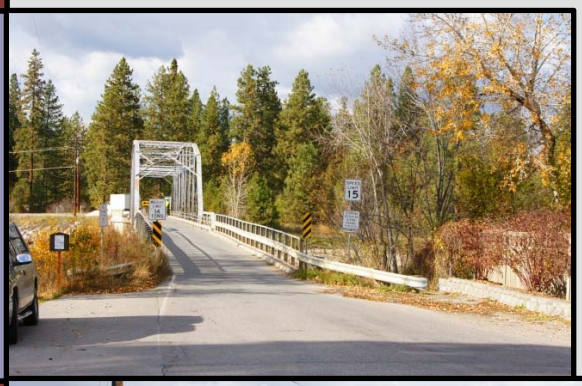
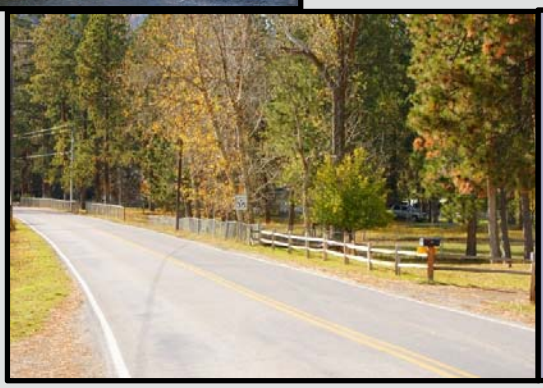
# SCREENING ASSESSMENT

FINAL

## Maclay Bridge Planning Study





*Prepared for:*
**Montana Department of Transportation**
Helena, Montana

*Prepared by:*
**Robert Peccia & Associates**
Helena, Montana
January 4, 2013

# TABLE OF CONTENTS



# TABLES

# SCREENING ASSESSMENT

Screening is used to describe the process for reviewing a range of conceptual options or strategies and deciding which ones to carry forward for more evaluation and study. The primary function of screening is to determine feasible and practicable options that address the identified needs and objectives (**Appendix C**).

Items or considerations used to evaluate options are referred to as **screening criteria**. Screening may be carried out through one or more iterations (levels) with the screening criteria for each level becoming more specific. Screening may rely upon qualitative or quantitative screening criteria. *Qualitative criteria* refer to subjective evaluations often based on ratings (yes/no, excellent to poor, high to low, or pass/fail). *Quantitative criteria* typically refer to items that can be readily calculated or quantified through analysis like construction costs, right-of-way needs/relocations, or general areas of impact.

First level screening is used to help identify options that fail to meet the critical aspects of the study's needs and objectives or that may have "fatal flaws" with respect to other key factors (i.e. a potential option may consist of a new roadway alignment that traverses directly through a conservation easement that is prohibited from development of any type). First level screening provides an initial evaluation of a wide range of potential options or strategies. The results of the first level screening assessment narrowed the set of options or strategies to those with the greatest capacity to address identified areas of concern and satisfy the study needs and objectives.

Second level screening builds upon the first level screening by taking the options that have been carried forward from the first level and performing an evaluation against certain needs and objectives. Second level screening is more advanced in that more elements can be utilized to screen the options based on parameters like cost, traffic, environmental impacts, etc.

## 1.1. FIRST LEVEL SCREENING CRITERIA

The first level screening criteria consists of two questions to generally establish how well potential options meet safety and connectivity needs. These screening questions focus on important considerations relating to the overall viability or reasonableness of the options or strategies.

- *Would the option improve safety on the bridge and its approaches?*
- *Does the option provide an efficient connection with the street network/road system in the area?*

This first level screening assessment allows for a simple YES or NO answer to the two questions. The analysis is qualitative and intended to help identify options that comply with the identified needs and objectives.

**Table 1** summarizes the initial screening criteria, identifies why they are important screening considerations, and relates each consideration to a specific identified need for this planning study.

**Table 1: First Level Screening – General Compliance with Identified Needs/Objectives**

| SCREENING ASSESSMENT | SCREENING QUESTION | CORRELATION TO NEED |
|---|---|---|
| ***SAFETY PERFORMANCE.*** *This criterion screens against the option's potential to improve the overall safety performance on the bridge and its approaches.* | *Q1. Would the option improve safety on the bridge and its approaches?* | ***NEED #1*** |
| ***CONNECTIVITY.*** *This criterion screens against whether or not the option provides an efficient connection to the transportation network within the area.* | *Q2. Does the option provide an efficient connection with the street network/road system in the area?* | ***NEED #2*** |

To advance to the second screening level, an option must receive a 'YES' answer to the screening questions indicating the fundamental safety and connectivity needs required to serve the overall transportation system would be met.

## 1.2. FIRST LEVEL SCREENING ASSESSMENT AND RESULTS

### 1.2.1. SAFETY PERFORMANCE

This screening criterion screens against an option's potential to improve the overall safety performance on the bridge and its approaches by implementing measures to address identified deficiencies or safety concerns. The *Existing and Projected Conditions Report* highlighted a variety of safety concerns associated with the existing bridge, including substandard horizontal curves and the presence of unshielded obstacles and/or non-recoverable slopes on its approaches. The crash analysis conducted for this study identified several crash clusters on the road network in the Maclay Bridge area and highlighted common contributing circumstances at each location. For purposes of first level screening, safety relates to motorized uses such as vehicular traffic, motorcycles, and emergency response vehicles. It also relates to non-motorized users such as bicyclists and pedestrians. Although some public comments have correlated safety to swimmers, bridge jumpers, scour holes, etc., these are not explicitly tied to the features of the transportation system that can be documented and addressed through this planning study (i.e. geometrics, clear zones, travel speeds, etc.) and are therefore not included in the screening process.

The following screening question, which relates directly to Need Number 1, was asked:

***Q1. Would the option improve safety on the bridge and its approaches?***

In order to receive a YES answer to this question, options should address identified safety deficiencies and improve or correct sub-standard elements of the bridge and its approaches that pose safety concerns for the traveling public. It was assumed that options providing bridges on new locations would be engineered to design standards that would provide a desirable level of safety. Several questions inherent to improving safety were explored during the screening process. These questions helped inform whether question 1 received a YES or NO response. Note that each of the three sub-questions did not have to receive a YES answer in order to answer YES to the screening question. The sub-questions included the following:

- ***Would the option improve sub-standard elements [deficiencies] on the bridge?*** Sub-standard elements of the bridge include the bridge deck width and load-restricted condition. Options that would rectify or improve these conditions are considered desirable.

- ***Would the option reduce or remove vehicle restrictions on the bridge?*** Vehicle restrictions on the bridge presently include a posted load limit of 11 tons, one direction of travel at a time, and speed restrictions for larger emergency vehicles and school buses. Options that would eliminate the vehicle restrictions on the bridge are considered desirable.
- ***Would the option reduce crashes resulting from approaches to the bridge?*** Deficiencies on the approaches include horizontal alignment, lack of roadway shoulders, steep roadside slopes, obstructions in the clear zone, and lack of lighting. Crash clusters have been identified and documented previously. Improvements to the approaches leading in to and out of the bridge to meet current design standards are considered desirable and a positive step to reduce identified crash trends.

**Table 2** shows how the options address the safety performance screening question.

### Table 2: First Level Screen – Safety Performance

| Option | ***Q1. Would the option improve safety on the bridge and its approaches?*** |
|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | |
| **1A - Enhance Traffic Operations and Safety on and Near the Structure** | **YES.** Management of traffic flows on bridge and lighting in area would benefit overall traffic safety. Although sub-standard elements of the bridge or approaches would not be rectified, increased signage and markings would heighten driver awareness of infrastructure conditions and potentially reduce crashes. Existing load limits and speed restrictions would remain in effect. |
| **1B - Maintain Current Usage and Add Pedestrian/Bicyclist Facilities** | **NO.** Separated facilities for non-motorized users and limited work on approaches would provide minor safety enhancements. However, major geometric changes on approaches and clear zone work are not included, thereby not improving the sub-standard conditions of the bridge and approaches. Existing load restrictions would remain in effect. |
| **1C - Implement Additional Restrictions on Bridge Use** | **NO.** Assumes measures implemented would not have overall benefits for safety Sub-standard elements of the bridge and approaches would not be addressed. |
| **1D – Close Bridge to Vehicles and Retain Use for Non-Motorized Travel Modes** | **YES.** Option would reduce vehicular traffic volumes in vicinity of bridge and eliminate vehicle traffic on the bridge. The potential for conflicts between motorized and non-motorized users on structure would be eliminated, The existing bridge would be designated for non-motorized uses only. |
| **1E - Retain Bridge and Provide New Bridge Elsewhere** | **NO.** Would not resolve safety issues at existing crossing and on approaches. Sub-standard elements would remain, as well as load restrictions. |
| **1F - New One-Lane Bridge at a New Location & Retain Existing Bridge for Non-Motorized Uses** | **NO.** New one-lane bridge for vehicles would have same inherent limitations as existing bridge due to width and lack of capacity to accommodate travel in two directions. Option would reduce vehicular traffic volumes in vicinity of existing bridge but introduce more traffic at new bridge location. The potential for conflicts between motorized and non-motorized users on existing structure would be eliminated, but would be re-introduced at the new location. Would eliminate load restrictions. |
| **1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel** | **YES.** Would resolve overall safety issues on bridge and approaches by reducing traffic and lowering conflict potential between motorized and non-motorized users. Traffic would be distributed further throughout the area between North and South Avenues. Load restrictions would not be resolved on the existing bridge but would be constructed to standards on new bridge. |
| **1H - Close Bridge and Remove Structure** | **YES.** Would eliminate all modes of travel at the existing crossing. |
| **OPTION 2 - REHABILITATE THE BRIDGE** | |
| **2A - Minor Rehabilitation (Structure Only)** | **NO.** Minor rehabilitation would include limited measures to improve the load-carrying capacity of the existing bridge and its physical condition. Such a project would not change geometric conditions on the approaches or the general configuration of the existing bridge. Potential to reduce |

| | |
|---|---|
| | crashes is minimal with no changes to geometrics of bridge or reconstruction of approaches. |
| **2B - Major Rehabilitation (Structure Only)** | **NO.** Major rehabilitation would include activities to substantially improve the load-carrying capacity of the existing bridge and its physical condition. Such a project would not change geometric conditions on the approaches or be likely to change the general configuration of the existing bridge. Existing sub-standard conditions would remain. |
| **2C - Minor Rehabilitation (includes Approaches)** | **YES.** Minor rehabilitation would include limited measures to improve the load-carrying capacity of the existing bridge and its physical condition. Approaches leading into and out of the bridge would be improved to meet current design standards. Improvements to the approaches may reduce crashes and improve overall safety. Traffic management with improved signage and markings would also contribute to overall safety improvement. |
| **2D - Major Rehabilitation (includes Approaches)** | **YES.** Major rehabilitation would include activities to improve the load-carrying capacity of the existing bridge and its physical condition. Bridge approaches would be improved to meet current design standards. Improvements to the approaches may reduce crashes and improve overall safety. Traffic management with improved signage and markings would also contribute to overall safety improvement. |
| **OPTION 3 - BUILD NEW BRIDGE** | |
| **3A.1- Existing Alignment on North Avenue** | **NO.** Building a new bridge on the existing alignment would perpetuate substandard horizontal curves on the approaches to the structure, and would not eliminate many of the features that contribute to noted crash trends. |
| **3A.2 - North 1 Alignment** | **YES.** Assumes adequate alignment could be developed on west approach to new bridge. New bridge structure would meet current design standards, and eliminate conflicts and load restrictions. |
| **3A.2 - North 2 Alignment** | **NO.** The proposed alignment would likely create an undesirable approach at the west end of the new bridge by introducing a sub-standard horizontal curve to tie into River Pines Road. |
| **3B.1 - South 3rd Street West Extension** | **YES.** The proposed alignment would meet current road and bridge standards, thereby achieving safety objectives. No load restrictions would be required, allowing all currently restricted vehicles to safely cross the river. Motorized/non-motorized conflicts would be eliminated. |
| **3B.1 - Spurgin Road Extension** | **YES.** Same reasoning as 3B.1 (South 3rd Street West Extension). |
| **3B.2 - Mount 1 Alignment** | **YES.** Same reasoning as 3B.1 (South 3rd Street West Extension). |
| **3B.2 - Mount 2 Alignment** | **YES.** Same reasoning as 3B.1 (South 3rd Street West Extension). |
| **3B.3 - Edward 1 Alignment** | **YES.** Same reasoning as 3B.1 (South 3rd Street West Extension). |
| **3B.3 - Edward 2 Alignment** | **YES.** Same reasoning as 3B.1 (South 3rd Street West Extension). |
| **3B.4 - South 1 Alignment** | **YES.** Same reasoning as 3B.1 (South 3rd Street West Extension). |
| **3B.4 - South 2 Alignment** | **YES.** Same reasoning as 3B.1 (South 3rd Street West Extension). |
| **3B.5 - Sundown 1 Alignment** | **YES.** Same reasoning as 3B.1 (South 3rd Street West Extension). |
| **3B.5 - Sundown 2 Alignment** | **YES.** Same reasoning as 3B.1 (South 3rd Street West Extension). |
| **3B.6 - Humble Road-Blue Mountain Road** | **YES.** Same reasoning as 3B.1 (South 3rd Street West Extension). |
| **3B.7 – New Bridge at a Location Not Identified in the 1994 EA** | **YES.** However, no additional new locations for a bridge have been identified via the planning process with the public, stakeholders, or the planning team. |
| **OPTION 4 -DO NOTHING** | |
| **4A – Do Nothing** | **NO.** This option would not address or improve the conditions that pose safety concerns on or near the Maclay Bridge. |

### 1.2.2. CONNECTIVITY CONSIDERATIONS

This screening criterion addresses whether or not the option provides an efficient connection to the existing and/or future road network within the area. Roadway connections that enhance the ability of the network to serve users and accommodate efficient travel through the community are desirable. The following screening question, which relates directly to Need Number 2, was asked:

### *Q2. Does the option provide an efficient connection with the street network/road system in the area?*

Options that provide linkages to roadways with higher functional classifications (minor arterials, urban collectors, or rural major collectors) merited a YES response. A grid system of roadways is desirable, and the hierarchy of roadways in Missoula County encourages travel connectivity to reduce travel time and emissions, while at the same time recognizing that access needs vary between different users. Options that provided undesirable system linkages or result in long, out-of-direction travel to make network connections were given a NO response.

**Table 3** shows how the options rate with respect to connectivity considerations.

**Table 3: First Level Screen – Connectivity Considerations**

| Option | *Q2. Does the option provide an efficient connection with the street network/road system in the area?* |
|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | |
| 1A - Enhance Traffic Operations and Safety on and Near the Structure | **YES.** Maintains current level of connectivity at North Avenue. |
| 1B - Maintain Current Usage and Add Pedestrian/Bicyclist Facilities | **YES.** Maintains current level of connectivity and provides enhanced facilities for non-motorized users. |
| 1C - Implement Additional Restrictions on Bridge Use | **YES.** Maintains current level of connectivity. |
| 1D - Close Bridge to Vehicles and Retain Use for Non-Motorized Travel Modes | **NO.** Option eliminates an existing river crossing and would require use of other area crossing to provide east-west connection across Bitterroot River. Would continue to provide connectivity for non-motorized users. |
| 1E - Retain Bridge and Provide New Bridge Elsewhere | **YES.** Maintains current level of connectivity on North, assumes new bridge would be sited to provide efficient connection. |
| 1F - New One-Lane Bridge at a New Location & Retain Existing Bridge for Non-Motorized Uses | **YES.** Assumes new bridge would be sited to provide efficient connection. Would continue to provide connectivity for non-motorized users at present location. |
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | **YES.** Maintains current level of connectivity on North, assumes new bridge would be sited to provide efficient connection for other travel direction. |
| 1H - Close Bridge and Remove Structure | **NO.** Option eliminates an existing river crossing and would require use of other area crossing to provide east-west connection across Bitterroot River. |
| **OPTION 2 - REHABILITATE THE BRIDGE** | |
| 2A - Minor Rehabilitation (Structure Only) | **YES.** Maintains current level of connectivity. |
| 2B - Major Rehabilitation (Structure Only) | **YES.** Maintains current level of connectivity. |
| 2C - Minor Rehabilitation (includes Approaches) | **YES.** Maintains current level of connectivity. |
| 2D - Major Rehabilitation (includes Approaches) | **YES.** Maintains current level of connectivity. |
| **OPTION 3 - BUILD NEW BRIDGE** | |
| 3A.1- Existing Alignment on North Avenue | **YES.** North Avenue is urban collector. |
| 3A.2 - North 1 Alignment | **YES.** North Avenue is urban collector. |
| 3A.2 - North 2 Alignment | **YES.** North Avenue is urban collector. |
| 3B.1 - South 3rd Street West Extension | **NO.** Undesirable. Although S. 3rd Street is a minor arterial, the out-of-direction travel requirement, overall travel length, and lack of grid connection does not promote efficiency in travel system. |
| 3B.1 - Spurgin Road Extension | **NO.** Undesirable new connection that departs from established grid system in area. Would result in lengthy out-of-direction travel and additional new roadway network construction. |
| 3B.2 - Mount 1 Alignment | **NO.** This alignment deviates from the established grid system and does not promote any efficiency in the travel system. Would result in additional new roadway network construction. |
| 3B.2 - Mount 2 Alignment | **YES.** This route would connect existing roads (i.e. Mount Avenue and River Pines Road) with relatively minimal amounts of new roadway |

| | |
|---|---|
| | required, and results in minimal out-of-direction travel. |
| **3B.3 - Edward 1 Alignment** | **NO.** Edward Avenue ends west of Clements Road and does not directly connect to the north-south route, which is a higher order route. This connection would result in additional out-of-direction travel. |
| **3B.3 - Edward 2 Alignment** | **NO.** Same as reasoning for Edward 1 above. |
| **3B.4 - South 1 Alignment** | **YES.** This route would connect existing roads (i.e. South Avenue and River Pines Road) with relatively minimal amounts of new roadway required, and results in minimal out of direction travel South Avenue east of Humble Road is an urban collector and a minor arterial west of Clements that provides a direct connection to Reserve Street. |
| **3B.4 - South 2 Alignment** | **YES.** Same as reasoning for South 1 above, but connects South Avenue with Blue Mountain Road. |
| **3B.5 - Sundown 1 Alignment** | **NO.** Option deviates from established east-west grid system and locates river crossing access farther south of neighborhood population center. Although the route may result in minimal new roadway work, topography and grade constraints will result in construction and operational issues (sight distance, etc.) |
| **3B.5 - Sundown 2 Alignment** | **NO.** Same as reasoning for Sundown 1 above. |
| **3B.6 - Humble Road-Blue Mountain Road** | **NO.** Undesirable. Option results in out-of-direction travel, additional length of new road, and lack of grid connection. Does not promote efficiency in travel system. |
| **3B.7 – New Bridge at a Location Not Identified in the 1994 EA** | **NO.** No additional new locations for a new bridge have been identified via the planning process with the public, stakeholders or the planning team. |
| **OPTION 4 -DO NOTHING** | |
| **4A – Do Nothing** | **YES.** Maintains current level of connectivity at North Avenue. |

### 1.2.3. REMOVAL OF OPTION 1A FROM FURTHER SCREENING

*Option 1A – Enhance Traffic Operations and Safety on and Near the Structure* was removed from further screening after the completion of the first level screen. This was based on the option being primarily a "traffic management system (TSM)" strategy that could be applied as a component of all the other options being considered. In other words, as a TSM option, the scope of improvements are relatively minor in nature and are intended to provide subtle improvements to the transportation system that include signing, lighting, pavement markings, etc. These small scale improvements could be considered with any remaining options going forward.

# Table 4: Summary of First Level Screening Assessment

| First Level Screening Consideration | | RANGE OF OPTIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON EXISTING BRIDGE | | | | | | | | OPTION 2 - REHABILITATE THE BRIDGE | | | | OPTION 3 - BUILD NEW BRIDGE | | | | | | | | | | | | | | | OPTION 4 DO NOTHING |
| | | 1A Enhance Operations and Safety on or near bridge | 1B Maintain Vehicle Use & Add Ped/Bike | 1C Add More Restrictions | 1D Close Bridge Use for Ped/Bike | 1E Retain & Add new bridge | 1F Add new 1 –lane bridge Retain old for Ped/Bike | 1G Add new 1 –lane bridge Retain old for 1-way travel | 1H Close & Remove Bridge | 2A Minor Rehab (Structure Only) | 2B Major Rehab (Structure Only) | 2C Minor Rehab (includes Approaches) | 2D Major Rehab (includes Approaches) | 3A.1 Exist Location | 3A.2 North 1 | 3A.2 North 2 | 3B.1 S 3rd St W | 3B.1 Spurgin Rd | 3B.2 Mount 1 | 3B.2 Mount 2 | 3B.3 Edward 1 | 3B.3 Edward 2 | 3B.4 South 1 | 3B.4 South 2 | 3B.5 Sundown 1 | 3B.5 Sundown 2 | 3B.6 Humble Rd – Blue Mtn Rd | 3B.7 Other Locations | 4A Do Nothing |
| *Q1. Would the option improve safety on the bridge and its approaches ?* | | NO | NO | YES | NO | NO | YES | YES | NO | NO | YES | YES | NO | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | NO |
| *Q2. Would the option provide an efficient connection with the street network/road system in the area?* | REMOVED FROM FURTHER SCREENING | YES | YES | NO | YES | YES | YES | NO | YES | YES | YES | YES | YES | YES | YES | NO | NO | NO | YES | NO | NO | YES | YES | NO | NO | NO | NO | YES |
| *ADVANCE TO SECOND LEVEL SCREENING? (See Note 1)* | | NO | NO | NO | NO | NO | YES | NO | NO | NO | YES | YES | NO | YES | NO | NO | NO | NO | YES | NO | NO | YES | YES | NO | NO | NO | NO | NO |

*NOTE 1: To advance to second level screening, option must (1) rate YES for both screening criteria.*

## 1.3. OPTIONS CARRIED FORWARD FROM FIRST LEVEL SCREENING

Seven options were carried forward as a result of the first level screening process. All of the options considered during the first level screening process are shown below and are discussed in more detail in the *Options Under Consideration* memorandum previously developed for this study. The options being carried forward for the second level screening are shown in bold, shaded text below:

- **Option 1 – Improve Safety and Operations on the Existing Bridge**
  - 1A: Enhance Traffic Operations and Safety on and Near the Structure
  - 1B: Maintain Current Usage and Add Pedestrian/Bicyclist Facilities
  - 1C: Implement Additional Restrictions on Bridge Use
  - 1D: Close Bridge to Vehicles and Retain Use for Non-Motorized Travel Modes
  - 1E: Retain Bridge for Two-Way Travel and Provide New Bridge Elsewhere for Two-Way Travel
  - 1F: New One-Lane Bridge at a New Location and Retain Existing Bridge for Non-Motorized Uses
  - **1G: New One-Lane Bridge at a New Location for One-Way Travel and Retain Existing Bridge for One-Way Travel**
  - 1H: Close Bridge and Remove Structure

- **Option 2 - Rehabilitate the Existing Bridge**
  - 2A: Minor Rehabilitation (Structure Only)
  - 2B: Major Rehabilitation (Structure Only)
  - **2C: Minor Rehabilitation (includes Approaches)**
  - **2D: Major Rehabilitation (includes Approaches)**

- **Option 3 - Build New Bridge**
  - 3A.1: Build on Existing Alignment at North Avenue
  - **3A.2: Build Near Existing Alignment - North 1 Alignment**
  - 3A.2: Build Near Existing Alignment - North 2 Alignment
  - 3B.1: Build Bridge on Northern Alignment - South 3rd Street West Extension
  - 3B.1: Build Bridge on Northern Alignment - Spurgin Road Extension
  - 3B.2: Build Bridge on Mount Avenue - Mount 1 Alignment
  - **3B.2: Build Bridge on Mount Avenue - Mount 2 Alignment**
  - 3B.3: Build Bridge on Edward Avenue - Edward 1 Alignment
  - 3B.3: Build Bridge on Edward Avenue - Edward 2 Alignment
  - **3B.4: Build Bridge on South Avenue - South 1 Alignment**
  - **3B.4: Build Bridge on South Avenue - South 2 Alignment**
  - 3B.5: Build Bridge on Sundown Road - Sundown 1 Alignment
  - 3B.5: Build Bridge on Sundown Road - Sundown 2 Alignment
  - 3B.6: Build Bridge on Southern Alignment - Humble Road-Blue Mountain Road
  - 3B.7: New Bridge at a New Location Not Identified in the 1994 EA

- **Option 4 – Do Nothing**
  - 4A: Do Nothing

## 1.4. SECOND LEVEL SCREENING CRITERIA

Second level screening criteria were developed to evaluate and rank the seven options carried forward from the first level screening process. The criteria were generated to correlate to the identified needs and objectives previously articulated. Care was exercised to develop criteria that could be evaluated given the limited amount of information available. For example, developing a criterion that quantifies "acreage of potential wetland impacts" is only relevant if wetland delineations have occurred and the locations of wetlands are known. For the second level screening process, sixteen screening criteria were developed to evaluate and rank options. The criteria are listed in **Table 5**, and fall under the following major types:

- *Operational and Safety Screening Criteria (4 Total)*
- *Connectivity and Growth (3 Total)*
- *Constructability and Cost Screening Criteria (2 Total)*
- *Resource Impacts Screening Criteria (3 Total)*
- *Neighborhood/Social Screening Criteria (4 Total)*

**Table 5** summarizes the second level screening criteria, identifies why they are important screening considerations, and relates each consideration to a specific identified need for this planning study.

**Table 5: Second Level Screening – General Compliance with Identified Needs/Objectives**

| *SCREENING CONSIDERATION* | *REASON & SUPPORT FOR SCREENING CONSIDERATION* | *RELATES TO NEED #?* |
|---|---|---|
| **OPERATIONAL AND SAFETY SCREENING CRITERIA** | | |
| *OS1. Would the option improve sub-standard elements on the bridge?* | ***SAFETY & OPERATIONS.*** *This criterion determines the option's potential to address the substandard elements found on the bridge. A major substandard element of the existing bridge is the bridge deck width, which results in only one travel lane being available.* | ***NEED #1*** |
| *OS2. Would the option improve vehicle load restrictions on the bridge?* | ***SAFETY & OPERATIONS.*** *This criterion determines whether or not the option improves or resolves load restrictions on vehicle use of the bridge. The existing bridge has a posted load limit of 11 tons, which prohibits some vehicles from crossing the bridge and requires restrictions on others.* | ***NEED #1*** |
| *OS3. Would the option accommodate bicyclists/pedestrians on the bridge and its approaches?* | ***CONNECTIVITY & GROWTH.*** *This criterion indicates whether or not the option accommodates bicyclists and pedestrians on the bridge and its approaches. Safe bicycle and pedestrian facilities implies a space for bicyclist or pedestrian use.* | ***NEED #2*** |
| *OS4. Would the option reduce crashes resulting from approaches to the bridge?* | ***SAFETY & OPERATIONS.*** *This criterion indicates whether or not the option would reduce crashes on the approaches to the bridge. A review of the crash history on area roadways shows substandard elements (deficiencies) on approaches contribute to the crashes. These substandard elements include horizontal alignment concerns, lack of road shoulders, steep roadside slopes, obstructions in clear zone, lack of lighting.* | ***NEED #1*** |
| *OS5. Would the option accommodate future capacity demands?* | ***CONNECTIVITY & GROWTH.*** *This criterion determines whether or not the option would accommodate future capacity demands. Future capacity demands include things like providing a* | ***NEED #2*** |

| | | |
|---|---|---|
| | *roadway wide enough for simultaneous bi–direction travel, and offering a crossing without limitations or restrictions due to horizontal and vertical clearances.* | |
| *OS6. Would the option help reduce or eliminate vehicle delays at the river crossing?* | ***SAFETY & OPERATIONS.*** *This criterion determines whether or not the option would reduce or eliminate vehicle delays at the river crossing. The current bridge allows for traffic to cross the structure in one direction at a time. This delays vehicles waiting to cross in the opposing direction. These vehicles may occasionally include emergency responders.* | ***NEED #1*** |
| *OS7. Does the option provide an efficient grid connection to the major road/street network in the Missoula area?* | ***CONNECTIVITY & GROWTH.*** *This criterion indicates whether or not the option would provide an efficient grid connection to the major road/street network in the Missoula area by measuring the total length of travel between two points (in both directions). An efficient connection to an established grid network is an important consideration of the transportation system in terms of reducing out-of-direction travel, thus reducing travel time, travel costs, and controlling emissions.* | ***NEED #2*** |
| **CONSTRUCTABILITY AND COST SCREENING CRITERIA** | | |
| *CC1. Planning level construction costs.* | ***COST.*** *This criterion details the option's high level planning costs to provide a reasonable measure of costs for comparison. Does not include highly variable costs like those associated with right-of-way acquisition, project development activities, environmental mitigation, or inflation.* | ***N/A*** |
| *CC2. Annual maintenance costs.* | ***COST.*** *This criterion is intended to provide some indication of annual maintenance costs for each option, over a 20-year horizon.* | ***N/A*** |
| **RESOURCE IMPACTS SCREENING CRITERIA** | | |
| *R 1. Effects on aquatic resources?* | ***ENVIRONMENTAL IMPACTS.*** *This criterion differentiates between options based on their potential effects to aquatic resources by considering the extent of work in the delineated floodplain.* | ***NEED #3*** |
| *R 2. Will the options have impacts to protected 4 (f) or Section 106 resources?* | ***SECTION 4(f) IMPACTS.*** *This criterion determines whether the options have the potential for impacting resources that are protected by Section 4(f) or fall under Section 106 of the National Historic Preservation Act (36 CFR 800).* | ***NEED #3*** |
| *R 3. Will the options affect lands held under conservation easements?* | ***LAND IMPACTS.*** *This criterion determines whether the options have potential to affect lands held under conservation easements, and would require crossing those lands. Sizable areas of private land along the Bitterroot River are held under conservation easements by the Five Valleys Land Trust. Such easements may limit the ability to construct improvements on these protected lands.* | ***NEED #3*** |
| **NEIGHBORHOOD/SOCIAL SCREENING CRITERIA** | | |
| *NS1. Number of privately owned parcels* | ***NEIGHBORHOOD & SOCIAL.*** *This criterion assesses how many individual privately-owned parcels would be crossed or potentially impacted* | ***NEED #4*** |

| | | |
|---|---|---|
| *Impacted?* | *by the alignment associated with each option. The criterion is suggestive of the potential extent of R/W acquisition associated with each option.* | |
| *NS2. Number of structures impacted?* | ***NEIGHBORHOOD & SOCIAL.*** *This criterion identifies whether or not structures may be impacted by each option. For purposes of this criterion, structures only consist of residences. Impacts to existing structures helps assess the potential for relocations or right-of-way impact mitigations associated with the options.* | ***NEED #4*** |
| *NS3. R/W needs?* | ***NEIGHBORHOOD & SOCIAL.*** *This criterion estimates how much new right-of-way may be required with each option. An assumed new right-of-way width was chosen for the option's alignments, and any known existing right-of-way is subtracted out, yielding a potential new right-of-way need.* | ***NEED #4*** |
| *NS4. Does the option compare favorably with year 2040 "no action" model traffic volume increases in front of Target Range School?* | ***NEIGHBORHOOD & SOCIAL.*** *This criterion measures the potential for traffic volume changes in front of the Target Range School.* | ***NEED #4*** |

## 1.5. SECOND LEVEL SCREENING CRITERIA RATING FACTORS

For some screening criteria, rating factors were developed to assist in evaluations and quantify how well an option may meet the identified question and thus, the corresponding need or objective. **Table 6** describes the impact rating factors. Low/high and yes/no rating factors were developed and assigned to those screening criteria as applicable. In some cases, the rating factors are not used as the type of screening criteria may better lend itself to an "order of ranking", between 1 and 7, due to there being seven options carried forward from the first level screening process. This is further defined in the following pages. The lower an individual or cumulative point value is, the more desirable or better the criterion (or option) is considered.

**Table 6: Second Level Screening Criteria Rating Factors**

| *Potential Influence (type of criteria)* | *Rating (value)* | *Rating (value)* | *Screening Consideration* |
|---|---|---|---|
| **Impact** (non-quantitative) | LOW (assigned point value = 1) | HIGH (assigned point value = 7) | R2 (protected resources); R3 (conservation easements); NS2 (structures) |
| **Improve / Accommodate / Reduce / Provide / Increase** (non-quantitative) | YES (assigned point value = 1) | NO (assigned point value = 7) | OS1 (sub-standard elements); OS2 (vehicle load restrictions); OS3 (bicyclists/pedestrian); OS4 (reduce crashes); OS5 (future traffic); OS6 (reduce delay) |
| **Impact / Accommodate** (quantitative) | Order of Ranking (1 – 7) | | OS7 (efficient connections); CC1 (construction costs); CC2 (maintenance costs); R1 (aquatic resources); NS1 (private parcels); NS3 (r/w); NS4 (traffic volumes) |

## 1.6. SECOND LEVEL SCREENING ASSESSMENT AND RESULTS

### 1.6.1. OS1 – WOULD THE OPTION IMPROVE SUB-STANDARD ELEMENTS ON THE BRIDGE?

A major substandard element of the existing bridge is the bridge deck width, which results in only one travel lane being available. This screening criterion determines the option's potential to address the substandard elements found on the bridge. The 2011 Bridge Inspection Report and the public list other areas of concern as contained in the *Existing and Projected Conditions* Report (pages 26-30). Any option that results in two lanes (one lane for each direction) on the bridge would meet current design standards and would therefore not exhibit sub-standard elements, meriting a YES response to this criterion. Other options that retain a one-lane configuration or do not provide additional bridge width would not rectify the substandard bridge condition and would receive a NO answer.

**Table 7** shows how the options address the substandard elements on the bridge screening question.

**Table 7: Screening Results for Criterion OS1**

| *Option ID* | *Answer/Reasoning* | *Assigned Points* |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| **1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel** | **NO.** Although a new one-way, one-lane bridge at a new location could be constructed to meet an appropriate width, the existing Maclay Bridge remaining in place is still substandard at 14' in width (16' required). | **7** |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| **2C - Minor Rehabilitation (includes Approaches)** | **NO.** Minor rehabilitation would not address or improve the substandard bridge width. | **7** |
| **2D - Major Rehabilitation (includes Approaches)** | **NO.** Major rehabilitation would not address or improve the substandard bridge width. | **7** |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| **3A.2 - North 1 Alignment** | **YES.** A new bridge can be built to meet current design standards, without any substandard bridge elements. | **1** |
| **3B.2 - Mount 2 Alignment** | **YES.** A new bridge can be built to meet current design standards, without any substandard bridge elements. | **1** |
| **3B.4 - South 1 Alignment** | **YES.** A new bridge can be built to meet current design standards, without any substandard bridge elements. | **1** |
| **3B.4 - South 2 Alignment** | **YES.** A new bridge can be built to meet current design standards, without any substandard bridge elements. | **1** |

### 1.6.2. OS2 – WOULD THE OPTION IMPROVE VEHICLE LOAD RESTRICTIONS ON THE BRIDGE?

This screening criterion determines whether or not the option improves or resolves load restrictions on vehicle use of the bridge. The existing bridge has a posted load limit of 11 tons. Inherent to the load restrictions, there are also speed restrictions in place for some of the larger vehicles using the bridge, such as emergency vehicles and school buses (note that these vehicles must also travel in the center of the bridge deck as they cross). Options that could eliminate or improve the existing load restriction up to at least a 25-ton-limit would merit a YES answer. Those options that would result in something less than at least a 25-ton-limit would merit a NO answer.

**Table 8** shows how the options rate with respect to eliminating or improving load restriction.

**Table 8: Screening Results for Criterion OS2**

| Option ID | Answer/Reasoning | Assigned Points |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | **NO.** Although a new one-way, one-lane bridge at a new location could be constructed to meet an appropriate loading, the existing Maclay Bridge remaining in place is still load restricted below 25 tons. | 7 |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| 2C - Minor Rehabilitation (includes Approaches) | **NO.** Minor rehabilitation would not address or improve the load limit up to 25 tons. | 7 |
| 2D - Major Rehabilitation (includes Approaches) | **YES.** Major rehabilitation efforts could increase the load limit to 25 tons, thereby eliminating load restrictions. | 1 |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| 3A.2 - North 1 Alignment | **YES.** A new bridge can be built to meet at least a 25-ton-load standard. | 1 |
| 3B.2 - Mount 2 Alignment | **YES.** A new bridge can be built to meet at least a 25-ton-load standard. | 1 |
| 3B.4 - South 1 Alignment | **YES.** A new bridge can be built to meet at least a 25-ton-load standard. | 1 |
| 3B.4 - South 2 Alignment | **YES.** A new bridge can be built to meet at least a 25-ton-load standard. | 1 |

*NOTE 1: Any new bridge would be built to current MDT loading standards, which incorporate a design loading greater than 25-tons.*

### 1.6.3. OS3 – WOULD THE OPTION ACCOMMODATE BICYCLISTS/PEDESTRIANS ON THE BRIDGE AND ITS APPROACHES?

This screening criterion indicates whether or not the option accommodates bicyclists and pedestrians on the bridge and its approaches. Safe bicycle and pedestrian facilities implies a space for bicyclist or pedestrian use. Exact widths and types of space are unknown, as this is a design-level detail. However whether or not an option can provide bicycle/pedestrian mobility can be reasonably estimated for the options. Options that could provide space for bicycle and pedestrian travel would merit a YES answer. Those options that would not allow for provision of space for bicycle and pedestrian would merit a NO answer. If an option could provide space on the approaches, but not across the bridge, a NO response is given, as that scenario results in a discontinuous facility for non-motorized use. New structures could be designed to provide space for bicycle and pedestrians. **Table 9** shows how the options rate with respect to accommodating bicyclists/pedestrians on the bridge and its approaches.

**Table 9: Screening Results for Criterion OS3**

| Option ID | Answer/Reasoning | Assigned Points |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | **NO.** Although a new one-way, one-lane bridge at a new location could be constructed to accommodate bicyclists and pedestrians, the existing bridge conditions still exhibit conflicts on the bridge, as well as on River Pines Road. | 7 |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| 2C - Minor Rehabilitation (includes Approaches) | **NO.** Minor rehabilitation would not address conflicts on the existing bridge between motorized & non-motorized travel. Approach conflicts could be eliminated with | 7 |

| | | |
|---|---|---|
| | approach work. | |
| 2D - Major Rehabilitation (includes Approaches) | **NO.** Major rehabilitation would not address conflicts on the existing bridge between motorized & non-motorized travel. Approach conflicts could be eliminated with approach work. | **7** |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| 3A.2 - North 1 Alignment | **YES.** A new bridge with associated approach work can be built to accommodate bicyclists and pedestrians. | **1** |
| 3B.2 - Mount 2 Alignment | **YES.** A new bridge with associated approach work can be built to accommodate bicyclists and pedestrians. | **1** |
| 3B.4 - South 1 Alignment | **YES.** A new bridge with associated approach work can be built to accommodate bicyclists and pedestrians. | **1** |
| 3B.4 - South 2 Alignment | **YES.** A new bridge with associated approach work can be built to accommodate bicyclists and pedestrians. | **1** |

### 1.6.4. OS4 – WOULD THE OPTION REDUCE CRASHES RESULTING FROM APPROACHES TO THE BRIDGE?

This screening criterion indicates whether or not the option would reduce crashes on the approaches to the bridge. A review of the crash history on area roadways shows substandard elements (deficiencies) on approaches contribute to the crashes. These substandard elements include horizontal alignment concerns, lack of road shoulders, steep roadside slopes, obstructions in clear zone, lack of lighting. Crash clusters have been identified on: North Avenue near the existing bridge, the intersection of River Pines Road/Riverside Drive, on Blue Mountain and Big Flat Roads, and on South Avenue (east of Woodlawn). Options that could reduce crashes resulting on approaches to the bridge, whether existing or new, would merit a YES answer. Those options that would not reduce crashes on approaches to the bridge would merit a NO answer.

**Table 10** shows how the options rate with respect to the potential to reduce crashes resulting from deficiencies on the approaches to the bridge.

**Table 10: Screening Results for Criterion OS4**

| *Option ID* | *Answer/Reasoning* | *Assigned Points* |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | **NO.** A new one-way, one-lane bridge at a new location could be constructed to current standards, thus reducing the potential for crashes. However, the existing bridge still would remain in its current configuration with no approach reconstruction, thus existing crash trends are still unresolved. | **7** |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| 2C - Minor Rehabilitation (includes Approaches) | **YES.** Minor rehabilitation on the existing bridge includes revising the approaches to meet current standards. Elimination of substandard approaches to meet current standards may reduce crashes. | **1** |
| 2D - Major Rehabilitation (includes Approaches) | **YES.** Major rehabilitation on the existing bridge includes revising the approaches to meet current standards. Elimination of substandard approaches to meet current standards may reduce crashes. | **1** |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| 3A.2 - North 1 Alignment | **YES.** A new bridge crossing with approaches would be built to current design standards, thus limiting the potential | **1** |

| | | |
|---|---|---|
| | for crashes on the approaches. | |
| 3B.2 - Mount 2 Alignment | **YES.** A new bridge crossing with approaches would be built to current design standards, thus limiting the potential for crashes on the approaches. | **1** |
| 3B.4 - South 1 Alignment | **YES.** A new bridge crossing with approaches would be built to current design standards, thus limiting the potential for crashes on the approaches. | **1** |
| 3B.4 - South 2 Alignment | **YES.** A new bridge crossing with approaches would be built to current design standards, thus limiting the potential for crashes on the approaches. | **1** |

### 1.6.5. OS5 – WOULD THE OPTION ACCOMMODATE FUTURE CAPACITY DEMANDS?

This screening criterion determines whether or not the option would accommodate future capacity demands. Future capacity demands include things like providing a roadway wide enough for simultaneous bi–direction travel, and offering a crossing without limitations or restrictions due to horizontal and vertical clearances. The idea is to provide a facility that will readily accommodate increasing traffic demands due to area growth over the next 20-plus years. Traffic is expected to increase on River Pines Road from the year 2010 count volume of 2,610 vehicles per day (vpd) to 5,650 vpd (year 2040 projected volume). North Avenue traffic will increase from the year 2010 count volume of 2,000 vpd to 4,750 vpd (year 2040 projected volume). These projected future year volumes exceed the planning level capacity threshold of a one-lane, two-directional road facility. Providing sufficient capacity is important to the development of an efficient future transportation network in Missoula area. Options that would accommodate future capacity demands on the bridge would merit a YES answer. Those options that would maintain the status quo, or would not accommodate future capacity demands, would merit a NO answer.

**Table 11** shows how the options rate with respect to the potential to accommodate future capacity demands.

**Table 11: Screening Results for Criterion OS5**

| *Option ID* | *Answer/Reasoning* | *Assigned Points* |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | **YES.** A new one-way, one-lane bridge at a new location, coupled with the existing bridge reconfigured as one-way, could provide the needed capacity – similar to that of a two-lane, two-way bridge. | **1** |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| 2C - Minor Rehabilitation (includes Approaches) | **NO.** Minor rehabilitation of the existing bridge and approaches does not improve capacity limitations of the one-lane, two-direction configuration. | **7** |
| 2D - Major Rehabilitation (includes Approaches) | **NO.** Major rehabilitation of the existing bridge and approaches does not improve capacity limitations of the one-lane, two-direction configuration. | **7** |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| 3A.2 - North 1 Alignment | **YES.** A new two-lane, two-way bridge crossing with approaches would be built to current design standards, and provide future capacity for the foreseeable future. | **1** |
| 3B.2 - Mount 2 Alignment | **YES.** A new two-lane, two-way bridge crossing with approaches would be built to current design standards, and provide future capacity for the foreseeable future. | **1** |

| | | |
|---|---|---|
| 3B.4 - South 1 Alignment | **YES.** A new two-lane, two-way bridge crossing with approaches would be built to current design standards, and provide future capacity for the foreseeable future. | **1** |
| 3B.4 - South 2 Alignment | **YES.** A new two-lane, two-way bridge crossing with approaches would be built to current design standards, and provide future capacity for the foreseeable future. | **1** |

### 1.6.6. OS6 – WOULD THE OPTION HELP REDUCE OR ELIMINATE VEHICLE DELAYS AT THE RIVER CROSSING?

This screening criterion determines whether or not the option would reduce or eliminate vehicle delays at the river crossing. The current bridge allows for traffic to cross the structure in one direction at a time. This delays vehicles waiting to cross in the opposing direction. These vehicles may occasionally include emergency responders. Options that provide a new bridge crossing with two lanes would reduce or eliminate vehicle delays, and would merit a YES answer. Those options that would retain the one-lane, two-way bridge, or consist of two one-way bridges (existing bridge and new location), would not reduce or eliminate vehicle delays and would merit a NO answer.

**Table 12** shows how the options rate with respect to reducing or eliminating vehicle delays at the river crossing.

**Table 12: Screening Results for Criterion OS6**

| *Option ID* | *Answer/Reasoning* | *Assigned Points* |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | **NO.** This option does not reduce or eliminate vehicle delays for all users. The existing bridge reconfigured as one-way would still have load restrictions under the 25-ton-limit. Emergency responders would still have restrictions leading to additional delay for travel. | **7** |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| 2C - Minor Rehabilitation (includes Approaches) | **NO.** Minor rehabilitation of the existing bridge and approaches would still have load restrictions under the 25-ton-limit. Emergency responders would still have restrictions leading to additional delay. | **7** |
| 2D - Major Rehabilitation (includes Approaches) | **NO.** Major rehabilitation of the existing bridge and approaches would likely remove the current load restrictions and achieve a 25-ton design loading, but the one-lane, two-way configuration does not eliminate or reduce delay to the travelling public or emergency service responders. | **7** |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| 3A.2 - North 1 Alignment | **YES.** A new two-lane, two-way bridge crossing with approaches would be built to current design standards, and reduce delay over that experienced at the existing bridge. | **1** |
| 3B.2 - Mount 2 Alignment | **YES.** A new two-lane, two-way bridge crossing with approaches would be built to current design standards, and reduce delay over that experienced at the existing bridge. | **1** |
| 3B.4 - South 1 Alignment | **YES.** A new two-lane, two-way bridge crossing with approaches would be built to current design standards, and reduce delay over that experienced at the existing bridge. | **1** |
| 3B.4 - South 2 Alignment | **YES.** A new two-lane, two-way bridge crossing with approaches would be built to current design standards, and reduce delay over that experienced at the existing bridge. | **1** |

### 1.6.7. OS7 – DOES THE OPTION PROVIDE AN EFFICIENT GRID CONNECTION TO THE MAJOR ROAD/STREET NETWORK IN THE MISSOULA AREA?

This screening criterion indicates whether or not the option would provide an efficient grid connection to the major road/street network in the Missoula area by measuring the total length of travel between two points (in both directions). For each of the seven options, the length of travel between the intersections of South Avenue/Clements Road and Big Flat Road/ River Pines Road/Blue Mountain Road/O'Brien Creek Road was measured. This screening consideration gets at whether the option provides a relatively direct linkage to the roadway grid system, and whether the length of travel with each option is less or more, for comparison purposes. An efficient connection to an established grid network is an important consideration of the transportation system in terms of reducing out-of-direction travel, thus reducing travel time, travel costs, and controlling emissions. A point ranking system is used where the option exhibiting the longest length of travel between the two subject intersections, in both directions, receives the highest number of points (7 possible) and the shortest length of travel between the two subject intersections, in both directions, receives the lowest number of points (1 possible). Since options 2.C, 2.D, and 3A.2 all potentially could realize similar lengths of travel, (i.e. 18,600 feet), they were given an equal ranking of 5 points (rather than 4, 5, and 6 points, respectively) as shown in **Table 9**. The value of 5 points is an average obtained by summing the position of the three options in the ranking (i.e. 4, 5 and 6) and dividing the total by 3.

**Table 13** shows how the options rate with respect to providing an efficient grid connection to the major road/street network in the Missoula area.

**Table 13: Screening Results for Criterion OS7**

| *Option ID* | *Answer/Reasoning* | *Assigned Points* |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| **1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel** | Total travel length = 16,275 feet. *(This includes 7,225 feet in eastbound direction and 9,150 feet in westbound direction).* | **3** |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| **2C - Minor Rehabilitation (includes Approaches)** | Total travel length = 18,600 feet. *(This includes 9,300 feet in eastbound direction and 9,300 feet in westbound direction).* | **5** |
| **2D - Major Rehabilitation (includes Approaches)** | Total travel length = 18,600 feet. *(This includes 9,300 feet in eastbound direction and 9,300 feet in westbound direction).* | **5** |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| **3A.2 - North 1 Alignment** | Total travel length = 18,600 feet. *(This includes 9,300 feet in eastbound direction and 9,300 feet in westbound direction).* | **5** |
| **3B.2 - Mount 2 Alignment** | Total travel length = 21,200 feet. *(This includes 10,600 feet in eastbound direction and 10,600 feet in westbound direction).* | **7** |
| **3B.4 - South 1 Alignment** | Total travel length = 14,450 feet. *(This includes 7,225 feet in eastbound direction and 7,225 feet in westbound direction).* | **1** |
| **3B.4 - South 2 Alignment** | Total travel length = 14,750 feet. *(This includes 7,375 feet in eastbound direction and 7,375 feet in westbound direction).* | **2** |

### 1.6.8. CC1 – PLANNING LEVEL CONSTRUCTION COSTS?

High level planning cost estimates provide a reasonable measure to help compare the general magnitude of capital construction costs among the options under consideration, or against typical construction costs associated with similar projects. The estimates reflect only the cost of construction and do not include highly variable costs like those associated with right-of-way acquisition, project development activities (preliminary engineering, indirect and incidental costs, etc.), environmental mitigation, or inflation. Necessary items that were considered to arrive at the high level planning cost included the following:

- Approximate bridge length (assumes bridge would have to be longer than the river's edge bank width)
- Approximate bridge width (assumes minimum width of 28 feet for two-way / 16 feet for one-way)
- Degree of skew of the bridge crossing (higher skew is more difficult to design, construct, and permit)
- Approximate bridge approach (i.e. road) length
- Approximate bridge approach width (assumes 40 feet minimum)

A minimum "new" width for bridge construction was assumed to be 28 feet, as this is the narrowest typical section that can be utilized (as discussed in the Existing and Projected Conditions Report). For the one-way new bridge option, the minimum bridge width would be 16 feet. For bridge lengths, it was assumed that any new bridge would have to be longer than the bank widths by 20 feet on each side. This assumption is considered realistic and allows for a reasonable comparison of similar potential bridge lengths. Design or rehabilitation details are not known as this time, including the number of piers in river, maximum span length, steel vs. reinforced concrete substructure, rehabilitation of existing bridge on-site or off-site, etc. This criterion also relies on the potential length of new approach road required for each option, and makes a determination of whether or not a substantial upgrade to approaches is required.

A point ranking system is used where the option exhibiting the highest planning level cost receives the most points (7 possible) and the option exhibiting the lowest planning level cost receives the fewest points (1 possible). **Appendix A** contains information on assumptions relative to planning level cost determination.

**Table 14** shows how the options rate with respect to the planning level constructions costs.

**Table 14: Screening Results for Criterion CC1**

| *Option ID* | *Answer/Reasoning* | *Assigned Points* |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| **1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel** | Estimated planning cost = $3,210,000. | **3** |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| **2C - Minor Rehabilitation (includes Approaches)** | Estimated planning cost = $776,000 (~$125k bridge). | **1** |
| **2D - Major Rehabilitation (includes Approaches)** | Estimated planning cost = $1,760,000 (~$850k bridge). | **2** |
| **OPTION 3 - BUILD NEW BRIDGE** | | |

| | | |
|---|---|---|
| 3A.2 - North 1 Alignment | Estimated planning cost = $3,650,000. | 4 |
| 3B.2 - Mount 2 Alignment | Estimated planning cost = $6,410,000. | 7 |
| 3B.4 - South 1 Alignment | Estimated planning cost = $5,210,000. | 5 |
| 3B.4 - South 2 Alignment | Estimated planning cost = $5,290,000. | 6 |

*NOTE 1: Option 2C bridge costs range from $50k to $200k, thus an average of $125k was used in the estimate.*
*NOTE 2: For option 2D bridge costs range from $200k to $1,500k, thus an average of $850k was used.*
*NOTE 3: Planning level costs are developed for comparison purposes only to accomplish screening. While every effort is made to forecast reasonable costs, the costs in **Table 14** may ultimately be greater or lesser during project development activities.*

### 1.6.9. CC2 – ANNUALIZED MAINTENANCE COSTS?

This criterion provides some indication of annual maintenance costs for each option. The potential maintenance costs for the approach roads have been calculated as an annual maintenance cost in present day dollars (2012) by using an average maintenance cost of $4,300 per lane mile (based on query of statewide average maintenance costs). For bridge maintenance costs, a review of past expenditures provided by Missoula County for the Maclay Bridge over a twenty-year period was completed. During the time period between 1993 and 2013, $147,000 will have been expended on the Maclay Bridge. This equals approximately $7,350 per year, or $1.50 per square foot, for bridge maintenance activities on the existing Maclay Bridge. Potential bridge maintenance costs were developed based on this cost per square foot, and applied to those options that retain the existing bridge as part of the option (i.e. options 1.G and 2.C). Option 2.D is assumed to have no 20-year bridge maintenance need since a major rehabilitation effort inherently would bring the condition of the bridge up to a standard that is similar to a new bridge.

A point ranking system is used where the option exhibiting the highest annualized maintenance cost receives the highest number of points (7 possible) and the option exhibiting the lowest annualized maintenance cost receives the lowest number of points (1 possible) as shown in **Table 15**. **Appendix B** contains information on assumptions relative to annualized maintenance cost determination.

**Table 15** shows how the options rate with respect to the annualized maintenance costs.

**Table 15: Screening Results for Criterion CC2**

| *Option ID* | *Answer/Reasoning* | *Assigned Points* |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | Estimated maintenance cost = $10,000. Includes bridge maintenance cost. Road maintenance costs are based on "lane-miles", so with this configuration the option length is not "doubled" (see **Appendix B**). | 6 |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| 2C - Minor Rehabilitation (includes Approaches) | Estimated maintenance cost = $10,400. Includes bridge maintenance cost. | 7 |
| 2D - Major Rehabilitation (includes Approaches) | Estimated maintenance cost = $3,100. Includes bridge maintenance cost same as option 2C due to uncertainties over scope of rehabilitation. | 3 |
| **OPTION 3 - BUILD NEW BRIDGE** | | |

| | | |
|---|---|---|
| 3A.2 - North 1 Alignment | Estimated maintenance cost = $3,300. | 5 |
| 3B.2 - Mount 2 Alignment | Estimated maintenance cost = $3,000. | 2 |
| 3B.4 - South 1 Alignment | Estimated maintenance cost = $2,100. | 1 |
| 3B.4 - South 2 Alignment | Estimated maintenance cost = $3,200. | 4 |

### 1.6.10. R1 – EFFECTS ON AQUATIC RESOURCES?

This criterion differentiates between options based on their potential effects to aquatic resources by considering the extent of work in the delineated floodplain. Information on the delineated floodplain is available via DFIRM maps (draft digital FIRM [DFIRM] panel 1455E) in a GIS database format, and was previously shown in the study's *Environmental Scan*. National Wetland Inventory (NWI) wetlands are identified in the area; however, detailed wetland delineations are not completed for a planning study and therefore are not available to consider as a screening mechanism. If a project is forwarded a detailed wetland delineation would be completed. A point ranking system is used where the option exhibiting the longest crossing of the delineated 100-year floodplain receives the highest number of points (7 possible) and the shortest crossing of the 100-year delineated floodplain receives the lowest number of points (1 possible). Since options 2.C, 2.D, and 3A.2 all potentially could impact the same length of floodplain (i.e. 1,725 feet), they were given an equal ranking of 5 points (rather than 4, 5, and 6 points, respectively) as shown in **Table 16**. The value of 5 points is an average obtained by summing the position of the three options in the ranking (i.e. 4, 5 and 6) and dividing the total by 3.

Note that each option when analyzed also includes existing infrastructure and corresponding lengths within the floodplain. As an example, a rehabilitation option may only include work to the existing Maclay Bridge, however that option is still part of a road system that includes North Avenue and River Pines Road that collectively falls within and potentially impacts the floodplain form and function.

**Table 16** shows how the options rate with respect to the effects on aquatic resources.

**Table 16: Screening Results for Criterion R1**

| *Option ID* | *Answer/Reasoning* | *Assigned Points* |
|---|---|---|
| OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE | | |
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | Estimated length of floodplain encroachment = 2,910 feet. | 7 |
| OPTION 2 - REHABILITATE THE BRIDGE | | |
| 2C - Minor Rehabilitation (includes Approaches) | Estimated length of floodplain encroachment = 1,730 feet. | 5 |
| 2D - Major Rehabilitation (includes Approaches) | Estimated length of floodplain encroachment = 1,730 feet. | 5 |
| OPTION 3 - BUILD NEW BRIDGE | | |
| 3A.2 - North 1 Alignment | Estimated length of floodplain encroachment = 1,730 feet. | 5 |
| 3B.2 - Mount 2 Alignment | Estimated length of floodplain encroachment = 700 feet. | 1 |

| | | |
|---|---|---|
| 3B.4 - South 1 Alignment | Estimated length of floodplain encroachment = 1,180 feet. | 2 |
| 3B.4 - South 2 Alignment | Estimated length of floodplain encroachment = 1,270 feet. | 3 |

## 1.6.11. R2 – WILL THE OPTIONS HAVE IMPACTS TO PROTECTED 4 (F) OR SECTION 106 RESOURCES?

This criterion determines whether the options have the potential for impacting resources that are protected by Section 4(f) or fall under Section 106 of the National Historic Preservation Act (36 CFR 800). Section 4(f) resources include public parks, recreation areas, or wildlife and waterfowl refuges of national, State, or local significance, or land from a historic site of national, State, or local significance. Section 106 of the National Historic Preservation Act (36 CFR 800) establishes requirements for taking into account the effects of proposed Federal, Federally-assisted or Federally-licensed undertakings on any district, site, building, structure or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). For the Maclay Bridge Planning Study, these resources include historic residences/outbuildings, a historic school building, and historic irrigation features. Section 4(f) and 106 resources were identified in the study's *Environmental Scan*.

Options that would have the potential for impacting 4(f) or Section 106 resources would merit a HIGH answer. Those options that would not have the potential for impacting 4(f) or Section 106 resources would merit a LOW answer.

**Table 17** shows how the options rate with respect to the potential for impacting 4(f) or Section 106 resources.

### Table 17: Screening Results for Criterion R2

| *Option ID* | *Answer/Reasoning* | *Assigned Points* |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | **LOW.** Assumes activities to the existing Maclay Bridge would be minor in nature to accommodate one-way travel, and new South Avenue location for opposing one-way direction does not impact Section 4(f) resources or any known cultural, historic or archaeological resources. | 1 |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| 2C - Minor Rehabilitation (includes Approaches) | **LOW.** Minor rehabilitation activities are not expected to impact the aesthetic and visual characteristics of the existing Maclay Bridge. | 1 |
| 2D - Major Rehabilitation (includes Approaches) | **HIGH.** Major rehabilitation activities would potentially alter characteristics of the existing Maclay Bridge. It is likely that the truss appearance and other bridge member appearance could change. Such effects could be a Section 4(f) use and affect the structure's eligibility for the National Register. | 7 |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| 3A.2 - North 1 Alignment | **HIGH.** A new bridge slightly upstream of the existing Maclay Bridge, a Section 4(f) resource (24MO0521), would necessitate removal of the existing bridge. This would be a 4(f) use, and an adverse effect under section 106. | 7 |
| 3B.2 - Mount 2 Alignment | **HIGH.** This route would cross a Missoula Irrigation District Ditch (24MO0520) that was given a consensus determination of eligibility for the National Register. This would be a minor 4(f) use and a minor impact under | 7 |

| | | |
|---|---|---|
| | section 106. | |
| 3B.4 - South 1 Alignment | **LOW.** This route does not directly impact any identified Section 4(f) resources, nor does it directly impact any identified cultural, historic or archaeological resources. | **1** |
| 3B.4 - South 2 Alignment | **LOW.** Same as reasoning for South 1 above. | **1** |

## 1.6.12. R3 – WILL THE OPTIONS AFFECT LANDS HELD UNDER CONSERVATION EASEMENTS?

This criterion determines whether the options have potential to affect lands held under conservation easements, and would require crossing those lands. Sizable areas of private land along the Bitterroot River are held under conservation easements by the Five Valleys Land Trust. Conservation easements exist for the purposes of preserving open space, protecting fish or wildlife habitat, or limiting the extent and density of development. Options that would have the potential for crossing lands held under conservation easements would merit a HIGH answer. Those options that would not have the potential for crossing lands held under conservation easements would merit a LOW answer.

**Table 18** shows how the options rate with respect to the potential for affecting lands held under conservation easements.

### Table 18: Screening Results for Criterion R3

| *Option ID* | *Answer/Reasoning* | *Assigned Points* |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | **LOW.** Option does not affect or cross lands held under conservation. | **1** |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| 2C - Minor Rehabilitation (includes Approaches) | **LOW.** Option does not affect or cross lands held under conservation. | **1** |
| 2D - Major Rehabilitation (includes Approaches) | **LOW.** Option does not affect or cross lands held under conservation. | **1** |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| 3A.2 - North 1 Alignment | **LOW.** Option does not affect or cross lands held under conservation. | **1** |
| 3B.2 - Mount 2 Alignment | **LOW.** Option does not affect or cross lands held under conservation. | **1** |
| 3B.4 - South 1 Alignment | **LOW.** Option does not affect or cross lands held under conservation. | **1** |
| 3B.4 - South 2 Alignment | **LOW.** Option does not affect or cross lands held under conservation. | **1** |

### 1.6.13. NS1 – NUMBER OF PRIVATELY OWNED PARCELS IMPACTED?

This criterion assesses how many individual privately-owned parcels would be crossed or potentially impacted by the alignment associated with each option. The criterion is suggestive of the potential extent of R/W acquisition associated with each option. The number of privately-owned parcels crossed by an alignment was based on review of the Montana Cadastral Mapping database (accessed November 12, 2012 at http://giscoordination.mt.gov/cadastral/msdi.asp). Parcels crossed by the proposed alignment and falling within an assumed, standard 80' R/W width were counted. An exception to this is option 1.G. For option 1.G it was assumed that the new one-way configuration would necessitate a 60' R/W width.

A point ranking system is used where the option exhibiting the most number of privately owned parcels impacted receives the highest number of points (7 possible) and the least number of privately owned parcels impacted receives the lowest number of points (1 possible). Since options 2.C, 2.D, and 3A.2 all potentially could impact 12 private parcels, they were given an equal ranking of 6 points (rather than 5, 6 and 7 points, respectively) as shown in **Table 19**. The value of 6 points is an average obtained by summing the position of the three options in the ranking (i.e. 5, 6 and 7) and dividing the total by 3.

**Table 19** shows how the options rate with respect to the potential number of privately owned parcels impacted.

**Table 19: Screening Results for Criterion NS1**

| *Option ID* | *Answer/Reasoning* | *Assigned Points* |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| **1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel** | Potentially affects 3 privately owned parcels. | **1** |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| **2C - Minor Rehabilitation (includes Approaches)** | Potentially affects 12 privately owned parcels. | **6** |
| **2D - Major Rehabilitation (includes Approaches)** | Potentially affects 12 privately owned parcels. | **6** |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| **3A.2 - North 1 Alignment** | Potentially affects 12 privately owned parcels. | **6** |
| **3B.2 - Mount 2 Alignment** | Potentially affects 6 privately owned parcels. | **4** |
| **3B.4 - South 1 Alignment** | Potentially affects 4 privately owned parcels. | **2** |
| **3B.4 - South 2 Alignment** | Potentially affects 5 privately owned parcels. | **3** |

### 1.6.14. NS2 – NUMBER OF STRUCTURES IMPACTED?

This criterion identifies whether or not structures may be impacted by each option. For purposes of this criterion, structures only consist of residences. Impacts to existing structures helps assess the potential for relocations or right-of-way impact mitigations associated with the options. The number of structures potentially impacted was based on review of recent aerial photography (BingMapsAerial - © 2012 Microsoft Corporation, accessed November 12, 2012 at http://www.bing.com/maps/#). Structures are assumed to be impacted if they occur within a typical 80' wide R/W corridor. An exception to this is option

1.G. For option 1.G it was assumed that the new one-way configuration would necessitate a 60' R/W width.

Options that would potentially impact structures given the assumptions above would merit a HIGH answer, while those that would not potentially impact structures are given a LOW answer.

**Table 20** shows how the options rate with respect to the number of structures impacted.

**Table 20: Screening Results for Criterion NS2**

| *Option ID* | *Answer/Reasoning* | *Assigned Points* |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| **1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel** | **LOW.** No structures impacted. | **1** |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| **2C - Minor Rehabilitation (includes Approaches)** | **HIGH.** Potentially impacts one (1) structure. | **7** |
| **2D - Major Rehabilitation (includes Approaches)** | **HIGH.** Potentially impacts one (1) structure. | **7** |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| **3A.2 - North 1 Alignment** | **HIGH.** Potentially impacts one (1) structure. | **7** |
| **3B.2 - Mount 2 Alignment** | **LOW.** No structures impacted. | **1** |
| **3B.4 - South 1 Alignment** | **LOW.** No structures impacted. | **1** |
| **3B.4 - South 2 Alignment** | **LOW.** No structures impacted. | **1** |

## 1.6.15. NS3 – R/W NEEDS?

This criterion estimates how much new right-of-way may be required with each option. An assumed new right-of-way width of 80 feet is used for the option's alignments, and any known existing right-of-way is subtracted out, yielding a potential new right-of-way need. An exception to this is option 1.G. For option 1.G it was assumed that the new one-way configuration would necessitate a 60' R/W width. Existing available right-of-way was measured from the Montana Cadastral Mapping database (accessed November 12, 2012 at http://giscoordination.mt.gov/cadastral/msdi.asp). The area crossing the Bitterroot River was also subtracted out from each option, as that would require a permit for crossing navigable waters from the Montana Department of Natural Resources and Conservation (DNRC).

A point ranking system is used where the option exhibiting the most needed right-of-way receives the highest number of points (7 possible) and the option exhibiting the least needed right-of-way receives the lowest number of points (1 possible). Since options 2.C, 2.D, and 3A.2 all potentially have the same right-of-way needs, they were given an equal ranking of 2 points (rather than 1, 2 and 3 points, respectively) as shown in **Table 21**. The value of 2 points is an average obtained by summing the position of the three options in the ranking (i.e. 1, 2 and 3) and dividing the total by 3.

**Table 21** shows how the options rate with respect to the new "net" right-of-way potentially required.

**Table 21: Screening Results for Criterion NS3**

| Option ID | Answer/Reasoning | Assigned Points |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | Potential new r/w needed = 1.1 acres. | 4 |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| 2C - Minor Rehabilitation (includes Approaches) | Potential new r/w needed = 0.4 acres. | 2 |
| 2D - Major Rehabilitation (includes Approaches) | Potential new r/w needed = 0.4 acres. | 2 |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| 3A.2 - North 1 Alignment | Potential new r/w needed = 0.4 acres. | 2 |
| 3B.2 - Mount 2 Alignment | Potential new r/w needed = 2.4 acres. | 7 |
| 3B.4 - South 1 Alignment | Potential new r/w needed = 1.5 acres. | 5 |
| 3B.4 - South 2 Alignment | Potential new r/w needed = 2.3 acres. | 6 |

## 1.6.16. NS4 – DOES THE OPTION COMPARE FAVORABLY WITH YEAR 2040 "NO ACTION" MODEL TRAFFIC VOLUME INCREASES IN FRONT OF TARGET RANGE SCHOOL?

This criterion measures the potential for traffic volume changes in front of the Target Range School. Target Range School is located on South Avenue, just east of Clements Road. Public comments have expressed concerns about decreased safety in the vicinity of schools due to more traffic and increased travel speeds that could result from some options. The Missoula MPO travel demand model was used to compare future year 2040 "No Action" conditions to the options being considered that may affect traffic distribution. A point ranking system was developed based on the percent increase (or decrease) associated with each options modeled year 2040 traffic volumes as compared to the modeled year 2040 "No Action" traffic volumes. Options 2.C and 2.D do not have any changes, as the improvements contemplated under rehabilitation of the bridge do not affect capacity, thus not influencing the model. The option exhibiting the greatest percent change in traffic model volumes directly in front of Target Range School receives the highest number of points (7 possible) and the option exhibiting the least change in traffic model volumes directly in front of Target Range School receives the lowest number of points (1 possible). Since options 2.C and 2.D do not change traffic volumes in front of the school, they were given an equal ranking of 2 points (rather than 2 and 3 points, respectively) as shown in **Table 22**.

**Table 22** shows how the options rate with respect to ADT volume increases in front of the Target Range School.

**Table 22: Screening Results for Criterion NS4**

| Option ID | Answer/Reasoning | Assigned Points |
|---|---|---|
| **OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON THE EXISTING BRIDGE** | | |
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | **NO.** Traffic in front of Target Range School increases when compared to the future year 2040 "No Action" model volume (increases by 5.3%). | 5 |
| **OPTION 2 - REHABILITATE THE BRIDGE** | | |
| 2C - Minor Rehabilitation (includes Approaches) | **YES.** Compared to future year 2040 "No Action" model volume, traffic does not increase in front of Target Range School (no change in volumes). | 2 |
| 2D - Major Rehabilitation (includes Approaches) | **YES.** Compared to future year 2040 "No Action" model volume, traffic does not increase in front of Target Range School (no change in volumes). | 2 |
| **OPTION 3 - BUILD NEW BRIDGE** | | |
| 3A.2 - North 1 Alignment | **NO.** Traffic in front of Target Range School increases when compared to the future year 2040 "No Action" model volume (increases by 1.1%). | 4 |
| 3B.2 - Mount 2 Alignment | **YES.** Compared to future year 2040 "No Action" model volume, traffic does not increase in front of Target Range School (decreases by 1.0%). | 1 |
| 3B.4 - South 1 Alignment | **NO.** Traffic in front of Target Range School increases when compared to the future year 2040 "No Action" model volume (increases by 17.9%). | 7 |
| 3B.4 - South 2 Alignment | **NO.** Traffic in front of Target Range School increases when compared to the future year 2040 "No Action" model volume (increases by 17.4%). | 6 |

## 1.7. SECOND LEVEL SCREENING RESULTS

Sixteen second level screening criteria were developed to assist in the evaluation of the seven options forwarded for consideration through the first level screening process. The sixteen second level criteria address each of the needs, and many of the objectives, previously identified during the course of the study. Efforts were made not to "double count" the particular item being screened, and all criteria were treated equal in that no "weighting" occurred – thus no one criterion is more important than the other.

The results of the second level screening criteria are shown in **Table 23**. The point ranking was developed such that those options with the fewest points rank the best and are considered desirable, while those with the most points rank the worst and are considered undesirable.

- 3B.4 - South 1 Alignment (32 POINTS)
- 3B.4 - South 2 Alignment (39 POINTS)
- 3B.2 - Mount 2 Alignment (44 POINTS)
- 3A.2 - North 1 Alignment (52 POINTS)
- 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel (68 POINTS)
- 2D - Major Rehabilitation (includes Approaches) (70 POINTS)
- 2C - Minor Rehabilitation (includes Approaches) (73 POINTS)

# Table 23: Summary of Second Level Screening Assessment

| First Level Screening Consideration | RANGE OF OPTIONS | | | | | | |
|---|---|---|---|---|---|---|---|
| | OPTION 1 - IMPROVE SAFETY AND OPERATIONS ON EXISTING BRIDGE | OPTION 2 - REHABILITATE THE BRIDGE | | OPTION 3 - BUILD NEW BRIDGE | | | |
| | 1G<br>Add new 1 –lane bridge Retain old for 1-way travel | 2C<br>Minor Rehab (includes Approaches) | 2D<br>Major Rehab (includes Approaches) | 3A.2<br>North 1 | 3B.2<br>Mount 2 | 3B.4<br>South 1 | 3B.4<br>South 2 |
| *OS1. Would the option improve sub-standard elements on the bridge?* | 7 | 7 | 7 | 1 | 1 | 1 | 1 |
| *OS2. Would the option improve vehicle load restrictions on the bridge?* | 7 | 7 | 1 | 1 | 1 | 1 | 1 |
| *OS3. Would the option accommodate bicyclists/pedestrians on the bridge and its approaches?* | 7 | 7 | 7 | 1 | 1 | 1 | 1 |
| *OS4. Would the option reduce crashes resulting from approaches to the bridge?* | 7 | 1 | 1 | 1 | 1 | 1 | 1 |
| *OS5. Would the option accommodate future capacity demands?* | 1 | 7 | 7 | 1 | 1 | 1 | 1 |
| *OS6. Would the option help reduce or eliminate vehicle delays at the river crossing?* | 7 | 7 | 7 | 1 | 1 | 1 | 1 |
| *OS7. Does the option provide an efficient grid connection to the major road/street network in the Missoula area?* | 3 | 5 | 5 | 5 | 7 | 1 | 2 |
| *CC1. Planning level construction costs?* | 3 | 1 | 2 | 4 | 7 | 5 | 6 |
| *CC2. Annualized maintenance costs?* | 6 | 7 | 3 | 5 | 2 | 1 | 4 |
| *R 1. Effects on aquatic resources?* | 7 | 5 | 5 | 5 | 1 | 2 | 3 |
| *R 2. Will the options have impacts to protected 4 (f) or Section 106 resources?* | 1 | 1 | 7 | 7 | 7 | 1 | 1 |
| *R 3. Will the options affect lands held under conservation easements?* | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *NS1. Number of privately owned parcels impacted?* | 1 | 6 | 6 | 6 | 4 | 2 | 3 |
| *NS2. Number of structures impacted?* | 1 | 7 | 7 | 7 | 1 | 1 | 1 |
| *NS3. R/W needs?* | 4 | 2 | 2 | 2 | 7 | 5 | 6 |
| *NS4. Does the option compare favorably with year 2040 "no action" model traffic volume increases in front of Target Range School?* | 5 | 2 | 2 | 4 | 1 | 7 | 6 |
| *TOTAL TABULATED POINTS* | 68 | 73 | 70 | 52 | 44 | 32 | 39 |
| *RANKING* | 5 | 7 | 6 | 4 | 3 | 1 | 2 |

Maclay Bridge Planning Study

# APPENDIX A

## PLANNING LEVEL CONSTRUCTION COST ESTIMATES

# Second Level Screening - Planning Level Cost Estimate

(11/20/2012)

| Option 1 - Improve Safety and Operations on the Existing Bridge | Planning Level Cost (2012 Dollars) |
|---|---|
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | $3,210,000 |

| Option 2 - Rehabilitate the Bridge | Planning Level Cost (2012 Dollars) |
|---|---|
| 2C - Minor Rehabilitation (includes Approaches) | $776,000 |
| 2D - Major Rehabilitation (includes Approaches) | $1,760,000 |

| Option 3 - Build New Bridge | Planning Level Cost (2012 Dollars) |
|---|---|
| 3A.2 - North 1 Alignment | $3,650,000 |
| 3B.2 - Mount 2 Alignment | $6,410,000 |
| 3B.4 - South 1 Alignment | $5,210,000 |
| 3B.4 - South 2 Alignment | $5,290,000 |

**OPTION 1 - IMPROVE SAFETY AND OPERATION ON THE EXISTING BRIDGE**
Planning Level Cost Estimates

| Item Description | 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Tra |
|---|---|
| Estimated Bridge Length (FT) | 650 |
| Estimated Bridge Width (FT) | 16 |
| Estimated Bridge Area (SF) | 10400 |
| Estimated Bridge Skew (degrees) | 30 |
| Estimated Cost per SF | $200 |
| **Estimated Bridge Cost (SEE NOTE 1)** | $2,080,000 |
| | |
| Estimated Road Length (FT) | 2312 |
| Estimated Road Length (MILE) | 0.44 |
| Estimated Cost per MILE (SEE NOTE 2) | $600,000 |
| **Estimated Road Cost** | $262,727 |
| | |
| Bridge | $2,080,000 |
| Road Work | $262,727 |
| Traffic Control (SEE NOTE 3) | $21,018 |
| Remove Structure | $0 |
| Subtotal | $2,363,745 |
| Mobilization (18%) | $425,474 |
| Subtotal | $2,789,220 |
| Contingencies (15%) | $418,383 |
| **Total Construction (CN) - ROUNDED** | **$3,210,000** |

**NOTE 1:**
Bridge skew 0 to 15 degrees - USE $165 per SF
Bridge skew 14 to 30 degrees - USE $200 per SF
Bridge skew greater than 30 degrees - USE $250 SF
Road widths 40 feet (two-way/two-lane); 20 feet (one-way/one-lane)

**NOTE 2:**
$1.2 million per mile obtained from from MDT PET
spreadsheet tool (MSEXCEL) dated September 2011.
Assumes 40-foot top width, 0.3' pms, 2"cts, and
1-foot crushed aggregate base course.
Adjusted downward for one-way infrastructure (20 feet - $600,00)

**NOTE 3:**
Traffic control uses 8% of road cost

**OPTION 2 - REHABILITATION**
Planning Level Cost Estimates

| Item Description | 2C - Minor Rehabilitation (w/Approaches) | 2D - Major Rehabilitation (w/Approaches) |
|---|---|---|
| Estimated Bridge Length (FT) | | |
| Estimated Bridge Width (FT) | | |
| Estimated Bridge Area (SF) | | |
| Estimated Bridge Skew (degrees) | | |
| Estimated Cost per SF | | |
| **Estimated Bridge Cost** | $125,000 | $850,000 |
| | | |
| Estimated Road Length (FT) | 1642 | 1642 |
| Estimated Road Length (MILE) | 0.31 | 0.31 |
| Estimated Cost per MILE (SEE NOTE 2) | $1,200,000 | $1,200,000 |
| **Estimated Road Cost** | $373,182 | $373,182 |
| | | |
| Bridge | $125,000 | $850,000 |
| Road Work | $373,182 | $373,182 |
| Traffic Control (SEE NOTE 3) | $29,855 | $29,855 |
| Remove Structure (SEE NOTE 4) | $44,000 | $44,000 |
| Subtotal | $572,036 | $1,297,036 |
| Mobilization (18%) | $102,967 | $233,467 |
| Subtotal | $675,003 | $1,530,503 |
| Contingencies (15%) | $101,250 | $229,575 |
| **Total Construction (CN) - ROUNDED** | **$776,000** | **$1,760,000** |

**NOTE 1:**
Bridge skew 0 to 15 degrees - USE $165 per SF
Bridge skew 14 to 30 degrees - USE $200 per SF
Bridge skew greater than 30 degrees - USE $250 SF

**NOTE 2:**
$1.2 million per mile obtained from from MDT PET spreadsheet tool (MSEXCEL) dated September 2011. Assumes 40-foot top width, 0.3' pms, 2"cts, and 1-foot crushed aggregate base course.

**NOTE 3:**
Traffic control uses 8% of road cost

**NOTE 4:**
Lump sum cost provided by MDT Bridge

**OPTION 3 - BUILD NEW BRIDGE**
Planning Level Cost Estimates

| Item Description | 3A.2 - North 1 Alignment | 3B.2 - Mount 2 Alignment | 3B.4 - South 1 Alignment | 3B.4 - South 2 Alignment |
|---|---|---|---|---|
| Estimated Bridge Length (FT) | 400 | 625 | 650 | 500 |
| Estimated Bridge Width (FT) | 28 | 28 | 28 | 28 |
| Estimated Bridge Area (SF) | 11200 | 17500 | 18200 | 14000 |
| Estimated Bridge Skew (degrees) | 20 | 45 | 30 | 37 |
| Estimated Cost per SF | $200 | $250 | $200 | $250 |
| **Estimated Bridge Cost (SEE NOTE 1)** | $2,240,000 | $4,375,000 | $3,640,000 | $3,500,000 |
| Estimated Road Length (FT) | 1642 | 1232 | 620 | 1431 |
| Estimated Road Length (MILE) | 0.31 | 0.23 | 0.12 | 0.27 |
| Estimated Cost per MILE (SEE NOTE 2) | $1,200,000 | $1,200,000 | $1,200,000 | $1,200,000 |
| **Estimated Road Cost** | $373,182 | $280,000 | $140,909 | $325,227 |
| Bridge | $2,240,000 | $4,375,000 | $3,640,000 | $3,500,000 |
| Road Work | $373,182 | $280,000 | $140,909 | $325,227 |
| Traffic Control (SEE NOTE 3) | $29,855 | $22,400 | $11,273 | $26,018 |
| Remove Structure (SEE NOTE 4) | $44,000 | $44,000 | $44,000 | $44,000 |
| Subtotal | $2,687,036 | $4,721,400 | $3,836,182 | $3,895,245 |
| Mobilization (18%) | $483,667 | $849,852 | $690,513 | $701,144 |
| Subtotal | $3,170,703 | $5,571,252 | $4,526,695 | $4,596,390 |
| Contingencies (15%) | $475,605 | $835,688 | $679,004 | $689,458 |
| **Total Construction (CN) - ROUNDED** | **$3,650,000** | **$6,410,000** | **$5,210,000** | **$5,290,000** |

**NOTE 1:**
Bridge skew 0 to 15 degrees - USE $165 per SF
Bridge skew 14 to 30 degrees - USE $200 per SF
Bridge skew greater than 30 degrees - USE $250 SF

**NOTE 2:**
$1.2 million per mile obtained from from MDT PET spreadsheet tool (MSEXCEL) dated September 2011. Assumes 40-foot top width, 0.3' pms, 2"cts, and 1-foot crushed aggregate base course.

**NOTE 3:**
Traffic control uses 8% of road cost

**NOTE 4:**
Lump sum cost provided by MDT Bridge

Maclay Bridge Planning Study

# APPENDIX B

## ANNUALIZED MAINTENANCE COST ESTIMATES

## Second Level Screening - Annualized Maintenance Cost Estimate

(12/04/2012)

### Potential Road Maintenance Costs (per year)

| | Length of Bridge (ft) | Length of New Road (ft) | Total Length (ft) | Total Length (miles) | Total Length (lane-miles) | Annual Road Maintenance Cost |
|---|---|---|---|---|---|---|
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | 1000 | 2312 | 3312 | 0.627 | 0.627 | $2,697 |
| 2C - Minor Rehabilitation (includes Approaches) | 350 | 1692 | 2042 | 0.387 | 0.707 | $3,041 |
| 2D - Major Rehabilitation (includes Approaches) | 350 | 1692 | 2042 | 0.387 | 0.707 | $3,041 |
| 3A.2 - North 1 Alignment | 400 | 1642 | 2042 | 0.387 | 0.773 | $3,326 |
| 3B.2 - Mount 2 Alignment | 625 | 1232 | 1857 | 0.352 | 0.703 | $3,024 |
| 3B.4 - South 1 Alignment | 650 | 620 | 1270 | 0.240 | 0.481 | $2,068 |
| 3B.4 - South 2 Alignment | 500 | 1431 | 1931 | 0.366 | 0.731 | $3,145 |

### Potential Bridge Maintenance Costs (per year - assumes 20 year horizon)

| | Length of Bridge (ft) | Length of Bridge to be Maintained (ft) | Width of Bridge to be Maintained (ft) | SF of Bridge to be Maintained (ft) | Cost of Bridge Maintenance (per year) | Annual Bridge Maintenance Cost |
|---|---|---|---|---|---|---|
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | 1000 | 350 | 14 | 4900 | $7,350 | $7,350 |
| 2C - Minor Rehabilitation (includes Approaches) | 350 | 350 | 14 | 4900 | $7,350 | $7,350 |
| 2D - Major Rehabilitation (includes Approaches) | 350 | 350 | 14 | 4900 | $0 | $0 |
| 3A.2 - North 1 Alignment | 400 | 400 | 28 | 11200 | $0 | $0 |
| 3B.2 - Mount 2 Alignment | 625 | 625 | 28 | 17500 | $0 | $0 |
| 3B.4 - South 1 Alignment | 650 | 650 | 28 | 18200 | $0 | $0 |
| 3B.4 - South 2 Alignment | 500 | 500 | 28 | 14000 | $0 | $0 |

### Potential COMBINED Maintenance Costs (per year - assumes 20 year horizon)

| | Annual Road Maintenance Cost | Annual Bridge Maintenance Cost | TOTAL ANNUAL MAINTENANCE COST |
|---|---|---|---|
| 1G - New One-Lane Bridge at a New Location & Retain Existing Bridge for One-Way Travel | 2,697 | 7,350 | $10,047 |
| 2C - Minor Rehabilitation (includes Approaches) | 3,041 | 7,350 | $10,391 |
| 2D - Major Rehabilitation (includes Approaches) | 3,041 | 0 | $3,041 |
| 3A.2 - North 1 Alignment | 3,326 | 0 | $3,326 |
| 3B.2 - Mount 2 Alignment | 3,024 | 0 | $3,024 |
| 3B.4 - South 1 Alignment | 2,068 | 0 | $2,068 |
| 3B.4 - South 2 Alignment | 3,145 | 0 | $3,145 |

Based on Missoula County data, since the 1994 EA through 20-years a total expenditure of $147,081.79 will have been spent on Maclay Bridge maintenance activities. This equates to $7,350 per year for the 20-year period. On a square footage basis, this equals $7,350 divided by 4,900 square foot (existing bridge), for a cost of $1.50 per square foot.

For new bridges, it is assumed that there are no bridge maintenance needs required over a 20-year horizon, thus for this purpose the annual maintenance cost is assumed to be zero dollars.

Since these lengths represent two-lanes on the road, but one lane on the bridge, 350 feet is subtracted out of the "lane-miles" to account for the one-lane bridge.

It is assumed that after "major rehab" bridge will have no maintenance needs required over a 20-year horizon, thus for this purpose the annual maintenance cost is assumed to be zero dollars.

Maclay Bridge Planning Study

# APPENDIX C

## NEEDS AND OBJECTIVES

## NEEDS AND OBJECTIVES (APPENDIX C)

The four major needs and associated objectives established for the Maclay Bridge Planning Study are listed below. The needs and objectives were derived from a comprehensive review of existing data and input from resource agencies, stakeholders and the public. The needs and objectives reflect the existing social, environmental, and engineering conditions described in the *Existing and Projected Conditions Report* and recognize the local and regional use of the bridge. They also provide a basic set of considerations to help evaluate potential options.

***NEED NUMBER 1: Improve the safety and operation of the river crossing and connecting roadway network.***

Objectives (To the Extent Practicable)

- Improve sub-standard elements of facilities to meet current applicable design standards.
- Reduce delay and vehicle restriction for emergency responders under existing and future traffic demands.
- Manage travel speeds and provide adequate clear zones to improve operations.

***NEED NUMBER 2: Provide a long-term river crossing and connecting roadway network that accommodates planned growth in the Maclay Bridge area.***

Objectives (To the Extent Practicable)

- Accommodate existing and future capacity demands.
- Address non-motorized facilities consistent with local planning efforts.
- Provide connectivity to neighborhood residents, and regional users accessing recreational lands to the west of the Bitterroot River.

***NEED NUMBER 3: Minimize adverse impacts from options to the environmental, cultural, scenic and recreational characteristics of the study area.***

Objectives (To the Extent Practicable)

- Minimize adverse impacts to the Bitterroot River from potential options.
- Minimize adverse impacts to the wildlife and aquatic organisms from potential options.
- Provide reasonable access to recreational sites in the study area (Kelly Island Fishing Access Site, Lolo National Forest, and Missoula County Parks).
- Avoid or otherwise minimize adverse impacts to historic, cultural, and archaeological resources that may result from implementation of options.

***NEED NUMBER 4: Minimize adverse impacts from options to the neighborhood characteristics of the study area.***

Objectives (To the Extent Practicable)

- Implement improvements with special sensitivity to area schools.
- Minimize impacts to existing residents and businesses in the area.
- Recognize the historic value of the Maclay Bridge to the community and the role it plays in local regional events.