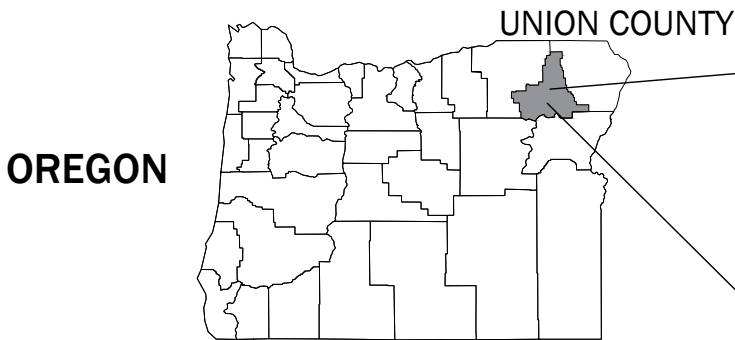


AIWOHI-CISCO DRY CREEK

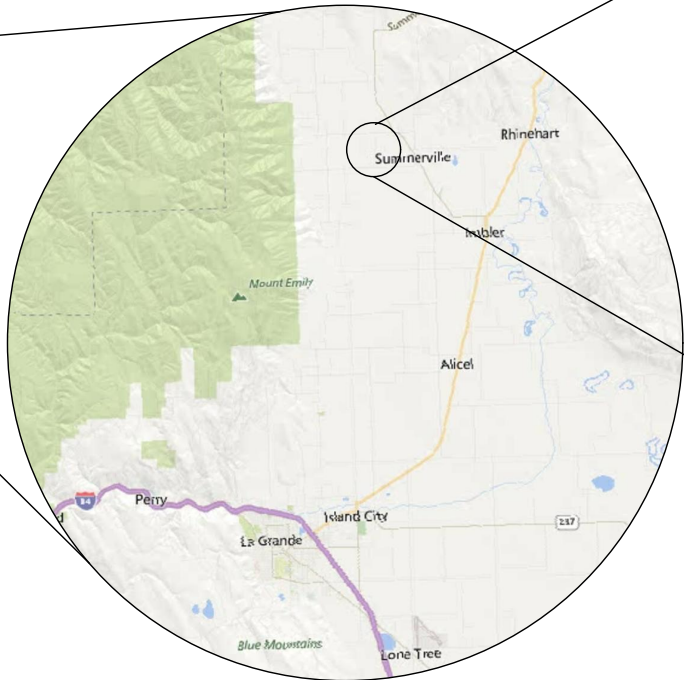
HABITAT RESTORATION

FINAL DESIGN

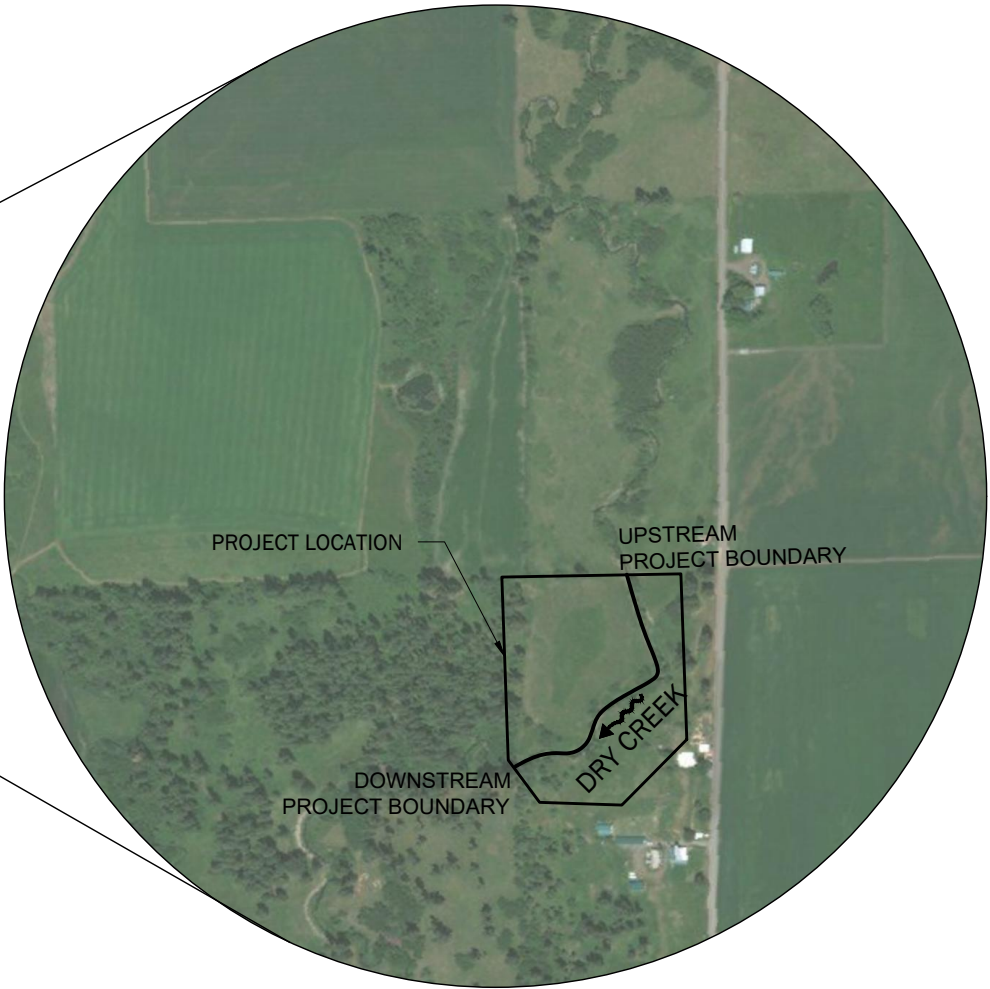


PROJECT LOCATION

THE PROJECT SITE IS LOCATED APPROXIMATELY 14 MILES NORTH OF LA GRANDE, OREGON. TO GET TO THE PROJECT SITE FROM LA GRANDE TAKE OR-82 E TO N MCALISTER RD. TURN LEFT ONTO N MCALISTER RD AND FOLLOW FOR 9.6 MILES. CONTINUE ONTO HUNTER ROAD. TURN RIGHT ONTO MCKENZIE LN AND CONTINUE FOR 0.9 MILES. TURN LEFT ONTO SLACK ROAD AND CONTINUE FOR APPROXIMATELY 0.5 MILES. THE PROJECT SITE WILL BE ON THE LEFT.



Not to Scale



Not to Scale

Sheet Index

Sheet Number	Sheet Title
1.1	Cover Sheet
1.2	Project Goals and Objectives
1.3	Legend and Notes
1.4	Access, Staging and Dewatering
2.1	Existing Conditions Overview
2.2	Existing Plan and Profile STA. 10+00 - 15+60
2.3	Existing Plan and Profile STA. 15+60 - 21+50
3.1	Proposed Conditions Overview
3.2	Proposed Plan and Profile STA. 10+00 - 18+50
3.3	Proposed Plan and Profile STA. 18+50 - 27+50
4.1	Channel Sections
4.2	Channel Sections
5.1	Construction Sequencing and Dewatering Plan
5.2	Construction Sequencing and Dewatering Plan
6.1	Typical Channel Details
6.2	Typical Habitat Details
6.3	Typical Habitat Details
7.1	Revegetation Plan
8.1	HIP IV General Conservation & Implementation Measures
8.2	HIP IV General Conservation & Implementation Measures

CONTACT INFORMATION

Union Soil and Water Conservation District
Aaron Bliesner
10507 North McAlister Road
La Grande, OR. 97850
Ph: (541)-963-1313

GeoEngineers Inc.
Tim Hanrahan
523 E. Second Ave.
Spokane, WA. 99202
Ph: (509) 209-2821

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AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

COVER SHEET

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: BHM/TPH	SHEET 1 OF 20
CHECKED: RSC/JRS	DATE: 4.27.2018
SHEET NO. 1.1	

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Aiwohi Dry Creek Restoration Objectives ¹	Performance Metrics for Restoration Objectives	Associated Limiting Factors ²
Increased number of large wood pieces and jams	Increase the amount of large wood pieces (greater than 6 inch diameter and 10 feet in length) to greater than 15 per 100 feet of stream length by 2020 and following a discharge greater than a 2-year recurrence.	Large wood deficiencies
Increased quantity and quality of habitat diversity	Increase the quantity of individual habitat unit types (riffle, pool, glide) to at least 7.5 per 20 times the average bankfull width by 2022 and following the occurrence of at least 3 discharge events greater than a 2-year recurrence.	Stream channelization, loss of wetlands
Increased juvenile rearing habitat	Increase the area of zero velocity habitat and side channel habitat to 20% of the total inundated area at the 2-year recurrence discharge.	Large wood deficiencies, high summer water temperatures, stream channelization, loss of wetlands
Increased adult spawning habitat	Increase the area of spawning substrate grain size ranging from fine gravel (>4 mm) to small cobble (<64 mm) in pool tailout areas by 2022.	Large wood deficiencies, elevated sediment and nutrient inputs, stream channelization
Increased stem density (#/m ²) of native shrubs and trees	Increase stem density of native riparian shrub and tree species to a minimum of 195 stems per acre by 2022.	Large wood deficiencies, lack of shade, high summer water temperatures
Site-appropriate native vegetation	Increase native riparian plant species diversity (herbaceous, shrub, tree) by more than a factor of 6.	Large wood deficiencies, lack of shade, high summer water temperatures
Increased floodplain connectivity	Increase the inundated floodplain area to twice (2x) the pre-project condition during discharge events greater than the modeled 2-year recurrence.	High summer water temperatures (hyporheic interaction), loss of wetlands, stream channelization
Increased Width:Depth at greater than 2-year peak flows	Achieve an average bankfull width/depth ratio less than 30 by 2022 and following the occurrence of a discharge greater than a 2-year recurrence.	Stream channelization
Channel morphology closer to fully functional form	Increase channel sinuosity to greater than 1.6 by 2022.	High summer water temperatures, elevated sediment and nutrient inputs, loss of wetlands, stream channelization
Increased floodplain connectivity	Decrease channel entrenchment, measured as a ratio between floodprone width of the 25-year recurrence inundation level and the bankfull width, to an increased value greater than 2.2 by 2022.	Stream channelization, high summer water temperatures, loss of wetlands
Increased number and depth of pools	Increase the quantity of pools greater than 3 feet in depth at bankfull flow to a greater than 35% of total stream area and at a frequency of length between pools less than 8 times bankfull channel width.	Large wood deficiencies, high summer water temperatures, stream channelization

1. Union Soil and Water Conservation District
2. Limiting Factors as defined by Grande Ronde Model Watershed (2001) and applicable to project reach

Project Goal:

Enhance and increase natural channel function and processes that improve habitat suitability for spawning and rearing summer steelhead, spring Chinook salmon, and other native fish and wildlife resources.

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AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

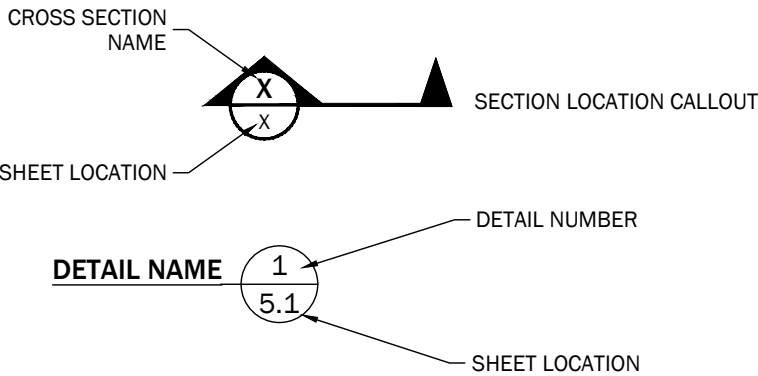
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DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: BHM/TPH	SHEET 2 OF 20
CHECKED: RSC/JRS	DATE: 4.27.2018
SHEET NO. 1.2	

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GENERAL NOTES:

- These designs and drawings have been prepared for the exclusive use of the Union Soil and Water Conservation District (USWCD) and their authorized agents. No other party may rely on the product of our services unless GeoEngineers Inc. (GeoEngineers) agrees in writing in advance of such use.
- The drawings contained within should not be applied for any purpose or project except the Dry Creek Project Reach as shown in the Project Area located on Sheet 1.1.
- These designs and drawings are copyrighted by GeoEngineers, Inc. Any use, alteration, deletion, or editing of this document without explicit written permission from GeoEngineers, Inc. is strictly prohibited. Any other unauthorized use of this document is prohibited.
- USWCD is advised to contact and to obtain the necessary permits and approvals from all appropriate regulatory agencies (local, state, and federal) prior to construction.
- Geomorphic conditions can change and these designs are based on conditions that existed at the time the design was performed. The results of these designs may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying these designs to determine if they remain applicable.
- All rivers, streams, rocks and woody habitat structures are potentially dangerous. These proposed creek improvements are intended to address a wide variety of constraints which target more naturally functioning stream systems and habitat; they are inherently dangerous to people in or around the pond and stream crossing. USCWD and the property owner should address safety concerns appropriately.
- Potential regulatory changes to flood elevations and flood extents resulting from the proposed enhancements have not been addressed by GeoEngineers as part of this project.
- In general, the proposed enhancements are intended to result in more stable streambeds, banks and floodplains. However, channel erosion, channel migration and/or avulsions can be expected to occur over time. These channel processes are natural and appropriate for these stream systems.
- Design specifics for structures shall be confirmed and/or verified by a qualified engineer prior to or during construction at each proposed structure location.
- These figures were originally produced in color.
- The project horizontal datum references Oregon State Plane, North, International Feet. Vertical datum references NAVD88.



GENERAL CONSTRUCTION NOTES:

- All contractors working within the project boundaries are responsible for compliance with all applicable safety laws. The contractor shall be responsible for all barricades, safety devices and control of traffic within and around the construction area.
- All material and workmanship furnished on or for the project must meet the minimum requirements of project permits, approving agencies, specifications as set forth herein, or whichever is more restrictive.
- Contractor shall not work within any wetland area until they have obtained a 404 permit from the United States Army Corps of Engineers. All work within or adjacent to any wetland area shall comply with the conditions of the 404 permit.
- All federal, state and local permits shall be obtained by the Client prior to construction activity commencement.
- The contractor shall install and maintain appropriate erosion and sediment control devices throughout the whole project site, including those associated with construction access, staging and stockpile areas throughout the project's construction period. Temporary construction and permanent erosion control measures shall be designed, constructed and maintained in accordance with all applicable local, state and federal regulations.
- Construction activity shall be limited to the construction areas and access routes to minimize disturbance of the existing vegetation and landscape. All public and private property either inside or outside the construction limits impacted by construction shall be restored to a condition equal to or better than that which existed prior to the construction. No construction-related materials, debris, garbage, equipment, fuel, provisions of any kind shall remain on site after construction. No stockpiles or excavations are to remain after construction unless authorized by the landowner. The site will be graded to appear natural and conform to the natural topography.
- Construction shall minimize disturbance to, and maximize reuse of, existing riparian vegetation.
- Only appropriate approved native riparian vegetation shall be used for cuttings and transplanting. Vegetation cutting, transplanting, planting and irrigation shall be managed by an appropriate professional.
- Construction records and as-built information shall be accurately recorded by the contractor and supplied to the owner and GeoEngineers for future use, reference and monitoring. Submittal of record information is a condition of final acceptance.
- This design has been performed and these plans have been prepared with the express understanding that GeoEngineers will provide guidance to the contractor during construction.
- The long-term success of this project relies upon the success of the proposed vegetation. The vegetation and disturbed project site must be monitored and maintained to promote vigorous revegetation.

ABBREVIATIONS:

WSEL	WATER SURFACE ELEVATION
TYP	TYPICAL
FT	FEET
ELEV	ELEVATION
Horiz.	HORIZONTAL
Vert.	VERTICAL
MIN	MINIMUM
MAX	MAXIMUM
NTS	NOT TO SCALE
AC	ACRES
CFS	CUBIC FEET PER SECOND
ACW	ACTIVE CHANNEL WIDTH
OHW	ORDINARY HIGH WATER
SQ-FT	SQUARE FEET
CY	CUBIC YARDS

QUANTITIES

Item #	Item Description	Units	No. of Units
1	Environmental Controls - Permit Compliance-Best Management Practices	LS	1
2	Mobilization and Demobilization	LS	1
3	Clearing, Grubbing, Stockpile and Disposal	LS	1
4	Temporary Stream Crossing	EA	1.0
5	Temporary Stream Diversion	EA	14
6	Excavation	CY	10900
7	Place Material - Channel and Floodplain Grading	CY	2500
8	Place Material - Dispose on site	CY	8400
9	ELJ - Import and Place 20' Log With Rootwad 12" DBH	EA	10
10	ELJ - Import and Place 30' Log with Rootwad 14-16" DBH	EA	95
11	ELJ - Import and Place 40' Whole Tree	EA	10
12	ELJ - Import and Place Slash Material	CY	120
13	ELJ - Import and Place Racking Members	EA	555
14	ELJ - Import and Place Vertical Piles (4-6" Dia, 8 ft length)	EA	185
15	Willow Trench	LF	1340
16	Install Bridge Abutments	EA	2

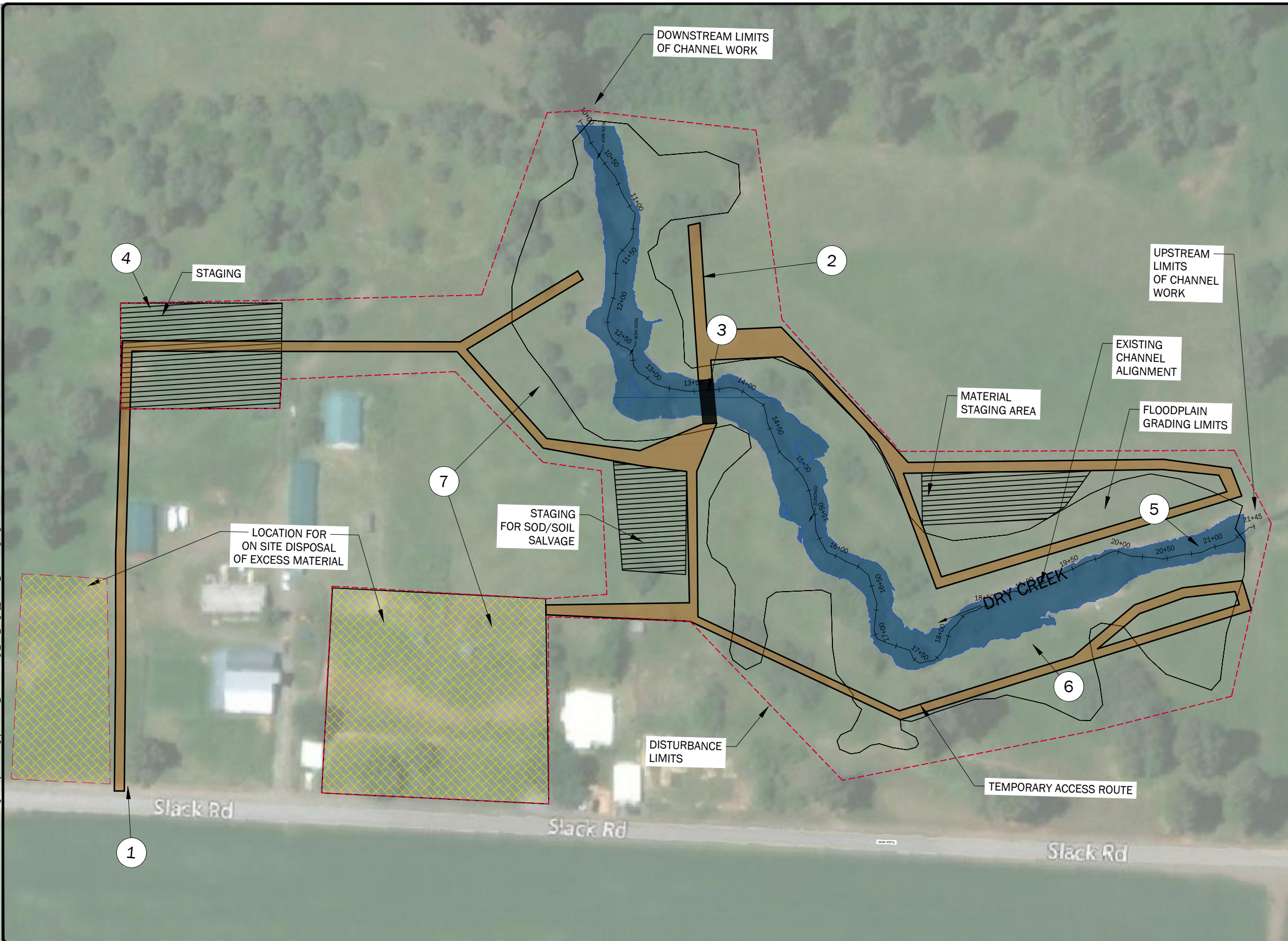
NO.	DATE	BY	REVISION



AIWOHI-CISCO DRY CREEK HABITAT RESTORATION FINAL DESIGN LA GRANDE, OREGON	
LEGEND AND NOTES	

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DESIGN: BHM/TPH	SHEET 3 OF 20
CHECKED: RSC/JRS	DATE: 4.27.2018
SHEET NO. 1.3	

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LEGEND

- DISTURBANCE LIMITS
- FLOODPLAIN GRADING LIMITS
- EXISTING DRY CREEK ALIGNMENT
- EXISTING 2-YR INUNDATION
- STAGING AREA
- TEMPORARY CHANNEL CROSSING

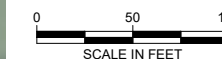
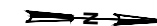
NOTES:

- Sheets are projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
- Existing topography provided by RSI, October 2017.
- Aerial imagery from Bing Maps.
- Existing inundation boundaries modeled in HEC-RAS V. 5.0.3. 2-yr discharge is equal to 233 cfs.

ACCESS AND STAGING GENERAL NOTES

- ALL IN-WATER WORK SHALL OCCUR BETWEEN JULY 1 - OCTOBER 15 OR AS OTHERWISE SPECIFIED IN ENVIRONMENTAL PERMITS.
- ALL WORK IS SUBJECT TO HIP IV GENERAL AQUATIC CONSERVATION MEASURES (SEE SHEETS 8.1 - 8.2).

- ACCESS SITE FROM SLACK ROAD.
- TEMPORARY ACCESS ROUTES SHALL MINIMIZE DISTURBANCE TO NATIVE VEGETATION.
- INSTALL TEMPORARY CHANNEL CROSSING AT EXISTING FORD SUCH AS RAILCAR BRIDGE.
- INSTALL PERIMETER SEDIMENT CONTROLS AROUND STAGING AREAS AND STABILIZE ANY TEMPORARY STOCKPILES.
- ISOLATE WORK ZONE USING WORK AREA ISOLATION STRUCTURE. DEWATER ISOLATED WORK AREA AND CONDUCT FISH SALVAGE. FISH PASSAGE SHALL BE MAINTAINED THROUGHOUT CONSTRUCTION. REFER TO SHEETS 5.1 - 5.2 FOR DETAILED DEWATERING PLAN.
- EXCAVATE CHANNELS AND CONSTRUCT LARGE WOOD STRUCTURES (SEE SHEETS 3.1 - 3.3).
- RESTORE DISTURBED AREAS OUTSIDE FLOODPLAIN GRADING LIMITS. EVENLY DISTRIBUTE EXCESS MATERIAL ON SITE WITHIN THE DISTURBANCE LIMITS. STABILIZE WITH NATIVE SEED MIX AFTER CHANNEL EXCAVATION AND LOG STRUCTURE INSTALLATION IS COMPLETE.



NO.	DATE	BY	REVISION



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AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

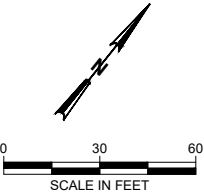
ACCESS, STAGING AND DEWATERING

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DESIGN: BHM/TPH SHEET 4 OF 20
CHECKED: RSC/JRS DATE: 4.27.2018
SHEET NO.

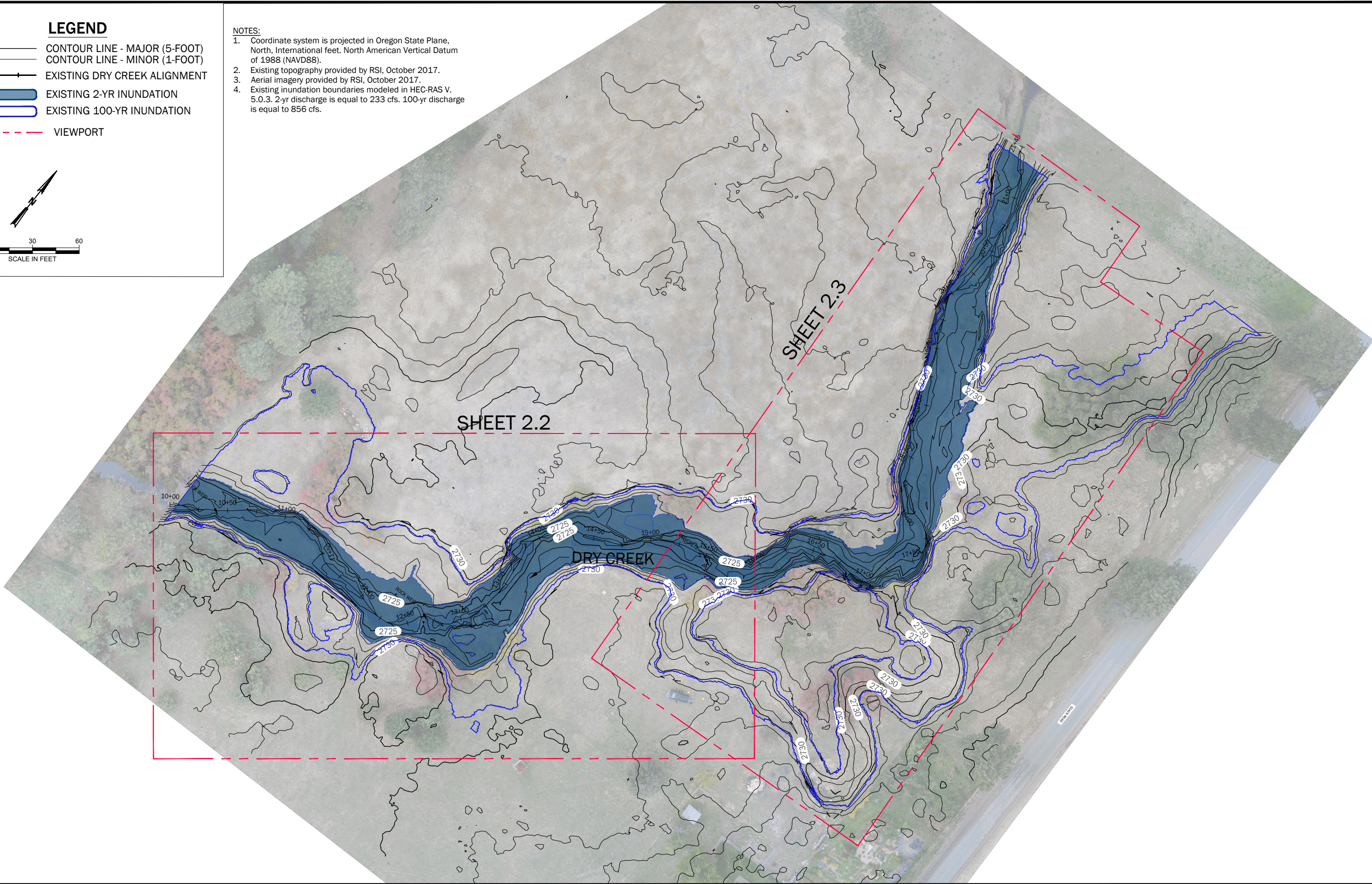
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LEGEND

- CONTOUR LINE - MAJOR (5-FOOT)
- CONTOUR LINE - MINOR (1-FOOT)
- EXISTING DRY CREEK ALIGNMENT
- EXISTING 2-YR INUNDATION
- EXISTING 100-YR INUNDATION
- VIEWPORT



- NOTES:
- Coordinate system is projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
 - Existing topography provided by RSI, October 2017.
 - Aerial imagery provided by RSI, October 2017.
 - Existing inundation boundaries modeled in HEC-RAS V.5.0.3. 2-yr discharge is equal to 233 cfs. 100-yr discharge is equal to 856 cfs.



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NO.	DATE	BY	REVISION



523 EAST SECOND AVENUE : SPOKANE, WA 99202 : 509-363-3125 : WWW.GEOENGINEERS.COM

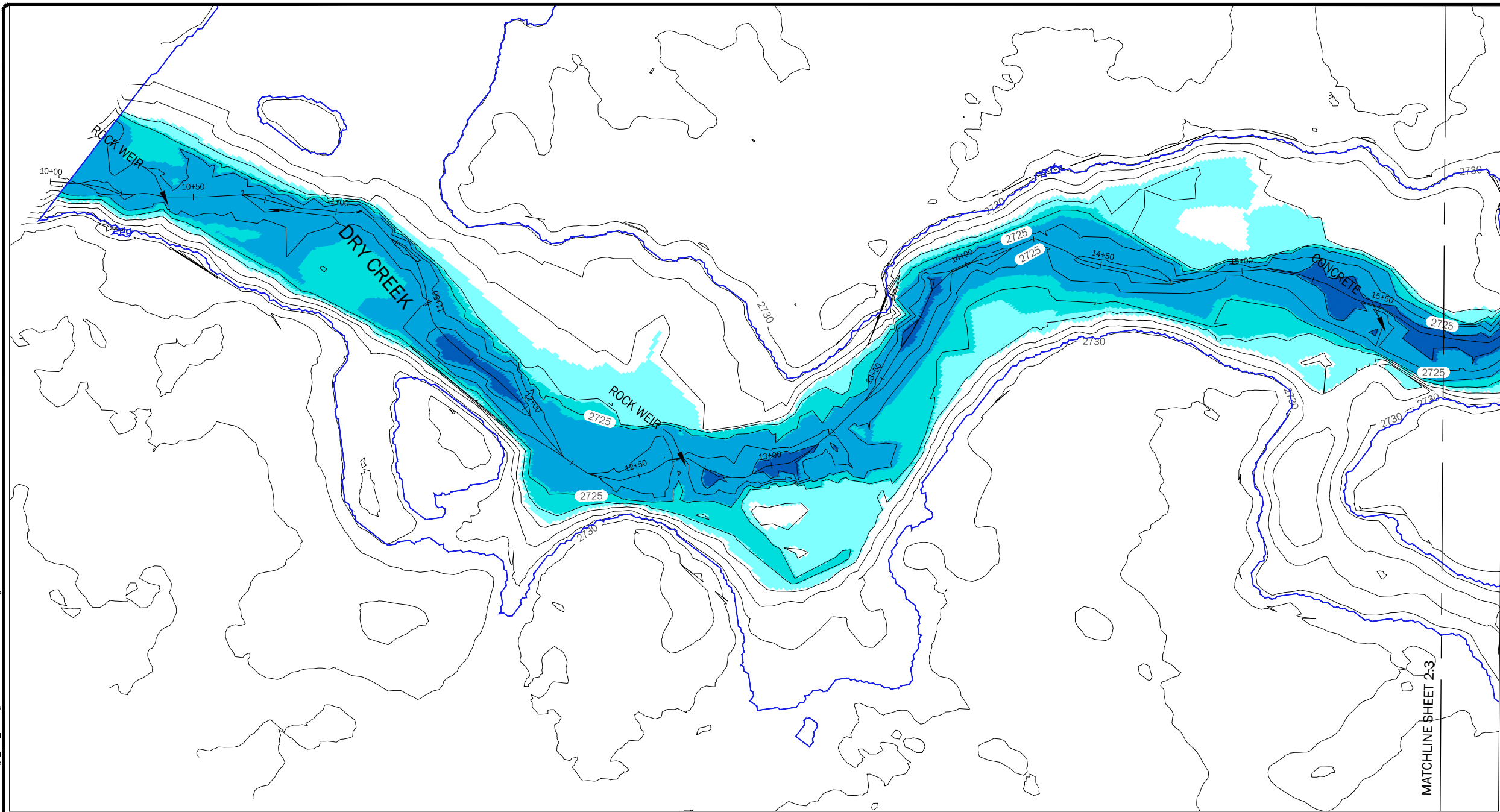


AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

EXISTING CONDITIONS OVERVIEW

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: BHM/TPH	SHEET 5 OF 20
CHECKED: RSC/JRS	DATE: 4.27.2018
SHEET NO.	2.1

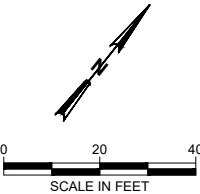
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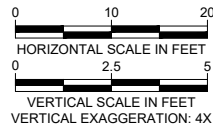
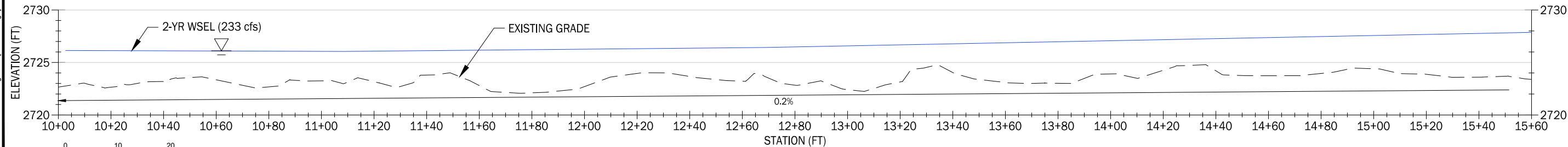
LEGEND

— CONTOUR LINE - MAJOR (5-FOOT)
— CONTOUR LINE - MINOR (1-FOOT)
+ EXISTING DRY CREEK ALIGNMENT
EXISTING 100-YR INUNDATION

2-YR WATER DEPTHS (FT)		
Minimum	Maximum	Color
0.0	1.0	
1.0	2.0	
2.0	4.0	
4.0	5.0	
5.0	6.0	



- NOTES:**
- Coordinate system is projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
 - Existing topography provided by RSI, October 2017.
 - Aerial imagery provided by RSI, October 2017.
 - Existing inundation boundaries modeled in HEC-RAS V. 5.0.3. 2-yr discharge is equal to 233 cfs. 100-yr discharge is equal to 856 cfs.



EXISTING THALWEG PROFILE

NO.	DATE	BY	REVISION

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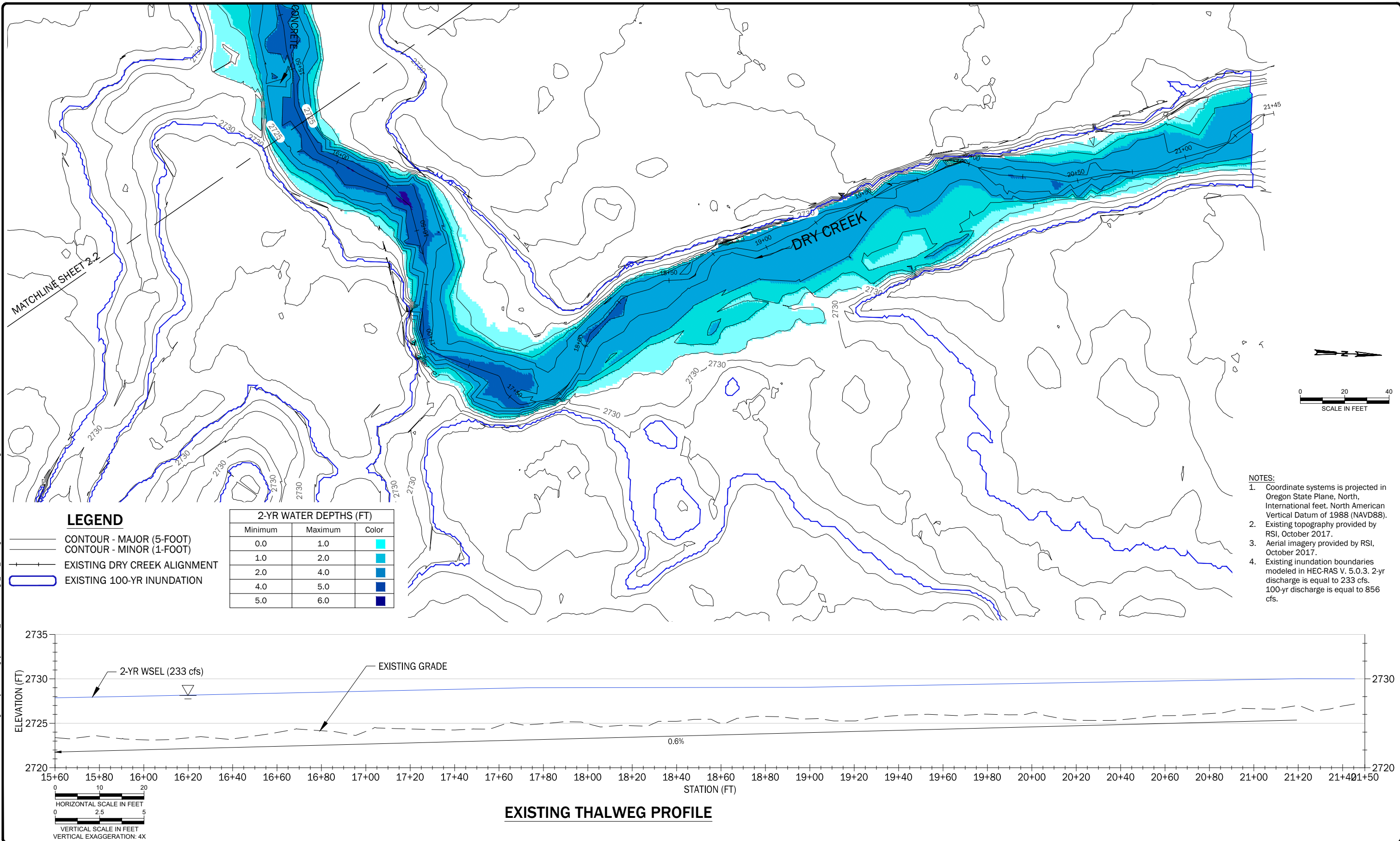


AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

EXISTING PLAN AND PROFILE STA. 10+00 - 15+60

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: BHM/TPH	SHEET 5 OF 20
CHECKED: RSC/JRS	DATE: 4.27.2018
SHEET NO.	2.2

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AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

EXISTING PLAN AND PROFILE STA. 15+60 - 21+50

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: BHM/TPH	SHEET 7 OF 20
CHECKED: RSC/JRS	DATE: 4.27.2018
SHEET NO.	2.3

NOTES:

1. Coordinate system is projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).

2. Existing topography provided by RSI, October 2017.

3. Aerial imagery provided by RSI, October 2017.

4. Existing inundation boundaries modeled in HEC-RAS V. 5.0.3. 2-yr discharge is equal to 233 cfs. 100-yr discharge is equal to 856 cfs.

LEGEND

CONTOUR LINE - MAJOR (5-FOOT)

CONTOUR LINE - MINOR (1-FOOT)

EXISTING DRY CREEK ALIGNMENT

PROPOSED DRY CREEK ALIGNMENT

FLOODPLAIN GRADING LIMITS

VIEWPORT

PROPOSED 100-YR INUNDATION

PRIMARY CHANNEL

PRIMARY CHANNEL POOL

SECONDARY CHANNELS

REGRADE FLOODPLAIN

WETLAND/ALCOVE

V = VERTICAL POST ARRAY

B = BANK ROOTWADS

L = LONGITUDINAL LOGS

0

0

0

SCALE IN FEET

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Union

Soil and Water Conservation District

AIWOHI-CISCO DRY CREEK HABITAT RESTORATION

FINAL DESIGN

LA GRANDE, OREGON

PROPOSED CONDITIONS OVERVIEW

DRAWN: BHM

DESIGN: BHM/TPH

CHECKED: RSC/JRS

SHEET NO.

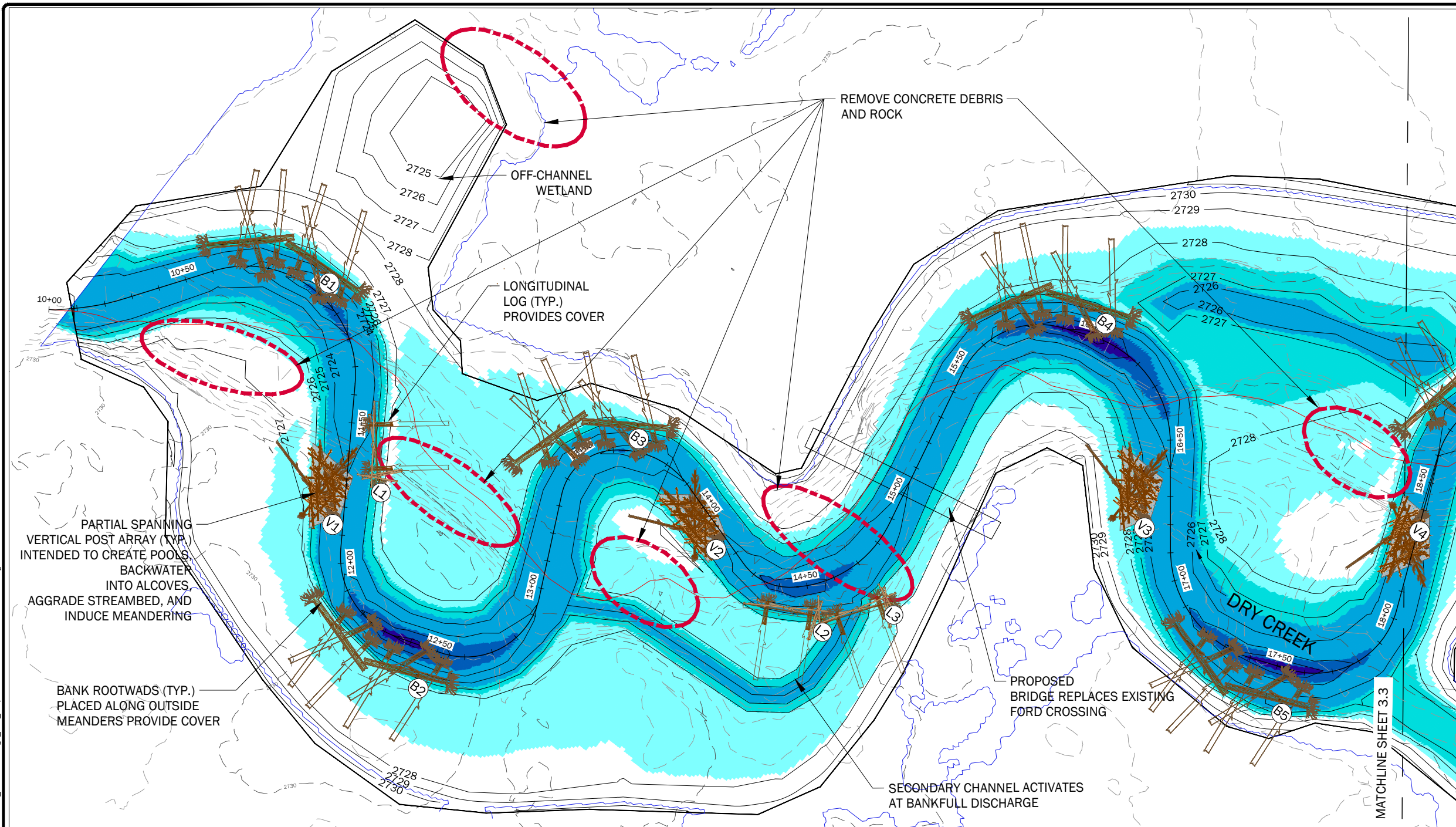
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SHEET 8 OF 20

DATE: 4.27.2018

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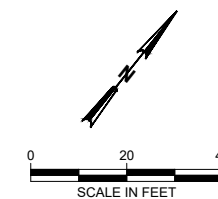
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LEGEND

- PROPOSED CONTOUR LINE - MAJOR (5-FOOT)
- PROPOSED CONTOUR LINE - MINOR (1-FOOT)
- EXISTING CONTOUR LINE - MAJOR (5-FOOT)
- EXISTING CONTOUR LINE - MINOR (1-FOOT)
- EXISTING DRY CREEK ALIGNMENT
- PROPOSED DRY CREEK ALIGNMENT
- FLOODPLAIN GRADING LIMITS
- PROPOSED 100-YR INUNDATION
- V = VERTICAL POST ARRAY
- B = BANK ROOTWADS
- L = LONGITUDINAL LOGS

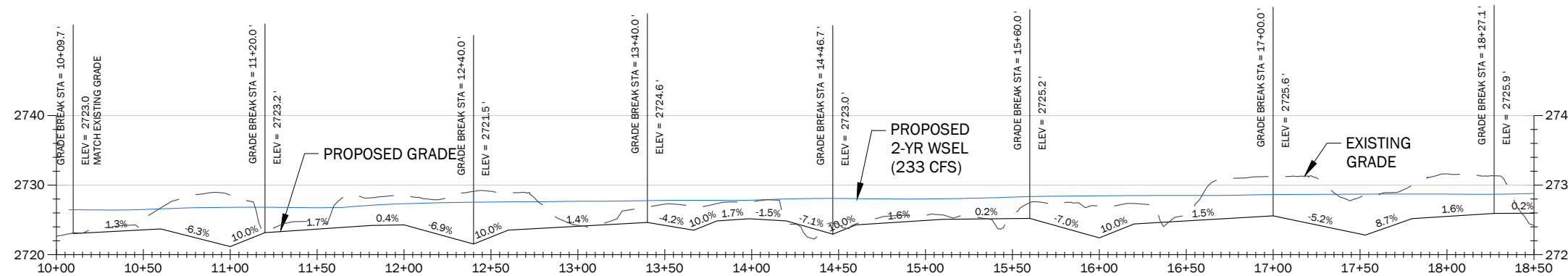
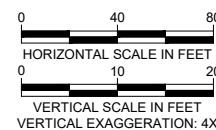
2-YR WATER DEPTHS (FT)		
Minimum	Maximum	Color
0.0	1.0	
1.0	2.0	
2.0	4.0	
4.0	5.0	
5.0	6.0	



NOTES:

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- Existing and proposed inundation boundaries modeled in HEC-RAS V. 5.0.3. 2-yr discharge is equal to 233 cfs. 100-yr discharge is equal to 856 cfs.

PROPOSED THALWEG PROFILE



NO.	DATE	BY	REVISION



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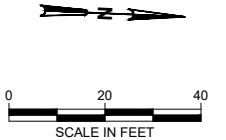
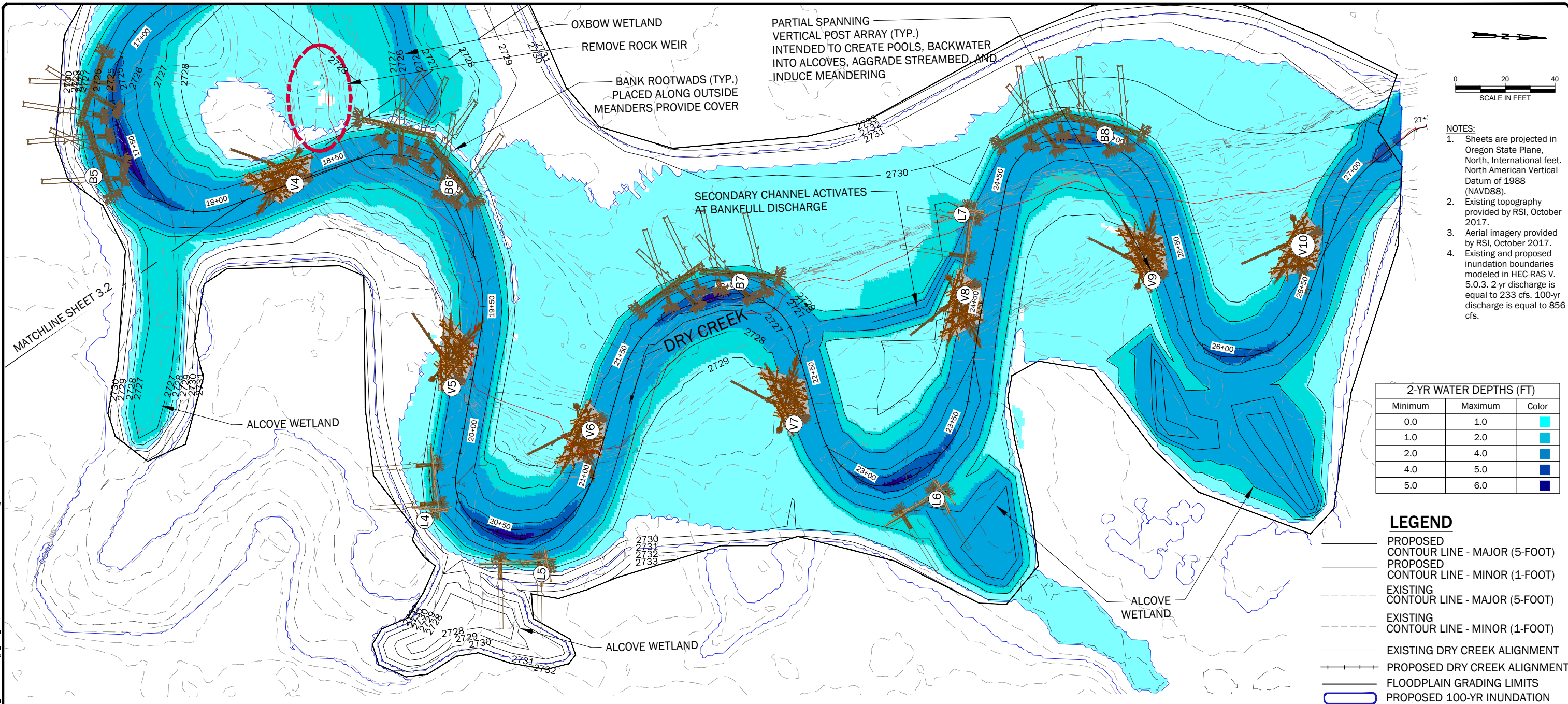
AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

PROPOSED PLAN AND PROFILE STA. 10+00 - 18+50

DRAWN: BHM PROJ NO: 19369-002-00
DESIGN: BHM/TPH SHEET 9 OF 20
CHECKED: RSC/JRS DATE: 4.27.2018
SHEET NO.

3.2

Plotted: 04/19/2018, 13:26 Lbmiller P:\191936902\CAD\000Channel Design\100% Design\19369002_Channel Design_S10_Proposed Conditions Plan and Profile.dwg



- NOTES:
1. Sheets are projected in Oregon State Plane, North, International feet, North American Vertical Datum of 1988 (NAVD88).
 2. Existing topography provided by RSI, October 2017.
 3. Aerial imagery provided by RSI, October 2017.
 4. Existing and proposed inundation boundaries modeled in HEC-RAS V. 5.0.3. 2-yr discharge is equal to 233 cfs. 100-yr discharge is equal to 856 cfs.

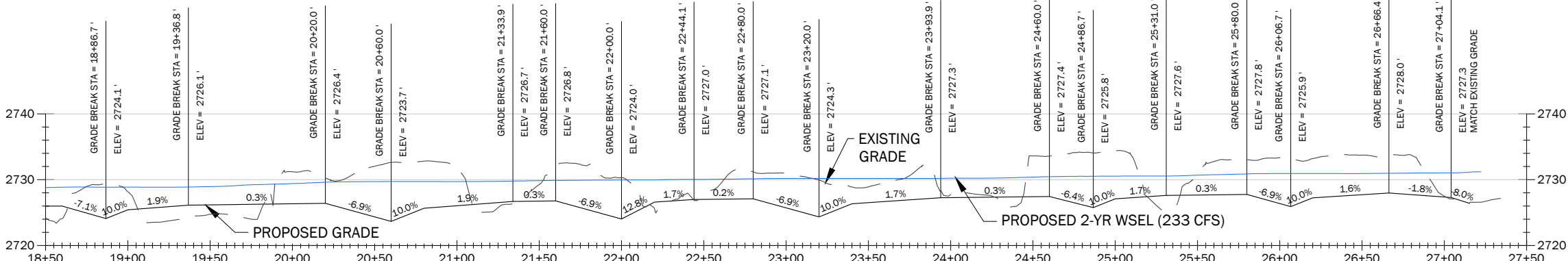
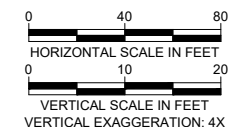
2-YR WATER DEPTHS (FT)		
Minimum	Maximum	Color
0.0	1.0	Light Blue
1.0	2.0	Medium Blue
2.0	4.0	Dark Blue
4.0	5.0	Very Dark Blue
5.0	6.0	Black

LEGEND


- PROPOSED CONTOUR LINE - MAJOR (5-FOOT)
- PROPOSED CONTOUR LINE - MINOR (1-FOOT)
- EXISTING CONTOUR LINE - MAJOR (5-FOOT)
- EXISTING CONTOUR LINE - MINOR (1-FOOT)
- EXISTING DRY CREEK ALIGNMENT
- PROPOSED DRY CREEK ALIGNMENT
- FLOODPLAIN GRADING LIMITS
- PROPOSED 100-YR INUNDATION

- V = VERTICAL POST ARRAY
- B = BANK ROOTWADS
- L = LONGITUDINAL LOGS


PROPOSED THALWEG PROFILE



NO.	DATE	BY	REVISION



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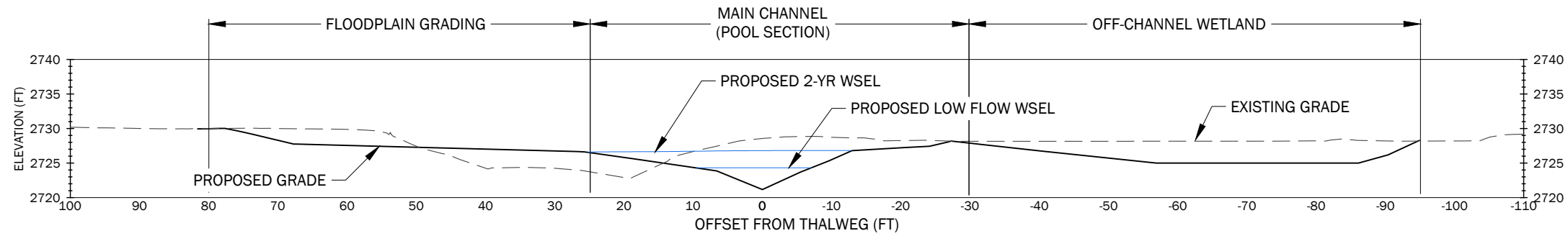
AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

PROPOSED PLAN AND PROFILE STA. 18+50 - 27+50

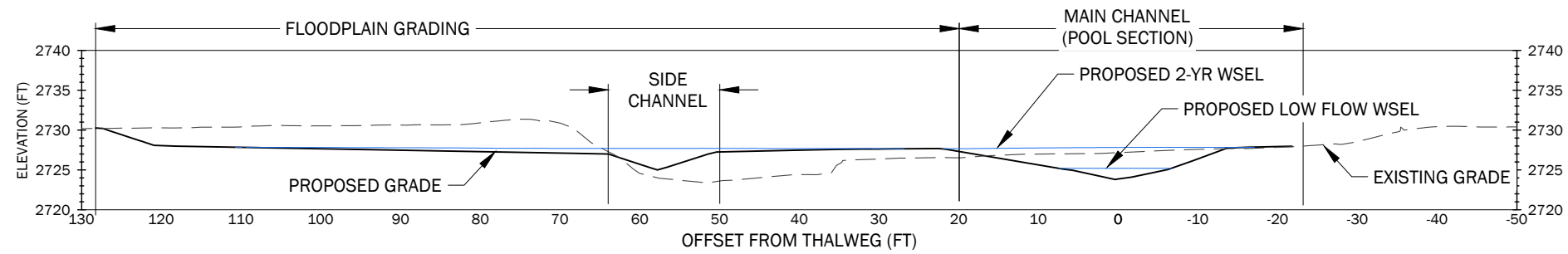
DRAWN: BHM PROJ NO: 19369-002-00
DESIGN: BHM/TPH SHEET 10 OF 20
CHECKED: RSC/JRS DATE: 4.27.2018
SHEET NO. 3.3

P:\19\19369002\CAD\00\Channel Design\100% Design\19369002_Channel Design_S11_Channel Section.dwg
Plotted: 04/27/2018, 07:19 | bmillar

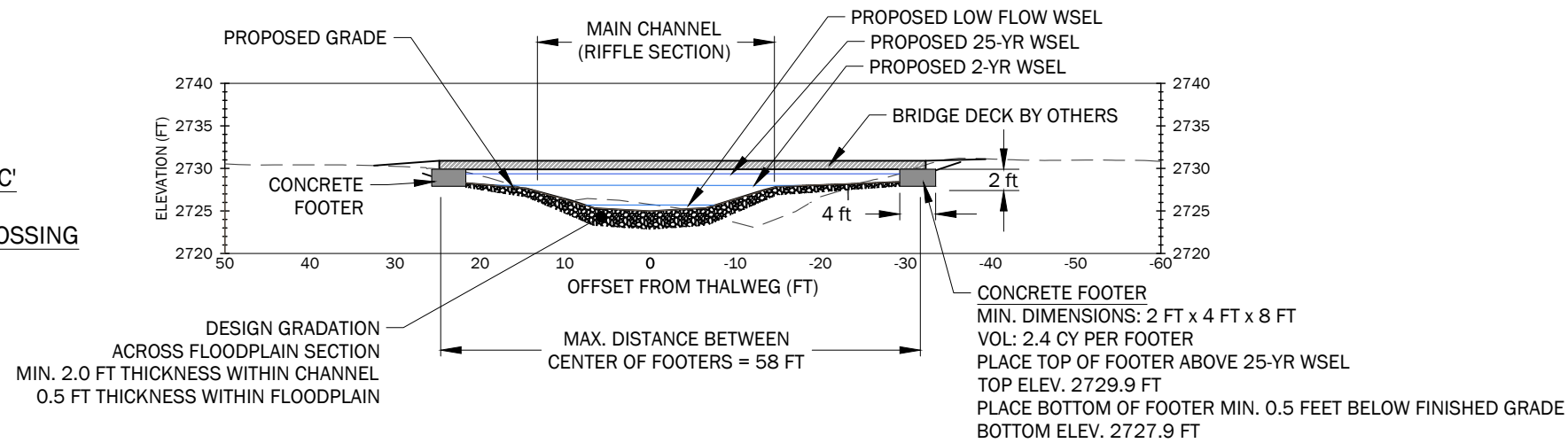
SECTION A-A'



SECTION B-B'



SECTION C-C'
PROPOSED
BRIDGE CROSSING



- FOOTER NOTES:
- CONTRACTOR TO COMPACT SOIL WITH A VIBRATORY COMPACTOR TO THE SATISFACTION OF THE CONTRACTING OFFICER OR THE ENGINEER PRIOR TO PLACEMENT OF FOOTING.
 - ECOLOGY BLOCKS MAY BE USED AS FOOTERS. (4) MINIMUM PER SIDE.

NOTES:

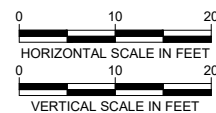
- Coordinate system is projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
- Existing topography provided by RSI, October 2017.
- Cross Section face downstream, stationing increases from right to left.
- No Vertical Exaggeration

Existing Gradations

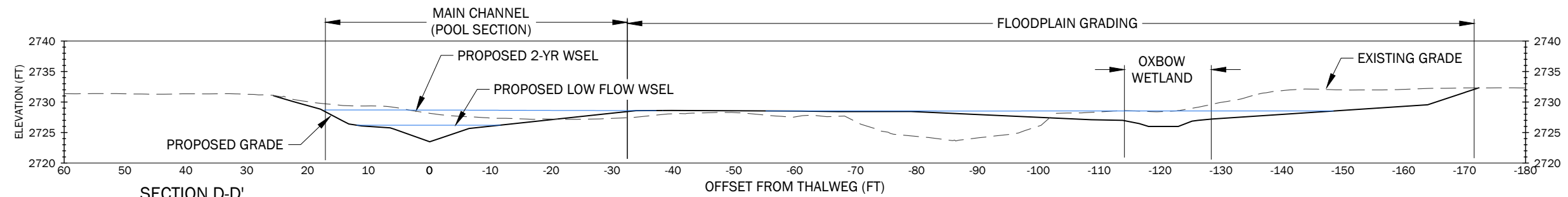
Percent Gradation Smaller Than	Sample 1 (in)	Sample 2 (in)
D95	1.8	2.3
D84	1.3	1.9
D75	1.1	1.7
D50	0.8	1.2
D25	0.6	0.7
D16	0.4	0.5
D5	0.2	0.2

Design Gradation

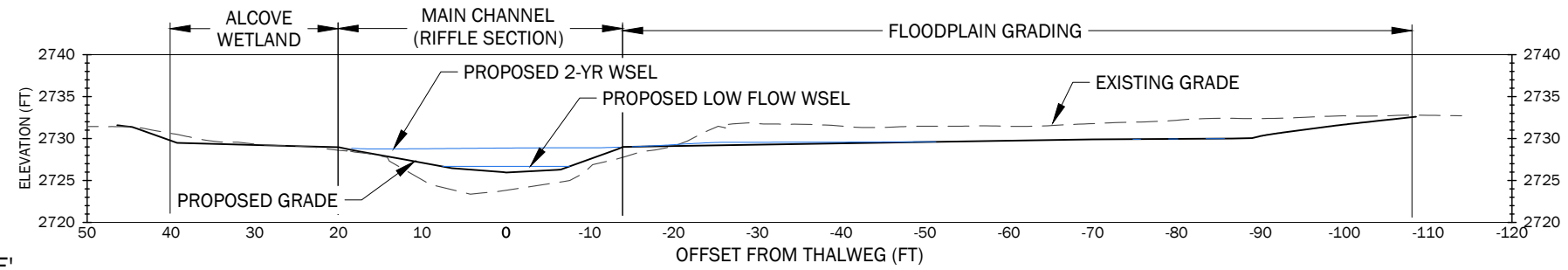
Percent Gradation Smaller Than	Min. (in)	Max. (in)
D100	1.3	2.5
D80	1.2	1.3
D50	0.9	1.1
D15	0.4	0.5



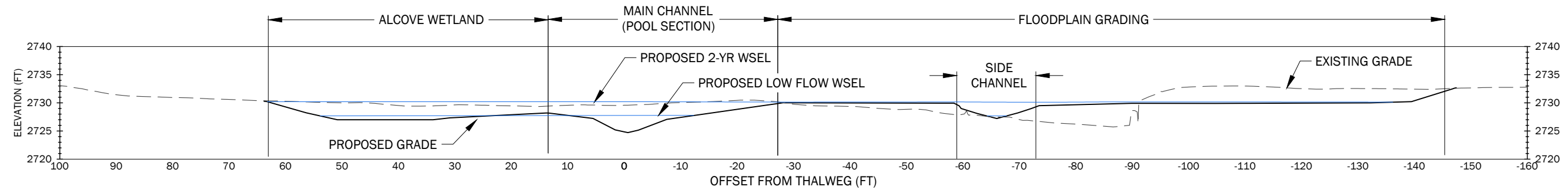
NO.	DATE	BY	REVISION



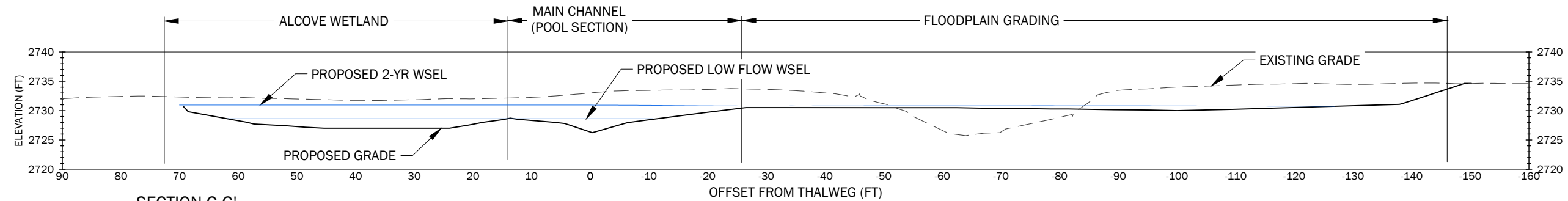
SECTION D-D'



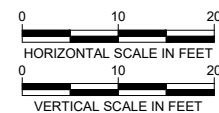
SECTION E-E'



SECTION F-F'



SECTION G-G'



NOTES:

1. Coordinate system is projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
2. Existing topography provided by RSI, October 2017.
3. Cross Section face downstream, stationing increases from right to left.
4. No Vertical Exaggeration.

Plotted: 04/16/2018, 10:15 Lbmiller P:\19\19369002\CAD\00\Channel Design\19369002_Channel Design_S12_Channel Section.dwg

NO.	DATE	BY	REVISION



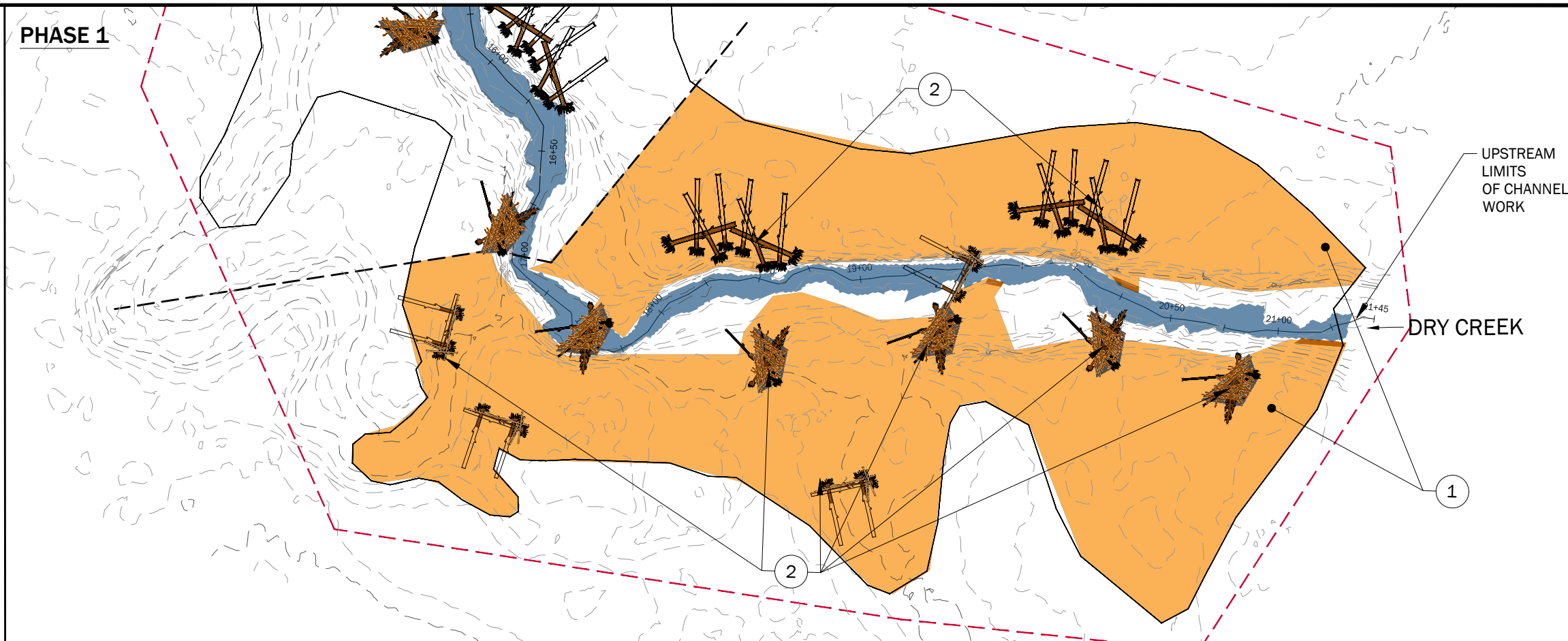
AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

CHANNEL SECTIONS

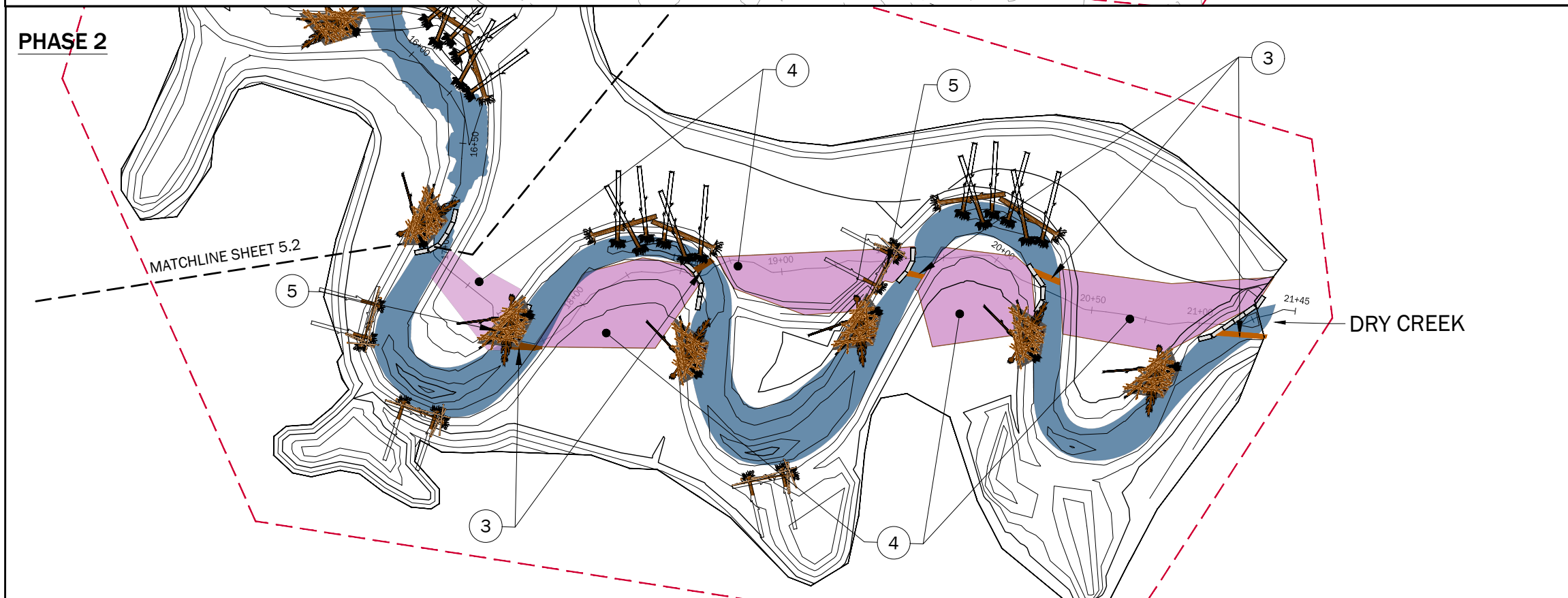
DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: BHM/TPH	SHEET 12 OF 20
CHECKED: RSC/JRS	DATE: 4.27.2018
SHEET NO.	4.2

Plotted: 04/17/2018, 12:51 | bmillar P:\19\19369002\CAD\00\Channel Design\100% Design\19369002_Channel Design_S13_Construction Sequencing and Dewatering.dwg

PHASE 1



PHASE 2

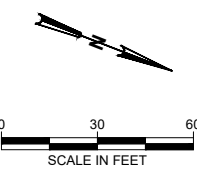


LEGEND

- DISTURBANCE LIMITS
- FLOODPLAIN GRADING LIMITS
- EXISTING DRY CREEK ALIGNMENT
- ACTIVE CHANNEL
- WORK ZONE 1
- WORK ZONE 2
- TEMPORARY CHANNEL CROSSING
- TEMPORARY CHANNEL DIVERSION
- SOIL PLUG

- NOTES:
- Sheets are projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
 - Existing topography provided by RSI, October 2017.
 - Active Channel Flow is equal to 16 cfs, which is the 50% exceedance flow during the in-water work window (July 1 - Oct. 15).

- ACCESS AND STAGING GENERAL NOTES
- ALL IN-WATER WORK IS SHALL OCCUR BETWEEN JULY 1 - OCTOBER 15 OR AS OTHERWISE SPECIFIED IN ENVIRONMENTAL PERMITS.
 - ALL WORK IS SUBJECT TO HIP IV GENERAL AQUATIC CONSERVATION MEASURES (SEE SHEETS 8.1 - 8.2).
- GRADE FLOODPLAIN AND CHANNEL WITHIN WORK ZONE 1. HAUL EXCESS MATERIAL TO STOCKPILE LOCATIONS. LEAVE SOIL PLUGS AT THE INTERFACE BETWEEN THE EXISTING AND PROPOSED CHANNEL.
 - INSTALL WOOD STRUCTURES WITHIN WORK ZONE 1
 - DEWATER WORK ZONE 2 STARTING AT UPSTREAM MOST SEGMENT. CONSTRUCT TEMPORARY FLOW DIVERSION STRUCTURES WITHIN THE ACTIVE CHANNEL AND METER THE FLOW INTO THE NEWLY CONSTRUCTED CHANNEL BY GRADUALLY EXCAVATING THE SOIL PLUG SEPARATING THE EXISTING AND PROPOSED CHANNEL UNTIL FLOW IN THE EXISTING CHANNEL IS 1/3 OF THE TOTAL FLOW. CONDUCT FISH SALVAGE IN THE EXISTING MAIN CHANNEL IN THE UPSTREAM MOST SEGMENT OF WORK ZONE 2. WHEN SALVAGE IS COMPLETE, GRADUALLY CONTINUE FLOW DIVERSION UNTIL THE ENTIRETY OF FLOW IS IN THE NEWLY CONSTRUCTED CHANNEL. REPEAT THIS FOR THE FOUR REMAINING WORK ZONE 2 LOCATIONS.
 - CONSTRUCT PROPOSED GRADE WITHIN THE DEWATERED WORK ZONE 2 USING STOCKPILED FILL MATERIAL. HAUL EXCESS MATERIAL TO STOCKPILE LOCATIONS.
 - INSTALL REMAINING WOOD STRUCTURES WITHIN WORK ZONE 2



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AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

CONSTRUCTION SEQUENCING AND DEWATERING PLAN

DRAWN: BHM PROJ NO: 19369-002-00
DESIGN: BHM/TPH SHEET 13 OF 20
CHECKED: RSC/JRS DATE: 4.27.2018
SHEET NO. 5.1

PHASE 3

LEGEND

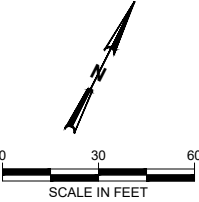
- DISTURBANCE LIMITS
- FLOODPLAIN GRADING LIMITS
- EXISTING DRY CREEK ALIGNMENT
- ACTIVE CHANNEL
- WORK ZONE 3
- WORK ZONE 4
- TEMPORARY CHANNEL CROSSING
- TEMPORARY CHANNEL DIVERSION
- SOIL PLUG

NOTES:
1. Sheets are projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
2. Existing topography provided by RSI, October 2017.
3. Active Channel Flow is equal to 16 cfs, which is the 50% exceedance flow during the in-water work window (July 1 - Oct. 15).

ACCESS AND STAGING GENERAL NOTES

- ALL IN-WATER WORK IS SHALL OCCUR BETWEEN JULY 1 - OCTOBER 15 OR AS OTHERWISE SPECIFIED IN ENVIRONMENTAL PERMITS.
- ALL WORK IS SUBJECT TO HIP IV GENERAL AQUATIC CONSERVATION MEASURES (SEE SHEETS 8.1 - 8.2).

- ISOLATE WORK ZONE 3 FROM THE ACTIVE CHANNEL USING FLOW ISOLATION STRUCTURES AS SHOWN.
- GRADE FLOODPLAIN AND CHANNEL WITHIN WORK ZONE 3. HAUL EXCESS MATERIAL TO STOCKPILE LOCATIONS. LEAVE SOIL PLUGS AT THE INTERFACE BETWEEN THE EXISTING AND PROPOSED CHANNEL. INSTALL WOOD STRUCTURES WITHIN WORK ZONE 3
- DEWATER WORK ZONE 4 STARTING AT UPSTREAM MOST SEGMENT. CONSTRUCT TEMPORARY FLOW DIVERSION STRUCTURES WITHIN THE ACTIVE CHANNEL AND METER THE FLOW INTO THE NEWLY CONSTRUCTED CHANNEL BY GRADUALLY EXCAVATING THE SOIL PLUG SEPARATING THE EXISTING AND PROPOSED CHANNEL UNTIL FLOW IN THE EXISTING CHANNEL IS 1/3 OF THE TOTAL FLOW. CONDUCT FISH SALVAGE IN THE EXISTING MAIN CHANNEL IN THE UPSTREAM MOST SEGMENT OF WORK ZONE 4. WHEN SALVAGE IS COMPLETE, GRADUALLY CONTINUE FLOW DIVERSION UNTIL THE ENTIRETY OF FLOW IS IN THE NEWLY CONSTRUCTED CHANNEL. REPEAT THIS FOR THE REMAINING WORK ZONE 4 LOCATIONS.
- TEMPORARILY DIVERT MAIN CHANNEL INTO THE CONSTRUCTED SIDE CHANNEL.
- CONSTRUCT PROPOSED GRADE WITHIN THE DEWATERED WORK ZONE 4 USING STOCKPILED FILL MATERIAL. HAUL EXCESS MATERIAL TO STOCKPILE LOCATIONS.
- INSTALL REMAINING WOOD STRUCTURES WITHIN WORK ZONE 4
- POUR CONCRETE FOOTERS FOR BRIDGE DECK.
- METER FLOW FROM THE SIDE CHANNEL INTO THE NEWLY CONSTRUCTED CHANNEL BY GRADUALLY EXCAVATING THE SOIL PLUG SEPARATING THE ACTIVE CHANNEL AND WORK ZONE 4.
- RESTORE DISTURBED AREAS OUTSIDE FLOODPLAIN GRADING LIMITS. EVENLY DISTRIBUTE EXCESS MATERIAL ON SITE WITHIN THE DISTURBANCE LIMITS. STABILIZE WITH NATIVE SEED MIX AFTER CHANNEL EXCAVATION AND LOG STRUCTURE INSTALLATION IS COMPLETE. PLANT RIPARIAN VEGETATION (SHEET 7.1)



PHASE 4

Plotted: 04/17/2018, 12:48 | bmliller P:\1919369002\CAD\000Channel Design\04 100% Design\19369002 Channel Design_S14 Construction Sequencing and Dewatering.dwg

NO.	DATE	BY	REVISION

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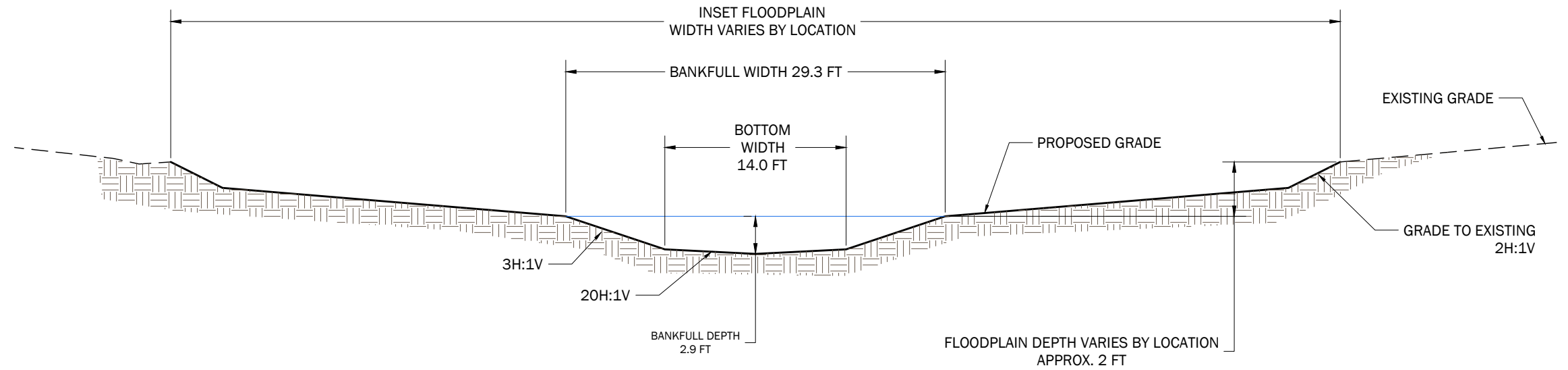
AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

CONSTRUCTION SEQUENCING AND DEWATERING PLAN

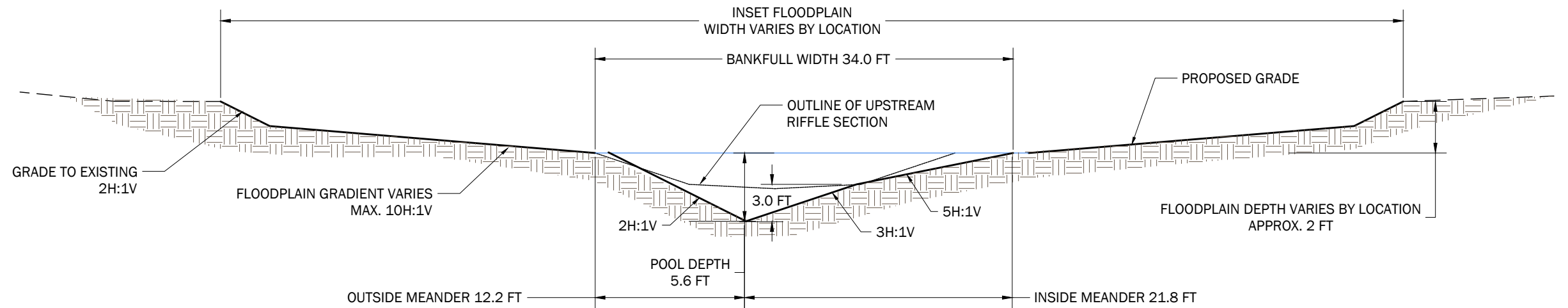
DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: BHM/TPH	SHEET 14 OF 20
CHECKED: RSC/JRS	DATE: 4.27.2018
SHEET NO.	5.2

P:\19\19369002\CAD\00\Channel Design\100% Design\19369002_Channel Design_S15_Typical Channel Details.dwg
Plotted: 04/17/2018, 13:24 | bmillar

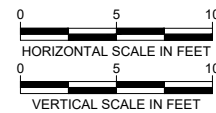
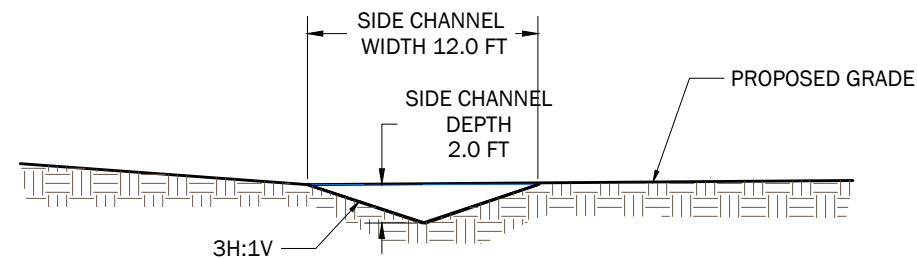
MAIN CHANNEL / RIFFLE SECTION



POOL SECTION



SIDE CHANNEL SECTION



NOTES:

1. Coordinate system is projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
2. Existing topography provided by RSI, October 2017.
3. Cross Section face downstream, stationing increases from right to left.
4. No Vertical Exaggeration

NO.	DATE	BY	REVISION



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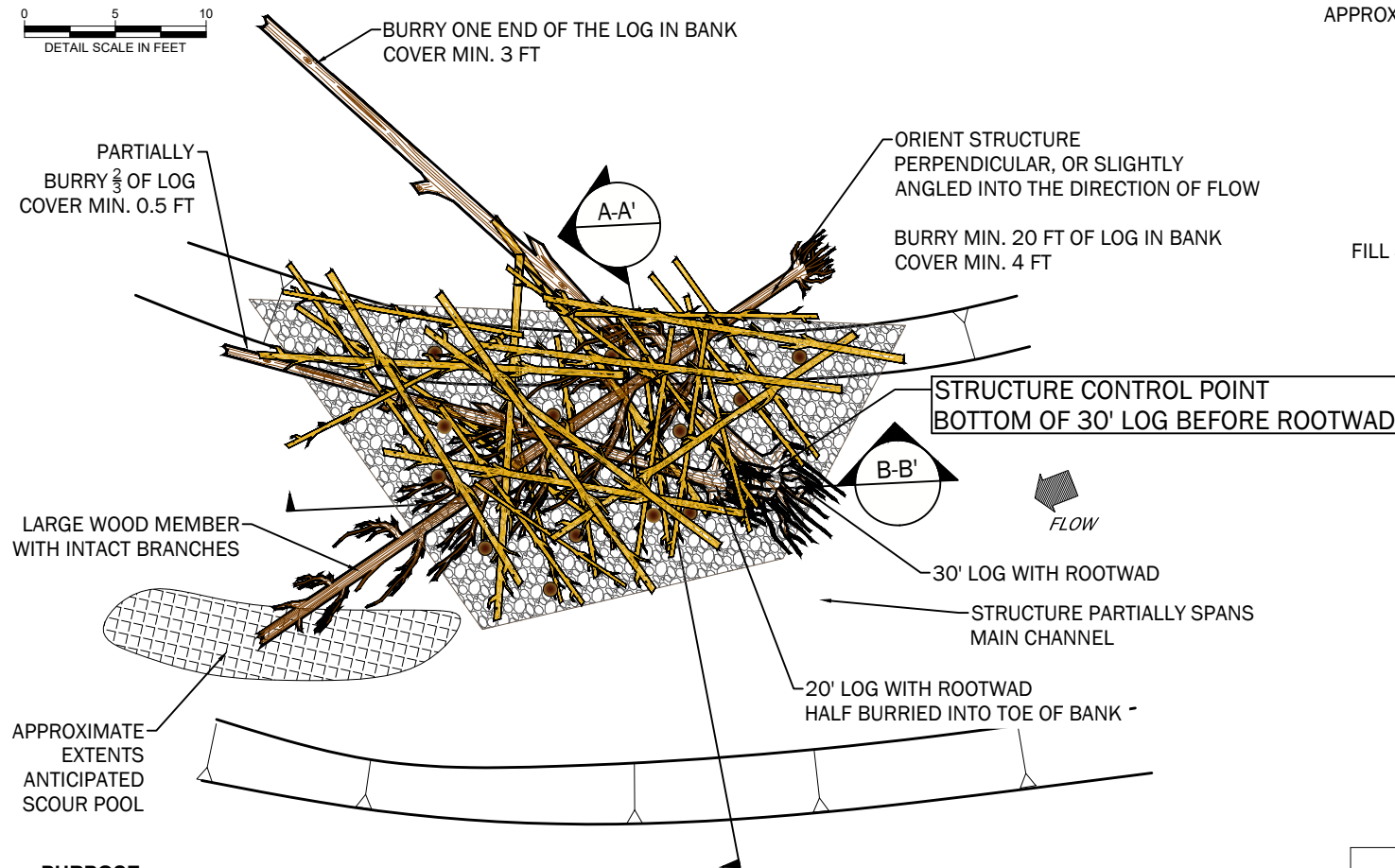
AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

TYPICAL CHANNEL DETAILS

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: BHM/TPH	SHEET 15 OF 20
CHECKED: RSC/JRS	DATE: 4.25.2018
SHEET NO.	6.1

Plotted: 04/26/2018, 11:49 | bmillar P:\1919369002\CAD\000\Channel Design\04 100% Design\19369002_Channel Design_S16_Typical Habitat Structures Details.dwg

VERTICAL POST ARRAY



PURPOSE:

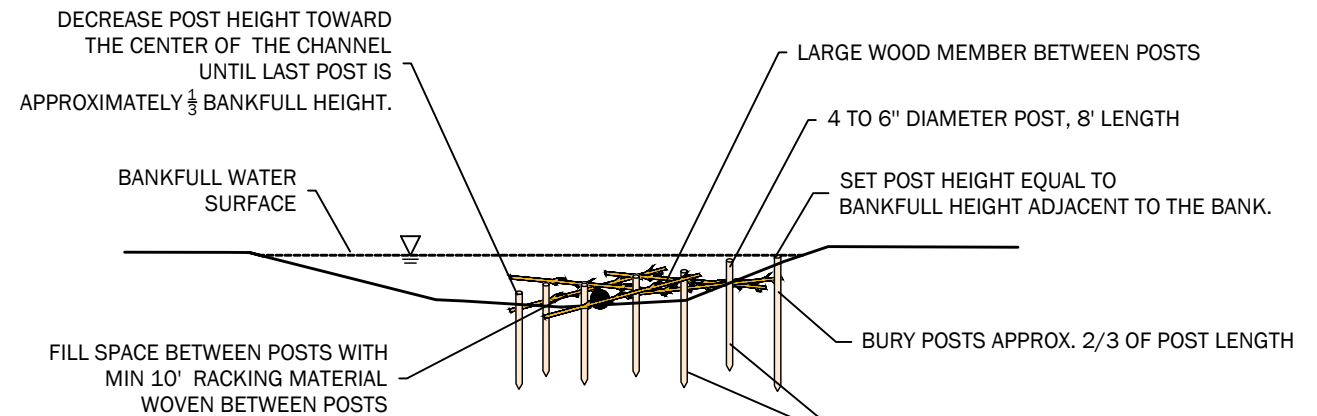
- MIMICS FUNCTIONALITY OF FLOODPLAIN WOODY VEGETATION
- USE IN MAIN CHANNEL TO CREATE BACKWATER CONDITIONS, INCREASED FLOODPLAIN INUNDATION AND HYPORHEIC EXCHANGE

DESIGN SPECIFICS:

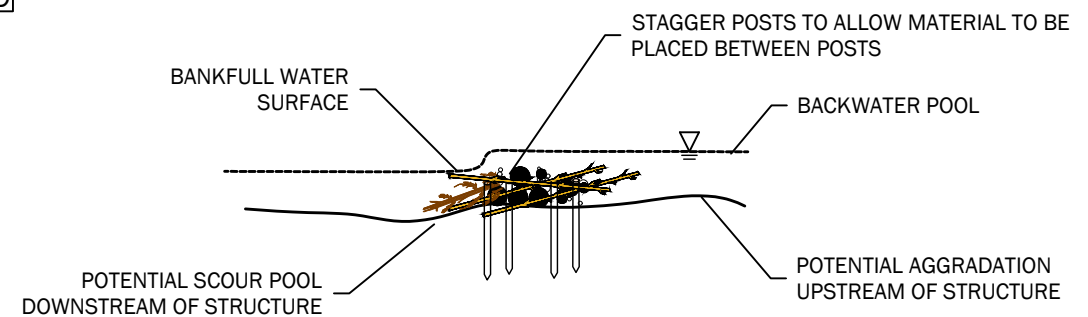
- USE 4 TO 6" DIAMETER POSTS, APPROXIMATELY 8' LONG AT 3' SPACING
- STAGGER POSTS SO THEY ARE NOT IN A STRAIGHT LINE
- DRIVE POSTS APPROXIMATELY 4' BELOW GROUND SURFACE
- WEAVE RACKING MATERIAL BETWEEN POSTS
- STRUCTURE SPANS 40-60% OF THE CHANNEL
- ADDITIONAL DEBRIS IS EXPECTED TO COLLECT OVER TIME
- PARTIALLY BURRY ALL KEY MEMBERS. REFER TO PLAN VIEW FOR MINIMUM COVER DEPTHS.

MATERIAL QUANTITIES

KEY MEMBERS			SLASH	RACKING	VERTICAL POSTS
LOG WITH ROOTWAD 20' LENGTH AND 12" DBH (EACH)	LOG WITH ROOTWAD 30' LENGTH AND 14 TO 16" DBH (EACH)	WHOLE TREE, 40' LENGTH (EACH)			
1	1	1	6	30	13



SECTION A-A'



SECTION B-B'

CONTROL POINTS (BOTTOM OF 30' LOG BEFORE ROOTWAD)

STRUCTURE REFERENCE NUMBER	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
V1	674891.5	8835561.2	2723.9
V2	674967.7	8835674.4	2725.1
V3	675066.8	835790.1	2726.3
V4	675125.5	8835868.3	2726.0
V5	675192.2	8835947.2	2726.5
V6	675248.6	8835962.0	2726.6
V7	675330.2	8835955.8	2727.3
V8	675396.8	8835900.8	2727.5
V9	675471.7	8835891.6	2728.0
V10	675532.9	8835873.6	2728.2

NO.	DATE	BY	REVISION

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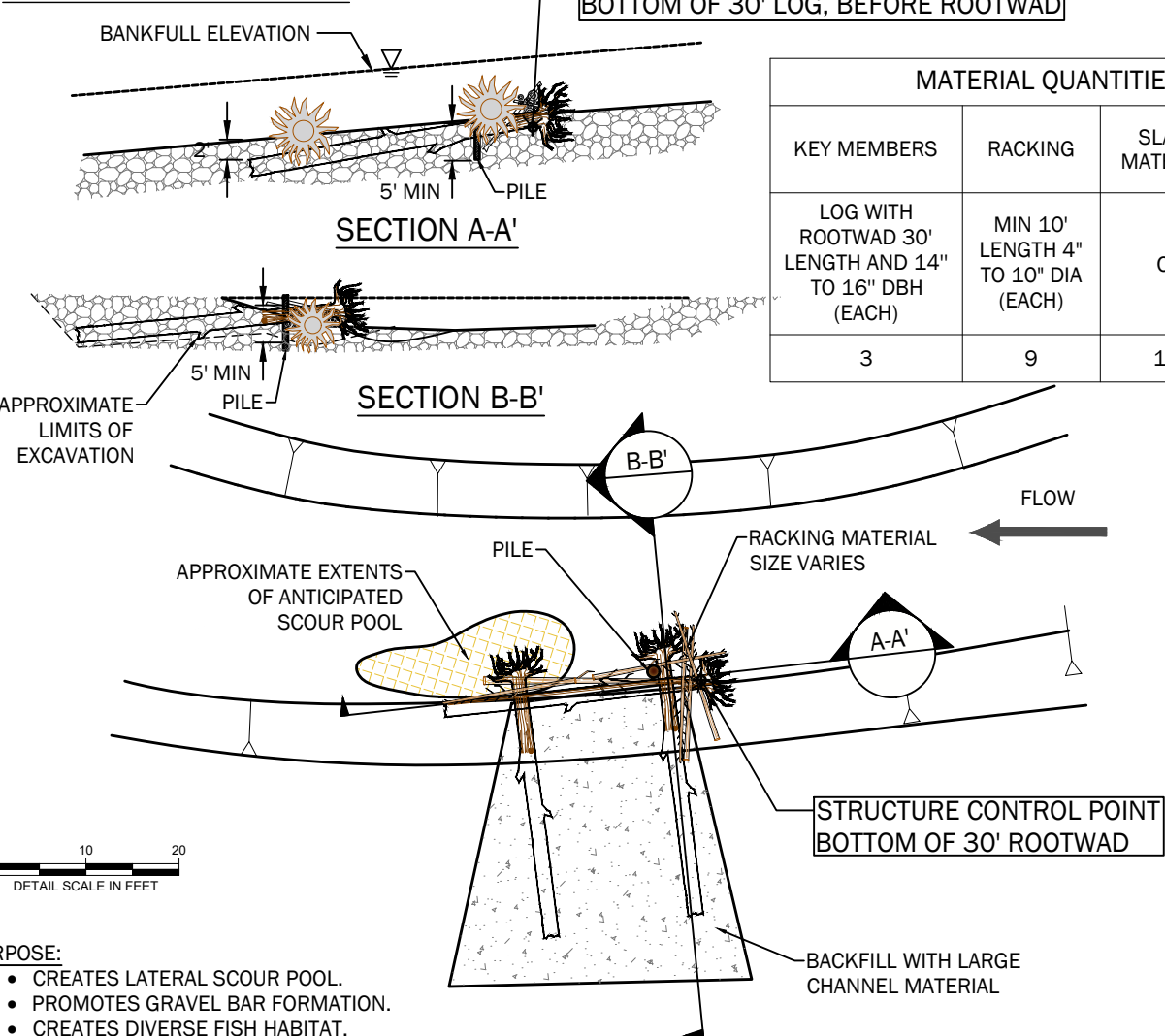
AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

TYPICAL HABITAT DETAILS

DRAWN: BHM PROJ NO: 19369-002-00
DESIGN: BHM/TPH SHEET 16 OF 20
CHECKED: RSC/JRS DATE: 4.27.2018
SHEET NO.

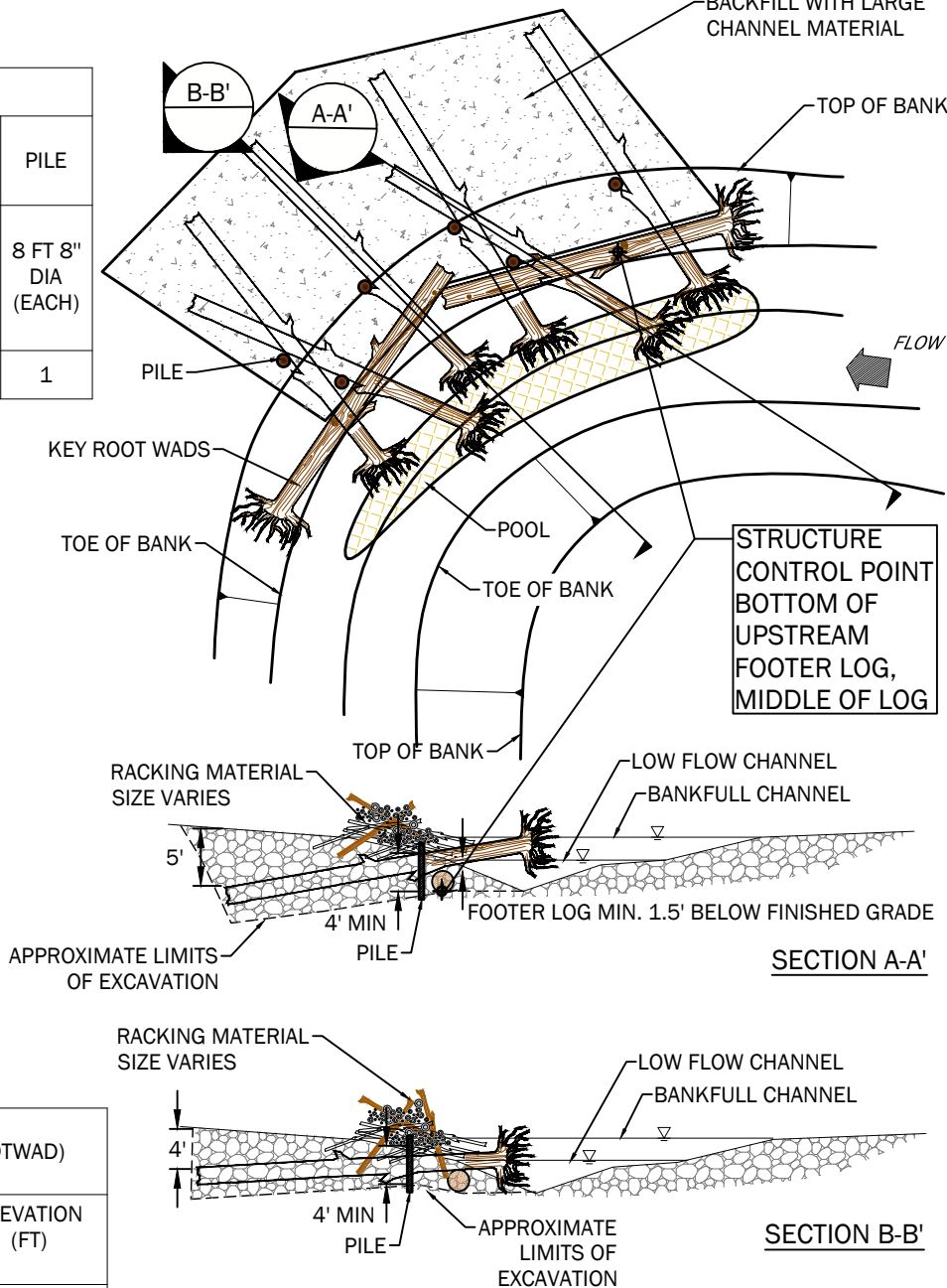
6.2

LONGITUDINAL LOGS



MATERIAL QUANTITIES			
KEY MEMBERS	RACKING	SLASH MATERIAL	PILE
LOG WITH ROOTWAD 30' LENGTH AND 14" TO 16" DBH (EACH)	MIN 10' LENGTH 4" TO 10" DIA (EACH)	CY	8 FT 8" DIA (EACH)
3	9	1.7	1

BANK ROOTWADS



MATERIAL QUANTITIES			
KEY MEMBERS	RACKING	SLASH MATERIAL	PILE
LOG WITH ROOTWAD 30' LENGTH AND 14" TO 16" DBH (EACH)	MIN 10' LENGTH 4" TO 10" DIA (EACH)	CY	8' LENGTH 8" DIA. (EACH)
8	24	6	6

CONTROL POINTS (BOTTOM OF UPSTREAM FOOTER LOG, MIDDLE OF LOG)			
STRUCTURE REFERENCE NUMBER	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
B1	674958.5	8835507.8	2723.4
B2	674863.9	8835620.9	2725.6
B3	674982.0	8835628.6	2726.4
B4	675115.0	8835734.8	2726.6
B5	675044.0	8835868.9	2725.8
B6	675187.0	8835866.7	2726.0
B7	675306.0	8835899.7	2727.8
B8	675450.0	8835834.1	2728.3

- PURPOSE:**
- CREATES LATERAL SCOUR POOL.
 - PROMOTES GRAVEL BAR FORMATION.
 - CREATES DIVERSE FISH HABITAT.
 - PROVIDES COVER.
- DESIGN SPECIFICS:**
- KEY MEMBERS SHALL BE A MINIMUM LENGTH OF 30 FT AND SHALL HAVE A DIAMETER EQUAL TO 14 TO 26 INCHES.
 - THE TOP OF ROOTWADS SHALL NOT EXTEND MORE THAN 0.5 FT ABOVE TOP OF BANK.
 - PARTIALLY BURY THE ROOTWAD ORIENTED PARALLEL TO FLOW THEN PLACE PERPENDICULAR ROOTWADS.
 - PLACE VERTICAL PILE BEHIND UPSTREAM ROOTWADS. EMBED PILE INTO THE CHANNEL A MINIMUM OF 5.0 FT.
 - INSTALL RACKING MEMBERS WHILE INSTALLING KEY MEMBERS.
 - WEAVE RACKING MEMBERS AND SLASH MATERIAL (NOT SHOWN) INTO VOIDS BETWEEN KEY MEMBERS.
 - RACKING MEMBER AND SLASH QUANTITIES MAY VARY PER STRUCTURE.
 - BACKFILL STRUCTURE IN 1 FT MAXIMUM LIFTS. COMPACT EACH LIFT FOLLOWING PLACEMENT USING EXCAVATOR BUCKET.

CONTROL POINTS (BOTTOM OF 30' LOG, BEFORE ROOTWAD)			
STRUCTURE REFERENCE NUMBER	NORTHING (FT)	EASTING (FT)	ELEVATION (FT)
L1	64910.7	835568.1	2724.8
L2	674967.3	8835722.5	2726.7
L3	674987.6	8835738.7	2727.9
L4	675183.4	8836001.4	2728.4
L5	675231.3	8836020.7	2728.6
L6	675388.8	8835983.6	2728.2
L7	67593.7	8835868.9	2728.7

- PURPOSE:**
- INCREASES POOL DEPTH.
 - SLOWS LATERAL MIGRATION.
 - REDUCES BANK EROSION.

- DESIGN SPECIFICS:**
- TOP OF ROOTWAD SHOULD NOT EXTEND MORE THAN 0.5-FT ABOVE TOP OF BANK. (BANKFULL)
 - PLACE ROOT WADS ALONG OUTSIDE OF BENDS.
 - PLACE VERTICAL AS SHOWN. EMBED PILES INTO THE CHANNEL A MINIMUM OF 4.0 FT.
 - WEAVE RACKING MEMBERS AND SLASH MATERIAL (NOT SHOWN) INTO VOIDS BETWEEN KEY MEMBERS UNTIL A MAXIMUM OF 20 PERCENT VOID SPACE IS ACHIEVED.
 - RACKING MEMBER AND SLASH QUANTITIES MAY VARY PER STRUCTURE.
 - BACKFILL STRUCTURE IN 1 FT MAXIMUM LIFTS. COMPACT EACH LIFT FOLLOWING PLACEMENT USING EXCAVATOR BUCKET.
 - ADDITIONAL BALLASTING IS NEEDED IF TREE DIAMETER (DBH) EXCEEDS 25 INCHES.
 - THE DESIGN ENGINEER SHALL MAINTAIN THE ABILITY TO MAKE ADJUSTMENTS TO THE PROPOSED STRUCTURE IF SITE CONDITIONS WARRANT.

Plotted: 04/26/2018, 11:51 | bmillar P:\19\19369002\CAD\000\Channel Design\04 100% Design\19369002_Channel Design_S17_Typical Habitat Structures Details.dwg

NO.	DATE	BY	REVISION



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AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

TYPICAL HABITAT DETAILS

DRAWN: BHM PROJ NO: 19369-002-00
DESIGN: BHM/TPH SHEET 17 OF 20
CHECKED: RSC/JRS DATE: 4.27.2018
SHEET NO. 6.3

- NOTES:
1. Sheets are projected in Oregon State Plane, North, International feet. North American Vertical Datum of 1988 (NAVD88).
 2. Existing topography and Aerial Imagery provided by RSI, October 2017.
 3. Inundation boundaries modeled in HEC-RAS V. 5.0.3. 2-yr discharge is equal to 233 cfs.

PLANTINGS				
ZONE	COMMON NAME	SIZE	SPACING (FT O.C.)	QUANTITY
UPLAND	PONDEROSA PINE	1 GAL	50 FT O.C.	70
RIPARIAN	RED ELEDERBERRY	1 GAL	20 FT O.C.	56
	WOODS ROSE	1 GAL	20 FT O.C.	56
	GOLDEN CURRANT	1 GAL	20 FT O.C.	56
	BLACK COTTONWOOD	1 GAL	20 FT O.C.	56
	WATER BIRCH	1 GAL	20 FT LINEAR	30
	WILLOW	STAKE	1 FT LINEAR	1340
	RED OSIER DOGWOOD	STAKE	5 FT O.C.	120
WETLAND	SEDGE (CAREX SP)	10 CU PLUG	10 FT O.C.	108
	BLACK HAWTHORNE	1 GAL	15 FT LINEAR	52

- PLANTING NOTES:
- PLANTING LOCATIONS AND DENSITIES WILL BE DIRECTED BY THE USWCD STAFF ON-SITE DURING CONSTRUCTION
 - PLACE HAWTHORNS ALONG OUTER MARGINS OF WETLAND
 - PLACE COTTONWOODS ABOVE 2-YR WSEL AND BELOW 2730 FT
 - PLACE DOGWOODS IN AND AROUND THE VERTICAL POST ARRAYS AND SLIGHTLY BELOW 2-YR WSEL
 - PLACE WATER BIRCH ALONG HIGH-FLOW CHANNELS BELOW THE 2-YR WSEL

RIPARIAN SEEDING MIX

15 LB / ACRE
2.3 ACRES TO COVER
34.5 LB SEED MIX

Common Name	Mix%
Tufted Hairgrass	5.5
Nebraska Sedge	4.1
Small Fruited Bulrush	4.1
Idaho Fescue	20.5
Blue Wildrye	24.6
Mountain Brome	21.9
Basin Wildrye	17.8
Western Yarrow	0.5
Lewis Flax	1

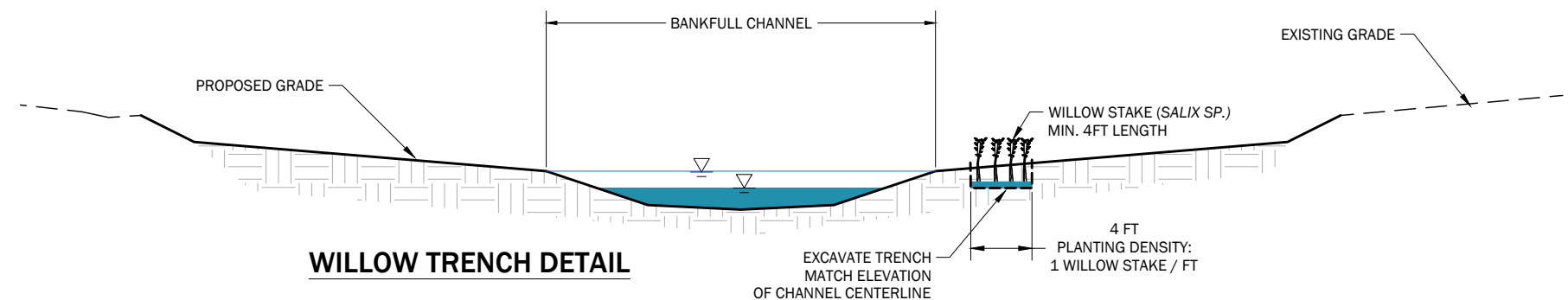
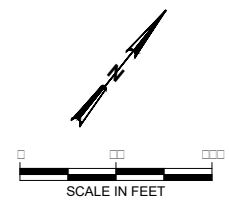
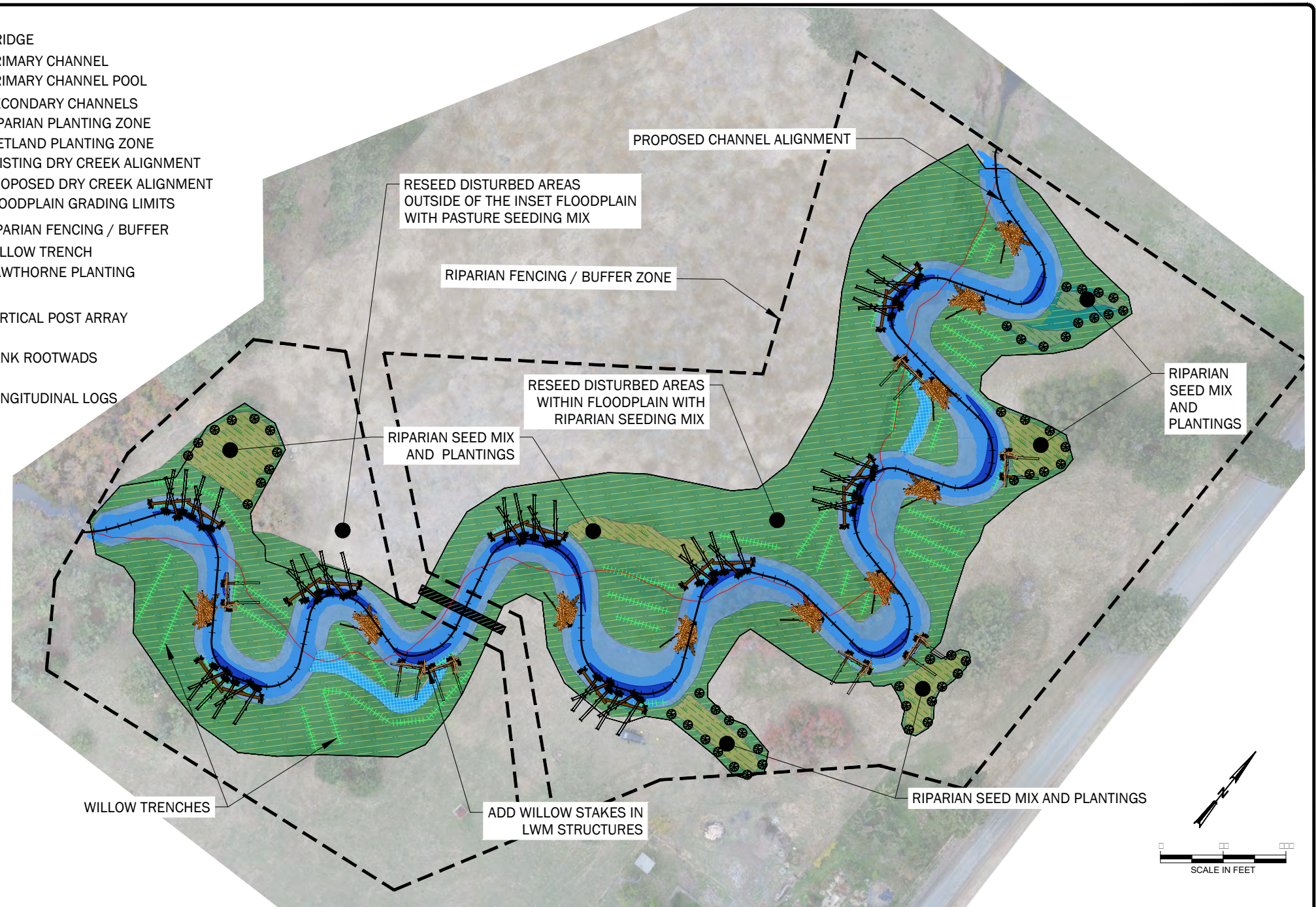
PASTURE SEEDING MIX

12LB / ACRE
8.1 ACRES PASTURE SEEDING
97.2 LBS SEED MIX

Common Name	Mix%
Orchardgrass	26.7
Tall Fescue	23.3
Perennial Ryegrass	26.7
Meadow Brome	13.3
White Clover	10

LEGEND


- BRIDGE
- PRIMARY CHANNEL
- PRIMARY CHANNEL POOL
- SECONDARY CHANNELS
- RIPARIAN PLANTING ZONE
- WETLAND PLANTING ZONE
- EXISTING DRY CREEK ALIGNMENT
- PROPOSED DRY CREEK ALIGNMENT
- FLOODPLAIN GRADING LIMITS
- RIPARIAN FENCING / BUFFER
- WILLOW TRENCH
- HAWTHORNE PLANTING
- VERTICAL POST ARRAY
- BANK ROOTWADS
- LONGITUDINAL LOGS




WILLOW TRENCH DETAIL

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NO.	DATE	BY	REVISION



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AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

REVEGETATION PLAN

DRAWN: BHM PROJ NO: 19369-002-00
DESIGN: BHM/TPH SHEET 18 OF 20
CHECKED: RSC/JRS DATE: 4.25.2018
SHEET NO. 7.1

Plotted: 04/16/2018, 10:18 | bmiller | P:\19\19369002\CAD\00\Channel Design\R04 [100% Design]\19369002_Channel Design_S19_HIP 4 Notes.dwg

PROJECT DESIGN AND SITE PREPARATION.

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.

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:

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

5) TEMPORARY ACCESS ROADS AND PATHS.

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).

6) TEMPORARY STREAM CROSSINGS.

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

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

7) STAGING, STORAGE, AND STOCKPILE AREAS.

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:

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

A) TEMPORARY EROSION CONTROLS.

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

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

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

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

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

[illegible]

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AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
FINAL DESIGN
LA GRANDE, OREGON

HIP IV GENERAL CONSERVATION & IMPLEMENTATION MEASURES

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: BHM/TPH	SHEET 19 OF 20
CHECKED: RSC/JRS	DATE: 4.25.2018
SHEET NO.	

8.1

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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 SALMONID 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 WILL BE USED.

II. FOR CONDUCTIVITY RANGES BETWEEN 100 TO 300 MS, VOLTAGE RANGES WILL BE 500 TO 800.

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, OR A 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 2014, 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:

HTTP://WWW.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 ALTERNATIVESCONSIDERED, 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.

NO.	DATE	BY	REVISION



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AIWOHI-CISCO DRY CREEK HABITAT RESTORATION
80% PRELIMINARY DESIGN
LA GRANDE, OREGON

HIP IV GENERAL CONSERVATION & IMPLEMENTATION MEASURES

DRAWN: BHM	PROJ NO: 19369-002-00
DESIGN: BHM/TPH	SHEET 20 OF 20
CHECKED: RSC/JRS	DATE: 3.20.2018
SHEET NO.	8.2