Advisory Group Meeting #4

Cape Cod Bridges Program

October 22, 2024

Project File No. 608020

Agenda

01 Introductions

02 Funding Update

03 Environmental Update

04 Highway Interchange Options – Detailed Assessment

05 Recommendation

06 Discussion

Introductions

Advisory Group 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 Sen. 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
- Barnstable County Commissioners
- Barnstable County Sheriff's Office
- Bourne Commission on Disabilities
- Bourne Police
- Bourne Public Schools
- Bourne Recreation Authority
- Bourne Selectboard
- Bourne Town Administrator's Advisory Committee on Pedestrian Bicycle Committee

Stakeholders Continued

- 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

Funding Update

Funding Update – Sagamore Bridge Project

- Total cost for the Sagamore Bridge Project is estimated to be $2.131 billion.
- In January of 2024, MassDOT was formally notified that the Sagamore Bridge Project was selected to receive $372 million in Mega grant funding.
- In July of 2024, MassDOT was informed that the Sagamore Bridge Project was selected to receive $993 million in Bridge Investment Program funding.

Funding Update – Sagamore Bridge Project

- The Consolidated Appropriations Act of 2024 appropriated $350 million to the USACE for the Cape Cod Bridges Program.
- MassDOT has entered a Memorandum of Understanding (MOU) with the USACE and the FHWA that allows the transfer of the $350 million in federal funding from the USACE to the FHWA.

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Funding Update – Sagamore Bridge Project

- The FHWA's Eastern Federal Lands Division will use these funds to construct a portion of the Sagamore Bridge Project.
- State Bond funds will be provided to complete the overall finance plan for the Sagamore Bridge Project.

Funding Update – Bourne Bridge Project

- Total cost for the Bourne Bridge Project is estimated to be $2.38 billion.
- In May of 2024, MassDOT submitted a grant application requesting $634 million in Mega funds and $634 million in Infra funds for the Bourne Bridge Project.
- In August of 2024, MassDOT submitted a grant application requesting $634 million Bridge Investment Program funds for the Bourne Bridge Project.
- The remaining funding for the project would consist of State Bond Funds and USACE funding.

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Funding Update – Bourne Bridge Project

- On October 15th, MassDOT met with USDOT staff to discuss their preliminary review of the BIP application.
- The Finance Plan included in the application relies upon USACE funding that has not yet been appropriated by Congress.
- MassDOT is awaiting notification from USDOT regarding the applications for Mega and INFRA funds.

Environmental Update

NEPA Updates and Program Scoping

February 2024 - FHWA published a Notice of Intent (NOI) in the Federal Register:

- Identified **two Alternatives** for the DEIS/DEIR as directed by FHWA:
  - No Build and In-Kind Bridge Replacement
- The In-Kind Bridge Replacement will consist of the previously recommended mainline location, cross-section, bridge type and bridge configuration, combined with a single highway interchange option at each of the four quadrants of the Program.

May 2024 - FHWA concluded the NEPA Scoping Process with:

- Agency coordination meeting and correspondence;
- Comment letters from two State agencies and the Town of Bourne;
- Virtual public meeting on 4/25/2024, with 367 attendees;
- Open House in Bourne on 5/13/2024, with 283 attendees;
- Over 90 individual comments

Spring 2025 - Publish DEIS/DEIR

Winter 2026 – NEPA process complete

Highway Interchange Options – Analysis Process

Highway Interchange Options - Detailed Assessment

At the April 2024 Advisory Group Meeting we discussed:

- The alternatives analysis process that was used to identify 10 Interchange Options for a Detailed Analysis.
- The Evaluation Criteria that will be used to analyze these 10 Interchange Options relative to the Program Needs and the Program Goals.

This information was then presented to the public during the April 2024 virtual public meeting.

Program Needs and Goals Assessment

MassDOT developed evaluation criteria and quantitative and qualitative performance measures to rate each option according to the Program Needs:

- **Operations**: address poor vehicular traffic operations.
- **Geometrics and Safety:** address the substandard design elements of the bridges and their highway networks.
- **Multi-Modal Accommodations**: address the lack of accessible bicycle and pedestrian accommodations and connections.
- **Structural and Maintenance**: address the deteriorating structural condition and escalating maintenance demands of the Cape Cod canal highway bridges.

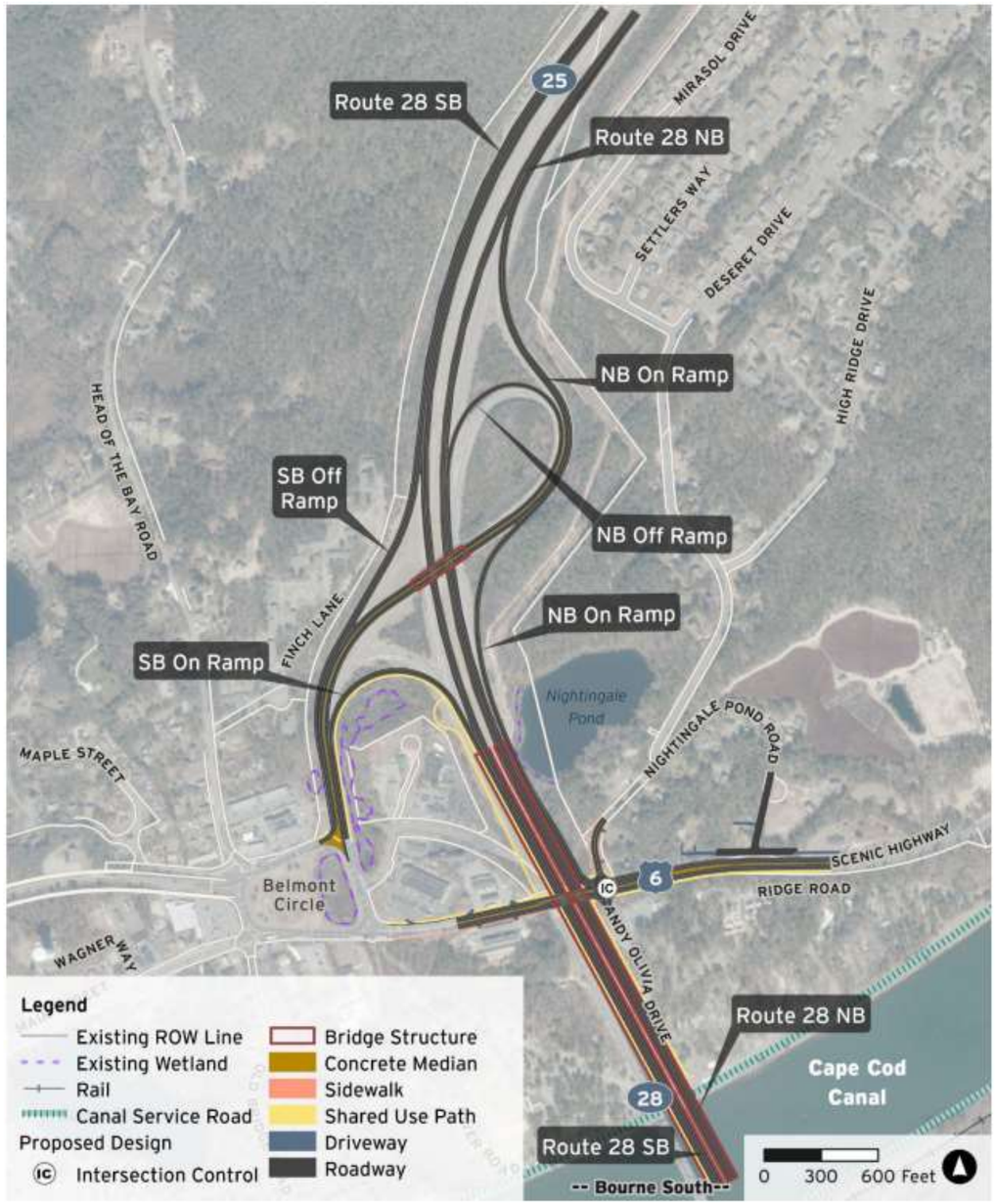
Program Needs and Goals Assessment

MassDOT developed objectives and quantitative and qualitative performance measures to rate each option according to the Program Goals:

- Maintain and improve the socioeconomic fabric of the surrounding community.
- Preserve and protect natural resources.
- Enhance the resiliency and sustainability of the built environment.
- Maximize constructability.
- Facilitate emergency response.
- Maximize cost effectiveness.

Highway Interchange Options – Detailed Assessment

Bourne North – Northbound On-Ramp – BN-6.1



- BN-6.1 is similar to the existing condition, with modifications to meet the offset mainline alignment and with the addition of a new Route 25 northbound on-ramp from Scenic Highway.
- Under BN-6.1, vehicles using the Route 25 southbound off-ramp, Route 25 southbound on-ramp and Route 25 northbound off-ramp will continue to be routed through Belmont Circle.
- A Regional Traffic Operations analysis was performed. This analysis evaluated multiple interchange pairings (a pairing is a combination of 4 Interchange Options, one Interchange Option on each side of the canal, at each canal crossing).
- Pairings involving BN-6.1 processes the fewest number of vehicles, had an increased Average Delay per Vehicle (longer delays than No-Build), had longer total travel times and would have queues extending onto Route 25.
- As result, BN-6.1 was screened from further review.

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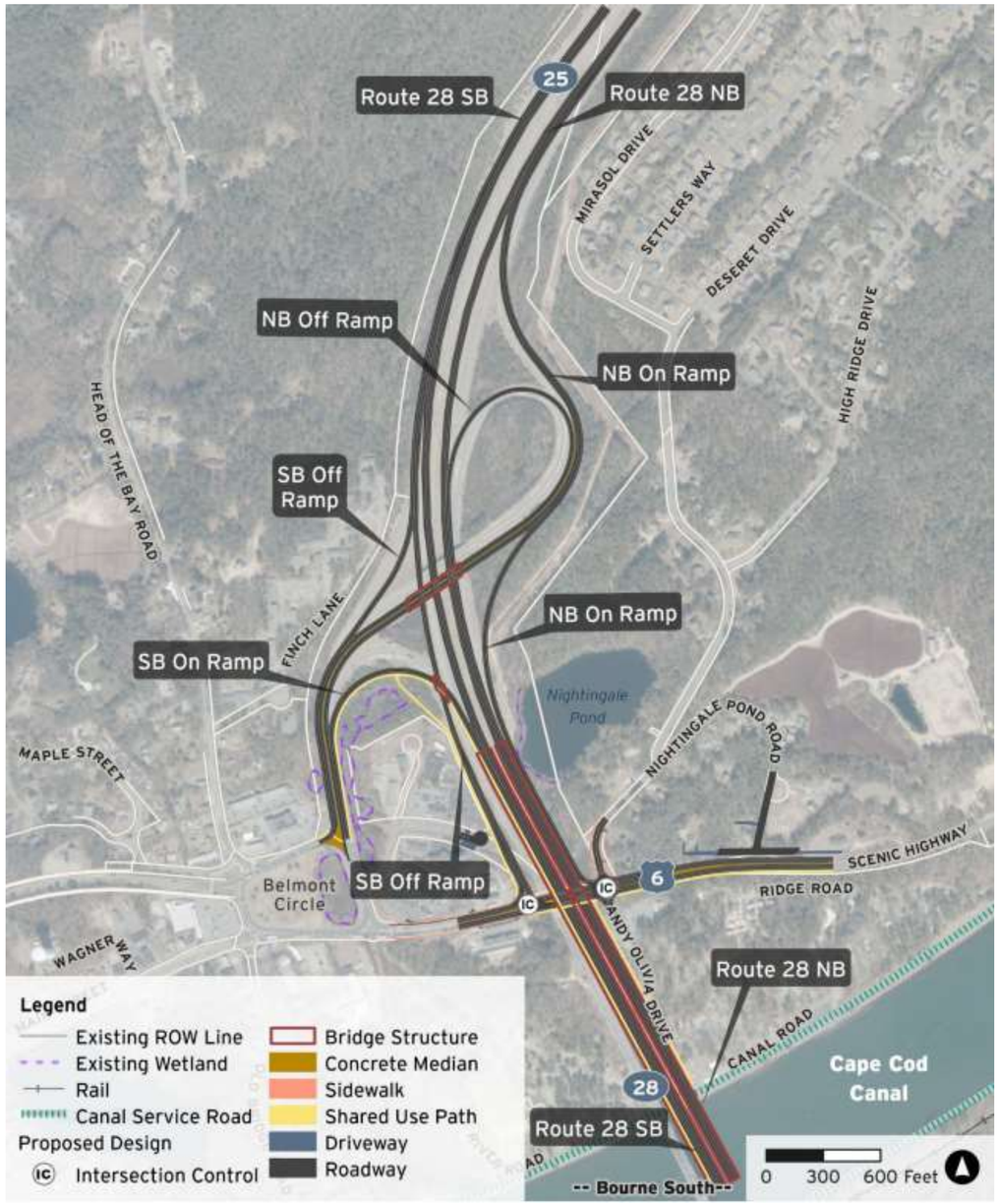
Bourne North – Hybrid Partial Interchange - BN-13.1



- BN-13.1 builds upon Option BN-6.1 and adds a connection from the Route 25 southbound off-ramp directly to Scenic Highway.
- Considering the Route 25 southbound off-ramp and Route 25 northbound on-ramp intersect with Scenic Highway at grade, this option did not score well with respect to separating local and regional traffic.
- The location of the Route 25 southbound off-ramp intersection necessitates a wide cross section on Scenic Highway. Due to the location of the businesses on either side of Scenic Highway, there is not adequate space to provide a SUP at this location.

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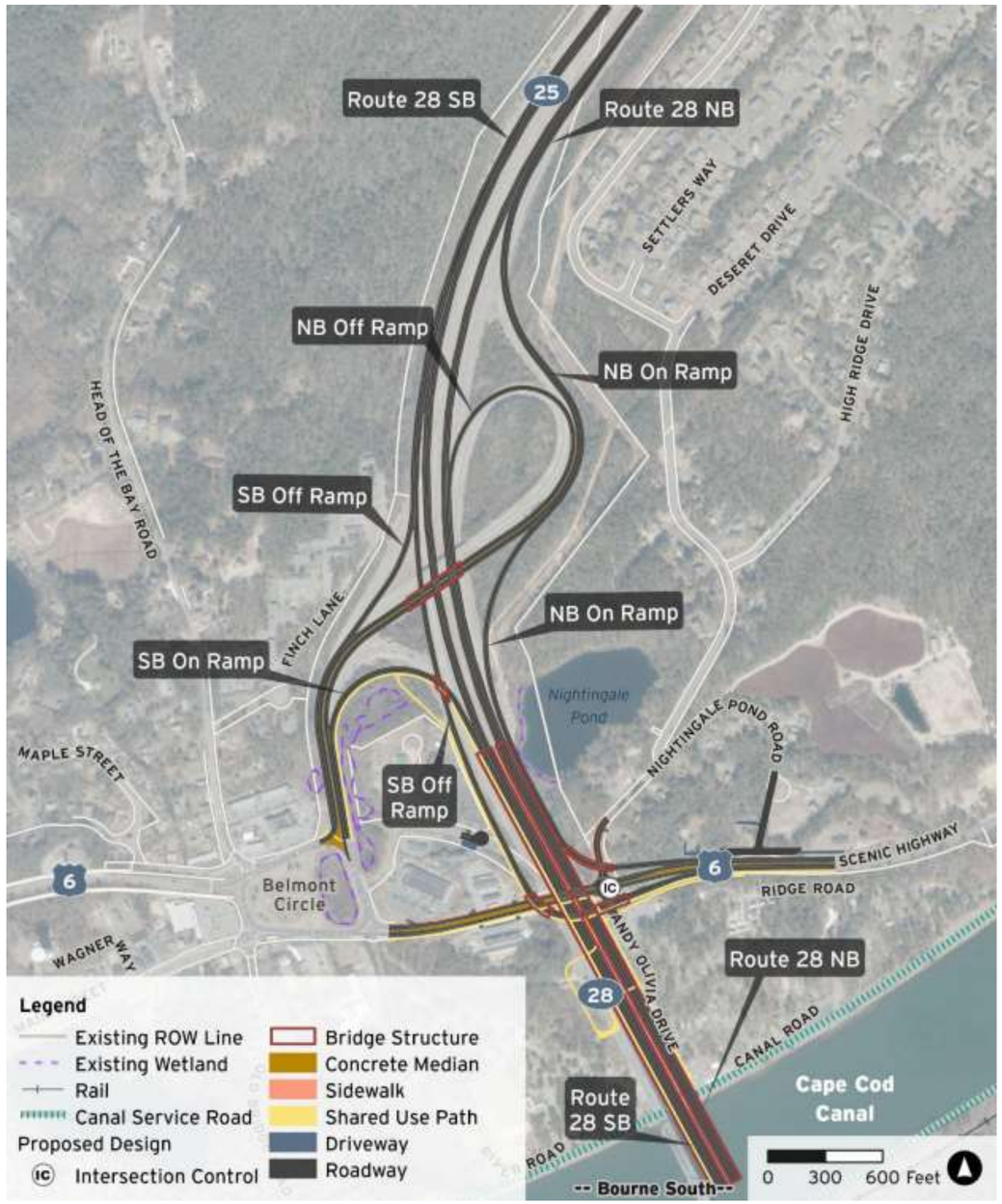
Bourne North – Directional Interchange - BN-14.4B



- BN-14.4B is similar to Option BN-13.1, however the ramp connections between Scenic Highway and Route 25 and Route 6 are grade separated.
- This option scores well with respect to separating local and regional traffic due to the grade separated ramps.
- Because the grade separated ramps allow for a narrower Scenic Highway roadway cross-section, it is possible to provide a SUP at this location.
- The Route 25 southbound to Route 6 eastbound grade separated ramp encroaches onto Bourne Scenic Park property (approximately ½ acre more than BN13.1). However, this configuration does facilitate access to Bourne Scenic Park from Scenic Highway.

Bourne North - Program Needs and Goals Assessment

DIFFERENTIATORS

Program Need/Goal	Evaluation Criteria/Objectives	BN-13.1	BN-14.4b
Program Need	*Evaluation Criteria*		
Operations	Does the option separate local and regional traffic?	◇◇	◇◇◇
Geometrics and Safety	Does the option minimize wrong way driving risk?	◇◇	◇◇◇
Multi-Modal Accommodations	Does the option Improve pedestrian/bicycle access adjacent to local roads?	◇	◇◇◇
	Does the option improve pedestrian/bicycle access to existing trail facilities?	◇◇	◇◇◇
	Does the option improve pedestrian/bicycle connections at ramp terminals?	◇◇	◇◇◇
	Does the option enhance the pedestrian/bicycle experience?	◇◇	◇◇◇
Program Goal	*Objectives*		
Socioeconomics	Does the option improve neighborhood access to community facilities and services, specifically, schools, hospitals, and emergency services (police & fire)?	◇◇	◇◇◇
	Does the option maintain or improve neighborhood cohesion?	◇◇	◇◇◇
	Does the option avoid and/or minimize effects to parks, open space, and recreational facilities?	◇◇	◇
Resiliency and Sustainability	Does the option effectively manage stormwater, demonstrated by change in 2-year peak discharge rate?	◇◇	◇◇◇
Emergency Response	Does the option improve emergency evacuation capabilities from Cape Cod and the islands to mainland Massachusetts?	◇◇	◇◇◇
Cost Effectiveness	Does the option maximize construction cost effectiveness?	◇◇◇	◇◇

- The Directional Interchange (BN-14.4B) is the recommended Highway Interchange Option at Bourne North primarily due to better Operations, better geometrics and better multi-modal accommodations.

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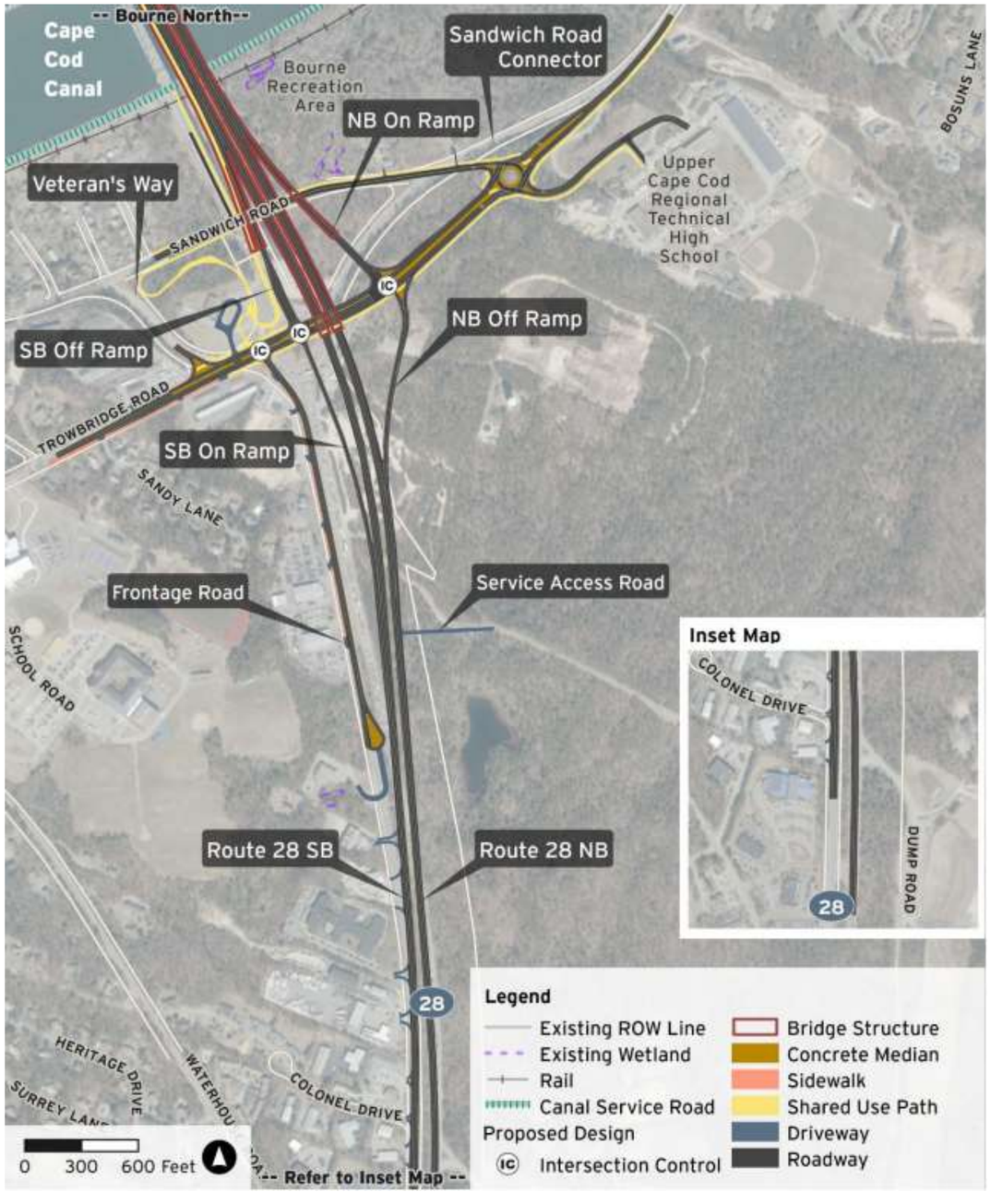
Bourne South – Diamond Interchange - BS-2



- BS-2 replaces the existing Bourne Rotary with a grade separated diamond interchange.
- Option BS-2 would provide substantial improvements to Operations within the program area.
- Option BS-2, would provide an approximate 20 percent reduction in vehicle-hours traveled compared to Option BS-2.2.

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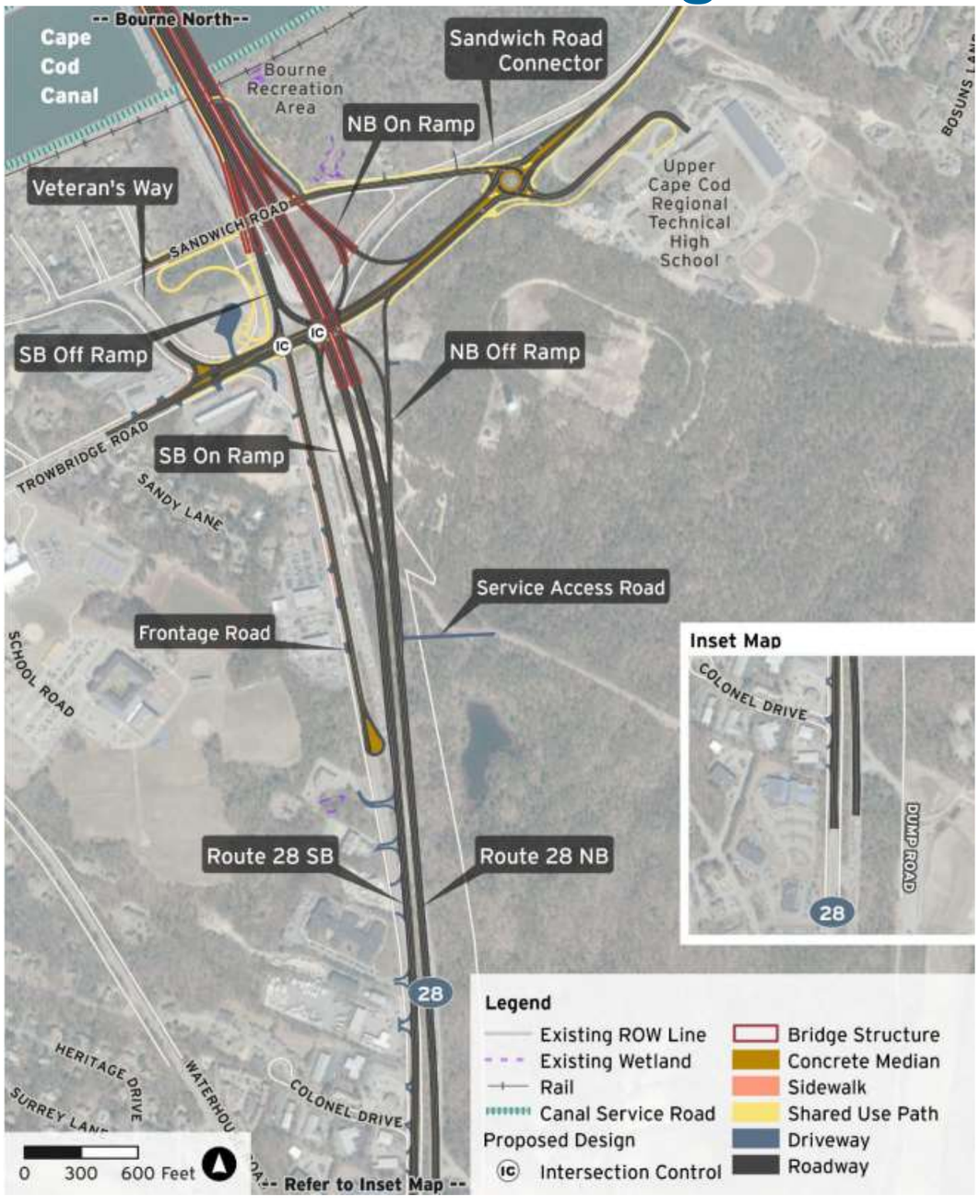
Bourne South – Single Pint Interchange – BS-2.2



- BS-2.2 replaces the existing Bourne Rotary with a grade separated single point interchange configuration.
- Option BS-2.2 received a marginal benefit rating with respect to Geometrics, as the design of the single point urban interchange would result in an inherent risk of wrong-way driving.
- Option BS-2.2 presents a variety of lane arrangements that pedestrians and bicyclists would have to cross, resulting in marginal benefit rating for Multi-Modal.

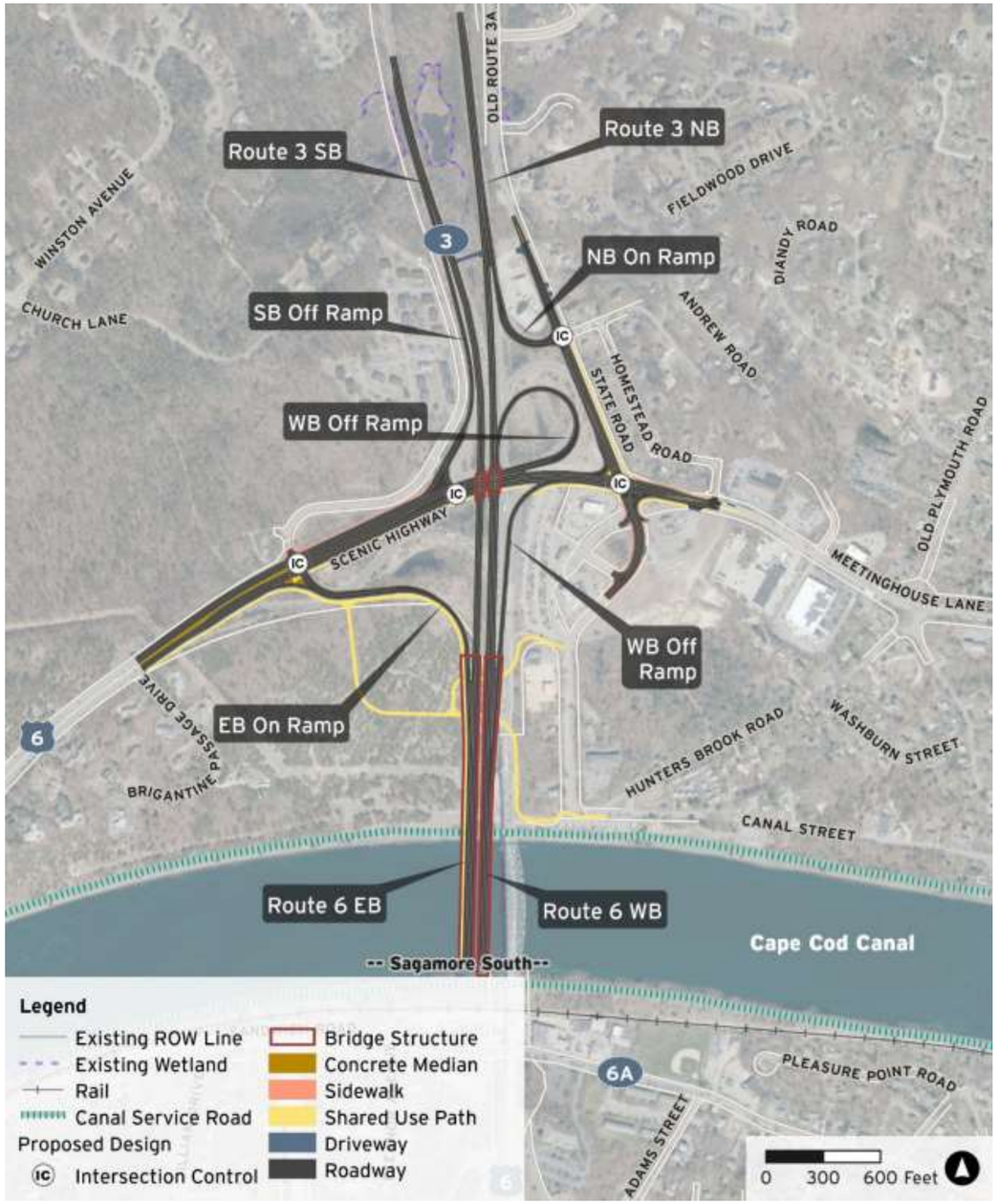
Bourne South - Program Needs and Goals Assessment

DIFFERENTIATORS

Program Need	Performance Evaluation Criteria	BS-2	BS-2.2
Operations	Does the option improve cross-canal mobility?	◇◇◇	◇◇
Geometrics and Safety	Does the option minimize wrong way driving risk?	◇◇◇	◇◇
Multi-Modal Accommodations	Does the option improve pedestrian/ bicycle connections at ramp terminals?	◇◇◇	◇◇

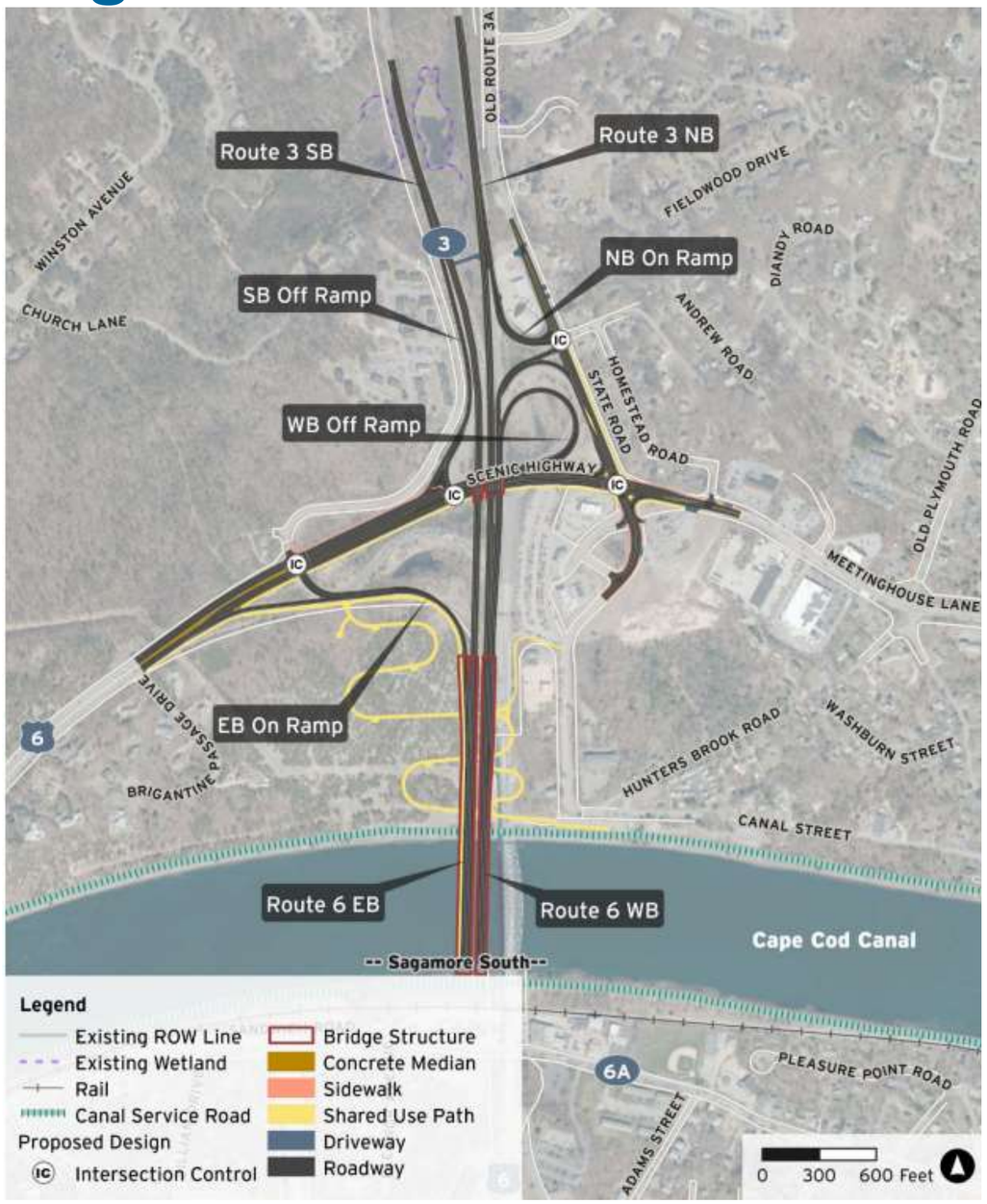
- The Diamond Interchange (BS-2) is the recommended Highway Interchange Option at Bourne South due to better Operations (a 20 percent reduction in vehicle-hours traveled compared to Option BS-2), less risk of wrong way driving and better multi-modal accommodations.

Sagamore North – Existing Ramp Configuration – SN-1A



- SN-1A is similar to the existing interchange ramp configuration with modifications to support the relocated Route 3 alignment.
- This option maintains existing traffic patterns and therefore received a negligible improvement rating regarding separating regional traffic from local traffic.
- Construction requires either long term detours or building both canal crossings (2 bridges) prior to removing traffic from existing bridge.
- SN-1A would take 12-18 months longer to remove all traffic from the existing bridge than SN-8A.
- Keeping traffic on the existing bridge for a longer duration, increases the risk that the USACE is required to perform potentially disruptive maintenance repairs on the existing Sagamore Bridge.

Sagamore North – Direct Connection to State Road – SN-8A



- SN-8A provides a single exit location for all northbound Route 6 traffic including a connection to State Road north of Scenic Highway.
- SN-8A provides some separation between local and regional traffic by removing the Sagamore Bridge westbound traffic destined for State Road from the Meetinghouse/Canal Street intersection, resulting in a higher rating than Option SN-1A
- This option allows for a construction sequencing strategy that removes traffic from the Sagamore Bridge in an optimal time frame.
- Although Option SN-8A has a lower rating on minimizing wrong-way driving risks due to the intersection of Route 6 westbound off-ramp at State Road, this can be partially mitigated through refinements to the intersection geometry.
- SN-8A will provide a significant benefit to multi-modal accommodations.

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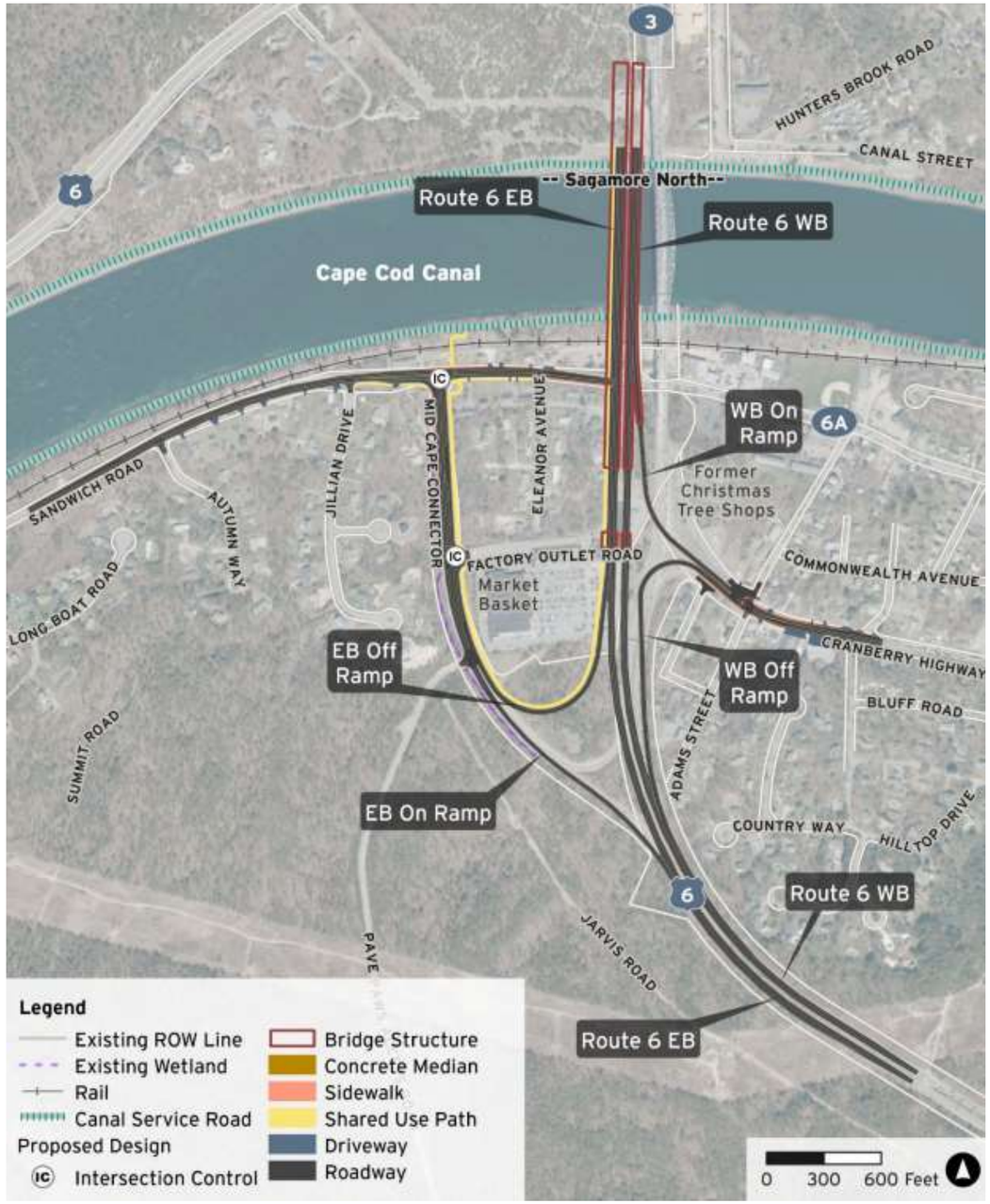
Sagamore North Program Needs and Goals Assessment

DIFFERENTIATORS

Program Need/Goal	Evaluation Criteria/Objectives	SN-1A	SN-8A
Program Need	*Evaluation Criteria*		
Operations	Does the option separate local and regional traffic?	◇	◇◇
Geometrics and Safety	Does the option minimize weaving movements?	◇◇	◇◇◇
	Does the option minimize wrong way driving risk?	◇◇◇	◇◇
	Does the option minimize deceleration lane speed variances with the mainline greater than 25 MPH?	◇◇	◇◇◇
Multi-Modal Accommodations	Does the option improve pedestrian/bicycle connections at ramp terminals?	◇◇	◇◇◇
	Does the option enhance the pedestrian/bicycle experience?	◇◇	◇◇◇
Maintenance/Structural	Does the option minimize the risk of disruptive maintenance and/or rehabilitation on the existing bridges?	◇	◇◇◇
Program Goal	*Objectives*		
Socioeconomics	Does the option minimize construction period effects upon the traveling public?	◇◇	◇◇◇
Constructability	Does the option minimize the construction duration?	◇◇◇	◇◇
	Does the option maintain existing connections during construction?	◇◇	◇◇◇

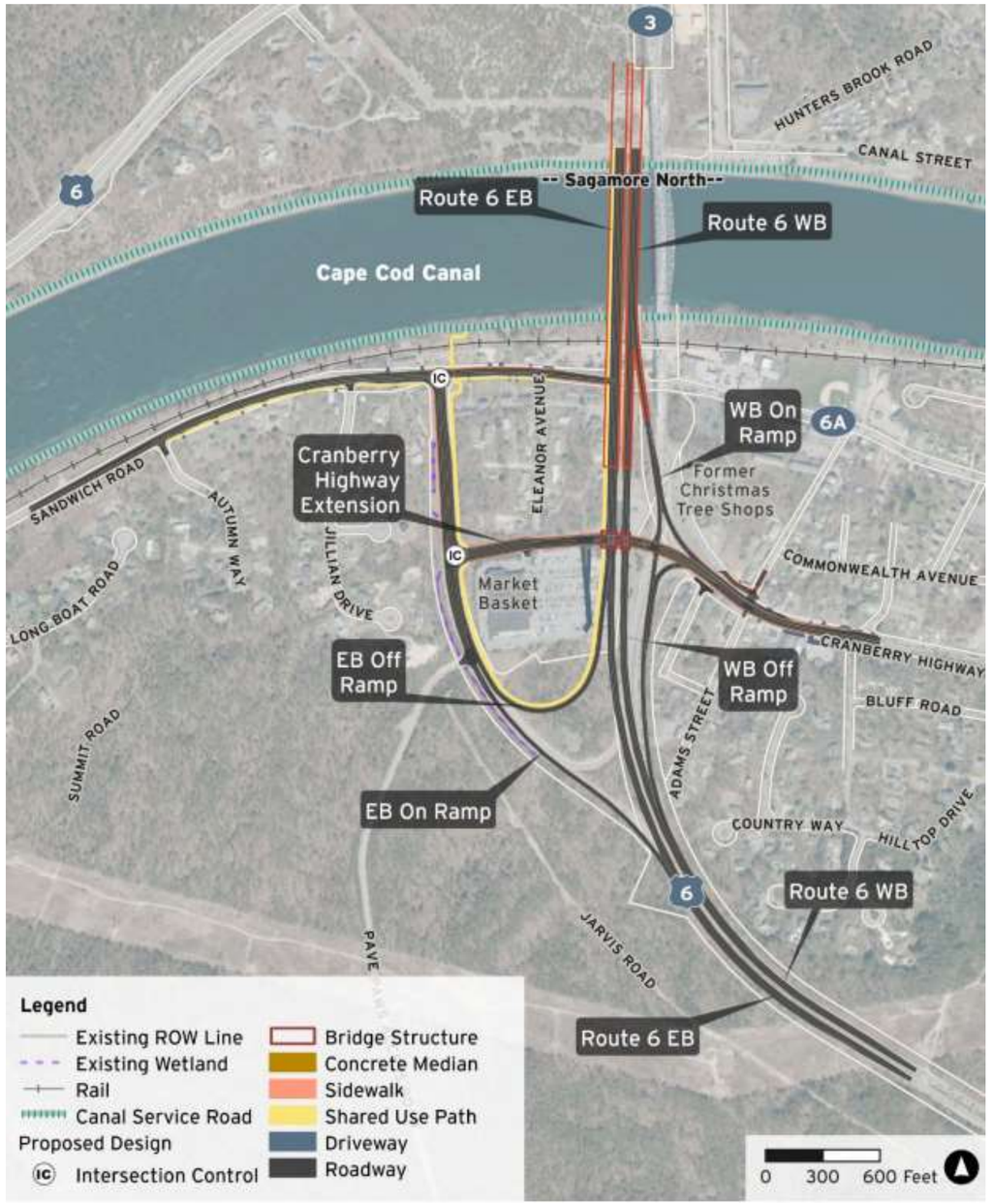
- The Direct Connection to State Road (SN-8A) is the recommended Highway Interchange Option at Sagamore North mainly due to receiving better ratings than SN-1A with respect to multi-modal accommodations, removing traffic from the existing bridge sooner and separating local and regional traffic.

Sagamore South – Existing Ramp Configuration - SS-1.1



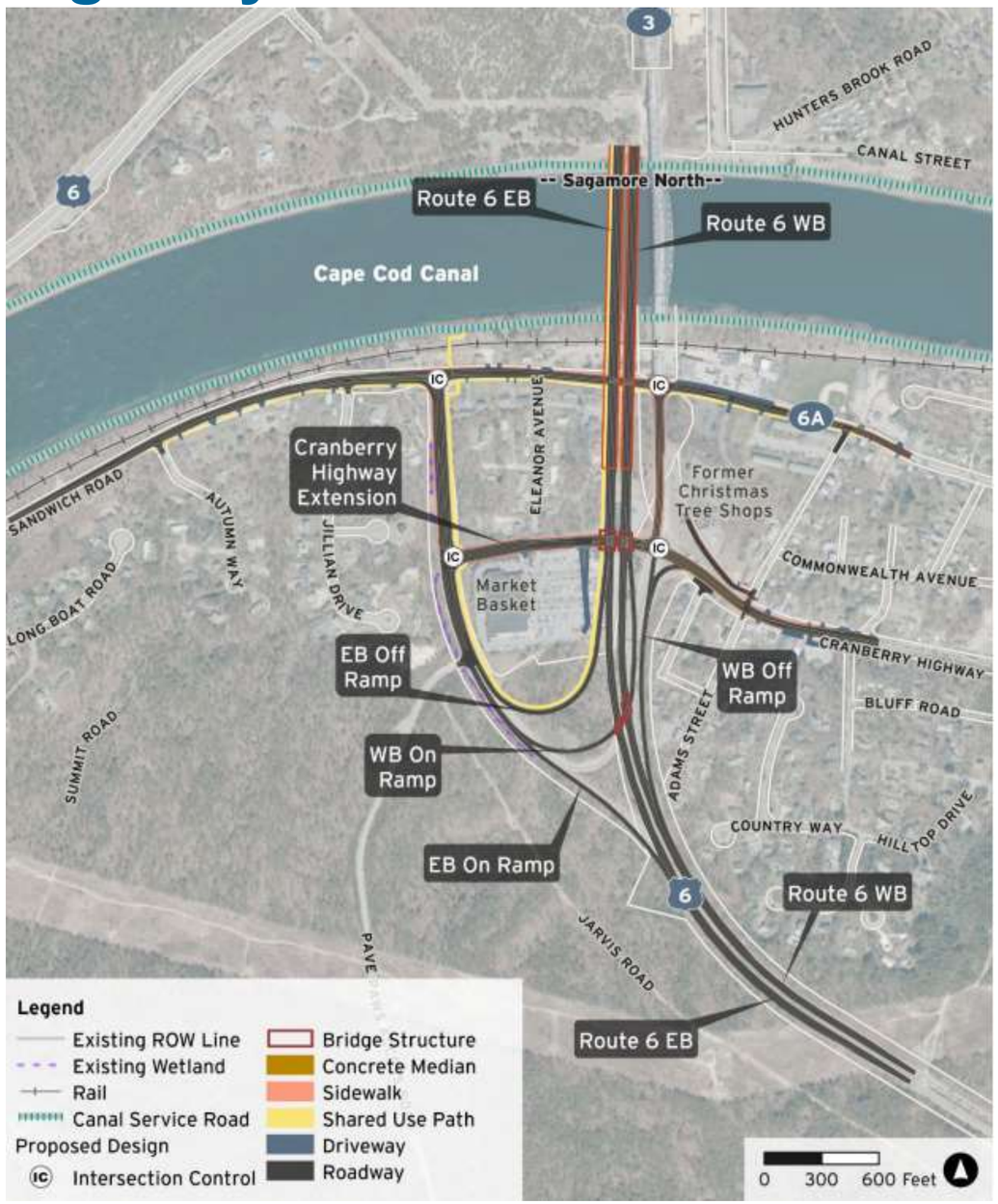
- SS-1.1 provides the same interchange configuration as the existing condition with the ramp alignments modified to accommodate the relocated Route 6 mainline.
- The location of the westbound on-ramp gore relative to the delta girder spans presents an undesirable complexity to bridge framing system, affecting constructability and performance.
- The configuration of the proposed ramps requires a construction sequence that keeps traffic on the existing Sagamore Bridge for a longer duration compared SS-3.1A.

Sagamore South – Existing Ramp Configuration with Cranberry Highway Extension – SS-1



- SS-1 is similar to SS-1.1, however Cranberry Highway is extended under Route 6 to provide a connection to the Mid-Cape Connector improving neighborhood cohesion.
- The location of the westbound on-ramp gore relative to the delta girder spans presents an undesirable complexity to bridge framing system, affecting constructability and performance.
- The configuration of the proposed ramps requires a construction sequence that keeps traffic on the existing Sagamore Bridge for a longer duration compared SS-3.1A.

Sagamore South – Westbound On-Ramp Under Route 6 with Cranberry Highway Extension and Sandwich Rd Connector – SS-3.1A



- SS-3.1A is similar to SS-1, however it relocates the westbound on-ramp so it passes under the Route 6 mainline and then joins Route 6 westbound. It also includes a new connection between Cranberry Highway and Sandwich Road.
- Improves neighborhood cohesion and multi-modal accommodations with the introduction of the proposed Cranberry Highway Extension and the connector Road between Cranberry Highway and Sandwich Road.
- Improves the separation of local and regional traffic and the multi-modal accommodations compared to SS-1 and SS-1.1
- Locates the gore for the Route 3 eastbound on-ramp south of the delta girder spans simplifying the design and improving the long-term performance compared to SS-1 and SS-1.1.
- Removes traffic from the existing bridge sooner than options SS-1 and SS-1.1.

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Sagamore South Program Needs and Goals Assessment

DIFFERENTIATORS

Program Need/Goal	Performance Evaluation Criteria	SS-1	SS-1.1	SS-3.1A
Program Needs				
Operations	Does the option reduce local travel times?	◇◇◇	◇◇	◇◇◇
	Does the option improve cross-canal mobility?	◇◇◇	◇◇	◇◇◇
	Does the option separate local and regional traffic?	◇◇	◇	◇◇◇
Geometrics and Safety	Does the option minimize weaving movements?	◇◇	◇◇	◇◇◇
Multi-Modal Accommodations	Does the option improve pedestrian/bicycle connections at ramp terminals?	◇◇	◇◇◇	◇◇◇
	Does the option enhance the pedestrian/bicycle experience?	◇◇	◇◇	◇◇◇
Maintenance/ Structural	Does the option minimize the risk of disruptive maintenance and/or rehabilitation on the existing bridges?	◇	◇	◇◇◇
	Does the option allow for the most efficient and simplest structural system to accommodate the interchange ramps?	◇	◇	◇◇◇

- The Westbound On-Ramp under Route 6 (SS-3.1A) is the recommended Highway Interchange Option at Sagamore North due to receiving numerous favorable ratings particularly with respect to multi-modal accommodations, separating local and regional traffic, removing traffic from the existing bridge sooner than the other options and simplifying the structural framing system.

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Sagamore South Program Needs and Goals Assessment

DIFFERENTIATORS

Program Need/Goal	Performance Evaluation Criteria	SS-1	SS-1.1	SS-3.1A
Program Goals				
Socioeconomics	Does the option minimize commercial property effects, regarding the number of easements on occupied parcels?	◇◇	◇◇◇	◇◇
	Does the option improve access to commercial properties?	◇◇	◇	◇◇
	Does the option maintain or improve neighborhood accessibility to community facilities & services?	◇◇◇	◇◇	◇◇◇
	Does the option maintain or improve neighborhood cohesion?	◇◇	◇	◇◇◇
	Does the option minimize construction period effects upon the traveling public?	◇◇	◇◇	◇◇◇
Resiliency and Sustainability	Does the option effectively manage stormwater, regarding an increase in impervious area from existing conditions?	◇◇	◇◇◇	◇◇
Constructability	Does the option minimize the construction duration?	◇◇◇	◇◇◇	◇◇
	Does the option maintain existing connections during construction?	◇◇	◇◇	◇◇◇
Emergency Response	Does the option improve emergency evacuation capabilities from Cape Cod and the islands to mainland Massachusetts?	◇◇◇	◇◇	◇◇◇
	Does the option improve emergency response?	◇◇◇	◇◇	◇◇◇

- In addition, the introduction of the Cranberry Highway Extension and the connector road between Cranberry Highway and Sandwich Road, improves access to commercial properties and improves neighborhood cohesion.

Recommendation

Recommendation

Based upon the results of the Detailed Assessments, MassDOT recommends that the following Highway Interchange pairings advance for further evaluation in the DEIS/DEIR as part of the Build Alternative Retained for Detailed Study:

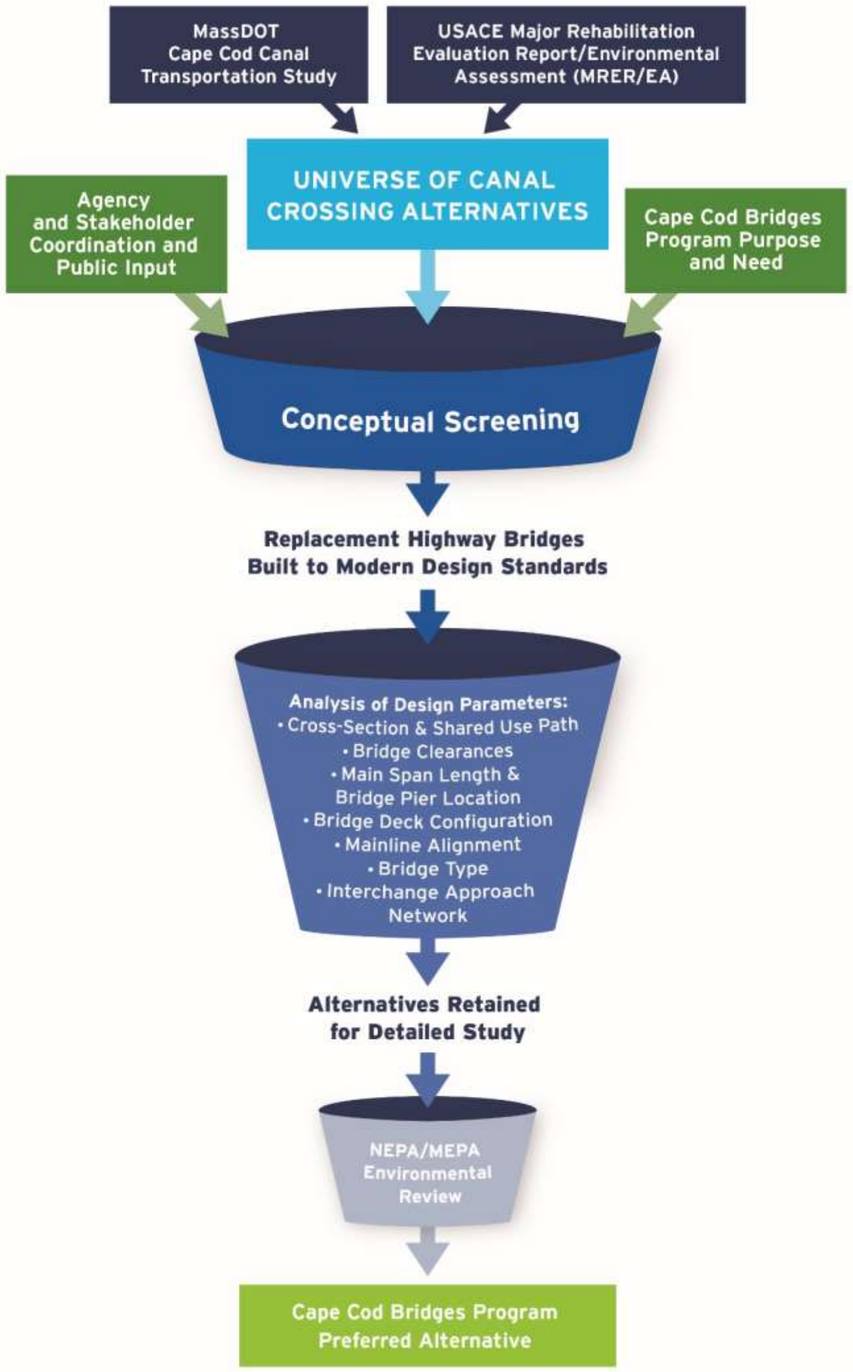
Bourne Crossing
- Bourne North - Directional Interchange Option (BN-14.4B)
- Bourne South – Diamond Interchange Option (BS-2)

Sagamore Crossing
- Sagamore North – Direct Connection to State Road Option (SN-8A)
- Sagamore South – Westbound On-Ramp under Route 6 with Cranberry Highway Extension and Sandwich Road Connector Option (SS-3.1A)

These Highway Interchange Options will be combined with the previously recommended mainline location, cross-section, bridge type and bridge configuration to form the In-Kind Bridge Replacement Alternative to be included in the DEIS/DEIR.

Discussion

Alternatives Analysis Process



JUNE 2021 PUBLIC MEETING - PROGRAM HISTORY, MRER, MASSDOT TRANSPORTATION STUDY, PROGRAM NEED

NOVEMBER 2021 PUBLIC MEETING - PROGRAM PURPOSE AND NEED, EXISTING CONDITIONS

NOVEMBER 2022 PUBLIC MEETING – CROSS-SECTION, SHARED USE PATH, BRIDGE TYPE, BRIDGE CONFIGURATION

JANUARY 2023 PUBLIC MEETING - CROSS-SECTION, BRIDGE CLEARANCE, MAINLINE ALIGNMENT LOCATION

MARCH 2023 PUBLIC MEETING - INTERCHANGE APPROACH NETWORK

MAY 2023 OPEN HOUSE - ENF

MAY 2024 PUBLIC MEETING AND OPEN HOUSE – NEPA SCOPING, PROCESS FOR ASSESING INTERCHANGES

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Step 2 – Program Needs and Goals Assessment

MassDOT developed a scoring system to evaluate the highway interchange approach options based on performance relative to the Program Needs and the Program goals:

- ◈ Insufficient or negligible benefits and/or improvement.
- ◈◈ Marginal benefits and/or some improvement.
- ◈◈◈ Substantial benefit and/or Improvement.

Example table demonstrating differences between BN interchange options

Program Need/Goal	Evaluation Criteria/Objectives	BN-13.1	BN-14.4b
Program Need	***Evaluation Criteria***		
Operations	Does the option separate local and regional traffic?	◈◈	◈◈◈
Geometrics and Safety	Does the option minimize wrong way driving risk?	◈◈	◈◈◈
Multi-Modal Accommodations	Does the option Improve pedestrian/bicycle access adjacent to local roads?	◈	◈◈◈
	Does the option improve pedestrian/bicycle access to existing trail facilities?	◈◈	◈◈◈
	Does the option improve pedestrian/bicycle connections at ramp terminals?	◈◈	◈◈◈
	Does the option enhance the pedestrian/bicycle experience?	◈◈	◈◈◈
Program Goal	***Objectives***		
Socioeconomics	Does the option improve neighborhood access to community facilities and services, specifically, schools, hospitals, and emergency services (police & fire)?	◈◈	◈◈◈
	Does the option maintain or improve neighborhood cohesion?	◈◈	◈◈◈
	Does the option avoid and/or minimize effects to parks, open space, and recreational facilities?	◈◈	◈
Resiliency and Sustainability	Does the option effectively manage stormwater, demonstrated by change in 2-year peak discharge rate?	◈◈	◈◈◈
Emergency Response	Does the option improve emergency evacuation capabilities from Cape Cod and the islands to mainland Massachusetts?	◈◈	◈◈◈
Cost Effectiveness	Does the option maximize construction cost effectiveness?	◈◈◈	◈◈

Step 1- Regional Traffic Operations Assessment

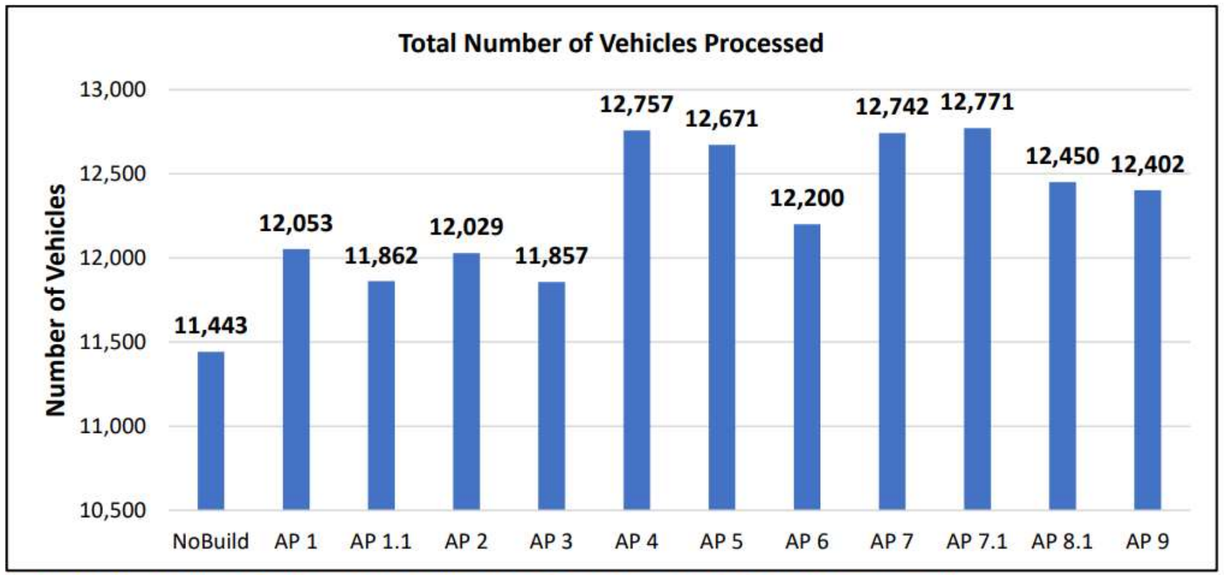

Exhibit 3-1. Network Performance Evaluation: Total Number of Vehicles Processed

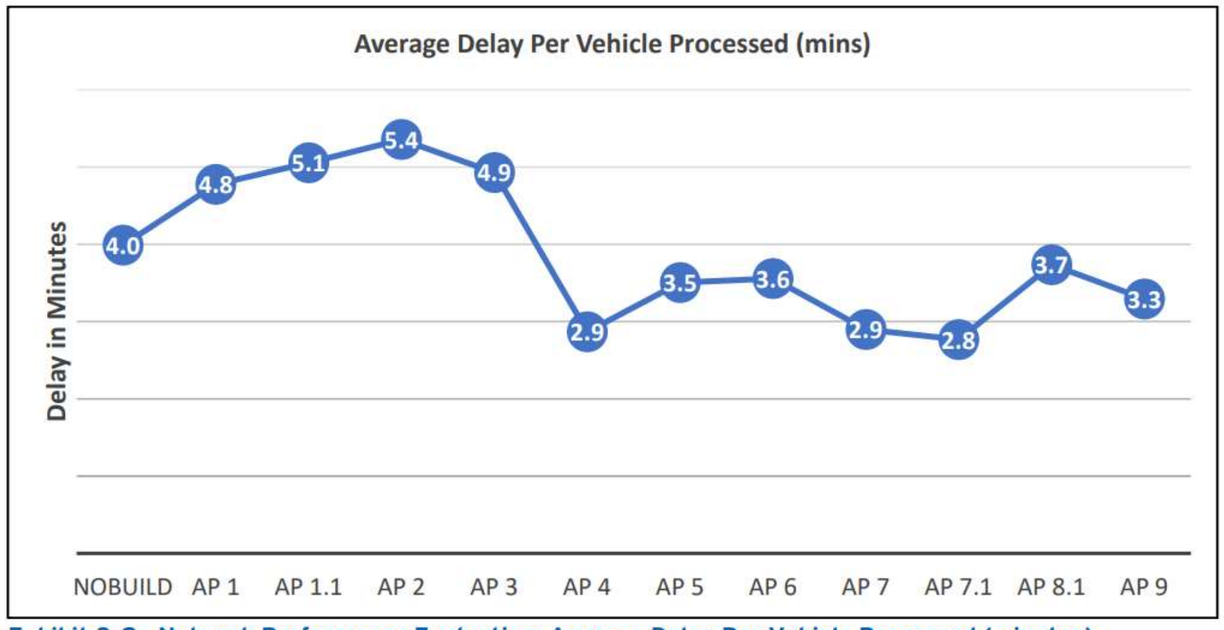

Exhibit 3-2. Network Performance Evaluation: Average Delay Per Vehicle Processed (minutes)

- 36 permutations of pairings of Highway Interchange Options were identified.
- Shortlisted down to 11 pairings.
- A network performance evaluation was conducted utilizing the VISSIM software modeled with the Future (2050) Build Traffic volumes.
- Analysis assessed the total number of vehicles processed, the average delay per vehicle, total travel time and queue length back-up onto the mainline.
- This analysis revealed that pairings involving Highway Interchange Option BN-6.1 did not perform well (AP 1, AP 1.1, AP 2 and AP 3.).
- Options involving BN-6.1 processed less vehicles and resulted in longer average delays compared to the other options.

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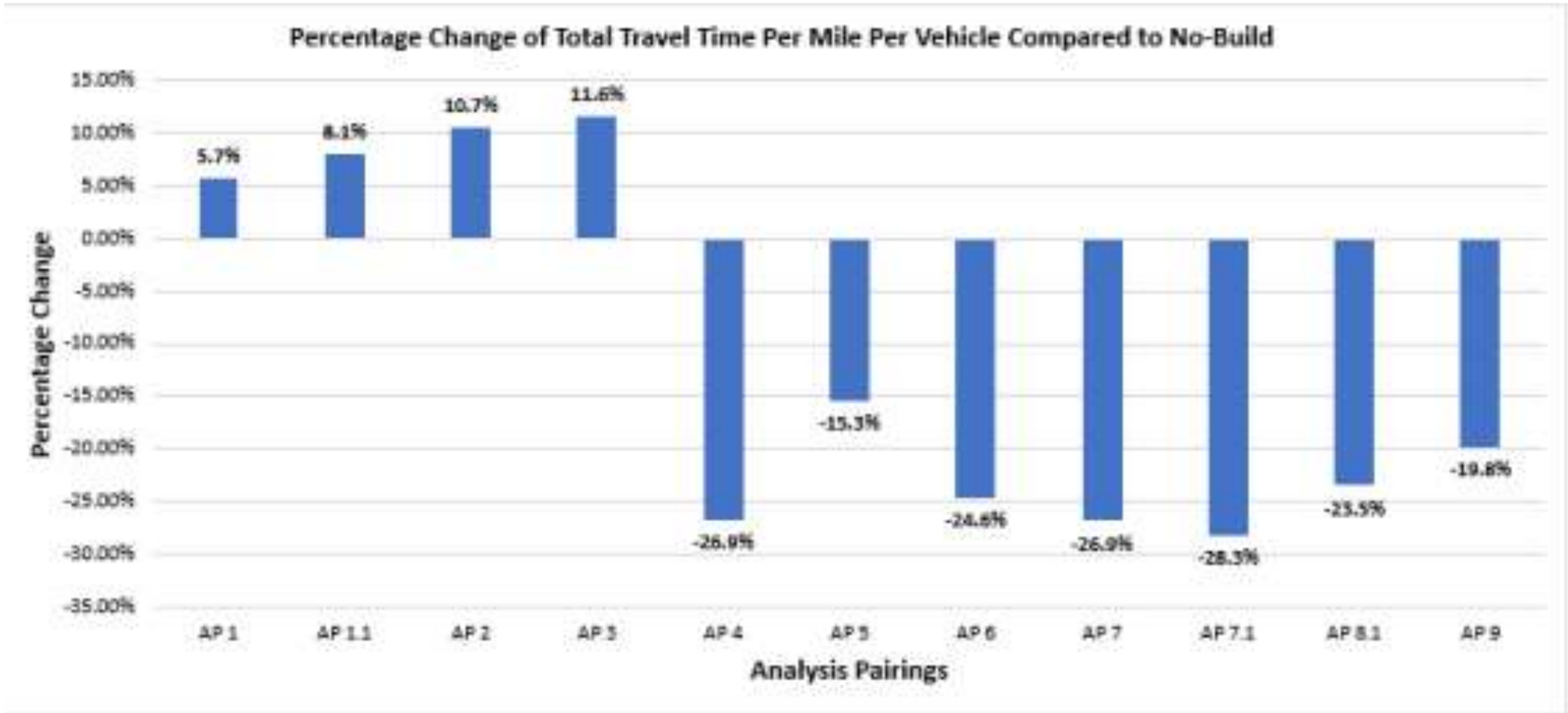
Step 1- Regional Traffic Operations Assessment



- Options involving BN-6.1 experienced longer total travel times than the No-Build Option.
- VISSM traffic simulations were used identified the length of average and maximum queue lengths within the network.
- Options involving BN-6.1 had queue lengths extending onto Route 25.

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