Appendix E – Greater Atlantic Regional Fisheries Office (GARFO) Coordination

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

Victoria F. Sheehan
Commissioner

William Cass, P.E.
Assistant Commissioner

January 23, 2019

Mike Johnson
Marine Habitat Resource Specialist
Greater Atlantic Regional Fisheries Office
NOAA Fisheries
55 Great Republic Drive
Gloucester, MA 01930

RE: Essential Fish Habitat Assessment Worksheet
Spaulding Turnpike / Little Bay Bridge: NHS-027-1(037), 11238S
Newington and Dover, New Hampshire

Dear Mr. Johnson:

The New Hampshire Department of Transportation (NHDOT) is providing this Essential Fish Habitat (EFH) Assessment information in support of proposed improvements to the General Sullivan Bridge over the Little Bay in Dover and Newington, New Hampshire. The proposed project [NHS-027-1(037)] is evaluating the rehabilitation or replacement of the General Sullivan Bridge (GSB), which was most recently used as a pedestrian bridge connecting Dover with Newington over the Little Bay. Based on the work that is anticipated to be completed to rehabilitate or replace the bridge, the project will likely involve in-water work within the Little Bay, which is designated as essential fish habitat (EFH) for several fish species. The following provides supplemental information about the proposed project and the in-water work that is anticipated to be conducted.

The GSB was built in 1934 and connected Newington and Dover, New Hampshire, over the Little Bay. Although originally designed to support two lanes of highway traffic over the mouth of the Little Bay, the bridge was closed to vehicular traffic in 1984, when the adjacent Little Bay Bridge, located east of the GSB, was completed. Now the bridge is even closed to pedestrian and bicycle traffic due to a recent inspection of the bridge completed in September 2018, which found significant additional deterioration of a critical floor beam under the bridge deck.

The condition of the GSB has been declining over the last few decades. To address this issue, options for the rehabilitation or replacement of the GSB were previously reviewed in a 2007 Final Environmental Impact Statement (FEIS) and a 2008 Record of Decision (ROD), which were produced by NHDOT and the Federal Highway Administration (FHWA) under the National Environmental Policy Act (NEPA). In the ROD, NHDOT and FHWA committed to maintain pedestrian/bicycle connectivity between Dover and Newington, and to accomplish that by rehabilitating the GSB. During development of the FEIS, you previously concurred with the findings of the DEIS and EFH Assessment that there should be minimal adverse effects to benthic flora and fauna and that there would be no permanent impacts to EFH (Mike Johnson email to William O'Donnell, dated November 21, 2006).

Since the 2008 ROD, further inspections and studies of the GSB condition were completed to prepare for the rehabilitation project. The information gathered by these inspections and studies revealed that the GSB was more deteriorated than originally thought, therefore bridge rehabilitation would have very high costs, high risks, and a limited life span. Therefore, NHDOT and FHWA determined to further evaluate rehabilitation and consider other options, leading to the preparation of a Supplemental Environmental Impact Statement (SEIS).

Of the various alternatives being considered in the SEIS, the preferred alternative that will be proposed to the public by NHDOT and FHWA is Alternative 9 – Superstructure Replacement (Girder Option), which involves complete

JOHN O. MORTON BUILDING • 7 HAZEN DRIVE • P.O. BOX 483 • CONCORD, NEW HAMPSHIRE 03302-0483
TELEPHONE: 603-271-3734 • FAX: 603-271-3914 • TDD: RELAY NH 1-800-735-2964 • INTERNET: WWW.NHDOT.COM

Of the various alternatives being considered in the SEIS, the preferred alternative that will be proposed to the public by NHDOT and FHWA is Alternative 9 – Superstructure Replacement (Girder Option), which involves complete removal and replacement of the GSB superstructure. Under alternative 9, the GSB superstructure would be replaced with a steel girder system with a structural steel frame extending from the bottom of the girders to the top of the existing GSB piers. Alternative 9 would reuse the existing piers without requiring significant modifications. Plans of the preferred alternative are provided, attached.

Construction of the preferred alternative is expected to take approximately 18 months. Construction would begin with a one- to two-week period of installing temporary causeways and trestles west of the existing GSB for a staging and equipment access work pad during the bridge replacement work. The bridge would be removed and replaced using the causeways, trestles, and water craft. Upon completion of the bridge replacement, the causeways and trestles would be removed and the area restored to pre-construction conditions, which is anticipated to take approximately one to two weeks. The causeways and trestles are considered a temporary impact within the Little Bay and are the only in-water work that is proposed. We've attached a plan that depicts the construction phase impacts, but note that these plans are for planning purposes only and may be modified during construction if required to allow for safe and efficient contractor access.

Upon completing the EFH worksheet, the NHDOT and FHWA determined that the preferred alternative will not have a substantial adverse effect on EFH. Attached is the EFH assessment worksheet and supplemental information to support the determination of impact. FHWA and NHDOT respectfully request your concurrence with our finding that there would be no substantial adverse effects to EFH or trust resources as a result of the replacement of the GSB over Little Bay, and that the submitted documentation satisfies the requirements for an abbreviated EFH consultation. Please contact me at (603) 271-4044 if you have any questions. We look forward to coordinating with you on this project.

Sincerely,

Marc G. Laurin
Senior Environmental Manager
Room 109 – Tel (603) 271-4044
E-mail – marc.laurin@dot.nh.gov

Attachments:
EFH Assessment Worksheet
References List
Table 1 – Habitat Conditions and Suitability Assessment for EFH Species Within Great Bay
Table 2 – Habitat Conditions and Suitability Assessment for Additional EFH Species Present on EFH Mapper
Figure 1 – USGS Location Map
Figure 2 – Essential Fish Habitat Study Area
Figure 3 – Alternative 9 Conceptual Design Rendering
General Sullivan Bridge Existing Condition Plan
Alternative 9 – Draft Steel Frame Alternatives Elevation
Alternative 9 – Draft Typical Elevation and Section
Alternative 9 – Draft Construction Impact Plan

cc: Zach Jylkka, NOAA
Keith Cota, NHDOT
Jamie Sikora, FHWA
P. Walker, VHB
G. Goodrich, VHB

EFH ASSESSMENT WORKSHEET FOR FEDERAL AGENCIES (modified 3/2016)

PROJECT NAME: Newington-Dover General Sullivan Bridge (referred to as "Project" throughout the worksheet)

DATE: 01/23/2019

PROJECT NO.: NHDOT: 11238S, FHWA: NHS-027-1(37)

LOCATION (Water body, county, physical address):

Great Bay estuarine system, crossing the Little Bay and connecting Dover and Newington, NH. The General Sullivan Bridge (GSB) is located west of the existing Little Bay Bridge connecting Dover and Newington, NH.

PREPARER: Elise Edwards & Lindsay Matras, VHB

Step 1: Use NOAA's EFH Mapper to generate the list of designated EFH for federally-managed species and life stages for the geographic area of interest. Use this list as part of the initial screening process to determine if EFH for those species occurs in the vicinity of the proposed action. The list can be included as an attachment to the worksheet. Make a preliminary determination on the need to conduct an EFH consultation.

1. INITIAL CONSIDERATIONS

EFH Designations	Yes	No
Is the action located in or adjacent to EFH designated for eggs? List the species: Atlantic cod (Gadus morhua), Haddock (Melanogrammus aeglefinus), Pollock (Pollachius virens), White Hake (Urophycis tenuis), Winter Flounder (Pleuronectes americanus), Yellowtail flounder (Pleuronectese ferruginea), Windowpane Flounder (Scopthalmus aquosus), Atlantic Halibut (Hippoglossus hippoglossus), Atlantic Mackerel (Scomber scrombrus), and Atlantic wolffish (Anarhichas lupus). Note: This information was obtained from the NOAA EFH Mapper as well as the NMFS Northeast Regional Office's table named "Summary of Essential Fish Habitat and General Habitat Parameters for Federally Managed Species."	✓	
Is the action located in or adjacent to EFH designated for larvae? List the species: Atlantic cod (Gadus morhua), Haddock (Melanogrammus aeglefinus), Pollock (Pollachius virens), Winter Flounder (Pleuronectes americanus), Yellowtail flounder (Pleuronectese ferruginea), Windowpane Flounder (Scopthalmus aquosus),Atlantic Halibut (Hippoglossus hippoglossus), Atlantic sea herring (Clupea harengus), Atlantic Mackerel (Scomber scrombrus), and Atlantic wolffish (Anarhichas lupus). Note: This information was obtained from the NOAA EFH Mapper as well as the NMFS Northeast Regional Office's table named "Summary of Essential Fish Habitat and General Habitat Parameters for Federally Managed Species."	✓	
Is the action located in or adjacent to EFH designated for juveniles? List the species: Atlantic salmon (Salmo salar), Pollock (Pollachius virens), Red Hake (Urophycis chuss),White Hake (Urophycis tenuis),Winter Flounder (Pleuronectes americanus), Windowpane Flounder (Scopthalmus aquosus),Atlantic Halibut (Hippoglossus hippoglossus), Atlantic sea scallop (Placopecten magellanicus), Atlantic sea herring (Clupea harengus), bluefish (Pomatomus saltatrix), Atlantic Mackerel (Scomber scrombrus), and Atlantic wolffish (Anarhichas lupus). Note: This information was obtained from the NOAA EFH Mapper as well as the NMFS Northeast Regional Office's table named "Summary of Essential Fish Habitat and General Habitat Parameters for Federally Managed Species."	✓	

Is the action located in or adjacent to EFH designated for adults or spawning adults? List the species: Red Hake (Urophycis chuss),White Hake (Urophycis tenuis),Winter Flounder (Pleuronectes americanus), Windowpane Flounder (Scopthalmus aquosus),Atlantic Halibut (Hippoglossus hippoglossus), Atlantic sea scallop (Placopecten magellanicus), bluefish (Pomatomus saltatrix), and Atlantic wolffish (Anarhichas lupus). Note: This information was obtained from the NOAA EFH Mapper as well as the NMFS Northeast Regional Office's table named "Summary of Essential Fish Habitat and General Habitat Parameters for Federally Managed Species."	✓	

If you answered 'no' to all questions above, then an EFH consultation is not required - go to Section 5.

If you answered 'yes' to any of the above questions, proceed to Section 2 and complete the remainder of the worksheet.

Step 2: In order to assess impacts, it is critical to know the habitat characteristics of the site before the activity is undertaken. Use existing information, to the extent possible, in answering these questions. Identify the sources of the information provided and provide as much description as available. These should not be yes or no answers. Please note that there may be circumstances in which new information must be collected to appropriately characterize the site and assess impacts. Project plans that show the location and extent of sensitive habitats, as well as water depths, the HTL, MHW and MLW should be provided.

2. SITE CHARACTERISTICS

Site Characteristics	Description
Is the site intertidal, subtidal, or water column?	The project area is located within all three of these zones in the Little Bay of Dover/Newington, New Hampshire.
What are the sediment characteristics?	Subtidal areas, where temporary work is proposed to be conducted within the Little Bay, mainly consists of rocky bottom types ranging from small gravel to large boulders, interspersed with widely scattered and small patches of soft sediments (Grizzle and Brodeur, 2003).
Is there submerged aquatic vegetation (SAV) at or adjacent to project site? If so describe the SAV species and spatial extent.	There is no eelgrass in the vicinity of the project based on field work conducted in the project area by UNH (Grizzle and Brodeur, 2003). However, kelp beds and macroalgal beds are located in the subtidal zone near the Newington and Dover coastlines within the project area (See Figure 2). The closest mapped eelgrass locations according to the NH Coastal Viewer the nearest mapped eel grass bed to the project area is located over 500 feet away. Some of the mapped SAV will be impacted by the temporary placement of the causeways and trestles, however populations are expected to rebound once the causeways and trestles are removed.
Are there wetlands present on or adjacent to the site? If so, describe the spatial extent and vegetation types.	According to the National Wetlands Inventory, jurisdictional estuarine and marine deepwater wetlands are present within the main channel of Little Bay under the General Sullivan Bridge (GSB). There is also a small palustrine wetland on the coastline of Little Bay near the abutments of the GSB in Newington that will be impacted during construction by a temporary access road.

Is there shellfish present at or adjacent to the project site? If so, please describe the spatial extent and species present.	Shellfish are present within and adjacent to the project area. According to the NH Coastal Viewer, a +/- 2.8 acre blue mussel shellfish bed is located in Little Bay along the Dover Point coastline on the northern side of the project. This bed was identified by the NHDES Shellfish Program in 2013 (Morrissey and Nash, 2013). Temporary impacts to shellfish may occur from sediment disturbance during the installation and removal of the causeways and trestles at the beginning and end of construction. The next closest shellfish bed is a very small American oyster aquaculture site located about 0.5 mile west of the project area, as well as shellfish aquaculture sites located about one mile west of the project area. An oyster restoration site is located about 1.5 miles west of the project.
Are there mudflats present at or adjacent to the project site? If so please describe the spatial extent.	Mudflats were mapped within the project area by UNH (Grizzle and Brodeur, 2003) - refer to Figure 2. Based on this mapping, only a small amount of mudflat may be temporarily impacted, if any, by the placement of causeways and trestles during construction since they are located along the outside edge of the project area. Areas that are temporarily disturbed will be restored to existing conditions upon project completion as much as practicable.
Is there rocky or cobble bottom habitat present at or adjacent to the project site? If so, please describe the spatial extent.	According to the study completed by UNH (Grizzle and Brodeur, 2003), rocky bottom habitats exist within and adjacent to the project area. Figure 2 includes the locations of rocky bottom habitat present at/adjacent to the project area. Rocky/cobble bottom habitat within the project area is concentrated near the shoreline of the Little Bay along the Newington and Dover coastlines. No permanent impacts to rocky or cobble bottom habitat are anticipated as a result of the proposed project, however there will be temporary impact to these habitat types by the placement of the causeways and trestles during construction.
Is Habitat Area of Particular Concern (HAPC) designated at or near the site? If so for which species, what type habitat type, size, characteristics?	A Habitat Areas of Particular Concern (HAPC) was designated in January 2018 for juvenile cod. This HAPC extends down almost the entire coastline of Maine, New Hampshire, Massachusetts, and Rhode Island. The HAPC includes rocky or cobble bottoms between 0 to 20 meters in depth along these coastlines, and provides protection to juvenile cod as well as other species that may occupy these areas. The juvenile cod HAPC will be temporarily impacted by the proposed placement of the causeways and trestles. Upon removal of the causeways and trestles the rocky/cobble floor of the Little Bay will be restored to existing conditions to the maximum extent practicable to avoid long-term impacts to the juvenile cod HAPC.
What is the typical salinity, depth and water temperature regime/range?	Salinity data from the NHDES Environmental Monitoring Database of water samples taken within the vicinity of the GSB from 1996 to 2008 indicate that the salinity of the Little Bay in this area varies from 10 to 34 ppt with an average of 25 ppt. Water temperatures within the same location vary seasonally, averaging about 5.6ºC in the winter months (November to April) and about 15ºC in the summer months (May to October). Overall the temperature in this location ranges from 0.3ºC to 24ºC. (Data obtained from the NHDES Environmental Monitoring Database on December 5, 2018.)
What is the normal frequency of site disturbance, both natural and man-made?	Regarding man-made disturbance, Little Bay is an active navigational channel from the Piscataqua River to Great Bay and experiences boat traffic at varying levels throughout the year. Natural disturbance within the project area of the Little Bay is caused by strong force of tidal wave action from waters leaving/entering Little and Great Bay to/from the Piscataqua Estuary underneath the General Sullivan and Little Bay Bridges. This narrow point in the waterbody complex has resulted in diverse habitat types within the vicinity of the bridges.
What is the area of proposed impact (work footprint & far afield)?	The project area footprint is currently defined as the GSB and surrounding Little Bay waterbody within 2,000 feet of the bridge, as well as land areas approximately 800 feet north and south of the Newington and Dover bridge abutments. The in-water work proposed to occur as part of the project involves the installation and removal of causeways and trestles at the start and end of the project. These will serve as platforms from which the bridge replacement work can be conducted. These structures will remain in place throughout the duration of the proposed work, which is expected to be approximately 18 months. The proposed bridge replacement will re-use the existing piers, which will be repointed; only the superstructure of the bridge will be replaced. Refer to the attached project plans for more information. The exact location of the temporary causeways and trestles are pending based on the contractor's discretion.

<u>Step 3</u>: This section is used to describe the anticipated impacts from the proposed action on the physical/chemical/biological environment at the project site and areas adjacent to the site that may be affected.

3. DESCRIPTION OF IMPACTS

Impacts	Y	N	Description
Nature and duration of activity(s). Clearly describe the activities proposed and the duration of any disturbances.			Construction along the GSB is expected to take approximately 18 months. Impacts affecting EFH include the temporary installment of two causeways and trestles which will remain in place throughout construction. Therefore, these temporary impacts will only occur at the beginning and end of the proposed project. Other temporary affects on EFH as the result of construction include a possible increase in turbidity from the placement and removal of the causeways and trestles. Additionally, installation and removal of the causeways and trestles, as well as the removal of the existing bridge structure and construction of the new bridge will result in acoustic impacts within the Little Bay.
Will the benthic community be disturbed? If no, why not? If yes, describe in detail how the benthos will be impacted.	✓		The project will temporarily disturb the benthic community through the installation of two causeways and trestles, which will be installed at the beginning of construction and removed at the end. The causeways will be approximately 260 feet long on the Newington side of the bridge and 130 feet long on the Dover side of the bridge. The causeways will provide a top width of 30-feet for construction on the approach spans of the bridge. Based on a 1.5:1 side slope, the causeways are expected to be approximately 70 feet wide at their bottom, for a total of approximately 0.75 acre of disturbed area. Additionally, placement of trestles beyond the causeways constructed on the Dover and Newington side of the bridge will be used during construction. The trestles will be approximately 450 to 460 feet long from the Newington side and 470 to 480 feet on the Dover side. The trestles will be supported by pile bents. This infrastructure will be removed at the end of the project work and the benthic communities are presumed to rebound in the impacted area. See the attached Construction Impact Plan for more information.
Will SAV be impacted? If no, why not? If yes, describe in detail how the SAV will be impacted. Consider both direct and indirect impacts. Provide details of any SAV survey conducted at the site.	✓		The study conducted by UNH (Grizzle and Brodeau, 2003) of marine intertidal and subtidal habitats and bottom types identified areas of SAV within the project area. The study conducted included a survey for kelp beds and macroalgal beds (refer to Figure 2). Kelp beds and macroalgal beds will be temporarily impacted by the placement of causeways and trestles in the project area. Additionally, the NH Coastal Viewer was used to identify the nearest eel grass bed to the project area, which is over 500 feet away. No direct or indirect impacts are anticipated to occur to eelgrass. The causeways will be constructed about 130 feet to 270 feet into the Little Bay parallel to the GSB, from the Dover and Newington sides, respectively. Construction of the causeways will require temporarily placing fill material into the Little Bay, resulting in about 0.75 acre of impact. Of this total, about 30 percent is mapped as kelp/microalgal beds. The temporary trestles proposed to be constructed beyond the causeways will impact the bed of the Little Bay where the pile bents (or similar method) will be placed to support the trestles, resulting in additional temporary impact to known locations of kelp/microalgal beds. Upon removal of the temporary structures, existing SAV in these areas are anticipated to rebound upon project completion.
Will salt marsh habitat be impacted? If no, why not? If yes, describe in detail how wetlands will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?		✓	No salt marsh habitat will be impacted by the project. The study conducted by UNH in 2003 included mapping salt marsh habitat within or in close proximity to the project area. The study did not reveal any salt marsh habitats within the project area (refer to Figure 2). (Grizzle and Brodeau, 2003).

Will mudflat habitat be impacted? If no, why not? If yes, describe in detail how mudflats will be impacted. What is the aerial extent of the impacts? Are the effects temporary or permanent?	✓		Mudflats are present adjacent to the project site, as shown in Figure 2, however none are anticipated to be within the project construction limits. However, since they are located along the outside edge of the anticipated construction limits a small amount of mudflats may be temporarily impacted, if any, by the placement of the causeways and trestles during construction. The causeways and trestles are anticipated to be in place for approximately 18 months.
Will shellfish habitat be impacted? If so, provide in detail how the shellfish habitat will be impacted. What is the aerial extent of the impact? Provide details of any shellfish survey conducted at the site.	✓		Areas of shellfish habitat were identified along the coastline of Newington and Dover within the project area by NHDES (Morrissey and Nash, 2013). The study identified blue mussel habitat around Dover Point under the bridge. The project is within the Shellfish Water Classification Prohibited/Safety Zone of estuarine waters with respect to shellfish harvesting according to the NH Coastal Viewer. The closest shellfish aquaculture site is a very small American oyster aquaculture site located approximately 0.5 mile west of the project area, as well as shellfish aquaculture sites located approximately one mile west of the project area. While the project would have temporary impacts on the Dover Point blue mussel bed as a result of the placement and removal of the causeway and trestle (approximately 0.2 acres), there would be no impacts to the shellfish aquaculture sites located near the project. During this in-water work, standard marine construction BMPs will be implemented wherever feasible to mitigate the potential for suspension of sediments and consequent siltation.
Will hard bottom (rocky, cobble, gravel) habitat be impacted at the site? If so, provide in detail how the hard bottom will be impacted. What is the aerial extent of the impact?	✓		A study of marine intertidal and subtidal bottom types was conducted by UNH (Grizzle and Brodeau, 2003) (refer to Figure 2). According to the study, rocky/cobble bottom habitat within the project area are concentrated near the shoreline of the Little Bay along the Newington and Dover coastlines. There will be no permanent impacts to rocky or cobble bottom habitat, however there will be temporary impact to these habitat types by the placement of the causeways and trestles during construction.
Will sediments be altered and/or sedimentation rates change? If no, why not? If yes, describe how.	✓		The in-water work associated with the project involves the placement of temporary causeways and trestles. As a result of the causeway and trestle installation, the sediment along the estuary floor of Little Bay will be altered and sedimentation rates will change while the causeways and trestles are in place. Once the causeways and trestles are in place, sedimentation rates are not expected to change until their removal. During the installation and removal of these structures, mitigation measures will be used, which may include the use of turbidity curtains, to ensure there are no major impacts related to sedimentation.
Will turbidity increase? If no, why not? If yes, describe the causes, the extent of the effects, and the duration.	✓		Turbidity will increase temporarily during placement and removal of the causeways/trestles in preparation for the bridge demolition and construction efforts, and at the conclusion of construction. The causeways and trestles are anticipated to take approximately one to two weeks to install and remove. Mitigation measures, such as turbidity curtains, may be placed around the area of in-water impact if determined necessary to prevent sedimentation and turbidity effects.

Will water depth change? What are the current and proposed depths?		✓	Since the GSB will be replaced on existing piers there will be no change to currents or depths. The hydrodynamic model completed for the original EIS (Celikkol et. al, 2006) investigated potential changes to tidal flow due to bridge pier modification from the Little Bay Bridge construction (located next to the GSB). This model predicted that the modifications will result in little change to the tidal flow within Little Bay. Since the GSB replacement will use existing piers, the project will not permanently change water depth nor the current of Little Bay. Low tide depths in the deepest portion of the project area range from approximately 30 to 34 ft (9.1 to 10.4 meters). Normal tidal range in this portion of the estuary is about 8 ft (2.4 meters). The temporary placement of the causeways/trestle may result in minor, localized changes to the water depth and current of Little Bay, but these changes will be insignificant and temporary.
Will contaminants be released into sediments or water column? If yes, describe the nature of the contaminants and the extent of the effects.	✓		Although sediment samples taken from 1973-1994 revealed that lead and chromium concentrations from Trickys Cove and chromium concentrations in Pomeroy Cove are relatively high (Jones, 2000), no work is proposed within Trickys Cove and therefore contaminants from this area will not be disturbed. The project proposes to temporarily disturb bottom sediments from the installation and removal of the causeways and trestles. The causeway/trestles will be temporarily installed and will involve placement of fill material for the causeways and setting of pile bents for the trestles. Sediment disturbance within the Little Bay will be minimized to the greatest extent practicable during the installation and removal of the temporary causeways/trestles.
Will tidal flow, currents, or wave patterns be altered? If no, why not? If yes, describe in detail how.	✓		The placements of the causeways and trestles will temporarily alter currents at a localized scale and will cause minor changes in tidal velocities. Based on field measurements at multiple locations and depths over several tidal cycles, maximum speeds of about 6 knots (9 feet per second) occurred on the ebb tide with fastest flows in the deeper waters along the south (Newington) side. Speeds up to about 4 knots (6 feet per second) were recorded during flooding tides in the shallow subtidal areas along the north (Dover Point) side. (Mathieson, et al. 1983) Current flows in the area were complex and had a wide range of directional components and speeds during a tidal cycle. Tidal flows, currents and wave patterns are not expected to be permanently altered, there will be no new permanent structure associated with the project and all changes to the tidal flow, currents, and wave patterns will be temporary and minor.
Will water quality be altered? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration of the impact.		✓	With the use of standard BMPs for marine construction, no significant water quality degradation of any EFH is expected. Any impacts are likely to be limited to a temporary increase in turbidity and suspended solids. Because of substantial tidal exchange and normal river flows, water quality at the project site is expected to return quickly to its pre-disturbance condition. Minimal, temporary water quality impacts may occur during the in-water construction phases of the project since the temporary causeways and trestles may disturb bottom sediments. This in-water work to install and remove the causeways/trestle is anticipated to take approximately one to two weeks at the start and end of the bridge replacement work.
Will ambient noise levels change? If no, why not? If yes, describe in detail how. If the effects are temporary, describe the duration and degree of impact.		✓	Ambient noise levels will change temporarily during construction. Ambient noise levels will be related to causeway installation and pile driving (if needed) to install the temporary trestles over a one to two week period. Based on previous experience in this location (i.e., the expansion of the Little Bay Bridge), it is unlikely that pile driving will be necessary since there is limited sediment depth in this area. Rather, the temporary trestle will likely be anchored using pile "stingers" or similar anchor types.
Does the action have the potential to impact prey species of federally managed fish with EFH designations?	✓		The action has the potential to have indirect and temporary impact to prey species of federally managed fish species. No measurable population impacts are anticipated; prey species are expected to return to existing conditions once construction is complete and the habitat has been restored.

Step 4: This section is used to evaluate the consequences of the proposed action on the functions and values of EFH as well as the vulnerability of the EFH species and their life stages. Identify which species (from the list generated in Step 1) will be adversely impacted from the action. Assessment of EFH impacts should be based upon the site characteristics identified in Step 2 and the nature of the impacts described within Step 3. NOAA's EFH Mapper should be used during this assessment to determine the ecological parameters/ preferences associated with each species listed and the potential impact to those parameters.

4. EFH ASSESSMENT			
Functions and Values	**Y**	**N**	**Describe habitat type, species and life stages to be adversely impacted**
Will functions and values of EFH be impacted for:			
Spawning **If yes, describe in detail how, and for which species. Describe how adverse effects will be avoided and minimized.**	✓		Spawning habitat may be affected for windowpane flounder and winter flounder within the project area (refer to Table 1). Spawning habitat for both species includes bottom habitats of mud or fine grained sand with depths less than 6 meters. This type of habitat exists within the project area. Adverse effects will be avoided by time of year restrictions for all in-water activities or activities that may affect the spawning habitats of these flounder species, including acoustic effects and any work that will increase turbidity or sedimentation.
Nursery **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**	✓		Four species nursery habitats will be impacted by project activities, specifically in regard to the placement of the temporary causeways and trestles. The project area may include white hake, winter flounder, and windowpane flounder surface water nursery habitat, which may be impacted by any in water work. Winter flounder nursery habitats are bottom habitat with sand/mud/gravel substrates, which may be impacted by impacted by the installation and removal of the causeways and trestles. Lastly, nursery habitat for Atlantic mackerel may be impacted by the construction activities since the nursery habitat is located in pelagic or estuary waters. Impacts to these nursery habitats will be avoided/minimized through time of year restrictions for all in water work.
Forage **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**	✓		All species listed in Table 1 and Table 2, attached, potentially have foraging habitat within the project area since these species are moving through the Little Bay or seasonally inhabiting the project area. Foraging habitat impacts will most likely result from the placement and removal of the temporary causeways and trestles over a one to two week period. The intertidal and subtidal habitats within the project area will be disturbed directly in the causeways/trestles locations. Additionally, overall disturbance during the installation and removal of the temporary structures may impact foraging activities within the immediate vicinity of these activities. (Table 1 and Table 2 were created using the EFH Mapper as well as a table from the NOAA - NMFS "Summary of Essential Fish Habitat (EFH) and General Habitat Parameters for Federally Managed Species.")
Shelter **If yes, describe in detail how and for which species. Describe how adverse effects will be avoided and minimized.**	✓		Shelter functions and values may be impacted in the project area for species that use cobble/gravel substrate or the SAV to find shelter and avoid predation. These shelter habitats may be temporarily impacted by the placement of the causeways/trestles. More specifically, shelter habitats for juvenile red hake may be temporarily impacted because this species uses bottom habitats such as mud substrates with depressions and macroalgae as shelter habitats. The project will minimize effects to shelter habitats by limiting the scope of in-water work to the areas identified on the project plans.

Will impacts be temporary or permanent? Please indicate in description box and describe the duration of the impacts.			All in-water disturbance and impacts related to the proposed project will be temporary. These temporary impacts are related to the placement of the construction access causeways and trestles, and the resulting sedimentation, acoustic effects, and habitat disturbance that the installation and removal of these structures, over one to two week periods, will cause. The causeways and trestles will be present for the duration of the project construction, which is expected to be approximately 18 months.
Will compensatory mitigation be used? If no, why not? Describe plans for mitigation and how this will offset impacts to EFH. Include a conceptual compensatory mitigation plan, if applicable.		✓	No compensatory mitigation will be used as part of this project. All impacts to EFH will be temporary and standard best management practices (BMPs) for marine construction will be used for this project, wherever feasible. BMPs will be implemented to mitigate the potential for suspension of sediments and consequent siltation during in-water construction. If needed, turbidity curtains may be used to reduce turbidity and prevent sedimentation. A well defined drainage and erosion control plan for all shoreside construction will be implemented which will include BMPs to control and capture silt-laden stormwater runoff. The contractor will be directed to divert runoff to temporary erosion check dams or to capture runoff using silt fences, hay bales, silt socks, mulch filter berms, or temporary detention basins. Areas of soil disturbance will be seeded and mulched as quickly as possible after initial grading. With these measures, erosion during construction is expected to be minimal. Standard BMPs will be used for in-water and shoreside construction to address potential fuel or oil spills from the construction equipment. An emergency response plan for all spills will be in place prior to construction. Finally, the contractor will be required to inspect all construction BMPs on a daily basis to ensure that they are properly installed and maintained.

Step 5: This section provides the federal agency's determination on the degree of impact to EFH from the proposed action. The EFH determination also dictates the type of EFH consultation that will be required with NOAA Fisheries.

Please note: if information provided in the worksheet is insufficient to allow NOAA Fisheries to complete the EFH consultation additional information will be requested.

5. DETERMINATION OF IMPACT		
Federal Agency's EFH Determination		
Overall degree of adverse effects on EFH (not including compensatory mitigation) will be: **(check the appropriate statement)**		**There is no adverse effect on EFH or no EFH is designated at the project site.** **EFH Consultation is not required.**
	✓	**The adverse effect on EFH is not substantial. This means that the adverse effects are either no more than minimal, temporary, or that they can be alleviated with minor project modifications or conservation recommendations.** **This is a request for an abbreviated EFH consultation.**
		The adverse effect on EFH is substantial. **This is a request for an expanded EFH consultation.**

Step 6: Consultation with NOAA Fisheries may also be required if the proposed action results in adverse impacts to other NOAA-trust resources, such as anadromous fish, shellfish, crustaceans, or their habitats as part of the Fish and Wildlife Coordination Act Some examples of other NOAA-trust resources are listed below. Inquiries regarding potential impacts to marine mammals or threatened/endangered species should be directed to NOAA Fisheries' Protected Resources Division.

6. OTHER NOAA-TRUST RESOURCES IMPACT ASSESSMENT	
Species known to occur at site (list others that may apply)	**Describe habitat impact type (i.e., physical, chemical, or biological disruption of spawning and/or egg development habitat, juvenile nursery and/or adult feeding or migration habitat). Please note, impacts to federally listed species of fish, sea turtles, and marine mammals must be coordinated with the GARFO Protected Resources Division.**
alewife	Alewife are an anadromous species that spawn in slow moving shallow sections of rivers, streams, lakes, and ponds. The spawning habitat does not occur within the project area, however alewife may move through the project area on their way to spawn. According to the New Hampshire Wildlife Action Plan, the current distribution of alewife includes the Great Bay area. No impacts to this species migration is anticipated from construction activities. (NHF&G, 2015).
American eel	The American eel is a catadromous species that inhabits freshwaters or estuaries and then spawns at sea. There are no spawning habitats for this species in the project area. Shelter habitats for the American eel may be temporarily impacted by the temporary construction measures related to the project.
American shad	American shad are anadromous fish that migrate up large freshwater rivers and tributaries to spawn. Spawning can occur in tidal and non-tidal freshwater of rivers and tributaries. The Wildlife Action Plan (2015) indicates that American shad is no longer known to occur within the watersheds that drain into the Great Bay, however they are occasionally seen traveling up coastal river fish ladders. Therefore, the proposed project is not anticipated to impact Atlantic shad. (NHF&G, 2015).
Atlantic menhaden	Atlantic menhaden occupy estuarine habitats as juveniles, and migrate within coastal waters, spawning during the fall or early winter along the coast of North Carolina. Juveniles prefer habitat that is composed of unconsolidated mud, but also uses rocky coves with cobble/rock/sand bottoms within their northern range. As the life stage of Atlantic menhaden increases, sub-adults and adults use habitats composed of mud/sand/organic material. The temporary placement of the causeways and trestles within the project area may cause temporary disturbance to this species, but it is unlikely that this species will be present within the rocky bottom of the project area. (ASMFC, 2015).
blue crab	Blue crab occupy offshore high salinity waters during early larval stages, however they use estuary and intertidal marshes, seagrass beds and soft-sediment shorelines as they grow into adults. There may be temporary impacts to shelter, and foraging habitat for blue crab as the result of the temporary construction measures. (NOAA, Chesapeake Bay Office, 2018).
blue mussel	The NH Coastal Viewer identifies a +/- 2.8-acre blue mussel shellfish bed in Little Bay along the Dover Point coastline underneath the GSB on the northern side of the project. This bed was identified by the NHDES Shellfish Program in 2013 (Morrissey and Nash, 2013). Temporary impacts to this shellfish bed may occur during the installation and removal of the causeways and trestles at the beginning and end of construction. The causeways/trestles will be in place throughout the duration of construction, which is anticipated to take approximately 18 months.
blueback herring	Blueback herring spawn in fast moving, shallow water of rivers and streams. Spawning occurs in the spring, and then juvenile blueback herring normally remain in freshwater throughout the summer and fall and then migrate to the sea. There is the potential for the project to temporarily impact juvenile shelter and foraging habitat that may be within the project area as a result of the trestles and causeways construction. It is unlikely that the salinity of the estuary will support spawning habitat within the project area. (NHF&G, 2015).

Eastern oyster	There are no eastern oyster (also known as the American oyster) locations within the project area. According to the NH Coastal Viewer, the closest known location of American oyster is a very small shellfish aquaculture site located approximately 0.5 miles west of the project area. The nearest oyster restoration site is located over 1.5 miles from the project area. No natural oyster sites are within the vicinity of the project area.
horseshoe crab	Spawning habitat for horseshoe crabs includes sandy beaches of bays and coves, which are not present within the project area. Nurseries for this species include areas next to sandy beaches in intertidal sand flats. The potential for nursery habitat exists in the project area and may be temporarily impacted by the temporary construction measures. Specific adult horsehoe crab habitat requirements are unknown. Adult habitat varies and adults can be found in waters 30 to 200 meters in depth. It is unlikely that adult horseshoe crabs will be within the project area. (NHF&G, 2015).
quahog	Hard clam/northern quahog are sessile and burrow into sediment in intertidal and sub-tidal areas. The project area may temporarily impact this species due to the temporary placement of the causeways and trestles. (NOAA, 2018).
soft-shell clams	Soft-shelled clams are found in mud/sand/rock substrates of intertidal waterbodies. According to the NH Coastal Viewer, the closest known location is 5,000 feet west of the project area. (NH WAP, 2015).
striped bass	Striped bass inhabit coastal waters and migrate to freshwater rivers to spawn. This species spend approximately May through October in the vicinity of Great Bay, spawning in the freshwater tributaries in April and May. This species is likely to pass through the project area during spawning season, however the project's in water work is unlikely to affect this species and its movements. (NHF&G, 2018).
other species:	Critical habitat designations were finalized in 2017 for Atlantic sturgeon in various locations along the northeast coast of the United States, including the Piscataqua River (as well as Little Bay and Great Bay). The critical habitat is defined by four physical and biological features, including 1) hard bottom substrate in low salinity water for egg to early juvenile stage (0.0 - 0.5 ppt), 2) soft substrate (mud) and salinity ranging from 0.5 to 30 ppt for juveniles, 3) waters uninhibited by barriers for the movement of juveniles and spawning adults within waterbodies, and 4) waterbodies connected to spawning sites and mouth of the river that support all life stages including temperatures from 13ºC to 30ºC and 6 mg/L for dissolved oxygen. Separate consultation regarding this critical habitat is currently being completed between the lead federal agency (FHWA) and NOAA.

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Table 1. Habitat Conditions and Suitability Assessment for EFH Species Within Great Bay, New Hampshire
Green shading: Suitable EFH habitat in project area. Orange Shading: Marginal habitat in project area, not optimal.

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Atlantic salmon (*Salmo salar*)			Temperature: < 25° C Salinity: Freshwater to oceanic Depth: 10 – 61 cm Habitat: Shallow gravel/cobble riffles interspersed with deeper riffles and pools in rivers and estuaries. Water velocities between 30-92 cm/sec. **Not Suitable:** The project area does not include shallow gravel/cobble riffles and water velocity speeds within the GSB project area are too swift (greater than 92 cm/sec) compared to water velocities tolerated by juvenile salmon.		
Atlantic cod (*Gadus morhua*)	Temperature: < 12° C Salinity: 32-33 ppt Depth: <110 m Seasonal Occurrence: Begins in fall, peaks in winter and spring Habitat: Surface waters **Not Suitable:** The project area includes salinity levels between 18 and 25 ppt and are estuarine habitats, salinity levels are too low within the Project area to be suitable for cod eggs.	Temperature: < 10° C Salinity: 32-33 ppt Depth: 30-70 m Seasonal Occurrence: Spring Habitat: Pelagic waters **Not Suitable:** The project area includes salinity levels between 18 and 25 ppt and are estuarine habitats, salinity levels are too low within the Project area to be suitable for cod larvae.			
Haddock (*Melanogrammus aeglefinus*)	Temperature: < 10° C Salinity: 34-36 ppt Depth: 50-90 m Seasonal Occurrence: March to May, peak in April Habitat: Surface waters **Not Suitable:** The project area includes salinity levels between 18 and 25 ppt and are estuarine habitats, salinity levels are too low within the Project area to be suitable for haddock eggs.	Temperature: < 14° C Salinity: 34-36 ppt Depth: 30-90 m Seasonal Occurrence: January to July, peak in April and May Habitat: Surface waters **Not Suitable:** The project area includes salinity levels between 18 and 25 ppt and are estuarine habitats, salinity levels are too low within the Project area to be suitable for haddock larvae.			

Table 1. Habitat Conditions and Suitability Assessment for EFH Species Within Great Bay, New Hampshire
Green shading: Suitable EFH habitat in project area. Orange Shading: Marginal habitat in project area, not optimal.

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Pollock (*Pollachius virens*)	Temperature: < 17° C Salinity: 32-32.8 ppt Depth: 30-270 m Seasonal Occurrence: October to June, peaks in November to February Habitat: Pelagic Waters **Not Suitable:** The project area has salinity that is too low, and depths that area to shallow/ not pelagic waters to support Pollock eggs.. The normal tide depth in the project area portion of the estuary is 8 feet.	Temperature: < 17° C Depth: 10-250 m Seasonal Occurrence: September to July, peaks from December to February Habitat: Pelagic waters, migrate inshore as they grow. **Not Suitable:** The project area has salinity that is too low, and depths that area to shallow/ not pelagic waters to support Pollock eggs. The normal tide depth in the project area portion of the estuary is 8 feet.	Temperature: < 18° C Salinity: 29-32 ppt Depth: 0-250 m Habitat: Bottom habitats with aquatic vegetation or a substrate of sand, mud, or rocks.		
Red Hake (*Urophycis chuss*)			Temperature: < 16° C Salinity: 31-33 ppt Depth: < 100 m Habitat: Bottom habitats with substrate of shell fragments, including areas with an abundance of live scallops.	Temperature: < 12° C Salinity: 33-34 ppt Depth: 10-130 m Habitat: Bottom habitats in depressions with a substrate of sand and mud.	
White Hake (*Urophycis tenuis*)	Salinity: Seawater zone Seasonal Occurrence: August to September Habitat: Surface Waters		Temperature: < 19° C Salinity: Seawater zone Depth: 5-225 m Seasonal Occurrence: May to September, pelagic Habitat: Pelagic stage – pelagic waters; Dermersal stage – Bottom habitat with seagrass beds or substrate of mud or fine-grained sand.	Temperature: < 14° C Salinity: Seawater zone Depth: 5-325 m Habitat: Bottom habitat with substrate of mud or fine-grained sand.	
Winter Flounder (*Pleuronectes americanus*)	Temperature: <10° C Salinity: 10-30 ppt Depth: <5 m Seasonal Occurrence: February to June Habitat: Bottom habitats with a substrate of sand, muddy sand, mud, and gravel.	Temperature: <15° C Salinity: 4-30 ppt Depth: <6 m Seasonal Occurrence: March to July Habitat: Pelagic and bottom waters.	Temperature: <25° C Salinity: 10-30 ppt Depth: 1-50 m Seasonal Occurrence: March to July Habitat: Bottom habitats with a substrate of mud or fine-grained sand.	Temperature: < 25° C Salinity: 15 – 33 ppt Depth: 1 – 100 m Habitat: Bottom habitats including estuaries with sand, mud, and gravel substrate	Temperature: < 15° C Salinity: 5.5 – 36 ppt Depth: < 6 m Seasonal Occurrence: February to June Habitat: Bottom habitats including estuaries with sand, mud, and gravel substrate.

Table 1. Habitat Conditions and Suitability Assessment for EFH Species Within Great Bay, New Hampshire
Green shading: Suitable EFH habitat in project area. Orange Shading: Marginal habitat in project area, not optimal.

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Yellowtail Flounder (*Pleuronectes ferruginea*)	Temperature: <15° C Salinity: 32.4-33.5 ppt Depth: 30-90 m Seasonal Occurrence: Mid-March to July Habitat: Surface waters **Marginal:** Low salinity level and water depths within the project area do not provide ideal conditions for yellowtail flounder eggs.	Temperature: <17° C Salinity: 32.4-33.5 ppt Depth: 10-90 m Seasonal Occurrence: May to July Habitat: Surface waters, largely an oceanic nursery. **Not Suitable:** Low salinity level within the project area do not provide ideal conditions for yellowtail flounder larvae, however marginal conditions for depth and temperature do exist within the project area.			
Windowpane Flounder (*Scopthalmus aquosus*)	Temperature: <20° C Depth: < 70 m Seasonal Occurrence: February to November Habitat: Surface waters	Temperature: <20° C Depth: < 70 m Seasonal Occurrence: February to November Habitat: Pelagic waters	Temperature: <25° C Salinity: 5.5-36 ppt Depth: 1-100 m Habitat: Bottom habitats with substrate of mud or fine-grained sand.	Temperature: <26.8° C Salinity: 5.5-36 ppt Depth: 1-75 m Habitat: Bottom habitats with substrate of mud or fine-grained sand.	Temperature: <21° C Salinity: 5.5-36 ppt Depth: 1-75 m Seasonal Occurrence: February to December Habitat: Bottom habitats with substrate of mud or fine-grained sand.
Atlantic Halibut (*Hippoglossus hippoglossus*)	Temperature: 4 - 7° C Salinity: < 35 ppt Depth: < 700 m Seasonal Occurrence: Between late fall and early spring, peak November and December Habitat: Pelagic waters to the sea floor **Not Suitable:** The project area is estuarine and riverine habitat, and not pelagic waters.	Salinity: 30 – 35 ppt Habitat: Surface waters **Not Suitable:** The project area is estuarine habitat and riverine with salinity less than 30 ppt.	Temperature: > 2° C Depth: 20 – 60 m Habitat: Bottom habitats with a substrate of sand, gravel, and clay. **Not Suitable:** The project area is estuarine and riverine habitat with depths less than 20m.	Temperature: < 13.6° C Salinity: 30.4 – 35.3 ppt Depth: 100 – 700 m Habitat: Substrate with bottom habitats of sand, gravel, or clay. **Not Suitable:** The project area is estuarine and riverine habitat with depths less than 100m.	Temperature: < 7° C Salinity: < 35 ppt Depth: < 700 m Seasonal Occurrence: Between late fall and early spring, peaks in November and December. Habitat: Bottom habitats with a substrate of soft mud, clay, sand, or gravel. Rough or rocky bottom locations along slopes of the outer banks. **Not Suitable:** The project area is estuarine/riverine habitat without suitable depths, salinity and temperatures needed by adult Atlantic Halibut.
Atlantic mackerel (*Scomber scombrus)*	Temperature: 5-23° C Salinity: 18- >30 ppt Depth: 0 – 15 m Habitat: Pelagic waters and estuaries.	Temperature: 6-22° C Salinity: >30 ppt Depth: 10 – 130 m Habitat: Pelagic waters.	Temperature: 4-22° C Salinity: >25 ppt Depth: 0 – 320 m Habitat: Pelagic waters.		

Table 1. Habitat Conditions and Suitability Assessment for EFH Species Within Great Bay, New Hampshire
Green shading: Suitable EFH habitat in project area. Orange Shading: Marginal habitat in project area, not optimal.

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Atlantic Sea Scallop (*Placopecten magellanicus*)			Temperature: < 15° C Depth: 18 – 110 m Habitat: Bottom habitats with silt, cobble, and shell substrate. **Not Suitable:** The project area does contain bottom habitats suitable for Atlantic sea scallops, however depths within the project area are not suitable for this species.	Temperature: < 21° C Salinity: > 16.5 ppt Depth: 18 – 110 m Habitat: Bottom habitats with a substrate of cobble, shells, coarse/gravelly sand, and sand. **Not Suitable:** The project area does contain bottom habitats suitable for Atlantic sea scallops, however depths within the project area are not suitable for this species.	
Atlantic Sea Herring (*Clupea harengus*)		Temperature: < 16° C Salinity: 32 ppt Depth: 50 – 90 m Seasonal Occurrence: Between August and April, peaks from September to November. Habitat: Pelagic waters. **Not Suitable:** The project area represents estuarine and riverine habitat, not pelagic waters, has less than 11 meters at the project areas deepest point, and salinity below 25ppt. However, because this is a migratory species it may be observed in the project area.	Temperature: < 10° C Salinity: 26-32 ppt Depth: 15 – 135 m Habitat: Pelagic and bottom habitats **Not Suitable:** The project area represents estuarine and riverine habitat, not pelagic waters, has less than 11 meters at the project areas deepest point, and salinity below 25ppt. However, because this is a migratory species it may be observed in the project area.		
Bluefish (*Pomatomus saltatrix*)			Temperature: >19-24° C Salinity: 23-36 ppt Seasonal Occurrence: June to October Habitat: Pelagic waters. Use estuaries as nursery areas. Can intrude into areas with salinities as low as 3 ppt.	Temperature: >14-16° C Salinity: > 25 ppt Seasonal Occurrence: June to October Habitat: Pelagic waters. Highly migratory.	

Source: National Marine Fisheries Service, Northeast Regional Office, Habitat Conservation Division. *Summary of Essential Fish Habitat and General Habitat Parameters for Federally Managed Species*. National Oceanic and Atmospheric Administration Greater Atlantic Fisheries Guide to Essential Fish Habitat Descriptions.
Notes: (1) Species that were listed in the EFH mapper that are not included in this table (Table 1) are bluefin tuna (*Thunnus thynnus*), Atlantic wolffish (*Anarhichas lupus*), smooth skate (*Malacoraja senta*), thorny skate (*Amblyraja radiata*), winter skate (*Leucoraja ocellata*) and little skate (*Leucoraja erinacea*). These species are included in Table 2. (2) Species that are included in this table that were not listed in the EFH mapper include Haddock (*Melanogrammus aeglefinus*), Yellowtail Flounder (*Pleuronectes ferruginea*), Atlantic Halibut (*Hippoglossus hippoglossus*), and Atlantic mackerel (*Scomber scombrus*).

Table 2. Habitat Conditions and Suitability Assessment for Additional EFH Species Present on the EFH Mapper
Green shading: Suitable EFH habitat in project area. Orange Shading: Marginal habitat in project area, not optimal.

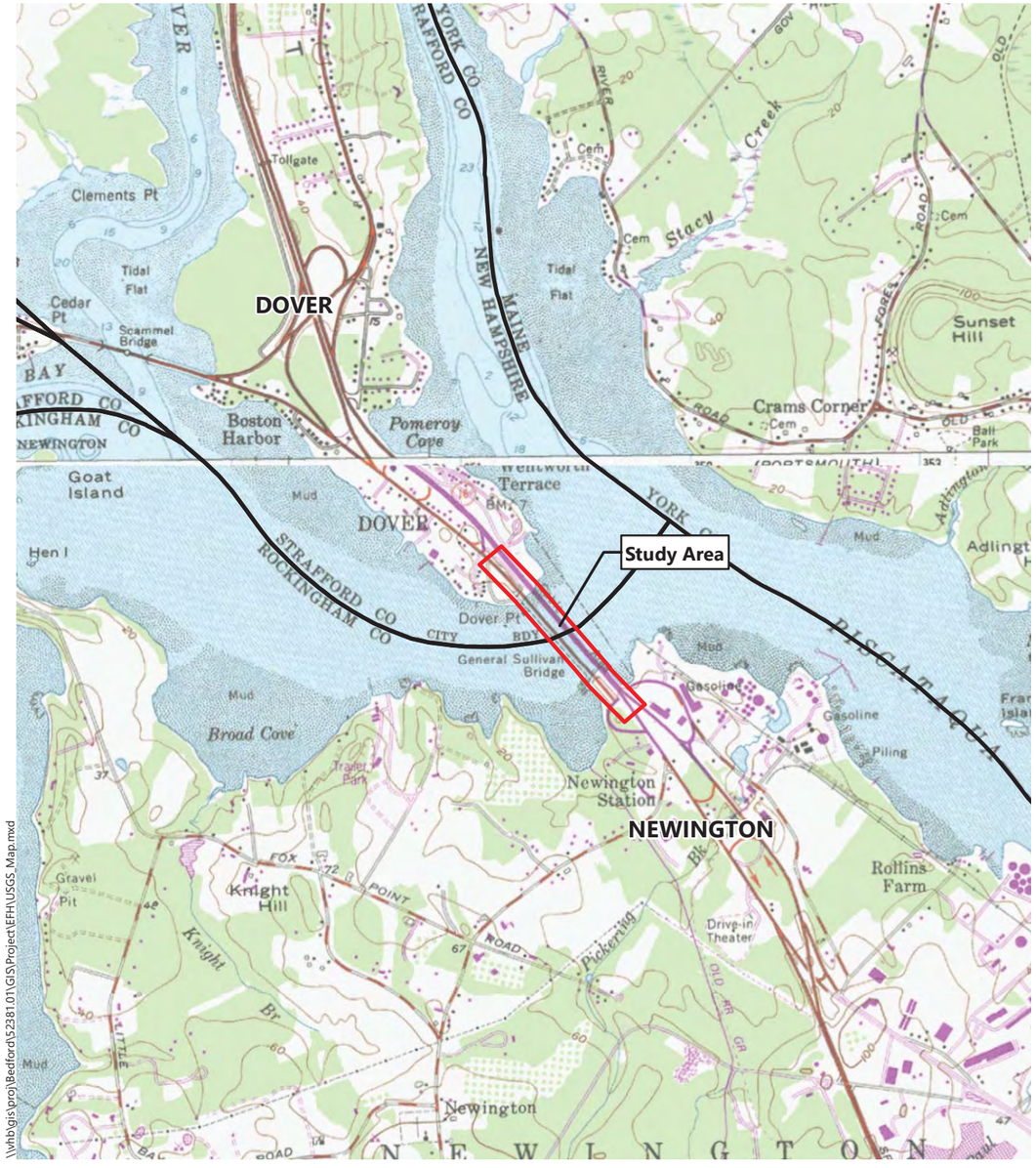
Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Little Skate (*Leucoraja erinacea*)			Temperature: 4-15° C Salinity: 26-36 ppt Depth: 0 – 137 m With the highest abundance occurring between 73-91 meters Habitat: Bottom habitats with sandy or gravelly substrate or mud. **Not Suitable:** The project area does contain bottom habitats suitable for juveniles, however salinity values within the project area are not suitable for this species.	Temperature: 2-15° C Salinity: 20-34 ppt Depth: 0 – 137 m With the highest abundance occurring between 73-91 meters Habitat: Bottom habitats with sandy or gravelly substrate or mud.	
Smooth Skate (*Malacoraja senta*)			Temperature: 2-12° C Salinity: 32-35 ppt Depth: 31 – 500 m Habitat: Deep water habitats with soft mud bottoms and offshore bank areas with sand, broken shells, gravel and pebble substrates. **Not Suitable:** The project area does contain bottom habitats suitable for juveniles, however the depths within the project area are not suitable for this species.		

Table 2. Habitat Conditions and Suitability Assessment for Additional EFH Species Present on the EFH Mapper
Green shading: Suitable EFH habitat in project area. Orange Shading: Marginal habitat in project area, not optimal.

Species	Eggs	Larvae	Juveniles	Adults	Spawning Adults
Thorny Skate (*Amblyraja radiata*)			Temperature: -1.3-17° C Depth: 18-2000 m Habitat: Bottom habitats with a substrate of sand, gravel, broken shell, pebbles, or soft mud. **Not Suitable:** The project area does contain bottom habitats suitable for juveniles, however depths within the project area are not suitable for this species.		
Winter Skate (*Leucoraja ocellata*)			Temperature: 5-21° C Salinity: 32-34 ppt Depth: 11-70 m Habitat: Bottom habitats with a substrate of sand, mud, or rocks.		
Atlantic Wolffish (*Anarhichas lupus*)	Depth: <100 m Habitat: Sub-tidal benthic habitats. Egg masses are hidden under rocks and boulders.	Habitat: Pelagic and sub-tidal benthic habitats. After hatching, larvae become more and more buoyant over time.	Depth: 70-184 m Habitat: Sub-tidal benthic habitats; no substrate preferences.	Depth: <173 m Habitat: Sub-tidal benthic habitats. Use areas with sandy or gravel substrates (not mud).	Depth: <100 m Habitat: Rocky habitats at various depths.

Sources:
Packer DB, Zetlin CA, Vitaliano JJ. 2003. Essential Fish Habitat Source Document: Little Skate, *Malacoraja senta*, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS NE 175.
Packer DB, Zetlin CA, Vitaliano JJ. 2003. Essential Fish Habitat Source Document: Smooth Skate, *Malacoraja senta*, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS NE 177.
Packer DB, Zetlin CA, Vitaliano JJ. 2003. Essential Fish Habitat Source Document: Thorny Skate, *Malacoraja senta*, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS NE 178.
Packer DB, Zetlin CA, Vitaliano JJ. 2003. Essential Fish Habitat Source Document: Winter Skate, *Leucoraja ocellata*, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS NE 179.
New England Fishery Management Council. 2017. *Final Omnibus Essential Fish Habitat Amendment 2*. Volume 2: EFH and HAPC Designation Alternatives and Environmental Impacts. National Marine Fisheries Service. Gloucester, MA.
Note: (1) Bluefin tuna (*Thunnus thynnus*) was listed on the EFH mapper, however due to the water depth and geographic habitat around the project area, the habitat of the Little Bay does not support any of these life stages for bluefin tuna. Therefore, bluefin tuna is unlikely to be present within the project area.

FIGURE 1



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0 1000 2000 4000 Feet

Newington-Dover 11238S | Newingtong and Dover, NH

Legend

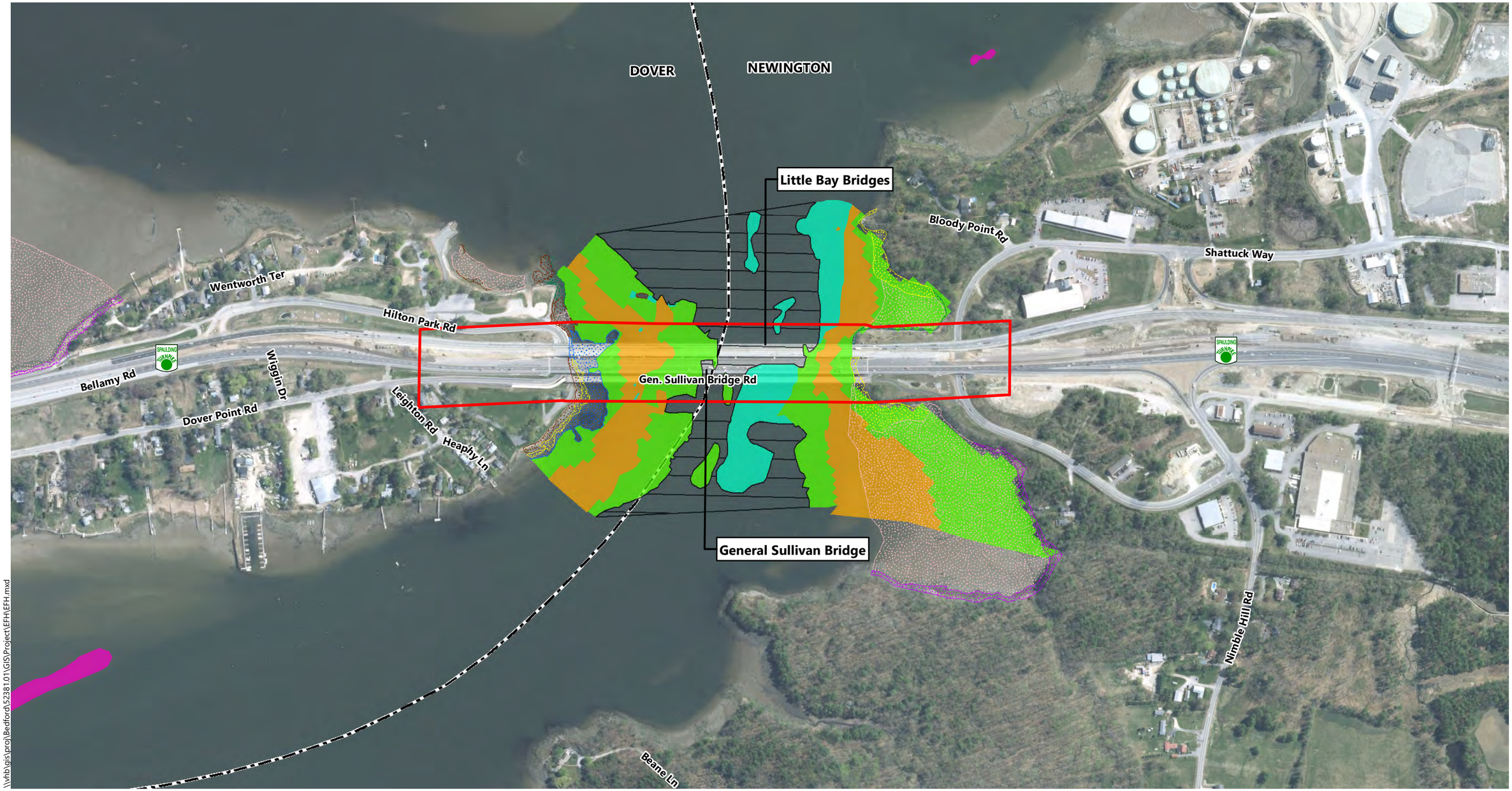
Study Area

Town Boundary

General Sullivan Bridge

USGS Map

Source: VHB, NHGRANIT



0 250 500 1000 Feet

Legend

- Study Area
- Town Boundaries
- State Boundary

Intertidal Habitats

- Hard Bottom with Rockweed
- Mudflat
- Rock/Algal Abundant Mussel
- Rock/Algal Sparse Mussel
- Saltmarsh
- Scattered Rock/Algal Soft Sediment
- Eelgrass

Subtidal Habitats

- Kelp Bed
- Macroalgal (Non-Kelp) Bed
- Mussel Reef
- Other

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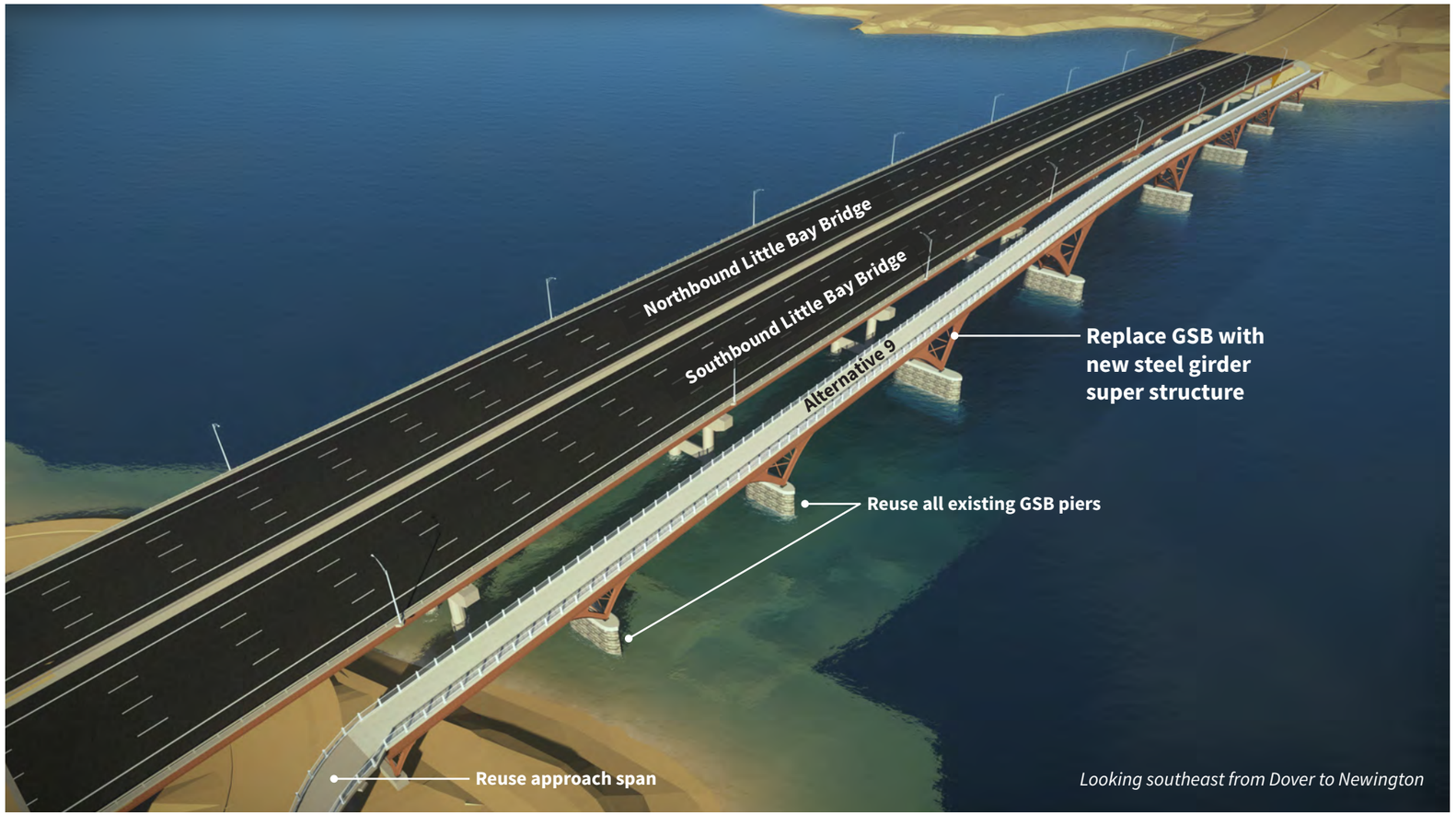
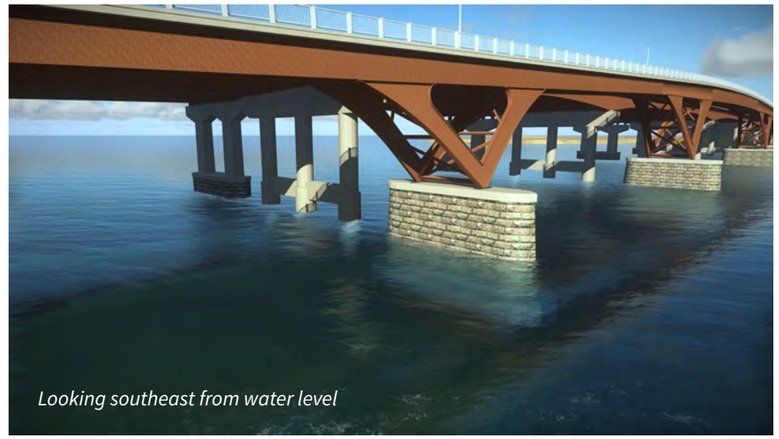
General Sullivan Bridge

Essential Fish Habitat Study Area

Source: NHGRANIT, VHB, Grizzle and Brodeur, 2003



Looking southeast from Dover to Newington



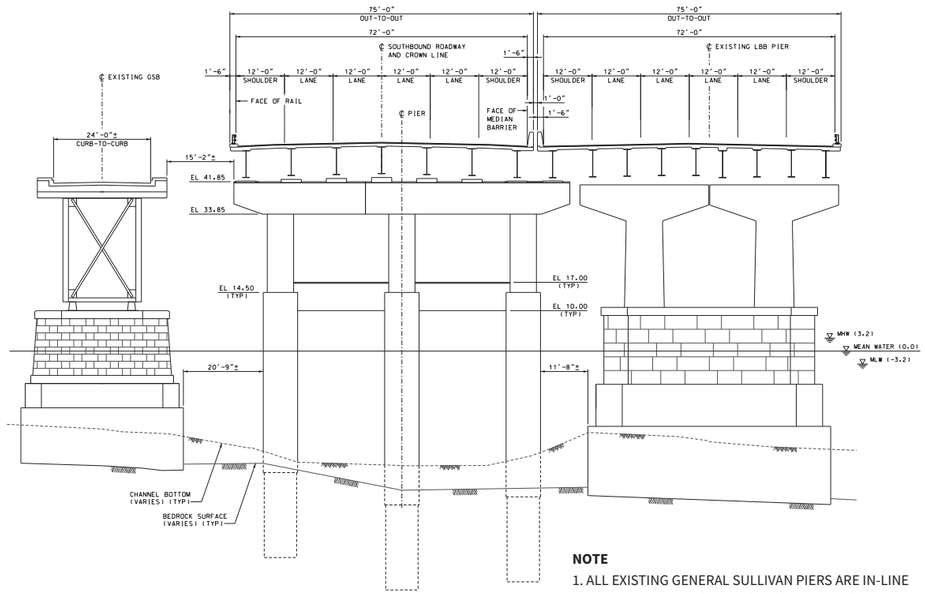
Looking southeast from water level

Looking south from deck

Newington-Dover 11238S | Newington and Dover, NH

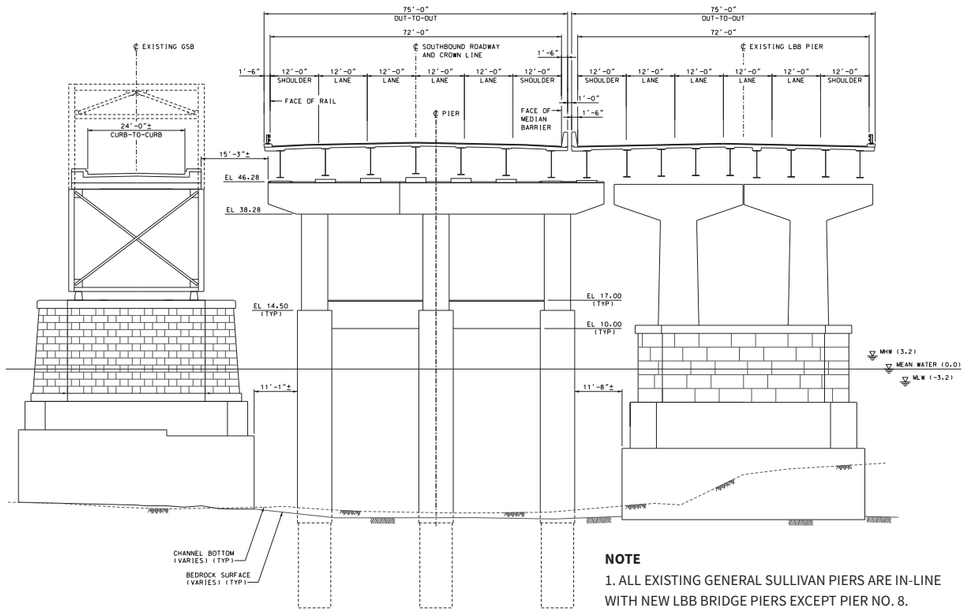
General Sullivan Bridge

Alternative 9:
Superstructure Replacement—
Girder Alternative
(Preferred Alternative)
Conceptual Design Renderings



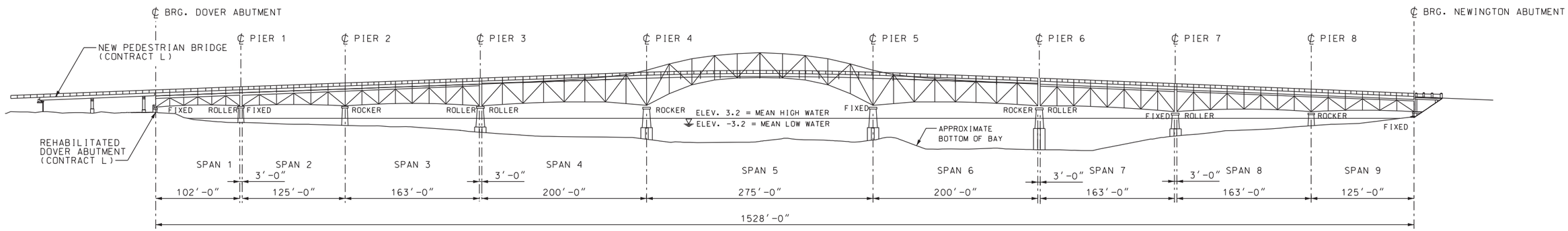
NOTE
1. ALL EXISTING GENERAL SULLIVAN PIERS ARE IN-LINE WITH NEW LBB BRIDGE PIERS EXCEPT PIER NO. 8.

EXISTING CONDITION
TYPICAL BRIDGE SECTION (PIERS 1, 2, 7, & 8)—EXISTING
NTS

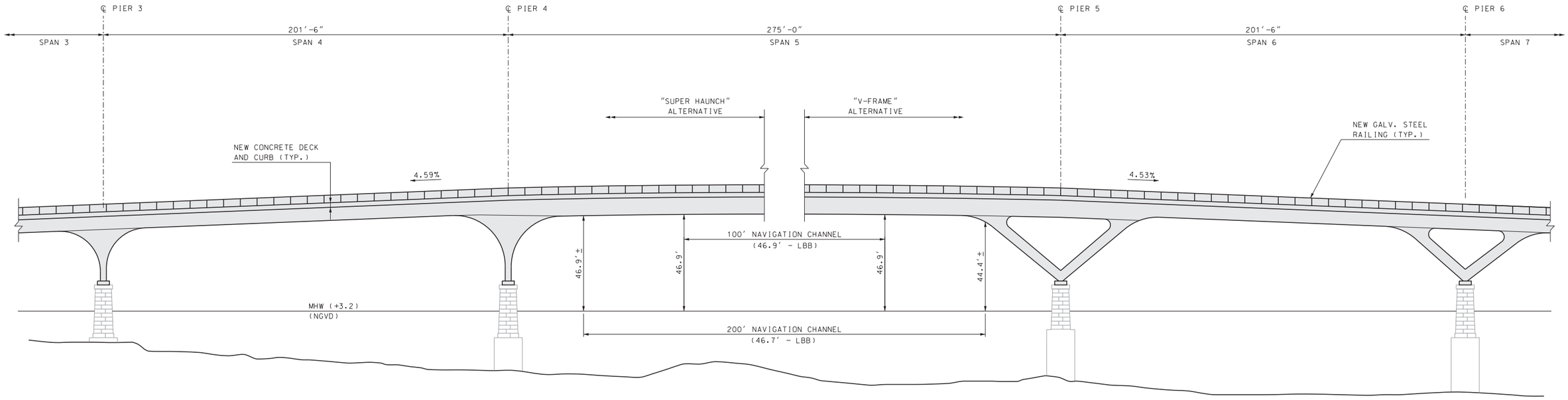


NOTE
1. ALL EXISTING GENERAL SULLIVAN PIERS ARE IN-LINE WITH NEW LBB BRIDGE PIERS EXCEPT PIER NO. 8.

EXISTING CONDITION
TYPICAL BRIDGE SECTION (PIERS 3, 4, 5, & 6)—EXISTING
NTS



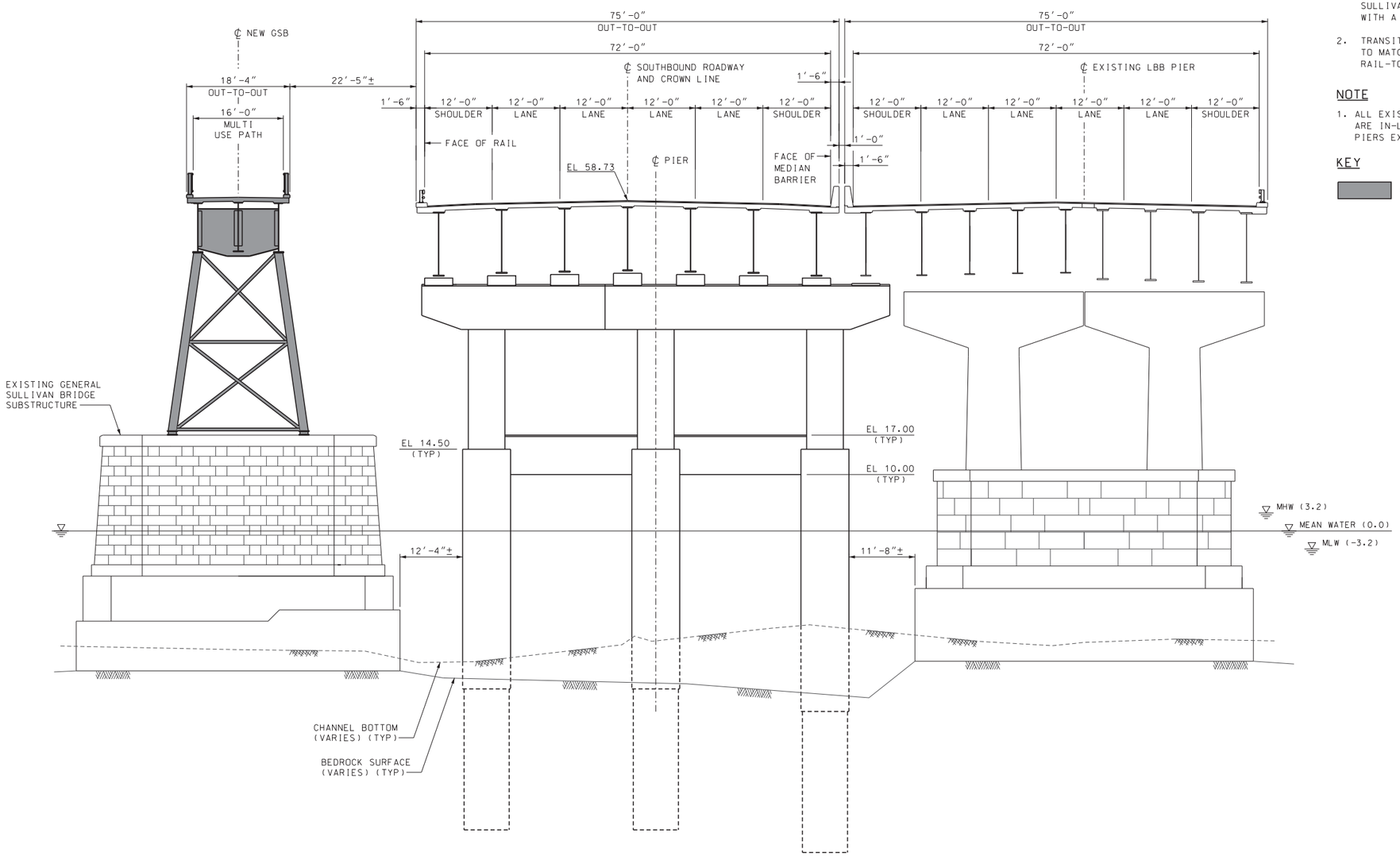
EXISTING GENERAL SULLIVAN BRIDGE ELEVATION
NTS



ALTERNATIVE 9 – SPANS 4, 5, & 6

Draft - January 2019

ALTERNATIVE 9B – SUPERSTRUCTURE REPLACEMENT – GIRDER/FRAME OPTION



ELEVATION
SCALE: $\frac{3}{32}$″ = 1′-0″

TYPICAL BRIDGE SECTION (PIERS 4 & 5) – ALTERNATIVE #9B
SCALE: $\frac{3}{32}$″ = 1′-0″

ALTERNATIVE #9B NOTES:

1. THIS ALTERNATIVE COMPLETELY REPLACES THE EXISTING GENERAL SULLIVAN BRIDGE SUPERSTRUCTURE WITH A GIRDER/FRAME SYSTEM.
2. TRANSITION THE NORTH END OF SPAN 1 TO MATCH THE NORTH APPROACH BRIDGE RAIL-TO-RAIL WIDTH OF 21′-0″.

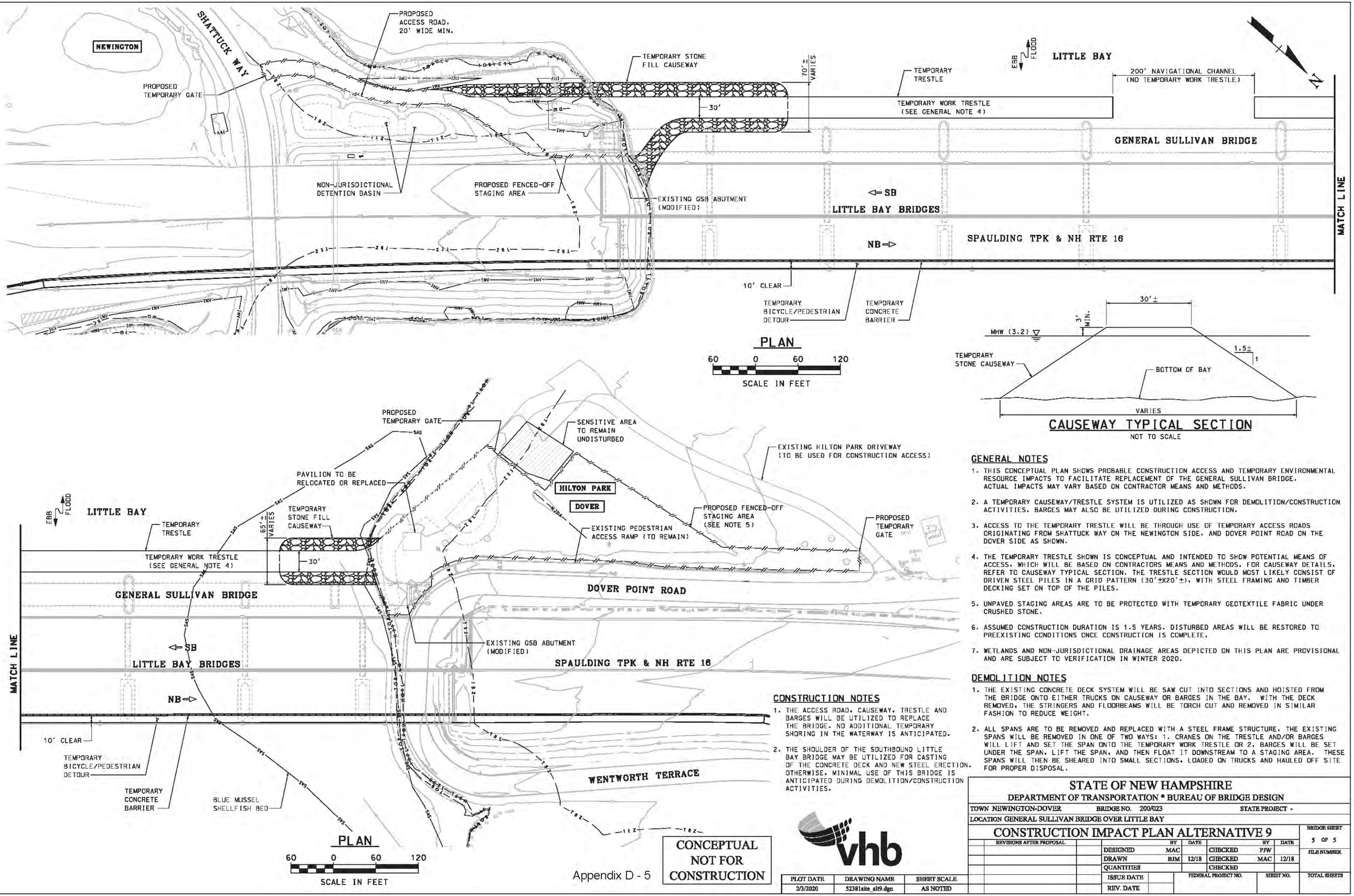
NOTE

1. ALL EXISTING GENERAL SULLIVAN PIERS ARE IN-LINE WITH NEW LBB BRIDGE PIERS EXCEPT PIER NO. 8.

KEY

= NEW STRUCTURE

Draft - January 2019



GENERAL NOTES

1. THIS CONCEPTUAL PLAN SHOWS PROBABLE CONSTRUCTION ACCESS AND TEMPORARY ENVIRONMENTAL RESOURCE IMPACTS TO FACILITATE REPLACEMENT OF THE GENERAL SULLIVAN BRIDGE. ACTUAL IMPACTS MAY VARY BASED ON CONTRACTOR MEANS AND METHODS.
2. A TEMPORARY CAUSEWAY/TRESTLE SYSTEM IS UTILIZED AS SHOWN FOR DEMOLITION/CONSTRUCTION ACTIVITIES. BARGES MAY ALSO BE UTILIZED DURING CONSTRUCTION.
3. ACCESS TO THE TEMPORARY TRESTLE WILL BE THROUGH USE OF TEMPORARY ACCESS ROADS ORIGINATING FROM SHATTUCK WAY ON THE NEWINGTON SIDE, AND DOVER POINT ROAD ON THE DOVER SIDE AS SHOWN.
4. THE TEMPORARY TRESTLE SHOWN IS CONCEPTUAL AND INTENDED TO SHOW POTENTIAL MEANS OF ACCESS, WHICH WILL BE BASED ON CONTRACTORS MEANS AND METHODS. FOR CAUSEWAY DETAILS, REFER TO CAUSEWAY TYPICAL SECTION. THE TRESTLE SECTION WOULD MOST LIKELY CONSIST OF DRIVEN STEEL PILES IN A GRID PATTERN (30'±X20'±), WITH STEEL FRAMING AND TIMBER DECKING SET ON TOP OF THE PILES.
5. UNPAVED STAGING AREAS ARE TO BE PROTECTED WITH TEMPORARY GEOTEXTILE FABRIC UNDER CRUSHED STONE.
6. ASSUMED CONSTRUCTION DURATION IS 1.5 YEARS. DISTURBED AREAS WILL BE RESTORED TO PREEXISTING CONDITIONS ONCE CONSTRUCTION IS COMPLETE.
7. WETLANDS AND NON-JURISDICTIONAL DRAINAGE AREAS DEPICTED ON THIS PLAN ARE PROVISIONAL AND ARE SUBJECT TO VERIFICATION IN WINTER 2020.

CONSTRUCTION NOTES

1. THE ACCESS ROAD, CAUSEWAY, TRESTLE AND BARGES WILL BE UTILIZED TO REPLACE THE BRIDGE. NO ADDITIONAL TEMPORARY SHORING IN THE WATERWAY IS ANTICIPATED.
2. THE SHOULDER OF THE SOUTHBOUND LITTLE BAY BRIDGE MAY BE UTILIZED FOR CASTING OF THE CONCRETE DECK AND NEW STEEL ERECTION. OTHERWISE, MINIMAL USE OF THIS BRIDGE IS ANTICIPATED DURING DEMOLITION/CONSTRUCTION ACTIVITIES.

DEMOLITION NOTES

1. THE EXISTING CONCRETE DECK SYSTEM WILL BE SAW CUT INTO SECTIONS AND HOISTED FROM THE BRIDGE ONTO EITHER TRUCKS ON CAUSEWAY OR BARGES IN THE BAY. WITH THE DECK REMOVED, THE STRINGERS AND FLOORBEAMS WILL BE TORCH CUT AND REMOVED IN SIMILAR FASHION TO REDUCE WEIGHT.
2. ALL SPANS ARE TO BE REMOVED AND REPLACED WITH A STEEL FRAME STRUCTURE. THE EXISTING SPANS WILL BE REMOVED IN ONE OF TWO WAYS: 1. CRANES ON THE TRESTLE AND/OR BARGES WILL LIFT AND SET THE SPAN ONTO THE TEMPORARY WORK TRESTLE OR 2. BARGES WILL BE SET UNDER THE SPAN, LIFT THE SPAN, AND THEN FLOAT IT DOWNSTREAM TO A STAGING AREA. THESE SPANS WILL THEN BE SHEARED INTO SMALL SECTIONS, LOADED ON TRUCKS AND HAULED OFF SITE FOR PROPER DISPOSAL.

CONCEPTUAL NOT FOR CONSTRUCTION

vhb

PLOT DATE	DRAWING NAME	SHEET SCALE
2/3/2020	52381site_al9.dgn	AS NOTED

STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION * BUREAU OF BRIDGE DESIGN

TOWN NEWINGTON-DOVER BRIDGE NO. 200/023 STATE PROJECT -

LOCATION GENERAL SULLIVAN BRIDGE OVER LITTLE BAY

CONSTRUCTION IMPACT PLAN ALTERNATIVE 9

BRIDGE SHEET: 5 OF 5

REVISIONS AFTER PROPOSAL	BY	DATE		BY	DATE
			DESIGNED	MAC	
			DRAWN	BJM	12/18
			QUANTITIES		
			CHECKED	PJW	
			CHECKED	MAC	12/18
			CHECKED		
			ISSUE DATE		
			REV. DATE		

FEDERAL PROJECT NO. | SHEET NO. | TOTAL SHEETS | FILE NUMBER

Matras, Lindsay

From: Mike R Johnson - NOAA Federal <mike.r.johnson@noaa.gov>
Sent: Friday, May 17, 2019 12:53 PM
To: Laurin, Marc <Marc.Laurin@dot.nh.gov>
Cc: Jamie Sikora <jamie.sikora@dot.gov>; Cota, Keith <Keith.Cota@dot.nh.gov>; Walker, Peter <PWalker@VHB.com>; Goodrich, Gregory <GGoodrich@VHB.com>
Subject: [External] Re: Newington-Dover, 11238S - EFH Assessment

Marc,

Yes, I thought I had already responded to you on this one but I guess I did not. I do not have any EFH conservation recommendations to provide for this project. The impacts are temporary and minor in nature.

Also, just wanted to give me thanks for the VHB team for producing a high quality EFH assessment for this project.

Mike

On Fri, May 17, 2019 at 11:19 AM Laurin, Marc <Marc.Laurin@dot.nh.gov> wrote:

Mike,

Have you had a chance to review the EFH Assessment for the project?

Thanks,
Marc

From: Mike R Johnson - NOAA Federal [mailto:mike.r.johnson@noaa.gov]
Sent: Thursday, March 21, 2019 10:51 AM
To: Laurin, Marc
Cc: Jamie Sikora; Zach Jylkka; Cota, Keith; Peter Walker; Goodrich, Gregory
Subject: Re: Newington-Dover, 11238S - EFH Assessment

OK. Thanks, Marc.

On Thu, Mar 21, 2019 at 10:50 AM Laurin, Marc <Marc.Laurin@dot.nh.gov> wrote:

Mike,

I noticed that I did not reply to you on the time frame for your review.

The Department is anticipating completion of a draft of the Supplemental EIS by May 2019.

A response by mid-April would be appreciated.

Thanks,

Marc

From: Mike R Johnson - NOAA Federal [mailto:mike.r.johnson@noaa.gov]
Sent: Monday, January 28, 2019 9:49 AM
To: Laurin, Marc
Cc: Jamie Sikora; Zach Jylkka; Cota, Keith; Peter Walker; Goodrich, Gregory
Subject: Re: Newington-Dover, 11238S - EFH Assessment

Marc,

We just returned today after the partial government shutdown, and I'll be sorting through a massive number of emails and consultation requests during this week. I'm trying to process these as they were submitted, so it may be some time before I can review and respond to your request.

In the meantime, could you please provide a time frame for when you need our comments. I don't believe your email or the EFH assessment included a deadline for comments.

Thanks,

Mike

On Fri, Jan 25, 2019 at 9:11 AM Laurin, Marc <Marc.Laurin@dot.nh.gov> wrote:

> **Mike,**
>
> Attached for your review is the EFH Assessment Worksheet that assesses the potential effects to EFH in the vicinity of the project, the rehabilitation or replacement the General Sullivan bridge over Little Bay in Newington and Dover, **NH.**
>
> Please review for concurrence on the determination that the adverse effect of the proposed action is not substantial and, if applicable, provide appropriate conservation recommendations.
>
> I have also mailed out a hard copy for your files.
>
> Thanks,
>
> Marc

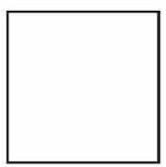
--

Michael R. Johnson

U.S. Department of Commerce
NOAA Fisheries
Greater Atlantic Regional Fisheries Office
Habitat Conservation Division
55 Great Republic Drive
Gloucester, MA 01930
978-281-9130

mike.r.johnson@noaa.gov

http://www.greateratlantic.fisheries.noaa.gov/



Web www.nmfs.noaa.gov
Facebook www.facebook.com/usnoaafisheries.gov
Twitter www.twitter.com/noaafisheries.gov
YouTube www.youtube.com/usnoaafisheries.gov

New Hampshire DOT
Department of Transportation

THE STATE OF NEW HAMPSHIRE
DEPARTMENT OF TRANSPORTATION

Victoria F. Sheehan
Commissioner

William Cass, P.E.
Assistant Commissioner

June 6, 2019

Zachary Jylkka
Fisheries Biologist, Protected Resources Division
Greater Atlantic Regional Fisheries Office
NOAA Fisheries
55 Great Republic Drive
Gloucester, MA 01930

RE: Atlantic Sturgeon & Shortnose sturgeon
Spaulding Turnpike / Little Bay Bridge: NHS-027-1(037), 11238S
Newington and Dover, New Hampshire

Dear Mr. Jylkka:

The New Hampshire Department of Transportation (NHDOT) is planning to rehabilitate or replace the General Sullivan Bridge (GSB) located over the Little Bay. The GSB is located within designated critical habitat for Atlantic sturgeon (*Acipenser oxyrhynchus oxyrhynchus*) and within the estimated range for shortnose sturgeon (*Acipenser brevirostrum*) according to the ESA Section 7 Mapper.[1] Based on the work that is anticipated to be completed to rehabilitate or replace the bridge, we have determined that the project "*may affect but is not likely to adversely affect*" Atlantic/shortnose sturgeon critical habitat. The National Oceanic and Atmospheric Administration (NOAA), the National Marine Fisheries Service (NMFS) Greater Atlantic Regional Fisheries Office (GARFO), and the Federal Highway Administration (FHWA) developed the FHWA GARFO 2018 NLAA Program, which is a Programmatic Endangered Species Act (ESA) Section 7 Consultation process designed to ensure the actions covered under the programmatic agreement are not likely to adversely affect ESA-listed species and designated critical habitats. In accordance with the FHWA GARFO 2018 NLAA Program, we completed and have attached an Appendix A Verification Form for the proposed project. In addition to this coordination regarding ESA-listed species, we have also submitted a NOAA Fisheries Essential Fish Habitat (EFH) Assessment Worksheet for the proposed project to Mike Johnson.

Project Overview
The GSB was built in 1934 and connected Newington and Dover, New Hampshire, over the Little Bay. Although originally designed to support two lanes of highway traffic over the mouth of the Little Bay, the bridge was closed to vehicular traffic in 1984, when the adjacent Little Bay Bridge, located east of the GSB, was completed. Now the bridge is closed even to pedestrian and bicycle traffic due to a recent inspection completed in September 2018, which found additional deterioration of a critical floor beam under the bridge deck.

The condition of the GSB has been declining over the last few decades. To address this issue, options for the rehabilitation or replacement of the GSB were previously reviewed in a 2007 Final Environmental Impact Statement (FEIS) and a 2008 Record of Decision (ROD), which were produced by NHDOT and the Federal Highway Administration (FHWA) under the National Environmental Policy Act (NEPA). In the ROD, NHDOT and FHWA committed to maintain pedestrian/bicycle connectivity between Dover and Newington, and to accomplish that by rehabilitating the GSB.

[1] NOAA Fisheries. 2018. *Section 7 Mapper*. Greater Atlantic Region. Accessed January 11, 2019 <https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=1bc332edc5204e03b250ac11f9914a27>.

Since the 2008 ROD, further inspections and studies of the GSB condition were completed to prepare for the rehabilitation project. The information gathered by these inspections and studies revealed that the GSB was more deteriorated than originally thought. Bridge rehabilitation would have very high costs, high risks, and a limited life span. Therefore, NHDOT and FHWA are proceeding to further evaluate rehabilitation and consider other alternatives; these alternatives and their environmental and cultural resource impacts will be presented in a Supplemental Environmental Impact Statement (SEIS) currently in preparation.

Of the various alternatives being considered in the SEIS, the current Preferred Alternative is Alternative 9 – Superstructure Replacement (Girder Option), which involves complete removal and replacement of the GSB superstructure. Under Alternative 9, the GSB superstructure would be replaced with a steel girder system with a structural steel frame extending from the bottom of the girders to the top of the existing GSB piers. Alternative 9 would reuse the existing piers without requiring significant modifications. This approach eliminates permanent impacts to intertidal and subtidal habitat. Plans of the preferred alternative are attached.

Construction of the preferred alternative is expected to take approximately 18 months. Construction would begin with a one- to two-week period of installing a temporary causeways and trestles west of the existing GSB for staging and equipment access during the bridge replacement work. The bridge would be removed and replaced using these causeways, the trestles, and water craft. Upon completion of the bridge replacement, the causeways and trestles would be removed and the area restored to pre-construction conditions, which is anticipated to take approximately one to two weeks. The causeways and trestles are considered a temporary impact within the Little Bay and are the only in-water work that is proposed. We've attached a plan that depicts the construction phase impacts, but note that these plans are for planning purposes only and may be modified during construction if required to allow for safe and efficient contractor access.

Appendix A Verification Form
Based on the proposed project work, this project "*may affect but is not likely to adversely affect*" critical habitat for Atlantic/shortnose sturgeon. Therefore, in accordance with the Programmatic ESA Section 7 Consultation provided under the FHWA GARFO 2018 NLAA Program, an Appendix A Verification Form was completed for the proposed project (see attached). Upon completion of the Verification Form, the NHDOT and FHWA determined that the project complies with the Programmatic ESA Section 7 Consultation since the project involves bridge rehabilitation/replacement and meets the applicable project design criteria (PDC) included in the FHWA GARFO 2018 NLAA Program Appendix A Verification Form. Further explanation for the responses to the PDCs listed in the Appendix A Verification Form are provided in the Continuation Sheets, attached.

Based on the attached Appendix A Verification Form and Continuation Sheets, we determined that the bridge replacement or rehabilitation project is eligible under the Programmatic ESA Section 7 Consultation and the FHWA GARFO 2018 NLAA Program. FHWA and NHDOT respectfully request your concurrence with our finding that the project falls under the determination of "*may affect but not likely to adversely affect*" Atlantic/shortnose sturgeon or their critical habitat. Applicable minimization and mitigation measures would be followed during project construction to ensure impacts to these species would be minimized to the greatest extent practicable. Additionally, the project would comply with the NMFS/FHWA Best Management Practices Manual for Transportation Activities in the Greater Atlantic Region (April 2018). Please contact me at (603) 271-4044 if you have any questions. We look forward to coordinating with you on this project.

Sincerely,

Marc Laurin
Senior Environmental Manager
Room 109 – Tel (603) 271-4044
E-mail – marc.laurin@dot.nh.gov

Attachments:
Appendix A – Verification Form
Continuation Sheets
Memorandum – Hydroacoustic Impact Assessment from Pile Driving
Figure 1 – USGS Location Map
Figure 2 – Conceptual Design Rendering
Figure 3 – Habitat Types
Existing Condition Plan
Alternative 9 Elevation and Typical Sections
Alternative 9 Construction Impact Plan

cc: Mike Johnson, NOAA
Keith Cota, NHDOT
Jamie Sikora, FHWA
P. Walker, VHB
G. Goodrich, VHB

Appendix A. Verification Form

Federal Highway Administration (FHWA) or the applicable state Department of Transportation (state DOT) will submit a signed version of this completed form, together with any project plans, maps, supporting analyses, etc., to NOAA's National Marine Fisheries Service (NMFS), Greater Atlantic Regional Fisheries Office, Protected Resources Division (GARFO PRD) at nmfs.gar.esa.section7@noaa.gov with "FHWA GARFO 2018 NLAA Program" in the subject line, upon obtaining sufficient information.

Project Activity Type (check all that apply to entire action):
- [x] 1. Bridge repair, demolition, and replacement
- [ ] 2. Culvert repair and replacement
- [x] 3. Docks, piers, and waterway access projects
- [ ] 4. Slope stabilization

Transportation Project Information

Name of Project:	Newington-Dover 11238, General Sullivan Bridge		
Project Sponsor:	NH Departmetn of Transportation		
Contact Person:	Marc Laurin	Email/Phone:	marc.laurin@dot.nh.gov / 603-271-4044
Latitude (e.g., 42.625884):		43.117921	
Longitude (e.g., -70.646114):		-70.826102	
Anticipated Project Start Date:	09/01/2020	Anticipated Project End Date:	04/01/2022
Total Area of Habitat Alteration (acres):		~0.75 acre	
Project/Action Description and Purpose (*include town/city/state and water body where project is occurring*:	The General Sullivan Bridge spans Little Bay in Dover and Newington, NH. The Preferred Alternative would remove and replace the General Sullivan Bridge superstructure while reusing the substructure (existing piers). Under this alternative, the superstructure would be replaced with a steel girder system with a structural frame extending from the bottom of the girders to the top of the existing piers. Refer to the attached cover letter for more information.		

ESA-Listed Species and/or Critical Habitat Present (Check all that apply)

[x]	Atlantic sturgeon (all DPSs) If not all DPSs, list which here: Gulf of Maine	[ ]	Kemp's ridley sea turtle
[x]	Atlantic sturgeon critical habitat (GOM, NYB, Chesapeake Bay DPSs)	[ ]	Loggerhead sea turtle (Northwest Atlantic DPS)
[x]	Shortnose sturgeon	[ ]	Leatherback sea turtle
[ ]	Atlantic salmon (GOM DPS)	[ ]	North Atlantic right whale
[ ]	Atlantic salmon critical habitat (GOM DPS)	[ ]	North Atlantic right whale critical habitat
[ ]	Green sea turtle (North Atlantic DPS)	[ ]	Fin whale

The following stressors are applicable to the action (check all that apply- use Table 1 for guidance)

- ■ Underwater Noise
- ■ Impingement/Entrainment and Entanglement
- ■ Water Quality/Turbidity
- ■ Habitat Alteration
- ■ Vessel Traffic

FHWA's Determination of Effects to ESA-Listed Species and/or Critical Habitat

By submitting this Verification Form, FHWA, or state DOT as FHWA's designated non-federal representative, indicates that they determined that the proposed activity described above is not likely to adversely affect (NLAA) ESA-listed species or designated critical habitat under NMFS' jurisdiction in accordance with the Program, and all effects (direct, indirect, interrelated, and interdependent) are either insignificant (so small they cannot meaningfully be measured, detected, or evaluated) and/or discountable (extremely unlikely to occur).

◉ The activity complies with all of the Project Design Criteria (PDC) in the Program, as confirmed in the PDC checklist.

○ The activity does not comply with all of the PDC in the Program, but the additional justification demonstrates how the project conforms to the Program. This does not apply to PDC that are not applicable to the project.

FHWA/state DOT preparer:

Marc Laurin
Name

Signature

6/18/19
Date

By providing your determination and signature, you are certifying that to the best of your knowledge the information provided in this form is accurate and based upon the best available scientific information. This form must be filled out and signed by FHWA or state DOT staff, as an officially designated non-federal representative.

Project Design Criteria (PDC) Checklist

FHWA/state DOT shall incorporate all general PDC and all applicable PDC in the appropriate stressor category. For any PDC that are not incorporated, additional justification is required for a project to be eligible for the Program. FHWA/state DOT shall check the corresponding box for each PDC that is, or will be, incorporated into the project.

General

■ 1. Ensure all operators, employees, and contractors are aware of all FHWA environmental commitments, including these PDC, when working in areas where ESA-listed species may be present or in critical habitat.

■ 2. No work will individually or cumulatively have an adverse effect on ESA-listed species or critical habitat.

N/A ☐ 3. No work will occur in the tidally influenced portion of rivers/streams where Atlantic salmon presence is possible from April 10 through November 7.

N/A ☐ 4. No work will occur in areas identified as Atlantic or shortnose sturgeon spawning grounds as follows:

i. Gulf of Maine: April 1 through August 31
ii. Southern New England/New York Bight: March 15 through August 31
iii. Chesapeake Bay: March 15 through July 1 & September 15 through November 1

N/A ☐ 5. No work will occur in areas identified as sturgeon overwintering grounds where dense aggregations are known to occur, as follows:

i. Gulf of Maine: October 15 through April 30
ii. Southern New England/New York Bight: November 1 through March 15
iii. Chesapeake Bay: November 1 through March 15

■ 6. Within designated Atlantic sturgeon critical habitat, no work will affect hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand (ppt) range) for settlement of fertilized eggs, refuge, growth, and development of early life stages) (PBF 1).

■ 7. Work will result in no or only temporary/short-term changes in water temperature, water flow, salinity, or dissolved oxygen levels.

■ 8. If it is possible for ESA-listed species to pass through the action area, a zone of passage with appropriate habitat for ESA-listed species (e.g., depth, water velocity, etc.) must be maintained (i.e., physical or biological stressors such as turbidity and sound pressure must not create barrier to passage).
If the "maximum extent of stressor" exceeds the "width of water body," PDC 9 is NOT met, and justification is required to proceed with the Verification Form.
Width (m) of waterbody in action area: 450 meters
Stressor category (stressor that extends furthest distance into waterbody- e.g., turbidity plume, sound pressure wave): sound pressure wave
Maximum extent (m) of stressor into the waterbody: 300.000

■ 9. The project will not directly affect any submerged aquatic vegetation (SAV) or oyster reefs.

■ 10. No blasting or use of explosives will occur.

■ 11. No in-water work on dams or tide gates.

Underwater Noise

■ 12. If pile driving is occurring during a time of year when ESA-listed species may be present, and the anticipated noise is above the behavioral noise threshold, a 20-minute "soft start" is required to allow animals an opportunity to leave the project vicinity before sound pressure increases.

■ 13. If the project involves driving steel piles, non-steel piles greater than 24-inches in diameter, or any other noise-producing mechanism, the expected underwater noise (pressure) must be below the physiological/injury noise threshold for ESA-listed species in the action area.
Submit your calculation showing that the noise is below the injury thresholds.

Pile material (e.g., steel pipe, timber, concrete)	Pile diameter/ width (inches)	Number of piles	Installation method (e.g., impact hammer, vibratory start and then impact hammer to depth)
14" steel pipe	14"	< 50	Driven (impact hammer)

■ 14. Any new pile-supported structure must involve the installation of no more than 50 piles (below MHW).

Impingement/Entrainment/Entanglement

N/A ☐ 15. Only mechanical, cutterhead, and low volume hopper dredges may be used.

N/A ☐ 16. No new dredging in Atlantic sturgeon or Atlantic salmon critical habitat (maintenance dredging still must meet all other PDC). New dredging outside Atlantic sturgeon or salmon critical habitat is limited to one-time dredge events (e.g., burying a utility line) and minor (≤2 acres) expansions of areas already subject to maintenance dredging.

N/A ☐ 17. Temporary intakes related to construction must be equipped with 2 mm wedge wire mesh screening and must not have greater than 0.5 feet per second intake velocities, to prevent impingement or entrainment of any ESA-listed species.

N/A ☐ 18. Work behind cofferdams, turbidity curtains, and other methods to block access of animals to dredge footprint is required when ESA-listed species may be present.

N/A ☐ 19. No new permanent surface water withdrawal, water intakes, or water diversions.

■ 20. Turbidity control measures, including cofferdams, must be designed to not entangle or entrap ESA-listed species.

■ 21. Any in-water lines, ropes, or chains must be made of materials and installed in a manner to minimize or avoid the risk of entanglement by using thick, heavy, and taut lines that do not loop or entangle. Lines can be enclosed in a rigid sleeve.

Water Quality/Turbidity

N/A ☐ 22. In-water offshore disposal may only occur at designated disposal sites that have already been the subject of ESA section 7 consultation with NMFS and where a valid consultation is in place.

N/A ☐ 23. Any temporary discharges must meet state water quality standards (i.e., no discharges of substances in concentrations that may cause acute or chronic adverse reactions, as defined by EPA water quality standards criteria).

N/A ☐ 24. Only repair of existing discharge pipes or replacement in-kind allowed; no new construction.

■ 25. Work behind cofferdams, turbidity curtains, or other methods to control turbidity are required when ESA-listed species may be present.

Habitat Alteration

■ 26. Minimize all new waterward encroachment and permanent fill.

N/A ☐ 27. In Atlantic salmon critical habitat, replaced culverts must be constructed at a minimum of 1.2 bankfull width (BFW).

N/A ☐ 28. In Atlantic salmon critical habitat, no culvert end extensions, invert line culvert rehabilitation, or slipline culvert rehabilitation may occur.

Vessel Traffic

■ 29. Maintain project vessel speed limits below 10 knots and dredge vessel speeds of 4 knots maximum, while dredging.

■ 30. Maintain a 150-foot buffer between project vessels and ESA-listed whales and sea turtles (1,500 feet for right whales) and while dredging, at least a 300-foot buffer between dredge vessels and ESA-listed whales and sea turtles (1,500 feet for right whales).

■ 31. The number of project vessels must be limited to the greatest extent possible, as appropriate to size and scale of project.

■ 32. A project must not result in the permanent net increase of commercial vessels.

Justification for NLAA Determination if not Incorporating All PDC

If the project is not in compliance with all of the applicable PDC, but FHWA/state DOT determined that the project is consistent with the Program and all effects are insignificant and/or discountable, provide justification below and identify which PDC are not incorporated. Project modifications must not result in different effects not already considered.

GARFO PRD Determination (To be filled out by GARFO PRD)

After receiving the Verification Form, GARFO PRD will contact FHWA/state DOT with any concerns and indicate whether GARFO PRD concurs with FHWA/state DOT's determination.

☐ GARFO PRD concurs with FHWA's determination that the proposed project complies with the Program.

☐ GARFO PRD concurs with FHWA's determination that the proposed project complies with the Program, with the justification described.

☐ GARFO PRD does not concur with FHWA's determination that the project complies with the Program and FHWA/state DOT should initiate a separate individual consultation.

GARFO PRD reviewer:

William Barnhill
Name

William Barnhill
Signature

06/18/2019
Date

Continuation Sheets

Appendix A Verification Form – FHWA GARFO 2018 NLAA Program

Spaulding Turnpike / Little Bay Bridge: NHS-027-1(037), 11238S

June 2019

Project Design Criteria Checklist

General

1. *Ensure all operators, employees, and contractors are aware of all FHWA environmental commitments, including these PDC, when working in areas where ESA-listed species may be present or in critical habitat.*

   All personnel working on the project will be made aware of all FHWA environmental commitments, as well as the commitments included in the PDC. This requirement will be included in any construction contract issued for the project.

2. *No work will individually or cumulatively have an adverse effect on ESA-listed species or critical habitat.*

   Two ESA-listed species or critical habitat occur within the project area, the Atlantic sturgeon and shortnose sturgeon. While the proposed project involves in-water work that will impact these species' habitat, this work will only cause limited, temporary disturbance to the bed of the Little Bay, since the in-water work related to installing and removing the causeways/trestles will take place over a few weeks at the start and end of construction. The minimization and mitigation measures proposed to be used throughout the duration of construction will also reduce any potential adverse effects that the project may have on ESA-listed species. Therefore, the project is anticipated to have little to no adverse effect on ESA-listed species.

3. *No work will occur in the tidally influenced portion of rivers/streams where Atlantic salmon presence is possible from April 10 through November 7.*

   The proposed project is located in Little Bay. In New Hampshire, the designated EFH for Atlantic salmon is located in the Merrimack River.

4. *No work will occur in areas identified as Atlantic or shortnose sturgeon spawning grounds as follows:*
   i. Gulf of Maine: April 1 through August 31

   Based on the GARFO Master ESA Species Table, the Piscataqua River does not contain spawning grounds for Atlantic or shortnose sturgeon. Spawning within the Piscataqua River Watershed is limited to the Salmon Falls and Cocheco rivers, which are located outside of the project area. Therefore, if project work takes place during the April 1 to August 31 timeframe, this work is not anticipated to negatively impact Atlantic or shortnose sturgeon spawning grounds.

5. *No work will occur in areas identified as sturgeon overwintering grounds where dense aggregations are known to occur, as follows:*
   i. Gulf of Maine: October 15 through April 30

   Based on the GARFO Master ESA Species Table, the Piscataqua River Watershed is not located in sturgeon overwintering grounds. Therefore, if project work takes place during the October 15 to April 30 timeframe, this work is not anticipated to impact Atlantic or shortnose sturgeon overwintering grounds.

6. *Within designated Atlantic sturgeon critical habitat, no work will affect hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand (ppt) range) for settlement of fertilized eggs, refuge, growth, and development of early life stages (PBF 1).*

   No work is anticipated to affect hard bottom substrate in low salinity waters as part of the project work. Salinity data from the NH Department of Environmental Service's Environmental Monitoring Database of water samples taken within the vicinity of the GSB from 1996 to 2008 indicate that the salinity of the Little Bay in this area varies from 10 to 34 ppt with an average of 25 ppt, therefore the salinity of the Little Bay is greater than the low salinity waters for settlement of fertilized eggs, refuge, growth, and development of early life stages, and is unlikely to support these early life stages.

   Only temporary impacts to hard bottom substrate are anticipated as a result of the project work. A study of the bottom habitat within the project area was completed in 2003 which documented rocky bottom habitats within and adjacent to the project area. Rocky/cobble-bottom habitat within the project area is concentrated near the shoreline of the Little Bay along the Newington and Dover coastlines. Temporary impact to these habitat types will result from the placement of the causeways and trestles during construction; the causeways and trestles are expected to be in place for approximately 18 months.

7. *Work will result in no or only temporary/short-term changes in water temperature, water flow, salinity, or dissolved oxygen levels.*

   Changes in water temperature, salinity, or dissolved oxygen levels would not occur as a result of the proposed project. Minor, temporary impacts to water flow may occur from the temporary causeways and trestles in Little Bay. A hydrodynamic model completed for the original December 2007 Environmental Impact Statement for this project (Celikkol et. al, 2006) investigated potential changes to tidal flow due to bridge pier modification from the construction of the Little Bay Bridge (located next to the General Sullivan Bridge). This model predicted that the modifications will result in little change to the tidal flow within Little Bay. Since the proposed replacement of the General Sullivan Bridge will take place on existing piers, the project will not permanently change water depth nor the current of Little Bay. Low tide depths in the deepest portion of the project area range from approximately 30 to 34 feet (9.1 to 10.4 meters). Normal tidal range in this portion of the estuary is about 8 feet (2.4 meters).

The temporary causeways/trestles are anticipated to temporarily alter currents at a localized scale and will cause minor, near-field changes in tidal velocities. Current flows in the area are complex and have a wide range of direction components and speeds during a tidal cycle. Tidal flows, currents, and wave patterns would not be permanently altered since no permanent structure will be constructed in the water.

8. *If it is possible for ESA-listed species to pass through the action area, a zone of passage with appropriate habitat for ESA-listed species (e.g., depth, water velocity, etc.) must be maintained (i.e., physical or biological stressors such as turbidity and sound pressure must not create a barrier to passage).*

Since the project area is located at the mouth of Little Bay adjacent to the Piscataqua River, it is possible that Atlantic/shortnose sturgeon may pass through the project area during construction. During project construction temporary causeways and trestles will be installed from the Newington and Dover ends of the project. The causeways will be approximately 260 feet long on the Newington side of the bridge and 130 feet long on the Dover side of the bridge. The trestles will be approximately 450 to 460 feet long from the Newington side and approximately 470 to 480 feet long on the Dover side. The width of the Little Bay in the project area is about 1,500 feet. Even with the causeways and temporary platforms in place, there will be room for boats and fish to navigate through the project area.

No changes to water depth would result from the placement of the causeways and trestles, except temporary but minor changes in water velocity/flow may occur from the installation of these platforms as explained above in Response #7. Similarly, sound pressure from installation of the temporary causeway and trestle is not anticipated to create a barrier to passage. See Responses #12-14 below.

Only minor, short duration turbidity in the Little Bay may occur during the placement and removal of the causeways/trestles at the start and end of construction. The placement of these platforms is anticipated to take approximately one to two weeks to install and another one to two weeks to remove. Turbidity generated by the proposed project would be localized to the vicinity of the project area and would be quickly dissipated by the current. Since any turbidity generated would be limited to the immediate project area and be of very short duration, turbidity would not create a barrier to passage.

9. *The project will not directly affect any submerged aquatic vegetation (SAV) or oyster reefs.*

The project will not substantially nor permanently impact SAV. There is no eelgrass in the project area based on field work conducted in the project area by UNH (Grizzle and Brodeur, 2003). The closest mapped eelgrass locations according to the New Hampshire Coastal Viewer based on 2017 data is approximately 3,200 feet west of the project area within the Little Bay and 2,200 feet east within the Piscataqua River. However, kelp and microalgal beds are located in the subtidal zone near the Newington and Dover coastlines within the project area (See Figure 3). Some of the

mapped SAV documented within the project area will be temporarily impacted by the proposed project from the placement of the temporary trestles, however this impact would be limited to the placement of temporary pilings and therefore minor; kelp and macroalgal populations are expected to persist during the construction phase and any minor population impact would rebound once the trestles are removed.

Oyster reefs will not be affected by the project, although shellfish are present within and adjacent to the project area. According to the NH Coastal Viewer, a ±2.8-acre blue mussel shellfish bed is located in Little Bay along the Dover Point coastline on the northern side of the project. This bed was identified by the NHDES Shellfish Program in 2013 (Morrissey and Nash, 2013). The next closest bed is a shellfish aquaculture site of razor clams/soft shell clams located approximately 1.5 miles west of the project area. An oyster restoration site is located about 1.5 miles west of the project. These aquaculture sites will not be directly impacted by the proposed project.

10. *No blasting or use of explosives will occur.*

The project does not require the use of blasting or explosives.

11. *No in-water work on dams or tide gates.*

The project does not involve dams or tide gates.

Underwater Noise

12. *If pile driving is occurring during a time of year when ESA-listed species may be present, and the anticipated noise is above the behavioral noise threshold, a 20-minute "soft start" is required to allow animals an opportunity to leave the project vicinity before sound pressure increases.*

The project would use a 20-minute "soft start" technique to allow animals an opportunity to leave the project vicinity and move out of range of any potential injury-causing noise before sound pressure increases.

13. *If the project involves driving steel piles, non-steel piles greater than 24-inches in diameter, or any other noise-producing mechanism, the expected underwater noise (pressure) must be below the physiological/injury noise threshold for ESA-listed species in the action area. (Submit your calculation showing that the noise is below the injury thresholds.)*

The project will involve driving steel piles to support two temporary trestles, but no more than 50 such piles are anticipated. The method used to drive the piles will be based on the contractors' preference but will likely be via impact hammer. The behavioral threshold for sturgeon/salmon according to the NMFS FARFO *Interim Criteria* is 150 dBRMS, and physiological threshold is 206

dBRMS. The NOAA GARFO has developed a Simplified Attenuation Formula (SAF)[1] which was applied to the proposed project.

Based on the NOAA GARFO methodology, fish at least 190 feet (58 meters) from pile driving would avoid the potential for injury, and at least 256 feet (78 meters) would not experience behavioral disturbance. See the attached *Hydroacoustic Impact Assessment from Pile Driving* memo for more information.) Sturgeon would need to be within 190 feet of active pile driving for a prolonged period of time to be exposed to potentially injurious sound levels. This is unlikely to occur since sturgeon are expected to modify their behavior and move away from the area upon exposure to underwater sound levels of 150 dBRMS. Sturgeon would be exposed to sound levels that would cause behavioral modification (at 256 feet) before being exposed to injurious levels of noise, we expect sturgeon would avoid the sound source before cumulative exposure results in injury. Further, the work area at the mouth of Little Bay is between 1,300 feet to 1,400 feet wide, depending on tidal conditions. Given that piles are typically driven individually, this would leave most of the width of the area below levels that would have either behavioral or physiological impacts. Given the small distance a sturgeon would need to move to avoid disturbances, these effects would not be able to be measured or detected and are therefore insignificant. Refer to the *Hydroacoustic Impact Assessment from Pile Driving* memo, attached, for more information.

14. *Any new pile-supported structure must involve the installation of no more than 50 piles (below MHW).*

    As described above, no more than 50 temporary piles would be used to support two temporary work trestles for a period of approximately 18 months.

<u>Impingement/Entrainment/Entanglement</u>

15. *Only mechanical, cutterhead, and low volume hopper dredges may be used.*

    Not applicable – the project does not include dredging.

16. *No new dredging in Atlantic sturgeon or Atlantic salmon critical habitat (maintenance dredging still must meet all other PDC). New dredging outside Atlantic sturgeon or salmon critical habitat is limited to one-time dredge events (e.g., burying a utility line) and minor (≤2 acres) expansions of areas already subject to maintenance dredging.*

    Not applicable – the project does not include dredging.

17. *Temporary intakes related to construction must be equipped with 2 mm wedge wire mesh screening and must not have greater than 0.5 feet per second intake velocities, to prevent impingement or entrainment of any ESA-listed species.*

    Not applicable – the project does not require the use of temporary intakes.

[1] NOAA Greater Atlantic Region. *Effects Analysis: Acoustic Impacts*. Accessed from https://www.greateratlantic.fisheries.noaa.gov/protected/section7/guidance/consultation/index.html. Accessed April 19, 2019.

18. *Work behind cofferdams, turbidity curtains, and other methods to block access of animals to dredge footprint is required when ESA-listed species may be present.*

    Not applicable – the project does not include dredging.

19. *No new permanent surface water withdrawal, water intakes, or water diversions.*

    Not applicable - the project will not involve installing any new permanent surface water withdrawal, water intakes, or water diversions.

20. *Turbidity control measures, including cofferdams, must be designed to not entangle or entrap ESA-listed species.*

    Any turbidity control measures used during project construction will be those that are designed to not entangle or entrap ESA-listed species.

21. *Any in-water lines, ropes, or chains must be made of materials and installed in a manner to minimize or avoid the risk of entanglement by using thick, heavy, taut lines that do not loop or entangle. Lines can be enclosed in a rigid sleeve.*

    If any in-water lines, ropes, or chains are used during project construction, this equipment will be made of heavy materials and will be installed to avoid the risk of entanglement.

<u>Water Quality/Turbidity</u>

22. *In-water offshore disposal may only occur at designated disposal sites that have already been the subject of ESA section 7 consultation with NMFS and where a valid consultation is in place.*

    Not applicable – no offshore disposal is required as part of the project.

23. *Any temporary discharges must meet state water quality standards (i.e., no discharges of substances in concentrations that may cause acute or chronic adverse reactions, as defined by EPA water quality standards criteria).*

    Not applicable – no temporary discharges will be required as part of the project work.

24. *Only repair of existing discharge pipes or replacement in-kind allowed; no new construction.*

    Not applicable – no discharge pipes will be installed or repaired as part of the project.

25. *Work behind cofferdams, turbidity curtains, or other methods to control turbidity are required when ESA-listed species may be present.*

    Since no sediment disturbance is anticipated to release sediments into the water column from the proposed construction work, no in-water turbidity control methods are proposed to be used during construction. All permanent impacts associated with the project construction would occur above the highest observable tide line (HOTL), which would result in little to no release of sediment into Little Bay with the use of silt fence or similar erosion control methods that would be in place

above the HOTL. Temporary impacts within Little Bay would occur during the placement of clean stone material for the temporary installation of the causeways, as well as for the placement of steel piles or "stingers" that would be used to support the work trestles beyond the causeways. Additionally, the project is located within a tidal area with a strong current, any minimal turbidity generated during the work is expected to rapidly dissipate and be at or below typical tidal estuary background levels.

Habitat Alteration

26. *Minimize all new waterward encroachment and permanent fill.*

    The project will not add waterward encroachment towards or permanent fill within Little Bay. The project requires the use of temporary fill for the placement of causeways. Once the project is complete these causeways will be removed and the area will be restored to its original condition to the maximum extent practicable. The lengths of the temporary causeways has been minimized to the extent practical.

27. *In Atlantic salmon critical habitat, replaced culverts must be constructed at a minimum of 1.2 bankfull width (BFW).*

    Not applicable – the project is not located within Atlantic salmon critical habitat and does not involve the construction of any culverts.

28. *In Atlantic salmon critical habitat, no culvert end extensions, invert line culvert rehabilitation, or slipline culvert rehabilitation may occur.*

    Not applicable – the project is not located within Atlantic salmon critical habitat and does not involve the construction of any culverts.

Vessel Traffic

29. *Maintain project vessel speed limits below 10 knots and dredge vessel speeds of 4 knots maximum, while dredging.*

    The occasional use of vessels to access the work space and remove the bridge superstructure may occur, but these vessels would never approach or exceed 10 knots. The project does not include dredging, so the 4 knot maximum does not apply.

30. *Maintain a 150-foot buffer between project vessels and ESA-listed whales and sea turtles (1,500 feet for right whales) and while dredging, at least a 300-foot buffer between dredge vessels and ESA-listed whales and sea turtles (1,500 feet for right whales).*

    Whales and sea turtles are not expected to be encountered during construction, and the project does not include dredging. If any whales or turtles are encountered, project vessels would adhere to the required 150-foot buffer.

31. *The number of project vessels must be limited to the greatest extent possible, as appropriate to size and scale of project.*

    One or more project vessel may be used when the GSB superstructure is removed in addition to the use of the causeways and trestles that would run parallel to the bridge.

32. *A project must not result in the permanent net increase of commercial vessels.*

    The project is to provide pedestrian and bicycle connectivity over Little Bay between Newington and Dover. The preferred alternative will not change the width of the navigational channel nor increase clearances as permitted by the USGS for the existing Little Bay Bridges. As such the project will not change the amount of boat traffic or commercial vessels traveling through Little Bay.

References

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.

Grizzle, R. and M. Brodeur. 2003. *Spaulding Turnpike Environmental Impact Study: Technical Report for Phase 1 – Data Collection and Coordination (Assessment of Existing Conditions in Little Bay*. Progress Report on Jackson Estuarine Laboratory Work Tasks 1-4. Jackson Estuarine Laboratory, University of New Hampshire, Durham, NH.

Morrissey, E., and C. Nash. 2013. *Identifying Blue Mussel (*Mytilus edulis*) Resource in Coastal New Hampshire*. NH Department of Environmental Services' Shellfish Program. Accessed January 14, 2019 <https://www.des.nh.gov/organization/divisions/water/wmb/shellfish/red-tide/aquaculture.htm>.

Memorandum

To: Marc Laurin, NHDOT

Date: June 5, 2019

Project #: 52381.01

From: Jason Ross, P.E. Director of Noise and Vibration

Re: General Sullivan Bridge - Hydroacoustic Impact Assessment from Pile Driving

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VHB has assessed the potential for hydroacoustic effects from pile driving on ESA-listed species, including the Atlantic sturgeon and shortnose sturgeon, which may pass through the General Sullivan Bridge (GSB) project area during construction. This assessment includes background information on potential effects from pile driving, the types of piles and construction equipment used, methods to predict underwater sound propagation, how underwater sound is measured and evaluated, interim criteria used for assessing potential impacts, the results of the impact assessment for the General Sullivan Bridge project, and recommendations for Best Management Practices (BMPs) to minimize potential effects.

Background on Hydroacoustic Effects of Pile Driving on Fish

Sound generated by underwater pile driving has the potential to affect fish such as altering their behavior, disrupting their functions or physiology, causing injury or resulting in mortality. Behavioral effects from pile driving sound may include causing fish to be startled, moving away from typical habitats, reducing the ability to locate prey, or inability to communicate. Physiological effects may include stress, temporary hearing loss, or cellular changes to organs such as a fish's swim bladder, eyes or brain.

The severity of these effects depends on the intensity and characteristics of underwater sound and the size and type of fish present. Underwater sound levels depend on many factors such as the size and type of piles and pile driving equipment, the use of sound attenuation measures during construction, the proximity of fish to the source of sound and the efficiency that sound propagates at the project site.

Cast-in-shell steel (CISS) piles are most commonly used for permanent bridge structures. CISS piles generally produce higher sound levels compared to H-type steel piles, wood, or concrete piles. Smaller piles will typically result in lower underwater sound levels per strike than larger piles; however, there may be a need for more piles to be driven and the cumulative sound exposure could actually be greater than with fewer larger piles. Impact pile driving equipment is most commonly used and generally causes the highest sound levels compared to other installation equipment such as vibratory hammers, oscillating, or push-in methods.

Underwater Sound Propagation

Similar to airborne sound, underwater sound attenuates with distance from the source. Underwater sound propagation is complex and depends on several factors such as the depth of water, interactions with sound reflecting off the water surface and the ground surfaces, and the frequency of sound generated by the pile drivers. Underwater sound propagation is rather different and more complex in shallow water, where sound interacts more with the ground and the surface, compared to deep water sound propagation. Due to these complexities, sound

2 Bedford Farms Drive
Suite 200
Bedford, NH 03110-6532
P 603.391.3900

from pile driving in shallow waters is typically predicted based on empirical data from measurements of similar conditions. A substantial body of reference measurement data on the sound level emissions from pile driving has been collected and documented in Caltrans' "Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish."1

Reference sound measurements from pile driving are generally conducted 10 to 30 meters from the source. There are different sound attenuation methods that may be used to predict sound levels at other distances from the source. The Practical Spreading Loss Model (PSLM) is typically used for deep water conditions where sound interacts less with the ground. This model typically assumes that underwater sound will attenuate 4.5 dB per doubling of distance for a typical sound attenuation factor (F = 15). Therefore, if underwater sound is 200 dB at 10 meters, it would be 195.5 dB at 20 meters and 191 dB at 40 meters.

The NOAA Greater Atlantic Regional Fisheries Office (GARFO) has developed a Simplified Attenuation Formula (SAF) which is more accurate for predicting sound propagation in rivers and nearshore waters. The SAF assumes there is a constant sound reduction due to distance (typically 5 dB per 10 meters). Therefore, if underwater sound is 200 dB at 10 meters, it would be 195 dB at 20 meters, and 190 dB at 40 meters. Since the GSB study area is near shore with water heights of approximately 9 to 13 meters, the SAF sound propagation method is most appropriate.

Underwater Sound Levels

Sound is the rapid fluctuation of a fluid that is transferred away from a source via waves. Underwater sound levels are typically expressed in decibels based on a ratio of the change in pressure relative to a reference level of 1 micro-Pascal. There are several ways to describes sound levels to account for the way they change from moment-to-moment.

- "Peak" sound level (dBpeak) represents the maximum instantaneous change in sound pressure compared to ambient conditions. For pile driving, this would be highest instantaneous sound level during an individual strike.
- "RMS" sound level (dBRMS) represents the root-mean squared sound pressure over a duration (typically 50 to 100 milliseconds). For pile driving, this would represent the typical pressure and intensity over the course of an individual strike.
- "sSEL" is the single strike sound exposure level (dBsSEL) which takes into account the cumulative sound energy over an entire single pile driving strike.
- "cSEL" is the cumulative sound exposure level (dBcSEL) which takes into account the total sound energy over multiple strikes during a construction period (typically 24 hours).

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[1] "Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish", Caltrans report No. CTHWANP-RT-15-306.01.01, November, 2015.

Interim Criteria

The Federal Highway Administration (FHWA), U.S. Fish and Wildlife Service, NOAA Fisheries Northwest and Southwest regions, and the California, Oregon, and Washington Departments of Transportation established the Fisheries Hydroacoustic Working Group (FHWG) to improve and coordinate on information about underwater sound caused by pile driving. The FHWG led to an *Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities* (AIP) in 2008. The National Marine Fisheries Service (NMFS) Greater Atlantic Region Fisheries Office (GARFO) has adopted the *Interim Criteria* which include thresholds for assessing potential effects on fish including potential injury. Table 1 presents the physiological/injury and behavioral thresholds for sturgeon and salmon.

Table 1: Behavioral and Physiological (Injury) Thresholds for ESA-Listed Species in NMFS' Greater Atlantic Region

Species	Threshold	Unit
Sturgeon/Salmon Behavioral	150	dBRMS (re 1 µPA)
Sturgeon/Salmon Physiological	206	dBpeak
Sturgeon/Salmon Physiological (>2g)	187	dBcSEL
Sturgeon/Salmon Physiological (<2g)	183	dBcSEL

Source: GARFO, 2018.

When the number of strikes that will be needed for the piles and the piling schedule is not known, it is not possible to accurately calculate the distance to the cumulative strike SEL 187 dBcSEL. In these circumstances, we calculate the distance to the single strike SEL level of 150 dBsSEL. When the received sound level from an individual pile strike is below a certain level, then the accumulated energy from multiple strikes would not contribute to injury, regardless of how many strikes occur. Beyond this distance, no physical injury is expected, regardless of the number of strikes. Since the number of strikes is not know at this time for the GSB project, impact has been evaluated according to 150 dBsSEL.

Impact Assessment

The current Preferred Alternative for General Sullivan Bridge (Alternative 9) is for a superstructure replacement, which involves complete removal and replacement of the existing superstructure. During project construction, temporary causeways and trestles will be installed from the Newington and Dover ends of the project. The causeways will be approximately 260 feet long on the Newington side of the bridge and 130 feet long on the Dover side of the bridge. The trestles will be approximately 450 to 460 feet long from the Newington side and approximately 470 to 480 feet long on the Dover side.

Construction of the preferred alternative is expected to take approximately 18 months and construction would begin with a one- to two-week period to install temporary causeways and trestles west of the existing GSB for staging and equipment access during the bridge replacement work.

The project will involve driving 14-inch steel piles to support two temporary trestles; no more than 50 such piles are anticipated. The method used to drive the piles will be based on the contractors' preference but will likely be via impact hammer. Table 2 presents reference sound levels from measurements of similar 14-inch steel pile driving at a

distance of 10 meters. The typical sound level emissions from a 14-inch steel pipe in a water depth of 15 meters are a peak sound level of 200 dBpeak, a single strike sound level of 174 dBsSEL , and an RMS sound level of 184 dBRMS.

Table 2: Underwater Sound Levels for Similar Pile Driving Operations

Pile Size / Type	Hammer Type	Water Depth (m)	Reference Sound Levels at 10 meters		
			Peak Sound Level (dBpeak)	Single Strike Sound Exposure Level (dBsSEL)	Pressure Level (dBRMS)
14" Steel Pipe	Impact	15	200	174	184

Source: Caltrans, 2012. Sound pressure levels from Table I.2-1 on page I-2

VHB has computed the distances to potential impact for injury based on thresholds of 206 dBpeak and 150 dBsSEL and potential behavioral disturbance based on a threshold of 150 dBRMS using the SAF method. As shown in Table 3, the impact assessment results indicate that exposure to peak sound levels that may result in injury are not anticipated to occur since this type of pile generates less than 206 dBpeak at 10 meters. At 58 meters from the piles, fish are far enough away that the sound from a single strike is below 150 dBsSEL and there is no potential for injury. At 78 meters from the piles, fish are far enough away to avoid behavioral disturbance.

Table 3: Estimated Distances to Sturgeon Injury and Behavioral Thresholds

Pile Size / Type	Hammer Type	Distance (m) to Injury at 206 dBpeak	Distance (m) to Injury at 150 dBsSEL (surrogate for 187 dBcSEL)	Distance (m) to Behavioral Disturbance at 150 dBRMS
14" Steel Pipe	Impact	N/A	58	78

Source: VHB, 2019.
N/A: Sound levels from this type of pile does not exceed 206 dBpeak at 10 meters

In order to be exposed to potentially injurious sound levels, a sturgeon would need to be within 58 meters of the pile for a prolonged period of time. This is unlikely to occur as we expect sturgeon to modify their behavior and move away from the area upon exposure to -underwater sound levels of 150 dBRMS. Given that sturgeon would be exposed to sound levels that cause behavioral modification (at 78 meters) before being exposed to injurious levels of noise (at 58 meters), we expect sturgeon would move away from the sound source before cumulative exposure results in injury.

If any sturgeon are within 58 meters of the pile at the time pile driving commences, we expect sturgeon to leave the area in a matter of seconds once pile driving commences. The additional utilization of a soft start technique will also give any sturgeon in the area time to move out of the range of any potential injury causing noise; therefore, no injury is anticipated.

Behavioral disturbances, such as becoming startled, moving away from typical habitats, reducing the ability to locate prey, or inability to communicate, may occur in sturgeon exposed to noise above 150 dBRMS. Underwater sound levels would be below 150 dBRMS at distances beyond 78 meters from the pile being installed. If sturgeon were to go into the area where sound levels exceed 150 dBRMS, it is reasonable to assume that a sturgeon will modify its

behavior such that it redirects its course of movement away from the area where pile driving occurs and the project area. It is extremely unlikely that these movements away from the project area would affect essential sturgeon behaviors such as spawning, foraging, resting, and migration, as the area is not a spawning area. Given the small distance a sturgeon would need to move to avoid disturbances, these effects would not be able to be measured or detected and are therefore insignificant.