

FUTURE FISHERIES IMPROVEMENT PROGRAM GRANT APPLICATION

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

I. APPLICANT INFORMATION

- A. Applicant Name: Big Blackfoot Chapter of Trout Unlimited
- B. Mailing Address: PO Box 1
- C. City: Ovando State: MT Zip: 59854
- Telephone: 406-240-4824 E-mail: ryen@montanatu.org
- D. Contact Person: Ryen Neudecker
- Address if different from Applicant: See above
- City: _____ State: _____ Zip: _____
- Telephone: _____ E-mail: _____
- E. Landowner and/or Lessee Name (if other than Applicant): Kyle Graveley & Bob Geary
- Mailing Address: PO Box 68
- City: Helmville State: MT Zip: 59843
- Telephone: 406-793-0006 E-mail: kgraveley@gmail.com

II. PROJECT INFORMATION*

- A. Project Name: Nevada Creek Fish Screening Project
- River, stream, or lake: Nevada Creek
- Location: Township: 16N Range: 15W Section: 12
- Latitude: 46.495013 Longitude: -112.541216 *within project (decimal degrees)*
- County: Powell
- B. Purpose of Project:
- The goal of this project is to eliminate entrainment of trout down an irrigation diversion while providing fish passage and bed and bank stability within the stream channel.
- C. Brief Project Description: _____

Nevada Creek fish screening

Nevada Creek is a large third-order tributary to the middle Blackfoot River and supports populations of westslope cutthroat trout, rainbow trout, brown trout and many other fish species. Several large-scale restoration projects completed throughout the drainage during the past ~ten years, and the associated positive fisheries response has resulted in an increase of interest and focus on several potential projects, including channel restoration, fish passage, water conservation and fish screening. An existing irrigation diversion on the mainstem Nevada Creek is the focus of this application.

The existing diversion is a debris dam consisting of a combination of logs, tarps, sandbags and other materials that are not stable and create a three-foot drop which is a fish barrier during many stages of stream flows. The diversion also creates a backwater effect on Nevada Creek and has resulted in an over-widened stream channel suffering from sediment deposition. The debris dam requires annual maintenance and there is no headgate to allow for hydraulic control within the ditch. To address the current situation, the proposed project objectives include:

- Eliminate entrainment of trout populations within the project reach by installing a low maintenance fish screen capable of operating between two and 15-cfs.
- Install a cost-effective, low maintenance headgate capable of providing hydraulic control through a range of flows from 0 to 15 cfs.
- Minimize sediment delivery to the ditch using a sediment sluice gate.
- Provide bed and bank stability in the immediate project area.
- Restore fish passage through the project reach

To address these objectives, the proposed project would upgrade the existing infrastructure with a stable grade control weir that will allow for water diversion while improving sediment transport and fish passage. A Farmers Conservation Alliance (FCA) fish screen will also be installed within the ditch and will include a fish and debris bypass. A headgate and sluice gate will also be installed at the ditch inlet. A limited amount of instream wood and willow plantings will be installed along the stream bank margin in the diversion area to protect the new infrastructure.

D. Length of stream or size of lake that will be treated: ~250 feet of stream channel

E. Project Budget:

Grant Request (Dollars): \$ Existing FCA fish screen valued at \$50,000

Contribution by Applicant (Dollars): \$ 38,797 In-kind \$ 3,855
(salaries of government employees are not considered as matching contributions)

Contribution from other Sources (Dollars): \$ 55,000 In-kind \$ 3,100
(attach verification - See page 2 budget template)

Total Project Cost: \$ 150,752

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

Nevada Creek fish screening

- Attach **specific project plans, detailed sketches, plan views, photographs, maps, evidence of landowner consent, evidence of public support and fish biologist support, and/or other information necessary to evaluate the merits of the project. If project involves water leasing or water salvage complete a *supplemental questionnaire*** (fwp.mt.gov/habitat/futurefisheries/supplement2.doc).
- G. **Attach land management & maintenance plans that will ensure protection of the reclaimed area.**
- H. **Attach land management & maintenance plans that will ensure protection of the reclaimed area.**

III. PROJECT BENEFITS*

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

Brown trout, rainbow trout, and westslope cutthroat trout.

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

The proposed project will upgrade an existing irrigation diversion which will improve fish passage, sediment transport conditions and channel stability. The new fish screen will also ensure trout are no longer "lost" down the irrigation ditch.

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

We expect the project to help address entrainment and fish passage issues within this stretch of Nevada Creek.

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

Restoration on tributaries that feed the river is the focus of our program as these streams are the lifeblood to the river. The combination of potential work throughout Nevada Creek has the potential to result in cleaner water and increased recruitment of trout to the middle Blackfoot River. We view this project as an important step in addressing multiple irrigation diversion projects that could include water conservation, fish screening, consolidation and fish passage aspects.

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

The landowners have signed a 20-year landowner agreement with the USFWS and BBCTU.

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

The existing irrigation diversion has caused the channel to become over-widened and accumulate fine sediment. We will address both issues with the treatments described in the design.

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

This project involves the continuation of the Blackfoot River Restoration program and the restoration of westslope cutthroat stream. Public benefits include: 1) expanding suitable habitat conditions for pure westslope cutthroat trout, 2) improved habitat for rainbow and brown trout and 3) improved water quality conditions by eliminating a potentially unstable instream diversion.

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

No

Nevada Creek fish screening

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

No

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

No

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

IV. AUTHORIZING STATEMENT

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

Applicant Signature:



Date:

11-28-2017

Sponsor (if applicable):

***Highlighted boxes will automatically expand.**

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

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

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

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

Nevada Creek fish screening



Photo 1: Existing diversion on Nevada Creek proposed to be upgraded with a fish screen and a stable grade control weir.

Nevada Creek fish screening
BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

Both tables must be completed or the application will be returned

| WORK ITEMS (ITEMIZE BY CATEGORY) | NUMBER OF UNITS | UNIT DESCRIPTION* | COST/UNIT | TOTAL COST | CONTRIBUTIONS | | | |
|--|--------------------|----------------------|---------------|---------------|-----------------------------|-----------------------|--------------|---------------|
| | | | | | FUTURE FISHERIES REQUEST | IN-KIND SERVICES** | IN-KIND CASH | TOTAL |
| Personnel*** | | | | | | | | |
| Survey | 50 | hours | \$100.00 | \$ 5,000.00 | | | 5,000.00 | \$ 5,000.00 |
| Design | 250 | hours | \$110.00 | \$ 27,500.00 | | | 27,500.00 | \$ 27,500.00 |
| Permitting | 60 | hours | \$50.00 | \$ 3,000.00 | | 3,000.00 | | \$ 3,000.00 |
| Oversight | 90 | hours | \$100.00 | \$ 9,000.00 | | | 9,000.00 | \$ 9,000.00 |
| | | | | \$ - | | | | \$ - |
| | | | Sub-Total | \$ 44,500.00 | \$ - | \$ 3,000.00 | \$ 41,500.00 | \$ 44,500.00 |
| Travel | | | | | | | | |
| Mileage | 1500 | miles | \$0.57 | \$ 855.00 | | 855.00 | | \$ 855.00 |
| Per diem | | | | \$ - | | | | \$ - |
| | | | Sub-Total | \$ 855.00 | \$ - | \$ 855.00 | \$ - | \$ 855.00 |
| Construction Materials**** | | | | | | | | |
| FCA Fish Screen | 1 | each | \$50,000.00 | \$ 50,000.00 | 50,000.00 | | | \$ 50,000.00 |
| Headgate/Sluice Gate | 1 | each | \$6,000.00 | \$ 6,000.00 | | | 6,000.00 | \$ 6,000.00 |
| 12" HDPE Pipe | 320 | ft | \$9.10 | \$ 2,912.00 | | | 2,912.00 | \$ 2,912.00 |
| Bypass pipe flange | 1 | each | \$175.00 | \$ 175.00 | | | 175.00 | \$ 175.00 |
| Transistion Box | 1 | each | \$500.00 | \$ 500.00 | | | 500.00 | \$ 500.00 |
| Wood | 1 | lump sum | \$4,000.00 | \$ 4,000.00 | | 4,000.00 | | \$ 4,000.00 |
| Willow Cuttings | 2300 | each | \$1.00 | \$ 2,300.00 | | 1,000.00 | 1,300.00 | \$ 2,300.00 |
| Boulders | 100 | each | \$50.00 | \$ 5,000.00 | | 5,000.00 | | \$ 5,000.00 |
| 18-24" Rock | 176 | each | \$10.00 | \$ 1,760.00 | | 1,760.00 | | \$ 1,760.00 |
| Streambank fill | 240 | CY | \$30.00 | \$ 2,100.00 | | 2,100.00 | | \$ 2,100.00 |
| | | | Sub-Total | \$ 74,747.00 | \$ 50,000.00 | \$ 13,860.00 | \$ 10,887.00 | \$ 74,747.00 |
| Equipment and Labor | | | | | | | | |
| Hydraulic Excavator | 140 | hours | \$165.00 | \$ 23,100.00 | | | 23,100.00 | \$ 23,100.00 |
| Track Truck | 30 | hours | \$125.00 | \$ 3,750.00 | | | 3,750.00 | \$ 3,750.00 |
| Labor | 40 | hours | \$45.00 | \$ 1,800.00 | | | 1,800.00 | \$ 1,800.00 |
| | | | Sub-Total | \$ 28,650.00 | | \$ - | \$ 28,650.00 | \$ 28,650.00 |
| Mobilization | | | | | | | | |
| Mob/demob | 1 | lump sum | \$2,000.00 | \$ 2,000.00 | | | 2,000.00 | \$ 2,000.00 |
| | | | Sub-Total | \$ 2,000.00 | \$ - | \$ - | \$ 2,000.00 | \$ 2,000.00 |
| | | | TOTALS | \$ 150,752.00 | \$ 50,000.00 | \$ 17,715.00 | \$ 83,037.00 | \$ 150,752.00 |

MATCHING CONTRIBUTIONS (do not include requested funds)

| CONTRIBUTOR | IN-KIND SERVICE | IN-KIND CASH | TOTAL | Secured? (Y/N) |
|-------------|-----------------|--------------|-------|----------------|
|-------------|-----------------|--------------|-------|----------------|

BUDGET TEMPLATE SHEET FOR FUTURE FISHERIES PROGRAM APPLICATIONS

| | | | | |
|---|-------------|--------------|---------------|-----|
| Landowner | \$ 3,100.00 | \$ 10,000.00 | \$ 13,100.00 | Yes |
| Big Blackfoot Chapter of Trout Unlimited | \$ 3,855.00 | \$ 38,797.00 | \$ 42,652.00 | Yes |
| USFWS Partners for Fish & Wildlife Service | \$ - | \$ 45,000.00 | \$ 45,000.00 | Yes |
| TOTALS | \$ 6,955.00 | \$ 93,797.00 | \$ 100,752.00 | |



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Montana Partners for Fish & Wildlife
POB 66
Ovando, MT 59854

November 28, 2017

MTFWP
Future Fisheries Funding Program
1420 E. 6th Ave
Helena, MT 59620

RE: BBCTU Nevada Creek Fish Screen, Poorman Creek & Lincoln Spring Creek Projects

Dear Program Review Members:

I am submitting this letter in support of the Future Fisheries grant applications submitted by the BBCTU and partners. These important projects detailed within the application are a collaborative effort between many partners including private landowners, BBCTU, Montana Fish, Wildlife & Parks (MTFWP), DEQ, Blackfoot Challenge, Montana Trout Unlimited, WestSlope Chapter of TU, US Forest Services and the USFWS Partners for Fish and Wildlife Program.

The proposed projects will complement numerous efforts in the Blackfoot Watershed during the past 30 years and this watershed wide, community based conservation and restoration effort has resulted in population increases of almost 800% for westslope cutthroat and bull trout in comparison to baseline numbers, the strongest indicator we have for the health of our watershed.

The Partners for Fish and Wildlife has a long history of working with the associated private landowners and other partners collaborating to restore the cold water fishery of the important tributaries feeding the Blackfoot River. We support the proposed projects in that we will be able to continue our efforts of restoring native trout by addressing limiting factors within the watershed by working with committed landowners.

I encourage your strong consideration of this proposal and please don't hesitate to contact me if you have questions or need additional information at (406)793-7402.

Thanks for your consideration.

Sincerely,

Randy Gazda, Assistant State Coordinator

FINAL DESIGN

WINEGLASS FISH SCREEN AND IRRIGATION DIVERSION IMPROVEMENT PROJECT

NEVADA CREEK NEAR LINCOLN, MONTANA



PROJECT PARTNERS



BIG BLACKFOOT CHAPTER OF TROUT UNLIMITED
PO Box 1
Ovando, MT 59854



**Montana Fish,
Wildlife & Parks**

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



US FISH AND WILDLIFE SERVICE
P.O. BOX 66
196 LOWER LAKE SIDE LANE
OVANDO, MONTANA 59854

PROJECT DESCRIPTION

BIG BLACKFOOT CHAPTER OF TROUT UNLIMITED (BBCTU), IN COOPERATION WITH MONTANA FISH, WILDLIFE AND PARKS (MFWP), AND US FISH AND WILDLIFE SERVICE (USFWS) RETAINED RIVER DESIGN GROUP, INC. (RDG) TO DESIGN A FISH SCREEN AND DIVERSION IMPROVEMENT PROJECT ON NEVADA CREEK LOCATED APPROXIMATELY 52 MILES EAST OF MISSOULA, MT. NEVADA CREEK IS A THIRD ORDER TRIBUTARY TO THE MIDDLE BLACKFOOT RIVER AND SUPPORTS POPULATIONS OF WESTSLOPE CUTHROAT TROUT, RAINBOW TROUT, BROWN TROUT AND OTHER FISH SPECIES. NEVADA CREEK HAS BEEN IDENTIFIED AS AN IMPAIRED WATERBODY BY THE MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY. THE STREAM IS CONSIDERED NON-SUPPORTING OF AQUATIC LIFE, COLD WATER FISHERY, AND CONTACT RECREATION DUE TO SEDIMENT AND HABITAT RELATED CAUSES (MDEQ 2008). PROBABLE CAUSES OF WATER QUALITY IMPAIRMENT INCLUDE LOW FLOW ALTERNATION, TOTAL PHOSPHORUS, PHYSICAL SUBSTRATE, HABITAT ALTERATIONS, SEDIMENTATION/SILTATION, AND TOTAL NITROGEN. PROBABLE SOURCES OF IMPAIRMENT INCLUDE AGRICULTURE AND STREAMBANK MODIFICATION/DESTABILIZATION.

THE PROJECT GOALS IS TO UPGRADE THE EXISTING IRRIGATION INFRASTRUCTURE TO ENSURE THAT IT PROVIDES FOR THE TRADITIONAL IRRIGATION WATER NEEDS OF THE IRRIGATOR WHILE ELIMINATING ENTRAINMENT OF ALL SPECIES AND SIZE CLASSES OF TROUT INHABITING THE RIVER. SPECIFIC OBJECTIVES OF THE PROJECT INCLUDE:

1. INSTALL A LOW MAINTENANCE, COST-EFFECTIVE AND SELF CLEANING FISH SCREEN CAPABLE OF OPERATING BETWEEN 2 AND 15 CFS WHILE SCREENING ALL AGE CLASSES OF TROUT (3/32" SCREEN OPENING);
2. THE SCREEN DESIGN WILL PROVIDE A BYPASS THAT OPERATES AT ALL FLOW CONDITIONS;
3. INSTALL A COST-EFFECTIVE, LOW MAINTENANCE HEADGATE AND STREAM GRADE CONTROL CAPABLE OF PROVIDING HYDRAULIC CONTROL THROUGH A RANGE OF FLOWS FROM BASEFLOW TO BANKFUL FLOW;
4. MINIMIZE SEDIMENT DELIVERY TO THE DITCH;
5. PROVIDE BED AND BANK STABILITY IN THE IMMEDIATE PROJECT REACH.

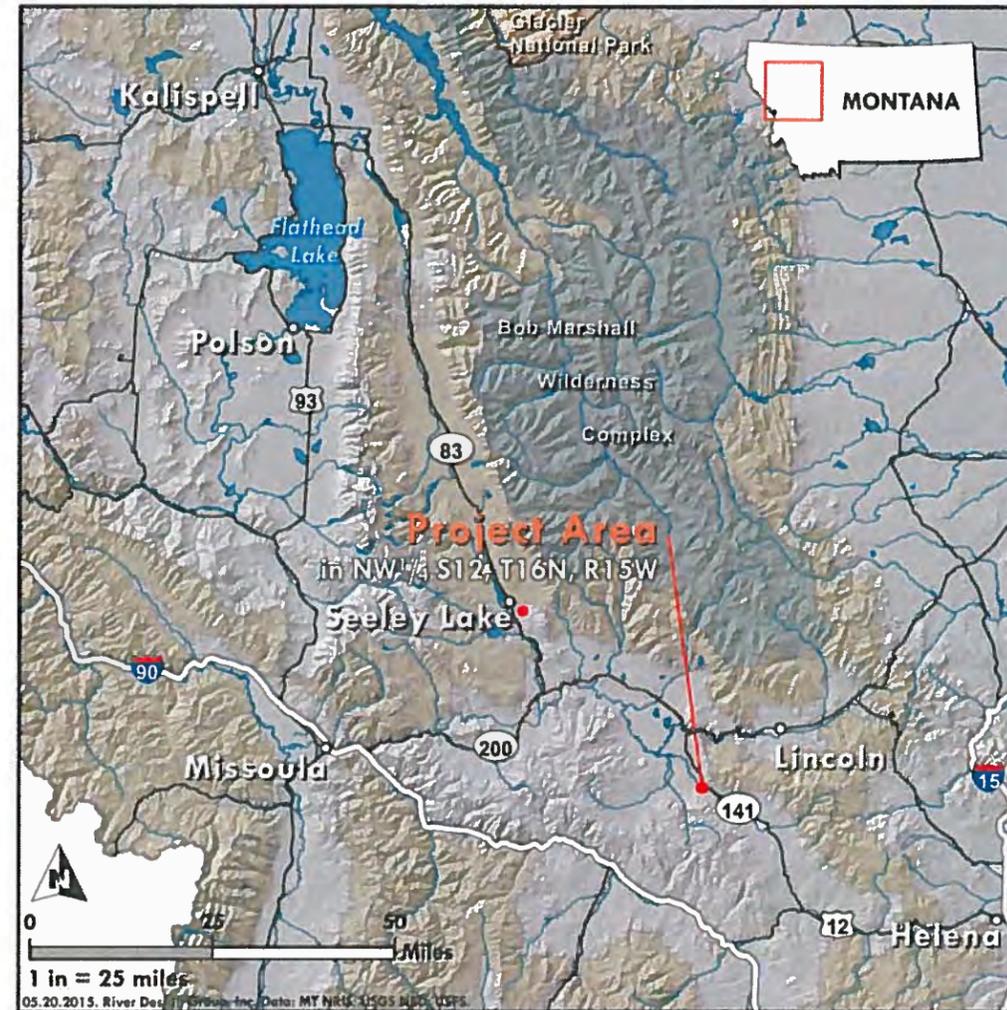
BENCHMARK

SURVEY CONTROL WAS ESTABLISHED UNDER THE RESPONSIBLE CHARGE OF ANDREW BELSKI, PLS 14731.

THE PROJECT COORDINATES ARE BASED ON THE FOLLOWING:

HORIZONTAL PROJECTION: MT83F
HORIZONTAL DATUM: NAD83 CORS 2011
UNITS: US SURVEY FEET
VERTICAL DATUM: NAVD88 (GEOID 12B)

PROJECT VICINITY MAP



DRAWING INDEX

- 1.0 COVER PAGE AND NOTES
- 2.0 SPECIFICATIONS
- 3.0 SITE PLAN
- 3.1 EXISTING CONDITIONS
- 3.2 CLEARWATER BYPASS PLAN
- 4.0 SURVEY CONTROL PLAN
- 5.0 PLAN VIEW
- 5.1 PROFILE VIEWS
- 6.0 FISH SCREEN DETAILS
- 6.1 HEAD GATE AND SLUICE GATE DETAIL
- 6.2 BOULDER CASCADE STRUCTURE DETAIL
- 6.3 VEGETATED WOOD MATRIX DETAIL
- 6.4 LARGE WOOD STRUCTURE DETAIL
- 6.5 CONSTRUCTED RIFFLE STRUCTURE
- 7.0 MATERIALS LIST

NEVADA CREEK - WINEGLASS DIVERSION COVER PAGE AND NOTES

| NO. | DATE | BY | DESCRIPTION | CHK | |
|-----|----------|----|--------------|-----|--|
| | | | | GD | |
| 1 | 10-12-17 | NW | FINAL DESIGN | | |

PROJECT NUMBER
RDG-14-080

SHEET NUMBER
1.0

GENERAL SPECIFICATIONS

1. THE PROJECT SHALL BE CONSTRUCTED ACCORDING TO THE PLAN SET. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER OF ANY CHANGES PRIOR TO IMPLEMENTATION. THE CONSTRUCTION MANAGER FOR THIS PROJECT SHALL BE A DESIGNATED RIVER DESIGN GROUP REPRESENTATIVE.
2. IT IS THE CONTRACTOR'S RESPONSIBILITY TO IDENTIFY ALL UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION. CALL U-DIG PRIOR TO CONSTRUCTION.
3. COSTS INCURRED DUE TO PROJECT DELAYS RESULTING FROM FAILURE OF THE CONTRACTOR TO MEET THE REQUIREMENTS OF THE GENERAL SPECIFICATIONS, CONTRACTOR QUALIFICATIONS, CONSTRUCTION SPECIFICATIONS, MATERIALS SPECIFICATIONS AND REVEGETATION SPECIFICATIONS SHALL BE THE EXPENSE OF THE CONTRACTOR.
4. IN-WATER WORK PERIOD SHALL BE COORDINATED WITH MONTANA FISH, WILDLIFE AND PARKS. NO IN-STREAM WORK SHALL BE PERMITTED OUTSIDE OF THE APPROVED WINDOW.

CONTRACTOR QUALIFICATIONS

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

TEMPORARY DIVERSION PROCEDURES

1. BBCTU SHALL BE NOTIFIED AT LEAST 72 HOURS PRIOR TO ACTIVATION OR DEACTIVATION OF ALL TEMPORARY BYPASS CHANNELS. THE PHONE NUMBER FOR THE BBCTU OFFICE IS 406-240-4824. BBCTU SHALL DETERMINE IF IT IS NECESSARY TO CONDUCT A FISH RESCUE.

TEMPORARY DIVERSION PROCEDURES

2. TEMPORARY DIVERSIONS SHALL BE ACTIVATED OR DEACTIVATED INCREMENTALLY IN THREE EQUAL STAGES TO ALLOW RESIDENT AQUATIC LIFE TO EXIT THE DEWATERED AREA.
3. A PERIOD OF APPROXIMATELY ONE HOUR SHALL BE ALLOWED BETWEEN THE FIRST TWO STAGES.
4. A PERIOD OF APPROXIMATELY 12 HOURS SHALL BE ALLOWED BEFORE THE FINAL STAGE. MFWP SHALL CONDUCT FISH RESCUES DURING THE 12 HOUR PERIOD.
5. UPON NOTIFICATION FROM TU, THE REMAINING FLOW SHALL BE DIVERTED.
6. EFFORTS SHALL BE MADE TO LIMIT TURBIDITY DURING DIVERSION ACTIVATION AND DEACTIVATION. MATERIAL USED TO DIVERT FLOW DURING STAGED DIVERSIONS SHALL BE CLEAN AND DEVOID OF FINES.

7. EFFORTS SHALL BE MADE TO LIMIT DISTURBANCE TO VEGETATION.
8. EFFORTS SHALL BE MADE TO AVOID FATALITIES OF AQUATIC LIFE.

MATERIALS SPECIFICATIONS

1. THE CONTRACTOR SHALL FURNISH ALL MATERIALS NECESSARY TO CONSTRUCT THE PROJECT. THE CONTRACTOR SHALL DELIVER ALL MATERIALS TO THE DESIGNATED STOCKPILE LOCATIONS LABELED ON THE PLAN SET OR TO A LOCATION SPECIFIED BY THE CONSTRUCTION MANAGER. IF A MATERIAL SOURCE HAS BEEN PRE-DETERMINED, THE CONSTRUCTION MANAGER SHALL PROVIDE DIRECTIONS TO THE CONTRACTOR.
2. MATERIAL QUANTITIES, DIMENSIONS AND SIZES SHALL CONFORM TO THE NOTES AND SPECIFICATIONS PROVIDED ON THE PLAN SET OR ON THE MATERIALS LIST.
3. THE CONSTRUCTION MANAGER SHALL INSPECT AND APPROVE ALL MATERIALS PRIOR TO CONSTRUCTION. IF MATERIALS DO NOT MEET THE MINIMUM REQUIREMENTS SPECIFIED IN THE PLAN SET OR MATERIAL LIST, THE CONSTRUCTION MANAGER SHALL REJECT THE MATERIALS.

EQUIPMENT SPECIFICATIONS

1. THE CONTRACTOR SHALL FURNISH ALL EQUIPMENT NECESSARY TO CONSTRUCT THE PROJECT. THE CONTRACTOR SHALL MOBILIZE ALL EQUIPMENT TO THE PROJECT AREA AS DIRECTED BY THE CONSTRUCTION MANAGER.
2. AT A MINIMUM, THE CONTRACTOR SHALL PROVIDE THE FOLLOWING EQUIPMENT FOR THIS PROJECT:

Nevada Creek fish screening

EXCAVATOR - ONE (1) EXCAVATOR SHALL BE REQUIRED. THE EQUIPMENT SHALL BE MINIMUM 200 CLASS. THE BUCKET VOLUME SHALL BE ONE (1) CUBIC YARD(S). THE BUCKET SHALL BE EQUIPPED WITH A HYDRAULIC THUMB FOR GRASPING LOGS, ROCKS, AND OTHER MATERIALS. THE EQUIPMENT MUST BE CAPABLE OF CROSSING WATER AND WORKING ON OR ADJACENT TO STEEP SLOPES. A CHAIN SHALL BE AVAILABLE FOR ATTACHING CULVERTS, PUMPS AND OTHER EQUIPMENT OR MATERIALS TO THE BUCKET FOR TRANSPORT ON-SITE.

DUMP TRUCK - ONE (1) TRACKED DUMP TRUCK SHALL BE REQUIRED FOR THIS PROJECT. TRUCK(S) SHALL HAVE A MINIMUM BED VOLUME OF EIGHT TO TEN (8-10) CUBIC YARDS. THE TRUCK(S) SHALL BE TRACKED AND CAPABLE OF DRIVING ON NON-ASPHALT SURFACES AND OFF-ROAD SURFACES.

ALL SURFACE VEHICLE - ONE (1) ALL-SURFACE VEHICLE (ASV) SHALL BE REQUIRED. THE EQUIPMENT SHALL BE EQUIPPED WITH SOD TRACKS TO MINIMIZE DISTURBANCE TO FRAGILE AREAS. ONE TREE SPADE SHALL BE PROVIDED AND BE OF SUFFICIENT SIZE TO TRANSPLANT LARGE, MATURE WILLOWS. A HARROW RAKE OR SIMILAR ATTACHMENT SHALL BE AVAILABLE TO RIP COMPACTED SURFACES AND TEMPORARY CONSTRUCTION ACCESS ROADS AT THE TERMINATION OF THE PROJECT.

CHAINSAW - ONE (1) CHAINSAW SHALL BE REQUIRED. THE CHAINSAW MUST BE CAPABLE OF COMPLETELY SAWING LOGS OF THE DIAMETER SPECIFIED IN THE MATERIAL SPECIFICATIONS. ALSO, THE CHAINSAW MUST BE CAPABLE OF SAWING PVC PIPES AS NOTED IN THE MATERIAL SPECIFICATIONS.

3. ALL EQUIPMENT SHALL BE WASHED PRIOR TO MOBILIZATION TO THE SITE TO MINIMIZE THE INTRODUCTION OF FOREIGN MATERIALS AND FLUIDS TO THE PROJECT SITE. ALL EQUIPMENT SHALL BE FREE OF OIL, HYDRAULIC FLUID, AND DIESEL FUEL LEAKS. TO PREVENT INVASION OF NOXIOUS WEEDS OR THE SPREAD OF WHIRLING DISEASE SPORES, ALL EQUIPMENT SHALL BE POWER WASHED OR CLEANED TO REMOVE MUD AND SOIL PRIOR TO MOBILIZATION INTO THE PROJECT AREA. IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO INSURE THAT ADEQUATE MEASURES HAVE BEEN TAKEN.

4. EQUIPMENT SHALL BE IN A WELL-MAINTAINED CONDITION TO MINIMIZE THE LIKELIHOOD OF A FLUID LEAK. IF A FLUID LEAK DOES OCCUR, THE CONSTRUCTION MANAGER SHALL BE NOTIFIED IMMEDIATELY, AND ALL WORK CEASED UNTIL THE LEAK HAS BEEN RECTIFIED. AT ALL TIMES DURING THE CONSTRUCTION PHASE, FLUID SPILL CONTAINMENT EQUIPMENT SHALL BE PRESENT ON-SITE AND READY FOR DEPLOYMENT SHOULD AN ACCIDENTAL SPILL OCCUR.

5. THE CONTRACTOR SHALL MAINTAIN A COMPLETE TOOL SET WITH COMMONLY REPLACED PARTS (E.G. O-RINGS) TO MINIMIZE DOWNTIME IN THE EVENT OF EQUIPMENT MALFUNCTION. THE CONTRACTOR SHALL HAVE AN EMERGENCY SPILL KIT ON SITE DURING THE PROJECT.

CONSTRUCTION SPECIFICATIONS

CHANNEL AND STABILIZATION STRUCTURES

1. CONSTRUCTION SHALL OCCUR IN ACCORDANCE WITH THE PLAN SET, CONSTRUCTION SPECIFICATIONS, EQUIPMENT SPECIFICATIONS, MATERIAL SPECIFICATIONS, REVEGETATION SPECIFICATIONS AND GENERAL SPECIFICATIONS.
2. CONSTRUCTION ACCESS SHALL BE DETERMINED BY THE CONSTRUCTION MANAGER. CONSTRUCTION EQUIPMENT SHALL NOT CROSS PRIVATE LAND UNLESS PERMISSION IS OBTAINED FROM THE LANDOWNER. THE CONTRACTOR SHALL LEAVE ALL GATES, WHETHER OPEN OR CLOSED, AS FOUND.

3. STRAW BALES AND SILT FENCING SHALL BE AVAILABLE AND INSTALLED BY THE CONTRACTOR IF DEEMED NECESSARY BY THE CONSTRUCTION MANAGER. CONSTRUCTION FENCING (LIMITS OF DISTURBANCE) SHALL BE INSTALLED BY THE CONTRACTOR IF DEEMED NECESSARY BY THE CONSTRUCTION MANAGER.

4. INITIALLY, THE CONTRACTOR SHALL EXCAVATE THE CHANNEL TO APPROXIMATE DESIGN DIMENSIONS USING THE EXCAVATOR. EXCAVATION SHALL COMPLY WITH CONSTRUCTION STAKES AND THE PLAN SET. EXCAVATION SHALL ESTABLISH CHANNEL ELEVATIONS WITHIN ONE-HALF FOOT OF FINAL ELEVATIONS. THE CONSTRUCTION MANAGER SHALL INSPECT THE CHANNEL EXCAVATION FOR COMPLIANCE WITH THE PLAN SET. ALL EXCAVATED MATERIALS SHALL BE STOCKPILED ON-SITE, ABOVE THE BANKFULL CHANNEL UNTIL HAULED OFF-SITE OR USED ON-SITE. DISTURBANCE TO RIPARIAN VEGETATION, CHANNEL BANKS AND SOD SHALL BE MINIMIZED. EXCAVATED SOD AND RIPARIAN SHRUB TRANSPLANTS SHALL BE CAREFULLY STOCKPILED AND REUSED FOR PLANTING FLOODPLAINS OR STREAM BANKS.

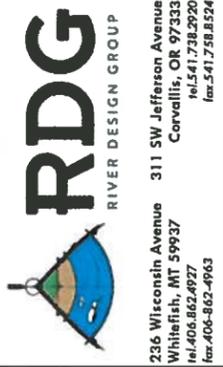
5. AFTER EXCAVATING THE CHANNEL, THE CONTRACTOR SHALL INSTALL BANK STABILIZATION AND HABITAT STRUCTURES USING THE EXCAVATOR. EACH STRUCTURE SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE LOCATIONS AND SPECIFICATIONS PROVIDED IN THE PLAN SET. THE CONSTRUCTION MANAGER SHALL INSPECT AND APPROVE ALL STRUCTURES PRIOR TO BACKFILLING.

6. AFTER ALL STRUCTURES ARE INSTALLED, THE CHANNEL WILL BE SHAPED TO WITHIN 0.2 FEET OF THE FINAL ELEVATIONS SPECIFIED ON THE PLAN SET USING AN EXCAVATOR. THE CONSTRUCTION MANAGER SHALL CHECK THE FINAL ELEVATIONS FOR COMPLIANCE WITH THE PLAN SET. ALL EXCAVATED MATERIALS SHALL BE STOCKPILED ON-SITE, ABOVE THE BANKFULL CHANNEL UNTIL HAULED OFF-SITE OR USED ON-SITE. DISTURBANCE TO RIPARIAN VEGETATION, CHANNEL BANKS AND SOD SHALL BE MINIMIZED.

7. THE CONTRACTOR SHALL REMOVE EXCESS MATERIALS, TEMPORARY CULVERTS AND EQUIPMENT FROM THE SITE. THE CONTRACTOR SHALL REGRADE DISTURBED AREAS AND CONSTRUCTION ACCESS ROADS TO THEIR ORIGINAL GRADES. THE CONTRACTOR SHALL TREAT COMPACTED SOIL AREAS INCLUDING ACCESS ROADS AND MATERIAL STOCKPILE AREAS. THE CONTRACTOR SHALL REMOVE SOIL FROM THE PROJECT SITE IF THE SOIL IS TAINTED WITH PETROLEUM-BASED FLUIDS.

DIVERSION STRUCTURES

1. DIVERSION STRUCTURES SHALL BE CONSTRUCTED ACCORDING TO THE PLANSET. THE SPECIFIC SEQUENCE WILL BE DEVELOPED BETWEEN THE CONTRACTOR, TU REPRESENTATIVE AND RDG CONSTRUCTION MANAGER. THE HEADGATE, SLUICEGATE, FISH RETURN PIPE, DITCH SHAPING, THE PRE-EXCAVATION FOR THE FISH SCREEN AND CONNECTING STRUCTURES WILL BE COMPLETED WITH THE OVERSIGHT OF RDG CONSTRUCTION MANAGER. THE ACTUAL SETTING OF THE FISH SCREEN WILL BE COMPLETED WITH THE OVERSIGHT OF THE FARMERS SCREEN REPRESENTATIVE. AFTER THE FISH SCREEN IS INSTALLED AND FUNCTIONAL, THE FINISH WORK WILL THEN BE COMPLETED WITH THE OVERSIGHT OF THE RDG CONSTRUCTION MANAGER.



NEVADA CREEK - WINEGLASS DIVERSION SPECIFICATIONS SHEET

| NO. | DATE | BY | DESCRIPTION | CHK |
|-----|----------|----|--------------|-----|
| | | | | |
| 1 | 10-12-17 | NW | FINAL DESIGN | |
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PROJECT NUMBER
RDG-14-080

SHEET NUMBER
2.0



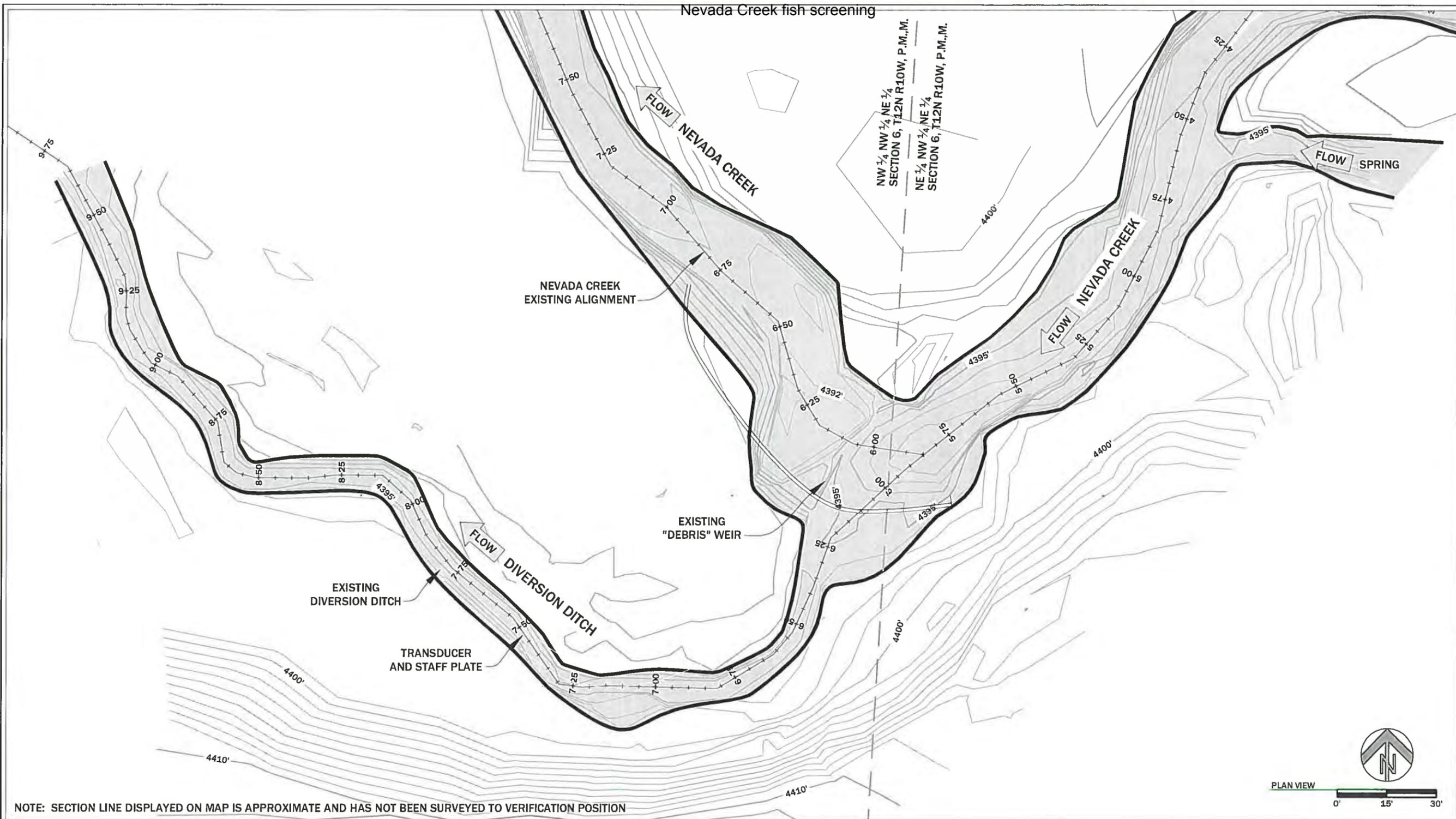
**NEVADA CREEK - WINEGLASS DIVERSION
SITE PLAN**

| NO. | DATE | BY | DESCRIPTION | CHK |
|-----|----------|----|--------------|-----|
| 1 | 10-12-17 | NW | FINAL DESIGN | GD |
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| | | | | |

PROJECT NUMBER
RDG-14-080

SHEET NUMBER
3.0

Nevada Creek fish screening



RDG
RIVER DESIGN GROUP

236 Wisconsin Avenue
Whitefish, MT 59937
Tel: 406.862.4927
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311 SW Jefferson Avenue
Corvallis, OR 97333
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**NEVADA CREEK - WINEGLASS DIVERSION
EXISTING CONDITIONS**

| NO. | DATE | BY | DESCRIPTION | CHK | |
|-----|----------|----|--------------|-----|--|
| | | | | GD | |
| 1 | 10-12-17 | NW | FINAL DESIGN | | |

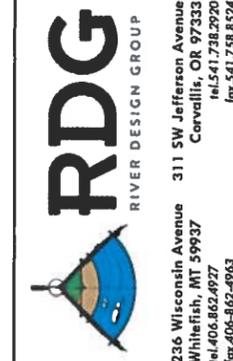
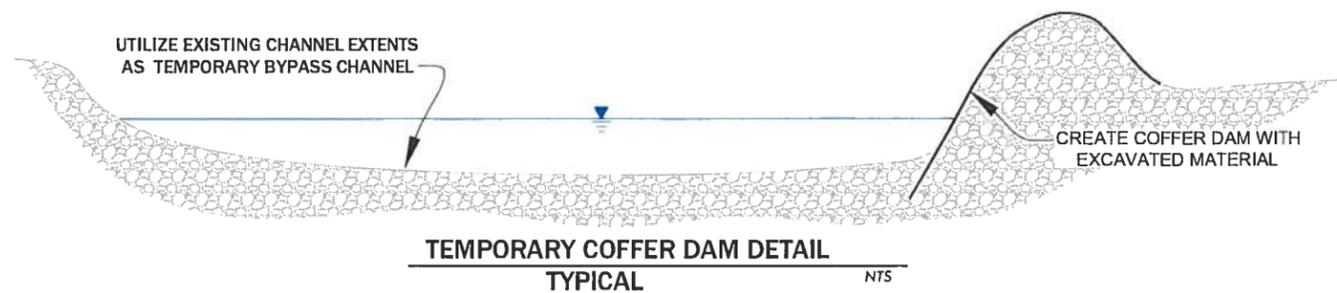
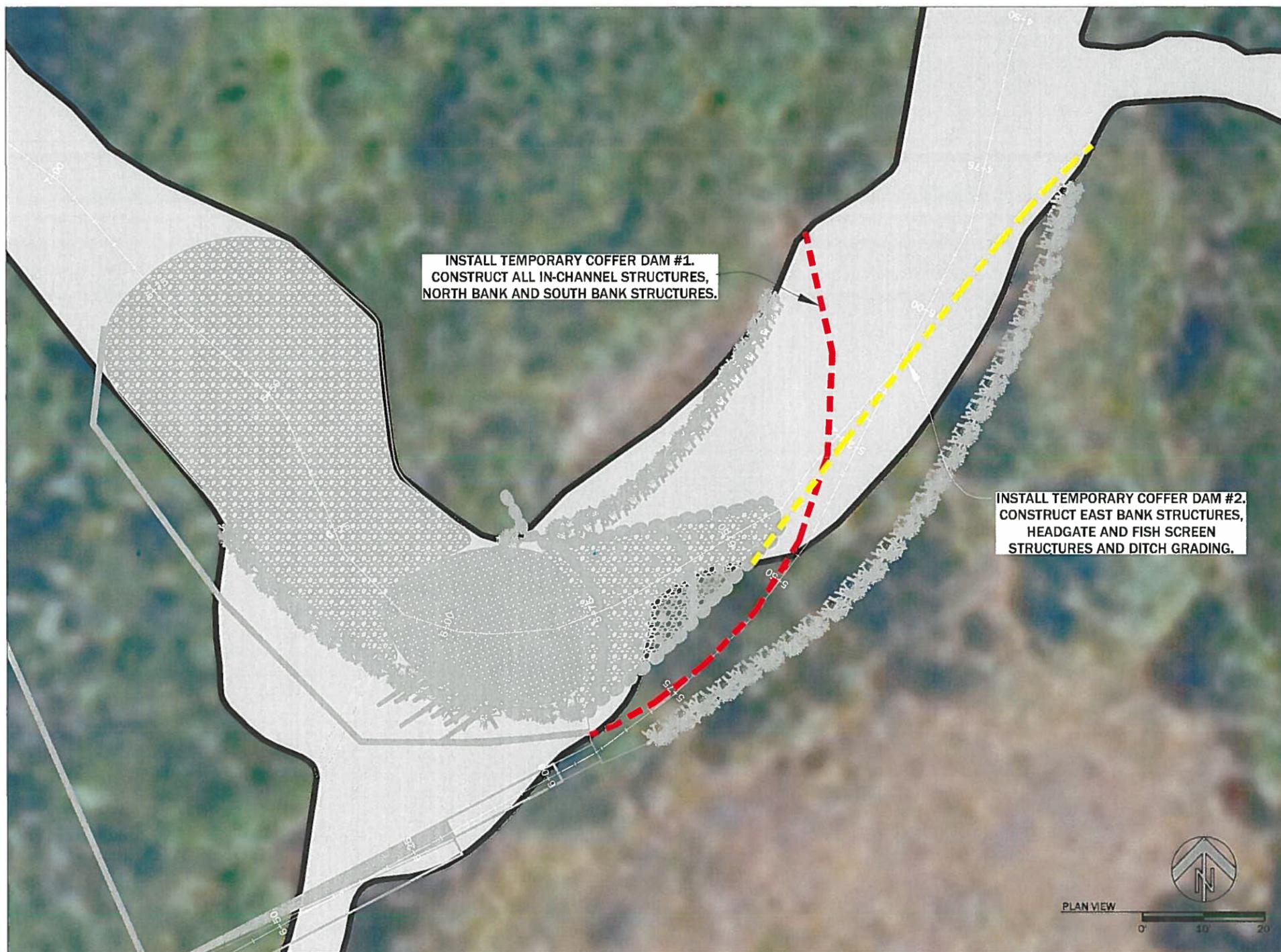
PROJECT NUMBER
RDG-14-080

SHEET NUMBER
3.1

EXISTING CONDITIONS AND PROPOSED PROJECT SUMMARY

THE PROJECT IS LOCATED ON THE MAINSTEM OF NEVADA CREEK. THE EXISTING DIVERSION IS A DEBRIS DAM CONSISTING OF A COMBINATION OF LOGS, TARPS, SANDBAGS AND OTHER MATERIALS THAT IS NOT STABLE AND CREATES A 3-4 FOOT DROP WHICH IS A FISH BARRIER DURING SOME STREAMFLOWS. THE DIVERSION ALSO CREATES BACKWATER, AN OVER-WIDENED CHANNEL AND SEDIMENT DEPOSITION UPSTREAM FOR SEVERAL HUNDRED FEET. THE DEBRIS DAM REQUIRES ANNUAL MAINTENANCE TO DIVERT LOW FLOWS INTO THE DITCH. THE DITCH DOES NOT PRESENTLY HAVE A HEADGATE OR WAY TO DIRECTLY CONTROL THE FLOWS ENTERING THE DITCH. THE EXISTING DITCH SIMPLY CAPTURES ALL THE WATER AVAILABLE DEPENDING ON CURRENT STREAMFLOW AND CONDITION OF THE DEBRIS DAM AT THE TIME. THERE IS A CHECK STRUCTURE AND CULVERT DOWN-DITCH ABOUT 500 FEET THAT RESTRICTS THE FLOW IN THE DITCH AND SHUNTS EXCESS WATER BACK TO THE STREAM IN A SWALE. THERE IS CURRENTLY NO FISH SCREEN ON THE DITCH.

THE PROPOSED PROJECT WOULD INSTALL A STABLE GRADE CONTROL WEIR AT AN ELEVATION THAT WILL ALLOW DIVERSION OF WATER AT MOST STREAMFLOWS. THE GRADE CONTROL WILL IMPROVE SEDIMENT TRANSPORT AND WILL STEP THE WATER DOWN TO ALLOW FISH PASSAGE DURING MOST FLOWS. STREAMBANKS WILL ALSO BE STABILIZED UPSTREAM AND DOWNSTREAM OF THE WEIR. A HEADGATE WILL BE CONSTRUCTED AT THE START OF THE DITCH AND WILL INCLUDE A SLUICE GATE TO BYPASS SEDIMENT AND DEBRIS BACK TO THE STREAM. A FARMERS SCREEN WILL BE INSTALLED JUST DOWNSTREAM FROM THE HEADGATE AND WILL INCLUDE A FISH AND DEBRIS BYPASS BACK TO THE CHANNEL. THE DITCH WILL BE GRADED TO ALLOW EFFICIENT WATER FLOWS AND THE DOWNSTREAM CHECK STRUCTURE AND CULVERT WILL BE ELIMINATED.



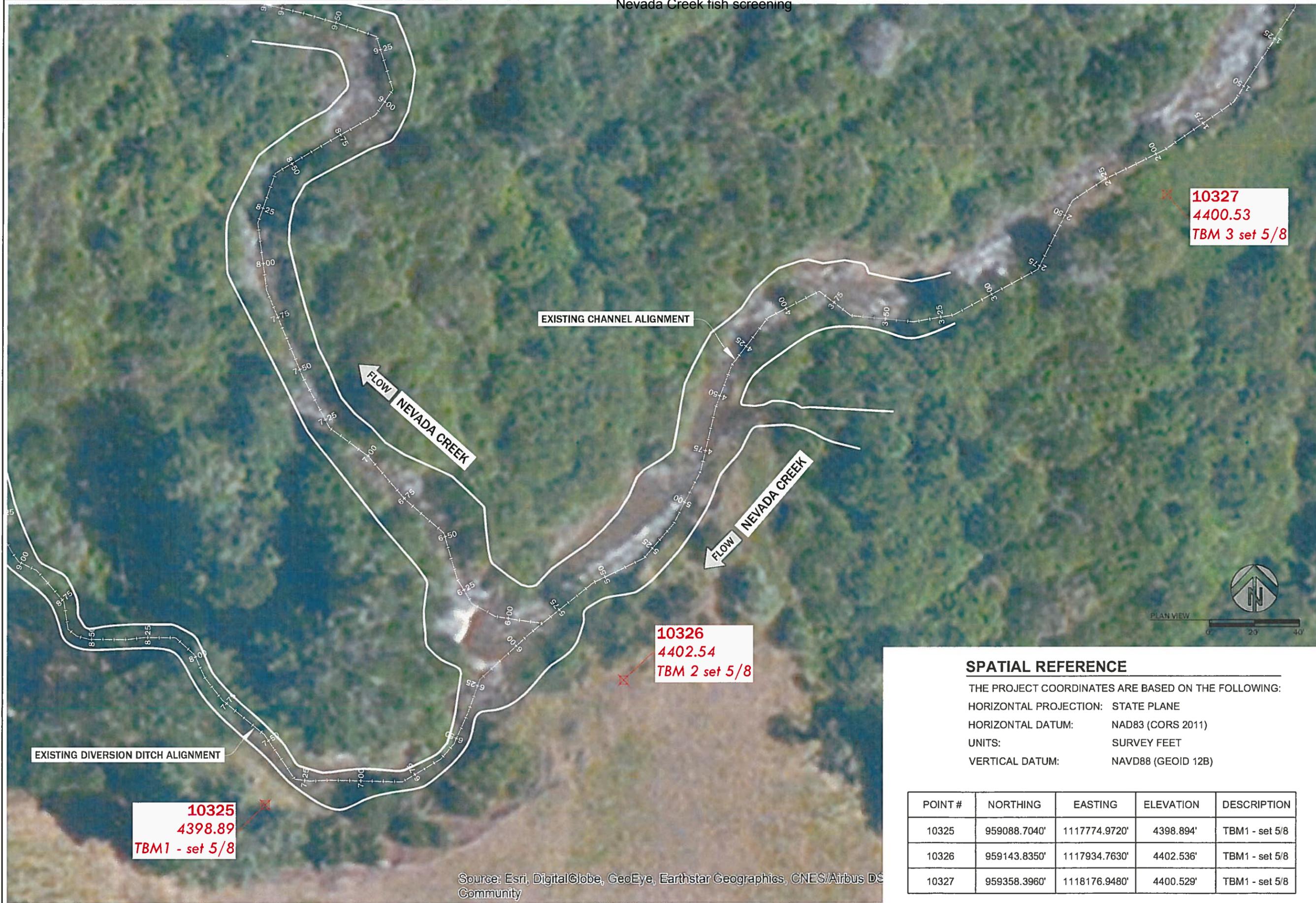
**NEVADA CREEK - WINEGLASS DIVERSION
CLEARWATER BYPASS PLAN**

| NO. | DATE | BY | DESCRIPTION | CHK | |
|-----|----------|----|--------------|-----|--|
| | | | | GD | |
| 1 | 10-12-17 | NW | FINAL DESIGN | | |
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| | | | | | |
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PROJECT NUMBER
RDG-14-080

SHEET NUMBER

3.2



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS Community

NEVADA CREEK - WINEGLASS DIVERSION
SURVEY CONTROL SHEET

SPATIAL REFERENCE

THE PROJECT COORDINATES ARE BASED ON THE FOLLOWING:
 HORIZONTAL PROJECTION: STATE PLANE
 HORIZONTAL DATUM: NAD83 (CORS 2011)
 UNITS: SURVEY FEET
 VERTICAL DATUM: NAVD88 (GEOID 12B)

| POINT # | NORTHING | EASTING | ELEVATION | DESCRIPTION |
|---------|--------------|---------------|-----------|----------------|
| 10325 | 959088.7040' | 1117774.9720' | 4398.894' | TBM1 - set 5/8 |
| 10326 | 959143.8350' | 1117934.7630' | 4402.536' | TBM1 - set 5/8 |
| 10327 | 959358.3960' | 1118176.9480' | 4400.529' | TBM1 - set 5/8 |

| NO. | DATE | BY | DESCRIPTION | CHK | |
|-----|----------|----|--------------|-----|--|
| | | | | GD | |
| 1 | 10-12-17 | NW | FINAL DESIGN | | |

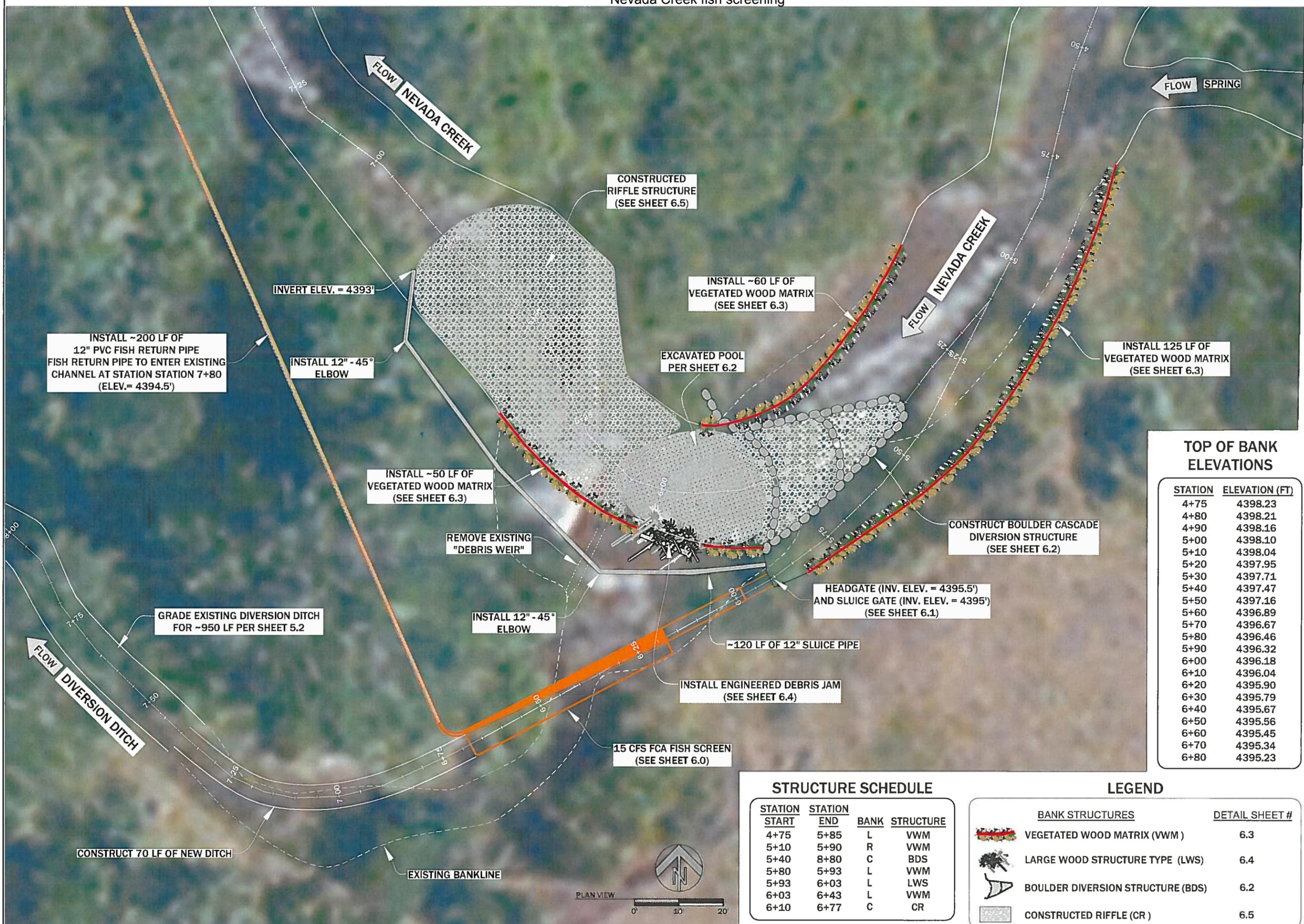
PROJECT NUMBER
RDG-14-080

SHEET NUMBER

4.0

ALL "SET RDG" POINTS ARE 5/8" X 24" REBAR WITH 2" ALUMINUM CAP

NEVADA CREEK - WINEGLASS DIVERSION
PLAN VIEW



TOP OF BANK ELEVATIONS

| STATION | ELEVATION (FT) |
|---------|----------------|
| 4+75 | 4398.23 |
| 4+80 | 4398.21 |
| 4+90 | 4398.16 |
| 5+00 | 4398.10 |
| 5+10 | 4398.04 |
| 5+20 | 4397.95 |
| 5+30 | 4397.71 |
| 5+40 | 4397.47 |
| 5+50 | 4397.16 |
| 5+60 | 4396.89 |
| 5+70 | 4396.67 |
| 5+80 | 4396.46 |
| 5+90 | 4396.32 |
| 6+00 | 4396.18 |
| 6+10 | 4396.04 |
| 6+20 | 4395.90 |
| 6+30 | 4395.79 |
| 6+40 | 4395.67 |
| 6+50 | 4395.56 |
| 6+60 | 4395.45 |
| 6+70 | 4395.34 |
| 6+80 | 4395.23 |

STRUCTURE SCHEDULE

| STATION START | STATION END | BANK | STRUCTURE |
|---------------|-------------|------|-----------|
| 4+75 | 5+85 | L | VWM |
| 5+10 | 5+90 | R | VWM |
| 5+40 | 8+80 | C | BDS |
| 5+80 | 5+93 | L | VWM |
| 5+93 | 6+03 | L | LWS |
| 6+03 | 6+43 | L | VWM |
| 6+10 | 6+77 | C | CR |

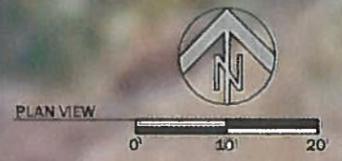
LEGEND

| BANK STRUCTURES | DETAIL SHEET # |
|-----------------------------------|----------------|
| VEGETATED WOOD MATRIX (VWM) | 6.3 |
| LARGE WOOD STRUCTURE TYPE (LWS) | 6.4 |
| BOULDER DIVERSION STRUCTURE (BDS) | 6.2 |
| CONSTRUCTED RIFFLE (CR) | 6.5 |

| NO. | DATE | BY | DESCRIPTION | CHK |
|-----|----------|----|--------------|-----|
| 1 | 10-12-17 | NW | FINAL DESIGN | GD |

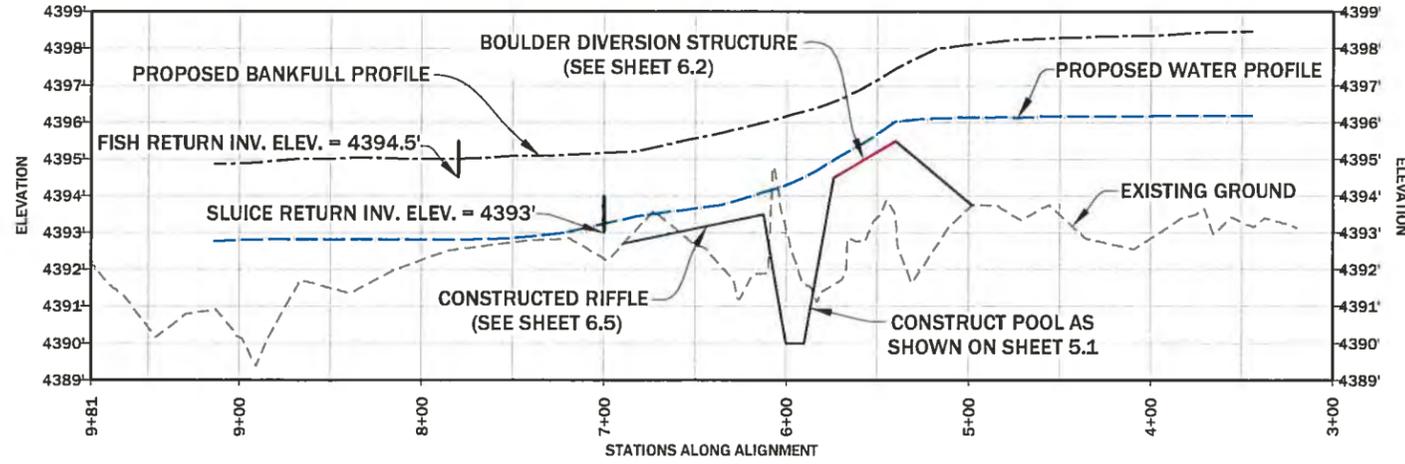
PROJECT NUMBER
RDG-14-080

SHEET NUMBER
5.0

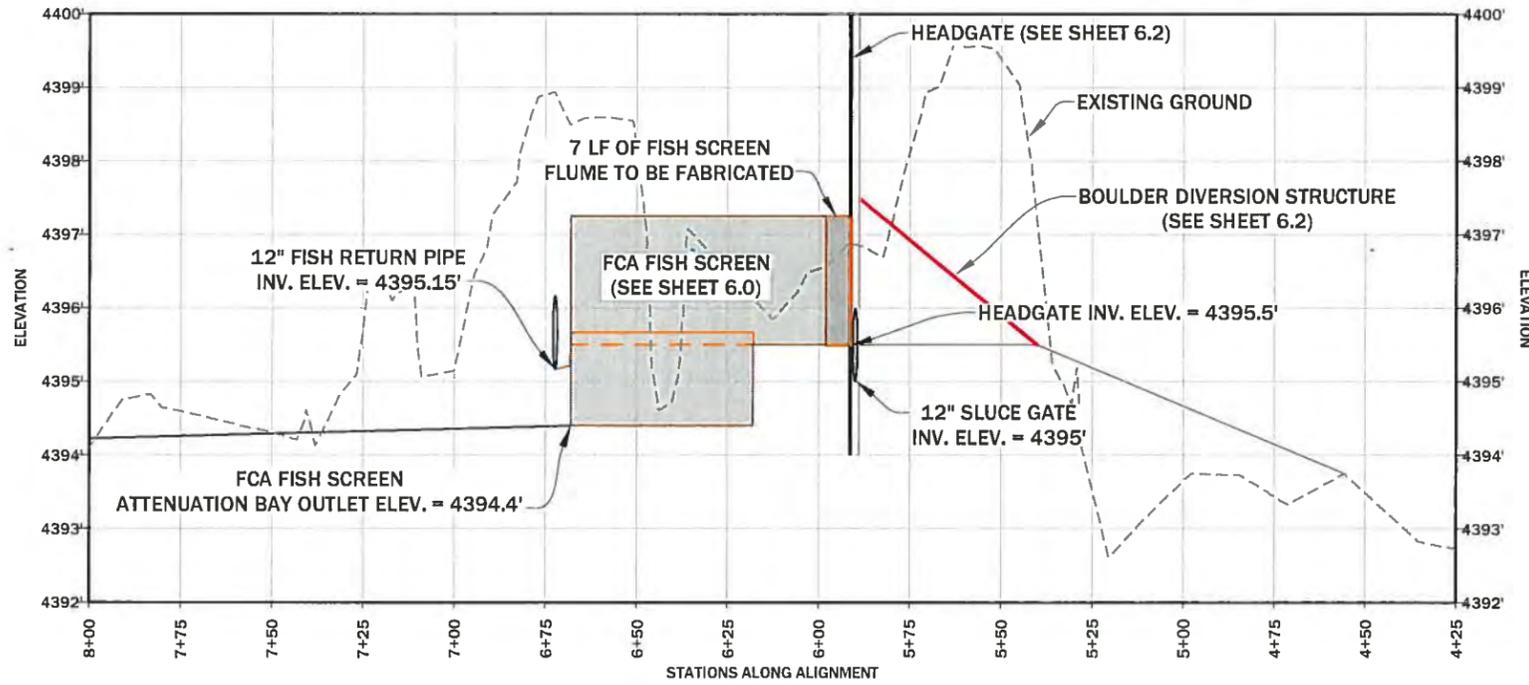


Nevada Creek fish screening

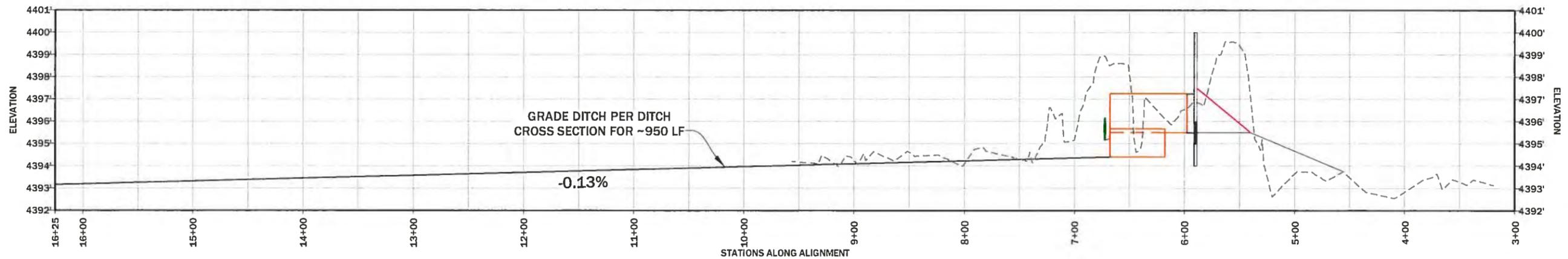
NEVADA CREEK MAIN CHANNEL PROFILE



DIVERSION DITCH PROFILE



DIVERSION DITCH PROFILE



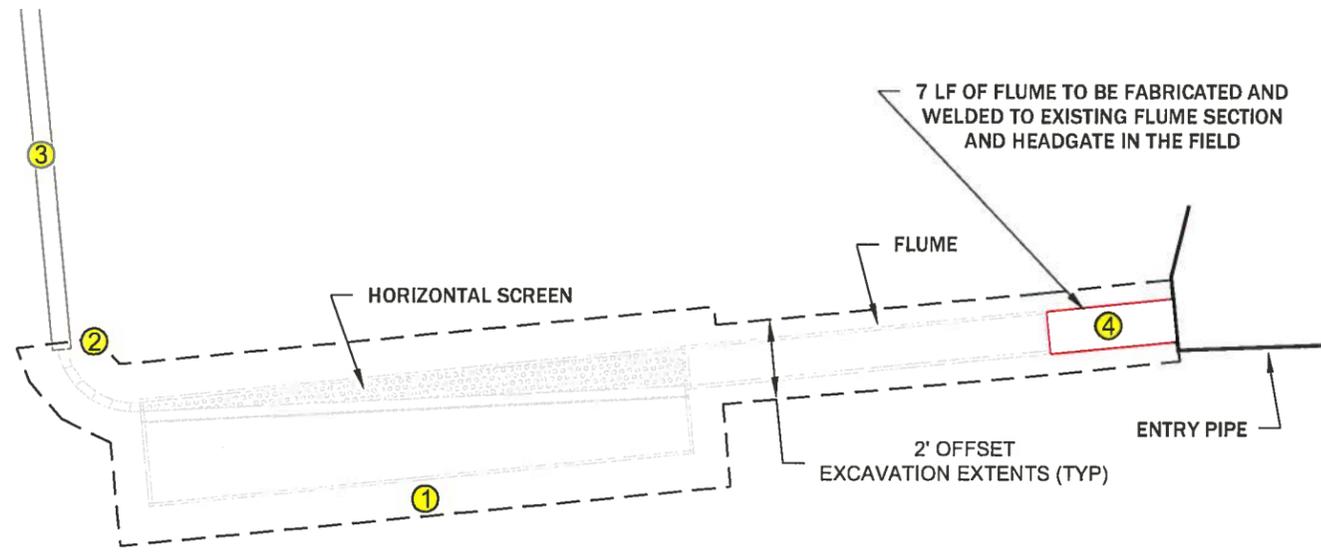
NEVADA CREEK - WINEGLASS DIVERSION
PROFILE VIEWS

| NO. | DATE | BY | DESCRIPTION | CHK |
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| 1 | 10-12-17 | NW | FINAL DESIGN | |

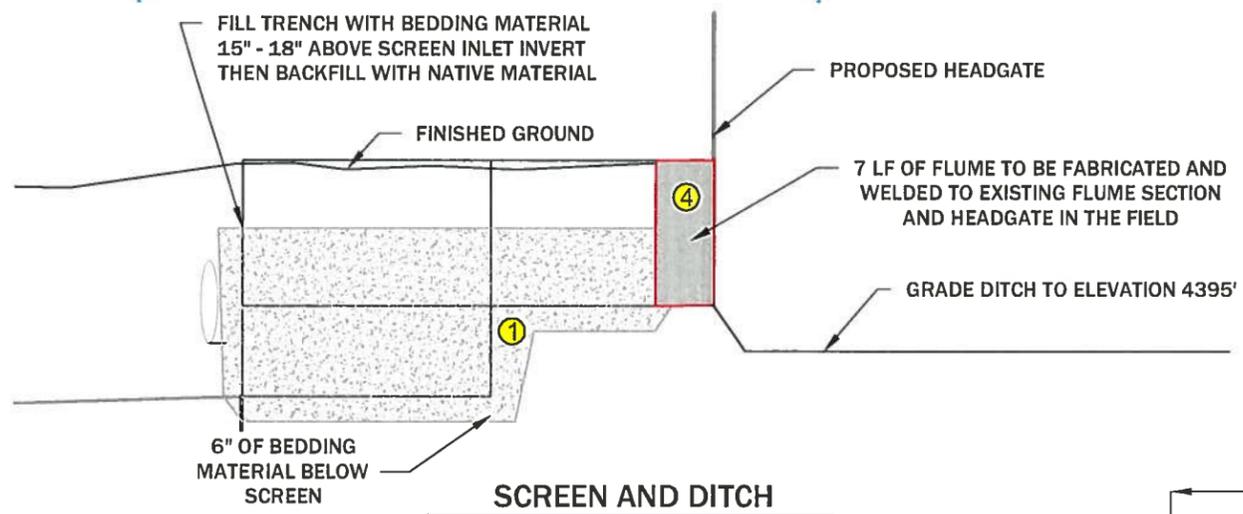
PROJECT NUMBER
RDG-14-080

SHEET NUMBER

5.1



EXCAVATION LIMITS
PLAN VIEW NTS

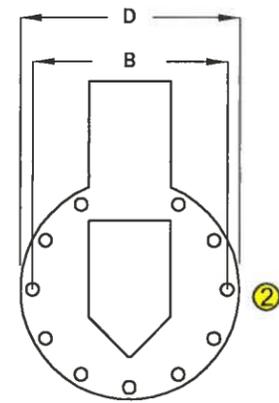


SCREEN AND DITCH
PROFILE VIEW NTS

BYPASS PIPE FLANGE
CLASS 150 FLANGE SPECIFICATIONS

| NOMINAL PIPE SIZE | DIAMETER OF FLANGE, D | NUMBER OF BOLTS | DIAMETER OF BOLTS | DIAMETER OF BOLT HOLES | DIAMETER OF BOLT CIRCLE, B |
|-------------------|-----------------------|-----------------|-------------------|------------------------|----------------------------|
| 12 INCHES | 21 INCHES | 12 | 1 INCH | 1.12 INCHES | 18-3/4 |

NOTE: THE BYPASS PIPE FLANGE WILL REQUIRE NUT, BOLT, AND WASHER COMBINATIONS TO SECURE THE PIPE TO THE FLANGE CONNECTION PLATE.



FLANGE CONNECTION PLATE DETAIL
PLAN VIEW NTS

GENERAL NOTES

1. THE SCREEN EXCAVATION AND GRAVEL BASE PROVIDE A UNIFORM LEVEL SURFACE FOR FINAL PLACEMENT OF THE FARMERS SCREEN. THE FARMERS SCREEN SECTIONS WILL BE ASSEMBLED ON SITE AND CONNECTED TO THE BYPASS RETURN PIPE DURING ASSEMBLY. THE ENTRY PIPE WILL BE ATTACHED TO THE FLUME BY MEANS OF A CUSTOM TRANSITION BOX. THE ENTRY PIPE, TRANSITION BOX, BYPASS PIPE AND PIPE FLANGE WILL NEED TO BE PROCURED BY THE CONTRACTOR. THE FARMERS SCREEN EXIT FLUME WILL HAVE A STANDARD FLANGE CONNECTION PLATE AS SPECIFIED IN THE FLANGE CONNECTION PLATE DETAIL.
2. THE FARMERS SCREEN LOCATION HAS BEEN SELECTED BASED ON PROXIMITY TO THE HEADGATE AND HYDRAULIC FLOW CRITERIA. SITE EXCAVATION SHOULD EXTEND APPROXIMATELY 2 FEET BEYOND THE SCREEN DIMENSIONS AS SHOWN IN EXCAVATION LIMIT DRAWING.
3. A PLATE COMPACTOR AND A LASER LEVEL ARE REQUIRED FOR FARMERS SCREEN ASSEMBLY AND PLACEMENT. BOTTOM OF ENTRY PIPE WILL NEED TO BE CUT FLAT AS SHOWN IN TRANSITION BOX ISOMETRIC VIEW TO FIT INTO TRANSITION BOX.

CONSTRUCTION NOTES

1. EXCAVATE DIVERSION DITCH TO THE PRESCRIBED ELEVATIONS.
2. FILL AND COMPACT 3/4" MINUS TO FINISH GRADE.
3. PLACE AND ASSEMBLE FARMERS SCREEN.
4. BACKFILL AROUND SCREEN
5. EXCAVATE ENTRY PIPE AND BYPASS PIPE TRENCHES.
6. PLACE TRANSITION BOX, ENTRY PIPE, BYPASS PIPE AND CONNECT TO FARMERS SCREEN.
7. GRADE DITCH DOWNSTREAM OF FARMERS SCREEN TO MATCH THE PROPOSED DITCH SLOPE.

CONTRACTOR SUPPLIED CONSTRUCTION MATERIALS

| ITEM | MATERIAL | QUANTITY |
|------|-----------------------|---------------------------------|
| ① | SCREEN BEDDING GRAVEL | 3/4" MINUS 70 CUBIC YARDS |
| ② | BYPASS PIPE FLANGE | SEE SPEC. BELOW 1 |
| ③ | BYPASS RETURN PIPE | 12" DIAMETER 200 LINEAR FEET |
| ④ | FLUME SECTION | STEEL PLATE 7 LINEAR FEET |

NOTE: FURNISH SCREEN ZONE BACKFILL MATERIAL THAT IS REASONABLY FREE OF CLAY, SILT, AND OTHER DELETERIOUS MATERIAL IN ACCORDANCE AGGREGATE NO. 4 IN TABLE 701-4 OF THE MONTANA STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION 2014 EDITION.

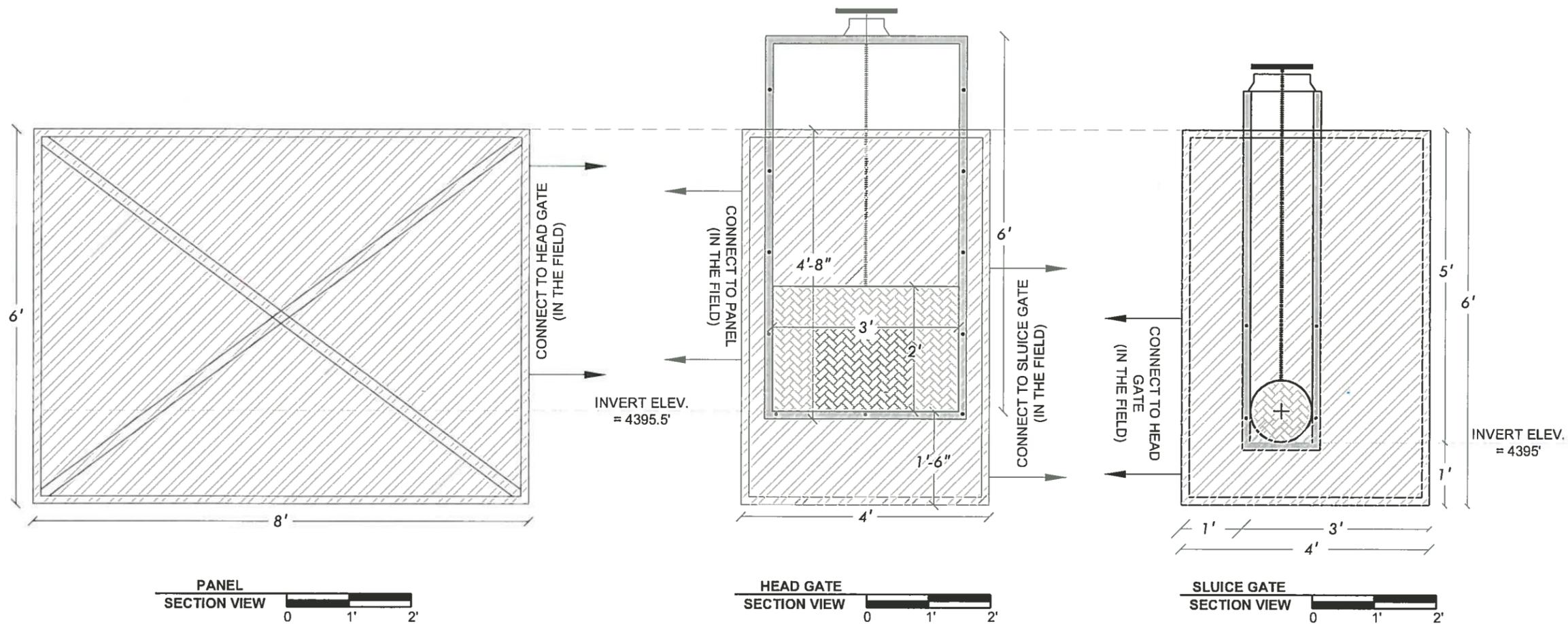
NOTE: BYPASS PIPE WILL NEED TO BE BENT IN AREAS TO ADJUST TO SITE CONDITIONS. HDPE PIPE CAN BE ANGLED SLIGHTLY AT THE JOINTS TO CREATE THIS CURVATURE. COUPLING BANDS ALLOW APPROXIMATELY 3 DEGREES OF ANGULAR MISALIGNMENT AT EACH JOINT, WHILE EACH BELL-AND-SPIGOT JOINT CAN ACCOMMODATE 1-1.5 DEGREES AND REMAIN AT ITS SPECIFIED JOINT QUALITY.

| NO. | DATE | BY | DESCRIPTION | CHK | |
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| | | | | GD | |
| 1 | 10-12-17 | NW | FINAL DESIGN | | |

PROJECT NUMBER
RDG-14-080

SHEET NUMBER

6.0



NOTE: TRASH RACK TO BE DESIGNED BY FABRICATOR

NOTE: SLUICE PIPE INTAKE MUST MATCH 12" HDPE PIPE

NEVADA CREEK - WINEGLASS DIVERSION
HEAD GATE AND SLUICE GATE DETAIL

| NO. | DATE | BY | DESCRIPTION | CHK |
|-----|----------|----|--------------|-----|
| 1 | 10-12-17 | NW | FINAL DESIGN | GD |
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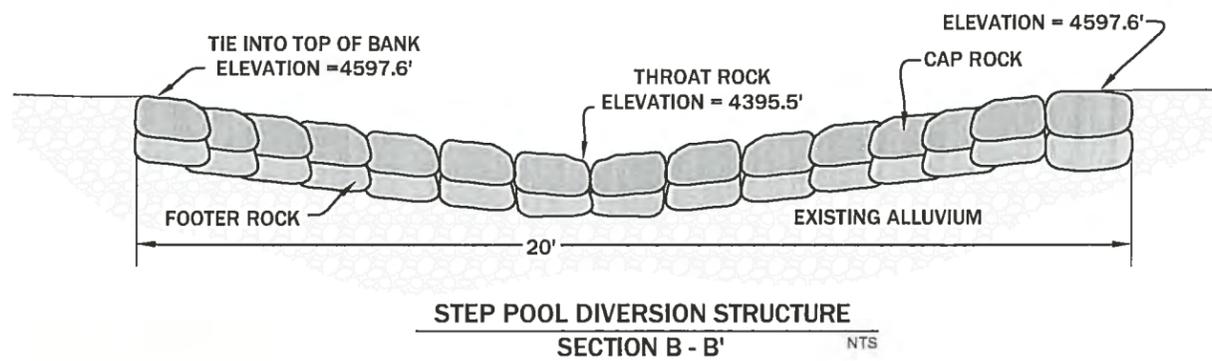
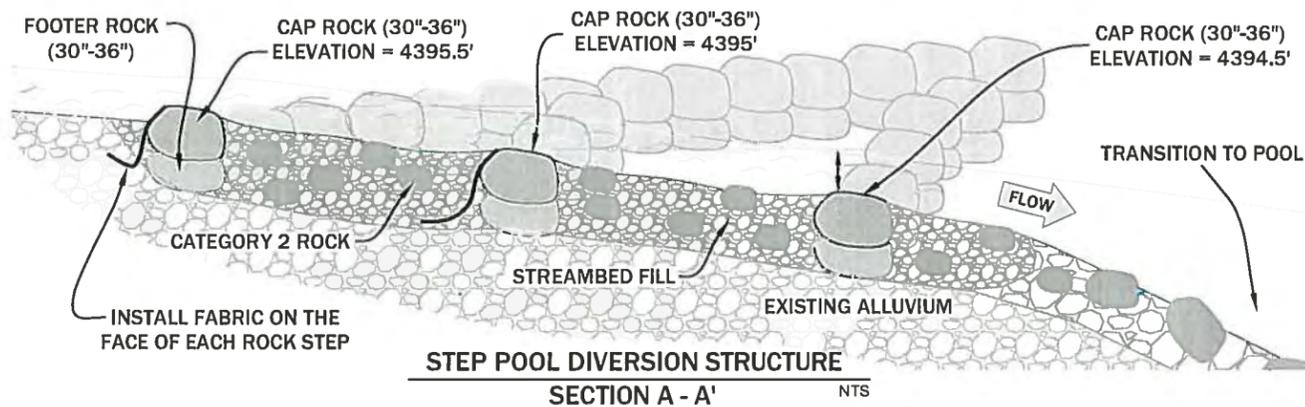
PROJECT NUMBER
RDG-14-080

SHEET NUMBER
6.1

CONSTRUCTION NOTES

Nevada Creek fish screening

1. ROCK SHALL BE FROM AN APPROVED SOURCE AND SHALL BE SOUND, DENSE (SG=2.65 MIN) AND FREE FROM CRACKS, SEAMS OR OTHER DEFECTS CONDUCTIVE TO ACCELERATED WEATHERING.
2. ROCK SHALL BE EQUIPMENT PLACED SO THAT LARGER ROCKS ARE UNIFORMLY DISTRIBUTED AND IN CONTACT WITH ONE ANOTHER AND SMALLER ROCKS FILLING IN VOIDS. NO END DUMPING OF ROCK WILL BE ALLOWED.
3. EXCAVATE POOL TO SET WEIR FOOTER AND POOL FOUNDATION ROCKS. FOOTER ROCKS ARE TO BE PLACED TO MINIMIZE VOIDS AND MAXIMIZE ROCK TO ROCK CONTACT.
4. PLACE WEIR ROCKS ONTOP OF FOOTERS, ALIGN AS SHOWN IN DETAIL AS SO TO CREATE TWO ACTIVE FLOW PATHS. WEIR AND WING ROCK SHALL BE PLACED TO MINIMIZE GAPS.
5. BACKFILL EACH POOL AND FILL ALL GAPS AND VOIDS OF EACH STRUCTURE WITH NATIVE GRAVELS, COBBLE AND BOULDERS TO MINIMIZE PIPING OF WATER THROUGH EACH STRUCTURE.
6. EXCAVATE POOL ACCORDING TO SPECIFIED DIMENSIONS. USE EXCAVATED MATERIAL FOR STRUCTURE BACKFILL OR HAUL TO A LOCATION SPECIFIED BY CONSTRUCTION MANAGER.
7. THE CONSTRUCTION MANAGER HAS THE RIGHT TO ALTER OR CHANGE THE DESIGN DURING CONSTRUCTION DUE TO UNFORESEEN CIRCUMSTANCES.

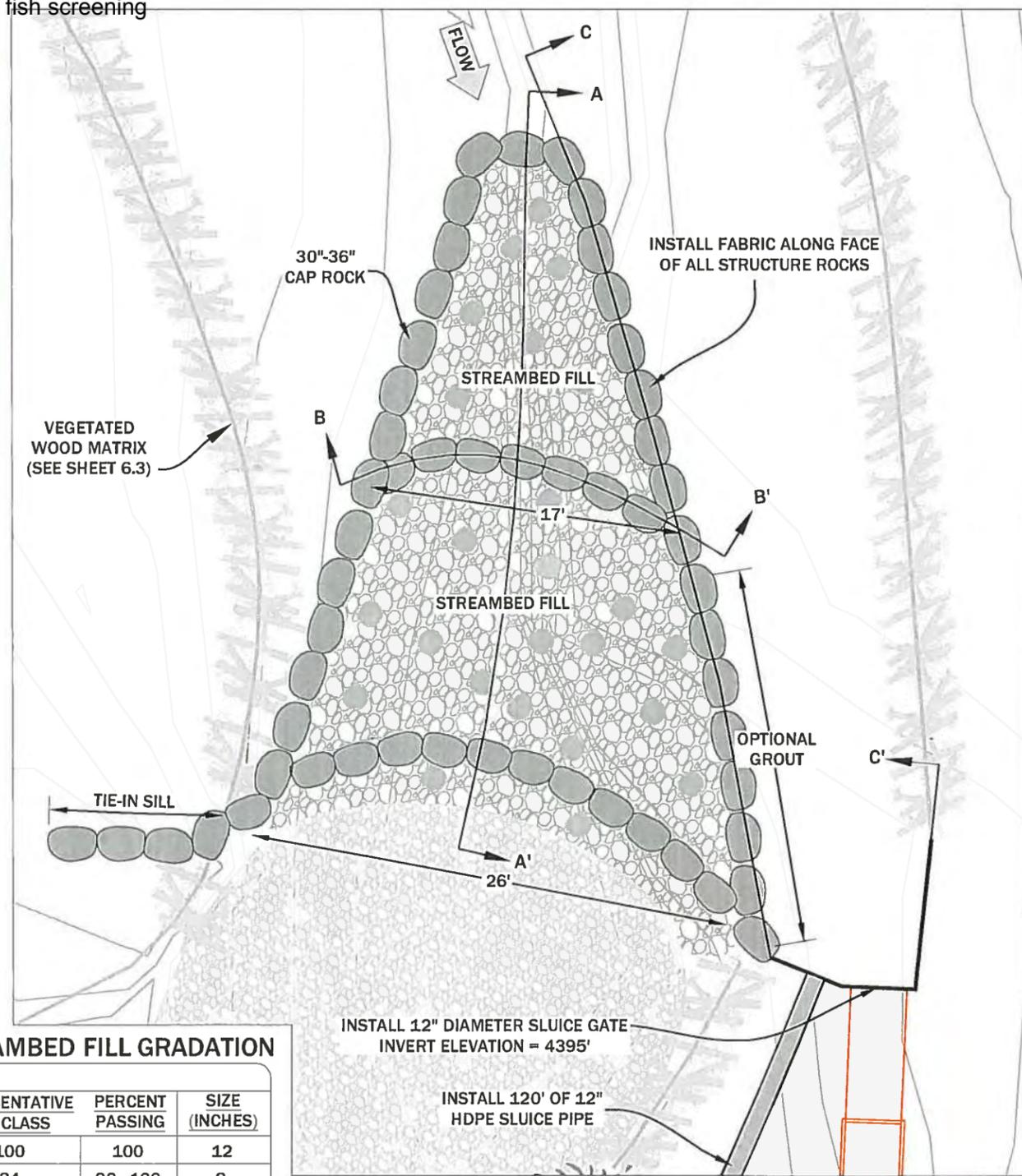


MATERIAL SCHEDULE (COMPLETE STRUCTURE)

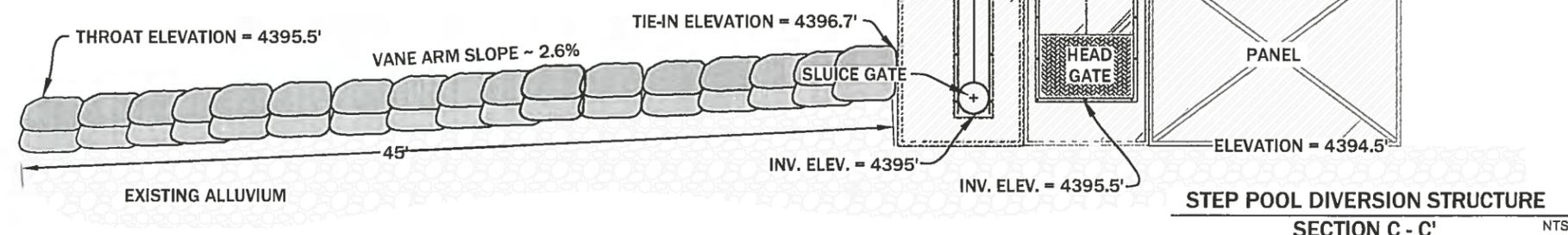
| ITEM | DIAMETER (IN) | QUANTITY |
|----------------------------|---------------|----------|
| ③ CATEGORY 1 ROCK | 30 - 36 | 100 EA |
| ④ CATEGORY 2 ROCK | 18 - 24 | 30 EA |
| ⑦ STREAMBED FILL GRADATION | SEE GRADATION | 20 CY |

STREAMBED FILL GRADATION

| REPRESENTATIVE SIZE CLASS | PERCENT PASSING | SIZE (INCHES) |
|---------------------------|-----------------|---------------|
| D100 | 100 | 12 |
| D84 | 90 - 100 | 8 |
| D50 | 50 - 80 | 6 |
| D35 | 30 - 50 | 4 |
| D15 | 15 - 30 | 2 |
| <D15 | 15 | 0.08 |



BOULDER DIVERSION STRUCTURE PLAN VIEW



STEP POOL DIVERSION STRUCTURE SECTION C - C' NTS



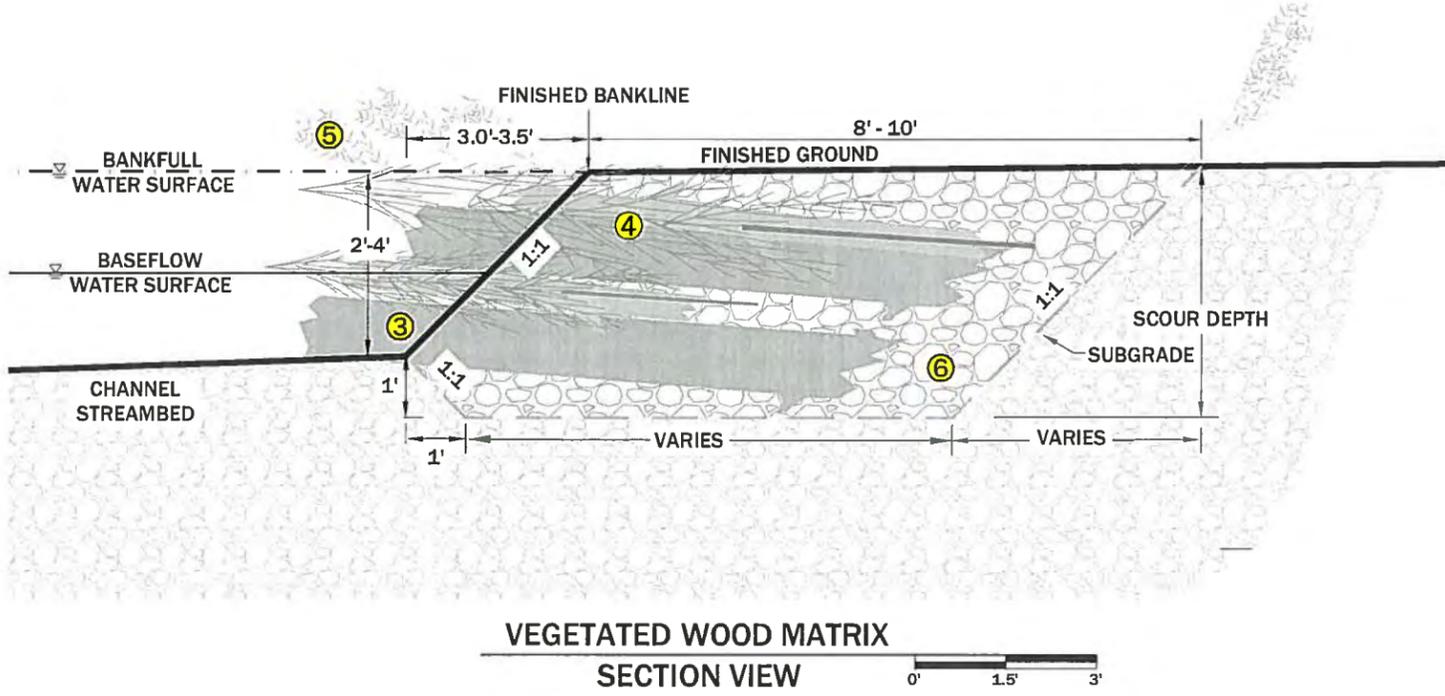
RDG
RIVER DESIGN GROUP
236 Wisconsin Avenue
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Tel: 406.862.4727
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311 SW Jefferson Avenue
Corvallis, OR 97333
Tel: 541.758.2920
Fax: 541.758.8524

**NEVADA CREEK - WINEGLASS DIVERSION
BOULDER CASCADE
DIVERSION STRUCTURE**

| NO. | DATE | BY | DESCRIPTION | CHK | GD |
|-----|----------|----|-------------|-----|----|
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| 1 | 10-12-17 | NW | | | |

PROJECT NUMBER
RDG-14-080

SHEET NUMBER
6.2

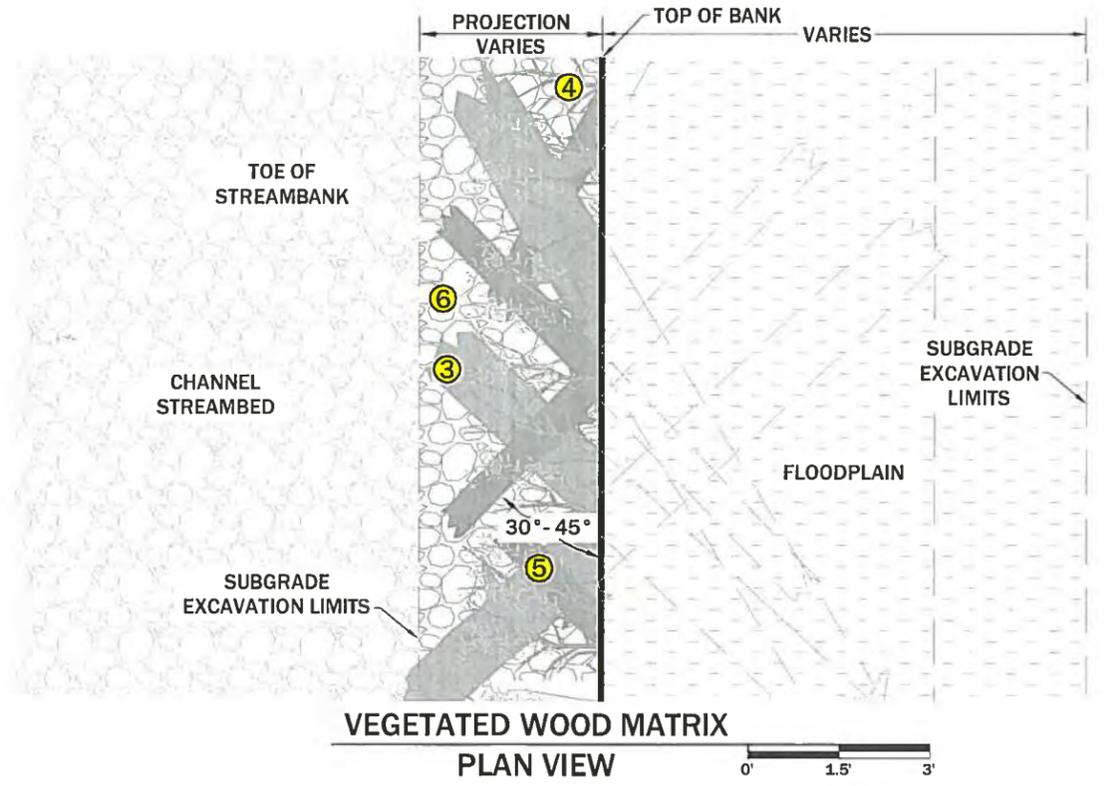


VEGETATED WOOD MATRIX
SECTION VIEW

- GENERAL NOTES**
1. CONSTRUCTION OF THE VEGETATED WOOD MATRIX WILL OCCUR ALONG THE BANK MARGINS NOTED ON SHEET PV-2 OR AS DIRECTED BY CONSTRUCTION SUPERVISOR.
 2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED THE ENGINEER.
 3. FIELD ENGINEER SHALL MARK THE GENERAL CONSTRUCTION LOCATION FOR EACH VEGETATED WOOD MATRIX STRUCTURE PRIOR TO CONSTRUCTION.

- NOTES ON VEGETATED WOOD MATRIX INSTALLATION**
1. EXCAVATE STREAMBANK TO SUBGRADE ELEVATIONS.
 2. PLACE CATEGORY 2 WOOD (SMALL LOGS) IN THE STREAMBANK AT SKEWED ANGLE TO THE STREAMBANK. LOGS SHALL BE PLACED BELOW THE TOP OF BANK ELEVATION. LOGS SHALL OVERLAP.
 3. PLACE CATEGORY 3 WOOD (BRUSH) WITHIN THE MATRIX OF SMALL LOGS. BRUSH MAY EXTEND ABOVE THE TOP OF BANK ELEVATION BY UP TO ONE FOOT.
 4. PLACE RIPARIAN CUTTINGS INTO THE TOP LAYER OF LOG/BRUSH MATRIX WITH THE STEMS IN CONTACT WITH THE BASEFLOW WATER TABLE AND THE LEAVES AT OR ABOVE THE BANKFULL WATER SURFACE ELEVATION.
 5. BACKFILL STREAMBANK WITH STREAMBANK FILL PER THE GRADATION SHOWN ON THE DRAWINGS.
 6. WASH FINES AND WATER FROM ONSITE INTO THE STREAMBANK FILL TO SEAL THE VOIDS IN THE BACKFILL.
 7. GRADE THE TOP OF BANK TO MATCH FINISHED GROUND ELEVATIONS.

NOTES ON VEGETATED WOOD MATRIX INSTALLATION



VEGETATED WOOD MATRIX
PLAN VIEW

MATERIAL SCHEDULE (PER LINEAR FOOT)

| ITEM | DIAMETER (IN) | LENGTH (FT) | ROOTWAD | LIMBS | QUANTITY |
|------|---------------|-------------|----------|-------|----------|
| ③ | 6-8 | 10-15 | OPTIONAL | YES | 2 |
| ④ | <3 | 10-15 | OPTIONAL | YES | 3 |
| ⑤ | 0.25 | 6-8 | | | 10 |
| ⑥ | SEE GRADATION | | | | 0.5 |

STREAMBANK FILL GRADATION

| REPRESENTATIVE SIZE CLASS | PERCENT PASSING | SIZE (INCHES) |
|---------------------------|-----------------|---------------|
| D100 | 95 -100 | 6 |
| D84 | 84 - 90 | 4 |
| D65 | 65 - 80 | 3 |
| D50 | 50 - 60 | 2 |
| D35 | 35 - 45 | 1 |
| D15 | 15 - 30 | 0.5 |
| <D15 | 5 - 10 | 0.08 |

NOTE: ALL GRADATIONS TO BE APPROVED BY THE CONTRACTING OFFICER. ON-SITE MATERIALS MAY NEED TO BE SUPPLEMENTED WITH IMPORTED ROCK FROM AN APPROVED SOURCE.

NEVADA CREEK - WINEGLASS DIVERSION
VEGETATED WOOD MATRIX

| NO. | DATE | BY | DESCRIPTION | CHK | |
|-----|----------|----|--------------|-----|----|
| | | | | CD | CD |
| 1 | 10-12-17 | NW | FINAL DESIGN | | |

PROJECT NUMBER
RDG-14-080

SHEET NUMBER

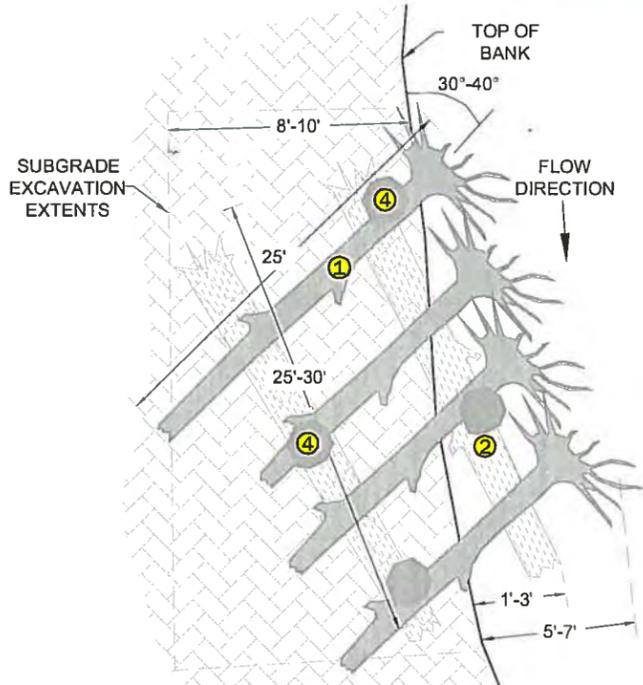
6.3

Nevada Creek fish screening
NOTES ON LARGE WOOD STRUCTURE INSTALLATION

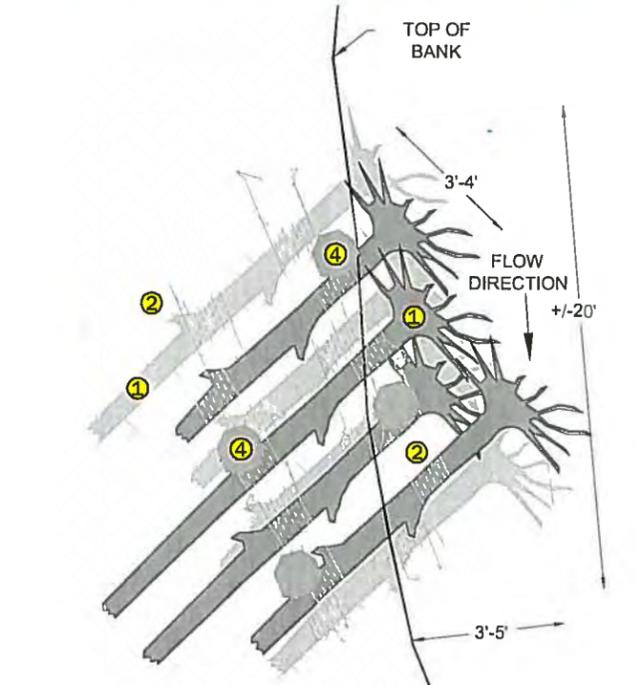
GENERAL NOTES

1. CONSTRUCTION OF THE LARGE WOOD STRUCTURE WILL OCCUR PRIOR TO INSTALLATION OF VEGETATED WOOD MATRIX STRUCTURE.
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.

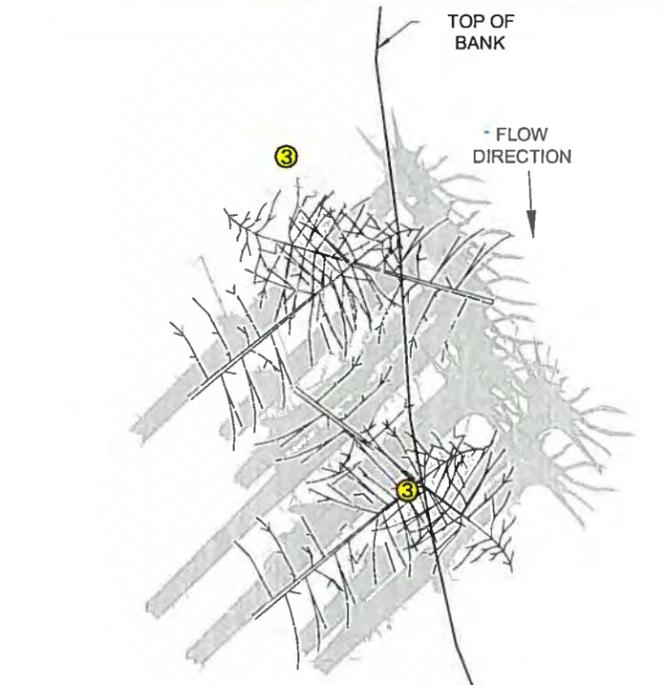
1. EXCAVATE TO THE EXCAVATION LIMITS. EXCAVATED MATERIAL SHALL BE STOCKPILED ON THE FLOODPLAIN OUTSIDE OF THE IMMEDIATE WORK AREA.
2. INSTALL TWO FOOTER LOGS (CATEGORY 2 WOOD) AT THE BASE OF THE EXCAVATED TRENCH AT THE ORIENTATIONS NOTED IN PLAN VIEW. FOOTER LOGS SHALL PROJECT NO GREATER THAN 2 FT. BEYOND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



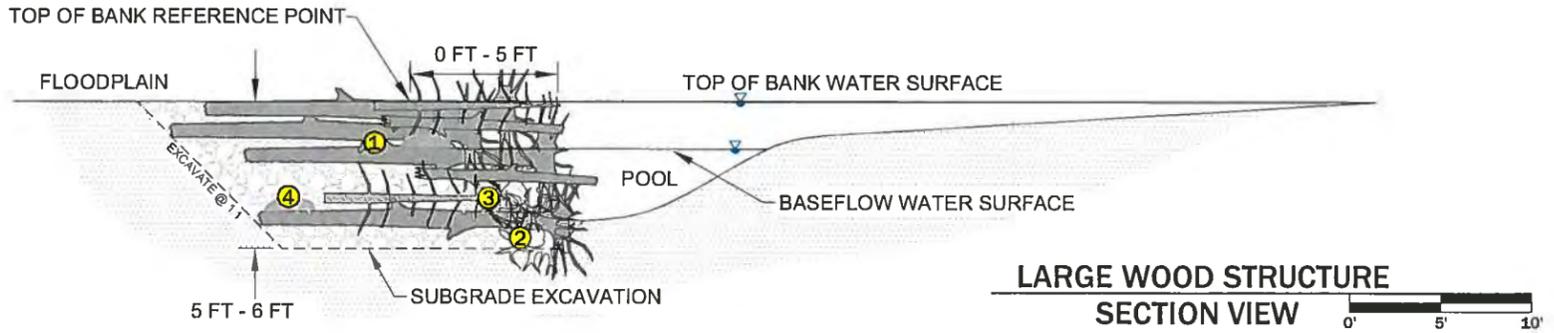
**TIER 1 - FOOTER & ROOTWAD LOGS
 PLAN VIEW**



**TIER 2 - FOOTER & ROOTWAD LOGS
 PLAN VIEW**



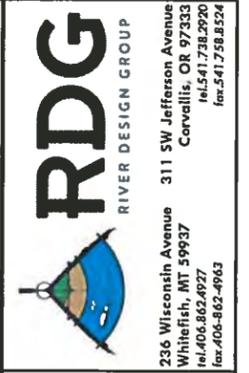
**TIER 3 - DEFLECTOR AND BRUSH WOOD
 PLAN VIEW**



**LARGE WOOD STRUCTURE
 SECTION VIEW**

MATERIAL SCHEDULE (PER STRUCTURE)

| NO. | ITEM | QUANTITY | DIA. (IN) | LENGTH (FT) | ROOTWAD (Y/N) |
|-----|-----------------|----------|-----------|-------------|---------------|
| ① | CATEGORY 1 WOOD | 10 | 12-18 | 25 | YES 4 FT DIA. |
| ② | CATEGORY 2 WOOD | 6 | 10-12 | 15-20 | OPTIONAL 5 FT |
| ③ | CATEGORY 3 WOOD | 10 | 6-8 | 10-15 | OPTIONAL 5 FT |
| ④ | CATEGORY 2 ROCK | 6 | 18-24 | | |



**NEVADA CREEK - WINEGLASS DIVERSION
 LARGE WOOD STRUCTURE**

| NO. | DATE | BY | DESCRIPTION | CHK |
|-----|----------|----|--------------|-----|
| 1 | 10-12-17 | NW | FINAL DESIGN | GD |

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6.4

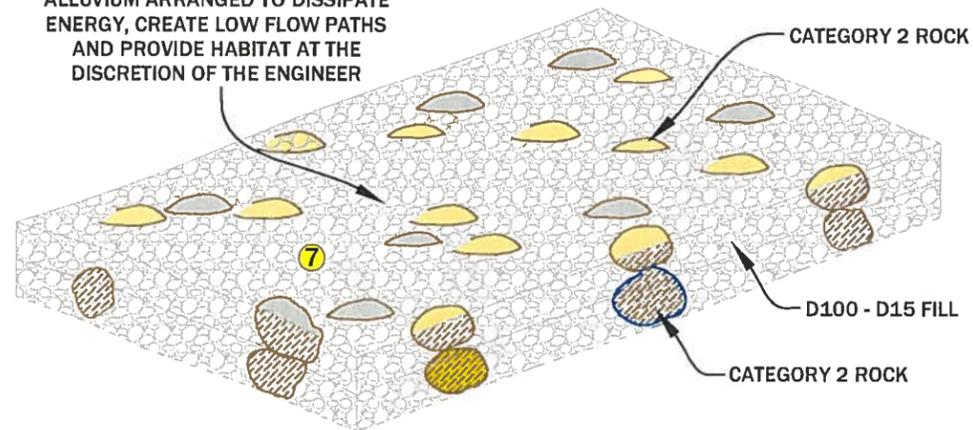
GENERAL NOTES

1. CONSTRUCTION OF THE CHANNEL STREAMBED WILL OCCUR AFTER THE CHANNEL AND FLOODPLAIN SUBGRADE BACKFILL IS PLACED.
2. ANY CHANGES TO THE CONSTRUCTION SEQUENCE MUST BE APPROVED THE ENGINEER.
3. CONTRACTOR SHALL MARK THE UPSTREAM AND DOWNSTREAM EXTENTS OF THE LOCATIONS OF THE CONSTRUCTED CHANNEL STREAMBED STRUCTURES.

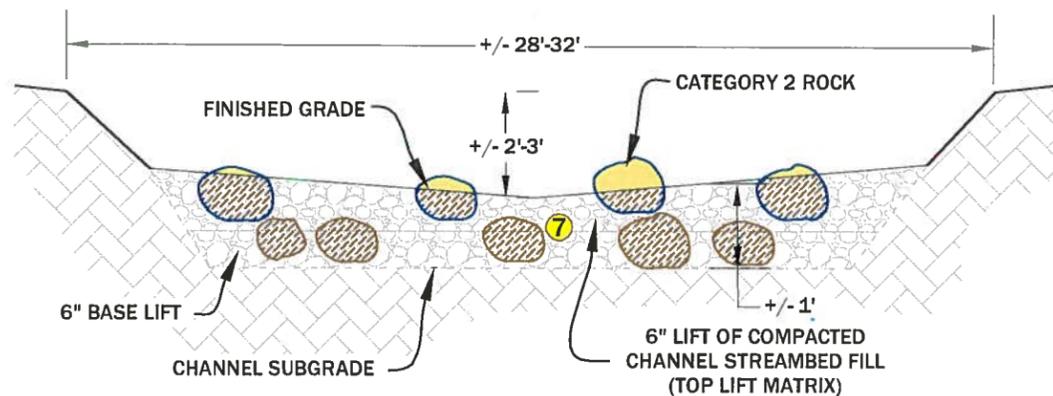
NOTES ON CONSTRUCTED CHANNEL STREAMBED INSTALLATION

1. PRIOR TO CONSTRUCTION OF THE CHANNEL STREAMBED, ENGINEER SHALL VERIFY CHANNEL SUBGRADE ELEVATIONS. CHANNEL SUBGRADE SERVES AS THE FOUNDATION FOR THE CONSTRUCTED CHANNEL STREAMBED.
2. CONTRACTOR SHALL STOCKPILE CHANNEL ALLUVIUM PER SPECIFICATIONS NOTED ON THE DRAWING.
3. PREPARE THE BOULDER FRAMEWORK. CONTRACTOR SHALL PLACE 18-INCH TO 30-INCH D100 BOULDERS (CATEGORY 1 ROCK) ON OR EMBEDDED IN THE SURFACE OF THE CHANNEL SUBGRADE AS INDICATED ON THE DRAWING. DUE TO THE INHERENT VARIABILITY IN MATERIALS, D100 BOULDER ELEVATIONS SHALL BE EMBEDDED INTO THE EXISTING SUBGRADE TO ASSURE BOULDER PROTRUSION ABOVE FINISH GRADE WILL BE NO GREATER THAN 0.7-FT.
4. PREPARE THE CHANNEL ALLUVIUM MATRIX. AFTER THE BOLDER FRAMEWORK IS COMPLETE AND INSPECTED BY ENGINEER, PLACE A 0.5' LIFT OF CATEGORY 3 ROCK AND WASH FINES INTO THE STREAMBED. PLACE A 0.5' LIFT OF CATEGORY 2 ROCK TO FINISHED GRADE AND WASH FINES INTO STREAMBED. INDIVIDUAL COURSES SHALL BE BUCKET COMPACTED.

ALLUVIUM ARRANGED TO DISSIPATE ENERGY, CREATE LOW FLOW PATHS AND PROVIDE HABITAT AT THE DISCRETION OF THE ENGINEER



**CONSTRUCTED RIFFLE
3-D VIEW** NTS



**CONSTRUCTED RIFFLE
SECTION VIEW** NTS

MATERIAL SCHEDULE (PER LINEAR FOOT)

| ITEM | DIAMETER (IN) | QUANTITY |
|----------------------------|---------------|----------|
| ① CATEGORY 2 ROCK | 18 - 24 | 2 EA |
| ② STREAMBED FILL GRADATION | SEE GRADATION | 1.5 CY |

STREAMBED FILL GRADATION

| REPRESENTATIVE SIZE CLASS | PERCENT PASSING | SIZE (INCHES) |
|---------------------------|-----------------|---------------|
| D100 | 80 - 90 | 14 |
| D84 | 60 - 70 | 11 |
| D65 | 45 - 55 | 8 |
| D50 | 30 - 40 | 5 |
| D35 | 10 - 15 | 2 |
| D15 | 5 - 15 | 0.08 |
| <D15 | 0 - 5 | 0.001 |

NOTE: PRIOR TO INSTALLATION ALL ALLUVIUM SHALL BE SALVAGED FROM EXISTING CHANNEL.



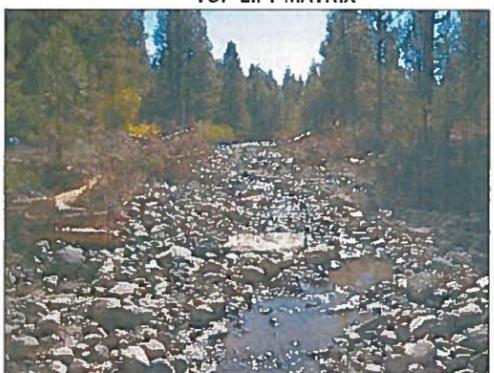
CHANNEL SUBGRADE



TOP LIFT MATRIX



BASE LIFT MATRIX



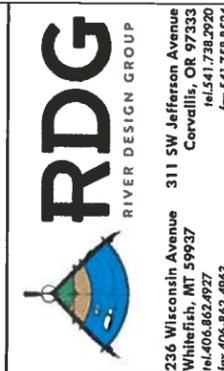
TOP LIFT MATRIX WITH FRAMEWORK



TYPICAL CONSTRUCTED RIFFLE



TYPICAL CONSTRUCTED RIFFLE



NEVADA CREEK - WINEGLASS DIVERSION

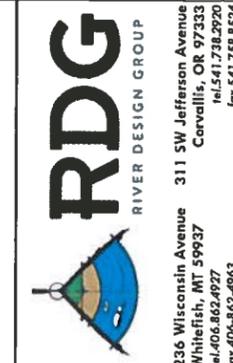
CONSTRUCTED RIFFLE STRUCTURE

| NO. | DATE | BY | DESCRIPTION | CHK | |
|-----|----------|----|--------------|-----|--|
| | | | | GD | |
| 1 | 10-12-17 | NW | FINAL DESIGN | | |

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**NEVADA CREEK - WINEGLASS DIVERSION
MATERIALS LIST**

| Category | Item | Quantity | Units | Diameter | Length | Rootwad |
|---------------|--|----------|-------|---------------------------|-------------|----------|
| Wood | Category 1 Wood | 10 | ea | 12 in - 18 in | 25 ft | Yes |
| | Category 2 Wood | 6 | ea | 10 in - 12 in | 15 - 20 ft | Optional |
| | Category 3 Wood | 470 | ea | 6 in - 8 in | 10 - 15 ft | No |
| | Category 4 Wood | 690 | ea | < 3 in | 10 - 15 ft | No |
| | Riparian Cuttings | 2,300 | ea | 0.25 in | 6 ft - 8 ft | No |
| Category | Item | Quantity | Units | Diameter | | |
| Rock | Category 1 Rock 30"-36" | 100 | ea | 30"-36" | | |
| | Category 2 Rock 18"-24" | 176 | ea | 18"-24" | | |
| | Streambank Fill | 115 | cy | see gradation (sheet 6.3) | | |
| | Streambed Fill | 125 | cy | see gradation (sheet 6.5) | | |
| Category | Item | Quantity | Units | Rolls | | |
| Miscellaneous | Filter Fabric- Mirafi 180 N or equivalent | 1,000 | sf | 1 | | |
| | 12" HDPE smooth wall pipe | 320 | lf | | | |
| | 12" HDPE 45 Degree Elbow | 3 | ea | | | |
| | 36" x 24" x 72" Slide gate or equivalent | 1 | ea | | | |
| | equivalent | 1 | ea | | | |
| | 6' x 4' x 1/4" Re-inforced steel headwall as per Sheet 6.1 | 2 | ea | | | |
| | 6' x 8' x 1/4" Re-inforced steel headwall as per Sheet 6.1 | 1 | ea | | | |
| | Bypass Pipe Flange as per Sheet 6.0 | 1 | ea | | | |
| | FCA Fish Screen (already aquired) | ± | ea | | | |
| | 7 ft section of FCA supply flume | 1 | ea | | | |
| | Seed mix- upland | 10 | lbs | | | |

| NO. | DATE | BY | DESCRIPTION | CHK | |
|-----|----------|----|--------------|-----|--|
| | | | | GD | |
| 1 | 10-12-17 | NW | FINAL DESIGN | | |
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PROJECT NUMBER
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SHEET NUMBER
7.0