



R & E Grant Application 15 Biennium

Project #:
15-029

Elk Creek RM 5.6 High Flow Habitat Enhancement

Project Information

R&E Project Request: \$29,900.00
Total Project: \$303,363.00
Start Date: 8/10/2015
End Date: 11/30/2017
Organization: Rogue River Watershed Council (Tax ID #: 11-3823736)

Applicant Information

Name: RR WC
Email: bbarrrrwc@gmail.com

Past Recommended or Completed Projects

This applicant has no previous projects that match criteria.

Location Information

Where is it?

The project will occur on public land owned or managed by another party

Landowner Information

Name: US Army Corps of Engineers
Affiliation: POC-April Andujar
Address: 100 Cole M. Rivers Drive
Trail, Oregon, 97541
Phone: 541-878-1080
Email: April.D.Andujar@usace.army.mil

Site Description

Street Address, nearest intersection, or other descriptive location.

The site is located approximately 3 miles upstream from the partially built and now notched Elk Creek Dam site, 5.6 mile up from the confluence with the Rogue River.

Directions to the site from the nearest highway junction.

Heading north on Highway 62 turn left at Elk Creek Road. At West Branch Elk Creek there is a gated access road for vehicles, the site is about two miles up this road. Public access is by foot or bike and starts at the Yellow Rock Picnic Area where the site is about 1.5 miles up Elk Creek.

Following project completion, public anglers will be allowed the following level of access to the project site:

No access

Please describe what leases, easements, agreements are in place to ensure angler access to the project site, and what is the length of each agreement.

The closest fishing is on the Rogue River at the mouth of Elk Creek (5.6 mile downstream). Although fishing is not permitted on most tributaries to the Rogue River, these tributaries, and Elk Creek in particular, serve as nursery areas for fall Chinook, summer and winter steelhead, coho, and cutthroat trout.

Dominant Land Use Type:

Forest

Project Location

General Project Location.

County: Jackson
Town/City: Trail
ODFW Dist: Rogue
Stream/Lake/Estuary Name: Elk Creek
Sub-basin: 171003070505
Tributary of: Rogue River
Rogue River

Specific Project Location.

Project Summary

Project Summary

Please provide a couple sentence summary of the proposal.

This project will create high flow refuge habitat for coho salmon and steelhead juveniles resulting in higher survival and growth rates by allowing fish to high flows. The project removes a 500 foot long levy to allow reconnection of off channel habitat on the right bank.

Overall Project Goals

Describe the primary goals or outcomes of the entire project, including elements not requesting funding from R&E.

Increase the frequency and quality of floodplain connectivity during annual high flow periods.

Reconnect and restore off channel stream habitats during annual high flow periods (typically November through March).

Reclaim riparian condition to historical density, structure and species composition.

Primary objectives of R&E funding

Please describe the measurable objectives for the R&E portion of the funding request.

Remove five hundred foot long levee on right bank to reconnect a historic side channel. Re-grading stream side area following the levee removal will allow about six inches of flow into the side channel each winter.

Add two to five habitat structures in right bank off channel. Structures will use five logs (with and without root wads) and be ballasted through burial and using boulders.

Develop and implement riparian planting and maintenance plan covering a total of 1.5 acres along right bank of Elk Creek. Planting will target stream banks affected by construction.

Current Situation/Justification

Please describe the current situation and explain why this funding is needed.

The area where this project is located has been logged, farmed and ranched for most of the last 150 years. The levee was likely constructed by ranchers to keep Elk Creek away from homes and fields. In the 1970's the ranches were purchased by the Army Corps of Engineers in anticipation of the area being inundated by a reservoir that would be created from the construction of Elk Creek Dam. Dam construction stopped prior to completion. It has since been notched.

Historic removal of large wood, removal of riparian vegetation, straightening of the channel and beaver removal have resulted in a greatly simplified channel and floodplain. There is almost no large wood in the channel or on the floodplain despite the low gradient channel and available floodplain. There is a thin band of hardwoods along the reach and abundant willow with relatively small infestations of invasive plants (primarily Armenian blackberry). The floodplain on the right bank has a shallow layer of sandy loam soils over a cobble/gravel layer.

Recreation and Commercial Benefit

This project will provide benefits to:

Recreational fisheries
Commercial fisheries

Explain how this project will contribute to current (and/or potential) fishing opportunities, access, or fisheries management.

Recreational fisheries in the mainstem Rogue River will benefit from an increase in returning adult summer and winter steelhead, coho salmon and cutthroat trout. Because this project will improve winter rearing habitat quality and quantity, it will result in an increase in survival of coho and steelhead winter parr and juvenile and adult cutthroat trout. Winter survival is followed by smolt outmigration to the ocean where salmon and steelhead rear to adulthood and are targeted by recreational and commercial fishers.

Is this project part of an approved Salmon-Trout Enhancement Program (STEP) activity?

No

This project has been identified as a priority for:

Basin/regional

Identify any plan or other document that identifies this priority.

The US Forest Service considers Elk Creek a priority basin in the Pacific Northwest for salmonid habitat and led the effort to publish the "Elk Creek Watershed Restoration Action Plan".

NOAA's Southern Oregon Northern California Coastal Coho (SONCC) recovery plan lists off channel reconnection as a top priority for the recovery of the Upper Rogue coho population.

Rogue Basin Coordinating Council (RBCC)-"Watershed Health Factors Assessment" lists temperature, water quantity, channel modification, large wood, pool/riffle composition, sediment and stream complexity as limiting factors to Upper Rogue fish populations.

The Upper Rogue Watershed Assessment(2006)lists the restoration of riparian areas and in-stream complexity on streams where coho spawn and rear as priority actions for the Elk Creek basin.

This project is intended to benefit the following species:

Coho Salmon
Lamprey
Winter Steelhead
Summer Steelhead
Cutthroat Trout
Rainbow Trout

This project will benefit anglers or fishery by providing:

Habitat Enhancements

Habitat Enhancements

The primary purpose of this project is to improve/increase:

In water structure, complexity, and habitat
Flow and/or connectivity
Riparian - reduce bank erosion

Project Description

Schedule

Activity	Date	RE Funding
70% design package-the design are currently at 30%-RRWC will work with E k Creek Project Advisory Committee and consultants (Inter-Fluve)to bring designs from 30% to final.	June/July 2016	No
Permits: Historic and cultural with SHPO, Removal/Fill with ACOE and DSL, 401 with DEQ, floodplain development and road use with Jackson County.	August 2016/April 2017	No
Purchase logs and boulders, plants, grass seed and mulch (for erosion control)	August 2016/April 2017	Yes
Select Contractor: Send out RFP to at least three qualified contractors, work with advisory committee to select contractor for instream work using consensus, negotiate contract.	May/June 2017	No
Implement project: instream work during instream period and riparian site preparation and planting in fall.	June/October 2017	Yes

Permits

Permit	Secured?	Date Expected
SHPO clearances-cultural and archaeological clearances. ACOE is providing these as in-kind.	No	September 2016
Removal/Fill permits from the ACOE and DSL (ACOE will be securing as in-kind).	No	April 2017
Jackson County floodplain development and land use compatability.	No	February 2017
Jackson County road use: for increased traffic on county roads.	No	June 2017
Army Corps of Engineers for NEPA.	No	May 2017
NOAA Fisheries for Biological Opinion.	No	May 2017
Oregon DEQ for 401 water quality certification.	No	May 2017

Project Design and Description

Please describe in detail the methods or approach that will be used to achieve the project objectives.

- Off channel habitat should be active at regular annual high flows (here defined as a minimum of .5 feet depth at the annual high flow event)
 - Encourage floodplain connectivity through the removal/re-grading of the right bank levee.
 - Add complexity and cover to reconnected floodplain areas and enhance habitat through large wood placements. Large wood will be ballasted through burial no artificial anchoring will be used. Specific locations and feasibility of wood placements will depend upon subsequent design phases.
 - To reduce stranding, if feasible, a lower flow notch will be constructed at the outlet of the right bank off channel area to promote draining.
 - Minimize impacts to existing native vegetation.
 - Prepare riparian area by re-grading impacted area.
 - Remove non-native noxious plants and replant with appropriate native trees and shrubs.
- Ensure success of plantings by utilizing weed mats and summer watering for first two years.

Engineering

Does the project involve capital improvement, engineering, site grading or other construction?

Yes

Not associated with ODFW

Project Management and Maintenance

What is the life expectancy of R&E funded construction, structures, equipment, supplies, data or fishery?

The log jams will be designed to remain stable at the 50 year event. Fir logs under average

wet/dry conditions and no pests will degrade but still have a presence for an estimated thirty years. The floodplain will stay reconnected with Elk Creek for many more years.

Who is responsible for long term management, maintenance, and oversight of the project beyond what is funded by R&E.

The land is managed by the ACOE but this project is part of a partnership between the ACOE, RRWC, ODFW, BLM, and US Forest Service. This partnership is called the NWP Challenge Partnership Elk Creek Agreement and represents the beginning of the implementation phase for projects identified in a planning exercise called the “Elk Creek Project Opportunities Assessment”. The RRWC and partners expect to be implementing projects along this reach for the next 10 years. This will provide the RRWC and partners the ability to observe how the project elements handle large flow events that and, if needed, make adjustments to maintain the purpose of each element.

RRWC will need to seek funding from other entities such as OWEB who will likely require monitoring in order to secure funding. There is also a good chance that the ACOE will also require monitoring as part of the removal/fill permit.

The RRWC with help of project partners will be managing the implementation of the project beyond the purchase of logs and boulders.

Will the project require ongoing maintenance?

Yes

The riparian plantings will need watering through the first two summers. This area is hot and dry in the summer and the plantings will need to access the water table to maximize survival.

Is there a plan to collect baseline data and to conduct monitoring efforts to measure the effectiveness of the project?

No

Project Funding

Funding

Have you applied for OWEB funding for this project?

No

Other Funding Source	Type	Secured	Dollar Value	Comments
OWEB	Cash	Pending	219463	Plan on applying to OWEB in October 2015 cycle.
ODFW R&E	Cash	Pending	29900	This money will be used for logs, boulders, riparian plants and mobilization costs.
Rogue Flyfishers	Other	Pending	6000	This group has supported many of our projects in the past. Seeking cash and in-kind.
Middle Rogue Steelheaders	Other	Pending	6000	This group has supported many of our projects in the past. Seeking cash and in-kind.
TFT-Blue Sky Program	Cash	Pending	30000	Funding opportunity available in early 2016.
Army Corps of Engineers	Other	Secured	12000	Corps to cover permits and cultural clearances as stated in cooperative agreement and provide project management.
		Total	303363	

Budget

Item	Unit Number	Unit Cost	In-kind or non-cash contributions	Funding from other sources	R&E Funds	Total Costs
PROJECT MANAGEMENT						
Rogue River Watershed Council	250	37	0	9250	0	9250
ODFW	0	0	0	0	0	0
USFS	0	0	0	0	0	0
permits	1	6000	6000	6000	0	12000
		SUBTOTAL(1)	6000	15250	0	21250
IN-HOUSE PERSONNEL						
	0	0	0	0	0	0
		SUBTOTAL(2)	0	0	0	0
CONTRACTED SERVICES						
Design-Engineering	1	78521	0	78521	0	78521
Mobilization	1	13472	0	1472	12000	13472
Excavation of Levee	5800	22	0	127600	0	127600
Right Bank Wood Enhancements	4	1280	0	5120	0	5120
Riparian Enhancements	1.5	15000	6000	16500	0	22500
LOMR	1	15000	0	15000	0	15000
		SUBTOTAL(3)	6000	244213	12000	262213
TRAVEL						
	0	0	0	0	0	0
		SUBTOTAL(4)	0	0	0	0
SUPPLIES/MATERIALS						
Logs	20	300	0	0	6000	6000
Boulders	20	120	0	0	2400	2400
Plantings	1500	4	0	2000	4000	6000
Native grass seed	1	600	0	0	600	600
Mulch/certified weed free straw	80	30	0	0	2400	2400
		SUBTOTAL(5)	0	2000	15400	17400
EDUCATION/OUTREACH						
	0	0	0	0	0	0
		SUBTOTAL(6)	0	0	0	0
EQUIPMENT						
	0	0	0	0	0	0
		SUBTOTAL(7)	0	0	0	0
FISCAL ADMINISTRATION						
grant and contract management	0	0	0	0	2500	2500
		SUBTOTAL(8)	0	0	2500	2500
		BUDGET TOTAL	12000	261463	29900	303363

Additional Files

Click a link to view that particular file.

[30% design](#)

[Land owner-letter of support](#)

[Locator map](#)

[ODFW-letter of support](#)

[Preliminary design report](#)

[Probable construction costs](#)

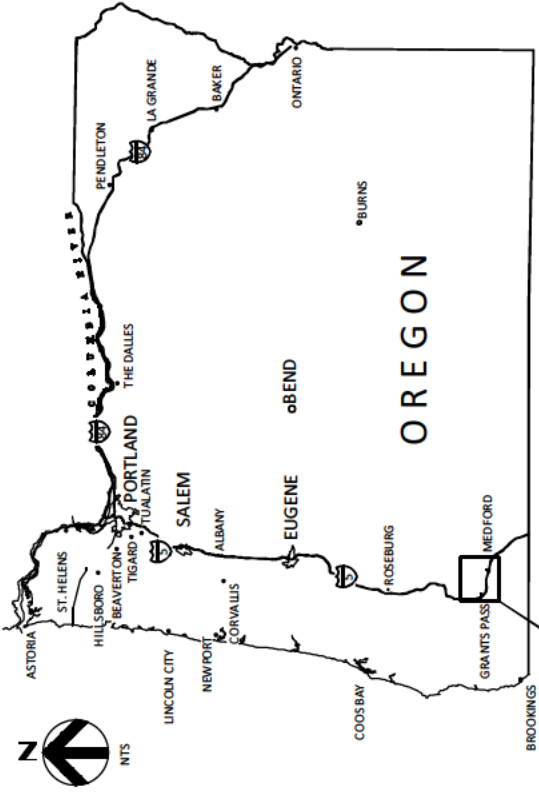
[Probable design costs](#)

[Scope of Work](#)

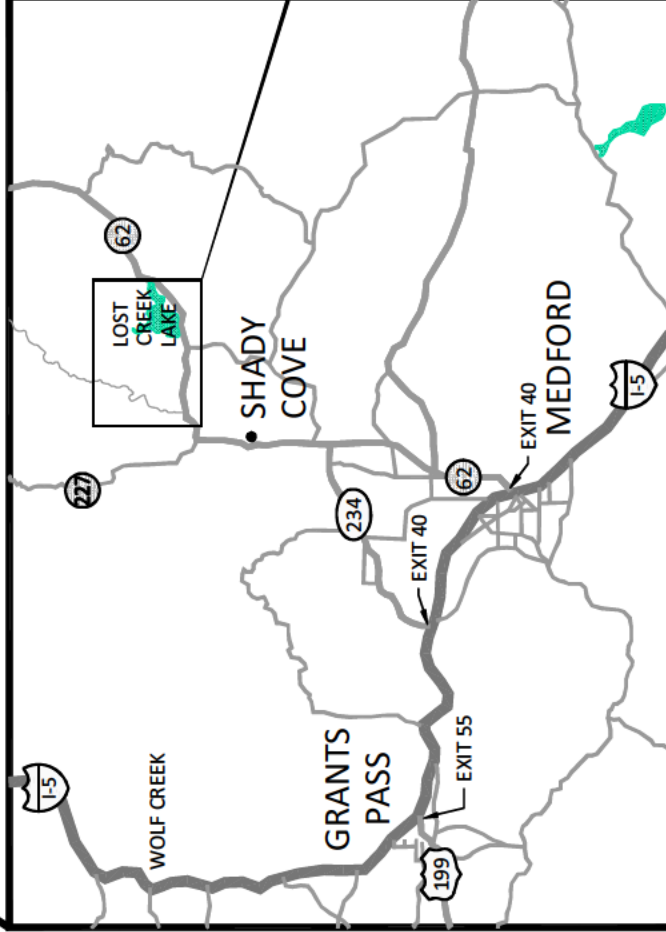
[Signature Authorization Page](#)

ELK CREEK RIVER MILE 5.6 HIGH-FLOW HABITAT ENHANCEMENT

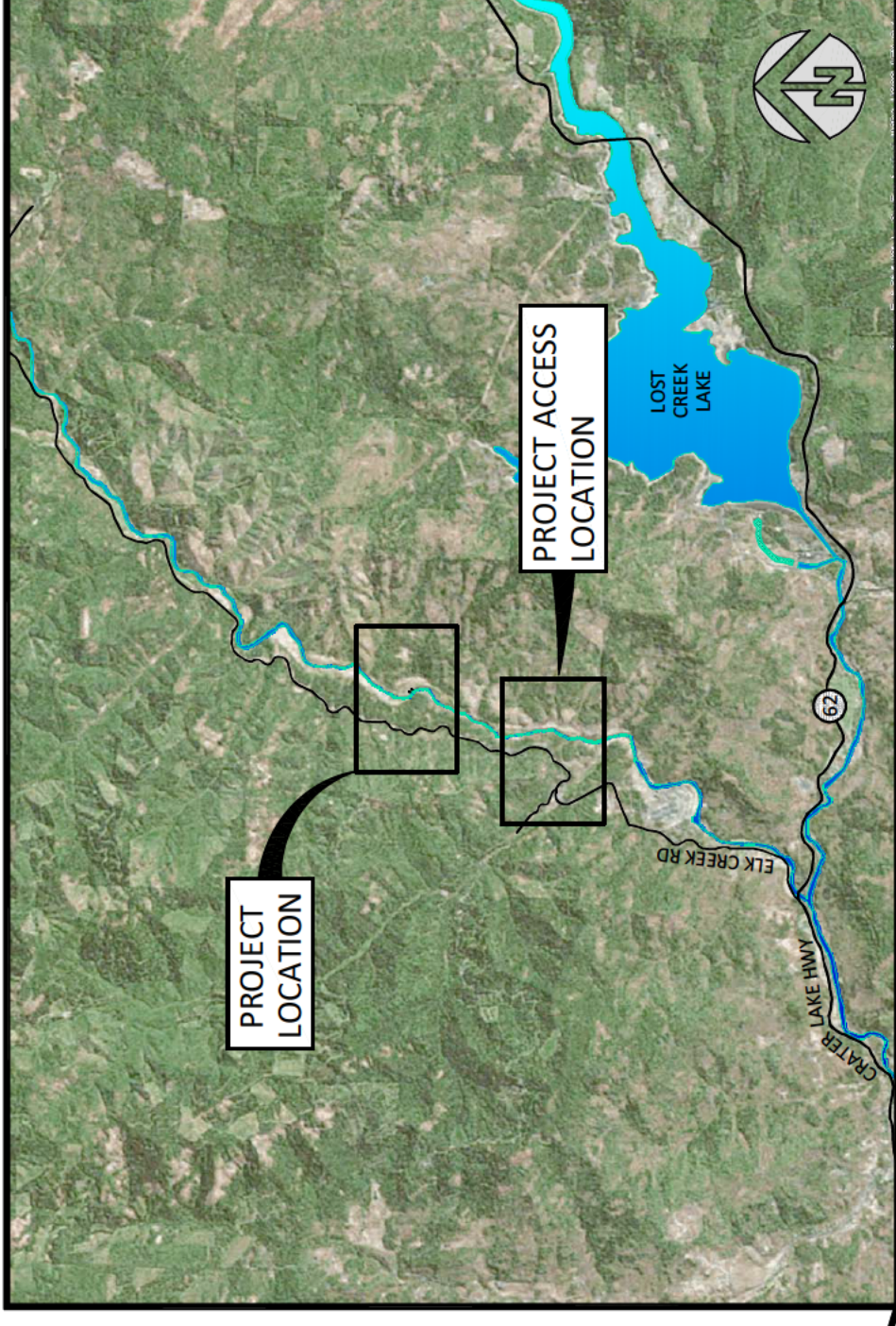
JACKSON COUNTY, OREGON - DECEMBER, 2014



**LOCATION MAP
STATE OF OREGON**



VICINITY MAP
NOT TO SCALE



SITE MAP
1"=10,000'

COORDINATES:

LATITUDE : 42°43'31.95" NORTH
LONGITUDE: 122°42'59.68" WEST

SECTION 20, TOWNSHIP 21S, RANGE 1E

WATERBODY: ELK CREEK
TRIBUTARY OF: ROGUE RIVER

SHEET INDEX

- 1 - COVER, SHEET INDEX AND VICINITY MAP
- 2 - GENERAL NOTES
- 3 - GENERAL NOTES AND EROSION CONTROL
- 4 - EROSION, SEDIMENT CONTROL, ACCESS AND STAGING PLAN
- 5 - EXISTING CONDITIONS, SURVEY CONTROL AND OWNERSHIP
- 6 - PROPOSED CONDITIONS PLAN AND PROFILE
- 7 - TYPICAL DETAILS - LEVEE REGRADING
- 8 - PROPOSED CONDITIONS OF ALCOVE ENHANCEMENTS
- 9 - TYPICAL DETAILS - LARGE WOOD
- 10 - TYPICAL DETAILS
- 11 - TYPICAL DETAILS - TEMPORARY CROSSING



30% SUBMITTAL

NO.	BY	DATE	REVISION DESCRIPTION

LK	EA, DM	MB
DRAWN	DESIGNED	CHECKED
DM	9/30/2014	130251
APPROVED	DATE	PROJECT

UPPER ROGUE WATERSHED ASSOCIATION
ELK CREEK RIVER MILE 5.6
HIGH FLOW HABITAT ENHANCEMENT



501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.5005
www.interfluve.com

COVER, SHEET INDEX AND
VICINITY MAP

SHEET
1 OF 11

GENERAL

THE CONTRACTOR SHALL ATTEND A MANDATORY PRE-BID MEETING. THE CONTRACTOR SHALL ATTEND PRE-CONSTRUCTION CONFERENCES WITH REPRESENTATIVES OF THE US ARMY CORPS OF ENGINEERS AND UPPER ROGUE WATERSHED ASSOCIATION PRIOR TO BEGINNING CONSTRUCTION.

ALL WORK SHALL CONFORM TO THE CURRENT EDITIONS OF STANDARD PLANS AND SPECIFICATIONS OF THE OREGON DEPARTMENT OF TRANSPORTATION AND LOCAL STANDARDS UNLESS INDICATED OTHERWISE BY THE CONTRACT DOCUMENTS. IN CASE OF A CONFLICT BETWEEN THE REGULATORY STANDARDS OR SPECIFICATIONS, THE MORE STRINGENT WILL PREVAIL.

PERMITS

CONTRACTOR SHALL HAVE COPIES OF ALL PERMITS ON SITE AND SHALL COMPLY WITH ALL PERMIT CONDITIONS.

WORK SHALL OCCUR DURING THE PERMITTED IN-WATER WORK PERIOD, JULY 1 THROUGH OCTOBER 15.

UTILITIES

THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE TO HAVE UTILITIES LOCATED AND SHALL CONTACT ALL UTILITY OWNERS FOR LOCATIONS AND TO FIELD VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION. THE ONE-CALL NUMBER FOR UNDERGROUND UTILITIES IS 1-800-332-2344.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE INTEGRITY OF ALL EXISTING UTILITIES THROUGHOUT CONSTRUCTION.

IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO PROMPTLY NOTIFY THE OWNER OF ANY CONFLICT WITH EXISTING UTILITIES.

ALL EXISTING FACILITIES, LANDSCAPE IMPROVEMENTS, AND UTILITIES NOT SPECIFICALLY IDENTIFIED FOR REMOVAL SHALL BE PROTECTED THROUGHOUT CONSTRUCTION OR RESTORED AT COMPLETION OF THE WORK.

THE CONTRACTOR SHALL IMMEDIATELY CONTACT THE EFFECTED UTILITY SERVICE TO REPORT ANY DAMAGED OR DESTROYED UTILITIES.

THE CONTRACTOR SHALL PROVIDE EQUIPMENT OR LABOR TO AID THE EFFECTED UTILITY SERVICE IN REPAIRING DAMAGED OR DESTROYED UTILITIES AT NO ADDITIONAL COST.

CONSTRUCTION ACCESS/TRAFFIC CONTROL

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROVIDING ANY REQUIRED TRAFFIC CONTROL INCLUDING, BUT NOT LIMITED TO, SIGNAGE AND FLAGGERS.

THE CONTRACTOR IS SOLELY RESPONSIBLE FOR OBTAINING ANY REQUIRED TRAFFIC CONTROL OR ACCESS PERMITS.

ALL EQUIPMENT, MATERIALS AND PERSONNEL SHALL REMAIN WITHIN THE LIMITS OF DISTURBANCE.

THE CONTRACTOR SHALL KEEP THE WORK AREAS IN A CLEAN AND NEAT CONDITION FREE OF DEBRIS AND LITTER FOR THE DURATION OF THE PROJECT.

PUBLIC RIGHTS-OF-WAY AND PRIVATE DRIVEWAYS SHALL BE KEPT IN A CLEAN AND SERVICEABLE CONDITION AT ALL TIMES. IN THE EVENT MATERIALS ARE INADVERTENTLY DEPOSITED ON ROADWAYS THE MATERIAL SHALL BE PROMPTLY REMOVED.

ALL AFFECTED AREAS WITHIN THE LIMITS OF DISTURBANCE INCLUDING ROADS AND ACCESS ROUTES SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER AT NO ADDITIONAL COST.

CONSTRUCTION STAKING

OWNER WILL PROVIDE STAKING OF PROJECT LIMITS, AND ELEVATION CONTROL POINTS. SOME ADJUSTMENTS TO THE LINES AND GRADES ARE TO BE EXPECTED.

CONTRACTOR SHALL MEET WITH THE OWNER'S REPRESENTATIVE TO DEFINE AND MARK LIMITS OF DISTURBANCE PRIOR TO MOBILIZATION OF EQUIPMENT OR MATERIALS ONTO THE SITE.

THE CONTRACTOR SHALL REPLACE DAMAGED OR DESTROYED CONSTRUCTION STAKES AT NO ADDITIONAL COST.

CONSTRUCTION MATERIALS

LOCATION, ALIGNMENT, SIZE, AND ELEVATION OF LOGS AND LOGS WITH ROOT WADS ARE SUBJECT TO CHANGE BASED ON FIELD CONDITIONS, AND MATERIAL SIZE.

ANY EXCESS MATERIALS SHALL BE STOCKPILED NEATLY IN AN APPROVED LOCATION OF THE STOCKPILE AND STAGING AREAS. THE MATERIAL SHALL BE REMOVED FROM THE SITE AND LEGALLY DISPOSED OF PRIOR TO THE COMPLETION OF WORK.

CONTROL DEWATERING

TURBID OR CONTAMINATED DEWATERING WATER FROM CONSTRUCTION EQUIPMENT OPERATION SHALL BE PREVENTED FROM ENTERING ELK CREEK. DISPOSAL OPTIONS FOR DEWATERING DISCHARGE INCLUDE:

1. SEDIMENT-LADEN WATER MAY BE PUMPED TO AN UPLAND AREA AND ALLOWED TO SHEET FLOW OVER UNDISTURBED GROUND THROUGH EXISTING VEGETATION TO INFILTRATE INTO THE GROUND.
2. USE OF AN APPROPRIATELY SIZED AND MAINTAINED SEDIMENTATION BAG (DIRT-BAG) OR OTHER SEDIMENTATION FACILITY WITH OUTFALL TO A DITCH OR SWALE FOR SMALL VOLUMES OF LOCALIZED DEWATERING.

VEHICLE OPERATIONS AND STAGING

THE CONTRACTOR SHALL COMPLETE VEHICLE STAGING, CLEANING, MAINTENANCE, REFUELING, AND FUEL STORAGE IN VEHICLE STAGING AREA PLACED 150 FEET OR MORE FROM ANY STREAM, WATER BODY OR WETLAND. ALL EQUIPMENT OPERATING WITHIN 10 FEET OF SURFACE WATERS SHALL HAVE NON-TOXIC HYDRAULIC FLUIDS.

FUEL CONTAINERS SHALL BE CONTAINED WITHIN BASINS LINED WITH AN IMPERMEABLE MEMBRANE AND CAPABLE OF HOLDING 150% OF ANTICIPATED FUEL VOLUME.

THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING QUICK RESPONSE CONTAINMENT AND CLEANUP MEASURES ON THE SITE, ALONG WITH PERSONNEL TRAINED IN PROPOSED METHODS FOR DISPOSAL OF SPILLED MATERIALS AND SPILL CONTAINMENT.

CONTRACTOR SHALL INSPECT ALL VEHICLES OPERATED WITHIN 150 FEET OF ANY STREAM, WATER BODY OR WETLAND DAILY FOR FLUID LEAKS BEFORE LEAVING THE VEHICLE STAGING AREA. REPAIR ANY LEAKS DETECTED IN THE VEHICLE STAGING AREA BEFORE THE VEHICLE RESUMES OPERATION. DOCUMENT INSPECTIONS IN A RECORD THAT IS AVAILABLE FOR REVIEW UPON REQUEST.

WHEN TRUCKING SATURATED SOILS FROM THE SITE, WATERTIGHT TRUCKS MUST BE USED, OR LOADS SHALL BE DRAINED ON-SITE SO THAT WATER SEEPING FROM THE SOIL CANNOT DRAIN FROM THE VEHICLE. ALL VEHICLES LEAVING THE SITE SHALL HAVE TIRES CLEANED AT A TRUCK WASHING STATION.

BEFORE OPERATIONS BEGIN AND AS OFTEN AS NECESSARY DURING OPERATION, PRESSURE WASH ALL EQUIPMENT THAT WILL BE USED BELOW BANKFULL ELEVATION UNTIL ALL VISIBLE EXTERNAL OIL, GREASE, MUD, AND OTHER VISIBLE CONTAMINANTS ARE REMOVED.

CONTRACTOR SHALL DIAPER ALL STATIONARY POWER EQUIPMENT (I.E. GENERATORS, PUMPS, CRANES) OPERATED WITHIN 150 FEET OF ANY STREAM, WATER BODY OR WETLAND TO PREVENT LEAKS, UNLESS SUITABLE CONTAINMENT IS PROVIDED TO PREVENT POTENTIAL SPILLS FROM ENTERING ANY STREAM OR WATER BODY.

DUST CONTROL

THE CONTRACTOR SHALL CONTROL DUST FOR THE DURATION OF THE PROJECT. CONTROL MEASURES MAY INCLUDE, BUT NOT LIMITED TO: SPRINKLERS, MULCH, SLOWER VEHICLE OPERATING SPEEDS.

TREE SALVAGE

ALL TREES AND SLASH REMOVED FOR CONSTRUCTION SHALL TEMPORARILY BE STOCKPILED WITHIN LIMITS OF DISTURBANCE. STOCKPILED TREE/SLASH SHALL BE REINCORPORATED INTO FINISHED PROJECT.

ANY REMOVED VEGETATION GREATER THAN 6 INCHES DIAMETER AND 15 FEET LONG SHALL BE INCORPORATED INTO LOG STRUCTURES. CONTRACTOR IS RESPONSIBLE FOR REMOVING SMALLER CLEARING AND GRUBBING DEBRIS FROM THE SITE AND DISPOSING AT A LEGAL LOCATION AT THE END OF THE PROJECT UNLESS DIRECTED BY THE OWNER.

ALL TREES REMOVED WITHIN CLEARING LIMITS SHALL BE REMOVED WHOLE WITH ROOT WAD AND UTILIZED IN THE STREAM CONSTRUCTION AS DIRECTED BY OWNER.

LIVE TREES

ALL TREES NOT MARKED FOR REMOVAL SHALL BE LEFT STANDING UNDISTURBED. CONSTRUCTION ACTIVITY SHALL NOT DEBARK OR DAMAGE LIVE TREES.

CONTRACTOR SHALL KEEP EXCAVATION AND EQUIPMENT OUT OF DRIP LINE OF EXISTING TREES TO REMAIN.

SOILS:

NO SOILS INVESTIGATIONS HAVE BEEN COMPLETED.

TEST PITS OR SUBSURFACE GEOPHYSICAL INVESTIGATIONS RECOMMENDED PRIOR TO CONSTRUCTION.

CONTRACTOR SHALL CONDUCT OWN SOILS INVESTIGATIONS FOR VEHICLE BEARING CAPACITY INFILTRATIONS AND EXPANSION OF EXCAVATED MATERIALS AND COMPACTION OF PLACED MATERIALS.

RIVER SAFETY SIGNAGE:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING TWO SIGNS WARNING RECREATORS OF THE PRESENCE OF LARGE WOOD JAMS. ONE SIGN SHALL BE INSTALLED UPSTREAM OF LARGE WOOD. THE SECOND SIGN SHALL BE INSTALLED AT THE LAUNCH OR PROPERTY ENTRANCE.

ABBREVIATIONS

' FEET
" INCHES
° DEGREES
% PERCENT
APPROXIMATE
CY CUBIC YARDS
DBH DIAMETER AT BREAST HEIGHT
DIA DIAMETER
ECP EROSION CONTROL PLAN
ELEV ELEVATION
FES FABRIC ENCAPSULATED SOIL
FT FEET
H HORIZONTAL
IN INCH
INV INVERT
L LENGTH
LWM LARGE WOODY MATERIAL
MIN MINIMUM
MAX MAXIMUM
STA STATION
TBD TO BE DETERMINED
TYP TYPICAL
USWCD UNION SOIL AND WATER CONSERVATION DISTRICT
OHW ORDINARY HIGH WATER
OLW ORDINARY LOW WATER
V VERTICAL
W/ WITH
W/O WITHOUT
YR YEAR

BID QUANTITIES

ITEM	TOTAL QUANTITY
18" DBH x 40' LONG, ROOTWAD	74
18" DBH x 40' LONG, NO ROOTWAD	63

ALL EARTHWORK QUANTITIES PROVIDED ARE IN-PLACE QUANTITIES. QUANTITIES DO NOT ACCOUNT FOR EXPANSION OF EXCAVATED MATERIALS OR COMPACTION OF INSTALLED MATERIALS.

QUANTITIES SHALL BE MEASURED BY GROUND BASED SURVEY OF EXISTING, SUBGRADE AND FINISHED GROUND SURFACES. QUANTITY MEASURE SHALL NOT INCLUDE WEIGHT OR TRUCK MEASURE.

30% SUBMITTAL

NO.	BY	DATE	REVISION DESCRIPTION

LK

DRAWN

DM

APPROVED

EA

DESIGNED

9/30/2014

DATE

MB

CHECKED

130251

PROJECT

UPPER ROGUE WATERSHED ASSOCIATION
ELK CREEK RIVER MILE 5.6
HIGH FLOW HABITAT ENHANCEMENT



501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.5005
www.interfluve.com

SHEET

GENERAL NOTES

2 of 11

EROSION/SEDIMENTATION CONTROL (ESC) PLAN

THE EROSION AND SEDIMENT CONTROL (ESC) PLAN PROVIDED IS FOR INFORMATIONAL PURPOSES ONLY. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR PROVIDING EROSION CONTROL MEASURES TO COMPLY WITH APPLICABLE REGULATIONS.

THE RECOMMENDATIONS FOR AN ESC PLAN INCLUDED HEREIN WILL PROVIDE A GUIDELINE FOR THE CONTRACTOR TO DEVELOP AND IMPLEMENT AN ESC PLAN.

- THE IMPLEMENTATION OF AN ESC PLAN AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CONTRACTOR UNTIL ALL CONSTRUCTION IS COMPLETED AND APPROVED AND VEGETATION/LANDSCAPING IS ESTABLISHED.
- THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED IN THE FIELD PRIOR TO CONSTRUCTION. DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE FLAGGED CLEARING LIMITS SHALL BE PERMITTED. THE FLAGGING SHALL BE MAINTAINED BY THE CONTRACTOR FOR THE DURATION OF CONSTRUCTION.
- ESC FACILITIES AS APPROXIMATELY SHOWN ON THIS PLAN ARE TO BE CONSTRUCTED PRIOR TO CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT ENTER SURFACE WATERS, THE DRAINAGE SYSTEM, OR VIOLATE APPLICABLE WATER STANDARDS.
- THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED AT NO ADDITIONAL COST FOR UNEXPECTED STORM EVENTS AND TO ENSURE THAT SEDIMENT AND SEDIMENT-LADEN WATER DO NOT LEAVE THE SITE.
- THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE CONTRACTOR AND MAINTAINED AS NECESSARY TO ENSURE THEIR CONTINUED FUNCTIONING.
- THE ESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A MONTH OR WITHIN THE 24 HOURS FOLLOWING A STORM EVENT.
- STABILIZED CONSTRUCTION ENTRANCES AND ADDITIONAL MEASURES MAY BE REQUIRED AND SHALL BE MAINTAINED FOR THE DURATION OF THE PROJECT TO ENSURE ALL ACCESS ROADS ARE KEPT CLEAN AT NO ADDITIONAL COST.

INSPECTION AND MAINTENANCE

ALL ESC FACILITIES SHALL BE INSPECTED, MAINTAINED, AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. ALL ESC FACILITIES SHALL BE INSPECTED DAILY AND WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.5 INCHES OF RAIN PER 24 HOUR PERIOD AND AFTER EVENTS EXCEEDING 2 HOURS DURATION.

CONTRACTOR'S ESC RECORD

WEEKLY REPORTS SUMMARIZING THE SCOPE OF INSPECTIONS, THE PERSONNEL CONDUCTING THE INSPECTION, THE DATE(S) OF THE INSPECTION, MAJOR OBSERVATIONS RELATING TO THE IMPLEMENTATION OF THE CONTRACTOR'S EROSION AND SEDIMENT CONTROL PLAN, AND ACTIONS TAKEN AS A RESULT OF THESE INSPECTIONS SHALL BE PREPARED AND RETAINED ON SITE BY THE CONTRACTOR. IN ADDITION, A RECORD OF THE FOLLOWING DATES SHALL BE INCLUDED IN THE REPORTS:

- DATES MAJOR GRADING ACTIVITIES OCCUR.
- DATES OF RAINFALL EVENTS EITHER EXCEEDING 2 HOURS DURATION OR MORE THAN 0.5 INCHES/24 HOURS.
- WHEN CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON SITE, OR ON A PORTION OF THE SITE.
- WHEN STABILIZATION MEASURES ARE INITIATED FOR PORTIONS OF THE SITE.
- ESC RECORDS SHALL BE MADE AVAILABLE TO THE OWNER AND OWNER'S REPRESENTATIVE ON REQUEST AND SHALL BE PROVIDED FOR REVIEW AND APPROVAL PRIOR TO APPLICATION FOR PAYMENT.

STABILIZE SOILS AND PROTECT SLOPES

FOLLOWING CONSTRUCTION THROUGH SEPTEMBER 30, ALL EXPOSED SOILS SHALL BE PROTECTED FROM EROSION BY MULCHING, HYDROSEED COVERING, OR OTHER APPROVED MEASURES WITHIN THREE DAYS OF GRADING. FROM OCTOBER 1 THROUGH APRIL 30, ALL EXPOSED SOILS MUST BE PROTECTED WITHIN TWO DAYS OF GRADING. SOILS SHALL BE STABILIZED BEFORE A WORK SHUTDOWN, HOLIDAY OR WEEKEND IF NEEDED BASED ON THE WEATHER FORECAST. SOIL STOCKPILINGS MUST BE STABILIZED AND PROTECTED WITH SEDIMENT TRAPPING MEASURES. HYDROSEED ALL DISTURBED AREAS AS SOON AS PRACTICAL. NOT INDICATED IN THE CONTRACT DOCUMENTS FOR OTHER PERMANENT STABILIZATION MEASURES.

DESIGN, CONSTRUCT, AND PHASE CUT AND FILL SLOPES IN A MANNER THAT WILL MINIMIZE EROSION. REDUCE SLOPE VELOCITIES ON DISTURBED SLOPES BY PROVIDING TEMPORARY BARRIERS. STORMWATER FROM OFF SITE SHOULD BE HANDLED SEPARATELY FROM STORMWATER GENERATED ON SITE.

AFTER FINAL SITE STABILIZATION

ALL TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHIEVED OR AFTER THE TEMPORARY BEST MANAGEMENT PRACTICES (BMPs) ARE NO LONGER NEEDED. TRAPPED SEDIMENT SHALL BE REMOVED FROM THE SITE OR INCORPORATED INTO FINISHED GRADING. DISTURBED SOIL AREAS RESULTING FROM REMOVAL SHALL BE PERMANENTLY STABILIZED

RIVER DIVERSION

DIVERSION MAY BYPASS THE RIVER AROUND SMALLER WORK AREAS AT CONTRACTOR'S DISCRETION.

DEWATERING OF IN-CHANNEL WORK AREA(S) SHALL OCCUR CONCURRENT WITH FISH RESCUE. CONTRACTOR SHALL COORDINATE WITH THE OWNER'S REPRESENTATIVE FOR FISH RESCUE. CONTRACTOR SHALL PROVIDE AMPLE TIME TO SCHEDULE FISH RESCUE. IF DIVERSION FAILS DUE TO CONTRACTOR NEGLIGENCE, FISH RESCUE SHALL BE REPEATED BY OWNER'S REPRESENTATIVE AT CONTRACTOR'S EXPENSE.

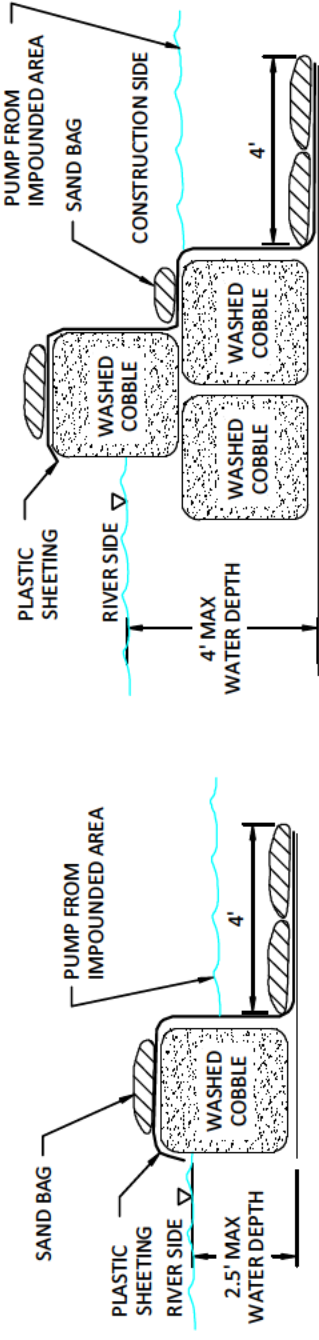
IF ADDITIONAL PUMPING IS REQUIRED TO DEWATER DURING CONSTRUCTION, PUMPED DISCHARGE SHALL RELEASE SEDIMENT-LADEN WATER AT AN UPLAND DISCHARGE LOCATION IN A MANNER THAT DOES NOT CAUSE EROSION, CONTAMINATION OR INCREASE TURBIDITY OF SURFACE WATERS (SEE CONSTRUCTION DEWATERING).

OWNER'S REPRESENTATIVE SHALL APPROVE DEWATERING DISCHARGE LOCATION PRIOR TO IMPLEMENTATION.

CONSTRUCTION DEWATERING

CONTRACTOR SHALL PERFORM CONSTRUCTION DEWATERING IN SUCH A MANNER AS TO AVOID THE RELEASE OF SEDIMENT-LADEN WATER TO SURFACE WATERS. SEDIMENT LADEN WATER MAY BE PUMPED TO AN UPLAND DISCHARGE LOCATION AND ALLOWED TO SHEET FLOW THROUGH EXISTING VEGETATION BEFORE INFILTRATING INTO THE GROUND. IF THIS METHOD IS NOT SUFFICIENT TO PREVENT RETURN OF TURBID WATER TO THE RIVER, A 'DIRT-BAG' OR SEDIMENT RETENTION STRUCTURE MAY BE REQUIRED AS NECESSARY TO COMPLY WITH LAWS AND PERMIT REQUIREMENTS AT NO ADDITIONAL COST TO THE OWNER.

CONTRACTOR SHALL PROVIDE VISQUINE OR GEOTEXTILE LINER OR PLYWOOD OR METAL PLATING AS NECESSARY TO DISSIPATE PUMP DISCHARGE JET TO PREVENT EROSION.



SINGLE LAYER COFFERDAM
(WATER DEPTH LESS THAN 2.5')

TEMPORARY COFFERDAM DETAILS
NOT TO SCALE

BULK BAG NOTES:

- BULK BAG COFFERDAM SHALL BE CONSTRUCTED OF SEVERAL UNITS OF BULK BAGS FILLED WITH WASHED COBBLE, AND ABUTTED SIDE BY SIDE TO CREATE A ROW THAT ISOLATES THE CONSTRUCTION SITE FROM THE RIVER.
- IF WATER DEPTH EXCEEDS 85% OF THE BULK BAG HEIGHT, AN ADDITIONAL TOP ROW OF BULK BAGS SHALL BE INSTALLED, SUPPORTED BY TWO BOTTOM ROWS OF BULK BAGS.
- BULK BAG COFFERDAM SHALL BE SEALED BY COVERING THE COFFERDAM WITH PLASTIC SHEETING HELD IN PLACE BY STANDARD SANDBAGS PLACED IN ROWS ON TOP OF COFFERDAM, AND AT TOE OF COFFERDAM. THE PLASTIC SHEETING SHALL BE DRAPED ALONG THE CHANNEL BOTTOM ON THE WORK AREA SIDE OF THE COFFERDAM WITH OUTWARD EDGE OF SHEETING MINIMUM 4-FEET FROM TOE OF COFFERDAM. THE DRAPED PORTION OF PLASTIC SHEETING SHALL BE PINNED TO THE CHANNEL BED BY MINIMUM TWO ROWS OF STANDARD SANDBAGS.
- THE OUTWARD EDGE OF PLASTIC SHEETING ON WORK AREA SIDE SHALL BE TOED INTO THE CHANNEL BED MINIMUM 1-FT. TOEING IN THE OUTWARD EDGE OF PLASTIC SHEETING SHALL OCCUR AFTER THE COFFERDAM IS CLOSED TO PREVENT TURBIDITY RELEASE TO THE WATERWAY.
- IF POSSIBLE, THE COFFERDAM SHALL BE EXTENDED ONTO A GRAVEL BAR AND OUT OF THE WATER. IF THE END MUST BE TERMINATED AT THE RIVERBANK, THE COFFERDAM SHALL BE TIGHTLY SEALED TO THE GROUND BY PLASTIC SHEETING AND STANDARD SANDBAGS. MULTIPLE LAYERS OF SANDBAGS MAY BE REQUIRED TO FORM A WATERTIGHT SEAL.
- BULK BAGS SHALL BE WATERPROOF CUBE-SHAPED POLYPROPYLENE WOVEN FABRIC BAGS WITH FULLY OPEN TOP, FLAT BOTTOM, FOUR LOOPS, MINIMUM 2-TON WEIGHT CAPACITY, MINIMUM 5:1 SAFETY FACTOR.
- PLASTIC SHEETING SHALL BE MINIMUM 6-MIL THICKNESS. ROLL LENGTH SHALL BE LONG ENOUGH TO ENSURE THAT ENTIRE LENGTH OF COFFERDAM WILL BE COVERED WITHOUT A SEAM. MINIMUM 12-FT WIDE ROLL SHALL BE USED FOR SINGLE LAYER BULK BAG COFFERDAM. MINIMUM 16-FT WIDE ROLL SHALL BE USED FOR 2-LAYER STACKED BULK BAG COFFERDAM.
- CONTRACTOR SHALL PROVIDE PUMPING SUFFICIENT FOR A NET INFLOW TO THE WORK AREA, AND DISCHARGE TURBID WATER TO UPLAND FLOODPLAIN.
- BULK BAG COFFERDAM SHALL BE COMPLETELY REMOVED AFTER CONSTRUCTION IS COMPLETED AND TURBIDITY HAS BEEN REMOVED. ALL MATERIALS AND FILL SHALL BE REMOVED FROM SITE.
- ALTERNATE COFFERDAM MATERIALS AND CONFIGURATIONS MAY BE ALLOWED BUT SHALL NOT BE IMPLEMENTED WITHOUT REVIEW AND APPROVAL BY THE OWNER OR OWNER'S REPRESENTATIVE. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS AND/OR VENDOR CUT SHEETS FOR SUBSTITUTIONS.
- IF NECESSARY, GAPS BETWEEN BULK BAGS SHALL BE FILLED WITH WASHED STREAM GRAVEL TO IMPROVE COFFERDAM SEAL.

Preliminary
Not for Construction

30% SUBMITTAL

NO.	BY	DATE	REVISION DESCRIPTION

LK
DRAWN

EA DM
DESIGNED

DM
APPROVED

MB
CHECKED

130251
PROJECT

9/30/2014
DATE

UPPER ROGUE WATERSHED ASSOCIATION
ELK CREEK RIVER MILE 5.6
HIGH FLOW HABITAT ENHANCEMENT

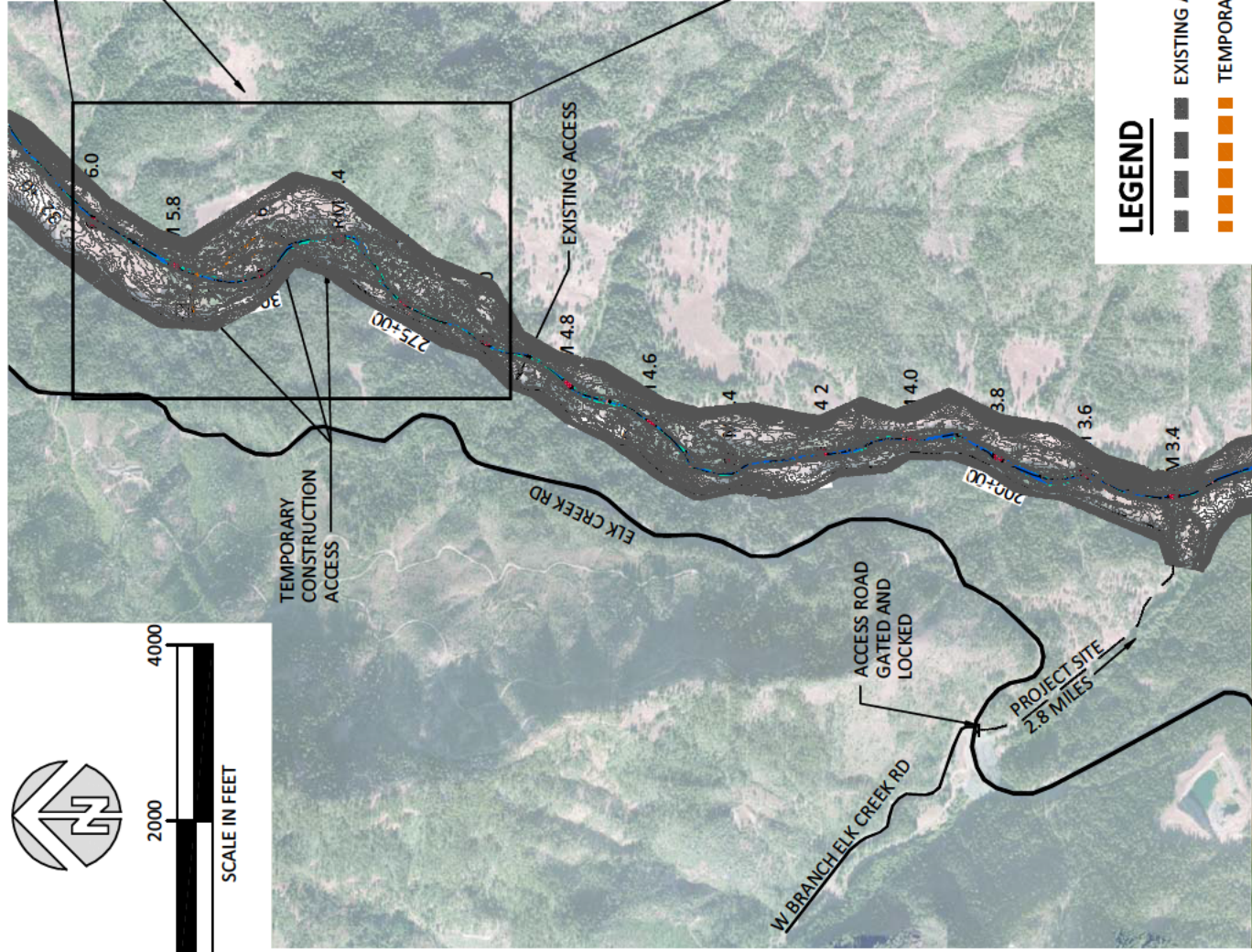
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.5005
www.interfluv.com



GENERAL NOTES AND
EROSION CONTROL

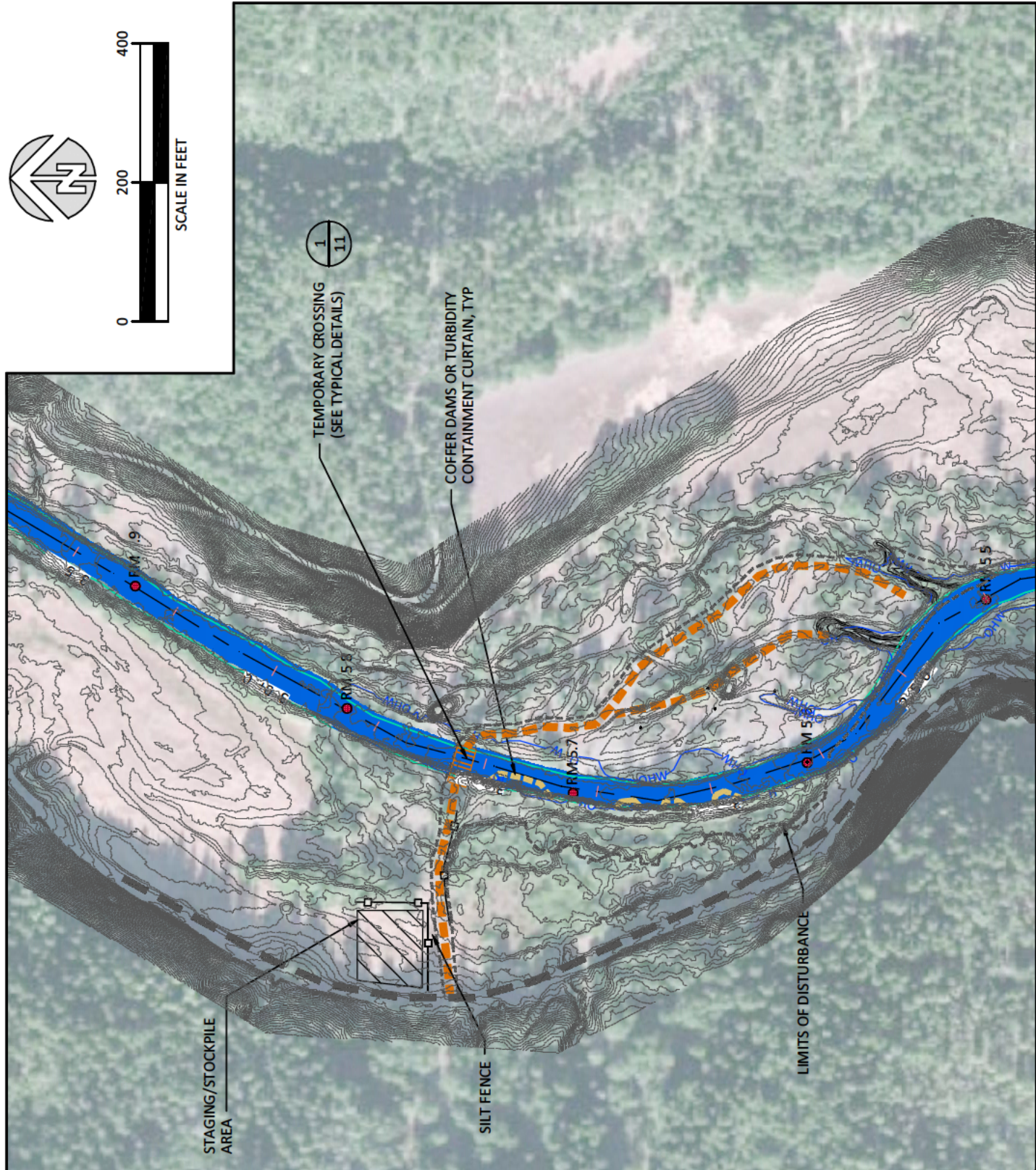
SHEET

3 OF 11



- LEGEND**
- EXISTING ACCESS ROAD
 - TEMPORARY ACCESS
 - TEMPORARY CROSSING
 - STAGING/STOCKPILE AREA
 - EXISTING 10 FT MAJOR CONTOURS
 - EXISTING 2 FT MINOR CONTOURS
 - LIMITS OF DISTURBANCE
 - SILT FENCE
 - COFFER DAM OR TURBIDITY CONTAINMENT CURTAIN
 - ORDINARY HIGH WATER
 - RM 4.6 RIVER MILE

1 SITE MAP - ACCESS AND STAGING
4 1"=2000'



2 PLAN - EROSION AND CONTROL PLAN
4 1"=300'



Preliminary
Not for Construction

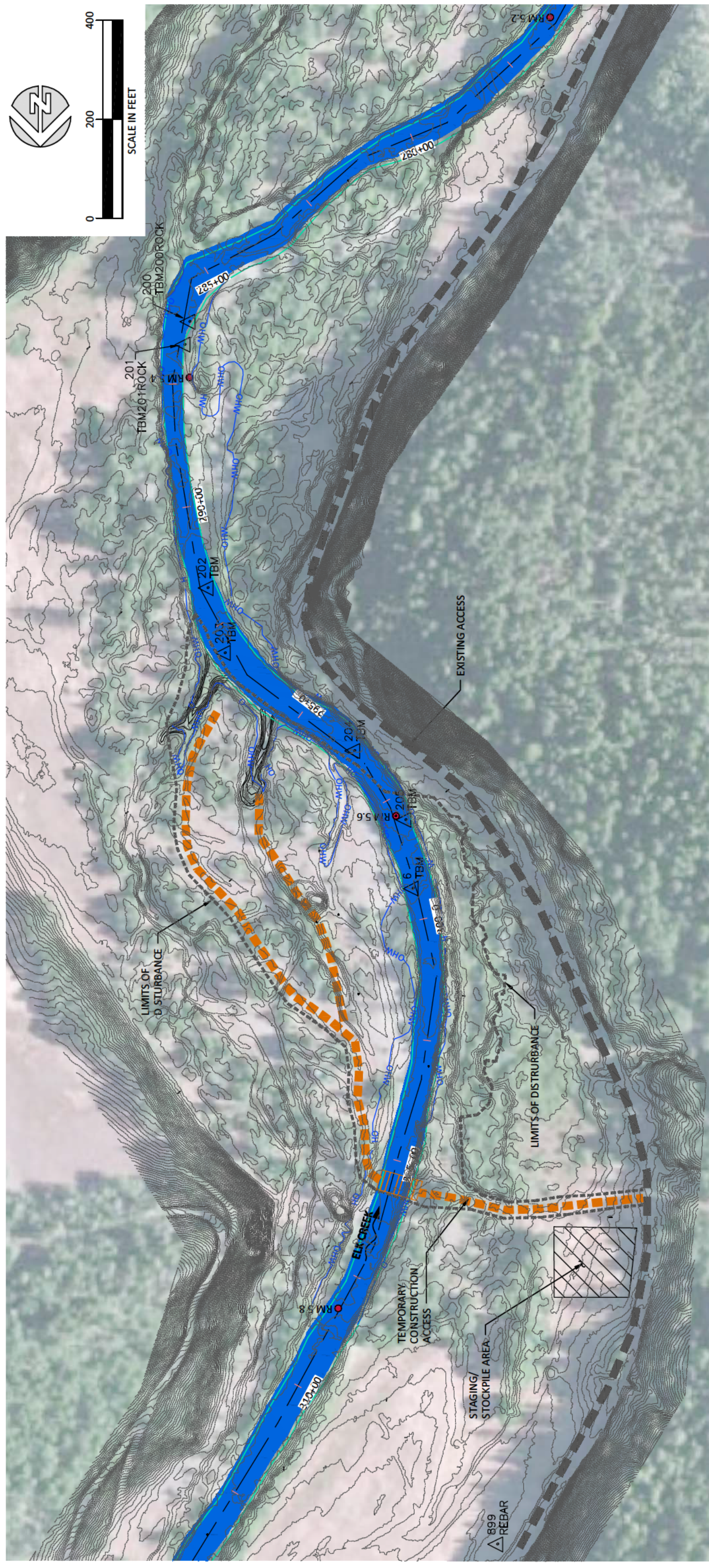
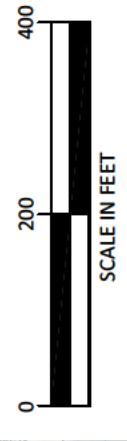
30% SUBMITTAL

NO.	BY	DATE	REVISION DESCRIPTION

LK	EA	DM	MB	PROJECT	SHEET
DRAWN	DESIGNED	APPROVED	CHECKED	130251	4 OF 11
DM	9/30/2014	DATE	PROJECT		

UPPER ROGUE WATERSHED ASSOCIATION
 ELK CREEK RIVER MILE 5.6
 HIGH FLOW HABITAT ENHANCEMENT

501 Portway Avenue, Suite 101
 Hood River, OR 97031
 541.386.5005
 www.interfluv.com



SURVEY CONTROL POINTS

POINT #	EASTING	NORTHING	ELEVATION	DESCRIPTION
202	4326311.12	392491.64	1632.33	TBM
203	4326276.2	392622.84	1631.94	TBM
204	4326015.09	392820.53	1633.41	TBM
205	4325911.81	392959.39	1634.38	TBM
899	4325726.59	394421.5	1653.56	REBAR

LEGEND

- EXISTING ACCESS
- TEMPORARY ACCESS
- TEMPORARY CROSSING
- STAGING/STOCKPILE AREA
- EXISTING 2 FT CONTOURS
- EXISTING 10 FT CONTOURS
- LIMITS OF DISTURBANCE
- ORDINARY HIGH WATER
- RIVER MILE

NOTE: ALL AREA DISPLAYED OWNED BY U.S. ARMY CORPS OF ENGINEERS



30% SUBMITTAL

NO.	BY	DATE	REVISION DESCRIPTION

LK	EA_DM	MB
DRAWN	DESIGNED	CHECKED
DM	9/30/2014	130251
APPROVED	DATE	PROJECT

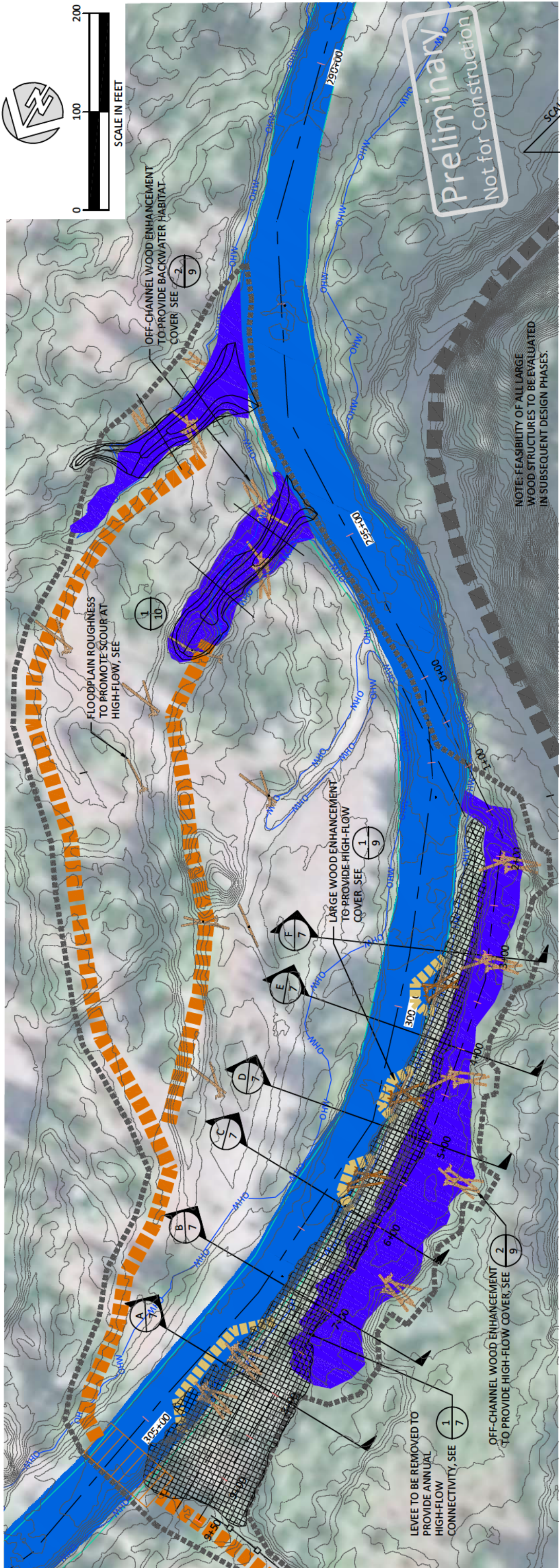
UPPER ROGUE WATERSHED ASSOCIATION
ELK CREEK RIVER MILE 5.6
HIGH FLOW HABITAT ENHANCEMENT



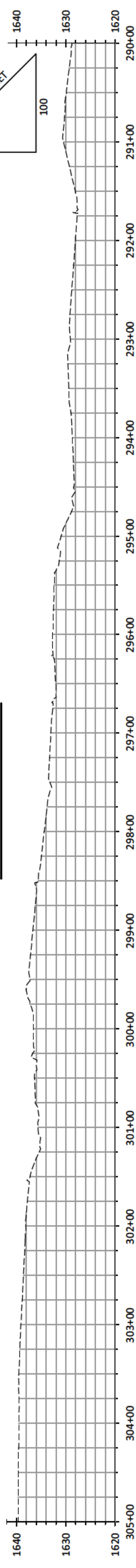
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.5005
www.interfluve.com

EXISTING CONDITIONS, SURVEY CONTROL AND OWNERSHIP

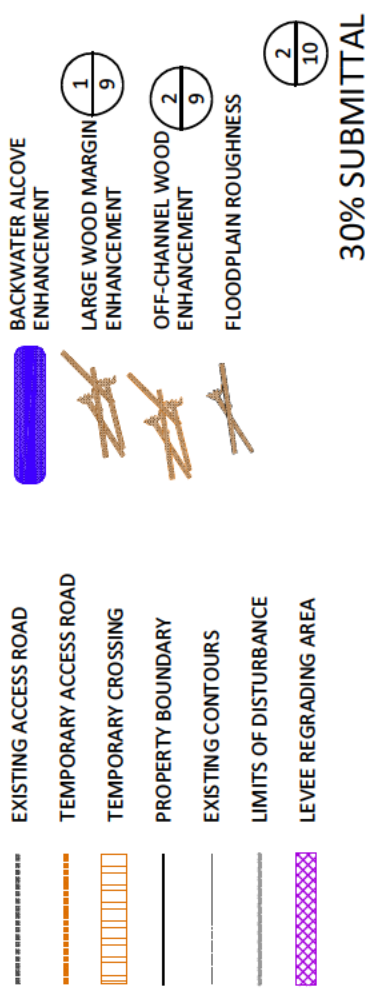
SHEET 5 OF 11



ELK CREEK PLAN VIEW



ELK CREEK PROFILE VIEW



LEGEND

OFF-CHANNEL PROFILE VIEW

30% SUBMITTAL

NO.	BY	DATE	REVISION DESCRIPTION

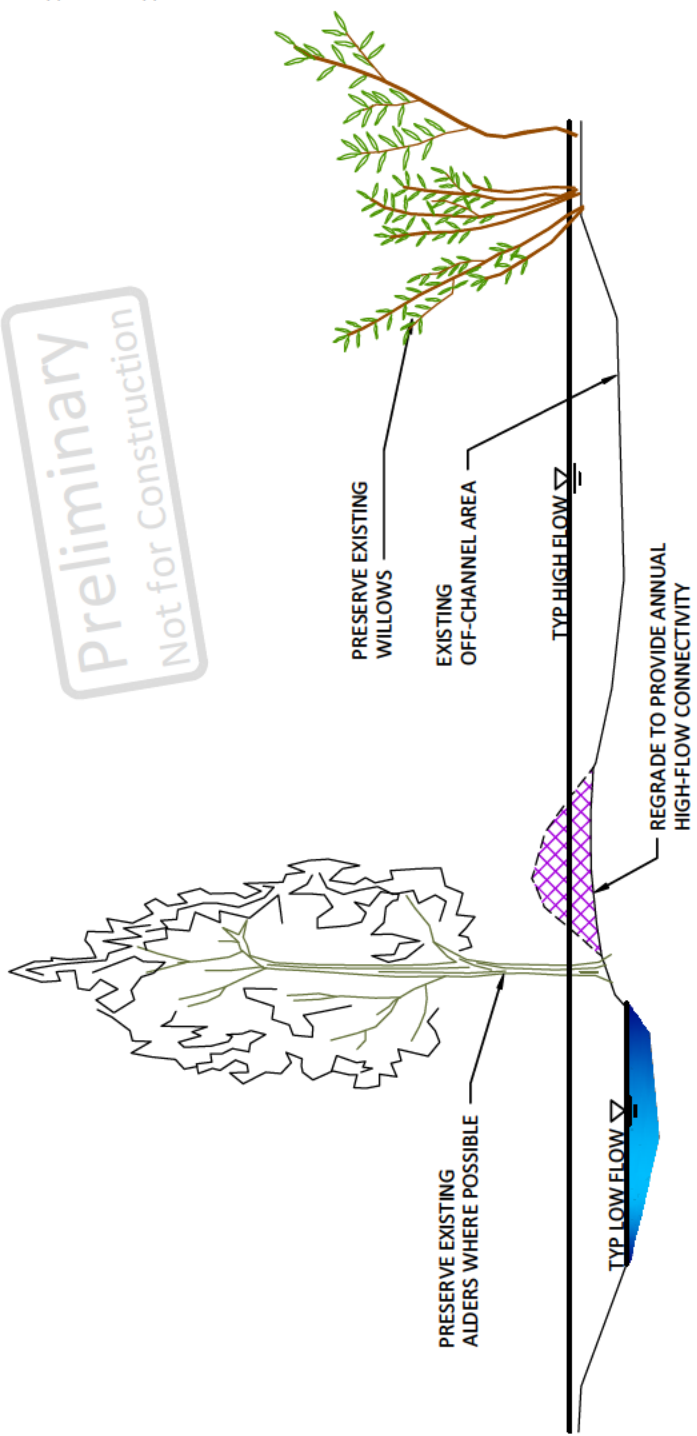
LK	EA_DM	MB
DRAWN	DESIGNED	CHECKED
DM	9/30/2014	130251
APPROVED	DATE	PROJECT

UPPER ROGUE WATERSHED ASSOCIATION		501 Portway Avenue, Suite 101 Hood River, OR 97031 541.386.5005 www.interfluv.com
ELK CREEK RIVER MILE 5.6		interfluv
HIGH FLOW HABITAT ENHANCEMENT		
PROPOSED CONDITIONS		30% SUBMITTAL
PLAN AND PROFILE		
SHEET		6 OF 11

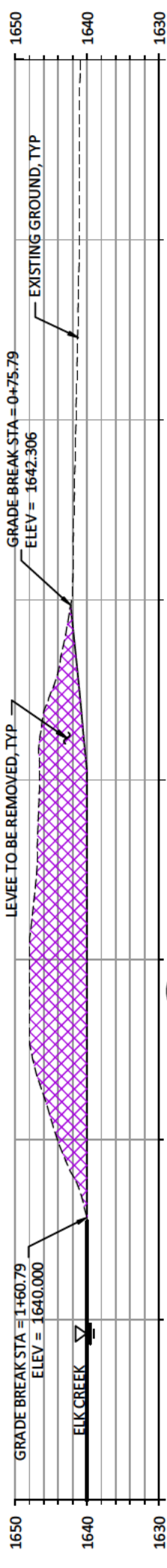
EXISTING LEVEE TO BE REGRADED



EXISTING CONDITIONS

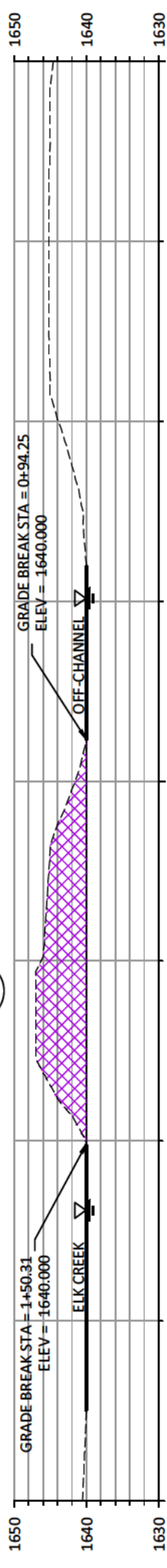


1 TYPICAL DETAIL - LEVEE TO BE REGRADED
NTS

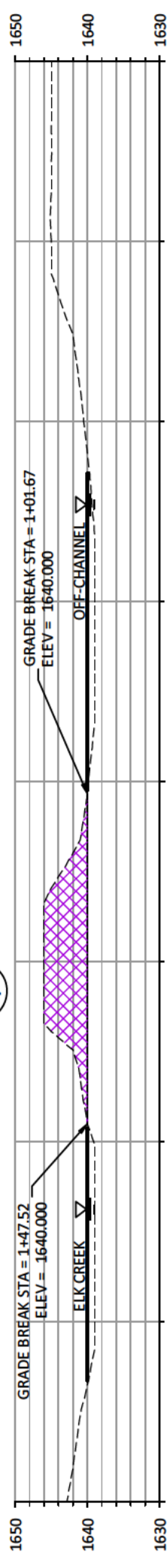


A SECTION - LEVEE
1"=20'

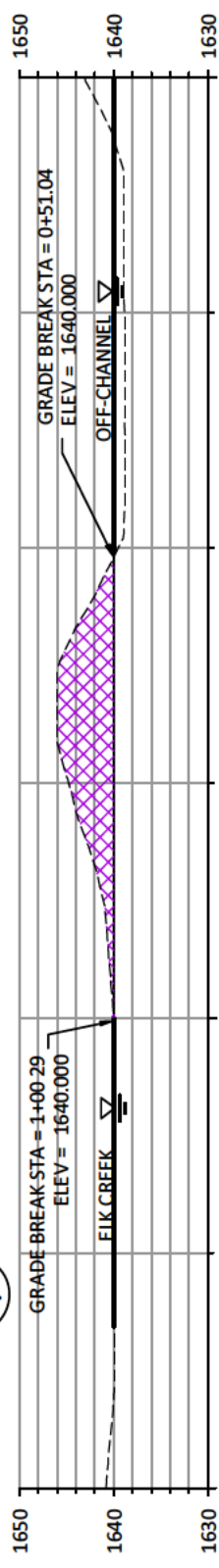
NOTE:
CONSTRUCTION SECTIONS ARE ORIENTED FACING DOWNSTREAM.



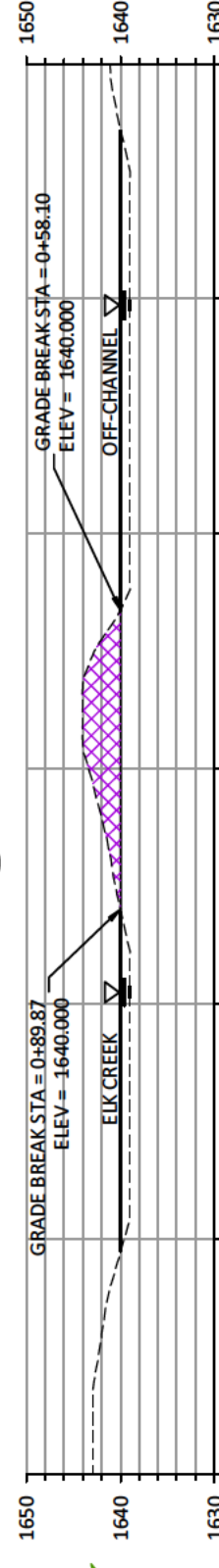
B SECTION - LEVEE
1"=20'



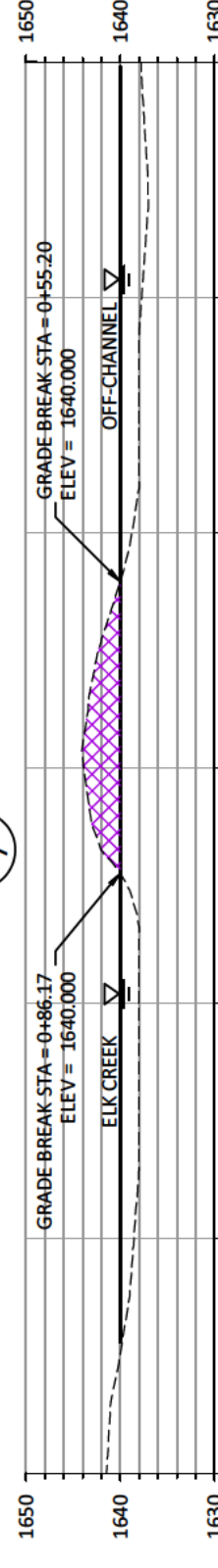
C SECTION - LEVEE
1"=20'



D SECTION - LEVEE
1"=20'



E SECTION - LEVEE
1"=20'



F SECTION - LEVEE
1"=20'

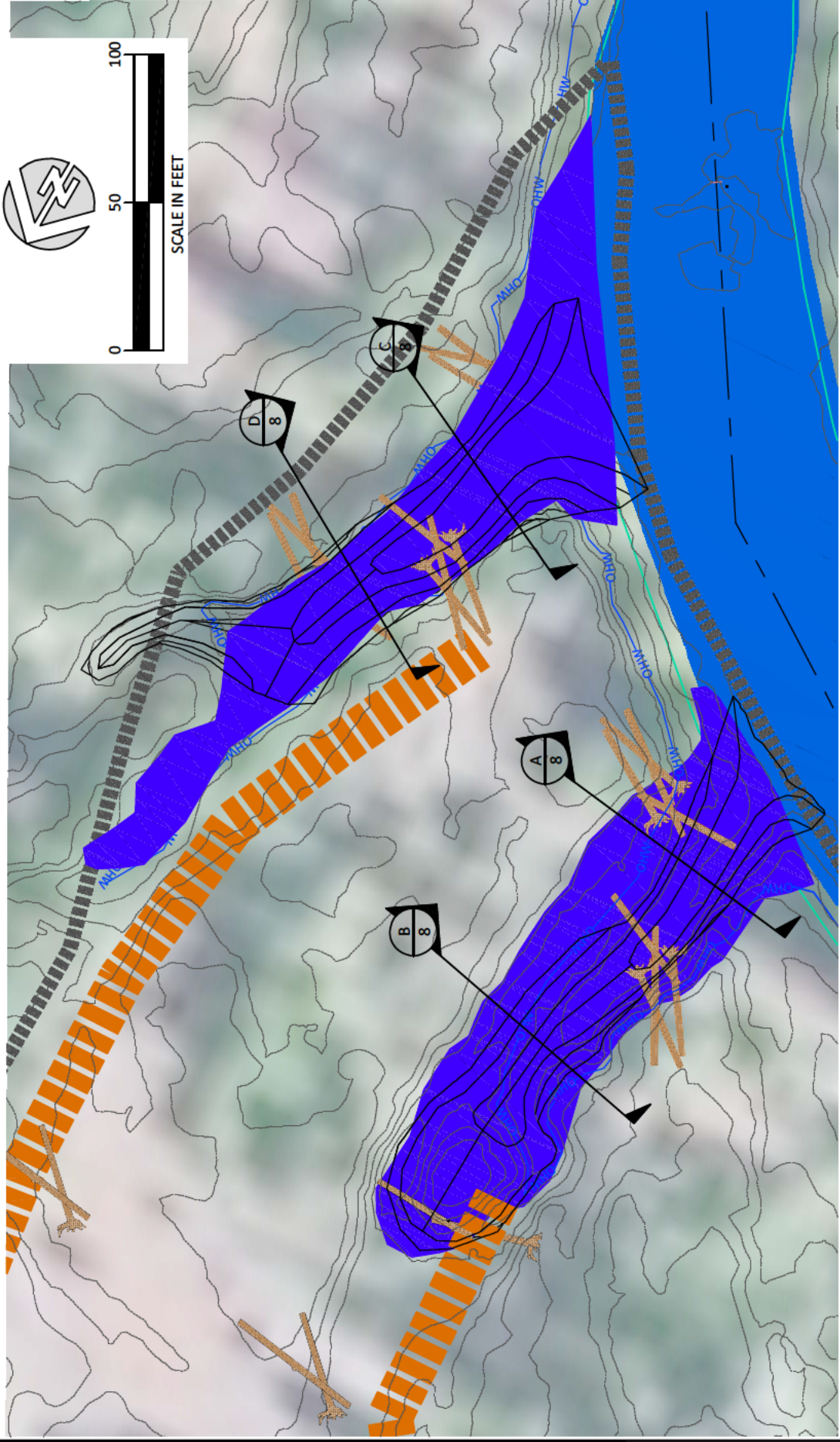
30% SUBMITTAL

NO.	BY	DATE	REVISION DESCRIPTION

LK	EA	DM	MB
DRAWN	DESIGNED	CHECKED	CHECKED
DM	9/30/2014	130251	PROJECT
APPROVED	DATE	PROJECT	

UPPER ROGUE WATERSHED ASSOCIATION		501 Portway Avenue, Suite 101 Hood River, OR 97031 541.386.3003 www.interfluvio.com	
ELK CREEK RIVER MILE 5.6		interfluvio	
HIGH FLOW HABITAT ENHANCEMENT		TYPICAL DETAILS - LEVEE REGRADED	
		SHEET 7 OF 11	

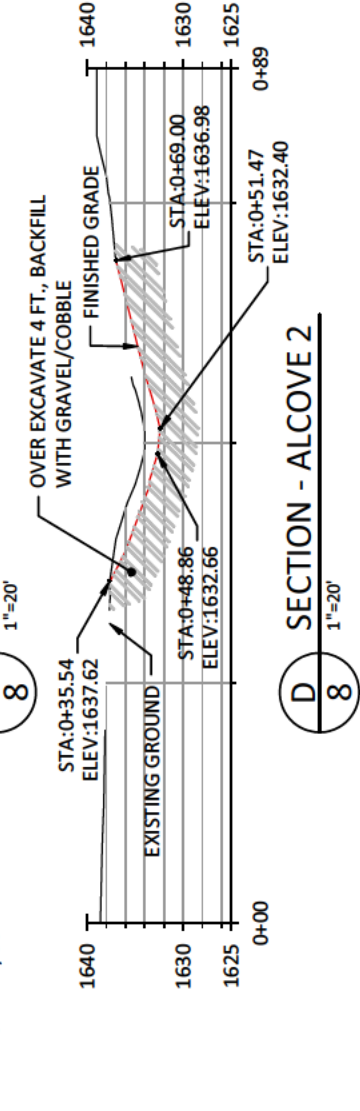
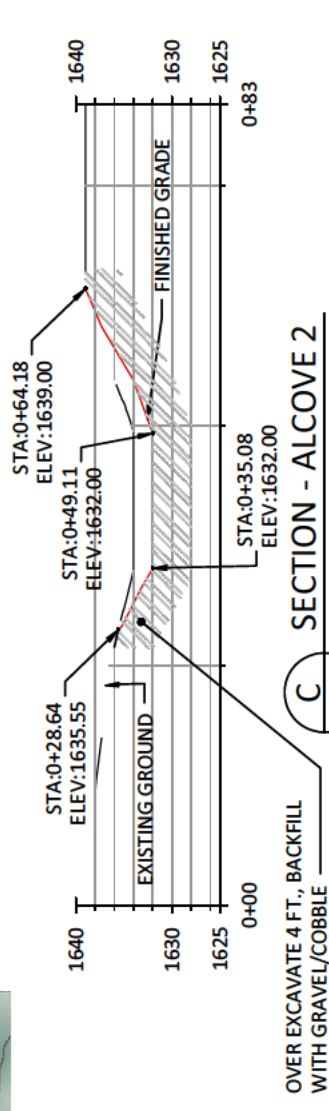
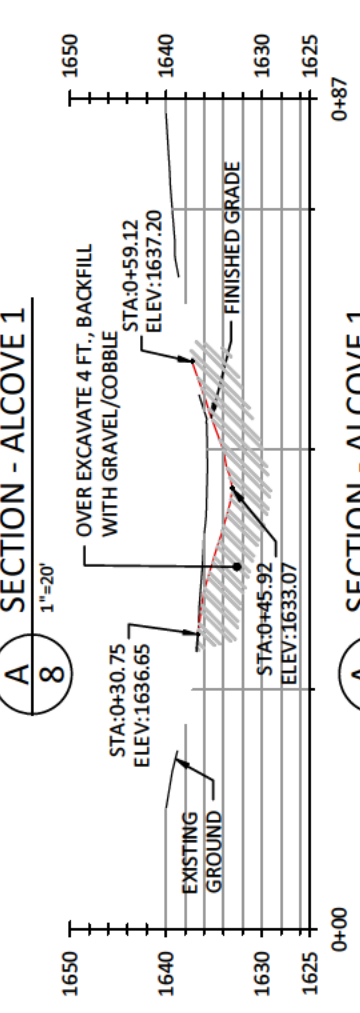
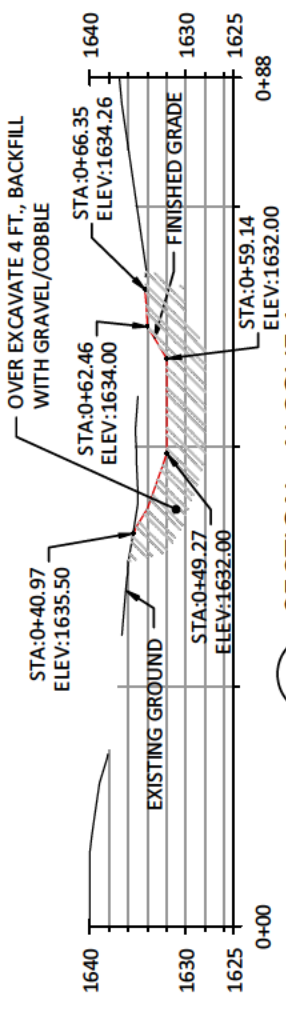
Preliminary
Not for Construction



- LEGEND**
- TEMPORARY ACCESS ROAD
 - EXISTING CONTOURS
 - LIMITS OF DISTURBANCE
 - ALCOVE ENHANCEMENT
 - ✂ OFF-CHANNEL WOOD ENHANCEMENT



EXISTING BACKWATER TO BE EXTENDED



Preliminary
Not for Construction

30% SUBMITTAL

NO.	BY	DATE	REVISION DESCRIPTION

LK	EA_DM	MB
DRAWN	DESIGNED	CHECKED
DM	9/30/2014	130251
APPROVED	DATE	PROJECT

UPPER ROGUE WATERSHED ASSOCIATION
ELK CREEK RIVER MILE 5.6
HIGH FLOW HABITAT ENHANCEMENT



501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.5005
www.interfluve.com

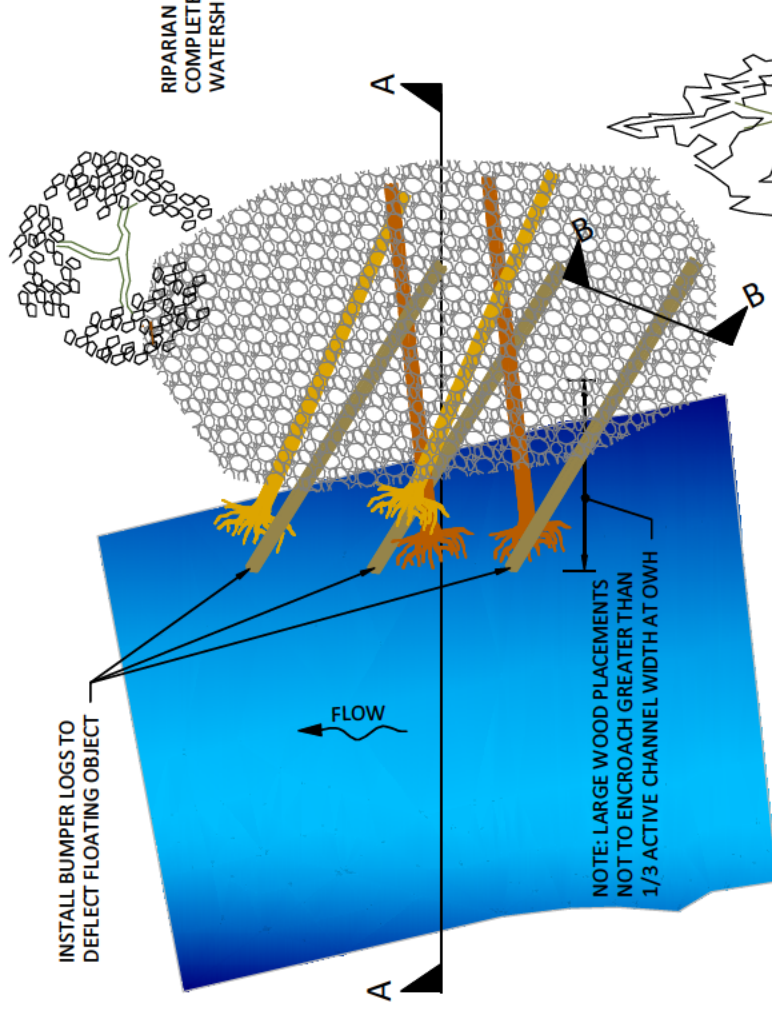
PROPOSED CONDITIONS OF
ALCOVE ENHANCEMENTS

SHEET

8 OF 11

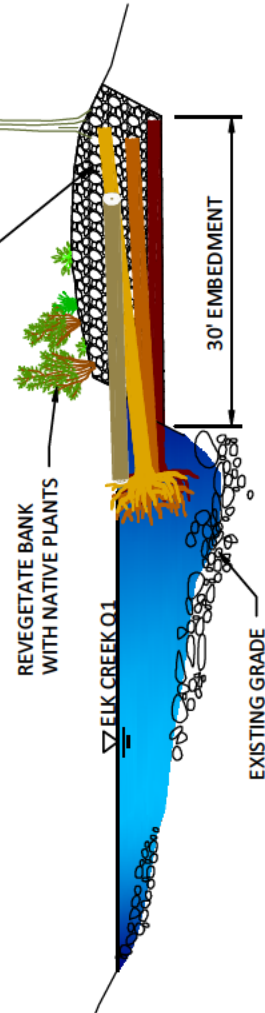
P:\01-RogueRiverRestoration\130251\Drawings\Rogue River Restoration_recover.dwg - Rich - 12/16/14

NOTE:
NEED FOR ADDITIONAL
BALLASTING WITH BOULDERS
TBD (E.G. 3.5 - 4.0 FT. DIAMETER)

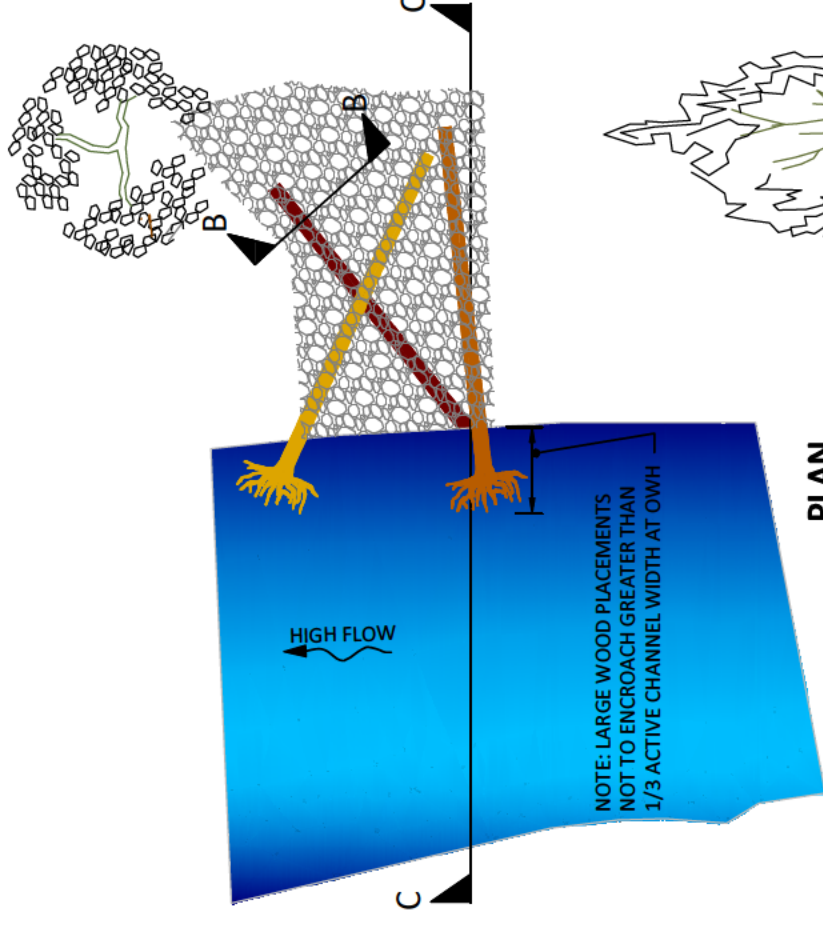


PLAN

PROTECT EXISTING TREES WHERE POSSIBLE
INSTALL LWM IN TRENCH AND BACKFILL WITH 3FT. MIN. DEPTH GRAVEL/COBBLE

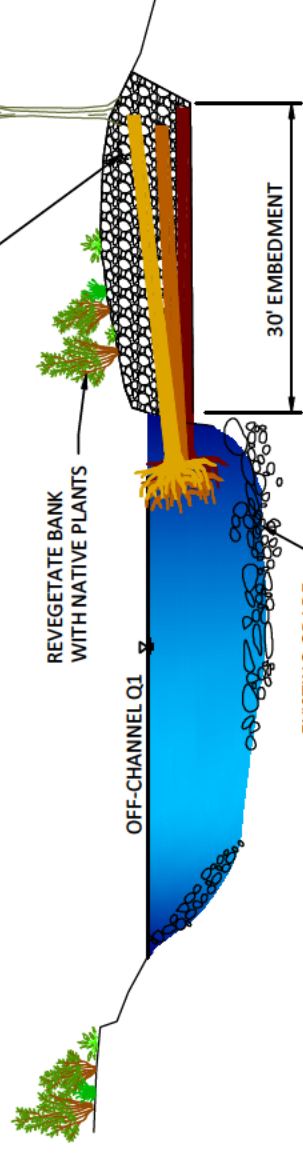


SECTION A-A



PLAN

PROTECT EXISTING TREES WHERE POSSIBLE
INSTALL LWM IN TRENCH AND BACKFILL WITH GRAVEL/COBBLE



SECTION C-C

Preliminary
Not for Construction

1 TYPICAL DETAIL - LARGE WOOD ENHANCEMENT
9 NTS

2 TYPICAL DETAIL - OFF-CHANNEL, AND BACKWATER WOOD ENHANCEMENT
9 NTS

30% SUBMITTAL

NO.	BY	DATE	REVISION DESCRIPTION

LK	EA_DM	MB
DRAWN	DESIGNED	CHECKED
DM	9/30/2014	130251
APPROVED	DATE	PROJECT

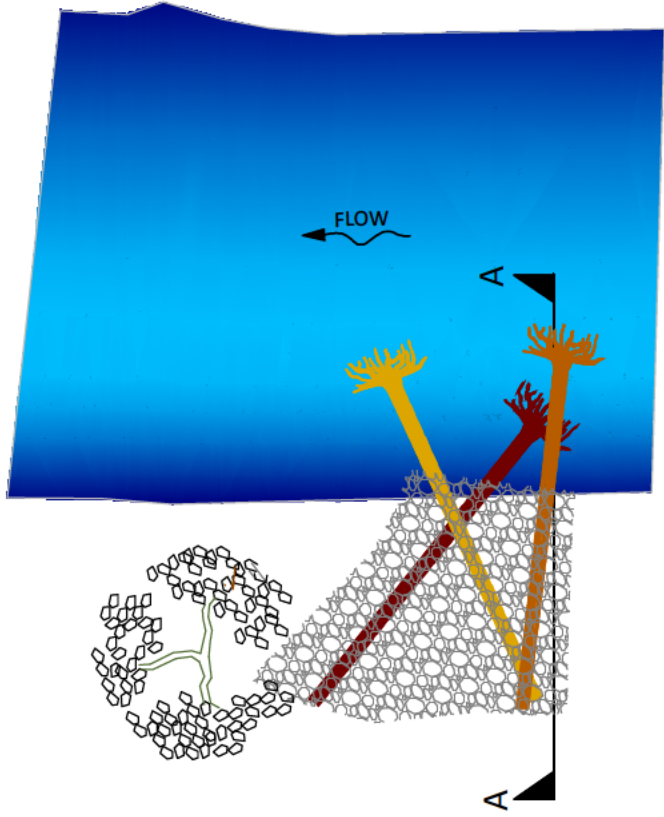
UPPER ROGUE WATERSHED ASSOCIATION
ELK CREEK RIVER MILE 5.6
HIGH FLOW HABITAT ENHANCEMENT



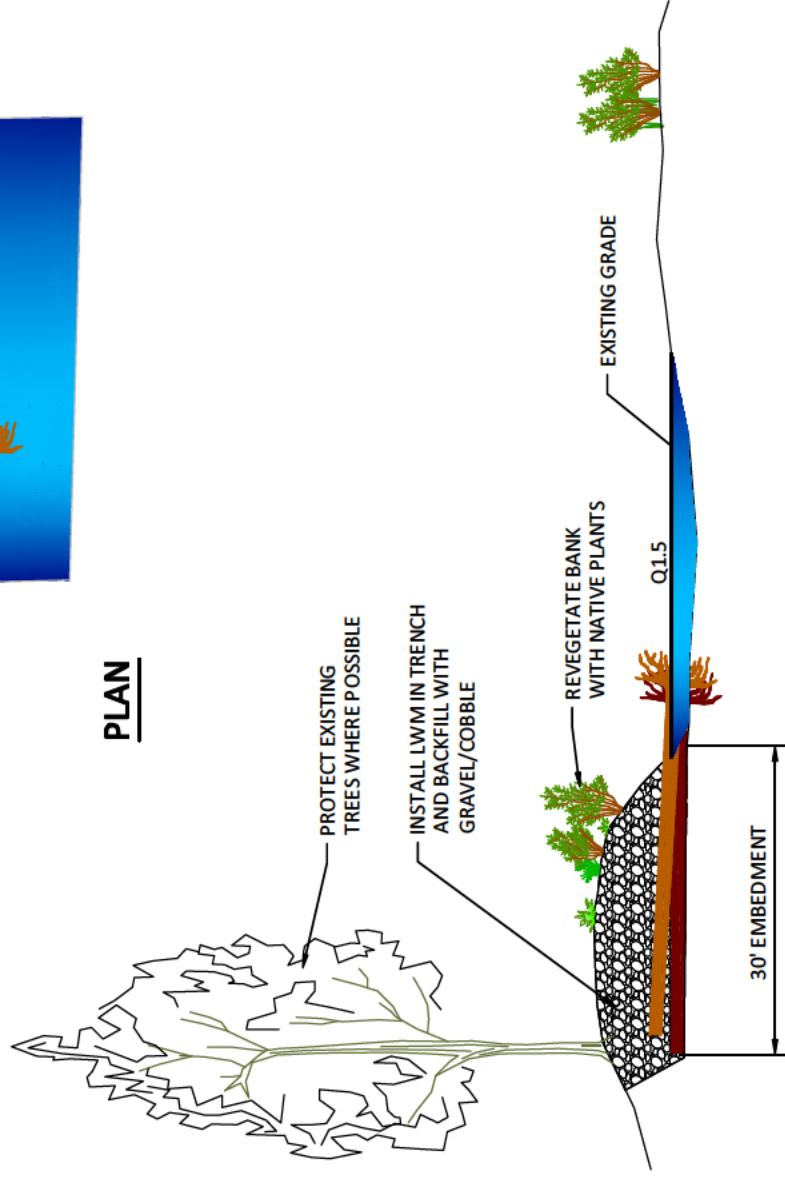
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.5005
www.interfluve.com

TYPICAL DETAILS - LARGE
WOOD

SHEET
9 OF 11

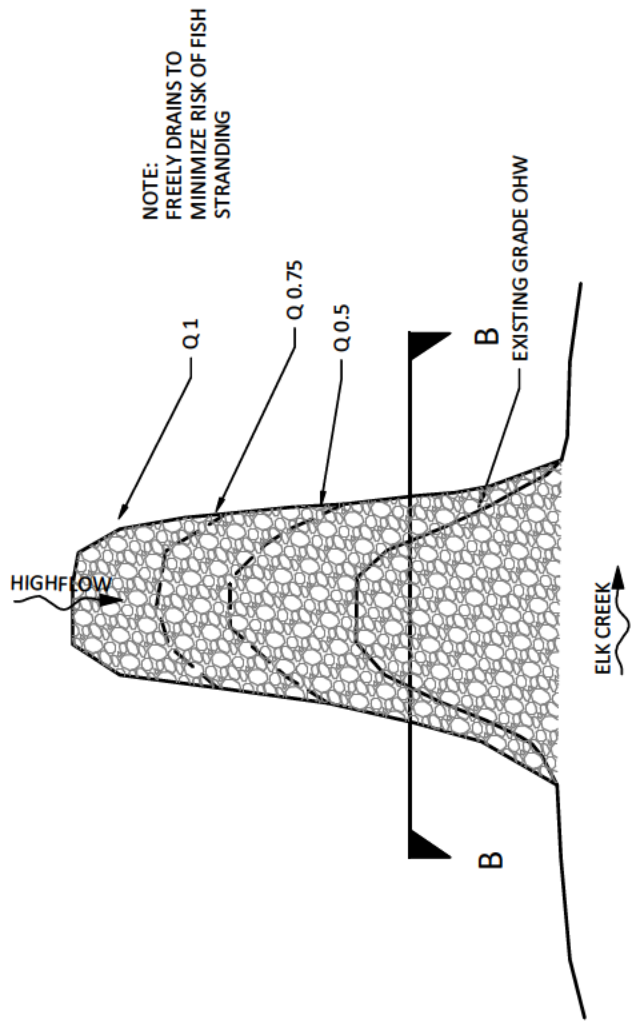


PLAN

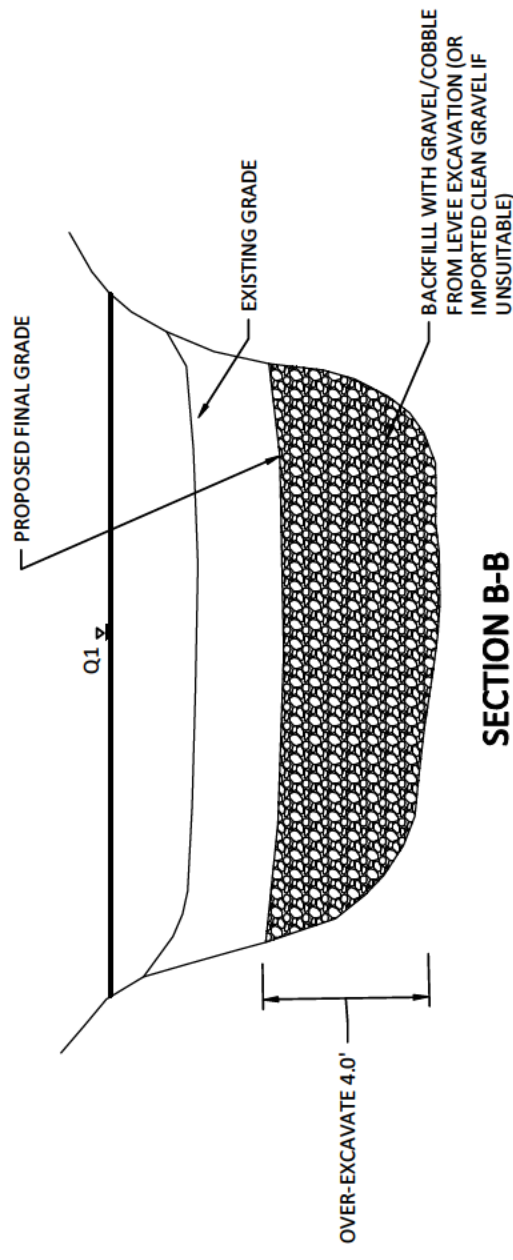


SECTION A-A

1 TYPICAL DETAIL - FLOODPLAIN ROUGHNESS
10 NTS



PLAN



SECTION B-B

2 DETAIL - CROSS-SECTION BACKWATER ALCOVE ENHANCEMENT
10 NTS

Preliminary
Not for Construction

30% SUBMITTAL

501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.5005
www.interfluve.com



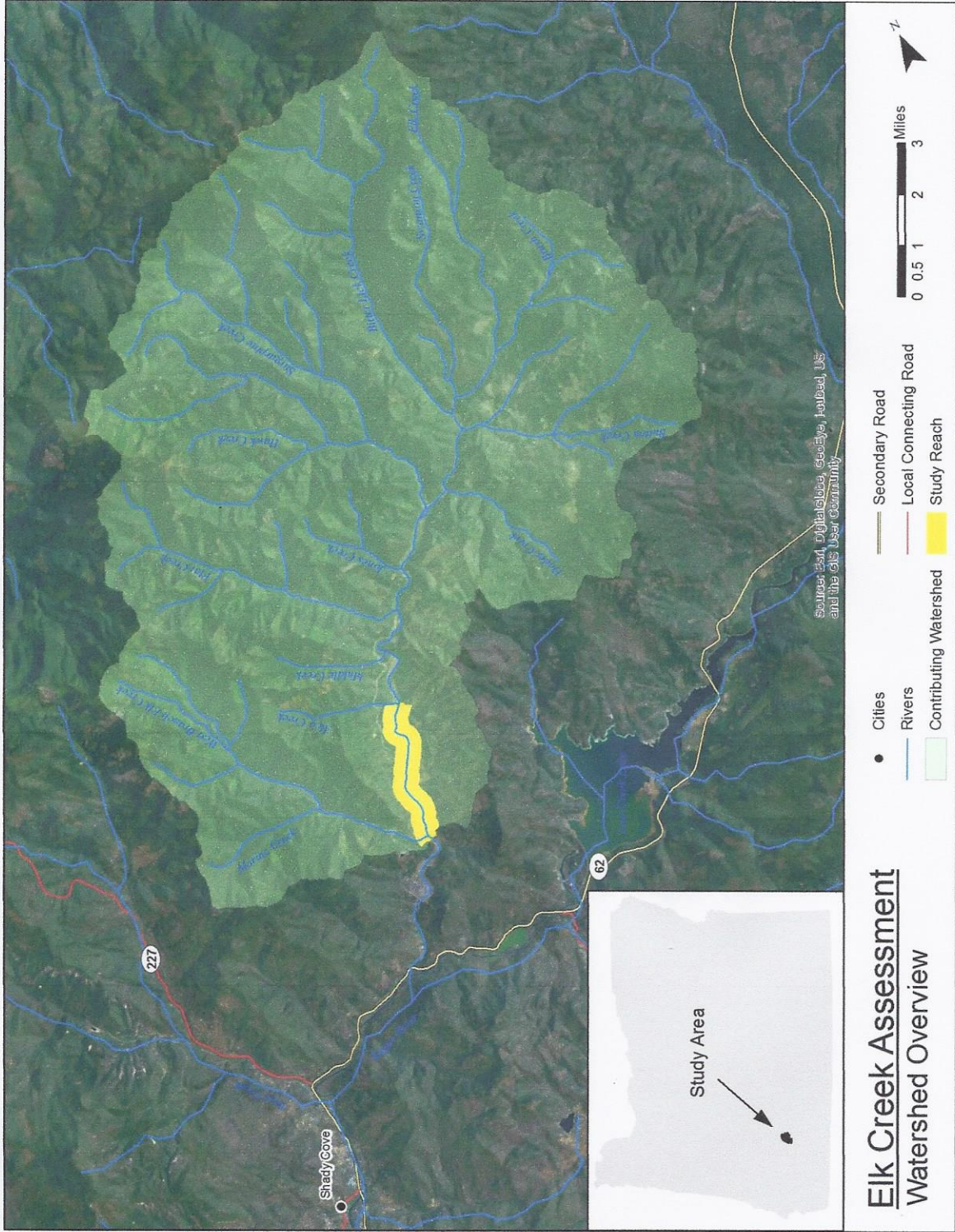
UPPER ROGUE WATERSHED ASSOCIATION
ELK CREEK RIVER MILE 5.6
HIGH FLOW HABITAT ENHANCEMENT

LK DRAWN
DM APPROVED
EA_DM DESIGNED
9/30/2014 DATE
MB CHECKED
130251 PROJECT

NO.	BY	DATE	REVISION DESCRIPTION

TYPICAL DETAILS

SHEET
10 OF 11



Elk Creek Assessment
Watershed Overview

Figure 1 Locator map for the Elk Creek Assessment Area

Elk Creek Engineer's Preliminary Opinion of Probable Cost – RM 5.6 High-flow habitat enhancement

March 2015 - Inter-Fluve, Inc.

Preliminary Design					
Volumes are in-place planned quantity based on surveyed existing ground versus design grades. Volume changes from expansion of excavated and compaction of placed materials are not included and shall be incidental for hauling/handling purposes.					
Assumes wood is purchased and stockpiled near construction site by Owner. On site movement and installation in project is by Contractor.					
Assumes large wood sizes are 18" DBH x 40' length coniferous species.					
Assumes LWM is provided and stockpiled onsite					
Assumes revegetation design/materials/installation will be completed by others (erosion control seeding is included).					
Includes ballast by burial (3 feet minimum, 30 feet long). Assumes stability at Q50 can be achieved through burial.					
Assumes levee excavation can be done with excavator (does not require blasting or jackhammering)					
Does not include additional required test pits, permitting services, 30-100% Design, and construction oversight.					
Location	Item	Unit	Qty	Unit Cost	Total
Levee Removal + Base Costs					
Excavation quantities based on preliminary grading plan Assumes nearby on-site disposal using high capacity off-road dump trucks Establish access and clear & grub material haul	Establish access	HR	40	\$300	\$12,000
	Excavate levee to grade. Haul and dispose excavated materials within 2 miles.	CY	5,800	\$12	\$69,600
	Dewatering and sediment control	LS	1	\$30,000	\$30,000
	Temporary Crossing	LS	1	\$15,000	\$15,000
	Seed and Mulch	AC	1.5	\$2,000	\$3,000
	Construction costs				
Right Bank Wood Enhancements - reconnected area					
4 large wood units (5 logs each)	Large wood (no root wads) delivered from staging area, installed	EA	5	\$250	\$1,250
	Large wood (root wads) delivered from staging area, installed	EA	15	\$250	\$3,750
	Backfill jams with imported gravel/cobble	CY	20	\$6	\$120
	Construction costs				\$5,120
Subtotal construction costs					\$134,720
Mobilization (10% of Project costs)					\$13,472
Estimate of Probable Construction Cost					\$150,000
Estimate of Probable Construction Cost + 30% Contingency					\$195,000

Elk Creek RM 5.6 High-flow Habitat Restoration - Final Design & Construction Observation

Proposal: Tasks 1-4



INTER-FLUVE, INC.

INTER-FLUVE, INC.

ESTIMATED HOURS / LABOR COSTS

DIRECT COSTS

BY RESOURCE

BY ITEM

BY COST

Task	ESTIMATED HOURS / LABOR COSTS						DIRECT COSTS									
	Principal	Project Manager	Hydraulic Engineer Sr.	Geomorphologist, Sr.	Hydrologist, Staff	CADD Tech, Sr	Clerical Support I	Subtotal Labor Costs	Trans.	Per diem	Lodging	Supplies	Direct Costs			
	\$203.00	\$157.00	\$142.00	\$142.00	\$119.00	\$98.00	\$62.00		\$0.565	\$46	\$83					
									Per Mile	Per Person/Day	Per Person/Day					
Task 1: 30-70% Design																
1.1 - 70% Design Documents	3	10	60	14	0	60	6	\$18,939	740	6	4	\$0	\$276	\$332	\$0	\$1,026
1.2 - Update Existing Design Report	2	10	2	0	0	0	4	\$2,508	0	0	0	\$0	\$0	\$0	\$0	\$0
SUB TOTAL	5	20	62	14	0	60	10	\$21,447	740	6	4	\$0	\$276	\$332	\$0	\$1,026
Task 2: Final Design																
2.1 - Construction-level documents	4	5	20	12	0	20	8	\$8,597	0	0	0	\$0	\$0	\$0	\$20	\$20
SUB TOTAL	4	5	20	12	0	20	8	\$8,597	0	0	0	\$0	\$0	\$0	\$20	\$20
Task 3: Construction Observation																
3.1 - Construction Observation	2	20	114	94	0	0	6	\$33,454	4780	22	22	\$0	\$1,012	\$1,826	\$0	\$5,539
SUB TOTAL	2	20	114	94	0	0	6	\$33,454	4,780	22	22	\$0	\$1,012	\$1,826	0	5,539
Task 4: Project Management																
4.1 General project management	0	6	0	0	0	0	8	\$1,438	0	0	0	\$0	\$0	\$0	\$0	\$0
SUB TOTAL	0	6	0	0	0	0	8	\$1,438	0	0	0	\$0	\$0	\$0	0	0
												SUBTOTAL EXPENSES:		\$6,585		
								TOTAL LABOR + EXPENSES						\$71,521		

Scope of Work

This scope describes the final design and construction observation tasks and deliverables for the right bank portion (no mainstem wood, no left bank work) of the Elk Creek River Mile 5.6 High Flow Habitat Enhancement project (Inter-Fluve 2014). Inter-Fluve will prepare 70% and Final (100%) Construction plan deliverables and observe construction of those designs as described below.

Task 1-4 Total: \$71,521

TASK 1 – 70% DESIGN DOCUMENTS (FOR PERMIT SUBMITTAL)

Inter-Fluve will prepare 70% Design documents for the right bank portion of the Elk Creek River Mile 5.6 High Flow Habitat Enhancement Project (based on right bank portion of the 30% plans developed by Inter-Fluve 2014; further design of the mainstem wood structures and left bank work (alcoves, floodplain wood) shown in the original planset is not included). The planset shall include information necessary to submit for regulatory permits from Oregon Department of State Lands (DSL), United States Army Corps of Engineers (USACE), and Jackson County. A supporting design report documenting project components will also be provided. This task includes one trip by two Inter-Fluve staff to the project site to utilize RTK equipment to ground-truth large wood placements and design components.

Task 1 Assumptions:

- Designs will be based upon 30% Elk Creek River Mile 5.6 High-Flow Habitat Enhancement Designs provided by Inter-Fluve to the Upper Rogue Watershed Association in 2014.
- Design report will be based upon 30% Elk Creek River Mile 5.6 High-Flow Habitat Enhancement Preliminary Design Report provided by Inter-Fluve to the Upper Rogue Watershed Association in 2014.
- This task does not include completion or submittal of permitting documents. Inter-Fluve will provide relevant design parameters (e.g. cut/fill volumes above/below OHW, area of disturbance) to the Rogue River Watershed Council and project partners to support completion of USACE and DSL permitting requirements.

- Subsurface investigations are covered under a separate scope and fee. It is assumed that the subsurface investigations (test pits) will have been completed prior to Task 1 initiation.

Deliverables:

- We preliminarily estimate the sheet set will include the following (approximately 15 sheets):
 - Title sheet (1 sheet) – project vicinity and location map and drawing index
 - General notes (2 sheets)
 - ESC plan (1 sheet)
 - Existing Conditions (1 sheet) – plan view including aerial photos of site
 - Site Plan (1 sheet) – plan view including access, staging, erosion and sediment control
 - Proposed Grading Plan and Profile (2 sheets)
 - Channel Cross Sections (4 sheets) – including existing and proposed grades
 - Typical Details (4 sheets)
- Inter-Fluve shall deliver one electronic copy of project designs to the Rogue River Watershed Council via a fileshare page. Anticipated sheet set includes:
- Printable design sets shall be formatted to print on 8½ by 11 sheets as required by permitting agencies.

Timeline:

- To be determined by Rogue River Watershed Council funding strategy and grant application timeline. Estimated time of 12 weeks upon completion of subsurface investigations and Notice to Proceed.

TASK 2 – CONSTRUCTION DOCUMENTS

Based on feedback from regulatory agencies on designs provided as part of Task 1, Inter-Fluve will incorporate changes to provide one set of construction plans for the right bank portion of the Elk Creek RM 5.6 High-Flow Habitat Enhancement Area (no maintenance)

wood, no left bank work). Construction drawings and specifications will be stamped and signed by an Oregon-Licensed engineer.

Task 2 Assumptions:

- It is assumed that final designs will be based on 70% designs submitted as part of Task 1
- Significant changes to the project site prior to construction due to flood conditions may require re-survey and re-design of the project.
- It is assumed that an Inter-Fluve staff person will be onsite for construction of all large wood placements associated with the project.
- It is assumed that the final design report will be based on the 70% design report submitted as part of Task 1.

Deliverable:

- Construction Drawings “wet” signed and stamped drawings on 11 x 17” paper.
- Final PDF drawings submitted to the Rogue River Watershed Council via a fileshare page.
- Final Opinion of Probable construction Costs.
- Final design report.

Timeline:

- To be determined by Rogue River Watershed Council funding strategy and grant application timeline. Estimated time to completion eight weeks following completion of Task 2 and comments received from Rogue River Watershed Council.

TASK 3 – CONSTRUCTION OBSERVATION

Inter-Fluve shall provide full-time construction observation throughout construction. Inter-Fluve will support scheduling of the construction contractor and provide construction observation throughout the Project. Project shall be built to design plans and specifications developed as part of Tasks 1-2. This includes attendance at one pre-bid meeting.

Task 3 Assumptions:

- Assumed two week construction duration. Additional observation can be provided via addendum.
- Inter-Fluve will provide staking of project limits, grade stakes, and elevation control points. Some field adjustments to the lines and grades are to be expected. Stakes damaged during construction are to be replaced by construction contractor.

Deliverables:

- Electronic copy of the construction log for days Inter-Fluve staff observed construction, submittals, and addenda issued.

Timeline:

- To be determined by Rogue River Watershed Council funding strategy and grant application timeline.

TASK 4 – PROJECT MANAGEMENT

General project management – Inter-Fluve will manage staff and tasks to support timely completion of deliverables and will maintain regular correspondence with Owner staff for the duration of the project.

Task 4 Assumptions:

- Inter-Fluve staff will not attend any on site coordination or planning meetings during the design phase of the project. If an onsite meeting is necessary, it may be added via addendum.

Deliverables:

- Inter-Fluve will complete monthly invoices.
- Inter-Fluve will complete meeting minutes for all project meetings.



Elk Creek RM 5.6 High-Flow Habitat Enhancement Preliminary Design Report

SUBMITTED TO
Upper Rogue Watershed Association

DECEMBER 2014

Elk Creek RM 5.6 High-Flow Habitat Enhancement Preliminary Design Report

DECEMBER 2014



SUBMITTED TO
Upper Rogue Watershed Association
PO Box 1128
Shady Grove, OR 97539

PREPARED BY
Inter-Fluve, Inc.
501 Portway Ave, Suite 101
Hood River, OR 97031
(541) 386-9003

Table of Contents

1. Introduction	1
1.1 Background.....	1
1.2 Summary of Project Components	1
1.3 Goals and Objectives	4
2. Site Analysis	8
Site Survey & Data Collection.....	8
2.1 Hydrology	9
2.2 Hydraulics	11
3. Design	14
3.1 Design Criteria	14
3.2 Design Considerations	16
Next Steps.....	23
4. References	23

Appendix A – Opinion of Probable Costs

Appendix B – HEC-RAS Output

1. Introduction

1.1 BACKGROUND

This RM 5.6 High-flow habitat enhancement project site is located on Elk Creek between West Branch Elk Creek (River Mile (RM) 3.2) and Alco Creek (RM 6.2). Elk Creek is a major tributary of the upper Rogue River, one of the US Forest Service's priority watersheds in the Pacific Northwest (Figure 1). Elk Creek is an important producer of ESA federally-listed Coho salmon, as well as summer and winter steelhead, spring and fall Chinook, as well as Pacific Lamprey, and rainbow and cutthroat trout.

The Project Reach was investigated and analyzed by Inter-Fluve as part of the Elk Creek Project Opportunities Assessment (Inter-Fluve 2014a), in addition to the more recent surveys and analyses that are presented in this report. Other prior studies considered as part of this effort have been the Elk Creek Watershed Analysis (USFS 1997), the Elk Creek Water Quality Restoration Plan (BLM 2009), the Upper Rogue Watershed Assessment (Cascade Earth Sciences et al. 2006), and the Elk Creek Watershed Restoration Action Plan (WRAP) (USFS 2012). These documents and the Project Opportunities report (Inter-Fluve 2013) should be reviewed for additional watershed- and site-specific background information.

This report is being submitted as part of a preliminary design package that includes a preliminary design planset. Included in this report are descriptions of the more focused technical analyses that were conducted in order to support project design at the RM 5.6 site. These analyses include site survey, additional hydrologic analysis, and hydraulic modeling. Project design criteria and descriptions of the individual project components are also provided. Hydraulic modeling output and preliminary cost estimates are included as appendices.

1.2 SUMMARY OF PROJECT COMPONENTS

This memorandum focuses on preliminary analysis and design of the following project elements:

- Reconnection and enhancement of a 500-foot long off channel alcove area through removal and regrading of a levee. This area will be designed to have six inches of depth at the Q1 and will be active at high flows to provide high-flow refugia. Large wood will be installed within this area to provide high-flow cover and complexity.
- Enhancement of two backwater alcoves through the placement of large wood and excavation. These backwaters are inundated at Ordinary High Water and this wood will provide habitat and cover at moderate to high regularly annual flows.
- Placement of wood along portions of the mainstem Elk Creek right bank. These wood complexes will range from three to five pieces each. Structures will be designed to mimic the contribution of large riparian trees that, as the channel migrates laterally into the riparian corridor, fall into the channel.

- Placement of floodplain roughness along Elk Creek's left bank. Roughness elements are intended to provide cover, complexity, and roughness at high flows.

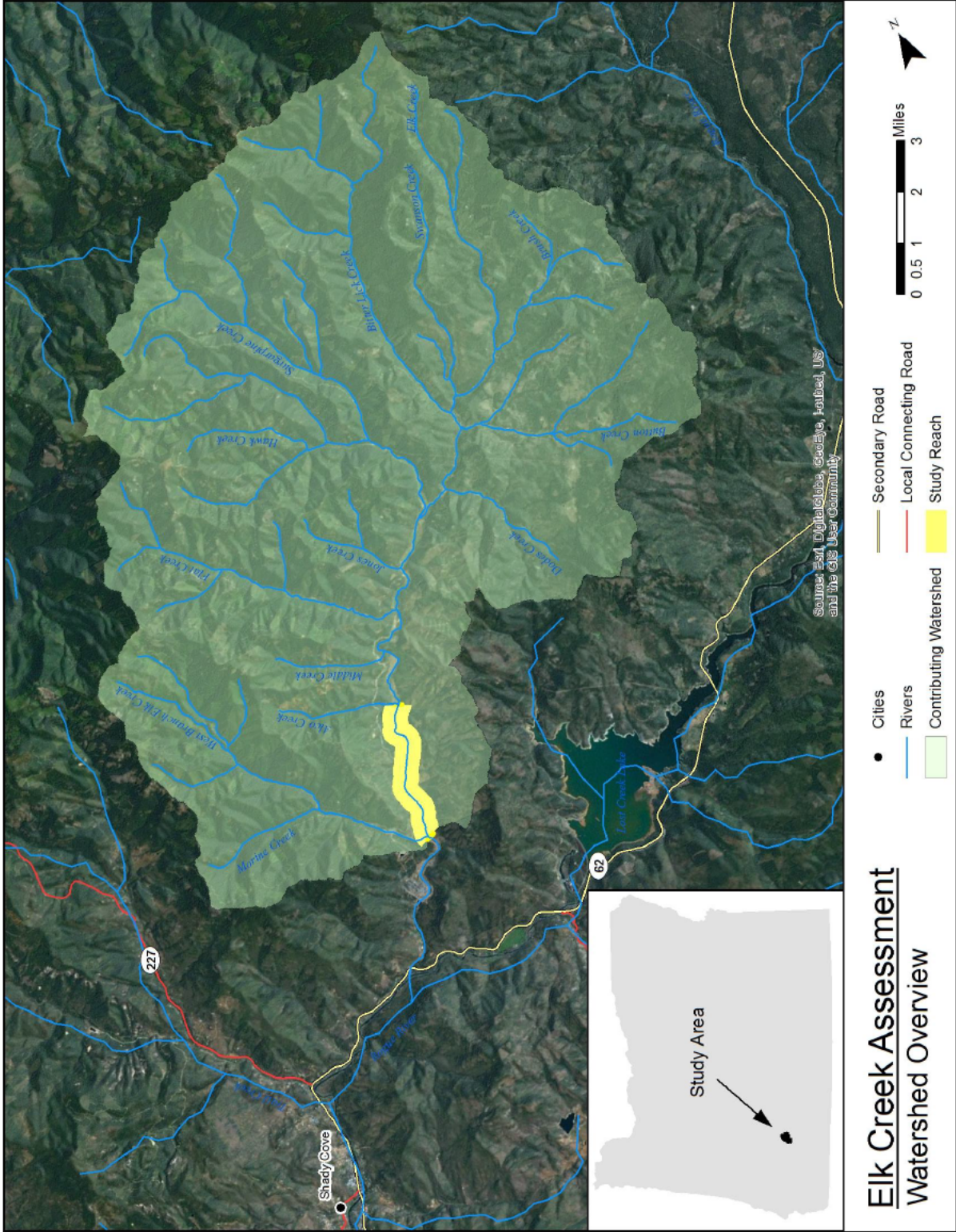


Figure 1 Locator map for the Elk Creek Assessment Area

1.3 GOALS AND OBJECTIVES

Priorities Identified in Previous Studies

The Elk Creek Watershed has been identified by the Forest Service as one of the Pacific Northwest's top three priority basins for salmonid habitat. Geomorphic reaches (Figure 2), project goals and objectives were developed as part of the project identification process (Inter-Fluve 2014), conceptual design consultation with project partners (Inter-Fluve 2014), and with reference to regional and basin-specific restoration objectives (e.g. Elk Creek Watershed Analysis (USFS 1997), the Elk Creek Water Quality Restoration Plan (BLM 2009), the Upper Rogue Watershed Assessment (Cascade Earth Sciences et al. 2006), and the Elk Creek Watershed Restoration Action Plan (WRAP) (USFS 2012)). These goals and objectives have helped guide the development of more specific project design criteria, which are presented later in this report.

Based on these efforts, the goals of this project are to:

1. Increase the frequency and quality of floodplain connectivity during annual high flow periods (typically November through February)
2. Create, restore, and/or reconnect off-channel stream habitats during annual high flow periods (typically November through February)
3. Reclaim riparian condition to historical density, structure, and species composition

Of note, the UWRA advisory committee has elected to focus internally on the riparian restoration efforts (Goal 3), so this goal is not explicitly discussed as part of this effort. It is advised that riparian restoration accompany any of the efforts detailed below.

Site Selection

After review of projects presented in the Elk Creek Project Opportunities Assessment (Inter-Fluve 2014a), The Elk Creek Projects Advisory committee (hereafter advisory committee) provided Inter-Fluve with a list of prioritized project opportunity areas to further examine. Given that further analysis would be required to evaluate project feasibility, the advisory committee provided a list of a top three priority areas. These areas were:

- Alco Creek tributary reconnection
- RM 3.6 to RM 3.9 off-channel habitat enhancement
- RM 5.57 to RM 6.0 Bedrock Bend

Each of the three project sites listed above was revisited to provide a more extensive evaluation of design opportunities, their ability to meet the above listed project goals, and construction feasibility. Based on this further evaluation, two project opportunity areas were refined and were taken through conceptual design, these projects were:

- **Project A:** RM 3.6 off-channel habitat enhancement (refined from RM 3.6 to RM 3.9 off-channel habitat enhancement)
- **Project B:** RM 5.6 off-channel habitat reconnection (refined from RM 5.57 to RM 6.0 Bedrock Bend)

Project conceptual designs (Inter-Fluve 2014b) were based on a review of existing studies, use of remote sensing data, topographic/bathymetric survey, hydraulic modeling, and field visits. These two conceptual designs were presented to the advisory committee for review. Based upon this review, the advisory committee selected RM 5.6 off-channel habitat reconnection to move to 30% design (Figure 3).

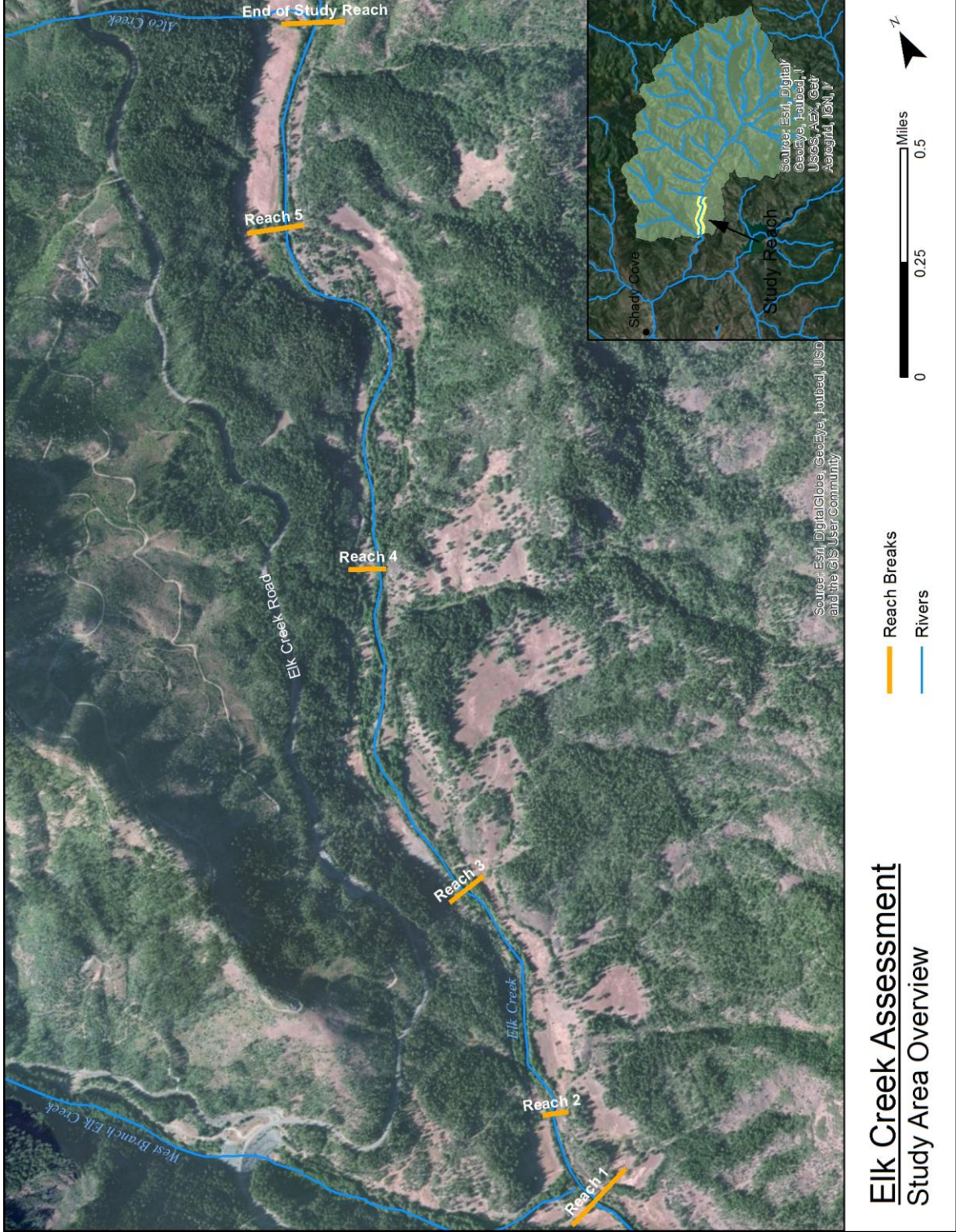


Figure 2 Geomorphic reaches of Elk Creek Study area.

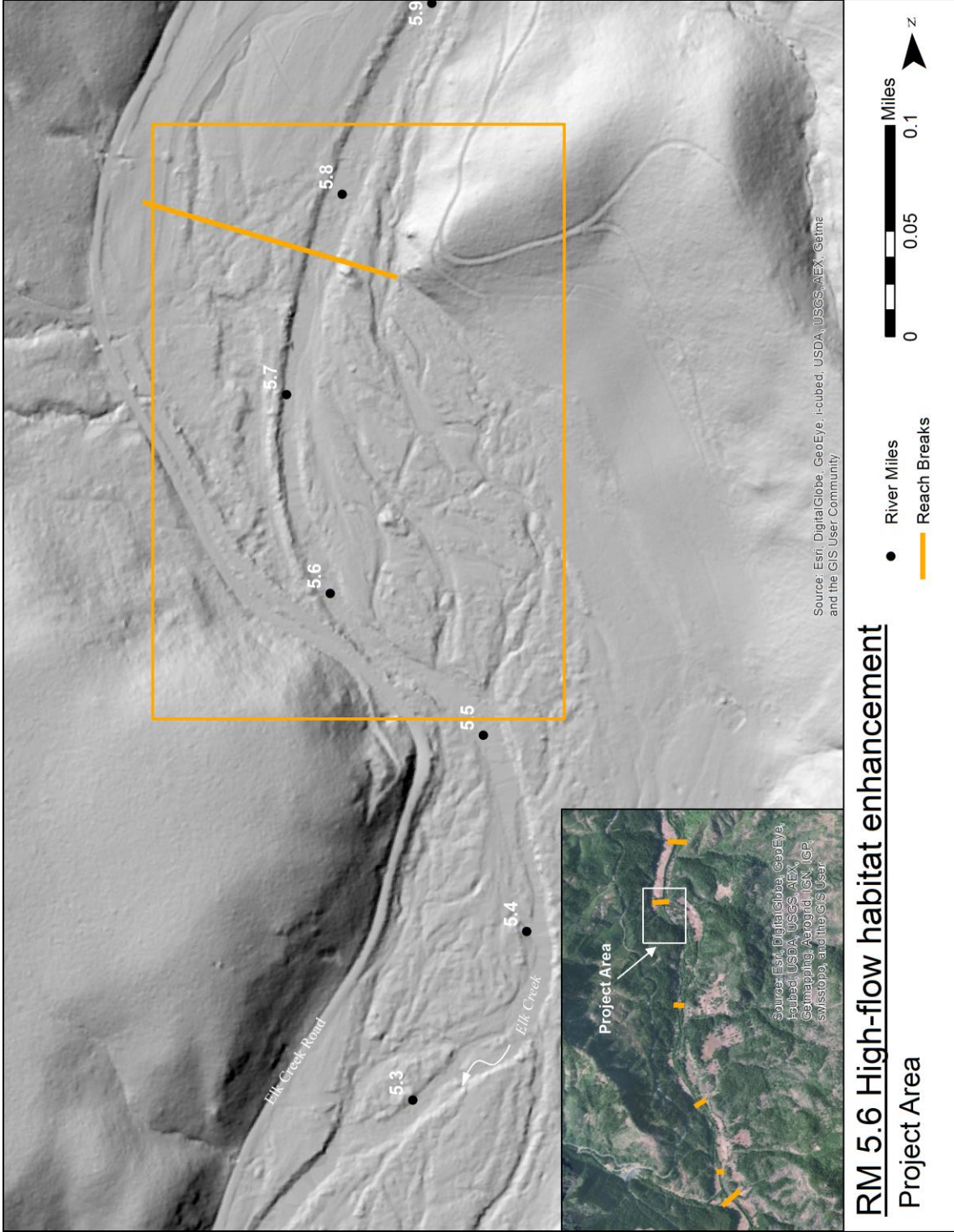


Figure 3 RM 5.6 project area.

2. Site Analysis

SITE SURVEY & DATA COLLECTION

Site visits were conducted on multiple dates in 2013 and 2014 for site reconnaissance, collection of topographic data, geomorphic analysis, and habitat evaluation.

Site Reconnaissance

Initial site reconnaissance was conducted along the Elk Creek Area, including the RM 5.6 site, in 2013 as part of the Elk Creek project opportunities identification effort (Inter-Fluve 2014a). This opportunity area was revisited in July 2014, and selected by the project advisory committee to move to 30% design.

Topographic Survey

Topographic surveys were conducted in July 2014. The surveys collected bathymetry data of the mainstem Elk Creek and backwater areas as well as detailed topographic data of the floodplain on river-right and left and the right-bank levee. The bathymetry and floodplain topography was collected with survey grade GPS and total station equipment. Data from the surveys was used for: 1) refinement of existing LiDAR data and provision of bathymetric data to support existing LiDAR ground surface data, 2) channel and floodplain cross-sections for hydraulic modeling of current and proposed restoration alternatives, and 3) creation of a preliminary grading plan and calculation of excavation quantities for off-channel restoration alternatives.

2.1 HYDROLOGY

Overview

The Elk Creek watershed is a 133 square mile sub-basin to the Rogue River in the western Cascades. Dominant hydrologic patterns are driven by precipitation in the form of snow, rain-on-snow events, and subsequent spring snowmelt. Peak runoff usually occurs during winter months and is initiated by rain-on-snow events (Figure 4). Typically, high flow events occur during December, January, and February. Stream discharge typically returns to baseflow by July and stays at that level until September. Mean daily flow is 467 cubic feet per second, with flow exceeding 4.7 cubic feet per second 90% of the time (USGS 2014).

Precipitation amounts vary with elevation. In the higher elevation areas of the basin, which top out at 5,800, average annual precipitation is 60 inches. The downstream end of the watershed is at an elevation of 1,480 feet and receives 30 to 35 inches of precipitation annually. Mean annual precipitation in the study area watershed is about 40 to 45 inches (USFS 1997). Tributaries in the study area include West Branch Elk Creek (RM 3.2), Alco Creek (RM 6.2), and a number of unnamed tributaries and ephemeral drainages.

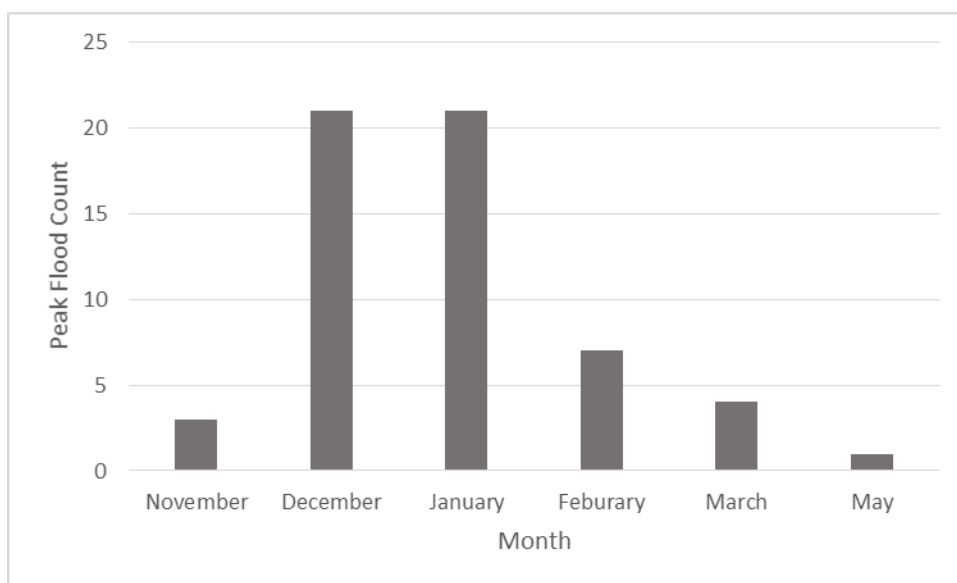


Figure 4 Month of occurrence for annual peak flow events recorded at the USGS gage on the Elk Creek (as measured at USGS Gage 14338000) (data retrieved 26 March 2014)

Peak Flow Hydrology

There is one USGS real-time stream gage on Elk Creek (USGS gage number 14338000) located at RM 1.5. The gage has a period of record from 1947 to 2013. A list of the ten largest flood events on record is presented in Table 1. For preliminary analyses, the Elk Creek gage was also used to perform a flood recurrence analysis. Here, the contributing discharge from West Branch Elk Creek was subtracted from these values. For subsequent design efforts, a tributary drainage area ratio will be compared to surveyed water surface elevations determine and model peak flows. Top ten floods of record (Table 1) and flood frequency for Elk Creek was generated using USGS StreamStats for Oregon (Table 2)

Table 1 Top 10 floods on record on Elk Creek Gage (USGS Gage 14338000) (data retrieved on March 26, 2014). Data noted to have been impacted by agricultural diversions or dam failure were removed.

Month	Day	Year	Discharge (cubic feet per second)
12	22	1964	19,200
12	22	1955	13,700
12	30	2005	12,100
1	1	1997	11,300
1	15	1974	10,600
1	17	1971	8,550
1	29	1958	8,460
12	2	1962	8,220
3	2	1972	8,220
12	11	1956	7,850

Table 2. Flood Recurrence Analysis for USGS Elk Creek gage (USGS gage number 12448998). Period of record from 1947 to 2013. Data retrieved on 26 March 2014.

Exceedance Probability (% Chance)	1	2	5	10	20	50
Recurrence Interval (years)	100	50	25	10	5	2
Discharge (cfs)	13,415	12,020	10,514	8,309	6,456	3,627

Annual High Flow Hydrology

A high-flow hydrologic analysis was conducted to support design components. Within the project reach, high flow refugia has been identified as a major limiting factor. To achieve the goal of accessible high flow habitat during annual high flow periods, exceedance curves for typical annual high flow months (December, January, and February) were examined (Figure 5). The current design re-grades the levee to be accessible during approximately the highest 25% of flows that are reached during the combined mean daily flows of December, January, and February. This discharge is equivalent to 0.5 feet of depth at the Q1 discharge.

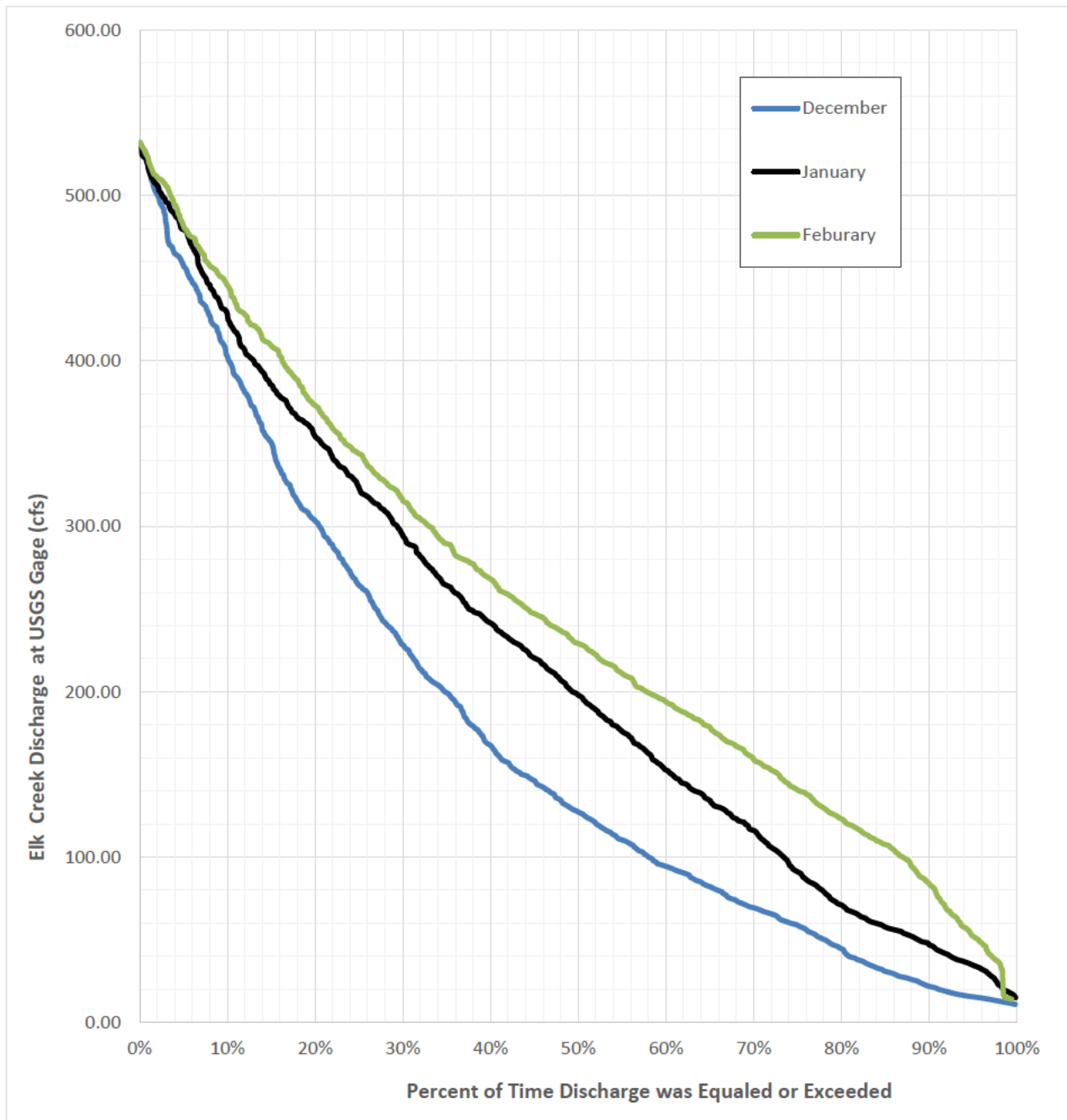


Figure 5 Daily Mean Flow Discharge Duration for Elk Creek at Trail (USGS Gage 14338000) for typical annual high flow months. Only flows below the Q1 are displayed.

2.2 HYDRAULICS

A preliminary-level hydraulic model was built to evaluate possible proposed conditions.

2.2.1 Methods

Existing and proposed channel and floodplain hydraulics were simulated using the U.S. Army Corps of Engineers Hydraulic Engineering Center River Analysis System (HEC-RAS 4.1.0; USACE 2010). HEC-

RAS is a computer program that models the hydraulics of water flow through natural rivers and other channels. The program is one-dimensional, meaning that there is no direct modeling of the hydraulic effect of lateral components of flow in areas such as cross section shape changes, bends, and other two- and three-dimensional aspects of flow. The hydraulic model calculates channel and floodplain water surface elevations, velocities, depths, and shear stresses (among other metrics) for various input flows.

The existing conditions model geometry was developed using topographic and bathymetric data obtained through surveys completed in July 2014. Survey limits focused on floodplain and channel topography and bathymetry to inform modeling and design. Survey data were supplemented with LiDAR data in select locations, primarily floodplain surfaces. Model geometry for existing conditions included 27 cross sections spaced over two river miles on the mainstem Elk Creek RM 5.35 to RM 5.80 (Figure 6). Cross sections extended through the right bank floodplain to the right valley wall terrace toe. The 1.01-, 1.5-, 2-, 5-, 10-, 25-, 50-, and the 100-year recurrence interval floods were modeled. Manning's values represent resistance to flow, and are applied both to in-channel and overbank (floodplain) areas. Values were based on field observation of median size of channel substrate, and reference to photographic comparisons in Barnes 1967 and roughness partitioning methods provided in Acrement and Schneider (1989). Channel values were 0.12 in areas with very rough, craggy bedrock to 0.038 in areas of gravel/cobble. A value of 0.12 was applied to the right overbank areas to convey roughness of a scrub/shrub vegetative condition with the left bank ranging from 0.07 to 0.12 a grass/forbes to a forested condition with a scrub/shrub understory.

Proposed conditions were modeled by copying and modifying existing cross-section geometry according to the proposed grading plan. Cross-section stationing and alignment were maintained while altering cross sections to represent proposed condition topography. Resulting hydraulic conditions were analyzed in several ways: model outputs were used to quantify aspects of project stability, such as inundation levels, channel stability and required ballast for LWD; model outputs were used to assess potential of successfully meeting design criteria; and proposed hydraulic conditions were compared to existing hydraulic conditions to assess any potential impacts to nearby infrastructure. Results of modeling are presented in Appendix B.

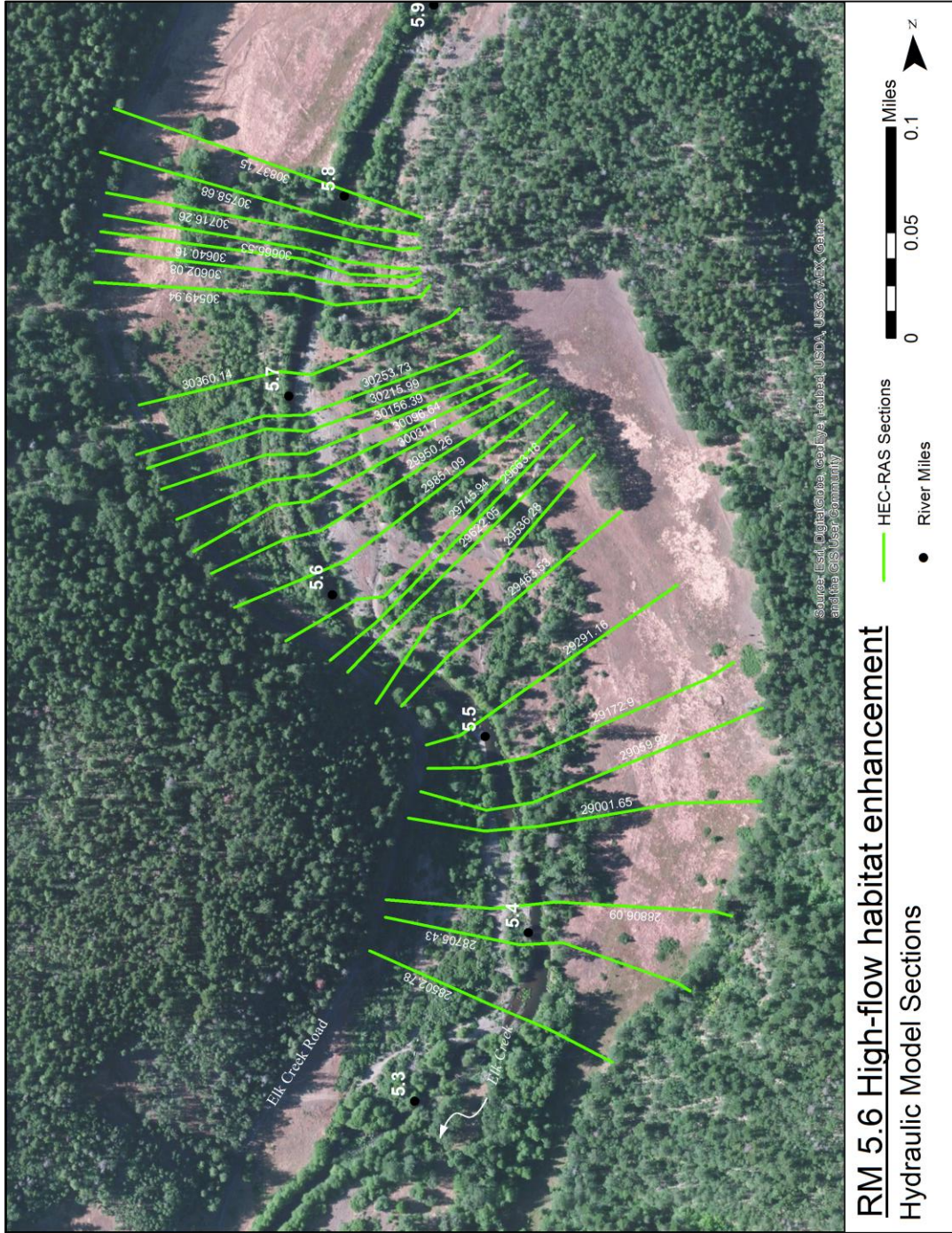


Figure 6. HEC-RAS cross-sections for the RM 5.6 high flow habitat enhancement area.

3. Design

3.1 DESIGN CRITERIA

Designs were developed with consideration of the project objectives and constraints, regulations, safety, and feasibility. Design criteria have been developed to guide the design process, to achieve project objectives, and to confirm project constraints are understood and explicitly addressed. Design criteria were developed with reference to: 1) habitat objectives and restoration priorities in the Watershed Restoration Action Plan (USFS 2012), 2) the goals identified in the Elk Creek Project Opportunities assessment (Inter-Fluve 2014a), and 3) site analysis and project objectives identified in the Conceptual Design technical memorandum (Inter-Fluve 2014b).

Design criteria are presented below first for the landowner and advisory committee requirements (general criteria), and then for each of the three restoration elements: right-bank off-channel area, left bank backwater alcove enhancement, and mainstem wood placements (see accompanying planset for design element locations). The following design criteria may continue to be revised as the design process proceeds.

General Criteria

- Large wood placements are to be stable up to the Q50 event. Ballast may only be achieved through burial and boulders. No artificial anchoring is to be used. Due to this criteria, wood placements displayed on the 30% plans may be eliminated or adjusted in subsequent design phases.
- Safety of recreational river users is a primary concern. Mainstem wood placements are only acceptable if they have a minimum line of site of 400 feet, have advisory signage upstream (see Safety Considerations section), protrude a maximum of 1/3 the channel width at low-flow, and have a bumper log included in an effort to deflect floating objects.

Right-Bank Off-Channel Criteria

Goal: Restore connectivity to off-channel habitat at regular winter annual high-flows (specifically November through February) within the historically complex floodplain. Enhancement will provide high-flow refugia for steelhead and Chinook in an area where human impacts have reduced the likelihood of future off-channel habitat creation by natural river processes (Inter-Fluve 2014a).

- Off-channel habitat should be active at regular annual high flows (here defined as minimum 0.5 feet depth at Q1).
- Encourage floodplain connectivity through the removal of the right bank-levee.
- Add complexity and cover to reconnected and enhanced habitat through large wood placements. Large wood to be ballasted through burial. Specific locations and feasibility of wood placements will depend upon subsequent design phases.

- In an effort to reduce stranding, if feasible, a lower flow notch will be constructed at the outlet of the off-channel area to promote draining.
- Minimize, to the extent practicable, impacts to existing vegetation.

Backwater Alcove Enhancement Criteria

Goal: Provide off-channel backwater alcove habitat at a range of flows. Increase the diversity and complexity of available off-channel habitats that will support multiple species and life stages.

- Utilize existing floodplain swales to minimize excavation volumes, minimize impacts to existing vegetation, and maximize potential groundwater exchange.
- Over-excavate (through excavation) four to six feet below average low summer flow. Fill back to grade with alluvium salvaged from levee re-grading effort to promote cooling through gravel/cobble alluvium groundwater filtration.
- Use large wood placements to add complexity and cover to constructed and enhanced habitat. Specific locations and feasibility of wood placements will depend upon subsequent design phases.
- Utilize floodplain wood placements between the backwater and mainstem to provide hydraulic roughness to moderate flows coming from the mainstem into the backwater. These wood placements are intended to provide habitat during high flow events.
- Create backwater channel side-slopes that minimize excavation volumes and impacts to existing vegetation to the extent possible while still allowing for slopes that will be stable and allow re-vegetation by woody riparian species.

Mainstem Wood Placements Criteria

Goal: Restore channel complexity and diversity by placing large wood to provide cover and promote wood material recruitment and retention. Utilize design standards appropriate to the recreation on this section of the mainstem.

- Focus large wood placements in areas where large wood will provide habitat benefit at a range of flows.
- Due to the high amount of river users with low skill-level, any wood placements placed in major flow paths will have sufficient line of sight (400+ feet) and navigable escape routes to be easily avoided by river users with limited navigability skills.
- Wood placements will be limited to smaller habitat wood placements along channel margins, through straight reaches with high visibility and avoid areas that a non-maneuvering object would follow by natural river flow paths.
- Mainstem structures shall be located in low risk areas and configured in the field intended to help shed objects floating along the river and thus minimize risk to recreationists. The optimal configuration for safety will be site dependent, but will commonly depend on flow orientation to the bank, bank height, depth of log submersion, line of sight, near bank velocity, near bank shear stress, and near bank depth.

- Mainstem structures will be designed for stability of location under submerged conditions and under hydraulic conditions produced by the 50-year flood with consideration given to buoyancy and floating with stage, depth of burial, and ballasting.
- Safety signage warning river users of the presence of log structures may be a viable component of safety measures. This may include signs along the river, at put-ins, or on industry websites (e.g. American Whitewater).

3.2 DESIGN CONSIDERATIONS

Based upon the project goals and objectives, site analyses and design criteria the three components of the Elk Creek RM 5.6 restoration effort have been developed. The individual design components including a description, anticipated benefits and hydraulic, engineering and construction considerations are discussed in detail below.

Right-Bank Off-Channel Area Reconnection

Description

This project element includes reconnection of a 500-foot-long off-channel area in the right-bank floodplain (Figure 8). Reconnection will occur through removal of an existing levee. This reconnection will increase availability of high-flow refugia and will include complex large wood placements for habitat and to encourage complex flow patterns. The upstream extent of the off-channel area will be located near RM 5.75 and the outlet located near RM 5.6. The off-channel area will preserve existing topography throughout the floodplain, with the exception of the downstream area where, if feasible, a lower-flow outlet will be graded.

The side channel is designed to be active at 0.5 feet below the Q1. This translates to availability of high flows exceeded 25% of the time annually. Off-channel areas are naturally at risk for deposition and infilling. Consequently, there is possibility for overbank deposition of silts through this habitat feature, but the feature's location on the outside of a meander bend and across from a gravel bar somewhat decreases depositional risk.

Large wood placements will be installed throughout the length of the off-channel area and will provide profile complexity. Wood placements will consist of accumulations/jams of approximately two to five pieces per structure to provide cover and complexity throughout the channel. Proposed large wood placements are designed to provide features consistent with natural processes of large wood recruitment within the floodplain. Historically, large trees would have fallen into the side channel as large floods raft material into place.



Figure 7 Existing off-channel area to be reconnected

Anticipated Benefits

The side channel is expected to primarily provide high-flow refuge from high flows and velocities for juvenile and adult holding for ESA-listed Chinook, steelhead, and coho. The area is designed to be connected only at moderate to annual high flows, so will not be accessible during low flow periods. Large wood additions are intended to provide diverse channel structure and form by increasing channel margin complexity and providing cover and holding areas. Large wood placements will enhance off-channel structure and form by providing margin habitat complexity. Wood placements will restore habitat diversity by enhancing large woody material abundance, retention, and complexity.

Hydraulic, Engineering, and Construction Considerations

A total length of about 500 lineal feet of off-channel area will be reconnected via excavation of a levee along the river-right floodplain. An average of three feet depth of excavation along the levee will be required to achieve grade with a total of approximately 5,800 cubic yards of excavation of in-place material. Both transfer of the material to the left bank alcove area (see subsequent section) as well as nearby off-site hauling (within two miles) are considered for cost estimation purposes. The final disposal location for excavated material has not been determined but it has been indicated that disposal can occur on the property. If determined suitable alluvium (through test pits), this material could be utilized to backfill the Backwater Alcove design elements (see subsequent section). Due to the need to achieve stability at the Q50 and the desire to not use artificial ballasting methods, the feasibility and precise location of large wood placements will require ground-truthing in subsequent design phases.

Backwater Alcove Enhancement

Description

This element includes the expansion of two small backwater alcove complexes along the river-left floodplain in historical side-channels. These alcoves will be directly connected to the main channel, and be designed to be active at varying river stages. Currently, the river-left floodplain within this area exhibits complex topography resulting from overland flow through a network of channels and swales (Figure 8). Excavation of the backwater alcove would take advantage of these swales to minimize excavation quantities, minimize impacts to mature vegetation, and maximize connectivity with groundwater. The floodplain channel network is currently only connected at the flows exceeding the 1.5-year flood event, though a portion of the backwaters are active at ordinary high water. The expanded backwater complexes will fluctuate with river levels, with the downstream-most portion inundated at average annual low flows and the upstream most portion active at regular annual high flows (i.e. freely draining). The alcoves will be 'over-excavated' (estimated four to six feet below finished grade), and, if suitable quality, alluvium from the removed levee (see above Right-Bank Off-Channel Area Reconnection section) will be placed as the new substrate. Large wood will be added throughout the backwater complex for rearing/holding and high flow refuge habitat cover and complexity.



Figure 8 Existing backwater alcove area (facing upstream)

Anticipated Benefits

The backwater alcove will address the off-channel habitat and floodplain connectivity design criteria. Alcove habitat will increase the abundance and quality of off-channel habitat that has been reduced due

to anthropogenic impacts to the channel and floodplain throughout Elk Creek. Further, altered river processes make the future natural creation of similar habitat types unlikely. The backwater area is designed to be connected to the mainstem at a range of flows (from ordinary high water to annual high flows). The alcove will provide protected winter rearing and winter/spring high flow refuge. Large wood will add cover and complexity within the backwater area. Though impacts may be minor, the placement of alluvium is intended to create a 'groundwater reservoir' effect in an effort to cool warm summer water temperatures.

Hydraulic, Engineering, and Construction Considerations

A total length of about 500 lineal feet and an area of 1,200 square feet of backwater channel will be created via excavation within the river-left floodplain. Maximum depths of up to six feet will be required to excavate beyond grade with a total of approximately 2,825 cubic yards excavation of in-place material and subsequent alluvial fill of 2,075 cubic yards. Of particular concern here is the proximity of bedrock to the surface. Test pits or more detailed geophysical testing will be required to determine the proximity of bedrock to the surface. If bedrock is detected, the planform and profile of the alcove features would need to be adjusted or construction may not be feasible at all. Large wood will be placed throughout the enhanced backwater as small groups of logs providing cover habitat. The precise location and feasibility of these placements will be field-verified in subsequent design phases. If feasible, these structures will be stabilized using burial by gravel, cobble, and boulders and bracing against existing vegetation. Existing vegetation along the margins of these channels should be preserved to the extent practicable.

If alluvium is transferred from the right-bank levee, construction sequencing will be critical due to the transfer of materials across the channel. A temporary bridge may be required to transfer materials across Elk Creek.

Mainstem Wood Placements

Description

Habitat cover wood is being placed along the right bank from RM 5.65 to RM 5.75. These bank jams will average five to seven pieces and will provide cover and complexity along the channel margin as well as provide temporary sorting/storing of spawning gravel. The wood will enhance an existing long, straight glide that lacks overall cover and complexity (Figure 9).

These large wood complexes are intended to mimic the contribution of large riparian trees that fall into the channel through processes such as lateral migration, windfall, or senescence. Historical wood removal and riparian clearing practices will prevent wood-load recovery for the foreseeable future.



Figure 9 Existing plane-bed mainstem (facing upstream).

Anticipated Benefits

Large wood placements will enhance channel structure and form by providing margin habitat complexity. Wood placements will restore habitat diversity by enhancing large woody material abundance, retention, and complexity. These wood placements will provide cover from low to ordinary high water.

Hydraulic, Engineering, & Construction Considerations

Margin habitat structures will be constructed with an average twelve pieces of large wood. Mainstem wood will be ballasted using a combination of burial and boulders in the streambank. Logs about 18" dbh and 40 feet long are specified. Under this condition, 30' of the logs will be buried by 3' of gravel/cobble backfill over the logs to achieve the desired stability level. Excavation is expected to include a minimally-sized temporary trench to place buried pieces and ballast, with all suitable excavated material placed back into the excavated area during construction. Proximity of bedrock is not yet known. Excavation is not expected to interface with the active channel, with minimal requirements for erosion control and dewatering. It is also intended that excavation will avoid existing riparian trees, and that placed logs will be 'threaded' in between these existing trees. Each structure site will be accessed via routes set back to avoid disturbance of streambank vegetation and aligned to avoid large riparian trees. Clearing for construction of each structure will be minimized.

SAFETY CONSIDERATIONS

Army Corps staff have indicated that this river is commonly used for recreation, and is frequently used by those with little to no knowledge of whitewater safety or swiftwater rescue. A number of potential safety concerns have been and will continue to be considered as part of project design. These considerations primarily apply to the use of large wood, which can pose a potential risk to river recreational users. Though the State of Oregon has not set a policy regarding large wood placements, safety considerations as part of design follow protocols by the State of Washington and other groups (e.g. American Whitewater).

Preliminary designs include large wood placements along the mainstem and as cover wood within created off-channel habitats. The structures on the mainstem have been designed to provide habitat function while minimizing risk to river recreationists to the extent practicable, and designs specify sufficient anchor to achieve stability at the design flow (Q50). A number of safety guidelines are available and were considered during design, including:

- Washington State Department of Transportation. August 9, 2010. Project Delivery Memo #10-01, Geomorphic/Safety Guidance for the use of Large Woody Materials for Mitigation Applications in Bridge Scour Projects.
- Beth Andrus & James Gessford, P.E., Skellenger & Bender Attorneys. 2007. Understanding the Legal Risks Associated with Design and Construction of Engineered Logjams
- River Safety Council. Proposed Safety Guidelines for the Construction and Placement of Large Woody Debris (LWD) Affecting Streams used for Recreation in Washington State.
- American Whitewater. Integrating Recreational Boating Considerations into Stream Channel Modification & Design Projects.

In general, these guidelines are aligned with the standard approach taken by Inter-Fluve in design and placement of large wood. These guidelines are also consistent with the guidelines provided in the Safety Appendix of the Washington State Stream Habitat Restoration Guidelines (Cramer 2012). A number of considerations were included in the design to minimize risk consistent with the guidelines, such as:

- As a design standard, due to the high amount of river users with low skill-level, any wood placements placed in major flow paths will have sufficient line of sight (400+ feet) and navigable escape routes to be easily avoided by river users with limited skills. Wood placements will be limited to smaller habitat wood placements along channel margins, through straight reaches with high visibility and avoid areas that a non-maneuvering object would follow by natural river flow paths.
- Mainstem structures shall be located in lower risk areas and configured in the field to have a 'bumper log' intended to help shed objects floating along the river and thus reduce or minimize risk to recreationists. The optimal configuration for safety will be site dependent, but will commonly depend on flow orientation to the bank, bank height, depth of log submersion, line of sight, near bank velocity, near bank shear stress, and near bank depth. **It**

is important to note that these bumper logs do not guarantee protection, and may not be effective at all river stages.

- Mainstem structures will be designed for stability of location under submerged conditions and under hydraulic conditions produced by flows up to the calculated 50-year flood with consideration given to buoyancy and floating with stage, depth of burial and ballasting.
- Safety signage warning river users of the presence of log structures may be a viable component of safety measures (Figure 10). This may include signs along the river, at put-ins, or on industry websites (e.g. American Whitewater). This is consistent with recommendations (2007) the River Safety Council and the Washington State Department of Natural Resources (Andrus & Gessford 2007).



Figure 10 Example safety signage warning river users of presence of log structures installed upstream of the structures (A) and at the boat launch (B).

NEXT STEPS

Following review and input from the advisory committee, agency personnel, and relevant stakeholders, input from the preliminary design phase will be reviewed and incorporated where appropriate into final designs.

Next steps in the design process will include moving from the current 30% design set to a 60%, 90% (pre-final), and a final (100%) set of stamped construction plans and accompanying Engineer's opinion of probable cost. Additional steps in the design process will include:

- Coordination with the advisory committee to identify a soil disposal location
- Coordination with the advisory committee to apply for grant funding to bring designs to 100% and for construction
- Test pits or more detailed geophysical testing will be required to determine the proximity of bedrock to the surface
- Finalizing proposed grading plans
- Ground-truthing log-placements and finalizing ballasting requirements
- Development of a construction sequencing plan

4. References

- Andrus, B.M. and Gessford, P.E., James, L. 2007. Understanding the Legal Risks Associated with Design and Construction of Engineered Log Jams, Skellenger Bender.
- Arcement, G.J., Jr. and V.R. Schneider, 1989. Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains. US Geological Survey Water Supply Paper 2339, 38 p.
- Barnes, H.H., Jr., 1967, Roughness characteristics of natural channels: U.S. Geological Survey Water-Supply Paper 1849, 213 p.
- Bureau of Land Management (BLM), Medford District Butte Falls Resource Area, July 2009. Water Quality Restoration Plan, Southern Oregon Coastal Basin, Elk Creek Watershed. Bureau of Land Management, 37 p.
- Cascade Earth Sciences, Et Al., 2006. *Upper Rogue Watershed Assessment*. Prepared by Cascade Earth Sciences, Et Al. for the Upper Rogue Watershed Association.
- Cramer, Michelle L. (managing editor). 2012. Stream Habitat Restoration Guidelines. Co-published by the Washington Departments of Fish and Wildlife, Natural Resources, Transportation and Ecology, Washington State Recreation and Conservation Office, Puget Sound Partnership, and the U.S. Fish and Wildlife Service. Olympia, Washington.
- Inter-Fluve. 2014a. Elk Creek Project Opportunities Assessment. Prepared for Upper Rogue Watershed Association. Hood River, OR.
- Inter-Fluve. 2014b. Elk Creek Project Concepts and Selection. Prepared for Upper Rogue Watershed Association. Hood River, OR.

United States Forest Service (USFS). 1997. Elk Creek Watershed Analysis Summary Report for Handoff. USFS Boise-Cascade District. October 1997.

United States Forest Service (USFS). 2012. *Watershed Restoration Action Plan*. Pacific Northwest Region, Rogue River-Siskiyou National Forest. High Cascades Ranger District, 2012. US Forest Service, 52 p.

US Geological Survey (USGS). 2014. Basin Characteristics Report. Oregon Streamstats. Available from: <http://water.usgs.gov/osw/streamstats/oregon.html>

USACE (U.S. Army Corps of Engineers). 2010. HEC-RAS, River Analysis System. Version 4.1.0.

Appendix A – Opinion of Probable Costs

This appendix includes the Engineer's preliminary (30%) opinion of probable cost. It should be noted that the costs are likely to change with subsequent design efforts.

Elk Creek Engineer's Preliminary Opinion of Probable Cost – RM 5.6 High-flow habitat enhancement

March 2015 - Inter-Fluve, Inc.

Preliminary Design

Volumes are in-place planned quantity based on surveyed existing ground versus design grades. Volume changes from expansion of excavated and compaction of placed materials are not included and shall be incidental for hauling/handling purposes.

Assumes levee materials are suitable for use as placed backwater substrate.

Assumes wood is purchased and stockpiled near construction site by Owner. On site movement and installation in project is by Contractor.

Assumes large wood sizes are 18" DBH x 40' length coniferous species.

Assumes LWM is provided and stockpiled onsite

Assumes revegetation design/materials/installation will be completed by others (erosion control seeding is included).

Includes ballast by burial (3 feet minimum, 30 feet long). Assumes stability at Q50 can be achieved through burial.

Assumes levee excavation can be done with excavator (does not require blasting or jackhammering)

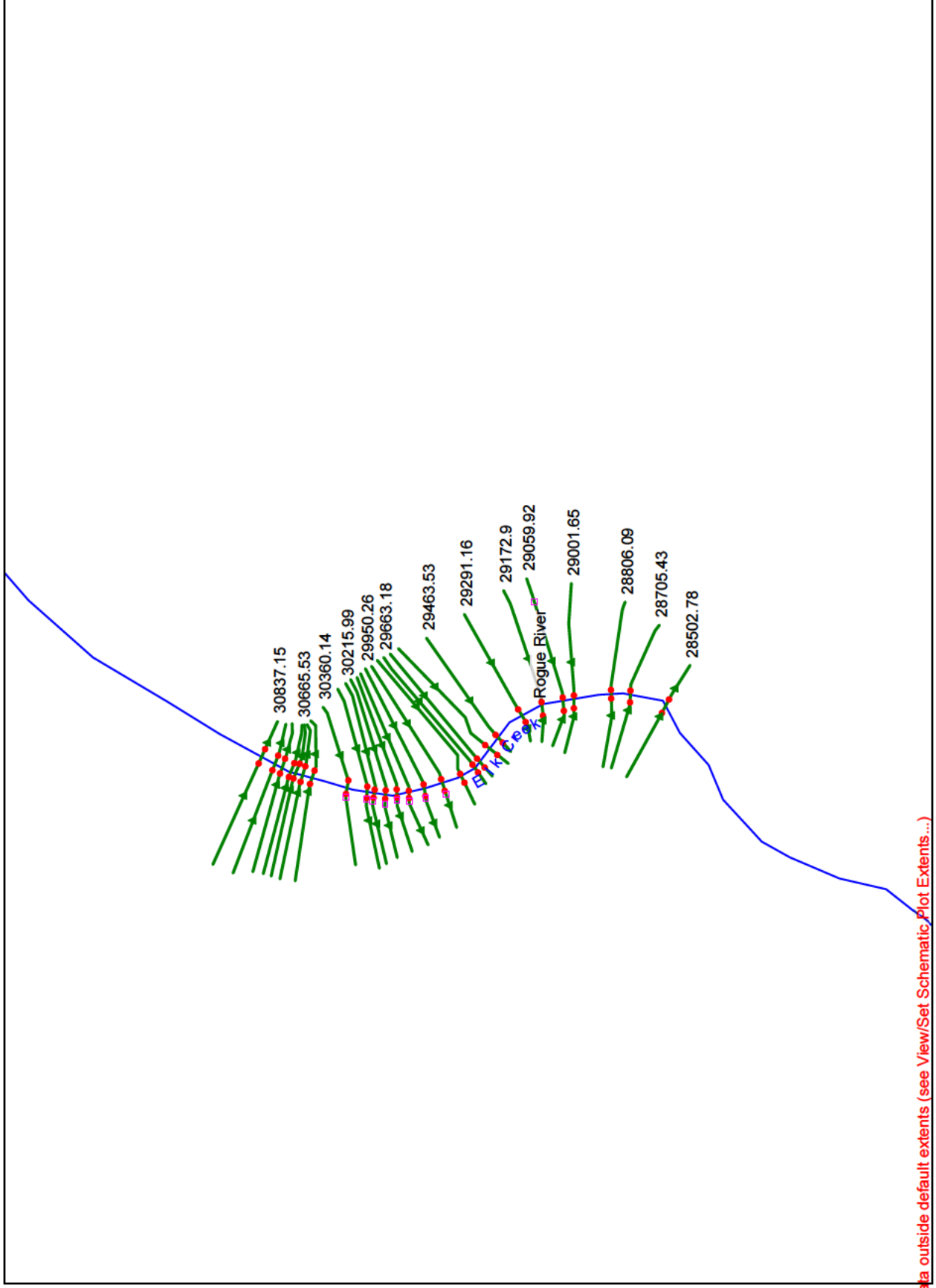
Does not include additional required test pits, permitting services, 30-100% Design, and construction oversight.

Location	Item	Unit	Qty	Unit Cost	Total
Levee Removal + Base Costs					
Excavation quantities based on preliminary grading plan Assumes nearby on-site disposal using high capacity off-road dump trucks Establish access and clear & grub material haul	Establish access	HR	40	\$300	\$12,000
	Excavate levee to grade. Haul and dispose excavated materials within 2 miles.	CY	5,800	\$12	\$69,600
	Dewatering and sediment control	LS	1	\$30,000	\$30,000
	Temporary Crossing	LS	1	\$15,000	\$15,000
	Seed and Mulch	AC	1.5	\$2,000	\$3,000
	Construction costs				
Right Bank Wood Enhancements - reconnected area					
4 large wood units (5 logs each)	Large wood (no root wads) delivered from staging area, installed	EA	5	\$250	\$1,250
	Large wood (root wads) delivered from staging area, installed	EA	15	\$250	\$3,750
	Backfill jams with imported gravel/cobble	CY	20	\$6	\$120
	Construction costs				\$5,120
Left Bank - Floodplain roughness					
16 Large wood units	Large wood (no root wads) delivered from staging area, installed	EA	16	\$250	\$4,000
	Large wood (root wads) delivered from staging area, installed	EA	16	\$250	\$4,000
	Backfill jams with imported gravel/cobble	CY	224	\$6	\$1,344
	Construction costs				\$9,344
Left Bank Backwater Enhancement					
5 large wood units (5 logs each)	Large wood (no root wads) delivered from staging area, installed	EA	12	\$250	\$3,000
	Large wood (root wads) delivered from staging area, installed	EA	13	\$250	\$3,250
	Backfill jams with imported gravel/cobble	CY	2,000	\$6	\$12,000
	Over-excavating of backwater areas (four feet below grade)	CY	2,825	\$12	\$33,900
	Backfill backwaters with gravel/cobble from levee excavation	CY	2,075	\$6	\$12,450
	Construction costs				\$64,600
Mainstem wood enhancements					
5 large wood units (12 logs each)	Large wood (no root wads) delivered from staging area, installed	EA	30	\$250	\$7,500
	Large wood (root wads) delivered from staging area, installed	EA	30	\$250	\$7,500
	Backfill jams with imported gravel/cobble	CY	135	\$6	\$810
	Construction costs				\$15,810
Subtotal construction costs					\$215,130
Mobilization (10% of Project costs)					\$21,513
Estimate of Probable Construction Cost					\$240,000
Estimate of Probable Construction Cost + 30% Contingency					\$312,000

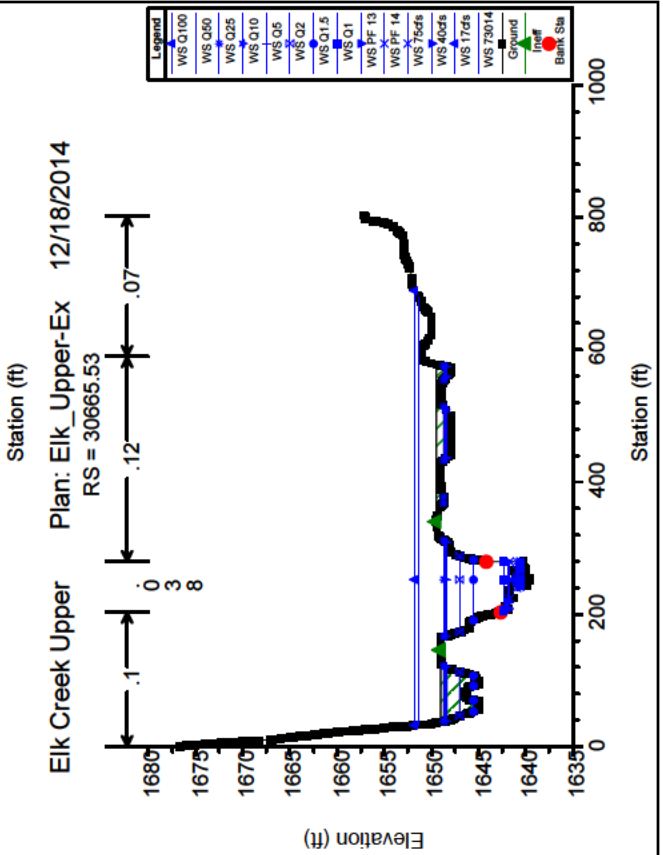
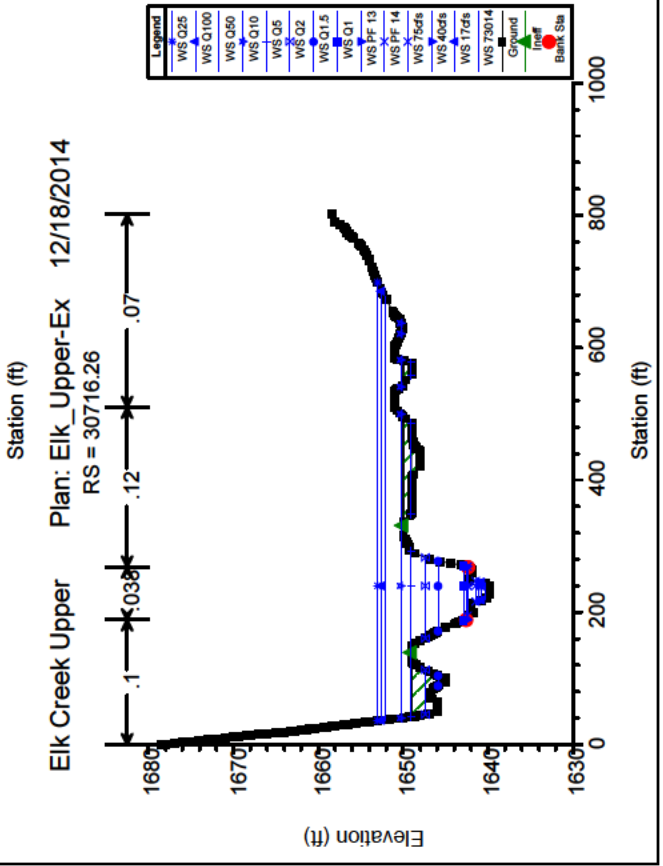
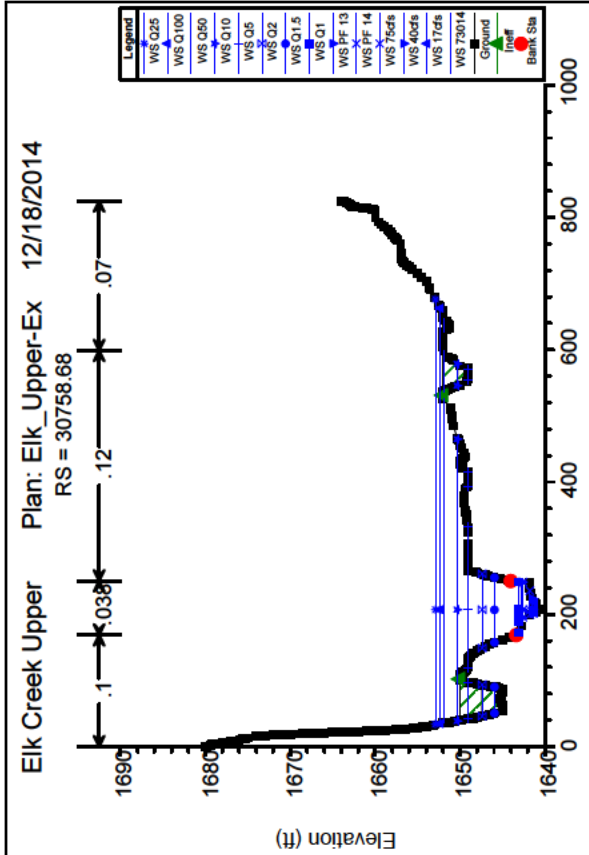
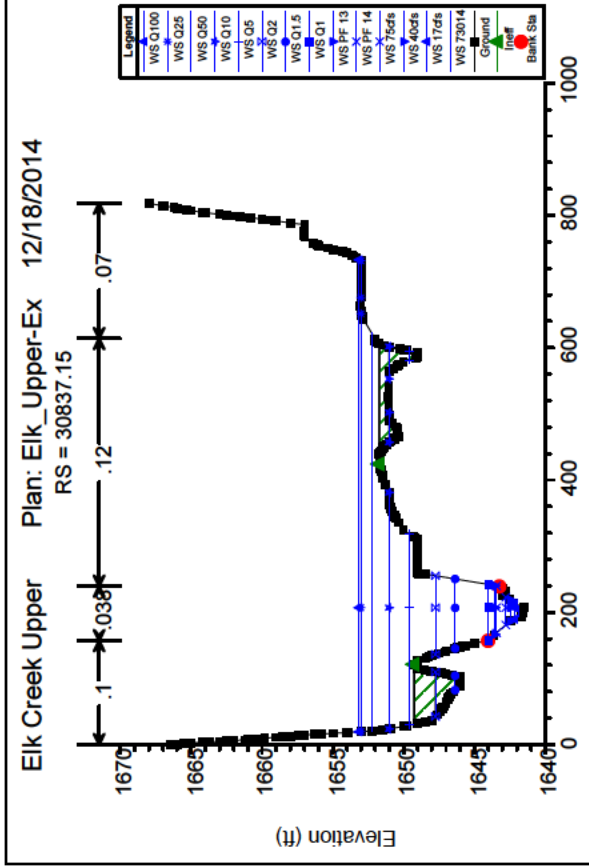
Appendix B – HEC-RAS Results

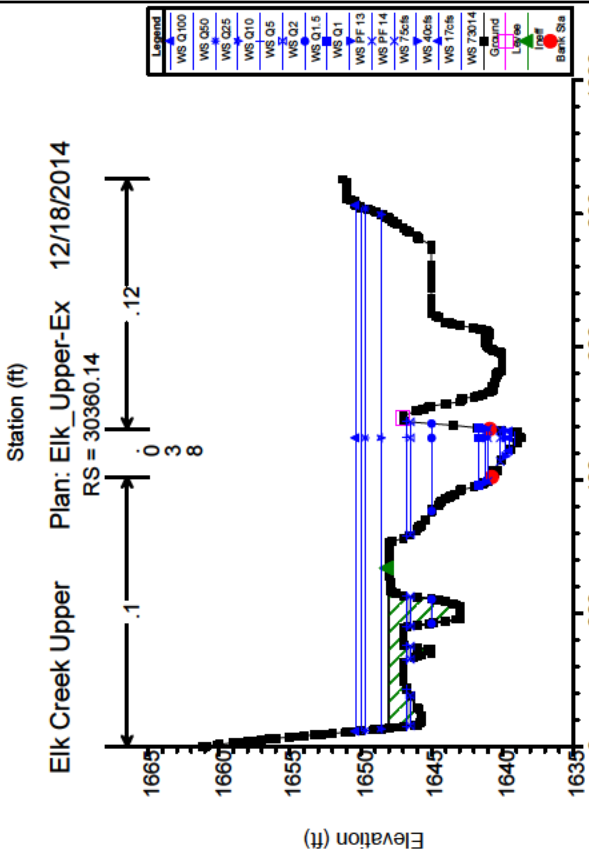
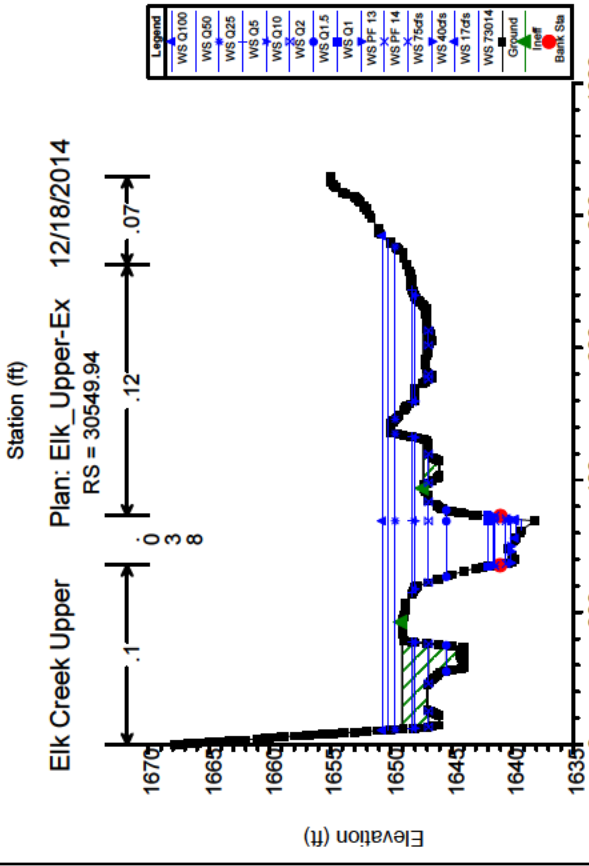
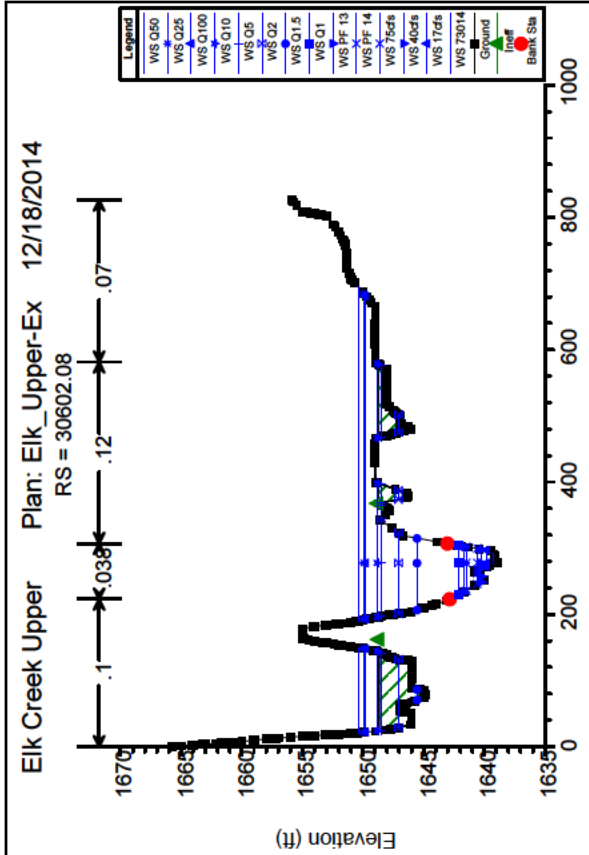
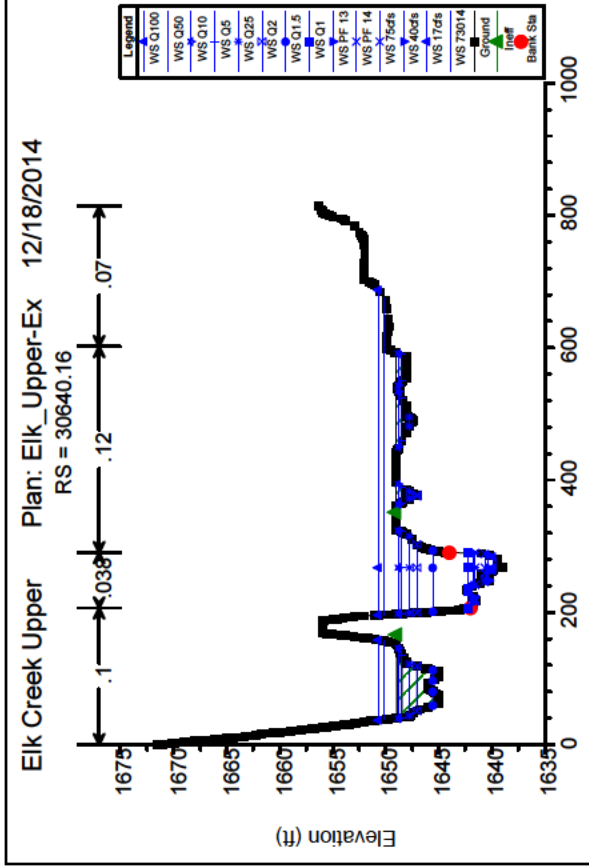
This appendix includes HEC-RAS modeling results for existing and proposed conditions.

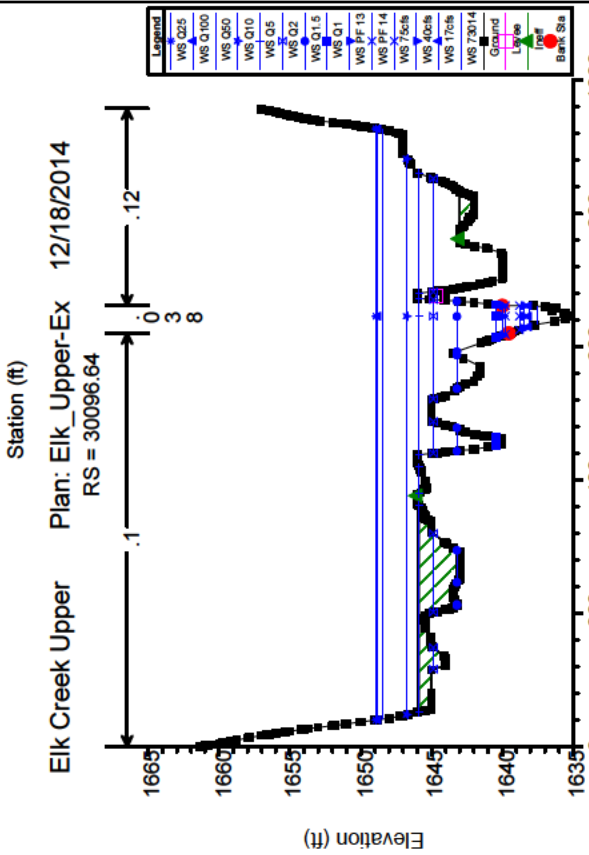
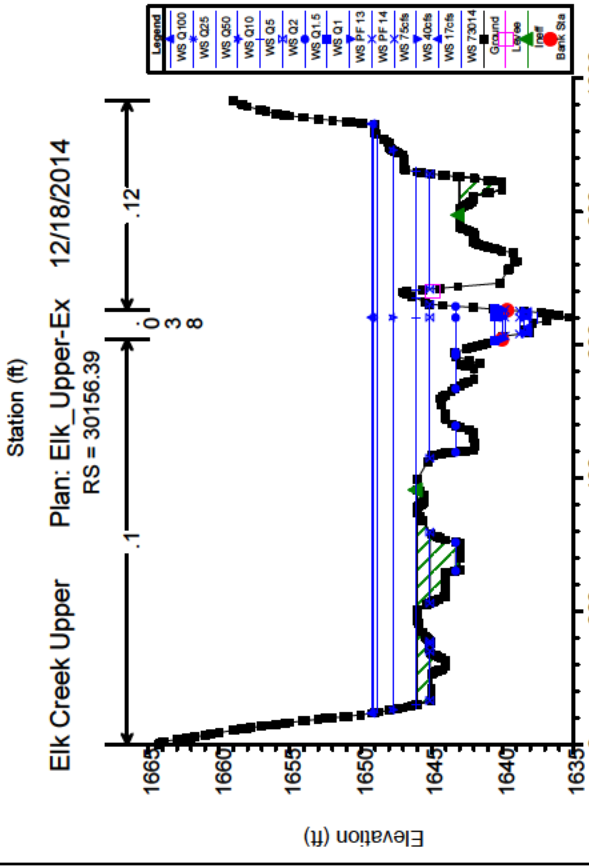
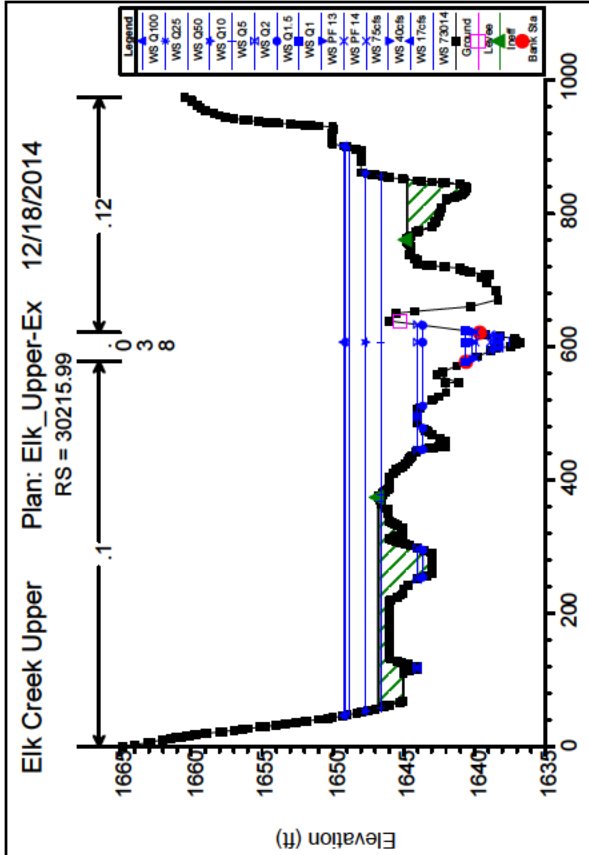
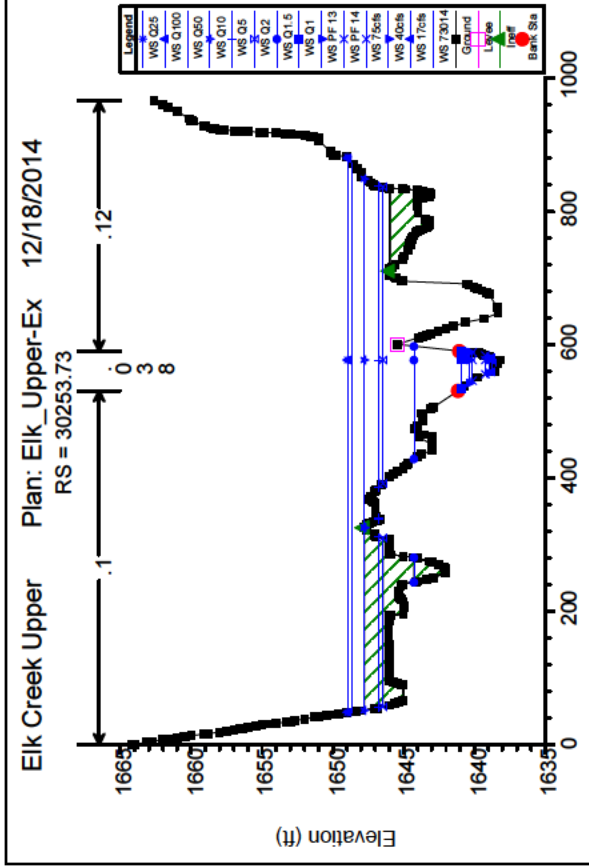
Existing

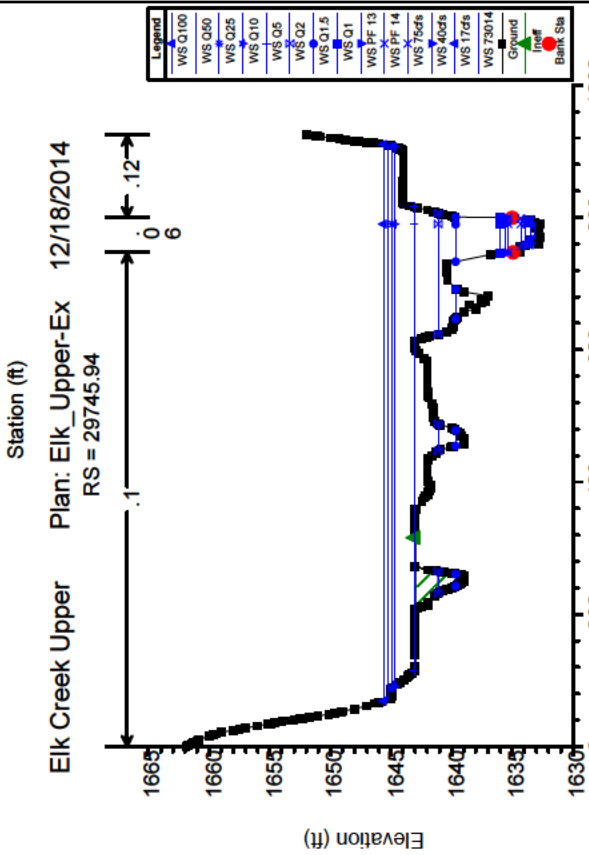
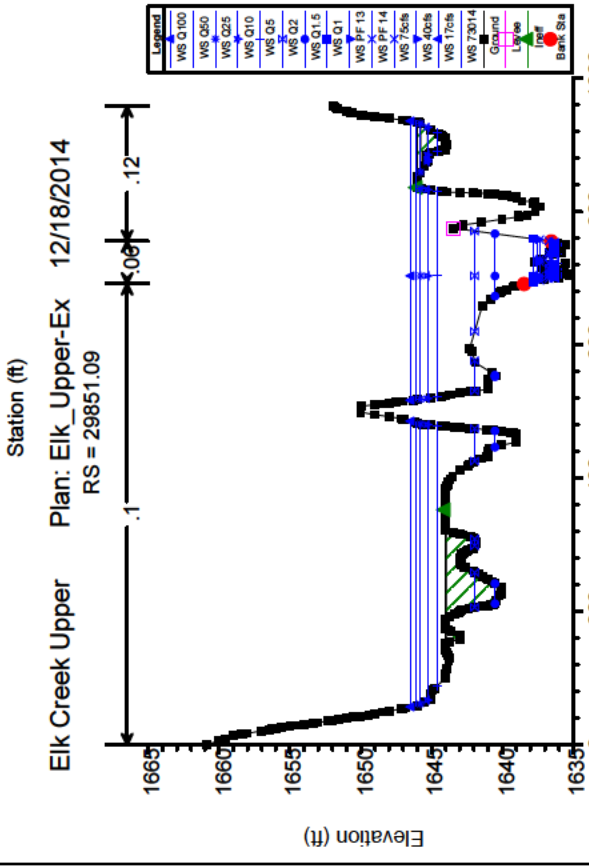
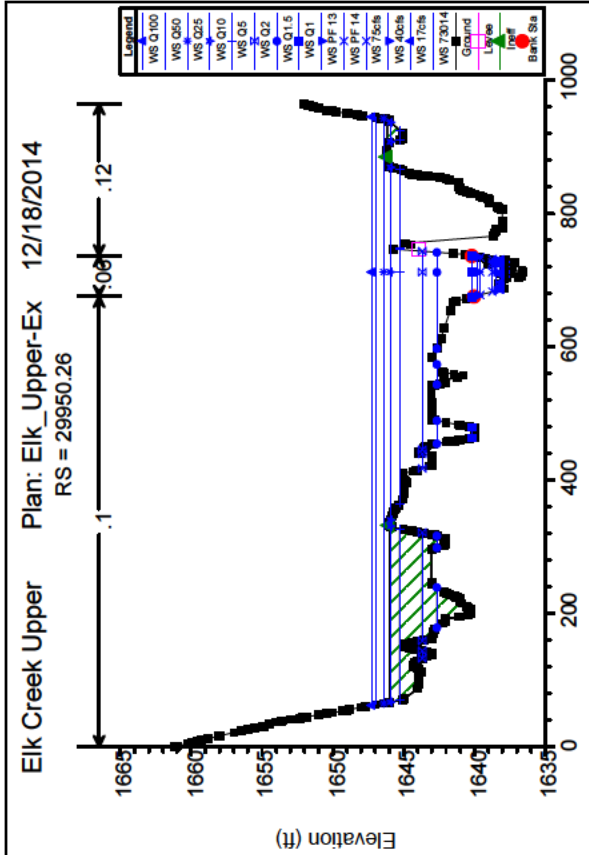
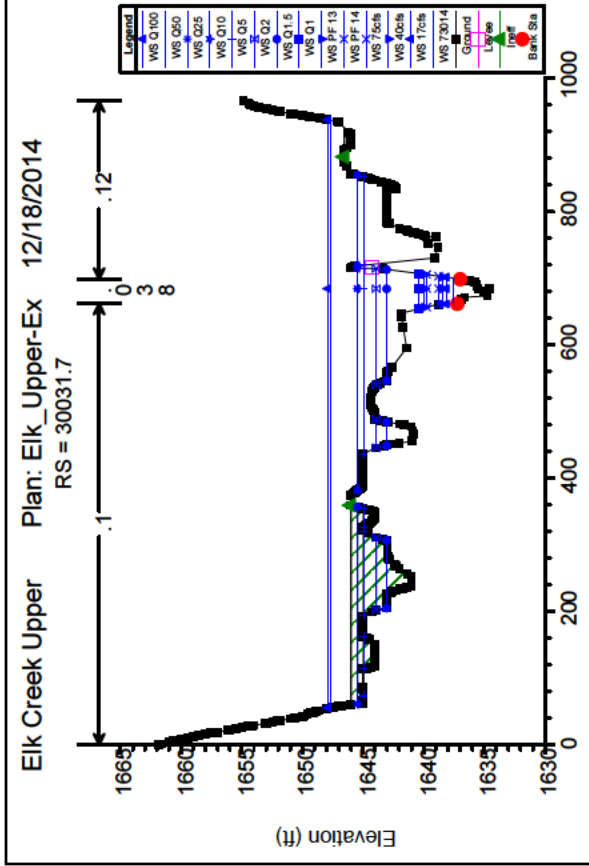


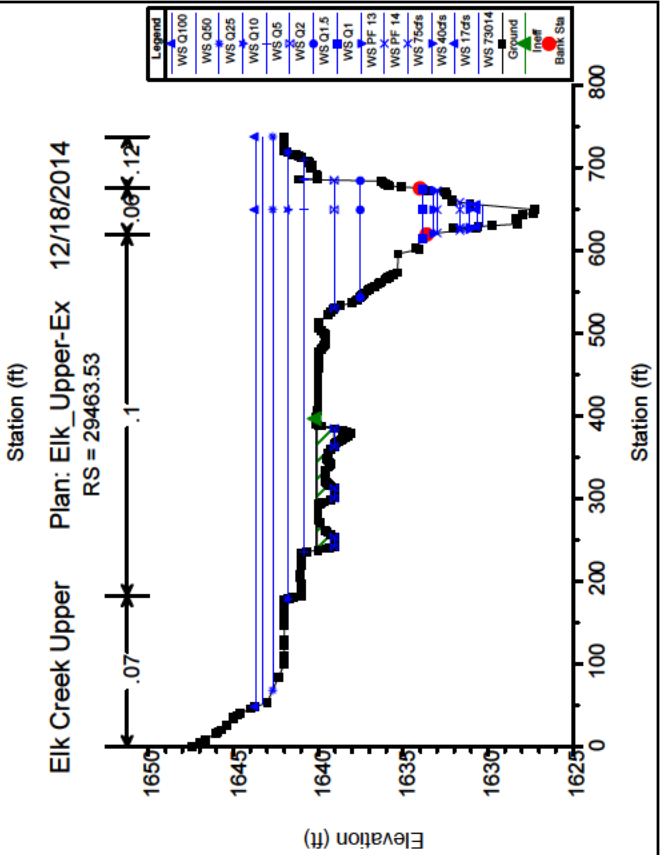
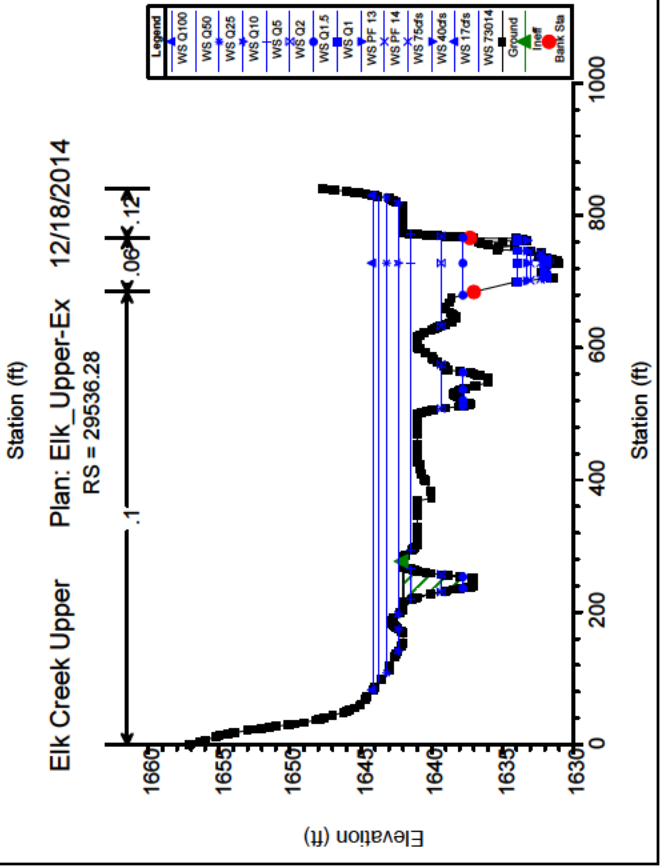
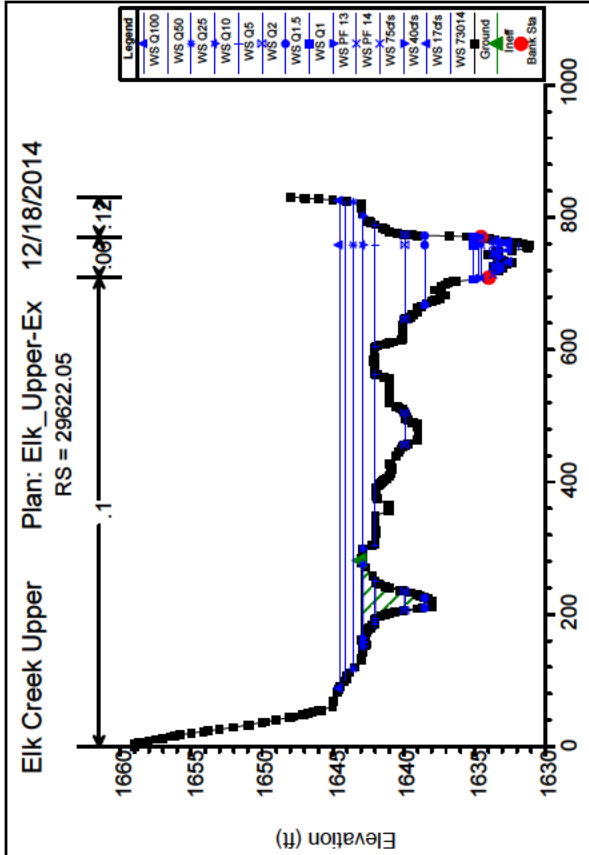
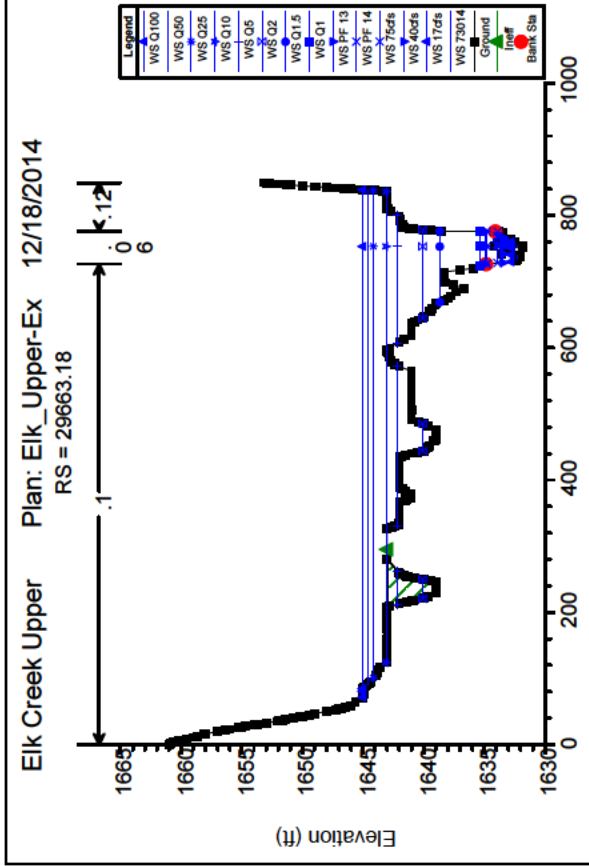
Some schematic data outside default extents (see View/Set Schematic, Plot Extents ...)

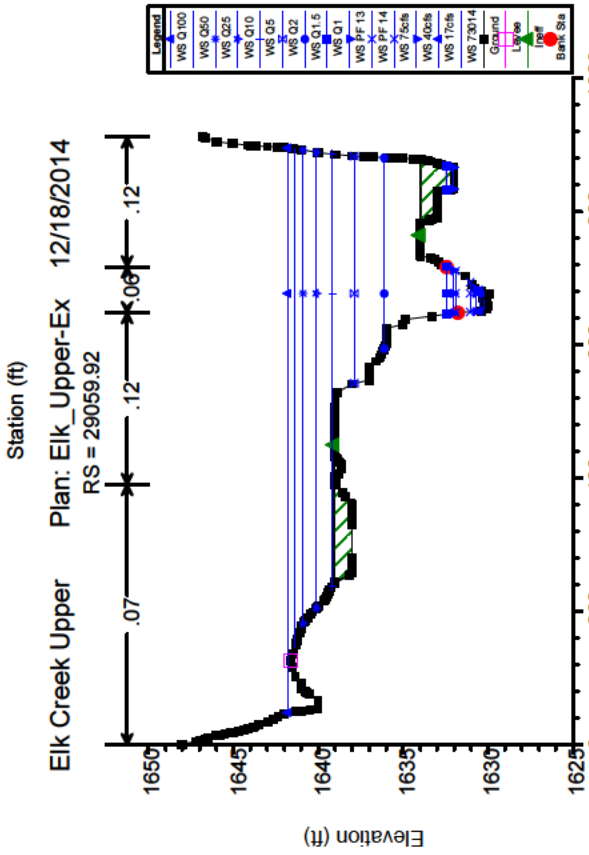
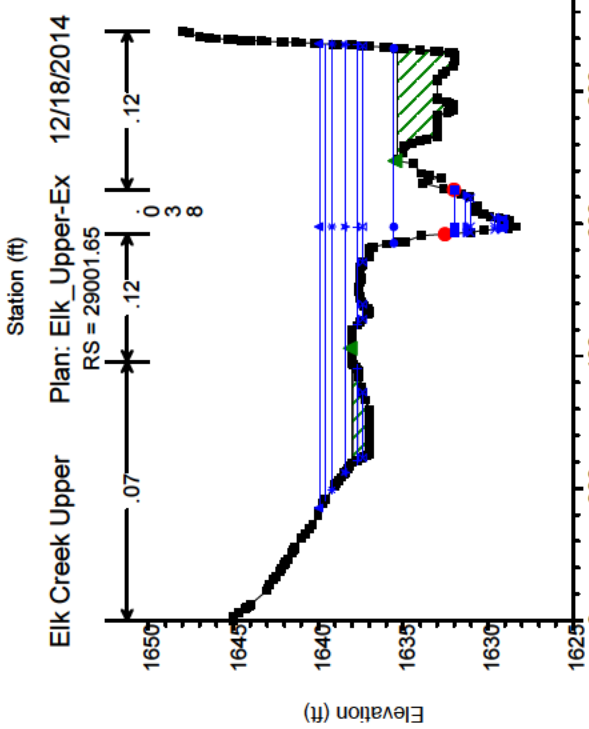
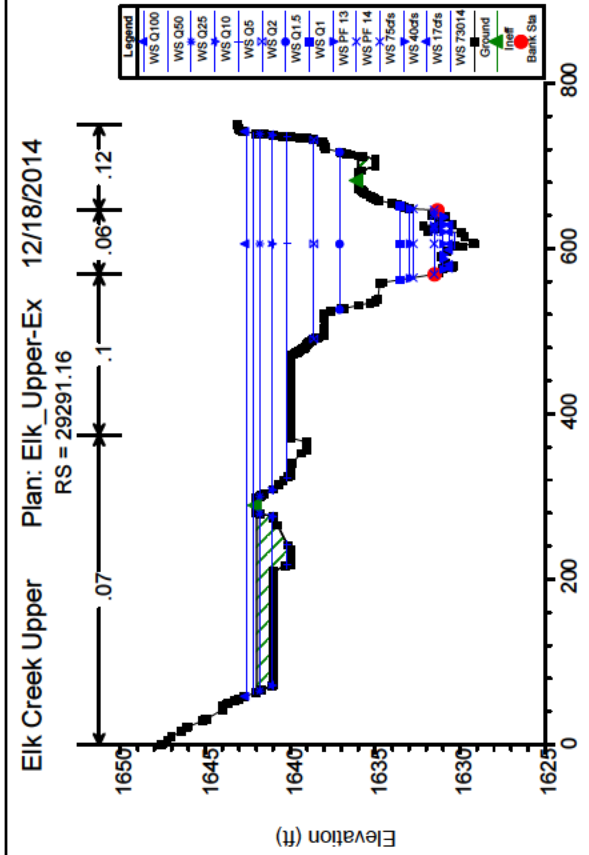
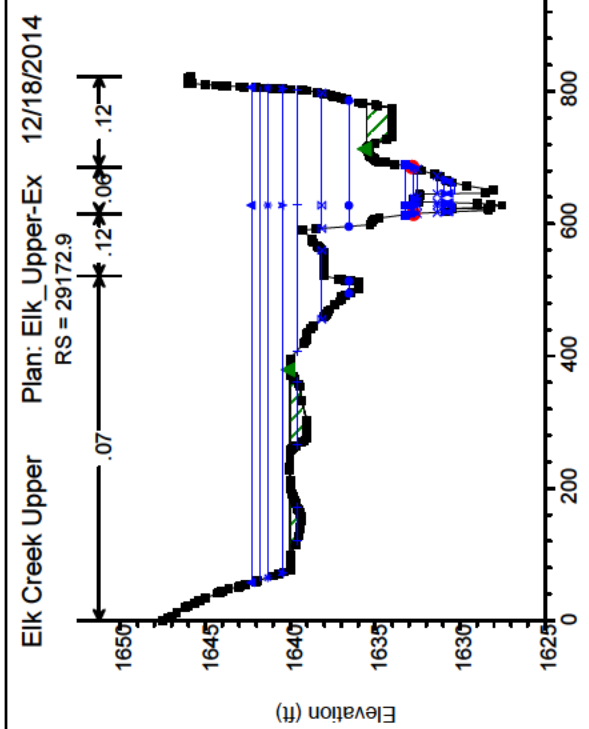












HEC-RAS Plan: Ex River: Elk Creek Reach: Rogue River

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E. G. Elev (ft)	E. G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	30837.15	73014	0.06	4.00	1641.45	1641.83	1641.70	1641.84	0.004511	0.97	4.11	18.22	0.36
Rogue River	30837.15	17dfs	0.14	17.00	1641.45	1642.14	1641.90	1642.18	0.004941	1.60	10.61	23.75	0.42
Rogue River	30837.15	40cfs	0.20	40.00	1641.45	1642.47	1642.13	1642.53	0.005369	2.03	19.68	32.83	0.46
Rogue River	30837.15	75dfs	0.26	75.00	1641.45	1642.77	1642.39	1642.86	0.005660	2.41	31.15	41.95	0.49
Rogue River	30837.15	Q1	0.58	447.00	1641.45	1643.98	1643.50	1644.23	0.006812	3.98	113.29	84.58	0.60
Rogue River	30837.15	Q1.5	1.44	2300.00	1641.45	1646.34	1645.51	1647.17	0.006223	7.39	335.61	126.53	0.68
Rogue River	30837.15	Q2	1.65	3627.00	1641.45	1647.74	1646.53	1648.79	0.005172	8.35	493.16	186.09	0.65
Rogue River	30837.15	Q5	2.51	6456.00	1641.45	1649.58	1648.37	1651.34	0.005791	10.84	796.03	302.73	0.72
Rogue River	30837.15	Q10	2.36	8309.00	1641.45	1651.02	1648.89	1652.67	0.004504	10.83	1241.85	451.43	0.66
Rogue River	30837.15	Q25	1.80	10514.00	1641.45	1653.01	1651.10	1654.21	0.002789	9.82	2291.28	687.65	0.54
Rogue River	30837.15	Q50	3.18	12020.00	1641.45	1652.25	1652.19	1654.44	0.005306	12.87	1823.44	601.41	0.73
Rogue River	30837.15	Q100	2.81	13416.00	1641.45	1653.13	1652.63	1654.99	0.004287	12.27	2376.60	713.56	0.67
Rogue River	30837.15	PF 13	0.56	300.00	1641.45	1643.56	1643.24	1643.78	0.008291	3.77	79.80	74.13	0.64
Rogue River	30837.15	PF 14	0.53	250.00	1641.45	1643.42	1643.12	1643.62	0.008540	3.58	69.81	71.15	0.63
Rogue River	30758.68	73014	0.40	4.00	1640.64	1640.95	1640.95	1641.03	0.041315	2.28	1.75	11.36	1.02
Rogue River	30758.68	17dfs	0.64	17.00	1640.64	1641.19	1641.19	1641.36	0.031722	3.29	5.17	15.88	1.02
Rogue River	30758.68	40cfs	0.78	40.00	1640.64	1641.47	1641.47	1641.70	0.027472	3.84	10.41	22.67	1.00
Rogue River	30758.68	75dfs	0.83	75.00	1640.64	1641.77	1641.77	1642.02	0.025613	4.03	18.59	35.76	0.99
Rogue River	30758.68	Q1	1.05	447.00	1640.64	1643.04	1643.04	1643.46	0.014350	5.19	86.11	73.11	0.84
Rogue River	30758.68	Q1.5	1.32	2300.00	1640.64	1645.92	1645.92	1646.70	0.005472	7.12	339.06	137.52	0.63
Rogue River	30758.68	Q2	1.52	3627.00	1640.64	1647.41	1647.41	1648.39	0.004552	8.05	494.76	160.08	0.61
Rogue River	30758.68	Q5	2.55	6456.00	1640.64	1649.06	1647.80	1650.87	0.005870	10.93	701.73	307.31	0.73
Rogue River	30758.68	Q10	2.72	8309.00	1640.64	1650.28	1648.76	1652.25	0.005333	11.59	1099.85	458.97	0.71
Rogue River	30758.68	Q25	1.63	10514.00	1640.64	1652.89	1652.89	1653.97	0.002427	9.38	2458.93	642.47	0.70
Rogue River	30758.68	Q50	3.00	12020.00	1640.64	1651.93	1651.46	1654.01	0.004896	12.53	1866.04	571.31	0.50
Rogue River	30758.68	Q100	3.33	13416.00	1640.64	1652.29	1652.29	1654.59	0.005247	13.29	2083.92	627.55	0.73
Rogue River	30758.68	PF 13	0.81	300.00	1640.64	1642.70	1642.70	1643.03	0.010846	4.59	65.37	54.10	0.74
Rogue River	30758.68	PF 14	0.75	250.00	1640.64	1642.56	1642.56	1642.85	0.011173	4.34	57.63	53.11	0.73
Rogue River	30716.26	73014	0.01	4.00	1639.79	1640.32	1639.96	1640.32	0.000365	0.41	9.80	24.16	0.11
Rogue River	30716.26	17dfs	0.03	17.00	1639.79	1640.73	1640.14	1640.74	0.000663	0.83	20.42	26.94	0.17
Rogue River	30716.26	40cfs	0.07	40.00	1639.79	1641.08	1640.35	1641.11	0.001112	1.33	30.13	29.01	0.23
Rogue River	30716.26	75dfs	0.12	75.00	1639.79	1641.45	1640.58	1641.50	0.001512	1.82	41.28	31.16	0.28
Rogue River	30716.26	Q1	0.42	447.00	1639.79	1642.90	1642.90	1643.09	0.004279	3.48	129.26	83.26	0.48
Rogue River	30716.26	Q1.5	0.93	2300.00	1639.79	1645.88	1645.88	1646.46	0.003280	6.14	408.94	121.17	0.51
Rogue River	30716.26	Q2	1.16	3627.00	1639.79	1647.40	1647.40	1648.17	0.003077	7.19	580.09	189.49	0.51
Rogue River	30716.26	Q5	2.11	6456.00	1639.79	1649.04	1647.10	1650.57	0.004399	10.08	806.28	405.34	0.64
Rogue River	30716.26	Q10	2.28	8309.00	1639.79	1650.29	1648.22	1651.96	0.004095	10.75	1203.86	516.85	0.63
Rogue River	30716.26	Q25	1.25	10514.00	1639.79	1653.00	1648.61	1653.80	0.001729	8.32	2859.34	662.45	0.43
Rogue River	30716.26	Q50	2.27	12020.00	1639.79	1652.14	1651.35	1653.67	0.003388	11.07	2301.10	639.05	0.59
Rogue River	30716.26	Q100	2.45	13416.00	1639.79	1652.51	1651.82	1654.13	0.003529	11.56	2540.27	648.52	0.61

HEC-RAS Plan: Ex River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	30716.26	PF 13	0.33	300.00	1639.79	1642.57		1642.70	0.004181	2.95	101.94	81.25	0.46
Rogue River	30716.26	PF 14	0.29	250.00	1639.79	1642.42		1642.54	0.003850	2.76	90.48	74.33	0.44
Rogue River	30665.53	73014	0.53	4.00	1639.59	1640.12	1640.12	1640.25	0.036879	2.81	1.42	5.85	1.00
Rogue River	30665.53	17dfs	0.63	17.00	1639.59	1640.47	1640.47	1640.62	0.035542	3.19	5.34	17.79	1.02
Rogue River	30665.53	40cfs	0.76	40.00	1639.59	1640.72	1640.72	1640.93	0.028296	3.73	10.71	23.50	0.97
Rogue River	30665.53	75cfs	1.01	75.00	1639.59	1640.95	1640.95	1641.27	0.027682	4.56	16.46	26.02	1.01
Rogue River	30665.53	Q1	0.89	447.00	1639.59	1642.37		1642.73	0.011866	4.80	93.17	74.03	0.75
Rogue River	30665.53	Q1.5	1.20	2300.00	1639.59	1645.53		1646.25	0.004737	6.83	349.74	123.41	0.58
Rogue River	30665.53	Q2	1.46	3627.00	1639.59	1647.01		1647.97	0.004321	7.93	505.13	181.98	0.58
Rogue River	30665.53	Q5	2.77	6456.00	1639.59	1648.35	1647.28	1650.26	0.006661	11.30	671.45	304.89	0.74
Rogue River	30665.53	Q10	4.35	8309.00	1639.59	1648.50	1648.49	1651.52	0.010250	14.21	692.66	316.78	0.92
Rogue River	30665.53	Q25	6.50	10514.00	1639.59	1648.69	1648.69	1653.23	0.014921	17.45	721.19	343.13	1.12
Rogue River	30665.53	Q50	3.10	12020.00	1639.59	1651.34	1651.34	1653.41	0.005265	12.67	1992.68	646.38	0.70
Rogue River	30665.53	Q100	3.23	13416.00	1639.59	1651.76	1651.76	1653.86	0.005270	13.03	2266.83	656.93	0.71
Rogue River	30665.53	PF 13	1.03	300.00	1639.59	1641.91	1641.82	1642.29	0.018025	4.96	60.50	62.53	0.89
Rogue River	30665.53	PF 14	1.15	250.00	1639.59	1641.71	1641.69	1642.12	0.022553	5.14	48.67	56.32	0.97
Rogue River	30640.16	73014	0.05	4.00	1638.98	1639.65	1639.50	1639.67	0.003230	0.89	4.51	17.77	0.31
Rogue River	30640.16	17dfs	0.16	17.00	1638.98	1639.93	1639.71	1639.97	0.005520	1.74	9.79	21.02	0.45
Rogue River	30640.16	40cfs	0.19	40.00	1638.98	1640.35	1639.94	1640.41	0.004146	2.03	19.73	27.04	0.42
Rogue River	30640.16	75cfs	0.27	75.00	1638.98	1640.69	1640.21	1640.78	0.004778	2.50	29.98	33.25	0.46
Rogue River	30640.16	Q1	0.60	447.00	1638.98	1642.22		1642.47	0.006939	4.06	110.25	78.05	0.60
Rogue River	30640.16	Q1.5	0.85	2300.00	1638.98	1645.56		1646.10	0.003057	5.87	402.61	129.60	0.48
Rogue River	30640.16	Q2	1.09	3627.00	1638.98	1647.07		1647.82	0.002956	6.97	549.01	174.13	0.49
Rogue River	30640.16	Q5	2.12	6456.00	1638.98	1648.47		1650.01	0.004662	10.03	710.25	348.93	0.64
Rogue River	30640.16	Q10	3.19	8309.00	1638.98	1648.77	1647.67	1651.11	0.006745	12.38	748.03	394.06	0.78
Rogue River	30640.16	Q25	7.08	10514.00	1638.98	1647.78	1648.75	1652.77	0.017142	18.04	627.45	218.99	1.21
Rogue River	30640.16	Q50	4.13	12020.00	1638.98	1650.13	1650.81	1653.16	0.007461	14.48	1375.13	597.92	0.84
Rogue River	30640.16	Q100	4.10	13416.00	1638.98	1650.69	1651.30	1653.62	0.006971	14.56	1715.39	613.11	0.82
Rogue River	30640.16	PF 13	0.55	300.00	1638.98	1641.75		1641.98	0.006725	3.86	77.74	57.60	0.59
Rogue River	30640.16	PF 14	0.51	250.00	1638.98	1641.57		1641.78	0.006299	3.67	68.09	51.80	0.56
Rogue River	30602.08	73014	0.35	4.00	1638.91	1639.28	1639.28	1639.35	0.047317	2.06	1.94	16.28	1.05
Rogue River	30602.08	17dfs	0.09	17.00	1638.91	1639.80	1639.80	1639.82	0.002671	1.31	12.97	24.68	0.32
Rogue River	30602.08	40cfs	0.11	40.00	1638.91	1640.24	1640.24	1640.28	0.002500	1.53	26.13	37.42	0.32
Rogue River	30602.08	75cfs	0.15	75.00	1638.91	1640.58	1640.58	1640.63	0.002878	1.85	40.55	48.59	0.36
Rogue River	30602.08	Q1	0.34	447.00	1638.91	1642.12		1642.28	0.002957	3.20	139.68	74.92	0.41
Rogue River	30602.08	Q1.5	0.69	2300.00	1638.91	1645.52		1645.97	0.002238	5.39	454.93	124.53	0.42
Rogue River	30602.08	Q2	0.91	3627.00	1638.91	1647.06		1647.68	0.002236	6.43	629.89	266.52	0.44
Rogue River	30602.08	Q5	1.76	6456.00	1638.91	1648.49	1646.21	1649.78	0.003560	9.26	827.79	417.41	0.58
Rogue River	30602.08	Q10	2.66	8309.00	1638.91	1648.81	1647.23	1650.77	0.005182	11.46	904.36	435.13	0.70

HEC-RAS Plan: Ex River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E. G. Elev (ft)	E. G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	30602.08	Q25	2.77	10514.00	1638.91	1649.93	1648.36	1651.93	0.004765	11.96	1549.91	619.09	0.69
Rogue River	30602.08	Q50	2.98	12020.00	1638.91	1650.41	1650.34	1652.51	0.004875	12.50	1849.28	634.52	0.70
Rogue River	30602.08	Q100	4.82	13416.00	1638.91	1649.77	1650.78	1653.28	0.008427	15.72	1451.52	614.30	0.91
Rogue River	30602.08	PF 13	0.28	300.00	1638.91	1641.66		1641.79	0.002970	2.82	106.54	69.52	0.40
Rogue River	30602.08	PF 14	0.25	250.00	1638.91	1641.49		1641.60	0.002915	2.64	94.58	66.90	0.39
Rogue River	30549.94	73014	0.01	4.00	1638.16	1639.25	1638.61	1639.25	0.000315	0.46	8.77	16.14	0.11
Rogue River	30549.94	17dfs	0.03	17.00	1638.16	1639.74		1639.75	0.000835	0.86	19.70	29.02	0.18
Rogue River	30549.94	40dfs	0.05	40.00	1638.16	1640.17		1640.18	0.001257	1.04	38.63	59.21	0.23
Rogue River	30549.94	75dfs	0.06	75.00	1638.16	1640.51		1640.53	0.001173	1.23	61.12	68.89	0.23
Rogue River	30549.94	Q1	0.20	447.00	1638.16	1642.06		1642.16	0.001400	2.56	175.88	77.18	0.29
Rogue River	30549.94	Q1.5	0.65	2300.00	1638.16	1645.43		1645.86	0.001858	5.34	467.17	139.71	0.39
Rogue River	30549.94	Q2	0.92	3627.00	1638.16	1646.91		1647.57	0.002085	6.60	632.59	279.71	0.43
Rogue River	30549.94	Q5	1.84	6456.00	1638.16	1648.25	1645.88	1649.59	0.003507	9.58	1026.41	537.64	0.58
Rogue River	30549.94	Q10	3.29	8309.00	1638.16	1648.04	1646.89	1650.43	0.006417	12.75	943.34	518.64	0.78
Rogue River	30549.94	Q25	2.87	10514.00	1638.16	1649.66	1649.66	1651.68	0.004683	12.27	1221.81	707.65	0.69
Rogue River	30549.94	Q50	2.92	12020.00	1638.16	1650.25	1650.25	1652.23	0.004501	12.50	2250.58	741.19	0.68
Rogue River	30549.94	Q100	3.04	13416.00	1638.16	1650.67	1650.63	1652.67	0.004501	12.83	2561.45	747.64	0.68
Rogue River	30549.94	PF 13	0.15	300.00	1638.16	1641.60		1641.67	0.001302	2.14	140.81	75.90	0.27
Rogue River	30549.94	PF 14	0.13	250.00	1638.16	1641.43		1641.49	0.001250	1.96	127.59	75.42	0.26
Rogue River	30360.14	73014	0.03	4.00	1638.66	1639.12	1638.92	1639.13	0.001950	0.72	5.56	20.62	0.24
Rogue River	30360.14	17dfs	0.07	17.00	1638.66	1639.48	1639.13	1639.50	0.002343	1.17	14.54	29.81	0.30
Rogue River	30360.14	40dfs	0.11	40.00	1638.66	1639.81	1639.34	1639.85	0.002634	1.54	25.98	38.43	0.33
Rogue River	30360.14	75dfs	0.15	75.00	1638.66	1640.15	1639.58	1640.20	0.002835	1.86	40.28	47.33	0.36
Rogue River	30360.14	Q1	0.32	447.00	1638.66	1641.65	1640.75	1641.80	0.002663	3.15	148.33	85.70	0.40
Rogue River	30360.14	Q1.5	0.77	2300.00	1638.66	1644.98	1642.84	1645.47	0.002343	5.73	495.36	167.61	0.44
Rogue River	30360.14	Q2	1.00	3627.00	1638.66	1646.49	1643.95	1647.15	0.002383	6.82	724.71	278.92	0.46
Rogue River	30360.14	Q5	2.91	6456.00	1638.66	1646.71	1646.00	1648.65	0.006671	11.67	763.87	296.11	0.78
Rogue River	30360.14	Q10	1.30	8309.00	1638.66	1648.57	1646.99	1649.21	0.002359	8.11	2735.44	771.83	0.48
Rogue River	30360.14	Q25	1.27	10514.00	1638.66	1649.68	1646.99	1650.28	0.002046	8.17	3605.09	782.84	0.46
Rogue River	30360.14	Q50	1.46	12020.00	1638.66	1649.99	1646.99	1650.67	0.002282	8.81	3849.06	784.66	0.48
Rogue River	30360.14	Q100	1.60	13416.00	1638.66	1650.33	1647.70	1651.06	0.002421	9.27	4112.52	789.32	0.50
Rogue River	30360.14	PF 13	0.27	300.00	1638.66	1641.20	1640.42	1641.31	0.002897	2.76	110.79	80.72	0.40
Rogue River	30360.14	PF 14	0.25	250.00	1638.66	1641.03	1640.27	1641.13	0.002978	2.59	97.51	78.77	0.39
Rogue River	30253.73	73014	0.41	4.00	1638.17	1638.48	1638.48	1638.57	0.037343	2.36	1.69	9.67	0.99
Rogue River	30253.73	17dfs	0.54	17.00	1638.17	1638.74	1638.74	1638.87	0.031192	2.92	5.81	21.02	0.98
Rogue River	30253.73	40dfs	0.79	40.00	1638.17	1638.95	1638.95	1639.17	0.028836	3.82	10.47	23.86	1.02
Rogue River	30253.73	75dfs	0.94	75.00	1638.17	1639.20	1639.20	1639.50	0.024911	4.41	17.02	28.06	1.00
Rogue River	30253.73	Q1	0.93	447.00	1638.17	1640.88	1640.51	1641.29	0.009571	5.12	87.28	55.84	0.72
Rogue River	30253.73	Q1.5	1.38	2300.00	1638.17	1644.26	1643.07	1645.09	0.004618	7.54	408.54	206.15	0.61

HEC-RAS Plan: Ex River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	30253.73	Q2	0.77	3627.00	1638.17	1646.46	1644.54	1646.85	0.001774	6.01	1453.51	698.43	0.40
Rogue River	30253.73	Q5	2.11	6456.00	1638.17	1646.74	1645.43	1647.80	0.004660	9.99	1579.12	708.67	0.65
Rogue River	30253.73	Q10	2.19	8309.00	1638.17	1647.77	1645.43	1648.84	0.004243	10.41	2089.04	796.01	0.64
Rogue River	30253.73	Q25	2.12	10514.00	1638.17	1648.97	1646.98	1649.96	0.003599	10.49	3062.02	833.00	0.60
Rogue River	30253.73	Q50	3.35	12020.00	1638.17	1648.59	1648.56	1650.21	0.005910	13.08	2754.19	822.78	0.76
Rogue River	30253.73	Q100	3.59	13416.00	1638.17	1648.89	1648.88	1650.58	0.006128	13.61	3000.37	830.96	0.78
Rogue River	30253.73	PF 13	0.95	300.00	1638.17	1640.35	1640.12	1640.74	0.011898	5.01	59.87	46.65	0.78
Rogue River	30253.73	PF 14	0.99	250.00	1638.17	1640.12	1639.95	1640.51	0.013836	5.05	49.47	42.65	0.83
Rogue River	30215.99	73014	0.02	4.00	1636.72	1637.56	1637.15	1637.56	0.000700	0.62	6.46	13.80	0.16
Rogue River	30215.99	17cfs	0.05	17.00	1636.72	1638.15	1637.44	1638.17	0.000892	1.08	15.67	17.16	0.20
Rogue River	30215.99	40cfs	0.13	40.00	1636.72	1638.50	1637.73	1638.55	0.001852	1.82	21.99	19.08	0.30
Rogue River	30215.99	75cfs	0.25	75.00	1636.72	1638.85	1638.07	1638.95	0.003294	2.53	29.59	24.09	0.40
Rogue River	30215.99	Q1	0.74	447.00	1636.72	1640.64	1639.89	1641.00	0.005676	4.81	94.21	47.28	0.58
Rogue River	30215.99	Q1.5	2.07	2300.00	1636.72	1643.62	1643.15	1644.84	0.006617	9.32	374.49	193.81	0.73
Rogue River	30215.99	Q2	4.19	3627.00	1636.72	1644.01	1643.97	1646.50	0.012441	13.42	437.13	235.44	1.01
Rogue River	30215.99	Q5	2.23	6456.00	1636.72	1646.61	1645.77	1647.61	0.004487	10.44	1771.27	789.08	0.65
Rogue River	30215.99	Q10	2.26	8309.00	1636.72	1647.70	1646.62	1648.65	0.004005	10.73	2597.52	806.94	0.62
Rogue River	30215.99	Q25	1.76	10514.00	1636.72	1649.09	1647.82	1649.74	0.002713	9.70	3759.77	853.86	0.53
Rogue River	30215.99	Q50	2.58	12020.00	1636.72	1648.86	1648.25	1649.83	0.004071	11.71	3564.37	851.70	0.64
Rogue River	30215.99	Q100	2.75	13416.00	1636.72	1649.17	1648.49	1650.18	0.004205	12.14	3831.62	854.58	0.66
Rogue River	30215.99	PF 13	0.59	300.00	1636.72	1640.14	1639.40	1640.41	0.005391	4.20	71.88	41.23	0.55
Rogue River	30215.99	PF 14	0.55	250.00	1636.72	1639.91	1639.17	1640.16	0.005421	3.99	62.73	38.47	0.55
Rogue River	30156.39	73014	0.00	4.00	1635.25	1637.55	1635.94	1637.55	0.000044	0.25	15.94	15.74	0.04
Rogue River	30156.39	17cfs	0.02	17.00	1635.25	1638.13	1636.48	1638.14	0.000250	0.64	26.65	24.31	0.11
Rogue River	30156.39	40cfs	0.05	40.00	1635.25	1638.46	1637.03	1638.48	0.000738	1.10	36.34	33.14	0.19
Rogue River	30156.39	75cfs	0.09	75.00	1635.25	1638.79	1637.42	1638.83	0.001125	1.58	47.55	34.60	0.24
Rogue River	30156.39	Q1	0.46	447.00	1635.25	1640.49	1639.16	1640.73	0.002937	3.91	115.59	47.96	0.43
Rogue River	30156.39	Q1.5	1.94	2300.00	1635.25	1643.27	1642.59	1644.46	0.006032	9.07	363.86	201.33	0.69
Rogue River	30156.39	Q2	1.13	3627.00	1635.25	1645.10	1643.89	1645.63	0.002619	7.27	1307.66	589.26	0.48
Rogue River	30156.39	Q5	2.56	6456.00	1635.25	1646.08	1645.12	1647.30	0.005221	11.16	1746.00	788.45	0.69
Rogue River	30156.39	Q10	1.61	8309.00	1635.25	1647.73	1646.62	1648.37	0.002735	9.13	3095.09	839.42	0.51
Rogue River	30156.39	Q25	1.35	10514.00	1635.25	1649.08	1647.30	1649.55	0.002015	8.54	4249.42	883.74	0.45
Rogue River	30156.39	Q50	1.91	12020.00	1635.25	1648.87	1647.60	1649.55	0.002909	10.13	4067.41	866.50	0.54
Rogue River	30156.39	Q100	2.12	13416.00	1635.25	1649.15	1647.84	1649.90	0.003148	10.72	4315.35	884.11	0.56
Rogue River	30156.39	PF 13	0.34	300.00	1635.25	1640.00	1638.73	1640.16	0.002606	3.23	92.89	43.68	0.39
Rogue River	30156.39	PF 14	0.28	250.00	1635.25	1639.80	1638.57	1639.93	0.002146	2.95	84.69	39.07	0.35
Rogue River	30096.64	73014	0.00	4.00	1635.42	1637.55	1635.70	1637.55	0.000004	0.10	39.41	27.81	0.02
Rogue River	30096.64	17cfs	0.00	17.00	1635.42	1638.13	1635.98	1638.13	0.000028	0.30	56.73	31.86	0.04
Rogue River	30096.64	40cfs	0.01	40.00	1635.42	1638.45	1636.29	1638.46	0.000098	0.59	67.28	34.10	0.07

HEC-RAS Plan: Ex River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	30096.64	75dfs	0.03	75.00	1635.42	1638.78	1636.60	1638.79	0.000225	0.95	78.77	36.39	0.11
Rogue River	30096.64	Q1	0.25	447.00	1635.42	1640.45	1638.20	1640.59	0.001233	3.04	153.91	60.74	0.29
Rogue River	30096.64	Q1.5	1.44	2300.00	1635.42	1643.19	1641.66	1644.09	0.003948	7.99	438.69	209.99	0.56
Rogue River	30096.64	Q2	1.18	3627.00	1635.42	1644.87	1643.38	1645.48	0.002546	7.51	1207.78	518.03	0.47
Rogue River	30096.64	Q5	2.33	6456.00	1635.42	1645.85	1644.91	1646.99	0.004469	10.76	1616.50	761.82	0.64
Rogue River	30096.64	Q10	2.81	8309.00	1635.42	1646.75	1646.75	1648.09	0.004896	12.01	2299.02	834.19	0.68
Rogue River	30096.64	Q25	1.40	10514.00	1635.42	1648.92	1646.99	1649.44	0.002004	8.77	4194.69	887.18	0.45
Rogue River	30096.64	Q50	2.28	12020.00	1635.42	1648.47	1647.73	1649.36	0.003377	11.11	3800.93	884.17	0.58
Rogue River	30096.64	Q100	2.45	13416.00	1635.42	1648.77	1647.99	1649.69	0.003542	11.57	4064.37	886.21	0.59
Rogue River	30096.64	PF 13	0.16	300.00	1635.42	1639.97	1637.68	1640.05	0.000916	2.38	126.95	44.74	0.24
Rogue River	30096.64	PF 14	0.13	250.00	1635.42	1639.77	1637.49	1639.84	0.000793	2.12	118.21	43.34	0.22
Rogue River	30031.7	73014	0.00	4.00	1634.58	1637.55	1635.09	1637.55	0.000001	0.06	62.42	38.47	0.01
Rogue River	30031.7	17dfs	0.00	17.00	1634.58	1638.13	1635.38	1638.13	0.000010	0.20	85.29	40.26	0.02
Rogue River	30031.7	40dfs	0.01	40.00	1634.58	1638.45	1635.71	1638.45	0.000035	0.42	98.28	41.23	0.05
Rogue River	30031.7	75dfs	0.01	75.00	1634.58	1638.78	1635.99	1638.78	0.000082	0.70	111.79	42.23	0.07
Rogue River	30031.7	Q1	0.17	447.00	1634.58	1640.42	1637.53	1640.53	0.000631	2.61	190.24	53.18	0.22
Rogue River	30031.7	Q1.5	1.28	2300.00	1634.58	1643.03	1640.85	1643.85	0.003009	7.72	512.99	303.94	0.51
Rogue River	30031.7	Q2	2.08	3627.00	1634.58	1643.92	1643.17	1645.21	0.004343	10.02	699.99	325.97	0.62
Rogue River	30031.7	Q5	3.19	6456.00	1634.58	1644.97	1644.97	1646.63	0.005902	12.68	1393.82	616.18	0.74
Rogue River	30031.7	Q10	4.31	8309.00	1634.58	1645.44	1645.48	1647.63	0.007560	14.85	1613.75	764.36	0.85
Rogue River	30031.7	Q25	6.76	10514.00	1634.58	1645.48	1645.48	1648.91	0.011828	18.62	1631.45	765.35	1.06
Rogue River	30031.7	Q50	3.37	12020.00	1634.58	1647.63	1647.63	1649.07	0.004813	13.59	3266.51	880.95	0.70
Rogue River	30031.7	Q100	3.65	13416.00	1634.58	1647.88	1647.88	1649.39	0.005110	14.20	3491.02	882.42	0.72
Rogue River	30031.7	PF 13	0.10	300.00	1634.58	1639.95	1637.06	1640.01	0.000414	1.97	165.84	50.01	0.17
Rogue River	30031.7	PF 14	0.08	250.00	1634.58	1639.75	1636.86	1639.80	0.000340	1.73	156.20	48.70	0.15
Rogue River	29950.26	73014	0.13	4.00	1636.51	1637.54	1637.00	1637.55	0.006053	0.94	4.23	9.09	0.24
Rogue River	29950.26	17dfs	0.18	17.00	1636.51	1638.11	1637.55	1638.13	0.007342	1.12	15.12	34.41	0.30
Rogue River	29950.26	40dfs	0.26	40.00	1636.51	1638.41	1637.96	1638.44	0.007514	1.46	27.34	43.25	0.32
Rogue River	29950.26	75dfs	0.38	75.00	1636.51	1638.70	1638.21	1638.76	0.007721	1.86	40.42	45.43	0.35
Rogue River	29950.26	Q1	1.14	447.00	1636.51	1640.17	1639.28	1640.38	0.010220	3.69	123.60	78.02	0.46
Rogue River	29950.26	Q1.5	3.53	2300.00	1636.51	1642.63	1641.78	1643.38	0.014108	7.42	419.43	287.74	0.62
Rogue River	29950.26	Q2	4.14	3627.00	1636.51	1643.68	1642.99	1644.52	0.013374	8.32	711.75	493.13	0.63
Rogue River	29950.26	Q5	2.56	6456.00	1636.51	1645.28	1643.00	1645.66	0.006408	6.83	1843.73	770.41	0.45
Rogue River	29950.26	Q10	3.09	8309.00	1636.51	1645.90	1643.93	1646.36	0.007108	7.62	2164.21	822.44	0.48
Rogue River	29950.26	Q25	4.96	10514.00	1636.51	1646.41	1644.49	1647.16	0.010695	9.75	2565.53	877.39	0.60
Rogue River	29950.26	Q50	4.57	12020.00	1636.51	1646.90	1644.78	1647.55	0.009312	9.45	2997.77	880.95	0.56
Rogue River	29950.26	Q100	4.61	13416.00	1636.51	1647.23	1645.23	1647.87	0.009040	9.55	3285.87	882.95	0.56
Rogue River	29950.26	PF 13	0.88	300.00	1636.51	1639.75	1638.94	1639.91	0.009489	3.13	95.75	58.26	0.43
Rogue River	29950.26	PF 14	0.78	250.00	1636.51	1639.58	1638.80	1639.71	0.009180	2.91	85.80	56.66	0.42

HEC-RAS Plan: Ex River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E. G. Elev (ft)	E. G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	29851.09	73014	1.19	4.00	1635.28	1635.86	1635.86	1635.96	0.110852	2.55	1.57	7.68	0.99
Rogue River	29851.09	17dfs	1.60	17.00	1635.28	1636.17	1636.17	1636.33	0.093869	3.20	5.32	16.60	1.00
Rogue River	29851.09	40cfs	1.95	40.00	1635.28	1636.44	1636.44	1636.65	0.082628	3.72	10.76	24.48	0.99
Rogue River	29851.09	75cfs	2.24	75.00	1635.28	1636.70	1636.70	1636.96	0.078382	4.12	18.25	35.17	1.00
Rogue River	29851.09	Q1	3.78	447.00	1635.28	1637.76	1637.76	1638.35	0.056392	6.17	73.94	64.09	1.00
Rogue River	29851.09	Q1.5	5.11	2300.00	1635.28	1640.49	1640.10	1641.60	0.023450	8.73	310.44	150.94	0.79
Rogue River	29851.09	Q2	5.04	3627.00	1635.28	1641.94	1641.41	1643.06	0.016788	9.15	567.22	308.83	0.70
Rogue River	29851.09	Q5	2.68	6456.00	1635.28	1644.59	1643.16	1645.07	0.005939	7.13	1855.17	727.17	0.45
Rogue River	29851.09	Q10	2.90	8309.00	1635.28	1645.27	1643.46	1645.75	0.005918	7.52	2338.34	770.76	0.45
Rogue River	29851.09	Q25	3.46	10514.00	1635.28	1645.77	1643.74	1646.32	0.006687	8.30	2703.19	809.21	0.48
Rogue River	29851.09	Q50	4.24	12020.00	1635.28	1646.08	1644.86	1646.76	0.007920	9.24	2944.02	843.10	0.53
Rogue River	29851.09	Q100	4.33	13416.00	1635.28	1646.42	1645.00	1647.09	0.007810	9.39	3227.80	847.91	0.53
Rogue River	29851.09	PF 13	3.27	300.00	1635.28	1637.46	1637.46	1637.93	0.060705	5.53	55.11	58.99	1.00
Rogue River	29851.09	PF 14	3.09	250.00	1635.28	1637.34	1637.34	1637.77	0.063372	5.29	47.93	56.41	1.00
Rogue River	29745.94	73014	0.05	4.00	1632.69	1633.16	1632.92	1633.16	0.003191	0.59	6.79	24.53	0.20
Rogue River	29745.94	17dfs	0.13	17.00	1632.69	1633.51	1633.51	1633.53	0.004144	1.01	16.89	33.11	0.25
Rogue River	29745.94	40cfs	0.18	40.00	1632.69	1633.88	1633.32	1633.91	0.003783	1.28	31.24	39.79	0.25
Rogue River	29745.94	75cfs	0.23	75.00	1632.69	1634.30	1633.56	1634.34	0.003328	1.54	48.57	42.29	0.25
Rogue River	29745.94	Q1	0.79	447.00	1632.69	1636.03	1634.70	1636.19	0.004925	3.26	138.10	54.37	0.35
Rogue River	29745.94	Q1.5	2.44	2300.00	1632.69	1639.66		1640.30	0.006396	6.62	427.16	155.06	0.47
Rogue River	29745.94	Q2	3.09	3627.00	1632.69	1641.12		1641.92	0.006556	7.72	705.29	257.64	0.49
Rogue River	29745.94	Q5	4.72	6456.00	1632.69	1643.08	1641.52	1644.27	0.007991	9.91	1405.38	701.36	0.56
Rogue River	29745.94	Q10	2.76	8309.00	1632.69	1644.69	1644.69	1645.23	0.004012	7.78	2615.98	815.53	0.41
Rogue River	29745.94	Q25	3.82	10514.00	1632.69	1644.95		1645.67	0.005415	9.17	2823.34	820.77	0.48
Rogue River	29745.94	Q50	4.17	12020.00	1632.69	1645.28		1646.04	0.005756	9.63	3101.21	839.03	0.49
Rogue River	29745.94	Q100	4.35	13416.00	1632.69	1645.60		1646.37	0.005837	9.88	3373.98	841.69	0.50
Rogue River	29745.94	PF 13	0.59	300.00	1632.69	1635.52	1634.30	1635.63	0.004545	2.72	110.75	53.26	0.33
Rogue River	29745.94	PF 14	0.51	250.00	1632.69	1635.32	1634.17	1635.42	0.004351	2.49	100.42	52.83	0.32
Rogue River	29663.18	73014	1.16	4.00	1631.83	1632.30	1632.30	1632.39	0.103800	2.53	1.58	8.25	1.02
Rogue River	29663.18	17dfs	0.68	17.00	1631.83	1632.76	1632.76	1632.84	0.023517	2.28	7.47	14.46	0.56
Rogue River	29663.18	40cfs	0.30	40.00	1631.83	1633.46	1633.46	1633.50	0.006748	1.64	24.46	30.24	0.32
Rogue River	29663.18	75cfs	0.36	75.00	1631.83	1633.90	1633.90	1633.95	0.006901	1.84	40.79	43.64	0.34
Rogue River	29663.18	Q1	1.24	447.00	1631.83	1635.39		1635.63	0.009566	3.93	114.47	53.09	0.46
Rogue River	29663.18	Q1.5	3.71	2300.00	1631.83	1638.67		1639.59	0.011809	7.90	343.10	107.20	0.59
Rogue River	29663.18	Q2	4.59	3627.00	1631.83	1640.09	1638.91	1641.24	0.011642	9.14	544.55	205.31	0.61
Rogue River	29663.18	Q5	5.69	6456.00	1631.83	1642.17	1640.94	1643.49	0.011109	10.61	1097.77	485.78	0.62
Rogue River	29663.18	Q10	7.05	8309.00	1631.83	1643.08	1642.63	1644.71	0.012502	12.00	1538.58	711.87	0.67
Rogue River	29663.18	Q25	5.58	10514.00	1631.83	1644.14		1645.22	0.008955	10.86	2301.04	737.24	0.58
Rogue River	29663.18	Q50	5.46	12020.00	1631.83	1644.62		1645.62	0.008397	10.82	2658.33	747.25	0.56
Rogue River	29663.18	Q100	5.49	13416.00	1631.83	1645.00		1645.96	0.008174	10.91	2943.94	763.17	0.56

HEC-RAS Plan: Ex River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E. G. Elev (ft)	E. G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	29663.18	PF 13	0.92	300.00	1631.83	1634.95		1635.12	0.008809	3.27	91.71	50.34	0.42
Rogue River	29663.18	PF 14	0.78	250.00	1631.83	1634.80		1634.93	0.008188	2.98	83.94	49.58	0.40
Rogue River	29622.05	73014	0.06	4.00	1631.08	1631.91	1631.44	1631.91	0.001600	0.67	6.00	10.59	0.16
Rogue River	29622.05	17dfs	0.15	17.00	1631.08	1632.56		1632.58	0.002625	1.21	14.02	14.23	0.22
Rogue River	29622.05	40cfs	0.23	40.00	1631.08	1633.24	1632.11	1633.27	0.004551	1.45	27.59	32.45	0.28
Rogue River	29622.05	75cfs	0.29	75.00	1631.08	1633.66	1632.52	1633.70	0.005371	1.65	45.42	50.19	0.31
Rogue River	29622.05	Q1	0.93	447.00	1631.08	1635.09		1635.27	0.007323	3.41	132.27	64.55	0.41
Rogue River	29622.05	Q1.5	2.48	2300.00	1631.08	1638.49		1639.12	0.007463	6.51	398.29	119.07	0.49
Rogue River	29622.05	Q2	3.27	3627.00	1631.08	1639.90		1640.77	0.007853	7.78	593.32	205.58	0.52
Rogue River	29622.05	Q5	4.14	6456.00	1631.08	1642.00	1639.96	1643.04	0.007632	9.15	1204.77	501.42	0.54
Rogue River	29622.05	Q10	4.71	8309.00	1631.08	1642.84		1643.96	0.007940	9.90	1614.63	621.59	0.56
Rogue River	29622.05	Q25	5.61	10514.00	1631.08	1643.55	1643.37	1644.84	0.008824	10.93	2087.32	705.89	0.59
Rogue River	29622.05	Q50	5.45	12020.00	1631.08	1644.09		1645.26	0.008161	10.87	2468.73	724.68	0.57
Rogue River	29622.05	Q100	5.41	13416.00	1631.08	1644.52		1645.63	0.007795	10.89	2784.11	737.23	0.56
Rogue River	29622.05	PF 13	0.73	300.00	1631.08	1634.65	1633.79	1634.78	0.007193	2.90	104.07	63.32	0.39
Rogue River	29622.05	PF 14	0.61	250.00	1631.08	1634.52	1633.67	1634.62	0.006594	2.62	95.60	62.95	0.37
Rogue River	29536.28	73014	1.32	4.00	1631.02	1631.35	1631.35	1631.47	0.0091618	2.82	1.42	5.91	1.01
Rogue River	29536.28	17dfs	1.74	17.00	1631.02	1631.73	1631.73	1631.92	0.0076207	3.49	4.87	12.87	1.00
Rogue River	29536.28	40cfs	1.84	40.00	1631.02	1632.05	1632.05	1632.26	0.0072680	3.66	10.94	26.35	1.00
Rogue River	29536.28	75cfs	2.23	75.00	1631.02	1632.28	1632.28	1632.55	0.0068844	4.20	17.87	33.69	1.02
Rogue River	29536.28	Q1	2.00	447.00	1631.02	1633.94		1634.31	0.018269	4.87	91.80	50.43	0.64
Rogue River	29536.28	Q1.5	2.54	2300.00	1631.02	1637.77		1638.37	0.010227	6.29	392.14	139.76	0.53
Rogue River	29536.28	Q2	2.77	3627.00	1631.02	1639.33		1640.02	0.008210	6.91	645.73	230.06	0.50
Rogue River	29536.28	Q5	3.50	6456.00	1631.02	1641.46		1642.33	0.007636	8.17	1277.99	523.96	0.51
Rogue River	29536.28	Q10	3.71	8309.00	1631.02	1642.35		1643.23	0.007281	8.56	1766.75	653.92	0.50
Rogue River	29536.28	Q25	3.86	10514.00	1631.02	1643.18		1644.03	0.006947	8.87	2334.62	718.49	0.50
Rogue River	29536.28	Q50	3.78	12020.00	1631.02	1643.72		1644.51	0.006441	8.86	2730.72	734.62	0.49
Rogue River	29536.28	Q100	3.81	13416.00	1631.02	1644.15		1644.92	0.006238	8.95	3046.16	747.63	0.48
Rogue River	29536.28	PF 13	2.21	300.00	1631.02	1633.31		1633.68	0.028811	4.89	61.41	45.27	0.74
Rogue River	29536.28	PF 14	2.75	250.00	1631.02	1633.00	1632.91	1633.43	0.041756	5.25	47.63	44.13	0.89
Rogue River	29463.53	73014	0.00	4.00	1627.22	1630.29	1627.60	1630.29	0.000004	0.08	51.44	25.57	0.01
Rogue River	29463.53	17dfs	0.01	17.00	1627.22	1630.64	1628.01	1630.64	0.000047	0.28	60.48	26.65	0.03
Rogue River	29463.53	40cfs	0.02	40.00	1627.22	1631.12	1628.47	1631.12	0.000155	0.54	73.86	29.31	0.06
Rogue River	29463.53	75cfs	0.05	75.00	1627.22	1631.66	1628.72	1631.67	0.000331	0.83	90.84	33.44	0.09
Rogue River	29463.53	Q1	0.37	447.00	1627.22	1633.83		1633.92	0.001823	2.33	192.81	60.36	0.22
Rogue River	29463.53	Q1.5	1.46	2300.00	1627.22	1637.52		1637.89	0.003527	5.18	572.58	141.19	0.34
Rogue River	29463.53	Q2	1.96	3627.00	1627.22	1639.06		1639.57	0.003910	6.22	802.60	201.31	0.37
Rogue River	29463.53	Q5	3.78	6456.00	1627.22	1640.82		1641.81	0.006260	8.90	1325.17	474.74	0.49
Rogue River	29463.53	Q10	3.91	8309.00	1627.22	1641.80		1642.74	0.005916	9.18	1838.22	540.72	0.48

HEC-RAS Plan: Ex River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E. G. Elev (ft)	E. G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	29463 53	Q25	4.03	10514.00	1627.22	1642.68		1643.56	0.005659	9.44	2389.92	669.58	0.47
Rogue River	29463 53	Q50	3.93	12020.00	1627.22	1643.27		1644.08	0.005269	9.39	2792.97	686.49	0.46
Rogue River	29463 53	Q100	3.98	13416.00	1627.22	1643.71		1644.50	0.005157	9.50	3095.14	689.51	0.46
Rogue River	29463 53	PF 13	0.25	300.00	1627.22	1633.26		1633.31	0.001383	1.86	161.52	52.19	0.19
Rogue River	29463 53	PF 14	0.21	250.00	1627.22	1633.00		1633.05	0.001243	1.69	148.21	51.14	0.17
Rogue River	29291.16	73014	0.01	4.00	1629.14	1630.29		1630.29	0.000398	0.34	11.71	19.73	0.08
Rogue River	29291.16	17dfs	0.09	17.00	1629.14	1630.60		1630.61	0.002172	0.90	18.90	26.41	0.19
Rogue River	29291.16	40dfs	0.17	40.00	1629.14	1631.02		1631.05	0.003889	1.23	32.43	43.61	0.25
Rogue River	29291.16	75dfs	0.16	75.00	1629.14	1631.52		1631.54	0.003113	1.23	60.94	70.01	0.23
Rogue River	29291.16	Q1	0.31	447.00	1629.14	1633.53		1633.60	0.001852	2.05	226.21	89.64	0.22
Rogue River	29291.16	Q1.5	0.99	2300.00	1629.14	1637.08		1637.33	0.002626	4.21	703.77	190.26	0.29
Rogue River	29291.16	Q2	1.32	3627.00	1629.14	1638.60		1638.94	0.002825	5.04	1026.95	240.89	0.32
Rogue River	29291.16	Q5	2.45	6456.00	1629.14	1640.17		1640.80	0.004371	7.08	1471.68	437.05	0.41
Rogue River	29291.16	Q10	2.76	8309.00	1629.14	1641.09		1641.77	0.004471	7.62	1857.00	633.60	0.42
Rogue River	29291.16	Q25	3.31	10514.00	1629.14	1641.81		1642.60	0.005020	8.45	2169.41	652.76	0.45
Rogue River	29291.16	Q50	3.79	12020.00	1629.14	1642.22		1643.12	0.005537	9.09	2410.41	678.39	0.47
Rogue River	29291.16	Q100	3.98	13416.00	1629.14	1642.62		1643.54	0.005626	9.37	2678.18	683.23	0.48
Rogue River	29291.16	PF 13	0.23	300.00	1629.14	1633.00		1633.05	0.001695	1.70	180.32	84.43	0.20
Rogue River	29291.16	PF 14	0.21	250.00	1629.14	1632.75		1632.79	0.001746	1.60	159.40	83.31	0.20
Rogue River	29172 9	73014	0.00	4.00	1627.53	1630.29		1630.29	0.000011	0.09	42.63	29.05	0.01
Rogue River	29172 9	17dfs	0.01	17.00	1627.53	1630.57		1630.57	0.000119	0.33	51.35	31.64	0.05
Rogue River	29172 9	40dfs	0.04	40.00	1627.53	1630.93		1630.94	0.000383	0.63	63.31	35.78	0.08
Rogue River	29172 9	75dfs	0.08	75.00	1627.53	1631.36		1631.38	0.000763	0.93	80.25	42.78	0.12
Rogue River	29172 9	Q1	0.44	447.00	1627.53	1633.23		1633.32	0.003035	2.39	187.85	75.31	0.26
Rogue River	29172 9	Q1.5	1.51	2300.00	1627.53	1636.54		1636.91	0.004607	5.08	583.21	209.84	0.37
Rogue River	29172 9	Q2	1.69	3627.00	1627.53	1638.14		1638.54	0.004060	5.59	967.80	308.47	0.36
Rogue River	29172 9	Q5	2.74	6456.00	1627.53	1639.60		1640.22	0.005522	7.33	1485.43	540.89	0.43
Rogue River	29172 9	Q10	3.11	8309.00	1627.53	1640.49		1641.17	0.005698	7.93	1999.58	731.72	0.44
Rogue River	29172 9	Q25	3.03	10514.00	1627.53	1641.32		1641.92	0.005123	7.94	2613.64	740.37	0.43
Rogue River	29172 9	Q50	3.00	12020.00	1627.53	1641.82		1642.39	0.004855	7.96	2981.12	745.09	0.42
Rogue River	29172 9	Q100	3.00	13416.00	1627.53	1642.24		1642.79	0.004666	8.00	3296.47	748.89	0.41
Rogue River	29172 9	PF 13	0.32	300.00	1627.53	1632.74		1632.80	0.002629	1.97	152.01	69.14	0.23
Rogue River	29172 9	PF 14	0.27	250.00	1627.53	1632.51		1632.56	0.002161	1.82	137.32	59.82	0.21
Rogue River	29059 92	73014	0.16	4.00	1629.90	1630.27	1630.16	1630.28	0.014873	0.94	4.25	24.35	0.40
Rogue River	29059 92	17dfs	0.36	17.00	1629.90	1630.49	1630.34	1630.53	0.016801	1.57	10.84	31.65	0.47
Rogue River	29059 92	40dfs	0.65	40.00	1629.90	1630.73	1630.51	1630.80	0.016197	2.11	18.98	34.53	0.50
Rogue River	29059 92	75dfs	0.55	75.00	1629.90	1631.05	1631.71	1631.14	0.015008	2.39	31.40	44.67	0.50
Rogue River	29059 92	Q1	1.30	447.00	1629.90	1632.45	1631.79	1632.69	0.012529	3.88	115.76	108.54	0.53
Rogue River	29059 92	Q1.5	1.39	2300.00	1629.90	1636.11	1634.45	1636.40	0.004210	4.88	768.81	286.24	0.37

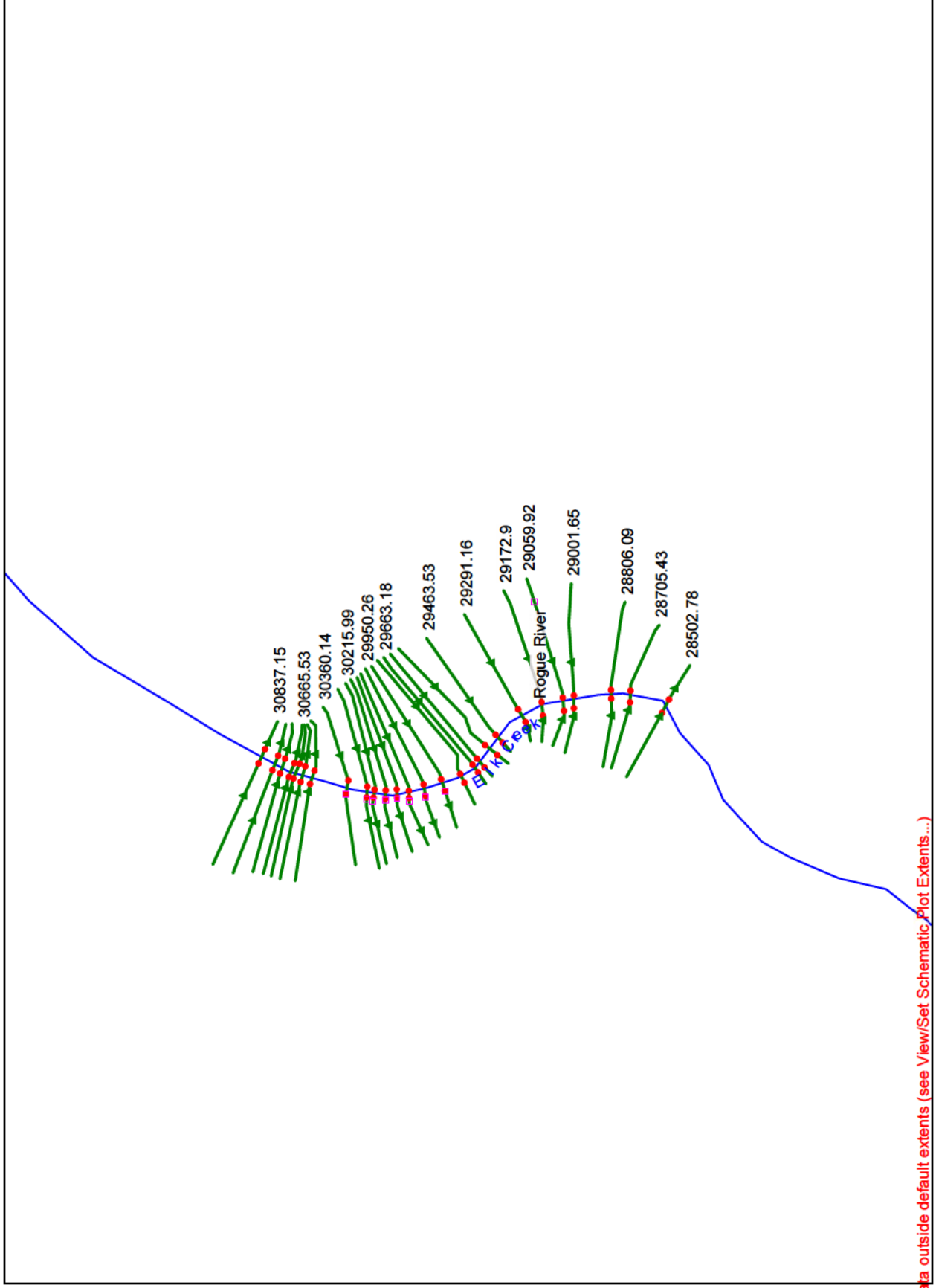
HEC-RAS Plan: Ex River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E. G. Elev (ft)	E. G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	29059.92	Q2	1.26	3627.00	1629.90	1637.87	1635.35	1638.12	0.002863	4.86	1333.77	341.24	0.32
Rogue River	29059.92	Q5	2.36	6456.00	1629.90	1639.15	1636.68	1639.63	0.004551	6.85	1815.24	647.25	0.42
Rogue River	29059.92	Q10	2.42	8309.00	1629.90	1640.11	1637.39	1640.57	0.004183	7.06	2452.48	684.23	0.41
Rogue River	29059.92	Q25	2.65	10514.00	1629.90	1640.90	1638.01	1641.38	0.004225	7.49	3001.72	710.51	0.42
Rogue River	29059.92	Q50	2.82	12020.00	1629.90	1641.37	1638.42	1641.86	0.004293	7.78	3342.43	747.65	0.42
Rogue River	29059.92	Q100	2.90	13416.00	1629.90	1641.78	1638.78	1642.28	0.004261	7.96	3729.76	847.17	0.42
Rogue River	29059.92	PF 13	1.07	300.00	1629.90	1632.05	1631.49	1632.23	0.012617	3.41	88.02	97.88	0.51
Rogue River	29059.92	PF 14	0.91	250.00	1629.90	1631.93	1631.37	1632.08	0.011479	3.11	80.34	63.24	0.48
Rogue River	29001.65	73014	0.41	4.00	1628.37	1628.79	1628.79	1628.87	0.045907	2.31	1.73	11.93	1.07
Rogue River	29001.65	17cfs	0.67	17.00	1628.37	1629.03	1629.03	1629.21	0.031807	3.37	5.05	14.91	1.02
Rogue River	29001.65	40cfs	0.93	40.00	1628.37	1629.30	1629.30	1629.59	0.026723	4.33	9.24	16.33	1.01
Rogue River	29001.65	75cfs	1.17	75.00	1628.37	1629.61	1629.61	1630.02	0.023821	5.15	14.57	18.10	1.01
Rogue River	29001.65	Q1	0.59	447.00	1628.37	1631.95		1632.21	0.005759	4.11	108.75	65.64	0.56
Rogue River	29001.65	Q1.5	0.97	2300.00	1628.37	1635.54		1636.16	0.003037	6.40	476.63	294.64	0.49
Rogue River	29001.65	Q2	0.90	3627.00	1628.37	1637.39	1634.96	1637.95	0.002090	6.50	1045.04	449.50	0.43
Rogue River	29001.65	Q5	2.50	6456.00	1628.37	1637.69	1636.98	1639.23	0.005545	10.88	1162.16	560.33	0.71
Rogue River	29001.65	Q10	2.90	8309.00	1628.37	1638.43	1638.43	1640.15	0.005836	11.90	1567.12	646.51	0.74
Rogue River	29001.65	Q25	3.13	10514.00	1628.37	1639.19	1639.19	1640.95	0.005763	12.56	2072.25	674.09	0.74
Rogue River	29001.65	Q50	3.35	12020.00	1628.37	1639.59	1639.59	1641.43	0.005906	13.09	2346.59	689.80	0.76
Rogue River	29001.65	Q100	3.63	13416.00	1628.37	1639.89	1639.89	1641.83	0.006188	13.69	2552.98	702.31	0.78
Rogue River	29001.65	PF 13	0.71	300.00	1628.37	1631.30		1631.59	0.009324	4.30	69.76	56.53	0.68
Rogue River	29001.65	PF 14	0.84	250.00	1628.37	1631.03		1631.35	0.012976	4.57	54.68	51.81	0.78
Rogue River	28806.09	73014	0.01	4.00	1626.66	1627.46	1626.91	1627.46	0.000307	0.45	8.89	16.57	0.11
Rogue River	28806.09	17cfs	0.04	17.00	1626.66	1627.93	1627.20	1627.95	0.000751	0.97	17.50	19.78	0.18
Rogue River	28806.09	40cfs	0.09	40.00	1626.66	1628.37	1627.49	1628.41	0.001174	1.50	26.72	21.79	0.24
Rogue River	28806.09	75cfs	0.15	75.00	1626.66	1628.83	1627.79	1628.89	0.001544	2.03	36.89	23.03	0.28
Rogue River	28806.09	Q1	0.80	447.00	1626.66	1630.70		1631.10	0.005430	5.09	87.80	49.97	0.56
Rogue River	28806.09	Q1.5	2.73	2300.00	1626.66	1633.48	1633.39	1635.07	0.010047	10.45	303.80	277.48	0.86
Rogue River	28806.09	Q2	4.57	3627.00	1626.66	1634.17	1634.17	1636.87	0.014652	13.84	394.41	378.60	1.06
Rogue River	28806.09	Q5	2.81	6456.00	1626.66	1636.70	1636.70	1638.03	0.006094	11.57	1597.99	587.14	0.73
Rogue River	28806.09	Q10	4.00	8309.00	1626.66	1636.93	1637.23	1638.77	0.008425	13.87	1736.51	593.69	0.86
Rogue River	28806.09	Q25	4.73	10514.00	1626.66	1637.43	1637.86	1639.50	0.009401	15.25	2036.29	612.51	0.92
Rogue River	28806.09	Q50	4.80	12020.00	1626.66	1637.95	1638.40	1639.98	0.008994	15.51	2375.06	725.27	0.91
Rogue River	28806.09	Q100	5.12	13416.00	1626.66	1638.24	1638.72	1640.34	0.009285	16.09	2596.06	777.56	0.93
Rogue River	28806.09	PF 13	0.59	300.00	1626.66	1630.11		1630.40	0.004252	4.35	68.91	38.92	0.49
Rogue River	28806.09	PF 14	0.48	250.00	1626.66	1629.90		1630.15	0.003458	3.94	63.38	26.47	0.45
Rogue River	28705.43	73014	0.00	4.00	1626.33	1627.45		1627.45	0.000036	0.19	20.93	28.49	0.04
Rogue River	28705.43	17cfs	0.01	17.00	1626.33	1627.91		1627.92	0.000146	0.48	35.13	33.26	0.08
Rogue River	28705.43	40cfs	0.02	40.00	1626.33	1628.34		1628.35	0.000275	0.81	49.67	34.91	0.12

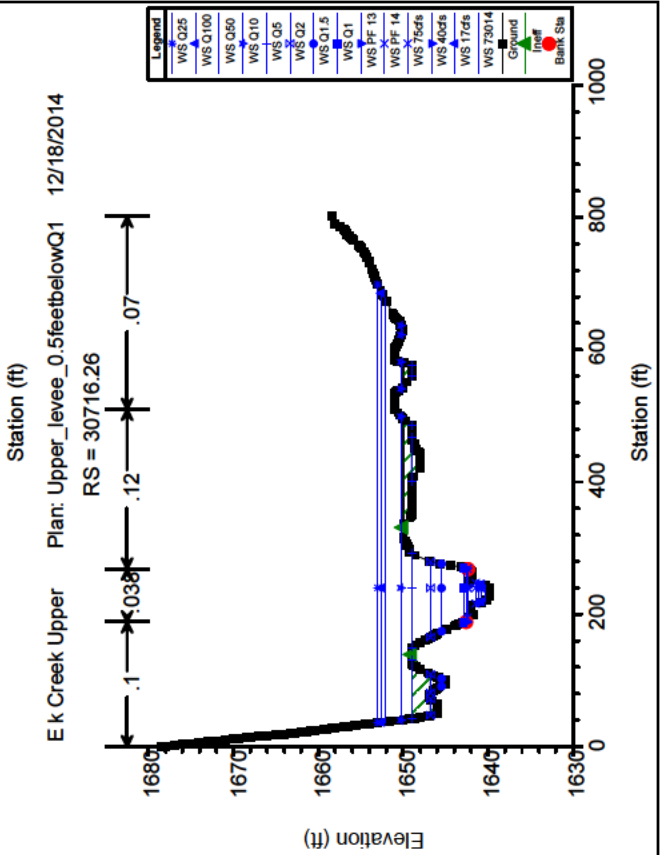
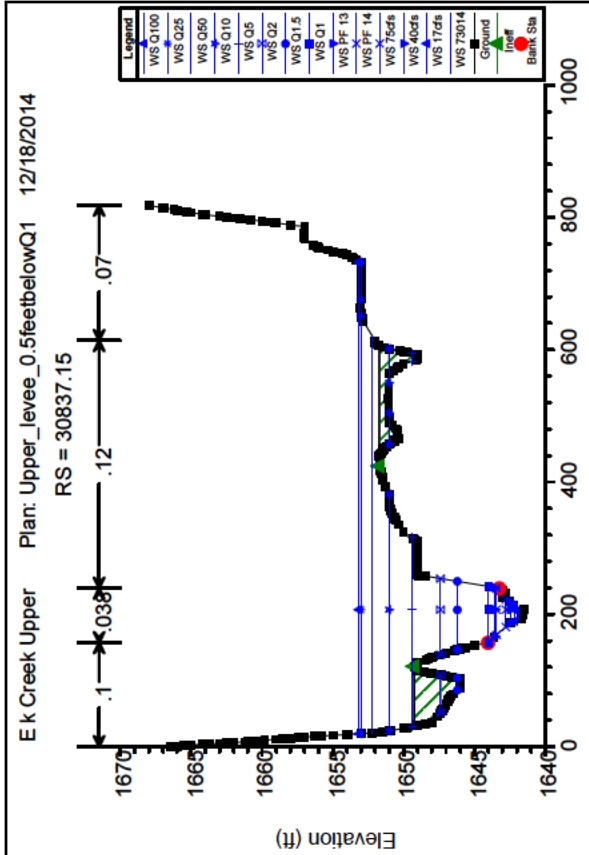
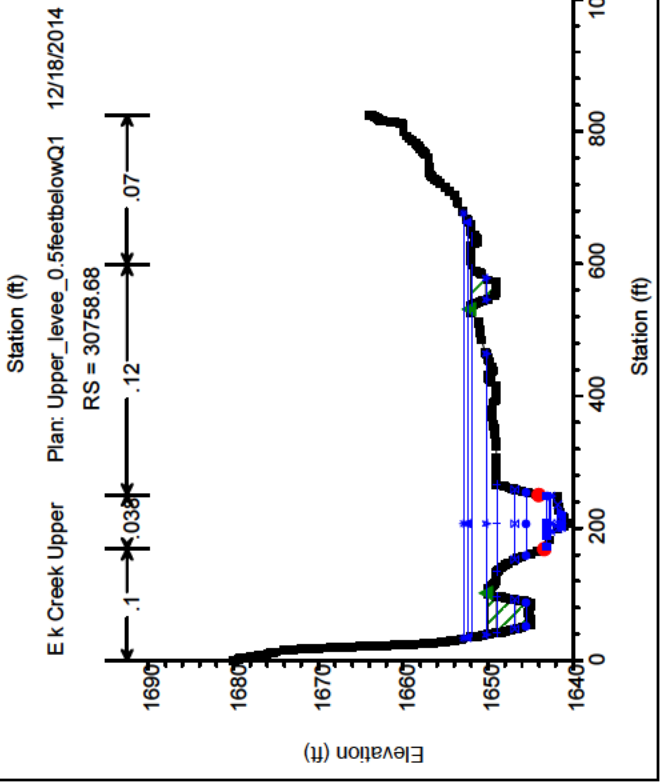
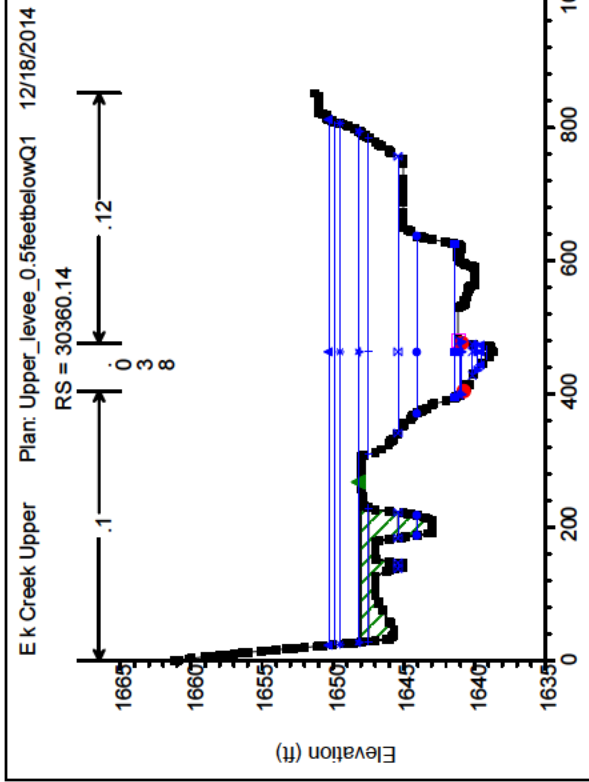
HEC-RAS Plan: Ex River: Elk Creek Reach: Rogue River (Continued)

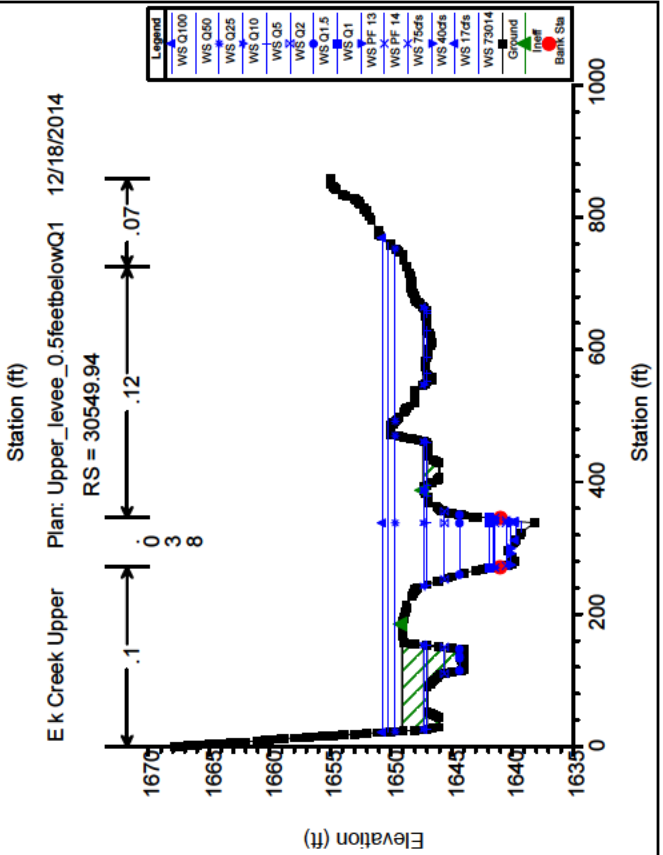
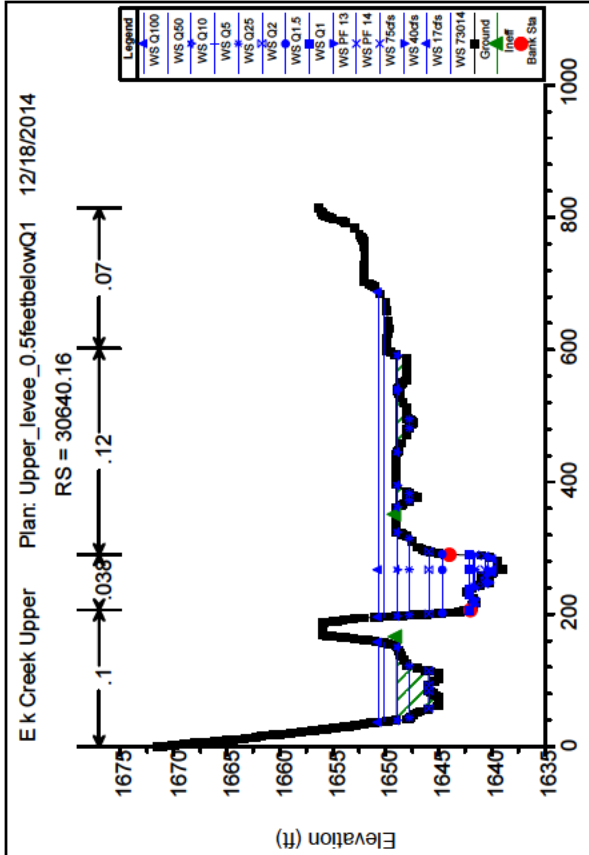
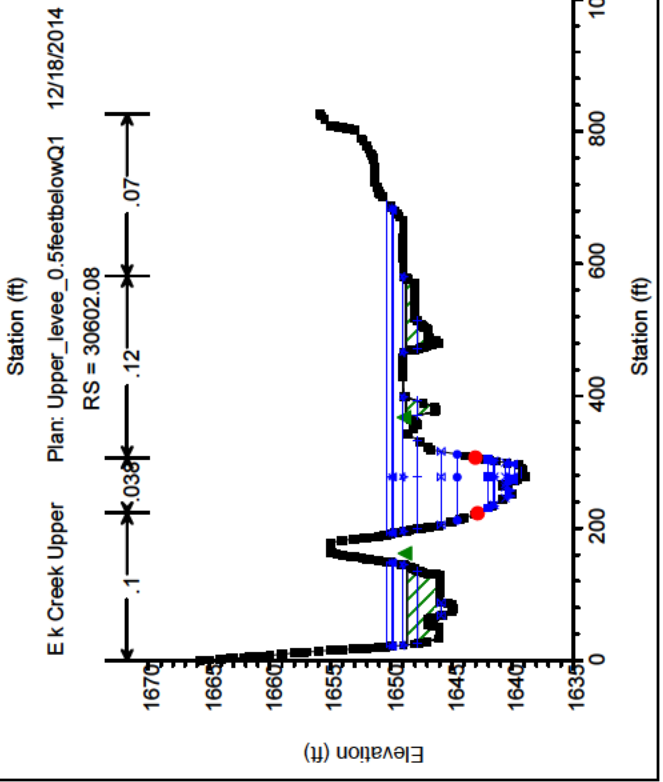
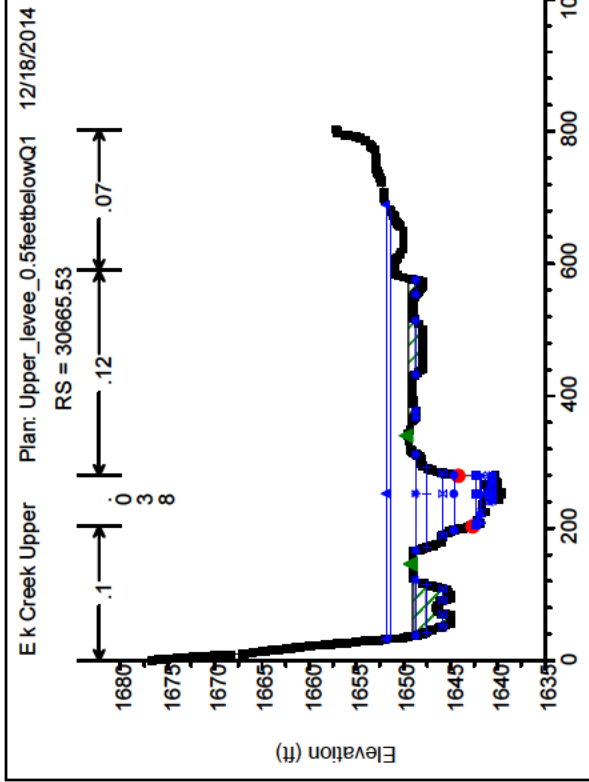
Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E. G. Elev (ft)	E. G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	28705.43	75dfs	0.04	75.00	1626.33	1628.78		1628.80	0.000413	1.14	65.60	36.63	0.15
Rogue River	28705.43	Q1	0.31	447.00	1626.33	1630.56		1630.72	0.001929	3.25	138.52	86.08	0.35
Rogue River	28705.43	Q1.5	1.27	2300.00	1626.33	1633.42	1631.88	1634.22	0.004170	7.27	414.12	381.30	0.57
Rogue River	28705.43	Q2	1.45	3627.00	1626.33	1634.67	1633.89	1635.53	0.003825	8.06	912.28	415.60	0.56
Rogue River	28705.43	Q5	2.29	6456.00	1626.33	1635.84	1635.57	1637.09	0.005095	10.41	1508.42	562.84	0.67
Rogue River	28705.43	Q10	2.59	8309.00	1626.33	1636.51	1636.42	1637.84	0.005283	11.22	1963.28	732.12	0.69
Rogue River	28705.43	Q25	2.56	10514.00	1626.33	1637.33	1637.03	1638.54	0.004749	11.34	2572.33	747.08	0.67
Rogue River	28705.43	Q50	2.52	12020.00	1626.33	1637.86	1637.38	1638.99	0.004409	11.35	2966.73	750.37	0.65
Rogue River	28705.43	Q100	2.55	13416.00	1626.33	1638.27	1637.61	1639.37	0.004277	11.50	3275.58	752.35	0.64
Rogue River	28705.43	PF 13	0.21	300.00	1626.33	1630.03		1630.13	0.001251	2.64	113.90	59.36	0.28
Rogue River	28705.43	PF 14	0.17	250.00	1626.33	1629.83		1629.92	0.001079	2.36	106.05	46.38	0.26
Rogue River	28502.78	73014	0.21	4.00	1626.90	1627.37	1627.30	1627.42	0.014719	1.80	2.23	9.50	0.65
Rogue River	28502.78	17cfs	0.36	17.00	1626.90	1627.71	1627.61	1627.81	0.014711	2.53	6.72	17.14	0.71
Rogue River	28502.78	40cfs	0.53	40.00	1626.90	1627.99	1627.88	1628.16	0.014721	3.28	12.18	20.95	0.76
Rogue River	28502.78	75dfs	0.55	75.00	1626.90	1628.37	1628.20	1628.54	0.014713	3.37	22.27	36.83	0.76
Rogue River	28502.78	Q1	1.01	447.00	1626.90	1629.46	1629.33	1629.86	0.014722	5.07	88.40	80.04	0.85
Rogue River	28502.78	Q1.5	2.62	2300.00	1626.90	1631.32	1631.32	1632.73	0.014337	9.58	253.51	384.51	0.98
Rogue River	28502.78	Q2	2.97	3627.00	1626.90	1632.46	1632.46	1634.21	0.011749	10.77	385.26	481.48	0.94
Rogue River	28502.78	Q5	2.34	6456.00	1626.90	1634.69	1634.69	1636.01	0.005982	10.27	1366.15	638.55	0.72
Rogue River	28502.78	Q10	2.71	8309.00	1626.90	1635.24	1635.24	1636.71	0.006380	11.21	1720.73	642.83	0.75
Rogue River	28502.78	Q25	3.08	10514.00	1626.90	1635.83	1635.83	1637.42	0.006678	12.11	2097.26	646.16	0.78
Rogue River	28502.78	Q50	3.43	12020.00	1626.90	1636.12	1636.12	1637.86	0.007172	12.87	2284.90	647.68	0.81
Rogue River	28502.78	Q100	3.65	13416.00	1626.90	1636.42	1636.42	1638.24	0.007339	13.36	2482.39	649.17	0.83
Rogue River	28502.78	PF 13	0.80	300.00	1626.90	1629.22	1629.05	1629.51	0.014708	4.34	69.24	78.72	0.81
Rogue River	28502.78	PF 14	0.78	250.00	1626.90	1629.08	1628.90	1629.36	0.014729	4.25	58.87	68.76	0.81

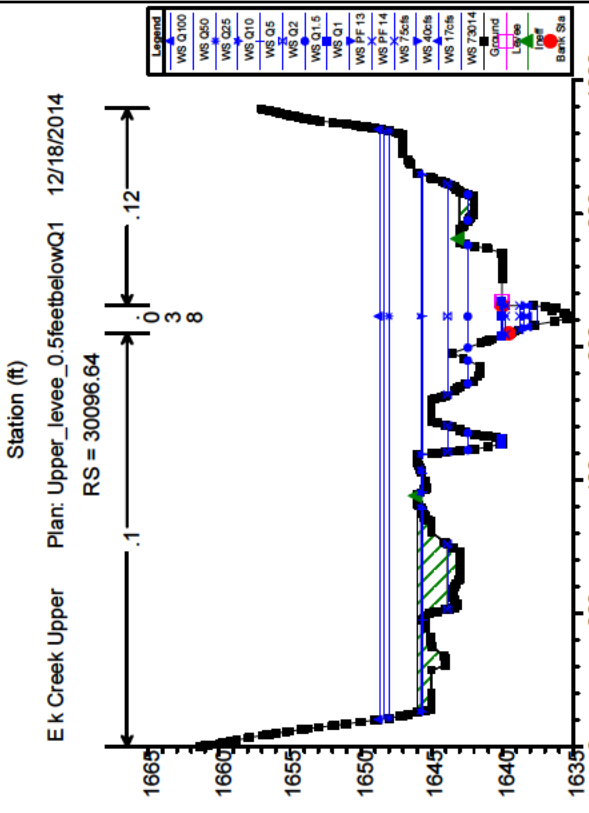
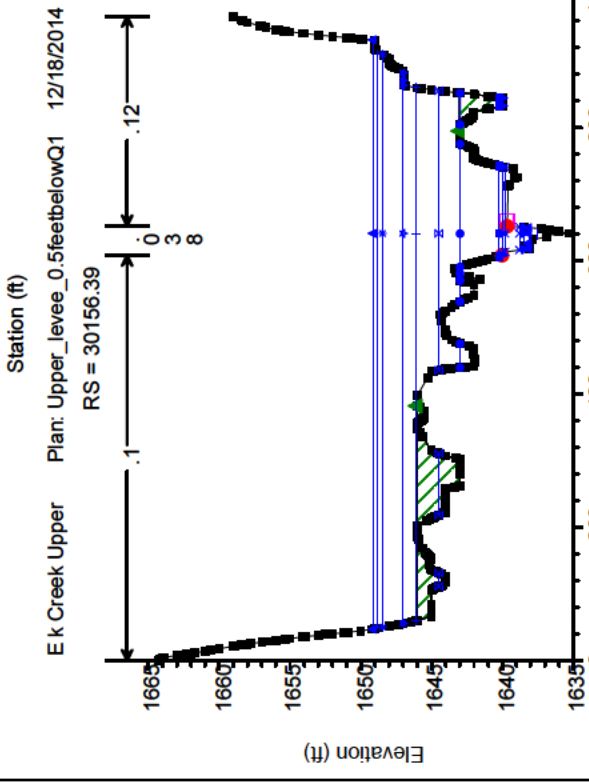
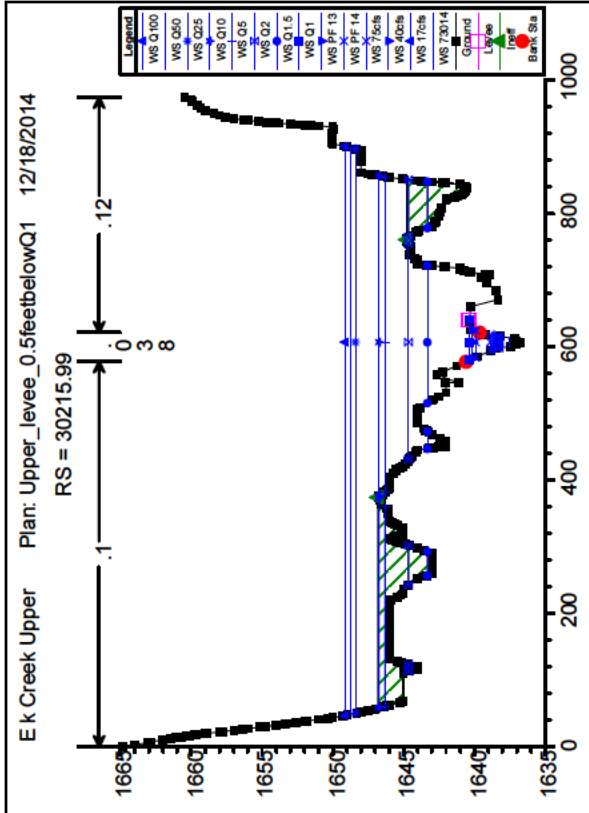
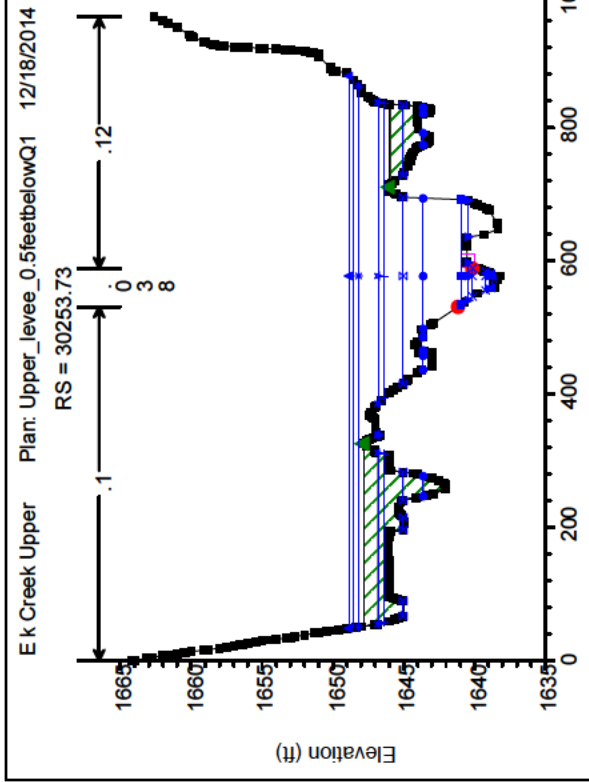
Proposed

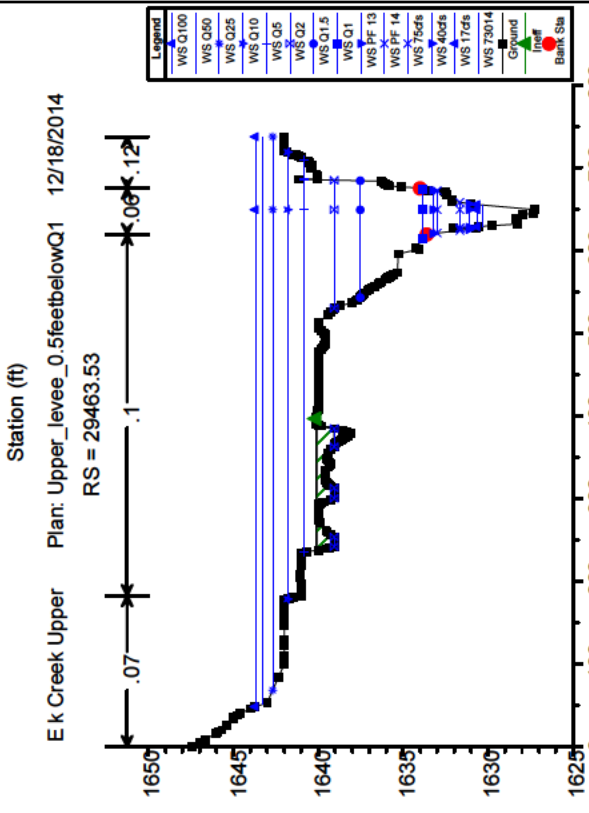
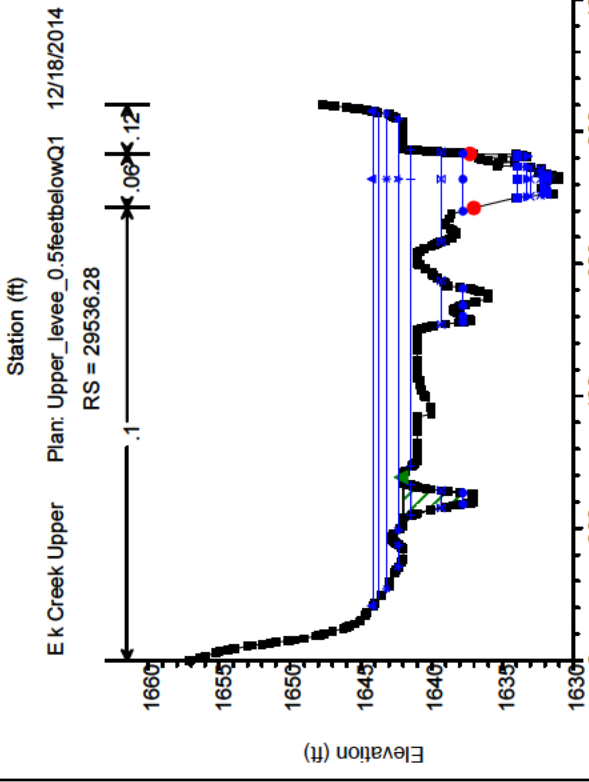
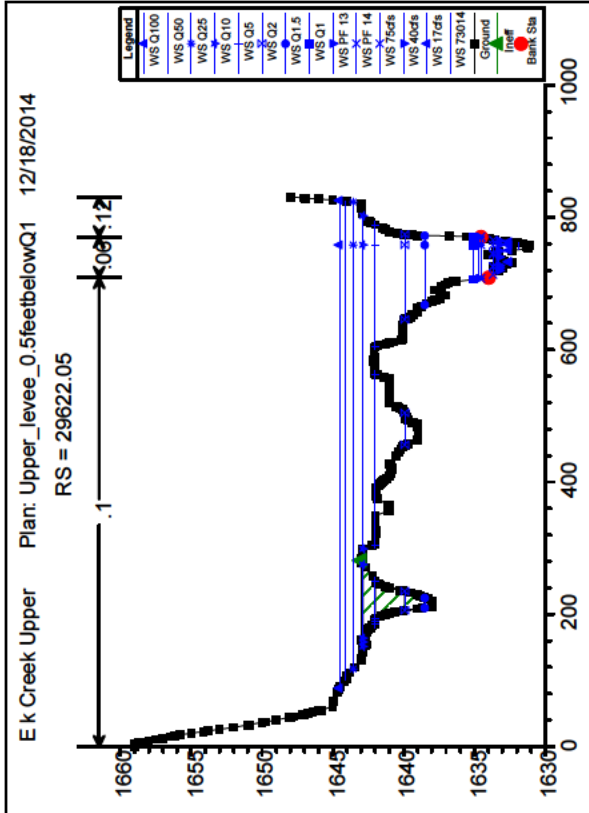
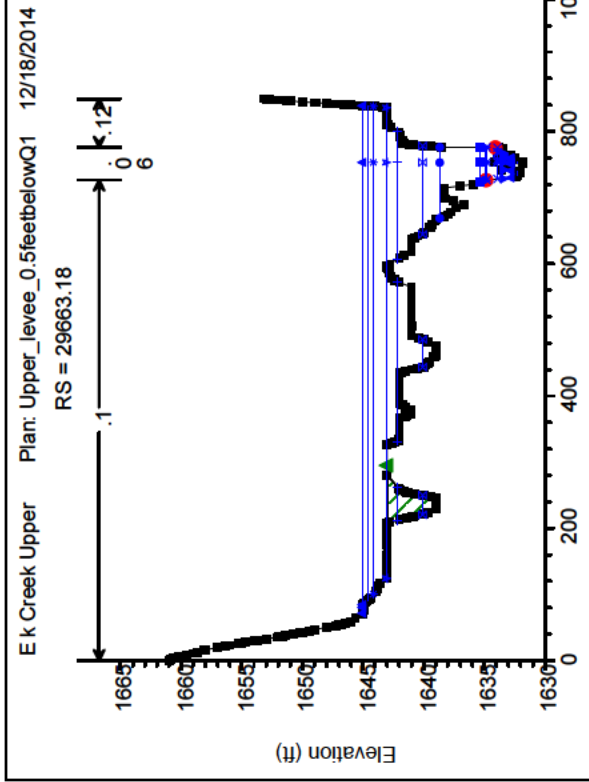


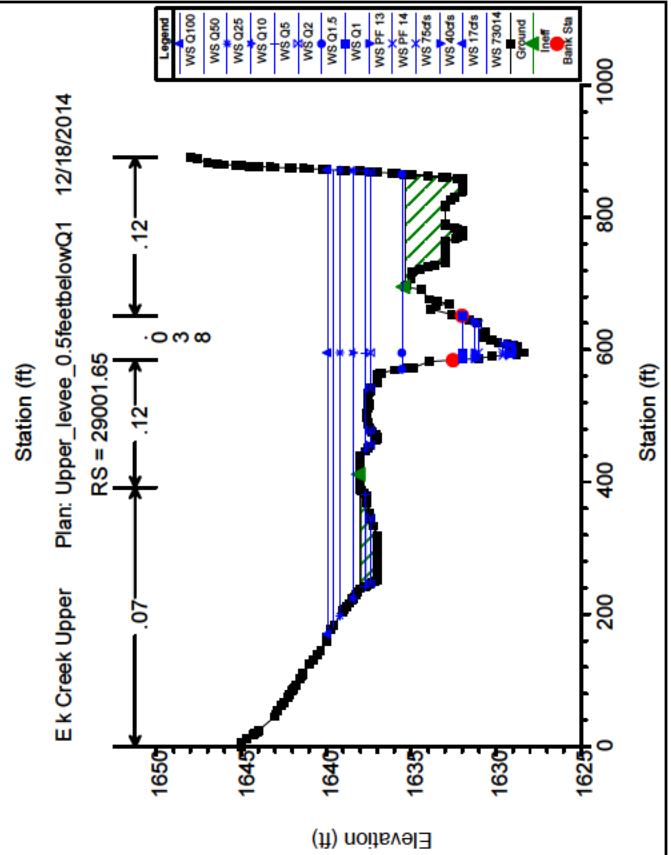
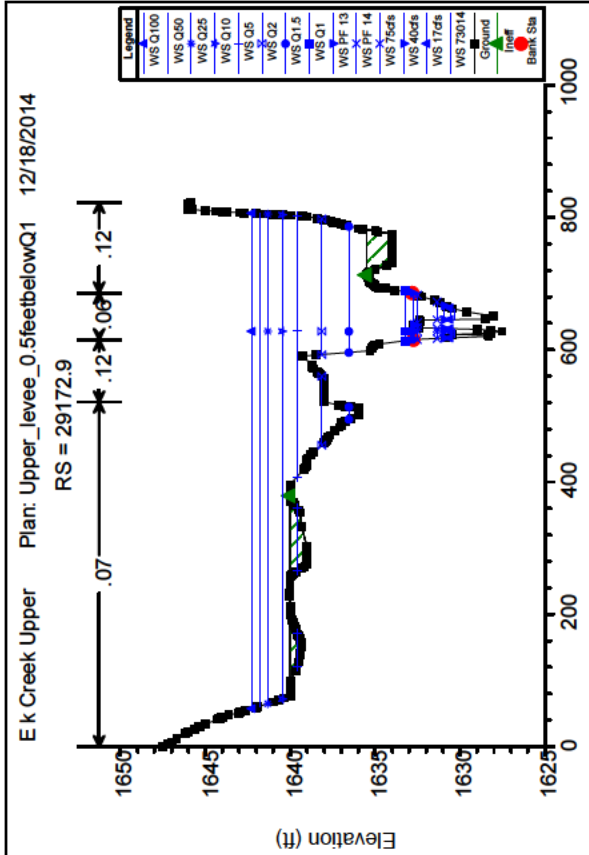
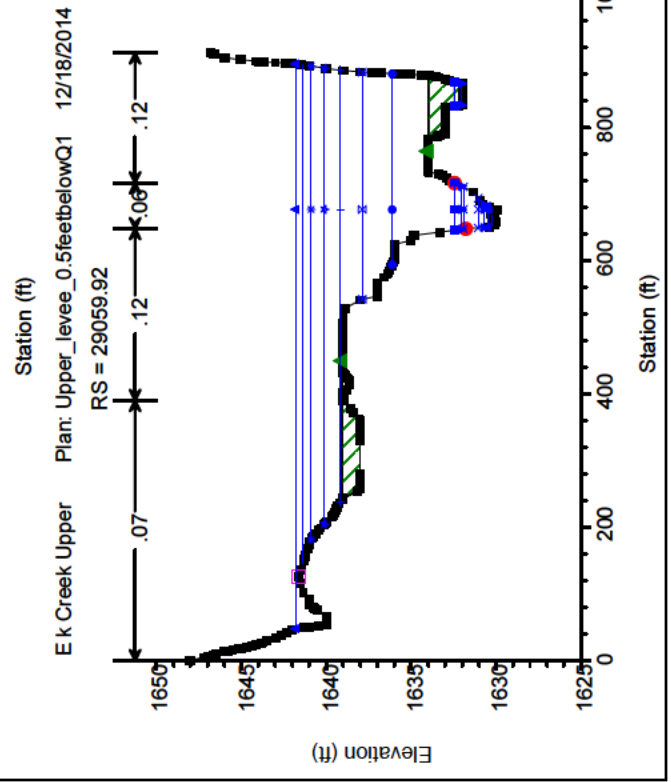
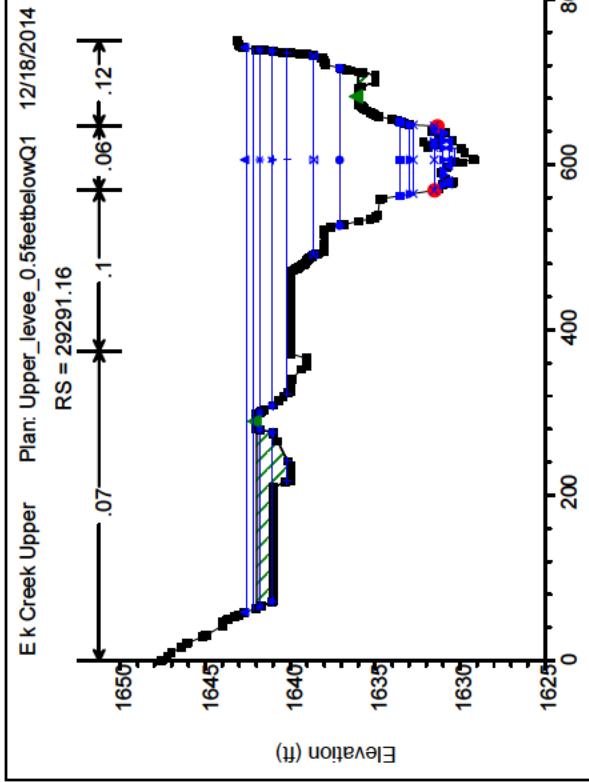
Some schematic data outside default extents (see View/Set Schematic, Plot Extents ...)











HEC-RAS Plan: belowQ1 River: Elk Creek Reach: Rogue River

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	30837.15	73014	0.06	4.00	1641.45	1641.83	1641.70	1641.84	0.004511	0.97	4.11	18.22	0.36
Rogue River	30837.15	17dfs	0.14	17.00	1641.45	1642.14	1641.90	1642.18	0.004941	1.60	10.61	23.75	0.42
Rogue River	30837.15	40cfs	0.20	40.00	1641.45	1642.47	1642.13	1642.53	0.005369	2.03	19.68	32.83	0.46
Rogue River	30837.15	75cfs	0.26	75.00	1641.45	1642.77	1642.39	1642.86	0.005660	2.41	31.15	41.95	0.49
Rogue River	30837.15	Q1	0.58	447.00	1641.45	1643.98	1643.50	1644.23	0.006815	3.98	113.27	84.57	0.60
Rogue River	30837.15	Q1.5	1.60	2300.00	1641.45	1646.18	1645.52	1647.09	0.007235	7.74	318.82	121.11	0.72
Rogue River	30837.15	Q2	1.98	3627.00	1641.45	1647.37	1646.53	1648.61	0.006691	9.03	449.86	171.84	0.73
Rogue River	30837.15	Q5	2.73	6456.00	1641.45	1649.40	1648.37	1651.30	0.006457	11.24	741.73	297.10	0.76
Rogue River	30837.15	Q10	2.35	8309.00	1641.45	1651.03	1648.89	1652.67	0.004493	10.82	1243.73	457.01	0.66
Rogue River	30837.15	Q25	1.80	10514.00	1641.45	1653.01	1651.10	1654.21	0.002789	9.82	2291.28	687.65	0.54
Rogue River	30837.15	Q50	3.18	12020.00	1641.45	1652.25	1652.19	1654.44	0.005306	12.87	1823.44	601.41	0.73
Rogue River	30837.15	Q100	2.81	13416.00	1641.45	1653.13	1652.63	1654.99	0.004287	12.27	2376.60	713.56	0.67
Rogue River	30837.15	PF 13	0.56	300.00	1641.45	1643.56	1643.24	1643.78	0.008302	3.77	79.76	74.12	0.64
Rogue River	30837.15	PF 14	0.53	250.00	1641.45	1643.42	1643.12	1643.62	0.008534	3.58	69.83	71.16	0.63
Rogue River	30758.68	73014	0.40	4.00	1640.64	1640.95	1640.95	1641.03	0.041315	2.28	1.75	11.36	1.02
Rogue River	30758.68	17dfs	0.64	17.00	1640.64	1641.19	1641.19	1641.36	0.031722	3.29	5.17	15.88	1.02
Rogue River	30758.68	40cfs	0.78	40.00	1640.64	1641.47	1641.47	1641.70	0.027472	3.84	10.41	22.67	1.00
Rogue River	30758.68	75cfs	0.83	75.00	1640.64	1641.77	1641.77	1642.02	0.025613	4.03	18.59	35.76	0.99
Rogue River	30758.68	Q1	1.04	447.00	1640.64	1643.04	1643.04	1643.46	0.014320	5.19	86.19	73.16	0.84
Rogue River	30758.68	Q1.5	1.71	2300.00	1640.64	1645.52	1645.52	1646.49	0.007889	7.96	300.22	131.12	0.75
Rogue River	30758.68	Q2	2.00	3627.00	1640.64	1646.82	1646.82	1648.08	0.006757	9.08	430.44	150.25	0.73
Rogue River	30758.68	Q5	2.58	6456.00	1640.64	1648.97	1647.80	1650.78	0.006008	10.96	684.76	187.91	0.73
Rogue River	30758.68	Q10	2.77	8309.00	1640.64	1650.24	1648.76	1652.24	0.005467	11.69	1079.85	457.50	0.72
Rogue River	30758.68	Q25	1.63	10514.00	1640.64	1652.89	1652.89	1653.97	0.002427	9.38	2458.93	642.47	0.70
Rogue River	30758.68	Q50	3.00	12020.00	1640.64	1651.93	1651.46	1654.01	0.004896	12.53	1866.04	571.31	0.50
Rogue River	30758.68	Q100	3.33	13416.00	1640.64	1652.29	1652.29	1654.59	0.005247	13.29	2083.92	627.55	0.73
Rogue River	30758.68	PF 13	0.81	300.00	1640.64	1642.70	1642.70	1643.03	0.010791	4.58	65.48	54.11	0.73
Rogue River	30758.68	PF 14	0.75	250.00	1640.64	1642.56	1642.56	1642.85	0.011177	4.34	57.62	53.11	0.73
Rogue River	30716.26	73014	0.01	4.00	1639.79	1640.32	1639.96	1640.32	0.000365	0.41	9.80	24.16	0.11
Rogue River	30716.26	17dfs	0.03	17.00	1639.79	1640.73	1640.14	1640.74	0.000663	0.83	20.42	26.94	0.17
Rogue River	30716.26	40cfs	0.07	40.00	1639.79	1641.08	1640.35	1641.11	0.001112	1.33	30.13	29.01	0.23
Rogue River	30716.26	75cfs	0.12	75.00	1639.79	1641.45	1640.58	1641.50	0.001512	1.82	41.28	31.16	0.28
Rogue River	30716.26	Q1	0.42	447.00	1639.79	1642.90	1639.79	1643.09	0.004265	3.48	129.39	83.27	0.48
Rogue River	30716.26	Q1.5	1.18	2300.00	1639.79	1645.45	1645.45	1646.16	0.004592	6.81	364.15	113.22	0.59
Rogue River	30716.26	Q2	1.50	3627.00	1639.79	1646.79	1646.79	1647.76	0.004417	8.03	508.06	167.43	0.60
Rogue River	30716.26	Q5	2.06	6456.00	1639.79	1649.00	1647.10	1650.47	0.004332	9.97	794.92	312.66	0.63
Rogue River	30716.26	Q10	2.32	8309.00	1639.79	1650.24	1648.22	1651.95	0.004193	10.84	1179.58	513.62	0.64
Rogue River	30716.26	Q25	1.25	10514.00	1639.79	1653.00	1648.61	1653.80	0.001729	8.32	2859.34	662.45	0.43
Rogue River	30716.26	Q50	2.27	12020.00	1639.79	1652.14	1651.35	1653.67	0.003388	11.07	2301.10	639.05	0.59
Rogue River	30716.26	Q100	2.45	13416.00	1639.79	1652.51	1651.82	1654.13	0.003529	11.56	2540.27	648.52	0.61

HEC-RAS Plan: belowQ1 River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	30716.26	PF 13	0.33	300.00	1639.79	1642.57	1642.70	1642.70	0.004133	2.94	102.29	81.28	0.46
Rogue River	30716.26	PF 14	0.29	250.00	1639.79	1642.42	1642.54	1642.54	0.003851	2.76	90.47	74.32	0.44
Rogue River	30665.53	73014	0.53	4.00	1639.59	1640.12	1640.12	1640.25	0.036879	2.81	1.42	5.85	1.00
Rogue River	30665.53	17dfs	0.63	17.00	1639.59	1640.47	1640.47	1640.62	0.035542	3.19	5.34	17.79	1.02
Rogue River	30665.53	40cfs	0.76	40.00	1639.59	1640.72	1640.72	1640.93	0.028296	3.73	10.71	23.50	0.97
Rogue River	30665.53	75cfs	1.01	75.00	1639.59	1640.95	1640.95	1641.27	0.027682	4.56	16.46	26.02	1.01
Rogue River	30665.53	Q1	1.00	447.00	1639.59	1642.31	1642.70	1642.70	0.014097	5.06	88.31	73.73	0.82
Rogue River	30665.53	Q1.5	2.05	2300.00	1639.59	1644.64	1645.78	1645.78	0.010225	8.62	272.26	83.47	0.82
Rogue River	30665.53	Q2	2.52	3627.00	1639.59	1645.84	1645.28	1647.39	0.009321	10.04	378.86	132.26	0.82
Rogue River	30665.53	Q5	3.68	6456.00	1639.59	1647.58	1647.28	1650.05	0.009894	12.77	572.50	194.56	0.89
Rogue River	30665.53	Q10	4.05	8309.00	1639.59	1648.70	1648.49	1651.53	0.009291	13.78	722.11	344.09	0.88
Rogue River	30665.53	Q25	6.50	10514.00	1639.59	1648.69	1648.69	1653.23	0.014921	17.45	721.19	343.13	1.12
Rogue River	30665.53	Q50	3.10	12020.00	1639.59	1651.34	1651.34	1653.41	0.005265	12.67	1992.68	646.38	0.70
Rogue River	30665.53	Q100	3.23	13416.00	1639.59	1651.76	1651.76	1653.86	0.005270	13.03	2266.83	656.93	0.71
Rogue River	30665.53	PF 13	1.11	300.00	1639.59	1641.88	1641.82	1642.28	0.019562	5.12	58.57	61.27	0.92
Rogue River	30665.53	PF 14	1.15	250.00	1639.59	1641.71	1641.69	1642.12	0.022544	5.14	48.68	56.32	0.97
Rogue River	30640.16	73014	0.05	4.00	1638.98	1639.65	1639.50	1639.67	0.003230	0.89	4.51	17.77	0.31
Rogue River	30640.16	17dfs	0.16	17.00	1638.98	1639.93	1639.71	1639.97	0.005520	1.74	9.79	21.02	0.45
Rogue River	30640.16	40cfs	0.19	40.00	1638.98	1640.35	1639.94	1640.41	0.004148	2.03	19.73	27.04	0.42
Rogue River	30640.16	75cfs	0.27	75.00	1638.98	1640.69	1640.21	1640.78	0.004778	2.50	29.98	33.25	0.46
Rogue River	30640.16	Q1	0.74	447.00	1638.98	1642.09	1642.40	1642.40	0.008887	4.45	100.49	74.37	0.67
Rogue River	30640.16	Q1.5	1.42	2300.00	1638.98	1644.66	1645.48	1645.48	0.006297	7.30	320.73	89.19	0.66
Rogue River	30640.16	Q2	1.76	3627.00	1638.98	1645.95	1647.08	1647.08	0.005795	8.54	439.20	143.08	0.67
Rogue River	30640.16	Q5	2.66	6456.00	1638.98	1647.79	1649.67	1649.67	0.006431	11.06	628.64	219.70	0.74
Rogue River	30640.16	Q10	3.05	8309.00	1638.98	1648.92	1647.67	1651.16	0.006338	12.15	766.10	414.52	0.76
Rogue River	30640.16	Q25	7.08	10514.00	1638.98	1647.78	1648.75	1652.77	0.017142	18.04	627.45	218.99	1.21
Rogue River	30640.16	Q50	4.13	12020.00	1638.98	1650.13	1650.81	1653.16	0.007461	14.48	1375.13	597.92	0.84
Rogue River	30640.16	Q100	4.10	13416.00	1638.98	1650.69	1651.30	1653.62	0.006971	14.56	1715.39	613.11	0.82
Rogue River	30640.16	PF 13	0.60	300.00	1638.98	1641.70	1641.95	1641.95	0.007292	4.00	75.03	56.03	0.61
Rogue River	30640.16	PF 14	0.51	250.00	1638.98	1641.57	1641.78	1641.78	0.006296	3.67	68.10	51.81	0.56
Rogue River	30602.08	73014	0.35	4.00	1638.91	1639.28	1639.28	1639.35	0.047317	2.06	1.94	16.28	1.05
Rogue River	30602.08	17dfs	0.09	17.00	1638.91	1639.80	1639.82	1639.82	0.002669	1.31	12.97	24.68	0.32
Rogue River	30602.08	40cfs	0.11	40.00	1638.91	1640.24	1640.28	1640.28	0.002501	1.53	26.12	37.42	0.32
Rogue River	30602.08	75cfs	0.15	75.00	1638.91	1640.58	1640.63	1640.63	0.002878	1.85	40.55	48.59	0.36
Rogue River	30602.08	Q1	0.42	447.00	1638.91	1641.96	1642.15	1642.15	0.003865	3.50	127.54	72.98	0.47
Rogue River	30602.08	Q1.5	1.17	2300.00	1638.91	1644.54	1645.24	1645.24	0.004698	6.75	352.42	99.61	0.59
Rogue River	30602.08	Q2	1.47	3627.00	1638.91	1645.88	1646.84	1646.84	0.004414	7.92	493.70	130.77	0.60
Rogue River	30602.08	Q5	2.21	6456.00	1638.91	1647.79	1649.37	1649.37	0.004905	10.22	723.94	306.18	0.67
Rogue River	30602.08	Q10	2.49	8309.00	1638.91	1648.99	1647.23	1650.83	0.004760	11.14	983.75	439.45	0.67

HEC-RAS Plan: belowQ1 River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	30602.08	Q25	2.77	10514.00	1638.91	1649.93	1648.36	1651.93	0.004765	11.96	1549.91	619.09	0.69
Rogue River	30602.08	Q50	3.00	12020.00	1638.91	1650.39	1650.34	1652.51	0.004913	12.54	1839.45	634.09	0.70
Rogue River	30602.08	Q100	4.82	13416.00	1638.91	1649.77	1650.78	1653.28	0.008427	15.72	1451.52	614.30	0.91
Rogue River	30602.08	PF 13	0.31	300.00	1638.91	1641.60		1641.74	0.003332	2.93	102.40	68.63	0.42
Rogue River	30602.08	PF 14	0.25	250.00	1638.91	1641.49		1641.60	0.002914	2.64	94.59	66.91	0.39
Rogue River	30549.94	73014	0.01	4.00	1638.16	1639.25	1638.61	1639.25	0.000315	0.46	8.77	16.14	0.11
Rogue River	30549.94	17dfs	0.03	17.00	1638.16	1639.74	1639.75	1639.75	0.000834	0.86	19.71	29.03	0.18
Rogue River	30549.94	40dfs	0.05	40.00	1638.16	1640.17	1640.18	1640.18	0.001259	1.04	38.61	59.19	0.23
Rogue River	30549.94	75dfs	0.06	75.00	1638.16	1640.51	1640.53	1640.53	0.001172	1.23	61.13	68.89	0.23
Rogue River	30549.94	Q1	0.25	447.00	1638.16	1641.87	1641.99	1641.99	0.001848	2.78	161.49	76.64	0.33
Rogue River	30549.94	Q1.5	1.09	2300.00	1638.16	1644.34	1645.01	1645.01	0.003812	6.64	363.68	119.48	0.54
Rogue River	30549.94	Q2	1.53	3627.00	1638.16	1645.58	1646.60	1646.60	0.004222	8.19	482.63	142.60	0.60
Rogue River	30549.94	Q5	2.84	6456.00	1638.16	1647.01	1645.88	1649.04	0.006317	11.59	644.91	380.81	0.76
Rogue River	30549.94	Q10	4.27	8309.00	1638.16	1647.30	1646.89	1650.38	0.009145	14.30	684.57	460.10	0.92
Rogue River	30549.94	Q25	2.87	10514.00	1638.16	1649.66	1649.66	1651.68	0.004683	12.27	1821.81	707.65	0.69
Rogue River	30549.94	Q50	2.96	12020.00	1638.16	1650.22	1650.22	1652.23	0.004568	12.57	2230.05	740.76	0.68
Rogue River	30549.94	Q100	3.04	13416.00	1638.16	1650.67	1650.63	1652.67	0.004501	12.83	2561.45	747.64	0.68
Rogue River	30549.94	PF 13	0.17	300.00	1638.16	1641.53	1641.61	1641.61	0.001475	2.22	135.56	75.71	0.29
Rogue River	30549.94	PF 14	0.13	250.00	1638.16	1641.43	1641.49	1641.49	0.001250	1.96	127.60	75.42	0.26
Rogue River	30360.14	73014	0.03	4.00	1638.66	1639.12	1638.92	1639.13	0.001948	0.72	5.56	20.62	0.24
Rogue River	30360.14	17dfs	0.07	17.00	1638.66	1639.48	1639.13	1639.50	0.002333	1.17	14.56	29.83	0.29
Rogue River	30360.14	40dfs	0.11	40.00	1638.66	1639.81	1639.35	1639.85	0.002654	1.54	25.91	38.38	0.33
Rogue River	30360.14	75dfs	0.15	75.00	1638.66	1640.15	1639.59	1640.20	0.002829	1.86	40.31	47.35	0.36
Rogue River	30360.14	Q1	0.37	447.00	1638.66	1641.36	1640.76	1641.51	0.003593	3.30	214.99	230.16	0.45
Rogue River	30360.14	Q1.5	0.64	2300.00	1638.66	1644.05	1642.42	1644.33	0.002376	5.07	877.22	296.39	0.43
Rogue River	30360.14	Q2	0.89	3627.00	1638.66	1645.39	1643.12	1645.82	0.002512	6.23	1303.16	463.46	0.46
Rogue River	30360.14	Q5	1.01	6456.00	1638.66	1647.46	1644.32	1647.93	0.002098	7.00	2233.25	674.07	0.44
Rogue River	30360.14	Q10	1.39	8309.00	1638.66	1648.14	1645.77	1648.81	0.002644	8.31	2589.21	766.63	0.50
Rogue River	30360.14	Q25	1.24	10514.00	1638.66	1649.48	1646.50	1650.04	0.002041	8.05	3625.57	781.61	0.45
Rogue River	30360.14	Q50	1.37	12020.00	1638.66	1649.88	1646.91	1650.50	0.002173	8.53	3945.22	784.02	0.47
Rogue River	30360.14	Q100	1.51	13416.00	1638.66	1650.23	1647.28	1650.89	0.002304	8.98	4214.06	788.47	0.49
Rogue River	30360.14	PF 13	0.41	300.00	1638.66	1640.95	1640.43	1641.12	0.005201	3.29	91.70	78.89	0.51
Rogue River	30360.14	PF 14	0.25	250.00	1638.66	1641.03	1640.27	1641.13	0.002970	2.59	97.84	81.87	0.39
Rogue River	30253.73	73014	0.41	4.00	1638.17	1638.48	1638.48	1638.57	0.037488	2.36	1.69	9.66	1.00
Rogue River	30253.73	17dfs	0.54	17.00	1638.17	1638.74	1638.74	1638.87	0.031753	2.94	5.78	20.99	0.99
Rogue River	30253.73	40dfs	0.77	40.00	1638.17	1638.95	1638.95	1639.17	0.027894	3.78	10.59	23.95	1.00
Rogue River	30253.73	75dfs	0.95	75.00	1638.17	1639.20	1639.20	1639.50	0.025141	4.42	16.96	28.03	1.00
Rogue River	30253.73	Q1	0.45	447.00	1638.17	1640.94	1640.42	1641.09	0.004430	3.59	219.80	158.04	0.50
Rogue River	30253.73	Q1.5	0.97	2300.00	1638.17	1643.60	1642.01	1644.01	0.003691	6.17	703.85	278.46	0.53

HEC-RAS Plan: belowQ1 River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	30253.73	Q2	1.10	3627.00	1638.17	1645.03	1642.89	1645.51	0.003141	6.92	1077.23	470.45	0.51
Rogue River	30253.73	Q5	2.36	6456.00	1638.17	1646.38	1644.53	1647.53	0.005429	10.50	1531.44	695.98	0.70
Rogue River	30253.73	Q10	3.15	8309.00	1638.17	1646.80	1645.23	1648.30	0.006854	12.25	1716.34	711.31	0.79
Rogue River	30253.73	Q25	3.02	10514.00	1638.17	1648.18	1645.47	1649.62	0.005534	12.34	2524.98	811.57	0.73
Rogue River	30253.73	Q50	3.33	12020.00	1638.17	1648.50	1647.75	1650.05	0.005889	13.04	2791.03	820.37	0.76
Rogue River	30253.73	Q100	3.58	13416.00	1638.17	1648.80	1648.70	1650.42	0.006124	13.59	3035.88	828.48	0.78
Rogue River	30253.73	PF 13	0.38	300.00	1638.17	1640.48	1640.11	1640.60	0.004453	3.21	149.92	112.28	0.48
Rogue River	30253.73	PF 14	1.01	250.00	1638.17	1640.11	1639.94	1640.51	0.014131	5.09	49.09	42.49	0.84
Rogue River	30215.99	73014	0.02	4.00	1636.72	1637.56	1637.15	1637.56	0.000691	0.62	6.49	13.81	0.16
Rogue River	30215.99	17cfs	0.05	17.00	1636.72	1638.15	1637.43	1638.17	0.000894	1.09	15.67	17.16	0.20
Rogue River	30215.99	40cfs	0.13	40.00	1636.72	1638.50	1637.74	1638.55	0.001840	1.81	22.05	19.12	0.30
Rogue River	30215.99	75cfs	0.25	75.00	1636.72	1638.85	1638.07	1638.95	0.003301	2.54	29.56	24.08	0.40
Rogue River	30215.99	Q1	1.03	447.00	1636.72	1640.35	1639.88	1640.83	0.008709	5.57	83.24	61.43	0.71
Rogue River	30215.99	Q1.5	1.26	2300.00	1636.72	1643.30	1642.08	1643.85	0.004306	7.20	672.86	337.96	0.58
Rogue River	30215.99	Q2	1.62	3627.00	1636.72	1644.64	1643.10	1645.35	0.004312	8.49	1033.48	481.54	0.61
Rogue River	30215.99	Q5	2.26	6456.00	1636.72	1646.32	1643.96	1647.28	0.004716	10.45	1767.85	771.48	0.66
Rogue River	30215.99	Q10	3.06	8309.00	1636.72	1646.71	1645.95	1647.99	0.006096	12.27	1952.79	795.38	0.76
Rogue River	30215.99	Q25	2.29	10514.00	1636.72	1648.40	1647.53	1649.27	0.003772	10.94	3313.48	847.24	0.61
Rogue River	30215.99	Q50	2.46	12020.00	1636.72	1648.77	1647.87	1649.68	0.003913	11.42	3629.50	850.89	0.63
Rogue River	30215.99	Q100	2.62	13416.00	1636.72	1649.09	1648.29	1650.03	0.004035	11.83	3902.45	853.93	0.64
Rogue River	30215.99	PF 13	0.61	300.00	1636.72	1640.11	1639.40	1640.39	0.005602	4.25	71.62	43.99	0.56
Rogue River	30215.99	PF 14	0.56	250.00	1636.72	1639.90	1639.17	1640.15	0.005555	4.03	62.44	40.10	0.55
Rogue River	30156.39	73014	0.00	4.00	1635.25	1637.55	1635.94	1637.56	0.000043	0.25	15.97	15.76	0.04
Rogue River	30156.39	17cfs	0.02	17.00	1635.25	1638.13	1636.49	1638.14	0.000251	0.64	26.64	24.29	0.11
Rogue River	30156.39	40cfs	0.05	40.00	1635.25	1638.46	1637.03	1638.48	0.000731	1.10	36.45	33.15	0.18
Rogue River	30156.39	75cfs	0.09	75.00	1635.25	1638.79	1637.41	1638.82	0.001129	1.58	47.50	34.60	0.24
Rogue River	30156.39	Q1	0.51	447.00	1635.25	1640.20	1639.16	1640.43	0.003660	4.03	165.20	148.34	0.47
Rogue River	30156.39	Q1.5	1.32	2300.00	1635.25	1642.96	1641.78	1643.58	0.004361	7.41	657.59	309.18	0.58
Rogue River	30156.39	Q2	1.34	3627.00	1635.25	1644.49	1642.85	1645.09	0.003400	7.80	1229.24	532.96	0.53
Rogue River	30156.39	Q5	2.04	6456.00	1635.25	1646.12	1644.85	1647.00	0.004136	9.97	1975.02	800.01	0.61
Rogue River	30156.39	Q10	1.99	8309.00	1635.25	1646.99	1645.40	1647.77	0.003661	10.03	2677.30	818.47	0.59
Rogue River	30156.39	Q25	1.57	10514.00	1635.25	1648.45	1646.80	1649.00	0.002481	9.12	3909.89	859.92	0.49
Rogue River	30156.39	Q50	1.74	12020.00	1635.25	1648.81	1647.21	1649.40	0.002662	9.66	4217.18	865.52	0.51
Rogue River	30156.39	Q100	1.94	13416.00	1635.25	1649.10	1647.47	1649.75	0.002895	10.25	4470.94	883.85	0.54
Rogue River	30156.39	PF 13	0.29	300.00	1635.25	1640.01	1638.74	1640.15	0.002315	3.03	139.56	144.58	0.37
Rogue River	30156.39	PF 14	0.26	250.00	1635.25	1639.80	1638.57	1639.92	0.002028	2.87	111.96	127.03	0.34
Rogue River	30096.64	73014	0.00	4.00	1635.42	1637.55	1635.70	1637.55	0.000004	0.10	39.47	27.83	0.01
Rogue River	30096.64	17cfs	0.00	17.00	1635.42	1638.13	1635.98	1638.13	0.000028	0.30	56.72	31.85	0.04
Rogue River	30096.64	40cfs	0.01	40.00	1635.42	1638.46	1636.30	1638.46	0.000098	0.59	67.40	34.13	0.07

HEC-RAS Plan: belowQ1 River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	30096.64	75dfs	0.03	75.00	1635.42	1638.78	1636.61	1638.79	0.000225	0.95	78.71	36.38	0.11
Rogue River	30096.64	Q1	0.33	447.00	1635.42	1640.09	1638.20	1640.27	0.001778	3.40	133.90	60.62	0.34
Rogue River	30096.64	Q1.5	1.59	2300.00	1635.42	1642.42	1641.66	1643.28	0.004952	8.20	529.73	253.05	0.62
Rogue River	30096.64	Q2	1.84	3627.00	1635.42	1643.86	1642.82	1644.82	0.004552	9.18	953.18	454.35	0.61
Rogue River	30096.64	Q5	2.30	6456.00	1635.42	1645.65	1644.79	1646.72	0.004507	10.64	1648.62	748.29	0.64
Rogue River	30096.64	Q10	3.62	8309.00	1635.42	1645.75	1645.75	1647.43	0.007018	13.38	1694.34	760.68	0.79
Rogue River	30096.64	Q25	2.03	10514.00	1635.42	1648.02	1646.99	1648.82	0.003139	10.43	3527.49	881.08	0.55
Rogue River	30096.64	Q50	2.23	12020.00	1635.42	1648.37	1647.54	1649.21	0.003329	10.96	3833.68	883.45	0.57
Rogue River	30096.64	Q100	2.38	13416.00	1635.42	1648.68	1647.81	1649.56	0.003468	11.39	4109.11	885.57	0.59
Rogue River	30096.64	PF 13	0.16	300.00	1635.42	1639.96	1637.69	1640.05	0.000922	2.38	126.71	44.70	0.24
Rogue River	30096.64	PF 14	0.13	250.00	1635.42	1639.76	1637.49	1639.83	0.000798	2.12	117.96	43.30	0.22
Rogue River	30031.7	73014	0.00	4.00	1634.58	1637.55	1635.09	1637.55	0.000001	0.06	63.45	41.69	0.01
Rogue River	30031.7	17dfs	0.00	17.00	1634.58	1638.13	1635.39	1638.13	0.000010	0.20	88.98	46.60	0.02
Rogue River	30031.7	40dfs	0.01	40.00	1634.58	1638.46	1635.72	1638.46	0.000034	0.41	104.47	49.34	0.05
Rogue River	30031.7	75dfs	0.01	75.00	1634.58	1638.77	1635.99	1638.78	0.000080	0.69	120.64	52.04	0.07
Rogue River	30031.7	Q1	0.18	447.00	1634.58	1640.08	1637.54	1640.18	0.000725	2.66	245.69	109.12	0.23
Rogue River	30031.7	Q1.5	1.41	2300.00	1634.58	1642.19	1640.80	1642.98	0.003756	7.94	567.26	265.41	0.56
Rogue River	30031.7	Q2	2.46	3627.00	1634.58	1643.06	1642.41	1644.46	0.005747	10.70	790.96	433.88	0.70
Rogue River	30031.7	Q5	3.14	6456.00	1634.58	1644.79	1644.73	1646.36	0.005912	12.52	1421.34	608.54	0.74
Rogue River	30031.7	Q10	3.61	8309.00	1634.58	1645.58	1645.58	1647.31	0.006253	13.63	1781.42	771.19	0.77
Rogue River	30031.7	Q25	3.13	10514.00	1634.58	1647.16	1647.16	1648.54	0.004653	13.00	2960.43	878.37	0.68
Rogue River	30031.7	Q50	3.41	12020.00	1634.58	1647.48	1647.48	1648.92	0.004940	13.65	3238.19	880.08	0.71
Rogue River	30031.7	Q100	3.70	13416.00	1634.58	1647.73	1647.73	1649.24	0.005249	14.27	3460.22	881.53	0.73
Rogue River	30031.7	PF 13	0.09	300.00	1634.58	1639.95	1637.06	1640.00	0.000367	1.85	232.33	108.04	0.16
Rogue River	30031.7	PF 14	0.07	250.00	1634.58	1639.75	1636.85	1639.79	0.000309	1.65	210.99	106.34	0.15
Rogue River	29950.26	73014	0.13	4.00	1636.51	1637.54	1637.00	1637.55	0.005987	0.94	4.25	9.12	0.24
Rogue River	29950.26	17dfs	0.18	17.00	1636.51	1638.11	1637.56	1638.13	0.007357	1.13	15.11	34.38	0.30
Rogue River	29950.26	40dfs	0.26	40.00	1636.51	1638.41	1637.97	1638.45	0.007351	1.45	27.53	43.29	0.32
Rogue River	29950.26	75dfs	0.38	75.00	1636.51	1638.70	1638.22	1638.76	0.007754	1.86	40.36	45.42	0.35
Rogue River	29950.26	Q1	0.91	447.00	1636.51	1639.90	1639.28	1640.03	0.009069	3.23	198.24	152.61	0.43
Rogue River	29950.26	Q1.5	2.53	2300.00	1636.51	1641.97	1640.85	1642.36	0.011740	6.13	605.84	294.44	0.55
Rogue River	29950.26	Q2	2.71	3627.00	1636.51	1643.15	1641.68	1643.57	0.009605	6.63	982.02	581.43	0.52
Rogue River	29950.26	Q5	2.43	6456.00	1636.51	1645.16	1643.00	1645.52	0.006136	6.64	1879.62	765.60	0.44
Rogue River	29950.26	Q10	2.83	8309.00	1636.51	1645.85	1643.77	1646.25	0.006522	7.28	2227.27	815.58	0.46
Rogue River	29950.26	Q25	4.72	10514.00	1636.51	1646.36	1644.32	1647.05	0.010205	9.51	2615.74	877.02	0.58
Rogue River	29950.26	Q50	4.36	12020.00	1636.51	1646.86	1644.60	1647.47	0.008887	9.23	3055.55	880.69	0.55
Rogue River	29950.26	Q100	4.42	13416.00	1636.51	1647.19	1644.87	1647.78	0.008678	9.35	3341.41	882.70	0.55
Rogue River	29950.26	PF 13	0.87	300.00	1636.51	1639.76	1638.94	1639.91	0.009384	3.13	96.45	65.40	0.43
Rogue River	29950.26	PF 14	0.78	250.00	1636.51	1639.58	1638.80	1639.71	0.009193	2.92	85.76	56.66	0.42

HEC-RAS Plan: belowQ1 River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E. G. Elev (ft)	E. G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	29851.09	73014	1.23	4.00	1635.28	1635.86	1635.86	1635.96	0.115333	2.59	1.55	7.61	1.01
Rogue River	29851.09	17dfs	1.58	17.00	1635.28	1636.18	1636.18	1636.33	0.092310	3.18	5.35	16.66	0.99
Rogue River	29851.09	40cfs	2.08	40.00	1635.28	1636.43	1636.43	1636.65	0.089685	3.84	10.42	24.01	1.03
Rogue River	29851.09	75cfs	2.21	75.00	1635.28	1636.70	1636.70	1636.96	0.077098	4.09	18.39	35.41	0.99
Rogue River	29851.09	Q1	3.11	447.00	1635.28	1637.81	1637.81	1638.27	0.044875	5.63	95.46	119.49	0.90
Rogue River	29851.09	Q1.5	2.60	2300.00	1635.28	1640.73	1639.60	1641.20	0.011256	6.29	527.70	225.98	0.55
Rogue River	29851.09	Q2	2.47	3627.00	1635.28	1642.26	1640.44	1642.71	0.007769	6.47	927.71	426.18	0.48
Rogue River	29851.09	Q5	2.17	6456.00	1635.28	1644.63	1641.98	1645.00	0.004797	6.43	2005.96	728.79	0.40
Rogue River	29851.09	Q10	2.40	8309.00	1635.28	1645.33	1642.89	1645.72	0.004862	6.85	2507.52	779.61	0.41
Rogue River	29851.09	Q25	2.94	10514.00	1635.28	1645.83	1643.44	1646.28	0.005634	7.65	2868.48	812.98	0.45
Rogue River	29851.09	Q50	3.77	12020.00	1635.28	1646.15	1644.48	1646.73	0.006995	8.72	3122.94	844.34	0.50
Rogue River	29851.09	Q100	3.89	13416.00	1635.28	1646.48	1644.76	1647.07	0.006966	8.91	3402.05	848.68	0.50
Rogue River	29851.09	PF 13	3.34	300.00	1635.28	1637.45	1637.45	1637.93	0.062522	5.59	54.42	57.92	1.01
Rogue River	29851.09	PF 14	3.08	250.00	1635.28	1637.34	1637.34	1637.77	0.063100	5.28	47.94	55.88	1.00
Rogue River	29745.94	73014	0.05	4.00	1632.69	1633.16	1632.92	1633.16	0.003191	0.59	6.79	24.53	0.20
Rogue River	29745.94	17dfs	0.13	17.00	1632.69	1633.51	1633.51	1633.53	0.004144	1.01	16.89	33.11	0.25
Rogue River	29745.94	40cfs	0.18	40.00	1632.69	1633.88	1633.32	1633.91	0.003783	1.28	31.24	39.79	0.25
Rogue River	29745.94	75cfs	0.23	75.00	1632.69	1634.30	1633.56	1634.34	0.003328	1.54	48.57	42.29	0.25
Rogue River	29745.94	Q1	0.79	447.00	1632.69	1636.03	1634.70	1636.19	0.004925	3.26	138.10	54.37	0.35
Rogue River	29745.94	Q1.5	2.44	2300.00	1632.69	1639.66		1640.30	0.006396	6.62	427.16	155.06	0.47
Rogue River	29745.94	Q2	3.09	3627.00	1632.69	1641.12		1641.92	0.006556	7.72	705.29	257.64	0.49
Rogue River	29745.94	Q5	4.72	6456.00	1632.69	1643.08	1641.52	1644.27	0.007991	9.91	1405.38	701.36	0.56
Rogue River	29745.94	Q10	2.76	8309.00	1632.69	1644.69	1644.69	1645.23	0.004012	7.78	2615.98	815.53	0.41
Rogue River	29745.94	Q25	3.82	10514.00	1632.69	1644.95		1645.67	0.005415	9.17	2823.34	820.77	0.48
Rogue River	29745.94	Q50	4.17	12020.00	1632.69	1645.28		1646.04	0.005756	9.63	3101.21	839.03	0.49
Rogue River	29745.94	Q100	4.35	13416.00	1632.69	1645.60		1646.37	0.005837	9.88	3373.98	841.69	0.50
Rogue River	29745.94	PF 13	0.59	300.00	1632.69	1635.52	1634.30	1635.63	0.004545	2.72	110.75	53.26	0.33
Rogue River	29745.94	PF 14	0.51	250.00	1632.69	1635.32	1634.17	1635.42	0.004351	2.49	100.42	52.83	0.32
Rogue River	29663.18	73014	1.16	4.00	1631.83	1632.30	1632.30	1632.39	0.103800	2.53	1.58	8.25	1.02
Rogue River	29663.18	17dfs	0.68	17.00	1631.83	1632.76	1632.76	1632.84	0.023517	2.28	7.47	14.46	0.56
Rogue River	29663.18	40cfs	0.30	40.00	1631.83	1633.46	1633.46	1633.50	0.006748	1.64	24.46	30.24	0.32
Rogue River	29663.18	75cfs	0.36	75.00	1631.83	1633.90	1633.90	1633.95	0.006901	1.84	40.79	43.64	0.34
Rogue River	29663.18	Q1	1.24	447.00	1631.83	1635.39		1635.63	0.009566	3.93	114.47	53.09	0.46
Rogue River	29663.18	Q1.5	3.71	2300.00	1631.83	1638.67		1639.59	0.011809	7.90	343.10	107.20	0.59
Rogue River	29663.18	Q2	4.59	3627.00	1631.83	1640.09	1638.91	1641.24	0.011642	9.14	544.55	205.31	0.61
Rogue River	29663.18	Q5	5.69	6456.00	1631.83	1642.17	1640.94	1643.49	0.011109	10.61	1097.77	485.78	0.62
Rogue River	29663.18	Q10	7.05	8309.00	1631.83	1643.08	1642.63	1644.71	0.012502	12.00	1538.58	711.87	0.67
Rogue River	29663.18	Q25	5.58	10514.00	1631.83	1644.14		1645.22	0.008955	10.86	2301.04	737.24	0.58
Rogue River	29663.18	Q50	5.46	12020.00	1631.83	1644.62		1645.62	0.008397	10.82	2658.33	747.25	0.56
Rogue River	29663.18	Q100	5.49	13416.00	1631.83	1645.00		1645.96	0.008174	10.91	2943.94	763.17	0.56

HEC-RAS Plan: belowQ1 River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	29663.18	PF 13	0.92	300.00	1631.83	1634.95		1635.12	0.008809	3.27	91.71	50.34	0.42
Rogue River	29663.18	PF 14	0.78	250.00	1631.83	1634.80		1634.93	0.008188	2.98	83.94	49.58	0.40
Rogue River	29622.05	73014	0.06	4.00	1631.08	1631.91	1631.44	1631.91	0.001600	0.67	6.00	10.59	0.16
Rogue River	29622.05	17dfs	0.15	17.00	1631.08	1632.56		1632.58	0.002625	1.21	14.02	14.23	0.22
Rogue River	29622.05	40cfs	0.23	40.00	1631.08	1633.24	1632.11	1633.27	0.004551	1.45	27.59	32.45	0.28
Rogue River	29622.05	75cfs	0.29	75.00	1631.08	1633.66	1632.52	1633.70	0.005371	1.65	45.42	50.19	0.31
Rogue River	29622.05	Q1	0.93	447.00	1631.08	1635.09		1635.27	0.007323	3.41	132.27	64.55	0.41
Rogue River	29622.05	Q1.5	2.48	2300.00	1631.08	1638.49		1639.12	0.007463	6.51	398.29	119.07	0.49
Rogue River	29622.05	Q2	3.27	3627.00	1631.08	1639.90		1640.77	0.007853	7.78	593.32	205.58	0.52
Rogue River	29622.05	Q5	4.14	6456.00	1631.08	1642.00	1639.96	1643.04	0.007632	9.15	1204.77	501.42	0.54
Rogue River	29622.05	Q10	4.71	8309.00	1631.08	1642.84		1643.96	0.007940	9.90	1614.63	621.59	0.56
Rogue River	29622.05	Q25	5.61	10514.00	1631.08	1643.55	1643.37	1644.84	0.008824	10.93	2087.32	705.89	0.59
Rogue River	29622.05	Q50	5.45	12020.00	1631.08	1644.09		1645.26	0.008161	10.87	2468.73	724.68	0.57
Rogue River	29622.05	Q100	5.41	13416.00	1631.08	1644.52		1645.63	0.007795	10.89	2784.11	737.23	0.56
Rogue River	29622.05	PF 13	0.73	300.00	1631.08	1634.65	1633.79	1634.78	0.007193	2.90	104.07	63.32	0.39
Rogue River	29622.05	PF 14	0.61	250.00	1631.08	1634.52	1633.67	1634.62	0.006594	2.62	95.60	62.95	0.37
Rogue River	29536.28	73014	1.32	4.00	1631.02	1631.35	1631.35	1631.47	0.091618	2.82	1.42	5.91	1.01
Rogue River	29536.28	17dfs	1.74	17.00	1631.02	1631.73	1631.73	1631.92	0.076207	3.49	4.87	12.87	1.00
Rogue River	29536.28	40cfs	1.84	40.00	1631.02	1632.05	1632.05	1632.26	0.072680	3.66	10.94	26.35	1.00
Rogue River	29536.28	75cfs	2.23	75.00	1631.02	1632.28	1632.28	1632.55	0.068844	4.20	17.87	33.69	1.02
Rogue River	29536.28	Q1	2.00	447.00	1631.02	1633.94		1634.31	0.018269	4.87	91.80	50.43	0.64
Rogue River	29536.28	Q1.5	2.54	2300.00	1631.02	1637.77		1638.37	0.010227	6.29	392.14	139.76	0.53
Rogue River	29536.28	Q2	2.77	3627.00	1631.02	1639.33		1640.02	0.008210	6.91	645.73	230.06	0.50
Rogue River	29536.28	Q5	3.50	6456.00	1631.02	1641.46		1642.33	0.007636	8.17	1277.99	523.96	0.51
Rogue River	29536.28	Q10	3.71	8309.00	1631.02	1642.35		1643.23	0.007281	8.56	1766.75	653.92	0.50
Rogue River	29536.28	Q25	3.86	10514.00	1631.02	1643.18		1644.03	0.006947	8.87	2334.62	718.49	0.50
Rogue River	29536.28	Q50	3.78	12020.00	1631.02	1643.72		1644.51	0.006441	8.86	2730.72	734.62	0.49
Rogue River	29536.28	Q100	3.81	13416.00	1631.02	1644.15		1644.92	0.006238	8.95	3046.16	747.63	0.48
Rogue River	29536.28	PF 13	2.21	300.00	1631.02	1633.31		1633.68	0.028811	4.89	61.41	45.27	0.74
Rogue River	29536.28	PF 14	2.75	250.00	1631.02	1633.00	1632.91	1633.43	0.041756	5.25	47.63	44.13	0.89
Rogue River	29463.53	73014	0.00	4.00	1627.22	1630.29	1627.60	1630.29	0.000004	0.08	51.44	25.57	0.01
Rogue River	29463.53	17dfs	0.01	17.00	1627.22	1630.64	1628.01	1630.64	0.000047	0.28	60.48	26.65	0.03
Rogue River	29463.53	40cfs	0.02	40.00	1627.22	1631.12	1628.47	1631.12	0.000155	0.54	73.86	29.31	0.06
Rogue River	29463.53	75cfs	0.05	75.00	1627.22	1631.66	1628.72	1631.67	0.000331	0.83	90.84	33.44	0.09
Rogue River	29463.53	Q1	0.37	447.00	1627.22	1633.83		1633.92	0.001823	2.33	192.81	60.36	0.22
Rogue River	29463.53	Q1.5	1.46	2300.00	1627.22	1637.52		1637.89	0.003527	5.18	572.58	141.19	0.34
Rogue River	29463.53	Q2	1.96	3627.00	1627.22	1639.06		1639.57	0.003910	6.22	802.60	201.31	0.37
Rogue River	29463.53	Q5	3.78	6456.00	1627.22	1640.82		1641.81	0.006260	8.90	1325.17	474.74	0.49
Rogue River	29463.53	Q10	3.91	8309.00	1627.22	1641.80		1642.74	0.005916	9.18	1838.22	540.72	0.48

HEC-RAS Plan: belowQ1 River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E. G. Elev (ft)	E. G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	29463 53	Q25	4.03	10514.00	1627.22	1642.68		1643.56	0.005659	9.44	2389.92	669.58	0.47
Rogue River	29463 53	Q50	3.93	12020.00	1627.22	1643.27		1644.08	0.005269	9.39	2792.97	686.49	0.46
Rogue River	29463 53	Q100	3.98	13416.00	1627.22	1643.71		1644.50	0.005157	9.50	3095.14	689.51	0.46
Rogue River	29463 53	PF 13	0.25	300.00	1627.22	1633.26		1633.31	0.001383	1.86	161.52	52.19	0.19
Rogue River	29463 53	PF 14	0.21	250.00	1627.22	1633.00		1633.05	0.001243	1.69	148.21	51.14	0.17
Rogue River	29291.16	73014	0.01	4.00	1629.14	1630.29		1630.29	0.000398	0.34	11.71	19.73	0.08
Rogue River	29291.16	17dfs	0.09	17.00	1629.14	1630.60		1630.61	0.002172	0.90	18.90	26.41	0.19
Rogue River	29291.16	40dfs	0.17	40.00	1629.14	1631.02		1631.05	0.003889	1.23	32.43	43.61	0.25
Rogue River	29291.16	75dfs	0.16	75.00	1629.14	1631.52		1631.54	0.003113	1.23	60.94	70.01	0.23
Rogue River	29291.16	Q1	0.31	447.00	1629.14	1633.53		1633.60	0.001852	2.05	226.21	89.64	0.22
Rogue River	29291.16	Q1.5	0.99	2300.00	1629.14	1637.08		1637.33	0.002626	4.21	703.79	190.26	0.29
Rogue River	29291.16	Q2	1.32	3627.00	1629.14	1638.60		1638.94	0.002825	5.04	1026.95	240.89	0.32
Rogue River	29291.16	Q5	2.45	6456.00	1629.14	1640.17		1640.80	0.004371	7.08	1471.68	437.05	0.41
Rogue River	29291.16	Q10	2.76	8309.00	1629.14	1641.09		1641.77	0.004471	7.62	1857.00	633.60	0.42
Rogue River	29291.16	Q25	3.31	10514.00	1629.14	1641.81		1642.60	0.005020	8.45	2169.41	652.76	0.45
Rogue River	29291.16	Q50	3.79	12020.00	1629.14	1642.22		1643.12	0.005537	9.09	2410.41	678.39	0.47
Rogue River	29291.16	Q100	3.98	13416.00	1629.14	1642.62		1643.54	0.005626	9.37	2678.18	683.23	0.48
Rogue River	29291.16	PF 13	0.23	300.00	1629.14	1633.00		1633.05	0.001695	1.70	180.32	84.43	0.20
Rogue River	29291.16	PF 14	0.21	250.00	1629.14	1632.75		1632.79	0.001746	1.60	159.40	83.31	0.20
Rogue River	29172 9	73014	0.00	4.00	1627.53	1630.29		1630.29	0.000011	0.09	42.63	29.05	0.01
Rogue River	29172 9	17dfs	0.01	17.00	1627.53	1630.57		1630.57	0.000119	0.33	51.35	31.64	0.05
Rogue River	29172 9	40dfs	0.04	40.00	1627.53	1630.93		1630.94	0.000383	0.63	63.31	35.78	0.08
Rogue River	29172 9	75dfs	0.08	75.00	1627.53	1631.36		1631.38	0.000763	0.93	80.25	42.78	0.12
Rogue River	29172 9	Q1	0.44	447.00	1627.53	1633.23		1633.32	0.003035	2.39	187.85	75.31	0.26
Rogue River	29172 9	Q1.5	1.51	2300.00	1627.53	1636.54		1636.91	0.004606	5.08	583.27	209.84	0.37
Rogue River	29172 9	Q2	1.69	3627.00	1627.53	1638.14		1638.54	0.004060	5.59	967.80	308.47	0.36
Rogue River	29172 9	Q5	2.74	6456.00	1627.53	1639.60		1640.22	0.005522	7.33	1485.43	540.89	0.43
Rogue River	29172 9	Q10	3.11	8309.00	1627.53	1640.49		1641.17	0.005698	7.93	1999.58	731.72	0.44
Rogue River	29172 9	Q25	3.03	10514.00	1627.53	1641.32		1641.92	0.005123	7.94	2613.64	740.37	0.43
Rogue River	29172 9	Q50	3.00	12020.00	1627.53	1641.82		1642.39	0.004855	7.96	2981.12	745.09	0.42
Rogue River	29172 9	Q100	3.00	13416.00	1627.53	1642.24		1642.79	0.004666	8.00	3296.47	748.89	0.41
Rogue River	29172 9	PF 13	0.32	300.00	1627.53	1632.74		1632.80	0.002629	1.97	152.01	69.14	0.23
Rogue River	29172 9	PF 14	0.27	250.00	1627.53	1632.51		1632.56	0.002161	1.82	137.32	59.82	0.21
Rogue River	29059 92	73014	0.16	4.00	1629.90	1630.27	1630.16	1630.28	0.014873	0.94	4.25	24.35	0.40
Rogue River	29059 92	17dfs	0.36	17.00	1629.90	1630.49	1630.34	1630.53	0.016801	1.57	10.84	31.65	0.47
Rogue River	29059 92	40dfs	0.65	40.00	1629.90	1630.73	1630.51	1630.80	0.016197	2.11	18.98	34.53	0.50
Rogue River	29059 92	75dfs	0.55	75.00	1629.90	1631.05	1630.71	1631.14	0.015008	2.39	31.40	44.67	0.50
Rogue River	29059 92	Q1	1.30	447.00	1629.90	1632.45	1631.79	1632.69	0.012529	3.88	115.76	108.54	0.53
Rogue River	29059 92	Q1.5	1.39	2300.00	1629.90	1636.11	1634.45	1636.40	0.004209	4.87	768.92	286.26	0.37

HEC-RAS Plan: belowQ1 River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	29059.92	Q2	1.26	3627.00	1629.90	1637.87	1635.35	1638.12	0.002863	4.86	1333.77	341.24	0.32
Rogue River	29059.92	Q5	2.36	6456.00	1629.90	1639.15	1636.68	1639.63	0.004551	6.85	1815.24	647.25	0.42
Rogue River	29059.92	Q10	2.42	8309.00	1629.90	1640.11	1637.39	1640.57	0.004183	7.06	2452.48	684.23	0.41
Rogue River	29059.92	Q25	2.65	10514.00	1629.90	1640.90	1638.01	1641.38	0.004225	7.49	3001.72	710.51	0.42
Rogue River	29059.92	Q50	2.82	12020.00	1629.90	1641.37	1638.42	1641.86	0.004293	7.78	3342.43	747.65	0.42
Rogue River	29059.92	Q100	2.90	13416.00	1629.90	1641.78	1638.78	1642.28	0.004261	7.96	3729.76	847.17	0.42
Rogue River	29059.92	PF 13	1.07	300.00	1629.90	1632.05	1631.49	1632.23	0.012617	3.41	88.02	97.88	0.51
Rogue River	29059.92	PF 14	0.91	250.00	1629.90	1631.93	1631.37	1632.08	0.011479	3.11	80.34	63.24	0.48
Rogue River	29001.65	73014	0.41	4.00	1628.37	1628.79	1628.79	1628.87	0.045907	2.31	1.73	11.93	1.07
Rogue River	29001.65	17cfs	0.67	17.00	1628.37	1629.03	1629.03	1629.21	0.031807	3.37	5.05	14.91	1.02
Rogue River	29001.65	40cfs	0.93	40.00	1628.37	1629.30	1629.30	1629.59	0.026723	4.33	9.24	16.33	1.01
Rogue River	29001.65	75cfs	1.17	75.00	1628.37	1629.61	1629.61	1630.02	0.023821	5.15	14.57	18.10	1.01
Rogue River	29001.65	Q1	0.59	447.00	1628.37	1631.95		1632.21	0.005759	4.11	108.75	65.64	0.56
Rogue River	29001.65	Q1.5	0.97	2300.00	1628.37	1635.54		1636.16	0.003036	6.40	476.71	294.64	0.49
Rogue River	29001.65	Q2	0.90	3627.00	1628.37	1637.39	1634.96	1637.95	0.002090	6.50	1045.04	449.50	0.43
Rogue River	29001.65	Q5	2.50	6456.00	1628.37	1637.69	1636.98	1639.23	0.005545	10.88	1162.16	560.33	0.71
Rogue River	29001.65	Q10	2.90	8309.00	1628.37	1638.43	1638.43	1640.15	0.005836	11.90	1567.12	646.51	0.74
Rogue River	29001.65	Q25	3.13	10514.00	1628.37	1639.19	1639.19	1640.95	0.005763	12.56	2072.25	674.09	0.74
Rogue River	29001.65	Q50	3.35	12020.00	1628.37	1639.59	1639.59	1641.43	0.005906	13.09	2346.59	689.80	0.76
Rogue River	29001.65	Q100	3.63	13416.00	1628.37	1639.89	1639.89	1641.83	0.006188	13.69	2552.98	702.31	0.78
Rogue River	29001.65	PF 13	0.71	300.00	1628.37	1631.30		1631.59	0.009324	4.30	69.76	56.53	0.68
Rogue River	29001.65	PF 14	0.84	250.00	1628.37	1631.03		1631.35	0.012976	4.57	54.68	51.81	0.78
Rogue River	28806.09	73014	0.01	4.00	1626.66	1627.46	1626.91	1627.46	0.000307	0.45	8.89	16.57	0.11
Rogue River	28806.09	17cfs	0.04	17.00	1626.66	1627.93	1627.20	1627.95	0.000751	0.97	17.50	19.78	0.18
Rogue River	28806.09	40cfs	0.09	40.00	1626.66	1628.37	1627.49	1628.41	0.001174	1.50	26.72	21.79	0.24
Rogue River	28806.09	75cfs	0.15	75.00	1626.66	1628.83	1627.79	1628.89	0.001544	2.03	36.89	23.03	0.28
Rogue River	28806.09	Q1	0.80	447.00	1626.66	1630.70		1631.10	0.005430	5.09	87.80	49.97	0.56
Rogue River	28806.09	Q1.5	2.73	2300.00	1626.66	1633.47	1633.39	1635.07	0.010053	10.45	303.71	277.41	0.86
Rogue River	28806.09	Q2	4.57	3627.00	1626.66	1634.17	1634.17	1636.87	0.014652	13.84	394.41	378.60	1.06
Rogue River	28806.09	Q5	2.81	6456.00	1626.66	1636.70	1636.70	1638.03	0.006094	11.57	1597.99	587.14	0.73
Rogue River	28806.09	Q10	4.00	8309.00	1626.66	1636.93	1637.23	1638.77	0.008425	13.87	1736.51	593.69	0.86
Rogue River	28806.09	Q25	4.73	10514.00	1626.66	1637.43	1637.86	1639.50	0.009401	15.25	2036.29	612.51	0.92
Rogue River	28806.09	Q50	4.80	12020.00	1626.66	1637.95	1638.40	1639.98	0.008994	15.51	2375.06	725.27	0.91
Rogue River	28806.09	Q100	5.12	13416.00	1626.66	1638.24	1638.72	1640.34	0.009285	16.09	2596.06	777.56	0.93
Rogue River	28806.09	PF 13	0.59	300.00	1626.66	1630.11		1630.40	0.004252	4.35	68.91	38.92	0.49
Rogue River	28806.09	PF 14	0.48	250.00	1626.66	1629.90		1630.15	0.003457	3.94	63.39	26.50	0.45
Rogue River	28705.43	73014	0.00	4.00	1626.33	1627.45		1627.45	0.000036	0.19	20.93	28.49	0.04
Rogue River	28705.43	17cfs	0.01	17.00	1626.33	1627.91		1627.92	0.000146	0.48	35.13	33.26	0.08
Rogue River	28705.43	40cfs	0.02	40.00	1626.33	1628.34		1628.35	0.000275	0.81	49.67	34.91	0.12

HEC-RAS Plan: belowQ1 River: Elk Creek Reach: Rogue River (Continued)

Reach	River Sta	Profile	Shear Chan (lb/sq ft)	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E. G. Elev (ft)	E. G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Rogue River	28705.43	75dfs	0.04	75.00	1626.33	1628.78		1628.80	0.000413	1.14	65.60	36.63	0.15
Rogue River	28705.43	Q1	0.31	447.00	1626.33	1630.56		1630.72	0.001929	3.25	138.52	86.08	0.35
Rogue River	28705.43	Q1.5	1.27	2300.00	1626.33	1633.41	1631.88	1634.22	0.004174	7.27	413.66	381.27	0.57
Rogue River	28705.43	Q2	1.45	3627.00	1626.33	1634.67	1633.89	1635.53	0.003825	8.06	912.28	415.60	0.56
Rogue River	28705.43	Q5	2.29	6456.00	1626.33	1635.84	1635.57	1637.09	0.005095	10.41	1508.42	562.84	0.67
Rogue River	28705.43	Q10	2.59	8309.00	1626.33	1636.51	1636.42	1637.84	0.005283	11.22	1963.28	732.12	0.69
Rogue River	28705.43	Q25	2.56	10514.00	1626.33	1637.33	1637.03	1638.54	0.004749	11.34	2572.33	747.08	0.67
Rogue River	28705.43	Q50	2.52	12020.00	1626.33	1637.86	1637.86	1638.99	0.004409	11.35	2966.73	750.37	0.65
Rogue River	28705.43	Q100	2.55	13416.00	1626.33	1638.27	1637.61	1639.37	0.004277	11.50	3275.58	752.35	0.64
Rogue River	28705.43	PF 13	0.21	300.00	1626.33	1630.03		1630.13	0.001251	2.64	113.90	59.36	0.28
Rogue River	28705.43	PF 14	0.17	250.00	1626.33	1629.83		1629.92	0.001078	2.36	106.06	46.38	0.26
Rogue River	28502.78	73014	0.21	4.00	1626.90	1627.37	1627.30	1627.42	0.014719	1.80	2.23	9.50	0.65
Rogue River	28502.78	17dfs	0.36	17.00	1626.90	1627.71	1627.61	1627.81	0.014711	2.53	6.72	17.14	0.71
Rogue River	28502.78	40dfs	0.53	40.00	1626.90	1627.99	1627.88	1628.16	0.014721	3.28	12.18	20.95	0.76
Rogue River	28502.78	75dfs	0.55	75.00	1626.90	1628.37	1628.20	1628.54	0.014713	3.37	22.27	36.83	0.76
Rogue River	28502.78	Q1	1.01	447.00	1626.90	1629.46	1629.33	1629.86	0.014722	5.07	88.40	80.04	0.85
Rogue River	28502.78	Q1.5	2.62	2300.00	1626.90	1631.32	1631.32	1632.73	0.014337	9.58	253.51	384.51	0.98
Rogue River	28502.78	Q2	2.97	3627.00	1626.90	1632.46	1632.46	1634.21	0.011749	10.77	385.26	481.48	0.94
Rogue River	28502.78	Q5	2.34	6456.00	1626.90	1634.69	1634.69	1636.01	0.005982	10.27	1366.15	638.55	0.72
Rogue River	28502.78	Q10	2.71	8309.00	1626.90	1635.24	1635.24	1636.71	0.006380	11.21	1720.73	642.83	0.75
Rogue River	28502.78	Q25	3.08	10514.00	1626.90	1635.83	1635.83	1637.42	0.006678	12.11	2097.26	646.16	0.78
Rogue River	28502.78	Q50	3.43	12020.00	1626.90	1636.12	1636.12	1637.86	0.007172	12.87	2284.90	647.68	0.81
Rogue River	28502.78	Q100	3.65	13416.00	1626.90	1636.42	1636.42	1638.24	0.007339	13.36	2482.39	649.17	0.83
Rogue River	28502.78	PF 13	0.80	300.00	1626.90	1629.22	1629.05	1629.51	0.014708	4.34	69.24	78.72	0.81
Rogue River	28502.78	PF 14	0.78	250.00	1626.90	1629.08	1628.90	1629.36	0.014729	4.25	58.87	68.76	0.81



Oregon

Kate Brown, Governor

Department of Fish and Wildlife

Rogue Watershed District Office

1495 East Gregory Road

Central Point, OR 97502

(541) 826-8774

Fax: (541) 826-8776

odfw.com



June 4, 2015

Peter Mazzini
Rogue River Watershed Council
84 Alder Street
Central Point, OR 97502

RE: R&E application for habitat enhancement on Elk Creek


Elk Creek is a major tributary to the upper Rogue River and supports populations of coho salmon, summer and winter steelhead trout and cutthroat trout. At river mile 5.6, Elk Creek is constrained by a human made berm on its west side. The berm has resulted in: 1) a disconnected floodplain; 2) an incised stream channel scoured to bedrock and; 3) increased water velocities during high flow events. Most importantly, the berm also limits access to valuable off channel rearing habitat for juvenile fishes – especially important for overwintering coho salmon (federally listed as threatened under the ESA). These conditions appear to have been present for considerable time, probably decades, and left unaddressed they will likely remain unchanged.

In 2014, a partnership comprised of the Corps of Engineers, the Rogue River Watershed Council, US Forest Service, Bureau of Land Management and Oregon Fish and Wildlife identified this berm for removal as part of an ongoing effort to enhance and restore aquatic habitat in Elk Creek. Mechanical removal of the berm would ameliorate the aforementioned conditions by reconnecting the creek to its floodplain. This would facilitate flood water storage, locally attenuate peak flow events, slow water velocities and allow substrate to drop out of the water column and aggrade the stream channel. Reconnecting the creek to its floodplain would also provide enhanced access to valuable off channel rearing and refuge habitat for juvenile fishes.

ODFW's upper Rogue district supports berm removal and associated activities as proposed in the Rogue River Watershed Council's grant application and will contribute in-kind technical assistance during the construction phase of this project.

Thank you for your consideration and please contact me with any questions.

Sincerely,


Jay Doimo
Oregon Department of Fish and Wildlife





DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, PORTLAND DISTRICT
100 COLE M. RIVERS DRIVE
TRAIL, OR 97541

JUNE 4, 2015

Dear Rogue River Watershed Council,

I am please to express my full support for this important fishery habitat improvement project that will occur on U.S. Army Corps of Engineers managed public lands and waters at Elk Creek.

Fisheries enhancement is one of the congressionally authorized purposes of Elk Creek and this project will significantly support that mission. The creation of high flow refuge habitat for steelhead and ESA listed coho will be accomplished by reconnecting and restoring off channel stream habitat during high flow periods. Also, the reclamation of historic riparian habitat will assist us in improving the aquatic water temperatures of this temperature impaired stream.

We are excited to work with our Watershed Council partners and multi-agency partners in accomplishing this critical work. Please feel free to contact me at 541-878-2255 or jim.a.buck@usace.army.mil if additional information is desired.

Sincerely,

James Buck
Operations Project Manager
Rogue River Basin Project

Signature Authorization Page

I hereby make an application for financial assistance under the terms and conditions of the R&E Program as described in my project application.


I understand that if my project is approved for funding, the following will apply:

- All project sponsors must sign a grant agreement containing the terms and conditions on which funding will be released.
- Project expenses which occur before the grant agreement is signed or after the expiration date will not be paid by the R&E Program.
- Copies of all necessary permits must be submitted to the R&E Program.
- Project sponsors must certify compliance with local, state, and federal regulations and laws.
- Landowner, monitoring and maintenance agreements must be submitted to the R&E Program.
- Regular progress reports may be required, and at the end of each project a Completion Report must be submitted.
- Educational products resulting from projects are public domain.
- All information submitted to either party under this application is subject to the federal Freedom of Information Act.

Project Title: Elk Creek RM 5.6 High Flow Habitat Enhancement

Applicant: Rogue River Watershed Council

Date: 5/26/15

Fiscal Officer: 

Date: 6/4/15