

Lake Terrell Dam Channel Restoration and Fish Passage Project

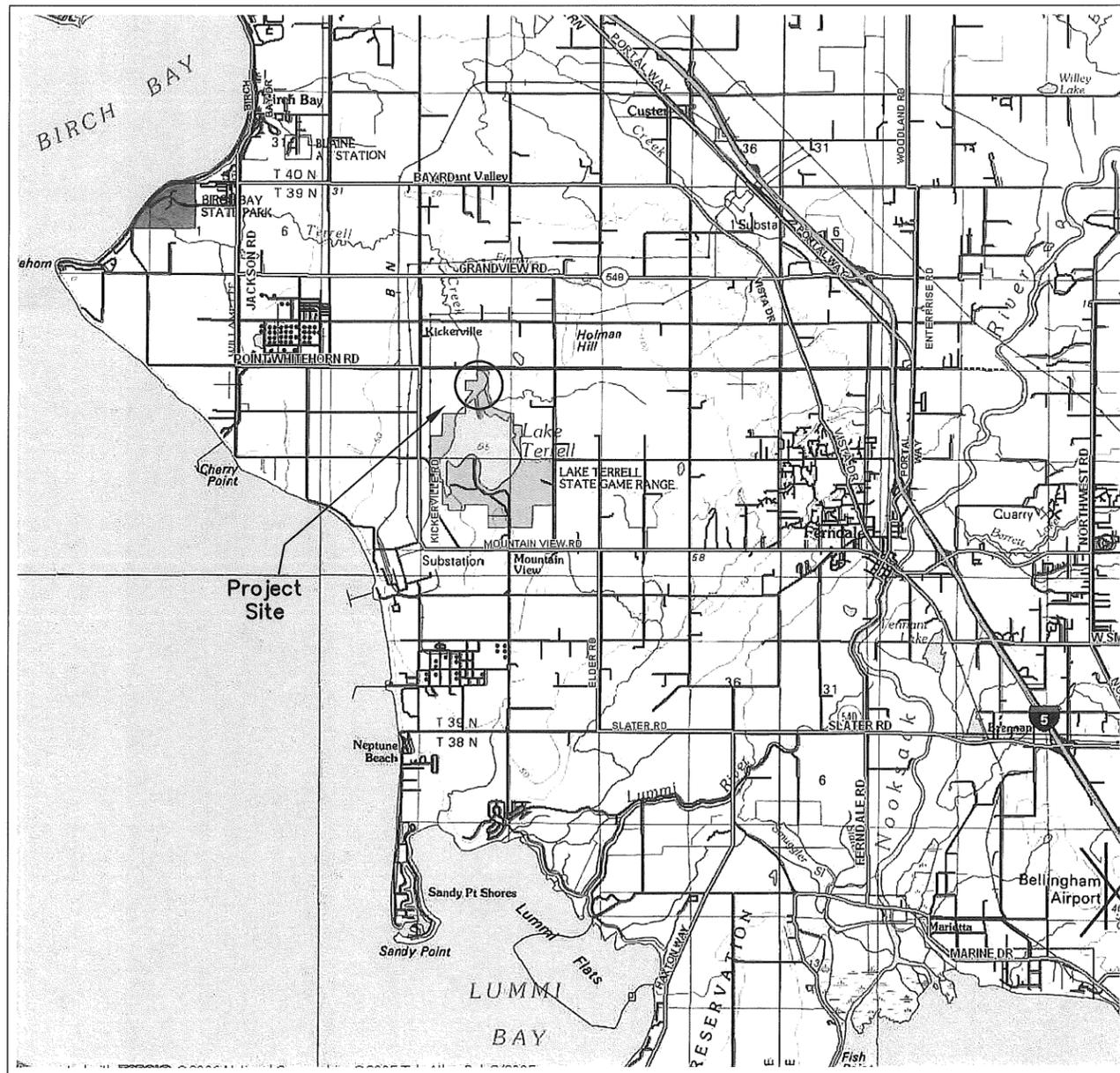
Project owner:
Washington Dept. of Fish and Wildlife
600 Capitol Way North
Olympia, WA 98501-1091

Project applicant:
Whatcom Conservation District
6975 Hannegan Road
Lynden WA 98264-9019

Project Description

The purpose of the project is to correct a fish passage barrier on Terrell Creek by reconstructing approx. 753 lineal feet of channel to allow fish passage over WDFW's dam at the outlet of Lake Terrell.

Site Location

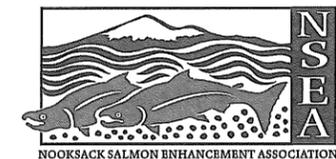


Site Location: The project site is located at the outlet of Lake Terrell in Sec. 16, T 39N, R 1E, near Ferndale, Whatcom County, Washington. Lat. 48.872° N, 122.686° W

Index of Drawings

Sheet	Description
1.	Cover Sheet
2.	Project Information Sheet
3.	Existing Site Plan
4.	Proposed Site Plan and Creek Profile – North Area
5.	Proposed Site Plan and Creek Profile – South Area
6.	North Area Typical Channel Section Views
7.	South Area Typical Channel Section Views
8.	Detail A: Weir Construction Details
9.	Detail B: Channel Reconstruction Details
10.	Detail C: Overflow Channel Details
11.	Detail D: Tributary Channel and Culvert Replacement Details
12.	Detail E: Foot Bridge Details
13.	Planting Plan Summary
14.	TESC and Construction Plans
15.	TESC and Construction Plans (continued)

Project Partners



Design Prepared by

Whatcom Conservation District
6975 Hannegan Road
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Wilson Engineering, LLC
805 Dupont Street
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Project Purpose

The purpose of the project is aquatic habitat enhancement. The project will reconstruct 753 lineal feet of dredged creek channel at a one percent grade and replace WDFW's existing flash board dam with a weir to allow fish passage between Terrell Creek and tributary habitat upstream of the dam.

Project Description

Correction of the fish passage barrier will involve the following tasks:

- Demolition and removal of an existing 18-foot long flashboard dam and replacing it with a concrete weir.
- Filling 753 lineal feet of dredged channel downstream of the dam to simulate geomorphic and fish passage conditions at nearby reference sites
- Installing a high-flow overflow system that bypasses the new fish weir
- Replacing an undersized and perched culvert on a tributary stream with one that meets WDFW's fish passage guidance
- Supplementing existing riparian vegetation with new conifer plantings.

Elevation Datum and OHW

All elevation data in the plans are referenced to a project benchmark on the top of the wall of the existing dam spillway. For the purposes of the project, the benchmark was assigned an arbitrary elevation of 100.00'.

Ordinary High Water (OHW) in Terrell Creek and the adjacent tributaries and side channel was determined by field indicators by Whatcom Conservation District staff and verified using available hydrologic data and HEC-RAS modeling. The OHW line for all waterbodies is indicated on Sheets 3, 4 and 5.

Land Ownership

All land at the project site is owned by the Washington Department of Fish and Wildlife and managed as part of WDFW's Whatcom Wildlife Area.

General Specifications

The project shall be constructed to the lines, grades and specifications shown in the drawings. Except where noted in the drawings or supplemental detailed specification sheets, all work shall follow current WSDOT "Standard Specifications for Road, Bridge and Municipal Construction."

Permits

The project applicant is responsible for obtaining all relevant environmental permits. All work shall be done in accordance with all relevant permit requirements,

Utilities

These plans do not make any representation as to the existence or non-existence of unidentified utility lines. Responsibility for identifying and protecting utilities shall be the contractor's in accordance with WSDOT standard specifications. Costs incurred by the contractor for removing or relocating utilities, if any, shall be paid by the project contracting agent under a written change order.

Estimated Work Quantities

1. Grading Quantities for Permitting Purposes:

Estimated quantities of grading are listed in the following table. These estimates are the design engineer's best estimates, but may not necessarily represent the actual as-built quantities for the completed project.

Grading Quantities for Permit Purposes		
Item	Quantity	
	(cy)	(sf)
Excavation below the OHW line	132	950
Excavation above the OHW line	55	580
Fill below the OHW line (channel reconstruction and pipe trench backfill)	1590	11140
Fill above the OHW line (culvert backfill)	39	580
Total Grading	1816	13250
Excavation in Wetlands (included in total)	0	0
Fill in Wetlands	0	0

2. Construction Work and Materials Quantity Estimates

(to be included with bid documents)



Revisions

Lake Terrell Dam Channel Restoration and Fish Passage Project
Project Information Sheet



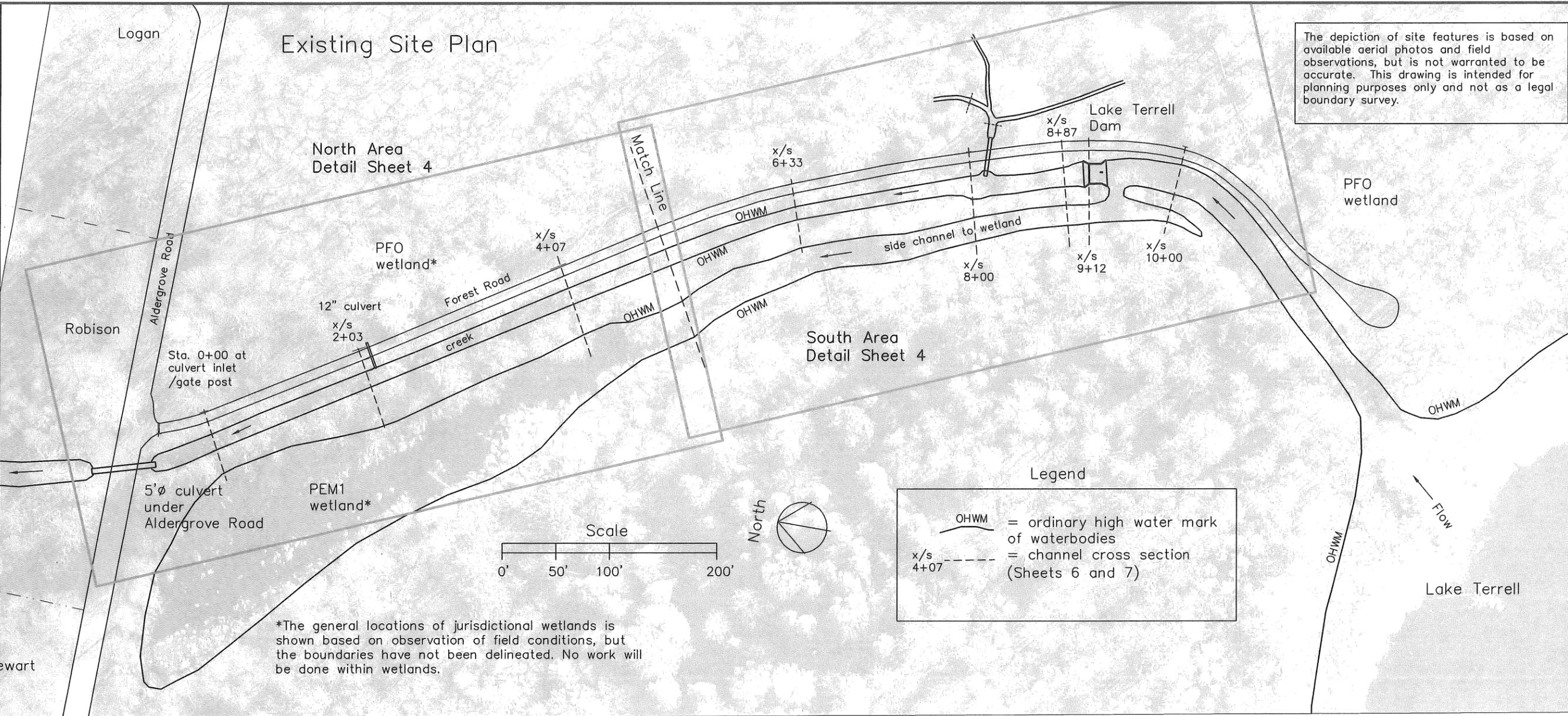
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6975 Hannegan Road
Lynden WA 98264-9620
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Date: 11-18-11

Scale: NTS

Sheet # 2 of 13

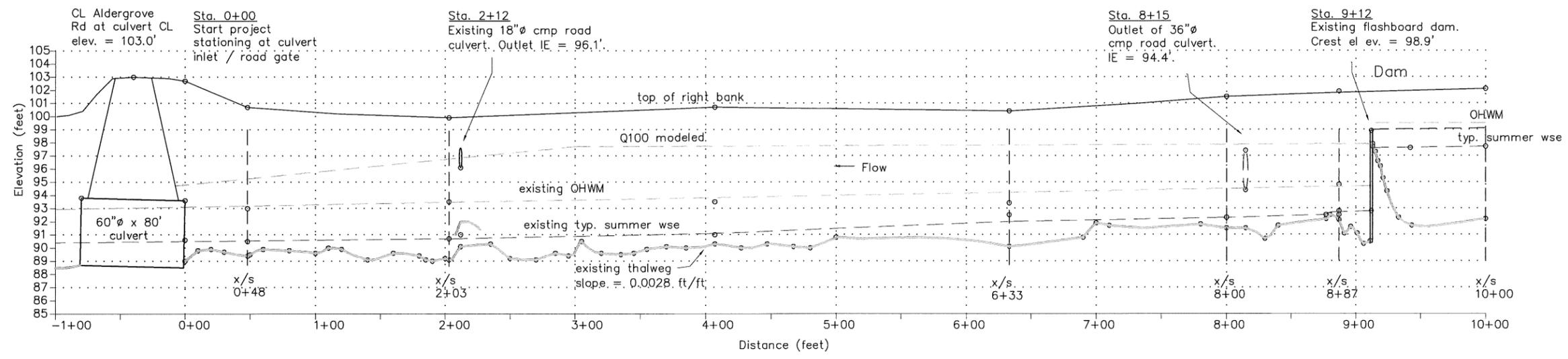


THOMAS M. SLOCUM
 STATE OF WASHINGTON
 34003
 REGISTERED
 PROFESSIONAL ENGINEER
 1-17-12

Revisions

Lake Terrell Dam Channel Restoration and Fish Passage Project
 General Site Plan

Existing Terrell Creek Channel Profile Sta. 0+00 to 10+00 - Scale 1'V = 10'H

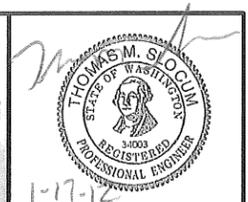


Prepared for:
 Washington Department of FISH and WILDLIFE

Prepared by:
 Whatcom CONSERVATION DISTRICT
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Date: 11-18-11
 Scale: 1" = 100'
 Sheet # 3 of 15

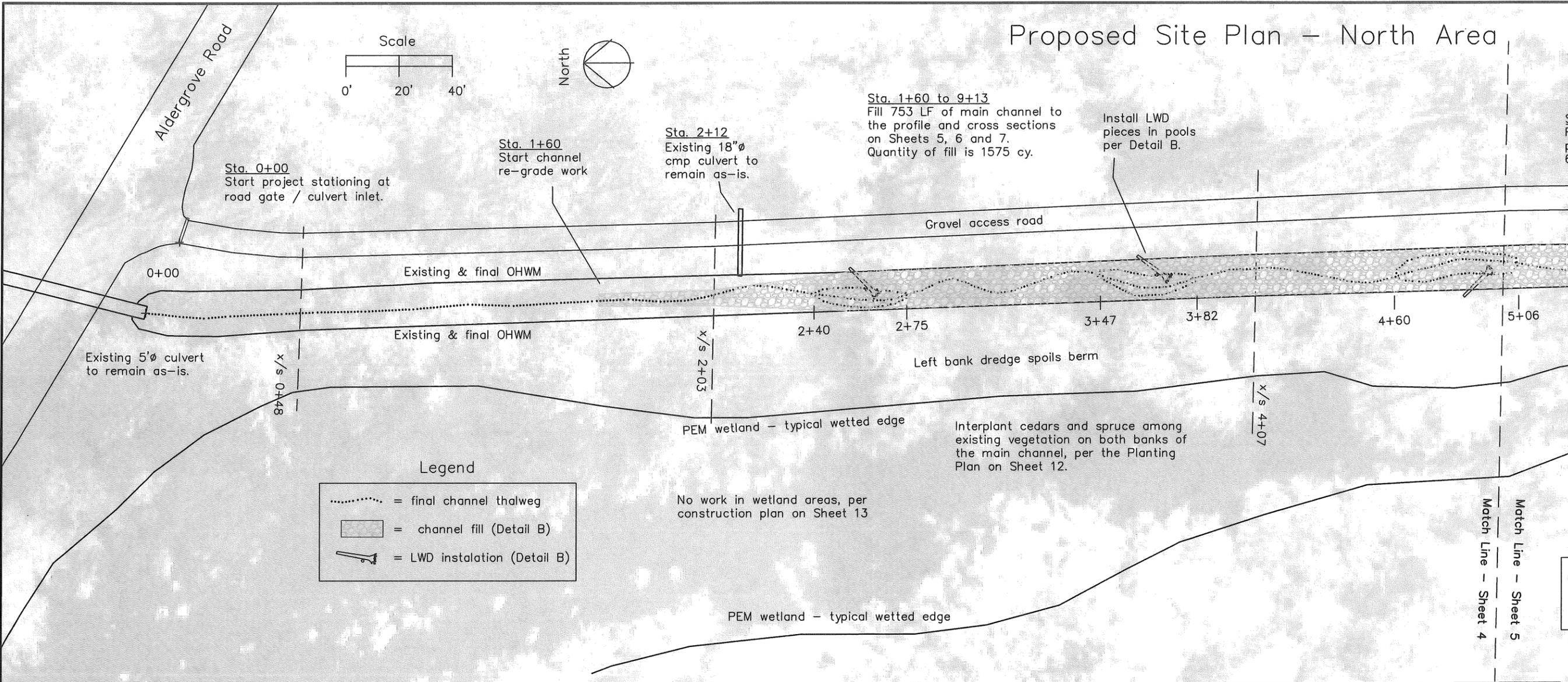
Proposed Site Plan – North Area



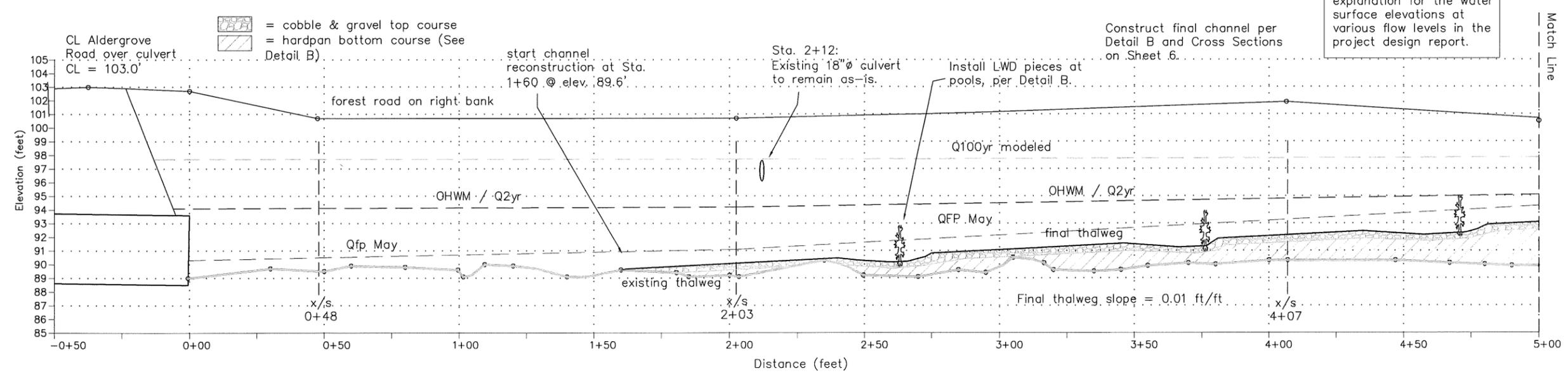
1-17-12

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Lake Terrell Dam Channel Restoration and Fish Passage Project
 Proposed Site Plan and Profile – North Area



Proposed Channel Profile Sta. 0+00 to 5+00 – Scale 1'V = 5'H



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Date: 11-18-11

Scale: 1" = 40'

Sheet # 4 of 15

Proposed Site Plan - South Area

Sta. 1+60 to 9+13
 Fill 753 LF of main channel to the profile and cross sections on Sheets 5, 6 and 7. Quantity of fill is 1575 cy.

Install a prefab 40' x 3' aluminum gangway over the creek and concrete footings, per Detail E.

Replace existing culvert with a new 36" x 60" pipe arch culvert per Detail B, Sheet 9.

Fill 45 LF of dredged ditch upstream of culvert to the cross sections and profile on Detail D, Sheet 11. Quantity of fill = 15 cy.

Demolish existing flashboards and dredged muck from forebay. Construct new concrete weir per Detail A, Sheet 8. All existing concrete structures to remain as-is.

End channel work at Sta. 9+24

Interplant cedars and spruce among existing vegetation on both banks of the main channel, per the Planting Plan on Sheet 12.

Install concrete catch basin and two 24" x 40' drain overflow pipes, per Detail C, Sheet 10.

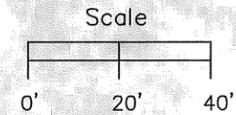
Dredge muck from 80 LF of channel to match thalweg at x/s 8+87. Quantity of dredging as approx. 35 cy.

Construct pools and install LWD pieces at locations shown, per Detail B, Sheet 9.

Existing side channel inlet left as-is.

Legend

- = area of channel dredging
- = area of channel fill



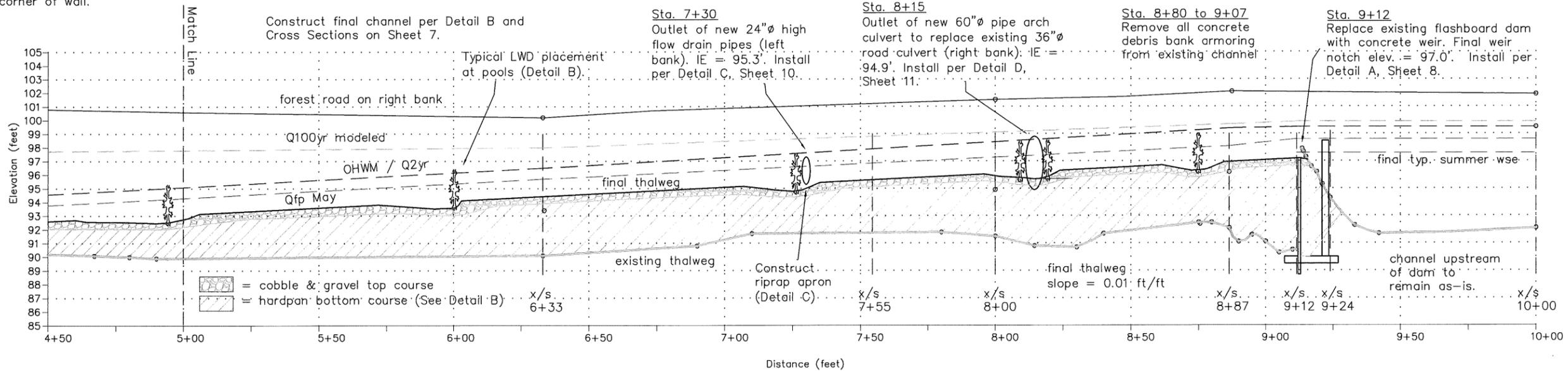
Revisions

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Lake Terrell Dam Channel Restoration and Fish Passage Project
 Proposed Site Plan & Profile - South Area

Channel Profile Sta. 5+00 to 10+00 - Scale 1'V = 5'H

Project BM 100.00' assumed elev. at top NE corner of wall.



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Scale: 1" = 40'

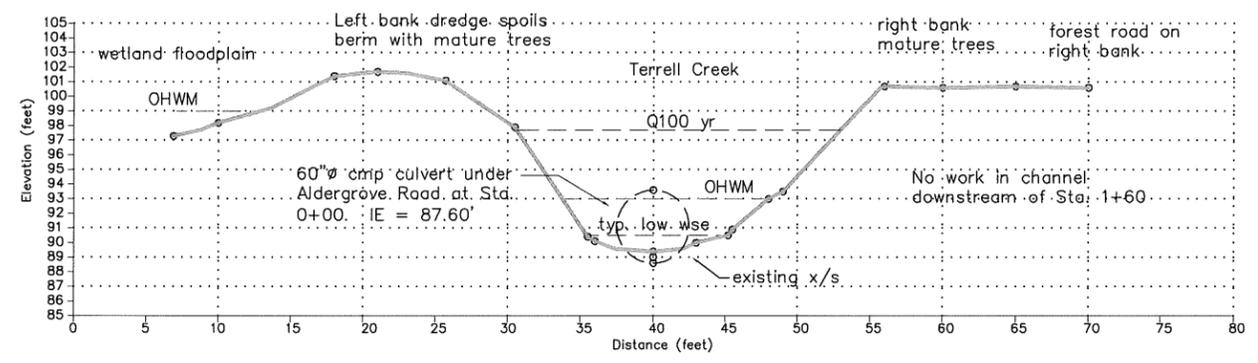
Sheet # 5 of 15



Revisions

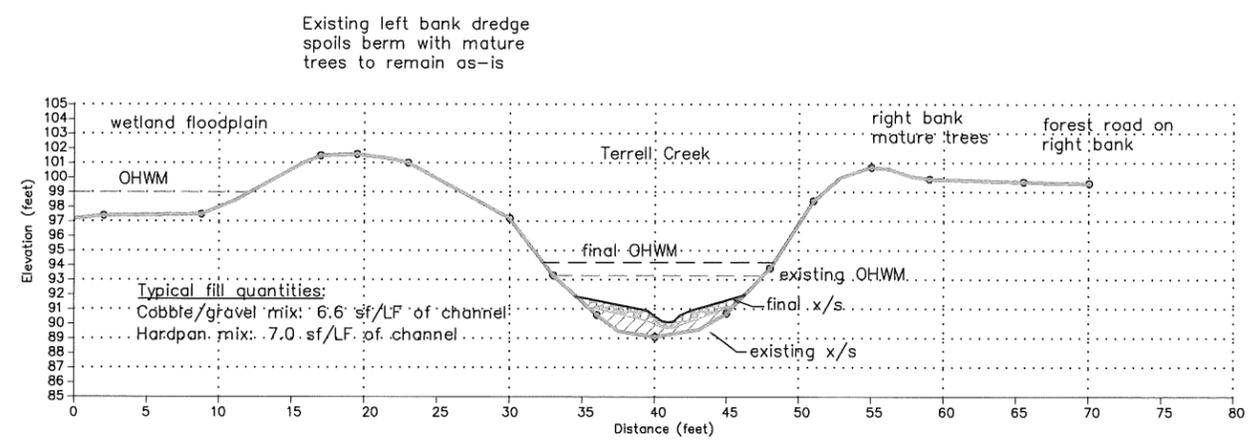
Lake Terrell Dam Channel Restoration and Fish Passage Project
 North Area Typical Channel Section Views

Channel Cross Section at Sta. 0+48 – Scale 1’V = 1’H
(Downstream Reference Section)



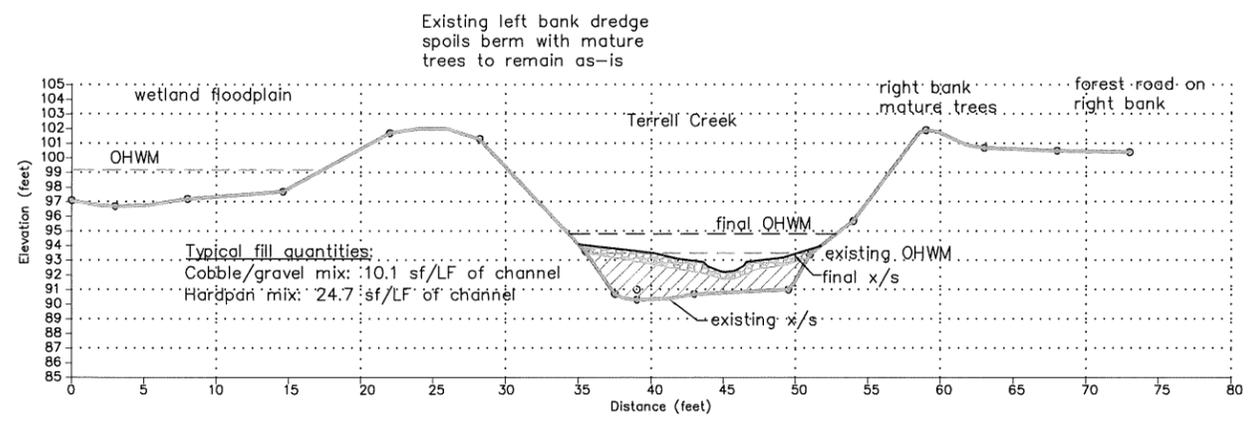
Note
 The existing OHWM in all cross sections was determined by observations of field conditions. Final OHWM and 100yr flood elevation were estimated by HEC-RAS modeling.

Channel Cross Section at Sta. 2+03 – Scale 1’V = 1’H

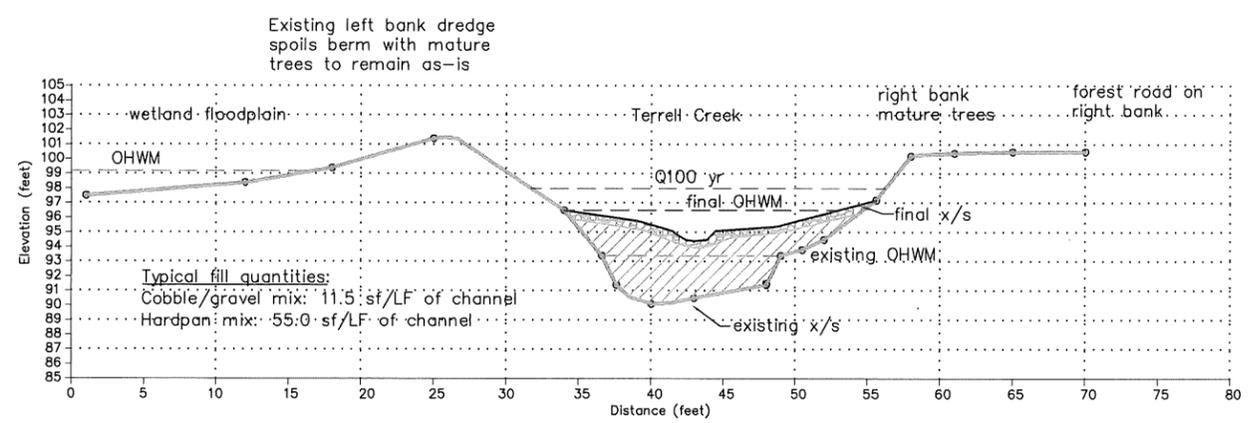


= cobble & gravel top course
 = hardpan bottom course (See Detail B)

Channel Cross Section at Sta. 4+07 – Scale 1’V = 1’H



Channel Cross Section at Sta. 6+33 – Scale 1’V = 1’H



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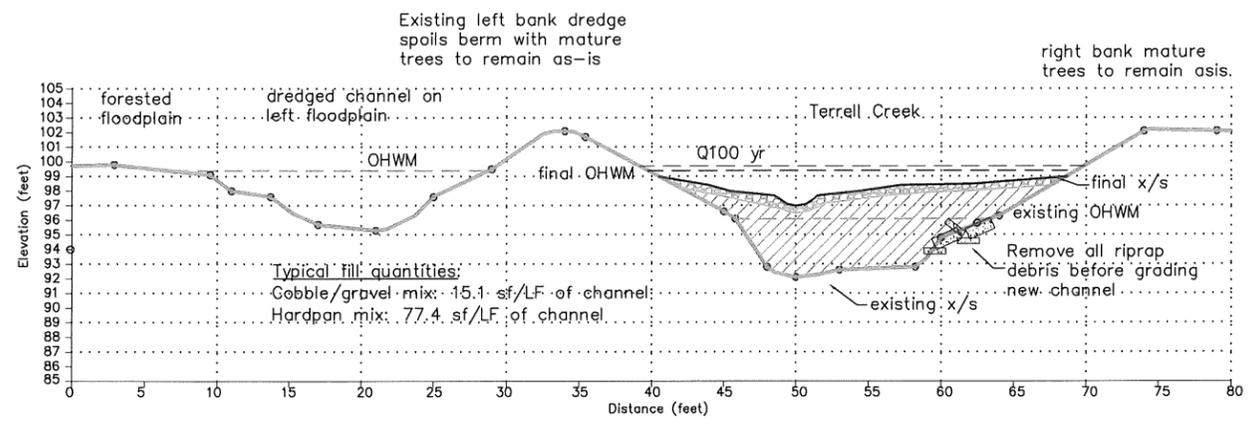


Date: 11-18-11

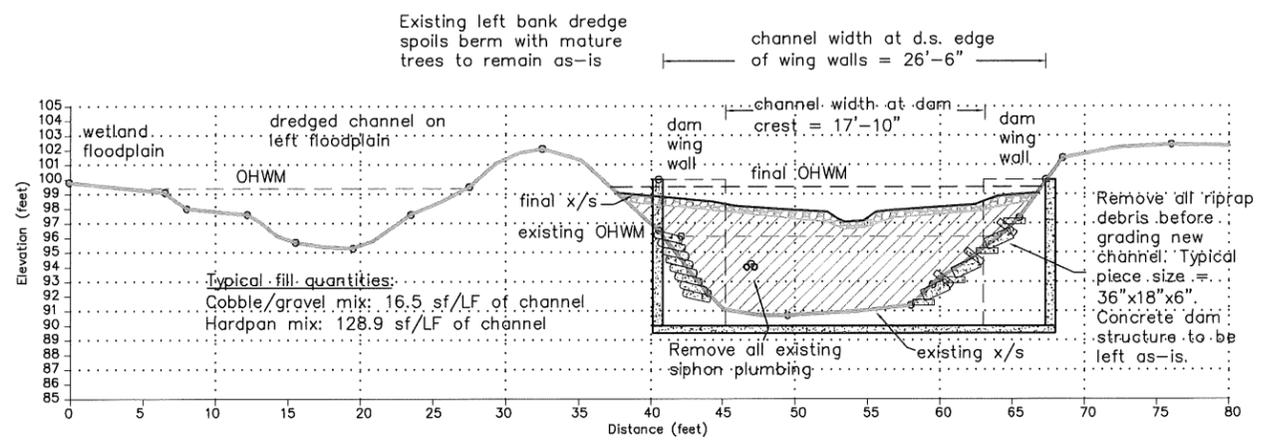
Scale: as noted

Sheet # 6 of 15

Channel Cross Section at Sta. 8+87 - Scale 1'V = 1'H



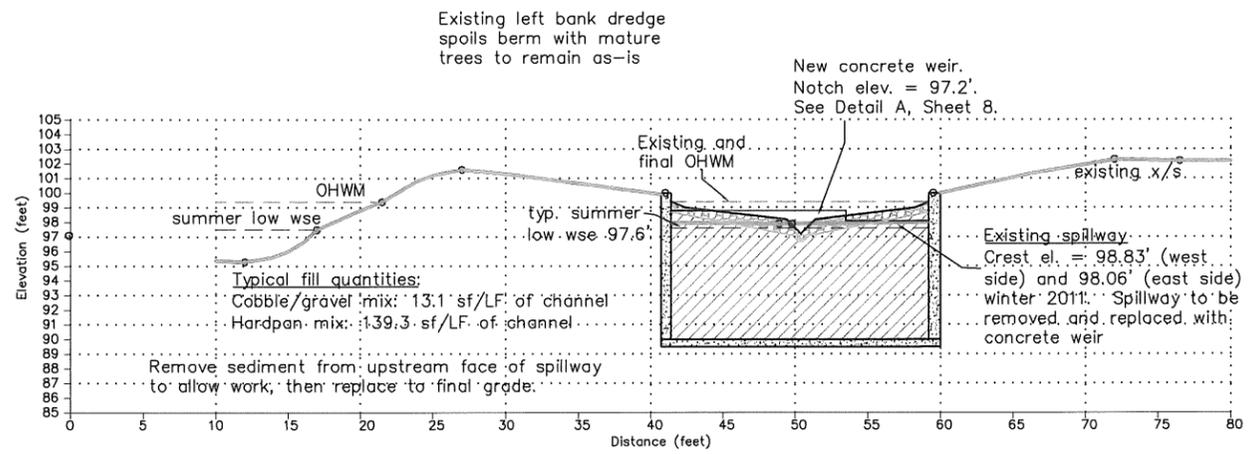
Section at Sta. 9+05 (D.S. Side of Dam) - Scale 1'V = 1'H



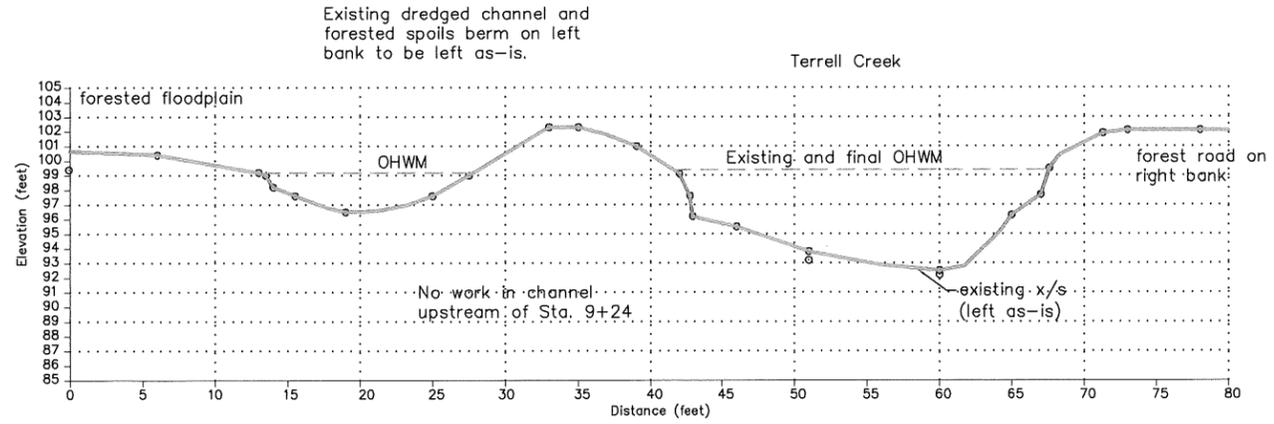
▨ = cobble & gravel top course
▩ = hardpan bottom course (See Detail B)

Note
The existing OHWM in all cross sections was determined by observations of field conditions. Final OHWM and 100yr flood elevation were estimated by HEC-RAS modeling.

Section at Sta. 9+13 (U.S. Face of Dam) - Scale 1'V = 1'H



Channel Section at Sta. 10+00 - Scale 1'V = 1'H (Upstream Reference Section)



Lake Terrell Dam Channel Restoration and Fish Passage Project
South Area Typical Channel Section Views

Prepared for:
Washington Department of FISH and WILDLIFE

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Date: 11-18-11

Scale: as noted

Sheet # 7 of 15

Proposed Channel Detail at Inlet Weir – Section View

Scale 1" = 4'

Concrete weir elevations

Wall top elev. = 100.0'

Weir top elev. = 99.0'

Notch top elev. = 98.1'

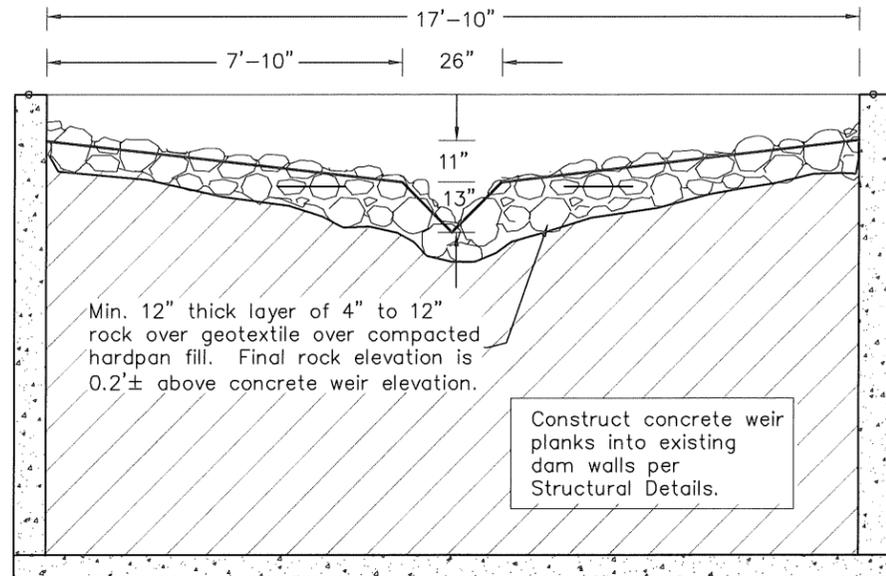
Notch btm elev. = 97.0'

Final rock/channel elevations

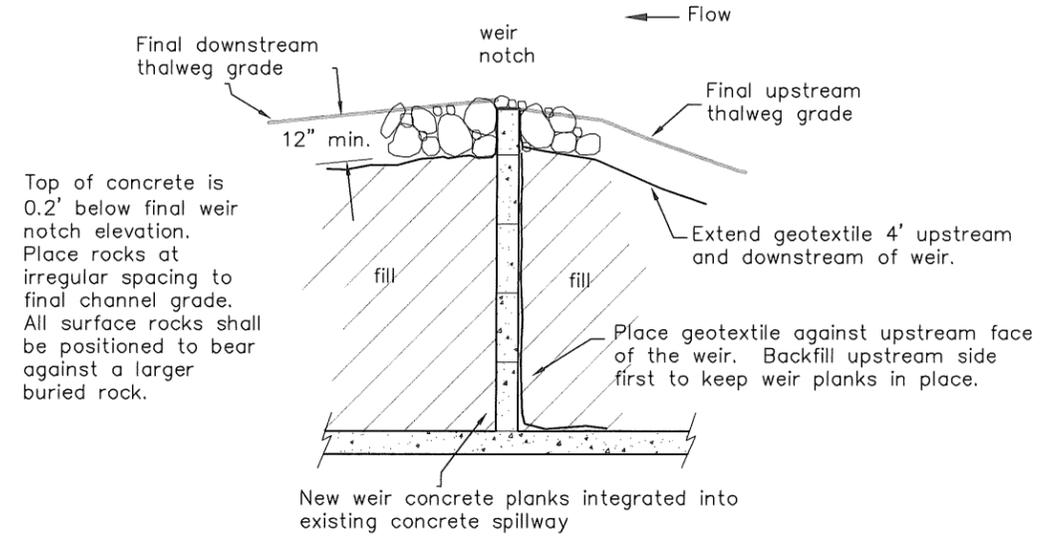
Bank top elev. 99.2'

Low flow channel top elev. 98.3'

Thalweg elev. 97.2'

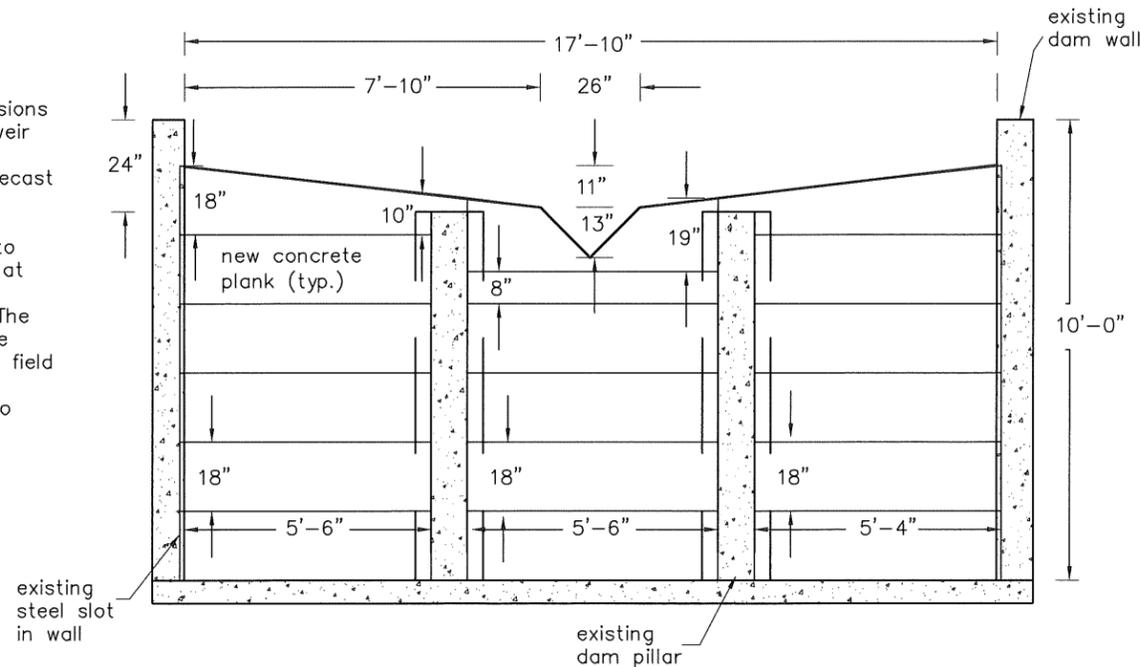


Proposed Channel Detail at Inlet Weir Profile View



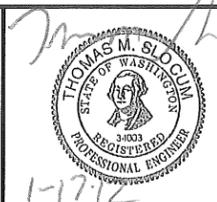
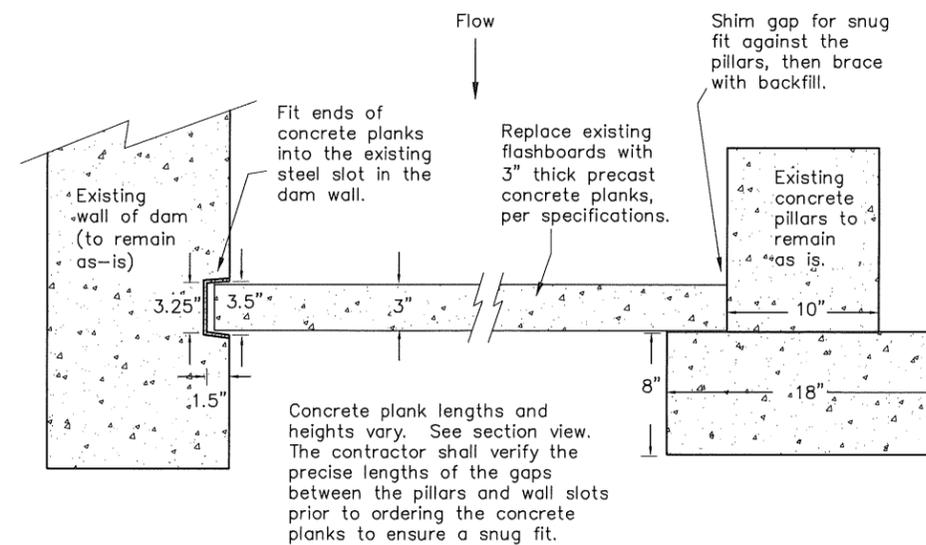
Section View of New Weir Plank Layout

Layout and dimensions of new concrete weir planks shown. The planks shall be precast per the structural specifications and installed onsite into the existing slots at the dam, per the Detail Plan View. The contractor and the site engineer shall field verify all plank dimensions prior to casting.



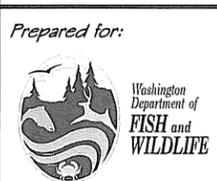
Detail Plan View of New Concrete Weir Placement

Scale 1" = 1'-0"



Revisions	
11-18-11	

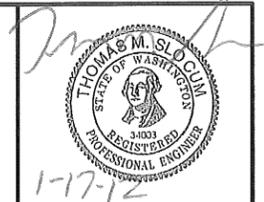
Lake Terrell Dam Channel Restoration and Fish Passage Project
 Detail A: Channel Details at Inlet Weir



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Date: 1-12-12
 Scale: 1" = 4'
 Sheet # 8 of 15

Typical Channel Reconstruction Section Views – Scale 1" = 4'



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Lake Terrell Dam Channel Restoration and Fish Passage Project
 Detail B: Channel Reconstruction Details

Top of left bank

Typical Riffle and Run

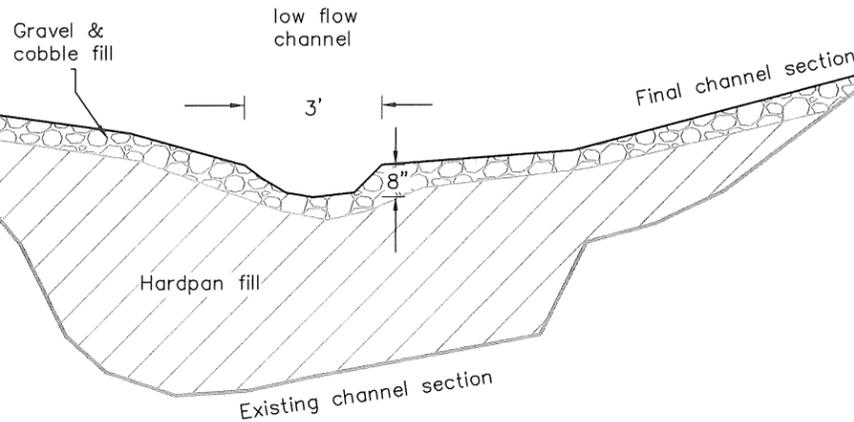
Top of right bank

Hardpan Channel Fill

1. Remove any riprap and concrete debris (limited to the upper 50 LF of channel).
2. Fill the existing channel to 6" below the final grade as shown in Sheets 4, 5, 6 and 7 with "Hardpan Fill", per the specification. Place in compacted 6" lifts to match the density of the surrounding native hardpan soil.
3. Slope the sides of the fill as shown in the typical cross section, allowing for a "low flow" channel with dimensions about 3' wide and 8" deep, and sloping benches. The location of the low flow channel shall meander along the length of the project, per the plan views in Sheets 4 and 5.

Gravel & Cobble Mix

1. Place an approximately 6 inch layer of gravel and cobble mix on top of the hardpan, per the specification.
2. The largest cobbles shall be arranged per the direction of the site engineer to provide habitat complexity for fish during high flows.
3. Vary the slope of the final channel profile slightly to approximate small riffles, per the direction of the site engineer.



Fill Specifications:

Hardpan Fill

Mix of fines, sand and fine gravel with particle size ranging from silt to 1/2" in approximately the following proportions:

- 50% of the total volume shall be silt and fine sand passing a #30 (0.6mm) screen
- 25% shall be coarse sand passing a #10 (2 mm) screen
- 25% shall be gravel passing a 1/2" screen

Gravel & Cobble Fill

Well sorted mix of gravel to large cobble with particle size ranging from < 1/4" to 10", in approximately the following proportions:

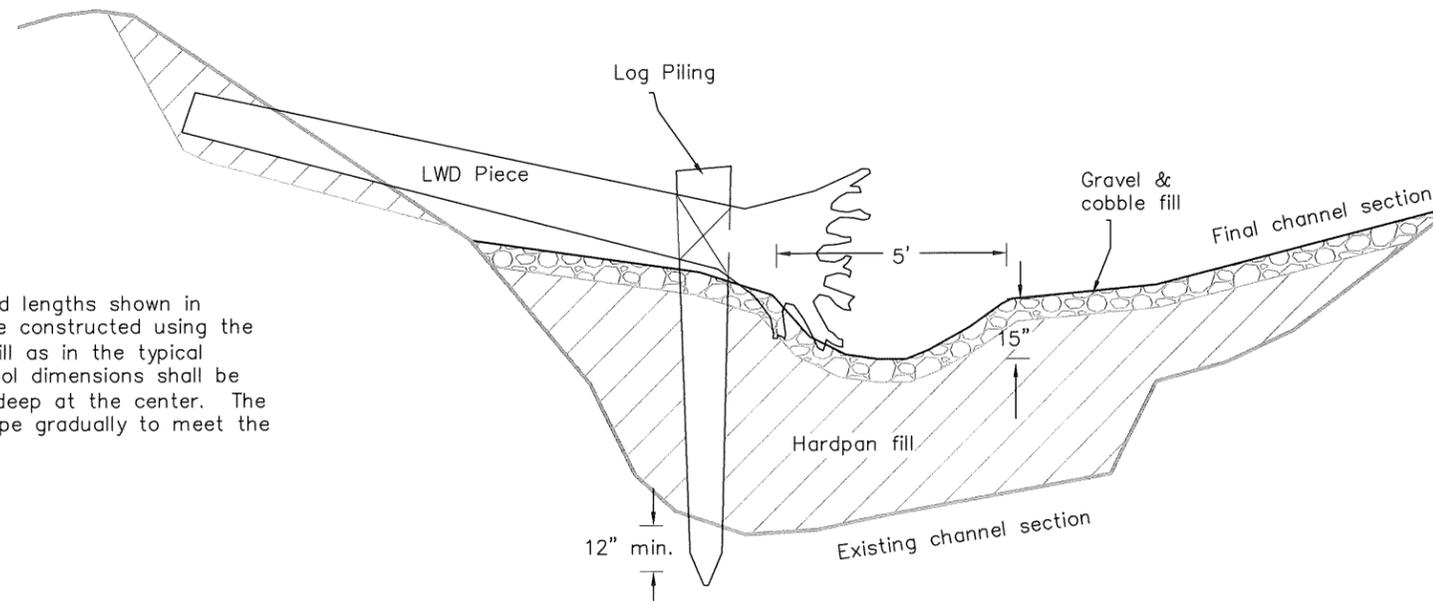
- 50% of the total volume shall be gravel of size passing a 1 1/2" screen
- 25% shall be coarse gravel and small cobble between 1.5" and 3.5"
- 25% shall be cobble between 3.5" and 10" size.

Final mix shall be approved by the site manager.

Typical Pool

Pool Construction

Construct pools at locations and lengths shown in Sheets 4 and 5. Pools shall be constructed using the hardpan fill and gravel/cobble fill as in the typical channel sections, except the pool dimensions shall be approximately 5' wide and 15" deep at the center. The pool inlets and outlets shall slope gradually to meet the surrounding final channel grade.



Large Wood Debris (LWD) Pieces

1. One large wood debris piece shall be placed in each pool per the locations shown on Sheets 4 and 5. The LWD piece shall be a fir or cedar log in good condition of at least 10" diameter at the narrow end and include a root ball of at least 3' diameter. Total length of each piece shall be at least 15 feet. All LWD pieces shall be approved for use by the site engineer.
2. The root ball shall be set at the bottom of the pool and fixed in place with one log piling. Each piling shall be a fir or cedar log in good condition of size at least 9" diameter at the narrow end. Length of pilings shall vary from 5' long at the downstream end of the project to 10' long at the upstream end. The piling shall be placed on the downstream side of the LWD piece and driven at least one foot below the existing channel bottom, then backfilled with compacted hardpan fill, per the specifications. Cable the LWD piece securely to the piling with 1/4" galvanized logging cable and clamps.
3. Bury the upper end of each LWD piece securely into the creek bank as shown in the drawing by excavating a narrow trench, setting the end in it, and backfilling with compacted hardpan fill up to the surrounding grade.

Prepared for:



Prepared by:



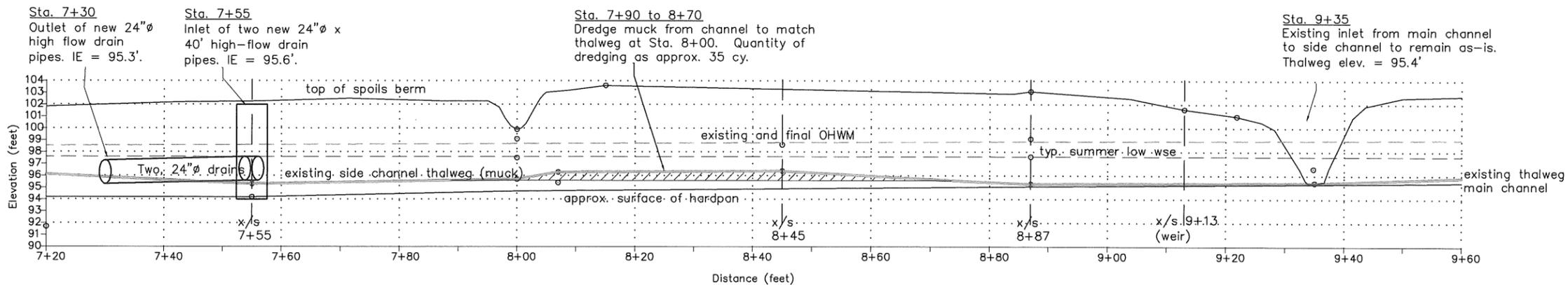
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Date: 11-18-11

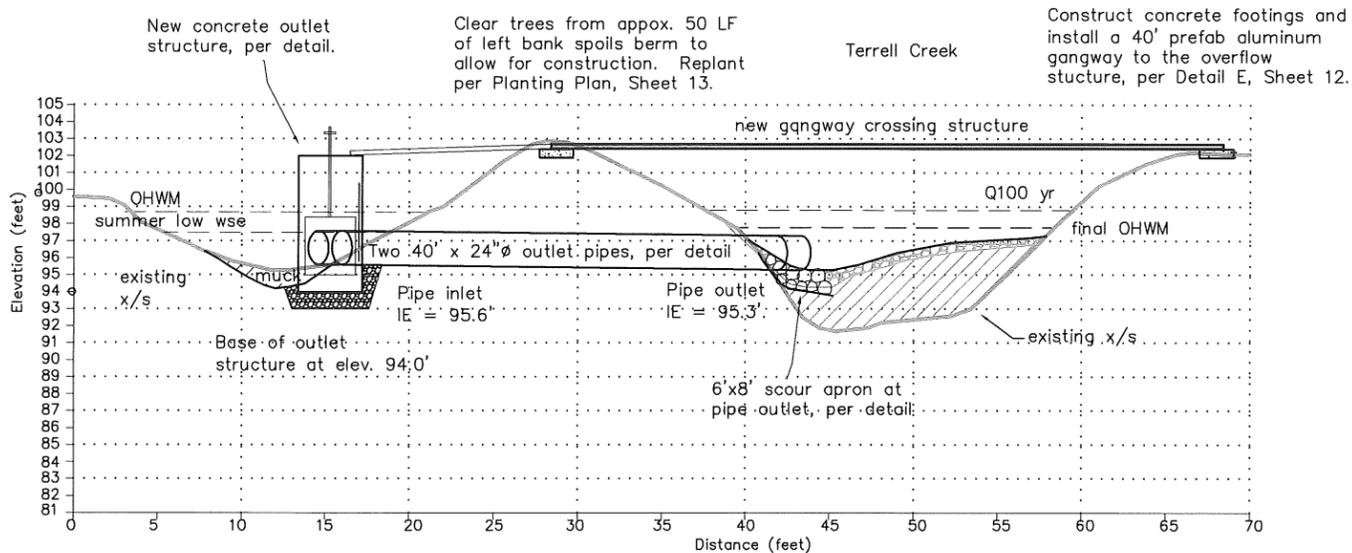
Scale: 1" = 4'

Sheet # 9 of 15

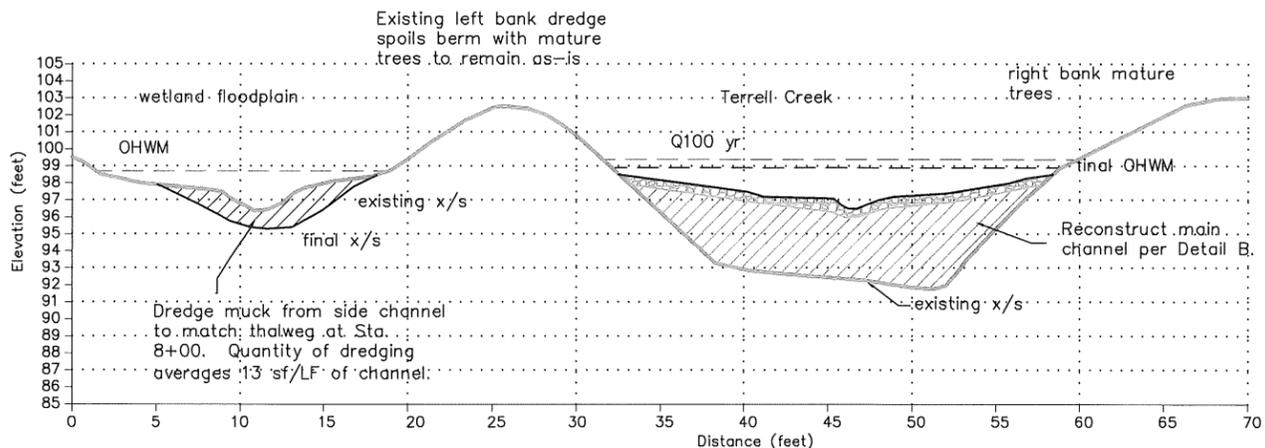
Existing and Proposed Side Channel Profile: Sta. 7+20 to 9+50 – Scale 1'V = 2'H



Channel Cross Section at Sta. 7+55 – Scale 1'V = 1'H



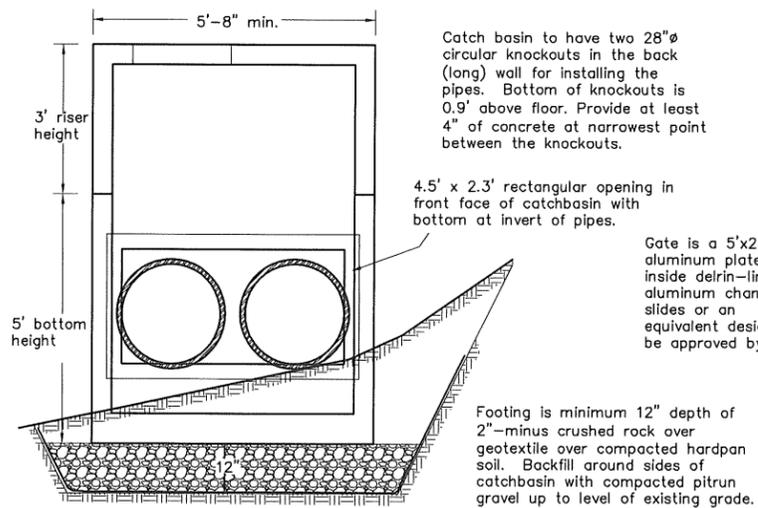
Channel Cross Section at Sta. 8+45 – Scale 1'V = 1'H



Overflow Structure Details – Scale 1" = 4'

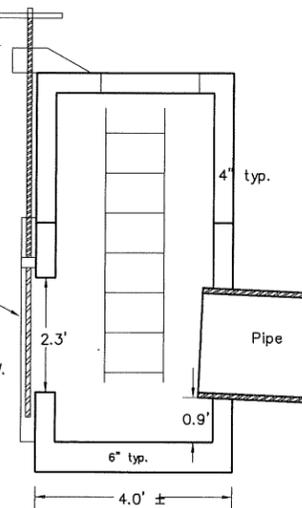
Overflow Structure Section View

- Contractor to provide a precast concrete catch basin or vault and riser structure meeting the dimensions in the plan and following minimum specifications:
- concrete $F_c = 4000$ psi after 28 days
 - reinforcing steel = welded wire fabric ASTM A 497 and rebar ASTM A615 Grade 60
 - Base slab min. 6" with 0.25 square in/lin foot rebar minimum
 - Walls and riser min. 4" with 0.15" linear foot reinforcing steel min.
 - Lifting holes or attachments
 - Min. 24" access hole with lockable steel cover and interior ladder

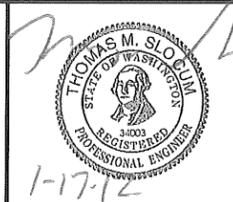
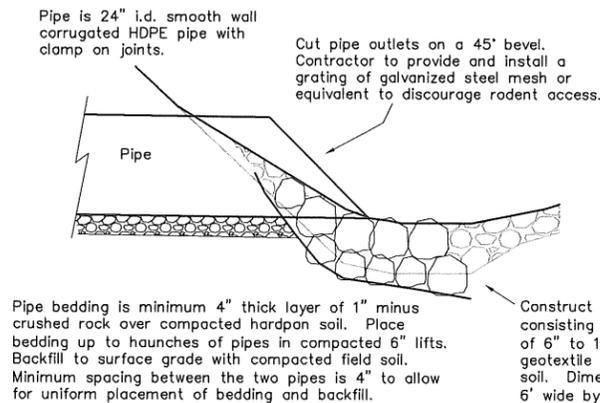


Overflow Structure Profile View

Contractor to provide a manually operated screw gate valve system for opening and closing the overflow. Sample configuration shown. WDFW shall approve the contractor's selection prior to signing the contract.



Pipe Outlet Detail



Revisions
11-18-11

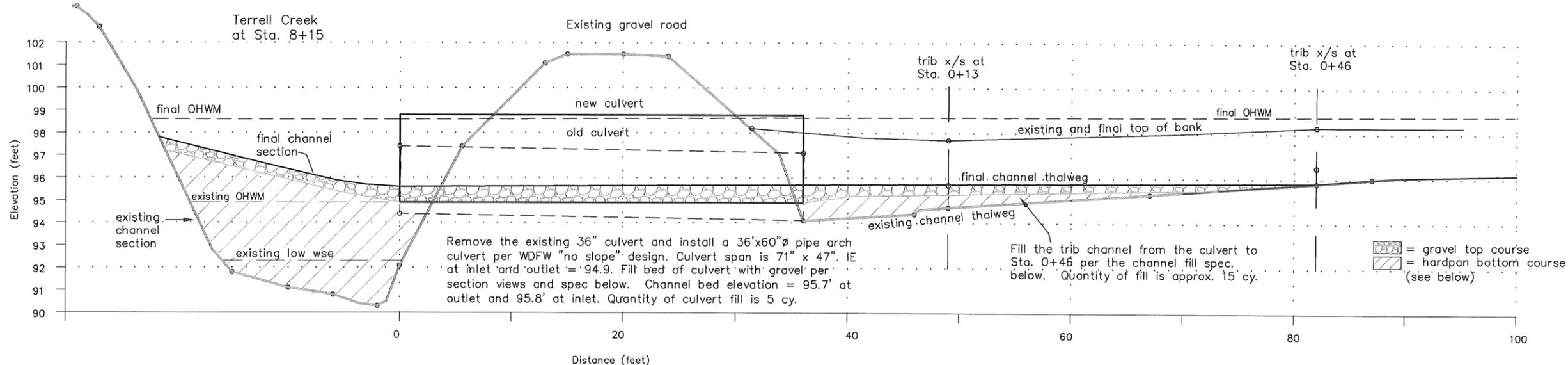
Lake Terrell Dam Channel Restoration and Fish Passage Project
 Detail C: Overflow Channel Details



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Date: 1-12-12
 Scale: 1" = 4'
 Sheet # 10 of 15

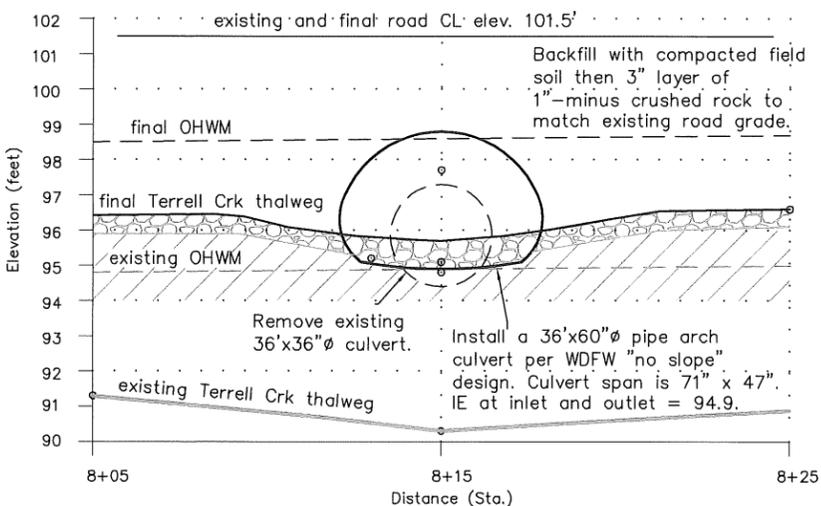
Unnamed Tributary Channel Profile – Scale 1'V = 2'H



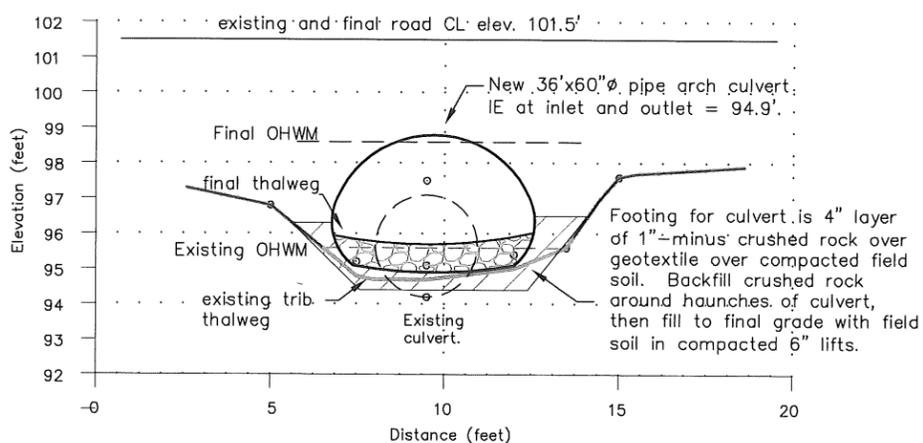
Revisions

Lake Terrell Dam Channel Restoration and Fish Passage Project
 Detail D: Tributary Channel and Culvert Replacement Details

New Road Culvert – Outlet Section View
 Scale 1'H = 1'V



New Road Culvert – Inlet Section View
 Scale 1'H = 1'V



Channel and Culvert Fill Specifications:

Hardpan Fill (same as in Detail B)

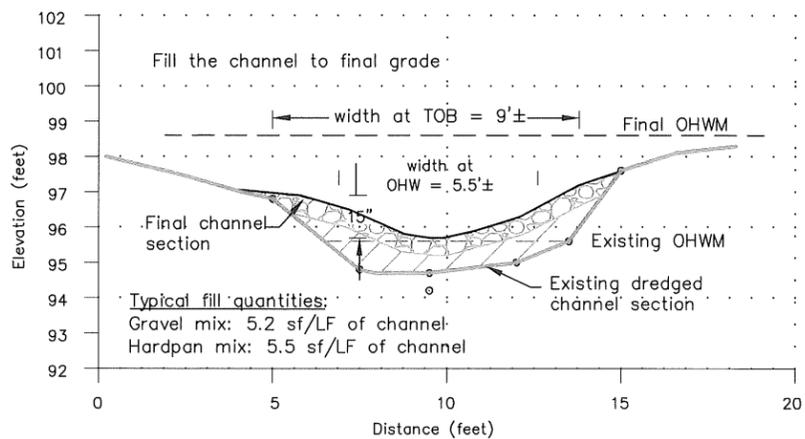
- Mix of fines, sand and fine gravel with particle size ranging from silt to 1/2" in approximately the following proportions:
- 50% of the total volume shall be silt and fine sand passing a #30 (0.6mm) screen
 - 25% shall be coarse sand passing a #10 (2 mm) screen
 - 25% shall be gravel passing a 1/2" screen

Gravel Fill

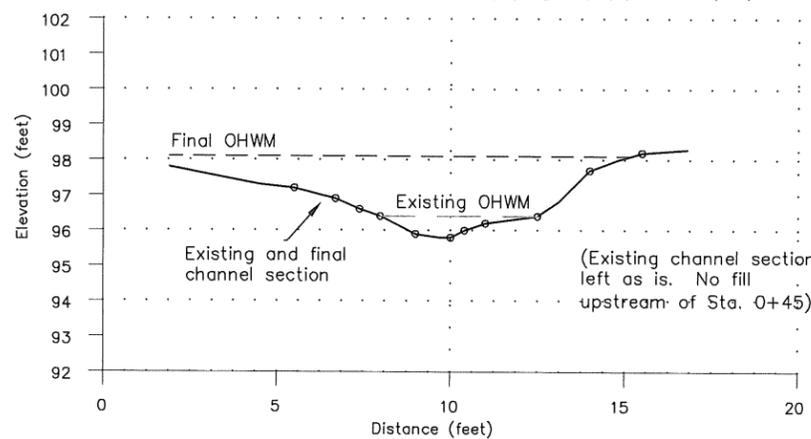
- Well sorted mix of gravel to small cobble with particle size ranging from < 1/4" to 4" in approximately the following proportions:
- 50% of the total volume shall be sand and gravel of size passing a 1" screen
 - 25% shall be coarse gravel passing a 2" screen
 - 25% shall be small cobble passing a 4" screen.

Final mix shall be approved by the site manager.

Unnamed Tributary Channel – Section View at Sta. 0+13 – Scale 1'H = 1'V



Unnamed Tributary Channel – Section View at Sta. 0+46 – Scale 1'H = 1'V



Prepared for:



Prepared by:

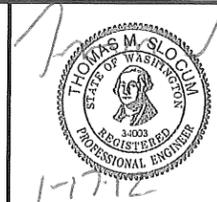


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Date: 11-18-11

Scale: as noted

Sheet # 11 of 15



Revisions

Lake Terrell Dam Channel Restoration and Fish Passage Project
Detail E: Foot Bridge Details



Prepared by:
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Date: 12-5-11

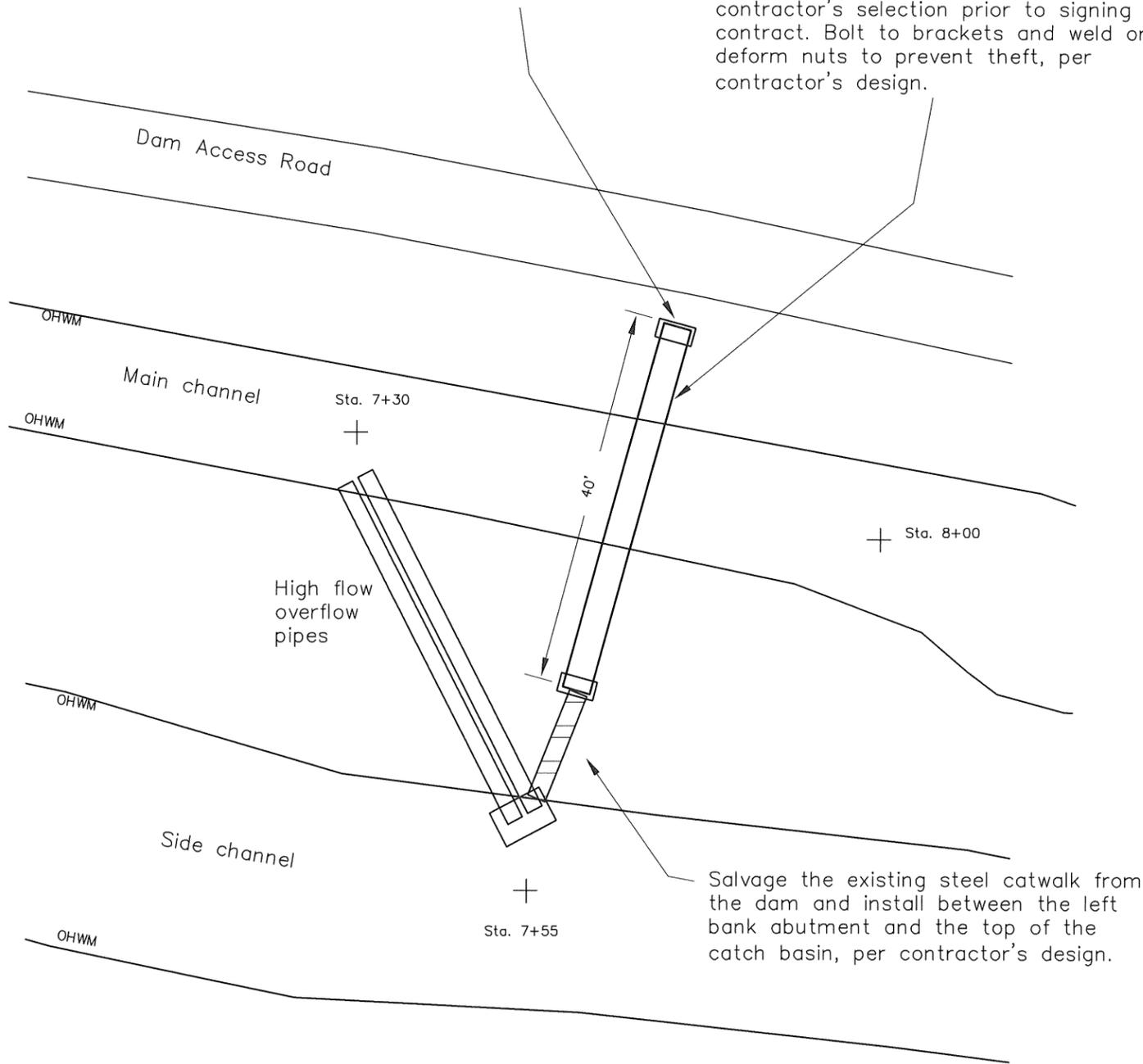
Scale: 1" = 16'

Sheet # 12 of 15

Foot Bridge Plan View - Scale 1" = 16'

Construct cast-in-place concrete abutments at the top of right bank and top of left bank spoils mound, per elevations on Sheet 10 and Detail E.

Provide and install a prefab 40' x 3' aluminum "gangway" footbridge on the abutments. WDFW shall approve the contractor's selection prior to signing the contract. Bolt to brackets and weld or deform nuts to prevent theft, per contractor's design.

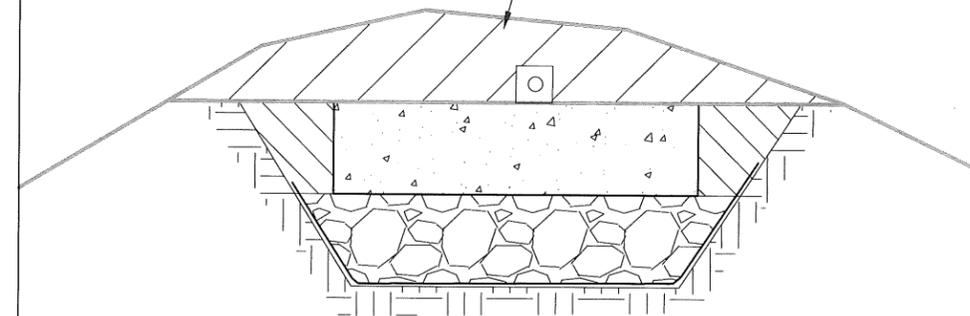


Salvage the existing steel catwalk from the dam and install between the left bank abutment and the top of the catch basin, per contractor's design.

Foot Bridge Abutment Detail Scale 1" = 1'

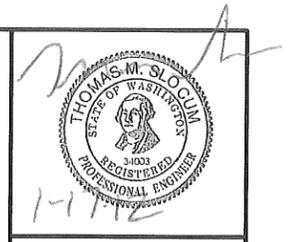
Construct reinforced concrete pad footings for the prefabricated gangway structure. Footings shall be minimum 2'x4'x6" thick with No. 4 rebar on 6" spacing and with brackets cast in for securely attaching the gangway. Gangway shall be welded or otherwise securely attached to the brackets to prevent theft.

Excavate top of left bank spoils mound as needed so that the left bank abutment is level with the right bank abutment.



Abutment footings are min. 6" thick layer of 2"-minus crushed rock over geotextile over compacted hardpan soil. Backfill to surrounding grade with compacted pitrun gravel.

Planting Plan Summary



Revisions

Lake Terrell Dam Channel Restoration and Fish Passage Project Planting Plan Summary

Purpose

The purpose of the planting work is to replace any native vegetation damaged or removed during construction and to reestablish native plant communities along Terrell Creek where good riparian cover is lacking. The goal is to enhance fish habitat and improve water quality.

Site Preparation

Large clumps of Himalayan blackberry will be mowed and removed during the stream channel reconstruction work in the late summer of 2012. The remaining blackberries will be cut and removed by Nooksack Salmon Enhancement Association (NSEA) volunteers and a Whatcom Sheriff's Office work crew in the fall of 2012.

Initial Erosion Control Planting

The construction contractor will plant grass seed mix and mulch all soils disturbed by construction activities at the completion of the construction work. Planting shall follow USDA NRCS Spec. CS-342, as follows:

Apply a native grass seed mix at the following rates: Annual Ryegrass at 10 lbs/acre and Creeping Red Fescue at 24 lbs/acre. Fertilize with 16-20-20 fertilizer or equivalent at rate of 250 lbs/acre. Mulch with weed-free straw at a rate of 1.5 tons per acre. Press straw into the soil or cover with biodegradable netting to keep it in place.

Final Revegetation Planting

NSEA Volunteers and a Whatcom Sheriff's Office work crew will plant using hand tools in the late fall of 2012 or early spring of 2013. Plants will be protected with seedling protectors.

Maintenance

NSEA Volunteers and a Whatcom Sheriff's Office work crew will mow as needed from the spring of 2013 to the fall of 2015, or until the plantings are established and blackberries have been eradicated. Herbicide may be applied if needed by a licensed applicator.

Plant Distribution

Conifer trees will be planted on the upper stream banks and adjacent upland areas where the soils are dry enough to support conifer growth. Early succession native deciduous trees and shrubs will be planted along the stream banks where needed beginning at the ordinary high water mark.

Plant List

Species	Quantity	Species	Quantity
<u>Trees</u>			
Grand Fir	100	Sitka Spruce	100
Paper Birch	35	Western Red Cedar	100
Scoulers Willow	50	Sitka Willow	50
<u>Shrubs</u>			
Pacific Ninebark	100	Black Twinberry	100
Cascara	35	Red Osier Dogwood	100

Prepared for:



Prepared by:

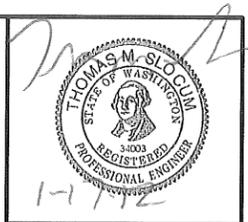


Date: 12-5-11

Scale:

Sheet # 13 of 15

Construction Plan and Temporary Erosion and Sediment Control Plan



Revisions

For the purpose of protecting water quality and public safety, the construction work shall follow the general plan below. The contractor is solely responsible for deciding the actual methods and sequence of all construction tasks, subject to approval by WDFW.

1. General Best Management Practices

- 1.1. All work shall be done during summer low water in accordance with the conditions of all environmental permits.
- 1.2. Vehicle traffic is restricted to the construction area boundaries outlined in the site plan, below. Stage construction materials at the road turn-around located immediately south of the dam site.
- 1.3. All excavation and filling shall be done with a tracked excavator and small bulldozer operating from either the existing access road, the reconstructed main creek channel, or the right bank of the side channel, as detailed below. Transportation of materials shall be done by dump truck operating on the access road. No construction vehicles shall operate within wetland areas or within the creek channel outside of the construction area boundaries.
- 1.4. All construction work shall be isolated from surface water using the BMPs listed in Item 3, below.

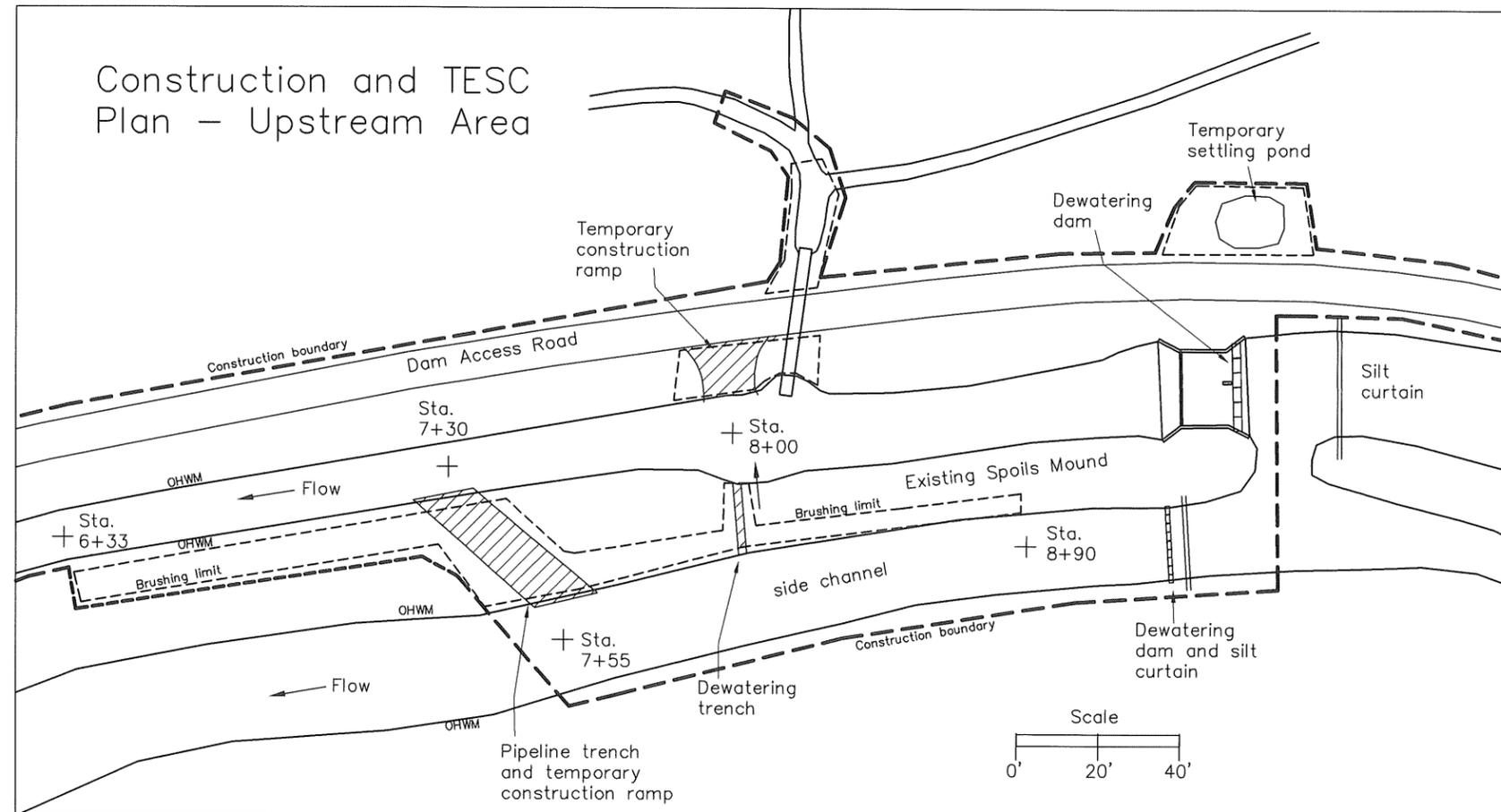
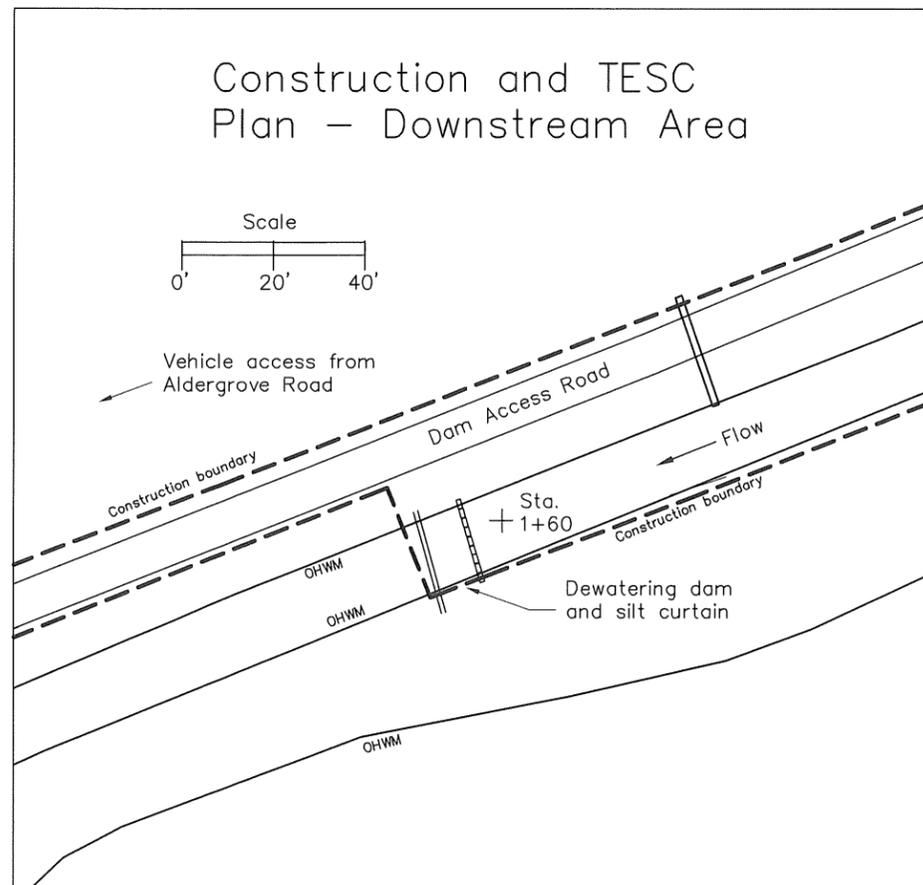
2. Pre-construction Brushing

- 2.1. The site engineer or construction site manager shall flag all trees and blackberry thickets to be cut to allow construction access. The areas of brushing are shown in the site plan below. Flagged vegetation shall be removed from the site. No other vegetation shall be removed without permission from the site manager.

3. Water Quality Protection BMPs

- 3.1. During the summer low-flow construction window, it is anticipated that there will be no flow in the creek. The contractor, however, shall be prepared to suspend construction work in the event of unexpected high rainfall events.
- 3.2. A straw dam and filter fabric silt fence shall be placed across the main creek channel at approximately the location shown in the site plan below.
- 3.3. A suspended silt curtain will be placed across the main channel upstream of the work area at the location shown.

Lake Terrell Dam Channel Restoration and
 Fish Passage Project
 Construction Plan and TESC Plan



Prepared for:

 Washington Department of FISH and WILDLIFE

Prepared by:

 WHITMAN CONSERVATION DISTRICT
 6975 Hannegan Road
 Lynden WA 98264-9620
 (360) 354-2035

Date: 12-5-11

Scale: 1" = 40'

Sheet # 14 of 15

Construction Plan and Temporary Erosion and Sediment Control Plan (continued)

4. Construction Dewatering

- 4.1. The existing siphons, remote site incubator (RSI) and associated plumbing shall be removed, per the directions of WDFW and NSEA.
- 4.2. The upstream end of the existing spillway structure will be blocked by placing large "super sack" sandbags, water bags, or equivalent across the channel and flush with the walls. The final height of the temporary dam will be at least 1 foot above the typical summer water surface elevation.
- 4.3. The main channel at the downstream end of the project reach will be blocked by placing a sandbag and plastic sheeting dam across the channel at the location shown.
- 4.4. The side channel will be blocked upstream of the project area by placing a sandbag and plastic sheeting dam at the location shown. At typical summer low flow, the side channel ends about 30 feet downstream of the project work area, so there is no need to block the downstream end for construction dewatering.
- 4.5. Fish will be removed from the main channel and side channel work areas by NSEA staff. The fish will be hand netted and released into either the main Terrell Creek channel downstream of the project work area (resident fish) or back into Lake Terrell upstream of the dam (non-native fish).
- 4.6. A narrow trench will be hand excavated through a low point in the spoils berm at approximately Sta. 8+00 to drain all standing water in the side channel into the main channel.
- 4.7. Standing water in the fore bay of the dam will be pumped into a settling pit constructed on the east side of the access road at approximately Sta. 9+20. Settled water will be allowed to flow into the forest east of the road. Water from the fore bay will be pumped on a continual basis as needed during construction of the new weir.
- 4.8. Water from the main channel downstream of the dam will be pumped over the downstream sandbag dam into the channel, where it will be allowed to settle before flowing through the silt fence.

5. Preliminary Reconstruction of the Main Creek Channel

- 5.1. A construction vehicle access ramp will be graded from the existing dam access road into the main creek channel at approximately Sta. 8+00. The channel at this location will be filled with compacted hardpan soil mix to the initial grade on the drawings. The ramp and a small work surface at the base of the ramp will be temporarily stabilized with geotextile and rock spall to support vehicle access.
- 5.2. The channel will be filled to the initial design grade with hardpan soil mix by a small bulldozer (or equivalent equipment) pushing and compacting the soil along the channel upstream and downstream from the access ramp at Sta. 8+00. All existing large logs, organic debris, and riprap will be removed from the channel prior to placing the compacted hardpan soil mix. At least five feet of channel immediately downstream of the existing dam will be left unfilled until the dam demolition and weir construction (Task 6) is completed.

6. Dam Demolition and Weir Construction

- 6.1. All muck and organic debris will be excavated from the existing dam spillway structure.
- 6.2. The existing wood and steel flashboards will be removed and disposed of offsite. The steel catwalk will be removed and salvaged for reuse in the new foot bridge structure.
- 6.3. The new weir will be constructed by placing pre-cast concrete planks in the existing wall slots, per the specs in Detail D (Sheet 8).
- 6.4. After the new weir is finished, the remainder of the new channel upstream and downstream of the dam will be filled with compacted hardpan soil mix to the preliminary design grade.

7. High Flow Overflow Construction

- 7.1. A trench for the high flow overflow pipes will be excavated through the left bank spoils mound from Project Sta. 7+30 to 7+55 (see figure below). The bottom of the trench will be temporarily stabilized with geotextile and crushed rock to allow construction vehicle access along the trench.
- 7.2. A small tracked excavator will be used to dredge muck from the side channel from approx. Sta. 7+90 to 8+70 to match the channel profile in Detail C (Sheet 10). The excavator will operate from the right bank of the side channel and will spread the dredge spoils on the existing spoils mound.
- 7.3. The footings for the overflow catch basin and for the pedestrian foot bridge will be excavated and constructed per Details C and E.
- 7.4. The prefabricated catch basin will be placed on the footings and backfilled. The abutment for the foot bridge will be cast in-place and backfilled.
- 7.5. The overflow pipes will be installed from the catch basin to the main channel, and the riprap scour apron at the pipe outlets will be constructed, per Detail C. The temporary geotextile and rock spall will be removed prior to installing the pipes.
- 7.6. The gate mechanism at the inlet of the catch basin will be installed.
- 7.7. The pipe trench will be backfilled to final grade per Detail C.

8. Tributary Culvert Replacement

- 8.1. The existing culvert across the dam access road at Sta. 8+15 will be excavated and disposed of off-site.
- 8.2. The channel upstream of the culvert will be filled with compacted hardpan soil mix to the initial profile and grade shown in Detail D (Sheet 11).
- 8.3. The new culvert will be installed and backfilled to final grade, per Detail D.
- 8.4. The gravel top course will be placed in the culvert bottom and in the re-graded creek channel to the final profile and grade shown in Detail D.

9. Final Reconstruction of the Main Channel

- 9.1. The pools and meandering thalweg will be graded in the lower hardpan layer of the main channel to match the details in Sheets 4 and 5 using a small tracked excavator operating in the channel.
- 9.2. The LWD structures will be installed at the locations shown in the drawings, per the specifications in Detail B (Sheet 9).
- 9.3. The gravel and cobble mix top course will be placed to the final design grade. The largest cobbles (approx. 8" diameter and larger) will be placed for optimal fish habitat benefit under the direction of the site engineer.
- 9.4. The foot bridge structure will be placed over the channel and secured to the brackets in its abutments, per Detail E (Sheet 12).
- 9.5. The dewatering trench through the left bank spoils mound at Sta. 8+00 will be backfilled with topsoil to the original initial grade. The temporary construction access ramp at Sta. 8+00 will be removed and backfilled with hardpan soil mix and topsoil to the original initial grade.

10. Erosion Control Planting and Site Cleanup

- 10.1. All temporary dewatering dams, silt curtains and filter fences shall be removed.
- 10.2. All soils that were disturbed by construction will be planted with an erosion control grass planting mix and mulched, per USDA NRCS construction spec. CS-342 (attached to the Planting Plan, Sheet 13).
- 10.3. All construction materials and equipment will be removed to the satisfaction of WDFW.

11. Final Site Revegetation

- 11.1. Final revegetation of the construction site will be done in the autumn or early spring following construction, per the Planting Plan.



Revisions

Lake Terrell Dam Channel Restoration and
Fish Passage Project
Construction Plan and TESC Plan (cont.)

Prepared for:



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Scale: 1" = 40'

Sheet # 15 of 15