

**FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION**

Please fill in the highlighted areas  
all sections (IA, IB, IC, etc.) must be addressed or the application will be considered invalid

**I. APPLICANT INFORMATION**

- A. Applicant Name: Big Hole Watershed Committee
- B. Mailing Address: P.O. Box 21
- C. City: Divide State: MT Zip: 59727  
Telephone: 406-960-4855 E-mail: [info@bhwc.org](mailto:info@bhwc.org)
- D. Contact Person: Pedro Marques, Restoration Programs Manager  
Address if different from Applicant: \_\_\_\_\_  
City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Telephone: 406-552-2369 E-mail: [pmarques@bhwc.org](mailto:pmarques@bhwc.org)
- E. Landowner and/or Lessee Name (if other than Applicant): Montana Fish, Wildlife and Parks – Mount Haggin WMA  
Attn: Vanna Boccadori, WMA Manager  
Mailing Address: 1820 Meadowlark Lane  
City: Butte State: MT Zip: 59701  
Telephone: 406-494-1953 E-mail: [vboccadori@fwp.gov](mailto:vboccadori@fwp.gov)

**II. PROJECT INFORMATION\***

- A. Project Name: French Creek Sediment Load Reduction  
River, stream, or lake: French Creek  
Location: Township: 2N Range: 12W Section: 1  
Latitude: 45.94653 Longitude: -113.07099 *within project (decimal degrees)*  
County: Deer Lodge
- B. Purpose of Project:  
To provide a long-term sediment reduction solution for French Creek.

C. Brief Project Description:

---

**Goals & Objectives:**

- Reduce fine sediment loads in French Creek and Big Hole River.
- Restore French Creek where impacted by past mining & logging operations.
- Improve native fish and aquatics habitat.
- Reconnect floodplain & wetlands to surface water in lower French Creek.
- Restore public lands.
- Increase overbank deposition and groundwater recharge for late season base-flow.

The French Creek drainage, located on the Mount Haggin Wildlife Management Area (WMA), was heavily placer mined for gold and logged for nearly a century, beginning in the 1860s. Its soils and waters were also contaminated by fallout emissions from nearby smelters. The French Creek drainage has been a priority area for watershed restoration to the Big Hole Watershed Committee (BHWC) as well as several State & Federal agencies and NGOs for the last five years due to the extensive damages caused to steep slope vegetation, stream form and function, and riparian health. Several projects have already been completed or are currently in progress in this area, and the entire French Creek drainage is slated for native fish restoration by Montana Fish, Wildlife and Parks. The proposed French Creek Sediment Reduction project will contribute substantial habitat improvements to the overall goals of native fish restoration in this watershed.

The proposed project will address mining-related damages to French Creek, which has been pinned against a high eroding bank by an unnatural dike feature, causing annual deposition of an estimated 800+ tons of sediment per year, affecting downstream fish and mussel habitat (see images in attachments where linear sagebrush vegetation marks dike location). Our restoration approach for this project is to replicate reference conditions in this reach by constructing an unconfined stream channel east of the channel's current location, connecting the unconfined reaches above and below the project area. Approximately 4000' of lineal feet of new stream channel will be constructed in the floodplain away from the hillslope. The new stream channel will be located in an area of healthy riparian vegetation. Native sods and existing willows and willow transplants will be used to construct the banks of the new stream channel. Bioengineered meander bends will also be used where native vegetation may be lacking to both temporarily ensure stability until vegetation is re-established and to create complex cover habitats. The existing floodplain and wetland vegetation in the restoration area will be incorporated into the design to provide cost effective and robust vegetation restoration. By placing new channel in degraded upland areas, and work on abandoned channel will establish new wetlands that will provide ecosystem benefits locally and also serve to mitigate for lost wetlands from the French Creek fish barrier project.

The project currently has secured funding from Montana DEQ that cover all coordination, monitoring, education/outreach, design, permitting, bidding and oversight costs, as well as some construction costs and mobilization (\$240,000). Assessment and design has been completed and initial design drawings and cost estimates are provided. **BHWC and FWP are prepared to adjust project design details and construction costs with engineer to match available funding.** Our target funding for the project is shown in the Match side of the budget sheet, while the engineers initial estimate is shown on the left side of the sheet. Project savings could be found by decreasing the amount of bioengineering on banks and relying more on willows and sods. Funding from the Future Fisheries program would be used for the construction of the new channel. More details provided in the budget attachment. Other sources of funding- George Grant Trout Unlimited (\$5,000), Montana Trout Unlimited (\$5,000) have been secured and additional funding from The Nature Conservancy (\$47,000) has been verbally but not officially committed. Additional savings will be found by contracting this project with our Oregon Creek project upstream, saving on mobilization and bonding costs.

Once Arctic grayling and Westslope Cutthroat trout are restored, French Creek will represent the second largest interconnected stream system (over 40 miles of stream) in the upper Missouri River drainage with a native fish community. This project may also contribute to the restoration of

Western Pearlshell mussels to French Creek once water quality and aquatic and riparian habitat have improved.

D. Length of stream or size of lake that will be treated: 4000 ft

E. Project Budget:

**Grant Request (Dollars):** \$ 66,495.00

Contribution by Applicant (Dollars): \$ \_\_\_\_\_ In-kind \$ 4000

(salaries of government employees are not considered as matching contributions)

Contribution from other Sources (Dollars): \$ 354,245 In-kind \$ \_\_\_\_\_

(attach verification - See page 2 budget template)

**Total Project Cost:** \$ 420,240.00

F. Attach itemized (line item) budget – see template

G. Attach **specific project plans, detailed sketches, plan views, photographs, maps, evidence of landowner consent, evidence of public support and fish biologist support, and/or other information necessary to evaluate the merits of the project. If project involves water leasing or water salvage complete a *supplemental questionnaire*** ([fwp.mt.gov/habitat/futurefisheries/supplement2.doc](http://fwp.mt.gov/habitat/futurefisheries/supplement2.doc)).

H. **Attach land management & maintenance plans that will ensure protection of the reclaimed area.**

### III. PROJECT BENEFITS\*

A. What species of fish will benefit from this project?:

Westslope cutthroat trout and Arctic grayling

B. How will the project protect or enhance wild fish habitat?:

The project will enhance fish habitat on 4,000 feet of channel by significantly reducing a major sediment source to the channel. Spawning substrate within and far downstream of the project reach will benefit from the relocation of the channel away from the high terrace. Channel design and bioengineered streambanks will create more diverse habitat in the channel with the use of root wads and mature transplants and construction of pools and riffles.

C. Will the project improve fish populations and/or fishing? To what extent?:

\_\_\_\_\_

The project will improve water quality and fish habitat by reducing stream sedimentation. Project will improve quality and quantity of spawning habitat and habitat diversity conditions beyond the 2700 feet of channel of active construction. These improvements should increase fish populations. Reduced water temperature from active floodplain function and increased late season flows will benefit fish in both the French Creek drainage and the Big Hole River.

This project is part of a suite of projects on public land in the Mt. Haggin Wildlife Management Area. With the implementation of the fish barrier downstream and introduction of native fish species to 40 miles of headwater tributaries upstream, the fishery in this region could become one-of-a-kind. The fishing locally and in the Big Hole River downstream would benefit from a stronghold of pure native cutthroat and grayling in the French Creek watershed. There are also potential benefits for pearlshell mussel.

- D. Will the project increase public fishing opportunity for wild fish and, if so, how?:

Yes, the project is located entirely on public land. The public will have the opportunity to fish for native species (Arctic grayling and Westslope cutthroat trout) in a system without nonnative fish upon completion of the barrier project. The improved habitat conditions and decreased sedimentation of French Creek will improve availability of spawning substrate and suitable habitat diversity for the native species.

- E. The project agreement includes a 20-year maintenance commitment. Please discuss your ability to meet this commitment.

Montana Fish, Wildlife and Parks manages this land and has dedicated personnel to the WMA for the foreseeable future. The Big Hole Watershed Committee is committed to supporting MFWP as necessary and provided funding.

- F. What was the cause of habitat degradation in the area of this project and how will the project correct the cause?:

This area was the location of the first gold strike in the Big Hole watershed in the 1860s, resulting in extensive placer mining as well as logging to feed the nearby Washoe smelter. Linear gravel features, clearly the result of this mining history, run through French Creek's floodplain, confining the channel against a high eroding bank (terrace). These gravel piles act as a dike, limiting proper stream function and forcing the channel into an erosive bank. Preliminary estimates (BEHI method) show over 800 tons/year of sediment contributed to French Creek.

This project will eliminate this large sediment source by constructing 4000 feet of new channel with only natural amounts of annual streambank erosion and improve water quality by reducing sediment loading. Natural channel function and riparian vegetation will be restored along 4000 feet of channel, with benefits for native fish and other species of concern. Abandoned channel will be restored to a depressional feature.

- G. What public benefits will be realized from this project?:
-

The intact system will provide benefits to fish & wildlife, recreation, and the floodplain, as well as to the water supply of Butte, which sources 40% of its water from the Big Hole River (French Creek<Deep Creek<Big Hole River).

*Fish & Wildlife:* Westslope cutthroat trout and Arctic grayling are slated to be restored to the French Creek drainage. Both Species are species of Concern in Montana and have been petitioned for listing under the Endangered Species Act. Large scale restoration projects such as the French Creek watershed project will aid in conserving these species and lessen the chances that they will warrant listing as a Threatened or Endangered Species. Preventing the listing of these species will benefit all Montanans, particularly private landowners in the Big Hole.

Woody debris rootwads, channel bed shaping and mature transplants and sod mats will immediately improve fish and wildlife habitat in the project reach. After several seasons of overbank stream events in the new channel, floodplain and riparian habitat will be substantially improved. Wildlife habitat will also improve as a result of the restoration of the riparian area, with benefits multiple game species such as moose, elk, deer, and bear as well as non-game species such as Sandhill crane, beaver.

*Recreation:* Opportunities for Montanans to observe, and in some cases harvest, wildlife species will be increased through the restoration of French Creek. Upon completion, this project will provide anglers the unique opportunity to fish for native species in a healthy, functioning stream system that excludes nonnative fish species.

*Floodplain:* This project will benefit French Creek's floodplain by creating 2700' of new channel with a hydrologically active floodplain. Almost 20 acres of floodplain is not currently mapped as riparian. These acres will become active parts of the floodplain post construction and likely convert to wetland.

H. Will the project interfere with water or property rights of adjacent landowners? (explain):

No, the project is located entirely on public property (FWP Mount Haggin Wildlife Management Area).

I. Will the project result in the development of commercial recreational use on the site?: (explain):

No.

J. Is this project associated with the reclamation of past mining activity?:

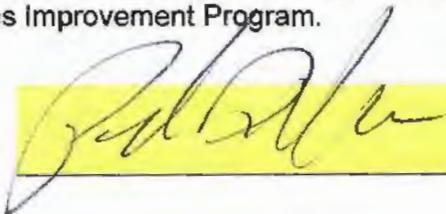
The dike and earthwork that created the impairment was likely related to mining activity in the watershed beginning in 1863. While the actual impairment is sediment from the high terrace, the location of the channel and restriction of the floodplain is related to mining activity.

**Each approved project applicant must enter into a written agreement with Montana Fish, Wildlife & Parks specifying terms and duration of the project. The applicant must obtain all applicable permits prior to project construction. A competitive bid process must be followed when using State funds.**

#### IV. AUTHORIZING STATEMENT

I (we) hereby declare that the information and all statements to this application are true, complete, and accurate to the best of my (our) knowledge and that the project or activity complies with rules of the Future Fisheries Improvement Program.

Applicant Signature:



Date:

11/30/2015

Sponsor (if applicable):



**\*Highlighted boxes will automatically expand.**

**Mail To:** Montana Fish, Wildlife & Parks  
Fisheries Division  
PO Box 200701  
Helena, MT 59620-0701

**E-mail To:** Michelle McGree  
[mmcgree@mt.gov](mailto:mmcgree@mt.gov)  
(electronic submissions MUST be signed)

Incomplete or late applications will be rejected and returned to applicant.  
Applications may be rejected if this form is modified.

**\*\*\*Applications must be signed and received by the Future Fisheries Program Officer in Helena before December 1 and June 1 of each year to be considered for the subsequent funding period.\*\*\***

**Big Hole Watershed Committee**

Post Office Box 21  
Divide, MT 59727  
(406) 960-4855  
info@bhwc.org  
bhwc.org



November 28, 2018

Michelle McGree  
Montana Fish, Wildlife & Parks  
Fisheries Division  
PO Box 200701  
Helena, MT 59620-0701

Dear Montana FWP,

Please accept the Big Hole Watershed Committee's submission of a Future Fisheries grant proposal. Our request supports the reduction of sediment inputs into French Creek on the Mount Haggin Wildlife Management Area in the Big Hole River watershed.

An electronic version of these files were emailed to [mmcgree@mt.gov](mailto:mmcgree@mt.gov) via the State File Transfer Service.

Our Application includes:

- Future Fisheries Final Proposal Form PDF, signed
- Attachments:
  - Letters of Support
  - Big Hole River Watershed – Project Location
  - French Creek Project Files
    - § Project Budget
    - § Preliminary Design Sheets
    - § MFWP EA Decision Notice
    - § Cultural Inventory- Dike report

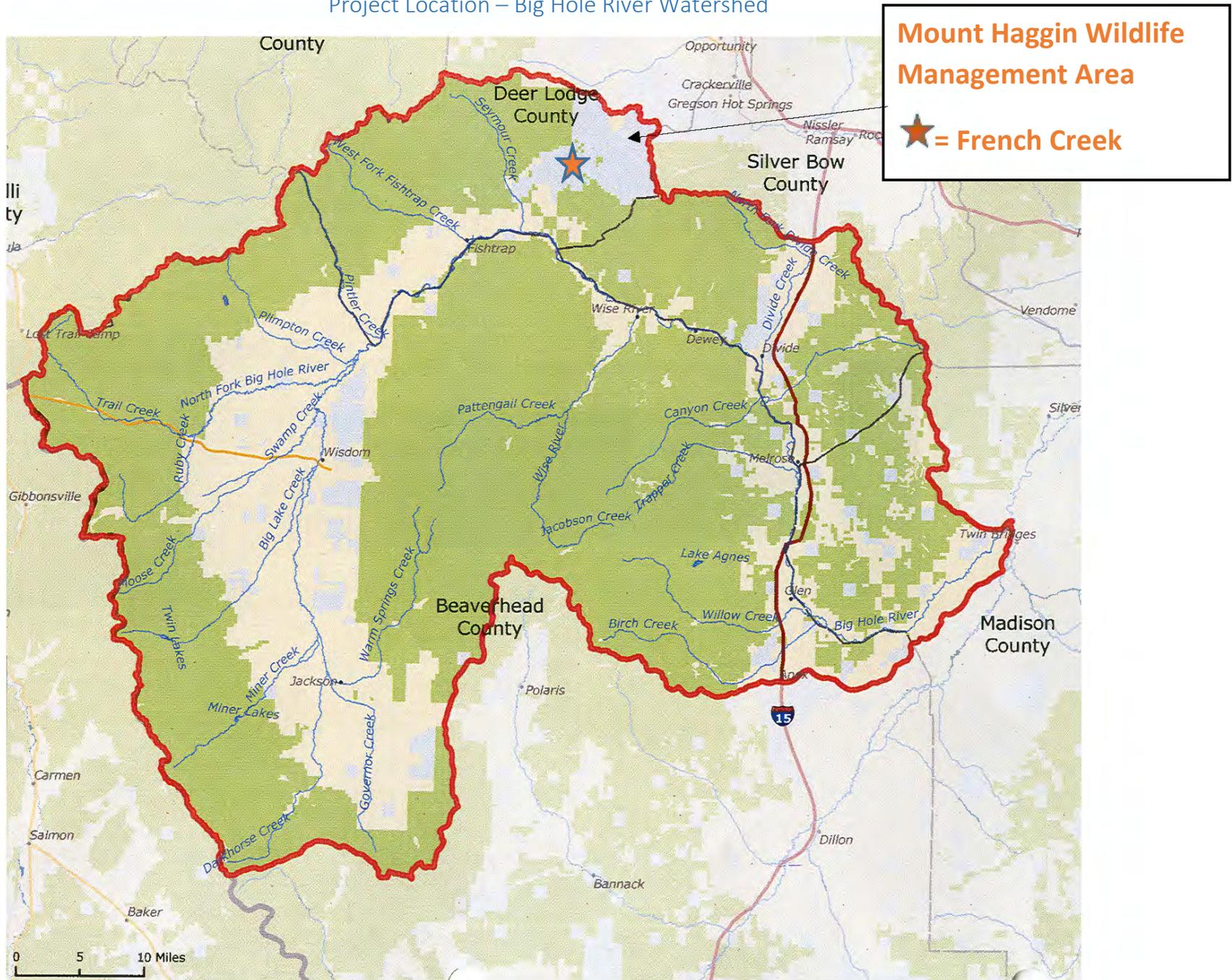
Thank you and MFWP staff for assisting us with this application and all our efforts in the Big Hole.

Sincerely,

Jennifer Downing  
Executive Director

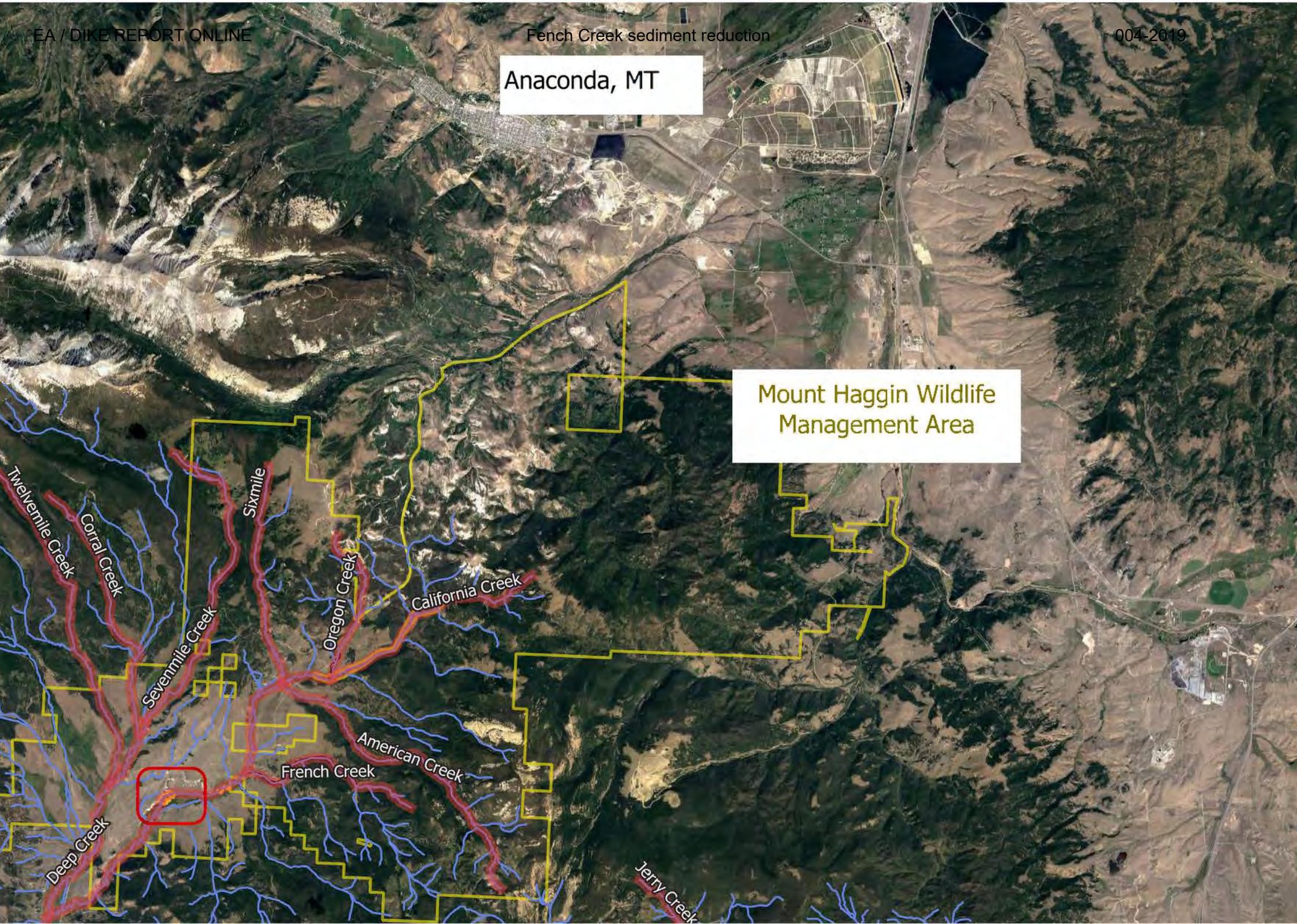
# 2018 Big Hole Watershed Committee FF Application – French Creek

Project Location – Big Hole River Watershed



Anaconda, MT

Mount Haggin Wildlife Management Area



Oregon Creek Sediment and Habitat Project  
(40% Design Complete- Proposed Project)

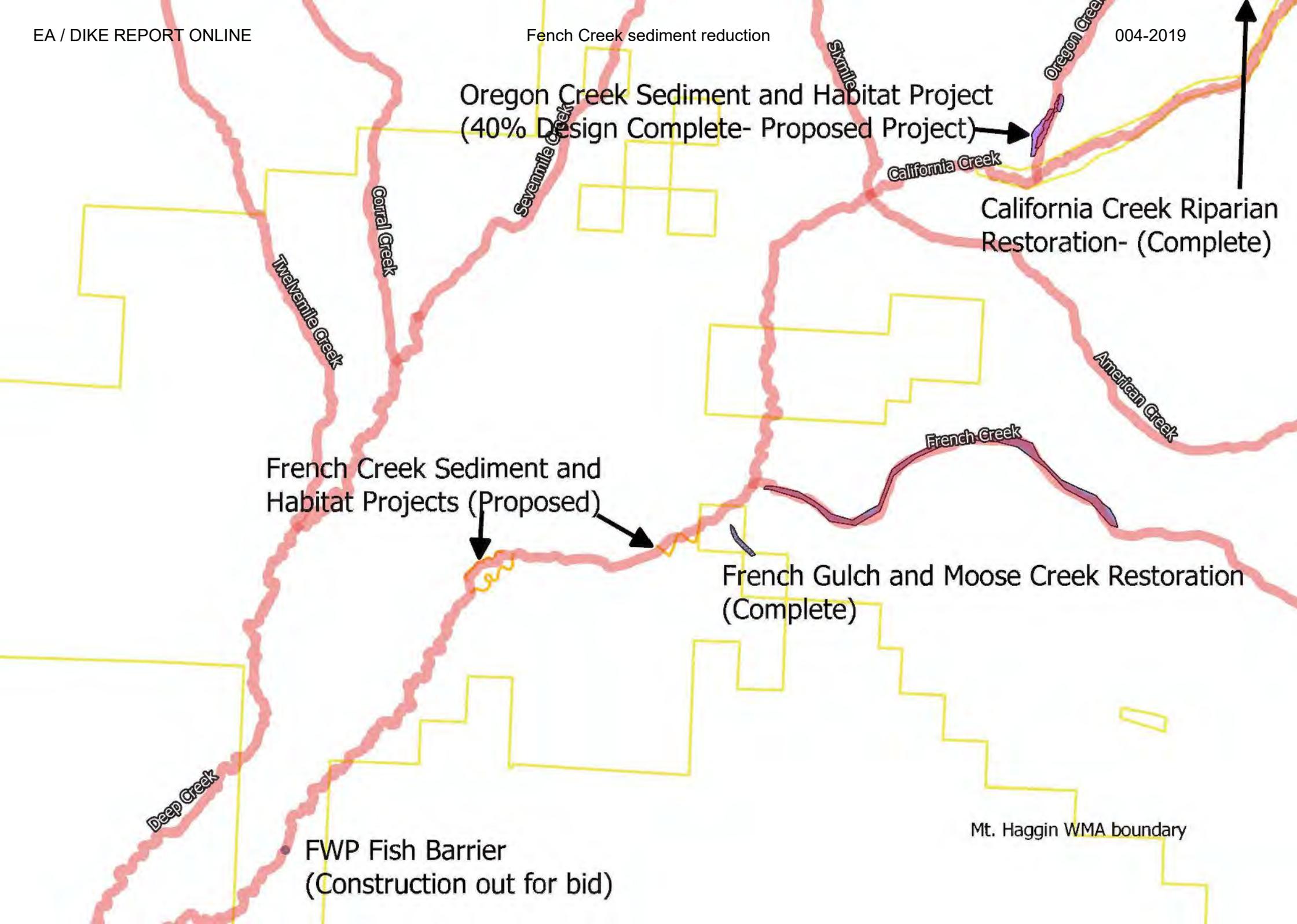
California Creek Riparian  
Restoration- (Complete)

French Creek Sediment and  
Habitat Projects (Proposed)

French Gulch and Moose Creek Restoration  
(Complete)

FWP Fish Barrier  
(Construction out for bid)

Mt. Haggin WMA boundary



French Creek sediment reduction

Both tables must be completed or the application will be returned

WORK ITEMS (ITEMIZE BY CATEGORY)	NUMBER OF UNITS	UNIT DESCRIPTION*	COST/UNIT	TOTAL COST	CONTRIBUTIONS				
					FUTURE FISHERIES REQUEST	IN-KIND SERVICES**	IN-KIND CASH	TOTAL	
<b>Personnel***</b>									
Survey	1	LS	\$5,000.00	\$5,000.00			5,000.00	\$ 5,000.00	
Design	1	LS	\$29,200.00	\$29,200.00			29,200.00	\$ 29,200.00	
Permitting + Delineation	1	LS	\$12,000.00	\$12,000.00		3,000.00	12,000.00	\$ 15,000.00	
Project Bidding	1	LS	\$6,000.00	\$6,000.00			6,000.00	\$ 6,000.00	
Oversight	1	LS	\$35,000.00	\$35,000.00			35,000.00	\$ 35,000.00	
BHWC Admin	1	LS	\$24,000.00	\$24,000.00			18,000.00	\$ 18,000.00	
BHWC Monitoring	1	LS	\$5,000.00	\$5,000.00		1,000.00	3,500.00	\$ 5,000.00	
BHWC Outreach, Education	1	LS	\$5,000.00	\$5,000.00			5,000.00	\$ 5,000.00	
			Sub-Total	\$121,200.00	\$ -	\$ 4,000.00	\$ 113,700.00	\$ 113,200.00	
<b>Travel</b>									
Mileage				\$ -				\$ -	
Per diem				\$ -				\$ -	
			Sub-Total	\$ -	\$ -	\$ -	\$ -	\$ -	
<b>Construction Materials****</b>									
Taxes, Bonds, and Insurance	1	LS	\$23,000.00	\$23,000.00			23,000.00	\$ 23,000.00	
General Requirements	1	LS	\$20,000.00	\$20,000.00			20,000.00	\$ 20,000.00	
				\$ -				\$ -	
			Sub-Total	\$43,000.00	\$ -	\$ -	\$ 43,000.00	\$ 43,000.00	
<b>Equipment and Labor</b>									
Water & Erosion Control	1	LS	\$12,000.00	\$12,000.00			-	\$ -	
Clearing and Grubbing	2	AC	\$25,000.00	\$37,500.00			17,500.00	\$ 17,500.00	
Earthwork - Floodplain Shaping	24000	CY	\$4.00	\$96,000.00			55,000.00	\$ 55,000.00	
Stream Channel Restoration	4030	LF	\$15.00	\$60,450.00	60,450.00		-	\$ 60,450.00	
Slash Wood Streambanks	2015	LF	\$20.00	\$40,300.00			15,000.00	\$ 15,000.00	
Point Bar Streambanks	2015	LF	\$10.00	\$20,150.00			10,150.00	\$ 10,150.00	
Native Streambanks	4030	LF	\$8.00	\$32,240.00			12,000.00	\$ 12,000.00	
Woody Debris Structure - Restored Channel	40	EA	\$150.00	\$6,000.00			6,000.00	\$ 6,000.00	
Abandoned Channel Plug	3	EA	\$1,500.00	\$4,500.00			4,500.00	\$ 4,500.00	
Abandoned Channel Wetland Creation	2000	LF	\$15.00	\$30,000.00			10,000.00	\$ 10,000.00	
Collect Willow Poles and Brush	1	LS	\$15,000.00	\$15,000.00			15,000.00	\$ 15,000.00	
Install Willow Poles	2015	LF	\$3.00	\$6,045.00			2,500.00	\$ 2,500.00	
Topsoil/ Organics/Sod Mat Salvaging Separation & Stockpiling	7	AC	\$3,000.00	\$19,500.00			12,000.00	\$ 12,000.00	
Seed Wetland and Streambank Zones	2	AC	\$1,500.00	\$3,300.00			3,300.00	\$ 3,300.00	
Sod Salvage	1	LS	\$10,000.00	\$10,000.00			\$0.00	\$ -	
Mature Willow Transplants	1	LS	\$10,000.00	\$10,000.00			3,000.00	\$ 3,000.00	
Optional - Streambed Material Sorting/Transport from French Gulch	3000	CY	\$20.00	\$60,000.00			\$0.00	\$ -	
SUBTOTAL				\$462,985.00	\$60,450.00	\$0.00	\$165,950.00	\$226,400.00	
Contingency (10%)				\$46,298.50	\$6,045.00	\$0.00	\$16,595.00	\$ 22,640.00	
				\$509,283.50	\$66,495.00	\$0.00	\$182,545.00	\$249,040.00	
<b>Mobilization</b>									
Mobilization/Demobilization	1	LS	\$30,000.00	\$30,000.00			15,000.00	\$15,000.00	
				\$ -				\$0.00	
				\$ -				\$0.00	
			Sub-Total	\$30,000.00	\$0.00	\$0.00	\$15,000.00	\$15,000.00	
			<b>TOTALS</b>	\$703,483.50	\$66,495.00	\$4,000.00	\$354,245.00	\$420,240.00	

OTHER REQUIREMENTS:

**All of the columns in the budget table and the matching contribution table MUST be completed appropriately or the application will be invalid.** Please see the example budget sheet for additional clarification.

\*Units = feet, hours, inches, etc. Do not use lump sum unless there is no other way to describe the costs.

\*\*Can include in-kind materials. Justification for in-kind labor (e.g. hourly rates used for calculations). Describe here or in text.

Reminder: Government salaries cannot be used as in-kind match

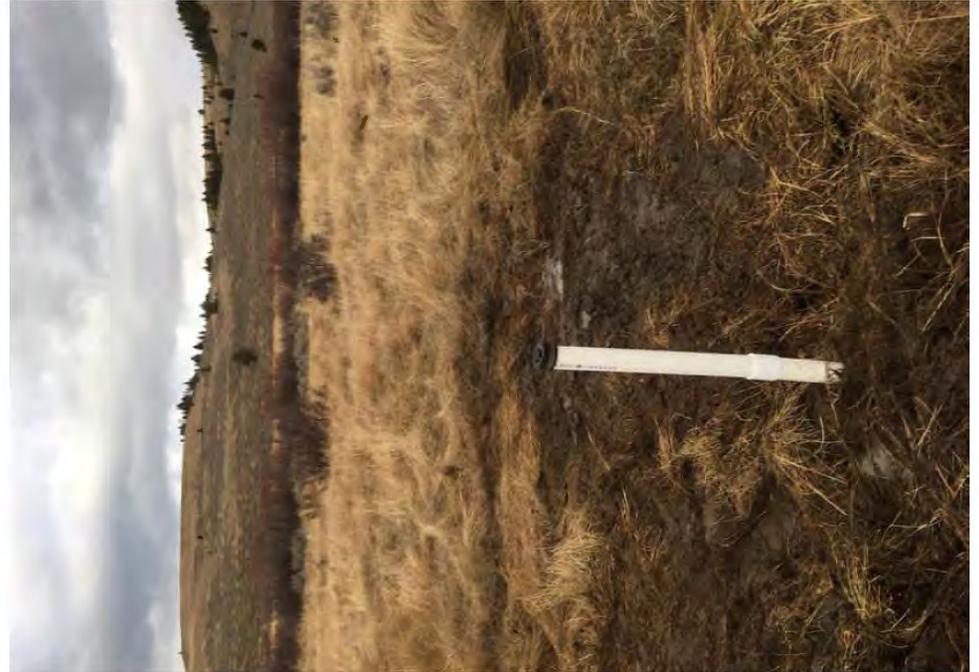
\*\*\*The Review Panel suggests that design and oversight costs associated with a proposed project not exceed 15% of the total project budget. If design and oversight costs are in excess of 15%, applications must include a minimum of two competitive bids for the cost of undertaking the project.

\*\*\*\*The Review Panel recommends a maximum fencing cost of \$1.50 per foot. Additional costs may be the responsibility of the applicant and/or partners.

### MATCHING CONTRIBUTIONS (do not include requested funds)

CONTRIBUTOR	IN-KIND SERVICE	IN-KIND CASH	TOTAL	Secured? (Y/N)
Montana DEQ	\$ -	\$ 240,000.00	\$ 240,000.00	Yes
Montana Trout Unlimited	\$ -	\$ 5,000.00	\$ 5,000.00	Yes
George Grant Trout Unlimited	\$ -	\$ 5,000.00	\$ 5,000.00	Yes
The Nature Conservancy	\$ -	\$ 45,245.00	\$ 45,245.00	No
FFIP (2019)	\$ -	\$ 55,000.00	\$ 55,000.00	No
In-Kind (Montana FWP- landowner agreement, permitting, coordination)	\$ 4,000.00	\$ -	\$ 4,000.00	No
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
	\$ -	\$ -	\$ -	
<b>TOTALS</b>	\$ 4,000.00	\$ 350,245.00	\$ 354,245.00	









# Montana Fish, Wildlife & Parks

1820 Meadowlark Lane, Butte, MT 59701

May 30, 2018

FFIP Review panel

Dear Pannel,

I am writing this letter in support of the Big Hole Watershed Committee's application for funding to restore reaches of French Creek that are suffering from significant streambank erosion. Significant channel alteration occurred in this reach of stream in the early 1900's (prior to 1940) where the stream appears to have been channelized and directed toward a work area. Historical records are unclear on the type of work that went on at this area. The stream has abandoned this straightened channel is attempting to reestablish itself. This his causing massive bank erosion and sedimentation (see photo below). Further the stream flows along the base of large chalky bluffs and is constantly eroding the toe of these slopes causing material fall into the stream. The stream channel downstream of this reach is choked with fine sediments from this high erosion area.



The potential solution for reducing long-term erosion of the site is to relocate the stream channel to a section of the floodplain with a flourishing riparian area. This area has abundant willows and sedges and would be an excellent area to for channel establishment. The potential benefits of the project will be significant reduction in sediment entering French Creek. Also, there would likely be improvements in aquatic habitat because the large sediment loads are

filling pools and clogging gravels. Reduced sediment would benefit spawning fish, aquatic invertebrates and pearlshell mussels.

The French Creek drainage has been a priority area for watershed restoration in the Big Hole River drainage. Work is currently underway in the headwaters (California Creek) to improve water quality affected by atmospheric deposition from the Anaconda Smelter. French Gulch which was heavily impacted by placer mining was also restored in 2016. French Creek is also slated for native fish restoration including Arctic grayling and westslope cutthroat trout. Native salmonids are not as tolerant to habitat alterations and fine sediment loading as non-native brook trout. Once restored to a native fish population, French Creek will represent the second largest interconnected stream system (over 40 miles of stream) in the upper Missouri River drainage with a native fish community. The project will also result in advancing the goal of restoring westslope cutthroat trout to 400 miles of stream in the Big Hole Drainage (Statewide Fisheries Management Plan 2011). French Creek is also home to a native population of pearlshell mussels. Pearlshell mussels have been documented downstream of the project area, but their numbers are few. It is likely that the altered habitat conditions and fine sediment inputs from upstream reaches limits mussel populations in the area. It may be possible to restore pearlshell mussels to French Creek once water quality and aquatic and riparian habitat is improved.

The collaboration between FWP, the Big Hole Watershed Committee and other partners to improve the water quality and fisheries of French Creek and its tributaries represents a huge step in the right direction in this area. While substantial healing has occurred over the past 100 years, there are still significant problems that are causing degradation of water quality. Many of these problems can be fixed with proper restoration. Efforts such as those proposed in this application will make great strides in reducing fine sediment loading to French Creek. I would hope that FFIP funds this grant proposal because of the potential improvements to water quality and stream and floodplain function of the area.

Sincerely,

Jim Olsen  
Fisheries Biologist  
Montana Fish Wildlife and Parks



May 24, 2018

Montana Fish, Wildlife & Parks  
Fisheries Division  
PO Box 200701  
Helena, MT 59620-0701

Dear Ms. McGree,

Please accept this letter of support for the Big Hole Watershed Committee's proposal to restore an altered section of French Creek. The Watershed Protection Section (WPS) at the Department of Environmental Quality (DEQ) administers Clean Water Act Section 319 funding to address nonpoint sources of pollution impairing the state's water quality. WPS has an annual call for proposals and review internally and by an inter-agency review panel. In 2017, WPS elected to fund this project on French Creek for \$240,000 based on anticipated funding from the Environmental Protection Agency. Additional funding is necessary for the project to meet its proposed objectives and 319 match requirements.

French Creek is currently water quality impaired by excess fine sediment impacting aquatic life beneficial uses, including macroinvertebrates and native cold-water fish. Streambank erosion is a major source of sediment in French Creek and the TMDL requires a 36% reduction in anthropogenic causes of erosion to meet beneficial uses. This project will go a long way toward meeting target by addressing historical channel alterations that confine French Creek against a large eroding bank contributing tons of sediment annually. This project fits into a broad watershed approach to addressing sediment impairments from the headwaters downstream – including recent projects in California Creek, Moose Creek, and further upstream in French Creek. The Watershed Restoration Plan for the Middle-Lower Big Hole identifies French Creek as a priority for stream restoration. WPS encourages funding this proposal to improve water quality, promote natural stream functions, and restore a native fishery to this watershed.

Sincerely,

A handwritten signature in blue ink that reads "Dean Yashan".

Dean Yashan, Section Supervisor  
MDEQ, Watershed Protection Section  
1520 E 6th Ave  
Helena, MT 59601  
Email: [dyashan@mt.gov](mailto:dyashan@mt.gov)  
(406) 444-5317

Phil Ralston  
Ralston Ranch  
54289 MT Hwy 43  
Wise River, MT 59762  
September 14, 2017

Montana Department of Environmental Quality  
PO Box 200901  
Helena, MT 59620

Dear Montana DEQ,

I would like to communicate my support for the Big Hole Watershed committee's project to restore French Creek through the 319 application process.

Ralston Ranch is my family's cattle ranch and it is the only operating ranch in the Deep Creek drainage. My family began ranching here in 1886. The ranch property is located at the lower end of Deep Creek, and on the Big Hole River near Deep Creek which includes two miles of Deep Creek frontage and 4 miles of Big Hole River frontage. Ralston Ranch borders both Mt. Haggin Wildlife Management Area, and US Forest Service. I have a grazing lease for cattle on the Mt. Haggin Wildlife Management Area.

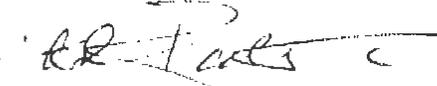
I have been a board member and supporter of the Big Hole Watershed Committee since its inception in 1995. Ralston Ranch is enrolled in the Candidate Conservation Agreement with Assurances (CCAA) program for restoration of arctic grayling. I welcomed the first restoration project completed under the CCAA program in 1998.

The entire upper drainage affected by the Anaconda Smelter fallout have long been a problem and its repair is of interest to me. The sediment wash from California Creek that enters the stream is very fine. In a heavy rain event white sediment from California Creek uplands enters the stream and washes down through Deep Creek and enters the Big Hole River. This sediment stays suspended in the river for miles. When placer mining was active in the entire drainage, similar white sediment washed downstream turning the water white. French Creek gulch and First Chance gulch were part of this placer mining, seasonally until the mid 1950's.

The Big Hole Watershed Committee has tried to bring attention to the significant impairments on Mt. Haggin since 2000. Working with Montana Fish, Wildlife and Parks and others to repair California Creek and the hillsides, French Gulch and Moose Creek have already made noticeable improvements to the land and water. I have seen a significant improvement in the water quality in lower Deep Creek in the last twenty years, and in the last couple of years there has been no evidence of the white, chalky water flowing by the ranch.

I urge Montana DEQ to support the Big Hole Watershed Committee's request to support the French Creek's repair. Its location at the headwaters of the Deep Creek drainage makes this a critical piece to watershed health and quality.

Sincerely,



Phil Ralston

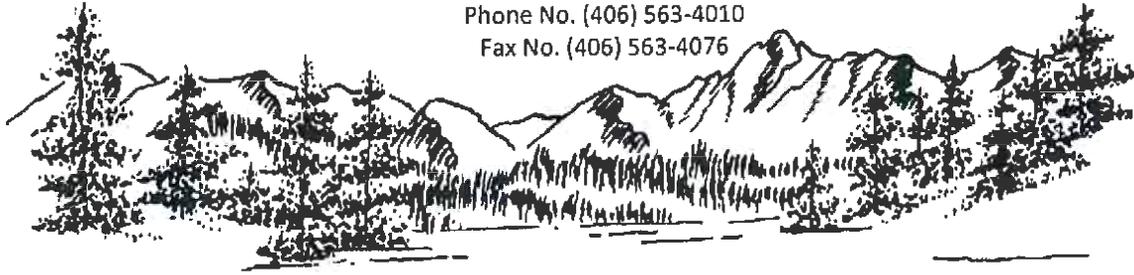
## PLANNING DEPARTMENT

800 South Main

Anaconda, Montana 59711

Phone No. (406) 563-4010

Fax No. (406) 563-4076



September 18, 2017

Montana Department of Environmental Quality  
*Non-Point Source 319 Funding*  
PO Box 200901  
Helena, Montana 59620

Dear Montana DEQ,

Anaconda-Deer Lodge County (ADLC) would like to pledge its support for stream restoration work on French Creek in the Mount Haggin Wildlife Management Area. We support the partnership and efforts of Montana Fish, Wildlife and Parks and the Big Hole Watershed Committee to complete this work. We strongly encourage the non-point source 319 program to fund the proposed work.

The French Creek portion of work will build upon successful restoration upstream in French Gulch, Moose Creek, and California Creek all of which now have rebuilt natural streams, connected floodplains, increased natural water storage, reduced sediment loads, and improved fish and wildlife habitat. The proposed French Creek work will continue to support a transformation on the state owned land from historic damage of Anaconda Company Smelter operations to a thriving ecosystem.

ADLC has had an opportunity to review the work recently completed in the French Gulch-Moose Creek drainages. We are very impressed by the results and encouraged that restoration of these watersheds can be accomplished as rapidly and cost-effectively as already demonstrated. 319 funding is a key factor in this success and we encourage continued support of these restoration efforts by MDEQ through this grant program.

As you may be aware, USEPA Region 8 is proposing a waiver/relaxation of state water quality standards for a number of high elevation watersheds in the County due to the "technical infeasibility" of implementing effective best management practices in these mountainous areas. The success of work performed in the French Gulch and Moose Creek drainages by the Big Hole Watershed Committee and its partners clearly demonstrates otherwise. Again, we strongly support continued funding of these restoration activities.

Respectfully,

Handwritten signature of Chas Ariss in blue ink.

Chas Ariss, PE  
Public Works-Planning Director-County Engineer  
Anaconda-Deer Lodge County



George Grant TU  
PO Box 563  
Butte, MT 59703

*Cold Clean Fishable Water*

---

Montana Department of Environmental Quality  
*Non-Point Source 319 Funding*  
PO Box 200901  
Helena, Montana 59620

Dear Montana DEQ,

The George Grant Chapter of Trout Unlimited (GGTU) would like to pledge our support for stream restoration work on French Creek on the Mount Haggin Wildlife Management Area. We support the partnership and efforts of Montana Fish, Wildlife and Parks and the Big Hole Watershed Committee to complete this work and we encourage the non-point source 319 program to fund the proposed work.

The French Creek portion of work will build upon successful restoration upstream in French Gulch, Moose Creek, and California Creek all of which have rebuilt natural streams, connected floodplains, increased natural water storage, reduced sediment loads, and improved fish and wildlife habitat. The proposed French Creek work will continue to support a transformation on the state owned land from historic damage to a thriving ecosystem.

Projects like this and specifically this project fits perfectly with our mission statement to: Conserve, Protect and Restore cold water fisheries and their watersheds in southwest Montana. In fact, GGTU has been supporting this work with funding and volunteer hours to remediate and restore the drainage. Not only does it benefit the fisheries resource it also provides jobs in our area. There's no reason to continue to pollute the Big Hole River. It's not going to get better without help. Now is the time to fund and complete the project. ***Cold, Clean, Fishable Water*** benefits everyone in the Big Hole Valley.

Thank you,

Roy Morris  
Past President  
George Grant TU  
PO Box 563  
Butte, MT 59703  
president@ggtu.org  
406-491-4255

September 14, 2017

Montana Department of Environmental Quality  
*Non-Point Source 319 Funding*  
PO Box 200901  
Helena, Montana 59620

Dear Montana DEQ,

As a local fly fisherman living close to French Creek I support the restoration work being done on French Creek in the Mount Haggin Wildlife Management Area. I bought property in 1982 and built our home in 1990 a mile from French Creek and I fish the creek as often as I can. Over the years I have seen a big improvement in the fishery since restoration work has been done in the French Creek drainage on the Wildlife Management Area.

I support the partnership and efforts of Montana Fish, Wildlife and Parks and the Big Hole Watershed Committee to continue their restoration work on this valuable fishery. I hope the non-point source 319 program will fund the proposed work. I have seen the clay banks eroding, discoloring the stream and having an impact on the fishery.

Other work already completed in French Gulch, the California uplands and California Creek have rebuilt natural stream channels and greatly reduced sediment loads in the creek. All this previous work has improved fish and wildlife habitat. I have noticed the fish are in better condition and larger than they have been prior to the restoration work that has been completed.

I would hope funding will be provided to continue restoration work on this fishery. I have seen an increase in the number of grayling being caught since sediment loads have been greatly reduce after completion of past restoration work. I've also noticed the health and condition of westslope cutthroat, brooktrout and rainbow trout has also improved.

Approval of funding under the non-point source 319 program will help in continuing the restoration work in French Creek.

Thank you.

Sincerely,



Paul Olson  
524 Wolf Ridge Road  
Wise River, MT 59762

Sunrise Fly Shop  
472 Main St  
Melrose, MT 59743  
sunriseflyshop.com

Montana Department of Environmental Quality  
*Non-Point Source 319 Funding*  
PO Box 200901  
Helena, Montana 59620

Dear Montana DEQ,

I would like to pledge my support for stream restoration work on French Creek on the Mount Haggin Wildlife Management Area. I support the partnership and efforts of Montana Fish, Wildlife and Parks and the Big Hole Watershed Committee to complete this work. I encourage the non-point source 319 program to fund the proposed work.

The French Creek portion of work will build upon successful restoration upstream in French Gulch, Moose Creek, and California Creek all of which have rebuilt natural streams, connected floodplains, increased natural water storage, reduced sediment loads, and improved fish and wildlife habitat. The proposed French Creek work will continue to support a transformation on the state owned land from historic damage to a thriving ecosystem.

Montana's fishing industry brings millions of dollars to State's economy every year. The success of the fishing and outfitting industries are dependent on healthy fish and naturally reproducing fish populations. Without clean water and thriving riparian habitats, healthy populations of fish cannot exist. The restoration work on French Creek will help to improve the overall water quality of the Big Hole River, which will insure future generations of healthy fish.

The Big Hole River is the lifeblood of all Big Hole Valley communities. Improving the overall health of the Big Hole Watershed directly benefits all the Big Hole River's rural communities.

Thank you.

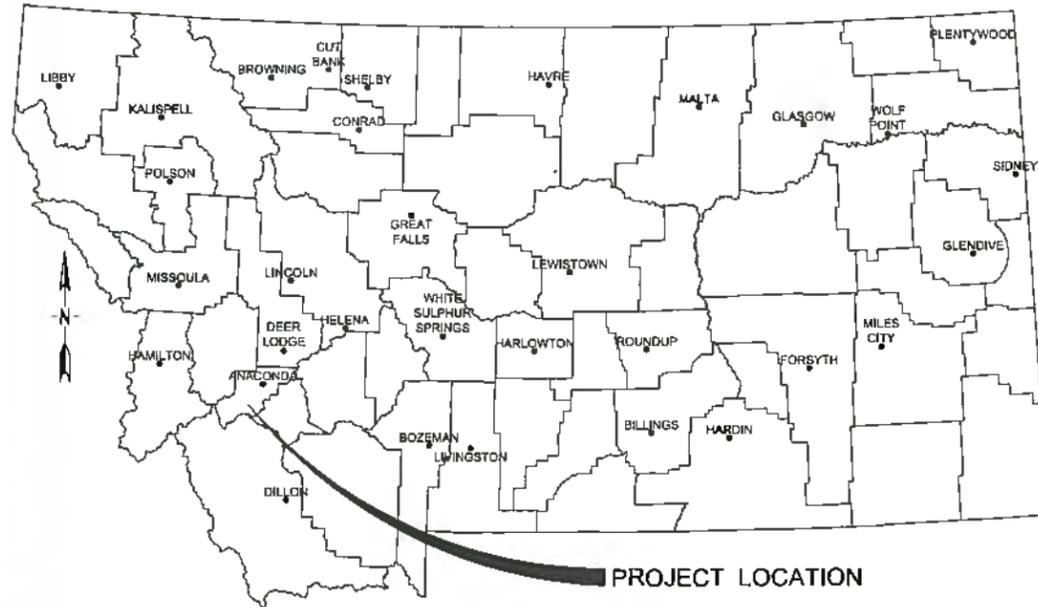
Sincerely,

A handwritten signature in black ink, appearing to read 'Eric Thorson', with a long horizontal flourish extending to the right.

Eric Thorson  
Co-Owner of Sunrise Fly Shop

# PRELIMINARY DRAWINGS FOR FRENCH CREEK STREAM RESTORATION

DEER LODGE COUNTY, MONTANA  
11/2018

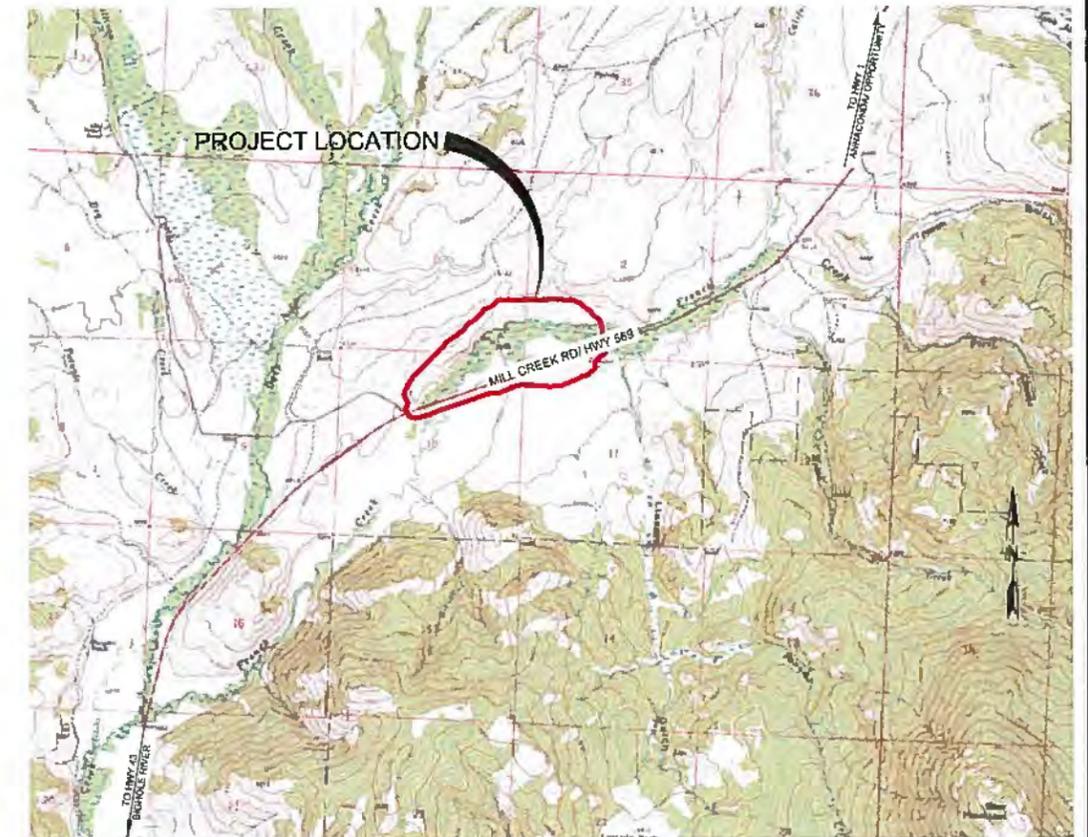


**LOCATION MAP**  
NOT TO SCALE

PREPARED BY:  
**Morrison  
Maierle**  
engineers • surveyors • planners • scientists

1 Engineering Plaza, Helena, MT 59802  
406.442.3050 • www.m-m.net

PREPARED FOR:



**VICINITY MAP**  
NOT TO SCALE

SHEET LIST TABLE		
Sheet Number	DRAWING NUMBER	Sheet Title
0	-	COVER SHEET
1	G-1	GENERAL LEGEND AND NOTES
2	G-2	EXISTING CONDITIONS
3	C-1	OVERALL SITE MAP
4	C-2	PLAN & PROFILE STA. 0+00 TO STA. 12+00
5	C-3	PLAN & PROFILE STA. 12+00 TO STA. 24+00
6	C-4	PLAN & PROFILE STA. 24+00 TO STA. 36+00
7	C-5	PLAN & PROFILE STA. 36+00 TO STA. 40+31
8	C-6	CROSS SECTIONS STA. 0+50 TO STA. 13+25
9	C-7	CROSS SECTIONS STA. 13+75 TO STA. 27+75
10	C-8	CROSS SECTIONS STA. 29+00 TO STA. 38+50
11	C-9	CUT AND FILL MAP STA. 0+00 TO STA. 24+00
12	C-10	CUT AND FILL MAP STA. 24+00 TO STA. 40+31
13	D-1	CHANNEL TYPICAL SECTIONS AND DETAILS
14	D-2	FLOODPLAIN AND WETLAND TYPICAL SECTIONS AND DETAILS
15	D-3	FLOODPLAIN AND ABANDONED CHANNEL DETAILS
16	D-4	CHANNEL STABILIZATION STRUCTURE DETAILS
17	D-5	PLANTING SPECIFICATIONS NOTES

**PRELIMINARY**  
NOT FOR CONSTRUCTION

APPROVED BY: \_\_\_\_\_  
**MATT BARNES, PE, CFM**  
Project Manager

© This document was prepared by Morrison-Maierle, Inc. and may contain confidential or privileged information. Morrison-Maierle, Inc. retains all common law, statutory, and reserved rights including the copyright thereto. Unauthorized use of this document or changes are strictly prohibited and may be unlawful.

**VERIFY COLOR!**  
THIS SHEET IS INTENDED TO BE IN COLOR. RED, GREEN AND BLUE WILL BE VISIBLE IF REPRODUCED CORRECTLY.

 engineers • surveyors • planners • scientists	
<b>QUALITY ASSURANCE</b>	
PROJECT MANAGER	Q.A. APPROVAL DATE
OFFICE QUALITY ASSURANCE COORDINATOR	Q.A. PROJECT NUMBER
PEER REVIEWER	

SET NO. \_\_\_\_\_  
MORRISON-MAIERLE PROJECT NO. 5406.004.01

**GENERAL NOTES**

1. SITE SURVEYED ON 9/24/18 AND 9/25/18 WITH RTK AND UAS EQUIPMENT.
2. HORIZONTAL DATUM= NAD 83 MONTANA STATE PLANE, INTERNATIONAL FEET, VERTICAL DATUM= NAVD88.
3. ALL EXISTING CONTROL POINTS, SURVEY MONUMENTS, AND STAKING SHALL BE PRESERVED OR REPLACED. REPLACEMENT SHALL BE TO SAME LEVEL OF ACCURACY IN A TIMELY MANNER AT CONTRACTOR'S EXPENSE.
4. EXISTING FEATURES AND UTILITIES SHOWN ON PLANS ARE BASED ON INFORMATION AVAILABLE AT TIME PLANS WERE PREPARED. CONTRACTORS ARE RESPONSIBLE FOR BURIED UTILITY LOCATES. CONTRACTOR SHALL INFORM ENGINEER IMMEDIATELY IF DISCREPANCY IS FOUND IN EXISTING FEATURES OR CONDITIONS THAN THOSE SHOWN.
5. ACCESS TO WORK AREAS SHALL BE BY DEFINED ROUTES SHOWN ON PLANS OR AS APPROVED BY ENGINEER. AREAS OUTSIDE WORK AREAS, STAGING AREAS, AND STOCK PILE AREAS SHALL BE PRESERVED TO MAXIMUM EXTENT POSSIBLE.
6. ALL EXISTING ROADS, GATES, CROSSINGS, ETC. SHALL BE PRESERVED IN EXISTING CONDITION. IF IMPACTS OCCUR DURING CONSTRUCTION, CONTRACTOR SHALL REPAIR AND/OR REPLACE AT CONTRACTORS EXPENSE. ENGINEER SHALL APPROVE ALL REPAIRS.
7. CONTRACTOR SHALL REVIEW AND ABIDE BY ALL INFORMATION AND REQUIREMENTS FOUND IN PROJECT PERMITS. COPIES OF PERMITS ARE INCLUDED IN PROJECT MANUAL.
8. PROJECT IS LOCATED ON THE MOUNT HAGGIN WILDLIFE MANAGEMENT AREA OWNED BY MONTANA FISH, WILDLIFE, AND PARKS.

**EROSION CONTROL NOTES**

1. CONTRACTOR IS RESPONSIBLE FOR MONTANA POLLUTANT DISCHARGE ELIMINATION SYSTEM (MPDES) PERMIT. CONTRACTOR SHALL DEVELOP STORM WATER POLLUTION PREVENTION PLAN (SWPPP), DEWATERING AND DIVERSION PLAN, EROSION AND DUST CONTROL PLAN FOR PERMIT REQUIREMENTS.
2. CONTRACTOR SHALL SUBMIT ALL MPDES DOCUMENTATION INCLUDING NOTICE OF INTENT, SWPPP, AND NOTICE OF TERMINATION. COPIES OF ALL MPDES DOCUMENTS SHALL BE PROVIDED TO ENGINEER WHEN SUBMITTED TO MONTANA DEQ.
3. WATER FOR CONSTRUCTION PURPOSES SHALL BE OBTAINED BY CONTRACTOR AT THEIR EXPENSE. ALL APPLICABLE PERMITS RELATED TO CONSTRUCTION WATER ALL THE CONTRACTOR'S RESPONSIBILITY AND ARE INCIDENTAL TO THE WORK.

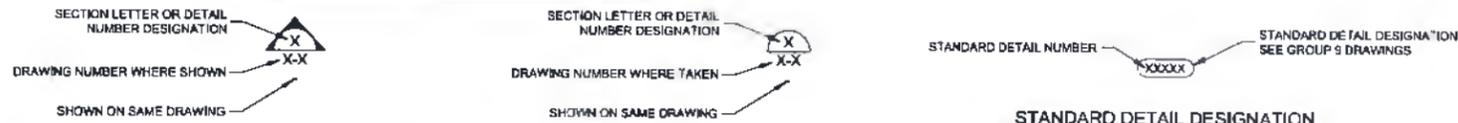
**ABBREVIATION**

- N/C = NOT IN CONTRACT
- FG = FINISHED GROUND
- EG = EXISTING GROUND

**LEGEND**

- MINOR EXISTING CONTOUR
- MAJOR EXISTING CONTOUR
- MINOR PROPOSED CONTOUR
- MAJOR PROPOSED CONTOUR
- CONSTRUCTION ACCESS ROUTE
- EXISTING WETLAND AREAS
- EXISTING STREAM CHANNEL
- NEW STREAM CHANNEL
- EXISTING ROAD
- NEW WETLANDS CREATION AREAS
- BIOENGINEERED STREAM BANK
- ABANDONED CHANNEL RE-CONTOURING

**GENERAL DESIGN DESIGNATIONS**



DETAIL AND SECTION DESIGNATION - WHERE TAKEN    DETAIL AND SECTION DESIGNATION - WHERE SHOWN

**PRELIMINARY**  
NOT FOR CONSTRUCTION

REVISIONS		BY	DATE
NO.	DESCRIPTION		

**Morrison Maierle**  
engineers • surveyors • planners • scientists

1 Engineering Plaza  
Helena MT 59602  
406.442.3050  
www.m-m.net

DRAWN BY: DAH
DSGN. BY: MDB
APPR. BY: MDB
DATE: 11/20/19
Q.C. REVIEW BY:
DATE:

FRENCH CREEK STREAM RESTORATION	
DEER LODGE COUNTY	MONTANA
GENERAL LEGEND AND NOTES	

PROJECT NUMBER 5406.004.01
SHEET NUMBER 1
DRAWING NUMBER G-1



VERIFY SCALE		REVISIONS			
THESE PRINTS MAY BE REPRODUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.		NO.	DESCRIPTION	BY	DATE
MODIFY SCALE ACCORDINGLY					

**Morrison Maierle**  
engineers • surveyors • planners • scientists

1 Engineering Place  
Helena, MT 59602  
406.442.3050  
www.m-m.net

COPYRIGHT © MORRISON MAIERLE, INC., 2018

DRAWN BY: DAH  
DSGN. BY: MDB  
APPR. BY: MDS  
DATE: 11/2018  
O.C. REVIEW BY: DATE:

FRENCH CREEK STREAM RESTORATION  
DEER LODGE COUNTY MONTANA  
EXISTING CONDITIONS

PROJECT NUMBER: S406.004.01  
SHEET NUMBER: 2  
DRAWING NUMBER: G-2

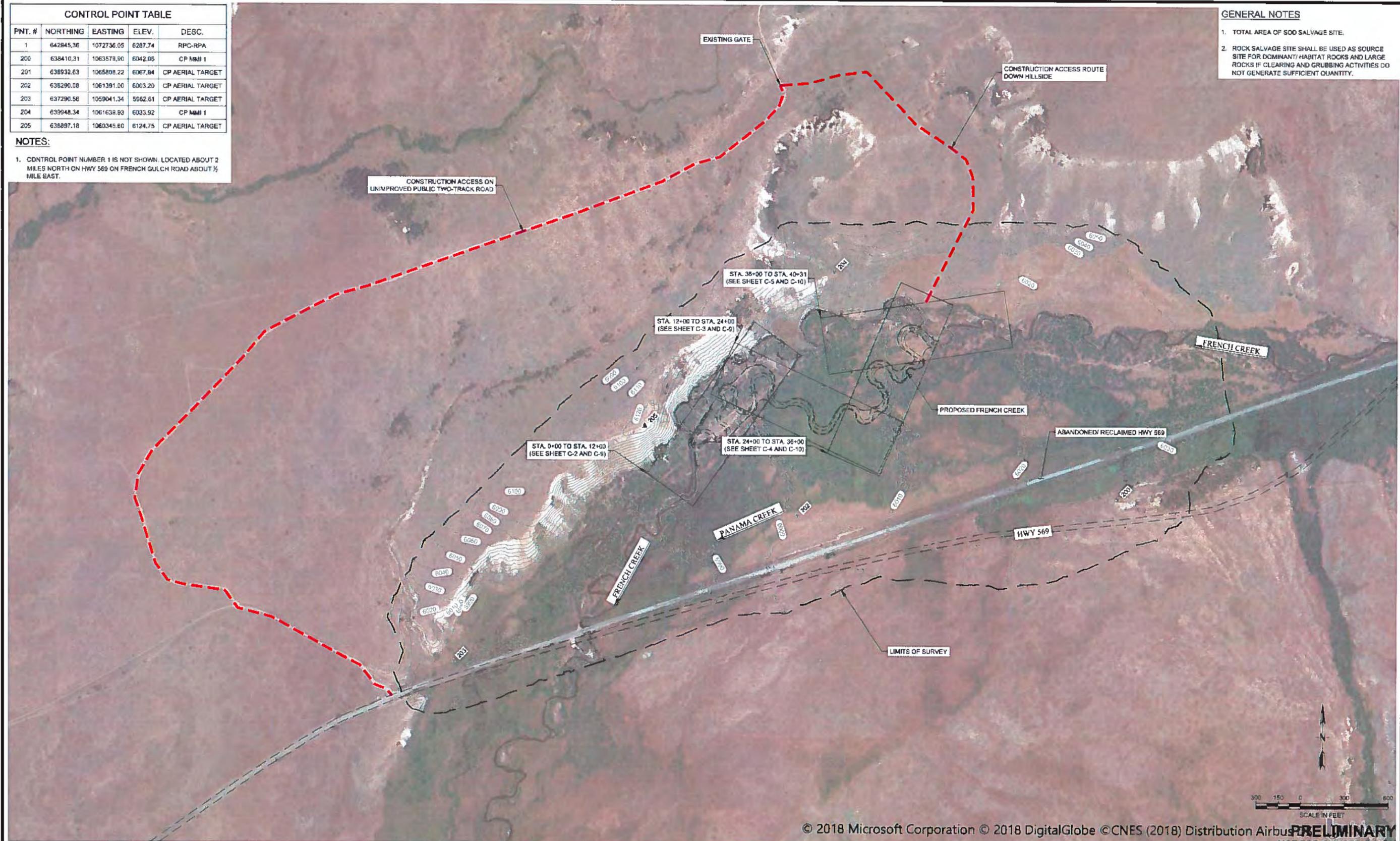
R:\S406-8\HWY004\1ACAD\SHETS\2 EXISTING CONDITIONS.DWG PLOTTED BY DAVID A. HALLSTEN ON Nov25/2018

**PRELIMINARY**  
NOT FOR CONSTRUCTION

CONTROL POINT TABLE				
PNT. #	NORTHING	EASTING	ELEV.	DESC.
1	642845.36	1072736.05	6287.74	RPC-RPA
200	638410.31	1063579.90	6042.05	CP MMI 1
201	638932.63	1065808.22	6067.84	CP AERIAL TARGET
202	638290.08	1061391.00	6003.20	CP AERIAL TARGET
203	637290.56	1059041.34	5982.61	CP AERIAL TARGET
204	639948.34	1061638.93	6033.92	CP MMI 1
205	638887.18	1060345.80	6124.75	CP AERIAL TARGET

**NOTES:**  
 1. CONTROL POINT NUMBER 1 IS NOT SHOWN. LOCATED ABOUT 2 MILES NORTH ON HWY 569 ON FRENCH GULCH ROAD ABOUT 1/2 MILE EAST.

**GENERAL NOTES**  
 1. TOTAL AREA OF 500 SALVAGE SITE.  
 2. ROCK SALVAGE SITE SHALL BE USED AS SOURCE SITE FOR DOMINANT/HABITAT ROCKS AND LARGE ROCKS IF CLEARING AND GRUBBING ACTIVITIES DO NOT GENERATE SUFFICIENT QUANTITY.



© 2018 Microsoft Corporation © 2018 DigitalGlobe © CNES (2018) Distribution Airbus **PRELIMINARY**  
 NOT FOR CONSTRUCTION

VERIFY SCALE		REVISIONS	
NO.	DESCRIPTION	BY	DATE

**Morrison Maierle**  
 engineers • surveyors • planners • scientists

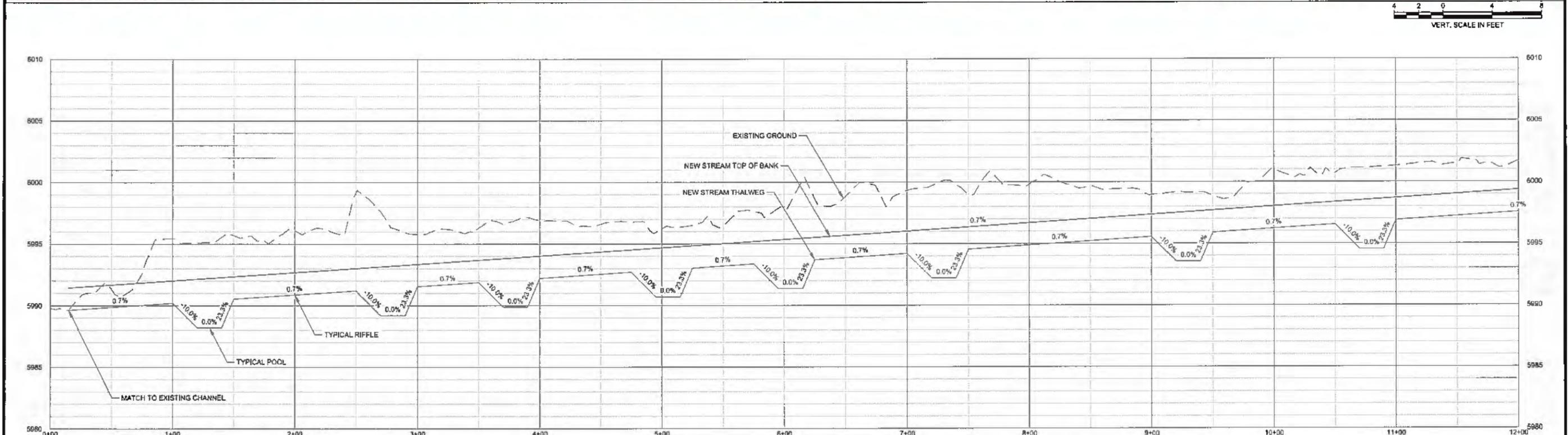
1 Engineering Place  
 Helena, MT 59602  
 406.442.3050  
 www.m-m.net

COPYRIGHT © MORRISON MAIERLE, INC. 2018

DRAWN BY: DAH OSGN. BY: MDB APPR. BY: MDB DATE: 11/20/18 O.C. REVIEW BY: _____ DATE: _____	FRENCH CREEK STREAM RESTORATION DEER LODGE COUNTY MONTANA OVERALL SITE MAP	PROJECT NUMBER 5406.004.01 SHEET NUMBER 3 DRAWING NUMBER C-1
---	---	---



- GENERAL NOTES**
1. EXISTING GROUND CONTOURS NOT SHOWN FOR CLARITY.
  2. WETLANDS CREATION, WOOD SLASH BANKS, ABANDONED CHANNEL PLUGS, ETC. WILL BE INCLUDED IN FINAL DESIGN.



**PRELIMINARY**  
NOT FOR CONSTRUCTION

VERIFY SCALE!		REVISIONS		BY	DATE
THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.		NO.	DESCRIPTION		
MODIFY SCALE ACCORDINGLY!					

**Morrison  
Mazierle**  
engineers • surveyors • planners • scientists

1 Engineering Place  
Helena, MT 59602  
406.442.3050  
www.m-m.net

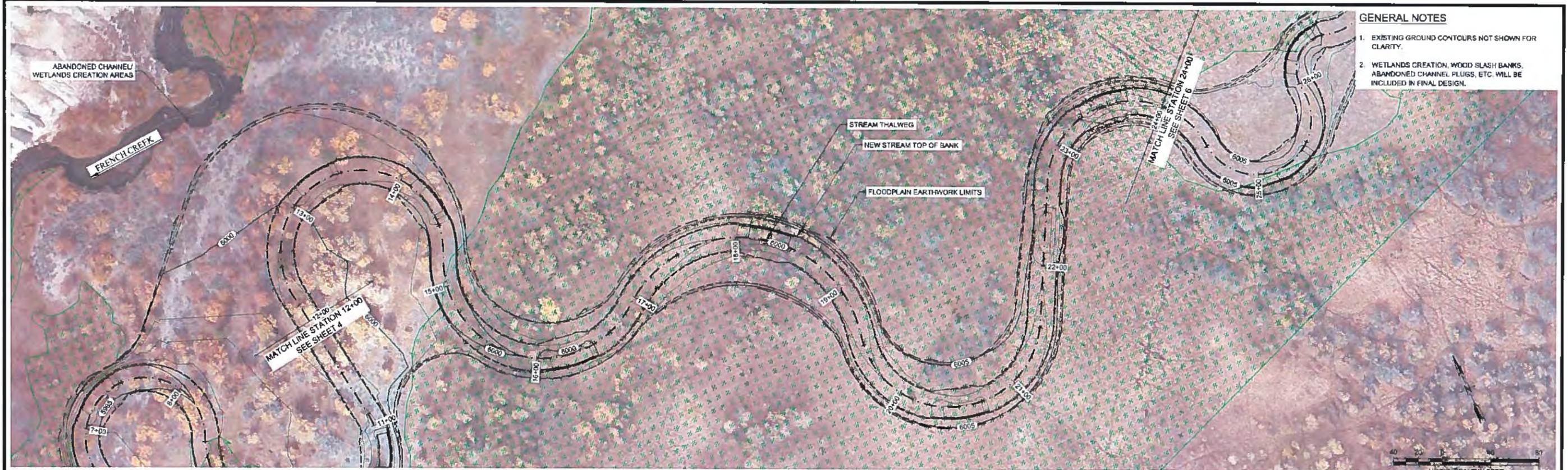
COPYRIGHT © MORRISONMAIERLE, INC. 2018

DRAWN BY: DAH  
DSGN. BY: MDB  
APPR. BY: MDB  
DATE: 11/2018  
O.C. REVIEW BY: \_\_\_\_\_  
DATE: \_\_\_\_\_

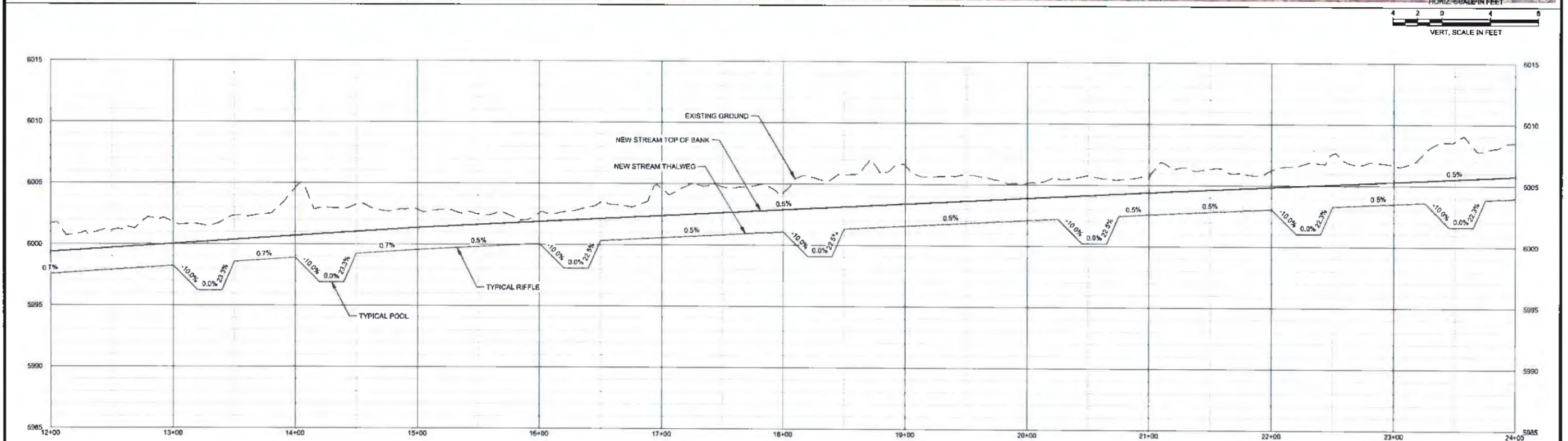
FRENCH CREEK STREAM RESTORATION  
DEER LODGE COUNTY MONTANA  
PLAN AND PROFILE STA. 0+00 TO STA. 12+00

PROJECT NUMBER  
5406.004.01  
SHEET NUMBER  
4  
DRAWING NUMBER  
**C-2**

R:\5406-01\HYDRO\40\1\CAD\SHETS\4 PLAN & PROFILE STA. 0+00 TO STA. 12+00.DWG PLOTTED BY DAVID A. HALLSTEN ON Nov/29/2018



- GENERAL NOTES**
1. EXISTING GROUND CONTOURS NOT SHOWN FOR CLARITY.
  2. WETLANDS CREATION, WOOD SLASH BANKS, ABANDONED CHANNEL PLUGS, ETC. WILL BE INCLUDED IN FINAL DESIGN.



**PRELIMINARY**  
NOT FOR CONSTRUCTION

VERIFY SCALE!		REVISIONS	
NO.	DESCRIPTION	BY	DATE

THESE PRINTS MAY BE REDUCED, LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.  
MODIFY SCALE ACCORDINGLY!

**Morrison Maierle**  
engineers • surveyors • planners • scientists

1 Engineering Place  
Helena, MT 59602  
406.442.3050  
www.m-m.net

COPYRIGHT © MORRISON MAIERLE, INC., 2018

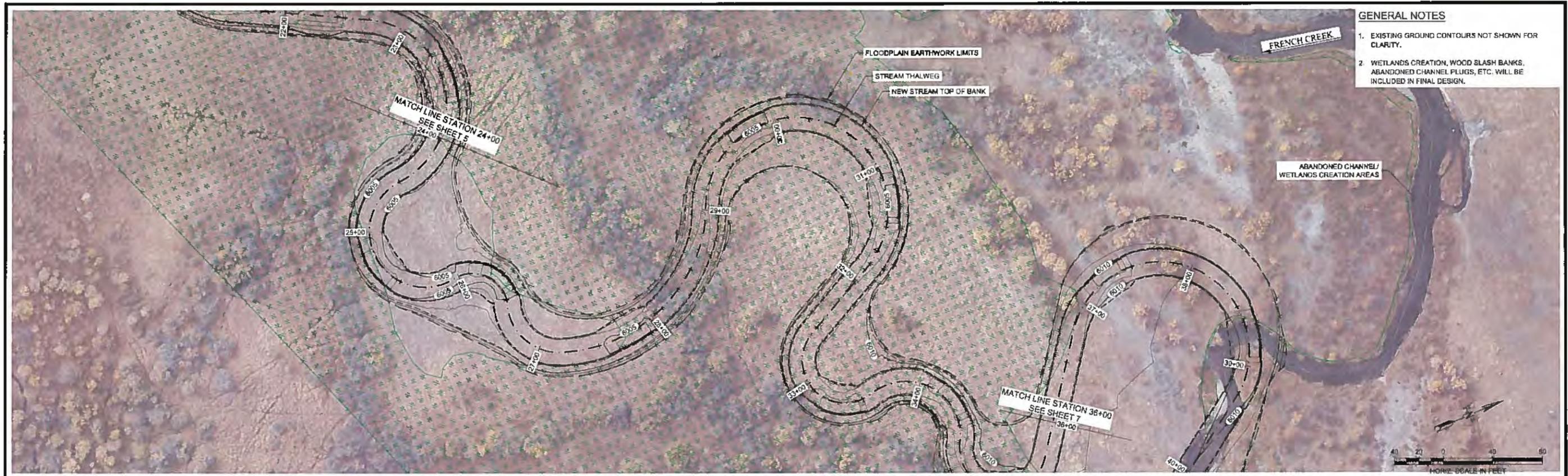
DRAWN BY: DAH  
DSGN. BY: MDB  
APPR. BY: MDB  
DATE: 11/2018  
Q.C. REVIEW BY: \_\_\_\_\_  
DATE: \_\_\_\_\_

**FRENCH CREEK STREAM RESTORATION**  
DEER LODGE COUNTY MONTANA

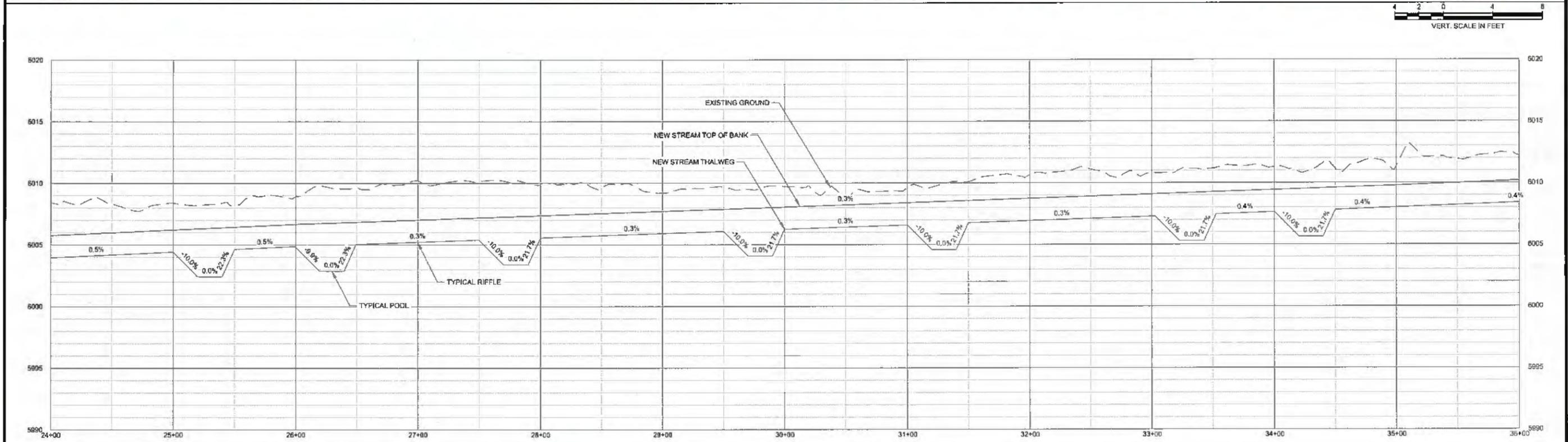
PLAN AND PROFILE STA. 12+00 TO STA. 24+00

PROJECT NUMBER: 5406.004.01  
SHEET NUMBER: 5  
DRAWING NUMBER: C-3

R:\5406-B\WCD\043\ACAD\SHEETS\PLAN & PROFILE STA. 12+00 TO STA. 24+00.DWG PLOTTED BY DAVID A. HALLSTEN ON Nov/29/2018



- GENERAL NOTES**
1. EXISTING GROUND CONTOURS NOT SHOWN FOR CLARITY.
  2. WETLANDS CREATION, WOOD SLASH BANKS, ABANDONED CHANNEL PLUGS, ETC. WILL BE INCLUDED IN FINAL DESIGN.



**PRELIMINARY**  
NOT FOR CONSTRUCTION

VERIFY SCALE		REVISIONS			
THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.		NO.	DESCRIPTION	BY	DATE
MODIFY SCALE ACCORDINGLY!					

**Morrison Maierle**  
engineers • surveyors • planners • scientists

1 Engineering Plaza  
Helena, MT 59602  
406.442.3050  
www.m-m.net

© COPYRIGHT © MORRISON MAIERLE, INC. 2018

DRAWN BY: OAH  
DSGN. BY: MGB  
APPR. BY: MGB  
DATE: 11/2018  
O.C. REVIEW BY: \_\_\_\_\_  
DATE: \_\_\_\_\_

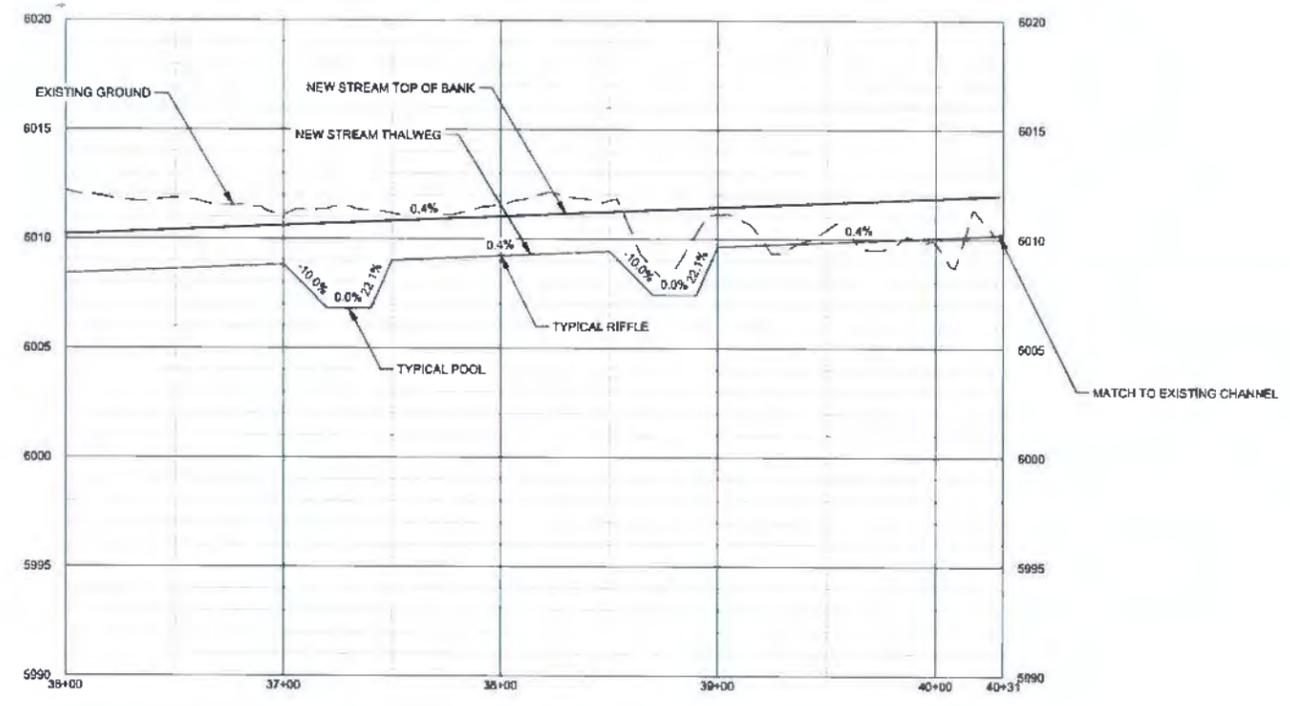
FRENCH CREEK STREAM RESTORATION  
DEER LODGE COUNTY MONTANA  
PLAN AND PROFILE STA. 24+00 TO STA. 36+00

PROJECT NUMBER: 5406.004.01  
SHEET NUMBER: 6  
DRAWING NUMBER: C-4

R:\5406-BHW\0049\TACAS\SHEETS\6 PLAN & PROFILE STA. 24+00 TO STA. 36+00.DWG PLOTTED BY DAVID A. HALLSTEN ON Nov28/2018



- GENERAL NOTES**
1. EXISTING GROUND CONTOURS NOT SHOWN FOR CLARITY.
  2. WETLANDS CREATION, WOOD SLASH BANKS, ABANDONED CHANNEL PLUGS, ETC. WILL BE INCLUDED IN FINAL DESIGN.



HORIZ. SCALE IN FEET  
 0 2 4 6 8  
 VERT. SCALE IN FEET

**PRELIMINARY**  
 NOT FOR CONSTRUCTION

VERIFY SCALE!		REVISIONS		BY	DATE
THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.		NO.	DESCRIPTION		
MODIFY SCALE ACCORDINGLY!					

**Morrison Maierle**  
 engineers • surveyors • planners • scientists

1 Engineering Place  
 Helena, MT 59602  
 406.442.3050  
 www.m-m.net

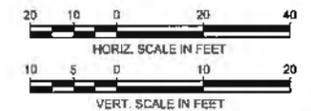
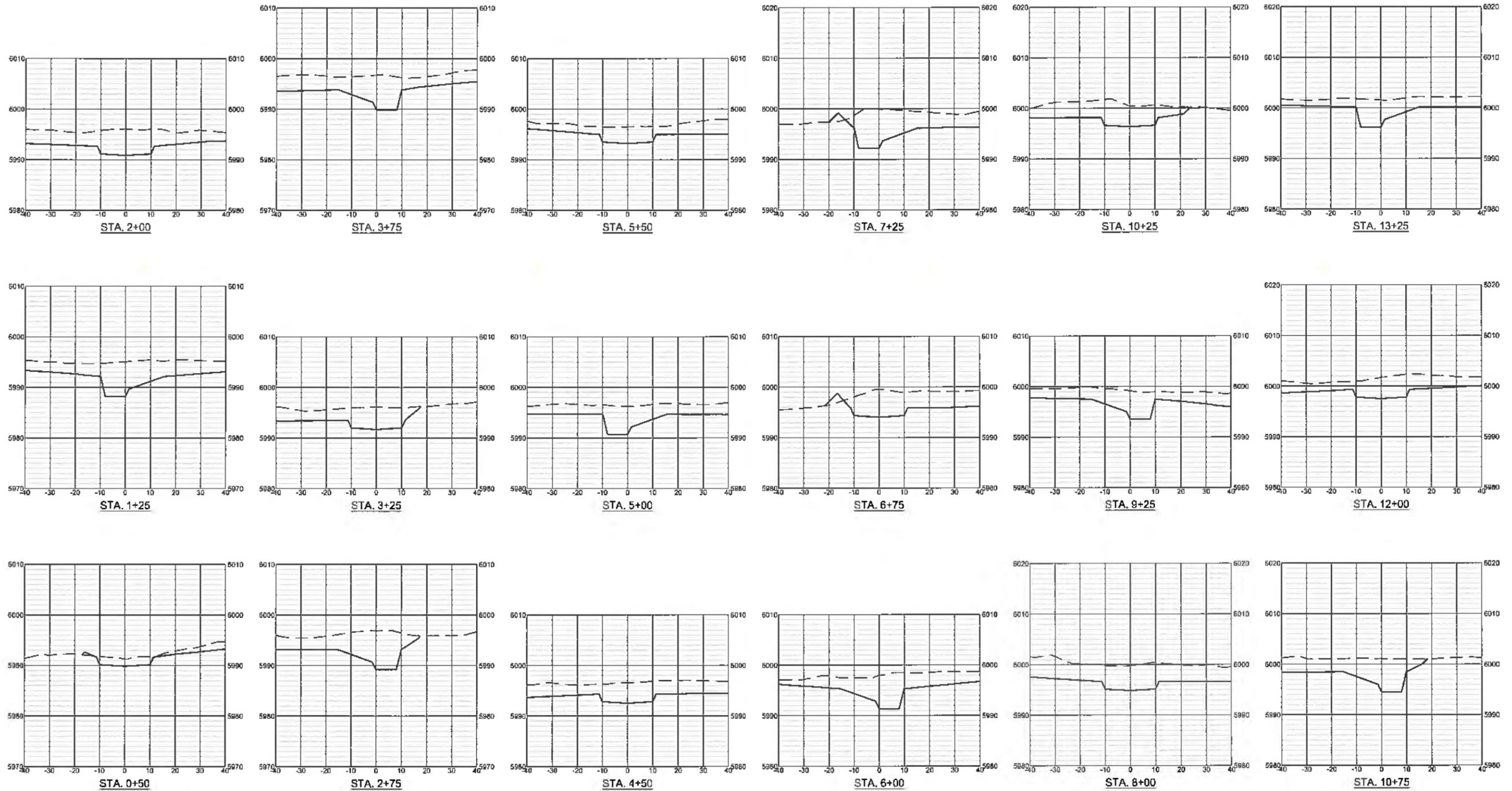
Copyright © MorrisonMaierle, Inc., 2018

DRAWN BY: DAH  
 DSGN. BY: MDB  
 APPR. BY: MDB  
 DATE: 11/2018  
 Q.C. REVIEW BY:  
 DATE:

FRENCH CREEK STREAM RESTORATION  
 DEER LODGE COUNTY MONTANA  
 PLAN AND PROFILE STA. 36+00 TO STA. 40+31

PROJECT NUMBER 5408.004-01  
 SHEET NUMBER 7  
 DRAWING NUMBER C-5

R:\5408-B\HYC\0049\ACAD\GHEETS\7 PLAN & PROFILE STA. 36+00 TO STA. 40+31.DWG PLOTTED BY DAVID A. HALLSTEN ON Nov/29/2018



**PRELIMINARY**  
 NOT FOR CONSTRUCTION

NO.	DESCRIPTION	REVISIONS	
		BY	DATE

VERIFY SCALE:  
 THESE PRINTS MAY BE REDUCED.  
 LINE BELOW MEASURES ONE INCH  
 ON ORIGINAL DRAWING.  
 MODIFY SCALE ACCORDINGLY!

**Morrison  
 Maierle**  
 engineers • surveyors • planners • scientists

1 Engineering Place  
 Helena, MT 59602  
 408.442.3050  
 www.m-m.net

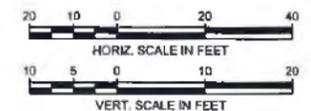
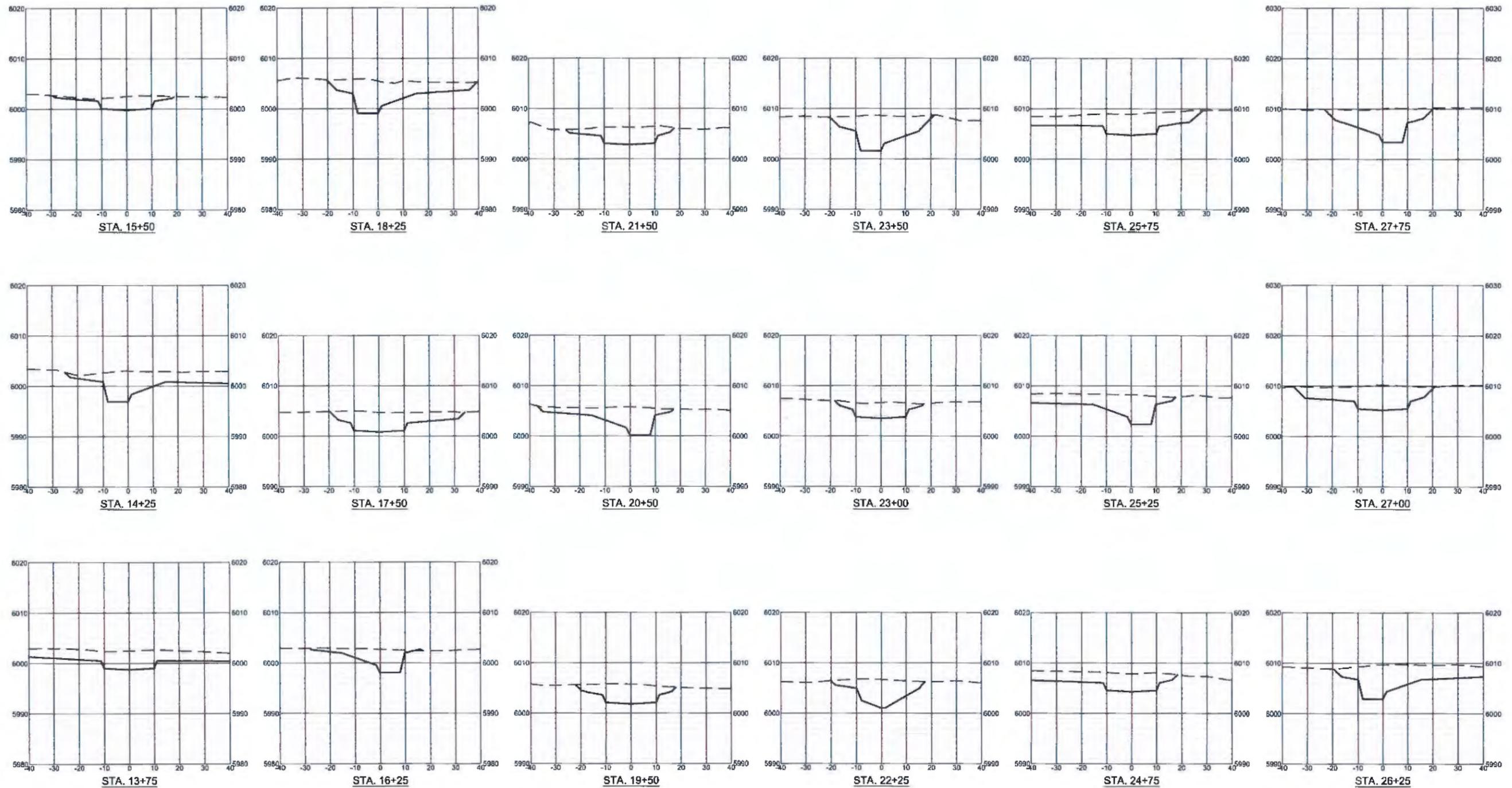
DRAWN BY: DAH  
 DESGN. BY: MDB  
 APPR. BY: MDB  
 DATE: 11/2018  
 Q.C. REVIEW  
 BY:  
 DATE:

FRENCH CREEK STREAM RESTORATION  
 DEER LODGE COUNTY MONTANA  
 CROSS SECTIONS STA. 0+50 TO STA. 13+25

PROJECT NUMBER  
 5408.004.01  
 SHEET NUMBER  
 8  
 DRAWING NUMBER  
**C-6**

RS4588-BHW0049\FACAD\SHEETS\CROSS SECTIONS.DWG PLOTTED BY DAVID A. HALLSTEN ON Nov 29, 2018

COPYRIGHT © MORRISON MAIERLE, INC. 2018



**PRELIMINARY**  
NOT FOR CONSTRUCTION

VERIFY SCALE		REVISIONS		
NO.	DESCRIPTION	BY	DATE	

THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.

MODIFY SCALE ACCORDINGLY



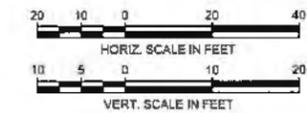
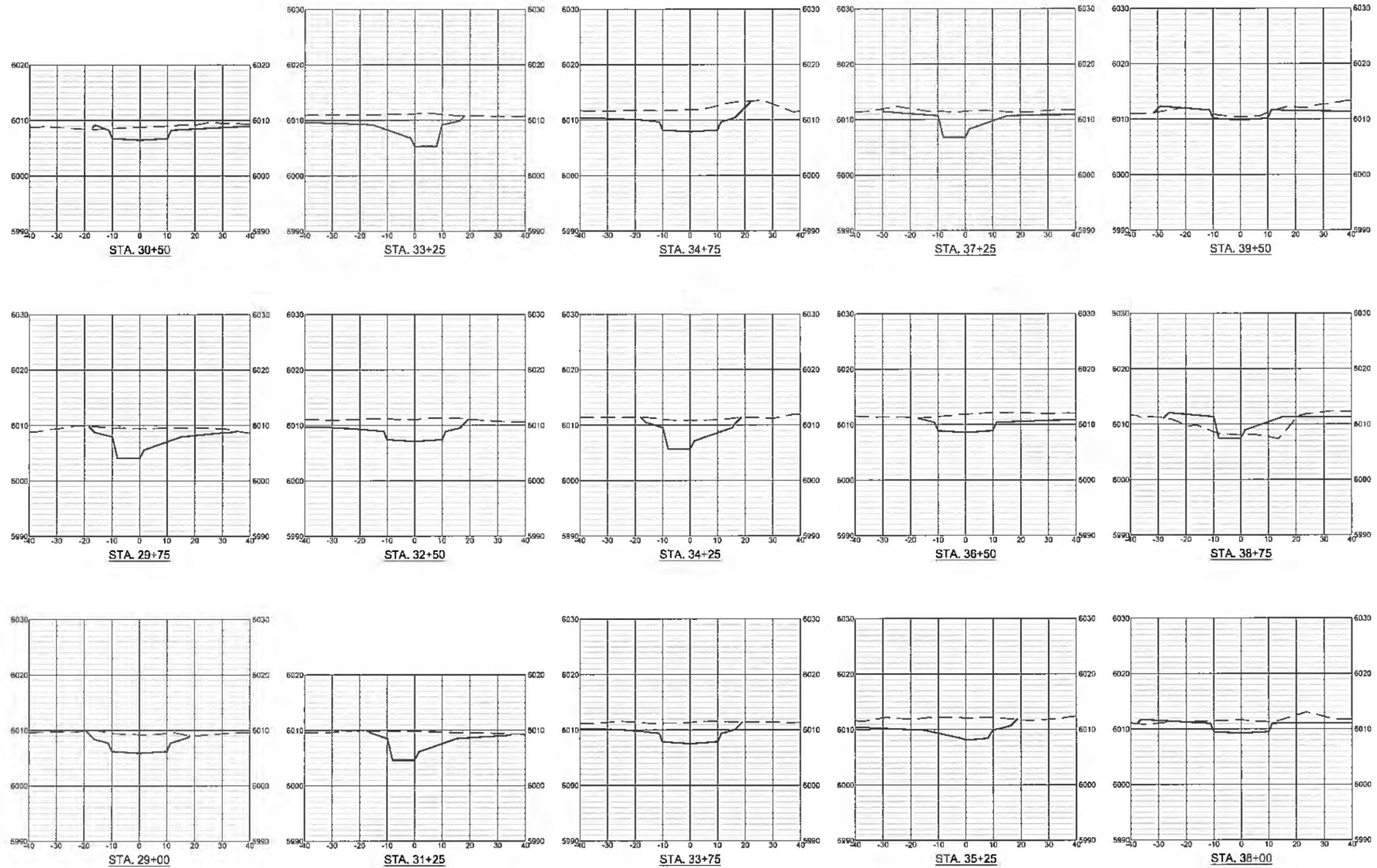
1 Engineering Place  
Helena, MT 59602  
406.442.3050  
www.m-m.net

COPYRIGHT © MORRISON MAIERLE, INC. 2018

DRAWN BY: JAH  
DSGN. BY: MDB  
APPR. BY: MDB  
DATE: 11/2018  
Q.C. REVIEW BY: \_\_\_\_\_  
DATE: \_\_\_\_\_

FRENCH CREEK STREAM RESTORATION  
DEER LODGE COUNTY MONTANA  
CROSS SECTIONS STA. 13+75 TO STA. 27+75

PROJECT NUMBER 5406.004.01  
SHEET NUMBER 9  
DRAWING NUMBER C-7



**PRELIMINARY**  
NOT FOR CONSTRUCTION

VERIFY SCALE!		REVISIONS			
NO	DESCRIPTION	BY	DATE		

THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.

MODIFY SCALE ACCORDINGLY



1 Engineering Place  
Helena, MT 59602  
406.442.3050  
www.m-m.net

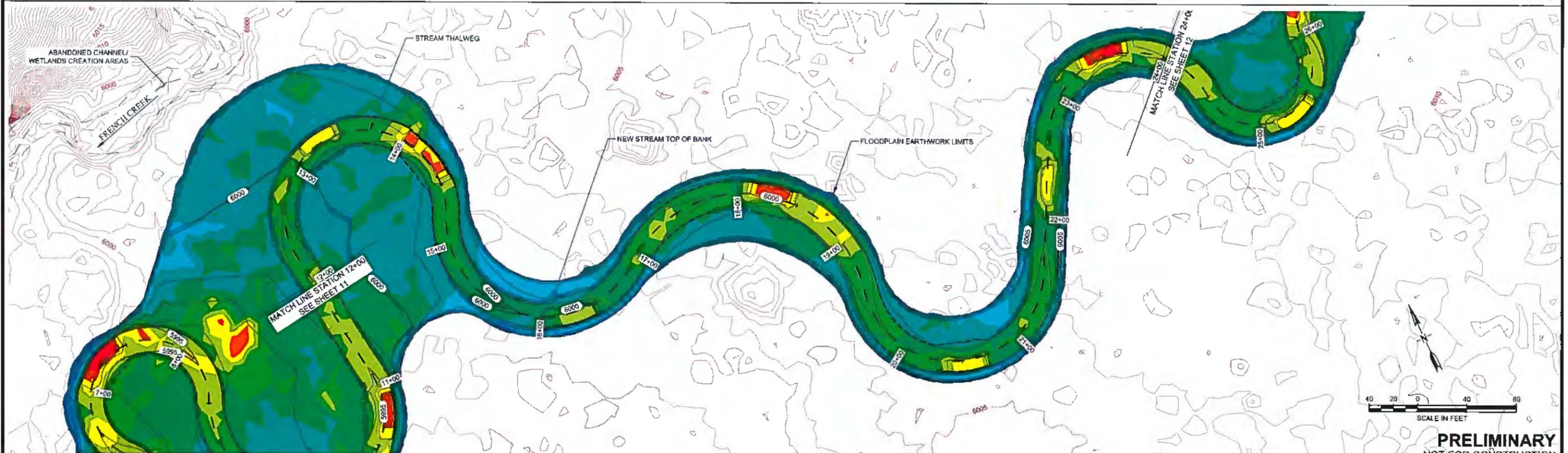
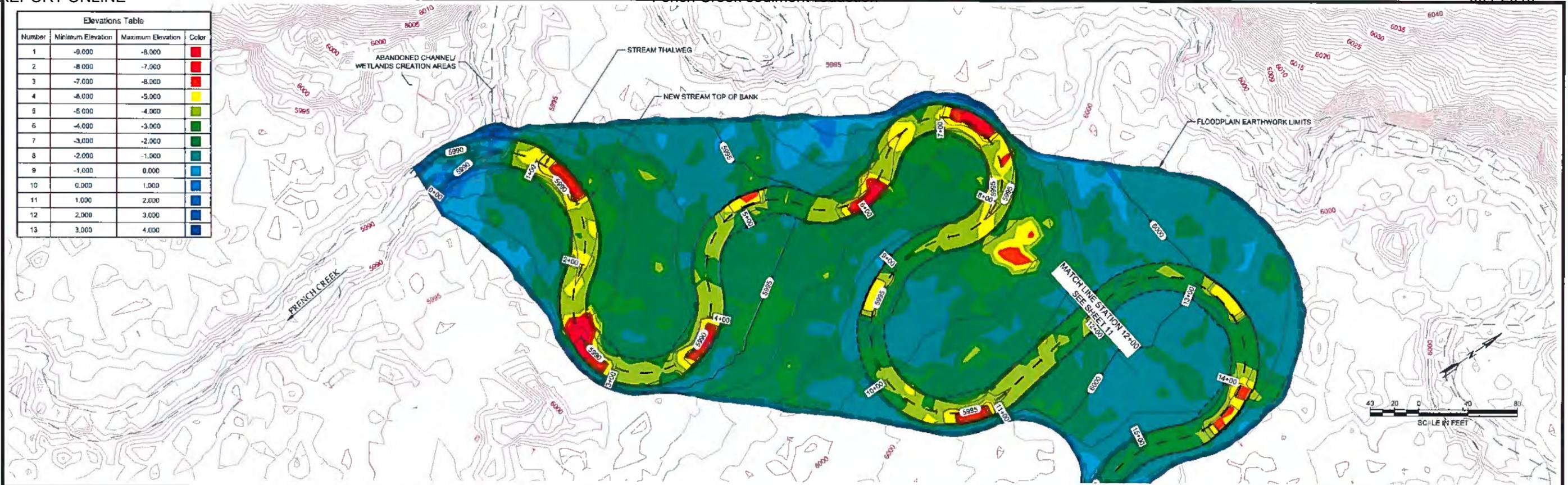
COPYRIGHT © MORRISONMAIERLE, INC., 2016

DRAWN BY: DAB  
DSGN. BY: MDB  
APPR. BY: MDB  
DATE: 11/2018  
O.C. REVIEW BY: \_\_\_\_\_  
DATE: \_\_\_\_\_

FRENCH CREEK STREAM RESTORATION  
DEER LODGE COUNTY, MONTANA  
CROSS SECTIONS STA. 29+00 TO STA. 39+50

PROJECT NUMBER: 5406.004.01  
SHEET NUMBER: 10  
DRAWING NUMBER: C-8

Elevations Table			
Number	Minimum Elevation	Maximum Elevation	Color
1	-9.000	-8.000	Red
2	-8.000	-7.000	Red
3	-7.000	-6.000	Red
4	-6.000	-5.000	Yellow
5	-5.000	-4.000	Light Green
6	-4.000	-3.000	Green
7	-3.000	-2.000	Green
8	-2.000	-1.000	Teal
9	-1.000	0.000	Blue
10	0.000	1.000	Blue
11	1.000	2.000	Blue
12	2.000	3.000	Blue
13	3.000	4.000	Blue



**PRELIMINARY**  
NOT FOR CONSTRUCTION

REVISIONS			
NO.	DESCRIPTION	BY	DATE

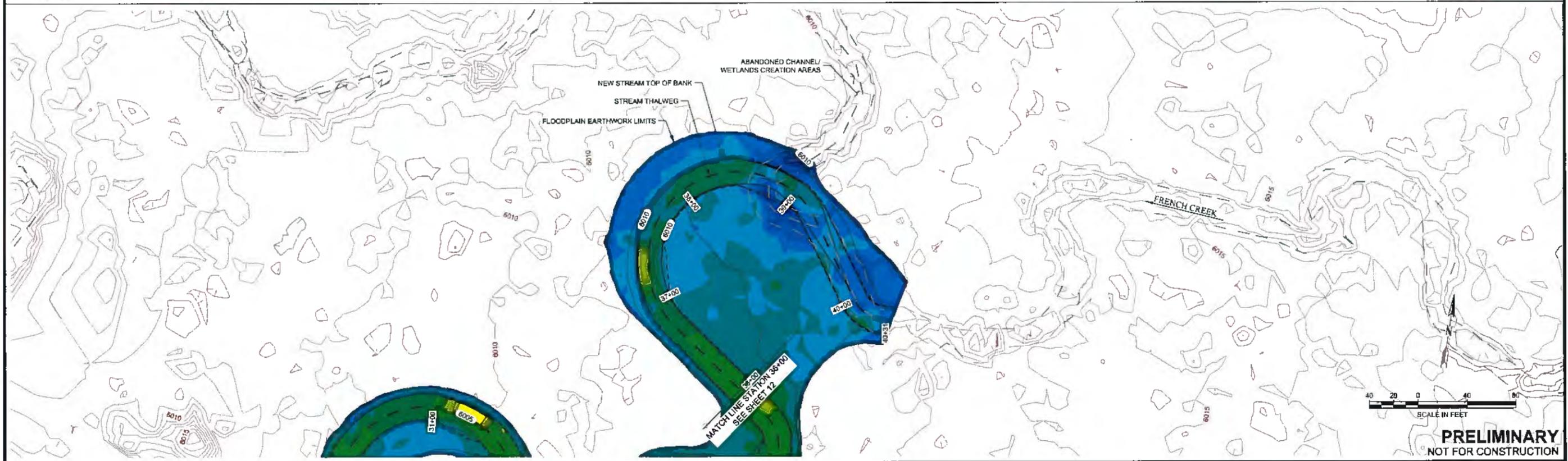
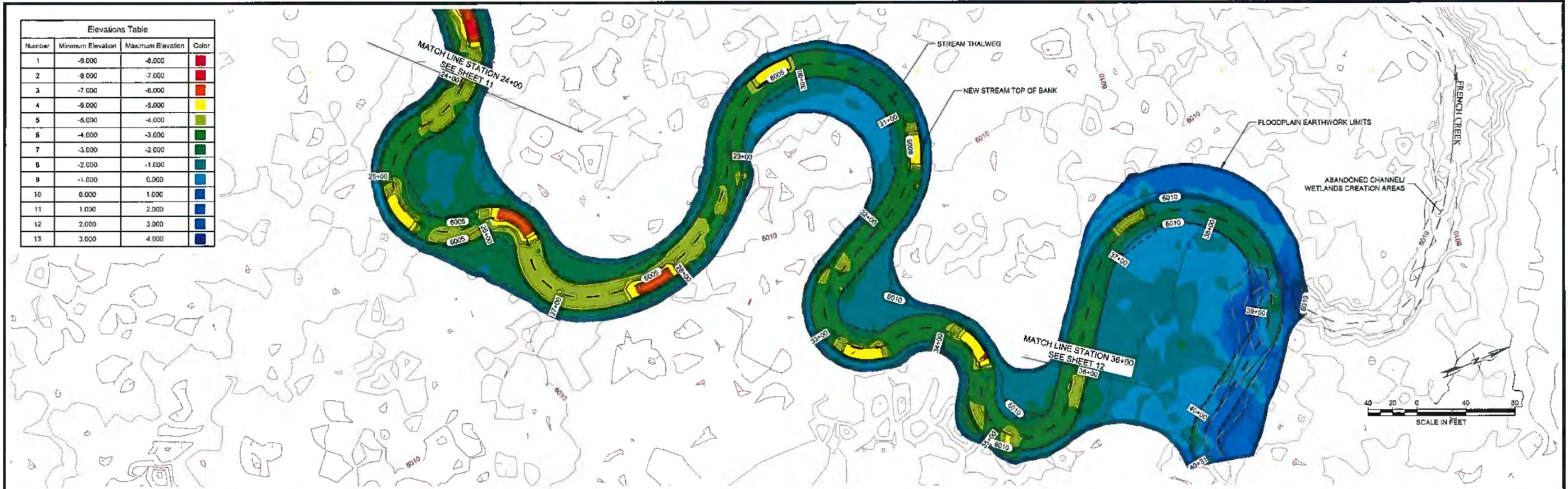
**Morrison Maierle**  
engineers • surveyors • planners • scientists

1 Engineering Place  
Helena, MT 59602  
406.442.3050  
www.m-m.net

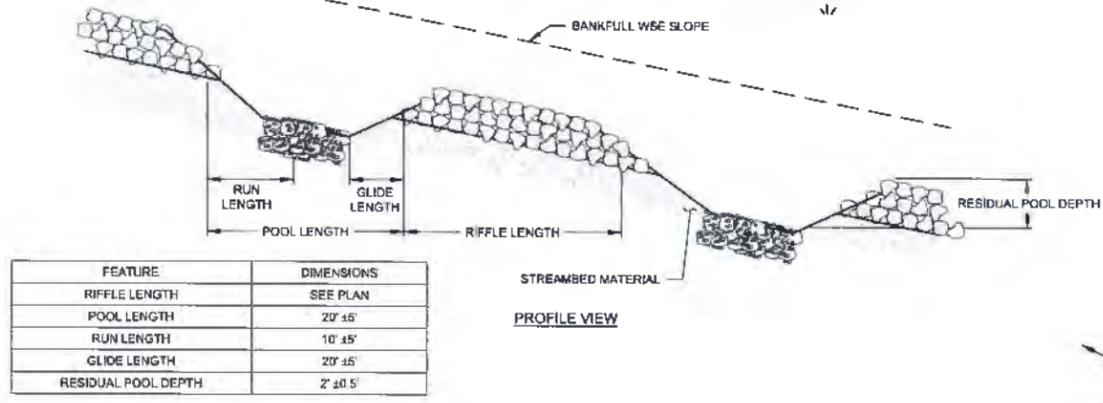
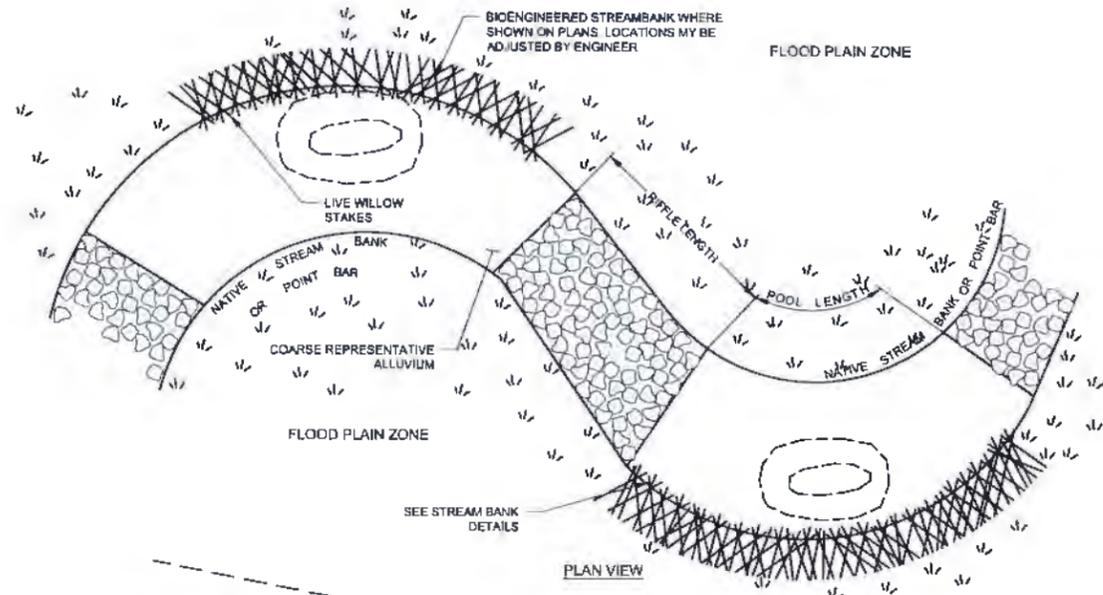
COPYRIGHT © MORRISONMAIERLE INC. 2018

DRAWN BY: DAH DSGN. BY: MDR APPR. BY: MDR DATE: 11/2018 Q.C. REVIEW BY: DATE:	FRENCH CREEK STREAM RESTORATION DEER LODGE COUNTY MONTANA	PROJECT NUMBER: 5406.004 G1 SHEET NUMBER: 11 DRAWING NUMBER: C-9
--	--	--

R15406-B1WC00461ACADISHEETS:11 CUT AND FILL MAP STA. 0+00 TO STA. 24+00 DWG PLOTTED BY DAVID A. HALLSTEN ON 11/28/2018

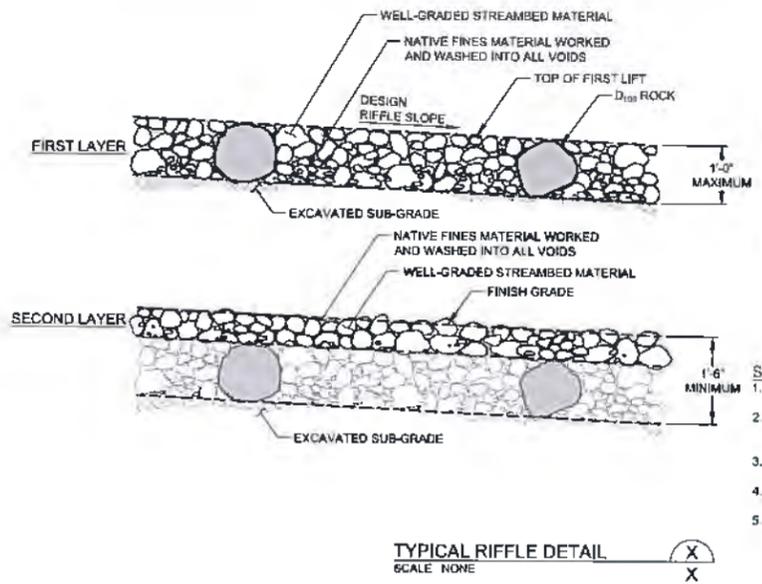


<p>VERIFY SCALE!</p> <p>THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.</p> <p>MODIFY SCALE ACCORDINGLY!</p>	<p>REVISIONS</p> <table border="1"> <thead> <tr> <th>NO</th> <th>DESCRIPTION</th> <th>BY</th> <th>DATE</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>			NO	DESCRIPTION	BY	DATE													<p>1 Engineering Place Helena, MT 59802 406.442.3050 www.m-m.net</p> <p>COPYRIGHT © MORRISON MAIERLE, INC. 2016</p>	<p>DRAWN BY: DAH</p> <p>DSGN. BY: MDR</p> <p>APPR. BY: MDR</p> <p>DATE: 11/2018</p> <p>Q.C. REVIEW BY: _____</p> <p>DATE: _____</p>	<p>FRENCH CREEK STREAM RESTORATION</p> <p>DEER LODGE COUNTY MONTANA</p> <p>CUT AND FILL MAP</p> <p>STA. 24+00 TO STA. 36+00 AND STA. 36+00 TO STA. 40+31</p>	<p>PROJECT NUMBER: 5406.004.01</p> <p>SHEET NUMBER: 12</p> <p>DRAWING NUMBER: C-10</p>
	NO	DESCRIPTION	BY	DATE																			
<p>PRELIMINARY NOT FOR CONSTRUCTION</p>																							



FEATURE	DIMENSIONS
RIFPLE LENGTH	SEE PLAN
POOL LENGTH	20' ±5'
RUN LENGTH	10' ±5'
GLIDE LENGTH	20' ±5'
RESIDUAL POOL DEPTH	2' ±0.5'

POOL/RIFPLE SEQUENCE DETAIL  
SCALE: NONE



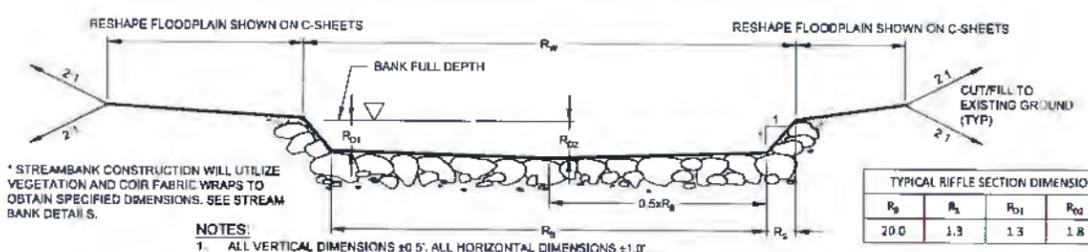
**STREAMBED MATERIAL:**

% PASSING	SIZE (INCHES)
D <sub>15</sub> 10-15	0.5-1
D <sub>30</sub> 40-60	5-8
D <sub>60</sub> 85-100	8-10

- APPROVED ALLUVIUM FOR STREAMBED AND BANK CONSTRUCTION SHALL HAVE MINIMUM 10% FINES DETERMINATION SHALL BE MADE BY ENGINEER.

- SEQUENCE NOTES:**
- EXCAVATE AND SHAPE EXISTING SUB-GRADE TO PROVIDE CONSISTENT SURFACE A MINIMUM 1'-6" BELOW FINISH RIFPLE ELEVATIONS.
  - STOCK PILE ALL EXCAVATED MATERIAL. ROCKS THAT MEET WELL-GRADED STREAMBED MATERIAL GRADATION AND REMAINING FINES SHALL BE SEPARATED FOR USE IN RIFPLE.
  - PLACE FIRST LAYER OF MATERIAL TO PROVIDE A SOLID, WELL-GRADED AND CONSISTENT SURFACE.
  - WORK AND WASH NATIVE FINES (GENERALLY <D<sub>15</sub>>) INTO ALL VOID SPACES TO TOP OF LAYER.
  - REPEAT PROCESS FOR REMAINING LAYERS. ENGINEER APPROVAL OF EACH LAYER PLACEMENT IS REQUIRED PRIOR TO PROCEEDING.

TYPICAL RIFPLE DETAIL  
SCALE: NONE

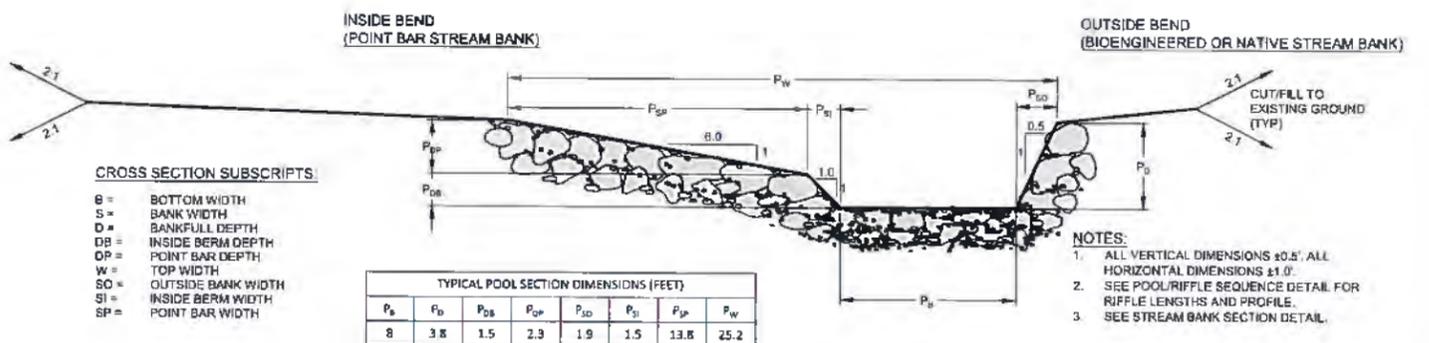


TYPICAL RIFPLE SECTION DIMENSIONS (FEET)

R <sub>b</sub>	R <sub>l</sub>	R <sub>01</sub>	R <sub>02</sub>	R <sub>0</sub>
20.0	1.3	1.3	1.8	22.6

- \* STREAMBANK CONSTRUCTION WILL UTILIZE VEGETATION AND COIR FABRIC WRAPS TO OBTAIN SPECIFIED DIMENSIONS. SEE STREAM BANK DETAILS.
- NOTES:**
- ALL VERTICAL DIMENSIONS ±0.5'. ALL HORIZONTAL DIMENSIONS ±1.0'.
  - SEE POOL/RIFPLE SEQUENCE DETAIL FOR RIFPLE LENGTHS AND PROFILE.
  - SEE STREAM BANK SECTION DETAIL.

TYPICAL RIFPLE CROSS SECTION DETAIL  
SCALE: NONE



- CROSS SECTION SUBSCRIPTS:**
- B = BOTTOM WIDTH
  - S = BANK WIDTH
  - D = BANKFULL DEPTH
  - DB = INSIDE BERM DEPTH
  - DP = POINT BAR DEPTH
  - W = TOP WIDTH
  - SO = OUTSIDE BANK WIDTH
  - SI = INSIDE BERM WIDTH
  - SP = POINT BAR WIDTH

TYPICAL POOL SECTION DIMENSIONS (FEET)

P <sub>b</sub>	P <sub>0</sub>	P <sub>01</sub>	P <sub>02</sub>	P <sub>03</sub>	P <sub>04</sub>	P <sub>05</sub>	P <sub>06</sub>	P <sub>07</sub>	P <sub>08</sub>	P <sub>09</sub>	P <sub>10</sub>
8	3.8	1.5	2.3	1.9	1.5	13.8	25.2				

- NOTES:**
- ALL VERTICAL DIMENSIONS ±0.5'. ALL HORIZONTAL DIMENSIONS ±1.0'.
  - SEE POOL/RIFPLE SEQUENCE DETAIL FOR RIFPLE LENGTHS AND PROFILE.
  - SEE STREAM BANK SECTION DETAIL.

TYPICAL POOL/POINT BAR CROSS SECTION DETAIL  
SCALE: NONE

**PRELIMINARY**  
NOT FOR CONSTRUCTION

VERIFY SCALE: THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING. MODIFY SCALE ACCORDINGLY!

REVISIONS		BY	DATE
NO.	DESCRIPTION		

DRAWN BY: DAH  
 DSGN BY: MJB  
 APPR BY: MOB  
 DATE: 11/2018  
 G.C. REVIEW BY:  
 DATE:

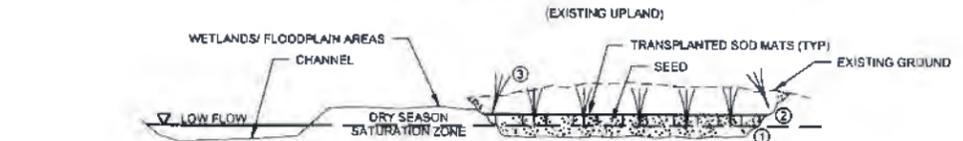
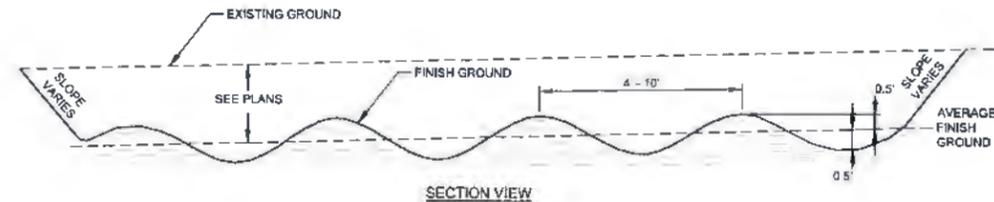
FRENCH CREEK STREAM RESTORATION  
 DEER LODGE COUNTY MONTANA  
 CHANNEL TYPICAL SECTIONS AND DETAILS

PROJECT NUMBER: 540B.004.01  
 SHEET NUMBER: 13  
 DRAWING NUMBER: D-1

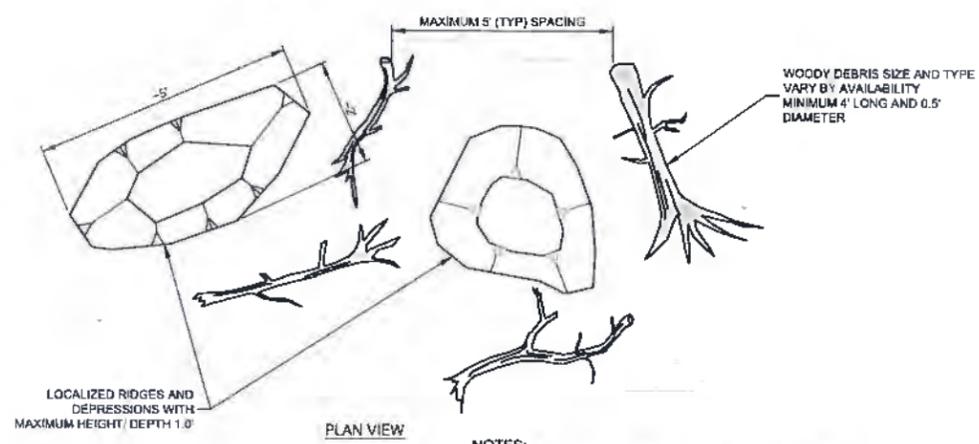
R 15406-BHW02946 (1)CADSHEETS: PROJECT SECTIONS AND DETAILS DWG PLOTTED BY DAVID A. HALLSTEN ON Nov/29/2018

COPYRIGHT © MORRISON MAIERLE, INC., 2018



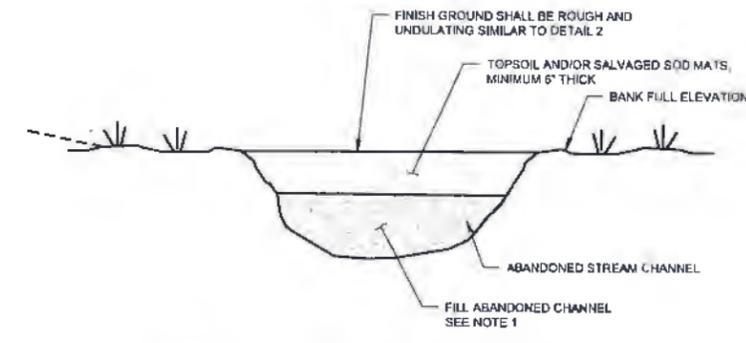
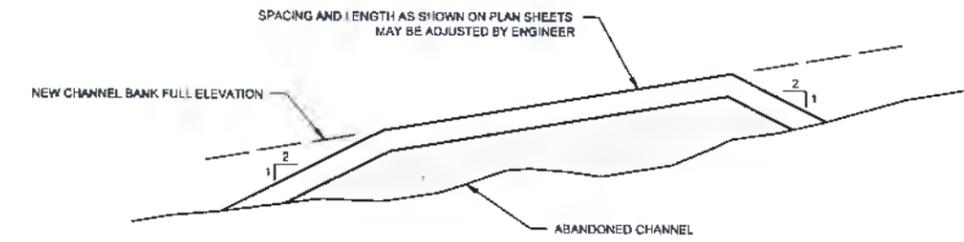


- ① REMOVE MATERIAL TO A 6" DEPTH BELOW FINISH GROUND
  - ② PLACE 6" LOAMY/CLAYS/ORGANICS.
  - ③ TRANSPLANT WETLAND SOD IN CHECKERBOARD FASHION
- UPLAND RESTORATION NOTES:  
 1. UPLAND AREAS THAT HAVE BEEN DISTURBED AS A RESULT OF CONSTRUCTION WILL REQUIRE RESTORATION. SEE SPECIFICATIONS



- NOTES:
1. MICRO TOPOGRAPHY SHALL BE IRREGULAR IN DIRECTION, SPACING AND MAGNITUDE TO PRODUCE NATURAL APPEARING LAND FEATURES AND TOPOGRAPHY. FINISH GROUND SHALL BE DE-COMPRESSED BEFORE SEEDING AND WOODY DEBRIS PLACEMENT.
  2. DEPTH TO MATCH ADJACENT BASE FLOW ELEVATION. COORDINATE WITH ENGINEER PRIOR TO EXCAVATION OF DEPRESSION.

FLOODPLAIN DEPRESSION DETAIL  
SCALE: NONE



- NOTES:
1. USE GRANULAR MATERIAL FROM ADJACENT MINE TAILINGS TO FILL EXISTING CHANNEL. COMPACT UNTIL NO VISIBLE DEFORMATION OCCURS.
  2. CONTOUR AND FINISH GRADE TO PROVIDE UNDULATIONS UP TO ±6" AND PREVENT FLOW LINES PARALLEL TO EXISTING CHANNEL.
  3. PRESERVE EXISTING VEGETATION ADJACENT TO RECONTOURING.

ABANDONED CHANNEL FILL DETAIL  
SCALE: NONE

**PRELIMINARY**  
NOT FOR CONSTRUCTION

VERIFY SCALE!		REVISIONS	
NO.	DESCRIPTION	BY	DATE

THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.

MODIFY SCALE ACCORDINGLY!

R 15496-BHWCD040 (1A)CAD(SHEETS) PROJECT SECTIONS AND DETAILS DWG PLOTTED BY DAVID A. HALLSTEN ON 10/28/2018

**Morrison Maierle**  
engineers • surveyors • planners • scientists

1 Engineering Place  
Helena MT 59602  
409 442 3050  
www.m-m.net

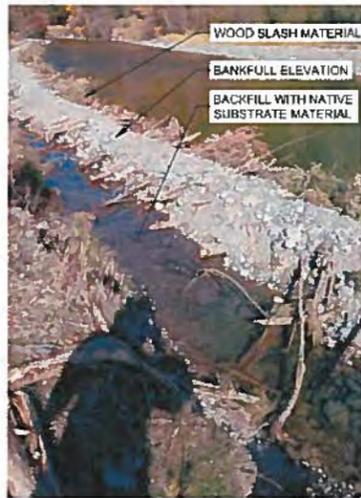
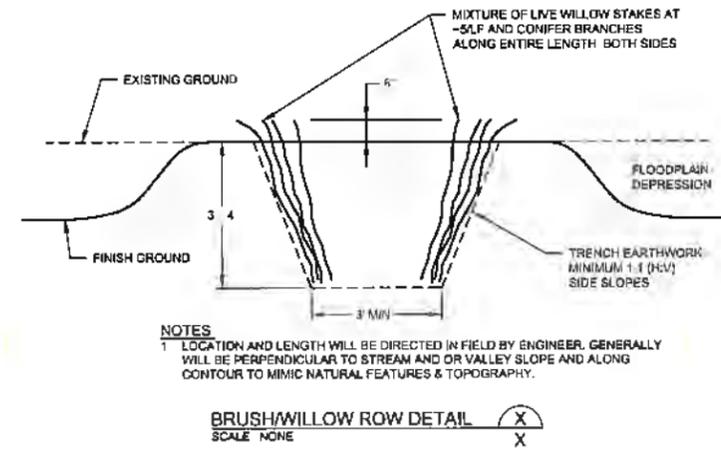
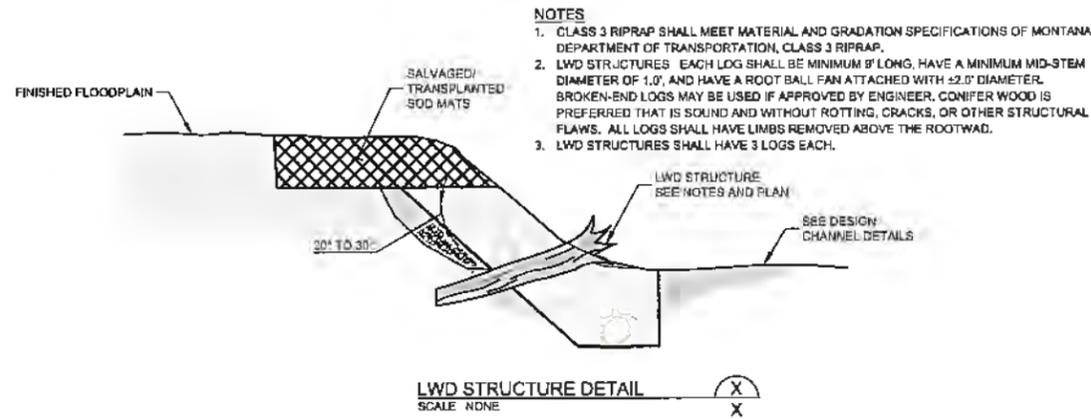
COPYRIGHT © MORRISONMAIERLE, INC., 2018

DRAWN BY: DAH
DSGN BY: MQB
APPR BY: MQB
DATE: 11/2018
O.C. REVIEW BY: _____
DATE: _____

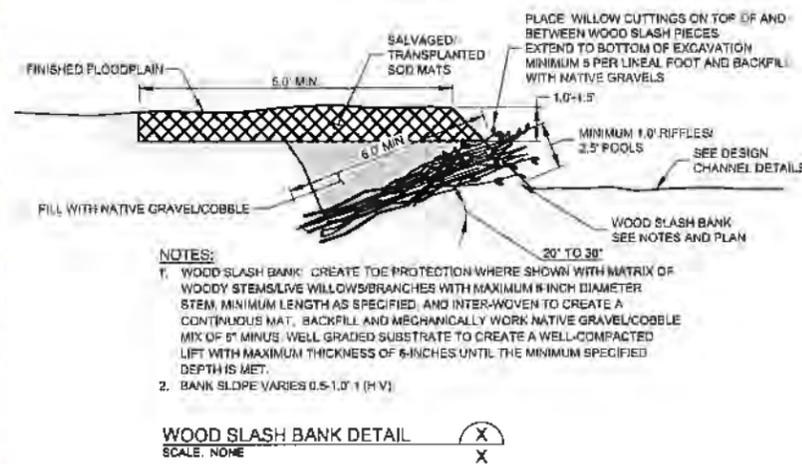
FRENCH CREEK STREAM RESTORATION  
DEER LODGE COUNTY MONTANA

FLOODPLAIN AND ABANDONED CHANNEL DETAILS

PROJECT NUMBER 5406.004.01
SHEET NUMBER 15
DRAWING NUMBER <b>D-3</b>



WOOD SLASH BANK DURING INSTALLATION



**PRELIMINARY**  
NOT FOR CONSTRUCTION

NO.	DESCRIPTION	BY	DATE



1 Engineering Place  
Helena, MT 59602  
406.442.3050  
www.m-m.net

DRAWN BY: DAB  
DSGN BY: MDR  
APPR BY: MDR  
DATE: 11/2018  
O.C. REVIEW BY: DATE:

FRENCH CREEK STREAM RESTORATION  
DEER LODGE COUNTY MONTANA

CHANNEL STABILIZATION STRUCTURE DETAILS

PROJECT NUMBER: 5406.004.01  
SHEET NUMBER: 10  
DRAWING NUMBER: D-4

**PLANTING SPECIFICATIONS PER ZONE**

**STREAMBANK ZONE**

1. REVEGETATION TECHNIQUES WITHIN THE STREAMBANK ZONE WILL INCLUDE WILLOW BRUSH LAYERING AND POLE PLANTINGS (TABLES D-6.10, D-6.11, AND D-6.12), CONTAINERIZED TALL POT (WOODY SPECIES) PLANTING TABLE D-6.1 (SHEET D-8), TRANSPLANTED SOD MATS, AND SEEDING WITH STREAMBANK SEED MIX TABLES D-6 AND D-6.7 (SHEET D-8). THESE TECHNIQUES WILL BE INCORPORATED INTO THE CONSTRUCTION CDIR FABRIC WRAP AND STREAMBANK WORK.
2. WOODY SPECIES PLANTINGS (WILLOW POLES AND BRUSH, AND CONTAINERIZED) AND SEEDING TREATMENT AREAS WERE CALCULATED BASED ON A MOSAIC OF PLANTING LOCATIONS WITHIN THE STREAMBANK AREA. WOODY PLANTINGS WILL BE GROUPED AT HIGHER DENSITIES, OFFERING ADDED STABILITY FOR THE STREAMBANK. APPROXIMATELY 40% TO 60% OF THE BIOENGINEERED STREAMBANK WILL BE PLANTED WITH GROUPS OF WOODY SPECIES. THE REMAINING AREAS WILL EXIST AS GRASS DOMINATED MEADOW WITHIN THE FLOODPLAIN.
3. CONTAINERIZED WOODY PLANTINGS WILL BE PROTECTED WITH BROWSE CONTROL NETTING TO PROVIDE PROTECTION FROM WILDLIFE BROWSE.
  - A). SPECIFICATIDNS FOR BROWSE CONTRDL AND GRASS COMPETITION INCLUDE THE FOLLOWING
    - PLACE A 2-FOOT DIAMETER PLASTIC MULCH MAT AROUND THE BASE OF EACH SHRUB TO REDUCE GRASS COMPETITION;
    - MATERIAL: RIGID, UV1 POLYETHYLENE OR POLYPROPYLENE - MATERIAL NEEDS TO BE PHOTODEGRADABLE WITHIN 2-5 YEARS,
    - MESH SHOULD COVER THE ENTIRE PLANT AND EXCEED PLANT HEIGHT BY 1 FOOT;
    - DIAMETER: 10 - 12 INCHES. HEIGHT: 4 FEET,
    - SECURE MESH WITH 2 WOODEN STAKES ON EACH SIDE OF THE PROTECTOR.
    - WOODEN STAKES POUNDED TIGHTLY IN THE INTO THE GROUND WITH ABOUT 6 INCHES IN THE GROUND AND CAN STAND ON ITS OWN.
    - MESH ATTACHED TO STAKES WITH PLASTIC ZIP TIES AT TWO POSITIONS ON EACH STAKE; AND,
    - MESH SECURELY PLACED ON THE GROUND AND AROUND THE BASE OF THE PLANT.

**EMERGENT WETLANDS (FLOODPLAIN) ZONES**

EMERGENT WETLAND TREATMENTS WILL INCLUDE BROADCAST SEEDING WITH A WETLAND SEED MIX (TABLE D-6.4 AND D-6.5, SHEET D-6), SOD MAT TRANSPLANTS FROM AREAS OF STREAM CONSTRUCTION THROUGH EXISTING WETLANDS, TALL POT CONTAINERIZED WOODY SPECIES (TABLE D-6.2), AND MATURE WILLOW TRANSPLANTS (TABLE D-6.3) AT THE WETLAND-UPLAND INTERFACE ZONE.

**1. CREATION EMERGENT WETLANDS**

THESE WETLANDS ARE CREATED FROM UPLAND (NONWETLAND) AREAS BY EXCAVATING TO A DEPTH OF 6 TO 12 INCHES BELOW THE DRY SEASON SATURATION LEVEL. THESE CREATED EMERGENT WETLANDS WILL BE VEGETATED USING ONE OF THE FOLLOWING METHODS

- A). 100% SEED: USING D-6.5 (SHEET D-6),
- B). 50% SEED/50% WETLAND SOD
- SOD WILL BE SALVAGED (REMOVED IN 6-FOOT STRIPS, 6 TO 8 INCHES THICK) FROM AREAS OF STREAM CONSTRUCTION THROUGH EXISTING WETLANDS AND TAMPED INTO PLACE (WITH REVERSED BACKHOE BUCKET) IN THE CREATED EMERGENT WETLAND IN A CHECKERBOARD FASHION, WITH THE HIGHEST CONCENTRATION OF SOD MATS IN THE WETTEST PORTION OF THE PREPARED PLACEMENT AREA.
- THE AREAS OF MISSING SOD AT THE SALVAGE SITE WILL BE TOP-DRESSED WITH TOPSOIL TO A DEPTH OF 6 TO 8 INCHES.
- WETLAND SEED (TABLES D-6.4 AND D-6.5) WILL BE HAND RAKED INTO THE AREAS WHERE THE SOD WAS REMOVED.
- C). 100% SOD MATS: THE ENTIRE CREATED WETLAND WILL BE REVEGETATED USING SOD MATS AS DETAILED ABOVE (1.B).

**2. HYDROLOGICALLY ENHANCED EMERGENT WETLAND**

THESE WETLANDS ARE IN PLACE ALONG THE NEWLY EXCAVATED CHANNEL, BECAUSE OF CHANNEL EXCAVATION, THESE WETLANDS MAY BECOME PERCHED ABOVE AN ALTERED WATER TABLE LEVEL. AREAS THAT WILL BECOME PERCHED ABOVE APPROPRIATE SATURATION ZONES DUE TO STREAM RESTORATION WILL BE TREATED AS FOLLOWS.

- A). WETLAND SOD WILL BE LIFTED AND PLACED ASIDE;
- B). UNDERLYING SUBSTRATE WILL BE REMOVED TO A DEPTH OF 6 TO 12 INCHES BELOW THE WATER TABLE AND SUBSTRATE WILL BE SORTED INTO LOAM (SILT LOAM), CLAY, GRAVELS, AND COBBLES;
- C). 6 TO 12 INCHES OF SUBSTRATE WILL BE RETURNED TO THE ENTIRE SURFACE OF THE EXCAVATED AREA (PRESUMING THE BOTTOM OF THE PREPARED AREA IS COBBLES) LAYER APPROXIMATELY 6 INCHES OF CLAY LOAM INTO THE LOWER LAYER AND TOP WITH 6 INCHES OF LOAM/SILT LOAM.
- D). REPLACE SOD MATS ONTO THE SURFACE OF THE SILT LOAM SUBSTRATE, TAMP INTO PLACE WITH REVERSED BACK HOE BUCKET.

**BROADCAST SEEDING**

1. ALL PLANTING ZONES WILL BE SEEDDED WITH SITE-SPECIFIC SEED MIX TAILORED FOR THE HYDROLOGIC REGIME OF THAT ZONE (SHEET D-4): EMERGENT WETLAND SEED MIX (TABLES D-6.4 AND D-6.5), STREAM BANK SEED MIX (TABLES D-6.8 AND D-6.7), AND UPLAND SEED MIX (TABLES D-6.8 AND D-6.9). SEED MIXES WILL BE SPREAD ON THE PREPARED GROUND SURFACE WITH A BROADCAST SEEDER AND

THEN SLIGHTLY COVERED WITH SOIL BY MECHANICAL HARROWING OR HAND RAKING.

2. THE GROUND SURFACE WILL BE PREPARED BY SCARIFYING UPLAND AREAS THAT HAVE BEEN COMPACTED BECAUSE OF HEAVY EQUIPMENT TRAFFIC, OR "ROUGH-SMOOTHED" (SMOOTHING TO REMOVE UNNATURAL RUTS) IN CONSTRUCTED WETLAND AND BANK AREAS.

3. THE APPROPRIATE SEED MIX WILL BE INCORPORATED INTO THE CONSTRUCTION OF SOIL LIFTS THAT ARE WRAPPED WITH COIR FABRICS (DUAL LAYER: INNER - STRAW MATS WITH NON-PLASTIC NETTING, OUTER - COIR FABRIC) ENCASING NATIVE SOILS/SUBSTRATE. SEED MIX WILL BE APPLIED BY HAND BRADCASTING ON TOP OF SUBSTRATE PRIOR TO THE COMPLETION OF THE WRAP DURING CONSTRUCTION

**TRANSPLANTED MATERIALS**

**MATURE WILLOWS**

1. MATURE WILLOWS WITHIN THE PROJECT AREA WILL BE TRANSPLANTED TO PROVIDE LARGE STATURE PLANTS WITH ESTABLISHED ROOT SYSTEMS.
2. WILLOW TRANSPLANTS WILL BE PLANTED AT THE UPLAND/WETLAND INTERFACE ZONES.
3. THE MATURE WILLOW WILL BE EXCAVATED FROM AREAS WHERE THEY ARE ROOTED IN SILT/LOAM/FINES SUBSTRATE (I.E. NOT IN COBBLES, AS COBBLES WILL FALL FROM THE ROOT BALL AND EXPOSE SENSITIVE ROOT SYSTEMS)
4. A PLACEMENT HOLE WILL BE DUG AT THE UPLAND/WETLAND INTERFACE THAT EXCEEDS THE ROOT BALL DIAMETER BY 1 TO 2 FEET WITH THE BOTTOM AT THE GROUNDWATER TABLE.
5. SILT/LOAM/FINES SUBSTRATE WILL BE BACKFILLED INTO THE TRANSPLANT HOLE AND TAMPED.
6. THE STEMS WILL BE TRIMMED TO A HEIGHT OF 3 FEET.

**WETLAND SOD MATS**

EMERGENT WETLAND SOD MATS PRIMARILY COMPRISED OF SEDGE SPECIES WILL BE USED TO PROVIDE ESTABLISHED ROOTED VEGETATION WITHIN EMERGENT WETLANDS AND ALONG BIOENGINEERED STREAMBANKS.

**1. SOD SALVAGE METHOD.**

- A). SOD WILL BE SALVAGED (REMOVED IN 6-FOOT STRIPS, 6 TO 8 INCHES THICK) FROM AREAS OF STREAM CONSTRUCTION THROUGH EXISTING WETLANDS AND/OR AN IDENTIFIED SOD SALVAGE SITE AND TAMPED INTO PLACE (WITH REVERSED BACKHOE BUCKET) IN THE TREATMENT WETLAND.
- B). NO MORE THAN 50% OF SOD FROM THE SOD SALVAGE SITE WILL BE REMOVED.
- C). THE AREAS OF STRIPPED SOD WITHIN THE SALVAGE SITE WILL BE TOP-DRESSED WITH TOPSOIL TO A DEPTH OF 6 TO 8 INCHES.
- D). WETLAND SEED (TABLES D-6.4 AND D-6.5) WILL BE HAND RAKED INTO THE AREAS WHERE THE SOD WAS REMOVED.

**2. CREATION EMERGENT WETLANDS - SOD MAT INSTALLATION**

THESE WETLAND ZONES ARE CREATED FROM UPLAND (NONWETLAND) AREAS BY EXCAVATING TO A DEPTH OF 6 TO 12 INCHES BELOW THE DRY SEASON SATURATION LEVEL.

SOD MATS (AND OR SEEDING) WILL BE PLACED IN CREATED EMERGENT WETLANDS IN A CHECKERBOARD FASHION OR USED TO COMPLETELY VEGETATE THE WETLAND (DEPENDING ON QUANTITY OF AVAILABLE SOD) USING ONE OF THE FOLLOWING METHODS

- A). NO SOD: 100% SEED (TABLES D-6.4 AND D-6.5),
- B). CHECKERBOARD: 50% SEED/50% WETLAND SOD, WITH THE HIGHEST CONCENTRATION OF SOD MATS IN THE WETTEST PORTION OF THE PREPARED PLACEMENT AREA;
- C). TOTAL SOD MATS: 100%: THE ENTIRE CREATED WETLAND WILL BE VEGETATED USING SOD MATS.

**3. HYDROLOGICALLY ENHANCED EMERGENT WETLAND - SOD MAT LIFT**

THESE WETLAND AREAS CURRENT OCCUR ALONG THE NEWLY EXCAVATED CHANNEL BECAUSE OF CHANNEL EXCAVATION, THESE WETLANDS MAY BECOME PERCHED ABOVE AN ALTERED (I.E. LOWERED) WATER TABLE LEVEL.

- A). WETLAND SOD WILL BE LIFTED AND PLACED ASIDE;
- B). UNDERLYING SUBSTRATE WILL BE REMOVED TO A DEPTH OF 6 TO 12 INCHES BELOW THE WATER TABLE AND SUBSTRATE WILL BE SORTED INTO LOAM (SILT LOAM), CLAY, GRAVELS, AND COBBLES,
- C). 6 TO 12 INCHES OF SUBSTRATE WILL BE BACKFILLED ONTO THE ENTIRE SURFACE OF THE EXCAVATED AREA (PRESUMING THE BOTTOM OF THE PREPARED AREA IS COBBLES); LAYERING APPROXIMATELY 6 INCHES OF CLAY LOAM ONTO THE COBBLE BASE AND TOPPED WITH 6 INCHES OF LOAM/SILT LOAM/CLAY.
- D). SOD MATS WILL BE REPLACED ONTO THE SURFACE OF THE SILT LOAM SUBSTRATE AND TAMPED INTO PLACE WITH REVERSED BACK HOE BUCKET.

**4. STREAMBANK - SOD MAT INSTALLATION**

SOD MATS AT LEAST 3 FEET WIDE AND THE LENGTH OF THE TREATMENT AREA WILL BE OVERLAPPED WITH DOWNSTREAM EDGE ON TOP OF THE NEXT SOD MAT EDGE (SHINGLED). THE UPSTREAM AND DOWNSTREAM ENDS OF THE TREATMENT WILL BE KEYED INTO THE SUBSTRATE.

**WILLOW COLLECTION**

**SPECIES SELECTION & WILLOW RECONNAISSANCE**

WILLOW SPECIES USED FOR WILLOW POLES AND WILLOW BRUSH TREATMENTS SHOULD BE IDENTIFIED BY A BOTANIST. SPECIES IDENTIFICATION IS IMPORTANT TO INSURE THAT THE SPECIFIC SPECIES ARE PLANTED OR INSTALLED IN APPROPRIATELY BASED ON LEVELS OF SATURATION AND SPECIES-SPECIFIC HYDROLOGIC REGIME REQUIREMENTS.

WILLOWS HAVE DIFFERENT TYPE OF GROWTH FORMS SUCH AS SMALL TO MEDIUM-SIZED SHRUB OR CREEPING-TYPE WILLOWS THAT SPREAD ALONG STREAMBANKS. WILLOW SPECIES WITH CREEPING-TYPE (RHIZOMATOUS) ROOTS SYSTEM WILL BE UTILIZED FOR THE STREAMBANK ZONE. WILLOW SPECIES (IN THE FORM OF WILLOW POLES) WITH A DENSE BASAL AREA WILL BE UTILIZED FOR BIOENGINEERED STREAMBANK CONSTRUCTION AND ALONG EMERGENT WETLAND FRINGE.

IF WILLOW SPECIES CANNOT BE IDENTIFIED USE THE FOLLOWING CHARACTERISTICS TO DETERMINE APPROPRIATE ZONE LOCATION: SITE CONDITIONS, SOIL TYPE, WATER REGIME AND GROWTH FORM.

**WILLOW POLE AND BRUSH COLLECTION METHODS.**

1. COLLECT WILLOW STEMS DURING DORMANT SEASON PRIOR (PREFERABLE) TO BUD BREAK (MARCH-APRIL) OR AFTER LEAF FALL ONCE PLANT IS DORMANT AND STORE AS PER INSTRUCTIONS BELOW.

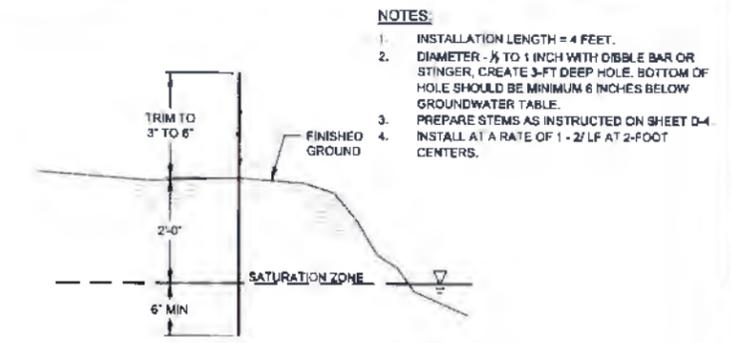
2. TRIMMING METHODS:
  - A). TYPICAL SPACING FOR WILLOW POLES WILL BE APPROXIMATELY 1 TO 2/LF AT 2-FOOT CENTERS.
  - B). SPACING FOR WILLOW BRUSH IS 5 PER LINEAR FOOT.

3. HARVESTING
  - A). SEE SPECIFICATIONS FOR HARVESTING AND STORAGE REQUIREMENTS.

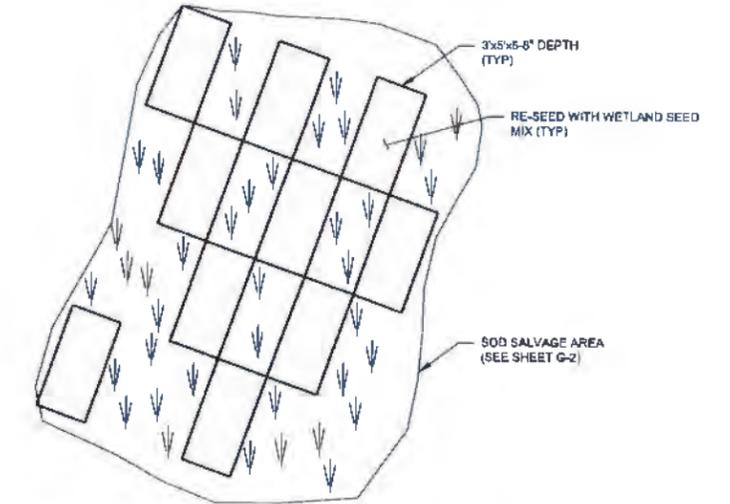
4. INSTALL WILLOW POLES ALONG DISTURBED OR CONSTRUCTED STREAMBANKS JUST ABOVE AND BELOW BANKFULL DISCHARGE WHERE CUTTING WILL BE IN EITHER SATURATED SOIL DURING LOW WATER OR IN CONTACT WITH GROUNDWATER DURING THE GROWING SEASON.

5. SPACING
  - A). TYPICAL SPACING FOR WILLOW POLES WILL BE APPROXIMATELY 1 TO 2/LF AT 2-FOOT CENTERS.
  - B). SPACING FOR WILLOW BRUSH IS 5 PER LINEAR FOOT.

6. INTERSPERSE STREAMBANK GRASS SEED MIX BETWEEN WILLOW POLES AND RAKE INTO SUBSTRATE.



**WILLOW POLE PLANTING CROSS SECTION**  
SCALE NONE



- NOTES:**
1. STRIP SOD FROM THE SALVAGE SITE IN A CHECKERBOARD FASHION (APPROX. 5 FEET LONG, 3 FEET WIDE, 6 TO 8-INCH DEPTH).
  2. DO NOT REMOVE MORE THAN 50% OF THE SOD FROM A SALVAGE SITE.
  3. BACKFILL AREAS OF STRIPPED SOD WITH 6 TO 8 INCHES OF TOPSOIL.
  4. SEED BACKFILLED SOIL AREAS BY HAND BROADCASTING WITH EMERGENT WETLAND SEED MIX (SHEET D-4); RAKE IN SEED.

**SOD SALVAGE AND RESTORATION - PLAN VIEW**  
SCALE NONE

**PRELIMINARY**  
NOT FOR CONSTRUCTION

VERIFY SCALE		REVISIONS		BY	DATE
NO.	DESCRIPTION				

**Morrison Maierle**  
engineers • surveyors • planners • scientists

1 Engineering Place  
Helena MT 59602  
406 442.3050  
www.m-m.net

DRAWN BY: DAH  
DSGN. BY: MCB  
APPR. BY: MCB  
DATE: 11/2018

FRENCH CREEK STREAM RESTORATION  
DEER LODGE COUNTY MONTANA

PROJECT NUMBER: 5406.004.01  
SHEET NUMBER: 17  
DRAWING NUMBER: D-5

B:\5406-BHW\00401\ACAD\SHETS\PROJECT SECTIONS AND DETAILS DWG PLOTTED BY DAVID A. HALLSTEN ON Nov/29/2018

© COPYRIGHT © MORRISONMAIERLE, INC., 2018