COMPLETION REPORT
MILL CREEK DITCH
FISH PASSAGE IMPROVEMENT PROJECT
MILL CREEK, PESHATIN CREEK
WENTATCHEE SUBBASIN, WASHINGTON

PREPARED FOR
CHELAN COUNTY CONSERVATION DISTRICT
WENATCHEE, WASHINGTON

BY U.S. BUREAU OF RECLAMATION
PACIFIC NORTHWEST REGION
UPPER COLUMBIA AREA OFFICE
WENATCHEE FIELD STATION

JULY 2005

On the Cover

Cover Photo 1. **Looking upstream at original concrete Mill Creek Ditch diversion. The ditch is on the left side of Mill Creek, a tributary of Peshatin Creek of the Wenatchee River in the middle Columbia River Basin.**

Photo by Chelan County C.D Wenatchee, WA; July 7, 1999

Cover Photo 2. **Upstream view of completed fish passage improvement project. Weir No. 5 is in the foreground. The photo was taken about three months after site revegetation.**

photo by Bureau of Reclamation, Wenatchee Field Office, Steve Kolk; July 17, 2004

This project was initiated and completed through the combined efforts of many entities, public and private. The purpose of the project was to provide for continued use of water while enhancing conditions for anadromous fish listed under the Endangered Species Act. The Bureau of Reclamation prepared this completion report in accordance with the 2004 National Marine Fisheries Service Federal Columbia River Power System Biological Opinion to describe the design and construction of this project.

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Photographs provided by U.S. Bureau of Reclamation, Upper Columbia Area Office, Wenatchee Field Station (Steve Kolk), except as noted.

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1. INTRODUCTION AND BACKGROUND

In the spring of 2004, the Mill Creek Diversion Dam, identified by the U.S. Fish and Wildlife Service (FWS) and the Chelan County Conservation District (Chelan County CD or the District) as a barrier to fish movement, was replaced by six log weirs. The new weirs and the diversion modifications now allow fish passage for all species and life stages, meet diversion flow requirements for the landowner-irrigator, and are less noticeable in the stream.

Mill Creek is a tributary of Peshastin Creek in the Wenatchee River watershed in Chelan County, Washington. The creek's headwaters are within the Wenatchee National Forest. The diversion dam, the irrigation ditch, and the orchard are on private property.

This report explains the design process and regulatory requirements leading to the new diversion and documents the construction that took place. To better illustrate what was accomplished, two appendices have been included: Appendix A shows a series of photographs documenting the work; Appendix B shows "as-built" drawings of the project.

1.1 PROBLEMS AND SOLUTIONS

The Mill Creek Ditch fish passage improvement project is one of several voluntary efforts by various Wenatchee River subbasin landowners intended to improve habitat for ESA listed species. The original design concept was provided to the Chelan County CD by the USDA National Resources Conservation Service (NRCS). At the request of the District, Reclamation reviewed the NRCS design and continued on with the design work. The project evolved from September 2002 through construction in response to comments from the landowner and permitting agencies.

The project was funded through a so-called "FRIMA" grant. This program, authorized under the Fisheries Restoration and Irrigation Mitigation Act (Public Law 106-502), provides for FWS to allocate money to a state for further distribution.

Based on the early designs and in cooperation with WDFW, Chelan County CD applied for and received FRIMA funds for this project. The District coordinated and administered the contracting process between the landowner and the construction company. When provided with paid invoices related to the project, the District would reimburse the landowner for such items as contractor payments. Materials were purchased by the District. As part of a "matching funds" agreement, the District provided materials and manpower for restoration of the construction site. A condition of the FRIMA grant is that the District will monitor the site restoration efforts.

1.2 PARTICIPATION AND COOPERATION

The key to the success of the Mill Creek Ditch fish passage improvement project was the involvement of John and Debin Smith, the owners of the diversion dam, and the other landowners whose properties are also supplied with irrigation water. The Smiths also provided permission for the staging area to be located on their property. As a portion of their in-kind "match" (or share) of the project costs, they provided the logs used for the weirs. Originally, the landowners intended to

supply the logs from their own timber, but because of seasonal access difficulties, the logs were purchased. (The project was postponed from Fall 2003 until Spring 2004 because of delays in the permitting process.)

Another important aspect of this project was the cooperation and coordination between the various permitting agencies. The various agencies were involved with the design concepts from the beginning. This involvement was intended to produce a relatively smooth process for permit application and issuance, although as evidenced by the delay in beginning the project, this was not necessarily the case. FWS provided valuable support during the permitting process (Section 1.3 below) and on-site assistance and advice during fish-salvage operations at no cost to the landowner; the District continued its support on and off site.

The use of local contractors helped during pre-construction and on-site discussions. Marcon Timber Company, locally owned by Mark Forsman, performed the primary construction work. Subcontract work was provided by Dennis Pobst with Natapoc Forest Resources. The firms provided all heavy equipment and various other items, including a dewatering pump and hand tools.

1.3 PERMITTING

WDFW administers a coordinated interagency permitting process (Joint Aquatic Resource Permit Application, or "JARPA"). A single application is submitted to WDFW, which distributes it to other local, State, and Federal agencies for their review and approval, as appropriate. As part of this process, a "Hydraulic Project Approval" (HPA) was required from WDFW prior to construction. A HPA has specific requirements for the protection of aquatic habitat, streambank vegetation, prevention of oil and gas spills from equipment, and requirements for site restoration. A separate HPA is required for each project; the HPA for the Mill Creek Ditch project was issued in February 2003.[1/]

Because the FRIMA funding originated from Federal sources, Section 7 of the Endangered Species Act (ESA) required "consultation" with FWS and NOAA Fisheries. Biologist Malenna Cappellini produced a "biological assessment" (BA) for Chelan County CD.[2/] Reclamation provided technical assistance to the District during the consultation.

The BA was submitted to FWS, which determined there would be no adverse affects on anadromous fish listed under the ESA.[3/]

1. The HPA was issued on February 17, 2003 by the Washington Department of Fish and Wildlife Region 2 Wenatchee Field Office, 1550 Alder Street NW, Ephrata, WA 98823-9651. Log Number ST-F8250-01.

2. *Biological Assessment for the Mill Creek FRIMA Project*, May 2003, prepared by U.S. Fish and Wildlife Service, Mid-Columbia Fish Resource Office (Malenna M. J. Cappellini, fishery biologist/stream restoration), Leavenworth, WA, for Chelan County Conservation District, Wenatchee, WA, in cooperation with the Bureau of Reclamation's Wenatchee Field Office and the U.S. Fish and Wildlife Service, Leavenworth, WA.

3. The U.S. Fish and Wildlife Service determined that the proposed action was not likely to adversely affect the Upper Columbia River (UCR) spring Chinook or UCR steelhead Evolutionary Significant Units on May 29, 2003. Document number 03-I-W0259.

NOAA Fisheries was not satisfied with the proposed designs, and negotiations delayed construction. Once the issues were resolved, NOAA Fisheries did issue a biological opinion (BiOp) in December 2003.[4/]

1.4 CONTRACT SPECIFICATIONS AND BIDDING

Technical specifications for the project were completed by Reclamation using standard NRCS format and language. The landowner, who was responsible for contract administration, reviewed and concurred with the document.

For the project, the contract for construction was between the landowner and the construction company. Chelan County CD received and held the FRIMA grant funds. The District bought some materials. When provided with paid invoices, the District reimbursed the landowner for project-related items; these included contractor payments and materials such as pipe and materials for modifying the concrete diversion structure. During construction, Reclamation had no contractual relationship or other obligations with the contractor or Chelan County CD.

4. NMFS Biological Opinion of December 5, 2003; tracking number, 2003/00619. *Endangered Species Act Section 7 Formal Consultation and Magnusson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Mill Creek FRIMA Project (WRIA 45). Mill Creek Fisheries Restoration and Irrigation Mitigation Program, Upper Columbia River Steelhead and Upper Columbia River Spring Chinook, Peshastin Creek Watershed, Wenatchee Subbasin, Chelan County, Washington, WRIA 45.*

2. PROJECT DESCRIPTION

The purpose of the Mill Creek Ditch project was to improve fish passage while avoiding any adverse affect to the dam owner's irrigation water supply. This was accomplished by using a series of fish-friendly weirs to backwater the 4-foot drop downstream of the old diversion dam and raise the water surface at the headgate, thereby eliminating the need for flashboards to be installed across the channel (photos A-1, A-2, and A-3).

2.1 MATERIALS

The materials used for the project were ordered or supplied separately from the construction contract. Invoices for materials were sent to the landowner who made payment to the suppliers; he was then reimbursed by Chelan County CD from the FRIMA funds. The District paid for some material directly. Originally, the landowner intended to supply the weir logs from his own timber, but because of seasonal access difficulties, they were purchased from a local source. (The project was postponed from Fall 2003 until Spring 2004 because of delays in the permitting process.)

2.2 CONSTRUCTION PROCESS AND TIMELINE

Construction took place over a two-week period, but was not continuous. It began on the morning of March 22, 2004 with the excavation for the dewatering trench for the diversion. The last of the cleanup was completed on April 9. The weather was very good with moderate temperature and very little rainfall. Creek flows stayed consistent and were estimated to range from 10 to 12 cfs. Revegetation was completed in the spring of 2004 and has been monitored by Chelan County CD as part of the FRIMA agreement; informal site monitoring by the landowner, the District, and Reclamation will continue through the years.

The project construction process was divided into the following steps:

- Mobilizing and staging
- Dewatering and bypassing creek water around site
- Excavating for log weirs
- Cutting weir logs to proper length, securing to ecology blocks with wire rope.
- Placing weir logs
- Placing geomembrane on weirs
- Backfilling
- Confirming weir notch elevations
- Modifications to existing concrete diversion structure

- Returning water flow to main channel
- Installing fish screen and connections
- Installing flowmeter to irrigation water conveyance pipe
- Pre-completion walk-through
- Revegetation

2.3 CONSTRUCTION

2.3.1 Day 1 – Mobilization and staging

Initial mobilization of equipment and materials to the site proceeded. The project area was laid out using stakes and flagging. (Monday, March 22)

2.3.2 Day 2 – Dewatering and bypassing creek water around site

Following discussion, the preferred routing for and the method of the temporary stream diversion were determined. The contractor felt that the best approach would be to use a trench lined with polyethylene, an approach acceptable to Chelan County CD. An above-ground pipeline would have provided certain advantages such as reduced ground disturbance, reduced potential for erosion, and a better flow control; these were outweighed by the disadvantages of higher material procurement and installation costs. (Wednesday, March 31)

The use of the polyethylene liner created some concerns and eventually some minor complications. Originally, the project job had been bid with construction scheduled for the fall, when flows would be seasonally low. Under those circumstances, the plastic sheeting probably would have worked satisfactorily. However, with construction delayed until the spring, an early runoff brought substantially higher flows through the work area than originally anticipated. Because of the additional stresses, the liner tore in several places but was repaired.

Accepting the constraints created by the higher flows, it was decided to use the existing diversion ditch to bypass the creek water around the new-weir construction area. The concrete header box was sawcut; this would have been done anyway when it was time to install the new fish screen. The tracked excavator (photo A-9) dug a 100-foot-long trench from the outfall back up to the concrete diversion structure. The trench was lined with 6 mil polyethylene (photo A-4). Sandbags and rocks were placed to hold the plastic in place and to dissipate energy in the diverted flow.

Sediment protection was provided by placing hay bales downstream from the project area. As the water was cut from the stream channel to the temporary diversion bypass, two FWS employees used electro-shock techniques to remove salmonids and other fish from the reach that was dewatered. The fish were released downstream from the project area.

Once the stream was diverted, some additional sandbags and large racks were added to the diversion channel to reduce velocities and protect against erosion.

2.3.3 Day 3 – Excavating for log weirs

Using the tracked excavator, the stream bed and banks were excavated in preparation for placement of the six log weirs. (Thursday, April 1).

2.3.4 Day 4 – Preparing log weirs

Because of the seasonal access problems, the logs for the weirs were unavailable from the landowner-irrigator, so they were purchased from a local source. The specifications called for logs that were 18 to 24 inches in diameter (figure B-4) with a minimum of taper. (Friday, April 2)

The "low flow center cross-pieces" and "arms" were cut by chainsaw from the logs to design length and the butts were angled (photo A-5). The cross-pieces were notched to size.

2.3.5 Day 4 – Placing log weirs

The original specifications called for the use of custom-sized and cast concrete piers to anchor the log weirs; however, due to the cost differential, generic "ecology blocks" were used instead (figure B-4). Ecology blocks are cast at a concrete plant from left-over ready-mix; for the Mill Creek piers, the blocks were 3 feet wide by 3 feet high by 2 feet deep (photo A-6; figure B-4); this is a typical size. The primary differences between the design for custom blocks and the ecology blocks are that the latter needed to be set at an angle and there were no wire ropes cast into them. (Friday, April 2)

To attach the weir logs to the ecology blocks, ¼-inch-diameter wire rope and wire anchors were used. Some of the wire used was donated by Longview Fibre Company's sawmill near Leavenworth.

The wire rope was double-looped around the log-and-ecology-block units (photo A-6). Once secured, one loop was lifted by the backhoe, which cinched the assembly together (photo A-8). While tension was maintained, additional fasteners were installed in the wire ropes to secure the tension.

The loop that was used to tension the wire was then used to place the each section of the weir assembly in the channel (photos A-9 and A-10). The weir was then adjusted to grade as needed. (Later, once the weir was assembled and backfilled, the extra loop was cut off the assembly so there was no extraneous wire length exposed.)

2.3.6 Day 5 – Placing geomembrane on the weirs

When the weirs were in place, the geomembrane was affixed to the upstream side of the logs. The specifications called for the geomembrane to extend 5 feet upstream from the face of each weir (figure B-4). This could not be accomplished without excavating all of the bank material between the full length of all of the weir logs. It was felt that it was more important to leave some natural bank in place, so the membrane at the outer edges of the weirs was only extended one foot or so upstream from that section of the weir. (Saturday, April 3)

2.3.7 Day 5 – Backfilling

The weirs were then backfilled to the approximate original bank widths (photo A-11). Once the weirs were backfilled, scour holes (photo A-13) were excavated and filled with gravel (photo A-19) as required by WDFW. (Saturday, April 3)

2.3.8 Day 5 – Confirming weir notch elevations

The weir notch elevations were measured before water was run into the channel, and the results are as follows (Weir 1 is at the upstream end). Table 1 compares installation elevations to design elevation; these were considered good results and within allowable tolerance. Follow-up measurements three months later show an increase in elevation, and actually resulted in a net reduction in variation from design specifications. The increase in elevations could be attributed to the weir logs absorbing water. (Saturday, April 3)

Table 1. Weir Notch Elevation Comparisons (in feet)

Weir	Design Elevation	As of 4/03/04	Variance from design height	As of 7/15/04	Change from 4/03/04
No. 1	995.00	994.93	0.07 low	994.97	up 0.04
No. 2	994.00	994.03	0.03 high	994.08	up 0.05
No. 3	993.00	993.03	0.03 high	993.07	up 0.04
No. 4	992.00	992.00	none	992.07	up 0.07
No. 5	991.00	990.85	0.15 low	990.96	up 0.11
No. 6	990.00	989.95	0.05 low	990.06	up 0.11

2.3.9 Day 5 – Modification of existing diversion structure

The concrete lip in the invert of the stream at the diversion point was partially removed to make room for the placement of the first (upstream) weir. (Saturday, April 3)

2.3.10 Day 5 – Returning water flow to main channel

The sediment protection measures were removed, then the water was cut back to the main stream channel to flow through the new weirs and observed overnight (photos A-14 and A-15). Minor adjustments were made the following morning where a small amount of erosion had occurred, but this was easily addressed with a few rocks and some fill. (Saturday, April 3)

2.3.11 Day 6 – Installing fish screen and connections

The site for the new fish screen was excavated only after the weirs were installed and the flows returned to the main channel. After the fish screen was in place (photo A-16), the flashing and other connections were made. Inspection determined that the delivered structure did not conform to the

design specifications (see Section 3.1 “Lessons Learned”). Among other non-conforming features, the sides were too low to prevent overtopping in the event the pumps were shut off, a potential problem addressed in the original designs. (Sunday, April 5)

Because the screen was non-conforming, the return pipe came off at the wrong angle. The contractor's initial installation put the outlet of the pipe in the wrong spot and the bend in the pipe didn't meet NOAA criteria. This was adjusted, and now satisfies the criteria (photo A-17).

2.3.12 Day 7 – Irrigation flow metering

In compliance with WDOE requirements, a flow metering system was installed. This was an off-the-shelf unit (photo A-20). It was recommended by Reclamation as suitable for anticipated pipeline flows through the irrigation pipe line and reliability of operation. It was installed about 30 feet downstream from the headgate structure by the contractor (photo A-21). Purchase and installation costs were paid by a grant from WDOE. (Friday, April 9)

2.3.13 Day 8 – Pre-completion walk-through

An end-of-construction-phase walk-through was conducted on by the landowner, CCCD, the contractor, and Reclamation. There were a few punchlist items. They reached agreement on final grading and cleanup and discussed revegetation, including the type of and number of plants, and the schedule for work. (Saturday, April 10)

2.3.14 Day 8 – Clean-up

Following the pre-completion walk-through, all remaining construction materials and debris were removed. The stream banks and construction area were graded in preparation for revegetation. (Saturday, April 10)

2.3.15 Day 9 – Revegetation

The contractor undertook the revegetation of the site, which took one day. Plantings included willow, alder, cottonwood, and native grasses and was in accordance with NRCS practices and standards. See Photos A-18 and A-19. (Thursday, April 29)

2.4 FINAL WALK-THROUGH

A final walkthrough of the project by the landowner, Chelan County CD, and Reclamation took place on Friday, July 16. There were no additional punchlist items and repairs.

3. CONCLUSIONS

So far, the project has been successful. The new facilities have performed satisfactorily and are delivering the required amount of water to the ditch while providing for fish passage.

They were built during seasonal high flows. Over the winter of 2004-2005, the new structures were tested by snowmelt and the high-water season, such as it was. There were no apparent complications or deficiencies. Basic monitoring will occur over the next couple of years to make sure the project is functioning satisfactorily.

The diversion seems to be providing adequate flow to the ditch, although during the late summer 2004, a flashboard across part of the creek was used to increase the diversion. Reclamation will be working with the landowners to adjust the headgate and eliminate the future need for a flashboard.

The maintenance of the new log structures and headworks should be minimal for the landowner. A "landowners' agreement" is now in place. This established their responsibility for maintenance of the project and any necessary repairs to the facilities. The revegetation program was completed and plant growth will be monitored.

3.1 LESSONS LEARNED

One note for similar projects is to be sure to measure the lengths of the logs for where the ends enter the bank, not where they start across the channel. Because the arms of the weirs angle downstream, they enter the bank at a different location than where they would if they came straight off of the cross log section. Typically, specifications require logs to penetrate the bank about 3 feet (for anchoring). At the Mill Creek diversion site, the bank width was measured at the cross log, not downstream where the angled logs actually entered the bank. Fortunately, there wasn't a lot of variation in the bank width and the measurements were conservative enough that this didn't become an issue.

It was difficult affixing the geomembrane to the logs. A specification for similar projects that calls for cutting a flat upstream side of the logs would make it easier to affix membranes.

There was a lapse in communication between Reclamation design engineers and WDFW staff. Reclamation provided a fish screen design custom to the Mill Creek project site. The structure produced by the WDFW screen shop came from a standard design for the required diversion flow. This substitution resulted in sides too low to prevent overtopping in the event the irrigation pumps were shut off, a feature incorporated into the original design, and affected the installation of the outlet pipe. The problems were overcome with field modifications (which are reflected in the Appendix B "as-built" drawings). However, the facility will require either more diligence on the part of the irrigator, or some adjustments to the boards used to control the diversion flow.

Because the screen was non-conforming, the return pipe came off at the wrong angle. The contractor's initial installation put the outlet of the pipe in the wrong spot and the bend in the pipe didn't meet NOAA criteria. This was adjusted and now satisfies the criteria.

APPENDIX A

LOCATION MAPS AND CONSTRUCTION PHOTOS

MILL CREEK DITCH

FISH PASAGE IMPROVEMENT PROJECT

WENATCHEE SUBBASIN, WA

Photographs by

U.S. Bureau of Reclamation

Upper Columbia Area Office

Wenatchee Field office

(except as noted)

Location Map, Mill Creek Ditch Fish Passage Improvement Project

Site Map, Mill Creek Ditch Fish Passage Improvement Project

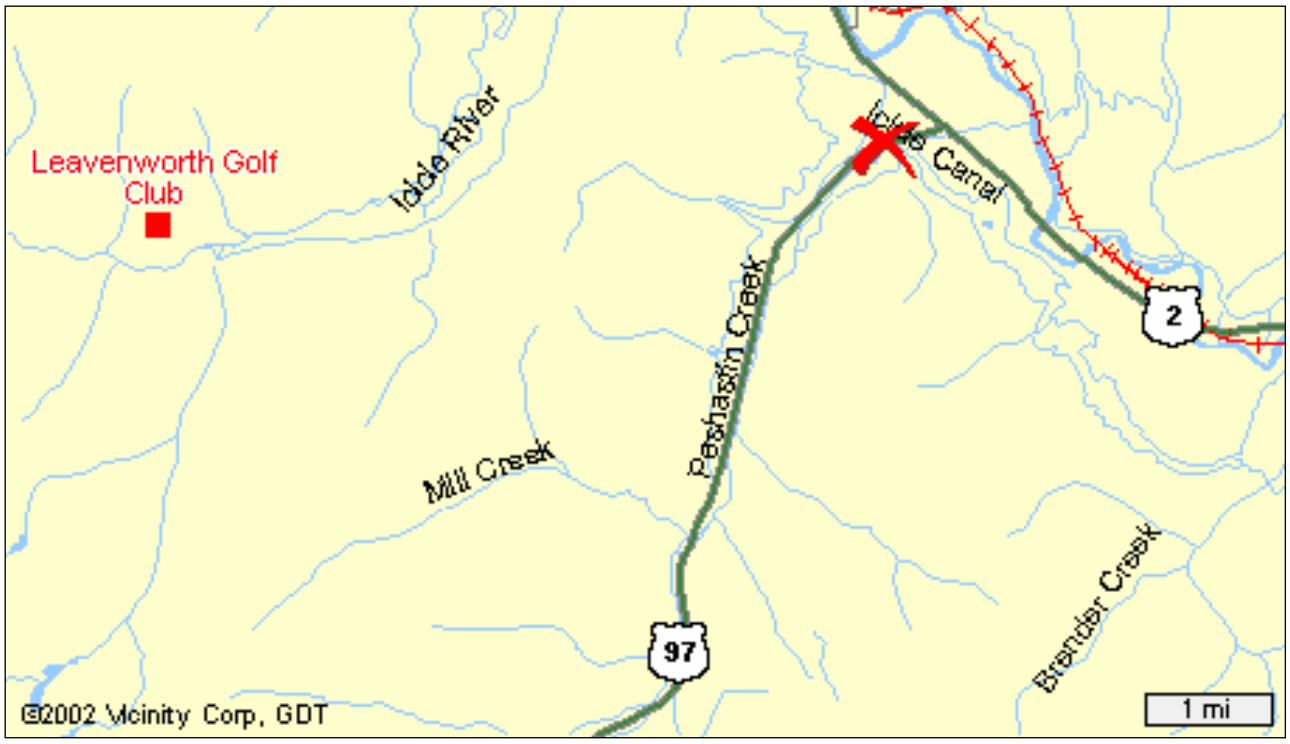


Photo A-1. Mill Creek Diversion, July 1999. *(photo by Chelan County Conservation District)*

Photo A-2. Mill Creek Diversion ditch, looking upstream, circa July 1999. *(photo by Chelan County Conservation District)*

Photo A-3. Existing Mill Creek Diversion structure prior to construction.

Photo A-4. Diverting water through temporary bypass channel; note use of polyethylene liner to limit erosion.

Photo A-5. Preparing to cut logs for weir arm. The template was used to ensure the proper angle for butting the ends of the logs.

Photo A-6. Workers use cable to secure the weir's notched, low-flow center crosspiece.

Photo A-7. Weir No. 6 (downstream-most) was placed first.

Photo A-8. Fastening an angle-cut arm to an "ecology block" pier.

Photo A-9. Maneuvering right-side arm for Weir No. 6 into place.

Photo A-10. Weir No. 6 fully installed; Weir No. 5 with center piece and left arm is in place.

Photo A-11. Backfilling between weir arms, looking downstream.

Photo A-12. Panoramic shot (looking upstream) at temporary bypass and weirs.

Photo A-13. Looking upstream at completed weirs; groundwater has filled the individual scour holes.

Photo A-14. The bypass has been closed and "first water" flows through the new weirs on Mill Creek; note lack of clarity of water clouded by sediment.

Photo A-15. Increased flows of “first water;" already the sediment levels are lower.

Photo A-16. The new fish screen was purchased under a FRIMA grant through WDFW. The arrow indicates the outflow of the bypass pipe .

Photo A-17. Final bypass pipe alignment.

Photo A-18. Looking upstream at the six weirs that have replaced the Mill Creek Diversion and restored fish passage.

Photo A-19. The new Mill Creek Diversion weirs, six months after revegetation; note gravels visible in ponds.

Photo A-20. Manufacturer's illustration of McCrometer™ flow meter, an off-the-shelf instrument paid for by WDOE.

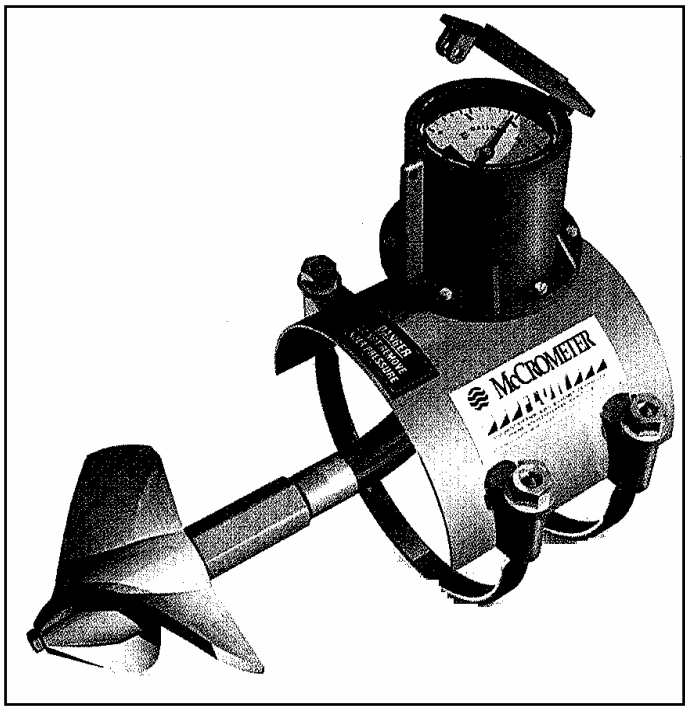


Photo A-21. Flow meter installed downstream from the diversion structure near the point-of-diversion.

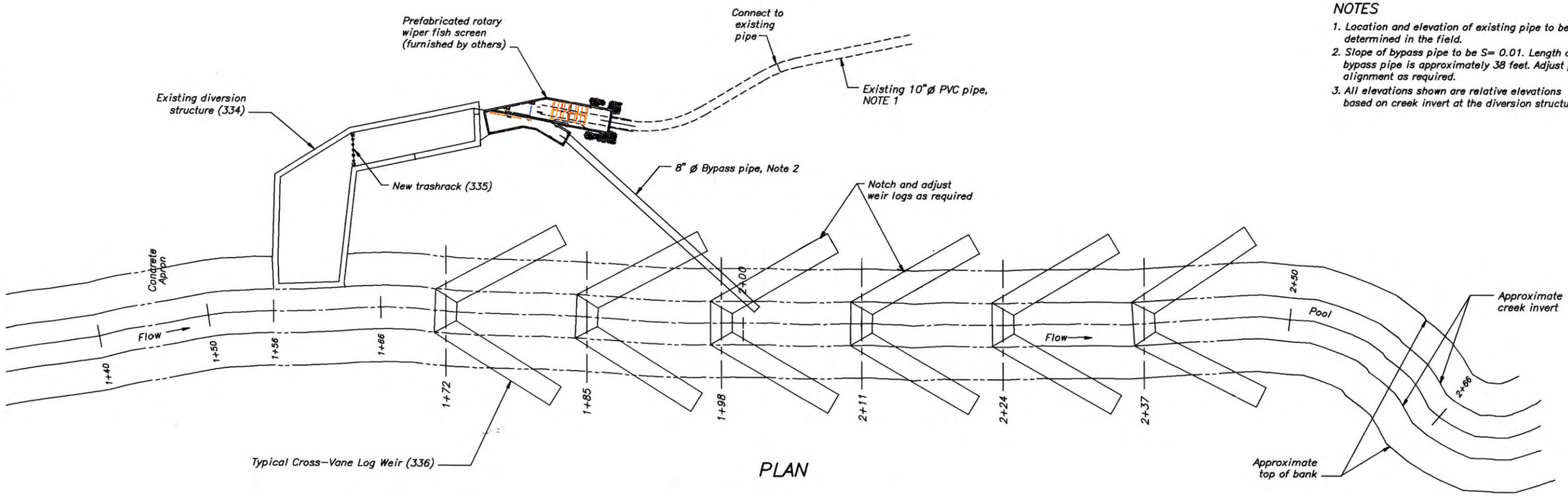
APPENDIX B

AS-BUILT DRAWINGS

MILL CREEK DITCH

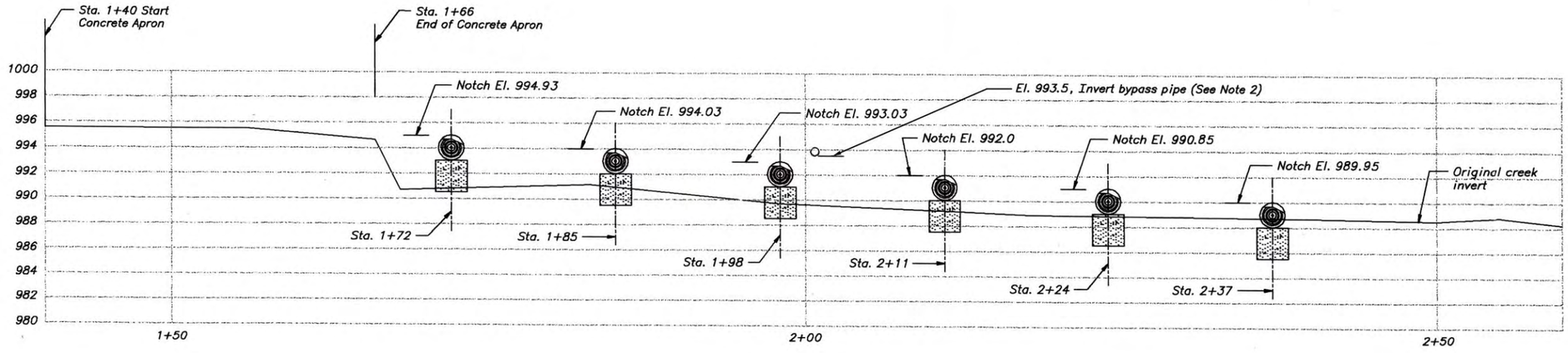
FISH PASSAGE IMPROVEMENT PROJECT

WENATCHEE SUBBASIN, WA



PLAN

SCALE OF FEET



PROFILE

SCALE OF FEET

NOTES

1. Location and elevation of existing pipe to be determined in the field.
2. Slope of bypass pipe to be S= 0.01. Length of bypass pipe is approximately 38 feet. Adjust pipe alignment as required.
3. All elevations shown are relative elevations based on creek invert at the diversion structure.

REV NO		
1	2005-2-23 100-SEM	AS BUILT BY 109. REVISED BYPASS PIPE AND NOTCH ELEVATIONS.

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM
WENATCHEE SUBBASIN - WASHINGTON

MILL CREEK DIVERSION MODIFICATIONS

GENERAL PLAN & PROFILE

DESIGNED Steve E. Montague CHECKED Dennis Hawkins
DRAWN Carlos Haus EDM TECH. APPROVAL Steve E. Montague
APPROVAL Dave Jennings PROGRAM MANAGER

CADD SYSTEM AutoCAD Rel. 16.0 BOISE, IDAHO
CADD FILENAME 1678-100-333.dwg
FEBRUARY 4, 2003

1678-100-333

Specification #

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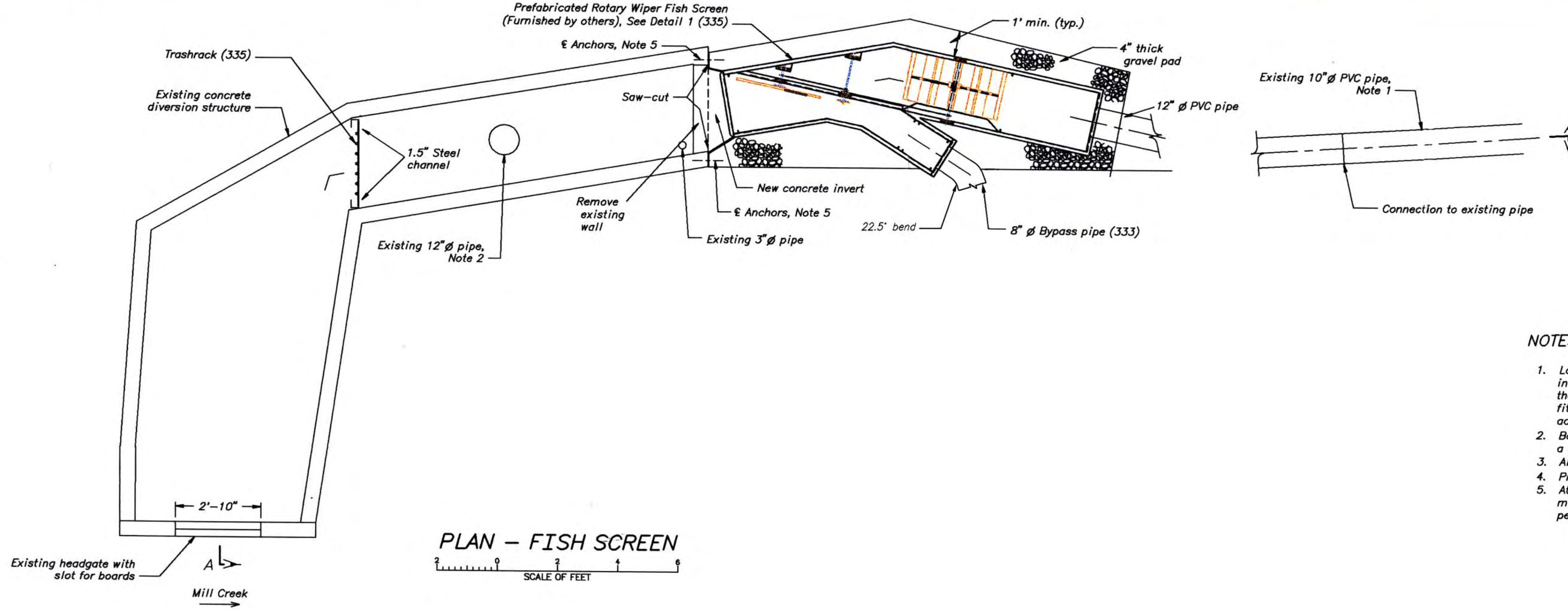
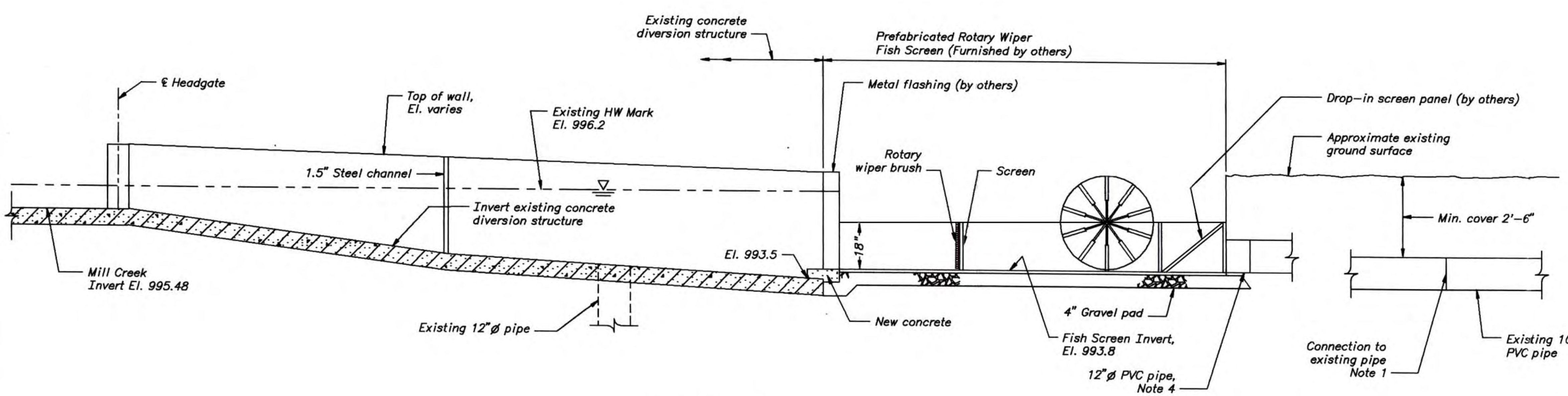


PLAN – FISH SCREEN

SCALE OF FEET

NOTES:

1. Location of connection to existing pipe to be determined in the field. Contractor to make change in alignment by the use of elbows, sweeps, or other direction–change fittings, or by longitudinal bending of the pipe within acceptable limits in accordance with AWWA Manual M23.
2. Backfill existing pipes with native material and cap with a 6" minimum concrete plug.
3. All elevations are relative elevations, see survey data.
4. Provide 12" to 10" reducer fitting.
5. Attach fish screen flashing to existing concrete with a minimum of 2 – Hilti Light duty anchors, or equal, per side.



SECTION A–A

REV NO		
1	2005–2–23 100– SEM	AS BUILT BY 109. REVISED HEIGHT OF FISH SCREEN. REVISED BYPASS.

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROJECT
WENATCHEE SUBBASIN, WASHINGTON

MILL CREEK DIVERSION MODIFICATIONS
FISH SCREEN
PLAN AND SECTION

DESIGNED Steve E. Montague — CHECKED Dennis Hawkins
DRAWN Carlos Hsue — EDM — TECH. APPROVAL Steve E. Montague
APPROVAL Dave Jennings, PROGRAM MANAGER

CADD SYSTEM AutoCAD Rel. 16.0 — CADD FILENAME 1678–100–334.dwg
BOISE, IDAHO — FEBRUARY 4, 2003 — 1678–100–334

Specification #

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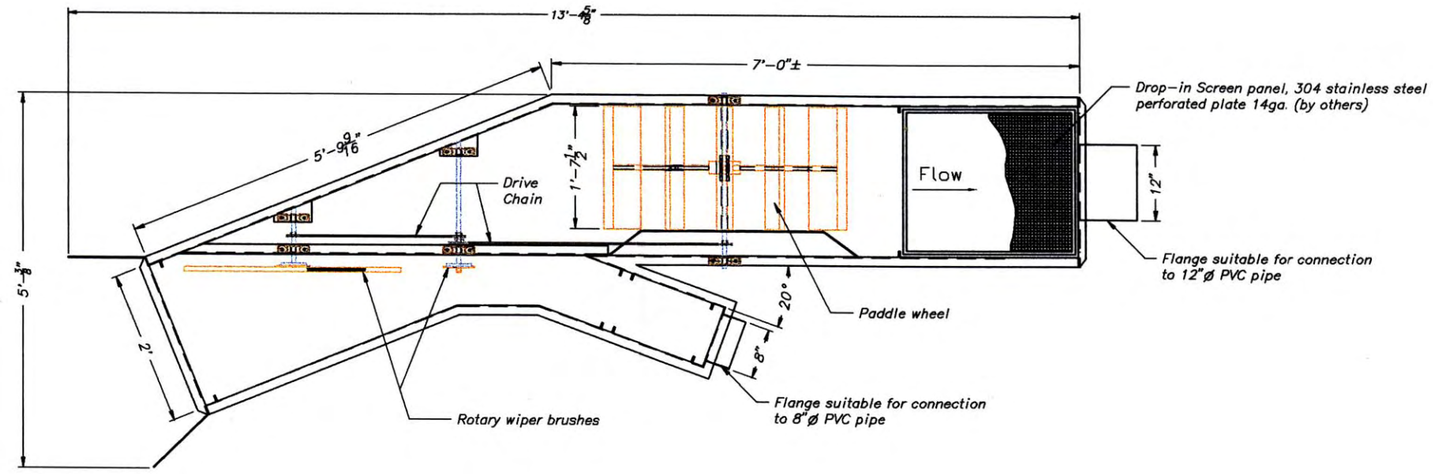
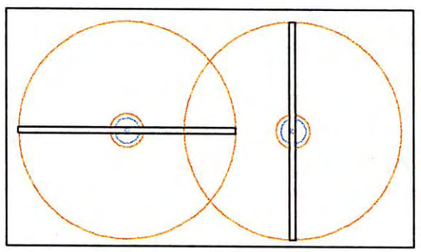
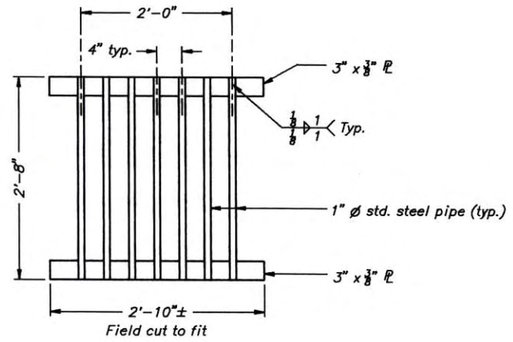


DETAIL 1 – FISH SCREEN *(Furnished by others)*

See WDFW std. dwg.



ELEVATION
SCREEN WITH BRUSHES



TRASHRACK
(1 req'd.)

SCALE OF FEET

REV. NO.		
1	2005-2-23 100-SEM	AS BUILT BY 109.

ALWAYS THINK SAFETY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

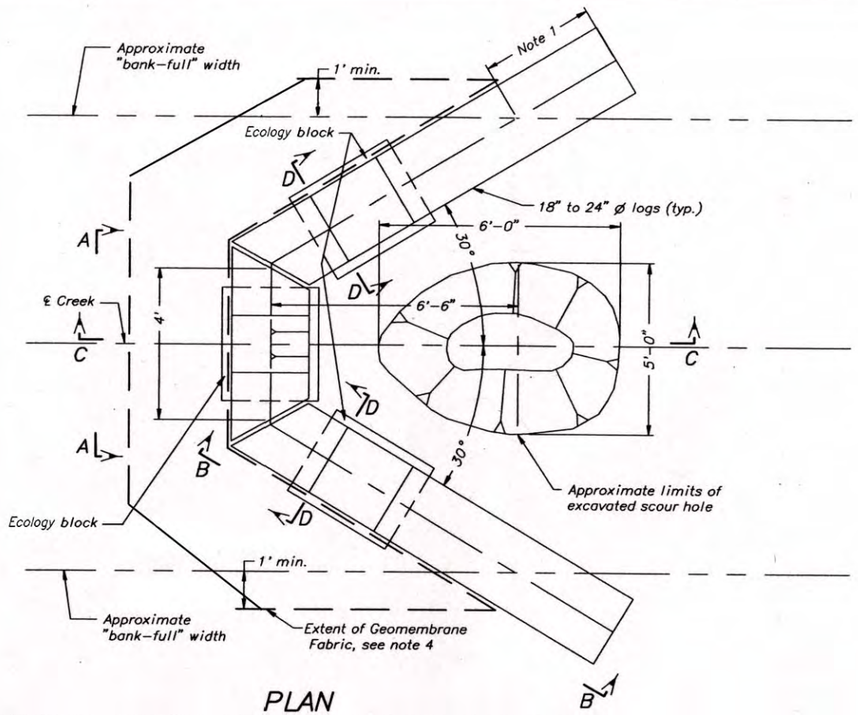
COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM
WENATCHEE SUBBASIN–WASHINGTON

MILL CREEK DIVERSION MODIFICATIONS
FISHSCREEN DETAIL

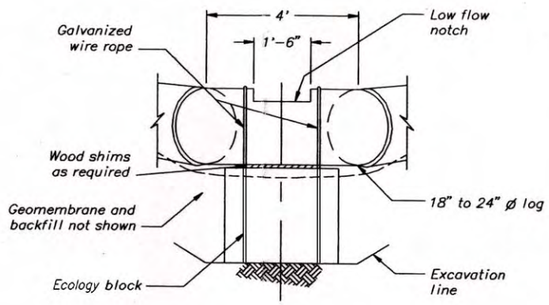
DESIGNED Steve E. Montague CHECKED Dennis Hawkins
DRAWN Carlos Haue EDM TECH. APPROVAL Steve E. Montague
APPROVAL Dave Jennings PROGRAM MANAGER

CADD SYSTEM AutoCAD Rel. 16.0 BOISE, IDAHO
CADD FILENAME 1678-100-335.DWG
MARCH 25, 2003
1678-100-335

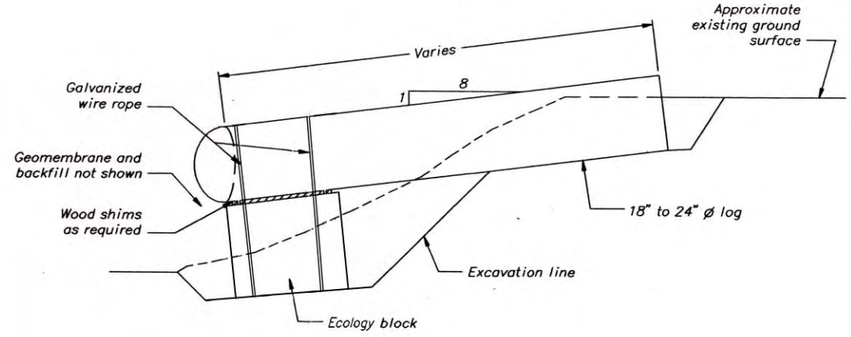
PLOTTED BY EMORGHORST MARCH 18, 2004 08:30



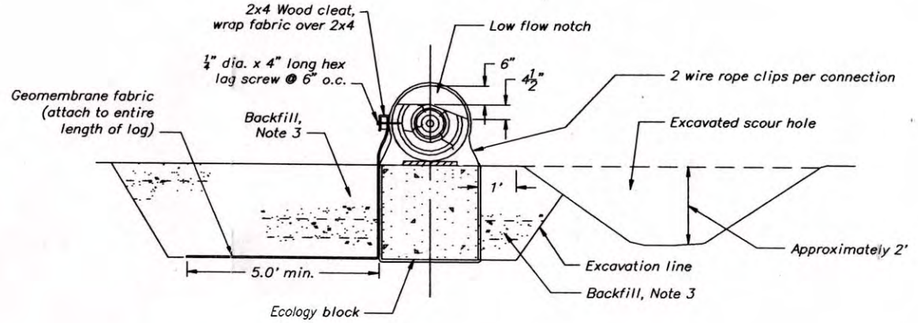
PLAN
TYPICAL CROSS-VANE LOG WEIR STRUCTURE
(6 Required)



SECTION A-A



SECTION B-B

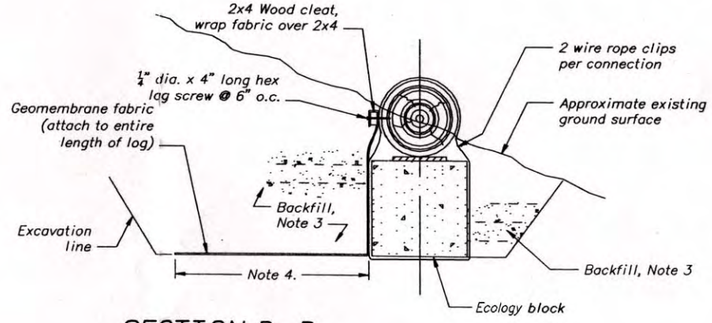


SECTION C-C

NOTES:

1. Extend log a minimum of 3 feet into bank. Total length of side logs to be determined in the field.
2. The three logs in each structure should be approximately the same diameter. Shim or adjust logs such that the tops of the three logs in each weir are flush.
3. Backfill with river alluvium to existing stream invert or to top of precuts block, whichever is greater.
4. Extend geomembrane fabric to approximately 1 foot minimum into bank.
5. For locations and elevations of log weirs, see (333).
6. Logs for construction of cross-vane log weirs will be furnished to the contractor.

TYPICAL ECOLOGY BLOCK
(18 Required)



SECTION D-D

2 0 2 4 6
SCALE OF FEET

REV NO		
1	2005-2-23 100-SEM	AS BUILT BY 109. REVISED CONCRETE BLOCKS AND WIRE ROPE. REVISED EXTENT OF GEOMEMBRANE FABRIC.

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WENATCHEE SUBBASIN - WASHINGTON

MILL CREEK DIVERSION MODIFICATIONS

CROSS-VANE LOG WEIR STRUCTURE
PLAN AND SECTIONS

DESIGNED Steve E. Montague CHECKED Dennis Hawkins
DRAWN Carlos Hawe EDM TECH. APPROVAL Steve E. Montague
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CADD SYSTEM AutoCAD Rel. 15.06
BOISE, IDAHO
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MARCH 18, 2003

1678-100-336

Specification #

PLOTTED BY: EMONROST