ALTERNATIVES ANALYSIS MEMORANDUM

Sun River Bridge Replacement, MT FLAP BOR 2980(1)
IDIQ Contract No. 69056721D000008
Task Order No. 69056723F00008N

U.S. Department of Transportation
Federal Highway Administration

Prepared for:
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May 2023

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Table of Contents

Tables

Figures

Abbreviations and Acronyms

FHWA	Federal Highway Administration
FLAP	Federal Lands Access Program
GID	Greenfields Irrigation District
LiDAR	Light Detection and Ranging
NEPA	National Environmental Policy Act
PDC	Project Decision Committee
PER	Preliminary Engineering Report
RPA	Robert Peccia and Associates
USBLM	United States Bureau of Land Management
USBR	United States Bureau of Reclamation
USFS	United States Forest Service
WFLHD	Western Federal Lands Highway Division

1.0. Summary

The Western Federal Lands Highway Division (WFLHD) of the Federal Highway Administration (FHWA) is intending to complete the design and National Environmental Policy Act (NEPA) documentation for the Sun River Bridge Replacement project. Agencies involved in the project include the U.S. Bureau of Reclamation (USBR), U.S. Bureau of Land Management (USBLM), U.S. Forest Service (USFS), and Greenfields Irrigation District (GID). FHWA is the lead agency for NEPA purposes, and USBR, USBLM, and USFS are cooperating agencies.

The purpose of this alternatives analysis memorandum is to describe the bridge reconstruction alternatives screening process and identify the preferred alternative advanced for detailed evaluation in NEPA documentation. The memorandum explains how preliminary alternatives were developed, identifies alternatives that were previously considered and dismissed, and outlines evaluation criteria used during the alternatives screening process.

The screening process incorporated information from preliminary engineering and environmental evaluations conducted in 2019, as well as additional engineering evaluations conducted in 2023. The result of the screening process is the selection of a preferred alternative for further review in the Sun River Bridge Replacement Project Environmental Assessment (EA).

Based on the screening process outlined in this memo, the project team has selected **Alternative 8** as the preferred bridge reconstruction alternative to be evaluated in the project EA.

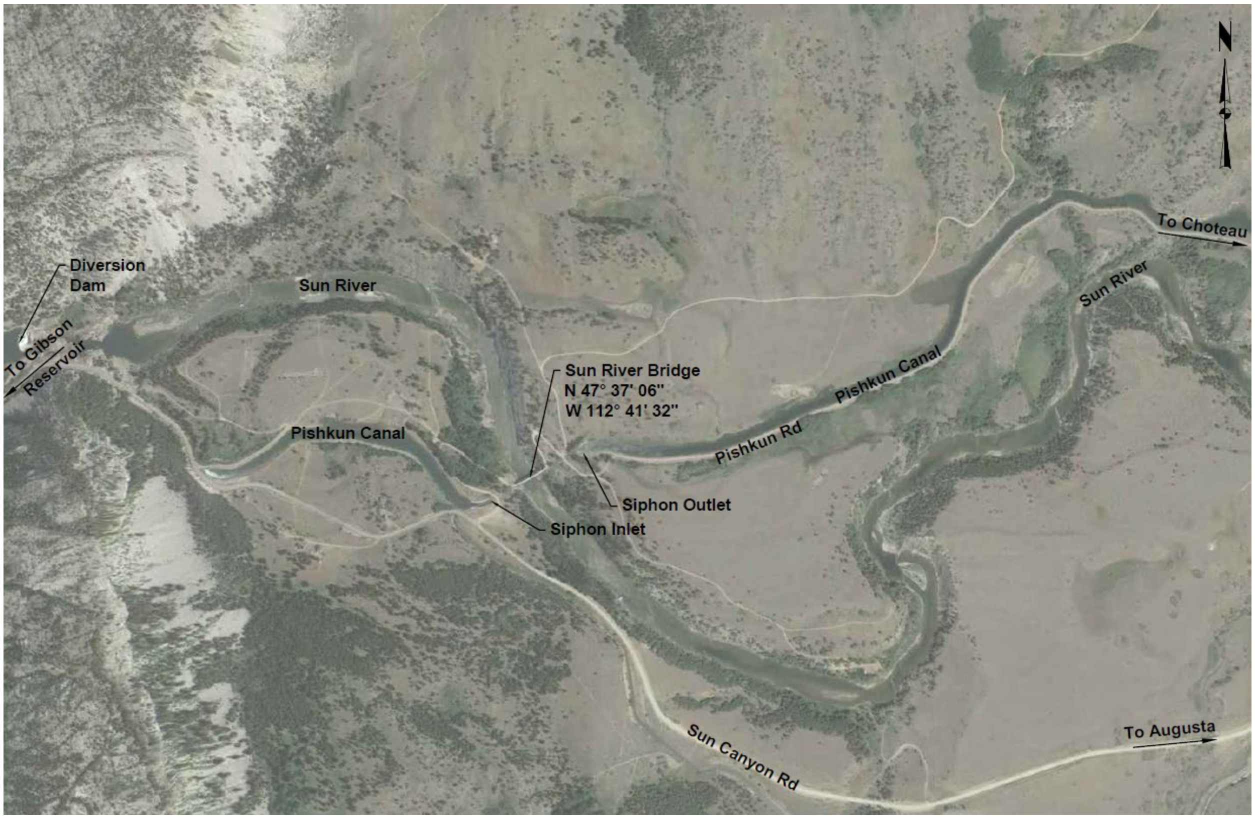
In addition, the memorandum discusses potential options to address the existing bridge as part of a future project. Additional evaluation is needed to determine the feasibility of these options, and therefore no screening has been conducted for the existing bridge.

2.0. Project Location and History

The proposed project is located 73 miles west of Great Falls, 19 miles west of Augusta, and 0.75 mile downstream from the GID Diversion Dam near Gibson Reservoir in Montana. The bridge crosses the Sun River and spans the boundaries of Lewis and Clark County and Teton County. The project location is shown in **Figure 1**.

The 2019 Preliminary Engineering Report (PER)[1] prepared for this project noted that the Sun River Bridge (NBI# MTA-SR-001) was originally built in 1916 by the USBR as part of the Sun River Project. Its primary purpose at the time was to support and convey an 8-foot-diameter wood-stave siphon pipe across the Sun River. The original design intended for lightly loaded vehicles to travel across the upper truss chord of the single-lane structure, primarily to support GID maintenance duties, although it has also been used by the public since it was constructed. In the 1940s, the wood-stave siphon was removed and replaced with a buried, cast-in-place concrete siphon that passes under the Sun River channel and remains in place today.

Figure 1: Sun River Bridge Location



Source: Preliminary Engineering Report, June 2019.

3.0. Purpose and Need Statement

The purpose and need statement specify what the project will accomplish and why it is being pursued. If an alternative does not meet the purpose and need, it will not be advanced for further study.

3.1. Purpose

The purpose of the proposed project is to ensure continued safe transportation access across the Sun River to federal lands, irrigation facilities, and other destinations in the vicinity.

The project would provide service continuity for a variety of federal, state, and local agencies including USBR, USBLM, USFS, GID, Montana Department of Natural Resources and Conservation (MDNRC), and Montana Fish Wildlife & Parks (MFWP), whose personnel use the crossing to access and maintain public lands and irrigation infrastructure including Gibson Dam, Diversion Dam, Pishkun Supply Canal, and the Pishkun Canal Siphon. Additionally, the new bridge would serve local residents and outfitters who access privately held ranches, homes, cabins, and range land and would support public access to federal, state, and local lands used for recreation, including the Sun River, Gibson Reservoir, public campgrounds, trailheads, guest ranches, hunting areas, and fishing access sites. The bridge is also used by local law enforcement and emergency response vehicles for fire-fighting activities and by the Sun River Watershed Group and the Rocky Mountain Front Weed Roundtable for weed control and management activities.

3.2. Need

The existing Sun River Bridge is structurally deficient and functionally obsolete. Its poor condition and outdated design pose safety hazards and limitations to users. Based on an inspection conducted by USBR in 2017[2], the 2019 Preliminary Engineering Report (PER)[1] prepared for this project identified the following specific deficiencies.

- ***Weight Limitations*** – The bridge is currently load posted at 5 tons for small trucks. Public travelers in the area include recreational vehicles, horse trailers, and boats on trailers, all of which can overload the bridge beyond 5 tons. Members of the public may not be aware of their vehicle's weight, and they may unknowingly endanger themselves and the bridge. Additionally, heavy emergency response vehicles, such as fire trucks, may not be able to safely cross the existing bridge, and emergency personnel could be delayed in their response due to alternate routes requiring two to three hours of out-of-direction travel.
- ***Bridge Railings*** – The top chord of the steel truss structure serves as the bridge guardrail. This condition is not desirable because vehicular impact to the truss structure can cause damage and collapse of the entire truss.
- ***Concrete Deck*** – The precast concrete deck panels are not attached to the steel stringers, allowing for lateral movement of the precast concrete decking. The deck panels are free to slide off the bridge and fall to the river below, posing a risk to people below and to bridge users.
- ***Steel Superstructure*** – The steel truss superstructure has several deficiencies. The expansion bearing plates are non-functional due to excessive movement, debris, and deterioration. The truss paint has worn off and left the steel exposed to weather, leading to minor structural deterioration due to corrosion. Some truss members have sustained impact damage from either vehicles or flood debris. Seven gusset plates are missing rivets. Deficiencies associated with the existing superstructure could lead to further reduced load rating or potentially bridge collapse.
- ***Substructure*** – The concrete pier at the northeast approach span is deteriorated beyond reliability for support. Large boulders have been placed as fill under the approach span and are inducing additional lateral pressure on the damaged pier. The pier is at risk of failing and causing a collapse of the northeast approach span.
- ***Approach Guardrail*** – Concrete jersey barriers on the northeast approach are not properly supported. Substantial loss of subgrade material below the barriers has resulted in potentially unstable conditions, and the existing barrier may not be capable of containing an errant vehicle.
- ***Approach Roadway*** – Steep slopes navigated by switchbacks and sharp, hairpin curves at both ends of the bridge require a substantial reduction in speed when approaching the structure and reduce the line of sight across the bridge. These conditions present safety hazards for vehicular traffic and make passage difficult, especially for heavy loads and travel during inclement weather.

The bridge design, condition, load limitations, and approach deficiencies pose a threat to continued user access.

4.0. Preliminary Alternatives

A multi-step process was used to identify and evaluate a range of bridge reconstruction alternatives and ultimately to identify a preferred alternative to advance for evaluation in the project EA.

4.1. Conceptual Reconstruction Alternatives from PER

The 2019 PER identified the eleven reconstruction alternatives described below and illustrated in **Figure 2** for replacement of the Sun River Bridge. Variables including location of a new bridge, number of bridge spans and span lengths, superstructure types, foundation and substructure alternatives, and approach roadway alignments were explored. The PER assumed two 12-foot traffic lanes for all alternatives identified below. Additional information on assumptions, costs, advantages, and disadvantages associated with the eleven alternatives is provided in the PER.

- **Alternative 1 and 1A – Skew Crossing at Existing Bridge Location:** Alternatives 1 and 1A would replace the existing 250-foot bridge with a new bridge near the existing location. Alternative 1 would place the new bridge at a clockwise, 30-degree angle at approximately the same location as the existing bridge, requiring removal of the existing bridge. The bridge length for Alternative 1 was estimated at approximately 350 feet. Alternative 1A would place the new bridge approximately 75 feet upstream of the existing bridge, enabling the existing bridge to remain intact during construction. The bridge would be angled at a clockwise, 10-degree skew to widen the western road approach corner from the existing curve. The bridge length for Alternative 1A was estimated at approximately 275 feet. For both alternatives, the bridge deck was estimated at approximately 23 feet above the water surface. The total length of road work was estimated at approximately 5,100 feet. The west approaches for these alternatives would generally follow the existing grade down to the bridge location, and the east approach would require some right-of-way adjustments to allow for the new road connection through private property. The east approach would connect to Pishkun Road along the canal, with substantial excavation resulting in a new grade of approximately 4.5 to 5% from the bridge end to Pishkun Road.

- **Alternative 2 – High Bridge Crossing:** Alternative 2 would place the new bridge approximately 100 feet downstream and parallel to the existing bridge. The new bridge ends would be placed at the top edges of the river canyon, and the bridge would span the entire canyon, allowing the most direct route to connect the existing roadways at the top of the canyon. The bridge length for Alternative 2 would be approximately 600 feet. The new bridge would be approximately 50 feet taller than the existing bridge, with the bridge deck approximately 75 feet above the water surface. Approximately 400 feet of road would need to be constructed to tie in the new alignment with the existing roads. The grades of the new road would be less than 5%, and the approaches would require small amounts of earthwork. The east approach would involve some right-of-way adjustments to allow for the new road connection through private property.

- **Alternative 3 – East Crossing:** Alternative 3 would place the new bridge approximately 3,500 feet downstream of the existing bridge at a location selected due to is gentle slopes and shortened canyon walls. The bridge length for Alternative 3 was estimated at approximately 500 feet. The bridge deck would be approximately 40 feet above the water surface. This alternative would produce gentle grades and would require approximately 3,700 feet of road construction. The new south approach road would cut through undisturbed BLM land. The north approach road would tie in to an existing two-track dirt road on BLM land, which would need to be reconstructed to a graveled surface. The bridge would be located near private cabins and would require right-of-way from two private property parcels.

- **Alternative 4 – Southeast Crossing:** Alternative 4 would place the new bridge approximately 1,300 feet downstream of the existing bridge, with new bridge ends placed at the top edges of the river canyon, and the bridge spanning the entire canyon. The new bridge would be approximately 50 feet taller than the existing bridge, with the bridge deck approximately 80 feet above the water surface. The bridge length for Alternative 4 was estimated at approximately 480 feet. Approximately 1,400 feet of road would need to be constructed to tie in the new alignment with the existing roads. The grades of the new road would be limited to 5%. The approaches would require small amounts of earthwork. The north approach road would tie in to an existing two-track dirt road on BLM land, which would be reconstructed to a graveled surface. The south approach would cut in a short new road on BLM land.

- **Alternative 5 – Upstream Skewed Crossing to Switchback:** Alternative 5 would place the new bridge approximately 500 feet upstream of the existing bridge. The east bridge end would tie in to the switchback on the existing approach road, and the bridge would be skewed to align with that road. The west bridge end would be located towards the top of the lower lying riverbank. The bridge length for Alternative 5 was estimated at approximately 520 feet. The bridge deck would be approximately 60 feet above the water surface. The total length of affected road work was estimated at approximately 5,400 feet. The west approach to the bridge would be similar to Alternative 1 but would turn east after the U-turn to cross over the river. The east approach would maintain its current alignment above the hairpin turn, potentially eliminating the need for new right-of-way. The grades would be approximately 4 – 5%.

- **Alternative 6 – Upstream Crossing to Switchback:** Alternative 6 would place the new bridge approximately 400 feet upstream of the existing bridge. The east bridge end would tie in to the switchback on the existing approach road. Under Alternative 6, the west bridge end would be located at a lower elevation and farther south on the lower lying riverbank compared to Alternative 5. The bridge length for Alternative 6 was estimated at approximately 500 feet. The bridge deck would be approximately 55 feet above the water surface. The roadwork for the approaches would be similar to Alternative 5.

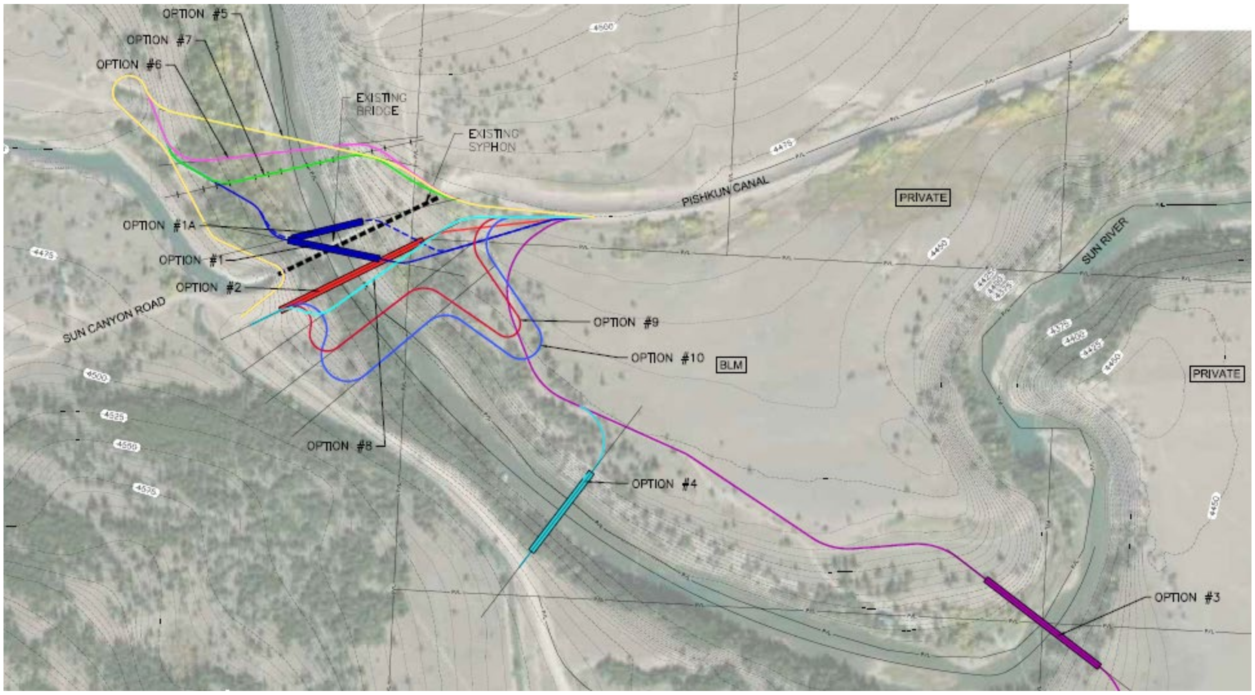
- **Alternative 7 – Lower Elevation Upstream Right-Angle Crossing:** Alternative 7 would place the new bridge approximately 350 feet upstream of the existing bridge. The east bridge end would tie into the switchback on the existing approach road, but the bridge would be perpendicular to the river, creating a horizontal curve in the alignment at the east end of the bridge. The west bridge end would be located at a lower elevation and farther south on the lower riverbank compared to Alternatives 5 and 6. The bridge length for Alternative 7 was estimated at approximately 358 feet. The bridge deck would be approximately 32 feet above the water surface. The length of roadwork for the approaches would be similar to Alternative 6.

- **Alternative 8 – Downstream Crossing:** Alternative 8 would place the new bridge approximately 200 feet downstream of the existing bridge. The new bridge ends would be placed slightly below the top edges of the river canyon and slightly offset from Alternative 2. The bridge length for Alternative 8 was estimated at approximately 520 feet. The bridge deck would be approximately 68 feet above the water surface. Approximately 580 feet of road would need to be constructed to tie in the new alignment with the existing roads. The grades of the new road would be less than 5%. The approaches would require small amounts of earthwork. The east approach would involve some right-of-way adjustments to allow for the new road connection through private property.

- **Alternative 9 – Midway Downstream Crossing:** Alternative 9 would place the new bridge approximately 350 feet downstream of the existing bridge. The bridge length for Alternative 9 was estimated at approximately 400 feet. The bridge deck would be approximately 56 feet above the water surface. The west and east approaches to the bridge for this alternative would utilize S-curves to traverse down the canyon wall, with grades limited to 5%. Approximately 2,000 feet of road would need to be constructed to tie in the new alignment with the existing roads, and the approaches would require large amounts of earthwork. The east approach would involve some right-of-way adjustments to allow for the new road connection through private property.

- **Alternative 10 – Low Elevation Downstream Crossing:** Alternative 10 would place the new bridge approximately 500 feet downstream of the existing bridge. The bridge length for Alternative 10 was estimated at approximately 380 feet. The bridge deck would be approximately 45 feet above the water surface. The west and east approaches to the bridge for this alternative would utilize S-curves to traverse down the canyon wall, with grades limited to 5%. Approximately 2,125 feet of road would need to be constructed to tie in the new alignment with the existing roads, and the approaches would require large amounts of earthwork. The east approach would involve some right-of-way adjustments to allow for the new road connection through private property.

Figure 2: PER Alternatives



Source: Preliminary Engineering Report, June 2019.

Alternatives 1A, 7, and 10 were shortlisted in the PER, and refined road alignments, bridge layouts, and appraisal-level cost estimates were developed. An alternatives screening process was conducted for these three alternatives using screening criteria for environmental impacts, siphon and canal impacts, ability to maintain the canal and siphon, right-of-way requirements resulting in new land acquisition, ability of the existing bridge to remain open, approach navigability, and total costs. Screening results from the PER for the short-listed alternatives are summarized in **Table 1**.

Table 1: PER Screening

Alternative	Environmental Impacts	Siphon Impacts	Canal Impacts	Ability to Maintain Canal and Siphon	Land Acquisition	Ability of Existing Bridge to Remain Open	Ability of Existing Road to Remain Open	Approach Navigability	Total Costs (Appraisal)
PER 1A Cross Just Upstream from Existing Bridge	••••	•••	•••••	••	•	•••••	•••••	••••	•••
PER 7 Upstream at Lower Elevation with Right-Angle Crossing	••••	•••	•••••	••••	•	•••••	•••••	••••	••••
PER 10 Downstream Crossing at Lower Elevation	••	•	•	•	•	•••••	•••••	•••	•••
No Action	•	•	•	•	•	•	•••••	•••	•

Source: Preliminary Engineering Report, June 2019. • =least, ••••• = most.

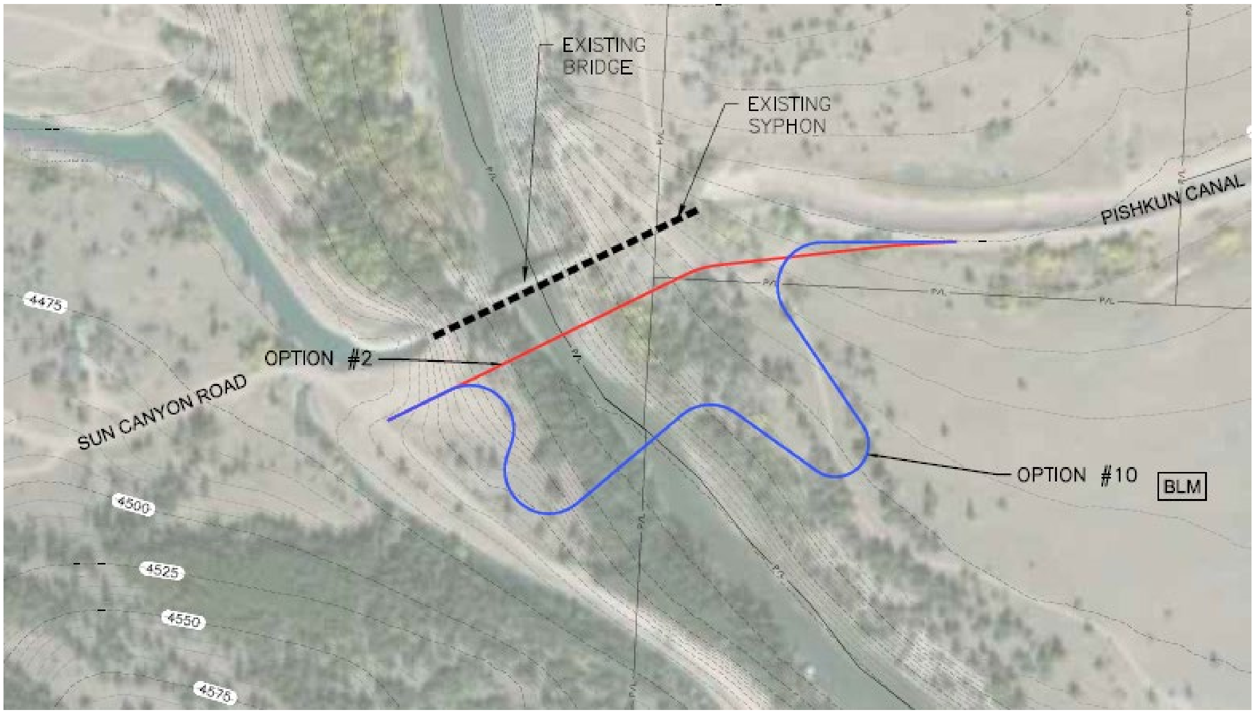
The PER determined that all three alternatives were feasible, however Alternative 10 was identified as the recommended alternative due to a determination of lowest cost based on preliminary analysis.

Based on the results of the PER, GID submitted a Federal Lands Access Program (FLAP) grant application for the project in 2021. The project was approved by the Montana Project Decision Committee (PDC), and a total of $6.2 million was initially allocated from FLAP for construction, with additional matching funds of $1.8 million from USBR provided through the Federal Lands Transportation Program (FLTP), for a total of $8.0 million. The funding was intended to cover the construction of a new two-lane bridge, approximately 2,100 feet of new two-lane approach roadway, inspection of the Pishkun Canal siphon, and demolition or retrofit of the existing bridge. The grant application also requested canal and siphon repairs, but the USBR and Montana PDC directed that FLAP funding cannot be used for irrigation repair work.

4.2. WFLHD Risk Analysis and Design Verification

After FLAP funding was awarded and the project was programmed, WFLHD reviewed the PER for geotechnical and other design criteria assumptions as well as quantity calculations and unit costs. WFLHD considered the PER recommendation (Alternative 10) alongside Alternative 2, which was determined to present lower risks and cost uncertainty and reduced potential impacts to cultural resources and wildlife due to the combination of a longer bridge, smaller footprint, and reduced road construction, rock blasting, and retaining walls. The two alternatives analyzed in more detail by WFLHD are shown in Figure 2.

Figure 3: Design Alternatives Analyzed by WFLHD



Source: Preliminary Engineering Report, June 2019.

WFLHD obtained more recent LiDAR mapping of the site and updated the quantities and unit costs compared to those used in the PER report. Labor shortages and supply chain issues due to the Covid-19 pandemic have caused dramatic increases in construction costs since the time of the PER. The average total project costs in 2025 dollars for a two-lane structure were higher than the costs identified in the PER by approximately $2 million (for Alternative 2) to $8 million (for Alternative 10).

Because the updated costs from the initial design verification were significantly higher than the programmed amount, WFLHD explored alternatives to modify the project scope and reduce construction costs. The existing bridge is a single-lane bridge and connects Sun Canyon Road to the single-lane Pishkun Canal Road. Since the new bridge would connect to a single-lane road, WFLHD determined there was no need for a two-lane structure and developed single-lane designs for Alternatives 2 and 10. Additionally, due to risks and uncertainties associated with demolition or rehabilitation of the existing bridge, this element was separated from the bridge reconstruction project scope and is being evaluated independently as a potential future project. WFLHD developed a range of total project costs in 2025 dollars to account for the uncertainty in bid prices, with the upper ranges approximately $0.2 million (Alternative 2) to $5.4 million (Alternative 10) higher than costs reported in the PER.

A consultant team led by Robert Peccia & Associates (RPA) conducted a quality control review to provide an independent verification of the WFLHD results[3]. Based on a quantity and unit price verification process and quality control review, the RPA team found that WFLHD's assumptions, quantities, and unit prices were reasonable and accurate. However, the consultant team determined that Alternative 8 would provide a more desirable bridge configuration by crossing the river at a perpendicular angle while resulting in similar risks, impacts, and costs compared to Alternative 2. Accordingly, Alternative 8 was advanced in place of Alternative 2.

4.3. Alternatives Previously Considered But Dismissed

All alternatives identified in the PER were determined to meet the purpose and need statements by replacing the existing structurally deficient bridge with a new bridge structure meeting current design standards that would provide a safe, local crossing of the Sun River to serve all users.

Some alternatives were determined to be unreasonable, however, because they would be difficult to construct, excessively costly, and would result in greater environmental impacts than the reasonable alternatives.

Through preliminary analysis, the PER considered environmental impacts, right-of-way requirements, impacts to the existing siphon and canal, ability of the existing bridge to remain open, approach navigability, and planning-level costs. Based on the screening process GID used to evaluate the preliminary concepts, the following alternatives were dismissed from further review in the PER and were either not reconsidered or were subsequently dismissed by WFLHD.

- **Alternative 1** was dismissed in the PER due to its location at the existing bridge site, which would eliminate the possibility of maintaining traffic during construction. Additionally, new bridge foundations would need to be constructed close to the underground siphon, risking siphon damage. The new bridge would be skewed and cross over the siphon, making future siphon maintenance and access difficult. WFLHD concurred with these findings and dismissed this alternative from further consideration.

- **Alternative 1A** was identified in the PER as one of three shortlisted alternatives. However, WFLHD dismissed this alternative from further consideration due to its close proximity to the existing bridge and siphon and the associated risk of impacts to these historic structures. Additionally, the alignment of the western approach roadway would cross the canal spillway, presenting risk of overtopping during a spillway flood event. For these reasons, this alternative was dismissed.

- **Alternative 2** was dismissed in the PER due to its high relative cost to other alternatives. WFLHD selected this alternative for further consideration because it would maximize the length of the finite bridge structure while minimizing the length of road work, the project footprint, and high-risk project elements such as rock blasting and retaining walls, while resulting in reduced potential impacts to environmental resources. Ultimately, Alternative 2 was dismissed in favor of Alternative 8, which offered a slightly improved bridge angle while still providing all of the same benefits of Alternative 2.

- **Alternative 3** was dismissed in the PER because of its high relative cost to other alternatives. Additionally, this alternative would require the largest amount of new road construction and consequently would result in excessive impacts to private property and the environment. WFLHD concurred with these findings and dismissed this alternative from further consideration.

- **Alternative 4** was dismissed in the PER because of its high relative cost to other alternatives, along with new roadwork on the east approach and associated impacts. WFLHD concurred with these findings and dismissed this alternative from further consideration.

- **Alternative 5** was dismissed in the PER because of its high relative cost to other alternatives. Additionally, approach roadways would cross over the existing siphon, and this alternative would result in the greatest impacts to nearby fishing and camping areas, likely requiring the area to be closed during construction. WFLHD concurred with these findings and dismissed this alternative from further consideration.

- **Alternative 6** was dismissed in the PER because of its high relative cost to other alternatives and negative impacts on the nearby fishing and camping area. Additionally, approach roadways would cross over the existing siphon, presenting risk of impacts to the existing structure. WFLHD concurred with these findings and dismissed this alternative from further consideration.
- **Alternative 7** was identified in the PER as one of three shortlisted alternatives. However, WFLHD dismissed this alternative from further consideration because it would require the construction of substantial new approach roadway that would cross the historic siphon on both sides of the river, resulting in potential impacts to the historic structure and other environmental resources. For these reasons, this alternative was dismissed.
- **Alternative 9** was dismissed in the PER because of its high relative cost to other alternatives with comparatively similar attributes to Alternative 10. Given the higher costs and similarity to Alternative 10, WFLHD concurred with these findings and dismissed this alternative from further consideration.

Alternative 1, 1A, 2, 3, 4, 5, 6, 7, and 9 were dismissed and will not be advanced for further consideration.

4.4. Preliminary Alternatives Screening

The project team identified the following screening criteria to guide evaluation of Alternatives 8 and 10 and determine selection of the preferred alternative for evaluation in the EA.

Criteria:

- Environmental Impacts: Potential impacts to wetlands and streams, upland and riparian vegetation, endangered species, general wildlife and fish species, and cultural and historical resources
- Historic Structures: Risk of potential impacts to existing bridge, siphon, and canal
- Constructability: Geotechnical stability and associated risks
- Right-of-way Impacts: Amount of new land to be disturbed in terms of number of parcels and landowners impacted, severity of impacts, quantity of right of way required and estimated costs, and potential risks related to the right of way acquisition.
- Schedule: Amount of time required to complete design and construction of proposed alternatives.
- Financial Feasibility: Total estimated construction costs

The screening analysis used the following symbols to compare the alternatives.

- A full circle ● indicates that the alternative best meets the criteria.

- A half-full circle ◒ indicates that the alternative partially meets the criteria.
- An empty circle ○ represents that the alternative fails or is least able to meet the criteria.

The following sections present the findings from the screening process. Information on components, assumptions, costs, advantages, and disadvantages associated with Alternatives 8 and 10 is based on the most current design as of May 2023 and differs in some cases from the 2019 PER.

4.4.1. Environmental Impacts

The project area is adjacent to the Rocky Mountain Front on public lands and near designated wilderness areas. The project is located in a steep rocky river canyon with a narrow floodplain. Environmental resources that could be affected by the proposed project include wetlands and streams, upland and riparian vegetation, fish, wildlife including state and federally listed species, and cultural resources.

Land Disturbance

Alternative 8: Approximately 1,350 feet of road would need to be constructed to tie the new alignment with the existing roads. The approaches would require small amounts of earthwork and potential to disturb the smallest area of existing vegetation.

Alternative 10: Approximately 2,000 feet of road would need to be constructed to tie in the new alignment with the existing roads, and the approaches would require large amounts of earthwork. The existing vegetation would be disturbed the greatest amount due to the length of the access road improvements to get to the new bridge.

Wetlands and Streams

The only features shown on the U.S. Fish and Wildlife Service National Wetlands Inventory map are the Sun River and Pishkun Canal. There are no wetlands mapped in the project vicinity.

Both alternatives would limit work within the river channel. Support piers for the new bridge would be installed on each side of the riverbank which may temporarily increase turbidity in the stream and lower water quality. Best management practices would be followed to reduce the amount of disturbance along the banks and sediment that could potentially enter the water.

Upland and Riparian Vegetation

Riparian vegetation is limited to a strip along the river's edge. The riparian areas surrounding the existing bridge generally consist of a densely populated growth comprised of tall and medium trees, grasses, forbs, and shrubs. The northeast bank of the river located upstream of the existing bridge is only moderately vegetated with similar species, and the riverbank is predominately a rock canyon.

Both alternatives would limit work within riparian areas. Upland vegetation would be impacted by construction of new approach roadways, with greater impacts resulting from the longer approach roads under Alternative 10 compared to shorter approach roads under Alternative 8.

Endangered Species

Two known threatened and endangered species (grizzly bear and Canada lynx) and one proposed threatened species (North American wolverine) could potentially occur within the project area. Grizzly bears have been documented in the general project area. The threatened Canada lynx and the proposed threatened North American wolverine may be present in the general project vicinity as rare transients. This proposed project is located outside of the Canada lynx designated critical habitat boundary. The project area is not located in or near any Sage Grouse habitat. There are no known threatened or endangered plants in the area. The greatest disturbance to grizzly bears and other wildlife would result from rock blasting or soundless cracking demolition agents likely required to perform the required excavation for bridge supports.

<u>Alternative 8</u> would result in less noise disturbance since rock blasting would not be needed.

<u>Alternative 10</u> result in greater noise disturbance since rock blasting would be needed for approach road work.

General Wildlife and Fish

Both alternatives have the same potential to disrupt wildlife due to noise and there could be potential effects to migratory birds due to vegetation clearing. Breeding and non-breeding eagle activity occurs in the general project area year-round.

<u>Alternative 8</u> would remove less upland habitat for birds and large and small game animals due to its shorter road length and would avoid the need for rock blasting.

<u>Alternative 10</u> would remove more upland habitat for birds and large and small game animals due to its longer road length and would involve rock blasting for road approach work.

Neither alternative would degrade wildlife connectivity or aquatic organism passage.

Cultural Resources

Previous cultural resource inventories show previously recorded sites in the vicinity. Additional sites and artifacts may be discovered during surveys conducted in support of this project or during construction activities. Alternative 10 has an increased potential to impact cultural resources due to greater area of ground disturbance associated with the approach road work. Consultation would be required to comply with Section 106 under either alternative.

Summary

Table 2 summarizes environmental impacts for Alternatives 8 and 10. Alternative 8 is anticipated to be less impactful overall from an environmental standpoint due to the comparatively smaller area of land disturbance and reduced potential cultural resource impacts associated with shorter approach roadways compared to Alternative 10.

Table 2: Environmental Impacts

<table>
<tr><th>Alternative</th><th>Land Disturbance</th><th>Wetland and Stream Impacts</th><th>Wildlife Disturbance</th><th>Riparian Vegetation Impacts</th><th>Cultural Resources</th><th>Screening Evaluation</th></tr>
<tr><td>Alternative 8</td><td>Vegetation clearing associated with 1,350 feet of new road.</td><td rowspan="2">No impacts on wetlands would occur for either alternative. Water quality impacts could occur due to sediment to the same degree under both alternatives.</td><td>Noise from new bridge construction would temporarily disturb wildlife.</td><td rowspan="2">Some clearing of riparian vegetation may be required at bridge approaches for both alternatives.</td><td>Decreased potential for impacts due to smaller area of ground disturbance.</td><td>●</td></tr>
<tr><td>Alternative 10</td><td>Vegetation clearing associated with 2,000 feet of new road.</td><td>Noise from new bridge construction and rock blasting for approach road work would temporarily disturb wildlife.</td><td>Increased potential for impacts due to greater area of ground disturbance.</td><td>○</td></tr>
</table>

4.4.2. Historic Structures

Historic structures within the vicinity of the project include the Pishkun Supply Canal, the Pishkun Canal Siphon, and the existing bridge.

The canal and underground siphon are critical to GID operations. Depending on project location and scope, activities such as excavation, rock blasting, drilling, and heavy loads could potentially impact these structures during construction of a new bridge. Any damage to historic structures sustained during construction would require subsequent repair, resulting in increased overall costs.

Alternative 8 would place the new bridge approximately 300 feet downstream of the existing bridge. This offset alignment would minimize the potential for high-risk construction activities near the historic structures and provide flexibility for construction means and methods. Additionally, Alternative 8 would require a reduced amount of approach road work, and the higher bridge elevation compared to Alternative 10 would avoid the need for rock blasting.

Alternative 10 would place the new bridge approximately 500 feet downstream of the existing bridge, with the new bridge ends placed at a lower elevation, producing a shorter bridge with more roadwork. Of the two alternatives, Alternative 10 would provide the greatest distance from the historic structures. However, the increased amount of approach roadwork and bridge placement at a lower elevation would require rock blasting not needed on Alternative 8, which would represent a greater risk to the historic structures.

Summary

As presented in **Table 3**, Alternative 10 would pose the greatest risk of impacts to historic structures, with its distance from the historic bridge and siphon offset by the rock blasting required for approach road work.

Table 3: Historic Structure Impacts

Alternative	Historic Structure Impacts	Screening Evaluation
Alternative 8	New bridge constructed 300 feet away from historic structures, no approach road work requiring blasting	●
Alternative 10	New bridge constructed 500 feet away from historic structures, approach road work requiring blasting	◒

4.4.3. Constructability

Alternative 8 would place the new bridge elevation near the top of the Sun River canyon. Approach road construction would consist of conventional earth embankments with mechanically stabilized earth retaining walls at the abutments to reduce the bridge length. The approach roads would generally be straight and align with the new bridge, simplifying staging of materials and equipment access. The intermediate bridge support piers would be taller than Alternative 10, but the construction methods would be the same.

Alternative 10 would place the new bridge elevation approximately 40 feet lower than Alternative 8, roughly halfway down into the Sun River canyon. To keep the approach road grades gentle, S-curves are proposed on both ends of the bridge to lengthen the road and flatten the grade. The lower bridge elevation results in through cuts up to 30 feet deep. Given the shallow bedrock present at the site, blasting is anticipated along much of the alignment. Mechanically stabilized earth retaining walls are also required on the west side of the river to facilitate the construction of the S-curves on the steep canyon walls. The serpentine alignment, through cuts, and retaining walls combine to create a constrained construction site with limited space for equipment and material staging as well as difficult access for oversize loads, such as bridge girders.

Summary
As presented in **Table 4**, Alternative 8 would take advantage of the relatively flat benches on either side of the Sun River canyon for approach road construction and material and equipment staging. Alternative 10 would rely on blasting and retaining walls to descend into the canyon, constraining the work site and limiting access for construction equipment and materials.

Table 4: Constructability

Alternative	Constructability	Screening Evaluation
Alternative 8	Conventional road construction methods, open work site	●
Alternative 10	Specialty road construction methods, difficult bridge access for equipment and materials	○

4.4.4. Right-of-Way Impacts

A proposed right-of-way corridor was laid out for Alternative 8 and Alternative 10 based on preliminary construction limits. Alternative 8 yielded approximately 4.1 acres of new right-of-way required, while Alternative 10 yielded approximately 5.0 acres of new right-of-way required. Although Alternative 10 is roughly 50% longer than Alternative 8, the vertical features (rock cuts, retaining walls) proposed on Alternative 10 limit the width of new right-of-way required.

Both alternatives would require new right-of-way from one USFS parcel, one USBLM parcel, and one private parcel, owned by Frances Creek, LLC, for a total of three impacted parcels. Alternative 10 would require more right-of-way from the private parcel than Alternative 8. Right-of-way acquisition for Alternative 10 could take longer and would cost more given greater impacts to the private parcel.

Summary
As presented in **Table 5**, Alternatives 8 and 10 result in similar requirements for new right-of-way acquisition.

Table 5: Right-of-Way Impacts

Alternative	Right-of-Way Impacts	Screening Evaluation
Alternative 8	4.1 acres, 3 impacted parcels	●
Alternative 10	5.0 acres, 3 impacted parcels	◒

4.4.5. Schedule

The construction sequencing and schedule for the project are unknown at this time and would depend on the specific design of the selected alternative. From a preliminary screening level, key project elements that could impact the design and construction schedule include the amount and type of new roadway construction.

<u>Alternative 8</u> would minimize the amount of new approach roadway construction, resulting in a more accelerated construction schedule. Additionally, bridge and approach roadway construction could happen concurrently because the bridge pier and abutment locations would be accessible without the new approach roads. Two partial construction seasons are anticipated to construct Alternative 8.

Alternative 10 would require longer approach roadways following a serpentine alignment to navigate steep grades. Roadway construction would require more time due to the blasting required. The bridge abutment locations would not be accessible until the approach roads were blasted down to them, further lengthening the schedule in comparison to Alternative 8. Two full construction seasons are anticipated to construct Alternative 10.

Summary

As presented in **Table 6**, Alternative 8 is anticipated to provide an accelerated project schedule compared to Alternative 10.

Table 6: Schedule

Alternative	Schedule	Screening Evaluation
Alternative 8	Accelerated schedule due to shorter approach roadways and concurrent road and bridge construction; two partial construction seasons anticipated	●
Alternative 10	Lengthened schedule due to longer approach roadways, blasting, and delayed bridge abutment access; two full construction seasons anticipated	◒

4.4.6. Financial Feasibility

With $8.0 million in funding originally provided through FLAP and USBR matching funds and an additional $2.5 million approved by the PDC through FLAP, the total available funding for the project is currently $10.5 million.

The project team prepared preliminary cost estimates for each bridge replacement alternative. **Table 7** summarizes the total project costs in 2025 dollars developed by the RPA team for each alternative using typical percentages for mobilization (10%), preliminary engineering (12%), construction engineering (10%), and construction modifications (10%). For equivalent comparison purposes, a prestressed concrete bulb tee girder bridge type was assumed for both alternatives. Other bridge types, such as a steel girder or tub steel girder, could be considered during project development but would be more costly compared to the concrete bulb tee option.

Construction costs are for the new bridge and approach roads only and do not include retrofit or demolition of the existing bridge, which is being evaluated independently as a potential future project. Repair of the siphon and lining of the Pishkun Canal upstream of the siphon to control leakage are also not included as they are not eligible under the funding secured for the project.

Summary

As presented in **Table 7**, the total estimated project construction costs for Alternative 8 would fall within available funding levels, whereas the estimated cost for Alternative 10 would exceed available funding, assuming a prestressed concrete bulb tee girder bridge type.

Table 7: Financial Feasibility

Bridge Replacement Alternative	Bridge Type	Approximate Estimated Costs	Screening Evaluation
Alternative 8	Prestressed Concrete Bulb Tee Girder	$9.0 Million	●
Alternative 10	Prestressed Concrete Bulb Tee Girder	$15.0 Million	○

Source: Quality Control Review Memorandum (February 2023), Cost Estimate prepared in support of DRAFT Type, Size, and Location Memorandum (March 2023), and project adjustments incorporated after field review (April 2023).

5.0. Existing Bridge

Three options were identified for future consideration to address the existing historic bridge structure. These options were considered independently from the bridge reconstruction alternatives and could be pursued as a potential future project.

5.1.1. Option Identification

Option 1 – Repair Existing Bridge

The first option would be to repair the existing structure so it would be adequate for future equestrian/livestock and pedestrian use only. All vehicular traffic would be routed over the new bridge structure. Existing elements requiring repair would include the bridge deck, abutments, railings, and structural members to safely accommodate equestrian and pedestrian loading and address current structural deficiencies.

Option 2 – Remove Existing Bridge

A second option would be to demolish the existing bridge and route all pedestrian, equestrian/livestock, and vehicular traffic over the new structure. A detailed review of the existing substructure and approach elements would need to be conducted to determine feasible methods for removing these elements while minimizing impacts to the river and existing siphon.

Option 3 – Preserve in Place and Decommission Existing Bridge

A third option would be to leave the existing bridge in place and not improve it in any way. Removal of the concrete decking and/or installation of bridge closure signage and barriers may be needed to prevent public use of the structure given the existing structural deficiencies.

5.1.2. Additional Analysis Needs and Potential Risks

To determine the scope and cost of Option 1, detailed analyses would be required on all structural members, connections, and fasteners to determine their load carrying capacity and remaining service life. Calculations would need to account for loading after the bridge is repaired, as well as the likely higher loads imposed by construction equipment during the bridge repairs. All components with insufficient strength or service life would need to be designed and replaced. The abutment bearings have failed, and a system of lifting the existing bridge to replace the bearings would need to be designed. The bridge would need to be repainted to protect the structure, and the existing paint would need to be tested for hazardous materials to determine the appropriate method of removal and containment protocols required. A new bridge deck to replace the existing concrete panels and new bridge railing would be required.

For removal of the existing bridge under Option 2, the structure would need to be analyzed to determine the correct sequencing of disassembly to avoid an uncontrolled collapse. The bridge would need to be tested for hazardous material to determine the containment protocols required during demolition. Impacts of temporary work platforms in the river or a temporary work bridge would need to be examined. The removal plan would need to consider potential damage to the Pishkun Canal siphon, which is immediately downstream and parallel to the existing bridge. The slope above the southern abutment is unstable and appears to be buttressed by the existing bridge. A detailed geotechnical analysis would be required to determine if removing the existing bridge would further destabilize the slope and potentially pose risks to the canal. The existing bridge is eligible for the National Register of Historic Places. Before any demolition activities, the existing bridge would need to be documented and photographed.

For the preserve in place option, the existing bridge would continue to be inspected on a regular basis to monitor the structure and ensure the safety of recreational activities in the vicinity. Signage, barriers, or removal of the bridge deck would be required to protect the bridge from overweight loads. Leaving the existing bridge in place would minimize impacts to water quality and maintain existing scour pools around the bridge piers, which provide favorable fish habitat when the Sun River is low in summer.

Consideration of environmental impacts, geotechnical stability, hazardous materials, risk of damage to the historic siphon and canal, and financial feasibility would be needed to determine a preferred option for the existing bridge. At this time, insufficient information is available to evaluate these criteria.

6.0. Conclusion and Recommendation

While potentially still above the programmed funding amount depending on the bridge type selected during design, **the preferred bridge reconstruction alternative (Alternative 8) in a single-lane configuration meets the project purpose and need while also minimizing risks, impacts, and costs.**

- A smaller footprint with minimal approach road work would reduce potential impacts to environmental resources.
- The crossing alignment and minimal approach road work would minimize potential damage to the existing canal and siphon.
- Conventional construction methods would be employed without the need for specialty blasting contractors.
- Reduced right-of-way would be required.
- The project schedule would be streamlined due to the smaller footprint, simplified approach roadway construction, and concurrent roadway and bridge construction.
- The estimated construction cost is anticipated to fall within the available funding amount for the project.

Alternative 8 in a single-lane configuration meets the purpose and need of the project to provide a safe crossing for GID, the general public, and federal land management agencies. It meets applicable design standards, minimizes impacts to surrounding undisturbed areas, and offers a lower-cost alternative compared to Alternative 10, regardless of the bridge type ultimately selected.

Table 8: Bridge Reconstruction Screening Summary

Reconstruction Alternative	Environmental Impacts	Historic Structures	Constructability	Right-of-Way Impacts	Schedule	Financial Feasibility
Alternative 8	●	●	●	●	●	●
Alternative 10	○	◒	○	◒	◒	○

Analysis of the existing bridge is in the preliminary stages. More detailed evaluation is needed to evaluate the feasibility and potential risks and impacts associated with options for the existing bridge. A preferred option for the existing bridge will be made after additional data is collected and analyses are performed.

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[1] TD&H Engineering, Preliminary Engineering Report (PER) for Sun River Bridge Replacement, June 2019.

[2] U.S. Bureau of Reclamation, Montana Area Office, Bridge Inspection Report – Sun River Bridge, 2017.

[3] Robert Peccia & Associates, Quality Control Review Memorandum for the Sun River Bridge Replacement, February 2023.