



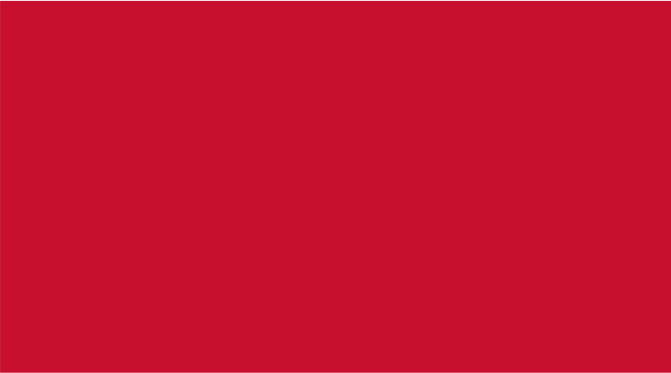
# Maclay Bridge Preservation Options Analysis

Bitterroot River – W of Missoula

BR 9032(65)

UPN 6296000

**January 2019**





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## Introduction

The purpose of this report is to summarize the evaluation of alternatives to rehabilitate and/or preserve the existing Maclay Bridge. This report is intended to support the National Environmental Policy Act (NEPA) and Montana Environmental Policy Act (MEPA) environmental document and Section 4(f) Evaluation prepared for the proposed South Avenue Bridge by analyzing the validity, reasonableness, and feasibility of rehabilitation options for Maclay Bridge. The existing Maclay Bridge was listed on the National Register of Historic Places (NHRP) in December 2016, and is thus afforded protection under Section 4(f) of the U.S. Department of Transportation Act of 1966 (49 USC 1653(f)). The feasibility of preserving the existing bridge must be analyzed as part of the environmental documentation process in compliance with 49 USC 303(c) of the Section 4(f) regulation, which contains the declaration of policy that allows the Secretary of USDOT to approve a program or project requiring the use of Section 4(f) resource only if (1) there is no prudent and feasible alternative to using the land, and (2) the program or project includes all possible planning to minimize harm to the Section 4(f) resource resulting from the use. This evaluation of rehabilitation options will also be used by the Montana Department of Transportation (MDT) and the Montana State Historic Preservation Office (SHPO) to identify whether the structural modifications of the rehabilitation options would affect NHRP eligibility of Maclay Bridge. The work summarized in this report was focused on identifying and evaluating options for rehabilitating and/or preserving the existing bridge in a manner that fulfills the project purpose and need and related design criteria.

The purpose of the proposed project is to enhance the operational characteristics, increase safety, and improve physical conditions of a Bitterroot River crossing for the traveling public over the foreseeable future. To accomplish this purpose, the proposed project must:

- Incorporate physical changes to the river crossing, road approaches, and adjoining roadway environment so the transportation facility meets the minimum requirements for a Minor Collector road per the Missoula County Public Works Manual (2010), including provisions for bicycle and pedestrian facilities that meet these standards;
- Incorporate physical changes to the river crossing to meet the American Association of State Highway Transportation Officials (AASHTO) and MDT bridge design standards; and,
- Provide a transportation facility that meets current and future demands by increasing capacity of the bridge to match the capacity of the two-way, two-lane roadways connecting to the bridge.

Refer to the *Maclay Bridge Planning Study, March 22, 2013*, and the *Bridge Type, Size, and Location (TSL) Report, October 24, 2016* for more detailed information related to the Purpose and Need and project design criteria, respectively.

The Maclay Bridge Alliance (MBA) brought forward 5 options to rehabilitate and preserve the existing Maclay Bridge that were presented to the public on September 20, 2016. The MBA

has been acknowledged as a consulting party in the Section 106 process<sup>1</sup>. As part of the Maclay Bridge preservation feasibility study summarized herein, those options brought forward by MBA that were reasonable avoidance alternatives that also met the project purpose and need were evaluated. Several criteria were considered in identifying which options were evaluated by this study:

1. Feasible and Prudent Avoidance Alternatives. Options that were neither feasible nor prudent were not evaluated. Definitions found at 23 CFR 774.17 include the following information:
  - (1) A feasible and prudent avoidance alternative avoids using Section 4(f) property and does not cause other severe problems of a magnitude that substantially outweighs the importance of protecting the Section 4(f) property. In assessing the importance of protecting the Section 4(f) property, it is appropriate to consider the relative value of the resource to the preservation purpose of the statute.
  - (2) An alternative is not feasible if it cannot be built as a matter of sound engineering judgment.
  - (3) An alternative is not prudent if: (i) It compromises the project to a degree that it is unreasonable to proceed with the project in light of its stated purpose and need; (ii) It results in unacceptable safety or operational problems; (iii) After reasonable mitigation, it still causes: Severe social, economic, or environmental impacts; Severe disruption to established communities; Severe disproportionate impacts to minority or low income populations; or Severe impacts to environmental resources protected under other Federal statutes; (iv) It results in additional construction, maintenance, or operational costs of an extraordinary magnitude; (v) It causes other unique problems or unusual factors; or (vi) It involves multiple factors in paragraphs (3)(i) through (3)(v) of this definition, that while individually minor, cumulatively cause unique problems or impacts of extraordinary magnitude.
2. Screening Results from the 2013 Maclay Bridge Planning Study. A screening assessment conducted in 2012 evaluated multiple improvement options that included several rehabilitation options. Options were screened based on multiple criteria related to: operational and safety performance; constructibility and cost; resource impacts; and neighborhood/social impacts. Results from the screening assessment factored into whether an option was evaluated.

The following table lists the preservation options that were included in MBA's presentation and whether or not they were evaluated by the project team with this study:

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<sup>1</sup> Refers to Section 106 of the National Historic Preservation Act. One additional party, Kitty Henderson of the Historic Bridge Foundation, has also been acknowledged as a consulting party in the Section 106 process.

**Table 1: Maclay Bridge Alliance (MBA) – Bridge Rehabilitation Options**

Option	Description	Included in this evaluation?
1	Rehabilitate the main span Parker through truss with arches for 36-ton load capacity. Replace the pony truss concrete approach spans with a new single span.	<b>No.</b> Per 23 CFR 774.17, this option is not prudent because it fails to meet the project purpose and need since it only provides for one lane of traffic. It is therefore not evaluated.
2	Widen the main span truss to 2-lanes and upgrade the load capacity. Replace the pony truss and concrete approach spans with a new single span.	<b>Yes.</b>
3	Build a new, one lane Parker through truss bridge parallel to the existing rehabilitated Parker truss bridge.	<b>Yes.</b> Although this work would consider other truss types for the new structure.
4	Construct a new 2-lane concrete or steel beam bridge parallel to the existing Parker through truss bridge rehabilitated for bike/pedestrian access.	<b>No.</b> The option to replace the existing bridge at the existing location was eliminated as part of the 2013 <i>Maclay Bridge Planning Study</i> due to potential impacts to adjacent properties/structures that would occur in order to improve the bridge approaches to meet current standards. Options 2 and 3 evaluate these potential impacts in greater detail. Option 4 would have the similar, if not greater, impacts as Options 2 and 3. It is therefore not evaluated.
5	Replace the existing Parker through truss bridge with a new, similar, wider 2-lane Parker through truss bridge.	<b>No.</b> This option is not a reasonable avoidance alternative because it involves removing the existing Maclay Bridge. It is therefore not evaluated.

**Maclay Bridge Alliance - Option 2**

Description: This option involves rehabilitating the existing bridge to the extent necessary to fulfill the project purpose and need at the existing location. The existing bridge would be widened to accommodate two lanes of traffic with a pedestrian walkway added along one side. The Parker through truss main span would be widened to include two traffic lanes and also structurally modified and strengthened to preclude load limit posting. A 28-ft roadway width has been assumed for this option which is the minimum acceptable off-system bridge width per MDT standards. Since this option would require near complete disassembly of the through truss, upgrading the capacity to HS-20 loading would be included. The eastern pony truss and concrete approach spans would be replaced with a new, single span truss, though not necessarily a Parker type truss. Further widening the bridge or providing a 10 ft wide cantilevered shared use path with a width similar to that proposed for the new South Avenue Bridge alternative is likely not structurally feasible for this alternative. Therefore, for the purpose of determining costs, a 5-foot wide cantilevered walkway was assumed. Replacement of the existing asphalt infill deck with a concrete deck was also assumed for the cost estimate. See Appendix-A for concept level details for this option.

Impacts and Considerations:

1. Significant structural modification and strengthening of the existing Parker through truss is required. Strengthening could be accomplished by the addition of a superimposed steel arch which would limit the amount of modification to the existing truss elements and this method has been assumed for cost estimating purposes. Replacement of the floor beams and stringers would be required to accommodate 2 traffic lanes and the greater width between individual trusses.
2. Widening of the existing foundations is not practical. For this option all of the

foundation units would be removed and replaced with two new abutments and a central pier. Justifications for this assumption include: 1.) the width of the widened bridge and loading on the foundations would be at least double that of the existing bridge, 2.) the central pier would need to support both the existing main span and the new approach span, 3.) the load carrying capacity and condition of the foundation support elements are unknown and are therefore considered unreliable for safe support of substantially greater loads, and 4.) rehabilitation/strengthening of the existing foundations to the point where they can adequately support the loading is not cost effective compared to replacement. New foundation units supported on concrete drilled shafts were assumed for cost estimating purposes. Concrete wall piers supported on piles are also a possibility, with cost being comparable to that of foundations on drilled shafts.

3. Significant modification to the existing Parker truss span is required for this alternate to meet the project purpose and need which may preclude its classification as a historic resource.
4. Current hydraulic analysis defining floodplain impacts assume that Maclay Bridge would be removed. Hence, the mitigation to floodplain risk provided by the removal of the bridge would be negated.
5. Removal of the existing intermediate piers on the east approach could serve to increase the conveyance at the existing bridge site. However, the new center pier would be misaligned to the direction of flow since the truss cannot be widened on a skew, decreases the conveyance when compared to the existing center pier. Furthermore, this configuration presents an elevated risk for scour and accumulation of debris at the center pier. Additional hydraulic analysis is necessary to fully assess the impacts.
6. Additional width of the structure would result in further encroachment in the floodway since it is not feasible to widen the bridge parallel to the river. Any resultant rise in the 100-year water surface elevation would require mitigation. Increasing the overall span length of the bridge could aid in mitigating the water surface rise, however, performance of hydraulic analyses is not included in the scope of this study.
7. Due to the change in the hydraulic characteristics of the bridge, the project would require a Certified Letter of Map Revision (CLOMR) prior to initiation of construction and a Letter of Map Revision (LOMR) within 6 months after construction is completed.
8. In this case of structure rehabilitation, it is not possible to fully achieve the level of improvements that could otherwise be provided with a new structure. Compared to a completely new structure, reduced service life should be expected since many of the existing structure components would be reused.
9. It is anticipated that the overall depth of the new deck and floor framing would be approximately one foot greater than that of the existing. To maintain the same vertical clearance between the superstructure and the 100-year flood (freeboard), the finished profile grade of the rehabilitated bridge would be set approximately one foot higher than existing. Additional coordination with Missoula County would be necessary to determine freeboard requirements for this option.
10. The existing roadway would be widened and realigned to connect to the widened bridge. Significant realignment of the west approach roadway (River Pines Road) and

- widening of the east approach roadway is necessary to improve safety and meet current design standards.
11. The approach roadway realignments would require acquisition of approximately 4.9 acres of right of way from up to 17 adjacent landowners and relocation of approximately five (5) residences.
  12. Retaining walls might be necessary along the river side of River Pines Road to support the wider roadway and prevent encroachment into the river or to limit property impacts. However, special measures for retaining the roadway were not evaluated with this analysis.
  13. Existing overhead power lines are located south of the existing bridge. Relocation of these power lines would likely be required and the related costs and impacts have not been determined with this study.
  14. A Northwestern Energy gas regulator station is located at the east bridge approach. Relocation of this facility may be required and the related costs and impacts have not been determined with this study.
  15. This alternative would require a road closure and detour during construction in order to widen and rehabilitate the existing bridge and replace the southern approach spans.

Estimated Cost: The estimated construction cost for this option is as follows:

**Table 2: Maclay Bridge Alliance - Option 2 Cost Estimate**

<b>Estimated Cost (2018 Dollars)</b>	<b>Option 2</b>
Bridge Cost (includes existing structure removal)	\$ 5,550,000
Roadway Approach Cost	\$ 597,000
Mobilization (18%)	\$ 1,106,000
<b>Subtotal</b>	<b>\$ 7,253,000</b>
Contingencies (35%)	\$ 2,539,000
Construction Engineering (15%)	\$ 1,088,000
<b>Subtotal Construction Costs (2018 Dollars)</b>	<b>\$10,880,000</b>
Right of Way Acquisition Cost* (excluding relocation)	\$ 1,670,000
<b>Total Estimated Cost – Option 2 (2018 Dollars)</b>	<b>\$12,550,000</b>
* Right of way costs were estimated using 2018 total assessed values from Montana Cadastral and include only the percentage of property value as required by the potential take. Where residences were directly impacted, the cost assumes full take of the property.	

The estimated cost to strengthen and widen the existing truss span was based on preliminary engineering to size replacement members for the new floor system (floor beams and stringers) and a similar project where a superimposed steel arch was used to strengthen an existing truss.

Unit prices were established based on recent bid history and the specific characteristics for this project to determine the overall bridge and roadway subtotal costs. A 35% contingency was included in accordance with the MDT Cost Estimation Procedures document to account for the level of design and the higher risk associated with a bridge rehabilitations project. The cost

summary above does not include any additional cost for engineering design or utility relocation. Relocation costs could be significant and are not included in the cost summary. Relocation benefits, as required under the Uniform Relocation Assistance and Real Property Acquisition Act of 1970 and the Uniform Relocation Act Amendments of 1987, entitle persons displaced as a direct result of federal or federally-assisted projects to comparable replacement dwellings and reimbursement of relocation costs and certain related expenses incurred in moving. Transportation department advisory services would also be made available to displaced persons. See Appendix-B for bridge and roadway detailed cost estimates.

### **Maclay Bridge Alliance - Option 3**

Description: This option involves rehabilitating the existing single lane bridge to remove weight restrictions, without widening, to carry westbound traffic and constructing a new single lane structure adjacent to the existing bridge to carry eastbound traffic. The existing bridge is currently posted at 11-tons and is governed by the pony truss span. Although the Parker through truss main span does not meet current design loading requirements, the span's load rating is such that posting is not required by the MDT Bridge Inspection and Rating Manual. Therefore, for the purpose of this study, rehabilitation would only include replacing the existing pony truss and concrete approach spans with a new, single span truss, though not necessarily a Parker type truss. The existing Parker through truss main span would be rehabilitated to extend useful service life, including replacing the bearings, replacing the existing asphalt infill deck with a concrete deck, cleaning and painting the existing floor framing and splash zones of the truss verticals, and installing crashworthy barriers along each side.

The new single lane, eastbound structure would consist of two truss spans, though not necessarily Parker type trusses. The new eastbound bridge would be designed to meet current loading requirements. The structure would also provide for an 8-foot wide shared use path. It is anticipated that the overall depth of the deck and floor framing of the new eastbound structure would be approximately one foot greater than that of the existing bridge. To maintain the same vertical clearance of the superstructure low steel above the 100-year flood and to facilitate connection to the divided roadway approaches, the finish profile grade of both the new and existing structures would be set approximately one foot higher than existing. See Appendix-A for concept level details for this option.

#### Impacts and Considerations:

1. For this option it was assumed that the existing west abutment would be used in place to support the existing Parker truss main span, with the top of the abutment stem wall being raised approximately one foot. The abutment would be lengthened to also support the new eastbound structure. If this alternate were to advance, a more detailed condition assessment of the existing abutment would be required to validate widening rather than replacement.
2. Replacement of the existing east approach spans has been assumed for the purpose of estimating cost. Some reduction in cost with this option would be realized if it were decided to leave these spans in place. Additional condition assessment of those spans, the foundations, and hydraulic impacts should be performed if the east approach spans are left in place.



3. Widening of the existing center pier and east abutment is not practical. A new east abutment and a central pier would be required and could support the new eastbound structure and existing westbound Parker truss span. The central pier would need to support both the existing main span and the new westbound approach span, and the load carrying capacity and condition of the existing foundation support elements are unknown and are therefore considered unreliable for safe support of substantially greater loads. New foundation units supported on concrete drilled shafts were assumed for cost estimating purposes. Concrete wall piers supported on piles are also a possibility, with cost being comparable to that of foundations on drilled shafts.
4. With this option, the overall bridge span could not be shifted east or west to avoid potential conflicts with below grade remnants of the existing foundations during construction which increases the risk and associated cost of the foundation construction.
5. In this case of structure rehabilitation, it is not possible to fully achieve the level of improvements that could otherwise be provided with a new structure. Compared to a completely new structure, reduced service life should be expected since many of the existing structure components would be reused.
6. The westbound bridge, which would reuse the existing Parker truss span, would not rate adequately for all legal load configurations. Although load limit posting of the bridge is precluded based on current policy, heavier loads such as a water tender might be advised to use the eastbound bridge to cross the river to avoid damaging the existing span. The additional cost to upgrade the existing Parker truss span load capacity was not estimated as part of this study.
7. Although only minor modifications to the Parker truss span are proposed with this option, there are significant modifications to the overall crossing. Whether or not the modified bridge would still be eligible for the historic register is unknown.
8. Current hydraulic analysis defining floodplain impacts assume that Maclay Bridge would be removed. Hence, the mitigation to floodplain risk provided by the removal of the bridge would be negated.
9. Removal of the existing intermediate piers on the east approach could serve to increase the conveyance of the bridge. However, the new center pier would be misaligned to the direction of flow since the truss cannot be widened on a skew, decreasing the conveyance when compared to the existing center pier. Furthermore, this configuration presents an elevated risk for scour and accumulation of debris at the center pier. Additional hydraulic analysis is necessary to fully assess the impacts.
10. Addition of the upstream bridge would result in further encroachment in the river and floodway and any resultant rise in the 100-year water surface elevation would require mitigation. The encroachment on the proposed upstream side would result in a severe contraction that in turn would increase the contraction scour through the section. Increasing the overall span length of both bridges could aid in mitigating the water surface rise and scour issues, however, performance of hydraulic analyses is not included in the scope of this study.
11. Due to the change in the hydraulic characteristics of the bridge, the project would require a Certified Letter of Map Revision (CLOMR) prior to initiation of construction

- and a Letter of Map Revision (LOMR) within 6 months after construction is completed.
12. The existing roadway would be widened and realigned to connect to the tandum existing and widened bridges. Significant realignment of the west approach roadway (River Pines Road) and widening of the east approach roadway is necessary to improve safety and meet current design standards.
  13. The approach roadway realignments would require acquisition of approximately 6.5 acres of right of way from up to 15 adjacent landowners and relocation of approximately six (6) residences.
  14. Existing overhead power lines are located south of the existing bridge. Relocation of these power lines would likely be required and the related costs and impacts have not been determined with this study.
  15. A Northwestern Energy gas regulator station is located at the east bridge approach. Relocation of this facility would likely be required and the related costs and impacts have not been determined with this study.
  16. Retaining walls might be necessary along the river side of River Pines Road to support the wider roadway and prevent encroachment into the river. However, special measures for retaining the roadway were not evaluated with this analysis.
  17. This alternative may require a road closure and detour during construction.

Estimated Cost: The estimated construction cost for this option is as follows:

**Table 3: Maclay Bridge Alliance - Option 3 Cost Estimate**

<b>Estimated Cost (2018 Dollars)</b>	<b>Option 3</b>
Bridge Cost (includes existing structure removal)	\$ 6,111,000
Roadway Approach Cost	\$ 664,000
Mobilization (18%)	\$ 1,220,000
<b>Subtotal</b>	<b>\$ 7,995,000</b>
Contingencies (35%)	\$ 2,798,000
Construction Engineering (15%)	\$ 1,199,000
<b>Subtotal Construction Costs (2018 Dollars)</b>	<b>\$ 11,992,000</b>
Right of Way Acquisition Cost* (excluding relocation)	\$ 2,070,000
<b>Total Estimated Cost – Option 3 (2018 Dollars)</b>	<b>\$14,062,000</b>
* Right of way costs were estimated using 2018 total assessed values from Montana Cadastral and include only the percentage of property value as required by the potential take. Where residences were directly impacted, the cost assumes full take of the property.	

Unit prices were established based on recent bid history and the specific characteristics for this project to determine the overall bridge and roadway subtotal costs. A 35% contingency was included in accordance with the MDT Cost Estimation Procedures document to account for the level of design and the higher risk associated with a bridge rehabilitations project. The cost summary above does not include any additional cost for engineering design, utility relocation, or costs to increase load capacity of the existing Parker truss span. Relocation costs could be significant and are not included in the cost summary. As described above, relocation costs would involve purchasing replacement dwellings for affected property owners as well as relocation costs and advisory services. See Appendix-B for bridge and roadway

detailed cost estimates.

### **Additional Option: Preservation Option A**

Another alternative to preserve the existing Maclay Bridge in place as a local access or pedestrian structure was also included in this evaluation. This option was not included in MBA's presentation, but would avoid an impact to the Section 4(f) property while allowing the project Purpose and Need to be fulfilled with a new bridge at South Avenue.

Description: The existing Maclay Bridge would be preserved in place as a local access or pedestrian bridge to maintain the historical status. To fulfill the project purpose and need, a new 2-lane bridge at South Avenue would be constructed. Increasing the load capacity or rehabilitation of the existing bridge to extend useful service life is not considered a requirement for this option. Should the existing bridge be converted to a pedestrian bridge, the railing should be upgraded or replaced, and signage and barriers to physically close the bridge to vehicular traffic would be required. See Appendix-A for existing bridge layout.

#### Impacts and Considerations:

1. The existing Maclay Bridge does not provide adequate freeboard over the river and is at risk during a flood event. The intermediate piers are misaligned with the direction of flow. The as-constructed details and condition of the existing bridge foundations below water are uncertain and could be vulnerable to scour.
2. A new bridge at South Avenue is required to meet the project purpose and need. Current hydraulic modelling is based on the existing Maclay Bridge being removed. Additional hydraulic modelling and assessment of floodplain impacts would be required if the Maclay Bridge is not removed.
3. Current hydraulic analysis defining floodplain impacts assume that Maclay Bridge would be removed. Hence, the mitigation to floodplain risk provided by the removal of the bridge would be negated.
4. The County would continue to have maintenance responsibility for the bridge. Access, safety, and liability issues should be addressed if the bridge is converted into a bicycle pedestrian structure. Preliminary design for converting the approaches and existing bridge to a pedestrian facility are outside the scope of this study.

Estimated Cost: The costs associated with preserving the existing bridge in place as part of this project were not calculated. The current estimated cost of the new South Avenue Bridge is approximately \$12.8M. The new South Avenue Bridge project would still move forward and the initial project costs to sign the roadway to preclude through traffic or to revise the structure for pedestrian use are likely minimal. However, the costs to mitigate floodplain risk or scour risk could be significant. Defining what mitigation measures are needed and the associated costs are outside the scope of this study.

## Summary

This report evaluates two rehabilitation options for Maclay Bridge as presented by the MBA in addition to a preservation option that includes preserving Maclay Bridge in place and building a new bridge at South Avenue. All options evaluated meet the purpose and need of the proposed project. It should be noted that modifications described in some or all the options may result in an adverse impact on the features that make Maclay Bridge eligible for listing on the National Register of Historic Places (NRHP). A brief summary of the evaluation options is provided in Table 4.

**Table 4: Summary of Evaluation Options**

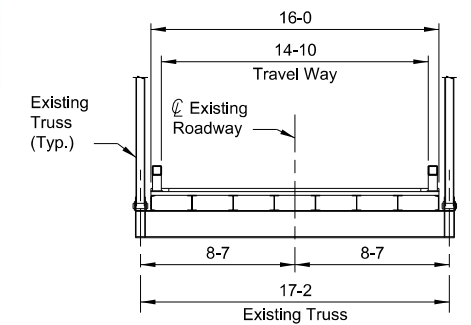
	MBA Option 2	MBA Option 3	Preservation Option A (includes new South Avenue Bridge)
Approximate acreage needed for new right of way?	4.9 acres	6.5 acres	5.4 acres (for new bridge approaches and realignment of River Pines Rd)
Approximate number of residential relocations?	5	6	0
Substantial structural modifications to Maclay Bridge needed?	Yes	Yes	No
Estimated Cost (2018 dollars)	\$12.6M	\$14.1M	\$12.8M (minimum)

The estimated total cost to provide a new bridge over the Bitterroot River at South Avenue is approximately \$12.8M (2018 dollars) which includes an estimated \$12.6M for bridge and roadway construction cost and \$200K for right of way. The estimated total costs for MBA Options 2 and 3 are approximately \$12.6M and \$14.1M, respectively. However, the right of way costs for MBA Option 2 and 3 do not include additional costs associated with relocation of residents, while the South Avenue alignment would not require any residential relocations.

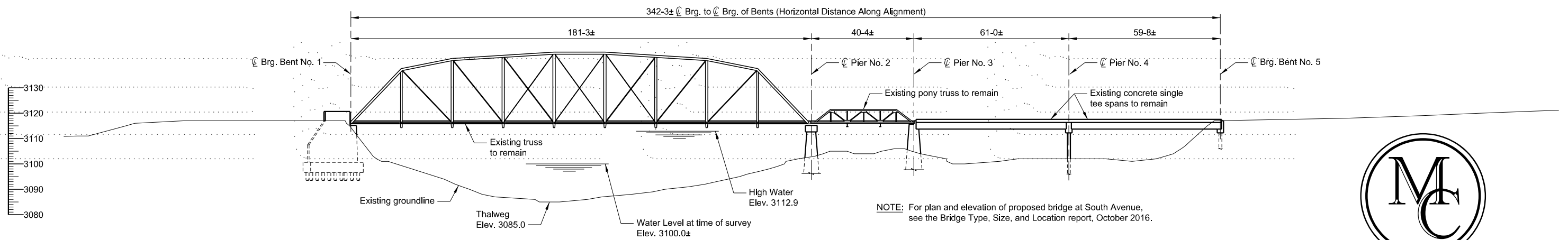
## Appendix – A: Conceptual Details for Preservation Alternatives



PLAN



TRUSS TYPICAL SECTION  
Scale ~ 3/32" = 1'-0"  
Looking Ahead on Line



ELEVATION

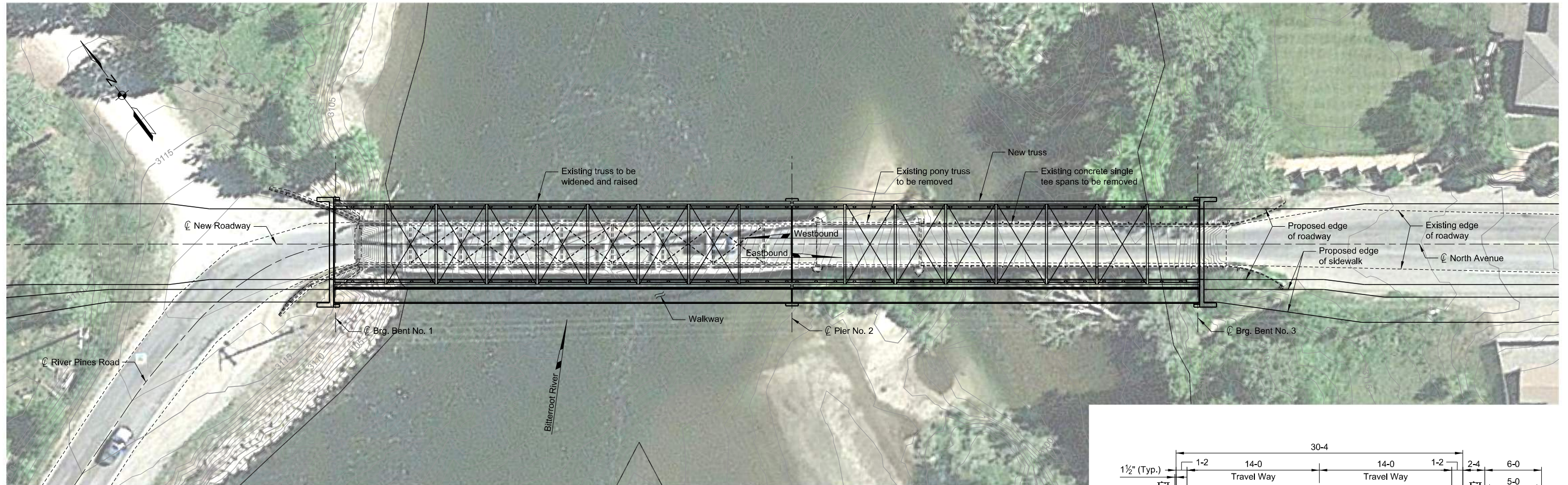
NOTE: For plan and elevation of proposed bridge at South Avenue, see the Bridge Type, Size, and Location report, October 2016.



**MACLAY BRIDGE PRESERVATION  
OPTION 1**  
AUGUST 2018  
Scale 1" = 40'-0" Except as Noted

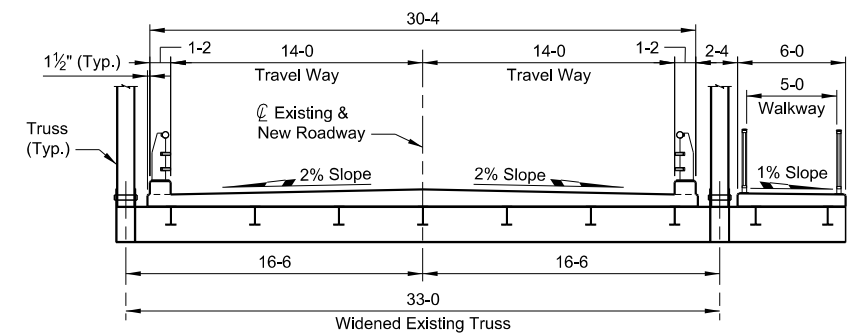


PRELIMINARY



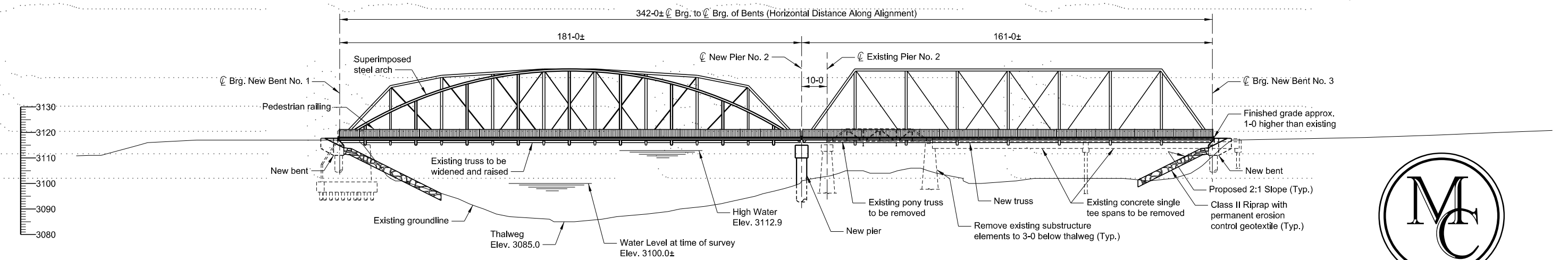
NOTE: For proposed roadway improvements see Option 2 Roadway Alignment Exhibit.

PLAN

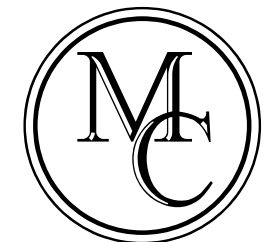


TYPICAL SECTION

Scale - 3/32" = 1'-0"  
Looking Ahead on Line



ELEVATION



**MACLAY BRIDGE PRESERVATION  
OPTION 2**

AUGUST 2018

Scale 1" = 40'-0" Except as Noted



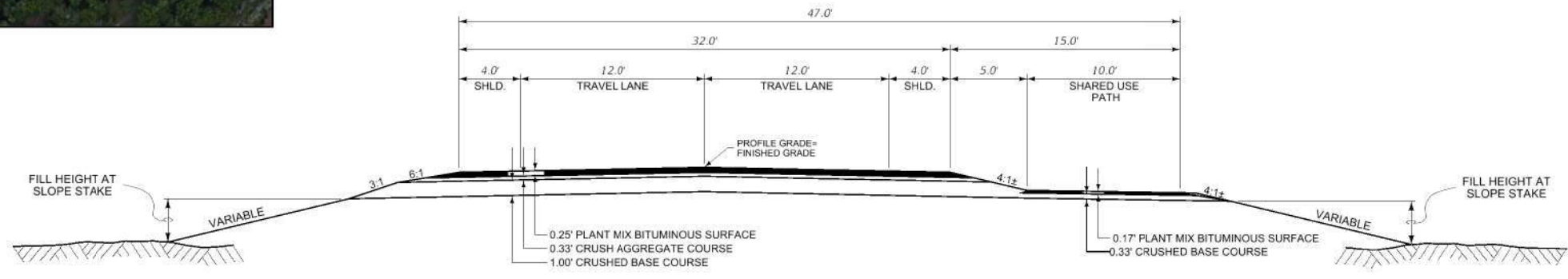
PRELIMINARY

**LEGEND**

- CONSTRUCTION LIMITS
- PROPOSED R/W
- EXISTING R/W



**TYPICAL SECTION**  
MAINLINE



MACLAY BRIDGE PRESERVATION  
ALIGNMENT EXHIBIT  
OPTION 2

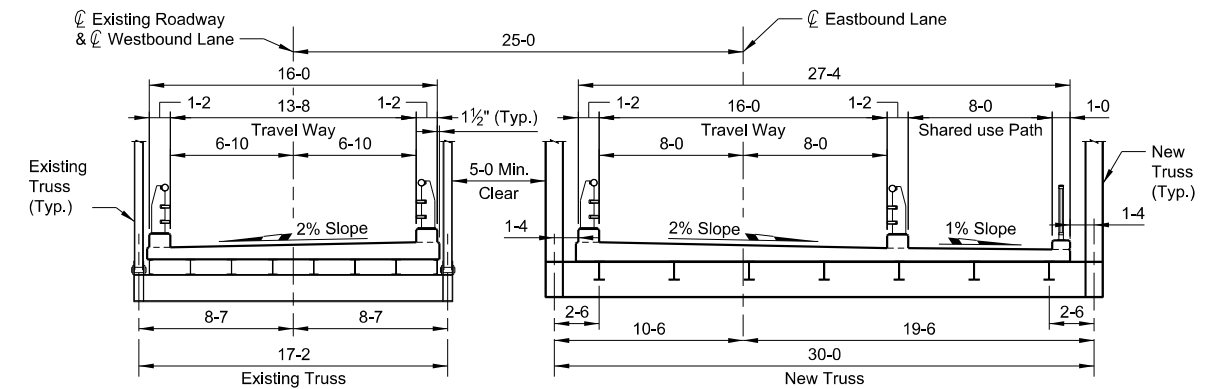




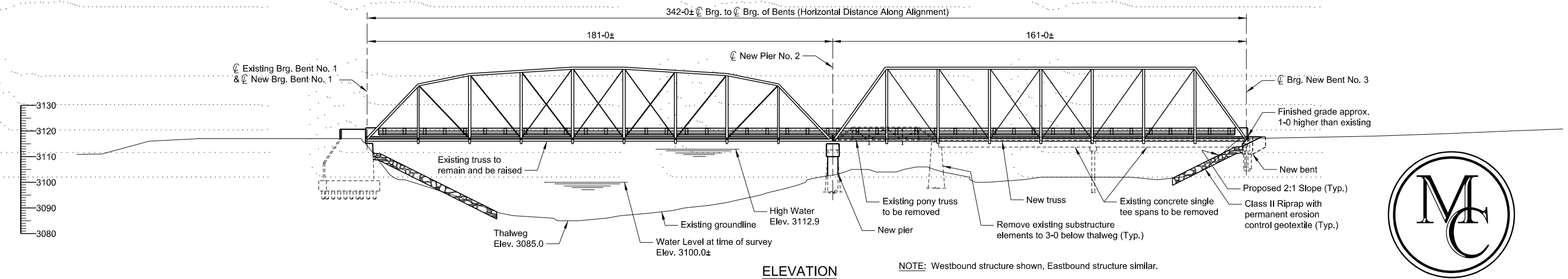


NOTE: For proposed roadway improvements see Option 3 Roadway Alignment Exhibit.

PLAN

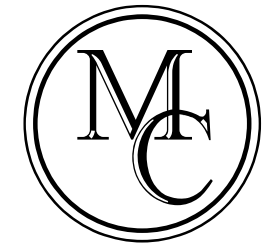


TYPICAL SECTION  
Scale - 3/32" = 1'-0"  
Looking Ahead on Line



ELEVATION

NOTE: Westbound structure shown, Eastbound structure similar.



**MACLAY BRIDGE PRESERVATION  
OPTION 3**  
AUGUST 2018  
Scale 1" = 40'-0" Except as Noted



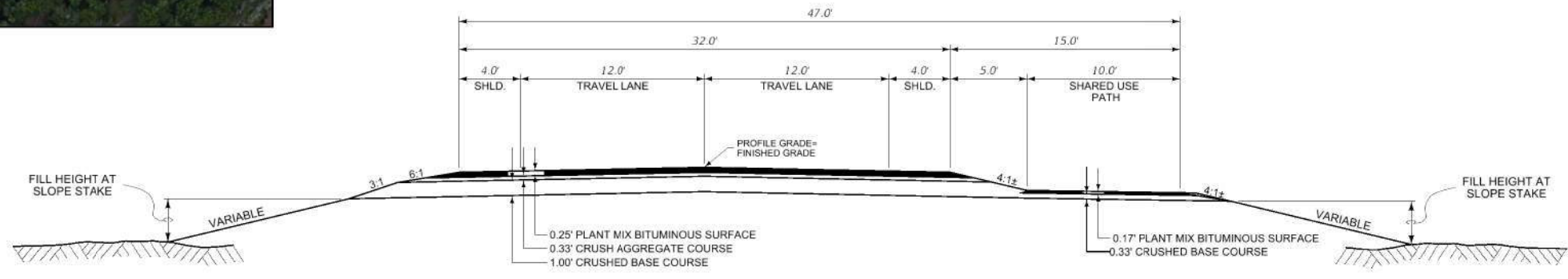
PRELIMINARY

**LEGEND**

- CONSTRUCTION LIMITS
- PROPOSED R/W
- EXISTING R/W



**TYPICAL SECTION**  
MAINLINE



**MACLAY BRIDGE PRESERVATION  
ALIGNMENT EXHIBIT  
OPTION 3**

## Appendix – B: Cost Estimates





Missoula County

**Preliminary Construction Cost Estimate for South Avenue  
over Bitterroot River in Missoula**

**Maclay Bridge Alternatives - Option 2**

**Spans: 181 ft - 161 ft = 342 ft**

Project Number: BR 9032(65)

Prepared By:



Job No. 10023180

Computed **ACW** | Date **6/27/2018**

Checked **BKC** | Date **8/14/2018**

Sheet No. **1** | Of **1**

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
202 020 041	REMOVE STRUCTURE	LS	1	\$175,000	\$175,000
551 020 035	CONCRETE - CLASS STRUCTURE	CY	218	\$625	\$136,250
551 020 107	CONCRETE - CLASS DECK	CY	331	\$560	\$185,360
551 020 166	CONCRETE - CLASS DRILLED SHAFT	CY	467	\$320	\$149,440
552 010 140	TRANSVERSE DECK GROOVING	SY	1072	\$7.35	\$7,879
552 011 010	EXPANSION JOINT STRIP SEAL	FT	74	\$230	\$17,020
555 010 100	REINFORCING STEEL	LB	21863	\$1.05	\$22,956
555 010 200	REINFORCING STEEL - EPOXY COATED	LB	125261	\$1.10	\$137,787
555 010 400	REINFORCING STEEL - SEISMIC	LB	122784	\$1.60	\$196,454
556 000 100	PAINT EXISTING STRUCTURAL STEEL	SY	490	\$250	\$122,500
556 010 010	STRUCTURAL STEEL - MISC	LS	1	\$1,255,912	\$1,255,912
556 010 011	STRUCTURAL STEEL - GIRDER	LS	1	\$205,100	\$205,100
557 010 105	PEDESTRIAN RAIL	FT	721	\$225	\$162,225
558 000 170	DRILLED SHAFT - 6.0 FT	FT	445	\$1,915	\$852,175
558 001 100	DRILLED SHAFT CASING - 6.0 FT	FT	90	\$800	\$72,000
	FIXED BEARING DEVICE FOR TRUSS	EA	4	\$3,000	\$12,000
	EXPANSION BEARING DEVICE FOR TRUSS	EA	4	\$10,000	\$40,000
	BARRIER RAIL - TXDOT T2P STEEL	FT	689	\$250	\$172,250
	160' PREFABRICATED THROUGH TRUSS	LS	1	\$1,628,000	\$1,628,000

**ESTIMATED BASE CONSTRUCTION COST \$5,550,308**

Estimated Cost per Deck Plan Area = \$436

Deck Plan Area (Per Bridge)= 37.00 FT x 344.44 FT 12744 FT2

BID PRICES  
July 2018

Preliminary Estimate

Project Number: 6296000  
 Project Name: Maclay Bridge Preservation Alternatives Analysis  
 UPN Number:  
 Project Length: 0.45 Miles  
 Design Stage: Planning - Option 2

Prepared By: HDR Engineering Inc.  
 Date: August 29, 2018  
 County: Missoula  
 District: Missoula  
 Type of Work: Bridge Rehab and Roadway Improvements

Item Number	Quantity	Description	Unit	G-Match	Average Bid Prices		Adjusted Unit Prices	
					Unit Price	Amount	Unit Price	Amount
					Dollars	Dollars	Dollars	Dollars
104030010	11250	MISCELLANEOUS WORK	UNIT	No	\$1.00	\$11,250.00		\$11,250.00
105080115	7130	FINISH GRADE CONTROL	CRFT	No	\$0.53	\$3,779.00		\$3,779.00
203020100	17750	EXCAVATION-UNCLASSIFIED	CUYD	No	\$5.99	\$106,323.00		\$106,323.00
203020200	1775	EXCAVATION-UNCLASS BORROW	CUYD	No	\$5.04	\$8,946.00		\$8,946.00
203020250	890	SPECIAL BORROW-EXCAVATION	CUYD	No	\$39.00	\$34,710.00		\$34,710.00
203080100	4050	TOPSOIL-SALVAGING AND PLACING	CUYD	No	\$5.19	\$21,020.00		\$21,020.00
208010200	5000	TEMPORARY EROSION CONTROL	UNIT	No	\$1.00	\$5,000.00		\$5,000.00
301020268	740	TRAFFIC GRAVEL	CUYD	No	\$16.60	\$12,284.00		\$12,284.00
301020340	5000	CRUSHED AGGREGATE COURSE	CUYD	No	\$24.71	\$123,550.00		\$123,550.00
301020521	1400	TOP SURFACING GR 2A	CUYD	No		\$0.00	\$25.00	\$35,000.00
301020625	7700	AGGREGATE TREATMENT	SQYD	No	\$0.37	\$2,849.00		\$2,849.00
304010002	7700	BLOTTER MATERIAL	SQYD	No	\$0.35	\$2,695.00		\$2,695.00
401020045	1850	PLANT MIX SURF GR S-3/4 IN	TON	No	\$31.27	\$57,850.00		\$57,850.00
401020300	26	HYDRATED LIME	TON	No	\$204.72	\$5,323.00		\$5,323.00
402020092	100	ASPHALT CEMENT PG 64-28	TON	No	\$428.99	\$42,899.00		\$42,899.00
402020368	20	EMULSIFIED ASPHALT CRS-2P	TON	No	\$436.27	\$8,725.00		\$8,725.00
409000010	11100	COVER-TYPE 1	SQYD	No	\$0.62	\$6,882.00		\$6,882.00
606010030	125	GUARDRAIL-STEEL	LNFT	Yes	\$17.03	\$2,129.00		\$2,129.00
606010047	12	GD RAIL-STL INT RDWY TERM SECT	LNFT	Yes	\$45.42	\$545.00		\$545.00
606010642	2	GUARDRAIL-OPTIONAL TERM SECT	EACH	Yes	\$3,003.55	\$6,007.00		\$6,007.00
607100271	4750	FARM FENCE-TYPE F5W AND FSM	LNFT	No	\$4.60	\$21,850.00		\$21,850.00
610100101	5	SEEDING AREA NO 1	ACRE	No	\$431.20	\$2,156.00		\$2,156.00
610100102	1.5	SEEDING AREA NO 2	ACRE	No	\$1,096.08	\$1,644.00		\$1,644.00
610100103	2	SEEDING AREA NO 3	ACRE	No	\$276.93	\$554.00		\$554.00
610100326	5	FERTILIZING AREA NO 1	ACRE	No	\$101.43	\$507.00		\$507.00
610100327	1.5	FERTILIZING AREA NO 2	ACRE	No	\$98.33	\$147.00		\$147.00
610100555	6.5	CONDITION SEEDBED SURFACE	ACRE	No	\$92.62	\$602.00		\$602.00
618030080	1	TRAFFIC CONTROL	LS	No	\$28,739.90	\$28,740.00	\$28,000.00	\$28,000.00
	1	SIGNING	LS			\$0.00	\$3,600.00	\$3,600.00
	1	STRIPING	LS			\$0.00	\$3,600.00	\$3,600.00
	1	DRAINAGE	LS			\$0.00	\$37,000.00	\$37,000.00
						\$518,966.00		\$597,426.00
	0%	Mobilization				\$0.00		\$0.00
		Subtotal				\$518,966.00		\$597,426.00
	0%	Contingency				\$0.00		\$0.00
		<b>Construction Total</b>				\$518,966.00		<b>\$597,426.00</b>
	0%	Construction Engineering						\$0.00
		<b>Total</b>						<b>\$597,426.00</b>
	0.00%	Indirect Cost (IDC)-Construction						\$0.00
		<b>Total Construction w/IDC</b>						<b>\$597,426.00</b>
	0.00%	Indirect Cost (IDC) - Construction Engineering						\$0.00
		<b>Total Construction Engineering w/IDC</b>						<b>\$0.00</b>
		<b>Total w/IDC</b>						<b>\$597,426.00</b>

Project Length	Miles						
Project Average Finish Top Width	Feet						
Cost per Mile (Uses Construction Total)							#DIV/0!
Cost per Sq. Yard (Uses Construction Total)							#DIV/0!



Missoula County

**Preliminary Construction Cost Estimate for South Avenue  
over Bitterroot River in Missoula  
Maclay Bridge Alternatives - Option 3  
Spans: 181 ft - 161 ft = 342 ft  
Project Number: BR 9032(65)**

Prepared By:



Job No. 10023180

Computed **ACW** Date **6/27/2018**

Checked **BKC** Date **8/14/2018**

Sheet No. **1** Of **1**

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL
202 020 041	REMOVE STRUCTURE	LS	1	\$160,000	\$160,000
551 020 035	CONCRETE - CLASS STRUCTURE	CY	270	\$625	\$168,750
551 020 107	CONCRETE - CLASS DECK	CY	387	\$560	\$216,720
551 020 166	CONCRETE - CLASS DRILLED SHAFT	CY	645	\$320	\$206,400
552 010 140	TRANSVERSE DECK GROOVING	SY	1136	\$7.35	\$8,350
552 011 010	EXPANSION JOINT STRIP SEAL	FT	87	\$230	\$20,010
555 010 100	REINFORCING STEEL	LB	28819	\$1.05	\$30,260
555 010 200	REINFORCING STEEL - EPOXY COATED	LB	144248	\$1.10	\$158,673
555 010 400	REINFORCING STEEL - SEISMIC	LB	171479	\$1.60	\$274,366
556 000 100	PAINT EXISTING STRUCTURAL STEEL	SY	640	\$320	\$204,800
557 010 105	PEDESTRIAN RAIL	FT	361	\$225	\$81,225
558 000 170	DRILLED SHAFT - 6.0 FT	FT	615	\$1,915	\$1,177,725
558 001 100	DRILLED SHAFT CASING - 6.0 FT	FT	150	\$800	\$120,000
	FIXED BEARING DEVICE FOR TRUSS	EA	8	\$3,000	\$24,000
	EXPANSION BEARING DEVICE FOR TRUSS	EA	8	\$10,000	\$80,000
	BARRIER RAIL - TXDOT T2P STEEL	FT	1378	\$250	\$344,500
	160' PREFABRICATED THROUGH TRUSS - WB	LS	1	\$595,000	\$595,000
	160' PREFABRICATED THROUGH TRUSS - EB	LS	1	\$1,050,000	\$1,050,000
	180' PREFABRICATED THROUGH TRUSS	LS	1	\$1,190,000	\$1,190,000

**ESTIMATED BASE CONSTRUCTION COST \$6,110,779**

*Estimated Cost per Deck Plan Area = \$409*

*Deck Plan Area (Per Bridge)= 43.33 FT x 344.44 FT 14925 FT<sup>2</sup>*

BID PRICES  
July 2018

Preliminary Estimate

Project Number: 6296000  
 Project Name: Maclay Bridge Preservation Alternatives Analysis  
 UPN Number:  
 Project Length: 0.46 Miles  
 Design Stage: Planning - Option 3

Prepared By: HDR Engineering Inc.  
 Date: August 29, 2018  
 County: Missoula  
 District: Missoula  
 Type of Work: Bridge Rehab and Roadway Improvements

Item Number	Quantity	Description	Unit	G-Match	Average Bid Prices		Adjusted Unit Prices	
					Unit Price	Amount	Unit Price	Amount
					Dollars	Dollars	Dollars	Dollars
104030010	11500	MISCELLANEOUS WORK	UNIT	No	\$1.00	\$11,500.00		\$11,500.00
105080115	7300	FINISH GRADE CONTROL	CRFT	No	\$0.53	\$3,869.00		\$3,869.00
203020100	19900	EXCAVATION-UNCLASSIFIED	CUYD	No	\$5.99	\$119,201.00		\$119,201.00
203020200	1990	EXCAVATION-UNCLASS BORROW	CUYD	No	\$5.04	\$10,030.00		\$10,030.00
203020250	990	SPECIAL BORROW-EXCAVATION	CUYD	No	\$39.00	\$38,610.00		\$38,610.00
203080100	4130	TOPSOIL-SALVAGING AND PLACING	CUYD	No	\$5.19	\$21,435.00		\$21,435.00
208010200	5000	TEMPORARY EROSION CONTROL	UNIT	No	\$1.00	\$5,000.00		\$5,000.00
301020268	860	TRAFFIC GRAVEL	CUYD	No	\$16.60	\$14,276.00		\$14,276.00
301020340	5700	CRUSHED AGGREGATE COURSE	CUYD	No	\$24.71	\$140,847.00		\$140,847.00
301020521	1610	TOP SURFACING GR 2A	CUYD	No		\$0.00	\$25.00	\$40,250.00
301020625	9100	AGGREGATE TREATMENT	SQYD	No	\$0.37	\$3,367.00		\$3,367.00
304010002	9100	BLOTTER MATERIAL	SQYD	No	\$0.35	\$3,185.00		\$3,185.00
401020045	2150	PLANT MIX SURF GR S-3/4 IN	TON	No	\$31.27	\$67,231.00		\$67,231.00
401020300	31	HYDRATED LIME	TON	No	\$204.72	\$6,346.00		\$6,346.00
402020092	115	ASPHALT CEMENT PG 64-28	TON	No	\$428.99	\$49,334.00		\$49,334.00
402020368	23	EMULSIFIED ASPHALT CRS-2P	TON	No	\$436.27	\$10,034.00		\$10,034.00
409000010	13000	COVER-TYPE 1	SQYD	No	\$0.62	\$8,060.00		\$8,060.00
606010030	125	GUARDRAIL-STEEL	LNFT	Yes	\$17.03	\$2,129.00		\$2,129.00
606010047	12	GD RAIL-STL INT RDWY TERM SECT	LNFT	Yes	\$45.42	\$545.00		\$545.00
606010642	2	GUARDRAIL-OPTIONAL TERM SECT	EACH	Yes	\$3,003.55	\$6,007.00		\$6,007.00
607100271	4900	FARM FENCE-TYPE F5W AND FSM	LNFT	No	\$4.60	\$22,540.00		\$22,540.00
610100101	5	SEEDING AREA NO 1	ACRE	No	\$431.20	\$2,156.00		\$2,156.00
610100102	1.5	SEEDING AREA NO 2	ACRE	No	\$1,096.08	\$1,644.00		\$1,644.00
610100103	2	SEEDING AREA NO 3	ACRE	No	\$276.93	\$554.00		\$554.00
610100326	5	FERTILIZING AREA NO 1	ACRE	No	\$101.43	\$507.00		\$507.00
610100327	1.5	FERTILIZING AREA NO 2	ACRE	No	\$98.33	\$147.00		\$147.00
610100555	6.5	CONDITION SEEDBED SURFACE	ACRE	No	\$92.62	\$602.00		\$602.00
618030080	1	TRAFFIC CONTROL	LS	No	\$28,739.90	\$28,740.00	\$30,000.00	\$30,000.00
	1	SIGNING	LS			\$0.00	\$3,700.00	\$3,700.00
	1	STRIPING	LS			\$0.00	\$3,700.00	\$3,700.00
	1	DRAINAGE	LS			\$0.00	\$37,000.00	\$37,000.00
						\$577,896.00		\$663,806.00
	0%	Mobilization				\$0.00		\$0.00
		Subtotal				\$577,896.00		\$663,806.00
	0%	Contingency				\$0.00		\$0.00
		<b>Construction Total</b>				\$577,896.00		<b>\$663,806.00</b>
	0%	Construction Engineering						\$0.00
		<b>Total</b>						<b>\$663,806.00</b>
	0.00%	Indirect Cost (IDC)-Construction						\$0.00
		<b>Total Construction w/IDC</b>						<b>\$663,806.00</b>
	0.00%	Indirect Cost (IDC) - Construction Engineering						\$0.00
		<b>Total Construction Engineering w/IDC</b>						<b>\$0.00</b>
		<b>Total w/IDC</b>						<b>\$663,806.00</b>

Project Length	Miles						
Project Average Finish Top Width	Feet						
Cost per Mile (Uses Construction Total)							#DIV/0!
Cost per Sq. Yard (Uses Construction Total)							#DIV/0!