FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION

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

I. APPLICANT INFORMATION

A. Applicant Name: Trout Unlimited – Paul Parson

Mailing Address: 312 N. Higgins Ave. Suite 200

City: Missoula State: MT Zip: 59802

Telephone: (406) 218-8635 E-mail: paul.parson@tu.org

B. Contact Person (if different than applicant): Same

Address:

City: State: Zip:

Telephone: E-mail:

C. Landowner and/or Lessee Name (if different than applicant): Amy Johnston Waller

Mailing Address: 33075 Ninemile Road

City: Huson State: MT Zip: 59846

Telephone: (406) 314-7331 E-mail: amywmontana@gmail.com

II. PROJECT INFORMATION

A. Project Name: Ninemile Creek Restoration – Phase 7

River, stream, or lake: Ninemile Creek

Location: Township: 17N Range: 24W Section: 25 & 36

Latitude: 47.196748° Longitude: -114.600415° *Within project (decimal degrees)*

County: Missoula

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

The purpose of the project is to reclaim mining impacts, improving water quality on Ninemile Creek and reconnect a previously disconnected and damaged tributary along this reach of Ninemile Creek.

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

Historic mining activity in the Ninemile Creek watershed significantly altered the landscape. Specific problems include piles of placer mine tailings that range from 12 to 40 feet tall, a lack of floodplain connectivity, and excessive erosion. Large settling ponds dot the landscape and riparian vegetation throughout the site is insufficient to maintain adequate bank stability, provide shade, and filter out sediments and other pollutants from the stream.

The seventh and final phase of reclamation work along the mainstem of Ninemile Creek is approximately 17 miles upstream from its confluence with the Clark Fork River. The project will remove and regrade approximately 40,000 cubic yards of abandoned placer mine material, create 3,500 feet of new stream channel and 15 acres of floodplain and wetland habitat.

The 2025 construction schedule is as follows:

- July – Site clearing, access road – haul route construction, channel diversion (fish salvage), alluvium and wood salvage.
- August – New channel construction, floodplain grading, existing channel fill.
- September – Floodplain shaping, vegetation transplant, wetland creation,
- October – Willow trench and bank construction, floodplain roughness, grass seeding, channel activation and final site cleanup.
- Spring 26 – Additional revegetation efforts, alder seeding.

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

The cause of the habitat degradation was placer mining. The project will correct the damage through new channel, floodplain and wetland construction.

E. Length of stream or size of lake that will be treated (project extent): 3,500 feet

Length/size of impact, if larger than project extent (e.g., stream miles opened): 6.5 miles upstream

F. Project Budget Summary:

Grant Request (Dollars):	**$**	**$56,300.00**
Matching Dollars:	**$**	**$60,025.00**
Matching In-Kind Services:*	**$**	

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

Other Contributions (not used as match)	**$**	**$605,773.00**
Total Project Cost:	**$**	**$722,098.00**

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 the landowners, FWP, DNRC, DEQ, Missoula County, Westslope Chapter of Trout Unlimited, Warriors and Quiet Waters and the Lolo National Forest.

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 [x] No [ ]

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

Trout Unlimited continues to monitor the completed projects in the Ninemile Valley. In addition, the landowners are committed to maintaining the property for its ecological value and have worked with TU and project partners on previous phases of restoration. The finished restoration project will function as a natural riparian-stream corridor and similar to previous work on Ninemile Creek, maintenance should be minimal.

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.*

Grazing is not part of the project. Future grazing will not occur.

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?

Yes, the project will be monitored to determine goals are met. Short-term plans include sediment reduction monitoring and vegetative success. Long term monitoring will include bank stability assessments, vegetative success and weed monitoring.

Pre-project data was collected and includes photo points, high resolution drone imagery and BEHI surveys (Bank Erosion Hazard Index). Monitoring information can be shared with FWP.

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

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

Ninemile Creek hosts an assemblage of cutthroat, brook, rainbow and brown trout. Little Bear Creek has cutthroat trout.

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

This project will improve wild fish habitat through revegetation of the site, re-sloping of site topography and reconstruction of the stream channel. Stream temperatures should decrease when ponded areas with maximum exposure to direct sunlight are removed. Reclaiming the placer mining spoil piles on Ninemile Creek will help decrease sediment sources in the system and establish a functional floodplain and reconstructing the stream channel to proper slope and width-depth ratios will help improve sediment transport, which will both improve fish and wildlife habitat in Little Bear Creek and Ninemile Creek.

Baseline data collection efforts on Ninemile Creek show a lack of pools, gravels, large woody debris and complex habitat. Results on Ninemile Creek should closely mirror results from the previous Ninemile placer mine reclamation projects, where post-project measurements showed an increase in pool frequency and depth, floodplain connectivity, substrate diversity, woody debris and vegetation.

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

Fish populations are expected to improve. Current conditions through this reach of Ninemile are very poor for spawning and rearing. The current state of the incised, confined channel, limits spawning gravels, pools and large woody debris.

With proper construction, the new channel and floodplain will allow for spawning gravels and large wood to accumulate. Spawning and rearing are expected to increase, providing both short term and long-term increases in populations. TU and project partners are confident that this project will mirror results of completed reclamation projects which showed improvements in fish populations.

Angler success will improve not only in Ninemile Creek but also in the Middle Clark Fork basin. Restored reaches of Ninemile Creek are seeing an increase in trout from the Clark Fork for spawning.

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 the project will increase public fishing opportunity for wild fish by improving habitat and spawning along this reach. Public fishing is allowed through this reach of Ninemile Creek with access from USFS lands, just upstream.

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

This project will improve water quality through surface runoff control, improved hydrology, and mine pile removal, which will directly benefit downstream water users and the community adjacent to the Lolo National Forest. Improved fishing will benefit anglers and improved wildlife habitat in the watershed for deer, elk, moose, grouse, and small game will improve public hunting.

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. This project will not have commercial recreational use.

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

Yes, the cause of degradation on this project site is due to historic placer mining.

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: Paul Parson Date: 05/15/2025

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

Ninemile Creek Restoration Phase 7 024-2025

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-**	**Other Contributions (Funds not used as**	**Total Funding**
**Units = feet, hours, cubic yards, etc. Do not use lump sum unless necessary.*								
Personnel								
Survey	40	hours	$ 150.00	$ 6,000.00			6,000.00	$ 6,000.00
Design	1	Each	$ 25,000.00	$ 25,000.00			25,000.00	$ 25,000.00
Engineering				$ -			-	$ -
Permitting	1	Each	$ 5,000.00	$ 5,000.00			5,000.00	$ 5,000.00
Oversight	420	hours	$ 90.00	$ 37,800.00			37,800.00	$ 37,800.00
Maintenance**				$ -				$ -
			Sub-Total	$ 73,800.00	$ -	$ -	$ 73,800.00	$ 73,800.00
Travel								
Mileage	3500	miles	$ 0.70	$ 2,450.00			2,450.00	$ 2,450.00
Per diem	50	days	$ 86.00	$ 4,300.00			4,300.00	$ 4,300.00
			Sub-Total	$ 6,750.00		$ -	$ 6,750.00	$ 6,750.00
Construction Materials								
Willow Cuttings	47,750	each	$ 1.10	$ 52,525.00	30,000.00	22,525.00		$ 52,525.00
Nursery - Native Plants	250	Each	$ 5.00	$ 1,250.00	1,250.00			$ 1,250.00
Native Grass Seed	240	Pounds	$ 15.00	$ 3,600.00	3,600.00			$ 3,600.00
				$ -				$ -
				$ -				$ -
				$ -				$ -
				$ -				$ -
				$ -				$ -
			Sub-Total	$ 57,375.00	$ 34,850.00	$ 22,525.00	$ -	$ 57,375.00
Equipment, Labor, and Mobilization								
MOBILIZATION, BONDING, DIRECT EXPENSES	1	LS	$ 47,500.00	$ 47,500.00			47,500.00	$ 47,500.00
CLEAR AND GRUB	1	LS	$ 8,000.00	$ 8,000.00			8,000.00	$ 8,000.00
CONSTRUCT AND DECOMMISSION CLEARWATER DIVERSIONS	2	EA	$ 3,500.00	$ 7,000.00			7,000.00	$ 7,000.00
SALVAGE, PRESERVE AND TRANSPLANT EXISTING VEGETATION	1.3	AC	$ 5,000.00	$ 6,500.00			6,500.00	$ 6,500.00
IMPROVE AND DECOMMISSION ROADS AND STAGING AREAS	1	LS	$ 6,000.00	$ 6,000.00			6,000.00	$ 6,000.00
SALVAGE AND SOURCE ALLUVIUM AND CATEGORY 1 ROCK	6025	CY	$ 3.00	$ 18,075.00			18,075.00	$ 18,075.00
COLLECT AND PROCESS WOOD	6000	EA	$ 2.00	$ 12,000.00		12,000.00		$ 12,000.00
EXCAVATE, HAUL AND PLACE FLOODPLAIN BACKFILL	42240	CY	$ 4.00	$ 168,960.00			168,960.00	$ 168,960.00
CONSTRUCT CHANNEL STREAMBED	3765	LF	$ 30.00	$ 112,950.00			112,950.00	$ 112,950.00
CONSTRUCT LARGE WOOD STRUCTURES	17	EA	$ 1,500.00	$ 25,500.00		25,500.00		$ 25,500.00
CONSTRUCT VEGETATED WOOD MATRIX TYPE 1	2389	LF	$ 22.00	$ 52,558.00			52,558.00	$ 52,558.00
CONSTRUCT VEGETATED WOOD MATRIX TYPE 2	2290	LF	$ 28.00	$ 64,120.00			64,120.00	$ 64,120.00
CONSTRUCT VEGETATED WOOD MATRIX TYPE 3	772	LF	$ 5.00	$ 3,860.00			3,860.00	$ 3,860.00
INSTALL WILDLIFE SNAGS	56	EA	$ 200.00	$ 11,200.00			11,200.00	$ 11,200.00
INSTALL VEGETATED BRUSH TRENCH	2300	LF	$ 5.00	$ 11,500.00			11,500.00	$ 11,500.00
INSTALL LOG STEP POOLS	2	EA	$ 3,500.00	$ 7,000.00			7,000.00	$ 7,000.00
INSTALL FLOODPLAIN ROUGHNESS AND WOODY DEBRIS	14.3	AC	$ 1,500.00	$ 21,450.00	21,450.00			$ 21,450.00
				$ -				$ -
				$ -				$ -
				$ -				$ -

(Revised 5/16/2025)

			Sub-Total	$ 584,173.00	$ 21,450.00	$ 37,500.00	$ 525,223.00	$ 584,173.00
			OVERALL TOTALS	$ 722,098.00	$ 56,300.00	$ 60,025.00	$ 605,773.00	$ 722,098.00

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: Landowner in-kind donation of merchantable timber, riparian vegetation and stream substrate.

APPLICATION MATCHING CONTRIBUTIONS

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

CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
Lolo National Forest		60,025.00	$ 60,025.00	Y
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
TOTALS	$ -	$ 60,025.00	$ 60,025.00	

OTHER CONTRIBUTIONS

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

CONTRIBUTOR	IN-KIND	CASH	TOTAL	Secured? (Y/N)
Montana DEQ	$ -	$ 250,800.00	$ 250,800.00	y
Montana DNRC/Missoula County	$ -	$ 280,000.00	$ 280,000.00	y
Landowner	$ 25,000.00	$ 15,000.00	$ 40,000.00	y
Lolo National Forest	$ -	$ 34,973.00	$ 34,973.00	y
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
	$ -	$ -	$ -	
TOTALS	$ 25,000.00	$ 580,773.00	$ 605,773.00	

MONTANA FISH, WILDLIFE & PARKS

Future Fisheries Improvement Program

Appendix: FWP Statement

Project Title: Ninemile Creek Restoration – Phase 7

Please describe the potential impact of the project, including the priorities of the Fisheries Division and the importance to Montana's anglers.

Trout Unlimited and project partners have cooperated to reclaim six reaches along mainstem Ninemile Creek and 11 mine sites on tributaries to Ninemile Creek over the past two decades. Project partners on these projects include: private landowners, Lolo National Forest, Montana DEQ, Montana DNRC, Missoula County, Montana FWP, Montana DES, FEMA, National Forest Foundation, National Wildlife Federation, Westslope Chapter of Trout Unlimited, Warriors and Quiet Waters, the University of Montana and Big Sky Brewing. In total, over $6,000,000 has been invested through these abandoned mine cleanup projects.

The current, proposed project is an extension of this work and involves the seventh phase along the mainstem of Ninemile Creek. Phase7 is planned on lands administered by the Lolo National Forest and a private, patented mining claim along Ninemile Creek located roughly 17 miles upstream from its confluence with the Clark Fork River. The purpose of the project is to mitigate mining impacts, improving water quality on Ninemile Creek and reconnect previously disconnected and damaged tributaries along this reach of the main stem. The project will remove and regrade approximately 40,000 cubic yards of abandoned placer mine material, create 3,500 feet of new stream channel and restore 15 acres of floodplain and wetland habitat at an estimated cost of $600,000.

The overall impact of these projects has been a watershed-scale improvement of upper Ninemile Creek, including floodplain and riparian restoration, channel reconstruction, and fisheries habitat enhancements. I am not aware of a larger or more comprehensive effort to improve fisheries anywhere in Western Montana.

In addition, these improvements have occurred on a vital tributary system for trout recruitment and production located in a heavily-used section of the Clark Fork River near Missoula. There is a direct connection and benefit of this work for the anglers of Montana.

Name of FWP Biologist W. Ladd Knotek Date: 3-1-2025

Please attach to the FFIP application and materials and submit according to listed deadlines.

Amy Johnston Waller
33075 Nine Mile Rd.
Huson, MT 59846

Michelle McGree
Future Fisheries Improvement Program
Montana Fish, Wildlife and Parks
P.O. Box 200701
1420 E. 6th Avenue Helena, MT 59620-0701

May 9, 2025

Dear Panel Members:

Please accept this letter as the Johnston family endorsement of the seventh and final phase of the Upper Ninemile Creek reclamation project in the Ninemile Creek watershed. Trout Unlimited is applying for grant funds from the FWP Future Fisheries program to work with the US Forest Service and private landowners to improve these mine sites, which have severe impacts from historical mining activity, including impaired water quality, altered stream geomorphology and altered hydrology.

The Johnston family has resided at the above address for more than 40 years. We have seen the Ninemile stream move from being a quality fish habitat in the early 1980s to a stream that has had a substantial declining fish population due to the placer mining that went on earlier and into the mid 1980s by Clay Lewis. We have had the pleasure to meet Paul Parson of Trout Unlimited and see some of his earlier work and believe his knowledge, dedication and persistence in leading this project is moving the Ninemile stream back to great water for the proliferation of trout and other fish life. Trout Unlimited (TU), Missoula County, DEQ, FPW, DNRC and the Lolo National Forest have been working on cooperative projects in the Ninemile Creek drainage for over a decade. This broad based group also includes private landowners, state agencies, watershed groups, volunteers, and other conservation organizations. To date, the cooperative effort has led to the reclamation and reconnection of eleven tributary streams and five reclamation phases on Ninemile Creek. TU has dedicated staff time and financial resources to these and other projects in the drainage. Planning, monitoring, and data collection on mainstem Ninemile Creek have been ongoing for 15 years, and this grant continues the large-scale implementation effort to rehabilitate nearly five miles of the creek. Funds from the Future Fisheries Program are essential to completing on-the-ground reclamation projects and will be matched by state, federal and private funds. The Johnston family has dedicated resources to the project and believes this request for funding is needed and necessary to keep this worthwhile stream project moving forward.

Sincerely,

Amy Johnston Waller

Amy Johnston Waller

Future Fisheries Improvement Program
c/o Michelle McGree
Montana Fish, Wildlife & Parks
P.O. Box 200701
1420 E. 6th Avenue
Helena, MT 59620-0701

Dear Panel Members,

On behalf of Warriors & Quiet Waters (WQW), I am pleased to offer our full support for Trout Unlimited's Upper Ninemile Creek reclamation project, currently under consideration for funding through the FWP Future Fisheries Improvement Program.

This collaborative project—bringing together Trout Unlimited, the Department of Environmental Quality, the Department of Natural Resources and Conservation, the U.S. Forest Service, and private landowners—seeks to address the legacy impacts of historical mining in the Ninemile Creek watershed. These impacts include degraded water quality, disrupted stream geomorphology, and altered hydrologic function.

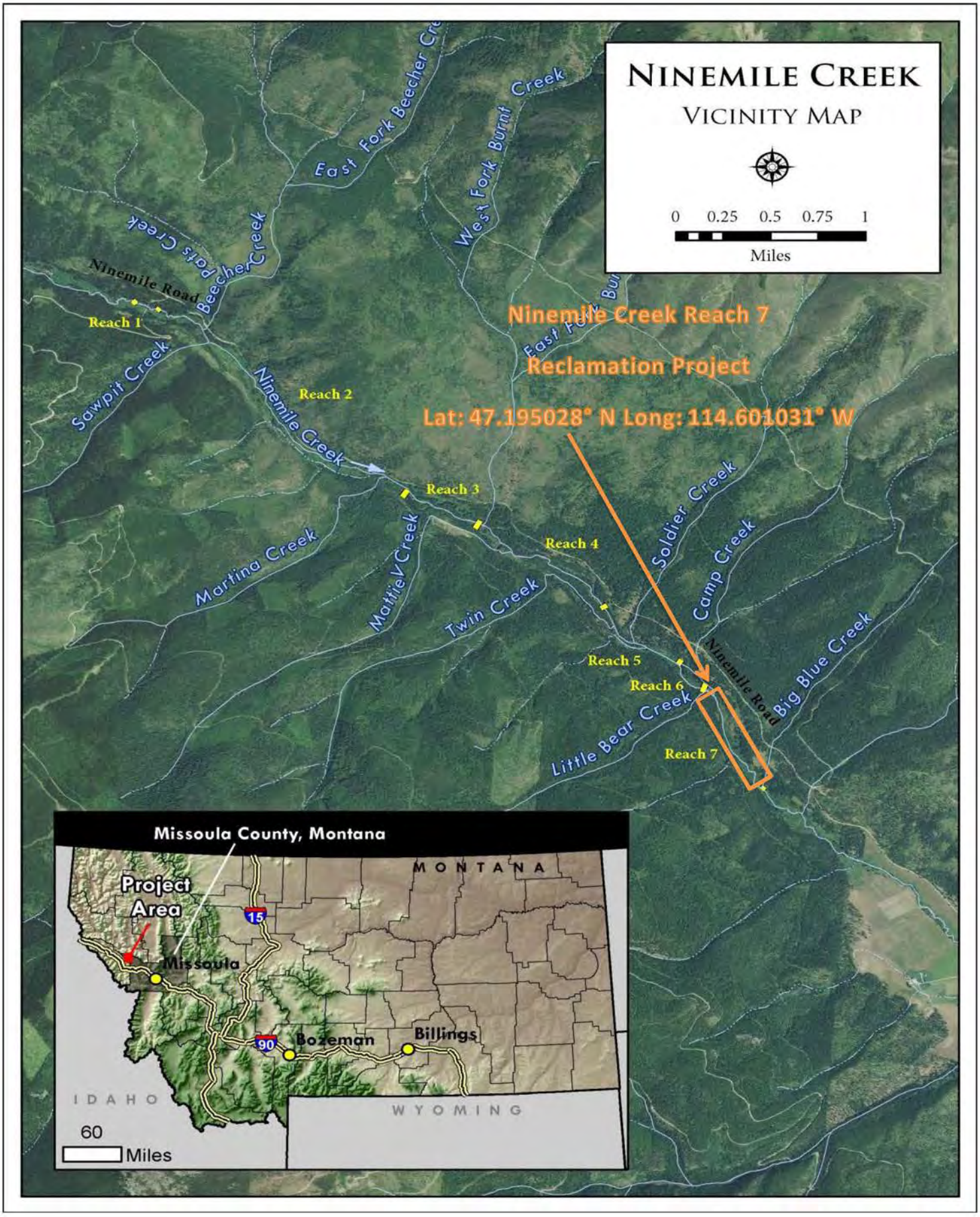
For the past five years, WQW has actively participated in volunteer efforts supporting this restoration work. Our veteran volunteers have contributed to fish salvage operations during stream channel diversions, invasive weed removal, and fence deconstruction. Additionally, WQW participants have had the opportunity to experience the positive results of this restoration firsthand by fishing in the rehabilitated reaches of Ninemile Creek.

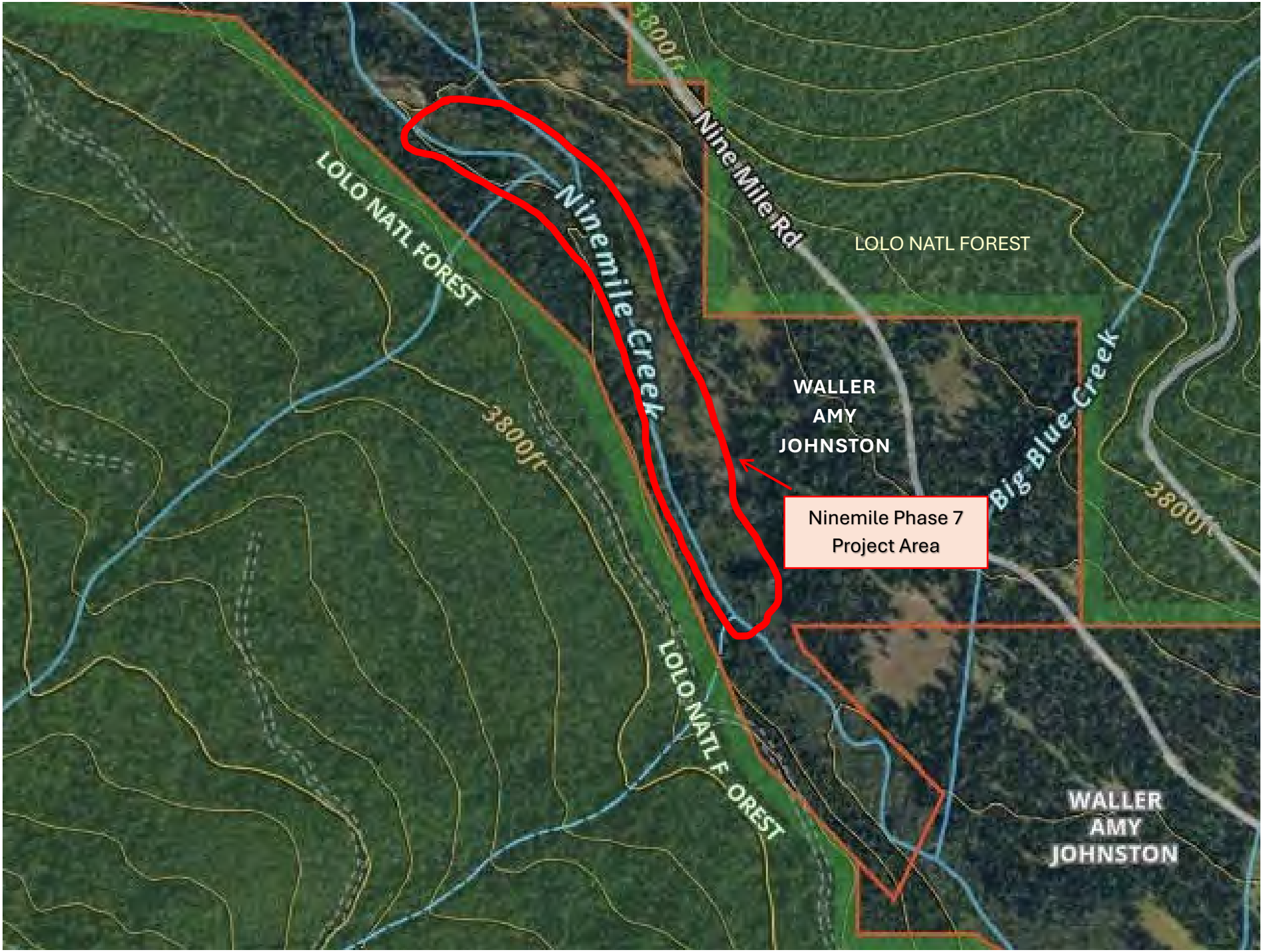
We strongly believe that this project not only restores critical aquatic habitat but also contributes to the broader goal of healing—both ecological and human. We commend the collaborative efforts of all partners involved and urge your favorable consideration of this grant application.

Sincerely,

Mike Powell
Chief Operating Officer

WARRIORS & QUIET WATERS
351 EVERGREEN DRIVE · STE A
BOZEMAN · MONTANA 59715
406.585.9793 · WQWF.ORG
501(C)(3) EIN #20-8837637


NINEMILE CREEK
VICINITY MAP
0 0.25 0.5 0.75 1
Miles
Ninemile Creek Reach 7
Reclamation Project
Lat: 47.195028° N Long: 114.601031° W
East Fork Beecher Cr
West Fork Burnt Creek
Pats Creek
Beecher Creek
Ninemile Road
Reach 1
Sawpit Creek
Ninemile Creek
Reach 2
Reach 3
Martina Creek
MattieV Creek
Reach 4
Twin Creek
Soldier Creek
Camp Creek
Reach 5
Reach 6
Ninemile Road
Big Blue Creek
Little Bear Creek
Reach 7
Missoula County, Montana
MONTANA
Project Area
15
Missoula
90
Bozeman
Billings
IDAHO
WYOMING
60
Miles


3800ft
Ninemile Rd
LOLO NATL FOREST
Ninemile Creek
LOLO NATL FOREST
WALLER
AMY
JOHNSTON
Big Blue Creek
3800ft
Ninemile Phase 7
Project Area
3800ft
LOLO NATL FOREST
WALLER
AMY
JOHNSTON

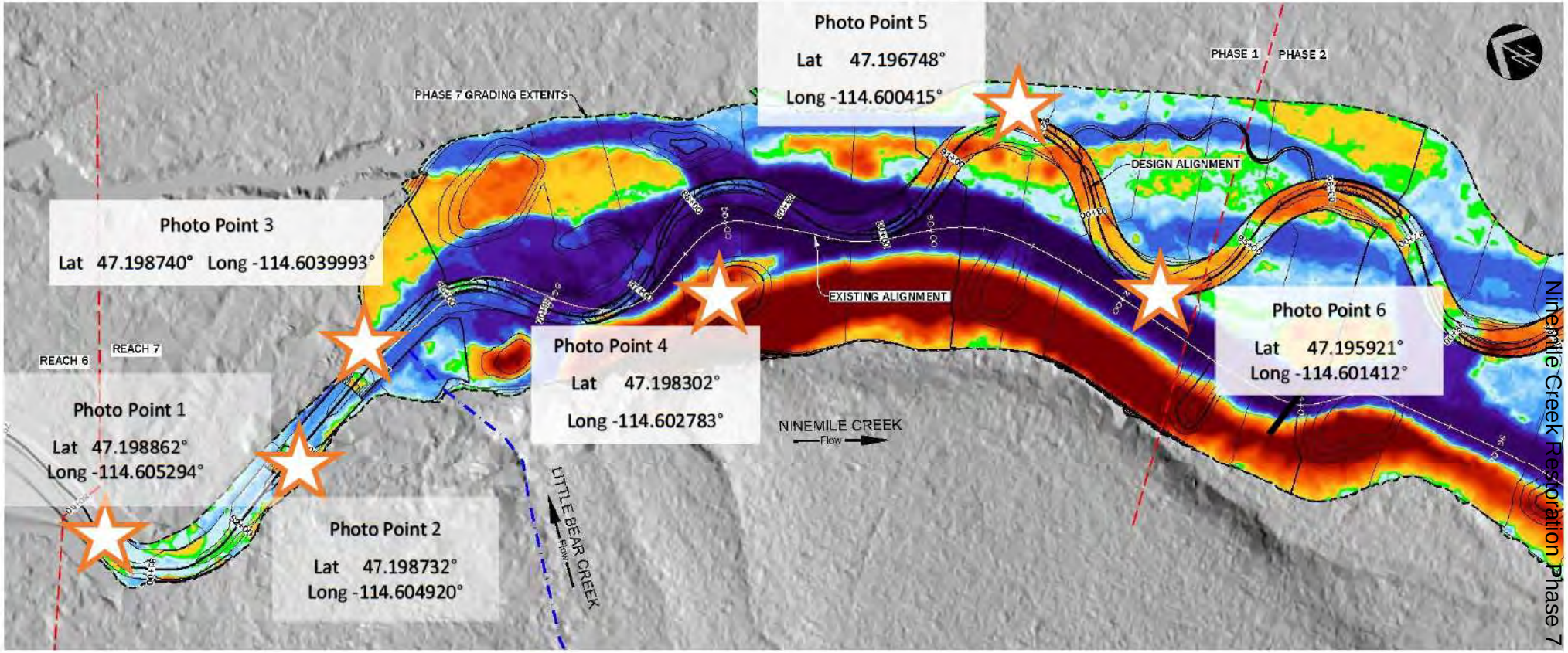


Photo Point Location

Ninemile Phase 7 Photo Point Monitoring

Pre-Project Photos taken on April 22, 2025 Taken By TU Project Manager—Paul Parson

Ninemile Creek Restoration Phase 7

024-2025

Photo Point 1 — April 22, 2025 (looking upstream at Phase 6 tie-in)

Photo Point 1 — April 22, 2025 (looking downstream at Phase 7 start)

Photo Point 2 — April 22, 2025 (looking upstream)

Photo Point 2 — April 22, 2025 (looking downstream)

Photo Point 3 — April 22, 2025 (looking upstream)

Photo Point 3 — April 22, 2025 (looking downstream near Little Bear Creek)

Photo Point 4 — April 22, 2025 (looking upstream, eroding placer pile)

Photo Point 4 — April 22, 2025 (looking downstream)

Photo Point 5 — April 22, 2025 (looking up valley) Future Channel

Photo Point 5— April 22, 2025 (looking down valley) Future Channel

Photo Point 6 — April 22, 2025 (looking upstream)

Photo Point 6— April 22, 2025 (looking downstream)

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7
FINAL DESIGN PLAN SET

PROJECT PARTNERS

TROUT UNLIMITED
312 NORTH HIGGINS AVENUE
SUITE 200
MISSOULA, MONTANA 59802

USDA FOREST SERVICE
LOLO NATIONAL FOREST
FORT MISSOULA, BUILDING 24
MISSOULA, MONTANA 59804

MONTANA FISH, WILDLIFE & PARKS
3201 SPURGIN ROAD
MISSOULA, MONTANA 59804

AMY JOHNSON WALLER
LANDOWNER

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
1520 E 6TH AVENUE
HELENA, MT 59601

GEUM ENVIRONMENTAL CONSULTING
307 STATE STREET
HAMILTON, MT 59840

PROJECT DESCRIPTION

THE NINEMILE CREEK WATERSHED IS LOCATED IN THE MIDDLE CLARK FORK RIVER WATERSHED APPROXIMATELY 20 MILES WEST OF MISSOULA, MONTANA. WITH A CONTRIBUTING AREA OF APPROXIMATELY 186 MI², THE WATERSHED ORIGINATES IN THE NINEMILE AND RESERVATION DIVIDES OF THE LOLO NATIONAL FOREST AND FLOWS 26 MILES TO THE CONFLUENCE WITH THE CLARK FORK RIVER. HISTORICAL MINING ACTIVITIES SIGNIFICANTLY ALTERED THE MORPHOLOGY AND LANDSCAPE OF THE NINEMILE CREEK VALLEY. RECORDS INDICATE THAT A PLACER GOLD BOOM OCCURRED ON NINEMILE CREEK BETWEEN 1874 AND 1977 AND MINING WITH DRAGLINES, DREDGES, HYDRAULIC HOSES AND SLUICING CONTINUED ON NINEMILE CREEK AND PRIMARY TRIBUTARIES UNTIL THE LATE 1940. THE MINING PROCESS REWORKED THE GLACIAL AND FLUVIAL SEDIMENTS COMPRISING THE VALLEY BOTTOM. ALLUVIAL GRAVELS AND COBBLES WERE WORKED INTO NUMEROUS TAILINGS PILES RANGING FROM 10 FEET TO 40 FEET IN ELEVATION ABOVE THE STREAM CHANNEL. MINING ACTIVITIES COMPROMISED THE INTEGRITY OF THE RIVER AND FLOODPLAIN ECOSYSTEM BY SIMPLIFYING AQUATIC HABITAT CONDITIONS, INCREASING STREAM ENERGY, AND REDUCING FLOODPLAIN CONNECTION AND FUNCTION.

IN 2009, TROUT UNLIMITED IN COLLABORATION WITH THE LOLO NATIONAL FOREST INITIATED A PLANNING PROCESS TO EVALUATE RESTORATION FEASIBILITY AND DESIGN AND IMPLEMENT RESTORATION EFFORTS ON A SIX MILE SECTION OF NINEMILE CREEK COMMONLY REFERRED TO AS THE HOUSUM PLACER, A PRIVATE, 250-ACRE MINING CLAIM LOCATED IN TOWNSHIP 17 NORTH, RANGE 24 WEST, IN SECTIONS 21, 22, 23, 25, 26, 27 AND 36. THIS DRAWING SET IS A DESIGN FOR A 2,900 FOOT SECTION OF NINEMILE CREEK IN REACH 7.

THE GOALS OF THIS PROJECT ARE TO:

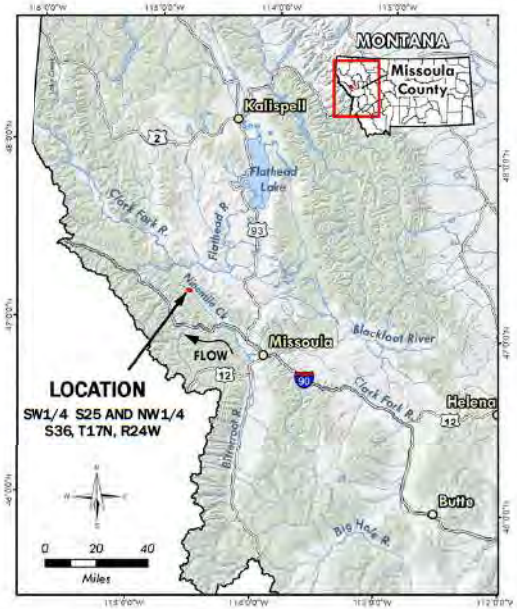
1) REHABILITATE STREAM, FLOODPLAIN AND HILLSLOPE PROCESSES IMPAIRED BY PREVIOUS PLACER MINING OPERATIONS;
2) PROMOTE AQUATIC HABITAT CONDITIONS THAT SUPPORT ALL LIFE STAGES OF FISH;
3) RECONNECT MAJOR TRIBUTARIES WITH THE MAINSTEM NINEMILE CREEK,
4) CONVERT PORTIONS OF THE EXISTING DRAGLINE PONDS TO SHALLOW EMERGENT AND OPEN WATER WETLANDS; AND
5) INCORPORATE THE DESIRES AND NEEDS OF THE LANDOWNERS AND MULTIPLE STAKEHOLDERS.

GENERAL NOTES

1. CONTOUR INTERVAL IS NOTED ON DRAWINGS.
2. SLOPES DESIGNATED AS 2:1, 1.5:1, ET CETERA, ARE THE RATIOS OF HORIZONTAL DISTANCE TO VERTICAL DISTANCE.
3. DIMENSIONS ARE GIVEN IN FEET AND TENTHS OF A FOOT.
4. TOPOGRAPHY AND CROSS SECTION GROUND LINES ARE BASED ON SURVEY WORK PERFORMED IN 2024 AND 2012 LIDAR DATA WAS CREATED IN OCTOBER 2011 AND PROVIDED BY TROUT UNLIMITED. ALL LIDAR DATA WAS COORDINATED BY RDG.
5. ALL EXISTING CONDITIONS ARE TO BE VERIFIED IN THE FIELD PRIOR TO CONSTRUCTION AND ANY ADJUSTMENTS TO THE DRAWINGS SHALL BE MADE AS DIRECTED BY THE ENGINEER.
6. EXISTING PRIVATE IMPROVEMENTS, WHICH LIE WITHIN THE CONSTRUCTION LIMITS, UNLESS OTHERWISE NOTED WILL BE REMOVED BY THE OWNER PRIOR TO CONSTRUCTION OR ABANDONED IN PLACE.
7. PROTECT ALL TREES AND LAND AREAS NOT LOCATED WITHIN THE PROJECT CONSTRUCTION, STAGING OR EARTHWORK LIMITS. EXERCISE CARE IN AREAS NOT SO MARKED TO AVOID UNNECESSARY DAMAGE TO NATURAL VEGETATION.
8. THE PROJECT SPONSOR IS RESPONSIBLE FOR COMPLYING WITH ALL PERMITS AND EASEMENTS INCLUDING ALL FEDERAL, STATE, COUNTY, AND LOCAL PERMIT CONDITIONS.
9. EXCAVATION, TRENCHING, SHORING, AND SHIELDING SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR PERFORMING THE WORK. THESE DRAWINGS ARE NOT INTENDED TO PROVIDE MEANS OR METHODS OF CONSTRUCTION.
10. EXCAVATION SHALL MEET THE REQUIREMENTS OF OSHA 29 CFR PART 1926, SUBPART P, EXCAVATIONS. ACTUAL SLOPES SHALL NOT EXCEED THE SLOPES AS INDICATED ON DRAWINGS.
11. ALL EXCAVATORS AND BULLDOZERS SHALL BE EQUIPPED WITH MACHINE GRADE GPS ((L1/L2/GLONASS)). CONSTRUCTION AREAS WILL BE STAKED OUT PRIOR TO CONSTRUCTION USING SURVEY GRADE GPS (L1/L2/GLONASS).
12. ENGINEER WILL PROVIDE SURVEY CONTROL AND GRADING SURFACES FOR EQUIPMENT WITH GPS MACHINE CONTROL CAPABILITY. CONTRACTOR SHALL PROVIDE SURVEY STAKING AND LAYOUT FOR CONSTRUCTION.
13. VERTICAL TOLERANCE FOR CONSTRUCTION COMPLIANCE WILL BE 0.3 FEET. HORIZONTAL TOLERANCE WILL BE 1.0 FEET.
14. CONTRACTOR SHALL CONFIRM QUANTITIES. REPORTED VOLUMES ARE NEAT LINE AND DO NOT INCLUDE ADJUSTMENTS FOR COMPACTION OR OTHER FACTORS.

DRAWING INDEX

NINEMILE CREEK VICINITY MAP



STANDARD OF PRACTICE

RIVER DESIGN GROUP, INC. WORKS EXCLUSIVELY 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 25-YEAR RECURRENCE INTERVAL DISCHARGE FLOOD. HEC-RAS, A ONE-DIMENSIONAL RIVER ANALYSIS MODEL WAS USED TO COMPLETE HYDRAULIC MODELING AND EVALUATE WATER SURFACE ELEVATIONS, CHANNEL AND OVERBANK SHEAR STRESSES, AND VELOCITIES FOR A RANGE OF FLOWS, INCLUDING BANKFULL DISCHARGE, THE 25-YEAR DESIGN STABILITY FLOW, AND HIGHER RETURN INTERVAL DISCHARGES INCLUDING THE 100-YEAR FLOW.

REUSE OF DRAWINGS

MONTANA
NATHAN W. WYATT
42005 PE
1-15-25
REGISTERED
PROFESSIONAL ENGINEER

RDG NOW PART OF SWCA
236 Wisconsin Avenue
Whitefish, MT 59937
406.862.4927
311 SW Jefferson Avenue
Corvallis, OR 97333
541.738.2920

COVER PAGE AND NOTES

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER RDG-23-186

DRAWING NUMBER 1.0

2024-2025

Drawing 1 of 24

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DRAWING LEGEND	
SYMBOL	
	REACH BREAK
	PROPERTY LINE
	CONTROL POINT
	EXISTING TRIBUTARY

1 EXISTING CONDITONS
PLAN VIEW
1" = 300'

EXISTING CONDITIONS

IMPACTS IN REACH 7 ARE SIMILAR TO THOSE DESCRIBED FOR PREVIOUS PROJECTS WITHIN THE NINEMILE CREEK DRAINAGE. THE STREAM CHANNEL IS ENTRENCHED AND BRACKETED BY A LARGE TAILINGS PILE AND HIGH TERRACE RESULTING IN FLOODPLAIN DISCONNECTION. AQUATIC HABITAT HAS BEEN SIMPLIFIED DUE TO HISTORICAL MINING ACTIVITIES. A NARROW INSET FLOODPLAIN HAS FORMED AT A LOWER ELEVATION THAN THE HISTORICAL FLOODPLAIN SURFACE. CHANNEL CONFINEMENT HAS INCREASED STREAM POWER RESULTING IN INCREASED SEDIMENT TRANSPORT CAPACITY AND COMPETENCY. AQUATIC HABITAT LIMITING FACTORS INCLUDE LACK OF POOLS, HOMOGENOUS RIFFLES, AND LACK OF LARGE WOOD. THE PROJECT DESIGN RESULTS IN SUBSTANTIAL CUT AND FILL EXCAVATION TO FORM A TWO STAGE ALLUVIAL VALLEY EMULATING THE PRE-DISTURBANCE CONDITIONS. CHANNEL DESIGN DIMENSIONS, INCLUDING PLAN FORM PATTERN, AND CROSS-SECTIONAL AND LONGITUDINAL PROFILE DIMENSIONS, WERE DERIVED FROM REFERENCE REACH DATA COLLECTED ON RIVER SYSTEMS OF SIMILAR MORPHOLOGY TO NINEMILE CREEK, AND REACH 1 OF NINEMILE CREEK.

BANKFULL DISCHARGE IS ESTIMATED TO RANGE FROM 250-270 CFS. CHANNEL SLOPE WILL AVERAGE 1 PERCENT TO SUPPORT A STABLE RIFFLE-POOL, SLIGHLY ENTRENCHED, GRAVEL AND COARSE COBBLE DOMINATED C3/C4 STREAM TYPE.

THE CONSTRAINTS AND LIMITING FACTORS IDENTIFIED DURING THE 2009 PHASE 1 GEOMORPHIC INVESTIGATION INCLUDE:

- HISTORICAL FLOODPLAIN SURFACES ARE NOT PRESENT AND AN INSET FLOODPLAIN WILL NEED TO BE CONSTRUCTED TO MATCH THE CURRENT BASE ELEVATION OF THE CHANNEL IN AREAS. WHERE FEASIBLE, THE CHANNEL BED ELEVATION WILL BE RAISED TO MATCH HISTORICAL FLOODPLAIN SURFACES IN ORDER TO MAXIMIZE MEANDER BELT WIDTH AND VALLEY WIDTH.
- A TAILINGS PILE AND HIGH TERRACE BRACKET THE CHANNEL ON THE WEST AND EAST SIDE OF THE VALLEY AND LIMIT FLOODPLAIN CONNECTIVITY AND FUNCTION.
- CHANNEL ENTRENCHMENT AND HISTORICAL MINING PRACTICES PARTIALLY TRUNCATED LITTLE BEAR CREEK FROM THE MAINSTEM, COMPROMISING FISH PASSAGE.

PROJECT DATUM	
THE PROJECT COORDINATES ARE BASED ON THE FOLLOWING:	
HORIZONTAL PROJECTION:	MONTANA STATE PLANE
UNITS:	US SURVEY FEET
HORIZONTAL DATUM:	NAD83 (CORS96 2002.00)
VERTICAL DATUM:	NAVD88 (GEOID 12A)
TOPOGRAPHY AND CROSS SECTION GROUND LINES ARE BASED ON SURVEY WORK PERFORMED BY RDG SURVEYING IN DECEMBER 2024. LIDAR DATA WAS CREATED IN 2022 AND COMBINED BY RDG.	

CONTROL POINTS

POINT NUMBER	NORTHING	EASTING	POINT ELEVATION	RAW DESCRIPTION
9	1114077.0480'	703059.7080'	3703.450'	5/8" REBAR WITH A 2" ALUMINUM CAP MARKED "RDG"
10	1113913.3930'	702830.5460'	3692.944'	5/8" REBAR WITH A 2" ALUMINUM CAP MARKED "RDG"

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236 Wisconsin Avenue Whitefish, MT 59937 406.862.3427
311 SW Jefferson Avenue Corvallis, OR 97333 541.738.2520

EXISTING CONDITONS & SURVEY CONTROL

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER RDG-23-188

DRAWING NUMBER 2.0

Drawing 2 of 24

2025

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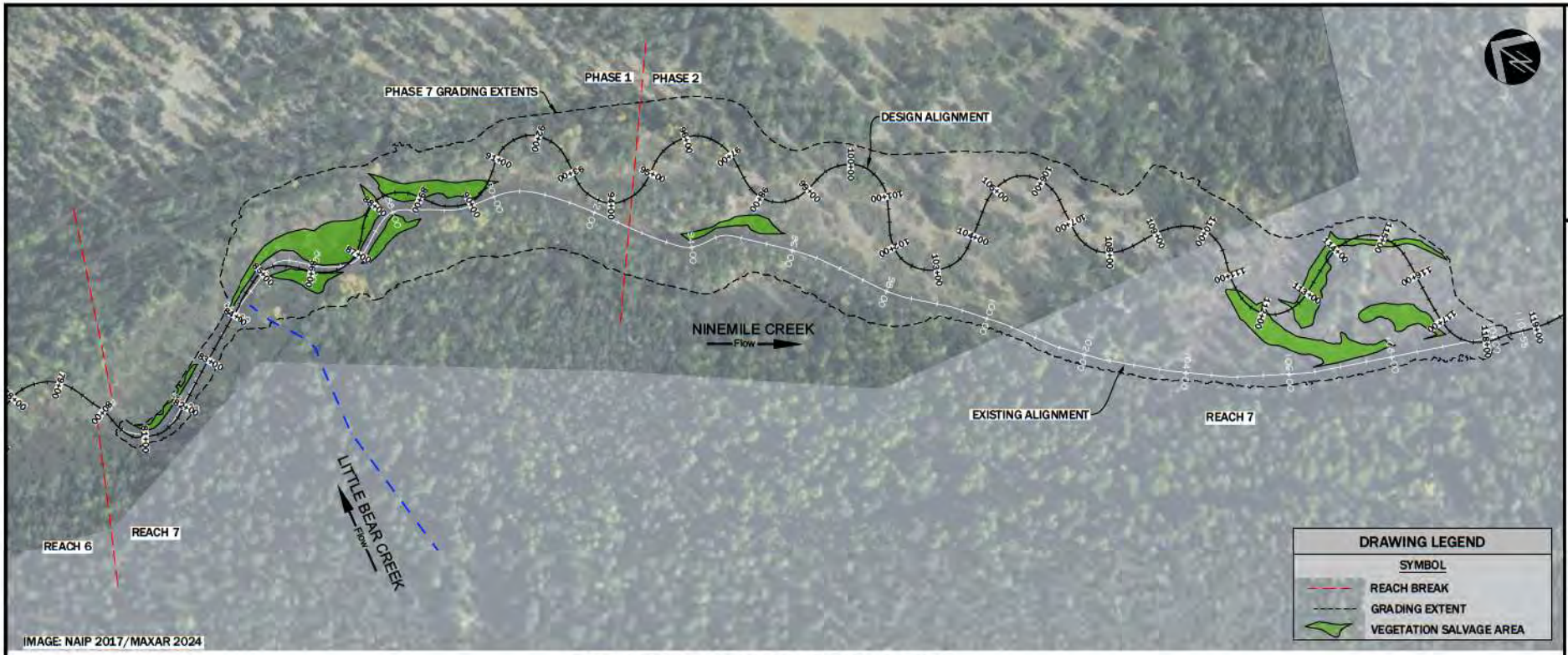

1 **PRESERVATION AND SALVAGE PLAN**
PLAN VIEW 1" = 200'

EXISTING VEGETATION PRESERVATION

WHERE POSSIBLE, EXISTING HIGH-QUALITY VEGETATION WITHIN THE PROJECT AREA SHALL BE PRESERVED. PRESERVATION AREAS WILL BE STAKED BY THE ENGINEER PRIOR TO CONSTRUCTION. PRESERVED AREAS ARE NOT TO BE DISTURBED BY ANY CONSTRUCTION ACTIVITIES, INCLUDING GRADING, MATERIALS STAGING, AND EQUIPMENT ACCESS. SALVAGED VEGETATION WILL BE REQUIRED TO BE TEMPORARILY STOCKPILED IN SHALLOW STANDING WATER AND/OR DIRECTLY TRANSPLANTED INTO STREAMBANK AND FLOODPLAIN TREATMENTS.

SOIL AND ORGANIC MATTER SALVAGE

SOIL FOUND WITHIN GRADING LIMITS SHALL BE SALVAGED AND STOCKPILED SEPARATELY. SOIL MATERIAL INCLUDES SOIL, SAND, FOREST DUFF AND ACCUMULATIONS OF ORGANIC MATTER ON THE GROUND SURFACE OR WITHIN DREDGE PONDS. ORGANIC MATTER FROM DREDGE PONDS MAY REQUIRE PARTIAL DEWATERING PRIOR TO SALVAGE OF ORGANIC MATTER. ACTUAL SALVAGE AND STOCKPILE LOCATIONS WILL BE DETERMINED BY THE ENGINEER PRIOR TO CONSTRUCTION. LOCATIONS FOR PLACEMENT OF SALVAGED SOIL AND ORGANIC MATTER WILL BE DETERMINED BY THE ENGINEER DURING CONSTRUCTION.

VEGETATION AND SOD SALVAGE AND TRANSPLANT

MATURE SHRUBS, SMALL TREES, AND HERBACEOUS SOD LOCATED WITHIN FLOODPLAIN GRADING LIMITS SHOULD BE SALVAGED AND TRANSPLANTED TO THE EXTENT FEASIBLE. THE CONSTRUCTION SEQUENCING SHOULD TAKE INTO CONSIDERATION THE PRESERVATION AND SALVAGE AREAS SHOWN ON THIS SHEET. EXACT LOCATIONS OF VEGETATION TO SALVAGE AND TRANSPLANT LOCATIONS SHALL BE STAKED BY THE ENGINEER PRIOR TO AND DURING CONSTRUCTION.

SHRUBS SHOULD BE HARVESTED IN A MANNER THAT ENSURES THE ROOTBALL REMAINS INTACT. SHRUBS SELECTED FOR SALVAGE AND TRANSPLANT SHOULD BE YOUNG, VIGOROUS AND RELATIVELY SMALL IN SIZE (6 TO 8 FT TALL, RATHER THAN 12 TO 15 FT TALL). LARGER SHRUBS SHOULD BE STOCKPILED WITH OTHER WOODY DEBRIS FOR USE IN FLOODPLAIN ROUGHNESS AND STREAMBANK TREATMENTS. WITHIN GRADING LIMITS, THERE ARE NUMEROUS DOGWOOD, WILLOW, ALDER AND COTTONWOOD THAT ARE THE APPROPRIATE SIZE FOR SALVAGE AND TRANSPLANT. THE TOPS OF THE SHRUB SHOULD BE PRUNED TO APPROXIMATELY THREE TO FOUR FEET IN ORDER TO BALANCE THE ROOT TO SHOOT RATIO OF THE TRANSPLANT. SALVAGED SHRUBS AND TREES SHOULD BE DIRECTLY TRANSPLANTED ALONG THE NEW CHANNEL OR IN DEPRESSIONS IN THE FLOODPLAIN. IF POSSIBLE, TRANSPLANT LOCATIONS SHOULD BE IDENTIFIED PRIOR TO SALVAGE OF SHRUBS AND TREES AND SALVAGED MATERIAL DIRECTLY PLACED INTO THE TRANSPLANT LOCATION. TRANSPLANT HOLES SHOULD BE TWICE THE WIDTH OF THE TRANSPLANT AND AT LEAST 0.5 FEET DEEPER THAN THE TRANSPLANT ROOTBALL. IF NOT POSSIBLE, SALVAGED TREES AND SHRUBS SHOULD BE STAGED IN SHADY, WET AREAS UNTIL TRANSPLANTING IS POSSIBLE

LITTLE HERBACEOUS SOD IS AVAILABLE FOR SALVAGE IN THE PROJECT AREA. IF IDENTIFIED BY THE ENGINEER, HERBACEOUS SOD SHOULD BE HARVESTED TO A DEPTH OF AT LEAST 6 INCHES. SALVAGED SOD MAY BE TEMPORARILY STAGED IN SHALLOW (LESS THAN 3 INCHES) WATER PRIOR TO PLACEMENT. TRANSPLANT LOCATIONS SHALL BE EXCAVATED TO A DEPTH OF 6 INCHES PRIOR TO PLACING SOD MATS. SOD MATS SHALL BE PLACED TIGHTLY TOGETHER TO AVOID DRYING OF SOIL AND VEGETATION. EDGES OF SOD MATS SHALL BE BACKFILLED WITH CLEAN VEGETATIVE BACKFILL TO ENSURE SMOOTH TRANSITIONS TO SURROUNDING SURFACE AND PREVENT DRYING OF SOIL AND VEGETATION.

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RDG RIVER DESIGN GROUP
236 Wisconsin Avenue Whitefish, MT 59937 406.862.3427
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PRESERVATION AND SALVAGE PLAN

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
X	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER RDG-23-188

DRAWING NUMBER 2.1

Drawing 3 of 24

2025

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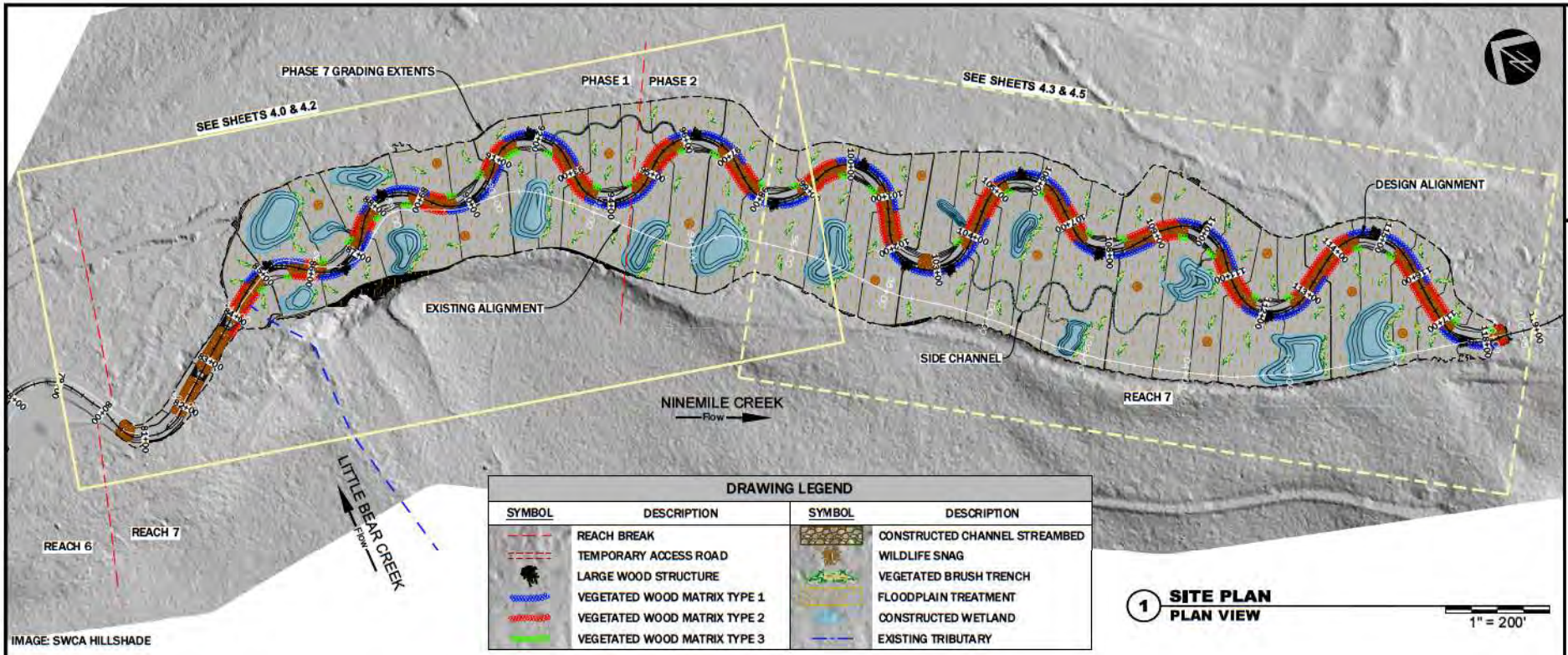

DRAWING LEGEND			
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	REACH BREAK		CONSTRUCTED CHANNEL STREAMBED
	TEMPORARY ACCESS ROAD		WILDLIFE SNAG
	LARGE WOOD STRUCTURE		VEGETATED BRUSH TRENCH
	VEGETATED WOOD MATRIX TYPE 1		FLOODPLAIN TREATMENT
	VEGETATED WOOD MATRIX TYPE 2		CONSTRUCTED WETLAND
	VEGETATED WOOD MATRIX TYPE 3		EXISTING TRIBUTARY

1 **SITE PLAN**
PLAN VIEW
1" = 200'

RESTORATION ALTERNATIVES

RESTORATION ALTERNATIVES FOR THE UPPER NINEMILE CREEK-HOUSUM PLACER RESTORATION PROJECT AREA WERE DEVELOPED BY TROUT UNLIMITED, US FOREST SERVICE, RIVER DESIGN GROUP, INC., AND GEUM ENVIRONMENTAL CONSULTING. ALTERNATIVES RANGED FROM NO ACTION (ALTERNATIVE A) TO EXPANDING THE FLOODPLAIN AND CONVERTING THE EXISTING CHANNEL MORPHOLOGY TO A MORE NATURAL STREAM TYPE (ALTERNATIVE E). A PREFERRED RESTORATION SCENARIO WAS DEVELOPED FOR THE PROJECT AREA BY ASSIGNING ALTERNATIVES TO EACH REACH AND SUB-REACH, BASED ON REACH-SPECIFIC LIMITING FACTORS, CONSTRAINTS, AND RESTORATION FEASIBILITY.

RESTORATION OBJECTIVES

THE PHASE 7 DESIGN ADDRESSES LIMITING FACTORS AND CONSTRAINTS IDENTIFIED IN THE 2012 UPPER NINEMILE CREEK-HOUSUM PLACER RESTORATION PROJECT PHASE 1 ALTERNATIVES DEVELOPMENT REPORT (TROUT UNLIMITED, 2012). OBJECTIVES RELATED TO CHANNEL MORPHOLOGY, AQUATIC HABITAT, FLOODPLAIN RESOURCES, AND RIPARIAN VEGETATION CONDITIONS INCLUDE:

- PRODUCE CLEAN WATER CONSISTENT WITH SUPPORTING AQUATIC LIFE AND BENEFICIAL USES.
- CREATE COMPLEX AQUATIC HABITAT COMPONENTS SUCH AS DEPTH, VELOCITY, SUBSTRATE, COVER, AND POOLS THAT SUPPORT POPULATIONS OF WILD TROUT AND OTHER AQUATIC ORGANISMS.
- CONSTRUCT A STREAM CHANNEL THAT IS CONNECTED TO THE FLOODPLAIN AND INTERACTS WITH THE CHANNEL IN TERMS OF SURFACE FLOW AND SEDIMENT AND NUTRIENT EXCHANGE.
- MAXIMIZE RIPARIAN AND FLOODPLAIN HABITATS AND FUNCTIONS.
- INCORPORATE, TO THE GREATEST EXTENT FEASIBLE, HISTORICAL FLOODPLAIN AND TERRACE SURFACES.
- RESTORE THE CONFLUENCE WITH LITTLE BEAR CREEK TO IMPROVE FISH PASSAGE AND STREAM CHANNEL FUNCTION.
- PRESERVE AS MUCH EXISTING RIPARIAN AND WETLAND AREAS WHILE RESTORING CHANNEL PATTERN AND PROFILE THOUGH THE PROJECT AREA.
- INSTALL INDIVIDUAL SNAGS AND MULTIPLE SNAG PODS IN THE FLOODPLAIN TO IMPROVE AVIAN PERCHING AND NESTING HABITAT. SPECIFIC CRITERIA ARE INCLUDED IN THE DESIGN DRAWINGS.

RESTORATION OVERVIEW

THE PROJECT AREA IS ACCESSED VIA NINEMILE CREEK ROAD AND INCLUDES REACH 7. COLLECTIVELY, RESTORATION ACTIVITIES WILL RECONSTRUCT APPROXIMATELY 3,800 FEET OF CHANNEL, BEGINNING APPROXIMATELY 400-FEET UPSTREAM OF LITTLE BEAR CREEK. RESTORATION WORK WILL BE COMPLETED OVER A THREE TO FOUR MONTH PERIOD AND WILL BE CLOSELY INTEGRATED WITH THE LOLO NATIONAL FOREST, TROUT UNLIMITED, PROJECT STAKEHOLDERS AND PERMITTING AGENCIES. RDG-SWCA WILL PROVIDE CONSTUCTION MANAGEMENT AND OVERSIGHT THROUGHOUT THE DURATION OF THE PROJECT AND WILL ESTABLISH SURVEY CONTROL AND PERFORM GPS SITE CALIBRATION.

THE RESTORATION PLAN INCLUDES THE USE OF MULTIPLE CHANNEL, STREAMBANK, AND FLOODPLAIN STRUCTURES. ALL MATERIALS WILL BE SOURCED ON-SITE, WITH THE EXCEPTION OF WILLOW CUTTINGS FOR STREAMBANK AND FLOODPLAIN TREATMENTS (TO BE FURNISHED BY TROUT UNLIMITED). CHANNEL STREAMBED STRUCTURES INTEGRATE MULTIPLE HABITAT FEATURES INCLUDING RIFFLES, RUNS, POOLS AND GLIDES. THE FEATURES ARE CONSTRUCTED WITH WOOD AND NATIVE ALLUVIUM. ALLUVIUM WILL BE SOURCED FROM THE EXISTING TAILINGS PILES LOCATED ON THE WEST SIDE IN THE PROJECT AREA. CONSTRUCTED CHANNEL STREAMBEDS ARE DESIGNED TO MIMIC NATURALLY OCCURRING COMPONENTS OF A HEALTHY, FUNCTIONING STREAM CHANNEL.

STREAMBANK TREATMENTS WILL BE COMPOSED OF WOOD, ALLUVIUM, AND VEGETATION, AND WILL INCREASE BANK RESISTANCE TO EROSION, PROVIDING FOR SHORT-TERM STREAMBANK STABILITY UNTIL MATURE VEGETATION ESTABLISHES ALONG THE CHANNEL MARGINS AND FLOODPLAINS. THE VEGETATION AND FLOODPLAIN DESIGNS EMPHASIZE CREATING A SELF-SUSTAINING MOSAIC OF RIPARIAN AND WETLAND COMMUNITIES ON A FLOODPLAIN THAT IS HYDROLOGICALLY CONNECTED TO THE CHANNEL. FLOODPLAIN RESTORATION STRATEGIES AND TREATMENTS ENCOURAGE DEVELOPMENT OF A VARIETY OF VEGETATION COVER TYPES BASED ON GEOMORPHIC FEATURE AND ELEVATION RELATIVE TO BASE FLOW WATER SURFACE ELEVATIONS. THE TECHNIQUES ACCOUNT FOR ECOLOGICAL PROCESSES THAT SUPPORT PLANT COMMUNITY DEVELOPMENT OVER TIME. FLOODPLAIN TREATMENTS WILL INCLUDE THE USE OF MACROTOPOGRAPHY (WETLANDS), FLOODPLAIN SWALES, ALCOVES, SIDE CHANNELS, VEGETATED BRUSH TRENCHES, WILDLIFE SNAGS, COARSE WOOD, PLANTINGS, AND SEEDING.

NOW PART OF SWCA ENVIRONMENTAL CONSULTANTS
RDG RIVER DESIGN GROUP
236 Wisconsin Avenue Whitefish, MT 59937 406.862.2627
311 SW Jefferson Avenue Corvallis, OR 97333 541.738.2500

SITE PLAN

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER
RDG-23-188

DRAWING NUMBER
3.0

Drawing 4 of 24

2024-2025

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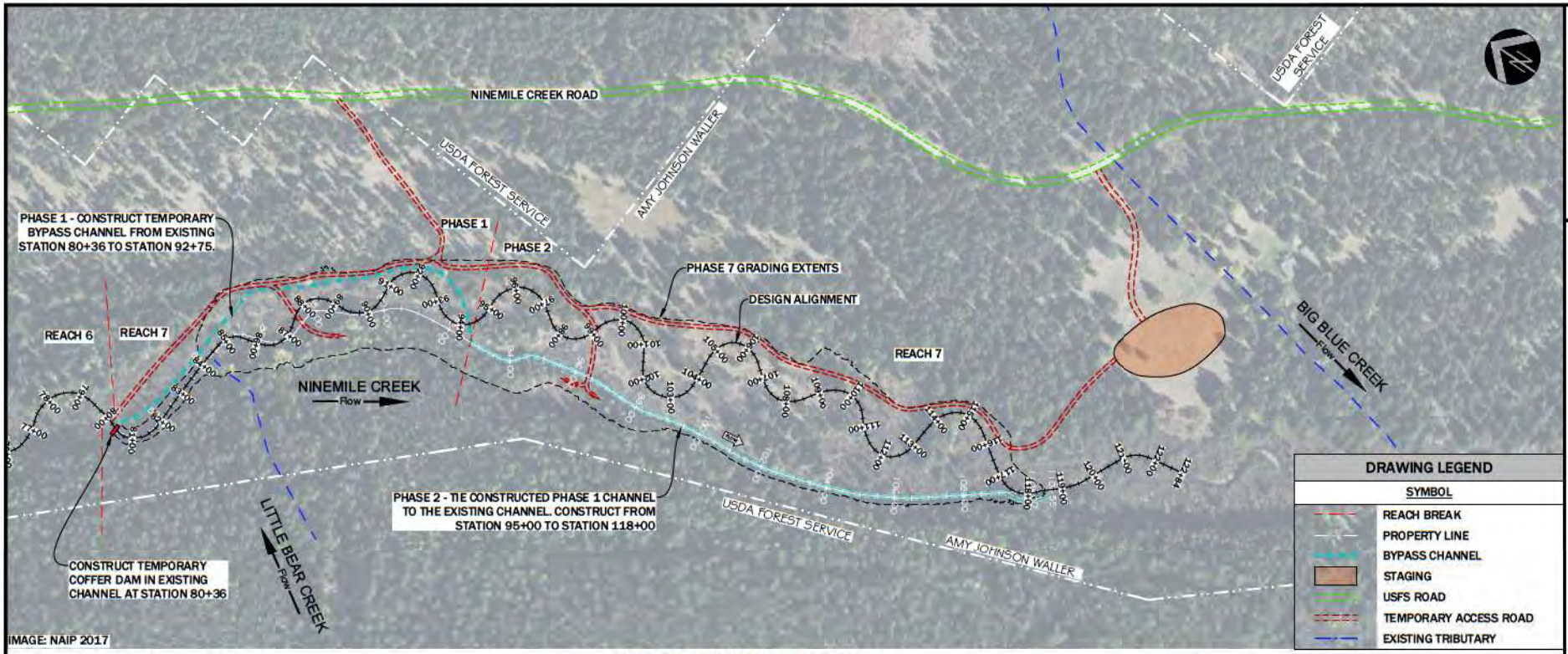

CONSTRUCTION SEQUENCING

WORK WILL BE PERFORMED IN TWO PHASES AS DESCRIBED BELOW. CHANGES TO THE PROPOSED SEQUENCING PLAN MUST BE APPROVED BY TU AND THE CONSTRUCTION MANAGER.

1 ACCESS, CONSTRUCTION SEQUENCING AND DEWATERING PLAN

PLAN VIEW

1" = 300'

NOTE

SUBSURFACE WATER MAY BE COLLECTED AND PUMPED TO A SUITABLE LOCATION IF IT IS CAUSING DOWNSTREAM TURBIDITY. THIS WILL BE A SITE-SPECIFIC POLLUTION CONTROL MEASURE IDENTIFIED BY THE DESIGNATED CONSTRUCTION MANAGER.

PHASE 1 (JULY 15 – SEPTEMBER 1, 2025)

1. ACCESS PHASE 7 PROJECT AREA (REACH 7) VIA NINEMILE CREEK ROAD. DEVELOP TWO PRIMARY ACCESS ROADS, INTERIOR HAUL ROAD, AND STAGING AREAS.
2. CONSTRUCT TEMPORARY BYPASS CHANNEL BEGINNING AT STATION 80+36 AND TERMINATING AT STATION 92+75 ALONG THE EXISTING ALIGNMENT. UTILIZING EXISTING LOW SWALES ON THE MARGINS OF THE GRADING EXENTS. CONTRACTOR SHALL STRIP AND SALVAGE ALL SALVAGEABLE PLANT MATERIAL AND WINDROW ADJACENT TO BYPASS CHANNEL FOR PLACEMENT ON FINISH GROUNND SURFACE FOLLOWING DECOMMISSIONING OF BYPASS CHANNEL.
3. INSTALL 3-24" ROUND CULVERTS IN TEMPORARY BYPASS CHANNEL AT DESIGN STATION 87+50. DEVELOP TEMPORARY ROAD TO ACCESS TAILINGS PILE ON WEST SIDE OF VALLEY.
4. INSTALL TEMPORARY BULK BAG DIVERSION DAM IN THE EXISTING CHANNEL AT STATION 80+36. INTRODUCE STREAMFLOW INCREMENTALLY. BYPASS CHANNEL ACTIVATION SHALL BE COORDINATED WITH TU AND MFWP TO ACCOMMODATE FISH RESCUE OPERATIONS.
5. SALVAGE AND STOCKPILE ALLUVIUM FROM EXISTING CHANNEL (STATION 80+40 - STATION 92+50).
6. DEVELOP SPUR ROADS TO ACCESS TAILINGS PILE. TIP AND SALVAGE TREES FROM EXISTING TAILINGS PILE TAKING CARE TO RETAIN LIMBS, BRANCHES AND INTACT ROOTWADS. LOAD, HAUL AND STOCKPILE TREES IN STAGING AREAS.
7. COMPLETE FLOODPLAIN BACKFILL FROM STATION 80+40 TO STATION 94+00.
8. INSTALL CHANNEL AND STREAMBANK TREATMENTS FROM DESIGN STATION 80+40 TO STATION 94+00.
9. INSTALL BULK BAG DIVERSION AT STATION 94+50 IN DESIGN CHANNEL ALIGNMENT. CONSTRUCT TEMPORARY BYPASS CHANNEL TO CONNECT DESIGN CHANNEL TO THE EXISTING CHANNEL AT STATION 93+00.
10. INSTALL 3-24" ROUND CULVERTS IN EXISTING CHANNEL AT STATION 96+50. DEVELOP TEMPORARY ROAD TO ACCESS TAILINGS PILE ON WEST SIDE OF VALLEY.
11. REMOVE BULK BAG DIVERSION DAM AT STATION 80+36 AND INTRODUCE STREAMFLOW INCREMENTALLY TO DESIGN CHANNEL.
12. DECOMMISSION TEMPORARY BYPASS CHANNEL.

PHASE 2 (SEPTEMBER 1 – OCTOBER 15, 2025)

1. COMPLETE FLOODPLAIN BACKFILL FROM STATION 94+00 TO STATION 118+00. NO FILL SHALL BE WINDROWED OR OTHERWISE STAGED IN CONTACT WITH LIVE WATER IN THE EXISTING CHANNEL.
2. INSTALL CHANNEL AND STREAMBANK TREATMENTS FROM STATION 95+00 TO STATION 118+00.
3. REMOVE BULK BAG DIVERSION DAM AT STATION 94+50 AND INTRODUCE STREAMFLOW INCREMENTALLY TO DESIGN CHANNEL.
4. REMOVE TEMPORARY CROSSINGS FROM EXISTING CHANNEL.
5. COMPLETE FLOODPLAIN BACKFILL IN EXISTING CHANNEL AND REMAINING FLOODPLAIN AREAS.
6. INSTALL DORMANT WILLOW CUTTINGS IN VEGETATED WOOD MATRIX BANK TREATMENTS.
7. IMPLEMENT FLOODPLAIN TREATMENTS INCLUDING SIDE CHANNELS, FLOODPLAIN ROUGHNESS, FLOODPLAIN BRUSH TRENCHES, WETLAND CELLS AND WILDLIFE SNAG PODS.
8. DECOMMISSION ACCESS ROADS AND SCARIFY ALL DISTURBED AREAS.

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236 Wisconsin Avenue Whitefish, MT 59937 406.862.3627
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ACCESS, CONSTRUCTION SEQUENCING AND DEWATERING PLAN

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
X	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER RDG-23-188

DRAWING NUMBER 3.1

Drawing 5 of 24

2024-2025

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13. CONTRACTOR SHALL CONFIRM QUANTITIES. REPORTED VOLUMES ARE NEATLINE AND DO NOT INCLUDE ADJUSTMENTS FOR COMPACTION OR OTHER FACTORS.

GENERAL SPECIFICATIONS

1. THE PROJECT SHALL BE CONSTRUCTED ACCORDING TO THE PLAN SET. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER OF ANY CHANGES PRIOR TO IMPLEMENTATION. THE CONSTRUCTION MANAGER FOR THIS PROJECT SHALL BE A DESIGNATED RIVER DESIGN GROUP REPRESENTATIVE.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY ALL UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. CALL U-DIG PRIOR TO CONSTRUCTION.
3. COSTS INCURRED DUE TO PROJECT DELAYS RESULTING FROM FAILURE OF THE CONTRACTOR TO MEET THE REQUIREMENTS OF THE GENERAL SPECIFICATIONS, CONTRACTOR QUALIFICATIONS, CONSTRUCTION SPECIFICATIONS, MATERIALS SPECIFICATIONS AND REVEGETATION SPECIFICATIONS SHALL BE THE EXPENSE OF THE CONTRACTOR.

CONTRACTOR QUALIFICATIONS

1. THE CONTRACTOR SHALL HAVE AT LEAST TWO (2) YEARS OF RIVER RESTORATION CONSTRUCTION EXPERIENCE AND SHALL HAVE COMPLETED AT LEAST FIVE (5) RIVER RESTORATION PROJECTS. OR, THE CONTRACTOR SHALL HAVE AT LEAST ONE (1) YEAR OF RIVER RESTORATION EXPERIENCE, SHALL HAVE COMPLETED AT LEAST THREE (3) RIVER RESTORATION PROJECTS, AND SHALL HAVE COMPLETED AN APPROVED RIVER RESTORATION TRAINING CLASS. APPROVED TRAINING CLASSES INCLUDE THOSE SPONSORED BY WILDLAND HYDROLOGY, INC., OR A SIMILARLY QUALIFIED PRACTITIONER OF NATURAL CHANNEL DESIGN STREAM RESTORATION PRINCIPLES.
2. IF THE CONTRACTOR CHOOSES TO DESIGNATE AN EMPLOYEE WITHOUT QUALIFIED STREAM RESTORATION EXPERIENCE, THE CONTRACTOR SHALL BE ON-SITE AT ALL TIMES WHEN THE EMPLOYEE IS PERFORMING RIVER RESTORATION WORK. FAILURE TO ABIDE BY THIS CONDITION WITHOUT PREVIOUS AGREEMENT WITH THE CONSTRUCTION MANAGER WOULD BE GROUNDS FOR TERMINATION.
3. THE CONTRACTOR SHALL MAINTAIN AT LEAST $2,000,000 IN LIABILITY INSURANCE AND HAVE PROOF OF LIABILITY INSURANCE ON-SITE DURING THE ENTIRETY OF PROJECT CONSTRUCTION.
4. THE CONTRACTOR SHALL HAVE PROOF OF WORKER'S COMPENSATION INSURANCE ON-SITE DURING THE ENTIRETY OF PROJECT CONSTRUCTION.
5. COPIES OF ALL PROJECT PERMITS SHALL BE POSTED ON-SITE IN A VISIBLE LOCATION. THE CONTRACTOR SHALL COMPLY WITH THE PROVISIONS OF THE PERMITS. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER OF ANY KNOWN CHANGES OR ACTIVITIES THAT COULD VIOLATE PERMIT REQUIREMENTS PRIOR TO IMPLEMENTATION. THE CONSTRUCTION MANAGER SHALL BE RESPONSIBLE FOR ALL CORRESPONDENCE WITH PERMIT AGENCIES.

TEMPORARY DIVERSION PROCEDURES

1. TEMPORARY DIVERSIONS SHALL BE ACTIVATED OR DEACTIVATED INCREMENTALLY IN TWO STAGES TO ALLOW RESIDENT AQUATIC LIFE TO EXIT THE DEWATERED AREA.
2. A PERIOD OF APPROXIMATELY ONE HOUR SHALL BE ALLOWED BETWEEN THE TWO STAGES.
3. EFFORTS SHALL BE MADE TO LIMIT TURBIDITY DURING DIVERSION ACTIVATION AND DEACTIVATION. MATERIAL USED TO DIVERT FLOW DURING STAGED DIVERSIONS SHALL BE CLEAN AND DEVOID OF FINES.
4. EFFORTS SHALL BE MADE TO LIMIT DISTURBANCE TO VEGETATION.
5. EFFORTS SHALL BE MADE TO AVOID FATALITIES OF AQUATIC LIFE.

CONSTRUCTION SPECIFICATIONS

1. CONSTRUCTION SHALL OCCUR IN ACCORDANCE WITH THE PLAN SET, CONSTRUCTION SPECIFICATIONS, EQUIPMENT SPECIFICATIONS, MATERIAL SPECIFICATIONS, REVEGETATION SPECIFICATIONS AND GENERAL SPECIFICATIONS.
2. CONSTRUCTION ACCESS SHALL BE DETERMINED BY THE CONSTRUCTION MANAGER. THE CONTRACTOR SHALL LEAVE ALL GATES, WHETHER OPEN OR CLOSED, AS FOUND.
3. STREAM CROSSINGS SHALL BE MINIMIZED DURING CONSTRUCTION. CONTRACTOR SHALL USE CULVERTS AT STREAM CROSSINGS SO THAT EQUIPMENT CAN CROSS THE STREAM WITHOUT GENERATING EXCESS TURBIDITY.
4. STRAW BALES AND SILT FENCING SHALL BE AVAILABLE AND INSTALLED BY THE CONTRACTOR IF DEEMED NECESSARY BY THE CONSTRUCTION MANAGER. CONSTRUCTION FENCING (LIMITS OF DISTURBANCE) SHALL BE INSTALLED BY THE CONTRACTOR IF DEEMED NECESSARY BY THE CONSTRUCTION MANAGER.
5. INITIALLY, THE CONTRACTOR SHALL EXCAVATE THE CHANNEL TO APPROXIMATE DESIGN DIMENSIONS. EXCAVATION SHALL COMPLY WITH CONSTRUCTION STAKES AND THE PLAN SET. EXCAVATION SHALL ESTABLISH CHANNEL ELEVATIONS WITHIN ONE-HALF FOOT OF FINAL ELEVATIONS. THE CONSTRUCTION MANAGER SHALL INSPECT THE CHANNEL EXCAVATION FOR COMPLIANCE WITH THE PLAN SET. ALL EXCAVATED MATERIALS SHALL BE STOCKPILED ON-SITE, ABOVE THE BANKFULL CHANNEL UNTIL HAULED OFF-SITE OR USED ON-SITE. DISTURBANCE TO RIPARIAN VEGETATION, CHANNEL BANKS AND SOD SHALL BE MINIMIZED. EXCAVATED SOD AND RIPARIAN SHRUB TRANSPLANTS SHALL BE CAREFULLY STOCKPILED AND REUSED FOR PLANTING FLOODPLAINS OR STREAM BANKS.
6. AFTER EXCAVATING THE CHANNEL, THE CONTRACTOR SHALL INSTALL BANK STABILIZATION AND HABITAT STRUCTURES USING THE EXCAVATOR. EACH STRUCTURE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LOCATIONS AND SPECIFICATIONS PROVIDED IN THE PLAN SET. THE CONSTRUCTION MANAGER SHALL INSPECT AND APPROVE ALL STRUCTURES PRIOR TO BACKFILLING.
7. AFTER ALL STRUCTURES ARE INSTALLED, THE CHANNEL WILL BE SHAPED TO WITHIN 0.3 FEET OF THE FINAL ELEVATIONS SPECIFIED ON THE PLAN SET USING AN EXCAVATOR. THE CONSTRUCTION MANAGER SHALL CHECK THE FINAL ELEVATIONS FOR COMPLIANCE WITH THE PLAN SET. ALL EXCAVATED MATERIALS SHALL BE STOCKPILED ON-SITE, ABOVE THE BANKFULL CHANNEL UNTIL HAULED TO AN ON-SITE REPOSITORY DESIGNATED BY THE CONSTRUCTION MANAGER. DISTURBANCE TO RIPARIAN VEGETATION, CHANNEL BANKS AND SOD SHALL BE MINIMIZED.
8. THE CONTRACTOR SHALL REMOVE EXCESS MATERIALS, TEMPORARY CULVERTS AND EQUIPMENT FROM THE SITE. THE CONTRACTOR SHALL REGRADE DISTURBED AREAS AND CONSTRUCTION ACCESS ROADS TO THEIR ORIGINAL GRADES. THE CONTRACTOR SHALL TREAT COMPACTED SOIL AREAS INCLUDING ACCESS ROADS AND MATERIAL STOCKPILE AREAS. THE CONTRACTOR SHALL REMOVE SOIL FROM THE PROJECT SITE IF THE SOIL IS TAINTED WITH PETROLEUM-BASED FLUIDS.

EQUIPMENT SPECIFICATIONS

1. THE CONTRACTOR SHALL FURNISH ALL EQUIPMENT NECESSARY TO CONSTRUCT THE PROJECT. EQUIPMENT SHALL BE EQUIPPED WITH DUAL PHASE GPS AND GLONASS. THE CONTRACTOR SHALL MOBILIZE ALL EQUIPMENT TO THE PROJECT AREA AS DIRECTED BY THE CONSTRUCTION MANAGER.
2. ALL EQUIPMENT SHALL BE WASHED PRIOR TO MOBILIZATION TO THE SITE TO MINIMIZE THE INTRODUCTION OF FOREIGN MATERIALS AND FLUIDS TO THE PROJECT SITE. ALL EQUIPMENT SHALL BE FREE OF OIL, HYDRAULIC FLUID, AND DIESEL FUEL LEAKS. TO PREVENT INVASION OF NOXIOUS WEEDS OR THE SPREAD OF WHIRLING DISEASE SPORES, ALL EQUIPMENT SHALL BE POWER WASHED OR CLEANED TO REMOVE MUD AND SOIL PRIOR TO MOBILIZATION INTO THE PROJECT AREA. IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO INSURE THAT ADEQUATE MEASURES HAVE BEEN TAKEN.
3. EQUIPMENT SHALL BE IN A WELL-MAINTAINED CONDITION TO MINIMIZE THE LIKELIHOOD OF A FLUID LEAK. IF A FLUID LEAK DOES OCCUR, THE CONSTRUCTION MANAGER SHALL BE NOTIFIED IMMEDIATELY, AND ALL WORK CEASED UNTIL THE LEAK HAS BEEN RECTIFIED. AT ALL TIMES DURING THE CONSTRUCTION PHASE, FLUID SPILL CONTAINMENT EQUIPMENT SHALL BE PRESENT ON-SITE AND READY FOR DEPLOYMENT SHOULD AN ACCIDENTAL SPILL OCCUR.
4. THE CONTRACTOR SHALL MAINTAIN A COMPLETE TOOL SET WITH COMMONLY REPLACED PARTS (E.G. O-RINGS) TO MINIMIZE DOWNTIME IN THE EVENT OF EQUIPMENT MALFUNCTION. THE CONTRACTOR SHALL HAVE AN EMERGENCY SPILL KIT ON SITE DURING THE PROJECT.

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NOW PART OF SWCA
236 Wisconsin Avenue Whitefish, MT 59937 406.862.4927
311 SW Jefferson Avenue Corvallis, OR 97333 541.738.2500

NOTES AND SPECIFICATIONS

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
X	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER
RDG-23-188

DRAWING NUMBER
3.2

Drawing 6 of 24

2024-2025

TOTAL WOOD QUANTITIES

ITEM	QUANTITY (EA)	DIAMETER	LENGTH	ROOTWAD
CATEGORY 1 WOOD	234	12 - 18 IN	25 FT	YES
CATEGORY 2 WOOD	14,700	6 - 10 IN	20 FT	OPTIONAL
CATEGORY 3 WOOD	29,164	< 3 IN	10 - 12 FT	OPTIONAL
WILLOW CUTTINGS	47,750	0.25-1.0 IN	8 FT	NO

NOTE:
WOOD LENGTHS SHOWN WILL PRODUCE THE PROPER AMOUNT MATERIAL FOR STRUCTURES WHEN SPLIT INTO APPROPRIATE SIZES DURING CONSTRUCTION. IT IS CONTRACTOR'S RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.

TOTAL ROCK QUANTITIES

ITEM	QUANTITY (EA)	DIAMETER (IN)
CATEGORY 1 ROCK	2,105	12-18

ITEM	QUANTITY (CY)	GRADATION	
		SIZE (IN)	PERCENT PASSING
STREAMBED/STREAMBANK FILL	5,872	6	95
		5	90-95
		4	85-90
		3	65-85
		2	50-65
		1	30-50
		0.5	20-30
		0.08	20

TOTAL EARTHWORK QUANTITIES

ITEM	QUANTITY (CY)
CUT	42,240
BACKFILL	42,240
NET CUT	0

NOTE:
A MINIMUM ANTICIPATED EXPANSION FACTOR OF 10% IS INCLUDED IN THE CUT QUANTITY. A MINIMUM ANTICIPATED COMPACTION FACTOR OF 10% IS INCLUDED IN THE FILL QUANTITY.

LARGE WOOD STRUCTURE QUANTITIES

ITEM	QUANTITY
LARGE WOOD STRUCTURES	17 EA
CATEGORY 1 WOOD	170 EA
CATEGORY 2 WOOD	102 EA
CATEGORY 3 WOOD	850 EA
WILLOW CUTTINGS	13,600 EA

VEGETATED WOOD MATRIX QUANTITIES

ITEM	QUANTITY
VEGETATED WOOD MATRIX TYPE 1	2,389 LF
VEGETATED WOOD MATRIX TYPE 2	2,290 LF
VEGETATED WOOD MATRIX TYPE 3	772 LF
CATEGORY 2 WOOD	13,836 EA
CATEGORY 3 WOOD	23,865 EA
WILLOW CUTTINGS	27,250 EA
STREAMBANK FILL	3,245 CY

CONSTRUCTED CHANNEL STREAMBED QUANTITIES

ITEM	QUANTITY
CONSTRUCTED RIFFLE	2,606 LF
CATEGORY 1 ROCK	2,085 EA
STREAMBED FILL	2,606 CY
CATEGORY 2 WOOD	261 EA

VEGETATED BRUSH TRENCH QUANTITIES

ITEM	QUANTITY
VEGETATED BRUSH TRENCH	2,300 LF
CATEGORY 3 WOOD	2,300 EA
WILLOW CUTTINGS	6,900 EA

WILDLIFE SNAG QUANTITIES

ITEM	QUANTITY
WILDLIFE SNAG PODS	14 EA
CATEGORY 1 WOOD	56 EA
STREAMBED FILL	21 CY

LOG STEP POOL QUANTITIES

ITEM	QUANTITY
LOG STEP POOL	2 EA
CATEGORY 1 WOOD	8 EA
CATEGORY 1 ROCK	20 EA
FILTER FABRIC	100 LF
4" RING SHANK NAILS	80 EA

FLOODPLAIN TREATMENT

ITEM	QUANTITY
ACRES OF FLOODPLAIN	14.3 AC
CATEGORY 2 WOOD	502 EA
CATEGORY 3 WOOD	2,149 EA

GENERAL NOTE

WOOD QUANTITIES SHOWN WILL PRODUCE THE PROPER AMOUNT OF MATERIAL FOR STRUCTURES WHEN SPLIT INTO APPROPRIATE SIZES DURING CONSTRUCTION. IT IS CONTRACTOR'S RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.

MATERIAL SPECIFICATIONS

THE CONTRACTOR SHALL FURNISH ALL MATERIALS NECESSARY TO CONSTRUCT THE PROJECT. THE CONTRACTOR SHALL DELIVER ALL MATERIALS TO THE DESIGNATED STOCKPILE LOCATIONS LABELED ON THE PLAN SET OR TO A LOCATION SPECIFIED BY THE CONSTRUCTION MANAGER. IF A MATERIAL SOURCE HAS BEEN PRE-DETERMINED, THE CONSTRUCTION MANAGER SHALL PROVIDE DIRECTIONS TO THE CONTRACTOR.

MATERIAL QUANTITIES, DIMENSIONS AND SIZES SHALL CONFORM TO THE NOTES AND SPECIFICATIONS PROVIDED ON THE PLAN SET OR ON THE MATERIALS LIST.

THE CONSTRUCTION MANAGER SHALL INSPECT AND APPROVE ALL MATERIALS PRIOR TO CONSTRUCTION. IF MATERIALS DO NOT MEET THE MINIMUM REQUIREMENTS SPECIFIED IN THE PLAN SET OR MATERIALS LIST, THE CONSTRUCTION MANAGER SHALL REJECT THE MATERIALS.

RDG
NOW PART OF SWCA
236 Wisconsin Avenue
Whitefish, MT 59937
406.862.3627
311 SW Jefferson Avenue
Corvallis, OR 97333
541.738.2500

MATERIALS AND QUANTITIES

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

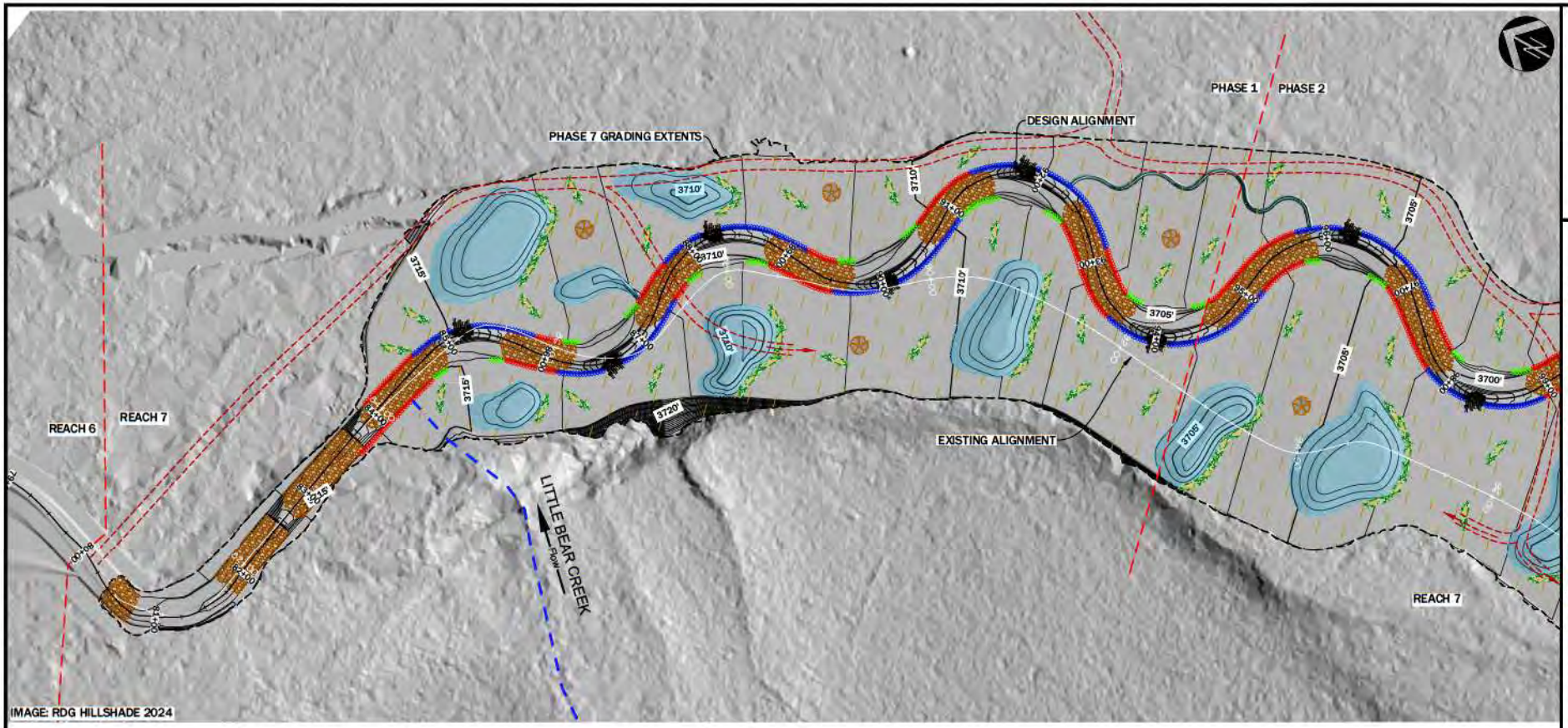
NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER
RDG-23-188

DRAWING NUMBER
3.3

Drawing 7 of 24

2024-2025



1 NINEMILE CREEK STRUCTURE LAYOUT
PLAN VIEW

1" = 100'

DRAWING LEGEND	
SYMBOL	
	REACH BREAK
	TEMPORARY ACCESS ROAD
	LARGE WOOD STRUCTURE
	VEGETATED WOOD MATRIX TYPE 1
	VEGETATED WOOD MATRIX TYPE 2
	VEGETATED WOOD MATRIX TYPE 3
	CONSTRUCTED CHANNEL STREAMBED
	WILDLIFE SNAG
	VEGETATED BRUSH TRENCH
	FLOODPLAIN TREATMENT
	CONSTRUCTED WETLAND
	EXISTING TRIBUTARY

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236 Wisconsin Avenue Whitefish, MT 59937 406.862.3627
311 SW Jefferson Avenue Corvallis, OR 97333 541.738.2520

PLAN VIEW AND STRUCTURE LAYOUT
STA 80+00 - 98+50
UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER
RDG-23-188

DRAWING NUMBER
4.0

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2024-2025

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STRUCTURE SCHEDULE				STRUCTURE SCHEDULE				STRUCTURE SCHEDULE			
STATION START	STATION END	BANK	STRUCTURE	STATION START	STATION END	BANK	STRUCTURE	STATION START	STATION END	BANK	STRUCTURE
80+00	80+77	CCS	C	87+73	88+15	VWM 2	L	92+48	93+50	VWM 1	R
81+79	84+85	CCS	C	87+73	87+94	VWM 3	R	92+99	93+50	VWM 1	L
82+59	82+89	SP	C	88+15	88+35	LWS	L	93+50	93+92	VWM 2	R
83+60	84+64	VWM 1	R	88+35	89+21	VWM 2	L	93+50	93+71	VWM 3	L
83+69	83+99	SP	C	88+61	89+75	CCS	C	93+92	94+12	LWS	R
84+00	84+64	VWM 1	L	88+61	88+88	VWM 3	R	94+12	95+19	VWM 2	R
84+64	85+06	VWM 2	L	88+88	89+54	VWM 1	R	94+38	95+93	CCS	C
84+64	84+85	VWM 3	R	89+21	89+54	VWM 1	L	94+38	94+65	VWM 3	L
85+06	85+25	LWS	L	89+54	89+95	VWM 2	R	94+65	95+72	VWM 1	L
85+25	85+88	VWM 2	L	89+54	89+75	VWM 3	L	95+19	95+72	VWM 1	R
85+43	86+34	CCS	C	89+95	90+15	LWS	R	95+72	96+13	VWM 2	L
85+43	85+62	VWM 3	R	90+15	91+00	VWM 2	R	95+72	95+93	VWM 3	R
85+62	86+13	VWM 1	R	90+40	91+54	CCS	C	96+13	96+33	LWS	L
85+88	86+13	VWM 1	L	90+40	90+67	VWM 3	L	96+33	97+32	VWM 2	L
86+13	86+55	VWM 2	R	90+67	91+33	VWM 1	L	96+59	97+99	CCS	C
86+13	86+34	VWM 3	L	91+00	91+33	VWM 1	R	96+59	96+86	VWM 3	R
86+55	86+75	LWS	R	91+33	91+75	VWM 2	L	96+86	97+77	VWM 1	R
86+75	87+51	VWM 2	R	91+33	91+54	VWM 3	R	97+32	97+77	VWM 1	L
87+01	87+94	CCS	C	91+75	91+95	LWS	L	97+77	98+19	VWM 2	R
87+01	87+28	VWM 3	L	91+95	92+99	VWM 2	L	97+77	97+99	VWM 3	L
87+28	87+73	VWM 1	L	92+21	93+71	CCS	C	98+19	98+39	LWS	R
87+51	87+73	VWM 1	R	92+21	92+48	VWM 3	R	98+39	99+33	VWM 2	R

CHANNEL TOP OF BANK ELEVATIONS		CHANNEL TOP OF BANK ELEVATIONS	
STATION START	ELEVATIONS (FT)	STATION START	ELEVATIONS (FT)
80+00	3719.54		
80+77	3718.84	90+13	3710.29
81+79	3717.91	90+67	3709.80
84+64	3715.31	91+33	3709.20
84+85	3715.11	91+54	3709.01
85+07	3714.91	91+76	3708.80
85+24	3714.76	91+93	3708.65
85+62	3714.41	92+48	3708.15
86+13	3713.95	93+50	3707.22
86+34	3713.75	9371	3707.02
86+56	3713.55	93+93	3706.82
86+73	3713.40	94+10	3706.67
87+28	3712.90	94+65	3706.17
87+73	3712.48	95+72	3705.19
87+94	3712.29	95+93	3705.00
88+16	3712.09	96+15	3704.80
88+33	3711.94	96+86	3704.15
88+88	3711.43	97+77	3703.32
89+54	3710.83	97+99	3703.12
89+75	3710.64	98+21	3702.91
89+97	3710.44	98+37	3702.77

RDG
A DIVISION OF SWCA
NOW PART OF SWCA
236 Wisconsin Avenue
Whitefish, MT 59937
406.862.3627
311 SW Jefferson Avenue
Corvallis, OR 97333
541.738.2500

DATA SHEET
STA 80+00 - 98+50
UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER
RDG-23-188

DRAWING NUMBER
4.1

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2024-2025

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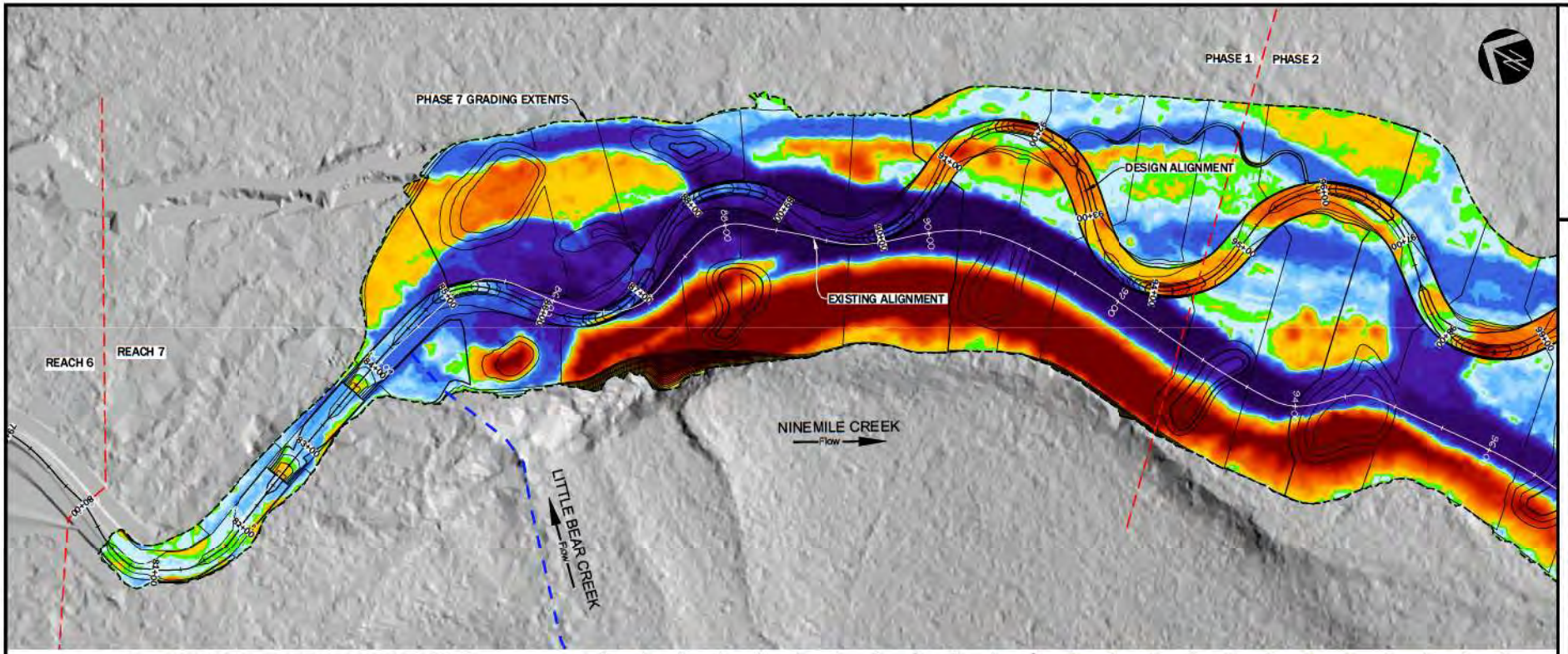
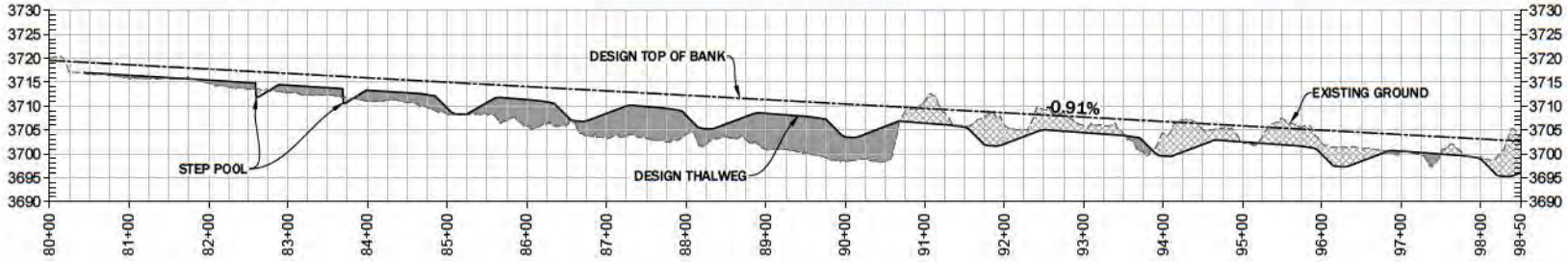


1 NINEMILE CREEK GRADING PLAN
PLAN VIEW
1" = 100'

< -9.0' -8.0' -7.0' -6.0' -5.0' -4.0' -3.0' -2.5' -2.0' -1.5' -1.0' -0.3' 0.3' 1.0' 1.5' 2.0' 2.5 3.0' 4.0' 5.0' 6.0' 7.0' 8.0' 9.0' >

CUT FILL

EXISTING GROUND COMPARED TO RDG DESIGN SURFACE



2 NINEMILE CREEK GRADING
PROFILE VIEW
HOR: 1" = 150'
VER: 1" = 25'

LEGEND
- EXISTING GRADE (EG)
- FINISHED GRADE (FG)
- BANKFULL (FG)
- CUT
- FILL

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236 Wisconsin Avenue Whitefish, MT 59937 406.862.3627
311 SW Jefferson Avenue Corvallis, OR 97333 541.738.2500

GRADING PLAN AND PROFILE STA 80+00 - 98+50
UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER RDG-23-188
DRAWING NUMBER 4.2
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Ninemile Creek Restoration Phase 7
2024-2025

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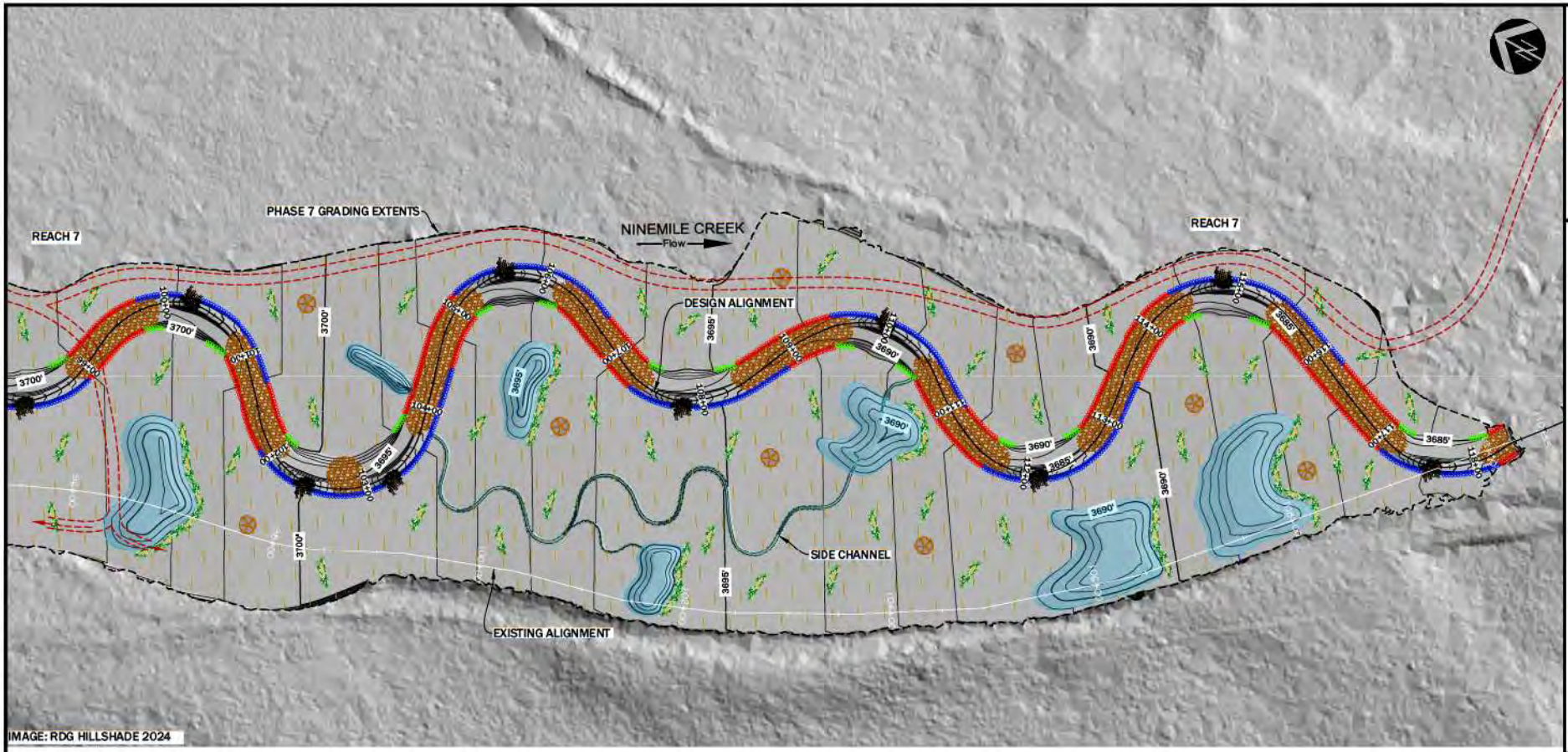

1 NINEMILE CREEK STRUCTURE LAYOUT
PLAN VIEW

1" = 100'

DRAWING LEGEND	
SYMBOL	
	REACH BREAK
	TEMPORARY ACCESS ROAD
	LARGE WOOD STRUCTURE
	VEGETATED WOOD MATRIX TYPE 1
	VEGETATED WOOD MATRIX TYPE 2
	VEGETATED WOOD MATRIX TYPE 3
	CONSTRUCTED CHANNEL STREAMBED
	WILDLIFE SNAG
	VEGETATED BRUSH TRENCH
	FLOODPLAIN TREATMENT
	CONSTRUCTED WETLAND

RDG RIVER DESIGN GROUP
NOW PART OF SWCA ENVIRONMENTAL CONSULTANTS
236 Wisconsin Avenue Whitefish, MT 59937 406.862.3427
311 SW Jefferson Avenue Corvallis, OR 97333 541.738.2520

PLAN VIEW AND STRUCTURE LAYOUT
STA 98+50 - 118+40
UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER RDG-23-188

DRAWING NUMBER 4.3

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2024-2025

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STRUCTURE SCHEDULE			
STATION START	STATION END	BANK	STRUCTURE
98+65	99+95	CCS	C
98+65	98+93	VWM 3	L
98+93	99+73	VWM 1	L
99+33	99+73	VWM 1	R
99+73	100+15	VWM 2	L
99+73	99+95	VWM 3	R
100+15	100+35	LWS	L
100+35	101+39	VWM 2	L
100+61	102+11	CCS	C
100+61	100+88	VWM 3	R
100+88	101+90	VWM 1	R
101+39	101+90	VWM 1	L
101+90	102+32	VWM 2	R
101+90	102+11	VWM 3	L
102+32	102+52	LWS	R
102+52	103+15	VWM 2	R
102+61	103+05	CCS	C
103+15	103+35	LWS	R
103+35	104+48	VWM 2	R
103+61	105+30	CCS	C
103+61	103+88	VWM 3	L
103+88	105+08	VWM 1	L
104+48	105+08	VWM 1	R

STRUCTURE SCHEDULE			
STATION START	STATION END	BANK	STRUCTURE
105+08	105+51	VWM 2	L
105+08	105+30	VWM 3	R
105+51	105+71	LWS	L
105+71	106+77	VWM 2	L
105+97	107+52	CCS	C
105+97	106+24	VWM 3	R
106+24	107+30	VWM 1	R
106+77	107+30	VWM 1	L
107+30	107+72	VWM 2	R
107+30	107+52	VWM 3	L
107+72	107+92	LWS	R
107+92	108+95	VWM 2	R
108+17	109+66	CCS	C
108+17	108+44	VWM 3	L
108+44	109+45	VWM 1	L
108+95	109+45	VWM 1	R
109+45	109+87	VWM 2	L
109+45	109+66	VWM 3	R
109+87	110+07	LWS	L
110+07	111+10	VWM 2	L
110+33	111+82	CCS	C
110+33	110+60	VWM 3	R
110+60	111+60	VWM 1	R

STRUCTURE SCHEDULE			
STATION START	STATION END	BANK	STRUCTURE
111+10	111+60	VWM 1	L
111+60	112+02	VWM 2	R
111+60	111+82	VWM 3	L
112+02	112+22	LWS	R
112+22	113+55	VWM 2	R
112+48	114+54	CCS	C
112+48	112+76	VWM 3	L
112+76	114+33	VWM 1	L
113+55	114+33	VWM 1	R
114+33	114+74	VWM 2	L
114+33	114+54	VWM 3	R
114+74	114+94	LWS	L
114+94	116+28	VWM 2	L
115+20	117+29	CCS	C
115+20	115+47	VWM 3	R
115+47	117+08	VWM 1	R
116+28	117+08	VWM 1	L
117+08	117+49	VWM 2	R
117+08	117+29	VWM 3	L
117+49	117+69	LWS	R
117+69	118+21	VWM 2	R
117+94	118+21	VWM 3	L
118+21	118+40	VWM 1	R
118+21	118+40	VWM 1	L

CHANNEL TOP OF BANK ELEVATIONS	
STATION START	ELEVATIONS (FT)
99+95	3701.33
100+17	3701.12
100+33	3700.98
100+88	3700.48
101+90	3699.54
102+11	3699.35
102+33	3699.15
102+50	3699.00
102+72	3698.80
102+94	3698.60
103+16	3698.39
103+33	3698.24
103+88	3697.74
105+08	3696.64
105+30	3696.44
105+52	3696.24
105+69	3696.08
106+24	3695.58
107+30	3694.52
107+52	3694.30
107+73	3694.09
107+90	3693.92
108+44	3693.38

CHANNEL TOP OF BANK ELEVATIONS	
STATION START	ELEVATIONS (FT)
109+45	3692.36
109+66	3692.15
109+88	3691.93
110+05	3691.76
110+60	3691.21
111+60	3690.21
111+82	3689.99
112+04	3689.77
112+20	3689.61
112+76	3689.05
114+33	3687.47
114+54	3687.26
114+76	3687.04
114+92	3686.88
115+47	3686.28
117+08	3684.52
117+29	3684.29
117+50	3684.06
117+67	3683.88
118+11	3683.39

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406.862.3627
311 SW Jefferson Avenue
Corvallis, OR 97333
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DATA SHEET

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER
RDG-23-188

DRAWING NUMBER
4.4

Drawing 12 of 24

2024-2025

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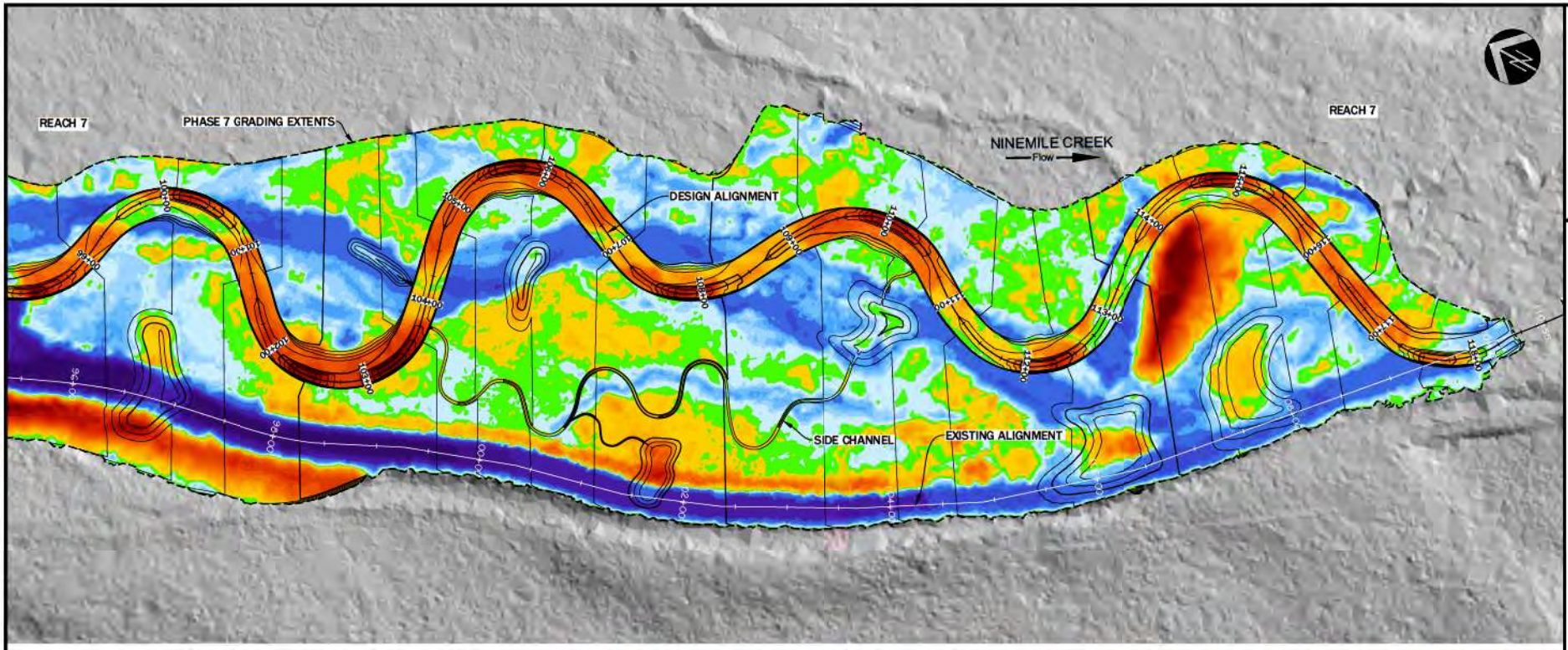
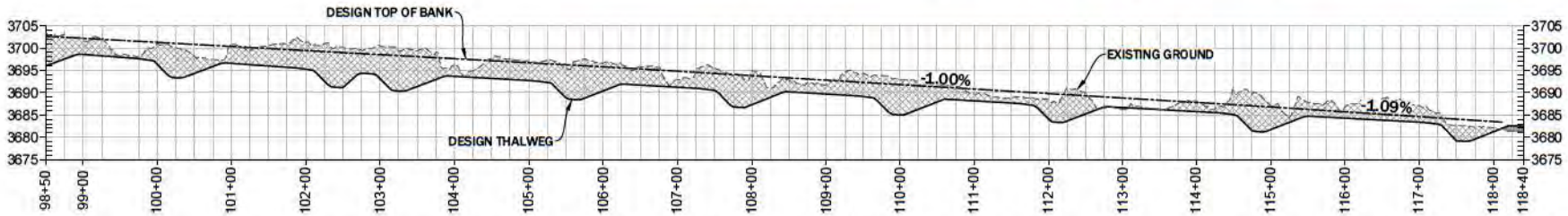


1 NINEMILE CREEK GRADING PLAN
PLAN VIEW
1" = 100'

< -9.0' -8.0' -7.0' -6.0' -5.0' -4.0' -3.0' -2.5' -2.0' -1.5' -1.0' -0.3' 0.3' 1.0' 1.5' 2.0' 2.5 3.0' 4.0' 5.0' 6.0' 7.0' 8.0' 9.0' >

CUT FILL

EXISTING GROUND COMPARED TO RDG DESIGN SURFACE



2 NINEMILE CREEK GRADING
PROFILE VIEW
HOR: 1" = 150'
VER: 1" = 25'

LEGEND
- EXISTING GRADE (EG)
- FINISHED GRADE (FG)
- BANKFULL (FG)
- CUT
- FILL

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Corvallis, OR 97333
541.738.2500
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GRADING PLAN AND PROFILE STA 98+50-118+40

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER
RDG-23-188

DRAWING NUMBER
4.5

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Ninemile Creek Restoration Phase 7 2024-2025

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CROSS SECTIONS

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
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DRAWING NUMBER
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BANKFULL CHANNEL HYDRAULIC DESIGN CRITERIA	
Stream Type	C3/4 (Cobble/Gravel Bed)
Valley Type	Terraced Alluvial Valley
Bankfull Discharge	265 cfs (+/-15cfs)
Valley Slope	0.013 ft/ft
Sinuosity	1.35
Channel Slope	0.01 ft/ft
Reach Average Slope	0.01 ft/ft
Bed Shear Stress	0.77 lbs/ft2
Mobile Particle Size	125 mm - 155 mm (LC-SB)
Mean Velocity	3.3 fps - 3.6 fps

PARTICLE SIZE DISTRIBUTION			
	Proposed		
Size Class	**Millimeter**	**Inches**	**% Passing**
D16	12	0.5	10-30
D35	25.4	1	30-50
D50	50	2	50-65
D65	80	3	65-85
D84	110	4	85-90
D95	135	5	90-95
D100	160	6	95

PLANFORM GEOMETRY DESIGN CRITERIA		
Variable	**Value (ft)**	**Dimensionless Ratio**
Bankfull Width	30	
Radius of Curvature		
Average	98	3.25
Range (Low)	75	2.5
Range (High)	120	4.0
Meander Length		
Average	420	14.0
Range (Low)	300	10.0
Range (High)	540	18.0
Belt Width		
Average	240	8.0
Range (Low)	60	2.0
Range (High)	420	14.0
Sinuosity	1.3	

LONGITUDINAL PROFILE DESIGN CRITERIA				
Variable	**Feature Length (ft)**	**Dimensionless Ratio***	**Slope Range (ft/ft)**	**Dimensionless Ratio****
Riffle				
Average	84	2.8	0.0171	1.9
Range (Low)	28	1.0	0.0126	1.4
Range (High)	144	4.5	0.0216	2.4
Run				
Average	30	1.0	0.0162	1.8
Range (Low)	22	0.8	0.0099	1.1
Range (High)	38	1.2	0.0225	2.5
Pool				
Average	75	2.5	0.0018	0.2
Range (Low)	28	1.0	0.0009	0.1
Range (High)	144	4.5	0.0027	0.3
Glide				
Average	35	1.15	0.0014	0.15
Range (Low)	31	1.1	0.0009	0.1
Range (High)	42	1.3	0.0018	0.2
Pool Spacing				
Average	150	5.0		
Range (Low)	84	3.0	N/A	N/A
Range (High)	256	8.0		

* Relative to bankfull riffle width (30 ft).

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DESIGN CRITERIA

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
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PROJECT NUMBER RDG-23-188

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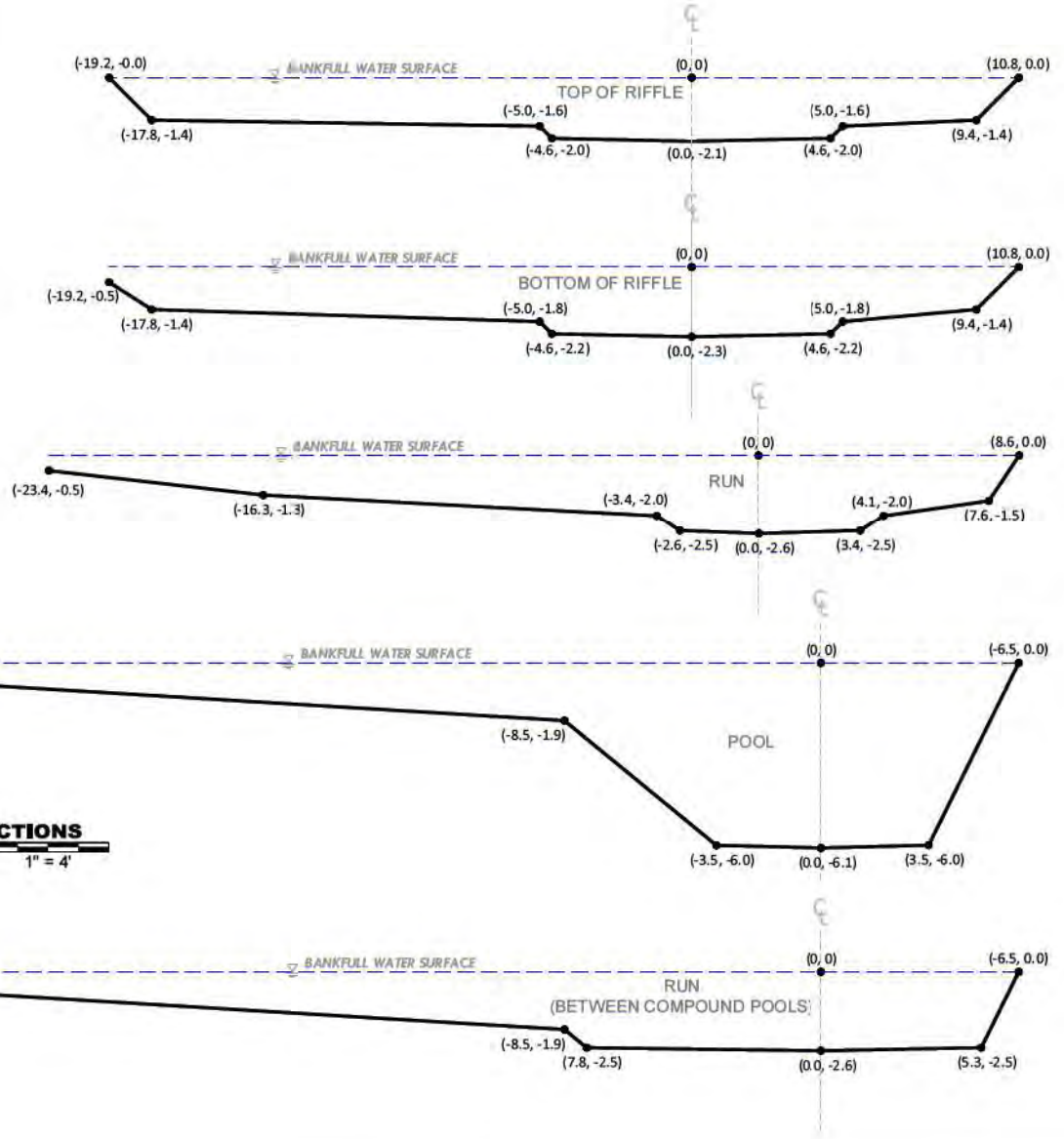
BANKFULL CROSS SECTION DESIGN CRITERIA				
	Riffle Value (ft)	Run Value (ft)	Pool Value (ft)	Glide Value (ft)
Area	45	47	56	52
Range (Low)	42	36	50	41
Range (High)	48	54	63	63
Width/Depth Ratio	20	16	-	26
Range (Low)	19	11	-	21
Range (High)	21	23	-	35
Width				
Average	30	32	38	36
Range (Low)	28	24	33	33
Range (High)	32	39	42	39
Avg. Depth				
Average	1.5	2.0	1.5	1.4
Range (Low)	1.4	1.7	1.3	1.1
Range (High)	1.6	2.3	1.7	1.6
Max.Depth				
Average	2.1	3.0	4.7	2.1
Range (Low)	2.0	2.4	4.2	1.8
Range (High)	2.3	3.5	5.3	2.4
Scour Depth	3.0	3.8	6.0	3.0



1 NINEMILE CREEK DESIGN CHANNEL CROSS SECTIONS
SECTION VIEW
1" = 4'

NOTE: COORDINATES ARE REFERENCED FROM TOP OF BANK THALWEG

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CHANNEL CROSS SECTION DIMENSIONS

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER
RDG-23-188

DRAWING NUMBER
6.1

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2024-2025

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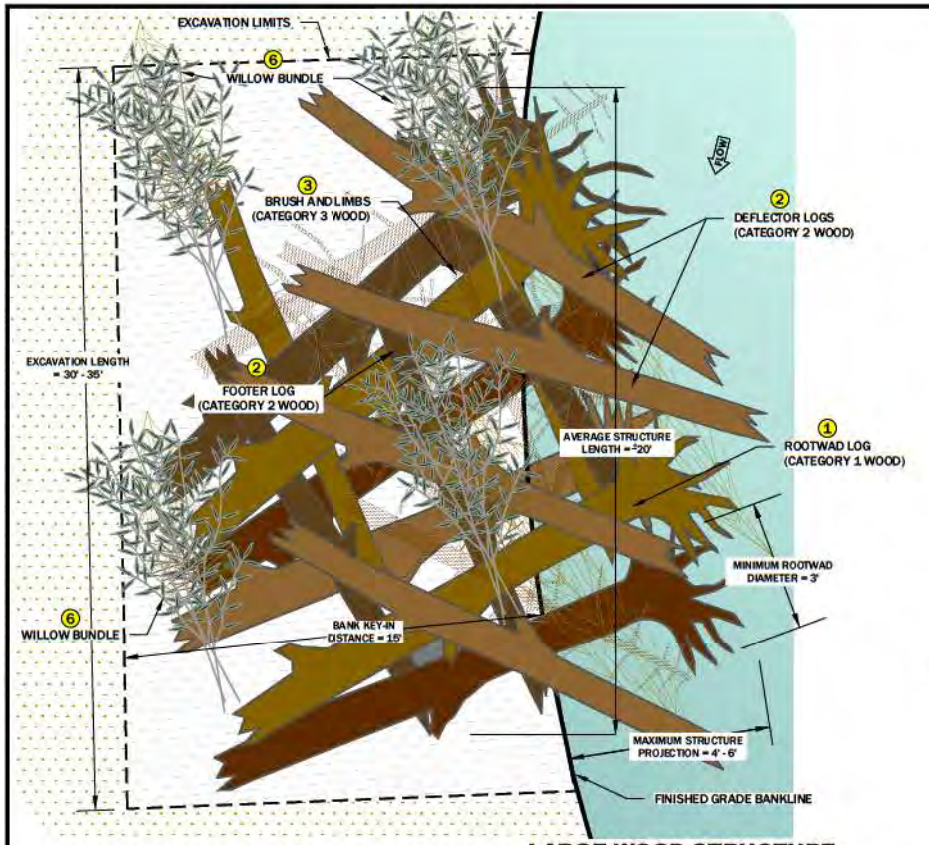
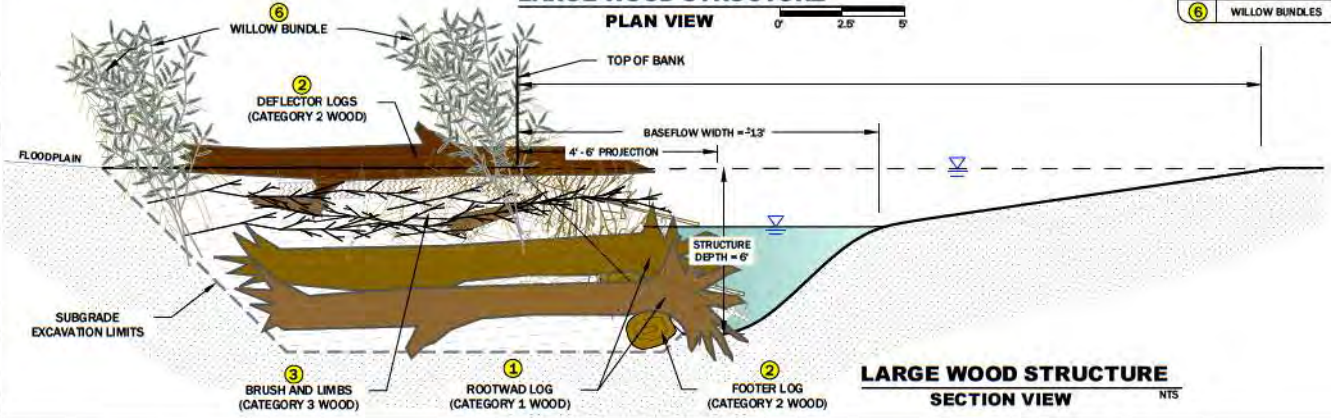


LARGE WOOD STRUCTURE
PLAN VIEW
0' 2.5' 5'



LARGE WOOD STRUCTURE
SECTION VIEW
NTS

GENERAL NOTES

1. CONSTRUCTION OF THE LARGE WOOD STRUCTURE WILL OCCUR BEFORE THE CONSTRUCTED CHANNEL STREAMBED AND VEGETATED WOOD MATRIX BANK TREATMENTS ARE INSTALLED. INSTALLATION OF FLOODPLAIN TREATMENT SHALL BE COMPLETED AFTER THE LARGE WOOD STRUCTURES ARE INSTALLED.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY THE CONSTRUCTION MANAGER.
3. CONSTRUCTION MANAGER SHALL MARK THE GENERAL CONSTRUCTION LOCATION FOR EACH LARGE WOOD STRUCTURE PRIOR TO CONSTRUCTION.

NOTES ON LARGE WOOD STRUCTURE INSTALLATION

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 INTO THE DESIGN CHANNEL NO GREATER THEN 3 FEET OR AT DISTANCE DIRECTED BY THE CONSTRUCTION MANAGER. 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 FOUR TO FIVE 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 4 - 6 FT. BEYOND THE FINISHED BANK LINE.
4. BACKFILL TRENCH WITH STOCKPILED MATERIAL UP TO THE TOP OF THE ROOTWAD LOGS. BACKFILL SHALL BE BUCKET COMPACTED.
5. INSTALL BRUSH AND LIMBS (CATEGORY 3 WOOD) AT APPROXIMATE 45° ANGLE TO FOOTWAD STEMS. BRUSH AND LIMBS SHALL PROJECT NO GREATER THAN 4 - 6 FT. BEYOND THE FINISHED BANK LINE.
6. INSTALL FOUR TO FIVE ROOTWAD LOGS (CATEGORY 1 WOOD) ON TOP OF THE BRUSH AND LIMBS AT THE ORIENTATION NOTED IN PLAN VIEW. THE TOP OF THE ROOTWAD STEMS SHALL SIT AT OR BELOW BASEFLOW ELEVATION (BANKFULL MINUS 2.4). 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 4 - 6 FT. BEYOND THE FINISHED BANK LINE.
7. INSTALL BRUSH AND LIMBS (CATEGORY 3 WOOD) UP TO TOP OF BANK AT APPROXIMATE 45° ANGLE TO ROOTWAD STEMS. BRUSH AND LIMBS SHALL PROJECT NO GREATER THAN 4 - 6 FT. BEYOND THE FINISHED BANK LINE.
8. PLACE FOUR WILLOW BUNDLES INTERWOVEN INTO WOOD MATRIX AS SHOWN IN THE PLAN VIEW. WILLOW BUNDLES SHALL BE SET AS TO BE IN CONTACT WITH LOW FLOW WATER SURFACE ELEVATION.
9. BACKFILL STRUCTURE WITH STOCKPILED MATERIAL UP TO THE TOP OF BANK LINE ELEVATION. BACKFILL SHALL BE BUCKET COMPACTED.
10. INSTALL THREE TO FOUR DEFLECTOR LOGS (CATEGORY 2 WOOD) AT APPROXIMATE 45° ANGLE TO ROOTWAD STEMS. TOP OF DEFLECTOR LOGS CAN BE UP TO 0.5 FT ABOVE TOP OF BANK ELEVATION AND SHALL PROJECT NO GREATER THAN 6 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.
11. PLACE AND BUCKET COMPACT STOCKPILED MATERIAL TO THE FINISHED BANK LINE. NO AREAS BEHIND THE FINISHED BANKLINE ARE TO BE LEFT BELOW FINISHED GRADE.

MATERIAL SCHEDULE (PER STRUCTURE)

	ITEM	DIA.	QUANTITY
1	CATEGORY 1 WOOD	12" - 18"	10
2	CATEGORY 2 WOOD	6" - 10"	6
3	CATEGORY 3 WOOD	< 3"	50
6	WILLOW BUNDLES	0.25" - 1"	8

EXAMPLE OF A LARGE WOOD STRUCTURE

NOW PART OF SWCA ENVIRONMENTAL CONSULTANTS
RDG WATER RESOURCE GROUP
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LARGE WOOD STRUCTURE DETAIL

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7
NEAR HUSON, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER RDG-23-188
DRAWING NUMBER 7.0
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Ninemile Creek Restoration Phase 7 024 2025

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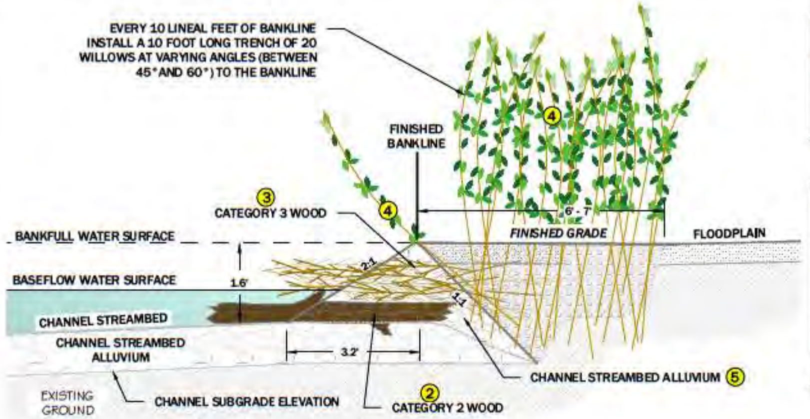
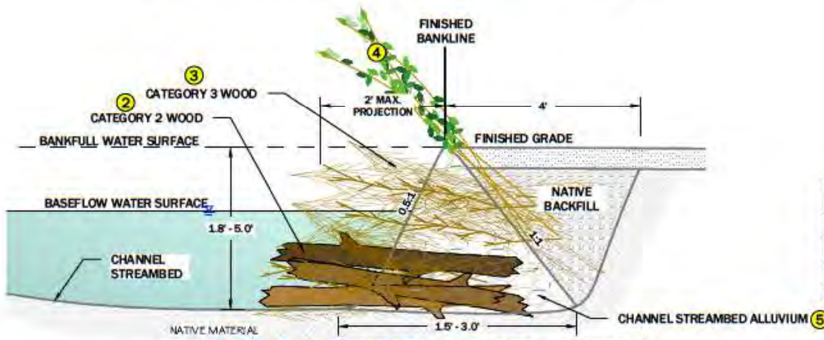
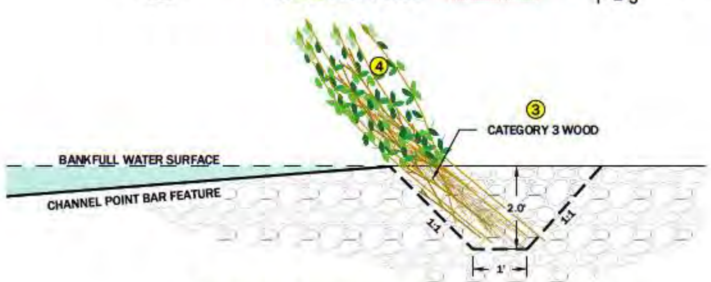


1 **VEGETATED WOOD MATRIX - TYPE 1**
SECTION VIEW PLAN VIEW KEY 1" = 3'



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



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

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

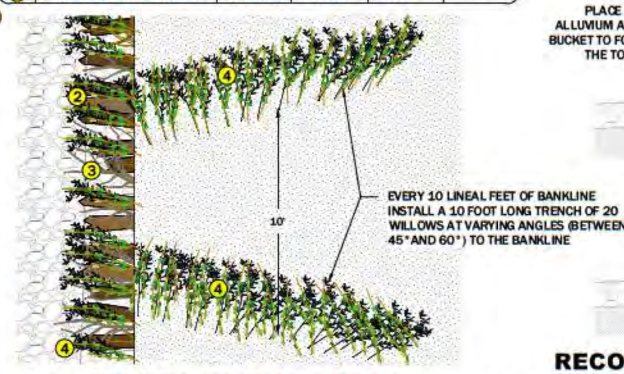
1. EXCAVATE TO THE EXCAVATION LIMITS AS SHOWN. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
2. PREPARE THE BENCH OF THE STRUCTURE BY PLACING CHANNEL STREAMBED ALLUVIUM FROM THE BASE OF THE EXCAVATION DEPTH/BOTTOM OF EXCAVATION TO WITHIN 1.0-FT. OF FINISHED 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

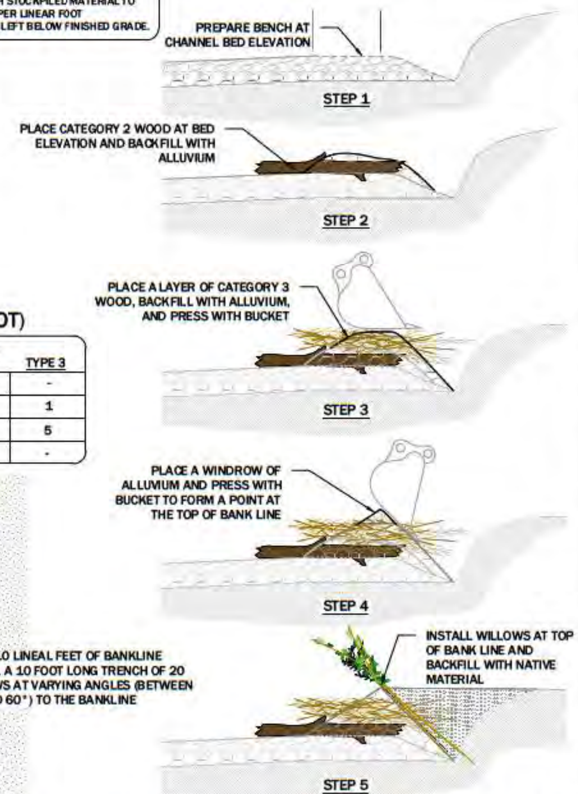
SIZE (INCHES)	PERCENT PASSING	REPRESENTATIVE SIZE CLASS
6	95	D100
5	90-95	D95
4	85-90	D84
3	65 - 85	D65
2	50 - 65	D50
1	30 - 50	D35
0.5	20 - 30	D15
FINES	20	

MATERIAL SCHEDULE (PER LINEAR FOOT)

	ITEM	DIA.	QUANTITY TYPE 1	TYPE 2	TYPE 3
2	CATEGORY 2 WOOD	3" - 6"	1	5	-
3	CATEGORY 3 WOOD	< 3"	2	8	1
4	WILLOW CUTTINGS	0.25" - 1"	5	5	5
5	STREAMBANK ALLUVIUM	6" MINUS	0.4 CY	1 CY	-



4 **WILLOW TRENCH DETAIL**
PLAN VIEW PLAN VIEW KEY 1" = 2'



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

VEGETATED WOOD MATRIX DETAIL
UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

Ninemile Creek Restoration Phase 7
NEAR HUSON, MONTANA

RDG RIVER DESIGN GROUP
NOW PART OF SWCA ENVIRONMENTAL CONSULTANTS
236 Wisconsin Avenue, Whitefish, MT 59937, 406.862.4927
311 SW Jefferson Avenue, Corvallis, OR 97333, 541.738.2920

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER RDG-23-188
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0-24-2025

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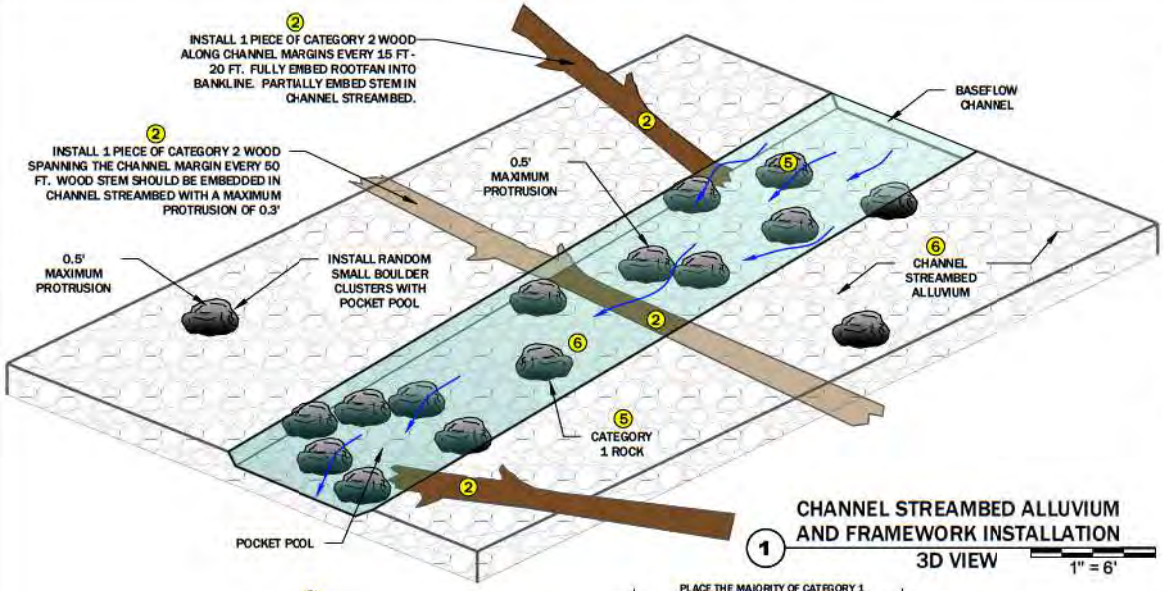
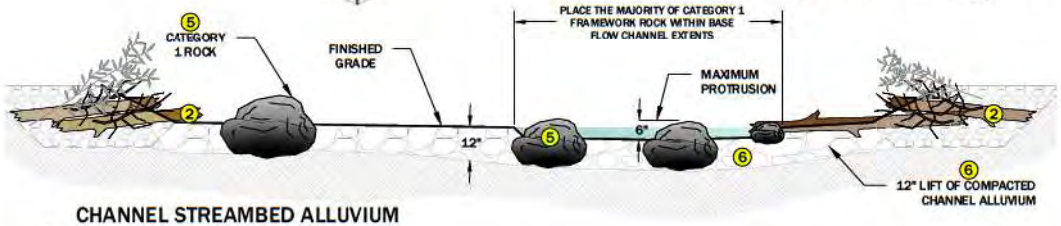


1 CHANNEL STREAMBED ALLUVIUM AND FRAMEWORK INSTALLATION
3D VIEW 1" = 6'



2 CHANNEL STREAMBED ALLUVIUM AND FRAMEWORK INSTALLATION
SECTION VIEW 1" = 5'

GENERAL NOTES

1. CONSTRUCTION OF THE CHANNEL STREAMBED WILL OCCUR AFTER THE CHANNEL SUBGRADE IS PREPARED.
2. ANY CHANGES TO THE CONSTRICTION SEQUENCE MUST BE APPROVED THE CONSTRUCTION MANAGER.
3. IT IS THE CONTRACTORS RESPONSIBILITY TO CUT WOOD INTO APPROPRIATE SIZE LENGTHS TO FIT STRUCTURE DIMENSIONS.
4. CONTRACTOR SHALL MARK THE UPSTREAM AND DOWNSTREAM EXTENTS OF THE LOCATIONS OF THE CONSTRUCTED CHANNEL STREAMBED STRUCTURES.

NOTES ON CONSTRUCTED CHANNEL STREAMBED INSTALLATION

1. 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.
2. CONTRACTOR SHALL STOCKPILE CHANNEL ALLUVIUM PER SPECIFICATIONS NOTED ON THE DRAWING.
3. PREPARE THE FRAMEWORK. CONTRACTOR SHALL PLACE 12-INCH TO 18-INCH BOULDERS (CATEGORY 1 ROCK) ON THE SURFACE OF THE CHANNEL SUBGRADE PRIMARILY WITHIN THE LOW FLOW CHANNEL AS INDICATED ON THE DRAWING. DUE TO THE INHERENT VARIABILITY IN MATERIALS, BOULDER ELEVATIONS SHALL BE ADJUSTED TO ASSURE BOULDER PROTRUSION ABOVE FINISH GRADE WILL BE NO GREATER THAN 0.5-FT.
4. CONTRACTOR MAY INSTALL 12-INCH TO 18-INCH BOULDERS (CATEGORY 1 ROCK) IN CLUSTERS, AS DIRECTED BY THE CONSTRUCTION MANAGER, TO CREATE A COMPLEX SERIES OF POCKET POOLS THAT EFFECTIVELY DISSIPATE ENERGY AND PROVIDE PATHWAYS FOR FISH MOVEMENT. BOULDER ELEVATIONS SHALL BE ADJUSTED TO ASSURE BOULDER PROTRUSION ABOVE FINISH GRADE IS NO GREATER THAN 0.5-FT.
5. CONTRACTOR SHALL INSTALL CHANNEL SPANNING WOOD (CATEGORY 2 WOOD) AND CHANNEL MARGIN WOOD (CATEGORY 2 WOOD) TO PROVIDE AQUATIC HABITAT COMPLEXITY AND ROUGHNESS. CHANNEL SPANNING WOOD SHALL BE INSTALLED INTO THE BED PERPENDICULAR TO FLOW WITH A MAXIMUM PROJECTION OF 0.3'. CHANNEL MARGIN WOOD SHALL PROJECT NO GREATER THAN 8 FEET INTO THE CONSTRUCTED STREAMBED IN VARIOUS ORIENTATIONS TO FLOW, AS DIRECTED BY CONSTRUCTION MANAGER. CHANNEL MARGIN WOOD SHALL BE EMBEDDED INTO THE CHANNEL STREAMBED A MINIMUM OF ONE-HALF THE LOG DIAMETER, AS SHOWN ON THE DRAWINGS.
6. PREPARE THE MATRIX. AFTER THE FRAMEWORK, WOOD, BOULDER CLUSTERS, AND SMALL BOULDER RIBS ARE INSTALLED AND INSPECTED BY CONSTRUCTION MANAGER, PLACE APPROPRIATE CHANNEL STREAMBED ALLUVIUM GRADATION AND WASH FINES INTO STREAMBED. CHANNEL STREAMED ALLUVIUM SHALL BE PLACED TO THE FULL COURSE THICKNESS OF 12-INCHES TO FINISHED GRADE.

STREAMBED ALLUVIUM GRADATION

SIZE (INCHES)	PERCENT PASSING	REPRESENTATIVE SIZE CLASS
6	95	D100
5	90-95	D95
4	85-90	D84
3	65 - 85	D65
2	50 - 65	D50
1	30 - 50	D35
0.5	20 - 30	D15
FINES	20	

MATERIAL SCHEDULE (PER LINEAR FOOT)

	ITEM	DIA.	QUANTITY
5	CATEGORY 1 ROCK	12" - 18"	0.8 EA
6	CHANNEL STREAMBED ALLUVIUM	8" MINUS	1.0 CY
2	CATEGORY 2 WOOD	3" - 6"	0.1 EA


TYPICAL CONSTRUCTED STREAMBED THROUGH A RIFFLE FEATURE


TYPICAL CONSTRUCTED STREAMBED THROUGH A RUN FEATURE

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235 Wisconsin Avenue 311 SW Jefferson Avenue
Whitefish, MT 59937 Corvallis, OR 97333
406.862.4927 541.799.2929

CONSTRUCTED CHANNEL STREAMBED DETAIL

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER RDG-23-188

DRAWING NUMBER 7.2

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Ninemile Creek Restoration Phase 7

02-12-2025

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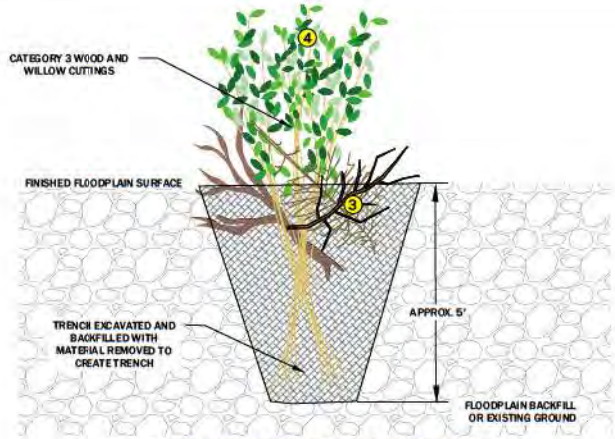


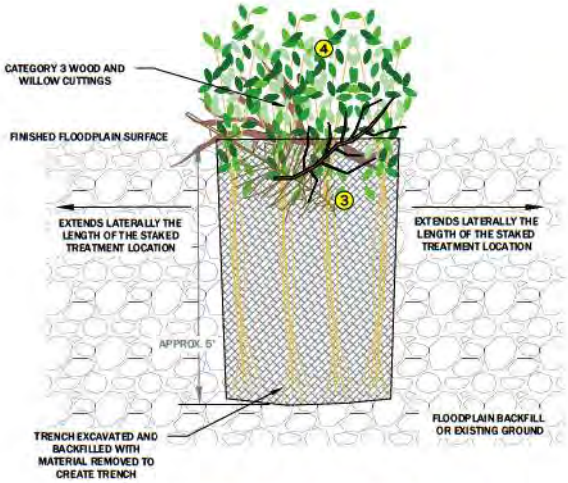
1 VEGETATED BRUSH TRENCH PROFILE VIEW NTS

GENERAL NOTES

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.

NOTES ON VEGETATED BRUSH TRENCH INSTALLATION

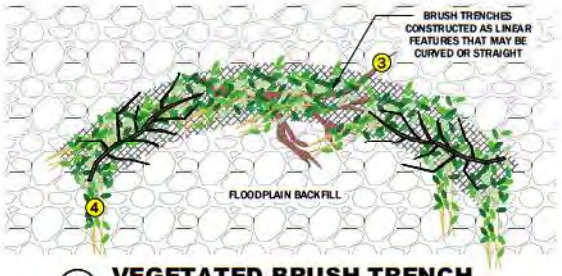
1. VEGETATED BRUSH TRENCHES WILL BE CONSTRUCTED WITHIN THE FLOODPLAIN AT THE DIRECTION OF THE CONSTRUCTION MANAGER.
2. A TRENCH WILL BE CONSTRUCTED APPROXIMATELY 5' DEEP AND EXTEND THE LENGTH OF THE STAKED TREATMENT LOCATION. LIVE WILLOW CUTTINGS AND CATEGORY 3 WOOD WILL BE PLACED IN THE TRENCH SUCH THAT THEY ARE INTERMIXED AND ORIENTED AT A NEAR VERTICAL ANGLE.
3. 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.



2 VEGETATED BRUSH TRENCH SECTION VIEW NTS

MATERIAL SCHEDULE (PER LINEAR FOOT)

	ITEM	DIA.	QUANTITY
3	CATEGORY 3 WOOD	< 3"	3
4	WILLOW CUTTINGS	0.25" - 1"	5



3 VEGETATED BRUSH TRENCH PLAN VIEW NTS

EXAMPLE OF A VEGETATED BRUSH TRENCH INSTALLATION

EXAMPLE OF A CONSTRUCTED VEGETATED BRUSH TRENCH

RDG A SWCA COMPANY
235 Wisconsin Avenue Whitefish, MT 59937 406.862.4927
311 SW Jefferson Avenue Corvallis, OR 97333 541.738.2920

VEGETATED BRUSH TRENCH DETAIL

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

NEAR HUSON, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
x	12/01/24	LS	Final Design	NW

PROJECT NUMBER RDG-23-188

DRAWING NUMBER 7.3

Drawing 20 of 24

Ninemile Creek Restoration Phase 7 2024-2025

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GENERAL NOTES

1. CONSTRUCTION OF THE WILDLIFE SNAGS WILL OCCUR AFTER THE SIDE CHANNEL AND FLOODPLAIN SUBGRADE BACKFILL IS PLACED AND THE CHANNEL STREAMBED IS CONSTRUCTED.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY THE ENGINEER.
3. FIELD ENGINEER SHALL MARK THE GENERAL CONSTRUCTION LOCATION FOR EACH WILDLIFE SNAG PRIOR TO CONSTRUCTION.

NOTES ON WILDLIFE SNAG INSTALLATION

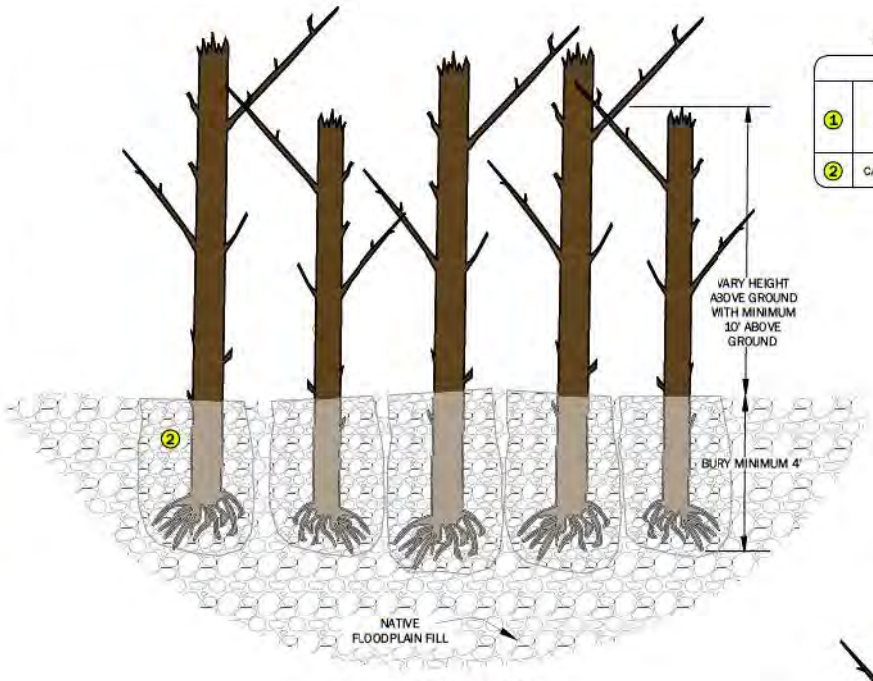
1. TRANSPORT SNAG TREES FROM DESIGNATED STOCKPILE AREAS TO THE TREATMENT SITES DESIGNATED BY CONSTRUCTION MANAGER.
2. INSTALL WILDLIFE SNAGS IN THE FLOODPLAIN SO THEY STAND VERTICALLY WITH NO LEAN AND WILL STAY STANDING AS THEY DECAY OVER TIME. DIG A HOLE A MINIMUM OF 4 FT DEEP AND LARGE ENOUGH FOR THE SNAG TO BE BACKFILLED WITH 6" PLUS COBBLE AND SOIL TO PROVIDE SUFFICIENT STABILITY. PLACE SNAG IN THE HOLE STANDING VERTICALLY AND BACKFILL UNTIL FLUSH WITH SURROUNDING FLOODPLAIN SURFACE.
3. SNAGS SHALL STAND A MINIMUM OF 10 FT ABOVE GROUND AFTER INSTALLATION.
4. INDIVIDUAL AND PODS OF SNAGS WILL BE INSTALLED AND THE LOCATION OF EACH TYPE WILL BE DIRECTED BY THE CONSTRUCTION MANAGER IN THE FIELD. SNAG PODS SHALL CONSIST OF 4-6 TREES PER POD WITH A MINIMUM OF 6 FT BETWEEN TREES.

EXAMPLE OF AN INSTALLED WILDLIFE SNAG

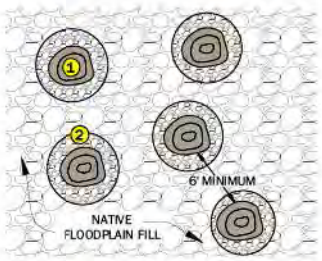
EXAMPLE OF AN INSTALLED WILDLIFE SNAG POD

WILDLIFE SNAG MATERIAL SCHEDULE (PER LINEAR FOOT)

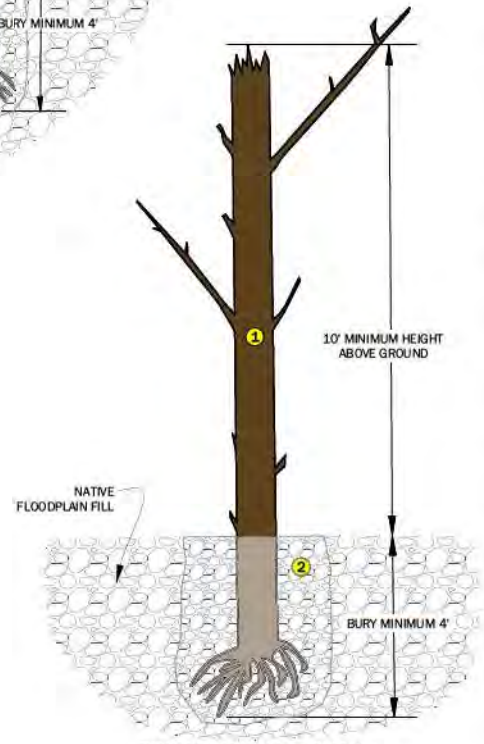
	ITEM	DIMENSIONS	QUANTITY
1	SNAG TREES	MIN. 12" DBH, MIN. 15' WITH ROOTWAD AND BRANCHES INTACT, MIX OF CONIFERS AND COTTONWOOD AS AVAILABLE	1 EA
2	CATEGORY 2 ROCK	6" PLUS COBBLE	1.5 CY



WILDLIFE SNAG POD
PROFILE VIEW



WILDLIFE SNAG POD
PLAN VIEW



SINGLE WILDLIFE SNAG
PROFILE VIEW

NOW PART OF SWCA
RDG
236 Wisconsin Avenue
Whitefish, MT 59937
406.862.4927
311 SW Jefferson Avenue
Corvallis, OR 97333
541.738.2920

WILDLIFE SNAG DETAILS

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

NEAR HUSON, MONTANA

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
x	12/01/24	LS	Final Design	NW

PROJECT NUMBER
RDG-23-188

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7.4

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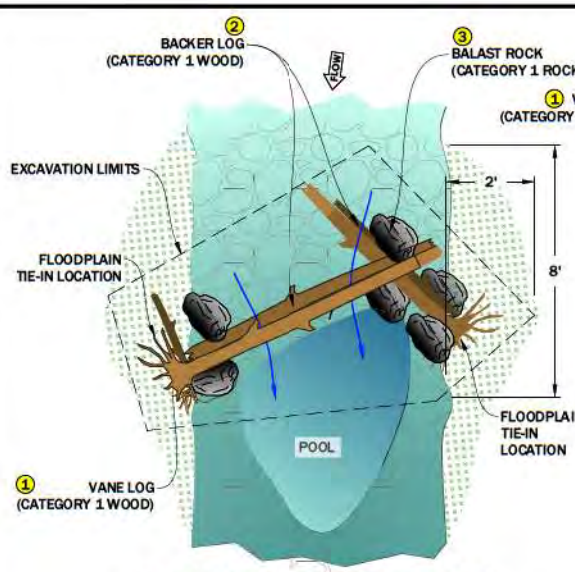
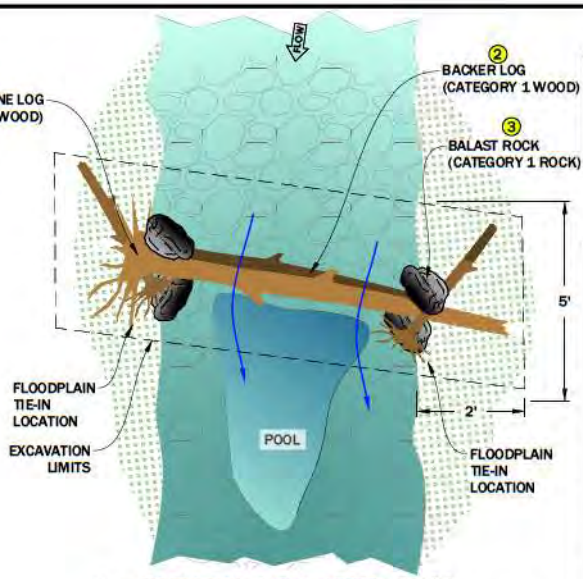
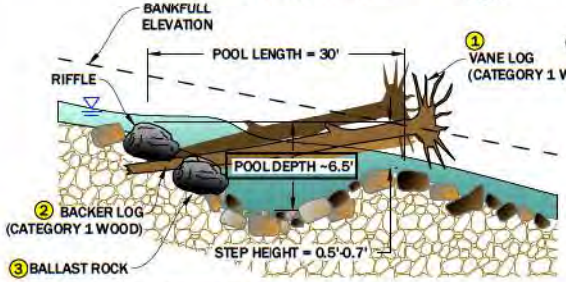


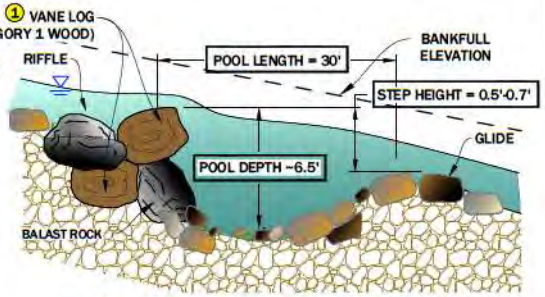
1 TYPICAL LOG STEP POOL PLAN VIEW NTS



3 TYPICAL LOG STEP POOL PLAN VIEW NTS



2 TYPICAL LOG STEP POOL PROFILE VIEW NTS



4 TYPICAL LOG STEP POOL PROFILE VIEW NTS

5 FILTER FABRIC DETAIL SECTION VIEW NTS

GENERAL NOTES

1. CONSTRUCTION OF THE CHANNEL LOG STEP POOL WILL OCCUR PRIOR TO THE CONSTRUCTED CHANNEL.
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 ENGINEER.
4. CONTRACTOR SHALL MARK AND ENGINEER SHALL APPROVE THE FLOODPLAIN AND CHANNEL STREAMBED TIE-IN LOCATIONS.

CONSTRUCTION NOTES

1. PRIOR TO CONSTRUCTION OF THE CHANNEL LOG STEP POOL, ENGINEER SHALL VERIFY CHANNEL SUBGRADE ELEVATIONS.
2. CONTRACTOR SHALL STOCKPILE WOOD AND ROCK PER SPECIFICATIONS NOTED ON THE DRAWINGS.
3. EXCAVATE TO THE EXCAVATION LIMITS. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
4. INSTALL VANE LOGS (CATEGORY 1 WOOD) AT THE FLOODPLAIN TIE-IN LOCATIONS AND TO THE ORIENTATIONS NOTED ON THE DRAWING. VANE LOGS SHALL BE PLACED ON CHANNEL ALLUVIUM AND THE ROOTWADS SHALL BE EMBEDDED INTO THE STREAMBANK A MINIMUM OF 2-FT. RELATIVE TO FINISHED BANK LINE.
5. ORIENT VANE LOGS IN CONTACT WITH THE CHANNEL STREAMBED AS SHOWN ON THE DRAWING. EMBED VANE LOG TIPS INTO THE CHANNEL STREAMBED A MINIMUM OF 3-FT. SLOPING AT AN ANGLE NO GREATER THAN 6% RELATIVE TO FLOODPLAIN ELEVATION. VANE LOG TIPS SHALL BE A MINIMUM OF 1-FT. BELOW THE CHANNEL STREAMBED FINISHED GRADE.
6. INSTALL BACKER LOGS (CATEGORY 1 WOOD) ON THE UPSTREAM SIDE OF THE VANE LOGS AS SHOWN ON THE DRAWINGS. BACKER LOGS SHALL BE FLUSH WITH THE VANE LOGS AND EXTEND FROM THE FLOODPLAIN TIE-IN LOCATIONS TO THE TIPS OF THE VANE LOGS.
7. INSTALL CATEGORY 1 ROCK UPSTREAM AND DOWNSTREAM OF THE STREAMBANK TIE-IN LOCATIONS AND VANE LOG TIPS. ROCK SHALL BE IN CONTACT WITH VANE LOGS AND BACKER LOGS TO PROVIDE BALLAST AND TO PREVENT THE STRUCTURE FROM SHIFTING WHILE THE STRUCTURE IS BACKFILLED.
8. ATTACH NON-WOVEN GEOTEXTILE FABRIC TO VANE LOGS AND EXTEND VERTICALLY TO THE MAXIMUM DEPTH OF THE POOL CHANNEL CROSS-SECTION ON THE UPSTREAM SIDE OF THE STRUCTURE, AS SHOWN ON DRAWING. BACKFILL VANE LOGS WITH EXCAVATED CHANNEL STREAMBED ALLUVIUM TO CHANNEL STREAMBED FINISHED GRADE.
9. REGRADE UPSTREAM AND DOWNSTREAM CHANNEL STREAMBED FINISHED GRADE ELEVATIONS. IF EXCESS MATERIAL IS SIDECAST IN POOL DURING CONSTRUCTION, CONTRACTOR SHALL RE-EXCAVATE POOL TO THE DESIGN DIMENSIONS AS APPROVED BY ENGINEER.

LOG STEP POOL STRUCTURE MATERIAL SCHEDULE (PER STRUCTURE)

	ITEM	DIA. (IN)	LENGTH (FT)	ROOTWAD (Y/N)	QTY.
1	CATEGORY 1 WOOD	12 - 18	30 - 35	Y	2 EA
2	CATEGORY 2 WOOD	10 - 12	20 - 25	Y	3 EA
3	CATEGORY 1 ROCK	18 - 24	-	-	6 EA
4	LF OF FILTER FABRIC	180	-	-	35 LF
5	2" RING SHANK NAILS	11 GA	0.1600	-	20 EA

EXAMPLE OF A CONSTRUCTED LOG STEP POOL

NOW PART OF SWCA ENVIRONMENTAL CONSULTANTS
RDG WATER RESOURCES GROUP
236 Wisconsin Avenue Whitefish, MT 59937 406.862.4927
311 SW Jefferson Avenue Corvallis, OR 97333 541.738.2920

LOG STEP POOL DETAIL

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

NEAR HUSON, MONTANA

Ninemile Creek Restoration Phase 7

NO.	DATE	BY	DESCRIPTION	CHK
x	12/01/24	LS	Final Design	NW

PROJECT NUMBER RDG-23-188

DRAWING NUMBER 7.5

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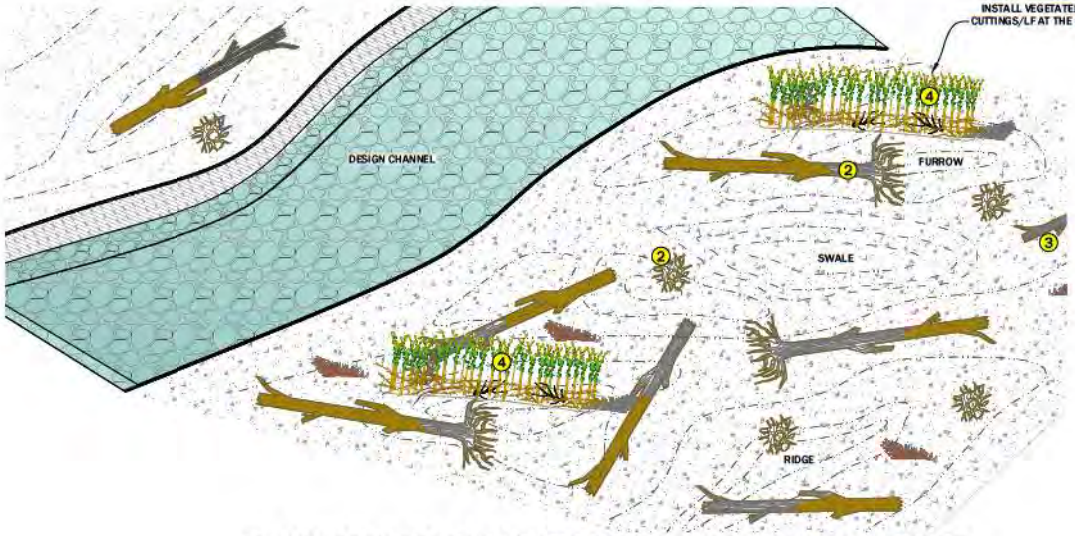


1 MICROTOPOGRAPHY AND FLOODPLAIN WOOD PLACEMENT
3D VIEW

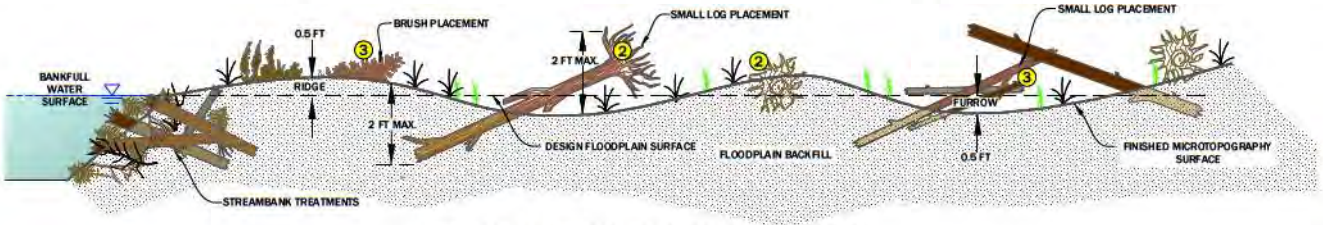
NTS

GENERAL NOTES

1. CONSTRUCTION OF FLOODPLAIN TREATMENT WILL OCCUR AFTER CONSTRUCTION OF THE CHANNEL STREAMBED, INSTALLATION OF LARGE WOOD STRUCTURE BANK TREATMENT, INSTALLATION OF VEGETATED WOOD MATRIX BANK TREATMENT.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY THE CONSTRUCTION MANAGER.

NOTES ON FLOODPLAIN ROUGHNESS INSTALLATION

1. CONTRACTOR SHALL DEVELOP MICROTOPOGRAPHY AND PLACE WOODY MATERIAL IN THE CONSTRUCTED FLOODPLAIN.
2. INSTALL VEGETATED BRUSH TRENCHES ACROSS THE FLOODPLAIN PER THE DIRECTION OF THE PROJECT MANAGER AND SHEET 7.3. BACKFILL TRENCH TO FLOODPLAIN GRADE AND COMPACT TO REMOVE ANY AIR VOIDS.
3. TRANSPORT CATEGORY 2, AND CATEGORY 3 WOOD FROM FROM DESIGNATED STOCKPILE AREAS. PLACE CATEGORY 2 WOOD AT A RATE OF 35 PIECES PER ACRE AND SPACED AT AN AVERAGE DISTANCE OF 20 FEET FROM OTHER CATEGORY 2 WOOD. PLACE CATEGORY 3 WOOD SO IT COVERS 25 PERCENT OF THE FLOODPLAIN SURFACE (APPROXIMATELY 250 PIECES PER ACRE).
4. BURY CATEGORY 2 WOOD WITHIN THE FLOODPLAIN SURFACE, WITH ONE HALF OF THE LENGTH BURIED TO A DEPTH OF 2-FT., AND ONE HALF EXPOSED A MAXIMUM OF 2-FT ABOVE FINISHED GRADE AS SHOWN ON DRAWING. PLACE CATEGORY 3 WOOD ON THE SURFACE. CATEGORY 3 WOOD DOES NOT NEED TO BE BURIED.
5. CONSTRUCT LOW AND HIGH FEATURES (RIDGES AND FURROWS) AS SHOWN ON THE DRAWINGS. MAXIMUM HEIGHT OF RIDGES AND DEPTH OF FURROWS SHALL BE NO GREATER THAN 0.5-FT. RELATIVE TO FINISHED FLOODPLAIN SURFACE.



2 FLOODPLAIN ROUGHNESS DETAIL
TYPICAL CROSS SECTION

NTS

MATERIAL SCHEDULE (PER ACRE)

	ITEM	DIA.	LENGTH	QUANTITY	UNIT
2	CATEGORY 2 WOOD	6" - 10"	10' - 12'	35	EA
3	CATEGORY 3 WOOD	<3"	10' - 12'	25	% COVER*
4	VEGETATED BRUSH TRENCH	SEE SHEET 7.4			

*APPROXIMATELY 250 PIECES/ACRE

EXAMPLE OF CONSTRUCTED FLOODPLAIN ROUGHNESS

EXAMPLE OF CONSTRUCTED FLOODPLAIN ROUGHNESS

EXAMPLE OF CONSTRUCTED FLOODPLAIN SWALE

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335 Wisconsin Avenue Whitefish, MT 59937 406.862.4927
311 SW Jefferson Avenue Corvallis, OR 97333 541.799.2929

FLOODPLAIN ROUGHNESS DETAIL

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

NINEMILE CREEK, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER
RDG-23-188

DRAWING NUMBER
7.6

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Ninemile Creek Restoration Phase 7

2024-2025

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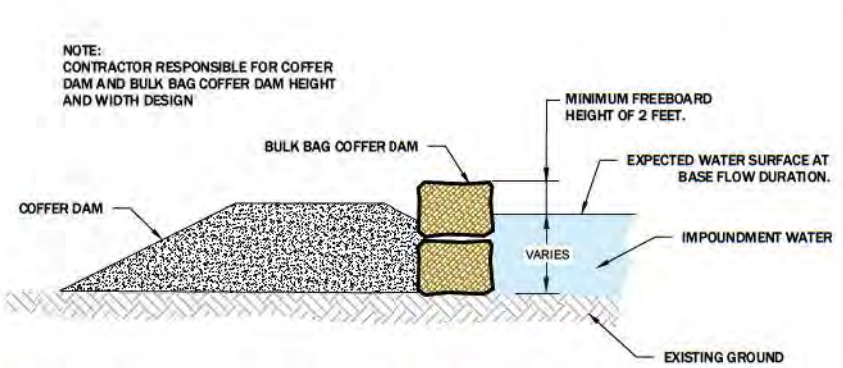
EXAMPLE OF BULK BAGS

EXAMPLE OF BULK BAG PLACEMENT



BULK BAG FILL GRADATION

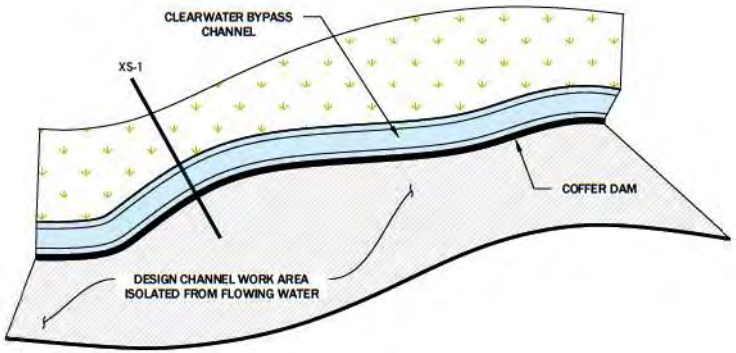
BULK PERCENTAGE	AVERAGE PARTICLE SIZE (INCHES)
20	1 1/2
30	3/4
30	1/2
20	3/8

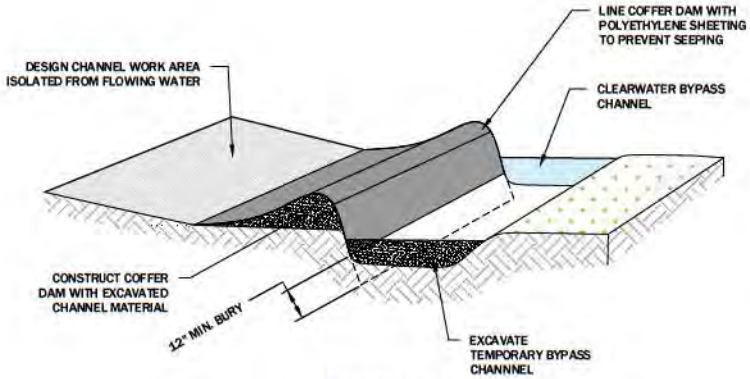
GENERAL NOTES:

1. WORK AREA TO BE ISOLATED USING COFFERDAMS CONSTRUCTED WITH BULK BAGS, SAND BAGS, OR APPROVED ALTERNATIVE. BULK BAGS ARE ALSO CALLED FLEXIBLE INTERMEDIATE BULK CONTAINERS (FIBC) THAT CAN BE CUSTOM MADE FROM VARIOUS FABRIC. THE FOLLOWING REQUIREMENTS ARE NECESSARY FOR THE RIVER ENVIRONMENT:
2. LARGE BULK BAGS SHALL BE CONSTRUCTED OF 8 oz WOVEN FABRIC, 1200 HOUR UV RESISTANT WITH SEWN LIFTING LOOPS. FILL MATERIAL SHALL BE COMPRISED OF SPAWNING GRAVEL AND MEET THE GRADATION SHOWN IN FILL GRADATION TABLE. THE BAGS ARE APPROXIMATELY 6' WIDE x 6' LONG x 4' HIGH WHEN FILLED.
3. SMALL BULK BAGS SHALL BE CONSTRUCTED OF 8 oz WOVEN FABRIC, 1200 HOUR UV RESISTANT WITH SEWN LIFTING LOOPS. FILL MATERIAL SHALL BE COMPRISED OF SPAWNING GRAVEL AND MEET THE GRADATION GIVEN BY THE CITY OF BOISE SPECIFICATIONS (SHOWN BELOW). THE BAGS ARE APPROXIMATELY 3' WIDE x 3' LONG x 2.5' HIGH WHEN FILLED.
4. BULK BAGS SHALL BE CAREFULLY PLACED TO ENSURE NO TEARING OR CUTTING OF THE BAGS OCCURS.
5. BULK BAGS SHALL BE PLACED USING A HYDRAULIC CRANE OR TRACKHOE USING LIFTING BARS AND STEEL CABLES TO EQUALIZE LOAD ON LIFTING LOOPS.

1 BULK BAG INSTALLATION
DETAIL NTS

REFER TO PLAN FOR PLACEMENT OF BMP'S





SECTION XS-1

2 TEMPORARY COFFER DAM WITH BYPASS CHANNEL
DETAIL NTS

REFER TO PLAN FOR PLACEMENT OF BMP'S

BMP DETAILS

UPPER NINEMILE CREEK RESTORATION PROJECT - REACH 7

NINEMILE VALLEY, MISSOULA COUNTY, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
x	1/15/25	LS	FINAL DESIGN	NW

PROJECT NUMBER
RDG-23-188

DRAWING NUMBER
7.7

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Ninemile Creek Restoration Phase 7

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