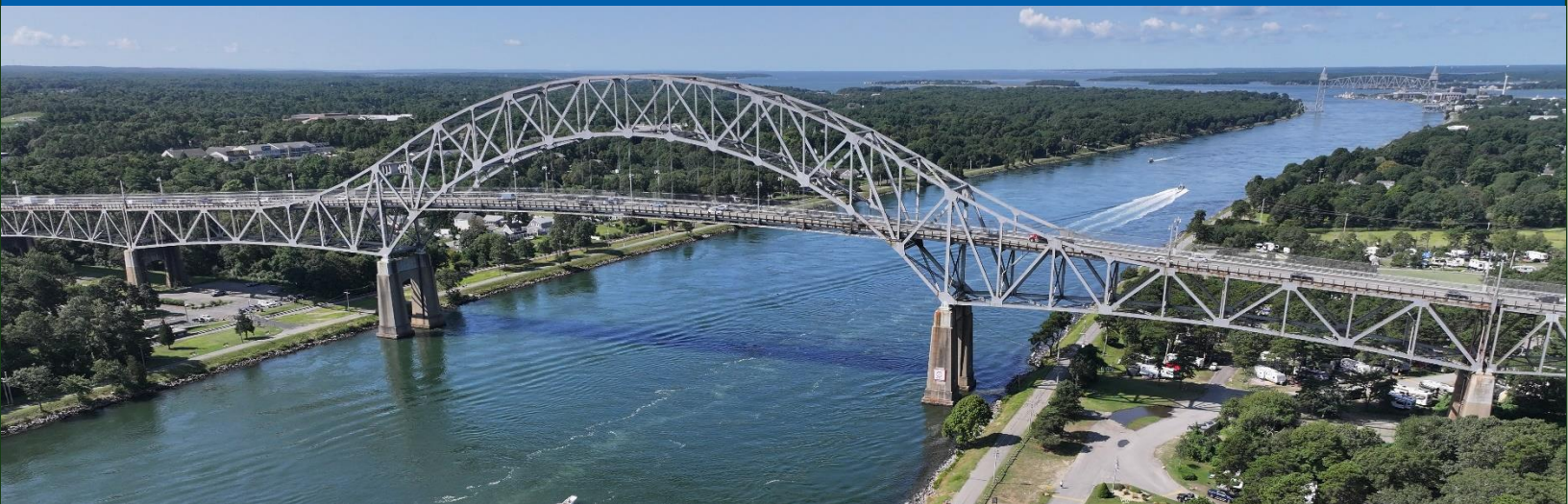




Cape Cod Bridges Program

Bourne, Massachusetts

Appendix 4.16 Cultural Resources Technical Report

SUBMITTED TO:
Federal Highway Administration
Massachusetts Division
220 Binney Street, 9th Floor
Cambridge, MA 02142

PROPONENT:
The Massachusetts Department of
Transportation
Highway Division
10 Park Plaza
Boston, MA 02116

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massDOT
Massachusetts Department of Transportation

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Massachusetts SHPO, New England District of the USACE, and MassDOT for the Cape Cod Bridges
Program

Attachment 2 – MHC Inventory Forms

Acronyms and Abbreviations

Acronym/Abbreviation	Definition
ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effects
CFR	Code of Federal Regulations
FHWA	Federal Highway Administration
MACRIS	Massachusetts Cultural Resources Information System
MassDOT	Massachusetts Department of Transportation
MHC	Massachusetts Historical Commission
MHC Inventory	Massachusetts Historical Commission Inventory of Historic and Archaeological Assets of the Commonwealth
MRER/EA	Major Rehabilitation Evaluation Report/Environmental Assessment
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
Program	Cape Cod Bridges Program
SHPO	State Historic Preservation Officer
SRHP	State Register of Historic Places
THPO	Tribal Historic Preservation Officer
USACE	U.S. Army Corps of Engineers
USC	United States Code

1 Introduction

This Cultural Resources Technical Report has been prepared in support of the Draft Environmental Impact Statement for the Cape Cod Bridges Program (Program), in accordance with the following federal and state statutes, regulations, and guidance:

- National Environmental Policy Act (NEPA) of 1969, as amended, 42 United States Code (USC) 4321 et seq.
- *Efficient Environmental Reviews for Project Decisionmaking and One Federal Decision*, 23 USC 139.
- Federal Highway Administration's (FHWA) regulations implementing NEPA, *Environmental Impact and Related Procedures* (23 Code of Federal Regulations [CFR 771]), and corresponding guidance, Technical Advisory (T 6640.8A): *Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (October 30, 1987).
- Section 4(f) of the U.S. Department of Transportation Act of 1966 and its implementing regulations, 49 USC 303, 23 CFR 774.

2 Summary of Findings

In accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and its implementing regulations (36 CFR 800), and in coordination with FHWA, the Massachusetts Department of Transportation (MassDOT) assessed the potential effects of the Build Alternative on historic architectural resources and archaeological resources (collectively referred to as historic properties) that are included in or eligible for inclusion in the National Register of Historic Places (NRHP).

In consultation with the Massachusetts State Historic Preservation Officer (SHPO), MassDOT established geographical Areas of Potential Effects (APE) to identify historic properties and to assess potential effects of the Build Alternative on those resources. MassDOT established a Construction APE for each bridge, which includes all areas that could be affected by the Build Alternative, due to bridge construction or demolition, approach highway realignment, interchange reconstruction, construction of new bicycle and pedestrian accommodations, use of temporary construction staging or laydown areas, and/or right-of-way acquisitions. The Sagamore and Bourne Construction APEs correspond to the two project limits for the Sagamore and Bourne Bridges. Additionally, MassDOT established a single, more expansive APE—the Viewshed APE—to identify areas where the existing bridges are visible, incorporating topography and the influence of trees and buildings within the landscape, and to assess the visual impact of the proposed bridge design.

To identify NRHP-listed and NRHP-eligible historic architectural properties within the Construction and Viewshed APEs, MassDOT reviewed previously identified architectural resources in the APEs and reviewed its Historic Bridge Inventory files, the online Massachusetts Cultural Resources Information System (MACRIS), the MHC Inventory of Historic and Archaeological Assets of the Commonwealth

(MHC Inventory), and other state, regional, and local resources. Additionally, in 2023, MassDOT conducted a Reconnaissance Level Architectural Resources Survey to identify architectural resources that could be temporarily and/or permanently affected by the Build Alternative based on preliminary plans, including field verification through site walkovers. MassDOT conducted an Archaeological Reconnaissance Survey (*Archaeological Sensitivity Assessment*) to identify known and potential pre-contact and post-contact archaeological sites within the Construction APEs, to assess the archaeological sensitivity of the Construction APEs, and to make recommendations for the protection of cultural resources and /or additional investigations.

Sagamore Bridge, Bourne Bridge, and the Cape Cod Canal Historic District are the only architectural historic properties identified within Construction APEs that are eligible for listing in the NRHP. No NRHP-listed properties were identified within the Construction APEs. In addition to the NRHP-eligible Cape Cod Canal Historic District, which is in the viewshed of both bridges, MassDOT identified one NRHP-listed and eight NRHP-eligible architectural historic properties within the viewshed of Sagamore Bridge and five NRHP-listed and six NRHP-eligible architectural historic properties within the viewshed of Bourne Bridge.

The demolition of the Sagamore and Bourne Bridges in the Build Alternative would have an unavoidable adverse effect on each of those NRHP-eligible structures in accordance with 36 CFR 800.5(a)(2)(i). Additionally, the Build Alternative would result in the loss of the two historic structures that are contributing resources to the NRHP-eligible Cape Cod Canal Historic District. Further, construction of new bridges to replace Sagamore and Bourne Bridges would affect the lands within the historic district. To mitigate the adverse effects on the NRHP-eligible Sagamore and Bourne Bridges, MassDOT has prepared a Draft Programmatic Agreement among FHWA, MassDOT, and SHPO in accordance with 36 CFR 800.14(b). The Programming Agreement will commit FHWA and MassDOT to certain stipulations and will guide the Program through Section 106 consultation during the design-build process.

To minimize impacts to the feeling and setting of the Cape Cod Canal Historic District, and in coordination with FHWA and with input from the public, MassDOT selected the replacement bridge type design in part because it would have a kinship with the existing historic high-level through truss bridges and would provide a similar monumental gateway experience across Cape Cod Canal. By incorporating a network arch main span across the canal and maintaining the arched bridge profiles similar to the existing structures, MassDOT determined that the proposed replacement bridges—parallel, twin steel tied-arch bridges supported on delta frames—would be compatible with the existing historic through truss bridges in scale and form. As a result, MassDOT determined that the replacement bridges would not have an adverse effect on the Cape Cod Canal Historic District.

MassDOT determined that due to their similar arched bridge profiles, the views of the replacement bridges from historic properties would be comparable to current views of the existing bridges. In accordance with 36 CFR 800.5(b), MassDOT determined that the replacement bridges would avoid adverse effects on architectural historic properties within the Program's Viewshed APE.

MassDOT's archaeological surveys confirmed that much of the surveyed landscape has low archaeological sensitivity; an additional selected intensive survey did not identify any significant

archaeological resources. However, as design progresses and through construction, MassDOT would continue to monitor the need for additional archaeological investigations. MassDOT would require the Program's contractor to regularly provide updated construction plans for review and assessment by MassDOT's Archaeologist. Additionally, MassDOT's Archaeologist would consult with the State Archaeologist, the U.S. Army Corps of Engineers' (USACE) Archaeologist, and the Section 106 consulting parties pending the need for additional archaeological surveys.

As the Program's plans develop during the design-build process, MassDOT would continue to consult with the Advisory Council on Historic Preservation (ACHP), SHPO, Tribal Historic Preservation Officers (THPO), and other Section 106 consulting parties. Additionally, MassDOT would include a Discovery of Unanticipated Archaeological and Skeletal Remains Special Provision with the construction contract.

3 Proposed Action and Alternatives

3.1 Purpose and Need

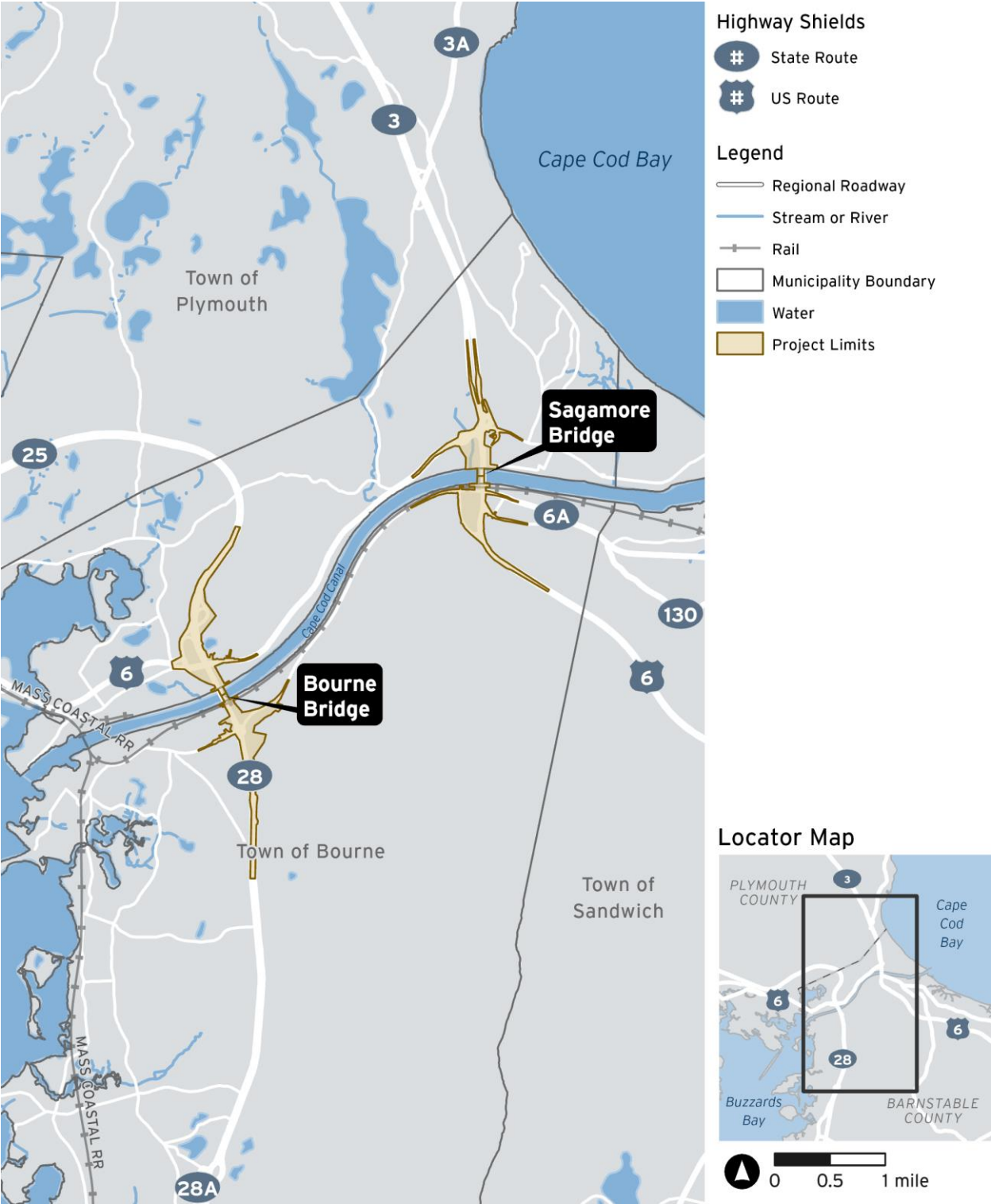
In partnership with the FHWA and the New England District of the USACE, MassDOT proposes advancing the Program in the town of Bourne, Barnstable County, Massachusetts.

The purpose of the Program is to improve cross-canal mobility and accessibility between Cape Cod and mainland Massachusetts for all road users and to address the increasing maintenance needs and functional obsolescence of the aging Sagamore and Bourne Bridges (also known as the Cape Cod Canal highway bridges), which the USACE owns, operates, and maintains as part of the Cape Cod Canal Federal Navigation Project. The needs for the Program are as follows:

- Address the deteriorating structural condition and escalating maintenance demands of the Sagamore and Bourne Bridges.
- Address the substandard design elements of the Sagamore and Bourne Bridges, the immediate mainline approaches, and their adjacent interchanges and intersections.
- Improve vehicular traffic operations.
- Improve accommodations for pedestrians and bicyclists.

Figure 3-1 shows two distinct project limits for the Program.

Figure 3-1. Program Limits



Source: Massachusetts Department of Transportation, 2024

3.2 Study Area

The historic and archaeological resources study area consists of the APEs, which were established in consultation with the SHPO.

MassDOT established a Construction APE for each bridge, which includes all areas that have the potential to be affected by construction impacts that might be caused by the Build Alternative, including bridge construction or demolition, approach highway realignment, interchange reconstruction, the construction of new bicycle and pedestrian accommodations, use of temporary construction staging or laydown areas, and right-of-way acquisitions. The Sagamore and Bourne Construction APEs correspond to the two Project Limits for the Sagamore and Bourne Bridges ([Figure 3-1](#)).

MassDOT established a single, more expansive APE for the Program, identified as the Viewshed APE, to identify potential viewshed impacts associated with the proposed replacement bridges.

[Section 4.2](#) provides further details on the methodology for establishing the APEs. [Section 5](#) presents figures of the distinct APEs.

3.3 Build Alternative

The Program’s Build Alternative would incorporate the USACE’s Major Rehabilitation Evaluation Report and Environmental Assessment’s (MRER/EA) preferred alternative of replacing both highway bridges with new bridges, each with four through-travel lanes and two auxiliary lanes (in-kind bridge replacement that would be updated to comply with federal and state highway and design safety standards). The Build Alternative would replace the Sagamore and Bourne Bridges with parallel, twin tied-arch bridge structures that would be supported on delta frames with an approximate 700-foot mainline span length. At both the Bourne Bridge and Sagamore Bridge crossings, the replacement mainline alignment locations would be offline and inboard of the existing bridges on the side of the canal between the bridges. At both canal crossings, the highway interchange approach networks north and south of Cape Cod Canal would be reconfigured to align with the replacement bridges. The replacement bridges and their interchange approaches would accommodate shared-use pedestrian and bicycle paths that connect to the local roadway network on both sides of Cape Cod Canal.

[Table 3-1](#) presents a description of the Program elements/design parameters of the recommended Build Alternative: Replacement Highway Bridges Built to Modern Design Standards.

Table 3-1. Description of Design Parameters of the Recommended Build Alternative

Program Element/ Program Design Parameter	Description
Highway Bridges	Both the Sagamore and Bourne Bridges would be replaced with new bridges, with each comprising four through-travel lanes and two auxiliary lanes (i.e., an in-kind bridge replacement that would comply with federal and state highway and design safety standards).

Program Element/ Program Design Parameter	Description
Bridge Highway Cross-Section and Shared-Use Path	Each replacement bridge would provide four 12-foot-wide through-traffic 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. Right and left barriers would be offset an additional 2 feet beyond the limits of the shoulders.
	Each crossing location would include one bidirectional pedestrian and bicycle shared-use path (SUP), separated from vehicular traffic by the shoulder and barrier. The usable width of the shared-use path would be 14 feet wide on the bridge main span, 20 feet wide on the interchange approaches, and 12 feet wide on the connecting roadways.
Bridge Clearances	The replacement bridges would maintain the existing vertical clearance of 135 feet above mean high water and account for 3 feet of fluctuations in relative sea level, for a total vertical clearance of 138 feet above mean high water.
	The replacement bridges would provide a minimum 500 feet of horizontal channel width to be consistent with existing conditions.
Main Span Length and Bridge Pier Location	The replacement bridges would have a main span length of approximately 700 feet, which would locate the bridge piers at the waterline adjacent to the service road (shoreline piers) into the riprap slope but above the low tide line.
Bridge Deck Configuration	Each replacement bridge would have two separate decks (twin structures).
Mainline Alignment	The mainline alignment locations at both crossings would be offline inboard: the main spans of each replacement bridge would be located outside the footprint of the existing bridge, approximately 10 feet apart and parallel to each other and on the side of the canal between the existing Bourne Bridge and Sagamore Bridge. At the Bourne crossing, both main spans would be located east of the existing Bourne Bridge toward Cape Cod Bay. At the Sagamore crossing, both main spans would be located west of the existing Sagamore Bridge toward Buzzards Bay.
Bridge Type	The replacement bridges would be twin tied-arch bridges with delta frames supporting an approximate 700-foot mainline span.

Program Element/ Program Design Parameter	Description
Interchange Approach Network: Sagamore North	The Sagamore North interchange approach network would follow the “Direct Connection to State Road (Option SN-8A)” configuration. This design would provide a single exit point from a relocated U.S. Route 6/State Route 3 and eliminate the existing Sagamore Bridge northbound off-ramp connection to Scenic Highway/Meetinghouse Lane eastbound. Instead, the new connection would tie into State Road, north of Scenic Highway/Meetinghouse Lane. The remaining ramp connections would remain similar to existing conditions. Intersections along Scenic Highway and Meetinghouse Lane would be modified to accommodate new lane configurations. The intersection of State Road at State Route 3 northbound would also be reconfigured to support the addition of the new northbound off-ramp. The design includes a SUP on the U.S. Route 6 eastbound main span, providing connections to the south side of Scenic Highway, Canal Street, and Canal Service Road. Additional SUPs would be constructed along the southern side of Scenic Highway and Meetinghouse Lane, as well as along the eastern side of State Road to Homestead Avenue.

Program Element/ Program Design Parameter	Description
Interchange Approach Network: Sagamore South	The Sagamore South interchange approach network would follow the “Westbound On-Ramp Under U.S. Route 6 with Sandwich Road Extension (Option SS-3.1A)” configuration. This design includes the Cranberry Highway Extension and relocates the westbound on-ramp to share the same entrance point as the eastbound on-ramp from the Mid-Cape Connector. The existing westbound ramp from Cranberry Highway to the Sagamore Bridge would be removed and replaced with a new westbound on-ramp connection from the Mid-Cape Connector. Lane arrangements at the intersections of the Mid-Cape Connector with Sandwich Road and Cranberry Highway Extension would be modified to accommodate revised traffic patterns resulting from the new Cranberry Highway Extension and changes to U.S. Route 6 access. A new connection from Cranberry Highway Extension to Sandwich Road would be provided east of the new mainline bridge structure, forming the Sandwich Road Extension. Access to Market Basket via Factory Outlet Road would be modified, and a new driveway would be added to serve the former Christmas Tree Shops property. A SUP would be constructed along the U.S. Route 6 eastbound main span, providing connections to Factory Outlet Road, Sandwich Road, and Canal Service Road. Additional bicycle and pedestrian improvements would be included along Cranberry Highway. A new connection would also be established through the Cranberry Highway Extension to the Mid-Cape Connector.

Program Element/ Program Design Parameter	Description
Interchange Approach Network: Bourne North	The Bourne North interchange approach would follow the “Directional Interchange (Option BN-14.4b)” configuration. This design includes a combination of direct connection ramps between State Route 25 and U.S. Route 6. The ramp connecting State Route 25 eastbound to Scenic Highway would be a direct connection, providing access to Scenic Highway eastbound only. A new flyover ramp from Scenic Highway to State Route 25 would allow vehicles to bypass Belmont Circle, improving traffic flow without the need for additional intersection control. This ramp would repurpose one of the existing travel lanes on Scenic Highway and provide a free-flowing movement to reduce congestion. To accommodate this new southbound-to-eastbound movement, the existing State Route 28 bridge over State Route 25 would be relocated and widened. The existing southbound off-ramp would be reconfigured as an option lane, improving geometry and decision sight distance for drivers. Intersection control at U.S. Route 6/Nightingale Road/Andy Oliva Drive is being evaluated, with a single-lane roundabout previously considered. MassDOT continues to assess appropriate control types through the Intersection Control Evaluation (ICE) process. The design also includes a SUP and a grade-separated crossing for pedestrians and bicyclists via the new flyover ramp over Scenic Highway. U.S. Route 6 would be reduced from four lanes to three, creating space for multimodal accommodations. A continuous 12-foot-wide SUP would be provided along the south side of U.S. Route 6, connecting to Belmont Circle, with a 6-foot-wide sidewalk along the north side.

Program Element/ Program Design Parameter	Description
Interchange Approach Network: Bourne South	The Bourne South interchange approach network would follow the “Diamond Interchange (Option BS-2)” configuration. This design would eliminate the existing Bourne Rotary and replace it with a grade-separated diamond interchange, allowing through movements on State Route 28 to bypass intersections with local roadways. Both intersections within the diamond interchange would include appropriate intersection controls to manage traffic flow and improve safety. Changes to the Trowbridge Road and Sandwich Road underpass would include a reconfigured entrance to Upper Cape Cod Regional Technical High School, relocated to improve access and circulation. The design would also provide Shared Use Path (SUP) connections to Trowbridge Road, the Cape Cod Canal Service Road, and the Bourne Recreation Area, enhancing multimodal connectivity throughout the corridor.

3.4 No Build Alternative

The Sagamore and Bourne Bridges, as components of the Cape Cod Canal Federal Navigation Project, are federal assets that are managed by the USACE's New England District. The Commonwealth of Massachusetts owns the connecting major highway corridors at the bridges, which consist of the Route 3/Route 6 corridor at Sagamore Bridge and the Route 25/Route 28 corridor at Bourne Bridge.

In the No Build Alternative, the Sagamore and Bourne Bridges would retain their current configuration of four 10-foot-wide travel lanes (two in each direction) with one 6-foot sidewalk and a 2-foot safety curb. The No Build Alternative would nullify the 2020 Memorandum of Understanding between the USACE and MassDOT.¹ The USACE would continue to own the Sagamore and Bourne Bridges and would implement a maintenance and repair program as needed to maintain bridge operations and public safety. MassDOT would continue to own, operate, and maintain the state highway interchange approach networks at the two bridges.

The No Build Alternative represents the "Fix as Fails" Base Condition of the USACE's MRER/EA. In the No Build Alternative, the USACE would implement an ongoing program of continued inspections and maintenance and repair of both existing bridges as needed to maintain safety. No major rehabilitation efforts involving extensive repairs and replacement of major bridge components would occur. Structural components would be repaired, and critical elements would be replaced only when inspections indicate unsatisfactory reliability ratings. The MRER/EA indicates that the deteriorated condition of both highway bridges is well beyond the state in which actions and funding from the USACE's operations and maintenance program could correct the deficiencies and restore and sustain reliability. The USACE has indicated that as the bridges continue to age, routine maintenance and minor component replacement would result in an unacceptable structural condition. As a result, it is likely that lower vehicle weights, traffic volume restrictions, and speed limits would be required and posted to maintain continued bridge safety.

The No Build Alternative would include recently completed and proposed Commonwealth of Massachusetts-sponsored and local transportation improvement projects in and near the Program as indicated in the Federal Fiscal Year 2025-2029 Transportation Improvement Program (endorsed on May 22, 2023) for the Cape Cod Metropolitan Planning Organization.² [Table 3-2](#) identifies the

¹ In July 2020 during the preparation of the USACE's MRER/EA, a Memorandum of Understanding (MOU) was executed between the USACE and MassDOT regarding the future ownership, operations, and maintenance of the Bourne and Sagamore highway bridges. According to the terms of the agreement, the USACE will continue to be responsible for the ownership, operation, and maintenance of the two existing bridges until replacement bridges are built and operational. MassDOT will be responsible for leading the Cape Cod Bridges Program delivery (including the feasibility study, alternatives analysis, preliminary design, and environmental permitting processes), as well as overseeing procurement and construction of the new bridges. MassDOT will then own, operate, and maintain the completed bridges and approaches as part of the system of state highways to be maintained by MassDOT. A revised MOU was executed on March 21, 2024.

² The TIP was endorsed on May 20, 2024, with subsequent amendments on November 18, 2024; December 16, 2024; February 24, 2025; and an adjustment on March 24, 2025.

Transportation Improvement Program projects within and near the Program to be incorporated in the No Build Alternative.

Table 3-2. Transportation Improvement Program Projects, 2025-2029

Project Number	Year	Transportation Project	Project Description	Status
606900	2020	Belmont Circle Traffic and Multimodal Improvements	Traffic and multimodal improvements at Belmont Circle at U.S. Route 6 and State Route 25 and State Route 28	Completed
608422	2022	Trail Improvements – Sandwich	Shared-use path on Service Road (State Route 130 to Chase Road)	Underway
610542	2023	Bourne Rotary Improvements	- Restriping Bourne Rotary to two lanes and adding a channelized right-turn lane from State Route 28 northbound to Sandwich Road eastbound - Adding signs at Bourne Rotary - Installing flashing beacons at the Bourne Rotary approaches	Underway
613195	2024	Bridge Systematic Maintenance	Bridge deck replacement of the Quaker Meetinghouse Road Bridge over U.S. Route 6/Mid-Cape Highway as part of an overall bridge preservation strategy	Programmed
609262	2025	Bourne Rail Trail, Phase 1	First phase of four planned phases of the Bourne Rail Trail connection to the Shining Sea Bikeway to the south in Falmouth and to the Cape Cod Canal path (Canal Service Road) in the town of Bourne; Phase 1 is approximately one-half mile long within the existing right-of-way of the Old Colony Railroad (Woods Hole branch line) from the Canal Service Road to Monument Neck Road.	Programmed
610673	—	Bourne Rail Trail, Phase 2	Phase 2 of four planned phases of the Bourne Rail Trail connection to Shining Sea Bikeway to the south in Falmouth and to the Cape Cod Canal path (Canal Service Road) in the town of Bourne; Phase 2 is approximately 2 miles long from Monument Neck Road to Monk's Park/ Valley Bars Road.	Not Programmed
---	—	Bourne Rail Trail, Phase 3 and Phase 4A	Phase 3 and Phase 4A of four planned phases of the Bourne Rail Trail connection to Shining Sea Bikeway to the south in Falmouth	Not Programmed

Project Number	Year	Transportation Project	Project Description	Status
607394/ 611998	—	Bourne Rail Trail, Phase 4B	Phase 4B of four planned phases of the Bourne Rail Trail connection to the Shining Sea Bikeway to the south in Falmouth and to the Cape Cod Canal path (Canal Service Road) in the town of Bourne; Phase 4B is approximately 1 mile long, extending the Shining Sea Bikeway from its current terminus in North Falmouth into the town of Bourne.	Not Programmed
606082	2025–2028	U.S. Route 6 Scenic Highway Median Installation	• Resurfacing • Safety improvements, including a raised center median and expanded shoulders to separate eastbound and westbound travel lanes • Drainage improvements • Traffic signal improvements at two intersections • Shared-use path	Programmed
612053	2025	Bourne/Sandwich, Resurfacing and Related Work on U.S. Route 6	Improvements to pavement serviceability, condition, and roadway safety on U.S. Route 6 from Sagamore Bridge to the Sandwich town line (8.55 miles)	Programmed
613200	2026	Chase Road over U.S. Route 6 Bridge	Bridge deck replacement of Chase Road over U.S. Route 6 (Mid-Cape Highway) bridge structure in the town of Sandwich	Programmed
612063	2028	State Route 28 Resurfacing and Related Work	Improvements to pavement serviceability, condition, and roadway safety on MacArthur Boulevard (State Route 28) from Bourne Rotary to Otis Rotary	Programmed
613199	2028	U.S. Route 6 over State Route 130 Bridge	Bridge deck replacement of U.S. Route 6 (Mid-Cape Highway) bridge structure over State Route 130 in the town of Sandwich	Programmed
613271	—	Shared-use path, State Route 130 to Canal Service Road	Shared-use path from State Route 130 to Canal Service Road in the town of Sandwich	Not Programmed

Note: [Table 3-2](#) includes only those projects in the Study Areas that are part of the No Build Alternative. It does not include Project S13144, the replacement of the Sagamore Bridge, which was added to the Federal Fiscal Year (FFY) 2025–2029 Transportation Improvement Program as Amendment #2, December 9, 2024.

— No date available.

Structural components would be repaired, and critical elements would be replaced only when inspections indicate unsatisfactory reliability ratings.

The No Build Alternative would not meet any of the Program’s identified needs:

- It would not address the deteriorating structural condition and escalating maintenance demands of the existing bridges.
- It would not address the substandard design elements of the bridges, the immediate mainline approaches, and their adjacent interchanges and intersections.
- It would not improve vehicular traffic operations.
- It would not improve accommodations for pedestrians and bicyclists.

Per NEPA requirements, the No Build Alternative is included in the DEIS as the base condition against which the Build Alternative is compared and evaluated.

4 Methods for Effect Evaluation

4.1 Regulatory Framework

4.1.1 Section 106 of the National Historic Preservation Act of 1966

Section 106 of the NHPA, as amended (Section 106) (36 CFR 800 et seq.) requires a “Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking” or any federal agency having authority to license an undertaking, to “take into account the effects of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in” the NRHP.

Section 106 also requires the federal agency to afford the ACHP “a reasonable opportunity to comment with regard to such undertaking.”

The Section 106 implementing regulations (36 CFR 800) require that a project’s Lead Federal Agency, consult with the SHPO to:

1. Initiate the Section 106 process.
2. Identify historic properties within the APE, defined as “the geographic area(s) within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties.”
3. Assess adverse effects to historic properties within the APE.
4. Resolve any adverse effects on historic properties within the APE.

The Section 106 regulations prescribe a consultation process, involving the SHPO, the ACHP, federally recognized Indian Tribes/THPOs, local governments, and the public, that the lead federal agency must

follow to “avoid, minimize, or mitigate” adverse effects to historic properties that might be caused by the project.

4.1.2 Section 4(f) of the U.S. Department of Transportation Act

Section 4(f) of the Department of Transportation Act of 1966 [Section 4(f); 49 USC 303] states that the Secretary of the U.S. Department of Transportation may approve a transportation project requiring the use of land from a historic site of national, state or local significance only if the following exists:

1. There is no feasible and prudent alternative to using that land, and the program or project includes all possible planning to minimize harm to the Section 4(f) property; or
2. The Section 4(f) use is *de minimis*.

Chapter 5, Draft Section 4(f) Evaluation, provides details regarding potential impacts of the Build Alternative on Section 4(f)-protected historic sites and coordination of the proposed use with the SHPO.

4.1.3 Massachusetts General Laws Chapter 9 Sections 26 to 27C as amended by St. 1988 Ch. 254

The Commonwealth’s historic preservation law, Massachusetts General Laws (MGL) Chapter (c.) 9 Sections 26 to 27C as amended by St. 1988 c. 254, and its implementing regulations (950 CMR 71.00) establish a standardized procedure, administered by Massachusetts Historical Commission (MHC), as the SHPO, to protect the public’s interest in preserving historic and archaeological properties listed in the State Register of Historic Places (SRHP). For undertakings that also receive federal funding or require federal licensing, the completion of consultation under Section 106 of the NHPA shall ordinarily fulfill the requirements of compliance with MGL c. 9 Sections 26-27C, unless otherwise determined by the MHC.

4.1.4 Additional Regulatory Guidance

Additional regulations and guidance documents for the Program’s cultural resources evaluations include the following:

- Programmatic Agreement between the USACE, New England District, and the Massachusetts State Historic Preservation Officer (SHPO) regarding the Cape Cod Canal Highway Bridges Project, Towns of Bourne and Sandwich, Barnstable County, Massachusetts, signed March 11, 2022 (provided in **Attachment 1**).
- Secretary of the Interior’s standards 36 CFR 79, Curation of Federally Owned and Administered Archeological Collections.
- Secretary of the Interior’s Standards and Guidelines for Archeological Documentation.
- U.S. Archaeological Resources Protection Act of 1979, as amended (16 USC 470; 43 CFR 7).

- Massachusetts Historic Commission’s (MHC) State Archaeologist’s Permit Regulations (950 CMR 70).
- Massachusetts Underwater Archaeological Resources (312 CMR 2.0-2.15).

MassDOT’s Cultural Resource Unit staff meet the [U.S. Secretary of the Interior’s Standards for Professional Qualifications](#), per NHPA Section 112 and Section 106 regulations.³

4.2 Methodology

This section identifies the process MassDOT conducted to identify and assess historic properties within the Program APEs, including coordination with agencies. Documentation of coordination with the SHPO, including consultation and concurrence, is provided in **Attachment 1**.

4.2.1 Initiation of Section 106 Consultation Process

FHWA initiated the Section 106 consultation process in a March 30, 2023, letter to the SHPO at MHC, wherein FHWA defined the Program as a federal undertaking, identified itself as the lead federal agency, and explained the undertaking’s Purpose and Need. In coordination with MassDOT, FHWA also indicated that it would identify other Section 106 consulting parties with interests in the Program and would establish APEs for the identification and evaluation of historic and archaeological properties.

4.2.2 Identification of Section 106 Consulting Parties

As stipulated in 36 CFR 800.2(c), the FHWA has identified consulting parties to provide advice and guidance during the Section 106 process regarding the identification of historic architectural and archaeological properties and the assessment of effects to those properties. A consulting party is defined as an individual or an organization with a demonstrated legal or economic relation to the undertaking or affected properties, or a concern with the undertaking’s effects on historic properties.⁴ Consulting parties also are provided the opportunity to review documents prepared by MassDOT that are pertinent to the Section 106 process and to share their views on those documents. In addition to the ACHP and SHPO, the FHWA has identified the following consulting parties in the Section 106 process for the Program:

- THPO of the Wampanoag Tribe of Gay Head (Aquinnah)
- THPO of the Mashpee Wampanoag Tribe
- THPO of the Narragansett Indian Tribe
- Chairperson of the Herring Pond Wampanoag Tribe
- Executive Director of the Massachusetts Commission on Indian Affairs
- Massachusetts Board of Underwater Archaeological Resources
- Massachusetts Executive Office of Energy and Environmental Affairs

³ <https://www.doi.gov/pam/asset-management/historic-preservation/PQS>

⁴ [Section 106 Tutorial, Section 106 Participants: Roles and Responsibilities](#)
https://www.environment.fhwa.dot.gov/env_topics/section_106_tutorial/chapter2_3.aspx

- Bourne Historical Commission
- Sandwich Historical Commission
- Cape Cod Commission
- U.S. Army Corps of Engineers
- National Trust for Historic Preservation

4.2.3 Establishment of Areas of Potential Effects

FHWA and MassDOT defined APEs for historic architectural and archaeological properties relative to the Sagamore Bourne and the Bourne Bridge per 36 CFR 800, 312 CMR 2.0-2.15, and in consideration of the APEs identified in the Programming Agreement between the USACE and MassDOT for the Cape Cod Canal Highway Bridges Project. The APEs (study areas) were broadly defined to provide information on the types, nature, and distribution of resources located in the vicinity of the Build Alternative.

MassDOT recommended two separate APEs for construction effects around each of the bridges, identified as Construction APEs. The Construction APEs include all areas that have the potential to be affected by the Build Alternative, including bridge construction or demolition, approach highway realignment, interchange reconstruction, the construction of new bicycle and pedestrian accommodations, use of temporary construction staging or laydown areas, and right-of-way acquisitions. The Sagamore and Bourne Construction APEs, which correspond to the project limits for the Sagamore and Bourne Bridges, respectively, are illustrated in [Section 5.1](#).

MassDOT established a single, more expansive APE for the Program, identified as the Viewshed APE, to identify potential viewshed impacts associated with the proposed replacement bridges. Geographic Information System (GIS) mapping incorporated surface raster data (including obstructions), as well as existing and proposed structural elevations, to determine radial lines-of-sight. A terrain model was generated for existing conditions using available Light Detection and Ranging (LiDAR) data, which considered both topography and the influence of trees and buildings within the landscape. MassDOT used the resulting viewshed maps to identify the visual impact of the proposed bridge design relative to existing conditions.

FHWA submitted the conceptual APEs to the SHPO on June 26, 2023, who concurred with the APEs without comment on July 7, 2023 (provided in **Attachment 1**). FHWA and MassDOT presented the APEs to the other Section 106 consulting parties at a virtual meeting convened by FHWA on January 22, 2024. None of the consulting parties objected to the geographical limits established for the APEs at that meeting or in subsequent correspondence. As necessary, FHWA will coordinate with the SHPO, as well as other Section 106 consulting parties, as the APEs are updated by design development.

4.2.4 Identification of Historic Properties

This section describes the research and field work MassDOT conducted to identify architectural and archaeological historic properties, which appear to meet the SRHP/NRHP criteria of eligibility based on

the National Register Criteria for Evaluation, established by the National Park Service of the U.S. Department of Interior (36 CFR 60).⁵ Historic properties are defined as follows:

- **Historic architectural properties** refer to aboveground historic resources, including buildings, structures, objects, sites, and districts of historical importance.
- **Archaeological resources** are subsurface physical remains of pre-contact (prehistoric, or the remains of Indigenous American societies) or post-contact (historical, between Native Americans and Europeans) activities.

4.2.4.1 National Register Criteria for Evaluation

The National Register Criteria for Evaluation are broadly defined to include the wide range of properties that are significant in American history, architecture, archaeology, engineering, and culture. The following presents the [National Register Criteria for Evaluation](#), including the four specific criteria of significance (Criteria A through D), as established by 36 CFR 60.4:

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and

- (a) that are associated with events that have made a significant contribution to the broad patterns of our history; or
- (b) that are associated with the lives of persons significant in our past; or
- (c) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- (d) That have yielded, or may be likely to yield, information important in prehistory or history.⁶

4.2.4.2 Historic Architectural Properties

Sagamore Bridge, Bourne Bridge, and Cape Cod Canal

MassDOT reviewed the history of Sagamore Bridge, Bourne Bridge, and the Cape Cod Canal relative to NRHP eligibility.

Based on information in MassDOT's Historic Bridge Inventory files and in the online MACRIS, Sagamore Bridge and Bourne Bridge are each eligible for individual listing in the NRHP. The Massachusetts

⁵ Per 36 CFR 60.3, the National Park Service is the bureau of the Department of Interior to which the Secretary of Interior has delegated the authority and responsibility for administering the National Register program.

⁶ <https://www.ecfr.gov/current/title-36/chapter-I/part-60/section-60.4>; [How to Apply the National Register Criteria for Evaluations](#), https://www.nps.gov/subjects/nationalregister/upload/NRB-15_web508.pdf

Department of Public Works (MassDPW), MassDOT's predecessor agency, had prepared historic property inventory forms for each bridge as part of MassDPW's comprehensive statewide inventory of historic steel truss bridges. FHWA submitted those inventory forms to MHC in March 1990 with a recommendation that both bridges are eligible for individual listing in the NRHP. MHC concurred with that recommendation in a letter to FHWA dated March 6, 1991. The Bourne Bridge and Sagamore Bridge are included in the MHC Inventory as BOU.919 and BOU.918, respectively.

An MHC Inventory form for the Cape Cod Canal was submitted to MHC in 2011 with a recommendation that the Cape Cod Canal is eligible for listing in the NRHP as a historic district. Cape Cod Canal is included in the MHC Inventory as BOU.AF. Bourne Bridge and Sagamore Bridge were included in the potentially NRHP-eligible Cape Cod Canal Historic District as contributing properties. Although MHC did not provide comments regarding the Cape Cod Canal's NRHP eligibility at the time of its inclusion in the MHC Inventory, FHWA and MassDOT concur with the recommendation that the Cape Cod Canal is eligible for listing in the NRHP as a historic district and that the bridges are contributing resources to the historic district.

MassDOT's [Cape Cod Canal Transportation Study](https://www.mass.gov/cape-cod-canal-transportation-study),⁷ completed in 2019, acknowledges that the Bourne Bridge and Sagamore Bridge are eligible for individual listing in the NRHP and that the two bridges contribute to the potentially NRHP-eligible Cape Cod Canal Historic District. The USACE issued a formal determination that Bourne Bridge, Sagamore Bridge, and the Cape Cod Canal Historic District are eligible for listing in the NRHP as part of the March 2022 Programmatic Agreement with the SHPO related to the NEPA process for the [USACE's MRER/EA and Finding of No Significant Impact \(FONSI\) for the Cape Cod Canal Highway Bridges](https://www.nae.usace.army.mil/Missions/Projects-Topics/Cape-Cod-Canal-Bridges-Major-Rehabilitation-Study/) (provided in **Attachment 1**).⁸

Other Historic Architectural Properties

To identify NRHP-listed and NRHP-eligible historic architectural properties within the Construction and Viewshed APEs, but outside of the NRHP-eligible Cape Cod Canal Historic District, MassDOT reviewed previously identified architectural resources in the APEs, including National Historic Landmarks, properties listed in the SRHP/NRHP, and properties that the SHPO has previously determined to be eligible for SRHP/NRHP listing. Additionally, MassDOT reviewed its Historic Bridge Inventory files, the online MACRIS, the MHC Inventory, and other state, regional, and local resources, including the Bureau of Underwater Archaeological Resources, the Cape Cod Commission, the Bourne Historical Commission, and the Sandwich Historical Commission. Additionally, MassDOT assessed and documented properties in the Viewshed APE that predate the bridges (pre-1935) that had not been previously inventoried.

Incorporating data from its review of MACRIS and other sources, in 2023, MassDOT conducted a Reconnaissance Level Architectural Resources Survey within the Construction and Viewshed APEs to identify architectural historic properties that could be temporarily and/or permanently affected by the Build Alternative based on preliminary plans, including field verification through site walkovers. MassDOT defined potential architectural resources as properties that would be at least 40 years old as

⁷ <https://www.mass.gov/cape-cod-canal-transportation-study>

⁸ <https://www.nae.usace.army.mil/Missions/Projects-Topics/Cape-Cod-Canal-Bridges-Major-Rehabilitation-Study/>

of 2027 (the estimated construction start date) that were not previously evaluated for SRHP/NRHP eligibility or included in the MHC Inventory, but which could meet the SRHP/NRHP criteria of eligibility based on the National Register Criteria for Evaluation.

Based on the National Register Criteria, MassDOT prepared NRHP Inventory (Determinations of Eligibility) Forms for any previously inventoried area or building within the APEs, including recommendations for NRHP eligibility.

4.2.4.3 Archaeological Resources

In accordance with the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* (48 FR 44716–44742) and the MHC's *Public Planning and Environmental Review: Archaeology and Historic Preservation* (1979), MassDOT conducted an Archaeological Reconnaissance Survey (Archaeological Sensitivity Assessment) in fall 2023 to identify known and potential pre-contact and post-contact archaeological sites within the Construction APEs, to assess the archaeological sensitivity of the Construction APEs, and to make recommendations for the protection of cultural resources and /or additional investigations. The Reconnaissance Survey was conducted under State Archaeologist Permit No. 4302, for site investigations performed on state-owned property, and a Permit for Archaeological Investigation (ARPA) Permit No. 33-3-23-059, for site investigations performed on federally owned property.⁹

The Reconnaissance Survey consisted of a review of existing conditions, environmental/geotechnical data, and prehistorical and historical data (cultural context), including locations and SRHP/NRHP eligibility status of known archaeological sites within a one-mile radius of the project APE on file at the MHC/SHPO. MassDOT conducted a search of MACRIS to identify previously recorded archaeological sites and aboveground historic resources within and adjacent to the Construction APEs. MassDOT's review included reports of cultural resource management investigations conducted for public and private projects near the Construction APEs, including at Joint Base Cape Cod and Cape Cod Canal. Additionally, MassDOT examined primary and secondary histories and historical maps and atlases about the town of Bourne and Cape Cod Canal to assess changes in land use, to locate any documented structures, and to trace the development of transportation networks, an important variable in the location of post-contact period archaeological sites.

The Reconnaissance Survey also included a walkover assessment survey of the Construction APEs to assess present environmental conditions, including the presence, types, and extent of fresh water; drainage characteristics; presence of bedrock outcrops and level terraces; and the angle of any slopes and to document surface indications of archaeological sites. While pre-contact sites in New England are most often found belowground, artifact scatters are sometimes exposed on the surface through cultural agents such as pedestrian and vehicular traffic, and natural processes such as erosion. Post-contact archaeological site types that might be visible include stone foundations, stone walls, and trash deposits.

⁹ Due to the confidentiality of the information, the Archaeological Reconnaissance Survey Technical Report is not provided as an attachment.

Information collected during the archival research and walkover survey was used to develop a predictive model for archaeological sensitivity. The predictive model considers various criteria to rank the potential for the Construction APEs to contain belowground cultural resources, including proximity of recorded and documented sites, local land use history, environmental data, and existing conditions. The Construction APEs were classified into zones of expected archaeological sensitivity, with rankings of low, moderate, or high archaeological sensitivity. Based on the results of the predictive model, MassDOT identified areas where further archaeological testing would be warranted.

5 Affected Environment

5.1 Architectural Historic Properties

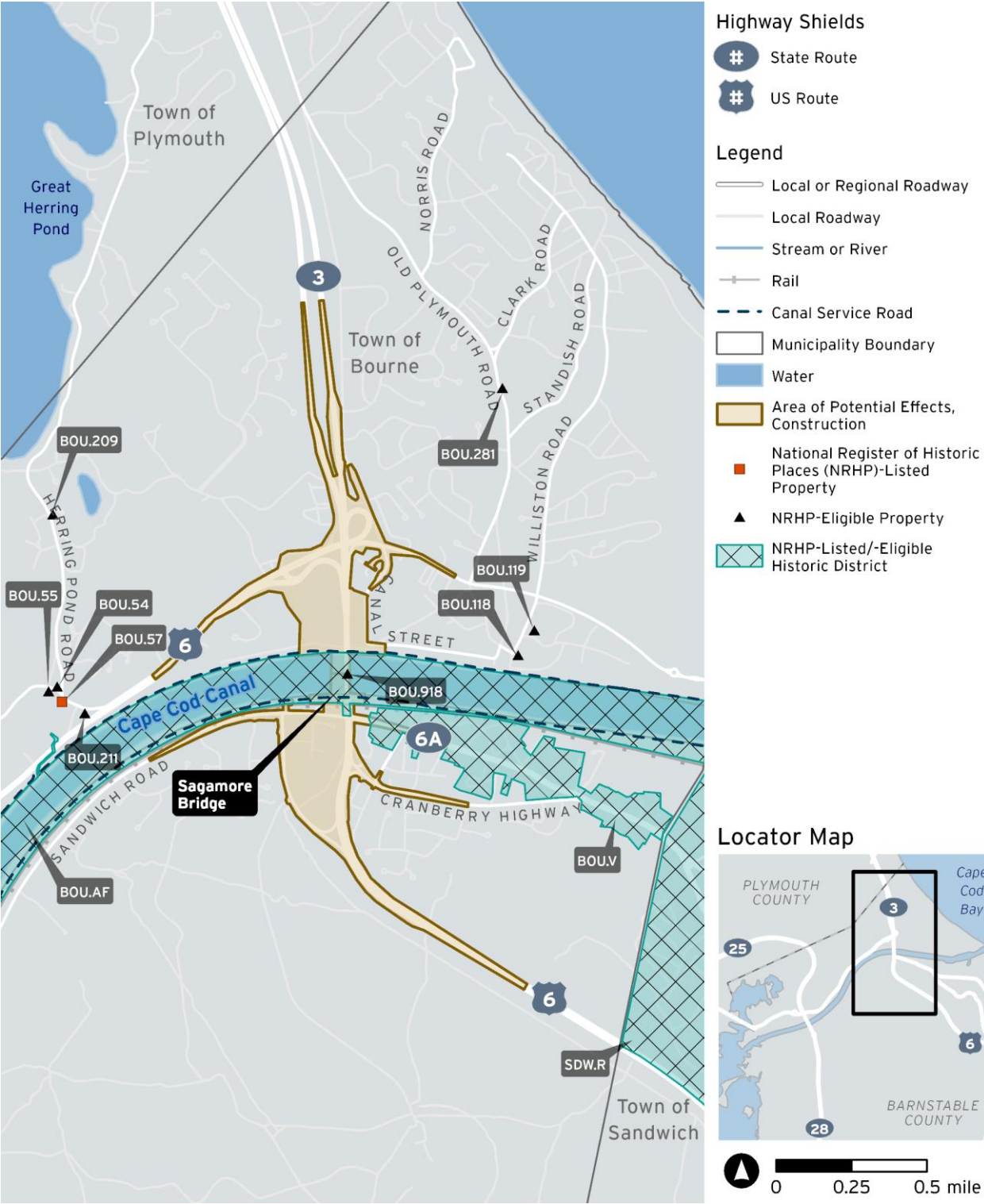
5.1.1 Architectural Historic Properties within the Construction Area of Potential Effects

Figure 5-1 presents the Sagamore Bridge Construction APE. **Figure 5-2** presents the Bourne Bridge Construction APE. Sagamore Bridge, Bourne Bridge, and the Cape Cod Canal Historic District are the only architectural historic properties identified within Construction APEs that are eligible for listing in the NRHP. No NRHP-listed properties were identified within the Construction APEs.

5.1.1.1 Sagamore Bridge

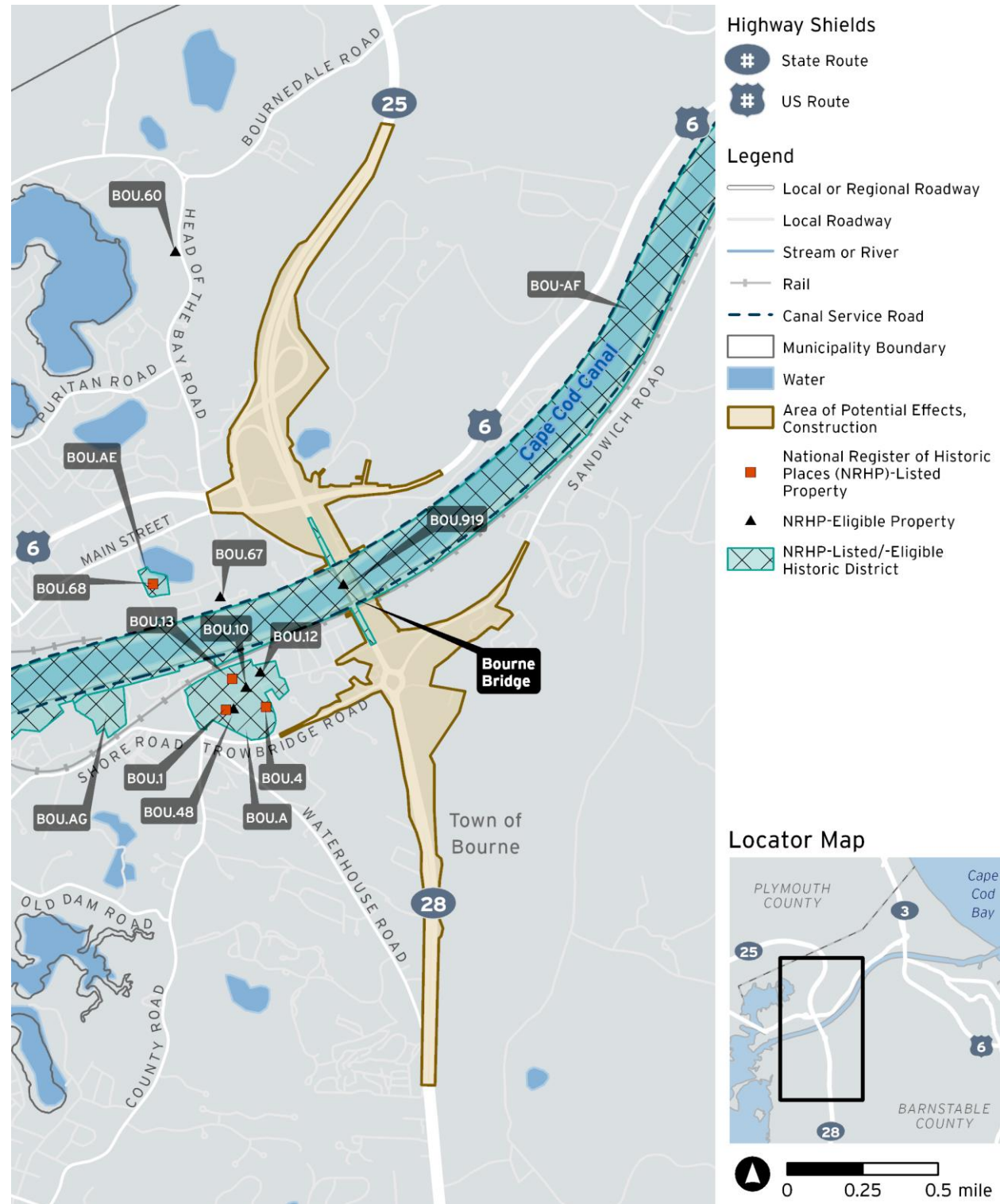
Sagamore Bridge is included in the MHC Inventory as BOU.918. It was constructed between 1933 and 1935 by the American Bridge Company and funded under the Depression-era Works Progress Administration (WPA). It is a three-span, 1,408-foot-long steel riveted Warren continuous truss bridge. According to the original USACE design drawings, Sagamore Bridge is comprised of three continuous spans with span lengths of 396 feet, 616 feet, and 396 feet. The 616-foot-long center span crossing Cape Cod Canal consists of deck truss side spans transitioning into an arched through truss with a “swinging” deck suspended from the lower chord of the arch by 44 suspension cables. The center span is supported by two granite-stone-facing concrete piers on each side of the canal. The bridge has open-web concrete column piers and reinforced concrete abutments with stylized Art Deco pylons. The hollow abutments at either end of the bridge are approximately 220 feet long; these are vaulted and consist of concrete T-beams. The bridge provides vertical navigation clearance of 135 feet above the navigation channel at mean high water.

Figure 5-1. Construction Area of Potential Effects (Sagamore Bridge)



Source: Massachusetts Department of Transportation, 2024

Figure 5-2. Construction Area of Potential Effects (Bourne Bridge)



Source: Massachusetts Department of Transportation, 2024

Sagamore Bridge is an exceptional example of the continuous arched through truss type, a rare bridge type in Massachusetts. The continuous arched through truss span is a particularly graceful example of this form, perfected by nationally acclaimed engineers Fay, Spofford and Thorndike. The main arched span has a cleaner, boxed appearance to the built-up, riveted truss members, since flat plates were applied to the outward faces of the beams and the connecting angles were turned inward. The bridge is further distinguished by its well-detailed Art Deco architectural elements, including the massive Art Deco pylons set at the abutments to provide a gateway to the bridge.

Sagamore Bridge has been determined individually eligible for listing in the NRHP at the state level under Criteria A and C. The MACRIS identifies its NRHP Significance Criteria as follows:

- The continuous “swinging” truss represents an unusual or unique type.
- Its design provides a valuable contribution to bridge technology.
- It retains its integrity.
- Its builder is known and important.
- The bridge is historically important to the area.

The MHC Inventory Form notes that in a national competition for the most beautiful steel bridges erected each year, Sagamore Bridge was awarded an [Honorable Mention – Class A – 1935 Award from the American Institute of Steel Construction for its graceful design](#).¹⁰ Sagamore Bridge is a contributing resource to the NRHP-eligible Cape Cod Canal Historic District. **Exhibit 5-1** presents a view of Sagamore Bridge.

Exhibit 5-1. View of Sagamore Bridge, facing southeast



Source: Massachusetts Department of Transportation, 2024

¹⁰ <https://mhc-macris.net/details?mhcid=BOU.918>

5.1.1.2 Bourne Bridge

Bourne Bridge is included in the MHC Inventory as BOU.919. It was constructed between 1933 and 1934 by the American Bridge Company concurrently with and nearly identical to the Sagamore Bridge. Also funded under the WPA, Bourne Bridge is a seven-span, 2,384-foot-long steel riveted Warren continuous truss bridge. According to the original 1934 USACE design drawings, from south to north Bourne Bridge is comprised of two simple spans with spans lengths of 242 feet and 274.5 feet; three continuous spans with span lengths of 398.5 feet, 616 feet, and 398.5 feet; and two simple spans with span lengths of 244.5 feet and 210 feet. The arched 616-foot-long center span over Cape Cod Canal is supported by two granite-stone-facing concrete piers on each side of the channel. There are hollow abutments at either end of the bridge that are approximately 150 feet long; these are vaulted and consist of concrete T-beams. Like Sagamore Bridge, the main span crossing Cape Cod Canal consists of deck truss side spans transitioning into an arched through truss with a “swinging” deck suspended from the lower chord of the arch by 44 suspension cables. The approach spans flanking the main span are deck truss spans, leading into the deck truss approach spans. The superstructure is supported by six reinforced open-web concrete column piers and reinforced concrete abutments with stylized Art Deco pylons. The bridge provides vertical navigation clearance of 135 feet above the navigation channel at mean high water.

Like Sagamore Bridge, Bourne Bridge is an exceptional example of the continuous arched through truss type, a rare bridge type in Massachusetts. The continuous arched through truss span is a particularly graceful example of this form, perfected by nationally acclaimed engineers Fay, Spofford, and Thorndike. The main arched span has a cleaner, boxed appearance to the built-up, riveted truss members, since flat plates were applied to the outward faces of the beams and the connecting angles were turned inward. The bridge is further distinguished by its well-detailed Art Deco architectural elements, including the massive Art Deco pylons set at the abutments to provide a gateway to the bridge.

Bourne Bridge has been determined individually eligible for listing in the NRHP at the State level under Criteria A and C. The MACRIS identifies its NRHP Significance as follows: the continuous “swinging” truss represents an unusual or unique type; its design provides a valuable contribution to bridge technology; it retains its integrity; its builder is known and important; and the bridge is historically important to the area. The MHC Inventory Form notes that [Bourne Bridge was awarded the First Place – Class A – 1934](#) and is included in American Institute of Steel Construction’s Prize Bridges 1928-1938.¹¹ Bourne Bridge is a contributing resource to the NRHP-eligible Cape Cod Canal Historic District. **Exhibit 5-2** presents a view of Bourne Bridge.

¹¹ <https://mhc-macris.net/details?mhcid=BOU.919>

Exhibit 5-2. View of Bourne Bridge, facing northwest



Source: Massachusetts Department of Transportation, 2024

5.1.1.3 Cape Cod Canal

Cape Cod Canal consists of a 17.4-mile-long, human-made, saltwater, sea-level, deep water, marine navigational canal stretching from a point east of the North Breakwater at Sandwich on Cape Cod Bay to Cleveland Ledge Lighthouse in Buzzards Bay. It has a 9.3-mile-long approach channel, and the visible section of the canal consists of an 8.1-mile-long land cut extending from Cape Cod Bay on the east to the village of Buzzards Bay in the west. Explorations into the concept of a canal to encourage commerce among European colonists and Indigenous tribes date to the early 1600s.¹² It was originally created by widening and deepening two inland rivers, located 3 miles apart: Manomet River (renamed Monument River), which flows into Buzzards Bay and Scusset River, which flows into Cape Cod Bay. After several failed attempts to dig a canal starting in the late 18th century, the canal was constructed from 1909 to 1914 as a tolled seaway by the privately owned Boston, Cape Cod and New York Canal Company. The United States government assumed control over Cape Cod Canal in World War I to strengthen its defenses, acquired title to the canal in 1928, and substantially improved the canal, including replacing the existing draw-type highway bridges, between 1933 and 1940. Cape Cod Canal has had a significant impact on maritime transportation and economic development in New England. Additionally, it played an important role in coastal defense during World War II. Cape Cod Canal originally was constructed by the privately-owned Boston, Cape Cod and New York Canal Company over the period from 1909 to 1914. The U.S. government acquired Cape Cod Canal in 1928, and Sagamore and Bourne Bridges were built in 1933-1935 as part of the USACE's program of widening and

¹² [Massachusetts Cultural Resource Information System. Historic Area Detail: SDW.Z.](https://mhc-macris.net/details?mhcid=SDW.Z) <https://mhc-macris.net/details?mhcid=SDW.Z>

improving the canal from 1933 to 1940. This nationally significant maritime engineering project improved the connection between Buzzards Bay and Cape Cod Bay, allowing ships traveling to commercial ports in northern New England to avoid the treacherous shoals and sand bars along the outer reaches of Cape Cod. The canal has been recognized as a masterful effort of engineering and is recognized for the significant effect it had on both the surrounding communities and the rest of New England.

The Cape Cod Canal area is eligible for listing in the NRHP as a historic district at the State level of significance under Criteria A and C in the areas of community planning and development, engineering, maritime history, and transportation. According to its NRHP Criteria Statement, Cape Cod Canal had a dramatic impact on transportation in Massachusetts and New England, including the development of the communities around it; therefore, it meets NRHP Criterion A. The Cape Cod Canal meets Criterion C as an engineering feat because it was recognized in 1985 by the American Society of Civil Engineers as a National Civil Engineering Landmark.

In its entirety, the Cape Cod Canal is included in the MHC Inventory as FAL.BG, which includes the southern approach channel from Buzzards Bay in the town of Falmouth; WRH.V, which includes the Stony Point Dike extending southwest into Buzzards Bay in the town of Wareham; BOU.AF, with 29 contributing resources, including the individually eligible Sagamore and Bourne Bridges and Buzzards Bay Railroad Bridge and buildings, structures, and sites associated with the construction and operation of the canal in the town of Bourne; and SDW.Z, which includes the East Mooring Basin, East Boat Basin and two jetties that extend into Cape Cod Bay in the town of Sandwich.

5.1.1.4 Other Architectural Properties within the Construction APEs

Table 5-1 lists architectural properties that are more than forty years old within the Sagamore Construction APE but outside the Cape Cod Canal Historic District, including MassDOT’s assessment of their NRHP eligibility. As noted in **Table 5-1**, MassDOT prepared new MHC inventory forms for the five properties/areas (provided in **Attachment 2**). Of the two areas and three individual properties that MassDOT evaluated in the Sagamore Construction APE, MassDOT determined that none were eligible for the NRHP.

Table 5-1. MassDOT’s Review of Architectural Properties over 40 Years Old Within the Sagamore Construction Area of Potential Effects*

Property	Address	MHC Inventory Number	MassDOT Recommendation
Round Hill Subdivision	16.75-acre area bounded by Sandwich Road and Mid-Cape Connector: Eleanor Avenue, John Lane, Louis Avenue, Cecilia Terrace	BOU.AO**	Visible alterations include new construction and minor alterations; not National Register of Historic Places (NRHP) eligible.

Property	Address	MHC Inventory Number	MassDOT Recommendation
Adams Street Area	11-acre area accessed via Cranberry Highway: Adams Street, Garfield Avenue, Marconi Street-	BOU.AP**	Not NRHP eligible.
Vercellone House and Outbuilding	788 Sandwich Road	BOU.1032, BOU.1033**	Visible alterations include asbestos siding and vinyl windows; not NRHP eligible.
Canal Cafe	71 Cranberry Highway	BOU.1031**	Visible alterations include replacement vinyl windows; not NRHP eligible.
Lyle and Beatrice Forsyth House	34 Canal Street	BOU.1030**	Does not retain original architectural features, form or details; not NRHP eligible.

** New MHC Inventory Form prepared.

According to MACRIS, no architectural properties previously recorded in the MHC Inventory are located within the Sagamore Construction APE.

Table 5-2 list architectural properties that are more than forty years old within the Bourne Construction APE but outside the Cape Cod Canal Historic District, including MassDOT's assessment of their NRHP eligibility. As noted in **Table 5-2**, MassDOT prepared a new MHC inventory form for one property, Bourne Scenic Park (provided as **Attachment 2**), and determined it was not eligible for the NRHP. Of the two properties that previously were recorded in the MHC Inventory, MassDOT determined that Deacon Gershon Ellis-Henry S. Blackwell House (BOU.50) is not eligible for the NRHP; additionally, MassDOT determined that the New York Central No. 16 Railroad Steam Tugboat/Grandma's Restaurant (BOU.905) no longer exists.

Table 5-2. MassDOT's Review of Architectural Properties over 40 Years Old Within the Bourne Construction Area of Potential Effects

Property	Address	Massachusetts Historical Commission Inventory Number	Recommendation
Bourne Scenic Park	370 Scenic Highway	BOU.AQ**	Not NRHP eligible.

Property	Address	Massachusetts Historical Commission Inventory Number	Recommendation
Deacon Gershon Ellis-Henry S. Blackwell House	201 Sandwich Road	BOU.50*	Visible alteration includes vinyl siding; not NRHP eligible.
New York Central No. 16 Railroad Steam Tugboat/ Grandma's Restaurant	Northbourne Rotary, Buzzards Bay	BOU.905*	Not applicable; property no longer exists and appears to have been removed by others.

* Previously listed in the Massachusetts Historical Commission Inventory.

** New MHC inventory form prepared.

The FHWA and MassDOT presented preliminary information about the six newly inventoried properties/areas, including maps and photographs, to the Section 106 consulting parties at a virtual meeting on January 22, 2024. None of the consulting parties commented about the proposed NRHP eligibility recommendations, nor did the consulting parties identify other properties that MassDOT should evaluate. In its transmittal of the MHC Inventory forms to the SHPO at MHC on October 16, 2024, the FHWA recommended that none of the areas or individual properties are eligible for listing in the NRHP. The SHPO responded to the FHWA with a stamped and signed concurrence dated November 15, 2024 (provided in **Attachment 1**).

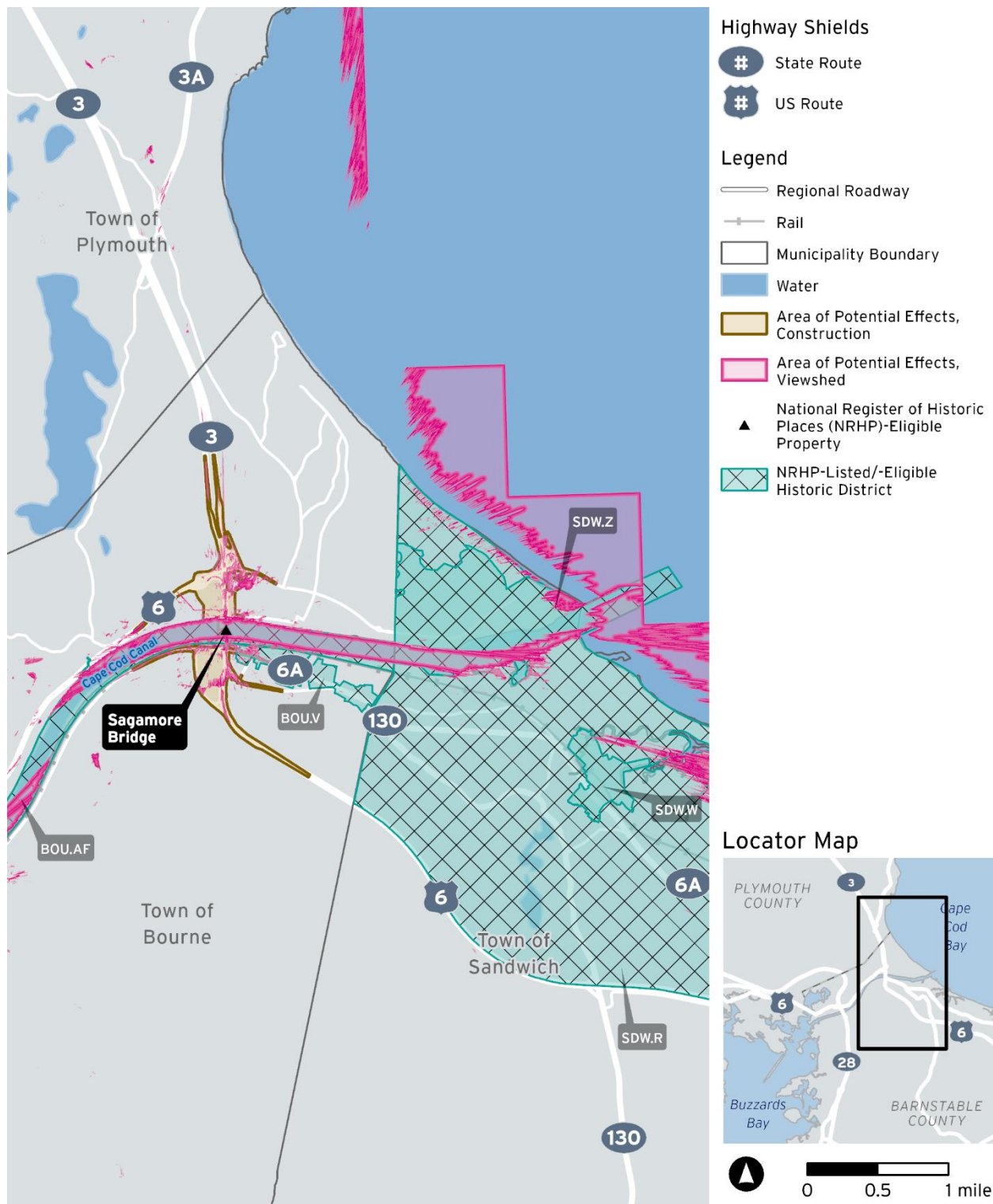
In correspondence to the SHPO on February 28, 2025, MassDOT recommended that the Deacon Gershon Ellis-Henry S. Blackwell House, which was previously recommended by others to be eligible for individual NRHP-listing, is not eligible for individual NRHP-listing due to its visible alterations (synthetic siding). The SHPO responded to MassDOT with a stamped and signed concurrence dated March 26, 2025 (provided in **Attachment 1**).

5.1.2 Architectural Historic Properties within the Viewshed APE

Figure 5-3 and **Figure 5-4** present the Viewshed APE, which includes the viewsheds for the Sagamore and Bourne Bridges, respectively. **Table 5-3** identifies MHC-inventoried architectural historic properties, including areas and individual structures, within the Viewshed APE of the Sagamore and/or Bourne Bridge, including their NHRHP-listed or NRHP-eligible status.¹³

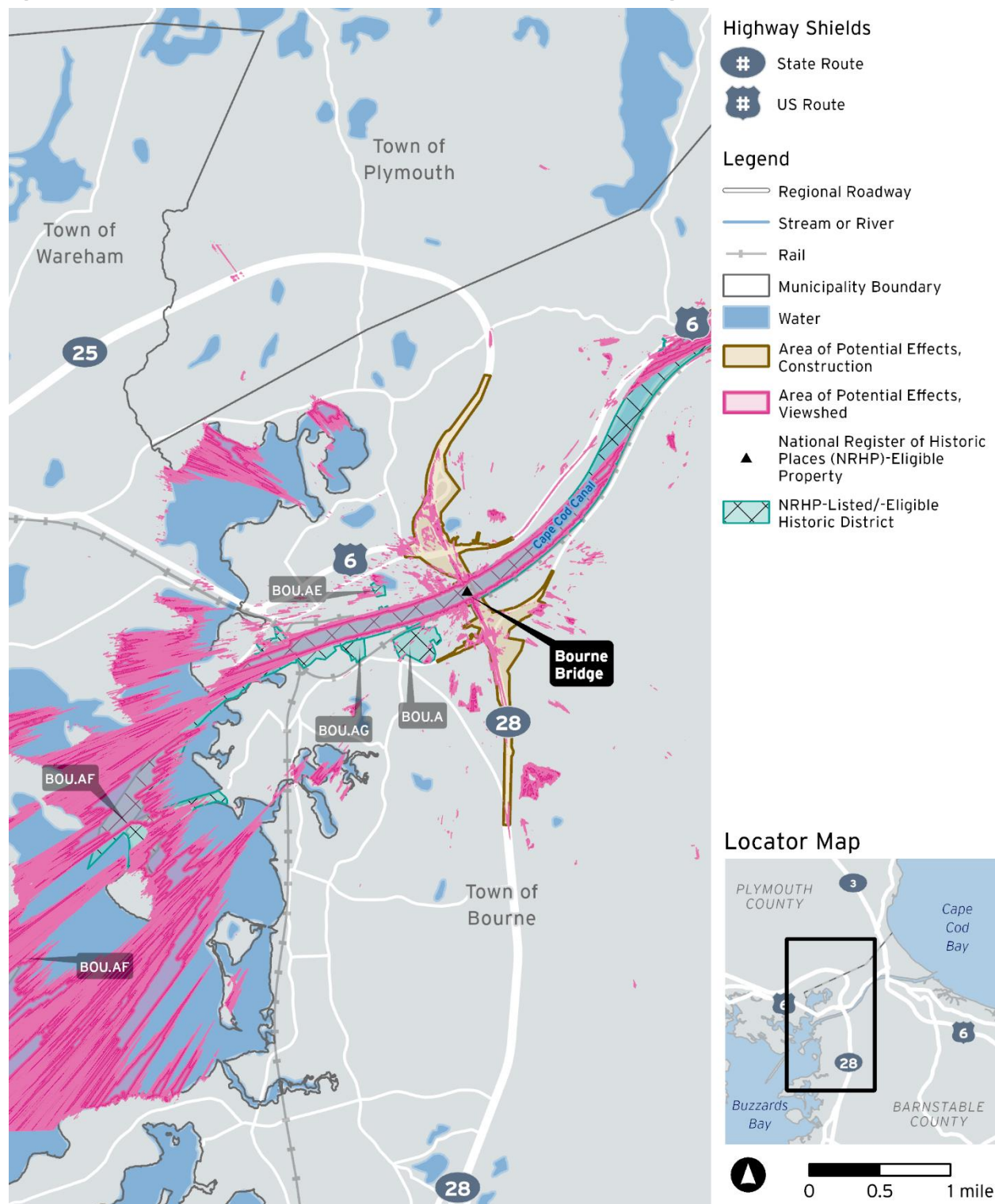
¹³ Note that except for the National Register of Historic Places (NRHP) eligible Sagamore and Bourne Bridges, only NRHP-listed, NRHP-eligible, and inventoried areas are presented on **Figure 5-3** and **Figure 5-4**.

Figure 5-3. Viewshed Area of Potential Effects (Sagamore Bridge)



Source: Massachusetts Department of Transportation, 2025

Figure 5-4. Viewshed Area of Potential Effects (Bourne Bridge)



Source: Massachusetts Department of Transportation, 2025

Table 5-3. Architectural Historic Properties within the Viewshed Area of Potential Effects*

Historic Properties/ Area	Address	MHC Inventory #	Bridge Viewshed	Protection
Cape Cod Canal Historic District	Cape Cod Canal	BOU.AF, FAL.BG, SDW.Z, WRH.V	Sagamore & Bourne Bridges	National Register of Historic Places (NRHP)-eligible
South Sagamore Area, consisting of 34 inventoried properties, of which 8 properties are NRHP-eligible, within approximately 55 acres	Sandwich Road area/Sagamore Village, a linear area along Sandwich Road extending east from Adams Street to the Sandwich town line	BOU.V	Sagamore Bridge	NRHP-eligible
Bournedale Village School	29 Herring Pond Road	BOU.57	Sagamore Bridge	NRHP-listed
Mason White-Battles House	6 Bournedale Road	BOU.54	Sagamore Bridge	NRHP-eligible
Wilson D. Bent House	9 Bournedale Road	BOU.55	Sagamore Bridge	NRHP-eligible
Josiah Ellis House	166 Herring Pond Road	BOU.209	Sagamore Bridge	NRHP-eligible
Nathan Bourne Ellis House	854 Scenic Highway	BOU.211	Sagamore Bridge	NRHP-eligible
Swift Memorial Methodist Episcopal Church	10 Williston Road	BOU.118	Sagamore Bridge	NRHP-eligible
Sagamore Grammar School	30 Williston Road	BOU.119	Sagamore Bridge	NRHP-eligible
Capt. William Crowell Gibbs House	252 Old Plymouth Road	BOU.281	Sagamore Bridge	NRHP-eligible

Historic Properties/ Area	Address	MHC Inventory #	Bridge Viewshed	Protection
Keene Street-Sandwich Road Area, an approximate 24-acre rectangular area with 20 inventoried properties, of which 10 properties are NRHP-eligible	Keene Street-Sandwich Road area/Bourne Village, defined by the intersection of Perry Avenue and Sandwich, Trowbridge, Waterhouse, Cotuit and Shore Roads at western end and intersection of Sandwich Road and Coastal Way at the eastern end.	BOU.A	Bourne Bridge	NRHP-eligible
Aptucxet Trading Post Museum Historic District, an approximate 6-acre open-air museum with reconstructed and relocated buildings	6 Aptucxet Road	BOU.AG	Bourne Bridge	NRHP-listed
George I. Briggs House	22 Sandwich Road	BOU.1	Bourne Bridge	NRHP-listed
Bourne High School	85 Cotuit Road	BOU.4	Bourne Bridge	NRHP-listed
Jonathan Bourne Public Library	30 Keene Street	BOU.13	Bourne Bridge	NRHP-listed
Bourne Town Hall	24 Perry Avenue	BOU.AE/BOU.68	Bourne Bridge	NRHP-listed
Albert R. Eldridge House	43 Sandwich Road	BOU.10	Bourne Bridge	NRHP-eligible
Moses Calvin Waterhouse House	59 Keene Street	BOU.12	Bourne Bridge	NRHP-eligible

Historic Properties/ Area	Address	MHC Inventory #	Bridge Viewshed	Protection
Alonzo E. Booth Blacksmith Shop	22 Sandwich Road	BOU.48	Bourne Bridge	NRHP-eligible
Gibbs House	291 Head of the Bay Road	BOU.60	Bourne Bridge	NRHP-eligible
Abram F. Swift House	37 Old Bridge Road	BOU.67	Bourne Bridge	NRHP-eligible

*Individual structures are not included on [Figure 5-3](#) and [Figure 5-4](#).

5.2 Archaeological Resources

A review of the MHC Inventory files indicates that there are nine recorded archaeological sites in and near the Sagamore Bridge Construction APE and 15 recorded archaeological sites in and near the Bourne Bridge Construction APE. Prior to the construction of Cape Cod Canal, the areas around the Sagamore and Bourne Bridges had high archaeological sensitivity, based on the presence of known Native American and early European settlements in close proximity to the Monument and Scusset Rivers. However, construction of the canal resulted in large scale disturbances that most likely destroyed any sites near the rivers. Previous investigations conducted by USACE in 1994 and subsequent investigations indicated that most of the areas immediately adjacent to the existing bridges have been disturbed by bridge construction.

Based on the results of its 2023 Reconnaissance Survey, MassDOT determined that much of the surveyed landscape has low archaeological sensitivity for intact archaeological resources due to disturbances caused by previous canal, roadway, bridge, railroad, utility, and drainage construction and residential and commercial development. In the segments of the surveyed area where prior disturbance is evident, no further archaeological investigations are recommended.

However, MassDOT conducted an intensive (locational) archaeological survey in the following five locations within the Construction APEs with intact soils to assess their sensitivity:

- Sagamore Bridge South Interchange, wooded terrace west of the Market Basket parking lot
- Bourne Bridge North Interchange, north of Nightingale Pond
- Bourne Bridge North Interchange, east of Nightingale Pond
- Bourne Bridge South Interchange, low ridge off Sandwich Road east of the interchange
- Bourne Bridge South Interchange, south of the interchange along proposed State Route 28 northbound

No significant archaeological resources were identified during the locational survey. Further, MassDOT determined that one previously recorded site and three new pre-contact spots within the Bourne Bridge Construction APE are not eligible for listing in the NRHP.

MassDOT coordinated with MHC and consulting parties on the findings of the Archaeological Survey and follow-up intensive archaeological survey. The MHC concurred that the five areas with intact soils were sufficiently tested and that the archaeological sites identified are not eligible for listing in the NRHP, provided on January 14, 2025, via stamped concurrence (provided in **Attachment 1**). No other comments were received from consulting parties on the Reconnaissance Survey or the results of the intensive archaeological survey.

6 Environmental Consequences

6.1 No Build Alternative

The No Build Alternative would involve continued operation of the NRHP-eligible Sagamore and Bourne Bridges. In the No Build Alternative, which is consistent with the No Action Alternative identified in the USACE's MRER/EA, major rehabilitation efforts would not be conducted, and components of the structures would be repaired and critical elements replaced as they deteriorate and before they fail. It is anticipated that there would be no effects on the bridges or other architectural historic properties, as there would be no change in appearance or location of the bridges.¹⁴

In the No Build Alternative, MassDOT would comply with Section 106 and Massachusetts-related historic regulations, as needed to maintain the highway interchange approach networks at the two bridges and implement the Transportation Improvement Program projects.

6.2 Build Alternative

6.2.1 Architectural Historic Properties

The demolition of the Sagamore and Bourne Bridges in the Build Alternative would have an unavoidable adverse effect on each of those NRHP-eligible structures in accordance with 36 CFR 800.5(a)(2)(i). Additionally, the Build Alternative would result in the loss of the two historic structures that are contributing resources to the NRHP-eligible Cape Cod Canal Historic District. Further, construction of new bridges to replace Sagamore and Bourne Bridges would affect the lands within the historic district.

To minimize impacts to the feeling and setting of the Cape Cod Canal Historic District, and in coordination with FHWA and with input from the public, MassDOT selected the replacement bridge type design in part because it would have a kinship with the existing historic high-level through truss bridges and would provide a similar monumental gateway experience across Cape Cod Canal. By incorporating a network arch main span across the canal and maintaining the arched bridge profiles similar to the existing structures, MassDOT determined that the proposed replacement bridges—parallel, twin steel tied-arch bridges supported on delta frames—would be compatible with the

¹⁴ U.S. Army Corps of Engineers. [Cape Cod Canal Bridges Major Rehabilitation Study](https://www.nae.usace.army.mil/Missions/Projects-Topics/Cape-Cod-Canal-Bridges-Major-Rehabilitation-Study/).
<https://www.nae.usace.army.mil/Missions/Projects-Topics/Cape-Cod-Canal-Bridges-Major-Rehabilitation-Study/>

existing historic through truss bridges in scale and form. As a result, MassDOT determined that the replacement bridges would not have an adverse effect on the Cape Cod Canal Historic District.

MassDOT determined that due to their similar arched bridge profiles, the views of the replacement bridges from historic properties would be comparable to current views of the existing bridges. In accordance with 36 CFR 800.5(b), MassDOT determined that the replacement bridges would avoid adverse effects on architectural historic properties, including districts and individual structures, within the Program's Viewshed APE.

6.2.2 Archaeological Resources

As the Program's plans develop during the design-build process, MassDOT would continue to consult with the ACHP, SHPO, THPOs, and other Section 106 consulting parties. Although the Archaeological Reconnaissance Survey confirmed that much of the surveyed landscape within the Construction APEs has low archaeological sensitivity and the intensive survey did not identify any significant archaeological resources, MassDOT would continue to monitor the need for additional archaeological investigations through final design and construction of the Build Alternative as follows:

1. MassDOT would require the Program's design-build contractor to provide the 75% and 100% design plans for review and assessment by MassDOT's Environmental Section; and
2. MassDOT's Archaeologist would consult with the State Archaeologist, the USACE's Archaeologist, and the Section 106 consulting parties pending the need for additional archaeological surveys.

Additionally, MassDOT would include a Discovery of Unanticipated Archaeological and Skeletal Remains Special Provision in the construction contract.

7 Mitigation Measures

In coordination with FHWA, MassDOT has prepared a Draft Programming Agreement among FHWA – Massachusetts Division, SHPO, the New England District of the USACE, and MassDOT in accordance with 36 CFR 800.14(b), provided as **Attachment 1**. The Programmatic Agreement will commit FHWA and MassDOT to certain stipulations to mitigate the adverse effects on the NRHP-eligible Sagamore and Bourne Bridges and guide the Program through Section 106 consultation during the design-build process. MassDOT submitted a Preliminary Draft Programmatic Agreement to SHPO and the Advisory Council on Historic Preservation (ACHP) for review. FHWA has invited the USACE and MassDOT to sign the Programmatic Agreement as Invited Signatories. The FHWA has invited the Mashpee Wampanoag Tribe, Wampanoag Tribe of Gay Head (Aquinnah), Narragansett Indian Tribe, Herring Pond Wampanoag Tribe, Massachusetts Commission on Indian Affairs, Bourne Historical Commission, Sandwich Historical Commission, Massachusetts Board of Underwater Archaeological Resources, Cape Cod Commission, and National Trust for Historic Preservation to sign the Programmatic Agreement as Concurring Parties. Further, FHWA and MassDOT will consult with the SHPO, THPOs, and other Section 106 consulting parties before the Programming Agreement is finalized.

The mitigation stipulations include the following:

- Design and construct new, high-level bridges comprising parallel, twin steel tied-arch superstructures supported on delta frames at each crossing. Each new bridge will provide four through traffic lanes (two lanes in either direction), two auxiliary (acceleration/deceleration) lanes, and a single shared-use path for bicycle and pedestrian use. Provide the Base Technical Concept plans to SHPO and other consulting parties for review and comment prior to the issuance of the project Request for Qualifications.
- Prepare historic recordation documentation for submittal to the Historic American Engineering Record (HAER) maintained by the National Park Service. The documentation will include a “narrative format” report printed on archival quality paper and black and white photographs, including aerial, with archival prints made from medium format (2½" x 2½") and large format (4" x 5") negatives. The original negatives will be packaged with the photographic prints. The documentation also will include either paper prints or high-resolution scans on an appropriate storage device of original bridge plans from the USACE archives and any historic photographs that might be available. All documentation will be prepared to prescribed HAER standards. Copies of all paper and electronic historic recordation documentation shall be submitted to the SHPO for transfer to the State Archives and to the Bourne Historical Commission for transfer to any local repository of their choosing.
- Prepare and fabricate at least one interpretive historic panel for installation at each of the pedestrian overlooks along each bridge. The subject of each interpretive panel shall be determined in consultation with the Section 106 consulting parties.
- Salvage original bridge plaques at both existing bridges. The existing plaques include: bridge name and date plaques at the four portals of the bridges; bridge dedication plaques located at the southeast and northeast pylons on the approaches to Sagamore Bridge, and at the southwest and northwest pylons on the approaches to Bourne Bridge; American Institute of Steel Construction award plaque for the Bourne Bridge, located at the southeast pylon on the bridge approach. All plaques will be carefully removed and placed in secure storage for reinstallation at publicly accessible locations within the Program area or for transfer to other appropriate local public entities.
- Continue to provide updated construction plans through the Base Technical Concept plans to the MassDOT Archaeologist in the Environmental Section, who shall review the plans to determine if additional archaeological survey might be required. The MassDOT Archaeologist shall consult with the State Archaeologist and the Section 106 consulting parties if additional archaeological survey is required.
- Include a Special Provision in the Construction Contract for the Discovery of Unanticipated Archaeological and Skeletal Remains.

- Include the Programmatic Agreement in the Request for Qualifications, Request for Proposals, and the construction contracts for both the Sagamore Bridge and the Bourne Bridge replacement projects.

The Draft Programmatic Agreement includes, as appendices, the Memoranda of Understanding between the USACE and MassDOT for the Cape Cod Bridges Program, July 7, 2020 and March 21, 2024 (Appendix A); the APEs in the vicinity of Bourne Bridge and Sagamore Bridge (Appendix B); correspondence with the SHPO/State Archaeologist (Appendix C); preliminary bridge renderings (Appendix D); MassDOT’s standard Special Provision for the Discovery of Unanticipated Archaeological and Skeletal Remains (Appendix E); and contact list (Appendix F).

8 Glossary of Terms

Table 8-1. Glossary of Terms

Term	Definition
Adverse Effect	An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register of Historic Places (NRHP)) in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association.
Area of Potential Effects (APE)	The geographic area(s) within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. An APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking.
Effect	Alteration to any of the characteristics of a historic property that qualify the property for inclusion in the NRHP.
Historic property	Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the NRHP maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian Tribe or Native Hawaiian Organization and that meet the NRHP criteria.
National Register of Historic Places (NRHP)	The official list of the nation’s historic places worthy of preservation maintained by the Secretary of the Interior under the authority of the National Historic Preservation Act of 1966. The NRHP includes districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture.

Term	Definition
No adverse effect	A finding where an undertaking may have an effect on a historic property, but will not alter any of the characteristics of the historic property that qualify it for inclusion in the NRHP in a manner that would diminish its integrity.
Pre-contact	The period before contact of an Indigenous people with an outside culture.
Programmatic Agreement	A way to tailor the Section 106 process for a specific program or series of undertakings, the Programmatic Agreement allows federal agencies to govern the implementation of a particular agency program or the resolution of adverse effects from complex projects or multiple undertakings similar in nature through negotiation of an agreement between the agency, appropriate State/Tribal Historic Preservation Office, and the Advisory Council on Historic Preservation.
Secretary of the Interior's Professional Qualifications Standards	Requirements set by the National Park Service to define the minimum education and experience required to perform identification and evaluation of historic properties, among other associated tasks. Qualified professionals in the relevant historic preservation fields apply the NRHP Criteria for Evaluation to determine the significance of a property.
Significance	The importance of a historic property as defined by the NRHP criteria in one or more areas of significance.
State Historic Preservation Officer (SHPO)	The official designated by the governor of each state to carry out the responsibilities of the National Historic Preservation Act of 1966 and administer the state's historic preservation program and the duties, as described in 36 CFR Part 61. While the SHPO is an individual, it is also an office that performs a variety of functions under the NHPA and associated state laws.
Undertaking	Projects, activities, or programs funded in whole or in part under the direct or indirect jurisdiction of a federal agency. Includes those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; and those requiring a federal permit, license, or approval.

Note: The Glossary of Terms is excerpted from the [FHWA Section 106 Tutorial Key Terms](https://www.environment.fhwa.dot.gov/env_topics/section_106_tutorial/keyterms.aspx),
https://www.environment.fhwa.dot.gov/env_topics/section_106_tutorial/keyterms.aspx