Alternative 9 (Preferred Alternative)

Under Alternative 9, the potential for water quality impacts would be the same as Alternative 1, with an anticipated 33 percent reduction in impervious area compared to existing conditions.

3.2.2.2 Indirect Impacts

No-Action Alternative

No indirect water quality impacts are expected to result from the No-Action Alternative.

Action Alternatives

No indirect water quality impacts are expected to result from any of the Action Alternatives. Indirect impacts typically relate to other ancillary activities or physical changes that may occur as a result of a project that may affect water quality. If anything, the increased capacity to accommodate alternatives modes of travel via bicycling or walking as result of the Project may reduce the number of vehicle miles traveled for local commuters and, thus, reduce the related vehicle exhaust emissions that have been shown to contribute to the pollutant levels contained in rainwater.

3.2.3 Mitigation

The GSB Project is located within an Urbanized Area that is subject to the 2017 EPA MS4 Permit; however, since the Action Alternatives would reduce impervious area relative to what currently exists today, less stormwater would be generated and discharged to the Little Bay. In fact, the pollutant load calculations associated with the stormwater treatment measures (*e.g.*, gravel wetlands and extended wet detention ponds) included in the larger Newington-Dover, Spaulding Turnpike Improvements Project indicate that the overall project is expected to result in a pollutant load reduction, which exceeds the requirements of the antidegradation provisions of the state surface water quality regulations and the MS4 Permit. No additional mitigation measures are considered necessary with respect to post-construction stormwater discharges under future conditions.

During the construction period, the project will need to address the provisions of EPA's Construction General Permit (CGP) as more than 1 acre of disturbance is expected, including the anticipated construction laydown areas. NHDOT will require contractors to submit a Notice of Intent (NOI) and develop a Stormwater Pollution Prevention Plan (SWPPP) outlining the various protective and containment measures that will be deployed to limit any land-based erosion or discharge of stormwater and minimize potential temporary water quality impacts associated with the construction activities. NHDOT will also require contractors to describe the construction methods that will be used to minimize the disturbance of marine sediments during construction of the temporary causeways or, if necessary, installation of temporary coffer dams, including any potential dewatering activity. NHDOT will require contractors to have a qualified environmental and erosion control monitor onsite to inspect, document and report on daily activities within the proposed project limits and construction staging areas.

Where dewatering activity may be needed, NHDOT will require contractors to provide a dewatering and erosion control plan that is consistent with NPDES Remedial Permit for Dewatering Activity in New Hampshire including contingency measures for extreme wet weather events.

3.3 Floodplain and Hydrodynamics

Floodplains are a vital part of riverine and coastal systems by providing areas for flood storage during storms including tidal events. Floodplains are defined as, "the lowland and relatively flat areas adjoining inland and coastal waters, including, at a minimum that area subject to a one percent or greater chance of flooding in any given year" (44 CFR 9).

All federally funded projects are required to evaluate the potential impact on floodplains, per Executive Order (EO) 11988, *Floodplain Management* (May 24,1977). The regulation that sets forth the policy and procedures of this order is titled *Floodplain Management and Protection of Wetlands* (44 CFR 9) which is administered by the Federal Emergency Management Agency (FEMA). The New Hampshire Office of Strategic Initiatives (OSI) has developed three state model floodplain ordinances which require communities to (at a minimum) adopt the National Flood Insurance Program outlined in 44 CFR.

The City of Dover Code for Floodplain Development (Chapter 113-3) recognizes floodplain elevations as those delineated in the FEMA "Flood Insurance Study (FIS) for the County of Strafford, NH," originally published May 17, 2005 (revised September 30, 2015), with the accompanying series of Flood Insurance Rate Maps (FIRMs). The City of Dover Code prohibits building, encroachment, or other development within the floodplain along watercourses that have been designated as Regulatory Floodways. For watercourses not designated as Regulatory Floodways, the City of Dover permits development if it is demonstrated that such development will not increase the base flood elevation more than one foot at any point within the community.

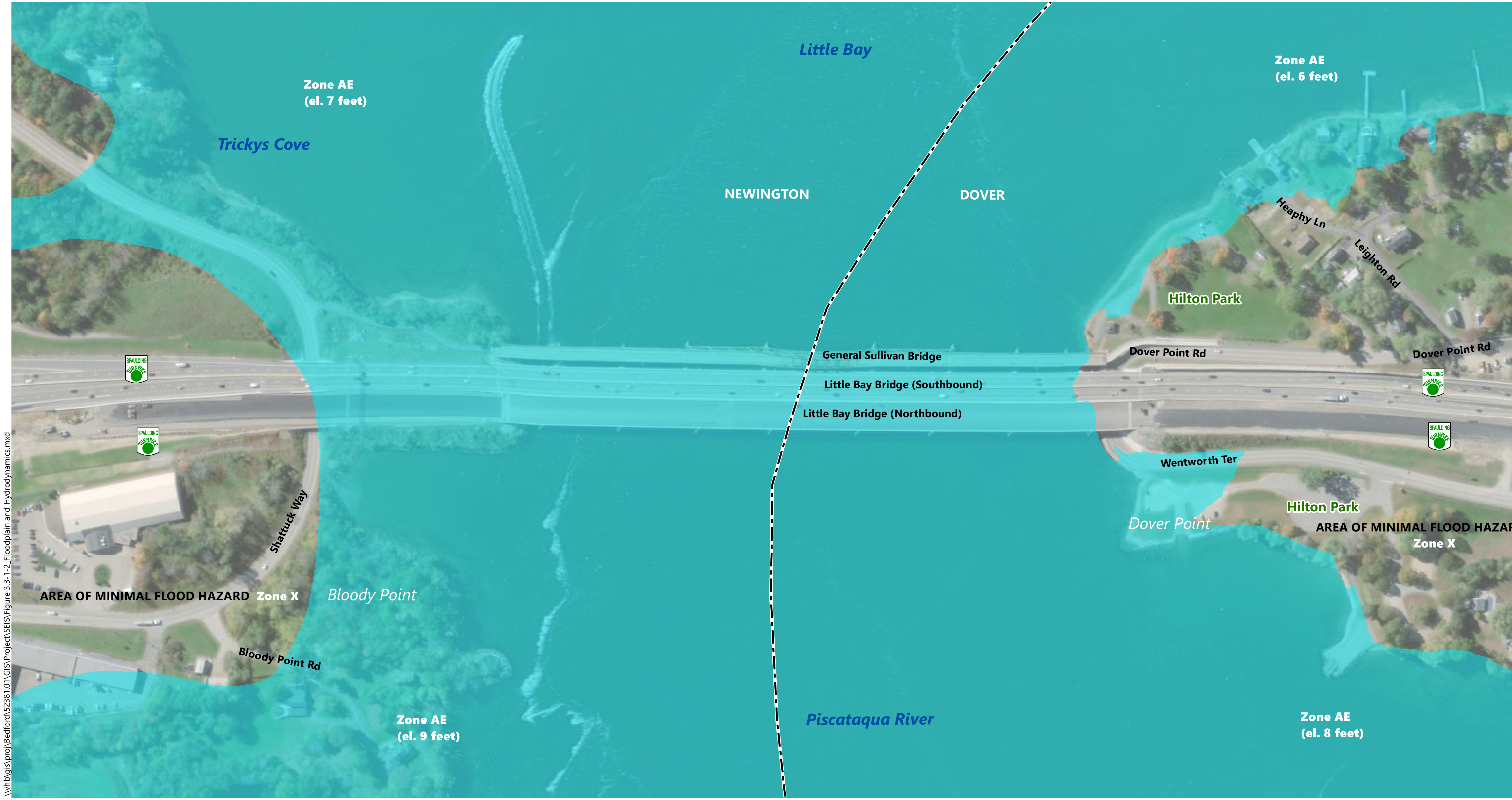
Since the publication of the 2007 FEIS, the Town of Newington has published information on floodplains, Article 17: Floodplain Management in April 2016. The Town of Newington adopted the requirements in the National Flood Insurance Program (44 CFR 59). The Newington zoning ordinance recognizes the lands designated as flood hazard areas defined in the FEMA FIS for the County of Rockingham, NH (dated January 29, 2021).

3.3.1 Affected Environment

3.3.1.1 Floodplains

Floodplain elevation data was examined for Dover and Newington, the two municipalities within the Study Area. Floodplain boundaries were determined using the most recent FEMA FIRMs for Dover and Newington. These maps show areas of potential risk from a 1-percent-annual-chance flood event, or also referred to as Zone AE (see **Figure 3.3-1**).

Figure 3.3-1



\\vhb\gis\proj\Bedford\52381.01\GIS\Project\SEIS\Figure 3.3-1-2_Floodplain and Hydrodynamics.mxd

0 125 250 500 Feet

Legend

Town Boundaries

1% Annual Chance Flood Hazard (FEMA)

Newington-Dover 11238S | Newington and Dover, NH

General Sullivan Bridge Supplemental EIS

Floodplain and Hydrodynamics

U.S. Department of Transportation
Federal Highway Administration

New Hampshire DOT
Department of Transportation

Source: VHB, NH GRANIT

Newington

Based on the FEMA FIRM maps for Rockingham County updated in 2021, there are two AE flood zones within the Study Area in Newington. The Piscataqua River 100-year flood zone along the entire Newington shoreline has an elevation of 8 feet (NAVD 88). This flood zone extends from the City of Portsmouth boundary north around Bloody Point and ending just east of the northbound LBB. The remaining portion of the flood zone along Newington's shoreline extends west from the northbound LBB to Trickys Cove and eventually into Great Bay; this area has a 100-year flood elevation of 7 feet (NAVD 88).

Dover

Based on the FEMA FIRM maps for Strafford County updated in 2015, there are two AE flood zones within the Study Area in Dover. The two zones in Dover include the area running south along the Piscataqua River and the shoreline along the Little Bay. The flood zone along the Piscataqua River begins at the southern portion of Pomeroy Cove and runs south around Hilton Park ending east of the LBB, this zone has an elevation of 8 feet (NAVD 88). The other flood zone in Dover begins just east of the LBB and extends west along the Dover coastline eventually turning north and ending on the opposite shoreline to Pomeroy Cove, this area has an elevation of 6 feet (NAVD 88).

3.3.1.2 Hydrodynamics

The UNH developed a hydrodynamic model of the Great Bay Piscataqua River Estuarine System which was presented in the 2007 FEIS. This hydrodynamic model predicted currents and tidal elevations in the Great Bay and Little Bay, including the areas around the LBB and GSB.[30] The model was used to predict the effects of changes to the bridge pier system on tidal dynamics in the area. In 2010, this model was revised to assess the proposed final design of the piers for the southbound LBB, which involved installation of drilled shaft piers rather than the connected pier foundations presented in the FEIS.[31] The 2010 modeling effort verified that the drilled shaft pier configuration was consistent with hydrodynamic effects presented in the 2007 FEIS.

The hydrodynamic models predicted that the construction of new piers for the LBB would result in a negligible increase in tidal maxima of 0.00 feet (0.1 inches) to 0.02 feet (0.24 inches) across the entirety of the Little Bay/Great Bay Estuary system. The completed conditions of the Spaulding Turnpike Improvements Project equaled a slight increase in current velocity within the 200-foot-wide navigation channel (between Piers 4 and 5) by a maximum of 5 percent. Data published in both analyses show the currents in the area of the LBBs are in the range of 10 to 12 feet per second at maximum values during both the ebb and flood tides, with the ebb values slightly greater than the flood values.

[30] Celikkol, B., T. Shevenell, Z. Aydinoglu, and J. Scott. 2006. *Hydrodynamic Computer Model Study of the Great Bay Estuarine System, New Hampshire, In Support of the Little Bay Bridge Project*. Computer Modeling Group, Ocean Engineering, University of New Hampshire, Durham, NH.

[31] AECOM. 2010. Hydraulic Modeling Analysis – Spaulding Turnpike Improvements, Little Bay Bridges Newington to Dover, New Hampshire. Prepared for VHB.

3.3.2 Environmental Consequences

For the GSB Project, impacts to floodplains and hydrodynamics were evaluated using data published by the UNH, State of New Hampshire, and FEMA. Potential impacts to floodplains and hydrodynamics would relate to the possible installation of new structures (*e.g.*, new piers) within Little Bay that would impact floodwater storage potential, tidal maxima, currents, and wave patterns.

3.3.2.1 Direct Impacts

Permanent direct impacts to floodplains and hydrodynamics would occur where new substructures are proposed in the tidal zone (*i.e.*, Alternatives 6 and 7). The removal and replacement of GSB Pier 1 would permanently alter conditions within Little Bay and placement of this structure would result in changes to the hydrodynamic conditions. Alternatives 1, 3, and 9 do not propose permanent changes to structures below the highest observable tide line; therefore, these three Action Alternatives would not permanently impact hydrodynamics within the Study Area.

Under all Action Alternatives, temporary direct impacts would occur due to the installation of structures needed to support access the GSB during construction (**Appendix D**). In Newington, the temporary causeway would extend approximately 260 feet north into Little Bay, adjacent to GSB piers and covering a total area of approximately 22,000 square feet. In Dover, the temporary causeway would extend south about 130 feet into Little Bay, also adjacent to GSB piers. The total area of this second causeway would be approximately 9,000 square feet. Trestles beyond the causeways would extend approximately 450 to 460 feet on the Newington side and 470 to 480 feet on the Dover side and would be held in place by piers.

The placement of causeways and trestles would temporarily alter floodplains and hydrodynamics on a localized scale in the Study Area, both at and directly adjacent to the temporary structures (*i.e.*, there would be no widespread impacts across Little Bay or Great Bay Estuary).[32] For the larger Spaulding Turnpike Improvements Project, the hydrodynamic models predicted a minor increase in tidal maxima of 0.00 feet (0.02 inches) to 0.03 feet (0.35 inches) across the entirety of Little Bay and Great Bay Estuary from the placement of temporary structures. The temporary structures would increase the current velocity (in feet per second) at a maximum of 10 percent through the main navigational channel (between GSB Piers 4 and 5).

During construction of any of the Action Alternatives, the causeways and trestles would divert floodwaters, tidal maxima, currents and wave patterns to other areas of the Little Bay/Great Bay Estuary. However, these temporary direct impacts would be minor due to the extensive area of the Little Bay and Great Bay Estuary, which has the ability to disperse the minor amount of displaced waters or waves over an expansive system of salt marsh, mud flat, and riverine habitat. The Great Bay National Estuarine Research Reserve (part of the Great Bay Estuary) encompasses 10,235 total acres, approximately 7,300 acres of open water and wetlands, the approximate areas

[32] It is important to note that the causeway and trestle structures are conceptual and will be finalized as the Project progresses to final design. As stated on the Preliminary Construction Impact Plans (**Appendix D**), temporary structures will be based on contractor means and methods for access.

occupied by the temporary causeways and trestles would equal 0.72 acre, or 0.007 percent of the total area of Great Bay National Estuarine Research Reserve. Post construction, coastal and marine habitats would be restored to pre-construction sloping and grading; conditions are anticipated to rebound to existing conditions.

No-Action Alternative

Under the No-Action Alternative, the existing conditions of floodplains and hydrodynamics in the Great Bay Estuary system would be unaltered. No permanent impacts would result from pier configuration changes, and there would be no temporary direct impacts from the causeway and trestle structures necessary for construction.[33]

Alternative 1

Permanent direct impacts to floodplains and hydrodynamics would not occur as part of Alternative 1 due to the lack of new or replacement infrastructure in the floodplain and tidal zone. Alternative 1 does not require the removal or replacement of pier structures in Little Bay.

Construction of Alternative 1 is expected to take approximately 3 years, the longest construction timeframe of the Action Alternatives. Minor temporary impacts to floodplains and hydrodynamics would occur from the installation of causeways and trestles which would remain in place through the duration of construction. The placement of causeways and trestles would result in minor changes in local tidal conditions during construction.

Alternative 3

Permanent direct impacts under Alternative 3 are the same as described in Alternative 1. Alternative 3 does not require the removal and replacement of pier structures in Little Bay; therefore, Alternative 3 would not result in any permanent impacts to floodplains or hydrodynamics.

Temporary impacts to floodplains and hydrodynamics would be similar to the impacts described in Alternative 1 (*i.e.*, shifts in flood storage potential and temporary changes to tidal maxima, currents and wave patterns at or directly adjacent to the temporary structures). However, the estimated timeframe to complete construction of Alternative 3 is less than the timeframe estimated to complete Alternative 1; Alternative 3 is estimated to take 2 years to construct.

Alternative 6

Alternative 6 would result in permanent direct impacts to floodplains and hydrodynamics in Little Bay and Great Bay Estuary system. Impacts to these resources would result from the removal of GSB Pier 1 and installation of a new pier to support the reconfigured approach span. GSB Piers 2 through 8 would be reused.

Temporary impacts to floodplains and hydrodynamics would be similar to the impacts described in Alternative 1 (*i.e.*, shifts in flood storage potential and temporary changes to tidal maxima, currents and wave patterns at- or directly adjacent to the temporary structures). However, the estimated timeframe to complete construction of Alternative 6 is 1.5 years - less than the timeframes estimated to complete Alternatives 1 and 3.

Alternative 7

Permanent direct impacts resulting from Alternative 7 on floodplains and hydrodynamics are the same as described in Alternative 6, from the removal of GSB Pier 1 and installation of a new pier. Temporary direct impacts on floodplains and hydrodynamics from Alternative 7 are also the same as described in Alternative 6. The estimated construction timeframe of Alternative 7 is 1.5 years.

Alternative 9 (Preferred Alternative)

Permanent direct impacts from Alternative 9 are the same as described in Alternative 1. Alternative 9 does not require the removal or replacement of pier structures in Little Bay.

Temporary direct impacts to floodplains and hydrodynamics are identical to the impacts described in Alternative 1 (*i.e.,* shifts in flood storage potential and temporary changes to tidal maxima, currents and wave patterns at or directly adjacent to the temporary structures). However, the estimated timeframe to complete construction of Alternative 9 is less than the timeframes estimated to complete Alternatives 1 and 3. The estimated construction timeframe is 1.5 years – equivalent to the estimated construction timeframes of Alternatives 6 and 7.

3.3.2.2 Indirect Impacts

Indirect impacts on floodplains and hydrodynamics are not anticipated as part of the Project. It is assumed that impacts occurring from any unforeseen future development within the Study Area would not impact floodplains or hydrodynamics because of federal and state regulations, and local policies and ordinances. Both the City of Dover and Town of Newington have adopted local policies aligned with FEMA policies.

3.3.3 Mitigation

The potential impacts to floodplains and hydrodynamics are considered minor in the context of the extensive volume of Little Bay, Piscataqua River and Great Bay. Direct impacts to the 100-year floodplain have been minimized in the conceptual designs developed to date and would continue to be considered as the Project progresses to final design.

Under all Action Alternatives, temporary direct impacts would result from the placement of the temporary stone causeways and trestles in Little Bay during construction. As the Project progresses into final design, the details on installation of the temporary structures would be determined and efforts would be made to further minimize the minor temporary impacts, where applicable.

[33] Note, however, that the USCG would require removal of the GSB if it is no longer used for transportation purposes. Removal of the bridge would require at least temporary impacts.