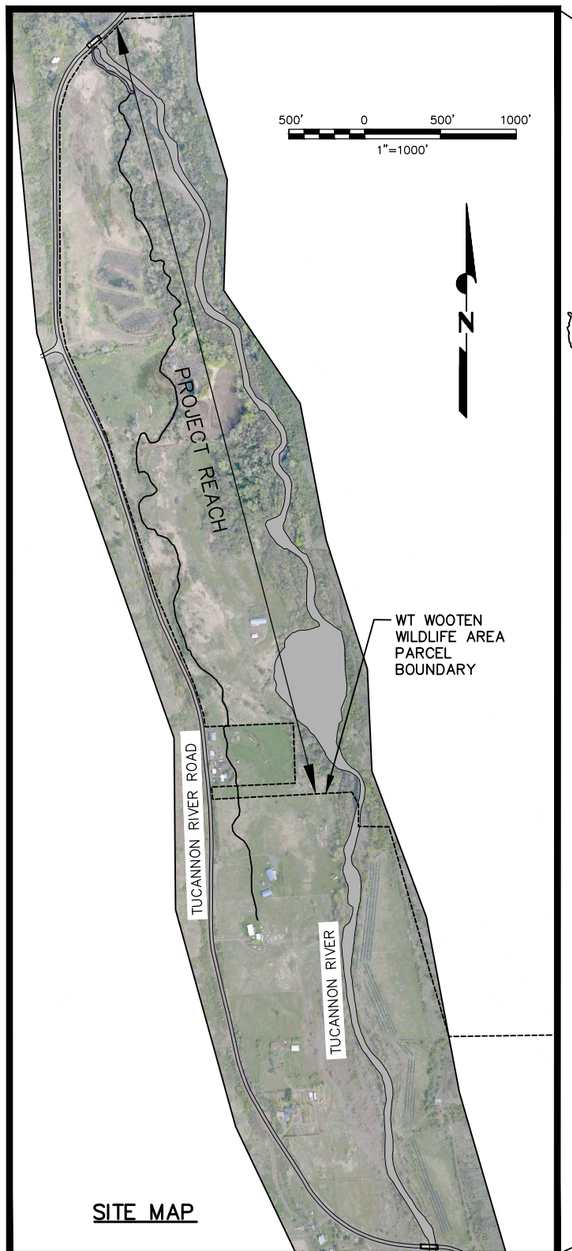
TUCANNON RIVER FISH HABITAT & FLOODPLAIN RESTORATION

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION

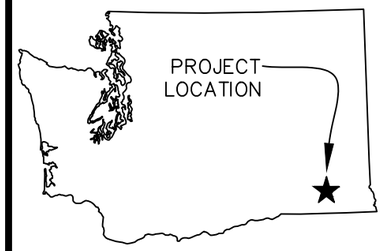
RM 33.1-34.4: HARTSOCK REACH - PHASE 1

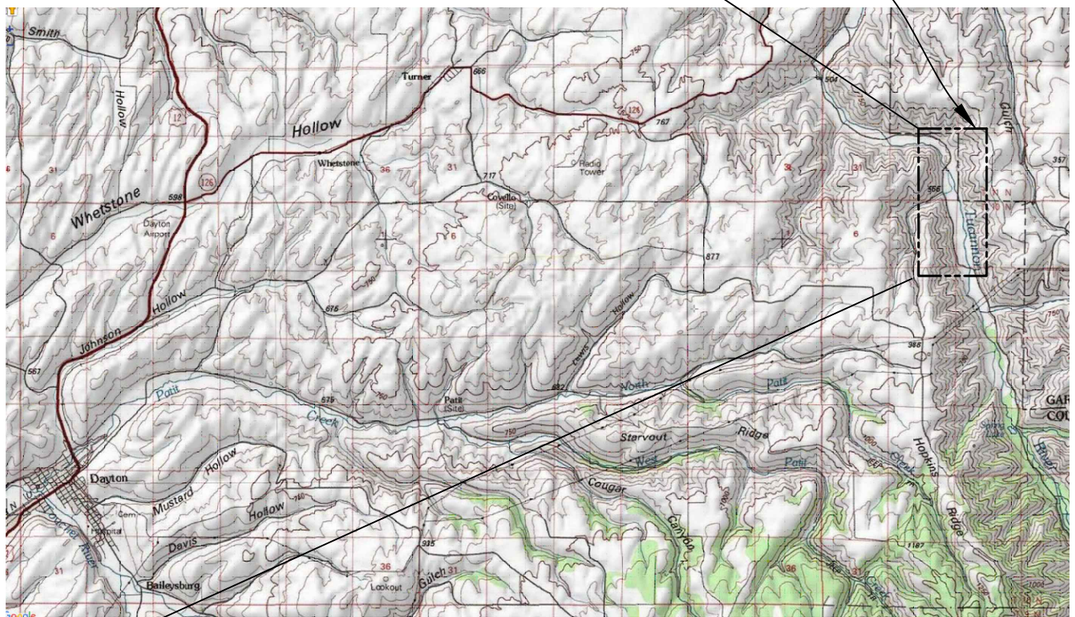
PROJECT MANAGER: KRIS FISCHER

100% DESIGN



SITE MAP





VICINITY MAP

5000' 0 5000' 10000'
1"=10000'

SHEET INDEX

SEE IMPLEMENTATION PLAN FOR CONSTRUCTION SEQUENCING

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK
1	6/16/17	MOVED STAGING AREA 1, ADD IRRIG LINE CUTS	PDV	
2	7/13/17	MODIFICATIONS TO LAYOUT BASED ON FIELD STAKING	PDV	

AS SHOWN

0 1"

BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
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TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

SHEET INDEX & LOCATION MAP

100% DESIGN

DATE: JUL 13, 2017
SHEET: 1
REV: 2

LEGEND

SYMBOL	DESCRIPTION
	KEY PLAN BORDER
	PROPERTY LINE
2230	CONTOUR (EXISTING MAJOR)
2233	CONTOUR (EXISTING MINOR)
2230	CONTOUR (PROPOSED MAJOR)
2233	CONTOUR (PROPOSED MINOR)
	PROFILE (EXIST)
	PROFILE (PROPOSED)
	TUCANNON RIVER MARGIN
TOP	TOP OF BANK/SLOPE
TOE	TOE OF BANK/SLOPE
	FLOODPLAIN TERRACE EDGE
	FLOODPLAIN SWALE/CHANNEL
THW	CHANNEL THALWEG
	WATER SURFACE
OHW	ORDINARY HIGH WATER LEVEL
100	100-YR FLOOD EXTENT
SF	SILT FENCE
	ACCESS ROAD
	LOG-LOG/LOG-TREE TIE

SYMBOL	DESCRIPTION
	TUCANNON RIVER
	GRAVEL/COBBLE
	UNDISTURBED EARTH / RIVERBED
	CUT
	FILL
	WOOD
	STAGING AREA
	DEPOSITIONAL FEATURE
	EXIST LEVEE/SPOILS PILE
	TREE BOLE
	BOULDER
	COTTONWOOD/TREE
	SURVEY CONTROL POINT

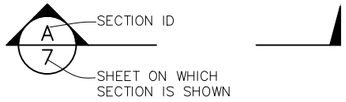
ABBREVIATIONS

BM	BENCH MARK
CL,℄	CENTERLINE
CP	CONTROL POINT
CS	CROSS SECTION
CY	CUBIC YARD
DBH	DIA AT BREAST HEIGHT
DIA	DIAMETER
DS, D/S	DOWNSTREAM
DSEL	DOWNSTREAM ELEVATION
DWG	DRAWING
E	EAST
EA	EACH
ELEV, EL	ELEVATION
ELJ	ENGINEERED LOG JAM
EXIST	EXISTING
FT	FOOT, FEET
H, HORZ	HORIZONTAL
HPA	HYDRAULIC PROJECT APPROVAL
ID	IDENTIFICATION, INNER DIA
IN	INCH, INCHES
L	LENGTH
LB	POUNDS
LT	LEFT
LF	LINEAR FOOT
LWD	LARGE WOODY DEBRIS
MAX	MAXIMUM
MIN	MINIMUM
MISC	MISCELLANEOUS
MON	MONUMENT
N	NORTH
NO	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OHWL	ORDINARY HIGH WATER LEVEL
OHWM	ORDINARY HIGH WATER MARK
PSI	POUNDS PER SQUARE INCH
RT	RIGHT
S	SLOPE, SOUTH
SHT	SHEET
SP	STATE PLANE COORDINATES
SPEC	SPECIFICATION
STA	STATION
STD	STANDARD
SF	SQUARE FOOT
SY	SQUARE YARD
TESC	TEMPORARY EROSION AND SEDIMENT CONTROL
TYP	TYPICAL
USEL	UPSTREAM ELEVATION
VAR	VARIES
V, VERT	VERTICAL
W	WEST, WIDE
W/	WITH
WM	WATER MARK
W/O	WITHOUT
WSDOT	WA DEPT OF TRANSPORTATION
WSEL	WATER SURFACE ELEVATION
WT	WEIGHT
YR	YEAR

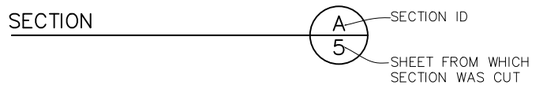
DRAWING REFERENCES

THE DRAWINGS ARE REFERENCED IN THE FOLLOWING MANNER

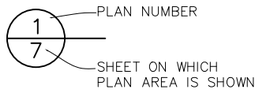
SECTION CUT ON SHEET 5, SHOWN ON SHEET 7:



ON SHEET 7 THIS SECTION IS DEFINED AS:



PLAN AREA OUTLINED ON SHEET 5, SHOWN ON SHEET 7:



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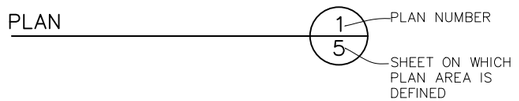

DETAILS ARE CROSS-REFERENCED IN A SIMILAR MANNER TO PLAN, USING LOWERCASE LETTERS FOR DETAIL NUMBER.

SURVEY DATUM

SURVEY HORIZONTAL DATUM FOR THIS PROJECT IS WASHINGTON STATE PLANE SOUTH ZONE COORDINATES, NORTH AMERICAN DATUM NAD83/07; VERTICAL DATUM IS NAVD88. CONTROL POINT LOCATIONS SHOWN ON THIS SHEET

SURVEY CONTROL POINT DATA

PROJECT CONTROL POINTS:	#1	#2	#3
POINT ID#	HART 2	HART 1	CP TUC-08
NORTHING (FT)	2347308.4	2347766.2	2349170.0
EASTING (FT)	396037.9	393651.9	390092.6
ELEVATION (FT; NAVD88)	1840.97	1872.48	1912.88

CONTRACTOR TO VERIFY QUANTITIES

TABLE 1. ESTIMATED QUANTITIES

PURPOSE	ITEM	SPEC/DIM	AMOUNT	UNIT
INSTREAM BOULDERS	HABITAT BOULDERS	THREE MAN WSDOT 9-03.11(4)	15	EA
EMBEDDED LOGS (SEE TABLE 2)	LOGS W/ ROOTWADS (STREAMBANKS)	(16"-28") DBH X (30'-45')L	59	EA
	BALLAST BOULDERS	VARIES, SEE TABLE 2	VARIES	EA
	LOGS W/ ROOTWADS (LEVEE)	(24"-30") DBH X 30'L	8	EA
	LOGS W/ ROOTWADS (SPRING CHANNEL CUT)	(12"-14") DBH X 25'L MIN	10	EA
	LIVE FRESH CUT COTTONWOOD TOPS	10'-12'L	62	EA
	VERTICAL BOLES	12" MIN X 12'L	32	EA
LWD LOGS	LOG W/O ROOTWAD, W/ BRANCHES	(16"-18") DBH X 65'L	8	EA
	LOG W/ ROOTWAD, BRANCHES	(16"-22") DBH X (40'-45')L	96	EA
	LOG W/ ROOTWAD, BRANCHES	(22"-26") DBH X 45'L	1	EA
	RACKING LOG W/ ROOTWAD	12" DBH MIN X 20'L MIN	19	EA
	BALLAST BOULDERS	4000 LB MIN	28	EA
	BALLAST BOULDERS	4500 LB MIN	22	EA
	ANCHOR BOULDERS W/ 2" HOLE	5000-6000 LB	13	EA
	GALVANIZED EYE BOLTS	5/8" -11 X 8" SHANK	100	EA
	GALVANIZED EYE BOLTS	3/4" -11 X 8" SHANK	56	EA
	GALVANIZED CHAIN, OPEN LINK	5/8" GRADE 30 PROOF COIL	996	LF
	CHAIN CONNECTING LINK	5/8"	122	EA
	MANILA HEMP ROPE	1" DIA	2387	LF
	REBAR	#10	0	LF
ELJs	LOG W/ ROOTWAD	18" DBH X 35'L	20	EA
	LOG W/ ROOTWAD	14" DBH X (35'-40')L	10	EA
	LOG W/ ROOTWAD	18" DBH X 20'L	20	EA
	LOG W/ ROOTWAD	12" DBH X 20'L	60	EA
	GALVANIZED CHAIN, OPEN LINK	5/8" GRADE 30 PROOF COIL	400	LF
	CHAIN CONNECTING LINK	5/8"	40	EA
	MANILA HEMP ROPE	1" DIA	924	LF
BALLASTED LOGS	LOG W/ ROOTWAD	(18"-24") DBH X 30'L	6	EA
	BALLAST BOULDERS	3000 LB MIN	12	EA
	EYE BOLTS	1" -8 X 8" SHANK	48	EA
	MANILA HEMP ROPE	1 1/8" DIA	444	LF
EXPOSED DEBRIS LOGS	LOGS W/ ROOTWADS	(14"-20") DBH X 35'L	20	EA
	VERTICAL BOLES	(10"-12") X 12'L	20	EA
BRIDGE	53' RAILCAR BRIDGE	SEE SHEET 26	1	EA
	STEEL ANCHOR FOOTINGS	SEE SHEET 26	4	EA
	PRECAST ABUTMENT BLOCKS - INTERLOCKING	3'5" X 3'10" X 1'6"	31	EA
	PRECAST ABUTMENT BLOCKS - TOP	3'5" X 3'10" X 1'6"	6	EA
	PRECAST ABUTMENT BLOCKS - INTERLOCKING	HALF BLOCK	4	EA
	CRUSHED STONE BACKFILL, STRUCTURAL RETAINING WALL	1" MINUS ASTM 57	40	CY
	QUARRY SPALLS FOR APPROACH	WSDOT 9-13.1(5)	18	CY
	CRUSHED ROCK TOP COURSE	WSDOT 9-03.9(3)	17	CY
	GEOTEXTILE	NON-WOVEN	46	SY
TESC	SILT FENCE	SEE SHEET 6	AS NEEDED	LS
WATER MANAGEMENT	SUPERSACKS/SANDBAGS FOR COFFER DAMS	SEE SHEET 7	AS NEEDED	LS
	PUMP FOR IN-CHANNEL WORK	SEE SHEET 7	AS NEEDED	LS
	PLASTIC SHEETING	SEE SHEET 7	AS NEEDED	SY
VEGETATION/SITE RESTORATION	SEE SHEET 29			

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

NONE

0 1"

BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

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TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

LEGEND, SURVEY DATUM, SUMMARY OF QUANTITIES
100% DESIGN

DATE: JUN 16, 2017
SHEET: 2
REV: –

HIP 3 GENERAL AQUATIC CONSERVATION MEASURES APPLICABLE TO ALL ACTIONS

THE ACTIVITIES COVERED UNDER THE HIPIII ARE INTENDED TO PROTECT AND RESTORE FISH AND WILDLIFE HABITAT WITH LONG-TERM BENEFITS TO EBA-LISTED SPECIES. TO MINIMIZE THESE SHORT-TERM ADVERSE EFFECTS AND MAKE THEM PREDICTABLE FOR THE PURPOSES OF PROGRAMMATIC ANALYSIS, BPA WILL INCLUDE IN ALL PROJECTS IMPLEMENTED UNDER THIS HIP III PROPOSED ACTION THE FOLLOWING GENERAL CONSERVATION MEASURES (DEVELOPED IN COORDINATION WITH USFWS AND NMFS).

PROJECT DESIGN AND SITE PREPARATION.

1) STATE AND FEDERAL PERMITS. ALL APPLICABLE REGULATORY PERMITS AND OFFICIAL PROJECT AUTHORIZATIONS WILL BE OBTAINED BEFORE PROJECT IMPLEMENTATION. THESE PERMITS AND AUTHORIZATIONS INCLUDE, BUT ARE NOT LIMITED TO, NATIONAL ENVIRONMENTAL POLICY ACT, NATIONAL HISTORIC PRESERVATION ACT, AND THE APPROPRIATE STATE AGENCY REMOVAL AND FILL PERMIT, USACE CLEAN WATER ACT (CWA) 404 PERMITS, AND CWA SECTION 401 WATER QUALITY CERTIFICATIONS.

2) TIMING OF IN-WATER WORK. APPROPRIATE STATE (OREGON DEPARTMENT OF FISH AND WILDLIFE (ODFW), WASHINGTON DEPARTMENT OF FISH AND WILDLIFE (WDFW), IDAHO DEPARTMENT OF FISH AND GAME {IDFG), AND MONTANA FISH WILDLIFE AND PARKS (MFWP)) GUIDELINES FOR TIMING OF IN-WATER WORK WINDOWS (IWW) WILL BE FOLLOWED.

A) BULL TROUT - WHILE UTILIZING THE APPROPRIATE STATE DESIGNATED IN-WATER WORK PERIOD WILL LESSEN THE RISK TO BULL TROUT, THIS ALONE MAY NOT BE SUFFICIENT TO ADEQUATELY PROTECT LOCAL BULL TROUT POPULATIONS. THIS IS ESPECIALLY TRUE IF WORK IS OCCURRING IN SPAWNING AND REARING AREAS BECAUSE EGGS, ALEVIN, AND FRY ARE IN THE SUBSTRATE OR CLOSELY ASSOCIATED HABITATS NEARLY YEAR ROUND. SOME AREAS MAY NOT HAVE DESIGNATED IN-WATER WORK WINDOWS FOR BULL TROUT OR IF THEY DO THEY MAY CONFLICT WITH WORK WINDOWS FOR SALMON AND STEELHEAD. IF THIS IS THE CASE, OR IF PROPOSED WORK IS TO OCCUR WITHIN BULL TROUT SPAWNING AND REARING HABITATS, PROJECT PROPONENTS WILL CONTACT THE APPROPRIATE USFWS FIELD OFFICE TO INSURE THAT ALL REASONABLE IMPLEMENTATION MEASURES ARE CONSIDERED AND AN APPROPRIATE IN-WATER WORK WINDOW IS BEING USED TO MINIMIZE PROJECT EFFECTS.

B) LAMPREY - THE PROJECT SPONSOR AND/OR THEIR CONTRACTORS WILL AVOID WORKING IN STREAM OR RIVER CHANNELS THAT CONTAIN PACIFIC LAMPREY FROM MARCH 1 TO JULY 1 IN LOW TO MID ELEVATION REACHES (<5,000 FEET). IN HIGH ELEVATION REACHES (>5,000 FEET), THE PROJECT SPONSOR WILL AVOID WORKING IN STREAM OR RIVER CHANNELS FROM MARCH 1 TO AUGUST 1. IF EITHER TIMEFRAME IS INCOMPATIBLE WITH OTHER OBJECTIVES, THE AREA WILL BE SURVEYED FOR NESTS AND LAMPREY PRESENCE, AND AVOIDED IF POSSIBLE. IF LAMPREYS ARE KNOWN TO EXIST, THE PROJECT SPONSOR WILL UTILIZE DEWATERING AND SALVAGE PROCEDURES OUTLINED IN US FISH AND WILDLIFE SERVICE BEST MANAGEMENT PRACTICES TO MINIMIZE ADVERSE EFFECTS TO PACIFIC LAMPREY (2010).

C) EXCEPTIONS TO ODFW, WDFW, MFWP, OR IDFG IN-WATER WORK WINDOWS WILL BE REQUESTED THROUGH THE VARIANCE PROCESS (PAGE 2).

3) CONTAMINANTS. THE PROJECT SPONSOR WILL COMPLETE A SITE ASSESSMENT WITH THE FOLLOWING ELEMENTS TO IDENTIFY THE TYPE, QUANTITY, AND EXTENT OF ANY POTENTIAL CONTAMINATION FOR ANY ACTION THAT INVOLVES EXCAVATION OF MORE THAN 20 CUBIC YARDS OF MATERIAL:

A) A REVIEW OF AVAILABLE RECORDS, SUCH AS FORMER SITE USE, BUILDING PLANS, AND RECORDS OF ANY PRIOR CONTAMINATION EVENTS;

B) A SITE VISIT TO INSPECT THE AREAS USED FOR VARIOUS INDUSTRIAL PROCESSES AND THE CONDITION OF THE PROPERTY;

C) INTERVIEWS WITH KNOWLEDGEABLE PEOPLE, SUCH AS SITE OWNERS, OPERATORS, AND OCCUPANTS, NEIGHBORS, OR LOCAL GOVERNMENT OFFICIALS; AND

D) A SUMMARY, STORED WITH THE PROJECT FILE THAT INCLUDES AN ASSESSMENT OF THE LIKELIHOOD THAT CONTAMINANTS ARE PRESENT AT THE SITE, BASED ON ITEMS 4(A) THROUGH 4(C).

4) SITE LAYOUT AND FLAGGING. PRIOR TO CONSTRUCTION. THE ACTION AREA WILL BE CLEARLY FLAGGED TO IDENTIFY THE FOLLOWING:

A) SENSITIVE RESOURCE AREAS, SUCH AS AREAS BELOW ORDINARY HIGH WATER, SPAWNING AREAS, SPRINGS, AND WETLANDS;

B) EQUIPMENT ENTRY AND EXIT POINTS;

C) ROAD AND STREAM CROSSING ALIGNMENTS;

D) STAGING, STORAGE, AND STOCKPILE AREAS; AND

E) NO-SPRAY AREAS AND BUFFERS.

5) TEMPORARY ACCESS ROADS AND PATHS.

A) EXISTING ACCESS ROADS AND PATHS WILL BE PREFERENTIALLY USED WHENEVER REASONABLE, AND THE NUMBER AND LENGTH OF TEMPORARY ACCESS ROADS AND PATHS THROUGH RIPARIAN AREAS AND FLOODPLAINS WILL BE MINIMIZED TO LESSEN SOIL DISTURBANCE AND COMPACTION, AND IMPACTS TO VEGETATION.

B) TEMPORARY ACCESS ROADS AND PATHS WILL NOT BE BUILT ON SLOPES WHERE GRADE, SOIL, OR OTHER FEATURES SUGGEST A LIKELIHOOD OF EXCESSIVE EROSION OR FAILURE. IF SLOPES ARE STEEPER THAN 30%, THEN THE ROAD WILL BE DESIGNED BY A CIVIL ENGINEER WITH EXPERIENCE IN STEEP ROAD DESIGN.

C) THE REMOVAL OF RIPARIAN VEGETATION DURING CONSTRUCTION OF TEMPORARY ACCESS ROADS WILL BE MINIMIZED. WHEN TEMPORARY VEGETATION REMOVAL IS REQUIRED, VEGETATION WILL BE CUT AT GROUND LEVEL (NOT GRUBBED).

D) AT PROJECT COMPLETION, ALL TEMPORARY ACCESS ROADS AND PATHS WILL BE OBLITERATED, AND THE SOIL WILL BE STABILIZED AND REVEGETATED. ROAD AND PATH OBLITERATION REFERS TO THE MOST COMPREHENSIVE DEGREE OF DECOMMISSIONING AND INVOLVES DECOMPACTING THE SURFACE AND DITCH, PULLING THE FILL MATERIAL ONTO THE RUNNING SURFACE, AND RESHAPING TO MATCH THE ORIGINAL CONTOUR.

E) TEMPORARY ROADS AND PATHS IN WET AREAS OR AREAS PRONE TO FLOODING WILL BE OBLITERATED BY THE END OF THE IN-WATER WORK WINDOW.

1) TEMPORARY STREAM CROSSINGS.

A) EXISTING STREAM CROSSINGS WILL BE PREFERENTIALLY USED WHENEVER REASONABLE, AND THE NUMBER OF TEMPORARY STREAM CROSSINGS WILL BE MINIMIZED.

B) TEMPORARY BRIDGES AND CULVERTS WILL BE INSTALLED TO ALLOW FOR EQUIPMENT AND VEHICLE CROSSING OVER PERENNIAL STREAMS DURING CONSTRUCTION. TREATED WOOD SHALL NOT BE USED ON TEMPORARY BRIDGE CROSSINGS OR IN LOCATIONS IN CONTACT WITH OR OVER WATER.

C) EQUIPMENT AND VEHICLES WILL CROSS THE STREAM IN THE WET ONLY WHERE:

I. THE STREAMBED IS BEDROCK; OR

II. MATS OR OFF-SITE LOGS ARE PLACED IN THE STREAM AND USED AS A CROSSING.

D) VEHICLES AND MACHINERY WILL CROSS STREAMS AT RIGHT ANGLES TO THE MAIN CHANNEL WHEREVER POSSIBLE.

E) THE LOCATION OF THE TEMPORARY CROSSING WILL AVOID AREAS THAT MAY INCREASE THE RISK OF CHANNEL RE-ROUTING OR AVULSION.

F) POTENTIAL SPAWNING HABITAT {I.E., POOL TAILOUTS) AND POOLS WILL BE AVOIDED TO THE MAXIMUM EXTENT POSSIBLE.

G) NO STREAM CROSSINGS WILL OCCUR AT ACTIVE SPAWNING SITES, WHEN HOLDING ADULT LISTED FISH ARE PRESENT, OR WHEN EGGS OR ALEVINS ARE IN THE GRAVEL. THE APPROPRIATE STATE FISH AND WILDLIFE AGENCY WILL BE CONTACTED FOR SPECIFIC TIMING INFORMATION.

H) AFTER PROJECT COMPLETION, TEMPORARY STREAM CROSSINGS WILL BE OBLITERATED AND THE STREAM CHANNEL AND BANKS RESTORED.

7) STAGING, STORAGE, AND STOCKPILE AREAS.

A) STAGING AREAS (USED FOR CONSTRUCTION EQUIPMENT STORAGE, VEHICLE STORAGE, FUELING, SERVICING, AND HAZARDOUS MATERIAL STORAGE) WILL BE 150 FEET OR MORE FROM ANY NATURAL WATER BODY OR WETLAND, OR ON AN ADJACENT, ESTABLISHED ROAD AREA IN A LOCATION AND MANNER THAT WILL PRECLUDE EROSION INTO OR CONTAMINATION OF THE STREAM OR FLOODPLAIN.

B) NATURAL MATERIALS USED FOR IMPLEMENTATION OF AQUATIC RESTORATION, SUCH AS LARGE WOOD, GRAVEL, AND BOULDERS, MAY BE STAGED WITHIN THE 100-YEAR FLOODPLAIN.

C) ANY LARGE WOOD, TOPSOIL, AND NATIVE CHANNEL MATERIAL DISPLACED BY CONSTRUCTION WILL BE STOCKPILED FOR USE DURING SITE RESTORATION AT A SPECIFICALLY IDENTIFIED AND FLAGGED AREA.

D) ANY MATERIAL NOT USED IN RESTORATION, AND NOT NATIVE TO THE FLOODPLAIN, WILL BE REMOVED TO A LOCATION OUTSIDE OF THE 100-YEAR FLOODPLAIN FOR DISPOSAL.

8) EQUIPMENT. MECHANIZED EQUIPMENT AND VEHICLES WILL BE SELECTED, OPERATED, AND MAINTAINED IN A MANNER THAT MINIMIZES ADVERSE EFFECTS ON THE ENVIRONMENT (E.G., MINIMALLY-SIZED, LOW PRESSURE TIRES; MINIMAL HARD-TURN PATHS FOR TRACKED VEHICLES; TEMPORARY MATS OR PLATES WITHIN WET AREAS OR ON SENSITIVE SOILS). ALL VEHICLES AND OTHER MECHANIZED EQUIPMENT WILL BE:

A) STORED, FUELED, AND MAINTAINED IN A VEHICLE STAGING AREA PLACED 150 FEET OR MORE FROM ANY NATURAL WATER BODY OR WETLAND OR ON AN ADJACENT, ESTABLISHED ROAD AREA;

B) REFUELED IN A VEHICLE STAGING AREA PLACED 150 FEET OR MORE FROM A NATURAL WATERBODY OR WETLAND, OR IN AN ISOLATED HARD ZONE, SUCH AS A PAVED PARKING LOT OR ADJACENT, ESTABLISHED ROAD (THIS MEASURE APPLIES ONLY TO GAS-POWERED EQUIPMENT WITH TANKS LARGER THAN 5 GALLONS);

C) BIODEGRADABLE LUBRICANTS AND FLUIDS SHALL BE USED ON EQUIPMENT OPERATING IN AND ADJACENT TO THE STREAM CHANNEL AND LIVE WATER.

D) INSPECTED DAILY FOR FLUID LEAKS BEFORE LEAVING THE VEHICLE STAGING AREA FOR OPERATION WITHIN 150 FEET OF ANY NATURAL WATER BODY OR WETLAND; AND

E) THOROUGHLY CLEANED BEFORE OPERATION BELOW ORDINARY HIGH WATER, AND AS OFTEN AS NECESSARY DURING OPERATION, TO REMAIN GREASE FREE.

9) EROSION CONTROL. EROSION CONTROL MEASURES WILL BE PREPARED AND CARRIED OUT, COMMENSURATE IN SCOPE WITH THE ACTION, THAT MAY INCLUDE THE FOLLOWING:

A) TEMPORARY EROSION CONTROLS.

I. TEMPORARY EROSION CONTROLS WILL BE IN PLACE BEFORE ANY SIGNIFICANT ALTERATION OF THE ACTION SITE AND APPROPRIATELY INSTALLED DOWNSLOPE OF PROJECT ACTIVITY WITHIN THE RIPARIAN BUFFER AREA UNTIL SITE REHABILITATION IS COMPLETE.

II. IF THERE IS A POTENTIAL FOR ERODED SEDIMENT TO ENTER THE STREAM, SEDIMENT BARRIERS WILL BE INSTALLED AND MAINTAINED FOR THE DURATION OF PROJECT IMPLEMENTATION.

III. TEMPORARY EROSION CONTROL MEASURES MAY INCLUDE FIBER WATTLES, SILT FENCES, JUTE MATTING, WOOD FIBER MULCH AND SOIL BINDER, OR GEOTEXTILES AND GEOSYNTHETIC FABRIC.

IV. SOIL STABILIZATION UTILIZING WOOD FIBER MULCH AND TACKIFIER (HYDRO-APPLIED) MAY BE USED TO REDUCE EROSION DF BARE SOIL IF THE MATERIALS ARE NOXIOUS WEED FREE AND NONTOXIC TO AQUATIC AND TERRESTRIAL ANIMALS, SOIL MICROORGANISMS, AND VEGETATION.

V. SEDIMENT WILL BE REMOVED FROM EROSION CONTROLS ONCE IT HAS REACHED 1/3 OF THE EXPOSED HEIGHT OF THE CONTROL.

VI. ONCE THE SITE IS STABILIZED AFTER CONSTRUCTION, TEMPORARY EROSION CONTROL MEASURES WILL BE REMOVED.

B) EMERGENCY EROSION CONTROLS. THE FOLLOWING MATERIALS FOR EMERGENCY EROSION CONTROL WILL BE AVAILABLE AT THE WORK SITE:

I. A SUPPLY OF SEDIMENT CONTROL MATERIALS; AND

II. AN OIL-ABSORBING FLOATING BOOM WHENEVER SURFACE WATER IS PRESENT.

10) DUST ABATEMENT. THE PROJECT SPONSOR WILL DETERMINE THE APPROPRIATE DUST CONTROL MEASURES BY CONSIDERING SOIL TYPE, EQUIPMENT USAGE, PREVAILING WIND DIRECTION, AND THE EFFECTS CAUSED BY OTHER EROSION AND SEDIMENT CONTROL MEASURES. IN ADDITION, THE FOLLOWING CRITERIA WILL BE FOLLOWED:

A) WORK WILL BE SEQUENCED AND SCHEDULED TO REDUCE EXPOSED BARE SOIL SUBJECT TO WIND EROSION.

B) DUST-ABATEMENT ADDITIVES AND STABILIZATION CHEMICALS {TYPICALLY MAGNESIUM CHLORIDE, CALCIUM CHLORIDE SALTS, OR LIGNINSULFONATE) WILL NOT BE APPLIED WITHIN 25 FEET DF WATER OR A STREAM CHANNEL AND WILL BE APPLIED SD AS TO MINIMIZE THE LIKELIHOOD THAT THEY WILL ENTER STREAMS. APPLICATIONS OF LIGNINSULFONATE WILL BE LIMITED TO A MAXIMUM RA TE OF 0.5 GALLONS PER SQUARE YARD OF ROAD SURFACE, ASSUMING A 50:50 (LIGNINSULFONATE TO WATER) SOLUTION.

C) APPLICATION DF DUST ABATEMENT CHEMICALS WILL BE AVOIDED DURING OR JUST BEFORE WET WEATHER, AND AT STREAM CROSSINGS OR OTHER AREAS THAT COULD RESULT IN UNFILTERED DELIVERY DF THE DUST ABATEMENT MATERIALS TOA WATERBODY (TYPICALLY THESE WOULD BE AREAS WITHIN 25 FEET OF A WATERBODY OR STREAM CHANNEL; DISTANCES MAY BE GREATER WHERE VEGETATION IS SPARSE OR SLOPES ARE STEEP).

D) SPILL CONTAINMENT EQUIPMENT WILL BE AVAILABLE DURING APPLICATION DF DUST ABATEMENT CHEMICALS.

E) PETROLEUM-BASED PRODUCTS WILL NOT BE USED FOR DUST ABATEMENT.

11) SPILL PREVENTION. CONTROL. AND COUNTER MEASURES. THE USE OF MECHANIZED MACHINERY INCREASES THE RISK FOR ACCIDENTAL SPILLS OF FUEL, LUBRICANTS, HYDRAULIC FLUID, OR OTHER CONTAMINANTS INTO THE RIPARIAN ZONE OR DIRECTLY INTO THE WATER. ADDITIONALLY, UNCURED CONCRETE AND FORM MATERIALS ADJACENT TO THE ACTIVE STREAM CHANNEL MAY RESULT IN ACCIDENTAL DISCHARGE INTO THE WATER. THESE CONTAMINANTS CAN DEGRADE HABITAT, AND INJURE OR KILL AQUATIC FOOD ORGANISMS AND EBA-LISTED SPECIES. THE PROJECT SPONSOR WILL ADHERE TO THE FOLLOWING MEASURES:

A) A DESCRIPTION OF HAZARDOUS MATERIALS THAT WILL BE USED, INCLUDING INVENTORY, STORAGE, AND HANDLING PROCEDURES WILL BE AVAILABLE ON-SITE.

B) WRITTEN PROCEDURES FOR NOTIFYING ENVIRONMENTAL RESPONSE AGENCIES WILL BE POSTED AT THE WORK SITE.

C) SPILL CONTAINMENT KITS (INCLUDING INSTRUCTIONS FOR CLEANUP AND DISPOSAL) ADEQUATE FOR THE TYPES AND QUANTITY OF HAZARDOUS MATERIALS USED AT THE SITE WILL BE AVAILABLE AT THE WORK SITE.

D) WORKERS WILL BE TRAINED IN SPILL CONTAINMENT PROCEDURES AND WILL BE INFORMED OF THE LOCATION OF SPILL CONTAINMENT KITS.

E) ANY WASTE LIQUIDS GENERATED AT THE STAGING AREAS WILL BE TEMPORARILY STORED UNDER AN IMPERVIOUS COVER, SUCH AS A TARPAULIN, UNTIL THEY CAN BE PROPERLY TRANSPORTED TO AND DISPOSED OF AT A FACILITY THAT IS APPROVED FOR RECEIPT OF HAZARDOUS MATERIALS.

12) INVASIVE SPECIES CONTROL. THE FOLLOWING MEASURES WILL BE FOLLOWED TO AVOID INTRODUCTION OF INVASIVE PLANTS AND NOXIOUS WEEDS INTO PROJECT AREAS:

A) PRIOR TO ENTERING THE SITE, ALL VEHICLES AND EQUIPMENT WILL BE POWER WASHED, ALLOWED TO FULLY DRY, AND INSPECTED TO MAKE SURE NO PLANTS, SOIL, OR OTHER ORGANIC MATERIAL ADHERES TO THE SURFACE.

B) WATERCRAFT, WADERS, BOOTS, AND ANY OTHER GEAR TO BE USED IN OR NEAR WATER WILL BE INSPECTED FOR AQUATIC INVASIVE SPECIES.

C) WADING BOOTS WITH FELT SOLES ARE NOT TO BE USED DUE TO THEIR PROPENSITY FOR AIDING IN THE TRANSFER OF INVASIVE SPECIES.

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
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TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

HIP III CONSERVATION MEASURES
GENERAL
100% DESIGN

DATE: JUL 13, 2017
SHEET: 3
REV: –

WORK AREA ISOLATION & FISH SALVAGE.

ANY WORK AREA WITHIN THE WETTED CHANNEL WILL BE ISOLATED FROM THE ACTIVE STREAM WHENEVER ESA-LISTED FISH ARE REASONABLY CERTAIN TO BE PRESENT. OR IF THE WORK AREA IS LESS THAN 300-FEET UPSTREAM FROM KNOWN SPAWNING HABITATS. WHEN WORK AREA ISOLATION IS REQUIRED, DESIGN PLANS WILL INCLUDE ALL ISOLATION ELEMENTS, FISH RELEASE AREAS, AND, WHEN A PUMP IS USED TO DEWATER THE ISOLATION AREA AND FISH ARE PRESENT, A FISH SCREEN THAT MEETS NMFS'S FISH SCREEN CRITERIA (NMFS 2011, OR MOST CURRENT). WORK AREA ISOLATION AND FISH CAPTURE ACTIVITIES WILL OCCUR DURING PERIODS OF THE COOLEST AIR AND WATER TEMPERATURES POSSIBLE, NORMALLY EARLY IN THE MORNING VERSUS LATE IN THE DAY, AND DURING CONDITIONS APPROPRIATE TO MINIMIZE STRESS AND DEATH OF SPECIES PRESENT.

- NATIONAL MARINE FISHERIES SERVICE. 2011. ANADROMOUS SALMON ID PASSAGE FACILITY DESIGN. NORTHWEST REGION. AVAILABLE ONLINE AT: ***HTTP://WWW.NWR.NOAA.GOV/SALMON-HYDROPOWER/FERC/UPLOAD/FISH-PASSAGE-DESIGN.PDF***
- U.S. FISH AND WILDLIFE SERVICE. 2010. BEST MANAGEMENT PRACTICES TO MINIMIZE ADVERSE EFFECTS TO PACIFIC LAMPREY. ***HTTP://WWW.FWS.GOV/PACIFIC/FISHERIES/SPHABCON/LAMPREY/PDF/BEST%20MANAGEMENT%20PRACTICES%20FOR%20PACIFIC%20LAMPREY%20APRIL %202010%20VERSION.PDF***

FOR SALVAGE OPERATIONS IN KNOWN BULL TROUT SPAWNING AND REARING HABITAT. ELECTROFISHING SHALL ONLY OCCUR FROM MAY 1 TO JULY 31. NO ELECTROFISHING WILL OCCUR IN ANY BULL TROUT OCCUPIED HABITAT AFTER AUGUST 15. BULL TROUT ARE VERY TEMPERATURE SENSITIVE AND GENERALLY SHOULD NOT BE ELECTROSHOCKED OR OTHERWISE HANDLED WHEN TEMPERATURES EXCEED 15 DEGREES CELSIUS. SALVAGE ACTIVITIES SHOULD TAKE PLACE DURING PERIODS OF THE COOLEST AIR AND WATER TEMPERATURES POSSIBLE. NORMALLY EARLY IN THE MORNING VERSUS LATE IN THE DAY, AND DURING CONDITIONS APPROPRIATE TO MINIMIZE STRESS TO FISH SPECIES PRESENT.

SALVAGE OPERATIONS WILL FOLLOW THE ORDERING, METHODOLOGIES. AND CONSERVATION MEASURES SPECIFIED BELOW IN STEPS 1 THROUGH 6. STEPS 1 AND 2 WILL BE IMPLEMENTED FOR ALL PROJECTS WHERE WORK AREA ISOLATION IS NECESSARY ACCORDING TO CONDITIONS ABOVE. ELECTROFISHING (STEP 3) CAN BE IMPLEMENTED TO ENSURE ALL FISH HAVE BEEN REMOVED FOLLOWING STEPS 1 AND 2, OR WHEN OTHER MEANS OF FISH CAPTURE MAY NOT BE FEASIBLE OR EFFECTIVE. DEWATERING AND REWATERING (STEPS 4 AND 5) WILL BE IMPLEMENTED UNLESS WETTED IN-STREAM WORK IS DEEMED TO BE MINIMALLY HARMFUL TO FISH, AND IS BENEFICIAL TO OTHER AQUATIC SPECIES. DEWATERING WILL NOT BE CONDUCTED IN AREAS KNOWN TO BE OCCUPIED BY LAMPREY, UNLESS LAMPREYS ARE SALVAGED USING GUIDANCE SET FORTH IN US FISH AND WILDLIFE SERVICE (2010)3.

1) ISOLATE.

A) BLOCK NETS WILL BE INSTALLED AT UPSTREAM AND DOWNSTREAM LOCATIONS AND MAINTAINED IN A SECURED POSITION TO EXCLUDE FISH FROM ENTERING THE PROJECT AREA.

B) BLOCK NETS WILL BE SECURED TO THE STREAM CHANNEL BED AND BANKS UNTIL FISH CAPTURE AND TRANSPORT ACTIVITIES ARE COMPLETE. BLOCK NETS MAY BE LEFT IN PLACE FOR THE DURATION OF THE PROJECT TO EXCLUDE FISH.

C) IF BLOCK NETS REMAIN IN PLACE MORE THAN ONE DAY, THE NETS WILL BE MONITORED AT LEAST DAILY TO ENSURE THEY ARE SECURED TO THE BANKS AND FREE OF ORGANIC ACCUMULATION. IF THE PROJECT IS WITHIN BULL TROUT SPAWNING AND REARING HABITAT, THE BLOCK NETS MUST BE CHECKED EVERY FOUR HOURS FOR FISH IMPINGEMENT ON THE NET. LESS FREQUENT INTERVALS MUST BE APPROVED THROUGH A VARIANCE REQUEST.

D) NETS WILL BE MONITORED HOURLY ANYTIME THERE IS INSTREAM DISTURBANCE.

2) SALVAGE. AS DESCRIBED BELOW, FISH TRAPPED WITHIN THE ISOLATED WORK AREA WILL BE CAPTURED TO MINIMIZE THE RISK OF INJURY, THEN RELEASED AT A SAFE SITE:

A) REMOVE AS MANY FISH AS POSSIBLE PRIOR TO DEWATERING.

B) DURING DEWATERING, ANY REMAINING FISH WILL BE COLLECTED BY HAND OR DIP NETS.

C) SEINES WITH A MESH SIZE TO ENSURE CAPTURE OF THE RESIDING ESA-LISTED FISH WILL BE USED.

D) MINNOW TRAPS WILL BE LEFT IN PLACE OVERNIGHT AND USED IN CONJUNCTION WITH SEINING.

E) IF BUCKETS ARE USED TO TRANSPORT FISH:

I. THE TIME FISH ARE IN A TRANSPORT BUCKET WILL BE LIMITED, AND WILL BE RELEASED AS QUICKLY AS POSSIBLE;

II. THE NUMBER OF FISH WITHIN A BUCKET WILL BE LIMITED BASED ON SIZE, AND FISH WILL BE OF RELATIVELY COMPARABLE SIZE TO MINIMIZE PREDATION;

III. AERATORS FOR BUCKETS WILL BE USED OR THE BUCKET WATER WILL BE FREQUENTLY CHANGED WITH COLD CLEAR WATER AT 15 MINUTE OR MORE FREQUENT INTERVALS.

IV. BUCKETS WILL BE KEPT IN SHADED AREAS OR WILL BE COVERED BY A CANOPY IN EXPOSED AREAS.

V. DEAD FISH WILL NOT BE STORED IN TRANSPORT BUCKETS, BUT WILL BE LEFT ON THE STREAM BANK TO AVOID MORTALITY COUNTING ERRORS.

F) AS RAPIDLY AS POSSIBLE (ESPECIALLY FOR TEMPERATURE-SENSITIVE BULL TROUT), FISH WILL BE RELEASED IN AN AREA THAT PROVIDES ADEQUATE COVER AND FLOW REFUGE. UPSTREAM RELEASE IS GENERALLY PREFERRED, BUT FISH RELEASED DOWNSTREAM WILL BE SUFFICIENTLY OUTSIDE OF THE INFLUENCE OF CONSTRUCTION.

G) SALVAGE WILL BE SUPERVISED BY A QUALIFIED FISHERIES BIOLOGIST EXPERIENCED WITH WORK AREA ISOLATION AND COMPETENT TO ENSURE THE SAFE HANDLING OF ALL FISH.

3) ELECTROFISHING. ELECTROFISHING WILL BE USED ONLY AFTER OTHER SALVAGE METHODS HAVE BEEN EMPLOYED OR WHEN OTHER MEANS OF FISH CAPTURE ARE DETERMINED TO NOT BE FEASIBLE OR EFFECTIVE. IF ELECTROFISHING WILL BE USED TO CAPTURE FISH FOR SALVAGE, THE SALVAGE OPERATION WILL BE LED BY AN EXPERIENCED FISHERIES BIOLOGIST AND THE FOLLOWING GUIDELINES WILL BE FOLLOWED:

A) THE NMFS'S ELECTROFISHING GUIDELINES (NMFS 2000).

B) ONLY DIRECT CURRENT (DC) OR PULSED DIRECT CURRENT (PDC) WILL BE USED AND CONDUCTIVITY MUST BE TESTED.

I. IF CONDUCTIVITY IS LESS THAN 100 MS. VOLTAGE RANGES FROM 900 TO 1100 D) TREATMENTS TO REMOVE DEBRIS, NUTRIENTS, SEDIMENT, PETROLEUM WILL BE USED. HYDROCARBONS, METALS AND OTHER POLLUTANTS LIKELY TO BE PRESENT WILL BE

II. FOR CONDUCTIVITY RANGES BETWEEN 100 TO 300 MS, VOLTAGE RANGES WILL PROVIDED. BE 500 TO BOO.

III. FOR CONDUCTIVITY GREATER THAN 300 MS. VOLTAGE WILL BE LESS THAN 400.

C) ELECTROFISHING WILL BEGIN WITH A MINIMUM PULSE WIDTH AND RECOMMENDED VOLTAGE AND THEN GRADUALLY INCREASE TO THE POINT WHERE FISH ARE IMMOBILIZED.

D) THE ANODE WILL NOT INTENTIONALLY CONTACT FISH.

E) ELECTROFISHING SHALL NOT BE CONDUCTED WHEN THE WATER CONDITIONS ARE TURBID AND VISIBILITY IS POOR. THIS CONDITION MAY BE EXPERIENCED WHEN THE SAMPLER CANNOT SEE THE STREAM BOTTOM IN ONE FOOT OF WATER.

F) IF MORTALITY OR OBVIOUS INJURY (DEFINED AS DARK BANDS ON THE BODY, SPINAL DEFORMATIONS, DE-SCALING OF 25% OR MORE OF BODY, AND TORPIDITY OR INABILITY TO MAINTAIN UPRIGHT ATTITUDE AFTER SUFFICIENT RECOVERY TIME) OCCURS DURING ELECTROFISHING. OPERATIONS WILL BE IMMEDIATELY DISCONTINUED, MACHINE SETTINGS, WATER TEMPERATURE AND CONDUCTIVITY CHECKED, AND PROCEDURES ADJUSTED OR ELECTROFISHING POSTPONED TO REDUCE MORTALITY.

4) DEWATER. DEWATERING, WHEN NECESSARY, WILL BE CONDUCTED OVER A SUFFICIENT PERIOD OF TIME TO ALLOW SPECIES TO NATURALLY MIGRATE OUT OF THE WORK AREA AND WILL BE LIMITED TO THE SHORTEST LINEAR EXTENT PRACTICABLE.

A) DIVERSION AROUND THE CONSTRUCTION SITE MAY BE ACCOMPLISHED WITH A COFFER DAM AND A BY-PASS CULVERT OR PIPE, ORA LINED, NON-ERODIBLE DIVERSION DITCH. WHERE GRAVITY FEED IS NOT POSSIBLE, A PUMP MAY BE USED, BUT MUST BE OPERATED IN SUCH A WAY AS TO AVOID REPETITIVE DEWATERING AND REWATERING OF THE SITE. IMPOUNDMENT BEHIND THE COFFERDAM MUST OCCUR SLOWLY THROUGH THE TRANSITION, WHILE CONSTANT FLOW IS DELIVERED TO THE DOWNSTREAM REACHES.

B) ALL PUMPS WILL HAVE FISH SCREENS TO AVOID JUVENILE FISH IMPINGEMENT OR ENTRAINMENT, AND WILL BE OPERATED IN ACCORDANCE WITH NMFS'S CURRENT FISH SCREEN CRITERIA (NMFS 20114, OR MOST RECENT VERSION). IF THE PUMPING RATE EXCEEDS 3 CUBIC FEET SECOND (CFS), A NMFS HYDRO FISH PASSAGE REVIEW WILL BE NECESSARY.

C) DISSIPATION OF FLOW ENERGY AT THE BYPASS OUTFLOW WILL BE PROVIDED TO PREVENT DAMAGE TO RIPARIAN VEGETATION OR STREAM CHANNEL.

D) SAFE REENTRY OF FISH INTO THE STREAM CHANNEL WILL BE PROVIDED, PREFERABLY INTO POOL HABITAT WITH COVER. IF THE DIVERSION ALLOWS FOR DOWNSTREAM FISH PASSAGE.

E) SEEPAGE WATER WILL BE PUMPED TO A TEMPORARY STORAGE AND TREATMENT SITE OR INTO UPLAND AREAS TO ALLOW WATER TO PERCOLATE THROUGH SOIL OR TO FILTER THROUGH VEGETATION PRIOR TO REENTERING THE STREAM CHANNEL.

4 NATIONAL MARINE FISHERIES SERVICE. 2011. ANADROMOUS SALMONID PASSAGE FACILITY DESIGN. NORTHWEST REGION. AVAILABLE ONLINE AT: HTIP:/MIWW.NWR.NOAA.GOV/SALMON-HYDROPOWER/FERC/UPLOAD/FISH-PASSAGE-DESIGN.PDF

5) SALVAGE NOTICE. MONITORING AND RECORDING OF FISH PRESENCE, HANDLING, AND MORTALITY MUST OCCUR DURING THE DURATION OF THE ISOLATION, SALVAGE. ELECTROFISHING, DEWATERING. AND REWATERING OPERATIONS. ONCE OPERATIONS ARE COMPLETED, A SALVAGE REPORT WILL DOCUMENT PROCEDURES USED, ANY FISH INJURIES OR DEATHS (INCLUDING NUMBERS OF FISH AFFECTED), AND CAUSES OF ANY DEATHS.

CONSTRUCTION AND POST .CONSTRUCTION CONSERVATION MEASURES.

1) FISH PASSAGE. FISH PASSAGE WILL BE PROVIDED FOR ANY ADULT OR JUVENILE FISH LIKELY TO BE PRESENT IN THE ACTION AREA DURING CONSTRUCTION. UNLESS PASSAGE DID NOT EXIST BEFORE CONSTRUCTION OR THE STREAM IS NATURALLY IMPASSABLE AT THE TIME OF CONSTRUCTION. IF THE PROVISION OF TEMPORARY FISH PASSAGE DURING CONSTRUCTION WILL INCREASE NEGATIVE EFFECTS ON AQUATIC SPECIES OF INTEREST OR THEIR HABITAT, A VARIANCE CAN BE REQUESTED FROM THE NMFS BRANCH CHIEF AND THE FWS FIELD OFFICE SUPERVISOR. PERTINENT INFORMATION, SUCH AS THE SPECIES AFFECTED, LENGTH OF STREAM REACH AFFECTED, PROPOSED TIME FOR THE PASSAGE BARRIER. AND ALTERNATIVES CONSIDERED, WILL BE INCLUDED IN THE VARIANCE REQUEST.

2) CONSTRUCTION AND DISCHARGE WATER.

A) SURFACE WATER MAY BE DIVERTED TO MEET CONSTRUCTION NEEDS, BUT ONLY IF DEVELOPED SOURCES ARE UNAVAILABLE OR INADEQUATE.

B) DIVERSIONS WILL NOT EXCEED 10% OF THE AVAILABLE FLOW.

C) ALL CONSTRUCTION DISCHARGE WATER WILL BE COLLECTED AND TREATED USING THE BEST AVAILABLE TECHNOLOGY APPLICABLE TO SITE CONDITIONS.

D) TREATMENTS TO REMOVE DEBRIS, NUTRIENTS, SEDIMENT, PETROLEUM HYDROCARBONS, METALS AND OTHER POLLUTANTS LIKELY TO BE PRESENT WILL BE PROVIDED.

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

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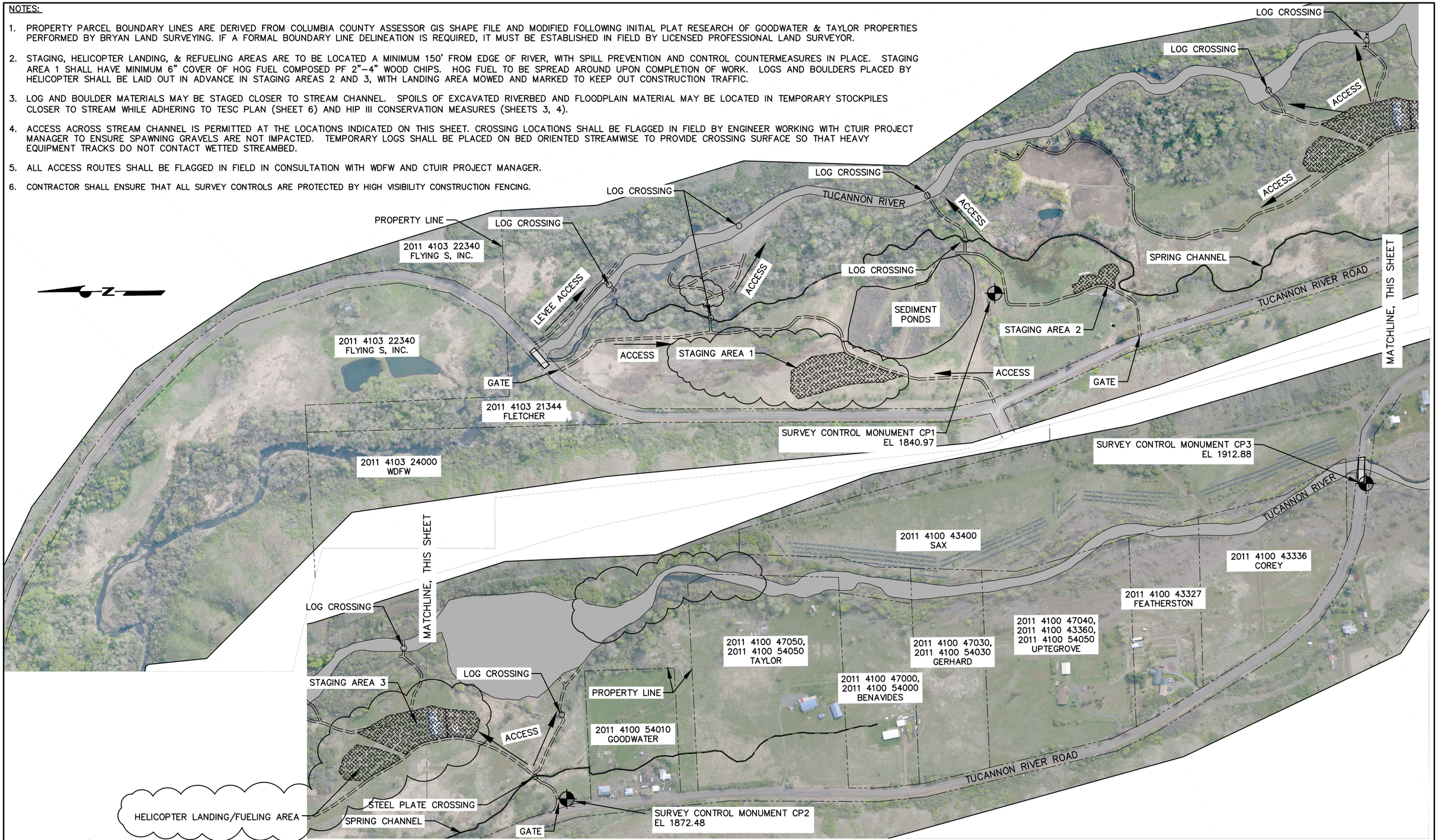
TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

HIP III CONSERVATION MEASURES
FISH PROTECTION
100% DESIGN

DATE: JUL 13, 2017
SHEET: 4
REV: –

NOTES:

1. PROPERTY PARCEL BOUNDARY LINES ARE DERIVED FROM COLUMBIA COUNTY ASSESSOR GIS SHAPE FILE AND MODIFIED FOLLOWING INITIAL PLAT RESEARCH OF GOODWATER & TAYLOR PROPERTIES PERFORMED BY BRYAN LAND SURVEYING. IF A FORMAL BOUNDARY LINE DELINEATION IS REQUIRED, IT MUST BE ESTABLISHED IN FIELD BY LICENSED PROFESSIONAL LAND SURVEYOR.
2. STAGING, HELICOPTER LANDING, & REFUELING AREAS ARE TO BE LOCATED A MINIMUM 150' FROM EDGE OF RIVER, WITH SPILL PREVENTION AND CONTROL COUNTERMEASURES IN PLACE. STAGING AREA 1 SHALL HAVE MINIMUM 6" COVER OF HOG FUEL COMPOSED PF 2"–4" WOOD CHIPS. HOG FUEL TO BE SPREAD AROUND UPON COMPLETION OF WORK. LOGS AND BOULDERS PLACED BY HELICOPTER SHALL BE LAID OUT IN ADVANCE IN STAGING AREAS 2 AND 3, WITH LANDING AREA MOWED AND MARKED TO KEEP OUT CONSTRUCTION TRAFFIC.
3. LOG AND BOULDER MATERIALS MAY BE STAGED CLOSER TO STREAM CHANNEL. SPOILS OF EXCAVATED RIVERBED AND FLOODPLAIN MATERIAL MAY BE LOCATED IN TEMPORARY STOCKPILES CLOSER TO STREAM WHILE ADHERING TO TESC PLAN (SHEET 6) AND HIP III CONSERVATION MEASURES (SHEETS 3, 4).
4. ACCESS ACROSS STREAM CHANNEL IS PERMITTED AT THE LOCATIONS INDICATED ON THIS SHEET. CROSSING LOCATIONS SHALL BE FLAGGED IN FIELD BY ENGINEER WORKING WITH CTUIR PROJECT MANAGER TO ENSURE SPAWNING GRAVELS ARE NOT IMPACTED. TEMPORARY LOGS SHALL BE PLACED ON BED ORIENTED STREAMWISE TO PROVIDE CROSSING SURFACE SO THAT HEAVY EQUIPMENT TRACKS DO NOT CONTACT WETTED STREAMBED.
5. ALL ACCESS ROUTES SHALL BE FLAGGED IN FIELD IN CONSULTATION WITH WDFW AND CTUIR PROJECT MANAGER.
6. CONTRACTOR SHALL ENSURE THAT ALL SURVEY CONTROLS ARE PROTECTED BY HIGH VISIBILITY CONSTRUCTION FENCING.



NO.	DATE	REVISION DESCRIPTION	BY	CHK
1	6/16/17	MOVED STAGING AREA 1	PDV	
2	7/13/17	ADDED ALTERNATE ACCESS ROUTE TO D1	PDV	
2	7/13/17	ELIMINATED E8 & ACCESS ROUTE	PDV	
2	7/13/17	MOVED HELICOPTER AREA PER FIELD CONDITIONS	PDV	

200' 0 200' 400'
1"=400'

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

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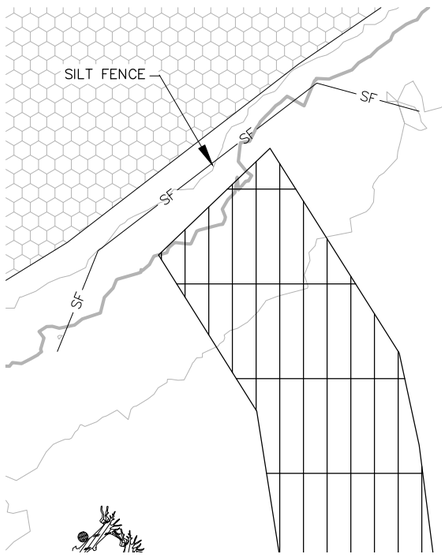
PROFESSIONAL ENGINEER

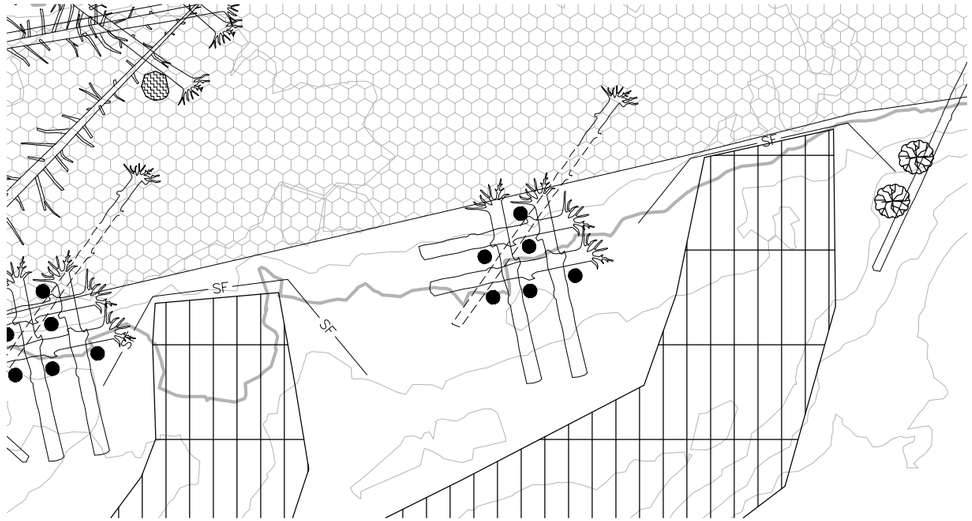
TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

PROPERTY BOUNDARIES, ACCESS, STAGING, SURVEY MONUMENTS
100% DESIGN

DATE: JUL 13, 2017
SHEET: 5
REV: 2

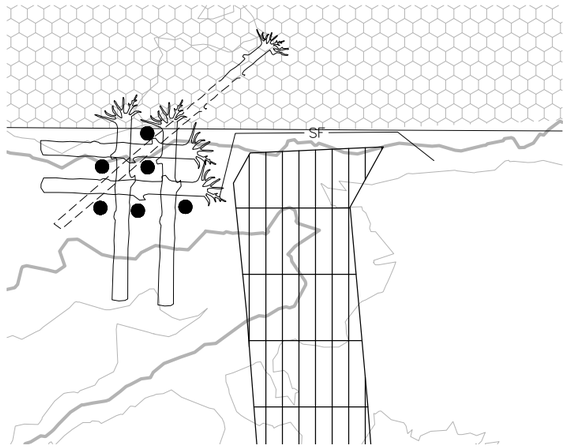


PLAN
SILT FENCE, PILOT CHANNEL SECT H — —



PLAN
SILT FENCE, PILOT CHANNELS SECT I — —

10' 0 10' 20'
1"=20'



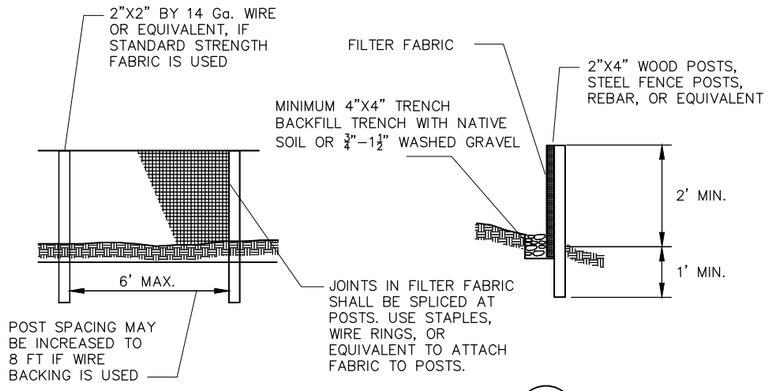
PLAN
SILT FENCE, PILOT CHANNEL SECT J — —

TEMPORARY EROSION AND SEDIMENT CONTROL NOTES

1. THE IMPLEMENTATION OF THESE TESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE TESC FACILITIES SHALL BE REVIEWED AND SUPERVISED BY AN INDIVIDUAL WITH CESCL CERTIFICATION AND EXPERIENCE IN IMPLEMENTING TESC PLANS.
2. BOUNDARIES OF CLEARING LIMITS IN RIPARIAN VEGETATION AREAS SHALL BE APPROVED BY ENGINEER AND/OR OWNER PRIOR TO CONSTRUCTION; DURING CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE CLEARING LIMITS SHALL BE MONITORED BY OWNER PROJECT MANAGER FOR THE DURATION OF CONSTRUCTION.
3. THE TESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO OR IN CONJUNCTION WITH ALL CLEARING AND GRADING SO AS TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATERS, AND ADJACENT PROPERTIES IS MINIMIZED.
4. THE TESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR THE ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD THESE TESC FACILITIES SHALL BE UPGRADED BY CONTRACTOR AND APPROVED BY THE ENGINEER AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITIONS (E.G., INSTALLATION/RELOCATION OF SILT FENCES, ETC.)
5. THE TESC FACILITIES SHALL BE INSPECTED DAILY AND MAINTAINED BY CONTRACTOR TO ENSURE CONTINUED PROPER FUNCTIONING.
6. THE TESC FACILITIES ON INACTIVE SITES SHALL BE INSPECTED AND MAINTAINED A MINIMUM OF ONCE A WEEK OR WITHIN 48 HOURS OF FOLLOWING A STORM EVENT.
7. WHERE TEMPORARY EROSION CONTROL IS REQUIRED STRAW MULCH SHALL BE APPLIED AT A MINIMUM 2–INCH THICKNESS.
8. EROSION CONTROL WILL MEET ALL HIP III REQUIREMENTS ON SHEET 3.
9. ALL CONSTRUCTION EQUIPMENT ACCESS TO WORK SITES REQUIRING CHANNEL CROSSING SHALL USE LOGS PLACED STREAMWISE IN SHALLOW WATER AS A PROTECTIVE BASE, ALONG THE ROUTES INDICATED ON SHEET 5. LOGS SHALL BE REMOVED ONCE ACCESS IS NO LONGER NEEDED AND PLACED AS SLASH WITHIN/AT UPSTREAM SIDE OF FLOOD FENCE ARRAYS
10. ALL DISTURBED AREAS SHALL BE SEEDED AT END OF CONSTRUCTION WITH APPROVED NATIVE SEED MIX PER SHEET 29.

SILT FENCE NOTE:

1. SILT FENCE SHALL BE USED FOLLOWING THESE SPECIFICATIONS:
   – FABRIC SHALL BE EQUAL TO "MIRAFI" WITH 100 LB GRAB TENSILE STRENGTH,
   – 200 PSI BURST STRENGTH, AND 70–200 SIEVE # APPARENT OPENING.



DETAIL, NTS
SILT FENCE BARRIER — a —

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REGISTERED
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AS SHOWN

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BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

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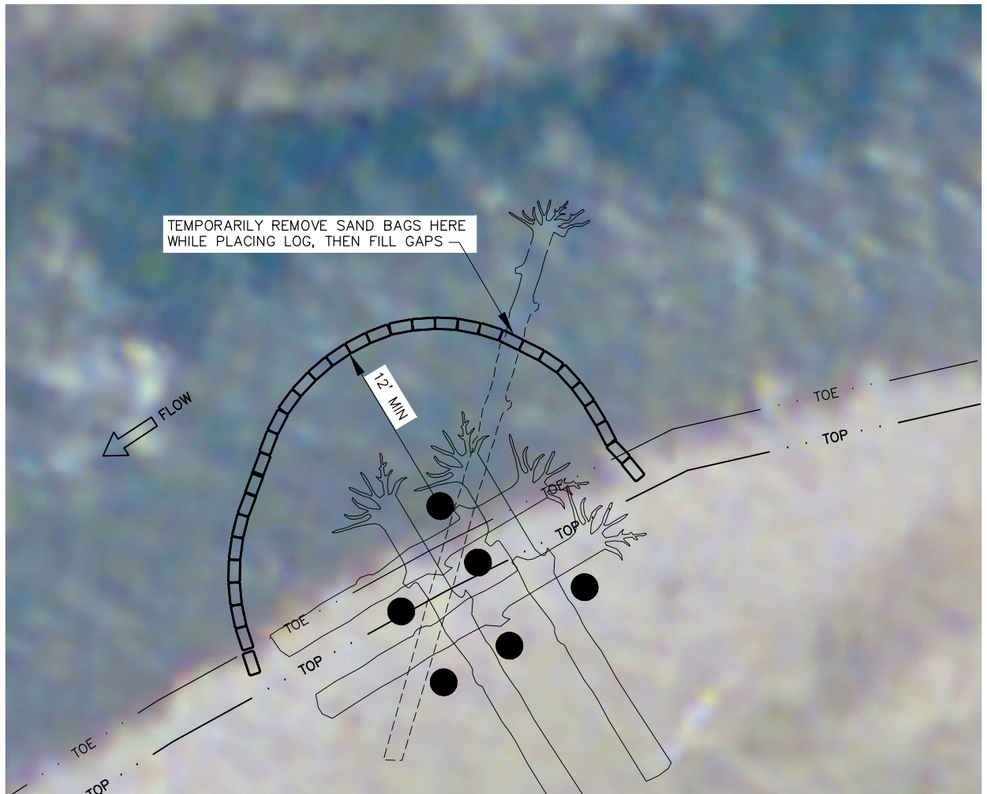
TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

TESC PLAN
—
100% DESIGN

DATE: JUL 13, 2017
SHEET: 6
REV: —



WATER MANAGEMENT, NTS, TYP
ELJ – SEE NOTE 2

5' 0 5' 10'
1"=10'

NOTES:

1. WATER MANAGEMENT IS REQUIRED FOR CONSTRUCTION OF (1) ENGINEERED LOG JAMS (ELJ), (2) EMBEDDED HABITAT LOGS, AND (3) FLOOD FENCES CONSTRUCTED ON GRAVEL BARS. WATER MANAGEMENT STRATEGY SHALL BE TO ISOLATE WORK AREAS AND PREVENT DISCHARGE AND SEEPAGE OF DIRTY WATER TO ADJACENT STREAM CHANNEL. IN ALL CASES, SCREENED PUMPS SHALL BE USED AS NEEDED TO EITHER KEEP ISOLATED WORK AREAS SUFFICIENTLY DRY OR MAINTAIN HYDRAULIC GRADIENT FROM CHANNEL TO WORK AREA. PUMPED WATER WILL BE DISCHARGED TO FLOODPLAIN SWALES OR SAND BAG–CONFINED SETTLING/INFILTRATION AREAS IF SWALE OVERFLOWS AND DRAINS TO CHANNEL. THERE SHALL BE A BACKUP PUMP AVAILABLE ON THE PROJECT SITE AS WELL.

2. GENERAL SEQUENCE FOR ENGINEERED LOG JAM (ELJ) ISOLATION AND CONSTRUCTION:
   - 2.1. FIRST SWEEP AREA OF FISH USING SEINING AND ELECTROFISHING FOLLOWING HIP III REQUIREMENTS ON SHEET 4 AND CTUIR FISH SALVAGE IMPLEMENTATION PLAN; WORK IN DOWNSTREAM DIRECTION TO CHASE FISH AWAY
   - 2.2. STARTING AT UPSTREAM END ON BANK, PLACE SUPERSACKS TO FORM COFFERDAM, WITH POLY SHEETING AND SAND BAGS AT TOE OF COFFERDAM, AROUND EXPECTED EXCAVATION AREA AND WORK BACK TO BANK AT DOWNSTREAM END.
   - 2.3. PERFORM FISH SALVAGE IN ISOLATED WORK AREA FOLLOWING HIP III REQUIREMENTS ON SHEET 4 AND CTUIR FISH SALVAGE IMPLEMENTATION PLAN. RELEASE FISH TO PROTECTED AREAS DOWNSTREAM WHERE THEY CAN RECOVER.
   - 2.4. USE SCREENED PUMP FOR DEWATERING WORK AREA AS NEEDED FOR SEDIMENT CONTROL AND WORKABILITY, FOLLOWING HIP III REQUIREMENTS ON SHEET 4, INCLUDING INSTALLING A SCREENED EXCLOSURE AROUND PUMP. DISCHARGE TO FLOODPLAIN SWALE AND CONTAIN –– DO NOT ALLOW DIRTY WATER TO RE–ENTER CHANNEL. MAX RATE ALLOWED PER PUMP = 1350 GPM.
   - 2.5. EXCAVATE FOR VERTICAL BOLE PLACEMENT, USING SCREENED PUMP TO MAINTAIN LOW WATER LEVEL AND MINIMIZE CAVING–IN OF SIDES OF PIT DUE TO SLOSHING.
   - 2.6. PLACE VERTICAL BOLES, BACKFILL WITH SPOILS TO STREAMBED ELEVATION.
   - 2.7. INSTALL LONG DIAGONAL HORIZONTAL LOG W/ ROOTWAD. DURING PLACEMENT, REMOVE GAP IN SANDBAG COFFER DAM, LOWER LOG INTO POSITION, AND REFORM SEAL ON EACH SIDE OF LOG AFTER PLACEMENT. MAINTAIN PUMPING IF WATER THREATENS TO OVERTOP SANDBAGS AT DOWNSTREAM END.
   - 2.8. CONSTRUCT REMAINING HORIZONTAL LOGS, COMPLETE ROPE WORK, BACKFILL WITH SPOILS.
   - 2.9. SLOWLY REMOVE SANDBAG COFFERDAM, STARTING AT UPSTREAM END AND ALLOW DIRTY WATER TO DISPERSE WITHOUT EXCEEDING STATE WATER QUALITY CRITERIA.

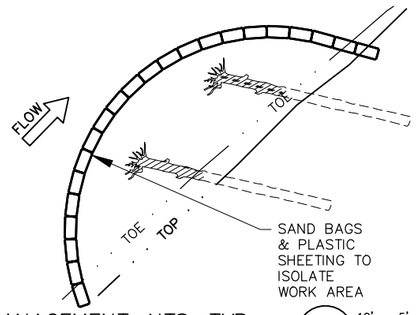
3. GENERAL SEQUENCE FOR ISOLATING EMBEDDED HABITAT LOG AREAS:
   - 3.1. ELECTRO–FISH GENERAL AREA TO BE ISOLATED.
   - 3.2. PLACE SUPERSACKS TO FORM COFFERDAM, WITH POLY SHEETING AND SAND BAGS AT TOE OF COFFERDAM, STARTING AT UPSTREAM END AND WORKING IN DOWNSTREAM DIRECTION.
   - 3.3. ELECTRO–FISH INSIDE ISOLATED AREA, RELEASE FISH TO PROTECTED AREA WHERE THEY CAN RECOVER.
   - 3.4. INSTALL AND START PUMP(S) PRIOR TO BEGINNING EXCAVATION; DISCHARGE TO FLOODPLAIN SWALE AND CONTAIN –– DO NOT ALLOW DIRTY WATER TO RE–ENTER CHANNEL.
   - 3.5. EXCAVATE TRENCH FOR LOG(S)
   - 3.6. WHEN FOLLOWING PARTIAL ENCLOSURE METHOD: WHILE PLACING LOG(S), REMOVE GAP IN SANDBAG COFFER DAM, LOWER LOG ONTO STREAMBED, AND REFORM SEAL ON EACH SIDE OF LOG IMMEDIATELY AFTER PLACEMENT. RESUME PUMPING IF WATER THREATENS TO OVERTOP SAND BAGS AT DOWNSTREAM END.
   - 3.7. CONTINUE WITH REMAINING CONSTRUCTION, BACKFILL.
   - 3.8. SLOWLY REMOVE SANDBAG COFFERDAM, STARTING AT UPSTREAM END AND ALLOW DIRTY WATER TO DISPERSE WITHOUT EXCEEDING STATE WATER QUALITY CRITERIA.

4. PRIOR TO EXCAVATING TRENCH FOR FLOOD FENCE, USE EXCAVATOR TO CONSTRUCT MINIMUM 2 FT HIGH PUSH–UP GRAVEL BERM ALONG EDGE OF BAR FOLLOWING TYPICAL PLAN THIS SHEET. START EXCAVATION AT DOWNSTREAM END AND WORK IN UPSTREAM DIRECTION. TRENCH MAY BE EXCAVATED IN WET WITHOUT PUMPING REQUIRED, TAKING CARE TO ALLOW WATER IN SPOILS TO INFILTRATE OR POND ON BAR WITHOUT RUNNING INTO STREAM.

5. FISH SALVAGE WILL BE REQUIRED AT ALL ISOLATION AREAS LEFT INTACT OVERNIGHT, PRIOR TO RESUMING CONSTRUCTION EACH DAY.

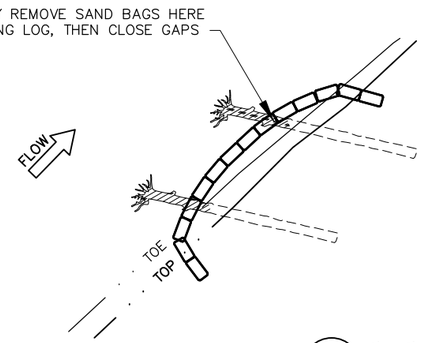
6. HABITAT BOULDERS AND LWD LOGS WILL BE INSTALLED USING A HELICOPTER WITHOUT ISOLATION OF PLACEMENT LOCATION, EXCEPT LWD LOGS L14 SHALL BE PLACED BY EXCAVATOR FROM SHORE, WITHOUT ISOLATION OF PLACEMENT LOCATION.

7. CHANGES TO PLAN AND MATERIALS MUST BE APPROVED BY ENGINEER AND OWNER PROJECT MANAGER.



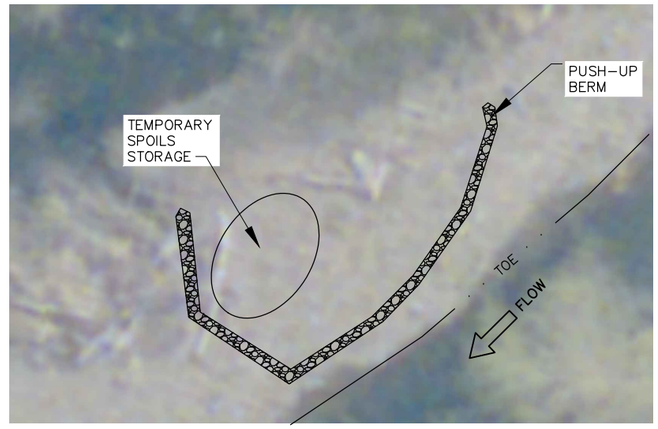
WATER MANAGEMENT, NTS, TYP
HABITAT LOGS, FULL ENCLOSURE METHOD

10' 5' 0 10' 20'
1"=20'



WATER MANAGEMENT, NTS, TYP
HABITAT LOGS, PARTIAL ENCLOSURE METHOD

10' 5' 0 10' 20'
1"=20'



WATER MANAGEMENT, NTS, TYP
FLOOD FENCE ON GRAVEL BAR – SEE NOTE 4

10' 5' 0 10' 20'
1"=20'

PAUL EDWARD DEVRIES
STATE OF WASHINGTON
37881
REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

AS SHOWN

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556–1288

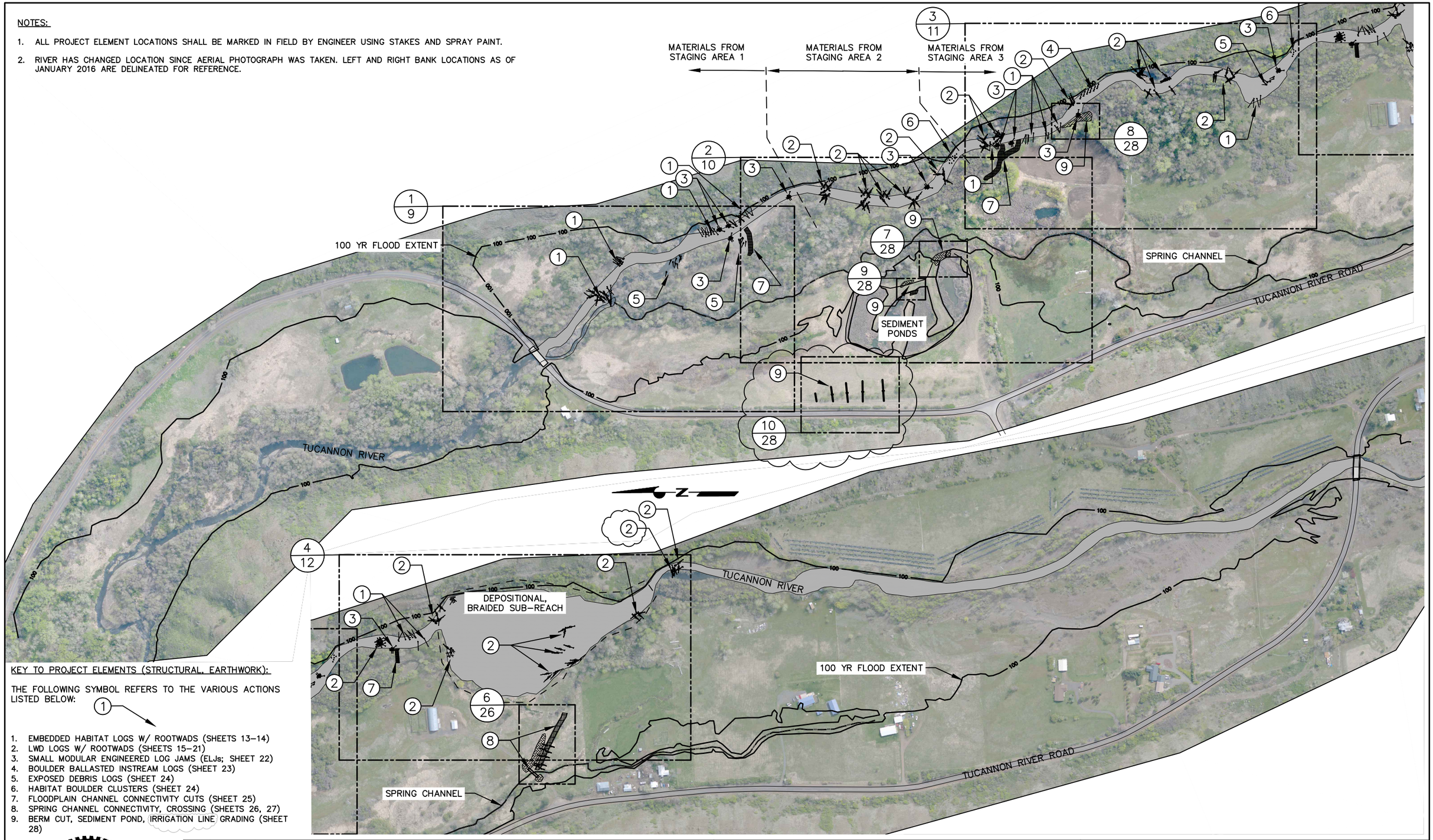
TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

WATER MANAGEMENT PLAN
–
100% DESIGN

DATE: JUL 13, 2017
SHEET: 7
REV: –

NOTES:

1. ALL PROJECT ELEMENT LOCATIONS SHALL BE MARKED IN FIELD BY ENGINEER USING STAKES AND SPRAY PAINT.
2. RIVER HAS CHANGED LOCATION SINCE AERIAL PHOTOGRAPH WAS TAKEN. LEFT AND RIGHT BANK LOCATIONS AS OF JANUARY 2016 ARE DELINEATED FOR REFERENCE.



KEY TO PROJECT ELEMENTS (STRUCTURAL, EARTHWORK):

THE FOLLOWING SYMBOL REFERS TO THE VARIOUS ACTIONS LISTED BELOW: (1)

1. EMBEDDED HABITAT LOGS W/ ROOTWADS (SHEETS 13–14)
2. LWD LOGS W/ ROOTWADS (SHEETS 15–21)
3. SMALL MODULAR ENGINEERED LOG JAMS (ELJs; SHEET 22)
4. BOULDER BALLASTED INSTREAM LOGS (SHEET 23)
5. EXPOSED DEBRIS LOGS (SHEET 24)
6. HABITAT BOULDER CLUSTERS (SHEET 24)
7. FLOODPLAIN CHANNEL CONNECTIVITY CUTS (SHEET 25)
8. SPRING CHANNEL CONNECTIVITY, CROSSING (SHEETS 26, 27)
9. BERM CUT, SEDIMENT POND, IRRIGATION LINE GRADING (SHEET 28)

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK
1	6/16/17	ADDED IRRIGATION LINE CUT PROJECT ELEMENT	PDV	
2	7/13/17	CHANGED E8 TO BE PART OF L15	PDV	

200' 0 200' 400'
1"=400'

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

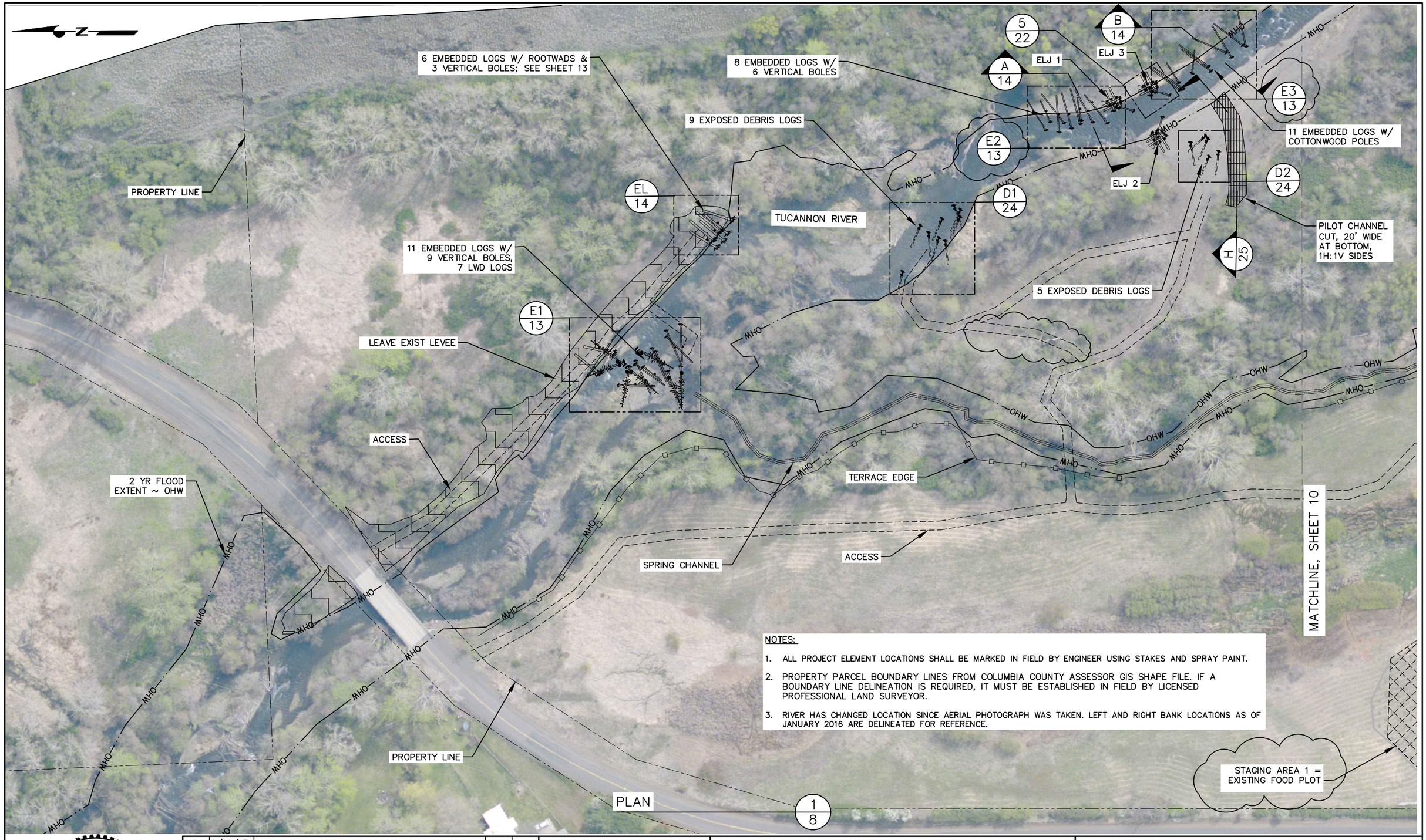
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556–1288

TUCANNON RIVER HARTSOCK – PHASE 1 FISH HABITAT & FLOODPLAIN RESTORATION

PROJECT CONSTRUCTION ELEMENTS
PLAN LAYOUT, SHEET KEY
100% DESIGN

DATE: JUL 13, 2017
SHEET: 8
REV: 2



NOTES:

1. ALL PROJECT ELEMENT LOCATIONS SHALL BE MARKED IN FIELD BY ENGINEER USING STAKES AND SPRAY PAINT.
2. PROPERTY PARCEL BOUNDARY LINES FROM COLUMBIA COUNTY ASSESSOR GIS SHAPE FILE. IF A BOUNDARY LINE DELINEATION IS REQUIRED, IT MUST BE ESTABLISHED IN FIELD BY LICENSED PROFESSIONAL LAND SURVEYOR.
3. RIVER HAS CHANGED LOCATION SINCE AERIAL PHOTOGRAPH WAS TAKEN. LEFT AND RIGHT BANK LOCATIONS AS OF JANUARY 2016 ARE DELINEATED FOR REFERENCE.

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER — LS

NO.	DATE	REVISION DESCRIPTION	BY	CHK
1	6/16/17	MOVED STAGING AREA 1	PDV	
2	7/13/17	MOVED LOG FROM E3 TO E2, ADDED ACCESS ROUTE	PDV	

50' 0 50' 100'
1"=100'

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556-1288

TUCANNON RIVER HARTSOCK – PHASE 1 FISH HABITAT & FLOODPLAIN RESTORATION

PLAN LAYOUT – SUBAREA 1
PROJECT ELEMENTS
100% DESIGN

DATE: JUL 13, 2017
SHEET: 9
REV: 2

HABITAT BOULDER FIELD PLACED BY HELICOPTER 9 TOTAL

7 LWD LOGS PLACED BY HELICOPTER

9 LWD LOGS PLACED BY HELICOPTER

9 LOGS PLACED BY HELICOPTER

2 YR FLOOD EXTENT ~ OHW

L1 15

L2 15

L3 16

L4 16

B1 24

ELJ 4

ELJ 5

TERRACE EDGE

MATCHLINE, SHEET 11

EXIST FOOD PLOT

EXIST FOOD PLOT

5 LWD LOGS PLACED BY HELICOPTER

5 LWD LOGS PLACED BY HELICOPTER

ACCESS

7 28

2 YR FLOOD EXTENT ~ OHW

FILL TO EL 1832' TO RAISE SEDIMENT POND OVERFLOW BERM

SPRING CHANNEL

STAGING AREA 2

9 28

CUT TO EL 1825' TO INCREASE SEDIMENT POND THROUGH FLOW DISPERSE SPOILS ON EXISTING BERM

SEDIMENT PONDS

INFLOW FROM HARTSOCK GRADE

MATCHLINE, SHEET 9

ACCESS

STAGING AREA 1

PLAN 2 8

NOTES:

1. ALL PROJECT ELEMENT LOCATIONS SHALL BE MARKED IN FIELD BY ENGINEER USING STAKES AND SPRAY PAINT.

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

50' 0 50' 100'
1"=100'

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

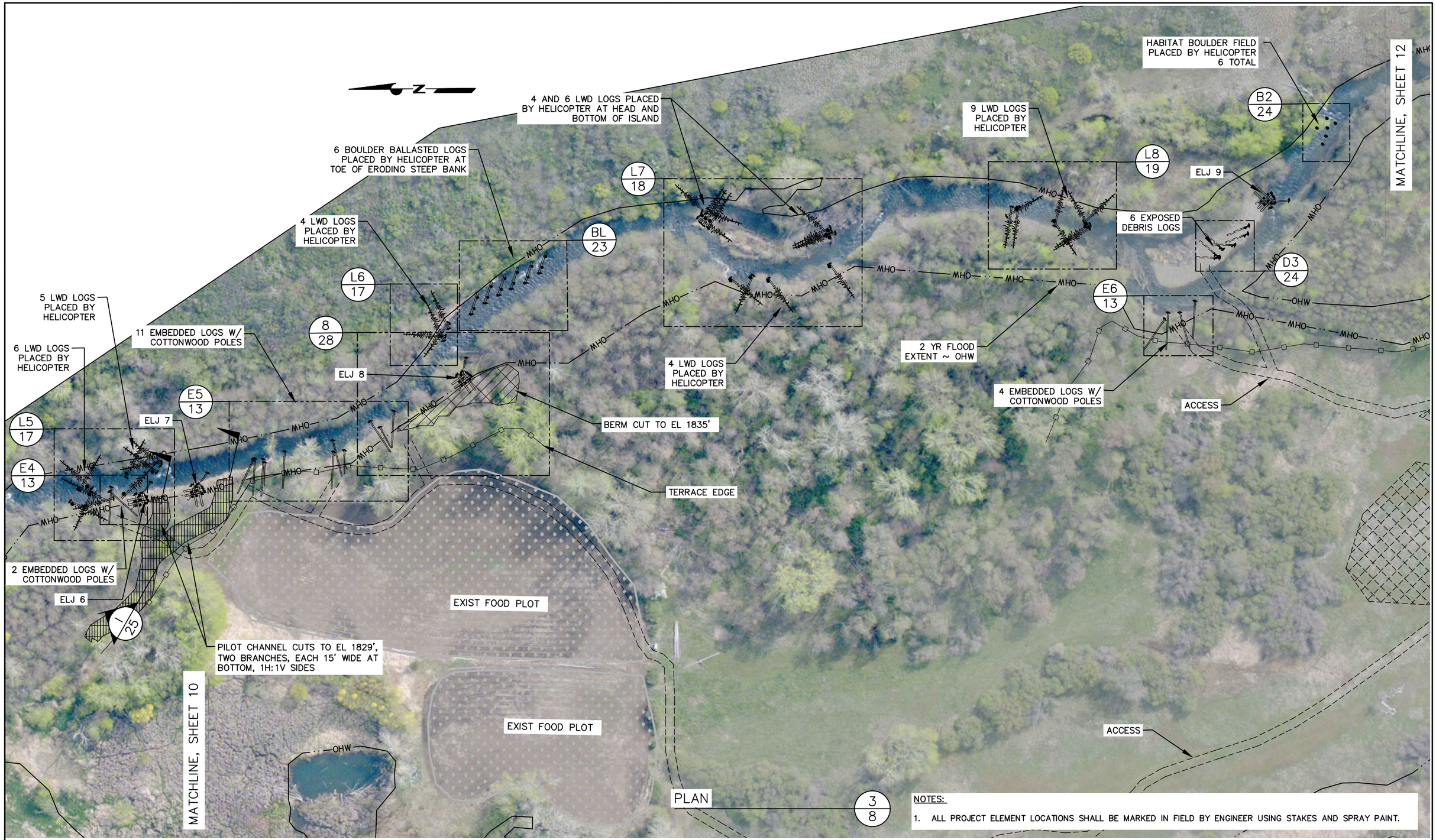
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556-1288

TUCANNON RIVER HARTSOCK – PHASE 1 FISH HABITAT & FLOODPLAIN RESTORATION

PLAN LAYOUT – SUBAREA 2
PROJECT ELEMENTS
100% DESIGN

DATE: JUL 13, 2017
SHEET: 10
REV: –



NOTES:

1. ALL PROJECT ELEMENT LOCATIONS SHALL BE MARKED IN FIELD BY ENGINEER USING STAKES AND SPRAY PAINT.

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

50' 0 50' 100'
1"=100'

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556-1288

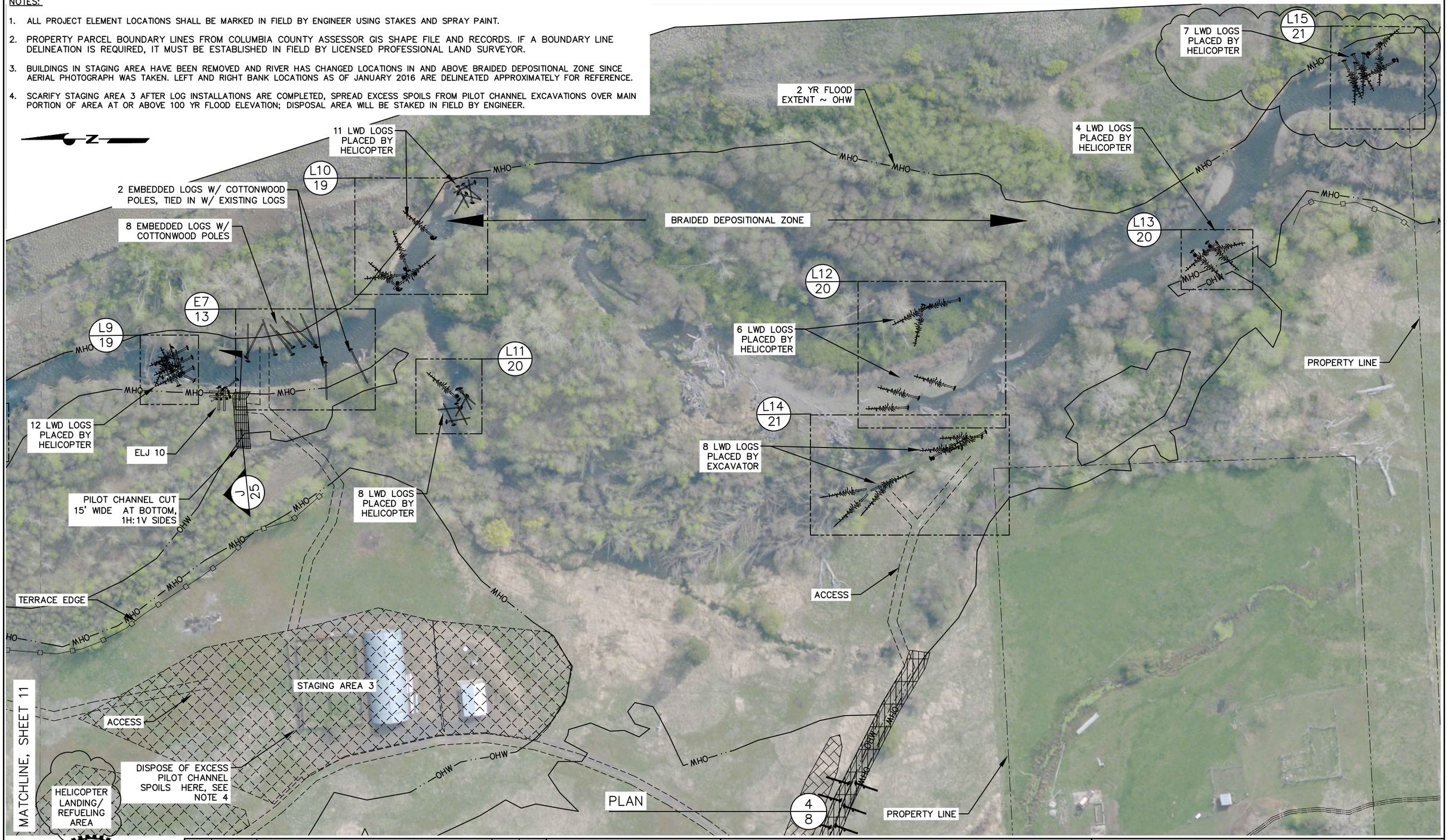
TUCANNON RIVER HARTSOCK – PHASE 1 FISH HABITAT & FLOODPLAIN RESTORATION

PLAN LAYOUT – SUBAREA 3
PROJECT ELEMENTS
100% DESIGN

DATE: JUL 13, 2017
SHEET: 11
REV: –

NOTES:

1. ALL PROJECT ELEMENT LOCATIONS SHALL BE MARKED IN FIELD BY ENGINEER USING STAKES AND SPRAY PAINT.
2. PROPERTY PARCEL BOUNDARY LINES FROM COLUMBIA COUNTY ASSESSOR GIS SHAPE FILE AND RECORDS. IF A BOUNDARY LINE DELINEATION IS REQUIRED, IT MUST BE ESTABLISHED IN FIELD BY LICENSED PROFESSIONAL LAND SURVEYOR.
3. BUILDINGS IN STAGING AREA HAVE BEEN REMOVED AND RIVER HAS CHANGED LOCATIONS IN AND ABOVE BRAIDED DEPOSITIONAL ZONE SINCE AERIAL PHOTOGRAPH WAS TAKEN. LEFT AND RIGHT BANK LOCATIONS AS OF JANUARY 2016 ARE DELINEATED APPROXIMATELY FOR REFERENCE.
4. SCARIFY STAGING AREA 3 AFTER LOG INSTALLATIONS ARE COMPLETED, SPREAD EXCESS SPOILS FROM PILOT CHANNEL EXCAVATIONS OVER MAIN PORTION OF AREA AT OR ABOVE 100 YR FLOOD ELEVATION; DISPOSAL AREA WILL BE STAKED IN FIELD BY ENGINEER.



MATCHLINE, SHEET 11

NO.	DATE	REVISION DESCRIPTION	BY	CHK
2	7/13/17	CHANGED E8 TO BE PART OF L15	PDV	
2	7/13/17	MOVED HELICOPTER AREA PER FIELD CONDITIONS	PDV	

50' 0 50' 100'
1"=100'

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556-1288

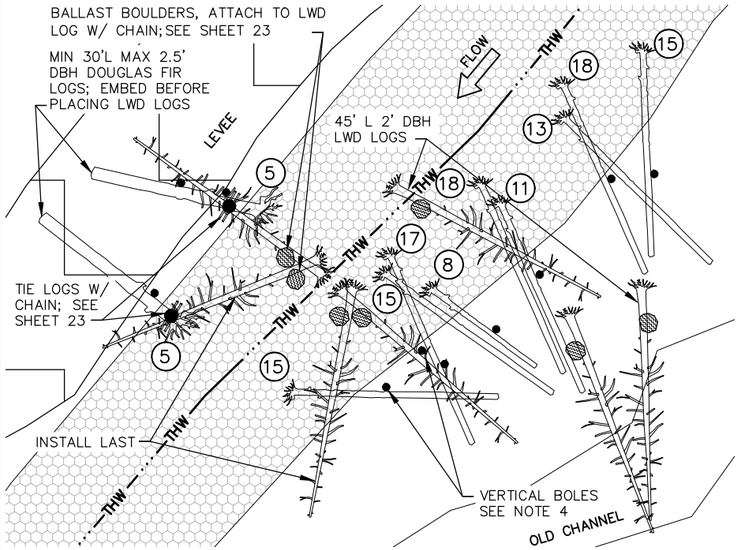
TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

PLAN LAYOUT – SUBAREA 4
PROJECT ELEMENTS
100% DESIGN

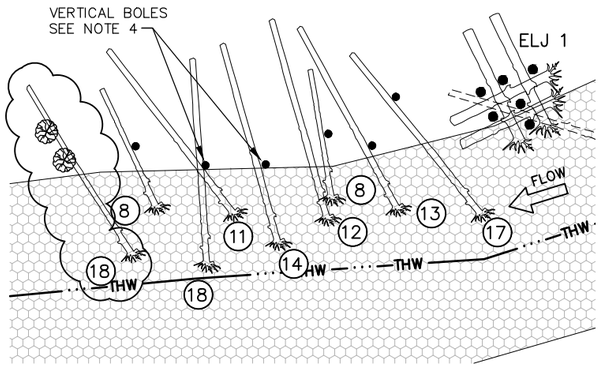
DATE: JUL 13, 2017
SHEET: 12
REV: 2

NOTES:

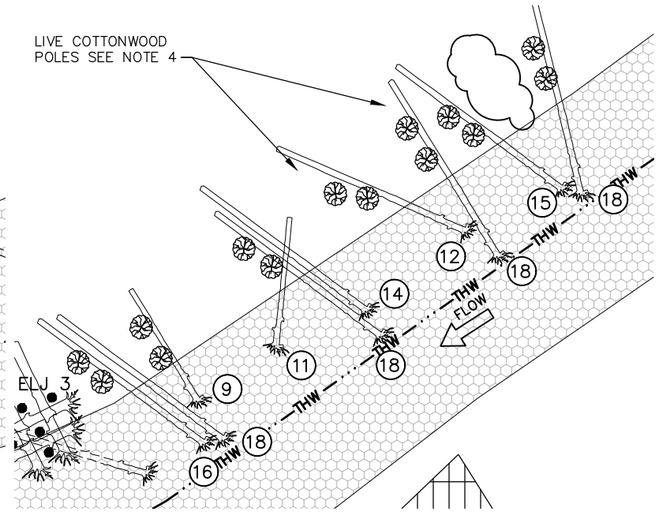
1. LOCATIONS OF LOGS TO BE STAKED IN FIELD BY ENGINEER. SINGLE AND GROUPED LOGS SHALL BE SPACED ALONG STREAM CHANNEL WITH SINGLE OR GROUPED ROOTWADS NO CLOSER THAN 12' APART. SIZES OF HABITAT LOGS TO BE INSTALLED SHALL VARY AT EACH GENERAL LOCATION WITHIN THE RANGE 16"–28" DBH, AND SHALL REFLECT AVAILABILITY OF MATERIALS. CONTRACTOR SHALL RANDOMIZE DISTRIBUTION AND MINIMIZE UNIFORMITY OF LOG SIZES AT EACH SITE ON SHEET 13
2. EMBEDDED LOGS SHALL BE INSTALLED WITH VARIED LENGTHS EXPOSED/PROTRUDING INTO FLOW, AND EMBEDDED INTO THE BANK TOE/STREAMBED SLOPE, FOLLOWING INSTALLATION SPECIFICATIONS IN TABLE 2, SHEET 14. APPROXIMATE EXPOSED LENGTH IS INDICATED IN FT FOR EACH LOG BY THE CIRCLED NUMBERS ON THIS SHEET. ANGLE OF INSTALLATION FROM BANK SHALL RESEMBLE ANGLES SHOWN (RANGE ±30° FROM PERPENDICULAR). LWD LOGS AT SITE E1 SHALL BE PLACED AFTER EMBEDDED LOGS; SEE SHEET 23 FOR LOG–BOULDER CONNECTION DETAILS AND SPECIFICATIONS.
3. RIVER HAS AVULSED OR ERODED AT SOME LOCATIONS SINCE AERIAL PHOTOGRAPH WAS TAKEN. BANK LOCATIONS AS OF JANUARY 2016 ARE DELINEATED APPROXIMATELY FOR REFERENCE.
4. PLAN LAYOUTS E1, E2, E8 ARE WITH VERTICAL BOLES (SEE SECTION A SHEET 14); OTHERS ARE WITH COTTONWOOD POLES (SEE SECTION B SHEET 14).



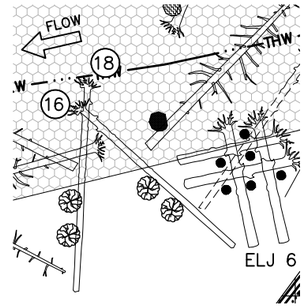
PLAN
EMBEDDED + LWD LOGS, LAYOUT — E1 / 9



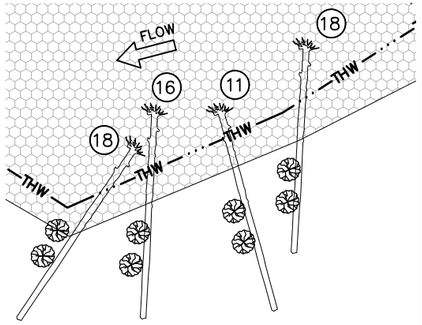
PLAN
EMBEDDED LOGS, LAYOUT — E2 / 9

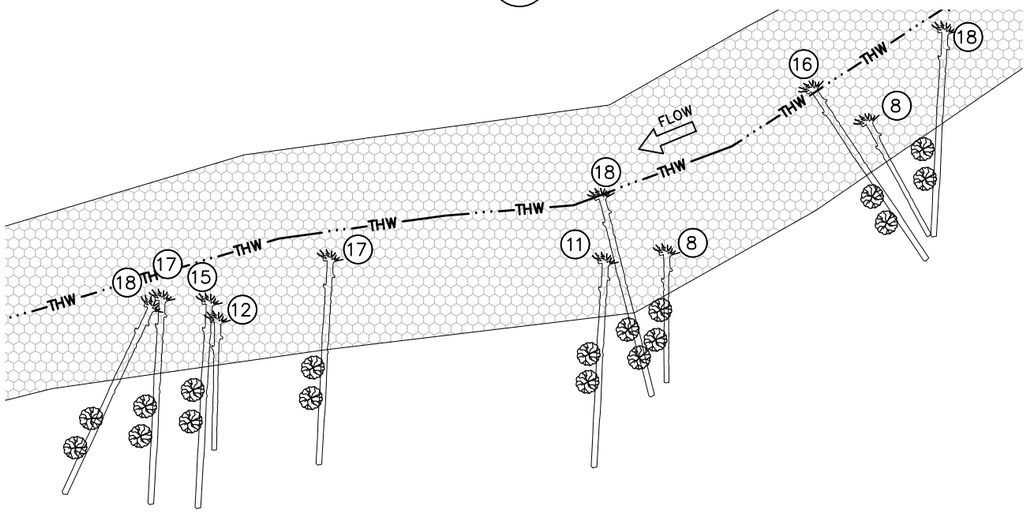


PLAN
EMBEDDED LOGS, LAYOUT — E3 / 9

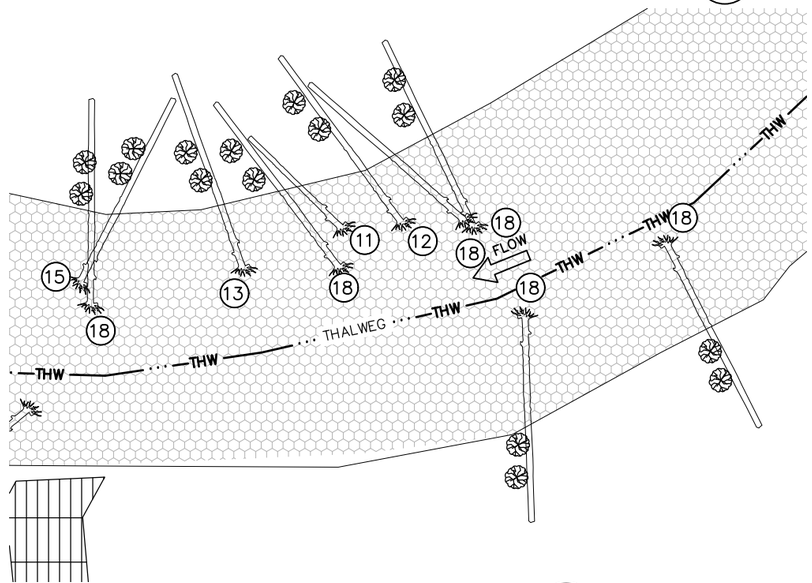


PLAN
EMBEDDED LOGS, LAYOUT — E4 / 11





PLAN
EMBEDDED LOGS, LAYOUT — E5 / 11



PLAN
EMBEDDED LOGS, LAYOUT — E7 / 12

PLAN
EMBEDDED LOGS, LAYOUT — E6 / 11

E8 REMOVED, 4 LOGS ADDED TO HELICOPTER LWD LOGS L15

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK
2	7/13/17	CHANGED E8 TO BE PART OF L15; MOVED ONE LOG FROM E3 TO E2	PDV	

15' 0 15' 30'
1"=30'

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

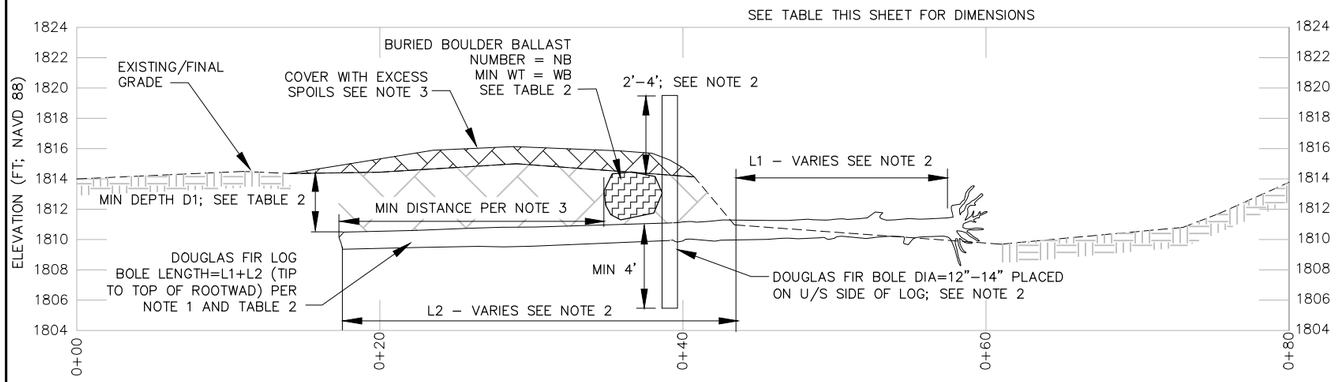
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556–1288

TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

EMBEDDED LOGS
LAYOUT PLAN
100% DESIGN

DATE: JUL 13, 2017
SHEET: 13
REV: 2

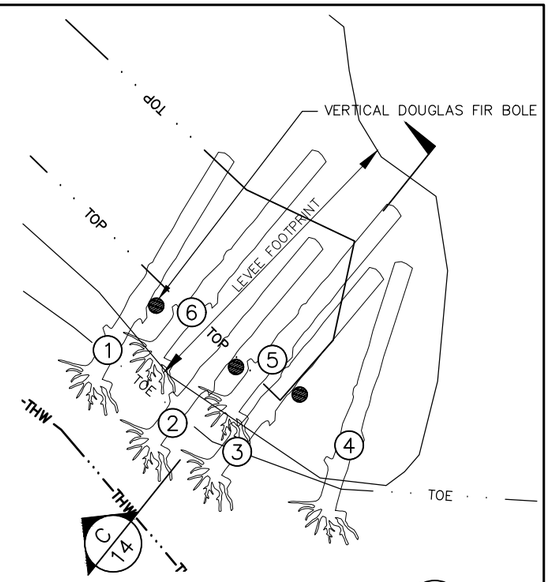


SECTION, TYP — A / 9
HABITAT LOG W/ VERTICAL BOLE

5' 0 5' 10'
1"=10'

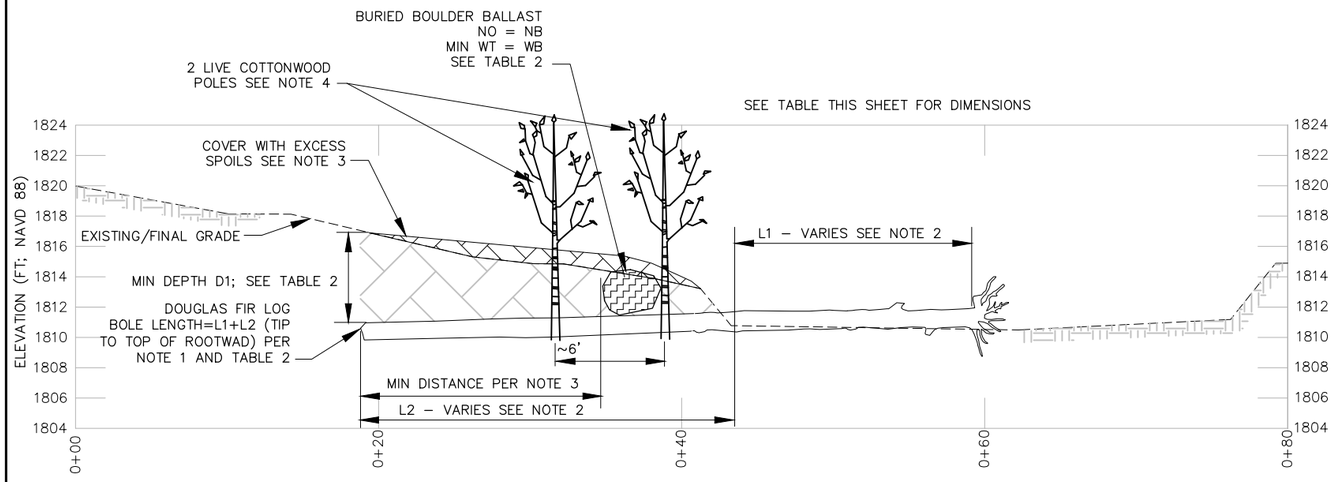
TABLE 2. HABITAT LOG DIMENSIONS & MINIMUM BOULDER BALLAST REQUIREMENTS

DBH	EXPOSED LENGTH L1		EMBEDDED LENGTH L2 (FT)		MIN D1	WB	
(IN)	LOW	HIGH	LOW	HIGH	(FT)	(LB)	NB
16	8	12	13	18	4	4500	1
16	14	16	22	24	4	2700	2
18	10	13	16	19	4	3300	2
18	15	17	23	25	4	3900	2
20	11	14	17	20	4	4600	2
20	16	18	24	27	4	3600	3
22	12	14	18	22	4.5	3800	3
22	16	18	24	27	4.5	4500	3
24	12	14	18	22	4.5	4900	3
24	16	18	24	27	4.5	5600	3
26	16	18	24	27	5	6700	3
28	16	18	24	27	5	6200	4



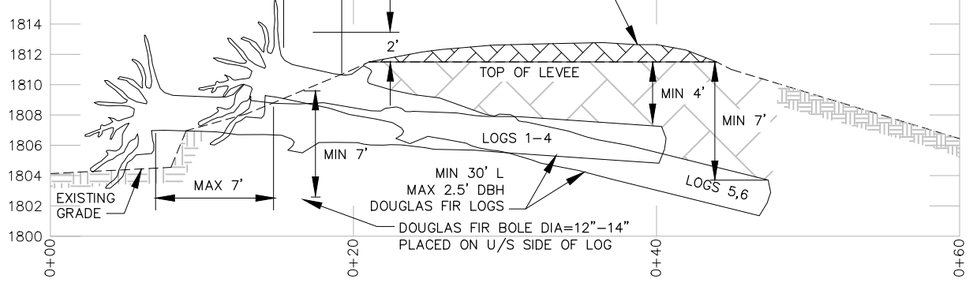
PLAN — EL / 9
LOGS EMBEDDED IN ROCK LEVEE

10' 0 10' 20'
1"=20'



SECTION, TYP — B / 9
HABITAT LOG W/ COTTONWOOD POLES

5' 0 5' 10'
1"=10'



SECTION — C / 14
LOGS EMBEDDED IN ROCK LEVEE

5' 0 5' 10'
1"=10'

NOTES:

1. SIZES OF HABITAT LOGS TO BE INSTALLED SHALL VARY AT EACH GENERAL LOCATION WITHIN THE RANGE 16"–28" DBH, AND SHALL REFLECT AVAILABILITY OF MATERIALS. CONTRACTOR SHALL RANDOMIZE DISTRIBUTION AND MINIMIZE UNIFORMITY OF LOG SIZES AT EACH SITE ON SHEET 13. ALL LOG DIMENSIONS AND BOULDER WEIGHTS SHALL REFLECT DBH OF LOG PER TABLE 2. ALL LOGS SHALL BE DOUGLAS FIR, PONDEROSA PINE, OR ENGINEER–APPROVED EQUIVALENT.
2. LOGS SHALL BE INSTALLED IN TRENCHES, PLACED W/ ROOTWAD ON STREAMBED SURFACE. LOGS SHALL BE INSTALLED WITH VARIED LENGTHS EXPOSED/PROTRUDING INTO FLOW, AND EMBEDDED INTO THE BANK TOE/STREAMBED SLOPE, FOLLOWING INSTALLATION SPECIFICATIONS IN TABLE 2. EMBED EACH LOG SO THAT THE BURIED DEPTH OF THE BUTT END IS AT LEAST EQUAL TO DIMENSION D1 IN TABLE 2, WITH CONDITION THAT LOG TIP END IS NOT HIGHER THAN ROOTWAD END. ENGINEER SHALL STAKE APPROXIMATE LOCATIONS FOR BOTH ENDS OF EACH LOG, WHICH SHALL VARY ACCORDING TO THE LAYOUT PLANS DEPICTED ON SHEET 13. WHERE VERTICAL BOLE IS SPECIFIED ON SHEET 13, VARY DISTANCE OF PLACEMENT FROM BANK EDGE AND HEIGHT ABOVE GROUND RANDOMLY.
3. BURY BALLAST BOULDERS ON TOP OF HABITAT LOG A MINIMUM DISTANCE EQUAL TO 40% OF THE BOLE LENGTH AWAY FROM THE BUTT END. FOR LARGER DIAMETER LOGS, THIS MAY REQUIRE EXTENDING OUT STABLY FROM TOP OF BANK EDGE. TO EXTENT POSSIBLE, BOULDERS SHOULD BE FLUSH W/ OR BELOW EXISTING GROUND SURFACE. ALL BOULDERS SHALL MEET WSDOT SPEC 9–03.11(3) AND SHALL MEET DRY WEIGHT SPECIFICATIONS AND NUMBER PER DBH LISTED IN TABLE 2. COVER OVER LOGS AND BOULDERS WITH EXCESS SPOILS.
4. WHERE CALLED FOR ON SHEET 13, BLACK COTTONWOOD (POPULUS BALSAMIFERA SSP. TRICHOCARPA) APEX POLES WILL BE CUT ~10'–12' TALL FROM LOCAL TUCANNON RIVER FLOODPLAIN SITES. CUT POLES 1 DAY PRIOR TO INSTALLATION. SOAK IN STREAM OVERNIGHT. PLANT POLES INTO HOLES EXCAVATED ON DOWNSTREAM SIDE OF, AND ADJACENT TO TRENCH DUG FOR, HABITAT LOG, DOWN TO SUMMER LOW WATER TABLE AS DIRECTED BY FOREST ECOLOGIST.
5. PLANT LIVE STAKE BUNCHES OVER DISTURBED CUT AREA, SEE SHEET 29 FOR PLANTING SPECIFICATIONS.

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

AS SHOWN

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

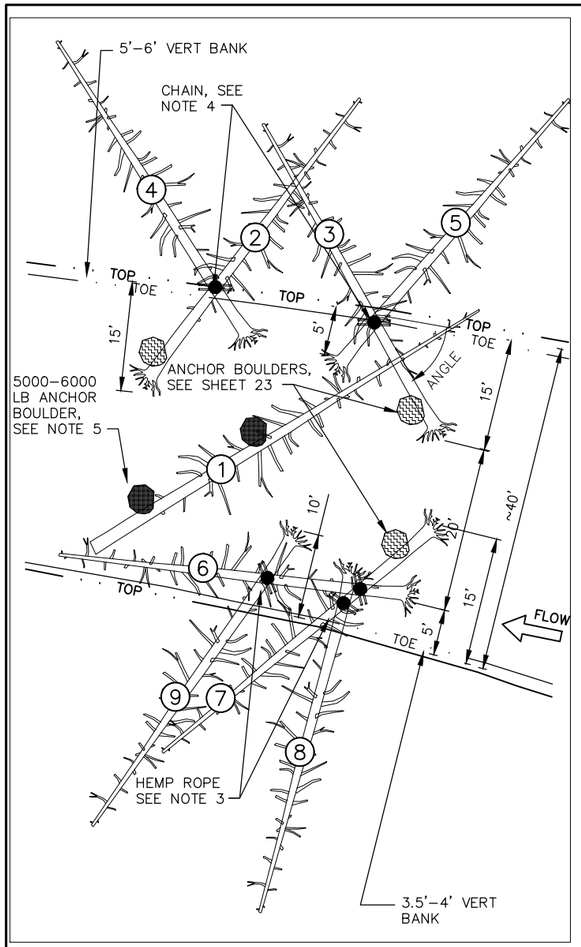
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556–1288

TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

EMBEDDED LOGS
PLAN, SECTION, DETAILS
100% DESIGN

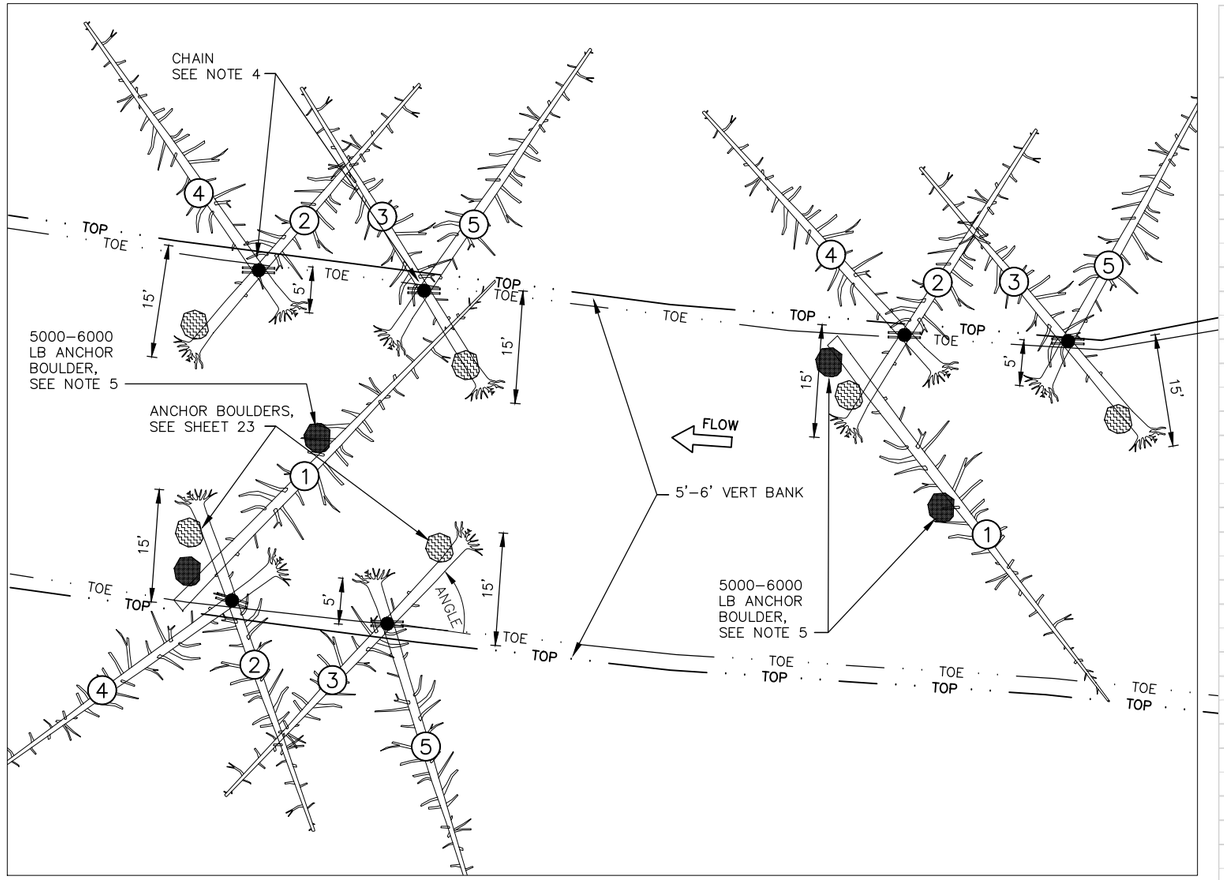
DATE: JUL 13, 2017
SHEET: 14
REV: –



PLACED BY HELICOPTER

PLAN L1

CHANNEL CHOKE/OVERFLOW SPAN JAM 10



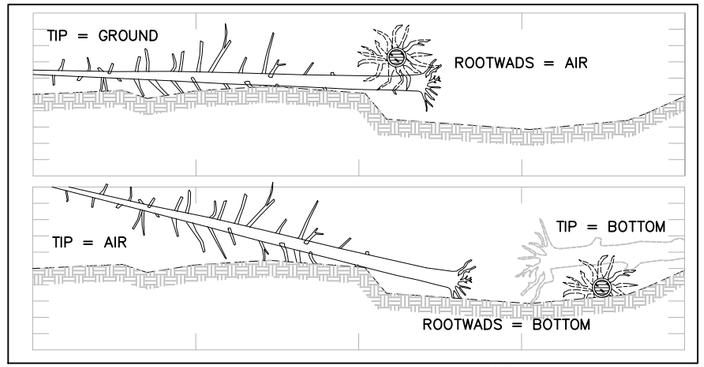
PLACED BY HELICOPTER

PLAN L2

CHANNEL CHOKE/OVERFLOW SPAN JAM 10

NOTES:

1. LOCATIONS OF LOGS WILL BE FINALIZED VIA DIRECTED WORK IN FIELD BY ENGINEER.
2. ALL LOGS SHALL BE DOUGLAS FIR, PONDEROSA PINE, OR ENGINEER–APPROVED EQUIVALENT.
3. REFER TO TABLE 3 THIS SHEET FOR LOG–SPECIFIC STACKING & LAYOUT SPECIFICATIONS, ORDERED BY PLAN ID # & LOG ID #. SEQUENCE OF STACKING FOLLOWS LOG ID #, WHERE LOG 1 IS STACKED FIRST, ETC. ANGLES ARE MEASURED IN DOWNSTREAM DIRECTION FROM BANK TO ROOTWAD, AND MAY VARY BY ±10 DEGREES FROM VALUE IN TABLE.
4. TIE SELECTED L1 AND L2 LOGS TOGETHER SNUG WITH $\frac{5}{8}$" GALVANIZED GRADE 30 PROOF COIL CHAIN AND CONNECTING LINKS AT ALL LOCATIONS INDICATED. SEE SHEET 23 FOR DETAILS ON TYING ANCHOR BOULDERS TO LEANING LOGS. ANCHOR BOULDERS SHALL WEIGH 4500 LB MIN (DRY) AND MEET WSDOT SPEC 9–03.11(3).
5. 65' LONG LOGS SHALL BE W/O ROOTWAD, AND SHALL BE PLACED FLUSH ON STREAMBED. 5000–6000 LB ANCHOR BOULDERS SHALL BE PLACED LEANING AGAINST LOG ON DOWNSTREAM SIDE. ANCHOR BOULDERS SHALL HAVE 2" DIAMETER HOLE DRILLED THROUGH FOR HELICOPTER RIGGING.
6. LWD JAMS L1 AND L2 SHALL BE STAGED IN STAGING AREA 2 (SEE SHEET 5). LOGS SHALL BE LAID OUT SIDE–BY–SIDE IN CONSTRUCTION SEQUENCE FOR RAPID PROCESSING BY HELICOPTER GROUND CREW.

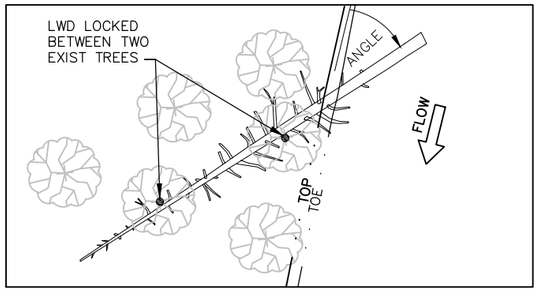


SECTION, TYP, NTS –

KEY TO TABLE 'ROOTWAD' COLUMN –

TABLE 3. LWD LOG SPECIFICATIONS

Plan ID	LWD ID	DBH (IN)	LEN (FT)	ROOTWAD POSITION	TIP POSITION	LOG-LOG TIE?	LOG-BLDR TIE?	ANGLE FROM U/S (°)
L1	1	16-18	65	BOTTOM	BOTTOM	N	Y	135
	2	16-18	45	BOTTOM	AIR	Y	Y	45
	3	16-18	45	BOTTOM	AIR	Y	Y	45
	4	16-18	45	AIR	GROUND	Y	N	45
	5	16-18	45	AIR	GROUND	Y	N	105
	6	16-18	40	BOTTOM	BOTTOM	Y	N	10
	7	18-22	45	BOTTOM	AIR	Y	Y	45
	8	16-22	40	AIR	GROUND	Y	N	90
	9	16-22	40	AIR	GROUND	Y	N	70
L2	1	16-18	65	BOTTOM	BOTTOM	N	Y	135
	2	16-18	45	BOTTOM	AIR	Y	Y	45
	3	16-18	45	BOTTOM	AIR	Y	Y	45
	4	16-22	45	AIR	GROUND	Y	N	45
	5	16-22	45	AIR	GROUND	Y	N	105
L3	1	16-18	65	BOTTOM	BOTTOM	N	Y	50
	2	18-22	40	BOTTOM	AIR	Y	Y	90
	3	16-22	45	AIR	GROUND	Y	N	130
	4	16-18	65	BOTTOM	BOTTOM	N	Y	50
	5	18-22	40	BOTTOM	AIR	Y	N	90
	6	16-22	45	AIR	GROUND	Y	Y	45
	7	18-22	45	AIR	AIR	Y	N	100
L4	1	18-22	45	BOTTOM	AIR	Y	Y	45
	2	16-22	40	AIR	GROUND	Y	N	90
	3	18-22	40	BOTTOM	GROUND	Y	Y	45
	4	16-18	65	BOTTOM	BOTTOM	N	Y	50
	5	16-22	45	AIR	GROUND	Y	N	90
L5	1	16-18	65	BOTTOM	GROUND	Y	N	45
	2	18-22	40	BOTTOM	BOTTOM	Y	N	0
	3	18-22	45	BOTTOM	AIR	Y	Y	60
	4	18-22	45	BOTTOM	AIR	Y	Y	135
	5	18-22	45	BOTTOM	AIR	Y	Y	60
	6	18-22	45	BOTTOM	AIR	Y	Y	120
	7	16-18	65	BOTTOM	BOTTOM	N	Y	135
	8	18-22	40	BOTTOM	BOTTOM	Y	N	0
	9	18-22	40	AIR	GROUND	Y	N	45
	10	18-22	40	BOTTOM	AIR	Y	Y	35
	11	18-22	45	BOTTOM	AIR	Y	Y	120



DETAIL PLAN, TYP, NTS –

TREE LAYOUT ON FLOODPLAIN –

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

10' 0 10' 20'

1"=20'

0 1"

BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

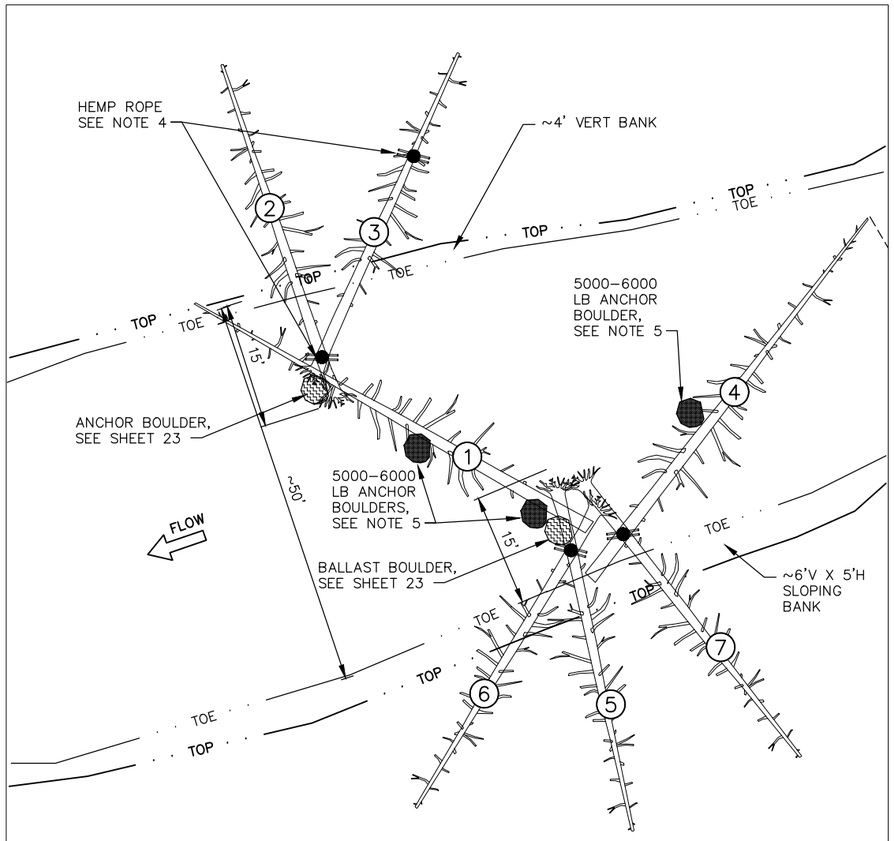
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556–1288

TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

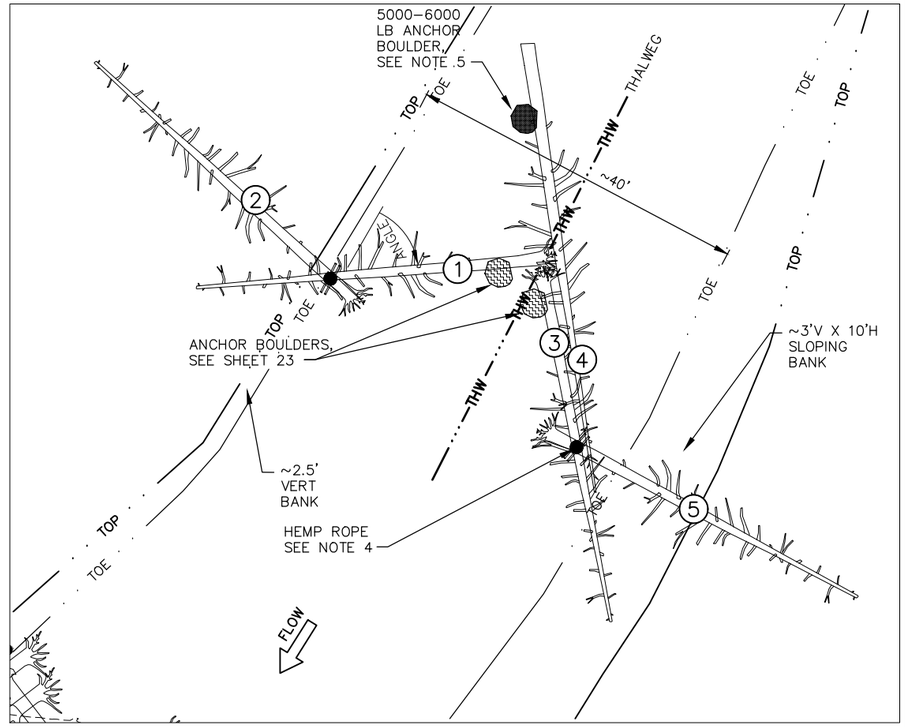
LWD LOGS – 1
PLAN, DETAILS
100% DESIGN

DATE: JUN 16, 2017
SHEET: 15
REV: –



PLACED BY HELICOPTER

PLAN — CHANNEL SPAN OVERFLOW JAM — L3 / 10

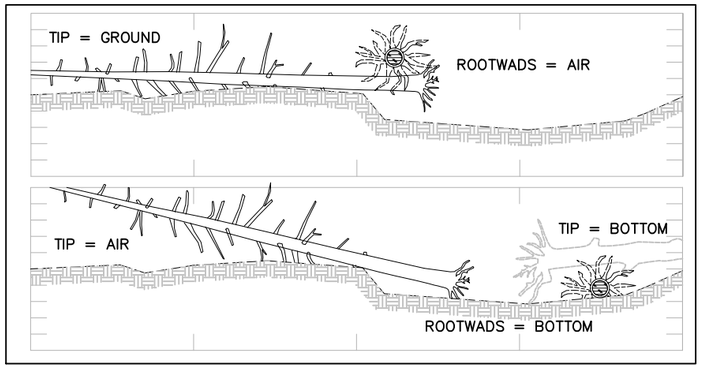


PLACED BY HELICOPTER

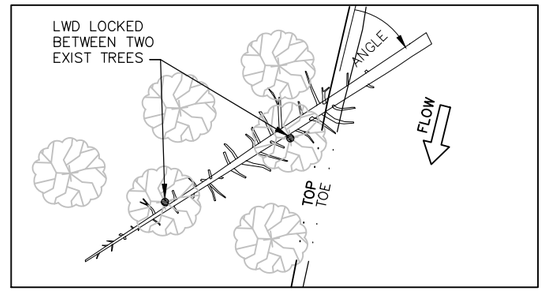
PLAN — CHANNEL SPAN UNDERFLOW JAM — L4 / 10

NOTES:

1. LOCATIONS OF LOGS WILL BE FINALIZED VIA DIRECTED WORK IN FIELD BY ENGINEER.
2. ALL LOGS SHALL BE DOUGLAS FIR, PONDEROSA PINE, OR ENGINEER–APPROVED EQUIVALENT.
3. REFER TO TABLE 3 SHEET 15 FOR LOG–SPECIFIC STACKING & LAYOUT SPECIFICATIONS, ORDERED BY PLAN ID # & LOG ID #. SEQUENCE OF STACKING FOLLOWS LOG ID #, WHERE LOG 1 IS STACKED FIRST, ETC. ANGLES MAY VARY BY ±10 DEGREES FROM VALUE IN TABLE.
4. TIE SELECTED LOGS TOGETHER SNUG, BUT NOT TIGHT, WITH 1" HEMP ROPE AT LOCATIONS INDICATED. USE 2 SEPARATE, ADJACENT DOUBLE WRAPS, EACH W/ CARRICK BEND KNOT. SEE SHEET 23 FOR DETAILS ON TYING ANCHOR BOULDERS TO LEANING LOGS. ANCHOR BOULDERS SHALL WEIGH 4000 LB MIN (DRY) AND MEET WSDOT SPEC 9–03.11(3).
5. 65' LONG LOGS SHALL BE W/O ROOTWAD, AND SHALL BE PLACED FLUSH ON STREAMBED. 5000–6000 LB ANCHOR BOULDERS SHALL BE PLACED LEANING AGAINST LOG ON DOWNSTREAM SIDE. ANCHOR BOULDERS SHALL HAVE 2" DIAMETER HOLE DRILLED THROUGH FOR HELICOPTER RIGGING.
6. LWD JAMS L3 AND L4 SHALL BE STAGED IN STAGING AREA 2 (SEE SHEET 5). LOGS SHALL BE LAID OUT SIDE–BY–SIDE IN CONSTRUCTION SEQUENCE FOR RAPID PROCESSING BY HELICOPTER GROUND CREW.



SECTION, TYP, NTS — KEY TO TABLE 'ROOTWAD' COLUMN — – / –



DETAIL PLAN, TYP, NTS — TREE LAYOUT ON FLOODPLAIN — – / –

TABLE 3. LWD LOG SPECIFICATIONS (CONTINUED)

Plan ID	LWD ID	DBH (IN)	MIN LEN (FT)	ROOTWAD POSITION	TIP POSITION	LOG-LOG TIE?	LOG-BLDR TIE?	ANGLE FROM U/S (°)
L6	1	16-18	40	BOTTOM	BOTTOM	Y	N	0
	2	16-22	45	AIR	GROUND	Y	N	110
	3	16-22	45	AIR	GROUND	Y	N	110
	4	16-22	45	AIR	GROUND	Y	N	50
L7	1	16-18	40	BOTTOM	BOTTOM	Y	N	180
	2	16-18	40	GROUND	BOTTOM	Y	N	180
	3	16-22	45	AIR	GROUND	Y	Y	90
	4	16-22	45	AIR	GROUND	Y	Y	90
	5	16-22	45	AIR	GROUND	Y	Y	90
	6	16-22	45	AIR	GROUND	Y	N	0
	7	18-20	40	GROUND	GROUND	N	Y	15
	8	18-20	40	GROUND	GROUND	N	Y	15
	9	18-20	40	GROUND	GROUND	Y	Y	15
	10	22-26	45	AIR	GROUND	Y	N	80
	11	18-22	45	BOTTOM	AIR	N	Y	90
	12	18-22	45	BOTTOM	AIR	N	Y	120
	13	18-22	45	BOTTOM	AIR	N	Y	70
	14	18-22	45	BOTTOM	AIR	N	Y	140
L8	1	16-18	45	BOTTOM	AIR	Y	Y	90
	2	16-18	40	BOTTOM	GROUND	Y	N	50
	3	16-18	45	BOTTOM	AIR	Y	Y	50
	4	16-22	45	AIR	GROUND	Y	N	110
	5	16-22	45	AIR	GROUND	Y	N	135
	6	16-18	45	AIR	AIR	Y	Y	50
	7	16-18	40	BOTTOM	BOTTOM	Y	N	135
	8	16-22	45	BOTTOM	AIR	Y	Y	90
	9	16-22	45	AIR	GROUND	Y	N	90
L9	1	16-20	40	BOTTOM	BOTTOM	N	N	30
	2	16-20	40	BOTTOM	BOTTOM	N	N	30
	3	16-20	45	BOTTOM	AIR	N	N	60
	4	16-20	45	BOTTOM	GROUND	N	N	70
	5	16-20	45	BOTTOM	AIR	N	N	30
	6	16-20	45	BOTTOM	AIR	N	N	30
L10	1	16-18	65	BOTTOM	BOTTOM	N	Y	160
	2	16-18	45	BOTTOM	AIR	Y	Y	90
	3	16-18	45	BOTTOM	AIR	Y	Y	45
	4	16-18	45	BOTTOM	AIR	N	Y	110
	5	16-18	45	BOTTOM	AIR	N	Y	90

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

10' 0 10' 20' — 1"=20'

0 1" — BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

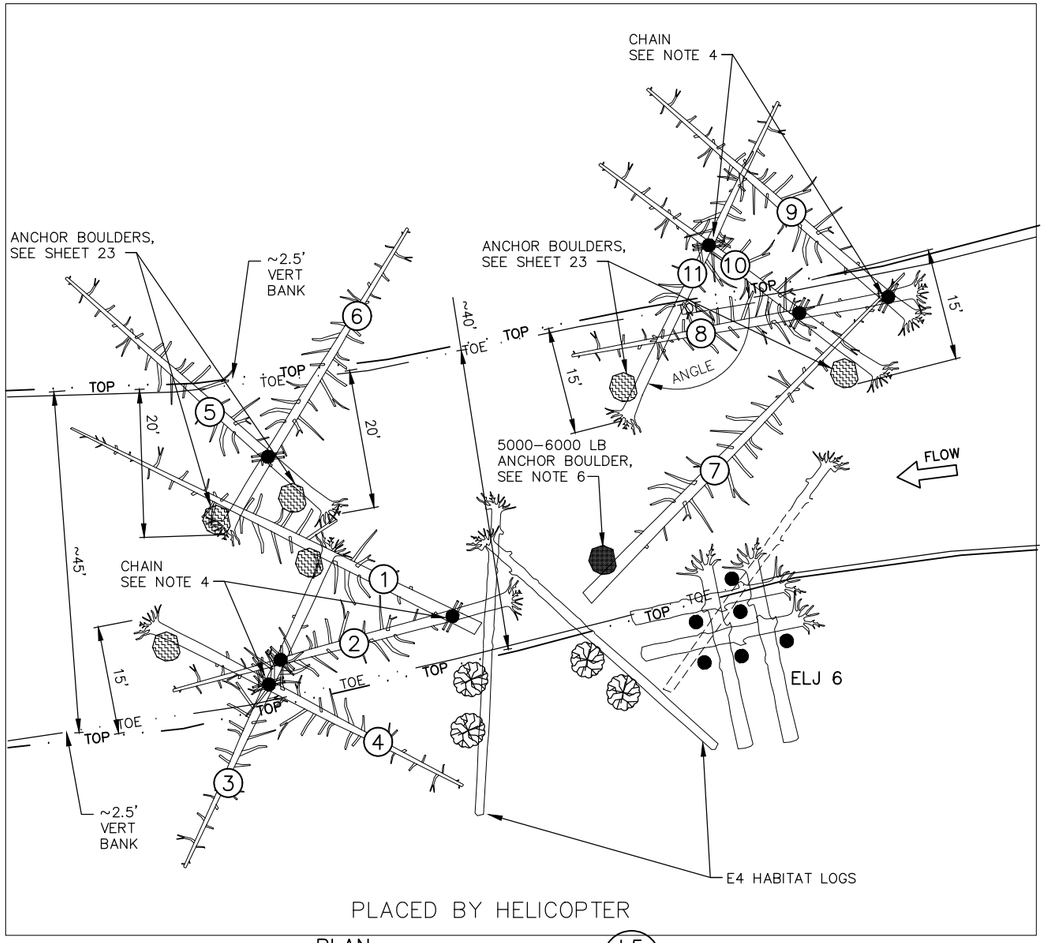
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556–1288

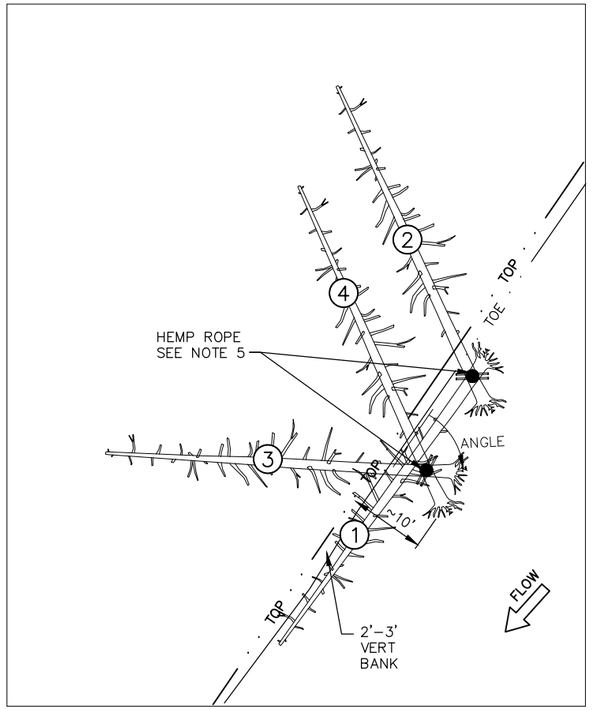
TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

LWD LOGS – 2
PLAN, DETAILS
100% DESIGN

DATE: JUL 13, 2017
SHEET: 16
REV: –



PLAN — L5 / 11
CHANNEL PLUG/OVERFLOW SPAN JAMS



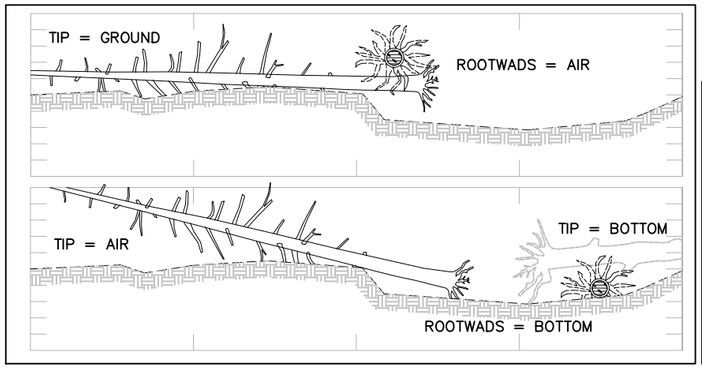
PLAN — L6 / 11
BANK JAM

TABLE 3. LWD LOG SPECIFICATIONS (CONTINUED)

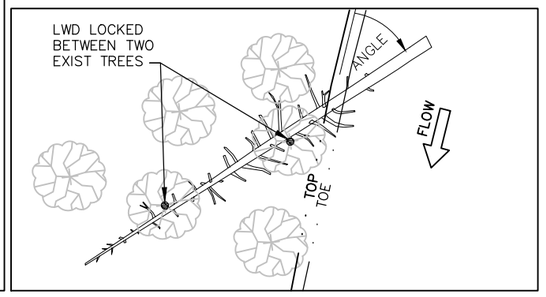
Plan ID	LWD ID	DBH (IN)	MIN LEN (FT)	ROOTWAD POSITION	TIP POSITION	LOG-LOG TIE?	LOG-BLDR TIE?	ANGLE FROM U/S (°)
L11	1	16-18	45	BOTTOM	AIR	N	Y	90
L12	1	16-18	45	GROUND	GROUND	N	N	0
	2	16-18	45	GROUND	GROUND	N	N	30
	3	16-18	45	GROUND	GROUND	N	N	45
	4	16-18	45	BOTTOM	BOTTOM	N	N	0
	5	16-18	45	BOTTOM	AIR	Y	N	20
	6	16-22	45	AIR	GROUND	Y	N	80
L13	1	16-18	40	BOTTOM	BOTTOM	Y	N	0
	2	16-22	45	AIR	GROUND	Y	N	30
	3	16-18	45	BOTTOM	AIR	Y	Y	90
	4	16-18	45	BOTTOM	AIR	N	Y	110
L14	1	16-18	40	BOTTOM	BOTTOM	N	N	20
	2	16-18	40	BOTTOM	BOTTOM	N	N	20
	3	16-18	40	BOTTOM	BOTTOM	N	N	0
	4	16-18	45	AIR	BOTTOM	N	N	20
	5	16-18	40	BOTTOM	BOTTOM	N	N	0
	6	16-22	45	AIR	GROUND	N	N	45
	7	16-18	45	BOTTOM	AIR	N	Y	0
	8	16-22	45	AIR	GROUND	N	N	45
L15	1	18-22	45	BOTTOM	AIR	Y	Y	160
	2	16-18	40	GROUND	GROUND	Y	N	90
	3	18-22	45	BOTTOM	AIR	Y	Y	30

NOTES:

1. LOCATIONS OF LOGS WILL BE FINALIZED VIA DIRECTED WORK IN FIELD BY ENGINEER.
2. ALL LOGS SHALL BE DOUGLAS FIR, PONDEROSA PINE, OR ENGINEER–APPROVED EQUIVALENT.
3. REFER TO TABLE 3 SHEETS 15/16 FOR LOG–SPECIFIC STACKING & LAYOUT SPECIFICATIONS, ORDERED BY PLAN ID # & LOG ID #. SEQUENCE OF STACKING FOLLOWS LOG ID #, WHERE LOG 1 IS STACKED FIRST, ETC. ANGLES MAY VARY BY ±10 DEGREES FROM VALUE IN TABLE.
4. TIE SELECTED L5 LOGS TOGETHER SNUG WITH $\frac{5}{8}$" GALVANIZED GRADE 30 PROOF COIL CHAIN AND CONNECTING LINKS AT ALL LOCATIONS INDICATED. SEE SHEET 23 FOR DETAILS ON TYING ANCHOR BOULDERS TO LEANING LOGS. ANCHOR BOULDERS SHALL WEIGH 4500 LB MIN (DRY) AND MEET WSDOT SPEC 9–03.11(3)
5. TIE SELECTED L6 LOGS TOGETHER SNUG, BUT NOT TIGHT, WITH 1" HEMP ROPE AT LOCATIONS INDICATED. USE 2 SEPARATE, ADJACENT DOUBLE WRAPS, EACH W/ CARRICK BEND KNOT. SEE SHEET 23 FOR DETAILS ON TYING ANCHOR BOULDERS TO LEANING LOGS. ANCHOR BOULDERS SHALL WEIGH 4000 LB MIN (DRY) AND MEET WSDOT SPEC 9–03.11(3).
6. 65' LONG LOGS SHALL BE W/O ROOTWAD, AND SHALL BE PLACED FLUSH ON STREAMBED. 5000–6000 LB ANCHOR BOULDERS SHALL BE PLACED LEANING AGAINST LOG ON DOWNSTREAM SIDE. ANCHOR BOULDERS SHALL HAVE 2" DIAMETER HOLE DRILLED THROUGH FOR HELICOPTER RIGGING.
7. LWD JAMS L5 AND L6 SHALL BE STAGED IN STAGING AREA 2 (SEE SHEET 5). LOGS SHALL BE LAID OUT SIDE–BY–SIDE IN CONSTRUCTION SEQUENCE FOR RAPID PROCESSING BY HELICOPTER GROUND CREW.



SECTION, TYP, NTS — –
KEY TO TABLE 'ROOTWAD' COLUMN



DETAIL PLAN, TYP, NTS — –
TREE LAYOUT ON FLOODPLAIN

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

10' 0 10' 20' — 1"=20'

0 1" — BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

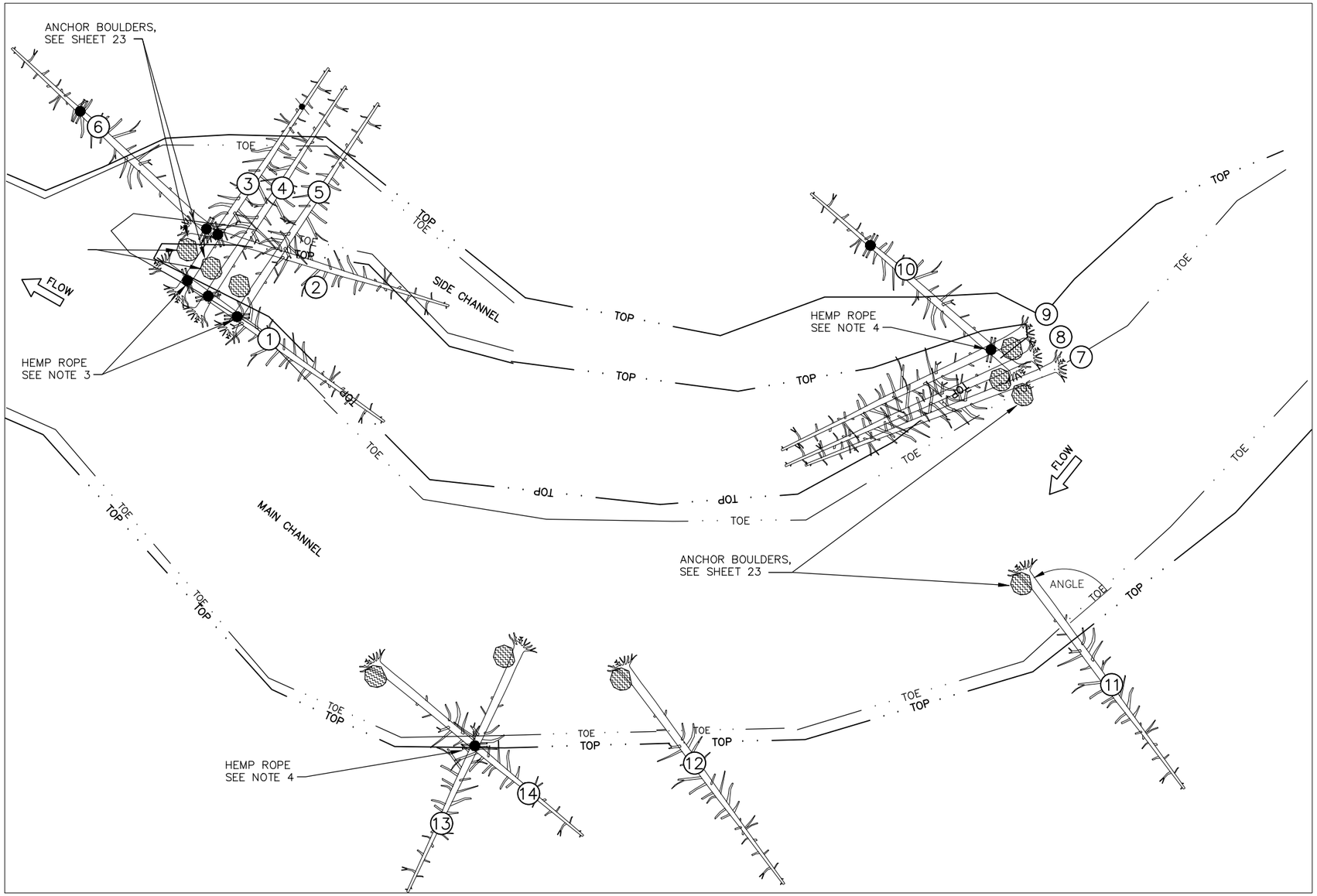
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556–1288

TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

LWD LOGS – 3
PLAN, DETAILS
100% DESIGN

DATE: JUL 13, 2017
SHEET: 17
REV: –



PLACED BY HELICOPTER

PLAN — ISLAND COMPLEX — L7/11

NOTES:

1. LOCATIONS OF LOGS WILL BE FINALIZED VIA DIRECTED WORK IN FIELD BY ENGINEER.
2. ALL LOGS SHALL BE DOUGLAS FIR, PONDEROSA PINE, OR ENGINEER–APPROVED EQUIVALENT.
3. REFER TO TABLE 3 SHEET 16 FOR LOG–SPECIFIC STACKING & LAYOUT SPECIFICATIONS, ORDERED BY PLAN ID # & LOG ID #. SEQUENCE OF STACKING FOLLOWS LOG ID #, WHERE LOG 1 IS STACKED FIRST, ETC. ANGLES MAY VARY BY ±10 DEGREES FROM VALUE IN TABLE.
4. TIE SELECTED LOGS TOGETHER SNUG, BUT NOT TIGHT, WITH 1" HEMP ROPE AT LOCATIONS INDICATED. USE 2 SEPARATE, ADJACENT DOUBLE WRAPS, EACH W/ CARRICK BEND KNOT. SEE SHEET 23 FOR DETAILS ON TYING ANCHOR BOULDERS TO LEANING LOGS. ANCHOR BOULDERS SHALL WEIGH 4000 LB MIN (DRY) AND MEET WSDOT SPEC 9–03.11(3).
5. LWD JAM L7 SHALL BE STAGED IN STAGING AREA 3 (SEE SHEET 5). LOGS SHALL BE LAID OUT SIDE–BY–SIDE IN CONSTRUCTION SEQUENCE FOR RAPID PROCESSING BY HELICOPTER GROUND CREW.

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

10' 0 10' 20' — 1"=20'

0 1" — BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

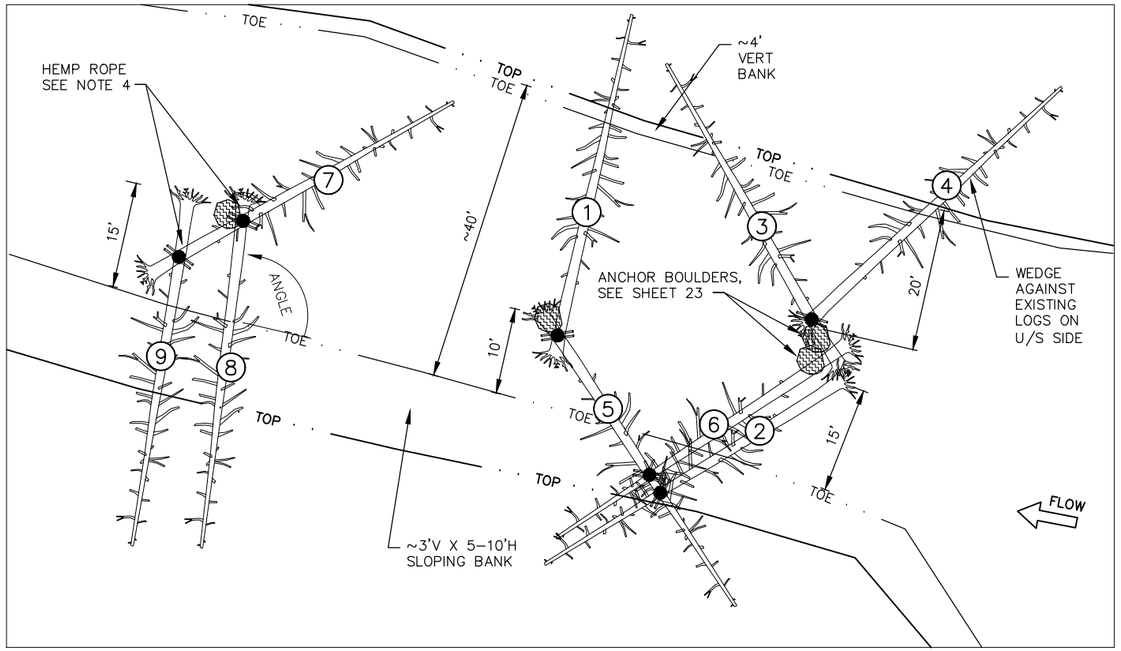
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556–1288

TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

LWD LOGS – 4
PLAN
100% DESIGN

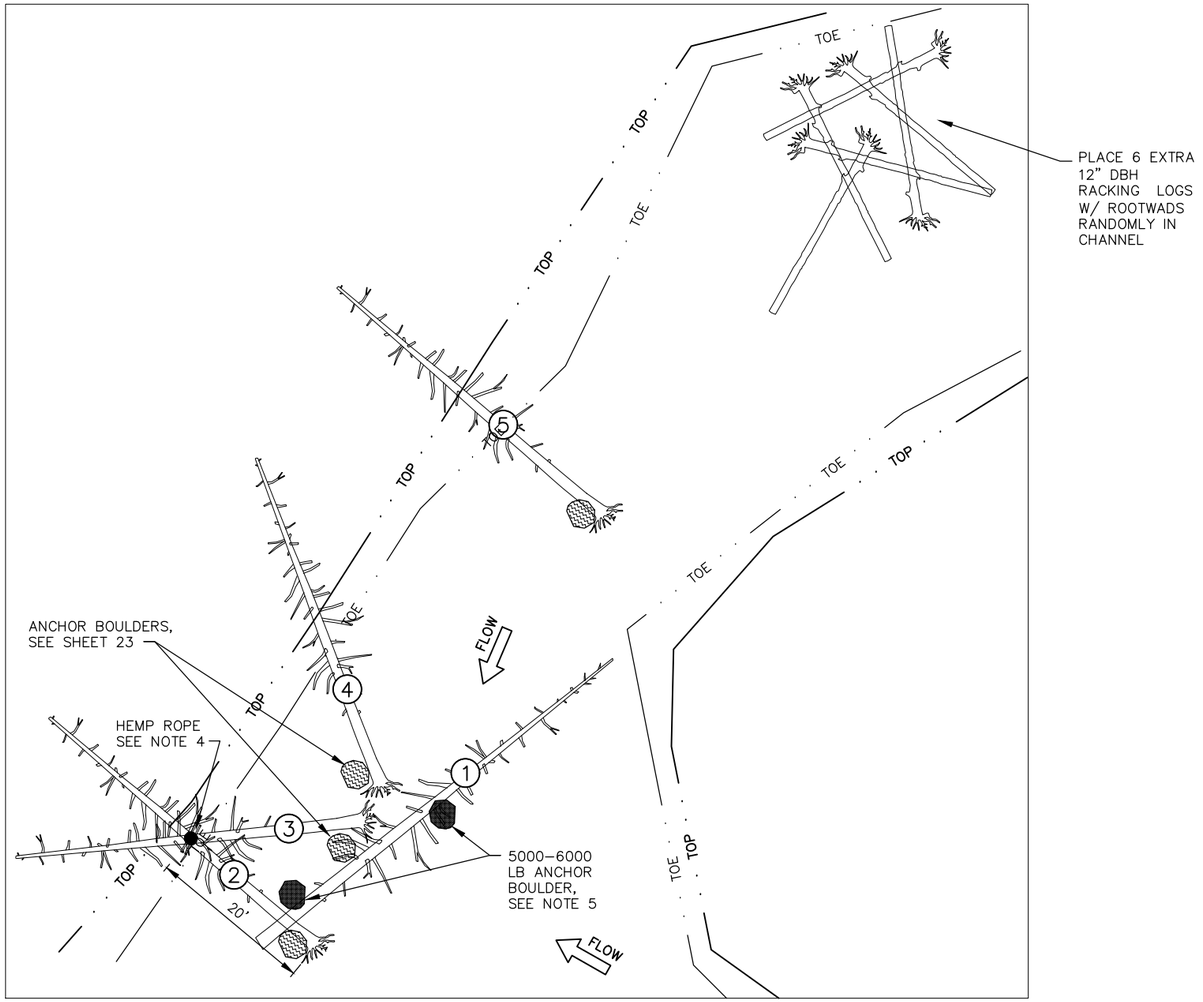
DATE: JUL 13, 2017
SHEET: 18
REV: –



PLACED BY HELICOPTER

PLAN — L8 / 11

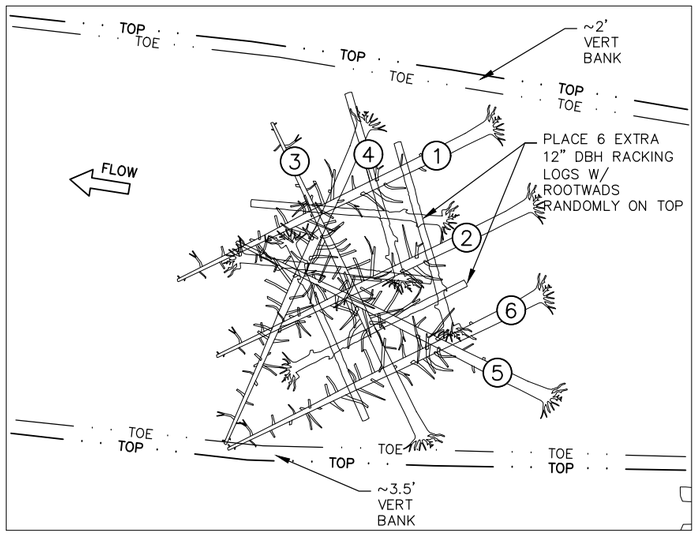
CHANNEL PLUG & UNDERFLOW JAMS



PLACED BY HELICOPTER

PLAN — L10 / 12

CONFLUENCE BANK JAM



PLACED BY HELICOPTER

PLAN — L9 / 12

CHANNEL PLUG JAM

NOTES:

1. LOCATIONS OF LOGS WILL BE FINALIZED VIA DIRECTED WORK IN FIELD BY ENGINEER.
2. ALL LOGS SHALL BE DOUGLAS FIR, PONDEROSA PINE, OR ENGINEER–APPROVED EQUIVALENT.
3. REFER TO TABLE 3 SHEET 16 FOR LOG–SPECIFIC STACKING & LAYOUT SPECIFICATIONS, ORDERED BY PLAN ID # & LOG ID #. SEQUENCE OF STACKING FOLLOWS LOG ID #, WHERE LOG 1 IS STACKED FIRST, ETC. ANGLES MAY VARY BY ±10 DEGREES FROM VALUE IN TABLE.
4. TIE SELECTED LOGS TOGETHER SNUG, BUT NOT TIGHT, WITH 1" HEMP ROPE AT LOCATIONS INDICATED. USE 2 SEPARATE, ADJACENT DOUBLE WRAPS, EACH W/ CARRICK BEND KNOT. SEE SHEET 23 FOR DETAILS ON TYING ANCHOR BOULDERS TO LEANING LOGS. ANCHOR BOULDERS SHALL WEIGH 4000 LB MIN (DRY) AND MEET WSDOT SPEC 9–03.11(3).
5. 65' LONG LOGS SHALL BE W/O ROOTWAD, AND SHALL BE PLACED FLUSH ON STREAMBED. 5000–6000 LB ANCHOR BOULDERS SHALL BE PLACED LEANING AGAINST LOG ON DOWNSTREAM SIDE. ANCHOR BOULDERS SHALL HAVE 2" DIAMETER HOLE DRILLED THROUGH FOR HELICOPTER RIGGING.
6. LWD JAMS L8, L9, AND L10 SHALL BE STAGED IN STAGING AREA 3 (SEE SHEET 5). LOGS SHALL BE LAID OUT SIDE–BY–SIDE IN CONSTRUCTION SEQUENCE FOR RAPID PROCESSING BY HELICOPTER GROUND CREW.

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

10' 0 10' 20'
1"=20'

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

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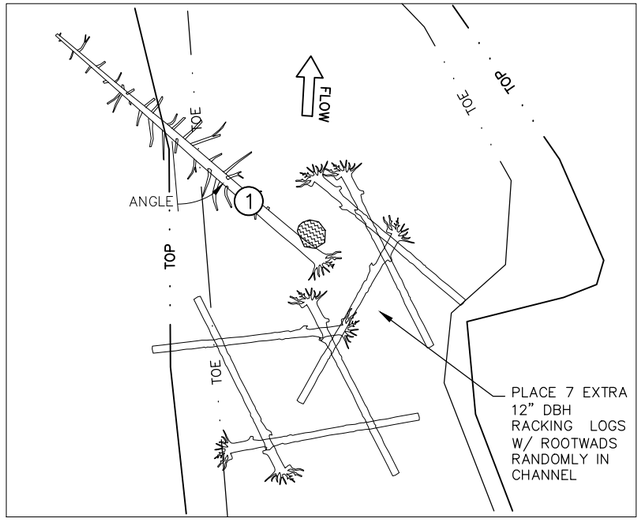
TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

LWD LOGS – 5
PLAN
100% DESIGN

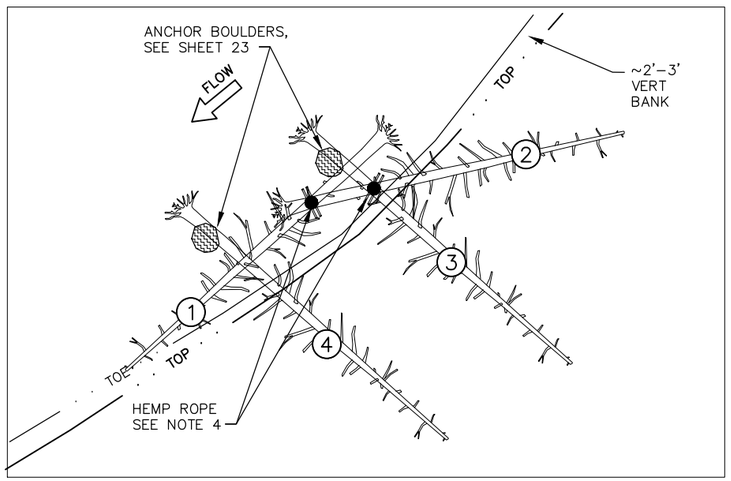
DATE: JUL 13, 2017
SHEET: 19
REV: –



PLACED BY HELICOPTER

PLAN — L11 / 12

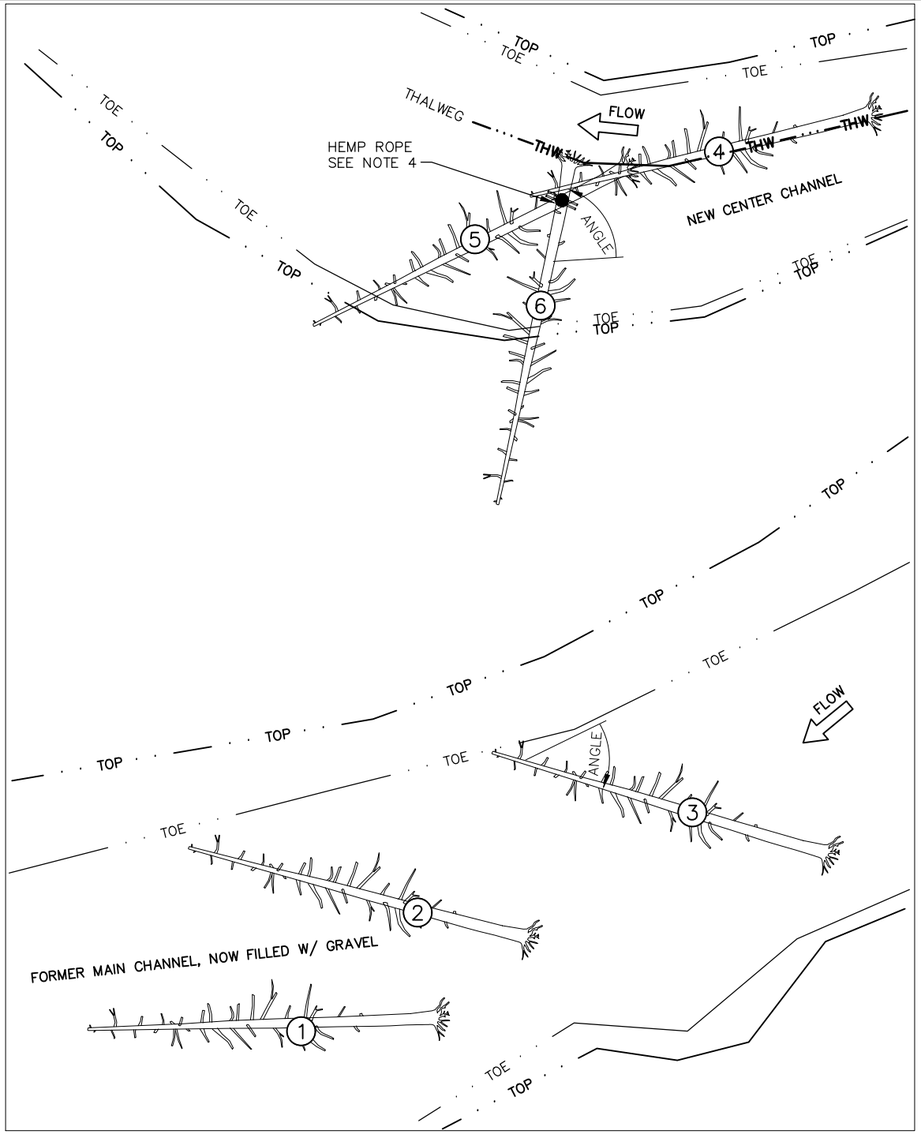
CHANNEL PLUG LOGS



PLACED BY HELICOPTER

PLAN — L13 / 12

CHANNEL BANK JAM



PLACED BY HELICOPTER

PLAN — L12 / 12

BRAIDED OLD/NEW CL CHANNEL JAMS

NOTES:

1. LOCATIONS OF LOGS WILL BE FINALIZED VIA DIRECTED WORK IN FIELD BY ENGINEER.
2. ALL LOGS SHALL BE DOUGLAS FIR, PONDEROSA PINE, OR ENGINEER–APPROVED EQUIVALENT.
3. REFER TO TABLE 3 SHEET 17 FOR LOG–SPECIFIC STACKING & LAYOUT SPECIFICATIONS, ORDERED BY PLAN ID # & LOG ID #. SEQUENCE OF STACKING FOLLOWS LOG ID #, WHERE LOG 1 IS STACKED FIRST, ETC. ANGLES MAY VARY BY +/– 10 DEGREES FROM VALUE IN TABLE.
4. TIE SELECTED LOGS TOGETHER SNUG, BUT NOT TIGHT, WITH 1" HEMP ROPE AT LOCATIONS INDICATED. USE 2 SEPARATE, ADJACENT DOUBLE WRAPS, EACH W/ CARRICK BEND KNOT. SEE SHEET 23 FOR DETAILS ON TYING ANCHOR BOULDERS TO LEANING LOGS. ANCHOR BOULDERS SHALL WEIGH 4000 LB MIN (DRY) AND MEET WSDOT SPEC 9–03.11(3).
5. LWD JAMS L11, L12, AND L13 SHALL BE STAGED IN STAGING AREA 3 (SEE SHEET 5). LOGS SHALL BE LAID OUT SIDE–BY–SIDE IN CONSTRUCTION SEQUENCE FOR RAPID PROCESSING BY HELICOPTER GROUND CREW.

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

10' 0 10' 20' — 1"=20'

0 1" — BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

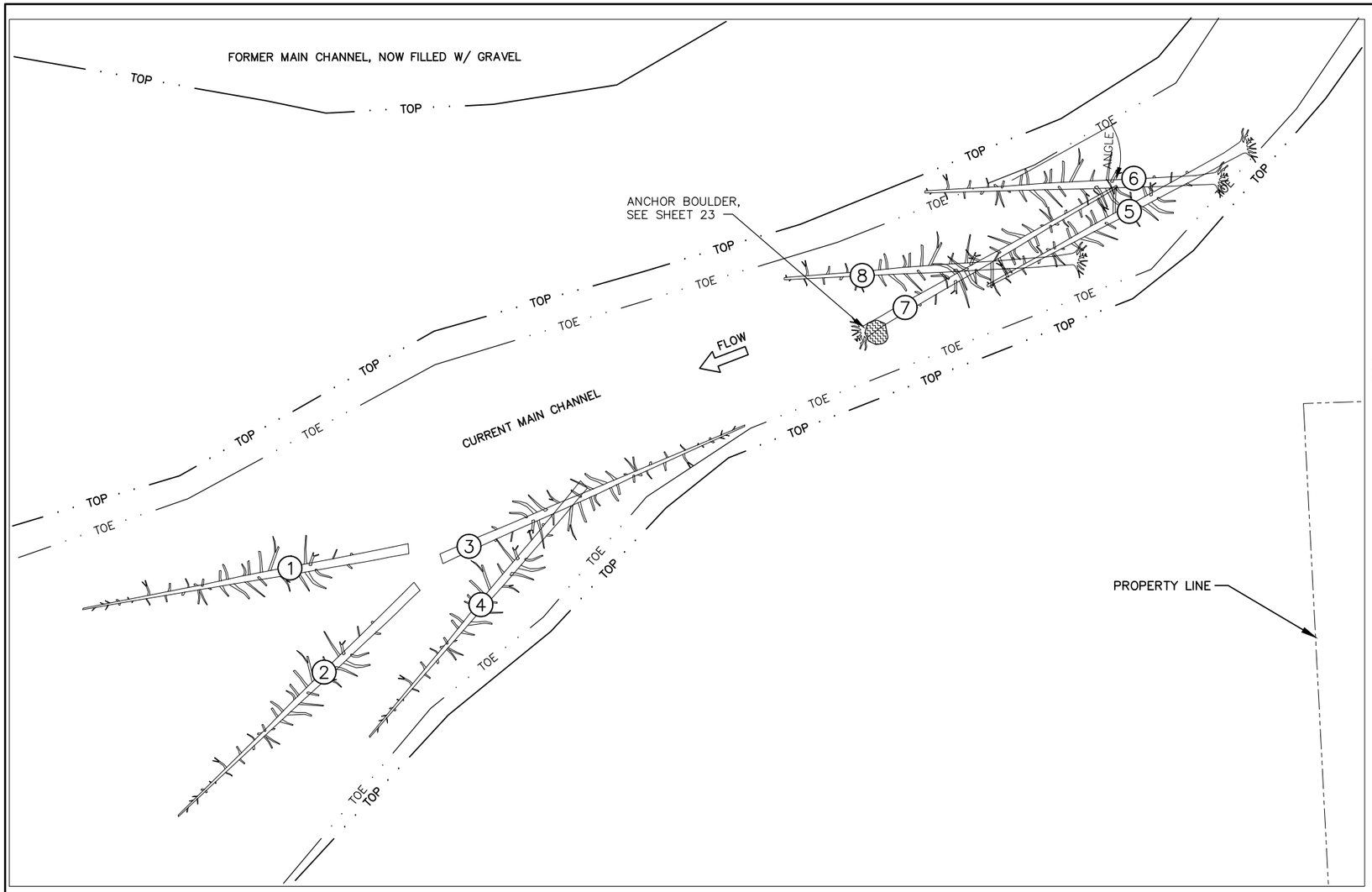
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556–1288

TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

LWD LOGS – 6
PLAN
100% DESIGN

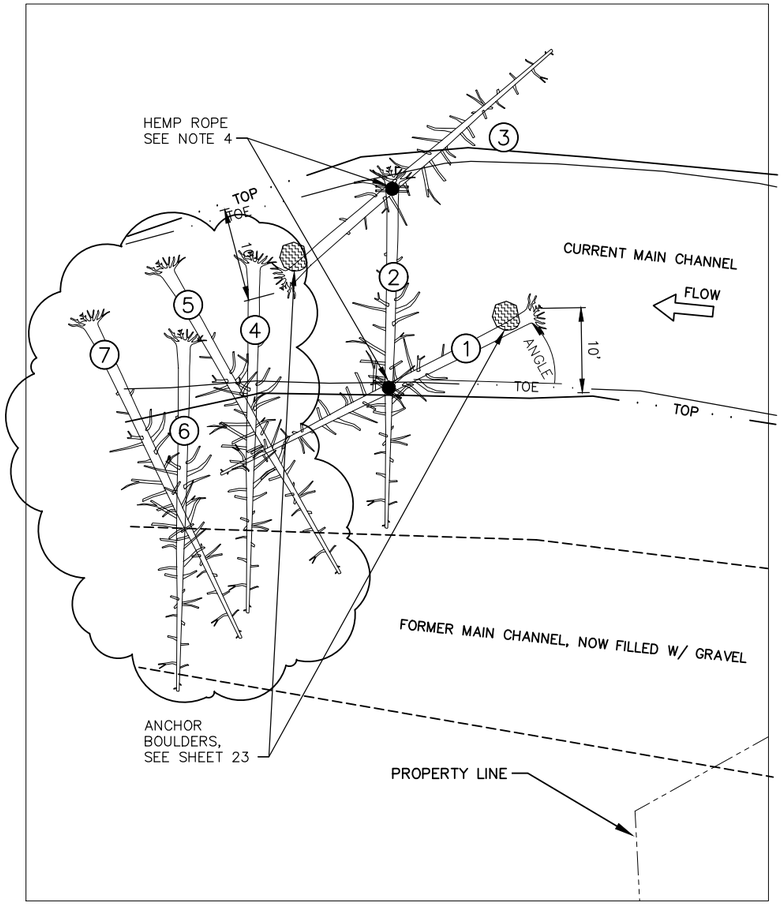
DATE: JUL 13, 2017
SHEET: 20
REV: –



PLACED BY EXCAVATOR

PLAN — L14 / 12

BRAIDED LEFT CHANNEL JAM



PLACED BY HELICOPTER

PLAN — L15 / 12

CHANNEL SPANNING UNDERFLOW JAM

NOTES:

1. LOCATIONS OF LOGS WILL BE FINALIZED VIA DIRECTED WORK IN FIELD BY ENGINEER; LOGS 4–7 IN L15 SHALL BE PLACED APPROXIMATELY AS SHOWN WITHOUT ANCHORING.
2. ALL LOGS SHALL BE DOUGLAS FIR, PONDEROSA PINE, OR ENGINEER–APPROVED EQUIVALENT.
3. REFER TO TABLE 3 SHEET 17 FOR LOG–SPECIFIC STACKING & LAYOUT SPECIFICATIONS, ORDERED BY PLAN ID # & LOG ID #. SEQUENCE OF STACKING FOLLOWS LOG ID #, WHERE LOG 1 IS STACKED FIRST, ETC. ANGLES MAY VARY BY ±10 DEGREES FROM VALUE IN TABLE. LOGS SHALL BE THOSE SLATED FOR USE IN E8.
4. TIE SELECTED LOGS TOGETHER SNUG, BUT NOT TIGHT, WITH 1" HEMP ROPE AT LOCATIONS INDICATED. USE 2 SEPARATE, ADJACENT DOUBLE WRAPS, EACH W/ CARRICK BEND KNOT. SEE SHEET 23 FOR DETAILS ON TYING ANCHOR BOULDERS TO LEANING LOGS. ANCHOR BOULDERS SHALL WEIGH 4000 LB MIN (DRY) AND MEET WSDOT SPEC 9–03.11(3).
5. LWD JAM L15 SHALL BE STAGED IN STAGING AREA 3 (SEE SHEET 5). LOGS SHALL BE LAID OUT SIDE–BY–SIDE IN CONSTRUCTION SEQUENCE FOR RAPID PROCESSING BY HELICOPTER GROUND CREW.

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK
2	7/13/17	CHANGED E8 TO BE PART OF L15	PDV	

10' 0 10' 20'
1"=20'

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
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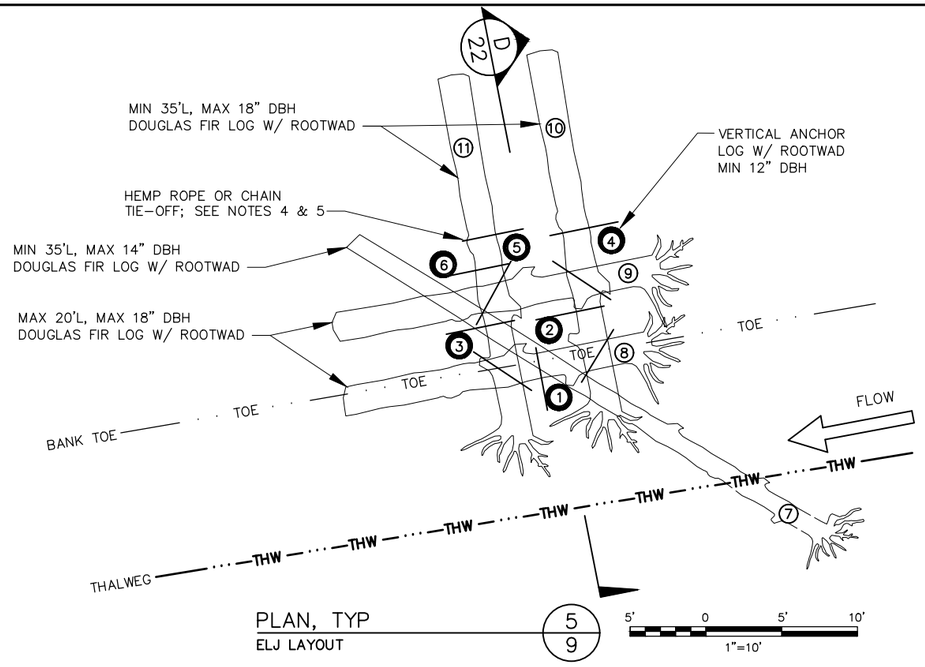
TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

LWD LOGS – 7
PLAN
100% DESIGN

DATE: JUL 13, 2017
SHEET: 21
REV: 2

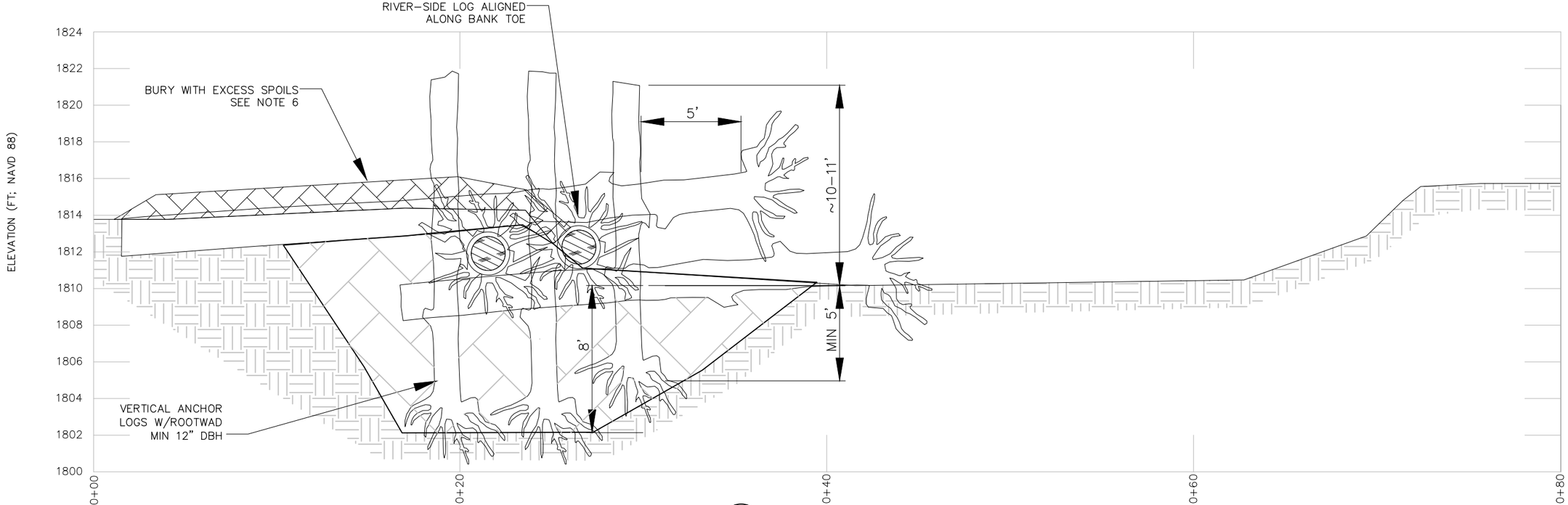


PLAN, TYP
ELJ LAYOUT
5
9

5' 0 5' 10'
1"=10'

NOTES

1. LOCATION OF ELJs WILL BE STAKED AND FLAGGED IN FIELD BY ENGINEER.
2. INSTALL SAND BAG COFFERDAM FOLLOWING GENERAL WATER MANAGEMENT AND FISH SALVAGE CONSERVATION MEASURES DESCRIBED ON SHEETS 3, 4, 7. ALLOW FOR CAVING IN ON STREAM SIDE DURING EXCAVATION FOR VERTICAL BOLE PLACEMENT.
3. ORDER OF INSTALLATION INDICATED BY NUMBERS ON PLAN THIS SHEET. USE SCREENED PUMP TO MAINTAIN LOW WATER LEVEL WHILE EXCAVATING HOLE FOR VERTICAL BOLES 1–6; SEE SHEET 7. FOR WORKABILITY, BOLE 1 MAY BE PLACED SHALLOWER THAN THE OTHERS AS SHOWN IN SECTION THIS SHEET. AFTER VERTICAL BOLES ARE PLACED, BACKFILL TO STREAMBED LEVEL. PLACE HORIZONTAL LOGS 7, 8, 9 SEQUENTIALLY, BACKFILLING IN LAYERS. MAKE GAP IN SANDBAG COFFER DAM FOR LOG 7.
4. FOR ELJ 1, 2, 3, 7, TIE LOGS TOGETHER SNUG USING $\frac{5}{8}$" GRADE 30 PROOF COIL GALVANIZED CHAIN W/ $\frac{5}{8}$" CONNECTING LINKS; SINGLE WRAP.
5. FOR ELJ 4, 5, 6, 8, 9, 10, TIE ALL LOGS TOGETHER USING 1" DIA MANILA HEMP ROPE, MINIMUM THREE (3) WRAPS AROUND LOGS BEFORE TYING OFF WITH CARRICK BEND KNOT. DO NOT OVERTIGHTEN (ROPE WILL SHRINK 10–15% IN LENGTH WHEN WET).
6. BACKFILL OVER HORIZONTAL LOGS 10, 11 AND EXPOSED ROPE WITH SPOILS FROM EXCAVATION AND/OR PILOT CHANNEL CUTS.
7. ADD LOOSE SLASH & RACKING WOOD BETWEEN AND ON UPSTREAM SIDE OF VERTICAL BOLES



SECTION, TYP
ELJ INSTALLATION
D
22

3' 0 3' 6'
1"=6'

PAUL EDWARD DEVRIES
STATE OF WASHINGTON
37861
REGISTERED
PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

AS SHOWN

0 1"
BAR MEASURES ONE INCH
ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

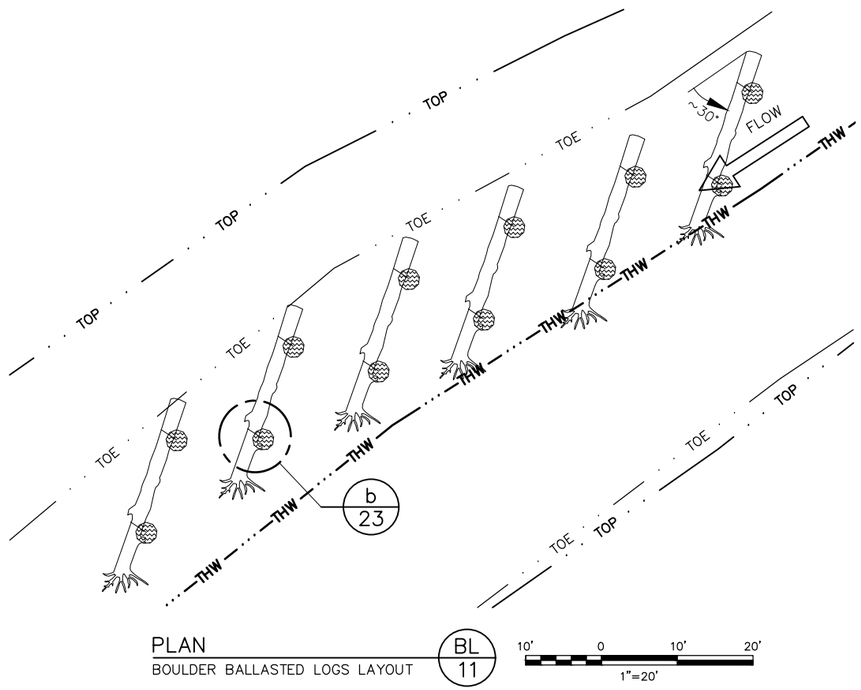
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556-1288

TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

ENGINEERED LOG JAMS (ELJs)
PLAN, SECTION, DETAILS
100% DESIGN

DATE: JUL 13, 2017
SHEET: 22
REV: –



PLAN
BOUNDER BALLASTED LOGS LAYOUT
BL
11

10' 0 10' 20'
1"=20'

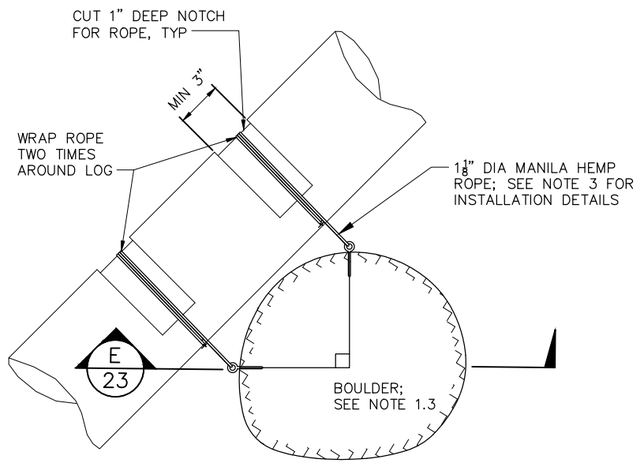
NOTES:

1. THE FOLLOWING SPECIFICATIONS APPLY TO THE SIX BOULDER BALLASTED LOGS AT SITE BL:
   - 1.1. LOGS WITH ROOTWADS SHALL BE 30'L MAX, 24" DBH MAX DOUGLAS FIR.
   - 1.2. UPSTREAM AND DOWNSTREAM BOUNDS OF LOG PLACEMENT TO BE STAKED/MARKED BY ENGINEER IN FIELD. CONSTRUCT LOGS W/ BOULDERS ON UPPER BANK, LOWER CAREFULLY INTO PLACE USING HELICOPTER W/SLINGS OR ALTERNATIVE.
   - 1.3. BALLASTED LOG BOULDERS SHALL BE SUB-ANGULAR TO ROUNDED, WT 3000-3500 LB EA, FOLLOWING WSDOT SPEC 9-03.11(3).
   - 1.4. USE 4 EYE BOLTS PER BOULDER. EYE BOLTS SHALL BE MINIMUM SIZE ϕ=1" W/ 8" SHANK, A36 HOT DIPPED GALVANIZED. DRILL HOLE AND INSERT EYE BOLT WITH BOULDER RESTING IN MOST STABLE ORIENTATION WHERE CENTER OF GRAVITY IS BELOW THE HORIZONTAL PLANE SLICING HALF WAY THROUGH THE SHORT AXIS DIMENSION, PER SECTION E. NOTE ORIENTATION OF EYE RELATIVE TO LOG IN DETAIL c.
   - 1.5. PLACE LOG SNUG NEXT TO BOULDERS, TIE ONE END OF 1$\frac{1}{8}$" DIA MANILA ROPE W/RATED NOMINAL STRENGTH 10,800 LB TO TOP BOLT, USE A SLIP KNOT. WRAP 2 TIMES AROUND LOG WITHIN NOTCH. DO NOT OVER-TIGHTEN -- ROPE WILL SHRINK ~10%-15% IN LENGTH WHEN WET. TIE OTHER END TO BOTTOM BOLT SNUGLY, ALSO USING A SLIP KNOT (OR ENGINEER-APPROVED ALTERNATIVE). TAPE OR TIE ENDS TO PREVENT FRAYING.
   - 1.6. BALLASTED LOGS SHALL BE CONSTRUCTED AND STAGED FOR PLACEMENT BY HELICOPTER IN STAGING AREA 3 (SEE SHEET 5). HELICOPTER LIFTING SHALL AVOID EXCESSIVE DYNAMIC LOADING FORCES; CONTRACTOR MAY PROPOSE ALTERNATIVE CONSTRUCTION SEQUENCING SUBJECT TO APPROVAL BY ENGINEER.

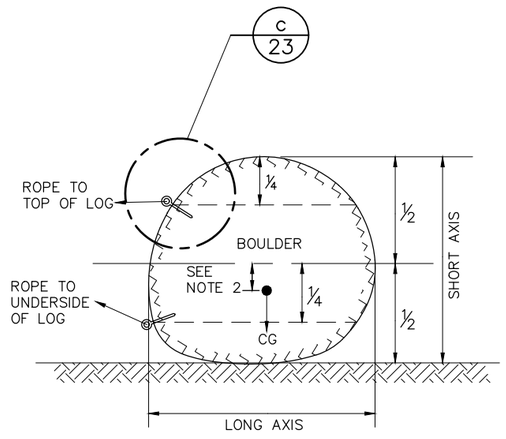
2. THE FOLLOWING SPECIFICATIONS APPLY TO ANCHOR BOULDERS FOR LWD LOGS AT SITES E1, L1, L2, L5 (SHEETS 15, 17):
   - 2.1. ANCHOR BOULDERS FOR LWD LOGS THAT ARE 45' AND SHORTER SHALL BE MIN WT 4500 LB EA.
   - 2.2. USE 2 EYE BOLTS PER BOULDER, ONE ABOVE THE OTHER PER SECTION E. EYE BOLTS SHALL BE ϕ=$\frac{7}{8}$" W/ 8" SHANK, A36 HOT DIPPED GALVANIZED. DRILL HOLE AND INSERT EYE BOLT WITH BOULDER RESTING IN MOST STABLE ORIENTATION WHERE CENTER OF GRAVITY IS BELOW THE HORIZONTAL PLANE SLICING HALF WAY THROUGH THE SHORT AXIS DIMENSION, PER SECTION E. NOTE ORIENTATION OF EYE RELATIVE TO LOG IN DETAIL c.
   - 2.3. TIE BOULDERS TO LWD LOGS NEAR ROOTWAD USING GALVANIZED $\frac{5}{8}$" GRADE 30 PROOF COIL CHAIN AND CONNECTING LINK; WRAP CHAIN TWICE AROUND LOG AND TIE EACH END OF CHAIN SNUG TO EYE BOLTS.
   - 2.4. ANCHOR BOULDERS FOR 65'L TREES SHALL WEIGH 5000-6000 LB AND HAVE A 2" HOLE DRILLED THROUGH FOR HELICOPTER RIGGING.

3. THE FOLLOWING SPECIFICATIONS APPLY TO ANCHOR BOULDERS FOR LWD LOGS AT ALL OTHER SITES (SHEETS 16-21):
   - 3.1. ANCHOR BOULDERS FOR LWD LOGS THAT ARE 45' AND SHORTER SHALL BE MIN WT 4000 LB EA.
   - 3.2. FOLLOW SAME DETAILS FOR EYE BOLTS AS FOR NOTE 2.2, EXCEPT USE ϕ=$\frac{3}{4}$".
   - 3.3. TIE BOULDERS TO LWD LOGS NEAR ROOTWAD USING 1" DIA MANILA ROPE; NOTE 1.5 APPLIES FOR CONNECTING BOULDER TO LOG.
   - 3.4. ANCHOR BOULDERS FOR 65'L TREES SHALL SHALL WEIGH 5000-6000 LB AND HAVE A 2" HOLE DRILLED THROUGH FOR HELICOPTER RIGGING.

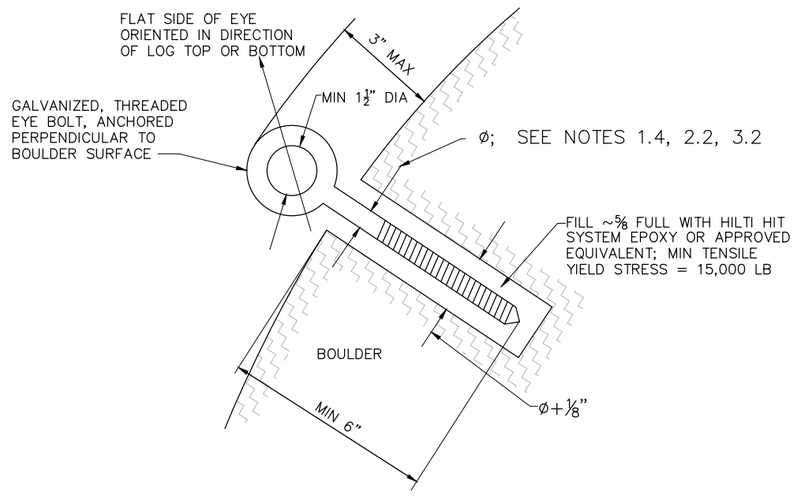
4. EYE BOLT MAY BE SUBSTITUTED WITH EYE NUT AND THREADED ROD OR DRILLED HOLE IN BOULDER, SUBJECT TO ENGINEER APPROVAL; CONTRACTOR SHALL SUBMIT SPECIFICATIONS OF PROPOSED ALTERNATIVE HARDWARE/CONNECTION METHOD.



DETAIL PLAN, TYP, NTS
BOULDER-LOG ATTACHMENT
b
23



SECTION, TYP, NTS
BOULDER ANCHORS
E
23



DETAIL, TYP, NTS
ANCHOR BOLT INSTALLATION
c
23

PAUL EDWARD DEVRIES
STATE OF WASHINGTON
37861
REGISTERED
PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

AS SHOWN

0 1"
BAR MEASURES ONE INCH
ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

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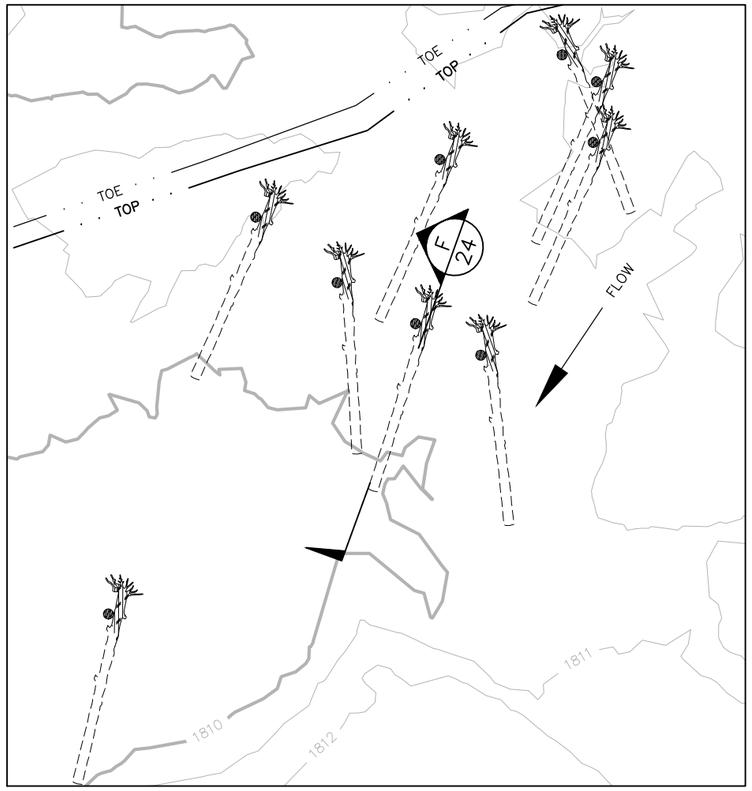
REDMOND, WA 98052
PHONE: (425) 556-1288

TUCANNON RIVER HARTSOCK - PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

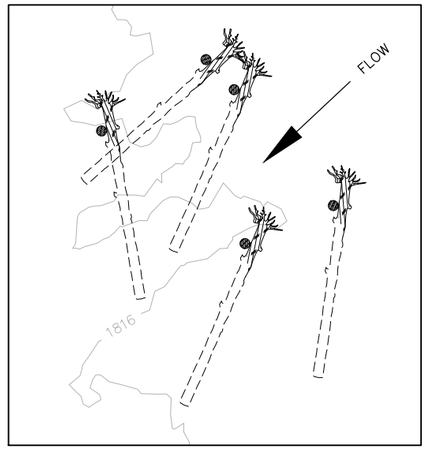
BALLASTED LOGS, BOULDERS
PLAN, SECTION, DETAILS
100% DESIGN

DATE: JUL 13, 2017
SHEET: 23
REV: -

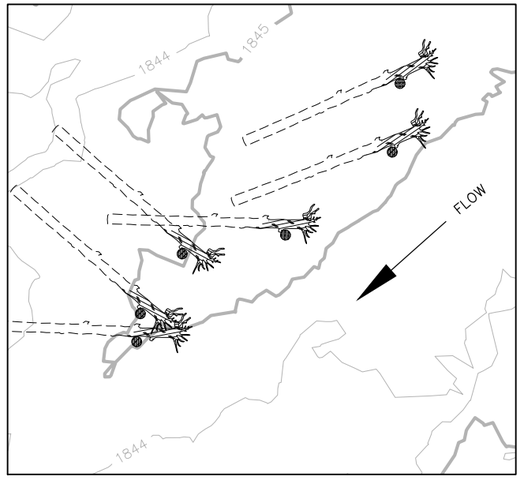


PLAN
EXPOSED DEBRIS LOG LAYOUT
D1
9

10' 0 10' 20'
1"=20'

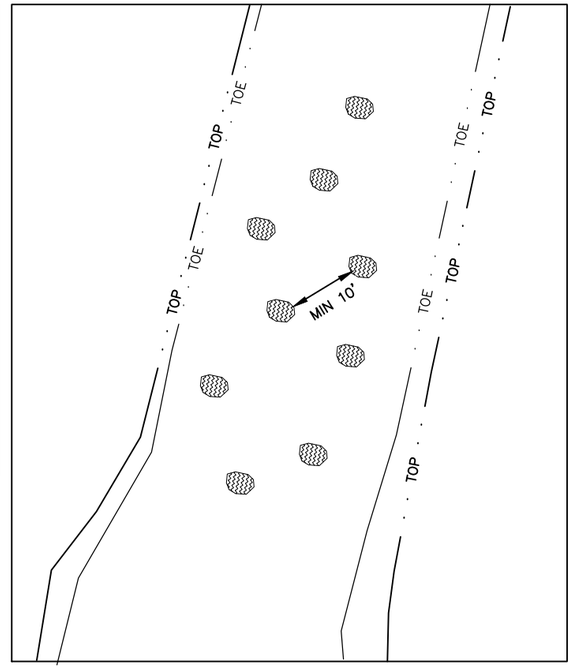


PLAN
EXPOSED DEBRIS LOG LAYOUT
D2
9



PLAN
EXPOSED DEBRIS LOG LAYOUT
D3
11

10' 0 10' 20'
1"=20'

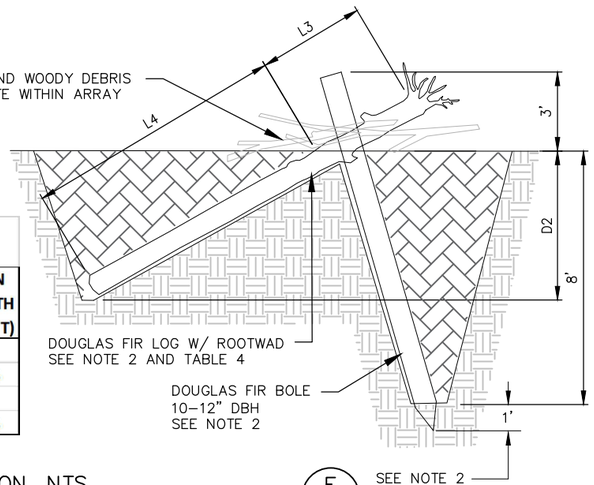


PLAN
HABITAT BOULDER SPACING – TYP
B1
10

10' 0 10' 20'
1"=20'

NOTES:

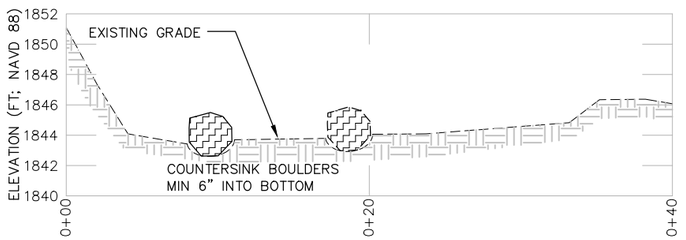
1. ALL EXPOSED LOGS AND HABITAT BOULDER LOCATIONS WILL BE STAKED IN FIELD BY ENGINEER. EACH EXPOSED LOG WILL BE INSTALLED SINGLY, OR IN GROUPINGS PER PLANS THIS SHEET.
2. EXCAVATE TRENCH FOR BOLE TO ~8' DEPTH, SHARPEN END OF BOLE WITH CHAIN SAW AND PUSH IN A MINIMUM OF 1', THEN BACKFILL AS NEEDED. EXCAVATE SLOPING TRENCH FOR EXPOSED LOG TO DESIGN DEPTH D2 AND LENGTH L4. PLACE LOG W/ ROOTWAD AND COMPLETE BACKFILL. RACK/WEAVE LOOSE LOGS AND SLASH AGAINST UPSTREAM SIDE .
3. HABITAT BOULDERS SHALL BE PLACED IN RANDOM PATTERN AMONG EXISTING BOULDERS, WITH MINIMUM 10' SPACING TO MINIMIZE INFLUENCE ON FLOOD FLOW CONVEYANCE AND SEDIMENT DEPOSITION, FOLLOWING NATURAL ANALOGUE SEEN IN VICINITY. BOULDERS SHALL BE THREE MAN AND MEET WSDOT SPEC 9–03.11(4).
4. HABITAT BOULDERS SHALL BE STAGED IN STAGING AREA 3 (SEE SHEET 5) FOR PLACEMENT BY HELICOPTER. BOULDERS SHALL HAVE 3" HOLE DRILLED THROUGH CENTER FOR HELICOPTER TRANSPORT.



SECTION, NTS
EXPOSED DEBRIS LOGS INSTALLATION
F
24

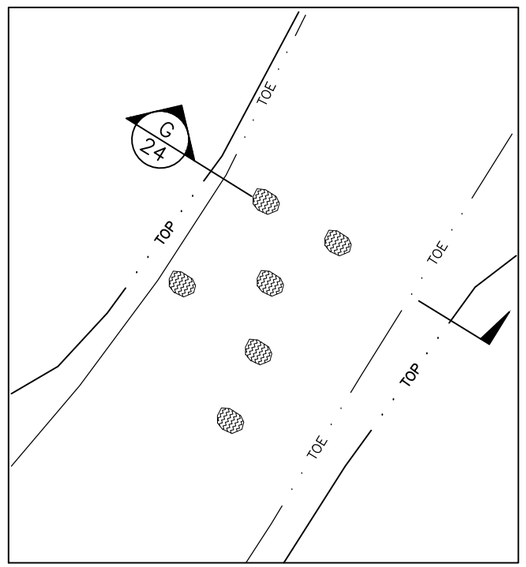
TABLE 4. EXPOSED DEBRIS LOG INSTALLATION SPECIFICATIONS

DBH	MAX EXPOSED LENGTH L3 (FT)		MIN EMBEDDED LENGTH L4 (FT)		MIN DEPTH
(IN)	LOW	HIGH	LOW	HIGH	D2 (FT)
14	5	7	17	20	5
16	5	7	18	22	5.5
18	5	7	20	25	6
20	5	7	23	28	6.5



SECTION
HABITAT BOULDER INSTALLATION, TYP
G
24

5' 0 5' 10'
1"=10'



PLAN
HABITAT BOULDER SPACING – TYP
B2
11

10' 0 10' 20'
1"=20'

PAUL EDWARD DEVRIES
STATE OF WASHINGTON
37861
REGISTERED
PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

NONE

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

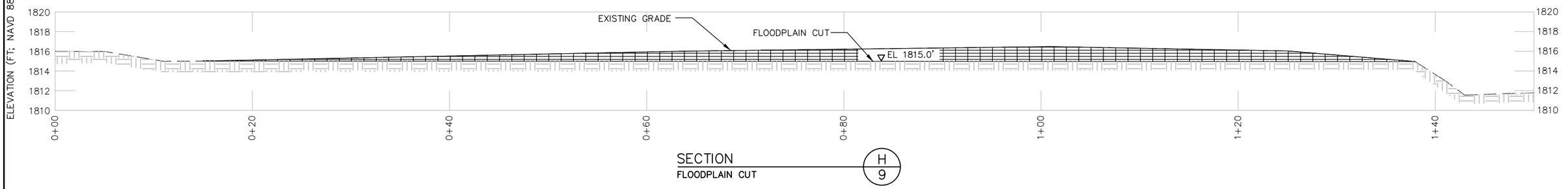
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556–1288

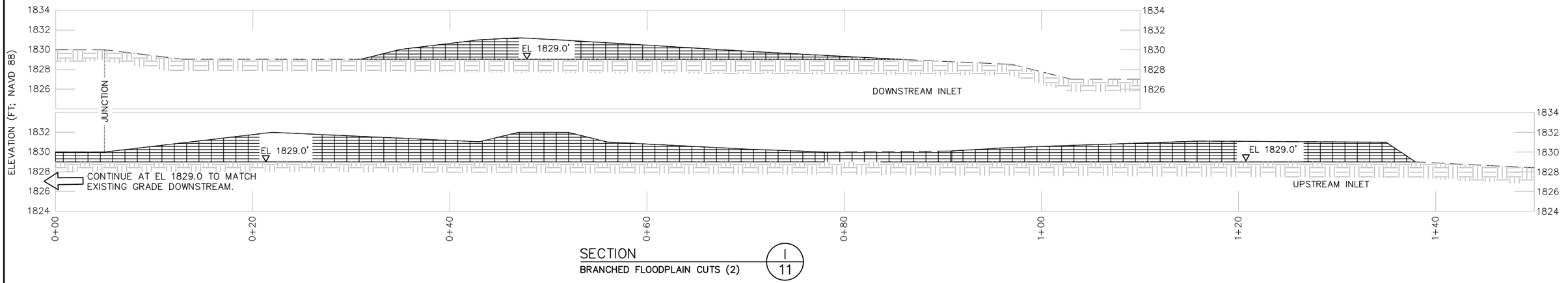
TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

EXPOSED DEBRIS LOGS, HABITAT BOULDERS: PLAN, SECTION, DETAILS
100% DESIGN

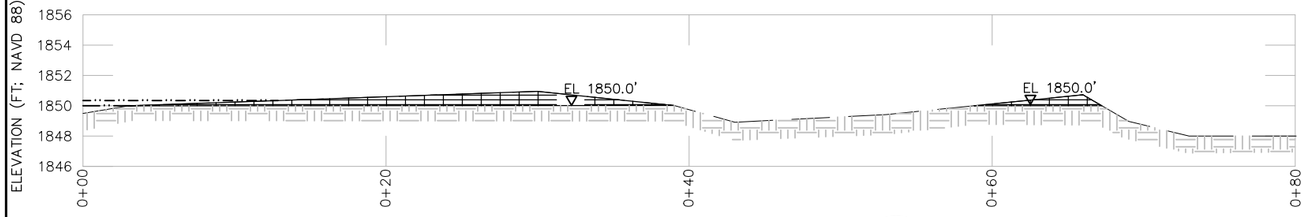
DATE: JUL 13, 2017
SHEET: 24
REV: –



SECTION H / 9
FLOODPLAIN CUT



SECTION I / 11
BRANCHED FLOODPLAIN CUTS (2)



SECTION J / 12
FLOODPLAIN CUT

NOTES:

1. PLACE SPOILS AROUND ELJs AND AT SEDIMENT POND OVERFLOW FILL. EXCESS SPOILS SHALL BE STOCKPILED AT STAGING AREA 3 AND SPREAD OUT OVER COMPACTED GROUND PRIOR TO REPLANTING AND RESTORING SITE.
2. SIDE SLOPES OF CUTS SHALL BE 1H:1V.

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

5' 0 5' 10'
1"=10'

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

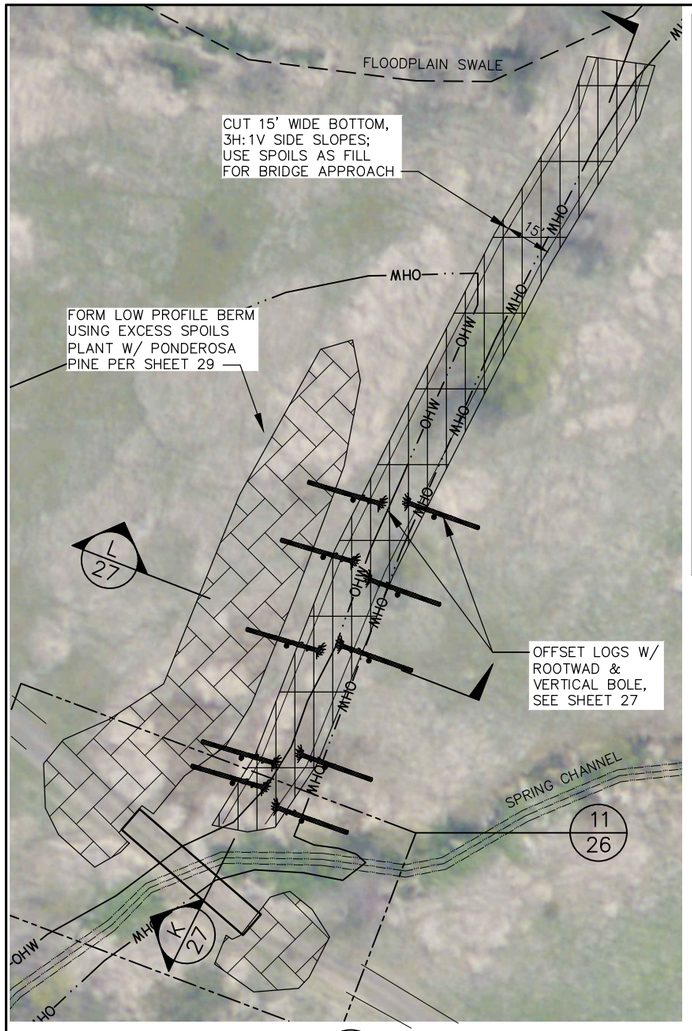
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556-1288

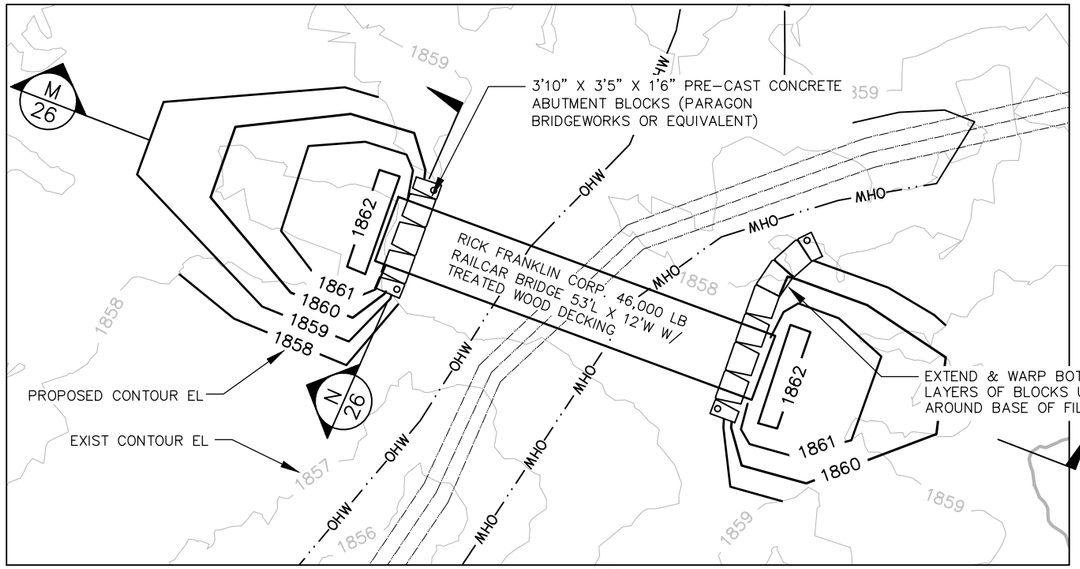
TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

FLOODPLAIN CUT SECTIONS
100% DESIGN

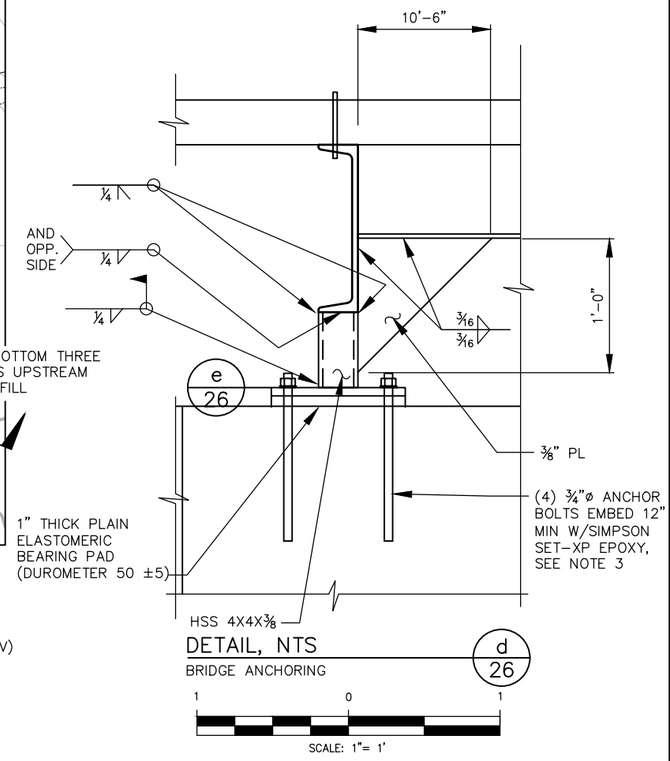
DATE: JUL 13, 2017
SHEET: 25
REV: –



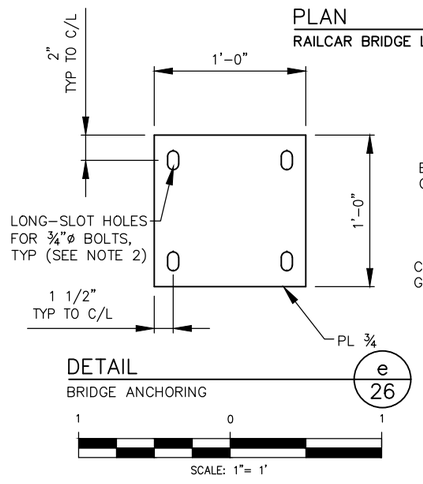
PLAN
SPRING CHANNEL CUT, FILL
6 / 8
25' 0 25' 50'
1"=50'



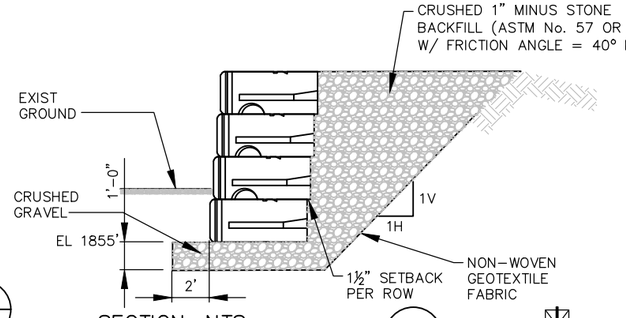
PLAN
RAILCAR BRIDGE LAYOUT, GRADING
11 / 26
10' 0 10' 20'
1"=20'



DETAIL, NTS
BRIDGE ANCHORING
d / 26
1 0 1
SCALE: 1"= 1'



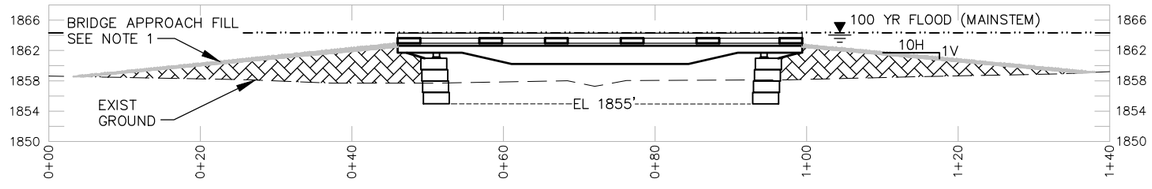
DETAIL
BRIDGE ANCHORING
e / 26
1 0 1
SCALE: 1"= 1'



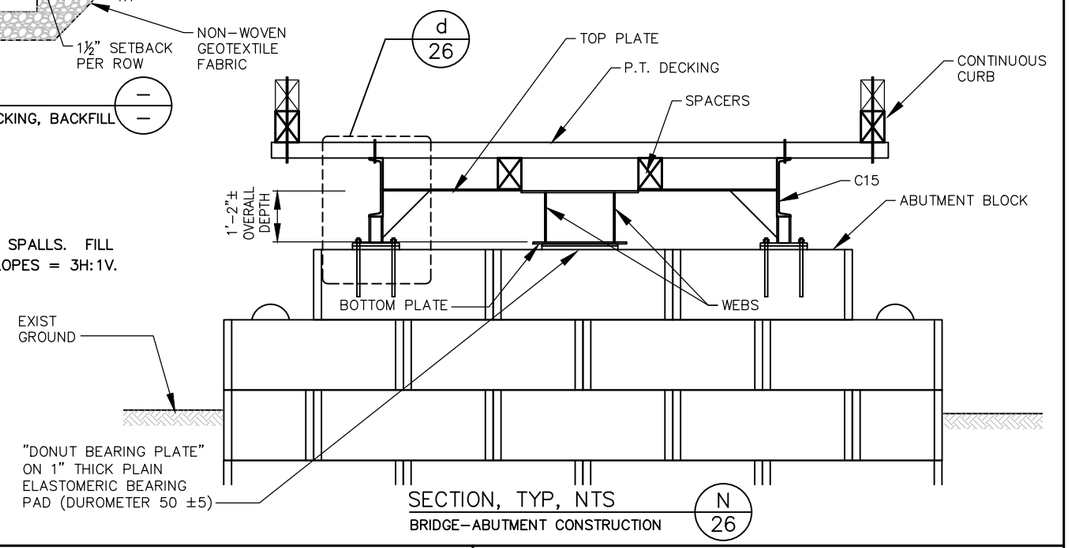
SECTION, NTS
ABUTMENT BLOCK STACKING, BACKFILL
— / —

NOTES:

1. USE SPOILS AS PRIMARY FILL BASE FOR BRIDGE APPROACH. IF SPOILS CONTAINS LESS THAN 60% ROCK BY VOLUME, COVER WITH 6" THICK SURFACE LAYER OF QUARRY SPALLS. FILL VOIDS & COVER WITH 4" THICK COVER OF 1¼"-MINUS CRUSHED ROCK TOP COURSE, WSDOT SPEC 9-03.9(3). TRACK = 12' WIDE, APPROACH SLOPE = 10H:1V, SIDE SLOPES = 3H:1V.



SECTION
PROFILE ALONG BRIDGE
M / 26
10' 0 10' 20'
1"=20'



SECTION, TYP, NTS
BRIDGE-ABUTMENT CONSTRUCTION
N / 26

PAUL EDWARD DEVRIES
STATE OF WASHINGTON
37861
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PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

AS SHOWN

0 1"

BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: PDV/BJ
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556-1288

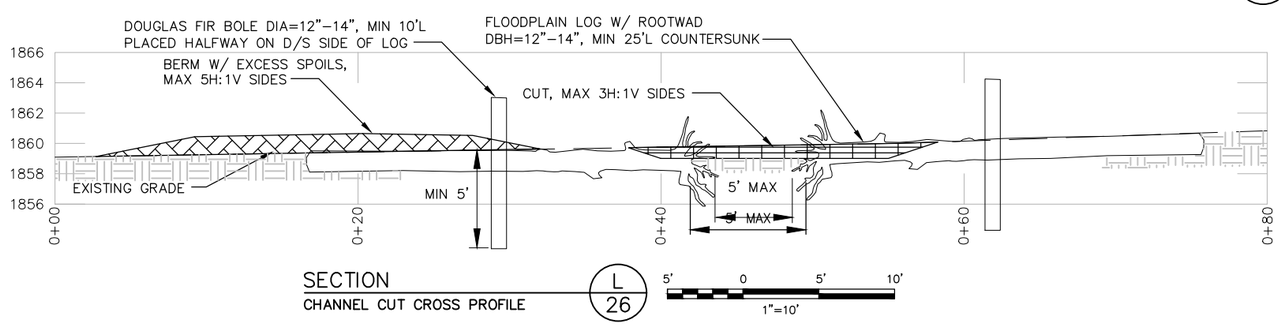
TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

SPRING CHANNEL CUT PLAN, BRIDGE PLAN, SECTION, DETAILS
100% DESIGN

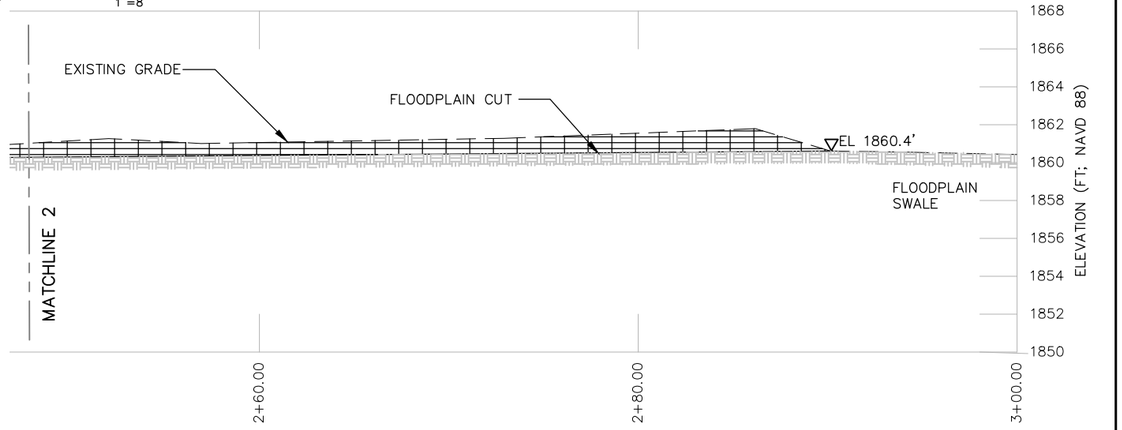
DATE: JUL 13, 2017
SHEET: 26
REV: —

SECTION
CHANNEL CUT LONG PROFILE
K
26
4' 0 4' 8'
1"=8'

SECTION
CHANNEL CUT LONG PROFILE
K
26
4' 0 4' 8'
1"=8'



SECTION
CHANNEL CUT CROSS PROFILE
L
26
5' 0 5' 10'
1"=10'



SECTION
CHANNEL CUT LONG PROFILE
K
26
4' 0 4' 8'
1"=8'

NOTES:

1. LOGS AND BOLES SHALL BE DOUGLAS FIR OR APPROVED EQUIVALENT.

PAUL EDWARD DEVRIES
STATE OF WASHINGTON
37861
REGISTERED
PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

AS SHOWN

0 1"

BAR MEASURES ONE INCH
ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

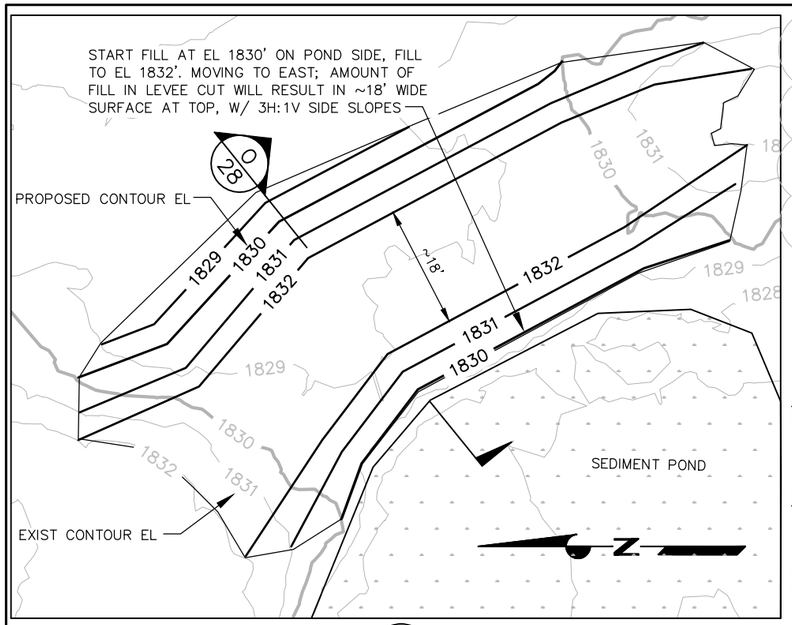
DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556–1288

TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

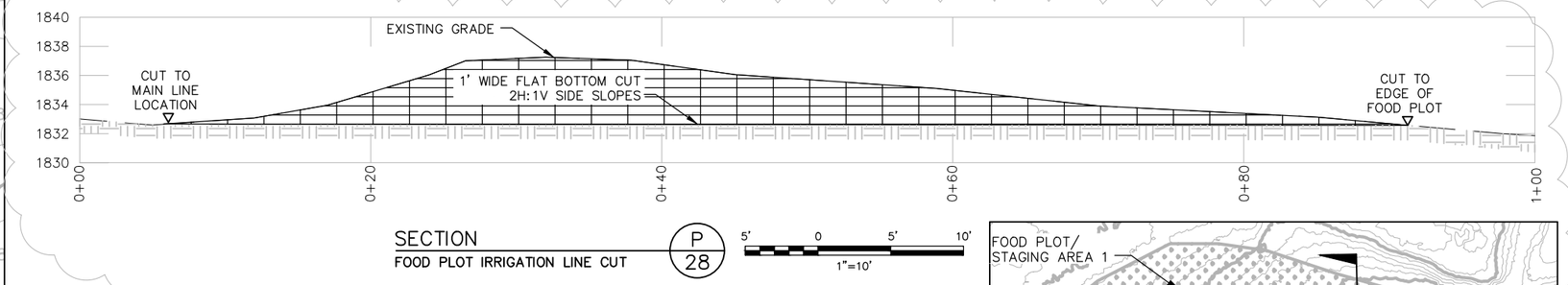
SPRING CHANNEL CUT
LONG, CROSS–SECTION PROFILES
100% DESIGN

DATE: JUL 13, 2017
SHEET: 27
REV: –



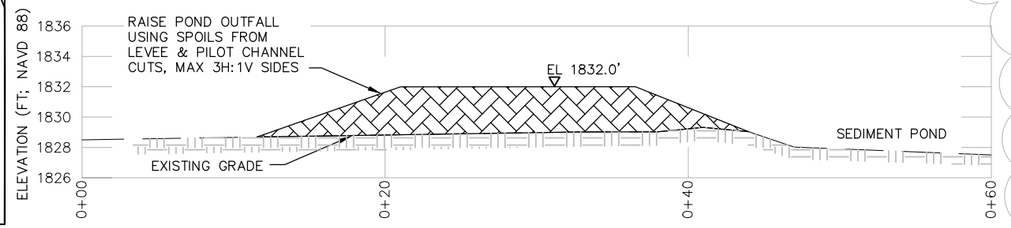
PLAN — SEDIMENT POND OVERFLOW FILL (7, 8,10)

10' 0 10' 20'
1"=20'



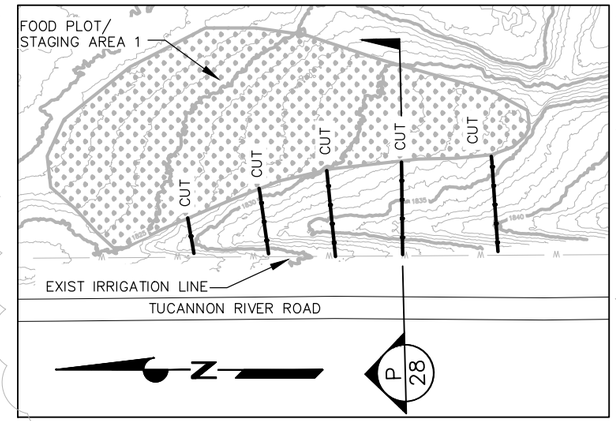
SECTION — FOOD PLOT IRRIGATION LINE CUT (P, 28)

5' 0 5' 10'
1"=10'

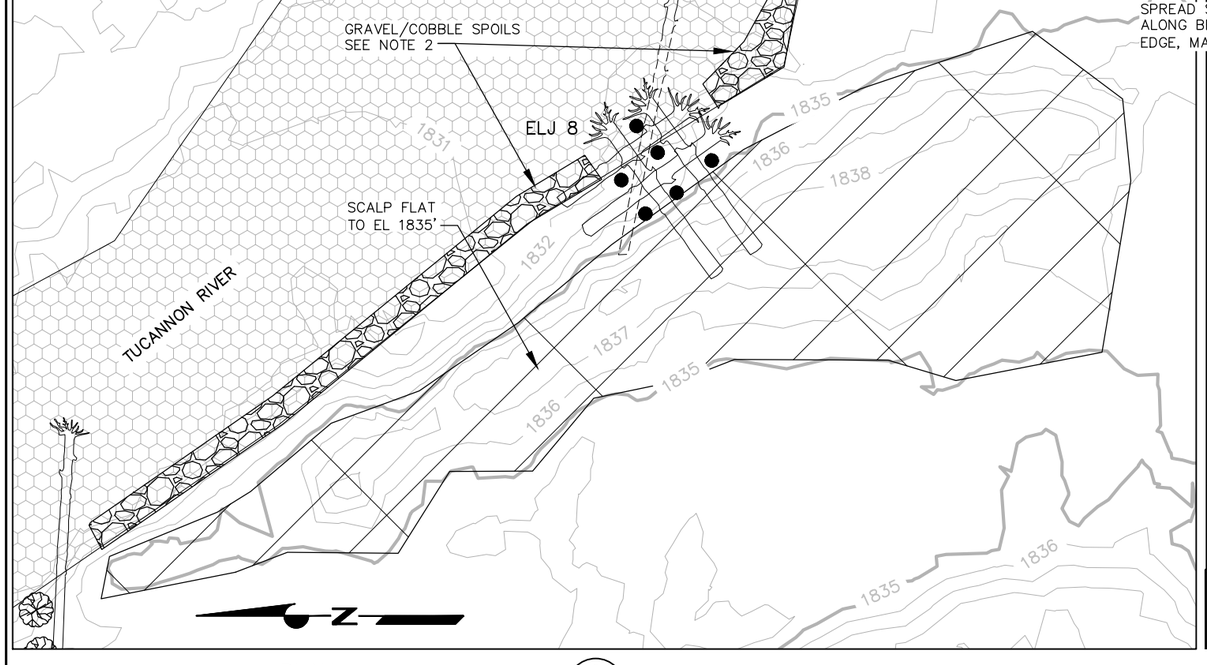


SECTION — POND OVERFLOW BERM FILL (0, 28)

5' 0 5' 10'
1"=10'

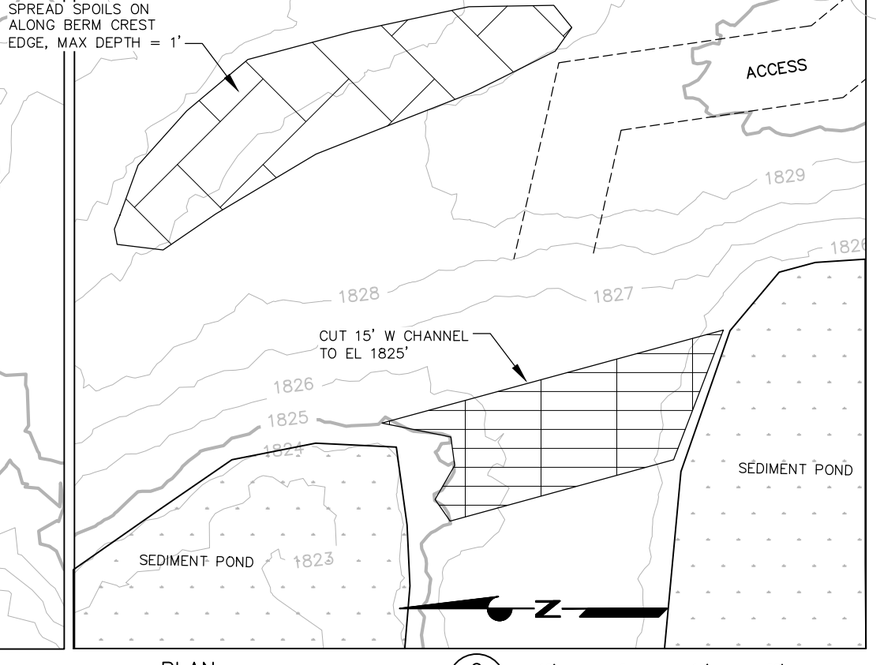


PLAN — FOOD PLOT IRRIGATION LINE CUTS (10, 8)



PLAN — BERM CUT (8, 8,11)

10' 0 10' 20'
1"=20'



PLAN — SEDIMENT POND CUT & FILL (9, 8,10)

10' 0 10' 20'
1"=20'

NOTES:

1. TEMPORARILY STOCKPILE SALVAGED TREES FROM LEVEE & ELJ 8 CUTS IN VICINITY, AND RACK IN AND AROUND ELJ 8 VERTICAL BOLES AFTER CONSTRUCTION.
2. BERM SPOILS COMPOSED OF MORE THAN 70% GRAVEL & COBBLE SHALL BE PLACED ON TOP OF ELJ 8, OR PLACED ALONG THE RIVERBANK TOE FOR RECRUITMENT TO THE RIVER DURING HIGH WATER. REMAINING SPOILS SHALL BE PLACED AT SEDIMENT POND OVERFLOW.
3. TREES GROWING BETWEEN THE BERM CUT FOOTPRINT & RIVERBANK SHALL BE: PROTECTED WHERE DBH>8". SMALLER TREES SHALL BE EITHER LEFT ALONE OR MAY BE CUT LEAVING AT LEAST 4' OF TRUNK ABOVE GROUND TO PERMIT EXCAVATOR BUCKET ACCESS TO RIVERBANK TOE.
4. EXTENT OF CUTS FOR IRRIGATION LINES WILL BE FLAGGED IN FIELD BY ENGINEER. DISPOSE OF SPOILS FROM IRRIGATION LINE CUT ALONG NORTH EDGE OF CUT, SPREAD OUT TO MAX THICKNESS 2'. REVEGETATE W/ NATIVE GRASS SEED MIX, COVER W/ STRAW/MULCH LAYER.

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK
1	6/16/17	ADD IRRIG LINE GRADING AT STAGING AREA 1	PDV	

AS SHOWN

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: P DEVRIES
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556-1288

TUCANNON RIVER HARTSOCK – PHASE 1 FISH HABITAT & FLOODPLAIN RESTORATION

BERM, SEDIMENT POND, IRRIG. LINE GRADING PLAN, SECTION
100% DESIGN

DATE: JUL 13, 2017
SHEET: 28
REV: 1

NOTES:

1. FOREST PLANTING AREAS DEPICT GENERAL EXTENT OF PLANTING AREAS, AND WILL BE FLAGGED OR OTHERWISE MARKED IN THE FIELD BY PROJECT FOREST ECOLOGIST. GRAND FIR, DOUGLAS FIR, PONDEROSA PINE SEEDLINGS (2+ STOCK) WILL BE PLANTED AT SPECIFIC LOCATIONS STAKED FOR EACH TREE BY FOREST ECOLOGIST BASED ON A SURVEY OF SUITABLE PLANTING SITE SOIL AND HYDROLOGIC CONDITIONS. PLANT MATERIAL SHOULD BE LOCAL SEED PROVENANCE STOCK.

2. PLANTING OPERATIONS WILL OCCUR IN LATE MARCH/EARLY APRIL. FOREST ECOLOGIST SHALL INSPECT AND APPROVE PLANTS PRIOR TO PLANTING, AND SUPERVISE PLANTING OPERATIONS.

3. ALL TREES SHALL BE INSTALLED WITH TREE PROTECTOR MESH PER DETAIL THIS SHEET. USE CABLE TIES TO FIX MESH SECURELY TO STAKE.

4. ALL DISTURBED GROUND SHALL BE SEEDED WITH LOCAL NATIVE GRASS SEED MIX:
   - 4.1. STREAMBANKS: RECOMMENDED SPECIES MIX & APPLICATION RATES = MOUNTAIN BROME (BROMUS MARGINATUS – 4 LB/ACRE), IDAHO FESCUE (FESTUCA IDAHOENSIS – 4 LB/ACRE).
   - 4.2. UPLAND AND OTHER DISTURBED GROUND: RECOMMENDED SPECIES MIX & APPLICATION RATES = MOUNTAIN BROME (BROMUS MARGINATUS – 2 LB/ACRE) AND IDAHO FESCUE (FESTUCA IDAHOENSIS – 2 LB/ACRE).

5. ALL FILL AREAS ASSOCIATED WITH CONSTRUCTION OF LOG STRUCTURES (DETAILED ON SHEETS 14, 22) SHALL BE PLANTED IN LATE OCTOBER WITH SINGLE SPECIES BUNDLES OF 2–3 LIVE CUTTINGS OF NATIVE WILLOW (SALIX SP.) AND DOGWOOD (CORNUS SP.) LIVE STAKES AT A DENSITY OF 1.5' ON–CENTER. STAKES SHALL BE MINIMUM 4' LONG. A PILOT HOLE SHALL BE MADE FIRST USING APPROPRIATE EQUIPMENT. CUTTINGS SHALL BE INSERTED MINIMUM 1.5' INTO SOIL, WITH BUDS ORIENTED CORRECTLY UPWARDS. CUTTINGS SHALL HAVE 6 BUDS MINIMUM EACH. CUTTINGS SHALL BE COLLECTED AS NEWER GROWTH TAKEN FROM OUTER CROWN PORTIONS. AFTER CUTTING, RECUT UNDER WATER AND STORE IN BUCKETS FOR AT LEAST 12 HOURS PRIOR TO INSTALLATION. MAKE SURE SOIL IS COMPACTED SNUGLY AROUND CUTTINGS AFTER INSERTING.

6. ALL VEGETATION SHALL BE WATERED DURING THE FIRST YEAR AFTER PLANTING/SEEDING.

7. EXISTING AND POTENTIAL FOOD PLOT AND WILLOW SCREEN AREAS ARE DEPICTED FOR REFERENCE ONLY AND SHALL NOT BE PLANTED WITH TREES TO PRESERVE FUTURE USE BY WDFW FOR WILDLIFE MANAGEMENT. CONTRACTOR SHALL MINIMIZE HEAVY EQUIPMENT TRAVEL OVER FOOD PLOT AREAS AND PROTECT ACCESS ROUTES AND IRRIGATION LINES; SEE SHEET 5 FOR ACCESS ROUTE PROTECTION MEASURE.

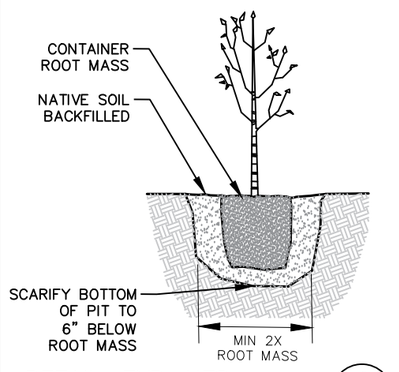
TABLE 5. PLANT QUANTITIES

GRAND FIR INTERPLANTINGS				
Scientific Name	**Common Name**	**Plant Material**	**Trees/Acre**	**Total No.**
Abies grandis	Grand Fir	1 Gallon Tall Container, 2+	100	2691

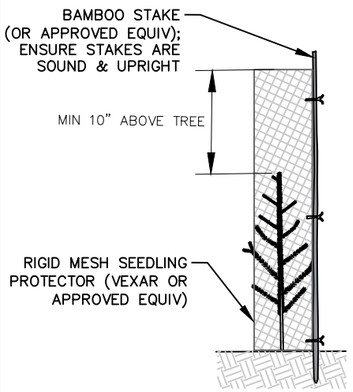
PONDEROSA PINE UPLAND FOREST				
Scientific Name	**Common Name**	**Plant Material**	**Trees/Acre**	**Total No.**
Pinus ponderosa	Ponderosa Pine	1 Gallon Tall Container, 2+	175	3275

DOUGLAS FIR/PONDEROSA PINE TERRACE FOREST				
Scientific Name	**Common Name**	**Plant Material**	**Trees/Acre**	**Total No.**
Pseudotsuga menziesii	Douglas-fir	1 Gallon Tall Container, 2+	87	1783
Pinus ponderosa	Ponderosa Pine	1 Gallon Tall Container, 2+	87	1783

LIVE STAKES AT LOG EXCAVATIONS				
Scientific Name	**Common Name**	**Plant Material**	**On-center spacing (ft)**	**Total No.**
Salix spp.	Willows	4 foot live stakes, 3/bunch	1.5	5227
Cornus spp.	Dogwood	4 foot live stakes, 3/bunch	1.5	5227



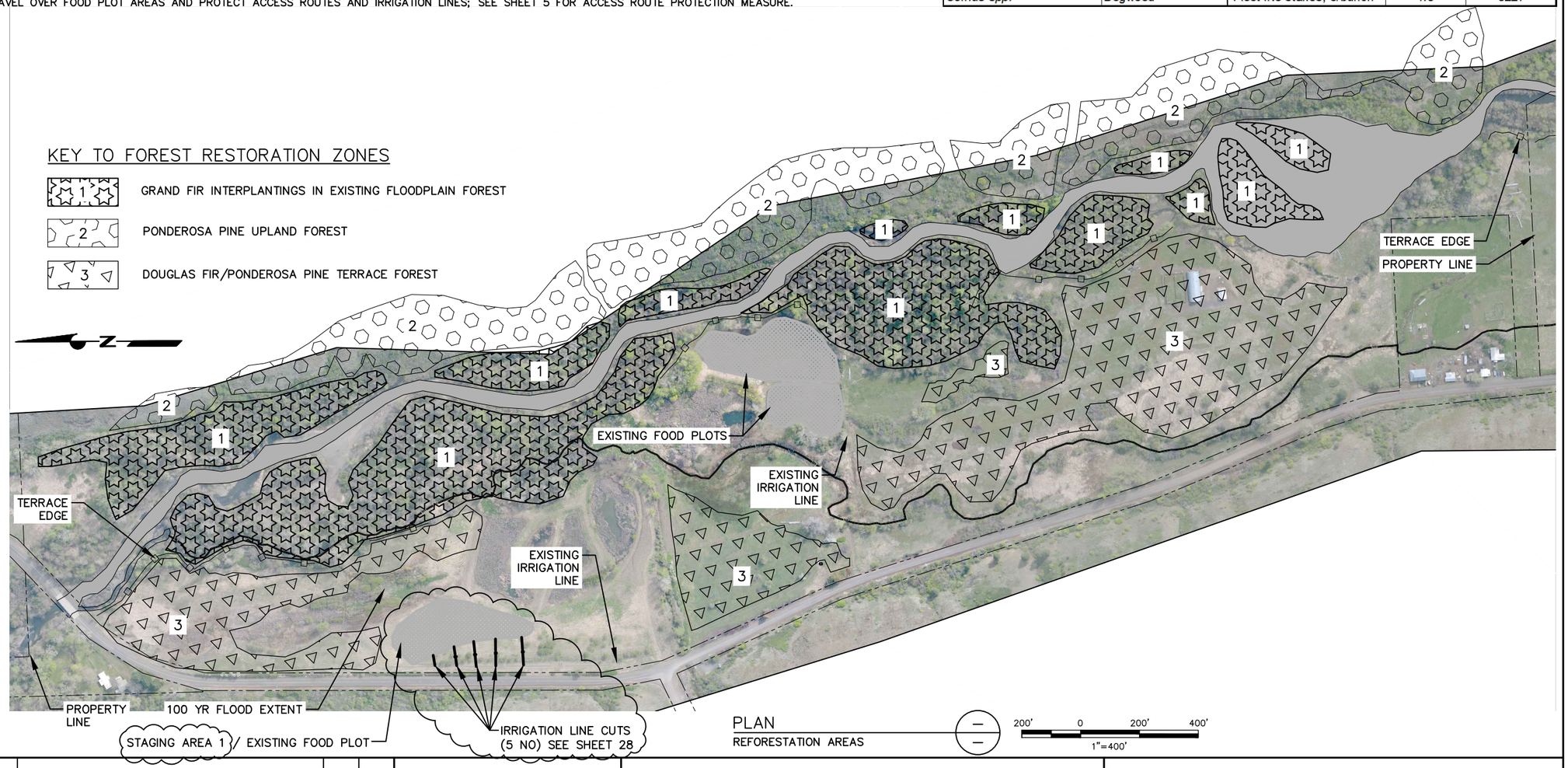
DETAIL, TYP, NTS (f/–)
CONTAINER PLANTING



DETAIL, TYP, NTS (g/–)
TREE PROTECTOR

KEY TO FOREST RESTORATION ZONES

- 1 — GRAND FIR INTERPLANTINGS IN EXISTING FLOODPLAIN FOREST
- 2 — PONDEROSA PINE UPLAND FOREST
- 3 — DOUGLAS FIR/PONDEROSA PINE TERRACE FOREST



PLAN (–/–)
REFORESTATION AREAS

200' 0 200' 400'
1"=400'

PAUL EDWARD DEVRIES — STATE OF WASHINGTON — 37861 — REGISTERED PROFESSIONAL ENGINEER

NO.	DATE	REVISION DESCRIPTION	BY	CHK

0 1"
BAR MEASURES ONE INCH ON ORIGINAL DRAWINGS

CONFEDERATED TRIBES UMATILLA INDIAN RESERVATION

DESIGNED BY: KLF
DRAWN BY: PDV/JS
CHECKED BY: MT
PROJECT MGR: P DEVRIES

Resource Consultants, Inc.
REDMOND, WA 98052
PHONE: (425) 556–1288

TUCANNON RIVER HARTSOCK – PHASE 1
FISH HABITAT & FLOODPLAIN RESTORATION

PLANTING, SITE RESTORATION PLAN, SPECIFICATIONS
100% DESIGN

DATE: JUL 13, 2017
SHEET: 29
REV: –