

4.0: Study Process and Summary of Fatal Flaw Analysis

4.1. STUDY PROCESS

The following provides an overview of the process established and implemented for the Maine-New Hampshire Connections Study. This planning study identifies, assesses and determines the feasibility of a broad range of transportation alternatives. This study provides a link between the planning phase of project development and the NEPA process. Further evaluation under NEPA of a selective number of alternatives under Section 404 of the Clean Water Act, Section 106 of the National Historic Preservation Act, and Section 4(f) of the U.S. DOT Act, will advance the preliminary assessments conducted under this study. The State of Maine’s Sensible Transportation Policy Act (STPA) also guides this study process.

NEPA requires all Federal agencies to conduct their planning and decision making process to;

- (1) Consider appropriate environmental factors when making decisions and not basing decisions solely on technical and economic factors;
- (2) Involve the affected and interested public early in its environmental-analysis process;
- (3) Seek less environmental damaging ways to document identified transportation needs; and
- (4) Document in plain language for the decision maker and the public this environmental-analysis process.

Section 404 of the Clean Water Act establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. Wetlands subject to Section 404 are defined as “areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas.” Activities in waters of the United States regulated under this program include fill for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports) and mining projects. Section 404 requires a permit obtainable from the U.S. Army Corps of Engineers, before dredged material may be discharged into waters of the United States.

Section 106 of the National Historic Preservation Act of 1966 requires federal agencies to consider the effects of projects, carried out by them or subject to their assistance or approval, on historic properties and provide the Advisory Council on Historic Preservation an opportunity to comment on these projects prior to a final decision on them. Projects range from construction or rehabilitation to demolition. Properties listed on or eligible for listing on the National Register of Historic Places are considered historic, subject to the provisions of Section 106. The National Register is a listing of historic properties maintained by the National Park Service. It includes buildings; structures; objects; districts; and sites of national, state, or local importance. Section 106 allows the past to be considered when looking to the future.

Section 4(f) of the Department of Transportation Act of 1966 stipulates that FHWA and other Department of Transportation agencies cannot approve the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites

unless there is no feasible and prudent alternative use of the land, and the action includes all possible planning to minimize harm to the property resulting from the use.

Section 106 of the National Historic Preservation Act and Section 4(f) were enacted by Congress on the same day in 1966 and have some overlap when historic properties are involved. A key difference is Section 106 is essentially a consultative procedural requirement, while Section 4(f) precludes project approval if the specific findings cannot be made.

STPA (23 MRSA §73) requires MaineDOT, Maine Turnpike Authority, Metropolitan Planning Organizations, and Regional Planning Councils (Regional Planning Commissions, Councils of Government, and Economic Development Districts) to incorporate the following policy objectives:

1. *TRANSPORTATION POLICY. It is the policy of the State that transportation planning decisions, capital investment decisions and project decisions must;*
 - A. *Minimize the harmful effects of transportation on public health and on air and water quality, land use and other natural resources;*
 - B. *Require that the full range of reasonable transportation alternatives be evaluated for all significant highway construction or reconstruction projects and give preference to transportation system management options, demand management strategies, improvements to the existing system, and other transportation modes before increasing highway capacity through road building activities;*
 - C. *Ensure the repair and necessary improvement of roads and bridges throughout the State to provide a safe, efficient and adequate transportation network;*
 - D. *Reduce the State's reliance on foreign oil and promote reliance on energy-efficient forms of transportation;*
 - E. *Meet the diverse transportation needs of the people of the State, including rural and urban populations and the unique mobility needs of the elderly and disabled;*
 - F. *Be consistent with the purposes, goals and policies of the Comprehensive Planning and Land Use Regulation Act; and*
 - G. *Incorporate a public participation process in which local governmental bodies and the public have timely notice and opportunity to identify and comment on concerns related to transportation planning decisions, capital investments decisions and project decisions. The department and the Maine Turnpike Authority shall take the comments and concerns of local citizens into account and shall be responsive to them.*

The Study was conducted in three steps: 1) Identification of Alternatives, 2) Fatal Flaw Analysis, and 3) Detailed Evaluation of Alternatives. Public Outreach was utilized throughout the process. These steps are summarized below:

1. ***Identification of Alternatives.*** The Study Team developed an initial list of alternatives presented to the committees and the public for input. In total, 63 alternatives were identified through this process, including a No-Build Alternative. Alternatives included rehabilitation of both bridges as well as a range of low, mid and high-level replacement

options, both on and off the current bridge alignments. Alternatives also included such suggestions as a tunnel or a ferry service that would replace both bridges.

2. ***Fatal Flaw Analysis.*** Using the jointly developed Study Purpose and Need statement as a guide, all alternatives identified above were qualitatively and quantitatively analyzed at a fatal flaw level to justifiably dismiss those conceptual alternatives that demonstrably:
 - Did not satisfy Study Purpose and Need;
 - Had significant environmental impacts;
 - Was not permissible;
 - Was not financially feasible;
 - Was not physically feasible; and/or
 - Was clearly inferior in comparison to other alternatives.

Some alternatives dismissed during the Fatal Flaw Analysis may require additional evaluation during future NEPA documentation to comply with other federal requirements such as Section 404 of the Clean Water Act or Section 4(f) of the Department of Transportation Act of 1966, although a Preliminary Section 4(f) Least Harm analysis was completed during the Fatal Flaw Analysis.

3. ***Detailed Evaluation of Alternatives.*** All conceptual alternatives that passed the Fatal Flaw criteria were brought forward to be evaluated in greater detail. In this detailed evaluation, alternatives were analyzed with due consideration of the Study Area constraints and opportunities, transportation deficiencies, and applicable design guidelines and standards. Those alternatives that best met the Study’s Purpose and Need and evaluation criteria developed from the Purpose and Need Statement are identified as Preferred Alternative(s) in this Study Report.

A continuous thread throughout the entire Study has been an extensive and ongoing Public Outreach process. The Connection Study Public Outreach process was designed to present an unbiased development of alternatives with no pre-determined outcomes, transparent decision-making and the maximum opportunity for feedback on all of the Study’s data compilation, analysis, and conclusions in order to facilitate extensive discussion and documentation among the varied stakeholders. A list of Steering and Stakeholder Committee members can be found in Chapter 2. Identification of Alternatives (Step 1) and Fatal Flaw Analysis (Step 2) are further described in detail below as part of Chapter 4. The Detailed Evaluation of Alternatives (Step 3) is described in Chapter 8.

4.2. IDENTIFICATION OF FATAL FLAW ALTERNATIVES

This section describes the alternatives that were developed and evaluated for the Connections Study during the Fatal Flaw process. The term “alternative” was used in two ways:

- 1) To describe new Piscataqua River crossings between Kittery and Portsmouth that would not include the use of the existing two bridges other than to maintain rail use; or
- 2) To describe combinations of a Memorial Bridge and a Sarah Mildred Long Bridge option.

The term “option” was used to describe different improvement scenarios that were evaluated for each individual existing bridge, i.e. the Sarah Mildred Long Bridge and the Memorial Bridge. Alternatives considered included 1) the No-Build Alternative; 2) combinations of options with varying improvements to the Memorial Bridge and Sarah Mildred Long Bridge simultaneously; and, 3) new alternatives with new Piscataqua River crossings. All alternatives assumed that a rail line connection across the Piscataqua River, currently provided on the Sarah Mildred Long Bridge, would remain.

a. No Build Alternative

The No Build alternative assumed that no new construction would occur, and that the present level of maintenance of the two existing bridges and their approaches within the study area would continue. Given this, the No Build alternative assumed that by the Study’s design year of 2035 the existing Memorial Bridge would not be available for use due to age and structural issues. It has been estimated that without improvements, the Memorial Bridge would likely have to be closed within 1 to 3 years. The Memorial Bridge was recently closed to vehicular traffic to make necessary structural repairs, and upon its reopening had been posted at a three-ton weight limit, effectively prohibiting all vehicles except automobiles and pickup trucks. The No-Build Alternative also assumes that the Sarah Mildred Long Bridge would remain open, but over time would require additional weight limit restrictions. It is currently posted at a 20-ton weight limit.

b. Memorial Bridge Options

Eight options were considered for addressing the Memorial Bridge (MB) needs. They included:

1. Option MB1 - Rehabilitation of the existing superstructure on existing alignment;
2. Option MB2 - Replacement of the superstructure on existing alignment with similar navigational clearances;
3. Option MB2A - Replacement of the lift bridge on new alignment either upstream or downstream with similar navigational clearances;
4. Option MB3 - Replacement of the lift bridge on existing alignment with a new mid-level bridge;
5. Option MB3A - Replacement of the lift bridge on new alignment either upstream or downstream with a new mid-level bridge;
6. Option MB4 - Replacement of the lift bridge on existing alignment with a new, fixed high-level bridge;
7. Option MB5 - Complete bridge removal; and
8. Option MB6 - Bridge replacement on existing alignment for bicycle/pedestrian use only.

c. Sarah Mildred Long Bridge Options

Seven options were considered for addressing the Sarah Mildred Long (SL) Bridge needs. They included:

1. Option SL1 - Rehabilitation of the existing structure on existing alignment;
2. Option SL2 - Replacement of the existing lift bridge on existing alignment with increased horizontal navigational clearances;

3. Option SL2A - Replacement of the lift bridge on new alignment upstream with increased horizontal navigational clearances;
4. Option SL3 - Replacement of the lift bridge on existing alignment with a new mid-level bridge;
5. Option SL3A - Replacement of the lift bridge on new alignment upstream with a new mid-level bridge;
6. Option SL4 - Replacement of the lift bridge on existing alignment with a new, fixed high-level bridge; and
7. Option SL5 - Close existing bridge to vehicular traffic, but keep rail portion of bridge.

All options assumed that rail service would remain – either on the existing Sarah Mildred Long Bridge or on a replacement Sarah Mildred Long Bridge. Downstream bridge replacement options were considered, but eliminated due to the proximity of the NH Port Authority dock facility and the ship turning basin within the river.

d. Combination Memorial Bridge/Sarah Mildred Long Bridge Alternatives

The eight Memorial Bridge options identified in Section “b” above were combined with the seven Sarah Mildred Long Bridge options identified in Section “c” above. These combinations created 56 individual alternatives to be considered and analyzed. In addition to these 56 combinations, two additional options were created. These two options would replace the existing Sarah Mildred Long Bridge with a new four-lane bridge (1 on existing alignment, 1 on an upstream alignment) with existing vertical clearances. These 58 alternatives are listed in Table 1 below.

e. New Alternatives

Four new alternatives that eliminated both the Memorial Bridge and Sarah Mildred Long Bridge and replaced them with a new infrastructure crossing (low/mid level bridge, high-level bridge, tunnel, and high speed ferry service) at a new location were also developed and analyzed for providing vehicular connections between the City of Portsmouth and the Town of Kittery. These four alternatives are also listed Table 4-1.

Table 4-1: Listing of the 63 Fatal Flaw Analysis Alternatives

Alternative Number	Alternative Description	Alternative Identification
1	Memorial Bridge closed and removed. Sarah Mildred Long Bridge remains open but with greater weight restriction.	No Build
2	The elimination of all vehicular traffic from the Memorial and Sarah Mildred Long Bridges and construction of a new high-level bridge.	NA1
3	The elimination of all vehicular traffic from the Memorial and Sarah Mildred Long Bridges and construction of a new low-level or mid-level bridge.	NA1A
4	The elimination of all vehicular traffic from the Memorial and Sarah Mildred Long Bridges and construction of a new tunnel under the river.	NA2
5	The elimination of all vehicular traffic from the Memorial and Sarah Mildred Long Bridges and providing a high speed ferry service.	NA3
6	Rehabilitate both bridges on existing alignment with existing clearances.	MB1+SL1
7	Rehabilitate the Memorial Bridge on existing alignment and replace the Sarah Mildred Long Bridge superstructure on existing alignment. Both bridges would maintain existing clearances.	MB1+SL2
8	Rehabilitate the Memorial Bridge on existing alignment and replace the Sarah Mildred Long Bridge on new upstream alignment. Both bridges would maintain existing clearances.	MB1+SL2A
9	Rehabilitate the Memorial Bridge on existing alignment with existing clearances and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on existing alignment.	MB1+SL3
10	Rehabilitate the Memorial Bridge on existing alignment with existing clearances and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on new upstream alignment.	MB1+SL3A
11	Rehabilitate the Memorial Bridge on existing alignment with existing clearances and replace the Sarah Mildred Long Bridge with a high-level fixed span bridge on new alignment.	MB1+SL4
12	Rehabilitate the Memorial Bridge on existing alignment with existing clearances and close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB1+SL5
13	Replace the Memorial Bridge superstructure on existing alignment with similar clearances and rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB2+SL1
14	Replace the Memorial Bridge and the Sarah Mildred Long Bridge superstructures on existing alignments with similar clearances.	MB2+SL2
15	Replace the Memorial Bridge superstructure on existing alignment and replace the Sarah Mildred Long Bridge on new upstream alignment. Both bridges would maintain similar clearances.	MB2+SL2A

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16	Replace the Memorial Bridge superstructure on existing alignment with similar clearances and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on existing alignment.	MB2+SL3
17	Replace the Memorial Bridge superstructure on existing alignment with similar clearances and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on new upstream alignment.	MB2+SL3A
18	Replace the Memorial Bridge superstructure on existing alignment with similar clearances and replace the Sarah Mildred Long Bridge with a high-level fixed span bridge on new alignment.	MB2+SL4
19	Replace the Memorial Bridge superstructure on existing alignment with similar clearances and close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB2+SL5
20	Replace the Memorial Bridge on new alignment either upstream or downstream with similar clearances and rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB2A+SL1
21	Replace the Memorial Bridge on new alignment either upstream or downstream with similar clearances and replace the Sarah Mildred Long Bridge superstructure on existing alignments with similar clearances.	MB2A+SL2
22	Replace the Memorial Bridge on new alignment either upstream or downstream and replace the Sarah Mildred Long Bridge on new upstream alignment. Both bridges would maintain similar clearances.	MB2A+SL2 A
23	Replace the Memorial Bridge on new alignment either upstream or downstream with similar clearances and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on existing alignment.	MB2A+SL3
24	Replace the Memorial Bridge on new alignment either upstream or downstream with similar clearances and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on new upstream alignment.	MB2A+SL3 A
25	Replace the Memorial Bridge on new alignment either upstream or downstream with similar clearances and replace the Sarah Mildred Long Bridge with a high-level fixed span bridge on new alignment.	MB2A+SL4
26	Replace the Memorial Bridge on new alignment either upstream or downstream with similar clearances and close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB2A+SL5
27	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB3+SL1
28	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and replace the Sarah Mildred Long Bridge superstructure on existing alignment with similar clearances.	MB3+SL2
29	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and replace the Sarah Mildred Long Bridge on new upstream alignment with similar clearances.	MB3+SL2A

30	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on existing alignment.	MB3+SL3
31	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on new upstream alignment.	MB3+SL3A
32	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and replace the Sarah Mildred Long Bridge with a high-level fixed span bridge on new alignment.	MB3+SL4
33	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB3+SL5
34	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB3A+SL1
35	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and replace the Sarah Mildred Long Bridge superstructure on existing alignments with similar clearances.	MB3A+SL2
36	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and replace the Sarah Mildred Long Bridge on new upstream alignment with similar clearances.	MB3A+SL2 A
37	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on existing alignment.	MB3A+SL3
38	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on new upstream alignment.	MB3A+SL3 A
39	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and replace the Sarah Mildred Long Bridge with a high-level fixed span bridge on new alignment.	MB3A+SL4
40	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB3A+SL5
41	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB4+SL1
42	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and replace the Sarah Mildred Long Bridge superstructure on existing alignment with similar clearances.	MB4+SL2

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43	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and replace the Sarah Mildred Long Bridge on new upstream alignment with similar clearances.	MB4+SL2A
44	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on existing alignment.	MB4+SL3
45	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on new upstream alignment.	MB4+SL3A
46	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and replace the Sarah Mildred Long Bridge with a high-level fixed span bridge on new alignment.	MB4+SL4
47	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB4+SL5
48	Close Memorial Bridge to all traffic and remove. Rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB5+SL1
49	Close Memorial Bridge to all traffic and remove. Replace the Sarah Mildred Long Bridge superstructure on existing alignment with similar clearances (two-lanes).	MB5+SL2
50	Close Memorial Bridge to all traffic and remove. Replace the Sarah Mildred Long Bridge superstructure on existing alignment with similar clearances (four-lanes).	MB5+SL2
51	Close Memorial Bridge to all traffic and remove. Replace the Sarah Mildred Long Bridge on new upstream alignment (four-lanes) with similar clearances.	MB5+SL2A
52	Close Memorial Bridge to all traffic and remove. Replace the Sarah Mildred Long Bridge with a mid-level movable bridge (4-lanes) on existing alignment.	MB5+SL3
53	Close Memorial Bridge to all traffic and remove. Replace the Sarah Mildred Long Bridge with a mid-level movable bridge (four-lanes) on new upstream alignment.	MB5+SL3A
54	Close Memorial Bridge to all traffic and remove. Replace the Sarah Mildred Long Bridge with a high-level fixed span bridge (four-lanes) on new alignment.	MB5+SL4
55	Close the Memorial Bridge to all traffic and remove. Close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB5+SL5
56	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances. Rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB6+SL1
57	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances. Replace the Sarah Mildred Long Bridge superstructure on existing alignment with similar clearances (two-lanes).	MB6+SL2

58	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances. Replace the Sarah Mildred Long Bridge superstructure on existing alignment with similar clearances (four-lanes).	MB6+SL2
59	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances. Replace the Sarah Mildred Long Bridge on new upstream alignment (four-lanes) with similar clearances.	MB6+SL2A
60	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances. Replace the Sarah Mildred Long Bridge with a mid-level movable bridge (four-lanes) on existing alignment.	MB6+SL3
61	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances. Replace the Sarah Mildred Long Bridge with a mid-level movable bridge (four-lanes) on new upstream alignment.	MB6+SL3A
62	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances. Replace the Sarah Mildred Long Bridge with a high-level fixed span bridge (four-lanes) on new alignment.	MB6+SL4
63	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances and the close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB6+SL5

4.3. **FATAL FLAW ANALYSIS PROCESS**

This section provides an overview of the fatal flaw analysis process. This includes information regarding approach, methodology, and objectives of the fatal flaw analysis, as well as the evaluation criteria identified through joint collaboration with the Steering Committee, Stakeholder Committee and general public.

a. Approach, Methodology, and Objectives

The fatal flaw analysis was a qualitative and quantitative level analysis that resulted in a limited evaluation and screening process of the study alternatives and options. The limited evaluation and screening was undertaken in a progressive approach by evaluating the identified alternatives and options against small groups of evaluation criteria (see Section b below). These small groups of evaluation criteria were selected with the purpose of identifying those alternatives that were able to move forward to the next round or be eliminated from further consideration with proper documentation. This methodology for the fatal flaw analysis was reviewed and approved by MaineDOT and NH DOT.

The fatal flaw analysis was used to eliminate from the large number of alternatives those that demonstrably:

- Did not satisfy Study Purpose and Need;
- Had significant environmental impacts;

- Was not permissible;
- Was not financially feasible;
- Was not physically feasible; and
- Was clearly inferior in comparison to other alternatives.

The objective of the fatal flaw analysis was to screen all of the study alternatives to determine which alternatives would be dismissed from further consideration and which alternatives would be advanced into the final round of analysis. This final round of analysis would utilize the same evaluation criteria, but in a more detailed, quantitative versus qualitative assessment.

b. Evaluation Criteria

The evaluation criteria summarized below were developed in joint collaboration with the Steering Committee, the Stakeholder Committee, and the general public. These criteria were based upon the Study Purpose and Need (See Chapter 3).

The 15 evaluation criteria listed below were used to evaluate each of the study's 63 alternatives in the Fatal Flaw Report⁶.

1. **Study Area Mobility and Accessibility:** Did the alternative provide adequate* Study Area mobility and accessibility as defined by the Study's Purpose and Need?
2. **Satisfy Structural Needs:** Did the alternative provide adequate* structural and functional life of Memorial and Sarah Mildred Long Bridges to 2060 or beyond?
3. **Lift Span Reliability:** Did the alternative provide adequate⁷ lift span reliability to 2060 or beyond?
4. **Bridge Design Features/Vehicular Traffic:** Did the alternative provide adequate* bridge design features for vehicular (car and truck) traffic (lane width, shoulder width, etc.)?
5. **Bridge Design Features/Marine Traffic:** Did the alternative provide adequate* bridge design features for marine traffic (clearance, bridge skew, etc.)?
6. **Bridge Design Features/Other Modes:** Did the alternative provide adequate* bridge design features for other modes (bicycle lanes, crosswalks, sidewalks, etc.)?
7. **Accessibility to Portsmouth, Kittery and Portsmouth Naval Shipyard (PNSY):** Did the alternative maintain or improve access to Portsmouth and Kittery downtowns and the PNSY?
8. **Rail Access to Portsmouth, Kittery and PNSY:** Did the alternative maintain the rail line through the City of Portsmouth across the Piscataqua River through the Town of Kittery and to the PNSY?
9. **Life Cycle Costs:** Estimated 100-year life cycle cost (in Present Value \$) for each alternative were developed and were compared based on the range of costs for each alternative. No alternatives were eliminated in the Fatal Flaw Analysis based on cost.

⁶ See Appendix 43

⁷ Adequacy related to the alternatives' compliance with federal and state design criteria.

10. **Property/Neighborhood Impacts:** Estimated level of individual properties/neighborhoods impacts for each alternative were developed and were compared based on range of impacts for each alternative.
11. **Natural Resource Impacts:** Estimated natural resource impacts for each alternative (in acres) were developed and were compared based on the range of impacts for each alternative.
12. **Physical Resource Impacts:** Estimated physical resource impacts for each alternative (in acres) were developed and were compared based on the range of impacts for each alternative. Physical resources include community and municipal facilities.
13. **Historic Resource Impacts:** Estimated level of historic properties/areas impacts by each alternative were developed and were compared based on the range of impacts for each alternative.
14. **Permittable:** Was the alternative considered permittable?
15. **Vehicle Miles Traveled (VMT)/Vehicle Hours Traveled (VHT)/Emissions:** Measure of VMT and VHT for each alternative as it related to vehicle emissions.

4.4. FATAL FLAW ANALYSIS RESULTS

The fatal flaw analysis went through three levels of screening for dismissing options/alternatives from further consideration.

ROUND 1 SCREENING: The goal of the Round 1 screening was to dismiss the options/alternatives that had the greatest impacts to the human environment as compared to other alternatives or did not meet study area mobility needs.

The Round 1 screening focused on the following six screening criteria:

1. Ability to satisfy the study purpose and need;
2. Ability to satisfy the regions mobility and accessibility needs from a traffic standpoint;
3. Historic resource impacts;⁸
4. Property and neighborhood impacts;
5. Physical resource impacts⁹; and
6. Natural resource impacts.

Thirty-four alternatives were dismissed from further consideration in the Round 1 screening analysis. These alternatives are listed below in Table 4-2.

Table 4-2: Listing of the 34 Alternatives Eliminated in Round 1

Alternative Number	Alternative Description	Alternative Identification
2	The elimination of all vehicular traffic from the Memorial and Sarah Mildred Long Bridges and construction of a new high-level bridge.	NA1

⁸ Appendix #17 - Preliminary Impact Analysis. Summarizes physical and historic impacts conducted for each Bridge Option as part of the Fatal Flaw Analysis.

⁹ Appendix #17 - Preliminary Impact Analysis. Summarizes physical and historic impacts conducted for each Bridge Option as part of the Fatal Flaw Analysis.

3	The elimination of all vehicular traffic from the Memorial and Sarah Mildred Long Bridges and construction of a new low-level or mid-level bridge.	NA1A
4	The elimination of all vehicular traffic from the Memorial and Sarah Mildred Long Bridges and construction of a new tunnel under the river.	NA2
5	The elimination of all vehicular traffic from the Memorial and Sarah Mildred Long Bridges and providing a high speed ferry service.	NA3
12	Rehabilitate the Memorial Bridge on existing alignment with existing clearances and close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB1+SL5
19	Replace the Memorial Bridge superstructure on existing alignment with similar clearances and close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB2+SL5
26	Replace the Memorial Bridge on new alignment either upstream or downstream with similar clearances and close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB2A+SL5
27	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB3+SL1
28	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and replace the Sarah Mildred Long Bridge superstructure on existing alignment with similar clearances.	MB3+SL2
29	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and replace the Sarah Mildred Long Bridge on new upstream alignment with similar clearances.	MB3+SL2A
30	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on existing alignment.	MB3+SL3
31	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on new upstream alignment.	MB3+SL3A
32	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and replace the Sarah Mildred Long Bridge with a high-level fixed span bridge on new alignment.	MB3+SL4
33	Replace the Memorial Bridge on existing alignment with a mid-level movable bridge and close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB3+SL5
34	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB3A+SL1

35	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and replace the Sarah Mildred Long Bridge superstructure on existing alignments with similar clearances.	MB3A+SL2
36	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and replace the Sarah Mildred Long Bridge on new upstream alignment with similar clearances.	MB3A+SL2 A
37	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on existing alignment.	MB3A+SL3
38	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on new upstream alignment.	MB3A+SL3 A
39	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and replace the Sarah Mildred Long Bridge with a high-level fixed span bridge on new alignment.	MB3A+SL4
40	Replace the Memorial Bridge on new alignment either upstream or downstream with a mid-level movable bridge and close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB3A+SL5
41	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB4+SL1
42	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and replace the Sarah Mildred Long Bridge superstructure on existing alignment with similar clearances.	MB4+SL2
43	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and replace the Sarah Mildred Long Bridge on new upstream alignment with similar clearances.	MB4+SL2A
44	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on existing alignment.	MB4+SL3
45	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on new upstream alignment.	MB4+SL3A
46	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and replace the Sarah Mildred Long Bridge with a high-level fixed span bridge on new alignment.	MB4+SL4
47	Replace the Memorial Bridge on existing alignment with a high-level fixed span bridge and close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB4+SL5

48	Close Memorial Bridge to all traffic and remove. Rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB5+SL1
49	Close Memorial Bridge to all traffic and remove. Replace the Sarah Mildred Long Bridge superstructure on existing alignment with similar clearances (two-lanes).	MB5+SL2
55	Close the Memorial Bridge to all traffic and remove. Close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB5+SL5
56	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances. Rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB6+SL1
57	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances. Replace the Sarah Mildred Long Bridge superstructure on existing alignment with similar clearances (two-lanes).	MB6+SL2
63	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances and the close Sarah Mildred Long Bridge to all traffic and remove deck. Rail portion of the Sarah Mildred Long Bridge would remain.	MB6+SL5

ROUND 2 SCREENING: The goal of the Round 2 screening was to dismiss the options/alternatives that had the greater impacts when compared to similar (like) options/alternatives.

The Round 2 screening focused on the following three screening criteria:

1. General ability to satisfy the study purpose and need;
2. Comparison to similar alternatives; and
3. Accessibility needs from a bicycle and pedestrian standpoint.

Fourteen alternatives were dismissed from further consideration in the Round 2 screening analysis. These alternatives are listed below in Table 4-3.

Table 4-3: Listing of the 14 Alternatives Eliminated in Round 2

Alternative Number	Alternative Description	Alternative Identification
11	Rehabilitate the Memorial Bridge on existing alignment with existing clearances and replace the Sarah Mildred Long Bridge with a high-level fixed span bridge on new alignment.	MB1+SL4
18	Replace the Memorial Bridge superstructure on existing alignment with similar clearances and replace the Sarah Mildred Long Bridge with a high-level fixed span bridge on new alignment.	MB2+SL4
20	Replace the Memorial Bridge on new alignment either upstream or downstream with similar clearances and rehabilitate the Sarah Mildred Long Bridge with existing clearances.	MB2A+SL1

21	Replace the Memorial Bridge on new alignment either upstream or downstream with similar clearances and replace the Sarah Mildred Long Bridge superstructure on existing alignments with similar clearances.	MB2A+SL2
22	Replace the Memorial Bridge on new alignment either upstream or downstream and replace the Sarah Mildred Long Bridge on new upstream alignment. Both bridges would maintain similar clearances.	MB2A+SL2 A
23	Replace the Memorial Bridge on new alignment either upstream or downstream with similar clearances and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on existing alignment.	MB2A+SL3
24	Replace the Memorial Bridge on new alignment either upstream or downstream with similar clearances and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on new upstream alignment.	MB2A+SL3 A
25	Replace the Memorial Bridge on new alignment either upstream or downstream with similar clearances and replace the Sarah Mildred Long Bridge with a high-level fixed span bridge on new alignment.	MB2A+SL4
50	Close Memorial Bridge to all traffic and remove. Replace the Sarah Mildred Long Bridge superstructure on existing alignment with similar clearances (four-lanes).	MB5+SL2
51	Close Memorial Bridge to all traffic and remove. Replace the Sarah Mildred Long Bridge on new upstream alignment (four-lanes) with similar clearances.	MB5+SL2A
52	Close Memorial Bridge to all traffic and remove. Replace the Sarah Mildred Long Bridge with a mid-level movable bridge (four-lanes) on existing alignment.	MB5+SL3
53	Close Memorial Bridge to all traffic and remove. Replace the Sarah Mildred Long Bridge with a mid-level movable bridge (four-lanes) on new upstream alignment.	MB5+SL3A
54	Close Memorial Bridge to all traffic and remove. Replace the Sarah Mildred Long Bridge with a high-level fixed span bridge (four-lanes) on new alignment.	MB5+SL4
62	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances. Replace the Sarah Mildred Long Bridge with a high-level fixed span bridge (four-lanes) on new alignment.	MB6+SL4

ROUND 3 SCREENING: The goal of the Round 3 screening was to dismiss the options/alternatives that had the greater impacts when compared to similar (like) options/alternatives.

The Round 3 screening focused on the following three screening criteria:

1. General ability to satisfy the study purpose and need;
2. Construction impacts of a mid level Sarah Mildred Long Bridge; and
3. Impact assessment to the Port of New Hampshire and nearby areas.

Six alternatives were dismissed from further consideration in the Round 3 screening analysis. These alternatives are listed below in Table 4-4.

Table 4-4: Listing of the 6 Alternatives Eliminated in Round 3

Alternative Number	Alternative Description	Alternative Identification
9	Rehabilitate the Memorial Bridge on existing alignment with existing clearances and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on existing alignment.	MB1+SL3
10	Rehabilitate the Memorial Bridge on existing alignment with existing clearances and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on new upstream alignment.	MB1+SL3A
16	Replace the Memorial Bridge superstructure on existing alignment with similar clearances and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on existing alignment.	MB2+SL3
17	Replace the Memorial Bridge superstructure on existing alignment with similar clearances and replace the Sarah Mildred Long Bridge with a mid-level movable bridge on new upstream alignment.	MB2+SL3A
60	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances. Replace the Sarah Mildred Long Bridge with a mid-level movable bridge (four-lanes) on existing alignment.	MB6+SL3
61	Replace Memorial Bridge on existing alignment with a pedestrian and bicycle lift only bridge with similar clearances. Replace the Sarah Mildred Long Bridge with a mid-level movable bridge (four-lanes) on new upstream alignment.	MB6+SL3A

4.5. SUMMARY OF FATAL FLAW ANALYSIS

The Final Fatal Flaw Report¹⁰ considered eight different Memorial Bridge Options with three of those options being carried forward for detailed evaluation, and considered seven different Sarah Mildred Long Bridge Options with three of those options being carried forward for detailed evaluation.

The Memorial Bridge Options being carried forward from the fatal flaw analysis included:

- **Option MB1:** Rehabilitate the existing bridge on existing alignment, including replacing the lift span, with existing clearances and reuse of the existing abutments and piers.
- **Option MB2:** Replace the superstructure of the existing bridge, including the lift span, with similar navigational clearances. Replace the existing abutments and reuse the existing piers.
- **Option MB6:** Similar to Option MB2 above, except that the replacement bridge would only accommodate bicycle and pedestrian traffic.

The Sarah Mildred Long Bridge Options being carried forward from the Fatal Flaw Analysis included:

¹⁰ See Appendix 43

- **Option SL1:** Rehabilitate the existing bridge on existing alignment consists of complete demolition and replacement of the abutment, approach spans, piers and foundations and the rehabilitation of the fixed span trusses, towers, the lift span truss, and the associated foundations and rehabilitation of the rail component.
- **Option SL2:** Replace the existing bridge on existing alignment with a new two-lane or four-lane bridge, including the lift span and substructure, with improved horizontal navigational clearances; and, replace the rail component.
- **Options SL2A:** Replace the existing bridge with a new two-lane or four-lane bridge, including the lift span and rail line, on a new alignment immediately upstream with improved horizontal navigational clearances to improve marine vessel safety.

Options SL2 and SL2A each have two-lane and four-lane options that can be combined with two of the three MB options, resulting in 12 distinct alternatives, not including the No-Build Alternative.

Of the 63 alternatives evaluated in the Final Fatal Flaw Report¹¹, the following alternatives were recommended to be carried forward for detailed evaluation:

- **Alternative 1:** No Build Alternative (Memorial Bridge Closed, Sarah Mildred Long Bridge remains open with reduced posting).
- **Alternative 6:** Memorial Bridge Rehabilitated, Sarah Mildred Long Bridge Rehabilitated (MB1 + SL1).
- **Alternative 7:** Memorial Bridge Rehabilitated, Sarah Mildred Long Bridge Replaced on existing alignment, two-lane (MB1 + SL2).
- **Alternative 7:** Memorial Bridge Rehabilitated, Sarah Mildred Long Bridge Replaced on existing alignment, four-lane (MB1 + SL2).
- **Alternative 8:** Memorial Bridge Rehabilitated, Sarah Mildred Long Bridge Replaced on upstream alignment, two-lane (MB1 and SL2A).
- **Alternative 8:** Memorial Bridge Rehabilitated, Sarah Mildred Long Bridge Replaced on upstream alignment, four-lane (MB1 and SL2A).
- **Alternative 13:** Memorial Bridge Replacement, Sarah Mildred Long Bridge Rehabilitated (MB2 + SL1).
- **Alternative 14:** Memorial Bridge Replacement, Sarah Mildred Long Bridge Replaced on existing alignment, two-lane (MB2 + SL2).
- **Alternative 14:** Memorial Bridge Replacement, Sarah Mildred Long Bridge Replaced on existing alignment, four-lane (MB2 + SL2).
- **Alternative 15:** Memorial Bridge Replacement, Sarah Mildred Long Bridge Replaced on upstream alignment, two-lane (MB2 + SL2A).
- **Alternative 15:** Memorial Bridge Replacement, Sarah Mildred Long Bridge Replaced on upstream alignment, four-lane (MB2 + SL2A).
- **Alternative 58:** Memorial Bicycle/Pedestrian Bridge Replacement, Sarah Mildred Long Bridge Replaced on existing alignment, four-lane (MB6 + SL2).

¹¹ See Appendix 43

- **Alternative 59:** Memorial Bicycle/Pedestrian Bridge Replacement, Sarah Mildred Long Bridge Replaced on upstream alignment, four-lane (MB6 + SL2A).

At the conclusion of the Fatal Flaw Report, the alternatives (above) being carried forward for detailed evaluation were relabeled as follows:

- **The No-Build Alternative** = Memorial Bridge Closed, Sarah Mildred Long Bridge remains open with reduced posting (*Was Alternative 1*).
- **Alternative 1** = Memorial Bridge Rehabilitated, Sarah Mildred Long Bridge Rehabilitated (*Was Alternative 6*).
- **Alternative 2a** = Memorial Bridge Rehabilitated, Sarah Mildred Long Bridge Replaced on existing alignment (two-lane) (*Was Alternative 7*).
- **Alternative 2b** = Memorial Bridge Rehabilitated, Sarah Mildred Long Bridge Replaced on existing alignment (four-lane) (*Was Alternative 7*).
- **Alternative 3a** = Memorial Bridge Rehabilitated, Sarah Mildred Long Bridge Replaced on upstream alignment (two-lane) (*Was Alternative 8*).
- **Alternative 3b** = Memorial Bridge Rehabilitated, Sarah Mildred Long Bridge Replaced on upstream alignment (four-lane) (*Was Alternative 8*).
- **Alternative 4** = Memorial Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Rehabilitated (*Was Alternative 13*).
- **Alternative 5a** = Memorial Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on existing alignment (two-lane) (*Was Alternative 14*).
- **Alternative 5b** = Memorial Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on existing alignment (four-lane) (*Was Alternative 14*).
- **Alternative 6a** = Memorial Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on upstream alignment (two-lane) (*Was Alternative 15*).
- **Alternative 6b** = Memorial Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on upstream alignment (four-lane) (*Was Alternative 15*).
- **Alternative 7** = Memorial Bicycle/Pedestrian Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on existing alignment (four-lane) (*Was Alternative 58*).
- **Alternative 8** = Memorial Bicycle/Pedestrian Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on upstream alignment (four-lane) (*Was Alternative 59*).

The No Build Alternative normally assumes that no new construction would occur, and that the present level of maintenance of the existing transportation system within the study area would continue. However, this No Build Alternative assumes that the existing Memorial Bridge would not be available for use due to structural issues. It has been estimated that without improvements, the Memorial Bridge would likely have to be closed within one to three years. The Memorial Bridge was closed to vehicular traffic in October of 2009 for approximately six weeks 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 also assumes that the Sarah Mildred Long Bridge would remain open, but would be posted weight limit restrictions. It is currently posted at a 20-ton weight limit.

In this report, the Memorial Bridge rehabilitation and replacement options would also include replacing both bridge abutments under both scenarios. The piers would not need replacement under either scenario.

Also in this report, the Sarah Mildred Long Bridge rehabilitation would consist of complete demolition and replacement of the abutment, approach spans, piers and foundations and the rehabilitation of the fixed span trusses, towers, the lift span truss, and the associated foundations and rehabilitation of the rail component. The only Sarah Mildred Long Bridge spans that would be rehabilitated under Alternatives 1 and 4 above would be the four existing fixed truss spans and the lift span.

4.6. SUPPLEMENTAL ALTERNATIVES (POST FATAL FLAW REPORT)

Subsequent to the completion of the Final Fatal Flaw Report, three additional alternatives were proposed by MaineDOT and were developed and evaluated in the same manner as the previous 63 alternatives that had been screened in the Final Fatal Flaw Report. These three additional alternatives were comprised of an additional Memorial Bridge Option, identified as MB7 and two additional Sarah Mildred Long Bridge Options, identified as SL2B (6 percent grade hybrid) and SL2C (5 percent grade hybrid).

These new options are described as follows:

- **Option MB7 (Transit Alternative):** Memorial Bridge would be closed and removed. The bridge between Kittery and Badgers Island would remain open. Bicycle and pedestrian river crossings on the Memorial Bridge would be replaced with a free bus transit system utilizing the Sarah Mildred Long Bridge that would operate seven days per week, 365 days per year from 5:00 AM to 11:00 PM.
- **Option SL2B and SL2C (Hybrid):** A new Sarah Mildred Long Hybrid Bridge would be constructed on new alignment immediately upstream with a two-lane mid level (86 foot± vertical clearance for SL2B in the closed position and 74 foot± vertical clearance for SL2C in the closed vehicle position) moveable span to reduce the number of openings, provide greater horizontal lift span opening to improve marine vessel passage (increase from 200 feet to approximately 270 feet), and increase bridge vehicle capacity. The existing Sarah Mildred Long Bridge would be closed and removed following construction of the new bridge. The new bridge would also provide for a new rail crossing. This option is being referred to as a hybrid lift span option in that the single moveable lift span deck would accommodate both vehicular and rail traffic, one mode at a time. This unique vertical lift span would be lowered from its mid-level vehicle traffic position to the low-level rail position to accommodate the rail traffic and raised to provide passage for tall marine vessels. The difference between SL2B and SL2C is based on meeting pedestrian accessibility requirements by using a lower percent approach grade (5 percent for SL2C vs. 6 percent for SL2B).

The new Memorial Bridge option and the two new Sarah Mildred Long Hybrid Bridge options created the three additional river crossing alternatives to be advanced for detailed analysis. The three additional alternatives are described as follows:

- **Alternative 9** = Memorial Bridge Replaced on existing alignment. A new two-lane “hybrid” mid-level Sarah Mildred Long Bridge with 6 percent road grade would be constructed on a new alignment immediately upstream with an 86-foot± vertical clearance moveable span (in the closed vehicle position) to reduce the number of lift openings and provide greater horizontal lift span opening (approximately 270 feet versus 200 feet) to improve marine vessel passage. The new bridge would also provide for a new rail crossing. (Memorial Bridge Option MB2 with Sarah Mildred Long Bridge Option SL2B.)
- **Alternative 10** = Memorial Bicycle/Pedestrian Bridge Replaced on existing alignment. A new two-lane “hybrid” mid-level Sarah Mildred Long Bridge with 6 percent road grade would be constructed on a new alignment immediately upstream with an 86-foot± vertical clearance moveable span (in the closed vehicle position) to reduce the number of lift openings and provide greater horizontal lift span opening (approximately 270 feet versus 200 feet) to improve marine vessel passage. The new bridge would also provide for a new rail crossing. (Memorial Bridge Option MB6 with Sarah Mildred Long Bridge Option SL2B.)
- **Alternative 11** = Memorial Bridge would be closed and removed, with the bridge between Kittery and Badgers Island remaining open. A free bus transit system would operate seven days per week, 365 days per year from 5:00 AM to 11:00 PM for providing bicycle/pedestrian river crossing connections that were provided by the Memorial Bridge. A new two-lane “hybrid” mid-level Sarah Mildred Long Bridge with 5 percent road grade, adequate shoulders for bicyclists and a sidewalk for pedestrians would be constructed on a new alignment immediately upstream with a 74-foot± vertical clearance moveable span (in the closed vehicle position) to reduce the number of lift openings and provide greater horizontal lift span opening (approximately 270 feet versus 200 feet) to improve marine vessel passage. The new bridge would also provide for a new rail crossing. (Memorial Bridge Option MB7 with Sarah Mildred Long Bridge Option SL2C.)

Also subsequent to the completion of the Final Fatal Flaw Report, a detailed inspection report of the Memorial Bridge (See Appendix 48) provided the basis for NH DOT and MaineDOT determination that rehabilitation of the Memorial Bridge is not reasonable and viable due to its poor structural condition. This is discussed in further detail in Chapter 5. Based on this report, MaineDOT and NH DOT are recommending that all alternatives that include the rehabilitation of the Memorial Bridge be dismissed from further analysis, subject to review and approval of all documentation. This recommendation removes the five alternatives (Alternatives 1, 2a, 2b, 3a, and 3b) that include the Memorial Bridge rehabilitation option from detailed evaluation as a part of this report.

This resulted in the following alternatives being carried forward for further evaluation in this report:

- ***The No-Build Alternative*** = Memorial Bridge Closed, Sarah Mildred Long Bridge remains open with reduced posting.
- ***Alternative 4*** = Memorial Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Rehabilitated.
- ***Alternative 5a*** = Memorial Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on existing alignment (two-lane).
- ***Alternative 5b*** = Memorial Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on existing alignment (four-lane).
- ***Alternative 6a*** = Memorial Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on upstream alignment (two-lane).
- ***Alternative 6b*** = Memorial Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on upstream alignment (four-lane).
- ***Alternative 7*** = Memorial Bicycle/Pedestrian Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on existing alignment (four-lane).
- ***Alternative 8*** = Memorial Bicycle/Pedestrian Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on upstream alignment (four-lane).
- ***Alternative 9*** = Memorial Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on upstream alignment with two-lane hybrid bridge with 6 percent road grade.
- ***Alternative 10*** = Memorial Bicycle/Pedestrian Bridge Replaced on existing alignment, Sarah Mildred Long Bridge Replaced on upstream alignment with two-lane hybrid bridge with 6 percent road grade.
- ***Alternative 11*** = Memorial Bridge would be closed and removed and replaced with a free bus transit system operating seven days per week, 365 days per year from 5:00 AM to 11:00 PM for providing bicycle/pedestrian river crossing connections that were provided by the Memorial Bridge. Sarah Mildred Long Bridge Replaced on upstream alignment with two-lane hybrid bridge with 5 percent road grade, adequate shoulders for bicyclists and a sidewalk for pedestrians.