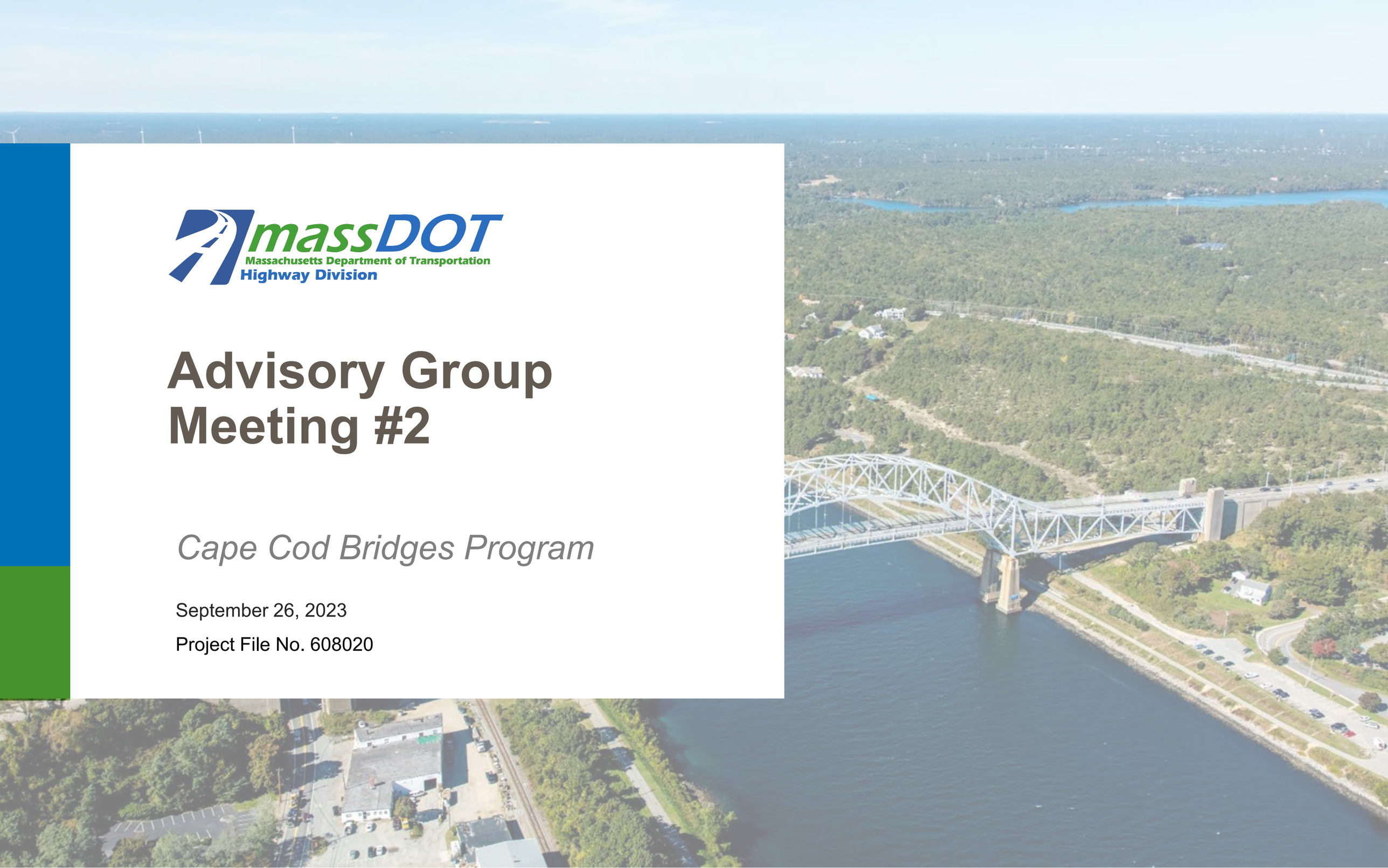
MassDOT
Massachusetts Department of Transportation
Highway Division

Advisory Group Meeting #2

Cape Cod Bridges Program

September 26, 2023

Project File No. 608020



Members

Program Team

- MassDOT
- USACE
- HNTB
- Stantec

State and Federal Elected Officials

- Office of Gov. Healey
- Office of Sen. Markey
- Office of Sen. Warren
- Office of U.S. Rep. Keating
- Office of U.S. Rep. Lynch
- State Sen. Moran
- State Senator Cyr
- State Rep. Vieira
- State Rep. Peake
- State Rep. Diggs
- State Rep. Xiarhos
- State Rep. Fernandes

Stakeholders

- Town of Bourne
- Association to Preserve Cape Cod
- Bourne Police
- Bourne Public Schools
- Bourne Recreation Authority
- Bourne Selectboard
- Bourne Town Administrator's Advisory Committee on Pedestrian Bicycle Committee
- Cape Cod Canal Region Chamber of Commerce
- Cape Cod Chamber of Commerce
- Cape Cod Commission
- Cape Cod Metropolitan Planning Organization
- Cape Cod Regional Transit Authority
- US Army Corps of Engineers
- Federal Highway Administration
- Mass State Police
- MEMA

Agenda

01 Introductions

02 Grant Application Update

03 Cost and Schedule Update

04 Environmental Update

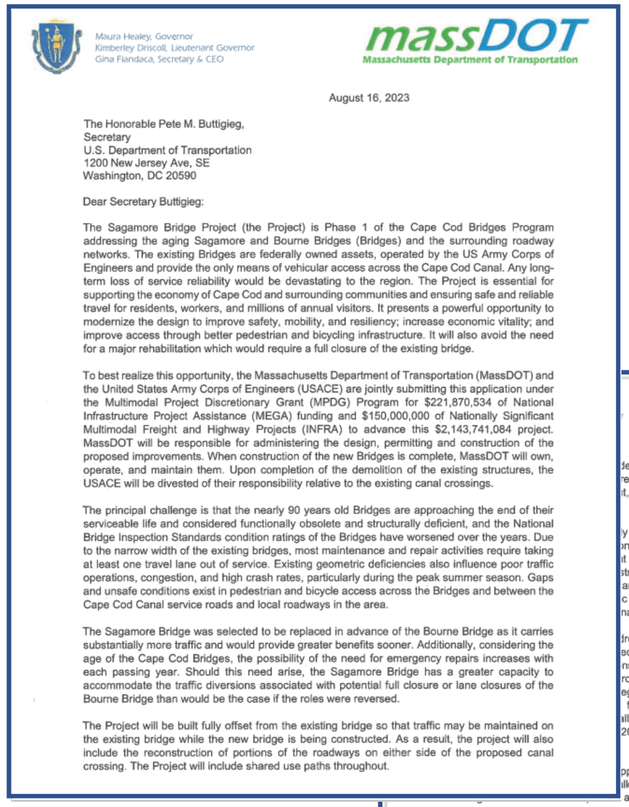
05 Measures of Effectiveness

06 Multimodal Accommodations

Grant Application Update

Grant Application Update

- On August 21, 2023, MassDOT (lead applicant) filed jointly with USACE for funding under the Multimodal Project Discretionary Grant program
- A single application for both the Nationally Significant Multimodal Freight and Highway Projects (INFRA) program and the National Infrastructure Project Assistance (Mega) program
- The application is for replacement of the Sagamore Bridge as a Phase 1 project for $2.144 B
- The application describes a “phased approach” where the Sagamore Bridge is part of a larger program involving the replacement of both bridges
- The application identifies future Bridge Investment Program grant funds as part of a complete financial plan



Maura Healey, Governor
Kimberley Driscoll, Lieutenant Governor
Gina Fiandaca, Secretary & CEO

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August 16, 2023

The Honorable Pete M. Buttigieg,
Secretary
U.S. Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Dear Secretary Buttigieg:

The Sagamore Bridge Project (the Project) is Phase 1 of the Cape Cod Bridges Program addressing the aging Sagamore and Bourne Bridges (Bridges) and the surrounding roadway networks. The existing Bridges are federally owned assets, operated by the US Army Corps of Engineers and provide the only means of vehicular access across the Cape Cod Canal. Any long-term loss of service reliability would be devastating to the region. The Project is essential for supporting the economy of Cape Cod and surrounding communities and ensuring safe and reliable travel for residents, workers, and millions of annual visitors. It presents a powerful opportunity to modernize the design to improve safety, mobility, and resiliency; increase economic vitality; and improve access through better pedestrian and bicycling infrastructure. It will also avoid the need for a major rehabilitation which would require a full closure of the existing bridge.

To best realize this opportunity, the Massachusetts Department of Transportation (MassDOT) and the United States Army Corps of Engineers (USACE) are jointly submitting this application under the Multimodal Project Discretionary Grant (MPDG) Program for $221,870,534 of National Infrastructure Project Assistance (MEGA) funding and $150,000,000 of Nationally Significant Multimodal Freight and Highway Projects (INFRA) to advance this $2,143,741,084 project. MassDOT will be responsible for administering the design, permitting and construction of the proposed improvements. When construction of the new Bridges is complete, MassDOT will own, operate, and maintain them. Upon completion of the demolition of the existing structures, the USACE will be divested of their responsibility relative to the existing canal crossings.

The principal challenge is that the nearly 90 years old Bridges are approaching the end of their serviceable life and considered functionally obsolete and structurally deficient, and the National Bridge Inspection Standards condition ratings of the Bridges have worsened over the years. Due to the narrow width of the existing bridges, most maintenance and repair activities require taking at least one travel lane out of service. Existing geometric deficiencies also influence poor traffic operations, congestion, and high crash rates, particularly during the peak summer season. Gaps and unsafe conditions exist in pedestrian and bicycle access across the Bridges and between the Cape Cod Canal service roads and local roadways in the area.

The Sagamore Bridge was selected to be replaced in advance of the Bourne Bridge as it carries substantially more traffic and would provide greater benefits sooner. Additionally, considering the age of the Cape Cod Bridges, the possibility of the need for emergency repairs increases with each passing year. Should this need arise, the Sagamore Bridge has a greater capacity to accommodate the traffic diversions associated with potential full closure or lane closures of the Bourne Bridge than would be the case if the roles were reversed.

The Project will be built fully offset from the existing bridge so that traffic may be maintained on the existing bridge while the new bridge is being constructed. As a result, the project will also include the reconstruction of portions of the roadways on either side of the proposed canal crossing. The Project will include shared use paths throughout.

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esign will bring the bridge into a state of good repair, lower the ess issues with traffic operations, improve safety by reducing t, and preserve and enhance productivity through new direct

y chains, spur economic development, and improve safety and nal and national significance. The Bridges support the Cape t goods cross over the two Bridges. The Bridges also enable structures through the Cape Cod Canal. The Bridges provide and regional significance. The Bridges are critical components c Plan, a vital link for emergency response on Cape Cod and nal security with access to the Joint Base Cape Cod.

ressing national, state, and local goals as identified through ceived overwhelming support at all levels. Both the USACE nsiderable resources to move Program planning and design ropolitan Planning Organization has expressed support for the egional transportation plan. Massachusetts has demonstrated funding to the Program by committing $350 million in a lly, the Program won a $1.6 million federal planning grant in 2023, President Biden included $350 million for the project in

portunity to access the federal funding that is needed to replace llow Massachusetts to deliver on the vision of this project and and the Islands, the Commonwealth, and the Nation.

Sincerely,

FOR-Justin R. Pabis, PE
Colonel, Corps of Engineers
District Engineer

Gina Fiandaca
MassDOT Secretary and CEO

Grant Application Update

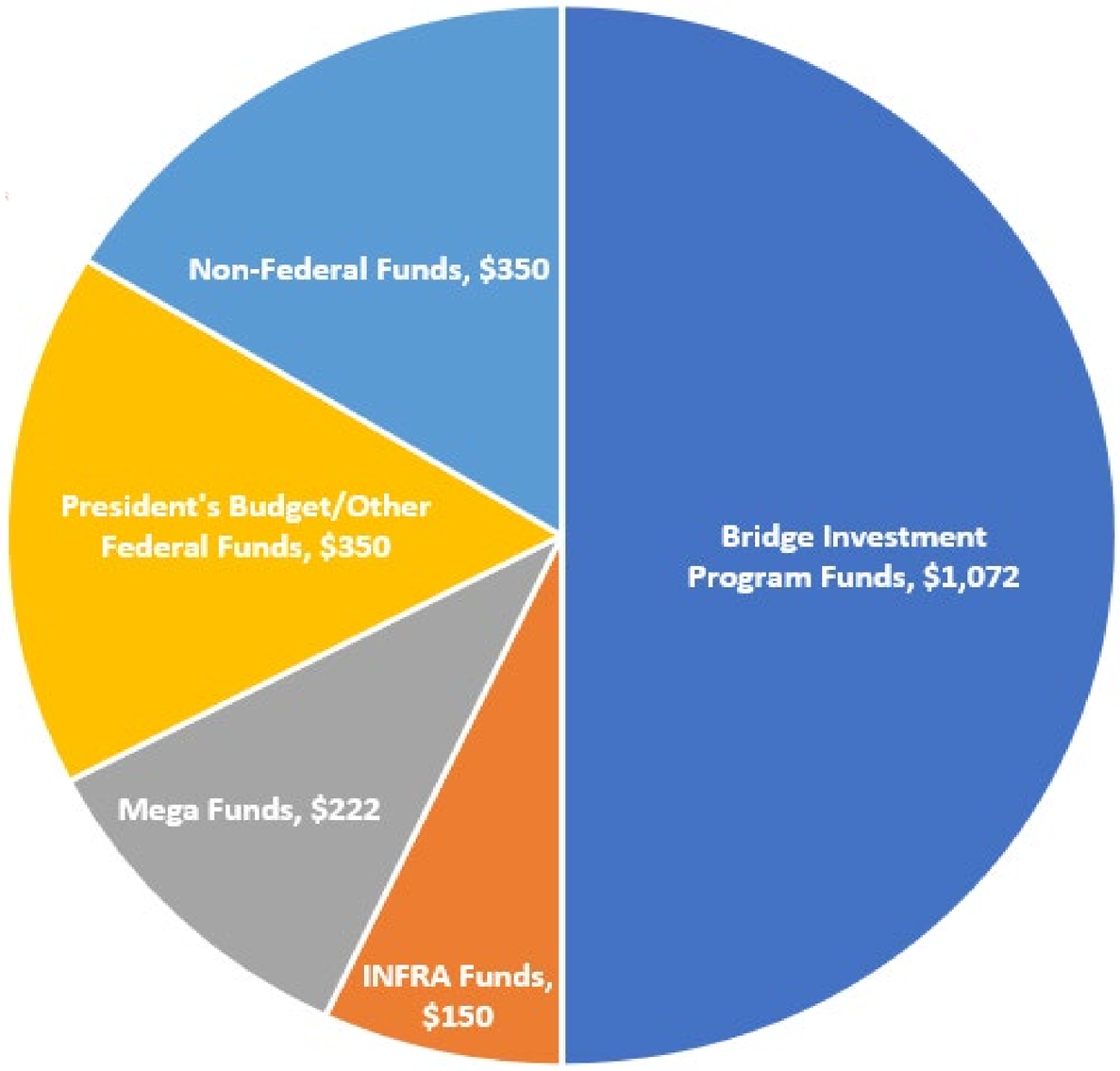
The Sagamore Bridge was chosen as Phase 1 over the Bourne Bridge due to a combination of value to the overall program and cost. Specifically:

- Traffic Volumes and Operations
  - The Sagamore Bridge carries significantly more traffic than the Bourne Bridge
  - The improvements to the bridge cross-section, particularly the addition of the Auxiliary Lanes, provide a greater benefit to the Sagamore crossing compared to the Bourne Bridge and allows for more flexibility in traffic management for Phase 2
- Cost
  - Sagamore has lower overall cost (reduces the amount of MassDOT/USACE matching funds required)
- Structural Condition is similar for both Bridges and therefore was not a key factor

Grant Application Update

- Bridge Investment Program ($1.072 B)
  - Will be requested in the upcoming round of BIP grants
- INFRA – ($150 M)
- Mega – ($222 M)
- President's Budget – ($350 M)
  - Approved by the Senate Appropriations Committee in the Energy and Water Bill
  - Will be assigned to USACE a Federal Land Management Agency (considered part of non-federal match)
- Non-Federal Funds – ($350)
  - Included in Transportation Bond Bill

Total Phase 1 Cost $2.144 Billion



Cost and Schedule Update

Cost and Schedule Update

- The first conceptual cost estimate prepared by MassDOT for the Cape Cod Bridges Program was developed in the spring of 2022.
- The estimate includes design, permitting, property acquisitions, utility relocations and the construction of new canal crossings at the Sagamore and Bourne locations.
- This conceptual Program estimate of approximately $4 Billion was included in the 2022 Grant applications.
- Any previous estimates of costs related to the replacement of the bridges were not prepared by MassDOT.

Cost and Schedule Update

Cost and Schedule Risk Assessment (CSRA) Workshop

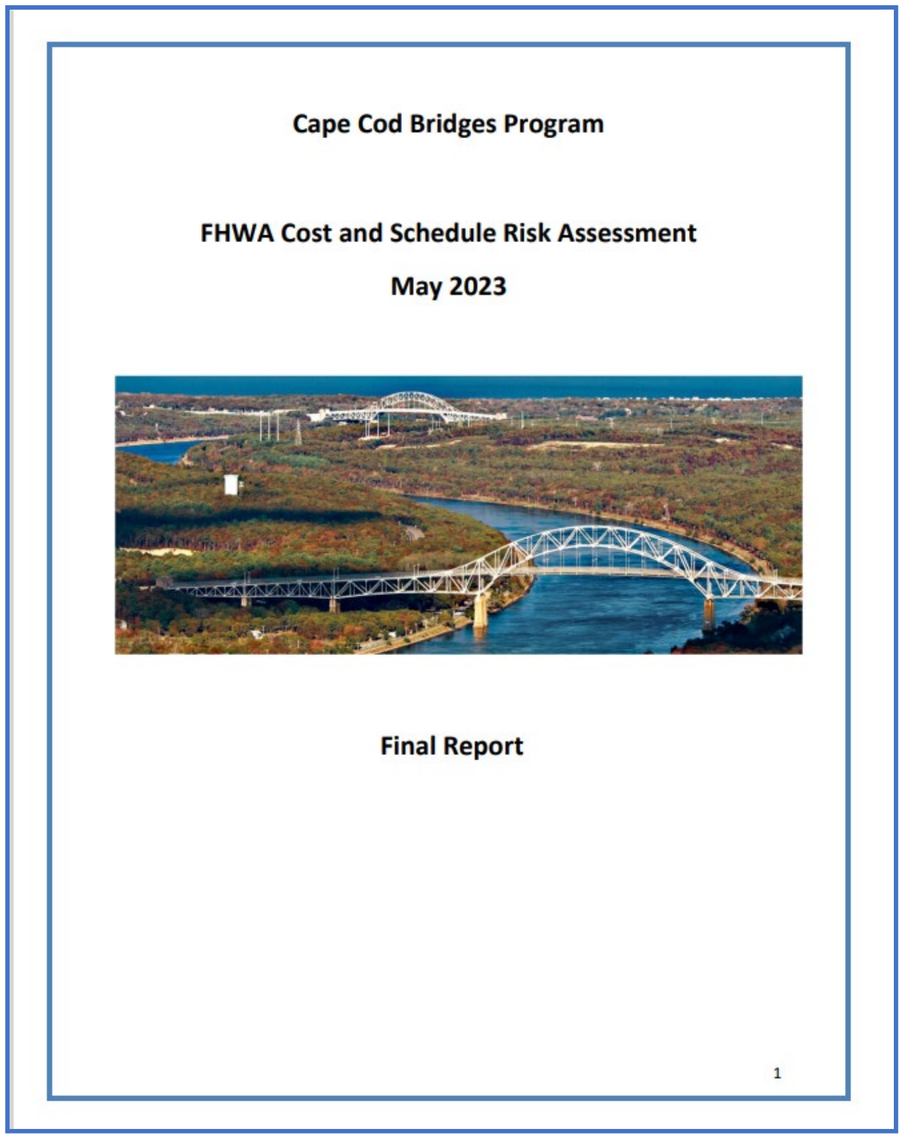
May 22, 2023, to May 25, 2023

Led by FHWA CSRA Cadre Team

Participants

- FHWA Division Office
- MassDOT
- USACE
- Project Team and Consultants
- Subject Matter Experts
- Over 80 Participants
- Up to 42 in person

Cost and Schedule Update – CSRA Results


Cape Cod Bridges Program

FHWA Cost and Schedule Risk Assessment

May 2023

Final Report

1

- The CSRA was conducted much earlier in the project development process than usual.
- Due to the early stage of project development and the complexities of the design, environmental permitting, property acquisitions and utility relocations, a number of risks were identified.
- The majority of these risks have the potential to result in schedule delays.
- Potential schedule delays cause an increase in cost due to inflationary impacts and potential adverse market conditions at the time of procurement.
- The CSRA Final Report recommends using a Program Cost of $4,541 Billion (in increase of $516 Million) compared to the Base Estimate to account for potential schedule and other risks.

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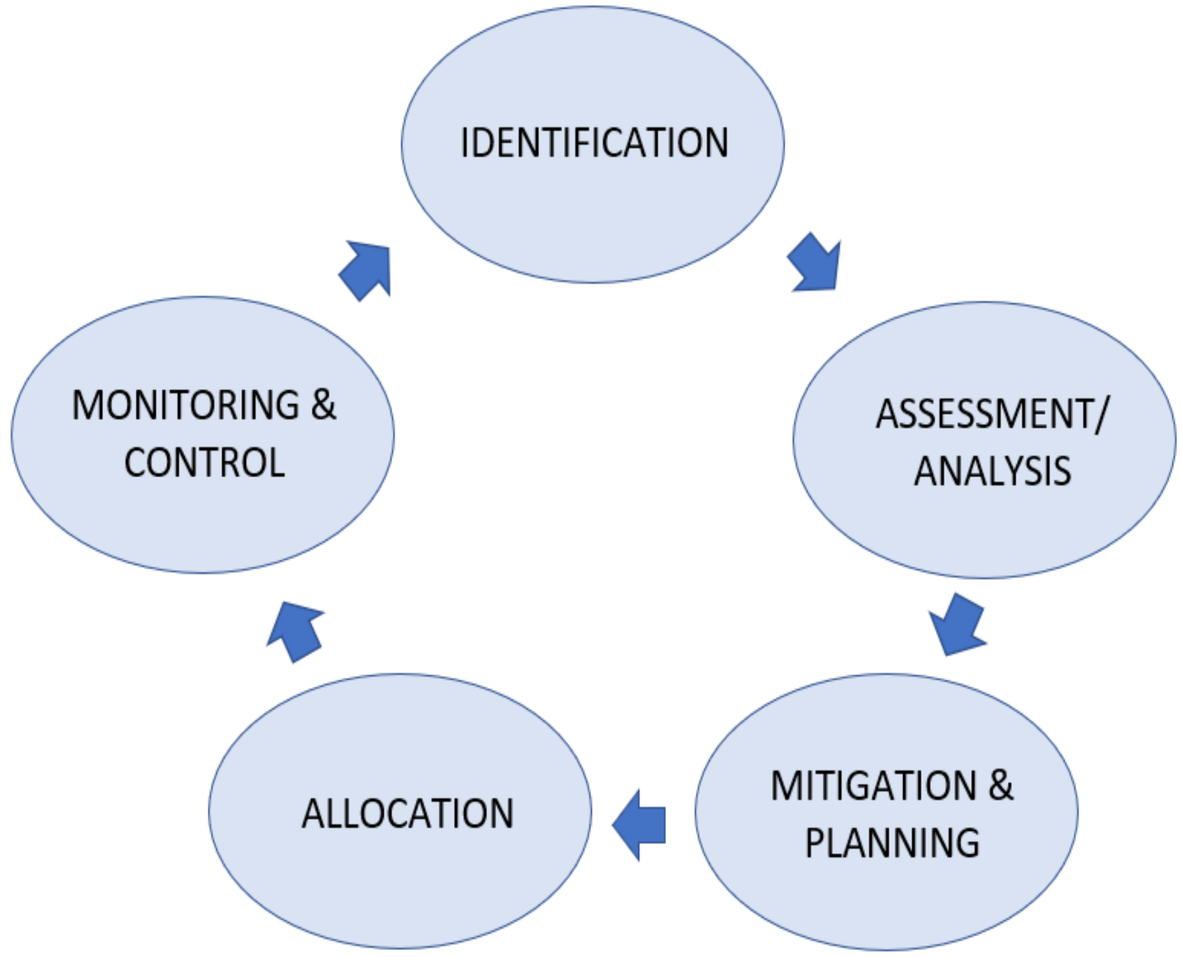
Cost and Schedule Update – CSRA Results

- Due to the early identification of Program risks, MassDOT and its federal partners are provided additional time to mitigate these risks
- As the project development process advances it is anticipated that the schedule, estimate, and risk profiles will be refined (and uncertainties reduced), and that these refinements will be reflected in future CSRAs



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Environmental Update

Environmental Update

Massachusetts Environmental Policy Act (MEPA)

- Environmental Notification Form filed on April 28, 2023
- Open House on May 17, 2023
- Executive Office of Energy and Environmental Affairs issued the ENF Certificate on July 7, 2023
- The Certificate included the Scope for the Draft Environmental Impact Report (DEIR)
- The Scope recognizes MassDOT's recommendations for bridge type, size and location and directs alternatives analysis specific to the following:

Environmental Justice	Waterways
Public Health	Areas of Critical Environmental Concern
Noise	Rare Species
Land Alteration, Impervious Areas and Stormwater	Historic and Archaeological Resources
Article 97	Solid and Hazardous Materials
Traffic and Transportation	Climate Change
Air Quality	Construction Period Impacts
Wetlands and Floodplains	Mitigations

Environmental Update

National Environmental Policy Act (NEPA)

- On March 20, 2023, FHWA directed MassDOT prepare an Environmental Assessment (EA) to determine if the Program is likely to result in significant impacts to the environment
- On August 11, 2023, FHWA directed MassDOT prepare an Environmental Impact Statement (EIS) citing the following:

  "This determination has been made to ensure full and fair discussion of significant environmental impacts are disclosed to decision makers and the public, and to ensure all reasonable alternatives that would avoid or minimize adverse impacts or enhance the quality of the environment are considered."
- Ongoing alternatives analysis and agency coordination will determine the specifics of significant environmental impacts
- The Program team has identified and engaged Cooperating Agencies to help inform the scope of the EIS
- The NEPA Notice of Intent (NOI) to Prepare an EIS will be published in the Federal Register
- Per FHWA regulation, a Record of Decision (ROD) will be scheduled for issuance within 2-years of the publication of the NOI

Environmental Update – Next Steps for the EIS

- Cooperating Agencies Meeting #2 – **Fall 2023**
- Publish the Notice of Intent in the Federal Register – **Late 2023 / Early 2024**
  - Purpose and Need
  - Alternatives
  - Summary of likely impacts
  - List of authorizations
  - Schedule
  - Description of public process
  - Request for feedback
  - Contact information
- Develop Draft EIS Scoping Report based on cooperating agency input – **Winter 2024**
- Finalize EIS Scoping Report – **Spring 2024**
- Accelerate Development of Draft EIS – **Spring/Summer 2024**

Measures of Effectiveness

Measures of Effectiveness

What are Measures of Effectiveness and why they are important?

- Measures of Effectiveness (MOEs) will be used to guide the development and evaluation of the roadway alternatives.
- Alternative designs will be evaluated based on how they respond to these categories.

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Measures of Effectiveness – Draft Criteria

- **Mobility and Operations**
  - Congestion - Mainline Highways
  - Congestion – Ramps
  - Congestion - Local Roads
  - Travel Time (Regional)
  - Travel Time (Local)
  - Local Traffic Cross Canal Mobility
  - Separation of Regional and Local Traffic
  - Efficiency of Regional Movements
- **Safety**
  - Number of Weaving Movements
  - Total Intersection Conflict Points
  - Vehicle, Pedestrian and Bicycle Conflict Points
  - High Speed Merges
  - Complexity of Decision Points
  - Consistency with Driver Expectation
  - Queues Extending onto Mainline
  - Spacing b/w Exit and Entrance Ramps
  - Acceleration Lane Speed Variance
  - Deceleration Lane Speed Variance

Measures of Effectiveness – Draft Criteria

- **Constructability/Staging**
  - Construction Duration
  - Time to Existing Bridge Closure
  - Time to 2nd Bridge Opening
  - Number of Restricted Movements
  - Complexity of Construction
  - Impacts to Traffic Management
- **Reliability**
  - Life Cycle Maintenance Requirements
  - Accommodations for Maintenance
  - Accommodations for Snow and Ice Removal

Measures of Effectiveness – Draft Criteria

- **Abutter Impacts**
  - Full Residential Impacts
  - Full Commercial Impacts (Active)
  - Full Commercial Impacts (Vacant)
  - Partial Residential Impacts
  - Partial Commercial Impacts (Active)
  - Partial Commercial Impacts (Vacant)
  - Residential Access Modifications
  - Commercial Access Modifications
  - Noise Impacts
- **Environmental Considerations**
  - Permanent Wetland Impacts
  - Temporary Wetland Impacts
  - Permanent BLSF Impacts
  - Temporary BLSF Impacts
  - Article 97 Impacts
  - Section 4(f) Impacts
  - ACEC Impacts
  - Potential Habitat Impacts
  - Impacts to Viewshed
  - Consistency with Regional Character
  - Consistency with Environmental Justice Policy

Measures of Effectiveness – Draft Criteria

- **Resiliency and Sustainability**
  - Access to Essential Services
  - Balanced Earthwork
  - Preserve Water Resources
  - Provide Wetland and Surface Water Buffers
  - Manage Stormwater
  - Maintain Floodplain Functions
  - Air Quality
  - Vulnerability to Flooding
  - Impact of Urban Heat Island Effect
- **Multimodal Connectivity**
  - Length of SUP to local road
  - Length of SUP to CSR
  - Max SUP Grade
  - Length of Max Grade

Measures of Effectiveness – Draft Criteria

- **Ramp Compatibility with Bridge Design**
  - Complexity of design and construction
  - Superstructure Framing Efficiency/Reliability
  - Deck Overbuild Required
- **Cost**
  - Capital Cost

Multimodal Accommodations

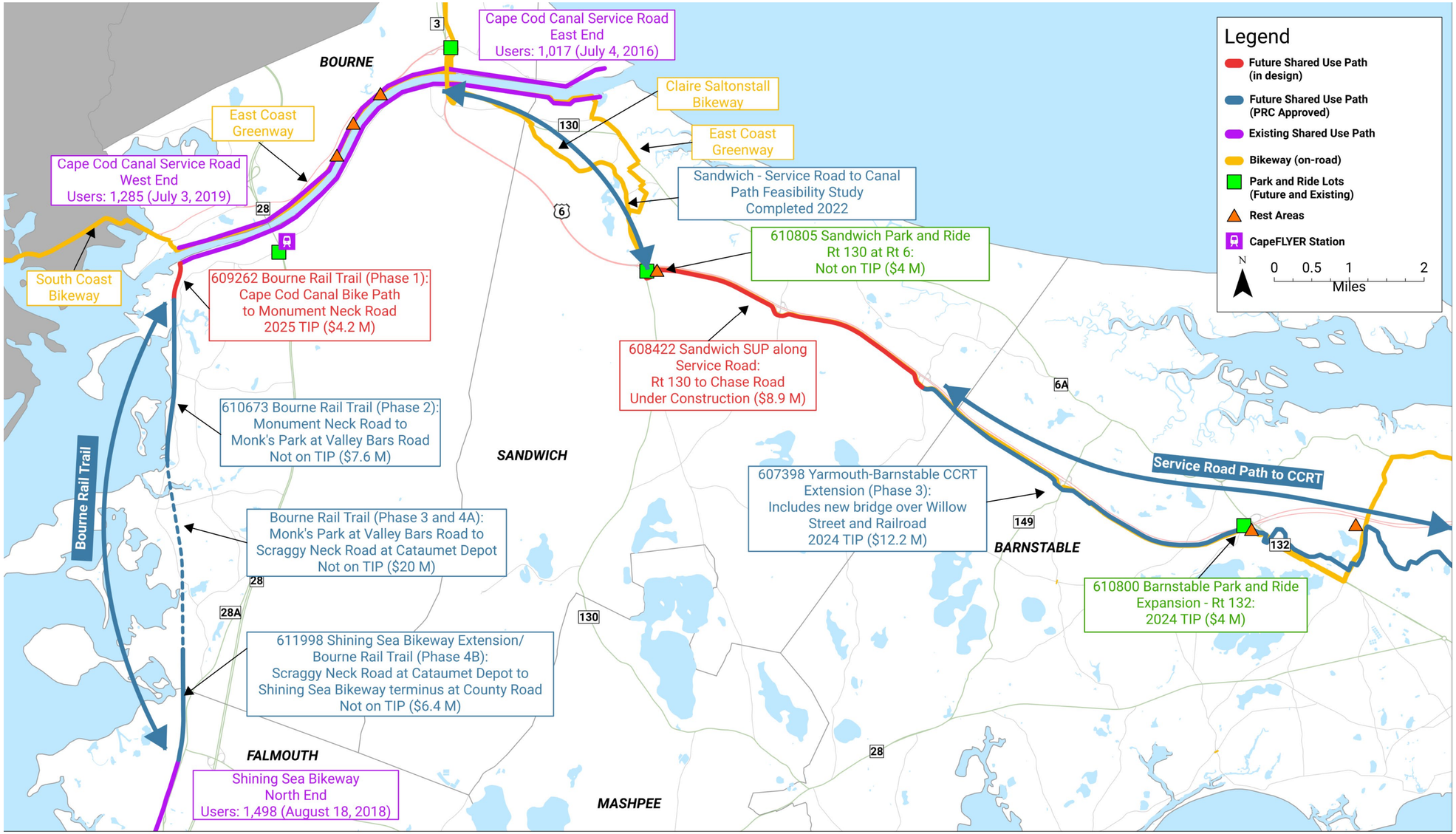
Draft Multi-Modal Goals

- ADA compliant facilities
- Improve cross-canal connections
- Improve social equity access
- Increase user comfort and safety
- Increase multi-modal usage in Cape Communities
- Enhance access and connectivity to transit facilities
- Reduce traffic congestion/GHG emissions
- Improve air & noise quality
- Improve local economy through recreational activities

Draft Multi-Modal Considerations

- Provide more accommodations for comfortable use
- Provide buffer space between high-speed users and pedestrians
- Provide bi-directional bicycle travel
- Provide designated space for pedestrian users
- Allow safe bicycle access during snow clearing events
- Accommodate passing for high-speed users

Regional Trail Connections

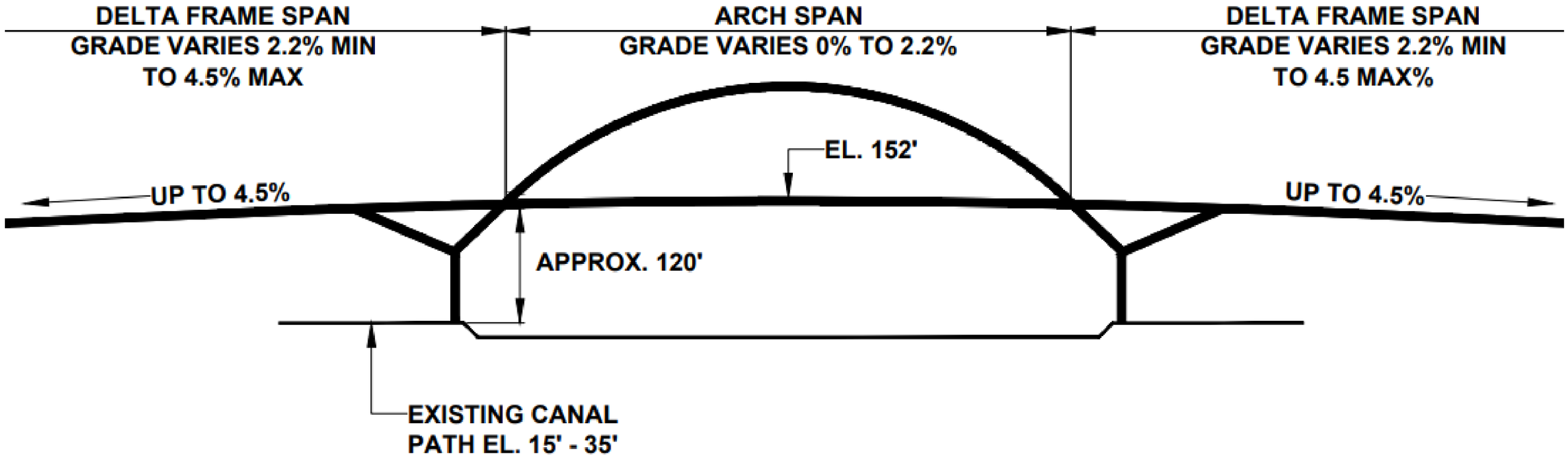


Map Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs and ArcGIS Online.

Cape Cod Regional Trail Connections

Cape Cod Canal Transportation Improvements Program

Cross-Canal SUP Profile Challenges



All elevations referenced refer to NAVD 88
All elevations and lengths referenced are approximate

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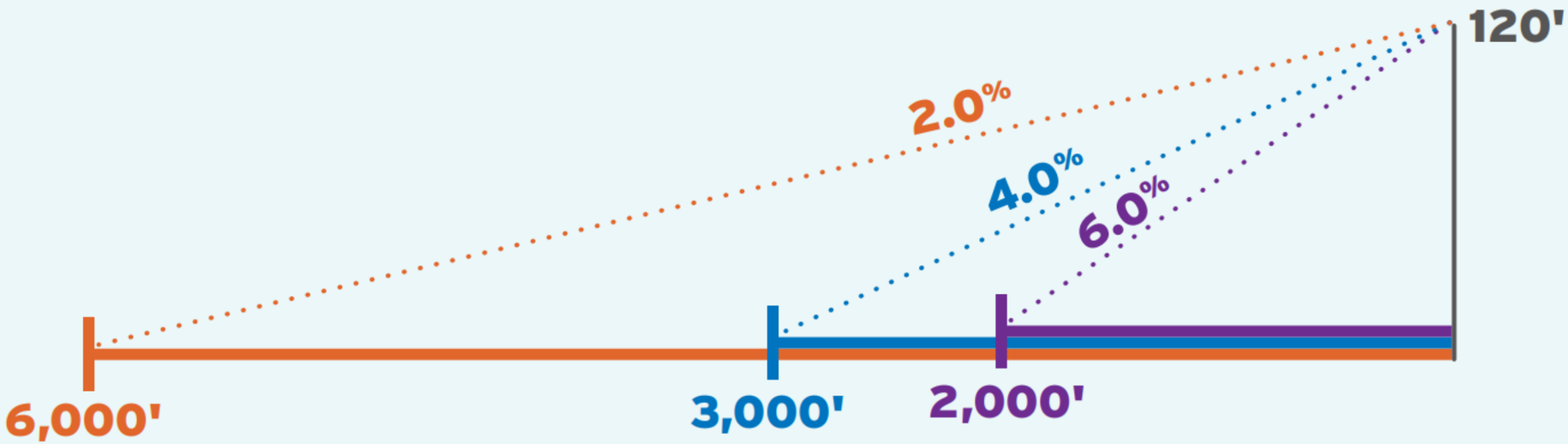
Cross-Canal SUP Profile Challenges



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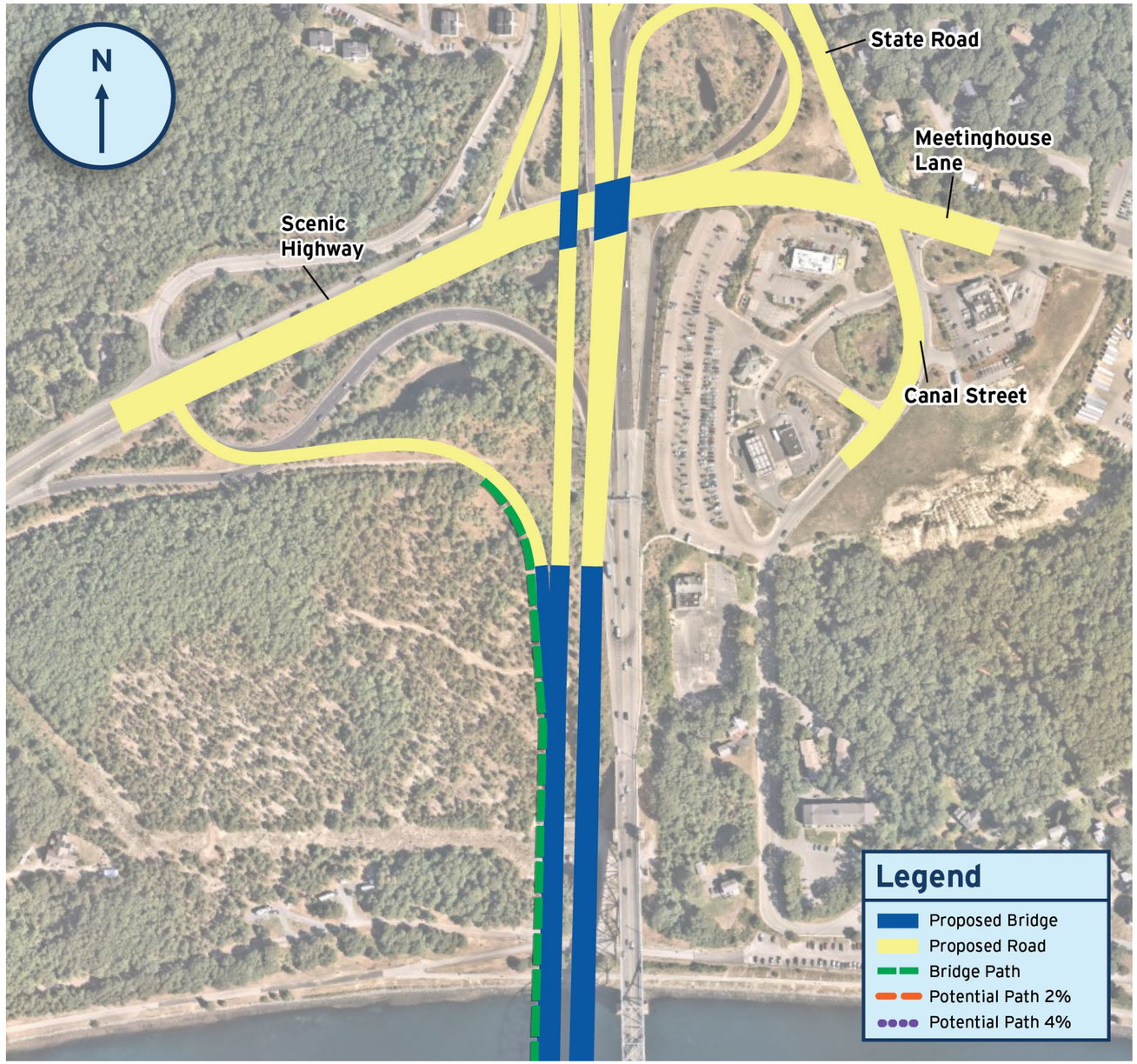
Sagamore North – Conceptual SUP Approach Challenges



Path Length [Mid Span to Canal Path]

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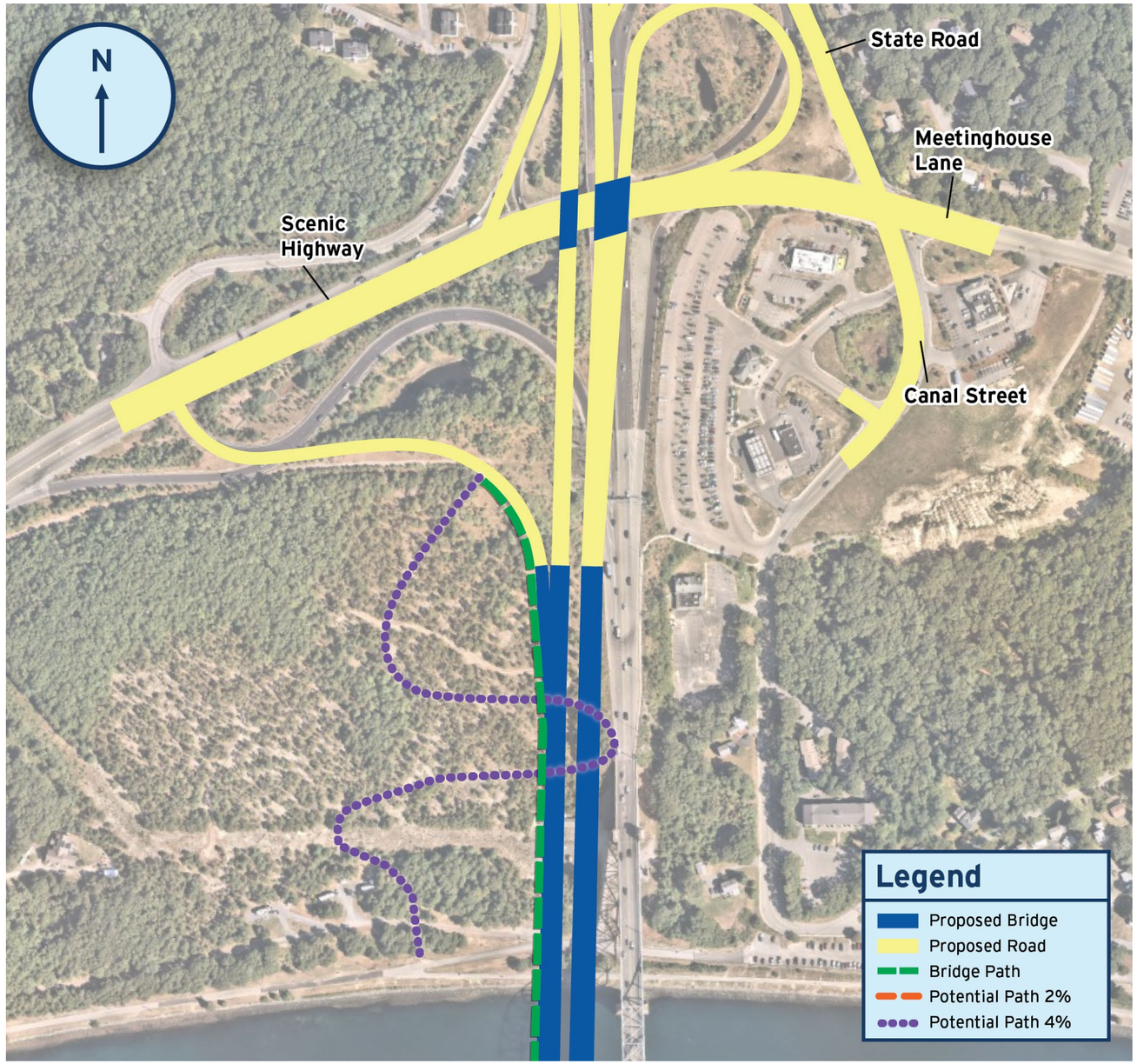
Sagamore North – Conceptual SUP Approach Challenges



Path Length [Mid Span to Canal Path]

❑At 4.0% = 3,750 feet

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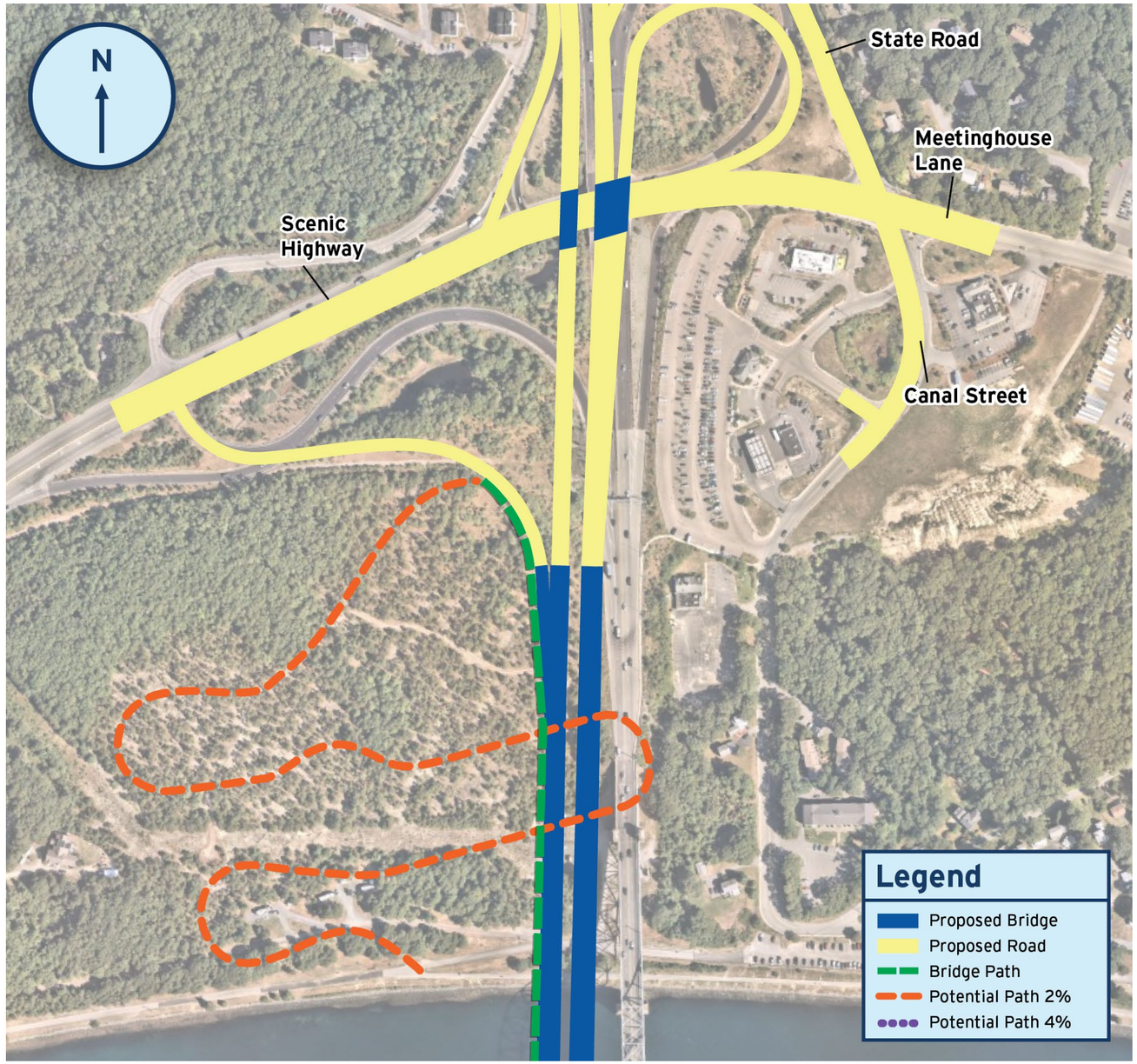
Sagamore North – Conceptual SUP Approach Challenges



Path Length [Mid Span to Canal Path]

❑At 2.0% = 5,900 feet

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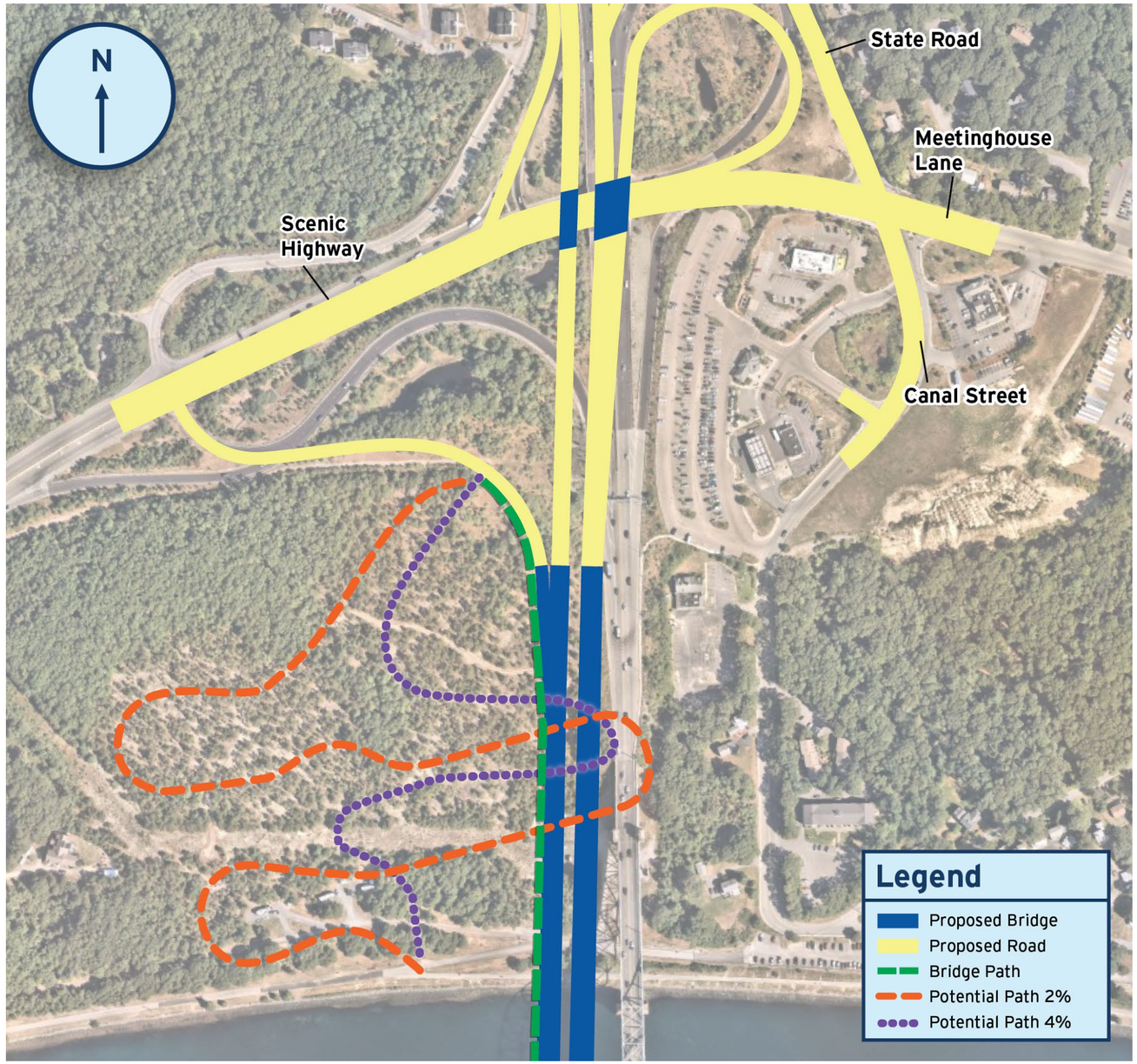
Sagamore North – Conceptual SUP Approach Challenges



Path Length [Mid Span to Canal Path]

- ❑At 4.0% = 3,750 feet
- ❑At 2.0% = 5,900 feet

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Next Steps

Next Steps

- Continued public outreach and stakeholder engagement.
- Coordinate the publication of the EIS NOI with FHWA and cooperating agencies
- Additional design and refinement of the interchange alternatives including bike and pedestrian accommodations.
- MassDOT in coordination with the U.S. Army Corps of Engineers will continue to pursue all opportunities for federal funding as they become available.

Communications

For General Information,
Visit the Project Website: www.mass.gov/cape-bridges

Project Contacts:

- Bryan Cordeiro, Project Manager, Email: bryan.cordeiro@state.ma.us
- Gareth Saunders, Office of Legislative Affairs Highway Liaison, Email: gareth.saunders@state.ma.us

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Questions and Discussion

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Thank You

Cape Cod Bridges Program

September 26, 2023

Project File No. 608020

Appendix

Cost and Schedule Update - FHWA CSRA Team Observations

General

- The CCBP is the highest profile CSRA the team has been involved in
- The CCBP is perhaps the most complicated CSRA the team has been involved in

Timing

- CSRA's are typically conducted 90 days prior to NEPA completion (November of 2024 for the CCBP based on the current schedule)
- Conducting a CSRA at such an early stage of project development presents many challenges (particularly considering a preferred alternative has not been identified)
- Conducting a CSRA at such an early stage results in a much wider distribution of potential cost and schedule outcomes
- Conducting a CSRA at such an early stage provides the opportunity to begin mitigating risks earlier than typical

Cost and Schedule Update - FHWA CSRA Team Observations

Estimate

- The conceptual program estimate was prepared to a greater level of detail than would typically be expected for a project at such an early stage of design
- The estimate was complete (included all costs associated with the scope work, contingencies, inflation and other costs)
- The methodology used in preparing the estimate was sound

Draft Risk Register

- The Draft Risk Register provided to FHWA in advance of the workshop was comprehensive and well supported

Attendees

- Excellent engagement and input provided by subject matter experts during the workshop
- Attendees provided input without bias (no attempt to influence the process to achieve a predetermined result)

Cost and Schedule Update - CSRA Most Significant Risks

1. Combined NEPA/MEPA review for Project and Gas Lines
2. EIS (rather than EA) required for Project NEPA review
3. Late project decisions and/or direction
4. Lack of capacity and/or staff turnover (including partner/external agencies)
5. Additional alternatives included in MEPA analysis
6. Individual Section 4(f) analysis for Cape Cod Historic District
7. Lack of interested bidders for the project
8. Delayed completion of gas line relocations
9. Critical ROW acquisitions lead to design-build contract delays
10. Critical repairs to existing bridges impacts traffic during construction

Cost and Schedule Update – CSRA Cost Results

- It is common practice to utilize the 70th percentile (P70) dollar amount for planning purposes
- P70 means there is a 70% chance that the total cost of the program will not exceed the P70 amount.

Percentiles	Forecast Values (Base Year $)	Forecast Values (YOE $)
0%	$2,192,062,601	$2,913,460,070
10%	$2,602,553,721	$3,587,314,596
20%	$2,749,521,286	$3,790,693,882
30%	$2,863,276,496	$3,955,084,212
40%	$2,965,135,756	$4,108,644,269
50%	$3,061,323,111	$4,245,100,209
60%	$3,163,904,403	$4,390,412,284
70%	**$3,268,071,362**	**$4,541,369,603**
80%	$3,386,909,998	$4,705,593,929
90%	$3,518,345,575	$4,906,135,313
100%	$4,027,791,190	$5,975,191,200

Figure 13: Percentile Rankings of Project Total Cost (Includes Prior Expenditures)

Cost and Schedule Update – CSRA Schedule Results

- Design Build Contract Notice To Proceed (NTP) dates range from October of 2027 (10th Percentile) to June of 2029 (90th Percentile)
- The 70th percentile NTP date of November 2028 is 10 months after the currently planned NTP date of January of 2028