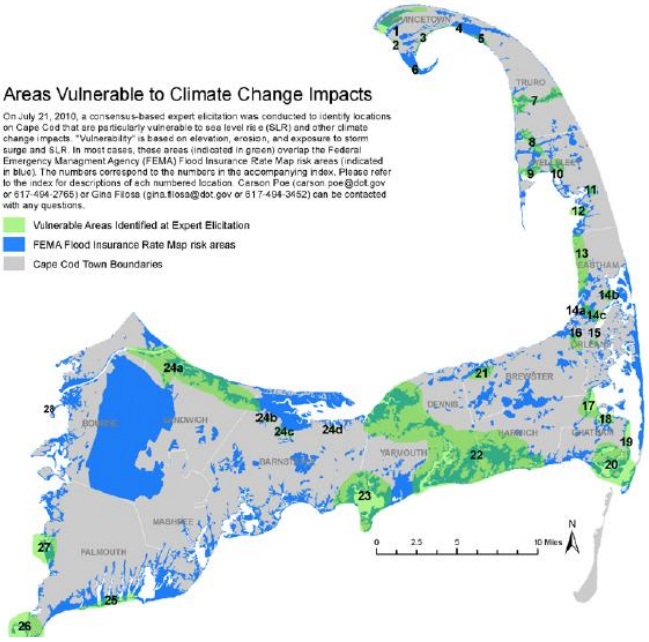

FIGURE 26.SCENARIO PLANNING PILOT PROJECT – AREAS VULNERABLE TO CLIMATE CHANGE IMPACTS

As part of this Pilot Project, as shown in Figure 26, areas vulnerable to climate change impacts were mapped with input from local and regional coastal experts. This analysis was used to inform the development of future development scenarios for consideration.

Three scenarios were initially analyzed as part of this Pilot Project including a trend scenario, a dispersed scenario, and a targeted scenario. These scenarios looked at the impacts of changes in household densities across Cape Cod as seen in Figure 27.

[40] http://www.fhwa.dot.gov/planning/scenario_and_visualization/scenario_planning/
[41] http://www.volpe.dot.gov/sites/volpe.dot.gov/files/docs/ccc_action_plan.pdf

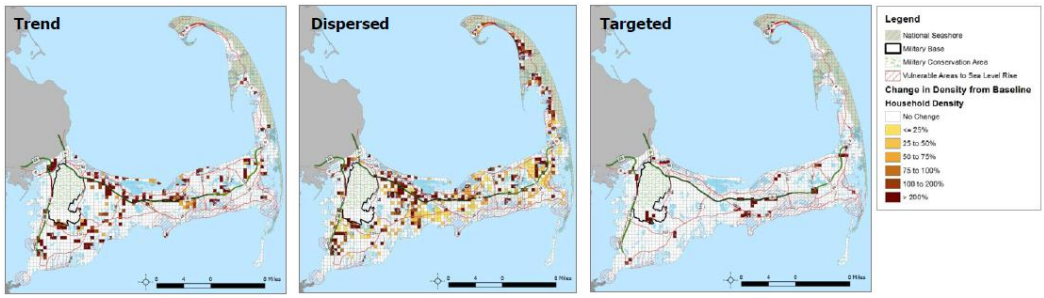

FIGURE 27. SCENARIO PLANNING PILOT PROJECT – PRELIMINARY SCENARIOS

Using the data gathered as part of this initiative, the workshop was hosted to let local, regional, state, and federal stakeholders engage in the scenario planning process. In attendance at the workshop were representatives from the Towns of Barnstable, Brewster, Chatham, Falmouth, Harwich, Mashpee, Sandwich, and Truro, the Martha's Vineyard Commissions, Nantucket Planning Office, Cape Cod Commission, Cape Cod Regional Transit Authority, and Massachusetts National Guard. Workshop participants were asked to allocate development units across Cape Cod considering the following constraints:

- Wellhead protection areas;
- Future water sources;
- Critical species habitat areas;
- Cape Cod National Seashore boundaries;
- Historic preservation areas; and
- Areas vulnerable to sea level rise and other climate change effects.

Following the workshop and further discussions with the Cape Cod Commission, Cape Cod National Seashore, Cape Cod Regional Transit Authority, and several towns a refined scenario was developed. The refined scenario, as presented in Figure 28, was used to inform the development of the RTP.

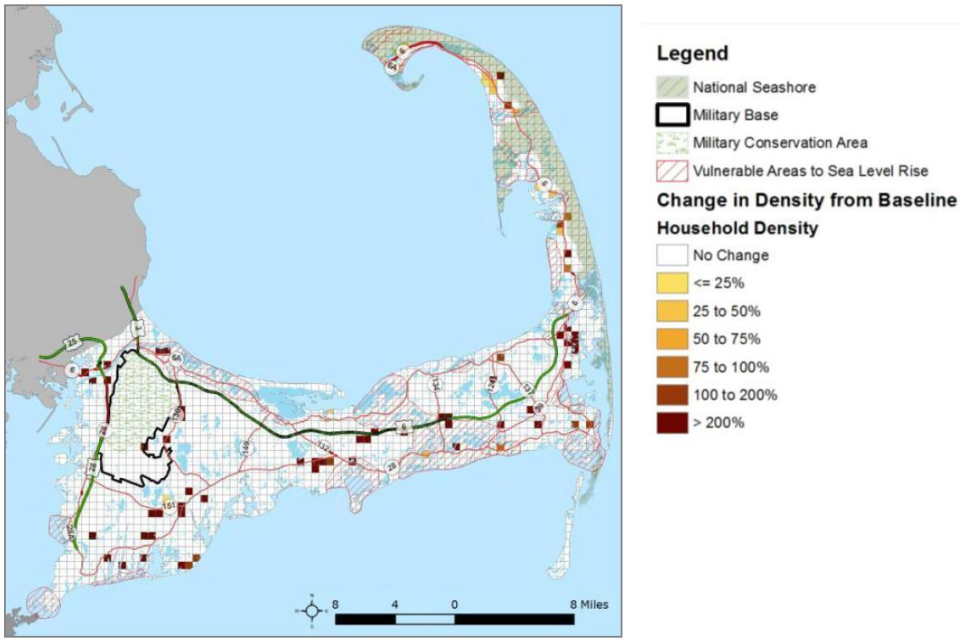

FIGURE 28. SCENARIO PLANNING PILOT PROJECT – REFINED SCENARIO

REGIONAL TRANSPORTATION PLAN SCENARIO PLANNING

Where the RTP sets the regional vision for transportation, the Regional Policy Plan (RPP) sets the regional vision for land use. In line with the RTP development schedule, the RPP is being updated in 2015. Part of the update process is a regional scenario planning exercise being conducted using the Envision Tomorrow suite of regional planning tools in process a summarized in Figure 29.[42]

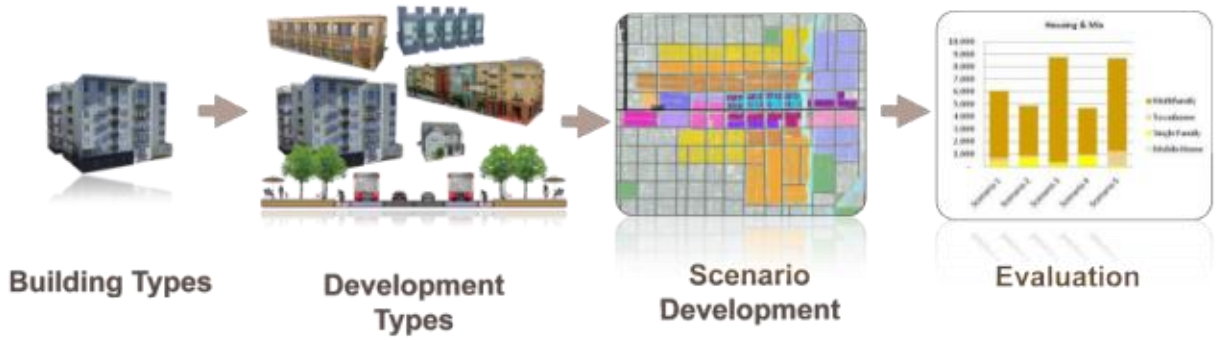

FIGURE 29. ENVISION TOMORROW SCENARIO PLANNING PROCESS

Using this software, users are able to test multiple development scenarios and then compare the impacts of each development scenario. The scenarios are built on a customized set of building types that are aggregated into development types that represent both existing and aspirational land uses in the region. Once the development types are established they are used to develop scenarios that are then evaluated on the basis of a number of indicators.

Scenario planning will be used in the RPP in a three step process depicted in the Figure 30. The business as usual, or the "Trend Scenario," answers the question: "What happens if current land use policies remain unchanged?" Based on existing zoning and constraints such as wetlands, the Trends Scenario builds on existing vacant land to see what Cape Cod would look like in 2030.

FIGURE 30. SCENARIO PLANNING AND THE RPP

[42] http://www.envisiontomorrow.org

The Trend Scenario was largely characterized by the development of large single family homes as shown in Figure 31.

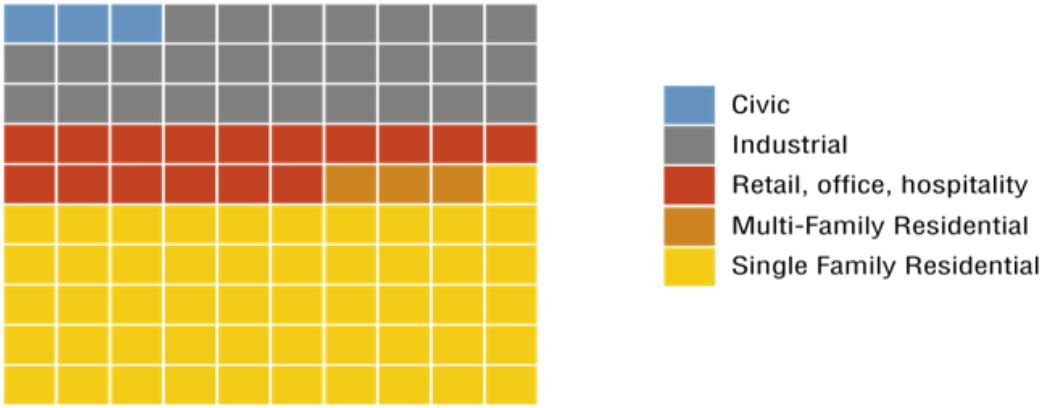

FIGURE 31. RPP TREND SCENARIO (LAND USE MIX – PERCENT OF TOTAL ACRES)

The results of these continued development patterns for the regions are characterized by the following:

- Limited vacant land,
- Lack of affordable housing,
- Loss of habitat,
- Wastewater challenges,
- Tourism dependence,
- Automobile dependence, and
- Climate change challenges.

Focusing just on the transportation impacts, the Trend Scenario results in disperse, auto-dependent development that would result in a significant need for new infrastructure including:

- Over 300 miles of new roadway construction – enough to stretch from the Sagamore Bridge to the Provincetown Monument five times, and
- Over 80,000 new parking spaces – the equivalent of paving over all of the 700 acre Shawme-Crowell State Forest for parking.

Based on feedback from the RTP and RPP development process, it is clear this is not consistent with the future vision for Cape Cod. As alternative scenarios are developed and a preferred alternative is identified, infrastructure investment under the RTP will support the regional vision shared by both documents.

Chapter 5: Financial Plan

The Financial Plan sent forth in this chapter sets the regional priorities for surface transportation spending for the next 25 year.

LEGISLATIVE BACKGROUND

Federal legislation that contains requirements for transportation plans, programs and projects includes the current legislation: *Moving Ahead for Progress in the 21st Century* (MAP-21) and the outgoing legislation: *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users* (SAFETEA-LU) as well as the *Clean Air Act Amendments of 1990*.

On July 6, 2012, President Obama signed into law P.L. 112-141, the Moving Ahead for Progress in the 21st Century Act (MAP-21). Funding surface transportation programs at over $105 billion for fiscal years (FY) 2013 and 2014, MAP-21 is the first long-term highway authorization enacted since 2005. MAP-21 was extended until May 31, 2015 by P.L.113-159. MAP-21 represents a milestone for the U.S. economy – it provides needed funds and, more importantly, it transforms the policy and programmatic framework for investments to guide the growth and development of the country's vital transportation infrastructure.

MAP-21 creates a streamlined, performance-based, and multimodal program to address the many challenges facing the U.S. transportation system. These challenges include improving safety, maintaining infrastructure condition, reducing traffic congestion, improving efficiency of the system and freight movement, protecting the environment, and reducing delays in project delivery.

FUNDING SOURCES

The primary source of funding for implementation of the RTP projects and programs is from the federal Highway Trust Fund. Distribution of Highway Trust Fund revenues are appropriated by Congress for surface transportation purposes through the United States Department of Transportation (USDOT) Federal Highway Administration (FHWA) and the USDOT Federal Transit Administration (FTA) as dedicated through federal legislation. The current federal legislation, Moving Ahead for Progress in the 21st Century (MAP-21), was signed into law in 2012 and has been extended to provide funding up to July 31, 2015.

In addition to federal funds, the Commonwealth of Massachusetts provided significant funds to the region. Highway projects can either be funded by a combination of federal and state funds (typically 80-90% federal funding) or fully funded by the state. For transit projects typically the state amount may average at a higher percentage due to the state funding a large percent of operating cost.

Receipts for the federal Highway Trust Fund are collected primarily from the federal fuel tax. Funding for transportation in Massachusetts comes from a combination of the state fuel tax, toll revenue, transportation-related fees (i.e. motor vehicle registration), and a portion of the state sales tax. Figure 32 shows the federal and state tax collected for a gallon of gasoline or diesel fuel in Massachusetts.

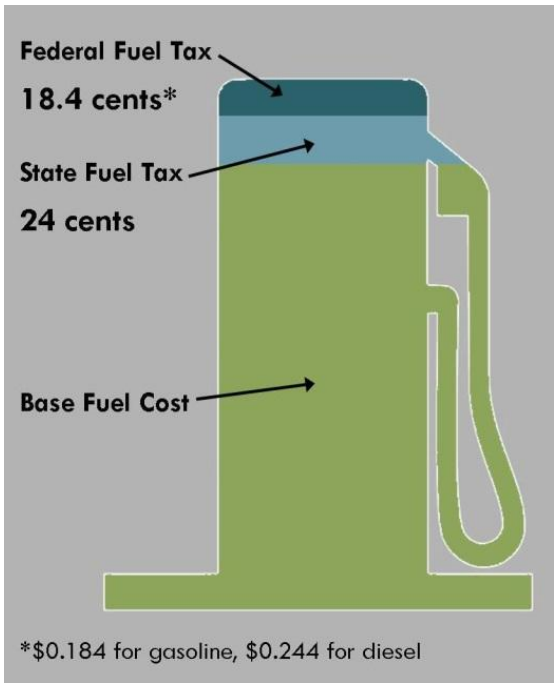

FIGURE 32. FUEL TAX

Local funds also play a large role in the advancement of projects with towns paying for the design of most highway projects with their borders. A town may even pay for the design of an improvement at a state-owned location if it sees the advancement of the project as a benefit to the town. Local funds are also occasionally used to cover items not covered by other sources such as landscaping above standard design or improvements to utilities. Transit services also have a local share in funding, with a portion of service operating costs assessed to the towns through the Cape Cod Regional Transit Authority.

ESTIMATED AVAILABLE FUNDS

Both the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), in partnership will MassDOT, provide funding to the region through a number of programs.

FEDERAL HIGHWAY ADMINISTRATION SOURCE FUNDS

MassDOT divides the federal highway funding that it receives between "regional target funding," which is allocated at the discretion of the MPOs for regional priority projects on the federal aid transportation system, and funding that is allocated at MassDOT's discretion for use principally on the state-owned transportation system.

Each MPO's regional target funding is composed of shares of Congestion Mitigation and Air Quality Improvement Program (CMAQ), Highway Safety Improvement Program (HSIP), Transportation Alternatives Program (TAP), and Surface Transportation Program (STP) funding. "Statewide" funding that is allocated at MassDOT's discretion includes funding from the federal highway sources detailed in Table 12.[43]

[43] https://www.massdot.state.ma.us/planning/Main/PlanningProcess/FundingConsiderations.aspx

TABLE 12: FHWA FUNDING PROGRAMS[44]

PROGRAM	DESCRIPTION
Congestion Mitigation and Air Quality Improvement Program (CMAQ)	This program provides federal funding for states to support projects and programs intended to improve air quality and reduce traffic congestion. CMAQ funds (80 percent federal / 20 percent non-federal) are used for transportation programs and projects that will contribute to the attainment of a National Ambient Air Quality Standard in ozone, small particulates matter and carbon monoxide non-attainment areas.
Highway Safety Improvement Program (HSIP)	Through this program, funds safety improvement projects to reduce the number and severity of crashes at hazardous locations (90% federal / 10% non-federal). The HSIP is guided by a data-driven state Strategic Highway Safety Plan that defines state safety goals, ranks dangerous locations, and includes a list of projects.
Transportation Alternatives Program (TAP)	This is a competitive grant program created by the federal Moving Ahead for Progress in the 21st Century Act (MAP-21). TAP provides funding for a variety of transportation projects types, including projects that would previously have been eligible for funding under separate programs: the Transportation Enhancements, Recreational Trails, and Safe Routes to School programs.
Surface Transportation Program (STP)	This program provides flexible funding that may be used by States and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel, as well as for projects on any public road (except local roads and rural minor collectors), pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals.
National Highway Performance Program (NHPP)	This program provides support for the condition and performance of the National Highway System (NHS). NHPP projects must be on an eligible facility and support progress toward achievement of national performance goals for improving infrastructure condition, safety, mobility, or freight movement on the NHS.
Bridge (BR)	Through this program, federal-aid bridge funding (80% federal / 20% non-federal) is used to rehabilitate or replace bridges based upon the structure's adequacy, safety, serviceability, age and public usage.

In March 2015, MassDOT provided estimated available funds for the Cape Cod region from Federal Highway Administration (FHWA) including the state matching funds as presented in Table 13.

TABLE 13. ESTIMATED CAPE COD REGIONAL TRANSPORTATION HIGHWAY FUNDING

TIME FRAME	FUNDING AVAILABLE FOR MPO (REGIONAL TARGET FUNDS)	STATEWIDE NATIONAL HIGHWAY SYSTEM, INFRASTRUCTURE, BRIDGE & OTHER PROGRAMS	NON-FEDERAL AID SYSTEM PRESERVATION (BRIDGES AND ROADWAYS)	TOTAL ESTIMATED AMOUNT
2016-2020	$47,129,097	$71,726,368	$22,925,500	$141,780,965
2021-2025	$49,606,993	$73,062,744	$23,269,383	$145,939,120
2026-2030	$61,989,101	$91,299,503	$23,613,265	$176,901,869
2031-2035	$70,191,885	$103,380,822	$23,957,148	$197,529,855
2036-2040	$75,616,595	$111,370,506	$24,301,030	$211,288,131
Total	**$304,533,670**	**$450,839,942**	**$118,066,325**	**$873,439,937**

[44] https://www.massdot.state.ma.us/planning/Main/PlanningProcess/FundingConsiderations.aspx

FEDERAL TRANSIT ADMINISTRATION SOURCE FUNDS

The Federal Transit Administration (FTA) provides financial assistance to develop new transit systems and improve, maintain, and operate existing systems. FTA oversees thousands of grants to state and local transit providers through the FTA regional offices. The grantees are responsible for managing their programs in accordance with federal requirements and FTA is responsible for ensuring that these grantees follow the mandates along with statutory and administrative requirements. FTA funding programs are summarized in Table 14.[45]

TABLE 14: FTA FUNDING PROGRAMS[45]

PROGRAM	DESCRIPTION
Section 5307 – Urbanized Area Formula Grant Program	This program funds routine capital investments, including bus purchases, but for some smaller systems, a portion can be used to defray transit system operating expenses.
Section 5310 – Elderly Persons and Persons with Disabilities Formula Program	This program is intended to enhance mobility for seniors and persons with disabilities by providing funds for programs to serve the special needs of transit-dependent populations beyond traditional public transportation services and Americans with Disabilities Act (ADA) complementary paratransit services.
Section 5311 – Rural Area Formula Program	This program funds public transportation in rural areas (areas with populations less than 50,000) for operating and capital grants for intercity facilities, services and equipment.
Section 5337 – State of Good Repair	The new formula-based State of Good Repair program is FTA's first stand-alone initiative written into law that is dedicated to repairing and upgrading the nation's rail transit systems along with high-intensity motor bus systems that use high-occupancy vehicle lanes, including bus rapid transit.
Section 5339 – Bus and Bus Facilities	This program seeks to provide capital funding to replace, rehabilitate, and purchase buses and related equipment and to construct bus-related facilities.

In March 2015, MassDOT provided estimated available funds for the Cape Cod region from Federal Transit Administration (FTA) including the state matching funds as presented in Table 15.

TABLE 15. ESTIMATED REGIONAL TRANSPORTATION TRANSIT FUNDING – CCRTA[46]

TIME FRAME	SECTION 5307	SECTION 5339	TOTAL ESTIMATED AMOUNT
2016-2020	$36,141,583	$3,153,680	$39,295,263
2021-2025	$38,934,748	$3,397,409	$42,332,157
2026-2030	$41,943,782	$3,659,976	$45,603,758
2031-2035	$45,185,365	$3,942,834	$49,128,199
2036-2040	$48,677,473	$4,247,551	$52,925,024
Total	**$210,882,951**	**$18,401,450**	**$229,284,401**

[45] https://www.massdot.state.ma.us/planning/Main/PlanningProcess/FundingConsiderations.aspx

[46] Funding to the Cape Cod Regional Transit Authority including funds distributed to regional intercity bus service providers. Greater Attleboro Tauton Regional Transit Authority also receives Section 5307 and Section 5339 funding for service in the Barnstable Urbanized Area.

UNIVERSE OF PROJECTS

The universe of projects identified for funding can be divided into one of four funding categories:

- Transportation Projects
- Transportation Programs
- Smart Solutions
- Transportation Studies

A "**transportation project**" is specific in the location and nature of construction or other activity that is anticipated. Examples of potential transportation projects include the reconfiguration of Exit 1C on Route 6 and the construction of a new multi-use trail from the end of the existing Shining Sea Bikepath to the Cape Cod Canal Path. Any project over $20 Million in total cost must be included in the RTP to receive federal funding. Projects under $20 Million may be included in the RTP depending on the level to which the project has been developed.

Given that the RTP, covers a 25-year time-span it beyond our ability to define every specific transportation project that will implemented. Therefore, "**transportation programs**" identifying categories of specific transportation projects that are anticipated to be implemented and identifying funds to pay for these bundles of transportation projects. Examples of potential transportation programs include roadway resurfacing, intersections improvements, and transit operating assistance and capital needs.

"**Smart solutions**" are initiatives that do not require major investments in capital or operations. Examples of potential smart solutions include coordination of Cape Cod Regional Transit Authority and ferry schedules with each other and the development of a Cape-wide bicycle route system.

Finally, "**transportation studies**," seek to solve problems through planning efforts that focus on analysis of alternatives and public participation. These transportation studies ultimately identify solutions to problems that may be in the form of future transportation projects, programs, and/or smart solutions.

See Appendix M for a complete listing of the Universe of Projects for the 2016 RTP. This list constitutes unmet need for the region.

PROJECT ANALYSIS

In order to determine the projects to be contained within the financially constraint of the document analysis was conducted on the universe of projects. Analysis of projects was limited to projects $5 million or greater with the expectation that smaller projects could be programmed in the bundle of "other TIP projects" included in the financial constraint of this document. Analysis was conducted with a subcommittee of the CCJTC where each project was considered for potential benefit, estimated cost, consistency with the objectives of the RTP, equity as it relates to minority, low income, Limited English Proficiency (LEP) and other protected populations,

and GHG reduction potential. Considering these factors and the anticipated available funding, a financially-constrained program of projects was developed with the CCJTC subcommittee and reviewed and approved by the Cape Cod MPO.

FINANCIALLY-CONSTRAINED PROGRAM OF PROJECTS

It is the responsibility of the Cape Cod MPO to select regional priority projects to be funded by the available highway regional target funds. With only $304 million anticipated in highway regional target funds available from 2016 through 2040, there is significantly more need than available funding.

Table 16 presents the Cape Cod MPO's recommended program of project for 2016 through 2040. This program of projects balances the need for large-scale regional projects that are specifically identified with smaller-scale projects included as a bundle of "Other TIP Projects."

Project costs are shown with both 2016 estimated costs and, in order to account for inflation, year of expenditure (YOE) costs that include a 4 percent annual inflation rate.

TABLE 16. HIGHWAY REGIONAL TARGET FUNDING – PROGRAM OF PROJECTS

YEARS OF FUNDING	PROJECT / PROGRAM	2016 ESTIMATED COST	YEAR OF EXPENDITURE (YOE) ESTIMATED COST[47]
2016-2020	Barnstable: Hyannis Access Improvements Phase I (Route 28 at Yarmouth Road)	$6,154,421	$6,656,622
	Route 28 Multimodal Improvements: Various Locations	$20,000,000	$21,632,000
	Other TIP Projects		$18,840,475
	Subtotal Funding		$47,129,097
2021-2025	Route 6 Outer Cape Safety Improvements	$5,000,000	$6,579,659
	Canal Area: Belmont Circle/ Route 25 Ramp Improvements	$5,000,000	$6,579,659
	Barnstable: Hyannis Access Improvements Phase II (Yarmouth Road)	$12,000,000	$15,791,181
	Other TIP Projects		$20,656,494
	Subtotal Funding		$49,606,993
2026-2030	Canal Area: Route 6 Exit 1C Reconfiguration	$10,000,000	$13,159,318
	Cape Cod Rail Trail Expansion: S. Wellfleet to Provincetown	$20,000,000	$32,020,644
	Other TIP Projects		$16,809,139
	Subtotal Funding		$61,989,101
2031-2035	Barnstable: Hyannis Access Improvements Phase III (Route 28 & Airport Rotary)	$25,000,000	$48,697,512
	Infrastructure Improvements (Platform, Parking, etc.) for Buzzards Bay Commuter Rail Service	$5,000,000	$9,739,502
	Other TIP Projects		$11,754,870
	Subtotal Funding		$70,191,885
2036-2040	Cape Cod Rail Trail Expansion: Barnstable to Sandwich	$15,000,000	$36,970,733
	Shining Sea Bikepath Extension to Cape Cod Canal Bikepath	$8,000,000	$19,717,724
	Other TIP Projects		$18,928,138
	Subtotal Funding		$75,616,595
2016 - 2040 TOTAL			**$304,533,671**

In allocating the available highway regional target funding, particularly for the bundled "Other TIP Projects," it is important to keep a balance between different types of projects. Based on feedback from the budget challenge in the RTP survey, recommendations from the CCJTC project selection subcommittee, and, ultimately the recommendation of the Cape Cod MPO, Figure 33**Error! Reference source not found.** presents the recommended distribution of

[47] YOE estimated cost based on inflation to the middle of each five-year time band

funding across the range of project types. Roadway maintenance, bridge maintenance, and transit are also often elements of these highway regional target projects, but are addressed primarily through statewide funding streams. A discussion of the overall RTP funding distribution is presented in the next section.

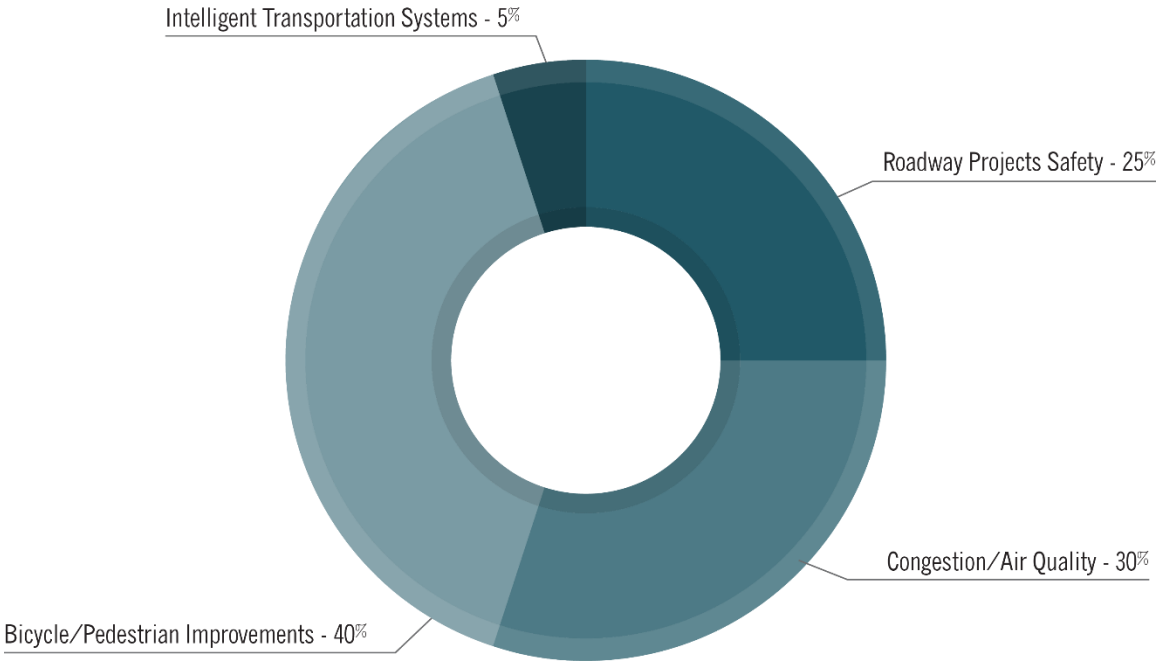

FIGURE 33: HIGHWAY REGIONAL TARGET PROJECT FUNDING – BY PROJECT TYPE

ANALYSIS OF HIGHWAY REGIONAL TARGET PROJECTS

An analysis of potential impacts (positive or negative) on low income, minority, and LEP populations was conducted on regional target projects and is presented in Table 17. Of the approximately $304 million in highway regional target funding, approximately $218 is programmed for specific projects while the remainder will go to "Other TIP Projects." Analysis was limited to the specific projects, with existing TIP analysis procedures ensuring that the "Other TIP Projects" will be programmed in an equitable way.[48]

[48] A recent review of the past ten years of highway projects in the Cape Cod TIP indicated that approximately 59% of spending was on projects within and proximate to low income, minority, and LEP populations. This represents an investment in transportation infrastructure serving these areas that is proportionally higher than other areas on Cape Cod.

TABLE 17. HIGHWAY REGIONAL TARGET PROJECTS – INCOME, MINORITY, AND LEP POPULATION IMPACTS

PROJECT	LOW INCOME [I], MINORITY [M], OR LIMITED ENGLISH PROFICIENCY [LEP] POPULATION AREA PROXIMATE	NATURE OF IMPACT ON LOW INCOME, MINORITY, OR LEP AREA
Barnstable: Hyannis Access Improvements	I, M, LEP	Improved bicycle/ pedestrian access, safety, traffic flow
Route 28 Multimodal Improvements: Various Locations	I, M, LEP	Improved bicycle/ pedestrian access, safety
Route 6 Outer Cape Safety Improvements	I, LEP	Improved bicycle/ pedestrian access, safety, traffic flow
Canal Area: Belmont Circle/ Route 25 Ramp Improvements		
Canal Area: Route 6 Exit 1C Reconfiguration		
Cape Cod Rail Trail Expansion: S. Wellfleet to Provincetown	I, LEP	Improved bicycle/ pedestrian access, safety
Infrastructure Improvements (Platform, Parking, etc.) for Buzzards Bay Commuter Rail Service		
Cape Cod Rail Trail Expansion: Barnstable to Sandwich	I, M, LEP	Improved bicycle/ pedestrian access, safety
Shining Sea Bikepath Extension to Cape Cod Canal Bikepath		

Of the approximately $218 million programmed for specific projects, approximately 60% was on projects within and proximate to minority populations, 77% was on projects within and proximate to low income populations, and 77%, was on projects within and proximate to LEP populations. This represents an investment in transportation infrastructure serving these areas proportionally higher than other areas on Cape Cod. In summary, the areas with higher proportions of low income and minority populations see more transportation dollars spent than other areas on Cape Cod. Further analysis of highway regional target projects is presented in Appendix M.

An analysis of regional target projects was also analyzed in relation to greenhouse gas (GHG) emissions. As presented Table 18, it is anticipated that most of the projects will result in nominal decreases in emissions for sidewalk and/or bicycle infrastructure or other improvements. It is anticipated that other projects will result in a quantifiable decrease in emissions that will need to be verified by statewide modeling efforts.

TABLE 18. HIGHWAY REGIONAL TARGET PROJECTS – ANTICIPATED GHG IMPACTS

PROJECT	ANTICIPATED GHG IMPACT
Barnstable: Hyannis Access Improvements	Quantified Decrease in Emissions from Traffic Operational Improvement – To be verified by statewide modeling
Route 28 Multimodal Improvements: Various Locations	Assumed Nominal Decrease in Emissions from Sidewalk and Bicycle Infrastructure
Route 6 Outer Cape Safety Improvements	Assumed Nominal Decrease in Emissions from Sidewalk and Bicycle Infrastructure
Canal Area: Belmont Circle/ Route 25 Ramp Improvements	Quantified Decrease in Emissions from Traffic Operational Improvement – To be verified by statewide modeling
Canal Area: Route 6 Exit 1C Reconfiguration	Quantified Decrease in Emissions from Traffic Operational Improvement – To be verified by statewide modeling
Cape Cod Rail Trail Expansion: S. Wellfleet to Provincetown	Assumed Nominal Decrease in Emissions from Bicycle Infrastructure
Infrastructure Improvements (Platform, Parking, etc.) for Buzzards Bay Commuter Rail Service	Assumed Nominal Decrease in Emissions from Other Improvements
Cape Cod Rail Trail Expansion: Barnstable to Sandwich	Assumed Nominal Decrease in Emissions from Bicycle Infrastructure
Shining Sea Bikepath Extension to Cape Cod Canal Bikepath	Assumed Nominal Decrease in Emissions from Bicycle Infrastructure

CONCLUSION

The spending on highway regional target projects, highway statewide projects on Cape Cod, and the transit service and projects, summarized in Figure 34, all contribute to the development of a transportation system that will serve the region for years to come.

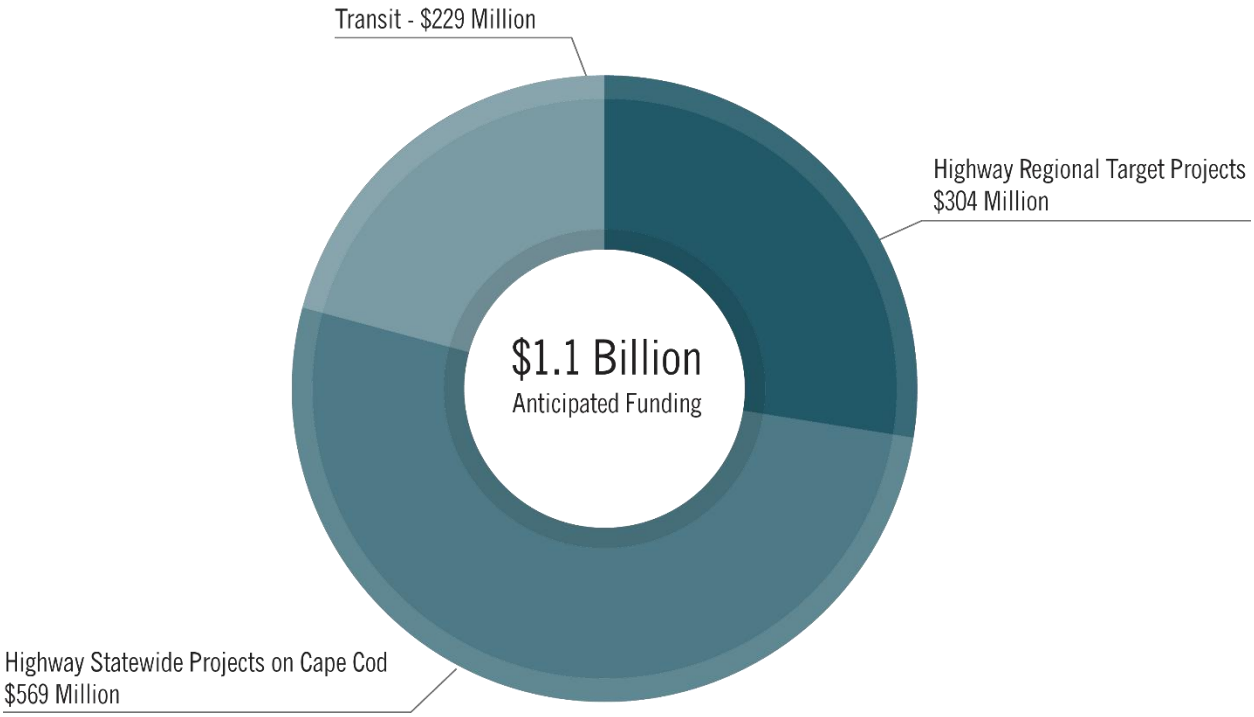

FIGURE 34: SUMMARY OF ANTICIPATED FUNDING

The RTP vision, goals, and objectives set a framework for the spending of surface transportation funds in the region. Based on the overall program established in this report, the anticipated $1.1 billion is allocated to overall spending categories as summarized in Figure 35.

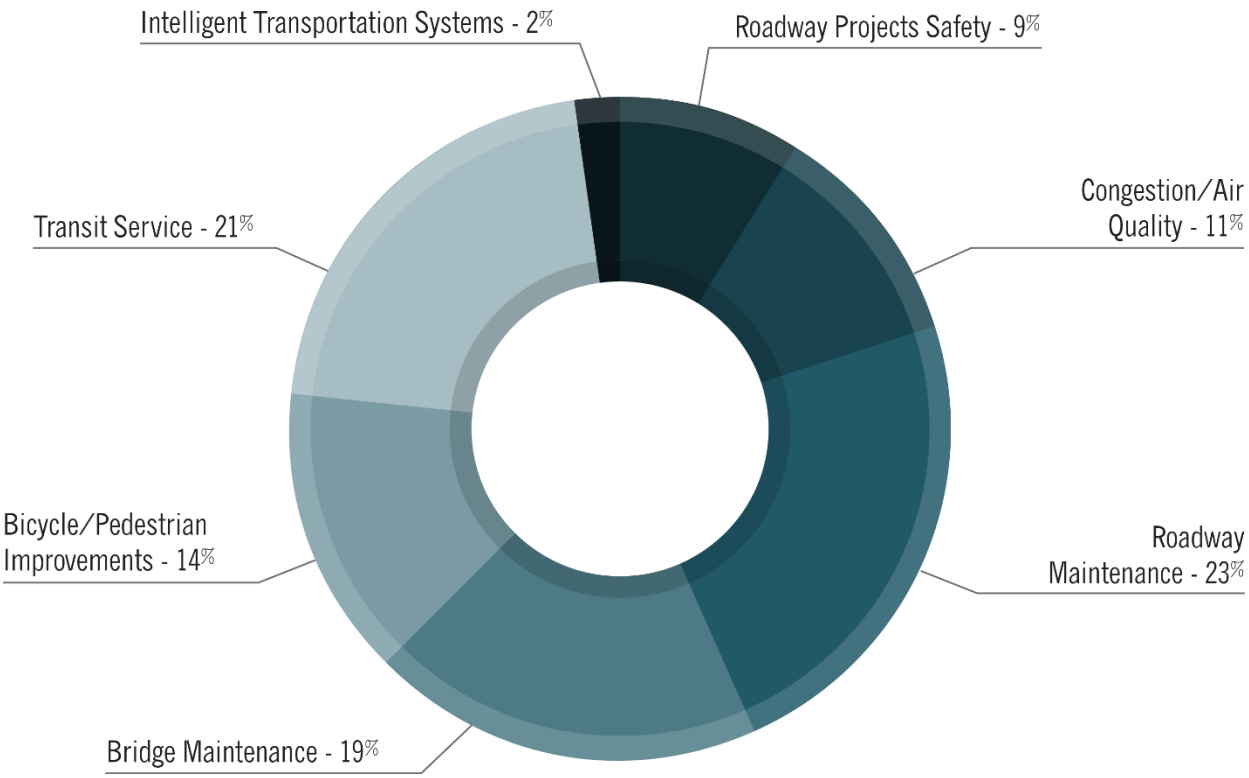

FIGURE 35: SUMMARY OF RECOMMENDED RTP SPENDING DISTRIBUTION

While there is still significant unmet need for the region, see Appendix M, the $1.1 billion of anticipated surface transportation funding available over the next 25 years represents a significant investment in the region.

List of Abbreviations

ADA	Americans with Disabilities Act
BMP	Best Management Practices
BR	Bridge (as Funding Category)
CCC	Cape Cod Commission
CCJTC	Cape Cod Joint Transportation Committee
CCRTA	Cape Cod Regional Transit Authority
CEDS	Comprehensive Economic Development Strategy
CMAQ	Congestion Mitigation and Air Quality Improvement Program
CMP	Congestion Management Process
DPW	Department of Public Works
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIRM	FEMA Flood Insurance Rate Maps
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
FFY or FY	Federal Fiscal Year or Fiscal Year
GHG	Greenhouse Gas
GIS	Geographic Information System
GWSA	Global Warming Solutions Act
ITS	Intelligent Transportation System(s)
LEP	Limited English Proficiency
LID	Low-impact Development
LiDAR	Light Detection and Ranging
MAP-21	Moving Ahead for Progress in the 21st Century
MassDER	Massachusetts Division of Ecological Restoration
MassDOT	Massachusetts Department of Transportation
MPO	Metropolitan Planning Organization
NHPP	National Highway Performance Program
NHS	National Highway System
PPP	Public Participation Plan
RPP	Regional Policy Plan
RTA	Regional Transit Authority

RTP	Regional Transportation Plan
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SLOSH	Sea, Lake and Overland Surges from Hurricanes
STIP	Statewide Transportation Improvement Program
STP	Surface Transportation Program
TAP	Transportation Alternatives Program
TDM	Transportation Demand Management
TIP	Transportation Improvement Program
Title VI	Title VI of the Civil Rights Act of 1964
TMA	Transportation Management Area
UPWP	Unified Planning Work Program
USDOT	United States Department of Transportation
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds
YOE	Year of Expenditure

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