

7.0 Development of Evaluation Criteria and Measures of Effectiveness (MOEs)

This chapter describes the evaluation criteria and Measures of Effectiveness (MOEs) developed to assist in screening the alternatives and identifying one or more preferred alternatives to be carried forward. Further documentation of impacts as required under NEPA and Section 4(f) of the U.S. DOT Act of 1966 would be required for all alternatives. Under NEPA, FHWA makes a determination as to the level of documentation required, either as Individual Categorical Exclusions, Environmental Assessments or Environmental Impacts Statements. Based on the alternatives recommended for NEPA evaluation, FHWA will determine the appropriate NEPA Class of Action.

EVALUATION CRITERIA

Evaluation criteria were developed for comparing all of the study alternatives that were carried forward from the Final Fatal Flaw Report. Evaluation criteria to address the various study needs and goals were divided into the nine following categories in the matrix:

- Structural Improvement
- Mobility for the Year 2035
- Accessibility
- Planning Level Cost Estimates in 2010 Dollars
- Historic (Section 106)
- Natural Environment
- Physical Environment
- Environmental Clearances
- Use of Section 4(f) Properties

Each of the nine categories included several MOEs for comparing the performance of each alternative. Several of the MOEs were described quantitatively while others were described qualitatively. In order to provide an overview comparison of the alternatives, each MOE for each alternative was assigned a color (where appropriate) to represent each alternative's performance against the other alternatives including the No-Build Alternative. In other words, a green color was assigned to the best performing alternatives, a red color was assigned to the worst performing alternatives, and a yellow color was assigned to alternatives performing in the middle range when compared to the other alternatives. This color representation treats every criterion as equal, but in transportation decision-making and permitting, certain criteria may carry greater weight than others due to environmental clearance or policy requirements. The following provides a description of the criteria and corresponding MOEs used and how each is rated.

These ratings were used in screening the alternatives and provide a basis for determining which alternatives can be dismissed from further consideration and those alternatives that can be carried

forward. Figure 8-18 provides a summary of the remaining alternatives following the fatal flaw analysis and their relative performance for each MOE. Where possible, the effects of each MOE are provided individually for the Memorial Bridge and the Sarah Mildred Long Bridge.

7.1. STRUCTURAL IMPROVEMENT

Satisfying Structural and Functional Needs

This criterion evaluates two things: the structure and the functional life of the bridge alternatives. For structural, the condition of the parts that make up and support the bridge were considered. Would the alternative periodically replace certain pieces in poor condition but keep the overall intent of the structure in place (rehabilitation), or would the alternative replace all pieces with a new structure (replacement)? As an example, a house requires maintenance. Roofing, painting and siding would wear out over time. Homeowners must choose between repair and replacement based on condition, opportunity and cost.

The functional life of a bridge is indicated by the ability of the bridge to accommodate the vehicular, pedestrian, bicycle and marine needs reliably over the desired timeframe. Generally, older structures may not meet current functional life requirements whereas newer structures are likely to meet these same requirements.

- Alternative provides improved structural and functional life (100 year life) to each bridge:
 - Considered red if no improvement done to the bridge.
 - Considered yellow if the bridge is rehabilitated.
 - Considered green if the bridge is replaced.

Lift Span Reliability

Lift span reliability looks at the proposed condition of the lift span to evaluate its dependability for providing reliable and adequate lift span operation over the desired timeframe.

- Alternative provides improved lift span reliability (100 year life) to each bridge:
 - Considered red if no improvement to the bridge lift span.
 - Considered yellow if the bridge lift span is rehabilitated.
 - Considered green if the bridge lift span is replaced.

7.2. MOBILITY

2035 Vehicle Miles Traveled (VMT)

Vehicle miles traveled is the total number of miles driven by all vehicles within a given time period (usually the afternoon peak hour) and geographic area. A region's VMT is influenced by factors such as efficiency of the highway system and location of jobs, housing and activity centers. For the alternatives, year 2035 PM Peak Hour VMT was calculated and summed for the Study Area. Less VMT is preferred over high VMT.

- Lowest VMT = 121,901 Highest VMT = 123,982 Average VMT=122,942
 - Alternatives with lowest VMT's considered green – 121,901 to 122,595
 - Alternatives with average VMT's considered yellow – 122,596 to 123,288

- Alternatives with highest VMT's considered red – 123,289 to 123,982

2035 Vehicle Hours Traveled (VHT)

Vehicle hours traveled is the total number of hours driven within a given time period (usually the afternoon peak hour) and geographic area. VHT is primarily influenced by the level of congestion within that geographical area. For the alternatives, year 2035 PM Peak Hour VHT was calculated and summed for the Study Area. Low VHT is preferred over high VHT

- Lowest VHT = 4,041 Highest VHT = 4,148 Average VHT=4,095
 - Alternatives with lowest VHT's considered green – 4,041 to 4,077
 - Alternatives with average VHT's considered yellow – 4,078 to 4,112
 - Alternatives with highest VHT's considered red – 4,113 to 4,148

Intersection Level of Service (LOS)

Level of service is a measure to determine the effectiveness of the transportation infrastructure. LOS is commonly used to analyze highways and is also used to analyze intersections, transit, bicycle and pedestrian facilities. The LOS system grades the effectiveness of the transportation infrastructure by rating it with the letters A through F, with A being the least congested and F the most congested. With LOS A, individual motorists are practically unaffected by the presence of other vehicles on the road. Ability to maneuver and level of comfort is excellent, as the driver needs to provide minimal attention to driving conditions. On the other hand, LOS F is synonymous with congestion and stop and go traffic that is typical of some of the worst driving conditions.

For the Alternatives, the number of intersections with undesirable level of service (LOS F) were compared to the No-Build Alternative.

- Under the No-Build Alternative, 5 of the 25 Study Area intersections that were evaluated are projected to be at LOS F operations by 2035. This No-Build condition is the benchmark for comparison purposes to the Build alternatives.
- By comparison, the matrix indicates the number of intersections where traffic operations are projected to remain at a LOS F in 2035 for each alternative.

Results for Matrix:

- Alternatives with 4 or more intersections at LOS F are considered red.
- Alternatives with 2 or 3 intersections at a LOS F are considered yellow.
- Alternatives with 0 to 1 intersection at a LOS F are considered green.

Available Bridge Vehicular Capacity

Available bridge vehicular capacity is determined by estimating how many vehicles are using a bridge at a certain time (volume) compared to the maximum number that could use the bridge if it was at full capacity (capacity). This ratio of the volume to capacity provides a numerical comparison. Ratios that are equal to or greater than 1.0 indicate that a bridge is at or over the capacity it can accommodate. This measure can also be used to determine congestion levels and

identify solutions to increase capacity, such as adding additional travel lanes to increase the roadway's or bridge's capacity.

- The Alternative provides the volume to capacity ratio for each bridge in the PM peak Hour in 2035 :
 - Considered red if volume to capacity (v/c) greater than 1.0.
 - Considered yellow if v/c is between 0.85 and 1.0.
 - Considered green if v/c is less than 0.85.

Local Road Traffic Impacts

Three local (non-state routes) roads in close proximity to the Sarah Mildred Long and Memorial Bridges that are generally residential in nature and maintained by the municipalities were identified: Bridge Street/Oak Terrace (Kittery), Government Street (Kittery), and Maplewood Avenue (Portsmouth). In this criterion the likelihood of an alternative to increase traffic volumes along those roads is evaluated.

- Alternatives that increase traffic volumes along all three local (non-state route) roads identified above as compared to the No-Build Alternative are considered red.
- Alternatives that increase traffic volumes along one or two local (non-state route) roads identified above as compared to the No-Build Alternative are considered yellow.
- Alternatives that do not increase traffic volume on the local (non-state route) roads identified above as compared to the No-Build Alternative are considered green.

Mobility During Construction

Mobility during construction evaluates if the bridges are closed to all modes of traffic during construction. Based on the traffic analyses that were conducted for this Study, both bridges would not be constructed at the same time due to traffic impacts that would occur on the I-95 High Level Bridge. This measure of effectiveness also assumes that the Memorial Bridge is closed for all alternatives, so it is not included in the evaluation. Only the positive impacts of keeping the Sarah Mildred Long Bridge open during construction of the Sarah Mildred Long Bridge are considered.

- Alternatives that keep the Sarah Mildred Long Bridge open to traffic during construction are considered green.
- Alternatives that close Sarah Mildred Long Bridge to traffic during construction are considered red.

Emergency Access

Emergency access relates to the alternatives ability to accommodate fire, ambulance, and other emergency services. Here we measure whether alternatives impede, maintain or improve the ability of emergency vehicles to cross the river.

- Alternatives that close the Memorial Bridge to vehicle traffic, reducing or impeding emergency accessibility between the 2 communities are considered red.

- Alternatives that replace the Memorial Bridge and rehabilitate the Sarah Mildred Long Bridge or replace it with a standard lift bridge that maintains existing emergency accessibility between the 2 communities are considered yellow.
- Alternatives that replace one or both bridges improving emergency accessibility between the 2 communities by providing a wider cross section are considered green.

Evacuation Access

Evacuation access relates to the existence of adopted¹⁶ evacuation route plans. The evacuation plans use all three bridges and include provisions if one or more of the existing three bridges are not available for evacuation purposes. This measure of effectiveness measure relates to how well an alternative maintains or improves the existing emergency evacuation plans over the river.

- Alternatives that close the Memorial Bridge to vehicle traffic, reducing or impeding capacity between the 2 communities as it relates to existing evacuation plans are considered red.
- Alternatives that rehabilitate both bridges that maintain existing capacity between the 2 communities as it relates to existing evacuation plans are considered yellow.
- Alternatives that replace one or both bridges between the 2 communities improve capacity by providing a wider cross section as it relates to existing evacuation plans are considered green.

7.3. ACCESSIBILITY

Accessibility to Portsmouth, Kittery Downtowns

This criterion measures the ability of the alternative to provide access to vehicular, bicycle, pedestrian and transit modes of transportation between Kittery and Portsmouth downtowns.

- Alternatives that reduce accessibility to the downtowns to all modes of traffic (vehicle, pedestrian and bicycle) are considered red.
- Alternatives that reduce accessibility to the downtowns to vehicular traffic are considered yellow.
- Alternatives that maintain or improve current accessibility to the downtowns for all modes of traffic are considered green.

Accessibility to Portsmouth Naval Shipyard

Ability of the alternative to provide safe and efficient access to PNSY, one of the region's largest employers.

- Alternatives that reduce accessibility to PNSY to one or more modes of traffic (vehicle, pedestrian and bicycle) are considered red.
- Alternatives that maintain current accessibility to PNSY to all modes of traffic are considered yellow.

Bridge Design Features/Vehicle

¹⁶ Add citation(s) for evacuation plans

Current design guidelines indicate that travel lanes should be 11 to 12-foot wide. Presently the Memorial Bridge has 11-foot wide travel lanes and the Sarah Mildred Long Bridge has 12-foot wide travel lanes. This criterion measures whether the alternatives would improve, maintain or reduce these features for each bridge.

- Considered red if the bridge design features for vehicular traffic do not provide meet current state and federal design guidelines.
- Considered green if the bridge design features for vehicular traffic meet current state and federal design guidelines.

Bridge Design Features/Marine

Current navigational clearances on the Memorial Bridge (260foot horizontal, 150 foot vertical) have been determined to meet current navigational needs. Current navigational clearances on the Sarah Mildred Long Bridge (200 foot horizontal, 135 foot vertical) coupled with the navigational channel skew to the bridge have been identified as not meeting future navigational needs. This criterion measures whether the alternatives would reduce, maintain or improve navigational clearances at the Sarah Mildred Long Bridge. The vertical navigational clearances refer to the lift span in the closed position for vehicular traffic use.

- Considered red if maintaining existing horizontal and vertical navigational clearances on the Sarah Mildred Long Bridge for marine traffic.
- Considered yellow if improving horizontal navigational clearances on the Sarah Mildred Long Bridge for marine traffic.
- Considered green if improving both horizontal and vertical navigational clearances on the Sarah Mildred Long Bridge for marine traffic.

Bridge Design Features/Bicycle

Current design guidelines indicate that minimum bicycle lane width with no curb or gutter should be four feet. The recommended width of a bicycle lane from the face of curb or guardrail is five feet. Presently the Memorial Bridge has bicycle access but no bicycle lanes and the Sarah Mildred Long Bridge has no bicycle access. This criterion measures whether the alternative does not, partially, or completely meets current bicycle guidelines for shoulder widths. The Memorial Bridge is a part of the East Coast Greenway.

- Considered red if current state and federal design guidelines for bicycles are not provided.
- Considered yellow if current state and federal design guidelines for bicycles are partially provided.
- Considered green if current state and federal design guidelines for bicycles are completely provided.

Bridge Design Features/Pedestrian

Current design guidelines indicate that desirable sidewalk widths should be five or more feet wide. Presently the Memorial Bridge has a six foot wide sidewalk and the Sarah Mildred Long

Bridge does not allow pedestrians but has a three foot wide walk for bridge worker access. This criterion measures whether the alternative does not, partially, or completely meets current pedestrian guidelines for each bridge. The Memorial Bridge is a part of the East Coast Greenway.

- Considered red if current state and federal design guidelines for pedestrians are not provided.
- Considered yellow if current state and federal design guidelines for pedestrians are partially provided.
- Considered green if current state and federal design guidelines for pedestrians are completely provided.

Bridge Design/Rail Line

A rail line is required for PNSY and is maintained for all alternatives.

- Alternatives that accommodate simultaneous rail and vehicular access across the Piscataqua River and are considered green.
- Alternatives that do not accommodate simultaneous rail and vehicle access across the Piscataqua River and are considered yellow.

7.4. PLANNING LEVEL COST ESTIMATES

The planning level cost estimates and resulting cost-derived measures of effectiveness were based on preliminary concept plans only without benefit of survey or design information. As such, the costs are considered to be “ballpark” only and may change significantly once design work is completed. Therefore, the capital, operation and maintenance, and life cycle costs in Figure 8-18 are presented as a cost range based on the conceptual design plans. Alternatives have not been dismissed based on these planning level cost estimates. The planning level cost estimates will be refined in the next study phase for only those alternatives that advance from this study.

The range of planning level costs is identified below.

Capital Cost

Capital cost includes all initial construction costs associated with a given build alternative, including all engineering, construction, and anticipated right of way needs. Wetland and other mitigation, permitting and other miscellaneous capital costs are not included in the present capital cost ranges.

Lowest Range of Cost = \$18M to \$22 M Highest Range of Cost = \$265 to \$325M

- Alternatives that have the highest capital costs (top 1/3 of range) are considered red.
- Alternatives that have moderate capital costs (middle 1/3 of range) are considered yellow.
- Alternatives that have the lowest capital costs (bottom 1/3 of range) are considered green.

Operation and Maintenance Costs

Lift bridges require an operational cost for staffing as well as utility costs for powering the lift span and communications that are not required on fixed span bridges such as the I-95 High Level Bridge. Maintenance costs include all costs after completion of construction, including routine preventive maintenance and periodic major capital reinvestments to extend and preserve the life of the bridge, such as painting, redecking, etc. Operation and maintenance costs for each build alternative were estimated and summed over a 100 year bridge life cycle. Utility costs have not been included.

Lowest Range of Cost = \$89M to \$111M Highest Range of Cost = \$126M to \$154M

- Alternatives that have the highest operation and maintenance costs (top 1/3 of range) are considered red.
- Alternatives that have an average operation and maintenance costs (middle 1/3 of range) are considered yellow.
- Alternatives that have the lowest operation and maintenance costs (bottom 1/3 of range) are considered green.

Life Cycle Costs

Life cycle costs include both the capital cost as well as the 100 year operation and maintenance costs.

Lowest Range of Cost = \$144M to \$176M Highest Range of Cost = \$368M to \$452M

- Alternatives that have the highest life cycle costs (top 1/3 of range) are considered red.
- Alternatives that have average life cycle costs (middle 1/3 of range) are considered yellow.
- Alternatives that have the lowest life cycle costs (bottom 1/3 of range) are considered green.

Travel Time Delay Cost

The inability for the transportation system to adequately accommodate travel results in an increased travel time cost that can be measured and quantified. Travel time delay cost is calculated by multiplying the Study Area travel delay time by a weighted average value of time that includes both cars and trucks. For the alternatives, year 2035 Afternoon Peak Hour travel time cost was calculated and summed for the Study Area. A value of \$12 per hour for passenger vehicles and \$39 per hour per trucks was used, resulting in a weighted value of \$13.40 per hour.

Lowest Cost = \$15,620 Highest Cost = \$22,970

- Alternatives that have the highest travel time costs (top 1/3 of range) are considered red.
- Alternatives that have moderate travel time costs (middle 1/3 of range) are considered yellow.

- Alternatives that have the lowest travel time costs (bottom 1/3 of range) are considered green.

Benefit/Cost Ratio

A benefit to cost ratio relates the benefits of each alternative, expressed in monetary terms, relative to its overall costs, also expressed in monetary terms. All benefits and costs are generally expressed in present values. Present value is essentially the amount of money that would have to be invested today to meet all future costs, given an assumed annual rate of inflation and the time period when each cost would be incurred over the next 100 years. Benefits are calculated as the reduction in travel time cost (\$13.40 per hour weighted average), reduction in travel distance cost, and reduced economic impacts of crashes resulting from safety improvements. The cost is the Life Cycle Cost annualized for each alternative. A high benefit cost ratio is preferred over a low benefit cost ratio.

- Benefit/cost ratios that are less and 1.0 are considered red.
- Benefit/costs ratios that are about 1.0 are considered yellow.
- Benefit/costs ratios that are greater than 1.0 are considered green.

Business Survey Impacts

This criterion measures business owners' and patrons' estimation of the impacts that would occur to businesses immediately adjacent to the Memorial Bridge should vehicle traffic be prohibited across the bridge under selected Alternatives. See Appendix 44 for details regarding the Customer and Business Survey Results Report.

- Alternatives that close the Memorial Bridge to all modes of traffic are considered red.
- Alternatives that close the Memorial Bridge to vehicular access only are considered yellow.
- Alternatives that maintain or improve the Memorial Bridge for all modes of traffic (vehicle, bicycle and pedestrian) between Kittery and Portsmouth are considered green.

Regional Economic Impacts

This criteria is also derived from Appendix 44 – Customer and Business Survey Results Report. It measures the overall regional economic impact should vehicles be prohibited across the Memorial Bridge. The region under this measure of effectiveness is defined as the Labor Market Areas (LMA) of coastal Maine and New Hampshire that includes Kittery and Portsmouth. It was determined that the closing of the Memorial Bridge would not have a measurable regional economic impact and therefore all alternatives are considered green.

7.5. PRELIMINARY HISTORIC EVALUATION

Impacts to National Register-Listed or Eligible Historic Bridges

National Register Listed or Eligible properties are in five categories (building, structure, object, site, and district). Both the Memorial and the Sarah Mildred Long Bridges fall under the structure category. This criterion evaluates the impact of the alternatives on each bridge based

on whether none, one, or both of the bridges are replaced and/or removed. The preliminary historic evaluation indicates that removal, replacement or rehabilitation of either the Memorial Bridge or the Sarah Mildred Long Bridge would be an adverse effect on the individual bridges. From a historic perspective, rehabilitation is generally preferred over replacement because certain elements of the bridges that contribute to their historic significance would likely be retained if the rehabilitation can be done in accordance with the U.S. Secretary of the Interior’s Standards and Guidelines for Preservation Planning 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.

- Alternatives that remove or replace both bridges are considered red.
- Alternatives that rehabilitate one bridge and replace one bridge are considered yellow.

Other Historic Resource Impacts

This criterion measures potential impacts to other historic resources based on preliminary Section 106 effects findings on Maine and New Hampshire resources. The number of properties having no effect, no adverse effect, and adverse effects findings has been tallied.

Lowest adverse effect= 0 Highest adverse effect= 13 Average adverse effect= 7

- The alternatives that have the highest number of “adverse effect” impacts to other historic resources are considered red (top 1/3 of range).
- The alternatives that have a moderate number of “adverse effect” impacts to other historic resources are considered yellow (middle 1/3 of range).
- The alternatives that have the lowest number of “adverse effect” impacts to other historic resources are considered green (bottom 1/3 of range).

Archaeological Resource Impacts

An archaeological resource is defined as evidence of past activity (ancient Native American or historic) that survives below ground. The archeological sensitivity of the project area was assessed by a qualified archaeologist based on research, historic maps, results of previously conducted archaeological surveys, and limited field reconnaissance. This criterion measures potential impacts to archeologically sensitive areas based on potential construction associated with each bridge.

- Alternative considered red if potential bridge work impacts areas of high archaeological sensitivity.
- Alternative considered yellow if potential bridge work impacts areas of moderate archaeological sensitivity.
- Alternative considered green if potential bridge work would have no impact on potential archaeological resources.

7.6. NATURAL ENVIRONMENT

River Quality Impacts

The measure of effectiveness for river quality impacts relates to the number of piers to be removed, replaced or placed in the river. The Memorial Bridge has 12 existing river piers and the Sarah Mildred Long Bridge has 15 existing river piers. It is assumed a new Sarah Mildred Long Bridge would have 17 river piers. (It is assumed that the rehabilitation of the Sarah Mildred Long Bridge would remove and replace 3 river piers.)

Lowest Impacts = 0 – 15 total piers added, removed or replaced in the river

Moderate Impacts = 16 - 30 total piers added, removed or replaced in the river

High Impacts = 31 – 44 total piers added, removed or replaced in the river

- Alternatives that require the greatest amount of work in the river have the highest impacts and thus considered red. Work includes both the removal of and installation of river piers.
- Alternatives that require a moderate amount of work in the river are considered yellow. Work includes both the removal of and installation of river piers.
- Alternatives that require the least amount of work in the river are considered green. Work includes both the removal of and installation of river piers.

Air Quality

This assessment conducted a local (microscale) air quality analysis to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS) by evaluating air quality impacts of 2035 No Build and Build conditions. The analysis also evaluated air quality impacts associated with the 2009 Existing Condition. The local or hotspot analysis evaluated carbon monoxide (CO) and particulate matter (PM). The air quality study assumes that if the 2035 Build Alternative that was selected for analysis purposes (the Alternative with the highest traffic demands and delays) meets the NAAQS, then all other alternatives would have lower concentrations and can be assumed to also meet the NAAQS. Air quality is not considered to be negatively impacted by any of the proposed bridge alternatives and therefore all alternatives are considered green.

Aquatic Habitat

Permanent aquatic habitat loss is measured by the number of additional bridge piers to be placed in the river for each alternative versus what exists today (27 piers).

Lowest Impacts = less than 27 piers

Moderate Impacts = 27 piers

High Impacts = more than 27 piers

- Alternatives that increase the number of bridge piers in the river versus what exists today are considered red.
- Alternatives that maintain the same number of bridge piers in the river versus what exists today are considered yellow.

- Alternatives that reduce the number of bridge piers in the river versus what exists today are considered green.

Access to River

This criterion looked at whether each alternative impacted public access to the Piscataqua River.

- Alternatives that require relocation to public access to the river are considered red.
- Alternatives that require minor adjustment or temporary closure to public access to the river are considered yellow.
- Alternatives that do not impact public access to the river are considered green.

None of the alternatives impact current access to the river.

Threatened and Endangered Species (T&E)

This criterion measures the potential for impacts to threatened and endangered species. Available information was obtained from federal and state agencies, but field investigations have not been performed. Several species are identified in the Study Area, but specific locations of these species in relation to the potential work areas of each alternative is not known at this time. Therefore each alternative is indicated as “Undetermined” at the time of publication of this report.

Wetlands

Wetlands are perennially wet areas supported by a spring or other water source, also called "wetland," "marsh," or "swamp." This criterion measures the quantified impact to wetlands for each alternative. The impact values below are from the Department of the Army Programmatic General Permit for the State of New Hampshire. It is not anticipated that any wetlands in Kittery will be impacted by any of the alternatives.

- Alternatives that require an Individual Corps Permit (greater than 3 acres of impact) are considered red.
- Alternatives that require a Corps Programmatic General Permit (less than 3 acres of impact) are considered yellow.
- Alternatives that do not require a Corps permit (no wetland impact) are considered green.

Floodplain/Floodway

Floodplain/floodways are the part of a stream through or over which water may flow at some time. This criterion measures the quantified impact to floodplains/floodways in square feet (sf) for each alternative.

Lowest impacts = 0 sf Highest impacts = 36,800 sf Average impacts = 18,400 sf

- Alternatives that have the highest impacts to floodplains/floodways are considered red (top 1/3 of range).

- Alternatives that have moderate impacts to floodplains/floodways are considered yellow (middle $\frac{1}{3}$ of range).
- Alternatives that have the lowest impacts to floodplains/floodways are considered green (bottom $\frac{1}{3}$ of range).

7.7. PHYSICAL ENVIRONMENT

Neighborhood Traffic Impacts

A neighborhood is defined as people living near one another in a particular district or area. Five neighborhoods were identified within close proximity to both the Memorial and Sarah Mildred Long Bridges that could experience traffic volume changes as a result of changed traffic patterns by some of the alternatives: 1) Badgers Island (Kittery), 2) Newmarch Street/Government Street (Kittery), 3) Bridge Street/Cook Street (Kittery), 4) Downtown Portsmouth along State Street/Daniel Street (Portsmouth), and 5) Maplewood Avenue (Portsmouth). Reduced traffic through neighborhoods is considered a positive impact and additional traffic through neighborhoods is considered to be a negative impact. This criterion measures traffic impact by the number of neighborhoods that would experience increased vehicular traffic for each alternative.

- Alternatives that increase roadway use through 3 - 5 neighborhoods are considered red.
- Alternatives that increase roadway use through 1 - 2 neighborhoods are considered yellow.
- Alternatives that maintain or reduce roadway use through neighborhoods are considered green.

Publicly Owned Property Impacts

A publicly owned property is a school, town or city office, etc - any building that is owned by a municipal, county, state or federal entity. This criterion measures the quantified impact for each alternative to publicly owned property. Publicly owned property impacts range from zero sf to a high of 26,402 sf.

Lowest Public Property Impact = 0 to 8,800 sf (bottom $\frac{1}{3}$ of range)

Moderate Public Property Impact = 8,801 to 17,601 sf (middle $\frac{1}{3}$ of range)

Highest Public Property Impact = 17,602 to 26,402 sf (top $\frac{1}{3}$ of range)

- Alternatives that have the highest public property impacts are considered red.
- Alternatives that have moderate public property impacts are considered yellow.
- Alternatives that have the lowest public property impacts are considered green.

Commercial Property Impacts

A commercial property is any privately owned business on land zoned for commercial use. This criterion measures the quantified impact for each alternative to commercial property. An impact means a portion of the property may be acquired. Commercial property impacts range from zero sf to a high of 5,163 sf.

Lowest Commercial Property Impact = 0 to 1,721 sf (bottom ⅓ of range)

Moderate Commercial Property Impact = 1,722 to 3,442 sf (middle ⅓ of range)

Highest Commercial Property Impact = 3,443 to 5,163 sf (top ⅓ of range)

- Alternatives that have the highest commercial property impacts are considered red.
- Alternatives that have moderate commercial property impacts are considered yellow.
- Alternatives that have the lowest commercial property impacts are considered green.

Residential Property Impacts

A residential property is any privately owned dwelling unit on land zoned for residential use. This criterion measures the quantified impact for each alternative to residential property. An impact means a portion of the property may be acquired. Residential impacts range from zero sf to a high of 26,294 sf.

Lowest Residential Property Impact = 0 to 8,765 sf (bottom ⅓ of range)

Moderate Residential Property Impact = 8,766 to 17,529 sf (middle ⅓ of range)

Highest Residential Property Impact = 17,530 to 26,294 sf (top ⅓ of range)

- Alternatives that have the highest residential property impacts are considered red.
- Alternatives that have moderate residential property impacts are considered yellow.
- Alternatives that have the lowest residential property impacts are considered green.

Business or Residential Displacements

A displacement means that an active business or occupied residence would require complete acquisition. This criterion measures the number of displacements currently identified by alternative and also provides the assessed value of displacements.

Lowest number of displacements = 0

Moderate number of displacements = 1

Highest number of displacements = 2

- Alternatives that require the highest number of displacements are considered red.
- Alternatives that require a moderate number of displacements are considered yellow.
- Alternatives that require the lowest number of displacements are considered green.

Noise

The Traffic Noise Model (TNM) was used to calculate the existing and future sound levels at all the receptor locations in the Study Area for each alternative. A noise level increase of 15 dbA over existing levels or a noise level exceeding 66 dbA require noise abatement such as vegetated buffers, sound walls, etc.

- Alternatives that increase noise levels by more than 15 dbA over existing levels or have a noise level exceeding 66 dbA are considered red.
- Alternatives that increase noise levels between 3 and 15 dbA are considered yellow.
- Alternatives that decrease noise levels or increase noise levels by less than 3 dbA are considered green.

7.8. ENVIRONMENTAL CLEARANCES

US Coast Guard Permitability

- Alternatives that are not regarded as permissible are considered red.
- Alternatives that are regarded as permissible are considered green.

Level of NEPA Documentation

The National Environmental Policy Act (NEPA) regulates the process of new construction in order to protect the environment, including the natural and built environment. FHWA will determine the appropriate NEPA Class of Action.

- Alternatives that are regarded to have significant NEPA impacts and sizable public comments that may require the preparation of an Environmental Impact Statement are considered red.
- Alternatives that may have significant NEPA impacts and may require the preparation of an Environmental Assessment are considered yellow.
- Alternatives that may be advanced as NEPA Categorical Exclusions are considered green.

7.9. USE OF SECTION 4(f) PROPERTIES

Section 4(f) applies to use of any publicly owned public park, recreation area, or wildlife and waterfowl refuge and any land from an historic site of national, state or local significance.

Section 4(f) Historic Properties

This criterion measured the number of historic Section 4(f) properties that may be impacted by each alternative.

Lowest impacts = 3

Highest impacts = 8

Average impacts = 6

- Alternatives that have the highest number of affected historic 4(f) Properties are considered red (top 1/3 of range).
- Alternatives that have a moderate number of affected historic 4(f) Properties are considered yellow (middle 1/3 of range).
- Alternatives that have the lowest number of affected historic 4(f) Properties are considered green (bottom 1/3 of range).

Other Section 4(f) Properties

This criterion measured the number of other Section 4(f) properties that may be impacted by each alternative.

Lowest impacts = 1

Highest impacts = 3

Average impacts = 2

- Considered red if three Section 4(f) Properties are impacted.
- Considered yellow if two Section 4(f) Properties are impacted.
- Considered green if one Section 4(f) Properties is impacted

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