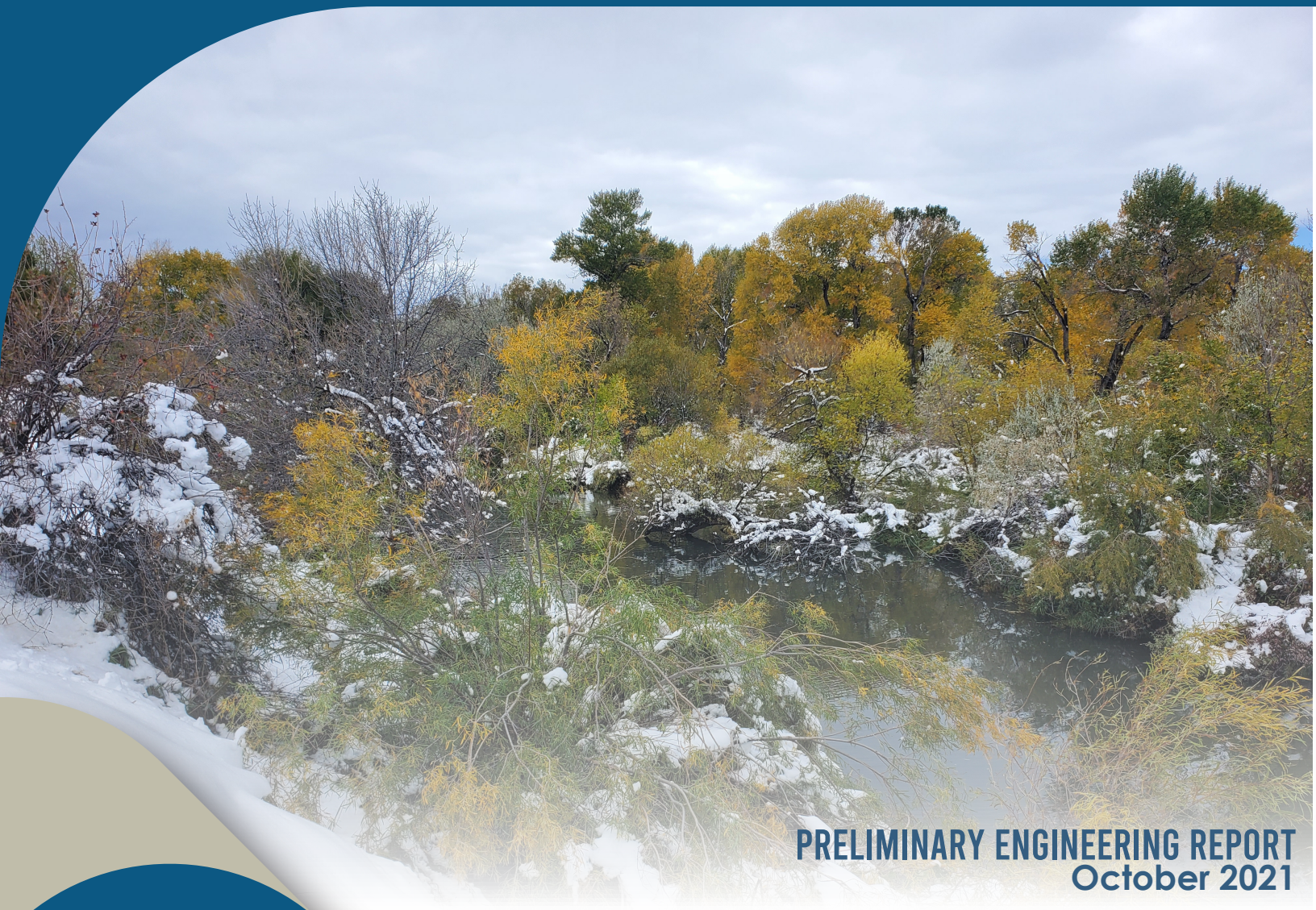
Fleshman Creek Connector at Moja Campbell Dog Park

Park County, Montana



PRELIMINARY ENGINEERING REPORT
October 2021

PROJECT OWNER:

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I. Executive Summary

Communities that prioritize and incorporate pedestrian and non-motorized trails into their active transportation and infrastructure plans are providing a foundation focused on healthy recreation and transportation opportunities. Trails create safe, attractive and accessible places for people of all ages and abilities to walk, hike, jog and cycle. In addition, trail systems can become a source of community identity and pride.

Park County is responsible for bridges over waterways and has been proactive in identifying long-range goals to create a system of interconnected trails throughout the County, as illustrated in the current Park County Growth Policy and the Park County Active Transportation Plan. Creating interconnected trails leads to more widespread use of existing infrastructure as neighborhoods and recreation areas become more readily accessible.

The Park County Active Transportation Plan recognizes a great demand for future trail development, which was identified through a survey of residents living within the 59047-zip code. Priorities discovered through the survey process included trails to Mayor's Landing and Fleshman Creek. The proposed bridge will allow users to access Moja Campbell Dog Park from East Lewis Street, providing improved pedestrian access for residents on the east end of Livingston. Upon completion of the Yellowstone River pedestrian bridge at Mayor's Landing, the Fleshman Creek pedestrian bridge at Moja Campbell Dog Park will allow additional connection to existing trails and recreation areas including the Meyers-Watson Trail, the Old Boulder Road, and Bureau of Land Management acreage.

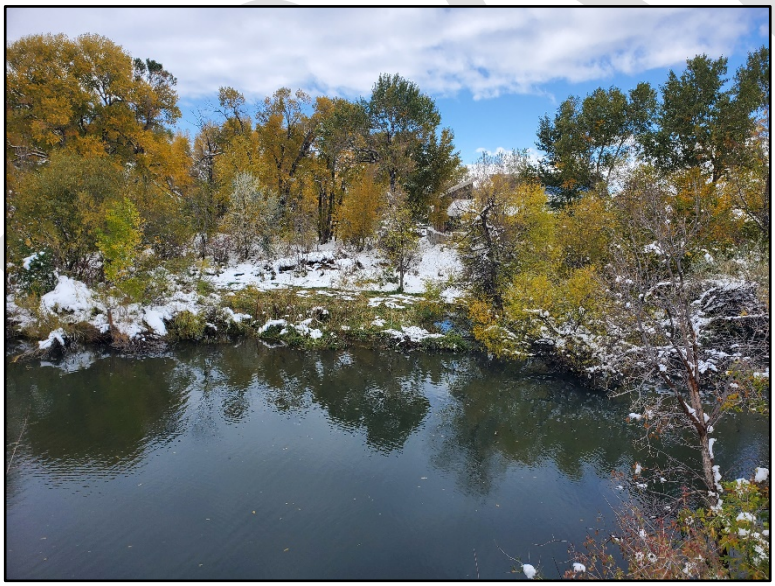

Figure 1: Location of proposed pedestrian bridge over Fleshman Creek

The primary benefit of the proposed pedestrian bridge is to provide a linked alternative transportation system on the east end of Livingston for pedestrian and bicycle traffic; however, additional benefits of the project include:

- Alleviating pedestrian/vehicle conflicts
- Economic boosts to local businesses
- Extended access for school students and educators for classroom or exercise activities
- Convenience and ability to experience the Yellowstone River and its many ecological attributes

Two alternatives have been considered to be the most economical and viable, long-term solution for the proposed bridge, and include:

Alternative 1: Single span prestressed concrete beam bridge
Alternative 2: Single span prefabricated steel bridge

Alternative 2 is the preferred alternative. While both bridge alternatives are very similar, the prefabricated steel bridge with a steel pile foundation has the lowest present worth.

The Opinion of Probable Cost for **Alternative 2**, Table 1, shows a line-item estimate of the total project cost, including design, construction and contingency allowance. The total project cost is $707,910.

Table 1

Fleshman Creek Connector Bridge at Moja Campbell Dog Park
Park County
Opinion of Probable Cost (OPC)
October 19, 2021
Alternative 2 - Single Span Prefabricated Steel

Item No.	Estimated Quantity	Unit	Description	Unit Price	Total Price
MOB / DEMOB					
1	1	LUMP SUM	Mobilization and Demobilization	$40,000.00	$40,000.00
2	1	LUMP SUM	Bonding and Insurance	$25,000.00	$25,000.00
3	1	LUMP SUM	Traffic Control	$2,500.00	$2,500.00
ABUTMENTS					
4	1	LUMP SUM	Work Bridge	$175,000.00	$175,000.00
5	30	CUBIC YARD	Structure Excavation, Type II	$75.00	$2,250.00
6	200	LINEAR FEET	Furnish Steel Piles	$55.00	$11,000.00
7	188	LINEAR FEET	Drive Steel Piles	$45.00	$8,460.00
8	4	EACH	Pile Driving Points	$125.00	$500.00
9	10	CUBIC YARD	Class "Structure" Concrete	$800.00	$8,000.00
10	175	CUBIC YARD	Riprap - Class II	$125.00	$21,875.00
SUPERSTRUCTURE					
11	1	LUMP SUM	Furnish Superstructure	$147,800.00	$147,800.00
12	1	LUMP SUM	Install Superstructure	$25,000.00	$25,000.00
13	4	EACH	Furnish & Install Bridge Approach Sections	$1,500.00	$6,000.00
14	80	CUBIC YARD	Bridge End Backfill	$70.00	$5,600.00
15	25	CUBIC YARD	Class "Deck" Concrete	$800.00	$20,000.00
CIVIL / ROADWORK					
16	100	CUBIC YARD	Unclassified Excavation	$60.00	$6,000.00
17	300	CUBIC YARD	Import Trail Fill	$25.00	$7,500.00
18	40	CUBIC YARD	6" Minus Gravel Base	$50.00	$2,000.00
19	15	CUBIC YARD	1" Minus Gravel Surfacing	$75.00	$1,125.00
20	2	ACRE	Seeding & Fertilizing	$2,000.00	$4,000.00
			SUB-TOTAL CONSTRUCTION COST		**$519,610.00**
			Preliminary Engineering	12%	$62,400.00
			Geotechnical Engineering	1.2%	$6,300.00
			Construction Administration	3%	$15,600.00
			Contingency	20%	$104,000.00
			TOTAL PROJECT COST		**$707,910.00**

II. Problem Definition

A. Identify the Area Served by the Bridge

1. Location of Bridge

The proposed location of the Fleshman Creek Pedestrian Bridge is in Section 18, Township 2 S, Range 10 E. The structure crosses Fleshman Creek utilizing an existing City of Livingston easement, identified as a "20' wide public easement for pedestrian and non-motorized vehicle access" on Certificate of Survey No. 2074RB. The easement begins on the south side of East Lewis Street and extends southeast to Fleshman Creek (see **Appendix A** for a copy of the COS). Property on the south side of Fleshman Creek, which is the Moja Campbell Dog Park, is owned by the City of Livingston.

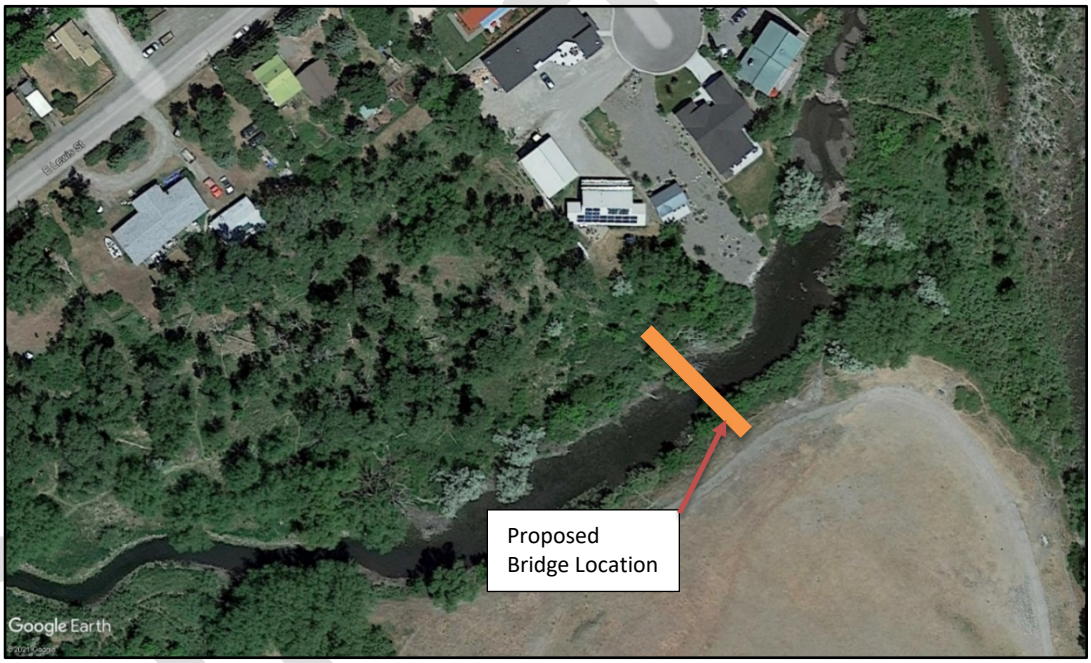

Figure 2: Aerial view of proposed pedestrian bridge location

Vicinity maps are enclosed in **Appendix A**, as well as the portion of the Glengarry quadrangle United States Geological Survey (USGS) map showing the project location. The bridge latitude and longitude are 45°40'07" and 110°32'26" respectively, and the deck elevation will be approximately 4,475 feet above mean sea level.

2. Physical Characteristics of the Area

This structure will be located at the end of an existing trail easement, as previously identified, crossing Fleshman Creek and terminating at Mayor's Landing.

The terrain at the bridge site is generally characterized by steeply sloped channel banks and wide, level wetlands, with primary vegetation being native shrubs and trees (see maps, **Appendix A**). According to the Natural Heritage Program, there are extensive mapped wetlands along the north bank of Fleshman Creek, which will require wetland delineation and mitigation to permit bridge construction (see map, **Appendix B**). The project area is located within a FEMA Zone X, which indicates a 0.2% annual chance flood hazard area (see map, **Appendix B**).

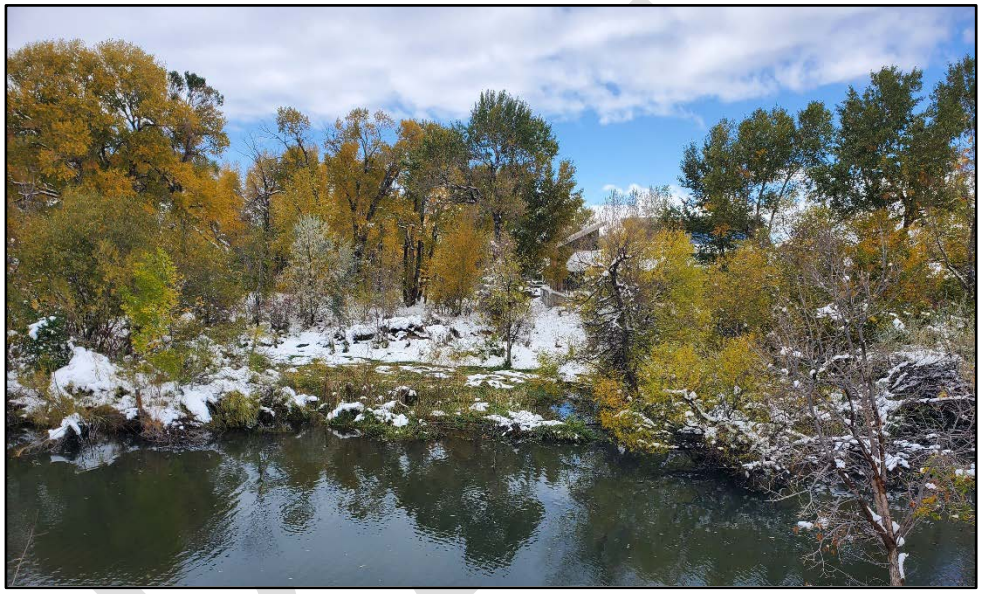

Figure 3: Wide wetland area along the north channel bank

Soil characteristics at the project site were taken from the Department of Natural Resources Conservation Service (DNRC) Web Soil Survey. The soil survey indicates that conditions at the project site are primarily loam and sandy loam, with cobbles and coarse sand in deeper strata. In addition to the DNRC Web Soil Survey, well log information taken from the Montana Bureau of Mines and Geology (MBMG) shows the location of water wells drilled in the project vicinity. The corresponding well logs indicate that soils in the area are generally comprised of sand, gravel and cobbles. Web Soil Survey information and nearby well logs from MBMG can be found in **Appendix B**.

Although geotechnical investigation is not generally part of the preliminary engineering report activities, based on the bridges located within the general project vicinity, it is likely that driven steel piles will best suit the project site.

The stream channel at the bridge site is approximately 45-feet wide and flows generally west to east in the project vicinity. However, the due to the

steep banks and low wetland area, the overall bridge span will be approximately 110-feet. The creek originates in the Gallatin National Forest, northwest of Livingston, and terminates in the Yellowstone River, approximately 900 feet downstream of the proposed bridge location.

3. Users of the Bridge

a. Use of the Structure

As the proposed bridge will provide connectivity of existing parks and trails within the community, it is anticipated that the structure will be heavily used by residents walking, cycling and hiking. In addition to adjacent parks and trails, upon completion of the Yellowstone River Pedestrian Bridge at Mayor's Landing, the bridge will provide connectivity to the Livingston HealthCare campus, Bureau of Land Management (BLM) land, and State of Montana land.

The Park County Active Transportation Plan identifies strong support for an expanded trail system, with specific priorities for trails to Mayor's Landing and Fleshman Creek. In addition, existing planning documents for Park County and the City of Livingston identify plans for general trail expansion, as identified below.

The Park County Growth Policy, adopted in 2017, identified the following objective and actions:

- *Objective 10.2: Continue partnerships with the City of Livingston to develop Active Transportation facilities in and around the city.*
- *Action 10.2.1: Identify city and county shared priorities.*
- *Action 10.2.3: Work with the city on grant applications for Active Transportation facility and infrastructure funding.*

Similarly, the City of Livingston Growth Policy contains this objective:

- *Objective 8.1.1: Ensure trail and sidewalk connectivity within and around the City.*

b. Number of Users

While the number of users is difficult to assess, it is anticipated that individuals taking advantage of the new pedestrian bridge will be significant.

As part of the City of Livingston Parks & Trails Master Plan, which was completed in 2011, a survey of local residents was completed to better understand the users of recreational facilities within the City. The majority of respondents indicated that they regularly take part in walking,

bicycling, and hiking. In addition, the majority of respondents indicated that they utilize the parks and trails within Livingston on a weekly basis.

The Park County Active Transportation Plan, completed in 2015, also conducted a needs assessment survey, which had very similar results. 50% of survey responses indicated that existing walking paths are utilized on a weekly basis, and 41.6% indicate use of hiking/biking trails on a weekly basis. 58% of survey respondents think that walking paths and hiking/biking trails should be improved and/or expanded throughout the County. In addition, when asked what the one thing was they would improve about Park County trails, 40% of respondents indicated they would increase the number of trails.

The responses to the above referenced public outreach illustrate that recreationists in Park County and the City of Livingston are very active, and providing connectivity of existing parks and trails is a considerable benefit to an already lively trail system.

c. Growth Areas and Population Trends

Census results show that the population of Park County was 15,752 in 2010, and 17,191 in 2020, indicating a 9.9% increase in population during that time frame. The City of Livingston had a population of 7,094 in 2010 and 8,040 in 2020, resulting in a 14.1% population increase during the same time frame.[1]

Based on information provided in the Park County Growth Policy, it is anticipated that population growth in the County will likely range from 10%-18% between 2014 and 2036, illustrating the continued need for additional recreation infrastructure throughout the community.

Many communities throughout Montana continue to have declining populations; however, as Park County and the City of Livingston are experiencing a trend of significant population growth, it is important to continue to improve the infrastructure to encourage continued growth and economic development.

B. Need for the Project and Problems to be Solved

1. Current and Future Trail and Bridge Standards

In 2014, Park County adopted Transportation Standards in an effort to lend a measure of uniformity to future projects within the County (**Appendix J**).

[1] United States Census Bureau, "Decennial Census P.L. 94-171 Redistricting Data", http://census.gov/programs-surveys/decennial-census/about/rdo/summary-files.html

The Standards provide the minimum requirements for the design, construction and reconstruction of transportation infrastructure, which includes, but is not limited to, roads, bridges, culverts and trails. The Standards provide design guidance for Multi-Use and Recreational Pathways, stating that facilities should be built to ADA standards and the minimum standards set forth in the AASHTO Guide for the Development of Bicycle Facilities.

Specifically related to bridges, the Park County Transportation Standards outline specifications for hydraulic conveyance, geotechnical and structural design standards:

Hydraulic Conveyance: Bridge openings shall be designed to have adequate hydraulic conveyance capacity as to not adversely affect the headwater elevations during a 100-year flood by more than 6 inches. In addition, bridge openings shall be sized such that the bridge meets the following free board requirements:

Freeboard: 24" @ the 25-year design event
12" @ the 50-year design event

Geotechnical: Where a comprehensive geotechnical investigation is deemed a requirement by the County Commission/Design Engineer, a reputable geotechnical engineering firm shall be retained to determine the engineering properties of the soils through the use of borings, test pits, sampling and other methods. The geotechnical report shall be stamped by a professional engineer registered with the State of Montana.

Design and construction shall conform to the following design standards unless otherwise modified or amended in this document:

- AASHTO LRFD Bridge Design Specifications
- LRFD Guide Specifications for the Design of Pedestrian Bridges
- Montana Department of Transportation Standard Specifications for Road and Bridge Construction

In February 2021 the City of Livingston adopted a Public Works Design Standards and Specifications Policy (see **Appendix J**), which also states that "all bike lanes/paths shall be designed in accordance with the Guide for the Development of Bicycle Facilities (AASHTO, latest edition)."

2. Safety Considerations

The proposed bridge will follow the AASHTO LRFD Bridge Design Specifications for the design of a combination pedestrian/bicycle guardrail system for the structure. The Specifications outline the geometry and live loads necessary to meet all safety requirements.

3. Impact on Public and Emergency Services

As previously mentioned, the bridge is primarily intended for pedestrian and bicycle traffic; therefore, no impact on emergency services is anticipated.

4. Utility Location or Relocation

There are currently no utilities crossing Fleshman Creek at the project location. Overhead power lines are located along the south side of East Lewis Street, which will be considered during construction of the bridge for equipment access.

5. Floodway

The proposed location of the bridge is located in a FEMA Zone X, just outside of the Floodway of the Yellowstone River. Zone X is designated as 0.2% annual chance flood hazard, areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile. Per the Park County Floodplain Hazard Management Regulations, the proposed project is exempt from floodplain permitting, but must be designed to limit impacts of waterway conveyance.

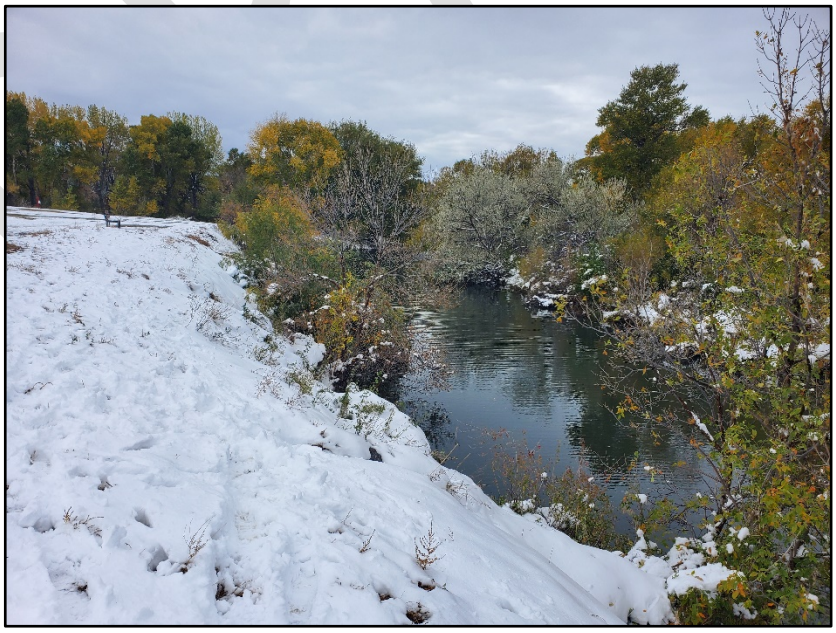

Figure 3: South channel bank with steep slope down to edge of water

The proposed bridge will clear span Fleshman Creek, which will minimize impacts to the channel and water surface elevation. The southern abutment will be perched approximately 10 feet above the channel to match existing grade from the trail loop at Moja Campbell Dog Park. Import fill will be required on the northern abutment to allow the required freeboard below the bridge. Through survey and final design, the exact height of fill will be determined, but all import fill will remain well outside of the active channel as to not impact stream conveyance.

C. Environmental Considerations

The proposed bridge crosses Fleshman Creek and will be approximately 110-ft long and 10-ft wide. On the north side of the creek, the bridge will tie into an existing City of Livingston trial easement and on the south side of the creek, the property is owned by the City of Livingston.

According to the Montana Natural Heritage Program (see **Appendix F**), there are 23 species of concern in the project vicinity. In addition, one special status species is located within the project vicinity, which is the bald eagle. Permitting regulations will ensure construction of the bridge will not impact the species of concern or the special status species.

The Montana Sage Grouse Habitat Conservation Program website was consulted to determine if the project is located within an area of concern. Based on the map, the project vicinity is not located within a Sage Grouse Executive Order Habitat Classification (see **Appendix B)**.

Permits will be obtained from the U.S. Army Corps of Engineers (404 and Section 10), Montana Fish, Wildlife and Parks (SPA 124), and, if necessary, the Montana Department of Environmental Quality (Authorization 318). Impacts to wetland areas are expected; therefore, a wetland delineation and mitigation will be required.

The following agencies will be contacted for comments concerning the Environmental Assessment: Montana Fish, Wildlife & Parks; US Fish and Wildlife; State Historic Preservation Office; Department of Environmental Quality; Department of Natural Resources Conservation; National Heritage Program; US Army Corps of Engineers; and Montana Department of Transportation. Comments can be found in **Appendix F**.

Best Management Practices (BMP's) will be implemented to prevent dust and sedimentation during construction, and water will be used for dust abatement as directed by the inspector. A Montana DEQ-Pollutant Discharge Elimination System (MPDES) Permit will be obtained prior to construction. Furthermore,

erosion and sediment control plans will be included as part of the contract specifications. Sediment control barrier will be placed on the downhill edge of all disturbances.

D. General Design Requirements

The new structure will meet or exceed the following Park County bridge design standards:

Design Load	= 90 psf Pedestrian Load
Hydraulic Requirements	= 50-year design flood
Freeboard	= 24" @ 25-year design event &
	= 12" @ 50-year design event

The vertical placement of the bridge will be based on the existing channel bank elevations and the 50-year water surface elevation. The bridge will be installed to provide a minimum 12" of freeboard, as required by the Park County design standards. Single span bridge alternatives will meet the no-rise requirement set forth within the Park County Floodplain Regulations.

A geotechnical investigation will be performed prior to the design and construction of the new structure to ensure appropriate practices are in place for the existing soils.

The new structure will follow all design requirements set forth in the AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges, the AASHTO LRFD Bridge Design Specifications, and the AASHTO Guide for the Development of Bicycle Facilities.

III. Alternative Screening Process

The Alternative Screening Process considers all reasonable and economic bridge design alternatives. A discussion on the designs that were considered follows.

1. Installation of a Culvert

   The Fleshman Creek drainage basin and resulting peak stream flows are moderate, as indicated by the existing stream width of approximately 40-feet. However, the full channel width, from bank to bank, is approximately 100-feet. Therefore, the natural width of the channel does not allow for a single culvert opening.

   In order to utilize culverts at this location, multiple barrels would need to be used to match the natural channel width; however, in areas with high debris passage, multiple barrels present a maintenance issue by catching debris and

restricting water passage. For these reasons, installation of a culvert is not a recommended option.

2. Installation of a Single Span Bridge
   This channel crossing is ideal for a single span bridge, as a bridge length of 110-feet provides the necessary waterway opening to pass the 50-year flood event with 1-foot of freeboard, as required by the Park County Transportation Standards. A single span bridge allows the stream channel to remain in a natural state, supporting aquatic habitat and fish passage, and allows for increased debris passage.

3. Installation of a Multiple Span Bridge
   As previously mentioned, the new bridge span will need to be approximately 110-feet to provide the necessary hydraulic capacity. In general, multiple span bridges are avoided whenever possible in order to minimize substructure construction costs, impacts to the channel, and long-term substructure and channel opening maintenance costs. Due to the number of available materials that will provide a single span bridge, as well as the cost of additional substructure units, a multiple span bridge will not be considered for this project.

Based on the bridge design options that were explored, a single span bridge is considered to be the best choice for this project. The bridge options that were evaluated are the following:

1. Precast / Prestressed Concrete Beam Superstructure

   A precast / prestressed concrete beam superstructure option for this bridge replaced would consist of bulb-tee beams, which are commonly used for spans up to 120-feet. Tri-deck sections were not considered as they are not adequate to accommodate the required span.

   Prestressed concrete I-beams with a cast in place concrete deck were also not considered for this option. The concrete I-beam option requires a cast in place deck, which can result in a smoother, more uniform bridge deck, but is much more expensive and labor intensive.

   The integral riding surface of the bulb-tee beam section will meet the desired finished surface for this pedestrian bridge and is a recommended option.

2. Prefabricated Steel Superstructure

   A prefabricated steel pedestrian bridge generally consists of wide flange steel beams and corrugated metal decking, which can be finished with a riding surface

of cast in place concrete, asphalt or timber. Because the bridge will be used for bicycle traffic, timber decking will not be considered as it does not provide a smooth ride. A prefabricated steel bridge with either concrete or asphalt decking will be considered for this proposed pedestrian bridge.

The substructure options for a single span bridge using both a concrete and prefabricated steel superstructure are listed below:

1. Driven Piles
   Driven piles commonly consist of either steel H-piles or pipe piles and are frequently used for bridge foundations throughout Montana. Steel piles can be used with either cast in place concrete caps or precast grade beams, can be used in most soil conditions. They are a good choice when larger gravel or cobbles are anticipated. Pipe piles can be used in most soil conditions as well but are better suited for soil types without large gravel or cobbles.

   While the final decision on a substructure option will be made after the geotechnical investigation has been completed, for the purpose of this report steel H-piles will be considered; however, the cost to purchase and drive either type of steel pile is similar.

2. Concrete Spread Footing
   A concrete spread footing can be used at most bridge locations and is recommended where the soil conditions consist of rock or hard gravel-based soils. If ground water is anticipated, dewatering and cofferdams may be necessary. Construction methods may also require shoring to prevent surface water from entering the excavation hole.

   Due to the location of the bridge and the proximity to a floodway, the potential for the bridge to be impacted due to flooding is significant, and without driven steel piles the bridge would be highly susceptible to foundation movement or failure due to erosion of the channel banks. In addition, the necessary foundation bearing capacity required can be substantial. Therefore, a spread footing foundation will not be evaluated as part of the alternative analysis.

3. Precast Concrete Grade Beam Abutment
   A precast concrete grade beam can be set directly on the soil with minimal excavation, significantly reducing the on-site concrete work required. Precast grade beam dimensions are commonly 3-ft x 3-ft x the length of the abutment. The U.S. Forest Service has u sed this type of foundation in the past, and some Montana county agencies have used this type of foundation on low volume vehicular structures.

Similar to a spread footing foundation, a grade beam abutment would be highly susceptible to foundation movement or failure due to the potential for flooding and high ground water. Therefore, a concrete grade beam abutment will not be evaluated further.

Based on the proximity of the bridge to the Yellowstone River and existing soil conditions, a steel pile foundation is the only substructure that will be considered for this proposed project.

Summary

A single span bridge will be used for this proposed pedestrian bridge. The superstructure and substructure that will be considered in the alternative analysis are listed below:

Superstructure Options

Option 1: Precast / prestressed concrete beam
Option 3: Prefabricated steel bridge with concrete surface

Substructure Options:

Option A: Steel piles with concrete cap

This will result in two options as described in the alternative analysis section.

IV. Alternative Analysis

A. Description

Each of the bridge layouts were designed using existing channel width, channel elevation and channel bank configuration. Channel slopes of 1.5:1 were used in determining the span length of the bridge, as this most closely matches the existing channel bank slopes.

The existing channel opening created by the previously built-up channel banks were used to determine that a bridge with a 110-foot length is required to match the existing channel banks. This span allows the new structure to have the least amount of impact on the detailed floodway.

B. Schematic Layout

Schematic layouts of the proposed bridge options will be enclosed in **Appendix D**. The four combinations are listed below:

Alternative 1: Concrete bulb-tee beam superstructure with driven steel pile foundation
Alternative 2: Prefabricated steel bridge with driven steel pile foundation

C. Regulatory Compliance and Permits

The new bridge will meet all current regulatory, compliance and permit requirements. The permits that may be required for this new structure are listed below:

Montana Stream Protection Act (SPA) 124 Permit

Any agency of federal, state, county or city government proposing a project that may affect the bed or banks of any stream in Montana must apply for this permit. The purpose of the law is to protect and preserve fish and wildlife resources and to maintain streams and rivers in their natural or existing state.

This permit requires the review and approval of the structure layout by the Montana Fish, Wildlife and Parks.

404 Permit: Federal Clean Water Act

Any person, agency, or entity, either public or private, proposing a project that will result in the discharge or placement of dredged or fill material into waters of the United States must apply for this permit. The purpose of this law is to restore and maintain the chemical, physical, and biological integrity of the nation's waters.

This permit requires the review and approval of the layout by the U.S. Army Corps of Engineers. While final design will strive for minimal impacts to the existing conditions, due to the significant wetlands located on the north side of the channel, the agency will require wetland delineation and mitigation. None-the-less, this project is very similar to many projects constructed throughout the state of Montana; therefore, no problems are expected in obtaining this permit.

318 Authorization: Short-Term Water Quality Standard for Turbidity

Any person, agency, or entity, either public or private, initiating construction activity that will cause short term or temporary violations of state surface water quality standards for turbidity must apply for this permit. The purpose of this permit is to protect water quality and minimize sedimentation.

Although this permit is administered by the Department of Environmental Quality, the authorization may be waived by the Montana Fish, Wildlife and Parks during its review process of the SPA 124 permit. Most often, for a bridge project this permit is not applied for directly and is obtained through the SPA 124 permit process.

County Floodplain Permit

The proposed project is located in a FEMA Zone X; therefore, per the Park County Floodplain Hazard Management Regulations, the proposed project is

exempt from floodplain permitting, but must be designed to limit impacts of waterway conveyance.

D. Land Requirements

There is no need for land acquisition as the land on the north end of the proposed project is located within an existing non-motorized trail easement for the City of Livingston, and the land on the south end of the proposed project is owned by the City of Livingston. Because this project is being coordinated by Park County and the City of Livingston, no issues with land acquisition are anticipated.

E. Environmental Considerations

Section II.D – Environmental Considerations includes a detailed discussion of the various environmental considerations for this project. Regarding the alternative analysis for each of the options explored, both have very similar environmental considerations and will promote efficient construction methods, minimize duration of construction, and consequently, will tend to minimize impacts at the project site.

Each alternative will have similar impacts to wetlands and wetland mitigation may be required, which is triggered when wetland impacts are greater than 0.10 acres.

F. Construction Problems

Challenges for this project include the following items:

- As there is currently not an existing trail leading up to the proposed bridge site, delivery of construction equipment and materials may require the installation of a construction access route.
- Overhead power lines along East Lewis Street may need to be temporarily relocated in order to access the project site with large construction equipment. Coordination with the power company will be essential to project planning.

A utility locate will be performed before a topographic and utility survey is conducted. Furthermore, the contractor will make assurances prior to construction by having all utilities located.

G. Cost Estimates

1. Project Costs

Detailed cost estimates will be prepared for all alternatives and will be included in **Appendix E**. The cost estimates have taken into account the administrative, financial, engineering and construction costs involved with the project. Unit costs have been taken from MDT average bid prices, as well

as bid tabs for recent projects in Park County. In the absence of a geotechnical investigation and recommendations report, the estimated substructure costs are the items subject to the greatest margin of error. However, based on the experience of the Engineer in the design, cost estimating and review of actual costs for bridge projects, the estimated substructure costs are felt to be realistic and sufficiently accurate for the purpose of comparing preliminary alternatives and project planning and budgeting. A detailed cost estimate has been completed for each preferred alternative.

2. Present Worth Analysis

The cost estimates will include detailed unit costs for the capital improvements of this project. In addition, a brief narrative of the O&M costs for each alternative, using a present worth analysis, will be provided. For this structure, because the substructure design and the concrete bridge deck is the same for each alternative, O&M cost are also the same for each. The O&M costs will be calculated based on a 100-year service life for a bridge. The cost indicated in the O&M narrative will be today's dollars.

O&M Costs

- Assumes deck repairs for the concrete surface every 25 years after initial construction at a cost of $20,000 each for a total of $60,000
- Assumes additional riprap needed twice during the life of the structure at a cost of $10,000

Total O&M Costs = $70,000

Table 2

Present Worth Analysis				
Alternatives	**Capital Costs**	**O&M Costs**	**Service Life**	**100-Year Present Worth**
Alternative 1 Concrete Bulb-Tee Beam with Driven Steel Piles	$722,510	$70,000	100 years	$792,510
Alternative 2 Prefabricated Steel with Concrete Deck and Driven Steel Piles	$707,910	$70,000	100 years	$777,910

H. Basis of Selection of a Preferred Alternative

Selection of a preferred alternative typically takes into account technical feasibility, environmental impacts and cost considerations, with points assigned to each category based on the following criteria:

- Technical Feasibility (Complexity)
  - (+1) point given for least complex
  - (-1) point given for most complex
- Environmental Impacts
  - (+1) point given for minimal impacts
  - (-1) point given for significant impacts
- Cost Effectiveness
  - Points assigned based on total cost, from lowest to highest

For this proposed project, the technical feasibility of the design and the environmental impacts are the same for each structure. Therefore, the selection of a preferred alternative is based on cost only.

The Opinion of Probable Cost demonstrates that **Alternative 2**, a prefabricated steel superstructure founded on driven steel piles, is the preferred alternative. Both alternatives have a similar life span and are well suited to fit this project site; therefore, planning for the least cost alternative is in the best interest of Park County.

V. Description of the Preferred Alternative

A. Site Location and Characteristics

The project site is located on at the end of View Vista Drive on the north and Meyers Lane on the south. Both riverbanks provide recreation opportunities, and the proposed bridge will improve access and connectivity of the existing infrastructure. The prefabricated elements of each structure alternative will minimize construction time and lessen the impacts to the project site.

B. Design Criteria

Following is a list of the design criteria used for preliminary engineering and layout of the preferred alternative:

Design Guidelines:	AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges
Design Load:	90-psf pedestrian loading
Design Flood:	50-year flood event
Trail Width:	10-foot clear width between guardrails
Channel Width:	Match existing / natural channel width

The Park County Transportation Standards identify that a 25-year event shall have 2-ft of freeboard and a 50-year or 100-year event shall have 1-ft of freeboard.

C. Environmental Impacts and Mitigation

Best management practices will be implemented to prevent dust and sedimentation during construction and erosion and sediment control plans will be included as part of the contract specifications. Sediment control barrier will be placed on the downhill edge of all disturbances.

State and federal agencies were provided information about this proposed project, as well as a request for comments concerning the project. All letters and responses are provided in **Appendix F**.

D. Cost Summary for the Selected Alternative

A cost summary for the selected Alternative will be included in the final report, and in **Appendix E**.

E. Public Participation

On November 1, 2021, a public meeting will be held in the City/County Complex Community Room at 6:00 p.m. The purpose of the meeting is to present the general findings of the draft Preliminary Engineering Report and provide an opportunity for interested individuals to comment on the proposed project and the environmental checklist prepared for the proposed project.

The public meeting presentations, meeting minutes, and public hearing legal notices will be located in **Appendix H**.