

4 Affected Environment, Environmental Consequences, and Mitigation

4.2 Transportation, Traffic, and Safety

4.2.1 Introduction

This section assesses the potential effects of the No Build and Build Alternatives on the following:

- Highway-traffic operations and safety
- Freight and public bus transit operations
- Commuter parking
- Rail facilities

This section also discusses existing emergency response travel and emergency evacuation routes, including the effects of the No Build and Build Alternatives on public safety and security. It also discusses proposed construction sequencing for the Build Alternative, in addition to assessing the potential for the Build Alternative to induce travel demand.

4.2.1.1 Methodology

Traffic Operations Methodology

- The collection of traffic counts between 2020 and 2022 was restricted because travel patterns shifted during the COVID-19 pandemic. Therefore, the Massachusetts Department of Transportation (MassDOT) developed a travel demand model using 2014 count data, 2019 count data at select locations, and INRIX Origin-Destination data. Spring and summer 2024 traffic counts were also collected to confirm volume patterns have not changed significantly from the previous data.
- The UMass Donohue Institute prepared a travel demand model for the 2050 design year for MassDOT's Office of Transportation Planning based on demographic projections (population, households, and employment) for the Cape Cod communities and future growth projections specific to visitor trips. This demand model was used to develop the traffic volume projections for the 2050 No Build Alternative and 2050 Build Alternative.

- MassDOT analyzed traffic operations using the following software applications in accordance with applicable Highway Capacity Manual standards,¹ and Federal Highway Administration (FHWA) standards:²
 - Synchro: analysis software used to analyze unsignalized and signalized intersections along the local and arterial roadways.
 - Sidra: analysis software used to analyze traffic circles along the local and arterial roadways.
 - Highway Capacity Software: analysis software used to analyze multilane freeway segments, weaving segments, and merge/diverge segments.
 - VISSIM: microsimulation software used to analyze the entire roadway network, including roadways of differing functional classifications.
 - Travel times along critical origin-destination (O-D) routes were estimated for the 2050 No Build Alternative and Build Alternative.
- MassDOT chose the Fall Weekday PM period as the design period in which to evaluate traffic operations. Through a review of the permanent count stations on the bridges, it was determined that the Fall Weekday PM period represents the 85th percentile traffic volumes. This means that 85% of the year, traffic volumes within the Study Area (as defined in [Section 4.2.1.2](#)) are equal to or lower than the Fall Weekday PM period. It is standard practice to use this method to determine the design period.

Traffic Safety Methodology

- MassDOT compiled and summarized existing crash data based on crash reports provided by MassDOT for the period between January 1, 2017, and December 31, 2019.
- Crash rates for roadway segments are determined based on the number of crashes per million vehicle miles traveled, and crash rates for intersections are determined based on the number of crashes per million entering vehicles. MassDOT's website publishes average crash rates within the state for intersections by control type and roadway functional classification.³
- MassDOT used crash modification factors (CMF)⁴ to assess the safety on the bridges based on proposed improvements and referenced CMFs for select improvements from the [Crash Modification Factor Clearinghouse](#) website that is maintained by the FHWA.⁵ The CMFs were used

¹ National Academies of Sciences, Engineering, and Medicine. 2016. [Highway Capacity Manual 6th Edition: A Guide for Multimodal Mobility Analysis](#). <https://doi.org/10.17226/24798>

² Federal Highway Administration. 2019. [Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software](#). <https://ops.fhwa.dot.gov/publications/fhwahop18036/index.htm>

³ Massachusetts Department of Transportation. 2023. [Crash Rates by Roadway Functional Classification](#). <https://www.mass.gov/info-details/intersection-and-roadway-crash-rate-data-for-analysis#intersection-crash-rates>

⁴ A crash modification factor is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site.

⁵ <https://cmfclearinghouse.fhwa.dot.gov/>

to determine relative impact, positive or negative, with respect to safety and were not applied to predicted, expected or observed crash data.

4.2.1.2 Study Area

For the purposes of conducting a detailed traffic operations and safety evaluation, the Study Area consists of the major roadways, interchanges, and intersections approximately within a 2-mile area centered around Sagamore Bridge and Bourne Bridge ([Figure 4.2-1](#)).

MassDOT also conducted limited traffic operations analysis along additional roadways, interchanges, and intersections beyond the limits indicated in [Figure 4.2-1](#). Refer to **Appendix 4.2, Traffic Engineering Technical Report**, for more information on the traffic operations analysis conducted at these locations.

4.2.2 Affected Environment

Sagamore Bridge and Bourne Bridge provide the only roadway access points to and from Cape Cod. Both bridges provide two 10-foot-wide travel lanes per direction with speed limits of 40 miles per hour. Traffic volumes and congestion levels in the vicinity of Cape Cod Canal are typically highest during the summer when more visitors travel to Cape Cod and the islands of Martha’s Vineyard and Nantucket. [Table 4.2-1](#) lists the Average Annual Daily Traffic (AADT) for the bridges in 2019.

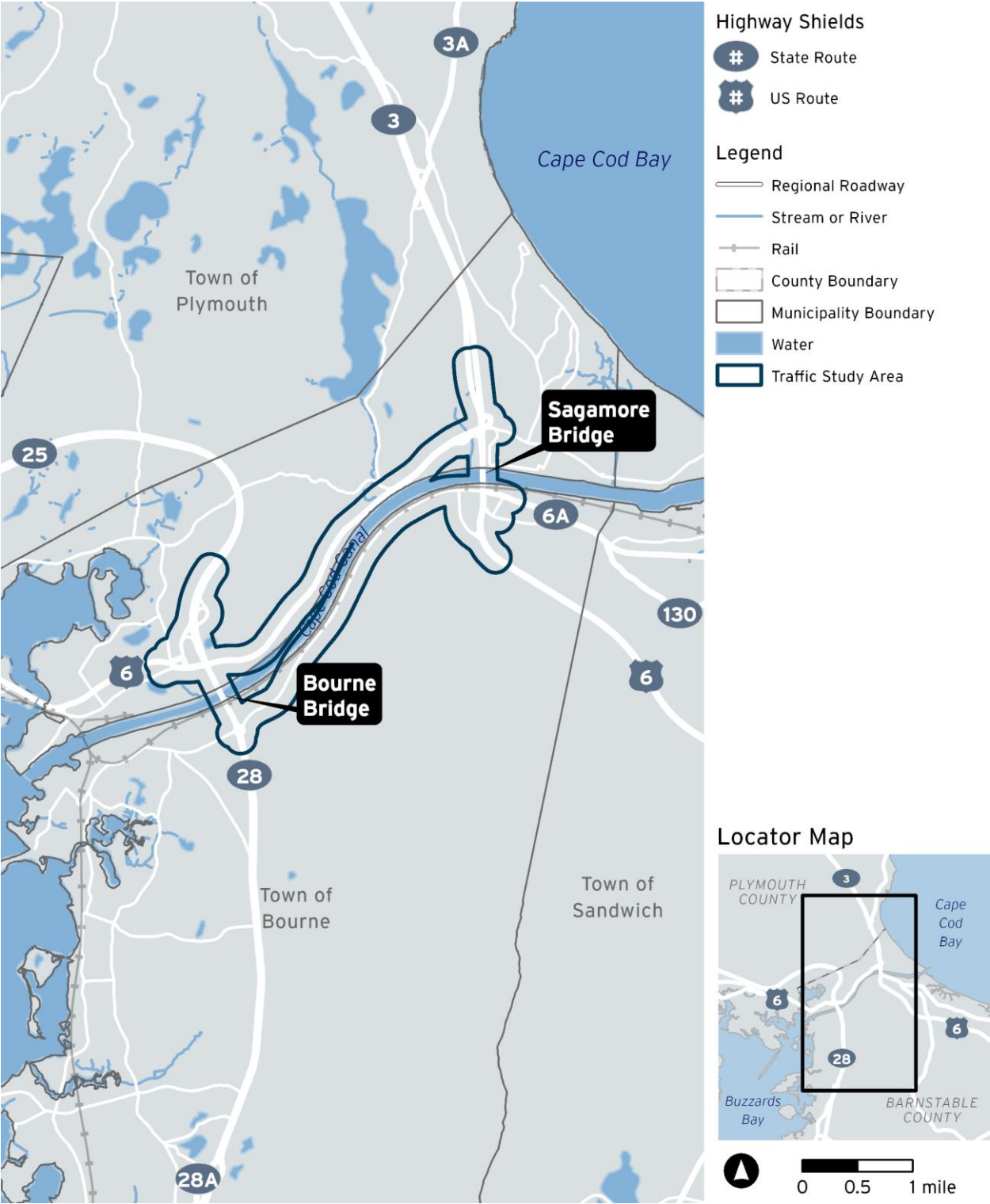
Table 4.2-1. Average Annual Daily Traffic on Sagamore and Bourne Bridges, 2019

Direction	Sagamore Bridge	Bourne Bridge
Northbound	33,120	21,520
Southbound	28,870	24,980
Total	61,990	46,500

4.2.2.1 Vehicular Traffic Operations

Sagamore Bridge is accessed from points north via State Route 3/Pilgrims Highway and from points on Cape Cod via U.S. Route 6. In the southbound direction, State Route 3 carries two travel lanes toward Sagamore Bridge and narrows to a single lane as State Route 3 approaches the bridge. The single lane from State Route 3 is joined by an add-lane from the entrance ramp from Scenic Highway (U.S. Route 6) to form the two lanes that are carried over the bridge. Congestion stemming from the steep grade and the narrow lanes on the bridge and the lane reduction on State Route 3 cause queues to extend approximately 2 miles from the bridge during the Fall Weekday PM peak hour (identified as 4 p.m. to 5 p.m.). In the northbound/westbound direction, U.S. Route 6 carries two travel lanes toward Sagamore Bridge. A heavy merge from the entrance ramp from Cranberry Highway immediately upstream of the bridge causes traffic on U.S. Route 6 to slow, creating congestion approaching Sagamore Bridge.

Figure 4.2-1. Traffic Study Area



Source: Massachusetts Department of Transportation, 2024

Bourne Bridge is accessed from points north and west via State Route 25, which carries three travel lanes per direction, but narrows to two travel lanes approaching the bridge. Heavy traffic volumes exiting to Belmont Circle and merging from the entrance ramp from Belmont Circle combined with steep inclines on the bridge itself cause congestion on the bridge approach in most peak hours. State Route 25 eastbound transitions to State Route 28 just north of Bourne Bridge, which spans Cape Cod Canal and connects to the Bourne Rotary at the bridge’s southern end. The rotary is a frequent source of congestion during peak travel hours. Difficulty merging into the rotary causes queueing on State Route 25 to extend for several miles during some peak hours. Limited capacity and heavy traffic volumes on the Bourne Rotary also cause queueing to extend onto its other approaches from northbound State Route 28, westbound Sandwich Road, and eastbound Trowbridge Road. Queueing on northbound State Route 28 often extends approximately 2 miles during the Fall Weekday PM peak hour (identified as 4 p.m. to 5 p.m.).

Because the bridges are only approximately 3.5 miles apart, drivers traveling regionally via State Route 3 and U.S. Route 6 or State Routes 25 and 28 often use the bridges interchangeably based on congestion levels. Drivers use Scenic Highway and Sandwich Road to reach the other bridge if navigational apps and dynamic message signage along the highways indicate lesser congestion on one of the two bridges during peak hours. Scenic Highway generally carries two lanes of east-west traffic per direction and connects Bourne Bridge with Sagamore Bridge on the north side of the canal. Sandwich Road generally carries one lane of east-west traffic per direction connecting the bridges on the south side of the canal.

Appendix 4.2, Traffic Engineering Technical Report, includes 2019 Existing Conditions traffic analysis including Level of Service for all Study Area intersections and roadways.

MassDOT prepared a VISSIM microsimulation model for the Fall Weekday PM peak hour to understand traffic operations on a network-wide basis. **Table 4.2-2** provides a summary of the 2019 Existing Conditions VISSIM model results for the Fall Weekday PM peak hour. Processed volumes are the number of vehicles that enter the model network that can complete their route within the hour-long simulation run. The network travel times are the summation of the travel times for all vehicles within the network.

Table 4.2-2. 2019 Existing Conditions VISSIM Model Network Results

Metric	Fall Weekday PM Peak
Processed Volumes	10,705
Network Travel Times (vehicle-hours traveled)	2,397

Appendix 4.2, Traffic Engineering Technical Report, includes a detailed summary of the 2019 Existing Conditions VISSIM analysis.

4.2.2.2 Freight Operations, Public Bus Transit, and Parking Facilities

As the only roadway access points between mainland Massachusetts and Cape Cod, Sagamore and Bourne Bridges and their adjoining highways—including State Route 3 and U.S. Route 6 at Sagamore

Bridge, and State Route 25 and State Route 28 at Bourne Bridge—are critical arteries for intrastate and interstate freight-truck transportation. The bridges also provide essential routes for freight-truck trips to and from the islands of Martha’s Vineyard and Nantucket via ferry connections at the Woods Hole and Hyannis Harbor terminals on the south shore of Cape Cod.

According to MassDOT traffic count data in 2019, nearly 6,000 trucks crossed the bridges on an average weekday, accounting for approximately 5.4% of all bridge traffic. Because Cape Cod Canal splits the towns of Bourne and Sandwich into Cape Cod and mainland sections, the bridges provide essential school bus transportation links for students living and commuting to school on either side of the canal. According to the Cape Cod Commission, the bridges provide access for 122 daily school bus crossings of Cape Cod Canal.⁶

The Cape Cod Regional Transit Authority (CCRTA) serves as the primary provider of public transportation within the Study Area and Barnstable County. The CCRTA’s year-round fixed public transit services operating within the Study Area includes Bourne Run and Sandwich Line. Bourne Run travels between Mashpee Commons and the Buzzards Bay Train Station, via Scenic Highway, County Road, State Route 28A, and State Route 151 ([Figure 4.2-2](#)). The Sandwich Line travels between the Hyannis Transportation Center in downtown Hyannis, through Sandwich, to the Buzzards Bay Train Station ([Figure 4.2-3](#)).

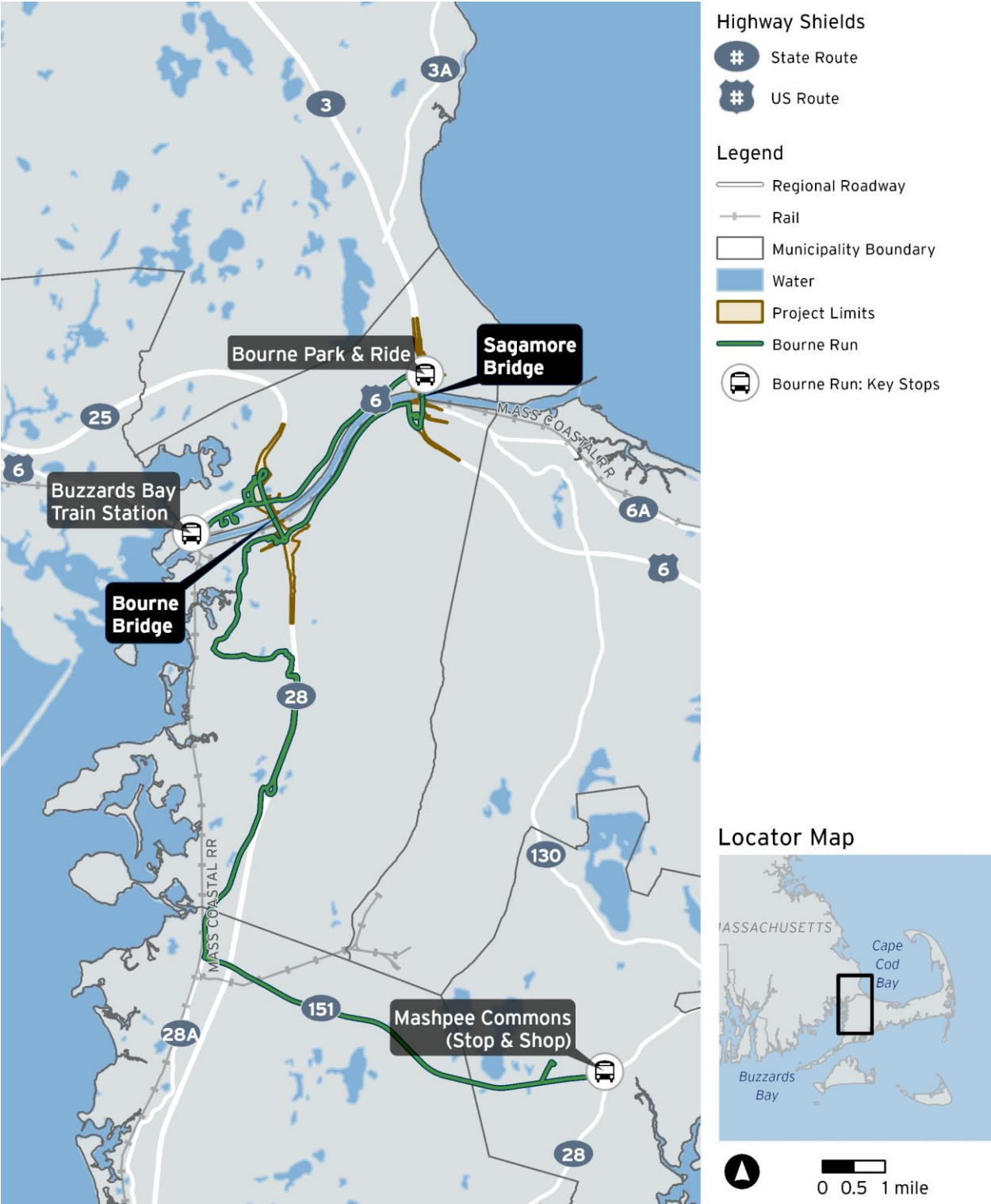
As discussed in **Chapter 2, Purpose and Need**, Sagamore and Bourne Bridges feature the following geometric constraints that affect the speed and efficiency of freight-truck and bus transit operations across Cape Cod Canal:

- Narrow travel lanes
- Lack of shoulders and physical separation between opposing traffic lanes
- Long steep grades of up to 6%

The mainline highway approaches to the bridges and their interchanges also feature geometric constraints that impede efficient freight-truck and bus transit operations. In the Sagamore North Study Area quadrant, the lane drop along State Route 3 southbound approaching Sagamore Bridge causes recurring congestion and reduced vehicle speeds. In the Sagamore South Study Area quadrant, the geometry of U.S. Route 6 Exit 55 westbound at Cranberry Highway features short acceleration and deceleration lanes, as well as steep grades approaching Sagamore Bridge, which do not allow vehicles—particularly heavy-duty trucks and buses—to gain adequate speed to merge into traffic or to slow down and exit the mainline travel lane. Belmont Circle (in the Bourne North Study Area quadrant) and Bourne Rotary (in the Bourne South Study Area quadrant) are also major bottlenecks for freight-truck and bus transit traffic due to high traffic volumes and cross mixing of local and regional traffic.

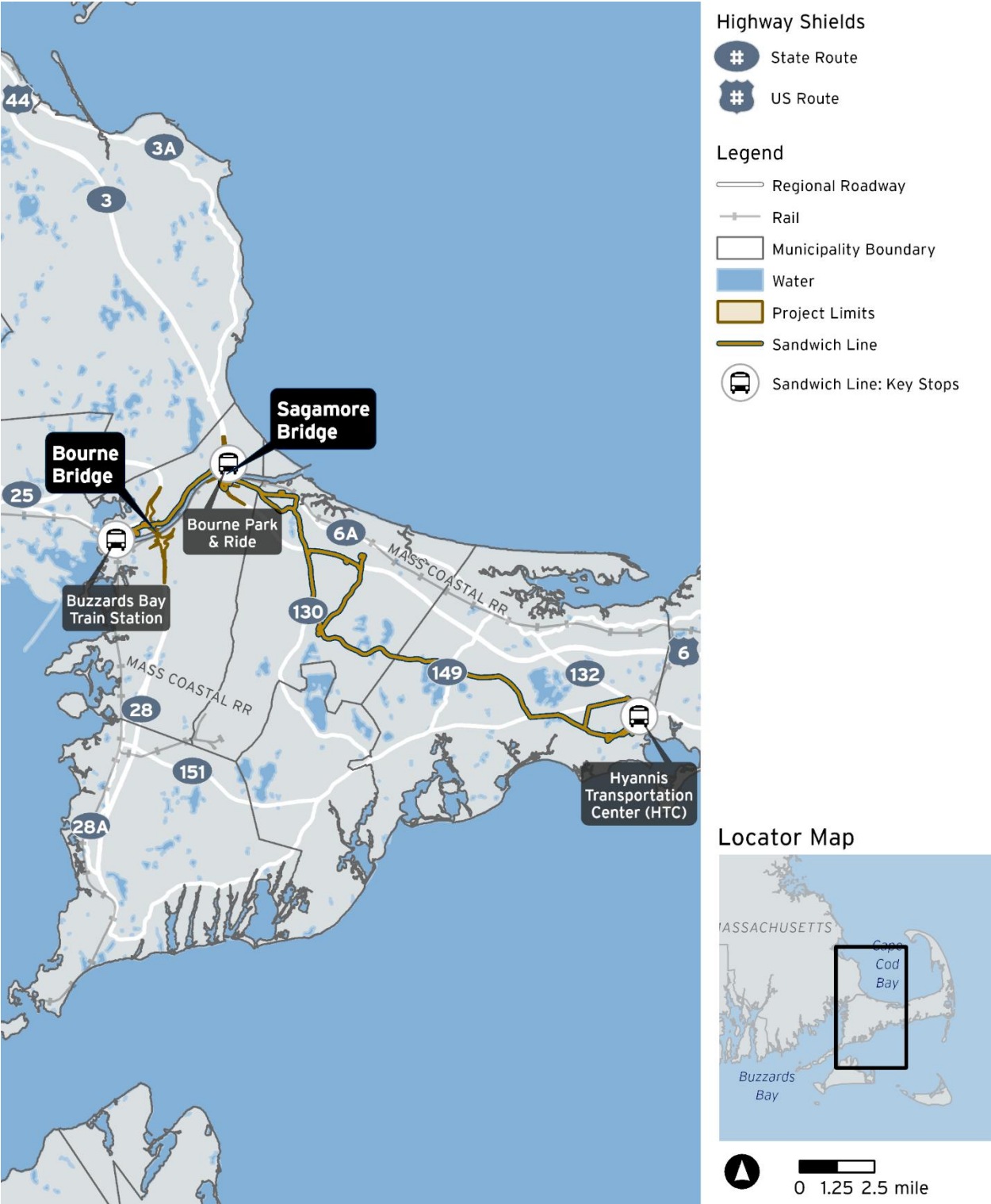
⁶ Cape Cod Commission. 2024. [2024 Cape Cod Comprehensive Economic Development Strategy](https://www.capecodcommission.org/resource-library/file?url=/dept/commission/team/Website_Resources/economicdevelopment/CEDS/2024/2024_CapeCodCEDS_Draft.pdf). May 15 (Draft). https://www.capecodcommission.org/resource-library/file?url=/dept/commission/team/Website_Resources/economicdevelopment/CEDS/2024/2024_CapeCodCEDS_Draft.pdf. The Cape Cod Commission met June 13, 2024, and voted to approve the 2024 CEDS.

Figure 4.2-2. Bourne Run (Cape Cod Regional Transit Authority)



Source: Massachusetts Department of Transportation, 2024

Figure 4.2-3. Sandwich Line (Cape Cod Regional Transit Authority)



Source: Massachusetts Department of Transportation, 2024

The Bourne Park and Ride Lot, located north of Cape Cod Canal in the southeast quadrant of the State Route 3/U.S. Route 6 (Scenic Highway) interchange in Bourne, is the only commuter parking facility in the Study Area (**Exhibit 4.2-1**). This lot, which is owned by MassDOT, allows commuters to park their individual vehicles and then transfer to high-occupancy modes of transportation (such as buses, vanpools, or carpools) to complete their commute. The Bourne Park and Ride Lot is serviced by the privately owned Plymouth & Brockton Bus Company, which offers daily bus trips from Woods Hole and Hyannis to downtown Boston and Logan Airport via Sagamore Bridge.

In 2009, parking capacity at Bourne Park and Ride Lot was increased from 377 parking spaces to 396 parking spaces. According to data collected by the Cape Cod Commission at various samples during peak travel summer months from 2009 to 2019, the maximum lot utilization was 96% of available spaces, while the average annual lot utilization was 73% of available spaces.⁷ Based on more recent data collected by the Cape Cod Commission during the peak travel summer months from 2021 to 2022, the lot was observed at maximum capacity in 2021, and below 60% capacity in 2022.⁸

4.2.2.3 Traffic Safety Analysis

As noted in **Chapter 2, Program Purpose and Need**, Sagamore and Bourne Bridges experienced significantly higher crash rates than the MassDOT average crash rate for similar facilities (Principal Arterial-Other Freeway and Expressway) during the most recently studied period between January 1, 2017, and December 31, 2019. **Table 4.2-3** summarizes the number of crashes reported on each bridge, as well as the interchanges and local roadways in each Study Area quadrant.

Exhibit 4.2-1. Aerial View of Bourne Park and Ride Lot, facing north, August 2024



Source: Massachusetts Department of Transportation, 2024

⁷ Cape Cod Commission. 2018. [Cape Cod Commission Traffic Counting Report 2018 \(Counts Conducted 2009-2019\), Appendix F: Park and Ride Lot Counts](https://capecodcommission.org/resource-library/file/?url=/dept/commission/team/Website_Resources/transportation/counts/pdf_count/PNR.pdf). https://capecodcommission.org/resource-library/file/?url=/dept/commission/team/Website_Resources/transportation/counts/pdf_count/PNR.pdf

⁸ Cape Cod Commission. 2023. [2024 Regional Transportation Plan, Technical Appendix G: Congestion Management Plan](https://capecodcommission.org/resource-library/file?url=/dept/commission/team/tr/Transportation%20Plans/RTP/2024_RTP/Report/FINAL%20PDF/RTP%20Appendix%20G%20-%20Congestion%20Management%20Plan.pdf). July. https://capecodcommission.org/resource-library/file?url=/dept/commission/team/tr/Transportation%20Plans/RTP/2024_RTP/Report/FINAL%20PDF/RTP%20Appendix%20G%20-%20Congestion%20Management%20Plan.pdf

Approximately 40% of the crashes on Sagamore Bridge and Bourne Bridge were reported as rear-end type collisions, which can be attributed to congestion. Approximately 60% of the crashes were reported to be either sideswipe, head-on, or single-vehicle crashes. These types of crashes can be attributed to the narrow 10-foot lanes, lack of shoulders, and lack of median separation between the directions of travel. Road Safety Audits (RSA) were not performed on Sagamore and Bourne Bridges as they do not fall within the top 5% of crash locations within the Cape Cod Commission's planning region. However, historical crash data was reviewed and analyzed to better understand the issues and safety needs within the Study Area.

Table 4.2-3. Crash Summary, 2017-2019

Bridge/Study Area Quadrant	2017	2018	2019	Total
Sagamore Bridge	13	24	19	56
Sagamore North quadrant	49	37	35	121
Sagamore South quadrant	33	37	32	102
Bourne Bridge	15	21	9	45
Bourne North quadrant	64	88	86	238
Bourne South quadrant	177	199	253	629

MassDOT performed several RSAs at intersections and roadways within the Study Area to identify potential safety issues and possible safety improvement opportunities, including Scenic Highway, Sandwich Road, and Cranberry Highway. **Figure 4.2-4** depicts a map of the locations within the Study Area where RSAs were conducted. **Appendix 4.2, Traffic Engineering Technical Report**, includes the RSA reports that document the existing issues and potential solutions.

4.2.2.4 Rail

The Cape Cod Canal Railroad Bridge at Buzzards Bay, which carries the Cape Cod Railroad (also referred to as the Cape Main Line) over Cape Cod Canal, provides the only access to Cape Cod by rail. The Cape Cod Canal Railroad Bridge, which is owned and operated by the U.S. Army Corps of Engineers, is a vertical lift bridge that lowers to allow trains to cross the canal and moves up to allow large marine vessels to pass underneath. Freight service is the major user of Cape Cod's rail network in addition to scenic excursions and weekend

Exhibit 4.2-2. Cape Main Line Railroad Track under Bourne Bridge, October 2024



Source: Massachusetts Department of Transportation, 2024

weekend passenger service.⁹ Freight rail facilities within the Study Area include the Cape Main Line, which is owned by MassDOT. The railroad segment of the Cape Main Line within the Study Area runs under Sagamore Bridge and Bourne Bridge (**Exhibit 4.2-2**).

Cape Rail, Inc. operates under contract to provide freight rail service on the Cape Main Line. The Massachusetts Coastal Railroad (a subsidiary of Cape Rail, Inc.) operates freight rail service on the Cape Main Line, which runs from Middleboro (northwest of Cape Cod) to Hyannis and South Yarmouth, and the Falmouth Secondary Line, which runs from Buzzards Bay to North Falmouth and Otis Air Force Base (**Figure 4.2-5**). The Massachusetts Coastal Railroad also operates an “Energy Train” via the Cape Main Line, which transports solid waste from the Yarmouth Transfer Station to a waste-to-energy and recycling facility in Rochester, Massachusetts.

The Cape Main Line is also used for passenger service by the Cape Cod Central Railroad (a subsidiary of Cape Rail, Inc.), and the CCRTA, in coordination with MassDOT and the Massachusetts Bay Transportation Authority (MBTA). The Cape Cod Central Railroad operates seasonal tourist excursion trains, from approximately April through December, on 27 miles of former New Haven Railroad tracks around Cape Cod. The CCRTA operates the CapeFLYER passenger rail service between Boston’s South Station and the Hyannis Transportation Center in downtown Hyannis via the MBTA

Middleboro/Lakeville Commuter Rail Line and the Cape Main Line on Friday evenings, Saturdays, and Sundays between Memorial Day and Labor Day. The Bourne Station, which serves the CapeFLYER, is within the Study Area under Bourne Bridge (**Exhibit 4.2-3**). According to CCRTA, 922 riders boarded, and 1,417 riders disembarked the CapeFLYER train at Bourne Station during the 2023 season.¹⁰ During the 2022 season, 791 riders boarded and 1,113 riders disembarked the CapeFLYER train at Bourne Station.¹¹

Exhibit 4.2-3. Bourne Station, September 2022



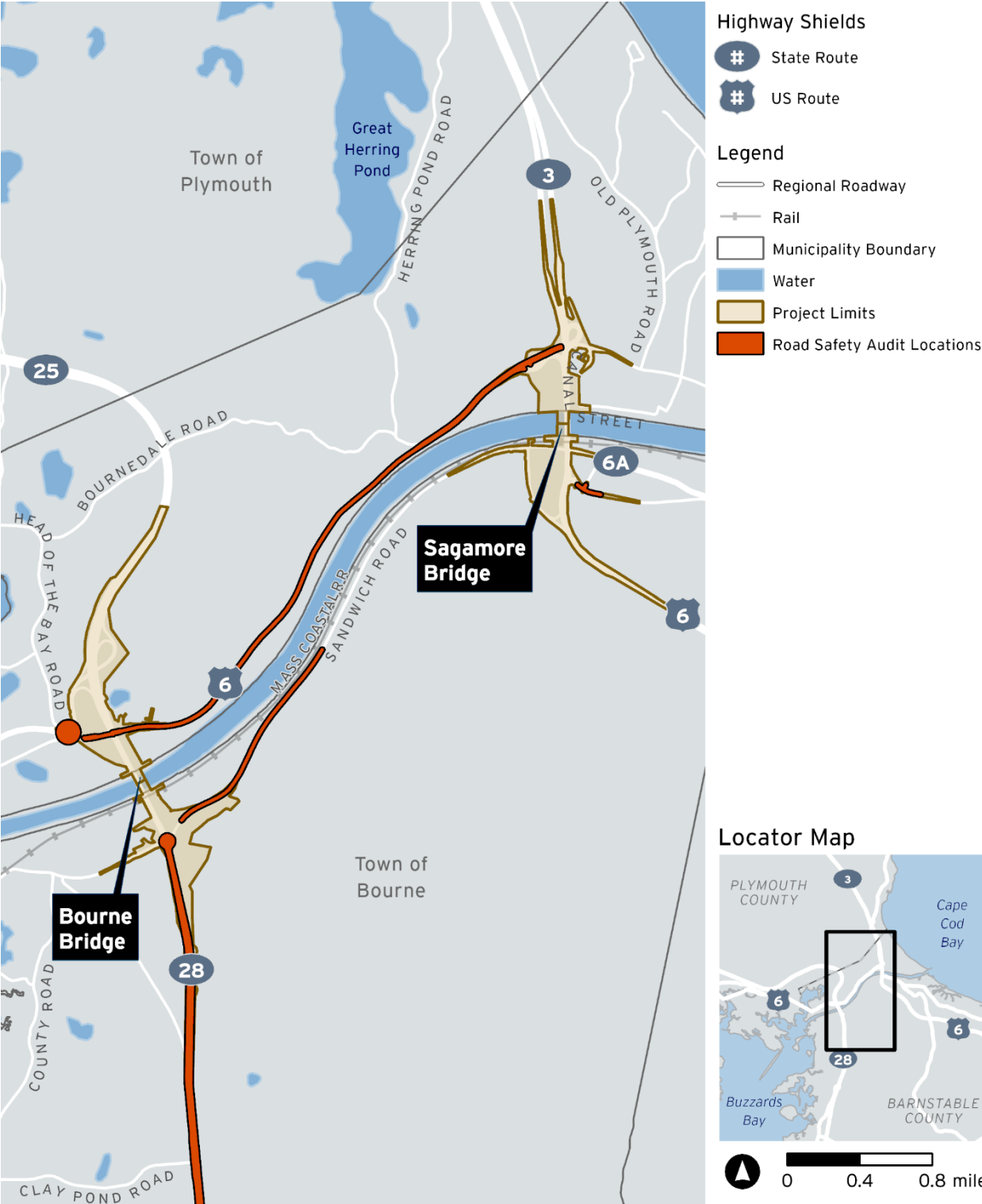
Source: Massachusetts Department of Transportation, 2022

⁹ Cape Cod Commission. 2023. [2024 Regional Transportation Plan, Technical Appendix E: Freight](https://capecodcommission.org/resource-library/file?url=/dept/commission/team/tr/Transportation%20Plans/RTP/2024_RTP/Report/FINAL%20PDF/RTP%20Appendix%20E%20-%20Freight.pdf). July https://capecodcommission.org/resource-library/file?url=/dept/commission/team/tr/Transportation%20Plans/RTP/2024_RTP/Report/FINAL%20PDF/RTP%20Appendix%20E%20-%20Freight.pdf

¹⁰ Cape Cod Regional Transit Authority. 2023. [CCRTA Bourne Town Report](https://capecodrta.org/wp-content/uploads/2023/10/FY23-Bourne.pdf). September. <https://capecodrta.org/wp-content/uploads/2023/10/FY23-Bourne.pdf>

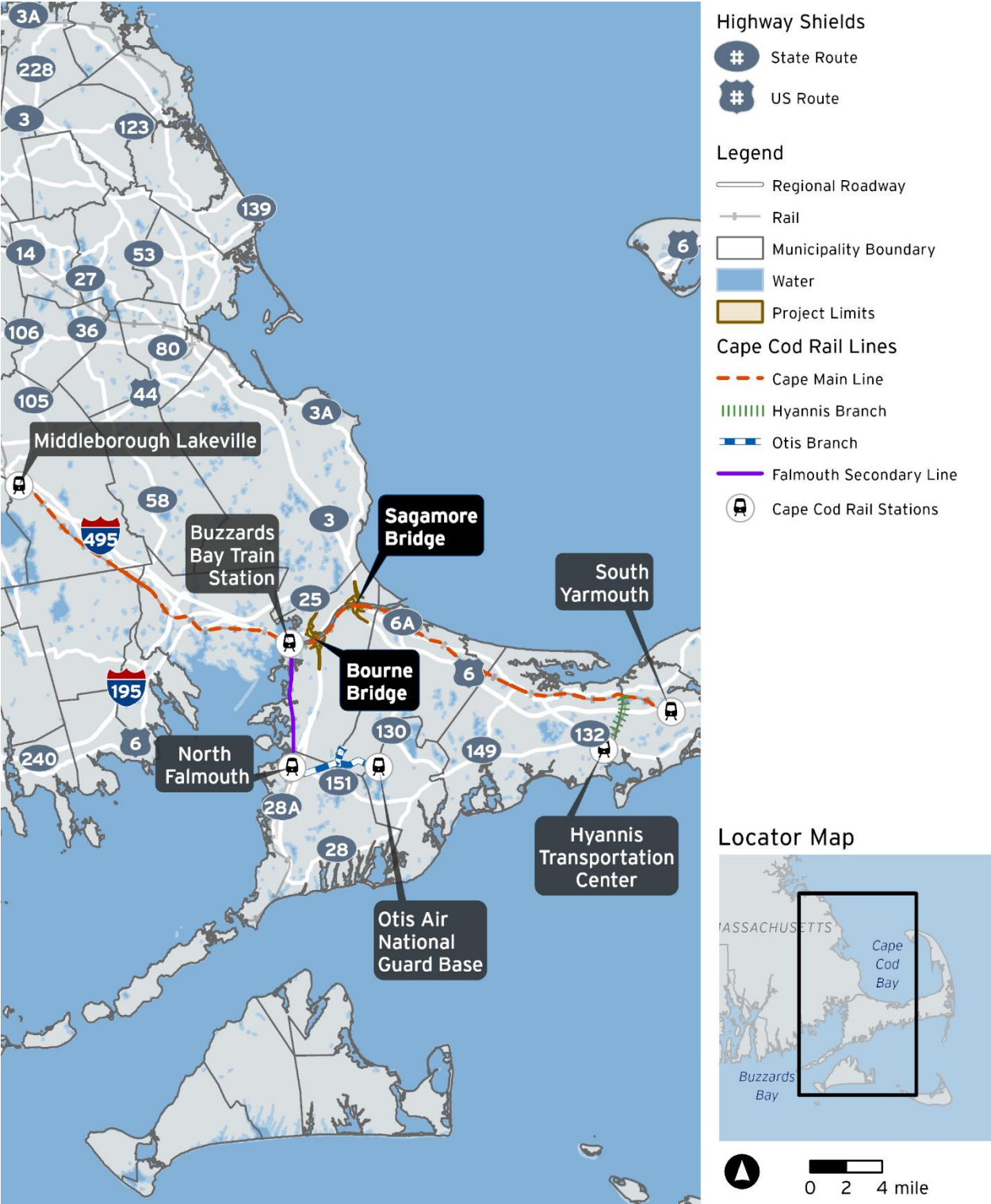
¹¹ Cape Cod Regional Transit Authority. 2022. [CCRTA Bourne Town Report](https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fcapecodrta.org%2Fwp-content%2Fuploads%2F2022%2F12%2FFY22-Bourne-Final.docx&wdOrigin=BROWSELINK). September. <https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fcapecodrta.org%2Fwp-content%2Fuploads%2F2022%2F12%2FFY22-Bourne-Final.docx&wdOrigin=BROWSELINK>

Figure 4.2-4. Road Safety Audit Locations within Study Area



Source: Massachusetts Department of Transportation, 2024

Figure 4.2-5. Cape Cod Rail Network



Source: Massachusetts Department of Transportation, 2024

In 2021, MassDOT, in partnership with the Cape Cod Commission, published the Cape Rail Study, which evaluated the feasibility of year-round passenger rail service to Cape Cod.¹² The Cape Rail Study considered two alternatives to expand passenger rail service to Cape Cod:

- Alternative 1 would provide weekday commuter service to and from Buzzards Bay, with a transfer required at Middleborough Station for passengers traveling to or from South Station in Boston.
- Alternative 2 would build and expand upon Alternative 1 with extended service south of Cape Cod Canal to Bourne Station along the Cape Main Line. Alternative 2 would provide additional service outside peak commuting periods and add direct service to South Station in Boston without a transfer.

4.2.2.5 Emergency Response

Cape Cod Canal physically divides the town of Bourne into Cape Cod and mainland sections, with Sagamore and Bourne Bridges providing the only roadway access to both sections of the town. Within the town of Bourne, the Bourne Police Department has one station on the mainland side of the canal and the State Police has one barracks on the Cape Cod side of the canal (**Figure 4.2-6**). The town of Bourne's fire stations are on either side of the canal (**Figure 4.2-6**).

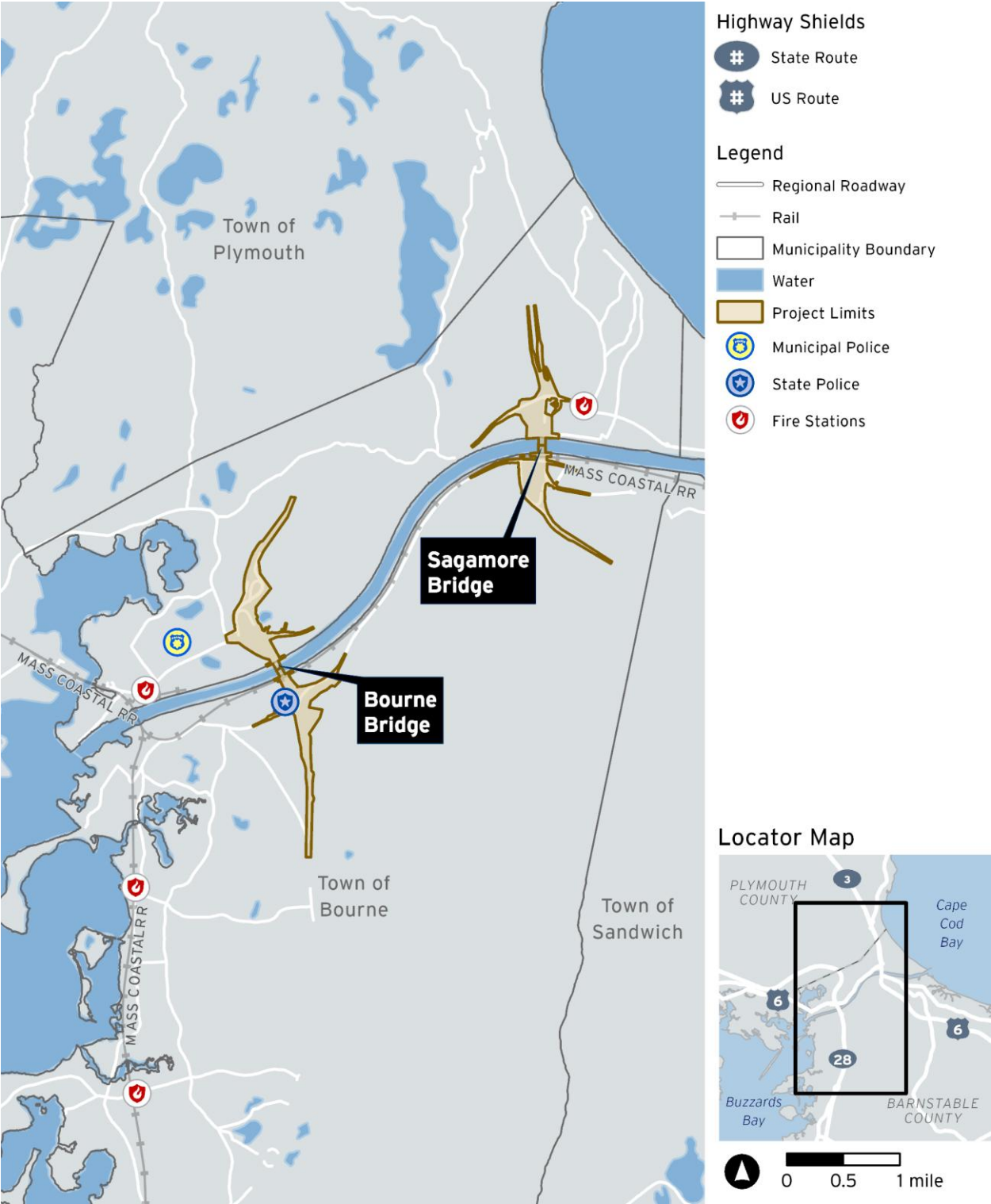
In coordination with FHWA, the Military Surface Deployment and Distribution Command Transportation Engineering Agency, a U.S. Department of Defense designated agency for public highways, identifies highways throughout the country that are part of the Strategic Highway Network (STRAHNET), the interstate and non-interstate system that is critical to support a U.S. military defense emergency.¹³ Of the nearly 600 miles of highways in Massachusetts that are part of STRAHNET, I-495 and I-195 (approximately 10.4 miles northwest of Bourne Bridge) are closest to the Study Area. Within the Study Area, State Route 28 North connecting to State Route 25 West and crossing Bourne Bridge has been designated a STRAHNET Connector Road (**Figure 4.2-7**), linking Joint Base Cape Cod (JBCC), Camp Edwards, with I-495.¹⁴ Camp Edwards is a U.S. military training site on the 22,000-acre JBCC in Barnstable County, Massachusetts, that houses five military commands from the Department of the Air Force, the U.S. Coast Guard, the Army National Guard, and the Air National Guard. There are several other tenants on JBCC with affiliation to the Department of Defense, the Department of Homeland Security and other federal, state, and county entities. Major missions at the JBCC include training for domestic and international operations; emergency response; airborne search and rescue; and intelligence command and control.

¹² Massachusetts Department of Transportation. 2021. [Cape Rail Study](https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/Website_Resources/transportation/Transit/Cape%20Rail%20Study%20Report.pdf). September. https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/Website_Resources/transportation/Transit/Cape%20Rail%20Study%20Report.pdf

¹³ The designated STRAHNET highways provide defense access, continuity, and emergency capabilities for moving personnel, materials, and equipment. Federal Highway Administration. 2020. [Strategic Highway Network \(STRAHNET\) Length-2019](https://www.fhwa.dot.gov/policyinformation/statistics/2019/pdf/hm49.pdf). September 30. <https://www.fhwa.dot.gov/policyinformation/statistics/2019/pdf/hm49.pdf>

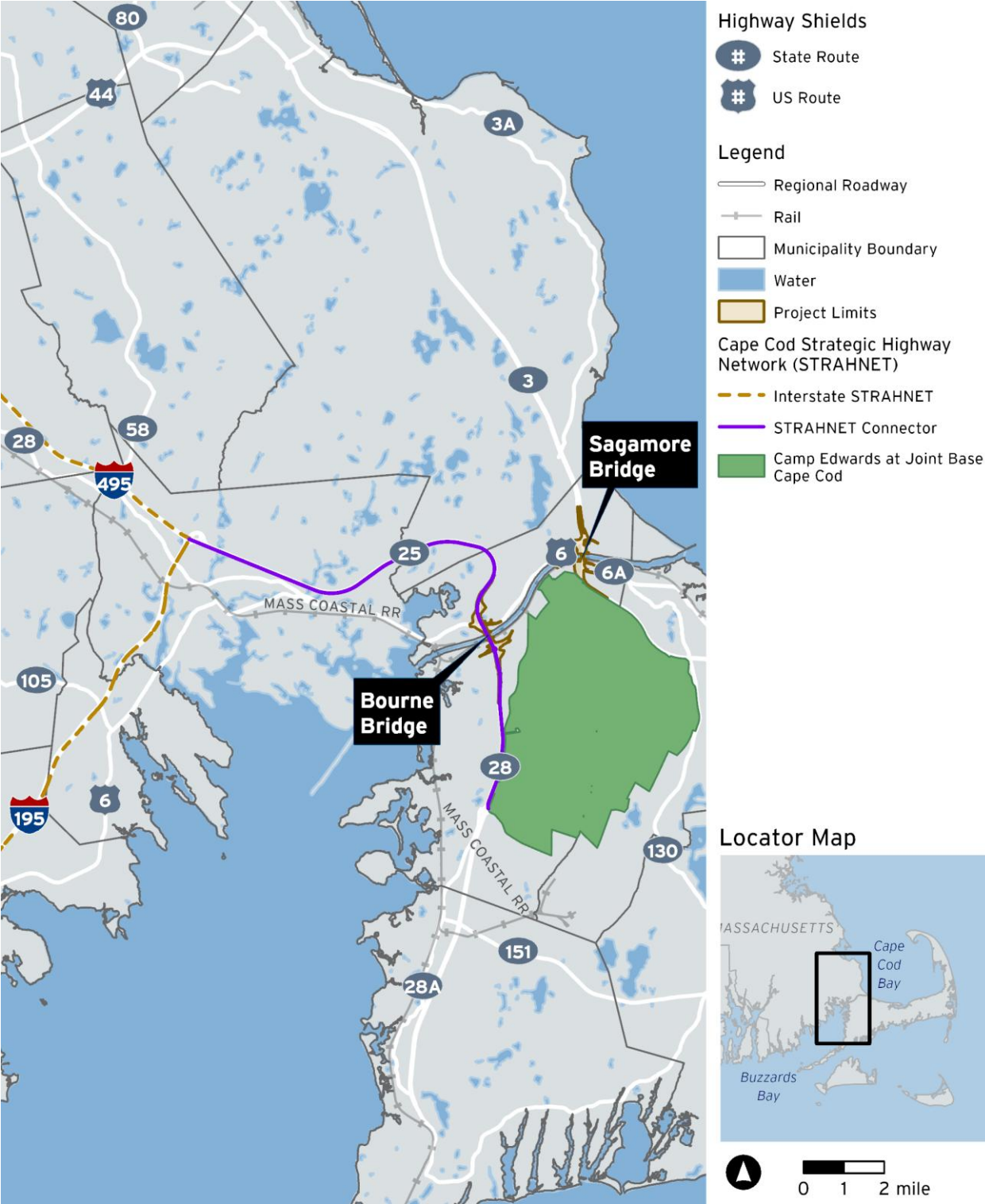
¹⁴ U.S. Army: Transportation Engineering Agency. 2012. [Camp Edward, Massachusetts STRAHNET map](https://www.sddc.army.mil/sites/TEA/functions/specialassistant/strahnet/forms/allitems.aspx). June 28. <https://www.sddc.army.mil/sites/TEA/functions/specialassistant/strahnet/forms/allitems.aspx>

Figure 4.2-6. Police and Fire Stations in the Town of Bourne



Source: Massachusetts Department of Transportation, 2024

Figure 4.2-7. Strategic Highway Network (STRAHNET) Connector Route from I-495 to Camp Edwards



Source: Massachusetts Department of Transportation, 2024

The bridges and their supporting roadway network within the Study Area are essential routes for law enforcement, fire services, and JBCC personnel to respond to emergencies and obtain supplies. In fall 2024, MassDOT consulted with the local police and fire departments in the town of Bourne, the Massachusetts State Police, and the Massachusetts Emergency Management Agency to solicit feedback on transportation challenges within the Study Area that affect emergency response times and accessibility. Based on feedback from these law enforcement and emergency services personnel, general challenges related to emergency response times and accessibility include the following:

- Recurring congestion during the peak summer travel season (Memorial Day through Labor Day) and more frequently during the fall and spring off-peak travel seasons
- Lack of roadway shoulders on the bridges and limited shoulder widths on the immediate bridge approaches
- Lane restrictions during bridge maintenance and repair activities

Emergency Traffic Planning

Cape Cod is vulnerable to hazards including storm surge and flooding, erosion, damaging winds, elevated summer temperatures, and wildfires. Cape Cod is also vulnerable to hurricanes and tropical storms, depending on the storm track.¹⁵ In the Atlantic Basin, hurricane season runs from June 1 to November 30. According to the Barnstable County Regional Government, the most recent hurricanes have affected Bourne and Cape Cod from late August through early September.¹⁶

The Massachusetts State Police in cooperation with the Massachusetts Emergency Management Agency and several other agencies developed a Cape Cod Emergency Traffic Plan (CCETP) to facilitate the egress of a high volume of traffic from Cape Cod in the event of a hurricane or other potential or actual hazard, particularly during peak tourist season.¹⁷ The primary goal of the CCETP is to ensure the safety of the community in the event of destructive weather or other hazards requiring the orderly but rapid movement of motorists off Cape Cod and the islands of Martha's Vineyard and Nantucket. The CCETP also addresses the process for establishing temporary emergency shelters on the JBCC in case the Sagamore and Bourne Bridges are closed.

The CCETP has identified proposed routes off Cape Cod in recognition of the “localized choke points of both the Sagamore and Bourne Bridges” and the need to reduce congestion and keep traffic moving in the areas of the bridges and their approaches along U.S. Route 6 and State Route 28.

¹⁵ Cape Cod Commission, [Cape Cod Climate Action Plan](https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/climate/Shared%20Documents/Climate%20Action%20Plan/Cape-Cod-Climate-Action-Plan.pdf). 2021. July. <https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/climate/Shared%20Documents/Climate%20Action%20Plan/Cape-Cod-Climate-Action-Plan.pdf>

¹⁶ Barnstable County. 2022. [“When is Hurricane Season?”](https://www.capecod.gov/2022/05/24/when-is-hurricane-season-on-cape-cod/) May 24. <https://www.capecod.gov/2022/05/24/when-is-hurricane-season-on-cape-cod/>

¹⁷ Commonwealth of Massachusetts. 2018. [Cape Cod Emergency Traffic Plan](https://www.mass.gov/doc/cape-cod-emergency-traffic-plan/download). July. <https://www.mass.gov/doc/cape-cod-emergency-traffic-plan/download>

To meet this need, the CCETP establishes four traffic pattern alterations that:

- Prohibit access to U.S. Route 6 and State Route 28 at the southern, Cape Cod side, bases of both bridges.
- Control access to Scenic Highway, Sandwich Road, and U.S. Route 6 to limit traffic attempting to merge into the mainstream of off-Cape traffic.
- Allows the Massachusetts State Police the flexibility in opening and closing exits to expedite off-Cape traffic flow across Sagamore and Bourne Bridges.
- Establishes traffic detours to alternate roadways to reduce congestion.

4.2.3 No Build Alternative

For the No Build Alternative, Sagamore and Bourne Bridges as well as the interchanges immediately north and south of the canal would retain their current configuration, number of lanes, and alignment. While the existing roadway infrastructure would remain unchanged, changes to the demographics within the Cape Cod communities as well as anticipated growth in visitor trips are estimated to result in an overall increase in the number of vehicles crossing the canal daily. [Table 4.2-4](#) provides a comparison of the 2019 bridge crossing volumes and those projected for 2050 for the No Build Alternative.

Table 4.2-4. 2050 No Build Alternative Average Annual Daily Traffic on Sagamore and Bourne Bridges

Existing/No Build	Direction	Sagamore Bridge	Bourne Bridge
2019 Existing Conditions	Northbound	33,120	21,520
	Southbound	28,870	24,980
	Total	61,990	46,500
2050 No Build Alternative	Northbound	36,810	27,790
	Southbound	36,850	27,750
	Total	73,660	55,540

4.2.3.1 Vehicular Traffic Operations

For the 2050 No Build Alternative, congestion would continue to be prevalent on the approaches to Sagamore and Bourne Bridges. With the higher traffic volumes, delays are expected to increase, and queues are anticipated to extend farther along the mainlines. [Table 4.2-5](#) provides a comparison of the 2019 Existing Conditions and 2050 No Build Alternative VISSIM model network results.

Table 4.2-5. 2019 Existing Conditions and 2050 No Build Alternative: VISSIM Model Network Results – Fall Weekday PM Peak Hour

Metric	2019 Existing Conditions	2050 No Build Alternative	Percentage Change
Processed Volumes	10,705	11,443	6.9%
Network Travel Times (vehicle-hours traveled)	2,397	2,879	20.1%

As **Table 4.2-5** indicates, more vehicles were processed in the 2050 No Build Alternative model because of an increase in traffic volumes, compared to the 2019 Existing Conditions model. However, overall vehicle hours traveled increased by 20.1% in the No Build Alternative, indicating more delay. **Appendix 4.2, Traffic Engineering Technical Report**, includes a detailed summary of the 2050 No Build Alternative analysis including Level of Service for all Study Area intersections and roadways.

Travel time between O-D points along major routes within the Study Area was measured in VISSIM. The travel-time measurements presented in this section encompass both diagonal bridge crossings and through-bridge crossings.

Diagonal bridge crossings refer to vehicles entering the Study Area from either Sagamore Bridge or Bourne Bridge side, using Scenic Highway or Sandwich Road, and exiting via Bourne Bridge or Sagamore Bridge side. Major diagonal crossing O-D routes include the following:

- State Route 25 eastbound (EB) to U.S. Route 6 EB
- State Route 28 northbound (NB) to State Route 3 NB
- State Route 3 southbound (SB) to State Route 28 SB
- U.S. Route 6 westbound (WB) to State Route 25 WB

The State Route 25 EB to State Route 3 NB travel route is projected to be a major O-D route in the 2050 Design Year and is also presented.

Through-bridge crossings refer to direct passage through the Study Area along State Route 3 and U.S. Route 6 via Sagamore Bridge or along State Route 25 and State Route 28 via Bourne Bridge and are defined as follows:

- State Route 25 EB to State Route 28 SB
- State Route 28 NB to State Route 25 WB
- State Route 3 SB to U.S. Route 6 EB
- U.S. Route 6 WB to State Route 3 NB

Table 4.2-6 summarizes the estimated diagonal bridge crossing travel times for predominant O-D routes for the 2050 No Build Alternative in minutes.

Table 4.2-6. 2050 No Build Alternative: Diagonal Bridge Crossing Travel Times – Fall Weekday PM Peak Hour

Route		No Build Alternative (minutes)
State Route 25 eastbound to U.S. Route 6 eastbound via	Scenic Highway	20.6
	Sandwich Road	24.2
State Route 28 northbound to State Route 3 northbound via	Sandwich Road	15.9
State Route 3 southbound to State Route 28 southbound via	Scenic Highway	21.5
	Sandwich Road	19.1
U.S. Route 6 westbound to State Route 25 westbound via	Scenic Highway	22.9
State Route 25 eastbound to State Route 3 northbound via	Scenic Highway	19.6

Table 4.2-7 summarizes the estimated through-bridge crossing travel times for the 2050 No Build Alternative in minutes.

Table 4.2-7. 2050 No Build Alternative Through-Bridge Crossing Travel Times – Fall Weekday PM Peak Hour

Route	Direction	No Build Alternative (minutes)
Sagamore Bridge	Southbound	11.4
	Northbound	8.5
Bourne Bridge	Southbound	10.4
	Northbound	14.5

4.2.3.2 Freight Operations, Public Bus Transit and Parking Facilities

For the No Build Alternative, no improvements would be made to the bridges or their roadway approach network, other than routine maintenance activities to maintain public safety. With anticipated growth in future 2050 traffic volumes, escalating maintenance repairs and no major improvements to address the underlying structural and geometric deficiencies of the bridges and their approach roadway network, there would be increased congestion and delays to freight-truck and bus transit traffic. Without major rehabilitation of the bridges, restrictions of vehicle loads, and speed limits would be posted in the future as the structures continue to age. Imposed restrictions on the amount of freight that can be carried in a single truck would lead to more trucks being needed to transport goods and services between Cape Cod and the mainland. As the only roadway crossings

between the mainland and Cape Cod, any future bridge restrictions through vehicle weight postings would compound congestion and create significant delays to freight-truck and bus transit traffic.

The No Build Alternative would not have any effect on the Bourne Park and Ride Lot in the Sagamore North quadrant.

4.2.3.3 Traffic Safety Analysis

The higher-than-average crash rates observed for the Sagamore and Bourne Bridges for current conditions are influenced by vehicle congestion and the geometric deficiencies of the cross sections of the bridges. These conditions are anticipated to worsen for the No Build Alternative due to an increase in traffic volumes over time without improvements to address vehicle congestion and geometric deficiencies of the existing bridges and their approaches.

4.2.3.4 Rail

The No Build Alternative would have no effect on rail operations within the Study Area. The expansion of passenger rail service to Cape Cod is not included on any approved transportation improvement plans and therefore is not considered part of the No Build Alternative in this DEIS.

4.2.3.5 Emergency Response and Emergency Traffic Planning

Law enforcement and emergency response vehicles would experience longer response times within the Study Area for the No Build Alternative as traffic volumes and congestion increase over time. The lack of roadway shoulders on the bridges and limited shoulder widths on the immediate bridge approaches would continue to impede access for emergency response vehicles responding to incidents.

As bridge conditions continue to deteriorate, increased maintenance would be required for longer periods with partial- or full-lane closures, depending on the extent of damage to their structural components. Because Sagamore and Bourne Bridges provide the only vehicular access between Cape Cod and the mainland, any lane closures on either bridge, regardless of the duration, would delay emergency response times and impede rapid egress of motor vehicles from areas of Cape Cod in the event of a hurricane or other potential hazard.

4.2.4 Build Alternative

The Build Alternative proposes improvements to the highway interchange networks in the immediate vicinity of the replacement bridges, which is anticipated to change some travel routes within the Study Area. [Table 4.2-8](#) provides a comparison of the 2050 No Build Alternative and Build Alternative traffic volumes on the bridges.

As indicated, it is anticipated that some vehicles that typically cross over the canal onto Cape Cod via Bourne Bridge may choose to use Scenic Highway and cross Sagamore Bridge. This would be due to the improvements and new State Route 25 EB to Scenic Highway ramp in the Bourne North quadrant. Similarly, access improvements in the Sagamore South quadrant may draw some vehicles to cross the canal off Cape Cod via Bourne Bridge.

Table 4.2-8. 2050 No Build Alternative compared to 2050 Build Alternative Average Annual Daily Traffic on Sagamore and Bourne Bridges

Alternative	Direction	Sagamore Bridge	Bourne Bridge
2050 No Build Alternative	Northbound	36,810	27,790
	Southbound	36,850	27,750
	Total	73,660	55,540
	Combined	129,200	
2050 Build Alternative	Northbound	34,630	29,970
	Southbound	44,070	20,530
	Total	78,700	50,500
	Combined	129,200	

It is important to note that the estimated total AADT crossing the canal would be 129,200 vehicles per day for both the 2050 No Build Alternative and Build Alternative.

4.2.4.1 Vehicular Traffic Operations

With the improvements on the bridges and at the interchanges on either side of the canal, it is anticipated that there would be significant reductions in delays and congestion throughout the Study Area. During the Fall Weekday PM peak hour, no queues are anticipated to extend onto the mainlines on State Route 25, State Route 28, State Route 3, or U.S. Route 6. [Table 4.2-9](#) provides a comparison of the VISSIM model network results for 2019 Existing Conditions, the 2050 No Build Alternative, and the 2050 Build Alternative.

Table 4.2-9. VISSIM Model Network Results – Fall Weekday PM Peak Hour

Metric	2019 Existing Conditions	2050 No Build Alternative	2050 Build Alternative	Percentage Change
Processed Volumes	10,705	11,443	12,402	8.4%
Network Travel Times (vehicle-hours traveled)	2,397	2,879	2,240	-22.2%

As indicated, the 2050 Build Alternative would process more vehicles than the 2050 No Build Alternative. Overall network-wide travel times for the 2050 Build Alternative are estimated to decrease by 22.2% compared to the 2050 No Build Alternative. The overall network-wide travel times estimated for the 2050 Build Alternative are also less than 2019 Existing Conditions, indicating significantly reduced delays despite estimated increases in future traffic volumes. **Appendix 4.2, Traffic Engineering Technical Report**, includes a detailed summary of the 2050 Build Alternative analysis, including Level of Service for all Study Area intersections and roadways.

Table 4.2-10 depicts the estimated diagonal bridge crossing travel times (in minutes) along the predominant O-D routes for both the 2050 No Build Alternative and 2050 Build Alternative. The estimated diagonal bridge crossing travel times for the 2050 Build Alternative are estimated to decrease compared to the 2050 No Build Alternative, except for State Route 3 SB to State Route 28 SB via Sandwich Road. Further refinements to intersection operations in the Sagamore South quadrant are anticipated to improve the travel time for this route for the 2050 Build Alternative. Refer to **Appendix 4.2, Traffic Engineering Technical Report**, for graphics depicting the vehicle paths along these O-D routes.

Table 4.2-10. 2050 No Build Alternative and 2050 Build Alternative Diagonal Bridge Crossing Travel Times – Fall Weekday PM Peak Hour

Route		No Build Alternative (minutes)	Build Alternative (minutes)
State Route 25 eastbound to U.S. Route 6 eastbound via	Scenic Highway	20.6	18.4
	Sandwich Road	24.2	14.9
State Route 28 northbound to State Route 3 northbound via	Sandwich Road	15.9	12.6
State Route 3 southbound to State Route 28 southbound via	Scenic Highway	21.5	13.0
	Sandwich Road	19.1	20.2
U.S. Route 6 westbound to State Route 25 westbound via	Scenic Highway	22.9	11.7
State Route 25 eastbound to State Route 3 northbound via	Scenic Highway	19.6	12.1

Table 4.2-11 summarizes (in minutes) the estimated through-bridge crossing travel times for both the 2050 No Build Alternative and 2050 Build Alternative. The estimated through-bridge crossing travel times for the 2050 Build Alternative are estimated to decrease compared to the 2050 No Build Alternative in each direction for both Sagamore and Bourne Bridges. Refer to **Appendix 4.2, Traffic Engineering Technical Report**, for graphics depicting the vehicle paths along these O-D routes.

Table 4.2-11. 2050 No Build Alternative and 2050 Build Alternative Through-Bridge Crossing Travel Times – Fall Weekday PM Peak Hour

Route	Direction	No Build Alternative (minutes)	Build Alternative (minutes)
Sagamore Bridge	Southbound	11.4	5.5
	Northbound	8.5	6.4
Bourne Bridge	Southbound	10.4	4.7
	Northbound	14.5	5.1

4.2.4.2 Freight Operations, Public Bus Transit, and Parking Facilities

For the Build Alternative, Sagamore and Bourne Bridges would be replaced with new bridges built to modern structural and roadway design standards. The replacement bridges would provide wider traffic lanes, auxiliary lanes, and safety shoulders. The increased through-travel lane widths on the replacement bridges from 10 feet to 12 feet, along with the addition of shoulders and separation of traffic in each direction on the replacement bridges would better accommodate large freight trucks and buses, thus reducing the risk of sideswipe and lane-departure crashes. The auxiliary lanes, which would span the on- and off-ramps on the replacement bridges, would also provide truck-freight and bus transit drivers with more space and time to adjust their speed before entering or exiting through-traffic lanes, thereby reducing disruptions to traffic flows on the mainline highways. The provision of auxiliary lanes would also eliminate the lane drop on the State Route 3 southbound approach to Sagamore Bridge, which is a bottleneck for vehicular traffic heading from the mainland to Cape Cod.

The replacement bridges—each providing a total of four 12-foot-wide through-travel lanes (two in each direction), two 12-foot-wide entrance/exit (auxiliary) lanes, a 4-foot-wide left shoulder, and a 10-foot-wide right shoulder and safety barriers—would reduce the impact to freight-truck and bus transit traffic when performing future maintenance on the bridges. Replacing the bridges to meet current design standards would also avoid the potential for future posting of weight restrictions, which largely affects freight traffic.

The steep 6% roadway grade on the existing bridges would also be reduced to a flatter 4.5% grade at Bourne Bridge and 4% grade at Sagamore Bridge for the Build Alternative. These grade reductions would improve sight distances and consistency of speed between passenger cars and larger vehicles, including trucks and buses.

In the Bourne South quadrant, the Build Alternative would replace Bourne Rotary with a grade-separated diamond interchange, which would allow regional truck-freight through movements on State Route 28 to bypass the intersections with the non-mainline roadways. This grade separation for local and regional traffic would alleviate congestion and improve operations for freight-truck and bus transit traffic.

In the Bourne North quadrant, the combination of new direct connection ramps between State Route 25 and U.S. Route 6 (Scenic Highway) would allow vehicles to bypass Belmont Circle. These direct ramp connections would improve traffic operations and safety at Belmont Circle, in addition to regional freight-truck and bus transit mobility and accessibility. Overall, the Build Alternative would provide long-term benefits to truck-freight and bus transit operations through improved speeds, more efficient fuel costs, and travel-time savings.

It is anticipated the Build Alternative would result in the displacement of approximately 17 parking spaces on the north side of MassDOT's Bourne Park and Ride Lot due to the realignment of Scenic Highway and construction of a shared-use path on the south side of Scenic Highway. Considering the Bourne Park and Ride Lot has an annual average parking occupancy rate of less than 75% of the maximum number of parking spaces since the facility was expanded in 2009, MassDOT will coordinate with appropriate local and regional entities to assess whether replacement parking spaces is necessary.

4.2.4.3 Traffic Safety Analysis

Based on a preliminary evaluation of the safety performance metrics and CMFs associated with the proposed improvements, predicted crashes experienced along Bourne and Sagamore Bridges could be reduced by as much as 48%.¹⁸ MassDOT does not have a statewide average for crashes by severity. The physical separation of the directions of travel in the twin bridge configuration for the Build Alternative would reduce the number of fatality and injury crashes by up to 12%,¹⁹ and the number of cross-median crashes (sideswipe in opposite direction and head-on) by up to 97%.²⁰

4.2.4.4 Rail

The Build Alternative would have no long-term effect on rail operations within the Study Area. Any future expansion of passenger rail services to Cape Cod would be subject to an independent environmental review process. The Build Alternative would not preclude future expansion and extension of passenger rail services to Cape Cod.

The Build Alternative would have temporary adverse construction-period effects on freight and seasonal passenger train operations within the Study Area due to required bridge construction and demolition activities over and adjacent to the active Cape Main Line corridor. During final design and construction, the contractor would be required to develop and implement a Rail Operations Coordination Plan that would be coordinated with MassDOT, the MBTA, Cape Rail, Inc., Massachusetts Coastal Railroad, Cape Cod Central Railroad, and CCRTA. All personnel working within the railroad property would be required to complete applicable right-of-way safety training courses. Flaggers would be required for any construction activities that have the potential to foul the tracks. Qualified inspectors would also be used to assess track conditions and monitor the safety of rail operations through the construction limits at both bridges.

The Build Alternative would likely require relocation of Bourne Station to accommodate construction of the replacement Bourne Bridge. The Highway Division of MassDOT will coordinate with the MassDOT Rail and Transit Division and MBTA to finalize details regarding station relocation, as necessary.

4.2.4.5 Emergency Response

With the provision of wider travel lanes, as well as auxiliary lanes, and left and right shoulders across the replacement bridges for the Build Alternative, vehicles could pull over and clear the way for emergency vehicles, resulting in improved response times for police, fire, medical, and emergency

¹⁸ Combination of the following crash modification factors (CMF):

(CMF ID: 8336 - Install an Additional Lane) Operational and Safety Trade-offs: Reducing Freeway Lane and Shoulder Width to Permit an Additional Lane. 2016.

(CMF ID: 8711 – Widen Shoulder, Lane Width) Evaluation of Safety Effectiveness of Multiple Cross Sectional Features on Urban Arterials. 2016.

¹⁹ AASHTO. 2010. [The Highway Safety Manual](http://www.highwaysafetymanual.org), American Association of State Highway Transportation Professionals, Washington, D.C., <http://www.highwaysafetymanual.org>

²⁰ (CMF ID: 7040) NCHRP Report 794: Median Cross-Section Design for Rural Divided Highways. 2011.

management services. The addition of auxiliary lanes and shoulders on the replacement bridges would also reduce delays for emergency vehicles during any future bridge inspections and maintenance activities conducted by MassDOT.

Replacing the bridges to modern structural and roadway design standards would benefit public safety and security through reduced delays and improved travel-time reliability for emergency vehicle service and operations. Construction of two separate deck structures for the replacement bridges for the Build Alternative would provide additional service redundancy in case of an emergency evacuation or a compromising event impacting a single bridge structure. The Build Alternative would facilitate emergency egress of high traffic volumes from Cape Cod in the event of a hurricane or other potential hazards through replacement of Bourne Rotary with a grade-separated diamond interchange and the construction of a new flyover ramp connection from Scenic Highway to State Route 25 westbound. These improvements for the Build Alternative would reduce congestion and keep traffic flowing in the areas of Bourne and Sagamore Bridges and their approaches along U.S. Route 6, and State Route 28, consistent with the Commonwealth's CCETP.

4.2.4.6 Induced Travel Demand

Induced demand is the growth in traffic volumes that results from an increase in capacity. Five different components contribute to induced demand:²¹

- Number of trips
- Change in mode of travel
- Travel routes
- Length of trips
- Time of travel

In general, the Build Alternative would improve traffic operations and safety conditions for the traveling public through geometric upgrades and the separation of local and regional traffic movements in the immediate vicinity of the replacement bridges. As indicated in [Table 4.2-8](#), the estimated AADT traffic crossing Sagamore and Bourne Bridges for both the 2050 No Build Alternative and the 2050 Build Alternative would be 129,200 vehicles per day. Projected travel-time improvements for the Build Alternative are not expected to generate additional trips to Cape Cod, as discussed in the following sections.

Change in Number of Trips

Change in number of trips, or latent demand, is a more difficult concept to forecast because many other non-transportation-related factors contribute to demand, including socioeconomic data such as expected changes in households and employment as well as growth in visitor trips. Based on the most recent 2020 census data, population growth on Cape Cod is expected to remain stagnant and in some

²¹ U.S. Department of Transportation, Federal Highway Administration, 2010. [Interim Guidance on the Application of Travel and Land Use Forecasting in NEPA](https://www.environment.fhwa.dot.gov/nepa/Travel_LandUse/travel_landUse_rpt.aspx). March. https://www.environment.fhwa.dot.gov/nepa/Travel_LandUse/travel_landUse_rpt.aspx

areas is expected to decline by the year 2050. Factors limiting visitor growth include availability and cost of seasonal rentals, occupancy limits of major attractions, and parking constraints, among others.

In addition, improvements to traffic operations are limited to the bridges and the interchanges directly north and south of the canal. Because Cape Cod attracts visitors from the greater New England region and beyond, improvements in travel time in the immediate vicinity of the replacement Sagamore and Bourne Bridges would represent only a minimal reduction of the overall trip duration. For these reasons, it is not anticipated that there would be a significant increase in the number of trips that would otherwise not travel to Cape Cod due to congestion.

Change in Mode of Travel

Within the Study Area, impacts due to changes in mode of travel are anticipated to be minimal because vehicular traffic makes up most trips across the canal with few other modal options. Improved traffic operations would improve bus travel times and reliability, which may make public transportation a more attractive mode of travel. With improved bicycle and pedestrian facilities, there are also opportunities to convert shorter vehicular trips to alternative modes.

Change in Travel Route and Length of Trips

Sagamore and Bourne Bridges make up the only two roadway access points to and from Cape Cod. Therefore, the travel route choices are limited to one bridge or the other, and trip lengths are limited to the extents of Cape Cod and the neighboring islands. The total number of trips crossing Cape Cod Canal are expected to remain the same, regardless of any potential changes to travel route or length of trips.

Change in Time of Travel

Today, visitors with flexible schedules tend to determine their time of travel based on congestion. For example, if there is consistently congestion at 5 p.m. on a weekday, visitors may choose to travel earlier in the day or after the afternoon peak period to avoid sitting in traffic. This results in “peak spreading,” a phenomenon that is most apparent in the vicinity of the bridges during summer weekends and other popular vacation times. With improved traffic operations, people may choose to shift their travel time. However, the total number of daily vehicle trips are not anticipated to increase as a result of the Cape Cod Bridges Program (Program), as previously discussed.

4.2.4.7 Construction Sequencing and Traffic Management

The construction sequencing and traffic management goals for the Program are as follows:

- Remove traffic from the existing bridges as soon as possible.
- Maintain existing roadway and ramp connections throughout the duration of construction.
- Avoid the need for construction detours.
- Reduce or minimize traffic shifts.
- Reduce schedule delays by providing large work zones at the bridge sites.
- Design temporary roadways at 10 miles per hour less than the existing roadway design speed.

- Maintain pedestrian and bicycle connectivity and access that are equal to or better than existing conditions throughout the duration of construction.

Figure 4.2-8 presents the optimal sequencing approach to constructing both highway bridges. There are four key phases:

- **Phase 1:** Construct the first mainline span and approaches, consisting of the eastbound mainline at the Sagamore Bridge crossing and the northbound mainline at the Bourne Bridge crossing.
- **Phase 2:** Shift all traffic off the existing bridge and onto the new mainline structure and demolish the existing bridge.
- **Phase 3:** Construct the second mainline span and approaches, consisting of the westbound mainline at the Sagamore Bridge crossing and the southbound mainline at the Bourne Bridge crossing.
- **Phase 4:** Reroute traffic onto the two mainline spans in the final configuration and open connections to the shared-use path over the canal and supporting path network.

MassDOT proposes to construct the interchange improvements concurrently with the construction of the mainline highway bridges. Using existing, temporary, and new ramp connections, MassDOT's goal for the interchange construction is to seamlessly connect to the new highway bridges. Accordingly, the interchange work would be substantially complete once construction of the second new mainline bridge has been completed for both Sagamore and Bourne Bridges. To minimize the number of traffic shifts, the construction sequencing would allow vehicles to use the same traffic pattern for substantial periods of time, including on the mainlines, ramps, and local roads.

MassDOT's goal is to maintain pedestrian and bicycle connectivity during construction. MassDOT proposes to maintain existing conditions until pedestrian and bicycle traffic can be transferred to the proposed bridge. Temporary connections may be required from the new highway bridges and approach paths to allow pedestrians to continue to travel to and from either side of Cape Cod Canal. MassDOT would not demolish the existing bridges until these temporary and/or new pedestrian/bicycle connections to the new highway bridges are completed.

Appendix 3.2, Construction Approach Technical Report, describes the Program's construction approach, including land- and water-based work.

Figure 4.2-8. Proposed Bridge Construction Sequencing Approach



Source: Massachusetts Department of Transportation, 2025

4.2.4.8 Design Parameters

MassDOT has established design parameters to be maintained for mainlines (and newly constructed bridges), interchange ramps, and local roads throughout construction:

- Mainlines (and newly constructed bridges)
 - Lane Configuration: 2 lanes minimum in each direction
 - Travel Lane Width: 11-foot minimum
 - Shoulder Width: 0-foot minimum on structure; 2 feet preferred; 1-foot minimum at-grade
 - Vertical Clearance: Maintain existing vertical clearance as a minimum.
- Ramps
 - Travel Lane Width: 11-foot minimum
 - Inside Shoulder Width: 2 feet preferred; 1-foot minimum
 - Outside Shoulder Width: 2 feet preferred; 1-foot minimum
 - Total Ramp Width: 18-foot minimum to accommodate emergency vehicles
 - Entrance/Exit Ramp Design: Taper style ramps preferred; parallel style where necessary.
- Local Roads
 - Travel Lane Width: 10-foot minimum
 - Shoulder Width: 2 feet preferred; 1-foot minimum

4.2.5 Mitigation

No long-term operational mitigation measures will be required for the Build Alternative because it would reduce congestion and improve traffic safety, freight mobility, and the resiliency of transportation infrastructure. Such improvements would be consistent with state and regional plans, including the Cape Cod Regional Transportation Regional Transportation Plan.²²

As discussed in [Section 4.2.4.7](#), construction of the Build Alternative would be phased to maintain existing roadway and ramp connections and minimize disruption to the traveling public throughout the duration of construction. Because all existing roadway and ramp connections would be maintained, long-duration detour routes would not be necessary. [Section 4.2.4.8](#) outlines the minimum design standards that will be maintained for mainlines (and newly constructed bridges), interchange ramps, and local roads throughout construction.

The design-build contractor will be required to submit a Traffic Management Plan (TMP) consistent with their final design for review and acceptance by MassDOT. The TMP will define the strategic plan for managing and communicating work zone impacts to roadway users during construction. Key elements of the TMP will include a Temporary Traffic Control Plan and a Public Involvement and Communication Plan.

²² Cape Cod Metropolitan Planning Organization. 2023. [Cape Cod 2024 Regional Transportation Plan](https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/tr/Transportation%20Plans/RTP/2024_RTP/Report/FINAL%20PDF/Cape%20Cod%202024%20Regional%20Transportation%20Plan_Endorsed%2007242023.pdf). July 24. https://www.capecodcommission.org/resource-library/file/?url=/dept/commission/team/tr/Transportation%20Plans/RTP/2024_RTP/Report/FINAL%20PDF/Cape%20Cod%202024%20Regional%20Transportation%20Plan_Endorsed%2007242023.pdf

The Temporary Traffic Control Plan will include engineered plans detailing traffic control devices, lane tapers, signage, and pavement markings to maintain traffic safety and control through the work zone. All temporary roadways, alignments, lane shifts, and tapers for the mainlines and interchange ramps within the Project Limits will be required to meet or exceed the design parameters outlined in

Section 4.2.4.8.

The Public Involvement and Communication Plan will be a comprehensive set of measures to inform affected road users, the public, emergency response personnel (police, fire, ambulance), and other stakeholders of anticipated work zone impacts and changing travel conditions. MassDOT will use all available resources to communicate project information including, but not limited to, broadcast and print media, variable message signs, a dedicated project webpage, mobile media, existing MassDOT websites, and other Commonwealth websites, flyers, fact sheets, social media tools, newsletters, e-mail, briefings, public meetings, and signs.

Additional measures in the TMP to minimize construction-period traffic effects of the Build Alternative will include the following:

- Designating construction truck routes, construction staging areas, and worker parking areas
- Scheduling major truck deliveries during off-peak traffic hours to avoid conflicts during school arrival and departure periods and during other congested times of the day
- Using police detail to safely direct traffic on roadways as needed

The TMP will be coordinated with the elected, engineering, planning, and public safety officials in the town of Bourne and other municipalities, as necessary.

MassDOT contract specifications will also require the contractor to develop and implement a Rail Operations Coordination Plan to minimize and mitigate construction-period impacts to rail operations within the Study Area. The Rail Operations Coordination Plan will require the contractor to provide advanced notice to freight and seasonal rail service providers of construction schedules and any planned construction activities that necessitate temporary service disruptions during construction. Additionally, the Rail Operations Coordination Plan will require coordination with the public to provide advanced notice of any disruptions to seasonal passenger service along the Cape Main Line.