

4 Affected Environment, Environmental Consequences, and Mitigation

4.2 Transportation, Traffic, and Safety

4.2.1 Introduction

This section presents the potential effects of the No Build and Build Alternatives on transportation networks, traffic operations, and safety. It evaluates how existing conditions are expected to change if no improvements are made, and how the Build Alternative could affect travel times, intersection performance, and transit facilities and services. Indirect effects, including whether the Build Alternative could result in induced travel demand, are addressed separately in **Section 4.22, Indirect Effects**.

The section also identifies measures that will be implemented to mitigate potential adverse effects associated with the construction or operation of the Build Alternative, as appropriate. Mitigation commitments are described in sufficient detail to demonstrate how adverse effects will be minimized, consistent with applicable regulatory requirements and the Massachusetts Department of Transportation's (MassDOT) construction contract provisions.

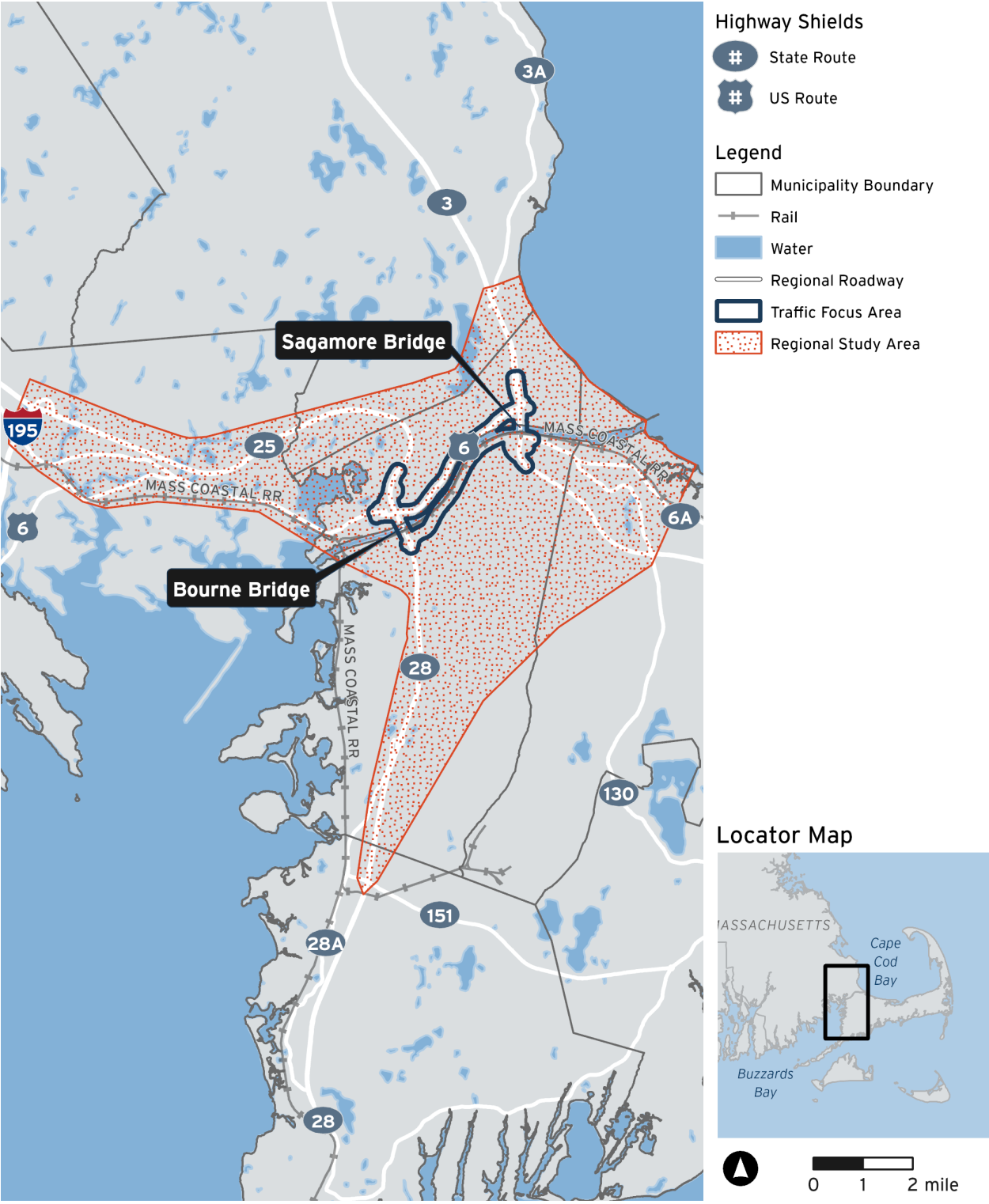
4.2.2 Study Areas

The Final Environmental Impact Statement (FEIS) evaluates transportation operations within a defined Traffic Focus Area encompassing roadway and transit facilities located within approximately 2 miles of the Sagamore and Bourne Bridges. This area captures the locations most directly influenced by the Cape Cod Bridges Program (Program), including the bridge approaches, key intersections, and adjacent multimodal facilities.

To assess broader systemwide effects, the FEIS also defines a Regional Study Area that extends beyond the Traffic Focus Area to include major roadways, interchanges, and intersections in Plymouth, Wareham, Bourne, Sandwich, and Falmouth.

Figure 4.2-1 depicts the Traffic Focus Area, and the broader Regional Study Area used to evaluate potential operational effects of the Build Alternative.

Figure 4.2-1. Traffic Focus Area and Regional Study Area



Source: Massachusetts Department of Transportation, 2025

4.2.3 Methodology

4.2.3.1 Traffic Operations Methodology

- The collection of traffic counts between 2020 and 2022 was restricted because travel patterns shifted during the COVID-19 pandemic. Therefore, [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.
- [MassDOT developed a fall and summer](#) travel demand model for the 2050 design year based on demographic projections (population, households, and employment) for the Cape Cod communities [\(prepared by the UMass Donohue Institute for MassDOT's Office of Transportation Planning\)](#) 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](#): Software used to analyze unsignalized and signalized intersections along the local and arterial roadways. Models developed in this software were used to assess Level of Service (LOS), which for intersections is measured using delay-based ratings ranging from LOS A (free-flowing conditions with minimal delay) to LOS F (conditions characterized by severe congestion and excessive delay).
 - [Sidra](#): Software used to analyze traffic circles along the local and arterial roadways. Similar to Synchro, models developed in this software were used to assess LOS, specifically for traffic circles.
 - [Highway Capacity Software](#): Software used to analyze multilane freeway segments, weaving segments, and merge/diverge segments. Models developed in this software were used to assess LOS, which for freeway segments is measured based on density.
 - [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 and Build Alternatives.
- 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

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>

85% of the year, traffic volumes within the Study Area are equal to or lower than the Fall Weekday PM period. It is standard practice to use this method to determine the design period.

4.2.3.2 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 conducted roadway safety audits \(RSAs\) at intersections and roadways within the Traffic Focus Area to identify potential safety issues and opportunities for improvement. These audits followed MassDOT’s procedures and incorporated multidisciplinary site walks, crash data review, and operational observations to document contributing factors and develop potential safety enhancements.](#)
- 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 FHWA.⁵ The CMFs were used to determine relative impact, positive or negative, with respect to safety and were not applied to predicted, expected or observed crash data.

4.2.4 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 the 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

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).
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/>

4.2.4.1 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.

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. [Refer to the Traffic Focus Area Capacity Analysis \(Synchro and SIDRA Analysis\) section for the existing conditions intersection LOS within the focus area as compared to the No Build and Build Conditions.](#)

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.

4.2.4.2 Traffic Safety

Crash History

As noted in **Chapter 2, Program Purpose and Need**, the 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.

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. RSAs 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

Road Safety Audits

Between April 2013 and June 2022, MassDOT completed RSAs at key intersections and roadway segments within the Traffic Focus Area to identify existing safety issues and opportunities for improvement. **Figure 4.2-2** depicts locations within the Study Area where RSAs were conducted.

The following sections describe the key safety issues identified through the RSAs.

Road Safety Audit: State Route 28 between Bourne Rotary and Otis Rotary

MassDOT completed an RSA on April 5, 2013, for the State Route 28 corridor (General MacArthur Boulevard) in Bourne between Bourne Rotary and Otis Rotary.⁶ The RSA identified issues at the Bourne Rotary relating to insufficient signage and pavement markings guiding lane use within the rotary, insufficient or incorrectly placed signage approaching and within the rotary, driveways allowing access to the rotary, and lack of sidewalks around the rotary.

Road Safety Audit: Scenic Highway (U.S. Route 6) between State Route 25 and State Route 3

MassDOT completed an RSA on February 11, 2014, for the Scenic Highway (U.S. Route 6) corridor in Bourne between State Route 25 and State Route 3.⁷ The RSA identified safety concerns related to hydroplaning, high speeds (especially on the downhill grade of Scenic Highway westbound approaching Nightingale Road), lack of usable shoulders between Nightingale Pond Road and Edge Hill Road, and poor visibility of signal warning signage on Scenic Highway westbound approaching Bournedale Road.

Road Safety Audit: Major Roadway Segments along Scenic Highway (U.S. Route 6), Sandwich Road, and Cranberry Highway

MassDOT completed an RSA on June 21, 2022, focusing on three roadway segments, including seven intersections, in Bourne that the Cape Cod Commission identified as being within the top five percent of crash locations.⁸

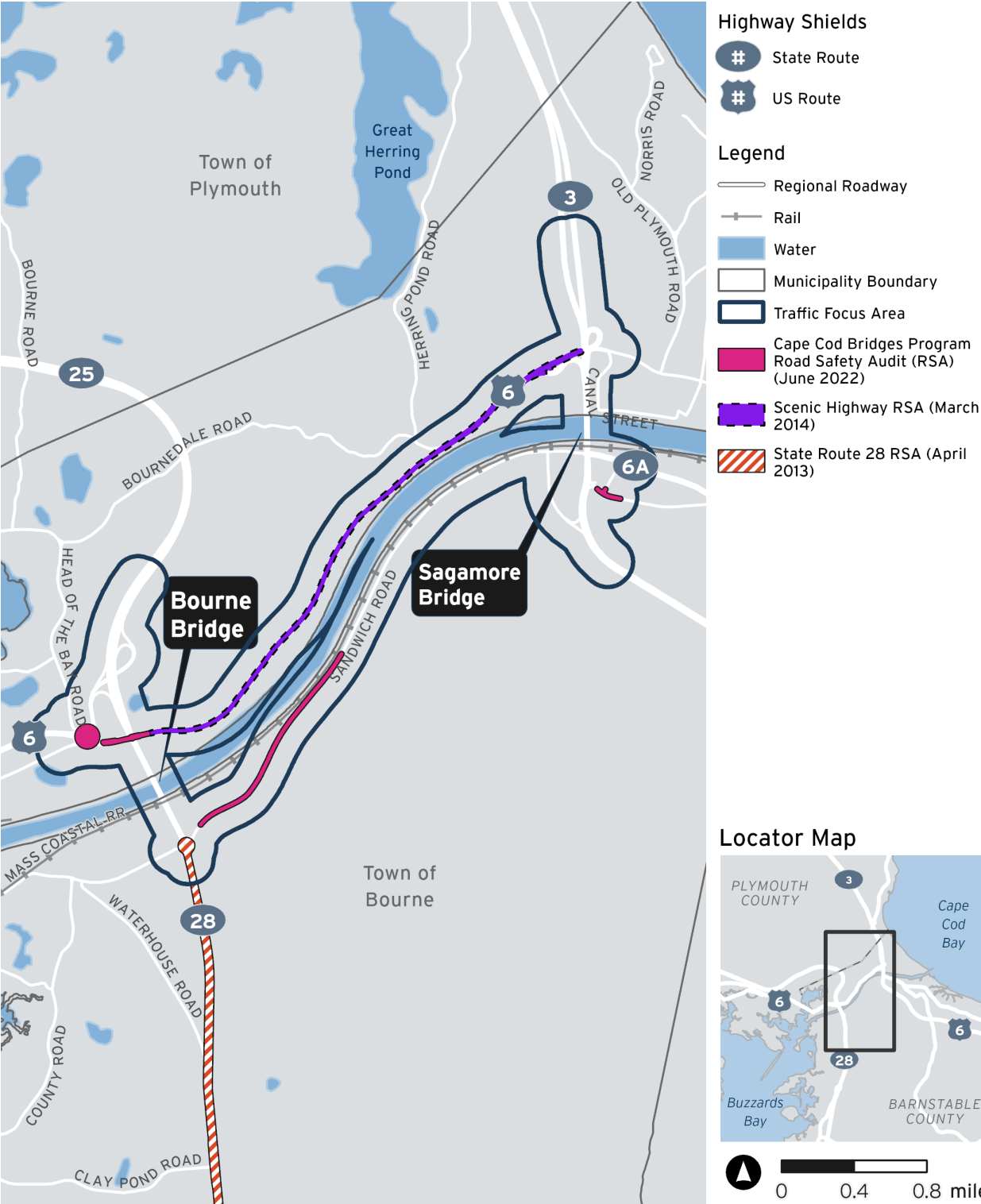
Several common safety issues were identified across the audit sites, including inadequate street lighting, limited signage, and faded pavement markings. Geometric constraints such as narrow shoulders and poor sight distances, combined with frequent speeding, further contributed to crash risks. Additional concerns involved gaps in pedestrian and bicycle facilities, inaccessible curb ramps, lack of crosswalks, outdated traffic signal equipment, and drainage deficiencies that lead to roadway flooding, pavement deterioration, and increased likelihood of crashes.

⁶ <https://gis.massdot.state.ma.us/arcgis/rest/services/Roads/RoadSafetyAudits/MapServer/0/310/attachments/291>

⁷ <https://gis.massdot.state.ma.us/arcgis/rest/services/Roads/RoadSafetyAudits/MapServer/0/318/attachments/298>

⁸ <https://gis.massdot.state.ma.us/arcgis/rest/services/Roads/RoadSafetyAudits/MapServer/0/59772/attachments/60924>

Figure 4.2-2. Road Safety Audit Locations within Study Area



Source: Massachusetts Department of Transportation, 2025

4.2.4.3 Transit Services and Facilities

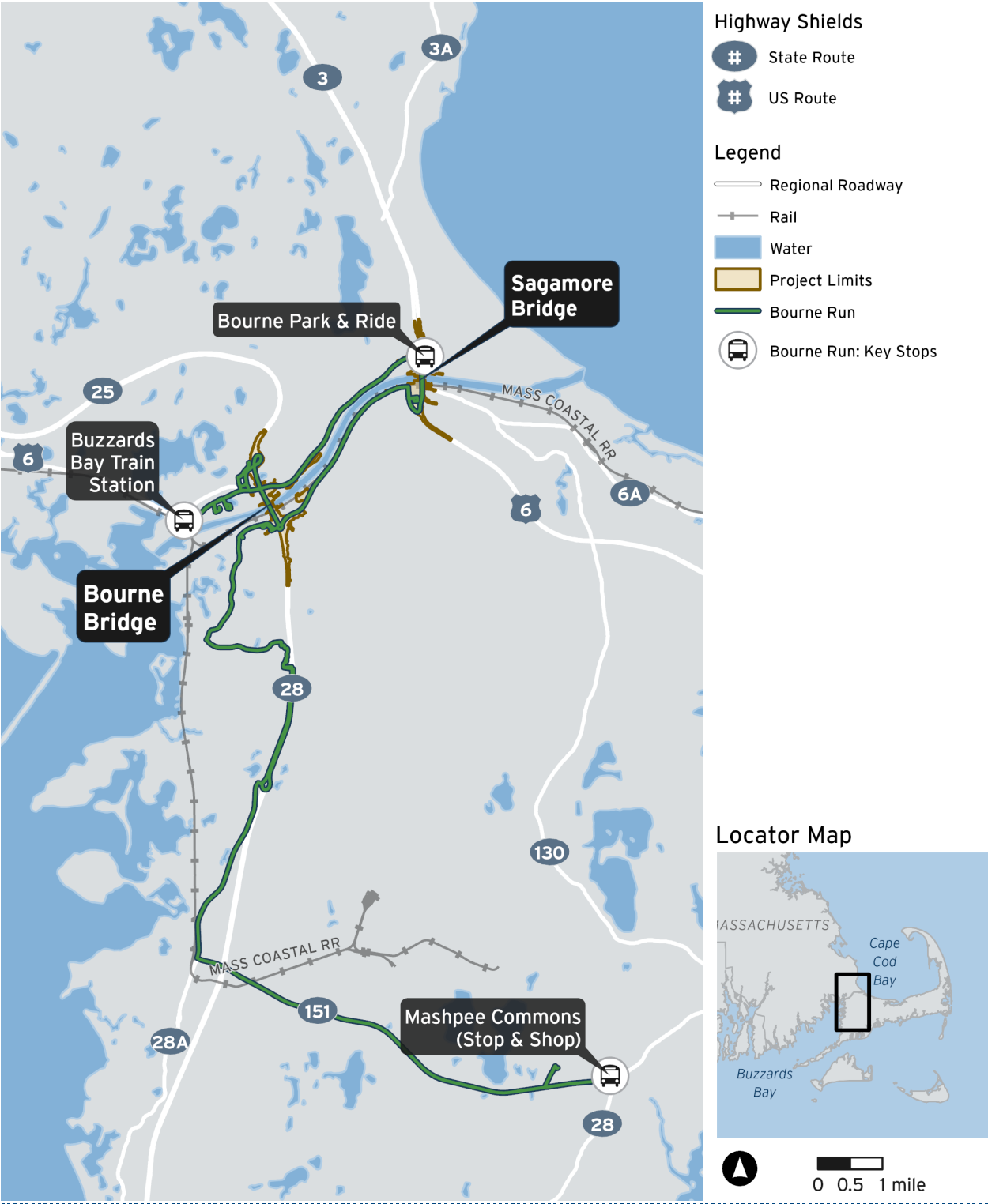
The Cape Cod Regional Transit Authority (CCRTA) is the primary public transportation provider within the Traffic Focus Area and Barnstable County. CCRTA provides fixed-route bus service within the Traffic Focus Area through two year-round routes, including the Bourne Run and Sandwich Line. Bourne Run travels between Mashpee Commons and the Buzzards Bay Train Station via Scenic Highway, County Road, State Route 28A, and State Route 151 (**Figure 4.2-3**). The Sandwich Line travels between the Hyannis Transportation Center in downtown Hyannis, through Sandwich, to the Buzzards Bay Train Station (**Figure 4.2-4**).

Sagamore and Bourne Bridges cross sections of the Cape Main Line, which runs approximately 31 miles from Middleborough (northwest of Cape Cod) to South Yarmouth, with a branch continuing to Hyannis (**Figure 4.2-5**). The Cape Main Line supports seasonal passenger service provided by the Cape Cod Central Railroad and the Cape Flyer and regular freight rail service operated by the Massachusetts Coastal Railroad (a subsidiary of Cape Cod Rail, Inc.).

The CapeFLYER, operated by the Massachusetts Bay Transportation Authority in partnership with CCRTA, provides weekend service between Boston and Hyannis from Memorial Day through Labor Day. The CapeFLYER stops at Bourne Station located within the U.S. Army Corps of Engineers (USACE)-managed Bourne Recreation Area near Bourne Bridge. The station, owned by MassDOT, features a prefabricated, high-level platform that accommodates seasonal passenger operations (**Exhibit 4.2-1**). Bourne Recreation Area also provides approximately 60 parking spaces, which are used by recreational visitors, USACE personnel, and rail passengers accessing Bourne Station for drop-off and pick-up.

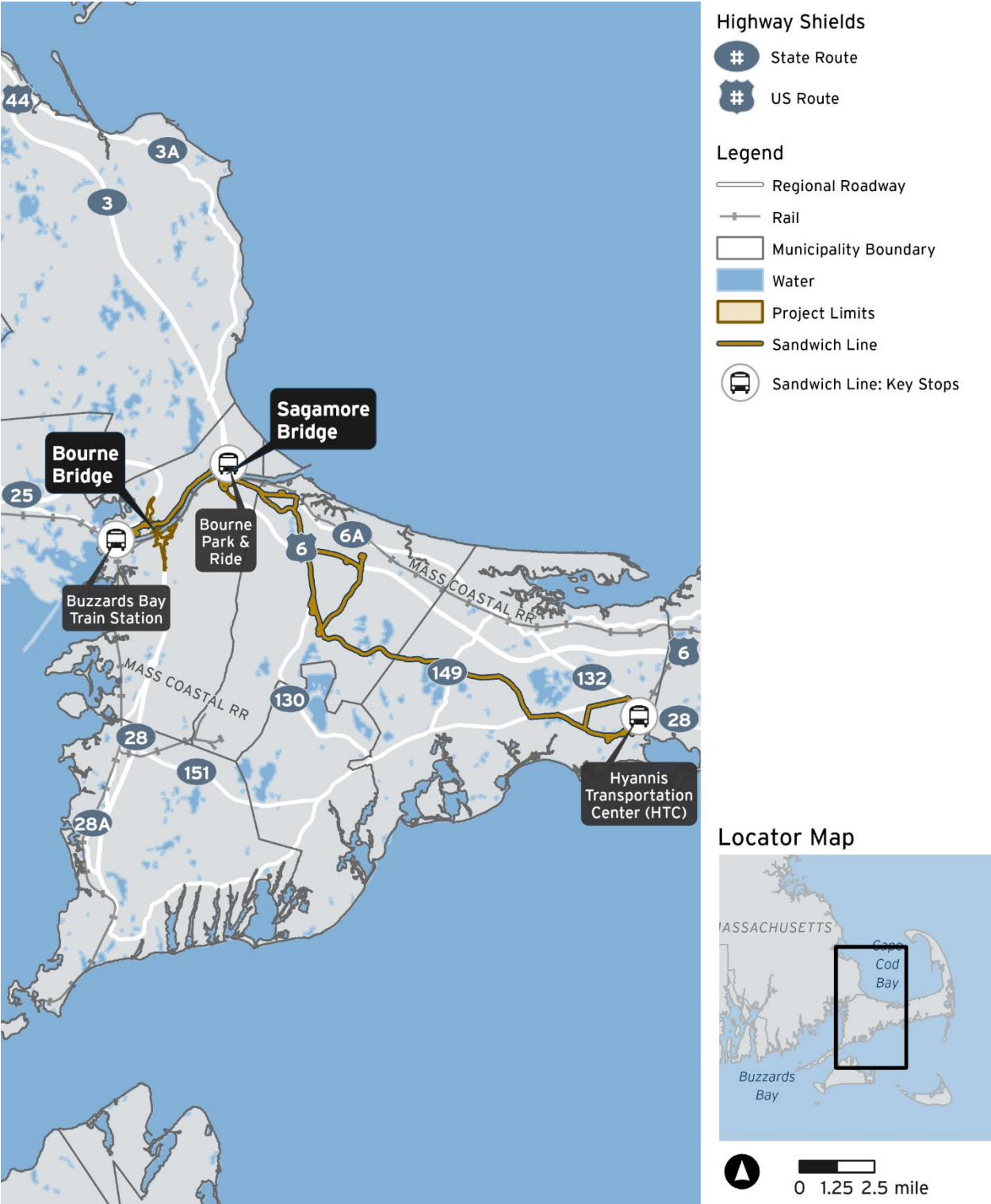
The Bourne Park and Ride facility, owned by MassDOT and located near Sagamore Bridge and adjacent to State Route 3, is the only commuter parking facility within the Traffic Focus Area (**Exhibit 4.2-2**). The lot provides 396 free parking spaces and allows commuters to park their vehicles and transfer to high-occupancy modes of transportation (such as buses, vanpools, or carpools) to complete their commute.

Figure 4.2-3. Bourne Run (Cape Cod Regional Transit Authority)



Source: Massachusetts Department of Transportation, 2024

Figure 4.2-4. Sandwich Line (Cape Cod Regional Transit Authority)



Source: Massachusetts Department of Transportation, 2024

Highway Shields

- # State Route
- # US Route

Legend

- Regional Roadway
- Rail
- Municipality Boundary
- Water
- Project Limits

Cape Cod Rail Lines

- Cape Main Line
- Hyannis Branch
- Otis Branch
- Falmouth Secondary Line

Cape Cod Rail Stations

- Cape Cod Rail Stations

Locator Map

MASSACHUSETTS

Cape Cod Bay

Buzzards Bay

0 2 4 mile

Cape Cod Bridges Program FEIS – Chapter 4, Section 4.2 Transportation, Traffic, and Safety

Exhibit 4.2-1. Bourne Station, September 2022



Source: Massachusetts Department of Transportation, 2022

Exhibit 4.2-2. Aerial View of Bourne Park and Ride Lot, August 2024



Source: Massachusetts Department of Transportation, 2024

4.2.5 Future Conditions

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 Traffic Focus Area. **Table 4.2-4** provides a comparison of the 2050 No Build and Build Alternatives traffic volumes on the bridges.

As indicated by the change in bridge volumes between 2050 No Build and Build in **Table 4.2-4**, 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 eastbound 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 4.2-4. 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
2050 Build Alternative	Northbound	34,630	29,970
	Southbound	44,070	20,530
	Total	78,700	50,500

To maintain a consistent basis for comparing the No Build and Build Alternatives in the future design year, both scenarios use the same combined average annual daily traffic that crosses the bridges. While travel time reductions under the proposed design may generate additional localized trips within the network, any resulting change in bridge crossing volumes is expected to be minimal and captured within the growth assumptions and adjustment factors applied to future traffic projections.

4.2.5.1 Vehicular Traffic Operations

Traffic Focus Area Capacity Analysis (Synchro and SIDRA Analysis)

The Existing Conditions Synchro and SIDRA models were updated from the 2019 Base Year to include the projected 2050 design year traffic volumes under the No Build Conditions. Additionally, models were created for the 2050 Build Alternative to reflect design updates and projected future traffic volumes. The models were used to assess intersection LOS, which is measured using delay-based ratings ranging from LOS A (free-flowing conditions with minimal delay) to LOS F (conditions characterized by severe congestion and excessive delay). Level of Service (LOS) is a letter grade system used to describe operational conditions within a traffic stream and their perception by the traveling public (**Table 4.2-5**).

Table 4.2-5 summarizes the delay criteria from the Highway Capacity Manual (7th edition) for each LOS letter grade at unsignalized, roundabout and signalized intersections. These criteria provide a consistent framework for comparing operational performance across different intersection control types.

Table 4.2-5. Intersection LOS Criteria

Delay (seconds per vehicle)		
LOS	Unsignalized and Roundabout	Signalized
A	≤10	≤10
B	>10 and ≤15	>10 and ≤20
C	>15 and ≤25	>20 and ≤35
D	>25 and ≤35	>35 and ≤55
E	>35 and ≤50	>55 and ≤80
F	>50	>80

Source: Highway Capacity Manual 7th Edition, 2022

Table 4.2-6 presents the projected LOS ratings for intersections within the Traffic Focus Area under the 2019 Existing Conditions and the 2050 No Build and Build Alternatives during the Fall Weekday PM peak period. The following findings provide a summary of the intersection LOS evaluation for the 2050 Build Alternative:

- Three intersections are projected to decline from LOS A or LOS B (No Build) to LOS C (Build), consistent with stable peak-period operating conditions.
- Belmont Circle is the only intersection that continues to operate at or above capacity (LOS F) under the Build Alternative. However, reduced delays and shorter queues are expected at this location compared to the No Build Alternative due to the introduction of direct-connect ramps between State Route 25 and Scenic Highway.
- None of the new or combined intersections under the Build Alternative are expected to operate at or above capacity (LOS E or LOS F).

Figure 4.2-6 depicts the LOS ratings for all intersections within the Sagamore North and Sagamore South quadrants of Traffic Focus Area under the 2050 Build Alternative. **Figure 4.2-7** depicts the LOS ratings for all intersections within the Bourne North and Bourne South quadrants of the Traffic Focus Area under the 2050 Build Alternative.

Table 4.2-6. Projected Traffic Focus Area Intersection LOS (2050 Fall Weekday PM Peak Period)

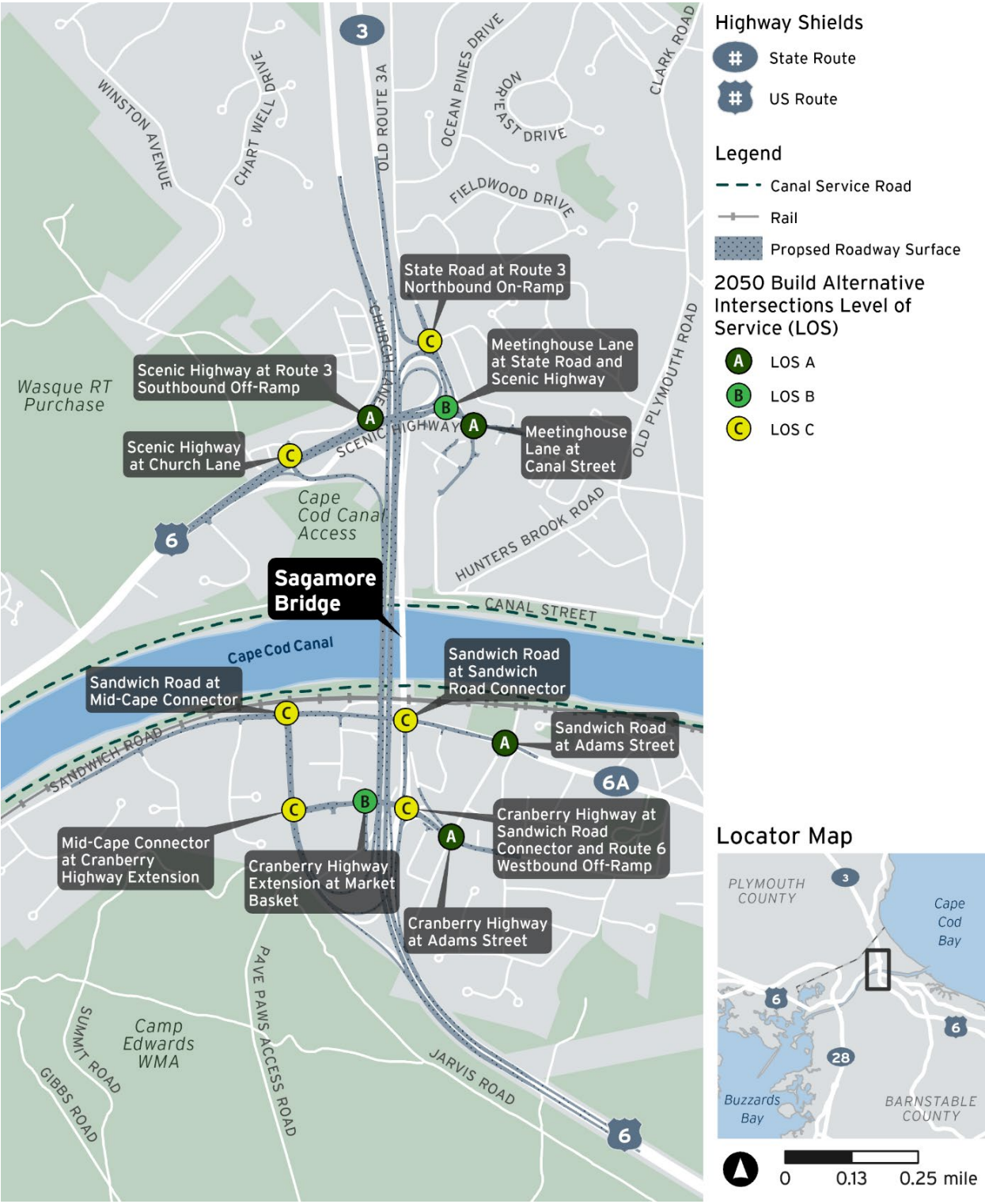
Quadrant	Intersection Name	Intersection Control Type	2019 Existing Level of Service (LOS)	2050 No Build Alternative LOS	2050 Build Alternative LOS
Sagamore North	Scenic Highway at Church Lane	Signalized	C	B	C
	Scenic Highway at State Route 3 Southbound (SB) Off-Ramp	Signalized	D	E	A
	Meetinghouse Lane at State Road/Canal Street	Signalized	E	D	N/A - Removed in 2050 Build Alternative
	Meetinghouse Lane at State Road and Scenic Highway (New in 2050 Build Alternative)	Roundabout	N/A	N/A	B
	Meetinghouse Lane at Canal Street (New in 2050 Build Alternative)	Roundabout	N/A	N/A	A
	State Road at State Route 3 Northbound (NB) On-Ramp	Signalized	A	A	C
Sagamore South	Sandwich Road at Mid-Cape Connector	Signalized	B	C	C
	Mid-Cape Connector at Factory Outlet Way	Signalized	B	B	N/A – Replaced by Mid-Cape Connector at Cranberry Highway Extension in 2050 Build Alternative
	Mid-Cape Connector at Cranberry Highway Extension	Signalized	N/A	N/A	C
	Cranberry Highway at Adams Street	Stop Control	A	A	A

Quadrant	Intersection Name	Intersection Control Type	2019 Existing Level of Service (LOS)	2050 No Build Alternative LOS	2050 Build Alternative LOS
	Sandwich Road at Adams Street	Uncontrolled	A	A	A
	Sandwich Road at Sandwich Road Connector (New in 2050 Build Alternative)	Signalized	N/A	N/A	C
	Cranberry Highway Extension at Market Basket (New in 2050 Build Alternative)	Roundabout	N/A	N/A	B
	Cranberry Highway at Sandwich Road Connector and U.S. Route 6 Westbound Off-Ramp (New in 2050 Build Alternative)	Roundabout	N/A	N/A	C
Bourne North	Belmont Circle	Unique rotary type (intersection of several roadways and driveways)	F	F	F
	Scenic Highway (U.S. Route 6) at Nightingale Road/Andy Oliva Drive	Signalized (under Existing Conditions & No Build Alternative) Roundabout (under Build Alternative)	B	D	A
Bourne South	Bourne Rotary	Rotary	F	F	N/A - Removed in 2050 Build Alternative
	State Route 28 SB Ramps at Trowbridge Road (New in 2050 Build Alternative)	Dogbone Roundabout	N/A	N/A	D
	Route 28 NB Ramps at Trowbridge Road (New in 2050 Build Alternative)	Dogbone Roundabout	N/A	N/A	C

Quadrant	Intersection Name	Intersection Control Type	2019 Existing Level of Service (LOS)	2050 No Build Alternative LOS	2050 Build Alternative LOS
	Trowbridge Road at Veterans Way	Stop Control	A	A	A
	Sandwich Road at Veterans Way	Stop Control	A	A	A
	Sandwich Road at Sandwich Road	Stop Control	F	F	N/A - Combined in 2050 Build Alternative
	Sandwich Road at Upper Cape Cod Technical School	Uncontrolled	F	F	N/A - Combined in 2050 Build Alternative
	Sandwich Road at Upper Cape Cod Technical School and Lower Sandwich Road (Combined intersection in 2050 Build Alternative)	Roundabout	N/A	N/A	C

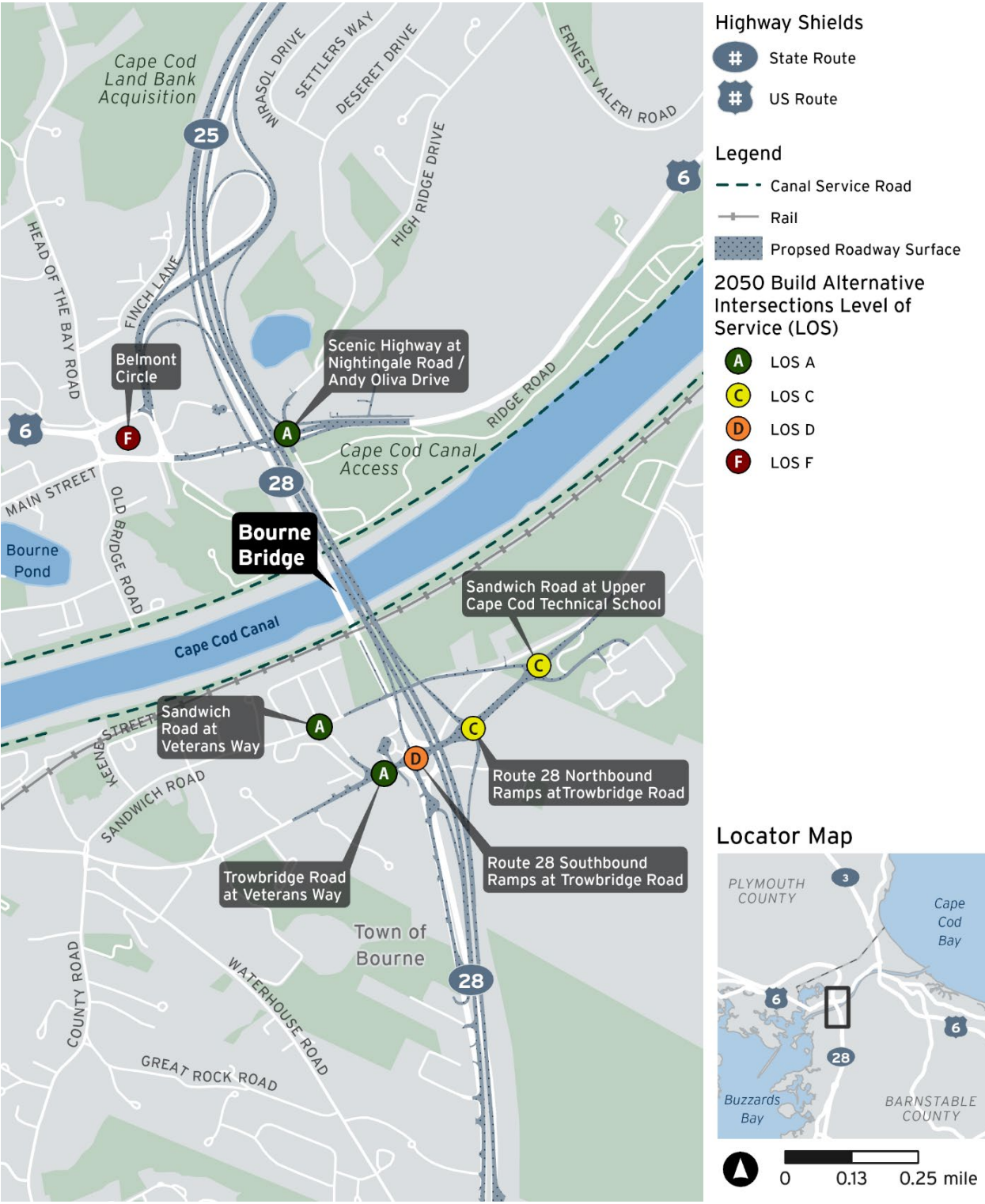
N/A = not applicable

Figure 4.2-6. Projected Traffic Focus Area Intersection LOS (2050 Fall Weekday PM Peak Period) – Sagamore Bridge



Source: Massachusetts Department of Transportation, 2025

Figure 4.2-7. Projected Traffic Focus Area Intersection LOS (2050 Fall Weekday PM Peak Period) – Bourne Bridge



Source: Massachusetts Department of Transportation, 2025

Traffic Focus Area VISSIM Analysis

Table 4.2-7 provides a comparison of the VISSIM model network results for the 2050 No Build and Build Alternatives. The processed volumes depict the total number of vehicles processed by the 2050 No Build and Build Alternatives VISSIM models. The network travel times depict the total network travel time for all vehicles that have been processed through each network along with those vehicles active at the end of the simulation.

Table 4.2-7. VISSIM Model Network Results (Fall Weekday PM Peak Hour)

Metric	2050 No Build Alternative	2050 Build Alternative	Percentage Change
Processed Volumes	11,443	13,922	21.7%
Network Travel Times (vehicle hours traveled)	2,879	2,126	-26.2%

As indicated in **Table 4.2-7**, 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 26.2% compared to the 2050 No Build Alternative representing an additional 4% reduction beyond what was reported in the Draft Environmental Impact Statement.

Table 4.2-8 depicts the estimated diagonal bridge crossing travel times (in minutes) along the predominant O-D routes for the 2050 No Build and Build Alternatives. Diagonal bridge crossings refer to travel in the Study Area between State Route 25 and U.S. Route 6 or between State Route 3 and State Route 28. These routes use Scenic Highway (U.S. Route 6) or Sandwich Road and include a single crossing of Cape Cod Canal via Sagamore Bridge or Bourne Bridge. 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 southbound to State Route 28 southbound via Sandwich Road. While the travel times do not improve for this route via Sandwich Road, the travel times improve for this movement using Scenic Highway, which becomes a much more desirable route. The collective total travel time from State Route 3 southbound to State Route 28 southbound via Scenic Highway and Sandwich Road is lower in the Build Alternative compared to the No Build. Refer to **Appendix 4.2, Traffic Engineering Technical Report**, for graphics depicting the vehicle paths along these O-D routes.

Table 4.2-8. 2050 Diagonal Bridge Crossing Travel Times (Fall Weekday PM Peak Hour)

Route		2050 No Build Alternative (minutes)	2050 Build Alternative (minutes)
State Route 25 eastbound (EB) to U.S. Route 6 EB via	Scenic Highway	24.2	11.3
	Sandwich Road	20.6	12.1
State Route 28 northbound (NB) to State Route 3 NB via	Sandwich Road	15.9	11.6

Route		2050 No Build Alternative (minutes)	2050 Build Alternative (minutes)
State Route 3 southbound (SB) to State Route 28 SB via	Scenic Highway	19.1	10.7
	Sandwich Road	21.5	23.4
U.S. Route 6 westbound (WB) to State Route 25 WB via	Scenic Highway	22.9	12.0

Table 4.2-9 summarizes (in minutes) the estimated through-bridge crossing travel times for the 2050 No Build and Build Alternatives. Through-bridge crossings refer to direct passage through the Study Area along State Route 25/28 via Bourne Bridge or along State Route 3/U.S. Route 6 via Sagamore Bridge. 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 4.2-9. 2050 Through-Bridge Crossing Travel Times (Fall Weekday PM Peak Hour)

Route	Direction	No Build Alternative (minutes)	Build Alternative (minutes)
Sagamore Bridge	Southbound	10.4	4.6
	Northbound	8.5	4.8
Bourne Bridge	Southbound	11.4	5.4
	Northbound	14.5	6.1

Regional Study Area Intersection Capacity Analysis (Synchro & SIDRA Analysis)

Table 4.2-10 presents the projected LOS ratings for intersections within the Regional Study Area under the 2050 No Build and Build Alternatives during the fall weekday PM peak period. As presented, no intersections within the Regional Study Area are projected to experience a decline in LOS to a level at or above capacity (LOS E or LOS F) under the Build Alternative, compared to the No Build.

Table 4.2-10. Projected Regional Study Area Intersection LOS Summary (Fall 2050 Weekday PM Peak Period)

Intersection	Town	2050 No Build Alternative Level of Service (LOS)	2050 Build Alternative LOS
Herring Pond Road at State Road	Plymouth	F	F
Herring Pond Road at State Route 3 Northbound (NB) Ramps	Plymouth	F	F
Herring Pond Road at State Route 3 Southbound (SB) Ramps	Plymouth	F	F

Intersection	Town	2050 No Build Alternative Level of Service (LOS)	2050 Build Alternative LOS
Cranberry Highway at Sandwich Road and Regency Drive	Sandwich	F	F
Old King's Highway (Route 6A) at Main Street (Route 130) and Tupper Road	Sandwich	F	F
Old King's Highway (Route 6A) at Tupper Road	Sandwich	F	F
Water Street (Route 130) at Beale Avenue	Sandwich	A	A
Main Street at Beale Avenue	Sandwich	A	A
Old King's Highway (Route 6A) at Main Street and Old Main Street	Sandwich	A	A
Forestdale Road (Route 130) at U.S. Route 6 Eastbound (EB) Ramps	Sandwich	F	F
Water Street (Route 130) at U.S. Route 6 Westbound (WB) Ramps	Sandwich	F	F
Quaker Meeting House Road at U.S. Route 6 EB Ramps	Sandwich	A	A
Quaker Meeting House Road at U.S. Route 6 WB Ramps	Sandwich	A	A
Route 130 at Cotuit Road	Sandwich	B	B
Maple Springs Road at State Route 25 NB On-Ramp	Wareham	A	A
Maple Springs Road at State Route 25 SB Off-Ramp	Wareham	A	A
Glen Charlie Road at State Route 25 NB Off-Ramp	Wareham	A	A
Glen Charlie Road at State Route 25 SB On-Ramp	Wareham	A	A
Buzzards Bay Rotary	Bourne	A	A
Sandwich Road at Trowbridge Road, County Road, and Shore Road	Bourne	A	C
Sandwich Road at Harbor Lights Road	Bourne	D	A
Sandwich Road at Jefferson Road (Tech Drive)	Bourne	A	A
Sandwich Road at Gibbs Road	Bourne	A	A

Intersection	Town	2050 No Build Alternative Level of Service (LOS)	2050 Build Alternative LOS
Nathan Ellis Highway (Route 151) at State Route 28 NB Ramps	Falmouth	B	B
Nathan Ellis Highway (Route 151) at State Route 28 SB Ramps	Falmouth	F	F

4.2.6 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.

Based on a preliminary evaluation of the safety performance metrics and CMFs associated with the proposed improvements, predicted crashes experienced along Sagamore and Bourne Bridges could be reduced by as much as 48%.⁹ 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%,¹⁰ and the number of cross-median crashes (sideswipe in opposite direction and head-on) by up to 97%.¹¹

[Additionally, the Build Alternative addresses many of the safety issues that were identified in the RSAs. The following sections discuss the recommendations from the RSAs that have been incorporated into the Build Alternative's proposed design.](#)

4.2.6.1 Road Safety Audit: State Route 28 between Bourne Rotary and Otis Rotary

[In 2023, MassDOT implemented short-term traffic improvements at Bourne Rotary \(MassDOT Project No. 610542\) to enhance safety and traffic flow in advance of major changes planned under the Program. These improvements included restriping the rotary to delineate the number of lanes, constructing channelization to separate traffic headed for Sandwich Road eastbound from those headed to Bourne Bridge, and installing new signage. Several key recommendations from the RSA were incorporated into the Build Alternative's proposed design, including:](#)

-
- ⁹ 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.
- ¹⁰ AASHTO. 2010. [The Highway Safety Manual](#), American Association of State Highway Transportation Professionals, Washington, D.C., <http://www.highwaysafetymanual.org>
- ¹¹ (CMF ID: 7040) NCHRP Report 794: Median Cross-Section Design for Rural Divided Highways. 2011.

- Replacing Bourne Rotary with a grade-separated option, such as a diamond interchange.
- Providing new ramp connections to the separated highway mainlines with acceleration and deceleration lanes designed to current standards.
- Establishing new designated entrance and exit driveways for the Cumberland Farms gas station at 4 MacArthur Boulevard.
- Providing overhead guide signage to improve motorist visibility.

4.2.6.2 Road Safety Audit: Scenic Highway (U.S. Route 6) between State Route 25 and State Route 3

In response to the findings in the RSA, MassDOT proposed a reconstruction project (MassDOT Project No. 606082) focusing on improvements to the Scenic Highway corridor between Edgehill Road and Nightingale Road. This project, listed in the 2026 Transportation Improvement Program for the Cape Cod Metropolitan Planning Organization,¹² includes the addition of a raised center median to separate eastbound and westbound curves, and installation of stormwater control measures to address drainage concerns. The design for this project is complete and is currently under construction.

4.2.6.3 Road Safety Audit: Major Roadway Segments along Scenic Highway, Sandwich Road, and Cranberry Highway

A key RSA recommendation was separating local and regional traffic at specific audit sites to reduce congestion and crash risk. These identified sites include:

- Audit Site 1: Scenic Highway, just East of Belmont Circle
- Audit Site 3: Sandwich Road at Sandwich Road Connector
- Audit Site 7: Cranberry Highway, between U.S. Route 6 westbound Exit 55 and east of Adams Street

The current design for the Build Alternative incorporates several RSA recommendations, including circulation changes to separate local and regional traffic, multimodal improvements, wayfinding signage, lighting, and upgraded drainage features.

Separation of Local and Regional Traffic

At Scenic Highway, just east of Belmont Circle (Audit Site 1), the proposed design includes new entrance and exit ramps connecting Scenic Highway (U.S. Route 6) to State Route 25. These ramps provide a direct connection for regional traffic, enabling vehicles traveling between Sagamore and Bourne Bridges to bypass Belmont Circle entirely. It also reduces the number of vehicles on Scenic Highway just east of Belmont Circle, allowing this segment of roadway to be reduced from two lanes in each direction to one lane in each direction. This would encourage lower operating speeds and make it easier for local access in and out of the adjacent driveways.

¹² Cape Cod Commission. (2025). Cape Cod Transportation Improvement Program: Federal Fiscal Year 2026–2030 (Endorsed May 19, 2025; Amended November 17, 2025).

At the Sandwich Road Connector (Audit Site 3), local and regional traffic would be separated by replacing the at-grade Bourne Rotary with a grade-separated diamond interchange. The grade separation would enable regional traffic to flow directly through the interchange without conflicting with local circulation. This configuration reduces speeds and conflicts points on local roadways, while improving traffic operations.

At Cranberry Highway, (Audit Site 7), the proposed design extends Cranberry Highway under U.S. Route 6 to link with Sandwich Road via Mid Cape Connector and adds a westbound on-ramp from Mid-Cape Connector to Sagamore Bridge. These upgrades are expected to divert regional traffic away from Adams Street, thereby reducing cut-through traffic on local roadways and improving safety for local circulation.

Proposed Multimodal, Safety, and Drainage Improvements

The proposed design incorporates several safety and mobility enhancements, including shared-use paths and Americans with Disabilities Act-compliant curb ramps to improve multimodal connectivity, upgraded roadway lighting, guide signage, pavement markings to enhance visibility and lane clarity, and new stormwater control measures to improve drainage and reduce roadway flooding.

4.2.7 Construction Sequencing and Traffic Management

As discussed in **Chapter 3, Proposed Action and Alternatives**, the replacement of the Sagamore and Bourne Bridges will be delivered through a phased construction approach that sequences activities to maintain continuous traffic operations and minimize disruption to local and regional mobility during construction. To support efficient construction and reduce on-site impacts, the bridge arches are proposed to be fabricated off-site, transported to the project area via barges on the Cape Cod Canal, and lifted into place using specialized heavy-lift equipment. This accelerated bridge construction method shortens the duration of work adjacent to active traffic, enhances worker and traveler safety, and enables faster transitions between phases.

Although the conceptual construction sequencing plan is designed to maintain mobility and minimize traffic disruption, motorists should expect temporary changes in travel patterns, periodic lane closures, and reduced travel speeds that may affect travel times and overall network performance. Construction vehicles entering and exiting work zones may also contribute to localized congestion and intermittent delays. These vehicle movements can momentarily disrupt traffic flow and reduce available roadway capacity, particularly during peak hours or where shoulder widths are restricted. To the extent feasible, any temporary lane closures would be scheduled during off-peak hours to minimize impacts on roadway users. Additional restrictions would apply during the peak summer season to limit impacts on heavy seasonal traffic.

4.2.8 Effects on Transit Services and Facilities

4.2.8.1 No Build Alternative

The 2050 No Build Alternative is not expected to improve bus operations within the Traffic Focus Area as vehicle hours traveled (VHT) is projected to increase relative to both existing 2019 conditions and the 2050 Build Alternative during the Fall Weekday PM peak hour. Higher VHT leads to slower operating speeds, longer travel times, and reduced efficiency, further constraining the reliability and operational performance of bus service within the Traffic Focus Area.

The No Build Alternative would retain the current Sagamore and Bourne Bridges despite their age and deteriorating condition. As the bridges continue to deteriorate, maintenance activities such as steel repairs and structural inspections would become more frequent. These activities may cause ongoing operational disruptions that limit the reliability and efficiency of freight and passenger rail service over time.

The No Build Alternative avoids direct, physical, or construction-related impacts to the Bourne Park and Ride facility.

4.2.8.2 Build Alternative

The VHT within the Traffic Focus Area is projected to decrease in the 2050 Build Alternative relative to both existing 2019 conditions and the 2050 No Build Alternative during the Fall Weekday PM peak hour. Lower VHT supports faster operating speeds, shorter travel times, and improved efficiency, strengthening the reliability and operational performance for all vehicular traffic, including buses, within the Traffic Focus Area.

During construction and similar to vehicular operations, bus operations would be affected by temporary traffic pattern changes, intermittent lane closures, and work-zone speed reductions, resulting in longer travel times and reduced schedule reliability. Mitigation measures to address these effects are described in **Section 4.2.9**.

The Build Alternative would have no long-term effect on rail operations within the Traffic Focus Area. However, construction of the new bridge spans and demolition of the existing structures would temporarily affect freight and seasonal passenger rail services, including periodic service interruptions, speed restrictions, and limited operating windows during critical construction activities. Mitigation measures to address these effects are described in **Section 4.2.9**.

The Build Alternative proposes full right-of-way acquisition of the 4.1-acre Bourne Recreation Area, which would result in the displacement of all existing facilities, including the Bourne Train Station and its associated parking areas. Mitigation measures to address these effects are described in **Section 4.2.9**.

The Build Alternative results in a permanent reduction of 12 spaces at the Bourne Park and Ride facility. The permanent loss of 12 parking spaces at the Bourne Park and Ride, which provides 396 spaces in total, represents a reduction of 5 spaces from what was reported in the Draft Environmental Impact Statement. This change results from grading and layout refinements made

during subsequent design development. MassDOT will continue coordinating with local and regional partners to determine whether replacement parking is needed and to ensure that any impacts on park-and-ride functionality are properly addressed.

4.2.9 Mitigation

4.2.9.1 Operational Traffic Effects

The 2050 Build Alternative is not expected to result in any LOS degradation to LOS E or F (conditions at or above capacity) at studied intersections within the Traffic Focus Area or Regional Study Area during the fall weekday PM peak hour, when compared to the 2050 No Build Alternative. Accordingly, no long-term operational mitigation measures are proposed.

4.2.9.2 Construction Traffic Management

MassDOT's request for proposals will require the design-builder to develop and implement a robust Transportation Management Plan (TMP) to minimize adverse effects to traffic during construction. The TMP will establish the strategic framework for managing work zone operations and communicating anticipated impacts to roadway users throughout the construction period. Key components of the TMP will include:

- Temporary Traffic Control Plan (TTCP)
- Transportation Operations (TO) strategies
- Public Involvement and Communication Plan

The TTCP will include engineered plans detailing traffic control devices, lane tapers, signage, and pavement markings needed to maintain traffic safety and control throughout the work zone. The plan will be consistent with the design-builder's final design and construction sequencing and subject to MassDOT's review and approval. All temporary roadways, alignments, lane shifts, and tapers for the highway mainlines and interchange ramps within the Project Limits will be required to meet or exceed the following design parameters 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

Development of the TTCP will involve coordination with elected officials, engineering and planning staff, and public safety departments in the Town of Bourne to ensure the plan reflects local needs and operational requirements.

The TO component of the TMP will address operations and management of the transportation system in the work zone impact area. Transportation operations strategies will include travel demand management, signal retiming, deployment of intelligent transportation systems, speed management, and traffic incident response protocols to support safe and efficient travel during construction.

The Public Involvement and Communication Plan will include measures to inform affected road users, emergency response personnel, and other stakeholders about construction activities, expected work zone conditions, changing travel patterns, and available travel alternatives. Strategies may include project websites, email and text alerts, variable message signs, press releases, social media updates, stakeholder coordination meetings, and public information sessions to ensure timely and accurate communication throughout construction.

The TMP will also define monitoring and performance requirements to evaluate the effectiveness of traffic management strategies throughout construction. These requirements will establish procedures for tracking traffic conditions, identifying emerging issues, and implementing adjustments as needed to maintain safe and reliable travel. Monitoring activities may include field observations, traffic data collection, and coordination with local and regional agencies to ensure the TMP remains responsive to changing conditions throughout the construction period.

4.2.9.3 Transit Facilities and Services

Bourne Train Station

MassDOT proposes to relocate Bourne Train Station within the new permanent Bourne Recreation Area, in accordance with mitigation commitments made under Section 4(f) of the U.S. Department of Transportation and in coordination with USACE. The new Bourne Recreation Area would be located approximately 0.75 miles to the east within the Cape Cod Canal Federal Navigation Project, including a portion of the USACE-leased Gallo Ice Arena parcel. The relocated station would be designed to function as a more accessible and better-connected facility that improves pedestrian, bicycle, transit, and vehicular access to the new railroad train platform.

The concept includes a new bus loop with approximately 24 parking spaces to support transit operations and short-term parking needs; a larger parking lot accommodating up to 100 vehicles for rail users, recreational visitors, and rideshare activity; and a new 24-foot-wide roadway providing access from Sandwich Road. Additionally, a shared-use path is currently proposed that would connect the new Bourne Recreation Area and Gallo Ice Arena to Sandwich Road and the South Canal Service Road. Together, these elements create a multimodal facility that improves circulation and supports

safe, efficient access for all users. Refer to **Section 4.17, Public Parks, Recreational Facilities, and Open Space**, for further mitigation details regarding the relocated Bourne Recreation Area.

Rail Service Operations

As part of the TMP, the Public Involvement and Communication Plan will outline measures to keep stakeholders and the traveling public informed of construction activities that may affect freight and seasonal passenger rail services during construction. This will include clear communication protocols, advance notification procedures, and coordinated outreach to ensure any anticipated service impacts are conveyed in a timely and accessible manner.