FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION

All sections must be addressed, or the application will be considered invalid

I. APPLICANT INFORMATION

A. Applicant Name: Big Blackfoot Chapter of Trout Unlimited

Mailing Address: PO Box 1

City: Ovando State: MT Zip: 59854

Telephone: 406-240-4824 E-mail: ryen@montanatu.org

B. Contact Person (if different than applicant): Ryen Neudecker

Address: Same as above

City: State: Zip:

Telephone: E-mail:

C. Landowner and/or Lessee Name (if different than applicant): Cottonwood Ranch-Mark Bretz

Mailing Address: 2930 Stockyard Ln

City: Missoula State: MT Zip: 59808

Telephone: 406-880-1088 E-mail:

II. PROJECT INFORMATION

A. Project Name: Cottonwood Creek Restoration Project Phase 1

River, stream, or lake: Cottonwood Creek

Location: Township: 13N Range: 11W Section: 33

Latitude: 46.8349891 Longitude: -112.9984564 *Within project (decimal degrees)*

County: Powell

B. Purpose of Project: *(high level, focus on why the project is important)*

The purpose of this project is to address several limiting factors impacting lower Cottonwood Creek and improve westslope cutthroat trout habitat by restoring channel stability, aquatic habitat function, fish passage, instream flows and riparian health while working in collaboration with several project partners and a private landowner who is committed to conservation in the Blackfoot River watershed.

C. Brief Project Description (attach additional information to end of application). Please include the anticipated construction schedule:

Cottonwood Creek is an important native trout tributary in the Douglas Creek, Nevada Creek and middle Blackfoot River watershed and flows 18 miles through BLM and private land. Supporting populations of westslope cutthroat trout in its upper reaches and listed by Montana DEQ as impaired for sedimentation/siltation, temperature and flow regime modification, the project has been identified as a priority project. Through initial assessment and monitoring work, the Blackfoot Restoration team has identified opportunities to improve instream, riparian and uplands conditions along with restoring fish passage and instream flows, all in collaboration and balance with ranch management and production goals.

Within this initial phase of restoration work on Cottonwood Creek, we are proposing to implement a restoration project on 3,700 feet of channel (phase one) that is tied in with the bigger picture goals and objectives designed to address limiting factors and restore resilience to Cottonwood Creek. Limiting factors identified within the proposed project reach include bank erosion, channel dewatering and lack of channel maintenance flows, channel entrenchment and floodplain disconnection, habitat degradation and inhibited fish movement, irrigation ditch losses and fish losses, historic grazing pressure and vegetation conversion and unsuitable water temperatures.

The design approach aims to work with, rather than against the natural riverine processes and historical conditions were determined based on analysis of LiDAR data and historical aerial imagery. The design emulates these natural conditions by incorporating wood structures and shaping the channel to encourage pool formation and overall aquatic habitat complexity, aligning the channel through historical meanders and integrates dense plantings of willows, while incorporating floodplain treatments that will set the stage for natural cottonwood regeneration.

Specific objectives include: restoring channel maintenance and minimum instream low flows; reducing channel entrenchment and floodplain disconnection; addressing chronic bank erosion; increasing the distribution and availability of complex instream habitat; elimination of water withdrawals and fish entrainment; reducing grazing pressure; and expanding the width and functionality of riparian habitat conditions to improve bank stability, floodplain function and improve water temperatures. The desired riparian condition is one dominated by riparian shrubs and a patchy mosaic of cottonwood galleries. The design includes willow brush trenches along the stream banks and throughout the floodplain and microsites will be created to encourage the colonization from upstream and surrounding seed sources from cottonwood, willow and other native species. Disturbing the root system of the existing cottonwood overstory will also propagate new seedlings. Recruitment and establishment of cottonwoods have been suppressed by past grazing practices in the floodplain and the proposed grazing management plan and exclosure will allow for existing cottonwood saplings to mature, which in turn, will result in the long-term recruitment of large wood to the stream channel. The grazing management plan goal is to allow the riparian area to establish and stream banks to stabilize following restoration work and involves a two-stage approach involving 1) recovery and stabilization and 2) management and monitoring.

Our collaborative efforts on Cottonwood include further stream reaches which will be presented in future applications. One important aspect of our proposed work throughout the drainage is an instream water lease and irrigation consolidation project where we will eliminate multiple irrigation diversions and the ranch will irrigate from one point of diversion. Minimum instream flows will also be secured through a water lease and one of the irrigation diversions that is proposed to be eliminated is in the proposed project reach phase 1.

Community richness and population densities of fishes in the main stem Blackfoot River closely reflect the quality of nearby tributaries making the broad level, systematic restoration program across the entire watershed fundamental to the success in recovering native trout all while working in collaboration with private, state and federal partners. This project will continue our efforts and provide new opportunities to educate communities about water quality and encourage new projects and partnerships.

D. What was the cause of habitat degradation and how will the project correct the cause?

Historic channel manipulations and streamside vegetation removal have contributed to the bank erosion issues and the existing irrigation diversions create partial fish passage barriers and instream flow limitations. The project design includes both active and passive techniques to rectify the specific issues and their causes.

E. Length of stream or size of lake that will be treated (project extent): 3,700 ft

Length/size of impact, if larger than project extent (e.g., stream miles opened): _____

F. Project Budget Summary:

Grant Request (Dollars):	**$**	**74,500**
Matching Dollars:	**$**	**403,364.90**
Matching In-Kind Services:*	**$**	**57,800**

**salaries of government employees are not considered matching contributions*

Other Contributions (not used as match)	**$**	
Total Project Cost:	**$**	**529,664.90**

G. Attach itemized (line item) budget – *see budget template*

H. Attach project location map(s) that include:

- [x] Extent of the project, including context (relation to major landmark or town)
- [x] Indication of public and private property
- [ ] Riparian buffer locations and widths (if applicable) and grazing locations

I. Attach project plans:

- [x] Detailed sketches or plan views with the location and proposed restoration
- [x] Pre-project photographs (GPS location strongly recommended)
- [ ] If water leasing or water salvage is involved, attach a supplemental questionnaire (*https://myfwp.mt.gov/getRepositoryFile?objectID=36110*)

J. Attach support letters or statements of (e.g., landowner consent, community or public support). For FWP statement, attach provided template. List any other project partners:

Project partners include: MTFWP, USFWS, Trout Unlimited, BLM and Blackfoot Challenge

III. MAINTENANCE AND MONITORING (attach additional information to end of application):

A. A 20-year maintenance commitment is required*. Please confirm that you will ensure this protection and describe your approach. Attach any relevant maintenance plans.

Yes	No
X	

**If it is a water leasing project, describe the length of the agreement.*

The landowner will sign a 20-year maintenance commitment agreement. The entire project is on private land.

B. Will grazing be part of or adjacent to the project? If so, describe or attach land management plans, including short term and long-term grazing regimes. If the landowner is not the applicant, please describe their involvement in the project. *If you want assistance with grazing plan development, note your need.*

Yes, there will be a grazing plan as part of the project. For now, a riparian exclusion is planned with a grazing management plan under development that incorporates healthy utilization of surrounding upland and riparian habitat through development of off-site water.

C. Will the project be monitored to determine if goals were met? If so, what are the short-term and long-term plans to assess benefits and lessons learned? Were pre-project data collected? Will monitoring information be shared with FWP?

The monitoring plan will include pre- and post-project data including photo points, as-built channel data, revegetation survival surveys, bank erosion hazard index data and FWP surveyed the project reach to assess the fisheries population in 2022. We will assess the project post-project to ensure that our project objectives are being met and if they are not, we will follow up appropriately.

IV. PROJECT BENEFITS (attach additional information to end of application):

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

Westslope cutthroat trout

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

The proposed reach along Cottonwood Creek lacks high-quality habitat. By addressing bank erosion issues, improper channel dimensions, lack of floodplain connection and riparian function we anticipate a dramatic improvement in instream and riparian habitat conditions. This will increase habitat capacity for trout, which is expected to lead to increased downstream recruitment to sections of lower Nevada Creek and the Blackfoot River. An important piece of this project involves upgrading existing irrigation diversions along with a water lease (part of a larger project) which is important to restore fish passage.

C. What is the expected improvement to fish populations, both short term and long term? How might the project translate to angler success?

This project is anticipated to expand the distribution of westslope cutthroat trout and to provide trout fishing opportunities in an area that is currently unsuitable for trout. Longer term benefits from additional projects and comprehensive restoration are expected to reestablish a migratory component of the cutthroat population, providing fish for anglers in a Nevada Creek and the Blackfoot River.

D. Will the project increase public fishing opportunity for wild fish and, if so, how? Is public fishing allowed onsite? Is it allowed by permission? If not, describe how the public would benefit.

Yes: Public access is available on upstream public land reaches as well as at bridge access points. Landowners request permission prior to accessing their property. Due to the monitoring data from similar projects, we have seen a significant increase in the number of trout and thus we anticipate adding close to one mile of fishable habitat on Cottonwood Creek. The project is also expected to increase trout recruitment to publicly accessible sections of lower Nevada Creek and the Blackfoot River. Increased trout production in this phase will contribute to improved fishing opportunities within adjacent reaches that are more easily accessible by the public.

E. Aside from angling, what local or large-scale public benefits will be realized from this project?

This project involves the continuation of the Blackfoot River Restoration program and the restoration of an important tributary. Public benefits include: 1) expanding suitable habitat conditions for pure westslope cutthroat trout, 2) improved water quality conditions in Cottonwood Creek and the Nevada Creek watershed, and 3) increased trout recruitment. The project will also support local economies contributing to the cold-water fishery of the Blackfoot River and will involve local contractors and consultants.

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

No.

G. Will the project result in the development of commercial recreational use on the site (including paid access)? Explain:

No.

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

No.

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.

V. 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: Ryer Neudecker Date: 05/11/2026

Submittal: **Applications must be signed and received on or before November 15 and May 15 to be considered for the subsequent funding period**. Late or incomplete applications will be rejected.

Mail to:	FWP Future Fisheries Fish Habitat Bureau PO Box 200701 Helena, MT 59620-0701	Email:	Future Fisheries Coordinator FWPFFIP@mt.gov (electronic submissions must be signed) For files over 10MB, use https://transfer.mt.gov and send to mmcgree@mt.gov

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

Both tables MUST be completed appropriately or the application will be invalid. Please see the example budget sheet for clarification.

PROJECT COSTS					GRANT REQUEST AND FUNDING			
Work Items (Itemize by Category)	**Number of Units**	**Unit Description***	**Cost/Unit**	**Total Cost**	**FUTURE FISHERIES REQUEST**	**Matching Contributions (Cash or In-Kind)*** **	**Other Contributions (Funds not used as match)**	**Total Funding**
**Units = feet, hours, cubic yards, etc. Do not use lump sum unless necessary.*								
Personnel								
Survey	77	hrs	$155.00	$ 11,935.00		11,935.00		$ 11,935.00
Design	139	hrs	$155.00	$ 21,545.00		21,545.00		$ 21,545.00
Engineering	106	hrs	$155.00	$ 16,430.00		16,430.00		$ 16,430.00
Permitting	58	hrs	$48.00	$ 2,784.00		2,784.00		$ 2,784.00
Oversight	120	hrs	$165.00	$ 19,800.00		19,800.00		$ 19,800.00
Project Mgmt	159	hrs	$48.00	$ 7,632.00		7,632.00		$ 7,632.00
			Sub-Total	$ 80,126.00	$ -	$ 80,126.00	$ -	$ 80,126.00
Travel								
Mileage	2347	miles	$0.70	$ 1,642.90		1,642.90		$ 1,642.90
Per diem				$ -				$ -
			Sub-Total	$ 1,642.90		$ 1,642.90	$ -	$ 1,642.90
Construction Materials								
Pulp Wood	6	loads	$3,000.00	$ 18,000.00		18,000.00		$ 18,000.00
Sods	20,400	sq ft	$0.80	$ 16,320.00		16,320.00		$ 16,320.00
Gravel	1250	CY	$15.00	$ 18,750.00		18,750.00		$ 18,750.00
Fill	2000	CY	$5.00	$ 10,000.00		10,000.00		$ 10,000.00
Transplants	50	Ea	$100.00	$ 5,000.00		5,000.00		$ 5,000.00
Willows	16100	Ea	$1.50	$ 24,150.00	3,000.00	21,150.00		$ 24,150.00
Stock tanks	10	Ea	$6,000.00	$ 60,000.00		60,000.00		$ 60,000.00
			Sub-Total	$ 152,220.00	$ 3,000.00	$ 149,220.00	$ -	$ 152,220.00
Equipment, Labor, and Mobilization								
Furnish and install sod	20,400	Sq Ft	$0.75	$ 15,300.00	3,000.00	12,300.00		$ 15,300.00
Decommission Diversion 1	1	LS	$3,000.00	$ 3,000.00	1,000.00	2,000.00		$ 3,000.00
Decommission Diversion 2	1	LS	$3,500.00	$ 3,500.00	1,000.00	2,500.00		$ 3,500.00
Process wood onsite	1	EA	$5,000.00	$ 5,000.00	2,000.00	3,000.00		$ 5,000.00
Furnish streambed/streambank fill	2000	CY	$6.00	$ 12,000.00	2,000.00	10,000.00		$ 12,000.00
Construct VWM Type 2 bank treatments	2050	LF	$28.00	$ 57,400.00	15,000.00	42,400.00		$ 57,400.00
Install large wood structures	16	EA	$1,500.00	$ 24,000.00	5,000.00	19,000.00		$ 24,000.00

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

Construct channel streambed (Reach 1)	1100	LF	$28.00	$ 30,800.00	6,800.00	24,000.00		$ 30,800.00
Reconstruct Channel Reach 2	2200	LF	$40.00	$ 88,000.00	22,000.00	66,000.00		$ 88,000.00
Install willow brush trenches	200	LF	$5.00	$ 1,000.00	200.00	800.00		$ 1,000.00
Livestock crossing/water gap	1	EA	$1,500.00	$ 1,500.00	500.00	1,000.00		$ 1,500.00
Load, haul and place fill in repos and ditches	2000	CY	$6.00	$ 12,000.00		12,000.00		$ 12,000.00
Electric Fencing	15840	FT	$1.40	$ 22,176.00	2,000.00	20,176.00		$ 22,176.00
Mobilization & GPS Set Up	1	LS	$20,000.00	$ 20,000.00	5,000.00	15,000.00		$ 20,000.00
			Sub-Total	$ 295,676.00	$ 71,500.00	$ 230,176.00	$ -	$ 295,676.00
			OVERALL TOTALS	$ 529,664.90	$ 74,500.00	$ 461,164.90	$ -	$ 529,664.90

OTHER REQUIREMENTS:

**For projects that include a maintenance request, it cannot exceed 10% of the total project cost.

***Match can include in-kind materials or labor. Justification for in-kind labor (e.g. hourly rates used) can be noted below. Do not use government salaries as match.

Additional budget detail:

APPLICATION MATCHING CONTRIBUTIONS

Total should equal match listed above; do not include requested funds

CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
USFWS Partners Program	$ -	$ 150,000.00	$ 150,000.00	Yes
DEQ 319 Grant Program	$ -	$ 98,312.85	$ 98,312.85	Yes
BLM	$ -	$ 59,400.00	$ 59,400.00	Yes
BBCTU	$ -	$ 31,311.05	$ 31,311.05	Yes
Landowner	$ 57,800.00	$ 64,341.00	$ 122,141.00	Yes
	$ -	$ -	$ -	
TOTALS	$ 57,800.00	$ 403,364.90	$ 461,164.90	

OTHER CONTRIBUTIONS

Total should equal other contributions listed above; these are funds not specically matched to the Future Fisheries application

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
TOTALS	$ -	$ -	$ -	

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Partners for Fish and Wildlife Program
Upsata Lake, 196 Lower Lake Side Lane
P.O. Box 66
Ovando, MT 59854

May 13, 2026

Montana Fish, Wildlife and Parks
Attn: Michelle McGree
1420 East 6th Ave.
Helena, MT 59620

RE: Support for the Big Blackfoot Chapter of Trout Unlimited Application to Future Fisheries for the Cottonwood Creek Phase 1 Restoration Project

Dear Future Fisheries Panel:

The U.S. Fish and Wildlife Service (Service) strongly endorses projects that support our mission to conserve and manage federal trust and at-risk species, including westslope cutthroat trout (*Oncorhynchus clarkii lewisi*), such as the proposal submitted by the Big Blackfoot Chapter of Trout Unlimited (BBCTU) for the Cottonwood Creek Phase 1 Restoration Project. Cottonwood Creek supports pure populations of resident westslope cutthroat trout and is an important native trout tributary to the Douglas Creek, Nevada Creek and the middle Blackfoot River watershed. This project is part of a broader effort to improve habitat for westslope cutthroat trout along an eight-mile reach of Cottonwood Creek. This phase will focus on restoring instream and riparian habitats and on reducing bank erosion and sediment inputs into downstream reaches.

The Service's Partners for Fish and Wildlife Program has a long history of working with private landowners, BBCTU, and other partners collaborating to restore the native trout fisheries in the Blackfoot Watershed. The funding through this grant will advance BBCTU and the Service's efforts to address large-landscape conservation issues with a locally led collaborative and inclusive approach. We are excited to support the BBCTU proposal and to continue to work in this landscape.

We urge the Future Fisheries Panel to provide funding for this collaborative effort. If you have any questions regarding this letter of support, please contact me at (406) 351-3078 or by email at rebecca_reeves@fws.gov. Thank you for considering this request.

Sincerely,

Rebecca A Reeves

Rebecca Reeves
Partners for Fish and Wildlife

Existing Conditions on Cottonwood Creek Phase 1-Restoration Project

Cottonwood overstory and unscreened irrigation diversion that will be retired.

COTTONWOOD CREEK STREAM RESTORATION PROJECT PHASE 1

Cottonwood Creek is a tributary to Douglas Creek, and ultimately Nevada Creek, all of which are 303(d) impaired.

Project End

Latitude: 46.8349891°N
Longitude: -112.9984564°W

COTTONWOOD CREEK

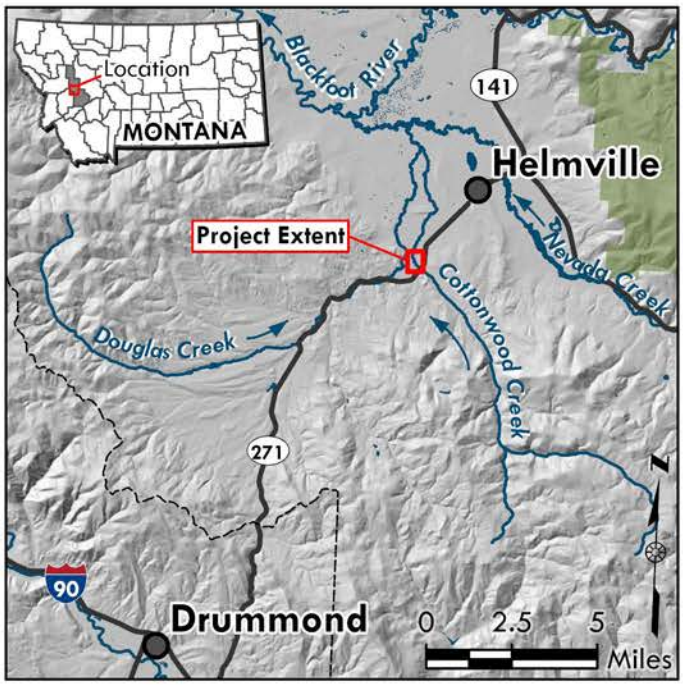
Point of Diversion

UWC LLC

Project Start

271

Scale: 1:3,500
0 250 500
Feet



2.19.2026. SWCA Environmental Consultants. Imagery: Vantor Vivid 2020. Data: USGS, MSL.

North Water System

014-2026_Lower Cottonwood Creek Stream Restoration

Untitled Placemark

fence really poor from here north

good wire&post

bad post& wire

271

Tank

New Well

Untitled Placemark

271

Google Earth

Image © 2026 Airbus

N

4000 ft

LOWER COTTONWOOD CREEK STREAM RESTORATION PROJECT
CONCEPTUAL DESIGN PLAN SET

PROJECT PARTNERS

Big Blackfoot Chapter of Montana Trout Unlimited

Blackfoot Challenge
Better Rural Communities through Collaborative Conservation

TROUT UNLIMITED

US FISH AND WILDLIFE SERVICE
MONTANA PARTNERS FOR
FISH AND WILDLIFE PROGRAM

BRETZ RANCH

MANNIX BROTHERS RANCH

PROJECT DESCRIPTION

COTTONWOOD CREEK IS AN IMPORTANT NATIVE TROUT TRIBUTARY TO DOUGLAS CREEK, NEVADA CREEK, AND THE MIDDLE BLACKFOOT RIVER. IT FLOWS 18 MILES FROM ITS HEADWATERS THROUGH BUREAU OF LAND MANAGEMENT AND PRIVATE LAND. MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY HAS LISTED COTTONWOOD CREEK AS WATER-QUALITY IMPAIRED. A COMPREHENSIVE, WATERSHED-SCALE RESTORATION PLANNING EFFORT HAS BEEN INITIATED BY THE PROJECT PARTNERS (BLACKFOOT RESTORATION TEAM) TO ADDRESS LIMITING FACTORS AND IMPROVE SPAWNING, REARING, AND OVERWINTERING HABITAT FOR RESIDENT WESTSLOPE CUTTHROAT TROUT AND OTHER FOCAL FISH SPECIES. LOWER COTTONWOOD CREEK HAS BEEN IDENTIFIED AS A PRIORITY DEMONSTRATION PROJECT AND PROVIDES IMPORTANT WESTSLOPE CUTTHROAT TROUT MIGRATORY CORRIDOR HABITAT TO UPSTREAM SPAWNING AND REARING REACHES. THE BLACKFOOT RESTORATION TEAM HAS IDENTIFIED OPPORTUNITIES IN LOWER COTTONWOOD CREEK TO IMPROVE INSTREAM, RIPARIAN, AND UPLAND CONDITIONS ALONG WITH RESTORING FISH PASSAGE AND INSTREAM FLOWS, ALL IN COLLABORATION AND BALANCE WITH RANCH MANAGEMENT AND AGRICULTURAL PRODUCTION GOALS.

THIS CONCEPTUAL DESIGN PLAN SET INCORPORATES RESTORATION STRATEGIES AND TECHNIQUES THAT IMPLEMENT THE GOALS AND OBJECTIVES OF THE BLACKFOOT RESTORATION TEAM. CONCEPTS ARE INTENDED TO ADDRESS WATER QUALITY AND HABITAT IMPAIRMENTS AND LIMITING FACTORS IN ORDER TO RESTORE ECOSYSTEM RESILIENCY TO COTTONWOOD CREEK.

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5.2 VEGETATED WOOD MATRIX TYPE 2
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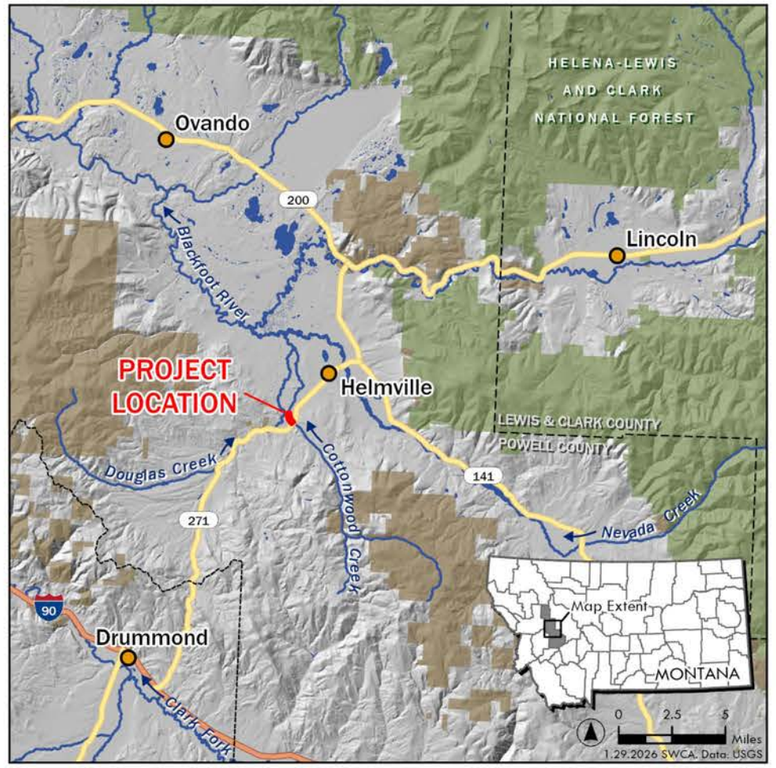
5.4 FLOODPLAIN BRUSH TRENCHES
5.5 TYPICAL CONSTRUCTED WETLAND DETAIL

LOWER COTTONWOOD CREEK VICINITY MAP



S$^1/_2$ S33, T13N, R11W
POWELL COUNTY, MONTANA

STANDARD OF PRACTICE

SWCA ENVIRONMENTAL CONSULTANTS WORKS IN THE RIVER ENVIRONMENT AND UTILIZES THE MOST CURRENT AND ACCEPTED PRACTICES AVAILABLE FOR PLANNING AND DESIGN OF RIVER, FLOODPLAIN, AND AQUATIC HABITAT RESTORATION PROJECTS. CURRENT STANDARDS FOR THE DESIGN OF RESTORATION PROJECTS VARY DEPENDING ON PROJECT GOALS. STABILITY CRITERIA INCLUDE DESIGNING STREAMBED AND STREAMBANK STRUCTURES FOR THE AVERAGE ANNUAL PEAK FLOW DISCHARGE (APPROXIMATELY 80-100 CFS).

SWCA ENVIRONMENTAL CONSULTANTS
311 SW Jefferson Avenue
Corvallis, OR 97333
tel.541.738.2920
fax.541.758.8524

236 Wisconsin Avenue
Whitefish, MT 59937
tel.406.862.4927
fax.406.862.4963

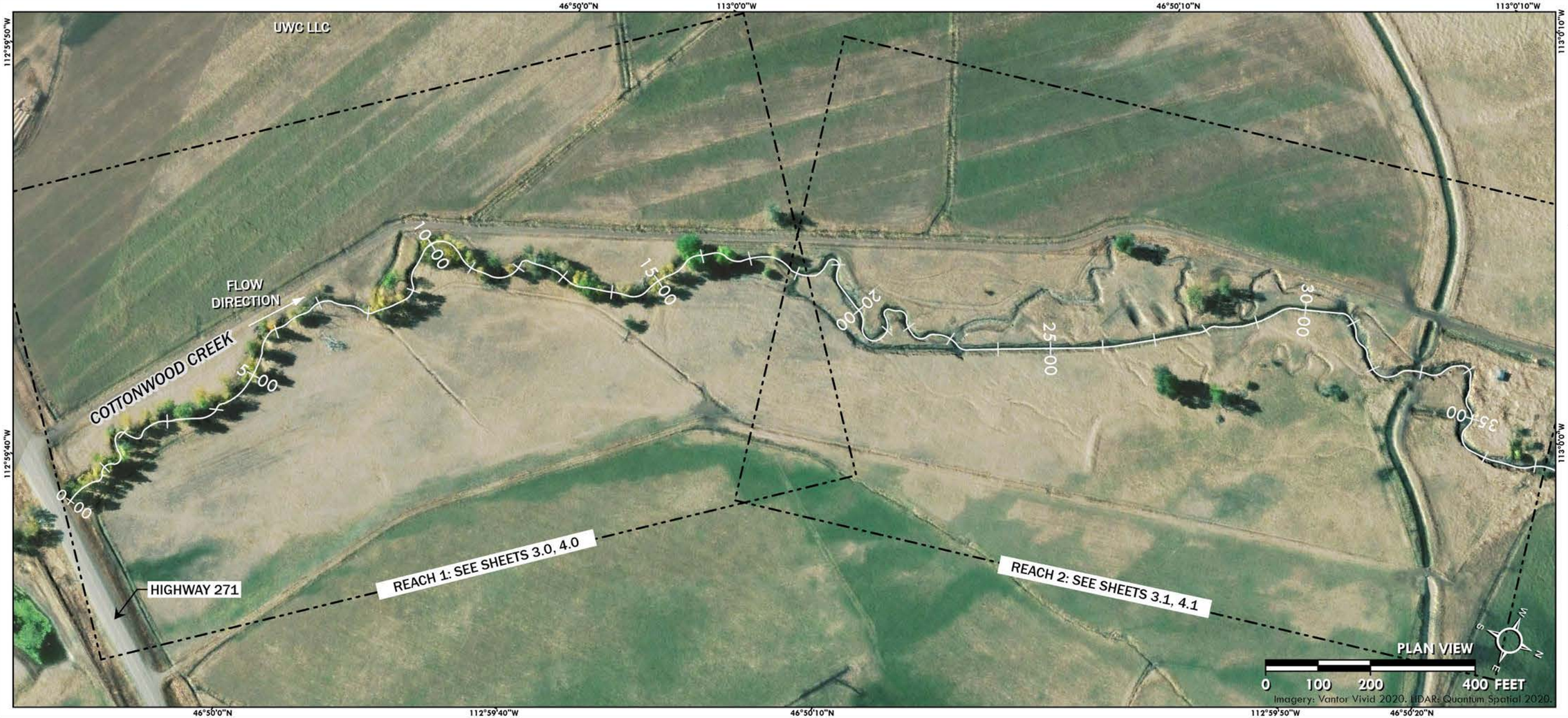
LOWER COTTONWOOD CREEK RESTORATION PROJECT

COVER PAGE

NO.	DATE	BY	DESCRIPTION	CHK
1	2-10-26	SH	DESIGN	JM
2	2-13-26	SH	DESIGN	JM

PROJECT NUMBER
102354

SHEET NUMBER
1.0



SWCA
ENVIRONMENTAL CONSULTANTS
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fax.406.862.4963
311 SW Jefferson Avenue
Corvallis, OR 97333
tel.541.738.2920
fax.541.758.8524

EXISTING CONDITIONS

LOWER COTTONWOOD CREEK RESTORATION PROJECT

PROJECT OVERVIEW AND EXISTING CONDITIONS

- THE PROJECT AREA ENCOMPASSES APPROXIMATELY 3,700 FEET OF LOWER COTTONWOOD CREEK FROM HIGHWAY 271 TO 200 FEET DOWNSTREAM OF THE NEVADA CREEK WATER USERS ASSOCIATION NEVADA CREEK DOUGLAS CANAL. LAND OWNERSHIP IS ENTIRELY PRIVATE.
- **REACH 1** IS CHARACTERIZED AS A MODERATELY ENTRENCHED B4C STREAM TYPE, AND TRANSITIONS TO AN ENTRENCHED, F4 STREAM TYPE IN SEGMENTS OF THE REACH MARKED BY HIGH BANK HEIGHT RATIOS. BED MORPHOLOGY IS CHARACTERIZED AS PLANE-BED WITH LIMITED POOL DEVELOPMENT DUE TO THE LACK OF INSTREAM LARGE WOOD AND PLANFORM VARIABILITY. A NARROW RIPARIAN CORRIDOR, DOMINATED BY A SPARSE, DECADENT COTTONWOOD GALLERY, BRACKETS THE CHANNEL AND PROVIDES SOME SHADE AND COVER TO REACH 1. PAST LAND MANAGEMENT PRACTICES PARTIALLY STRAIGHTENED AND CHANNELIZED REACH 1 TO ACCOMMODATE AGRICULTURAL LAND USE PRACTICES IN THE HISTORICAL FLOODPLAIN. DESPITE THE ENTRENCHED CONDITIONS, STREAMBANK STABILITY IS GENERALLY HIGH DUE TO THE DENSE ROOTING STRUCTURE PROVIDED BY MATURE COTTONWOODS. AN EXISTING UNSCREENED IRRIGATION DIVERSION IS PRESENT IN REACH 1 AND DELIVERS IRRIGATION WATER TO IRRIGATED PASTURE LOCATED TO THE SOUTHWEST OF COTTONWOOD CREEK.
- LOWER COTTONWOOD CREEK TRANSITIONS TO AN ENTRENCHED, G4 STREAM TYPE IN **REACH 2.** THE CHANNEL WAS MECHANICALLY STRAIGHTENED AND DITCHED, AND RELIC MEANDER SCROLLS ARE PRESENT ON THE LANDSCAPE TO THE WEST OF THE CURRENT ALIGNMENT. INTENSIVE GRAZING HAS DISPLACED WOODY SHRUBS AND CONVERTED VEGETATION WITHIN THE FLOODPLAIN CORRIDOR TO GRASS/FORB UPLAND COMMUNITIES. THE REACH LACKS INSTREAM HABITAT AND FLOODPLAIN DISCONNECTION LIKELY DEPLETES INSTREAM FLOWS DURING LATE SUMMER AND FALL. THE REACH IS HIGHLY DEVOID OF COMPLEX HABITAT FEATURES INCLUDING RUNS, POOLS, AND GLIDES. IN SEVERAL LOCATIONS, THE STRAIGHTENED CHANNEL HAS BREACHED ITS BERM, AND FLOWS ACCESS RELIC MEANDER SCROLLS, FURTHER COMPOUNDING FLOW DEWATERING AND HABITAT AVAILABILITY. AT THE BOTTOM OF REACH 2, DOUGLAS CANAL CROSSES COTTONWOOD CREEK IN A BURIED SIPHON. THIS INFRASTRUCTURE CONSTRAINT INHIBITS FISH MOVEMENT DURING LOW FLOW PERIODS AND IS A PHYSICAL CONSTRAINT IN REACH 1.
- DOWNSTREAM OF THE SIPHON, BANK HEIGHT RATIOS INCREASE, AND DESPITE A REMNANT RIPARIAN ZONE CONSISTING OF WOODY RIPARIAN SHRUBS, THE REACH EXPERIENCES HIGH RATES OF BANK EROSION AND ENTRENCHMENT, IMPACTING WATER QUALITY AND THE AVAILABILITY OF COMPLEX AQUATIC HABITAT.

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REACH 1 IS CHARACTERIZED AS A MODERATELY TO HIGHLY ENTRENCHED F4 STREAM TYPE. HISTORICAL STRAIGHTENING OF THE CHANNEL RESULTED IN DOWNCUTTING AND LOSS OF FLOODPLAIN CONNECTION. A SPARSE, DECADENT MATURE COTTONWOOD GALLERY BRACKETS THE CHANNEL AND PROVIDES MINIMAL SHADE AND COVER TO LOWER COTTONWOOD CREEK.

AT **REACH 1**, AN EXISTING IRRIGATION DIVERSION INTAKE STRUCTURE (PHOTO RIGHT) IS UNSCREENED AND DEPLETES LATE SEASON INSTREAM FLOWS. THE RESTORATION PLAN WILL REMOVE AND DECOMMISSION THE DIVERSION TO ELIMINATE FISH ENTRAINMENT AND INCREASE LATE SUMMER FLOWS TO LOWER COTTONWOOD CREEK.

HIGH BANK HEIGHT RATIOS AND CHANNEL ENTRENCHMENT DRIVES EROSION IN **REACH 2.** VEGETATION COMMUNITIES HAVE CONVERTED FROM A LIKELY WOODY RIPARIAN COMMUNITY TO A GRASS/FORB AGRICULTURAL ASSEMBLAGE.

HIGH BANK HEIGHT RATIOS AND CHANNEL ENTRENCHMENT DRIVES EROSION IN **REACH 2.** VEGETATION COMMUNITIES HAVE CONVERTED FROM A LIKELY WOODY RIPARIAN COMMUNITY TO A GRASS/FORB AGRICULTURAL ASSEMBLAGE.

A MAJORITY OF **REACH 2** WAS HISTORICALLY STRAIGHTENED AND CHANNELIZED TO ACCOMMODATE AGRICULTURAL LAND USES. THIS RESULTED IN CHANNEL INCISION AND LOSS OF FLOODPLAIN CONNECTION. HABITAT IS EXTREMELY SIMPLIFIED AND DOMINATED BY RIFFLE HABITAT UNITS WITH LIMITED POOL DEVELOPMENT.

VIEW OF EXISTING STRAIGHTENED CHANNEL (PHOTO LEFT) AND HISTORICAL CHANNEL ALIGNMENT (PHOTO RIGHT) IN **REACH 2.** THE EXISTING BERM HAS BREACHED RESULTING IN A BIFURCATED CHANNEL AND SEASONAL DEWATERING.

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ENVIRONMENTAL CONSULTANTS
236 Wisconsin Avenue
Whitefish, MT 59937
tel.406.862.4927
fax.406.862.4963
311 SW Jefferson Avenue
Corvallis, OR 97333
tel.541.738.2920
fax.541.758.8524

EXISTING CONDITIONS - PHOTOS

LOWER COTTONWOOD CREEK RESTORATION PROJECT

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1	2-10-26	SH	DESIGN	JM
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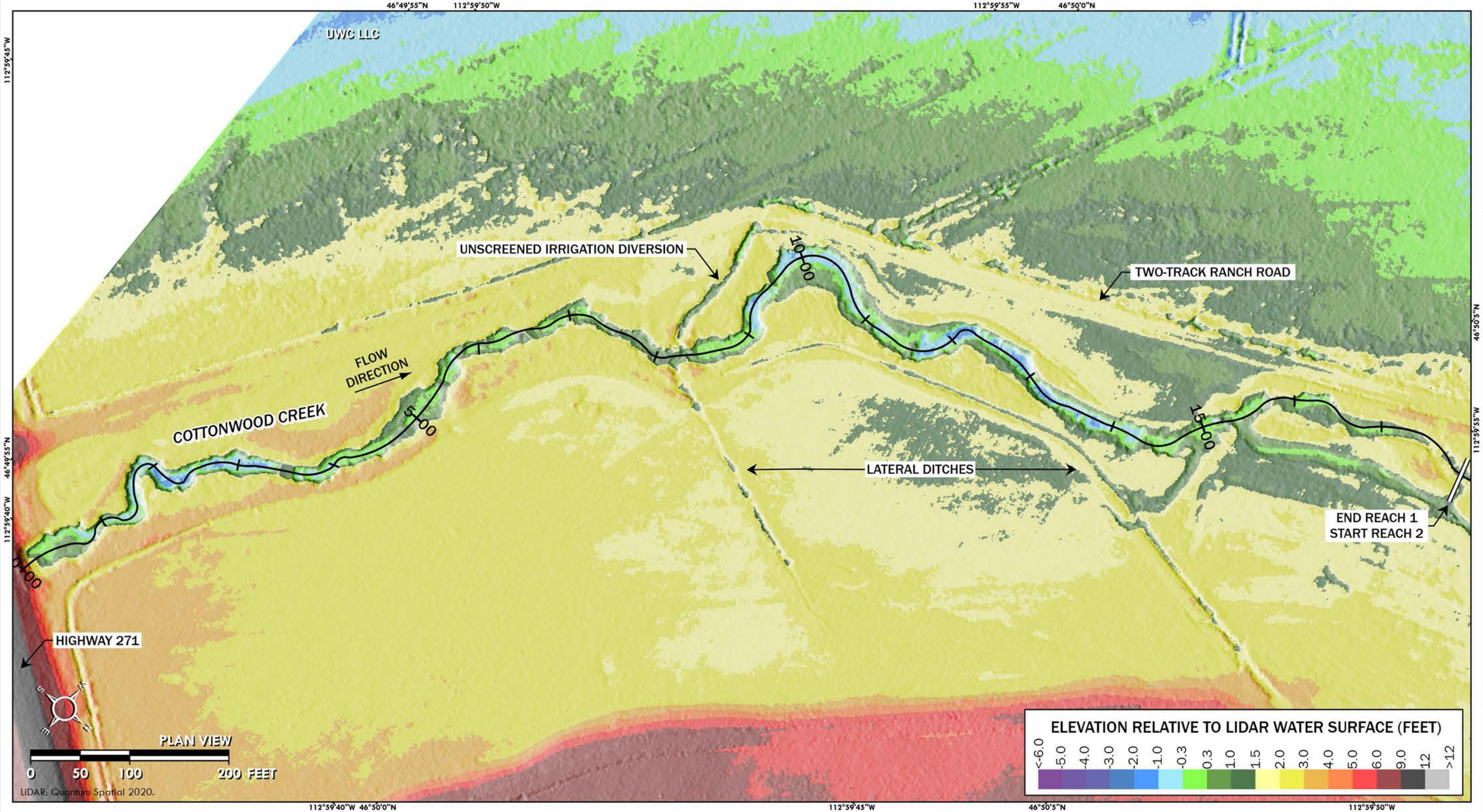
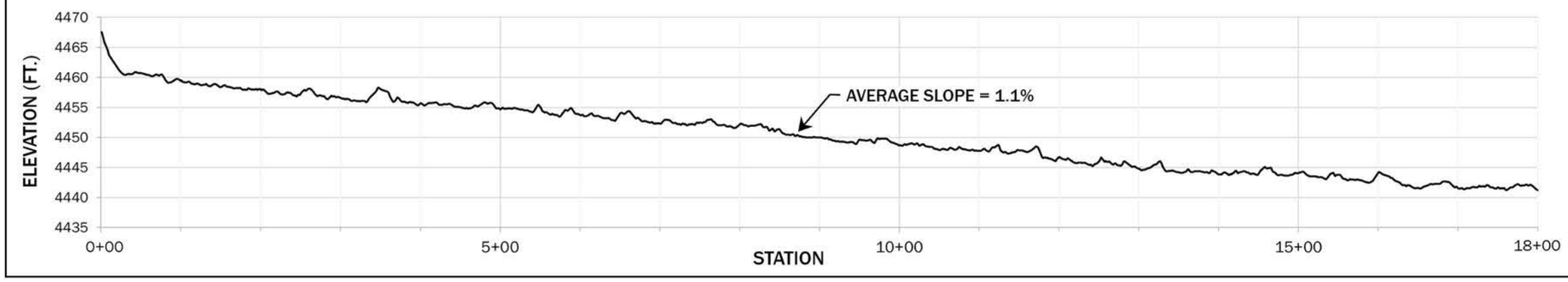
2.1





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ENVIRONMENTAL CONSULTANTS
236 Wisconsin Avenue
Whitefish, MT 59937
tel.406.862.4927
fax.406.862.4963
311 SW Jefferson Avenue
Corvallis, OR 97333
tel.541.738.2920
fax.541.758.8524

EXISTING PLAN AND PROFILE REACH 1

LOWER COTTONWOOD CREEK RESTORATION PROJECT

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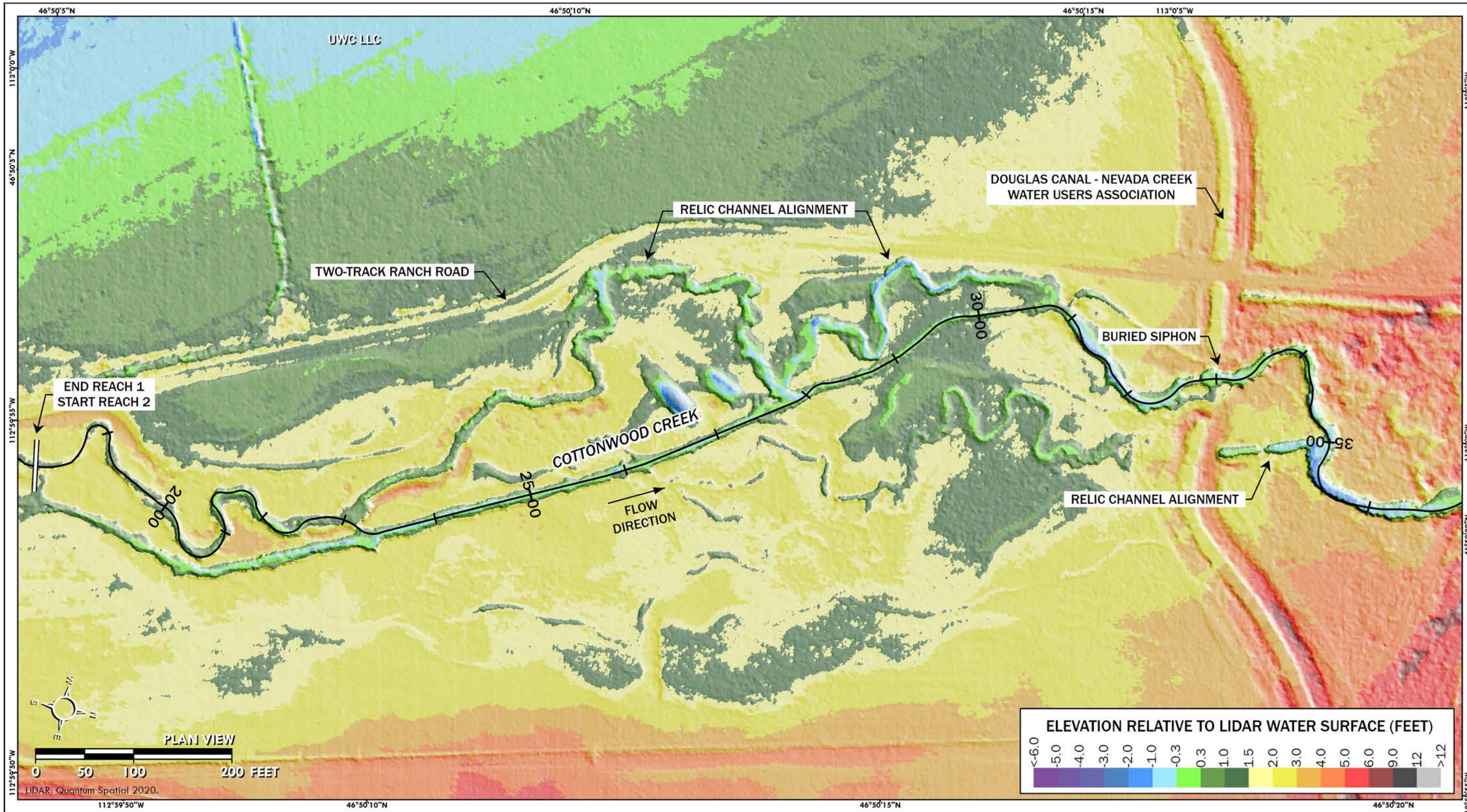
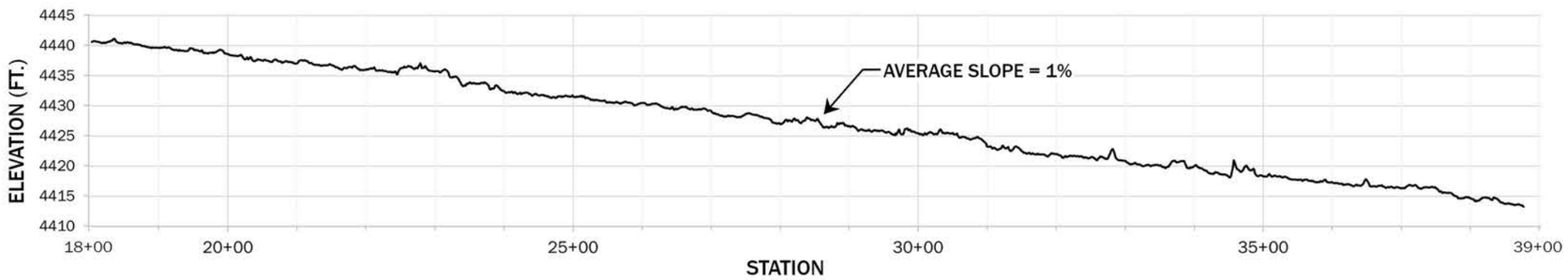
1	2-10-26	SH	DESIGN	JM
2	2-13-26	SH	DESIGN	JM

PROJECT NUMBER
102354

DRAWING NUMBER

3.0





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tel.541.738.2920
fax.541.758.8524
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tel.406.862.4927
fax.406.862.4963

EXISTING PLAN AND PROFILE REACH 2

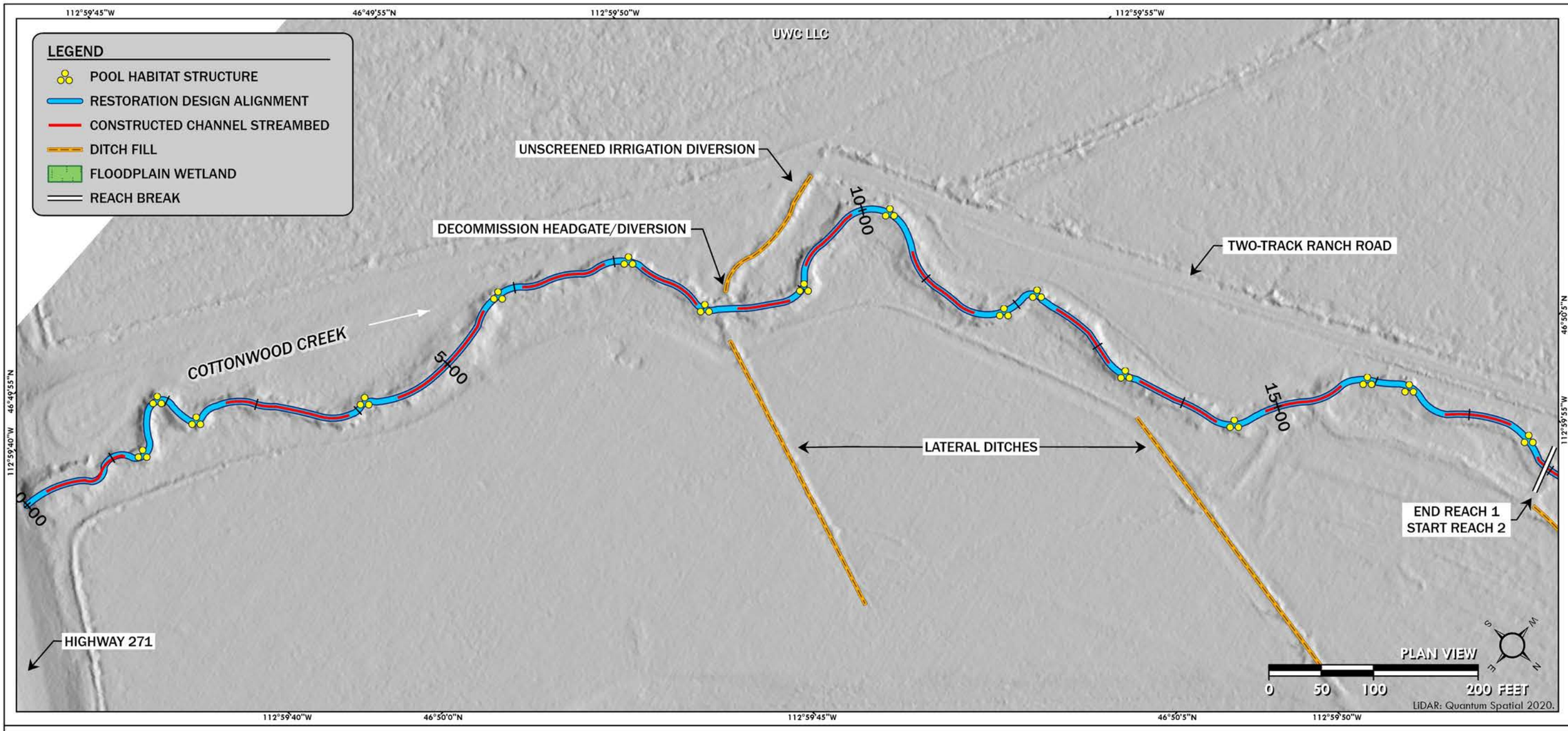
LOWER COTTONWOOD CREEK RESTORATION PROJECT

NO.	DATE	BY	DESCRIPTION	CHK
1	2-10-26	SH	DESIGN	JM
2	2-13-26	SH	DESIGN	JM

PROJECT NUMBER
102354

DRAWING NUMBER

3.1



LIMITING FACTORS

- CHANNEL DEWATERING AND LACK OF CHANNEL MAINTENANCE FLOWS
- CHANNEL ENTRENCHMENT AND FLOODPLAIN DISCONNECTION
- HABITAT DEGRADATION AND INHIBITED FISH MOVEMENT
- IRRIGATION DITCH ENTRAINMENT AND FISH LOSSES
- HISTORIC GRAZING PRESSURE AND VEGETATION CONVERSION
- MARGINAL OR UNSUITABLE WATER TEMPERATURES

RESTORATION OBJECTIVES

- RESTORE CHANNEL MAINTENANCE FLOWS AND MINIMUM INSTREAM LOW FLOWS
- REDUCE CHANNEL ENTRENCHMENT AND FLOODPLAIN DISCONNECTION
- INCREASE THE DISTRIBUTION AND AVAILABILITY OF COMPLEX INSTREAM HABITAT
- ELIMINATE WATER WITHDRAWALS AND FISH ENTRAINMENT
- REDUCE GRAZING PRESSURE AND EXPAND WIDTH OF VEGETATED FLOODPLAIN

RESTORATION TREATMENTS

- DECOMMISSION EXISTING IRRIGATION DIVERSION AND LATERAL DITCHES
- ELEVATE CHANNEL BED PROFILE WITH CONSTRUCTED RIFFLES TO INCREASE FLOODPLAIN CONNECTION
- ADD COARSE WOOD TO ENCOURAGE POOL DEVELOPMENT AND DIVERSIFY RIFFLE HABITAT
- IMPLEMENT GRAZING MANAGEMENT SYSTEM AND EXPAND WIDTH OF
- VEGETATED FLOODPLAIN

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ENVIRONMENTAL CONSULTANTS
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Corvallis, OR 97333
tel.541.738.2920
fax.541.758.8524
236 Wisconsin Avenue
Whitefish, MT 59937
tel.406.862.4927
fax.406.862.4963

RESTORATION PLAN
REACH 1

LOWER COTTONWOOD CREEK RESTORATION PROJECT

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2	2-13-26	SH	DESIGN	JM

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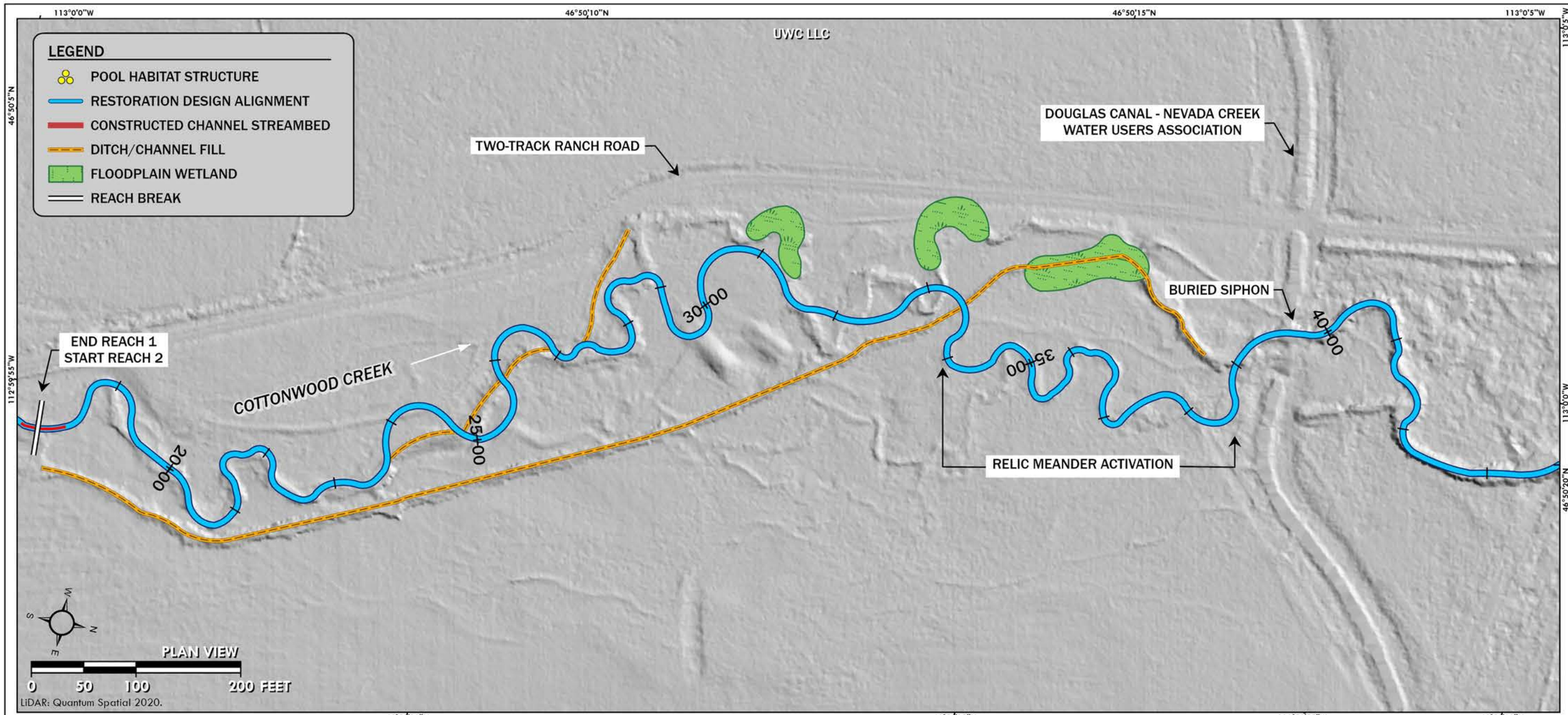
DRAWING NUMBER

4.0



LIMITING FACTORS

- CHANNEL DEWATERING AND LACK OF CHANNEL MAINTENANCE FLOWS
- CHANNEL ENTRENCHMENT AND FLOODPLAIN DISCONNECTION
- HABITAT DEGRADATION AND INHIBITED FISH MOVEMENT
- BREACHED FLOODPLAIN BERMS AND FLOW BIFURCATION
- HISTORIC GRAZING PRESSURE AND LACK OF WOOD RIPARIAN VEGETATION
- HIGH BANK EROSION AND SEDIMENT DELIVERY
- MARGINAL OR UNSUITABLE WATER TEMPERATURES

RESTORATION OBJECTIVES

- RESTORE CHANNEL MAINTENANCE FLOWS AND MINIMUM INSTREAM LOW FLOWS
- REDUCE CHANNEL ENTRENCHMENT AND FLOODPLAIN DISCONNECTION
- INCREASE PLANFORM VARIABILITY AND RESTORE FLOODPLAIN WETLANDS CONSOLIDATE FLOWS TO PRIMARY CHANNEL
- INCREASE THE DISTRIBUTION AND AVAILABILITY OF COMPLEX INSTREAM HABITAT
- ELIMINATE WATER WITHDRAWALS AND FISH ENTRAINMENT
- REDUCE GRAZING PRESSURE AND EXPAND WIDTH OF VEGETATED FLOODPLAIN

RESTORATION TREATMENTS

- DECOMMISSION EXISTING "DITCH" AND FILL TO FLOODPLAIN ELEVATION
- RECONSTRUCT A LOW GRADIENT, RIFFLE POOL STREAM TYPE (C4 AND E4 STREAM TYPES), MAXIMIZING USE OF RELIC MEANDER SCROLLS WHERE FEASIBLE AND COST-EFFECTIVE
- CONVERT SEGMENTS OF RELIC MEANDER SCROLLS TO OFF-CHANNEL EMERGENT AND SHALLOW WATER, DISCONNECTED FLOODPLAIN WETLANDS
- INCORPORATE VEGETATED WOOD MATRIX BANK STRUCTURES TO RESTORE WOODY RIPARIAN VEGETATION AND INCREASE HABITAT COMPLEXITY
- IMPLEMENT GRAZING MANAGEMENT SYSTEM AND EXPAND WIDTH OF VEGETATED FLOODPLAIN
- MITIGATE DOUGLAS CANAL INFRASTRUCTURE CONSTRAINTS AND RESTORE FISH PASSAGE

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ENVIRONMENTAL CONSULTANTS
236 Wisconsin Avenue
Whitefish, MT 59937
tel.406.862.4927
fax.406.862.4963
311 SW Jefferson Avenue
Corvallis, OR 97333
tel.541.738.2920
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RESTORATION PLAN
REACH 2

LOWER COTTONWOOD CREEK RESTORATION PROJECT

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1	2-10-26	SH	DESIGN	JM
2	2-13-26	SH	DESIGN	JM

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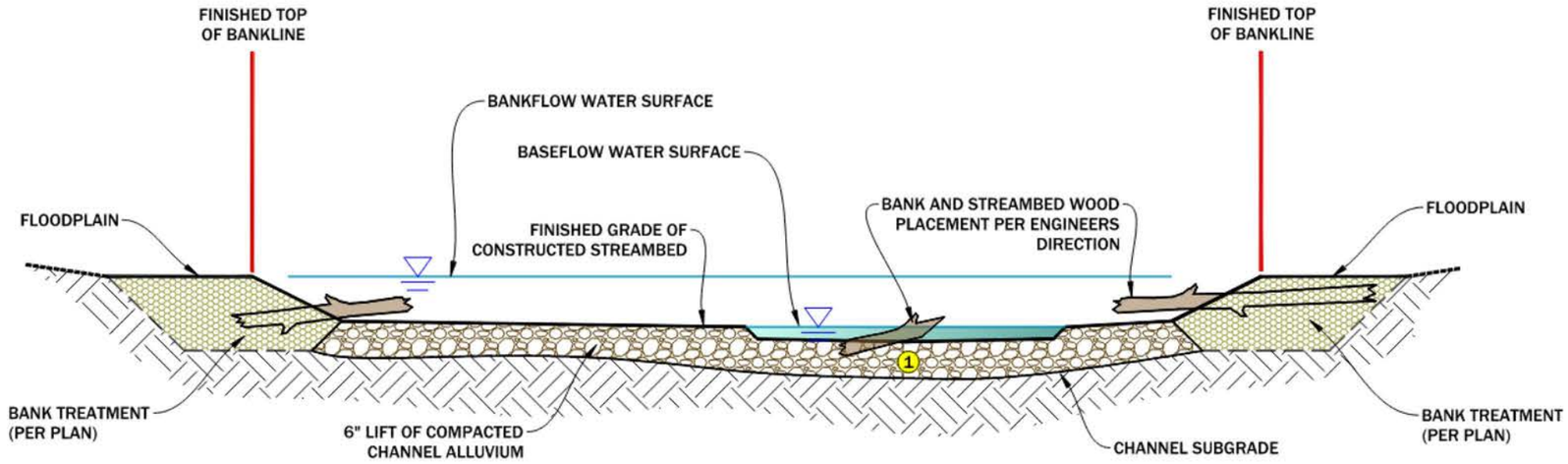
DRAWING NUMBER

4.1

NOTES ON CONSTRUCTED CHANNEL STREAMBED INSTALLATION

1. CONSTRUCTION OF THE CHANNEL STREAMBED WILL OCCUR AFTER THE CHANNEL SUBGRADE IS PREPARED.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED THE CONSTRUCTION MANAGER.
3. CONTRACTOR SHALL MARK THE UPSTREAM AND DOWNSTREAM EXTENTS OF THE LOCATIONS OF THE CONSTRUCTED CHANNEL STREAMBED STRUCTURES.
4. PRIOR TO CONSTRUCTION OF THE CHANNEL STREAMBED, CONSTRUCTION MANAGER SHALL VERIFY CHANNEL SUBGRADE ELEVATIONS. CHANNEL SUBGRADE SERVES AS THE FOUNDATION FOR THE CONSTRUCTED CHANNEL STREAMBED.
5. CONTRACTOR SHALL STOCKPILE CHANNEL ALLUVIUM PER SPECIFICATIONS NOTED ON THE DRAWING.



CONSTRUCTED CHANNEL STREAMBED ALLUVIUM INSTALLATION SECTION VIEW (1) 1" = 4'

STREAMBED FILL GRADATION	
SIZE (IN)	PERCENT PASSING
6	95
5	90-95
4	85-90
3	65-85
2	50-65
1	30-50
0.5	20-30
0.08	20
NOTE: MIX SALVAGED MATERIAL AND IMPORTED MATERIAL TO ACHIEVE SPECIFIED GRADATION	

MATERIAL SCHEDULE (PER FOOT)			
	ITEM	DIA. (IN)	QUANTITY (CY)
1	ALLUVIUM	SEE GRADATION TABLE	4 CY/LF

TYPICAL CONSTRUCTED STREAMBED THROUGH A RIFFLE FEATURE

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CONSTRUCTED CHANNEL STREAMBED TYPICAL DETAIL

LOWER COTTONWOOD CREEK RESTORATION PROJECT

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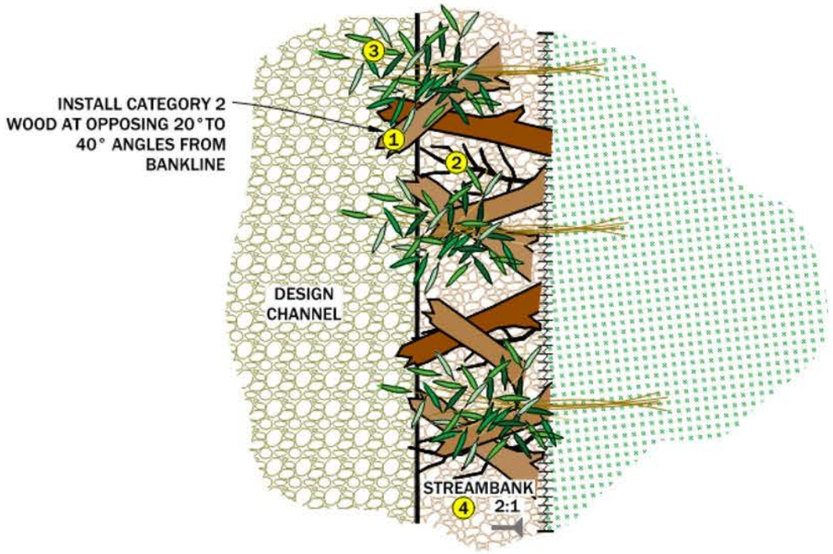
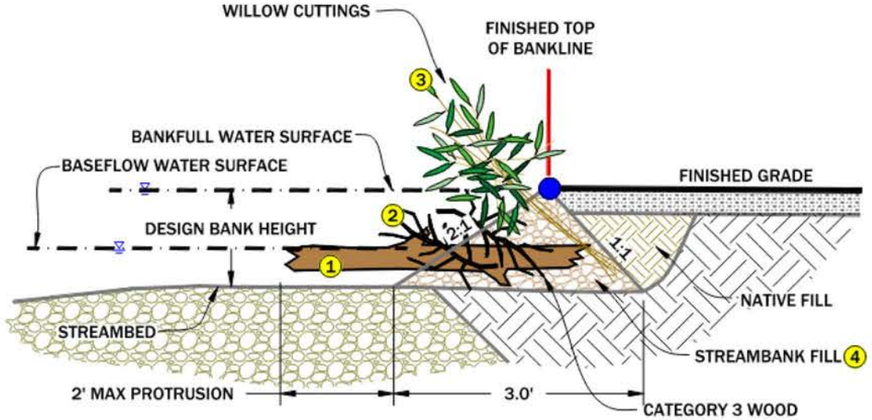
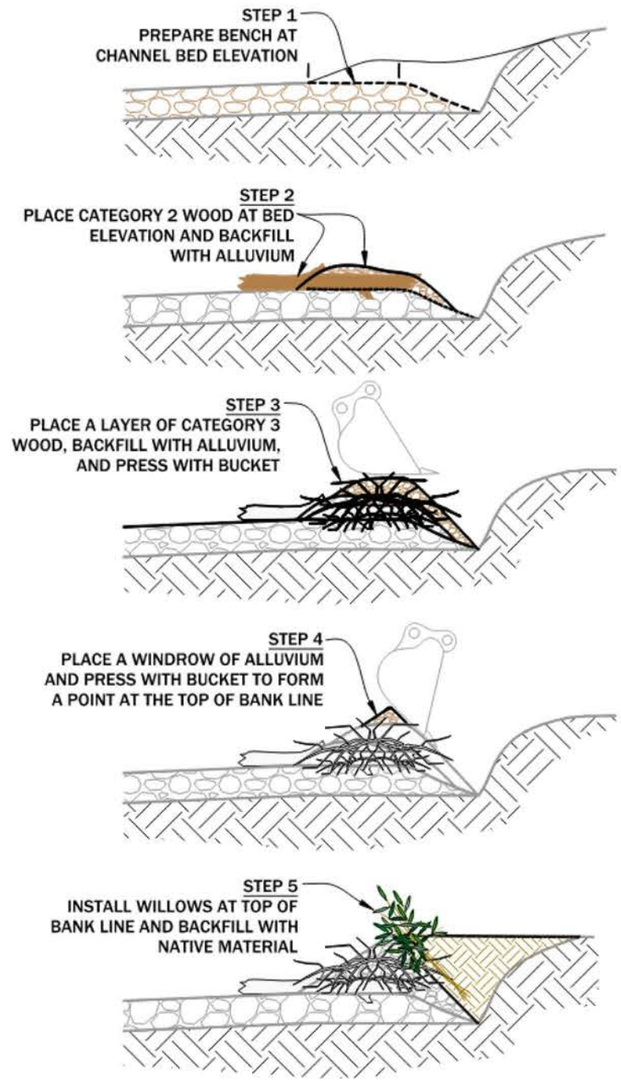


1 VEGETATED WOOD MATRIX - TYPE 1
PLAN VIEW
1" = 3'



2 VEGETATED WOOD MATRIX - TYPE 1
SECTION VIEW
1" = 3'



3 RECOMMENDED VEGETATED WOOD MATRIX INSTALLATION SEQUENCE
SECTION VIEW
1" = 5'

GENERAL NOTES

1. CONSTRUCTION OF THE VEGETATED WOOD MATRIX WILL OCCUR AFTER THE CHANNEL AND FLOODPLAIN BACKFILL IS PLACED AND THE CHANNEL STREAMBED IS CONSTRUCTED. INSTALLATION OF FLOODPLAIN TREATMENT SHALL BE COMPLETED AFTER VEGETATED WOOD MATRIXES ARE INSTALLED.
2. IF VEGETATED WOOD MATRIX STRUCTURES ARE INSTALLED PRIOR TO OCTOBER 1, LEAVE BACK TRENCH UNFILLED AND COMPLETE STRUCTURE WHEN DORMANT WILLOWS ARE AVAILABLE.
3. IT IS CONTRACTOR'S RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.
4. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY CONSTRUCTION MANAGER.
5. CONTRACTOR SHALL MARK AND CONSTRUCTION ENGINEER SHALL APPROVE THE GENERAL LOCATION FOR EACH VEGETATED WOOD MATRIX STRUCTURE PRIOR TO CONSTRUCTION.

NOTES ON VEGETATED WOOD MATRIX INSTALLATION

1. EXCAVATE TO THE EXCAVATION LIMITS AS SHOWN. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
2. PREPARE THE BENCH OF THE STRUCTURE BY PLACING CHANNEL STREAMBED ALLUVIUM FROM THE BASE OF THE EXCAVATION DEPTH/BOTTOM OF EXCAVATION TO WITHIN 1.0-FT. OF FINISHED GRADE.
3. CATEGORY 2 AND CATEGORY 3 WOOD, AND CHANNEL STREAMBED ALLUVIUM SHALL BE PLACED IN ALTERNATING LAYERS AND BUCKET COMPACTED UP TO THE TOP OF BANK ELEVATION AS SHOWN BELOW IN THE INSTALLATION SEQUENCE. PLACE SIX (6) FT TO EIGHT (8) FT. DORMANT WILLOW CUTTINGS AT A DENSITY OF 5 PER LINEAR FT ALONG THE TOP OF BANK LINE ELEVATION. WILLOW CUTTINGS SHALL SLOPE AT AN APPROXIMATE 1:1 SLOPE AS SHOWN IN SECTION VIEW. STEMS MAY OVERLAP. THE CUT ENDS SHALL BE PLACED AT THE BASE OF THE SLOPES WITH THE UN-CUT ENDS EXTENDING BEYOND THE EDGE OF THE TRENCH SO NO GREATER THAN ONE-THIRD OF THE TOTAL CUTTING LENGTH IS EXPOSED BEYOND THE TOP OF BANK EDGE. WILLOW CUTTINGS SHOULD INTERCEPT THE DESIGN TOP OF BANK LINE AS SHOWN IN STEP 5 OF THE INSTALLATION SEQUENCE.
4. THE UPSTREAM AND DOWNSTREAM ENDS OF THE STRUCTURE SHALL TRANSITION SMOOTHLY INTO ADJACENT STREAMBANK STRUCTURES TO MINIMIZE EROSION, FLANKING, AND BANK FAILURE. STRUCTURE ENDS MAY BE STABILIZED WITH ADDITIONAL CATEGORY 1 ROCK AS APPROVED BY ENGINEER.
5. AFTER INSTALLATION OF THE VEGETATED WOOD MATRIX, BACKFILL THE STRUCTURE WITH STOCKPILED MATERIAL TO FINISHED GRADE, AND BUCKET COMPACT. INSTALL WILLOW TRENCHES AT A RATE OF 2 PER LINEAR FOOT (OR 20 PER TRENCH) AS SHOWN. NO AREAS BEHIND THE FINISHED BANKLINE ARE TO BE LEFT BELOW FINISHED GRADE.

STREAMBANK FILL GRADATION	
SIZE (IN)	PERCENT PASSING
6	100
4	90-100
3	50-80
1	30-50
0.05	10-30
FINES	10

NOTE: MIX SALVAGED MATERIAL AND IMPORTED MATERIAL TO ACHIEVE SPECIFIED GRADATION

TYPE 1 - VEGETATED WOOD MATRIX MATERIAL SCHEDULE (PER LINEAR FOOT)			
	ITEM	DIA. (IN)	QTY.
1	CATEGORY 2 WOOD	2"-4"	0.2500
2	CATEGORY 3 WOOD	< 2"	2
3	WILLOW CUTTINGS	0.25"-1.0"	3
4	STREAMBANK ALLUVIUM	6" MINUS	0.1 CY

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VEGETATED WOOD MATRIX (TYPE 1) DETAIL

LOWER COTTONWOOD CREEK RESTORATION PROJECT

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2	2-13-26	SH	DESIGN	JM

PROJECT NUMBER
102354

DRAWING NUMBER
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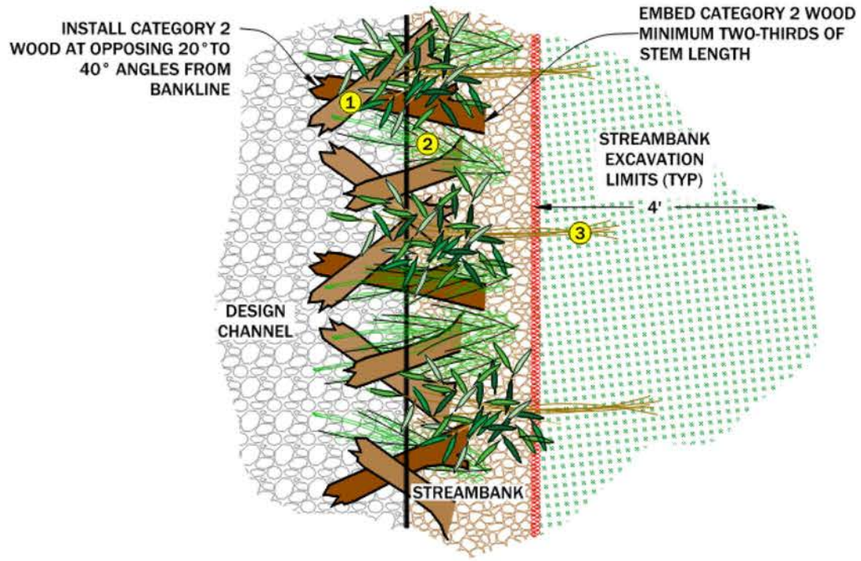
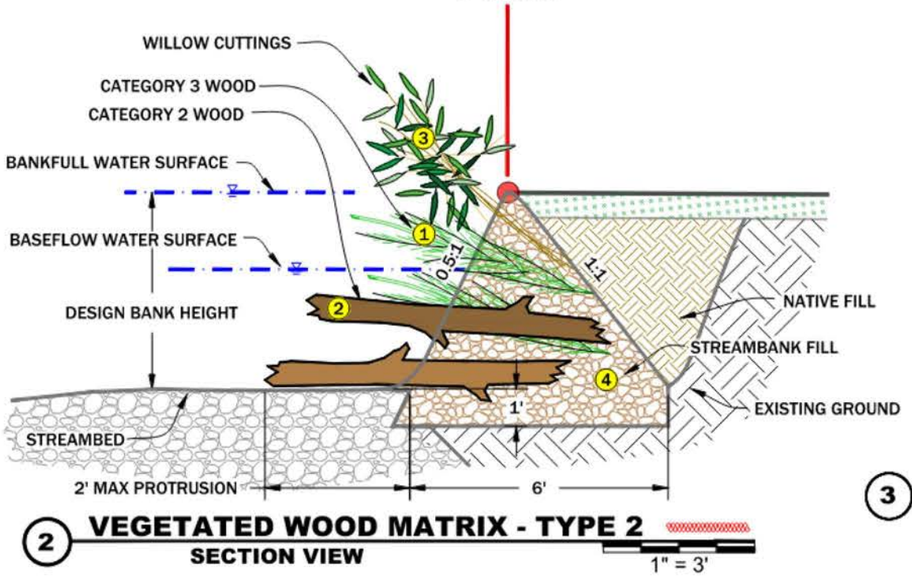


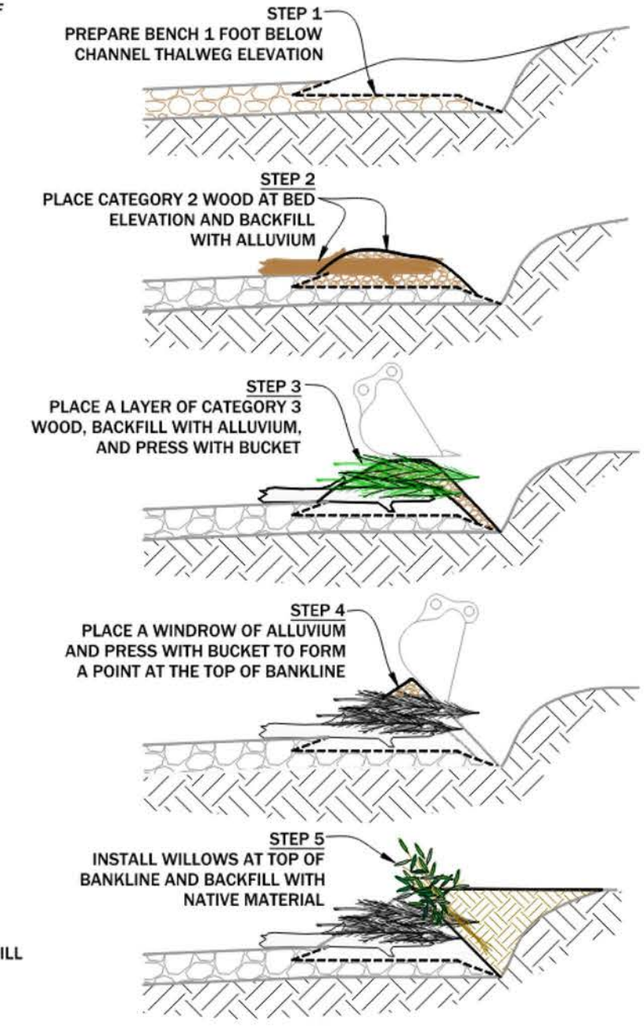
1 VEGETATED WOOD MATRIX - TYPE 2
PLAN VIEW

1" = 3'



2 VEGETATED WOOD MATRIX - TYPE 2
SECTION VIEW

1" = 3'



3 RECOMMENDED VEGETATED WOOD MATRIX INSTALLATION SEQUENCE
SECTION VIEW

1" = 5'

GENERAL NOTES

1. IF VEGETATED WOOD MATRIX STRUCTURES ARE INSTALLED PRIOR TO OCTOBER 1, LEAVE BACK TRENCH UNFILLED AND COMPLETE STRUCTURE WHEN DORMANT WILLOWS ARE AVAILABLE.
2. IT IS CONTRACTOR'S RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.
3. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY CONSTRUCTION MANAGER.
4. CONTRACTOR SHALL MARK AND CONSTRUCTION ENGINEER SHALL APPROVE THE GENERAL LOCATION FOR EACH VEGETATED WOOD MATRIX STRUCTURE PRIOR TO CONSTRUCTION.

INSTALLATION NOTES

1. EXCAVATE TO THE EXCAVATION LIMITS AS SHOWN. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
2. PREPARE THE BENCH OF THE STRUCTURE BY PLACING STREAMBED ALLUVIUM MINIMUM 1 FOOT BELOW CHANNEL THALWEG ELEVATION.
3. CATEGORY 2 AND CATEGORY 3 WOOD, AND STREAMBED ALLUVIUM SHALL BE PLACED IN ALTERNATING LIFTS AND BUCKET COMPACTED UP TO THE TOP OF BANK ELEVATION AS SHOWN IN THE INSTALLATION SEQUENCE. PLACE 6 FT TO 8 FT. DORMANT WILLOW CUTTINGS AT A DENSITY OF 5 PER LINEAR FT ALONG THE TOP OF BANK LINE ELEVATION. WILLOW CUTTINGS SHALL SLOPE AT AN APPROXIMATE 1:1 SLOPE AS SHOWN IN SECTION VIEW. STEMS MAY OVERLAP. THE CUT ENDS SHALL BE PLACED AT THE BASE OF THE SLOPES WITH THE UN-CUT ENDS EXTENDING BEYOND THE EDGE OF THE TRENCH SO NO GREATER THAN ONE-THIRD OF THE TOTAL CUTTING LENGTH IS EXPOSED BEYOND THE TOP OF BANKLINE. WILLOW CUTTINGS SHOULD INTERCEPT THE DESIGN TOP OF BANKLINE AS SHOWN IN STEP 5 OF THE INSTALLATION SEQUENCE.
4. THE UPSTREAM AND DOWNSTREAM ENDS OF THE STRUCTURE SHALL TRANSITION SMOOTHLY INTO ADJACENT STREAMBANK STRUCTURES TO MINIMIZE EROSION, FLANKING, AND BANK FAILURE.

AFTER INSTALLATION OF THE VEGETATED WOOD MATRIX, BACKFILL THE STRUCTURE WITH STOCKPILED MATERIAL TO FINISHED GRADE, AND BUCKET COMPACT. NO AREAS BEHIND THE FINISHED BANKLINE ARE TO BE LEFT BELOW FINISHED GRADE.

TYPE 2 - VEGETATED WOOD MATRIX MATERIAL SCHEDULE (PER LINEAR FOOT)

	ITEM	DIA. (IN)	QTY.
1	CATEGORY 2 WOOD	2"-4"	0.25
2	CATEGORY 3 WOOD	< 2"	2
3	BANK WILLOW CUTTINGS	0.25"-1.0"	5
4	STREAMBANK ALLUVIUM	6" MINUS	0.3 CY

STREAMBANK FILL GRADATION

SIZE (IN)	PERCENT PASSING
6	100
4	90-100
3	50-80
1	30-50
0.05	10-30
FINES	10

NOTE: MIX SALVAGED MATERIAL AND IMPORTED MATERIAL TO ACHIEVE SPECIFIED GRADATION

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fax.406.862.4963

VEGETATED WOOD MATRIX (TYPE 2) DETAIL

LOWER COTTONWOOD CREEK RESTORATION PROJECT

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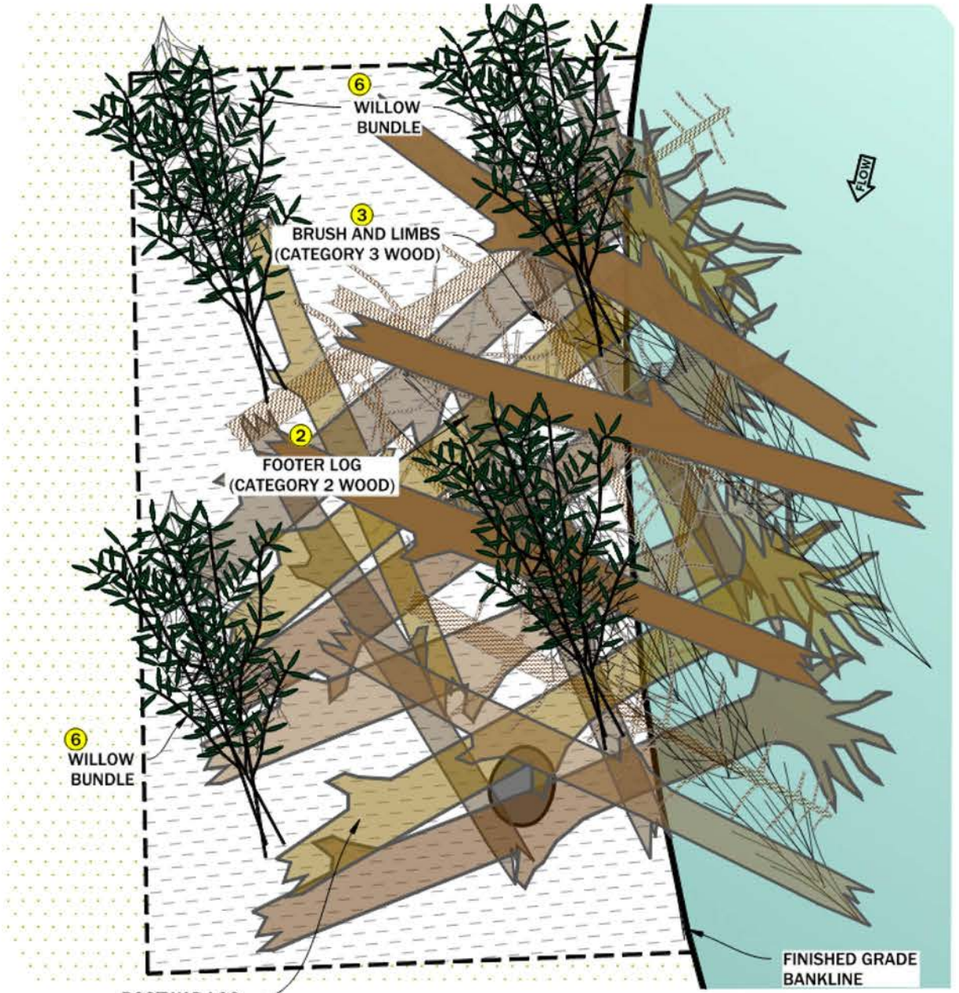
1	2-10-26	SH	DESIGN	JM
2	2-13-26	SH	DESIGN	JM

PROJECT NUMBER
102354

DRAWING NUMBER
5.2



LARGE WOOD STRUCTURE
PLAN VIEW 0' 2.5' 5'

GENERAL NOTES

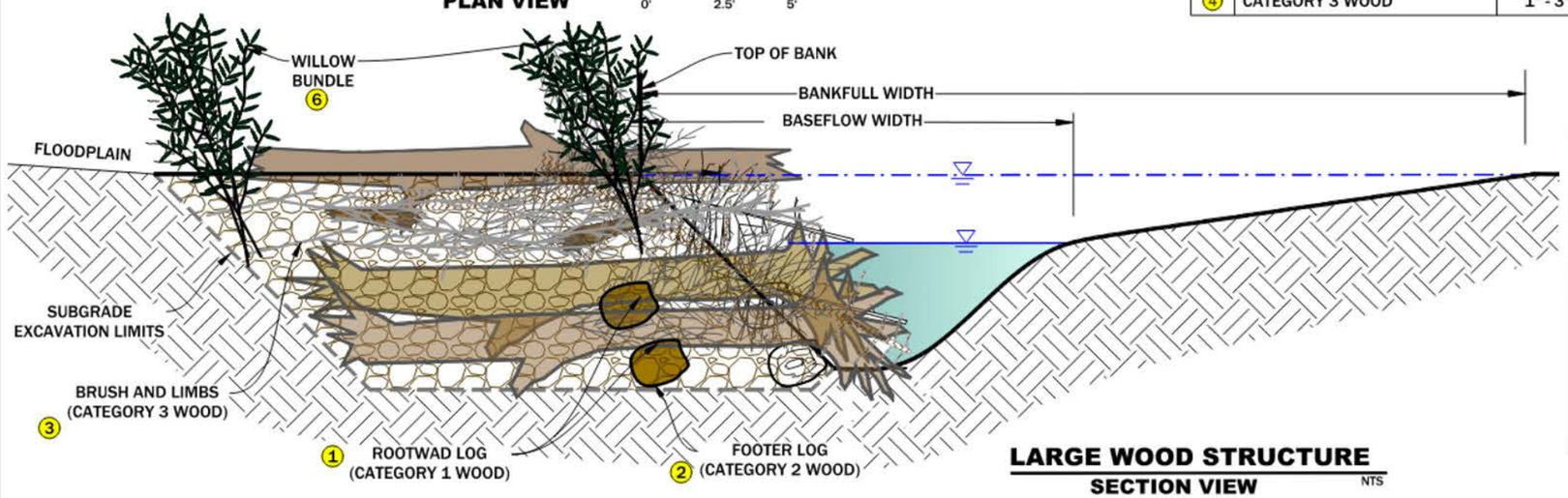
1. CONSTRUCTION OF THE LARGE WOOD STRUCTURE WILL OCCUR BEFORE THE CONSTRUCTED CHANNEL STREAMBED AND VEGETATED WOOD MATRIX BANK TREATMENTS ARE INSTALLED.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED THE ENGINEER.
3. FIELD ENGINEER SHALL MARK THE GENERAL CONSTRUCTION LOCATION FOR EACH LARGE WOOD STRUCTURE PRIOR TO CONSTRUCTION.

CONSTRUCTION NOTES

1. EXCAVATE TO THE EXCAVATION LIMITS. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
2. INSTALL TWO FOOTER LOGS (CATEGORY 2 WOOD) AT THE BASE OF THE EXCAVATED TRENCH AT THE ORIENTATIONS NOTED IN PLAN VIEW. FOOTER LOGS SHALL PROJECT NO GREATER THAN 1 FT. BEYOND THE FINISH GRADE BANK LINE. EXPOSED ENDS OF FOOTER LOGS SHALL BE BROKEN/ROUGHENED SO AS TO APPEAR NATURAL. SAWED ENDS OF FOOTER LOGS SHALL NOT BE EXPOSED.
3. INSTALL TWO ROOTWAD LOGS (CATEGORY 1 WOOD) INTERSECTING BOTH FOOTER LOGS AT THE ORIENTATION NOTED IN PLAN VIEW. THE UPSTREAM ROOTWAD SHALL NOT PROJECT INTO THE CHANNEL AND SHALL BE FLUSH WITH THE FINISHED BANK LINE. THE DOWNSTREAM ROOTWAD SHALL PROJECT NO GREATER THAN 3 FT. BEYOND THE FINISHED BANK LINE
4. BACKFILL TRENCH WITH STOCKPILED MATERIAL UP TO THE TOP OF THE FOOTER LOGS (CATEGORY 2 WOOD). BACKFILL SHALL BE BUCKET COMPACTED.
5. INSTALL A SECOND TIER OF TWO FOOTER LOG (CATEGORY 2 WOOD) FOOTER LOGS SHALL PROJECT NO GREATER THAN 1 FT. BEYOND THE FINISH GRADE BANK LINE. EXPOSED ENDS OF FOOTER LOGS SHALL BE BROKEN/ROUGHENED SO AS TO APPEAR NATURAL. SAWED ENDS OF FOOTER LOGS SHALL NOT BE EXPOSED.
6. INSTALL SMALL WOOD AND BRUSH (CATEGORY 3 WOOD) AT APPROXIMATE 45° ANGLE TO ROOTWAD STEMS. BRUSH AND LIMBS SHALL PROJECT NO GREATER THAN 3 FT. BEYOND THE FINISHED BANK LINE.
7. INSTALL ONE TO TWO ROOTWAD LOGS (CATEGORY 1 WOOD) INTERSECTING THE LOWER TIER OF ROOTWADS AT THE ORIENTATION NOTED IN PLAN VIEW. THE ROOTWADS SHALL PROJECT NO GREATER THAN 2 FT. BEYOND THE FINISHED BANK LINE.
8. INSTALL SMALL WOOD AND BRUSH (CATEGORY 3 WOOD) AND WILLOW CUTTINGS INTERWOMEN INTO WOOD MATRIX UP TO FINISHED GRADE. BRUSH, LIMBS, AND WILLOW CUTTINGS SHALL PROJECT NO GREATER THAN 4 FT. BEYOND THE FINISHED BANK LINE.
9. BACKFILL WOOD MATRIX WITH STREAMBED FILL UP TO FINISHED GRADE WITH STOCKPILED NATIVE MATERIAL. NO AREAS BEHIND THE FINISHED BANKLINE ARE TO BE LEFT BELOW FINISHED GRADE.
10. INSTALL DEFLECTOR LOGS (CATEGORY 2 WOOD)) AT APPROXIMATE 45° ANGLE TO ROOTWAD STEMS. DEFLECTOR LOGS SHALL BE HALF EMBEDDED IN THE FLOODPLAIN AND PROJECT NO GREATER THAN 4 FT. BEYOND THE FINISHED BANK LINE. EXPOSED ENDS OF FOOTER LOGS SHALL BE BROKEN/ROUGHENED SO AS TO APPEAR NATURAL. SAWED ENDS OF FOOTER LOGS SHALL NOT BE EXPOSED.

LARGE WOOD STRUCTURE
MATERIAL SCHEDULE (PER LINEAR STRUCTURE)

	ITEM	DIA. (IN)	LENGTH (FT)	ROOTWAD (Y/N)	QTY.
1	SUBGRADE EXCAVATION				5 CY
2	CATEGORY 1 WOOD	10"-12"	12-15	YES - 18IN DIA. MIN	2 EA
3	CATEGORY 2 WOOD	3"-10"	10-15	NO	4 EA
4	CATEGORY 3 WOOD	1" - 3"	10-12	OPTIONAL 1-2 FT	10 EA



LARGE WOOD STRUCTURE
SECTION VIEW NTS

EXAMPLE OF A LARGE WOOD STRUCTURE

SWCA ENVIRONMENTAL CONSULTANTS
311 SW Jefferson Avenue
Corvallis, OR 97333
tel.541.738.2920
fax.541.758.8524
236 Wisconsin Avenue
Whitefish, MT 59937
tel.406.862.4927
fax.406.862.4963

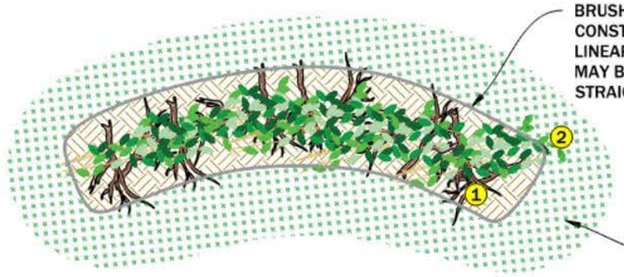
LARGE WOOD STRUCTURE DETAIL

LOWER COTTONWOOD CREEK RESTORATION PROJECT

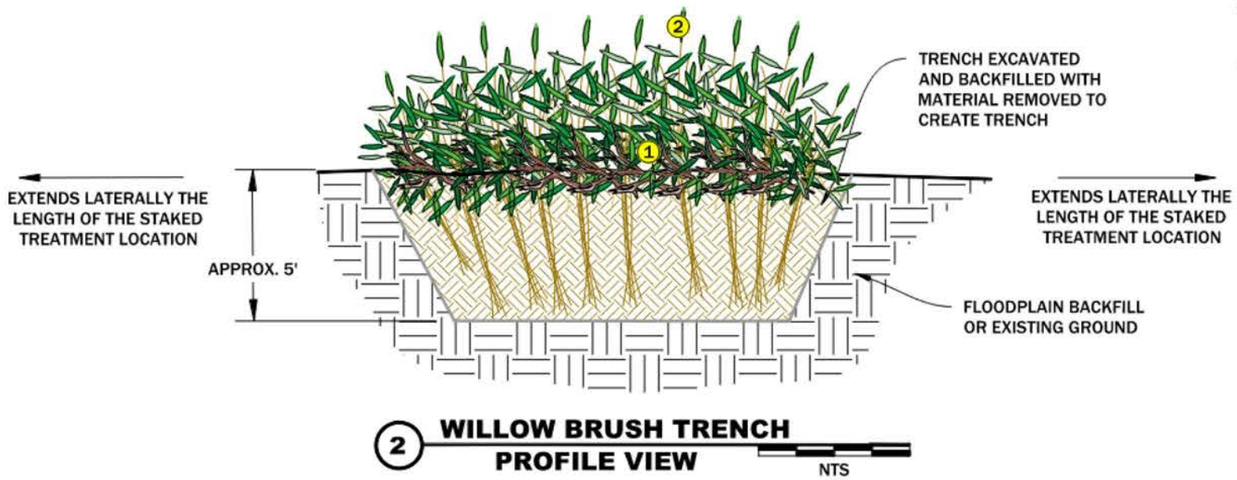
NO.	DATE	BY	DESCRIPTION	CHK
1	2-10-26	SH	DESIGN	JM
2	2-13-26	SH	DESIGN	JM

PROJECT NUMBER
102354

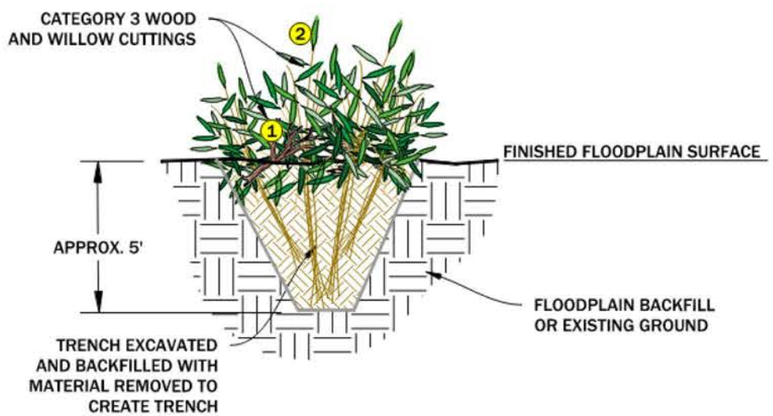
DRAWING NUMBER
5.3



1 WILLOW BRUSH TRENCH PLAN VIEW NTS



2 WILLOW BRUSH TRENCH PROFILE VIEW NTS



3 WILLOW BRUSH TRENCH SECTION VIEW NTS

NOTES ON WILLOW BRUSH TRENCH INSTALLATION

1. VEGETATED BRUSH TRENCHES WILL BE CONSTRUCTED TO INCREASE FLOODPLAIN CONNECTIVITY, DISPERSE SURFACE FLOWS AND PROMOTE REVEGETATION. CONSTRUCTION OF VEGETATED BRUSH TRENCHES WILL OCCUR AFTER SEPTEMBER 15TH AND BEFORE THE END OF THE CONSTRUCTION SEASON.
2. CONTRACTOR SHALL MARK AND ENGINEER SHALL APPROVE THE GENERAL CONSTRUCTION LOCATION FOR EACH VEGETATED BRUSH TRENCH PRIOR TO CONSTRUCTION.
3. VEGETATED BRUSH TRENCHES WILL BE CONSTRUCTED WITHIN THE FLOODPLAIN AT THE DIRECTION OF THE CONSTRUCTION MANAGER.
4. A TRENCH WILL BE CONSTRUCTED APPROXIMATELY 5' DEEP AND EXTEND THE LENGTH OF THE STAKED TREATMENT LOCATION. LIVE WILLOW CUTTINGS AND CATEGORY 3 WOOD WILL BE PLACED IN THE TRENCH SUCH THAT THEY ARE INTERMIXED AND ORIENTED AT A NEAR VERTICAL ANGLE.
5. THE TRENCH WILL THEN BE BACKFILLED WITH THE SAME MATERIAL REMOVED TO CREATE THE TRENCH AND SHOULD MATCH THE ELEVATION OF THE SURROUNDING FLOODPLAIN GRADE.

MATERIAL SCHEDULE (PER LINEAL FOOT)			
	ITEM	DIA.	QUANTITY (EA)
1	CATEGORY 3 WOOD	< 3"	3
2	WILLOW CUTTINGS	0.25" - 1"	5

EXAMPLE OF A VEGETATED BRUSH TRENCH INSTALLATION

EXAMPLE OF A CONSTRUCTED VEGETATED BRUSH TRENCH

SWCA ENVIRONMENTAL CONSULTANTS
311 SW Jefferson Avenue
Corvallis, OR 97333
tel.541.738.2920
fax.541.758.8524
236 Wisconsin Avenue
Whitefish, MT 59937
tel.406.862.4927
fax.406.862.4963

FLOODPLAIN BRUSH TRENCHES

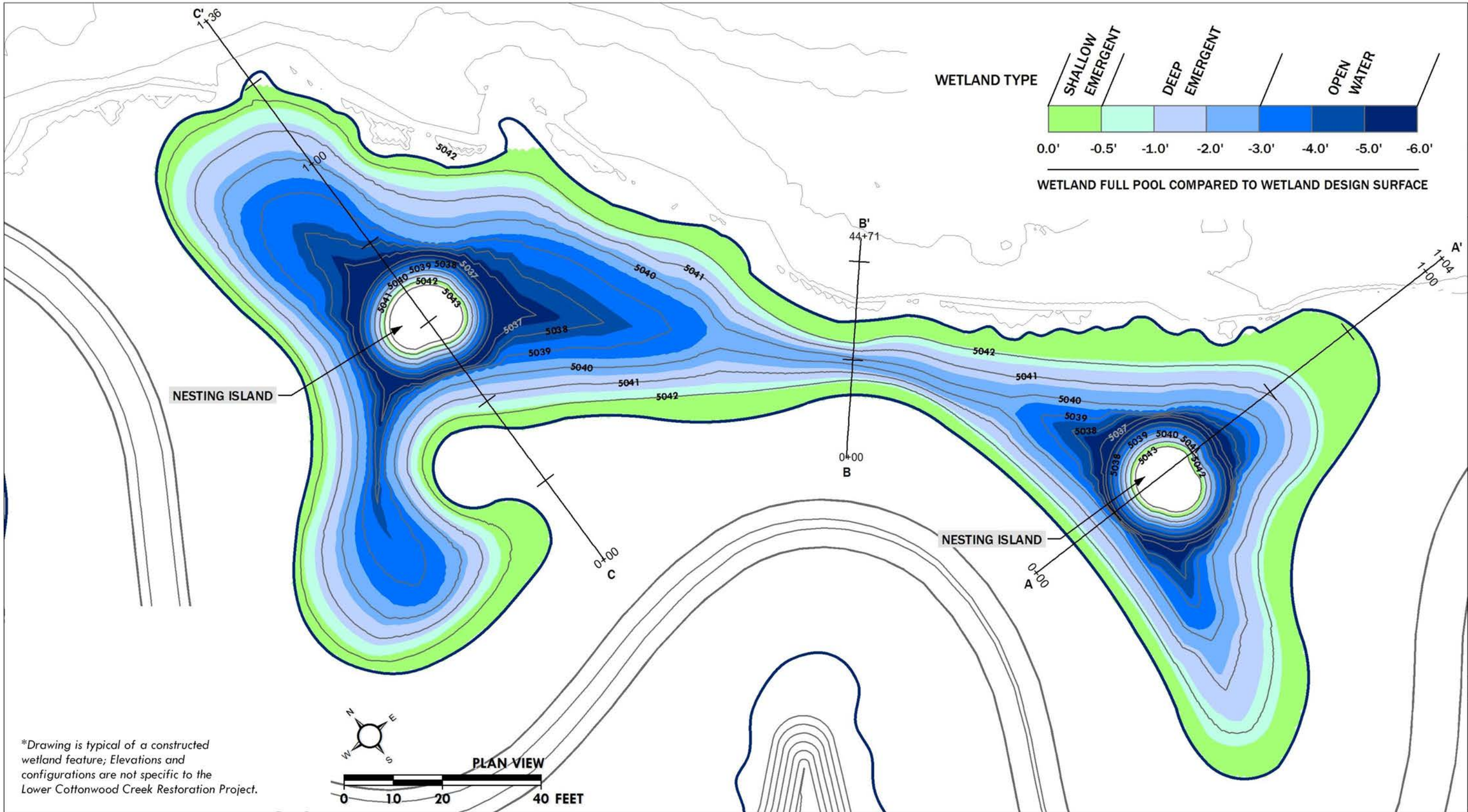
LOWER COTTONWOOD CREEK RESTORATION PROJECT

NO.	DATE	BY	DESCRIPTION	CHK
1	2-10-26	SH	DESIGN	JM
2	2-13-26	SH	DESIGN	JM

PROJECT NUMBER
102354

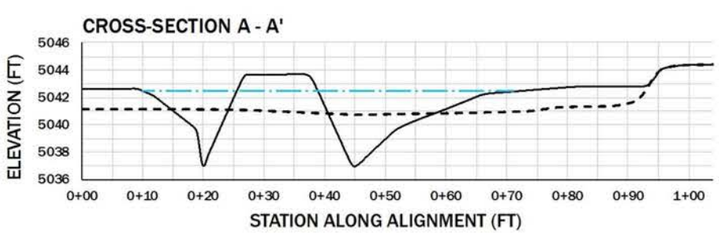
DRAWING NUMBER

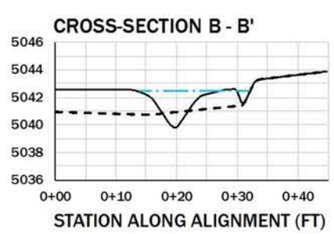
5.4

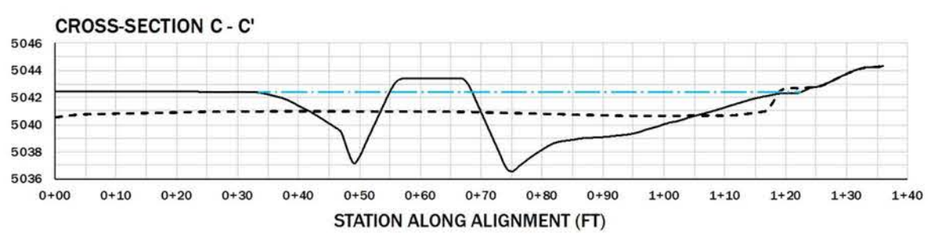


*Drawing is typical of a constructed wetland feature; Elevations and configurations are not specific to the Lower Cottonwood Creek Restoration Project.

EXISTING GROUND — DESIGN SURFACE — FULL POOL WATER SURFACE ELEVATION







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tel.406.862.4927
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TYPICAL CONSTRUCTED WETLAND DETAIL

LOWER COTTONWOOD CREEK RESTORATION PROJECT

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1	2-10-26	SH	DESIGN	JM
2	2-13-26	SH	DESIGN	JM

PROJECT NUMBER
102354

DRAWING NUMBER

5.5