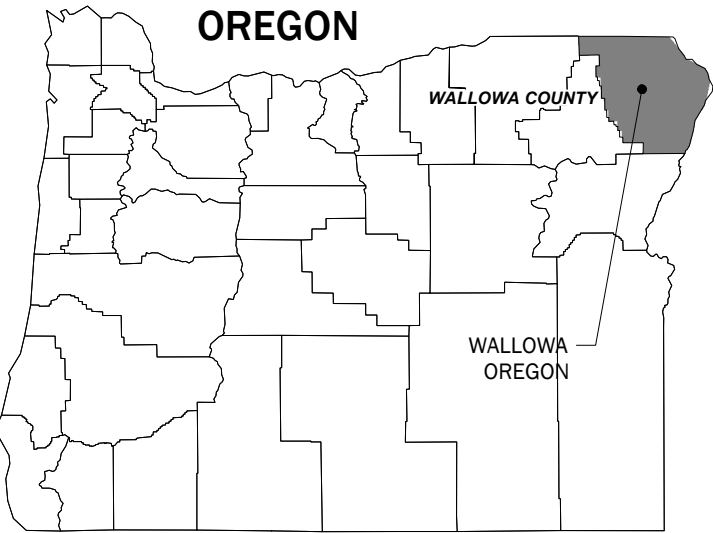


LOSTINE WETLAND AND SIDE CHANNEL COMPLEX

FINAL DESIGN



PROJECT LOCATION
THE GENERAL PROJECT IS LOCATED AT THE CONFLUENCE OF THE LOSTINE RIVER AND THE WALLOWA RIVER.

DIRECTIONS:
FROM THE CITY OF WALLOWA, TRAVEL EAST ON HIGHWAY 82 (WALLAWA LAKE HIGHWAY) APPROXIMATELY 1.8 MILES, SITE IS LOCATED TO THE NORTH.

CONTACT INFORMATION

Nez Perce Tribe
KATIE FRENYA
500 NORTH MAIN STREET
JOSEPH, OREGON 97846
PH: (541) 432-2506

GEOENGINEERS INC.
JASON SCOTT
523 EAST SECOND AVENUE
SPOKANE, WASHINGTON 99202
PH: (509) 209-2816



Not to Scale



Not to Scale

Sheet List Table		
Drawing Number	Sheet Number	Sheet Title
1.1	1	Cover Sheet
1.2	2	Goals and Objectives
1.3	3	Quantities and Control Points
2.1	4	Existing Conditions
3.1	5	Proposed Floodplain Flow Paths
3.2	6	Proposed Channel Grading Construction Access and Staging
3.3	7	Pilot Channel 1 - Outlet
3.4	8	Pilot Channel 1 - Inlet
3.5	9	Pilot Channel 2 - Inlet
3.6	10	Alcove 1

3.7	11	Pilot Channel 3 - Inlet
3.8	12	Pilot Channel 4 - Inlet
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3.10	14	Alcove 2 and 3
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6.1	23	Planting Plan
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7.1	26	General Sequencing
7.2	27	Sequencing - Pilot Channel 1 Outlet
7.3	28	Sequencing - Pilot Channel 1 Inlet
7.4	29	Sequencing - Pilot Channel 2 Inlet
7.5	30	Sequencing - Alcove 1
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7.9	34	Sequencing - Alcoves 2 and 3
8.1	35	General Conservation Measures
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NO.	DATE	BY	REVISION



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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

COVER SHEET

DRAWN: ESM
DESIGN: ESM
CHECKED: RSC
SHEET NO.

PROJ NO: 0571-018-00
SHEET 1 OF 36
DATE: 09-18-2020

1.1

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FINAL DESIGN

Vision

Restore self-sustaining ecosystem processes throughout the project area to provide habitats for native fish and wildlife including Chinook salmon, steelhead, bull trout, Columbia spotted frog, long-billed curlew and others.

Goal

Promote natural river and floodplain conditions by removing levees, reconnecting floodplain channels and enhancing floodplain wetlands. When complete, key site features that will improve habitat and water quality will include increased pool abundance, increased low-velocity off-channel alcoves and side channels, increased Large Woody Material (LWM) for mainstem habitat complexity, and a diverse mosaic of floodplain wetlands.

Objectives

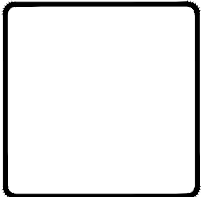
- 1. Improve stream structure and channel complexity to increase juvenile salmonid rearing habitat
- 2. Construct preferential flow paths to encourage floodplain interaction and connection
- 3. Improve riparian vegetation species composition and distribution
- 4. Breach the levees in key locations
- 5. Create and enhance wetlands within the floodplain
- 6. Minimize disturbance through “light-touch” construction methods

Plotted: 09/18/2020, 09:54 | esmiller P:\00571018\CAD\000\Design\Channel Design\2 1.2 Goals and Objectives.dwg

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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX WALLOWA, OREGON
GOALS AND OBJECTIVES

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 2 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	1.2

FINAL DESIGN






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QUANTITIES		
Item Description	Units	No. of Units
Mobilization and Demobilization	LS	1
Erosion and Sediment Control	LS	1
Environmental Protections	LS	1
Clearing and Grubbing	AC	0.6
General Excavation (Pilot Channel 1)	CY	221
General Excavation (Pilot Channel 2)	CY	197
General Excavation (Pilot Channel 3)	CY	0
General Excavation (Pilot Channel 4)	CY	70
General Excavation (Pilot Channel 5)	CY	88
General Excavation (Alcove 1)	CY	375
General Excavation (Alcove 2 and 3)	CY	152
Temporary Stream Diversion	EA	8
Large Woody Material - Type A (Large Apex Jam)	EA	5
Large Woody Material - Type B (Small Apex Jam)	EA	9
Large Woody Material - Type C (Vertical Post Array)	EA	29
Large Woody Material - Type D (Flow Deflection Jam)	EA	2
Large Woody Material - Type E (Habitat Wood)	EA	14
Permanent Seeding, Fertilizing and Mulching	AC	6.0
Place Excavated Material	CY	1103.0
Planting	EA	1575

NOTES

- CONTRACTOR SHALL PLACE EXCAVATED MATERIAL ONSITE, AND AROUND LARGE WOOD STRUCTURES AS DIRECTED BY THE CLIENT REPRESENTATIVE

SURVEY CONTROL POINTS				
POINT #	DESCRIPTION	ELEVATION	NORTHING	EASTING
CP1	HUB 1 BASE	2995.879	701201.2697	8971886.7620
CP2	POWERMETER	3000.520	701104.5307	8971485.6410
CP3	POWERPOLE	2998.976	701258.1217	8971662.3510
CP4	POWERPOLE	3000.568	701149.5687	8971515.0480
CP5	POWERPOLE	3000.119	701103.2777	8971491.6680

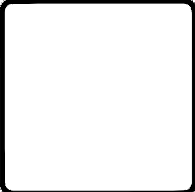
WOOD STRUCTURE LEGEND	
ID TAG	DESCRIPTION
	LARGE APEX JAM
	SMALL APEX JAM
	VERTICAL POST ARRAY
	FLOW DEFLECTION JAM
	HABITAT WOOD

WOOD STRUCTURE CONTROL POINTS				WOOD STRUCTURE CONTROL POINTS				WOOD STRUCTURE CONTROL POINTS				WOOD STRUCTURE CONTROL POINTS			
STRUCTURE ID	STRUCTURE	NORTHING	EASTING	STRUCTURE ID	STRUCTURE	NORTHING	EASTING	STRUCTURE ID	STRUCTURE	NORTHING	EASTING	STRUCTURE ID	STRUCTURE	NORTHING	EASTING
A1	LARGE APEX JAM	701498.1	8973183.6	C2	VERTICAL POST ARRAY	701642.9	8972635.7	C17	VERTICAL POST ARRAY	700316.7	8973290.1	E1	HABITAT WOOD	701469.7	8973126.3
A2	LARGE APEX JAM	701334.9	8973370.1	C3	VERTICAL POST ARRAY	701663.3	8972599.4	C18	VERTICAL POST ARRAY	700380.5	8973370.8	E2	HABITAT WOOD	701474.0	8973103.5
A3	LARGE APEX JAM	700804.7	8973401.2	C4	VERTICAL POST ARRAY	701598.7	8972839.9	C19	VERTICAL POST ARRAY	700216.5	8973493.9	E3	HABITAT WOOD	701484.1	8973087.2
A4	LARGE APEX JAM	700169.7	8973576.0	C5	VERTICAL POST ARRAY	701613.0	8972731.7	C20	VERTICAL POST ARRAY	700087.0	8973384.1	E4	HABITAT WOOD	701486.4	8973073.7
A5	LARGE APEX JAM	699962.1	8973602.4	C6	VERTICAL POST ARRAY	701582.0	8972940.4	C21	VERTICAL POST ARRAY	699970.1	8973553.3	E5	HABITAT WOOD	700893.3	8973324.9
B1	SMALL APEX JAM	700872.2	8973359.9	C7	VERTICAL POST ARRAY	701306.5	8972378.5	C22	VERTICAL POST ARRAY	700799.6	8973345.1	E6	HABITAT WOOD	700902.9	8973316.0
B2	SMALL APEX JAM	700822.5	8973346.0	C8	VERTICAL POST ARRAY	701171.7	8972623.5	C23	VERTICAL POST ARRAY	701673.4	8972578.1	E7	HABITAT WOOD	700935.6	8973290.7
B3	SMALL APEX JAM	700309.5	8973395.6	C9	VERTICAL POST ARRAY	701238.7	8972964.4	C24	VERTICAL POST ARRAY	701682.0	8972571.7	E8	HABITAT WOOD	699960.1	8973515.1
B4	SMALL APEX JAM	700309.9	8973407.4	C10	VERTICAL POST ARRAY	701118.0	8973094.1	C25	VERTICAL POST ARRAY	700875.9	8973365.2	E9	HABITAT WOOD	699962.5	8973504.2
B5	SMALL APEX JAM	699964.3	8973570.6	C11	VERTICAL POST ARRAY	700928.4	8972825.4	C26	VERTICAL POST ARRAY	699706.1	8973631.1	E10	HABITAT WOOD	699970.2	8973470.5
B6	SMALL APEX JAM	699968.8	8973539.2	C12	VERTICAL POST ARRAY	700852.9	8973169.8	C27	VERTICAL POST ARRAY	700762.9	8973349.1	E11	HABITAT WOOD	699713.6	8973582.8
B7	SMALL APEX JAM	699711.6	8973604.5	C13	VERTICAL POST ARRAY	700787.6	8972951.7	C28	VERTICAL POST ARRAY	700749.1	8973355.3	E12	HABITAT WOOD	699723.1	8973558.9
B8	SMALL APEX JAM	701673.9	8972563.1	C14	VERTICAL POST ARRAY	700665.4	8973077.5	C29	VERTICAL POST ARRAY	700685.1	8973382.7	E13	HABITAT WOOD	699731.7	8973542.2
B9	SMALL APEX JAM	700681.6	8973420.8	C15	VERTICAL POST ARRAY	700653.5	8973312.1	D1	FLOW DEFLECTION JAM	698977.4	8974006.1	E14	HABITAT WOOD	699731.4	8973533.6
C1	VERTICAL POST ARRAY	701673.4	8972934.6	C16	VERTICAL POST ARRAY	699803.7	8973419.0	D2	FLOW DEFLECTION JAM	698866.0	8974107.4				

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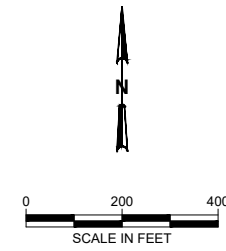
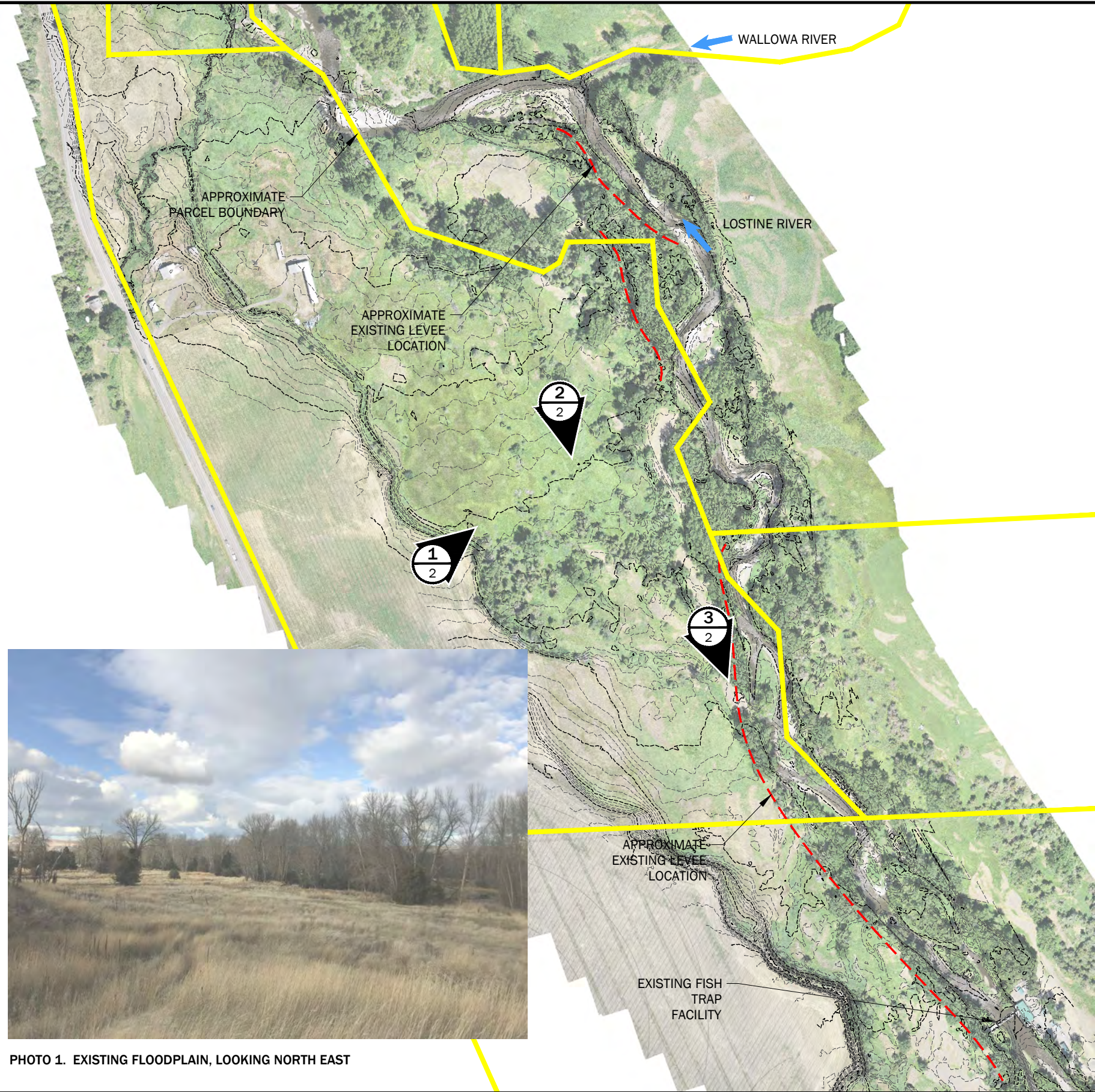


LOSTINE WETLAND AND SIDE CHANNEL COMPLEX WALLOWA, OREGON	
QUANTITIES AND CONTROL POINTS	

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 3 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO. 1.3	

FINAL DESIGN

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LEGEND

PHOTO LOCATION
X : PHOTO NUMBER
X-X : PAGE DISPLAYED



PHOTO 2. EXISTING CATTAIL PONDS WITHIN FLOODPLAIN, LOOKING SOUTH



PHOTO 3. EXISTING LEVEE AND LOSTINE RIVER, LOOKING UP STREAM

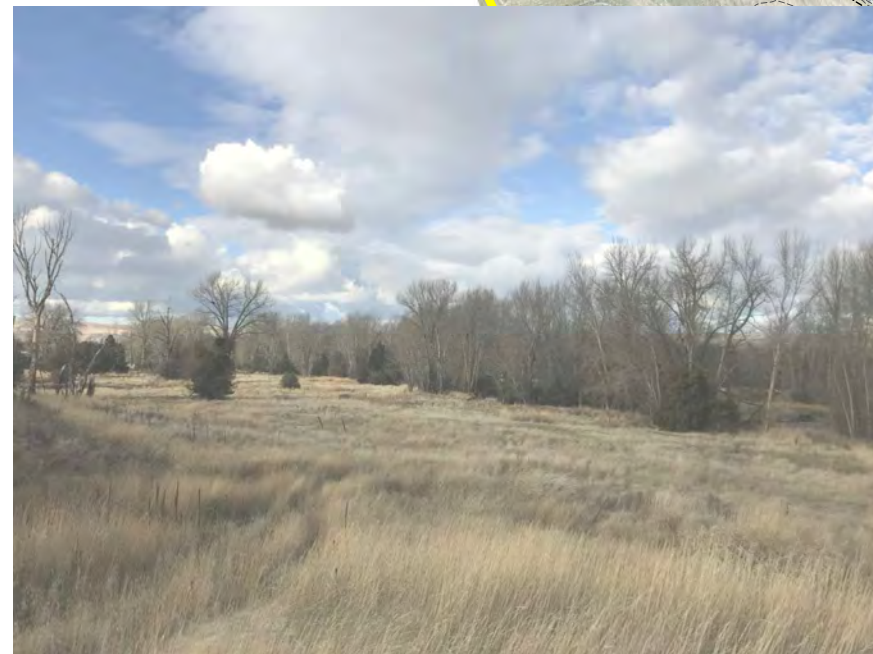


PHOTO 1. EXISTING FLOODPLAIN, LOOKING NORTH EAST

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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

EXISTING CONDITIONS

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 4 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	

2.1

FINAL DESIGN

Plotted: 09/18/2020, 09:56 | esmiller P:\0571018\CAD\000\Design\Channel Design\3.1 Proposed Flow Paths.dwg

IRRIGATION RETURN

ACTIVATED FLOW PATHS
WITHIN FLOODPLAIN

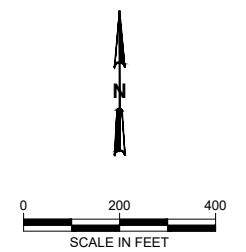
WALLOWA
RIVER

100 YEAR
INUNDATION
BOUNDARY

1.01 YEAR INUNDATION

FISH HANDLING FACILITY

LOSTINE
RIVER



NOTES
1.01 YEAR DISCHARGE SHOWN

NO.	DATE	BY	REVISION



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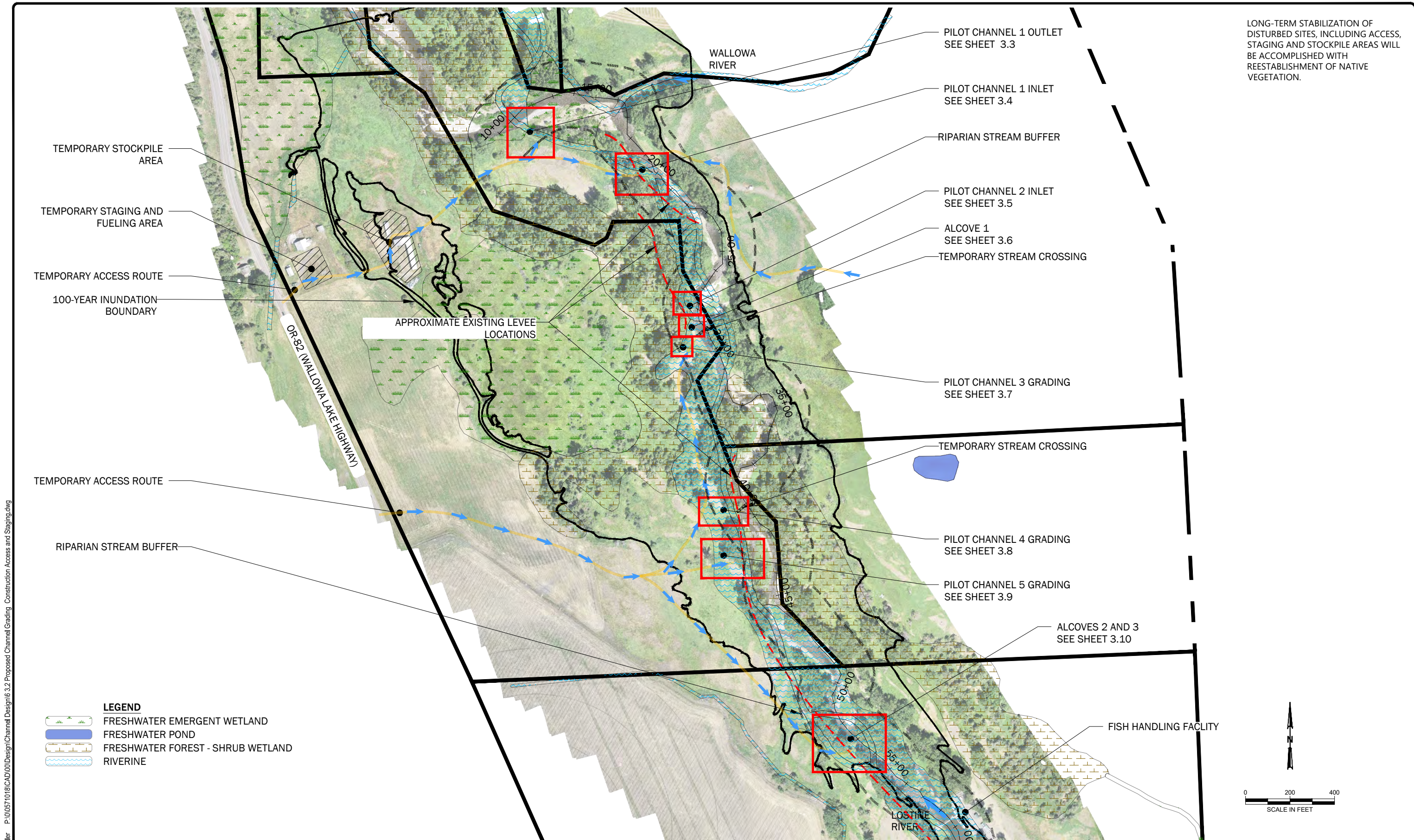
LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

PROPOSED FLOODPLAIN FLOW PATHS

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 5 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	3.1

FINAL DESIGN

Plotted: 09/18/2020, 09:59 | esmiller P:\00571018\CAD\00\Design\Channel Design\6 3.2 Proposed Channel Grading Construction Access and Staging.dwg

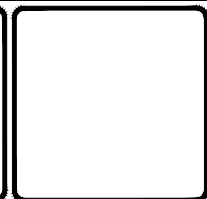


LONG-TERM STABILIZATION OF DISTURBED SITES, INCLUDING ACCESS, STAGING AND STOCKPILE AREAS WILL BE ACCOMPLISHED WITH REESTABLISHMENT OF NATIVE VEGETATION.

NO.	DATE	BY	REVISION



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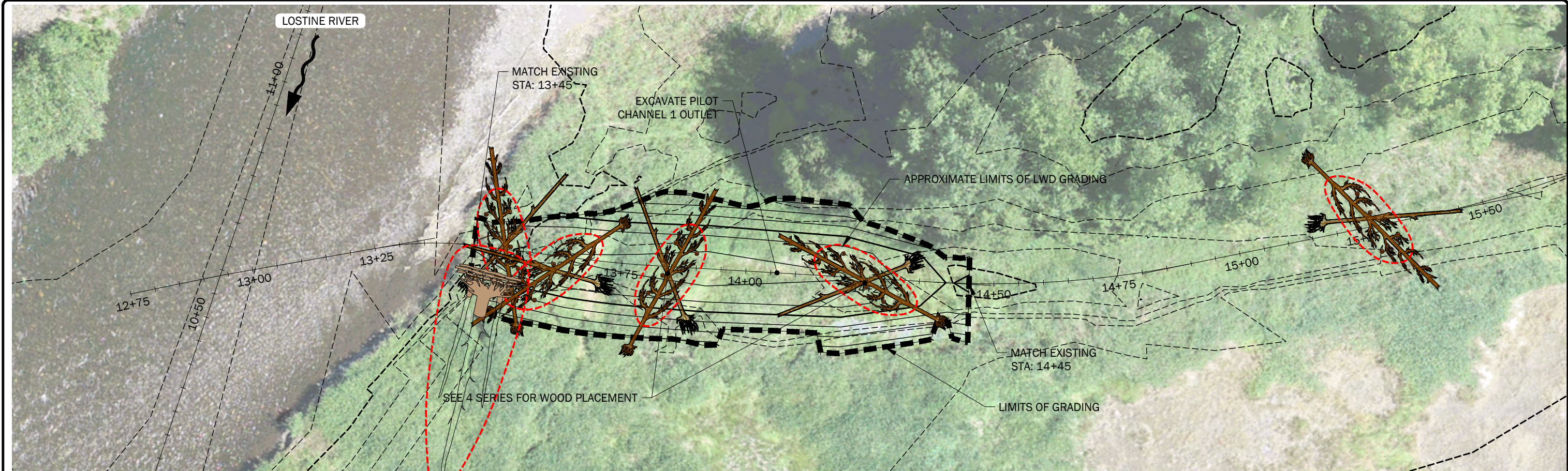


LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

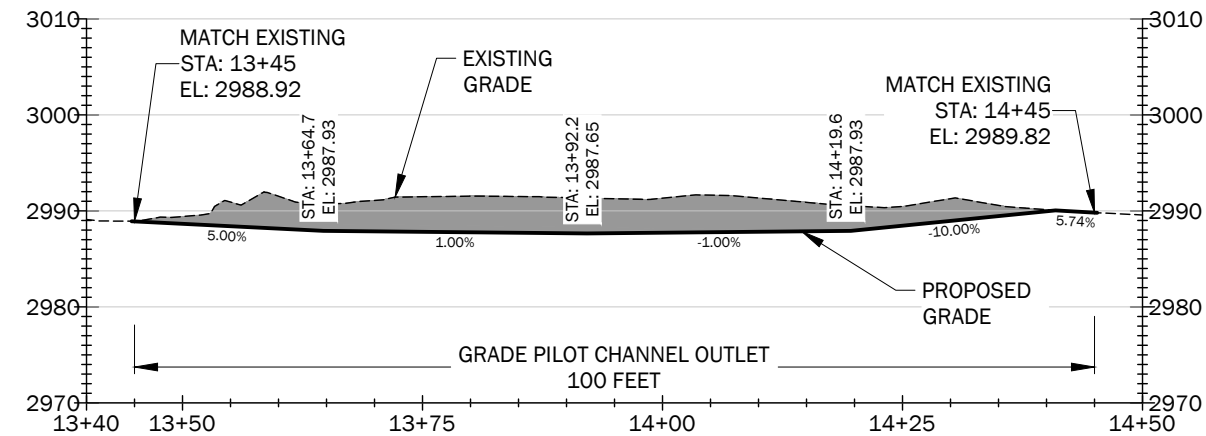
PROPOSED CHANNEL GRADING CONSTRUCTION ACCESS
AND STAGING

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 6 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	3.2

FINAL DESIGN

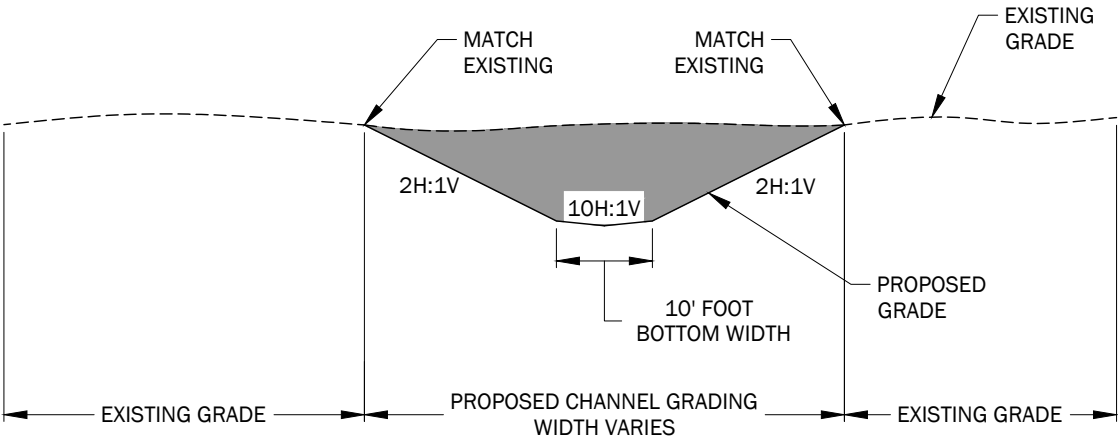


**PLAN
PILOT CHANNEL 1 OUTLET GRADING**
SCALE: 1"=10'

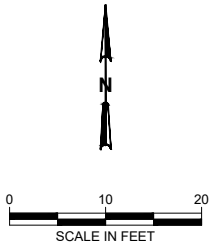


**PROFILE
PILOT CHANNEL 1 OUTLET GRADING**
SCALE: 1"=10'

- NOTES:
1. CONTRACTOR SHALL MINIMIZE IMPACTS TO EXISTING RIPARIAN VEGETATION DURING CONSTRUCTION TO THE EXTENTS PRACTICABLE.
 2. CONTRACTOR TO PLACE EXCAVATED MATERIAL ONSITE AND AT LOCATIONS OF LARGE WOOD STRUCTURES FOR ADDITIONAL BALLAST; AS DIRECTED BY CLIENT REPRESENTATIVE.



**TYPICAL CHANNEL SECTION
PILOT CHANNEL 1 OUTLET**
SCALE: NOT TO SCALE

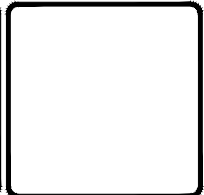


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NO.	DATE	BY	REVISION



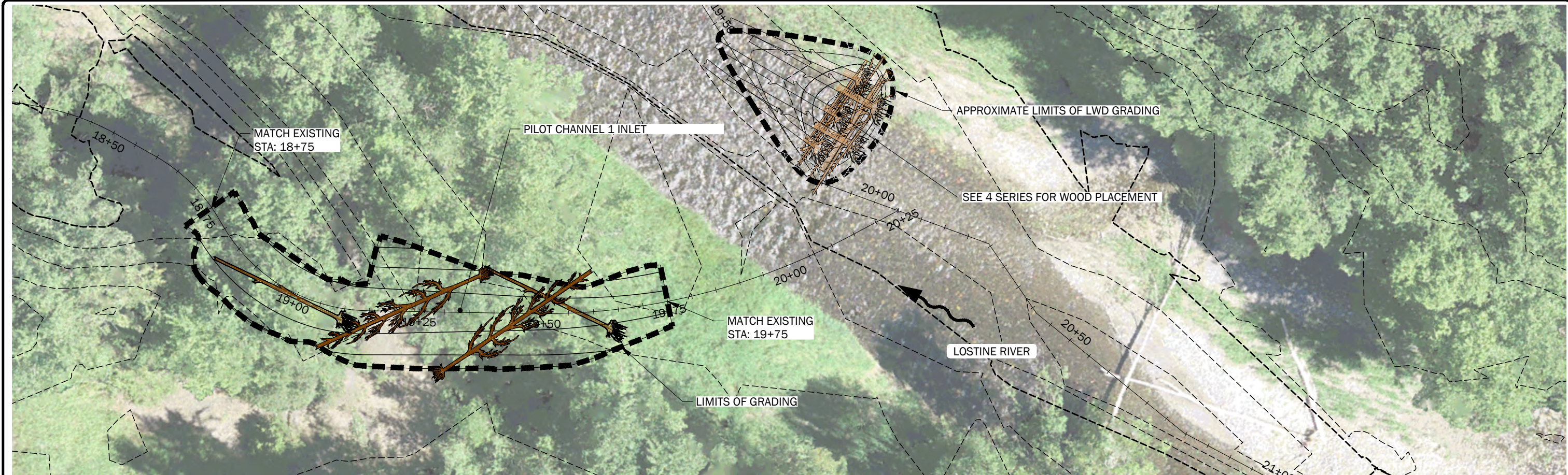
3501 WEST ELDER ST. BOISE, ID 83705 : 208-433-8098 : WWW.GEOENGINEERS.COM



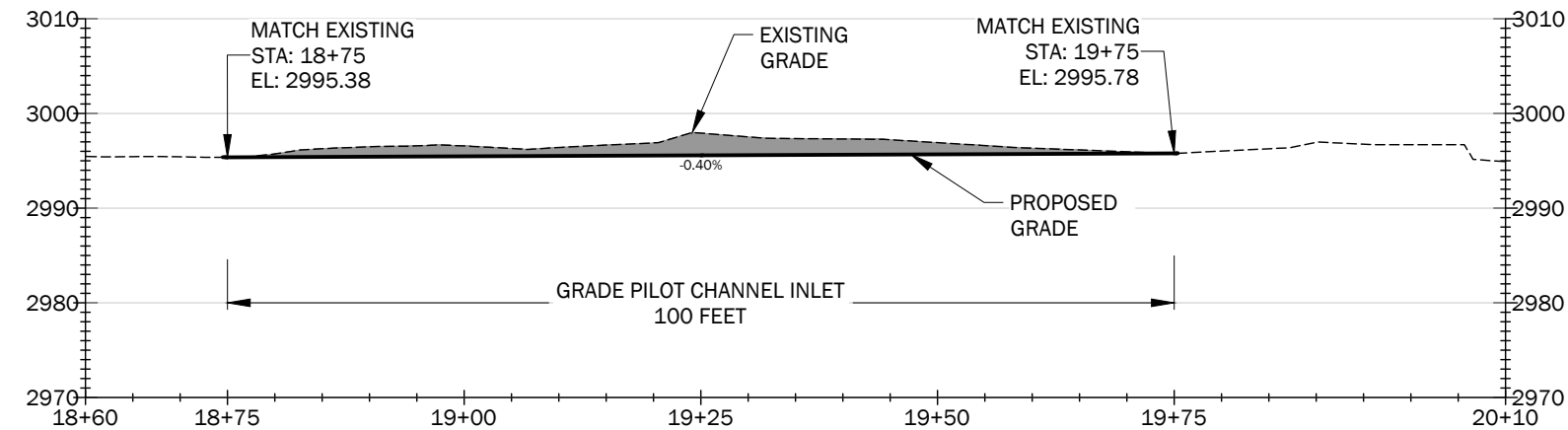
LOSTINE WETLAND AND SIDE CHANNEL COMPLEX WALLOWA, OREGON	
PILOT CHANNEL 1 - OUTLET	

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 7 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	3.3

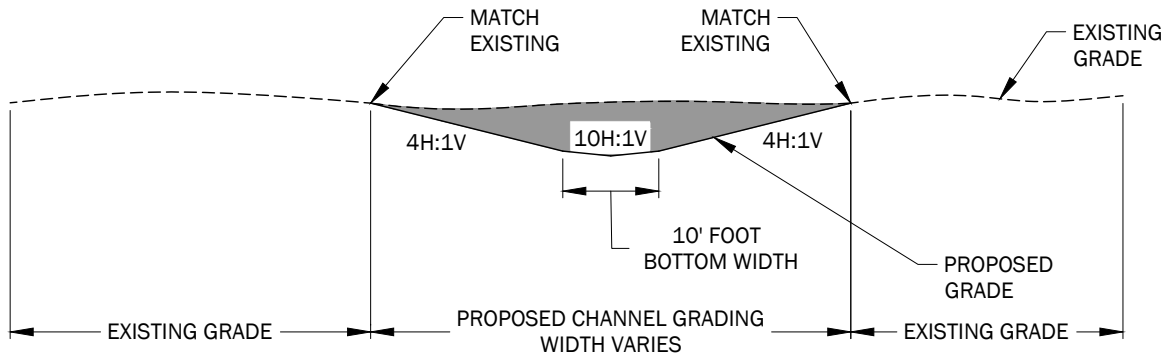
FINAL DESIGN



**PLAN
PILOT CHANNEL 1 INLET GRADING**
SCALE: 1"=10'



**PROFILE
PILOT CHANNEL 1 INLET GRADING**
SCALE: 1"=10'



**TYPICAL CHANNEL SECTION
PILOT CHANNEL 1 INLET**
SCALE: NOT TO SCALE

- NOTES:
1. CONTRACTOR SHALL MINIMIZE IMPACTS TO EXISTING RIPARIAN VEGETATION DURING CONSTRUCTION TO THE EXTENTS PRACTICABLE.
 2. CONTRACTOR TO PLACE EXCAVATED MATERIAL ONSITE AND AT LOCATIONS OF LARGE WOOD STRUCTURES FOR ADDITIONAL BALLAST; AS DIRECTED BY CLIENT REPRESENTATIVE.



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NO.	DATE	BY	REVISION



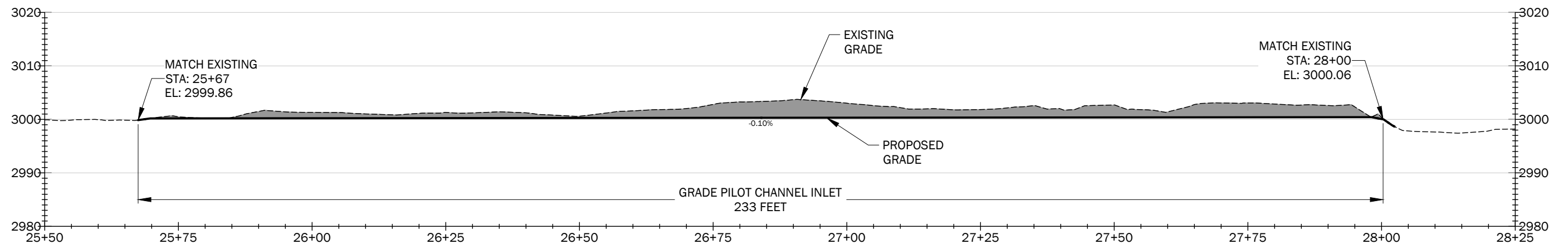
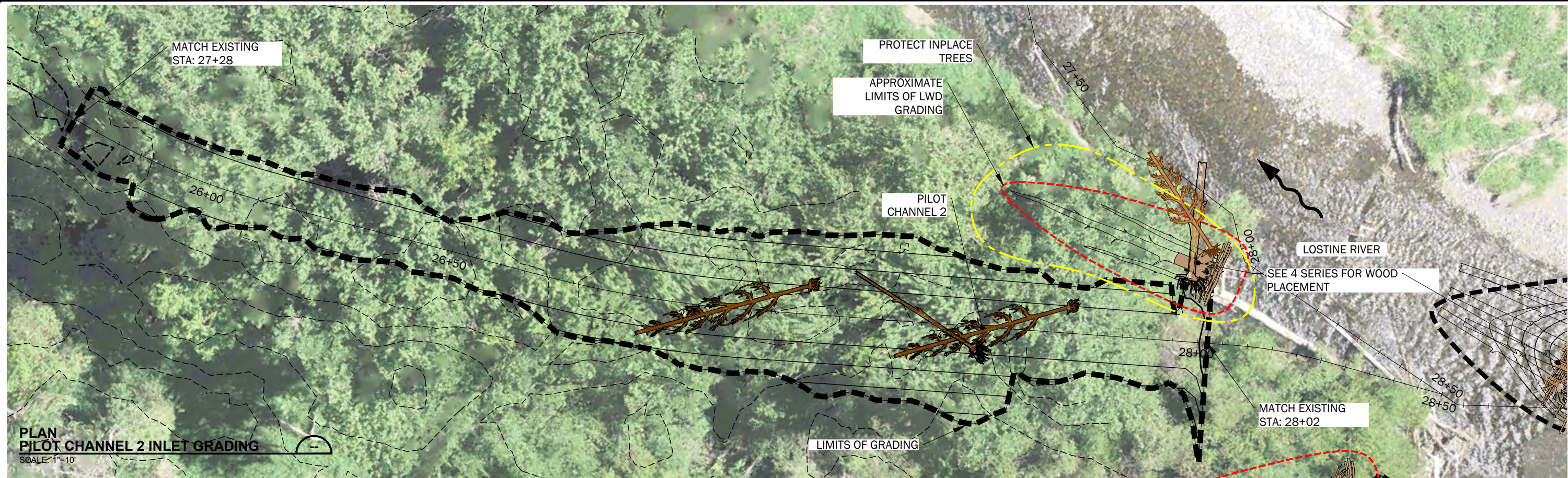
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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

PILOT CHANNEL 1 - INLET

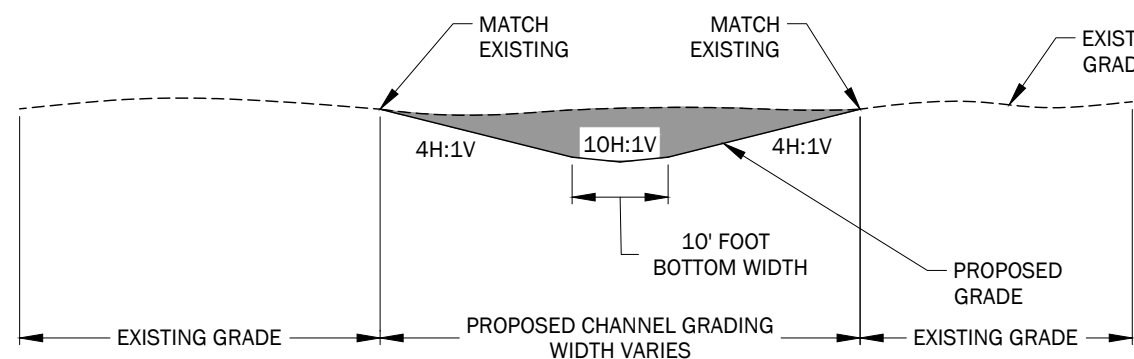
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DESIGN: ESM	SHEET 8 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	3.4

FINAL DESIGN



- NOTES:
1. CONTRACTOR SHALL MINIMIZE IMPACTS TO EXISTING RIPARIAN VEGETATION DURING CONSTRUCTION TO THE EXTENTS PRACTICABLE.
 2. CONTRACTOR TO PLACE EXCAVATED MATERIAL ONSITE AND AT LOCATIONS OF LARGE WOOD STRUCTURES FOR ADDITIONAL BALLAST; AS DIRECTED BY CLIENT REPRESENTATIVE.

**TYPICAL CHANNEL SECTION
PILOT CHANNEL 2 INLET**
SCALE: NOT TO SCALE



Plotted: 09/18/2020, 10:00 | esmiller P:\0571-018\CAD\00\Design\Channel Design\3.5 Pilot Channel 2 - Inlet.dwg

NO.	DATE	BY	REVISION



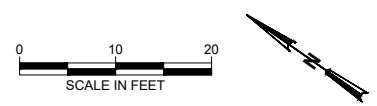
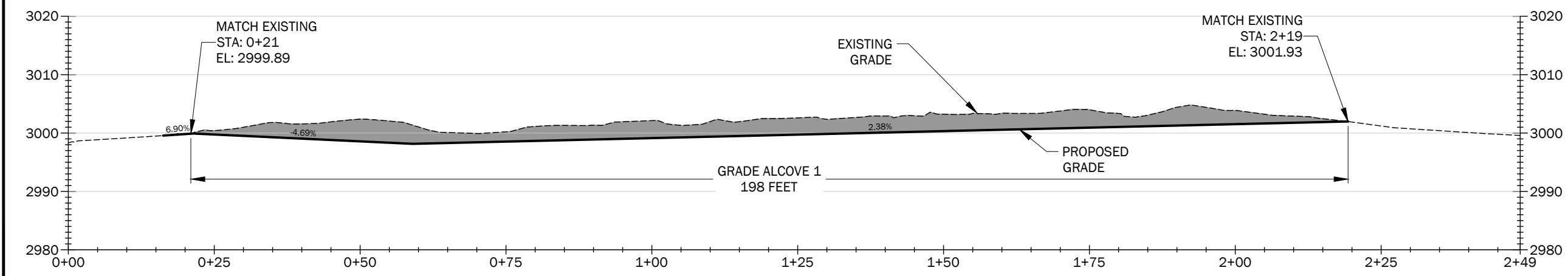
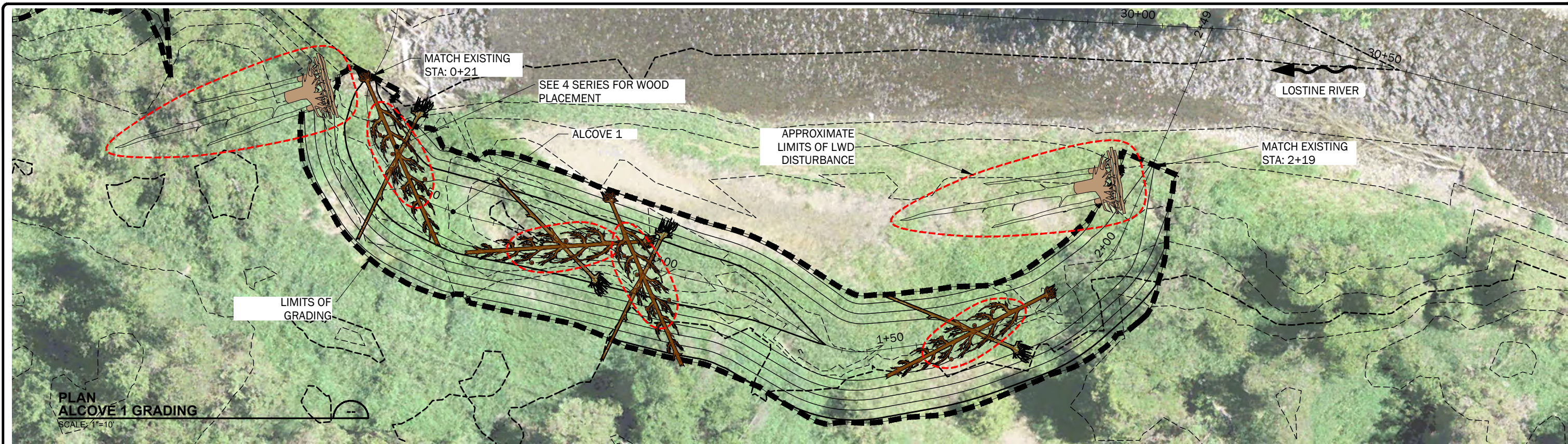
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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

PILOT CHANNEL 2 - INLET

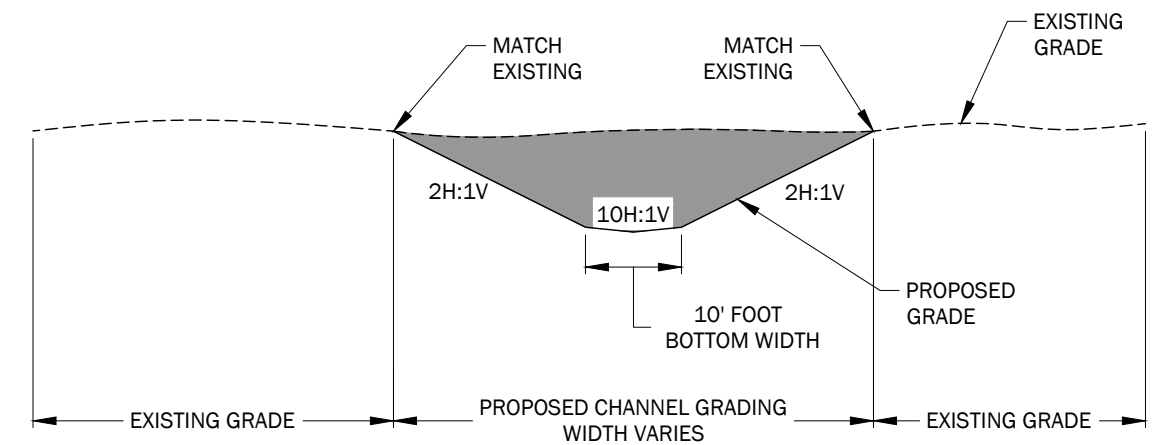
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DESIGN: ESM	SHEET 9 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	3.5

FINAL DESIGN



- NOTES:
1. CONTRACTOR SHALL MINIMIZE IMPACTS TO EXISTING RIPARIAN VEGETATION DURING CONSTRUCTION TO THE EXTENTS PRACTICABLE.
 2. CONTRACTOR TO PLACE EXCAVATED MATERIAL ONSITE AND AT LOCATIONS OF LARGE WOOD STRUCTURES FOR ADDITIONAL BALLAST; AS DIRECTED BY CLIENT REPRESENTATIVE.

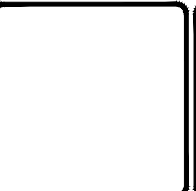
TYPICAL CHANNEL SECTION
ALCOVE 1
SCALE: NOT TO SCALE



Plotted: 09/18/2020, 10:00 | esmiller P:\00571018\CAD\000\Design\Channel Design\10 3.6 Alcove 1.dwg

NO.	DATE	BY	REVISION

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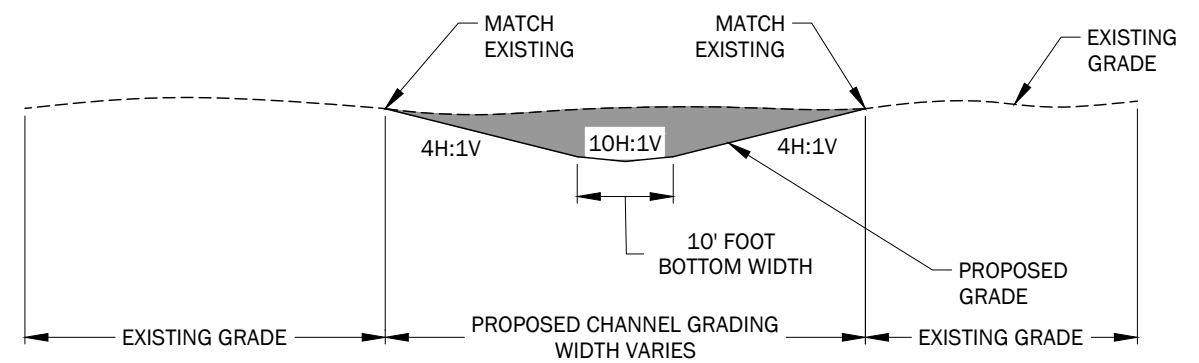
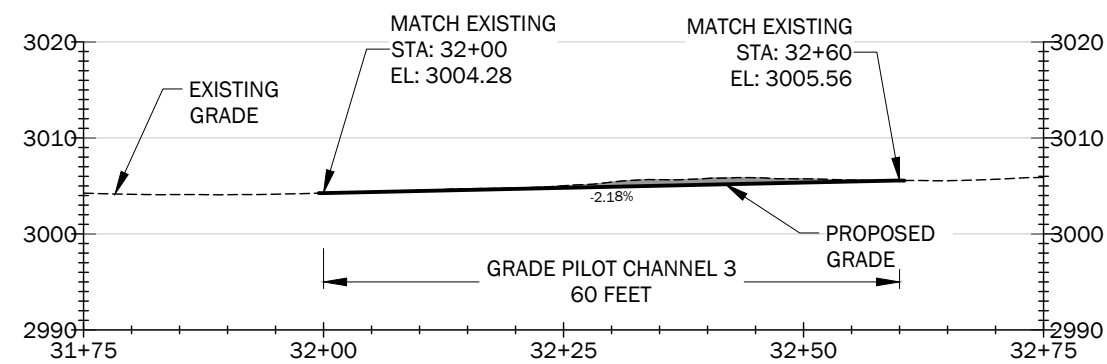
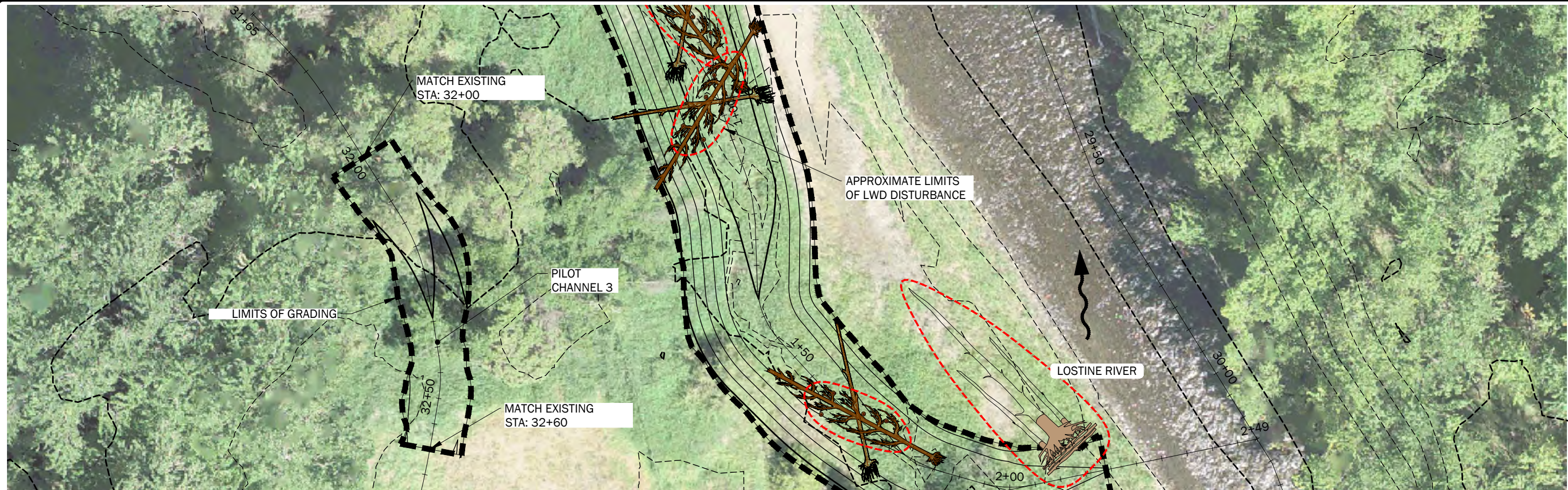


LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

ALCOVE 1

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 10 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	3.6

FINAL DESIGN



- NOTES:
1. CONTRACTOR SHALL MINIMIZE IMPACTS TO EXISTING RIPARIAN VEGETATION DURING CONSTRUCTION TO THE EXTENTS PRACTICABLE.
 2. CONTRACTOR TO PLACE EXCAVATED MATERIAL ONSITE AND AT LOCATIONS OF LARGE WOOD STRUCTURES FOR ADDITIONAL BALLAST; AS DIRECTED BY CLIENT REPRESENTATIVE.

NO.	DATE	BY	REVISION



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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

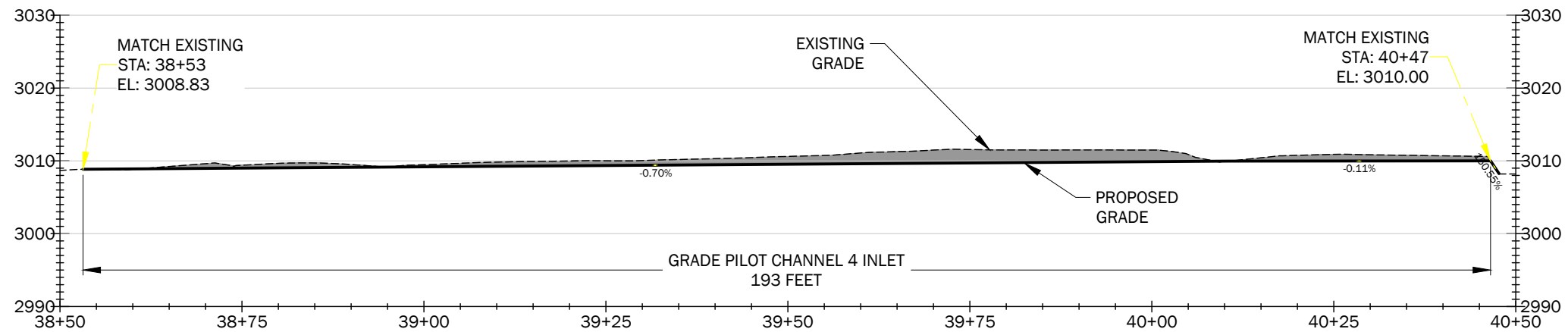
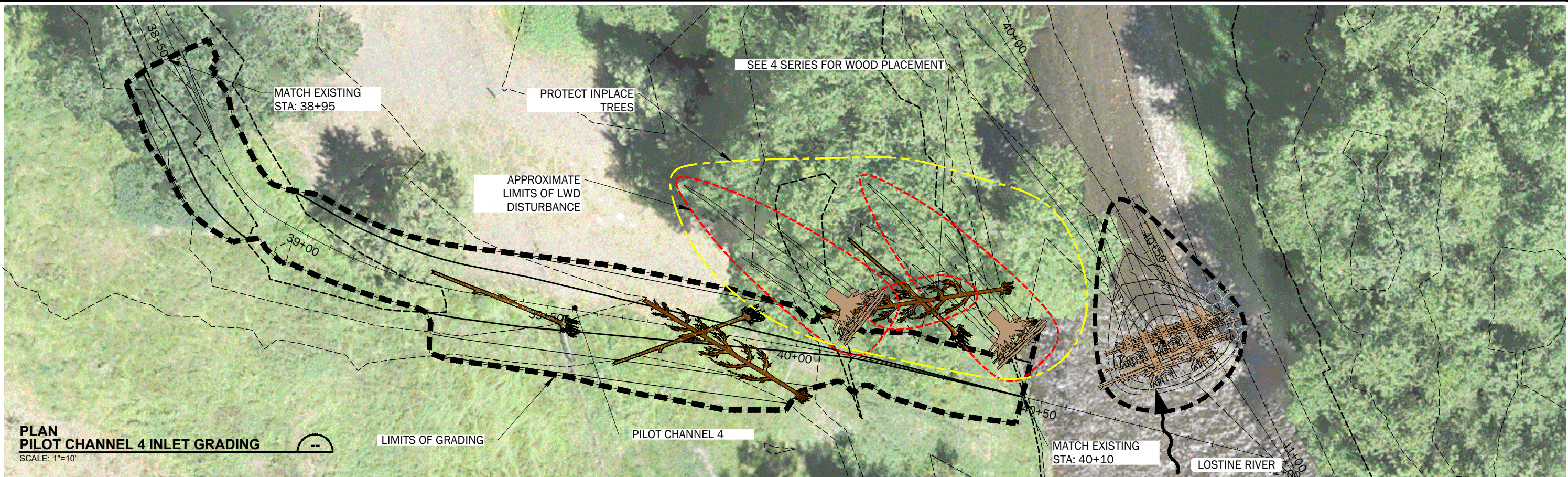
PILOT CHANNEL 3 - INLET

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 11 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	3.7

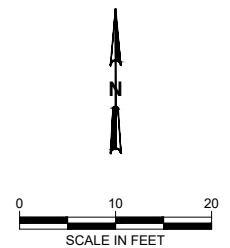
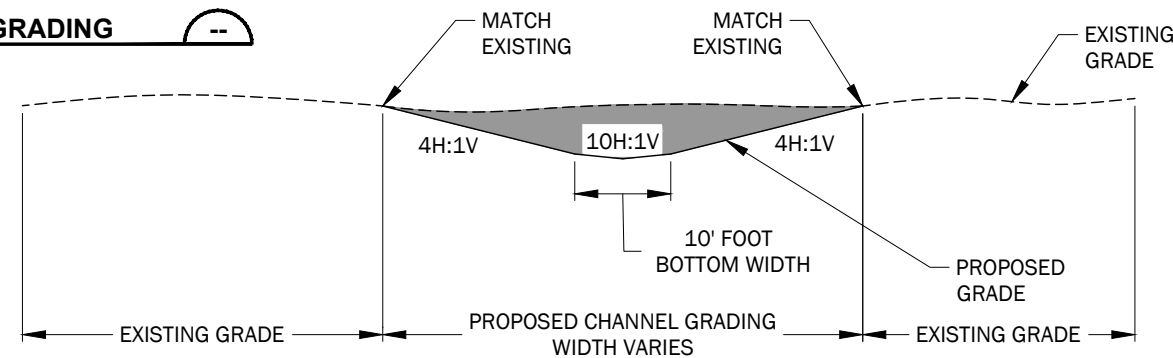
Plotted: 09/18/2020, 10:00 | esmiller P:\0571018\CAD\000\Design\Channel Design\11 3.7 Pilot Channel 3 - Inlet.dwg

FINAL DESIGN

Plotted: 09/18/2020, 10:00 | esmiller P:\00571018\CAD\000\Design\Channel Design\2 3.8 Pilot Channel 4 - Inlet.dwg



- NOTES:
- CONTRACTOR SHALL MINIMIZE IMPACTS TO EXISTING RIPARIAN VEGETATION DURING CONSTRUCTION TO THE EXTENTS PRACTICABLE.
 - CONTRACTOR TO PLACE EXCAVATED MATERIAL ONSITE AND AT LOCATIONS OF LARGE WOOD STRUCTURES FOR ADDITIONAL BALLAST; AS DIRECTED BY CLIENT REPRESENTATIVE.



NO.	DATE	BY	REVISION



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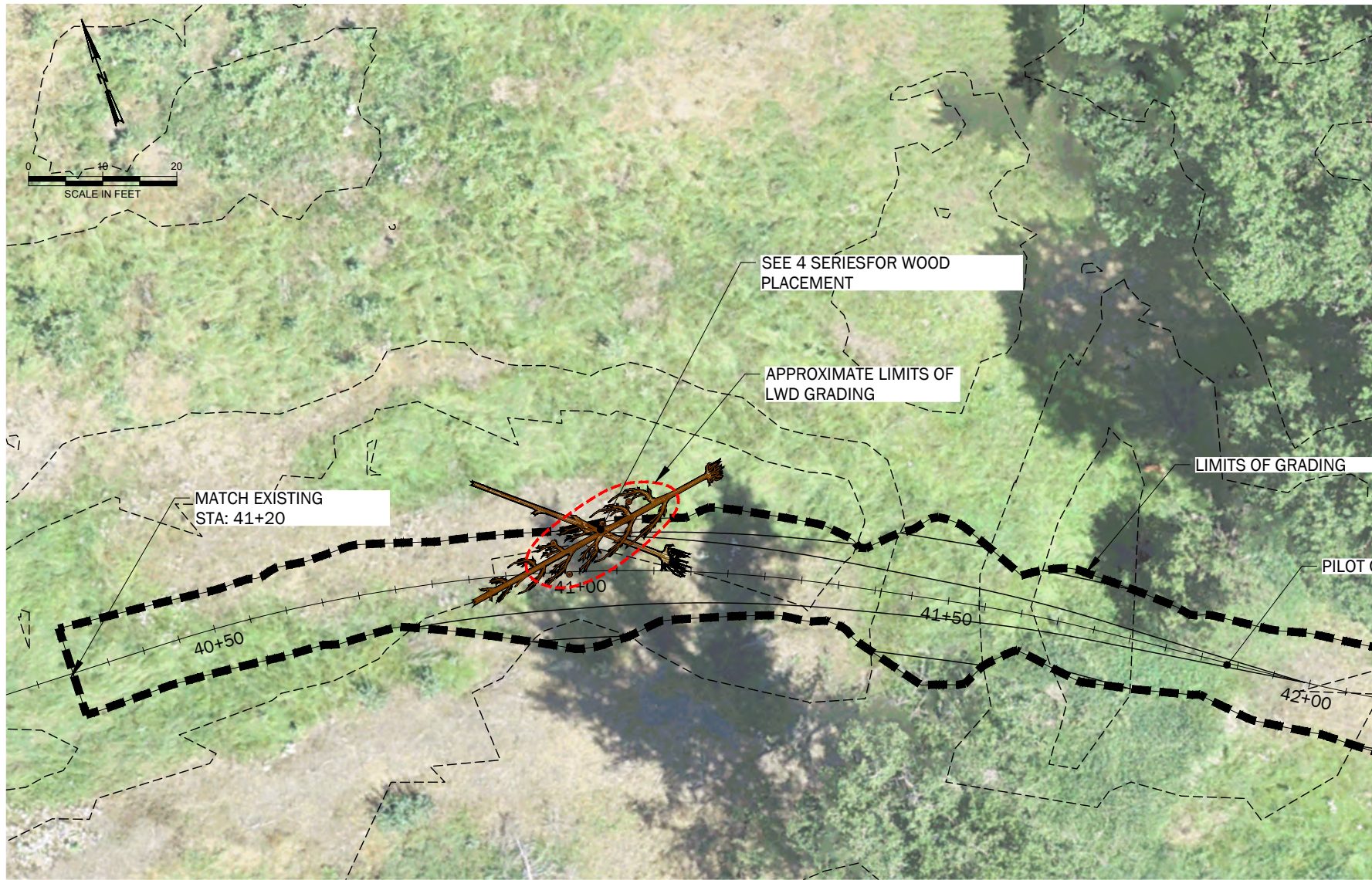
LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

PILOT CHANNEL 4 - INLET

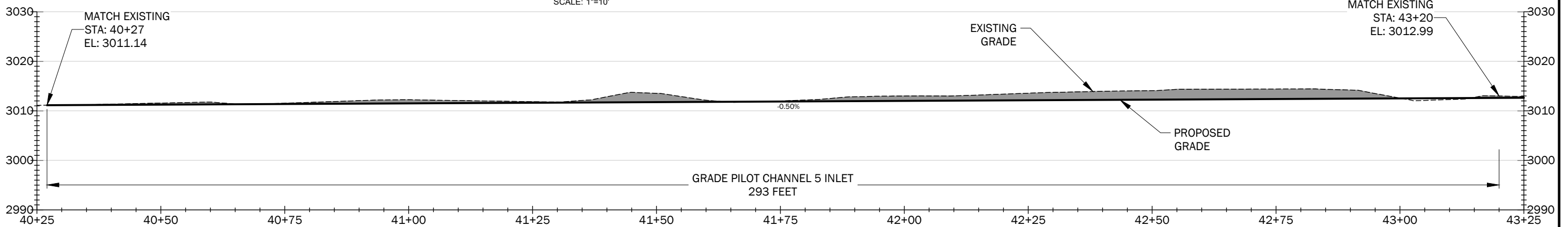
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DESIGN: ESM	SHEET 12 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	3.8

FINAL DESIGN

Plotted: 09/18/2020, 10:01 | esmiller P:\00571018\CAD\000\Design\Channel Design\13.9 Pilot Channel 5 - Inlet.dwg

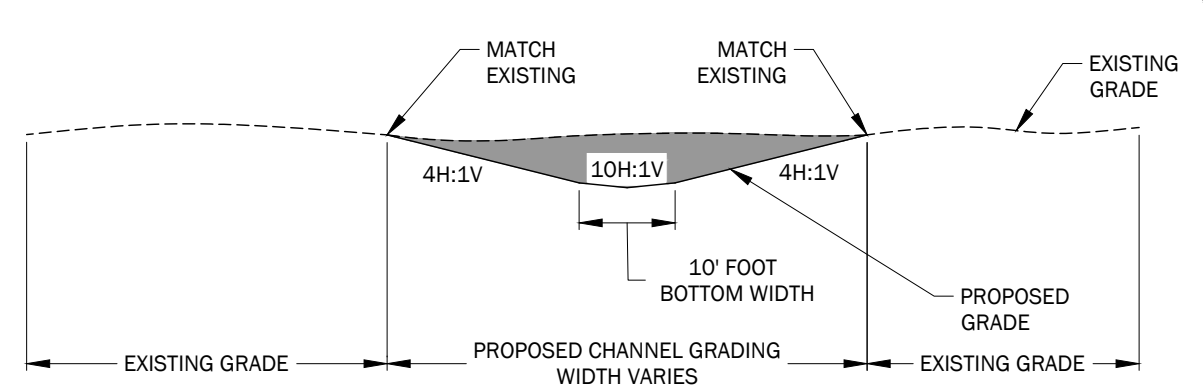


**PLAN
PILOT CHANNEL 5 INLET GRADING**
SCALE: 1"=10'



- NOTES:
1. CONTRACTOR SHALL MINIMIZE IMPACTS TO EXISTING RIPARIAN VEGETATION DURING CONSTRUCTION TO THE EXTENTS PRACTICABLE.
 2. CONTRACTOR TO PLACE EXCAVATED MATERIAL ONSITE AND AT LOCATIONS OF LARGE WOOD STRUCTURES FOR ADDITIONAL BALLAST; AS DIRECTED BY CLIENT REPRESENTATIVE.

**PROFILE
PILOT CHANNEL 5 INLET GRADING**
SCALE: 1"=10'



**TYPICAL CHANNEL SECTION
PILOT CHANNEL 5 INLET**
SCALE: NOT TO SCALE

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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

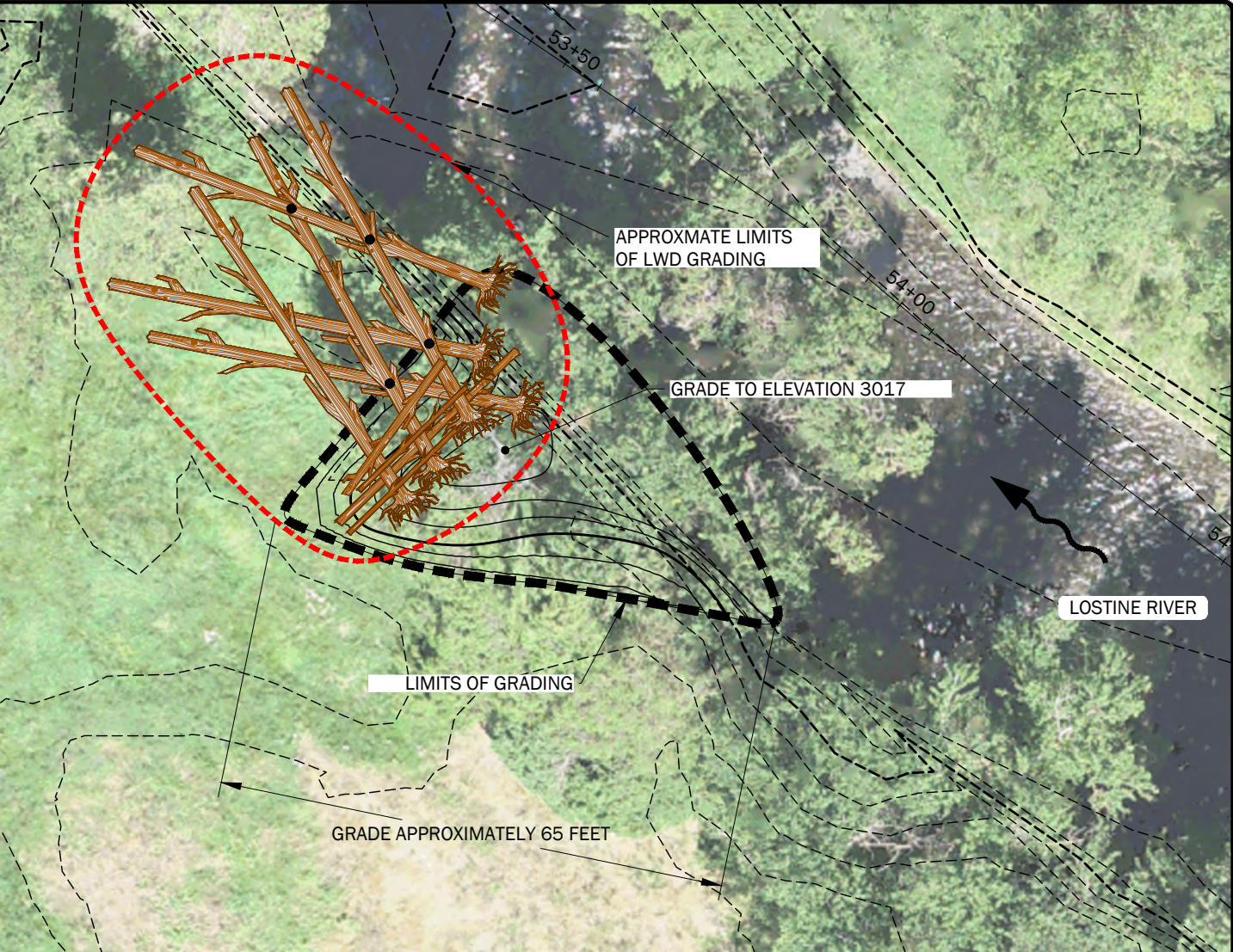
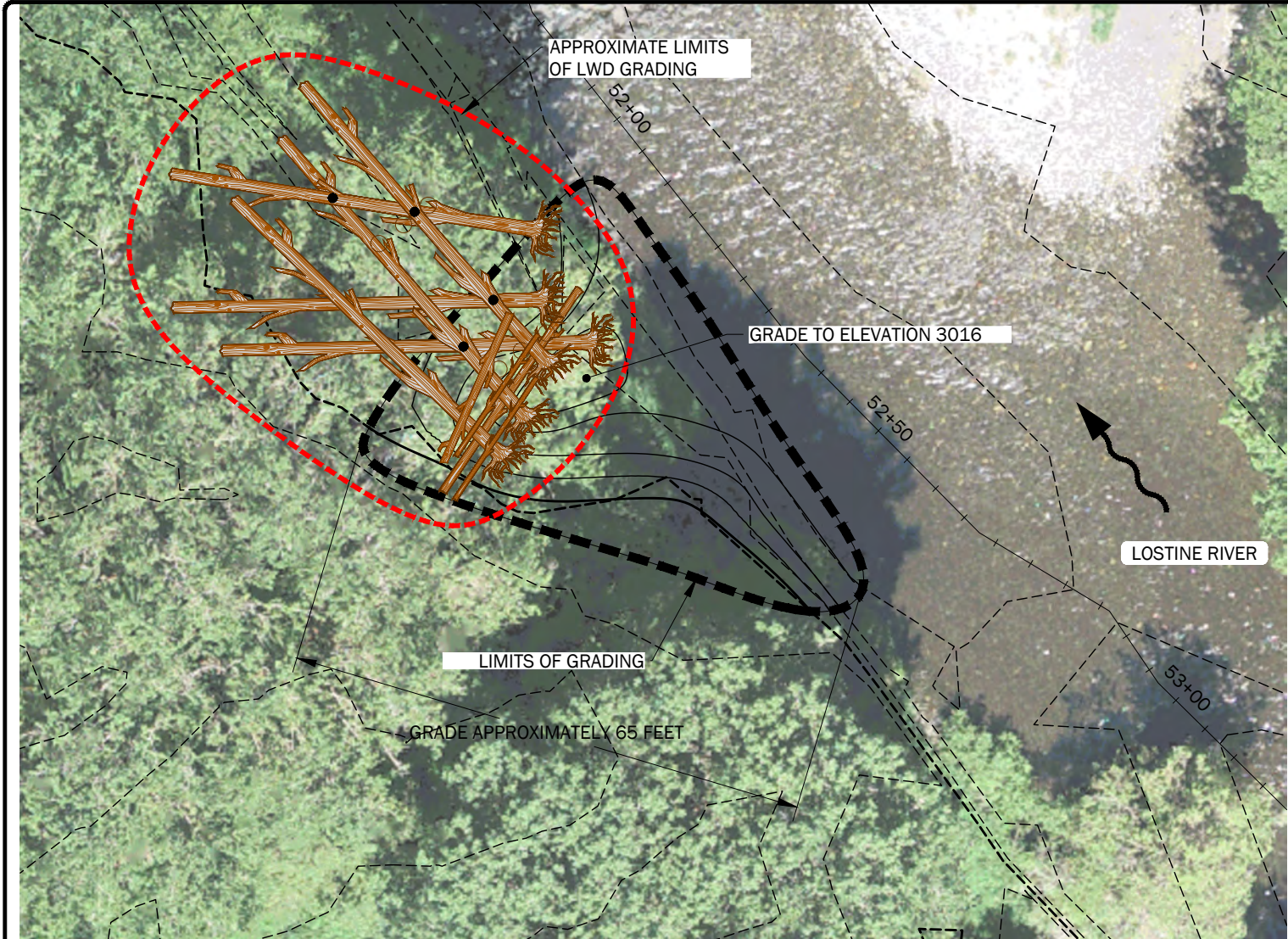
PILOT CHANNEL 5 - INLET

DRAWN: ESM
DESIGN: ESM
CHECKED: RSC
SHEET NO.

PROJ NO: 0571-018-00
SHEET 13 OF 36
DATE: 09-18-2020

3.9

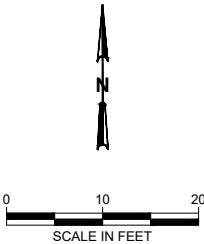
FINAL DESIGN



**PLAN
ALCOVE 2 GRADING**
SCALE: 1"=10'

**PLAN
ALCOVE 3 GRADING**
SCALE: 1"=10'

- NOTES:
- 1. ALCOVES 2 AND 3 ARE TO BE FIELD FIT AND ARE GENERALLY SHOWN ON THESE PLANS
 - 2. CONTRACTOR SHALL MINIMIZE IMPACTS TO EXISTING RIPARIAN VEGETATION DURING CONSTRUCTION TO THE EXTENTS PRACTICABLE.
 - 3. CONTRACTOR TO PLACE EXCAVATED MATERIAL ONSITE AND AT LOCATIONS OF LARGE WOOD STRUCTURES FOR ADDITIONAL BALLAST; AS DIRECTED BY CLIENT REPRESENTATIVE.



NO.	DATE	BY	REVISION



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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
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ALCOVE 2 AND 3

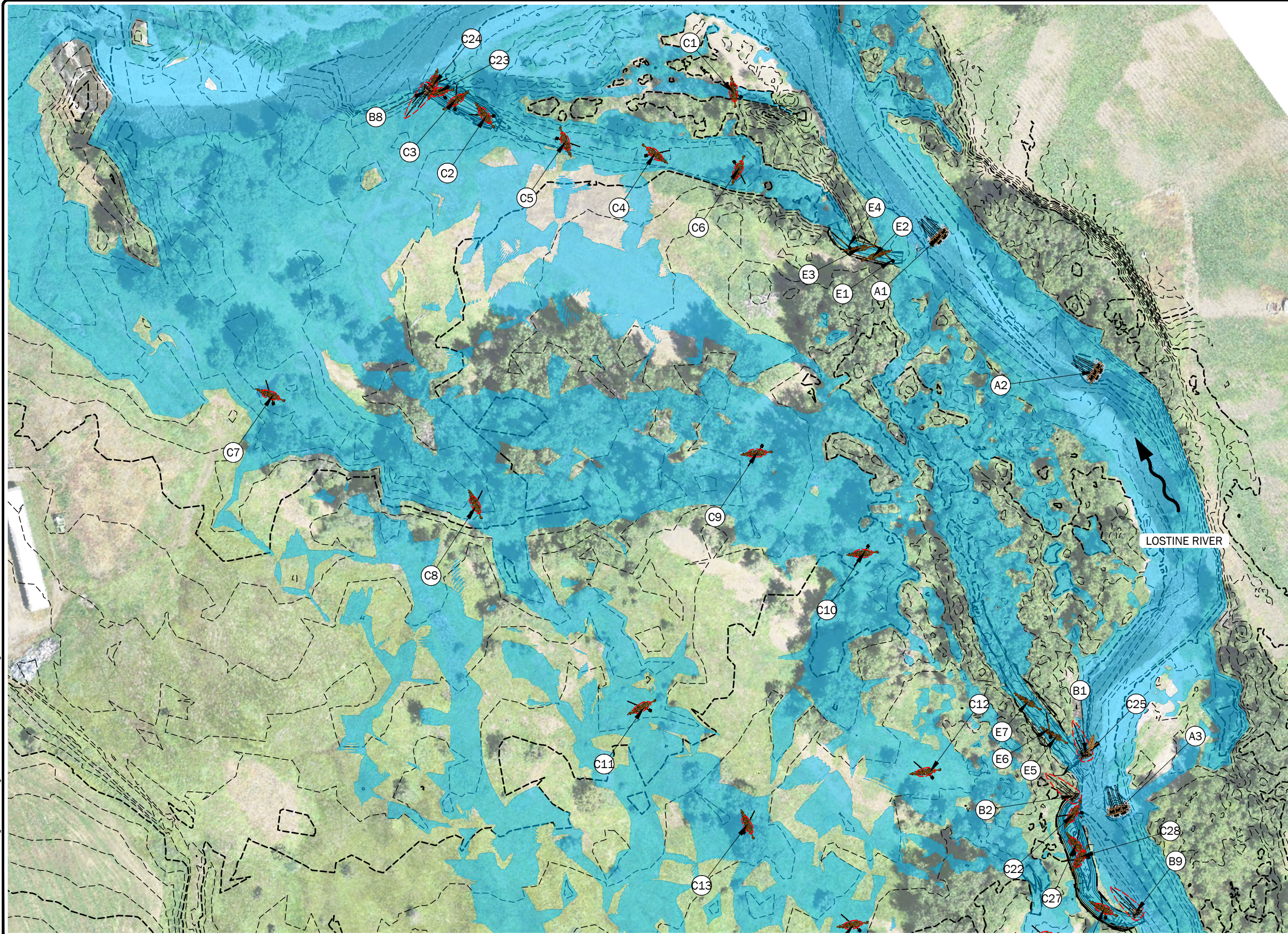
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DESIGN: ESM	SHEET 14 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	

3.10

Plotted: 09/18/2020, 10:01 | esmiller P:\0571\018\CAD\00\Design\Channel Design\14.3.10 Alcove 2 and 3.dwg

FINAL DESIGN

Plotted: 09/18/2020, 10:04 | esmiller P:\0571018\CAD\000\Design\Channel Design\15 4.1 Wood Structure Placement.dwg

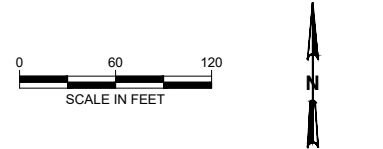


WOOD STRUCTURE LEGEND	
ID TAG	DESCRIPTION
(Ax)	LARGE APEX JAM
(Bx)	SMALL APEX JAM
(Cx)	VERTICAL POST ARRAY
(Dx)	FLOW DEFLECTION JAM
(Ex)	HABITAT WOOD

CONSTRUCTION NOTES:

1. VERTICAL POST ARRAYS ARE GENERALLY REPRESENTED AND TO BE FIELD FIT BY THE DESIGN ENGINEER OR OWNERS REPRESENTATIVE.

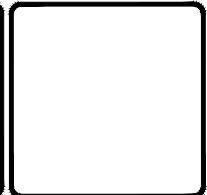
LEGEND	
	1.01 YEAR INUNDATION



NO.	DATE	BY	REVISION



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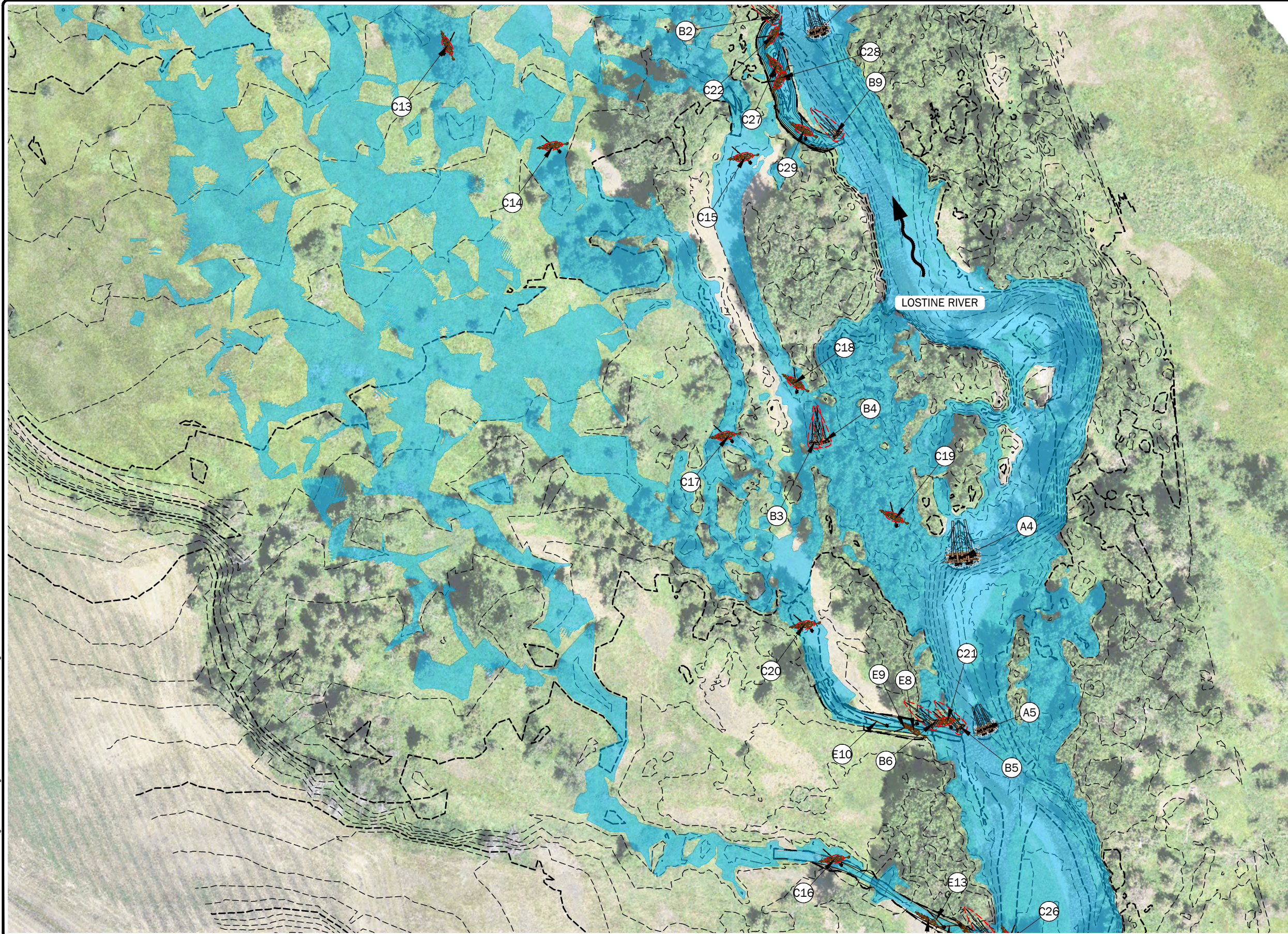


LOSTINE WETLAND AND SIDE CHANNEL COMPLEX WALLOWA, OREGON	
WOOD STRUCTURE PLACEMENT	

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 15 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	4.1

FINAL DESIGN

Plotted: 09/18/2020, 10:07 | esmiller P:\0571018\CAD\000\Design\Channel Design\16 4.2 Wood Structure Placement.dwg



WOOD STRUCTURE LEGEND	
ID TAG	DESCRIPTION
(Ax)	LARGE APEX JAM
(Bx)	SMALL APEX JAM
(Cx)	VERTICAL POST ARRAY
(Dx)	FLOW DEFLECTION JAM
(Ex)	HABITAT WOOD

CONSTRUCTION NOTES:

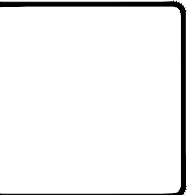
1. VERTICAL POST ARRAYS ARE GENERALLY REPRESENTED AND TO BE FIELD FIT BY THE DESIGN ENGINEER OR OWNERS REPRESENTATIVE.

LEGEND	
	1.01 YEAR INUNDATION

NO.	DATE	BY	REVISION



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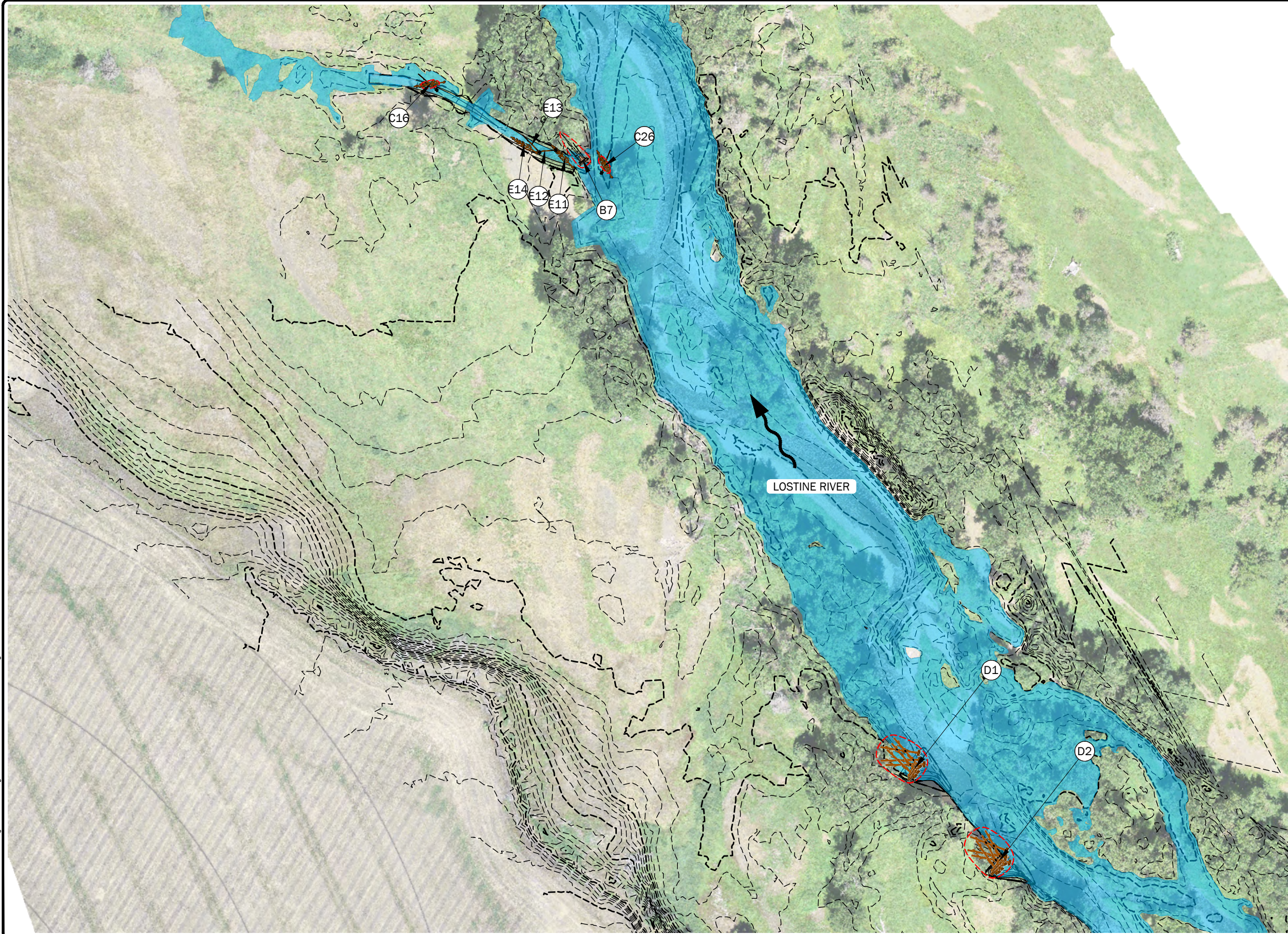


LOSTINE WETLAND AND SIDE CHANNEL COMPLEX WALLOWA, OREGON	
WOOD STRUCTURE PLACEMENT	

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 16 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	4.2

FINAL DESIGN

Plotted: 09/18/2020, 10:10 | esmiller P:\00571018\CAD\000\Design\Channel Design\17 4.3 Wood Structure Placement.dwg



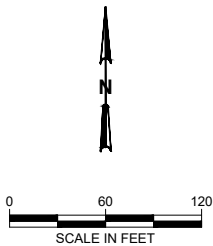
WOOD STRUCTURE LEGEND	
ID TAG	DESCRIPTION
(Ax)	LARGE APEX JAM
(Bx)	SMALL APEX JAM
(Cx)	VERTICAL POST ARRAY
(Dx)	FLOW DEFLECTION JAM
(Ex)	HABITAT WOOD

CONSTRUCTION NOTES:

- VERTICAL POST ARRAYS ARE GENERALLY REPRESENTED AND TO BE FIELD FIT BY THE DESIGN ENGINEER OR OWNERS REPRESENTATIVE.

LEGEND

1.01 YEAR INUNDATION



NO.	DATE	BY	REVISION



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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

WOOD STRUCTURE PLACEMENT

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 17 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	

4.3

FINAL DESIGN

Plotted: 09/18/2020, 10:10 | User: jmliller P:\00571018\CAD\000\Design\Channel Design\18_4_4 Wood Structure Control Points.dwg

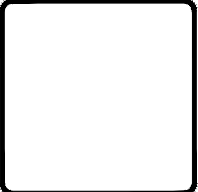
WOOD STRUCTURE CONTROL POINTS				WOOD STRUCTURE CONTROL POINTS				WOOD STRUCTURE CONTROL POINTS				WOOD STRUCTURE CONTROL POINTS			
STRUCTURE ID	STRUCTURE	NORTHING	EASTING	STRUCTURE ID	STRUCTURE	NORTHING	EASTING	STRUCTURE ID	STRUCTURE	NORTHING	EASTING	STRUCTURE ID	STRUCTURE	NORTHING	EASTING
A1	LARGE APEX JAM	701498.1	8973183.6	C2	VERTICAL POST ARRAY	701642.9	8972635.7	C17	VERTICAL POST ARRAY	700316.7	8973290.1	E1	HABITAT WOOD	701469.7	8973126.3
A2	LARGE APEX JAM	701334.9	8973370.1	C3	VERTICAL POST ARRAY	701663.3	8972599.4	C18	VERTICAL POST ARRAY	700380.5	8973370.8	E2	HABITAT WOOD	701474.0	8973103.5
A3	LARGE APEX JAM	700804.7	8973401.2	C4	VERTICAL POST ARRAY	701598.7	8972839.9	C19	VERTICAL POST ARRAY	700216.5	8973493.9	E3	HABITAT WOOD	701484.1	8973087.2
A4	LARGE APEX JAM	700169.7	8973576.0	C5	VERTICAL POST ARRAY	701613.0	8972731.7	C20	VERTICAL POST ARRAY	700087.0	8973384.1	E4	HABITAT WOOD	701486.4	8973073.7
A5	LARGE APEX JAM	699962.1	8973602.4	C6	VERTICAL POST ARRAY	701582.0	8972940.4	C21	VERTICAL POST ARRAY	699970.1	8973553.3	E5	HABITAT WOOD	700893.3	8973324.9
B1	SMALL APEX JAM	700872.2	8973359.9	C7	VERTICAL POST ARRAY	701306.5	8972378.5	C22	VERTICAL POST ARRAY	700799.6	8973345.1	E6	HABITAT WOOD	700902.9	8973316.0
B2	SMALL APEX JAM	700822.5	8973346.0	C8	VERTICAL POST ARRAY	701171.7	8972623.5	C23	VERTICAL POST ARRAY	701673.4	8972578.1	E7	HABITAT WOOD	700935.6	8973290.7
B3	SMALL APEX JAM	700309.5	8973395.6	C9	VERTICAL POST ARRAY	701238.7	8972964.4	C24	VERTICAL POST ARRAY	701682.0	8972571.7	E8	HABITAT WOOD	699960.1	8973515.1
B4	SMALL APEX JAM	700309.9	8973407.4	C10	VERTICAL POST ARRAY	701118.0	8973094.1	C25	VERTICAL POST ARRAY	700875.9	8973365.2	E9	HABITAT WOOD	699962.5	8973504.2
B5	SMALL APEX JAM	699964.3	8973570.6	C11	VERTICAL POST ARRAY	700928.4	8972825.4	C26	VERTICAL POST ARRAY	699706.1	8973631.1	E10	HABITAT WOOD	699970.2	8973470.5
B6	SMALL APEX JAM	699968.8	8973539.2	C12	VERTICAL POST ARRAY	700852.9	8973169.8	C27	VERTICAL POST ARRAY	700762.9	8973349.1	E11	HABITAT WOOD	699713.6	8973582.8
B7	SMALL APEX JAM	699711.6	8973604.5	C13	VERTICAL POST ARRAY	700787.6	8972951.7	C28	VERTICAL POST ARRAY	700749.1	8973355.3	E12	HABITAT WOOD	699723.1	8973558.9
B8	SMALL APEX JAM	701673.9	8972563.1	C14	VERTICAL POST ARRAY	700665.4	8973077.5	C29	VERTICAL POST ARRAY	700685.1	8973382.7	E13	HABITAT WOOD	699731.7	8973542.2
B9	SMALL APEX JAM	700681.6	8973420.8	C15	VERTICAL POST ARRAY	700653.5	8973312.1	D1	FLOW DEFLECTION JAM	698977.4	8974006.1	E14	HABITAT WOOD	699731.4	8973533.6
C1	VERTICAL POST ARRAY	701673.4	8972934.6	C16	VERTICAL POST ARRAY	699803.7	8973419.0	D2	FLOW DEFLECTION JAM	698866.0	8974107.4				

WOOD STRUCTURE LEGEND	
ID TAG	DESCRIPTION
<div>Ax</div>	LARGE APEX JAM
<div>Bx</div>	SMALL APEX JAM
<div>Cx</div>	VERTICAL POST ARRAY
<div>Dx</div>	FLOW DEFLECTION JAM
<div>Ex</div>	HABITAT WOOD

NO.	DATE	BY	REVISION



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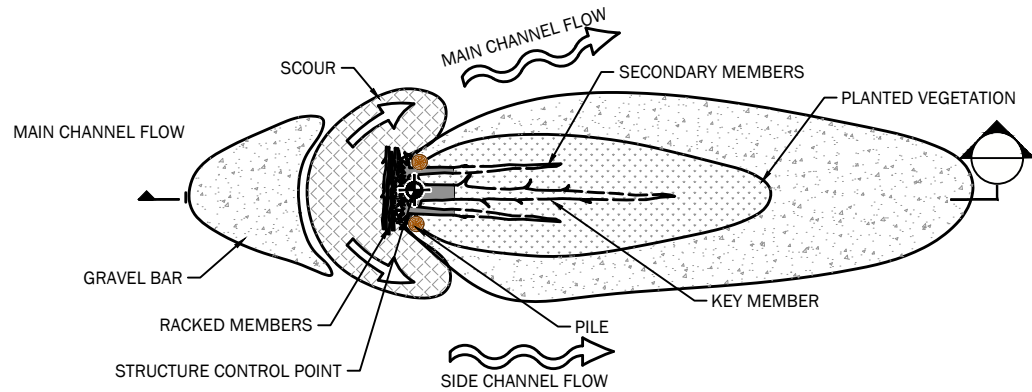


LOSTINE WETLAND AND SIDE CHANNEL COMPLEX WALLOWA, OREGON	
WOOD STRUCTURE CONTROL POINTS	

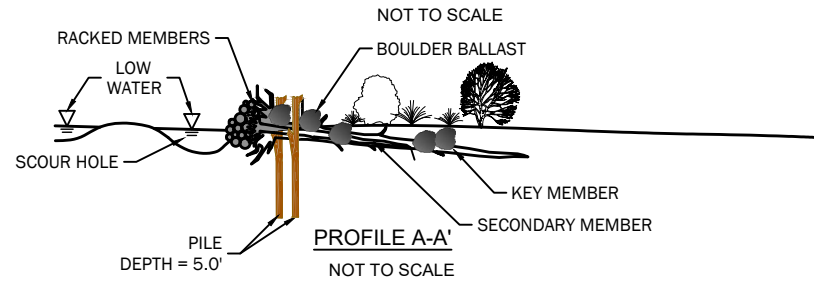
DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 18 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO. 4.4	

FINAL DESIGN

Plotted: 09/18/2020, 10:11 | esmiller P:\00571018\CAD\000\Design\Channel Design\20 5.2 Typical Structure Details.dwg



EXAMPLE PLAN VIEW AT SIDE CHANNEL ENTRANCE



SMALL APEX JAM

PURPOSE:

- CREATES MID-STREAM GRAVEL BARS, PROMOTES SIDE CHANNEL DEVELOPMENT AND MAINTENANCE
- PRINCIPAL MECHANISM FOR FORMATION OF ANASTOMOSING CHANNEL SYSTEMS.
- CREATES DIVERSE HABITAT AND GRAVEL CONDITIONS
- INCREASES WATER SURFACE ELEVATION UNDER A RANGE OF DISCHARGES AND HELPS AGGRADE BED MATERIAL BY EXPANDING EXISTING LATERAL BARS

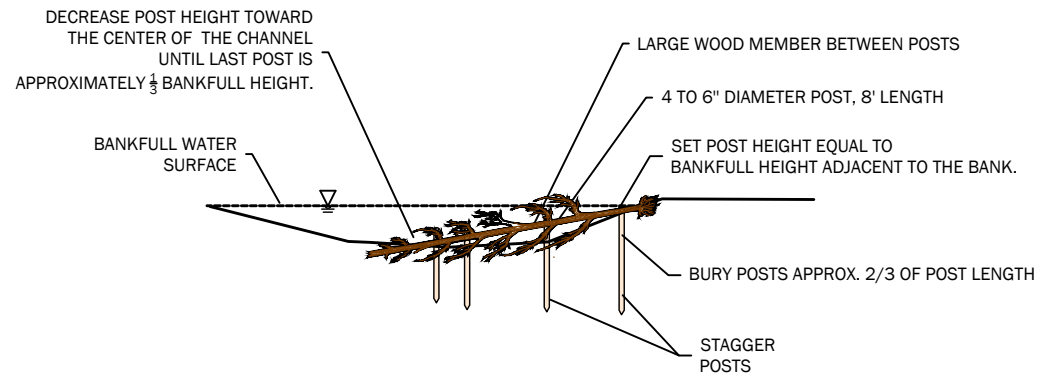
DESIGN SPECIFICS:

- PLACED ON CONSTRUCTED MID-STREAM GRAVEL BARS.
- NARROW END OF LARGE KEY MEMBERS, AND SECONDARY MEMBERS, ARE BURIED INTO THE BAR IN A DOWNWARD SLOPING MANNER TO REINFORCE STRUCTURE. SMALLER RACKED MEMBERS PLACED AMONG KEY MEMBERS.
- FILL AND DENSE VEGETATION PLACED AND PLANTED ON TOP OF STRUCTURE.
- MINIMUM LENGTH OF KEY MEMBERS IS 45 FEET.

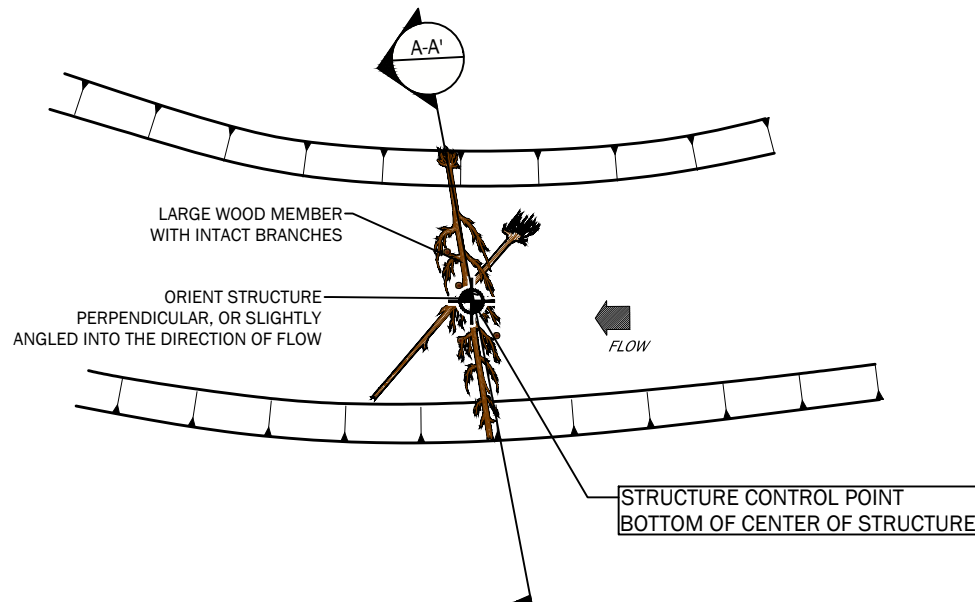
WOOD QUANTITIES				
45' LOG WITH ROOTWAD, MIN. 24" BDH	30' LOG WITH ROOTWAD, MIN. 18" DBH	10'-20' RACKING MATERIAL 6"-10" DIA (EA)	24" BOULDER BALLAST (EA)	18" DIA. 15' PILE MIN.
1	2	9	6	2

SMALL APEX JAM DETAIL

SCALE: NOT TO SCALE



SECTION A-A'



PURPOSE:

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

DESIGN SPECIFICS:

- USE 4 TO 6" DIAMETER POSTS, APPROXIMATELY 8' LONG AT APPROXIMATE 3' SPACING
- STAGGER POSTS SO THEY ARE NOT IN A STRAIGHT LINE
- DRIVE POSTS APPROXIMATELY 4' BELOW GROUND SURFACE
- WEAVE LARGE WOOD MEMBERS BETWEEN POSTS
- PLACEMENT IS TO BE FIELD FIT BY ENGINEERS OR OWNER REPRESENTATIVE
- ADDITIONAL DEBRIS IS EXPECTED TO COLLECT OVER TIME

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)	CY	MIN 10' LENGTH 4" TO 10" DIA (EACH)	8' LENGTH, 4 TO 6" DIA (EACH)
1	0	1	0	0	4

VERTICAL POST ARRAY DETAIL

SCALE: NOT TO SCALE

NO.	DATE	BY	REVISION



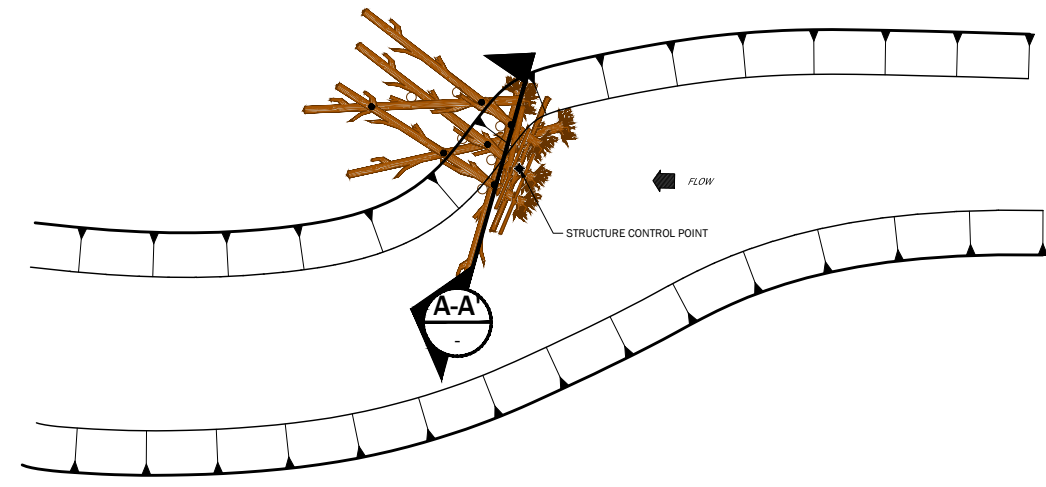
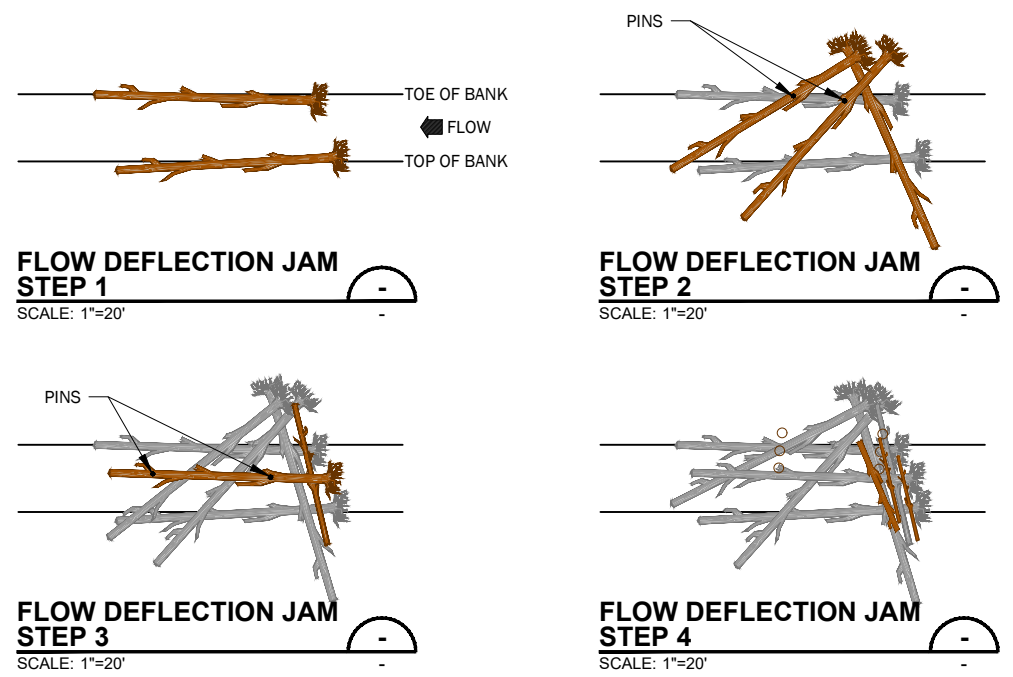
3501 WEST ELDER ST : BOISE, ID 83705 : 208-433-8098 : WWW.GEOENGINEERS.COM

LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

TYPICAL STRUCTURE DETAILS

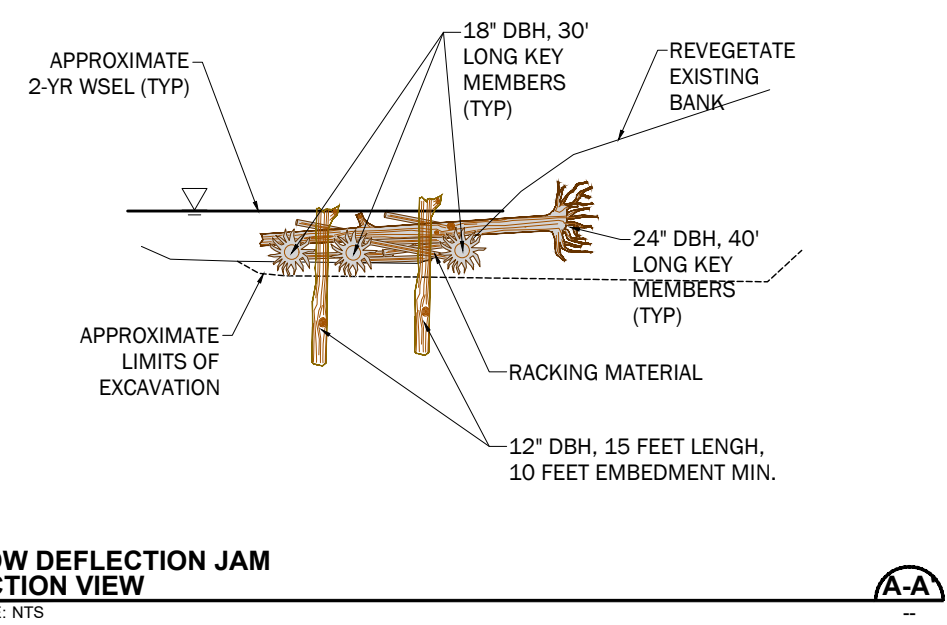
DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 20 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	5.2

FINAL DESIGN



- FLOW DEFLECTION JAM NOTES
- DESIGN SPECIFICATIONS:**
- ORIENT ROOT WADS PERPENDICULAR TO FLOW.
 - TOP OF ROOT WAD SHOULD NOT EXTEND MORE THAN 1/2-FT ABOVE TOP OF BANK.
 - MEMBERS SHALL EXTEND BELOW CALCULATED SCOUR DEPTH
 - PLACE ROOT WADS ALONG OUTSIDE OF BENDS
 - INSTALL VEGETATION AMONG ARMORING AND ROOT WADS WHILE INSTALLING ROOT WADS
 - EXPOSED ROOT WAD DEPTH EQUALS POOL DEPTH

**FLOW DEFLECTION JAM
PLAN VIEW**
SCALE: NTS

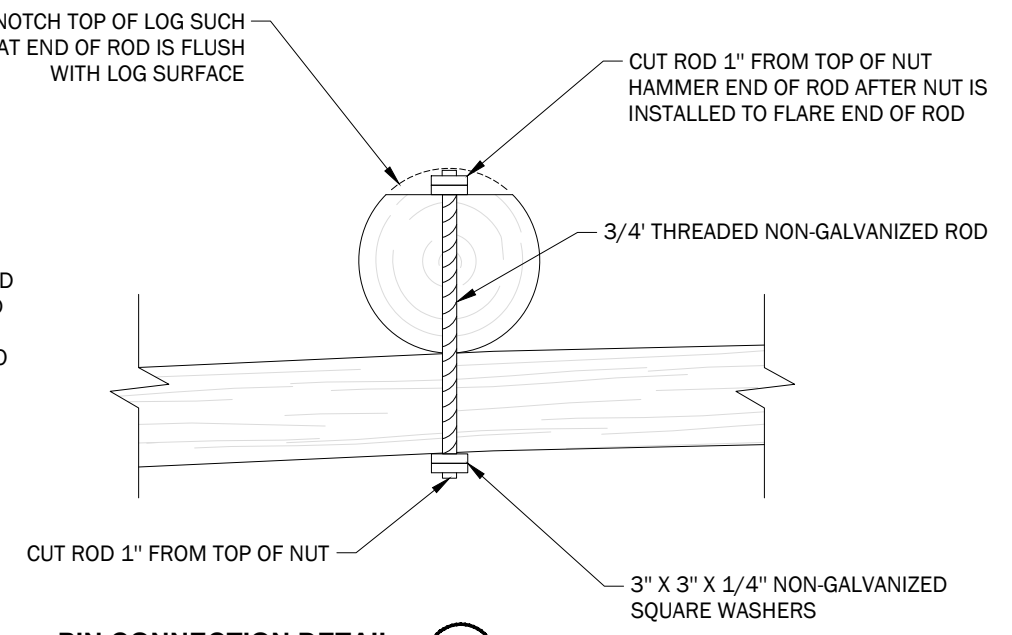


**FLOW DEFLECTION JAM
SECTION VIEW**
SCALE: NTS

WOOD QUANTITIES			
40' LOG WITH ROOTWAD, MIN. 24" BDH	30' LOG WITH ROOTWAD, MIN. 18" DBH	12" DIA. VERTICAL PILE, MIN. 15'	RACKING MATERIAL 6"-10" DIA. (EA)
2	3	6	20

- NOTES:
1. PILES ARE TO BE DRIVEN USING A VIBRATORY HEAD, IMPACT HAMMERS SHALL NOT TO BE USED TO DRIVE PILES


BOLTED CONNECTION NOTES:
DRILL 1 IN. HOLES THROUGH BOTH LOGS.
CUT 4 IN. WIDE X 3 IN. DEEP NOTCH INTO TOP LOG.
INSERT 3/4 IN. MINIMUM NON-GALVANIZED THREADED ROD AND ATTACH AT BOTH ENDS WITH WASHERS AND NUTS.
MAINTAIN A MINIMUM OF 24 IN. FROM END OF LOG TO PIN LOCATION.



PIN CONNECTION DETAIL
SCALE: NOT TO SCALE

Plotted: 09/18/2020, 10:11 | esmiller P:\00571018\CAD\000\Design\Channel Design\21 5.3 Typical Structure Details - Vertical Post Array.dwg

NO.	DATE	BY	REVISION



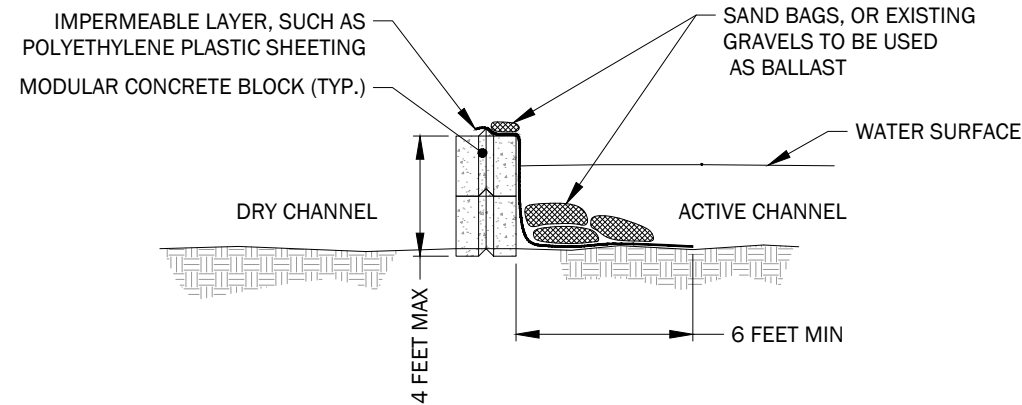
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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

TYPICAL STRUCTURE DETAILS

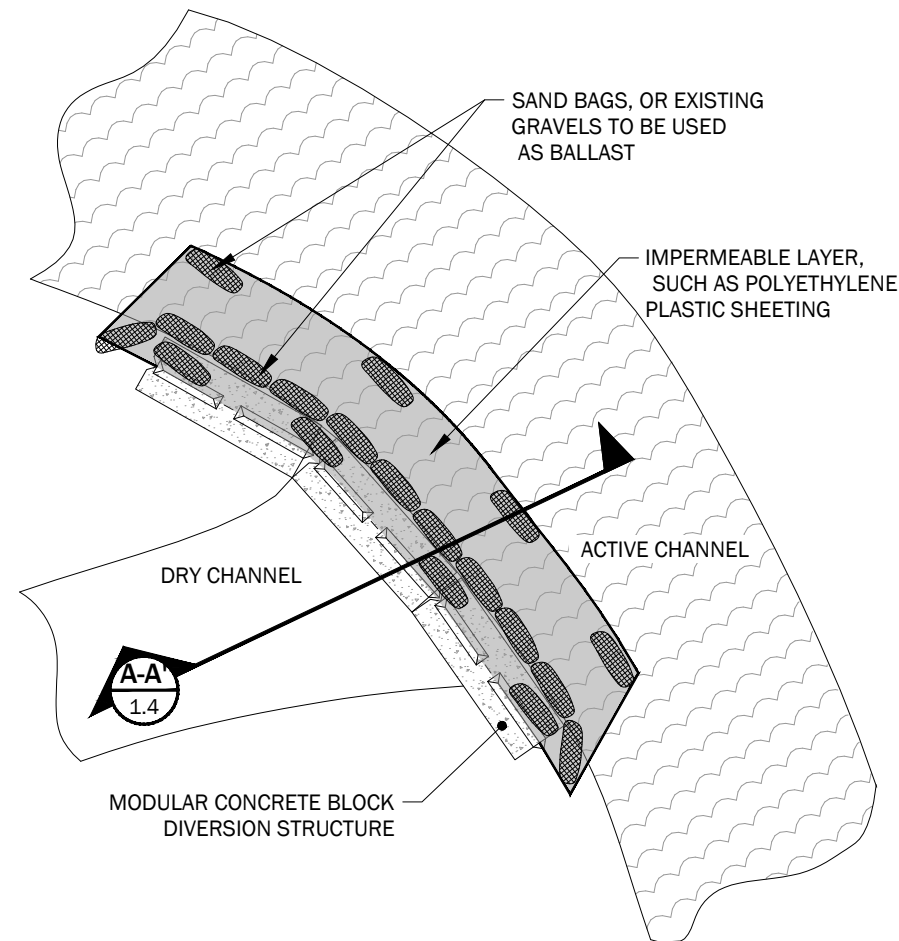
DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 21 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	5.3

FINAL DESIGN

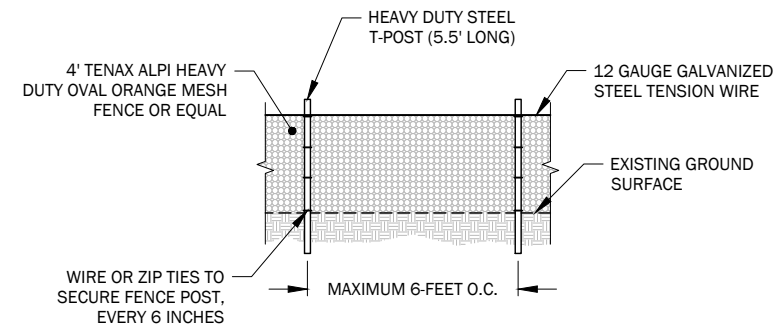


- NOTES:
1. TEMPORARY CHANNEL DIVERSION STRUCTURE SHALL BE CONSTRUCTED OF MODULAR CONCRETE BLOCKS, SANDBAGS, OR CONCRETE BARRIERS.
 2. OVERLAPPING SECTIONS OF IMPERMEABLE LINER SHALL OVERLAP A MINIMUM OF 5 FEET.
 3. TEMPORARY CHANNEL STRUCTURE SHALL BE PLACED AND REMOVED.

SECTION
SCALE: NOT TO SCALE



WORK ZONE ISOLATION STRUCTURE
SCALE: NOT TO SCALE



- NOTES:
1. THE CONTRACTOR SHALL ERECT FENCING TO DEFINE SOIL DISTURBANCE AND CLEARING LIMITS. SEE SITE ACCESS NOTES ON SHEET X.
 2. PROVIDE PLASTIC SAFETY CAPS ON FENCE POSTS.

HIGH VISIBILITY PLASTIC FENCE
SCALE: NOT TO SCALE

Plotted: 09/18/2020, 10:11 | esmiller P:\00571018\CAD\000\Design\Channel Design\22 5.4 Typical Structure Details - Deflection Jam.dwg

NO.	DATE	BY	REVISION



3501 WEST ELDER ST : BOISE, ID 83705 : 208-433-8098 : WWW.GEOENGINEERS.COM

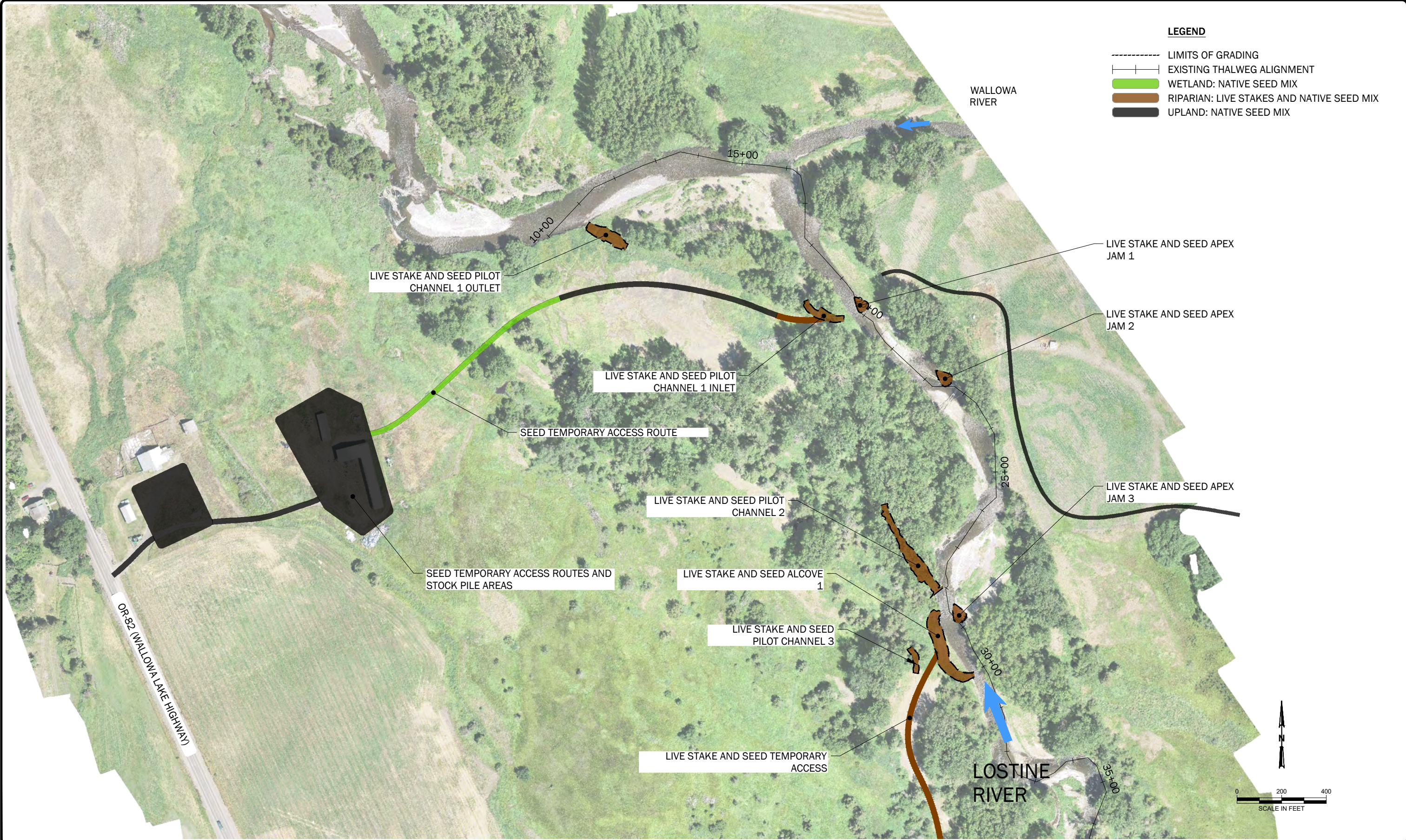
LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

TYPICAL DETAILS

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 22 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	5.4

FINAL DESIGN

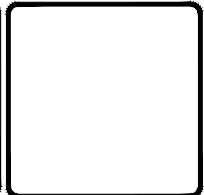
Plotted: 09/18/2020, 10:12 | esmiller P:\0571018\CAD\000\Design\Channel Design\22 Planting Plan.dwg



NO.	DATE	BY	REVISION



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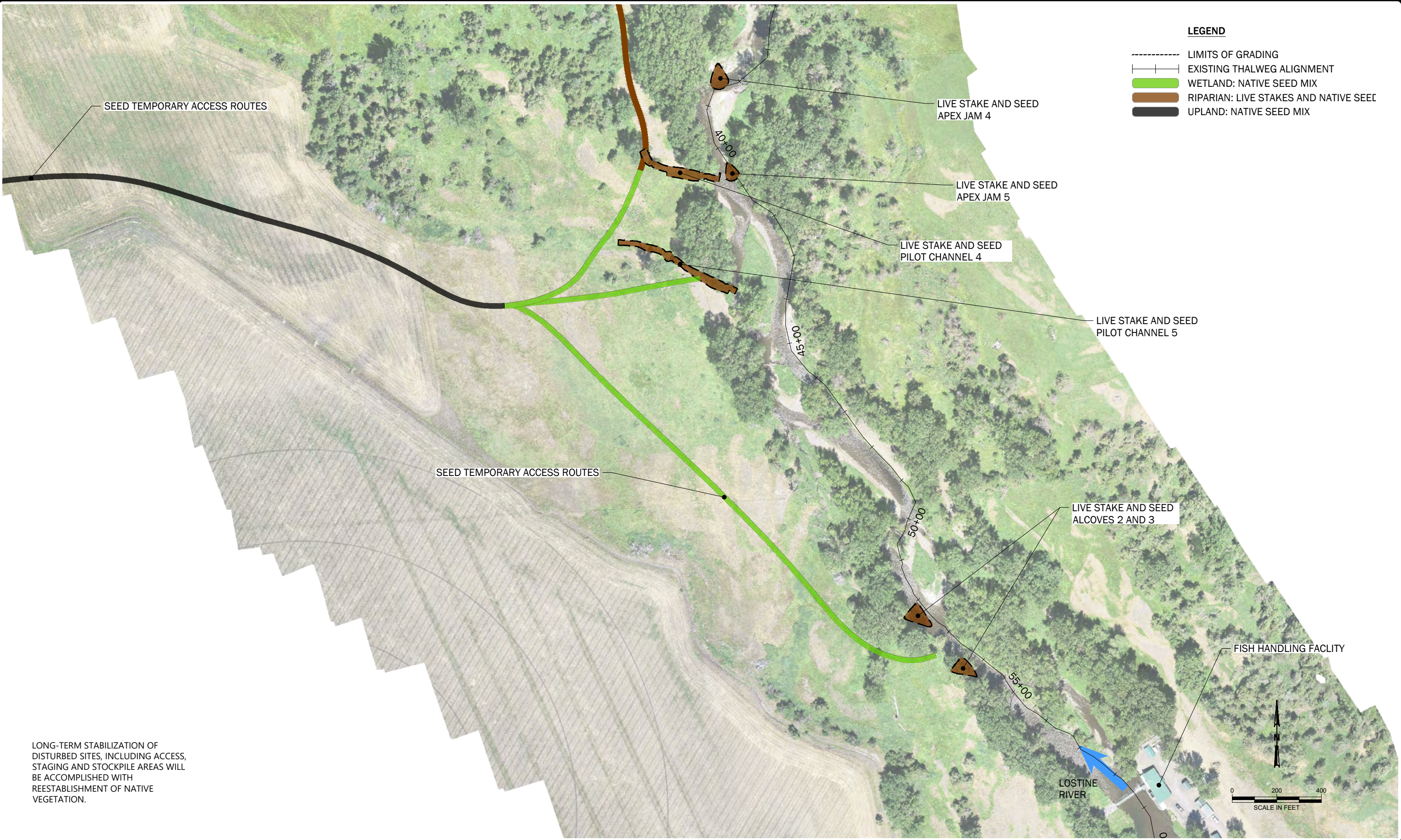
LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

PLANTING PLAN

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 23 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	6.1

FINAL DESIGN

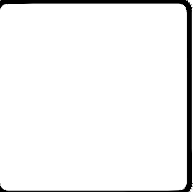
Plotted: 09/18/2020, 10:12 | esmiller P:\00571018\CAD\000\Design\Channel Design\23 Planting Plan.dwg



NO.	DATE	BY	REVISION



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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

PLANTING PLAN

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 24 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	6.2

FINAL DESIGN

Plotted: 09/18/2020, 10:12 | esmiller P:\00571018\CAD\00\Design\Channel Design\24 Planting Plan Notes.dwg

Plantings						
Zone	Common Name	Scientific Name	Type	Size	Spacing	Quantity
Riparian	Drummond Willow ₂	<i>Salix drummondiana</i>	Cutting	4-6 ft.	6 FT O.C.	530
	Coyote Willow ₁	<i>Salix exigua</i>	Cutting	4-6 ft.	6 FT O.C.	530
	Black Cottonwood ₃	<i>Populus trichocarpa</i>	Cutting	4-6 ft.	18 FT O.C.	100
Wetland	Coyote Willow ₁	<i>Salix exigua</i>	Cutting	4-6 ft.	6 FT O.C.	90
	Nebraska Sedge ₁	<i>Carex nebrascensis</i>	plug	10 CU Plug	10 FT O.C.	325

1. SUBSTITUTIONS OK IF APPROVED BY NPT. INSTALL CUTTINGS ABOVE THE 1.01 YEAR WSEL AND BELOW 2 YEAR WSEL. INSTALL CUTTINGS SO STEMS INTERCEPT SHALLOW GROUNDWATER AT LOW-FLOW CONDITIONS.
2. SUBSTITUTIONS OK IF APPROVED BY NPT. INSTALL CUTTINGS BELOW THE 1.01 YEAR WSEL AND TO A DEPTH WHERE STEMS INTERCEPT SHALLOW GROUNDWATER AT LOW-FLOW CONDITIONS.
3. INSTALL CUTTINGS ABOVE THE 2 YEAR WSEL. INSTALL TO A DEPTH WHERE STEMS INTERCEPT SHALLOW GROUNDWATER AT LOW-FLOW CONDITIONS.

Riparian/Wetland Seed Mix	
Common Name	% Mix (by wt.)
Nebraska Sedge	14
Tufted Hairgrass	10
American Sloughgrass	33
Basin Wildrye	43

1. SEED MIX CAN BE SUBSTITUTED BASED ON AVAILABILITY AND APPROVED BY NPT.

-15 LB/ACRE
-2.6 ACRES TO COVER
-39 LB SEED MIX

Upland Seed Mix	
Common Name	% Mix (by wt.)
Orchardgrass	27
Tall Fescue	23
Prennial Ryegrass	27
Meadow Brome	13
White Clover	10

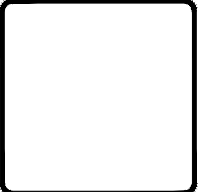
1. SEED MIX CAN BE SUBSTITUTED BASED ON AVAILABILITY AND APPROVED BY NPT.

-12 LB/ACRE
-4.4 ACRES TO COVER
-53 LB SEED MIX

NO.	DATE	BY	REVISION



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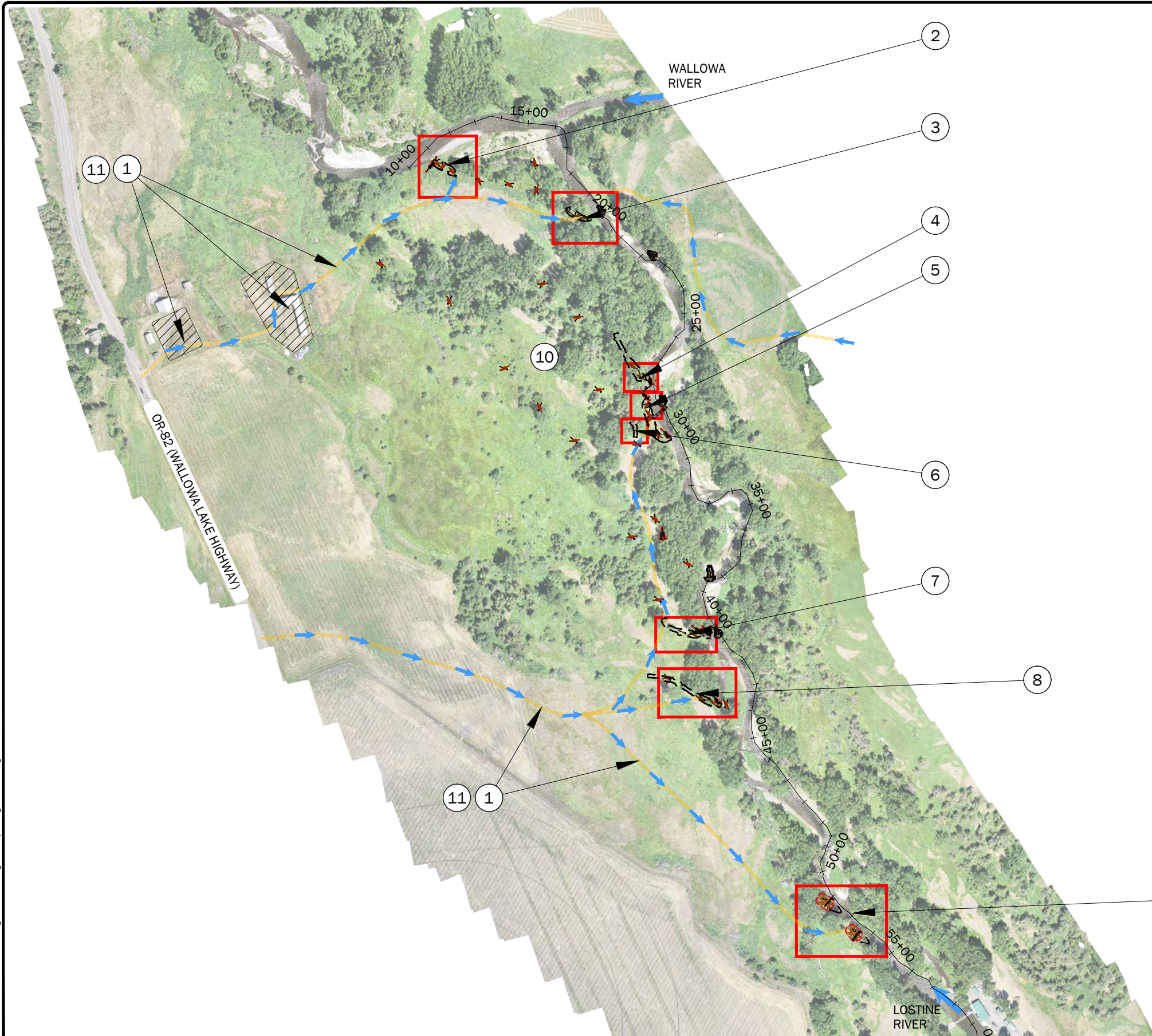
LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

PLANTING PLAN

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 25 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO. 6.3	

FINAL DESIGN

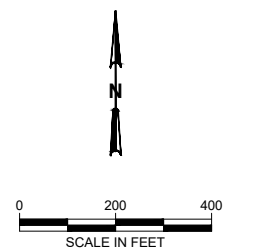
Plotted: 09/18/2020, 10:12 | esmiller P:\00571018\CAD\000\Design\Channel\Design\25 Sequencing Overview.dwg



- ① DEVELOP TEMPORARY STOCKPILE AND STAGING AREAS, AND ACCESS ROUTES. PLACE TESC
- ② GRADE PILOT CHANNEL 1 OUTLET AND PLACE WOOD STRUCTURES, SEE SHEETS 3.3, 7.2
- ③ GRADE PILOT CHANNEL 1 INLET AND PLACE NEARBY WOOD STRUCTURES, INCLUDING FLOODPLAIN WOOD BETWEEN INLET AND OUTLET, SEE SHEETS 3.4, 7.3
- ④ GRADE PILOT CHANNEL 2 INLET AND PLACE NEARBY WOOD STRUCTURES, SEE SHEETS 3.5, 7.4
- ⑤ GRADE ALCOVE 1 AND PLACE NEARBY WOOD STRUCTURES, SEE SHEETS 3.6, 7.5
- ⑥ GRADE PILOT CHANNEL 3 AND PLACE NEARBY WOOD STRUCTURES, SEE SHEETS 3.7, 7.6
- ⑦ GRADE PILOT CHANNEL 4 AND PLACE NEARBY WOOD STRUCTURES, SEE SHEETS 3.8, 7.7
- ⑧ GRADE PILOT CHANNEL 5 AND PLACE NEARBY WOOD STRUCTURES, SEE SHEETS 3.9, 7.8
- ⑨ GRADE ALCOVES 2 AND 3 AND PLACE NEARBY WOOD STRUCTURES, SEE SHEETS 3.10, 7.9
- ⑩ INSTALL FLOODPLAIN WOOD STRUCTURES
- ⑪ REVEGETATE ACCESS ROUTES AND RESTORE STAGING AREAS

NOTES

- CONTRACTOR SHALL HAUL AND DISPOSE OF EXCAVATED MATERIAL OFFSITE



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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

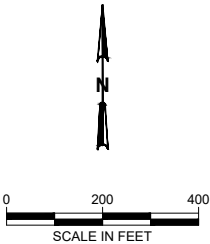
GENERAL SEQUENCING

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 26 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	7.1



SEQUENCING

- ① PLACE TEMPORARY WORK ZONE ISOLATION STRUCTURE ACROSS OUTLET OF PILOT CHANNEL 1, SEE SHEET 5.3
- ② PERFORM FISH SALVAGE WITHIN OUTLET OF PILOT CHANNEL 1
- ③ PLACE PUMP ISOLATION STRUCTURE AND BEGIN DEWATERING WORK ZONE. DEWATERING DISCHARGE IS TO BE ROUTED INTO THE FLOODPLAIN.
- ④ EXCAVATE OUTLET OF PILOT CHANNEL 1, 175 CUBIC YARDS, SEE SHEET 3.3
- ⑤ PLACE WOOD STRUCTURES WITHIN OUTLET OF PILOT CHANNEL 1, SEE 5 SERIES SHEETS
- ⑥ PLACE WOOD STRUCTURES WITHIN FLOODPLAIN, SEE 5 SERIES SHEETS
- ⑦ REMOVE WORK ZONE ISOLATION STRUCTURE AND DEWATERING PUMPS.
- ⑧ REVEGETATE DISTURBED AREAS, SEE 6 SERIES SHEETS



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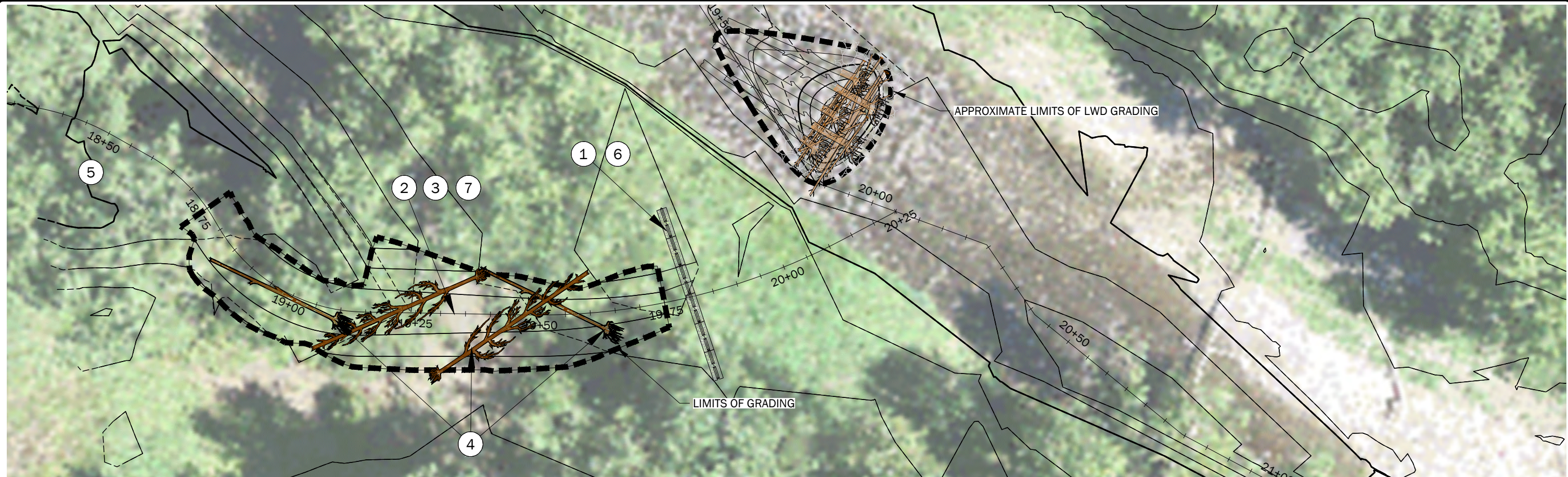
LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

SEQUENCING - PILOT CHANNEL 1 OUTLET

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 27 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	7.2

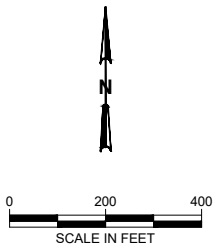
Plotted: 09/18/2020, 10:13 | esmiller P:\0571\018\CAD\00\Design\Channel Design\25 Sequencing.dwg

FINAL DESIGN



SEQUENCING

- 1 IF INLET IS INUNDATED, PLACE TEMPORARY WORK ZONE ISOLATION STRUCTURE ACROSS INLET OF PILOT CHANNEL 1, SEE SHEET 5.3
- 2 IF INUNDATED, PERFORM FISH SALVAGE WITHIN INLET OF PILOT CHANNEL 1
- 3 EXCAVATE INLET OF PILOT CHANNEL 1, 46 CUBIC YARDS, SEE SHEET 3.4
- 4 PLACE WOOD STRUCTURES WITHIN INLET OF PILOT CHANNEL 1, SEE 5 SERIES SHEETS
- 5 PLACE WOOD STRUCTURES WITHIN FLOODPLAIN BETWEEN INLET AND OUTLET, SEE 5 SERIES SHEETS
- 6 REMOVE WORK ZONE ISOLATION STRUCTURE
- 7 REVEGETATE DISTURBED AREAS, SEE 6 SERIES SHEETS

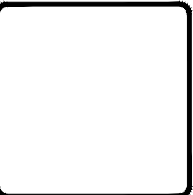


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NO.	DATE	BY	REVISION



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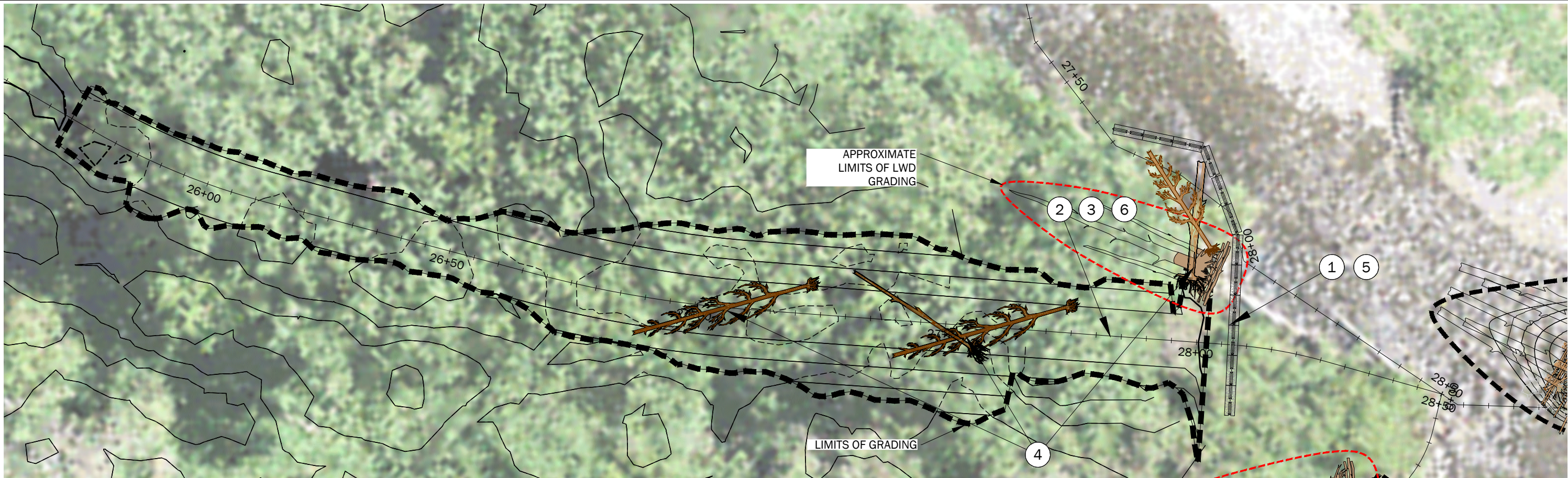
LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

SEQUENCING - PILOT CHANNEL 1 INLET

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 28 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	7.3

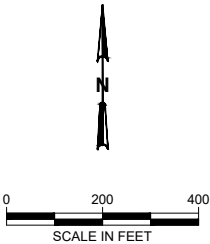
FINAL DESIGN

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SEQUENCING

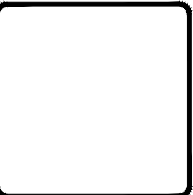
- 1 IF INLET IS INUNDATED, PLACE TEMPORARY WORK ZONE ISOLATION STRUCTURE ACROSS INLET OF PILOT CHANNEL 2, SEE SHEET 5.3
- 2 IF INUNDATED, PERFORM FISH SALVAGE WITHIN INLET OF PILOT CHANNEL 2
- 3 EXCAVATE INLET OF PILOT CHANNEL 2, 197 CUBIC YARDS, SEE SHEET 3.4
- 4 PLACE WOOD STRUCTURES WITHIN INLET OF PILOT CHANNEL 2, SEE 5 SERIES SHEETS
- 5 REMOVE WORK ZONE ISOLATION STRUCTURE
- 6 REVEGETATE DISTURBED AREAS, SEE 6 SERIES SHEETS



NO.	DATE	BY	REVISION



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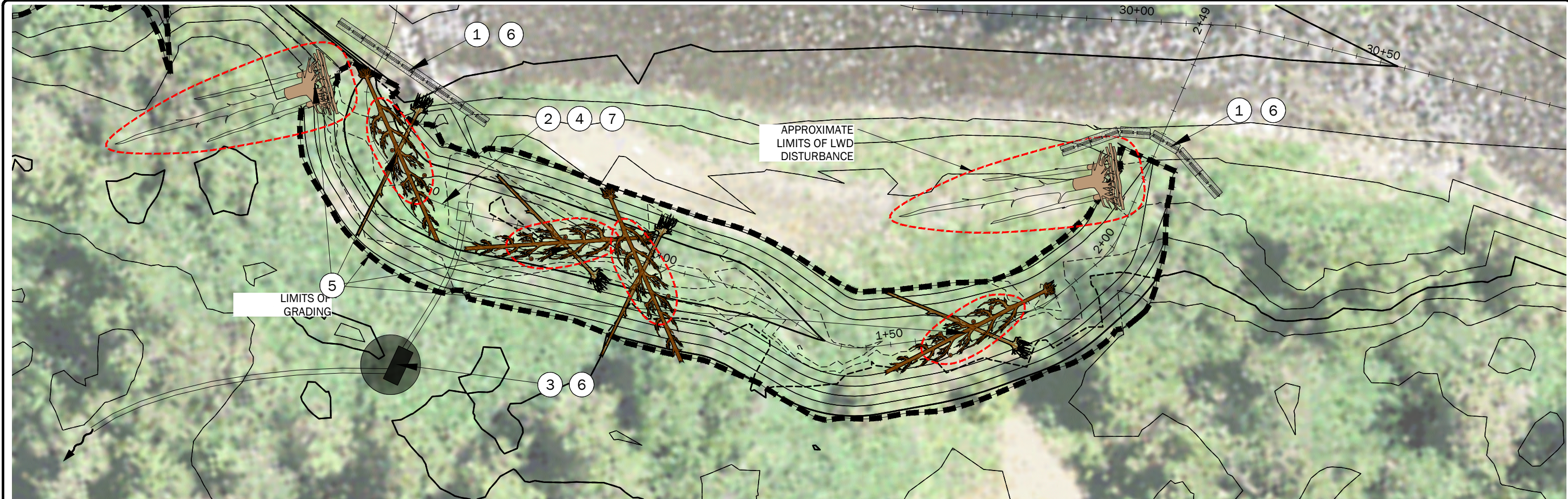


LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

SEQUENCING - PILOT CHANNEL 2 INLET

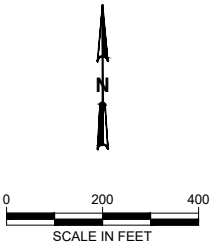
DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 29 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	7.4

FINAL DESIGN



SEQUENCING

- 1
- PLACE TEMPORARY WORK ZONE ISOLATION STRUCTURES ACROSS INLET AND OUTLET OF ALCOVE 1, SEE SHEET 5.3
- 2
- PERFORM FISH SALVAGE WITHIN OUTLET OF ALCOVE 1
- 3
- PLACE PUMP ISOLATION STRUCTURE AND BEGIN DEWATERING WORK ZONE. DEWATERING DISCHARGE IS TO BE ROUTED INTO THE FLOODPLAIN.
- 4
- EXCAVATE ALCOVE 1, 375 CUBIC YARDS, SEE SHEET 3.3
- 5
- PLACE WOOD STRUCTURES WITHIN ALCOVE 1, SEE 5 SERIES SHEETS
- 6
- REMOVE WORK ZONE ISOLATION STRUCTURE AND DEWATERING PUMPS.
- 7
- REVEGETATE DISTURBED AREAS, SEE 6 SERIES SHEETS

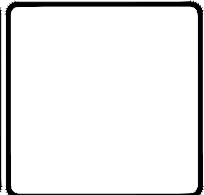


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NO.	DATE	BY	REVISION



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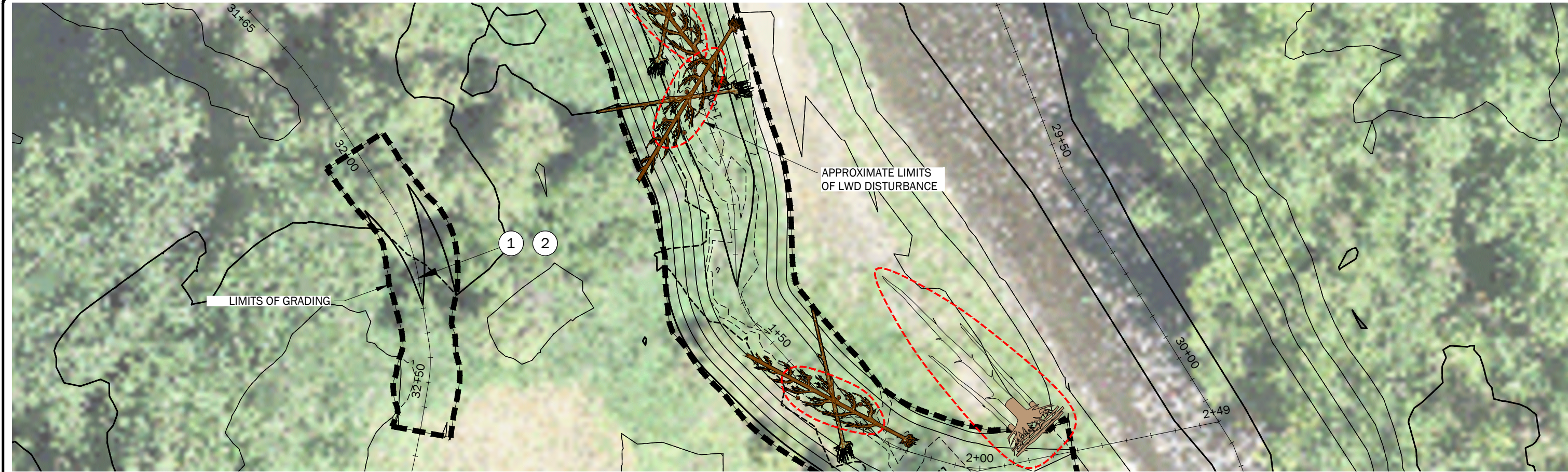


LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

SEQUENCING - ALCOVE 1

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 30 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	7.5

FINAL DESIGN

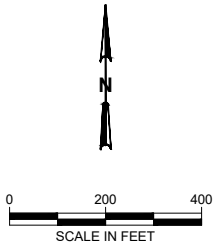


SEQUENCING

- 1

EXCAVATE OUTLET OF PILOT CHANNEL
3, 3 CUBIC YARDS CUT, 3 CUBIC YARDS
FILL, SEE SHEET 3.7
- 2

REVEGETATE DISTURBED AREAS, SEE 6
SERIES SHEETS

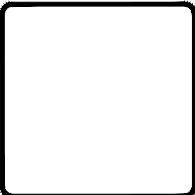


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NO.	DATE	BY	REVISION



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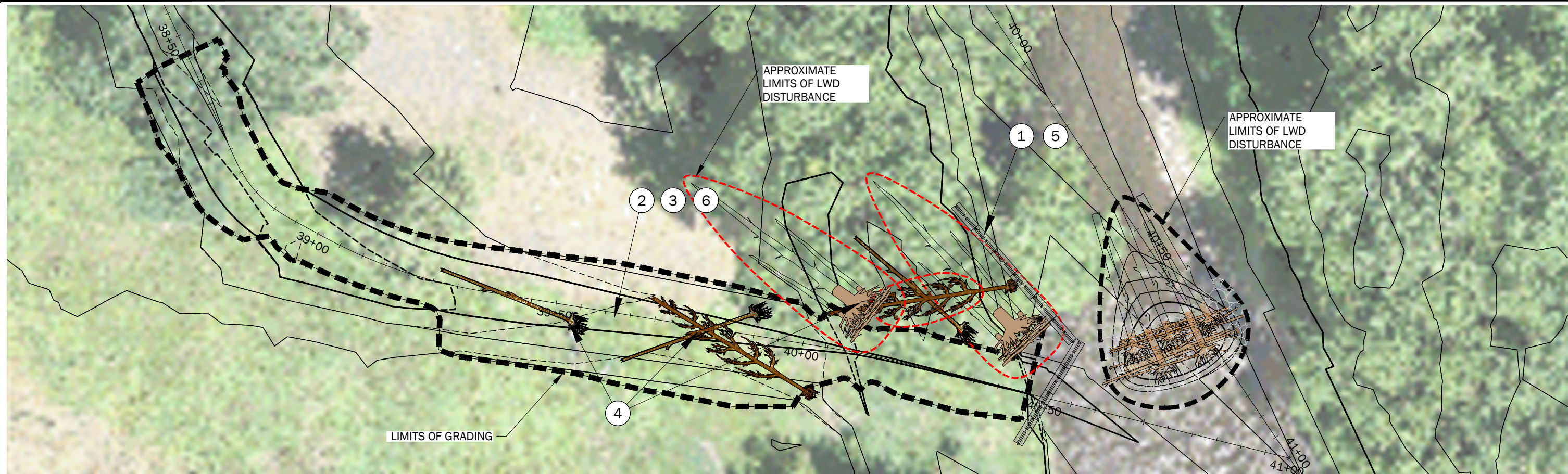
LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

SEQUENCING - PILOT CHANNEL 3

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 31 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	7.6

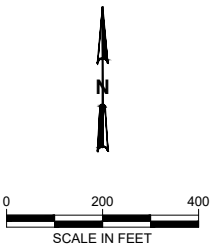
FINAL DESIGN

Plotted: 09/18/2020, 10:14 | esmiller P:\00571018\CAD\000\Design\Channel Design\32.7.7 Sequencing - Pilot Channel 4.dwg



SEQUENCING

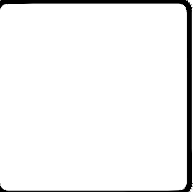
- 1 PLACE TEMPORARY WORK ZONE ISOLATION STRUCTURE ACROSS INLET OF PILOT CHANNEL 4, SEE SHEET 5.3
- 2 PERFORM FISH SALVAGE WITHIN INLET OF PILOT CHANNEL 4
- 3 EXCAVATE INLET OF PILOT CHANNEL 4, 70 CUBIC YARDS, SEE SHEET 3.8
- 4 PLACE WOOD STRUCTURES WITHIN FLOODPLAIN, SEE 5 SERIES SHEETS
- 5 REMOVE WORK ZONE ISOLATION STRUCTURE
- 6 REVEGETATE DISTURBED AREAS, SEE 6 SERIES SHEETS



NO.	DATE	BY	REVISION



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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

SEQUENCING - PILOT CHANNEL 4

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 32 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	7.7

FINAL DESIGN

Plotted: 09/18/2020, 10:14 | esmiller P:\00571018\CAD\000\Design\Channel Design\33 7.8 Sequencing - Pilot Channel 5.dwg

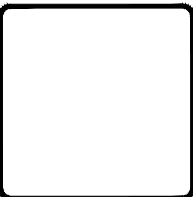


- 1 PLACE TEMPORARY WORK ZONE ISOLATION STRUCTURE ACROSS INLET OF PILOT CHANNEL 5 IF INUNDATED, SEE SHEET 5.3
- 2 PERFORM FISH SALVAGE WITHIN INLET OF PILOT CHANNEL 5 IF INUNDATED
- 3 EXCAVATE INLET OF PILOT CHANNEL 5, 88 CUBIC YARDS, SEE SHEETS 3.9, 7.8
- 4 PLACE WOOD STRUCTURES WITHIN FLOODPLAIN, SEE 5 SERIES SHEETS
- 5 REMOVE WORK ZONE ISOLATION STRUCTURE
- 6 REVEGETATE DISTURBED AREAS, SEE 6 SERIES SHEETS

NO.	DATE	BY	REVISION



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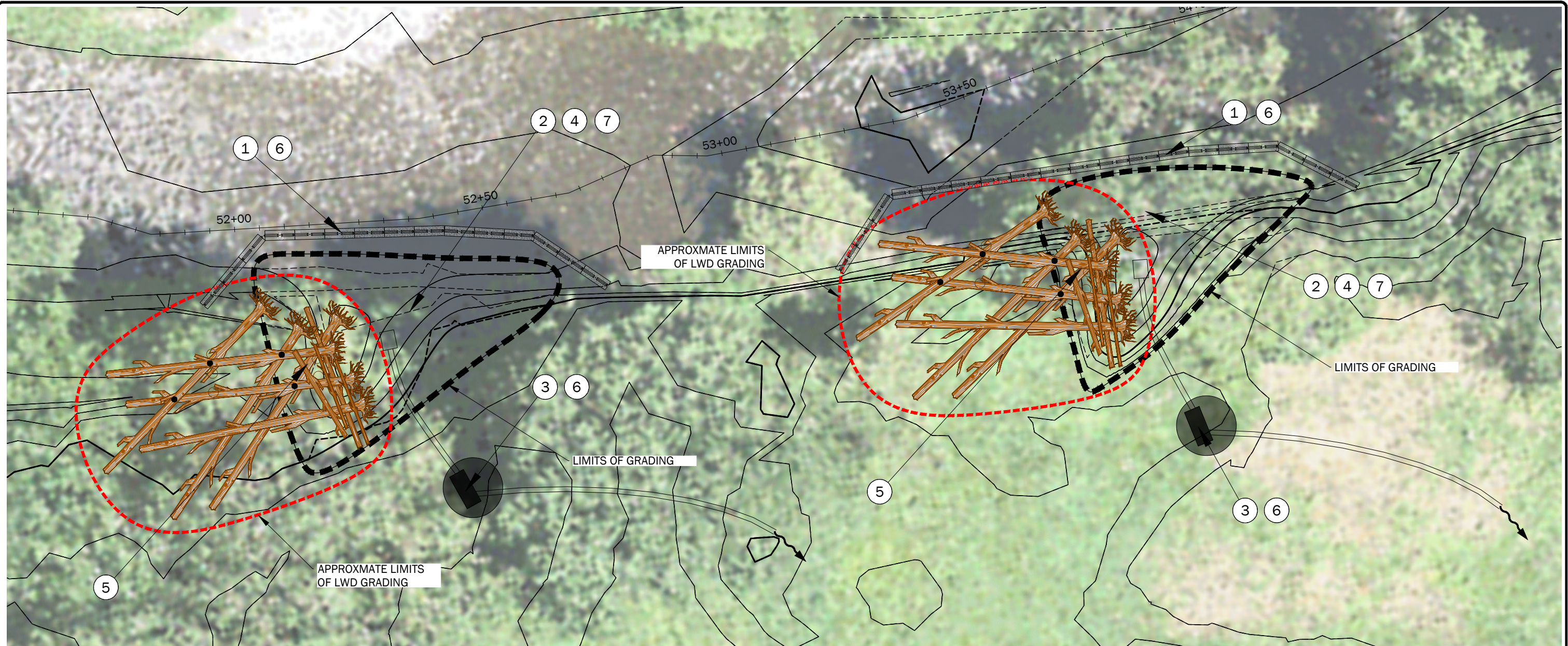


LOSTINE WETLAND AND SIDE CHANNEL COMPLEX WALLOWA, OREGON	
SEQUENCING - PILOT CHANNEL 5	

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 33 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	7.8

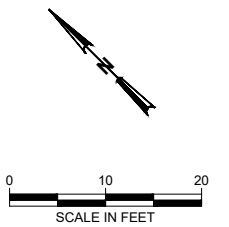
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Plotted: 09/18/2020, 10:14 | esmiller P:\0571018\CAD\000\Design\Channel Design\34 7.9 Sequencing - Alcoves 2 and 3.dwg



SEQUENCING

- | | | | |
|---|--|---|--|
| ① | PLACE TEMPORARY WORK ZONE ISOLATION STRUCTURES ACROSS ALCOVE 2, SEE SHEET 5.3 | ⑥ | REMOVE WORK ZONE ISOLATION STRUCTURE AND DEWATERING PUMPS. |
| ② | PERFORM FISH SALVAGE WITHIN WORK ZONE | ⑦ | REVEGETATE DISTURBED AREAS, SEE 6 SERIES SHEETS |
| ③ | PLACE PUMP ISOLATION STRUCTURE AND BEGIN DEWATERING WORK ZONE. DEWATERING DISCHARGE IS TO BE ROUTED ONTO THE FLOODPLAIN. | ⑧ | APPLY SAME SEQUENCING TO ALCOVE 3 |
| ④ | EXCAVATE ALCOVE 2, 56 CUBIC YARDS, SEE SHEET 3.10 | | |
| ⑤ | PLACE WOOD STRUCTURES WITHIN ALCOVE 2, SEE 5 SERIES SHEETS | | |



NO.	DATE	BY	REVISION



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LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

SEQUENCING - ALCOVES 2 AND 3

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 34 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO.	

7.9

Plotted: 09/18/2020, 10:14 | esmiller P:\00571018\CAD\000\Design\Channel Design\35 8.1 General Conservation Measures.dwg

HIP 4 GENERAL AQUATIC CONSERVATION MEASURES APPLICABLE TO ALL ACTIONS

THE ACTIVITIES COVERED UNDER THE HIP III ARE INTENDED TO PROTECT AND RESTORE FISH AND WILDLIFE HABITAT WITH LONG-TERM BENEFITS TO ESA-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.

6) 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 OF 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 OF WATER OR A STREAM CHANNEL AND WILL BE APPLIED SO AS TO MINIMIZE THE LIKELIHOOD THAT THEY WILL ENTER STREAMS. APPLICATIONS OF LIGNINSULFONATE WILL BE LIMITED TO A MAXIMUM RATE OF 0.5 GALLONS PER SQUARE YARD OF ROAD SURFACE, ASSUMING A 50:50 (LIGNINSULFONATE TO WATER) SOLUTION.

C) APPLICATION OF 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 OF THE DUST ABATEMENT MATERIALS TO A 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 OF 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 ESA-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 TARPULIN, 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.

NO.	DATE	BY	REVISION



3501 WEST ELDER ST : BOISE, ID 83705 : 208-433-8098 : WWW.GEOENGINEERS.COM

LOSTINE WETLAND AND SIDE CHANNEL COMPLEX
WALLOWA, OREGON

GENERAL CONSERVATION MEASURES

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 35 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO. 8.1	

FINAL DESIGN

Plotted: 09/18/2020, 10:14 | esmiller P:\00571018\CAD\000\Design\Channel Design\36 8.2 General Conservation Measures.dwg

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 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:

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.

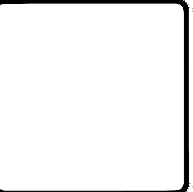
C) ALL CONSTRUCTION DISCHARGE WATER WILL BE COLLECTED AND TREATED USING THE BEST AVAILABLE TECHNOLOGY APPLICABLE TO SITE CONDITIONS.

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

NO.	DATE	BY	REVISION



3501 WEST ELDER ST : BOISE, ID 83705 : 208-433-8098 : WWW.GEOENGINEERS.COM



LOSTINE WETLAND AND SIDE CHANNEL COMPLEX WALLOWA, OREGON	
GENERAL CONSERVATION MEASURES	

DRAWN: ESM	PROJ NO: 0571-018-00
DESIGN: ESM	SHEET 36 OF 36
CHECKED: RSC	DATE: 09-18-2020
SHEET NO. 8.2	

FINAL DESIGN