

# **Completion Report East Fork Salmon River EF/10 and EF/11 Irrigation Diversion Consolidation Project Upper Salmon Subbasin Salmon, Idaho**



**Prepared for:**  
Custer Soil and  
Water Conservation District  
Salmon, Idaho

**Prepared by:**  
U.S. Department of the Interior  
Bureau of Reclamation  
Pacific Northwest Region  
Snake River Area Office  
Salmon Field Office

**July 2007**

New EF-12 flume crossing (constructed after the EF-11 ditch was enlarged to accommodate the additional diverted flows for EF-10).  
(July 2007)

New EF-10/11 headgate and spillway structure, shown during relatively high spring runoff flows. (July 2007)

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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## Attachments

Attachment A: Construction Photographs

Attachment B: Final Design Drawings (including location map)



# 1. Introduction

Throughout the Salmon River subbasin, irrigation diversions have negatively affected salmonids by reducing instream water flows, creating migration barriers, and entrapping juvenile fish in the diversions as they migrate downstream. In 2003, two diversions in the East Fork (EF) Salmon River were consolidated into a single point of diversion with improved fish passage. The primary purpose of the EF-10 and EF-11 diversion consolidation was to reduce the impacts of the irrigation diversions during the irrigation season to anadromous adult and juvenile salmon and steelhead and resident fish species in the East Fork Salmon River.

The East Fork Salmon River provides habitat for several species of fish listed as either threatened or endangered under the Endangered Species Act (ESA), as well as resident fish. Section 7(a)(2) of the ESA requires that all Federal agencies consult with the National Oceanic and Atmospheric Administrative Fisheries Services (NOAA Fisheries), and the U.S. Fish and Wildlife Service (USFWS), to ensure that any action authorized, funded, or carried out by such agency will not likely jeopardize the continued existence of any endangered or threatened species, or result in adversely modifying their critical habitat. NOAA Fisheries oversees the implementation of the ESA for certain listed species including anadromous salmon and steelhead.

At the time of this project, there were 13 listed anadromous Evolutionarily Significant Units (ESU) within the Columbia River system. The upper Salmon subbasin ESUs include the Snake River steelhead and the Snake River spring/summer Chinook. Consultation with NOAA Fisheries was completed on these ESUs and a Biological Opinion (BiOp) was issued on December 21, 2000.<sup>1</sup> This consultation contained an Updated Proposed Action by the action agencies including a Tributary Habitat Program.<sup>2</sup>

The Bureau of Reclamation (Reclamation) implements the Tributary Habitat Program for the Salmon River subbasin, as set forth in the Updated Proposed Action, as a conservation measure to provide early actions assisting with recovery of the ESUs within the Columbia River. Within these conservation measures, Reclamation addresses limiting factors such as instream flow, barriers, channel morphology, and entrainment. For this program, Reclamation works with willing partners to provide technical assistance and logistical help with implementation of habitat projects leading to correction of tributary, spawning, and rearing deficiencies associated

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<sup>1</sup> Biological Opinion Reinitiation of Consultation on Operation of the Federal Columbia River Power System, including the Juvenile Fish Transportation Program, and 19 Bureau of Reclamation Projects in the Columbia Basin, National Marine Fisheries Service, Northwest Region, December 21, 2000.

<sup>2</sup> Final Updated Proposed Action for the FCRPS Biological Opinion Remand, U.S. Army Corps of Engineers, Bureau of Reclamation, and Bonneville Power Administration, November 24, 2004.

with these limiting factors. This project was completed as part of the Tributary Habitat Program.

## 1.1 Background

Irrigation diversions have long been identified as having potential for causing harm to resident and migratory fish. Irrigators in the upper Salmon subbasin typically use push-up diversion dams to raise water levels and direct water into irrigation canals or ditches. Push-up diversion dams are usually constructed from river gravels and cobbles that are pushed up across the stream channel. Water diverted from the river or creek channel is then conveyed via a canal and distributed to agricultural fields.

The two East Fork Salmon diversions contributed to fish passage problems such as migration impediment, and entrainment of fish in ditches. Each diversion also required entering the river channel with heavy equipment several times per year to maintain or rebuild the push-up dam. Both diversions lacked water measurement devices, and the headgates were in various stages of disrepair. The existing fish screens were relatively new and met NOAA Fisheries screening criteria.

Reclamation, the Idaho Department of Fish and Game (IDFG) Anadromous Fish Screen Shop (Screen Shop) in Salmon, and other local parties identified the EF-10 and EF-11 diversions on the East Fork Salmon River as having potential for consolidation. Discussions with the irrigators and landowners proved that they were willing to change their current method of operation and endorse a plan for consolidation. A permit to allow the change in the point of diversion for EF-10 was obtained from Idaho Department of Water Resources (IDWR).

## 1.2 Participation and Cooperation

Planning for the EF-10/11 consolidation project was initiated under the NOAA Fisheries Federal Columbia River Power System (FCRPS) 2004 BiOp and Tributary Habitat Program. Therefore, Reclamation assistance for this project was funded under the direction of the Snake River Area Office (SRAO) Endangered Species Act (ESA) Program, which provided coordination, environmental compliance, surveys, designs, inspection, and construction management services.

Funding for construction was provided by Bonneville Power Administration (BPA),<sup>3</sup> along with financial support for the Screen Shop's involvement in the project. Distribution of BPA funding and construction contract administration was provided by Custer Soil and Water Conservation Districts (Custer SWCD). Additional coordination and project review was provided by the Upper Salmon Model Watershed Program.

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<sup>3</sup> Contract title 2002-065-00 Eastfork Watershel Holistic Restoration, Contract # 00011232.

## **1.3 Environmental Compliance**

Reclamation staff in the Salmon Field Office provided local coordination assistance and completed the National Environmental Policy Act (NEPA) and Section 7 ESA compliance documents on behalf of BPA, Custer SWCD, and IDFG. A Biological Assessment was completed and submitted to NOAA Fisheries and USFWS. USFWS issued a Letter of Concurrence on July 7, 2003, and NOAA issued a Biological Opinion for the project on August 29, 2003.

Work in the river to replace the diversions and construct new headworks was authorized pursuant to the Clean Water Act (CWA) and the IDWR permit exemption. This exemption, referred to locally as the “irrigators exemption,” authorizes irrigators to perform maintenance on diversions and appurtenances without need for obtaining a permit from the Army Corps of Engineers (Corps) or State.

NOAA Fisheries required a fish biologist (either NOAA Fisheries or IDFG) on site during all instream work to monitor river conditions. Best Management Practices were followed during all phases of construction to minimize disturbance to the river channel.

## **1.4 Contract Specifications and Bidding**

Reclamation’s Pacific Northwest (PN) Region design office developed project drawings and specifications for construction of the consolidation project. Custer SWCD added the contract documents. Modifications for the fish screen metalwork were developed by the Screen Shop. The project was advertised for 2 weeks in the local newspapers in Salmon and Challis. A project walk-through was conducted prior to bidding, with seven local contractors. Two contractors bid on the job, and the project was awarded to Crist Construction, Challis, Idaho.

## **2. Project Description**

The project is located on the East Fork Salmon River in central Idaho, approximately 20 miles south of the town of Clayton, in Custer County (Drawing 1678-100-281). Both the EF-10 and EF-11 diversions are located on private land. The EF-10 diversion was located approximately 13 miles upstream from the mouth of the East Fork Salmon River, and the EF-11 was located approximately 0.9 miles further upstream. See Attachment A for project photographs and Attachment B for project drawings.

The primary purpose of the EF-10 and EF-11 diversion consolidation was to reduce the impacts of the irrigation diversions during the irrigation season to anadromous adult and juvenile salmon and steelhead and resident fish species in the East Fork Salmon River.

## 2.1 Construction

Crist Construction began construction of the EF-10/11 consolidation in July 2003 and completed the project in August 2003. Construction inspection and project management was provided by Reclamation. Custer SWCD provided all contract management. Close coordination between the irrigators, Custer SWCD, Reclamation, and the Screen Shop was necessary to ensure successful completion of the project.

The EF-10 push-up dam was abandoned and left for the river to reclaim. The diversion ditch was blocked off near the river by filling it with soil, but was left intact further downstream to connect with the EF-11 ditch and the continued delivery of water.

Improvements were made to the main EF-11 ditch to carry the EF-10 water, which would be diverted 0.9 miles further upstream than before, down to the old EF-10 ditch. New irrigation control structures were added at various locations along the EF-11 ditch to allow the irrigator to continue irrigating while also delivering a steady flow of water to the EF-10 ditch. A new ditch was constructed to catch runoff from the gravity irrigated EF-11 fields and deliver it to the EF-10 ditch

The existing EF-11 push-up dam was removed and replaced with a rock "A-weir" structure with improved fish passage. The EF-11 fish screen was modified to allow for additional water to pass through by raising the concrete walls and installing larger diameter screens. A ramp flume was installed in the EF-11 ditch to accurately measure the diverted flow.

Construction for EF-10/11 involved:

- Removing the old EF-11 push-up dam;
- Constructing a rock "A-weir" diversion dam with a steel core to divert both the EF-10 and EF-11 irrigation water;
- Replacing the wooden headgate at EF-11 with a steel headgate at the same location;
- Removing the drum screens and all metalwork from the existing EF-11 fish screen, raising the concrete walls 8 inches, and installing larger diameter drums to handle the additional flow being diverted;
- Installing an additional 30-inch diameter corrugated metal pipe (cmp) below an access road over the EF-11 ditch;
- Installation of a steel ramp flume to measure the water being diverted;
- Enlargement of the EF-11 ditch for approximately 0.9 miles down to the EF-10 ditch;
- Replacement of a 24-inch diameter flume to carry water diverted upstream at the EF-12 diversion over the EF-11 ditch;

- Installation of multiple irrigation control structures along the EF-11 ditch to allow for coordinated water delivery to the EF-10 ditch;
- Excavation of a new ditch at the lower end of the EF-11 field to catch irrigation runoff and deliver to the EF-10 ditch;
- Blocking off the EF-10 ditch near the river. The old push-up diversion was left for the river to reclaim;
- Removal of the EF-10 fish-screen. The Screen Shop salvaged the metalwork for use elsewhere;
- Re-contouring and re-vegetating all disturbed areas. Willows were planted along the river bank near the new diversion structure.

## 2.2 Design Changes

Several items were changed after the final specifications were printed. Some of the items were merely typographical corrections or clarifications that were identified before the project went to bid. Some of these items were noticed by the designers, and some were the result of questions asked by the contractors either during or following the pre-bid tour. These items were all relatively minor, and included:

- Changing the estimated volume of rock required for the diversion structure;
- Clarifying the size of the new culvert under the access road;
- Clarifying the thickness of the steel plate used in the rock "A-weir;"
- Changing the height of the steel plate to a uniform 4 feet along the left leg of the A-weir, and to a uniform 6 feet within the core of the structure for ease of construction;
- Changing the diameter of the pvc pipe from 16 inches to a more standard 18 inches;
- Clarifying the type of irrigation control structure specified in one of the drawings.

There were also three change orders processed during the project to allow the project to accommodate on-site conditions, and irrigator or designer preferences. These changes included:

- Adding steel plate along the right leg of the A-weir to increase the structural integrity of the structure;
- Installing three additional irrigation check structures in the EF-11 ditch to better accommodate the irrigation of the EF-11 field while maintaining the EF-10 diversion flow;
- Installing a new pipe for the EF-12 flume crossing, instead of re-using the old pipe, which was in worse condition than originally determined;

- Eliminating the installation of 620 feet of 18-inch diameter pipe along one stretch of the EF-11 ditch, and enlarging the ditch instead.

## 2.3 Site Monitoring and Long-Term Effectiveness

Multiple trips were made to the EF-10/11 project site since the completion of the project. Some of the items noted during these visits are described below.

- The river has been slower than expected in removing the old EF-10 diversion dam from the river channel. Future consolidation projects may need to include removal of the old diversion dam as part of the project.
- The river has frozen over at the diversion structure during the cold winter months, resulting in an elevated water surface and minor localized flooding. This has not been a major issue due to the remote location and the configuration of the river banks around the structure. Placing the headgate closer to the diversion structure would confine the icing and flooding problems to the river channel and out of the diversion channel.
- Revegetation at the site was generally successful. Approximately half of the willows planted along the right bank of the river are still alive. The access route used during construction has recovered well, as have the staging areas.
- During the first 2 years of operation, the structure was extremely stable with almost no noticeable rock movement. However, during the spring runoff in 2006, large amounts of gravel were deposited upstream of the structure. The irrigator was forced to enter the river to move some of this gravel to allow water to enter the diversion channel. Several large cottonwood trees were left hanging on the structure. Some of the large rocks around the trees moved due to the resulting change in hydraulics. These rocks will need to be replaced to ensure the long-term stability of the structure.
- The irrigator has been able to adapt to the new point of diversion and method of delivery for the EF-10 irrigation water with no negative impacts to production.
- The new turnout and control structures along the EF-11 ditch are working well. The irrigator had to place rock riprap on the downstream side of several structures to keep them from undercutting and washing out.
- The river bottom downstream of the drop structure appears to have downgraded since the completion of the project, resulting in a larger drop across the A-wier. This may need to be stabilized in the future to ensure that fish can easily pass over the diversion structure.

Additionally, Custer SWCD and the Model Watershed office have completed a Monitoring Report<sup>4</sup> for BPA, which details the effects of construction and completion of the project .

### **3. Conclusions**

The EF-10/11 diversion consolidation was a very successful project. The EF-10 push-up dam diversion structure was eliminated from the river, consequently removing the need to enter the river several times each year with heavy equipment to rebuild and maintain it. The irrigators have adapted to the new method of diverting and delivering the water and have reported no major problems with the consolidation. Actual diversions of water from the river are slightly less with the consolidation than with the two separate diversions, due to the new ditch which captures EF-11 irrigation runoff and delivers it to the EF-10 ditch. The new A-weir rock dam is relatively stable, although some rock was moved during the high water in the spring of 2006. Instead of entering the river several times each season to build and maintain the push-up dam, the irrigator entered the river one time since the project was completed.

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<sup>4</sup> Habitat Improvement Program Biological Opinion Implementation Monitoring Report, Gini Canal Flume, BPA Fish & Wildlife Project # 1994-017-00, July 19, 2005



**Completion Report  
East Fork Salmon River EF/10 and EF/11  
Irrigation Diversion Consolidation Project**

**Upper Salmon Subbasin  
Salmon, Idaho**

**Attachment A**

**Construction Photographs**

**Photographs by the Bureau of Reclamation  
Pacific Northwest Region Design Group  
Boise, Idaho  
Salmon Field Office  
Salmon, Idaho  
and  
Idaho Fish and Game Screen Shop  
Salmon, Idaho**





**Photograph 1. EF-10 push-up diversion dam, with the diverted water in the foreground. This structure was abandoned, and the EF-10 ditch blocked off.**



**Photograph 2. EF-11 push-up diversion dam. This structure was removed and replaced with a rock "A-weir," with a steel plate core.**



**Photograph 3. EF-10/11 consolidated A-weir diversion structure. Photo shows the fish passage over the two drops during low summer flows in the East Fork Salmon River.**



**Photograph 4. EF-10/11 consolidated A-weir diversion structure. Water diverted for irrigation is in the foreground, with the East Fork Salmon River in the background.**



**Photograph 5. EF-12 flume, which crossed over the EF-11 ditch. This flume was replaced after the EF-11 ditch was enlarged to accommodate the additional diverted flows for EF-10.**



**Photograph 6. New EF-12 flume crossing.**



**Photograph 7. Control structures on the EF-11 ditch. These structures were removed and replaced when the EF-11 ditch was enlarged.**



**Photograph 8. New control structures on the EF-11 ditch.**



**Photograph 9. A new ditch was constructed at the lower end of the EF-11 irrigated fields to collect the irrigation runoff and deliver it to the EF-10 ditch.**



**Photograph 10. Concrete walls at the EF-11 fish screen were raised 8 inches, and larger diameter drum screens installed to accommodate the additional EF-10 irrigation water.**



**Photograph 11. EF-11 headgate and spillway structure. The wooden headgate was replaced, but the rest of the structure was left intact.**



**Photograph 12. The new EF-10/11 headgate and spillway structure, shown during relatively high spring runoff flows. The new diversion structure tends to divert excessive flows down the diversion to this point, and the excess water is causing some erosion in the channel back to the river.**



**Photograph 13. Steel plate was installed in the core of the rock A-weir. The steel plate was typically 4 feet tall in the legs of the structure, and 6 foot tall around the center where the two drops occur.**



**Photograph 14. Consolidated EF-10/11 diversion structure shown at the tail end of spring runoff in 2005. Only minor amounts of woody debris and gravel were deposited on or around the structure during the first 2 years of operation.**



**Photograph 15. Cold temperatures during the winter of 2004 resulted in the the river freezing over at the diversion structure. Water levels were raised approximately 2 feet before the river cleared a channel below the ice. No damage was done to the structure.**



**Photograph 16. The ice jam at the river also resulted in higher water levels in the diversion ditch upstream of the headgate and spillway. Water was actually flowing over the top of the ditch bank and concrete structures back to the river until the river dropped.**



**Photograph 17. High water during the spring of 2006 deposited several large cottonwood trees and a large amount of gravel on the diversion structure. The two drops are just visible behind one of the trees, noted by the white arrow. The irrigator was forced to remove some of the gravel to clear the diversion ditch.**



**Photograph 18. River flows directed by the cottonwood trees resulted in some of the rock moving away from the downstream side of the steel plate. This rock will need to be replaced.**



**Attachment B**  
**Final Design Drawings (includes location map)**

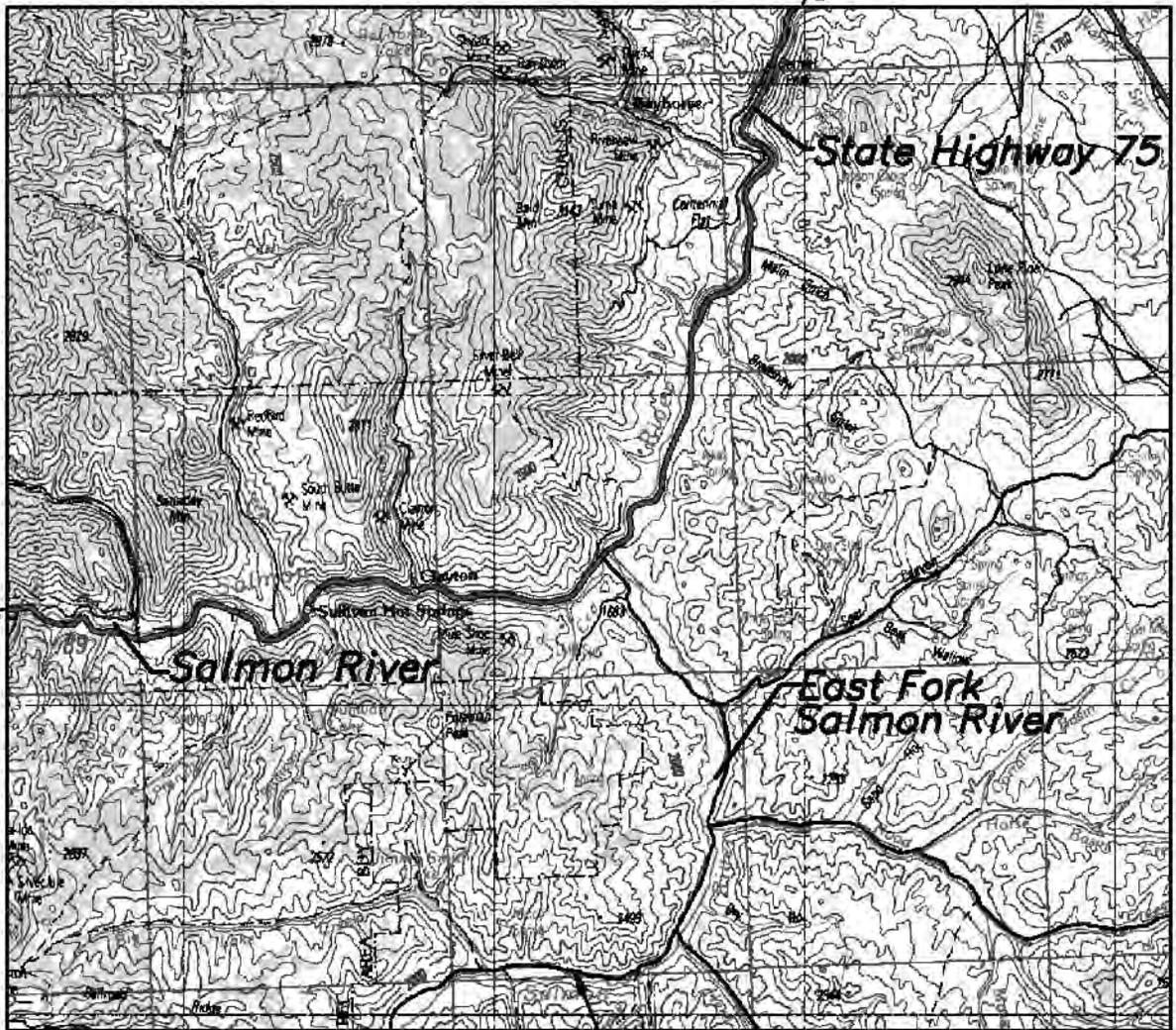


Final Design Drawings East Fork Salmon River EF/10 & EF/11 Consolidation

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1678-100-281	Location Map
1678-100-282	Rock Weir Plan and Sections
1678-100-283	Site Development Plan
1678-100-284	Boulder Weir – Plan
1678-100-285	Boulder Weir - Plan and Sections
1678-100-286	Boulder Weir - Typical Revegetation Sections
1678-100-287	Headgate Modifications – Pan & Elevation
1678-100-288	EF-11 Fishscreen Modification – Plans & Section
1678-100-289	22” Pipe Abutment & Check Gates Plan, Details & Sections
1678-100-298	Measurement Flume – Plan, Details, & Sections





Project Area

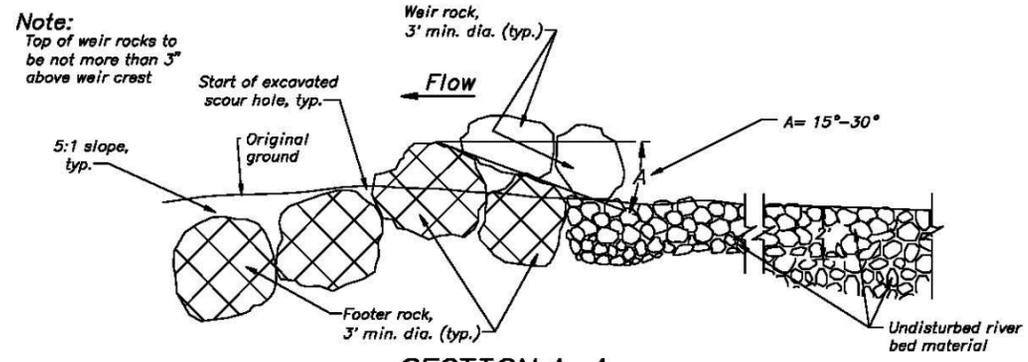


Key Map

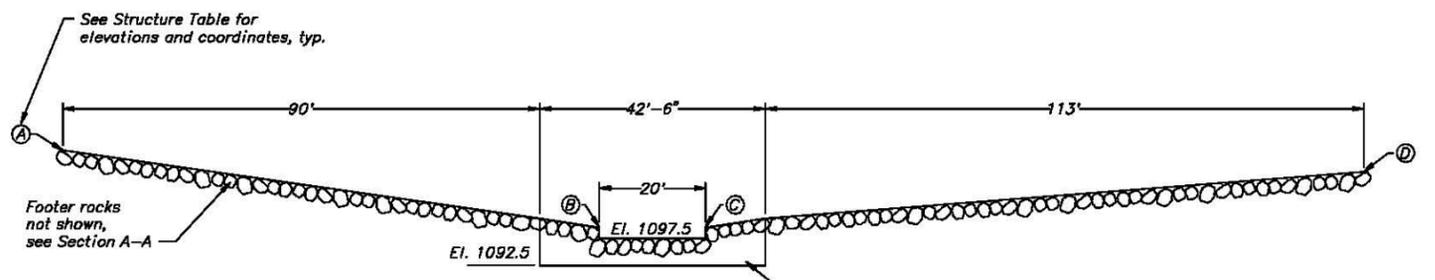
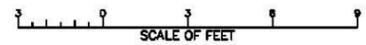
 <b>ALWAYS THINK SAFETY</b>	
<small>UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION</small>	
<b>FORPS HABITAT IMPROVEMENT PROGRAM</b> <b>SALMON RIVER BASIN</b> <b>EF 10 &amp; 11 DIVERSION IMPROVEMENTS PROJECT</b> <b>LOCATION MAP</b>	
DESIGNED <u>Dennis Hawkins</u>	CHECKED <u>Brian Hamilton</u>
DRAWN <u>G. Hoop</u>	TECH APPROVAL <u>Dennis Hawkins</u>
APPROVAL <u>Dave Jennings</u>	
<small>2024 REVISED PROGRAM NUMBER</small>	
<small>COORD SYSTEM NAD 83 - UTM BOISE 18000</small>	<small>COORD SYSTEM NAD 83 - UTM 5 JUNE 2003 1678-100-281</small>

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GPO

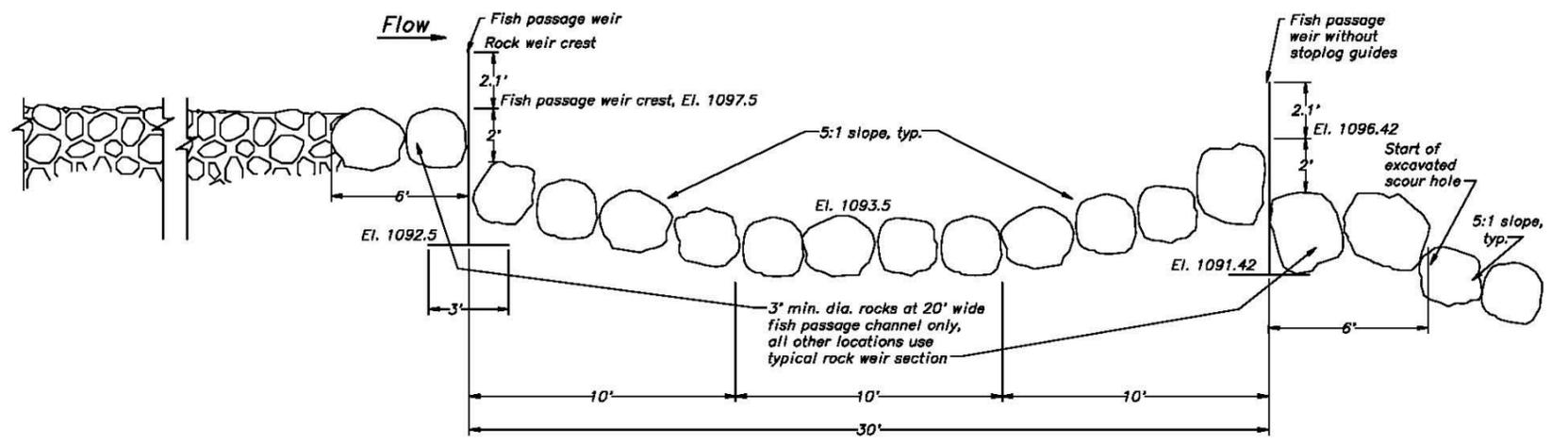




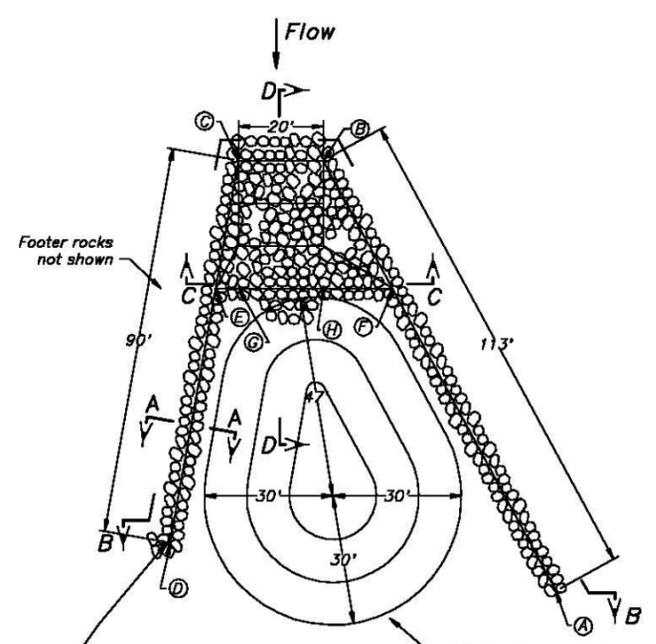
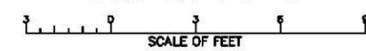
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(TYPICAL RIVER CONTROL STRUCTURE SECTION)**



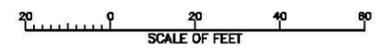
**SECTION B-B**



**SECTION D-D**

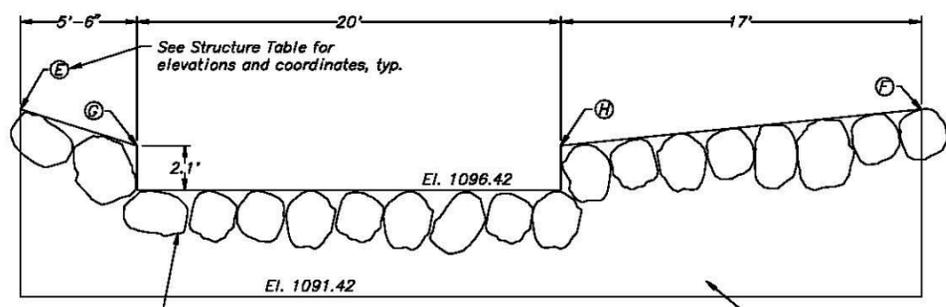


**PLAN-TYPICAL RIVER CONTROL STRUCTURE**

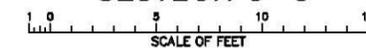


Elev.	
A	1100.00
B	1099.60
C	1099.60
D	1104.00
E	1101.07
F	1099.72
G	1098.52
H	1098.52

ROCK WEIR GRADATIONS	
%	SIZE (in.)
25	24 - 30
25	18 - 24
25	15 - 18
25	8 - 18



**SECTION C-C**



**⊕ ALWAYS THINK SAFETY**

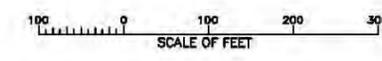
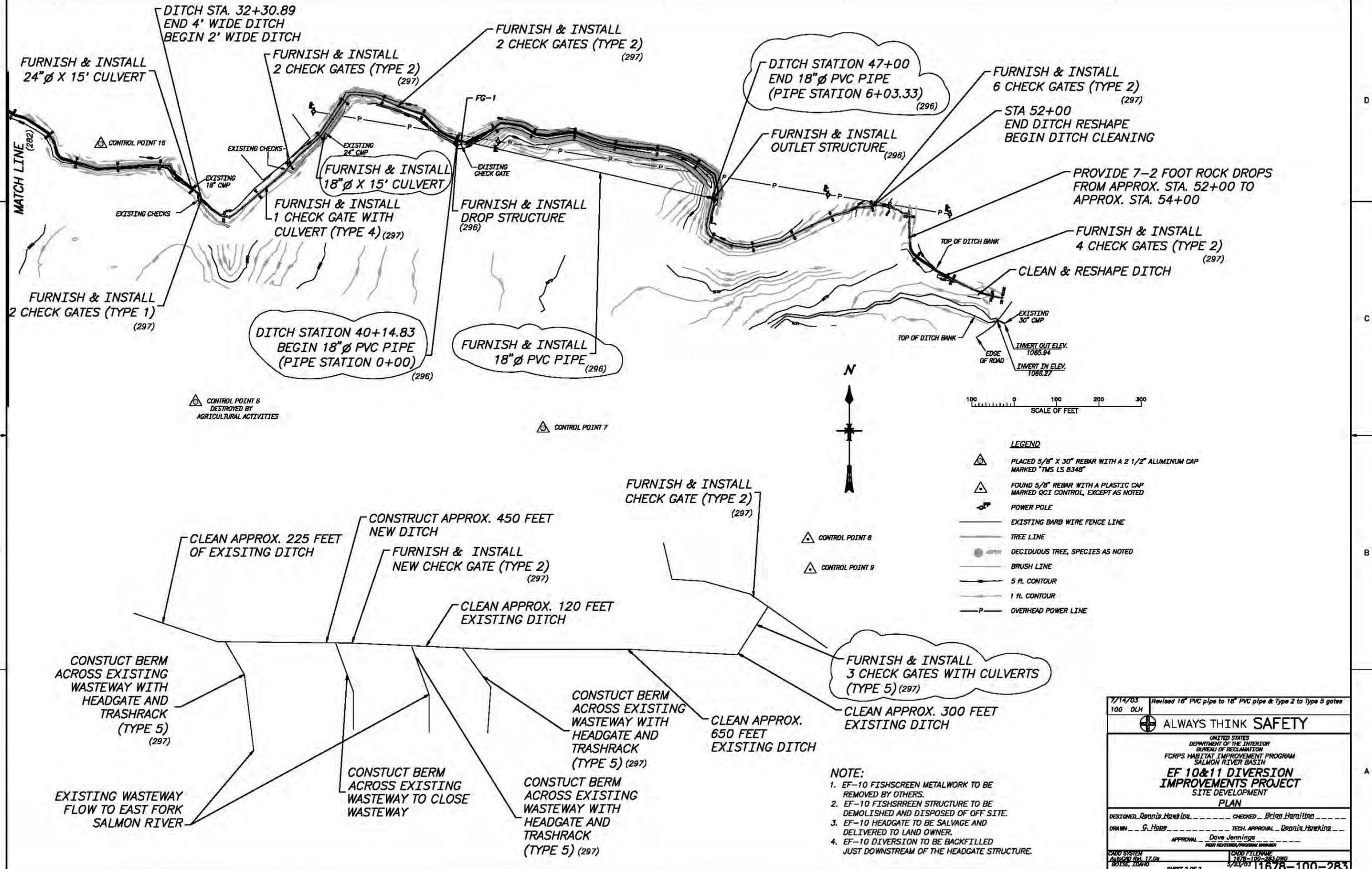
UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
FCRPS HABITAT IMPROVEMENT PROGRAM  
**SALMON RIVER BASIN**  
EF 10 & 11 DIVERSION IMPROVEMENTS PROJECT  
ROCK WEIR  
**PLAN AND SECTIONS**

DESIGNED \_\_\_\_\_ CHECKED \_\_\_\_\_  
DRAWN - EDM \_\_\_\_\_ TECH. APPROVAL \_\_\_\_\_  
PROGRAM MANAGER \_\_\_\_\_

CADD SYSTEM: AutoCAD Rev. 17.0a  
CADD PLOTTER: HP DesignJet 1700  
BOISE, IDAHO 83725-0001 30 MAY 2005

1678-100-282

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MAY 15, 2007 15:34  
PLOTTED BY  
GROPE

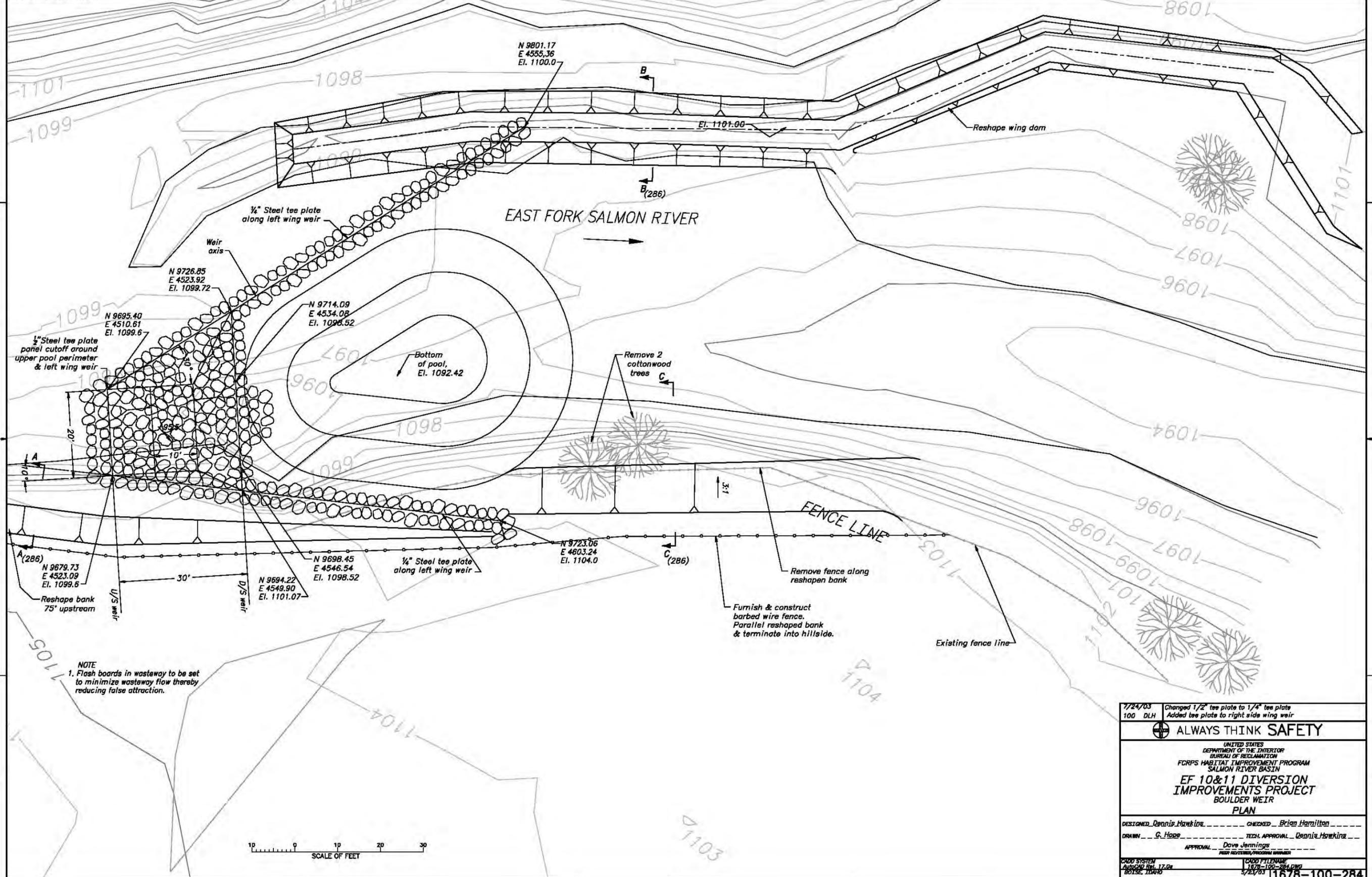


- LEGEND**
- PLACED 5/8" X 30" REBAR WITH A 2 1/2" ALUMINUM CAP MARKED "TMS LS 8348"
  - FOUND 5/8" REBAR WITH A PLASTIC CAP MARKED QCI CONTROL, EXCEPT AS NOTED
  - POWER POLE
  - EXISTING BARB WIRE FENCE LINE
  - TREE LINE
  - ASPEN DECIDUOUS TREE, SPECIES AS NOTED
  - BRUSH LINE
  - 5 ft. CONTOUR
  - 1 ft. CONTOUR
  - OVERHEAD POWER LINE

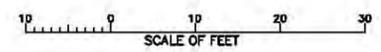
- NOTE:**
1. EF-10 FISHSCREEN METALWORK TO BE REMOVED BY OTHERS.
  2. EF-10 FISHSCREEN STRUCTURE TO BE DEMOLISHED AND DISPOSED OF OFF SITE.
  3. EF-10 HEADGATE TO BE SALVAGE AND DELIVERED TO LAND OWNER.
  4. EF-10 DIVERSION TO BE BACKFILLED JUST DOWNSTREAM OF THE HEADGATE STRUCTURE.

7/14/03 100 DLH	Revised 18" PVC pipe to 18" PVC pipe & Type 2 to Type 5 gates
<b>ALWAYS THINK SAFETY</b>	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION CORPS HABITAT IMPROVEMENT PROGRAM SALMON RIVER BASIN <b>EF 10&amp;11 DIVERSION                  IMPROVEMENTS PROJECT</b> SITE DEVELOPMENT <b>PLAN</b>	
DESIGNED: <u>Deonir Hawkins</u>	CHECKED: <u>Brian Hamilton</u>
DRAWN: <u>G. Hoop</u>	TECH. APPROVAL: <u>Deonir Hawkins</u>
APPROVAL: <u>Dave Jennings</u>	
FISH REVEALMENT PROGRAM NUMBER	
CADD SYSTEM LAUNCH: <u>17.08</u> BOYSE: <u>TAKU</u>	CADD PLOTNAME 1678-100-283.DWG 5/22/03
SHEET 2 OF 2	
SPECIFICATION # 1678-100-283	

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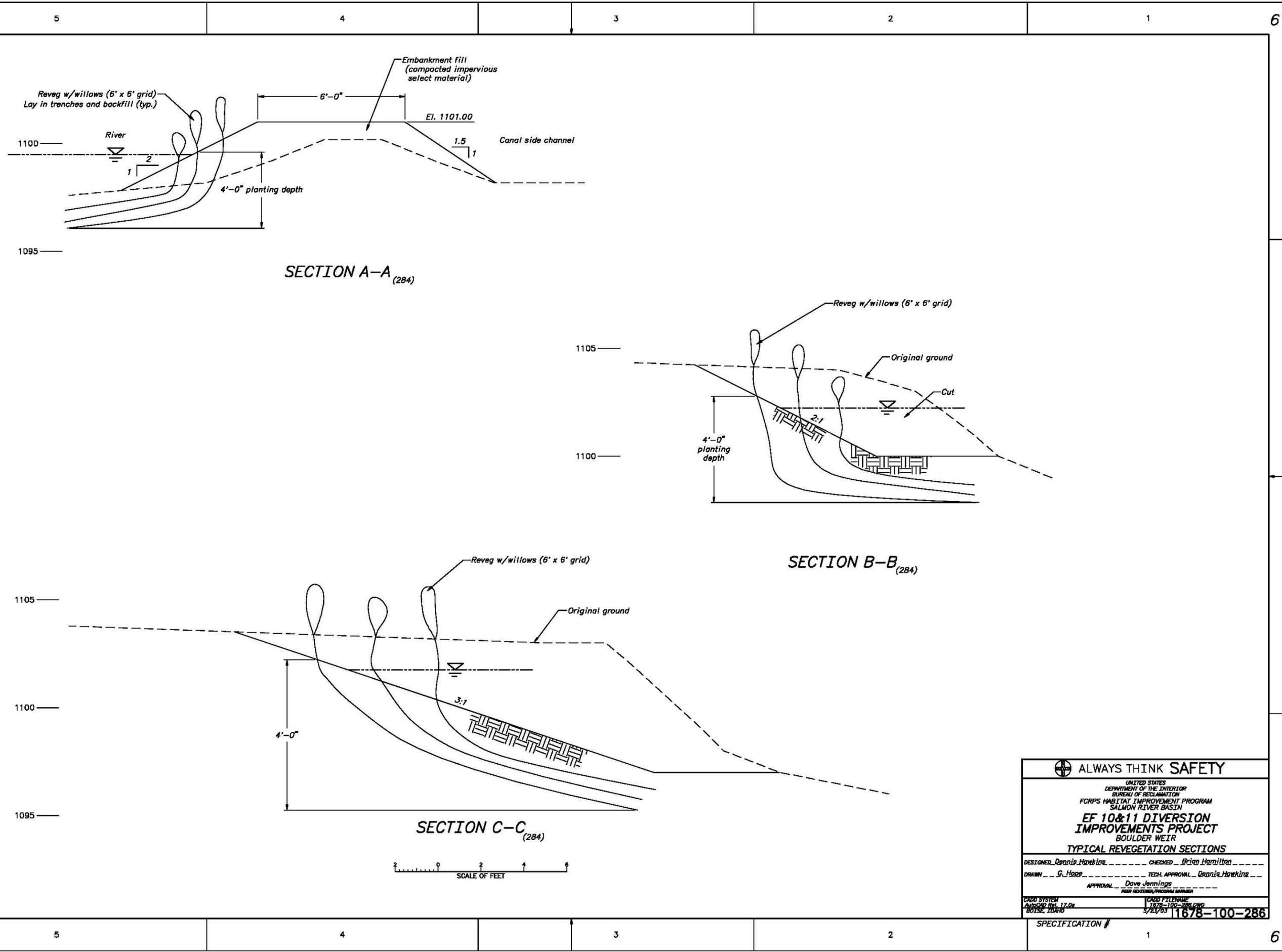
NOTE  
 1. Flash boards in wasteway to be set to minimize wasteway flow thereby reducing false attraction.



7/24/03 100 DLH	Changed 1/2" tee plate to 1/4" tee plate Added tee plate to right side wing weir
<b>ALWAYS THINK SAFETY</b>	
UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION CORPS HABITAT IMPROVEMENT PROGRAM SALMON RIVER BASIN	
<b>EF 10&amp;11 DIVERSION          IMPROVEMENTS PROJECT          BOULDER WEIR          PLAN</b>	
DESIGNED: <u>Deonir Hawkins</u>	CHECKED: <u>Brian Hamilton</u>
DRAWN: <u>G. Hoad</u>	TECH. APPROVAL: <u>Deonir Hawkins</u>
APPROVAL: <u>Dave Jennings</u>	
<small>PERM REVIEWER, PROGRAM MANAGER</small>	
<small>CADD SYSTEM          AUTOCAD REV. 17.0a          BOYSE, IDAHO</small>	<small>CADD FILENAME          1678-100-284.DWG          5/22/03</small>
SPECIFICATION # <b>1678-100-284</b>	

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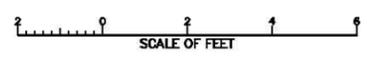




SECTION A-A (284)

SECTION B-B (284)

SECTION C-C (284)



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UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
FORPS HABITAT IMPROVEMENT PROGRAM  
SALMON RIVER BASIN

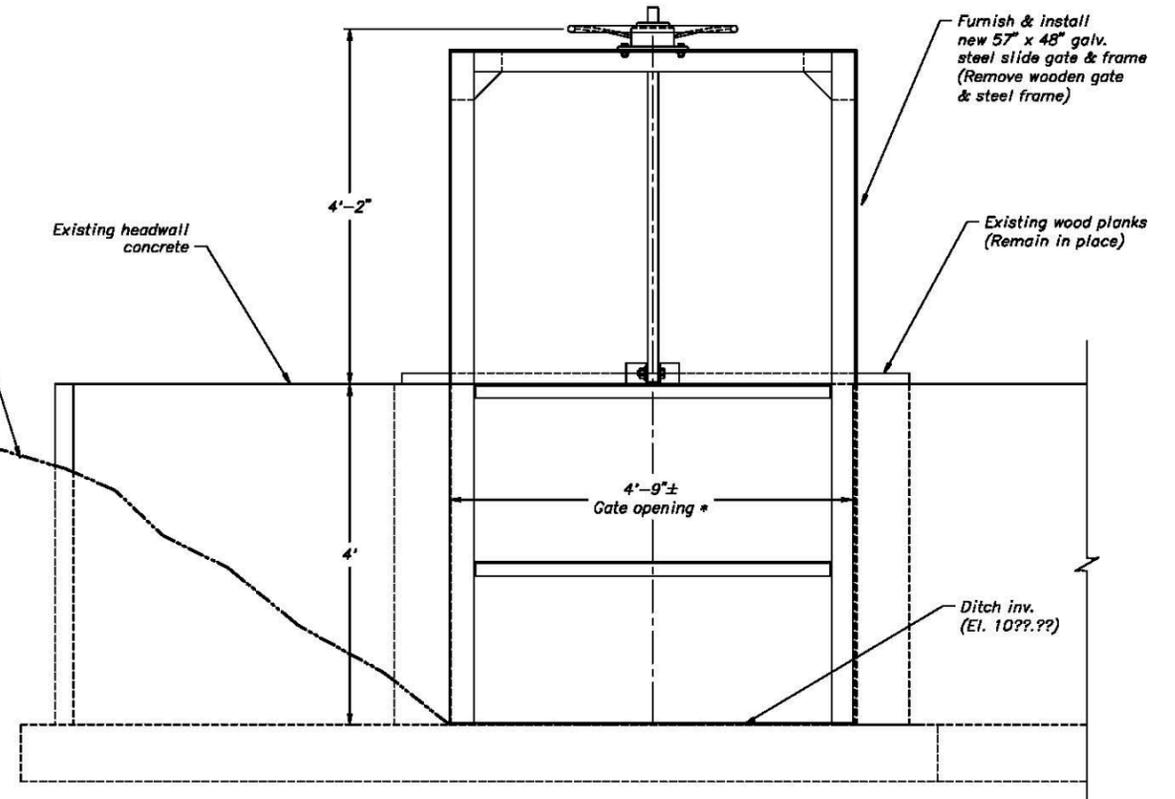
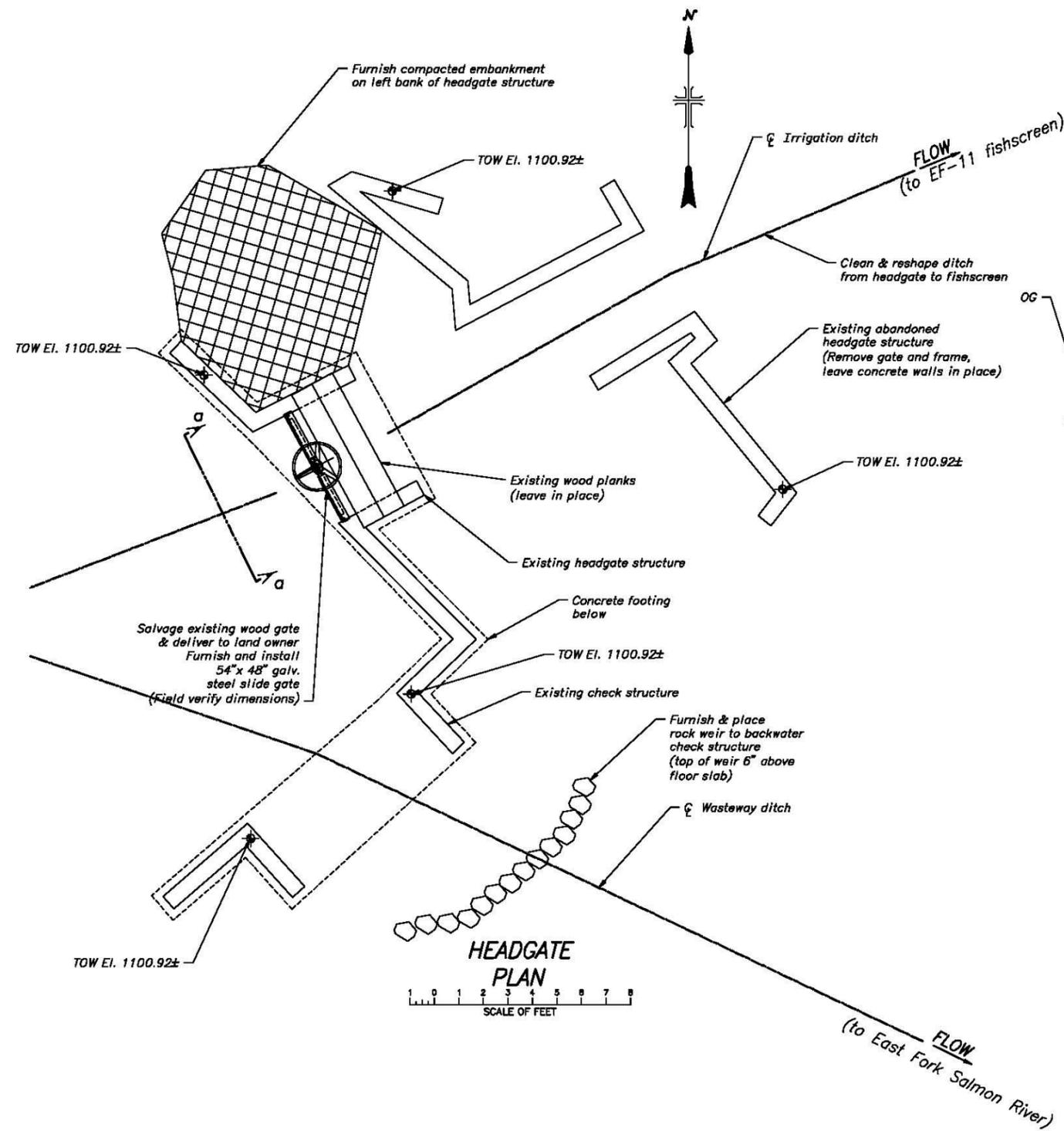
**EF 10&11 DIVERSION  
IMPROVEMENTS PROJECT  
BOULDER WEIR  
TYPICAL REVEGETATION SECTIONS**

DESIGNED Deoniz Hawkins CHECKED Brian Hamilton  
DRAWN G. Hoad TECH. APPROVAL Deoniz Hawkins  
APPROVAL Dave Jennings  
RIVER REVEGETATION PROGRAM MANAGER

CADD SYSTEM: AutoCAD Rev. 17.0a  
CADD FILENAME: 1678-100-286.DWG  
DATE PLOTTED: 5/22/07

1678-100-286

DATE AND TIME PLOTTED:  
MAY 15, 2007 15:48  
PLOTTED BY:  
GHOPE



**NOTE:**  
 \* Field verify

DATE AND TIME PLOTTED  
 MAY 13, 2007 15:50  
 PLOTTED BY  
 GROPE

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UNITED STATES  
 DEPARTMENT OF THE INTERIOR  
 BUREAU OF RECLAMATION  
 FORPS HABITAT IMPROVEMENT PROGRAM  
 SALMON RIVER BASIN

**EF 10&11 DIVERSION  
 IMPROVEMENTS PROJECT  
 HEADGATE MODIFICATIONS  
 PLAN & ELEVATION**

DESIGNED: Debris Hawkins CHECKED: Brian Hamilton  
 DRAWN: G. Hoop TECH. APPROVAL: Debris Hawkins  
 APPROVAL: Dave Jennings  
PERM REVIEWER, PROGRAM MANAGER

CADD SYSTEM: AutoCAD Rev. 17.0a CADD FILENAME: 1678-100-287.DWG  
 BOYSE: 10/10 5/22/07 1678-100-287

SPECIFICATION #

D

C

B

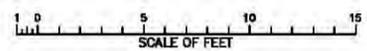
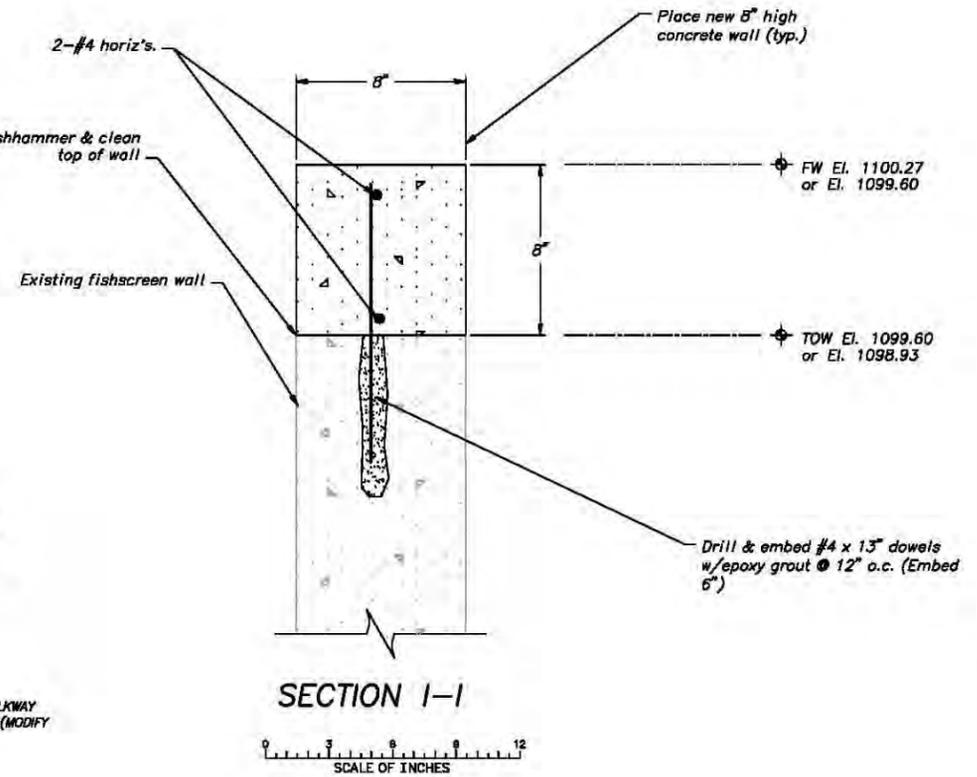
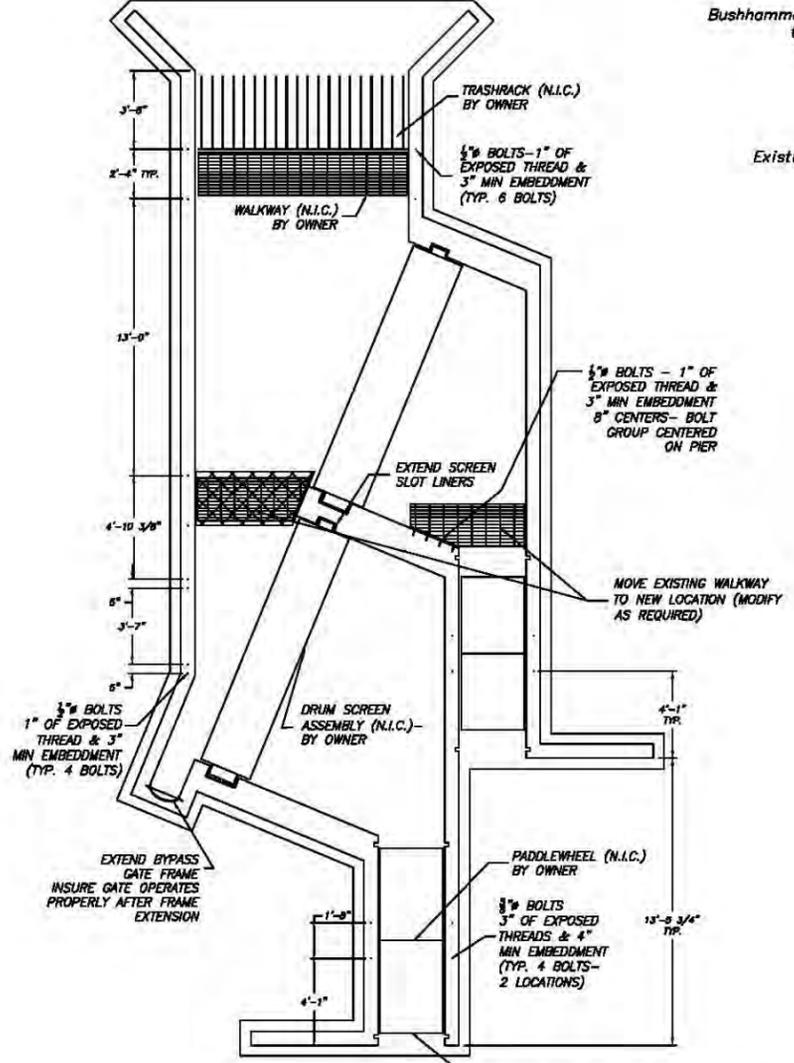
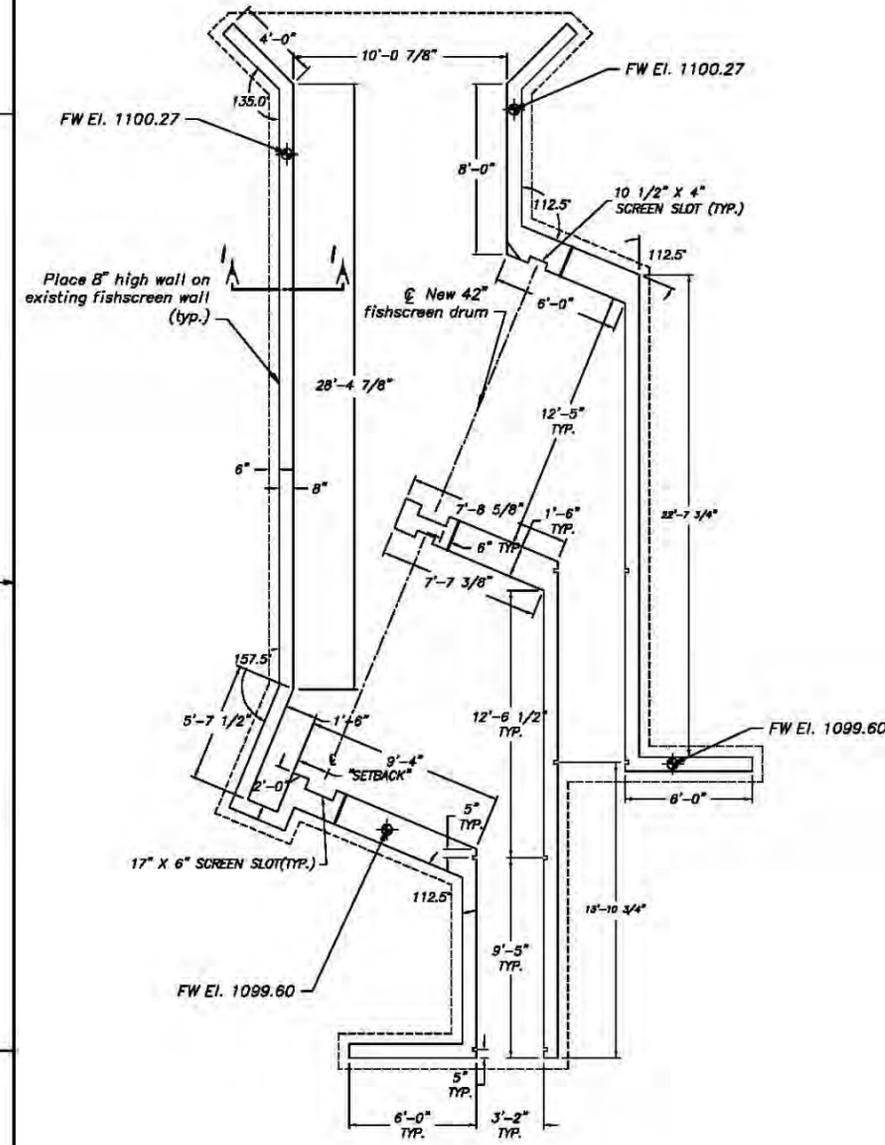
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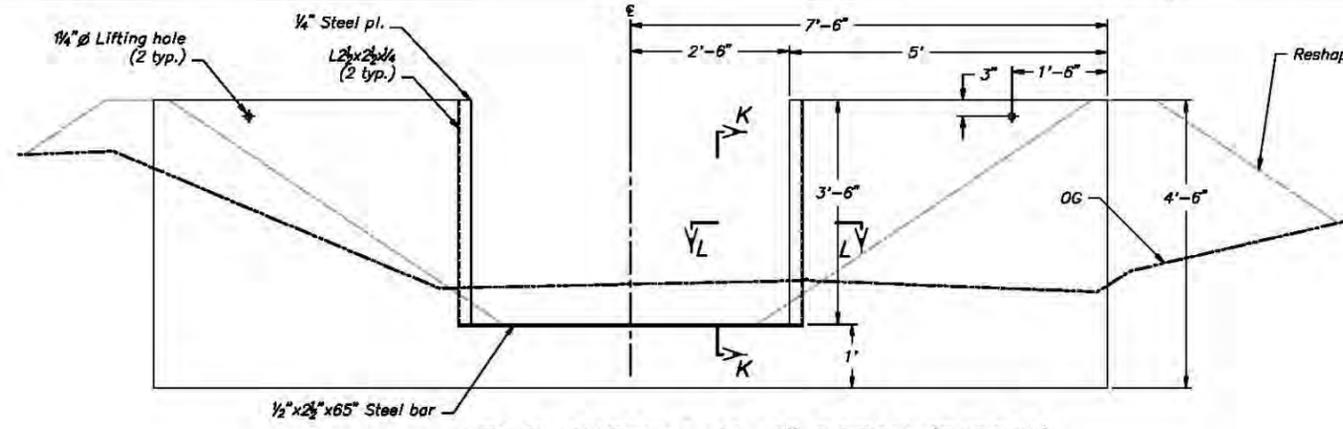
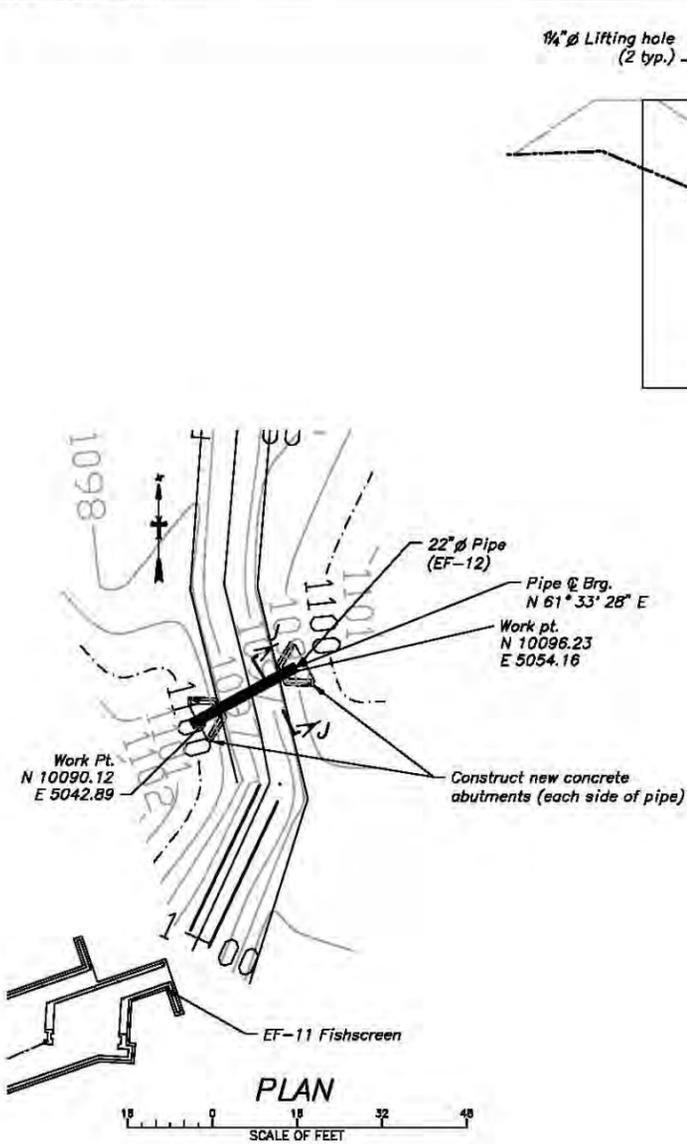
UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
FCRPS HABITAT IMPROVEMENT PROGRAM  
SALMON RIVER BASIN

**EF 10&11 DIVERSION  
IMPROVEMENTS PROJECT  
EF-11 FISHSCREEN MODIFICATION  
PLANS & SECTION**

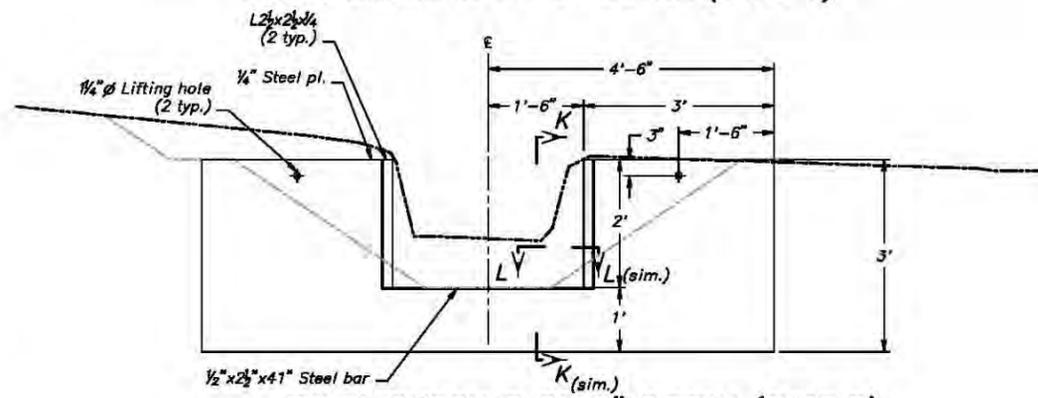
DESIGNED Darwin Hawkins CHECKED Brian Barillion  
DRAWN G. Hagg TECH. APPROVAL Darwin Hawkins  
APPROVAL Dave Jennings  
FIELD REVIEWER/PROGRAM MANAGER

CADD SYSTEM: AutoCAD 2017  
DATE: 5/23/03  
PROJECT NUMBER: 1678-100-288  
DRAWING NUMBER: 1678-100-288

DATE AND TIME PLOTTED  
MAY 15 2007 15:52  
PLOTTED BY  
GROPE

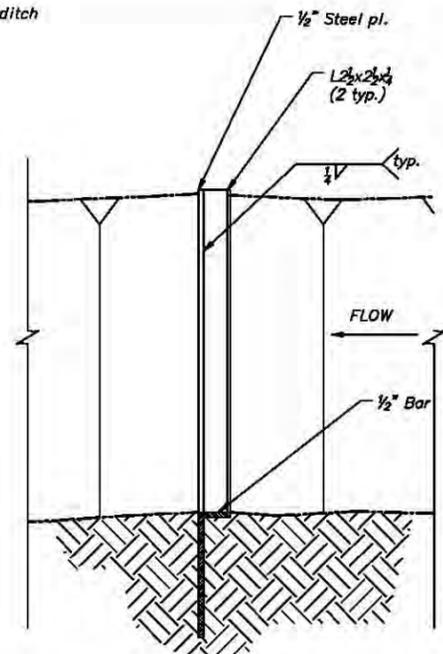


STEEL CHECK @ 4'-0" DITCH (TYPE 1)

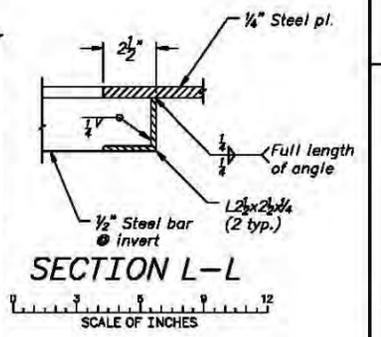


STEEL CHECK @ 2'-0" DITCH (TYPE 2)

NOTE:  
Stoplog boards not shown.

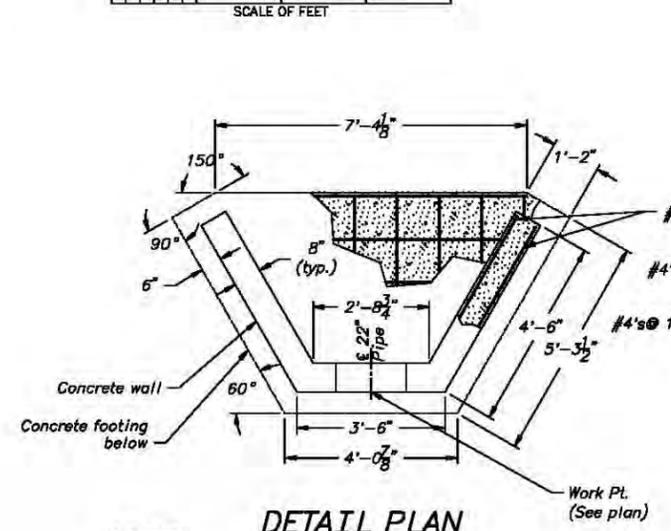


SECTION K-K



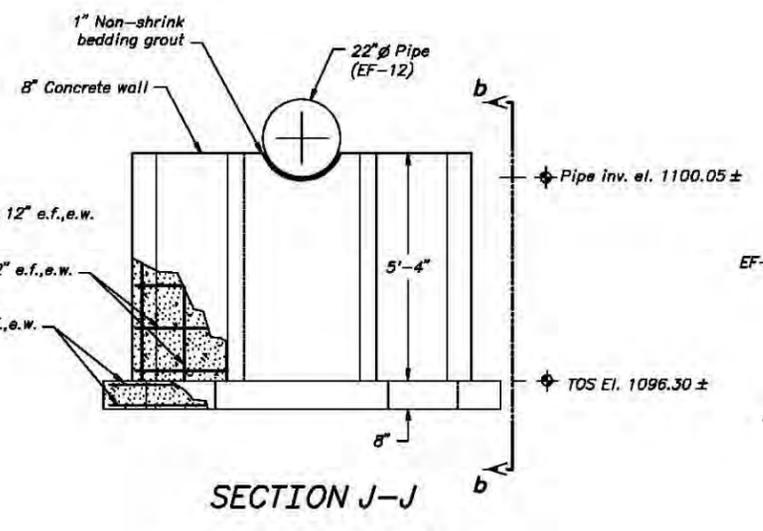
SECTION L-L

NOTE:  
Contractor to provide 2x6 rough cut stoplog boards for full height of check gate slots for all required check gates.

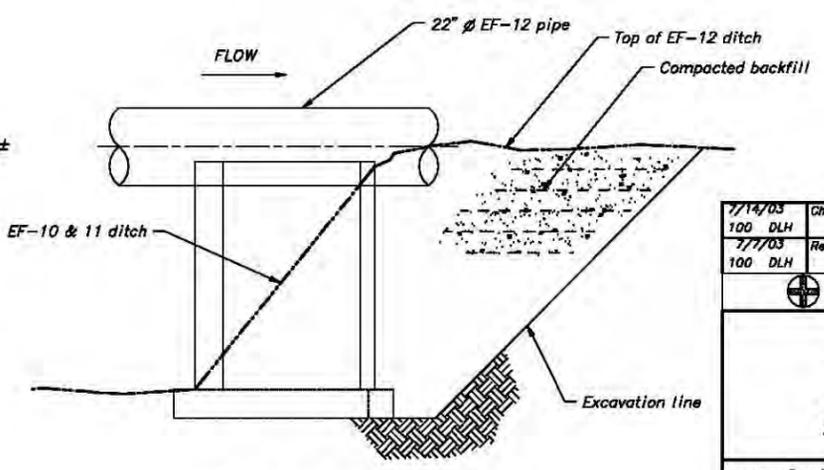


DETAIL PLAN

NOTE:  
Provide 2" minimum rebar cover



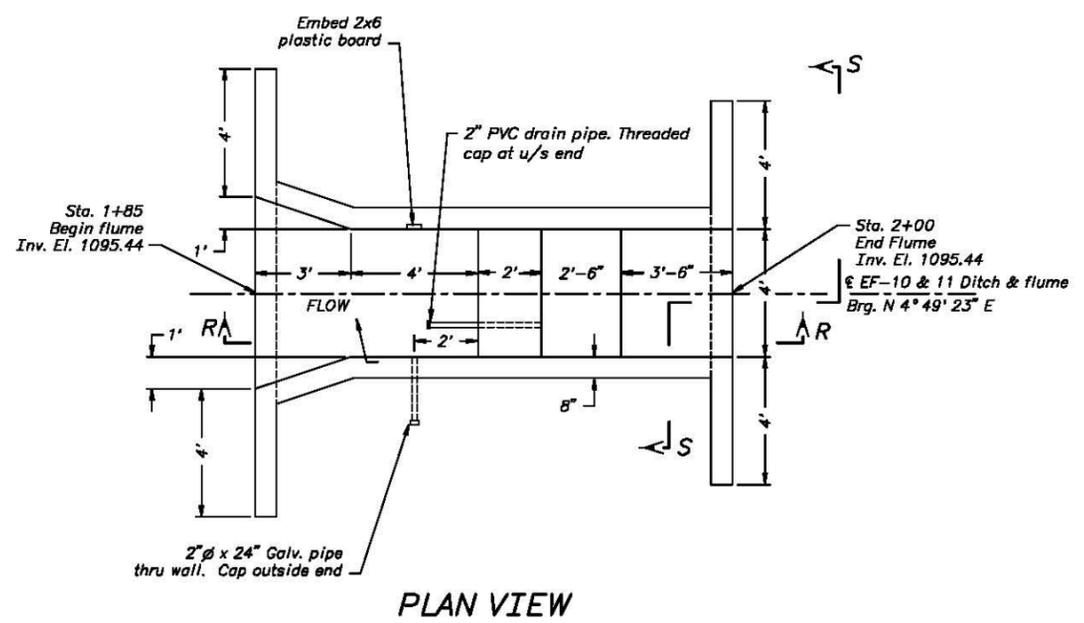
SECTION J-J



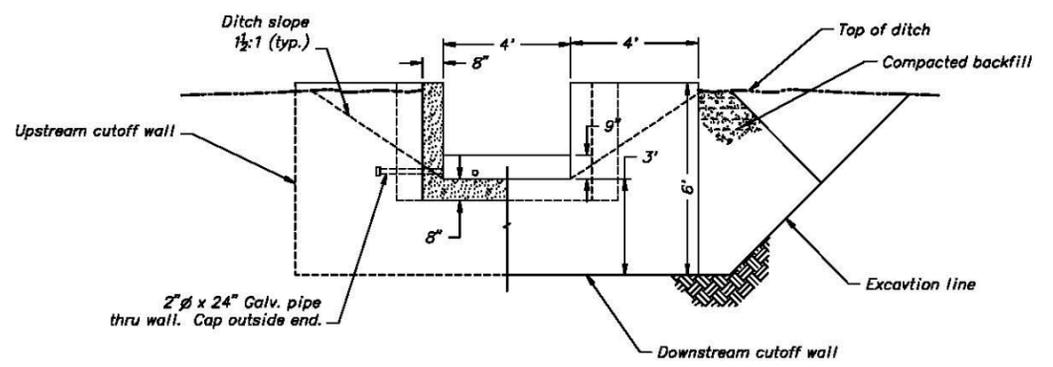
VIEW b-b

7/14/03 100 DLH	Changed check gate steel from 1/2" to 1/4".
7/7/03 100 DLH	Revised length of bars at invert of checks.
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UNITED STATES DEPARTMENT OF THE INTERIOR BUREAU OF RECLAMATION CORPS HABITAT IMPROVEMENT PROGRAM SALMON RIVER BASIN <b>EF 10&amp;11 DIVERSION                  IMPROVEMENTS PROJECT                  22" PIPE ABUTMENT &amp; CHECK GATES                  PLAN, DETAILS, &amp; SECTIONS</b>	
DESIGNED: Dennis Hawkins	CHECKED: Brian Hamilton
DRAWN: G. Hoop	TECH. APPROVAL: Dennis Hawkins
APPROVAL: Dave Jennings	
FIRST REVISION, PROGRAM NUMBER	
CADD SYSTEM AutoCAD Rev. 17.0a BOYSE, IDAHO	CADD FILENAME 1678-100-289.dwg 5/22/03
SPECIFICATION # 1678-100-289	

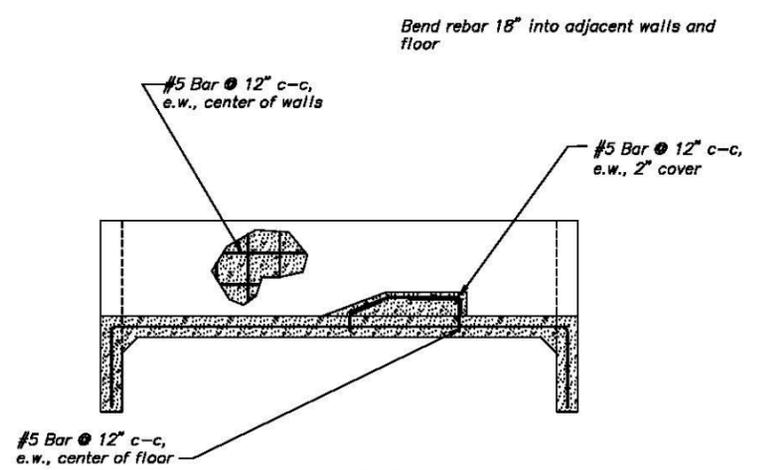
DATE AND TIME PLOTTED: MAY 15, 2007 15:55 PLOTTED BY: GROPE



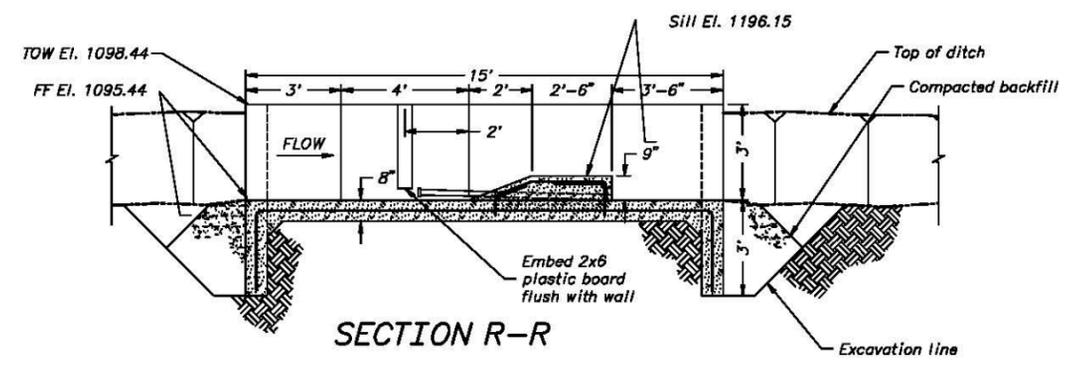
PLAN VIEW



SECTION S-S



REBAR LAYOUT



SECTION R-R

**NOTE:**  
 1. Sill must be level in all directions.  
 2. Sill elevation governs other dimensions.  
 3. Measurement flume can be fabricated from 3/8" minimum thick painted steel. Maintain internal dimensions. Brace as required.



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UNITED STATES

**FORPS HABITAT IMPROVEMENT PROJECT  
 SALMON RIVER BASIN  
 EF 10 & 11 DIVERSION  
 IMPROVEMENT PROJECT  
 MEASUREMENT FLUME  
 PLAN, DETAILS, & SECTIONS**

DESIGNED Deonir Hawkins CHECKED Brian Hamilton  
 DRAWN G. Hoop TECH. APPROVAL Deonir Hawkins  
 APPROVAL Dave Jennings  
PER REVIEWER, PROGRAM MANAGER

CADD SYSTEM AutoCAD Rev. 17.0a CADD FILENAME 1678-100-298.DWG  
 BOYSE, IDAHO

SPECIFICATION # **1678-100-298**

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 MAY 16, 2007 12:53  
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 CHOPPE