3 Alternatives Development

The development of alternatives was guided by the identification of the issues, constraints, and opportunities within the study corridor, along with the goals and objectives identified in the early stages of the study. As identified in Chapter 1, the purpose of this study was to evaluate multimodal transportation and associated land use issues, develop potential solutions, and to recommend improvements along the Route 6 Corridor between County Street in the City of New Bedford and Adams Street in the Town of Fairhaven.

During the alternative development process, the study team identified a set of feasible alternatives for short-, medium-, and long-term improvements in the corridor. The long-term alternatives focus on options and impacts of the potential replacement of the New Bedford-Fairhaven Bridge. The study team also identified a number of short- and medium- term improvements related to the corridor multi-modal transportation system. These nearer term improvements are related to intersection improvements for vehicles, pedestrian and bicycle accommodations, and bridge and traffic information systems.

This chapter describes in detail the screening process used to develop the alternatives and a description of the potential improvements. Chapter 4 provides in-depth analyses and evaluation of the alternatives.

3.1 LONG-TERM ALTERNATIVES SCREENING PROCESS

The long-term alternatives considered as part of this study focus on improving the functionality and addressing the impacts caused by the New Bedford-Fairhaven Bridge itself. A number of past bridge studies completed over the last 30 years were reviewed and conclusions from those studies are presented, along with a review of the key bridge alternative attributes. These key attributes that were used to identify the long-term alternatives include corridor alignment, bridge vertical clearance, marine channel horizontal clearance, and potential bridge or crossing types.

This section provides the rationale for the identification and screening of the preliminary long-term alternatives. This rationale is based on a review of conclusions from previous bridge studies, physical limitations of the bridge approach and clearance issues, and an assessment of the 2014 Existing Condition and the 2035 No Build Condition. The primary focus of these past studies was to eliminate or minimize the impact of the bridge on development opportunities in the North Harbor. This focus remains a driving force in identifying and developing long-term alternatives as part of this study. The long-term alternatives were based on four different physical attributes that were identified as part of this screening process:

- Roadway corridor and alignment;
- Vertical underclearance;
- Marine channel horizontal clearance; and
- Potential bridge/crossing types.

These attributes were used to identify the preliminary long-term alternatives described later in this chapter.

3.1.1 Review of Previous Studies & Conclusions

As described in Chapter 2, the New Bedford-Fairhaven Bridge is a major transportation constraint along the Route 6 Corridor. Modification of this bridge in the future could help minimize or eliminate some of these constraints to both vessels transiting the bridge and roadway users crossing over the bridge.

Several previous studies, including the *Feasibility Study Report* (1969), *Corridor Planning Study Report* (1977), *Environmental Assessment* (1985), and *Conceptual Alternative Study for the Relocation of the Route 6 Bridge over New Bedford Harbor* (2004), explored various corridors, crossing or bridge types, bridge configurations, clearances, and other options related to potential replacement of the New Bedford-Fairhaven Bridge. Much of the analyses conducted for these studies remains valid and therefore has been reviewed and incorporated into the development of alternatives for this study.

In identifying attributes of preferred bridge alternatives, most of the studies had similar conclusions. Many concluded that the continued use of the existing corridor and alignment were preferred over a new crossing location. Most of the studies also determined that the benefits of a higher bridge did not offset the impacts of the lengthened roadway approaches and therefore identified that a vertical profile similar to the existing bridge was preferred. A thorough assessment of bridge/crossing types was also conducted as part of past studies. A movable bridge type was typically preferred because a fixed bridge that would not constrain marine traffic would have to be very high, more than likely resulting in significant impacts.

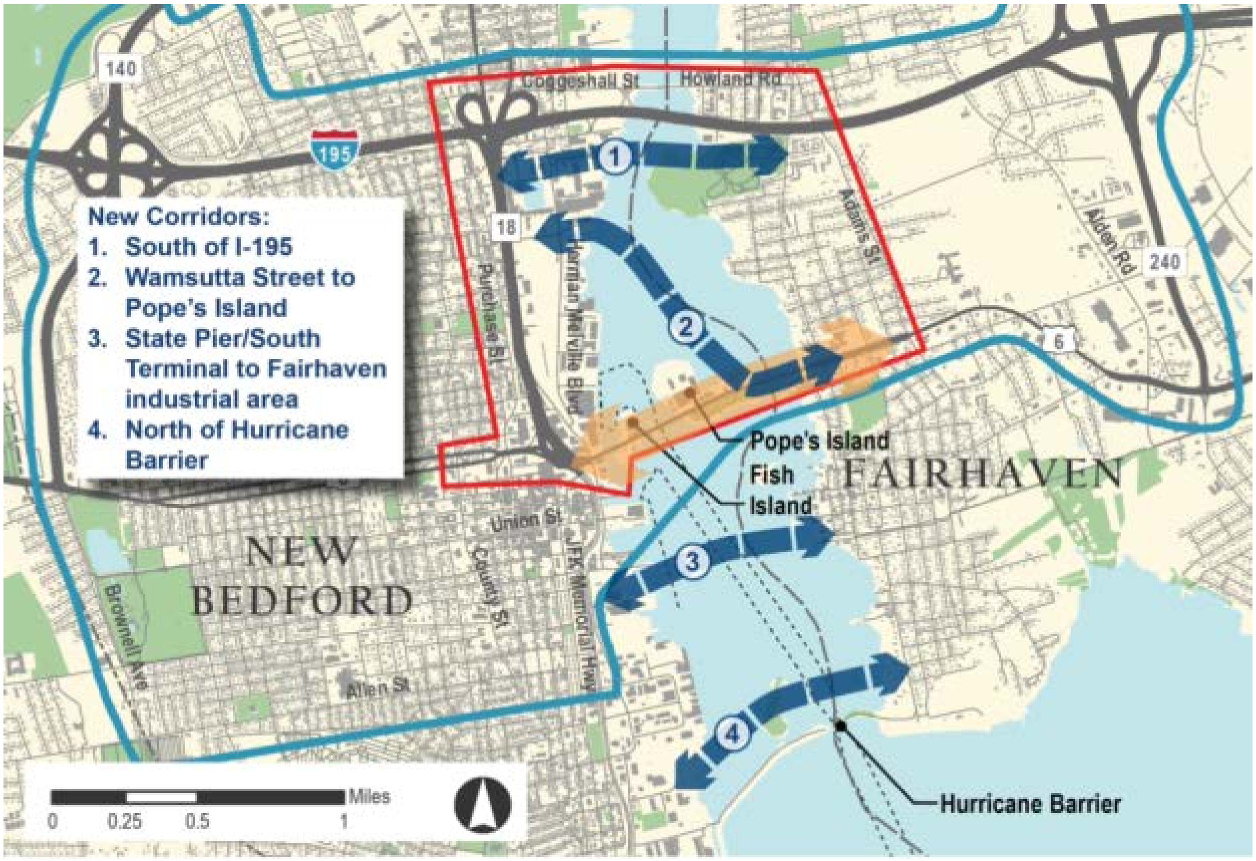
Based on two decades of extensive study, the preferred alternative from the 1985 EA was a double-leaf bascule bridge with a 10-foot vertical underclearance using the existing alignment. This decision was re-evaluated in the 2004 study, which recommended the relocation of the bridge along a northern corridor spanning between Wamsutta Street and Pope's Island. Major impacts regarding alignment of access routes near Wamsutta Street were identified, but were not resolved as part of the 2004 study's recommendation.

3.1.2 Roadway Corridor & Alignment

The past corridor studies analyzed the existing crossing and four possible locations for a new crossing between New Bedford and Fairhaven. As shown in Figure 3.1, four potential new bridge crossing corridors were evaluated:

- Just south of the I-195;
- Wamsutta Street to Pope's Island;
- State Pier/South Terminal to Fairhaven industrial area; and
- Just north of hurricane barrier.

Figure 3.1 Potential New Bridge Corridor Alignments



As part of the long-term alternative development process for this study, the four new corridors proposed in previous studies were determined to be unsatisfactory. The primary reasons for this conclusion are presented in Table 3.1.

Past studies concluded that the existing corridor was the most advantageous because it provides the shortest and most direct route between the historic business centers in Fairhaven and New Bedford, requires the minimum width of crossing over the harbor, and creates no additional obstructions to navigational traffic.

The study team also concluded that retaining the existing roadway horizontal alignment along the existing corridor is also preferred for several reasons. Most notably, bridge replacement along the existing alignment would eliminate the need for significant land acquisition and related business displacements on Fish Island or Pope's Island. The major disadvantage of bridge replacement on the existing alignment would be the disruption to bridge roadway traffic during construction.

Table 3.1 Summary of Potential New Bridge Corridor Alignments

Corridor Alignment Option	Issues/Constraints/Advantages/Disadvantages
1. New corridor south of I-195	• Close proximity to the I-195 bridge. • Provides a less direct route between the main business centers in New Bedford and Fairhaven. • Requires new roadway connections on both sides of the harbor. • Depending on the type of bridge constructed, would require excessively long elevated or underground structures as part of the bridge approaches.
2. New corridor between Wamsutta Street and Pope's Island.	• Interferes with an existing dredged maneuvering area in North Harbor. • Interferes with the future development of the north terminal. • Requires new roadway connections on both sides of the harbor. • Depending on the type of bridge constructed, would require excessively long elevated or underground structures as part of the bridge approaches. • A replacement bridge in this corridor was considered in the 2004 study. The principal issues associated with this proposal that were unresolved as part of the 2004 study were the required new interchange with Route 18 and the creation of entirely new traffic patterns in New Bedford.
3. New corridor between State Pier/South Terminal and Fairhaven industrial area.	• Requires elimination of large amounts of existing dock space. • Creates a new obstruction to existing navigational traffic in South Harbor. • Requires new roadway connections on both sides of the harbor. • Depending on the type of bridge constructed, would require excessively long elevated or underground structures as part of the bridge approaches.
4. New corridor just north of hurricane barrier.	• Provides a less direct route between the main business centers in New Bedford and Fairhaven. • Requires a long roadway connection to Route 6 and new roadway connections on both sides of the harbor. • Depending on the type of bridge constructed, would require excessively long elevated or underground structures as part of the bridge approaches. • Creates a new obstruction to existing navigational traffic in South Harbor. • Requires an excessively long crossing.

3.1.3 Vertical Underclearance

The vertical underclearance is an important consideration given the increasing number of bridge openings that result from the inability of most vessels to pass under the low clearance of the existing bridge. The current New Bedford-Fairhaven Bridge has an underclearance of six feet when in the closed position, which results in frequent openings for almost all vessels that need to transit the bridge.

Earlier studies reviewed multiple bridge vertical underclearance options and concluded that a bridge with a higher underclearance of 50 feet or less would not provide substantive benefits over the existing vertical alignment. A 50-foot vertical underclearance would still require the bridge to open frequently. Additionally, it was identified that substantially increasing the underclearance of the bridge over 35 feet would result in significant impacts to the roadway network and adjacent properties, which were considered unacceptable. The alternatives assessed as part of these earlier studies considered a range of increased bridge underclearances, including 20 feet, 23 feet, 35 feet, 42 to 72 feet, 50 feet, 60 feet, and 135 feet.

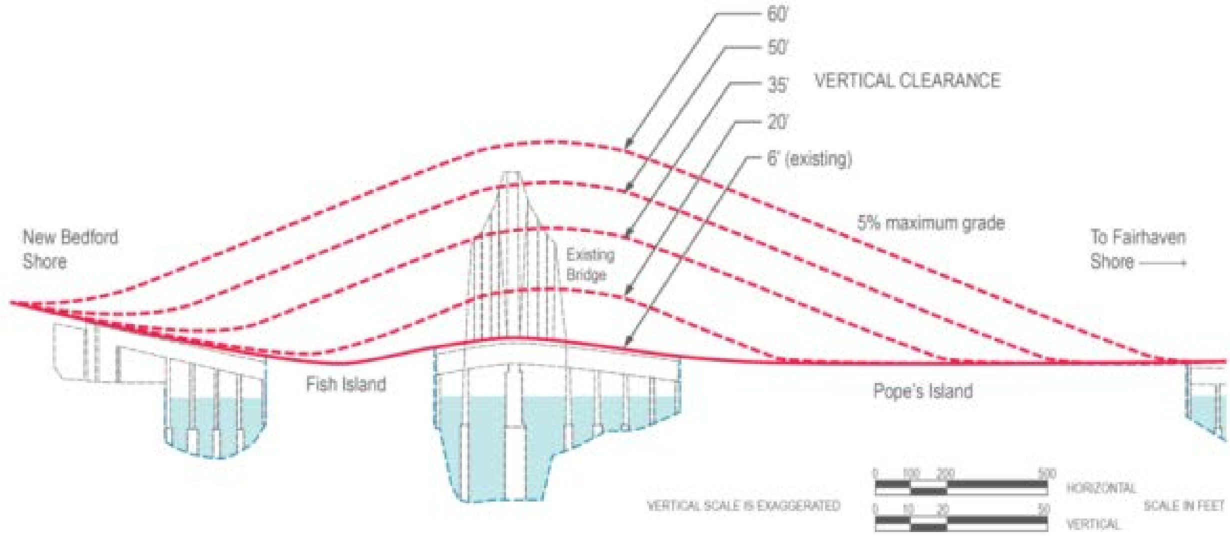
The impacts of increased bridge vertical underclearance vary greatly depending on the specific height. Any increase from the existing six-foot underclearance would necessitate the use of increased grades on the highway surface to clear the navigational channel. Additionally, as the vertical underclearance increases, the length of the bridge approaches would also need to increase so that the roadway remains in conformance with accessibility and highway safety standards. If the bridge underclearance was increased to over 50 feet, access to Fish Island and Pope's Island would be eliminated to accommodate the required approaches. An additional bridge structure would have to be constructed to each of the islands at or near the existing elevation, or ramps from the higher bridge structure would have to be constructed.

As discussed in the 1985 EA, replacement bridges with a higher vertical underclearance would result in a number of impacts. To maintain standard grades on the bridge approaches, the following types of impacts would result from a sample of potential higher underclearances:

- **20-foot underclearance**. This is the maximum underclearance that can be achieved without eliminating direct roadway access to Fish Island and Pope's Island. The middle (swing) bridge would have to be replaced and the west bridge would have to be reconstructed. The east bridge would not require any changes.
- **35-foot underclearance.** At this underclearance, Fish Island would be totally bypassed and another bridge would be required to provide access. The east end of Pope's Island would be maintained, but a new access roadway to parcels on the western edge would need to be provided. The middle bridge would have to be replaced and the west bridge would have to be reconstructed. The east bridge would not require any changes.
- **50-foot underclearance.** Fish Island and most of Pope's Island would be bypassed at this vertical clearance. A new form of access to Fish Island and most of the parcels on Pope's Island would be required. The middle bridge and the west bridge would be replaced. The east bridge would not require any changes.
- **60-foot underclearance.** All three bridges would have to be replaced with a single new bridge at this underclearance and both Fish Island and Pope's Island would be completely bypassed. A new form of access would have to be provided to each island, which could require an increase in the horizontal alignment of the roadway and result in greater impacts to adjacent properties.

Figure 3.2 provides a visual illustration of the impacts created by these four potential underclearance heights, specifically the length of approaches.

Figure 3.2 Bridge Vertical Underclearance Options



As shown in Table 3.2, the existing six-foot underclearance requires an opening for nearly every vessel that transits under the bridge. Increases in vertical underclearance could potentially reduce the number of unscheduled openings, as well as the length of time required for each opening. However, a review of the vessels that typically transit under the bridge indicates that a clearance of 35 feet or less would still require the bridge to open for 85 to 90 percent of the vessels. Furthermore, those vessels that would be able to fit under the bridge (i.e., recreational motorboats) with a 20-35 foot vertical underclearance typically transit the bridge during hours of scheduled openings, therefore having minimal impact on the number of bridge openings.

The ability for emergency vessels, including the City of New Bedford and Town of Fairhaven fire, police, and harbormaster vessels, to transit the bridge when it is open for vehicular traffic is an important consideration. Currently, all of these vessels are docked south of the bridge. This includes New Bedford's two fireboats, one police boat, and one harbormaster boat, which are located at the State Pier in New Bedford. Fairhaven's emergency vessels dock in the marina on Pope's Island. Four of these vessels generally need no more that 14 feet in air draft, while the largest fireboat requires 25 feet in air draft. Currently, all of these boats must wait for the existing bridge to open to marine traffic before they can access the north harbor. This potential delay in response time creates a safety concern.

The preferred alternative in the 1985 EA had a 10-foot vertical underclearance. This minimal increase over the existing 6-foot clearance allowed the bridge structure to be above the wash from wind driven waves during flood condition.

Based on the profile of existing and future projected vessels transiting the bridge, there does not appear to be any benefit to significantly increasing the vertical underclearance. By keeping the vertical profile of the bridge relatively flat, conditions will be preferable for non-motorized bridge users. Increasing access for the emergency vessels that transit the bridge and ensuring that these vessels can transit the bridge at all times is a significant consideration. For these reasons, the long-term alternatives will be developed with the vertical underclearance that is approximately 14 feet. Specific dimensions will be addressed based on detailed design.

Table 3.2. 2035 Projected Vessels and Openings by Vertical Underclearance Options

Vessel Type	Air Draft (feet)	2035 Projected Vessels Requiring Opening	2035 Projected Number of Openings	6-Foot Clearance % of Vessels Requiring Opening	6-Foot Clearance Number of Openings	20-Foot Clearance % of Vessels Requiring Opening	20-Foot Clearance Number of Openings	50-Foot Clearance % of Vessels Requiring Opening	50-Foot Clearance Number of Openings
Cargo Ships (tankers) / Large Fishing Vessels	-	465	172	100%	172	100%	172	100%	172
Fishing Vessels (commercial)	-	5,001	1,850	-	-	-	-	-	-
Scallop (55%)	60	2,751	1,018	100%	1,018	100%	1,018	100%	1,018
Troller (30%)	70	1,500	555	100%	555	100%	555	100%	555
Seiner (15%)	70	750	278	100%	278	100%	278	100%	278
Pleasure Craft	-	3,602	1,333	-	-	-	-	-	-
Recreational motor boats (60%)	5	2,161	800	100%	800	0%	-	0%	-
Sailboat (40%)	100	1,441	533	100%	533	100%	533	100%	533
Tow Boat (tugs)	12	3,511	1,299	100%	1,299	100%	1,299	60%	779
Towed Craft (barges)	40	3,004	1,112	100%	1,112	100%	1,112	35%	389
TOTAL	-	15,583	5,766	-	5,766	-	4,966	-	3,724
Reduction in Openings	-	-	-	-	-	-	(800)	-	(2,042)
% Reduction in Openings	-	-	-	-	0%	-	-14%	-	-35%

3.1.4 Horizontal Clearance

The two existing marine channels on either side of the central pier are 94 and 95 feet wide, while the channel through the hurricane barrier at the entrance to New Bedford Harbor is 150 feet wide. Previous studies recommended a replacement bridge that could accommodate a 150-foot-wide channel width. An increase in channel width to match the width of the hurricane barrier would remove the shipping constraints to the area north of the bridge.

In assessing the horizontal clearance requirements, it is first necessary to understand the types of vessels that may desire to transit the bridge in the future. The overall size of vessels that could transit the bridge is generally limited to channel and berthing limitations within the North harbor. A vessel with a 600-foot length overall (LOA) is considered the largest vessel that would come to the North Harbor. A vessel of this length would average less than 70 feet in beam (width).

The general standard for channel width is approximately three times the width of the largest anticipated vessel. New Bedford Harbor is already considered to have a constrained channel area due to the width of the hurricane barrier and therefore that general standard does not apply. Overall, the harbor pilots have stated their preference is for a bridge opening width set at the same width as the hurricane barrier.

In addition to the pilots' considerations, increasing the horizontal clearance to at least 150 feet is recommended for several reasons. A larger channel width at the bridge would reduce constraints to the North Harbor as compared to the rest of the harbor. Safety would be improved by allowing tugs to position themselves alongside larger vessels as they transit the bridge and by permitting the installation of an advanced fendering system that does not encroach on the channel width.

3.1.5 Potential Crossing/Bridge Types

The past bridge corridor studies also evaluated a number of bridge or crossing types. A summary of the bridge or crossing types is provided in Table 3.3. This table also highlights the issues, constraints, advantages, and disadvantages of each type. The bridge or crossing types reviewed included: a tunnel, permanent removal of a bridge, a fixed bridge with varying clearances, a bascule bridge, a vertical lift bridge, and a swing bridge. Several bascule bridge types were considered, including a traditional type with a counterweight underneath the roadway surface and a rolling or Dutch style that has the counterweight above the roadway surface. Both a single-leaf with one movable span and a double-leaf with two movable spans were reviewed for all bascule types.

Several of the bridge or crossing types previously considered have a number of issues or disadvantages that would make them unsuitable for consideration as part of this study. Consequently, these bridge types were rejected either because they would eliminate access for either maritime or vehicular/pedestrian/bicycle traffic, would be extremely costly or disruptive to the surrounding area, or would result in the loss of direct access to Fish Island or Pope's Island. For these reasons, a tunnel and a fixed bridge (low-level or high-level) were rejected from consideration. Complete removal of the bridge was also rejected.

The movable bridge types, including bascule bridges, vertical lift bridges, or swing bridges like the existing bridge, have the potential to achieve an acceptable balance for both vehicular and maritime traffic demands. The specific advantages or disadvantages of each of these types are outlined in Table 3.3.

Table 3.3 Summary of Bridge/Crossing Types

Bridge/ Crossing Type	Issues/Constraints/ Disadvantages	Advantages/Benefits
1. Tunnel	• Extremely costly. • Disruptive to surrounding area due to tunneling approaches. • Requires complete redesign of intersections and approaches. • Loss of direct access to Fish Island and Pope's Island. • Significant environmental impact due to disruption of harbor/PCB contamination.	• Eliminates need for periodic openings for maritime traffic. • Removes vehicular delays due to bridge openings.
2. Bridge Removal	• Loss of direct local connection between Fairhaven and New Bedford.	• Preferred option for maritime traffic as it removes the principal impediment to vessels.
3. Fixed Bridge		
3a. High-Level (over 80 feet clearance)	• Disruptive to the surrounding area due to the height of the bridge and the ramping required to connect to the adjacent roadway network. • Requires complete redesign of intersections and approaches. • Loss of direct access to Fish Island and Pope's Island or requires construction of new access to islands.	• Allows vehicular traffic and most maritime traffic to pass without conflict.
3b. Medium-Level (20-80 feet clearance)	• Creates barrier to north harbor to most commercial fishing vessels and all cargo ships. • Loss of direct access to Fish Island or requires construction of new access.	• Allows vehicular traffic to pass without conflict.
3c. Low-Level (10-20 foot clearance)	• Creates barrier to north harbor to all commercial fishing vessels and cargo ships.	• Allows vehicular traffic to pass without conflict. • Minimal impact on existing development on Fish Island and Pope's Island.

Bridge/ Crossing Type	Issues/Constraints/ Disadvantages	Advantages/Benefits
4. Bascule Bridge	• Medium- and high-level types will result in a loss of direct access to Fish Island and Pope's Island; disruptive to surrounding area; requires complete redesign of intersections and approaches; and could reduce number of openings required if clearance over 50 feet is provided.	• Permits the continued movement of both vehicular and maritime traffic through or over the bridge. • Unlimited vertical clearance when bridge is open to vessels. • Low-level types will not greatly reduce the number of bridge openings, but will have minimal impact on existing development on Fish Island and Pope's Island.
4a. Single-Leaf Bascule (Standard)	• Limits maximum channel width to 125 feet. • Requires piers and in-water construction, which increases potential for environmental impacts. • Significant construction impacts, requires bridge closure for vehicular traffic for 18-24 months.	
4b. Double-Leaf Bascule	• Requires piers and in-water construction, which increases potential for environmental impacts. • Significant construction impacts, requires bridge closure for vehicular traffic for 18-24 months. • Most expensive movable bridge type.	• Allows for channel width of 150 feet or greater.
4c. Alternative Bascule Bridge Types – Dutch Style or Rolling Style	• Design typically looks "industrial" due to sight of counterbalance. • Few examples of recent double-leaf Dutch or rolling bridges with horizontal clearances greater than 150 feet. • Long-term reliability concerns.	• Closure period could be reduced from standard bascule if bridge support shafts could be built out of the way of existing swing bridge and roadway. • Potential for minimal environmental impacts in harbor because less in-water work is required. • Allows for channel width of 150 feet with a single-leaf bridge. Wider channel widths can be accommodated with double-leaf bridge types. • Lower cost than standard bascule bridge types.

Bridge/ Crossing Type	Issues/Constraints/ Disadvantages	Advantages/Benefits
5. Vertical-Lift Bridge	• Limited vertical clearance when bridge is open to vessels (100-125 foot air draft clearance for vessels). • Requires high towers, which could create potential visual impacts. • Low-level types will not greatly reduce the number of bridge openings.	• Allows for a wider horizontal clearance (up to 300-foot span). • Off-site construction, short closure period required for installation (weeks, not months). • Potential for minimal environmental impacts in harbor because less in-water work is required. • Minimal access impacts on existing development on Fish Island and Pope's Island.
6. Swing Bridge	• Central pier creates obstruction in center of channel. The pivot pier would have to be relocated to create an unsymmetrical (Bobtail) swing that would allow 150-foot horizontal clearance on at least one of the channels. • Low-level types will not greatly reduce the number of bridge openings. • Construction period impacts would constrain marine traffic. • Reconstruction of central pier may have environmental impacts in harbor.	• Minimal impact to islands and surrounding land uses.
6b. Continued Maintenance of Existing Bridge (No Build)	• Age of structure, ongoing maintenance will continue to become more frequent and costs will continue to rise. • Does not increase channel width. • Does not reduce number of openings. • Does not encourage redevelopment of North Harbor.	

Based on the attributes of the various bridge/crossing types described above and the goals of the study, the following bridge types were recommended for further evaluation as part of the alternative development phase of the study.

1. **Double-Leaf Bascule Bridge (Standard).** This bridge type allows for a wider horizontal clearance and unlimited vertical clearances for vessels. It has the least visual impacts of all bridge types. However, due to the extensive in-water construction to accommodate the counterweight underneath the roadway surface, this bridge type is the most expensive, creates significant construction environmental impacts, and requires a lengthy bridge closure for vehicular traffic (18-24 months).

2. **Alternative Bascule Bridge: Dutch or Rolling Style.** The alternative bascule bridge types also allow for a wider horizontal clearance and unlimited vertical clearances for vessels. These two types of bascule bridges have counterweights located above the roadway surface, which results in less in-water work, fewer environmental impacts, a shorter construction period, and bridge closure for vehicular traffic. However, the visual impacts may be greater due to the counterweight's location above the roadway.
3. **Vertical Lift Bridge.** This type of bridge has a shorter construction period and has less construction environmental impacts. When the bridge opens to marine traffic, the vertical clearance for vessels is constrained by the height of the elevated roadway, which typically between 100 to 125 feet above the surface of the water. The towers used to lift the roadway surface can also create visual impacts due to their height.
4. **Continued Maintenance of Existing Bridge.** The 2035 No Build Condition of continued maintenance of the existing bridge should also be evaluated. However, the ongoing maintenance of the bridge is expected to become more frequent and more costly as the nearly 120-year old bridge continues to age. The continued use of the existing bridge would offer no changes to the channel width restrictions or reduction of bridge openings. Additionally, the redevelopment of the North Harbor Area may be affected due to vessel access restrictions.

3.2 DESCRIPTION OF LONG-TERM ALTERNATIVES

The study team developed a set of preliminary long-term alternatives based on the analysis and screening detailed in the previous section. The alternatives were refined during the alternative development process using a stakeholder advisory group and public input. Eight different long-term alternatives were developed:

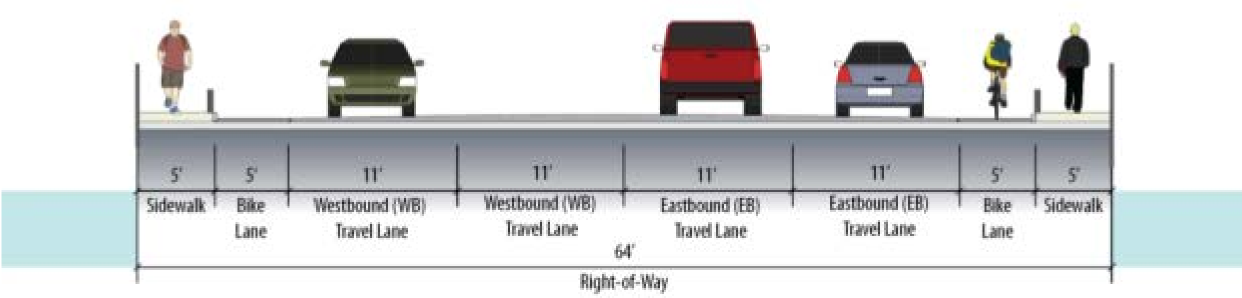
- **Alternative 1: Vertical Lift Bridge (110-135 feet vertical clearance)**
- **Alternative 1T: Tall Vertical Lift Bridge (150 feet vertical clearance)**
- **Alternative 2: Double-leaf Bascule Bridge (Standard)**
- **Alternative 2W: Wide Double-leaf Bascule Bridge (Standard)**
- **Alternative 3: Single-leaf Rolling Bascule Bridge**
- **Alternative 3W: Double-leaf Rolling Bascule Bridge**
- **Alternative 3D: Double-leaf Dutch-Style Bascule Bridge**
- **No Build Alternative: Repair Existing Swing Bridge**

Several of these long-term alternatives are similar, but have slight differences regarding physical dimensions. For example, the two vertical lift alternatives have different vertical clearance heights when the bridge is open for vessels. The two double-leaf bascule bridge alternatives have different horizontal clearance widths.

For the most part however, the study team developed the alternatives to have many consistent bridge attributes. The bridge attribute conclusions outlined in the previous section revealed that some attributes, such as underclearance and corridor alignment, should be consistent for all build alternatives. The consistent attributes for all alternatives include:

1. **Bridge Opening Time.** The time that it takes the bridge to open and close will not substantially change from the 2014 Existing Condition with any of the bridge alternatives. As discussed in Chapter 2, the duration of each bridge opening is dominated by the time it takes for vessels to pass through. This will not change with the configuration of the bridge. The time it takes for the actual bridge structure to open may be slightly improved with new mechanical systems. Since those changes would be measured in seconds and not minutes they would likely be immeasurable to most bridge users.
2. **Number of Bridge Openings.** The number of bridge openings is governed by the timing and frequency established for the scheduled openings, and the demand for openings during hours outside of the scheduled openings. As previously noted, over 80 percent of vessels passing through the bridge are over 20 feet high. Because each of the new bridge alternatives provides 14 feet of underclearance and the no build alternative retains the existing six-foot underclearance, the number of bridge openings is not projected to vary between alternatives or change significantly from the existing conditions.
3. **Corridor/Alignment.** The alignment of each of the new bridge alternatives will remain the same as the existing alignment. As identified earlier, all considered alternative alignments were identified to result in significantly more impacts. The existing bridge approaches will be utilized for all alternatives.
4. **Bridge Right-of-Way Width.** All of the new bridge alternatives would allow for a wider bridge. The right-of-way (ROW) width of the new bridge would be 64 feet wide. This would allow the accommodation of four eleven-foot-wide vehicular traffic lanes, two five-foot-wide bike lanes, and two five-foot-wide sidewalks. The cross section for all of the build alternatives is shown in Figure 3.5.

Figure 3.3 New Bridge Alternatives Cross-Section



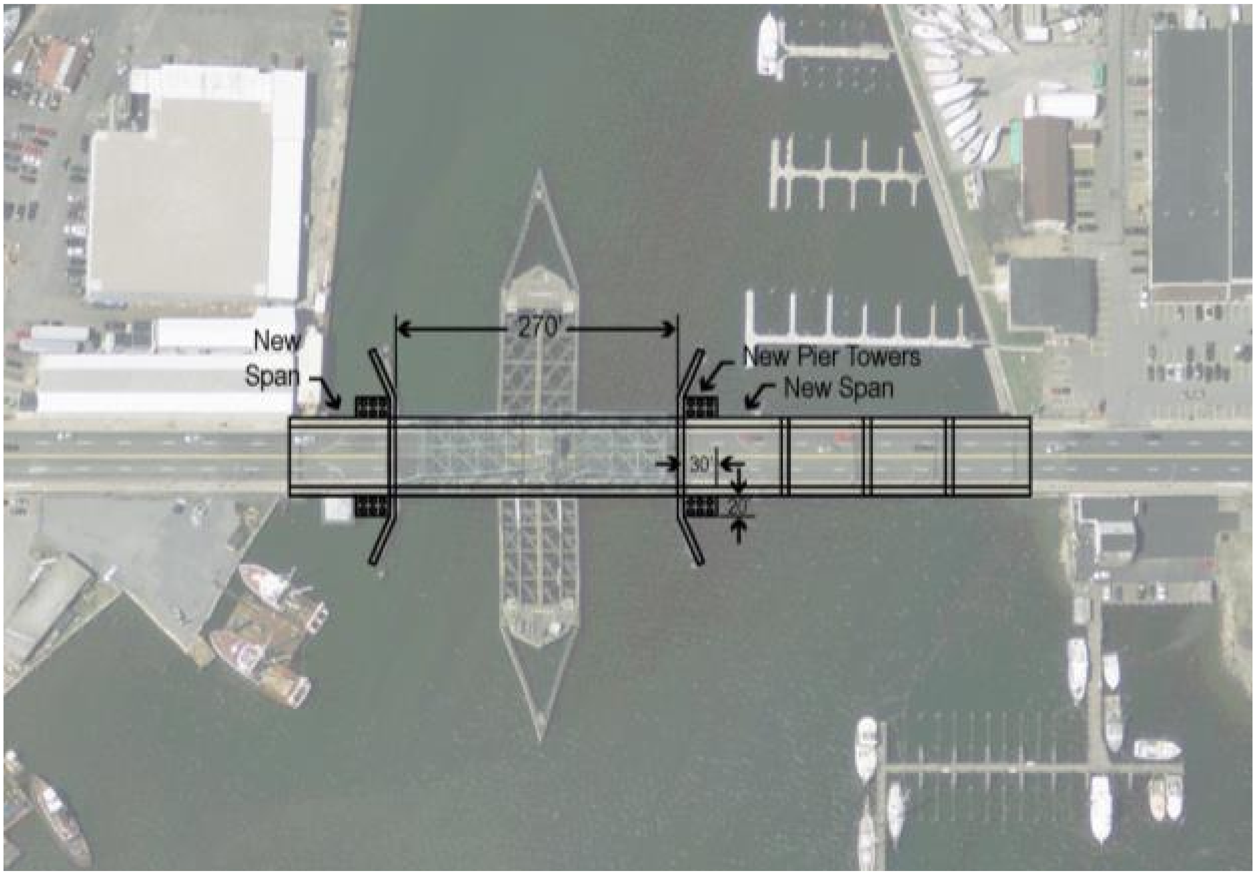
The following sections provide a summary of the eight long-term alternatives. More analysis on each alternative is provided in Chapter 4.

3.2.1 Alternative 1: Vertical Lift Bridge

BRIDGE DESIGN

This alternative constructs a new vertical lift bridge in place of the existing swing bridge. The bridge would include approximately 270 feet of navigational clearance and would only allow for approximately 110-135 feet of vertical clearance. As shown in Figure 3.4, the bridge is aligned so that the new pier towers are approximately in the same location as the east and west abutments of the existing swing bridge. The wider horizontal navigational clearance facilitates the construction methodology and would not significantly affect the cost of the bridge.

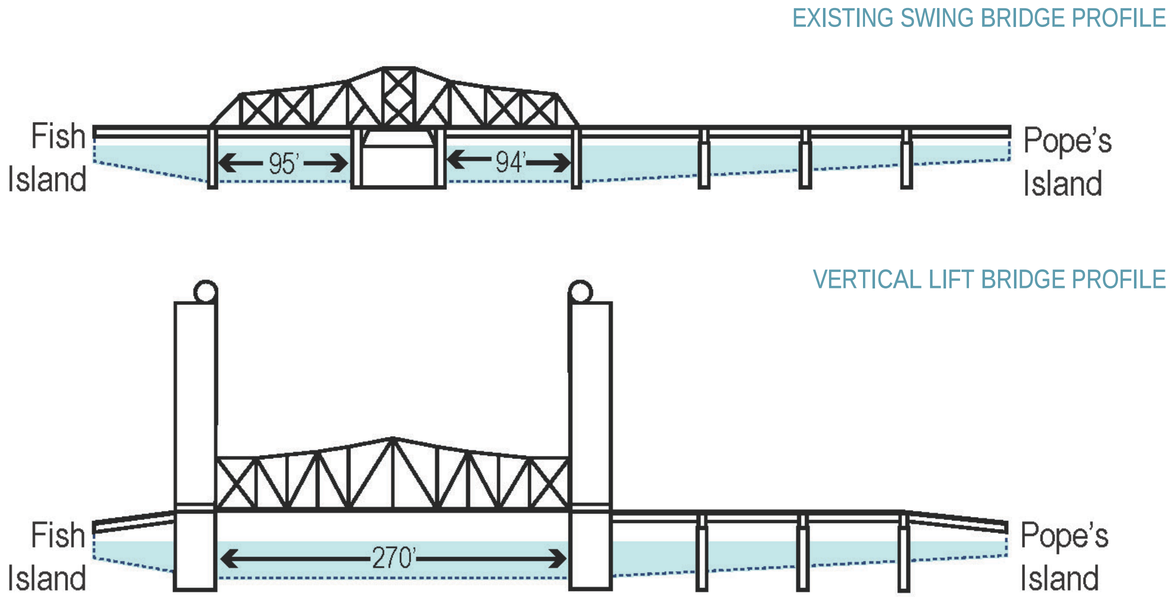
Figure 3.4 Alternative 1: Vertical Lift Bridge Plan



Since this bridge is approximately eight feet higher than the existing bridge, the two approach spans would be reconstructed. The new approach spans could use the same support pile structures, but the superstructure would need to be rebuilt to facilitate the grade change. Additional work would be required on the roadway approach located on Fish's Island. This segment would need to be raised by up to eight feet and would result in the construction of retaining walls between the sidewalk and the adjacent property for approximately 100 feet.

The profile would include the construction of four towers that would extend approximately 155 feet above the bridge deck, or 170 feet above the water line. These towers include the mechanical equipment used to raise and lower the bridge structure. As shown in Figure 3.5, the bridge span would be a truss structure, similar in length to the existing swing bridge. This bridge type has the potential to be designed with an approximately 25-foot-high truss structure, compared to the existing superstructure that is 55 feet high. When the bridge is in the open position, the span would be raised approximately 100-125 feet in the air above the level of the approach spans.

Figure 3.5 Alternative 1: Vertical Lift Bridge Profile



Like all of the new bridge alternatives, the vertical lift alternative allows for a wider bridge. As shown previously in Figure 3.3, the ROW width of the new bridge would be 64 feet wide. This would allow construction of four eleven-foot-wide vehicular traffic lanes, two five-foot-wide bike lanes, and two five-foot-wide sidewalks.

CONSTRUCTION PHASING / APPROACH

The construction phase of this project would be approximately three years long, or 33 to 36 months. This alternative would allow two or three traffic lanes to remain open for most of the time to vehicular traffic. Both of the existing navigational channels would be open for most of the construction duration. The first two years of construction would be focused on construction of the towers and off-site fabrication of the bridge span. One navigational closure would be required during a single long-weekend, which would occur in the 28th month of construction. During this weekend outage, the existing swing bridge would be removed while the new lift bridge span would be put into place. During this same month, the roadway would need to be closed for two to four weeks.

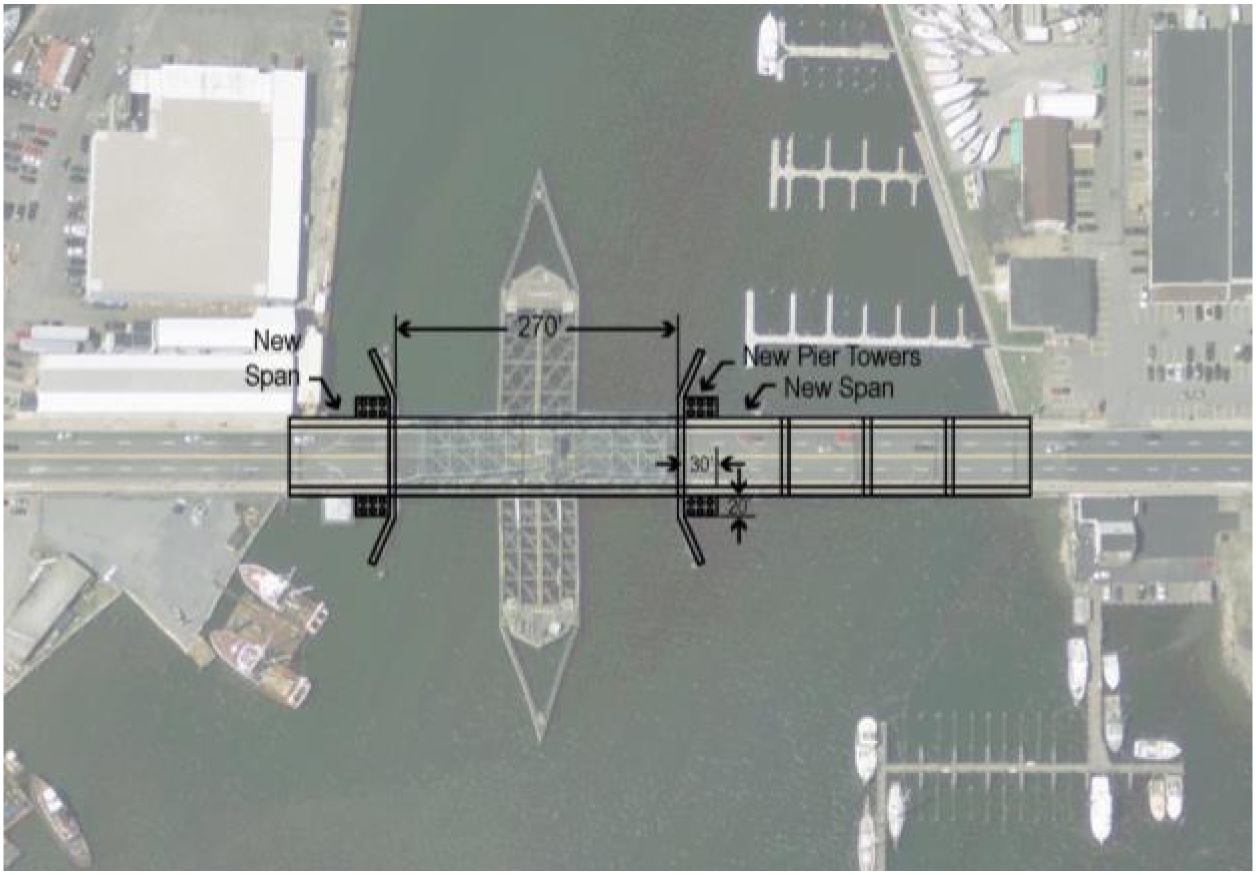
Construction may require extensive in-water work with this alternative. The foundations for the towers would be built just behind the existing swing bridge abutments. Each of the pier towers would be approximately 20 feet by 30 feet. The exact design for these tower foundations will depend upon the soil conditions, and there is a potential that work could be minimized by utilizing a pier foundation system, similar to what would be used for the single-leaf bascule alternative. Additional design would be required before the specific details regarding in-water work could be determined. In addition, the existing swing bridge's center pier structure would need to be removed and would require in-water work and disturbance of existing harbor sediments depending upon the depth of removal.

3.2.2 Alternative 1T: Tall Vertical Lift Bridge

BRIDGE DESIGN

This alternative constructs a new vertical lift bridge in place of the existing swing bridge. The bridge would include approximately 270 feet of navigational clearance, but would only allow for approximately 150 feet of vertical clearance. As shown in Figure 3.6, the bridge is aligned so that the new pier towers are approximately in the same location as the east and west abutments of the existing swing bridge. The wider horizontal navigational clearance is to facilitate the construction methodology and would not significantly affect the cost of the bridge.

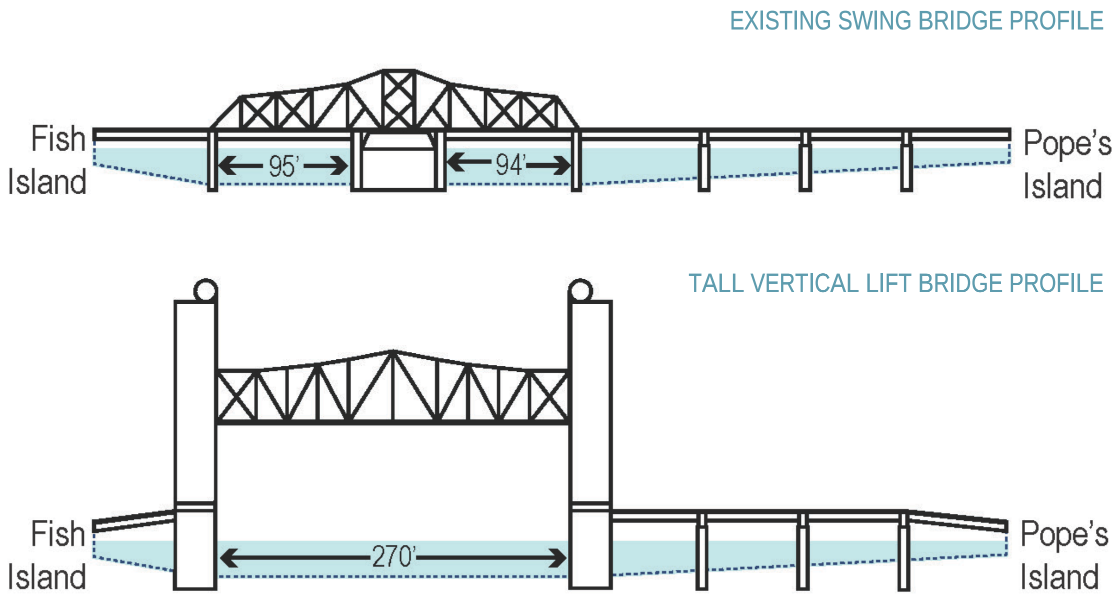
Figure 3.6 Alternative 1T: Tall Vertical Lift Bridge Plan



Since this bridge is approximately eight feet higher than the existing bridge, the two approach spans would be reconstructed. The new approach spans could use the same support pile structures, but the superstructure would need to be rebuilt to facilitate the grade change. Additional work would be required on the roadway approach located on Fish Island. This segment would need to be raised by up to eight feet and would result in the construction of 100-foot-long retaining walls between the sidewalks and adjacent properties.

The profile would include the construction of four towers that would extend approximately 200 feet above the bridge deck, or 190 feet above the water line. These towers include the mechanical equipment used to raise and lower the bridge structure. As shown in Figure 3.7, the bridge span would be a truss structure, similar in length to the existing swing bridge, with the potential of being only approximately 25 feet high, instead of the existing 55 feet high. When the bridge is in the open position, the span would be raised approximately 140 feet in the air above the level of the approach spans.

Figure 3.7 Alternative IT: Tall Vertical Lift Bridge Profile



Like all of the new bridge alternatives, the tall vertical lift bridge alternative allows for a wider bridge, with a 64-foot-wide ROW. This bridge width would allow the construction of four eleven-foot-wide vehicular traffic lanes, two five-foot-wide bike lanes, and two five-foot-wide sidewalks. The cross section for the vertical lift bridge alternative, and all the other build alternatives, is shown in Figure 3.3.

CONSTRUCTION PHASING / APPROACH

The construction phase of this project would be approximately three years long, or 33 to 36 months. This alternative would allow for two or three traffic lanes to remain open for most of the time to vehicular traffic. Both of the existing navigational channels would be open for most of the construction duration. The first two years of construction would be focused on construction of the towers and off-site fabrication of the bridge span. One navigational closure would be required during a single long-weekend, which would occur in month 28 of construction. During this weekend outage, the existing swing bridge would be removed while the new lift bridge span would be put into place. During this same month, the roadway would need to be closed for two to four weeks.

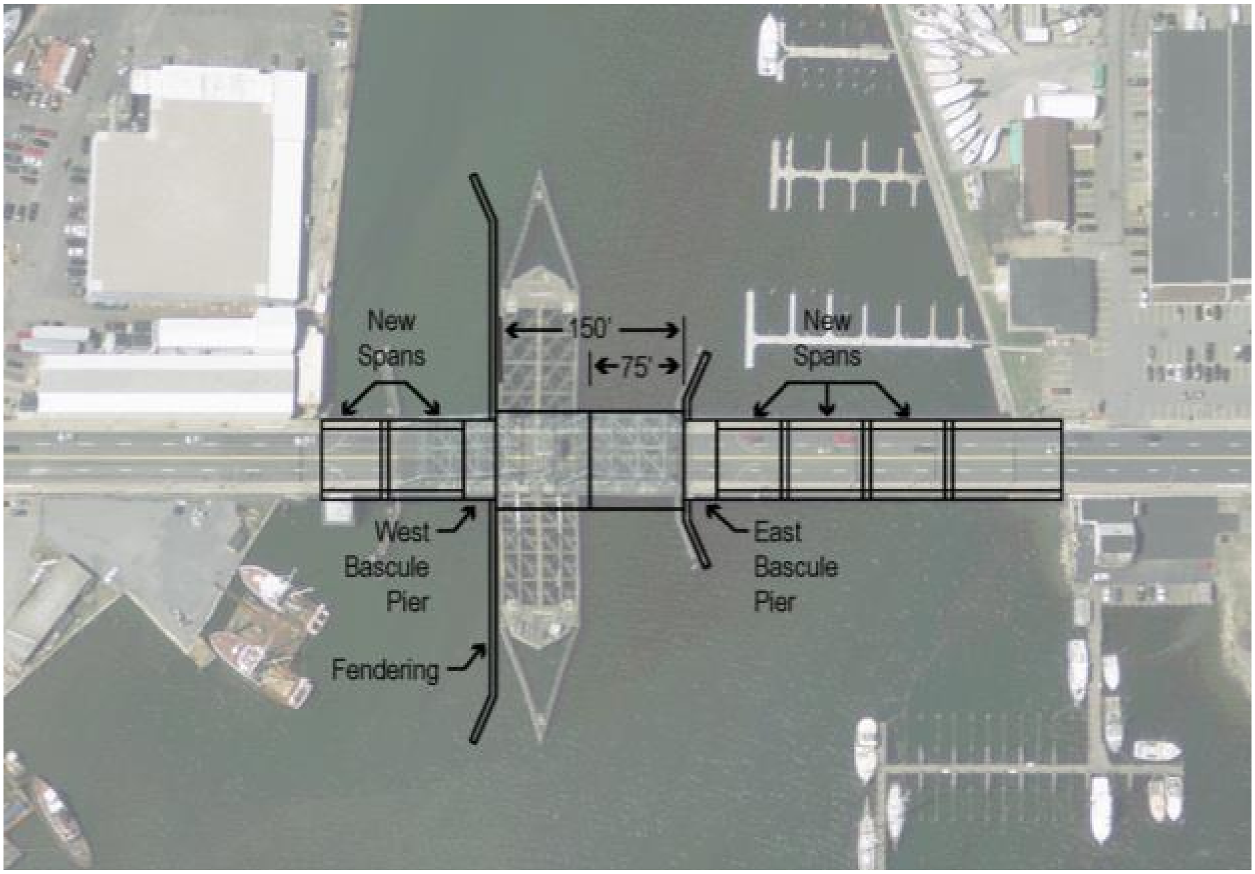
Construction may require extensive in-water work with this alternative. The foundations for the towers would be built just behind the existing swing bridge abutments. Each of the pier towers would be approximately 20 feet by 30 feet. The exact design for these tower foundations will depend upon the soil conditions, and there is a potential that work could be minimized by utilizing a pier foundation system, similar to what would be used for the single-leaf bascule alternative. Additional design would be required before the specific details regarding in-water work could be determined. In addition, the existing bridge's center pier structure would need to be removed and would require in-water work and disturbance of existing harbor sediments depending upon the depth of removal.

3.2.3 Alternative 2: Double-leaf Bascule Bridge (Standard)

BRIDGE DESIGN

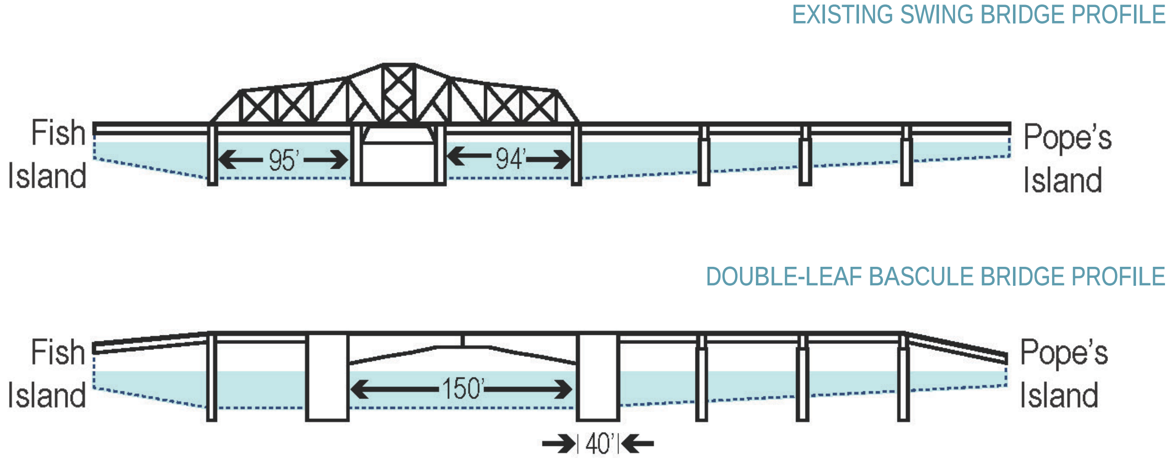
This alternative constructs a new double-leaf bascule bridge in place of the existing swing bridge. The bridge would include approximately 150 feet of navigational clearance and would have no vertical clearance restrictions with the bridge in the open position. As shown in Figure 3.8, the bridge would be aligned with the east bascule pier in the same location as the existing eastern abutment of the swing bridge.

Figure 3.8 Alternative 2: Double-leaf Bascule Bridge Plan



With the bridge being approximately eight feet higher than the existing bridge, the western approach spans would be reconstructed using the same support pile structures, with the superstructure rebuilt to facilitate the grade change. The same would be done to the eastern approach span. As shown in Figure 3.9, the profile of the bridge does not include much structure located above the roadway. The counterweights and mechanical equipment that is necessary to open the bridge is located in the bascule piers below the bridge deck. For bascule bridges, the bridge tender office is usually located, but not required to be located, on the bridge as part of the bascule piers. The specific location would be determined as part of the bridge design process.

Figure 3.9 Alternative 2: Double-leaf Bascule Bridge Profile



Like all of the new bridge alternatives, the double-leaf bascule bridge alternative allows for a wider bridge, with a 64-foot-wide ROW. This bridge width would allow the accommodation of four eleven-foot-wide vehicular traffic lanes, two five-foot-wide bike lanes, and two five-foot-wide sidewalks. The cross section for the vertical lift bridge alternative, and all the other build alternatives, is shown in Figure 3.3.

CONSTRUCTION PHASING / APPROACH

The construction phase of this project would take approximately 37 months. This alternative would consist of closing the bridge to vehicular traffic for approximately two years during that period. One of the two existing navigational channels would be open for most of the construction duration. However, navigational closures would be required during three long-weekends with one during the first year of construction (month 10), and two long weekends during the third year of construction (month 32 and 33).

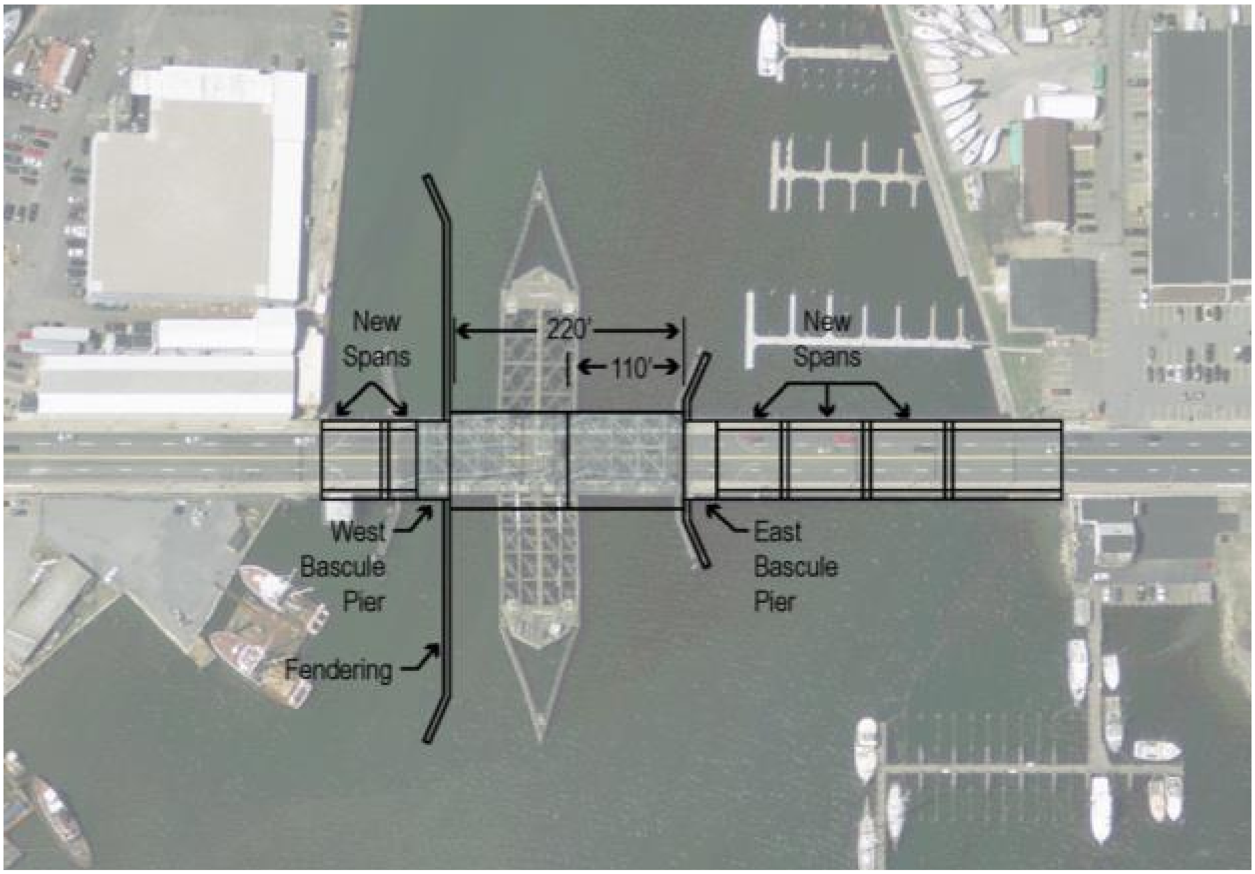
Construction will require extensive in-water work with this alternative. The bascule piers that house the bridge counter weights are located where the bridge leafs "hinge." These structures, which are at least 24 feet by 64 feet, would result in the disturbance of existing soils and the construction of foundations and structures all located under the water line. In addition, the existing swing bridge's center pier structure would need to be removed and would require work in-water. Existing harbor sediments could be disturbed depending upon the depth of removal. The remainder of the bridge construction would be done above the water line.

3.2.4 Alternative 2W: Wide Double-leaf Bascule Bridge (Standard)

BRIDGE DESIGN

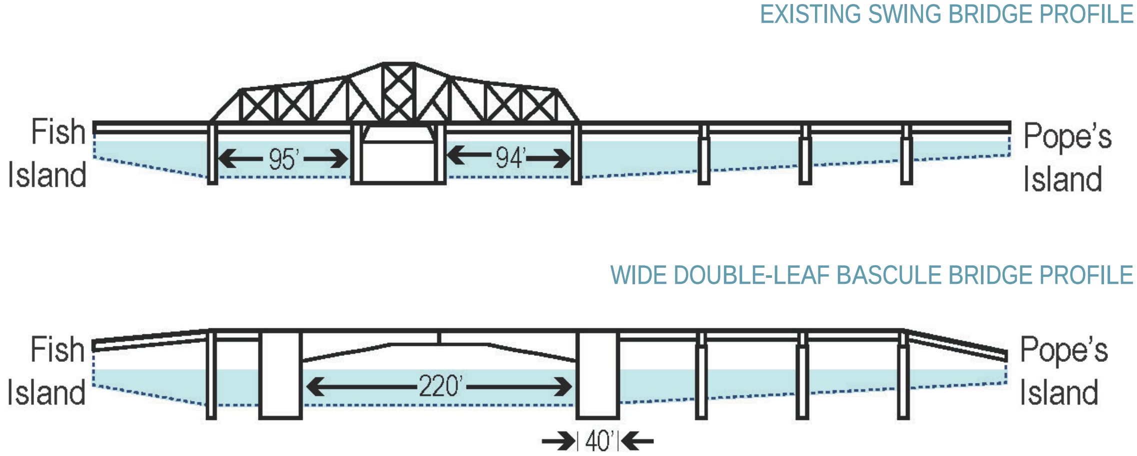
This alternative constructs a new wide double-leaf bascule bridge in place of the existing swing bridge. The bridge would include approximately 220 feet of navigational clearance and would have no vertical clearance restrictions. As shown in Figure 3.10, the bridge would be aligned with the east bascule pier in the same location as the existing eastern abutment of the swing bridge.

Figure 3.10 Alternative 2W: Wide Double-leaf Bascule Bridge Plan



With the bridge being approximately eight feet higher than the existing bridge, the western approach spans would be reconstructed using the same support pile structures, with the superstructure rebuilt to facilitate the grade change. The same would be done to the eastern approach span. As shown in Figure 3.11, the profile of the bridge does not include much structure located above the roadway. The counterweights and mechanical equipment that is necessary to open the bridge is located in the bascule piers below the bridge deck. For bascule bridges, the bridge tender office is usually located, but not required to be located, on the bridge as part of the bascule piers. The specific location would be determined as part of the bridge design process.

Figure 3.11 Alternative 2W: Wide Double-leaf Bascule Bridge Profile



Like all of the new bridge alternatives, the wide double-leaf bascule bridge alternative allows for a wider bridge, with a 64-foot-wide ROW. This bridge width would allow the accommodation of four eleven-foot-wide vehicular traffic lanes, two five-foot-wide bike lanes, and two five-foot-wide sidewalks. The cross section for the vertical lift bridge alternative, and all the other build alternatives, is shown in Figure 3.3.

CONSTRUCTION PHASING / APPROACH

The construction phase of this project would take approximately 37 months. This alternative would consist of closing the bridge to vehicular traffic for approximately two years during that period. One of the two existing navigational channels would be open for most of the construction duration. However, navigational closures would be required during three long-weekends with one during the first year of construction (month 10), and two long weekends during the third year of construction (month 32 and 33).

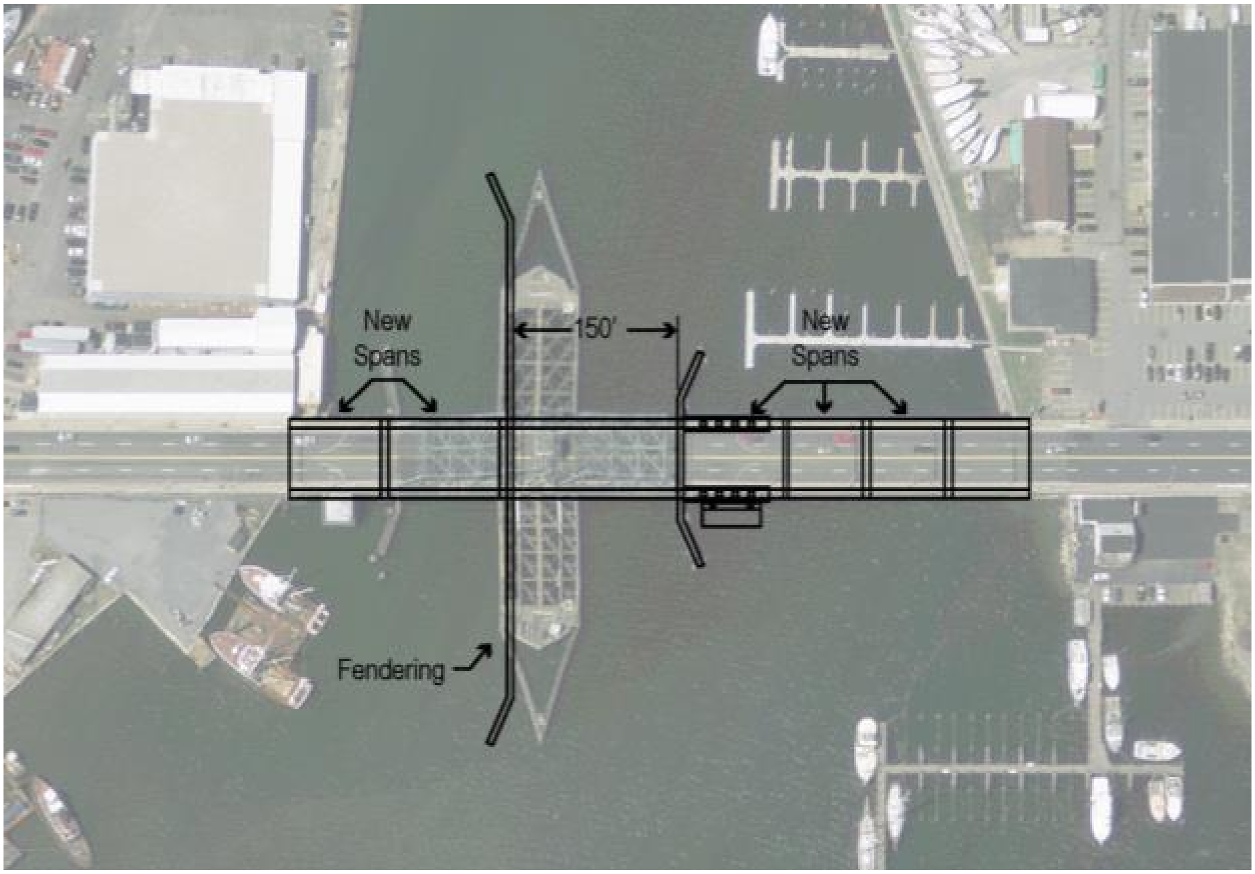
Construction will require extensive in-water work with this alternative. The bascule piers that house the bridge counter weights are located where the bridge leafs "hinge." These structures, which are at least 24 feet by 64 feet, would result in the disturbance of existing soils and the construction of foundations and structure all located under the water line. In addition, the existing swing bridge's center pier structure would need to be removed and would require work in-water. Existing harbor sediments could be disturbed depending upon the depth of removal. The remainder of the bridge construction would be done above the water line.

3.2.5 Alternative 3: Single-leaf Rolling Bascule Bridge

BRIDGE DESIGN

This alternative constructs a new single-leaf rolling bascule bridge in place of the existing swing bridge. Rolling bascule bridges are different from the standard bascule in that the counter-weights are located above the roadway surface and the spans segments are lifted by rolling the bridge into the up position along rails or plates located along the approaches. As shown in Figure 3.12, the bridge would include approximately 150 feet of navigational clearance and would not restrict vertical clearance. The bridge would be aligned with the east bascule pier in the same location as the existing eastern abutment of the swing bridge.

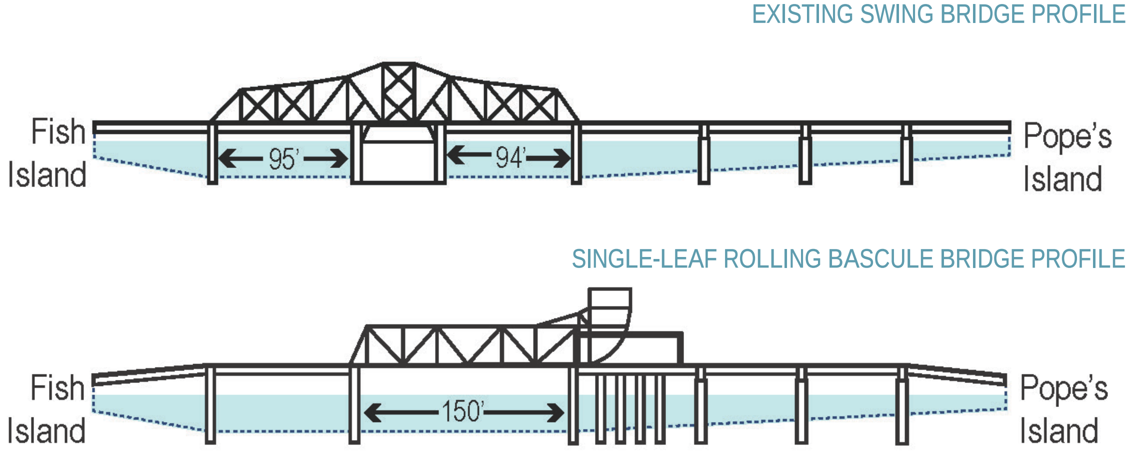
Figure 3.12 Alternative 3: Single-leaf Rolling Bascule Bridge Plan



With the bridge being approximately eight feet higher than the existing bridge, the western approach spans would be reconstructed using the same support pile structures with only the superstructure rebuilt to facilitate the grade change. The same would be done to the eastern approach span.

As shown in Figure 3.13, the profile of the bridge would include a truss structure, similar to the existing bridge structure located above the roadway. In addition, a counterweight would be located above the truss structure. Typically, this counterweight is designed as a large concrete block, although it may be possible to include some aesthetic or iconic masking of the block. The total height of the bridge truss structure and the counterweight would be approximately 55 feet, as high off the roadway as the existing bridge. The bridge would extend approximately 150 feet in the air above the roadway when the bridge is in the open position. As noted in the double-leaf bascule alternatives, the bridge tender office is usually located on the bridge as part of the bascule piers, but is not required to be there. The specific location would be determined as part of the bridge design process.

Figure 3.13 Alternative 3: Single-leaf Rolling Bascule Bridge Profile



Like all of the new bridge alternatives, the single-leaf rolling bascule bridge alternative allows for a wider bridge, with a 64-foot-wide ROW. This bridge width would allow the accommodation of four eleven-foot-wide vehicular traffic lanes, two five-foot-wide bike lanes, and two five-foot-wide sidewalks. The cross section for the vertical lift bridge alternative, and all the other build alternatives, is shown in Figure 3.3.

CONSTRUCTION PHASING / APPROACH

The construction phase of this project would be a little over two years long, or approximately 26-28 months. This alternative allows two vehicular lanes to remain open for most of the construction phase. One of the two existing navigational channels would be open for most of the construction duration. One navigational closure would be required during a single long-weekend, which would occur in month 21 of construction. The new 150-foot-wide channel would then be open during the following month.

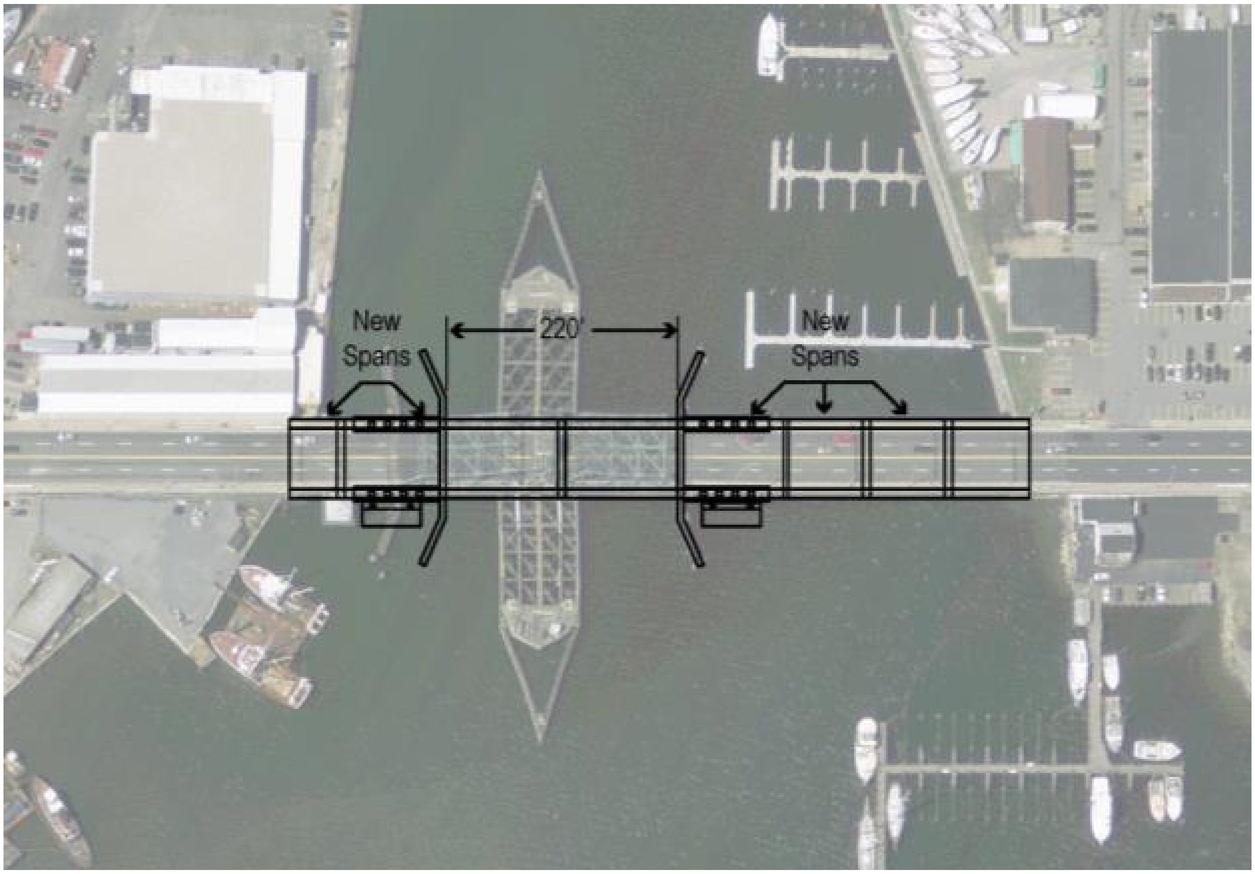
In-water construction work will be limited with this alternative. The bridge structure sits on top of a series of piles, or piers, that would extend from above the waterline, down through the mud and silt to the harbor floor. This foundation type is used for the existing east and west bridges. These piles can be driven in from above, thereby minimizing the work in the water. Furthermore, with the pile configuration possible for this bridge type, most of the piles can be driven with the existing swing bridge in place, thereby minimizing construction disruption. However, the existing bridge's center pier structure would need to be removed and would require in-water work and disturbance of existing harbor sediments depending upon the depth of removal. The remainder of the bridge construction would all be done above the water line.

3.2.6 Alternative 3W: Double-Leaf Rolling Bascule Bridge

BRIDGE DESIGN

This alternative constructs a new double-leaf rolling bascule bridge in place of the existing swing bridge. Rolling bascule bridges are different from the standard bascule in that the counter-weights are located above the roadway surface. As shown in Figure 3.14, the bridge would include approximately 220 feet of navigational clearance and would not restrict vertical clearance when the bridge is in the open position. The bridge would be aligned with the east bascule pier in the same location as the existing eastern abutment of the swing bridge.

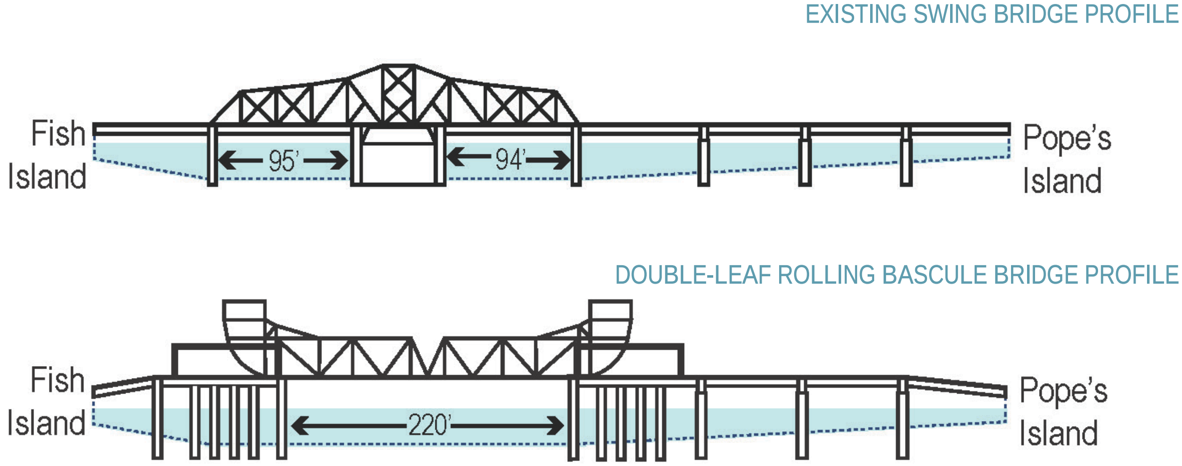
Figure 3.14 Alternative 3W: Double-leaf Rolling Bascule Bridge Plan



With the bridge being approximately eight feet higher than the existing bridge, the western approach spans would be reconstructed using the same support pile structures with only the superstructure rebuilt to facilitate the grade change. The same would be done to the eastern approach span.

As shown in Figure 3.15, the profile of the bridge would include a truss structure, similar to the existing bridge structure located above the roadway. In addition, a counterweight would be located above the truss structure. This is typically designed as a large concrete block, although it may be possible to include some aesthetic or iconic masking of the block. The total height of the bridge truss structure and the counterweight would be approximately 55 feet, as high off the roadway as the existing bridge. The bridge would extend approximately 220 feet in the air above the roadway when the bridge is in the open position. As noted in the double-leaf bascule alternative, the bridge tender office is usually located on the bridge as part of the bascule piers but is not required to be. The specific location would be determined as part of the bridge design process.

Figure 3.15 Alternative 3W: Double-leaf Rolling Bascule Bridge Profile



Like all of the new bridge alternatives, the double-leaf rolling bascule bridge alternative allows for a wider bridge, with a 64-foot-wide ROW. This bridge width would allow the accommodation of four eleven-foot-wide vehicular traffic lanes, two five-foot-wide bike lanes, and two five-foot-wide sidewalks. The cross section for the vertical lift bridge alternative, and all the other build alternatives, is shown in Figure 3.3.

CONSTRUCTION PHASING / APPROACH

The construction phase of this project would be a little over two years long, or approximately 26-28 months. This alternative would allow for keeping two lanes open for most of the time to vehicular traffic. One of the two existing navigational channels would be open for most of the construction duration. One navigational closure would be required during a single long-weekend, which would occur in month 21 of construction. The new 220-foot-wide channel would then be open during the following month.

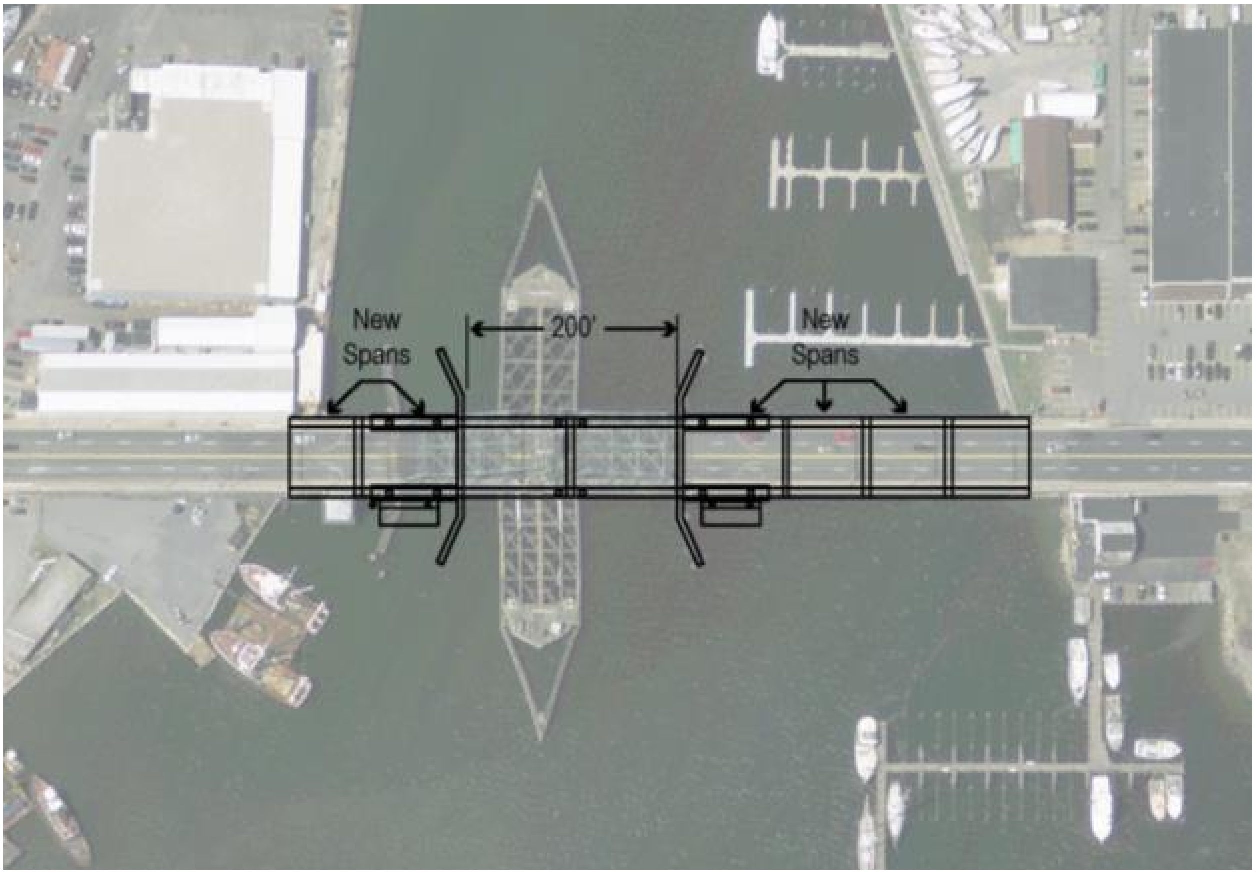
In-water construction work would be limited with this alternative. The bridge structure sits on top of a series of piles, or piers, that would extend from above the waterline, down through the mud and silt to the harbor floor. This foundation type is used for the existing east and west bridges. These piles can be driven in from above, thereby minimizing the work in the water. Furthermore, with the pile configuration possible for this bridge type, most of the piles can be driven with the existing swing bridge in place, thereby minimizing construction disruption. However, the existing bridge's center pier structure would need to be removed and would require in-water work and disturbance of existing harbor sediments depending upon the depth of removal. The remainder of the bridge construction would all be done above the water line.

3.2.7 Alternative 3D: Double-leaf Dutch Bascule Bridge

BRIDGE DESIGN

The final build alternative constructs a new double-leaf Dutch-style bascule bridge in place of the existing swing bridge. Dutch-style bascule bridges are different from the standard bascule in that the counter-weights are located above the roadway surface. As opposed to rolling bascule bridges, the bridge deck of a Dutch-style bascule bridge is lifted using a system that combines the counter-weight, an overhead beam and pivot points, or heel trunnions, for both the beam and the bridge deck. As shown in Figure 3.16, the bridge would include approximately 200 feet of navigational clearance and would not restrict vertical clearance. The bridge would be aligned with the east bascule pier in the same location as the existing eastern abutment of the swing bridge.

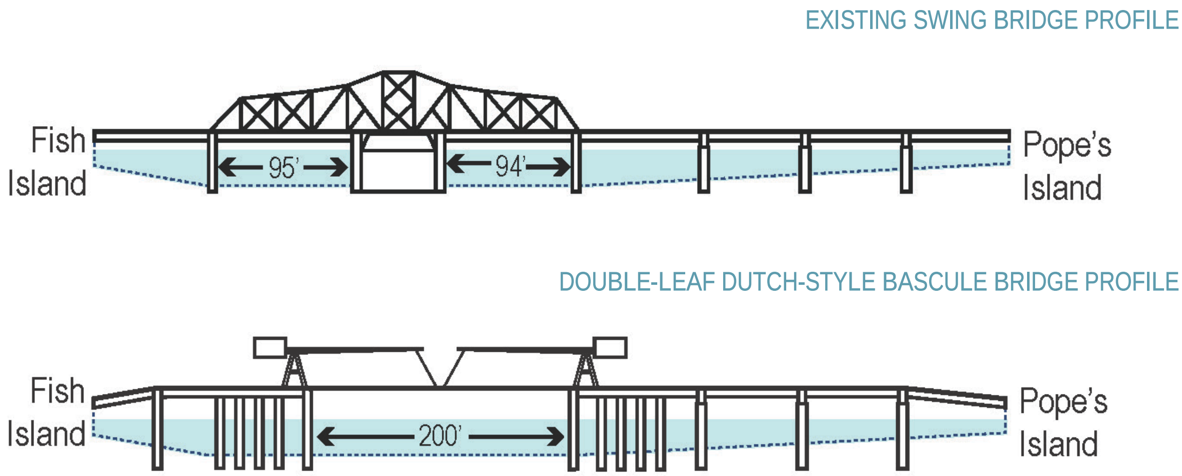
Figure 3.16 Alternative 3D: Double-leaf Dutch Bascule Bridge Plan



With the bridge being approximately eight feet higher than the existing bridge, the western approach spans would be reconstructed using the same support pile structures with only the superstructure rebuilt to facilitate the grade change. The same would be done to the eastern approach span.

As shown in Figure 3.17, the profile of the bridge would include a beam and counter-weight structure located above the roadway. The counter-weight is typically a large concrete block, although it may be possible to include some aesthetic or iconic masking of the block. The total height of the bridge structure and the counterweight would be approximately 55 feet, which is the same height above the roadway as the truss structure of the existing bridge. The bridge would extend approximately 100 feet in the air above the roadway when the bridge is in the open position. As noted in the double-leaf bascule alternative, the bridge tender office is usually located on the bridge as part of the bascule piers but is not required to be. The specific location would be determined as part of the bridge design process.

Figure 3.17 Alternative 3D: Double-leaf Rolling Bascule Bridge Profile



Like all of the new bridge alternatives, the Dutch-style bascule bridge alternative allows for a wider bridge, with a 64-foot-wide ROW. This bridge width would include the construction of four eleven-foot-wide vehicular traffic lanes, two five-foot-wide bike lanes, and two five-foot-wide sidewalks. The cross section for the vertical lift bridge alternative, and all the other build alternatives, is shown in Figure 3.3.

CONSTRUCTION PHASING / APPROACH

The construction phase of this project would be a little over two years long, or approximately 26-28 months. This alternative would allow for keeping two lanes open for most of the time to vehicular traffic. One of the two existing navigational channels would be open for most of the construction duration. One navigational closure would be required during a single long-weekend, which would occur in month 21 of construction. The new 200-foot-wide channel would then be open during the following month.

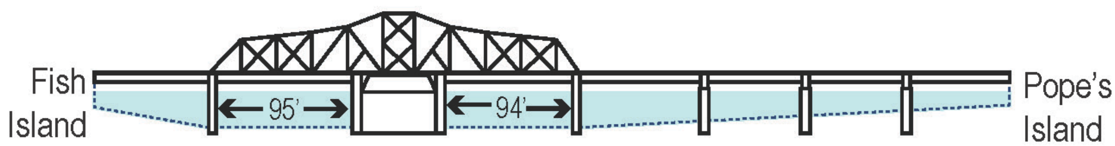
In-water construction work will be limited with this alternative. The bridge structure sits on top of a series of piles, or piers, that would extend from above the waterline, down through the mud and silt to the harbor floor. This foundation type is used for the existing east and west bridges. These piles can be driven in from above, thereby minimizing the work in the water. Furthermore, with the pile configuration possible for this bridge type, most of the piles can be driven with the existing swing bridge in place, thereby minimizing construction disruption.

However, the existing bridge's center pier structure would need to be removed and would require in-water work and disturbance of existing harbor sediments depending upon the depth of removal. The remainder of the bridge construction would all be done above the water line.

3.2.8 No Build Alternative: Repair Existing Swing Bridge

This alternative includes the continued maintenance of the existing swing bridge and repair of the bridge superstructure in the same configuration as currently exists (see Figure 3.18). As noted in Chapter 2, the existing swing bridge was constructed between 1896 and 1903. The bridge received its first major overhaul in 1931 and received minor repairs over the next 30 years, including upgrades to the fender piers, lighting, operator's house, plank decking, and removal of the streetcar tracks. Since the 1960s, bridge repairs have become more frequent and more significant as vehicular traffic over the bridge increased. In 1961, the deck and deck framing of the fixed spans were replaced. Since that time, the bridge has been either repaired or rehabilitated on a 12-year cycle, which is typical of movable bridges located over tidal waterways.

Figure 3.18 Existing Swing Bridge Profile



Based upon conclusions from the 2013 National Bridge Inspection Standards (NBIS) inspection report and an HDR cursory inspection completed in 2014, it is certain that the bridge can be maintained in a reliable operating state for the short-term. However, both the HDR cursory inspection and results from a Preliminary Structures Report conducted for MassDOT in 2010 raised concerns for the long-term future of the 120-year-old structure. Due to the age of some original structural components and the fatigue and stresses that are put on the bridge members on a regular basis, options for replacing the entire swing truss section of the bridge need to be considered. At 120 years, the swing truss section is showing signs that it is beyond its useful life and will need to be replaced. It is estimated that this will need to occur within the next 15 to 20 years.

This alternative includes the ongoing maintenance cycles and the likely replacement needs for the bridge in order to compare replacement alternatives regarding life-cycle costs. The future replacement of the superstructure (or swinging truss section) would not change the attributes of the bridge as identified for the other bridge alternatives, but would require a limited shut down of the navigational channel and roadway.

The construction phase of this project would be approximately 18 months. This alternative would allow for keeping two lanes open for most of the time to vehicular traffic. One of the two existing navigational channels would be open for most of the construction duration. Two navigational closures would be required during a two separate long-weekends, which would occur in the 21st month of construction. In-water construction work will be limited with this alternative.

3.3 DESCRIPTION OF SHORT-TERM/MEDIUM-TERM ALTERNATIVES

The identified long-term alternatives address many of the issues identified in the corridor, specifically those related to marine traffic and land use/economic development. Several additional corridor issues, described previously in Chapter 2, could be addressed through implementation of short- and medium-term improvements. Most of these improvements could be achieved with less financial resources and in a sooner timeframe than the long-term alternatives. While some of them may require fewer resources, timing is important and implementation may be dependent on the completion of other improvements, including a long-term alternative.

The following sections identify potential improvements that could be implemented in these shorter timeframes. They are included in the categories of:

- Corridor Intersections;
- Intelligent Transportation Systems; and
- Bicycle/Pedestrian Facilities.

3.3.1 Corridor Intersections

As described previously in Chapter 2, a 2035 No Build Condition analysis was completed to evaluate the need for potential corridor intersection improvements. Based on the specific issues identified during this analysis (listed in Section 2.10.5), several corridor intersection improvements were identified. The intersections that were identified as having potential issues in 2035 include several signalized intersections along Route 6 on both sides of the New Bedford-Fairhaven Bridge. The analysis indicated that these intersections currently operate or will operate in the future at a level of service (LOS) D or worse. Figure 3.19 shows the intersections along the Route 6 Corridor that were analyzed for improvements.

Figure 3.19 Short-term Corridor Intersection Improvements

Improvements proposed as part of this study are signal-related and do not require high capital costs and ROW acquisitions. They comprise of changing signal timing splits, phasing, coordination offsets, and/or cycle lengths. Since these changes are relatively quick to implement with minor costs and provide immediate benefits to the operations along the corridor, they are designated as short-term improvements. These improvements are expected to benefit the corridor during long-term closure of the bridge for construction.

The following describes the existing and/or future conditions that will necessitate potential improvements.

- **Kempton Street and Cottage Street.** During the AM peak hour, the southbound Cottage Street approach will change from a LOS C under the 2014 Existing Condition to a LOS E under the 2035 No Build Condition.
- **Mill Street and Cottage Street**. During both AM and PM peak hours, all approaches at this intersection operate at mid LOS D or better during the 2035 No Build Condition. However, changes may be possible that would result in better traffic coordination for travelers going in the north/south direction.
- **Mill Street and County Street.** During the PM peak hour, the southbound County Street approach will change from a LOS D under the 2014 Existing Condition to a LOS F under the 2035 No Build Condition.

- **Kempton Street and County Street.** During both AM and PM peak hours, all approaches at this intersection operate at mid LOS D or better during the 2035 No Build Condition. However, changes may be possible to achieve better traffic coordination for travel in the north/south direction and improve southbound conditions at the nearby Mill Street/County Street intersection
- **Route 6 and Pleasant Street (Octopus Intersection)/Route 18 southbound off-ramp.** During both AM and PM peak hours, all approaches at this intersection operate at a LOS E or worse and the overall intersection will operate at LOS F under the 2035 No Build Condition. In addition to signal changes the potential for closing the Route 18 southbound off-ramp to westbound Route 6 will be considered.
- **Main Street and Huttleston Avenue.** During the PM peak hour, the northbound approach of this intersection changes from a LOS D under existing conditions to a LOS E under the 2035 No Build Condition. The southbound approach changes from a low LOS E under the 2014 Existing Condition to a high LOS E under the 2035 No Build Condition. **Middle Street and Huttleston Avenue.** During both AM and PM peak hours, all approaches at this intersection operate at LOS C or better during the 2035 No Build Condition. However, since this intersection has combined signal operations with the intersection of Main Street and Huttleston Avenue, changes to that intersection may impact the Middle Street and Huttleston Avenue intersection
- **Adams Street and Huttleston Avenue.** During the AM peak hour, the northbound approach changes from a LOS C under the 2014 Existing Condition to a LOS F under the 2035 No Build Condition.

3.3.2 Corridor Signage/Intelligent Transportation Systems (ITS)

Roadside variable message signs or Intelligent Transportation Systems (ITS) are used to inform motorists of bridge closures, accidents, or other issues that cause delays in an effort to allow drivers to alter their routes accordingly. The types of ITS signage are diverse and can vary based on application. Some signs are portable, allow for variable messages, use different technology to transmit messages, and are used for a variety of types of applications.

Each time the New Bedford-Fairhaven Bridge is closed to motorists to allow vessels to transit the bridge, drivers are informed of the closures using a series of signs that are located on the bridge approaches (Figure 3.20). All of the existing signs are ground-mounted except for one sign, which is mounted on a signal mast arm. Five signs are located west of the bridge and three signs are located east of the bridge. Three of the five signs west of the bridge are located at the intersection of Kempton Street and Purchase Street. Two of the five signs west of the bridge are located along Route 18. The three signs located east of the bridge are installed at the intersection of Huttleston Avenue and Main Street, one of which is installed on a signal mast arm.

In the event of bridge closure, the bridge operator can illuminate the signs to display a 'CLOSED" message. However, the existing signs were installed approximately 20 years ago and use unreliable, outdated technology. The bridge operator has no confirmation if the signs are illuminated or not. The unreliability of the technology is compounded by the lack of replacement parts. MassDOT is currently working through a design process for a complete replacement of all eight signs.

During the summer of 2014, the regional Metropolitan Planning Organization (MPO), the Southeastern Regional Planning and Economic Development District (SRPEDD), conducted a study of ITS associated with the bridge. Consistent with the 2014 Existing Condition findings developed for this study, they found that all approach points to the bridge are provided with advanced warning. However, a deficiency was noted at the corner of Huttleston Avenue (Route 6) and Main Street in Fairhaven. At this location, signs are not visible to motorists traveling northbound on Middle Street until they are committed to make a left turn toward the bridge. It was also noted that there are deficiencies for information for motorists that could divert at Route 240 if bridge status information was provided. Results of a survey administered by SRPEDD found that:

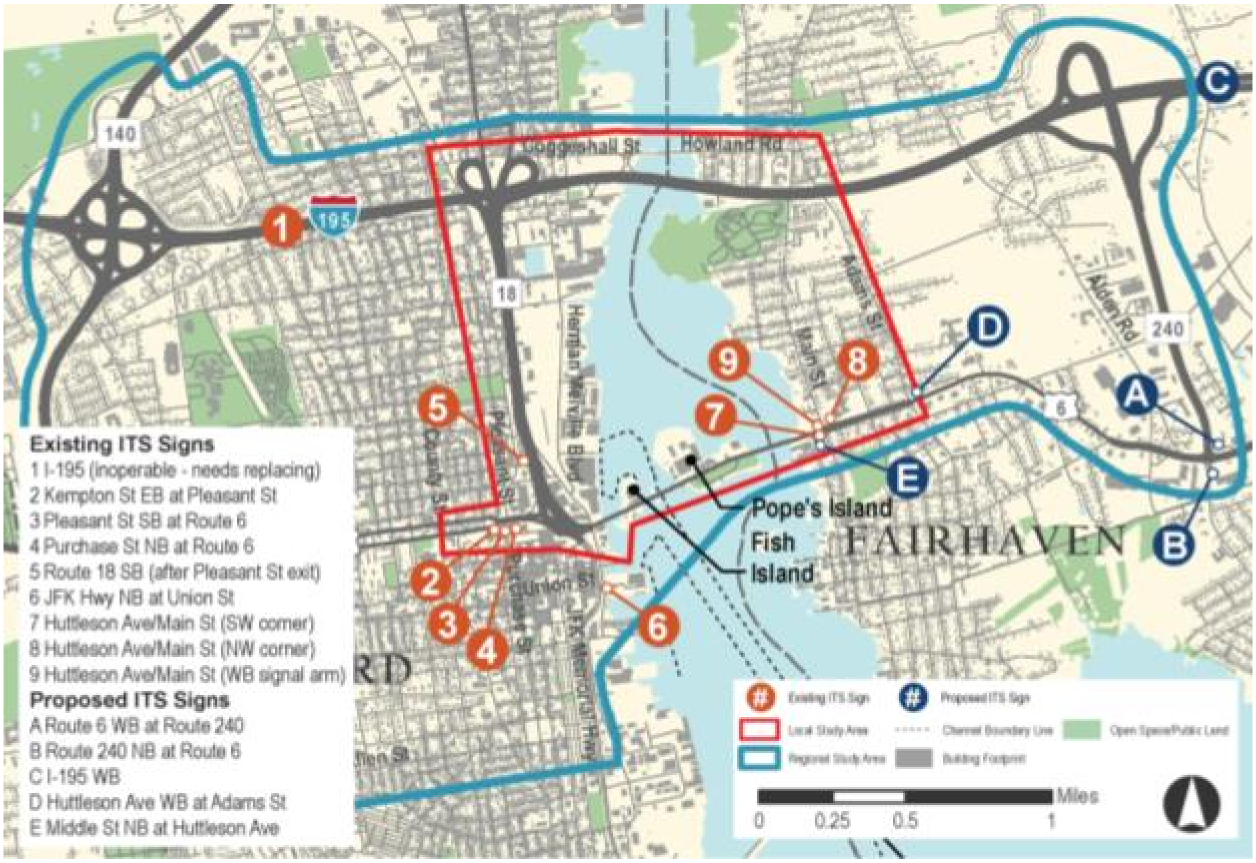
- 88 percent of respondents detour or change their route when the bridge is closed. Of these, 24 percent always change their route and 50 percent will change their route depending on the amount of traffic and / or time.
- Nearly 56 percent of survey respondents do not think the signs provide enough notice / warning to detour their route.

As a result of an assessment of the bridge's ITS system, coupled with the results of the SRPEDD study, the following potential improvements have been identified:

- Complete replacement of the ITS/sign system associated with the bridge.
- Upgrade of the ITS/sign system to provide additional information regarding travel time to the bridge and bridge status.
- Addition of two signs at the Route 6 and Route 240 intersection to facilitate route diversions along Route 240.
- Addition of a sign on I-195 Westbound to replace signs that were previously removed
- Addition of a sign on Route 6 at the Adams Street intersection to facilitate route diversions along Adams Street.
- Addition of a sign that is visible to Middle Street motorists to inform them of bridge closings.

The location of the existing ITS signs and the proposed ITS signs are shown in Figure 3.20.

Figure 3.20 Existing and Proposed ITS Signage Locations



3.3.3 Bicycle/Pedestrian Facilities

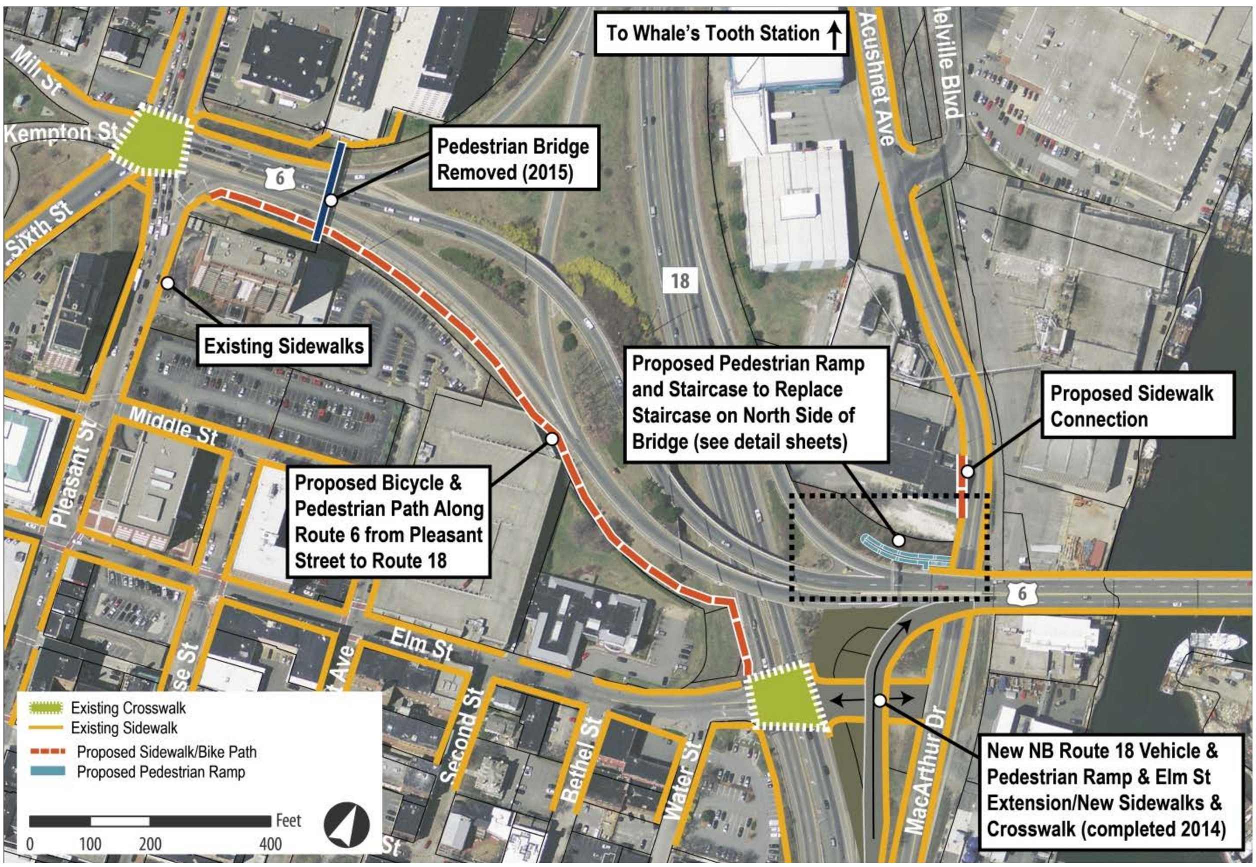
The New Bedford-Fairhaven Bridge is the only pedestrian or bicycle access point between downtown Fairhaven and New Bedford. Pedestrians can use a sidewalk on either side of the travel lanes, but there is only one crosswalk between the New Bedford and Fairhaven shores. Pedestrian access to the bridge from New Bedford is limited to a new pedestrian ramp down to JFK Memorial Highway. A staircase on the north side of the travel lanes down to MacArthur Drive is the only way off the bridge on that side of the highway. Pedestrians and bicyclists are prohibited on Route 6 ramps between Purchase Street and MacArthur Drive. The primary concern along the bridge is the lack of crosswalks. A single crosswalk on Pope's Island provides a safe crossing point for pedestrians between the New Bedford and Fairhaven shorelines.

Additionally, there are no safe routes for bicyclists on the bridge. Many bicyclists use the sidewalks to cross the bridge, which creates additional safety concerns for pedestrians. Access to the New Bedford-Fairhaven Bridge is also limited to the new pedestrian ramp down to JFK Memorial Highway on the south side of the highway.

Based on the bicycle and pedestrian conditions along the corridor, four potential improvements have been identified. Figure 3.21 shows the location of the first three potential improvements:

- Proposed bicycle and pedestrian path along Route 6 from Pleasant Street to Route 18;
- Proposed pedestrian ramp and staircase to replace staircase on north side of bridge;
- Replacement of sidewalk connection along MacArthur Drive to improve access to the South Coast Rail Whale's Tooth Station on Achushnet Avenue; and
- Addition of bike lanes across the entire New Bedford-Fairhaven Bridge by configuration of three-lane roadway cross section.

Figure 3.21 Route 6 Corridor Potential Bike/Pedestrian Improvements in New Bedford



PROPOSED BICYCLE AND PEDESTRIAN PATH BETWEEN PLEASANT STREET TO ROUTE 18

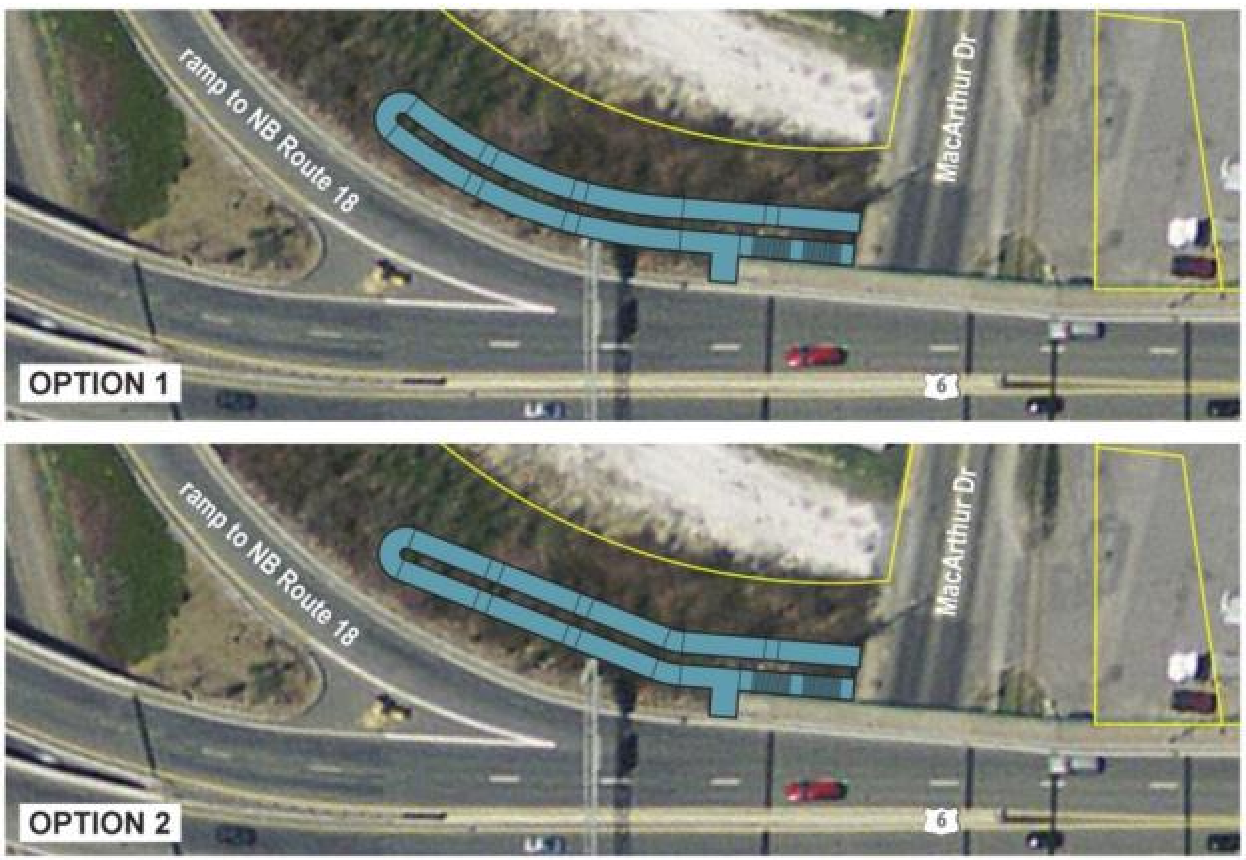
As previously noted, the pedestrian conditions along portions of the Route 6 Corridor are not optimal. The segment of Route 6 between Pope's Island and the "Octopus Intersection" presents multiple challenges. One challenge is the prohibition of pedestrians along the ramp system from the west end of the bridge to the Octopus intersection.

One improvement that has been identified to mitigate that condition is a bicycle/pedestrian path along the southern side of the Route 6 ramp structure to connect the Octopus Intersection area to the Route 18/Elm Street intersection. A project to improve pedestrian conditions at the Octopus intersection is currently being initiated by the City of New Bedford. In addition, a project that improved the pedestrian conditions along Route 18 (JFK Highway) was completed in 2014, including a bike path adjacent to the roadway. The addition of a direct pedestrian connection between these two locations would provide a missing link to the pedestrian network and leverage the improvements that are already being made in New Bedford. The path would be 10 to 12 feet wide, located within the existing Route 6 ROW. A four- to six-foot-high fence would be installed to provide separation between Route 6 and the path.

PROPOSED PEDESTRIAN RAMP AND STAIRCASE ON NORTH SIDE OF BRIDGE

The connection from the sidewalk on the north side of the bridge to New Bedford is limited. The western-most crosswalk on the bridge is located on Pope's Island. Since bicycles and pedestrians are not permitted on the ramp system, the only route off the bridge is down a set of stairs between the bridge and MacArthur Drive. The staircase is not ADA accessible and bicyclists have to unsafely cross Route 6 or backtrack the 2,200 feet to the nearest crosswalk. To improve this connection, a ramp system is proposed from the northern sidewalk to MacArthur Drive in a location similar to the former staircase. Two optional configurations of the ramp structure are included in Figure 3.22. The accessible ramp structure would be constructed within the existing Route 6 ROW. It would include both a new staircase and a 350-foot-long ramp that would facilitate travel from the bridge to MacArthur Drive.

Figure 3.22 Potential Bike/Pedestrian Ramp in New Bedford



REPLACEMENT OF SIDEWALK CONNECTION ALONG ACUSHNET AVENUE

A review of the sidewalk and crosswalk conditions along the corridor reveals that much work has been done in recent years or is currently underway to improve bicycle and pedestrian conditions in the corridor. It was noted that one particular segment of sidewalk is missing along MacArthur Drive just north of Route 6. Limited room is available along MacArthur Drive between the roadway curb line and the adjacent Atlantic Capes Fisheries building. Currently, there is a beaten path along this segment where pedestrians travel along the grassy area. When the Whale's Tooth station opens to the north, it is projected that more pedestrians will utilize this corridor. A sidewalk connection is proposed for this important 85-foot-long segment to remove the gap in the existing network.

ADDITION OF BIKE LANES ACROSS NEW BEDFORD-FAIRHAVEN BRIDGE

The existing conditions for bicyclists across the New Bedford-Fairhaven Bridge are challenging. Prior to disruption caused by ongoing construction, the shoulders along the bridge were generally a maximum of two to three feet wide, with some sections having no shoulder. It is reported that due to these conditions many cyclists ride on the sidewalks. Use of a five-foot-wide sidewalk by both bicyclists and pedestrians is a safety concern.

At the completion of the construction in 2015, all four traffic lanes will be restored. At that time, the travel lanes will be reduced across the entire bridge from the previous 12-foot-wide lanes to 11-foot-wide lanes. This lane reduction will provide adequate room for vehicular traffic while also providing an additional two feet to each shoulder. This will mean that the shoulders will be generally four to five feet wide. Although these will not be striped as bike lanes, the reconfiguration of the lanes along the bridge will result in significant improvement for bicyclists.

At 58 feet wide, the swing bridge cross section is narrower than the remainder of the corridor and this restriping of the lanes will result in a shoulder that is still only two feet wide. Figure 3.23 shows the lane configuration that will be in place upon completion of construction in 2015.

As noted in the previous discussions of long-term bridge alternatives, a wider bridge cross section is being considered. As shown in Figure 3.24, the new bridge alternatives would allow for a four- to five-foot-wide bike lane/shoulders across the entire bridge. This would represent a significant improvement in conditions for bicyclists.

Figure 3.23 Post-Construction Route 6 Corridor Lane Configuration (2015)

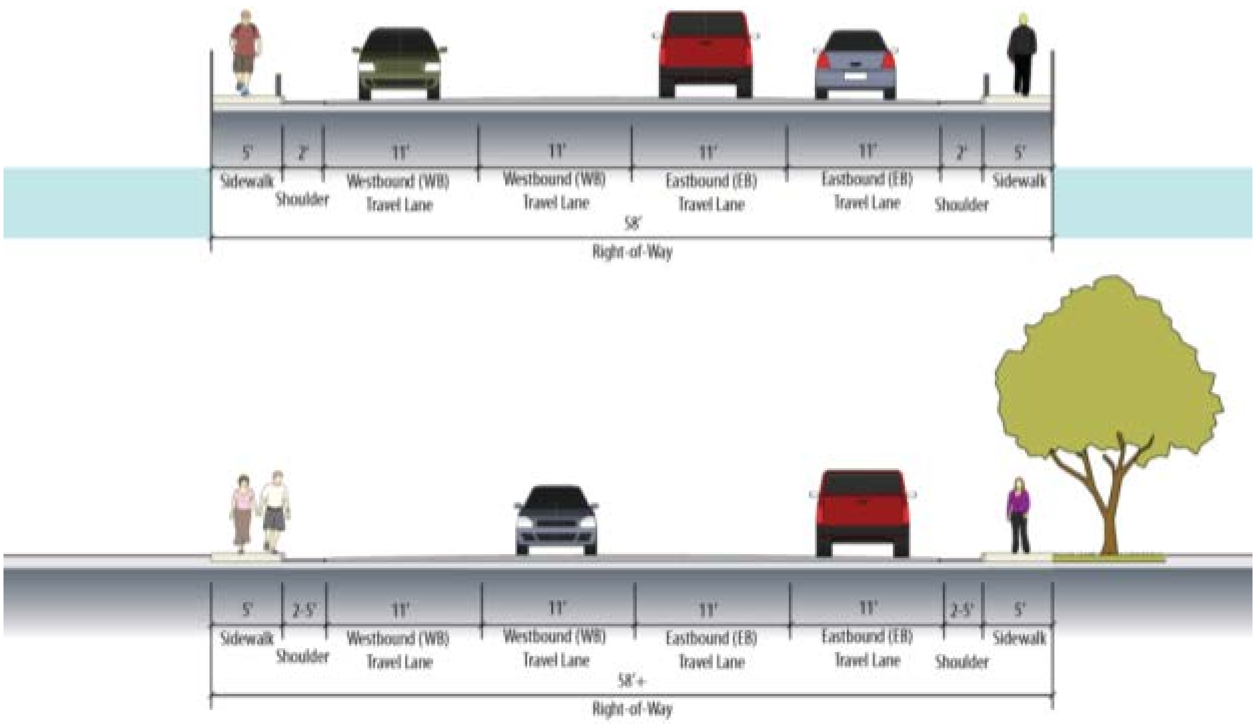
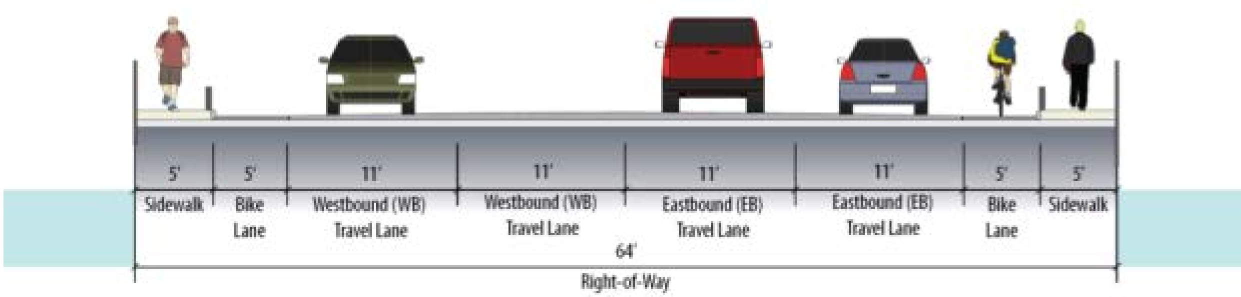


Figure 3.24 Long-term Alternative Bridge Improvement Lane Configuration



Due to space constraints along the existing fixed bridge spans (west bridge and east bridge), additional alternatives to provide improved bicycle facilities were considered. These alternatives would include a reduction of the number of lanes across the bridge from four to three to facilitate additional space that could be striped for bicycle lanes. In this configuration, the cross section would include two 12-foot–wide vehicular traffic lanes and two seven-foot-wide bicycle lanes. The third central vehicular traffic lane would be utilized alternatively as an additional eastbound or westbound travel lane or as a left-turn lane.

Two potential lane configuration options were considered. In both options, the lane configuration includes:

- Along the East Bridge between the Fairhaven shore and Pope's Island, there would be two westbound lanes and one eastbound lane.
- Along the West Bridge and Middle Bridge between the New Bedford shore and Pope's Island, there would be two eastbound lanes and one westbound lane.

The two options vary along the Pope's Island segment. In the first option, the middle lane would be used as a left turn lane for eastbound traffic. In the second option, it would include alternating eastbound and westbound left turn "pockets." The two potential options identified for the Pope's Island segment as shown in Figures 3.25 and 3.26. Figure 3.27 shows two cross sections along the Middle Bridge and the Pope's Island segment that would result from this configuration. The cross section locations are indicated on Figures 3.25 and 3.26.

Figure 3.25 Option 1: Pope's Island Segment Eastbound Left-Turn Lane Configuration

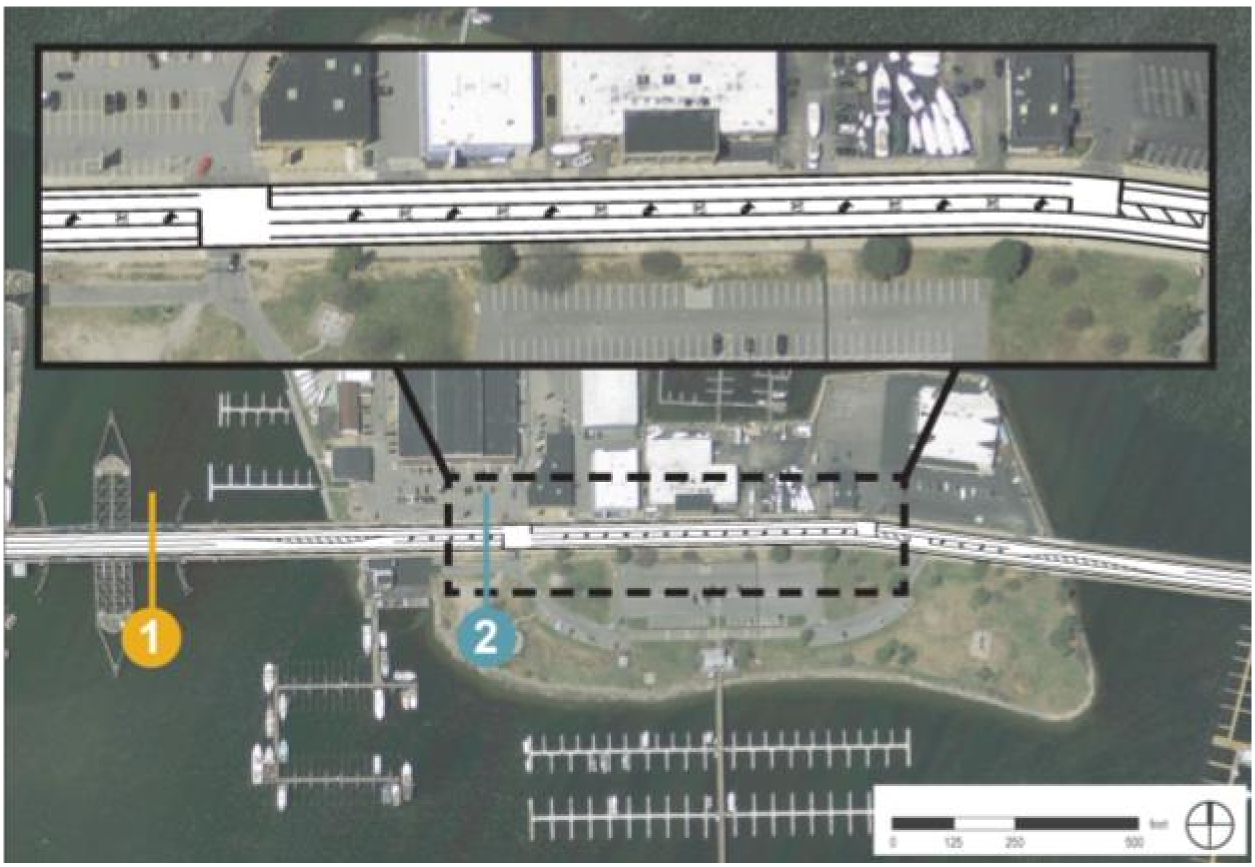


Figure 3.26 Option 2: Pope's Island Segment Left-Turn "Pockets" Lane Configuration

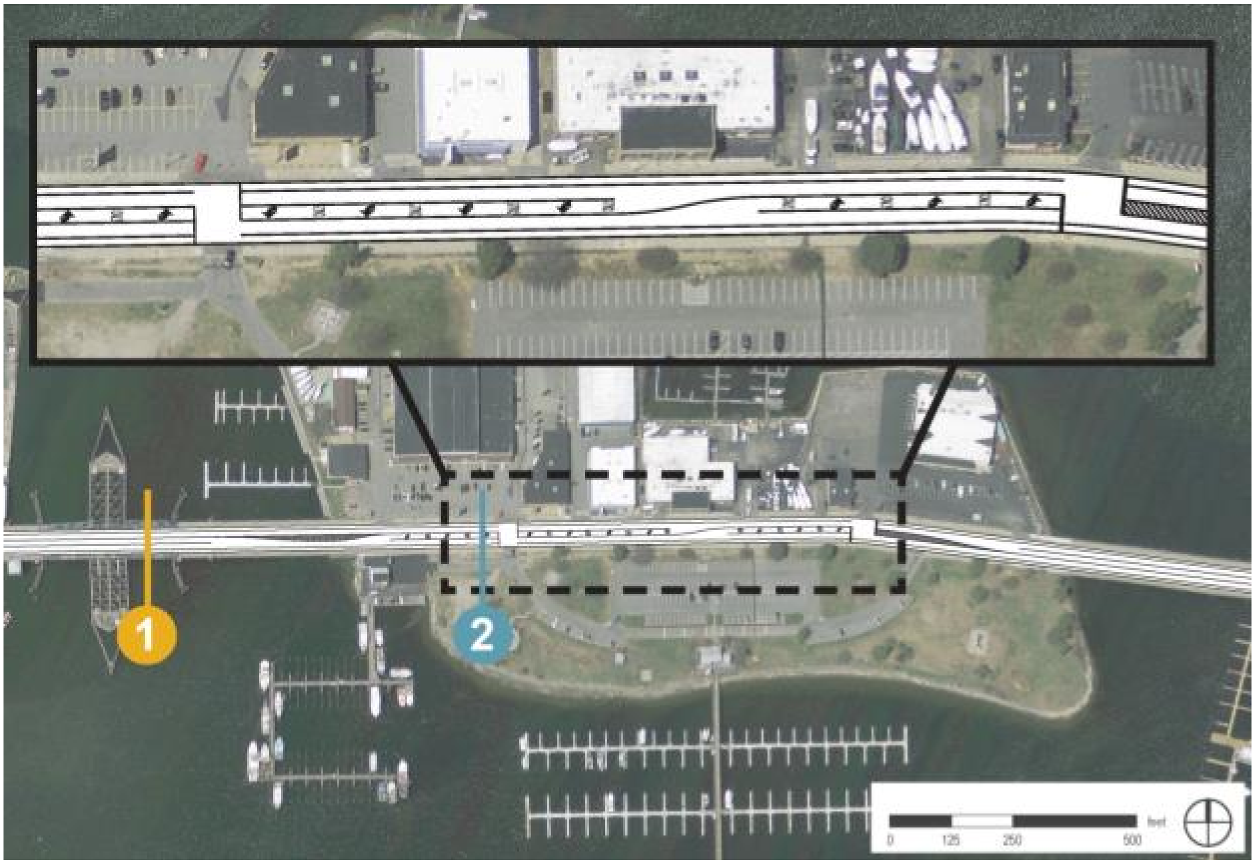
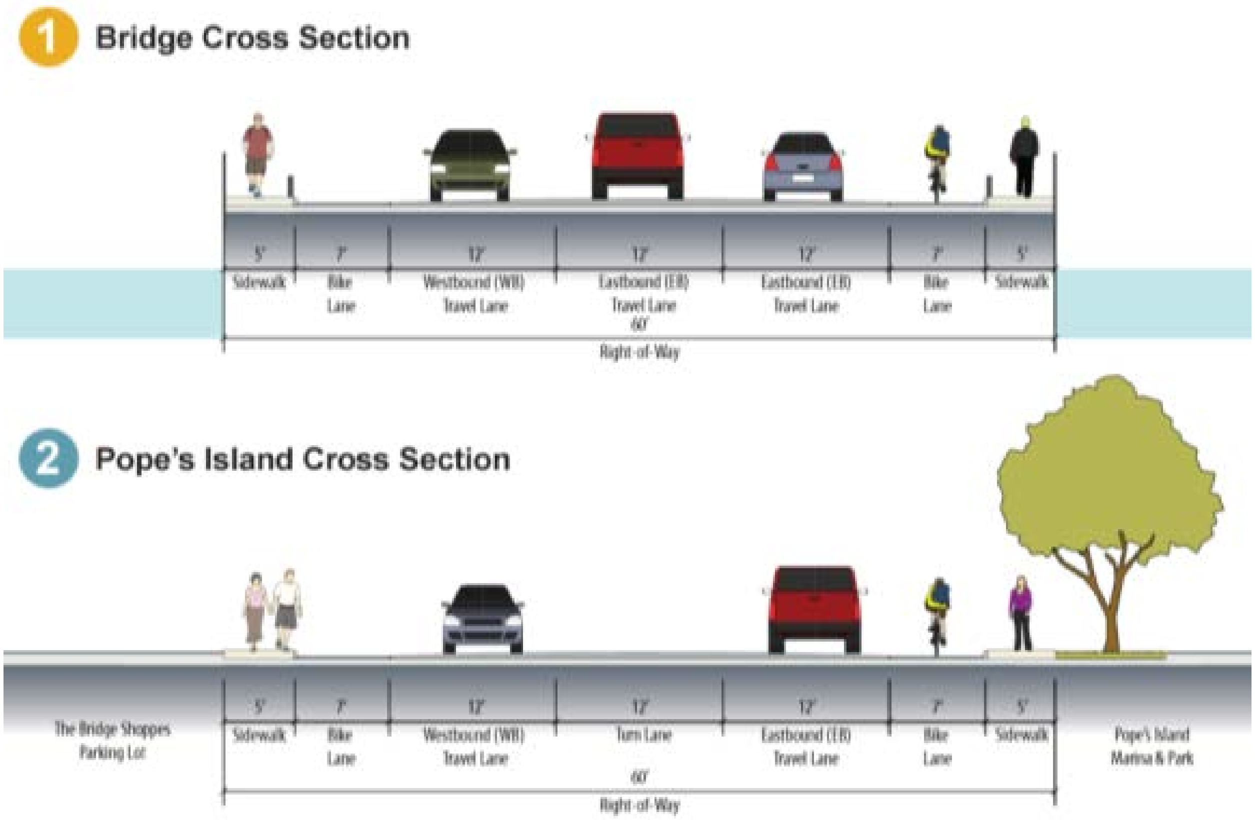


Figure 3.27 Three-lane Configuration Cross Sections



3.4 SUMMARY OF ALTERNATIVES

As part of the alternative development process, the preliminary short-, medium, and long-term alternatives were developed to address the study goals and objectives. The alternatives presented in this chapter underwent a complete analysis and evaluation that is presented in Chapter 4. Each long-term alternative is reviewed against the evaluation criteria prepared at the onset of the study. More detail on the short- and medium-term alternatives is also provided in Chapter 4.