

General Information

Project Name

Applicant Name

Is your organization registered with the Montana Secretary of State?

Explanation: Each applicant must be registered with the Montana Secretary of State to do business in the state of Montana. Registration with the Secretary of State may be completed via the following website: <https://sosmt.gov/business/>

Is your organization registered with the federal System for Award Management (SAM)?

Explanation: Each applicant is required to register with SAM. To register or check your organization's status, go to <https://sam.gov/content/home>. If you get an "Unsupported Browser" error, copy, and paste the link into a Google Chrome browser window.

Primary Contact Title

Address City State Zip Code

Phone Number Email

Signature Digitally signed by Chris Edgington
Date: 2026.02.17 15:23:21 -07'00'

Explanation: This is the person who DEQ would routinely contact to discuss project progress, billing, etc.

Signatory Title

Address City State Zip Code

Phone Number Email

Signature Digitally signed by David Brooks
Date: 2026.02.18 07:23:43 -07'00'

Explanation: This is the person who can legally sign contracts and other binding documents on behalf of the applicant (e.g., a board chair)

Note: The primary contact, signatory and landowner must sign the application. Signatures must be either signed electronically, or wet-signed, scanned and sent electronically.

Landowner Name

Landowner Signature

Landowner Name

Landowner Signature Digitally signed by Jason Quigley
Date: 2026.02.17 13:07:20 -07'00'

Landowner Name

Landowner Signature

Explanation: Landowner signatures are required. **Signing the application does not obligate the landowner to implement a project.** Instead, it is an indication that the landowner has read the application and agrees, in principle, with the project concept and goals.

Your organization's Unique Entity Identifier number (UEI #)

VZCCVYH5DH7

Explanation: Each applicant is required to have a current UEI number. The UEI number replaces the old DUNS number. If your organization had a DUNS number, you should have received a notification from the federal government indicating that your DUNS number has been changed to a UEI number. If you did not receive this notification, or if you never had a DUNS number, you will need to go to the federal government's System for Award Management (SAM - <https://sam.gov/content/home>) to obtain your UEI number. DEQ recommends starting this process early as it is very time-consuming, requires providing documentation-sometimes with follow-up requests for additional information, and can take up to 2 months to complete. If you need assistance, you may contact the federal help desk at 866-606-8220 Monday-Friday 8:00 a.m. through 8:00 p.m. EST.

Does your organization have adequate liability insurance for the risks associated with your project?

Y

Explanation: Each applicant must have or obtain liability insurance coverage meeting the requirements stated in the Draft Sample Contract and/or requirements negotiated based on the appropriate level of risk associated with the project.

Describe the technical and administrative skills your organization will use to effectively and efficiently complete your proposed project(s).

Chris Edgington (MTU) has led this collaborative project for 5 years. He is responsible for, but not limited to, project management, contracting, stakeholder coordination, data collection, grant development and administration, project reporting, and education and outreach. Chris has 7 years of project management experience in stream restoration, fish barrier construction, and drought mitigation. He co-led the complex and remote, 5-phase Middle Fork Judith project, made possible with DEQ-319 funding and technical expertise.

Maggie Althaus has 6 years of experience as MTU's administrator. She maintains all of MTU's records and bookkeeping.

SWCA, formally River Design Group (RDG), was procured by MTU in 2021 to complete the initial PER, and 2023 for the final design. They are responsible for construction oversight. They performed these same duties on TU's Rattlesnake Dam removal in Missoula (Figure 7, 319 Figures & Data). Water and Environmental Technologies was procured in conjunction with RDG in 2023 to complete the Wetland Delineation and permit applications. They will be responsible for post-construction monitoring and reporting.

Budget Form

Please fill out the On-the-Ground Project Budget Template (Excel file). Cells highlighted in yellow may be edited to fit the needs of your particular project. DEQ uses a template to construct nonpoint source grant contracts. The Budget Template contains tasks and typical deliverables that match up with the grant contract template. Please see the Example Contract and Scope of Work Template for a more detailed look at typical task requirements and deliverables.

Project Form

A separate Project Form (including providing separate attachments) must be submitted for each project included in your application. Use the following examples to help determine when to lump and when to split projects.

Splitting Examples (fill out multiple Project Forms)

- Stream restoration work occurring on two separate streams..
- Two projects with significantly different sets of project partners.
- Two projects that address substantially different pollution sources (e.g., one project move a corral off of a streambank, and another removes mine tailings, with both projects being on the same property).

Lumping Examples

- Contiguous stream restoration work spanning multiple land parcels.
- Three projects that address similar sources of pollution on a single land parcel (e.g., moving a corral off a stream, implementing a grazing management plan, and relocating a manure storage facility out of the floodplain, all on the same ranch)

Project Form

A separate Project Form (including providing separate attachments) must be submitted for each project included in your application

Project Name:

Lower Boulder River - Shaw Dam Removal and Riparian Restoration

Required Attachments in Addition to This Form

- Letter of support from the organization that created or sponsored the creation of the DEQ-accepted Watershed Restoration Plan or the Tribe that created the EPA-approved Tribal Nonpoint Source Management Plan (if applicable).
- Letter of support from EACH landowner associated with the proposed project area (if applicable).
- Budget Table (see Microsoft Excel Template).
- Detailed Project site map(s)** Attach a map or set of maps showing the location and size of proposed activity if a site has been predetermined. The map scale must be between 1:1,000 and 1:12,500. The map(s) must have an aerial photo background (e.g., USDA NAIP photography, Google Earth imagery, etc.). The map(s) must show the latitude, longitude, site name, and landowner for the activity site. The map(s) should also identify waterbodies affected by the pollution that the activity is designed to address. *(This is in addition to adding points of the project location to the website on page 4).*

Optional Attachments

Attach additional items and information that could help reviewers better understand your project. Information could describe public health risks, opportunities to leverage other funding sources, etc. However, application reviewers may have limited time available, and excessively long, optional attachments might not get reviewed. Do not attach copies of TMDL documents, TMDL implementation evaluations, Watershed Restoration Plans, Tribal Nonpoint Source Plans, or large comprehensive studies. The following attachments may be included. Please no more than 20 pages.

- Project Design Plans/Drawings
- Preliminary Engineering Reports / Site Evaluations
- Landowner Agreements / Construction Permits / Floodplain Permits
- Site photos
- Additional Letters of Support
- Other:
- Other:
- Other:

Project Area

Please provide as detailed a description of the project area as possible.

List the counties in which the project will be located.

Jefferson

List the 12-digit Hydrologic Unit Codes (HUCs), sometimes referred to as Sixth Code HUCS, in which the project will take place. Use the following link to help assist you in determining the HUCs: <https://apps.nationalmap.gov/viewer/>

100200060509

Project Location Map

In addition to providing your own project site map, please go to the following website and follow the instructions to add your project location to the map.

<https://gis.mtdeq.us/portal/apps/storymaps/stories/42f4a668285c4ef6aa94b1623f10df57>

Connection to a Previous or Ongoing Project

Is this project tied to a previous or ongoing project? If so, please describe the connection.

Yes. To remove the Shaw Diversion Dam, the Cardwell head gate, and the associated irrigation ditches, the two water users, LR Huckaba Ranch and Golden Sunlight Mine (GSM), must update their irrigation systems. These upgrades require time-consuming, complex water rights changes with the DNRC and expensive irrigation upgrades, including in-stream pumps and pivots.

The most downstream (LR Huckaba) water user's Point of Diversion (POD) on the Shaw Ditch change application was approved by DNRC in December 2025 (available on request). Their POD is now located on the much warmer Jefferson Slough. A key component to improving water temperature and quality on the Boulder and Jefferson Rivers. Technical assistance was provided by Trout Unlimited at no cost to the LR Huckaba Ranch. Montana Trout Unlimited (MTU) wrote a successful Targeted Implementation Plan (TIP) in 2023 (Figure 2, 319 Figures & Data), which helped the irrigator fund their new system through NRCS's EQIP program. Furthermore, MTU raised an additional \$30,000 for their irrigation upgrade. Their new system is installed and will be operational in Spring 2026, an important milestone for this project, the rancher, and the resource.

GSM will submit its own change application for their water rights and handle its own irrigation infrastructure upgrades. They will coordinate with MTU on timelines to align with the Lower Boulder River – Shaw Dam Removal and Riparian Restoration project timeline see GSM, landowner letter of support).

While not part of this DEQ-319 project proposal, these irrigation changes are a required and critical component to the successful implementation of the Shaw Dam Removal and Riparian Restoration project to maximize the benefits of this and future projects. An approximate water savings of ~8 cfs or 50% over past irrigation withdrawals of ~16 cfs adds significant value to this restoration project. These water savings will remain in-stream for at least 18 miles, where the next downstream water user is located.

Project Purpose

Select the watershed restoration plan or tribal nonpoint source plan that your project will help implement (please type in if missing from list) (Not required for HAB reduction projects)

Boulder River - Jefferson River Watershed Council

Letter of support from author, or if the author was contracted, the author sponsor, attached? (If no, explain why below.)

Note: The Boulder River Watershed had never had an organized watershed group; Montana Trout Unlimited changed that with a successful US Bureau of Reclamation (USBR) - Cooperative Watershed Management grant that provided capacity funding and expertise for the Jefferson River Watershed Council to develop a Watershed Restoration Plan (WRP). This WRP will help guide restoration priorities and actions into the future.

IMPAIRMENT LISTINGS: Projects that address water quality impairments on Montana’s 2020 List of Impaired Waters are preferred though not a requirement. Funding may be used for projects that protect waterbodies that are demonstrated to be healthy.

Waterbody name from the 2020 List of Impaired Waters

Boulder River, Cottonwood Creek to the Mouth (Jefferson Slough)

Probable causes of impairment to be addressed

Temperature, sediment/siltation.
Flow regime modification, alteration in stream-side or littoral vegetation covers.
Metals

Waterbody name from the 2020 List of Impaired Waters

Jefferson River, confluence of Jefferson Slough to Mouth (Missouri River)

Probable causes of impairment to be addressed

Temperature, sediment/siltation.

HEALTHY WATERSHEDS: While project funding is prioritized to addressing known impairments, funding can be used to protect healthy waters from becoming impaired.

Name of healthy waterbody to be protected

Description of identified threat

Name of healthy waterbody to be protected

Description of identified threat

Project Partners

Identify each of the project partners and describe their contribution to the project. Include landowners, land managers, project designers, funders, and your own organization. Indicate whether each partner, other than your organization, has provided a letter of support. (*Note: each landowner must provide a letter of support if project site(s) have been predetermined.*)

Landowner	Contributions to Project	Letter of Support Attached?
Golden Sunlight Mine	Changing water right point of diversion in 2026, to support project goals and dam removal. There are no intervening water users to object to WR change. Complete irrigation upgrade in 2027. Sediment wedge analysis (2025, Barrick Memo).	<input checked="" type="checkbox"/>
LR Huckaba Ranch	Downstream water user on the Shaw Ditch. MTU completed the water rights change and an irrigation infrastructure upgrade 2025. This was required in order for the diversion dam removal to occur.	<input checked="" type="checkbox"/>
SWCA/WET/Mitzi Rossillon (consultants)	Data collection, preliminary engineering report, feasibility study, 30%, 60%, and final design. Wetland delineation, cultural survey, and Joint 310/318/404 and floodplain permitting. Construction over site (SWCA).	<input type="checkbox"/>
MTU	Project coordinator responsible for project management, stakeholder coordination, grant writing and reporting, various data collection, and education and outreach.	<input type="checkbox"/>

Project Partner	Contributions to Project	Letter of Support Attached?
Montana Fish, Wildlife, & Parks	Baseline (long-term) fish population data. Significant stream discharge and temperature monitoring. Construction funding secured through its Future Fisheries Improvement Program.	<input checked="" type="checkbox"/>
DNRC, Cross Charitable Foundation (CCF, no letter), Resource Legacy Fund (RLF), Jefferson County (JeffCo)	These partners are responsible for funding the project planning, design, and permitting, including the wetland delineation and cultural surveys. JeffCo sponsored MTU's DNRC-ARPA grant (closed on 12/31/25). RLF is also sponsoring a filmmaker to document the project. CCF also supported the Huckaba irrigation.	<input checked="" type="checkbox"/>
Georger Grant TU, Madison-Gallatin TU, Pat Barnes TU, Westslope TU, and Chuck Robbins TU.	5 TU chapters have committed \$92,500 to the project. The largest collective funding commitment to a single project from TU chapters. This speaks volumes about the tremendous commitment of TU's grassroots. Their volunteer base will be integral for harvesting 27,810 willow cuttings.	<input checked="" type="checkbox"/>
Jefferson Valley Sportsman Assoc, Trout & Salmon Foundation (TSF) Montana Trout Foundation (MTF) Prvt. Found., American Rivers (AR)	Letters and funding (JVSA, AR) Funding only: Private Family Foundation, TSF, MTF	<input checked="" type="checkbox"/>
Confederated Salish-Kootenai, Jefferson Valley CD, Public Land and Water Access Assoc, Jefferson River Watershed Council	Technical input and letters of support. Tribal consultation. MTU funded the Jefferson River Watershed Council and worked with them to complete the Boulder WRP.	<input checked="" type="checkbox"/>

Project Coordination and Planning Task

This task would include completion of all applicable planning tasks from the list below, as well as coordination and oversight of the efforts of all project partners.

Identify the status of the following project planning tasks, where applicable.

	Completed?	Copy Attached?	To Be Completed Pre-Contract (Oct 2026)?	To Be Completed as Contract Deliverable?
*Draft Project Designs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
*Final Project Designs	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Consultation With Potential Regulators	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Necessary Permits	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Cultural Resources Inventory <i>(if relevant)</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: <input type="text" value="Aquatic Resources Impacts Analysis & Monitoring"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: <input type="text" value="Shaw Dam Structural & Sediment Analysis (WET)"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: <input type="text" value="Aquatic Invertebrate Survey (Save Wild Trout)"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

****See Call for Applications Section 5.1 for minimum design standards.**

Describe any additional project planning that will have been completed prior to execution of a contract (October 2026).

Advertise a construction RFP, 4/26. Mandatory bid tour, 4/26. Award contract, 5/26, pending outcome of DEQ-319 grant.

In 2024, Golden Sunlight Mine completed sediment sampling of the wedge behind the Shaw diversion dam to confirm that removal of the dam did not pose a risk of releasing metals from the sediment wedge or mobilizing material that is any different than the material that washes down through the Boulder River drainage (2025, Barrick Memo). In 2025, GSM completed a biodiversity assessment (BRIA). A post-project assessment will be completed by the landowner.

In 2025, MTU and JRWC complete a TIR flight survey on the lower 18 miles of the Boulder River. Streamflow and temp monitoring, and fish population estimates will continue in 2026 and beyond in collaboration with DNRC and FWP. (Figures 3-6, Fig. & Data).

Describe any additional project planning and coordination that will need to be completed after the execution of a contract (October 2026).

GSM and MTU will continue to coordinate on timelines related to GSM's change application for its water rights and its irrigation infrastructure upgrades (see GSM, landowner letter of support).

Landowner Agreement Task

DEQ includes the following language in every nonpoint source contract involving on-the-ground activities:

Contractor shall submit signed landowner agreement(s) verifying that Contractor and DEQ staff may access the project site, at reasonable times and with prior notification, for the purposes of project planning, implementation, and post-implementation monitoring. The agreement(s) must ensure appropriate operation and maintenance of all structures, vegetation, and management measures for the life of the project (typically 10 years). If grazing will be allowed within the project area, the agreement(s) must include a sustainable management plan for livestock grazing, designed to protect and enhance riparian function. If a signed landowner agreement does not meet the above-stated minimum requirements, Contractor shall negotiate an amended agreement with the landowner that ensures appropriate operation and maintenance of all structures, vegetation, management measures, and includes a sustainable management plan for any livestock grazing for the life of the project (typically 10 years).

Identify the status of the following landowner agreement tasks, where applicable.

	Completed?	Copy Attached?	To Be Completed Pre-Contract (Oct 2026)?	To Be Completed as Contract Deliverable?
Draft Landowner Agreement(s)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Final Landowner Agreement(s)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Grazing Management Plan	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Other: <input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other: <input type="text"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Project Effectiveness Monitoring Task

If you will be conducting any on-the-ground implementation work, you will be required to complete the monitoring activities described in the task language below, as applicable. Describe below how you plan to determine the effectiveness of your project. Project effectiveness success criteria should be time-bound and assess each project objective quantitatively. Success criteria should clearly define adaptive management thresholds. Examples may include: a minimum 25% decrease in sediment/nitrogen/phosphorus load within 2 years; a 70% survival rate of containerized plantings after one year.

If you are applying for nonpoint source grant funding for project design only, and not for project implementation, you may either skip this task, or describe below which parts of this task you intend to complete:

In February 2024, a qualitative Bank Erosion Hazard Index (BEHI) assessment was completed in the project reach and the immediate up- and downstream reaches (2024, Feasibility Analysis). Additionally, three pebble counts and two bar surveys were completed. These surveys will be duplicated in year 3, post-project construction. A wetland impacts analysis survey was completed for the project area (available upon request). This survey will be completed in year 3, per Army Corps, Nationwide 27 permit requirements. We anticipate a 70% survival rate of containerized plants and at least a 50% survival rate of wetland plugs. Photo-point monitoring will be conducted pre- and post-construction using DEQ-accepted methods.

We have also estimated the amount of sediment behind the dam (2000 CY) that will be protected (stabilized) and not released into the system if we can complete the project before a catastrophic dam failure. The Boulder River is prone to flash flooding (Figure 5, 319 Figures & Data). It's critical to proactively alleviate the potential for dam failure and unmanaged sediment release.

Example Task Language

Contractor shall, in consultation with the DEQ Project Manager, develop a reasonable method or set of methods for evaluating and reporting on the effectiveness of the project in addressing water quality issues. Contractor shall complete a monitoring plan to guide monitoring activities. Contractor shall complete the following monitoring activities:

- *Estimate the sediment load reductions (tons/year) achieved through implementation of the proposed restoration activities and management practices.*
- *Estimate the nitrogen load reductions (pounds/year) achieved through implementation of the proposed restoration activities and management practices.*
- *Estimate the phosphorus load reductions (pounds/year) achieved through implementation of the proposed restoration activities and management practices.*
- *For projects designed to address pollution from pollutants other than nitrogen, phosphorus and sediment, evaluate and report on the effectiveness of the project in addressing water quality issues.*
- *Contractor shall collect data, as directed by the DEQ Project Manager, to be used in estimating sediment, nitrogen, and phosphorus load reductions (and for harmful algal bloom reduction projects, carbon sequestration/emissions reductions) achieved through implementation of restoration activities and management practices designed to address these pollutants.*
- *Use the following measures to evaluate the sustainability of restoration activities and management practices:*
 - *[Vegetation mortality rate.]*
 - *Pre- and post-construction photo point monitoring consistent with the “Oregon Watershed Enhancement Board Guide to Photo Monitoring” methodologies, or a similar published photo point monitoring method accepted by DEQ. The U.S. Forest Service provides additional photo point monitoring guidance in the “United States Forest Service Photo Point Monitoring Handbook”.*
 - *[Riparian survey.]*
 - *[Other.]*

Please describe any additional monitoring you intend to do as part of the project.

Project partners have been collecting several datasets that are not directly tied to non-point source pollution. Fish population estimates downstream of the dam were collected in 2008, 2010, 2013-14, and 2021-2025 (Figure 6, 2026, 319 Figures and Data). Estimates will be conducted annually to biannually to track changes in population size, assemblage, and distribution. In 2021 and 2022, fish population estimates were collected upstream of the dam. It found that no Rock Mountain were present upstream of the dam, while there were hundreds of whitefish per mile downstream of the dam. This data is particularly important to MTU, and we will assist FWP in this data collection as needed.

Brown trout redd monitoring was conducted in 2007, and annually 2018-2025 near Cold Spring, 10 miles upstream (Table 1, 2026, 319 Figures and Data). This data will continue to be monitored annually by FWP. MTU is willing to assist as needed.

In 2025, with USBR funding secured by MTU, aerial thermal infrared (TIR) data were collected on the lower 18 miles of the Boulder River (Figure 3, 2026, 319 Figures and Data). This data helps partners and agencies to understand the longitudinal temperature profile and significant thermal features. This data should be collected at year 5, post-project, if funding is available.

Project Implementation Task

Provide a **detailed description of the solution you are proposing** to implement to address a nonpoint source pollution problem.

- Describe the practices you intend to design and/or implement to solve the problem (what, where, when, how much or how many).
- Describe the anticipated maintenance needs (what, where, who, how long).
- Refer to the minimum design standards in the Call for Applications.
 - *Please fill out this section to the best of your ability, even if you are only seeking funding for project design.*

The antiquated, channel-spanning Shaw Diversion dam (Figure 1, 2026, 319 Figures and Data), tied to the most-senior (1868) water right in the watershed, has interrupted natural-processes at this site for over a century. The dam creates a backwater in all flow regimes, preventing natural sediment transport and deposition. It has created a 700' long, 2-3' thick sediment wedge that contains over 2,000 CY of fine sediment. Below the dam, the stream is over-widened and shallow. Project partners considered four alternatives, including no action, and chose to leave the sediment wedge in place and construct a new stream channel in the dry. Golden Sunlight Mine and MTU will continue to coordinate on timelines related to Golden Sunlight Mine's water rights change application for its irrigation infrastructure upgrades. (see Connection to Ongoing Projects and GSM LoS). This phase of the project will restore about ~8 cfs of relatively cold Boulder River water to the river. Maximum water temperatures are 8 and 12 degrees colder than the adjacent Jefferson Slough and Jefferson River near Cardwell (Figure 4, 2026, 319 Figures and Data).

The mainstem (center) channel restoration will occur on 2,550 LF of channel. The alignment takes advantage of shading from existing mature cottonwood stands. 5 engineered riffles totaling 1,367 LF will promote natural sediment transport and deposition. 6 deep pools will be constructed. 6 large woody debris structures will be constructed. 3,552 LF of deformable vegetated wood matrices will promote streambank stability and growth of diverse riparian vegetation. Of utmost importance, the new stream channel will restore floodplain connectivity on this moderately entrenched stream reach, setting the stage for future phases of restoration.

The current (west side) stream channel will receive fill material from the construction of the new mainstem channel. The Shaw dam will be removed and used as fill in the existing irrigation ditch. A restored, high-water channel will be constructed to receive and filter floodwaters in a seasonally connected open-water oxbow wetland. The channel elevation is set to be inundated approximately biannually to maintain riparian vegetation vigor and wetland function. There will be 916 LF of constructed riffle.

The Cardwell head gate and ditch (east side) will be retired. The ditch will be converted into a ~2-acre open-water wetland complex. The channel elevation is set to inundate these wetlands annually, and will filter floodwaters, and promote surface and groundwater retention. There will be 649 LF of constructed riffle between wetland swales.

Due to channel-incision, conifer encroachment in the floodplain has crowded out cottonwood, willow, red-osier dogwood, and other riparian species. Much of the woody material needed to complete the streambank restoration will be sourced on-site by harvesting conifers on approximately 30 acres. Existing forested wetlands will be preserved and enhanced by increasing the availability of floodwater. 4.1 acres of floodplain roughness will be constructed, creating micro-topography to enhance riparian plant recruitment and growth. 27,810 willow cuttings will be sourced on-site and on adjacent landowner property for brush matrices, willow trenches, and staking. A comprehensive revegetation plan (see Final Design, pg 21) will ensure that the site is re-naturalized within 3-5 years. The plan calls for 320 woody species, 13,591 herbaceous wetland plants, 5.21 acres of floodplain seeding, 2.02 acres of wetland seeding, and 1.81 acres of upland seeding. 1,400 LF of 7.5' tall deer fencing and 32 browse protection cages for 15-gallon cottonwoods. The existing fence line will protect the area from cattle grazing. The average setback is well above the 35' minimum. Some portions of the fence may need to be moved or replaced after construction. Weed management will be coordinated between MTU and GSM, which maintains a fencing and weed contractor on annual contracts.

Education, Outreach and Training Task

To get good projects on the ground, trained staff and board members and educated, enthusiastic landowners are required. To promote the development of future projects, DEQ encourages project sponsors to use up to \$5,000 per project of funding to support training and conduct education and outreach. Example training topics might include: project management, public procurement, technical writing, GIS, water quality monitoring, web design, public speaking, human resource management, photo journalism, UAV (drone) piloting, financial management, and restoration techniques. Education and outreach activities might include targeted landowner outreach, conducting project site tours for local landowners, tabling at community events, holding a watershed festival, providing stipends and travel reimbursements for speakers and participants to attend a nonpoint source pollution prevention workshop, or generating articles for social media. The primary requirement for training and outreach is clearly explaining how the activity generates behavior change to address nonpoint source pollution. Funding may not be used to pay for food and beverages, or for honorariums and gifts.

Describe the education and outreach activities or training you will complete to promote behaviors or facilitate future efforts to reduce nonpoint source pollution. Additionally, identify the goals of the training/education and outreach activities.

Montana Trout Unlimited has a wide public outreach across Montana and the US. In our quarterly newsletter, Trout Line, we detail each of MTU's projects and its benefits. We post project updates and recognize partners on our Instagram and Facebook social media channels. MTU has, and will continue to host project tours. In 2025, MTU hosted a tour for staff from MT's congressional delegation and local elected officials to showcase how state and federal funding are key to restoring healthy ecosystems and conserving rural economies. A post-project tour was requested and will be conducted with them. MTU's partnership with the DEQ and the project's NPS benefits will be acknowledged in a short post-project film, funded by a project partner. Volunteer willow collection is an important component of project success. The project requires more than 27,810 willow cuttings during project implementation. MTU is a grassroots organization with robust, active local TU chapters committed to supporting this project through volunteer days, in addition to the significant financial support (\$92,500) they've already provided. Training these volunteers in proper willow collection is important to the success of riparian plantings. Interpretive signage at the site will discuss the problem at the project site, restoration goals, and objectives.

Identify the specific target audience and method of delivery. Additionally, describe how the proposed training and/or education and outreach will increase local capacity and interest for addressing/promoting behavior change to reduce nonpoint source pollution.

MTU's members, friends, and partners are an important target audience. Our quarterly newsletter, Trout Line, has a distribution of ~3,500 printed copies and is posted on MTU's web page. Our Facebook and Instagram channels have more than 6,000 followers each. Project updates are shared at MTU's quarterly board meeting, monthly chapter board meetings, and annual membership meetings. Our partner, Resource Legacy Fund, which has helped fund over 131 dam removals across the West, has dedicated a filmmaker to the project. We intend to have at least two versions of a project film. One, geared towards the TU-member/conservation community, and one for policy-makers. These will be memorialized on YouTube.

One message we want to make clear in our communications is that this is the first of many phases of restoration work to reconnect the Boulder River's floodplain and restore its riparian area. The reason we're starting at this site is that without removing this dam, no other river restoration work in the watershed could reach its full potential.

Audio, visual, and print media have lasting impacts on how people interact with natural resources, and should encourage them to conserve, protect, and restore Montana's fisheries and their watersheds - MTU's Mission.

Describe how you will evaluate the effectiveness of the proposed activities.

MTU tracks our social media outreach. Data shows that we engage the most people when sharing stories of on-the-ground projects. We will continue to monitor the success of this outreach. We will post our project film on YouTube and track its reach. Our goal is to have 900 hours of volunteer help to cut willows. Reaching at least 75% of that goal will be considered a success.

Project Administration Task

Please use the task description below as a guide when calculating your budget for project administration. DEQ typically includes these requirements in every nonpoint source grant contract, with only minor variation. Funding applied to the Project Administration Task on each project must not exceed 10% of the total amount of funding requested, or \$12,000, whichever is lower.

Example Task Language

Contractor shall oversee and be accountable for the completion of all tasks. Contractor shall maintain regular contact with the DEQ project manager. Contractor shall prepare and submit Status Reports, Final Reports and Attachment B Billing Statements according to the format and schedule described below.

Report Format

- *Contractor shall submit each Attachment B Billing Statement, Status Report and Final Report using the most current reporting guidance and templates provided by the DEQ project manager.*
- *Contractor shall ensure each Status Report and Final Report contains adequate documentation to justify accompanying reimbursement requests and match reporting, to the satisfaction of the DEQ project manager.*
- *Contractor shall ensure that the Final Report is a standalone document describing all contract activities and containing copies of all contract deliverables (even if the deliverables were previously submitted).*

Reporting Schedule

- *Status Reports: Due June 15th and December 15th of each year the Contract is in effect, and each time an Attachment B Billing Statement is submitted.*
- *Draft Final Report: Contractor shall submit a complete draft Final Report for DEQ review and comment at least 15 days prior to the contract expiration date.*
- *Final Report: Contractor shall submit a Final Report, addressing DEQ comments on the draft Final Report, on or before the Contract expiration date.*
- *Attachment B Billing Statements: Contractor shall submit an Attachment B Billing Statement with each Status Report, or Final Report submitted to DEQ while the Contract is in effect. To maintain cash flow, Contractor may submit interim Attachment B Billing Statements as frequently as monthly during the term of the Contract. However, each interim Attachment B Billing Statement must be accompanied by an Interim Report.*

Project Timeline

	4Q 2026	1Q 2027	2Q 2027	3Q 2027	4Q 2027	1Q 2028	2Q 2028	3Q 2028	4Q 2028	1Q 2029	2Q 2029	3Q 2029
Project Coordination and Planning Task	✓											
Landowner Agreement Task	✓											
Project Effectiveness Monitoring Task					✓				✓			✓
Project Implementation Task	✓		✓									
Education, Outreach and Training Task	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Project Administration Task	✓		✓		✓		✓		✓		✓	✓

Co-Benefit Considerations

DEQ is committed to carrying out nonpoint source pollution reduction projects within engaged communities where the impact stretches beyond improving water quality. DEQ will award additional points in the scoring form where co-benefits extend beyond the project. Below are a few examples of how projects might exemplify co-benefits.

- Project will reduce economic hardship such as from livestock mortalities, cost and energy needs to treat municipal drinking and wastewater treatment, or loss of income from recreation
- Project will benefit underserved markets
- Project will improve or create equitable access to a clean and healthy environment
- Project planning included consultation with Tribal Nations
- Project will improve flood and drought resilience of the landscape
- Project impacts will benefit a downstream community and other natural systems (e.g., drinking water sources, human health, wildlife habitat, etc)

Please use this section to highlight co-benefits your project may have.

The project has many benefits beyond improving non-point source pollution. MTU consulted with the Confederated Salish and Kootenai Tribes' fisheries staff on the historical significance of this place, as well as the project's methods and benefits. The Shaw Dam has been documented by FWP as a fish passage barrier. There are 74 miles of the mainstem Boulder River, and 100s of miles of tributaries upstream of this site. Restoring fish passage for thermal refugia and spawning access is a primary goal for MTU. Access to more and colder water will increase the resilience of local and migrating fish populations. Aquatic invertebrate communities will benefit from engineered riffles that provide interstitial spaces and improved sediment transport and deposition. Fish and insects will benefit from the additional large woody debris habitat. Water users will no longer struggle with dilapidated, hazardous infrastructure. The landowner allows year-round public access at this site. Their liability will be reduced, and recreational users will have safer access and passage here (floaters). Eliminating invasive conifers will restore the diversity of flora and fauna at this site. A wildlife-friendly fence will enhance migration corridors between Cardwell Hill and the Bull Mountains. Reconnecting the floodplain will help with drought and flood, especially as future phases build on the reconnection. There is significant infrastructure at and downstream of this site that will be better protected from flood impacts. This project exemplifies that good projects can unite atypical partners, such as MTU and Golden Sunlight Mine, and hopefully inspire more diverse partnerships across the region. Intact riparian areas can also be strategic fire breaks. There have been several fires on Cardwell Hill (east) and Bull Mountain (west).

BUDGET

2025 Nonpoint Source Pollution Reduction Application - On-the-Ground Project Budget Template

Project Title:		319 Funding Request*		Non-Federal Match**	Other Funding***	Match Source	Match Secured? (Y/N)	Total Project Cost	Additional Information****		
<p>This task includes completion of all planning tasks and coordination and oversight of the efforts of all project partners. Provide a detailed budget and add a row if needed.</p>	Project Planning										
	Preliminary site investigation data and site maps			\$	52,865.00	FWP, Cross Found, ARPA, Barrick, MTU	Yes	\$	52,865.00	FWP Fisheries, Wetland Assessment, Sediment Analysis, Structural Analysis, Cultural Survey, 3 seasons of irrigation monitoring	
	Required Permits			\$	55,150.00	ARPA, Cross Found, MTU	Yes	\$	55,150.00	ACE-404, Floodplain, 310/318	
	Draft Project Design			\$				\$			
	Final Project Design			\$	106,625.00	ARPA, RLF	Yes	\$	106,625.00	Final design (Preliminary Engineering Report, feasibility study, 60%, 90%, final)	
	Project Management			\$	33,113.00	MTU, RLF	Yes	\$	33,113.00		
	Project Billing			\$	6,115.00	MTU, RLF	Yes	\$	6,115.00		
Total				\$	253,868.00			\$	253,868.00	THIS TASK IS COMPLETED*	
<p>This task includes costs for developing and managing landowner agreements and developing grazing management plans as applicable. Provide a detailed budget and add a row if needed.</p>	Landowner Agreements										
	Draft Landowner Agreement			\$	1,000.00	MTU, RLF	Yes	\$	1,000.00		
	Final Landowner Agreement	\$	100.00	\$	900.00	MTU, RLF	Yes	\$	1,000.00		
	Grazing Management Plan			\$	1,000.00	MTU, RLF	Yes	\$	1,000.00		
Total				\$	2,900.00			\$	3,000.00		
<p>This task includes costs for developing and implementing a monitoring plan to evaluate effectiveness to reduce nonpoint source pollution. See example contract template or application instructions for required monitoring activities. Provide a detailed budget and add a row if needed.</p>	Effectiveness Monitoring										
	Draft Monitoring Plan			\$	1,000.00	MTU, RLF	Yes	\$	1,000.00		
	Final Monitoring Plan			\$	41,025.00	RLF	Yes	\$	41,025.00		
	Written Summary of all Monitoring Activities	\$	100.00					\$	100.00		
Total				\$	42,025.00			\$	42,125.00		
<p>This task includes all costs for implementation of the plans developed in the Project Planning task. If you are requesting funding for design only, leave this task blank. Provide a detailed budget and add a row if needed.</p>	Project Implementation										
	Mobilization, Bonding and Insurance			\$	100,000.00	MTU	No	\$	100,000.00		
	Materials	\$	150,000.00	\$	71,000.00	\$	102,850.00	MTU, GSM	Yes	\$	323,850.00
	labor	\$	100,000.00	\$	120,000.00	\$	494,650.00	MTU	Some (120,000)	\$	694,650.00
	Equipment costs								\$		
	Construction oversight			\$	400.00		Yes	\$	50,000.00		
	As-Built surveys			\$	13,415.00		No	\$	13,415.00		
	Photo documentation			\$	1,500.00	MTU	Yes	\$	1,500.00		
	Landowner recommendation letter							\$			
	MTU Project Management			\$	14,500.00	MTU	Yes	\$	14,500.00		
	MTU Travel			\$	4,531.00			\$	4,531.00		
Total			\$	299,600.00	\$	191,000.00	\$	671,846.00	\$	1,162,446.00	
<p>This task includes costs to develop and improve organizational capacity and to incorporate education and outreach into on-the-ground projects. Provide a detailed budget and add a row if needed.</p>	Education and Outreach										
	Volunteer Coordination							\$			
	Event/Tour Planning	\$	100.00					\$	100.00		
Outreach/Publication materials			\$	9,000.00	\$	5,700.00	MTU, RLF	Yes	\$	14,700.00	
Total			\$	100.00	\$	9,000.00	\$	5,700.00	\$	14,800.00	
<p>319 Funding applied to Project Administration must not exceed 10% of the total amount of 319 funding requested, or \$12,000, whichever is lower. Project includes normal business expenses and reporting requirements.</p>	Administration										
	Mid/Annual/Interim Reports and Billing Statements			\$	2,500.00	MTU	Yes	\$	2,500.00		
	Draft/Final Report and Billing Statements			\$	2,500.00	MTU	Yes	\$	2,500.00		
	Communication with DEQ	\$	100.00			\$	900.00	MTU	Yes	\$	1,000.00
Total			\$	100.00	\$	5,900.00		\$	6,000.00		
Grand Totals			\$	300,000.00	\$	200,000.00	\$	982,238.00	\$	1,482,238.00	

*319 Request - Must not exceed \$300,000

**Non-Federal Match - Can include in-kind materials.

***Other Funding - Use this space for funding that will be used to support creation of task

****Additional Information - Use to justify cost if needed. (Hourly rates, rental costs, etc.)

**LETTERS
OF
SUPPORT**



May 15, 2024

Les Evarts
CSKT Fisheries Program
POB 278
Pablo, MT 59860

Bureau of Reclamation
Water Recourses and Planning Office
P.O. Box 25007
Denver, CO 80225-0007

RE: FY24 WaterSMART Environmental Water Resources Projects NOFO No. R24AS00299

Dear grant review committee,

I write this letter with wholehearted support for funding of the Shaw Diversion Dam Removal. This project is a win-win for both the fisheries resource and the irrigators. As a fisheries professional with the Confederated Salish and Kootenai Tribes, I have a history working towards addressing impacts on fisheries from irrigation infrastructure. Montana has a long history of developing its water resources to support its vibrant agricultural heritage. Because this history is long, mixed with a bit of western get-er-done culture, and the technology of the time, some of the existing infrastructure is inadequate or simply failing due to time.

On the Flathead Indian Reservation, this type of work is one of our main focuses. I have seen great gains to a fishery resource by simply replacing and/or improving infrastructure especially when fish passage and screening is provided. In this case, the dam removal opens up essentially the entire Boulder River (70 plus miles) to the Jefferson River fishery and eliminates fish entrainment. This year-round access will provide both a cold water refugia and high-quality spawning habitat. The removal will allow for re-naturalization of the site providing for riparian/wetland recovery and floodplain connectivity. While this site is on the east-side of the continental divide, it is well known as an aboriginal area for the Salish and Pend 'd Oreille tribes.

This project has all the positive environmental boxes checked, and as part of the larger project, the irrigators benefit by updated irrigation equipment.

Sincerely,

Les Evarts
Program Manager,
CSKT Fisheries Program



Jefferson County Commission

118 W. Centennial

Post Office Box H

Boulder, Montana 59632-0249

(406) 225-4025 Voice / (406) 225-4148 Fax

Cory Kirsch, Chair Bob Mullen, Commissioner Dan Hagerty, Commissioner

May 24, 2024

Bureau of Land Reclamation
Water Resources and Planning Office
PO Box 25007
Denver, CO 80225-0007

RE:FY24 WaterSMART Environmental Water Resources Projects NOFO No.R24AS00299

Dear grant review committee,

Jefferson County has been fully aware and supportive of this project since November 2022. Also, Jefferson County is Montana Trout Unlimited's government agency grant sponsor for their Montanan Department of Natural Resources and Conservation American Rescue Plan Act - Irrigation Infrastructure grant to complete engineering, design, and permitting, and we have received project updates at appropriate milestones.

The Commissioners voted to support the USBR grant at their 4/30/2024 meeting, understanding that this project is important, with a collaboratively developed win-win restoration project for three of our County's economy base: mining, agriculture, and recreation. The project will replace the Shaw diversion dam, as there will be two in-stream irrigation pumps that will be utilized for agriculture. With the removal of the dam, fish will be able to pass, without incident, through the river's channel, allowing trout spawning. The Boulder River averages two to four degrees colder than the Jefferson River during August, which provides a cooler climate for the fish in summer.

The Jefferson County Commission fully supports this project and encourages grant approval.

Sincerely,

Dan Hagerty, Jefferson County Commissioner

COM/ha
cc: reading file



Water Resources Division
1424 9th Ave
Helena, MT 59601
(406) 444-6601

February 3, 2026

Nonpoint Source Program
Montana Department of Environmental Quality
2401 Colonial Dr.
Helena, MT 59601

Subject: Montana Trout Unlimited's Shaw Dam Removal and Boulder River Riparian Restoration Project – DNRC Letter of Support

Dear DEQ 319 Review Panel,

On behalf of the Montana DNRC's Water Resources Division, I am writing to express support for Montana Trout Unlimited's (MTU) application to the Montana Department of Environmental Quality for funding to implement riparian restoration projects in the Boulder River watershed. The Boulder River is a high value coldwater fishery and tributary to the Jefferson River that supports significant agricultural production in Jefferson County. Work outside of what is proposed with this funding is already underway to fully remove the deteriorating Shaw Dam and ditch system located in the lower Boulder River and replace the previous diversion system with instream pumps. Removal of the Shaw Dam is necessary to eliminate fish entrainment in two irrigation ditches and restore fish passage to 74 miles of the mainstem Boulder River, which includes the area of Cold Springs, a known source of 54°F water that flows into the river at a rate of 45 cubic feet per second.

The requested funding is needed to develop 2+ acres of wetland and juvenile rearing fish habitat away from sediment that has accumulated behind the Shaw Dam, as well as burial of accumulated sediment and metal contaminants to reduce nonpoint source pollution to the river. The riparian restoration efforts proposed by MTU will also support the natural storage management recommendation detailed in Section 5 of the 2023 Montana Drought Management Plan. This recommendation encourages enhancement of natural water storage through preserving or restoring function in natural systems to increase water capture and retention. Bolstering drought and flood resilience aligns with Montana DNRC's mission to foster the sound management of water in



our state. A sum of \$125,000 in American Rescue Plan Act Irrigation Grant funding (administered by DNRC) has been awarded for Shaw Dam removal project planning and design. The Water Resources Division's Water Planning Section is committed to the success of this riparian restoration project, and I will be available to provide additional planning and implementation support to MTU as needed. Thank you for your time in considering this important and impactful work.

Sincerely,

Danika Holmes
Regional Water Planner
Water Resources Division





FWP.MT.GOV

THE **OUTSIDE** IS IN US ALL.

Montana Fish, Wildlife & Parks
Region 3 Headquarters
1400 S 19th Avenue
Bozeman, MT 59718

February 18, 2026

Nonpoint Source and Wetlands Section
Montana Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901

RE: Support for Montana Trout Unlimited's proposal, Shaw Dam Removal and Riparian Restoration Project on the Boulder River

Dear DEQ-319 Review Panel,

Montana Fish, Wildlife & Parks (FWP) has spent significant time and resources to understand fish abundance, water quality, and water quantity in the Boulder River above and below the Shaw Diversion. Fish passage through the irrigation structure has been a primary concern. Removing the irrigation structure would enhance fish passage to 74 miles of the mainstem Boulder River and its tributaries. Trout Unlimited and FWP have worked closely with the landowners and water users to implement a solution that benefits the fishery and keeps agricultural production whole. Therefore, FWP strongly supports the proposed project by Montana Trout Unlimited to eliminate the old diversion structure and construct a modified stream channel allowing unrestricted fish passage.

Project benefits go well beyond fish passage improvement. The proposed project would create over 2 acres of wetland, enhancing local stream function and juvenile trout rearing habitat. Stream temperature nonpoint source reductions are being accomplished outside of this grant request by retiring two open ditches and changing irrigation withdrawals to instream pumps. This irrigation transition creates water savings (7-10 cfs), eliminates fish loss to ditch entrainment, and keeps the downstream irrigator whole. The benefits of this irrigation diversion removal project are expected to benefit cold-water fisheries in the lower Boulder River and, to some extent, the Jefferson River near the confluence.

FWP has committed \$41,000 of Future Fisheries Improvement Project funds as a match to the current project and will continue monitoring the fishery to document project effects.

Thank you for considering this funding request.

For questions or concerns, please reach out to the following FWP personnel:
Coltan Pipinich, fisheries biologist (406-521-5798, coltan.pipinich@mt.gov)
Jen Smitham, R3 comment coordinator (406-495-3262, jsmitham@mt.gov)

Sincerely,

Kelly Proffitt
Region 3 Supervisor

January 27, 2026

Golden Sunlight Mine, Inc.
453 MT Highway 2E
Whitehall, MT 59759

Nonpoint Source and Wetlands Section
Montana Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901
Submitted Electronically with Application

**RE: Support for Montana Trout Unlimited's Proposal, Shaw Dam Removal
and Riparian Restoration Project on the Boulder River**

Dear DEQ-319 Review Panel,

Golden Sunlight Mine (GSM) is the landowner and a partner with Montana Trout Unlimited and several entities on the Shaw Dam removal and riparian restoration project. The dam is severely dilapidated, with 200 cubic yards of sediment behind it that would have a negative impact on GSM's property, if floods eventually break it. We have paid a third party to conduct an impact analysis in the event the dam fails. The analysis has been provided with the grant application's supplemental information.

GSM has contributed a total of \$95,000 to the final design of the restoration project and for construction. We have committed to providing all the in-kind resources for the construction phase, including gravel, rock, willows, and trees for streambank protection and habitat.

To move the project forward, GSM has budgeted for two pivots and wheel lines to replace the flood irrigation ditches and maintain our current irrigation practices under our historical water rights.

Any necessary change authorizations for our irrigation water rights are being managed by GSM in conjunction with a third party. Points-of-diversion (POD) change authorizations may need to be approved by the Department of Natural Resources and Conservation to fully transition GSM's irrigation system to instream pumps, if GSM's proposed instream pump locations are not considered replacement PODs that are exempt from the change authorization process under Mont. Code Ann. § 85-2-429(3). If GSM has to go through the full POD change process, GSM believes the changes will be approved without issue, given the L.R. Huckaba POD change approval in December 2025, and the fact that there are no other intervening water users on the Boulder River between the current PODs and the replacement PODs to affect.

Project attributes are:

- Restore fish passage to 74 miles of the mainstem Boulder and its tributaries, especially to the area around Cold Springs, a 45 cubic feet per second 54°F spring. Opening the stream would allow trout and native whitefish to migrate easily.

- Reduce nonpoint source (NPS) sediment and metal pollution by creating new stream habitat away from the Shaw dam and burying sediment that has accumulated behind it. Bypassing the dam, covering the sediment, and armoring will remove the potential for extreme sediment loading to the Jefferson River should the dam fail.
- Stream temperature NPS reductions are being achieved outside this grant request by shifting irrigation withdrawals from a dam-and-ditch system to instream pumps, a necessary step before dam removal and riparian restoration. This transition will also eliminate fish entrainment in 2 irrigation ditches. The Jefferson River is used heavily for irrigation. This project can assist in a lower temperature source and increased flow during drought times of the summer, and help fish through those key times
- Develop 2+ acres of wetlands, including juvenile rearing habitat. Improved wetlands are key to the health of the Candlestick Ranch, which GSM allows the public to access through block management and for year-long recreation such as dog walking and training, horse riding, fishing, and other activities outside of hunting.
- Reduce consumptive use of 7-10 cfs of relatively cool Boulder River water.
- Helping our neighbors is the Montana way. GSM allows its neighbors to lease the land for cattle and hay production, thereby improving the aesthetics of a managed ranching property.

We hope the Panel can envision the opportunity to improve this piece of the North Boulder and the benefits for wildlife, fish, and our neighbors. This restoration project will be promoted and is expected to encourage upriver neighbors to consider similar improvements to their land.

Thank you, and please contact me if you have any questions.

Sincerely,



Charles Buus
ENV. Manager
Golden Sunlight Mine, Inc.

December 19, 2025

LR Huckaba Ranch, LLC
26 MT HIGHWAY 359
Cardwell, MT. 59271-9604

Nonpoint Source and Wetlands Section
Montana Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901
Submitted Electronically with Application

**RE: Support for Montana Trout Unlimited's Proposal, Shaw Dam Removal
and Riparian Restoration Project on the Boulder River**

Dear DEQ-319 Review Panel,

For the past five years, the LR Huckaba Ranch has been working with Montana Trout Unlimited (MTU), Trout Unlimited (TU), the Natural Resource Conservation Service (NRCS), and Montana Fish, Wildlife & Parks (FWP), to improve water delivery on our ranch and restore the fishery.

Since submitting our first water right claim in 1868, our family has relied on irrigation water from the Boulder River. We've been diverting water from the river at three points of diversion (POD), including the locations of the Shaw Dam and Cardwell ditch headgate, the primary focal area of MTU's DEQ application, *Shaw Dam Removal and Riparian Restoration Project*. While our family no longer owns the property where the diversions are located, we still rely on the irrigation water at our home place, and lease our former ground from Golden Sunlight Mine (GSM) to irrigate hay and alfalfa. Reliable irrigation water is critical to the success of our operation, but these diversions are failing, and they get more challenging every year.

We approached MTU and FWP in April 2021 to see if there was grant money to assist irrigators. They asked if we were ok with working towards a fish-friendly solution. During those discussions, along with GSM, we collaboratively developed a successful NRCS- Targeted Implementation Plan. On February 10, 2023, we signed an NRCS-EQIP contract. The NRCS has agreed to fund approximately 50% of the cost to upgrade critical irrigation infrastructure in 2025. While this is not part of the EWRP application, it's a necessary project to complete to keep our operation whole before the dam can be removed and stream restoration to occur. MTU and TU assisted us with our POD change with the Montana Department of Natural Resources and Conservation. MTU is further supporting this project by securing grant money to offset the cost of the irrigation upgrade. We installed our new irrigation system in late 2025.

This conversion will effectively leave more coldwater instream for fish and other aquatic species.

Thank you for the opportunity to share information about our ranch's irrigation system, how our project plays an integral role in restoring fish passage on the Boulder River, how it leaves more coldwater water instream, and how stream restoration will benefit the river and our ranch. Beyond irrigation improvements, we look forward to seeing the Shaw dam removed and the stream restoration completed. We ask that the DEQ fully fund MTU's proposal to improve the fishery and adjacent habitat.

Please don't hesitate to contact me about our role and support of this project.

A handwritten signature in cursive script that reads "Lenny Huckaba".

Lenny Huckaba
LR Huckaba Ranch Inc.
406.490.4919



February 12, 2026

Jefferson River Watershed Council
P.O. Box 550
Whitehall, MT 59759

Nonpoint Source and Wetlands Section
Montana Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901
Submitted Electronically with Application

**RE: Support for Montana Trout Unlimited's Proposal, Shaw Dam Removal
and Riparian Restoration Project on the Boulder River**

Dear DEQ-319 Review Panel,

The Jefferson River Watershed Council (JRWC) is writing in strong support of Montana Trout Unlimited's (MTU) Section 319 Nonpoint Source Pollution grant application for the Shaw Dam Removal and Riparian Restoration Project on the Boulder River.

JRWC serves as the sponsor of the Boulder River Watershed Restoration Plan (WRP). The WRP provides watershed-scale context for restoration efforts on the Boulder River, including projects that address water quality, instream flow, and aquatic habitat connectivity. The Shaw Dam Removal and Riparian Restoration Project is consistent with the goals and priorities outlined in this planning effort.

For over 25 years, MTU has been a trusted partner in the Jefferson Basin. We commend their continued effort to restore fish passage, conserve instream flows, and improve water quality while keeping agricultural producers whole. The proposed project will restore connectivity to approximately 74 miles of the mainstem Boulder River and its tributaries, including access to the Cold Springs area, a 45 cfs, 54°F spring that provides important cold-water refuge. Removal of the dam will address nonpoint-source pollution from sediment and metals associated with accumulated deposits behind the structure. The transition from a diversion dam and ditch system to instream pumps, implemented outside of this grant request, will reduce consumptive use, eliminate fish entrainment in two irrigation ditches, and support long-term stream temperature improvements. Development of more than two acres of wetlands will further enhance floodplain function and juvenile rearing habitat.

JRWC's role includes watershed planning leadership, partner coordination, and the long-term integration of project outcomes. JRWC authored the Boulder River Watershed Restoration Plan, which establishes watershed priorities and restoration needs addressed by this project. While no direct financial match is provided, JRWC is contributing staff time and coordination capacity to support implementation.

This project reflects the type of collaborative, watershed-scale restoration effort the DEQ 319 Program was designed to support. JRWC strongly encourages funding of this proposal and looks forward to continued partnership as the project moves toward implementation in fall 2026.

Sincerely,

Miranda Protzen
Watershed Coordinator
Jefferson River Watershed Council



**Resources
Legacy Fund®**

February 2, 2026

VIA ELECTRONIC DELIVERY

Nonpoint Source and Wetlands Section
Montana Department of Environmental Quality
P.O. Box 200901
Helena, MT 59620-0901
Submitted Electronically with Application

RE: Support for Montana Trout Unlimited's Proposal, Shaw Dam Removal and Riparian Restoration Project on the Boulder River

Dear Grant Review Committee,

I send this letter to document Resource Legacy Fund's (RLF) support of Montana Trout Unlimited's (MTU) application, titled "Lower Boulder River – Shaw Dam Removal and Riparian Restoration Project," to the Montana Department of Environmental Quality's 319 – Non-point Source Pollution grant program.

RLF is a conservation nonprofit working to secure a resilient world for people and nature. RLF's initiatives span Western North America and beyond, building and supporting programs at every scale – from local community efforts to national policy campaigns. We partner with leaders in philanthropy, communities, government, science, and business to protect and restore lands, oceans, and rivers and secure necessary funding.

RLF's Open Rivers Fund (ORF) program supports local efforts to remove obsolete dams, modernize water infrastructure, and restore rivers across the western United States. We partner with farmers, ranchers, local government, Tribes, and others to catalyze community-driven dam removal projects that provide a wide range of social, economic, and environmental benefits. To date, we have supported the removal of 131 river barriers across the West, opening more than 1,750 river miles.

In 2024, ORF provided a two-year, \$150,000 grant to MTU in support of the Lower Boulder River – Shaw Dam Removal and Riparian Restoration Project. We chose to invest in the project because of the significant ecological and social gains the project will achieve. More specifically,

RLF Support for Montana Trout Unlimited's Proposal
February 2, 2026
Page 2

we understand that MTU's project will provide the following benefits:

- Restore fish passage in the 77-mile-long Boulder River for all species and life stages of fish just 4 miles upstream of the Jefferson River by removing the channel-spanning Shaw Diversion Dam.
- Provide access to 10-miles of thermal refugia and high-quality spawning habitat between the dam removal and Cold Springs, a 45-45 cfs, 54°F spring.
- Improve floodplain connectivity and function, and reestablish riparian species.
- Address conifer encroachment.
- Conserve and enhance existing wetlands and create new wetland habitat by utilizing the retired irrigation ditches.
- Eliminate entrainment by transitioning the irrigation system to instream pumps, which will leave more cold water in-stream.
- Restore typical sediment transport regimes.
- Restore habitat complexity to more than 2,500' of instream and associated streambank habitat.

In addition to the grant, RLF has made an in-kind investment of \$9,000 to support production of public education videos of the project.

RLF is in full support of the Lower Boulder River – Shaw Dam Removal and Riparian Restoration Project and appreciates the opportunity to support MTU's DEQ-319 grant application. Thank you for your consideration.

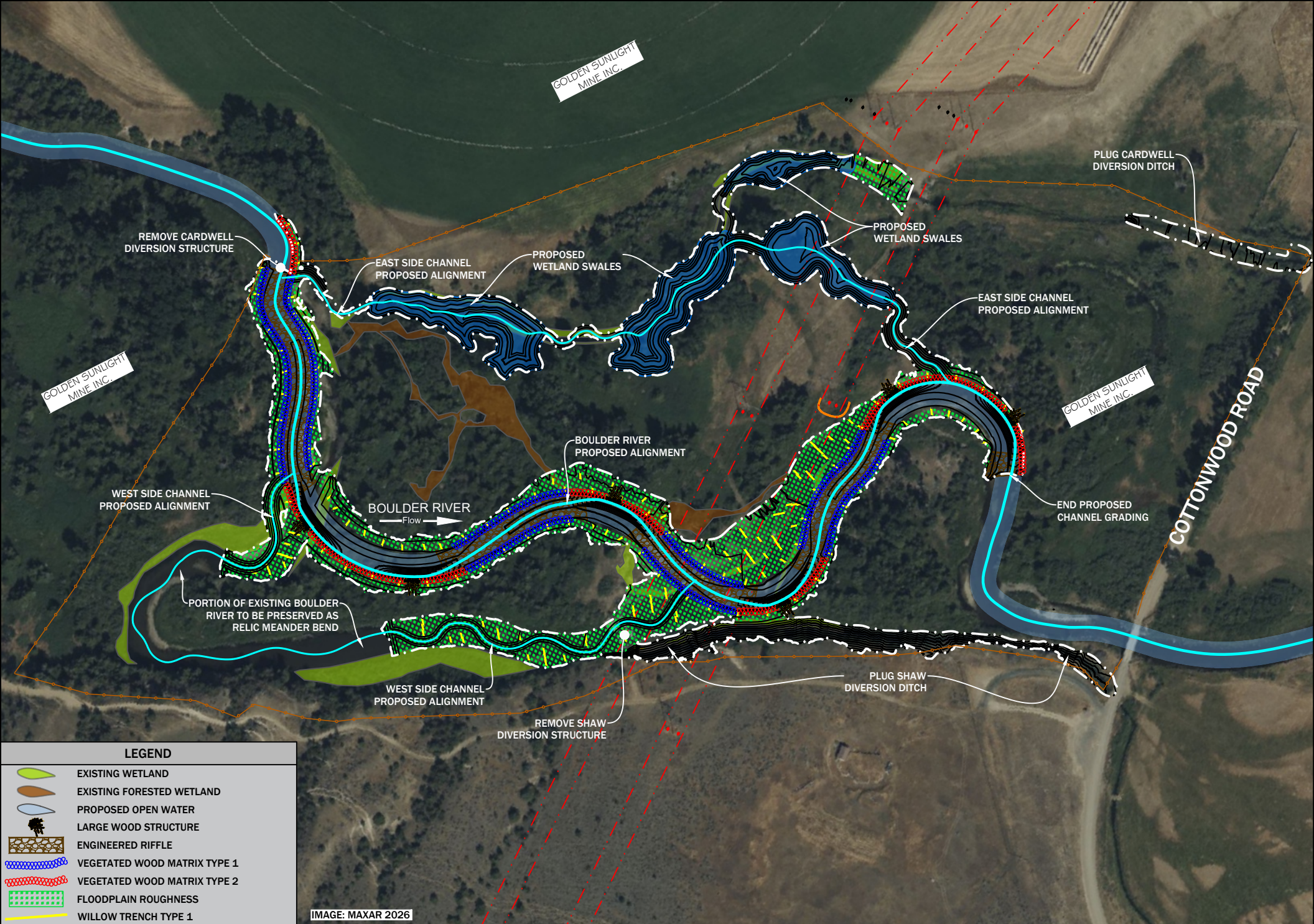
Sincerely,

Signed by:

77C0B6FA87B14B9...

Michael Scott
Vice President of Programs

MAPS/ DESIGNS



GOLDEN SUNLIGHT
MINE INC.

GOLDEN SUNLIGHT
MINE INC.

GOLDEN SUNLIGHT
MINE INC.

COTTONWOOD ROAD

REMOVE CARDWELL
DIVERSION STRUCTURE

EAST SIDE CHANNEL
PROPOSED ALIGNMENT

PROPOSED
WETLAND SWALES

PROPOSED
WETLAND SWALES

EAST SIDE CHANNEL
PROPOSED ALIGNMENT

PLUG CARDWELL
DIVERSION DITCH

WEST SIDE CHANNEL
PROPOSED ALIGNMENT

BOULDER RIVER
Flow

BOULDER RIVER
PROPOSED ALIGNMENT

END PROPOSED
CHANNEL GRADING

PORTION OF EXISTING BOULDER
RIVER TO BE PRESERVED AS
RELIC MEANDER BEND

WEST SIDE CHANNEL
PROPOSED ALIGNMENT

REMOVE SHAW
DIVERSION STRUCTURE

PLUG SHAW
DIVERSION DITCH

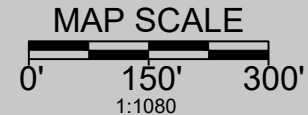
LEGEND

-  EXISTING WETLAND
-  EXISTING FORESTED WETLAND
-  PROPOSED OPEN WATER
-  LARGE WOOD STRUCTURE
-  ENGINEERED RIFFLE
-  VEGETATED WOOD MATRIX TYPE 1
-  VEGETATED WOOD MATRIX TYPE 2
-  FLOODPLAIN ROUGHNESS
-  WILLOW TRENCH TYPE 1
-  WILLOW TRENCH TYPE 2
-  WETLAND SWALE
-  GRADING EXTENT
-  EXISTING OVERHEAD POWER LINE AND POLE
- EXISTING FENCE

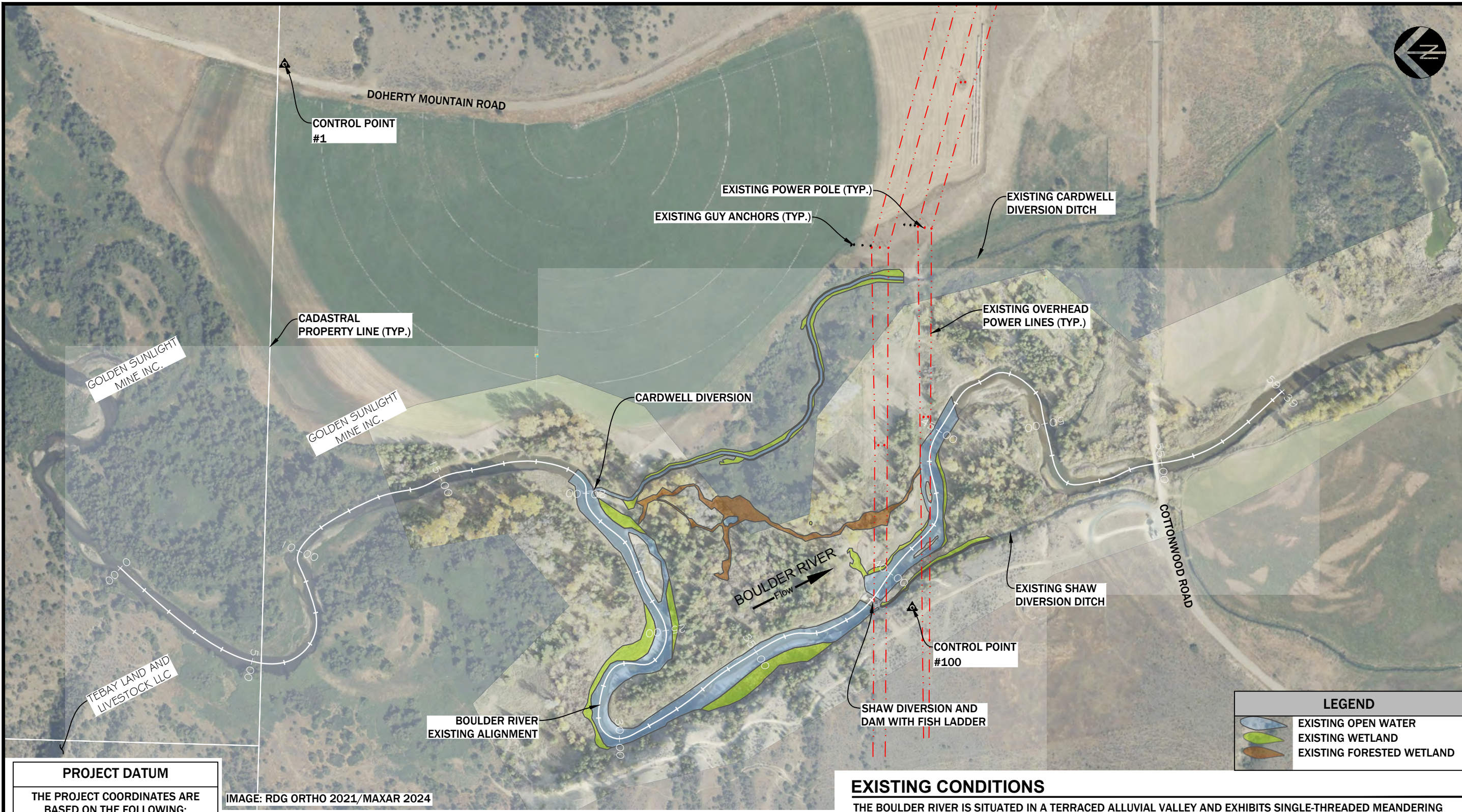
IMAGE: MAXAR 2026

PROJECT LOCATION:
NEAR CARDWELL, MONTANA
LAT. 45.88382, LONG. -111.94257

**SHAW DAM REMOVAL AND
RIPARIAN RESTORATION PROJECT**



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SWCA
ENVIRONMENTAL CONSULTANTS
 236 Wisconsin Avenue
 Whitefish, MT 59937
 406.862.4927
 311 SW Jefferson Avenue
 Conville, OR 97333
 541.738.2920

EXISTING CONDITIONS AND SURVEY CONTROL
BOULDER RIVER DAM REMOVAL
 CARDWELL, MONTANA

PROJECT DATUM	
THE PROJECT COORDINATES ARE BASED ON THE FOLLOWING:	
HORIZONTAL PROJECTION:	MONTANA STATE PLANE FIPS 2500
UNITS:	INTERNATIONAL FEET
HORIZONTAL DATUM:	NAD83 2011
VERTICAL DATUM:	NAVD88 (GEOID 18)
TOPOGRAPHY AND CROSS SECTION GROUND LINES ARE BASED ON SURVEY WORK PERFORMED BY RDG AND WET IN FEBRUARY 2024. LIDAR DATA WAS ACQUIRED IN 2018 AND MERGED WITH SURVEY DATA.	

IMAGE: RDG ORTHO 2021/MAXAR 2024

1 EXISTING CONDITIONS AND SURVEY CONTROL PLAN VIEW

1" = 300'

CONTROL POINTS					
POINT NUMBER	NORTHING	EASTING	POINT ELEVATION	RAW DESCRIPTION	
1	607215.412'	1348455.738'	4360.269'	5/8" REBAR WITH A 2" ALUMINUM CAP MARKED "RDG"	
100	605288.753'	1346787.298'	4317.776'	WET CONTROL	

EXISTING CONDITIONS

THE BOULDER RIVER IS SITUATED IN A TERRACED ALLUVIAL VALLEY AND EXHIBITS SINGLE-THREADED MEANDERING CHANNEL PLANFORM. THE CHANNEL IS MODERATELY ENTRENCHED THROUGH THE PROJECT REACH MEANING THAT IT HAS LIMITED CONNECTION WITH THE ADJACENT FLOODPLAIN. FLOODPLAIN TERRACES AND LARGER HILLSLOPES MODERATELY CONFINE THE CHANNEL THROUGH THE PROJECT REACH. THE FLOODPLAIN CONTAINS DIVERSE TOPOGRAPHY AND DEGRADED RIPARIAN VEGETATION. MEANDER SCROLLS AND CHANNEL SCARS ON THE FLOODPLAIN INDICATE ACTIVE LATERAL MIGRATION AND CHANNEL AVULSION PROCESSES THROUGHOUT THE PROJECT REACH. MIGRATION RATES ARE LIKELY GREATER IN THIS REACH COMPARED WITH UPSTREAM AND DOWNSTREAM REACHES GIVEN THE INCREASED LEVEL OF CONFINEMENT, MAKING IT A NATURALLY DYNAMIC SECTION OF THE BOULDER RIVER. THE CHANNEL SLOPE DECREASES IN THE DOWNSTREAM DIRECTION. AS THE BOULDER ENTERS THE JEFFERSON VALLEY IT IS NO LONGER CONFINED AND DOES NOT INTERACT WITH HILLSLOPES. CHANNEL SUBSTRATE IS DOMINATED BY GRAVEL AND COBBLE BELOW THE SHAW DIVERSION AND BY SAND AND GRAVEL UPSTREAM IN THE REACH IMMEDIATELY UPSTREAM OF THE DAM.

THE SHAW DIVERSION WAS ORIGINALLY CONSTRUCTED AS AN EARTHEN EMBANKMENT CROSSING THE RIVER. A CONCRETE HEADGATE, SPILLWAY, AND FISH LADDER WERE ADDED LATER. THE CARDWELL DIVERSION IS COMPRISED OF LARGE ROCK AND A CONCRETE HEADGATE. THE DIVERSION DAMS ARE BOTH LOCATED ON PROPERTY OWNED BY THE GOLDEN SUNLIGHT MINE, OPERATED BY BARRICK GOLD CORPORATION.

LEGEND	
	EXISTING OPEN WATER
	EXISTING WETLAND
	EXISTING FORESTED WETLAND

NO.	DATE	BY	DESCRIPTION	CHK
1	09/18/25	LJ	FINAL DESIGN	

PROJECT NUMBER
RDG-23-250

DRAWING NUMBER
2.0

Drawing 3 of 28

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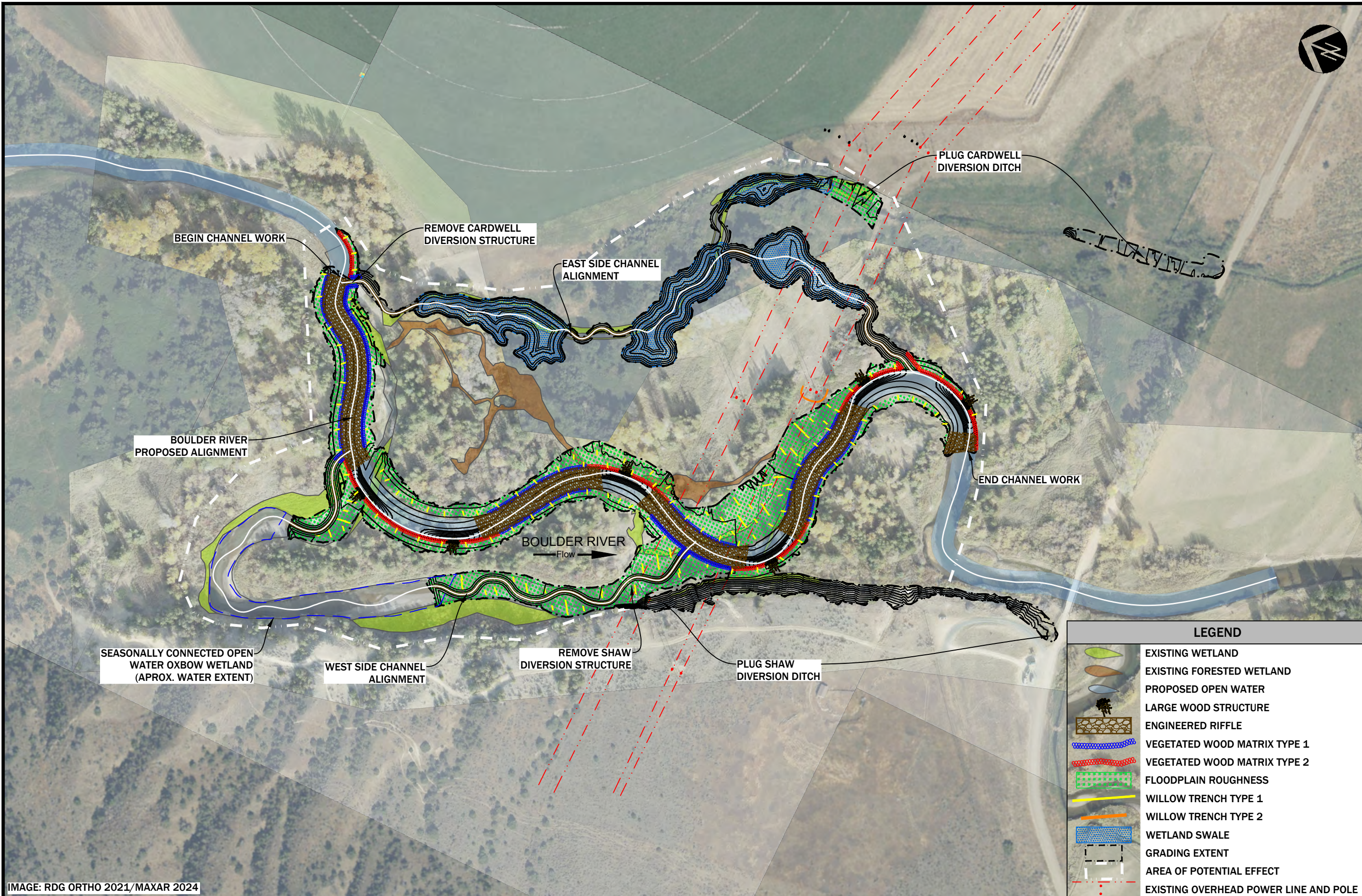


IMAGE: RDG ORTHO 2021/MAXAR 2024

RESTORATION PLAN
 BOULDER RIVER DAM REMOVAL
 CARDWELL, MONTANA

LEGEND			
	EXISTING WETLAND		
	EXISTING FORESTED WETLAND		
	PROPOSED OPEN WATER		
	LARGE WOOD STRUCTURE		
	ENGINEERED RIFFLE		
	VEGETATED WOOD MATRIX TYPE 1		
	VEGETATED WOOD MATRIX TYPE 2		
	FLOODPLAIN ROUGHNESS		
	WILLOW TRENCH TYPE 1		
	WILLOW TRENCH TYPE 2		
	WETLAND SWALE		
	GRADING EXTENT		
	AREA OF POTENTIAL EFFECT		
	EXISTING OVERHEAD POWER LINE AND POLE		

NO.	DATE	BY	DESCRIPTION	CHK	
				MD	
1	09/18/25	LJ	FINAL DESIGN		

PROJECT NUMBER
RDG-23-250

DRAWING NUMBER
2.1

1 RESTORATION PLAN
PLAN VIEW

1" = 200'

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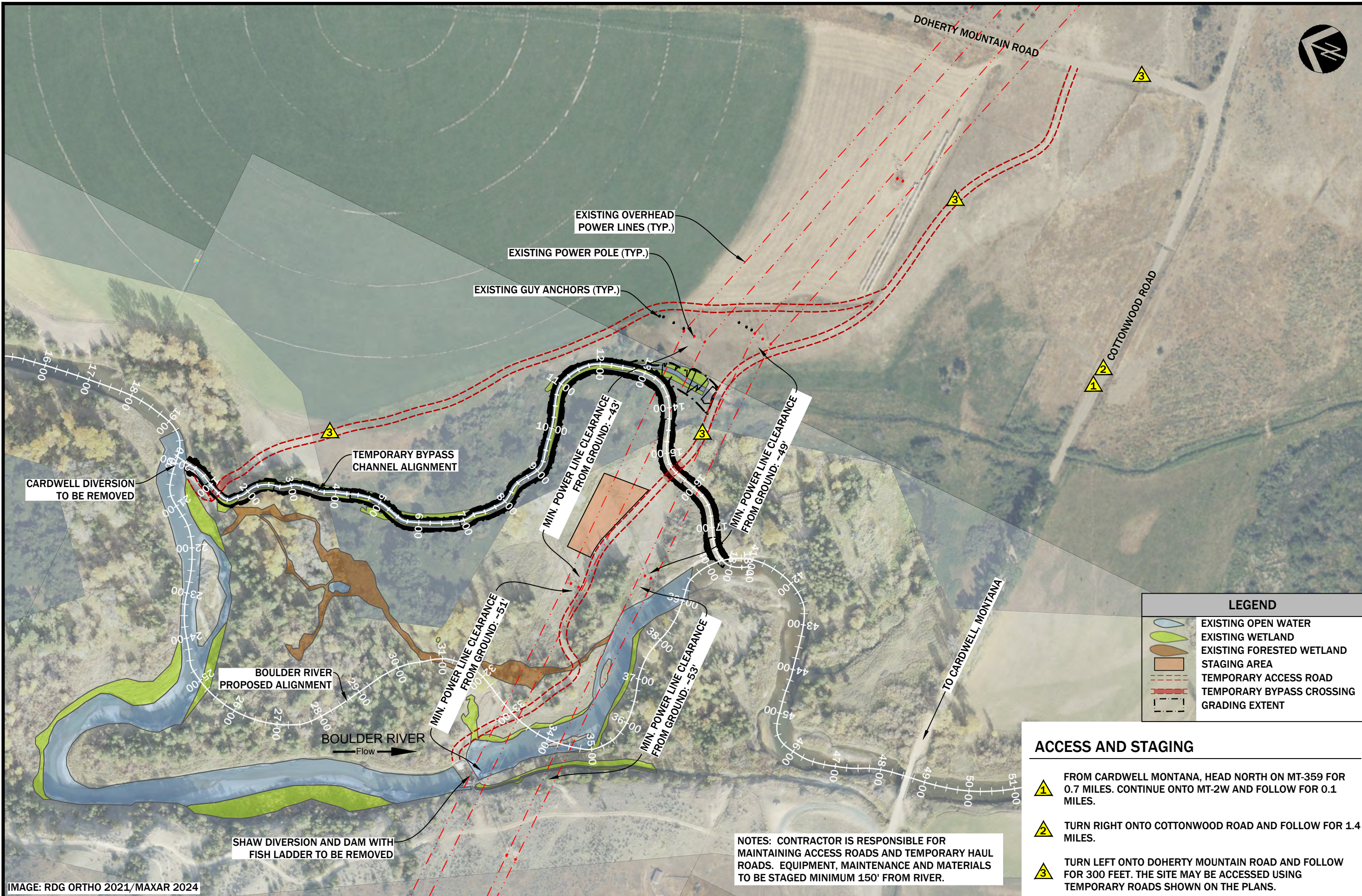


IMAGE: RDG ORTHO 2021/MAXAR 2024

NOTES: CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ACCESS ROADS AND TEMPORARY HAUL ROADS. EQUIPMENT, MAINTENANCE AND MATERIALS TO BE STAGED MINIMUM 150' FROM RIVER.

1 CONSTRUCTION ACCESS AND STAGING PLAN
PLAN VIEW

1" = 200'

LEGEND	
	EXISTING OPEN WATER
	EXISTING WETLAND
	EXISTING FORESTED WETLAND
	STAGING AREA
	TEMPORARY ACCESS ROAD
	TEMPORARY BYPASS CROSSING
	GRADING EXTENT

ACCESS AND STAGING

- 1** FROM CARDWELL MONTANA, HEAD NORTH ON MT-359 FOR 0.7 MILES. CONTINUE ONTO MT-2W AND FOLLOW FOR 0.1 MILES.
- 2** TURN RIGHT ONTO COTTONWOOD ROAD AND FOLLOW FOR 1.4 MILES.
- 3** TURN LEFT ONTO DOHERTY MOUNTAIN ROAD AND FOLLOW FOR 300 FEET. THE SITE MAY BE ACCESSED USING TEMPORARY ROADS SHOWN ON THE PLANS.

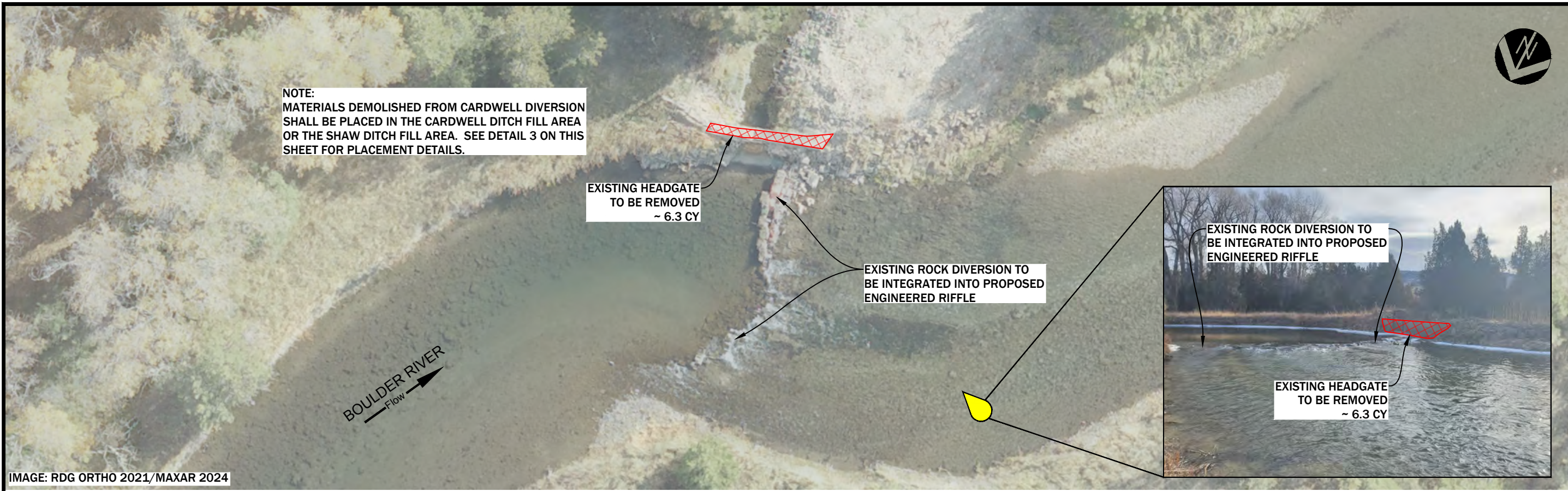
CONSTRUCTION ACCESS AND STAGING PLAN
 BOULDER RIVER DAM REMOVAL
 CARDWELL, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
1	09/18/25	LJ	FINAL DESIGN	

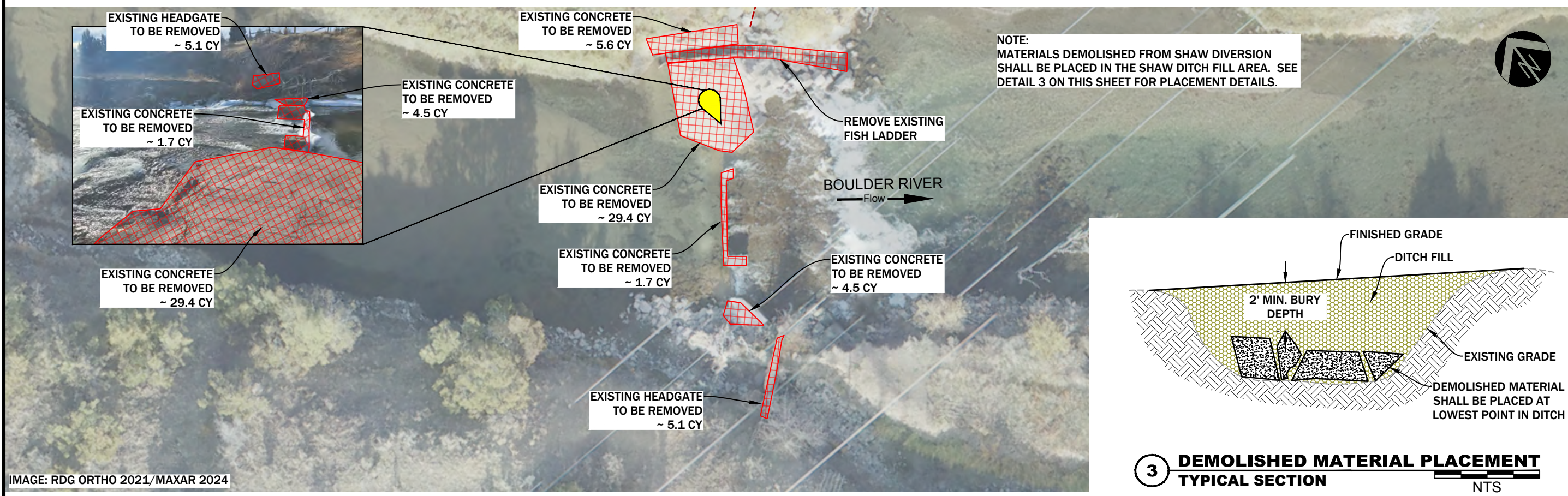
PROJECT NUMBER
RDG-23-250

DRAWING NUMBER
2.2

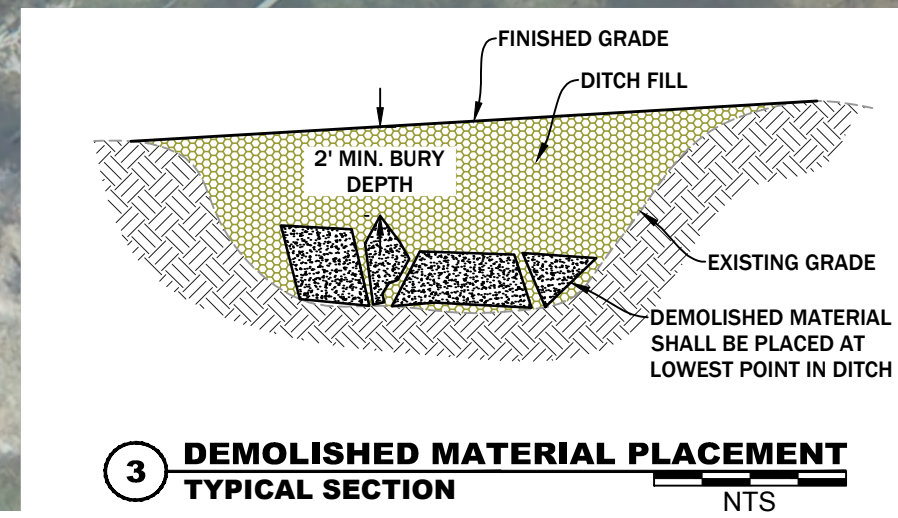
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1 DEMOLITION PLAN - CARDWELL DIVERSION
PLAN VIEW
1" = 20'



2 DEMOLITION PLAN - SHAW DIVERSION
PLAN VIEW
1" = 20'



NO.	DATE	BY	DESCRIPTION	CHK
1	09/18/25	LJ	FINAL DESIGN	MD
PROJECT NUMBER RDG-23-250				
DRAWING NUMBER 3.0				
Drawing 6 of 28				

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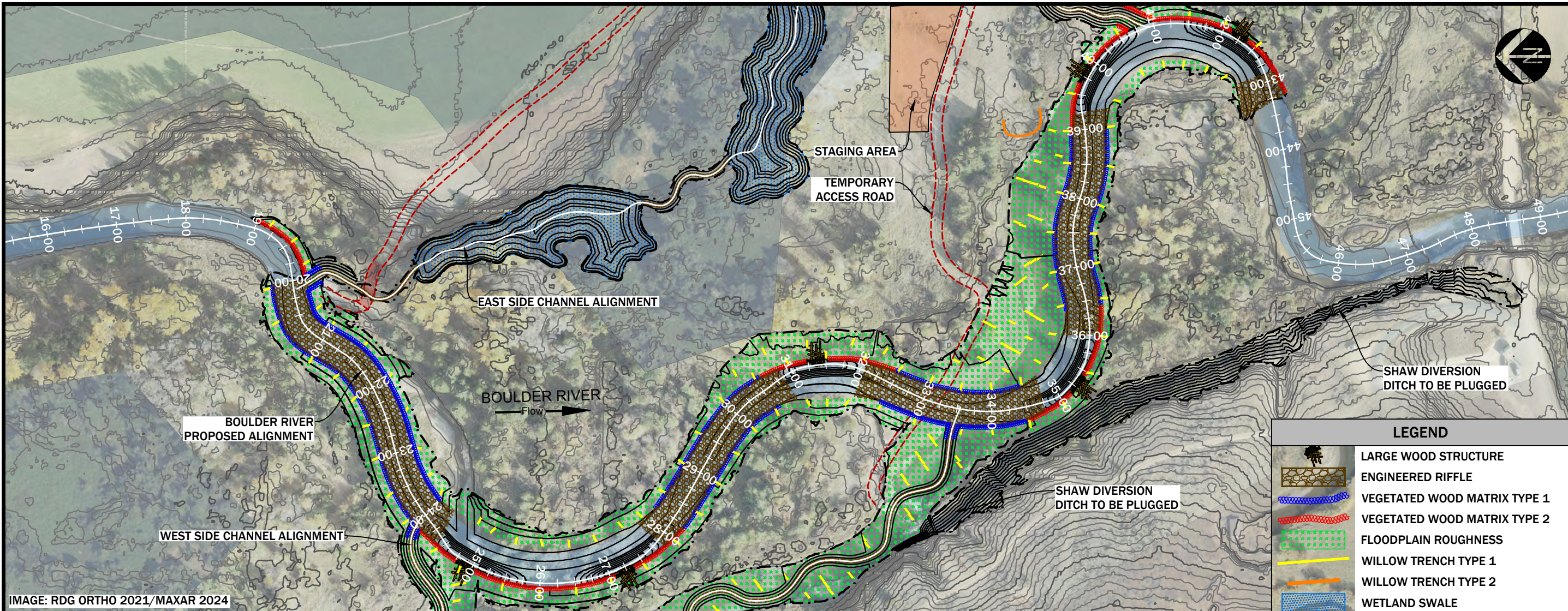


IMAGE: RDG ORTHO 2021/MAXAR 2024

LEGEND	
	LARGE WOOD STRUCTURE
	ENGINEERED RIFFLE
	VEGETATED WOOD MATRIX TYPE 1
	VEGETATED WOOD MATRIX TYPE 2
	FLOODPLAIN ROUGHNESS
	WILLOW TRENCH TYPE 1
	WILLOW TRENCH TYPE 2
	WETLAND SWALE

1 STRUCTURE LAYOUT STA 19+00 - 47+00
PLAN VIEW
 1" = 150'

CHANNEL TOP OF BANK ELEVATIONS					
STATION	ELEVATION (FT)	STATION	ELEVATION (FT)	STATION	ELEVATION (FT)
18+00	4300.7	27+00	4298.5	36+00	4295.4
18+50	4300.6	27+50	4298.4	36+50	4295.3
19+00	4300.5	28+00	4298.3	37+00	4295.1
19+50	4300.3	28+28.2	4298.2	37+50	4294.9
20+00	4300.2	28+50	4298.2	38+00	4294.7
20+50	4300.1	29+00	4298.0	38+50	4294.5
21+00	4300.0	29+50	4297.8	39+00	4294.4
21+50	4299.9	30+00	4297.6	39+50	4294.2
22+00	4299.7	30+50	4297.4	40+00	4294.0
22+50	4299.6	31+00	4297.3	40+50	4293.8
23+00	4299.5	31+50	4297.1	41+00	4293.6
23+50	4299.4	32+00	4296.9	41+50	4293.4
24+00	4299.3	32+50	4296.7	42+00	4293.3
24+50	4299.1	33+00	4296.5	42+50	4293.1
25+00	4299.0	33+50	4296.4	43+00	4292.9
25+50	4298.9	34+00	4296.2	43+50	4292.7
26+00	4298.8	34+50	4296.0	44+00	4292.5
26+50	4298.7	35+00	4295.8	44+50	4292.4
		35+50	4295.6	45+00	4292.2

STRUCTURE SCHEDULE							
STATION START	STATION END	BANK	STRUCTURE	STATION START	STATION END	BANK	STRUCTURE
19+00	20+01	L	VWM 2	32+06	34+75	C	ER
20+01	24+39	C	ER	32+46	34+47	L + R	VWM 1
20+01	24+12	L + R	VWM 1	34+47	35+19	R	VWM 2
24+12	24+80	R	VWM 2	35+19	35+44	R	LWS
24+80	25+05	R	LWS	35+44	36+41	R	VWM 2
25+05	27+12	R	VWM 2	36+00	39+25	C	ER
27+12	27+37	R	LWS	36+41	38+97	L + R	VWM 1
27+37	28+21	R	VWM 2	38+97	39+68	L	VWM 2
27+86	30+85	C	ER	39+68	39+93	L	LWS
28+21	30+58	L + R	VWM 1	39+93	42+11	L	VWM 2
30+58	31+27	L	VWM 2	42+11	42+36	L	LWS
31+27	31+52	L	LWS	42+36	43+24	L	VWM 2
31+52	32+46	L	VWM 2	42+88	43+24	C	ER

CHANNEL CROSS SECTION LAYOUT			
STATION	SECTION	STATION	SECTION
20+01	TOR-L	32+46	TOR-L
24+12	BOR-R	34+47	BOR-R
24+66	POOL-R	35+03	POOL-R
25+20	POOL-R	35+60	POOL-R
25+90	PUN-R	36+41	TOR-R
26+43	PUN-R	38+97	BOR-L
26+97	POOL-R	39+53	POOL-L
27+51	POOL-R	40+09	POOL-L
28+21	TOR-R	40+83	PUN-L
30+58	BOR-L	41+40	PUN-L
31+12	POOL-L	41+95	POOL-L
31+66	POOL-L	42+53	POOL-L
		43+24	TOR-L

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 236 Wisconsin Avenue
 Whitefish, MT 59937
 406.662.4927

BOULDER RIVER PLAN VIEW AND STRUCTURE LAYOUT

BOULDER RIVER DAM REMOVAL

CARDWELL, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK	MD
1	09/18/25	LJ	FINAL DESIGN		

PROJECT NUMBER
RDG-23-250

DRAWING NUMBER
4.0

Drawing 9 of 28

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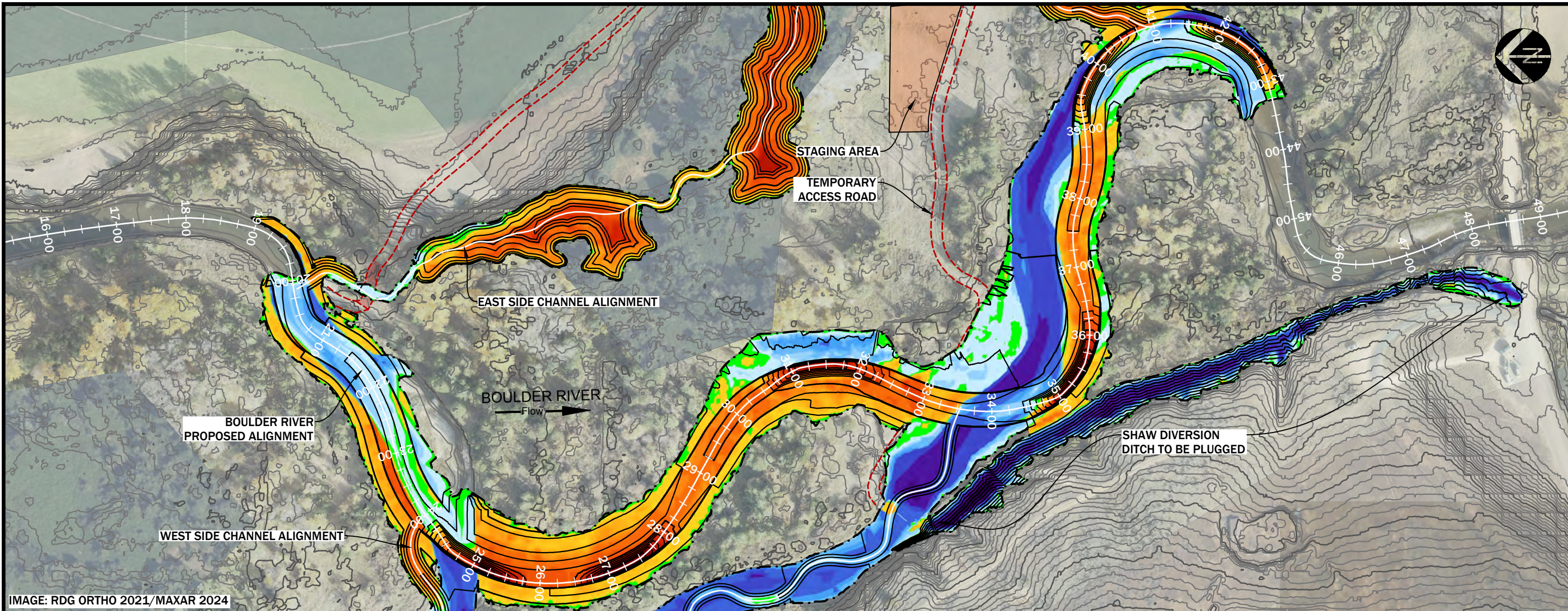
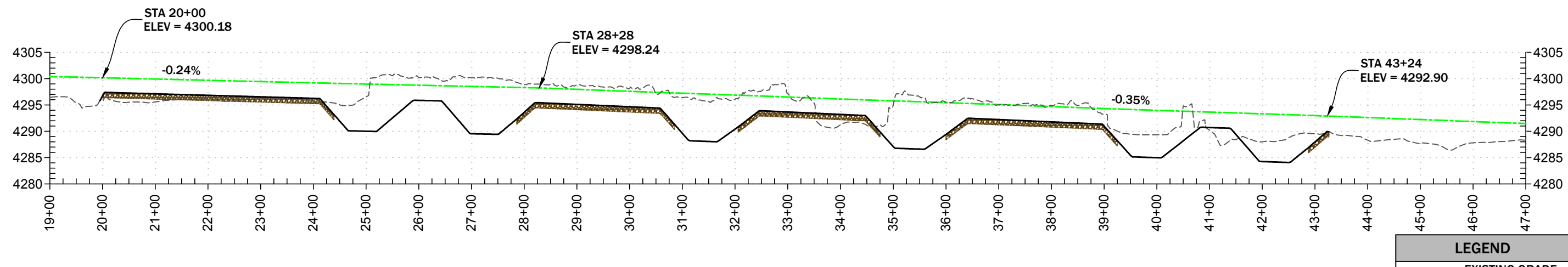
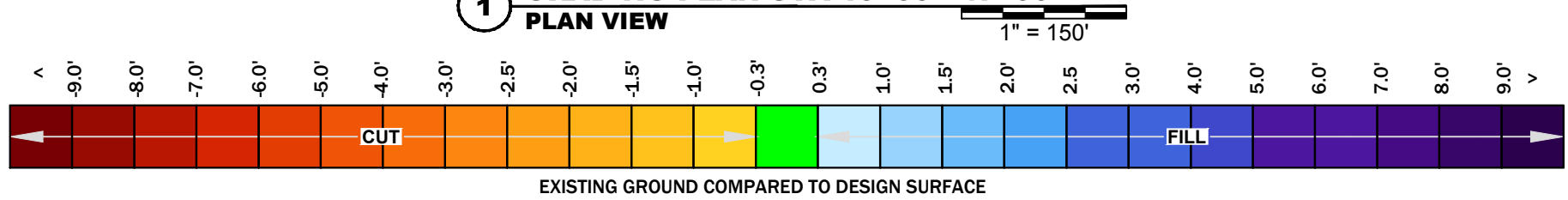


IMAGE: RDG ORTHO 2021/MAXAR 2024

1 GRADING PLAN STA 19+00 - 47+00
PLAN VIEW



2 GRADING PLAN STA 19+00 - 47+00
PROFILE VIEW

LEGEND

- EXISTING GRADE
- BANKFULL
- FINISHED GRADE
- ▨ RIFFLE MATERIAL

BOULDER RIVER GRADING PLAN AND PROFILE
BOULDER RIVER DAM REMOVAL
CARDWELL, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
1	09/18/25	LJ	FINAL DESIGN	MD

PROJECT NUMBER
RDG-23-250

DRAWING NUMBER
4.1

Drawing 10 of 28

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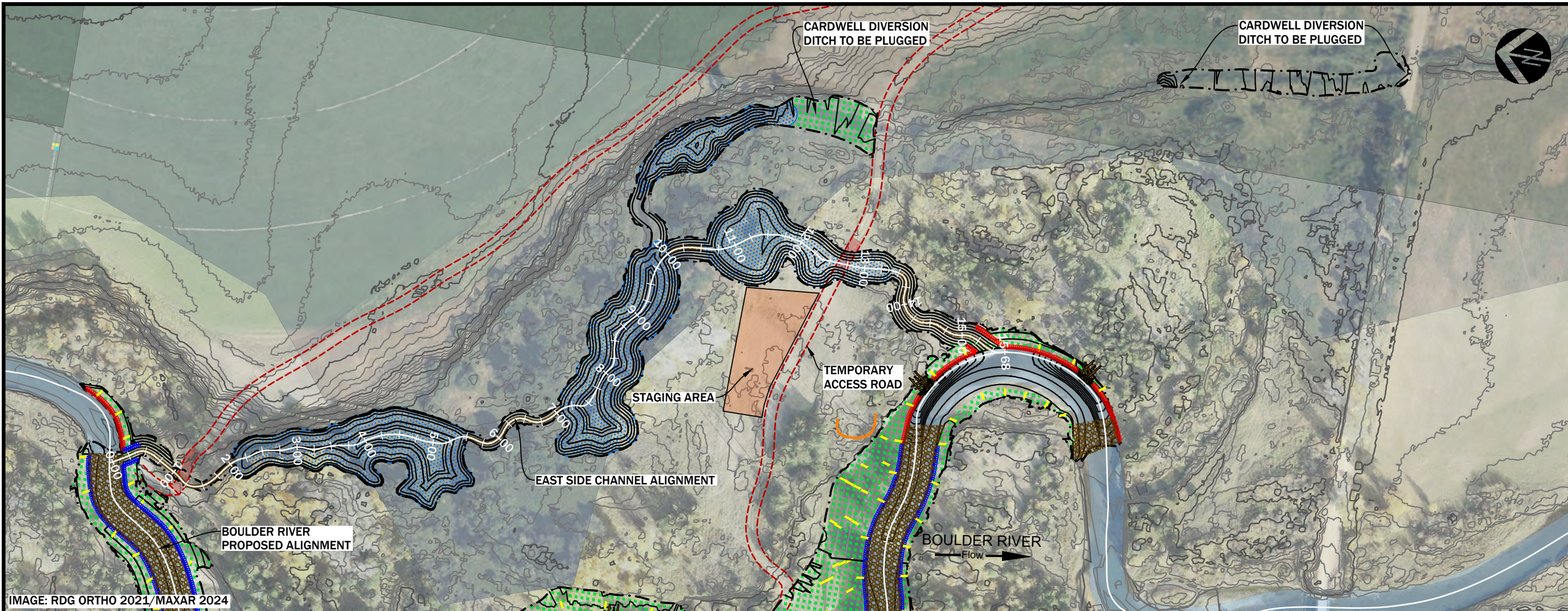
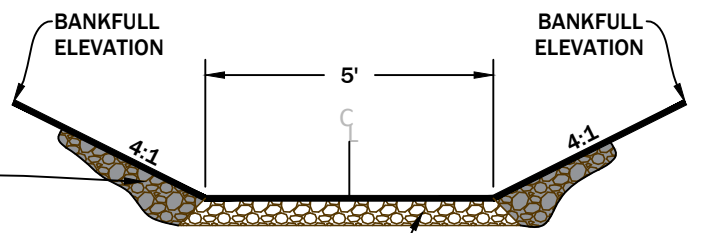


IMAGE: RDG ORTHO 2021/MAXAR 2024

1 EAST SIDE CHANNEL STRUCTURE LAYOUT PLAN VIEW
1" = 150'

LEGEND	
	LARGE WOOD STRUCTURE
	ENGINEERED RIFFLE
	VEGETATED WOOD MATRIX TYPE 1
	VEGETATED WOOD MATRIX TYPE 2
	FLOODPLAIN ROUGHNESS
	WILLOW TRENCH TYPE 1
	WILLOW TRENCH TYPE 2
	WETLAND SWALE



SURPLUS RIFFLE MATERIAL SHALL BE PLACED ON CHANNEL SIDE SLOPES.

RIFFLE MATERIAL PLACED AT 12 INCHES THICK. SEE DRAWING 6.1 FOR DETAILS.

NOTE:
RIFFLE MATERIAL FOR THE EAST SIDE CHANNEL WITH BE SALVAGED FROM THE TEMPORARY BYPASS INLET AND OUTLET RIFFLE MATERIAL PLACEMENT. A SURPLUS OF RIFFLE MATERIAL IS EXPECTED AND ADDITIONAL MATERIAL SHALL BE PLACED ON THE SIDE SLOPES OF THE EAST SIDE CHANNEL.

2 EAST SIDE CHANNEL TYPICAL SECTION
NTS

RIFFLE MATERIAL GRADATION	
SIZE (IN)	PERCENT PASSING
8	100
6	80-90
4	60-70
3	40-50
2	20-30
FINES	0-10

NOTE: MIX SALVAGED AND IMPORTED TO ACHIEVE SPECIFIED GRADATION

STRUCTURE SCHEDULE			
STATION START	STATION END	BANK	STRUCTURE
0+17	0+37	L + R	VWM 1
0+17	2+10	C	ER
5+44	7+12	C	ER
9+89	10+69	C	ER
13+38	15+46	C	ER
15+26	15+46	L + R	VWM 2

NO.	DATE	BY	DESCRIPTION	CHK
1	09/18/25	LJ	FINAL DESIGN	

PROJECT NUMBER
RDG-23-250

DRAWING NUMBER

4.2

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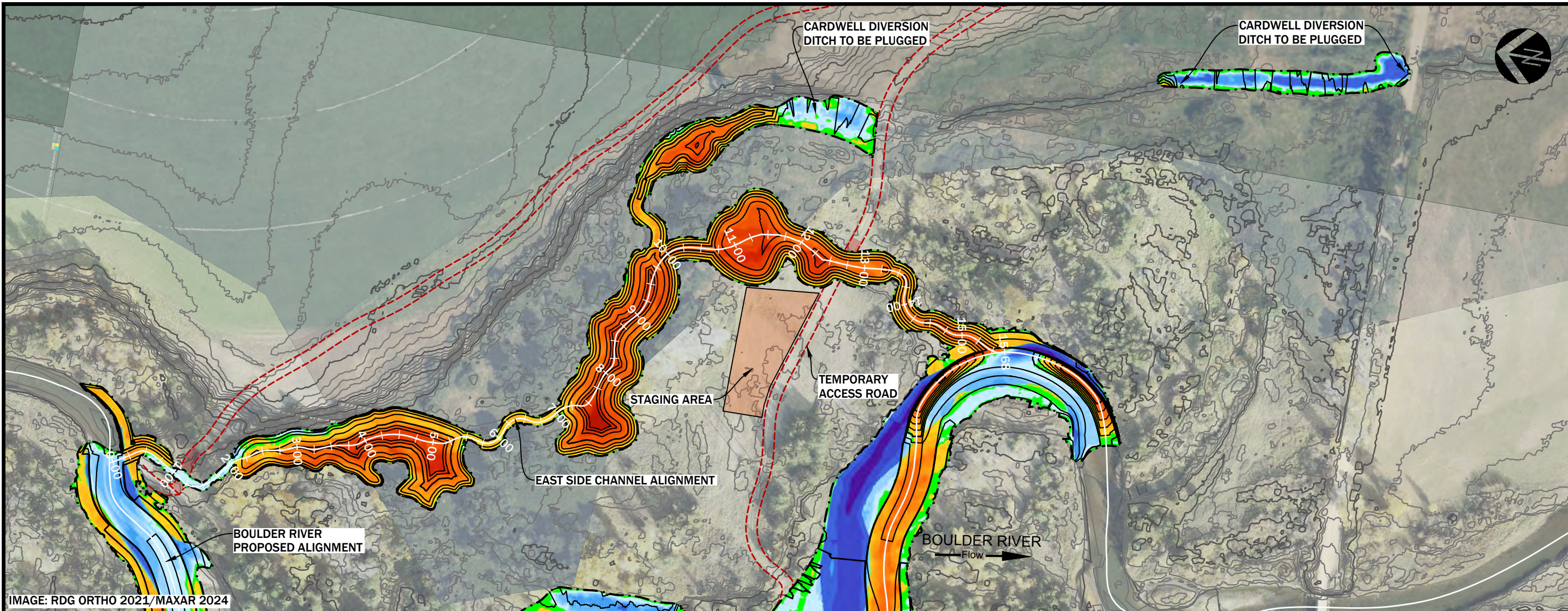
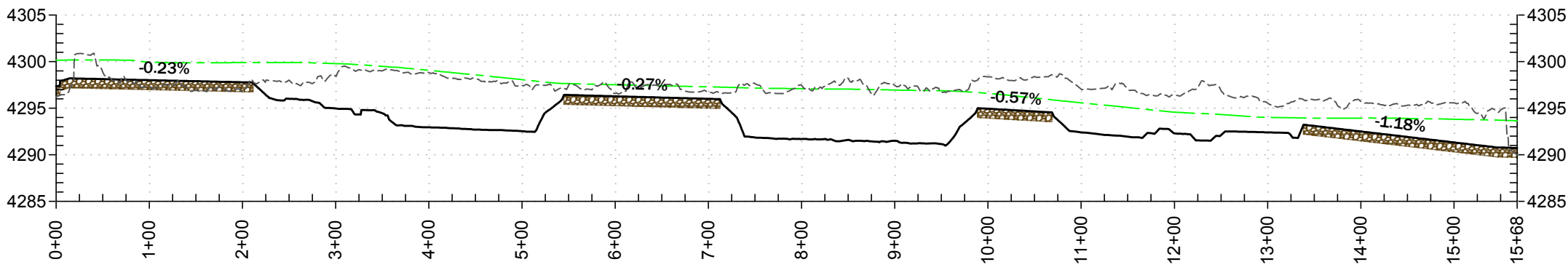
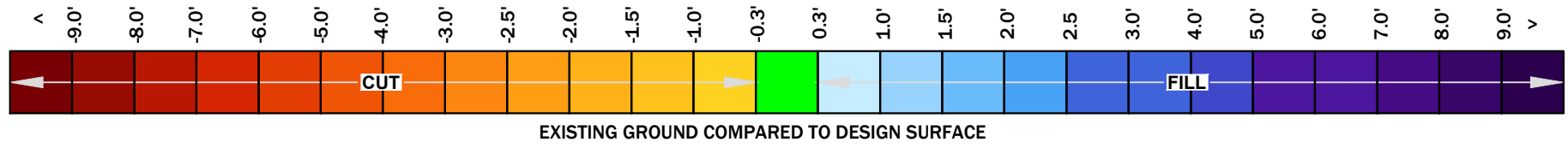


IMAGE: RDG ORTHO 2021/MAXAR 2024

1 EAST SIDE CHANNEL GRADING PLAN
PLAN VIEW
 1" = 150'



2 EAST SIDE CHANNEL GRADING PLAN
PROFILE VIEW
 H: 1" = 150'
 V: 1" = 15'

LEGEND

- EXISTING GRADE
- BANKFULL
- FINISHED GRADE
- ▨ RIFFLE MATERIAL

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 236 Wisconsin Avenue
 Whitefish, MT 59937
 406.662.4927

EAST SIDE CHANNEL GRADING PLAN AND PROFILE
 BOULDER RIVER DAM REMOVAL
 CARDWELL, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
1	09/18/25	LJ	FINAL DESIGN	MD
PROJECT NUMBER RDG-23-250				
DRAWING NUMBER 4.3				
Drawing 12 of 28				

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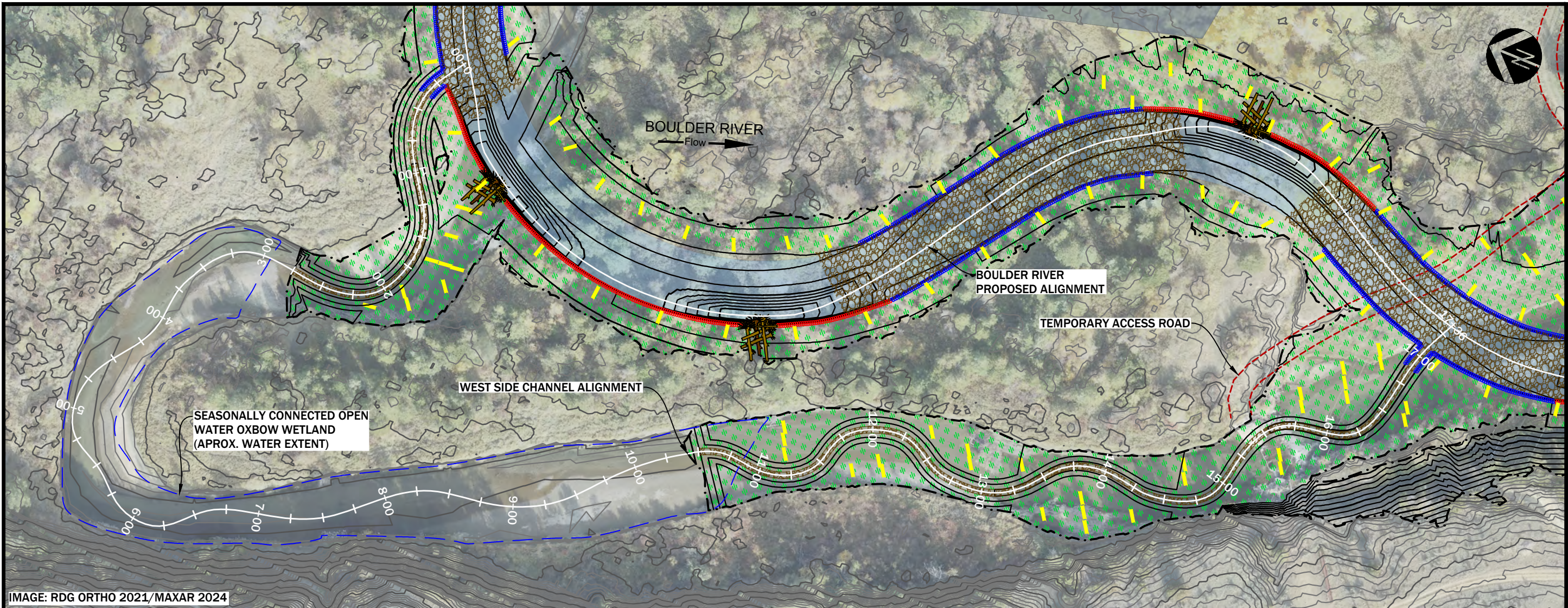
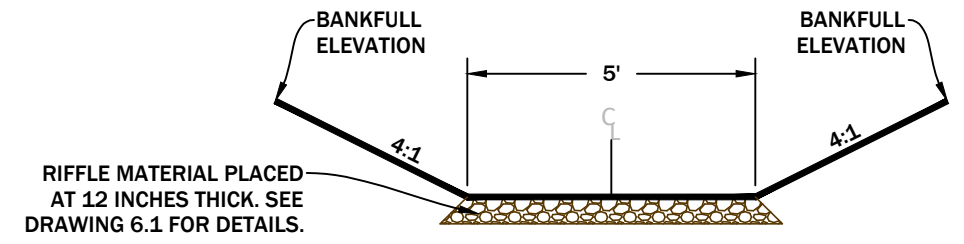


IMAGE: RDG ORTHO 2021/MAXAR 2024

1 WEST SIDE CHANNEL STRUCTURE LAYOUT PLAN VIEW
 1" = 80'

LEGEND	
	LARGE WOOD STRUCTURE
	ENGINEERED RIFFLE
	VEGETATED WOOD MATRIX TYPE 1
	VEGETATED WOOD MATRIX TYPE 2
	FLOODPLAIN ROUGHNESS
	WILLOW TRENCH



2 WEST SIDE CHANNEL TYPICAL SECTION
 NTS

RIFFLE MATERIAL GRADATION	
SIZE (IN)	PERCENT PASSING
8	100
6	80-90
4	60-70
3	40-50
2	20-30
FINES	0-10

NOTE: MIX SALVAGED AND IMPORTED TO ACHIEVE SPECIFIED GRADATION

STRUCTURE SCHEDULE			
STATION START	STATION END	BANK	STRUCTURE
0+18	0+38	L + R	VWM 1
0+18	2+75	C	ER
10+53	17+12	C	ER
16+89	17+09	L + R	VWM 1

NO.	DATE	BY	DESCRIPTION	CHK
				MD
1	09/18/25	LJ	FINAL DESIGN	

PROJECT NUMBER
RDG-23-250

DRAWING NUMBER

4.4

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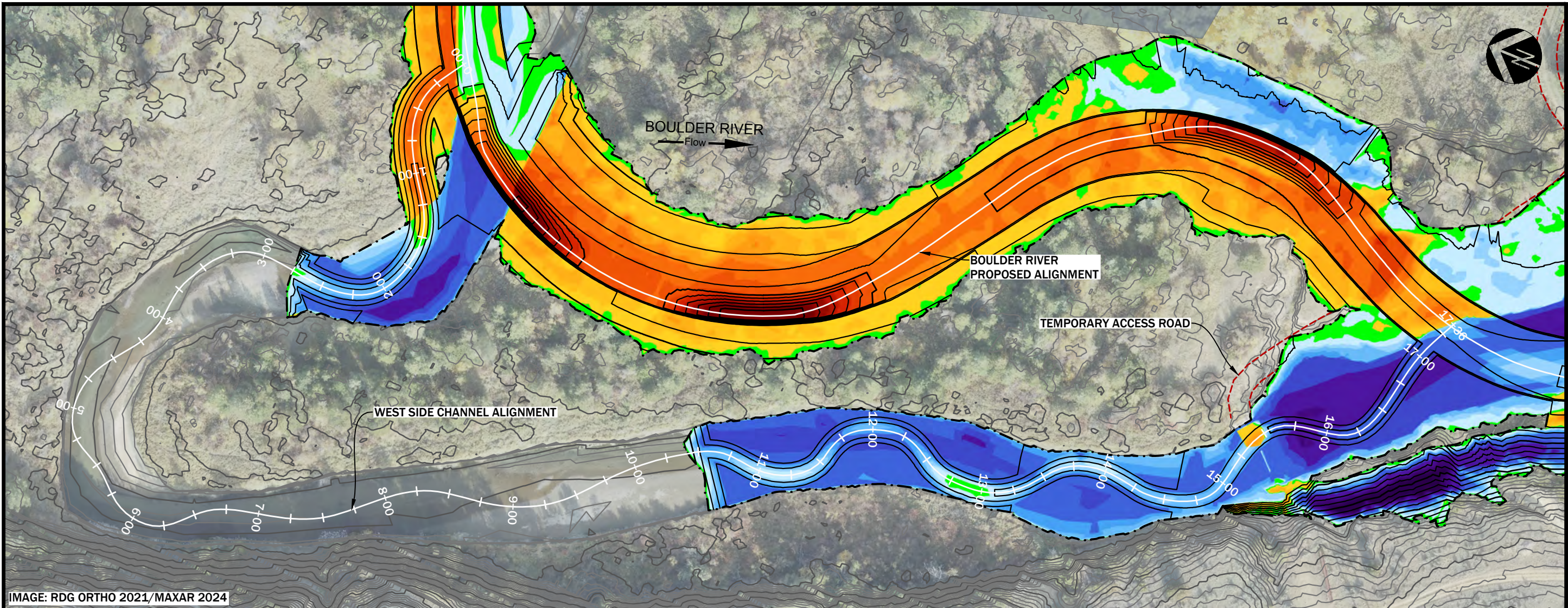
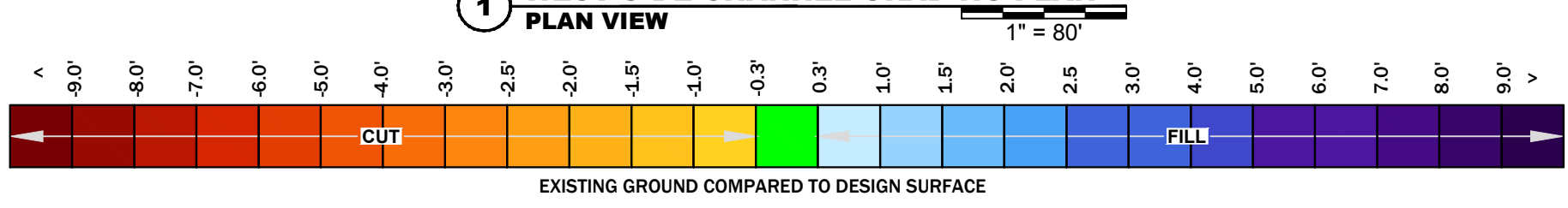
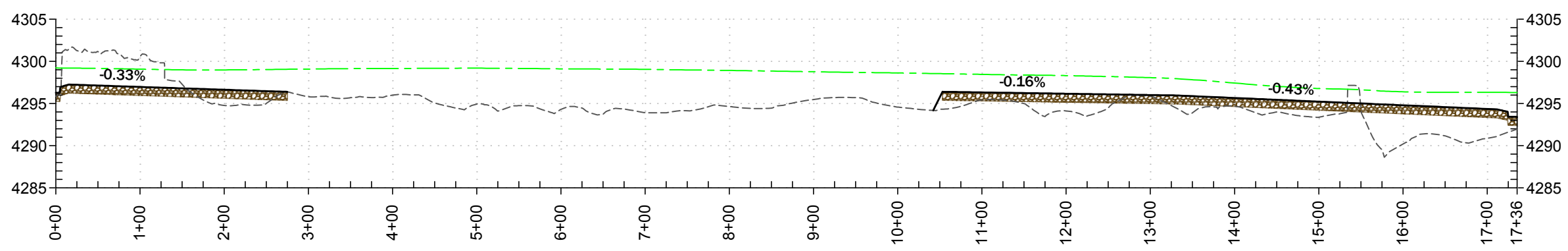


IMAGE: RDG ORTHO 2021/MAXAR 2024

**1 WEST SIDE CHANNEL GRADING PLAN
PLAN VIEW**



**2 WEST SIDE CHANNEL GRADING PLAN
PROFILE VIEW**



LEGEND

- EXISTING GRADE
- BANKFULL
- FINISHED GRADE
- ▨ RIFFLE MATERIAL

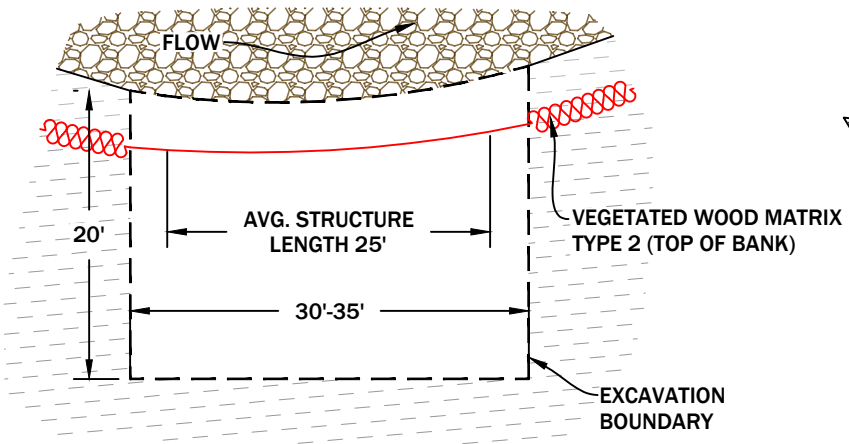
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WEST SIDE CHANNEL GRADING PLAN AND PROFILE
BOULDER RIVER DAM REMOVAL
CARDWELL, MONTANA

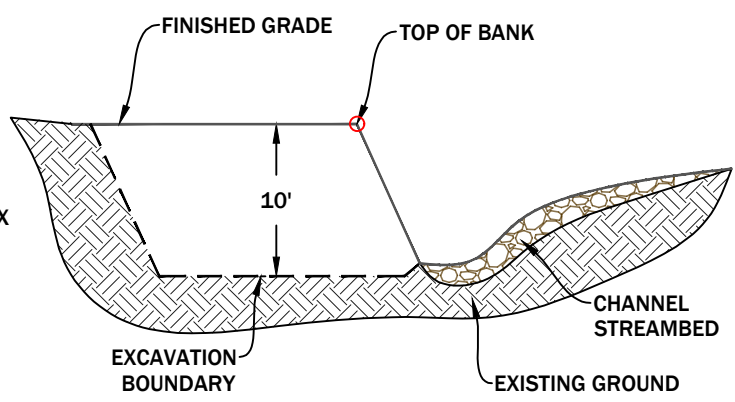
NO.	DATE	BY	DESCRIPTION	CHK
1	09/18/25	LJ	FINAL DESIGN	MD

PROJECT NUMBER
RDG-23-250
DRAWING NUMBER
4.5
Drawing 14 of 28

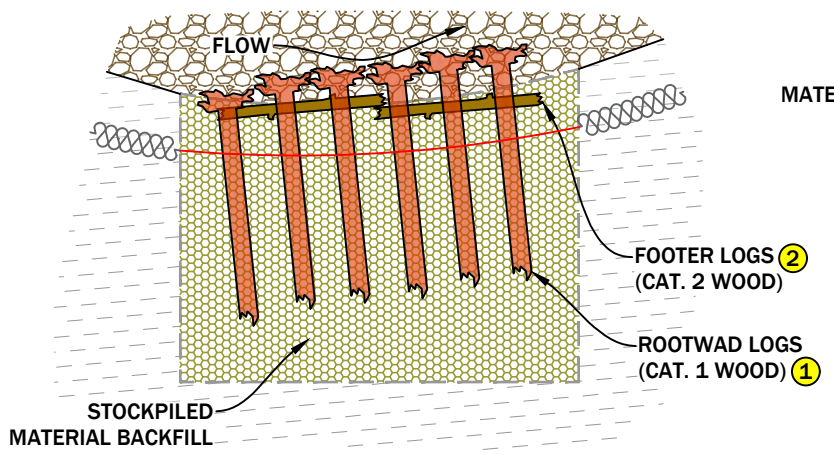
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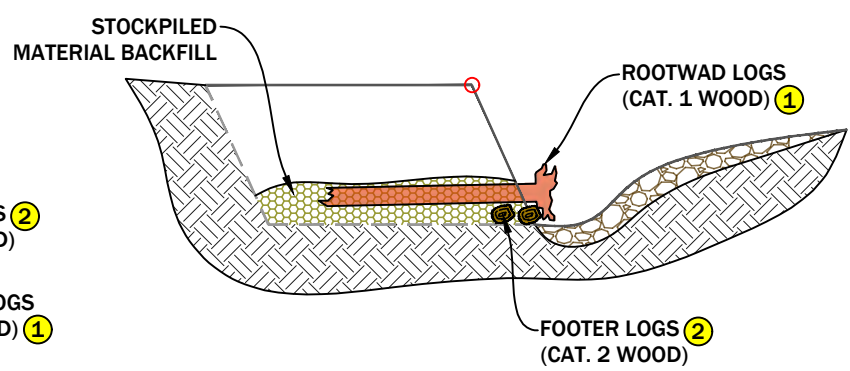
PLAN VIEW STEP 1



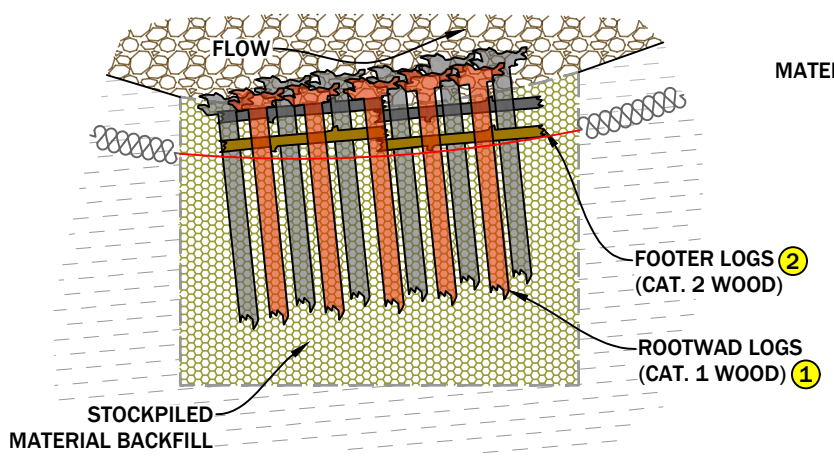
SECTION VIEW STEP 1



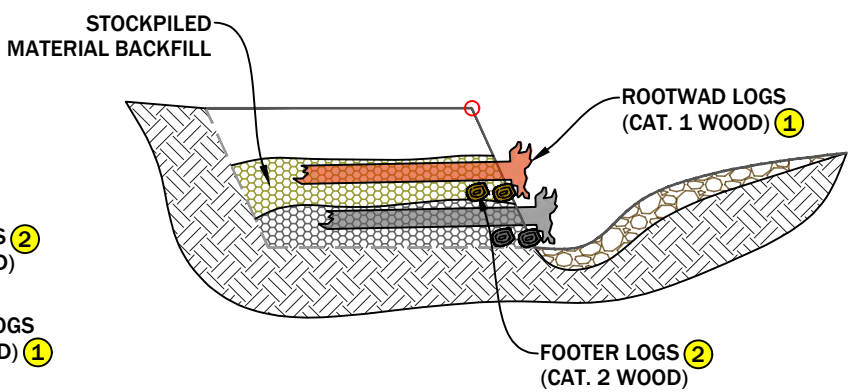
PLAN VIEW STEP 2-4



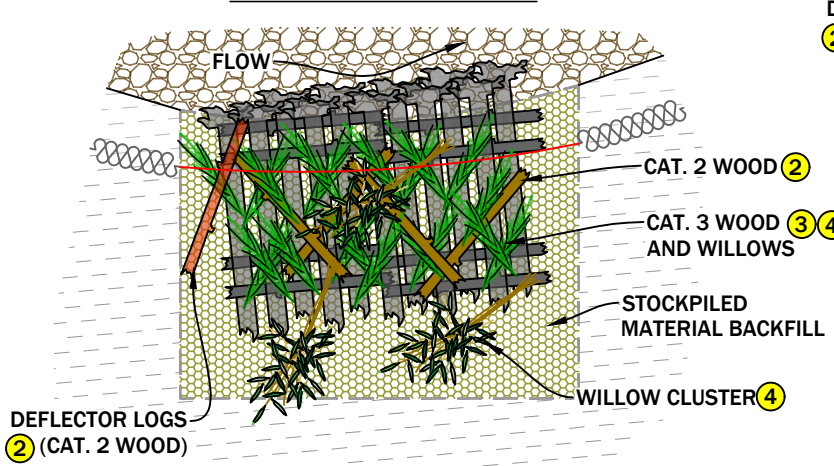
SECTION VIEW STEP 2-4



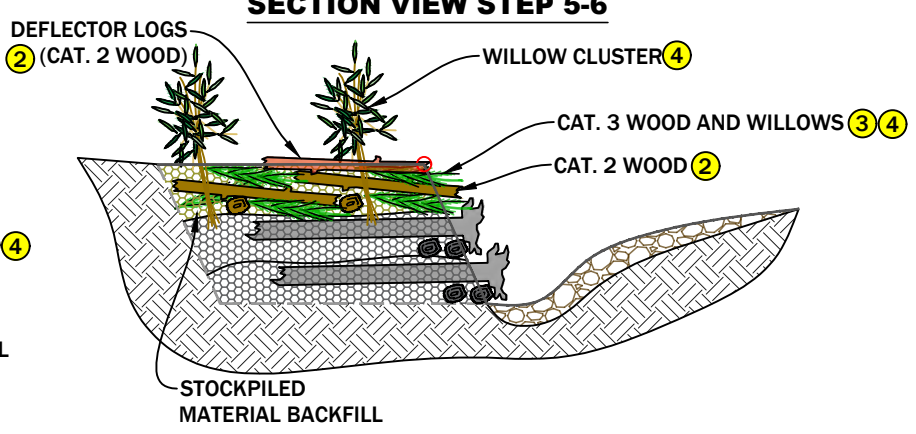
PLAN VIEW STEP 5-6



SECTION VIEW STEP 5-6



PLAN VIEW STEP 7-9



SECTION VIEW STEP 7-9

GENERAL NOTES

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

CONSTRUCTION NOTES

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

LARGE WOOD STRUCTURE MATERIAL SCHEDULE (PER STRUCTURE)				
ITEM	DIA. (IN)	LENGTH (FT)	ROOTWAD (Y/N)	QTY.
① CATEGORY 1 WOOD	8" - 12"	12-15	YES - 36 IN DIA. MIN	12 EA
② CATEGORY 2 WOOD	3" - 6"	8-10	NO	10 EA
③ CATEGORY 3 WOOD	1" - 3"	8-10	OPTIONAL 1-2 FT	50 EA
④ WILLOW CUTTINGS	0.25" - 1"	8	NO	200 EA



EXAMPLE OF A LARGE WOOD STRUCTURE

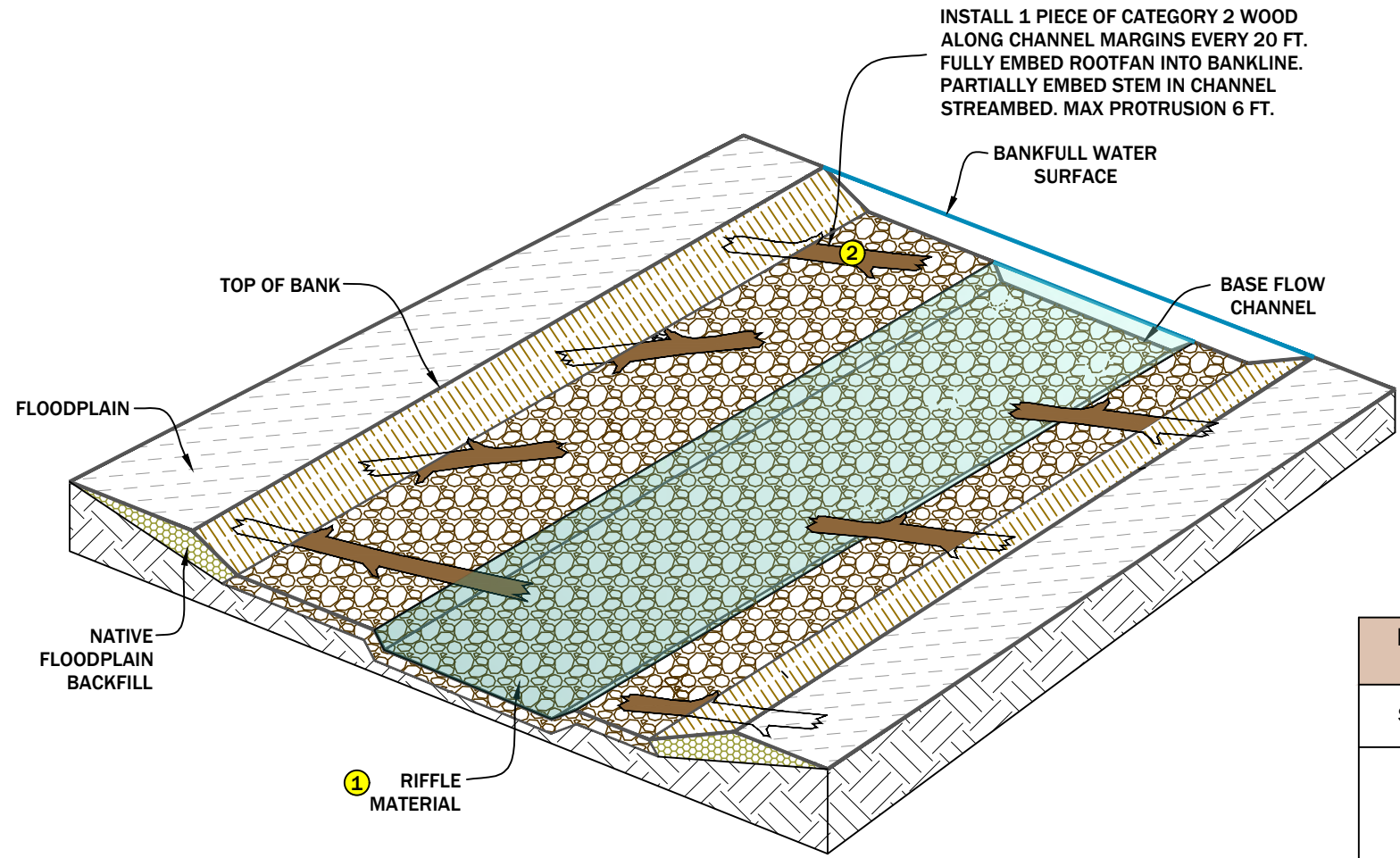
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				MD	MD
1	09/18/25	LJ	FINAL DESIGN		

PROJECT NUMBER
RDG-23-250

DRAWING NUMBER
6.0

Drawing 20 of 28

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1 ENGINEERED RIFFLE
3D VIEW NTS

NOTES ON ENGINEERED RIFFLE INSTALLATION

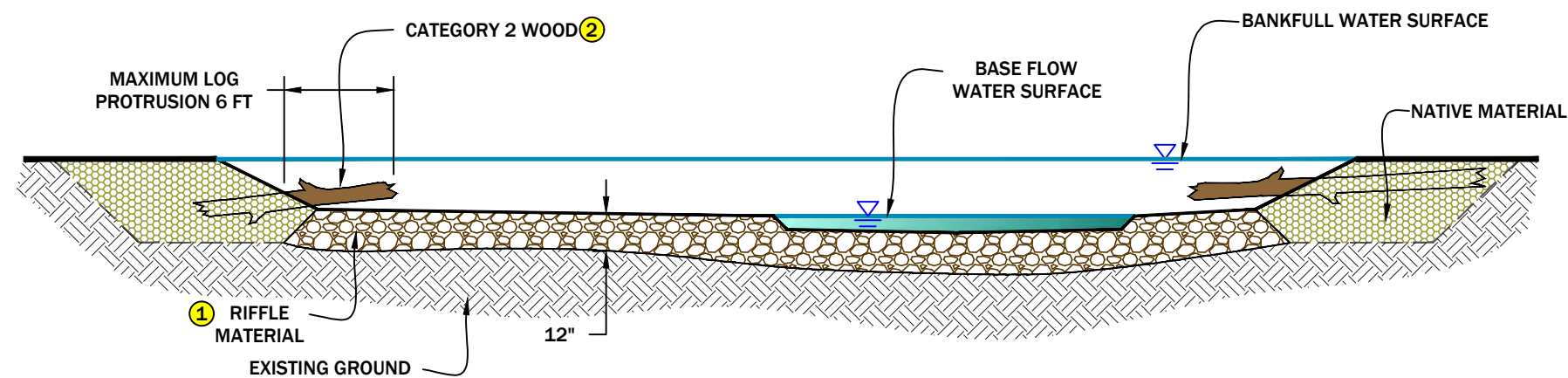
1. DURING CONSTRUCTION OF THE ENGINEERED RIFFLE, THE ENGINEER SHALL VERIFY THE RIFFLE LAYOUT AND CONDUCT PERIODIC INSPECTION OF ELEVATIONS AND MATERIAL PLACEMENT.
2. PREPARE THE SUBGRADE BY EXCAVATING THE RIFFLE FOOTPRINT ONE FOOT BELOW FINISHED GRADE ELEVATION. STOCKPILE SALVAGED ALLUVIUM FOR USE IN RIFFLE CONSTRUCTION.
3. INSTALL CHANNEL MARGIN WOOD (CATEGORY 2 WOOD) TO PROVIDE AQUATIC HABITAT COMPLEXITY AND ROUGHNESS. CHANNEL MARGIN WOOD SHALL PROJECT NO GREATER THAN 6 FEET INTO THE CHANNEL IN VARIOUS ORIENTATIONS TO FLOW. CHANNEL MARGIN WOOD SHALL BE EMBEDDED INTO THE CHANNEL STREAMBED A MINIMUM OF ONE-HALF THE LOG LENGTH AS SHOWN ON THE DRAWINGS.
4. MIX SALVAGED ALLUVIUM WITH IMPORTED ROCK TO ACHIEVE THE RIFFLE MATERIAL GRADATION SPECIFIED ON THE DRAWINGS.
5. PLACE THE RIFFLE MATERIAL AND WASH FINES INTO STREAMBED TO SEAL THE VOIDS. RIFFLE MATERIAL SHALL BE PLACED IN A LAYER 12 INCHES DEEP TO ACHIEVE FINISHED GRADE.

RIFFLE MATERIAL GRADATION	
SIZE (IN)	PERCENT PASSING
8	100
6	80-90
4	60-70
3	40-50
2	20-30
FINES	0-10

NOTE: MIX SALVAGED AND IMPORTED TO ACHIEVE SPECIFIED GRADATION

BOULDER RIVER MATERIAL SCHEDULE (PER 10 LINEAR FEET)			
ITEM	DIA.	LENGTH	QUANTITY (EA)
① RIFFLE MATERIAL	SEE GRAD.		17 CY
② CATEGORY 2 WOOD	3" - 6"	8' - 10'	0.5 EA

EAST/WEST SIDE CHANNEL MATERIAL SCHEDULE (PER 10 LINEAR FEET)			
ITEM	DIA.	LENGTH	QUANTITY (EA)
① RIFFLE MATERIAL	SEE GRAD.		1.9 CY
② CATEGORY 2 WOOD	3" - 6"	8' - 10'	0.25 EA



2 ENGINEERED RIFFLE
SECTION VIEW NTS



TYPICAL CONSTRUCTED STREAMBED THROUGH A RIFFLE FEATURE

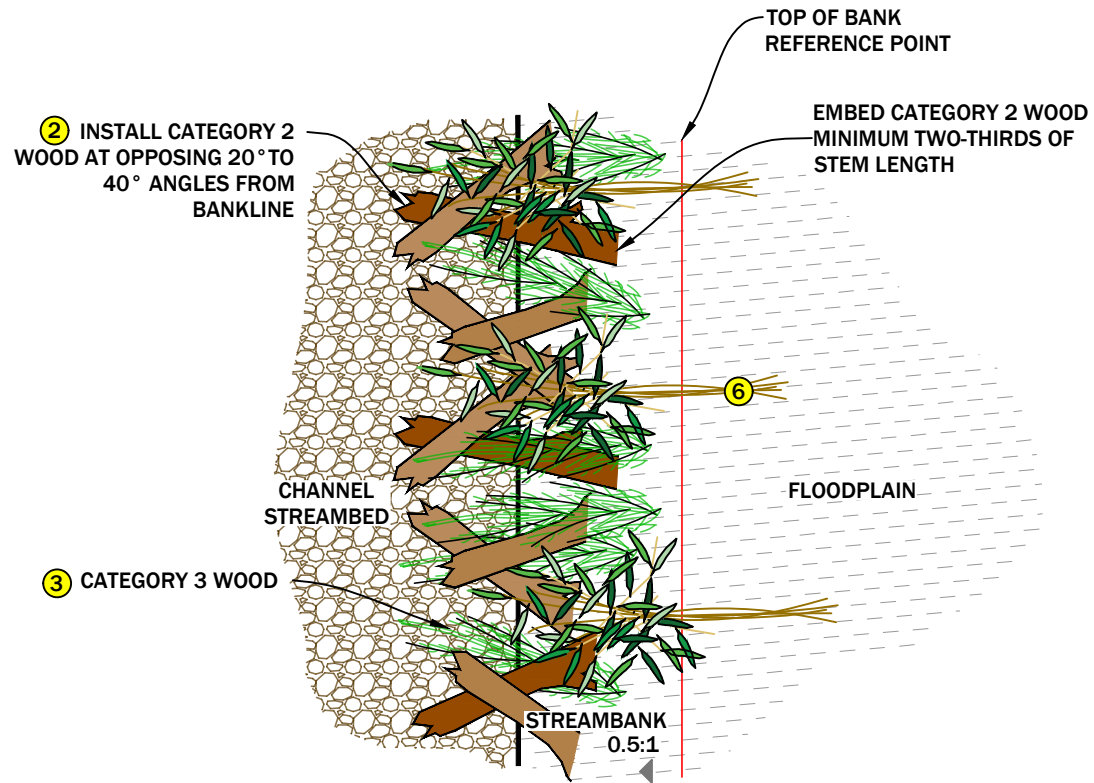
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1	09/18/25	LJ	FINAL DESIGN	MD

PROJECT NUMBER
RDG-23-250

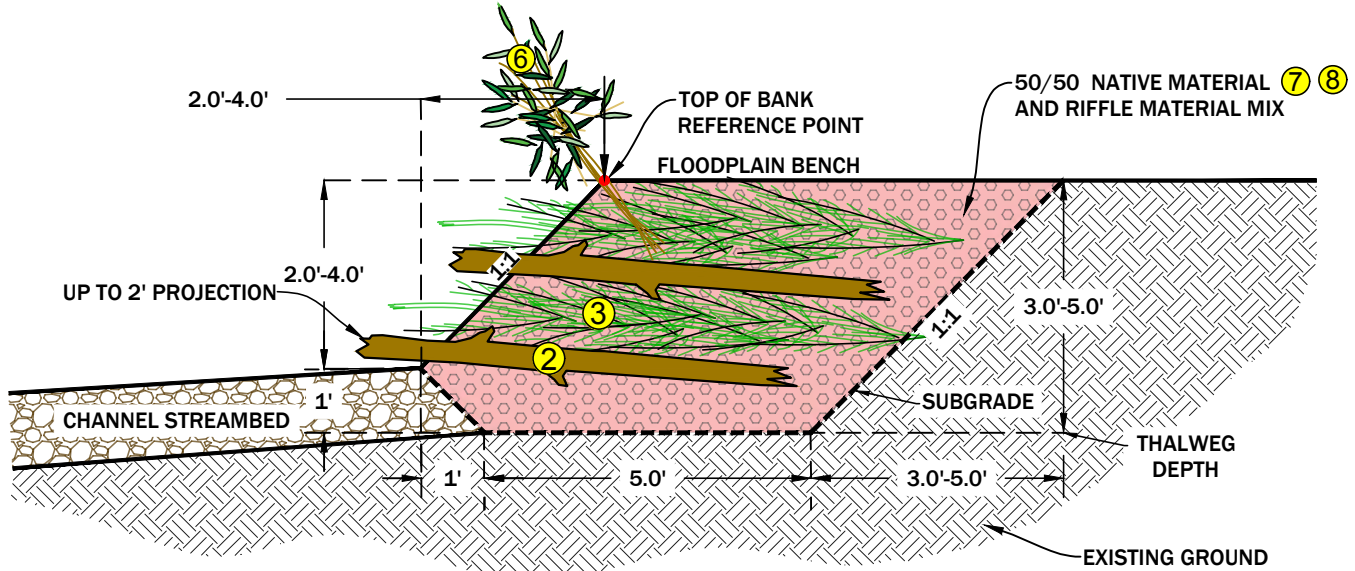
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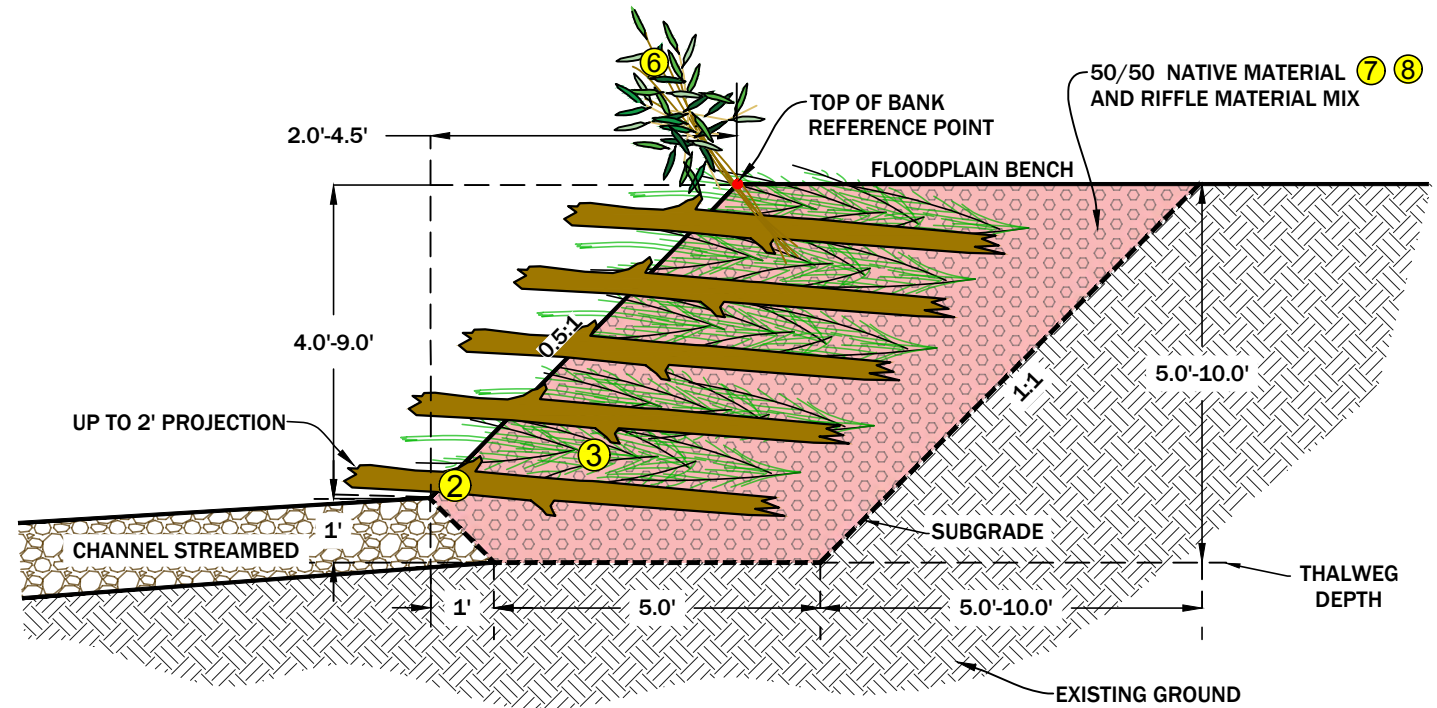
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1 VEGETATED WOOD MATRIX PLAN VIEW NTS



2 VEGETATED WOOD MATRIX - TYPE 1 SECTION VIEW NTS



3 VEGETATED WOOD MATRIX - TYPE 2 SECTION VIEW NTS

MATERIAL SCHEDULE (PER LINEAR FOOT)					
ITEM	TYPE 1 QTY.	TYPE 2 QTY.	DIA. (IN)	LENGTH (FT)	
①	CY OF SUBGRADE EXCAVATION	1	1.5		
⑦ ⑧	CY OF NATIVE MATERIAL	.45	1.1		
⑦ ⑧	CY OF RIFFLE MATERIAL	.45	1.1	SEE GRAD.	
②	CATEGORY 2 WOOD	2	5	3-6	8-10
③	CATEGORY 3 WOOD	3	5	1-3	8-10
⑥	WILLOW CUTTINGS	5	5	0.5	6-8

RIFFLE MATERIAL GRADATION	
SIZE (IN)	PERCENT PASSING
8	100
6	80-90
4	60-70
3	40-50
2	20-30
FINES	0-10

NOTE: MIX SALVAGED AND IMPORTED TO ACHIEVE SPECIFIED GRADATION

CONSTRUCTION NOTES

- EXCAVATE STREAMBANK TO SUBGRADE ELEVATIONS AND PLACE 50/50 NATIVE MATERIAL AND RIFFLE MATERIAL MIX TO DEPTHS SHOWN (SEE SPECIFIED GRADATIONS).
- PLACE LOGS (CATEGORY 2 WOOD) IN THE STREAMBANK AT SKEWED ANGLE TO THE STREAMBANK. LOGS MAY OVERLAP. NO CUT ENDS SHALL BE EXPOSED.
- PLACE BRUSH (CATEGORY 3 WOOD) WITHIN THE MATRIX OF LOGS. BRUSH SHALL BE PLACED BELOW TOP OF BANK LINE.
- PLACE 0.5 FT LAYER OF 50/50 NATIVE MATERIAL AND RIFFLE MATERIAL MIX ON LOG/BRUSH MATRIX AND COMPACT.
- REPEAT STEPS 2 THROUGH 4 UNTIL THE DESIRED TOP OF BANK ELEVATION IS ACHIEVED.
- PLACE CUTTINGS INTO THE LOG/BRUSH MATRIX WITH THE STEMS IN CONTACT WITH THE BASEFLOW WATER TABLE AND THE LEAVES AT OR ABOVE THE TOP OF BANK ELEVATION.
- BACKFILL STREAMBANK WITH A 50/50 MIX OF NATIVE MATERIAL AND RIFFLE MATERIAL.
- WASH FINES AND WATER FROM ONSITE INTO THE STREAMBANK TO SEAL THE VOIDS IN THE BACKFILL.



VEGETATED WOOD MATRIX DETAILS
BOULDER RIVER DAM REMOVAL
CARDWELL, MONTANA

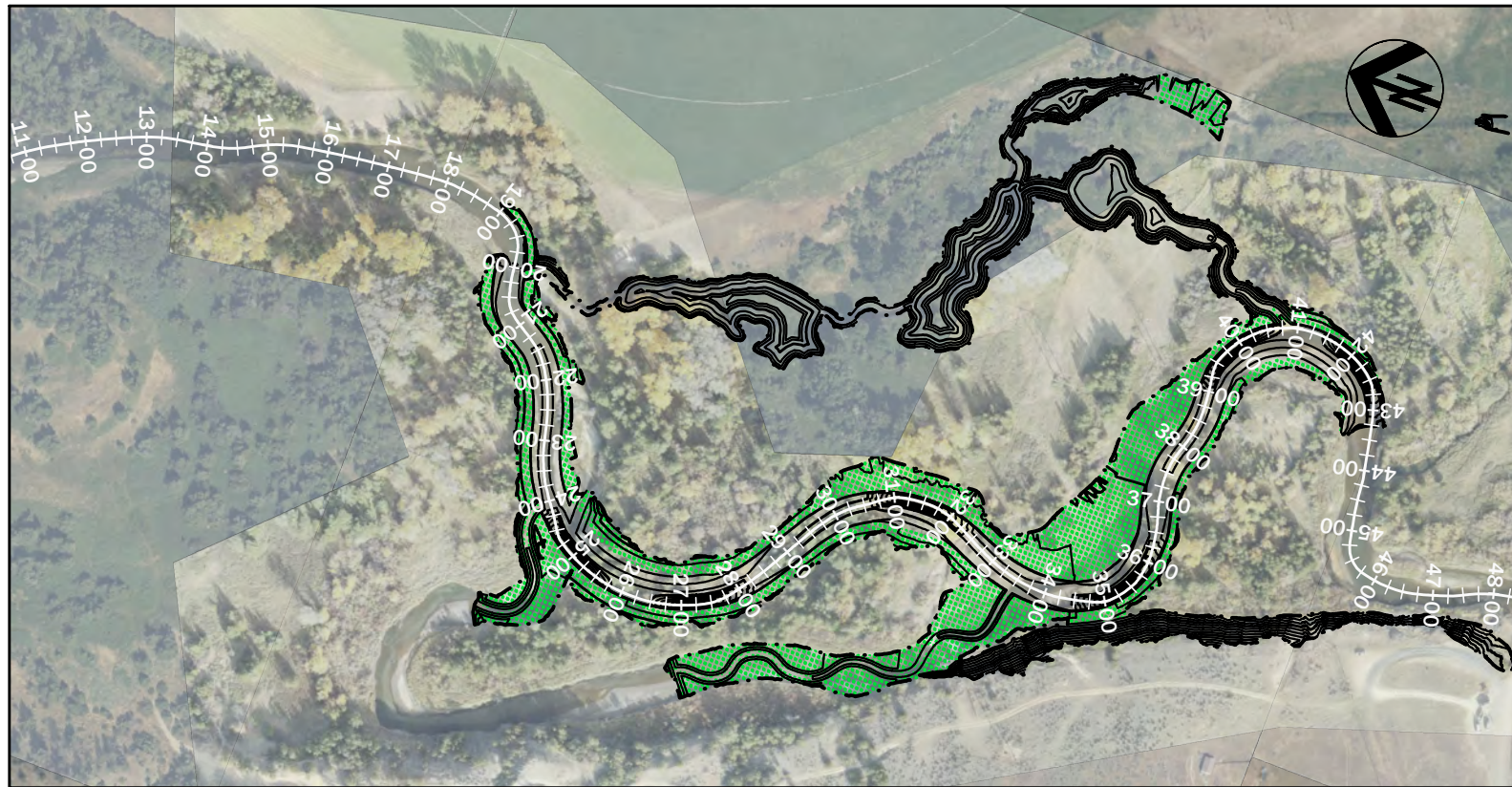
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1	09/18/25	LJ	FINAL DESIGN	MD

PROJECT NUMBER
RDG-23-250

DRAWING NUMBER
6.2

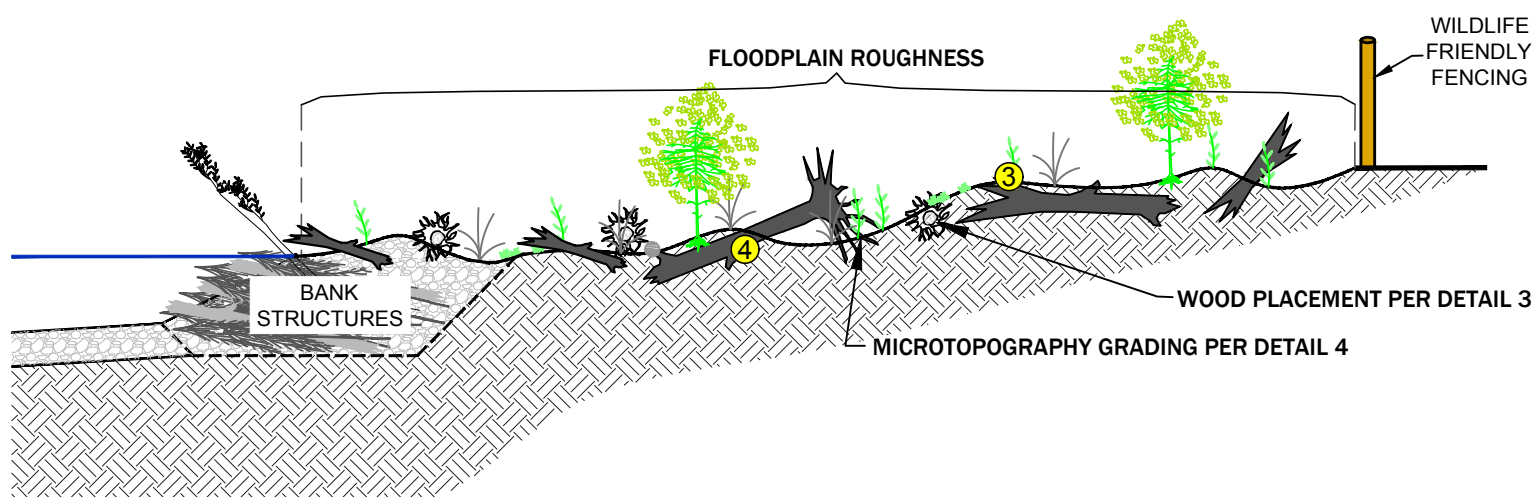
Drawing 22 of 28

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1 FLOODPLAIN ROUGHNESS PLAN VIEW
1" = 300'

AREAS TO RECEIVE FLOODPLAIN ROUGHNESS



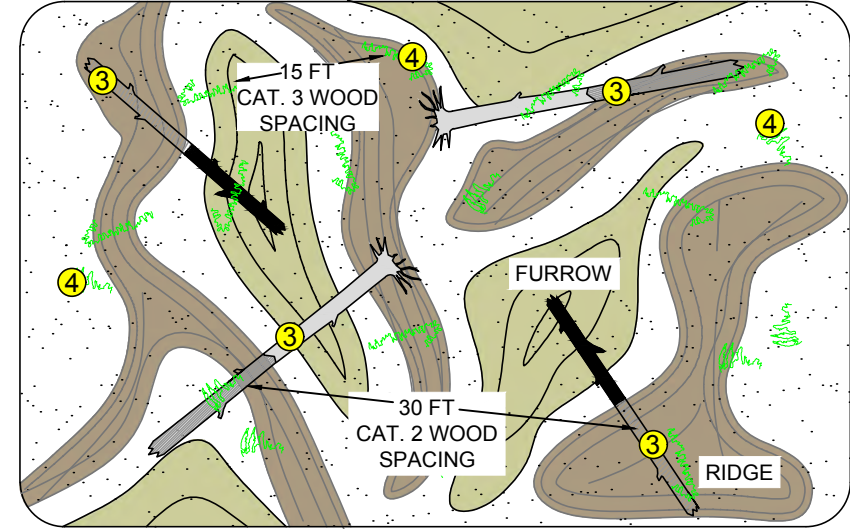
2 FLOODPLAIN ROUGHNESS TYPICAL SECTION
NTS

CONSTRUCTION NOTES

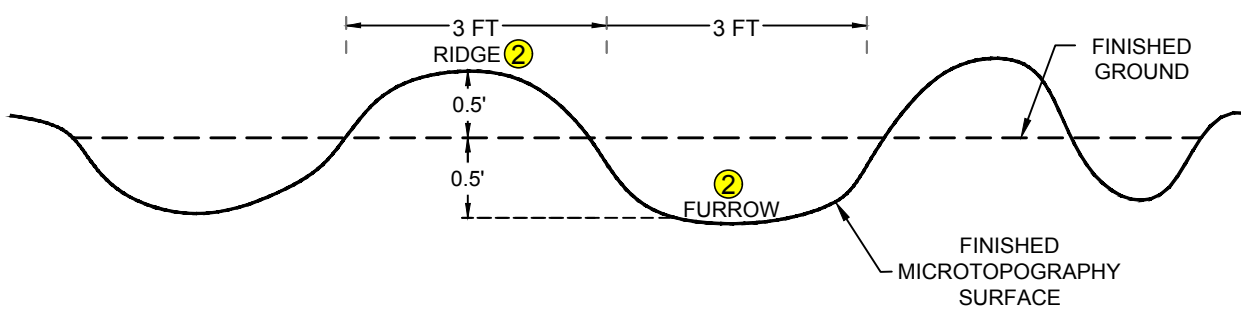
- 1 CONSTRUCT FLOODPLAIN ROUGHNESS AFTER FINISHED GRADING AND AFTER PLACEMENT OF VEGETATIVE FILL FOR GROWTH MEDIA. CONSTRUCT FLOODPLAIN ROUGHNESS PRIOR TO SEEDING, PLANTING AND FENCING.
- 2 GRADE FURROWS AND RIDGES INTO THE FINISHED GROUND SURFACE.
- 3 PARTIALLY BURY CATEGORY 2 WOOD INTO FURROWS AND RIDGES WITH AVERAGE SPACING OF 30 FEET AND A MINIMUM DEPTH OF TWO FEET WITH ONE HALF THE LOG LENGTH BELOW THE SURFACE.
- 4 PARTIALLY BURY CATEGORY 3 WOOD INTO FURROWS AND RIDGES WITH AVERAGE SPACING OF 15 FEET AND A MINIMUM DEPTH OF TWO FEET WITH ONE HALF THE BRUSH LENGTH BELOW THE SURFACE.

WOOD PLACEMENT CRITERIA

ITEM	DIA. (IN)	LENGTH (FT)	ROOTWAD	LIMBS	SPACING	BURIAL	RATE
3 CATEGORY 2 WOOD	3-6	8-10	OPTIONAL	YES	30 FT	50%	50/ACRE
4 CATEGORY 3 WOOD	1-3	8-10	OPTIONAL	YES	15 FT	50%	150/ACRE



3 WOOD PLACEMENT TYPICAL PLAN VIEW
NTS



4 MICROTOPOGRAPHY TYPICAL SECTION
NTS

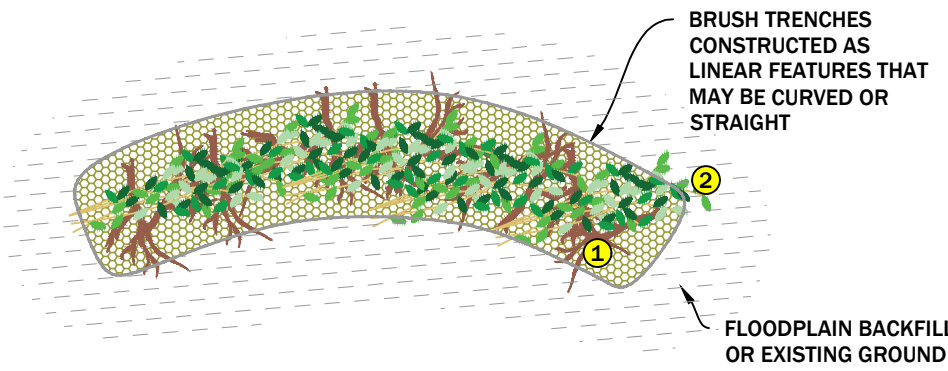
NO.	DATE	BY	DESCRIPTION	CHK
1	09/18/25	LJ	FINAL DESIGN	MD

PROJECT NUMBER
RDG-23-250

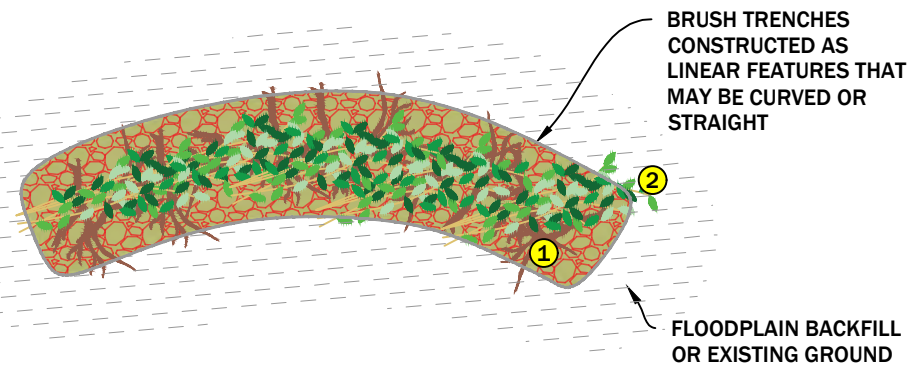
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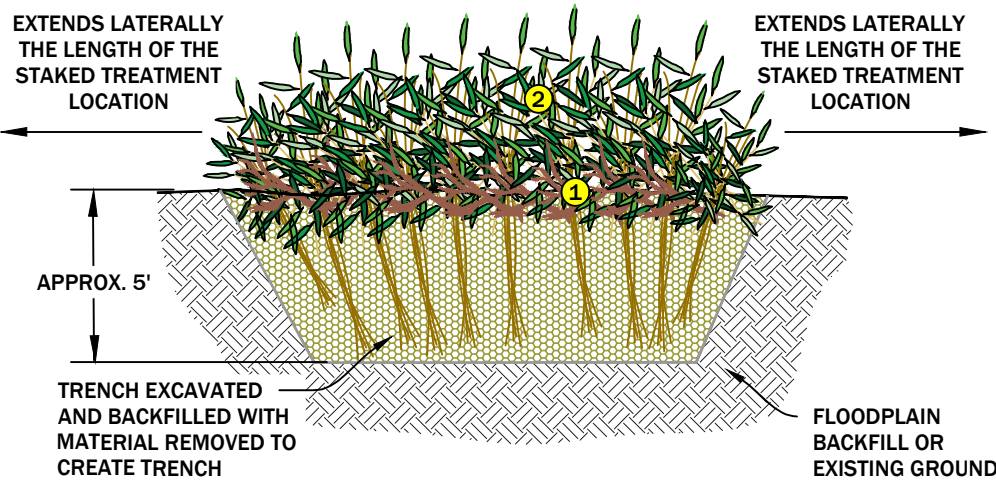
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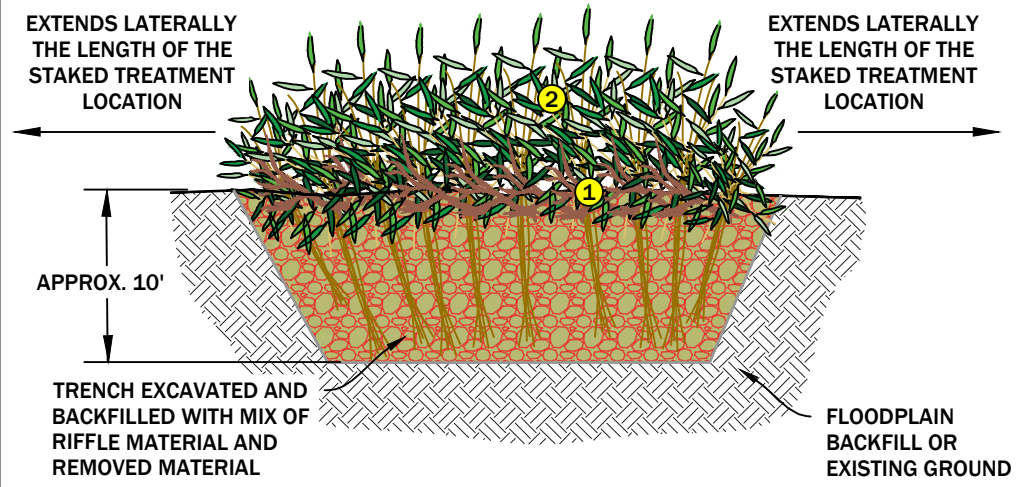
1 TYPE 1 WILLOW TRENCH PLAN VIEW NTS



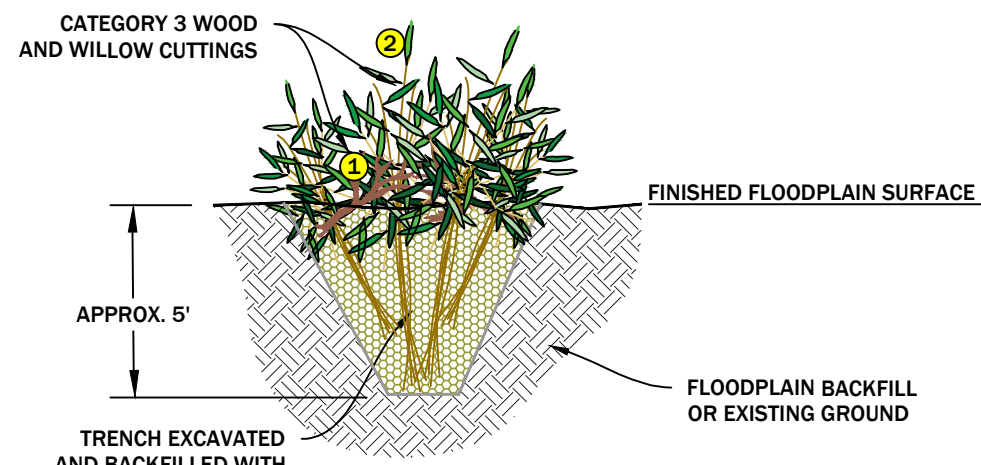
1 TYPE 2 WILLOW TRENCH PLAN VIEW NTS



2 TYPE 1 WILLOW TRENCH PROFILE VIEW NTS



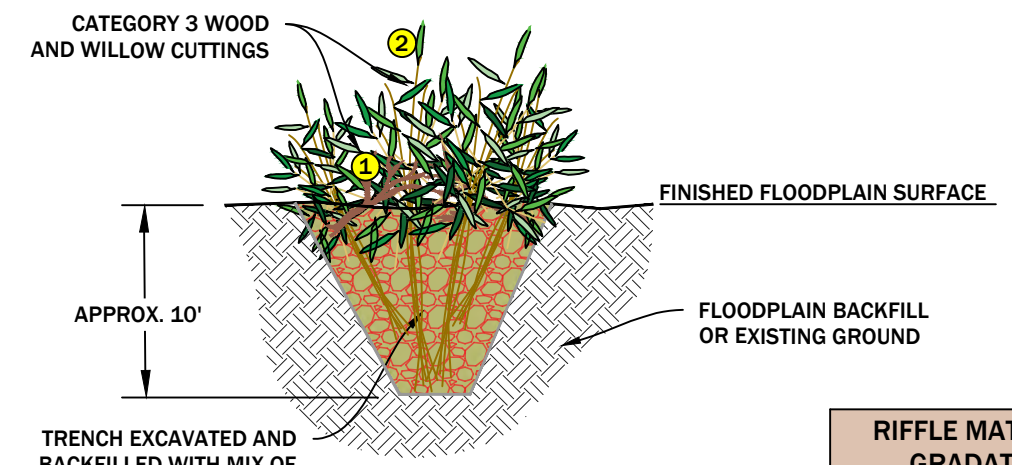
2 TYPE 2 WILLOW TRENCH PROFILE VIEW NTS



3 TYPE 1 WILLOW TRENCH SECTION VIEW NTS

TYPE 1 WILLOW TRENCH MATERIAL SCHEDULE (PER LINEAL FOOT)

ITEM	DIA.	QUANTITY (EA)
1 CATEGORY 3 WOOD	1" - 3"	1
2 WILLOW CUTTINGS	0.25" - 1"	5



3 TYPE 2 WILLOW TRENCH SECTION VIEW NTS

TYPE 2 WILLOW TRENCH MATERIAL SCHEDULE (PER LINEAL FOOT)

ITEM	DIA.	QUANTITY
1 CATEGORY 3 WOOD	1" - 3"	1 EA
2 WILLOW CUTTINGS	0.25" - 1"	5 EA
3 RIFFLE MATERIAL	SEE GRAD.	1 CY

RIFFLE MATERIAL GRADATION	
SIZE (IN)	PERCENT PASSING
8	100
6	80-90
4	60-70
3	40-50
2	20-30
FINES	0-10

NOTE: MIX SALVAGED AND IMPORTED TO ACHIEVE SPECIFIED GRADATION

GENERAL NOTES

1. CONSTRUCTION OF WILLOW BRUSH TRENCHES WILL OCCUR FOLLOWING APPROVAL OF FINISHED GRADE SURFACES BY THE CONSTRUCTION MANAGER, AND CONCURRENT WITH INSTALLATION OF THE FLOODPLAIN TREATMENTS.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY THE CONSTRUCTION MANAGER.
3. CONTRACTOR SHALL MARK THE UPSTREAM AND DOWNSTREAM EXTENTS OF THE LOCATIONS OF THE VEGETATED BRUSH TRENCHES.

NOTES ON WILLOW TRENCH INSTALLATION

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



EXAMPLE OF A VEGETATED BRUSH TRENCH INSTALLATION



EXAMPLE OF A CONSTRUCTED VEGETATED BRUSH TRENCH

WILLOW TRENCH DETAILS
 BOULDER RIVER DAM REMOVAL
 CARDWELL, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
1	09/18/25	LJ	FINAL DESIGN	MD

PROJECT NUMBER
RDG-23-250

DRAWING NUMBER

6.4

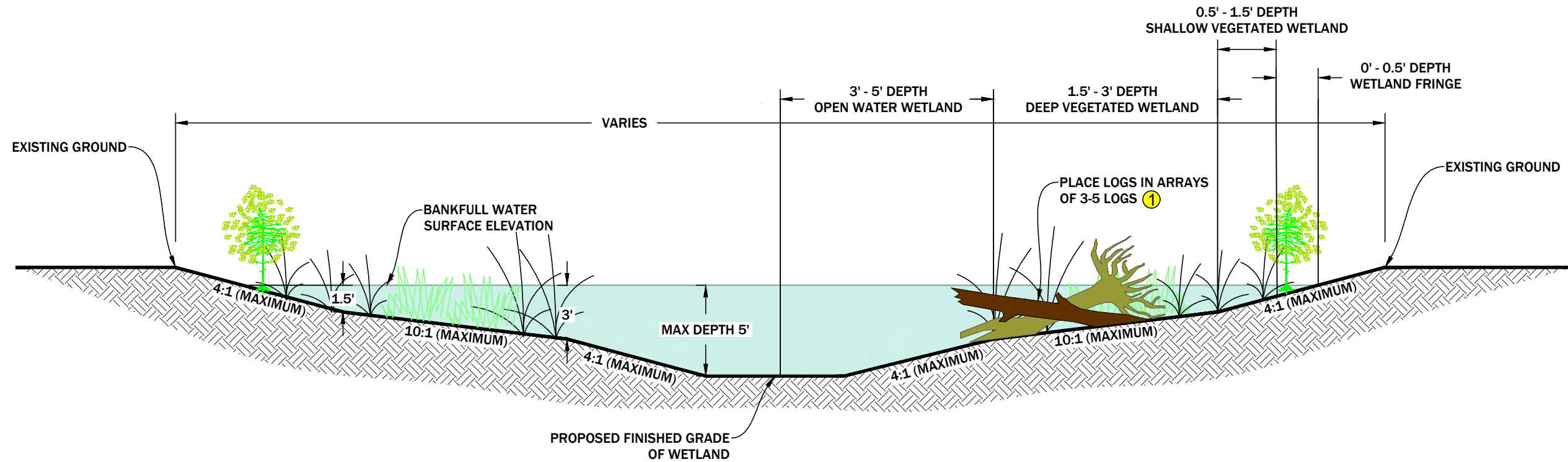
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GENERAL NOTES

1. CONSTRUCTION OF WETLANDS WILL OCCUR FOLLOWING APPROVAL OF FINISHED GRADE SURFACES BY THE CONSTRUCTION MANAGER, AND SHALL BE CONSTRUCTED CONCURRENTLY WITH INSTALLATION OF THE FLOODPLAIN TREATMENTS.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED BY THE CONSTRUCTION MANAGER.
3. CONTRACTOR SHALL MARK THE PERIMETERS OF THE CONSTRUCTED WETLANDS.

NOTES ON WETLAND INSTALLATION

1. EXCAVATE WETLANDS TO SLOPES AND DEPTHS AS SHOWN ON THE DRAWING.
2. EXCAVATED MATERIAL SHALL BE USED FOR FLOODPLAIN BACKFILL.
3. WETLANDS SLOPES SHALL NOT BE NO LESS THAN 10:1 (H:V) AND NO GREATER THAN 4:1 (H:V).
4. MAXIMUM DEPTHS SHALL NOT EXCEED 6-FEET BELOW EXISTING GROUND TIE-IN.
5. PLACE AND EMBED SINGLE LOGS IN FINISHED GRADE SURFACE, IN ARRAYS OF 3-5, AS DIRECTED BY CONSTRUCTION MANAGER.



1 WETLAND DETAIL SECTION VIEW



WOOD PLACEMENT CRITERIA							
ITEM	DIA. (IN)	LENGTH (FT)	ROOTWAD	LIMBS	SPACING	BURIAL	RATE
① CATEGORY 2 WOOD	3-6	8-10	OPTIONAL	YES	30 FT	50%	150/ACRE

NO.	DATE	BY	DESCRIPTION	CHK
1	09/18/25	LJ	FINAL DESIGN	MD

PROJECT NUMBER
RDG-23-250

DRAWING NUMBER

6.5

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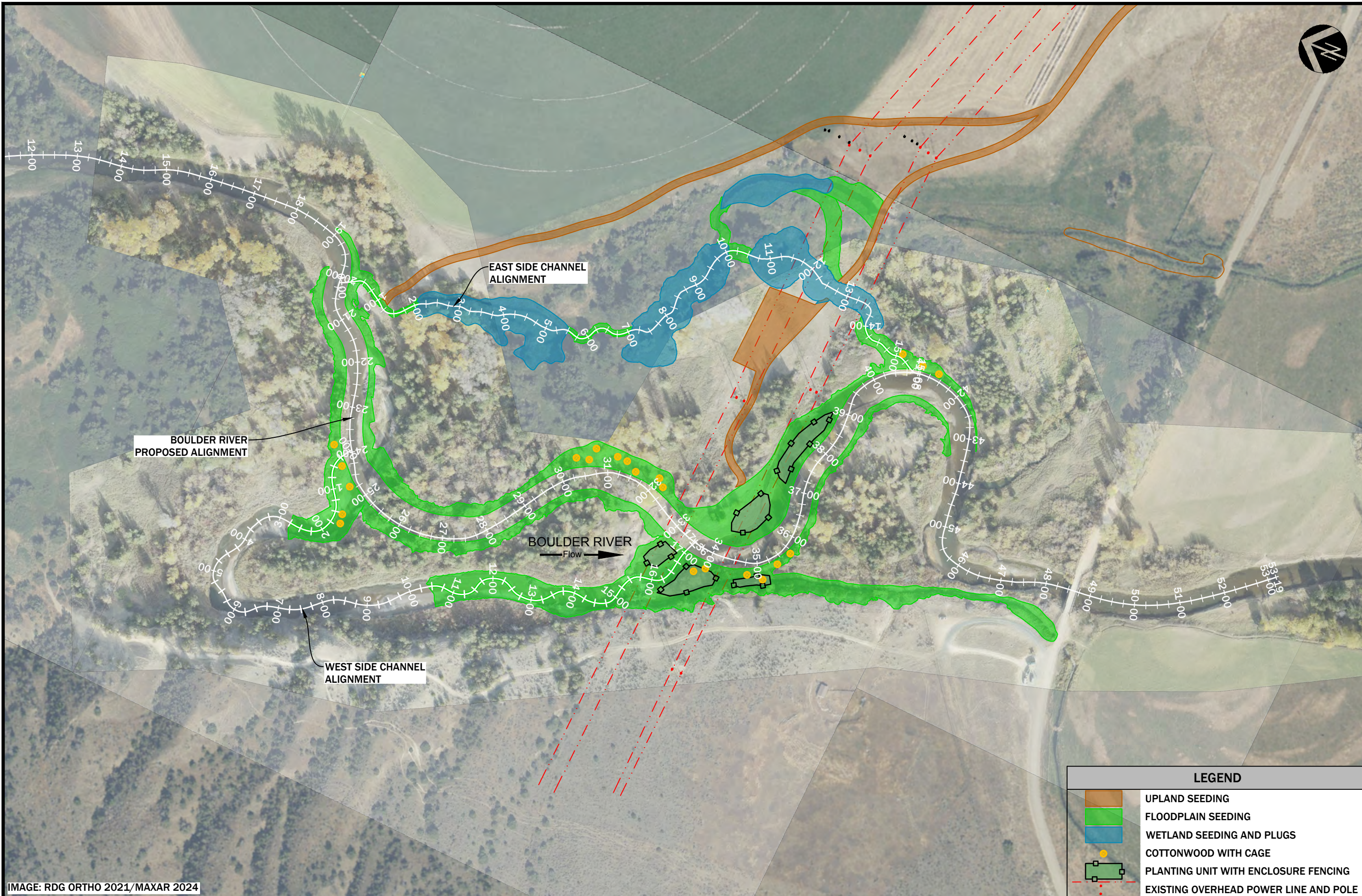


IMAGE: RDG ORTHO 2021/MAXAR 2024

**1 REVEGETATION PLAN
PLAN VIEW**

1" = 200'

REVEGETATION PLAN
BOULDER RIVER DAM REMOVAL
CARDWELL, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
1	09/18/25	LJ	FINAL DESIGN	MD

PROJECT NUMBER
RDG-23-250

DRAWING NUMBER

7.0

TOTAL WOOD QUANTITIES

ITEM	QUANTITY	DIAMETER	LENGTH	ROOTWAD
CATEGORY 1 WOOD	72 EA	8-12 IN	12-15 FT	YES
CATEGORY 2 WOOD	11,583 EA	3-6 IN	8-10 FT	OPTIONAL
CATEGORY 3 WOOD	15,883 EA	1-3 IN	8-10 FT	OPTIONAL
WILLOW CUTTINGS	27,810 EA	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.

EARTHWORK QUANTITIES

TOTAL COMBINED EARTHWORK*	
ITEM	QUANTITY (CY)
CUT	21,659
BACKFILL	17,696
NET CUT	3,963

TEMPORARY BYPASS CHANNEL		BOULDER RIVER CHANNEL AND FLOODPLAIN	
ITEM	QUANTITY (CY)	ITEM	QUANTITY (CY)
CUT	5,438	CUT	11,382
BACKFILL	182	BACKFILL	7,469
NET FILL	5,256	NET CUT	3,913
WEST SIDE CHANNEL		EAST SIDE CHANNEL	
ITEM	QUANTITY (CY)	ITEM	QUANTITY (CY)
CUT	265	CUT	9,986
BACKFILL	5,554	BACKFILL	56
NET FILL	5,289	NET CUT	9,930
SHAW DITCH FILL		CARDWELL DITCH FILL	
ITEM	QUANTITY (CY)	ITEM	QUANTITY (CY)
CUT	23	CUT	9
BACKFILL	3,843	BACKFILL	777
NET FILL	3,820	NET FILL	768

NOTE:
-VOLUMES ARE NEATLINE, CONTRACTOR TO APPLY EXPANSION FACTORS TO DETERMINE A MORE ACCURATE BACKFILL VOLUME.
-*THE TOTAL COMBINED EARTHWORK TABLE DOES NOT INCLUDE THE TEMPORARY BYPASS CHANNEL VOLUME.

TOTAL ROCK QUANTITIES

ITEM	QUANTITY (CY)	GRADATION		
		SIZE (IN)	PERCENT PASSING	REPRESENTATIVE CLASS
RIFFLE MATERIAL	5,246	8	100	D100
		6	80-90	D80
		4	60-70	D70
		3	40-50	D50
		2	20-30	D30
		FINES	0-10	D10

LARGE WOOD STRUCTURE QUANTITIES

ITEM	QUANTITY
LARGE WOOD STRUCTURES	6 EA
CATEGORY 1 WOOD	72 EA
CATEGORY 2 WOOD	60 EA
CATEGORY 3 WOOD	300 EA
WILLOW CUTTINGS	1,200 EA

ENGINEERED RIFFLE QUANTITIES

ITEM	QUANTITY
BOULDER RIVER CONSTRUCTED RIFFLE	1,367 LF
RIFFLE MATERIAL	2,324 CY
CATEGORY 2 WOOD	69 EA
EAST SIDE CHANNEL CONSTRUCTED RIFFLE	649 LF
RIFFLE MATERIAL	225 CY
CATEGORY 2 WOOD	16 EA
WEST SIDE CHANNEL CONSTRUCTED RIFFLE	916 LF
RIFFLE MATERIAL	174 CY
CATEGORY 2 WOOD	23 EA

VEGETATED WOOD MATRIX QUANTITIES

ITEM	QUANTITY
VEGETATED WOOD MATRIX TYPE 1	2,281 LF
VEGETATED WOOD MATRIX TYPE 2	1,271 LF
CATEGORY 2 WOOD	10,917 EA
CATEGORY 3 WOOD	13,198 EA
WILLOW CUTTINGS	17,760 EA
RIFFLE MATERIAL	2,425 CY

FLOODPLAIN ROUGHNESS

ITEM	QUANTITY
ACRES OF FLOODPLAIN	4.10 AC
CATEGORY 2 WOOD	205 EA
CATEGORY 3 WOOD	615 EA

TYPE 1 WILLOW TRENCH QUANTITIES

ITEM	QUANTITY
TYPE 1 WILLOW TRENCH	1,670 LF
CATEGORY 3 WOOD	1,670 EA
WILLOW CUTTINGS	8,350 EA

TYPE 2 WILLOW TRENCH QUANTITIES

ITEM	QUANTITY
TYPE 2 WILLOW TRENCH	100 LF
CATEGORY 3 WOOD	100 EA
WILLOW CUTTINGS	500 EA
RIFFLE MATERIAL	100 CY

WETLAND SWALE

ITEM	QUANTITY
ACRES OF WETLAND SWALE	1.96 AC
CATEGORY 2 WOOD	294 EA



MATERIALS AND QUANTITIES
BOULDER RIVER DAM REMOVAL
CARDWELL, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
1	09/18/25	LJ	FINAL DESIGN	MD

PROJECT NUMBER RDG-23-250
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LOCATION	SPECIES		CONTAINER SIZE	MINIMUM SPACING (FT)	NUMBER
FLOODPLAIN PLANTING UNITS	BLACK COTTONWOOD	<i>POPULUS TRICHOCARPA</i>	TALL 1 GALLON	20	17
	SERVICEBERRY	<i>AMELANCHIER ALNIFOLIA</i>	TALL 1 GALLON	20	15
	BLACK HAWTHORN	<i>CRATAEGUS DOUGLASII</i>	TALL 1 GALLON	10	23
	THINLEAF ALDER	<i>ALNUS INCANA</i>	TALL 1 GALLON	6	64
	THIMBLEBERRY	<i>RUBUS PARVIFLORUS</i>	TALL 1 GALLON	6	64
	RED-OSIER DOGWOOD	<i>CORNUS SERICEA</i>	TALL 1 GALLON	6	106
FLOODPLAIN INDIVIDUAL CAGES	BLACK COTTONWOOD	<i>POPULUS TRICHOCARPA</i>	15 GALLON	20	32
WOODY PLANT TOTAL					320
WETLAND PLUGS	BEAKED SEDGE	<i>CAREX UTRICULATA</i>	BARE ROOT PLUG	0.5	4,182
	WATER SEDGE	<i>CAREX AQUATILIS</i>	BARE ROOT PLUG	0.5	2,091
	BALTIC RUSH	<i>JUNCUS BALTICUS</i>	BARE ROOT PLUG	0.5	2,091
	HARDSTEM BULRUSH	<i>SCHOENOPLECTUS ACUTUS</i>	BARE ROOT PLUG	0.5	5,227
HERBACEOUS WETLAND PLANT TOTAL					13,591

LOCATION	SEED SPECIES		PLS/ACRE	TOTAL PLS LBS
FLOODPLAIN 5.21 ACRES	SLENDER WHEATGRASS	<i>ELYMUS TYACHYCAULUS</i>	11.13	57.99
	BLUEJOINT REEDGRASS	<i>CALAMAGROSTIS CANADENSIS</i>	4.35	22.65
	FOWL MANNAGRASS	<i>GLYCERIA STRIATA</i>	11.13	57.99
	CREEPING SPIKERUSH	<i>ELEOCHARIS PALUSTRIS</i>	0.70	3.62
FLOODPLAIN TOTAL				142.26
WETLAND 2.02 ACRES	TUFTED HAIRGRASS	<i>DESCHAMPSIA CAESPITOSA</i>	0.20	0.40
	AMERICAN SLOUGHGRASS	<i>BECHMANNIA SYZIGACHNE</i>	20.00	40.43
	FOWL MANNAGRASS	<i>GLYCERIA STRIATA</i>	7.20	14.56
	CREEPING SPIKERUSH	<i>ELEOCHARIS PALUSTRIS</i>	0.80	1.62
	SEDGE	<i>CAREX SPP.</i>	0.20	0.40
WETLAND TOTAL				57.41
UPLAND 1.81 ACRES	WESTERN WHEATGRASS	<i>PASCOPYRUM SMITHII</i>	11.64	21.06
	MOUNTAIN BROME	<i>BROMUS MARGINATUS</i>	18.18	32.91
	IDAHO FESCUE	<i>FESTUCA IDAHOENSIS</i>	2.91	5.27
UPLAND TOTAL				59.24

MATERIAL QUANTITIES			
ITEM	QUANTITY	UNITS	DIMENSIONS
TALL 1-GAL CONTAINERIZED PLANTS	288	EA	4" x 4" x 14"
15-GAL CONTAINERIZED PLANTS	30	EA	
BARE ROOT WETLAND PLANT PLUGS	13,591	EA	
SEED - FLOODPLAIN MIX	142.26	PLS LBS	
SEED - WETLAND MIX	57.41	PLS LBS	
SEED - UPLAND MIX	59.24	PLS LBS	
EXCLOSURE FENCING			
POLYPROPYLENE DEER FENCE	1,400	LF	7.5' TALL
STEEL T-POSTS	117	EA	10' TALL
CABLE TIES - SELF LOCKING	469	EA	1.75"
CABLE TIES - RELEASABLE	16	EA	12"
BROWSE PROTECTION FOR 30 15-GALLON COTTONWOOD CAGES			
WELDED WIRE DEER FENCE	3.2	EA	5' X 100' ROLL
T-POSTS	64	EA	5.5'
TREE TIE	32	EA	

REVEGETATION MATERIALS AND QUANTITIES

BOULDER RIVER DAM REMOVAL

CARDWELL, MONTANA

NO.	DATE	BY	DESCRIPTION	CHK
				MD
1	09/18/25	LJ	FINAL DESIGN	

PROJECT NUMBER
RDG-23-250

DRAWING NUMBER

8.1



OTHER ATTACHMENTS

6 CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis presented, potential failures of the Shaw Diversion and Cardwell Diversion would not likely present a potential for loss of life.

Infrastructure impacted due to failure of the Shaw Diversion would be limited to property owned by the Golden Sunlight Mine; however, it would likely impact the availability of water to downstream irrigation users in the event of a failure. Downstream damage to infrastructure would be unlikely. Environmental damage would include erosion to the riverbed and banks at the headwall structure and sediment loading downstream. Infrastructure damage due to a failure the embankment in the vicinity of the Cardwell Diversion or infrastructure downstream of the Cardwell Diversion is not likely.

Potential environmental impacts due to failures of the Shaw and Cardwell Diversions would mostly be confined to potential riverbank erosion and release of impounded sediment downstream.

Recommendations for repairing the diversion structures are listed below. Each recommendation listed has a conceptual opinion of probable cost included. These costs are preliminary and are based on the conceptual scope of the recommendations listed and include low and high ranges. Cost breakdowns used to determine the low range are included in Appendix C. High ranges are estimated at approximately 50% above the low range opinion of probable cost.

6.1 Shaw Diversion Recommendations

The Shaw Diversion headwall is in disrepair. The headwall has a structural crack and portions of the eastern wall are missing. The riverbank is experiencing head cutting downstream of the headwall where there is potential for the riverbank to fail. In the event of a headwall or riverbank failure, the Shaw Diversion may become inoperable until emergency repairs can be made.

6.1.1 Option 1: Replace Headwall and Armor Riverbank – Riprap

Option 1 would include the removal and replacement of the existing headwall and installation of riprap along the riverbank to mitigate erosion of the downstream riverbank. This option excludes removal or repair of the existing fish latter and embankment.

The existing headgate could be reused or replaced with a new headgate. If riprap is used to armor the downstream riverbank, the slopes will need to be pulled back to a maximum of 1.5:1 (horizontal to vertical), riprap keyed into the subgrade, and installed at an appropriate thickness to prevent further scour. Sloping the riverbank at this minimum slope would require pulling back the existing riverbank approximately 12 to 15 feet at finished grade. This would likely be more depending on how thick the riprap would need to be. This would present an issue with the proximity of the Shaw Ditch and would likely require moving the ditch further west into the hillside. This option would require relatively substantial disturbance in the project area. Total estimated cost to construct and permit is approximately **\$403,875 to \$605,800**.

6.1.2 Option 2: Replace Headwall and Armor Riverbank – Rock Gabions

Option 2 would still require a new headwall, but instead of tapering the riverbank slope back and installing riprap, rock gabions could be installed in a vertical configuration. This option excludes removal or repair of the existing fish ladder and embankment.

This option would not require the riverbank slopes to be tapered and would allow for the existing ditch to remain in its current location. Total estimated cost to permit and construct is approximately **\$372,500 to \$558,700**.

6.2 Cardwell Diversion Recommendations

The existing leak in the headwall should be repaired to reduce the current flow entering the Cardwell Ditch. The leak does not currently present a major risk to the structural integrity of the structure. However, the presence of this leak at the estimated flows observed in the field would likely present a water right issue if left unaddressed. Additionally, continued leakage could accelerate scour around the headwall and threaten its structural integrity in the future.

6.2.1 Option 1: Patch Existing Wall Holes

The holes located around the base of the existing headgate could be patched with non-shrink grout to provide a temporary seal. This would reduce the flow entering the Cardwell Ditch. However, this would not be a permanent fix and may degrade over a relatively brief period of time depending on weather and flow conditions, potentially lasting one to five years. Total estimated cost to construct is approximately **\$8,600-\$12,900**.

6.2.2 Option 2: Replace Portion of Headwall

A portion of the wall could be removed at the headgate and be repoured to provide a more permanent seal. The headgate would have to be removed and portions of the interior headwall concrete removed. The interior portion of wall would be reformed, doveled into the existing wall, and poured with concrete. The existing headgate could be reused, or it could be replaced with a new headgate. This option would provide a better long-term seal than Option 1 and would require a relatively small disturbance area. Total estimated cost to construct is approximately **\$59,400 to \$89,100**.

6.2.3 Option 3: Replace Headwall

Option 3 involves replacing the entire headwall. The current headgate could be reused, or a new headgate installed. This option would provide a structure with a longer lifespan than the other options but would be more costly and require a greater disturbance area. Total estimated cost to construct is approximately **\$90,000 to \$135,000**.

7 PERMIT REQUIREMENTS

Potential improvement options for the Shaw Diversion would likely include the following permits:

- Montana Streambed and Land Preservations Act - (310 Permit)
 - Required by any private, non-governmental person or entity that proposes to work in or near a stream on public or private land.
 - Issued by local conservation district.

2 Project Site Information

This section provides a summary of existing conditions in the watershed and project area. LiDAR data acquired in 2018 and 2019 were used to characterize site topography (Quantum Spatial, Inc. 2019). RDG acquired high-resolution aerial imagery of the project area during a site visit on 11/15/2021. Geomorphic and sediment data were collected in February and March 2024.

2.1 Existing Stream and Habitat Conditions

2.1.1 Boulder River

The Boulder River forms at the juncture of its south and west forks on the east side of the Continental Divide, north of Butte, Montana. It flows east, then south 77 miles to its confluence with the Jefferson River near Cardwell. Upstream of the town of Boulder, the river runs through a narrow floodplain blanketed with willows, alder, conifers and, to a lesser extent, cottonwoods and aspen. Downstream, the floodplain widens and the river meanders through cottonwoods, aspen, and willows.

Intensive hard rock mining in the drainage in the late 1800's and early 1900's left behind acid mine seeps and mill tailings which still affect the river and fishery below the town of Basin. Portions of the Boulder River have been relocated due to mining, agriculture, and road and railroad development, and it has been subject to riprapping and channel clearing. Flows in the river depend primarily on snowpack in the mountains and a number of springs add flow to the river in the lower valley. In low water years, irrigation diversions severely deplete water in the lower river.

2.1.2 Aquatic Habitat

The Boulder River watershed supports a diverse range of fish species. The stream system contains populations of Brook Trout *Salmo fontinalis*, Rainbow Trout *Oncorhynchus mykiss*, Brown Trout *Salmo trutta*, native Longnose Dace *Rhinichthys cataractae*, native longnose sucker *Catostomus catostomus*, native Mottled Sculpin *Cottus spp.*, native White Sucker *Catostomus commersonii*, and native Mountain Whitefish *Prosopium williamsoni*. Salmonid populations include both stream-resident fish and fluvial life forms that migrate to and from the Jefferson River. Upstream migrations of fish from the Jefferson River which would have historically used the lower Boulder River are directly impacted by the Shaw Diversion Dam.

Aquatic habitat in the Boulder River has been adversely affected by streambank and channel alterations, excessive sedimentation, and dewatering and pollution from mining operations (Knudson 1984). Aquatic habitat conditions in the lower watershed downstream of the Shaw Diversion are altered from historical conditions and less complex due to loss of diverse habitats. In the reach immediately upstream of the Cardwell Diversion, stream habitat appears to be somewhat more intact. Since the late 1970s it has been recognized that summer flows in the lower river are often severely depleted by irrigation diversions (MDFG 1979).

The Boulder River currently supports an average of about 3,400 angler-days per year with a range of 2,400 to 7,600 angler-days based on four surveys conducted between 2011 and 2017 (MFWP 2021a). MFWP, TU, and other partners have completed fisheries conservation projects on Boulder River including habitat improvement projects dating back to 1983. In an evaluation of habitat improvement structures in the Boulder River upstream of the town of Basin, regression analysis showed that maximum associated depth, a measure of pool presence and depth, was the most important physical parameter explaining variation in total salmonid biomass (Streu 1990). Efforts to improve native Westslope Cutthroat Trout in the basin

2.2.7 Geomorphic Assessment

A geomorphic field assessment was completed by RDG staff in February 2024. Data collection consisted of surveying longitudinal profiles (thalweg, water surface, and bankfull indicators), pebble counts, and bar samples in the project reach and in an upstream reference reach. A qualitative Bank Erosion Hazard Index (BEHI) assessment was completed in the project reach. Additionally, two representative cross sections were surveyed and a discharge measurement was collected in the reference reach. Field data collection and existing site features surveyed by RDG are shown in Figure 2-9.

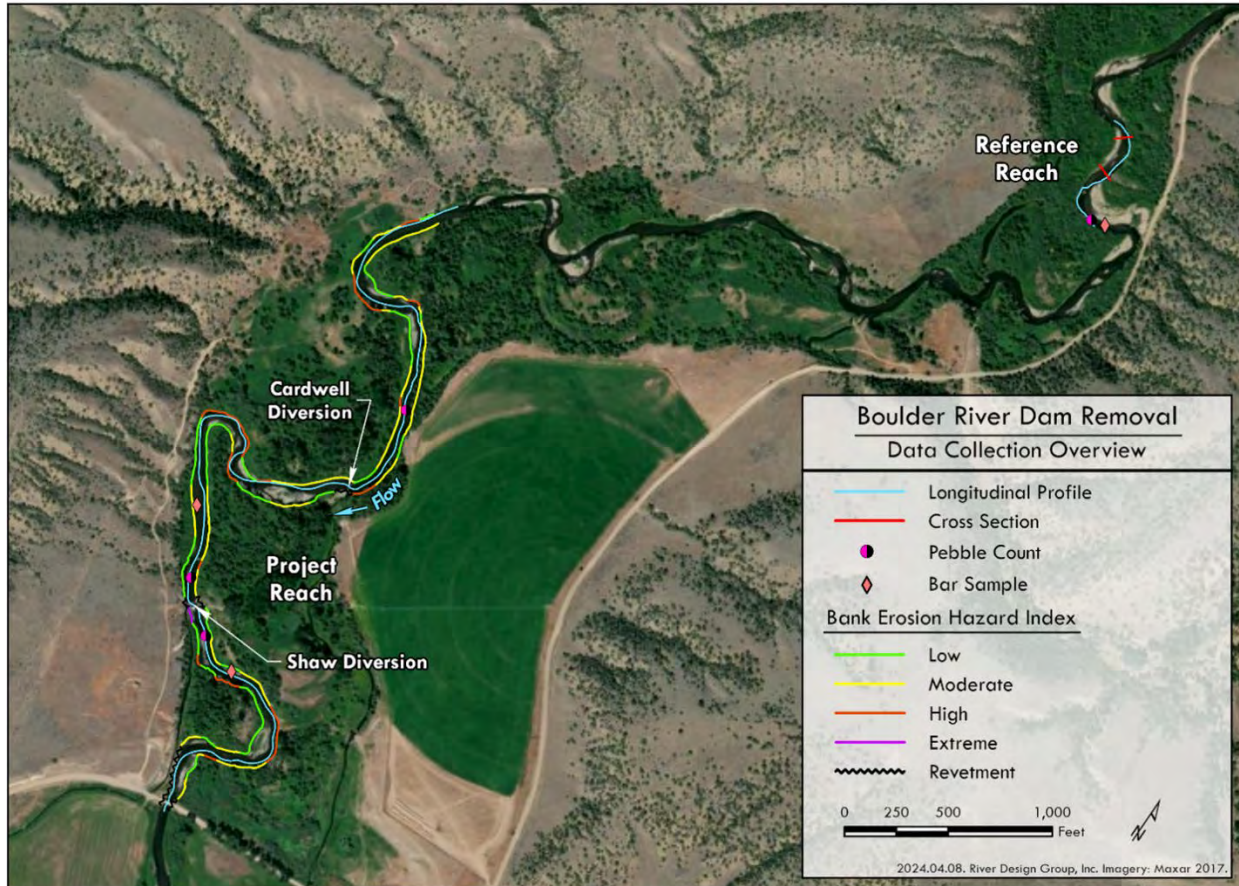


Figure 2-9. Geomorphic data collection overview map.

The project reach of the Boulder River is low gradient (0.23%) and exhibits moderate entrenchment and floodplain disconnection. Banks were classified as primarily moderate and high BEHI, reflecting entrenchment and bank erosion on outside meander bends into floodplain terraces. Banks were classified as low BEHI on aggrading inside meander bars and along the right bank north of the Shaw Diversion where the channel abuts a steep, stable hillslope. Exposed cutbanks reveal a layer of floodplain-deposited fine sediments atop mixed cobble and gravel alluvium. Bank erosion is occurring mainly via clast-by-clast removal of alluvium leading to block failure of the fine sediment layer.

Floodplain vegetation in the project reach is a mix of willows and upland species (e.g., junipers). Dying willows were observed on the floodplain and mid-channel bars, indicative of progressive downcutting of the channel during high flows and lowering of the water table. A large wood jam was observed just downstream of the Cardwell diversion at the upstream end of a mid-channel bar. Overall, the project reach lacks instream large wood and associated hydraulic and geomorphic complexity.

Substrate upstream of the Shaw Diversion gradually transitions from cobble-gravel-dominated at the upstream end of the project reach to gravel-sand-dominated and ultimately to sand-dominated immediately upstream of the diversion dam. Channel bars exhibit a similar transition in sediment gradations. A gravel-dominated riffle feature located approximately 600 feet upstream of the Shaw Diversion may define the upstream extent of the dam-forced fine sediment wedge. Immediately downstream of the Shaw Diversion, substrate coarsens to cobble-gravel-boulder and exhibits armoring, indicative of infrequent bed-material mobilization.

The upstream surveyed reference reach has a gradient of 0.03% and exhibits a sinuous planform. Despite moderate entrenchment, floodplain vegetation consists of a robust willow population. Dense wood embedded in the upstream inside meander bar may be from a relic beaver dam or lodge. Channel substrate material in the reference reach is primarily fines with some gravels, consistent with the composition of a wood-forced mid-channel bar. Discharge at the time of the field survey was measured as 105 cfs.

2.2.8 Sediment Data

Characterization of the sediment wedge impounded by the Shaw Diversion was completed by WET in March 2024. The work included evaluating the sediment wedge extent, completing core samples to determine representative substrate gradation, and estimating quantities of material in the sediment wedge. The wedge of deposited material ended approximately 680 feet upstream of the dam. WET collected 5 core samples that were used to create one composite sample of the sandy material from the deposit immediately upstream of the dam. The sandy material ranged from 2 feet to 3 feet in thickness and extended approximately 245 feet upstream of the dam. WET also collected one composite sample comprised of two sub-samples of the coarser material upstream of the sand wedge and found that it ranged from 1 foot to 2 feet in thickness. To estimate material quantities, 31 sediment depth measurements were collected along seven cross-sections which contained both sediment surface elevations and depth measurements. The sediment wedge surface area was calculated at each of the cross-sections and volumetric quantities were derived by multiplying the average cross-sectional area by the distance between cross-sections. The total quantity of material in the sediment wedge is estimated at just over 2,000 cubic yards (RDG and WET 2024).

2.2.9 Dam Effects

The effects of altered fluvial processes are evident within the project reach. The Shaw diversion dam impacts sediment transport, flood characteristics and floodplain function. The Boulder River is confined between the steep valley hillslope to the west and the Shaw Diversion Dam abutment to the east. Downstream of the dam, the river channel is somewhat wider and appears more entrenched than the channel upstream of the dam. A longitudinal profile through the project site is presented in Figure 2-10.

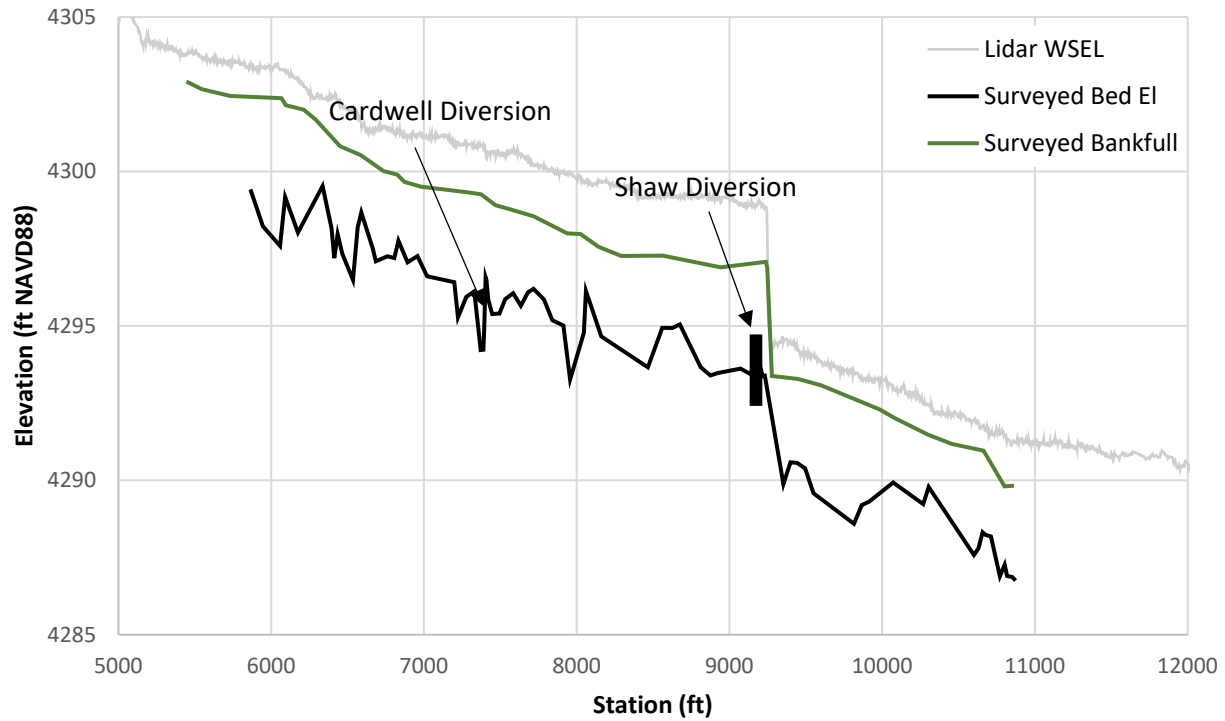


Figure 2-10. Longitudinal water surface profile of the Boulder River upstream and downstream of the project area, indicating locations of key features.

The Shaw Diversion Dam creates a backwater under all flow conditions and influences sediment transport characteristics through the project reach. In the current spillway configuration with the gates open, it is likely that some sediment can pass through the gates; however, a depositional wedge is evident in the channel extending upstream approximately 700 feet. The first 300 feet of sediment upstream of the dam appears to be fine-grained with a transition to coarser alluvial material upstream of that point. The bars immediately upstream of the spillway appear to be buried with sediment and the wedge of sediment behind the dam is clearly discernable in the longitudinal profile. The volume of stored sediment behind the dam is estimated to be approximately 2,000 cubic yards.



Figure 2-11. Sediment deposition and bar formation upstream of Shaw Diversion Dam (left). Active bank erosion along outside meander bend (right).

2.2.10 Potential Geomorphic Response to Dam Removal

Geomorphic response to dam removal is dependent on various factors, including dam height and removal strategy, relations between stored sediment volume and background sediment flux, stored sediment grain size, downstream valley morphology, and watershed geologic setting and geographic context (Major et al., 2017). Potential channel responses of the Boulder River to removal of the Shaw Diversion Dam were developed based on previous investigations that provide insight on typical channel responses in the context of these influencing factors.

The total volume of sediment stored behind the Shaw Diversion is approximately 2,000 cubic yards and is composed of 56% gravels (D50 = 5.4 mm) and 46% sand (D50 = 1.1 mm). The sediment wedge extends for approximately 700 feet upstream of the dam, above which is a gravel-dominated riffle feature functioning as a grade control. The coarser composition of the stored sediment behind the Shaw Diversion (as opposed to silts or clays) suggests that evacuation of stored sediment will be relatively quick and complete, regardless of breach and post-breach flow magnitude.

To provide insight on the relationship between the volume of stored sediment and background sediment flux from upstream sources, we approximated the annual volume of sediment inputs to the channel from bank erosion in the project reach. This is based on results of the Bank Erosion Hazard Index (BEHI) assessment and associated approximate erosion rates developed for the region (MT DEQ, 2008). The estimated annual sediment load to the Boulder River from bank erosion in the project reach is 230 cubic yards. The volume of stored sediment is approximately 9 times this amount. Based on previous studies (Major et al., 2017), this suggests that overall downstream impacts may be relatively modest and of short duration (months to a few years), as the downstream channel would be receiving an input of sediment not too much greater than that to which it is equilibrated and would foreseeably be able to redistribute released sediment quickly.

Although large-scale changes in channel form are not expected, there will be locally significant changes in channel morphology. Following dam removal, channel incision will begin at the dam site and migrate upstream. It can be assumed that the upstream extent of incision will extend the length of the sediment wedge to the grade control, approximately 700 feet (Figure 2-10 and Figure 2-11). Downcutting will occur until coarser grains comprising the pre-dam channel bed are exposed. Incision will be followed by channel widening due to mass wasting or eroding of banks. Over time, vegetation will colonize a newly developed floodplain and the channel will stabilize. Upstream channel degradation will be accompanied by aggradation downstream of the dam owing to the sudden increase in sediment supply relative to transport capacity (Figure 2-11). The combination of incision and aggradation produces a locally steeper gradient through the dam site.

The spatial extent of downstream impacts to the channel will be modulated by the Huckaba Diversion Dam located approximately 1.2 miles downstream of the Shaw Diversion (Figure 2-12). The Huckaba Diversion will act as a sediment sink; any released sediment not integrated into the channel and floodplain upstream will be impounded, and it is unlikely that there will be changes in gross channel morphology further downstream.

Within the downstream 1.2-mile length of channel where changes may occur, the spatial and temporal extent and magnitude of impacts will vary based on the caliber of stored sediment and spatial gradients in sediment transport capacity but, generally, changes will be greatest closer to the dam and less pronounced with distance downstream. Immediately downstream of the dam, where the existing bed

material is comprised of mostly cobbles, there will likely be long-term fining of the channel bed as gravels aggrade and a new equilibrium is established. Released gravels may induce pool filling, local changes in channel relief, and modification of channel bars and riffles that persists for months to years. New bar formation may induce bank erosion and increase channel sinuosity (Figure 2-12). There is a break in channel slope (0.20% to 0.07%) and associated reduction in sediment transport capacity 1600 feet below the Shaw Diversion at the Cottonwood Canyon Road Bridge. This may act as a temporary sink for released gravels, inducing aggradation and coarsening of the bed until upstream input declines and the river reworks deposited sediment.

Sand will travel farther and more rapidly than gravel, and may induce transient impacts to the channel, including filling of pools and the creation or growth of channel bars. Overall, sand is expected to be redistributed into the channel quickly and produce limited and short-lived effects.

Geomorphic response to removal of the Shaw Diversion may have complex, multifaceted effects on river and floodplain ecosystems, in a manner that challenges predictive capacities. Upstream of the dam, channel incision will be harmful by reducing floodplain connectivity, but bed-material coarsening will be beneficial by exposing spawning gravels. Downstream of the dam, bed aggradation will increase floodplain connectivity, but may reduce channel complexity by filling in pools. Alternatively, growth of channel bars may drive an increase in channel sinuosity and associated habitat diversity. The influx of spawning gravels downstream will be beneficial, however, these benefits may be partially offset by sand infiltrating and clogging interstitial spaces. The most substantial and prolonged benefits to aquatic biota from dam removal will be the restoration of unregulated flow and sediment regimes and the immediate accessibility of habitat upstream of the dam.

In conclusion, removal of the Shaw Diversion may cause long-term, locally significant changes in channel morphology in the vicinity of the dam via changes in channel elevation, relief, and bed material size. However, changes in gross channel form and function downstream of the dam are unlikely, and no impacts are expected below the Huckaba Diversion, 1.2 miles below the Shaw Diversion. Although the geomorphic response to dam removal is expected to be relatively modest, changes will have ecological and societal significance.

2.2.11 Vegetation

The Boulder River riparian corridor upstream of the Shaw Diversion appears to be well vegetated with a mix of woody riparian and upland species. Below the dam, the floodplain vegetation composition consists of fewer deciduous woody species. Agricultural land use downstream of the dam is a limiting factor to vegetation community development.

5 Feasibility Considerations

This section provides information and recommendations for evaluating the feasibility of the two proposed alternatives. Additional information regarding future project design phases and implementation phases is also provided in support of planning and public scoping.

5.1 Design Considerations

This section addresses items that should be considered before and during the project design phase.

5.1.1 Sediment Management

Management of sediment stored behind a dam is a key consideration for dam removal feasibility and site restoration. Options for sediment management include mechanical removal, evacuation by river flows, or leaving the sediment in place. Based on recent guidelines published by the U.S. Bureau of Reclamation (USBR), sediment impacts to downstream reaches can be considered negligible if the reservoir sediment volume is less than 10 percent of the average annual sediment load entering the reservoir (USBR 2017). While this can be difficult to quantify without detailed sediment investigations, inferences can be made by comparing stored reservoir sediments with typical depositional bars found in upstream settings outside of the dam's influence and unaffected by other anthropogenic disturbances.

The alternatives presented in this report assume that sediment will be left in place. In the case of Alternative 1, additional soil would be mechanically excavated and used in the construction of wetland and upland features in the location of the existing channel. In the case of Alternative 2, sediment would be allowed to be transported downstream by the river following dam removal. If sediment is found to be unsuitable it could potentially be left in place or moved to a suitable disposal site. Project cost could be significantly influenced by this factor.

5.1.2 Stability Criteria and Performance Expectations

Performance expectations address risk, uncertainty, failure modes and timeframes for project success. Performance expectations and industry standards for the design of restoration projects vary depending on project goals and site-specific situations. Because rivers are naturally dynamic systems, expectations for project stability can be expressed in the context of dynamic equilibrium, whereby project elements and restoration treatments are expected to remain quasi-stable but change in an ecologically beneficial manner as a result of desired disturbances from natural river processes.

Newly constructed restoration projects are vulnerable; they do not possess the resiliency to recover from large disturbances. Over time, project resiliency improves and ability to recover or *benefit* from disturbances increases. Selection of stability criteria for design of restoration projects must balance stability and dynamic equilibrium. When restoration treatments are installed primarily for habitat, stability of the treatment is usually evaluated at a 20-year flow (5 percent annual exceedance) event. When restoration treatments are installed for stability or around infrastructure, the stability of the treatment is usually evaluated at a 100-year flow (1 percent annual exceedance) event. For this project, stability criteria may vary by location, desired ecological effect and proximity to infrastructure. Table 5-1 provides guidance for selection of stability criteria based on desired project life and risk tolerances.



MEMO

Date February 19, 2025
To Site Environmental Manager
CC files
From Charles Buus
Subject Shaw Diversion Sediment Wedge Potential Environmental Impact

Introduction

This memo is prepared to document and communicate the investigation related to the potential environmental impacts of the sediment wedge should the Shaw Diversion fail as a result of flood or other trigger event. The wedge material was the focus specific to the metals loading and as compared to baseline and resulting from historic mining at the headwaters region as depicted in MDEQs TMDL study of the North Boulder River system.

At the request of GSM, WGM Group, Inc. ("WGM") sampled the sediment wedge upstream of the Shaw Diversion as well as river bottom sediments downstream of the diversion. Samples were analyzed for heavy metals including arsenic, barium, cadmium, chromium, copper, iron, lead, mercury, molybdenum, nickel, selenium, silver, and zinc. The results of WGM's sampling and analysis are summarized on the attached table. Concentrations of these metals were compared to Montana DEQ's Background Threshold Values ("BTVs") as determined by DEQ's Background Concentrations of Inorganic Constituents in Montana Surface Soils (2013) ("Background Concentrations Study").

The results show that the soil wedge upstream of the Shaw Diversion does not contain consistently higher concentrations of metals than are found in soils and sediments throughout the Boulder River drainage. Concentrations of arsenic, cadmium, lead, silver, and zinc in the soil wedge exceed DEQ's BTVs; however, arsenic and lead are within the range observed in DEQ's Background Concentrations Study and concentrations of cadmium and silver are close to the top end levels observed in the Background Concentration Study. The Background Concentrations Study also detected the second (0.5 mg/kg) and third (0.4 mg/kg) highest silver levels statewide in the Boulder River drainage.

Comparing the soil samples taken by WGM to DEQ's Boulder-Elkhorn Metals TMDLs and Framework for Water Quality Improvement Plan (2012) also provides useful perspective. Notably, the metal concentrations in the samples taken upstream and downstream of the Shaw Diversion are consistent with or lower than DEQ's measured concentrations of arsenic, cadmium, lead, and zinc in sediment collected throughout the Boulder River drainage. The 2012 TMDL dataset also shows that sediment concentrations of all metals decrease as the Boulder River flows through GSM-owned property. The concentrations of cadmium, lead,

and zinc in the sediment wedge are significantly lower than samples from the TMDL study. Additionally, although the 2012 TMDL dataset does not cover silver in sediment, the report does acknowledge that silver bearing ores were historically mined in the upper areas of the Boulder River drainage making it likely that similar (or higher) silver concentrations exist above and below the Shaw Diversion.

Conclusion

Based on the results of WGM's sampling and analysis, metal concentrations in the sediment wedge upstream of the Shaw Diversion appear to be consistent with or lower than metal concentrations in streambed soils found throughout the Boulder River drainage. Further, the proposed design to create an alternate stream channel east of the Shaw Diversion Dam, leaving the sediment wedge in place after the stream channel is redirected, makes it very unlikely that the sediment wedge would be rapidly eroded and washed downstream. Accordingly, the proposed project does not appear to pose a risk of releasing metals from the sediment wedge or mobilizing material that is any different than the material that washes down through the Boulder River drainage.

Table 1

Sample ID	Date Collected	Sample Depth (inches bgs)	Metals (mg/kg)												
			Arsenic	Barium	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
Background Threshold Values (BTVs) for MT Soils			22.5 *	429	0.7	41.7	165	24,400	29.8	n/a	n/a	31.4	0.7	0.3	118
200928-DOWNSED1	10/10/2024	0-12	9	66	ND	7	23	5,680	25	ND	ND	ND	ND	ND	153
200928-DOWNSED2	10/10/2024	0-3	15	79	ND	9	38	8,140	28	ND	ND	6	ND	1	234
200928-DOWNSED3	10/10/2024	0-8	11	130	1	12	46	10,000	30	ND	ND	10	ND	ND	323
200928-UPSED1	10/10/2024	0-12	10	65	2	6	26	5,440	24	ND	ND	ND	ND	1	747
200928-UPSED2	10/10/2024	0-30	12	115	ND	11	41	8,770	26	ND	ND	9	ND	ND	242
200928-UPSED3	10/10/2024	0-24	12	67	ND	7	40	7,260	26	ND	ND	ND	ND	ND	133
200928-UPSED4	10/10/2024	0-24	16	102	2	7	30	7,500	23	ND	ND	6	ND	ND	199
200928-UPSED5	10/10/2024	0-5	15	83	ND	20	32	12,300	21	ND	ND	14	ND	ND	144
UPSED5 (dup)	10/10/2024	0-5	26	78	ND	13	69	11,900	21	ND	ND	8	ND	ND	143
200928-UPSED6	10/10/2024	0-4	12	73	ND	8	36	9,760	22	ND	ND	7	ND	ND	186
200928-UPSED7	10/10/2024	0-5	10	64	ND	3	25	5,280	19	ND	ND	ND	ND	ND	156

Notes:
 All results in milligrams per kilogram (mg/kg; ppm) except for ID#200928-WATER1, which is a QA/QC equipment rinsate blank in mg/L.
 < indicates that the analyte was not detected above the laboratory reporting limit n/a indicates no screening level available; not published; or not applicable
Bolded value indicates the parameter was detected above the laboratory reporting limit
 * BTV - Background Threshold Value: Background Concentrations of Inorganic Constituents in Montana Surface Soils. Prepared for Montana DEQ, September 2013.



Boulder River Diversion Removal and Restoration Project - Anticipated Project Time Frame



Permit Tasks	2024					2025												2026											
	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks	Weeks
Preliminary Design, Grant Submittals, Environmental Permitting																													
Preliminary Design						Completed Feb, 2025																							
Bureau of Reclamation Grant																		On hold - No funding											
NEPA Compliance - Environmental Assessment																		On hold, no grant											
Cultural Resource Inventory - SHPO (Section 106 Consultation)																		On hold, contingent upon NEPA requirements											
Ute Lady's tresses - Species Specific Habitat Analysis (Section 7 Consultation)																		On hold, contingent upon NEPA requirements											
Section 404 Requirements (Corps Permitting)																													
Wetland Delineation 2025																													
Wetland Impacts Analysis																													
Document Current Stream Impairments & Reference Reach Comparison/Reporting																													
Wetland Functional Assessment																													
Site Monitoring Plan																													
Wetland Performance Monitoring																		Wetland monitoring, to satisfy Corps permit requirements anticipated after the 3rd growing season post-construction..											
Floodplain Development Permit																													
Hydrologic & Hydraulic Analysis																													
Conditional Letter of Map Revision (CLOMR)																													
Letter of Map Revision (LOMR)/As-Built Survey Post-Construction																													
Additional Permitting (310 & 318) & Joint Application Preparation																													
Permit Write-Up & Submittal																													
Local Conservation District Meeting																													
Final Design / Bid Documents / Construction Oversight																													
Final Design / Plan Set Development																													
Wood Procurement Contract																													
Bid Documents / Contractor Selection																													
Construction Oversight / As Built Data / Final Drawings																													

- Project Work Timeline
- Agency Review Timeline
- Wood Procurement



Figure 1. The Shaw Dam has disrupted natural processes, such as sediment transport and deposition, for over a century. Restoring these processes and reconnecting the floodplain to improve non-point source (NPS) pollution are key goals of the project.

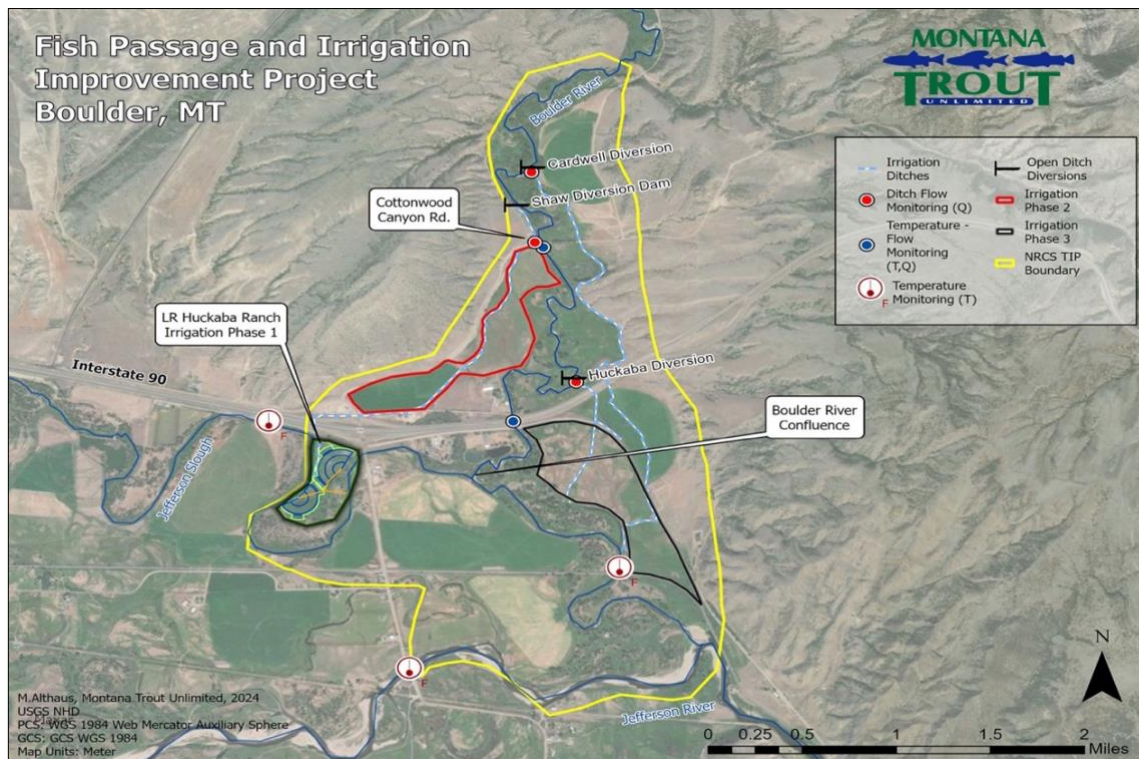


Figure 2. Project overview of the phased Shaw Dam Removal and Riparian Restoration Project, the Targeted Implementation Plan components, and monitoring locations.

Shaw Dam Removal and Riparian Restoration Project

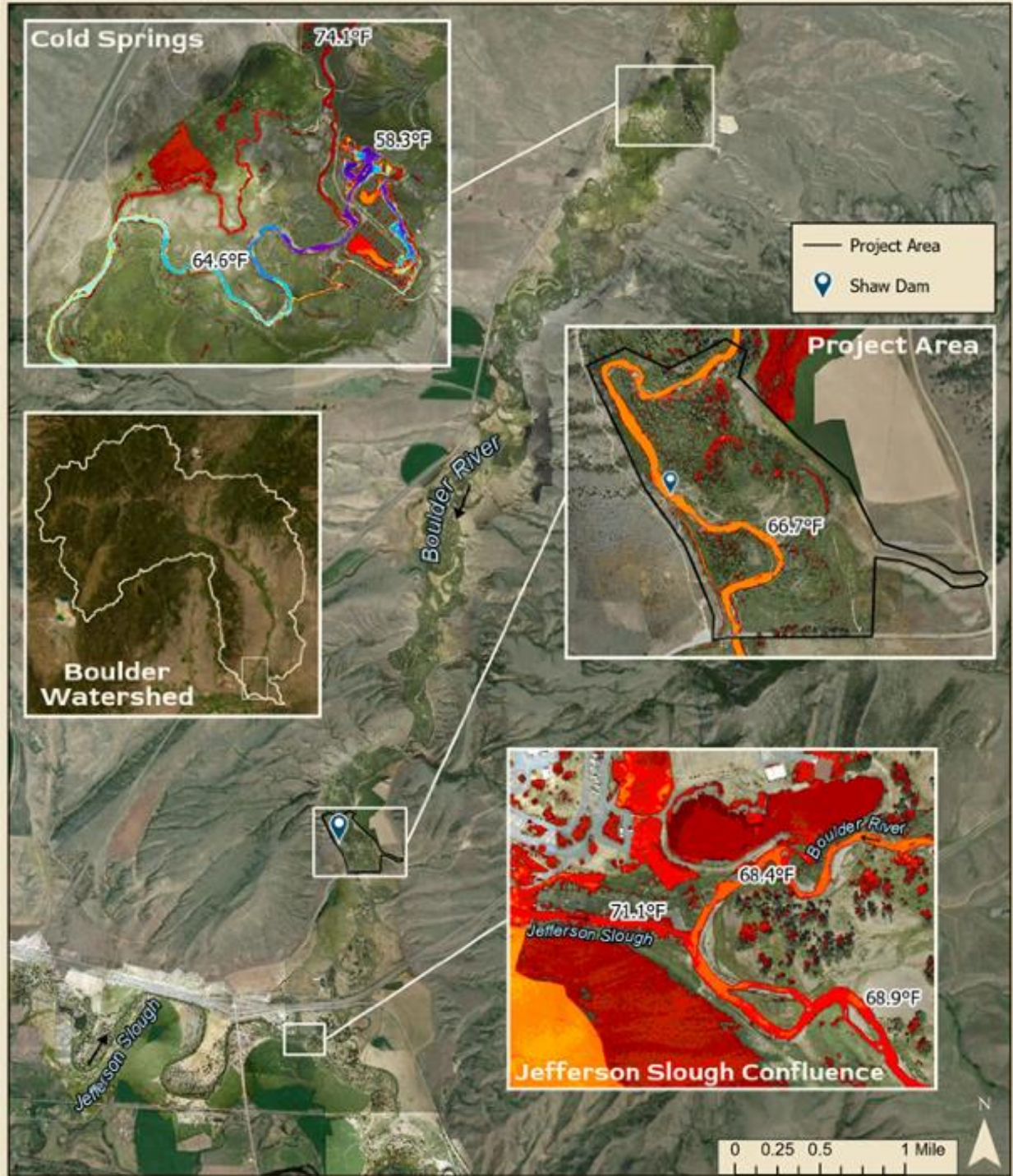


Figure 3. Overview of the thermally-impaired lower Boulder River and 2025 aerial thermal infrared data (TIR) at the Shaw Dam Removal and Riparian Restoration Project site, Cold Springs, and the Boulder River-Jefferson Slough confluence.

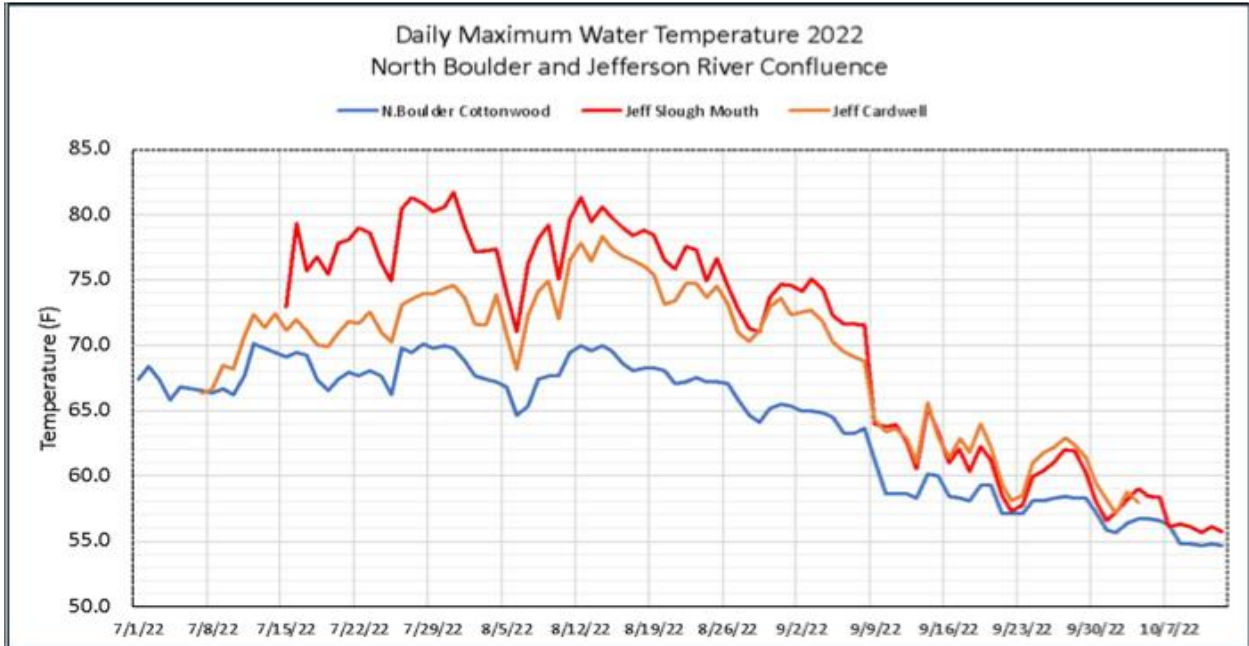


Figure 4. 2022 daily maximum water temperatures of the Boulder River, Jefferson Slough, and the Jefferson River near Cardwell. The pre-project irrigation improvement will increase the amount of cold water instream, reducing NPS temperature pollution.

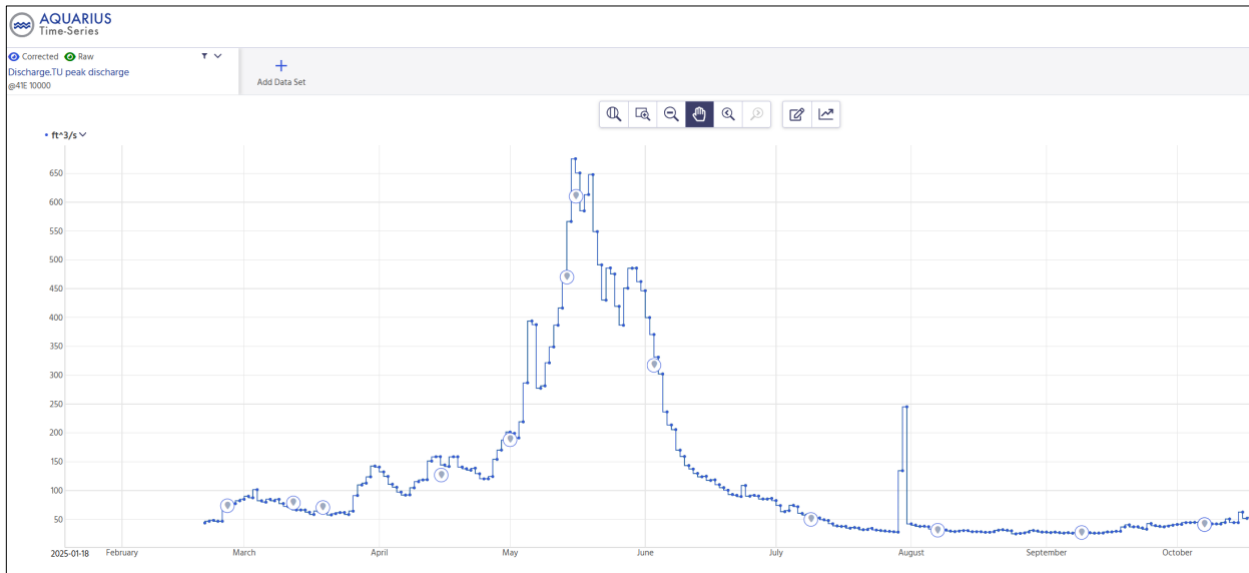


Figure 5. Discharge of the Boulder at the Cottonwood Bridge, March 1 to October 30, 2025. MTU lobbied for funding for real-time stream gauges at this site. The area is prone to flash floods. Notice the signature on 7.31.25. To prevent catastrophic dam failure, the project will proactively remove the outdated and vulnerable Shaw Dam, where 2,000 cubic yards of fine sediment have accumulated.

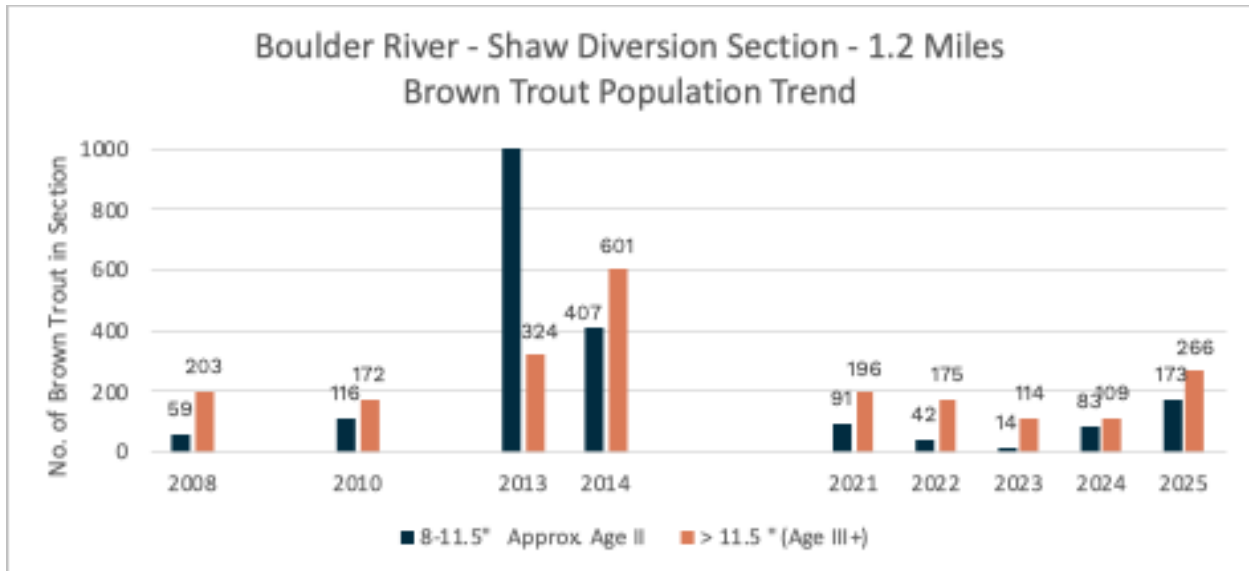


Figure 6. Brown trout population estimates in the Shaw Dam section since 2008. Two years following good water years, such as 2023, fish numbers increase, as they did in 2025. Fish populations are key indicators of watershed health.

Table 1. Average brown trout redd counts upstream of Shaw Dam, 2007, 2018-2025. Restoring fish passage to Cold Springs should improve fish recruitment.

	Cold Springs-Ford (0.71 mi.) Approximate per Mile	Ford-Gavin's Bridge (0.85 mi.) Approximate per Mile
9-year Average	183	43



Figure 7. Before and after photos of the TU-led Rattlesnake Dam removal. The scope and scale of the *Shaw Dam Removal and Riparian Restoration Project* are similar.



GOLDEN SUNLIGHT
MINE INC.

GOLDEN SUNLIGHT
MINE INC.

GOLDEN SUNLIGHT
MINE INC.

COTTONWOOD ROAD

REMOVE CARDWELL
DIVERSION STRUCTURE

EAST SIDE CHANNEL
PROPOSED ALIGNMENT

PROPOSED
WETLAND SWALES

PROPOSED
WETLAND SWALES

EAST SIDE CHANNEL
PROPOSED ALIGNMENT

PLUG CARDWELL
DIVERSION DITCH

WEST SIDE CHANNEL
PROPOSED ALIGNMENT

BOULDER RIVER
Flow →

BOULDER RIVER
PROPOSED ALIGNMENT

END PROPOSED
CHANNEL GRADING

PORTION OF EXISTING BOULDER
RIVER TO BE PRESERVED AS
RELIC MEANDER BEND

WEST SIDE CHANNEL
PROPOSED ALIGNMENT

REMOVE SHAW
DIVERSION STRUCTURE

PLUG SHAW
DIVERSION DITCH

LEGEND














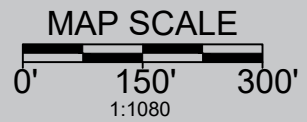
-  EXISTING WETLAND
-  EXISTING FORESTED WETLAND
-  PROPOSED OPEN WATER
-  LARGE WOOD STRUCTURE
-  ENGINEERED RIFFLE
-  VEGETATED WOOD MATRIX TYPE 1
-  VEGETATED WOOD MATRIX TYPE 2
-  FLOODPLAIN ROUGHNESS
-  WILLOW TRENCH TYPE 1
-  WILLOW TRENCH TYPE 2
-  WETLAND SWALE
-  GRADING EXTENT
-  EXISTING OVERHEAD POWER LINE AND POLE
- EXISTING FENCE

IMAGE: MAXAR 2026

PROJECT LOCATION:
NEAR CARDWELL, MONTANA
LAT. 45.88382, LONG. -111.94257

**SHAW DAM REMOVAL AND
RIPARIAN RESTORATION PROJECT**





DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
MONTANA REGULATORY OFFICE
100 NEILL AVENUE
HELENA, MT 59601-3329

February 13, 2026

SUBJECT: 2021 Nationwide Permit Verification, NWO-2024-01275-MT, Trout Unlimited, Boulder River Diversion Removal and Restoration Project - Jefferson County, MT

Montana Trout Unlimited
Attn: Mr. Chris Edgington
Post Office Box 7186
Missoula, Montana 59802

Dear Mr. Edgington:

This letter is in response to your October 8, 2025, Pre-construction Notification (PCN), requesting Department of the Army (DA) Nationwide Permit (NWP) verification for the above-referenced project. The proposed activity is located at Latitude 45.8862°, Longitude -111.9446° within Boulder River, within Section 35, Township 2 North, Range 3 West, Jefferson County, Montana.

Project-specific components:

The following aquatic habitat restoration work would be conducted below the OHWM of Boulder River and within freshwater wetlands:

- a. Location 1: Boulder River: As shown on the plan set titled "Boulder River Dam Removal Project" and Section D. and F. of the application submitted, approximately 2,955 linear feet of stream, including 1.3 acres of wetlands will be permanently impacted below the ordinary high water mark (OHWM) for the restoration activities. Boulder Creek will be realigned and reconnected to the Eastside and Westside Channels by removing the existing Cardwell Diversion Dam and Shaw Diversion Dam with fish ladder. A temporary bypass channel will be constructed utilizing the existing Cardwell Ditch to reroute the flow of Boulder River during construction. Portions of the bypass will be used to create the newly constructed Eastside channel.
- b. Location 2: Cardwell Diversion Channel: Approximately 2,211 linear feet of stream, will be permanently impacted below the ordinary high water mark (OHWM) for the restoration activities. Approximately, 6.3 Cubic yards (CY) of existing Cardwell Diversion Dam will be removed. Following the removal of the structure, 850 linear feet of the existing Cardwell Ditch will be plugged and abandoned. A temporary

bypass channel will be constructed utilizing the existing Cardwell Ditch to reroute the flow of Boulder River during construction. Approximately, 1,316 linear feet of the bypass will be used to create the newly constructed Eastside channel with wetlands. Approximately, 536 linear feet of additional channel will be created for connectivity to the Boulder River. Overall, a net loss of approximately 360 linear feet of stream would be permanently lost.

- c. Location 3: Shaw Diversion Dam: Permanently impact 942 linear feet of ditch below the ordinary high water mark to plug and abandon the ditch. Approximately, 52 CY of existing concrete fish ladder, concrete spillway, concrete walls, and headgate would be removed to eliminate hydraulic obstructions. Improve safety and enable the reestablishment of unimpeded aquatic organism passage.

Overall, a total of 4.2347 acres of adjacent wetlands were delineated within the project area. Approximately 1.2621 acres of existing wetlands will be impacted during construction; this loss will be offset by 1.9631 acres of constructed wetlands and 0.9405 acres of open water oxbow wetlands, resulting in approximately 5.8763 acres of wetlands post restoration, generating 1.6415 acres of additional wetland habitat. The 1.6415 acres of additional wetland habitat will offset the 1.1978 acres lost to the realignment of the Boulder River and the conversion of the irrigation ditches into side channels. The total aquatic resource net gain associated with this project was calculated at 0.4437 acres. Additionally, 3.6362 acres of habitat adjacent to the restored aquatic resources will be graded, roughened and restored to promote floodplain connectivity, further promoting the development of wetland fridges along the river and high flow channel banks.

The U.S. Army Corps of Engineers (USACE) regulates the discharge of dredged and fill material into waters of the United States under Section 404 of the Clean Water Act (CWA) (33 U.S.C. 1344) and structures or work in, over, and under navigable waters of the United States under Section 10 of the Rivers and Harbors Act (RHA) (33 U.S.C. 403). USACE regulations are published in the *Code of Federal Regulations* at 33 CFR parts 320 through 332. NWP's are defined in the *Federal Register* published on December 27, 2021 (86 FR 73522) and January 13, 2021 (86 FR 2744). Based on a review of the information you furnished and available to us, we have determined the above referenced work requires DA authorization under Section 404 of the CWA.

Based upon the information you provided, we hereby verify that the work described above, which would be performed in accordance with the plans you provided, dated October 7, 2025, is authorized by NWP 27, Aquatic Habitat Restoration, Establishment, and Enhancement Activities. Please note that deviations from the original plans and specifications of your project could require additional authorization from this office. This NWP and associated Regional and General Conditions are enclosed and can be accessed on our website at: <https://www.nwo.usace.army.mil/Missions/Regulatory-Program/Montana/>. Failure to comply with the General and Regional Conditions of this NWP, or the project-specific special conditions of this authorization, may result in the suspension or revocation of

your authorization, and you may be subject to appropriate enforcement action. You shall comply with all terms and conditions associated with this NWP.

Special Conditions:

1. The permittee must submit monitoring reports on the status of the project site to USACE as defined in the monitoring plan submitted by Mr. Jay Slocum, Water & Environmental Technologies, on behalf of the applicant entitled "Aquatic Resources Impacts Analysis, Ecological Reference, and Effectiveness Monitoring Plan" received October 7, 2025. These reports shall be submitted on or before December 31st for at least a period of five years, unless a USACE project manager determines that the project is successful as defined by the proposed monitoring report. If the project site is not progressing towards success, USACE may require additional monitoring beyond the five-year timeframe until success criteria have been met or remedial action has been taken place to rectify the project site. A wetland delineation may be required to be conducted in accordance with the 1987 Corps of Engineers Wetland Delineation Manual to determine the final wetland gain at the end of the 5-year monitoring plan if the project is not progressing satisfactorily towards the stated goals.
2. It is anticipated that approximately 1.1978 acres of the Boulder River, including 1.2621 acres of existing wetlands will be permanently impacted during construction. This loss will be offset by 1.9631 acres of constructed wetlands and 0.9405 acres of open water oxbow wetlands, resulting in approximately 5.8763 acres of wetlands post restoration, generating 1.6415 acres of additional wetland habitat. Upon completion of the project, an anticipated 0.4437 acres of new wetlands will be established. To be considered successful there will be a minimum of 1.2621 acres of wetland either restored or established and 1.1978 acres of Boulder River restored.

The Montana Department of Environmental Quality has provided the enclosed CWA Section 401 water quality certification for this NWP which includes General Conditions, all of which must be complied with for that certification to remain valid. This does not eliminate the need to obtain other permits that may be required by that agency.

Unless this NWP is suspended, modified, or revoked, it is valid until **March 14, 2026**. It is incumbent upon you to remain informed of changes to this NWP. We will issue a public notice when the NWPs are reissued. The project specific condition listed in this letter continues to remain in effect after the NWP verification expires unless the district engineer removes that condition.

To assist in your compliance with NWP General Condition 30, enclosed is a "Compliance Certification" form, which shall be signed and returned within 30 days of completion of the project, including any required mitigation. Your signature on this form certifies that you have completed the work in accordance with the terms and conditions

of the NWP. Activities completed under the authorization of an NWP which was in effect at the time the activity was completed continue to be authorized by that NWP.

Authorizations under this NWP does not relieve permittees from obtaining permits or other authorizations from any required federal, state, or local agency.

If you have any questions, please contact Frank Winter via email at Frank.J.Winter@usace.army.mil, by mail at the address above, or by phone at (406) 880-5878.

Sincerely,

A handwritten signature in cursive script that reads "Devetta A. Hill".

Devetta Hill
Chief, Field Support and Analysis

3 Enclosures

1. NWP 27 Fact Sheet with Regional and General Conditions
2. Compliance Certification
3. CWA Section 401 Water Quality Certification

The Omaha District, Regulatory Branch is committed to providing quality and timely service to our customers. In an effort to improve customer service, please take a moment to complete our Customer Service Survey found on our website at: <https://regulatory.ops.usace.army.mil/customer-service-survey/>.