



# CAPE COD CANAL TRANSPORTATION STUDY



Prepared by:



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# Introduction and Study Framework

## 1.1 INTRODUCTION

The Massachusetts Department of Transportation (MassDOT) commissioned the Cape Cod Canal Transportation Study (“the Study”) to gain a comprehensive understanding of multimodal travel within the Cape Cod Canal area — both the conditions that exist today and the forecast conditions for the future. The study identifies a series of multimodal transportation improvements that reflect the study findings and public feedback gathered as part of the study.

Cape Cod and the Islands of Martha’s Vineyard and Nantucket are major travel destinations whose recreational activities create travel demands that soar during the summer. The islands and the 15 municipalities that make up Cape Cod (Exhibit 1-1) feature beaches, golf courses, boating and fishing areas, recreation trails, historic sites, national parks, shopping areas, and restaurants. Families from New England and beyond have made Cape Cod and the Islands their preferred vacation destination for decades. For these same reasons, they have always attracted people as a place to live, to work, raise families, and retire.

The condition, capacity, and multimodal features of the Sagamore Bridge and the Bourne Bridge, the cross-Canal bridges that provide the only vehicular access to and from Cape Cod, lie at the heart the Cape's connectivity limitations. However, the configuration of approach roadways and intersections to the Canal bridges contribute to the severe congestion issues, particularly in the summer. Cape Cod also suffers from a lack of transportation options, with limited bus, transit, and pedestrian/ bicycle facilities.

Cape Cod residents and visitors must often contend with substantial traffic congestion during the summer tourist season and more frequently during the fall and spring shoulder seasons. While these delays result from increased traffic demands created by an influx of visitors, the impacts of these delays—increased travel time, increased crashes, and decreased mobility—impact visitors, year-round residents, and businesses alike.

*The goal of this study is to provide reliable multimodal connectivity and mobility levels across the Canal to ensure connectivity between Bourne and Sandwich and ensure public safety in the event of an evacuation.*

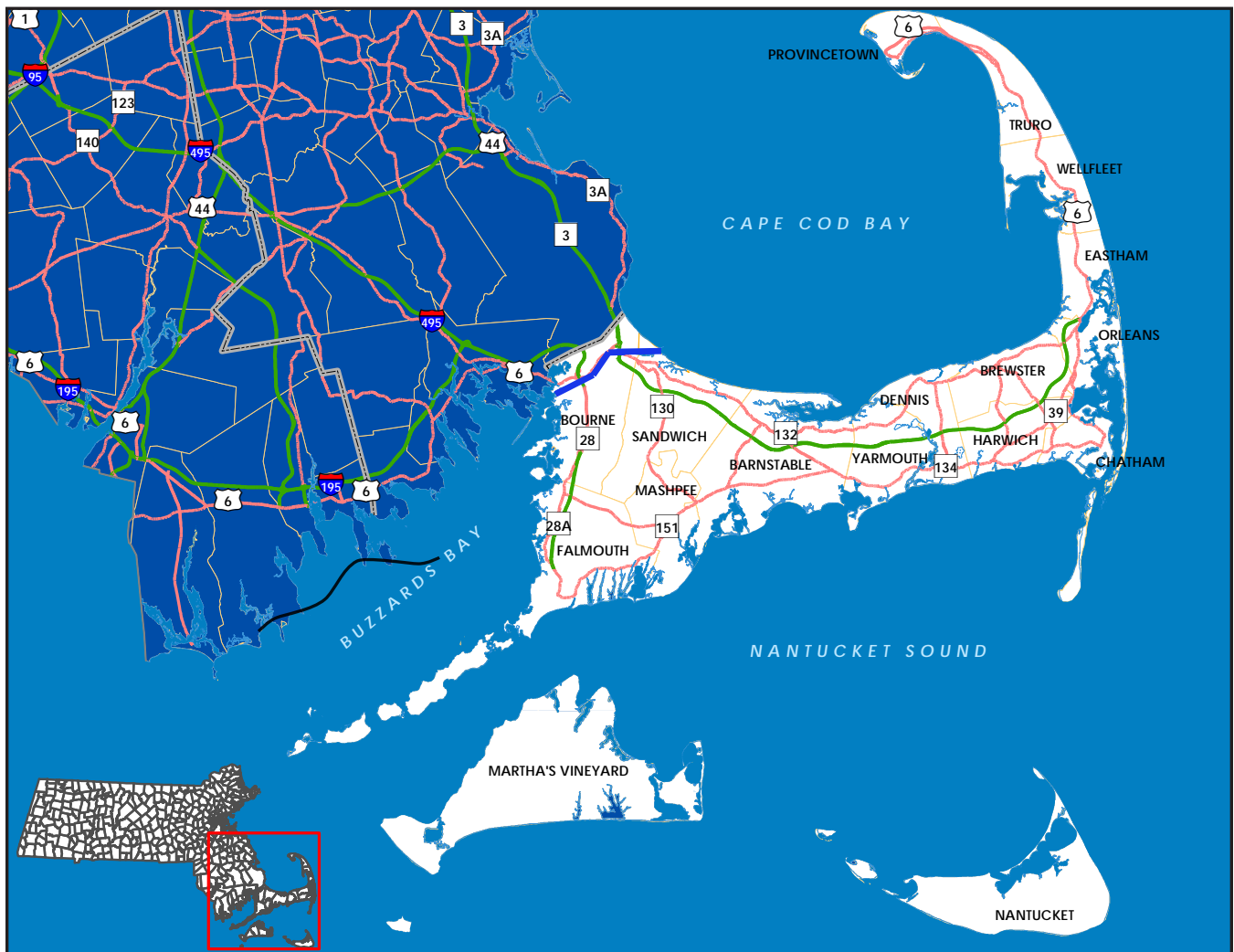


MassDOT launched this study to begin addressing transportation issues surrounding the access points to Cape Cod. The study will provide recommendations for improving all transportation modes in the study area that would expand multimodal connections to protect quality of life for residents and visitors in the future.

This report comprises five main sections, each of which focuses on a study task outlined by MassDOT:

- **Task 1:** Study Area, Goals and Objectives, Evaluation Criteria, and Public Involvement Plan
- **Task 2:** Existing Environmental and Traffic Conditions
- **Task 3:** Future No-Build Conditions
- **Task 4:** Alternatives Development and Analysis
- **Task 5:** Recommendations

*Exhibit 1-1 Cape Cod, Massachusetts*





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### 1.1.1 Cape Cod Canal Bridges

Opened in 1916, the 7-mile-long Cape Cod Canal connects Cape Cod Bay to the east and Buzzards Bay to the west. The Canal bisects the towns of Sandwich and Bourne. The bridges have been designated as eligible for individual listing on the National Register of Historic Places by the Massachusetts Historic Commission.

The U.S. Army Corps of Engineers (USACE) owns and operates the Canal and surrounding lands. Recreational and commercial vessels regularly use the Canal. These recreational and commercial vessels use the Canal extensively, passing beneath three bridges: the Bourne and Sagamore highway bridges and the Buzzards Bay Railroad Bridge.

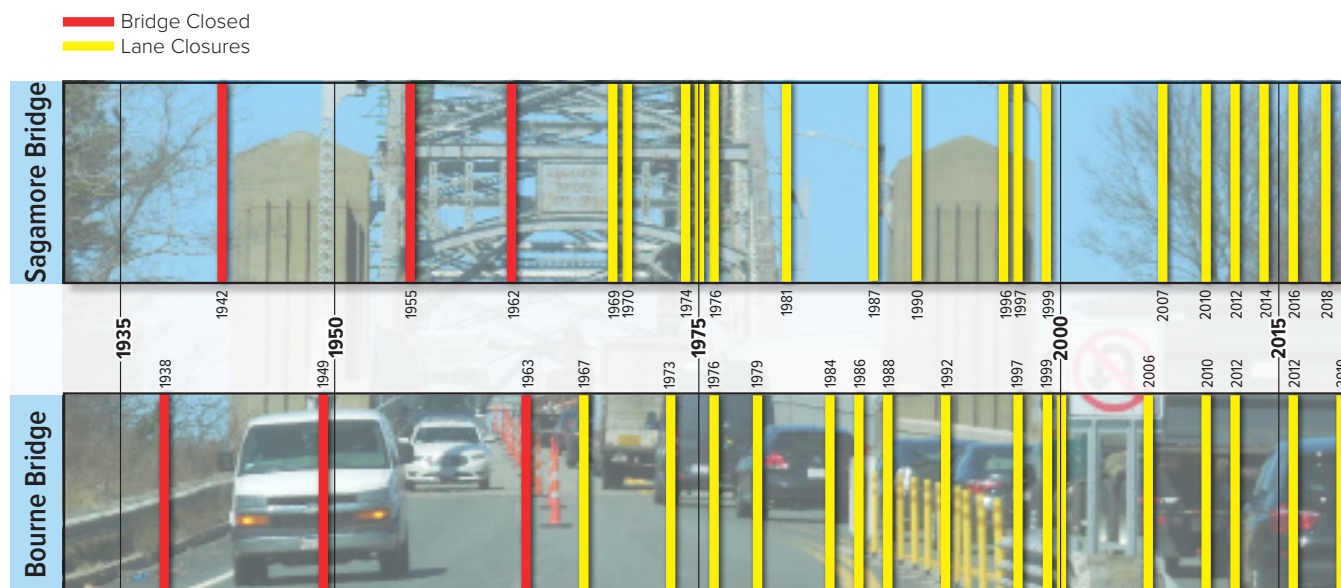
The USACE began construction on the Sagamore and Bourne bridges in 1933 and both opened on June 22, 1935. Like the Canal, the two highway bridges and the railroad bridge are owned and operated by the USACE. Identical in design, each highway bridge is approximately 48-feet in width providing four 10-foot-wide traffic lanes (two lanes in each direction), with no roadway shoulder and a single five-foot wide sidewalk with 2 foot safety walk on the opposite side. The sidewalks are on the east side of the Sagamore Bridge and the west side of the Bourne Bridge.

The design of the bridges is substandard in several ways: lane widths are too narrow, there are no roadway shoulders, and bicycle and pedestrian accommodations are minimal. At more than 80 years old, the bridges have exceeded their design life and require substantial regular maintenance to function reliably. Since 1990, they have needed more frequent maintenance that





# Bourne & Sagamore Bridge Maintenance History



often requires closing a travel lane in the off-season (as shown on the figure above). While necessary, these lane closures cause substantial delay and are disruptive to the local communities.

Due to the condition and age of the bridges, the USACE is currently conducting a ‘Major Rehabilitation Study’ of both bridges. The outcome of this study will be a determination to either continue long-term maintenance of the bridges or to replace them.

Chapter 2 describes the existing transportation facilities, land uses, socio-economic conditions, and environmental resources in the study area.

## 1.2 STUDY CONTEXT

This study focuses on transportation issues in the communities in the upper Cape Cod Canal area, including Bourne, Plymouth, Sandwich, and Wareham. However, the impact of these issues extends to all of Cape Cod (Barnstable County), Nantucket County, and Dukes County (Martha’s Vineyard and the Elizabeth Islands). Portions of both Bourne and Sandwich are north of the Cape Cod Canal.

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This study represents an initial step toward improving the transportation system in the study area. The study aims to:

- build a clear understanding of the existing transportation system, including operational and crash characteristics and projected future conditions at key locations;
- identify roadway locations with substantial operational and/or safety problems; and
- evaluate and provide recommendations, as appropriate, for other forms of transportation, including freight, transit, pedestrian, and bicycle facilities.

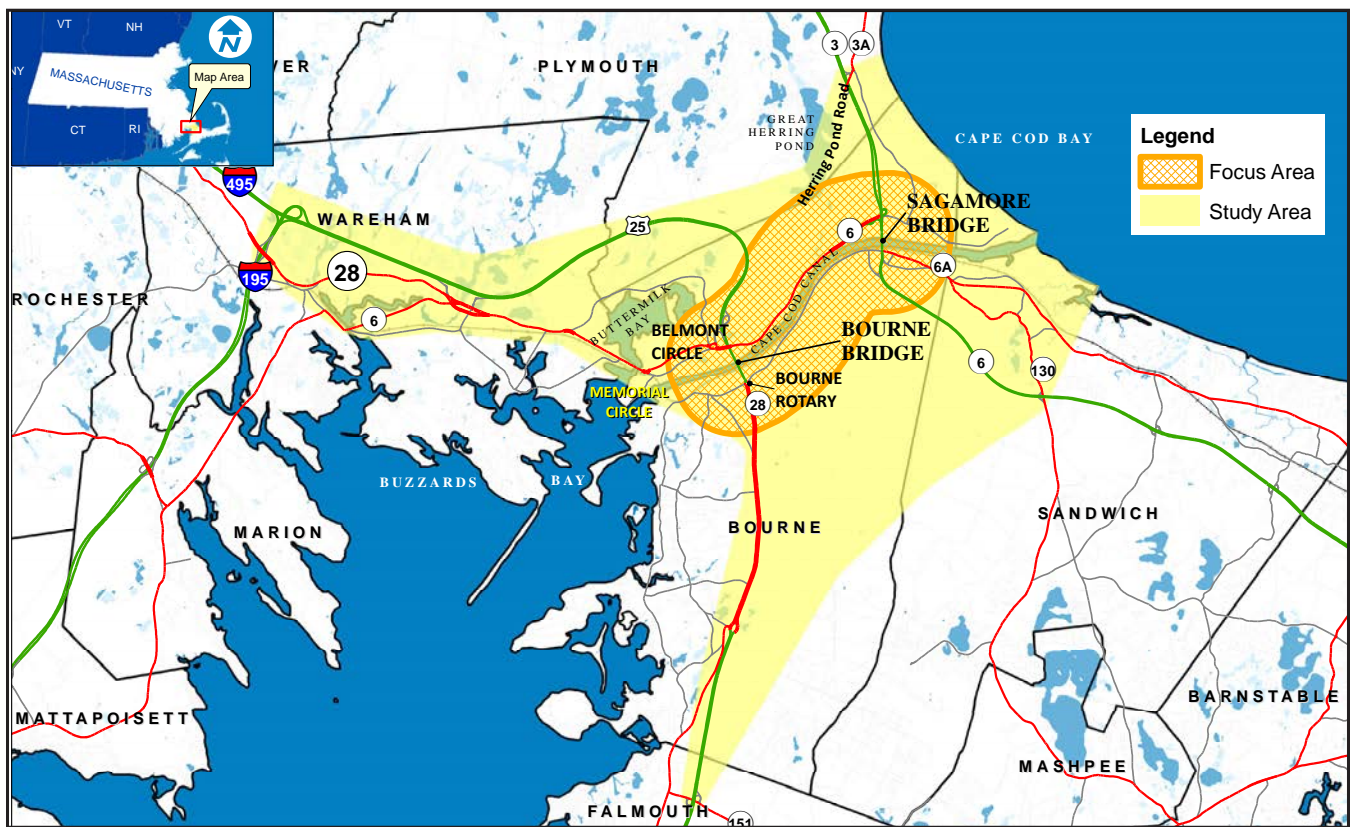
While this study makes recommendations for improving multimodal transportation, these recommendations represent only a first step toward solving these problems. Next steps include a thorough evaluation of potential improvements through state and federal environmental analysis, under the processes created by the National Environmental Policy Act (NEPA) and the Massachusetts Environmental Policy Act (MEPA).

These processes ensure that potential improvements undergo public review. They also ensure that a thorough comparison of alternatives is performed to test a project's ability to meet established purposes and needs, measure and minimize social and natural environmental impacts, and evaluate costs. When these processes end, recommended improvements undergo advanced engineering design and are programmed for funding through coordination with local metropolitan planning organizations, the USACE, and MassDOT.

### 1.3 STUDY AREA

Exhibit 1-2 shows the study area and a focus area. The study area includes land up to four miles on either side of the Canal, extending further at certain points to include major highway interchanges. From the northeast, the study area extends from the Route 3 Exit 2/Herring Pond Road interchange in Plymouth south over the Sagamore Bridge, to the Route 6 Exit 2/Forestdale Road interchange in Sandwich. From the northwest, the study area extends from the Route 25/I-195 interchange in Wareham south, over the Bourne Bridge, to Route 151 in Bourne.

*Cape Cod generally refers to all land within the 15 communities east of the Cape Cod Canal. Barnstable County consists of the same 15 communities, but portions of Bourne and Sandwich lie west of the Canal. Therefore, Barnstable County is slightly larger than Cape Cod in both land area and population*



**Exhibit 1-2 Study Area/Focus Area**

The focus area extends approximately one mile north and south of the Canal. To gain a thorough understanding of the issues and constraints within the study area, information related to environmental resources, socio-economic data, and traffic was gathered for this study area. More detailed data collection and analysis occurred within the focus area where most proposed transportation improvements would likely occur.

## 1.4 GOALS AND OBJECTIVES

The study's goals and objectives were developed, and revised as necessary, by MassDOT in cooperation with the study Working Group and shape the framework of the entire study. All transportation improvements recommended in this study seek to fulfill the following goals and objectives.

### 1.4.1 Goals

- Improve transportation mobility and accessibility in the Cape Cod Canal area and provide reliable year-round connectivity over the Canal and between the Sagamore and Bourne Bridges.



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### 1.4.2 Objectives

- Improve multimodal connectivity and mobility across the Canal to avoid degrading quality of life on the Cape.
- Ensure that cross-Canal connectivity does not become a barrier to reliable intra community travel within Bourne and Sandwich.
- Create a reliable multimodal connection across the Canal to assure public safety in the event of an emergency evacuation of portions of the Cape and accommodate first responders trying to reach the Cape.

The study area definition, goals and objectives, and evaluation criteria (Table 1-1) were presented to the project's Working Group in November 2014 and to the public at the study's first public meeting in January 2015.

## 1.5 EVALUATION CRITERIA

Chapter 4, Alternatives Development and Analysis, documents how potential transportation improvements perform against Transportation Improvement Evaluation Criteria (Table 1-1). These criteria were developed with the aim of advancing the study's goals and objectives (Section 1.4). As appropriate, the study team derived individual criteria directly from either existing data or analytical techniques used in this study. All these criteria—both quantifiable and qualitative measures of effectiveness—helped identify the solutions that best matched the goals and objectives.

## 1.6 PUBLIC INVOLVEMENT PLAN

Public involvement played a key role in this study, following the steps outlined in a "Public Involvement Plan" (Appendix A). Developed at the initiation of the study, the involvement plan guided the study team's efforts to elicit detailed and



*Working Group meeting, Bourne March 10, 2016*

**Table 1-1 Transportation Improvement Evaluation Criteria**

TRANSPORTATION	
Vehicles	Corridor intersections level of service (LOS)
	Corridor volume-to-capacity ratios
	50th- and 95th-percentile queues
Pedestrian and bicycle	Mobility and connectivity
	Bicycle/pedestrian delay
	Expansion/Provision of bicycle facilities
	Expansion/Provision of pedestrian facilities
Travel time	Average roadway travel time along corridor
	Average roadway delay
SAFETY	
Vehicular safety	Conformance with AASHTO and MassDOT standards
	Delay to emergency vehicle access
Pedestrian and bicycle safety	Compliance with ADA requirements
	Compliance with MassDOT requirements
ENVIRONMENT	
Environmental impacts	Impact on coastal resources (sq. ft.)
	Impact on wetland resources (sq. ft.)
	Impact on Areas of Critical Environmental Concern (ACEC)
	Impact on rare species/habitat
	Impact on public water supply
COMMUNITY	
Community impacts	Impact on protected and recreational open space
	Impact on public health
	Impacts on Environmental Justice neighborhoods
	Impact on historical/archaeological resources
Visual	Visual impacts
LAND USE AND ECONOMIC DEVELOPMENT	
Property or business impacts	Impact to residential or commercial property
	Impact to access to commercial property
FEASIBILITY	
Cost	Capital costs
Construction phase impacts	Construction duration
	Impacts on abutting land owners
	Impacts on marine traffic
	Impacts on vehicular traffic
Right-of-way impacts	Permanent and temporary right-of-way impacts

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*The Public Involvement Plan allows the public to contribute to the study in a meaningful way throughout the study.*

comprehensive comments from the public and to build agreement and support for the study recommendations.

Fully aligned with MassDOT's Accessible Meeting Policy Directive, the Public Involvement Plan, guided citizen engagement by emphasizing these principles:

- 1. Public Engagement** – The study offered multiple channels for members of the public to learn about or participate. These included public informational meetings, Working Group meetings, a study website, and media outreach. The public and the Working Group received advance notice of meeting times, and MassDOT worked diligently to hold meetings at convenient times and in convenient, comfortable, and accessible places. Meeting notices appeared on the project website, in e-mail notifications, and in local newspapers.
- 2. Public Participation** – There were many opportunities for members of the public to participate in the study. The study team recorded all questions from members of the public or the Working Group, whether raised in a meeting or by e-mail or letter and answered them in a timely manner. The study team coordinated and encouraged collaboration among agencies and community organizations with the aim of providing members of the public the most up-to-date and accurate information possible.
- 3. Access to Study Information** – The public had, and continues to have, access to information about the study through the study website: ([www.mass.gov/cape-cod-canal-transportation-study](http://www.mass.gov/cape-cod-canal-transportation-study)). Records include all public information and all Working Group presentations, agendas, summaries, and handouts. Community libraries in the study area received printed copies of this report. The study team developed a stakeholder mailing list for distributing e mail. These messages provided notices of website updates, meeting dates and times, media notices, and project documents.
- 4. Accessible Documents** – All information posted on the study website appears in an electronic format accessible to people with disabilities in compliance with Section 508 of the U.S. Rehabilitation Act of 1973, the Massachusetts General Law Chapter 272 Section 98/98A, and Web Content Accessibility Guidelines (WCAG 2.0).



**5. Clear Information** – Information provided to the public, including technical terms and regulatory procedures, has been presented in a clear, concise, and understandable manner.

### 1.6.1 Working Group

A Working Group guided the planning process for identifying transportation improvements in the study area. MassDOT invited members of stakeholder interest groups to join the Working Group. The Working Group, shown in Table 1-2, includes local and state elected officials and representatives from federal and state agencies, area municipalities, metropolitan planning organizations, chambers of commerce, key businesses, and other interested parties. The study team worked closely with the Working Group, sharing relevant study documents as they became available.

Working Group members provided advice and insight on local issues, helped to identify deficiencies in the transportation network, and helped develop and then assess improvement alternatives and their impacts. Feedback from the Working Group allowed continuous refinement of the alternatives under consideration.

Members of the Working Group identified issues important to members’ interests and communities, and members served as liaisons to their respective organizations or communities.

Table 1-2 Invited Members of the Study Working Group

<ul style="list-style-type: none"> <li>• State and Local Elected Officials</li> <li>• Cape Cod Commission</li> <li>• Army Corps of Engineers</li> <li>• Federal Highway Administration</li> <li>• Joint Base Cape Cod</li> <li>• U.S. Coast Guard</li> <li>• Wampanoag Tribes of Aquinnah and Mashpee</li> <li>• Massachusetts State Police</li> <li>• Massachusetts Bay Transportation Authority (MBTA)</li> <li>• Massachusetts Maritime Academy</li> </ul>	<ul style="list-style-type: none"> <li>• Massachusetts Department of Environmental Protection</li> <li>• Massachusetts Office of Coastal Zone Management</li> <li>• Massachusetts Historical Commission</li> <li>• Massachusetts Division of Marine Fisheries</li> <li>• Massachusetts National Heritage and Endangered Species Program</li> <li>• Massachusetts Division of Energy Resources</li> </ul>	<ul style="list-style-type: none"> <li>• Southeastern Regional Planning and Economic Development District (SRPEDD)</li> <li>• Old Colony Planning Council</li> <li>• Cape Cod Canal Area Traffic Task Force</li> <li>• Cape Cod Regional Transit Authority</li> <li>• Greater Attleboro Taunton Regional Transit Authority (GATRA)</li> <li>• Local and Regional Chambers of Commerce</li> <li>• Barnstable County Commission</li> </ul>	<ul style="list-style-type: none"> <li>• Representatives from Bourne, Sandwich, Plymouth and Wareham</li> <li>• Woods Hole, Martha’s Vineyard &amp; Nantucket Steamship Authority</li> <li>• Regional Commercial Bus Lines</li> <li>• Association for Preservation of Cape Cod</li> <li>• Representatives from Canal Area Neighborhoods</li> </ul>
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### 1.6.2 Working Group/Public Meetings

The study team held eleven Working Group and four public meetings between October 2014 and February 2019 (Table 1-3). These meetings were primarily held at the Massachusetts Maritime Academy in Bourne, the Bourne Public Library, and the Sandwich Town Hall.

Table 1-3 Public Involvement Meetings

DATE	LOCATION
WORKING GROUP MEETING #1	
October 29, 2014	Upper Cape Cod Regional Technical School, Bourne
CAPE COD COMMISSION	
January 14, 2015	Cape Cod Commission Office, Barnstable
PUBLIC INFORMATION MEETING #1	
January 15, 2015	Massachusetts Maritime Academy, Bourne
WORKING GROUP MEETING #2	
April 2, 2015	Massachusetts Maritime Academy, Bourne
PUBLIC INFORMATION MEETING #2	
April 16, 2015	Massachusetts Maritime Academy, Bourne
WORKING GROUP MEETING #3	
September 10, 2015	Sandwich Town Hall
CAPE COD COMMISSION	
March 3, 2016	Cape Code Commission Office, Barnstable
WORKING GROUP MEETING #4	
March 10, 2016	Bourne Community Building, Bourne
WORKING GROUP MEETING #5	
July 26, 2016	Massachusetts Maritime Academy, Bourne
WORKING GROUP MEETING #6	
September 28, 2016	Massachusetts Maritime Academy, Bourne
PUBLIC INFORMATION MEETING #3	
December 1, 2016	Massachusetts Maritime Academy, Bourne
WORKING GROUP MEETING #7	
January 26, 2017	Bourne Public Library
WORKING GROUP MEETING #8	
June 29, 2017	Sandwich Town Hall
WORKING GROUP MEETING #9	
December 14, 2017	Sandwich Town Hall
WORKING GROUP MEETING #10	
February 1, 2018	Sandwich Town Hall
WORKING GROUP MEETING #11	
August 1, 2018	Massachusetts Maritime Academy, Bourne
CAPE COD COMMISSION/CAPE COD METROPOLITAN PLANNING ORGANIZATION JOINT MEETING	
February 21, 2019	Barnstable County Complex, Barnstable
PUBLIC INFORMATION MEETING #4	
February 13, 2019	Massachusetts Maritime Academy, Bourne

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### 1.6.3 Outreach to Environmental Resource Agencies

The study team met with representatives of the Massachusetts Division of Fisheries and Wildlife (DFW) to review the parameters of the project and discuss rare species in the study area. DFW discussed the potential sensitivity of northern long-eared bat (designated by the US EPA as a threatened species) and the New England cottontail rabbit.

A formal request for information about the presence of rare, threatened, or endangered species was submitted to the Massachusetts Natural Heritage and Endangered Species Program in December 2016.

### 1.6.4 Outreach to Tribes

The study team held an informational meeting during summer 2015 with representatives of the Mashpee Wampanoag Tribe and the Wampanoag Tribe of Gay Head (Aquinnah). The team presented the overall goals and parameters of the study to tribal representatives. The team also provided a description and mapping of potential transportation improvements to the Mashpee Wampanoag Tribe.

The study team has also held discussions with the Herring Pond Wampanoag Tribal Council about the study goals and potential transportation improvements. The Tribal Council relayed its concerns and identified locations members considered to have cultural significance.

### 1.6.5 Project Website

MassDOT has created and maintained a study website. The website, found at <https://www.mass.gov/cape-cod-canal-transportation-study>, provides information about the study including an overview of the purpose of the study, contact information to provide any study-related questions or comments, and public meeting information. For each Working Group or public meeting held, the website provides a copy of the meeting agenda, the PowerPoint presentation, and the meeting notes.

All information posted on the study website is provided in an electronic format accessible to those with disabilities in compliance with Section 508 of the U.S. Rehabilitation Act of 1973, Massachusetts General Law Chapter 272 Section 98/98A and the Web Content Accessibility Guidelines (WCAG 2.0).