8.0. Results of Detailed Evaluation of Alternatives

This chapter summarizes the results of the detailed evaluation and analysis identified in Chapter 7 for each of the Alternatives carried forward from the Fatal Flaw Analysis. This summary includes an identification of benefits and impacts of the No-Build Alternative and the Build Alternatives.

8.1. NO-BUILD ALTERNATIVE

The No-Build Alternative assumes that no new construction would occur with the exception of a traffic signal installation at the intersection of Market and Russell Streets in Portsmouth to alleviate traffic congestion from the closure of the Memorial Bridge. The No-Build Alternative assumes that the existing Memorial Bridge would not be available for use in 2035 due to structural issues. It has been determined that without improvements, the Memorial Bridge would have to be closed within one to three years. The Memorial Bridge was recently closed to vehicular traffic to make necessary structural repairs, and upon its reopening has been posted at a three-ton weight limit, effectively prohibiting all vehicles except automobiles and pickup trucks. The No-Build Alternative assumes that the Sarah Mildred Long Bridge would remain open, but with a reduced weight limit posting. The results of the No-Build evaluation are:

- Engineering Analysis – The No-Build Alternative would not address any of the engineering issues or parameters necessary to accommodate the 2035 design year traffic.
- Traffic Analysis – This alternative yields the highest VMT (123,982) and VHT (4,148) due to the closure of the Memorial Bridge. Has the highest number of intersections (five) that will fail (LOS F) by 2035. This alternative includes the work required at failing intersections, in proximity to the bridges, to obtain a minimum LOS of D. The closure of the Memorial Bridge would reduce traffic and noise levels in the neighborhoods adjacent to the Memorial Bridge approaches. Traffic would increase in three neighborhoods cause by the diversion of traffic to the Sarah Mildred Long Bridge. With the Memorial Bridge closed, the Sarah Mildred Long Bridge would have a volume to capacity ratio of 1.09, indicating that the traffic volume would exceed the available bridge capacity in the peak hour by 2035.
- Multimodal Evaluation – This alternative would reduce bicycle/pedestrian facilities and limit use in the Study Area due to the closure of the Memorial Bridge. The lift span section of the Sarah Mildred Long Bridge would not provide adequate bicycle shoulder width, and would not provide pedestrian facilities. Removal of Memorial Bridge would improve the movement of marine traffic, particularly to the Port of Portsmouth. Rail would be maintained on the Sarah Mildred Long Bridge.
- Air Quality Analysis – The No-Build Alternative is not expected to increase air pollutants above the NAAQS standard.
- Noise Analysis – There would not be any noticeable (less than three dbA) increase in noise levels. Noise levels would likely decrease in the vicinity of the Memorial Bridge access points due to a reduction in traffic.

- Natural Resource Impact Analysis – The No Build Alternative would have beneficial long term effects on aquatic resources and floodplain areas due to the closure and removal of the Memorial Bridge and its piers in the Piscataqua River.
    - River Quality: Temporary impacts to river quality may occur during demolition of bridge piers in the Piscataqua River. These temporary impacts to river (water) quality include increased turbidity and sedimentation during demolition.
    - Aquatic Habitat: Potential temporary impacts associated with work in the river include increased turbidity, sedimentation, noise, and temporary loss of habitat. Time of year restrictions for work in the water may be required to avoid spawning periods of fisheries. Long term effects on aquatic habitat would be beneficial with the removal of the Memorial Bridge piers. Upon removal of the bridge piers, the impacted area would be naturally restored to the condition of the adjacent river bottom.
    - Threatened and Endangered Species: No federally-listed threatened or endangered species are known to exist in the Piscataqua River, however further coordination with resource agencies will be required during the development of environmental documentation, design and permitting phases of the project.
    - Wetlands: The removal of the Memorial Bridge piers would have a temporary impact to the Piscataqua River which is classified as an E1UBL wetland type.
    - Floodplain/Floodway: There would be a beneficial effect by removal of the Memorial Bridge piers from the floodplain.
- Physical Resource Impacts – There would be no impacts to the physical resources due to no infrastructure construction occurring in either community. This alternative would not directly impact any publically owned, commercial or residential properties.
- Land Use Impacts –No direct impact on zoning or activity centers would occur.
- Historic Impacts – The preliminary Section 106 effects determination indicates that closure and removal of the Memorial Bridge and subsequent change in traffic patterns would have an adverse effect on the following historic resources: U.S.S. Albacore, Moffatt-Ladd House, MacPhaedris-Warner House, Governor John Langdon House, Wentworth House, Memorial Bridge, Sarah Mildred Long Bridge, U.S. Route 1 Bypass Historic District, Memorial Bridge Historic District, Portsmouth Local Historic District, and Memorial Park.
- Archaeological Impacts – If the Scott Avenue Bridge in Portsmouth is removed as a part of the Memorial Bridge removal, the activity may impact an archaeological resource.
- Costs Analysis– This alternative yields the lowest capital costs ($18 to $22 million) because no new construction would occur. Total operations costs would be reduced due to the removal of the Memorial Bridge. Overall maintenance costs may be reduced due to the removal of the Memorial Bridge, but the maintenance costs would be expected to be higher on the unimproved Sarah Mildred Long Bridge due to its age (highest overall operation and maintenance costs ($126 to $154 million)). The life cycle cost is among

the lowest of all of the alternatives ($144 to $176 million) because operation and maintenance cost is only for the Sarah Mildred Long Bridge. This alternative provides the highest travel time delay cost ($22,970) due to having the highest congestion. It has the lowest benefit/cost ratio (0.00) because this alternative does not provide any transportation benefits. It should be noted that delays caused by bridge openings have not been factored into the calculations. This will be done during the environmental documentation phase.

- Business Impact Assessment – Closure of Memorial Bridge would have impact to adjacent local businesses that rely on customer traffic but would not affect the regional economy.
- Environmental Clearances – A bridge closure and removal does not require a Coast Guard permit. However, the Coast Guard must be notified to determine if the bridge closure and removal would have an effect on navigation so that waterway users may be notified. Under NEPA, FHWA is responsible for determining the Class of Action. A Categorical Exclusion (CE) would likely be the appropriate Class of Action for the removal of the Memorial Bridge. A U.S. Army Corps of Engineers permit likely would not be needed.

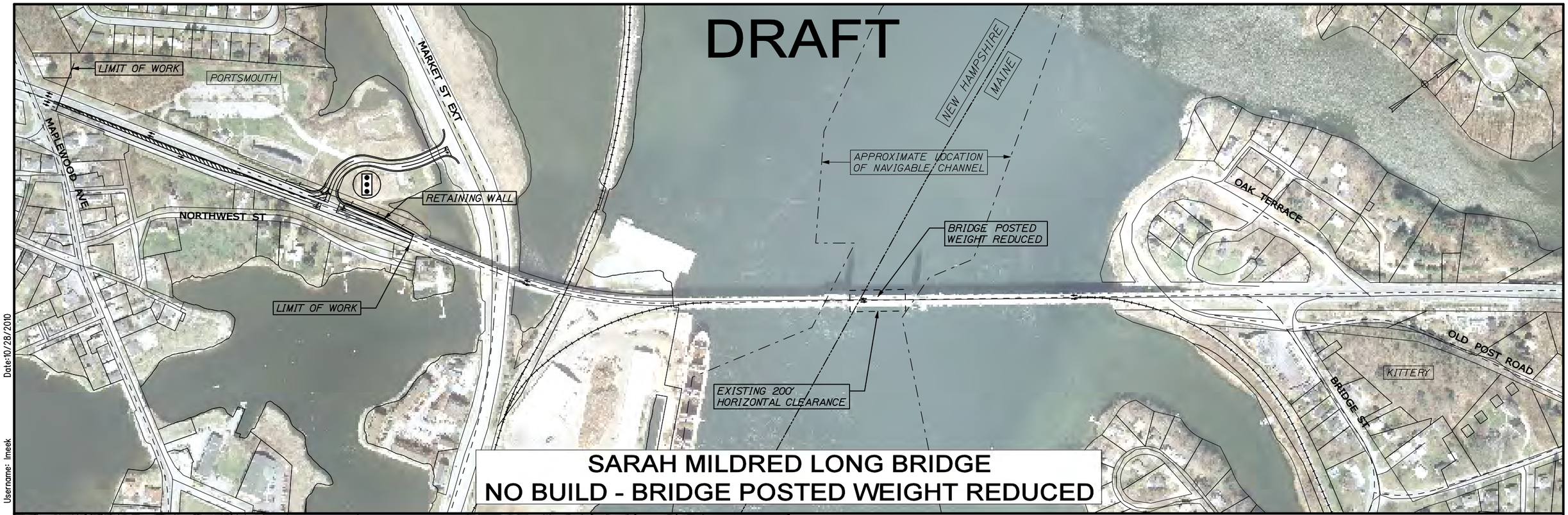
Figure 8-1 on the following page provides a plan and cross section of the No-Build alternative.

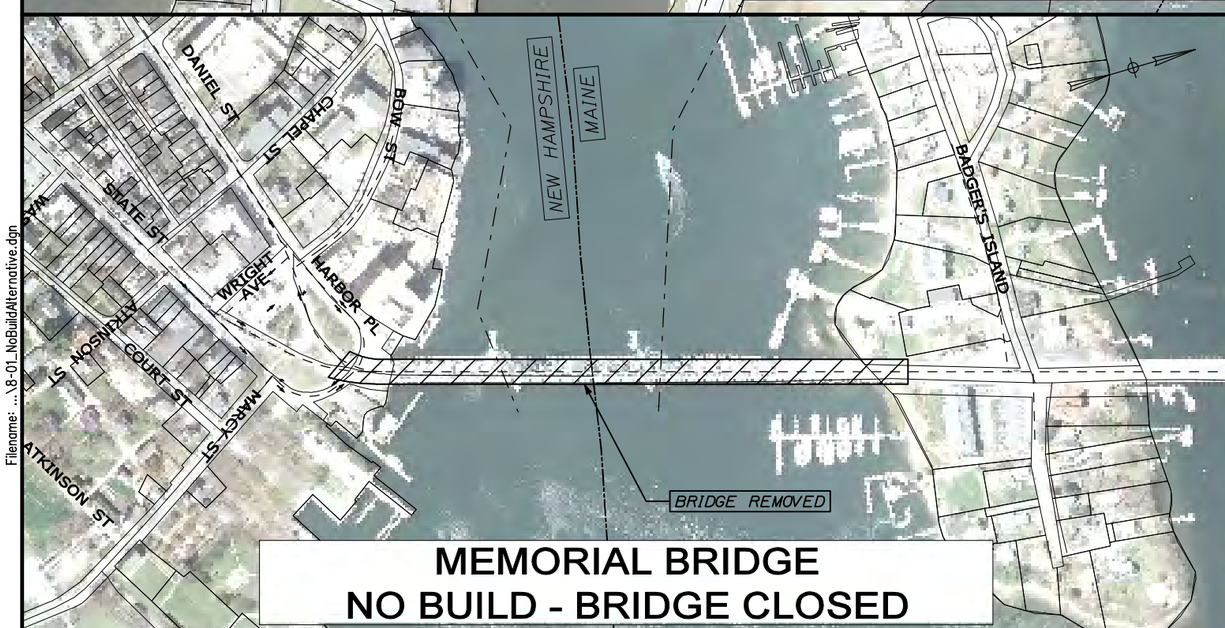
8.2 Alternative 1 - Memorial Bridge Rehabilitated and Sarah Mildred Long Bridge Rehabilitated

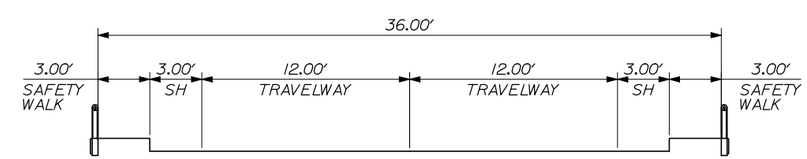
Per the findings summarized in Chapter 5 which states that the Memorial Bridge Rehabilitation is not prudent, Alternative 1 has been dismissed from further consideration. Figure 8-2 on the following pages provides a plan and cross section of Alternative 1 for reference only.

8.3 Alternative 2a - Memorial Bridge Rehabilitated and Sarah Mildred Long Bridge Replaced on Existing Alignment (two-lane), and Alternative 2b - Memorial Bridge Rehabilitated and Sarah Mildred Long Bridge Replaced on Existing Alignment (four-lane)

Per the findings summarized in Chapter 5 which states that the Memorial Bridge Rehabilitation is not prudent, Alternatives 2a and 2b have been dismissed from further consideration. Figures 8-3 and 8-4 on the following pages provide a plan and cross section of Alternatives 2a and 2b for reference only.







SARAH MILDRED LONG BRIDGE
NO BUILD - 2 TRAVEL LANES

BRIDGE TYPICAL SECTION

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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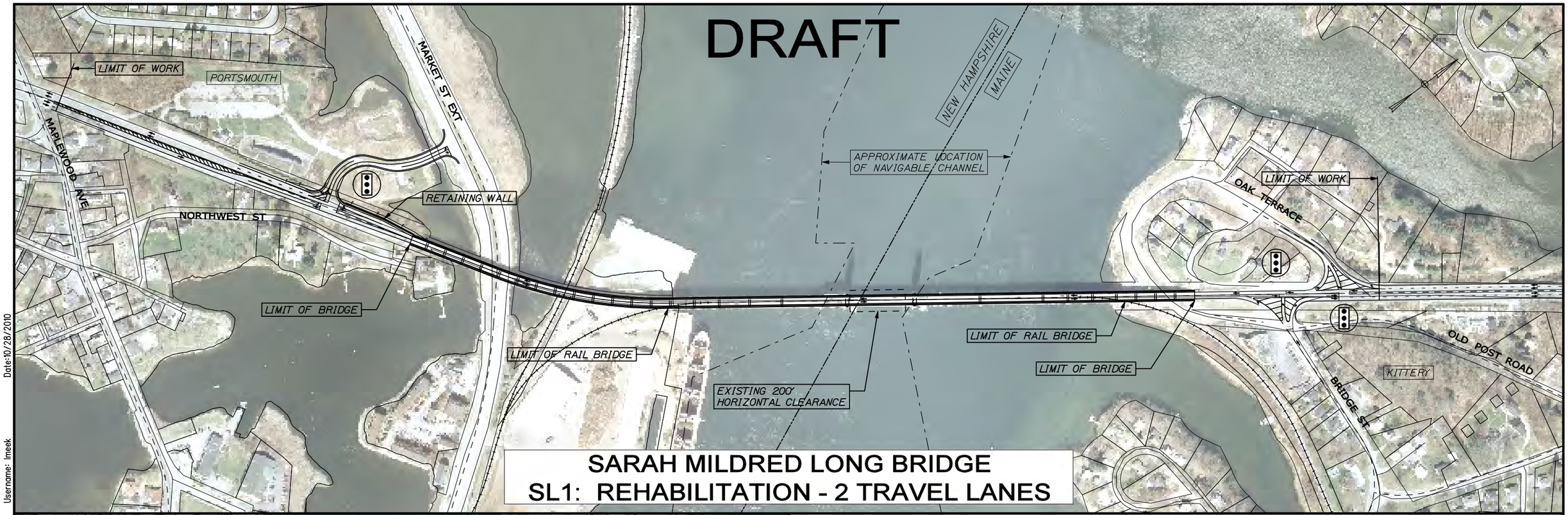
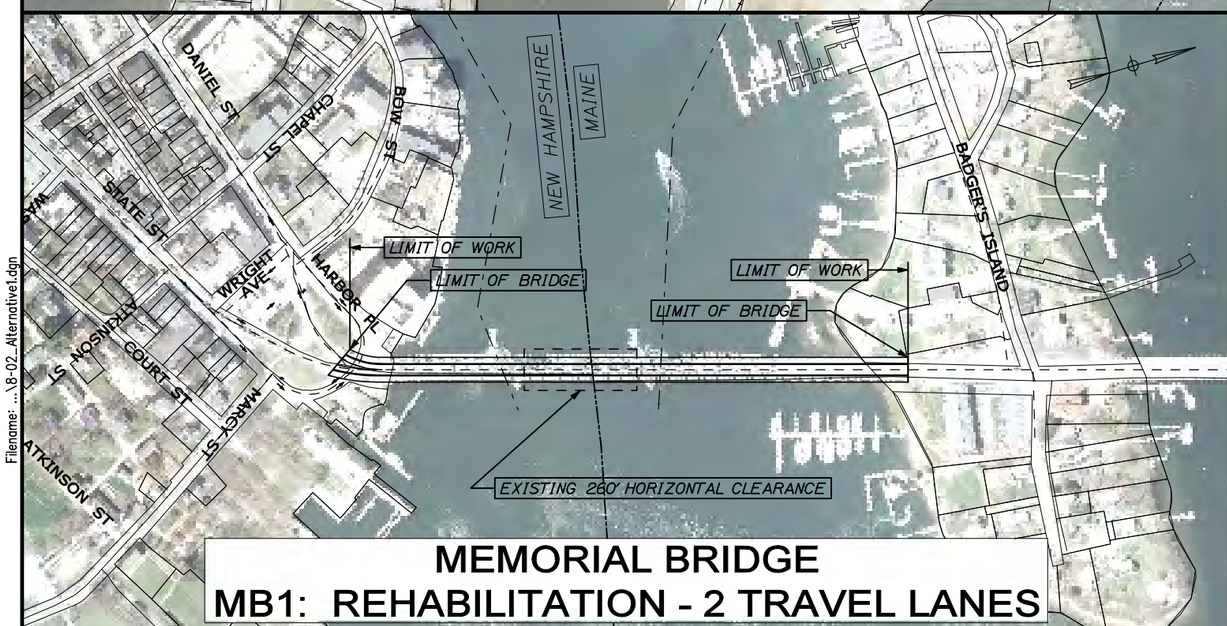
FIGURE 8-1
NO BUILD ALTERNATIVE

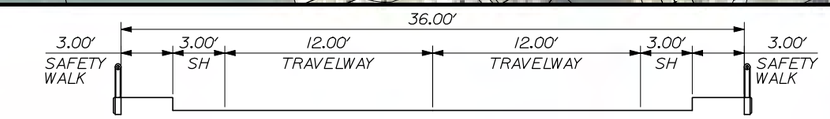
Date:10/28/2010
Username: lmeek
Filename: ...\8-01_NoBuildAlternative.dgn



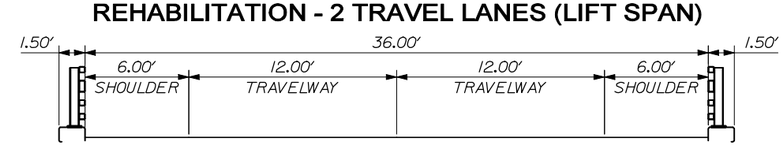
SARAH MILDRED LONG BRIDGE
SL1: REHABILITATION - 2 TRAVEL LANES



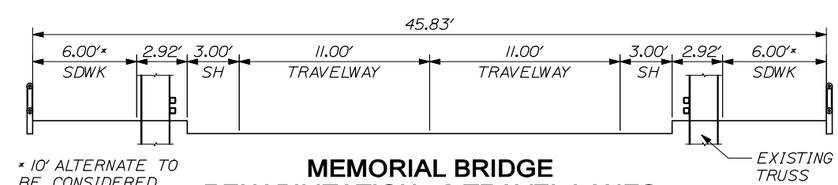
MEMORIAL BRIDGE
MB1: REHABILITATION - 2 TRAVEL LANES



SARAH MILDRED LONG BRIDGE
REHABILITATION - 2 TRAVEL LANES (LIFT SPAN)



SARAH MILDRED LONG BRIDGE
REHABILITATION - 2 TRAVEL LANES (APPROACH SPANS)



MEMORIAL BRIDGE
REHABILITATION - 2 TRAVEL LANES

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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NOVEMBER 2010

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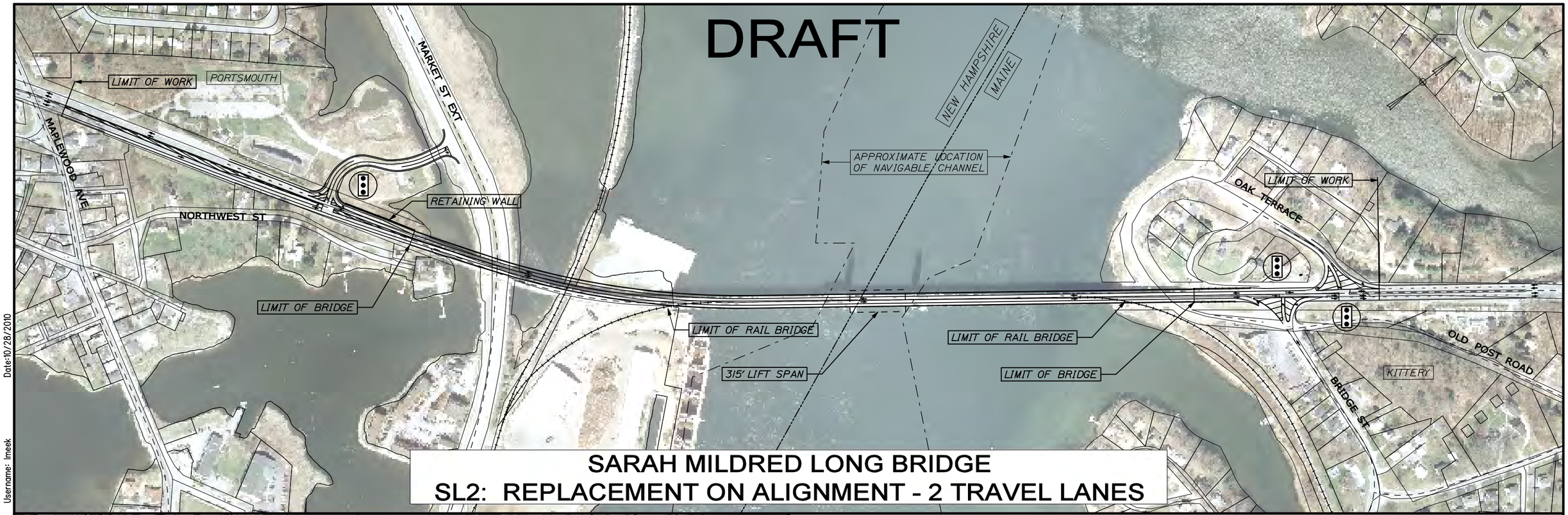
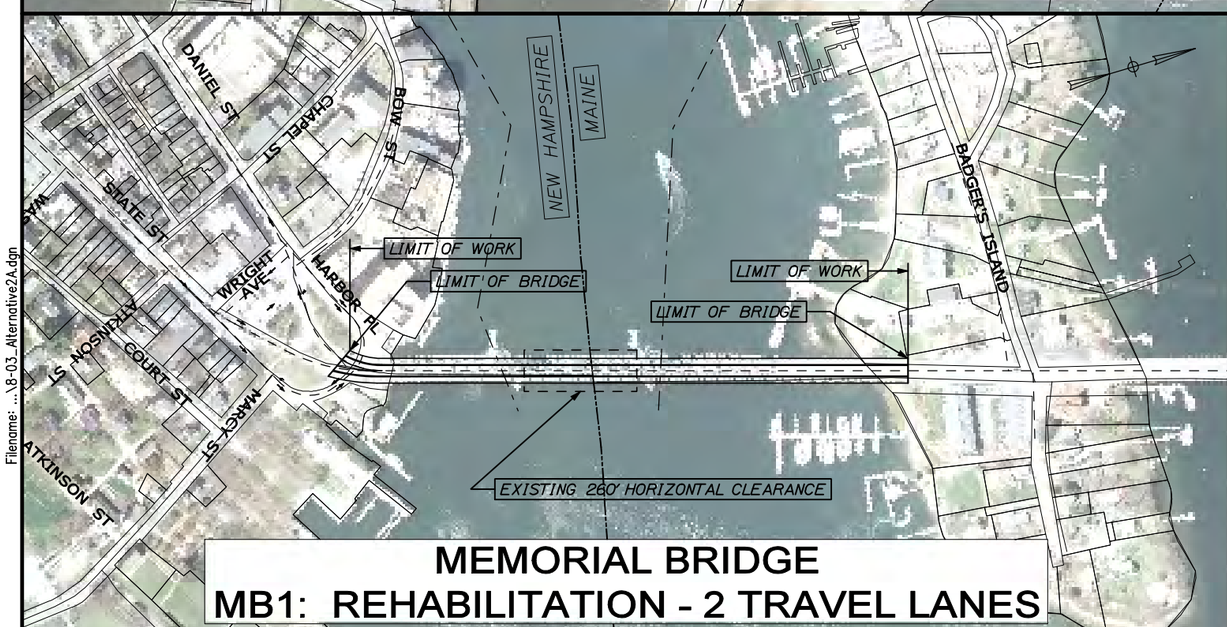
FIGURE 8-2
ALTERNATIVE 1

Date:10/28/2010
Username: lmeek
Filename: ...\8-02_Alternative1.dgn

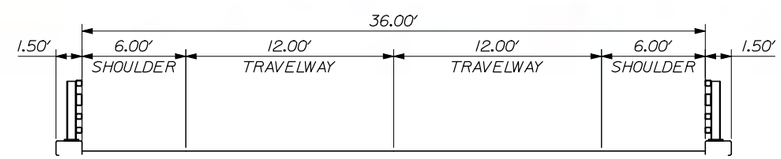
DRAFT



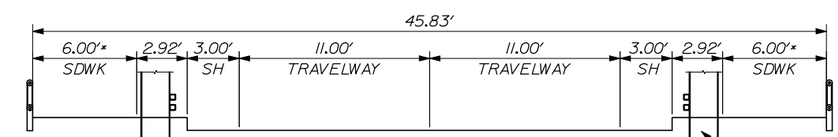
SARAH MILDRED LONG BRIDGE
SL2: REPLACEMENT ON ALIGNMENT - 2 TRAVEL LANES



MEMORIAL BRIDGE
MB1: REHABILITATION - 2 TRAVEL LANES



SARAH MILDRED LONG BRIDGE
REPLACEMENT - 2 TRAVEL LANES



* 10' ALTERNATE TO BE CONSIDERED

MEMORIAL BRIDGE
REHABILITATION - 2 TRAVEL LANES

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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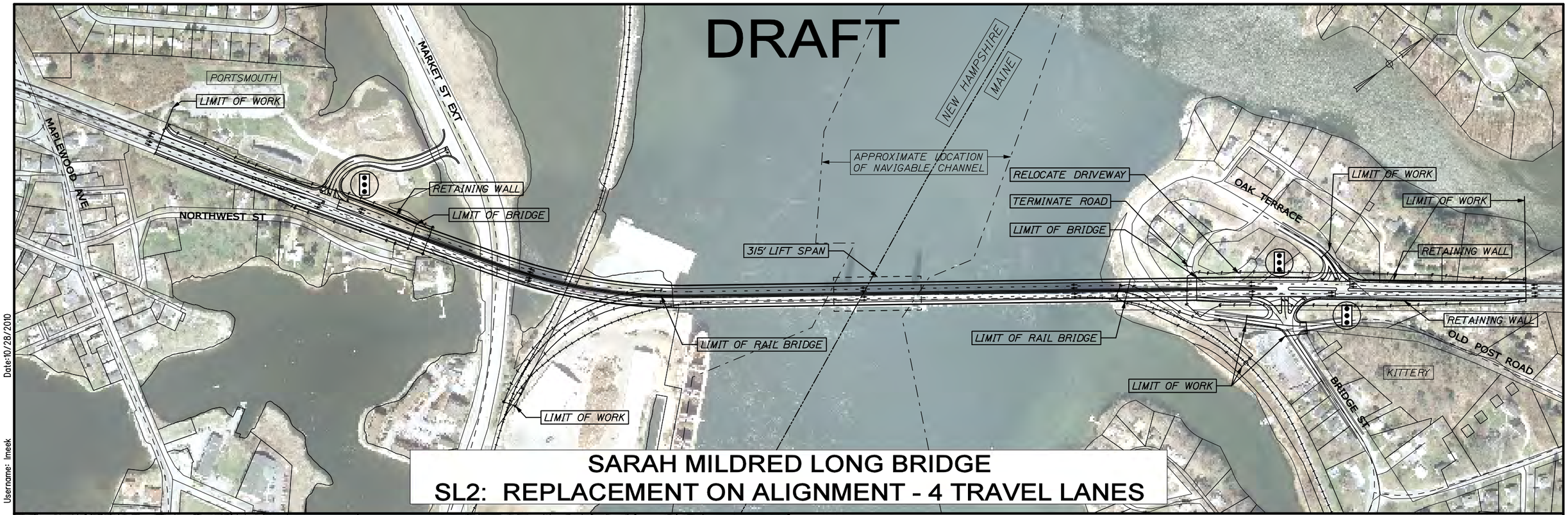
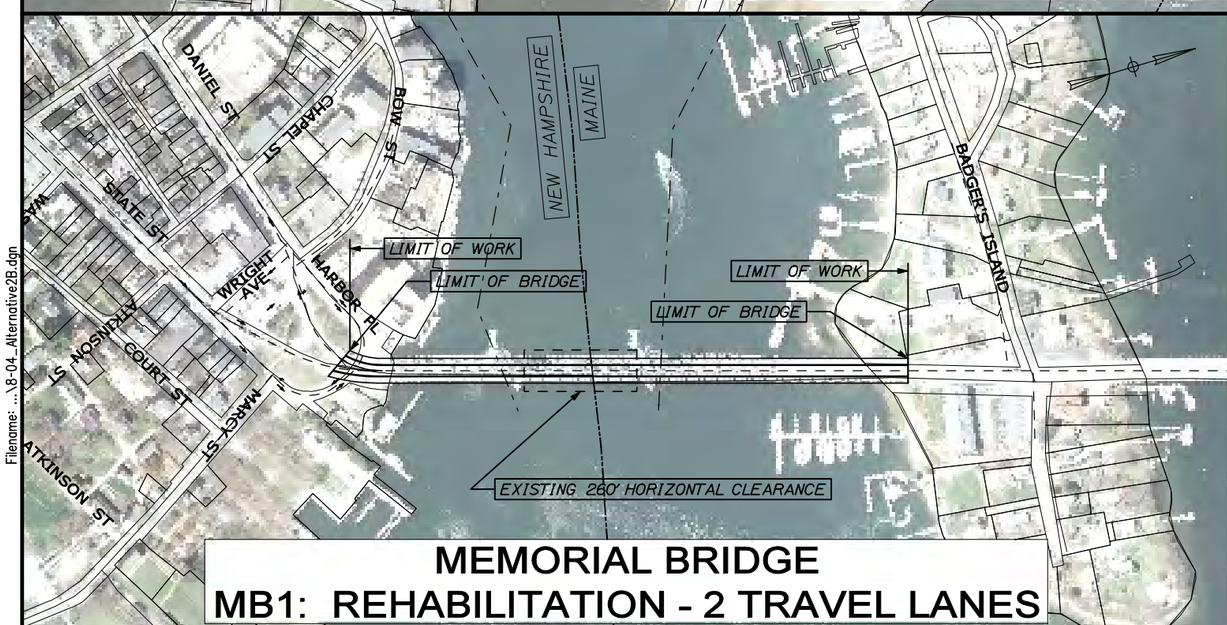
FIGURE 8-3
ALTERNATIVE 2A

Date:10/28/2010
Username: lmeek
Filename: ...\8-03_Alternative2A.dgn

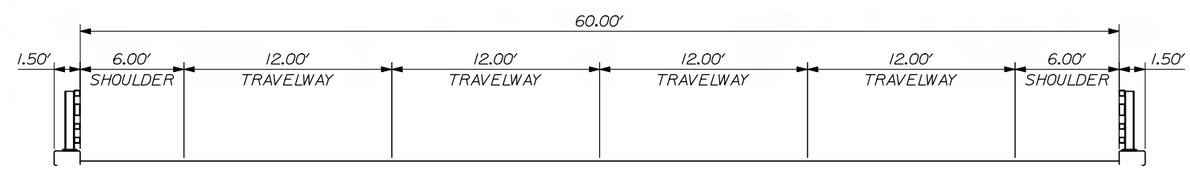
DRAFT



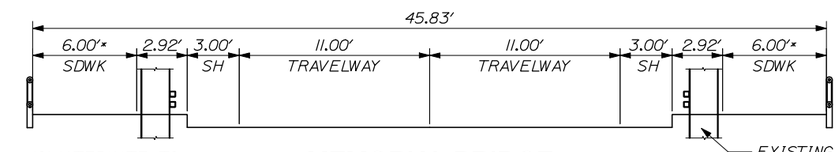
SARAH MILDRED LONG BRIDGE
SL2: REPLACEMENT ON ALIGNMENT - 4 TRAVEL LANES



MEMORIAL BRIDGE
MB1: REHABILITATION - 2 TRAVEL LANES



SARAH MILDRED LONG BRIDGE
REPLACEMENT - 4 TRAVEL LANES



MEMORIAL BRIDGE
REHABILITATION - 2 TRAVEL LANES

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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FIGURE 8-4
ALTERNATIVE 2B

Date:10/28/2010
Username: lmeek
Filename: ...\8-04_Alternative2B.dgn

8.4 Alternative 3a - Memorial Bridge Rehabilitated and Sarah Mildred Long Bridge Replaced on Upstream Alignment (two-lane), and Alternative 3b - Memorial Bridge Rehabilitated and Sarah Mildred Long Bridge Replaced on Upstream Alignment (four-lane)

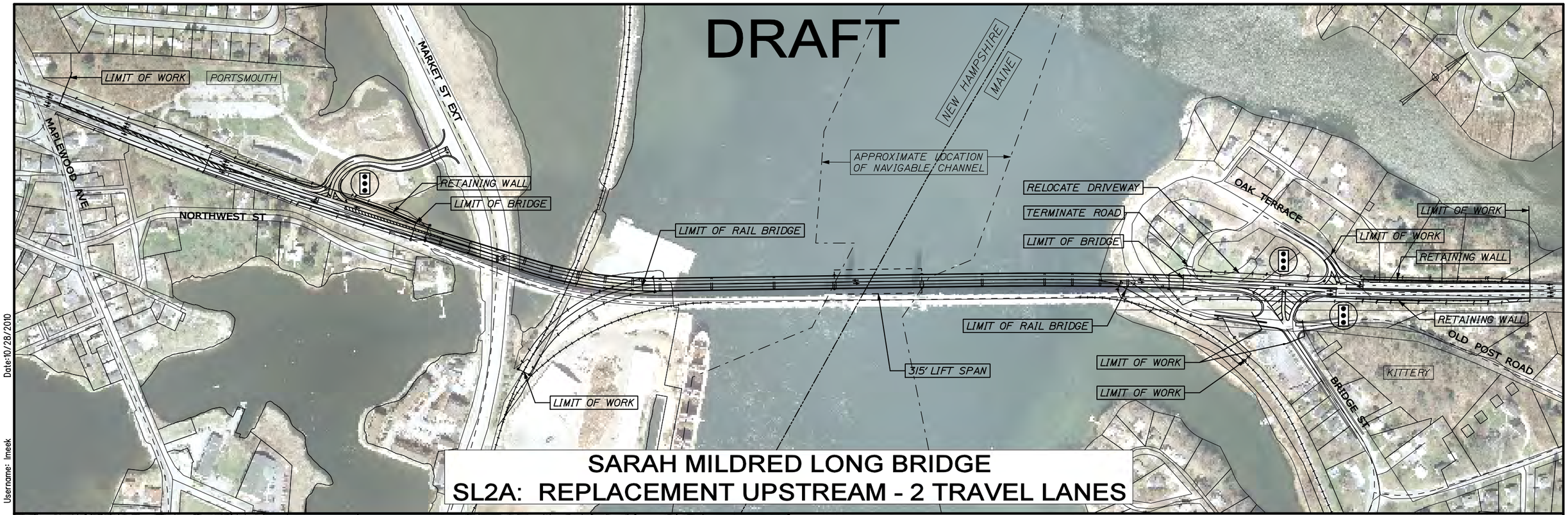
Per the findings summarized in Chapter 5 which states that the Memorial Bridge Rehabilitation is not prudent, Alternative 3a and 3b have been dismissed from further consideration. Figures 8-5 and 8-6 on the following pages provide a plan and cross section of Alternatives 3a and 3b for reference only.

8.5 Alternative 4 – Memorial Bridge Replaced on Existing Alignment and Sarah Mildred Long Bridge Rehabilitated

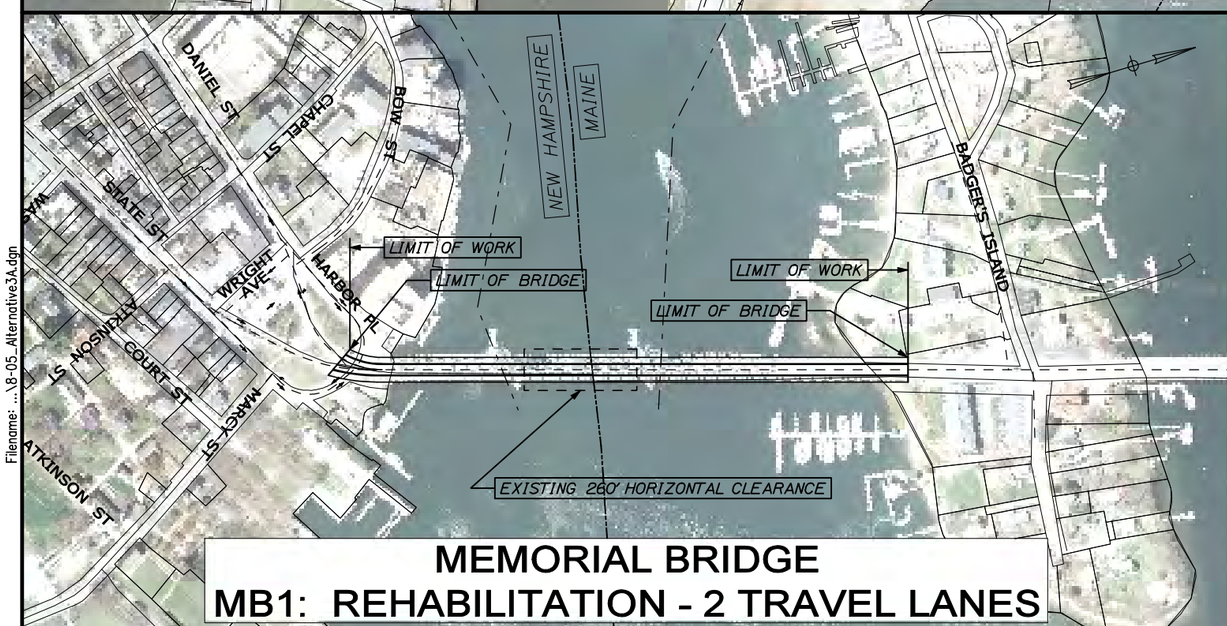
Alternative 4 would replace the Memorial Bridge and its abutments on existing alignment, retaining the existing piers and navigational clearances. Alternative 4 would rehabilitate the lift span and the four approach truss spans of the Sarah Mildred Long Bridge which maintains existing navigational clearances, and replaces the abutments, piers and spans to the truss spans (both super and sub-structure) including the rail component, all on the existing alignment. The results of the Alternative 4 evaluation are:

- Engineering Analysis – This alternative would not fully address the engineering issues or parameters necessary to accommodate the 2035 design year traffic. The replacement of the Memorial Bridge would improve roadway shoulder widths and bicycle/pedestrian facilities. The rehabilitation of the Sarah Mildred Long Bridge would not provide opportunities for improving the shoulder widths nor provide for bicycle/pedestrian facilities. The portion of the Sarah Mildred Long Bridge that would be rehabilitated would require a greater maintenance effort and increased maintenance costs, compared to a completely new bridge.
- Traffic Analysis – The Memorial Bridge superstructure replacement and the Sarah Mildred Long Bridge rehabilitation would improve vehicular cross river mobility. It has some of the lowest VMT (122,283) and VHT (4,062) of the build alternatives. Four intersections would fail (LOS F) by 2035, one less than the No-Build Alternative. The alternative includes the work required at failing intersections to obtain a minimum LOS of D. Traffic volumes (relative to the No-Build Alternative) in downtown Portsmouth would increase along State Street/Daniel Street and on Badgers Island. Both bridges would have volume to capacity ratios less than 1.0 indicating that the 2035 peak hour vehicular traffic would not exceed the available capacity of each bridge. It should be noted that delays caused by bridge openings have not been factored into the calculations. This will be done during the environmental evaluation phase.

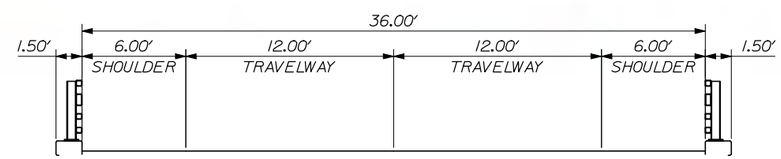
DRAFT



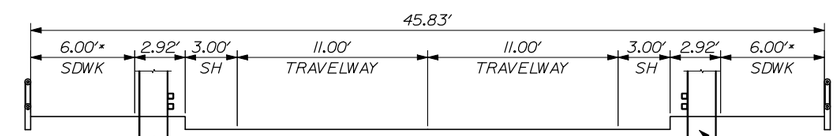
SARAH MILDRED LONG BRIDGE
SL2A: REPLACEMENT UPSTREAM - 2 TRAVEL LANES



MEMORIAL BRIDGE
MB1: REHABILITATION - 2 TRAVEL LANES



SARAH MILDRED LONG BRIDGE
REPLACEMENT - 2 TRAVEL LANES



* 10' ALTERNATE TO BE CONSIDERED

MEMORIAL BRIDGE
REHABILITATION - 2 TRAVEL LANES

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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NOVEMBER 2010

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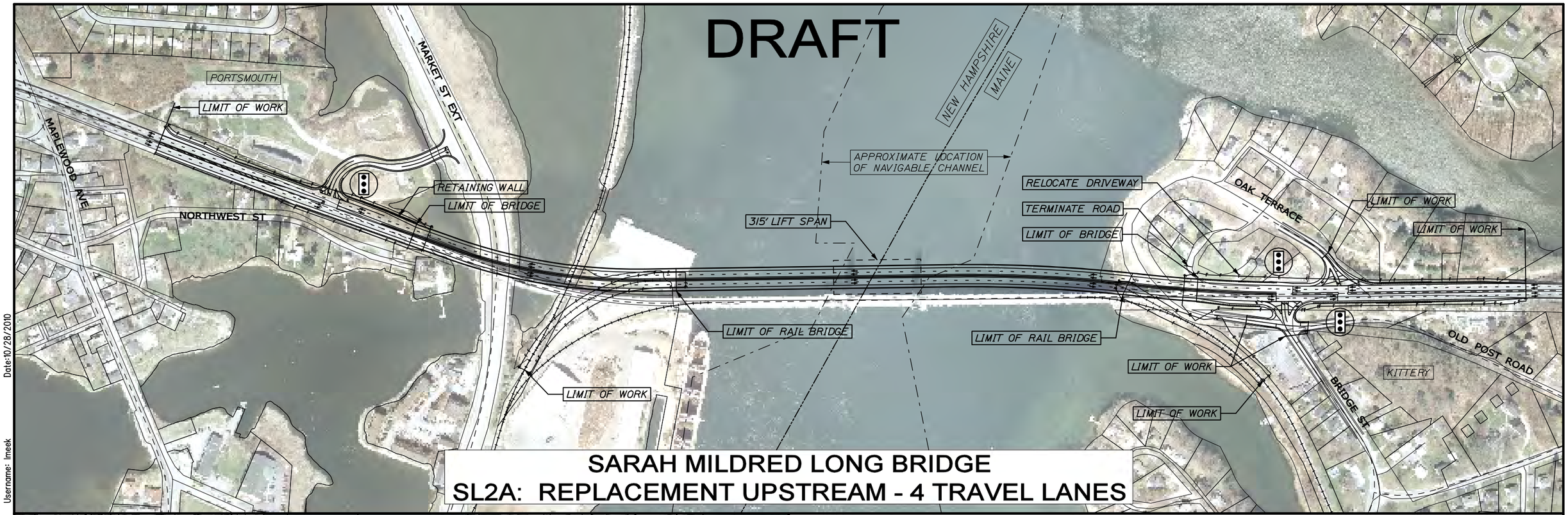
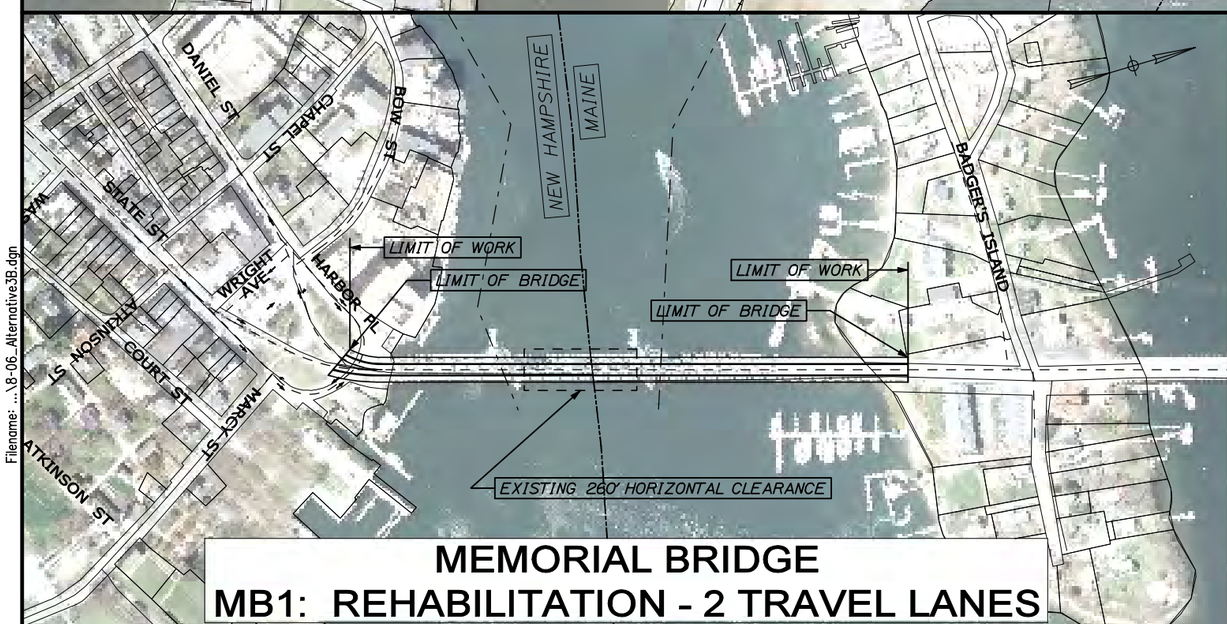
FIGURE 8-5
ALTERNATIVE 3A

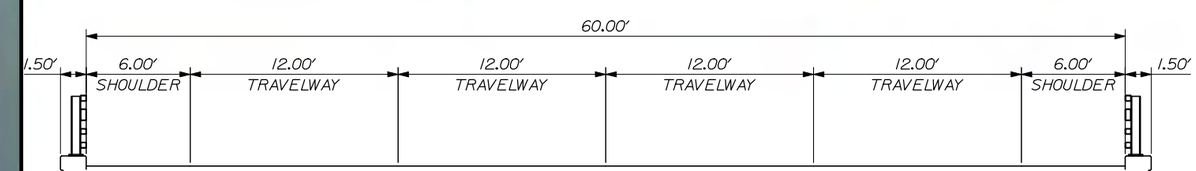
Date:10/28/2010
Username: lmeek
Filename: ...\8-05_Alternative3A.dgn



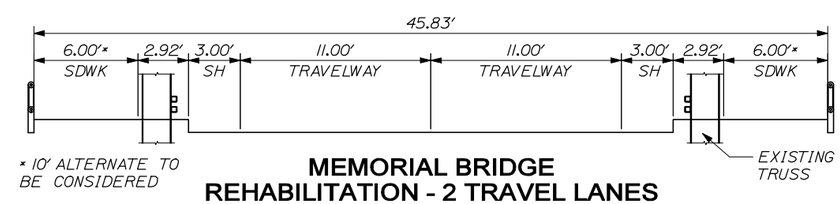
SARAH MILDRED LONG BRIDGE
SL2A: REPLACEMENT UPSTREAM - 4 TRAVEL LANES



MEMORIAL BRIDGE
MB1: REHABILITATION - 2 TRAVEL LANES



SARAH MILDRED LONG BRIDGE
REPLACEMENT - 4 TRAVEL LANES



MEMORIAL BRIDGE
REHABILITATION - 2 TRAVEL LANES

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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FIGURE 8-6
ALTERNATIVE 3B

Date:10/28/2010
Username: lmeek
Filename: ...\8-06_Alternative3B.dgn

- Multimodal Evaluation – The replacement of the Memorial Bridge would maintain/improve accessibility to bicyclists and pedestrians to the downtowns of Portsmouth and Kittery and PNSY. The rehabilitation of the Sarah Mildred Long Bridge would continue to not provide bicycle/pedestrian accommodations on that bridge. Replacement of the Memorial Bridge would have no effect on the movement of marine traffic, and the rehabilitation of the Sarah Mildred Long Bridge would not improve marine deficiencies associated with the lift span channel constrictions at that location. Rail would be maintained on the existing Sarah Mildred Long Bridge.
- Air Quality Analysis – Air pollutants would remain below the NAAQS standard.
- Noise Analysis – There would not be any noticeable (less than three dbA) increase in noise levels.
- Natural Resource Impact Analysis – With the rehabilitation of the Sarah Mildred Long Bridge (including all approach spans) three bridge piers in the river would be replaced. No substructure work is anticipated for the Memorial Bridge other than replacement of its abutments.
    - River Quality: Temporary impacts to river quality may occur during removal and replacement of three Sarah Mildred Long Bridge piers in the Piscataqua River. These temporary impacts to river (water) quality include increased turbidity and sedimentation during demolition and construction of bridge piers.
    - Aquatic Habitat: Potential temporary impacts associated with work in the river include increased turbidity, sedimentation, noise, and temporary loss of habitat. Time of year restrictions for work in the water may be required to avoid spawning periods of fisheries. There are areas of tidal waterfowl and wading bird habitat adjacent to the north side of the Sarah Mildred Long Bridge at both the Kittery and Portsmouth shorelines that may be temporarily impacted during replacement of the piers. There are areas of tidal waterfowl and wading bird habitat and softshell clam beds along the Kittery shoreline south of the Sarah Mildred Long Bridge that may be temporarily impacted during replacement of the piers and bridge abutment. Long term effects on aquatic habitat would be negligible with the removal and replacement of three Sarah Mildred Long Bridge piers. Upon removal of the existing bridge piers, the impacted area would be naturally restored to the condition of the adjacent river bottom.
    - Threatened and Endangered Species: No federally-listed threatened or endangered species are known to exist in the Piscataqua River, however further coordination with resource agencies will be required during the environmental documentation, design and permitting phases of the project.
    - Wetlands: The replacement of the Sarah Mildred Long Bridge piers would have a temporary impact to the Piscataqua River which is classified as an E1UBL wetland type. There is a small area of NH mapped salt marsh northeast of the Albacore Connector that may be temporarily impacted during construction. In

addition, an area of mapped eelgrass habitat exists south of the Sarah Mildred Long Bridge which may be temporarily impacted during construction.

  - Floodplain/Floodway: Permanent impact on floodplain areas would be negligible from replacement of bridge piers for the Sarah Mildred Long Bridge and replacement of abutments for the Memorial Bridge. Temporary impacts in work zones around the bridge piers and abutments would occur.

- Physical Resource Impacts – Since the proposed work associated with this alternative is located along the existing alignment, this alternative would have some of the lowest impacts to the physical resources (no publicly owned, no commercial and one residential) located at the Portsmouth approach to the Memorial Bridge.
- Land Use Impacts – No impact on zoning or activity centers would occur.
- Historic Impacts – The preliminary Section 106 effects determinations indicate that either replacement or rehabilitation of the Memorial Bridge and the Sarah Mildred Long Bridge would be an adverse effect on the individual bridges. From a historic perspective, rehabilitation is generally preferred over replacement if the rehabilitation can be done in accordance with the Secretary Standards to preserve key elements of the structure that contribute to its historic significance. For this reason, as well as with consideration of Section 4(f) avoidance and mitigation requirements, this alternative and other alternatives that replace one bridge and rehabilitate one bridge are considered to have the lowest impact on these historic bridges, as compared to alternatives that would replace both bridges. This alternative would have an adverse effect on six other historic resources located adjacent to the highway approaches to the bridges including: U.S.S. Albacore, U.S. Route 1 Bypass, U.S. Route 1 Bypass Historic District, Eastern Railroad Historic District, Memorial Bridge Historic District, and Memorial Park.
- Archaeological Impacts – The replacement of the Memorial Bridge would require excavation in areas of moderate archaeological sensitivity in Portsmouth and Kittery.
- Costs Analysis – This alternative could have the lowest capital costs ($166 to $204 million) of all of the build alternatives because it would not replace the truss and lift span portions of the Sarah Mildred Long Bridge. Total operations costs would be similar to other build alternatives. Overall maintenance costs would be higher than other build alternatives because of the anticipated higher maintenance effort needed on the rehabilitated portion of the Sarah Mildred Long Bridge (highest operation and maintenance costs of the build alternatives ($121 to $149 million)). The life cycle cost is among the lowest of all the build alternatives ($287 to $353 million) because of the lower capital cost of the Sarah Mildred Long Bridge. This alternative has relatively the same travel time delay cost ($15,880) as all of the other build alternatives. It has the highest benefit/cost ratio (1.62) because of the low capital cost.
- Business Impact Assessment – There would not be any permanent local business or regional economic impacts. Temporary impacts during the two to three year construction period for each bridge are not estimated.

- Environmental Clearances - A replacement of the Memorial Bridge superstructure and its abutments would require a Coast Guard permit. The rehabilitation of the Sarah Mildred Long Bridge may not require a Coast Guard permit, but the rehabilitation work must adhere to the navigational conditions of the original permit. Under NEPA, FHWA is responsible for determining the Class of Action. A CE would likely be an appropriate Class of Action for the rehabilitation of the Sarah Mildred Long Bridge and a CE or Environmental Assessment (EA) would likely be an appropriate Class of Action for the replacement of the Memorial Bridge superstructure and its abutments. A U.S. Army Corps of Engineers permit likely would be needed for construction activities in Portsmouth impacting wetland areas.

Figure 8-7 on the following page provides a plan and cross section of Alternative 4.

8.6 Alternative 5a – Memorial Bridge Replaced on Existing Alignment and Sarah Mildred Long Bridge Replaced on Existing Alignment (two-lane)

Alternative 5a would replace the Memorial Bridge and its abutments on existing alignment, retaining the existing piers, and navigational clearances. Alternative 5a would also replace the Sarah Mildred Long Bridge with a new two-lane bridge on existing alignment, with a new 270 foot horizontal lift span and rail components. The results of the Alternative 5a evaluation are:

- Engineering Analysis – This alternative would fully satisfy the design parameters necessary to accommodate the 2035 design year traffic. The Memorial Bridge would provide desirable lane and shoulder widths as well as appropriate bicycle/pedestrian facilities. The new Sarah Mildred Long Bridge would provide desirable lane and shoulder widths as well as an appropriate shoulder for bicyclists. The new bridges would also address the needs of long-term maintenance by providing new bridges with an expected 100-year life span.
- Traffic Analysis – The replacement of both bridges would improve cross river mobility by not limiting heavy loads and would improve efficiency in the local and regional transportation system by having lower VMT (122,283) and VHT (4,062). Four intersections would fail (LOS F) by 2035, one less than the No-Build Alternative. The alternative includes the work required at failing intersections to obtain a minimum LOS of D. Traffic volumes (relative to the No-Build Alternative) in downtown Portsmouth would increase along State Street/Daniel Street and on Badgers Island. Both bridges would have volume to capacity ratios less than 1.0 indicating that the 2035 peak hour vehicular traffic would not exceed the available capacity of each bridge. It should be noted that delays caused by bridge openings have not been factored into the calculations. This will be done during the environmental evaluation phase.

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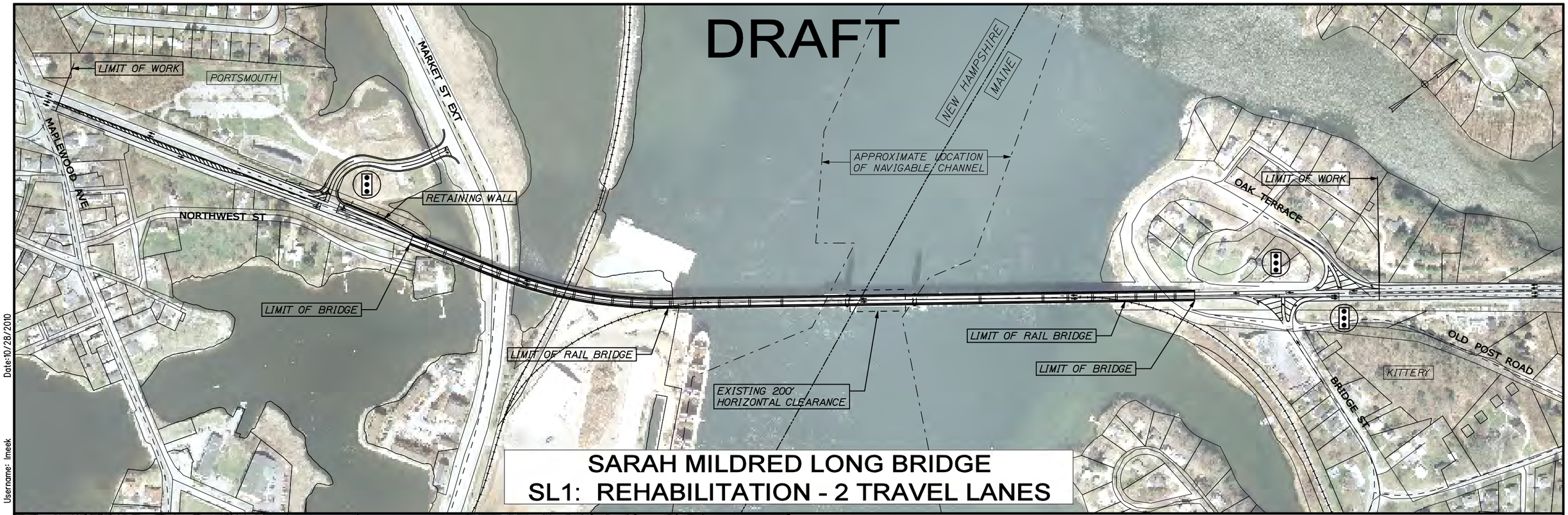
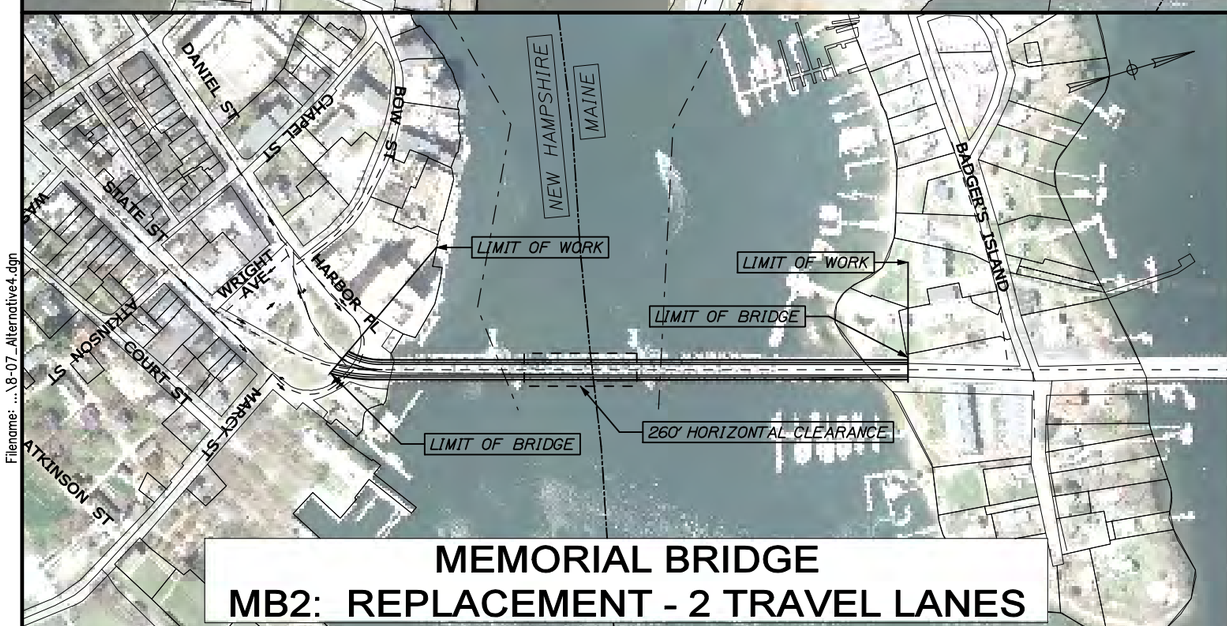
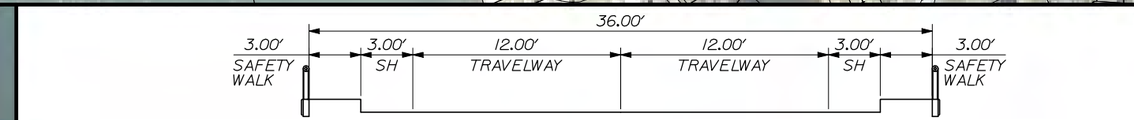


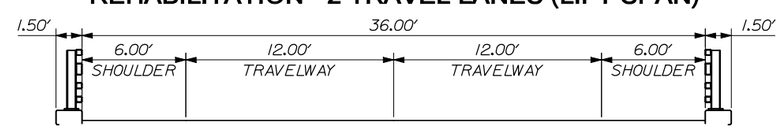
SARAH MILDRED LONG BRIDGE
SL1: REHABILITATION - 2 TRAVEL LANES



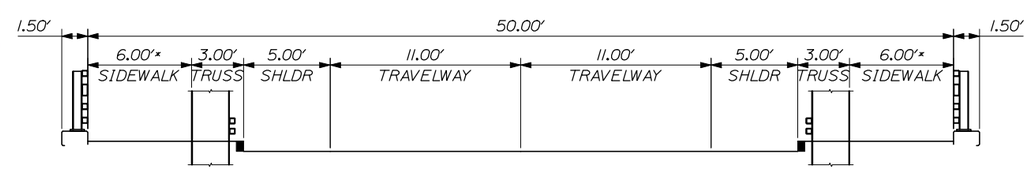
MEMORIAL BRIDGE
MB2: REPLACEMENT - 2 TRAVEL LANES



SARAH MILDRED LONG BRIDGE
REHABILITATION - 2 TRAVEL LANES (LIFT SPAN)



SARAH MILDRED LONG BRIDGE
REHABILITATION - 2 TRAVEL LANES (APPROACH SPANS)



* 10' ALTERNATE TO BE CONSIDERED

MEMORIAL BRIDGE
REPLACEMENT - 2 TRAVEL LANES

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

ME - NH CONNECTIONS STUDY
NOVEMBER 2010

New Hampshire DOT · MaineDOT · HNTB

FIGURE 8-7
ALTERNATIVE 4

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Username: lmeek
Filename: ...\8-07_Alternative4.dgn

- Multimodal Evaluation – The replacement of the Memorial Bridge would maintain/improve bicycle and pedestrian access to the downtowns of Portsmouth and Kittery and PNSY. Bicycle facilities would be provided on the Sarah Mildred Long Bridge. Replacement of the Memorial Bridge would have no effect on the movement of marine traffic (except during construction). Marine traffic would be improved by the replacement of the Sarah Mildred Long Bridge by providing a longer lift span (270 feet vs. 200 feet) over the existing marine channel. Rail would be included on the new Sarah Mildred Long Bridge.
- Air Quality Analysis – Air pollutants would remain below the NAAQS standard.
- Noise Analysis – There would not be any noticeable (less than three dbA) increase in noise levels.
- Natural Resource Impact Analysis –The replacement of the Sarah Mildred Long Bridge includes the removal of 15 existing piers in the river and construction of 17 new piers in the river. No substructure work is anticipated for the Memorial Bridge other than replacement of its abutments.
    - River Quality: Temporary impacts to river quality may occur during removal of 15 existing piers and replacement with 17 new piers in the Piscataqua River for the Sarah Mildred Long Bridge. These temporary impacts to river (water) quality include increased turbidity and sedimentation during demolition and construction of bridge piers.
    - Aquatic Habitat: Potential temporary impacts associated with work in the river include increased turbidity, sedimentation, noise, and temporary loss of habitat. Time of year restrictions for work in the water may be required to avoid spawning periods of fisheries. There are areas of tidal waterfowl and wading bird habitat adjacent to the north side of the Sarah Mildred Long Bridge at both the Kittery and Portsmouth shorelines that may be temporarily impacted during replacement of the piers. There are areas of tidal waterfowl and wading bird habitat and softshell clam beds along the Kittery shoreline south of the Sarah Mildred Long Bridge that may be temporarily impacted during replacement of the piers and bridge abutment. Long term effects on aquatic habitat would be small with the removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge. Upon removal of the existing bridge piers, the impacted area would be naturally restored to the condition of the adjacent river bottom.
    - Threatened and Endangered Species: No federally-listed threatened or endangered species are known to exist in the Piscataqua River, however further coordination with resource agencies will be required during the design, environmental documentation and permitting phases of the project.
    - Wetlands: The replacement of the Sarah Mildred Long Bridge piers would have a temporary impact to the Piscataqua River which is classified as an E1UBL

wetland type. There is a small area of NH mapped salt marsh northeast of the Albacore Connector that may be temporarily impacted during construction. In addition, an area of mapped eelgrass habitat exists south of the Sarah Mildred Long Bridge which may be temporarily impacted during construction.

  - Floodplain/Floodway: Permanent impact on floodplain areas would be small from removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge and replacement of abutments for the Memorial Bridge. Temporary floodway impacts in work zones around the bridge piers and abutments would occur.

- Physical Resource Impacts – Since the proposed work associated with this alternative is located along the existing alignment, this alternative would have some of the lowest impacts to the physical resources (three publicly owned, no commercial and four residential properties) located at the approaches to both bridges in both communities.
- Land Use Impacts –No impact on zoning or activity centers would occur.
- Historic Impacts – The preliminary Section 106 effects determinations indicate that either replacement or rehabilitation of the Memorial Bridge and the Sarah Mildred Long Bridge would be an adverse effect on the individual bridges. From a historic perspective, rehabilitation is generally preferred over replacement if the rehabilitation can be done in accordance with the Secretary Standards to preserve key elements of the structure that contribute to its historic significance. For this reason, as well as with consideration of Section 4(f) avoidance and mitigation requirements, this alternative and other alternatives that replace both bridges are considered to have the highest impact on these historic bridges, as compared to alternatives that would replace only one bridge. This alternative would have an adverse effect on six other historic resources located adjacent to the highway approaches to the bridges including: U.S.S. Albacore, U.S. Route 1 Bypass, U.S. Route 1 Bypass Historic District, Eastern Railroad Historic District, Memorial Bridge Historic District, and Memorial Park.
- Archaeological Impacts – This alternative would require excavation in areas of moderate to high archaeological sensitivity along the Portsmouth and Kittery shorelines at the Sarah Mildred Long Bridge and the Memorial Bridge.
- Costs Analysis – This alternative would have some of the highest capital costs ($229 to $281 million) of all of the build alternatives because it would replace both bridges. Total operations costs would be similar to other build alternatives. Overall maintenance and operation costs would be among the lowest because both bridges would be replaced ($94 to $116 million). The life cycle cost is among the highest of all the build alternatives ($323 to $397 million) due to the high capital costs. This alternative has relatively the same travel time delay cost ($15,880) as all of the other build alternatives. The benefit/cost ratio is 1.22.

- Business Impact Assessment – This alternative would not have any permanent local business or regional economic impacts. Temporary impacts during the two to three year construction period are not estimated.
- Environmental clearances – The replacement of the Sarah Mildred Long Bridge would require a Coast Guard permit. The replacement of the Memorial Bridge superstructure and its abutments would require a Coast Guard permit. Under NEPA, FHWA is responsible for determining the Class of Action. A CE or an EA would likely be the appropriate Class of Action for the replacement of the Memorial Bridge superstructure and its abutments and for the replacement of the Sarah Mildred Long Bridge. A U.S. Army Corps of Engineers permit likely would be needed for potential construction activities in Portsmouth.

Figure 8-8 on the following page provides a plan and cross section of Alternative 5a.

8.7 Alternative 5b – Memorial Bridge Replaced on Existing Alignment and Sarah Mildred Long Bridge Replaced on Existing Alignment (four-lane)

Alternative 5b would replace the Memorial Bridge and its abutments on existing alignment, retaining the existing piers, and navigational clearances. Alternative 5b also replaces the Sarah Mildred Long Bridge with a new four-lane bridge on existing alignment, with a new 270 foot horizontal lift span and rail components. The results of the Alternative 5b evaluation are:

- Engineering Analysis– This alternative would fully satisfy the design parameters necessary to accommodate the 2035 design year traffic. The Memorial Bridge would provide desirable lane and shoulder widths as well as appropriate bicycle/pedestrian facilities. The new four-lane Sarah Mildred Long Bridge would provide desirable lane and shoulder widths as well as appropriate bicycle facilities. The new bridges would also address the needs of long-term maintenance by providing new bridges with an expected 100-year life span.

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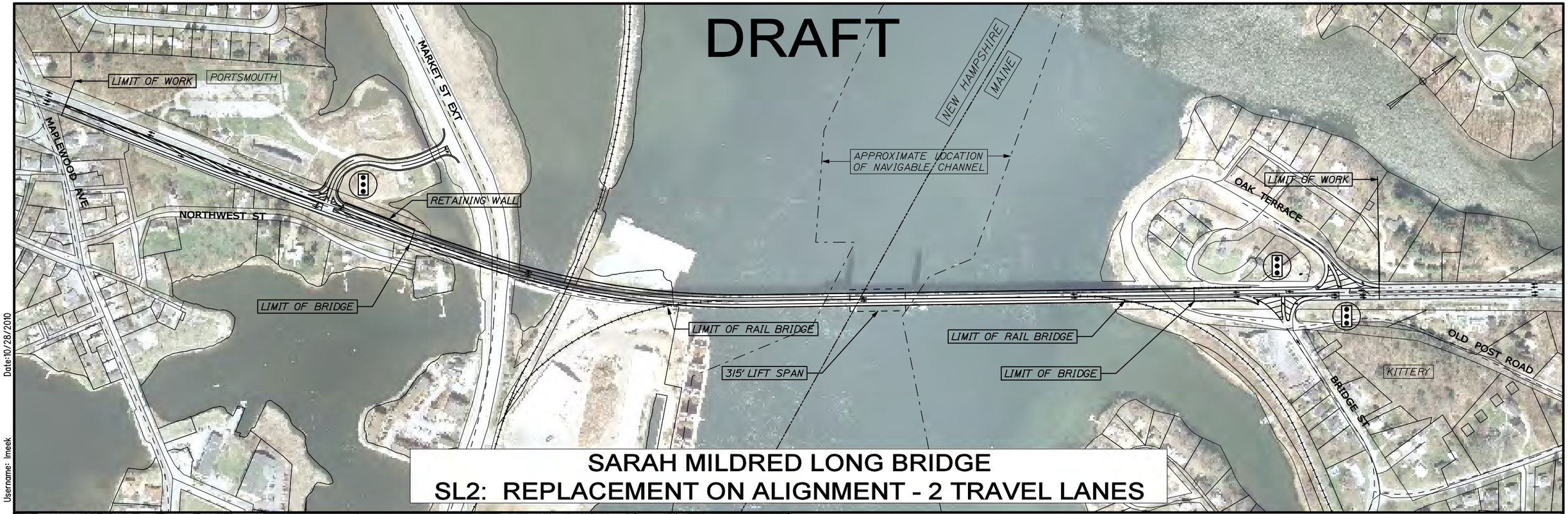
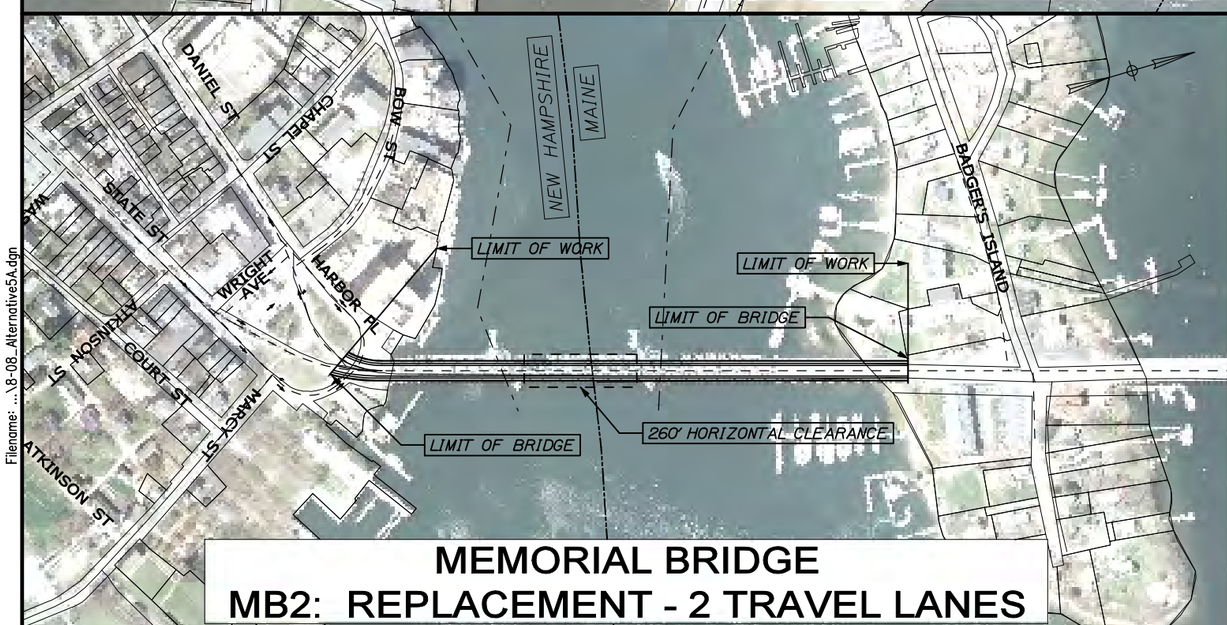
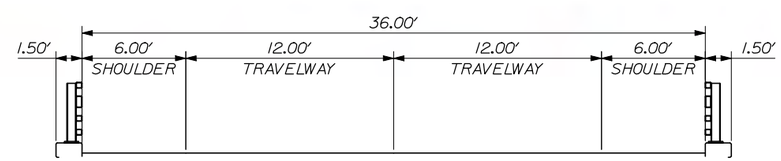


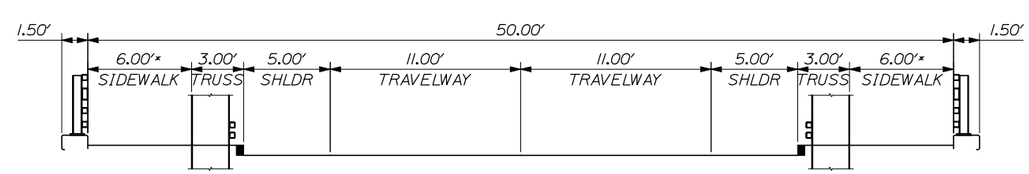
SARAH MILDRED LONG BRIDGE
SL2: REPLACEMENT ON ALIGNMENT - 2 TRAVEL LANES



MEMORIAL BRIDGE
MB2: REPLACEMENT - 2 TRAVEL LANES



SARAH MILDRED LONG BRIDGE
REPLACEMENT - 2 TRAVEL LANES



* 10' ALTERNATE TO BE CONSIDERED

MEMORIAL BRIDGE
REPLACEMENT - 2 TRAVEL LANES

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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NOVEMBER 2010

New Hampshire DOT · MaineDOT · HNTB

FIGURE 8-8
ALTERNATIVE 5A

Date:10/28/2010
Username: lmeek
Filename: ...\8-08_Alternative5A.dgn

- Traffic Analysis – The replacement of both bridges would improve cross river vehicular mobility by not limiting heavy loads and would improve local and regional transportation system efficiencies by having lower VMT (121,901) and VHT (4,049). Four intersections would fail (LOS F) by 2035, one less than the No-Build Alternative. The alternative includes the work required at failing intersections to obtain a minimum LOS of D. Traffic volumes (relative to the No-Build Alternative) in downtown Portsmouth would increase along State Street/Daniel Street and on Badgers Island. Both bridges would have volume to capacity ratios less than 1.0 indicating that the 2035 peak hour vehicular traffic would not exceed the available capacity of each bridge. It should be noted that delays caused by bridge openings have not been factored into the calculations. This will be done during the environmental evaluation phase.
- Multimodal Evaluation – The replacement of the Memorial Bridge would maintain/improve bicycle and pedestrian access to the downtowns of Portsmouth and Kittery and PNSY. Bicycle facilities would be provided on the Sarah Mildred Long Bridge. Replacement of the Memorial Bridge would have no effect on the movement of marine traffic (except during construction). Marine traffic would be improved by the replacement of the Sarah Mildred Long Bridge by providing a longer lift span (270 feet vs. 200 feet) over the existing marine channel. Rail would be included on the new Sarah Mildred Long Bridge.
- Air Quality Analysis – Air pollutants would remain below the NAAQS standard.
- Noise Analysis – There would not be any noticeable (less than three dbA) increase in noise levels.
- Natural Resource Impact Analysis – The replacement of the Sarah Mildred Long Bridge includes the removal of 15 existing piers in the river and construction of 17 new piers in the river. Although the substructure design has not advanced at this time, the substructure would be larger than the two-lane option and would have a greater impact on the river. No substructure work is anticipated for the Memorial Bridge other than replacement of its abutments.
    - River Quality: Temporary impacts to river quality may occur during removal of 15 existing piers and replacement with 17 new piers in the Piscataqua River for the Sarah Mildred Long Bridge. These temporary impacts to river (water) quality include increased turbidity and sedimentation during demolition and construction of bridge piers.
    - Aquatic Habitat: Potential temporary impacts associated with work in the river include increased turbidity, sedimentation, noise, and temporary loss of habitat. Time of year restrictions for work in the water may be required to avoid spawning periods of fisheries. There are areas of tidal waterfowl and wading bird habitat adjacent to the north side of the Sarah Mildred Long Bridge at both the Kittery and Portsmouth shorelines that may be temporarily impacted during replacement of the piers. There are areas of tidal waterfowl and wading bird habitat and

softshell clam beds along the Kittery shoreline south of the Sarah Mildred Long Bridge that may be temporarily impacted during replacement of the piers and bridge abutment. Long term effects on aquatic habitat would be small with the removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge. Upon removal of the existing bridge piers, the impacted area would be naturally restored to the condition of the adjacent river bottom.

- Threatened and Endangered Species: No federally-listed threatened or endangered species are known to exist in the Piscataqua River, however further coordination with resource agencies will be required during the design environmental documentation and permitting phases of the project.
- Wetlands: This alternative would impact 1,300 sf of wetlands (type PUBHx) adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector. The replacement of the Sarah Mildred Long Bridge piers would have a temporary impact to the Piscataqua River which is classified as an E1UBL wetland type. There is a small area of NH mapped salt marsh northeast of the Albacore Connector that may be temporarily impacted during construction. In addition, an area of mapped eelgrass habitat exists south of the Sarah Mildred Long Bridge which may be temporarily impacted during construction.
- Floodplain/Floodway: Permanent impact on floodplain areas would be small from removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge and replacement of abutments for the Memorial Bridge. Temporary impacts in work zones around the bridge piers and abutments would occur. This alternative would permanently impact 2,100 sf of special flood hazard area Zone AE adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector and 25,400 sf of special flood hazard area Zone AE along the PNSY rail spur in Kittery.

- Physical Resource Impacts – Replacing the existing two-lane Sarah Mildred Long Bridge with a new four-lane bridge on existing alignment would require widening of the highway approaches in both communities. The widening of the approaches would have the highest impacts to publicly owned (four), commercial (one) and residential (14) property impacts as compared to the other build alternatives. This alternative would impact 5,163 square feet of commercial real estate (among the highest) including one commercial business displacement. The assessed value of this displaced property is $166,900.
- Land Use Impacts – There would no impact on zoning or activity centers.
- Historic Impacts – The preliminary Section 106 effects determinations indicate that either replacement or rehabilitation of the Memorial Bridge and the Sarah Mildred Long Bridge would be an adverse effect on the individual bridges. From a historic perspective, rehabilitation is generally preferred over replacement if the rehabilitation can be done in

accordance with the Secretary Standards to preserve key elements of the structure that contribute to its historic significance. For this reason, as well as with consideration of Section 4(f) avoidance and mitigation requirements, this alternative and other alternatives that replace both bridges are considered to have the highest impact on these historic bridges, as compared to alternatives that would replace only one bridge. This alternative would have an adverse effect on seven other historic resources located adjacent to the highway approaches to the bridges including: U.S.S. Albacore, U.S. Route 1 Bypass, U.S. Route 1 Bypass Historic District, Christian Shore Historic District, Eastern Railroad Historic District, Memorial Bridge Historic District, and Memorial Park.

- Archaeological Impacts – This alternative would require excavation in areas of moderate to high archaeological sensitivity along the Portsmouth and Kittery shorelines at the Sarah Mildred Long Bridge and the Memorial Bridge.
- Costs Analysis – This alternative has the highest capital costs ($265 to $325 million) of all of the build alternatives because it would replace both bridges with the new Sarah Mildred Long Bridge having four lanes. Total operations costs would be similar to other build alternatives. Overall maintenance and operation costs would be among the lowest because both bridges would be replaced ($103 to $127 million). The life cycle cost is the highest of all the build alternatives ($368 to $452 million) due to the high capital costs. This alternative has relatively the same travel time delay cost ($15,620) as all of the other build alternatives. The benefit/cost ratio is 1.02.
- Business Impact Assessment – This alternative would not have any permanent local business or regional economic impacts. Temporary impacts during the two to three year construction period are not estimated.
- Environmental clearances – The replacement of the Sarah Mildred Long Bridge will require a Coast Guard permit. The replacement of the Memorial Bridge superstructure and its abutments will require a Coast Guard permit. Under NEPA, FHWA is responsible for determining the Class of Action. A CE or an EA would likely be the appropriate Class of Action for the replacement of the Memorial Bridge superstructure and its abutments and for the replacement of the Sarah Mildred Long Bridge. A U.S. Army Corps of Engineers permit likely would be needed for potential construction activities in Portsmouth.

Figure 8-9 on the following page provides a plan and cross section of Alternative 5b.

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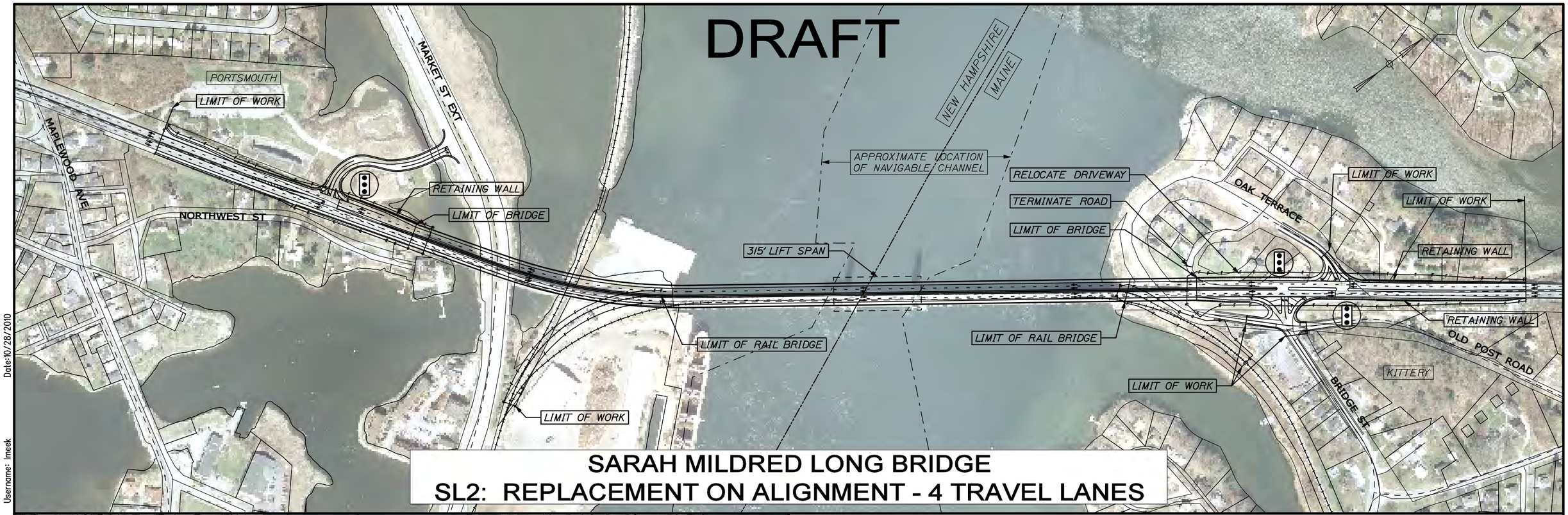
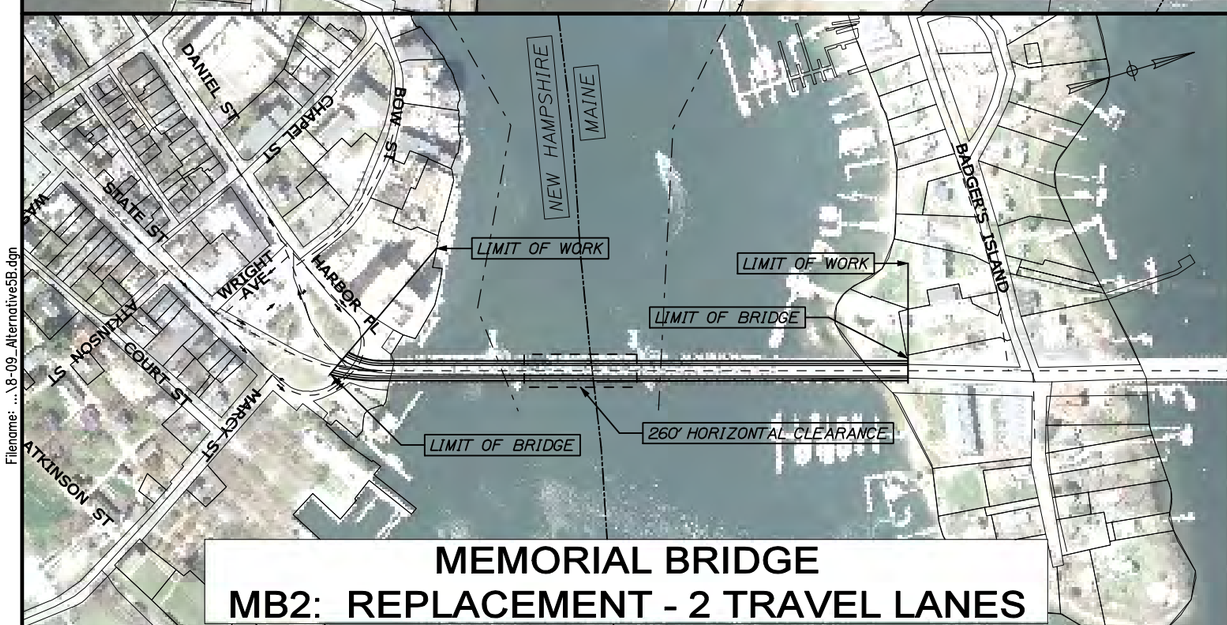
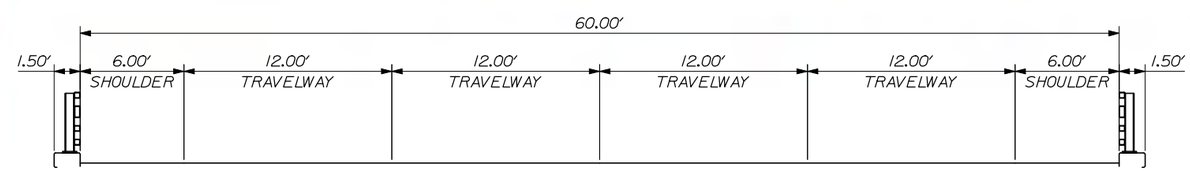


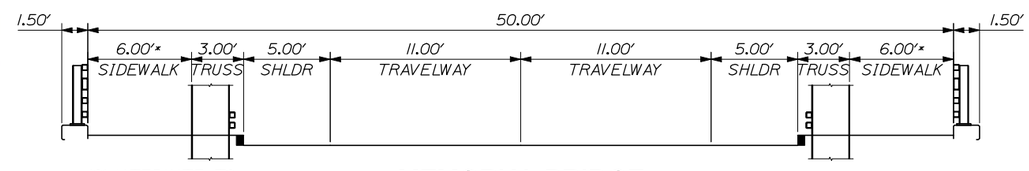
SARAH MILDRED LONG BRIDGE
SL2: REPLACEMENT ON ALIGNMENT - 4 TRAVEL LANES



MEMORIAL BRIDGE
MB2: REPLACEMENT - 2 TRAVEL LANES



SARAH MILDRED LONG BRIDGE
REPLACEMENT - 4 TRAVEL LANES



* 10' ALTERNATE TO BE CONSIDERED

MEMORIAL BRIDGE
REPLACEMENT - 2 TRAVEL LANES

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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NOVEMBER 2010

New Hampshire DOT · MaineDOT · HNTB

FIGURE 8-9
ALTERNATIVE 5B

Date:10/28/2010
Username: lmeek
Filename: ...\8-09_Alternative5B.dgn

8.8 Alternative 6a – Memorial Bridge Replaced on Existing Alignment and Sarah Mildred Long Bridge Replaced on Upstream Alignment (two-lane)

Alternative 6a would replace the Memorial Bridge on existing alignment, retaining the existing piers, and navigational clearances. Alternative 6a also replaces the Sarah Mildred Long Bridge with a new two-lane bridge on an upstream alignment, with a new 270 foot horizontal lift span and rail components. The results of the Alternative 6a evaluation are:

- Engineering Analysis – This alternative would fully satisfy the design parameters necessary to accommodate the 2035 design year traffic. The Memorial Bridge would provide desirable lane and shoulder widths as well as appropriate bicycle/pedestrian facilities. The new Sarah Mildred Long Bridge would provide desirable lane and shoulder widths as well as an appropriate shoulder for bicyclists. The new bridges would also address the needs of long-term maintenance by providing new bridges with an expected 100 year life span.
- Traffic Analysis – The replacement of both bridges would improve cross river mobility by not limiting heavy loads and improving local and regional transportation system efficiencies by having lower VMT (122,283) and VHT (4,062). Four intersections would fail (LOS F) by 2035, one less than the No-Build Alternative. The alternative includes the work required at failing intersections to obtain a minimum LOS of D. Traffic volumes (relative to the No-Build Alternative) in downtown Portsmouth would increase along State Street/Daniel Street and on Badgers Island. Both bridges would have volume to capacity ratios less than 1.0 indicating that the 2035 peak hour vehicular traffic would not exceed the available capacity of each bridge. It should be noted that delays caused by bridge openings have not been factored into the calculations. This will be done during the environmental evaluation phase.
- Multimodal Evaluation – The replacement of the Memorial Bridge would maintain/improve bicycle and pedestrian access to the downtowns of Portsmouth and Kittery and PNSY. Bicycle facilities would be provided on the Sarah Mildred Long Bridge. Replacement of the Memorial Bridge would have no effect on the movement of marine traffic (except during construction). Marine traffic would be improved by the replacement of the Sarah Mildred Long Bridge by including a longer lift span (270 feet vs. 200 feet) over the existing marine channel. Rail would be included on the new Sarah Mildred Long Bridge.
- Air Quality Analysis – Air pollutants would remain below the NAAQS standard.
- Noise Analysis – There would not be any noticeable (less than three dbA) increase in noise levels.
- Natural Resource Impact Analysis – The replacement of the Sarah Mildred Long Bridge includes the removal of 15 existing piers in the river and construction of 17 new piers in the river. No substructure work is anticipated for the Memorial Bridge other than replacement of its abutments.

- River Quality: Temporary impacts to river quality may occur during removal of 15 existing piers and replacement with 17 new piers in the Piscataqua River for the Sarah Mildred Long Bridge. These temporary impacts to river (water) quality include increased turbidity and sedimentation during demolition and construction of bridge piers.
- Aquatic Habitat: Potential temporary impacts associated with work in the river include increased turbidity, sedimentation, noise, and temporary loss of habitat. Time of year restrictions for work in the water may be required to avoid spawning periods of fisheries. There are areas of tidal waterfowl and wading bird habitat adjacent to the north side of the Sarah Mildred Long Bridge at both the Kittery and Portsmouth shorelines that may be temporarily impacted during replacement of the piers. There are areas of tidal waterfowl and wading bird habitat and softshell clam beds along the Kittery shoreline south of the Sarah Mildred Long Bridge that may be temporarily impacted during replacement of the piers and bridge abutment. Long term effects on aquatic habitat would be small with the removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge. Upon removal of the existing bridge piers, the impacted area would be naturally restored to the condition of the adjacent river bottom.
- Threatened and Endangered Species: No federally-listed threatened or endangered species are known to exist in the Piscataqua River, however further coordination with resource agencies will be required during the design, environmental documentation and permitting phases of the project.
- Wetlands: This alternative would impact 1,100 sf of wetlands (type PUBHx) adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector. The replacement of the Sarah Mildred Long Bridge piers would have a temporary impact to the Piscataqua River which is classified as an E1UBL wetland type. There is a small area of NH mapped salt marsh northeast of the Albacore Connector that may be temporarily impacted during construction. In addition, an area of mapped eelgrass habitat exists south of the Sarah Mildred Long Bridge which may be temporarily impacted during construction.
- Floodplain/Floodway: Permanent impact on floodplain areas would be small from removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge and replacement of abutments for the Memorial Bridge. Temporary impacts in work zones around the bridge piers and abutments would occur. This alternative would permanently impact 2,000 sf of special flood hazard area Zone AE adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector and 29,000 sf of special flood hazard area Zone AE along the PNSY rail spur in Kittery.

- Physical Resource Impacts – Replacing the existing two-lane Sarah Mildred Long Bridge with a new two-lane bridge on new alignment would require modifying the highway approaches in both communities. The modified highway approaches would have close to the highest publicly owned property impacts (three), and the highest commercial (one) and residential (14) property impacts as compared to the other build alternatives. This alternative would impact 3,633 square feet of commercial real estate (among the highest) including one commercial business displacement. The assessed value of this displaced property is $166,900.
- Land Use Impacts – No impact on zoning or activity centers would occur.
- Historic Impacts –The preliminary Section 106 effects determinations indicate that either replacement or rehabilitation of the Memorial Bridge and the Sarah Mildred Long Bridge would be an adverse effect on the individual bridges. From a historic perspective, rehabilitation is generally preferred over replacement if the rehabilitation can be done in accordance with the Secretary Standards to preserve key elements of the structure that contribute to its historic significance. For this reason, as well as with consideration of Section 4(f) avoidance and mitigation requirements, this alternative and other alternatives that replace both bridges are considered to have the highest impact on these historic bridges, as compared to alternatives that would replace only one bridge. This alternative would have an adverse effect on six other historic resources located adjacent to the highway approaches to the bridges including: U.S.S. Albacore, U.S. Route 1 Bypass, U.S. Route 1 Bypass Historic District, Eastern Railroad Historic District, Memorial Bridge Historic District, and Memorial Park.
- Archaeological Impacts – This alternative would require excavation in areas of moderate to high archaeological sensitivity along the Portsmouth and Kittery shorelines at the Sarah Mildred Long Bridge and the Memorial Bridge.
- Costs Analysis – This alternative would have some of the highest capital costs ($233 to $287 million) of all of the build alternatives because it would replace both bridges. Total operations costs would be similar to other build alternatives. Overall maintenance and operation costs would be among the lowest because both bridges would be replaced ($94 to $116 million). The life cycle cost is among the highest of all the build alternatives ($327 to $403 million) due to the high capital costs. This alternative has relatively the same travel time delay cost ($15,880) as all of the other build alternatives. The benefit/cost ratio is 1.18.
- Business Impact Assessment – This alternative would not yield any permanent local business or regional economic impacts. Temporary impacts during the two to three year construction period are not estimated.
- Environmental clearances - The replacement of the Sarah Mildred Long Bridge would require a Coast Guard permit. The replacement of the Memorial Bridge superstructure and its abutments would require a Coast Guard permit. Under NEPA, FHWA is responsible for determining the Class of Action. A CE or an EA would likely be the

appropriate Class of Action for the replacement of the Memorial Bridge superstructure and its abutments and for the replacement of the Sarah Mildred Long Bridge. A U.S. Army Corps of Engineers permit likely would be needed for potential construction activities in Portsmouth.

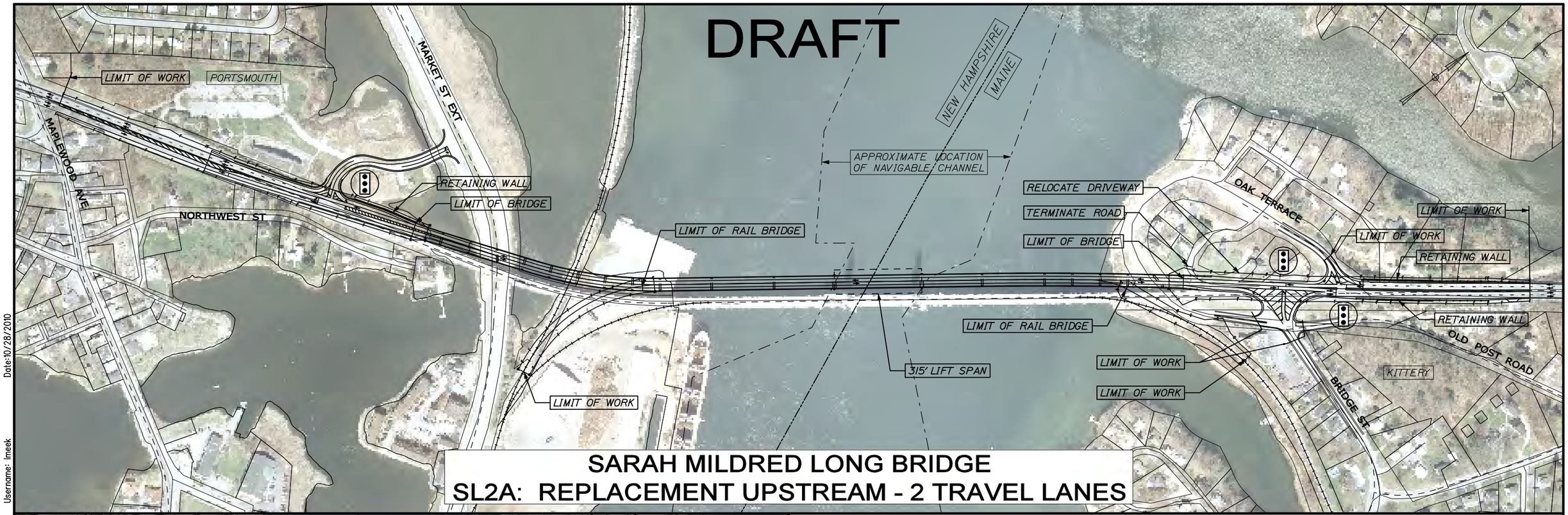
Figure 8-10 on the following page provides a plan and cross section of Alternative 6a.

8.9 Alternative 6b – Memorial Bridge Replaced on Existing Alignment and Sarah Mildred Long Bridge Replaced on Upstream Alignment (four-lane)

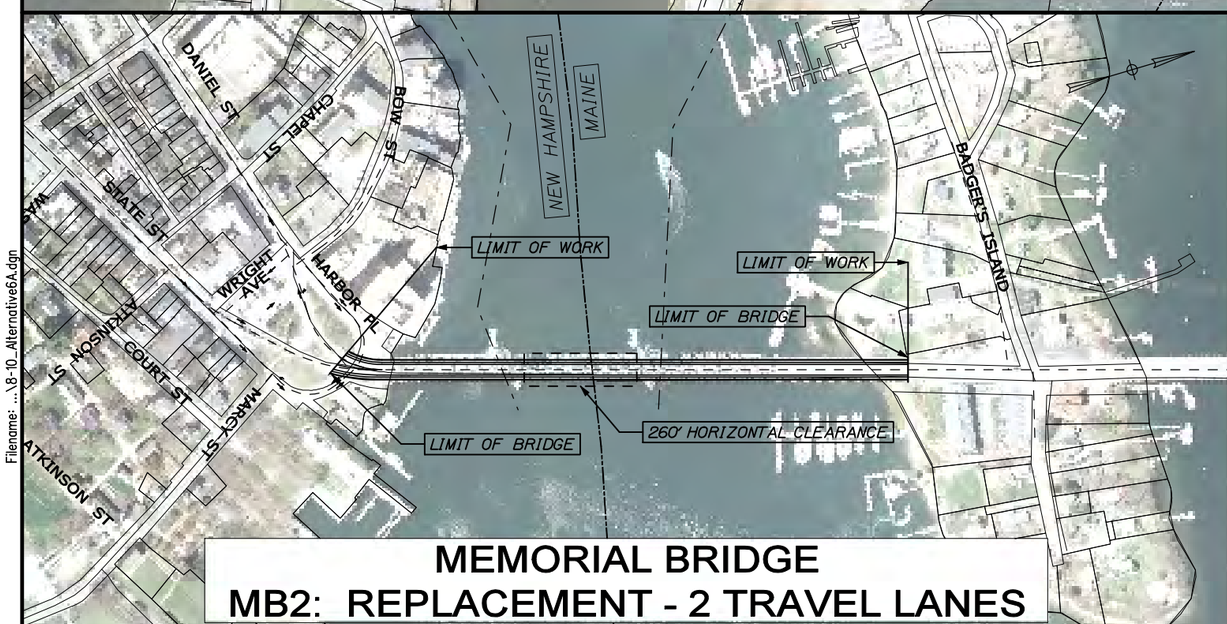
Alternative 6b would replace the Memorial Bridge and its abutments on existing alignment, retaining the existing piers, and navigational clearances. Alternative 6b also replaces the Sarah Mildred Long Bridge with a new four-lane bridge on an upstream alignment, with a new 270 foot horizontal lift span and rail components. The results of the Alternative 6b evaluation are:

- Engineering Analysis– This alternative would fully satisfy the design parameters necessary to accommodate the 2035 design year traffic. The Memorial Bridge would provide desirable lane and shoulder widths as well as appropriate bicycle/pedestrian facilities. The new four-lane Sarah Mildred Long Bridge would provide desirable lane and shoulder widths as well as appropriate bicycle facilities. The new bridges would also address the needs of long-term maintenance by providing new bridges with an expected 100 year life span.
- Traffic Analysis – The replacement of both bridges would improve cross river mobility by not limiting heavy loads and improving the local and regional transportation system efficiencies by having lower VMT (121,901) and VHT (4,049). Four intersections would fail (LOS F) by 2035, one less than the No-Build Alternative. The alternative includes the work required at failing intersections to obtain a minimum LOS of D. Traffic volumes (relative to the No-Build Alternative) in downtown Portsmouth would increase along State Street/Daniel Street and on Badgers Island. Both bridges would have volume to capacity ratios less than 1.0 indicating that the 2035 peak hour vehicular traffic would not exceed the available capacity of each bridge. It should be noted that delays caused by bridge openings have not been factored into the calculations. This will be done during the environmental evaluation phase.

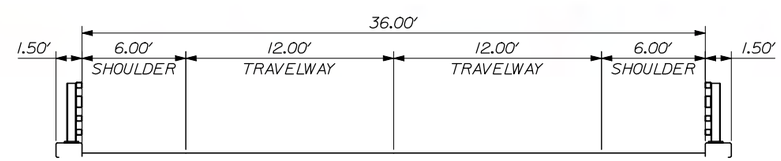
DRAFT



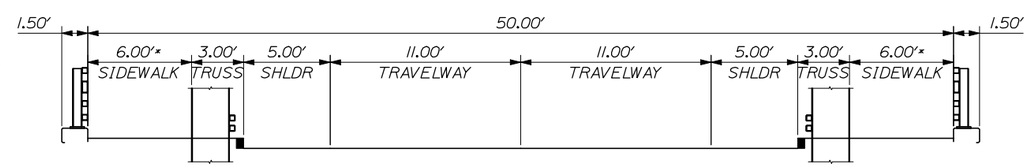
SARAH MILDRED LONG BRIDGE
SL2A: REPLACEMENT UPSTREAM - 2 TRAVEL LANES



MEMORIAL BRIDGE
MB2: REPLACEMENT - 2 TRAVEL LANES



SARAH MILDRED LONG BRIDGE
REPLACEMENT - 2 TRAVEL LANES



* 10' ALTERNATE TO BE CONSIDERED

MEMORIAL BRIDGE
REPLACEMENT - 2 TRAVEL LANES

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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NOVEMBER 2010

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FIGURE 8-10
ALTERNATIVE 6A

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- Multimodal Evaluation – The replacement of the Memorial Bridge would maintain/improve bicycle and pedestrian access to the downtowns of Portsmouth and Kittery and PNSY. Bicycle facilities would be provided on the Sarah Mildred Long Bridge. Replacement of the Memorial Bridge would have no effect on the movement of marine traffic (except during construction). Marine traffic would be improved by the replacement of the Sarah Mildred Long Bridge by including a longer lift span (270 foot vs. 200 foot) over the existing marine channel. Rail would be included on the new Sarah Mildred Long Bridge.
- Air Quality Analysis – Air pollutants would remain below the NAAQS standard.
- Noise Analysis – There would not be any noticeable (less than three dbA) increase in noise levels.
- Natural Resource Impact Analysis – The replacement of the Sarah Mildred Long Bridge includes the removal of 15 existing piers in the river and construction of 17 new piers in the river. Although the substructure design has not advanced at this time, the substructure would be larger than the 2-lane option and would have a greater impact on the river. No substructure work is anticipated for the Memorial Bridge other than replacement of its abutments.
    - River Quality: Temporary impacts to river quality may occur during removal of 15 existing piers and replacement with 17 new piers in the Piscataqua River for the Sarah Mildred Long Bridge. These temporary impacts to river (water) quality include increased turbidity and sedimentation during demolition and construction of bridge piers.
    - Aquatic Habitat: Potential temporary impacts associated with work in the river include increased turbidity, sedimentation, noise, and temporary loss of habitat. Time of year restrictions for work in the water may be required to avoid spawning periods of fisheries. There are areas of tidal waterfowl and wading bird habitat adjacent to the north side of the Sarah Mildred Long Bridge at both the Kittery and Portsmouth shorelines that may be temporarily impacted during replacement of the piers. There are areas of tidal waterfowl and wading bird habitat and softshell clam beds along the Kittery shoreline south of the Sarah Mildred Long Bridge that may be temporarily impacted during replacement of the piers and bridge abutment. Long term effects on aquatic habitat would be small with the removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge. Upon removal of the existing bridge piers, the impacted area would be naturally restored to the condition of the adjacent river bottom.
    - Threatened and Endangered Species: No federally-listed threatened or endangered species are known to exist in the Piscataqua River, however further coordination with resource agencies will be required during the design environmental documentation and permitting phases of the project.

- Wetlands: This alternative would impact 1,250 sf of wetlands (type PUBHx) adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector. The replacement of the Sarah Mildred Long Bridge piers would have a temporary impact to the Piscataqua River which is classified as an E1UBL wetland type. There is a small area of NH mapped salt marsh northeast of the Albacore Connector that may be temporarily impacted during construction. In addition, an area of mapped eelgrass habitat exists south of the Sarah Mildred Long Bridge which may be temporarily impacted during construction.
- Floodplain/Floodway: Permanent impact on floodplain areas would be small from removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge and replacement of abutments for the Memorial Bridge. Temporary impacts in work zones around the bridge piers and abutments would occur. This alternative would permanently impact 2,100 sf of special flood hazard area Zone AE adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector and 34,700 sf of special flood hazard area Zone AE along the PNSY rail spur in Kittery.

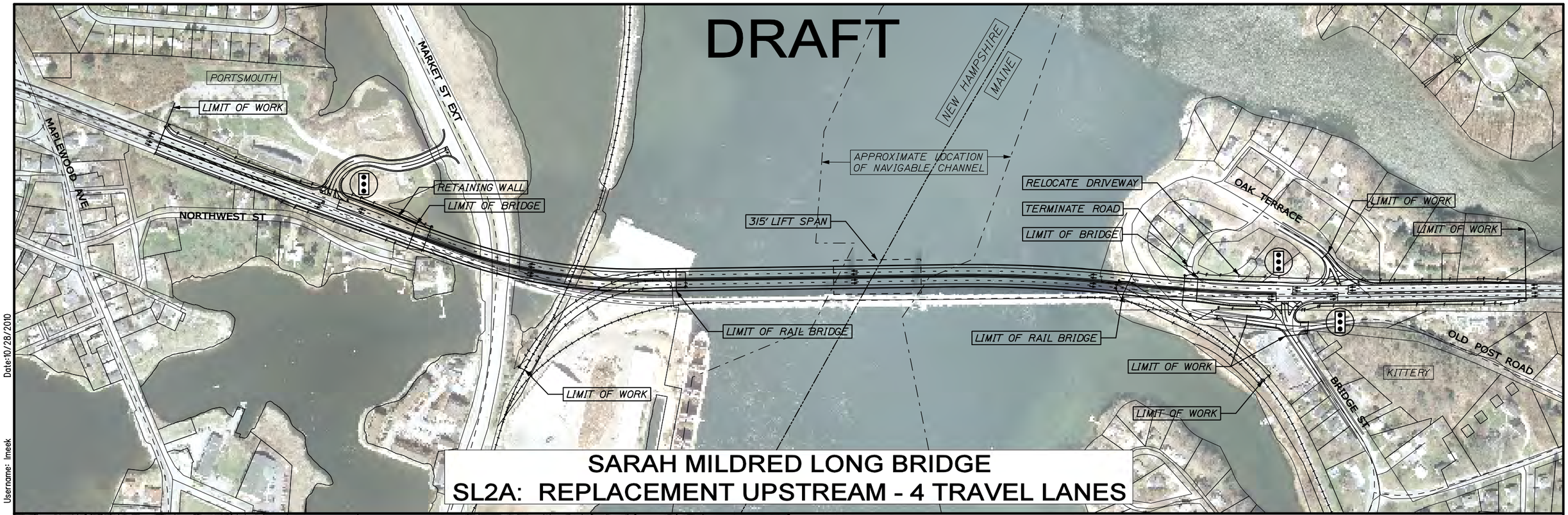
- Physical Resource Impacts – Replacing the existing two-lane Sarah Mildred Long Bridge with a new four-lane bridge on new alignment would require modifying the highway approaches in both communities. The modified highway approaches would have close to the highest publicly owned property impacts (three), and the highest commercial (one) and residential (13) property impacts as compared to the other build alternatives. This alternative would impact 2,496 square feet of commercial real estate including one commercial business displacement. The assessed value of this displaced property is $166,900.
- Land Use Impacts – No impact on zoning or activity centers would occur.
- Historic Impacts – The preliminary Section 106 effects determinations indicate that either replacement or rehabilitation of the Memorial Bridge and the Sarah Mildred Long Bridge would be an adverse effect on the individual bridges. From a historic perspective, rehabilitation is generally preferred over replacement if the rehabilitation can be done in accordance with the Secretary Standards to preserve key elements of the structure that contribute to its historic significance. For this reason, as well as with consideration of Section 4(f) avoidance and mitigation requirements, this alternative and other alternatives that replace both bridges are considered to have the highest impact on these historic bridges, as compared to alternatives that would replace only one bridge. This alternative would have an adverse effect on seven other historic resources located adjacent to the highway approaches to the bridges including: U.S.S. Albacore, U.S. Route 1 Bypass, U.S. Route 1 Bypass Historic District, Christian Shore Historic District, Eastern Railroad Historic District, Memorial Bridge Historic District, and Memorial Park.

- Archaeological Impacts – This alternative would require excavation in areas of moderate to high archaeological sensitivity along the Portsmouth and Kittery shorelines at the Sarah Mildred Long Bridge and the Memorial Bridge.
- Costs Analysis – This alternative has the highest capital costs ($265 to $325 million) of all of the build alternatives because it would replace both bridges with the new Sarah Mildred Long Bridge having four lanes. Total operations costs would be similar to other build alternatives. Overall maintenance and operation costs would be among the lowest because both bridges would be replaced ($103 to $127 million). The life cycle cost is the highest of all the build alternatives ($368 to $452 million) due to the high capital costs. This alternative has relatively the same travel time delay cost ($15,620) as all of the other build alternatives. The benefit/cost ratio is 1.02.
- Business Impact Assessment – There would not be any permanent local business or regional economic impacts. Temporary impacts during the two to three year construction period are not estimated.
- Environmental clearances - The replacement of the Sarah Mildred Long Bridge would require a Coast Guard permit. The replacement of the Memorial Bridge superstructure and its abutments would require a Coast Guard permit. Under NEPA, FHWA is responsible for determining the Class of Action. A CE or an EA would likely be the appropriate Class of Action for the replacement of the Memorial Bridge superstructure and its abutments and for the replacement of the Sarah Mildred Long Bridge. A U.S. Army Corps of Engineers permit likely would be needed for potential construction activities in Portsmouth.

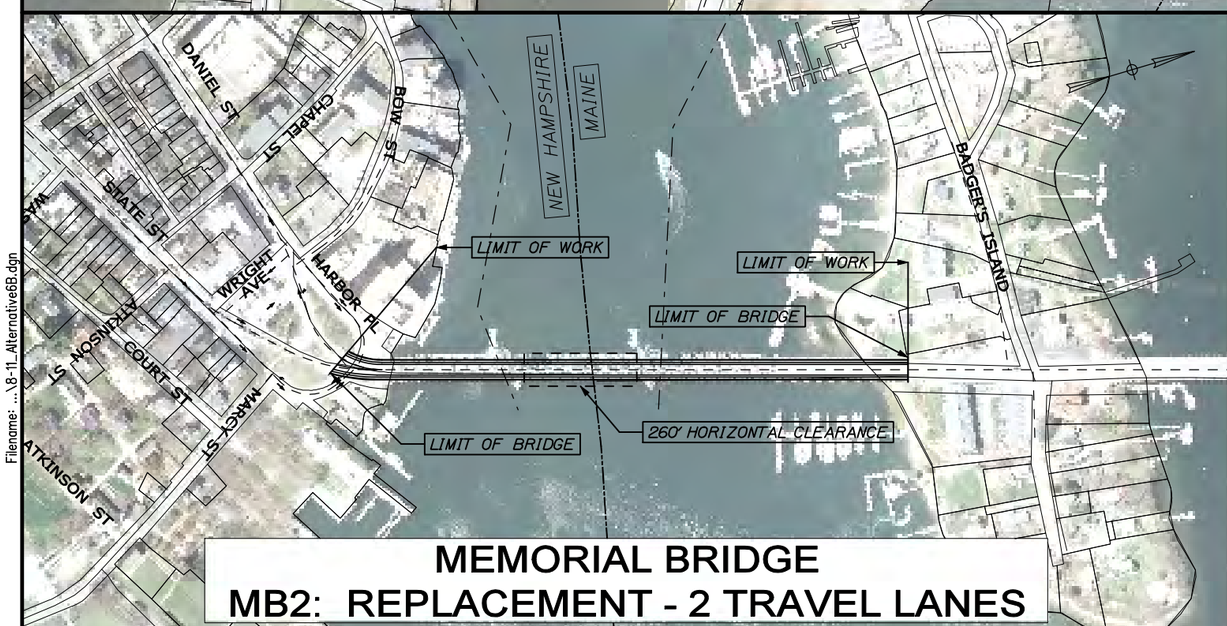
Figure 8-11 on the following page provides a plan and cross section of Alternative 6b.

8.10 Alternative 7 – Memorial Bridge Replaced on Existing Alignment with a Bicycle/Pedestrian Bridge Only and Sarah Mildred Long Bridge Replaced on Existing Alignment (four-lane)

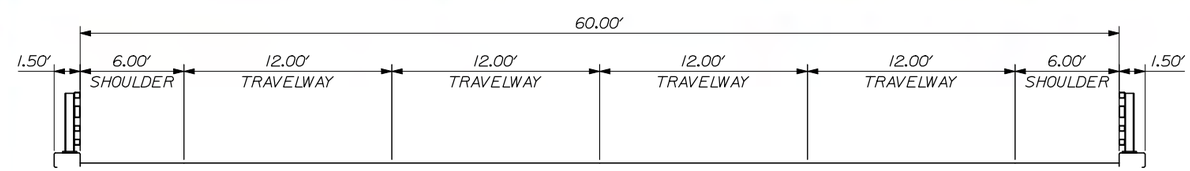
Alternative 7 replaces the Memorial Bridge with a bicycle/pedestrian only lift bridge on existing alignment with similar navigational clearances. Alternative 7 also replaces the Sarah Mildred Long Bridge with a new four-lane bridge on existing alignment, with a new 270 foot horizontal lift span and rail components. The results of the Alternative 7 evaluation are:



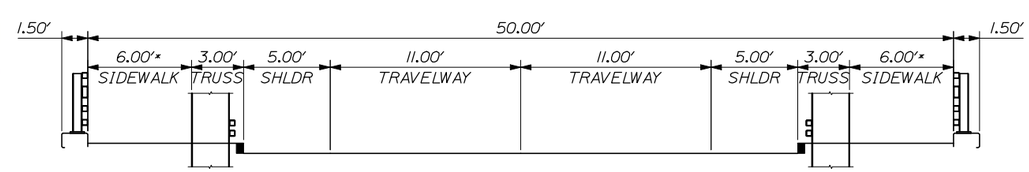
SARAH MILDRED LONG BRIDGE
SL2A: REPLACEMENT UPSTREAM - 4 TRAVEL LANES



MEMORIAL BRIDGE
MB2: REPLACEMENT - 2 TRAVEL LANES



SARAH MILDRED LONG BRIDGE
REPLACEMENT - 4 TRAVEL LANES



* 10' ALTERNATE TO BE CONSIDERED

MEMORIAL BRIDGE
REPLACEMENT - 2 TRAVEL LANES

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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FIGURE 8-11
ALTERNATIVE 6B

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- Engineering Analysis – This alternative would fully satisfy the design parameters necessary to accommodate the 2035 design year traffic. The new four-lane Sarah Mildred Long Bridge would provide desirable lane and shoulder widths as well as appropriate bicycle facilities. The new Memorial Bridge would provide appropriate bicycle/pedestrian facilities only. Both bridges would also address the needs of long-term maintenance by providing new bridges with an expected 100 year life span.
- Traffic Analysis – With the Memorial Bridge no longer available for vehicular traffic, cross river vehicle mobility and efficiencies would be similar to the No-Build alternative with some of the highest design year VMT (123,345) and VHT (4,107). Three intersections would fail (LOS F) by 2035, two less than the No-Build Alternative. The alternative includes the work required at failing intersections to obtain a minimum LOS of D. Traffic volumes (relative to the No-Build Alternative) would increase along Newmarch Street/Government Street in Kittery, Bridge Street/Cook Street in Kittery, and Maplewood Avenue in Portsmouth. Traffic on Badgers Island would be reduced substantially due to vehicles no longer being allowed on the Memorial Bridge. A four-lane Sarah Mildred Long Bridge would have volume to capacity ratio less than 1.0 indicating that the 2035 peak hour vehicular traffic would not exceed the available capacity of the bridge. It should be noted that delays caused by bridge openings have not been factored into the calculations. This will be done during the environmental evaluation phase.
- Multimodal Evaluation – The replacement of the Memorial Bridge with an exclusive bicycle/pedestrian bridge would improve accessibility to bicyclists and pedestrians to the downtowns of Portsmouth and Kittery and PNSY. Bicycle facilities would be provided on the Sarah Mildred Long Bridge. Replacement of the Memorial Bridge would have no effect on the movement of marine traffic (except during construction). Marine traffic would be improved by the replacement of the Sarah Mildred Long Bridge by including a longer lift span (270 feet vs. 200 feet) over the existing marine channel. Rail would be included on the new Sarah Mildred Long.
- Air Quality Analysis – Air pollutants would remain below the NAAQS standard.
- Noise Analysis – There would not be any noticeable (less than three dbA) increase in noise levels. Noise levels would be reduced in the vicinity of Badgers Island due to the elimination of vehicle access to the Memorial Bridge.
- Natural Resource Impact Analysis – The replacement of the Sarah Mildred Long Bridge includes the removal of 15 existing piers in the river and construction of 17 new piers in the river. Although the substructure design has not advanced at this time, the substructure would be larger than the 2-lane option and would have a greater impact on the river. No substructure work is anticipated for the Memorial Bridge other than replacement of its abutments.
    - River Quality: Temporary impacts to river quality may occur during removal of 15 existing piers and replacement with 17 new piers in the Piscataqua River for

the Sarah Mildred Long Bridge. These temporary impacts to river (water) quality include increased turbidity and sedimentation during demolition and construction of bridge piers.

- Aquatic Habitat: Potential temporary impacts associated with work in the river include increased turbidity, sedimentation, noise, and temporary loss of habitat. Time of year restrictions for work in the water may be required to avoid spawning periods of fisheries. There are areas of tidal waterfowl and wading bird habitat adjacent to the north side of the Sarah Mildred Long Bridge at both the Kittery and Portsmouth shorelines that may be temporarily impacted during replacement of the piers. There are areas of tidal waterfowl and wading bird habitat and softshell clam beds along the Kittery shoreline south of the Sarah Mildred Long Bridge that may be temporarily impacted during replacement of the piers and bridge abutment. Long term effects on aquatic habitat would be small with the removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge. Upon removal of the existing bridge piers, the impacted area would be naturally restored to the condition of the adjacent river bottom.
- Threatened and Endangered Species: No federally-listed threatened or endangered species are known to exist in the Piscataqua River, however further coordination with resource agencies will be required during the design, environmental documentation and permitting phases of the project.
- Wetlands: This alternative would impact 1,300 sf of wetlands (type PUBHx) adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector. The replacement of the Sarah Mildred Long Bridge piers would have a temporary impact to the Piscataqua River which is classified as an E1UBL wetland type. There is a small area of NH mapped salt marsh northeast of the Albacore Connector that may be temporarily impacted during construction. In addition, an area of mapped eelgrass habitat exists south of the Sarah Mildred Long Bridge which may be temporarily impacted during construction.
- Floodplain/Floodway: Permanent impact on floodplain areas would be small from removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge and replacement of abutments for the Memorial Bridge. Temporary impacts in work zones around the bridge piers and abutments would occur. This alternative would permanently impact 2,100 sf of special flood hazard area Zone AE adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector and 25,400 sf of special flood hazard area Zone AE along the PNSY rail spur in Kittery.

- Physical Resource Impacts – Replacing the existing two-lane Sarah Mildred Long Bridge with a new four-lane bridge on existing alignment would require modifying the highway approaches in both communities. The modification of the highway approaches would

have the highest publicly owned (four), commercial (one) and residential (14) property impacts as compared to the other build alternatives. This alternative would impact 5,163 square feet of commercial real estate (among the highest) including one commercial business displacement. The assessed value of this displaced property is $166,900.

- Land Use Impacts – No impact on zoning or activity centers would occur.
- Historic Impacts – The preliminary Section 106 effects determinations indicate that either replacement or rehabilitation of the Memorial Bridge and the Sarah Mildred Long Bridge would be an adverse effect on the individual bridges. From a historic perspective, rehabilitation is generally preferred over replacement if the rehabilitation can be done in accordance with the Secretary Standards to preserve key elements of the structure that contribute to its historic significance. For this reason, as well as with consideration of Section 4(f) avoidance and mitigation requirements, this alternative and other alternatives that replace both bridges are considered to have the highest impact on these historic bridges, as compared to alternatives that would replace only one bridge. This alternative would have an adverse effect on 13 other historic resources located adjacent to the highway approaches to the bridges including: U.S.S. Albacore, Richard Jackson House, Moffatt-Ladd House, MacPhaedris-Warner House, Governor John Langdon House, Wentworth House, U.S. Route 1 Bypass, U.S. Route 1 Bypass Historic District, Christian Shore Historic District, Eastern Railroad Historic District, Memorial Bridge Historic District, Portsmouth Local Historic District, and Memorial Park.
- Archeological Impacts – This alternative would require excavation in areas of moderate to high archaeological sensitivity along the Portsmouth and Kittery shorelines at the Sarah Mildred Long Bridge and the Memorial Bridge.
- Costs Analysis – This alternative would have some of the highest capital costs ($238 to $292 million) of all of the build alternatives because it would replace both bridges. Total operations costs would be similar to other build alternatives. Overall maintenance and operation costs would be among the lowest because both bridges would be replaced ($103 to $127 million). The life cycle cost is among the highest of all the build alternatives ($341 to $419 million) due to the high capital costs. This alternative has relatively the same travel time delay cost ($17,580) as all of the other build alternatives. The benefit/cost ratio is 0.77.
- Business Impact Assessment – This alternative would have an economic impact to local businesses. The closure of the Memorial Bridge to vehicles would have a negative impact to businesses located near the Memorial Bridge approaches, but not as substantial if bicycle/pedestrian access remains. This alternative would have no regional economic impact. Temporary impacts during the two to three year construction period are not estimated.
- Environmental clearances - The replacement of the Sarah Mildred Long Bridge would require a Coast Guard permit. The replacement of the Memorial Bridge with a bicycle/pedestrian only bridge would require a Coast Guard permit. A U.S. Army Corps

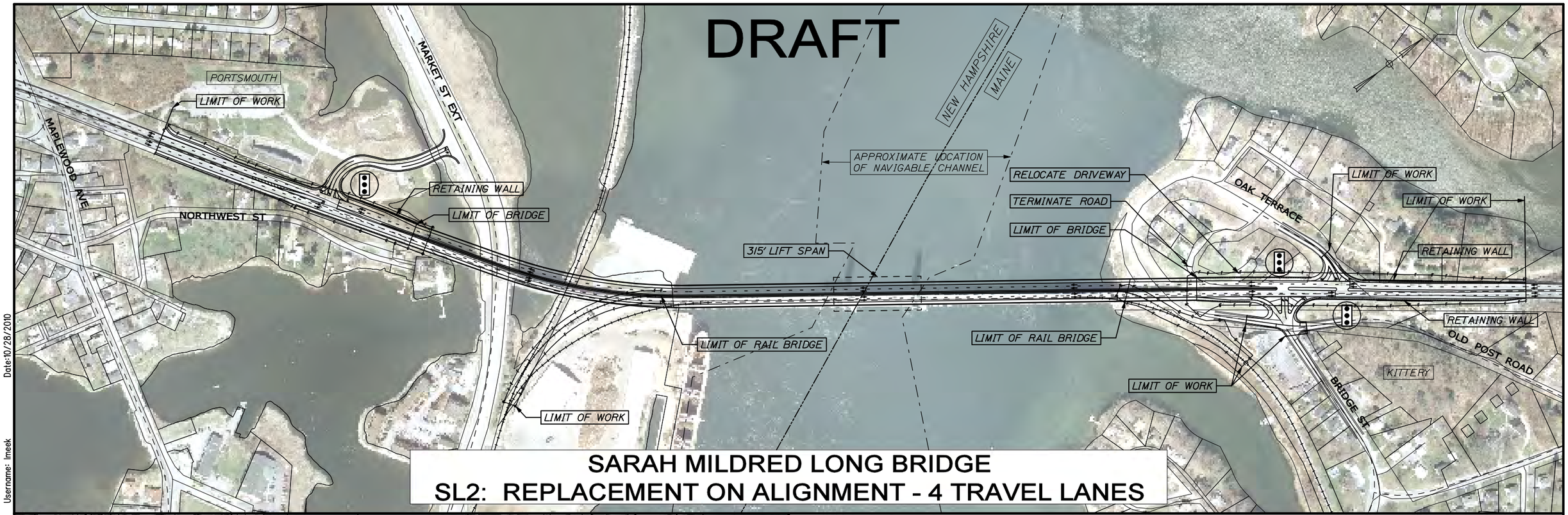
of Engineers permit likely would be needed for potential construction activities in Portsmouth. Under NEPA, FHWA is responsible for determining the Class of Action. It is likely that the appropriate Class of Action for the Sarah Mildred Long Bridge replacement and for the Memorial Bridge bicycle/pedestrian replacement will be individual CE's or EA's.

Figure 8-12 on the following page provides a plan and cross section of Alternative 7.

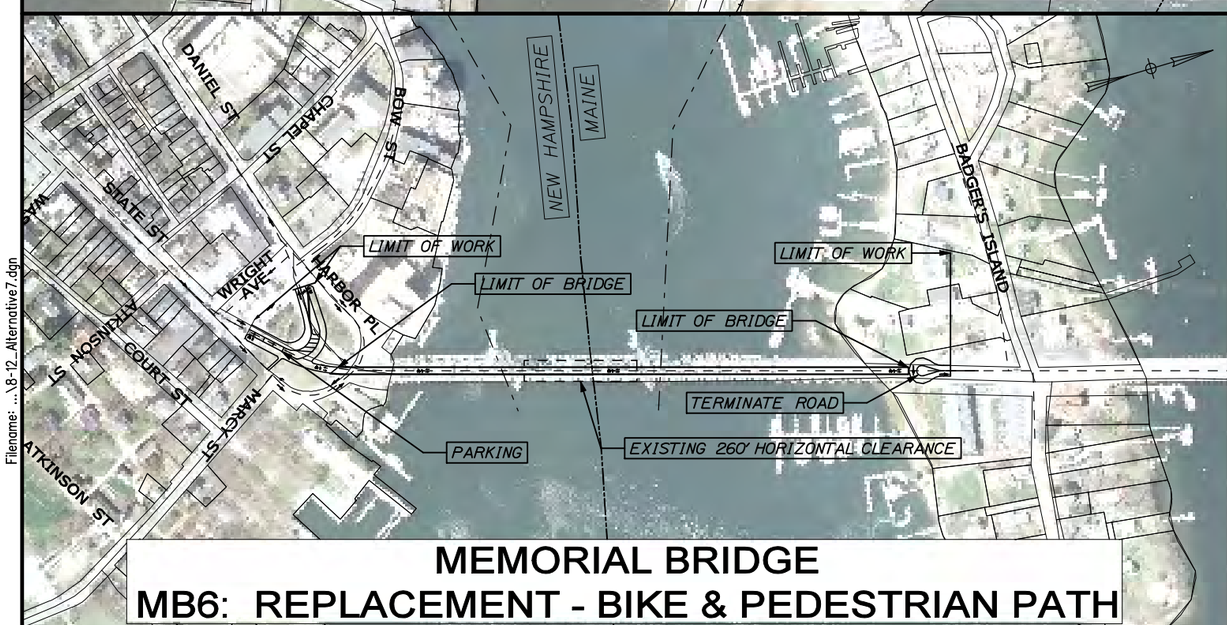
8.11 Alternative 8 – Memorial Bridge Replaced on Existing Alignment with a Bicycle/Pedestrian Bridge Only and Sarah Mildred Long Bridge Replaced on Upstream Alignment (four-lane)

Alternative 8 replaces the Memorial Bridge with a bicycle/pedestrian only lift bridge on existing alignment with similar navigational clearances. Alternative 8 also replaces the Sarah Mildred Long Bridge with a new four-lane bridge on an upstream alignment, with a new 270 foot horizontal lift span and rail components. The results of the Alternative 8 evaluation are:

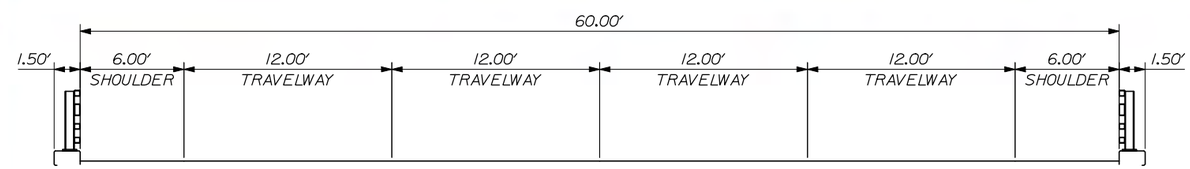
- Engineering Analysis – This alternative would fully satisfy the design parameters necessary to accommodate the 2035 design year traffic. The new four-lane Sarah Mildred Long Bridge would provide desirable lane and shoulder widths as well as appropriate bicycle facilities. The new Memorial Bridge would provide appropriate bicycle/pedestrian facilities only. Both bridges would also address the needs of long-term maintenance by providing new bridges with an expected 100 year life span.
- Traffic Analysis – With the Memorial Bridge no longer available for vehicular traffic, cross river vehicle mobility and efficiencies would be similar to the No-Build alternative with some of the highest design year VMT (123,345) and VHT (4,107). Three intersections would fail (LOS F) by 2035, two less than the No-Build Alternative. The alternative includes the work required at failing intersections to obtain a minimum LOS of D. Traffic volumes (relative to the No-Build Alternative) would increase along Newmarch Street/Government Street in Kittery, Bridge Street/Cook Street in Kittery, and Maplewood Avenue in Portsmouth. Traffic on Badgers Island would be reduced substantially due to vehicles no longer being allowed on the Memorial Bridge. A four-lane Sarah Mildred Long Bridge would have volume to capacity ratios less than 1.0 indicating that the 2035 peak hour vehicular traffic would not exceed the available capacity of the bridge. It should be noted that delays caused by bridge openings have not been factored into the calculations. This will be done during the environmental evaluation phase.



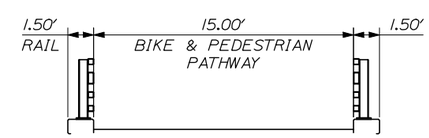
SARAH MILDRED LONG BRIDGE
SL2: REPLACEMENT ON ALIGNMENT - 4 TRAVEL LANES



MEMORIAL BRIDGE
MB6: REPLACEMENT - BIKE & PEDESTRIAN PATH



SARAH MILDRED LONG BRIDGE
REPLACEMENT - 4 TRAVEL LANES



MEMORIAL BRIDGE
REPLACEMENT - BIKE & PEDESTRIAN PATHWAY

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

ME - NH CONNECTIONS STUDY
NOVEMBER 2010

New Hampshire DOT · MaineDOT · HNTB

FIGURE 8-12
ALTERNATIVE 7

Date:10/28/2010
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- Multimodal Evaluation – The replacement of the Memorial Bridge with an exclusive bicycle/pedestrian bridge would improve accessibility to bicyclists and pedestrians to the downtowns of Portsmouth and Kittery and PNSY. Bicycle facilities would be provided on the Sarah Mildred Long Bridge. Replacement of the Memorial Bridge would have no effect on the movement of marine traffic (except during construction). Marine traffic would be improved by the replacement of the Sarah Mildred Long Bridge by including a longer lift span (270 feet vs. 200 feet) over the existing marine channel. Rail would be included on the new Sarah Mildred Long Bridge.
- Air Quality Analysis – Air pollutants would remain below the NAAQS standard.
- Noise Analysis – There would not be any noticeable (less than three dbA) increase in noise levels. Noise levels would be reduced in the vicinity of Badgers Island due to the elimination of vehicle access to the Memorial Bridge.
- Natural Resource Impact Analysis – The replacement of the Sarah Mildred Long Bridge includes the removal of 15 existing piers in the river and construction of 17 new piers in the river. Although the substructure design has not advanced at this time, the substructure would be larger than the 2-lane option and would have a greater impact on the river. No substructure work is anticipated for the Memorial Bridge other than replacement of its abutments.
    - River Quality: Temporary impacts to river quality may occur during removal of 15 existing piers and replacement with 17 new piers in the Piscataqua River for the Sarah Mildred Long Bridge. These temporary impacts to river (water) quality include increased turbidity and sedimentation during demolition and construction of bridge piers.
    - Aquatic Habitat: Potential temporary impacts associated with work in the river include increased turbidity, sedimentation, noise, and temporary loss of habitat. Time of year restrictions for work in the water may be required to avoid spawning periods of fisheries. There are areas of tidal waterfowl and wading bird habitat adjacent to the north side of the Sarah Mildred Long Bridge at both the Kittery and Portsmouth shorelines that may be temporarily impacted during replacement of the piers. There are areas of tidal waterfowl and wading bird habitat and softshell clam beds along the Kittery shoreline south of the Sarah Mildred Long Bridge that may be temporarily impacted during replacement of the piers and bridge abutment. Long term effects on aquatic habitat would be small with the removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge. Upon removal of the existing bridge piers, the impacted area would be naturally restored to the condition of the adjacent river bottom.
    - Threatened and Endangered Species: No federally-listed threatened or endangered species are known to exist in the Piscataqua River, however further coordination

with resource agencies will be required during the design, environmental documentation and permitting phases of the project.

- Wetlands: This alternative would impact 1,250 sf of wetlands (type PUBHx) adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector. The replacement of the Sarah Mildred Long Bridge piers would have a temporary impact to the Piscataqua River which is classified as an E1UBL wetland type. There is a small area of NH mapped salt marsh northeast of the Albacore Connector that may be temporarily impacted during construction. In addition, an area of mapped eelgrass habitat exists south of the Sarah Mildred Long Bridge which may be temporarily impacted during construction.
- Floodplain/Floodway: Permanent impact on floodplain areas would be small from removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge and replacement of abutments for the Memorial Bridge. Temporary impacts in work zones around the bridge piers and abutments would occur. This alternative would permanently impact 2,100 sf of special flood hazard area Zone AE adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector and 34,700 sf of special flood hazard area Zone AE along the PNSY rail spur in Kittery.

- Physical Resource Impacts – Replacing the existing two-lane Sarah Mildred Long Bridge with a new four-lane bridge on new alignment would require modifying the highway approaches in both communities. The modified highway approaches would have close to the highest publicly owned property impacts (three), and the highest commercial (one) and residential (13) property impacts as compared to the other build alternatives. This alternative would impact 2,496 square feet of commercial real estate (among the highest) including one commercial business displacement. The assessed value of this displaced property is $166,900.
- Land Use Impacts – No impact on zoning or activity centers would occur.
- Historic Impacts – The preliminary Section 106 effects determinations indicate that either replacement or rehabilitation of the Memorial Bridge and the Sarah Mildred Long Bridge would be an adverse effect on the individual bridges. From a historic perspective, rehabilitation is generally preferred over replacement if the rehabilitation can be done in accordance with the Secretary Standards to preserve key elements of the structure that contribute to its historic significance. For this reason, as well as with consideration of Section 4(f) avoidance and mitigation requirements, this alternative and other alternatives that replace both bridges are considered to have the highest impact on these historic bridges, as compared to alternatives that would replace only one bridge. This alternative would have an adverse effect on 13 other historic resources located adjacent to the highway approaches to the bridges including: U.S.S. Albacore, Richard Jackson House, Moffatt-Ladd House, MacPhaedris-Warner House, Governor John Langdon House, Wentworth House, U.S. Route 1 Bypass, U.S. Route 1 Bypass Historic District, Christian

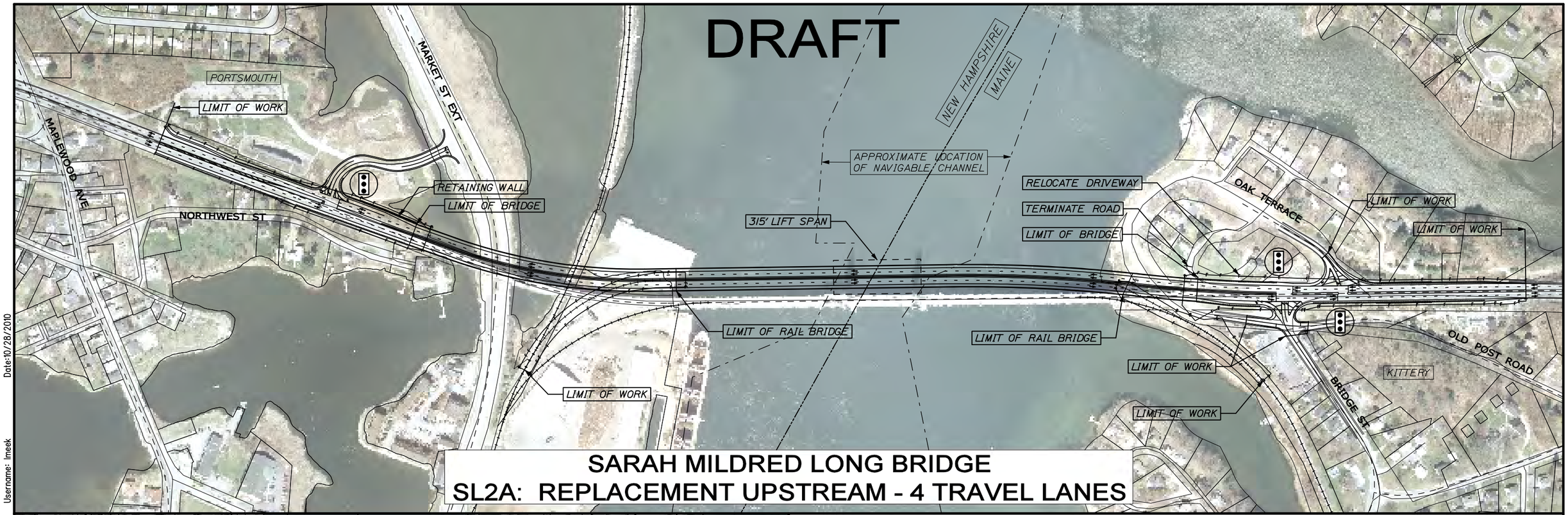
Shore Historic District, Eastern Railroad Historic District, Memorial Bridge Historic District, Portsmouth Local Historic District, and Memorial Park.

- Archeological Impacts – This alternative would require excavation in areas of moderate to high archaeological sensitivity along the Portsmouth and Kittery shorelines at the Sarah Mildred Long Bridge and the Memorial Bridge.
- Costs Analysis – This alternative would have some of the highest capital costs ($238 to $292 million) of all of the build alternatives because it would replace both bridges. Total operations costs would be similar to other build alternatives. Overall maintenance and operation costs would be among the lowest because both bridges would be replaced ($103 to $127 million). The life cycle cost is among the highest of all the build alternatives ($341 to $419 million) due to the high capital costs. This alternative has relatively the same travel time delay cost ($17,580) as all of the other build alternatives. The benefit/cost ratio is 0.77.
- Business Impact Assessment – This alternative would have an economic impact to local businesses. The closure of the Memorial Bridge to vehicles would have a negative impact to businesses located near the Memorial Bridge approaches, but not as substantial if bicycle/pedestrian access remains. This alternative would have no regional economic impact. Temporary impacts during the two to three year construction period are not estimated.
- Environmental clearances - The replacement of the Sarah Mildred Long Bridge would require a Coast Guard permit. The replacement of the Memorial Bridge with a bicycle/pedestrian only bridge would require a Coast Guard permit. The U.S. Army Corps of Engineers permit likely would be needed for potential construction activities in Portsmouth. Under NEPA, FHWA is responsible for determining the Class of Action. It is likely that the appropriate Class of Action for the Sarah Mildred Long Bridge replacement and for the Memorial Bridge bicycle/pedestrian replacement will be individual CE's or EA's.

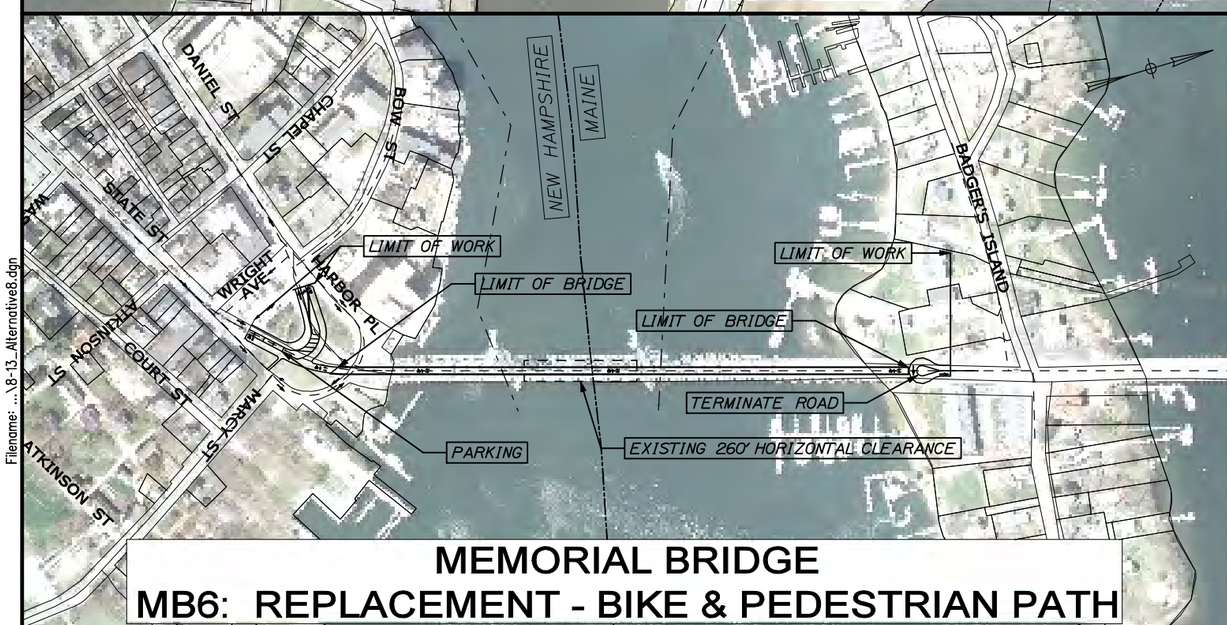
Figure 8-13 on the following page provides a plan and cross section of Alternative 8.

8.12 Alternative 9 – Memorial Bridge Replaced on Existing Alignment and Sarah Mildred Long Bridge Replaced on Upstream Alignment (two-lane) with Hybrid Bridge with 6 percent grade

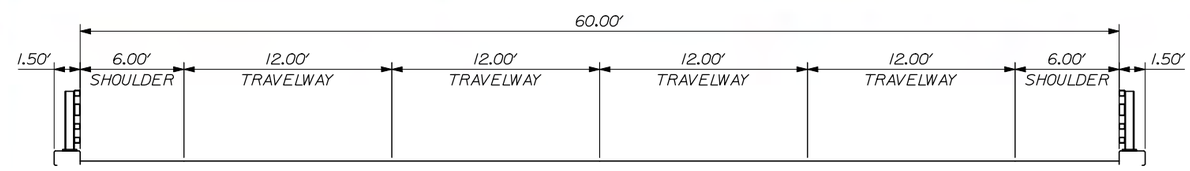
Alternative 9 would replace the Memorial Bridge and its abutments on existing alignment, retaining the existing piers, and navigational clearances. Alternative 9 also replaces the Sarah Mildred Long Bridge with a new mid-level (86 foot± vertical clearance), two-lane hybrid bridge on an upstream alignment with new lift span and rail components. The results of the Alternative 9 evaluation are:



SARAH MILDRED LONG BRIDGE
SL2A: REPLACEMENT UPSTREAM - 4 TRAVEL LANES



MEMORIAL BRIDGE
MB6: REPLACEMENT - BIKE & PEDESTRIAN PATH



SARAH MILDRED LONG BRIDGE
REPLACEMENT - 4 TRAVEL LANES

MEMORIAL BRIDGE
REPLACEMENT - BIKE & PEDESTRIAN PATHWAY

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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FIGURE 8-13
ALTERNATIVE 8

Date:10/28/2010
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Filename: ...\8-13_Alternative8.dgn

- Engineering Analysis – This Alternative would fully satisfy the design parameters necessary to accommodate the 2035 design year traffic. The Memorial Bridge would provide desirable lane and shoulder widths as well as appropriate bicycle/pedestrian facilities. The new hybrid Sarah Mildred Long Bridge would provide desirable lane and shoulder widths as well as appropriate bicycle facilities. The new bridges would also address the needs of long-term maintenance by providing new bridges with an expected 100 year life span. Additionally, the 86 foot± vertical clearance at the lift portion of the Sarah Mildred Long Bridge would provide a reduction in the number of required bridge lifts for marine vessel passage.
- Traffic Analysis – The replacement of both bridges would improve cross river mobility by not limiting heavy loads and improve efficiency in the local and regional transportation system by having lower VMT (122,032) and VHT (4,041). Four intersections would fail (LOS F) by 2035, one less than the No-Build Alternative. The alternative includes the work required at failing intersections to obtain a minimum LOS of D. Traffic volumes (relative to the No-Build Alternative) would increase along, Newmarch Street/Government Street in Kittery, Bridge Street/Cook Street in Kittery, and Maplewood Avenue in Portsmouth. Both bridges would have volume to capacity ratios less than 1.0 indicating that the 2035 peak hour vehicular traffic would not exceed the available capacity of each bridge. The 80 percent± reduction in required bridge lifts would provide increased river crossing capacity and reduced travel delays. It should be noted that delays caused by bridge openings have not been factored into the calculations. This will be done during the environmental evaluation phase.
- Multimodal Evaluation – The replacement of the Memorial Bridge would maintain/improve accessibility to bicyclists and pedestrians to the downtowns of Portsmouth and Kittery and PNSY. The replacement of the Sarah Mildred Long Bridge would provide a marginally (one foot) wider travelway and shoulder width on the hybrid lift span than is currently provided on the existing bridge for bicycle accommodations and would not include any pedestrian (sidewalk) facilities. Replacement of the Memorial Bridge would have no effect on the movement of marine traffic (except during construction). Marine traffic would be greatly improved by the replacement of this Sarah Mildred Long Bridge Option. It would include a longer lift span (270 feet vs. 200 feet) over the existing marine channel, similar to the other replacement Sarah Mildred Long Bridge Options, as well as a greater vertical opening of lift span (86 feet± vs. the current 10 feet) resulting from a higher roadway grade with this bridge option. This would result in an 80 percent± reduction in the required Sarah Mildred Long Bridge lifts, which would not be provided with other low level replacement Sarah Mildred Long Bridge Options. Rail would be included on the new hybrid Sarah Mildred Long Bridge. The lift portion of the rail bridge would be in the road surface and the existing retractable rail bridge would be eliminated. Only one mode at a time, highway or rail, could be accommodated with the hybrid lift bridge.

- Air Quality Analysis – Air pollutants would remain below the NAAQS standard.
- Noise Analysis – There would not be any noticeable (less than three dbA) increase in noise levels.
- Natural Resource Impact Analysis – The replacement of the Sarah Mildred Long Bridge includes the removal of 15 existing piers in the river and construction of 17 new piers in the river. No substructure work is anticipated for the Memorial Bridge other than replacement of its abutments.
    - River Quality: Temporary impacts to river quality may occur during removal of 15 existing piers and replacement with 17 new piers in the Piscataqua River for the Sarah Mildred Long Bridge. These temporary impacts to river (water) quality include increased turbidity and sedimentation during demolition and construction of bridge piers.
    - Aquatic Habitat: Potential temporary impacts associated with work in the river include increased turbidity, sedimentation, noise, and temporary loss of habitat. Time of year restrictions for work in the water may be required to avoid spawning periods of fisheries. There are areas of tidal waterfowl and wading bird habitat adjacent to the north side of the Sarah Mildred Long Bridge at both the Kittery and Portsmouth shorelines that may be temporarily impacted during replacement of the piers. There are areas of tidal waterfowl and wading bird habitat and softshell clam beds along the Kittery shoreline south of the Sarah Mildred Long Bridge that may be temporarily impacted during replacement of the piers and bridge abutment. Long term effects on aquatic habitat would be small with the removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge. Upon removal of the existing bridge piers, the impacted area would be naturally restored to the condition of the adjacent river bottom.
    - Threatened and Endangered Species: No federally-listed threatened or endangered species are known to exist in the Piscataqua River, however further coordination with resource agencies will be required during the design, environmental documentation and permitting phases of the project.
    - Wetlands: This alternative would impact 1,250 sf of wetlands (type PUBHx) adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector. The replacement of the Sarah Mildred Long Bridge piers would have a temporary impact to the Piscataqua River which is classified as an E1UBL wetland type. There is a small area of NH mapped salt marsh northeast of the Albacore Connector that may be temporarily impacted during construction. In addition, an area of mapped eelgrass habitat exists south of the Sarah Mildred Long Bridge which may be temporarily impacted during construction.
    - Floodplain/Floodway: Permanent impact on floodplain areas would be small from removal of 15 existing bridge piers and replacement with 17 new bridge piers for

the Sarah Mildred Long Bridge and replacement of abutments for the Memorial Bridge. Temporary impacts in work zones around the bridge piers and abutments would occur. This alternative would permanently impact 2,100 sf of special flood hazard area Zone AE adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector and 34,700 sf of special flood hazard area Zone AE along the PNSY rail spur in Kittery.

- Physical Resource Impacts – Replacing the existing two-lane Sarah Mildred Long Bridge with a new two-lane hybrid bridge on new alignment would require modifying the highway approaches in both communities. The modified highway approaches would have close to the highest publicly owned property impacts (three), and the highest commercial (one) and residential (13) property impacts as compared to the other build alternatives. Would impact 2,496 square feet of commercial real estate including one commercial business displacement. The assessed value of this displaced property is $166,900.
- Land Use Impacts – No impact on zoning or activity centers would occur.
- Historic Impacts – The preliminary Section 106 effects determinations indicate that either replacement or rehabilitation of the Memorial Bridge and the Sarah Mildred Long Bridge would be an adverse effect on the individual bridges. From a historic perspective, rehabilitation is generally preferred over replacement if the rehabilitation can be done in accordance with the Secretary Standards to preserve key elements of the structure that contribute to its historic significance. For this reason, as well as with consideration of Section 4(f) avoidance and mitigation requirements, this alternative and other alternatives that replace both bridges are considered to have the highest impact on these historic bridges, as compared to alternatives that would replace only one bridge. This alternative would have an adverse effect on seven other historic resources located adjacent to the highway approaches to the bridges including: U.S.S. Albacore, U.S. Route 1 Bypass, U.S. Route 1 Bypass Historic District, Christian Shore Historic District, Eastern Railroad Historic District, Memorial Bridge Historic District, and Memorial Park.
- Archaeological Impacts – This alternative would require excavation in areas of moderate to high archaeological sensitivity along the Portsmouth and Kittery shorelines at the Sarah Mildred Long Bridge and the Memorial Bridge.
- Costs Analysis – This alternative would have some of the highest capital costs ($251 to $309 million) of all of the build alternatives because it would replace both bridges. Total operations costs would be similar to other build alternatives. Overall maintenance and operation costs would be among the lowest because both bridges would be replaced ($94 to $116 million). The life cycle cost is among the highest of all the build alternatives ($345 to $425 million) due to the high capital costs. This alternative has relatively the same travel time delay cost ($15,880) as all of the other build alternatives, excluding the reduced travel delays resulting from the 80 percent± reduction in bridge lifts at the Sarah Mildred Long Bridge. The benefit/cost ratio is 1.15.

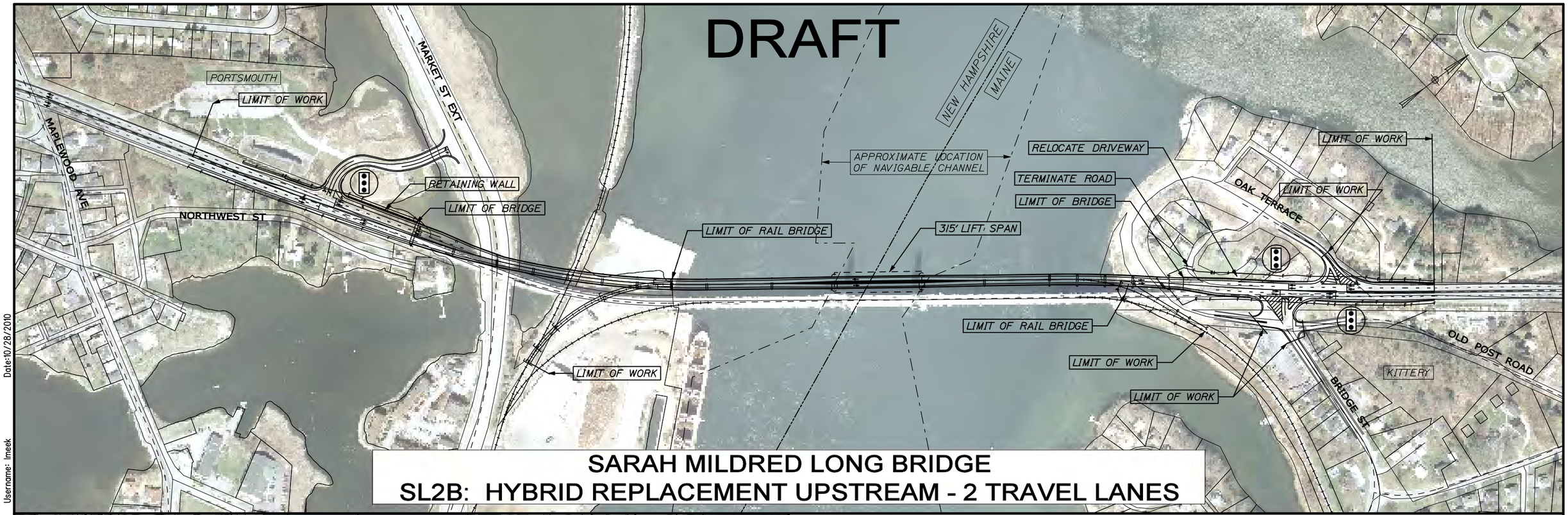
- Business Impact Assessment – This alternative would not have any permanent local business or regional economic impacts. Temporary impacts during the two to three year construction period are not estimated.
- Environmental clearances - The replacement of the Sarah Mildred Long Bridge would require a Coast Guard permit. The replacement of the Memorial Bridge with a bicycle/pedestrian only bridge would require a Coast Guard permit. A U.S. Army Corps of Engineers permit likely would be needed for potential construction activities in Portsmouth. Under NEPA, FHWA is responsible for determining the Class of Action. It is likely that the appropriate Class of Action for the Sarah Mildred Long Bridge replacement and for the Memorial Bridge bicycle/pedestrian replacement will be individual CE's or EA's.

Figure 8-14 on the following page provides a plan and cross section of Alternative 9.

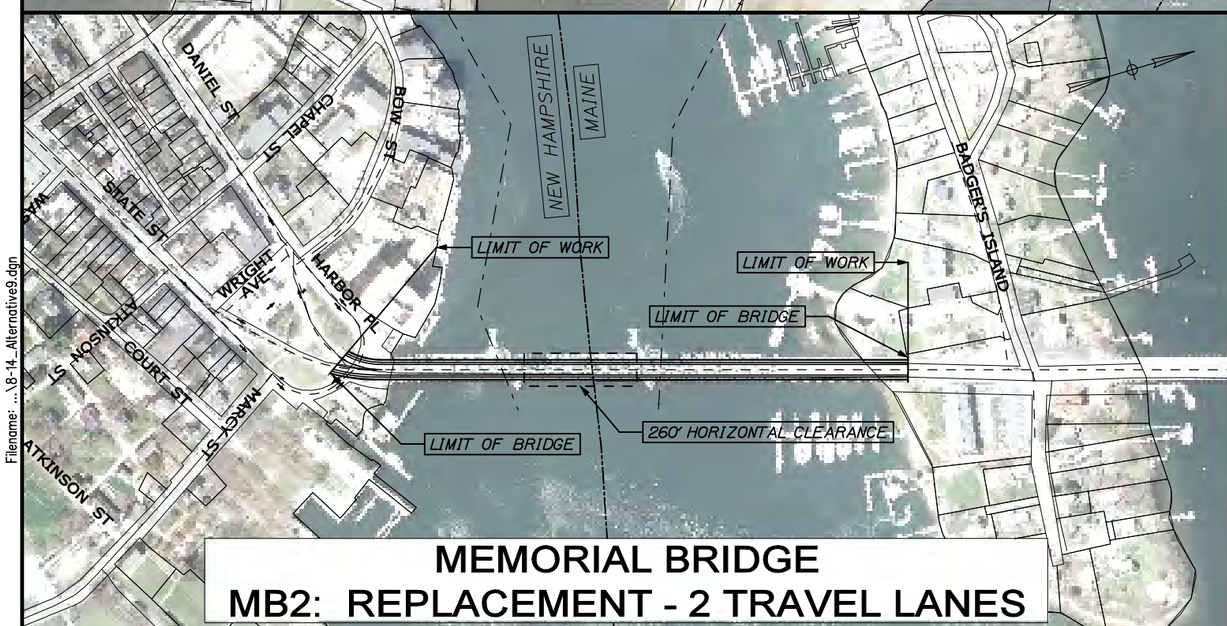
8.13 Alternative 10 – Memorial Bridge Replaced on Existing Alignment with a bicycle/pedestrian bridge only and Sarah Mildred Long Bridge Replaced on Upstream Alignment (two-lane) with Hybrid Bridge with 6 percent grade

Alternative 10 replaces the Memorial Bridge with a bicycle/pedestrian only lift bridge on existing alignment with similar navigational clearances. Alternative 10 also replaces the Sarah Mildred Long Bridge with a new mid-level (86 foot± vertical clearance), two-lane hybrid bridge on an upstream alignment with new lift span and rail components. The results of the Alternative 10 evaluation are:

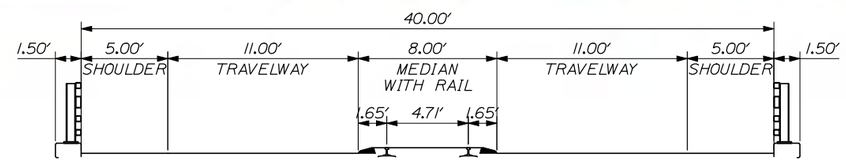
- Engineering Analysis – This alternative would not fully satisfy the design parameters necessary to accommodate the 2035 design year traffic. The new Sarah Mildred Long Bridge would provide desirable lane widths and minimal shoulder widths on the moveable lift span, though the recommended minimum shoulder widths for bicycle use would not be met on the moveable lift span. Pedestrian facilities would not provide on the Sarah Mildred Long Bridge. The new two-lane Sarah Mildred Long Bridge would not provide the necessary capacity to accommodate the 2035 design year river crossing traffic. The new Memorial Bridge would provide appropriate bicycle/pedestrian facilities only. Both bridges would address the needs of the long-term maintenance by providing new bridges with an expected 100 year life span. The 86 foot± vertical clearance at the lift portion of the Sarah Mildred Long Bridge would provide a reduction in the number of required bridge lifts for marine vessel passage.



SARAH MILDRED LONG BRIDGE
SL2B: HYBRID REPLACEMENT UPSTREAM - 2 TRAVEL LANES

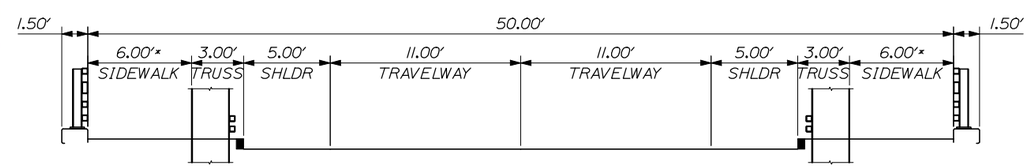


MEMORIAL BRIDGE
MB2: REPLACEMENT - 2 TRAVEL LANES



SARAH MILDRED LONG BRIDGE
REPLACEMENT - 2 TRAVEL LANES WITH RAIL IN RAISED MEDIAN

NOTE: TYPICAL SECTION OF THE HYBRID LIFT SPAN IS SHOWN. THE TYPICAL SECTION FOR THE APPROACH SPANS WILL BE CONSISTENT WITH THE TYPICAL SECTION OF THE OTHER 2 LANE REPLACEMENT OPTIONS SL2 & SL2A.



* 10' ALTERNATE TO BE CONSIDERED

MEMORIAL BRIDGE
REPLACEMENT - 2 TRAVEL LANES

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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New Hampshire DOT · MaineDOT · HNTB

FIGURE 8-14
ALTERNATIVE 9

Date:10/28/2010
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- Traffic Analysis – With the Memorial Bridge no longer available for vehicular traffic, cross river vehicle mobility and efficiencies are anticipated to be similar to the No-Build alternative with some of the highest design year VMT (123,372) and VHT (4,096). Three intersections would fail (LOS F) by 2035, two less than the No-Build Alternative. The alternative includes the work required at failing intersections to obtain a minimum LOS of D. Traffic volumes (relative to the No-Build Alternative) would increase in the following three neighborhoods, Newmarch Street/Government Street in Kittery, Bridge Street/Cook Street in Kittery, and Maplewood Avenue in Portsmouth. Traffic on Badgers Island would be reduced substantially due to the vehicles no longer being allowed on the Memorial Bridge. Additional widening of the U.S. Route 1 Bypass intersections at Bridge Street and the Albacore Connector would be required to achieve an acceptable LOS due to the increased traffic with the Memorial Bridge closed. With the Memorial Bridge closed, and only a 2-lane Sarah Mildred Long Bridge, the 2-lane Sarah Mildred Long Bridge would have a volume to capacity ratio of 1.06, indicating that the traffic volume would exceed the available bridge capacity in the peak hour by 2035. It should be noted that delays caused by bridge openings have not been factored into the calculations. This will be done during the environmental evaluation phase.
- Multimodal Evaluation – The replacement of the Memorial Bridge with an exclusive bicycle/pedestrian bridge would improve accessibility to bicyclists and pedestrians to the downtowns of Portsmouth and Kittery and PNSY. The new Sarah Mildred Long Bridge would provide a one foot wider travelway and shoulder width on the hybrid lift span than is currently provided on the existing bridge for bicycle accommodations and would not include any pedestrian (sidewalk) facilities. Replacement of the Memorial Bridge would have no effect on the movement of marine traffic (except during construction). Marine traffic would be greatly improved by the replacement of the Sarah Mildred Long Bridge Option. It would include a longer lift span (270 feet vs. 200 feet) over the existing marine channel, similar to the other replacement Sarah Mildred Long Bridge Options, as well as a greater vertical opening of lift span (86 feet± vs. the current 10 feet today) resulting from a higher roadway grade with this bridge option. This would result in an 80percent± reduction in Sarah Mildred Long Bridge lifts, which would not be provided with other low level replacement Sarah Mildred Long Bridge Options. Rail would be included on the new hybrid Sarah Mildred Long Bridge. The lift portion of the rail bridge would be in the surface of the road and the existing retractable rail bridge would be eliminated. Only one mode at a time, highway or rail, could be accommodated with the hybrid lift bridge.
- Air Quality Analysis – Air pollutants would remain below the NAAQS standard.
- Noise Analysis – There would not be any noticeable (less than three dbA) increase in noise levels. Noise levels would be reduced in the vicinity of Badgers Island due to the elimination of vehicle access to the Memorial Bridge.

- Natural Resource Impact Analysis – The replacement of the Sarah Mildred Long Bridge includes the removal of 15 existing piers in the river and construction of 17 new piers in the river. No substructure work is anticipated for the Memorial Bridge other than replacement of its abutments.
    - River Quality: Temporary impacts to river quality may occur during removal of 15 existing piers and replacement with 17 new piers in the Piscataqua River for the Sarah Mildred Long Bridge. These temporary impacts to river (water) quality include increased turbidity and sedimentation during demolition and construction of bridge piers.
    - Aquatic Habitat: Potential temporary impacts associated with work in the river include increased turbidity, sedimentation, noise, and temporary loss of habitat. Time of year restrictions for work in the water may be required to avoid spawning periods of fisheries. There are areas of tidal waterfowl and wading bird habitat adjacent to the north side of the Sarah Mildred Long Bridge at both the Kittery and Portsmouth shorelines that may be temporarily impacted during replacement of the piers. There are areas of tidal waterfowl and wading bird habitat and softshell clam beds along the Kittery shoreline south of the Sarah Mildred Long Bridge that may be temporarily impacted during replacement of the piers and bridge abutment. Long term effects on aquatic habitat would be small with the removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge. Upon removal of the existing bridge piers, the impacted area would be naturally restored to the condition of the adjacent river bottom.
    - Threatened and Endangered Species: No federally-listed threatened or endangered species are known to exist in the Piscataqua River, however further coordination with resource agencies will be required during the design, environmental documentation and permitting phases of the project.
    - Wetlands: This alternative would impact 1,250 sf of wetlands (type PUBHx) adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector. The replacement of the Sarah Mildred Long Bridge piers would have a temporary impact to the Piscataqua River which is classified as an E1UBL wetland type. There is a small area of NH mapped salt marsh northeast of the Albacore Connector that may be temporarily impacted during construction. In addition, an area of mapped eelgrass habitat exists south of the Sarah Mildred Long Bridge which may be temporarily impacted during construction.
    - Floodplain/Floodway: Permanent impact on floodplain areas would be small from removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge and replacement of abutments for the Memorial Bridge. Temporary impacts in work zones around the bridge piers and abutments would occur. This alternative would permanently impact 2,100 sf of special flood

hazard area Zone AE adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector and 34,700 sf of special flood hazard area Zone AE along the PNSY rail spur in Kittery.

- Physical Resource Impacts – Replacing the existing two-lane Sarah Mildred Long Bridge with a new two-lane bridge on new alignment would require relocating the bridge approaches in both communities. The relocated bridge approaches would have close to the highest publicly owned property impacts (three), and the highest commercial (one) and residential (13) property impacts as compared to the other build alternatives. Would impact 2,496 square feet of commercial real estate (among the highest) including one commercial business displacement. The assessed value of this displaced property is $166,900.
- Land Use Impacts – No impact on zoning or activity centers would occur.
- Historic Impacts – The preliminary Section 106 effects determinations indicate that either replacement or rehabilitation of the Memorial Bridge and the Sarah Mildred Long Bridge would be an adverse effect on the individual bridges. From a historic perspective, rehabilitation is generally preferred over replacement if the rehabilitation can be done in accordance with the Secretary Standards to preserve key elements of the structure that contribute to its historic significance. For this reason, as well as with consideration of Section 4(f) avoidance and mitigation requirements, this alternative and other alternatives that replace both bridges are considered to have the highest impact on these historic bridges, as compared to alternatives that would replace only one bridge. This alternative would have an adverse effect on 13 other historic resources located adjacent to the highway approaches to the bridges including: U.S.S. Albacore, Richard Jackson House, Moffatt-Ladd House, MacPhaedris-Warner House, Governor John Langdon House, Wentworth House, U.S. Route 1 Bypass, U.S. Route 1 Bypass Historic District, Christian Shore Historic District, Eastern Railroad Historic District, Memorial Bridge Historic District, Portsmouth Local Historic District, and Memorial Park.
- Archeological Impacts – This alternative would require excavation in areas of moderate to high archaeological sensitivity along the Portsmouth and Kittery shorelines at the Sarah Mildred Long Bridge and the Memorial Bridge.
- This alternative would have high capital costs ($224 to $276 million) because it would replace both bridges. Total operations costs would be similar to other build alternatives. Overall maintenance and operation costs would be among the lowest because both bridges would be replaced ($94 to $116 million). The life cycle cost is among the highest of all the build alternatives ($318 to $392 million) due to the high capital costs. This alternative has relatively the same travel time delay cost ($17,580) as all of the other build alternatives, excluding the reduced travel delays resulting from the 80 percent± reduction in lifts at the Sarah Mildred Long Bridge. It has a good benefit/cost ratio of 0.92.

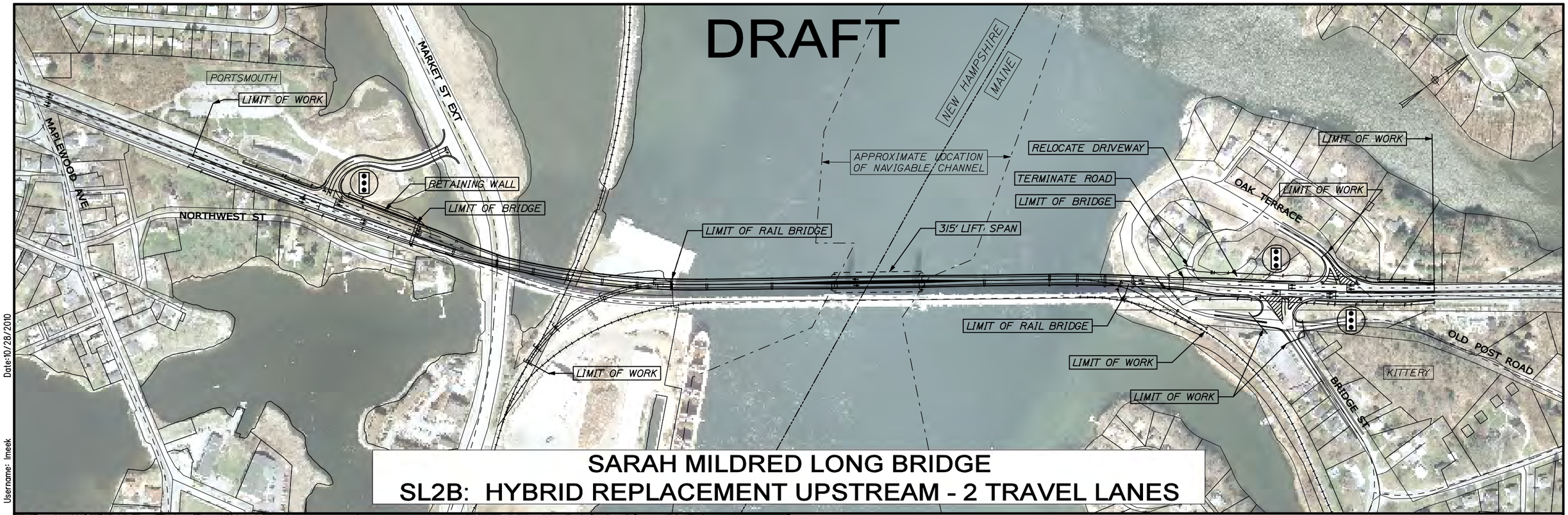
- Business Impact Assessment – This alternative would have an economic impact to local businesses. The closure of the Memorial Bridge to vehicles would have a negative impact to businesses located near the Memorial Bridge approaches, but not as substantial if bicycle/pedestrian access remains. Would have no regional economic impact. Temporary impacts during the two to three year construction period are not estimated.
- Environmental clearances - Environmental clearances - The replacement of the Sarah Mildred Long Bridge would require a Coast Guard permit. The replacement of the Memorial Bridge with a bicycle/pedestrian only bridge would require a Coast Guard permit. A U.S. Army Corps of Engineers permit likely would be needed for potential construction activities in Portsmouth. Under NEPA, FHWA is responsible for determining the Class of Action. It is likely that the appropriate Class of Action for the Sarah Mildred Long Bridge replacement and for the Memorial Bridge bicycle/pedestrian replacement will be individual CE's or EA's.

Figure 8-15 on the following page provides a plan and cross section of Alternative 10.

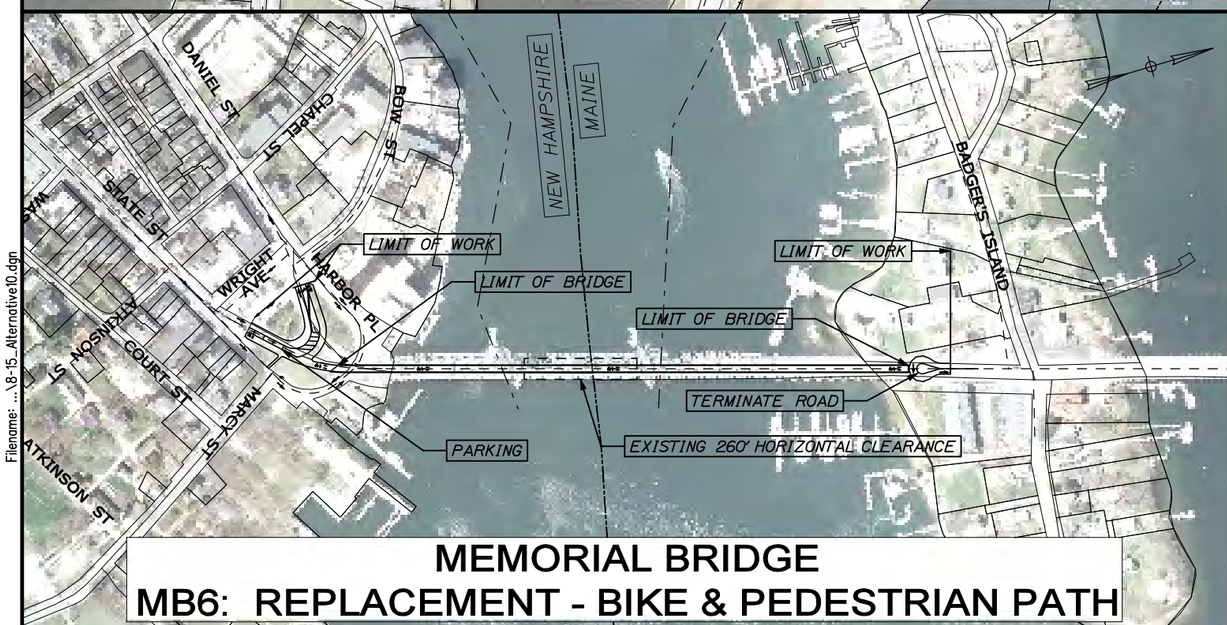
8.14 Alternative 11 – Memorial Bridge Removed and Sarah Mildred Long Bridge Replaced on Upstream Alignment (two-lane) with Hybrid Bridge with 5 percent grade and Provide Transit Service

Alternative 11 would close and completely remove the Memorial Bridge. Bicycle/pedestrian river crossing accommodations would be provided with a zero-fare, year round bus transit system between the two communities. The Sarah Mildred Long Bridge would be replaced with a new mid-level (74 foot± vertical clearance with 5 percent grade), two-lane hybrid bridge on an upstream alignment with new lift span and rail components. The results of the Alternative 11 evaluation are:

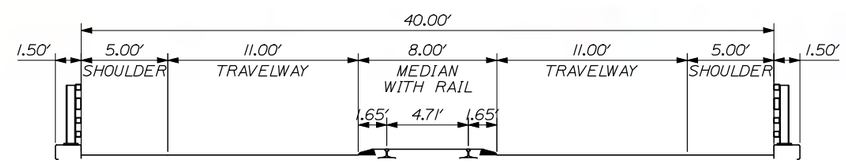
- Engineering Analysis – This alternative would not fully satisfy the design parameters necessary to accommodate the 2035 design year traffic. The new Sarah Mildred Long Bridge would provide adequate shoulder widths (five feet) to accommodate bicycle use and would provide an adequate pedestrian facility (a six foot wide sidewalk attached to bridge structure). The new Sarah Mildred Long Bridge would also address the needs of long term maintenance by providing a new bridge with an expected 100 year life span. The new 2-lane Sarah Mildred Long Bridge would not provide the necessary capacity to accommodate the 2035 design year river crossing traffic. The 74 foot± vertical clearance at the lift portion of the Sarah Mildred Long Bridge would provide a reduction in the number of required bridge lifts for marine vessel passage.



SARAH MILDRED LONG BRIDGE
SL2B: HYBRID REPLACEMENT UPSTREAM - 2 TRAVEL LANES



MEMORIAL BRIDGE
MB6: REPLACEMENT - BIKE & PEDESTRIAN PATH



SARAH MILDRED LONG BRIDGE
REPLACEMENT - 2 TRAVEL LANES WITH RAIL IN RAISED MEDIAN

NOTE: TYPICAL SECTION OF THE HYBRID LIFT SPAN IS SHOWN. THE TYPICAL SECTION FOR THE APPROACH SPANS WILL BE CONSISTENT WITH THE TYPICAL SECTION OF THE OTHER 2 LANE REPLACEMENT OPTIONS SL2 & SL2A.

MEMORIAL BRIDGE
REPLACEMENT - BIKE & PEDESTRIAN PATHWAY

BRIDGE TYPICAL SECTIONS

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

ME - NH CONNECTIONS STUDY
NOVEMBER 2010

New Hampshire DOT · MaineDOT · HNTB

FIGURE 8-15
ALTERNATIVE 10

Date:10/28/2010
Username: lmeek
Filename: ...\8-15_Alternative10.dgn

- Traffic Analysis – With the Memorial Bridge no longer available for vehicular traffic, cross river vehicle mobility and efficiencies are anticipated to be similar to the No-Build alternative with some of the highest design year VMT (123,375) and VHT (4,099). Three intersections would fail (LOS F) by 2035, two less than the No-Build Alternative. The alternative includes the work required at failing intersections to obtain a minimum LOS of D. Traffic volumes (relative to the No-Build Alternative) would increase in the following three neighborhoods, Newmarch Street/Government Street in Kittery, Bridge Street/Cook Street in Kittery, and Maplewood Avenue in Portsmouth. Traffic on Badgers Island would be reduced substantially due to no longer being allowed on Memorial Bridge. Additional widening of the U.S. Route 1 Bypass intersections at Bridge Street and the Albacore Connector would be required to achieve an acceptable LOS due to the increased traffic with the Memorial Bridge closed. With the Memorial Bridge closed, and only a two-lane Sarah Mildred Long Bridge, the two-lane Sarah Mildred Long Bridge would provide a volume to capacity ratio of 1.06, indicating that the traffic volume would exceed the available bridge capacity in the peak hour by 2035. It should be noted that delays caused by bridge openings have not been factored into the calculations. This will be done during the environmental evaluation phase.
- Multimodal Evaluation – This alternative provides transit service access to the Portsmouth and Kittery downtowns and PNSY to individuals who currently bicycle or walk to cross the Piscataqua River via the Memorial Bridge. This alternative would include a free bus transit service to be operated seven days per week, 365 days per year, from 5:00 AM to 11:00 PM to transport pedestrians and bicyclists between the Portsmouth and Kittery approaches of the demolished Memorial Bridge. Marine traffic would be greatly improved by the replacement of the Sarah Mildred Long Bridge with a hybrid bridge. It would include a longer lift span (270 feet vs. 200 feet) over the existing marine channel, similar to the other replacement Sarah Mildred Long Bridge Options, as well as a greater vertical opening of lift span (74 feet± vs. the current 10 feet today) resulting from a higher roadway grade with this bridge option. This would result in an 80 percent± reduction in Sarah Mildred Long lifts, which would not be provided with other low level replacement Sarah Mildred Long Bridge Options. Rail would be included on the new hybrid Sarah Mildred Long Bridge. Only one mode at a time, highway or rail, can be accommodated with this hybrid lift bridge.
- Air Quality Analysis – Air pollutants would remain below the NAAQS standard.
- Noise Analysis – There would not be any noticeable (less than three dbA) increase in noise levels. Noise levels would be reduced in the vicinity of Badgers Island due to the removal of the Memorial Bridge.
- Natural Resource Impact Analysis – The replacement of the Sarah Mildred Long Bridge includes the removal of 15 existing piers in the river and construction of 17 new piers in the river. The closure and removal of the Memorial Bridge and its piers in the Piscataqua River would have beneficial long term effects on aquatic resources and floodplain areas.

- River Quality: Temporary impacts to river quality may occur during removal of 15 existing piers and replacement with 17 new piers in the Piscataqua River for the Sarah Mildred Long Bridge. These temporary impacts to river (water) quality include increased turbidity and sedimentation during demolition and construction of bridge piers. Temporary impacts to river quality may also occur during demolition of Memorial Bridge piers in the Piscataqua River.
- Aquatic Habitat: Potential temporary impacts associated with work in the river include increased turbidity, sedimentation, noise, and temporary loss of habitat. Time of year restrictions for work in the water may be required to avoid spawning periods of fisheries. There are areas of tidal waterfowl and wading bird habitat adjacent to the north side of the Sarah Mildred Long Bridge at both the Kittery and Portsmouth shorelines that may be temporarily impacted during replacement of the piers. There are areas of tidal waterfowl and wading bird habitat and softshell clam beds along the Kittery shoreline south of the Sarah Mildred Long Bridge that may be temporarily impacted during replacement of the piers and bridge abutment. Long term effects on aquatic habitat would be small with the removal of 15 existing bridge piers and replacement with 17 new bridge piers for the Sarah Mildred Long Bridge. Long term effects of removal of the Memorial Bridge piers would be beneficial. Upon removal of the existing bridge piers, the impacted area would be naturally restored to the condition of the adjacent river bottom.
- Threatened and Endangered Species: No federally-listed threatened or endangered species are known to exist in the Piscataqua River, however further coordination with resource agencies will be required during the design, environmental documentation and permitting phases of the project.
- Wetlands: This alternative would impact 1,250 sf of wetlands (type PUBHx) adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector. The replacement of the Sarah Mildred Long Bridge piers would have a temporary impact to the Piscataqua River which is classified as an E1UBL wetland type. There is a small area of NH mapped salt marsh northeast of the Albacore Connector that may be temporarily impacted during construction. The removal of the Memorial Bridge piers would have a temporary impact to the Piscataqua River which is classified as an E1UBL wetland type.
- Floodplain/Floodway: This alternative would impact 2,100 sf of special flood hazard area Zone AE adjacent to the intersection of the U.S. Route 1 Bypass and the Albacore Connector and 34,700 sf of special flood hazard area Zone AE along the PNSY rail spur in Kittery. There would be a beneficial effect by removal of the Memorial Bridge piers from the floodplain.

- Physical Resource Impacts – Replacing the existing two-lane Sarah Mildred Long Bridge with a new two-lane bridge on new alignment would require modifying the highway

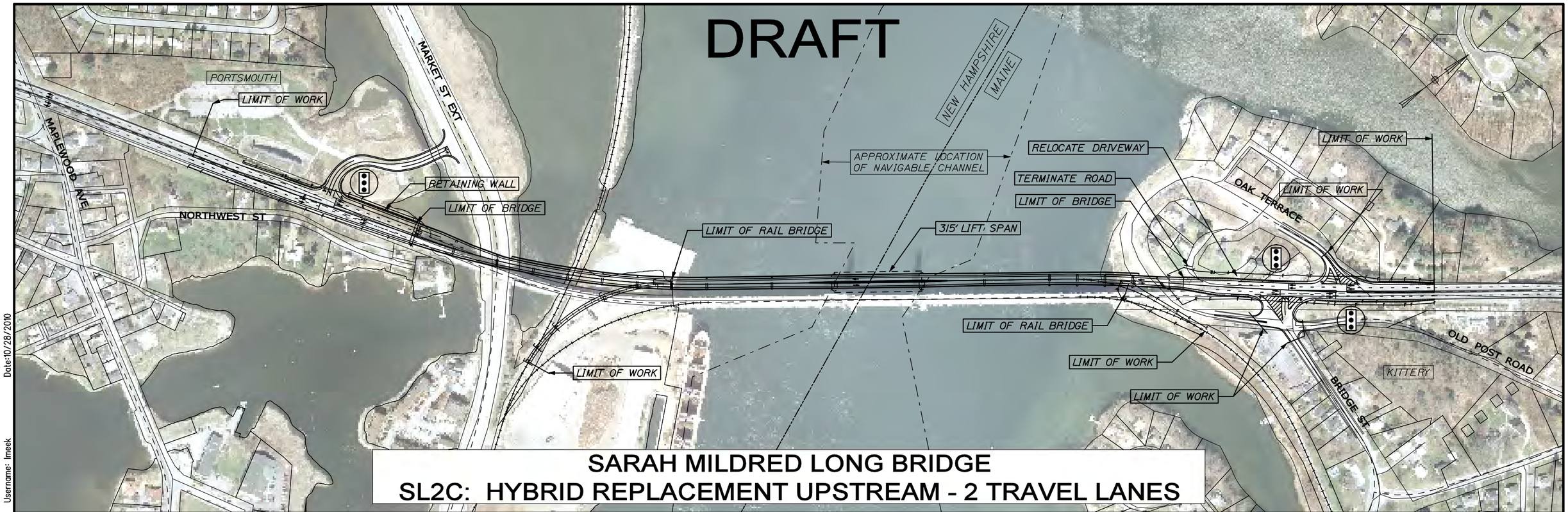
approaches in both communities. The modified highway approaches would have close to the highest publicly owned property impacts (three), and the highest commercial (one) and residential (13) property impacts as compared to the other build alternatives. Would impact 2,496 square feet of commercial real estate (among the highest) including one commercial business displacement. The assessed value of this displaced property is $166,900.

- Land Use Impacts –No impact on zoning or activity centers would occur.
- Historic Impacts – The preliminary Section 106 effects determinations indicate that either replacement or rehabilitation of the Memorial Bridge and the Sarah Mildred Long Bridge would be an adverse effect on the individual bridges. Removal of the Memorial Bridge also would be an adverse effect on that bridge. From a historic perspective, rehabilitation is generally preferred over replacement if the rehabilitation can be done in accordance with the Secretary Standards to preserve key elements of the structure that contribute to its historic significance. For this reason, as well as with consideration of Section 4(f) avoidance and mitigation requirements, this alternative, which removes the Memorial Bridge and replaces the Sarah Mildred Long Bridge, is considered to have the highest impact on these historic bridges, as compared to alternatives that would replace or remove only one bridge including: U.S.S. Albacore, Richard Jackson House, Moffatt-Ladd House, MacPhaedris-Warner House, Governor John Langdon House, Wentworth House, U.S. Route 1 Bypass, U.S. Route 1 Bypass Historic District, Christian Shore Historic District, Eastern Railroad Historic District, Memorial Bridge Historic District, Portsmouth Local Historic District, and Memorial Park.
- Archaeological Impacts – This alternative would require excavation in areas of moderate to high archaeological sensitivity along the Portsmouth and Kittery shorelines at the Sarah Mildred Long Bridge and the Memorial Bridge.
- Costs Analysis – Capital costs would be in the low-range ($197 to $243 million) of all the build alternatives because this alternative does not replace the Memorial Bridge. This alternative would have the lowest operation and maintenance cost ($89 to $111 million) and life cycle cost ($286 to $354 million). Has relatively the same travel time delay cost ($17,580) as all of the other build alternatives, excluding the reduced travel delays resulting from the 80 percent± reduction in bridge lifts at the Sarah Mildred Ling Bridge. The benefit/cost ratio is (1.07).
- Business Impact Assessment – This alternative would have an economic impact on local businesses located near the Memorial Bridge approaches due to removal of the Memorial Bridge. The new transit service could offset some of the local business impacts. This alternative would have no regional economic impact. Temporary impacts during the two to three year construction period are not estimated.
- Environmental clearances - The replacement of the Sarah Mildred Long Bridge would require a Coast Guard permit. A removal of the Memorial Bridge would not require a Coast Guard permit. However, the Coast Guard must be notified to determine if the

bridge removal would have an effect on navigation for notifying waterway users. A U.S. Army Corps of Engineers permit likely would be needed for potential construction activities in Portsmouth. Under NEPA, FHWA is responsible for determining the Class of Action. It is anticipated that all bridge work (Sarah Mildred Long Bridge replacement and Memorial Bridge removal) may be satisfied by the preparation of individual Categorical Exclusions or Environmental Assessments. It is likely that the appropriate Class of Action for the Sarah Mildred Long Bridge replacement and for the Memorial Bridge removal will be individual CE's or EA's.

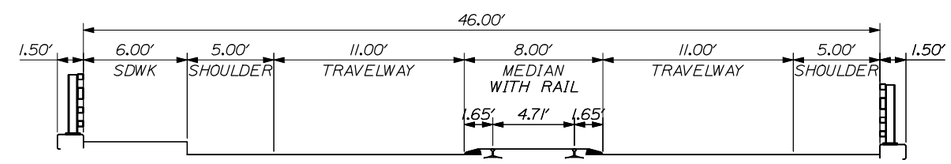
Figure 8-16 on the following page provides a plan and cross section of Alternative 11. Figure 8-17 on the following page provides profiles for the three bridge deck positions for the hybrid bridge.

The Alternatives Evaluation Matrix summarizing the results of the Evaluation Criteria Rating for the MOEs is shown in Figure 8-18 on the following page.

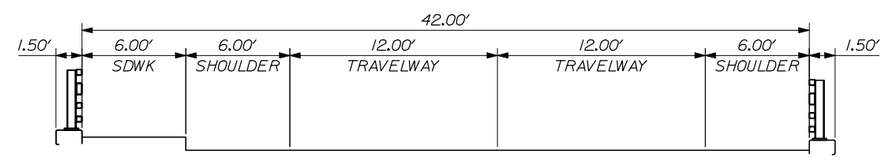


SARAH MILDRED LONG BRIDGE
SL2C: HYBRID REPLACEMENT UPSTREAM - 2 TRAVEL LANES

TRANSIT ALTERNATIVE



SARAH MILDRED LONG BRIDGE
REPLACEMENT LIFT SPAN- 2 TRAVEL LANES WITH RAIL IN RAISED MEDIAN



SARAH MILDRED LONG BRIDGE
REPLACEMENT APPROACH SPANS- 2 TRAVEL LANES

BRIDGE TYPICAL SECTION

Legend

- Approximate Property Lines
- Approximate Cut / Fill Lines
- Existing Roadway Centerline
- Existing or Proposed Signal
- Traffic Flow Arrows

350 0 350 700
Scale of Feet

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NOVEMBER 2010

New Hampshire DOT · MaineDOT · HNTB

FIGURE 8-16
ALTERNATIVE 11

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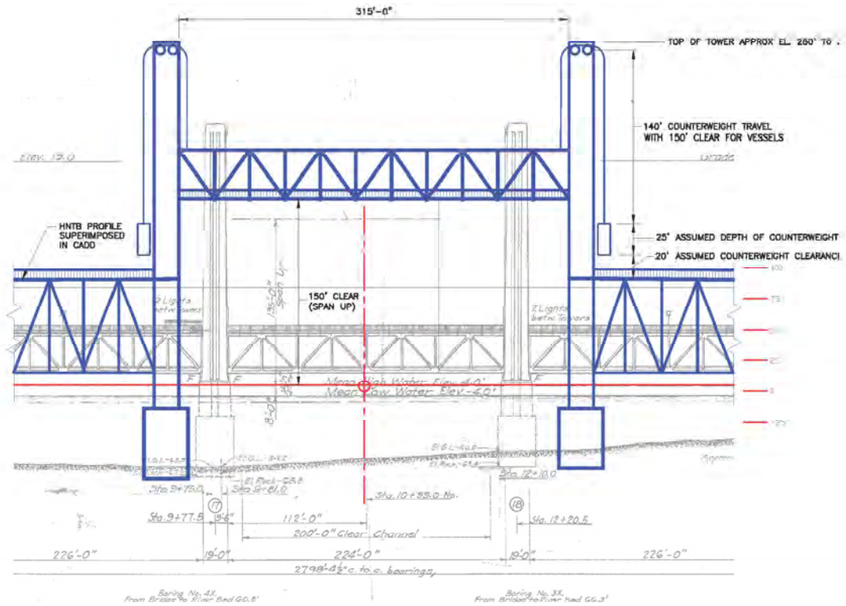
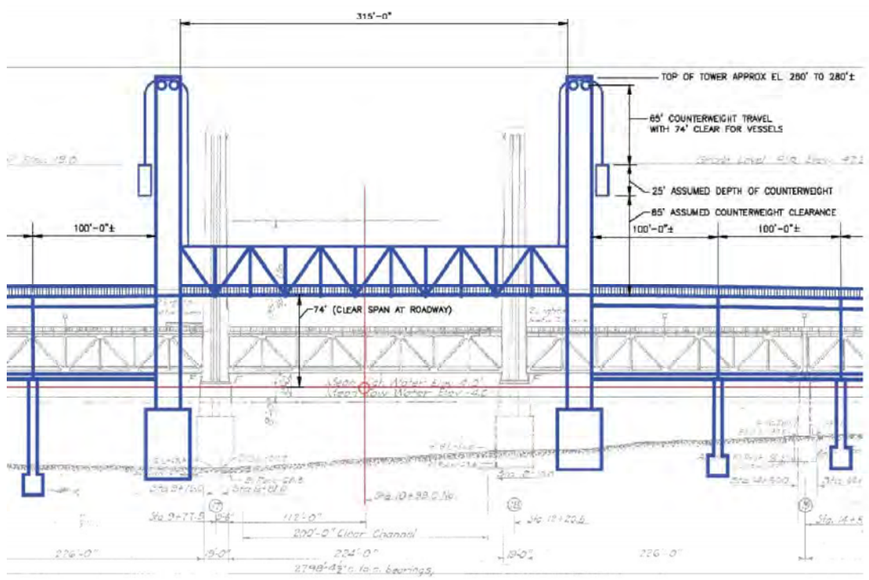
Filename: ...\8-16_Alternative11.dgn

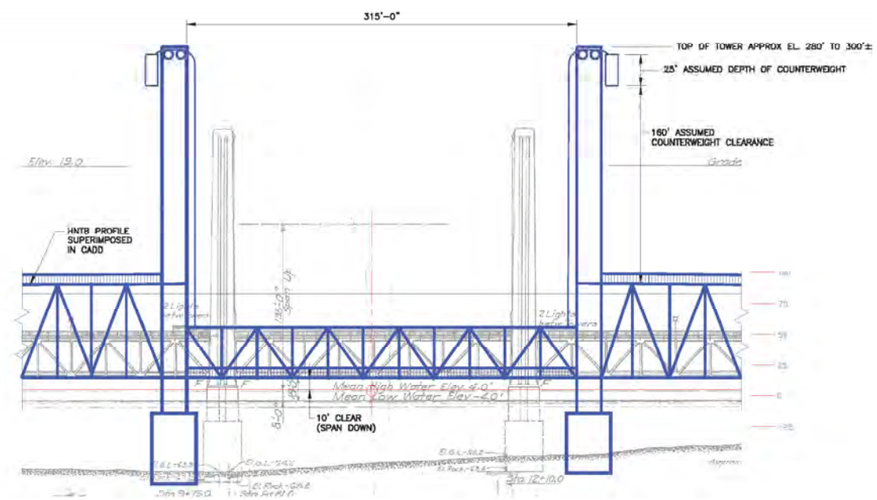
DRAFT



MAXIMUM OPEN POSITION



ROADWAY OPERATION POSITION



RAIL OPERATION POSITION

Not to Scale

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JULY 2010

New Hampshire DOT · MaineDOT · HNTB

FIGURE 8-17
SARAH MILDRED LONG BRIDGE
HYBRID LIFT SPAN ELEVATIONS

Filename: $file$ Username: $user$ Date:$date$

ME-NH Connections Study
Draft Report - Feasible Alternatives Evaluation Matrix
November 9, 2010

Needs/Goals Addressed	Evaluation Criteria Category	Description of Evaluation Criteria/Measures of Effectiveness (MOE's)[1]		No-Build Alternative	Alt #4 (MB Replace + SL Rehab)	Alt #5a (MB Replace +SL 2-lane on line)	Alt #5b (MB Replace +SL 4-lane on line)	Alt #6a (MB Replace +SL 2-lane off line)	Alt #6b (MB Replace + SL 4-lane off line)	Alt #7 (MB Bike-Ped + SL 4-lane on line)	Alt #8 (MB Bike-Ped + SL 4-lane off line)	Alt #9 (MB Replace + SL 2-lane hybrid)	Alt #10 (MB Bike-Ped + SL 2-lane hybrid)	Alt #11 (MB Removed + Bike-Ped Tunnel Option + SL 2-lane hybrid)
1,2	Structural Improvement	Improve structural deficiencies and increase reliability of lift spans												
		Satisfy Structural and Functional Needs	MB	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	N/A[3]
			SL	NO	Rehab	YES	YES	YES	YES	YES	YES	YES	YES	YES
		Lift Span Reliability	MB	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	N/A[3]
			SL	NO	Rehab	YES	YES	YES	YES	YES	YES	YES	YES	YES
1, 5, 17	Mobility for the year **2035**	Providing adequate mobility supports local and regional economic growth and stability, tourism and recreational opportunities and emergency evacuation efficiency												
		Vehicle Miles Traveled (VMT)		123,982	122,283	122,283	121,901	122,283	121,901	123,345	123,345	122,032	123,372	123,375
		Vehicle Hours Traveled (VHT)		4,148	4,062	4,062	4,049	4,062	4,049	4,107	4,107	4,041	4,096	4,099
		Intersection Level of Service (indicates # of intersections @ LOS F)		(5)	(4)	(4)	(4)	(4)	(4)	(3)	(3)	(4)	(3)	(3)
		Available Bridge Vehicular Capacity (V/C)	MB	N/A[3]	0.62	0.62	0.78	0.62	0.78	N/A	N/A	0.52	N/A	N/A[3]
			SL	1.09	0.86	0.86	0.59	0.86	0.59	0.79	0.79	0.79	1.06	1.06
		Local Road Traffic Impacts (increases traffic on 1, 2,or 3 local rds)		3	0	0	3	0	3	3	3	0	3	3
		Mobility During Construction (exist SL open or closed)		N/A	closed	closed	closed	open	open	closed	open	open	open	open
		Emergency Access		2-lane	4-lane	4-lane	6-lane	4-lane	6-lane	4-lane	4-lane	4-lane	2-lane	2-lane
		Evacuation Access		2-lane	4-lane	4-lane	6-lane	4-lane	6-lane	4-lane	4-lane	4-lane	2-lane	2-lane
3, 4, 5, 6, 7, 9, 18	Accessibility	Maintain or improve access to Portsmouth and Kittery downtowns and Portsmouth Naval Shipyard, connections to other transportation modes and potential future connection opportunities												
		Accessibility To Portsmouth/Kittery Downtowns		Doesn't satisfy	Satisfies	Satisfies	Satisfies	Satisfies	Satisfies	Partially satisfies	Partially satisfies	Satisfies	Partially satisfies	Partially satisfies
		Accessibility To Portsmouth Naval Shipyard (PNSY)		Doesn't satisfy	Satisfies	Satisfies	Satisfies	Satisfies	Satisfies	Doesn't satisfy	Doesn't satisfy	Satisfies	Doesn't satisfy	Doesn't satisfy
		Bridge Design Features/Vehicle	MB	N/A[3]	Meets	Meets	Meets	Meets	Meets	N/A	N/A	Meets	N/A	N/A[3]
			SL	Doesn't meet	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets
		Bridge Design Features/Marine	MB	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets
			SL	Doesn't Improve	Doesn't Improve	Improves Horizontal Only[8]	Improves Horizontal Only[8]	Improves Horizontal Only[8]	Improves Horizontal Only[8]	Improves Horizontal Only[8]	Improves Horizontal Only[8]	Improves Vertical & Horizontal[8]	Improves Vertical & Horizontal[8]	Improves Vertical & Horizontal[8]
		Bridge Design Features/Bicycle	MB	Doesn't meet	Meets [2]	Meets [2]	Meets [2]	Meets [2]	Meets [2]	Meets [2]	Meets [2]	Meets [2]	Meets [2]	N/A[3]
			SL	Doesn't meet	Partially meets[4]	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets
		Bridge Design Features/Pedestrian	MB	Doesn't meet	Meets [2]	Meets [2]	Meets [2]	Meets [2]	Meets [2]	Meets [2]	Meets [2]	Meets [2]	Meets [2]	N/A[3]
			SL	Doesn't meet	Doesn't Meet	Doesn't Meet	Doesn't Meet	Doesn't Meet	Doesn't Meet	Doesn't Meet	Doesn't Meet	Doesn't meet	Doesn't meet	Meets [5]
		Bridge Design/Rail Line		Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets	Meets[9]	Meets[9]	Meets[9]
8, 10	Cost in 2010 dollars	Minimize long-term costs for the regional transportation system												
		Range of Capital Cost (Millions)		$18 - $22	$166 - $204	$229 - $281	$265 - $325	$233 - $287	$265 - $325	$238 - $292	$238 - $292	$251 - $309	$224 - $276	$197 - $243
		Range of Operation and Maintenance Costs (Millions)		$126 - $154	$121 - $149	$94 - $116	$103 - $127	$94 - $116	$103 - $127	$103 - $127	$103 - $127	$94 - $116	$94 - $116	$89 - $111
		Range of Life Cycle Costs (Millions)		$144 - $176	$287 - $353	$323 - $397	$368 - $452	$327 - $403	$368 - $452	$341 - $419	$341 - $419	$345 - $425	$318 - $392	$286 - $354
		Travel Time Delay Cost		$22,970	$15,880	$15,880	$15,620	$15,880	$15,620	$17,580	$17,580	$15,880	$17,580	$17,580
		Benefit/Cost Ratio		0	1.62	1.22	1.02	1.18	1.02	0.77	0.77	1.15	0.92	1.07
		Business Survey Impacts												
		Regional Economic Impacts												
11	Historic Evaluation	Avoid or minimize detrimental impacts to the historic significance and integrity of the Kittery-Portsmouth area												
		Impacts to National Register-Listed or Eligible Historic Bridges[10]		1 bridge	1 bridge	2 bridges	2 bridges	2 bridges	2 bridges	2 bridges	2 bridges	2 bridges	2 bridges	2 bridges
		Other Historic Adverse Resource Impacts		0	6	6	7	6	7	13	13	7	13	13
		Archeological Resource Impacts	MB	None	Low to Mod	Low to Mod	Low to Mod	Low to Mod	Low to Mod	Low to Mod	Low to Mod	Low to Mod	Low to Mod	Low to Mod
			SL	None	High	High	High	High	High	High	High	High	High	High
12, 13, 15	Natural Environment	Conserve the aesthetic setting of the Piscataqua River												
		River Quality Impacts (# of piers replaced and/or removed in river during construction)		12	6	32	32	32	32	32	32	32	32	44
		Air Quality												
		Aquatic Habitat Loss (# of permanent piers in river)		15	29	29	29	29	29	29	29	29	29	17
		Access to River												
		Threatened and Endangered Species (T&E) [6]		Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined	Undetermined
		Wetlands		0	0	0	1,300	1,100	1,250	1,300	1,250	1,250	1,250	1,250
		Floodplain/Floodway [7]		0	0	0	27,500	31,000	36,800	27,500	36,800	36,800	36,800	36,800
5, 14	Physical Environment	Avoid or minimize detrimental impacts to residential neighborhoods												
		Neighborhood Traffic Impacts (5 total neighborhoods)		3	1	1	1	1	1	3	3	3	3	3
		Square Foot of Publicly Owned Property Impacts (Indicates # impacted)		0 (0)	0 (0)	8,486 (3)	19,984 (4)	20,228 (3)	26,402 (3)	19,984 (4)	26,402 (3)	26,402 (3)	26,402 (3)	26,402 (3)
		Square Foot of Commercial Property Impacts (Indicates # impacted)		0 (0)	0 (0)	0 (0)	5,163 (1)	3,633 (1)	2,496 (1)	5,163 (1)	2,496 (1)	2,496 (1)	2,496 (1)	2,496 (1)
		Square Foot of Residential Property Impacts (Indicates # impacted)		0 (0)	823 (1)	1,654 (4)	26,223 (14)	23,875 (14)	26,294 (13)	26,073 (14)	26,144 (13)	26,294 (13)	26,144 (13)	26,144 (13)
		Business or Residential Displacements		0	0	0	1	1	1	1	1	1	1	1
		Noise												
16	Environmental Clearances	Comply with applicable federal and state regulations												
		US Coast Guard Permitability		No permit needed	1 permit	2 permits	2 permits	2 permits	2 permits	2 permits	2 permits	2 permits	2 permits	1 permit
		Potential Level of NEPA Documentation		CE	CE/EA	CE/EA	CE/EA	CE/EA	CE/EA	CE/EA	CE/EA	CE/EA	CE/EA	CE/EA
5, 11, 16	Use of Section 4(f) Properties	Comply with Section 4(f) of the USDOT Act of 1966												
		Section 4(f) Historic Properties		1 use	7 use	7 use	8 use	7 use	8 use	8 use	8 use	8 use	8 use	8 use
		Other Section 4(f) Properties		1 use	3 use	3 use	3 use	3 use	3 use	3 use	3 use	3 use	3 use	3 use

NOTES:
1. The Alternatives that included the Memorial Bridge rehab options (Alternative #1, 2a, 2b, 3a, and 3b) have been dismissed from further consideration based on the recent Memorial Bridge Inspection Report and are not included in this matrix.
2. Alternatives with "MB Replace" and "MB Bike-Ped" include opportunity to better integrate East Coast Greenway with wider path.
3. Category is N/A because the Memorial Bridge has been removed and does not exist.
4. Approach spans provide a 6 foot wide shoulder with the existing lift span providing only a 3 foot wide shoulder.
5. Alternative has a 5% grade and a 5 foot wide sidewalk meeting ADA requirements.
6. Several T&E species are identified in the study area but specific locations are not known at this time.
7. The Floodplain/Floodway square foot impacts within this tidal area will have no noticable effect on water levels during high tidal events.
8. Vertical improvements for accommodating marine traffic are based on the vertical bridge clearances of the lift span in its closed position for accomodating vehicular traffic.
9. Hybrid lift span cannot accommodate roadway and rail traffic simultaneously.
10. Denotes number of historic bridges replaced and/or removed.

LEGEND

	Color assigned to worse performing alternatives
	Color assigned to alternatives performing in the middle
	Color assigned to best performing alternatives
MB	Memorial Bridge
SL	Sarah Mildred Long Bridge
N/A	Not Applicable

FIGURE 8-18