

Goldsborough Creek

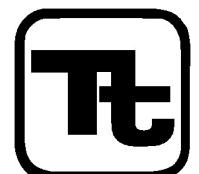
Dam Removal and Stream Restoration

Mason County, Washington



U.S. Army
Corps of Engineers
Seattle District

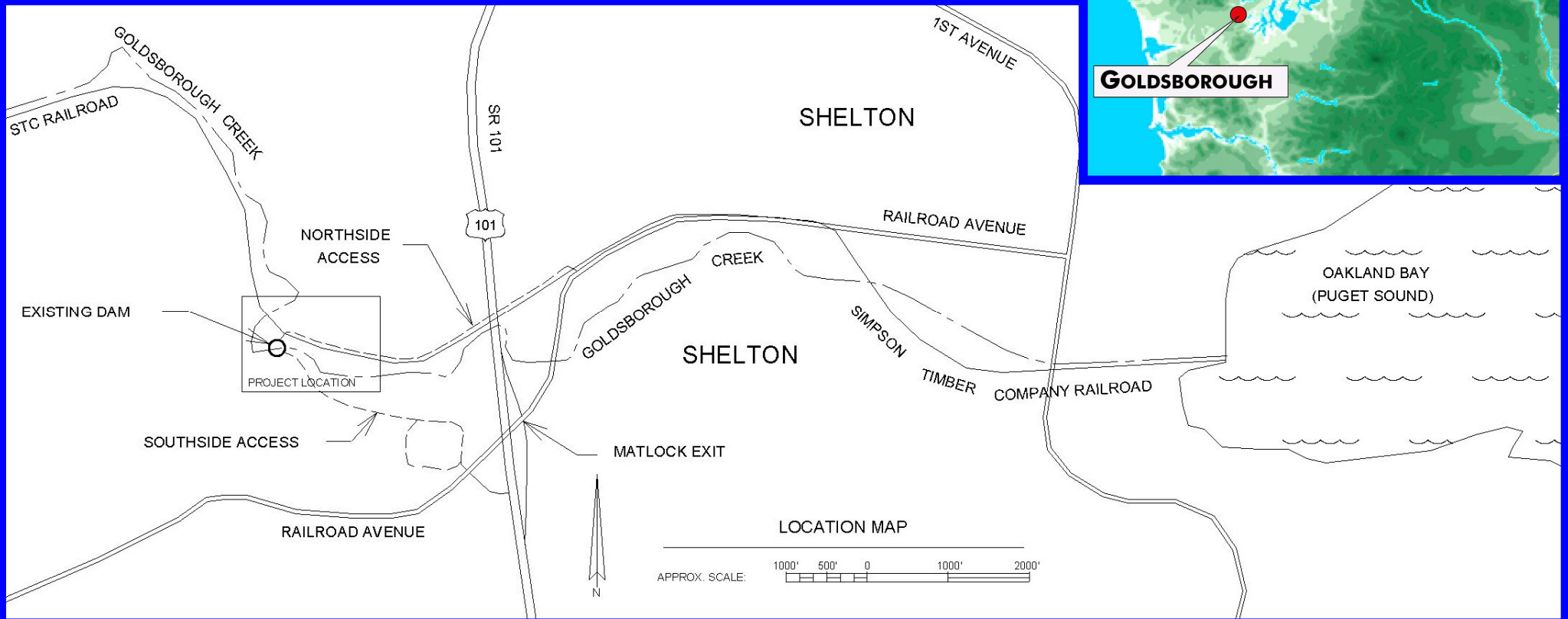
- **Project Sponsored by U.S. Army Corps of Engineers and Washington State Department of Fish and Wildlife**
- **Design prepared by Tetra Tech, Inc. ISG**
- **Presented by Krey H. Price, P.E.**



Tetra Tech Inc. ISG
Seattle

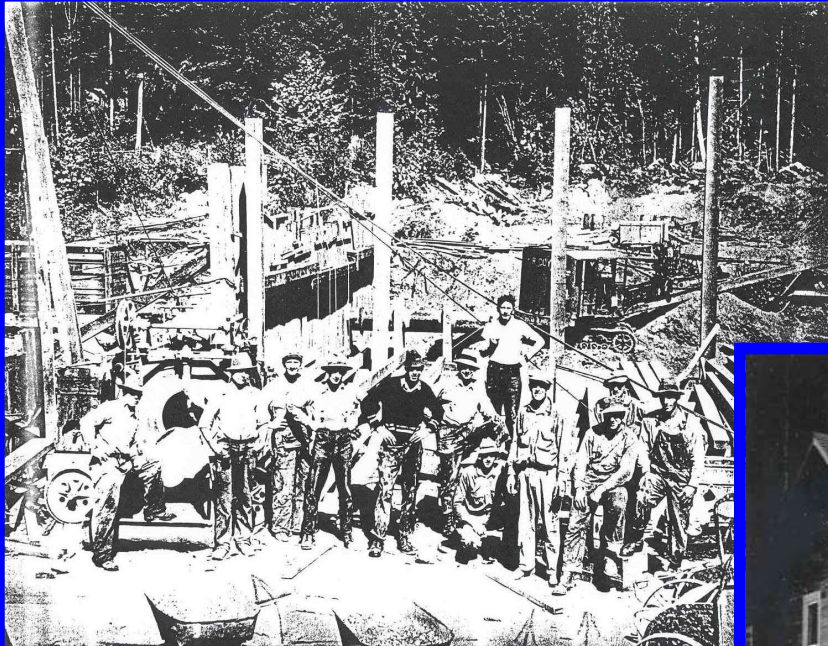
Project Location

- Goldsborough Creek drains to Oakland Bay (Puget Sound)
- Goldsborough Creek Dam is 2 miles upstream of outlet



Project Background

Dam History



- Dam Built in 1921
- Modified in 1932



- Abandoned in 1950's
- Stabilized in 1997

Project Background

Existing Dam



- Upstream Siltation
 - No Storage

- Downstream Erosion
 - Impedes Fish Passage



Project Background

Feasibility Study

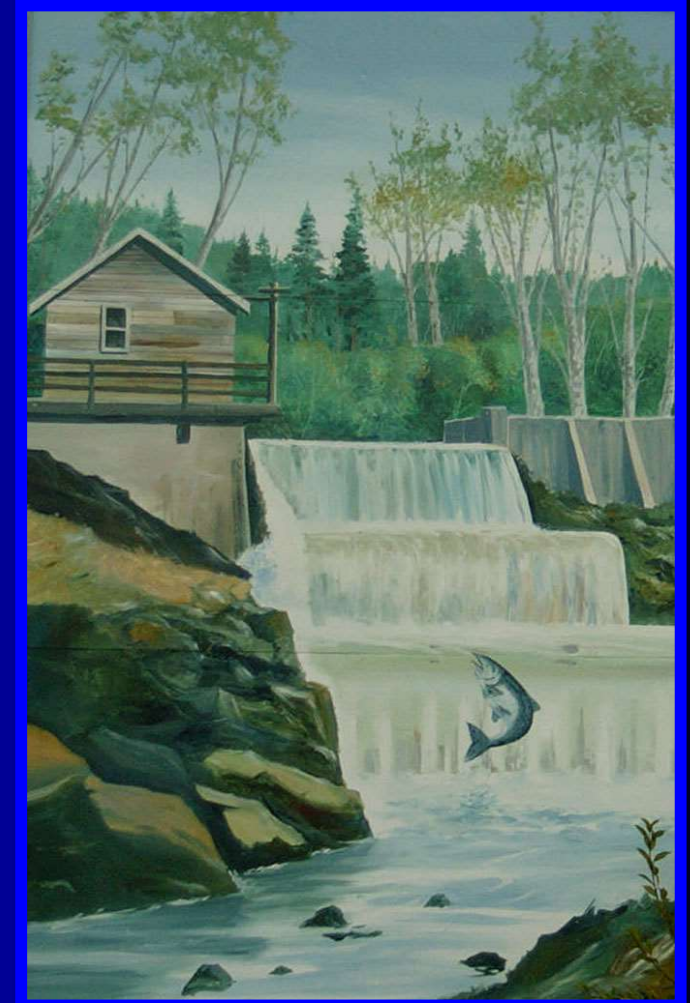


- Feasibility Report completed by U.S. Army Corps of Engineers in 1999
- Recommendation: Replacing existing dam with 33 sheet pile weirs in 7 groups spanning 2000 feet of channel



Design Analysis Fisheries

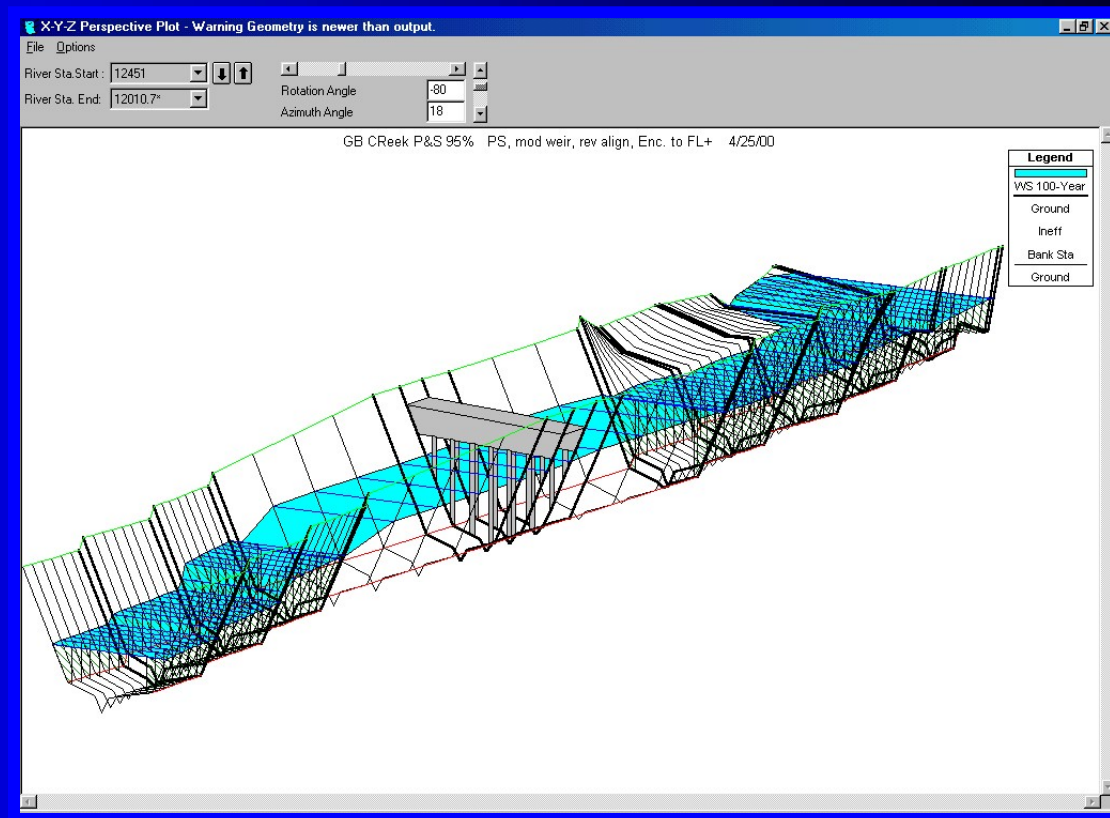
- Existing fish ladder ineffective for most species
- Target species is Chum Salmon
- Maximum drop height 1 foot



Design Analysis

Hydraulics

- HEC-RAS Analysis
 - Model incorporated various alignments and weir configurations
- Local Analyses
 - Stream banks at weirs
 - Stream invert at weirs



Design Analysis

Sedimentation

- Sampling:
 - Sieve Analyses
 - Pebble Counts

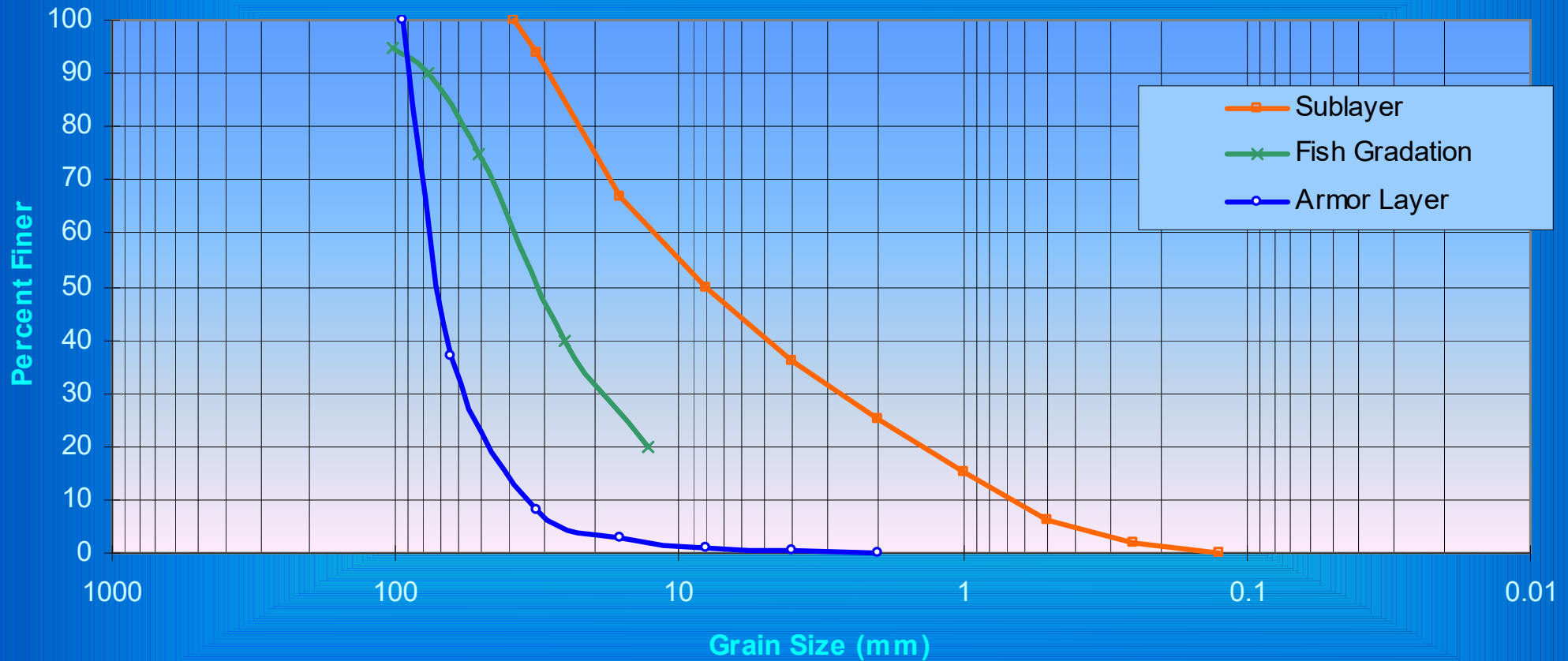


6" Grid Shown



Design Analysis Sedimentation

Goldsborough Creek Soil Gradation for SAM Input



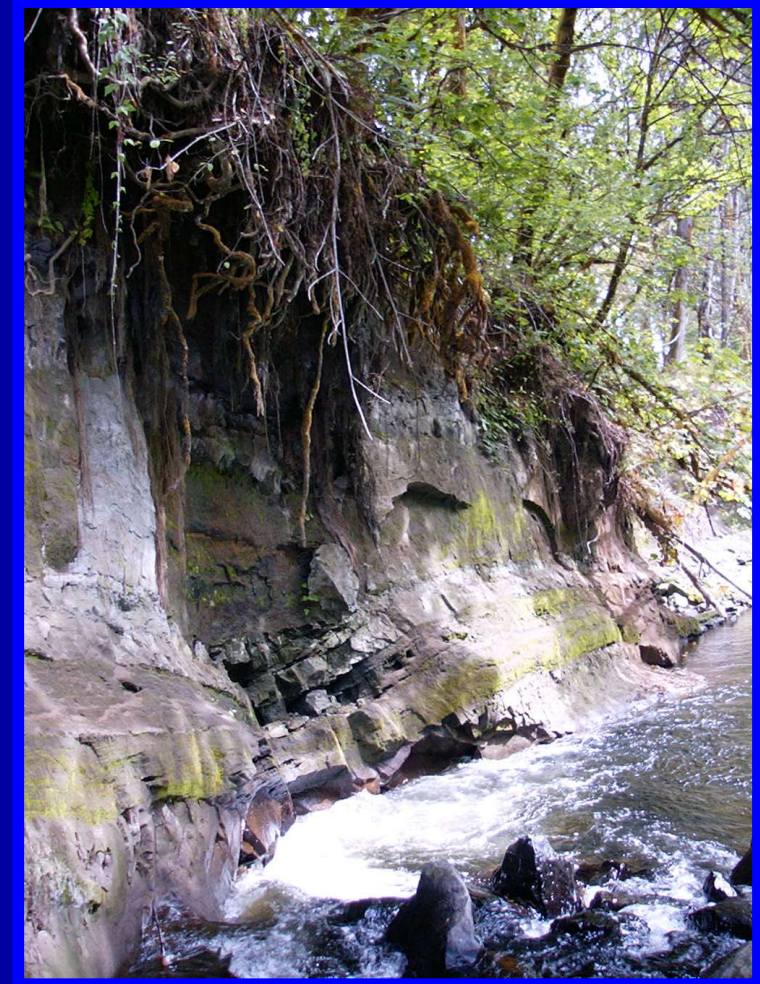
BOULDERS	large	small	v	coarse	mediu	fine	very	v	coarse	mediu	fine	very	coarse	mediu	fine
	COBBLES		GRAVEL					SAND					SILT		



Design Analysis

Geotechnical

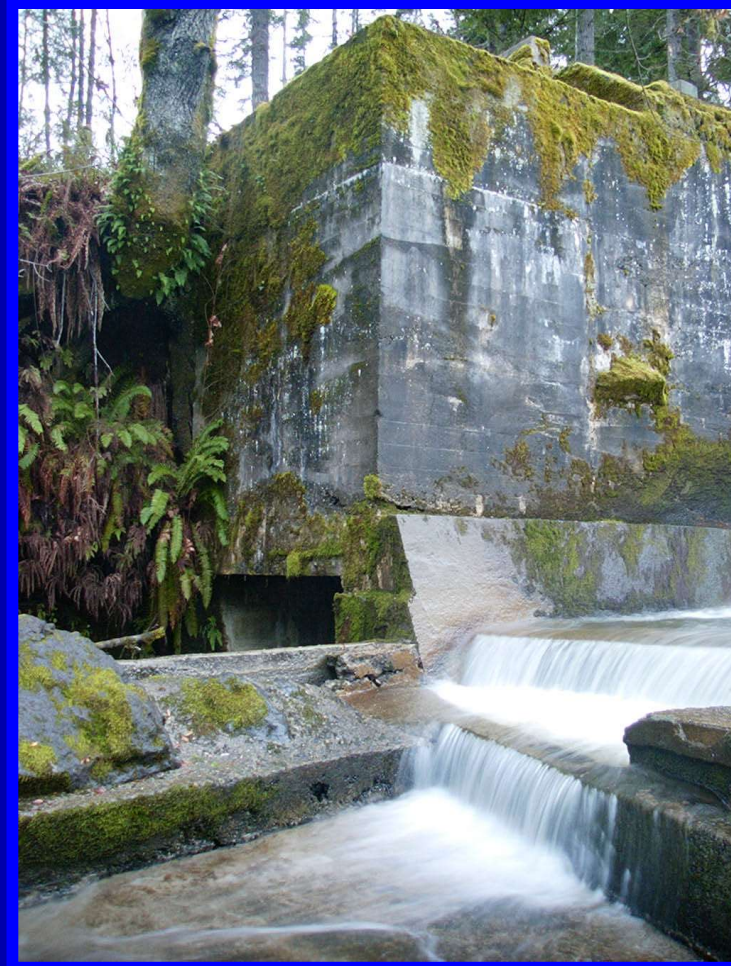
- Kitsap Formation
- Wetlands



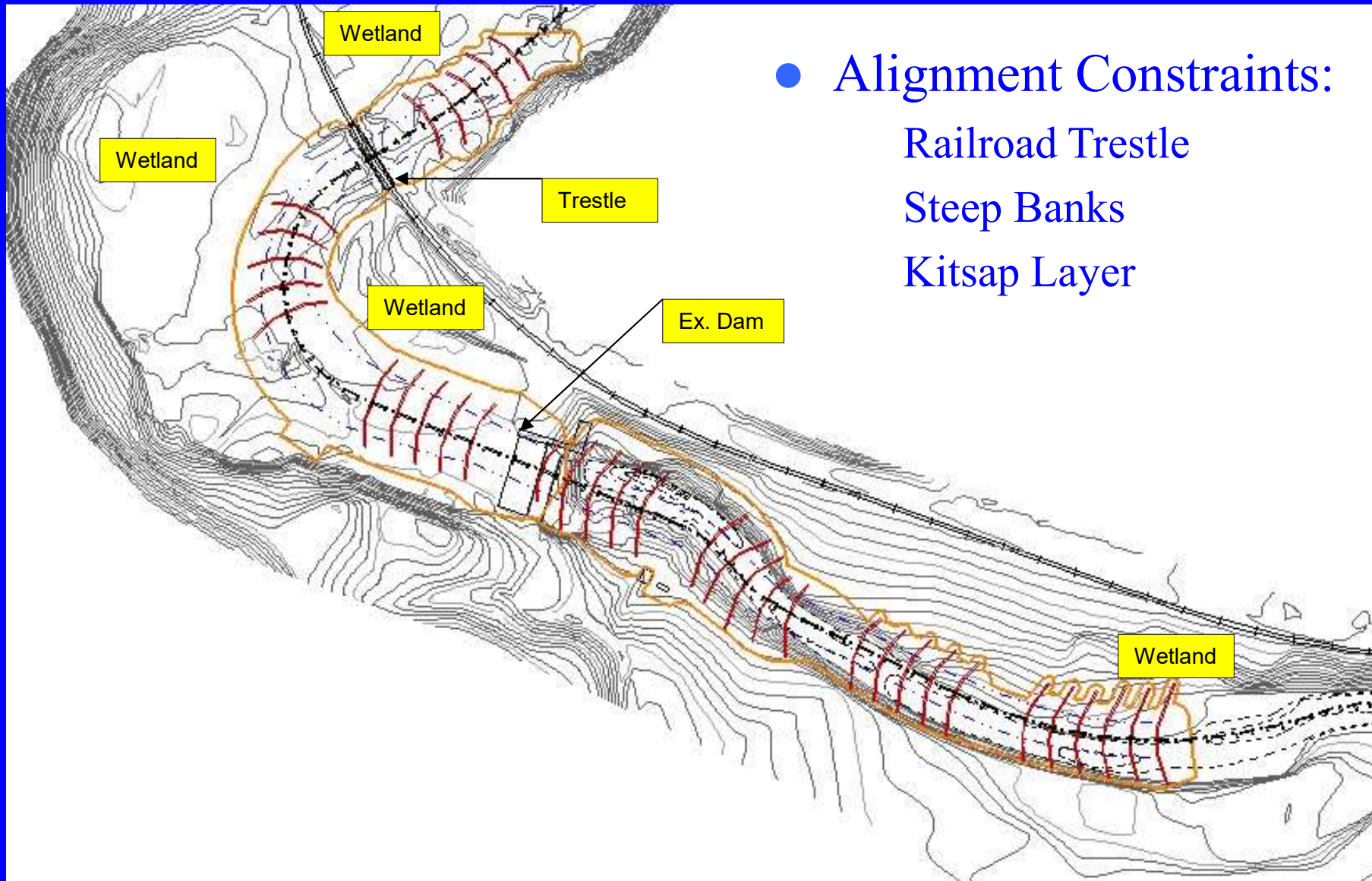
Design Analysis

Demolition

- Material
 - Timber (Dam and Fish Ladder)
 - Sheet Pile
 - Concrete
- Unknown Quantities

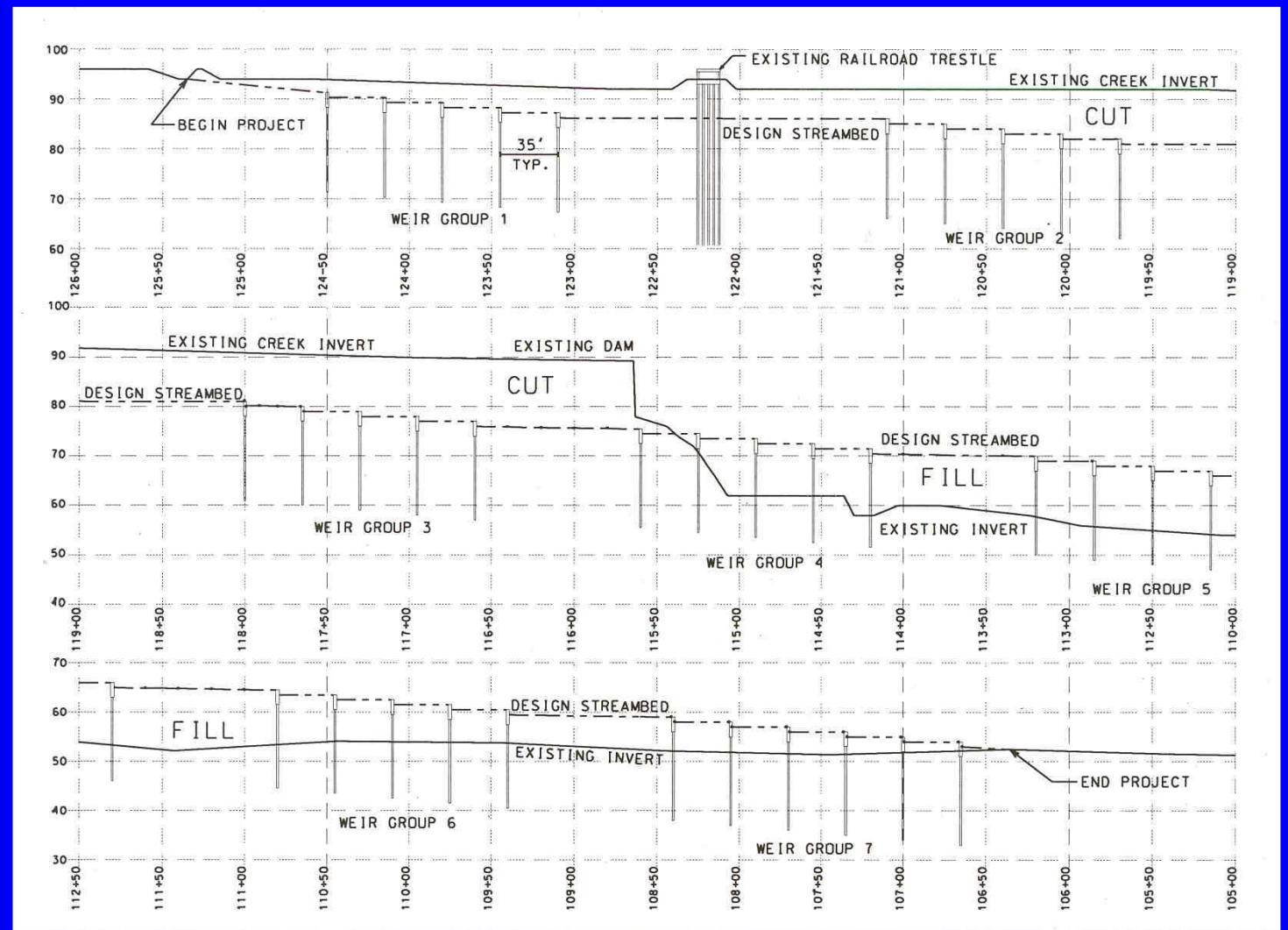


Stream Restoration General Plan



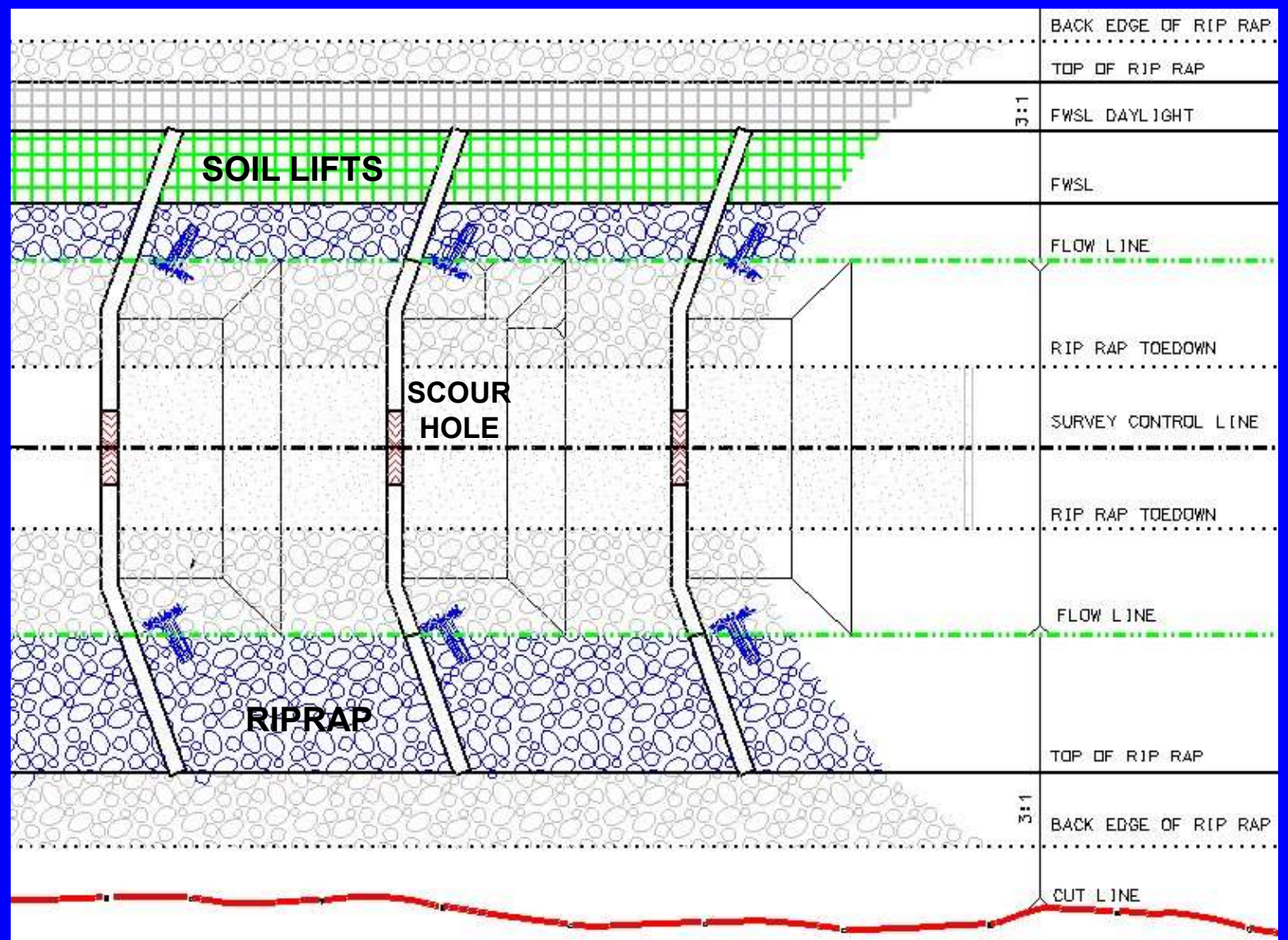
Stream Restoration General Profile

- 7 Weir Groups
- Cut and fill areas
- Existing $S = 0.5\%$
- Design $S = 2.5\%$



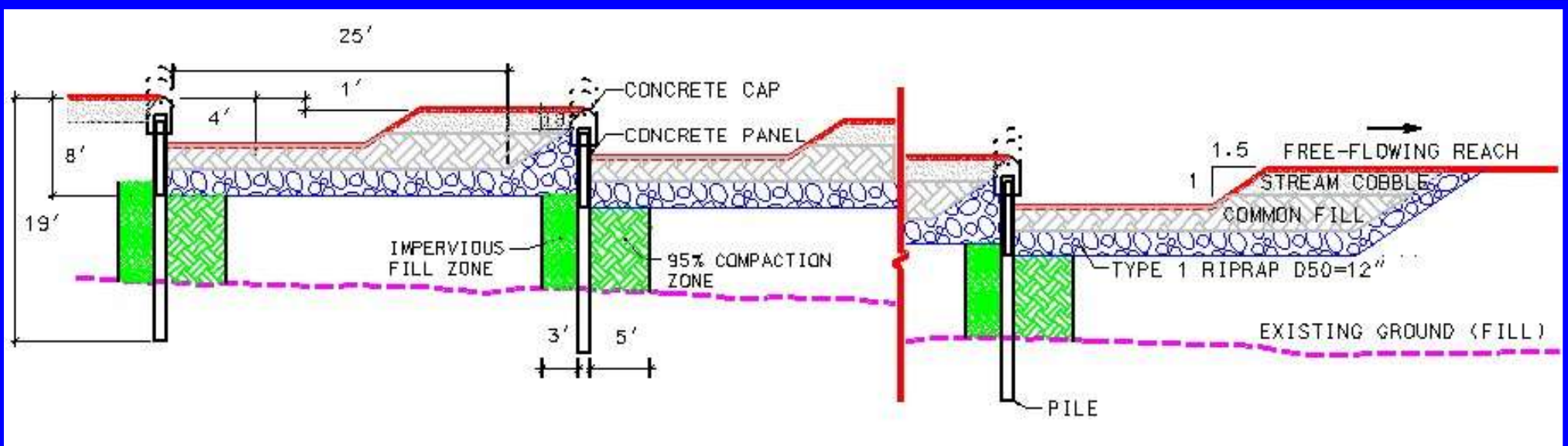
Stream Restoration Weir Plan

- 20° Dogleg
- Width Varies



Stream Restoration Weir Profile

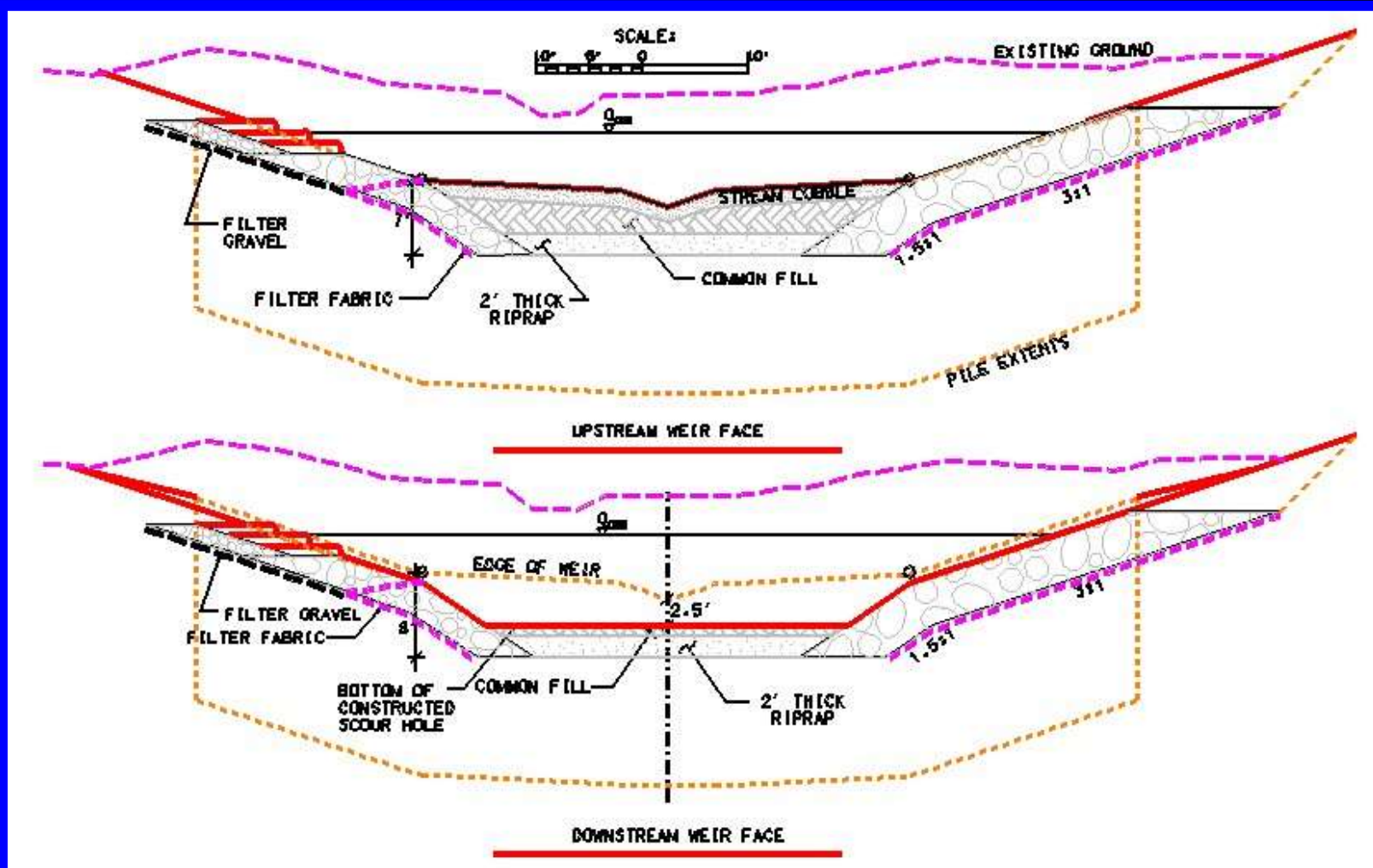
- Preformed Scour Holes:
 - Subsurface riprap
 - Common fill
 - Stream cobble
- Compaction Zones



Stream Restoration

Weir Section (cut)

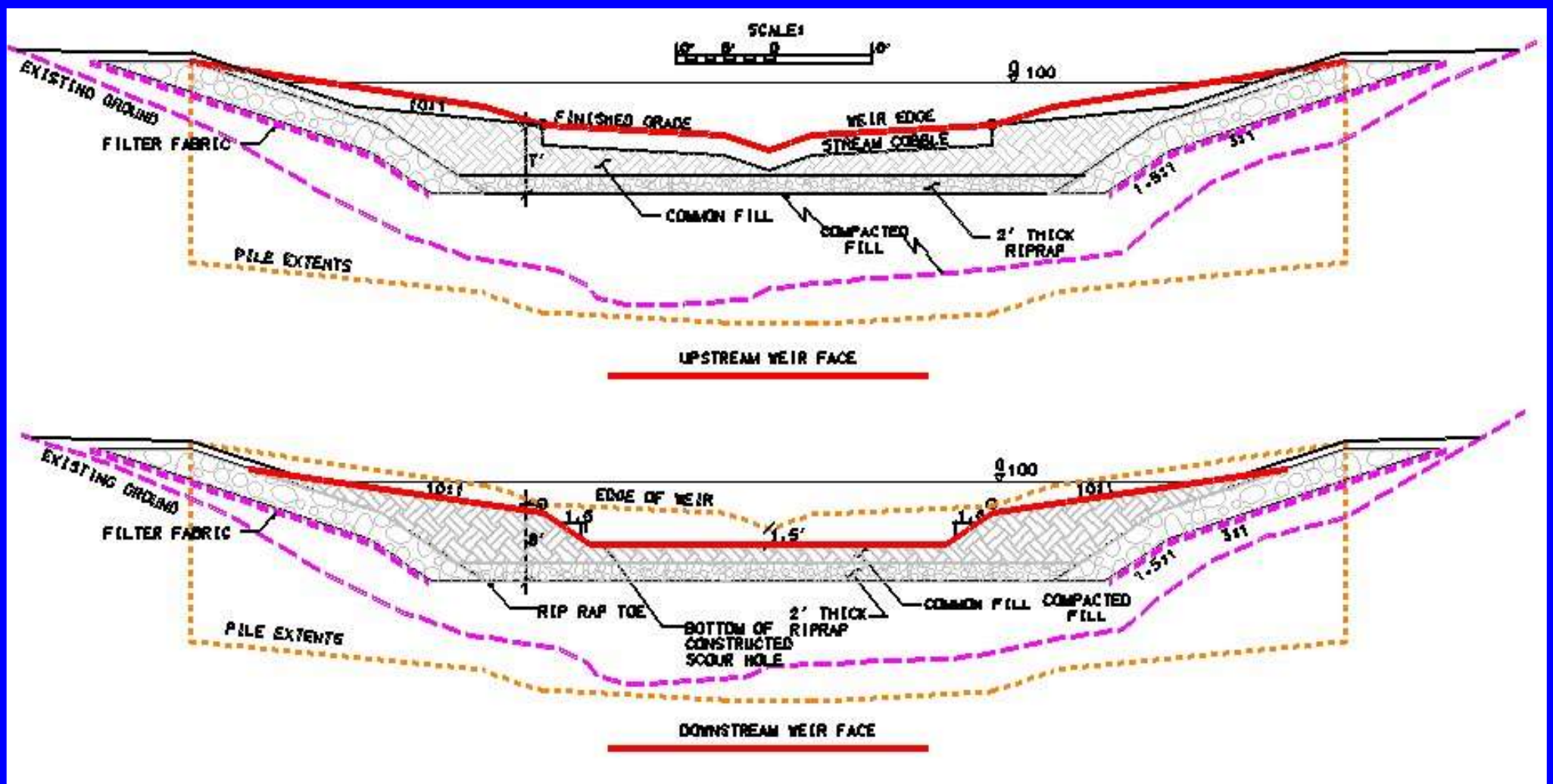
- Channel Invert Protection
- Stream Cobble Layer
- Common Fill
- Low-flow Notch



Stream Restoration

Weir Section (fill)

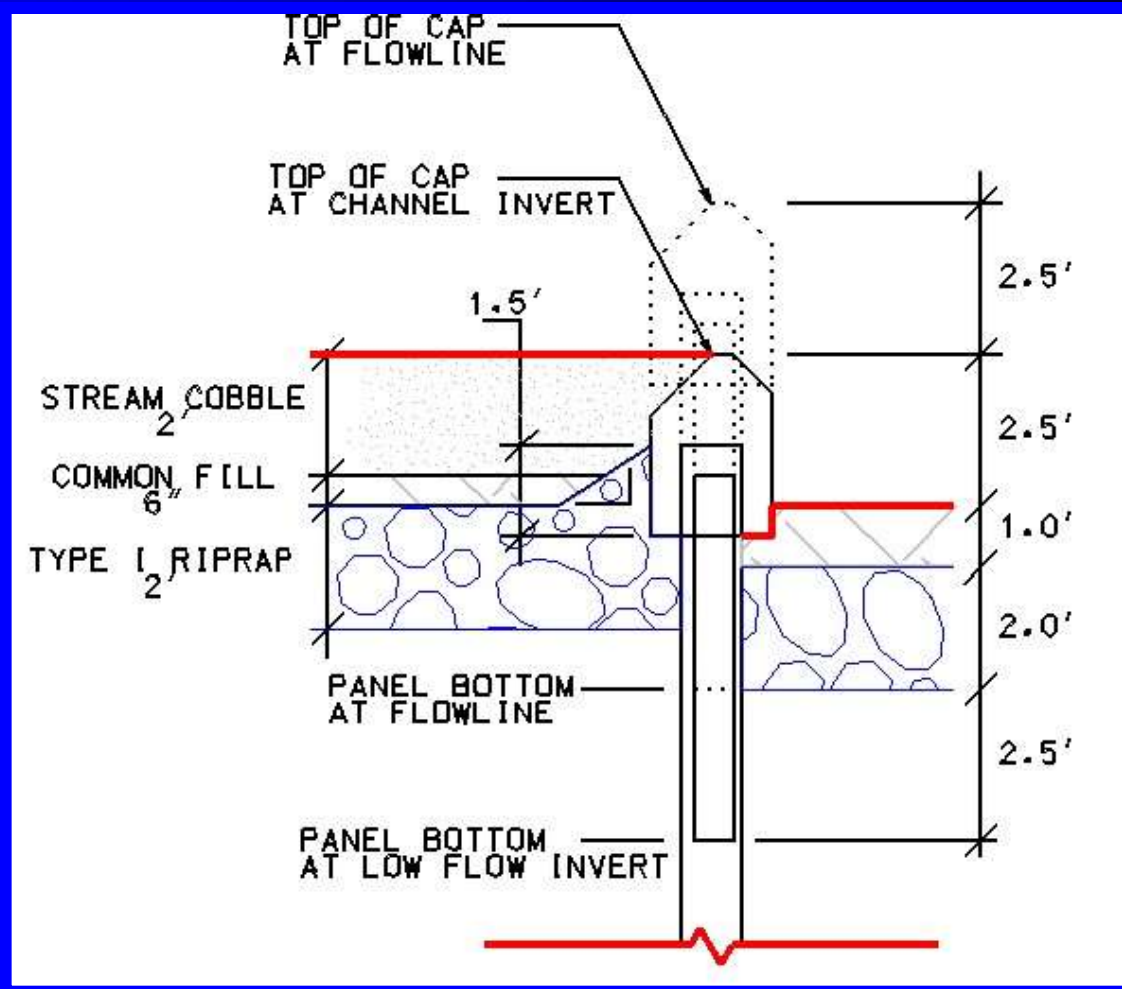
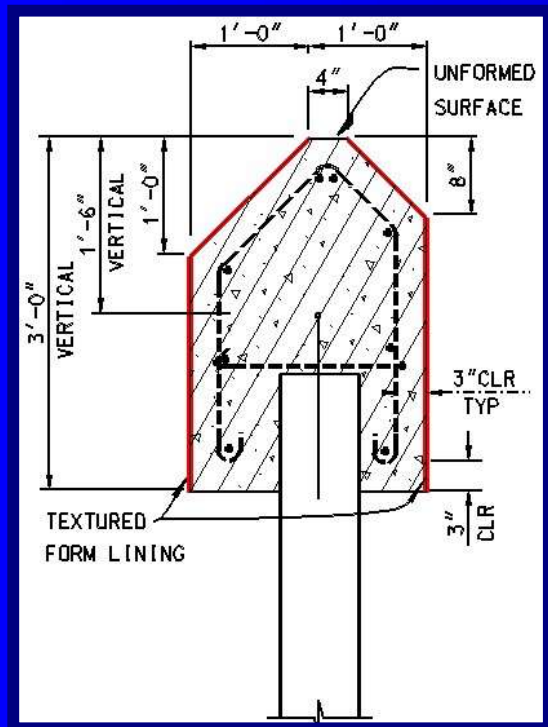
- Channel Invert Protection
- Common Fill
- Stream Cobble Layer
- Low-flow Notch



Stream Restoration

Weir Details

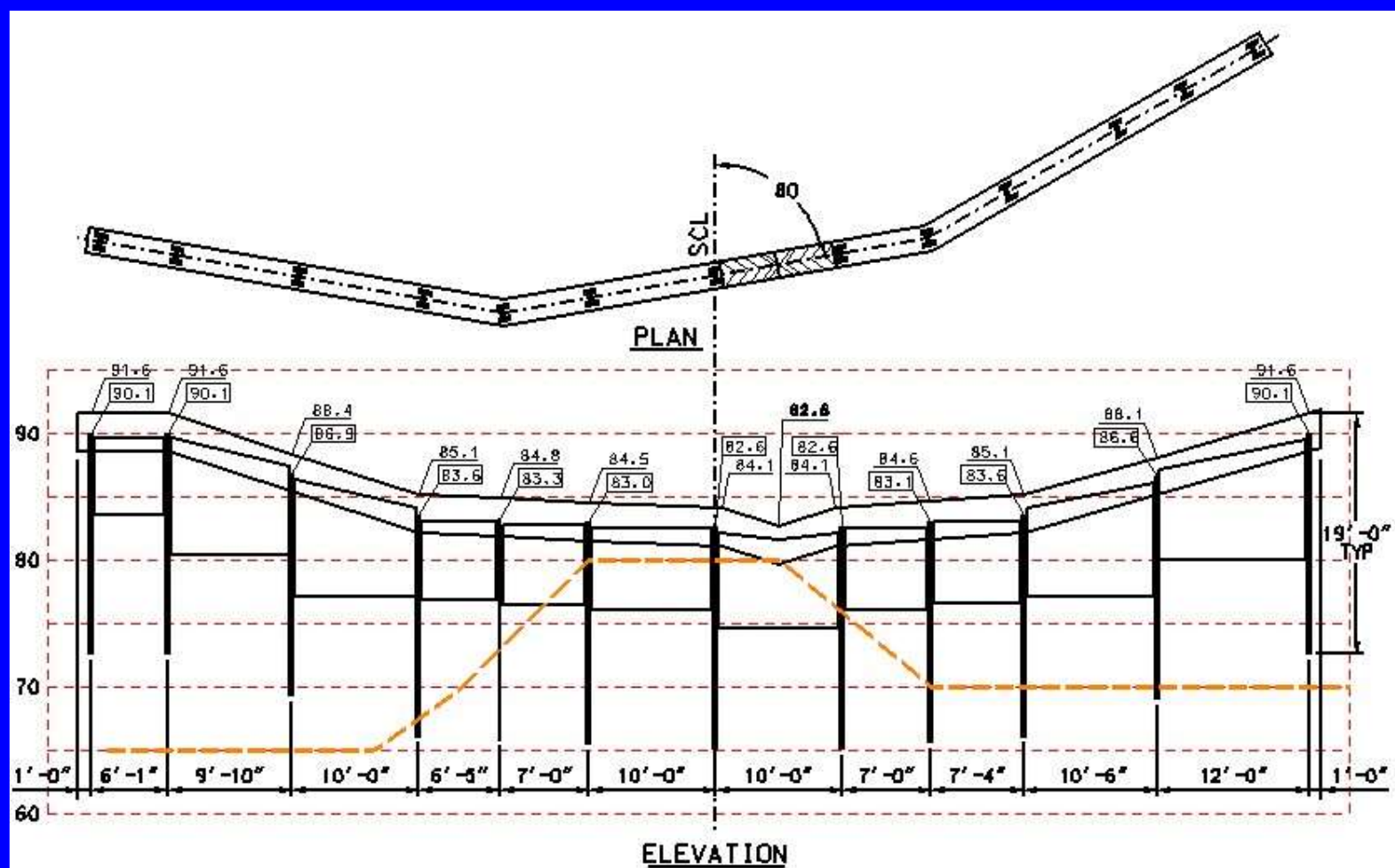
- Weir Cap
 - Shape
 - Material



Stream Restoration

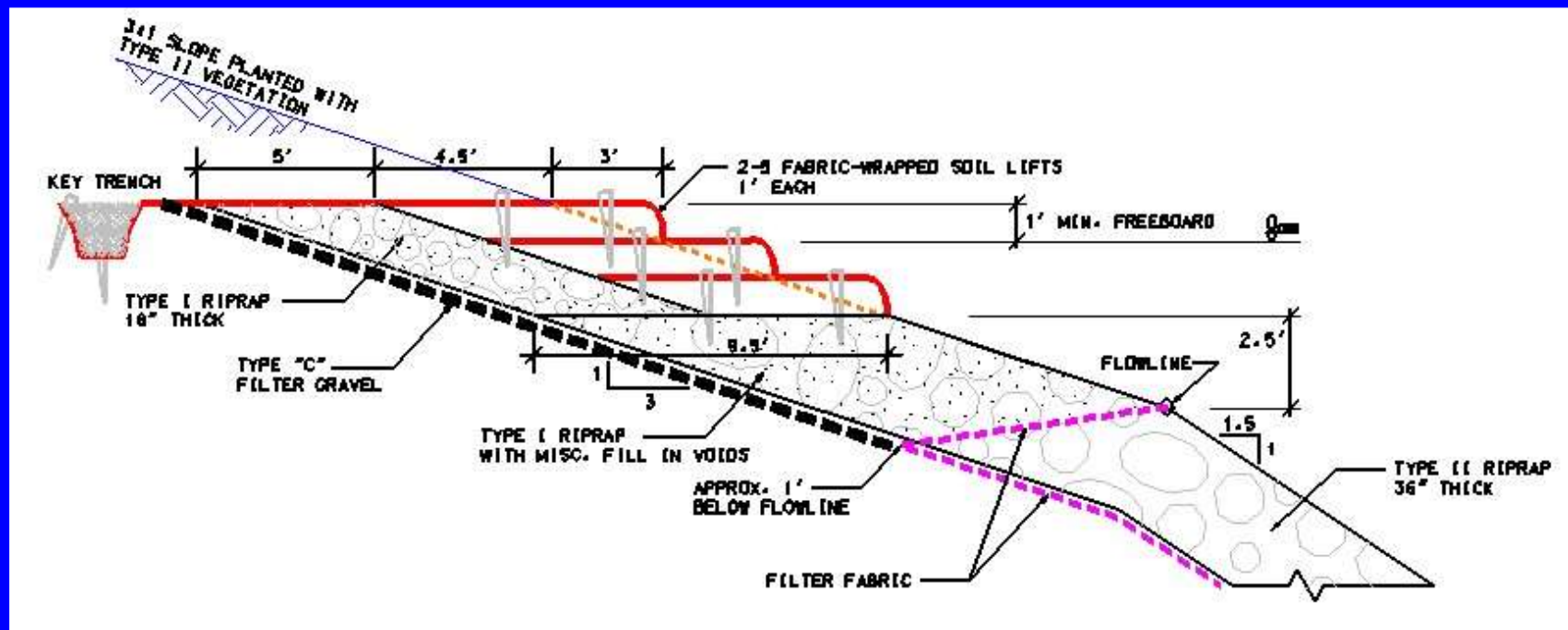
Weir Details

- H-Pile vs. Sheet Pile



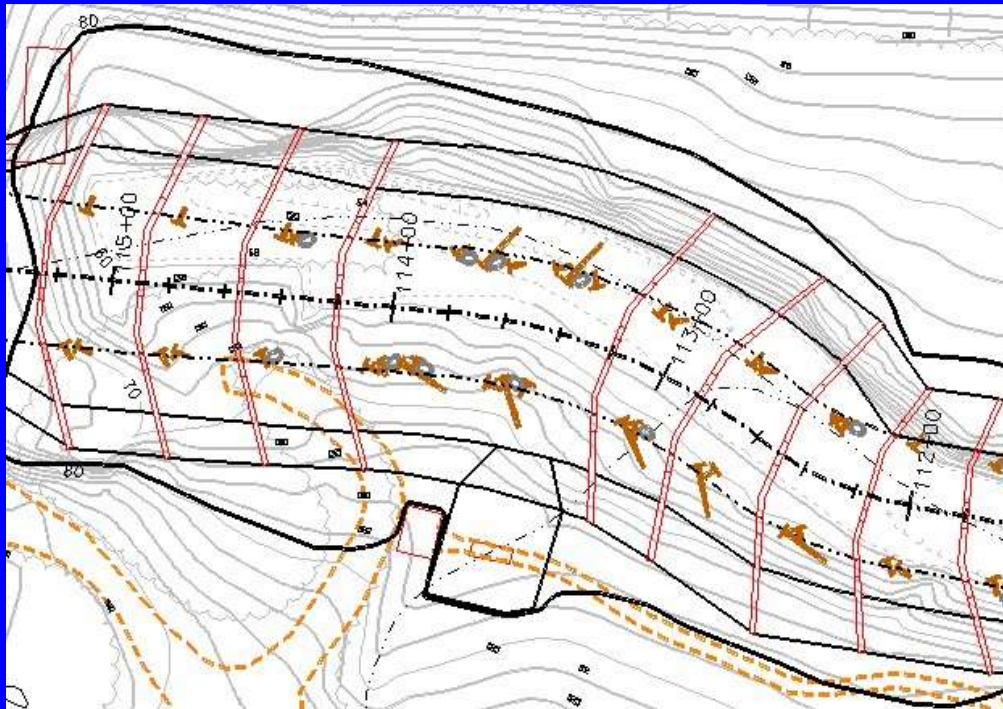
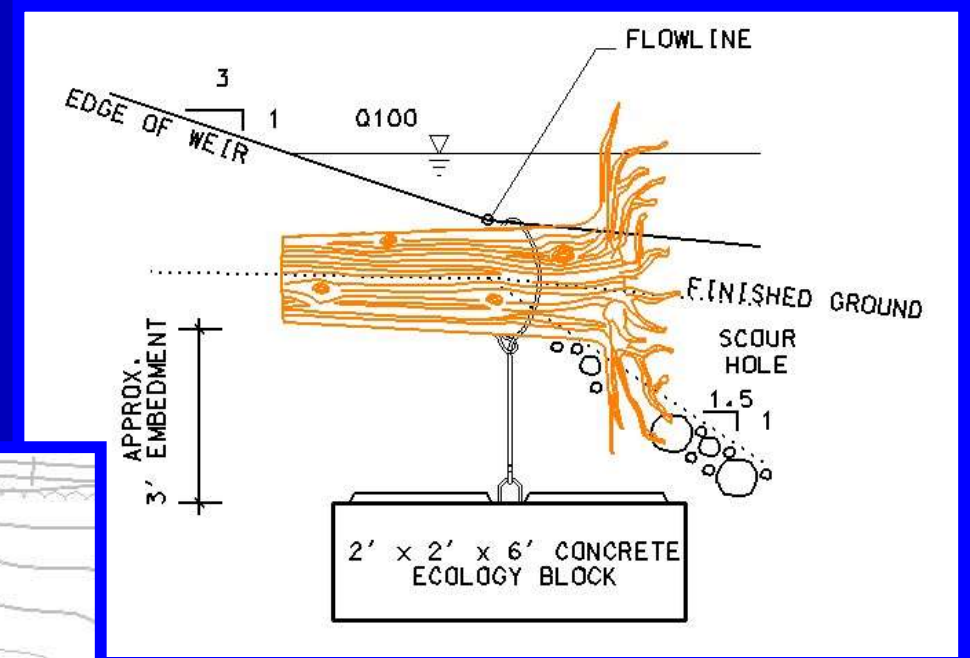
Stream Restoration Bank Protection

- Type 1 Riprap – 18” layer, D50 = 12”
- Type 2 Riprap – 36” layer, D50 = 24”
- Type 3 Riprap – 54” layer, D50 = 36”
- Fabric-Wrapped Reinforced Soil Lifts



Stream Restoration Habitat Features

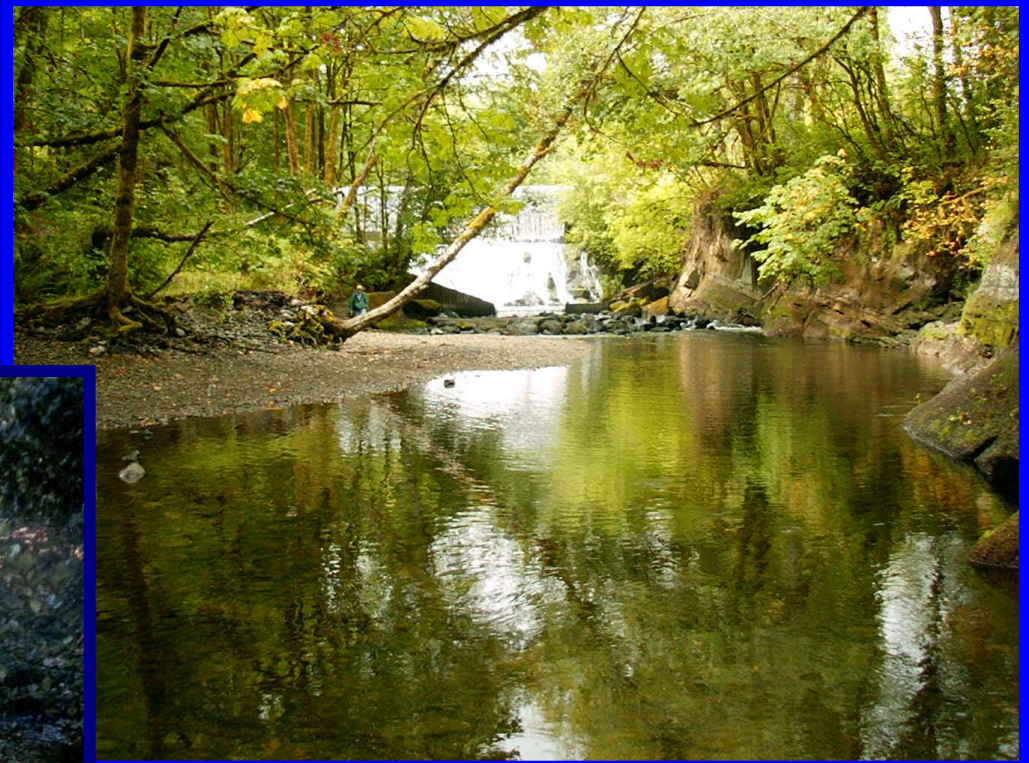
- Large Woody Debris
- Boulders



Stream Restoration

Additional Considerations

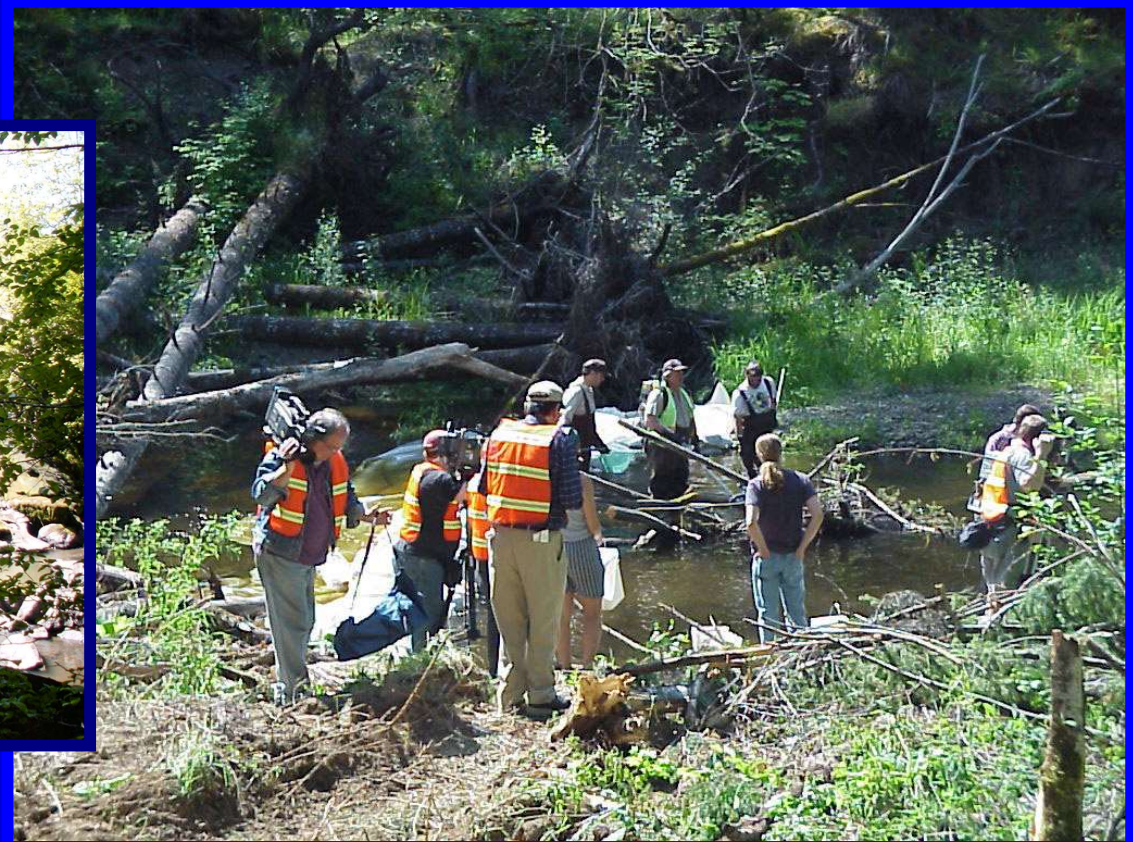
- Temporary Diversion
- Railroad Trestle
- Downstream Utilities



Construction

Summer 2001

- Mobilization
- Stream Diversion / Fish Capture
- Clearing and Grubbing



Construction

Demolition Sequence



Construction

Misc. Construction Photos

- Pile Driving
- Concrete Forms
- Habitat Features



Construction Lessons Learned

- Check
- Recheck
- Check Again



Construction

Final Grading

- Rewatering
- Revegetation



Stream Restoration Summary

- Project provides balance between fisheries needs and hydraulic requirements
- Current status: construction nearing completion
- Rewatering scheduled for September 21, 2001

Acknowledgements

- U.S. Army Corps of Engineers, Seattle District
- Washington State Department of Fish and Wildlife
- Previous Studies by Simpson Timber Company

