BEAVER SLOUGH
DRAINAGE DISTRICT

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Bryan Gillooly
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RE: Winter Lake Phase III System Restoration and Maintenance Permit Application

Dear, Tyler and Bryan,

The Beaver Slough Drainage District (BSDD) is pleased to submit the Winter Lake Phase III system restoration and maintenance permit application on behalf of our landowners. This project is designed to substantively enhance hydrologic/ecologic function for wetlands, fish and wildlife, as well as improve working lands opportunities for our agricultural operations in the Winter Lake area into the future. Project design and development has been a collaborative effort between BSDD, Coos Soil & Water Conservation District Manager (CoosSWCD), and Oregon Department of Fish and Wildlife (ODFW).

The project objective is to balance landowner's desires for ecological uplift, habitat enhancement, and agricultural production in a mutually beneficial framework. We will create an interior channel network with appropriate water control structures that mimic a natural channel network to the fullest extent possible which will maximize connectivity and the necessary volumes of water that can be moved across the landscape. Expanded system reservoir capacity is needed to take full advantage of the BSDD main tide gates at the Coquille River, maximize fish passage opportunities, enhance fish/wildlife habitat, improve water quality, and provide drainage/irrigation for agricultural enterprises. Project implementation will allow the entire system to function at its full design capability.

Proposed changes to the channel networks will include:

> *1). Installing new/reconstructed channels with bank sloping rather than vertical wall banks, which reduces cattle hoof action effects, resulting in sedimentation of channels and allows greater vegetative recovery.*
> *2). Reconstructed/new channels will be constructed on grade. This provides a direct gravity driven pathway for sediments to export properly.*

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3). Culvert pipes will be replaced with sufficiently sized pipes to facilitate water movement that can accommodate tidal and flood pulse water volumes.
4). Culverts will be placed at appropriate elevations in order to accommodate channel invert grade sloping, fish use, and water/sediment transport.

The Coos SWCD and ODFW have completed the bulk of permit preparation and layout design planning for the project (in alignment with Oregon DSL wetlands rules, NMFS Tidal Area Restoration Programmatic, and USACE environmental criteria). The BSDD is confident that proposed design/layout as noted in the permit will exceed protective and ecological minimums for permitting of the project.

This is a complex system with various interrelated components and objectives which require a balance of active system management to achieve stakeholder goals to the greatest extent possible. Ongoing management of the completed project will be included in the adaptive management plan (AMP) that will both monitor performance with regard to the District Water Management Plan, as well as provide for necessary system adjustments over time. A key component for the AMP is to allow for maintenance as needed to ensure the system functions at full design capability. As designed, the system is expected to be self-maintaining. However, berm slumps, nutria damage, unexpected sediment accumulation, and vegetation issues need to be addressed in a timely manner in order to maintain habitat values, maximize system efficiency, and control operating costs.

The effectiveness of the entire system to achieve stakeholder (Landowner, Regulatory Agencies, Funders, and the Public Interest) goals and objectives is dependent on having consistent and ongoing capacity and operational capability to move water across the landscape throughout the entire year.

BSDD suggests the following framework for system operation and maintenance:

Channel Excavation & Maintenance Framework

1) The adaptive management process in concert with the District Water Management Plan provide the structure and oversight to operate and maintain the system perpetually.
2) Maintenance excavation is allowable to keep the channel network and capacity to design specifications and to maintain water quality and fish passage.
3) Excavated material would be thin spread (< 3.0 inches) as a component of an agricultural practice or removed to an upland location.
4) BSDD would be responsible for direct operational oversight of system maintenance activities within the following parameters.

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a. Individual landowner maintenance plans would be included in and support the BSDD annual maintenance plan.
b. Maintenance plans will include a location map, activity description, and a volume estimate.
c. The BSDD annual maintenance plan would be submitted to USACE and DSL no later than June 15 of the current year for review.
d. All work will be performed in the July 1 to September 15 work window.
e. All work will be performed within USACE/DSL/Tarp BMPs
f. In water work will be performed in a manner to minimize water flow and turbidity.
g. Emergency work will be carefully performed within existing parameters.
h. A qualified fisheries biologist will review the annual plan and provide necessary oversight.
i. BSDD will provide a post season maintenance activity report by the end of each calendar year.

We look forward to working with you to successfully complete the permitting process for this project.

Regards,

Fred R. Messerle

Beaver Slough Drainage District
District Manager
541.404.6105
bsdd.bos@gmail.com

Joint Permit Application

This is a joint application, and must be sent to all agencies (Corps, DSL, and DEQ). Alternative forms of permit applications may be acceptable; contact the Corps and DSL for more information.

Date Stamp

U.S. Army Corps of Engineers Portland District	Oregon Department of State Lands	Oregon Department of Environmental Quality
Action ID Number	Number	

(1) TYPE OF PERMIT(S) IF KNOWN (check all that apply)

Corps: ☐ Individual ☐ Nationwide No.: ________ ☐ Regional General Permit ________ ☐ Other (specify): ______

DSL: ☐ Individual ☐ GP Trans ☐ GP Min Wet ☐ GP Maint Dredge ☐ GP Ocean Energy ☐ No Permit ☐ Waiver

(2) APPLICANT AND LANDOWNER CONTACT INFORMATION

	Applicant	Property Owners (if different)	Authorized Agent (if applicable) ☑ Consultant ☐ Contractor
Name (Required)	Beaver Slough Drainage District Manager: Fred Messerle	Fred Messerle & Sons, Inc. Bridges Foundation (Luke Fitzpatrick Everett-Ona Isenhart ranch, Inc. Laura Isenhart	Fred Messerle
Business Name	Beaver Slough Drainage District		Beaver Slough Drainage District
Mailing Address 1	60196 Old Wagon Rd.		60196 Old Wagon Rd.
City, State, Zip	Coos Bay, OR 97420		Coos Bay, OR 97420
Business Phone	541-404-6105		541-396-6879
Cell Phone			971-645-6634
Fax			541-824-0356
email	bsddbos@gmail.com		info@coosswcd.org

(3) PROJECT INFORMATION

A. Provide the project location.

Project Name	Latitude & Longitude*
Winter Lake Phase III	43.198183° -124.245289°

Project Address / Location	City (nearest)	County
	Coquille	Coos

Township	Range	Section	Quarter / Quarter	Tax Lot
27	13W	20		1503
27	13W	27		400
27	13W	27		500
27	13W	28		400
27	13W	28		600
27	13W	28		700
27	13W	29		101
27	13W	29		103
27	13W	33		100
27	13W	33		200
27	13W	34		800

Brief Directions to the Site:

The Winter Lake Phase III project action area is located on private and state-owned floodplain pastures within the Beaver Slough Drainage District (BSDD and Coaledo Drainage Districts (CDD) wetlands to the South of North Bank Lane/Hwy 42 and west of Coquille, OR, on the historic China Camp and Beaver Creek floodplain (***Attachment A: Figures and Photos, Figures 1-4***).

B. What types of waterbodies or wetlands are present in your project area? (Check all that apply.)

☒ River / Stream	☐ Non-Tidal Wetland	☐ Lake / Reservoir / Pond
☒ Estuary or Tidal Wetland	☐ Other	☐ Pacific Ocean

Waterbody or Wetland Name**	River Mile	6th Field HUC Name	6th Field HUC (12 digits)
China Camp Creek and tributaries (Winter Lake)	21	Beaver Slough	171003050603

* In decimal format (e.g., 44.9399, -123.0283)
** If there is no official name for the wetland or waterbody, create a unique name (such as "Wetland 1" or "Tributary A").

C. Indicate the project category. (Check all that apply.)

☐ Commercial Development	☐ Industrial Development	☐ Residential Development
☐ Institutional Development	☑ Agricultural	☐ Recreational
☐ Transportation	☑ Restoration	☑ Bridge
☐ Dredging	☐ Utility lines	☐ Survey or Sampling
☑ In- or Over-Water Structure	☐ Maintenance	☐ Other:

(4) PROJECT DESCRIPTION

A. Summarize the overall project including work in areas both in and outside of waters or wetlands.

INTRODUCTION /OVERALL PROJECT DESCRIPTION:
Historically, the Coquille River valley floor contained extensive freshwater tidal wetlands, tidal channels, and non-tidal wetland habitats that are estimated to have once comprised over 12,000+ acres of prime fish and wildlife habitat (Benner 1992). Native salmonids, specifically coho juveniles, used these habitats heavily during fall/winter/spring months to feed and rear prior to smoltification. A significant percentage of those habitats were cleared, leveed, tidegated, and drained for agriculture in the late 19th - early 20th century, thereby substantially altering the land from its natural state as a freshwater tidal wetland complex into drained pasture used seasonally to year round for grazing and hay production.

The "Winter Lake" floodplain area south of North Bank Lane/Hwy 42S, and west of Coquille, OR, at over 1,806 acres, represents one of the largest contiguous land areas in the lower Coquille Basin with high potential for Oregon Coast (OC) coho overwinter habitat and high-quality pasture production. Approximately 1,295 acres within the Beaver Slough Drainage District (BSDD) are below elevation 8.0ft NAVDD 88, and thus below the highest measured tides. The project-area is upstream of saline influence at River Mile (RM) 21.5 in the Coquille estuary (***Attachment A, Figure 2***). All figures and photos referenced within this permit text can be found within ***Attachment A: Figures and Photos.*** The Beaver Slough Drainage District (BSDD) was formed in 1906-1907 and this collaboration provided the framework for initiating converting the forested tidal floodplain at the project area, which prior to agricultural development and installation of the linear canals and tidegates in 1908-1909, the lands were forested and contained a dense tidal channel network (Benner 1992). The Coaledo Drainage District (CDD) was formed thereafter and installation of a tidegate on Beaver Creek in the "Winter Lake" area west of the BSDD allowed for drainage of pastures on the west side of Beaver Creek.

From 2010 to 2017 the BSDD, Oregon Department of Fish and Wildlife (ODFW), and The Nature

Conservancy (TNC) developed restoration actions for a portion of lands within the BSDD. The plans focused on two projects (Phase I and II) within three management Units (***Attachment A*, *Figure 5-6***) of the BSDD. The "Winter Lake Phase I," project installed seven new tidegates to replace the previously existing undersized and top-hinged gates that had obstructed fish movements. Four 8.0ft corrugated metal culverts (CMP's) installed in the early 1990's were replaced with seven 10.0x8.0ft concrete box culverts at the interface of the BSDD floodplain with the Coquille River. Slide-gate style and side-hinged aluminum tidegates (***Attachment A, Figure 7-8***) were installed to provide a dual controllability. The Vertical Slideframe Style Tidegates (VSFTG) network is configured with both manual and remote access control. The new tidegates have the capacity to be operated with Muted Tidal Regulator (MTR) technology, whereby the tidegates can be opened to allow for tidal inflow to a desired set level, computer controlled, and linked to river/tidal level feedback. The new gates have increased the capacity for water movement into and out of the 1,700-acre BSDD by 300%.

Unit 2 lands are owned by the China Camp Gun Club and ODFW and account for 407 acres of the BSDD. The China Camp Gun Club lands are managed for summer pasture grazing and recreational duck hunting during winter months. The ODFW lands comprise 286 acres (northern portion of Unit 2) with the Gun Club accounting for the remaining 121 acres that extend south to the C3P tidegate in Unit 2. In 2018 the Unit 2 restoration project or "Winter Lake Phase II" was implemented and a total of 31,000ft of tidal channel were excavated as designed by Tetratech Engineering staff through coordination with ODFW and the BSDD in the 407 acres of Unit 2 (***Attachment A, Figure 9***). The main tidal channel upstream of the C3P tidegates in Unit 2 was designed with capacity that exceeds the four concrete box culverts and tidegates. This has allowed for full ability to serve water from the C3P tidegates to Unit 2 lands and provide juvenile coho and other native fish passage into the site as well as provide for pasture irrigation into Units 1 and 3 at appropriate elevations that tidal inflow will reach.

The Winter Lake C3P tidegate construction (Phase I) and tidal channel restoration in Unit 2 (Phase II) resolved hydrologic restriction that existed prior to the projects and is currently allowing for water management strategies that are designed to more closely mimic historical conditions in Unit 2. Hydrologic connectivity in Unit 2 is considered fully adequate following restoration in 2017-2018. The proposed Phase III project does not include any actions within Unit 2. However, interior culverts/channel networks within Units 1 and 3 (**Figures 5,6**) remained unchanged following completion of Phase I and II. These remaining 1,399 acres in Units 1 and 3 and CDD pastures (1,806 minus Unit 2) of Winter Lake, which have had no internal restorative actions to date upstream of C3P, suffer from rampant hydrologic discontinuity across the land area. The main drainage canals in Winter Lake were aligned East/West and North/South (***Attachment A, Figure 10***) rather than based on land elevations or natural flow paths. Overall these main canals are sufficient in capacity to provide proper hydrology for the new concrete box culvers and tidegates for Units 1 and 3. However, the interior pasture drainage channels were installed historically largely on property lines, pasture boundaries, and without concern for "microtopography."

The proposed "Winter Lake Phase III" project has been developed by a team of partners including Coos Soil and Water Conservation District (Coos SWCD), the ODFW, and the BSDD. The project is designed as both ecological restoration and agricultural improvement to complement the BSDD C3P tidegate replacement project completed in 2017 (Winter Lake Phase I) and the 2018 installation of 31,000 ft of restored natural tidal channel which was completed in Unit 2 (Winter Lake Phase II). The Phase III Project Proposal seeks to address hydrologic connectivity within BSDD Units 1 and 3 (1,700 acres) and two pastures, which are 62 and 44 acres respectively, in the Coaledo Drainage District (CDD) (***Attachment A, Figure 5***).

Winter Lake Units 1 and 3 have high inherent potential for fish production; however, their current hydrologic disconnection yields:

- **a).** Poor access for fish from existing canals into floodplains which are rich in macroinvertebrate food items when flooded; resultantly, there is limited potential for fish use of the floodplain for foraging.
- **b).** Few or no channels present across large portions of the floodplain land area to provide refugia for native fishes when floodwaters periodically recede, which results in high potential for mortality due to predation and stranding.
- **c).** Poor capacity for landowning ranchers to move irrigation water from the canals into pastures during summer months.

Winter Lake Phase III specifically proposes to replace 42 existing undersized culverts and associated old style top-hinged tidegates with 38 new culverts and redesigned channels. The project actions are anticipated to maximize hydrologic connectivity in order to achieve a balance of fish/wildlife and agricultural (pasture) production.

NOTE: *Irrigation has been used by ranchers within the BSDD consistently over the past 100+ years through opening of the tidegates and allowing tidal inflow into pastures on high tide cycles. The new C3P tidegates installed in 2017, greatly enhanced irrigation inflow potential at the main tidegate network. Native fish have adapted to both tidal and floodwater inflow regimes. BSDD irrigation tactics utilize tidal inflow, which is a natural hydrologic pattern within native fish adaptive capacity. Native fish have used inherent adaptive genetic traits to react to tidal/floodwater cues that allow movement into floodplain habitats and retreat to channels following relatively short (6hr tidal cycles) inundation periods. Irrigation is implemented from mid-June to mid- September generally for the individual pastures over one or two days monthly. Coho juveniles are smolted and entering the ocean prior to the summer irrigation period. Salmonids including zero age coho are essentially absent from the BSDD canals and the mainstem Coquille River other than localized thermal refugia during summer months as canal and river temperatures have been measured as high as 80°F and 76° respectively. Resultantly, irrigation utilizing tidal inflow during summer is considered comparable with the natural life-history of native fish that are present. Additionally, native salmonid fishes are not likely to be present in high abundance during the months when irrigation is implemented within Units 1 and 3.*

PROPOSED PROJECT ACTIONS: *ALL ASSOCIATED WORK BOTH WITHIN AND OUTSIDE OF WATERS/WETLANDS AND TOTAL GROUND DISTURBANCE*

There are no active streams generated or moving through the active work areas on project site.
Note: *The lands within the project area were Shrub/Scrub and Forested wetland historically with tidal inflow/outflow. The Phase III project is designed to provide a substantial net benefit increase in wetland function over current condition that fully offsets the impacts of work. The site is anticipated to be for the most part dry during the work period although there will be water in existing historical channels. Some non-salmonid fish may be present in low lying areas during construction although no coho or other salmonids will likely be present in channels and ponded water in pastures during July 1 to September 15th as the temperatures are known to exceed thermal lethal limits during summer months in these habitats.*

1. Installation of New HDPE Culverts

We will be replacing 38 individual culverts in Units 1 and 3, (see ***Attachment B "Project Actions," Sheet 1, pg. 16***) that connect pasture floodplain channels with canals. New culverts will be primarily HDPE materials as this material provides for maximized life expectancy in tideland soils (with possibility of installation of three Corrugated Metal Pipes). The interior pasture channel network culverts currently are substantively undersized, and the new culverts have been sized to accommodate appropriate inflow/outflow. This ***"Winter Lake Hydrologic Assessment"*** is located in ***Attachment C***. Sizing was based on:

a). The volumetric inflow/outflow capacity of the C3P project and previous ODFW and NMFS approvals for fish passage.

b). The precipitation hydrology for the "micro-watershed" pasture areas specifically associated with the individual culverts (Figure 12).

c). Culvert hydraulic capacity for a given culvert size, which was then paired to a, and b.

The overall BSDD Water Management Plan (DWMP) guides inflow/outflow into Units 1 and 3 through the C3P tidegate. This DWMP plan has substantive effects on the methodology for the hydrology within Units 1 and 3, which is fully discussed in the "*Winter Lake Phase III Hydrologic Assessment."* The **DWMP and Winter Lake Phase III Hydrologic Assessment** are located within ***Attachment C.***

2. Installation of New Water Control Mechanisms

We will install two styles of water control mechanisms on the on the new HDPE pasture channel and canal connection culverts that provide for a higher degree of control over previously used top-hinged wooden and flapper tidegates. These new structures will allow for an open culvert strategy during late fall and winter months maximizing fish access to pasture channels and floodplain habitats and they will provide for individual pasture irrigation tactics during summer months.

Water control structures that will be used shall consist of two styles (specific style based on individual site and landowner needs):

a). Side-hinged aluminum tidegates (***Attachment A, Figure 13***) with an additional arm that can be set in a manner for the tidegate to be managed fully open or closed as is the water management strategy.

b). Aluminum slide-gates (***Attachment A, Figure 14***) on adjustable worm drive hand wheel operated shafts that allow for incremental degrees of door openness.

c). The BSDD and ODFW are in the process of developing a third louvered water control structure and seek the approval to install a single site as a prototype for testing.

3. Install New Bridge:

One new free-spanning 60ft railcar that is channel spanning (***"Winter Lake Phase III Project Actions" in Attachment B; Figures 15-18***) will be installed over the S.E. portion of the Unit 1 main canal (see ***Attachment A, Figure 15, 16*** for location of bridge). This bridge provides the landowner livestock management access point into the Messerle property from Hwy 42 ~1.0 miles west of the City of Coquille. This bridge will have appropriate approach sloping so as to minimize erosion. Riprap will be installed on banks to prevent inflow/outflow scour. The earthen streambanks provides the channel form and the location is generally low-energy hydrology, with the site subject to slow rising tidal inflow and outflow. Footer design will be a rock/fabric layered pattern with a railcar beam for the decking to rest upon (***Attachment A, Figures 17-18***). The bridge is designed to have fully sufficient capacity to provide for proper hydrologic connectivity and fish passage for all channels developed upstream of that location.

4. Construct On-Grade Tidal/Floodplain Channels:

NOTE: *(All channels proposed for construction are assumed to have the ecological productive capacity similar or equal to "Pasture Trenches" referenced in North Bank Access permit application (ODFW unpublished 2016).*

These channels will provide a greatly improved level of accessibility to the site for fish that has not been present since the interior pastures were originally bermed and drained in the early 1900's. Additionally the channels will allow for natural hydrologic regimes to the extent that is possible. The C3P tidegate ultimately controls water levels during low and moderate elevations and flows. The project is anticipated to improve water quality through:

a). Increased movement of water inflow/outflow and mixing. Elimination of stagnation of water where organic decomposition results in high levels of bioprocessed compounds, related to increased movement.

b). Improved thermal regimes resulting in decreased water temperatures during warmer months due to movement of water and elimination of shallow ponded areas where solar input is extreme. On-grade channels constructed to connect these low-lying areas in the floodplain will address this issue.

c). Greatly improved nutrient and energy cycling, which will result from increased inflow/outflow and movement of waters in winter through pasture stubble height vegetation prior to entering the main canals and Coquille River mainstem.

Channels will be constructed using an excavator. If soils/sod conditions are such that the excavator is likely to penetrate and sink, matting will be used. Spoils will be spread to the sides of channels to an average depth of 3.0 inches or end hauled to be used to assist with berm/road reconstruction if they meet particle specifications. Spoils will be spread at time of excavation or as channel segments are completed with the flat back of the excavator bucket and or a dozer. Standard dump truck equipment will be used where there is a need to end haul channel spoils to locations for berm repair (*see below*).

Channels will be constructed on a grade that meets the topography from mouth to terminus to provide for proper hydrologic inflow and outflow, long-term improved transport of sediments, proper fish ingress/egress, and irrigation capacity. The project is requesting permit approval to as well to install a total of 200 pieces of large woody debris, which at individual landowner discretion will be installed into strategic locations in channels on interval in order to provide additional ecological uplift for juvenile coho. Final channel layout trajectories on floodplain pastures will be based by individual site and coordinated agreement of SWCD, ODFW, the BSDD, and the landowner. All channel design is structured to meet the National Marine Fisheries (NMFS) Tidal Area Restoration Project (TARP) guidelines.

Primary/Large Conveyance Channels:

A total of 31,543 ft of Large channel with an avg depth 4.0ft in first 500ft; 3.0ft thereafter with 6.0 ft bottom width; Avg top width 18.0ft for the first 500ft; 21.0ft thereafter will be constructed to hydrologically connect the pasture floodplains of lands residing in Units 1 and 3 within the BSDD with canals to the Coquille River via the C3P tide gate (see ***Attachment A, Figure 19: Proposed Channel Enhancements map***). Channels mouth elevations will be set at canal junctions with an invert of either -0.5 to -1.0ft NAVDD 88 at connection point.

Large channels will be constructed with 1:1 side sloping (see ***Attachment A, Figure 20***, and ***"Winter Lake Phase III Project Actions" Attachment B, Sheets 2-17***). Skip Planting concepts will be used to increase ecologic uplift of large channels through planting of native ash and cottonwood trees (see ***Attachment A, Figures 21-23***, and ***Attachment B, Sheets 24-26***). Individual landowners have expressed that interior management fences will be beneficial to livestock operations. These fencing concepts for some parcels will be installed in a manner to augment protection of water quality and skip-style riparian planting will be done on large channels (**"Winter Lake Phase III Project Actions" Attachment B, Sheets 24-26**). Channels will be on-grade and provide the primary conveyance to supply inflow/outflow for Medium and Small Swale channels and water flow in the low-lying zones of the landscape as determined by LiDAR (***Attachment A, Figure 24-26***).

Medium Conveyance Channels:
A total of 36,146 ft. of Medium tidal/floodplain channel with an avg depth of 3.0ft in first 300ft; 2.5ft thereafter with 4.0 ft bottom width; avg top width 11.5ft for first 300ft 14.0ft thereafter (***"Winter Lake Phase III Project Actions" Attachment B; Sheets 2-17***); will be constructed connecting to the primary/large channel network. These will be on-grade and have been designed in the low- lying zones of the landscape as determined by LiDAR (***Attachment A, Figure 24-26***).

Small Swale Channels:
A total of 38,090 smaller swale type channels with an avg depth of 2.5ft in first 300ft; 1.5ft thereafter Avg width 8.0ft for first 300ft 9.5ft thereafter *(***"Winter Lake Phase III Project Actions" Attachment B; Sheets 2-17**); will be constructed on grade with side-sloping of 4:1 from connection point with Medium Size Conveyance Channels. Bottom width will be on average 2.0ft in width (***Attachment A, Sheets 2-17***). These channels will be at a depth that varies depending on the surrounding pasture elevations, however, are designed to provide fish ingress/egress to locations currently that have juvenile coho/salmonid stranding potential during the winter months and generate stagnate water areas during the summer that present risk for mosquito production. These will be on-grade and located in the low-lying zones of the landscape as determined by LiDAR (***Attachment A, Figure 24-26***).

5. Hydrologic Bulbs: At the endpoints of selected channels (***Attachment A, Figure 12***) the project will construct "hydrologic bulbs." These habitat improvement actions will:

- **a).** Provide areas of greater depth long distances within the pasture networks where native fish, e.g. coho can shelter and feed during winter months prior to floodwaters rising and allowing fish to feed on pastures.
- **b).** These habitat improvement structures will provide volumetric areas at endpoints where the hydraulic forces of inflow/outflow will flush minor sediment accumulations from the length of the channel network downstream.

6. Berm Repair:
No new berms will be constructed during the project. Existing internal berms are located along main canal pasture edges upstream of the C3P tidegate complex in within Units 1 and 3. These berms are essential to provide for winter and summer management strategies of water on the various individual landowner properties up to elevation 5.5ft NAVDD 88. Above that water level properties within Units 1 and 3 become connected as water overtops the berm network. Many of internal berms have been subjected to over 40yrs of rainfall, cattle, and general degradation since they received any substantial rehabilitative action in the 1960's and 1970's. Resultantly, the ability for these berms to provide isolation of individual pastures during irrigation events has been compromised by degraded sections where the berm height elevation is well below 5.5ft. Isolation of pastures is essential during summer irrigation events in order to allow for irrigation on incoming high tides in floodplain pastures, while maintaining select pastures dry in order for livestock to remain within the landscape vicinity. Berms will be repaired using channel excavated spoils from new channel construction locations, from hydrologic bulb construction locations or higher value soils obtained from closer to the Coquille River. An Excavator and Dozer methods will be used to complete all berm repair work. The bank sloping of the berms will be a maximum steepness of 1:1 on the canal slopes and <2:1 on the pasture approach side.
NOTE*: Unit 2 berms are constructed to elevation 7.0ft NAVDD 88 and thus Unit 2 is not connected hydrologically until water is above elevation ~7.0ft*).

B. Describe work within waters and wetlands.

The Winter Lake Phase III project proposed actions within waters and wetlands:

NOTE: *All work for this project will occur below the highest measured tidal elevation of 9.0ft NAVDD88. Therefore, the project assumes that all lands within the project where work will occur are considered Section 10 jurisdiction under the U.S. Army Corps of Engineers (USACE) and thus were historically tidal and or currently are wetland. In that context with all lands under one of both jurisdictions no wetland delineation was completed, and all designs employed BMP's appropriate for wetland habitats.*

1). Replacement of 38 of the existing 42 undersized culverts. At one location, where the Messerle pasture road accesses the floodplain from Hwy 42 a culvert will be replaced with a bridge (***Attachment A, Figure 15***). The remaining four culverts with associated tidegates will be removed and consolidated within the remaining reconstructed 38 channel networks. Culverts are currently located through pasture berms where they deliver water to the main canal networks (***Attachment B; Sheet 1***). The location of entry to main canals will be moved for six of these culverts to configure the network more appropriately to landscape topography. Culverts will be primarily HDPE to extend life with several exceptions where CMP materials might be used. The proposed pipes have been sized based on ***Hydrologic Assessment*** methodology (***Attachment C***) that incorporates outflow volume related to precipitation and hydraulic capacity in relation to:

- **a).** The volumetric inflow/outflow capacity of the C3P project and previous ODFW and NMFS approvals for fish passage.
- **b).** The precipitation hydrology for the "microwatersheds" pasture areas specifically associated with the individual culverts (***Attachment A, Figure 12***).
- **c).** Culvert hydraulic capacity for a given culvert size, which was then paired to a, and b.

2). Replacement of tidegates on the 38 interior culverts with either:

- **a).** Side-hinged aluminum tidegates with door brace for managing in the door open position (***Attachment A, Figures 10-13***);
- **b).** Water control slide gates operated manually through screw drive and wheel (***Attachment A, Figure 14***).

3). Reconfigure/reconstruct ~29,981ft or 5.7 miles of existing tidal channel. The existing channel networks (See ***Attachment A, Figure 10***) were not constructed to grade, and the ability for fish to move successfully to and from the river without becoming vulnerable to stranding currently limits their use of the network during the important fall/winter/spring rearing period.

4). Creation of 74,670 ft or 14.1 miles of new large, medium, and swale channels in Units 1 and 3 that will be designed/engineered through this project (see ***Attachment A, Figures 24-27***)**.** Although these newly constructed channels will be relatively simple compared to the channels previously constructed on Unit 2, they will:

- **a).** Provide depth refugia for native salmonids in winter and native resident fish in summer months,
- **b).** Contribute to greater utilization of the project area by juvenile coho, through increasing channel distribution on the landscape and fish penetration into the floodplain, and
- **c).** Facilitate pasture irrigation more functional irrigation management for landowners during summer months.

5). The project will create hydrologic bulbs at the endpoints of selected channels (*Attachment A*). These habitat improvement actions will:

- **a).** Provide areas of greater depth long distances within the pasture networks where native fish, (e.g. coho) can shelter and feed during winter months prior to floodwaters rising and allowing fish to feed on pastures.
- **b).** These habitat improvement structures will provide volumetric areas at endpoints where the hydraulic forces of inflow/outflow will flush minor sediment accumulations from the length of the channel network downstream.

6). Interior pasture berms will be reconstructed to elevation 5.5ft NAVDD88 in locations where they have degraded and are below elevation 5.5ft. Initial construction will be to elevation 6.0ft to provide for six inches of settling to final performance elevation. Implementation of the project has several goals:

- **a).** The project will restore more natural fish passage from canal networks into secondary channel networks and pasture floodplain habitats.
- **b).** There will be a greater quantity of water exchange within the networks and the Coquille River improving oxygenation loading.
- **c).** There will be a greatly enhanced processing of livestock nutrients. New channels are designed with 1:1 (main channels), 2:1 (medium channels), and 4:1 (pasture swale channels). This side-sloping will provide for greatly reduced bank erosion over traditional channels. The bottom and side slopes will be planted with a pasture seed mix. Roughly 60-70% of the channel surface in the upper 2/3 distance of these channels will be at an elevation where grasses will grow providing filtering of livestock nutrients during outflow from pasture floodplains.
- **d).** The amplified size of culverts feeding channels will increase the ability to irrigate pastures during single high tide events.

C. Construction Methods. Describe how the removal and/or fill activities will be accomplished to minimize impacts to waters and wetlands.

NOTE: *All work will be conducted within the ODFW/NMFS In-Water Work Window of July 1 to September 15th. This period is also when wetland habitats are dewatered due to summer drying and impacts reduced due to increased firmness of soils. All actions were designed with intent to meet NMFS Tidal Area Restoration Project (TARP) and or SLOPES V Restoration guidelines.*

Staging Area: The staging areas will be located at 4 locations (***Attachment A, Figure 28***); 1). The primary access point into Unit 1 from Highway 42; 2). at the C3P tidegate; 3). at the Chisholm barn parking area on south side of North Bank Rd., and 4). on the Smith/Isenhart properties near the Coquille River.

Minimization Measures:

1. Work will be conducted during the In-Water Work Window of July 1 to September 15th. This period has a number of advantages for minimizing impact to fish, wildlife, and water quality:

- **a).** Soils are driest during this period reducing potential for impacts to wetland, streambanks, and disturbed soils.
- **b).** Many salmonids species are in locations where there is thermal refugia; floodplain water levels are at their lowest level and thus fish are generally confined to known locations. Work can be adjusted to avoid locations where fish are present, or they can be salvaged.
- **c).** Many salmonids species including coho, cutthroat trout, and Chinook are confined to stream channels during summer months as temperatures in floodplain ponded waters in all floodplain pasture channels within the project area are generally lethal from July 1 to September 15th.
- **d).** Temperatures in the BSDD and CDD work areas including main Beaver Creek and Winter Lake Unit 1, 2, and 3 canals (China Camp Creek tributaries) and tidal channels are known to exceed 70.0 degrees F. Accordingly, salmonids are not expected to be in the main canals or interior pasture channels. Most pasture channels will be dry during the period or have only small segments with standing unconnected water.

2. All culvert removal and channel construction where there is connection to the main Winter Lake canals and Beaver Creek channel will be conducted on the low incoming tide cycle to minimize potential for sediment laden waters to move from the work area offsite. Work will be ceased as the tide elevation begins to excessively inundate the work area and reinitiated during the next low cycle. Excavation of culverts and bridge channel construction will be completed during the lowest tide cycles of August and or September. The elevations of water in the work area at low tides is expected to be 1.0-2.0ft based on the C3P data in ***Attachment C, Figures 14-19.***

3. For excavation when reconstructing existing tidal/floodplain channels, earthen channel blocking plugs will be installed at the connection point with the main canals to prevent entry of canal waters into the active construction zone. Native fish will be salvaged from the work area if water is present, which will allow excavation to occur without turbidity to fish resources. Screening will be set up where needed to prevent native fish from entering work areas where channel construction will occur and the site is not able to be dewatered or kept isolated through use of earthen berms.

- **a).** For channel construction on Winter Lake Units 1 and 3 a combination of earthen blocking plugs and as needed screening will be incorporated to prevent fish impacts during excavation of channels.
- **b).** For the two pastures in the CDD low earthen blocking plugs will be installed as needed in reaches of channel under construction to prevent channels from receiving tidal influence water inflow during excavation if the Beaver Creek/Coaledo tidegate does not fully eliminate tidal signal. This will prevent fish from entering the work area.

4. Excavators will work from the top of canal/channel banks, berms, and or in locations where soils are not highly penetrable with operation of heavy equipment. In locations where equipment might be at risk to penetrate through sod/root layers and sink, crane matting will be used. Dozer work will be on dry pastures during spreading of channel construction spoils.

5. No fill, other than clean onsite earthen material and clean riprap around culverts, will brought to the site. Riprap will be from a known clean upland source and earth for berm reconstruction will be from channel construction sites or upland locations near the Coquille River. Fill will be placed in a manner so as to prevent entry into a waterway or ponded wetland area.

6. Fueling of equipment will be conducted 150 ft. from waterways or standing water.

7. Channel excavation will occur during drier months. Direct excavation in water is planned for canal excavation in the Unit 1 main canal S.E and Unit 3 canal N.E. Machines that work in the water will have non-toxic biodegradable hydraulic fluid.

8. If any hydraulic or fuel leaks are noted on equipment, they will either be eliminated through repair or equipment will not be allowed to be used until repair or resolution.

9. Dust is not anticipated to be a factor that is likely to be an issue as the site has substantial ground moisture that will hydrate soils as they are placed. However, if dust abatement is needed to prevent entry into ponded water or canals/channels dust abatement measures with application from a pump that is properly screened to meet ODFW/NMFS criteria, or a dust abatement truck will be used.

10. Fill will be dumped, placed/moved, where it is not in contact with water to the highest extent possible. If fill is needed in locations where there is standing water or a stream/tidal/floodplain channel ODFW fisheries staff will determine if fish are present and need salvaged prior to installation of fill.

11. Equipment operators will be briefed on measures to reduce potential that sediment will enter waterways; e.g. excavation in a manner that moves material away from water; pulling upward rather than side to side when excavating in water and placement of temporary fill in locations where it will not impact ponded water or a waterway.

Stormwater Discussion

a). Large channel banks will be sloped to 1:1 for main channels; 2:1 for medium sized channels; and 4:1 for smaller swale channels. This will eliminate the potential for bank sloughing and slumping. Spoils will not be piled adjacent to channels and will be thin spread at time of work.

b). Following installation of culverts, the fill will be seeded with an appropriate pasture/erosion control mixture.

c). Mulching and seeding will be incorporated as needed on culvert fill and channel locations where there is considered to be an elevated risk for sediments to become mobilized during fall/winter precipitation events.

d). Seeding with an erosion control pasture seeding mix will be used on new and reconstructed channel banks to minimize erosion above the zone where water will prevent establishment of vegetation.

e). Soils excavated from channels will be thin spread to an average depth of 3.0 inches at time of excavation or prior to completion of a full channel segment extent Thin spreading allows for existing grass species to fully penetrate though the fill when fall/winter precipitation facilitates pasture grass vigor and thus will not be unvegetated during months with higher precipitation.

(4) PROJECT DESCRIPTION (continued)

D. Describe source of fill material and disposal locations if known.

1). Earthen Fill for berm reconstruction will be obtained from channel or hydrologic bulb construction sites, loaded on a standard dump truck and end hauled to the locations where berms need repaired.
2). Riprap protection for culvert inflow/outflow end protection will be obtained from a Coquille Basin or other south coast local source and installed from top of bank.
3). Soils excavated from channels will be thin spread to an average depth of 3.0 inches at time of excavation or prior to completion of a channel segment. Thin spreading allows for existing grass species to fully penetrate though the fill when fall/winter precipitation facilitates pasture grass vigor.

E. Construction timeline.

What is the estimated project start date? Some work estimated August 15th 2024.

What is the estimated project completion date? The estimated completion date is September 15th 2030

Is any of the work underway or already complete? If yes, please describe. ☐ Yes ☒ No

F. Removal Volumes and Dimensions (if more than 7 impact sites, include a summary table as an attachment)

Wetland / Waterbody Name *	Removal Dimensions					Time Removal is to remain**	Material***
	Length (ft.)	Width (ft.)	Depth (ft.)	Area (sq.ft. or ac.)	Volume (c.y.)		
Table 2; and See "Winter Lake Phase III Actions" Attachment A; Channels	99,781	Ave 14.0 lg Ave 1.5md Ave 1.0sm	4.0lg 3.0med 2.0sm	27.8 acres tot	110,815	Permanent	Earthen; Channel construction/ thinspread on adjacent pastures
Table 2; and See "Winter Lake Phase III Actions" Attachment A; Canals	2,302	various	various	1.0 acres	6,791	Permanent	Excavate accumulated sediments/ thinspread on adjacent pastures
Table 2; and See "Winter Lake Phase III Actions" Attachment A; Bridge	50	~15ft	3.0ft	500sq ft	456	Permanent	Excavate accumulated sediments/ thinspread on adjacent pastures
Table 2; and See "Winter Lake Phase III Actions" Attachment A; Hydrologic Bulbs	N/A polygons	various	1.5-3.0ft varies	18.6 acres	64,505	Permanent	Earthen; Hydrobulb construction/ thinspread on adjacent pastures
Table 2; and See "Winter Lake Phase III Actions" Heavy Use Livestock Watering Areas	20x20ft Polygons	20x20ft Polygons	0.8ft	0.8 acres	107	Permanent	Excavate, thinspread on adjacent pastures; leaving 0.8ft inset area for Heavy Use rock installation

G. Total Removal Volumes and Dimensions

Total Removal to Wetlands and Other Waters	Length (ft.)	Area (sq. ft or ac.)	Volume (c.y.)
Total Removal to Wetlands	Table 2 & previous	47.6 acres	182,780
Total Removal Below Ordinary High Water	Table 2 & previous	47.6 acres	182,780
Total Removal Below Highest Measured Tide	Table 2 & previous	47.6 acres	182,780
Total Removal Below High Tide Line	Table 2 & previous	47.6 acres	182,780
Total Removal Below Mean High Water Tidal Elevation	Table 2 & previous	47.6 acres	182,780

H. Fill Volumes and Dimensions (if more than 7 impact sites, include a summary table as an attachment)

Wetland / Waterbody Name*	Fill Dimensions					Time Fill is to remain**	Material***
	Length (ft.)	Width (ft.)	Depth (ft.)	Area (sq. ft. or ac.)	Volume (c.y.)		
Table 2; and See "Winter Lake Phase III Actions" Attachment A; Channels	Various polygons	Various	3.0" ave	87.2 acres	105,492	Permanent	Earthen excavated material from project area new/excavated channels; thinspread to 3.0" on pastures
Table 2; and See "Winter Lake Phase III Actions" Attachment A; Canals	Various polygons	Various	3.0" ave	5.6 acres	6,791	Permanent	Earthen excavated material from project area canals; thinspread to 3.0" on pastures
Table 2; and See "Winter Lake Phase III Actions" Attachment A; Bridge	Single Polygon	Single site Approx. 50x50ft	3.0" ave	0.11 acres	456	Permanent	Earthen excavated material from bridge location canal; thinspread to 3.0" on pastures
Table 2; and See "Winter Lake Phase III Actions" Attachment A; Berm Reconstruction	3,247ft total	20ft base	Various 1.0-3.5ft	1.49 acres	5,323	Permanent	Earthen excavated material from project new/excavated channels. ***Material will be placed on existing footprint of old berms.***
Table 2; and See "Winter Lake Phase III Actions" Attachment A; Hydrologic Bulbs	N/A polygons	Various depending on location	1.5-3.0ft varies	53.3 acres	64,505	Permanent	Earthen excavated material from project area new/excavated Hydrobulbs; thinspread to 3.0" on pastures
Table 2; and See "Winter Lake Phase III Actions" Heavy Use Livestock Watering Areas	20x20ft Polygons	20x20ft Polygons	0.8ft	0.25 acres (thinspread acres and 20x20ft polygons)	107	Permanent	Thinspread of excavated material and placement of Heavy Use rock in 20x20ft polygons 0.17 thinspread acres and .08 Heav Use

(4) PROJECT DESCRIPTION (CONTINUED)

I. Total Fill Volumes and Dimensions

Total Fill to Wetlands and Other Waters	Length (ft.)	Area (sq. ft or ac.)	Volume (c.y.)
Total Fill to Wetlands	See Table 2.	149.0 acres	183,453
Total Fill Below Ordinary High Water	See Table 2.	149.0 acres	183,453
Total Fill Below Highest Measured Tide	See Table 2.	149.0 acres	183,453
Total Fill Below High Tide Line	See Table 2.	149.0 acres	183,453
Total Fill Below Mean High Water Tidal Elevation	See Table 2.	149.0 acres	183,453

*If there is no official name for the wetland or water body, create a unique name (such as "Wetland 1" or "Tributary A").
**Indicate whether the proposed area of removal or fi ll is permanent or, if you are proposing temporary impacts, specify the days, months or years the f ill or removal is to remain.
*** Example: soil, gravel, wood, concrete, pilings, rock etc.

(5) PROJECT PURPOSE AND NEED

Provide a statement of the purpose and need for the overall project.

The proposed "Winter Lake Phase III" project has been developed by a team of partners including Coos Soil and Water Conservation District (Coos SWCD), the ODFW, the BSDD, and landowners. The project is designed to complement the BSDD C3P tidegate replacement project completed in 2017. Phase III proposes to replace 42 existing undersized culverts and associated old style top-hinged tidegates with 38 new culverts and redesigned channels. The project actions are anticipated to maximize hydrologic connectivity in order to achieve a balance of fish/wildlife and pasture grass production.

The proposed Phase III project is designed to address insufficient hydrologic capacity and channel layout issues in Units 1 and 3 and two parcels in the CDD (***Attachment A, Figure 5-6***). No work is planned for lands within Unit 2. The lands within Units 1 and 3 are managed with agricultural emphasis during spring and summer months, however, are considered by ODFW to have large unrealized capacity for juvenile coho rearing during the late fall and winter. Water management to date within Units 1 and 3 has relied largely on channel networks that were installed in the early 1900's with subsequent excavation on roughly a 15yr interval to clean sediments that accumulated.

The individual landowner pastures within Units 1 and 3 are isolated up to elevation 5.5ft NAVDD88 by legacy earthen berms. Berms run along the sides of the major canals (***Attachment A, Figure 29***) and serve as isolation of the individual landowner pastures during tidal inflow irrigation events associated with culverts that feed into these pastures. During summer irrigation the culvert water control tidegates are manipulated to move water into desired bermed pastures, while maintaining a dry refuge in others for livestock that are present. These berms have had little or no maintenance for a number of years and currently have substantive need for repair. There are 16 key locations where 100-200ft segments of the berms are below elevation 4.5ft and individual pasture irrigation inflow management is not possible.

Key Hydrology/Habitat Issues

The current culvert/tidegate infrastructure and channel network within the BSDD interior floodplain upstream of the C3P tidegate have multiple features that remain dysfunctional for tidal and floodwater inflow/outflow. Specifically, the project will work to improve conditions for Oregon Coast (OC) juvenile coho overwinter rearing and landowner pasture grazing production in Units 1 and 3. The project will address:

- *Hydrologic Flow Paths:* Discontinuity of channel networks due to construction of linear networks in 1909-current that redirected flow from the historical natural hydrologic flow paths.

- *Channel Density/Limited Intrusion:* Lack of density, per acre and limited length of interior channels within Units 1 and 3. These features are need to provide access routes to feed and sufficient refugia depth for juvenile fish within the BSDD floodplain. This deficiency results in very limited use of large portions of the floodplain by native salmonid fishes except at very high flood levels.

- *Salmonid Stranding Areas:* Low-lying land areas within individual ownership pastures are in many locations disconnected from channel networks, which results in water retention when flood levels decline resulting in high stranding risk for juvenile coho on the floodplain.

- *Undersized Culverts for Hydrology:* Undersized culverts connecting to the main canals within Units 1 and 3 that restrict proper tidal/flood-flow and underserve irrigation needs in summer months.

- *Invert Elevations Inappropriate:* Culverts that were installed with an elevation invert where interior pasture channel networks at early winter flow levels are disconnected from the main canals resulting in delayed ability for fish to enter the floodplain and subsequent increased potential for stranding and predation as floodflows recede.

- *Top Hinged Tidegates:* Top-hinged tidegates on the existing interior culverts upstream of the C3P tidegates that are difficult to manage in the open position. This results in long periods where the tidegate doors are closed leading to restriction of fish movements from the main canals into pasture floodplain channels where food availability is higher and competition with non-native fish lower.

- *Channels Not On Grade:* Channel networks that were not constructed on-grade and thus do not allow for sediments to be transported properly, resulting in premature accumulation, limited connectivity for fish movement, and poor drainage for landowners.

- *Poor Channel Locations:* Poorly located linear channel networks that do not follow land elevation hydrologic paths and undersized internal channels that do not provide sufficient length or route to provide connectivity to hundreds of acres of agricultural pastures within the BSDD resulting in highly limited ability to utilize the capacity of the new C3P tidegate for irrigation.

- *Non-Native Fish:* Canal networks that do not have substantial upstream channels that result in limited exchange volume when tidal influence is induced at the C3P tidegate. Resultantly, non-native fish including bullhead catfish, yellow perch, black crappie, bluegill, and mosquitofish are served by the relatively slack conditions within the canals that serve Units 1 and 3. This project will allow much greater exchange of volume in those canals reducing life history preference for the current condition and move favorability towards native fish.

- *Low-Lying Pasture Production Issues:* Channel networks that do not connect to low-lying areas properly resulting in long periods of standing water reducing pasture grass production during spring drain-out and early summer.

- *Channel Location Irrigation Issues:* Channel networks that are not located properly for individual pasture irrigation, resulting in over/under-watering of individual landowner pastures.

Water Elevation Management:
The Coquille River natural levee has developed over thousands of years as higher sediment deposition occurred in the first 100-350ft adjacent to the river channel with decreasing loading as the floodplain distance extends to the north. The natural levee runs from the hillslope just west of Coquille at Roseburg Forest Products mill upstream of the C3P tidegate to the west/northwest connecting to the hillslope at Coquille RM ~20.0, just west of Beaver Creek. There are two channels that currently enter the main Coquille River through the natural levee, the BSDD channel at the C3P tidegates and Beaver Creek. This levee has facilitated the ability to manage water elevation within the Winter Lake floodplain up to elevation 10.5ft NAVDD88 through management of the tidegates. At elevation 10.5 river waters overtop the Beaver Creek dike (***Attachment A, Figure 29***) and flows overland into the valley floodplain.

Tidal elevations are softened by the riverbank friction in the length from the ocean to RM 21.5 where the C3P tidegate channel enters the main river. Despite this effect the tidal signal is substantial and generally ranges from a low of around +1.5ft when there are powerful low tides at the ocean to highs at the C3P channel of 8.5ft (See ***Attachment C, Appendix A: Northwest Hydrology Consultants "Hydraulic Analysis"***). Tidal signal is highly related to river flow and when precipitation events raise river flows the tidal signal is also dampened. River levels are able to exceed elevation 16ft NAVDD88 with major flooding events.

Up to elevation 10.5ft the C3P tidegates are able to resist inflow and allow for managed water elevations upstream into interior floodplain pasturelands in the BSDD; of which ~1,295 acres is below elevation 8.0ft (***Attachment A, Figure 24, LiDAR imagery***). The C3P tidegate has been assigned water management based on the needs of both the upstream landowners and fish and wildlife goals within the BSDD. The interior lands upstream of the C3P tidegates and the 42 culverts addressed in the **"Winter Lake Phase III Hydrologic Assessment" (Attachment C)** are <u>subservient</u> to water management at the C3P tidegates and the BSDD DWMP, which has been reviewed and approved by ODFW and the National Marine Fisheries Service during the Winter Lake Phase I and II permitting process. The Units 1 and 3 DWMP is structured around seasonal agriculture and fish/wildlife needs with the following strategy periods:

Winter- October to March: *Manage for fish and wildlife aggressively in Unit 2 and to a more moderate level in Units 1 and 3.*
Spring- April to May: *Drain-out period*
Summer- June to September: *Manage for water at minimums; some flushing*

The specific DWMP goals for water elevations throughout the year are in ***Attachment C, Appendix A***.

NOTE: *there currently are locations where the interior berms in Units 1 and 3 are below elevation 5.5ft NAVDD 88 and in need of repair. This section discusses the water management goals with berms reconstructed to their goal height of elevation 5.5ft.*

When floodwaters are above elevation 10.5ft NAVDD88 water moves up Beaver Creek and flows over the low portion of the berm across the pastures. At this elevation Units 1, 2, 3, and the CDD are connected. Berms that isolate Unit 2 are elevation 7.0ft and berms around individual water management pastures in Units 1 and 3 are elevation 5.5ft or lower.

As floodwaters recede below elevation 10.5ft, the berm height is sufficient to allow for management of water elevation in the BSDD and CDD. The CDD tidegate (***Attachment A, Figure 7-8***) on Beaver Creek consists of three 6.0ft CMP's with top-hinged tidegates. There is currently no MTR capability at that site thus water is managed for drain-out only. At the BSDD C3P tidegates water can be managed for drain-out or using the slide-gates for tidal/floodwater inflow. From 10.5ft to elevation 7.0ft (the Unit 2 berm height), Units 1, 2, and 3 in the BSDD are connected, however, BSDD is disconnected from CDD.

From elevation 7.0ft to 5.5ft Unit 2 is isolated from Units 1 and 3. As Unit 2 is located between Units 1 and 3 there is no longer connection of Units 1 and 3 hydrologically below elevation 7.0ft. Below elevation 5.5ft the interior berms in Units 1 and 3 allow for individual water management on the various pastures using the interior culvert water control structures and channel networks.

Note: *It is important to keep in mind that above elevation 5.5ft water is able to move laterally over berms within the various pastures and into canals in Units 1 and 3 without dependence on or control through culverts and associated water control structures. This allows for large flood inflow/outflow independent of the culvert infrastructure in place in the berms when water is above elevation 5.5ft. The sizing of culverts and channels developed for the project (**Attachments B and C**) were guided by the following:*

1) In order to provide for fully adequate connectivity of interior pastures with main canals when water levels are below elevation 5.5ft;
2) To provide fully functional fish passage that meets State and Federal criteria in periods when water is restricted to movement through the Units 1 and 3 culvert networks below elevation 5.5ft.

Culverts/tidegates

Historically, culverts on the project area were installed with undersized capacity for various reasons, however, often due to lower cost. There have been long-term negative effects during winter flooding for fish passage and landowner pasture management impacts related to an extended drain-out period prior to spring and summer delaying vegetation growth. The Phase III project is designed to address the hydrologic capacity limitation associated with the culverts that are currently in place for fish/wildlife and pasture grass production.

Four channel networks will be realigned to reduce the overall culvert numbers needed from the current 42 to 38 through channel network consolidation. Old-style flapper tidegates are the predominant style (***Attachment A, Figure 11***) currently present. These will be replaced with either slide-gate/knife gate water control devices or side-hinged aluminum tidegates with a device to maintain the door open as desired. The BSDD DWMP dictates water management strategies (see ***Attachment C, Appendix A***), which provide for a high degree of access for water and fish during winter months. Landowners are on board with opening all interior culvert water control structures fully open from ~November 1st to March 30th in alignment with the BSDD DWMP and winter needs for fish access and flood flow hydrology.
Note: *There is flexibility under the DWMP for individual landowner water control structure operations with various pasture management goals during the late fall and drain-out periods.*

Channels

The existing channels in Units 1 and 3 were installed historically:
a). Design/layout that failed to align with micro-elevation topography on the landscape from interior pasture locations to delivery points with main canals;

b). Flow path trajectories of interior channels that are linear along pasture or landowner boundaries;
c). Channels were not constructed with on grade invert elevations;
d). Channels were constructed with vertical side-wall form that accelerated natural sloughing/slumping as well as livestock-related erosion resulting in exacerbated soil deposition into the channels. This has over time reducing their capacity to transport water effectively. The factors noted for pasture channel networks in Units 1 and 3 have resulted in widespread hydrologic discontinuity, poor access for juvenile native fish to enter and leave pasture habitats, and poor drainage for production of pasture grass. Winter Lake Units 1 and 3 have high inherent potential for fish production; however, their current hydrologic disconnection yields the issues noted in the previous ***Key Hydrology/Habitat*** section.

NOTE: *Irrigation has been used by ranchers within the BSDD consistently over the past 100+ years through opening of tidegates and allowing tidal inflow into pastures on high tide cycles. The new C3P tidegates installed in 2017, greatly enhanced irrigation inflow potential at the main tidegate network. Native fish have adapted to both tidal and floodwater inflow regimes. BSDD irrigation tactics utilize tidal inflow, which is a natural hydrologic pattern within native fish adaptive capacity. Native fish have used inherent adaptive genetic traits to react to tidal/floodwater cues that allow movement into floodplain habitats and retreat to channels following relatively short (6hr tidal cycles) inundation periods. Irrigation is implemented from mid-June to mid-September generally for the individual pastures over one or two days monthly. Coho juveniles are smolted and entering the ocean prior to the summer irrigation period. Salmonids are essentially absent from the BSDD canals and the mainstem Coquille River during summer months as canal and river temperatures have been measured as high as 80°F and 76° respectively. Irrigation utilizing tidal inflow during summer is therefore considered to be comparable with the natural life-history of native fish that are present, and native salmonids are unlikely to be present in high abundance during the months when irrigation is implemented within Units 1 and 3.*

(6) DESCRIPTION OF RESOURCES IN PROJECT AREA

A. Describe the existing physical, chemical, and biological characteristics of each wetland or waterbody. Reference the wetland and waters delineation report if one is available. Include the list of items provided in the instructions.

The Coquille River Valley is an expansive alluvial floodplain extending upstream from the mouth of the Coquille River at Bandon, OR upstream to the head of tidal influence at river mile 41. Other than the Columbia River, the Coquille River Valley encompasses the longest coastal estuary in Oregon. Historically the Coquille valley floor contained extensive freshwater tidal wetlands, tidal channels, and non-tidal wetland habitats that are estimated to have comprised over 12,000+ acres (Benner 1992) with some estimates as high as 17,000 acres. These habitats provided very high-quality fish and wildlife habitat historically (Benner 1992; Scranton, 2004). The Winter Lake Phase III project action area is located on floodplain pastures within the BSDD and CDD wetlands to the South of Northbank Lane/Hwy 42 and west of Coquille, OR, on the historic China Camp and Beaver Creek floodplain (***Attachment A, Figures 1 - 6***). The project area is predominated by lands that are below elevation 8.0ft (1,295+ acres).

The predominant majority of the floodplain and wetlands habitats in the Coquille estuary were cleared, leveed, tidegated, and drained for agricultural purposes in the late 19th - early 20th century, thereby substantially altering the land from its historical natural state as a freshwater tidal wetland complex into drained pasture lands. These lands are currently used seasonally to year-round for grazing. By the 1990s, the amount of tidally influenced and standing wetland within the Coquille Valley was reduced to less than 600 acres or ~5% of historical. Resultantly, there have been widespread ecological changes in the capacity of the valley floor to produce fish and wildlife. Coho abundance has averaged ~14,499 annually in the 1990- 2020 period compared to peak estimated abundance of over 400,000 historically and an annual abundance that likely averaged near ~150,000.

Research and salmonid population monitoring indicate that tidal floodplains, wetlands, and estuaries are a highly important habitat for young salmon. Restoration of these habitats is repeatedly identified as a critical action for increasing endangered coho populations in multiple federal, state, and local recovery plans. Substantial scientific evidence indicates that body size at ocean entry is an important, if not the primary, indicator of an individual's probability of returning from the ocean to spawn (*Katz JVE, et al. 2017*). Studies of the Coquille River Basin specifically have shown smolt growth rates are often 1.5-2.0 times greater for off channel and wetland habitats (*Nickelson 2012*) compared to stream and river locations. The Coquille River valley floodplain channels and freshwater tidally influenced habitats are believed to have the capacity to rear sufficient numbers of juvenile coho to produce up to 11-17 returning coho adults per acre of restored habitat on average (*Nickelson 2012*).

Enabling native salmonid fish access onto these productive floodplain rearing habitats is currently presents a widespread and complex challenge within the Coquille watershed. One of the largest factors suppressing juvenile fish use of the Coquille River Valley floodplains specifically has been the elimination of tidal inflow and access for fish due to installation of tidegate and levee networks onto such low-lying floodplain pastures that historically comprised large tidal wetlands. These tidegate networks were installed historically to facilitate agricultural production. Currently exhibited tidegate styles reflect legacy design and are typically top-hinged wood or steel (***See Attachment A, Figure 11***); typical style of existing top-hinge interior tidegate). The angle these gates open is generally <20% when open on an outgoing tide and velocities during winter months can be above swimming thresholds for juvenile salmonid fish. When tide levels are above inside pasture water elevations the tidegate doors are closed and the resultant condition result is severe restriction of juvenile fish movements from the main stem Coquille River into locations that would historically have provided very high quality fall and winter rearing.

Wetland Habitats: The project area has a substantial component of wetlands below elevation 8.0ft NAVDD 88 (***as determined by LiDAR and ground engineering survey; Attachment A, Figures 24 and 25***). Above elevation 8.0ft. the vegetative community is primarily a mixture of upland grasses and shrubs. All lands (except for berm crests that run east-west along the main Unit 1 canal and north-south along the new China Camp Creek canal to the east of Unit 2) within the action area are predominantly classified as Freshwater Emergent Wetlands (Figure 30). They are specifically classified as PEM1Ch or PEM1Ah (Palustrine Emergent Persistent Semi Permanently Flooded Berm Impounded and Palustrine Shrub-Shrub Broad Leafed Seasonally Flooded Berm Impounded wetland) and under the Hydrogeomorphic Class and Cowardin Class wetlands based on information obtained from the U.S. Fish and Wildlife Service National Wetlands Inventory. For this project the small strips of land elevated by historical berm construction that are not classed as wetland, under the USFWS national wetlands Inventory, will be considered wetland and ecological uplift of the implemented as a restoration action has been designed to develop ecological uplift that exceeds impacts. Overall there will be around 130 acres of impact (***Table 2 and "Winter Lake Phase III Project Actions" Attachment B***).

Hydrology: Diking and land elevation manipulations have resulted in a high degree of dysconnectivity in the project area as documented on the landscape and visible from LiDAR elevation information (Figure 24-25). Resultantly, accessibility for anadromous and resident fish is limited and stranding potential following flooding events is currently high. Function of the pasture wetlands has also been substantially altered due to lack of nutrient movements that would have occurred historically with tidal inflow/outflow and excessive persistent water in low-lying areas during late spring months that have been disconnected due to Euro-human channel construction tactics. In native tidal floodplains channel densities have been documented to have been as high as 192ft per acre. Densities at this magnitude and would have resulted in daily tidal inflow/outflow patterns. The historical plant communities adapted to tidal water regimes. Those conditions had vegetative native composition with a high disposition for aquatic production. Floodwaters currently flow onto a number of locations in the project area and remain for long periods in low areas surrounded by berms or where culvert and channels have altered historical flow paths. Overall the project actions are anticipated to improve Ecological Function for aquatic plants and production of fish/wildlife substantively:

- The project will restore more natural fish passage from main canal networks into secondary channel networks and pasture floodplain habitats.
- There will be a greater quantity of water exchange within the networks and the Coquille River improving oxygenation loading.
- There will be a greatly enhanced processing of livestock nutrients. New channels are designed with 1:1 (main channels), 2:1 (medium channels), and 4:1 (pasture swale channels) side-sloping. This side-sloping will provide for greatly reduced bank erosion over traditional channels. The bottom and side slopes will be planted with a pasture seed mix. Roughly 60-70% of the channel surface in the upper 2/3 distance of these channels will be at an elevation where grasses will grow providing filtering of livestock nutrients during outflow from pasture floodplains.
- The amplified size of culverts feeding channels will increase the ability to irrigate pastures during single high tide events.

Dominant Plant Species: Historically, the wetland habitats on the project area were subjected to full tidal amplitude and flooded for roughly 4.0-8.0 months annually associated with high river flows from heavy rainfall that prevented drain-out and from upland inflow to the floodplain. Historically, when the land area was un-tidegated it is suspected that the strength of ocean tidal inflow would have been greater in response to filling the 1,295 acres of the BSDD below elevation 8.0ft. It is possible this greater inflow would have drawn salinity upstream to the C3P tidegate location at RM 21.5. However, currently both tidal and river flooding that occurs currently is with freshwater as the upper extent of saline influence is downstream ~12 miles from the project area. This is important in regard to the plant community on site as many species are not salinity tolerant. The vegetation on the 1,295 acres below elevation 8.0ft is a mix of native and non-native species, primarily reed canary grass *(Phalaris arundinaceae)* and creeping bentgrass *(Agrostis stolonifera)*, however, there is a component of native slough sedge *(Carex obnupta)*, smartweed *(Polygonum hydropiper)*, and large areas with stands of Pacific silverweed *(Potentilla anseria)*. Seasonal grazing has occurred since the early 1900's and the plant community is reflective of the herbivory impact that has suppressed reestablishment of native woody trees and shrubs following forest clearing from 1907-the 1950's. There is a small stand of native Oregon Ash *(Fraxinus latifolia)* in Unit 1 on the Isenhart property and some native Scouler's willow *(Salix scouleriana)* along Hwy 42. Douglas spirea *(Spiraea douglasii)* is common along canal berms.

Existing Uses:
<u>Agriculture/Recreational:</u> Unit 1 and 3 lands are privately owned as are the pastures where work will occur in the CDD. The China Camp Gun Club lands are managed for summer pasture grazing and recreational duck hunting during winter months. Units 1 and 3 and CDD pastures are agricultural lands which are managed for seasonal (late spring and summer) cattle grazing. Individual owners of the parcels in the project area use the canals and pastures for fishing and hunting with invitation to others.

<u>Fish:</u> The Project interior pasture channels directly enter canals upstream of the C3P and Beaver Creek tidegates and then connect to the Coquille River. The main canals provide some suitable habitat for Oregon Coast (OC) ESA threatened Coho salmon *(Oncorhynchus kisutch)* currently. Interior pasture channels are of extremely limited benefit currently as they fail to penetrate with sufficient depth into interior pasture areas. The project is anticipated to substantially increase the capacity of the pasture floodplains to rear OC coho juveniles during the fall/winter. Both coho juveniles and non-ESA listed coastal cutthroat trout *(O. clarki clarki)* are present in the Coquille River during the cooler months of the year. In summer months when thermal regimes reach near lethal levels. Temperatures as high as 74ºF have been measured in the main Coquille River at RM 26.0.

Unit 1 and 3 canals are unshaded and thus provide fall/winter/spring habitat for juvenile coho and cutthroat trout. Juvenile coho are able to rear yearlong in Beaver Creek in the CDD. Coho emigrate through the C3P and CDD Beaver Creek tidegates during the fall/winter/spring months as large numbers of pre-smolts move from natal areas into the Coquille River floodplain stream networks to find improved foraging conditions and escape high velocities in the mainstem Coquille River. When flooding is generally >1.5 ft. in depth on the landscape coho may also move into pasture habitats to feed and rear. Cutthroat trout also have been documented using the floodplain as well during winter months when flooding occurs. Fall Chinook salmon *(O. tshawytscha)* are present in the mainstem Coquille River from April through June, however, while it is considered that they likely used these habitats historically, more work is needed to determine present levels of use. Pacific lamprey *(Entosphenus tridentata)* ammocoetes are known to rear in the Unit 1 and 3 canals as well as main Beaver Creek channel as well as several native sculpin species *(Cottus spp.)*. Movement of fish into the floodplains in the project area is currently obstructed to a notable degree when rising waters are below elevation 5.5ft due to undersized culvert and channel infrastructure.

<u>Waterfowl/shorebirds:</u> The pastureland wetlands of the project area provide high quality waterfowl (Anas spp.; Branta spp.) resting and feeding habitat. Some nesting occurs in the valley during spring and summer, but nesting habitat is limited since the Coquille River floodplain tributaries are channelized and much of the edge hiding cover has been removed with diking efforts. Farming practices have resulted in conversion of wetland to intensively managed pasture dominated by bent and reed canary grasses, but despite non-native conversion the plants remains a suitable carbohydrate source for ducks. Thousands of migrating and wintering ducks use the Winter Lake Valley for feeding and resting during the months of November through April annually, with notable use of the wetlands of the Action Area. It is likely the Coquille River Valley once provided extensive habitat for breeding marsh birds when tidally flooded. Restoration of tidally influenced wetland habitats will benefit these species. Shorebirds, which feed in mud flats, are expected to benefit from restoration of tidal activity on Unit 1, 3, and CDD pasturelands as these species often are found feeding along channels and in shallows. Bird species such as Western sandpipers *(Calidris mauri)* and greater yellow legs *(Tringa melanoleuca)* find feeding opportunities in floodplain pastures as well. The site is highly used by great blue herons *(Ardea Herodias)* and great egrets *(Ardea alba)*.

Eagles and Osprey: Both bald eagles *(Haliaeetus leucocephalus)* and osprey *(Pandion haliaetus)* have been known to nest in the valley and there is a known/active eagle nest ~0.5 mi. north, northwest of the very northern project area. Following the Oregon Forest Practices Act (OFPA) we will treat this nest as a "Resource Site." According to OFPA 629-665-0010 "the goal of resource site protection is to ensure that forest practices (in our case, berm building, culvert installation) do not lead to resource site destruction, abandonment or reduced productivity." To ensure protection of this site we wanted to make note that no channel, berm rehabilitation, or culvert installation work occur within one-half mile of the site within the critical use period (January 1 – August 31) per OFPA 629-665-0220 subsection 2- C however, "The specific critical period of use for individual nesting resource sites may be modified in writing by the State Forester (ODFW wildlife biologist) depending upon the actual dates that bald eagles are present at the resource site and are susceptible to disturbance." Construction will occur outside the core nesting period, however, in order to ensure compliance ODFW staff will monitor the nesting site weekly during project completion in accordance with OFPA rules in order to minimize impacts to the birds.

Other Wildlife: Rough skinned newts *(Taricha granulaosa)* breed in the existing floodplain channels and mainstem Beaver Creek and perhaps on occasion in some pasture wetland locations within Units 1 and 3. Several species of frog including Oregon State listed red legged frogs *(Rana aurora)* noted as Sensitive Vulnerable are also present in Winter Lake, however, mostly north of the active work area. Northwestern salamanders *(Ambystoma gracile)* are regularly captured by ODFW fish sampling staff in Beaver Creek and likely use the Winter Lake floodplain channels. American Beaver (Castor canadensis), river otter *(Lontra canadensis)*, and non-native nutria *(Myocastor coypus)* are present as well.

Streamflow Regime: The 1,806+ acres that comprises the project area has little elevation relief (***Attachment A, Figures 24-25***). There is no stream from an upland site that runs through the floodplain pastures of the project area. China Camp Creek is currently captured in a main canal. Rainfall in pasture floodplain channels and moves to main canals and out through the C3P and CDD Beaver Creek tidegates. The quantity of flow generated from the Winter Lake floodplain is considered sufficient to produce small seasonal stream channels, however, the primary force that generated channels historically was tidal action. The C3P tidegate is able to control inflow to the landscape up to elevation 10.5ft NAVDD88.

China Camp Creek is a medium sized stream (under Oregon Dept. of Forestry classification) that runs through the project area. Excavation of 1,262ft of the southeast portion of the China Camp Creek main canal is proposed. Beaver Creek is immediately adjacent to the Action Area on the West and is a medium sized stream under Oregon Dept. of Forestry classification. The China Camp Creek watershed is just over 1,600 acres. The Beaver Creek watershed is 12.1 mi^2 in size or 7.774 acres with average annual precipitation of 62.2 inches. The Coquille River has peak flows that move into the floodplain through the C3P tidegates, however, above elevation 10.5ft there are a number of locations where the river is able to move up Beaver Creek and move over berms onto the floodplain. Higher Coquille flows occur primarily during December through February with low flows from July through October. Peak flows from the Coquille River and Beaver Creek result in extensive floodplain inundation during wetter winter months. Tidal influence in the mainstem Coquille River is greatest in June, December, and January, however, tidal inflow is muted at the C3P tidegates and is managed within the BSDD Water Management Plan. On Beaver Creek the tidegates do not have the ability to allow for tidal inflow, however, they do leak to a readily detectable level.

Ordinary High Water (OHW): The project team has defined the Ordinary High Watermark for this project as the normal extent that <u>tidal</u> flooding would occur. The extent of high tides without tidegates would be around 9.0ft NAVDD88. Flood flows commonly reach elevation 10-11ft. Inundation of the site at elevation 10.0+ft is considered above OHW. The entire project area is within the 100yr. floodplain.

Channel and Bank Conditions: The interior pasture channels and main canals has been excavated/dredged multiple times since the early 1900s. The Unit 1 and 3 main canals are roughly 30ft in width, with very soft organic and silty substrates 3-4ft in depth. Canal Banks are vegetated with reed canary and pasture grasses along with Douglas spiraea. Interior channels in pastures are generally very shallow (<3.0ft in depth) and have banks sodded with bent grass/other pasture grasses. Canal and pasture channels were originally constructed with vertical banks, which has contributed to bank sloughing and filling of bedform. The Beaver Creek main channel is roughly 25ft. in width. Depths range at an estimated 3-10 ft. in mainstem Beaver Creek in the project reach. No work will occur in the main Beaver Creek channel.

Riparian Condition: There is no hardwood riparian plant community present adjacent to pasture channels and thus the riparian condition is noted as "Poor." Current lack of hardwoods is, due to historical clearing, altered hydrology, and livestock consumption of prodigals. The riparian community on the Beaver Creek berm is in "Very Poor" condition due to historical forest clearing and long-term browse effects as well as highly altered hydrology. Currently there is little or no native woody vegetation and steep streambanks immediately adjacent to Beaver Creek. Some of this steep condition is related to deposition of dredging spoils on the shoulder of the Creek bank.

Channel Morphology: The existing channels in Units 1 and 3:
a). Were installed historically with design that was not based on micro-elevation topography on the landscape from interior pasture locations to delivery points with main canals;
b). The drainage channels are linear along pasture or landowner boundaries;
c). The channels were not constructed on grade;
d). Channels were constructed with vertical side-wall form that accelerated natural sloughing and cattle hoof action soil deposition into the channels reducing their capacity to transport water. The factors noted for pasture networks in Units 1 and 3 have resulted in widespread hydrologic discontinuity, poor access for juvenile native fish to enter and leave pasture habitats, and poor drainage for production of pasture grass. Winter Lake Units 1 and 3 have high inherent potential for fish production; however, their current hydrologic disconnection yields the issues noted in the previous ***Key Hydrology/Habitat*** section.

Stream Substrate: Pasture floodplain channel substrates are organic/silt/clay.

Hydrologic Assessment:

Assessment of Functional Attributes: The two main linear canals in Units 1 and 3 that inflow/outflow through the C3P tidegate from the project area reflect a managed inflow/outflow regime. The project area is estimated to have subsided from 1.0-5.0ft, however, despite subsidence historically at the extent of high tide several feet of water would have likely been present on the floodplain over most of the lower elevations of the BSDD and CDD. This is supported by the need for tidegates prior to instituting farming in the early 1900's.

Historically, daily tidal inflow and outflow would have resulted in relatively high dissolved oxygen, nutrient cycling, and aquatic production potential. Currently, inflow/outflow to the project area through the C3P tide-gate allows for interior water management modestly imitating historical conditions. The Phase III project will address interior channel networks and water control structures within Units 1 and 3 (***Attachment A, Figures 5,6, and 10***) that have remained unchanged following completion of Phase I and II. Units 1 and 3 tidal interior pasture channel networks are dissimilar from historical conditions and the hydrologic connectivity is considered "Poor."

Disconnection of the floodplain from river high flows due to the previous non-MTR tidegate have contributed to less deposition of sediment during flood events. Restriction of movement of turbid water onto the project area and is considered a factor contributing to subsidence. However, dewatering of the site through elimination of the tidal cycles has resulted in drying of the soils during summer and facilitated biological digestion of the high carbon content in the soil. These human induced alterations have resulted in a myriad of negative effects for water quality and ecology including poor nutrient cycling. Water quality in the pasture channels is considered extremely low during the summer and early fall months and it is likely that nitrogen compounds are elevated as pools stagnate and bacterial digestion of organic material occurs. The negative impacts to ecological production on the project area are primarily related and ranked in decreasing order of negative impact as:

1). Hydrological Disconnection

2). Greatly inhibited natural hydrology; and

3). Poorly developed/functioning riparian condition.

B. Describe the existing navigation, fishing and recreational use of the waterbody or wetland.

The recreational use of the lands within the Action Area of the project, have historically been primarily for waterfowl hunting and fishing. Improved ecological function (water quality, nutrients) is expected to have benefits for production of fish resources and waterfowl.

(7) PROJECT SPECIFIC CRITERIA AND ALTERNATIVES ANALYSIS

Describe project-specific criteria necessary to achieve the project purpose. Describe alternative sites and project designs that were considered to avoid or minimize impacts to the waterbody or wetland.*

Alternatives Considered:

1). No Action Alternative: This alternative would leave the BSDD Unit 1 and 3 and CDD project lands in their current condition. The culverts under the berms would continue to obstruct proper hydrologic connection with the floodplain pastures and inflow/outflow capacity and interior pasture networks would remain in a condition that results in minimal ecological productivity. Locations where berms have deteriorated would also prevent individual pasture irrigation tactics. Without construction of new channels to provide fish ingress/egress to low lying swales stranding will continue to be a factor impacting juvenile coho that venture on the floodplain pastures. Poor access channels to interior floodplain pasture feeding areas results currently in low productivity during critical winter months for juvenile coho. This alternative was not the preferred alternative as it fails to address ecological function, and long-term pasture management goals issues on the project area lands.

2). Replace only culverts in worst condition without channel reconstruction and new channel development. This option would partially address ponding areas and benefit pasture grass production in those locations, however, continues to fail to address fish stranding as channels are needed for fish to move properly from these locations. This option would also not address the need to develop channel networks into the interior of pastures to provide for fish movements and staging. This option would also fail to address the limited capacity currently for irrigation management. Due to these reasons this alternative was not chosen.

3). Install new vertical walled channels and culverts with water control structures that do not have the ability to be maintained in an open position. This option would result in channels where the banks that are not sloped at 1:1 or 2:1. These designs, while identical to historically installed channels and of lower cost, are susceptible to high rates of sloughing/slumping than with sloped side-walls. This design would result in less volume capacity as well. While cost would be reduced the bank sloughing would result in reduced channel life prior to needing to be re-excavated. There are several water control structures (e.g. traditional top hinged tidegates) that are much cheaper than those proposed for the project. New water control structures that are not able to be managed in the open position would provide cost savings, however, would not meet one of the primary goals, providing optimum fish passage from main canals into interior pasture channels. Top-hinged tidegate designs currently do not meet ODFW and NMFS criteria for fish passage. These types of water control structures also do not facilitate irrigation management tactics. This option would also fail to meet project goals and was not chosen.

4). Chosen Alternative: Replacement of undersized interior culverts; installation of new technologically advanced water control structures; reconfigure/reconstruct channel networks with side sloping and rehabilitate locations where the berms are below elevation 5.5ft Upgrade Berm. This alternative will provide for the greatest public and ecological benefit with manageable impacts. Restoring hydrologic connectivity to the floodplain of the site will have substantive ecological and agricultural benefits.

Not required by the Corps for a complete application but is necessary for individual permits before a permit decision can be rendered.

Coho Critical Habitat Avoidance Measures: The project will be conducted during the summer In-Water Work Window outlined by the ODFW and the National Marine Fisheries Service. Work will be conducted from top of bank with an excavator or dozer. When excavating/grading all material will be pushed away from contact with any stream or waterway that has standing or running water. Equipment will be fueled in an upland dry location 150 ft. or greater from standing or running water as outlined in TARP and SLOPES V restoration. Disturbance will be confined to the work area to the degree possible. Excavator pads will be used if there is a likelihood of incurring deep ruts and substantial damage to wetland and stream habitats. Fish will be salvaged by ODFW staff prior to work and if electroshocking is used to salvage salmonids staff will employ NMFS guidelines. Temperatures have been measured at 70+ degrees during summer months in the project area wetland channels after early July, thus it is considered unlikley that native salmonids will be present during the work period. Some coho are present in the main Beaver Creek channel yearlong, however, work will be conducted during drier months and excavation for the two tidal channel connections to Beaver Creek will be conducted at the extent of low tide when the work area is dewatered to the greatest extent possible.

Floodplain Impact Avoidance Measures: Work will be conducted during the summer months when the soils are drier and more firm. The project area pastures and berms are vegetated with bent, reed canary, and other pastured grass, which forms a dense consolidated sod. Accordingly, impacts from equipment will be partially minimized due to the heavy rootmass layer. Some compaction may occur, however, equipment will be confined to the work area and crane mat/pads will be used as necessary to prevent equipment from breaking through the sod layer and settling into the deep organic soils when constructing the channels, installing culverts, and recontructing berms. Any excavator/equipment track turn soil rows will be inspected and if necessary graded to prevent specific channeling of water into locations where fish will become stranded or where hydrologic connectivity is negatively impacted.

(8) ADDITIONAL INFORMATION

Are there state or federally listed species on the project site?	☒ Yes	☐ No	☐ Unknown
Is the project site within designated or proposed critical habitat?	☒ Yes	☐ No	☐ Unknown
Is the project site within a national Wild and Scenic River ?	☐ Yes	☒ No	☐ Unknown
Is the project site within a State Scenic Waterway?	☐ Yes	☒ No	☐ Unknown
Is the project site within the 100-year floodplain?	☒ Yes	☐ No	☐ Unknown

If yes to any above, explain in Block 6 and describe measures to minimize adverse effects to those resources in Block 7.

Is the project site within the Territorial Sea Plan (TSP) Area? **If yes, attach TSP review as a separate document for DSL.**	☐ Yes	☒ No	☐ Unknown
Is the project site within a designated Marine Reserve? **If yes, certain additional DSL restrictions will apply.**	☐ Yes	☒ No	☐ Unknown
Will the overall project involve ground disturbance of one acre or more? **If yes, you may need a 1200-C permit from the Oregon Department of Environmental Quality (DEQ).**	☒ Yes	☐ No	☐ Unknown
Is the fill or dredged material a carrier of contaminants from on-site or off-site spills?	☐ Yes	☒ No	☐ Unknown
Has the fill or dredged material been physically and/or chemically tested? **If yes, explain in Block 6 and provide references to any physical/chemical testing report(s).**	☐ Yes	☒ No	☐ Unknown
Has a cultural resource (archaeological and/or built environment) survey been performed on the project area? ***A previous Archeological Survey has been completed and is applicable with some caveats.***	☐ Yes	☒ No	☐ Unknown
Do you have any additional archaeological or built environment documentation, or correspondence from tribes or the State Historic Preservation Office? ***A previous Archeological Survey has been completed and is applicable with some caveats.***	☐ Yes	☒ No	☐ Unknown

See Section 9.

If yes, provide a copy of the survey and/or documentation of correspondence with this application to the Corps only. Do not describe any resources in this document. Do not provide the survey or documentation to DSL.

Is the project part of a DEQ Cleanup Site? No ☒ Yes☐ Permit number ___________
DEQ contact.__________________

Will the project result in new impervious surfaces or the redevelopment of existing surfaces? Yes ☐ No ☒
If yes, the applicant must submit a post-construction stormwater management plan as part of this application to DEQ's 401 WQC program for review and approval, see https://www.oregon.gov/deq/FilterDocs/401wqcertPostCon.pdf

Identify any other federal agency that is funding, authorizing or implementing the project.

Agency Name	Contact Name	Phone Number	Most Recent Date of Contact
None			

List other certificates or approvals/denials required or received from other federal, state or local agencies for work described in this application.

Agency	Certificate / approval / denial description	Date Applied
None		

Other DSL and/or Corps Actions Associated with this Site (Check all that apply.)

☐ Work proposed on or over lands owned by or leased from the Corps (may require authorization pursuant to 33 USC 408). These could include the federal navigation channel, structures, levees, real estate, dikes, dams, and other Corps projects.

☐ State owned waterway	DSL Waterway Lease #:	
☐ Other Corps or DSL Permits	Corps #	DSL #
☐ Violation for Unauthorized Activity	Corps #	DSL #
☐ Wetland and Waters Delineation	Corps #	DSL #

Submit the entire delineation report to the Corps; submit only the concurrence letter (if complete) and approved maps to DSL. If not previously submitted to DSL, send under a separate cover letter

(9) IMPACTS, RESTORATION/REHABILITATION, AND COMPENSATORY MITIGATION

A. Describe unavoidable environmental impacts that are likely to result from the proposed project. Include permanent, temporary, direct, and indirect impacts.

Archeology Note: In March 2016 Tetratech completed and submitted the following document "*Cultural Resources Reconnaissance and Water Control System Recording for the Winter Lake and China Camp Creek Restoration Projects, Coquille, Coos County, Oregon"* This cultural review covers substantive cultural resource information on the project area. This document is on file with Oregon SHPO.

This project is designed to be restorative with actions that improve function for wetlands, tidal regimes, and more ecological uplift. A number of measures will be incorporated to minimize impacts associated with construction. As the project is considered restorative no Compensatory Mitigation is proposed.

1. Installation of New HDPE Culverts
There will be disturbance of earth through the berms when old culverts are excavated and new channels are excavated through pasture berms. All work will be completed during the NMFS and ODFW approved July 1 to September 15th In-Water work window. Excavators will work from top of

bank, pulling soils towards the berm crest or pasture locations to minimize potential or soils to enter the canals culverts connect to. Following the project actions seeding and mulching will be applied at culvert installations through berm locations. Culvert excavation and installation will be conducted at the low-incoming tide. During that period there will be minimal water in work areas. An earthen plug will be installed upstream of the installation site to prevent flow of water from work area into pasture channels. Fish salvage is not expected to be needed as work at low tides will assist with removing water from work area, however, the project will coordinate with ODFW staff for individual locations on the need and tactics for fish salvage as needed. Deployment of a seine net isolation will be incorporated as necessary for individual sites to prevent fish from entering trenches where culvert excavation/installation occurs. Conducting work on the low incoming tide will isolate turbidity to the immediate work area.

2. Installation of New Water Control Mechanisms

Installation of these mechanisms (side-hinged tidegates and vertical slide/knife-gates) is not soil disturbing and will be accomplished through inserting them on culverts prior to installation.

3. Install New Bridge:

There will be earth disturbance and some modest In-Water Work to remove the old culvert at this site where the bridge will be installed for the farm road entrance from Hwy 42 to the pasture. Following removal of the culvert channel banks will be shaped to 1.5:1 sloping and seeded and mulched following construction. The excavator will work from the top of bank. In-Water Work will be conducted during a low incoming tide to provide for turbidity to be maintained in the work area and not export to the main Coquille River.

4. Construct On-Grade Tidal/Floodplain Channels:

Excavation/reconstruction of pastured channels will result in soil disturbance. Additionally, there will be soil thin-spreading in pastures to an average depth of 3.0" adjacent to channel excavation locations. Those soils will have new regrowth of pasture grass/vegetation in the early fall with cooler temperatures. Side slopes of channels will be seeded with an appropriate pasture erosion control mix, following construction to expedite healing. Channels will be installed from July 1 to September 15th. Small earthen plugs will be installed at the connection point with the main canals at low tide to prevent entry of water into the canals during construction. Connection will be accomplished through excavation of the final water control plugs during a low-incoming tide. Channels will be isolated from water inflow through installation of a low earthen berm in the channel entry point from the berm culvert into the pastures. Work area isolation berms will be removed following channel completion on a low incoming tide, which will isolate turbidity to the immediate work area. There will be some limited excavator depression of pasture/wetland soils, soil disturbance, and placement of fill to an average depth of 3.0" on pastures.

5. Installation of Hydrologic Bulbs:

These excavated land areas are at the upper ends of channel networks. Excavation is expected to be fully in dry conditions. Earthen spoils will be thin spread to an average depth of 3.0" adjacent to the hydrologic bulb sites or in some cases hauled with use of a standard dump truck to berm repair locations. These locations have been designed with an elevation invert that provides for pasture grass growth. Following construction, we will seed and mulch these locations with an appropriate coastal pasture grass mix and weed free hay/straw. Five elevational diversity wetland mounds adjacent to hydrologic bulbs on the Bridges west and east properties will provide for planting success of Sitka Spruce and cottonwood. The max elevations will be 7.5ft NAVDD 88, which ensures wetland function.

6. Excavation of China Camp Creek and Unit 1 Canal S.E.:

This work will be conducted later in the summer In-Water Work window for two reasons:

- **a).** Temperatures continue to increase during the duration of the summer months, which will ensure salmonid fish are not present during excavation.
- **b).** Streamflows from China Creek and groundwater inputs into the Unit 1 S.E. canal will be minimized, reducing the movement of turbidity from the work area. ODFW consultation has determined that salmonid fish will be highly unlikely to be in the work area due to high stream temps in August-Early September. That said there is likely to be some lamprey ammocoetes, three-spined sticklebacks (*Gasterosteus aculeatus*), and a few native sculpin in the work zone.

The deep muddy substrates and overall width of the canals at the sites present conditions where the primary tactics that will be successful to minimize impacts will be to:

- **a).** Excavate sediments on low-incoming tide, which will hold turbidity in the work area;
- **b).** Salvage lamprey ammocoetes, sticklebacks, amphibians, and sculpin that become entrained

with bucket deposition of excavated earth as deposited in field locations using hand methods. All fish will be released into another reach of the canals where conditions are favorable.

7. Berm Repair:
Berm repair will be accomplished during the July 1 to September 15th In-Water Work window. The excavator and dozer will work from top of bank. Canal slopes will be from 1:1 to 1.5:1 sloping depending on reach. Pasture side sloping will be 2:1 or more gentle. Side-sloping will allow for mulching/seeding that will minimize erosion. Berm work will occur above canal water elevation as construction will be completed at either a low tide or when the C3P tidegates have been able to sustainably lower water elevations below the work zone. There will be several segments where some new earthen material will be needing to be placed down to the water surface elevation, however, turbidity will be contained within the work area as the work at those locations will be conducted on a low incoming tide.

Stormwater Management Discussion:
Channel Construction: Excavator work will result in minimal soil compaction levels for the floodplain/wetland soils present on the project area. Channel banks will be sloped to 1:1lg, 1.5:1med, and <2:1sm sloping depending on reach segment to prevent erosion. Pasture grass and sedge vegetation is anticipated to immediately re-sprout with fall rains and grow through thin-spread soils. This was readily evident from the North Bank Access Project (*see* ***ODFW report to USAC; North Bank Access Project Monitoring Report***) where soils were spread to an average depth of 3.0" on the land area. Seeding and mulching will be used where there is substantial soil disturbance with a potential to move from the location to a canal or watercourse outside the immediate channel construction area. No new hard surface roads will be constructed with this project.

B. For temporary removal or fill or disturbance of vegetation in waterbodies, wetlands or riparian (i.e., streamside) areas, discuss how the site will be restored after construction to include the timeline for restoration.

- Temporary fill storage areas will be only adjacent to berm repair locations and on the pasture side where there is not risk of slumping or bucket drift into main canals or waterways. Fill may be stored for a few days to a week. Fill will be excavated down to the existing vegetation level following storage to allow for re-sprouting of native/other vegetation that is currently on site after construction. If the root structure is removed through excavation at these sites occurs seeding and mulching will be employed to reestablish vegetation.

- We will employ seeding with a coastal zone pasture mix and mulching with weed free straw/hay for all locations where there is loose earthen fill, excavated fluff, or unconsolidated soils that have a likelihood of being activated with rainfall, wind, or tidal inflow/outflow due to project implementation. Seeding and mulching will be employed prior to the fall rainy period in order to provide for initial establishment of vegetation and prevent entry of sediments in watercourses.

- Noise and equipment vibration disturbance will be completed prior to cooler fall water temperatures and entry of listed salmonids into project area canals and waterways.

- Excavator work will be conducted from dry upland locations and top of bank during all work during unless necessary and then excavator support mats to prevent soil damage will be used as necessary.

- Skip Planting tactics (***Attachment B; Sheets 24-26***) will be employed as a long-term ecological uplift on chosen segments of larger and medium channels from the connection point with main canals upstream for 500ft or further (depending on landowner). Individual landowners have expressed interest in fencing larger channels with a minimal setback from livestock grazing. These hotwire fences would provide for full establishment of grasses/sedges on these reaches of channel providing fish cover and filtration of pasture nutrients.

Assessment Note: We have considered the ecological influence/effects of individual hydrologic/productivity factors and proposed Project Action effects at the site and have ranked them according to their capacity to benefit production or impact conditions. *(**Table 1, p. 26**):*

- _Hydrologic Connectivity:_ Increasing access for fish and water movements to habitats through installation of a more natural channel network is considered to have the greatest capacity for ecological benefit.

- Hydrologic Regimes/natural hydrology: New channels and culverts with proper sizing in combination with more functional water control structures will increase the ability for channel networks to reflect C3P tidegate operations and deliver a more natural tidal inflow/outflow from the project area. This is considered the second largest factor affecting ecological productivity.
- Riparian condition: Skip planting of native trees (cottonwood, spruce, and Oregon ash) with three trees per plot and spacing of plots on 100ft intervals will provide for some shading of the larger channels through time improving summer water quality and winter wildlife habitat. Other Skip Planting strategies were also considered similarly effective (**Attachment B; Sheets 24-26**).

Table 1. Analysis of Impacts and Benefits for Winter Lake Phase III proposed actions.
Note: *All disturbance actions are considered to be recovered/revegetated from disturbance 3yrs post project. Majority of attributes are designed to produce uplift that result in "Net Benefit" ecologically*

Action	Impact	Impact to Ecology Time of Construction Yes/No	Severity of Impact High/Med/Low	Healed by Year 2 Yes/No	Net Ecologic Benefit by Yr 3 Yes/No	Benefit Power High/Med/Low	Explanation
Installation of new proper sized culverts	Earth Work interior berms	Yes, due to soil disturbance	**Low**	**Yes**	**Yes, immediate uplift**	**High**	*New culverts allow for more natural hydrologic flow of water to interior pasture channels. greatly improved fish passage and wetland function. Net benefit strong much greater than impacts from time zero forward*
Channel construction/reconstruction; Excavation	Excavation/ soil disturbance	Yes, soil disturbance	**Medium**	**Yes**	**Yes, immediate uplift**	**High**	*New/reconstructed channels provide for more natural hydrologic flow of water to interior pastures, greatly improved fish passage and wetland function. Net benefit much greater than impacts from time zero forward.*
Channel construction/reconstruction; soil Thin-spread	Soil distribution to 3" on wetlands	Yes, plant disturbance, unvegetated soils	**Medium**	**Yes**	**Neutral by year 3**	**Neutral by year 3**	*Soils that are distributed on wetland pastures will be thin-spread on average to 3" in depth; they will be integrated into pasture grasses as wetland plants are fully able to grow through this application fall of year 1 with full healing by year 2.*
Channel Reconstruction bank sloping 1:1 and 2:1	Soil disturbance	Yes, soil disturbance	**Medium**	**Yes**	**Uplift by year 2**	**Medium**	*Current pasture drainage channels have vertical banks that lead to bank sloughing and provide little if any edge habitats for fish when winter flows fill channels. Sloping of banks of channels will provide edge for growth of vegetation/fish cover, reduce erosion, and sediments*
Construction of Hydrologic Bulbs	Soil disturbance	Yes, soil disturbance	**Low**	**Yes**	**Yes, immediate uplift**	**High**	*Hydrologic bulbs will be installed at upper reaches of channel networks in selected locations. These bulbs will be excavated to an elevation that during winter months they provide long-term wetted habitat for juvenile coho. These also increase hydrologic exchange of water, which results in greater flushing of channels during tidal inflow/outflow. This prevents channels from accumulating sediments and provides long term channel life expectancy with little or no reexcavation to "clean" sediment. These bulbs also allow for greater volume capacity of channel networks duriing inflow/outflow events, which provide for exchange of water in channels and canals improving water quality.*
Excavation of China Camp/Unit 1 Canal S.E.	Direct Substrate Disturbanc/ Turbity	Yes, remove substrates, organisms, turbidity	**Medium**	**Yes**	**Neutral by year 3**	**Neutral by year 3**	*Initial excavation will remove substrates that have macroinvertebrates and lamprey present. This action will, however, be carried out where banks of canals are not denuded of established grass cover. Skip Planting will be employed in these reaches on pasture side of berm. Spreading of spoils to 3.0" in adjacent pastures is anticipated provide for stabilization in year 1.*
Berm Reconstruction		Yes, soil disturbance	**Low**	**Yes**	**Neutral by year 2**	**Neutral by year 2**	*Locations where berms are reconstructed will be be seeded/mulched. They are expected to be fully revegetated by year by end of growing season year 2.*
Fence installation	Some soil disturbance	Minimal	**Very Low**	**Yes**	**Yes**	**Medium**	*Fencing of selected segments of channels provides immediate benefits to water quality and longer term establishment of riparian vegetative and woody plants for fish habitat complexity.*
Large Woody Debris Installation large channels	Some soil disturbance	Minimal	**Very Low**	**Yes**	**Yes**	**High**	*Installation of LWD rootwads in first 500ft of larger channels will fully provide uplift through providing complexity for fish and other aquatic organisms.*
Planting of Trees on large and selected secondary channels	N/A	N/A	**N/A**	**N/A**	**N/A**	**HIgh**	*Skip planting of trees will be implemented on large and selected medium channels in segments where fence is installed. Additionally, individual caged trees will be planted. Skip planting will be three trees planted in a single 8x8ft plot every 100ft on large channels and selected medium channel reaches (Sheets 24-26). Tree species will be either Oregon Ash, Black Cottonwood, or Spruce.*

Net Estimated Project Overall Ecological Benefit by Year 1 — Medium
Net Estimated Project Overall Ecological Benefit by Year2 — High

Table 2. Winter Lake Phase III Project Action Design Yardages.

Channel Construction/Reconstruction*

Landowner	Wetland/Waterbody	Size	Length (ft)	Excavate Cubic Yards	Fill Cubic Yards	Excavate Acres	Thinspread Area Acres	Fill Comments
Bridges Foundation	*Interior Pasture Channel*	Small	15,006	10,473	10,473	3.8	8.7	3.0" ave thinspread pasture
	Interior Pasture Channel	Medium	14,851	14,876	14,876	3.9	12.3	3.0" ave thinspread pasture
	Interior Pasture Channel	Large	18,690	31,121	29,292	6.0	24.2	3.0" ave thinspread pasture
Isenhart/Smith	*Interior Pasture Channel*	Small	8,633	5,974	5,317	2.2	4.4	3.0" ave thinspread pasture
	Interior Pasture Channel	Medium	3,651	3,666	3,666	1.0	3.0	3.0" ave thinspread pasture
	Interior Pasture Channel	Large	4,335	6,983	6,750	1.4	5.6	3.0" ave thinspread pasture
Messerle	*Interior Pasture Channel*	Small	12,582	8,795	7,556	3.2	6.2	3.0" ave thinspread pasture
	Interior Pasture Channel	Medium	2,119	2,078	2,078	0.6	1.7	3.0" ave thinspread pasture
	Interior Pasture Channel	Medium-S	3,030	4,038	4,038	0.8	3.3	3.0" ave thinspread pasture
	Interior Pasture Channel	Large	9,052	14,780	13,734	2.9	11.4	3.0" ave thinspread pasture
ODFW	*Interior Pasture Channel*	Small	2,495	2,037	2,037	0.6	1.7	3.0" ave thinspread pasture
	Interior Pasture Channel	Medium	4,562	4,675	5,175	1.2	4.3	3.0" ave thinspread pasture
	Interior Pasture Channel	Large	775	1,319	500	0.2	0.4	3.0" ave thinspread pasture
		Subtotals	***99,781***	***110,815***	***105,492***	***27.8***	***87.2***	

** 5,323 cy of cubic yards excavated used for berm repair*

Canal Excacavation

Landowner	Wetland/Waterbody	Size	Length (ft)	Excavate Cubic Yards	Fill Cubic Yards	Excavate Acres	Thinspread Area Acres	Fill Comments
Bridges Foundation	*China/Camp Canal E.*	Canal	1,262	3,675	3,675	0.87	3.0	3.0" ave thinspread pasture
Messerle	*Unit 1 Canal S.E. (2 locs)*	Canal	~200	2,000	2,000	0.06	1.7	3.0" ave thinspread pasture
ODFW	*Unit 3 Canal N.E.*	Canal	840	1,116	1,116	0.12	0.9	3.0" ave thinspread pasture
		Subtotals	***2,302***	***6,791***	***6,791***	***1.0***	***5.6***	

Berm Reconstruction

Landowner	Wetland/Waterbody	Size	Length (ft)	Excavate Cubic Yards	Fill Cubic Yards	Excavate Acres	Fill Area Acres	Fill Comments
Bridges Foundation	*China/Camp Canal Berm*	20ft base	587	0	997	N/A	0.27	Fill from chan construction
Bridges Foundation	*Unit 1 Canal Berm misc*	20ft base	221	0	376	N/A	0.10	Fill from chan construction
								Fill from chan construction
Messerle	*Unit 1 E.; #1 and 2 sites*	20ft base	530	0	901	N/A	0.24	Fill from chan construction
Messerle	*Unit 1 S. #2*	20ft base	220	0	374	N/A	0.10	Fill from chan construction
Messerle	*Bridge approach*	20ft base	80	0	358	N/A	0.04	Fill from chan construction
								Fill from chan construction
Isenhart/Smith	*Unit 1 S. #1, 3, & 4*	20ft base	460	0	675	N/A	0.21	Fill from chan construction
Isenhart/Smith	*Unit 1 E*	20ft base	149	0	732	N/A	0.07	Fill from chan construction
								Fill from chan construction
ODFW	*Unit 3 North*	20ft base	600	0	510	N/A	0.28	Fill from chan construction
ODFW	*Unit 3 N.E.*	20ft base	400	0	400	N/A	0.18	Fill from chan construction
		Suttotals	***3,247***	*0*	***5,323***		***1.49***	

Culvert Installation Riprap (and one bridge site)*

Landowner	Wetland/Waterbody	Area Sq Ft	Number Locations	Excavate Cubic Yards	Tot Fill Cubic Yards	Excavate Acres	Fill Area Acres	Fill Comments
Bridges Foundation	*Pasture chan culverts*	100	16	N/A	320	N/A	0.002	
Messerle	*Pasture chan culverts*	100	9	N/A	180	N/A	0.002	
Messerle	*Unit 1 S.E. Bridge*	480	1	456	496	0.01	1.130	3.0" thinspread/40cy riprap install
Isenhart/Smith	*Pasture chan culverts*	100	5	N/A	100	N/A	0.002	
ODFW	*Pasture chan culverts*	100	7	N/A	140	N/A	0.002	
			Totals	***456***	***1,236***	***0.11***	***1.139***	

Hydrologic Bulb Construction* *(some material may be used for berm reconstruction)*

Landowner	Wetland/Waterbody	Area Sq Ft	Number Locations	Excavate Cubic Yards	Fill Cubic Yards	Excavate Acres	Thinspread Area Acres	Fill Comments
Bridges Foundation	Interior Pastures	345,866	10	30,499	30,499	7.94	25.2	3.0" ave thinspread pasture
Messerle	Interior Pastures	184,259	5	12,907	12,907	4.23	10.7	3.0" ave thinspread pasture
Isenhart/Smith	Interior Pastures	134,208	4	10,159	10,159	3.081	8.4	3.0" ave thinspread pasture
ODFW	Interior Pastures	144,184	3	10,940	10,940	3.31	9.0	3.0" ave thinspread pasture
			Totals	***64,505***	***64,505***	***18.6***	***53.3***	
Bridges Foundation	**Wetland Diversity Mounds**	5 mounds 20ft in diameter ~3ft in depth, maintain wetland factors 80cy of 64,505 cy total.						

Heavy Use Watering Trough Sites

Landowner	Wetland/Waterbody	Area Sq Ft	Number Locations	Excavate Cubic Yards	Fill Cubic Yards	Excavate Acres	Thinspread & Rock Acres	Fill Comments
Messerle	Interior Pastures	1600	4	47.4	47.4	0.04	0.08	3.0" ave thinspread pasture/4" rock
Isenhart/Smith	Interior Pastures	800	2	23.7	23.7	0.02	0.04	3.0" ave thinspread pasture/4" rock
Bridges Foundation	Interior Pastures	1200	3	35.6	35.6	0.03	0.06	3.0" ave thinspread pasture/4" rock
			Totals	***106.7***	***106.7***	***0.08***	***0.17***	**0.25 acres thinspread and Heav use rock**

Compensatory Mitigation

Project is designed to be restorative in nature/self mitigating. All actions improve hydrologic function.

B. Proposed mitigation approach. Check all that apply:

Restoration project; will produce ecological uplift that overoffsets impacts.

☐ Permittee-responsible Onsite Mitigation	☐ Permittee-responsible Offsite mitigation	☐ Mitigation Bank or In-Lieu Fee Program	☐ Payment to Provide (not approved for use with Corps permits)

D. Provide a brief description of proposed mitigation approach and the rationale for choosing that approach. If you believe mitigation should not be required, explain why.

Project is designed to be restorative in nature with offset of impacts by improvements in:

1). Hydrological Connectivity that allows for water and fish to move readily from main canals to pasture channels.

2). Hydrological Regimes that more closely mimic historical condition

3). Riparian Improvement that provides for improved water quality and wildlife habitat

4). Improved Sloping of channels that prevents calving of channel banks and improved water quality

Mitigation Bank / In-Lieu Fee Information: N/A

Name of mitigation bank or in-lieu fee project:

Type and amount of credits to be purchased:

If you are proposing permittee-responsible mitigation, have you prepared a compensatory mitigation plan?

☐ Yes. Submit the plan with this application and complete the remainder of this section.

☐ No. A mitigation plan will need to be submitted (for DSL, this plan is required for a complete application).

This project is restorative in nature and uplift offsets temporary impacts

Mitigation Location Information (Fill out only if permittee-responsible mitigation is proposed)

Mitigation Site Name/Legal Description *N/A*	Mitigation Site Address	Tax Lot #
County	City	Latitude & Longitude (in DD.DDDD format)

Township	Range	Section	Quarter/Quarter

(10) ADJACENT PROPERTY OWNERS FOR PROJECT AND MITIGATION SITE

☐ **Pre-printed mailing labels of adjacent property owners attached**	**Project Site Adjacent Property Owners**	**Mitigation Site Adjacent Property Owners**

Contact Name	Juliana Ruble
Address 1	District 7, Oregon Department of Transportation
Address 2	307 Hwy 42 W
City, ST ZIP Code	Coquille, OR 97423

Contact Name
Address 1
Address 2
City, ST ZIP Code

Contact Name
Address 1
Address 2
City, ST ZIP Code

Contact Name
Address 1
Address 2
City, ST ZIP Code

Contact Name
Address 1
Address 2
City, ST ZIP Code

For U.S. Army Corps of Engineers send application to:

USACE Portland District
ATTN: CENWP-ODG-P
PO Box 2946
Portland, OR 97208-2946
Phone: 503-808-4373
portlandpermits@usace.army.mil

Counties:
Baker, Benton, Clackamas, Clatsop, Columbia, Gilliam, Grant, Hood River, Jefferson, Lincoln, Linn, Malheur, Marion, Morrow, Multnomah, Polk, Sherman, Tillamook, Umatilla, Union, Wallowa, Wasco, Washington, Wheeler, Yamhill

U.S. Army Corps of Engineers
ATTN: CENWP-ODG-E
211 E. 7th AVE, Suite 105
Eugene, OR 97401-2722
Phone: 541-465-6868
portlandpermits@usace.army.mil

Counties:
Coos, Crook, Curry, Deschutes, Douglas, Jackson, Josephine, Harney, Klamath, Lake, Lane

For Department of State Lands send application to:

West of the Cascades:
Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
Phone: 503-986-5200

East of the Cascades:
Department of State Lands
1645 NE Forbes Road, Suite 112
Bend, Oregon 97701
Phone: 541-388-6112

For Department of Environmental Quality e-mail application to:

ATTN: DEQ 401 Certification Program
Water Quality
700 NE Multnomah St, Suite 600
Portland, OR 97232
401applications@deq.state.or.us

(11) CITY/COUNTY PLANNING DEPARTMENT LAND USE AFFIDAVIT (TO BE COMPLETED BY LOCAL PLANNING OFFICIAL)

I have reviewed the project described in this application and have determined that:

☐ This project is not regulated by the comprehensive plan and land use regulations
☐ This project is consistent with the comprehensive plan and land use regulations
☒ This project is consistent with the comprehensive plan and land use regulations with the following:
  ☒ Conditional Use Approval
  ☒ Development Permit
  ☒ Other Permit (explain in comment section below)
☐ This project is not currently consistent with the comprehensive plan and land use regulations. To be consistent requires:
  ☐ Plan Amendment
  ☐ Zone Change
  ☐ Other Approval or Review (explain in comment section below)

An application or variance request has ☐ has not ☐ been filed for the approvals required above.

Local planning official name (print)	Title	City / County
Chris MacWhorter	**Principal Planner/Floodplain Admin.**	**Coos County**

Signature	Date
	5/2/2023

Comments:

Proposal requires ACU for CREMP zoning, CD for EFU, and Floodplain Review for all floodplain overlay zone.

(12) COASTAL ZONE CERTIFICATION

If the proposed activity described in your permit application is within the Oregon Coastal Zone, the following certification is required before your application can be processed. The signed statement will be forwarded to the Oregon Department of Land Conservation and Development (DLCD) for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program and consistency reviews of federally permitted projects, contact DLCD at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050 or click here.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Applicant Name	Title
Fred R. Messerle	District Manager
Applicant Signature	**Date**
Fred R Messerle	6/10/2022

(13) SIGNATURES

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities. By signing this application I consent to allow Corps or DSL staff to enter into the above-described property to inspect the project location and to determine compliance with an authorization, if granted. I hereby authorize the person identified in the authorized agent block below to act in my behalf as my agent in the processing of this application and to furnish supplemental information in support of this permit application. I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the permits requested before commencing the project. I understand that payment of the required state processing fee does not guarantee permit issuance.

To be considered complete, the fee must accompany the application to DSL. The fee is not required for submittal of an application to the Corps.

Fee Amount Enclosed	$
Applicant Signature (required) must match the name in Block 2	
Print Name Fred R. Messerle	Title District Manager
Signature Fred R. Messerle	Date 06/01/2022
Authorized Agent Signature	
Print Name Caley Sowers	Title District Manager
Signature Caley Sowers	Date 02/09/2023

Landowner Signature(s)*	
Landowner of the Project Site (if different from applicant)	
Print Name Fred Messerle & Sons, Inc.	Title Secretary-Treasurer
Signature Fred R. Messerle	Date 6/10/2022
Landowner of the Project Site (if different from applicant)	
Print Name Everett-Ona Isenhart Ranch, Inc.	Title President
Signature Cynthia Henson	Date 06/02/2022
Landowner of the Project Site (if different from applicant)	
Print Name Laura Isenhart	Title ~~Owner~~ Trustee, Isenhart Living Trust
Signature Laura J. Isenhart	Date 6.10.22
Landowner of the Project Site (if different from applicant)	
Print Name John Isenhart	Title Trustee, ~~6-10-22~~ Isenhart Living Trust
Signature John Isenhart	Date 6.10.22

(13) SIGNATURES

Application is hereby made for the activities described herein. I certify that I am familiar with the information contained in the application, and, to the best of my knowledge and belief, this information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities. By signing this application I consent to allow Corps or DSL staff to enter into the above-described property to inspect the project location and to determine compliance with an authorization, if granted. I hereby authorize the person identified in the authorized agent block below to act in my behalf as my agent in the processing of this application and to furnish supplemental information in support of this permit application. I understand that the granting of other permits by local, county, state or federal agencies does not release me from the requirement of obtaining the permits requested before commencing the project. I understand that payment of the required state processing fee does not guarantee permit issuance.

To be considered complete, the fee must accompany the application to DSL. The fee is not required for submittal of an application to the Corps.

Fee Amount Enclosed	$

Applicant Signature (required) must match the name in Block 2

Print Name	Title
Signature	Date

Authorized Agent Signature

Print Name	Title
Signature	Date

Landowner Signature(s)*

Landowner of the Project Site (if different from applicant)

Print Name	Title
Sara Gregory	ODFW, Umpqua Watershed District Manager
Signature	Date
Sara Gregory	April 13, 2022

Landowner of the Project Site (if different from applicant)

Print Name	Title
Luke Fitzpatrick	Trustee, The Bridges Foundation
Signature	Date
[signature]	7-28-2022

Landowner of the Project Site (if different from applicant)

Print Name	Title
Juliana Ruble	District 7 Permit Specialist
Signature	Date
Juliana Ruble	04.04.2023

Landowner of the Project Site (if different from applicant)

Print Name	Title
Signature	Date

Landowner of the Project Site (if different from applicant)	
Print Name	Title
Signature	Date

Landowner of the Project Site (if different from applicant)	
Print Name	Title
Signature	Date

Landowner of the Project Site (if different from applicant)	
Print Name	Title
Signature	Date

Landowner of the Project Site (if different from applicant)	
Print Name	Title
Signature	Date

Landowner of the Project Site (if different from applicant)	
Print Name	Title
Signature	Date

Landowner of the Mitigation Site (if different from applicant)	
Print Name	Title
Signature	Date

Department of State Lands, Property Manager (to be completed by DSL)	
If the project is located on state-owned submerged and submersible lands, DSL staff will obtain a signature from the Land Management Division of DSL. A signature by DSL for activities proposed on state-owned submerged/submersible lands only grants the applicant consent to apply for a removal-fill permit. A signature for activities on state-owned submerged and submersible lands grants no other authority, express or implied and a separate proprietary authorization may be required.	
Print Name	Title
Signature	Date

[*] Not required by the Corps.

(14) ATTACHMENTS

- ☐ Drawings
  - ☐ Location map with roads identified (figure 1)
  - ☐ U.S.G.S topographic map (figure 2)
  - ☐ Tax lot map (figure 3-4)
  - ☐ Site plan(s) (see figures 5-30)
  - ☐ Plan view and cross section drawing(s) (figures 18-24)
  - ☐ Recent aerial photo (figure 5 and 11)
  - ☐ Project photos (figures 8, 10, 12, 14, 17, 28)
  - ☐ Erosion and Pollution Control Plan(s), if applicable (N/A)
  - ☐ DSL / Corps Wetland Concurrence letter and map, if approved and applicable
- ☐ Pre-printed labels for adjacent property owners (Required if more than 5)
- ☐ Incumbency Certificate if applicant is a partnership or corporation
- ☐ Restoration plan or rehabilitation plan for temporary impacts
- ☐ Mitigation plan
- ☐ Wetland functional assessments, if applicable
  - ☐ Cover Page
  - ☐ Score Sheets
  - ☐ ORWAP OR, F, T, & S forms
  - ☐ ORWAP Reports
  - ☐ Assessment Maps
  - ☐ ORWAP Reports: Soils, Topo, Assessment area, Contributing area
- ☐ Stream Functional Assessments, if applicable
  - ☐ Cover Page
  - ☐ Score Sheets
  - ☐ SFAM PA, PAA, & EAA forms
  - ☐ SFAM Report
  - ☐ Assessment Maps
    - ☐ Aerial Photo Site Map and Topo Site Map (Both maps should document the PA, PAA, & EAA)
- ☐ Compensatory Mitigation (CM) Eligibility & Accounting Worksheet
  - ☐ Matching Quickguide sheet(s)
  - ☐ CM Eligibility & Accounting sheet
- ☐ Alternatives analysis
- ☐ Biological assessment (if requested by the Corps project manager during pre-application coordination)
- ☐ Stormwater management plan (may be required by the Corps or DEQ)
- ☐ Other
  - ☐ Please describe:

Attachment A:
FIGURES AND PHOTOS

WINTER LAKE PHASE III

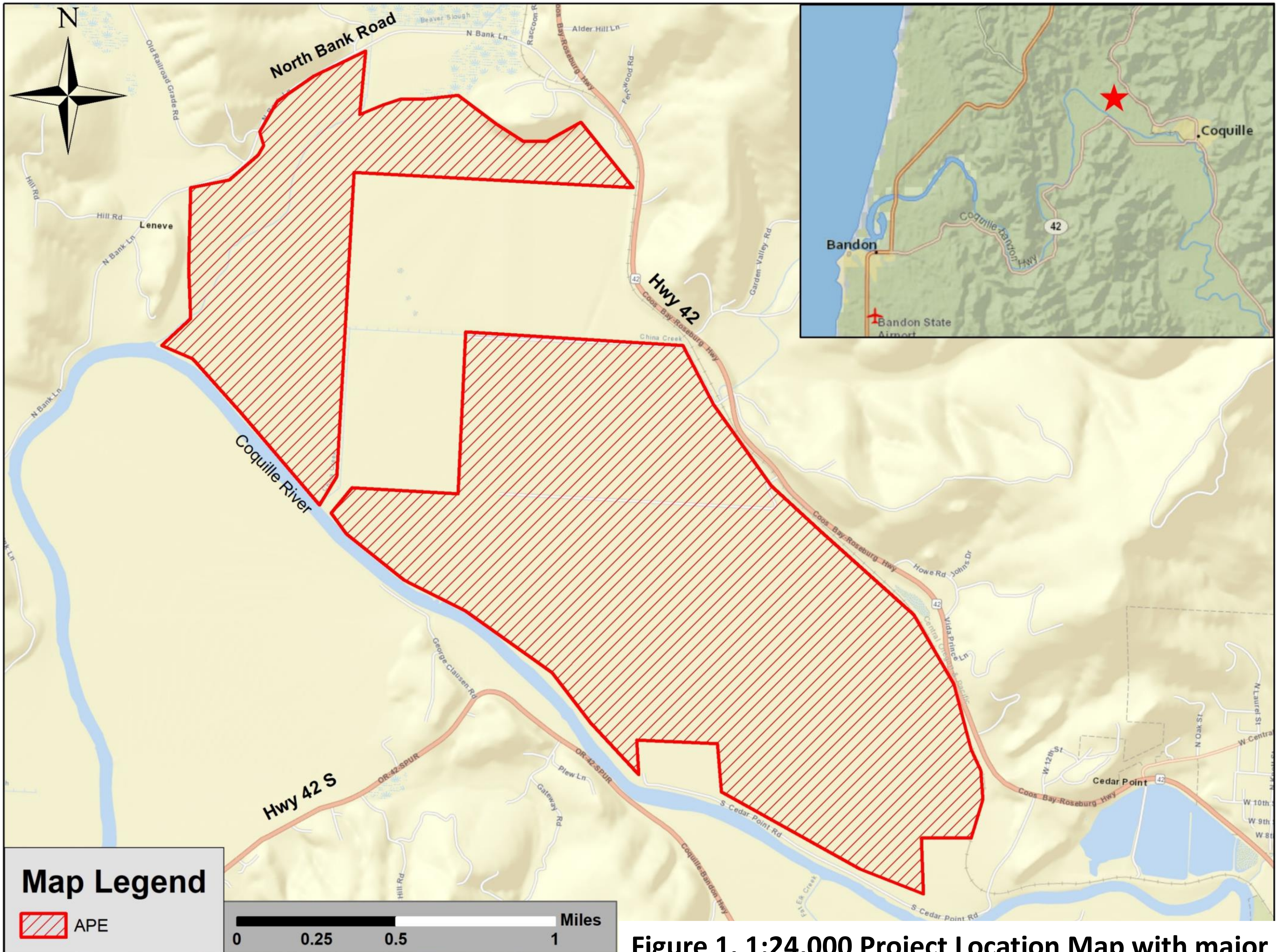


Figure 1. 1:24,000 Project Location Map with major roads/highways identified

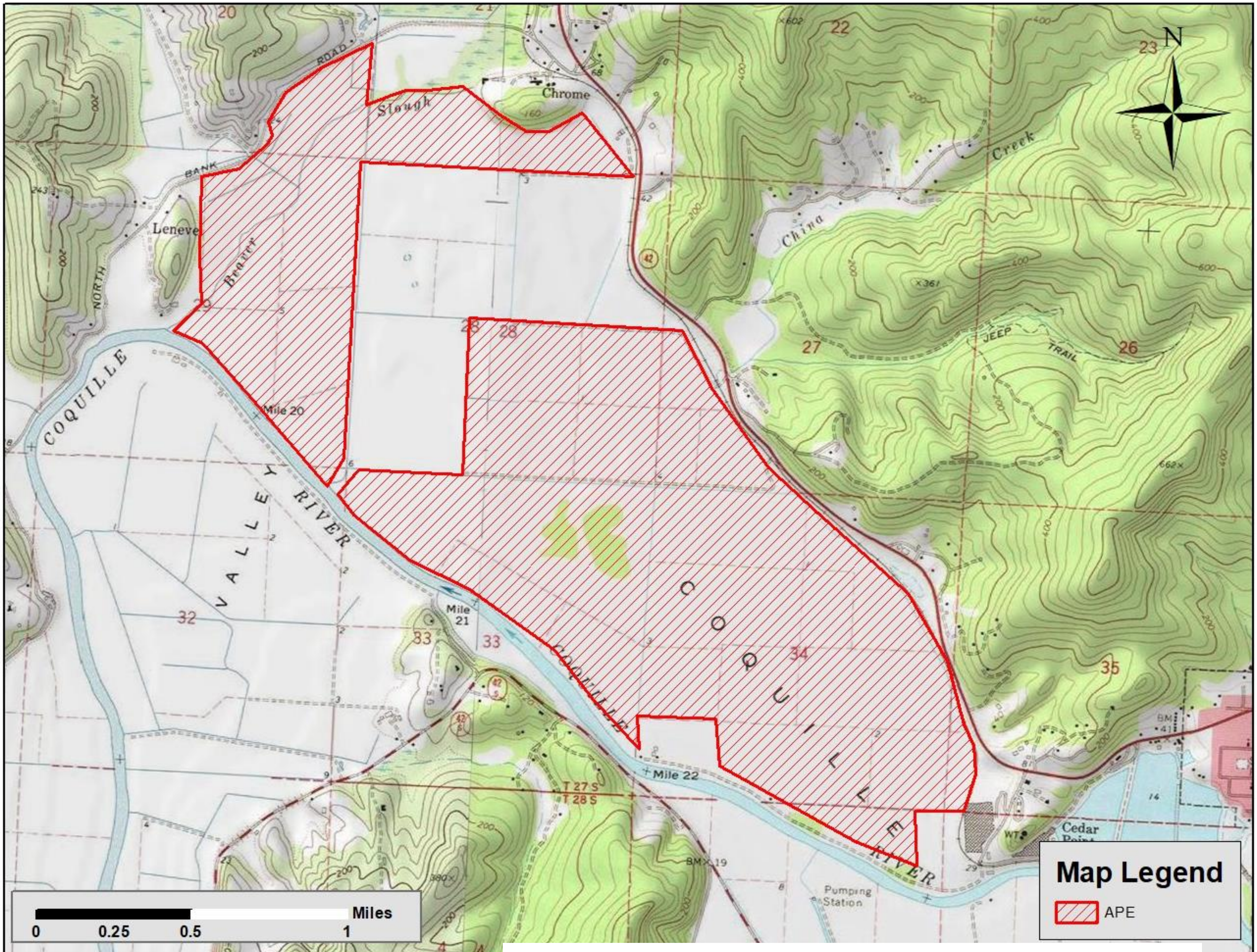
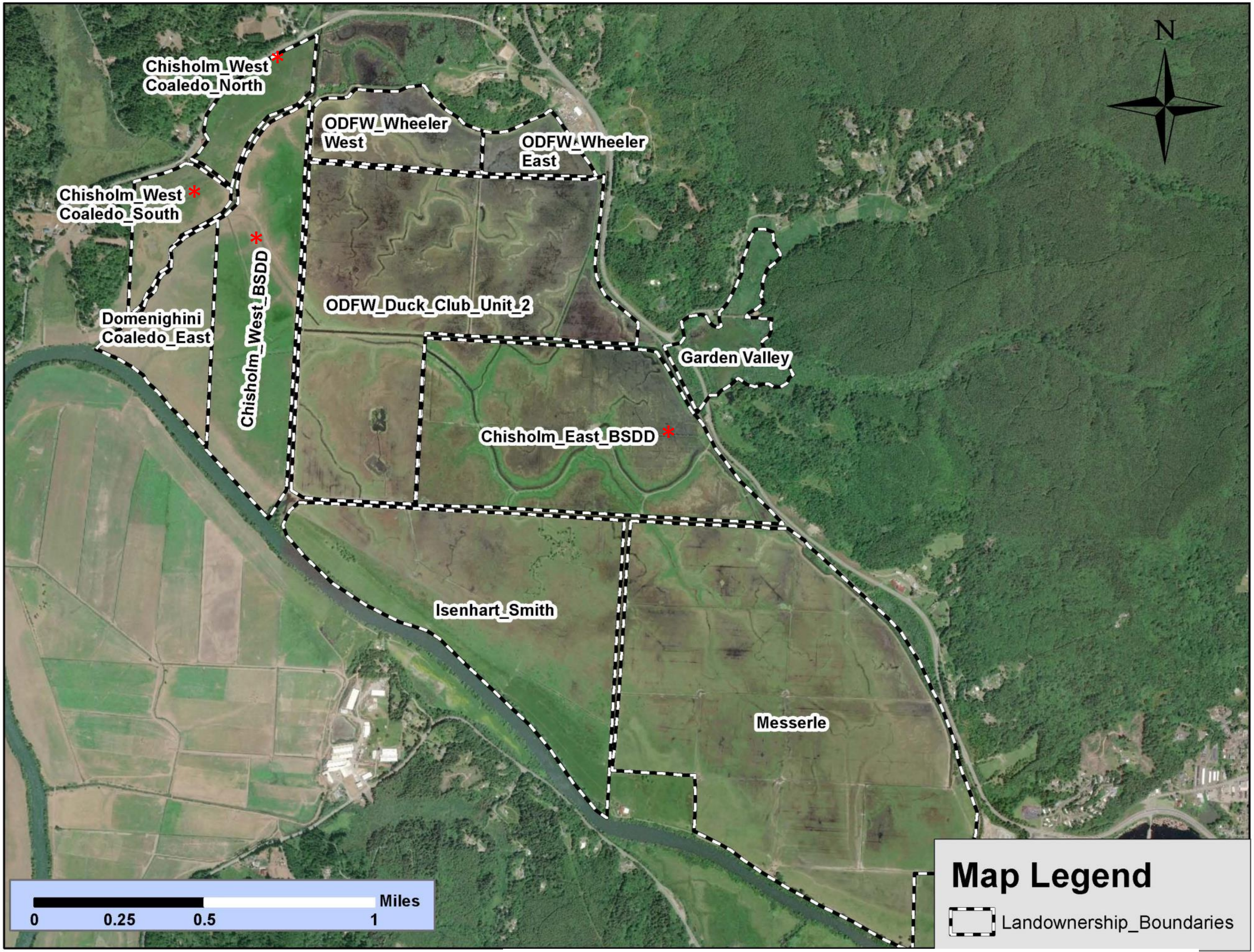


Figure 2. 1:24,000 USGS Topographic Map of Area of Project Effect (APE)

Figure 3. Taxlot ID Map



*Update 8/6/2022 Chisholm Properties now owned by The Bridges Foundation

Figure 4. Winter Lake Land Ownership Map

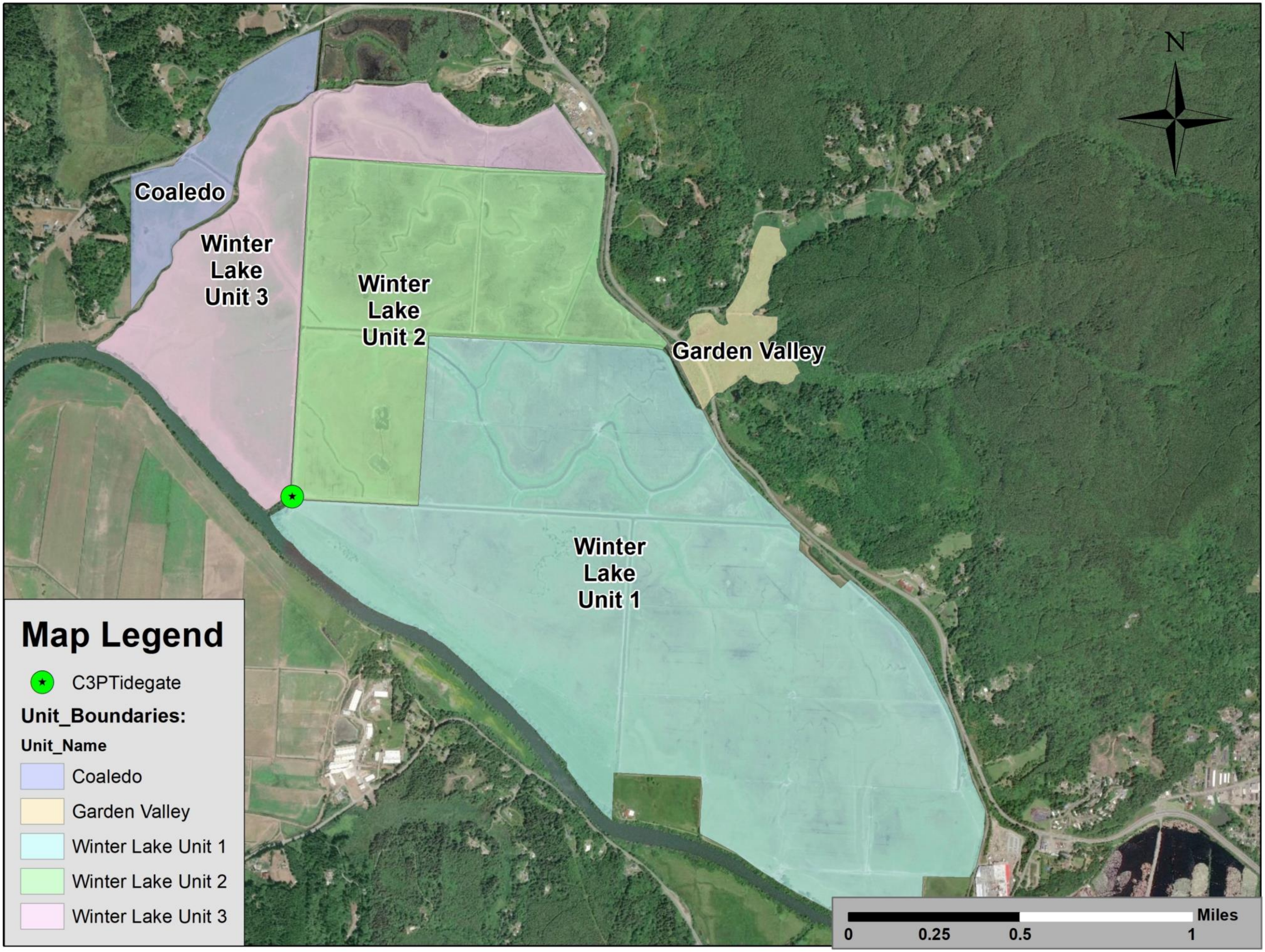


Figure 5. Winter Lake Unit Map

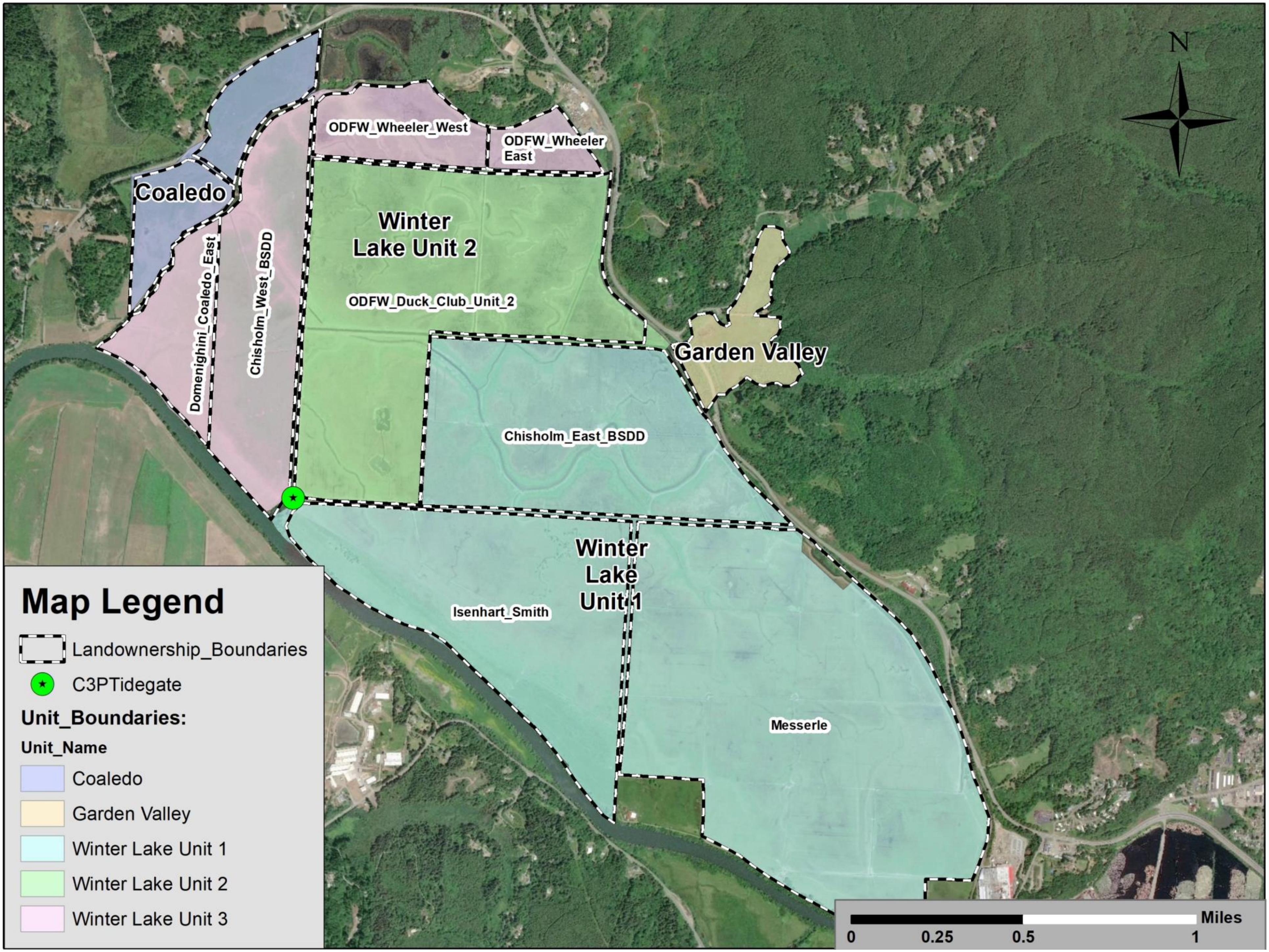


Figure 6. Winter Lake Land Ownership and Unit Map

Figure 7. Winter Lake Phase I, CP3 Tidegate

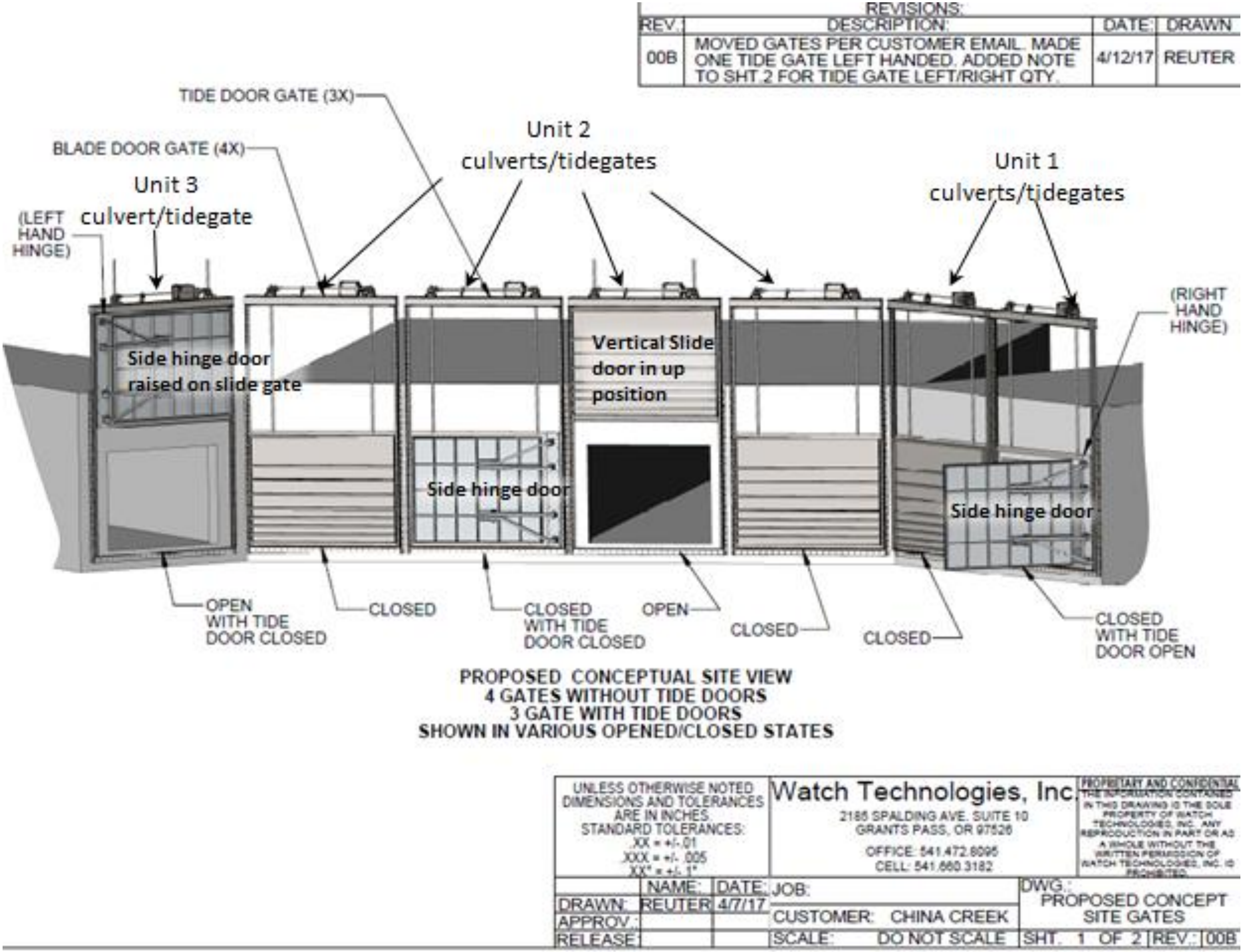


Figure 8. Winter Lake Phase I, CP3 Tidegate

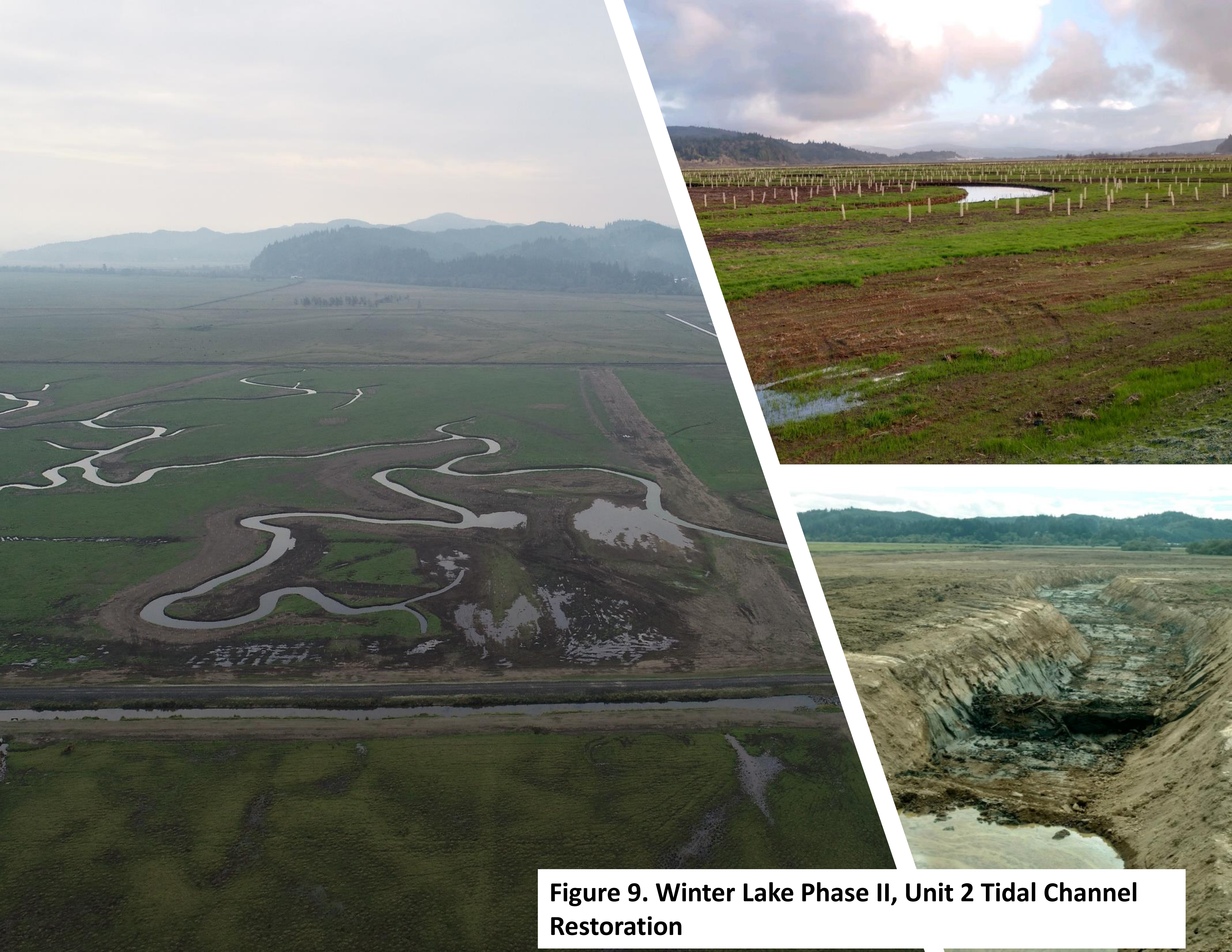


Figure 9. Winter Lake Phase II, Unit 2 Tidal Channel Restoration

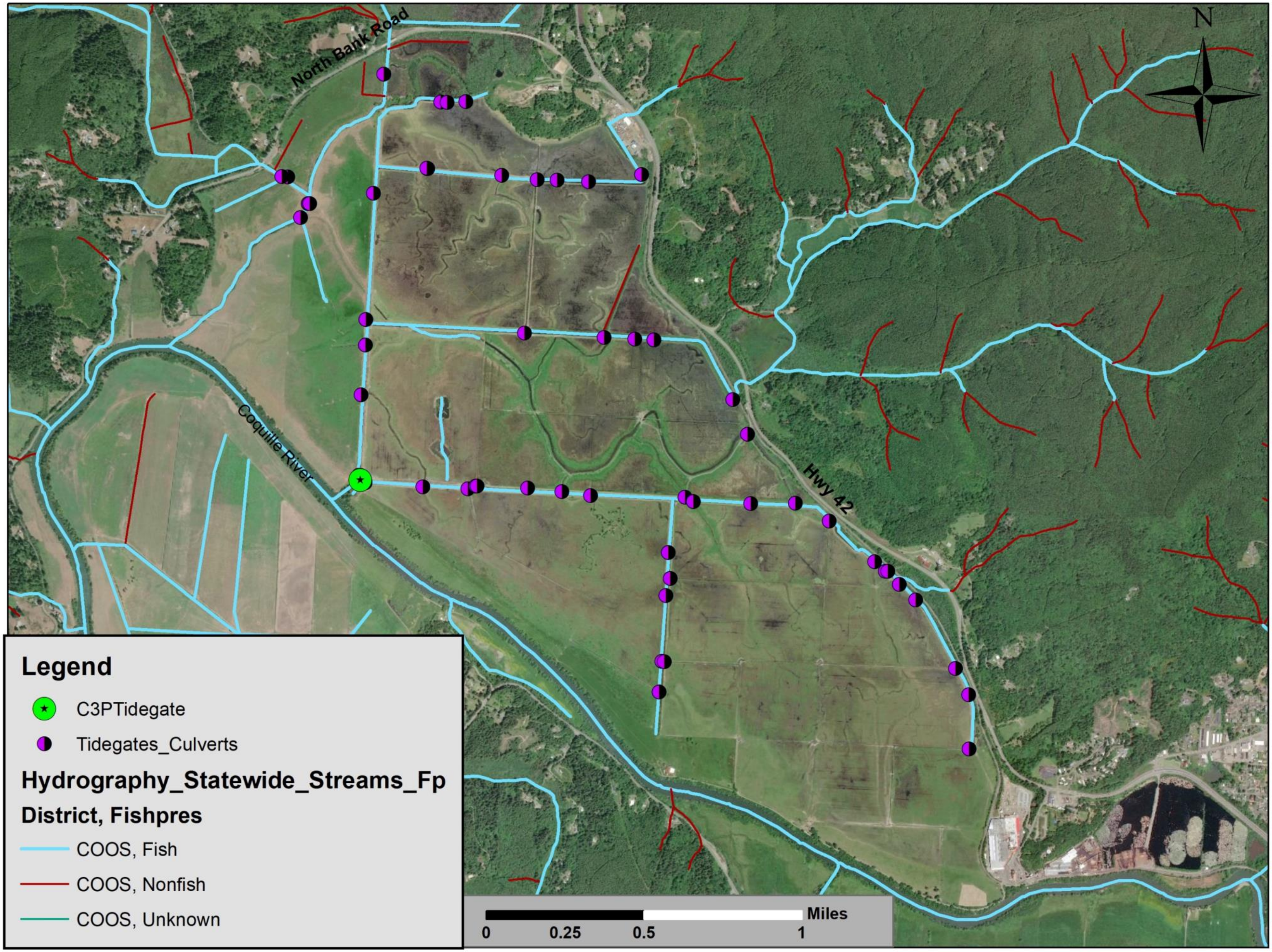


Figure 10. Winter Lake Aerial Imagery with existing linear channel network

Figure 11. “Flapper” and Top-hinge style interior tidegates

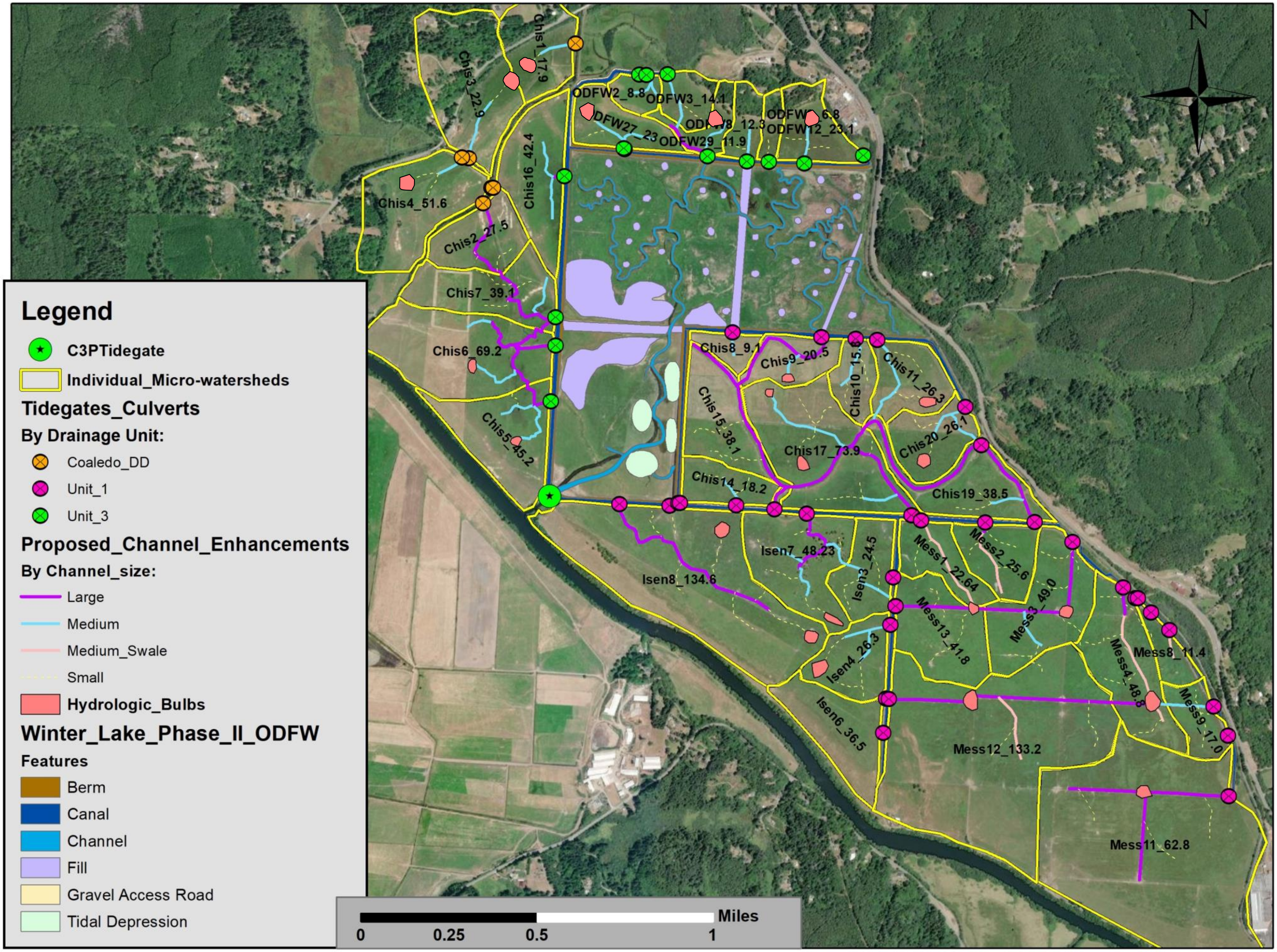


Figure 12. Individual micro-watersheds associated with culverts and proposed channel enhancements

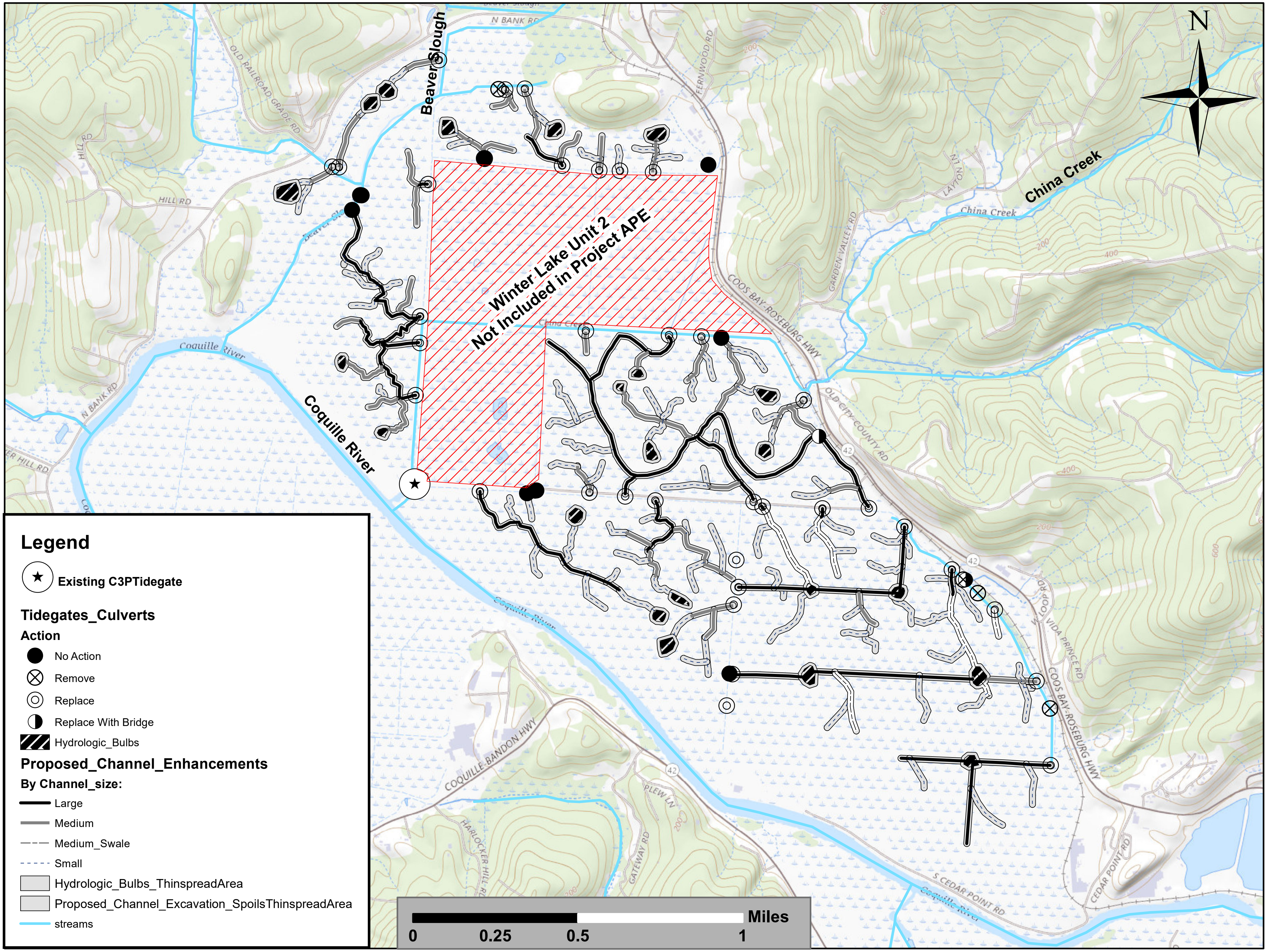


Figure 12.b Geographic Extent of Excavated Spoils

Figure 13. Examples of a side-hinge aluminum tidegate

Aluminum Waterman Style Gate

http://www.agriexpo.online/prod/waterman-industries/product-174233-19232.html

Figure 14. Aluminum Waterman Style gate

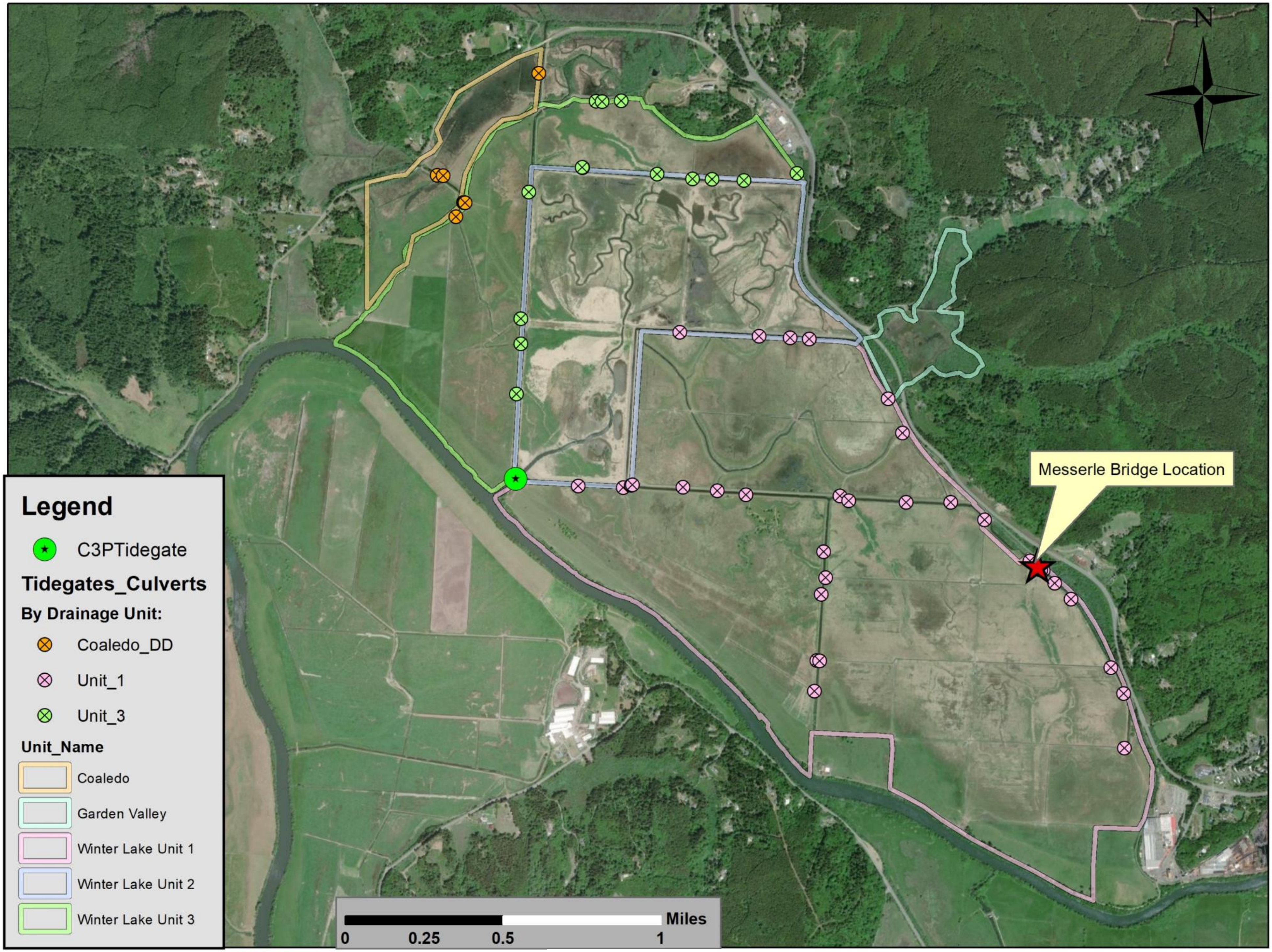


Figure 15. Messerle Bridge Location Map

Figure 16. Bridge Site Photo

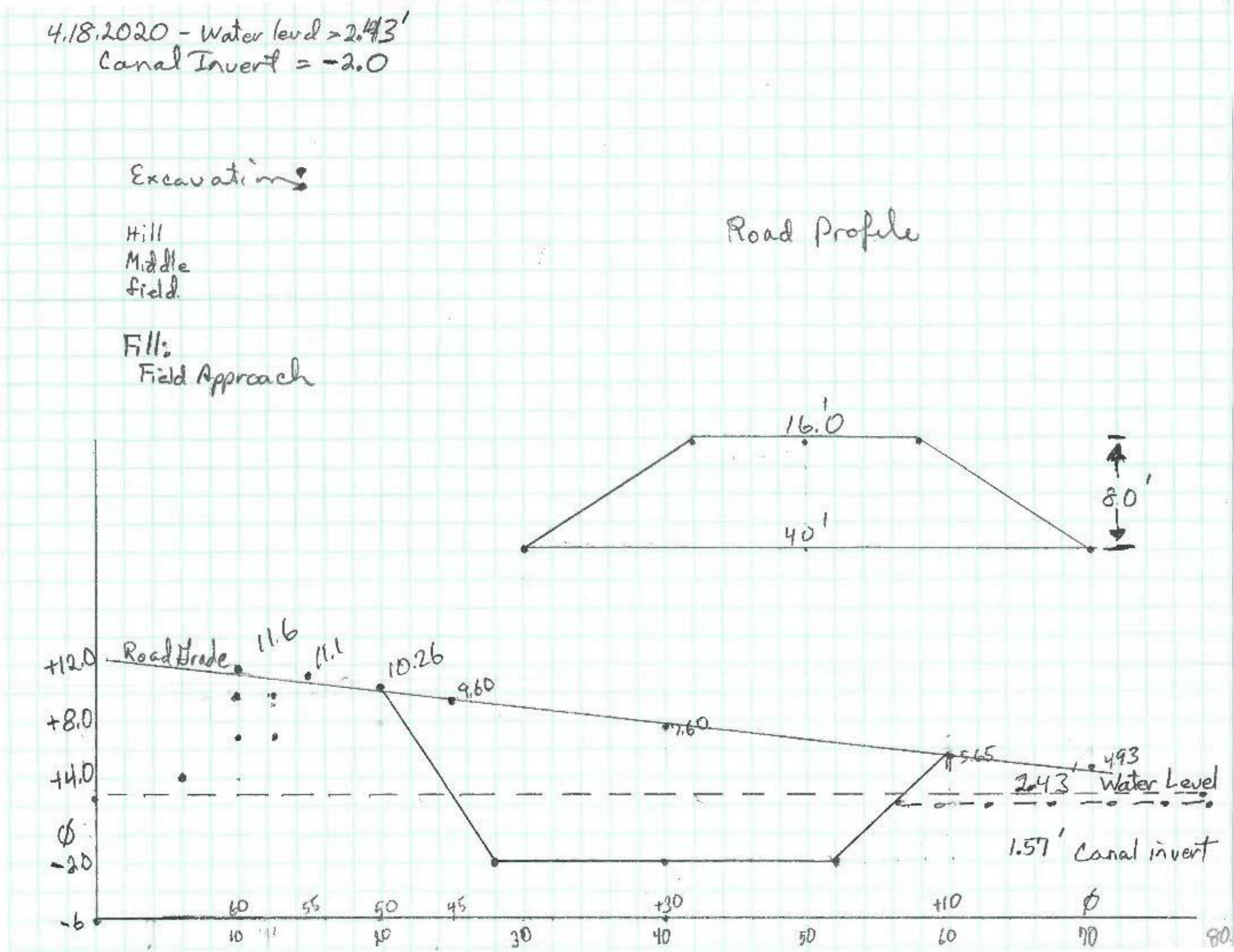


Figure 17. Bridge Design Drawing

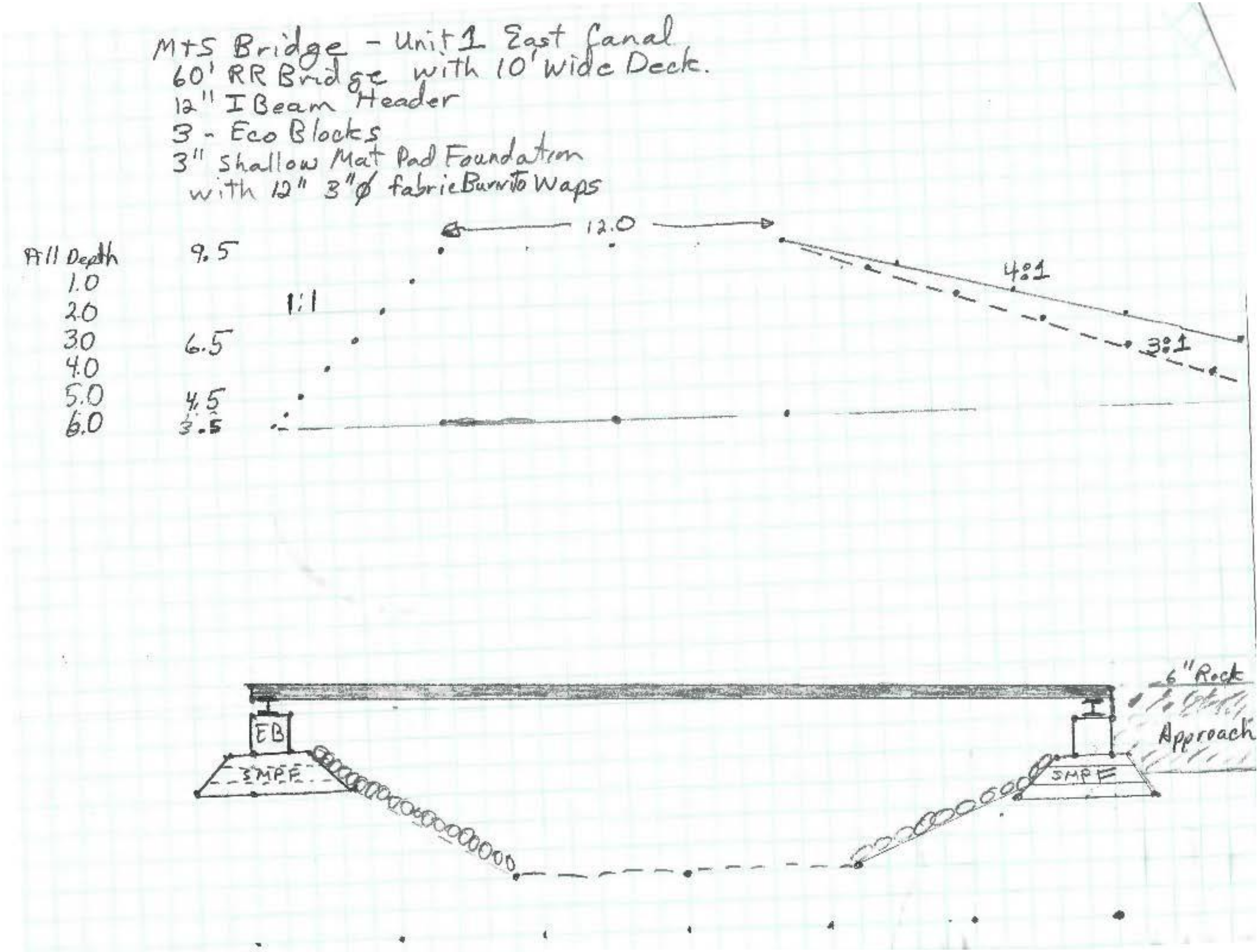


Figure 18. Bridge Design Drawing

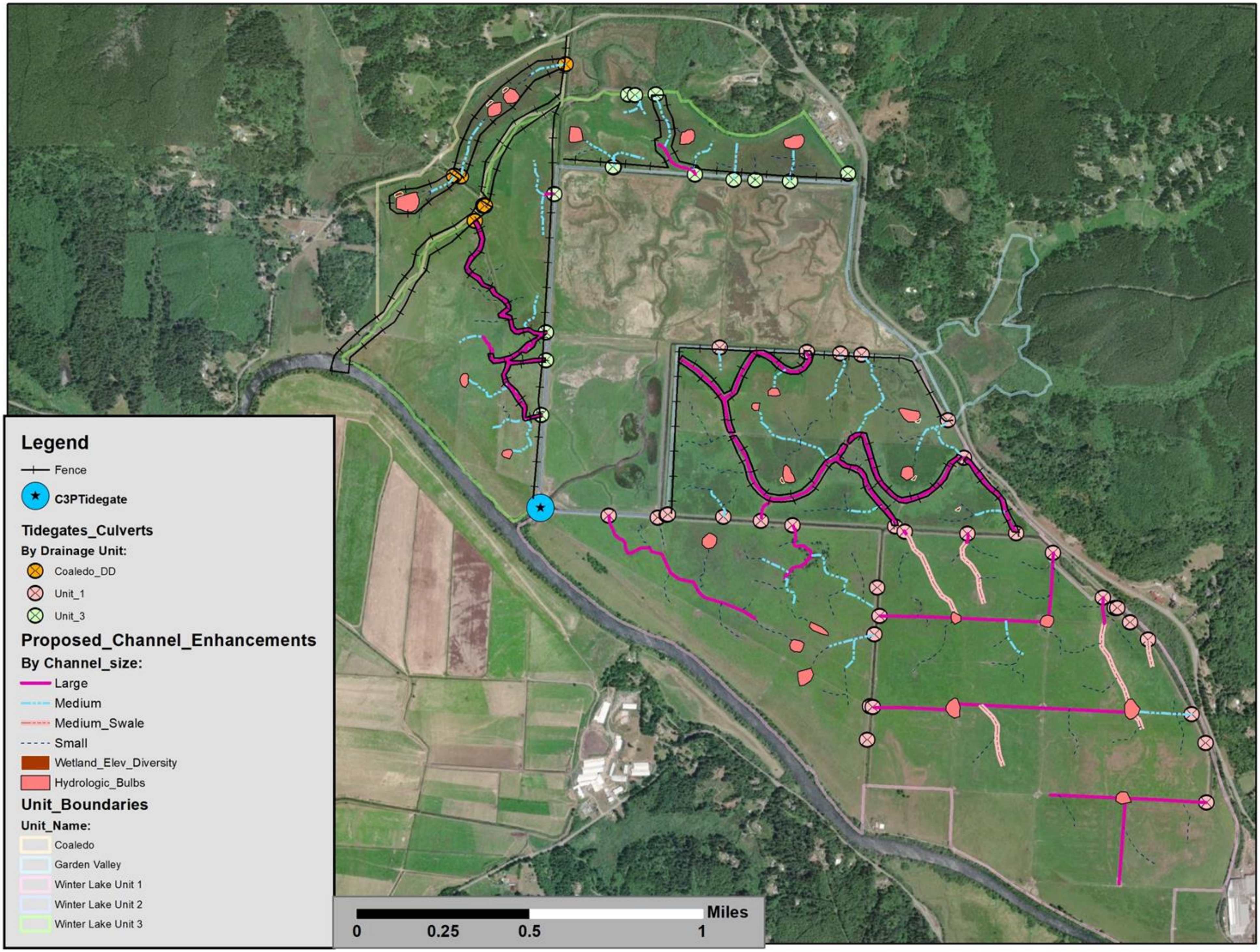


Figure 19. Winter Lake Phase III Proposed Channel Enhancements

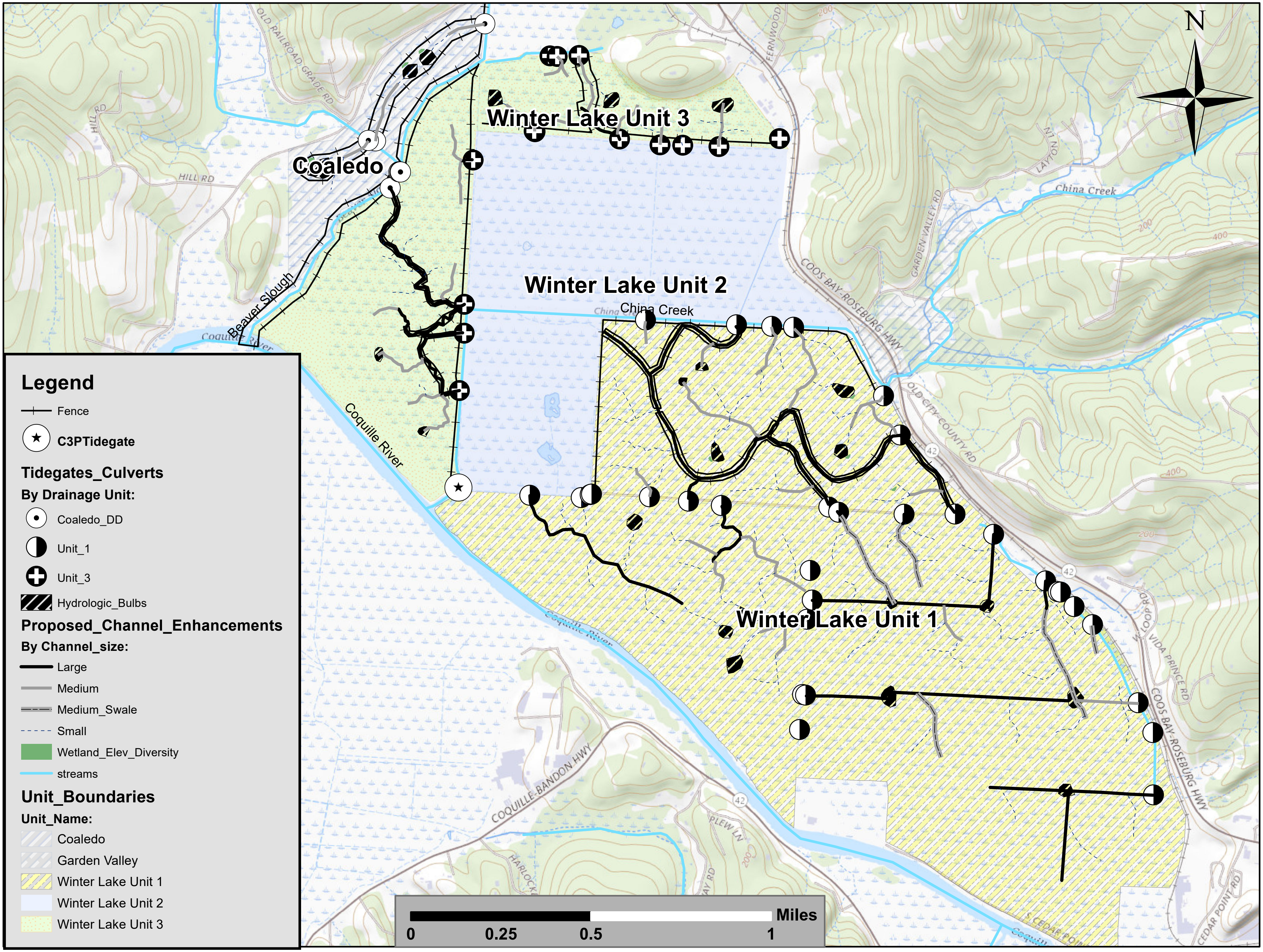


Figure 19.b (Revised) Winter Lake Phase III Proposed Channel Enhancements

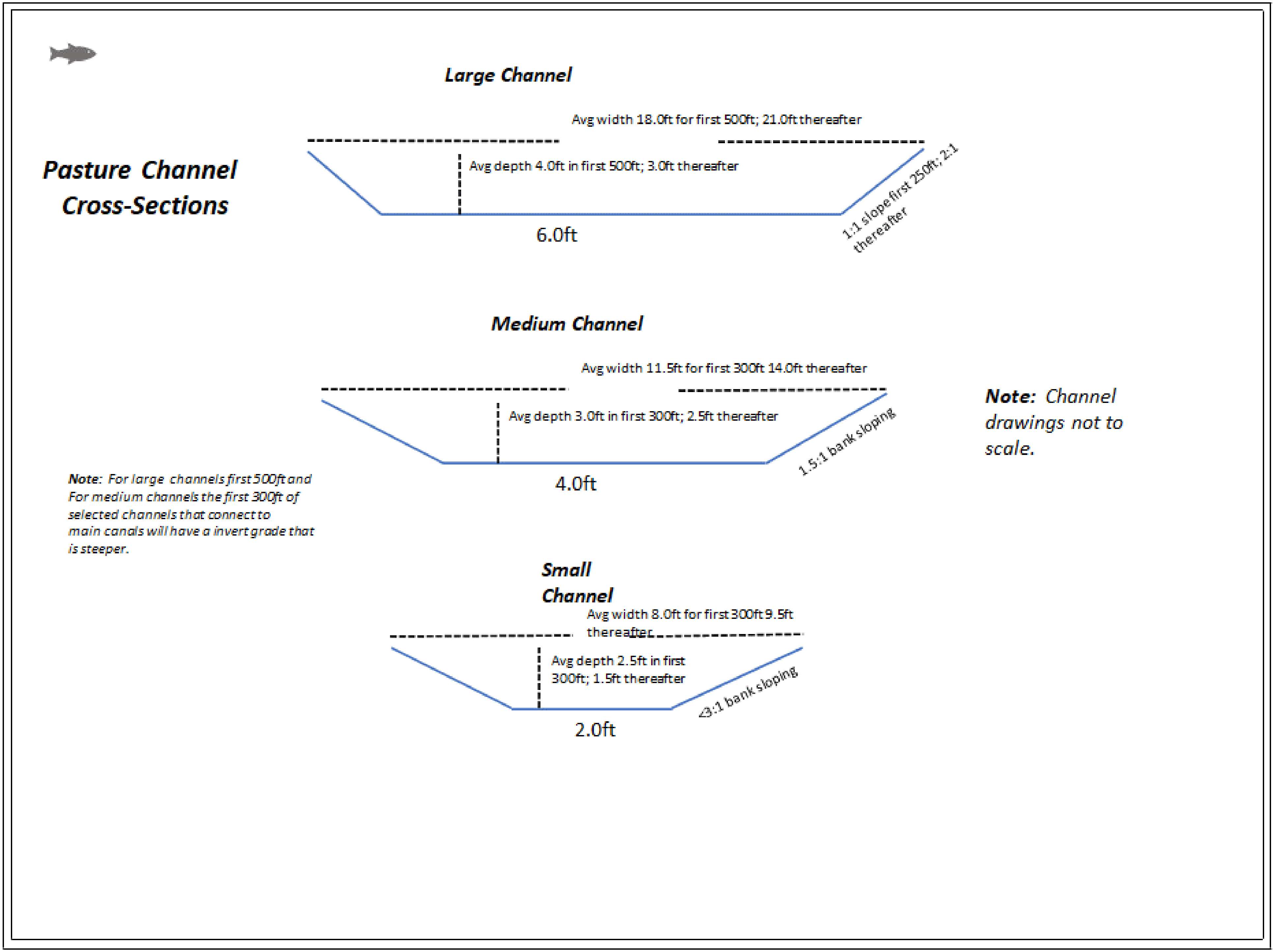


Figure 20. Pasture Channel Cross Sectional Drawings

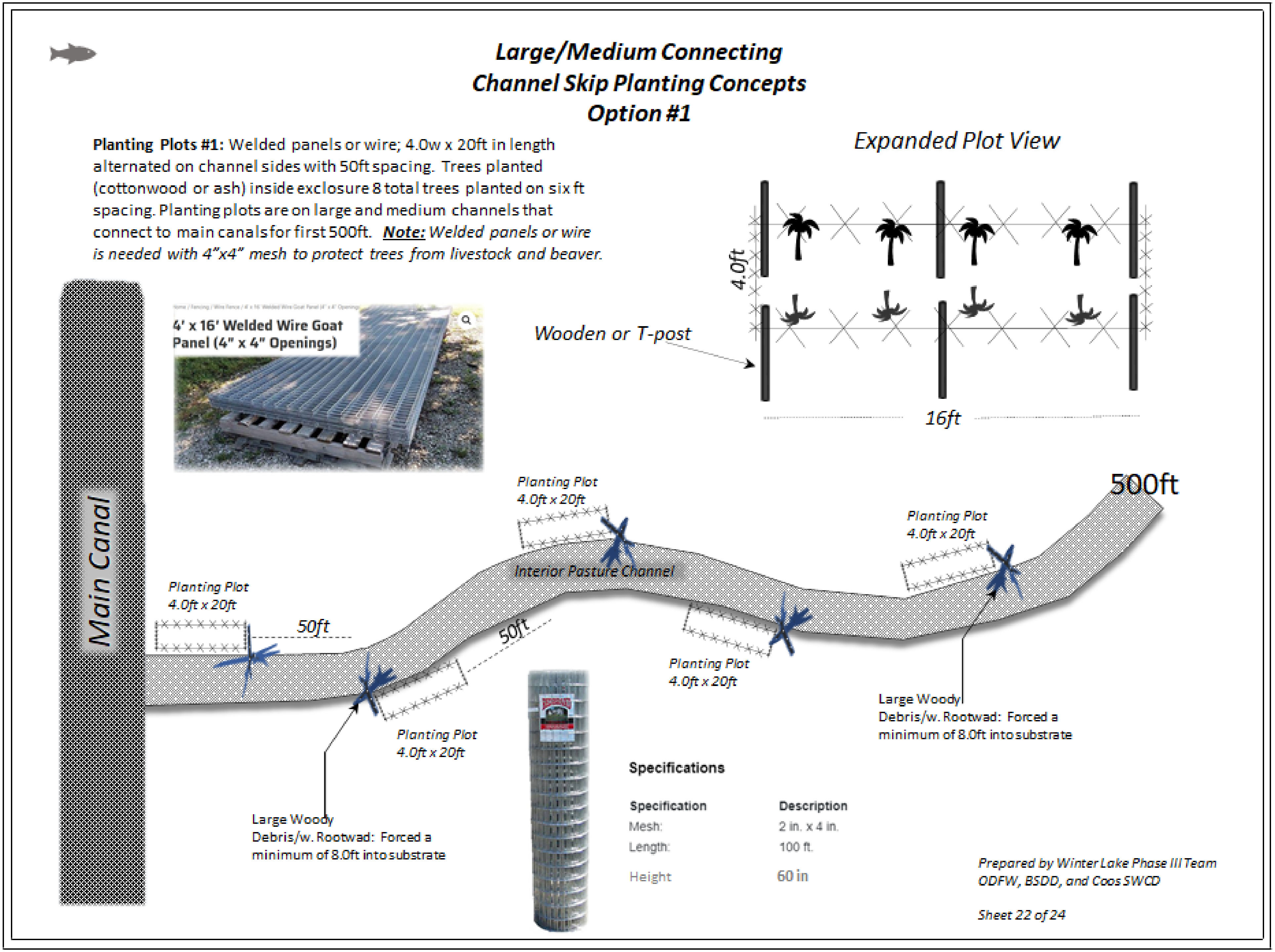


Figure 21. Photos of existing shallow swale channels

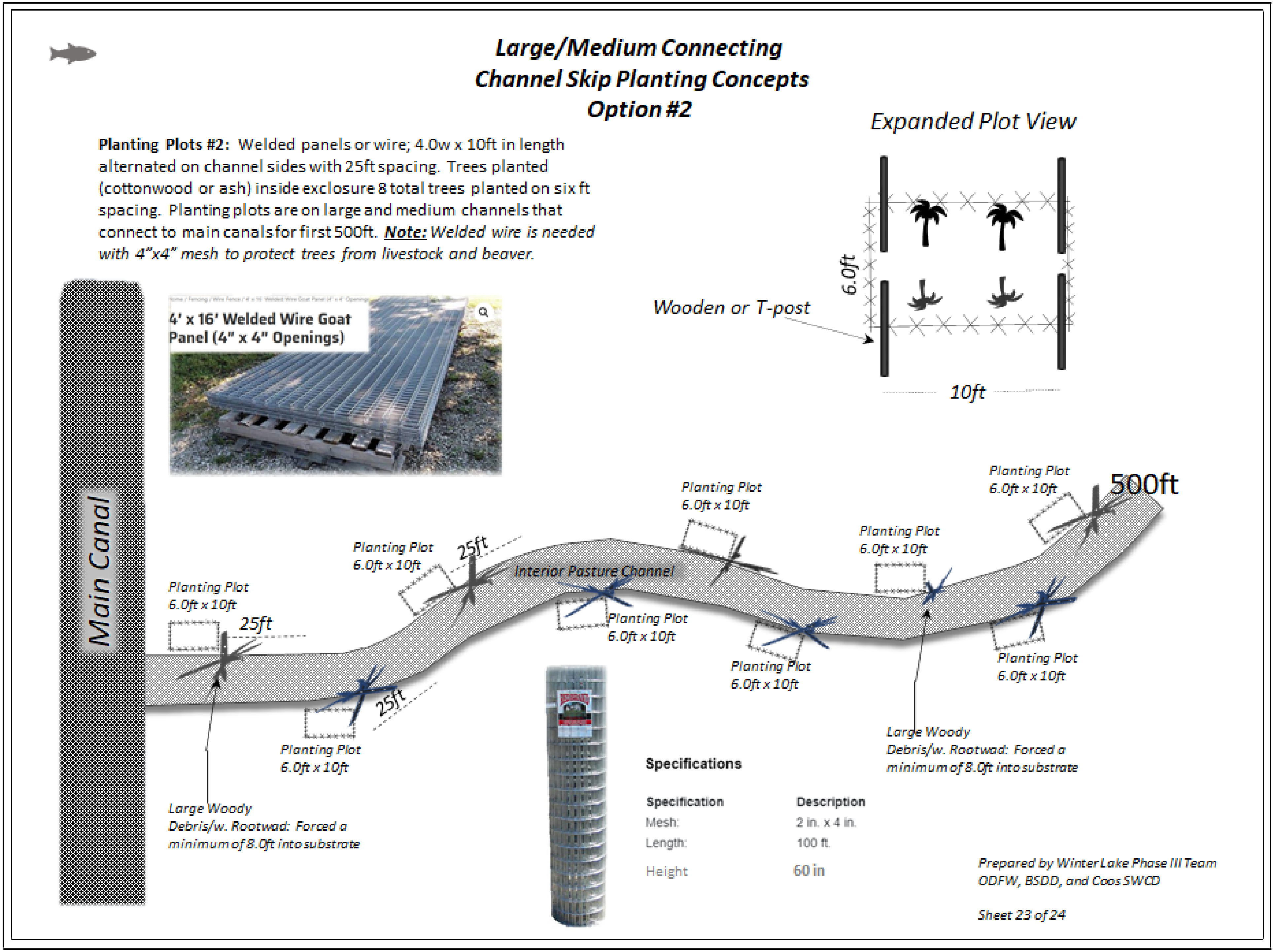


Figure 22. Photos of existing shallow swale channels

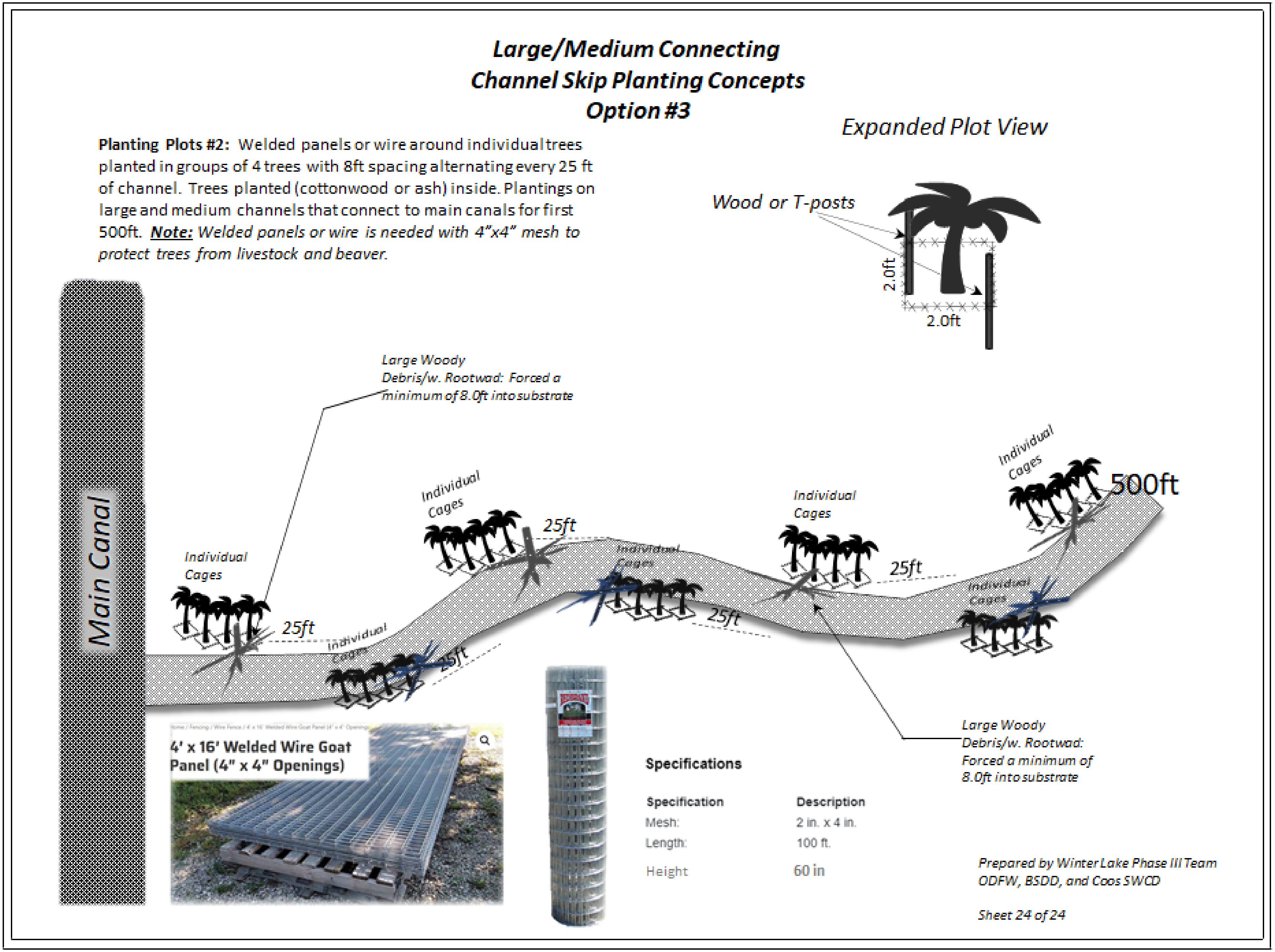


Figure 23. Photos of existing shallow swale channels

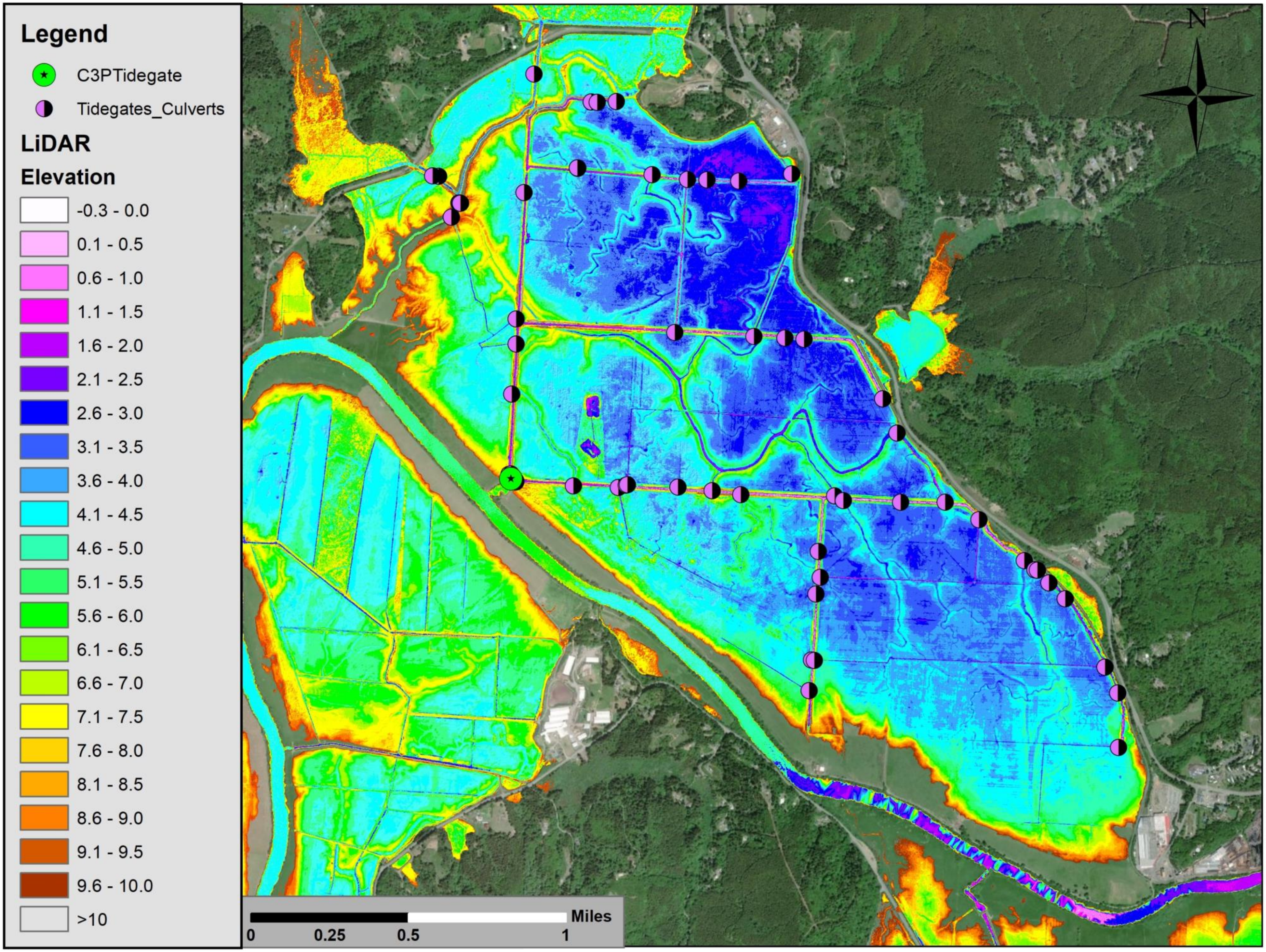


Figure 24. LiDAR color map

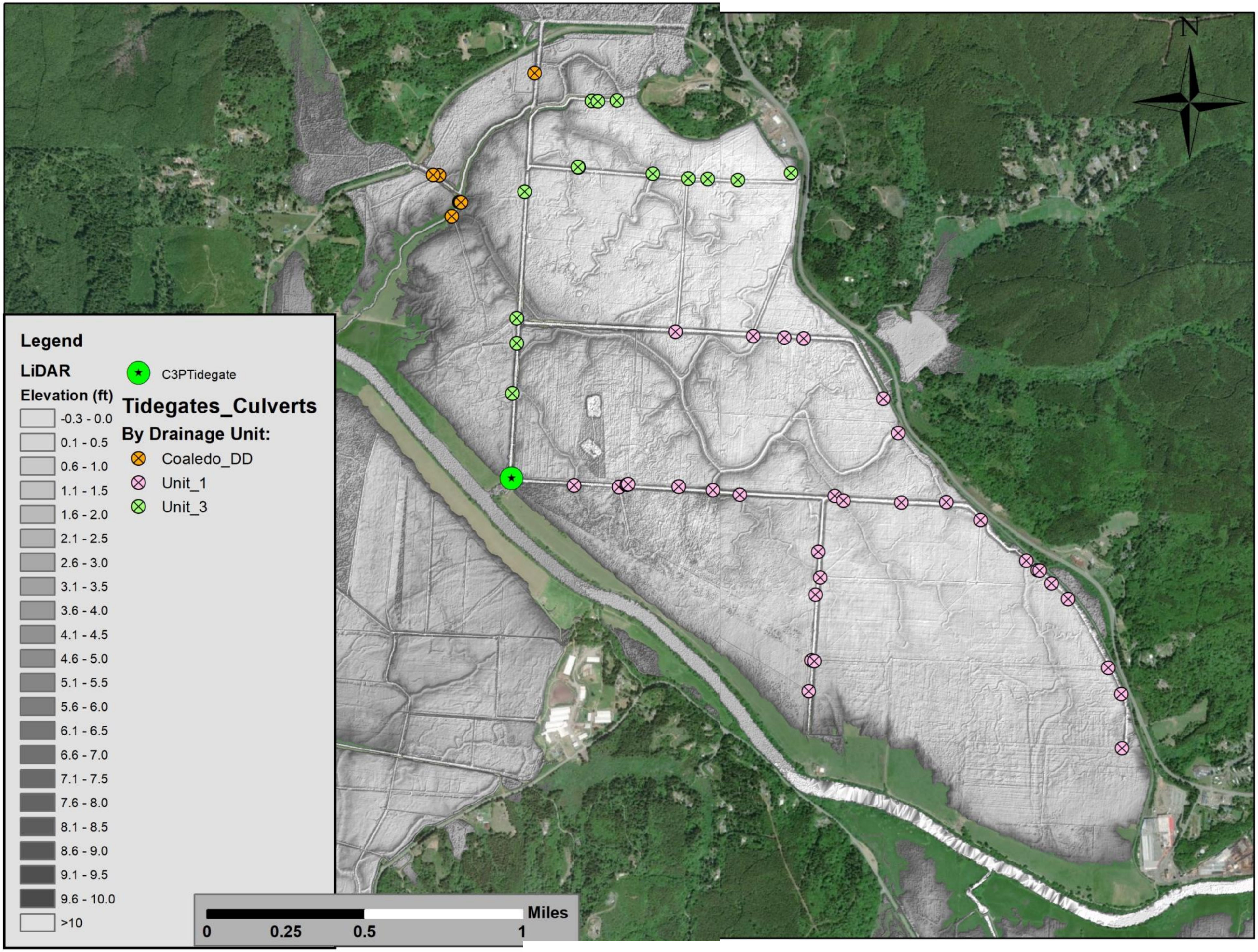


Figure 25. LiDAR Hillshade Imagery

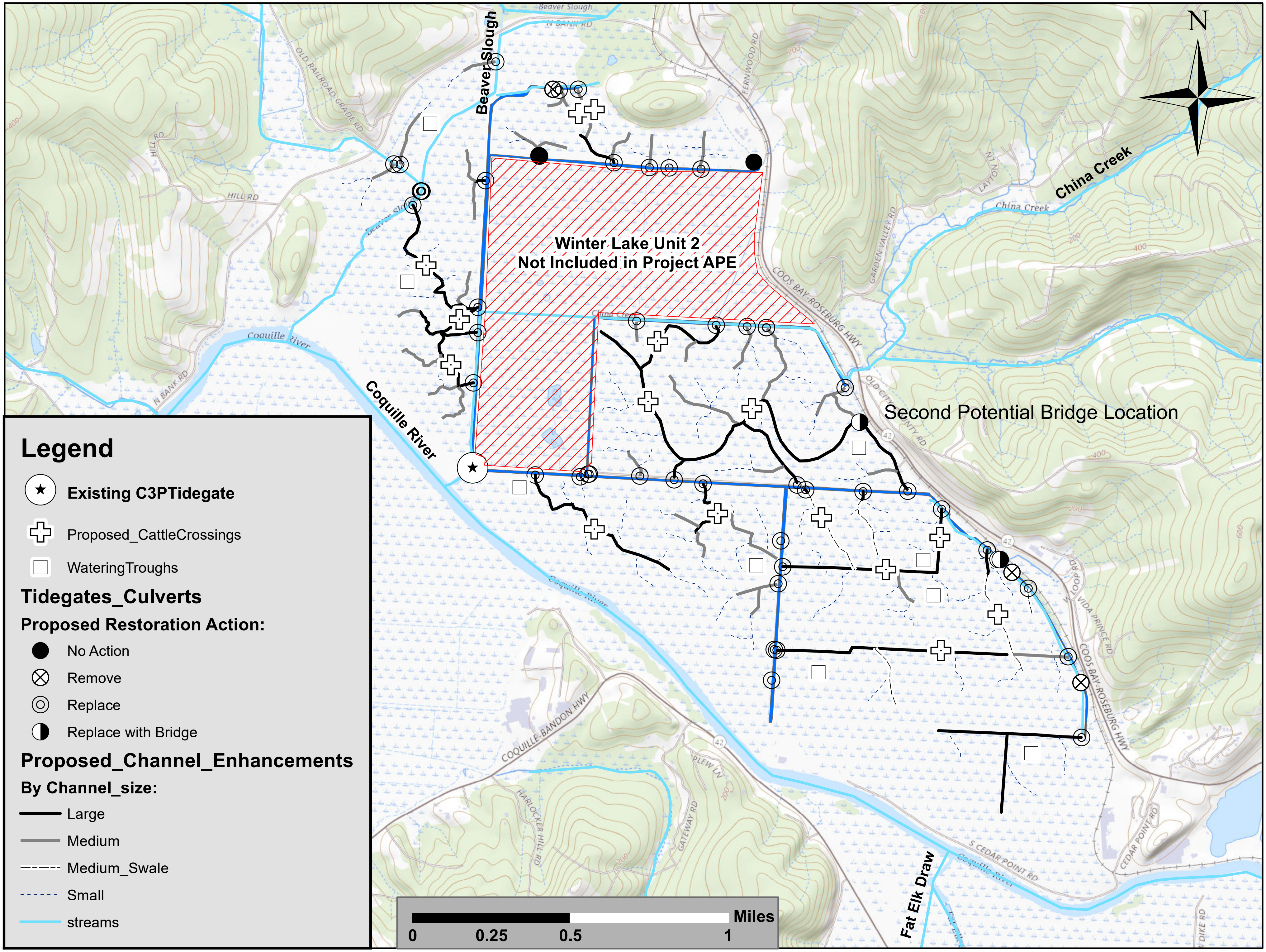


Figure 25.b (Revised): Map showing the locations of proposed Watering Troughs and Cattle Crossings.

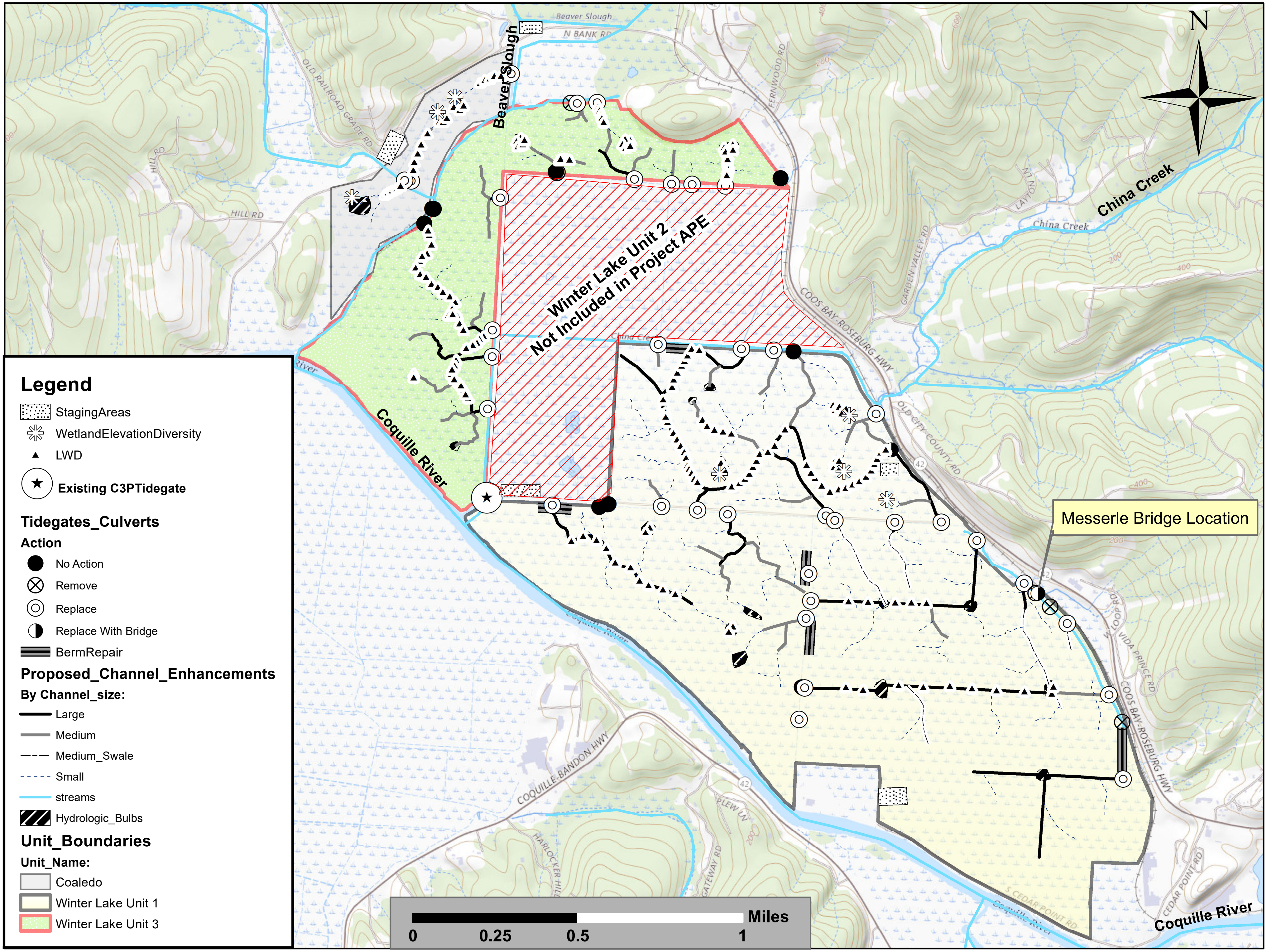


Figure 25. c. Large Woody Debris Map

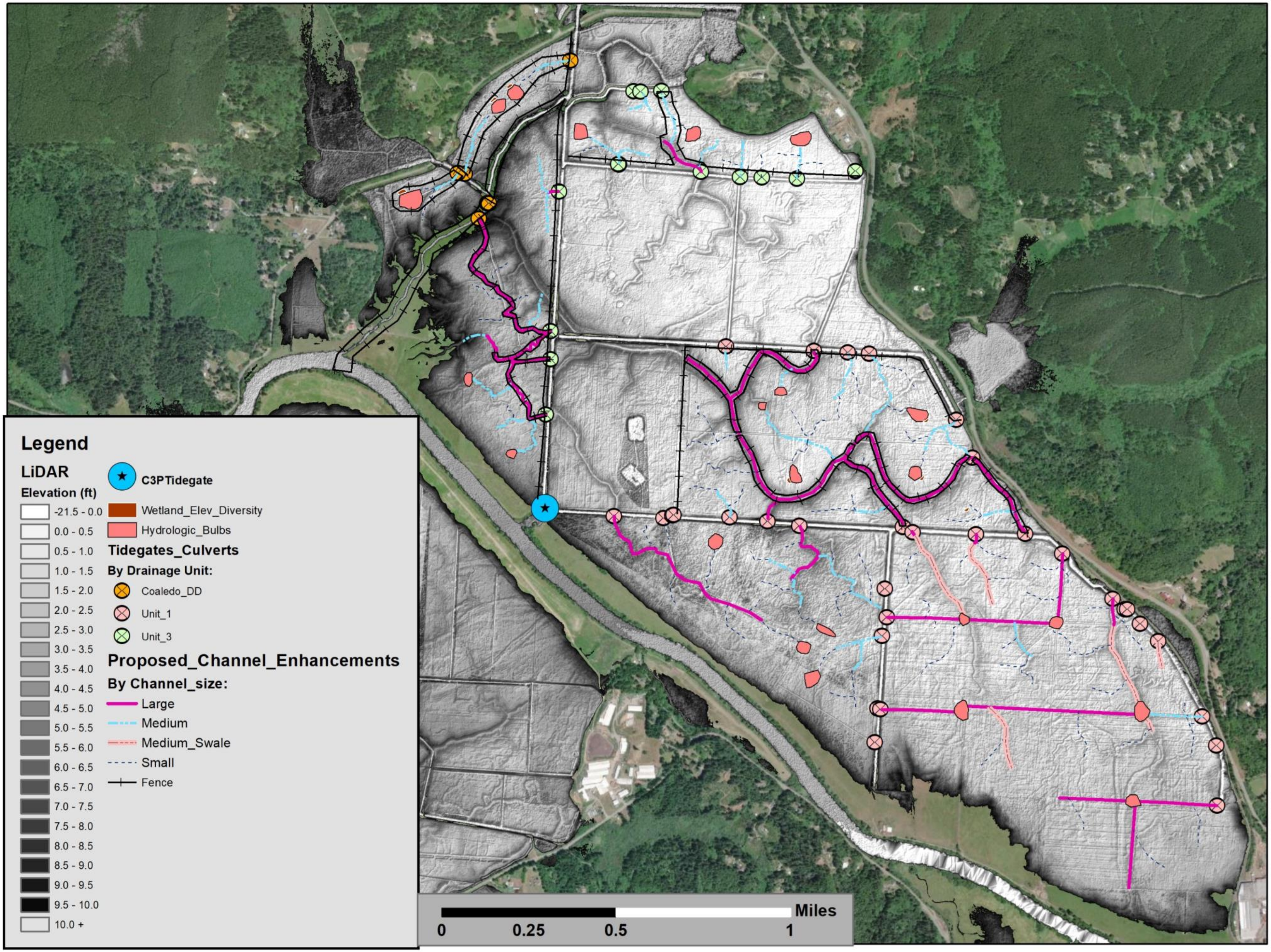


Figure 26. LiDAR Hillshade Imagery with proposed channel network

Figure 27. Photos of existing shallow swale channels

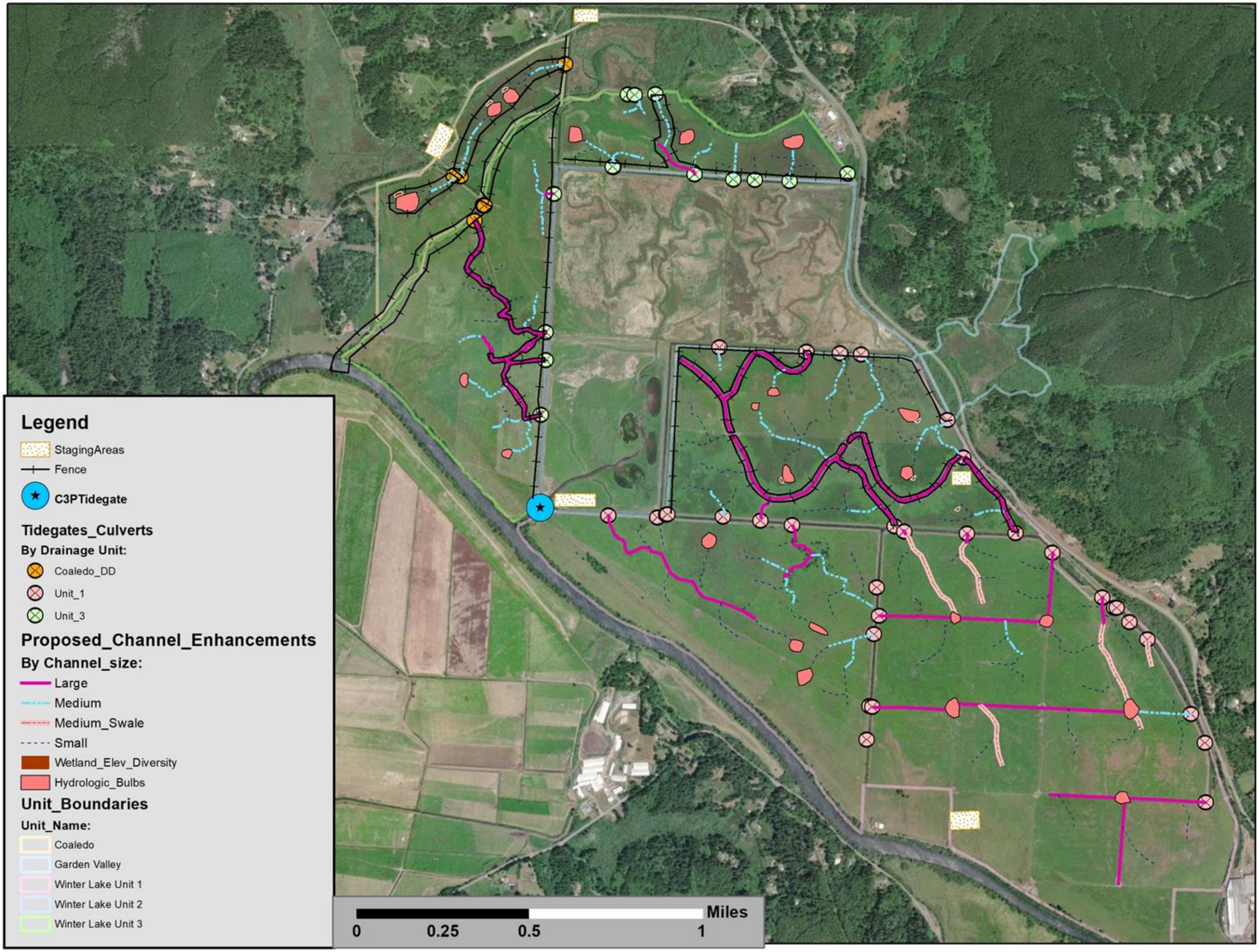


Figure 28. Map of Equipment Staging Areas

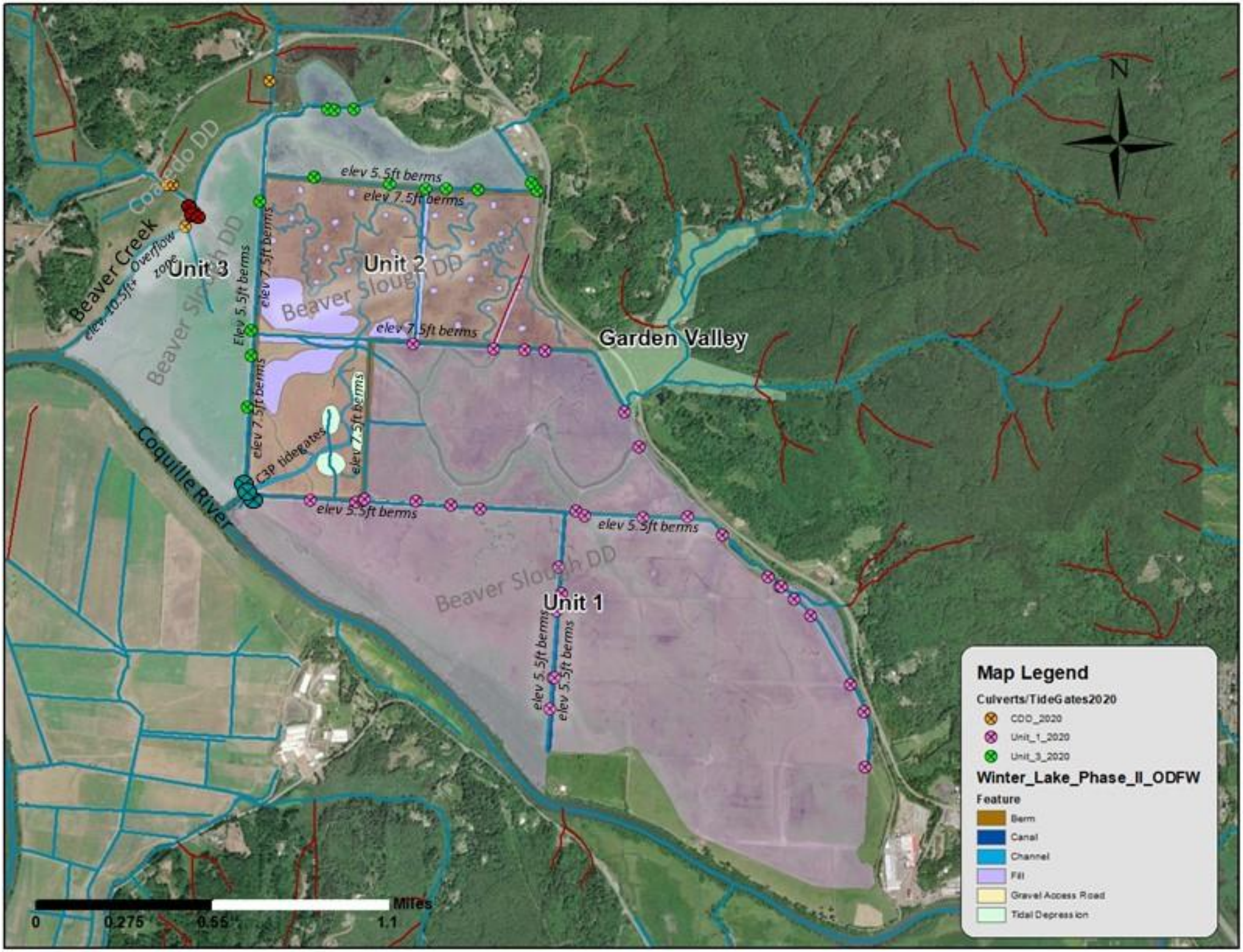


Figure 29. Berm Map

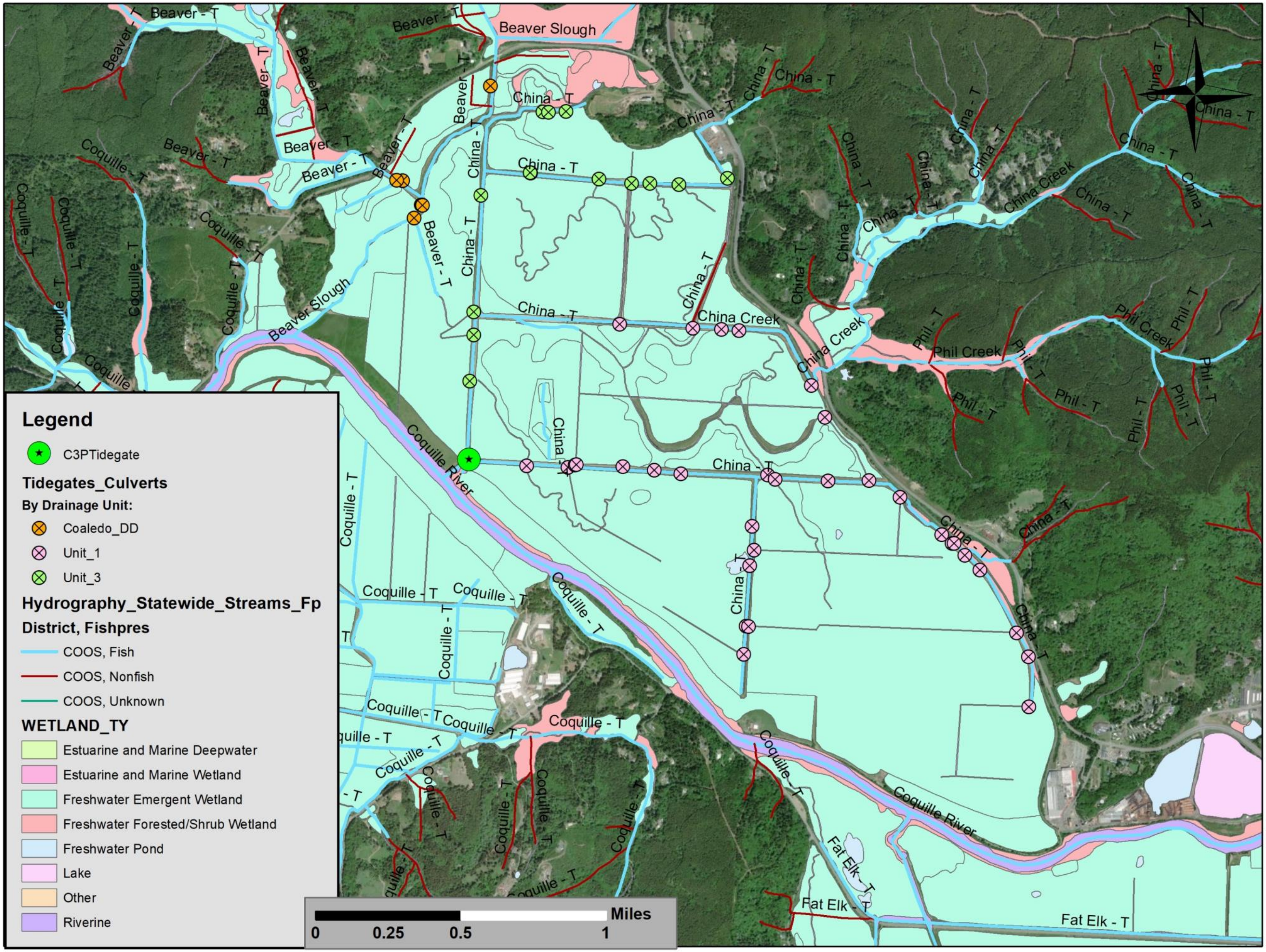
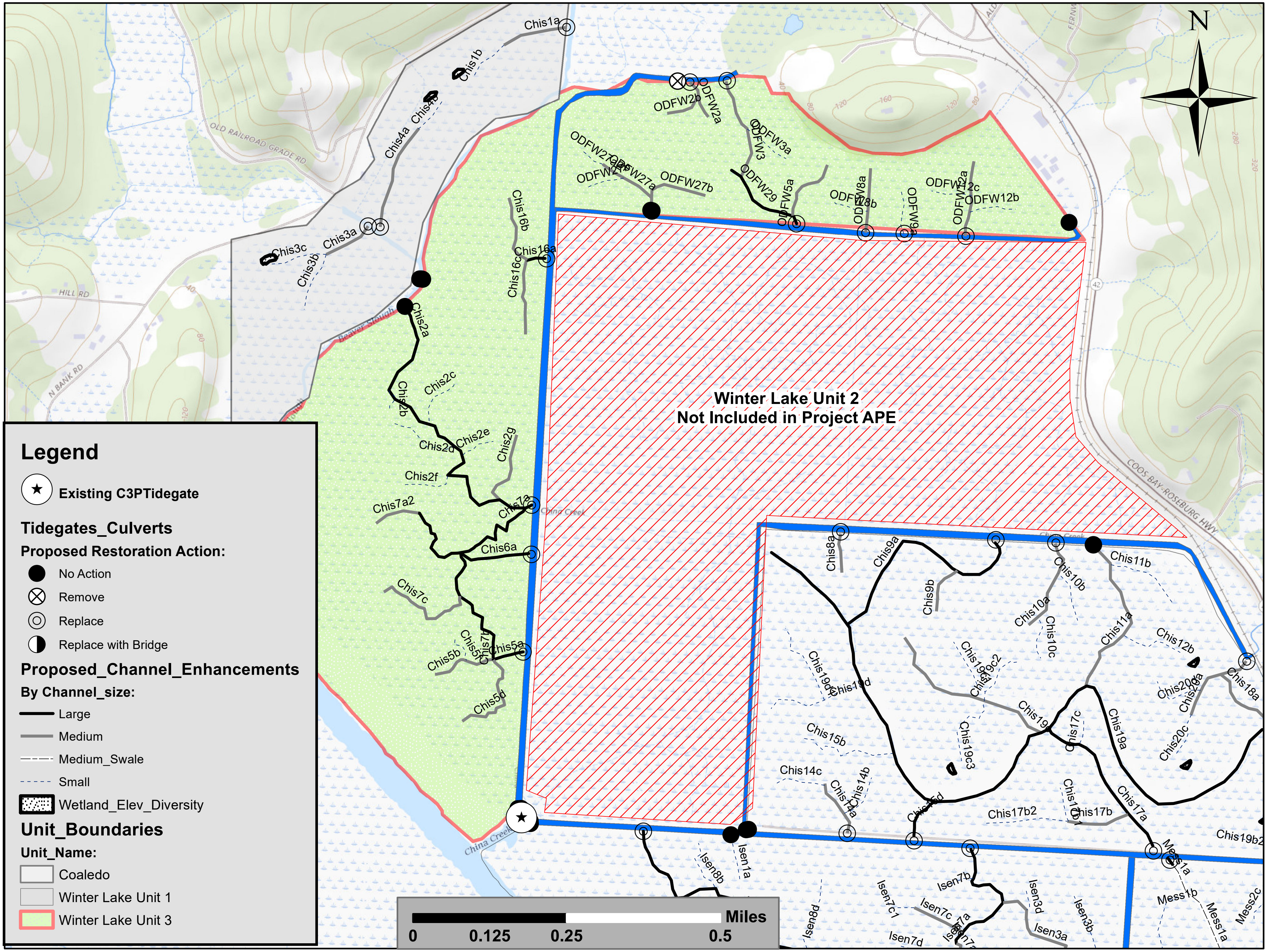


Figure 30. Wetlands Map



N
Winter Lake Unit 2
Not Included in Project APE
Legend
Existing C3PTidegate
Tidegates_Culverts
Proposed Restoration Action:
No Action
Remove
Replace
Replace with Bridge
Proposed_Channel_Enhancements
By Channel_size:
Large
Medium
Medium_Swale
Small
Wetland_Elev_Diversity
Unit_Boundaries
Unit_Name:
Coaledo
Winter Lake Unit 1
Winter Lake Unit 3
Miles
0
0.125
0.25
0.5
OLD RAILROAD GRADE RD
HILL RD
N BANK RD
COOS BAY-ROSEBURG HWY
Beaver Slough
China Creek
Chis1a
Chis1b
Chis2a
Chis2b
Chis2c
Chis2d
Chis2e
Chis2f
Chis2g
Chis3a
Chis3b
Chis3c
Chis4a
Chis4b
Chis5a
Chis5b
Chis5d
Chis6a
Chis7a
Chis7a2
Chis7c
Chis8a
Chis9a
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Chis10c
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Chis11b
Chis12b
Chis14b
Chis14c
Chis15b
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Chis19c3
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ODFW2a
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ODFW3
ODFW3a
ODFW5a
ODFW8a
ODFW8b
ODFW12a
ODFW12b
ODFW12c
ODFW27a
ODFW27b
ODFW29
Isen1a
Isen3a
Isen3b
Isen3d
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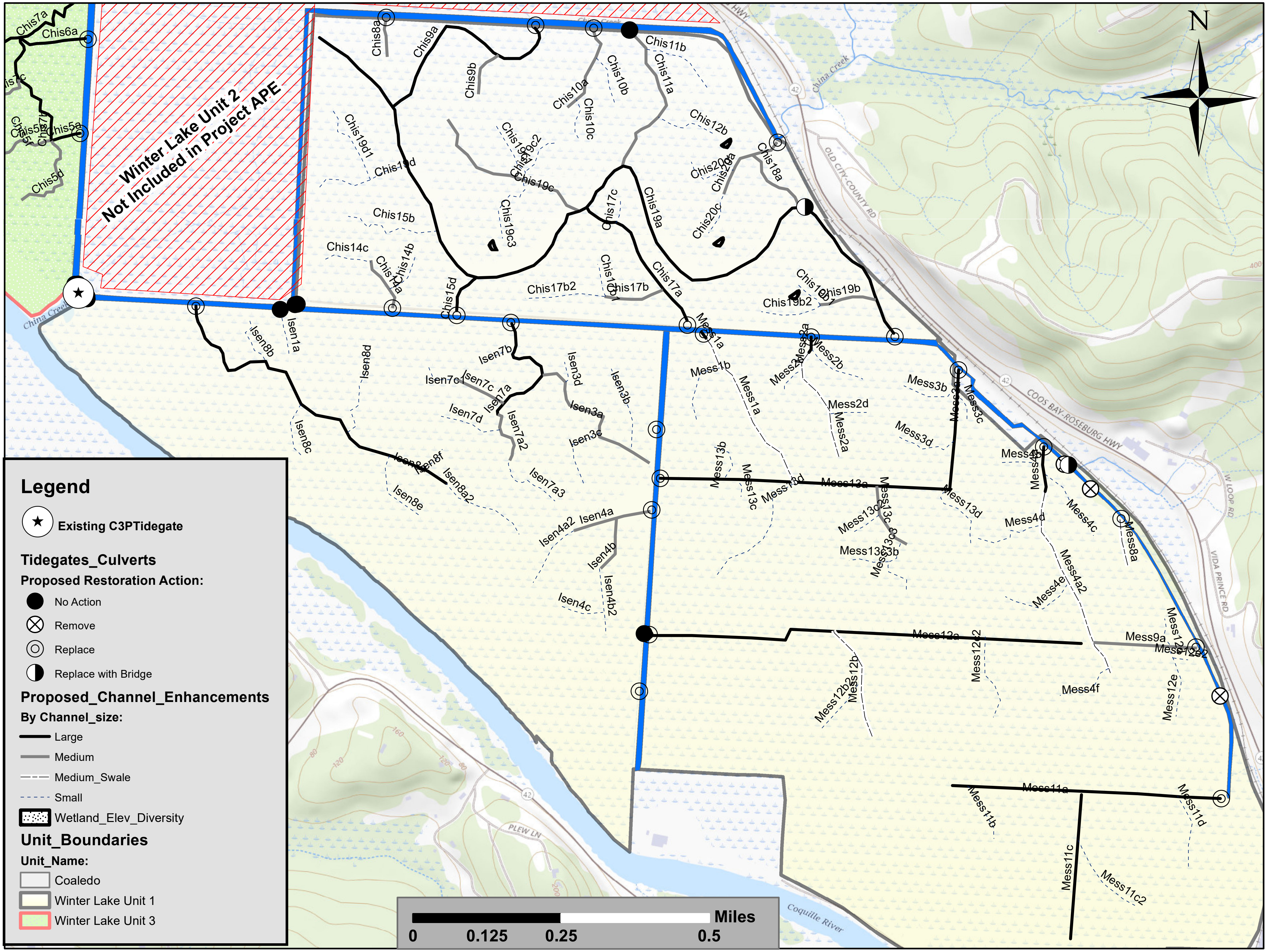
Mess1a
Mess1b
Mess2c



Winter Lake Unit 2
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Winter Lake Unit 1
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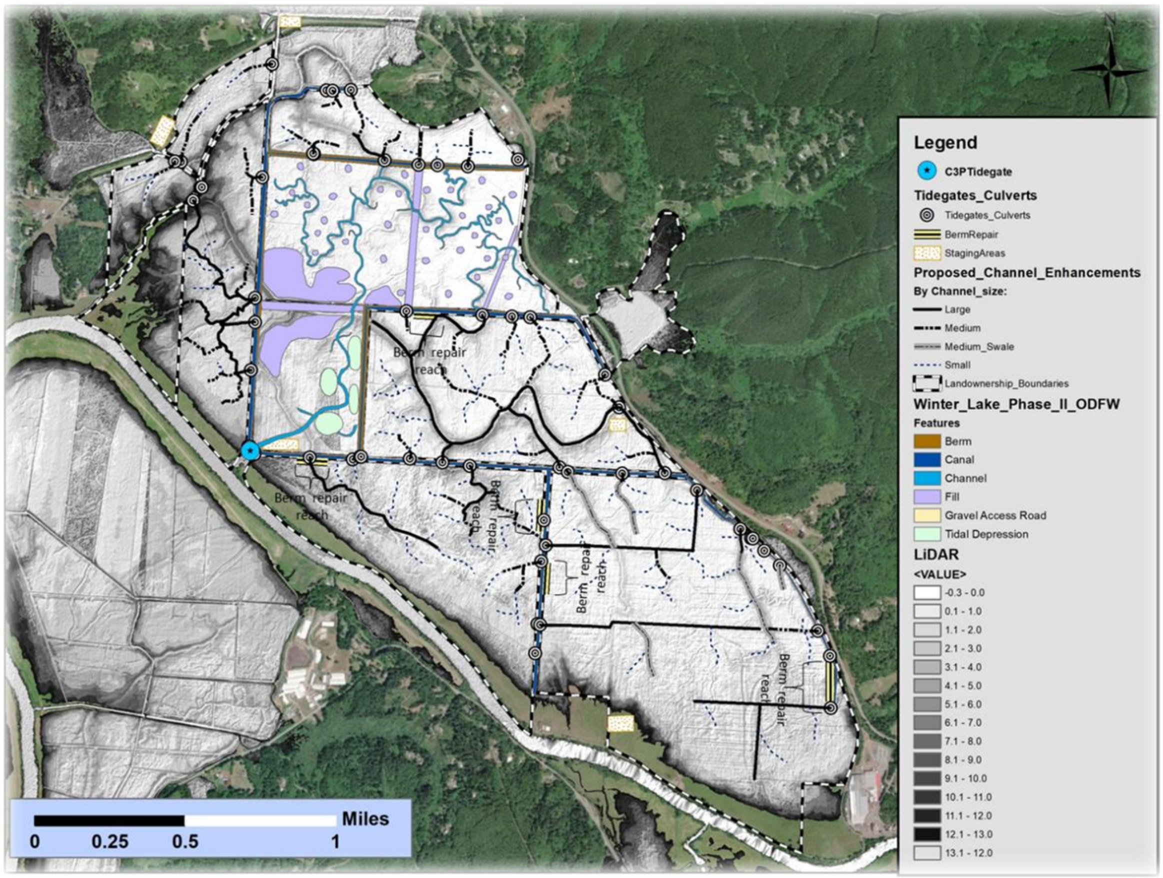
China Creek
Coquille River
COOS BAY-ROSEBURG HWY
OLD CITY-COUNTY RD
PLEW LN
VIDA PRINCE RD

WINTER LAKE PHASE III PROJECT
PROJECT ACTIONS

Designs and Yardage Calculations



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Introduction

The "Winter Lake" land area is a distinct river adjacent floodplain west of Coquille Oregon (Figure 1). The portion that is east and south of North Bank Lane and south of Hwy 42 and bordered by the Coquille River on the south is ~1,873 acres in size. Historically the acres of this unique valley floodplain that lie below elevation 8.0ft NAVDD88 were subjected to regular tidal inflow and outflow. In 1906-1907 the Beaver Slough Drainage District (BSDD; Figure 2) was formed and the Coaledo Drainage District (CDD; Figure 2) some years thereafter. These drainage districts provided social and financial framework facilitating construction of canal networks and installation of large tidegate systems for the properties to be drained. The BSDD installed tidegates in 1908-1909 allowed for drainage of 1,700 acres and the CDD installed the Beaver Creek tidegate that allowed for drainage of the remainder. The lands prior to conversion to pastureland were forested with wetland tree species with a highly dendritic tidal channel network. As part of the land alterations, interior berms were constructed along pasture and property boundaries with elevation crests of ~5.5ft in order to allow for individual pasture management when water was below that elevation. The land area ownership was originally comprised of multiple individuals and entities and in the early years and land use varied with cultivation of some crops and extensive hay production on higher pastures. Currently the primary use is pastureland grazing and ownership has been greatly consolidated.

In 2017 a largescale restoration project developed by the BSDD, Oregon Department of Fish and Wildlife (ODFW), and The Nature Conservancy (TNC) was implemented in the BSDD, where the four legacy 8.0ft corrugated metal culverts with associated top-hinged wooden tidegates connecting BSDD lands to the Coquille River were replaced with the C3P project (Phase I). The C3P project consisted of construction of seven 10.0x8.0ft concrete box culverts and associated vertical slide-gates (VSFTG) and side-hinged aluminum tidegates (Figure 2). In addition, an access road was rebuilt from Hwy 42 and from North Bank Lane, with associated bridges to provide access across existing legacy canals to serve this infrastructure. In 2018 restoration actions (Phase II) installed 31,000ft of sinuous channel on properties upstream of the C3P tidegate referred to as "Unit 2" lands and hydrology was returned to more historical condition within Unit 2 using the Muted Tidal Regulator (MTR) effects that were possible with the new C3P vertical slide-gates.

Upstream of the new C3P tidegate, in Units 1 and 3 at connection of interior pasture channels with main canals in the BSDD and CDD along Beaver Creek are 42 undersized culverts with a high prevalence in the 2.0-3.0 diameter range. These culverts greatly underserve the tidal inflow/outflow capacity of the new C3P tidegate. Additionally, the old linear field drainage channels were originally laid out with little attention to microtopography, often on property and or pasture boundaries. The Winter Lake Phase III project is proposing to replace the remaining 42 interior culverts and old style top-hinged tidegates in Units 1, 3, and pastures along Beaver Creek with 38 appropriately sized culverts. Upstream of the new culverts within pastures the project will construct on-grade channels that meet the precipitation hydrology as well as the tidal hydrology of the landscape and the Beaver Slough Drainage District (BSDD) Water Management Plan (DWMP). Existing engineering tools (USGS Streamstats) and engineering culvert capacity information were utilized to develop culvert and channel sizing that meets or exceeds the site hydrology and fish passage guidelines for both Federal and State jurisdictions. The project has been designed: 1). To develop channel networks that mimic historical condition, on grade and sufficient capacity; 2). Channel networks that provide for transport of sediments from reconstructed/constructed channels through proper construction design, management of flows, and time zero attention to locations where vegetation needs removed.

The C3P tidegates are able to be open and allow for inflow for a longer period of time, while not exceeding interior pasture management water elevation goals if the pasture channels have sufficient volume capacity. The project goals include creating interior “reservoir” capacity that will allow for a longer time of tidegate door openness on incoming tides at C3P prior to water elevations exceeding management goals. Greater time of C3P door openness is critical to allow for movement of native migratory fish into the project channel networks from the mainstem Coquille River. This reservoir capacity and greater overall inflow of water into the network and exchange on outflow with the Coquille River serves to mix waters and greatly improve water quality leading to a higher ecological function for native fish, wildlife, and livestock watering.

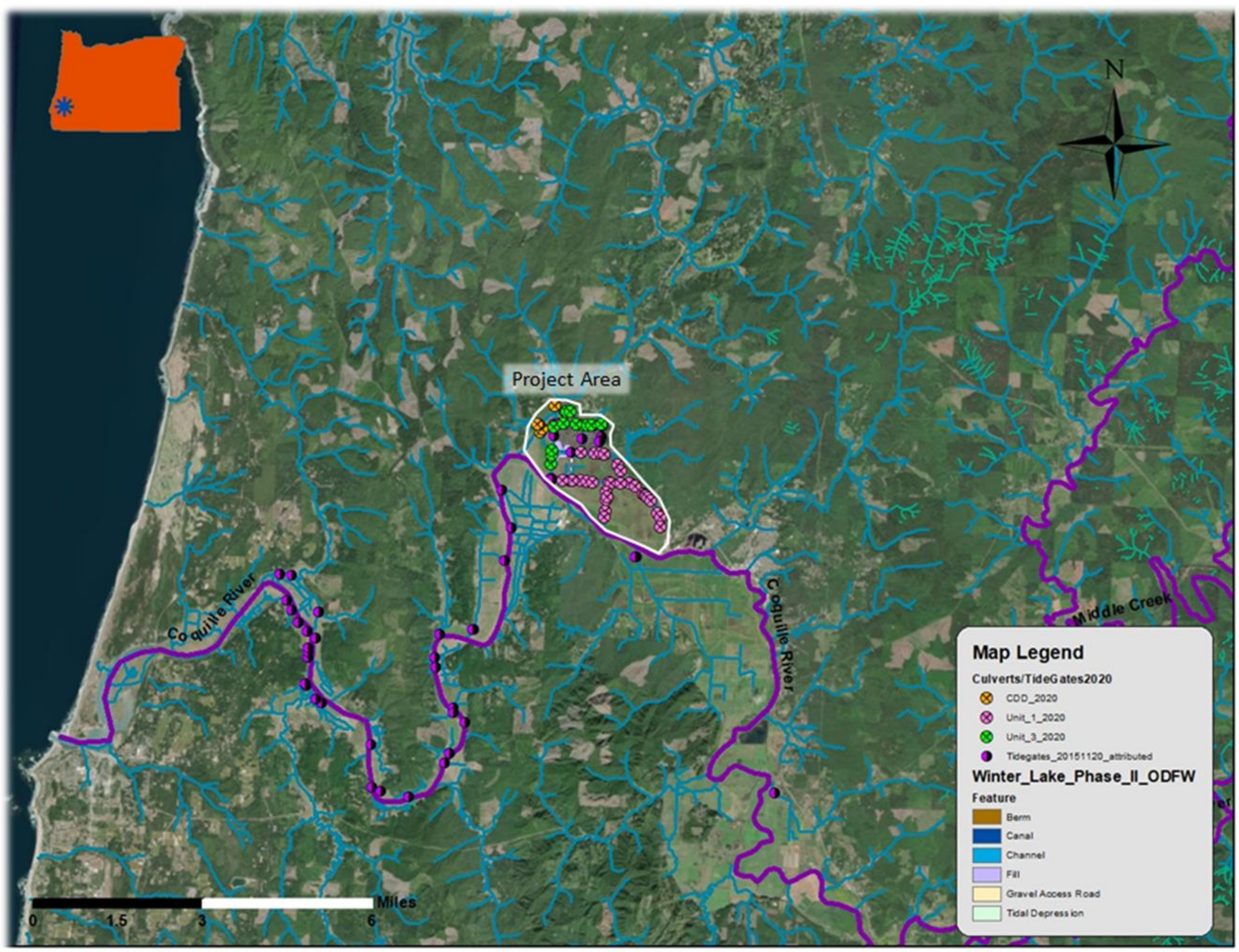


Figure 1. Coquille River estuary with demarcation of the Phase III project area at River Mile 21. 5.

The proposed “Winter Lake Phase III” project has been developed by a team of partners including BSDD, the Coos Soil and Water Conservation District (Coos SWCD), ODFW, and the Nature Conservancy (TNC). The project is designed to complement the BSDD C3P tidegate replacement project completed in 2017. The Phase III replacement of 42 existing undersized culverts and associated old style top-hinged tidegates with 38 new culverts, upgraded water control structures, and redesigned interior pasture channels are anticipated to maximize hydrologic connectivity in order to achieve a balance of fish/wildlife and pasture grass production. We are incorporating design that meets the ODFW Habitat Mitigation Policy guidelines and National Marine Fisheries Service (NMFS) Tidal Area Restoration Project (TARP) and Standard Local Operating Procedures for Endangered Species (SLOPES V) restoration guidelines.

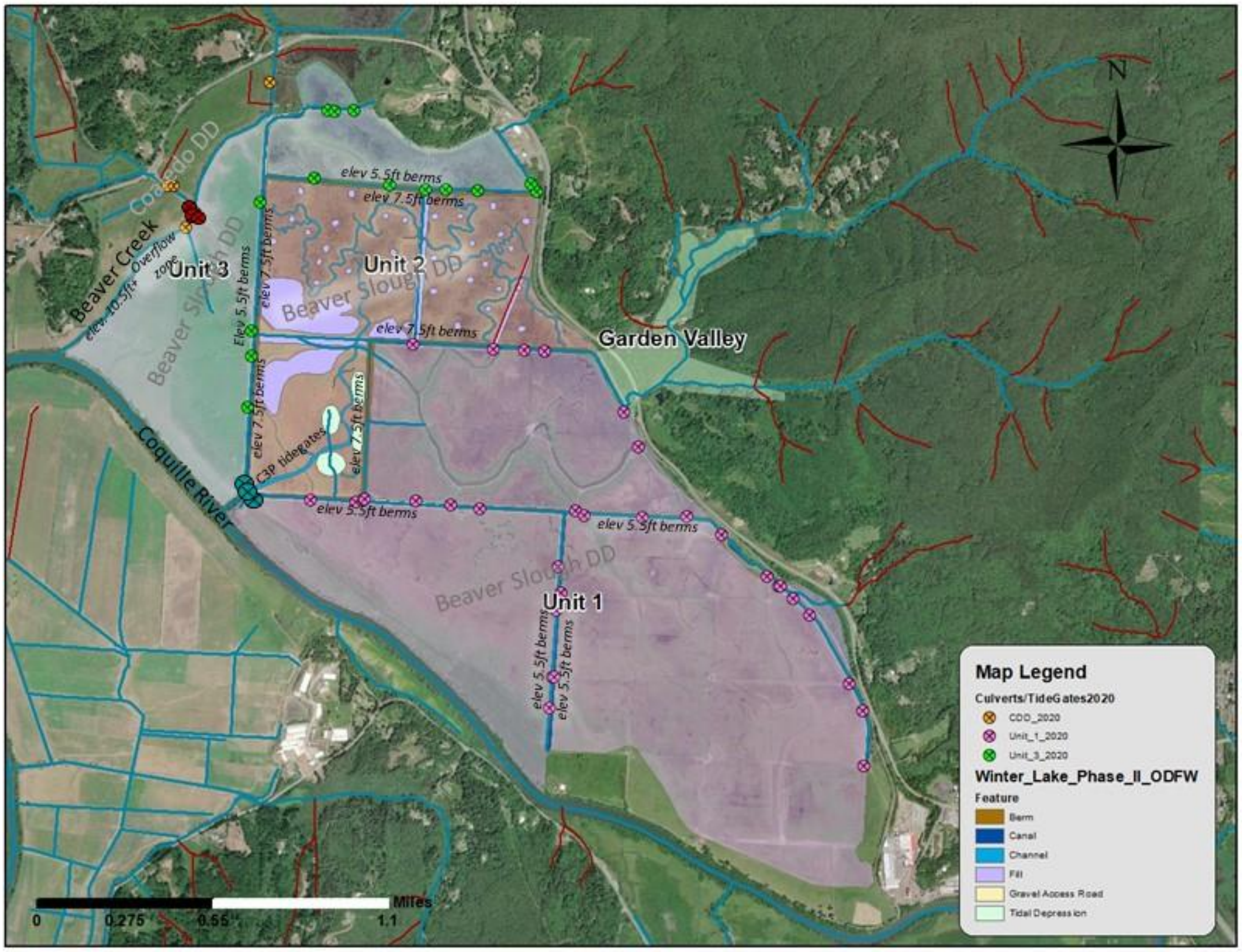


Figure 2. Winter Lake Phase I, II, and III project area and the land management Units within the Beaver Slough Drainage District; Rm 21.5 west of Coquille OR. Note two small parcels in the Coaledo Drainage District immediately to west/northwest of Unit 3 label are also in the Phase III project area.

The proposed Phase III project is designed to address insufficient hydrologic capacity and channel layout issues in Units 1 and 3 and two parcels in the CDD (*Figure 2*). The lands within Units 1 and 3 are managed with agricultural emphasis during spring, summer, and early fall months, however, are considered to have large unrealized capacity for juvenile coho rearing during the late fall, winter, and early spring. Water management to date within Units 1 and 3 has relied largely on channel networks that were installed in the early 1900's with subsequent modifications through time and maintenance dredging on roughly a 15yr interval to clean sediments that accumulated through time. This project as designed with installation of new channels that will provide adequate inflow/outflow capacity and reconstruct segments where sediments have accumulated to develop capacities that meet the project goals.

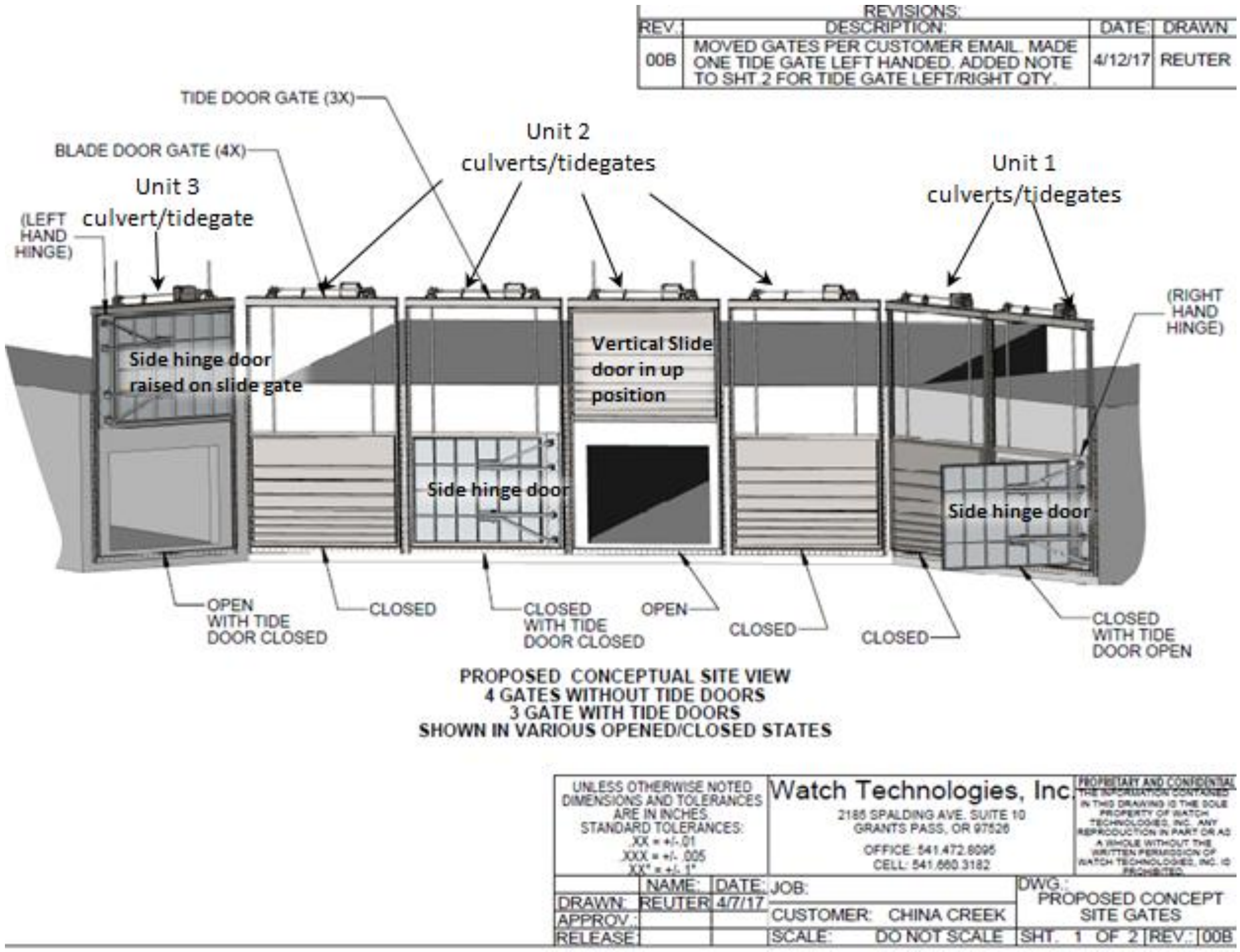


Figure 3. C3P tidegates and 10.0x8.0ft concrete box culverts configuration.

Key Hydrology/Habitat Issues

The Phase I C3P tidegate project in 2017 project alleviated hydrologic connectivity issues at the BSDD connection point to the mainstem Coquille River with main canals. In 2018 the Unit 2 “Restoration” project installed over 31,000ft of channel, connecting this 407 acre land area fully and addressing poor hydrologic connectivity, limited access for fish, fish stranding potential, and mosquito production risk. However, within Units 1 and 3 upstream of the C3P tidegate in the BSDD and the two parcels in the CDD, there remain numerous dysfunctional hydrological and habitat attributes for floodplain connectivity, wetland hydrologic function, and access for a number of native fish species including: Oregon Coast (OC) coho juveniles, fall Chinook juveniles, winter steelhead outmigrants, and coastal cutthroat trout that would otherwise use these locations seasonally. In addition, the poor hydrologic connectivity leads to poor functionality in regards to water management for pasture grazing production

Hydrological Issues:

There are a myriad of hydrologic connectivity issues within the project area fully discussed in the “Winter Lake Phase III Hydrologic Assessment” document. The primary concerns relate to culverts and associated channels that do not properly deliver or allow for outflow to “drained out” condition from the ~1,400 acres of pastureland below elevation 8.0ft in the BSDD and CDD project areas. Several of the primary issues from the Hydrologic Assessment are listed below:

- *<u>Channel Discontinuity:</u> Discontinuity of channel networks due to construction of linear networks in 1908-1909 that redirected flow from the historical natural hydrologic flow paths. This results in the inability for tidal inflow/outflow to move into and from the floodplain pastures properly.*

- *<u>Insufficient Fish Access:</u> Insufficient interior channel network density/acre and average channel depths in Units 1 and 3 to provide access routes for juvenile fish to feed and find sufficient refugia depth. This condition results in very limited use of large portions of the floodplain by juvenile Oregon Coast coho. The interior pasture elevations in Units 1 and 3 is just over 3.0ft. If there is <18" of water on pastures and channels are distant from a location, coho will not move overland to potential feeding areas. The distance coho will move is related to depth until around 3.0ft, where they will move widely. At 3.0ft of depth the overall average water elevation in Units 1 and 3 is around elevation 6.0ft, which is on the majority of years a small portion of the November to April time period when coho are present. Increased channel networks will allow for substantively increased use of available habitat as coho penetrate through channel networks into interior pasturelands and feed adjacent to channels when water is at depths under 3.0ft.*

- *<u>Restriction of Tidal Flow:</u> Undersized culverts connecting to the main canals within Units 1 and 3 and the CDD pastures that restrict proper tidal/flood-flow and underserve hydrologic connectivity/irrigation needs in the period when salmonid fish would use the habitats and pasture production months.*

- *<u>Top-Hinged Tidegates</u>: Top-hinged tidegates on the existing interior culverts upstream of the C3P tidegates that are difficult to manage in the open position. This results in restriction of fish movements from the canals into pasture floodplain channels where food availability is higher and competition with non-native fish lower.*

- *<u>Channel Grades:</u> Channel networks that were not constructed on-grade and thus do not allow for sediments to be transported properly, resulting in premature accumulation, limited connectivity for fish movement, and poor drainage for landowners. Limited excavation/maintenance through time to compensate for the poor sediment transport capacity of these historical designs has led to sediment accumulation restricting inflow/outflow of these interior channels. Reconstruction or new construction is now needed to achieve the desired capacity and functionality.*

- *<u>High Culvert Invert:</u> Culverts were in many locations installed with an invert elevation inappropriately high, which results in a condition where pasture channel networks at early winter water elevation levels are disconnected from main canals resulting in delayed ability for fish to enter the floodplain and resultant increased potential for stranding and predation.*

- *<u>Poor Sediment Transport:</u> The lack of proper sediment transport has facilitated establishment of aquatic vegetation in existing networks that further restricts inflow/outflow and the ability to meet goals for moving water into the landscape for fish passage and off of the landscape for pasture management/forage production.*

Methodology for Proposed Actions

<u>Culvert Replacement:</u> The project will implement replacement of 38 of the existing 42 undersized pasture channel culverts and elimination of 4. At one location, where the Messerle pasture road accesses the floodplain from Hwy 42 a culvert will be replaced with a bridge *(Figure 4)*. The remaining four culverts with associated tidegates will be removed and consolidated within the remaining reconstructed 38 channel networks. The location of entry for six of these pasture channels and associated culverts to main canals will be moved to more appropriately configure the network to landscape topography. Culverts will be primarily Advanced Drainage System (ADS) or High-density polyethylene (HDPE), to extend life of culverts.

Culvert Design/Materials

1). It is critical that culverts be installed with an invert elevation that provides for fish passage. Culverts will meet swim through conditions with continuous 20-50% backwatering that meets the ODFW and NMFS fish passage criteria.

2). Culverts will be installed with an invert elevation (-1.0 to 0.0ft NAVDD 88) that provide for both accommodation of inflow/outflow hydrology amplitudes, above criteria #1, and drainout of pastureland channels.

3). Culverts were sized in order to meet Hydrologic volumes for inflow/outflow (see Hydrologic Assessment) based on tidal regimes, the DWMP, and irrigation needs.

We have designed culvert sizing to meet ODFW and NMFS criteria based on the "Winter Lake Phase III Hydrologic Assessment." The low tide minimum elevations do not reach the minimums that are observed at the ocean due to riverbank damping of the tidal amplitude. Northwest Hydraulic Consultants water level logger data in the C3P tidegate Hydraulic Analysis noted that the minimum water elevations rarely fall below elevation +1.5ft. In order to accommodate inflow/outflow and meet Federal and State fish passage guidelines we have designed culvert inverts to be set from -1.0ft NAVDD 88 to 0.0ft elevation depending on the individual installation site. These elevation inverts will provide for proper depth to hydrologically connect channels. ADS, HDPE, and an in-development concrete pre-cast structure (Appendix A) will be installed on the project. Typical installation designs for culverts through berms is shown in Sheet 1.

<u>Water Control Structures:</u> The project is planning replacement of tidegates on the 38 interior culverts with either: a). Side-hinged aluminum tidegates (Appendix B); with door brace for managing in the door open position b). Water control slide/knife gates operated manually through screw drive and wheel (Appendix B); or c). Other water control structures such as baffles or louvered gates. The individual water control types will be operated similarly and open as prescribed under the BSDD DWMP. Several styles of water control structure are shown in Appendix A. These water control structures are generally connected to the culvert prior to installation and the culvert and water control structure are then installed as a unit.

<u>Channel Reconstruction/Channel Creation:</u> The Phase III project proposes reconfigure/reconstructing ~29,981ft or 5.7 miles of existing tidal channel *(Figures 5 and 6)* and creation of 74,670 ft or 14.1 miles of new tidal and tidal swale channels in Units 1 and 3 *(Figures 5, 6)*. These channels will encompass lessons learned from Ni-Les'tun and Unit 2 restoration including using on-grade design and bank sloping that maximizes edge habitats in order to:

- Provide depth refugia for native salmonids in winter and native resident fish in summer months,
- Contribute to greater utilization of the project area by juvenile coho, through increasing channel distribution on the landscape and fish penetration into the floodplain.

- Provide adequate volume capacity for:
  a). A hydrologic Connectivity relationship that more closely mimics water inflow/outflow management and capacity at the main C3P tidegate;
  b). Capacity that adequately provides for rain and floodwater outflow/drainage below elevation 5.5ft; and
  c). Capacity that provides for delivery of summer irrigation flows.

The yardage calculations for channel work (Sheets 1-17 and Tables 1, 2, and 3) were developed based on:

1). Use of the LiDAR elevation averaging to determine the pasture elevation average for a given channel
2). Use of the known invert elevation at the pasture channel connection point with the main existing canals to determine the depth of material that would be excavated.
3). Channels in a number of locations were designed with a different sloping in first 300ft for small/medium size channels and 500ft for large channels. This is demarcated in Sheets 3-17. Additionally, yardage calculations reflect greater depth in the initial 300/500ft due to invert elevations that are deeper in segments where channels enter pastures at connection points with canals.
4). Thin-spreading of excavated material to DSL/USACE approved 3.0" in average depth on pastures adjacent to channels will be the primary use of spoils. There will be some locations where suitable material for berm reconstruction excavated during channel construction will be identified and this material will be used in berm repair locations.

Note: *All channel calculations were designed with a margin that tends to slightly overestimate yardages so as to fully provide impacts appropriately for the Oregon Department of State Lands (DSL) and U.S. Army Corps of Engineers (USACE) 404 Fill and Removal Permit. Thin spreading of spoils will mimic natural deposition from flood events that was eliminated from 1909-2017 and now has been partially restored through installation of the C3P tidegate and capacity to deliver winter floodwaters. Subsidence through time has contributed to pasture topography variability that currently complicates water management and contributes to fish stranding.*

Interior Berms: Interior pasture berms will be reconstructed to elevation 5.5ft NAVDD88 in locations where they have degraded *(Figures 4, 5, and 6)*. Spoils from channel construction will be used to bring these locations into functional condition in order to allow for individual pasture/landowner water management up to elevation 5.5ft. Initial reconstruction will be completed with placement of earth to elevation 6.0ft, which will allow for 6.0" of settling and usable long-term berm height of 5.5ft. Berm yardage calculations were developed using aerial imagery estimation of the length of repair in combination with ground truthing and then defined design (Figures 6 and 7; Sheets 1, 18, and 19, and Table 3).

Excavation of Sediments China Canal and Sections of Unit 1 Southeast Canal: The China Camp Creek canal has accumulated 3,675 cy's of sediment that has been transported to where the stream gradient reaches near 0.0% (Figure 6; Sheets 19-22). This segment of canal is critical for transport of China Camp Creek flow and drainage of the Garden Valley lands upstream of Hwy 42. A total of 3,675 cy's of silt/clay material will be excavated in the 1,262ft long work reach (Sheet 19) using a long reach excavator working from top of bank. Dewatering of the canal is not possible in the work area as the damage to aquatic resources would exceed impacts of excavation. The work will be completed on a low incoming tide in a period when water temperatures are above the level tolerable for salmonid fishes, as such they will not be in the work area. Working on low incoming tide will keep sediments that are generated in the active work area. Lamprey ammocoetes and other non-salmonid fishes that are entrained in the excavated material e.g. sticklebacks and sculpin, will be salvaged as material is deposited in the pasture. Excavated material will be placed adjacent to the canal where it will be thin spread to a depth average of 3”, (Table 3).

There is also another reach of the Unit 1 canal where a small slump has narrowed flow volume capacity in the Unit 1 canal on the southeastern leg (Figure 4). An excavator working from the top of bank will be utilized to remove this flow constriction. Sediments will be excavated and thin spread to an average depth of 3” in the pastures adjacent to the canal. The total cy’s estimated for removal in this reach is 667cy (Sheet 21). The very southeast 904ft of the Unit 1 Canal has sediment accumulation of 1,333cy (Sheet 21) that will be removed. Finally, the northeast portion of the Wheeler Canal in an 840ft segment is in need of 1,116cy of excavation to reestablish proper hydrology and accommodate outflow from proposed culvert and channel upgrades (Sheet 22 and Table 3).

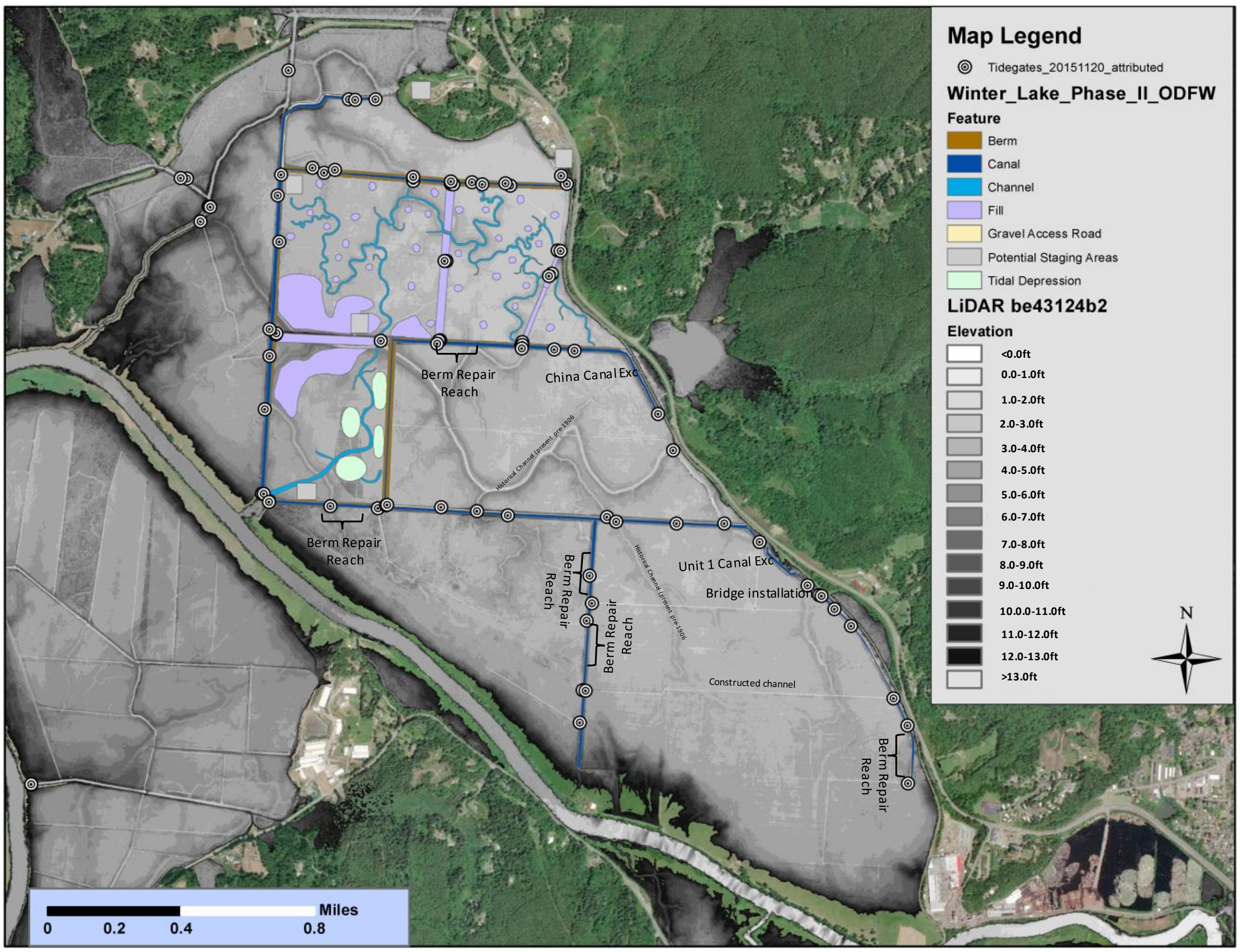


Figure 4. LiDAR elevational map and locations where berm reconstruction is needed. Grayscale depiction allows for historically installed linear pasture drainage channels to be visible.

Habitat Uplift: The Phase III project will incorporate a number of additional habitat uplift benefits. While these are not related to hydrology it is important to note that they will increase ecological functionality (Table 1 Appendix D) of the pasturelands and reduce the potential that channels will reaccumulate sediments. These actions are more fully addressed in the Phase III project DSL/USACE 404 fill and removal permit. Proposed Phase III project actions that are designed to greatly enhance ecologic uplift include (Table 1 Appendix D):

1). Fencing or exclosures with skip planting along the first 500ft of large and medium channels that connect to main canals (Skip planting concepts Sheets 24-26 in Appendix C), however, access for machinery will be left in the planting design and layout if a return excavation is needed in specific small locations;

2). Channel construction bank sloping that will provide for extended life of channels and provide extensive edge feeding habitat for fish along channel banks;

3). Installation of channels into locations where the topography is low, water ponds, and currently fish become stranded;

4). Hydrologic bulbs (Figure 7) at the terminus of larger channel networks that provide a small basinal low area excavated to provide fish habitat in winter and channel flushing to move any accumulation of sediments from the channel network.

5). The channels will be designed with on grade construction, which will result in hydrology where sediment accumulation in the invert will be transported in perpetuity down networks into the main Coquille River with a greatly reduced or no long term need for repeated/substantial excavation.

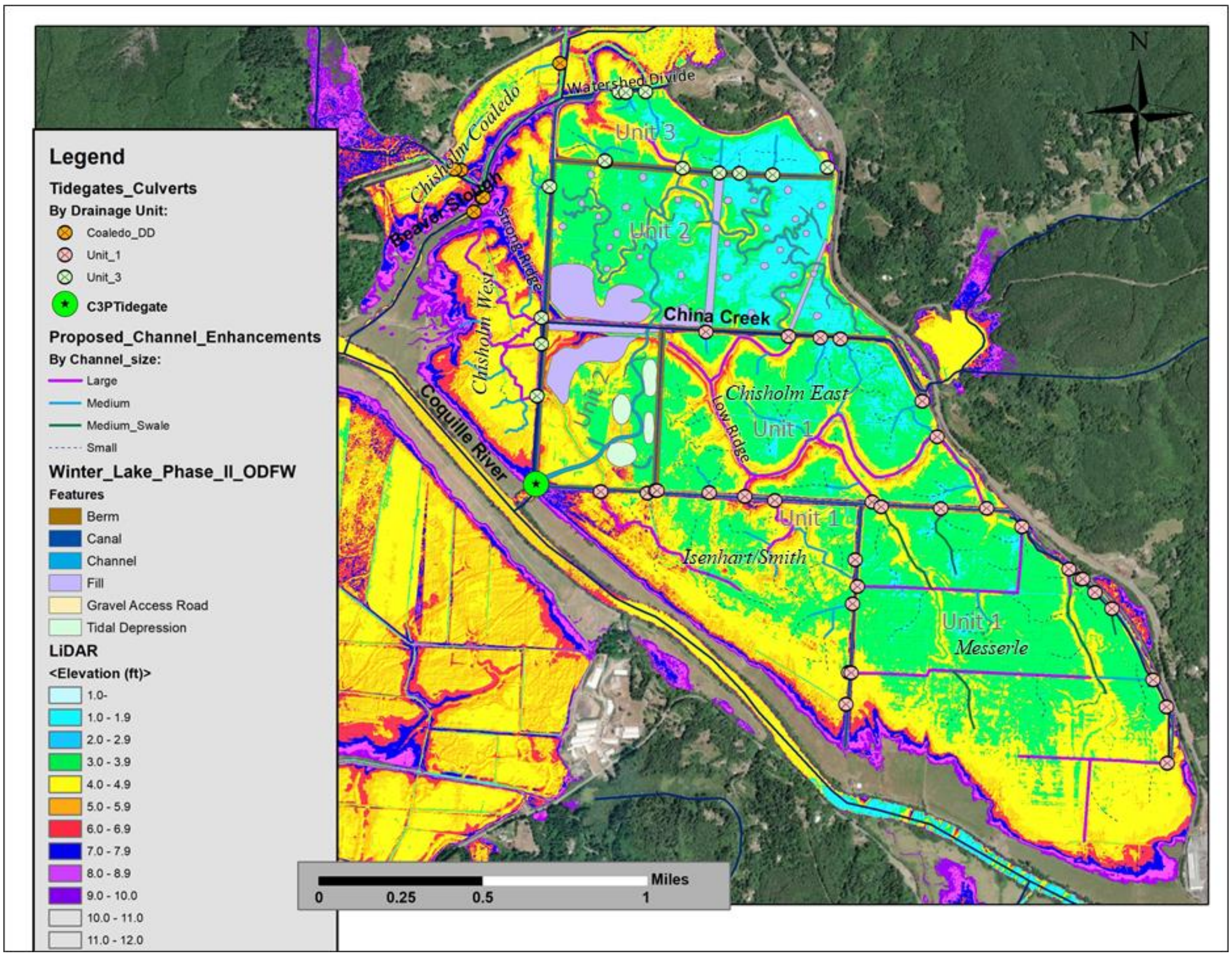


Figure 5. LiDAR elevational map of the Winter Lake Phase III project area with new proposed channels depicted. Lands above elevation 10ft allow for the aerial imagery to show through.

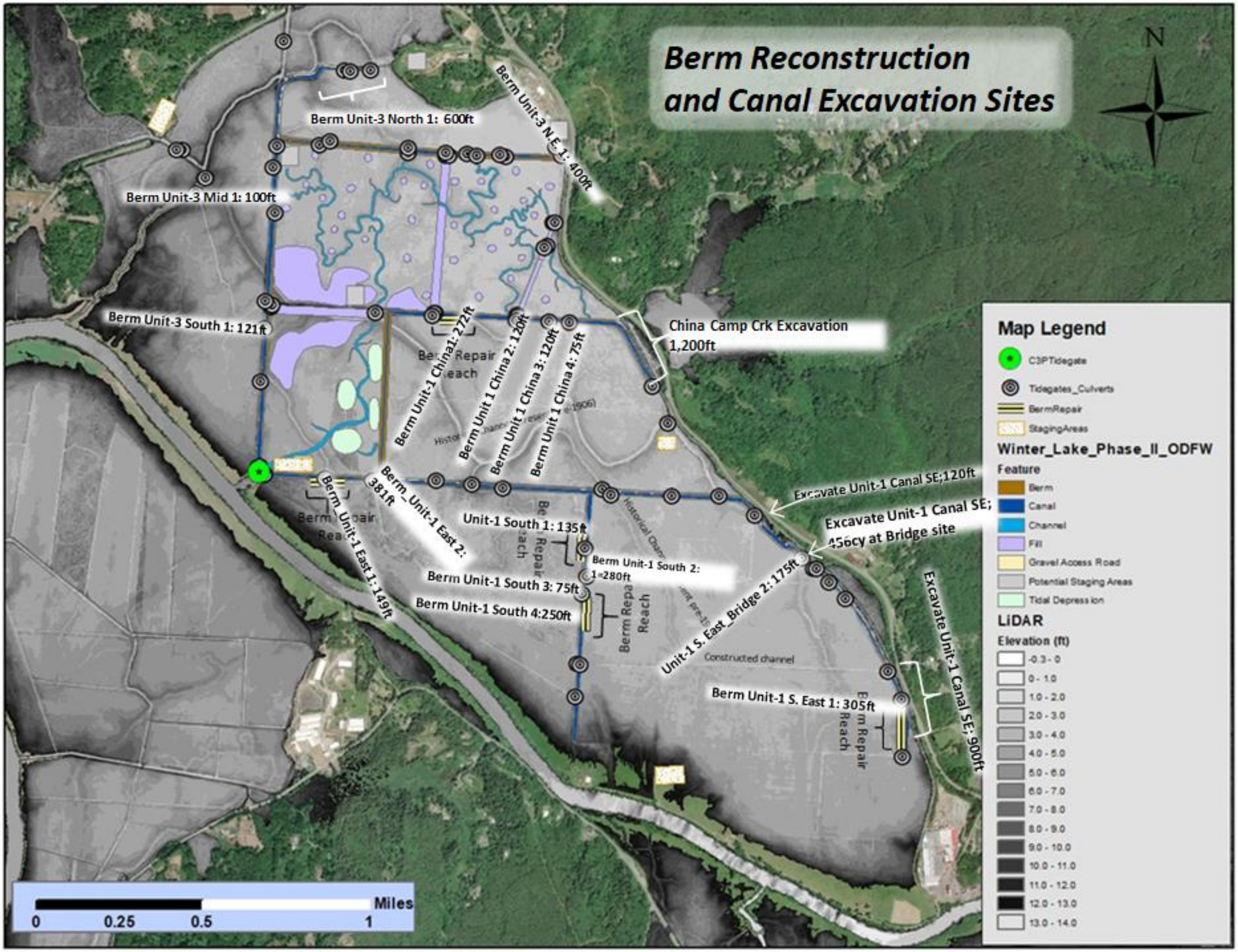


Figure 6. Phase III proposed channel reconstruction/construction depicted with LiDAR in grayscale.

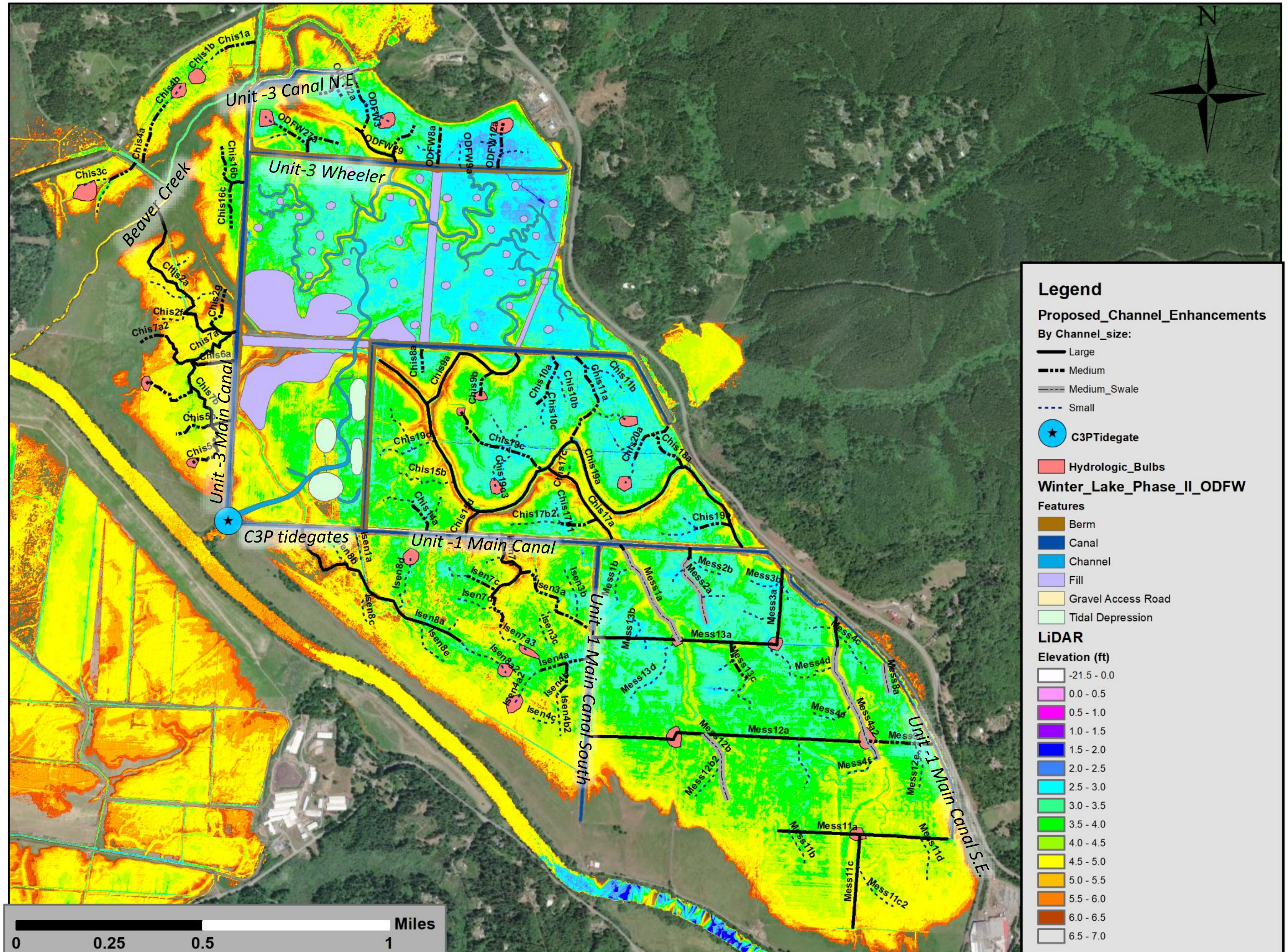


Figure 7. Reconstructed/New channel construction I.D. and configuration. ***Note:*** *culvert I.D. is same as channel I.D.; Large and Medium channel connection locations with main canals are culvert replacement locations.*

Table 1. Winter Lake Phase III interior culvert location I.D.'s and pipes. Culverts installed at channel connections with main canals as denoted in Figures 7 and 8.

Unit Number	CIS_ID	Chan Size	Acres	Acres_blw 10ft_elev	Current CulvrtSize_ft	Culvert Prop. (ft)	100yr Flow Clvrt [1]	Culvert_Cap% ± Prop Ovr 100yr[1]	Culvert_Size% ± Prop Ovr 100yr
Unit-3	Chis16	M	42.4	42.4	3.0	4.0	24	+598.8%	200.0%
Unit-3	ODFW27	M	23.0	23.0	4.0	4.0	24	+957.8%	200.0%
Unit-3	ODFW2	M	8.8	8.8	1.0	3.0	15	+1212.5%	240.0%
Unit-3	ODFW3	M	14.1	13.1	1.0	3.0	18	+756.8%	200.0%
Unit-3	ODFW29	L	11.9	9.56	None Present	4.0	15	+1851.2%	320.0%
Unit-3	ODFW8	M	12.3	7.6	2.0	4.0	18	+1791%	266.7%
Unit-3	ODFW9	M	6.8	4.0	1.0	3.0	12	+1569.2%	300.0%
Unit-3	Chis2	L	27.5	25.2	4.0	4.0	21	+801.1%	228.6%
CDD	Chis1	M	31.3	17.9	3.0	4.0	24	+703.8%	200.0%
CDD	Chis3	M	60.5	22.9	4.0	4.0	30	+364.1%	160.0%
CDD	Chis4	M	51.6	41.9	3.0	4.0	27	+426.9%	177.8%
Unit-3	Chis7	L	39.1	35.3	3.0	4.0	24	+563.4%	200.0%
Unit-3	Chis6	L	69.2	47.4	4.0	4.0	30	+318.3%	160.0%
Unit-3	Chis5	L	45.2	31.4	3.0	5.0	27	+860.5%	222.2%
Unit-1	Isen8	L	134.6	112.1	None Present	5.0	42	+289.0%	142.9%
Unit-1	Isen7	L	48.23	48.23	1.0	5.0	27	+806.4%	222.2%
Unit-1	Isen3	M	24.5	24.5	1.0	4.0	21	+899.1%	228.6%
Unit-1	Isen4	M	26.3	26.3	1.0	4.0	21	+837.6%	228.6%
Unit-1	Isen6	S	36.5	23.8	1.5	3.0	24	+292.3%	150.0%
Unit-1	Mess2	M	25.6	25.6	1.0	3.0	21	416.8%	171.4%
Unit-1	Mess3	M	49.0	49.0	1.5	4.0	27	449.2%	177.8%
Unit-1	Mess4	L	48.8	48.8	1.5	4.0	27	451.0%	177.8%
Unit-1	Mess8	M	11.4	11.4	1.5	4.0	15	2078.2%	320.0%
Unit-1	Mess9	M	17.0	17.0	2.0	4.0	18	1293.9%	266.7%
Unit-1	Mess11	M	199.3	162.0	2.0	5.0	48	195.1%	125.0%
Unit-1	Mess13	M	41.8	41.8	2.0	4.0	27	527.2%	177.8%
Unit-1	Mess12	M	177.2	137.6	2.0	5.0	42	219.5%	142.9%
Unit-1	Mess1	L	22.6	22.6	2.0	4.0	21	973.0%	228.6%
Unit-3	ODFW12	M	23.1	18.9	4.0	4.0	21	+1683.8%	228.6%
Unit-1	Chis8	M	9.1	9.1	2.0	4.0	15	+4274.2%	320.0%
Unit-1	Chis14	L	18.2	18.2	2.0	4.0	18	586.3%	266.7%
Unit-1	Chis15	L	38.1	38.1	2.0	4.0	24	+578.2%	200.0%
Unit-1	Chis9	L	20.5	20.5	2.0	5.0	21	+1897.3%	285.7%
Unit-1	Chis17	L	73.9	73.9	2.0	5.0	33	+526.3%	181.8%
Unit-1	Chis10	M	15.3	15.3	2.0	4.0	18	+1439.8%	266.7%
Unit-1	Chis11	M	26.3	26.3	2.0	4.0	21	+837.6%	228.6%
Unit-1	Chis20	M	26.1	26.1	2.0	3.0	21	+408.8%	171.4%
Unit-1	Chis19	L	38.5	38.5	4.0	6.0	24	+1591.4%	300.0%

1). Based on values from Table 6 Robison, George E., A. Mirati, and M. Allen 1999, also in Foltz et al. 2009

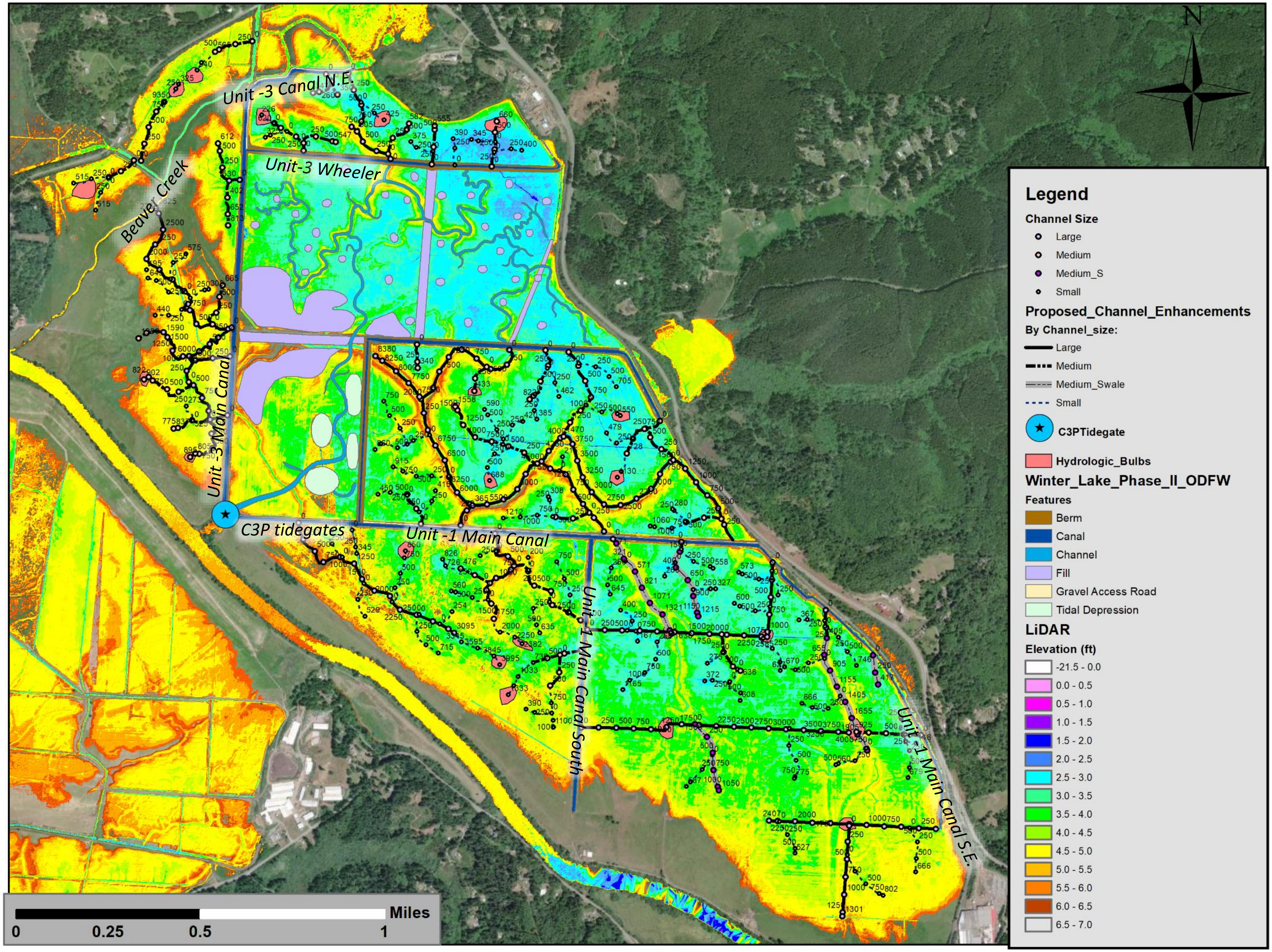
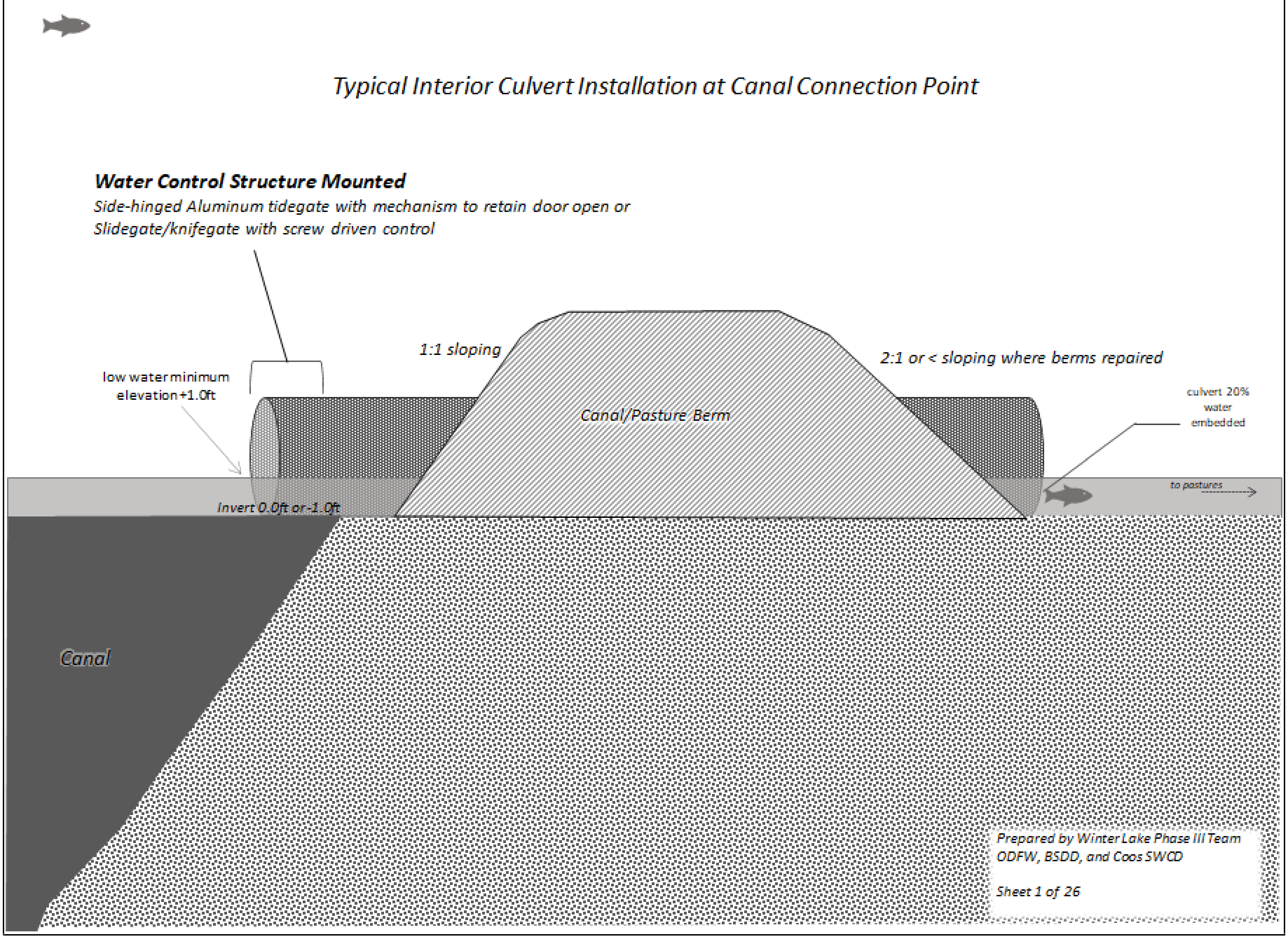


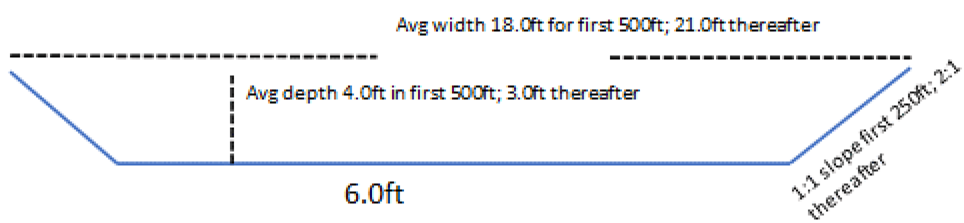
Figure 8. Reconstruct/New channel construction distance demarcation. ***Note:*** *Channel connection locations with main canals are culvert replacement sites.*

Typical Interior Culvert Installation at Canal Connection Point

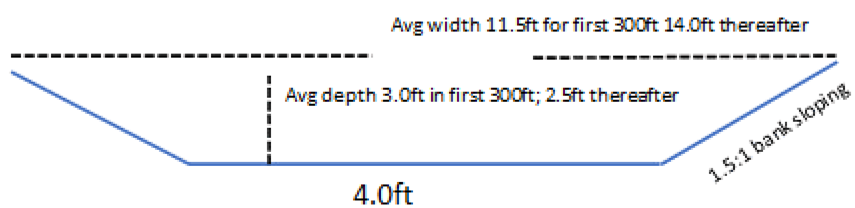


Pasture Channel Cross-Sections

Large Channel



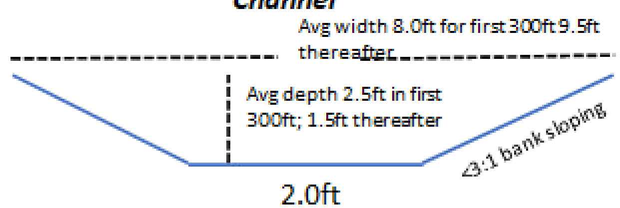
Medium Channel



Note: *Channel drawings not to scale.*

Note: *For large channels first 500ft and For medium channels the first 300ft of selected channels that connect to main canals will have a invert grade that is steeper.*

Small Channel



Prepared by Winter Lake Phase III Team
ODFW, BSDD, and Coos SWCD

Sheet 2 of 26

Table 2. Winter Lake Phase III channel excavation calculations for cubic yards of material.

Chan_ID	Channel Size (ft)	Channel Length (ft)	CY/ft; First 500/300ft	CY/ft; First 500/300ft	Length x CY/ft First 500/300ft[1]	Length x CY/ft First 500/300ft[2]	Total CY's
Chis7a	6	1,597	1.78	1.56	890	1,712	2,602
Chis7b	6	1,127	1.78	1.56	890	979	1,869
Chis7c	4	1,458	1.11	0.93	333	1,077	1,410
Chis5b	4	563	1.11	0.93	333	244	577
Chis5a	6	265	1.78	1.56	890		890
Chis2g	4	670	1.11	0.93	333	344	677
Chis2a	6	2,832	1.78	1.56	890	3,637	4,527
Chis2d	2	622	0.93	0.33	279	40	319
Chis7e	2	346	0.93	0.33	279	15	294
Chis2f	2	445	0.93	0.33	279	48	327
Chis6c	2	816	0.93	0.33	279	104	383
Chis5d	4	808	1.11	0.93	333	472	805
Chis7a2	4	645	1.11	0.93	333	321	654
Chis2b	2	201	0.93	0.33	279		279
Chis2c	2	476	0.93	0.33	279	58	337
Chis2e	2	309	0.93	0.33	279	3	282
Chis5f	2	270	0.93	0.33	279		279
Chis6a	6	606	1.78	1.56	890	165	1,055
Chis16c	4	658	0.93	0.93	279	333	612
Chis16a	6	152	1.78	1.56	534		534
Chis16b	4	612	1.11	0.93	333	290	623
Chis8a	4	337	1.11	0.93	333	34	367
Chis9a	6	1,978	1.78	1.56	890	2,305	3,195
Chis14a	4	504	1.11	0.93	333	4	337
Chis19c	4	1,488	1.11	0.93	333	1,105	1,438
Chis10a	4	826	1.11	0.93	333	489	822
Chis19c1	2	589	0.98	0.33	294	95	389
Chis11a	4	1,475	1.11	0.93	333	1,093	1,426
Chis15b	2	912	0.93	0.33	279	136	415
Chis14c	2	440	0.93	0.33	279	46	325
Chis15d	6	359	1.78	1.56	890	92	982
Chis19d	2	869	0.93	0.33	279	188	467
Chis20a	4	726	1.11	0.93	333	396	729

1. For Small and Medium Channels assumed minimum distance of 300ft of deeper dpeth of excavation. If overall length <300ft

2. If left blank then channel segment <500/300ft in length

Table 2. Continued.

Chan_ID	Channel Size (ft)	Channel Length (ft)	CY/ft; First 500/300ft	CY/ft; First 500/300ft	Length x CY/ft First 500/300ft[1]	Length x CY/ft First 500/300ft[2]	Total CY's
Chis11b	2	680	0.93	0.33	279	125	404
Chis20c	2	291	0.93	0.33	279		279
Chis20d	2	481	0.93	0.33	279	60	339
Chis19a	6	8,370	1.78	1.56	890	12,277	13,167
Chis14b	2	412	0.93	0.33	279	37	316
Chis17a	6	1,404	1.78	1.56	890	1,410	2,300
Chis17b	4	541	1.11	0.93	333	224	557
Chis17b1	2	303	0.93	0.33	279	1	280
Chis17b2	2	718	0.93	0.33	279	138	417
Chis17c	2	221	0.93	0.33	279		279
Chis19b	4	512	1.11	0.93	333	198	531
Chis19b1	2	281	0.93	0.33	279		279
Chis19b2	2	564	0.93	0.33	279	87	366
Chis18a	4	656	1.11	1.56	333	555	888
Chis19d1	2	746	0.93	0.33	279	147	426
Chis3a	4	445	1.11	0.93	333	135	468
Chis3b	2	517	0.93	0.33	279	72	351
Chis3c	2	516	0.93	0.33	279	71	350
Chis4a	4	932	1.11	0.93	333	587	920
Chis4b	2	338	0.93	0.33	279	12	291
Chis1a	4	563	1.11	0.93	333	245	578
Chis1b	2	377	0.93	0.93	279	71	350
Isen8a	6	3,097	1.78	1.56	890	4,051	4,941
Isen1a	2	341	0.93	0.33	279	14	293
Isen8d	2	732	0.93	0.33	279	143	422
Isen8c	2	526	0.93	0.33	279	75	354
Isen8e	2	714	0.93	0.33	279	137	416
Isen8f	2	253	0.93	0.33	279		279
Isen7a	6	1,238	1.78	1.56	890	1,152	2,042
Isen7a2	4	514	1.11	0.93	333	199	532
Isen7c	4	468	1.11	0.93	333	156	489
Isen7c1	4	347	0.93	0.33	279	16	295
Isen7d	2	565	0.93	0.33	279	87	366
Isen7b	2	252	0.93	0.33	279		279

1. For Small and Medium Channels assumed minimum distance of 300ft of deeper dpeth of excavation. If overall length <300ft

2. If left blank then channel segment <500/300ft in length

Table 2. Continued

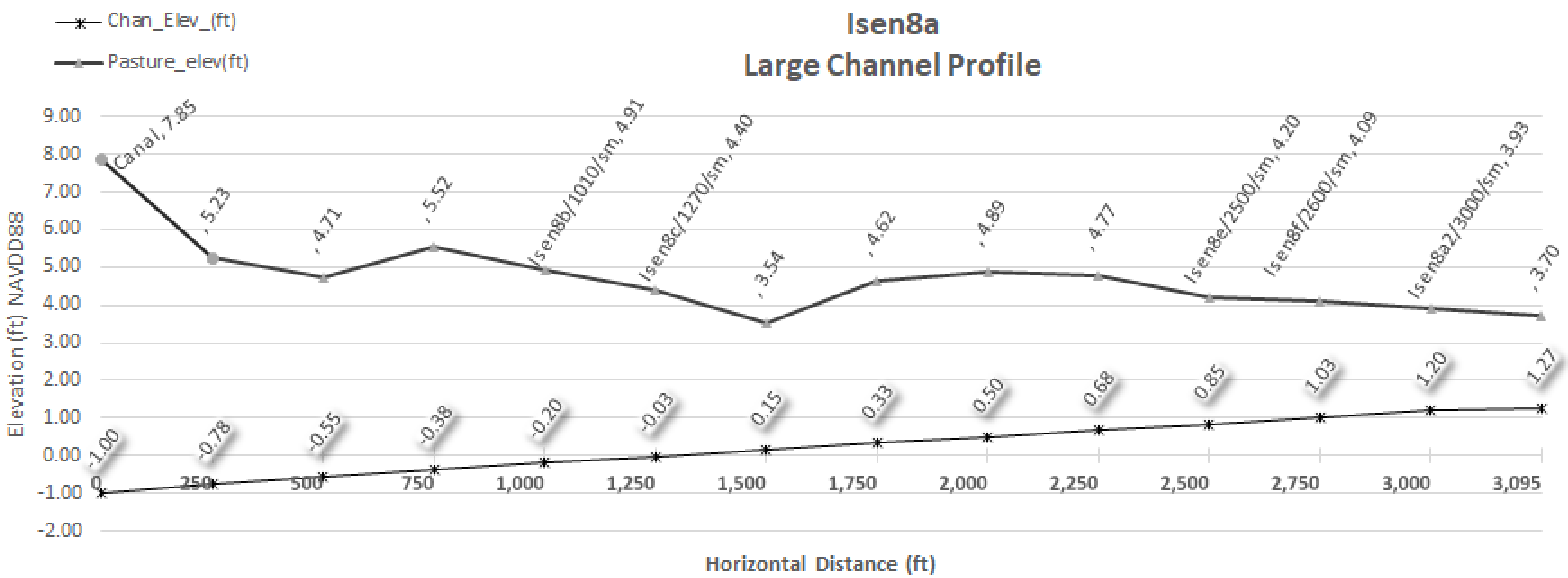
Chan_ID	Channel Size (ft)	Channel Length (ft)	CY/ft; First 500/300ft	CY/ft; First 500/300ft	Length x CY/ft First 500/300ft[1]	Length x CY/ft First 500/300ft[2]	Total CY's
Isen7a3	2	468	0.93	0.33	279	55	334
Isen3a	4	1,464	1.11	0.93	333	1,082	1,415
Isen3c	2	622	0.93	0.33	279	106	385
Isen3b	2	767	0.93	0.33	279	154	433
Isen4a	4	706	1.11	0.93	333	378	711
Isen4b2	2	595	0.93	0.33	279	97	376
Isen4a2	2	559	0.93	0.33	279	86	365
Isen8a2	2	821	0.93	0.33	279	172	451
Isen4c	2	381	0.93	0.33	279	27	306
Isen4b	4	499	1.11	0.93	333	185	518
Mess13a	4	1,194	1.11	0.93	333	831	1,164
Mess1a	4	1,554	1.78	1.56	445	2,034	2,479
Mess12a	4	3,902	1.78	1.56	890	5,307	6,197
Mess1a2	4	Removed 2022	1.11	0.93	333		
Mess1b	4	638	0.93	0.33	279	112	391
Mess2a	4	1,052	1.11	0.93	333	699	1,032
Mess2d	2	320	0.93	0.33	279	7	286
Mess3d	4	585	0.93	0.33	279	94	373
Mess3a	4	1,072	1.78	1.56	890	892	1,782
Mess3b	2	559	1.11	0.33	333	86	419
Mess2c	2	266	0.93	0.33	279		279
Mess4a	6	402	1.78	1.56	890		890
Mess3c	2	277	0.93	0.33	279		279
Mess1e	2	880	0.93	0.33	279	191	470
Mess13b	2	406	0.93	0.33	279	35	314
Mess11c	6	1,286	1.78	1.56	534	1,538	2,072
Mess11d	2	683	0.93	0.33	279	126	405
Mess4d	2	662	0.93	0.33	279	120	399
Mess8a	2	424	1.11	1.56	333	193	526
Mess4c	2	736	0.93	0.33	279	144	423
Mess9a	4	925	1.11	0.93	333	581	914
Mess4f	2	541	0.93	0.33	279	80	359
Mess4e	2	661	0.93	0.33	279	119	398
Mess13c2	2	274	0.93	0.33	279		279
Mess11a	6	2,390	1.78	1.56	890	2,948	3,838

1. For Small and Medium Channels assumed minimum distance of 300ft of deeper dpeth of excavation. If overall length <300ft

2. If left blank then channel segment <500/300ft in length

Table 2. Continued.

Chan_ID	Channel Size (ft)	Channel Length (ft)	CY/ft; First 500/300ft	CY/ft; First 500/300ft	Length x CY/ft First 500/300ft[1]	Length x CY/ft First 500/300ft[2]	Total CY's
Mess2b	2	368	0.93	0.33	279	22	301
Mess11b	2	540	0.93	0.33	279	79	358
Mess13c3	2	609	0.93	0.33	279	102	381
Mess13c3	2	362	0.93	0.33	279	20	299
Mess13c	2	627	0.93	0.33	279	108	387
Mess13d	2	618	0.93	0.33	279	105	384
Mess12d	2	277	0.93	0.33	279		279
Mess12e2	2	135	0.93	0.33	279		279
ODFW27a	4	618	1.11	0.93	333	296	629
ODFW27a2	2	230	0.93	0.33	279		279
ODFW27b	2	329	0.93	0.33	279	9	288
ODFW27b	4	547	1.11	0.93	333	230	563
ODFW2a	4	351	1.11	0.93	333	47	380
ODFW2b	4	342	1.11	0.93	333	39	372
ODFW3	4	905	1.11	0.93	333	563	896
ODFW29	6	775	1.78	1.56	890	429	1,319
ODFW3a	2	422	0.93	0.33	279		279
ODFW5a	4	589	1.11	0.93	333	268	601
ODFW8a	4	556	1.11	0.93	333	238	571
ODFW9a	2	387	0.93	0.33	279		279
ODFW12a	4	655	1.11	0.93	333	330	663
ODFW12b	2	403	0.93	0.33	279	34	313
ODFW12c	2	352	0.93	0.33	279	17	296
ODFW8b	2	372	0.93	0.33	279	24	303
Isen8b	2	491	0.93	0.33	279	63	342
Isen3d	2	198	0.93	0.33	279		279
Chis12b	2	440	0.93	0.33	279	46	325
Mess1c3	2	609	0.93	0.33	279	102	381
Mess1c4	2	362	0.93	0.33	279	21	300
Mess3b	2	585	0.93	0.33	279	94	373
Chis10b	2	457	0.93	0.33	279	52	331
Chis19c3	2	569	0.93	0.33	279	89	368
Chis10c	2	385	0.93	0.33	279	28	307
Chis19c2	2	419	0.93	0.33	279	39	318
Chis9b	4	433	1.11	0.93	333	124	457
Total Ft		**99,781**		***Totals***			**110,815**
	Miles	***18.9***					



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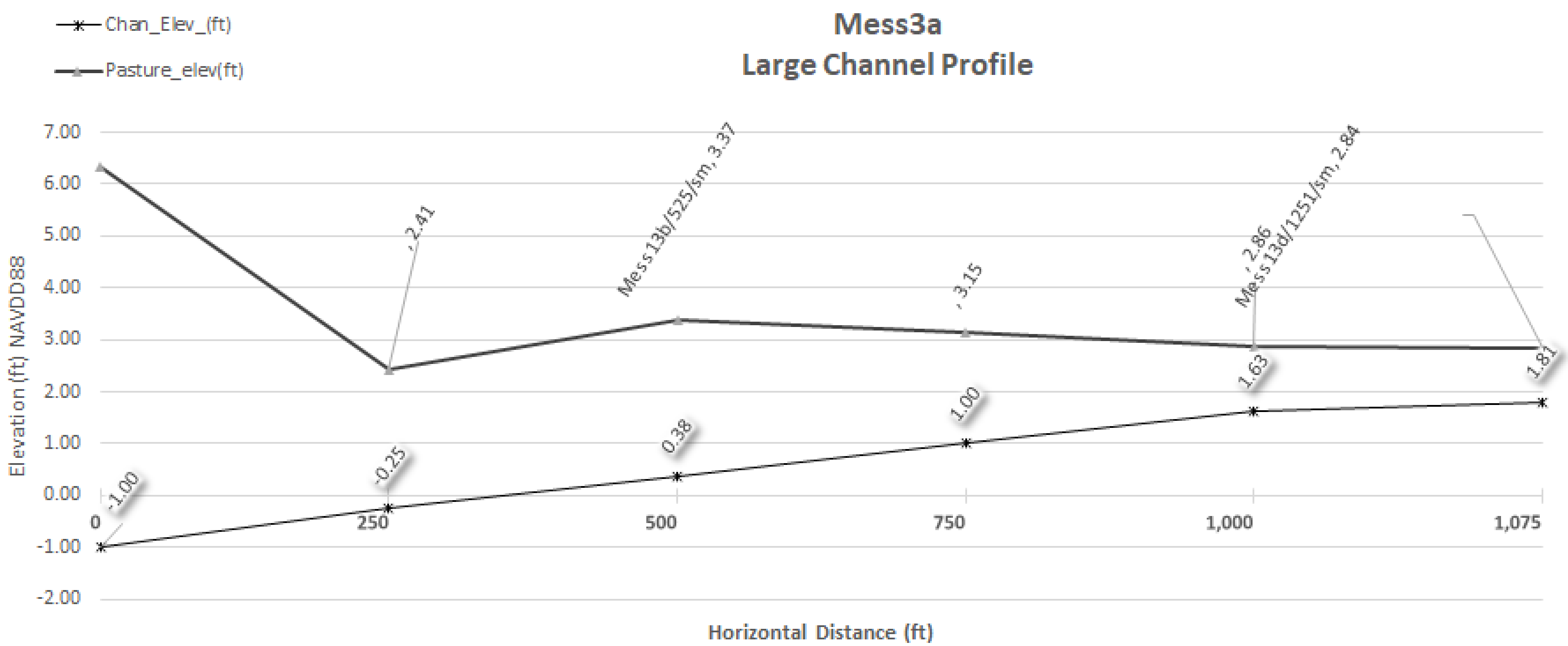

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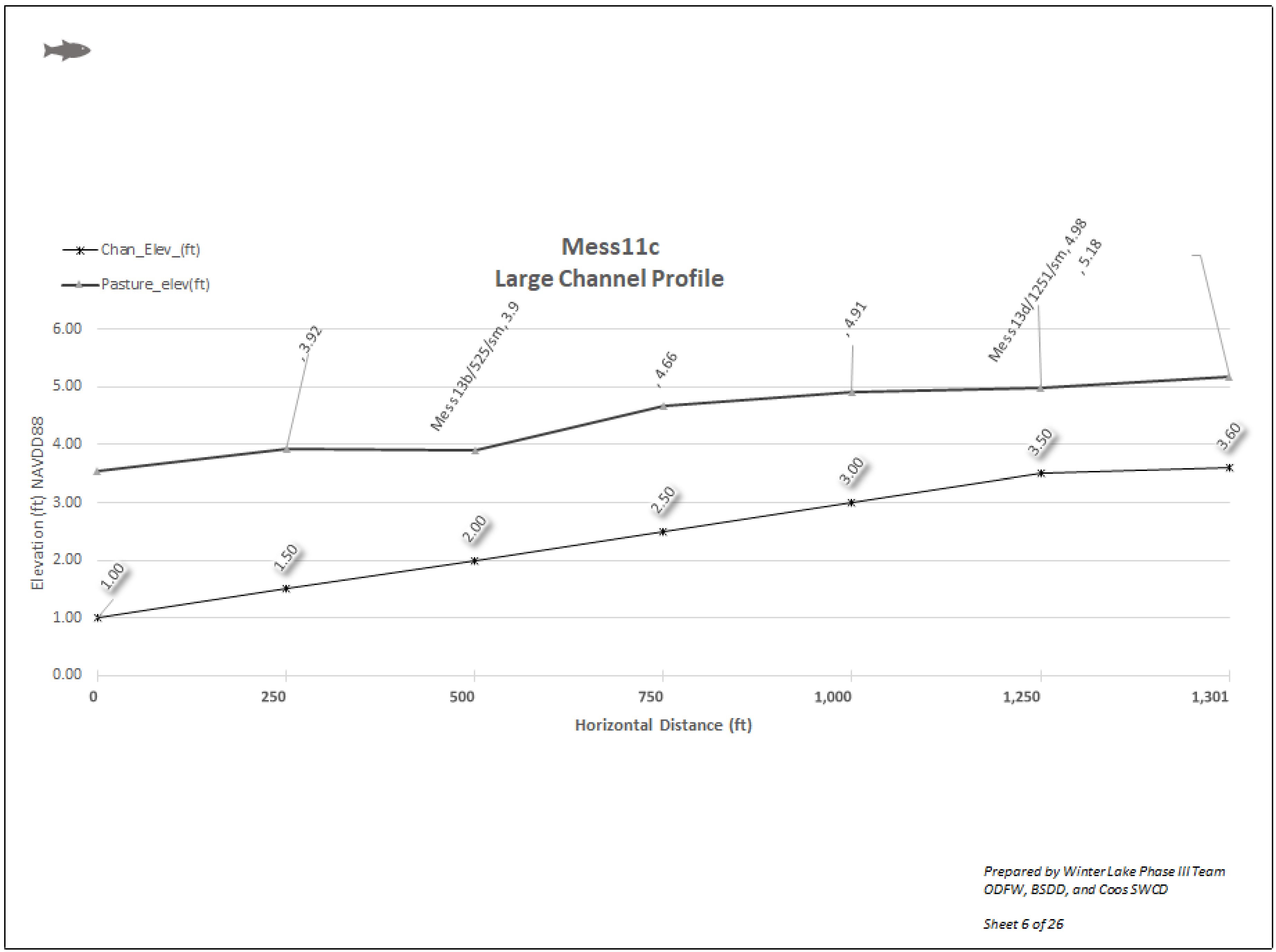
Mess11c
Large Channel Profile
Chan_Elev_(ft)
Pasture_elev(ft)
Elevation (ft) NAVDD88
Horizontal Distance (ft)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0
250
500
750
1,000
1,250
1,301
, 3.92
Mess13b/525/sm, 3.9
, 4.66
, 4.91
Mess13d/1251/sm, 4.98
, 5.18
1.00
1.50
2.00
2.50
3.00
3.50
3.60
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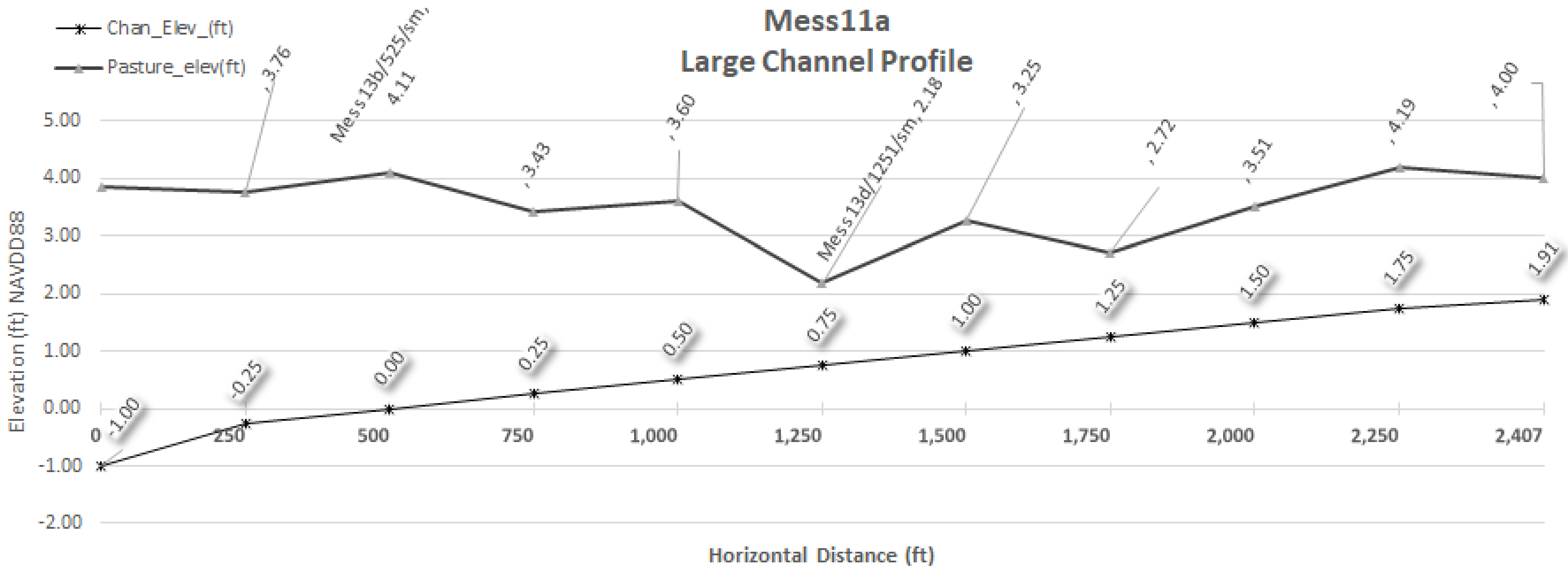

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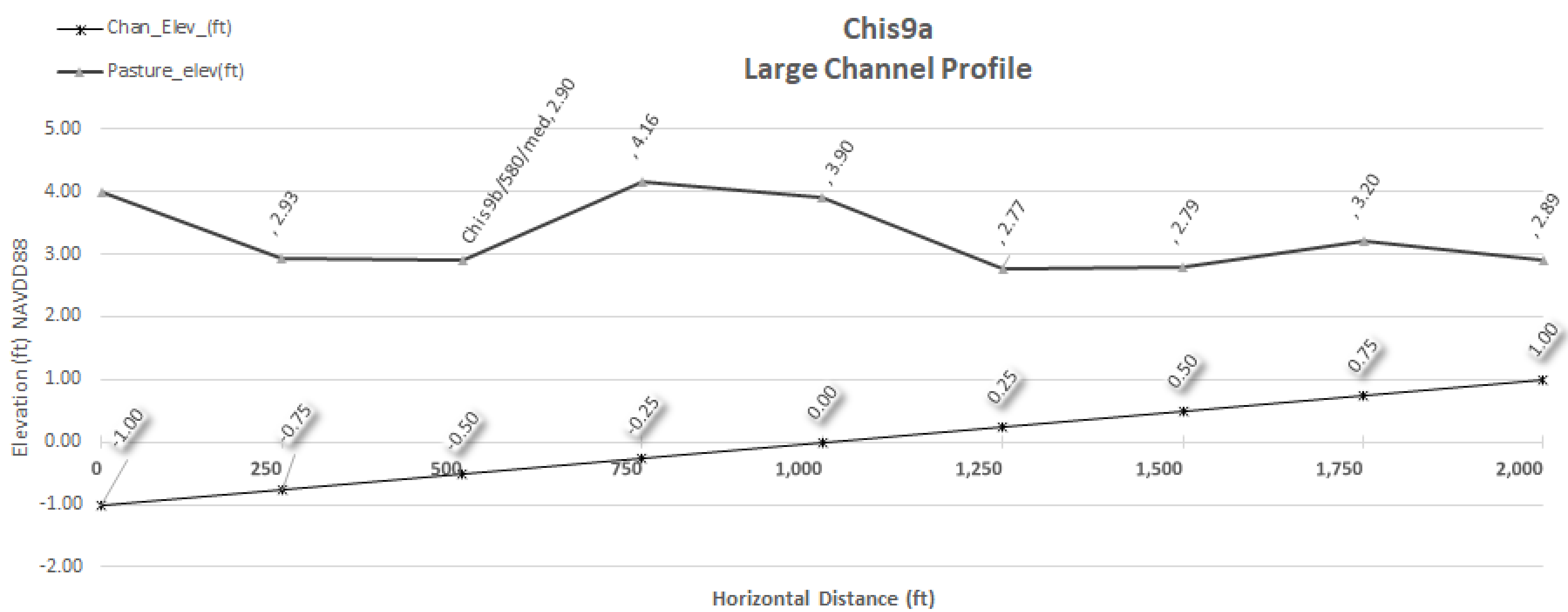

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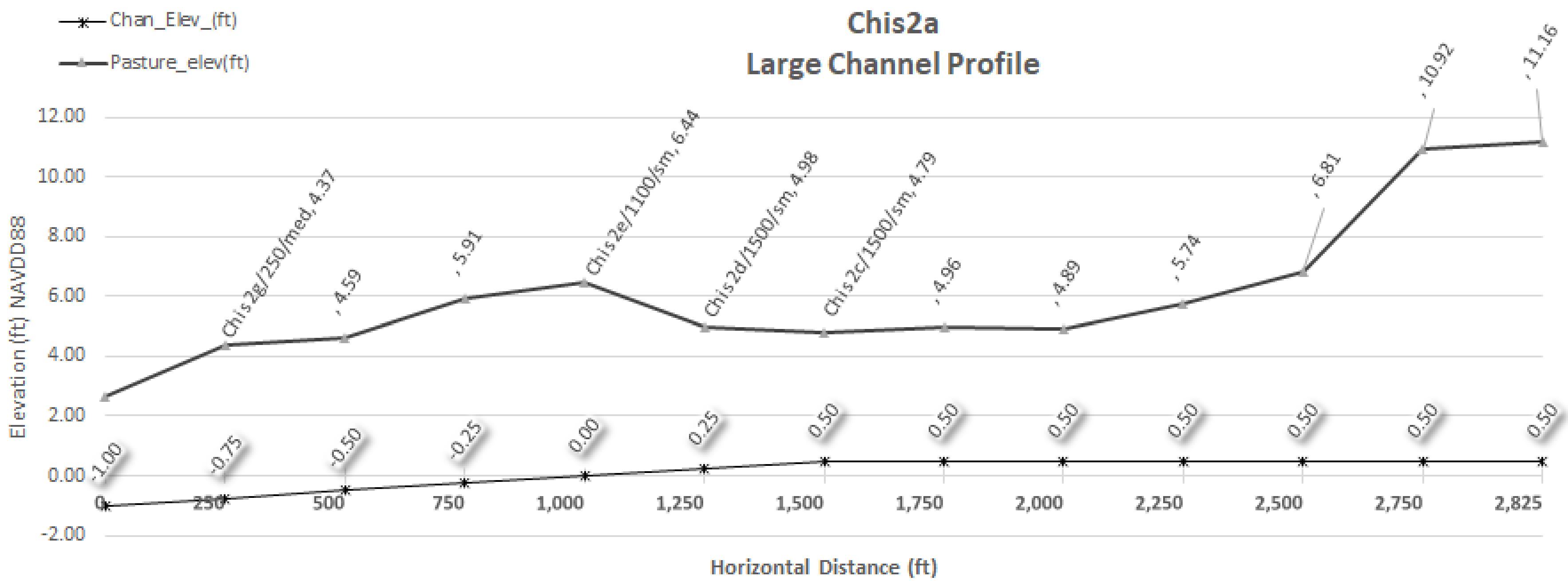

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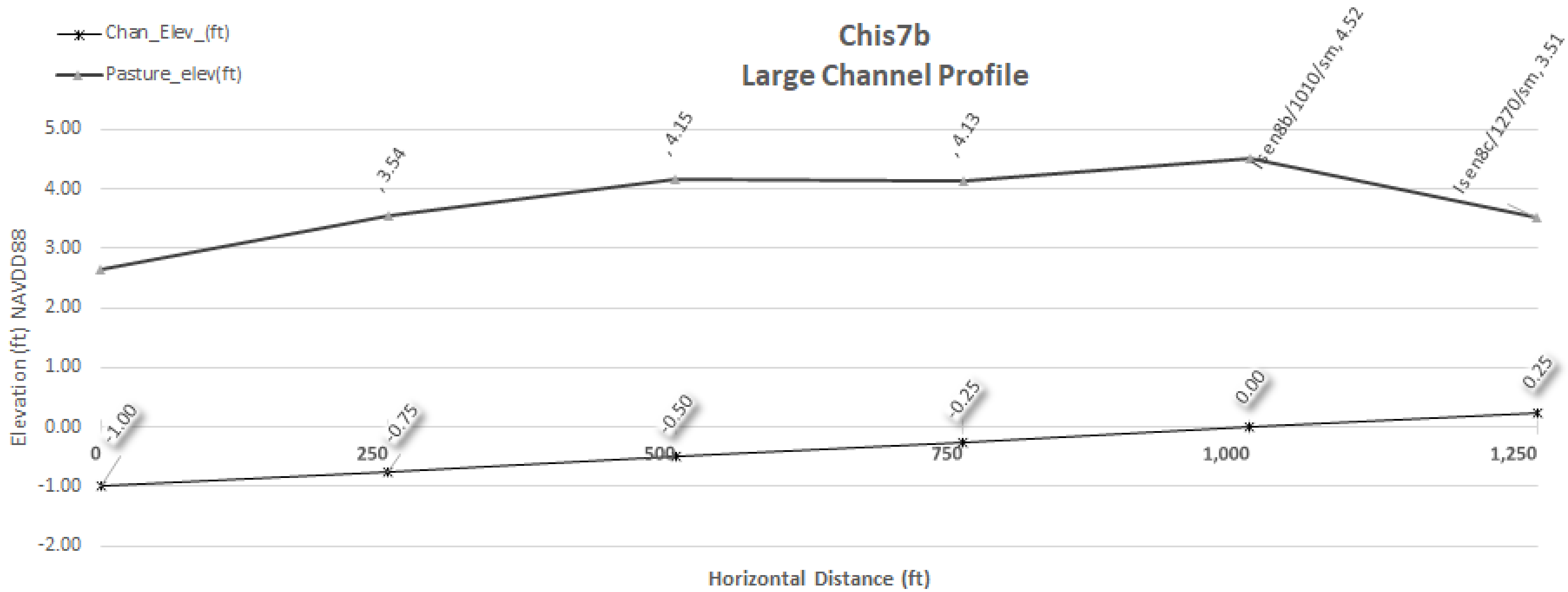

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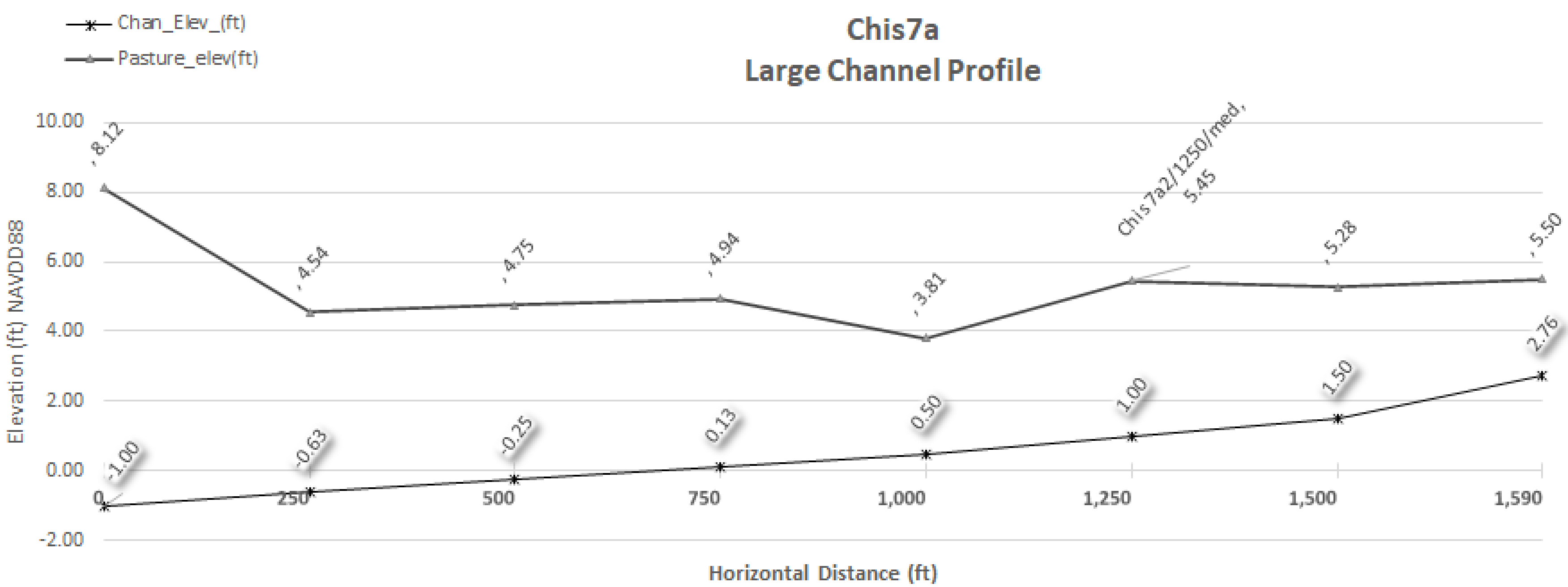

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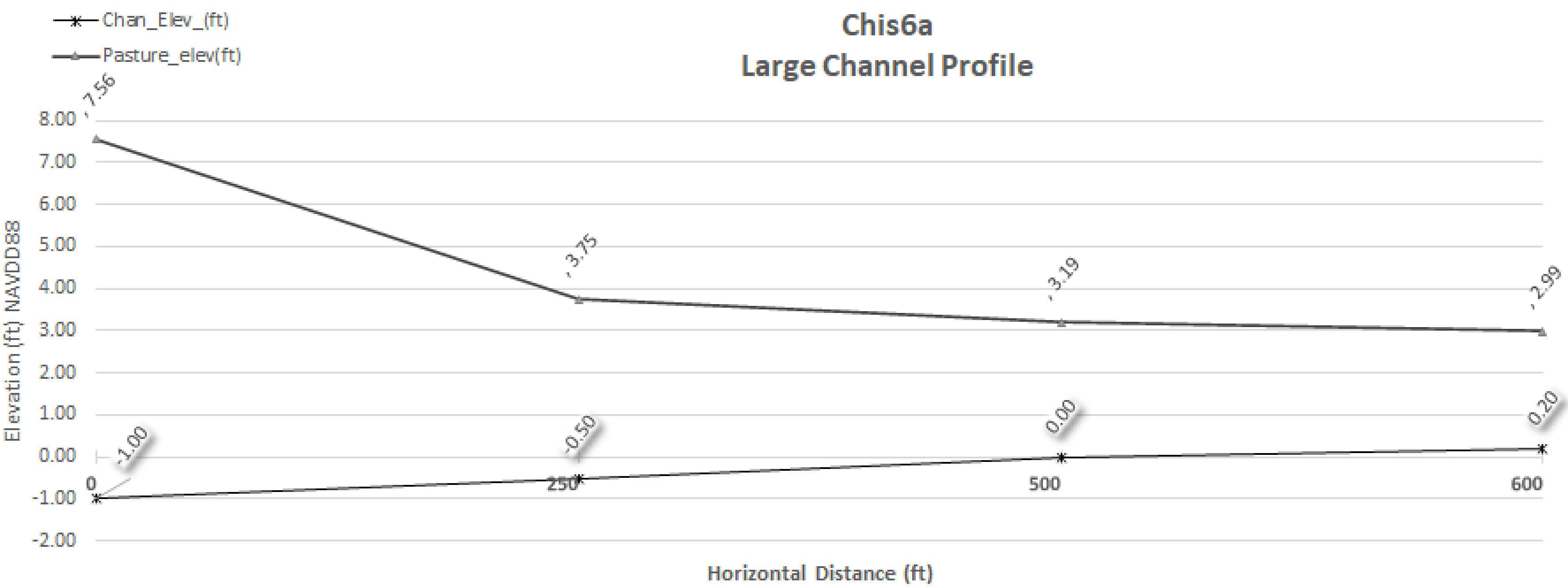

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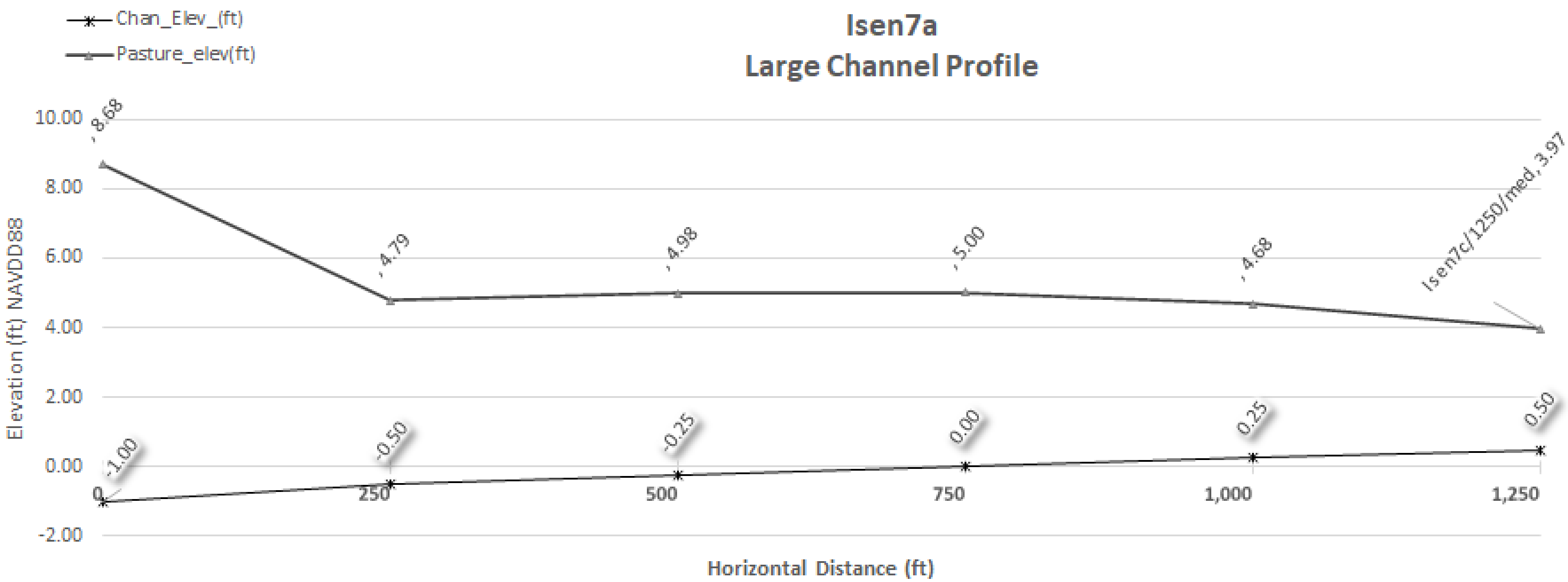

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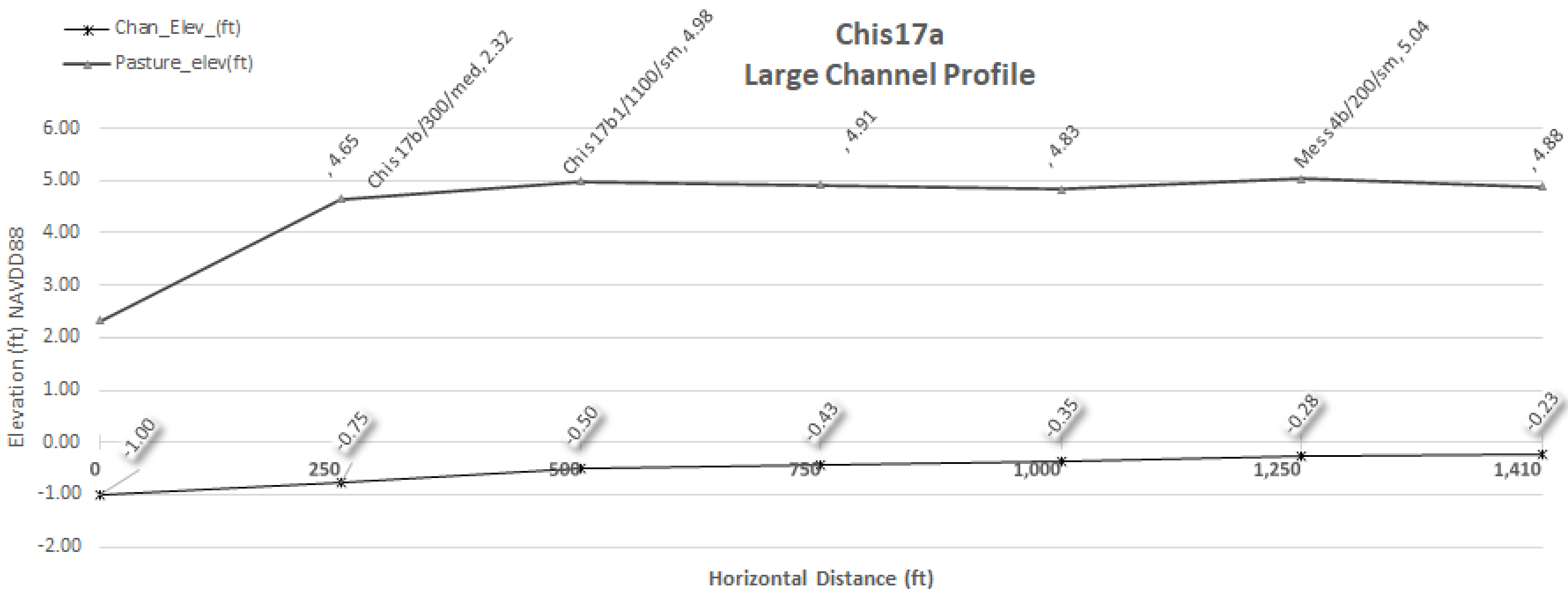

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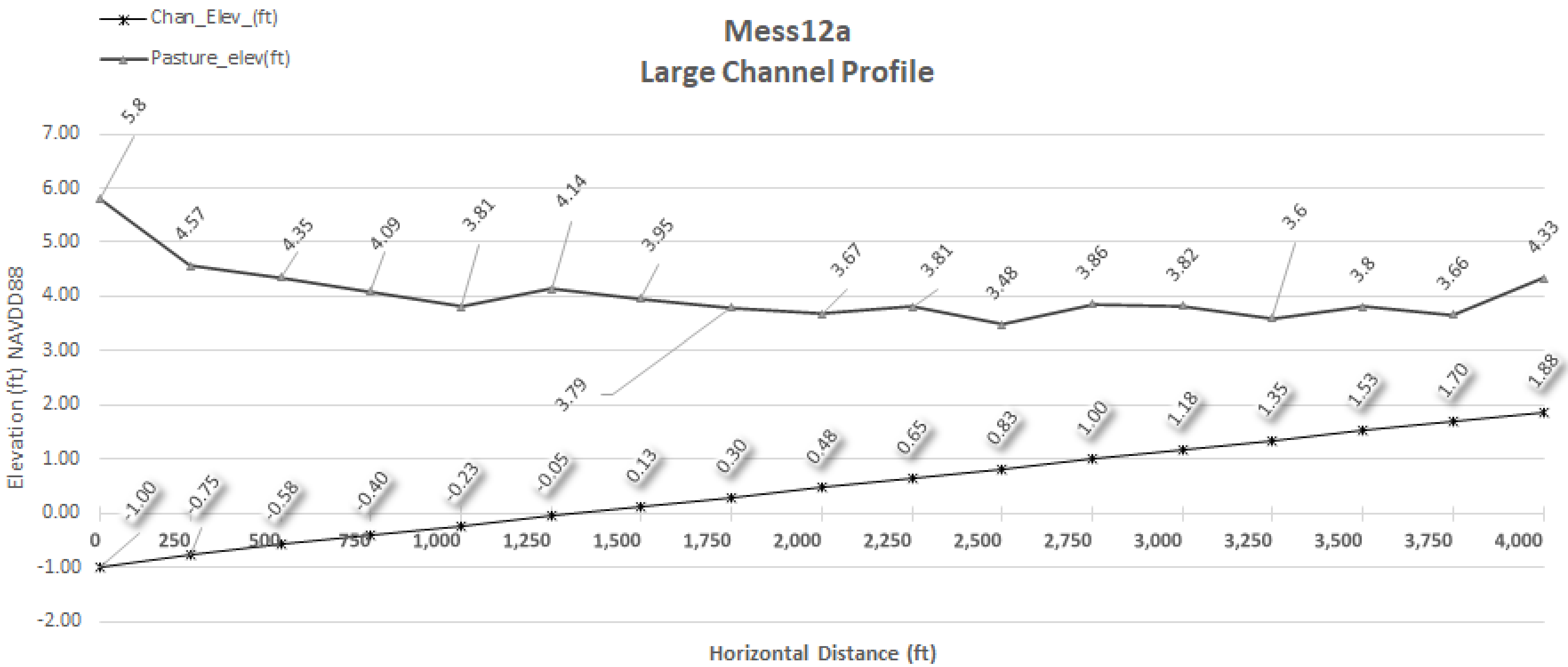

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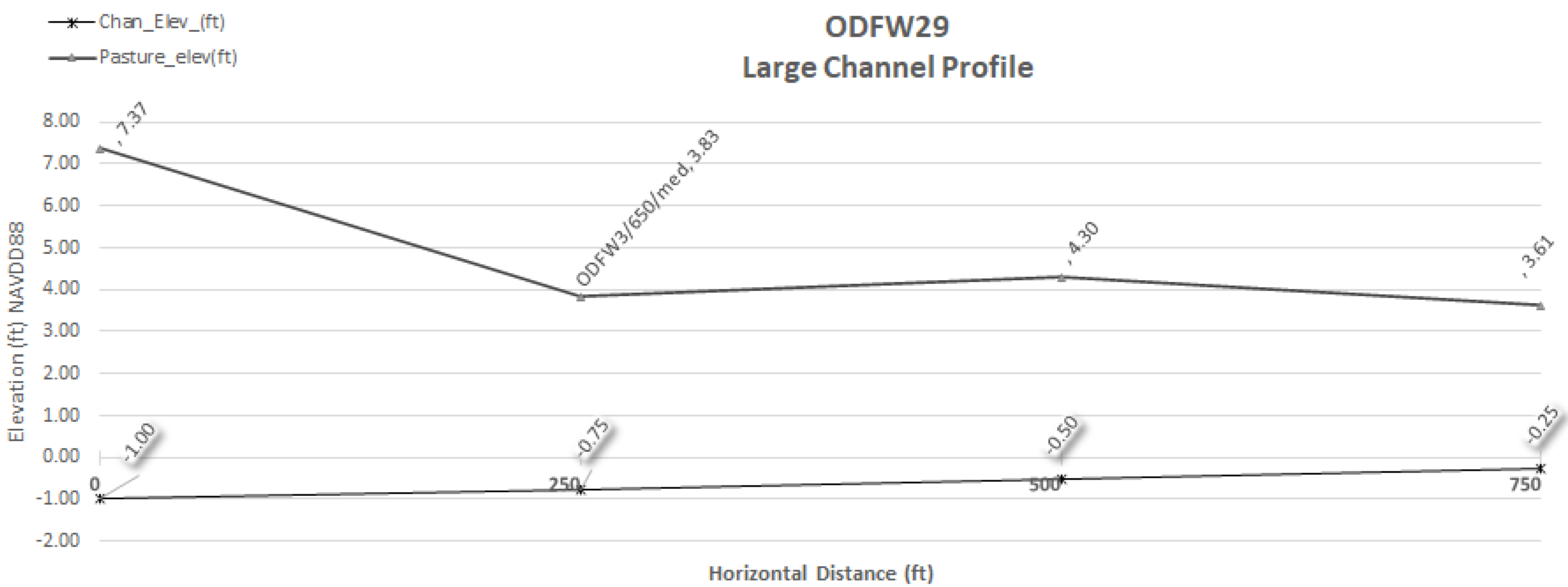

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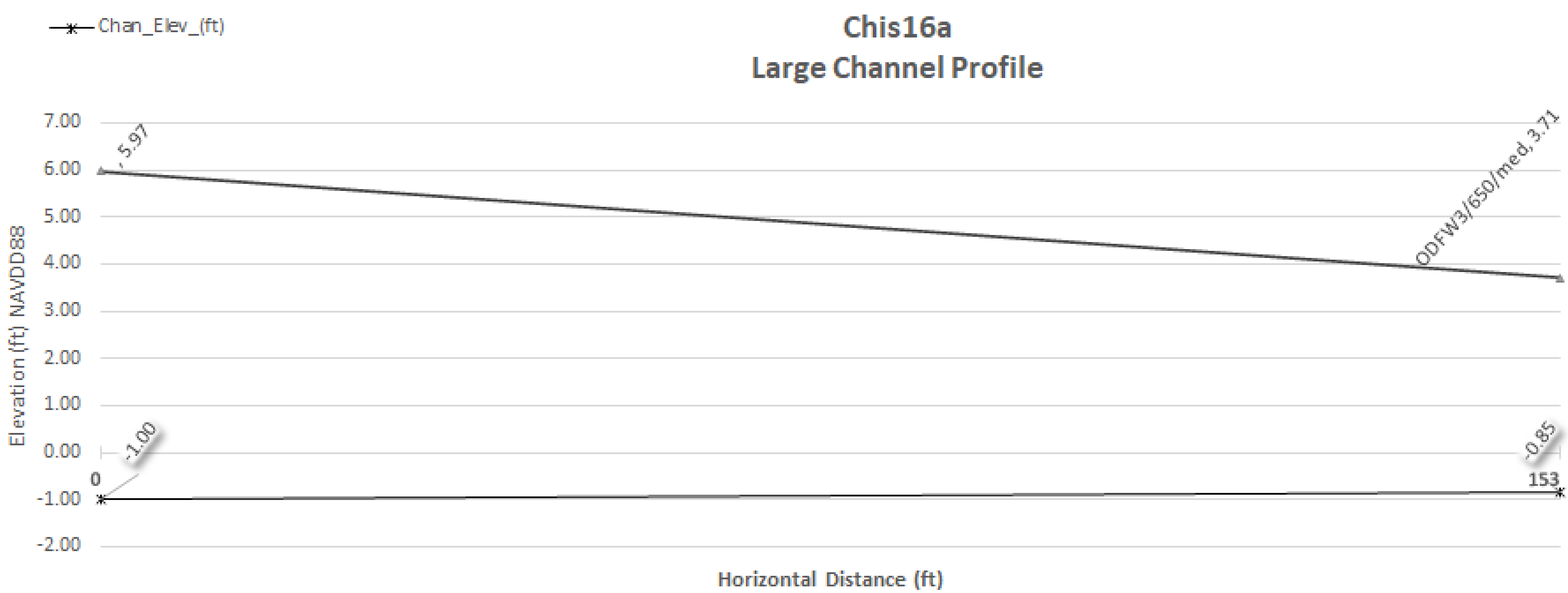

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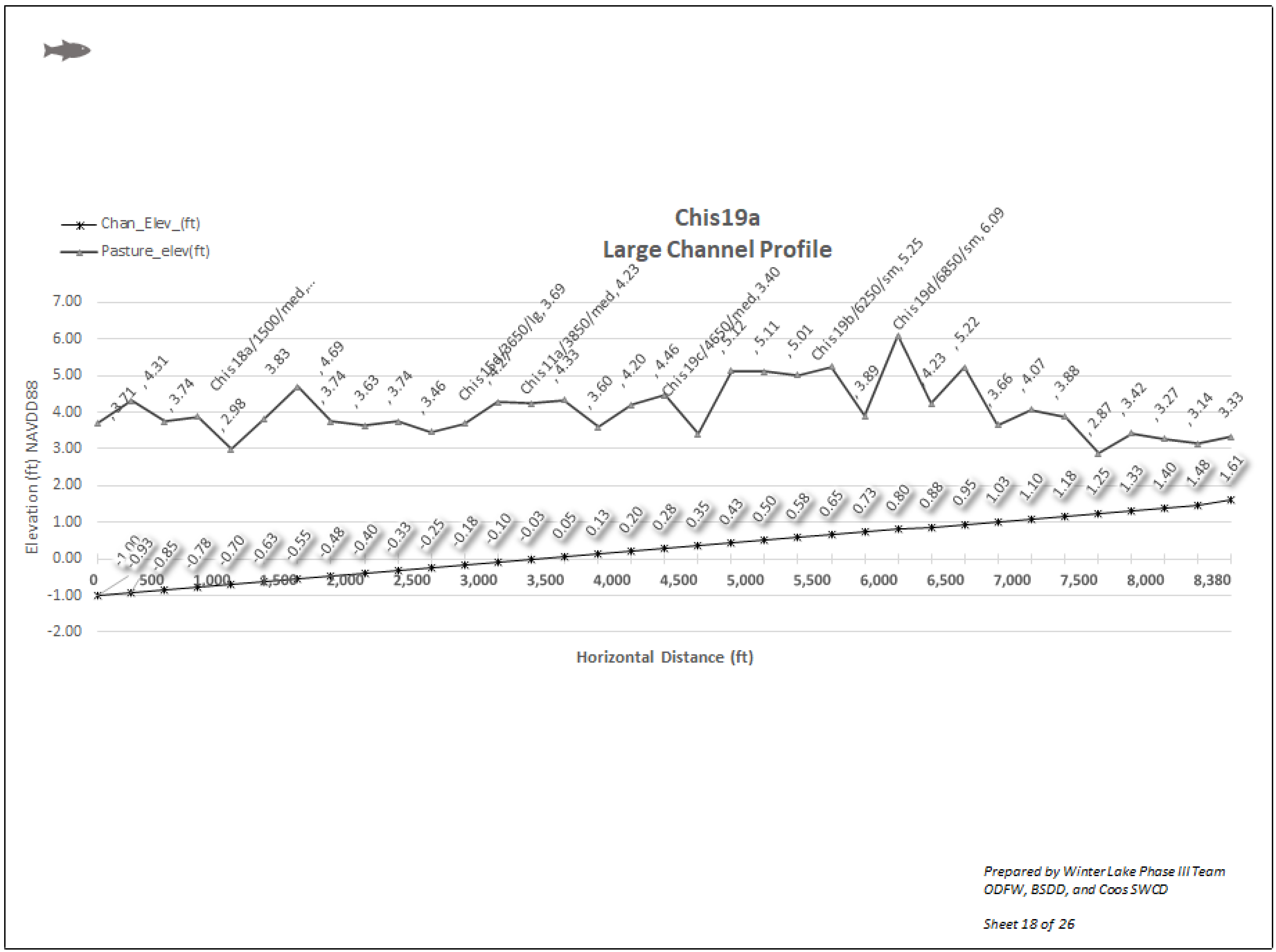
Chis19a
Large Channel Profile
Chan_Elev_(ft)
Pasture_elev(ft)
Elevation (ft) NAVDD88
Horizontal Distance (ft)
Chis18a/1500/med,...
Chis15d/3650/lg, 3.69
Chis11a/3850/med, 4.23
Chis19c/4650/med, 3.40
Chis19b/6250/sm, 5.25
Chis19d/6850/sm, 6.09
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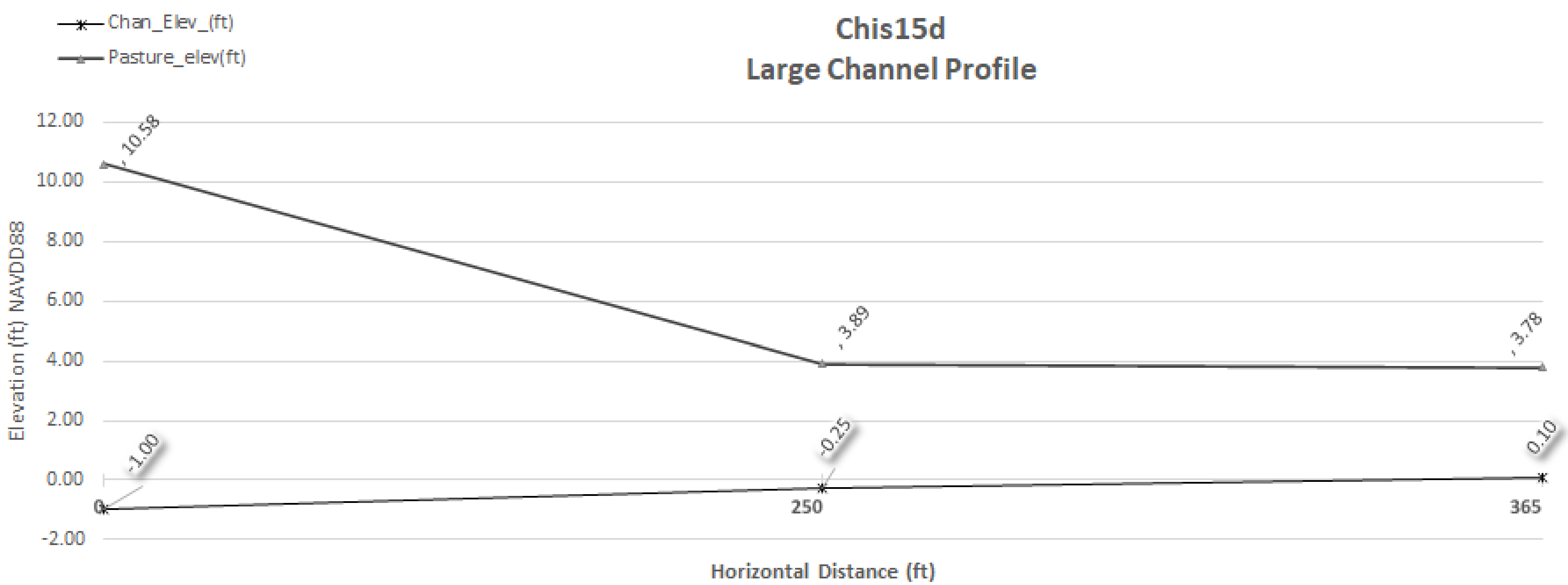

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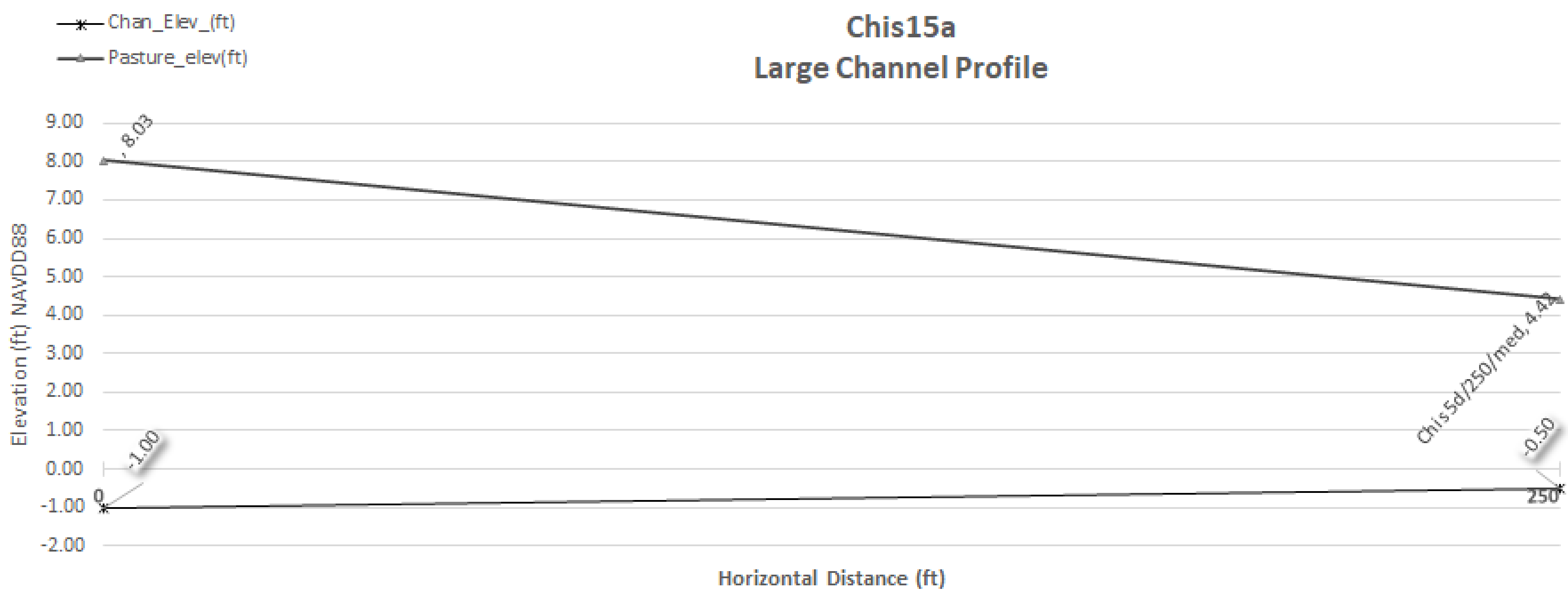

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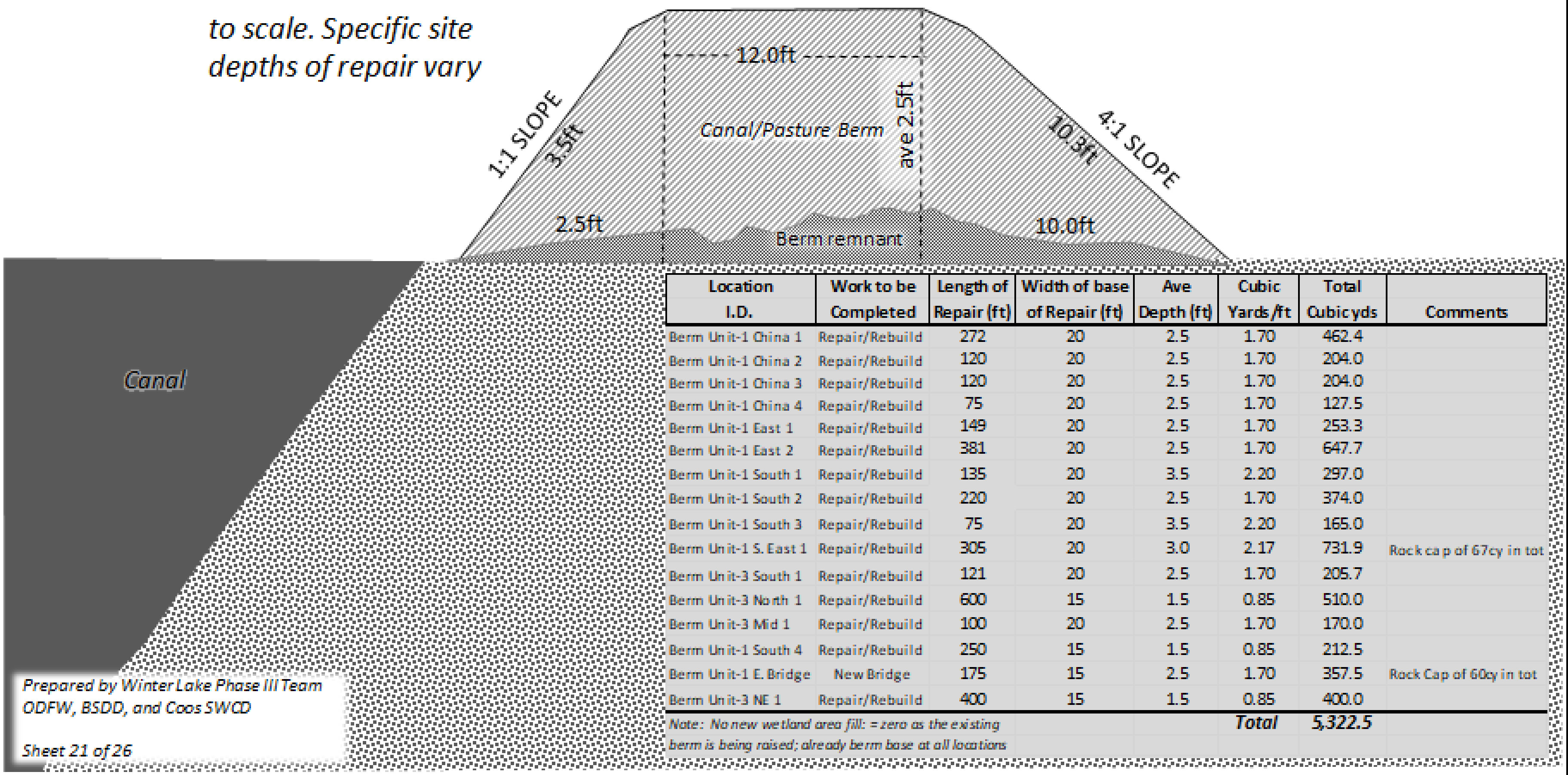
TYPICAL INTERIOR PASTURE/CANAL BERM REPAIR DESIGN

***Note:** Not Drawn to scale. Specific site depths of repair vary*



Location I.D.	Work to be Completed	Length of Repair (ft)	Width of base of Repair (ft)	Ave Depth (ft)	Cubic Yards /ft	Total Cubic yds	Comments
Berm Unit-1 China 1	Repair/Rebuild	272	20	2.5	1.70	462.4	
Berm Unit-1 China 2	Repair/Rebuild	120	20	2.5	1.70	204.0	
Berm Unit-1 China 3	Repair/Rebuild	120	20	2.5	1.70	204.0	
Berm Unit-1 China 4	Repair/Rebuild	75	20	2.5	1.70	127.5	
Berm Unit-1 East 1	Repair/Rebuild	149	20	2.5	1.70	253.3	
Berm Unit-1 East 2	Repair/Rebuild	381	20	2.5	1.70	647.7	
Berm Unit-1 South 1	Repair/Rebuild	135	20	3.5	2.20	297.0	
Berm Unit-1 South 2	Repair/Rebuild	220	20	2.5	1.70	374.0	
Berm Unit-1 South 3	Repair/Rebuild	75	20	3.5	2.20	165.0	
Berm Unit-1 S. East 1	Repair/Rebuild	305	20	3.0	2.17	731.9	Rock cap of 67cy in tot
Berm Unit-3 South 1	Repair/Rebuild	121	20	2.5	1.70	205.7	
Berm Unit-3 North 1	Repair/Rebuild	600	15	1.5	0.85	510.0	
Berm Unit-3 Mid 1	Repair/Rebuild	100	20	2.5	1.70	170.0	
Berm Unit-1 South 4	Repair/Rebuild	250	15	1.5	0.85	212.5	
Berm Unit-1 E. Bridge	New Bridge	175	15	2.5	1.70	357.5	Rock Cap of 60cy in tot
Berm Unit-3 NE 1	Repair/Rebuild	400	15	1.5	0.85	400.0	
					Total	***5,322.5***	

Note: No new wetland area fill: = zero as the existing berm is being raised; already berm base at all locations

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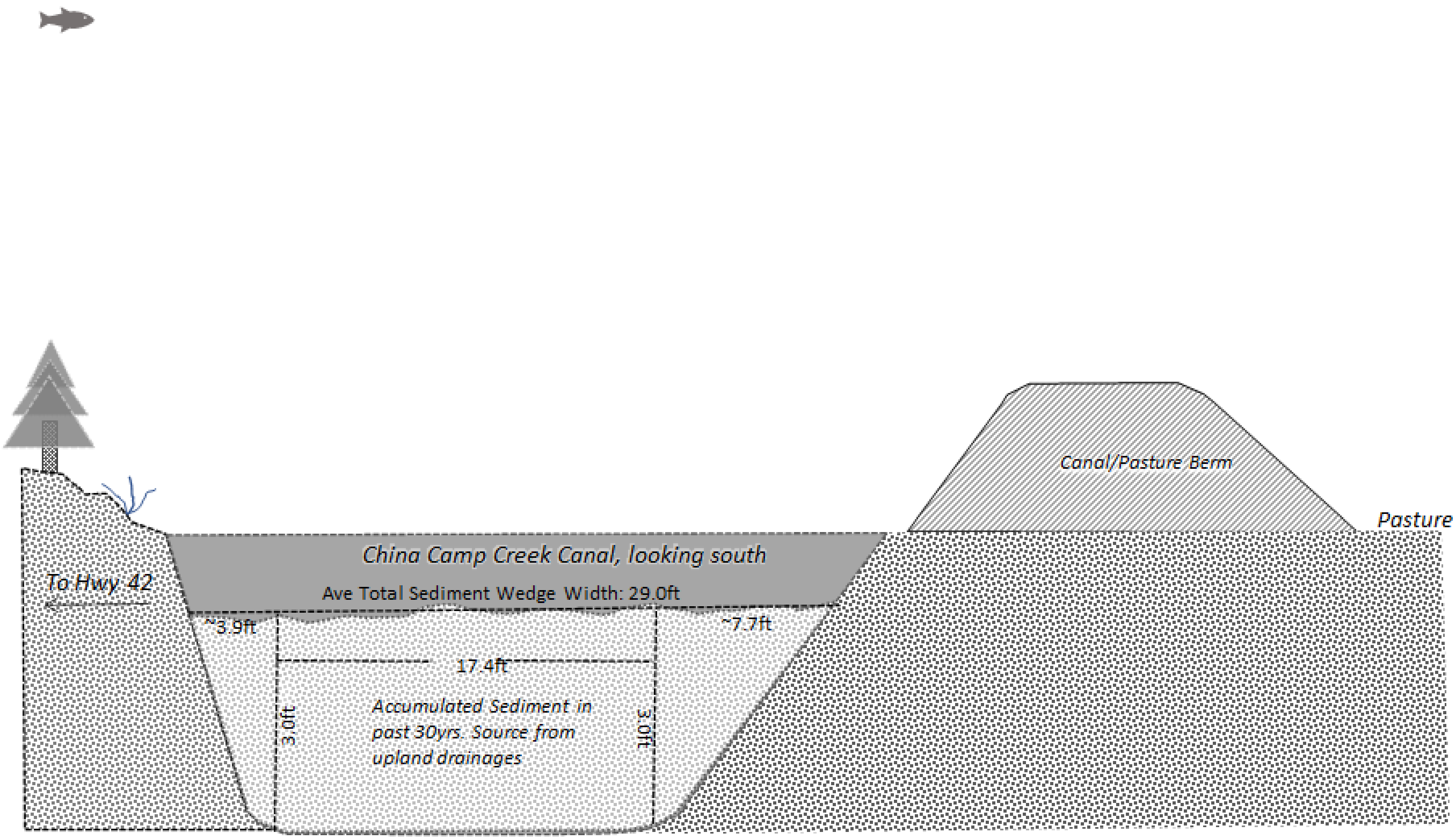

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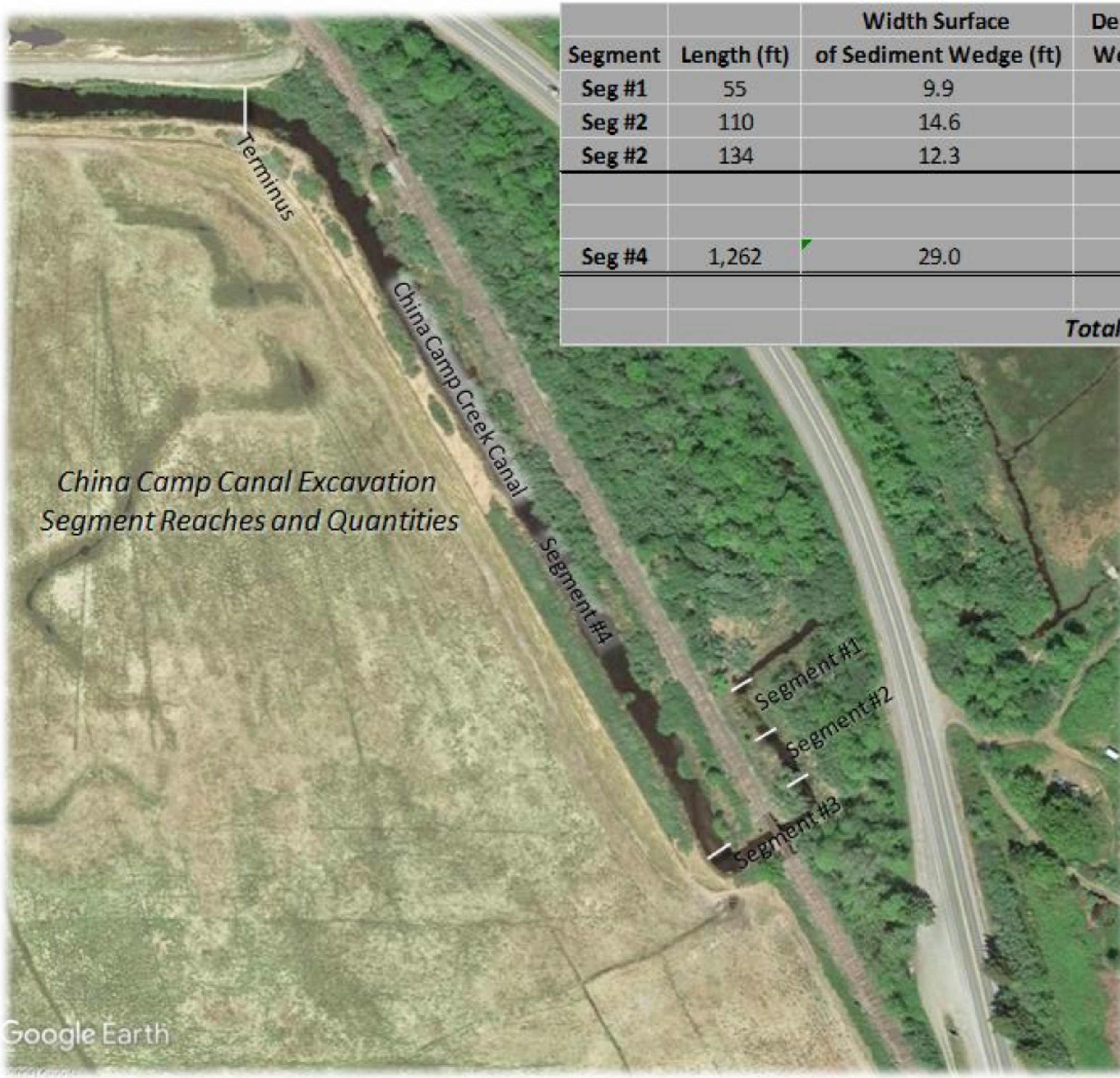
		Width Surface	Depth Sediment	
Segment	Length (ft)	of Sediment Wedge (ft)	Wedge; Ave (ft)	Total Cubic Yards
Seg #1	55	9.9	3.0	60.2
Seg #2	110	14.6	3.0	178.8
Seg #2	134	12.3	3.0	183.1
			SubTotal	**422.1**
Seg #4	1,262	29.0	4.0	3,253.0
			Total all Segments	***3675.1***



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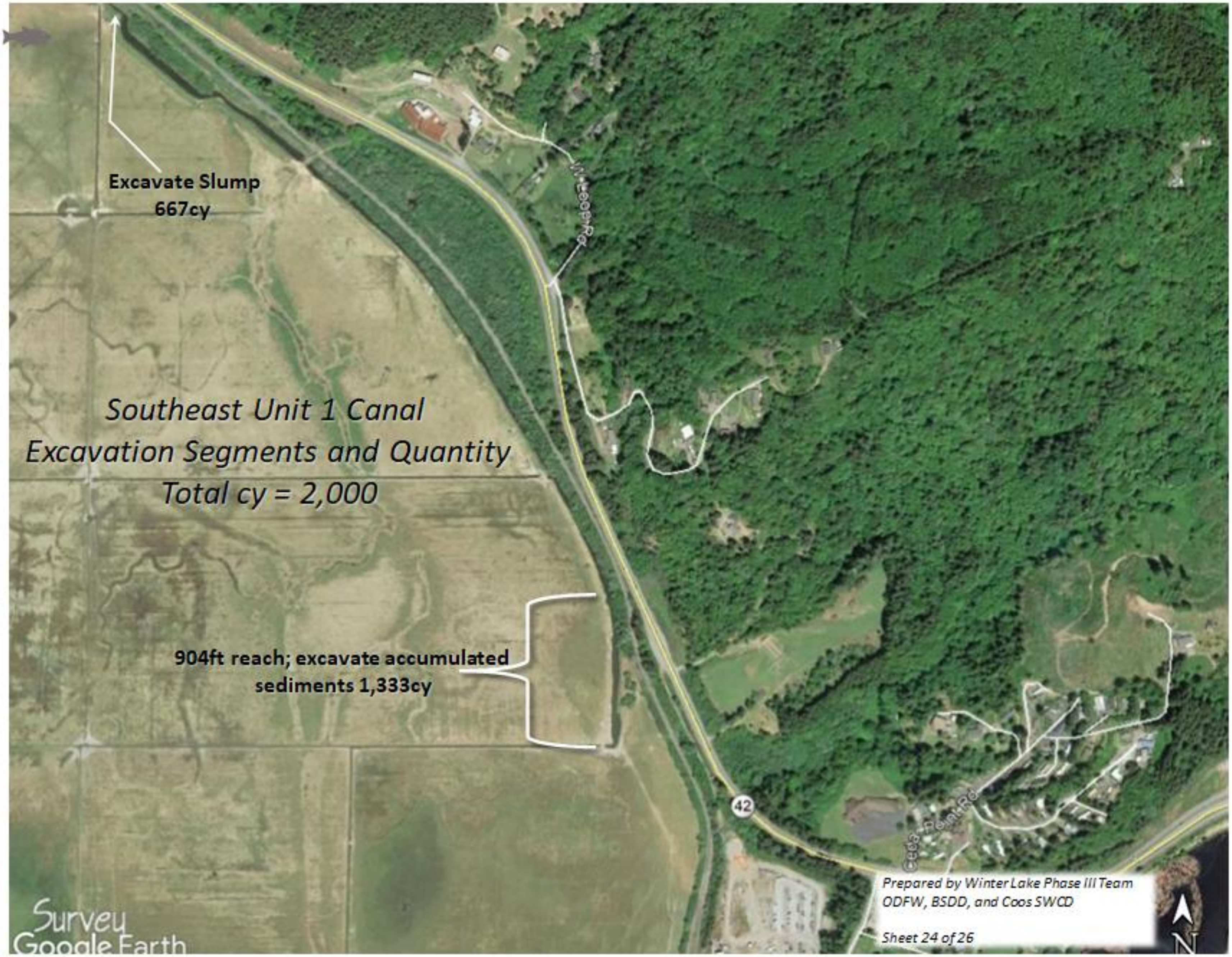

Excavate Slump
667cy
Southeast Unit 1 Canal
Excavation Segments and Quantity
Total cy = 2,000
904ft reach; excavate accumulated
sediments 1,333cy
42
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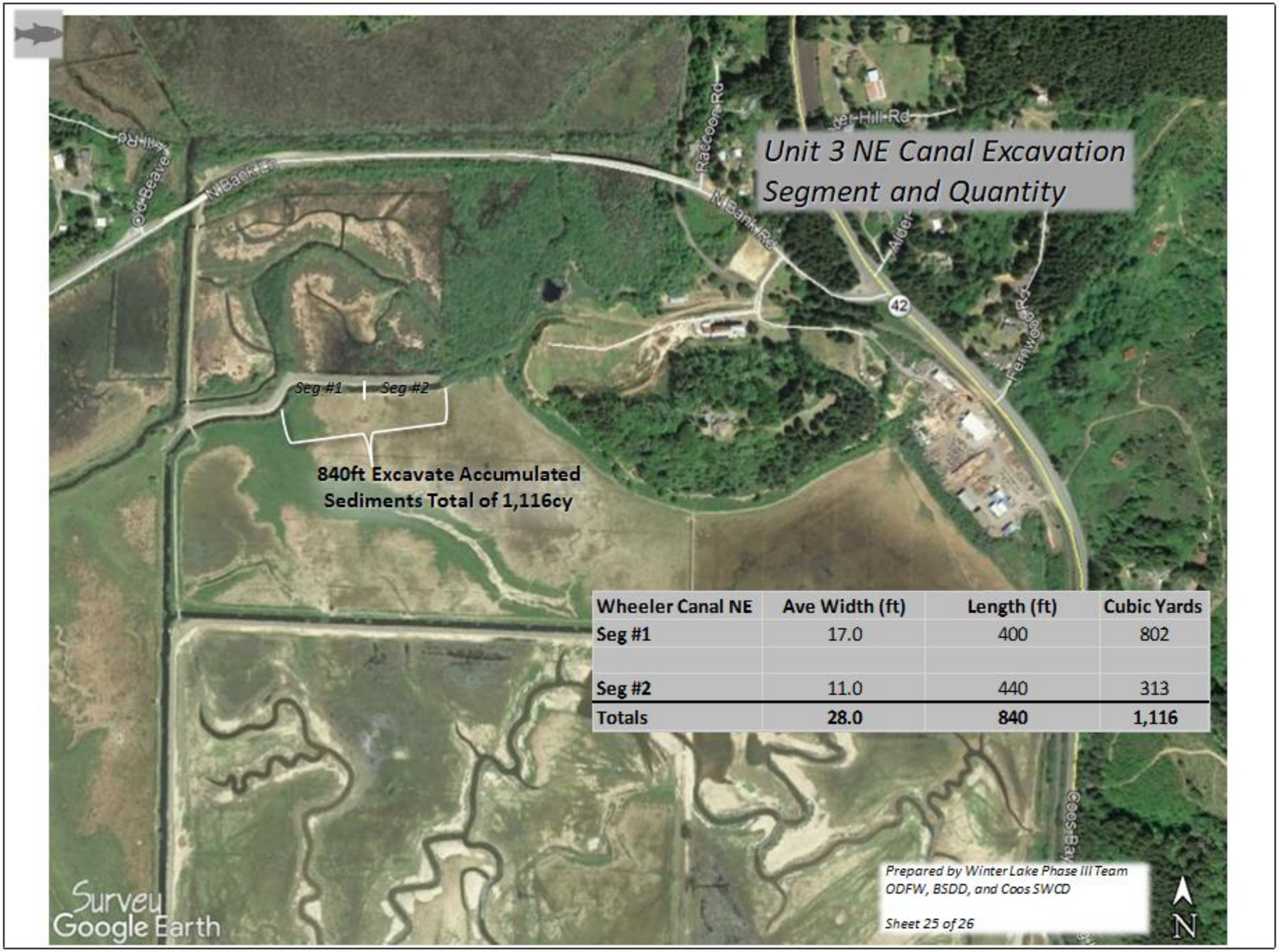
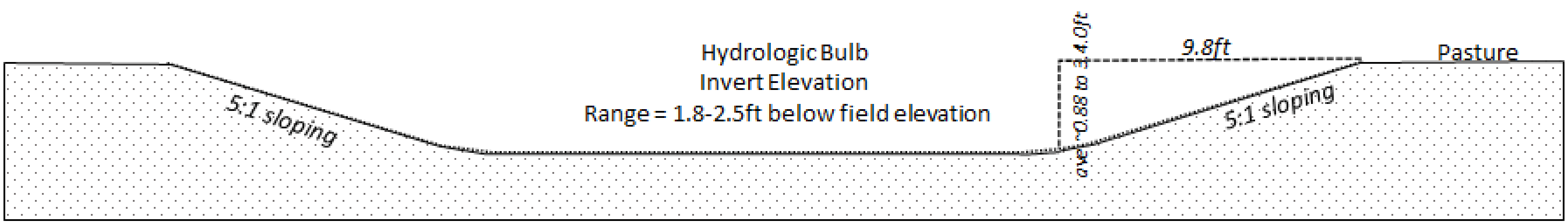
N
Google Earth



Wheeler Canal NE	Ave Width (ft)	Length (ft)	Cubic Yards
Seg #1	17.0	400	802
Seg #2	11.0	440	313
Totals	**28.0**	**840**	**1,116**

Hydrologic Bulb Layout Cross-Section

Hydro Bulb I.D.	Channel Connect Size	Distance frm Connect Chan (ft)	NAVDD88 Invert (ft)	Field Elevation (ft)	Excavate Depth (ft)	Acres	Sq ft	Excavate Volume CY
Isen8a2	Small	3,995	2.5	3.85	1.35	0.73	31,799	1,827
Mess1a2	Medium-S	1,571	1.8	4.35	2.55	0.7	30,492	3,112
Mess11d	Large	1,250	2.5	4.67	2.17	0.74	32,234	2,841
Mess1c2	Large	1,075	2.5	3.84	1.34	1.19	51,836	2,883
Isen7a3	Small	2,137	2.0	4.27	2.27	0.61	26,572	2,511
Mess2a	Large	1,215	1.8	2.99	1.19	0.46	20,038	1,081
Chis5b	Medium	837	2.1	3.74	1.64	0.43	18,731	1,331
Chis19c3	Small	688	1.8	2.88	1.12	0.8	34,848	1,686
Chis20c	Small	1,130	1.8	2.91	1.11	0.76	33,106	1,604
Chis5d	Medium	895	2.0	5.39	3.39	0.39	16,988	2,311
Chis19c	Small	1,500	2.3	4.33	2.03	0.28	12,197	1,071
Chis7c	Medium	902	3.5	4.79	1.28	0.47	20,473	1,172
Chis12b	Small	550	1.8	3.14	1.34	1.12	48,787	2,675
Mess1e	Small	880	2.5	3.96	1.46	1.14	49,658	2,990
Isen4a2	Small	1,333	2.0	4.62	2.62	1.05	45,738	4,631
Isen8d	Small	732	2.5	3.65	1.15	0.92	40,075	1,972
ODFW12a	Medium	655	1.0	2.71	1.71	1.2	52,272	3,627
ODFW3a	Small	422	1.0	2.89	1.89	0.94	40,946	2,866
ODFW27a	Small	230	1.0	3.23	2.23	0.941	40,990	3,666
Chis1b	Small	377	1.5	3.82	2.32	0.94	40,946	3,790
Chis4b	Small	338	1.5	4.18	2.68	0.85	37,026	3,939
Chis3c	Small	516	1.5	4.94	3.44	1.9	82,764	10,921
				Totals		*18.56*	*808,517*	*64,505*



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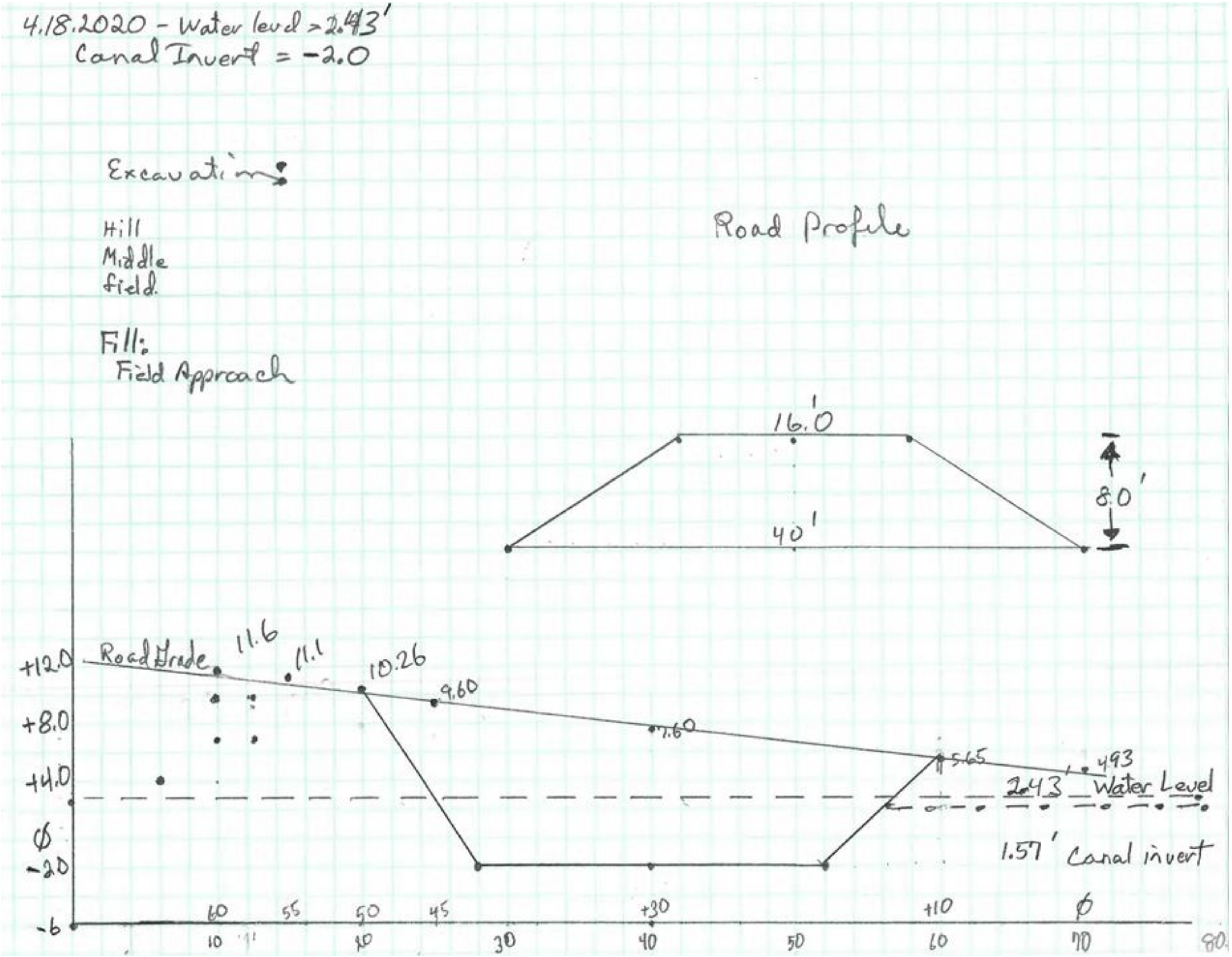


Figure 9. Unit 1 S. Canal S.E. pasture access bridge cross-section drawing profile of canal excavation and road profile.

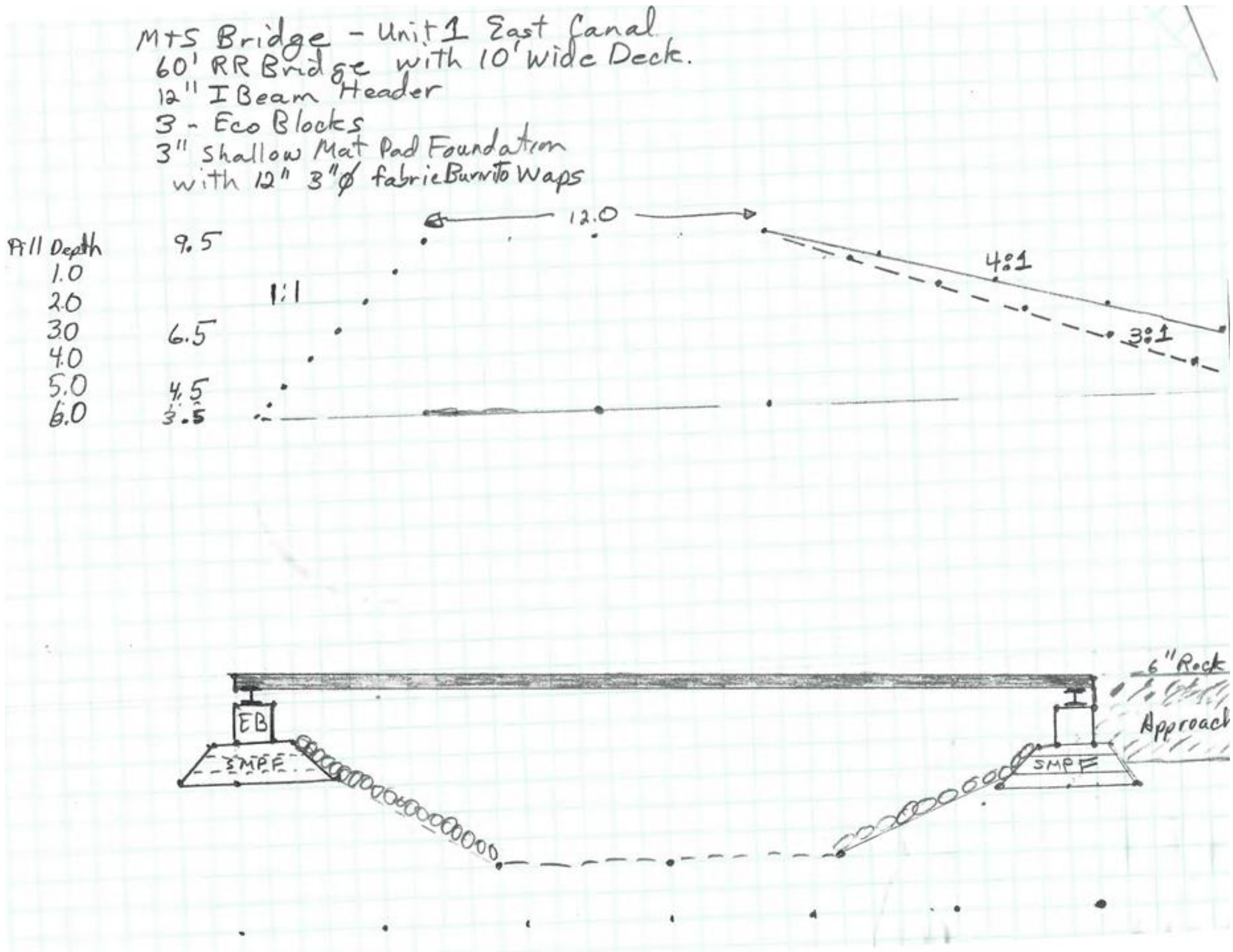


Figure 10. Unit 1 S. Canal S.E. pasture access bridge cross-section drawing.

Table 3. Phase III Fill and Removal volumes and dispositions

	Channel Construction/Reconstruction*							
			Length	Excavate	Fill	Excavate	Thinspread	Fill
Landowner	Wetland/Waterbody	Size	(ft)	Cubic Yards	Cubic Yards	Acres	Area Acres	Comments
Bridges Foundation	*Interior Pasture Channel*	Small	15,006	10,473	10,473	3.8	8.7	3.0" ave thinspread pasture
	Interior Pasture Channel	Medium	14,851	14,876	14,876	3.9	12.3	3.0" ave thinspread pasture
	Interior Pasture Channel	Large	18,690	31,121	29,292	6.0	24.2	3.0" ave thinspread pasture
Isenhart/Smith	*Interior Pasture Channel*	Small	8,633	5,974	5,317	2.2	4.4	3.0" ave thinspread pasture
	Interior Pasture Channel	Medium	3,651	3,666	3,666	1.0	3.0	3.0" ave thinspread pasture
	Interior Pasture Channel	Large	4,335	6,983	6,750	1.4	5.6	3.0" ave thinspread pasture
Messerle	*Interior Pasture Channel*	Small	12,582	8,795	7,556	3.2	6.2	3.0" ave thinspread pasture
	Interior Pasture Channel	Medium	2,119	2,078	2,078	0.6	1.7	3.0" ave thinspread pasture
	Interior Pasture Channel	Medium-S	3,030	4,038	4,038	0.8	3.3	3.0" ave thinspread pasture
	Interior Pasture Channel	Large	9,052	14,780	13,734	2.9	11.4	3.0" ave thinspread pasture
ODFW	*Interior Pasture Channel*	Small	2,495	2,037	2,037	0.6	1.7	3.0" ave thinspread pasture
	Interior Pasture Channel	Medium	4,562	4,675	5,175	1.2	4.3	3.0" ave thinspread pasture
	Interior Pasture Channel	Large	775	1,319	500	0.2	0.4	3.0" ave thinspread pasture
		Subtotals	***99,781***	***110,815***	***105,492***	***27.8***	***87.2***	
	** 5,323 cy of cubic yards excavated used for berm repair*							

	Canal Excacavation							
			Length	Excavate	Fill	Excavate	Thinspread	Fill
Landowner	Wetland/Waterbody	Size	(ft)	Cubic Yards	Cubic Yards	Acres	Area Acres	Comments
Bridges Foundation	*China/Camp Canal E.*	Canal	1,262	3,675	3,675	0.87	3.0	3.0" ave thinspread pasture
Messerle	*Unit 1 Canal S.E. (2 locs)*	Canal	~200	2,000	2,000	0.06	1.7	3.0" ave thinspread pasture
ODFW	*Unit 3 Canal N.E.*	Canal	840	1,116	1,116	0.12	0.9	3.0" ave thinspread pasture
		Subtotals	***2,302***	***6,791***	***6,791***	***1.0***	***5.6***	

	Berm Reconstruction							
			Length	Excavate	Fill	Excavate	Fill	Fill
Landowner	Wetland/Waterbody	Size	(ft)	Cubic Yards	Cubic Yards	Acres	Area Acres	Comments
Bridges Foundation	*China/Camp Canal Berm*	20ft base	587	0	997	N/A	0.27	Fill from chan construction
Bridges Foundation	*Unit 1 Canal Berm misc*	20ft base	221	0	376	N/A	0.10	Fill from chan construction
								Fill from chan construction
Messerle	*Unit 1 E.; #1 and 2 sites*	20ft base	530	0	901	N/A	0.24	Fill from chan construction
Messerle	*Unit 1 S. #2*	20ft base	220	0	374	N/A	0.10	Fill from chan construction
Messerle	*Bridge approach*	20ft base	80	0	358	N/A	0.04	Fill from chan construction
								Fill from chan construction
Isenhart/Smith	*Unit 1 S. #1, 3, & 4*	20ft base	460	0	675	N/A	0.21	Fill from chan construction
Isenhart/Smith	*Unit 1 E*	20ft base	149	0	732	N/A	0.07	Fill from chan construction
								Fill from chan construction
ODFW	*Unit 3 North*	20ft base	600	0	510	N/A	0.28	Fill from chan construction
ODFW	*Unit 3 N.E.*	20ft base	400	0	400	N/A	0.18	Fill from chan construction
		Suttotals	***3,247***	***0***	***5,323***		***1.49***	

	Culvert Installation Riprap (and one bridge site)*							
		Area	Number	Excavate	Tot Fill	Excavate	Fill	Fill
Landowner	Wetland/Waterbody	Sq Ft	Locations	Cubic Yards	Cubic Yards	Acres	Area Acres	Comments
Bridges Foundation	*Pasture chan culverts*	100	16	N/A	320	N/A	0.002	
Messerle	*Pasture chan culverts*	100	9	N/A	180	N/A	0.002	
Messerle	*Unit 1 S.E. Bridge*	480	1	456	496	0.01	1.130	3.0" thinspread/40cy riprap install
Isenhart/Smith	*Pasture chan culverts*	100	5	N/A	100	N/A	0.002	
ODFW	*Pasture chan culverts*	100	7	N/A	140	N/A	0.002	
			Totals	***456***	***1,236***	***0.11***	***1.139***	

	Hydrologic Bulb Construction* *(some material may be used for berm reconstruction)*							
		Area	Number	Excavate	Fill	Excavate	Thinspread	Fill
Landowner	Wetland/Waterbody	Sq Ft	Locations	Cubic Yards	Cubic Yards	Acres	Area Acres	Comments
Bridges Foundation	Interior Pastures	345,866	10	30,499	30,499	7.94	25.2	3.0" ave thinspread pasture
Messerle	Interior Pastures	184,259	5	12,907	12,907	4.23	10.7	3.0" ave thinspread pasture
Isenhart/Smith	Interior Pastures	134,208	4	10,159	10,159	3.081	8.4	3.0" ave thinspread pasture
ODFW	Interior Pastures	144,184	3	10,940	10,940	3.31	9.0	3.0" ave thinspread pasture
			Totals	***64,505***	**64,505**	***18.6***	***53.3***	
Bridges Foundation	Wetland Diversity Mounds	5 mounds 20ft in diameter ~3ft in depth, maintain wetland factors 80cy of 64,505 cy total.						

	Heavy Use Watering Trough Sites							
		Area	Number	Excavate	Fill	Excavate	Thinspread	Fill
Landowner	Wetland/Waterbody	Sq Ft	Locations	Cubic Yards	Cubic Yards	Acres	& Rock Acres	Comments
Messerle	Interior Pastures	1600	4	47.4	47.4	0.04	0.08	3.0" ave thinspread pasture/4" rock
Isenhart/Smith	Interior Pastures	800	2	23.7	23.7	0.02	0.04	3.0" ave thinspread pasture/4" rock
Bridges Foundation	Interior Pastures	1200	3	35.6	35.6	0.03	0.06	3.0" ave thinspread pasture/4" rock
			Totals	***106.7***	***106.7***	***0.08***	***0.17***	

APPENDIX A

Winter Lake Phase III Channel Gradients

Appendix A. Table 1. Winter Lake Phase III interior pasture channel gradient. ***Note:*** *In tables the channel grades are the grade forward of the station; i.e. if the grade at 250 is 0.50% and then 0.20% at 500ft then the grade from 250 to 500 is 0.20%*

Large Channels			**Chan Elev**			
Channel I.D.	**Channel Size**	**Distance frm Cnct Chan (ft)**	***NAVDD88* Invert (ft)**	**LiDAR (ft)[1]**	**Chan Slope %[2]**	**Connect Chan I.D./loc_dist/sze**
Isen8a	Large	0	-1.00	7.85	0.09%	Canal
Isen8a	Large	250	-0.78	5.23	0.09%	
Isen8a	Large	500	-0.55	4.71	0.09%	
Isen8a	Large	750	-0.38	5.52	0.07%	
Isen8a	Large	1000	-0.20	4.91	0.07%	Isen8b/1010/sm
Isen8a	Large	1250	-0.03	4.40	0.07%	Isen8c/1270/sm
Isen8a	Large	1500	0.15	3.54	0.07%	
Isen8a	Large	1750	0.33	4.62	0.07%	
Isen8a	Large	2000	0.50	4.89	0.07%	
Isen8a	Large	2250	0.68	4.77	0.07%	
Isen8a	Large	2500	0.85	4.20	0.07%	Isen8e/2500/sm
Isen8a	Large	2750	1.03	4.09	0.07%	Isen8f/2600/sm
Isen8a	Large	3000	1.20	3.93	0.07%	Isen8a2/3000/sm
Isen8a	Large	3095	1.27	3.70	0.07%	
Isen8a2	***Small***	***3995***	**1.90**	***3.85***	0.07%	Isen8a2/3995/term
Mess13a	Large	0	-1.00	3.92	0.10%	
Mess13a	Large	250	-0.75	3.36	0.10%	
Mess13a	Large	500	-0.55	2.96	0.08%	Mess13b/525/sm
Mess13a	Large	750	-0.35	2.04	0.080%	
Mess13a	Large	1000	-0.15	2.10	0.080%	
Mess13a	Large	1250	0.05	4.13	0.080%	Mess13d/1251/sm
Mess13a	*Large*	*1500*	*0.25*	*4.44*	0.080%	
Mess13a	Large	1750	0.45	3.43	0.080%	
Mess13a	Large	2000	0.65	4.29	0.080%	
Mess13a	Large	2250	0.85	4.44	0.080%	
Mess13a	Large	2500	1.05	3.19	0.080%	
Mess13a	Large	2585	1.12	2.73	0.080%	Mess1c2/hydrobulb
Mess12a	Large	0	-1.00	5.80	0.100%	
Mess12a	Large	250	-0.75	4.57	0.100%	
Mess12a	Large	500	-0.58	4.35	0.070%	
Mess12a	Large	750	-0.40	4.09	0.070%	
Mess12a	Large	1000	-0.23	3.81	0.070%	
Mess12a	Large	1250	-0.05	4.14	0.070%	
Mess12a	Large	1500	0.13	3.95	0.070%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Large Channels			Chan Elev			
Channel	Channel	Distance frm	*NAVDD88*	LiDAR	Chan	Connect Chan
I.D.	Size	Cnct Chan (ft)	Invert (ft)	(ft)[1]	Slope %[2]	I.D./loc_dist/sze
Mess12a	Large	1750	0.30	3.79	0.070%	
Mess12a	Large	2000.00	0.48	3.67	0.07%	
Mess12a	Large	2250	0.65	3.81	0.07%	
Mess12a	Large	2500	0.83	3.48	0.07%	
Mess12a	Large	2750	1.00	3.86	0.07%	
Mess12a	Large	3000	1.18	3.82	0.07%	
Mess12a	Large	3250	1.35	3.60	0.07%	
Mess12a	Large	3500	1.53	3.80	0.07%	
Mess12a	Large	3750	1.70	3.66	0.07%	
Mess12a	Large	4000	1.88	4.33	0.07%	Mess11d/hydrobulb
Mess3a	Large	0	-1.00	6.35	0.30%	
Mess3a	Large	250	-0.25	2.41	0.30%	
Mess3a	Large	500	0.38	3.37	0.25%	
Mess3a	Large	750	1.00	3.15	0.25%	
Mess3a	Large	1000	1.63	2.86	0.25%	
Mess3a	Large	1075	1.81	2.84	0.25%	Mess11d/hydrobulb
Mess11a	Large	0	-1.00	3.86	0.30%	
Mess11a	Large	250	-0.25	3.76	0.30%	
Mess11a	Large	500	0.00	4.11	0.10%	Mess11d/580
Mess11a	Large	750	0.25	3.43	0.10%	
Mess11a	Large	1000	0.50	3.60	0.10%	
Mess11a	Large	1250	0.75	2.18	0.10%	Mess11c/1250
Mess11a	Large	1500	1.00	3.25	0.10%	
Mess11a	Large	1750	1.25	2.72	0.10%	
Mess11a	Large	2000	1.50	3.51	0.10%	
Mess11a	Large	2250	1.75	4.19	0.10%	
Mess11a	Large	2407	1.91	4.00	0.10%	
Mess11c	Large	0	1.00	3.54	0.20%	
Mess11c	Large	250	1.50	3.92	0.20%	
Mess11c	Large	500	2.00	3.90	0.20%	
Mess11c	Large	750	2.50	4.66	0.20%	
Mess11c	Large	1000	3.00	4.91	0.20%	
Mess11c	Large	1250	3.50	4.98	0.20%	
Mess11c	Large	1301	3.60	5.18	0.20%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Large Channels			**Chan Elev**			
Channel I.D.	**Channel Size**	**Distance frm Cnct Chan (ft)**	***NAVDD88* Invert (ft)**	**LiDAR (ft)[1]**	**Chan Slope %[2]**	**Connect Chan I.D./loc_dist/sze**
Chis9a	Large	0	-1.00	3.98	0.10%	
Chis9a	Large	250	-0.75	2.93	0.10%	
Chis9a	Large	500	-0.50	2.90	0.10%	
Chis9a	Large	750	-0.25	4.16	0.10%	
Chis9a	Large	1000	0.00	3.90	0.10%	Chis9b/580/med
Chis9a	Large	1250	0.25	2.77	0.10%	
Chis9a	Large	1500	0.50	2.79	0.10%	
Chis9a	Large	1750	0.75	3.20	0.10%	
Chis9a	Large	2000	1.00	2.89	0.10%	
Chis2a	Large	0	-1.00	2.64	0.10%	
Chis2a	Large	250	-0.75	4.37	0.10%	
Chis2a	Large	500	-0.50	4.59	0.10%	
Chis2a	Large	750	-0.25	5.91	0.10%	Chis2g/250/med
Chis2a	Large	1000	0.00	6.44	0.10%	
Chis2a	Large	1250	0.25	4.98	0.10%	
Chis2a	Large	1500	0.50	4.79	0.10%	Chis2e/1100/sm
Chis2a	Large	1750	0.50	4.96	0.00%	Chis2d/1500/sm
Chis2a	Large	2000	0.50	4.89	0.00%	Chis2c/1500/sm
Chis2a	Large	2250	0.50	5.74	0.00%	
Chis2a	Large	2500	0.50	6.81	0.00%	
Chis2a	Large	2750	0.50	10.92	0.00%	
Chis2a	Large	2825	0.50	11.16	0.00%	
Chis7b	Large	0	-1.00	2.64	0.10%	
Chis7b	Large	250	-0.75	3.54	0.10%	
Chis7b	Large	500	-0.50	4.15	0.10%	
Chis7b	Large	750	-0.25	4.13	0.10%	Chis5b/250/med
Chis7b	Large	1000	0.00	4.52	0.10%	Chis5d/250/med
Chis7b	Large	1250	0.25	3.51	0.10%	
Chis7a	Large	0	-1.00	8.12	0.15%	Chis7c/1000/med
Chis7a	Large	250	-0.63	4.54	0.15%	
Chis7a	Large	500	-0.25	4.75	0.15%	
Chis7a	Large	750	0.13	4.94	0.15%	
Chis7a	Large	1000	0.50	3.81	0.15%	
Chis7a	Large	1250	1.00	5.45	0.20%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Large Channels			Chan Elev			
Channel	Channel	Distance frm	*NAVDD88*	LiDAR	Chan	Connect Chan
I.D.	Size	Cnct Chan (ft)	Invert (ft)	(ft)[1]	Slope %[2]	I.D./loc_dist/sze
Chis7a	Large	1500	1.50	5.28	0.20%	
Chis7a	Large	1590	2.76	5.50	1.40%	Chis7a2/1250/med
Chis7a2	Medium	1980	8.22	9.14	1.40%	
Chis6a	Large	0	-1.00	7.56	0.20%	
Chis6a	Large	250	-0.50	3.75	0.20%	
Chis6a	Large	500	0.00	3.19	0.20%	
Chis6a	Large	600	0.20	2.99	0.20%	
Isen7a	Large	0	-1.00	8.68	0.20%	
Isen7a	Large	250	-0.50	4.79	0.20%	
Isen7a	Large	500	-0.25	4.98	0.10%	
Isen7a	Large	750	0.00	5.00	0.10%	
Isen7a	Large	1000	0.25	4.68	0.10%	
Isen7a	Large	1250	0.50	3.97	0.10%	
Isen7a3	Small	2137	1.39	4.27	0.10%	
Chis17a	Large	0	-1.00	2.32	0.10%	Isen7c/1250/med
Chis17a	Large	250	-0.75	4.65	0.10%	Isen7a3/hydrobulb
Chis17a	Large	500	-0.50	4.98	0.10%	
Chis17a	Large	750	-0.43	4.91	0.03%	Chis17b/300/med
Chis17a	Large	1000	-0.35	4.83	0.03%	
Chis17a	Large	1250	-0.28	5.04	0.03%	Chis17b1/1100/sm
Chis17a	Large	1410	-0.23	4.88	0.03%	
ODFW29	Large	0	-1.00	7.37	0.10%	
ODFW29	Large	250	-0.75	3.83	0.10%	Mess4b/200/sm
ODFW29	Large	500	-0.50	4.30	0.10%	
ODFW29	Large	750	-0.25	3.61	0.10%	ODFW3/650/med
Chis16a	Large	0	-1.00	5.97	0.10%	
Chis16a	Large	153	-0.85	3.71	0.10%	
Chis19a	Large	0	-1.00	3.71	0.03%	Chis19b/275/med
Chis19a	Large	250	-0.93	4.31	0.03%	
Chis19a	Large	500	-0.85	3.74	0.03%	
Chis19a	Large	750	-0.78	3.88	0.03%	
Chis19a	Large	1000	-0.70	2.98	0.03%	
Chis19a	Large	1250	-0.63	3.83	0.03%	Chis18a/1500/med
Chis19a	Large	1500	-0.55	4.69	0.03%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Large Channels			Chan Elev			
Channel I.D.	Channel Size	Distance frm Cnct Chan (ft)	*NAVDD88* Invert (ft)	LiDAR (ft)[1]	Chan Slope %[2]	Connect Chan I.D./loc_dist/sze
Chis19a	Large	1750	-0.48	3.74	0.03%	
Chis19a	Large	2000	-0.40	3.63	0.03%	
Chis19a	Large	2250	-0.33	3.74	0.03%	
Chis19a	Large	2500	-0.25	3.46	0.03%	
Chis19a	Large	2750	-0.18	3.69	0.03%	
Chis19a	Large	3000	-0.10	4.27	0.03%	
Chis19a	Large	3250	-0.03	4.23	0.03%	Chis15d/3650/lg
Chis19a	Large	3500	0.05	4.33	0.03%	
Chis19a	Large	3750	0.13	3.60	0.03%	Chis11a/3850/med
Chis19a	Large	4000	0.20	4.20	0.03%	
Chis19a	Large	4250	0.28	4.46	0.03%	
Chis19c	Large	4500	0.35	3.40	0.03%	
Chis19a	Large	4750	0.43	5.12	0.03%	
Chis19a	Large	5000	0.50	5.11	0.03%	Chis19c/4650/med
Chis19a	Large	5250	0.58	5.01	0.03%	
Chis19a	Large	5500	0.65	5.25	0.03%	
Chis19a	Large	5750	0.73	3.89	0.03%	
Chis19a	Large	6000	0.80	6.09	0.03%	Chis19b/6250/sm
Chis19a	Large	6250	0.88	4.23	0.03%	
Chis19a	Large	6500	0.95	5.22	0.03%	Chis19d/6850/sm
Chis19a	Large	6750	1.03	3.66	0.03%	
Chis19a	Large	7000	1.10	4.07	0.03%	
Chis19a	Large	7250	1.18	3.88	0.03%	
Chis19a	Large	7500	1.25	2.87	0.03%	
Chis19a	Large	7750	1.33	3.42	0.03%	
Chis19a	Large	8000	1.40	3.27	0.03%	
Chis19a	Large	8250	1.48	3.14	0.03%	
Chis19a	Large	8380	1.61	3.33	0.10%	
Chis15d	Large	0	-1.00	10.58	0.30%	
Chis15d	Large	250	-0.25	3.89	0.30%	
Chis15d	Large	365	0.10	3.78	0.30%	
Chis5a	Large	0	-1.00	8.03	0.20%	
Chis5a	Large	250	-0.50	4.42	0.20%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Medium Channels			Chan Elev			
Channel	**Channel**	**Distance frm**	*NAVDD88*	**LiDAR**	**Chan**	**Hydro Bulb**
I.D.	**Size**	**Cnct Chan (ft)**	**Invert (ft)**	**(ft)[1]**	**Slope %[2]**	**Elev Invert (ft)**
Mess1a	Lg to Med-S	0	-1.00	7.47	0.80%	
Mess1a	Medium_S	71	-0.43	4.07	0.80%	
Mess1a	Medium_S	321	1.57	4.09	0.80%	mess1b/321
Mess1a	Medium_S	571	1.74	3.63	0.07%	
Mess1a	Medium_S	821	1.92	4.02	0.07%	
Mess1a	Medium_S	1071	2.09	3.90	0.07%	
Mess1a	Medium_S	1321	2.27	4.01	0.07%	
Mess1a	Medium_S	1571	2.44	3.31	0.07%	
Mess1a	Medium_S	1636	2.4885	3.50	0.070%	hydrobulb/1.8ft
Mess2a	Lg to Med-S	0	-1.00	7.85	0.900%	
Mess2a	Medium_S	150	0.20	3.08	0.800%	Mess2b/220
Mess2a	Medium_S	400	1.95	3.11	0.700%	
Mess2a	Medium_S	650	2.08	3.20	0.050%	
Mess2a	Medium_S	900	2.20	2.78	0.050%	
Mess2a	Medium_S	1150	2.33	2.69	0.050%	
Mess2a	Medium_S	1215	2.36	2.79	0.050%	
Mess12b	Medium_S	0	0.30	3.51	0.600%	Mess12a/1750
Mess12b	Medium_S	250	1.80	3.90	0.600%	
Mess12b	Medium_S	500	1.98	4.16	0.070%	Mess12b2/526
Mess12b	Medium_S	750	2.15	4.17	0.07%	
Mess12b	Medium_S	1000	2.33	4.08	0.07%	
Mess12b	Medium_S	1050	2.36	4.11	0.07%	
Mess4a	Lg to Med-S	0	-1.00	7.11	0.90%	
Mess4a	Lg to Med-S	250	1.25	3.32	0.90%	
Mess4a2	Medium_S	405	1.72	3.58	0.30%	Mess4c
Mess4a2	Medium_S	655	1.84	3.28	0.05%	Mess4d/710
Mess4a2	Medium_S	905	1.97	3.76	0.05%	
Mess4a2	Medium_S	1155	2.09	3.87	0.05%	
Mess4a2	Medium_S	1405	2.22	4.27	0.05%	Mess4e/1300
Mess4a2	Medium_S	1655	2.34	5.02	0.05%	
Mess4a2	Medium_S	1905	2.47	4.65	0.05%	
Mess4a2	Medium_S	2155	2.59	3.58	0.05%	
Mess4a2	Medium_S	2180	2.60	4.13	0.05%	
Mess8a	Medium_S	0	-1.00	4.85	1.40%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Medium Channels			Chan Elev			
Channel	Channel	Distance frm	*NAVDD88*	LiDAR	Chan	Hydro Bulb
I.D.	Size	Cnct Chan (ft)	Invert (ft)	(ft)[1]	Slope %[2]	Elev Invert (ft)
Mess8a	Medium_S	250	2.50	3.22	1.40%	Different formula
Mess8a	Medium_S	417	2.65	3.33	0.09%	Different formula
Mess13c	Medium	0	0.65	3.78	0.09%	Different formula
Mess13c	Medium	250	0.88	4.30	0.09%	Different formula
Mess13c	Medium	500	1.10	3.99	0.09%	Different formula
Mess13c	Medium	636	1.22	4.23	0.09%	Different formula
Mess9a	Medium	0	-1.00	4.89	0.20%	***Zero interior loc***
Mess9a	Medium	250	-0.50	3.59	0.20%	
Mess9a	Medium	500	0.00	3.49	0.20%	
Mess9a	Medium	750	0.50	3.05	0.20%	
Mess9a	Medium	925	0.85	3.01	0.20%	
Isen3a	Medium	1500	-1.00	4.13	0.20%	
Isen3a	Medium	1250	-0.50	3.85	0.20%	
Isen3a	Medium	1000	-0.30	4.20	0.08%	1.97
Isen3a	Medium	750	-0.10	4.21	0.08%	Different formula
Isen3a	Medium	500	0.10	4.64	0.08%	Different formula
Isen3a	Medium	250	0.30	4.95	0.08%	Different formula
Isen3a	Medium	0	0.50	4.76	0.08%	Different formula
Chis19c	Medium	0	0.35	4.62	0.20%	Different formula
Chis19c	Medium	250	0.85	3.29	0.20%	Different formula
Chis19c	Medium	500	1.35	2.73	0.20%	Different formula
Chis19c	Medium	750	1.58	2.94	0.09%	Different formula
Chis19c	Medium	1000	1.80	4.39	0.09%	Different formula
Chis19c	Medium	1250	2.03	3.86	0.09%	Different formula
Chis19c	Medium	1500	2.25	3.54	0.09%	
Chis19c	Medium	1558	2.30	4.33	0.09%	
Isen4a	Medium	0	-1.00	3.11	0.20%	
Isen4a	Medium	250	-0.50	3.26	0.20%	
Isen4a	Medium	500	0.08	3.73	0.23%	
Isen4a2	Small	1333	1.99	4.62	0.23%	
Chis19b	Medium	0	-0.85	4.10	0.55%	
Chis19b	Medium	250	0.53	3.26	0.55%	2.30
Chis19b	Medium	500	1.90	2.88	0.55%	
Isen7c	Medium	0	0.50	4.67	0.15%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Medium Channels			Chan Elev			
Channel	**Channel**	**Distance frm**	***NAVDD88***	**LiDAR**	**Chan**	**Hydro Bulb**
I.D.	**Size**	**Cnct Chan (ft)**	**Invert (ft)**	**(ft)[1]**	**Slope %[2]**	**Elev Invert (ft)**
Isen7c	Medium	250	0.88	3.56	0.15%	
Isen7c	Medium	476	1.21	3.70	0.15%	2.0
Isen7a2	Medium	1250	0.5	5.09	0.10%	
Isen7a2	Medium	1500	0.75	5.24	0.10%	
Isen7a2	Medium	1750	1.00	4.96	0.10%	2.0
Isen4b	Medium	0	-1.00	3.39	0.20%	
Isen4b	Medium	250	-0.50	4.32	0.20%	
Isen4b	Medium	500	-0.25	4.65	0.10%	
Mess2a	Medium	0	-1.00	4.72	0.20%	
Mess2a	Medium	250	-0.50	3.25	0.20%	
Mess2a	Medium	500	0.15	3.61	0.26%	
Mess2a	Medium	750	0.80	2.91	0.26%	
Mess2a	Medium	1000	1.45	2.86	0.26%	
Mess2a	Medium	1146	1.83	2.99	0.26%	
Chis20a	Medium	0	-1.00	3.31	0.20%	
Chis20a	Medium	250	-0.50	3.16	0.20%	
Chis20a	Medium	500	0.13	2.69	0.25%	
Chis20a	Medium	728	0.70	2.92	0.25%	
Chis20c	Small	1130	1.70	2.91	0.25%	
Chis18a	Medium	0	-0.55	3.33	0.25%	1.8
Chis18a	Medium	250	-0.55	3.37	0.00%	
Chis18a	Medium	500	-0.55	3.28	0.00%	
Chis18a	Medium	750	-0.55	3.17	0.00%	
Chis11a	Medium	0	-1.00	4.89	0.20%	
Chis11a	Medium	250	-0.50	2.92	0.20%	1.8
Chis11a	Medium	500	-0.375	2.81	0.05%	
Chis11a	Medium	750	-0.25	3.20	0.05%	
Chis11a	Medium	1000	-0.13	4.60	0.05%	
Chis11a	Medium	1250	0.00	4.75	0.05%	
Chis11a	Medium	1470	0.11	2.70	0.05%	
Chis10a	Medium	0	-1.00	5.64	0.20%	
Chis10a	Medium	250	-0.50	3.00	0.20%	
Chis10a	Medium	500	0.00	3.16	0.20%	
Chis10a	Medium	750	0.50	2.92	0.20%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Medium Channels			Chan Elev			
Channel	**Channel**	**Distance frm**	***NAVDD88***	**LiDAR**	**Chan**	**Hydro Bulb**
I.D.	**Size**	**Cnct Chan (ft)**	**Invert (ft)**	**(ft)[1]**	**Slope %[2]**	**Elev Invert (ft)**
Chis10a	Medium	822	0.64	3.20	0.20%	
Chis14a	Medium	0	-1.00	7.59	0.10%	
Chis14a	Medium	250	-0.75	3.24	0.10%	
Chis14a	Medium	500	-0.50	3.55	0.10%	
Chis5d	Medium	0	-0.75	3.49	0.10%	
Chis5d	Medium	250	0.00	4.89	0.30%	
Chis5d	Medium	500	1.25	5.03	0.50%	
Chis5d	Medium	750	2.50	4.93	0.50%	
Chis5d	Medium	895	3.23	5.39	0.50%	
Chis7c	Medium	0	0.00	4.07	0.10%	
Chis7c	Medium	250	0.25	4.27	0.10%	
Chis7c	Medium	500	1.50	4.87	0.50%	2
Chis7c	Medium	750	2.75	5.62	0.50%	
Chis7c	Medium	822	3.11	4.22	0.50%	
Chis7c	Medium	902	3.51	4.79	0.50%	2.0
Chis5b	Medium	0	-0.75	4.13	0.25%	
Chis5b	Medium	250	-0.13	3.33	0.25%	
Chis5b	Medium	275	-0.06	3.71	0.25%	
Chis5b	Medium	433	0.33	3.74	0.25%	
Chis5b	Medium	525	0.79	4.05	0.50%	
Chis5b	Medium	775	2.04	4.45	0.50%	
Chis5b	Medium	837	2.10	4.56	0.10%	
Chis8a	Medium	0	-0.50	3.50	0.20%	
Chis8a	Medium	250	0.00	3.15	0.20%	
Chis8a	Medium	340	0.18	3.59	0.20%	
Chis2g	Medium	0	-0.75	4.19	0.20%	
Chis2g	Medium	250	0.75	4.24	0.60%	
Chis2g	Medium	500	2.25	5.71	0.60%	
Chis2g	Medium	665	3.24	4.81	0.60%	
Chis7a2	Medium	1840	2.76	8.81	2.00%	1.8
Chis7a2	Medium	1980	6.96	9.14	3.00%	
Mess11c	Medium	3750	1.48	4.19	0.20%	
Mess11c	Medium	4000	1.73	~4.5	0.10%	
Mess11d	Small	4732	2.46	4.67	0.10%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Medium Channels			**Chan Elev**			
Channel	**Channel**	**Distance frm**	***NAVDD88***	**LiDAR**	**Chan**	**Hydro Bulb**
I.D.	**Size**	**Cnct Chan (ft)**	**Invert (ft)**	**(ft)[1]**	**Slope %[2]**	**Elev Invert (ft)**
ODFW12a	Medium	0	-1.00	3.84	0.20%	1.8
ODFW12a	Medium	250	-0.5	2.24	0.20%	
ODFW12a	Medium	500	-0.25	2.50	0.10%	
ODFW12a	Medium	660	-0.09	2.70	0.10%	
ODFW5a	Medium	0	-1.00	3.92	0.10%	
ODFW5a	Medium	250	-0.50	3.40	0.20%	
ODFW5a	Medium	500	-0.25	3.38	0.10%	
ODFW5a	Medium	582	-0.17	3.63	0.10%	
ODFW27b	Medium	0	-0.50	3.38	0.10%	
ODFW27b	Medium	250	-0.25	3.60	0.10%	
ODFW27b	Medium	500	0.00	3.28	0.10%	
ODFW27b	Medium	547	0.05	3.47	0.10%	
Chis4a	Medium	0	-1.00	7.57	0.20%	
Chis4a	Medium	250	-0.50	5.18	0.20%	
Chis4a	Medium	500	0.00	4.65	0.20%	
Chis4a	Medium	750	0.50	3.52	0.20%	
Chis4a	Medium	935	0.87	3.66	0.20%	
Chis17b	Medium	0	-0.75	4.95	0.20%	
Chis17b	Medium	250	-0.25	3.74	0.20%	
Chis17b	Medium	500	0.25	2.94	0.20%	
Chis16b	Medium	0	-0.85	3.71	0.50%	
Chis16b	Medium	250	0.65	4.19	0.60%	
Chis16b	Medium	500	2.15	4.20	0.60%	
Chis16b	Medium	612	2.822	4.69	0.60%	
ODFW3	Medium	0	-1.00	5.51	0.20%	2
ODFW3	Medium	250	-0.50	3.51	0.20%	
ODFW3	Medium	500	-0.25	2.81	0.10%	
ODFW3	Medium	750	0.00	3.31	0.10%	
ODFW3	Medium	905	0.16	4.77	0.10%	
Chis1a	Medium	0	-1.00	7.19	0.20%	
Chis1a	Medium	250	-0.50	4.36	0.20%	
Chis1a	Medium	500	0.25	4.07	0.30%	
Chis1a	Medium	565	0.45	4.17	0.30%	
Chis3a	Medium	0	-1.00	3.11	0.30%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Medium Channels			**Chan Elev**			
Channel I.D.	**Channel Size**	**Distance frm Cnct Chan (ft)**	***NAVDD88*** **Invert (ft)**	**LiDAR (ft)[1]**	**Chan Slope %[2]**	**Hydro Bulb Elev Invert (ft)**
Chis3a	Medium	250	-0.25	4.27	0.30%	
Chis3a	Medium	450	0.35	3.57	0.30%	
Chis16c	Medium	402	0.21	3.78	0.30%	
Chis16c	Medium	652	0.96	3.82	0.30%	
Chis16c	Medium	813	1.44	4.00	0.30%	
ODFW27a	Medium	0	-1.00	6.08	0.20%	
ODFW27a	Medium	250	-0.50	3.88	0.20%	
ODFW27a	Medium	500	0.00	3.66	0.20%	
ODFW27a	Medium	620	0.24	3.56	0.20%	
ODFW2b	Medium	0	-1.00	2.90	0.20%	
ODFW2b	Medium	260	-0.48	3.24	0.20%	
ODFW2b	Medium	347	-0.31	3.80	0.20%	
ODFW8a	Medium	0	-1.00	3.28	0.20%	
ODFW8a	Medium	250	-0.50	2.76	0.20%	
ODFW8a	Medium	500	-0.25	2.90	0.10%	
ODFW8a	Medium	555	-0.20	3.22	0.10%	2.5
Chis5d	Medium	805	0.06	5.03	0.10%	
ODFW2a	Medium	0	-0.48	5.19	0.20%	
ODFW2a	Medium	350	0.22	3.08	0.20%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Small Channels			**Chan Elev**			
Channel	**Channel**	**Distance frm**	***NAVDD88***	**LiDAR**	**Chan**	**Hydro Bulb**
I.D.	**Size**	**Cnct Chan (ft)**	**Invert (ft)**	**(ft)[1]**	**Slope %[2]**	**Elev Invert (ft)**
Mess1b	Small	0	1.57	4.48	0.07%	
Mess1b	Small	250	1.75	3.44	0.07%	
Mess1b	Small	500	1.92	3.69	0.07%	
Mess1b	Small	645	2.02	2.61	0.07%	
Mess13d	Small	0	0.05	2.76	0.17%	2.5
Mess13d	Small	250	0.48	3.05	0.17%	
Mess13d	Small	500	0.90	3.33	0.17%	
Mess13d	Small	750	1.33	3.11	0.17%	
Mess13d	Small	1000	1.75	3.01	0.17%	
Mess13d	Small	1165	2.03	3.22	0.17%	
Mess2b	Small	0	0.35	3.10	0.20%	2.5
Mess2b	Small	250	0.85	3.23	0.20%	
Mess2b	Small	500	1.35	3.37	0.20%	
Mess2b	Small	558	1.47	3.34	0.20%	
Mess13b	Small	0	1.00	2.83	0.20%	2.5
Mess13b	Small	250	1.50	2.82	0.20%	
Mess13b	Small	400	1.80	2.84	0.20%	1.8
Mess3b	Small	0	0.50	3.17	0.20%	
Mess3b	Small	250	1.00	3.02	0.20%	
Mess3b	Small	500	1.50	3.32	0.20%	
Mess3b	Small	573	1.65	3.47	0.20%	
Mess3d	Small	0	1.00	3.35	0.15%	
Mess3d	Small	250	1.38	3.47	0.15%	
Mess3d	Small	500	1.75	3.34	0.15%	
Mess3d	Small	600	1.90	3.19	0.15%	
Mess2c	Small	0	1.90	2.88	0.10%	
Mess2c	Small	265	2.17	3.28	0.10%	2.5
Mess2d	Small	0	2	3.02	0.05%	
Mess2d	Small	250	2.13	3.30	0.05%	
Mess2d	Small	327	2.16	3.08	0.05%	
Mess4b	Small	0	1.25	3.47	0.07%	
Mess4b	Small	250	1.43	3.38	0.07%	2.5
Mess4b	Small	367	1.51	3.44	0.07%	
Mess13d	Small	0	1.12	3.38	0.07%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Small Channels			Chan Elev			
Channel I.D.	Channel Size	Distance frm Cnct Chan (ft)	*NAVDD88* Invert (ft)	LiDAR (ft)[1]	Chan Slope %[2]	Hydro Bulb Elev Invert (ft)
Mess13d	Small	250	1.30	3.27	0.07%	
Mess13d	Small	500	1.47	3.36	0.07%	
Mess13d	Small	627	1.58	3.21	0.09%	
Mess13c2	Small	0	0.88	3.91	0.09%	
Mess13c2	Small	275	1.13	3.02	0.09%	
Mess13c3	Small	0	1.22	3.96	0.09%	
Mess13c3	Small	250	1.45	3.78	0.09%	
Mess13c3	Small	500	1.67	3.74	0.09%	
Mess13c3	Small	608	1.77	3.49	0.09%	
Mess13c3b	Small	0	1.22	3.73	0.09%	
Mess13c3b	Small	250	1.45	3.18	0.09%	
Mess13c3b	Small	372	1.55	3.01	0.09%	
Mess4c	Small	0	1.72	3.23	0.05%	
Mess4c	Small	250	1.85	3.73	0.05%	
Mess4c	Small	500	1.97	3.53	0.05%	
Mess4c	Small	746	2.09	3.65	0.05%	
Mess4d	Small	0	1.84	3.89	0.05%	
Mess4d	Small	250	1.97	4.09	0.05%	
Mess4d	Small	500	2.09	3.82	0.05%	
Mess4d	Small	670	2.18	3.42	0.05%	
Mess4e	Small	0	2.00	4.52	0.05%	
Mess4e	Small	250	2.13	3.72	0.05%	
Mess4e	Small	500	2.25	3.52	0.05%	
Mess4e	Small	666	2.33	3.91	0.05%	
Mess12b2	Small	0	1.90	3.89	0.05%	
Mess12b2	Small	250	2.03	4.04	0.05%	
Mess12b2	Small	500	2.15	3.89	0.05%	
Mess12b2	Small	587	2.1935	4.20	0.05%	
Mess12c2	Small	0	1.20	3.58	0.05%	
Mess12c2	Small	250	1.33	3.65	0.05%	
Mess12c2	Small	500	1.45	3.48	0.05%	
Mess12c2	Small	750	1.58	3.87	0.05%	
Mess12c2	Small	775	1.59	3.80	0.05%	
Mess12e	Small	0	0.50	3.49	0.07%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Small Channels			Chan Elev			
Channel	Channel	Distance frm	*NAVDD88*	LiDAR	Chan	Hydro Bulb
I.D.	Size	Cnct Chan (ft)	Invert (ft)	(ft)[1]	Slope %[2]	Elev Invert (ft)
Mess12e	Small	250	0.68	3.18	0.07%	
Mess12e	Small	500	0.85	3.66	0.07%	
Mess12e	Small	679	0.98	4.17	0.07%	
Mess4f	Small	0	2.50	3.93	0.07%	
Mess4f	Small	250	2.68	3.41	0.07%	
Mess4f	Small	500	2.85	4.27	0.07%	
Mess4f	Small	560	2.89	3.72	0.07%	
Mess12d	Small	0	1.18	3.51	0.07%	
Mess12d	Small	250	1.36	3.29	0.07%	
Mess12d	Small	275	1.37	3.49	0.07%	
Mess12e2	Small	0	1.00	3.22	0.09%	
Mess12e2	Small	148	1.13	3.07	0.09%	
Mess11b	Small	0	1.75	3.79	0.09%	
Mess11b	Small	250	1.98	4.49	0.09%	
Mess11b	Small	500	2.20	4.14	0.09%	
Mess11b	Small	527	2.22	3.95	0.09%	
Mess11c2	Small	0	2.00	4.15	0.10%	
Mess11c2	Small	250	2.25	4.81	0.10%	
Mess11c2	Small	500	2.50	4.23	0.10%	
Mess11c2	Small	750	2.75	4.63	0.10%	
Mess11c2	Small	802	2.802	4.64	0.10%	
Mess11d	Small	0	1.00	4.17	0.20%	
Mess11d	Small	250	1.50	4.54	0.20%	
Mess11d	Small	500	2.00	4.33	0.20%	
Mess11d	Small	666	2.332	4.67	0.20%	
Mess13c	Small	0	1.22	1.95	0.10%	
Mess13c	Small	167	1.39	2.85	0.10%	
Mess3c	Small	0	1.00	2.38	0.10%	
Mess3c	Small	250	1.25	3.31	0.10%	
Isen4a2	Small	730	0.80	3.52	0.28%	
Isen4a2	Small	1033	1.65	3.25	0.28%	
Isen4a2	Small	1170	2.03	4.53	0.28%	
Isen4a2	Small	1333	2.4884	4.62	0.28%	2.5
Chis20c	Small	1000	0.70	3.02	0.80%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Small Channels			**Chan Elev**			
Channel	**Channel**	**Distance frm**	***NAVDD88***	**LiDAR**	**Chan**	**Hydro Bulb**
I.D.	**Size**	**Cnct Chan (ft)**	**Invert (ft)**	**(ft)[1]**	**Slope %[2]**	**Elev Invert (ft)**
Chis20c	Small	1130	1.74	2.91	0.80%	1.8
Isen8c	Small	0	-0.03	3.85	0.60%	
Isen8c	Small	250	1.97	4.05	0.80%	
Isen8c	Small	529	3.64	4.76	0.60%	
ODFW9a	Small	0	-0.50	4.20	0.10%	
ODFW9a	Small	250	-0.25	2.54	0.10%	
ODFW9a	Small	390	0.03	2.22	0.20%	
Chis11b	Small	0	-0.5	2.86	0.20%	
Chis11b	Small	250	0.75	2.89	0.50%	
Chis11b	Small	500	1.50	2.69	0.30%	
Chis11b	Small	705	2.525	2.85	0.50%	
Chis19d	Small	0	1.10	4.68	0.13%	
Chis19d	Small	250	1.43	3.62	0.13%	
Chis19d	Small	500	1.75	3.52	0.13%	
Chis19d	Small	750	2.075	4.41	0.13%	
Chis19d	Small	860	2.22	3.51	0.13%	
Isen8a2	Small	3345	1.20	3.31	0.17%	
Isen8a2	Small	3595	1.63	3.73	0.17%	
Isen8a2	Small	3845	2.05	3.64	0.17%	
Isen8a2	Small	3995	2.31	3.85	0.17%	2.5
Isen3b	Small	0	-0.50	3.85	0.30%	
Isen3b	Small	250	0.25	3.25	0.30%	
Isen3b	Small	500	1.25	4.31	0.40%	
Isen3b	Small	750	2.25	3.80	0.40%	
Chis3c	Small	0	0.35	3.57	0.35%	
Chis3c	Small	250	1.23	4.88	0.35%	
Chis3c	Small	515	2.15	4.63	0.35%	
Chis2d	Small	0	0.50	4.73	0.35%	
Chis2d	Small	250	1.38	4.77	0.35%	
Chis2d	Small	500	2.25	4.76	0.35%	
Chis2d	Small	645	2.76	4.97	0.35%	
Isen8d	Small	0	0.33	7.25	0.50%	
Isen8d	Small	250	1.58	3.75	0.50%	
Isen8d	Small	500	1.83	3.90	0.10%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Small Channels			**Chan Elev**			
Channel I.D.	**Channel Size**	**Distance frm Cnct Chan (ft)**	***NAVDD88* Invert (ft)**	**LiDAR (ft)[1]**	**Chan Slope %[2]**	**Hydro Bulb Elev Invert (ft)**
Isen8d	Small	750	2.08	3.63	0.10%	
Isen8d	Small	850	2.18	3.65	0.10%	2.5
Isen4b2	Small	750	-0.25	4.15	0.15%	
Isen4b2	Small	1000	1.50	4.18	0.70%	
Isen4b2	Small	1100	2.20	4.29	0.70%	
Isen3c	Small	0	-0.10	4.20	0.45%	
Isen3c	Small	250	1.03	4.31	0.45%	
Isen3c	Small	500	1.9	4.33	0.35%	
Isen3c	Small	635	2.37	4.22	0.35%	
Chis19d1	Small	0	1.43	3.31	0.10%	
Chis19d1	Small	250	1.68	5.23	0.10%	
Chis19d1	Small	500	1.93	3.64	0.10%	
Chis19d1	Small	750	2.18	3.73	0.10%	
Chis19c1	Small	0	1.35	3.35	0.12%	
Chis19c1	Small	250	1.65	3.14	0.12%	
Chis19c1	Small	500	1.95	3.14	0.12%	
Chis19c1	Small	590	2.06	3.14	0.12%	
Chis15b	Small	0	0.88	5.68	0.15%	
Chis15b	Small	250	1.26	3.81	0.15%	
Chis15b	Small	500	1.63	3.71	0.15%	
Chis15b	Small	750	2.005	3.78	0.15%	
Chis15b	Small	915	2.25	3.66	0.15%	
Isen8b	Small	0	-0.38	3.62	0.80%	
Isen8b	Small	250	1.62	4.63	0.80%	
Isen8b	Small	515	2.15	3.83	0.20%	
Mess1c3	Small	0	0.29	3.70	0.90%	
Chis17b2	Small	500	0.25	3.09	0.25%	
Chis17b2	Small	750	0.88	3.14	0.25%	
Chis17b2	Small	1000	1.50	3.83	0.25%	
Chis17b2	Small	1212	2.03	3.82	0.25%	
Chis3b	Small	0	0.35	3.97	0.35%	
Chis3b	Small	250	1.73	4.39	0.55%	
Chis3b	Small	515	3.18	4.91	0.55%	
ODFW3a	Small	0	0	2.71	0.35%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Small Channels			Chan Elev			
Channel	Channel	Distance frm	*NAVDD88*	LiDAR	Chan	Hydro Bulb
I.D.	Size	Cnct Chan (ft)	Invert (ft)	(ft)[1]	Slope %[2]	Elev Invert (ft)
ODFW3a	Small	250	0.88	2.73	0.35%	
ODFW3a	Small	425	1.49	2.76	0.35%	
Chis14c	Small	0	-0.50	3.41	0.50%	
Chis14c	Small	250	1.00	4.07	0.60%	
Chis14c	Small	450	2.20	4.18	0.60%	
Chis19b1	Small	0	1.90	2.88	0.05%	
Chis19b1	Small	250	2.025	3.20	0.05%	
Chis19b1	Small	280	2.03	3.20	0.02%	
Chis19b2	Small	750	2.13	2.99	0.02%	
Chis19b2	Small	1000	2.18	3.27	0.02%	
Chis19b2	Small	1060	2.19	3.07	0.02%	
Isen7d	Small	0	0.75	5.10	0.30%	
Isen7d	Small	250	1.50	3.72	0.30%	
Isen7d	Small	500	2.00	3.29	0.20%	
Isen7d	Small	560	2.12	3.74	0.20%	
Chis10b	Small	0	-0.50	2.85	0.80%	
Chis10b	Small	250	1.25	2.98	0.70%	
Chis10b	Small	462	1.67	3.29	0.20%	
Chis2f	Small	0	0.00	4.65	0.80%	
Chis2f	Small	250	2.00	4.69	0.80%	
Chis2f	Small	440	3.52	5.86	0.80%	
ODFW12c	Small	0	-0.50	2.32	0.20%	
ODFW12c	Small	250	0	2.33	0.20%	
ODFW12c	Small	345	0.19	2.35	0.20%	
Isen8e	Small	0	-0.25	3.29	0.20%	
Isen8e	Small	250	1.00	4.23	0.50%	
Isen8e	Small	500	1.50	4.27	0.20%	
Isen8e	Small	715	1.93	3.80	0.20%	
Isen1a	Small	0	-0.50	4.97	0.40%	
Isen1a	Small	250	0.50	4.33	0.40%	
Isen1a	Small	345	0.88	4.37	0.40%	
Chis19c2	Small	0	1.35	3.37	0.09%	
Chis19c2	Small	250	1.575	2.58	0.09%	
Chis19c2	Small	420	1.73	3.36	0.09%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Small Channels			Chan Elev			
Channel I.D.	Channel Size	Distance frm Cnct Chan (ft)	*NAVDD88* Invert (ft)	LiDAR (ft)[1]	Chan Slope %[2]	Hydro Bulb Elev Invert (ft)
Chis14b	Small	0	-0.50	3.64	0.09%	
Chis14b	Small	250	1.5	3.70	0.80%	
Chis14b	Small	415	2.82	4.15	0.80%	
Chis19c3	Small	0	1.35	3.46	0.06%	
Chis19c3	Small	250	1.50	2.80	0.06%	
Chis19c3	Small	500	1.65	3.16	0.06%	
Chis19c3	Small	688	1.76	2.88	0.06%	1.8
Chis12b	Small	0	-0.13	4.00	0.35%	
Chis12b	Small	250	0.75	3.54	0.35%	
Chis12b	Small	500	1.62	3.50	0.35%	
Chis12b	Small	550	1.80	3.14	0.35%	1.8
ODFW12b	Small	0	-0.40	2.24	0.10%	
ODFW12b	Small	250	-0.15	2.27	0.10%	
ODFW12b	Small	400	0	2.69	0.10%	
ODFW8b	Small	0	-0.50	2.34	0.20%	
ODFW8b	Small	250	0.00	2.83	0.20%	
ODFW8b	Small	375	0.25	3.31	0.20%	
ODFW27b	Small	0	0.10	4.08	0.20%	
ODFW27b	Small	250	0.60	3.80	0.20%	
ODFW27b	Small	325	0.75	3.50	0.20%	
Chis2c	Small	0	0.50	4.92	0.90%	
Chis2c	Small	250	2.75	4.72	0.90%	
Chis2c	Small	575	4.05	5.11	0.40%	
Chis1b	Small	815	0.45	3.53	0.60%	
Chis1b	Small	940	1.20	3.72	0.60%	
Chis17b1	Small	250	0.25	3.10	1.00%	
Chis17b1	Small	308	0.83	2.94	1.00%	
Mess2d	Small	0	0.80	3.09	0.20%	
Chis4b	Small	0	0.87	3.83	0.50%	
Chis4b	Small	250	2.12	4.50	0.50%	
Chis4b	Small	325	2.72	4.27	0.80%	
Chis2e	Small	0	0.25	4.76	0.90%	
Chis2e	Small	250	2.50	4.85	0.90%	
Chis2e	Small	309	2.62	4.72	0.20%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

Appendix A. Table 1. Continued

Small Channels			**Chan Elev**			
Channel	**Channel**	**Distance frm**	***NAVDD88***	**LiDAR**	**Chan**	**Hydro Bulb**
I.D.	**Size**	**Cnct Chan (ft)**	**Invert (ft)**	**(ft)[1]**	**Slope %[2]**	**Elev Invert (ft)**
Chis20d	Small	0	0.13	2.56	0.20%	
Chis20d	Small	250	0.63	3.13	0.20%	
Chis20d	Small	479	1.08	3.01	0.20%	
Isen4c	Small	0	1.50	4.27	0.10%	
Isen4c	Small	250	1.75	4.26	0.10%	
Isen4c	Small	390	1.89	4.40	0.10%	
Isen7c1	Small	726	2.23	3.35	0.10%	
Isen7c1	Small	826	2.33	3.14	0.10%	
ODFW27a2	Small	0	0.24	3.58	0.30%	
ODFW27a2	Small	226	0.92	3.51	0.30%	
Chis5f	Small	0	-0.13	3.80	0.80%	
Chis5f	Small	273	2.06	3.75	0.80%	
Isen8b	Small	0	-0.67	3.51	1.00%	
Isen8b	Small	250	1.83	4.61	1.00%	
Isen8b	Small	515	3.15	4.61?	0.50%	
Chis10c	Small	0	0.40	2.92	0.40%	
Chis10c	Small	250	1.40	3.08	0.40%	
Chis10c	Small	385	1.94	2.92	0.40%	
Chis17c	Small	0	-0.35	4.89	0.90%	
Chis17c	Small	215	1.59	3.76	0.90%	
Isen7a3	Small	1750	1.00	4.76	0.25%	
Isen7a3	Small	2000	1.63	3.75	0.25%	
Isen7a3	Small	2137	1.97	4.27	0.25%	2.0
Isen3d	Small	0	0.70	4.85	1.00%	
Isen3d	Small	200	2.70	4.45	1.00%	
Isen7b	Small	0	1.00	4.82	0.70%	
Isen7b	Small	250	2.75	4.09	0.70%	
chis2b	Small	0	1.50	~4.00	0.90%	
Chis2b	Small	195	3.26	4.93	0.90%	

1). Elevation of general pasture lands adjacent to channel point

2.) In tables the channel grades are the grade forward of the station. i.e. if the grade at 250 is 0.50%and then 0.20%at 500ft then the grade from 250 to 500 is 0.20%

APPENDIX B

Culvert and Water Control Structures

http://www.agriexpo.online/prod/watermar
industries/product-174233-19232.html

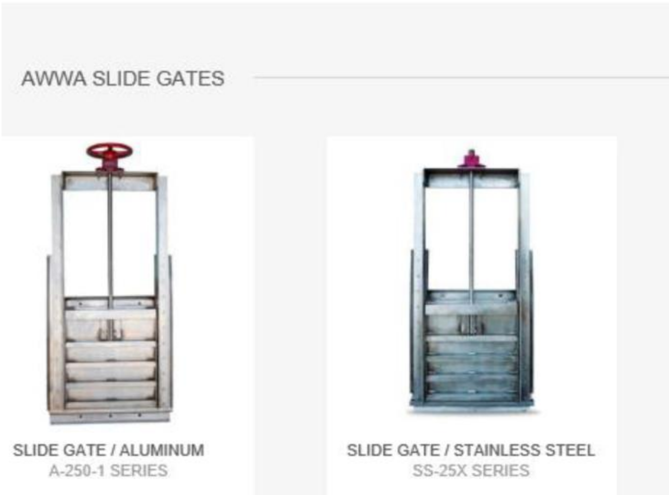


Figure 1. Slide gates proposed for selected interior pasture connection culverts.

Figure 2. Typical side-hinged aluminum tidegate mounted on 6.0ft CMP.

Figure 3. Side-hinged aluminum tidegate door in working location.

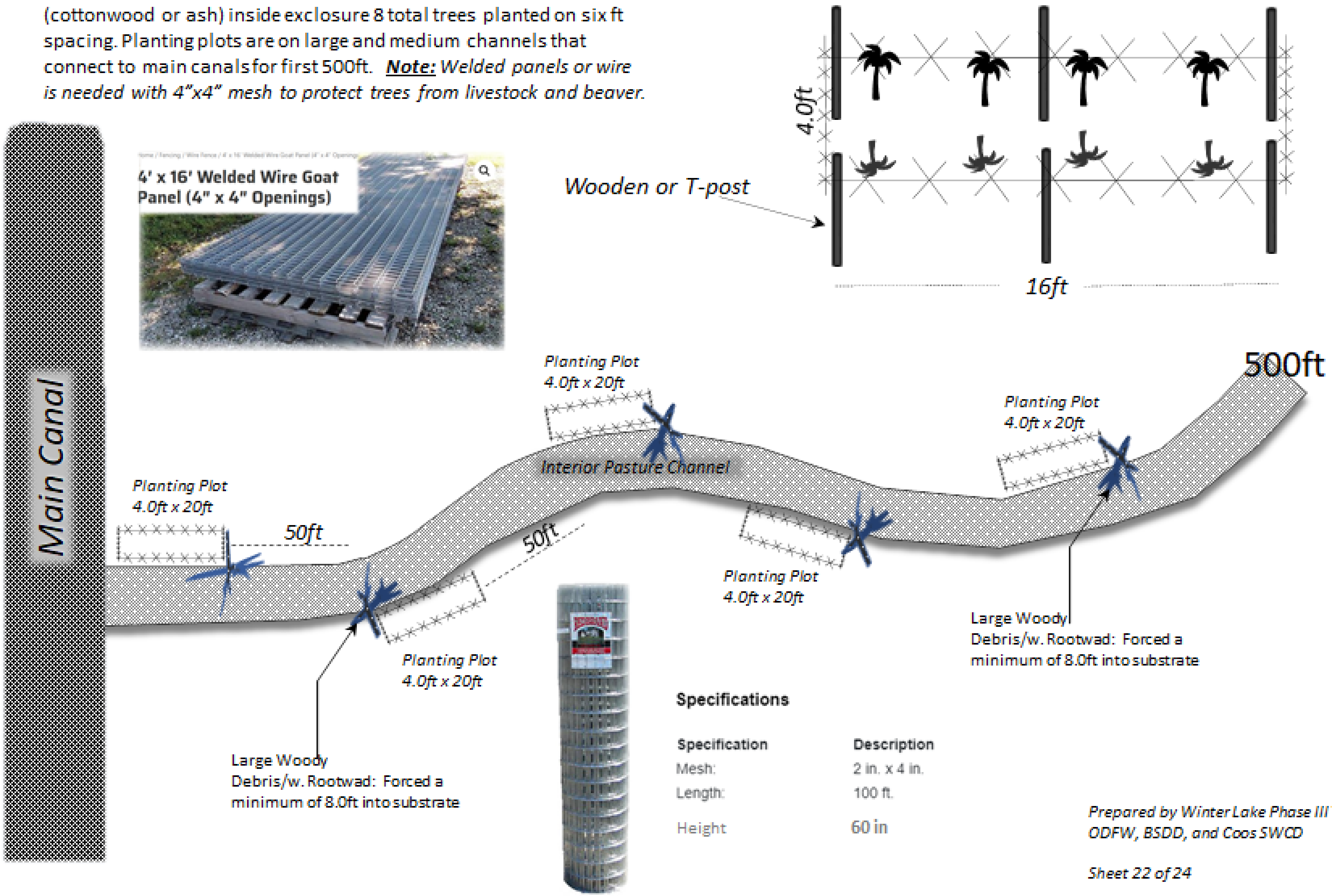
APPENDIX C

Winter Lake Phase III
Planting Concepts and Large Woody Debris Installation

Large/Medium Connecting Channel Skip Planting Concepts Option #1

Planting Plots #1: Welded panels or wire; 4.0w x 20ft in length alternated on channel sides with 50ft spacing. Trees planted (cottonwood or ash) inside exclosure 8 total trees planted on six ft spacing. Planting plots are on large and medium channels that connect to main canals for first 500ft. ***Note:*** *Welded panels or wire is needed with 4"x4" mesh to protect trees from livestock and beaver.*

Expanded Plot View



Specifications

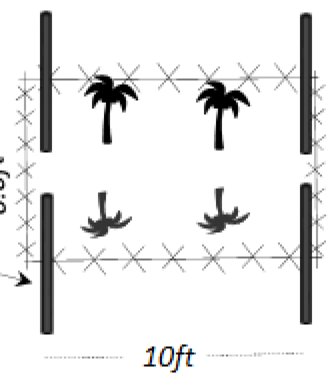
Specification	Description
Mesh:	2 in. x 4 in.
Length:	100 ft.
Height	60 in

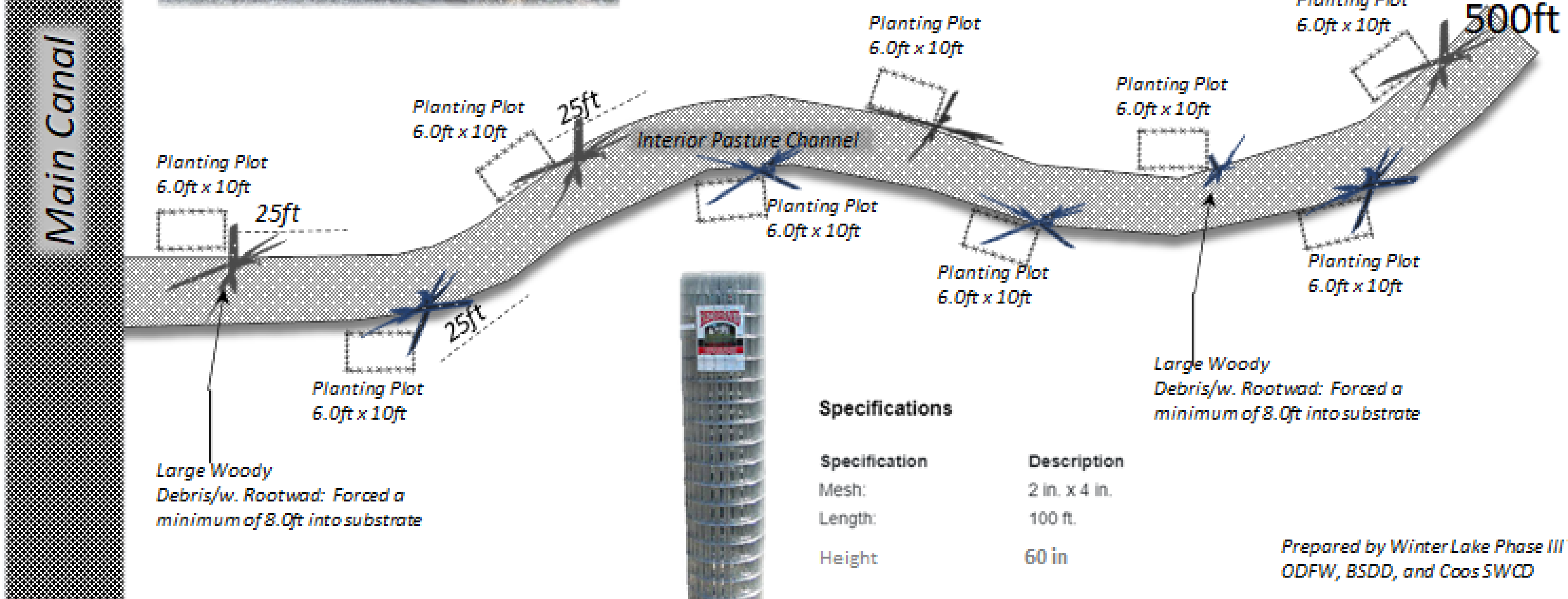
Prepared by Winter Lake Phase III Team
ODFW, BSDD, and Coos SWCD

Sheet 22 of 24

Large/Medium Connecting Channel Skip Planting Concepts Option #2

Planting Plots #2: Welded panels or wire; 4.0w x 10ft in length alternated on channel sides with 25ft spacing. Trees planted (cottonwood or ash) inside exclosure 8 total trees planted on six ft spacing. Planting plots are on large and medium channels that connect to main canals for first 500ft. ***Note:*** *Welded wire is needed with 4"x4" mesh to protect trees from livestock and beaver.*





Specifications

Specification	Description
Mesh:	2 in. x 4 in.
Length:	100 ft.
Height	60 in

Prepared by Winter Lake Phase III Team
ODFW, BSDD, and Coos SWCD

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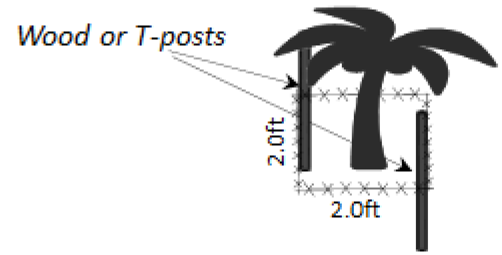
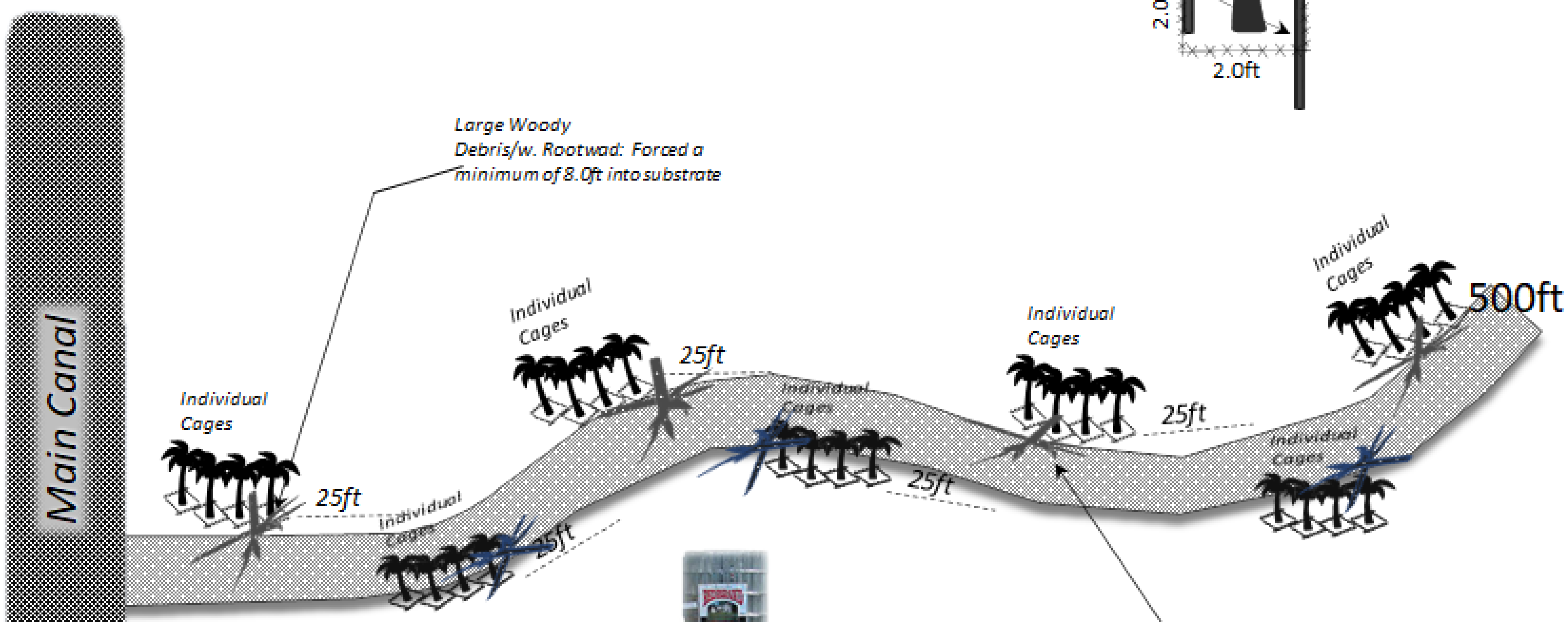
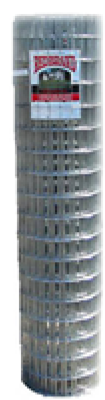
Large/Medium Connecting Channel Skip Planting Concepts Option #3

Planting Plots #2: Welded panels or wire around individual trees planted in groups of 4 trees with 8ft spacing alternating every 25 ft of channel. Trees planted (cottonwood or ash) inside. Plantings on large and medium channels that connect to main canals for first 500ft. ***Note:*** *Welded panels or wire is needed with 4"x4" mesh to protect trees from livestock and beaver.*

Expanded Plot View







Specifications

Specification	Description
Mesh:	2 in. x 4 in.
Length:	100 ft.
Height	60 in

Prepared by Winter Lake Phase III Team
ODFW, BSDD, and Coos SWCD

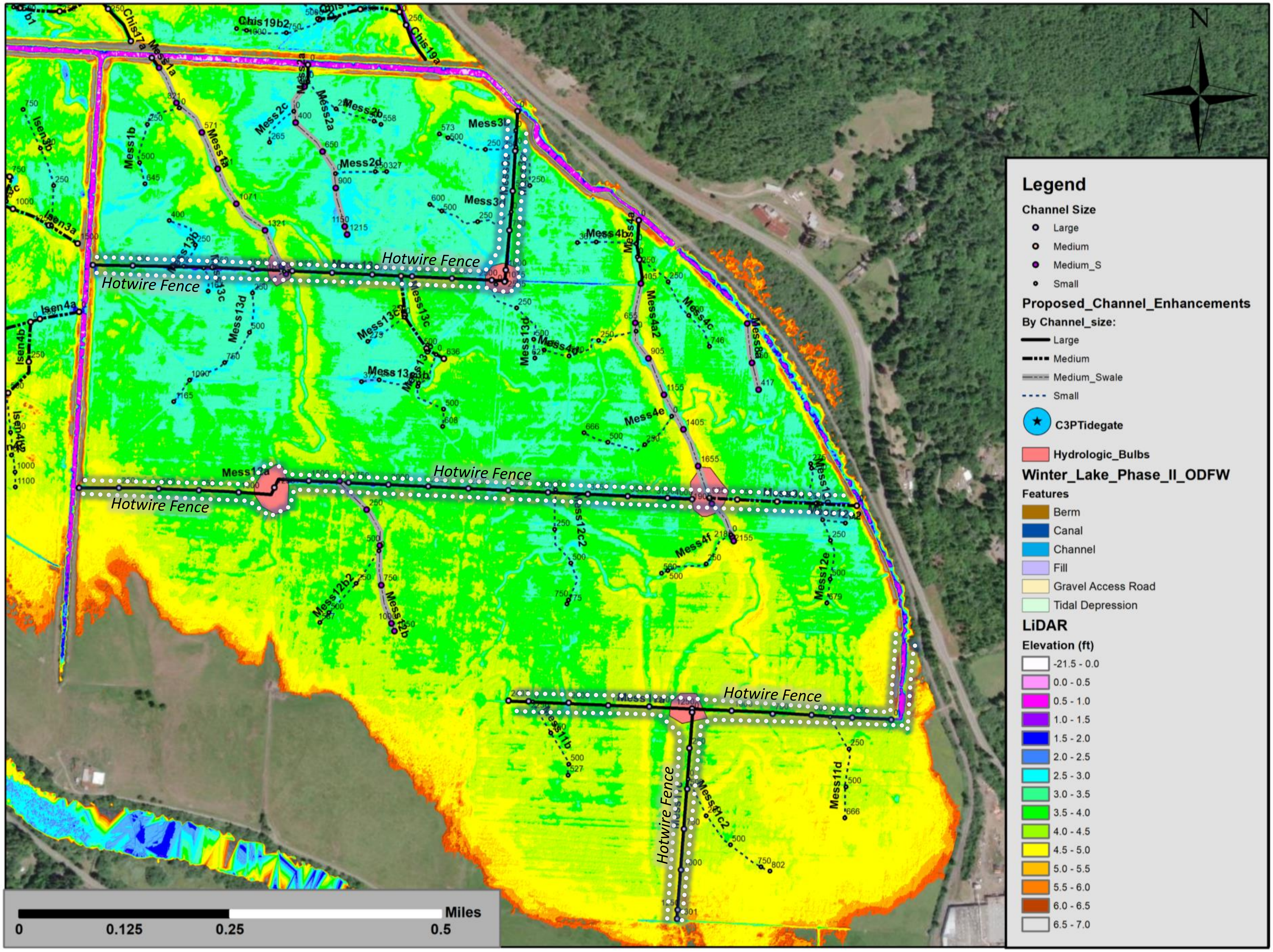
Sheet 24 of 24

APPENDIX D

Winter Lake Phase III
Habitat Uplift Table

Appendix D. Table 1. Winter Lake Phase III project proposed actions and Ecological Uplift assessment.

Action	Impact	Impact to Ecology Time of Construction Yes/No	Severity of Impact High/Med/Low	Healed by Year 2 Yes/No	Net Ecologic Benefit by Yr 3 Yes/No	Benefit Power Power High/Med/Low	Explanation
Installation of new proper sized culverts	Earth Work interior berms	Yes, due to soil disturbance	Low	Yes	Yes, immediate uplift	High	*New culverts allow for more natural hydrologic flow of water to interior pasture channels. greatly improved fish passage and wetland function. Net benefit strong much greater than impacts from time zero forward*
Channel construction/reconstruction; Excavation	Excavation/ soil disturbance	Yes, soil disturbance	Medium	Yes	Yes, immediate uplift	High	*New/reconstructed channels provide for more natural hydrologic flow of water to interior pastures, greatly improved fish passage and wetland function. Net benefit much greater than impacts from time zero forward.*
Channel construction/reconstruction; soil thin-spread	Soil distribution to 3" on wetlands	Yes, plant disturbance, unvegetated soils	Medium	Yes	Neutral by year 3	Neutral by year 3	*Soils that are distributed on wetland pastures will be thin-spread on average to 3" in depth; they will be integrated into pasture grasses as wetland plants are fully able to grow through this application fall of year 1 with full healing by year 2.*
Channel Reconstruction bank sloping 1:1 and 2:1	Soil disturbance	Yes, soil disturbance	Medium	Yes	Uplift by year 2	Medium	*Current pasture drainage channels have vertical banks that lead to bank sloughing and provide little if any edge habitats for fish when winter flows fill channels. Sloping of banks of channels will provide edge for growth of vegetation/fish cover, reduce erosion, and sediments*
Construction of Hydrologic Bulbs	Soil disturbance	Yes, soil disturbance	Low	Yes	Yes, immediate uplift	High	*Hydrologic bulbs will be installed at upper reaches of channel networks in selected locations. These bulbs will be excavated to an elevation that during winter months they provide long-term wetted habitat for juvenile coho. These also increase hydrologic exchange of water, which results in greater flushing of channels during tidal inflow/outflow. This prevents channels from accumulating sediments and provides long term channel life expectancy with little or no reexcavation to "clean" sediment. These bulbs also allow for greater volume capacity of channel networks duriing inflow/outflow events, which provide for exchange of water in channels and canals improving water quality.*
Berm Reconstruction		Yes, soil disturbance	Low	Yes	Neutral by year 3	Neutral by year 3	*Locations where berms are reconstructed will be be seeded/mulched. They are expected to be fully revegetated by year by end of growing season year 2.*
Fence installation	Some soil disturbance	Minimal	Very Low	Yes	Yes	Medium	*Fencing of selected segments of channels provides immediate benefits to water quality and longer term establishment of riparian vegetative and woody plants for fish habitat complexity.*
Large Woody Debris Installation large channels	Some soil disturbance	Minimal	Very Low	Yes	Yes	High	*Installation of LWD rootwads in first 500ft of larger channels will fully provide uplift through providing complexity for fish and other aquatic organisms.*
Planting of Trees on large and selected secondary channels	N/A	N/A	N/A	N/A	N/A	HIgh	*Skip planting of trees will be implemented on large and selected medium channels in segments where fence is installed. Additionally, individual caged trees will be planted. Skip planting will be three trees planted in a single 8x8ft plot every 100ft of large channels and selected medium channel reaches (Figure xxx). Tree species will be either Oregon Ash, Black Cottonwood, or Spruce.*
			Net Ecological Benefit by Year 1			Medium	
			Net Ecological Benefit by Year2			High	


N
Legend
Channel Size
Large
Medium
Medium_S
Small
Proposed_Channel_Enhancements
By Channel_size:
Large
Medium
Medium_Swale
Small
C3PTidegate
Hydrologic_Bulbs
Winter_Lake_Phase_II_ODFW
Features
Berm
Canal
Channel
Fill
Gravel Access Road
Tidal Depression
LiDAR
Elevation (ft)
-21.5 - 0.0
0.0 - 0.5
0.5 - 1.0
1.0 - 1.5
1.5 - 2.0
2.0 - 2.5
2.5 - 3.0
3.0 - 3.5
3.5 - 4.0
4.0 - 4.5
4.5 - 5.0
5.0 - 5.5
5.5 - 6.0
6.0 - 6.5
6.5 - 7.0
Hotwire Fence
Hotwire Fence
Hotwire Fence
Hotwire Fence
Hotwire Fence
Hotwire Fence
Mess1a
Mess1b
Mess2a
Mess2b
Mess2c
Mess2d
Mess3
Mess4a
Mess4a2
Mess4b
Mess4c
Mess4d
Mess4e
Mess4f
Mess11b
Mess11c2
Mess11d
Mess12b
Mess12b2
Mess12c2
Mess12e
Mess13b
Mess13c
Mess13d
Chis19b2
Chis17a
Chis19a
Isen3a
Isen3b
Isen4a
Isen4b
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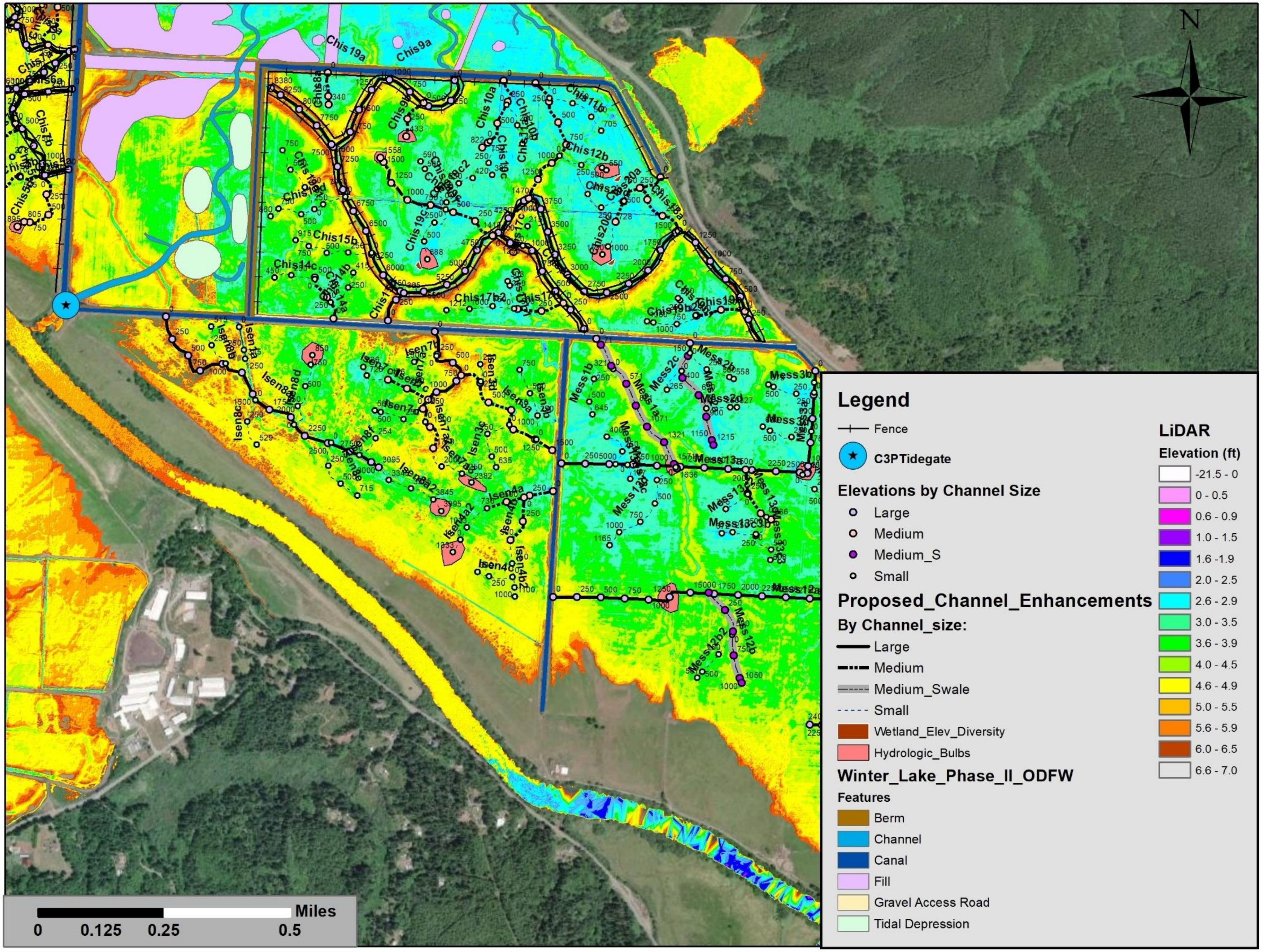

N
Legend
Fence
C3PTidegate
Elevations by Channel Size
Large
Medium
Medium_S
Small
Proposed_Channel_Enhancements
By Channel_size:
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Medium
Medium_Swale
Small
Wetland_Elev_Diversity
Hydrologic_Bulbs
Winter_Lake_Phase_II_ODFW
Features
Berm
Channel
Canal
Fill
Gravel Access Road
Tidal Depression
LiDAR
Elevation (ft)
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0.6 - 0.9
1.0 - 1.5
1.6 -1.9
2.0 - 2.5
2.6 - 2.9
3.0 - 3.5
3.6 - 3.9
4.0 - 4.5
4.6 - 4.9
5.0 - 5.5
5.6 - 5.9
6.0 - 6.5
6.6 - 7.0
Miles
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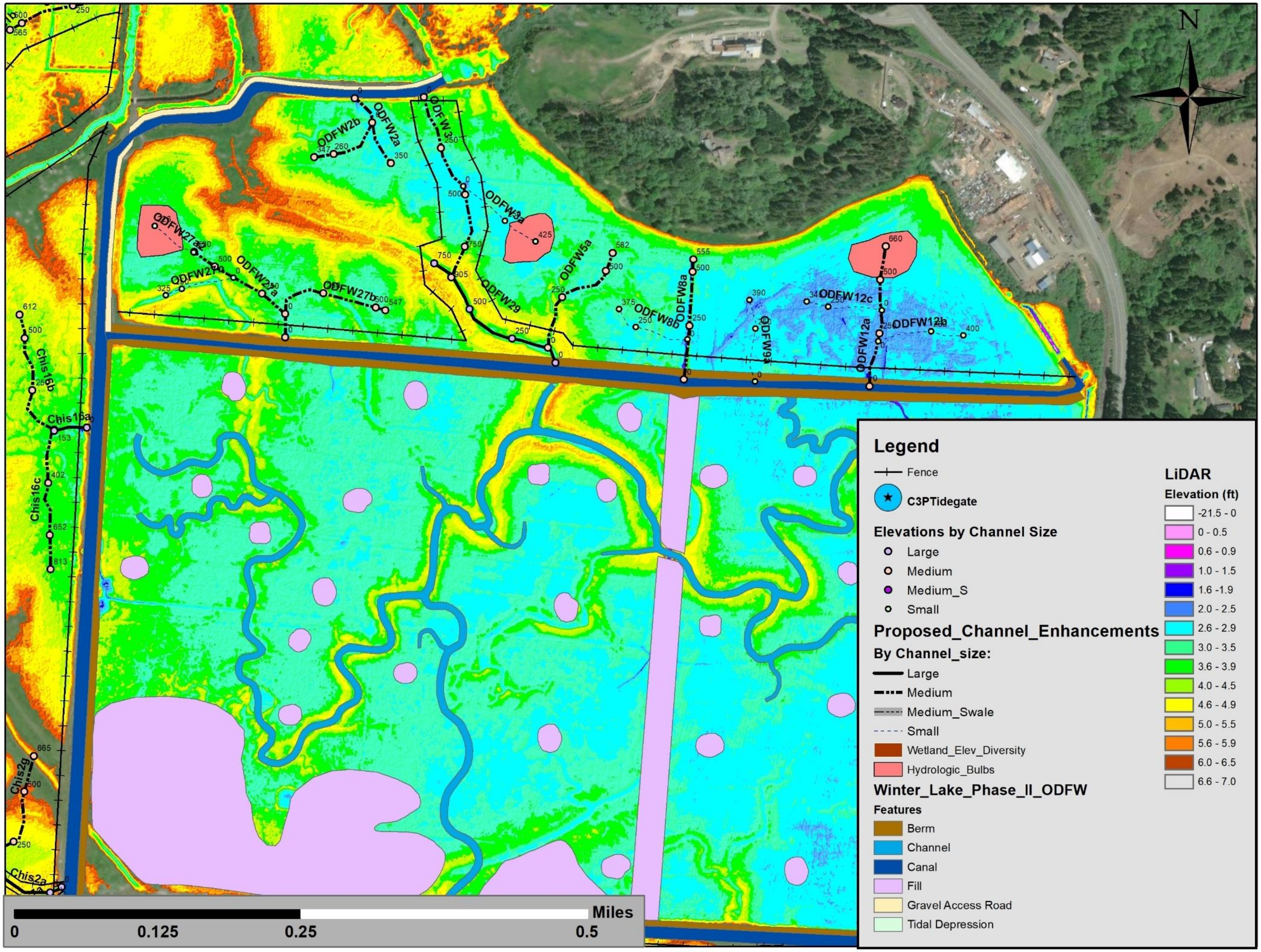

Legend
Fence
C3PTidegate
Elevations by Channel Size
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Medium_S
Small
Proposed_Channel_Enhancements
By Channel_size:
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Medium
Medium_Swale
Small
Wetland_Elev_Diversity
Hydrologic_Bulbs
Winter_Lake_Phase_II_ODFW
Features
Berm
Channel
Canal
Fill
Gravel Access Road
Tidal Depression
LiDAR
Elevation (ft)
-21.5 - 0
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0.6 - 0.9
1.0 - 1.5
1.6 -1.9
2.0 - 2.5
2.6 - 2.9
3.0 - 3.5
3.6 - 3.9
4.0 - 4.5
4.6 - 4.9
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6.6 - 7.0
Miles
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0.25
0.5
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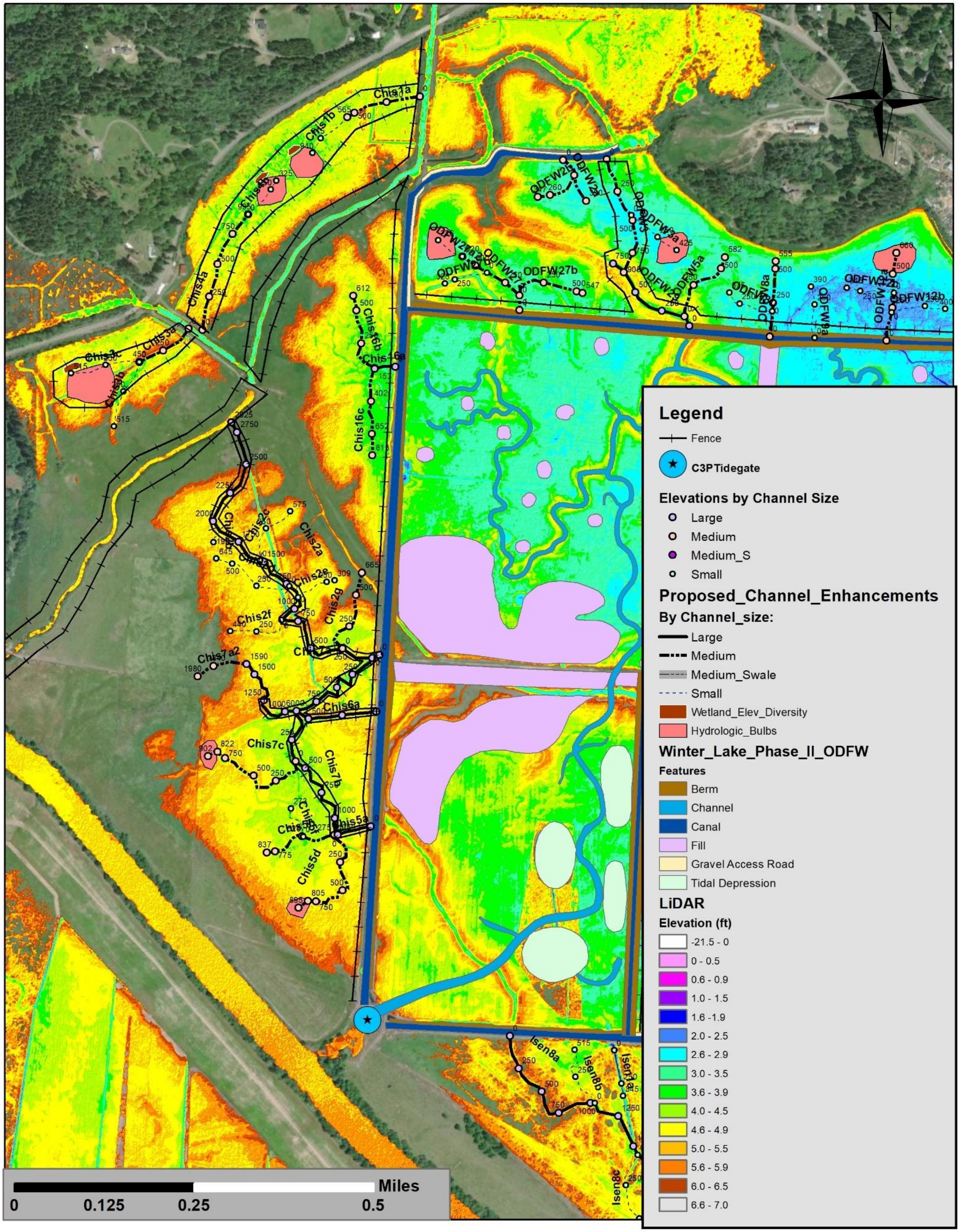
N
Legend
Fence
C3PTidegate
Elevations by Channel Size
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Medium
Medium_S
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Proposed_Channel_Enhancements
By Channel_size:
Large
Medium
Medium_Swale
Small
Wetland_Elev_Diversity
Hydrologic_Bulbs
Winter_Lake_Phase_II_ODFW
Features
Berm
Channel
Canal
Fill
Gravel Access Road
Tidal Depression
LiDAR
Elevation (ft)
-21.5 - 0
0 - 0.5
0.6 - 0.9
1.0 - 1.5
1.6 -1.9
2.0 - 2.5
2.6 - 2.9
3.0 - 3.5
3.6 - 3.9
4.0 - 4.5
4.6 - 4.9
5.0 - 5.5
5.6 - 5.9
6.0 - 6.5
6.6 - 7.0
Miles
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0.125
0.25
0.5
Chis1a
Chis1b
Chis4a
Chis3c
Chis16a
Chis16b
Chis16c
Chis2a
Chis2e
Chis2f
Chis2g
Chis7a2
Chis6a
Chis7c
Chis7b
Chis5a
Chis5d
ODFW27b
ODFW5a
ODFW8a
ODFW9a
ODFW12b
Isen8a
Isen8b
Isen8c

Winter Lake Phase III Project
Hydrologic Assessment

January, 2022

Produced by

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EXECUTIVE SUMMARY

The “Winter Lake” land area is a distinct river adjacent floodplain west of Coquille Oregon. The portion that is east and south of North Bank Lane and south of Hwy 42 bordered by the Coquille River is ~1,873 acres in size. Historically the acres of this unique valley floodplain that lie below elevation 8.0ft NAVDD88 were subjected to regular tidal inflow and outflow. In 1906-1907 the Beaver Slough Drainage District (BSDD) was formed and the Coaledo Drainage District (CDD) some years thereafter. These drainage districts provided social and financial framework facilitating construction of canal networks and installation of large tidegate systems for the properties to be drained. The BSDD installed canals and tidegates in 1908-1909 allowed for drainage of 1,700 acres and the CDD installed the Beaver Creek tidegate that allowed for drainage of the remainder in the early 1900s. The lands prior to conversion to pastureland were forested with wetland tree species with a highly dendritic tidal channel network. As part of the land alterations, interior berms were constructed along pasture and property boundaries with elevation crests of ~5.5ft in order to allow for individual pasture management when water was below that elevation. The land area ownership was originally comprised of multiple individuals and entities and in the early years and land use varied with cultivation of some crops and extensive hay production on higher pastures. Currently the primary use is pastureland grazing and ownership has been greatly consolidated.

In 2017 a largescale restoration project developed by the BSDD, Oregon Department of Fish and Wildlife (ODFW), and The Nature Conservancy (TNC) was implemented in the BSDD, where the four legacy 8.0ft corrugated metal culverts with associated top-hinged wooden tidegates connecting BSDD lands to the Coquille River were replaced with the C3P project (Phase I). The C3P project consisted of construction of seven 10.0x8.0ft concrete box culverts and associated vertical slide-gates and side-hinged aluminum tidegates. In addition, an access road was rebuilt from Hwy 42 and from North Bank Lane, with associated bridges to provide access across existing legacy canals to serve this infrastructure. In 2018 restoration actions (Phase II) installed 31,000ft of sinuous channel on properties upstream of the C3P tidegate referred to as “Unit 2” lands and hydrology was returned to more historical condition within Unit 2 using the Muted Tidal Regulator (MTR) effects that were possible with the new C3P vertical slide-gates.

Upstream of the new C3P tidegate, in Units 1 and 3 and pastures along Beaver Creek in the BSDD and CDD are 42 undersized culverts with a high prevalence in the 2.0-3.0 diameter range. These culverts greatly underserve the tidal inflow/outflow capacity of the new C3P tidegate and the water management strategies outlined under the BSDD Water Management Plan (DWMP). Additionally, the tidal channels that were present historically were largely cut-off when linear field drainage channels were originally laid out. These linear channels were installed with little attention to microtopography, often on property and or pasture boundaries resulting in a number of hydrologic discontinuity issues. The Winter Lake Phase III project is proposing to replace the remaining 42 interior culverts and old style top-hinged tidegates in Units 1, 3, and pastures along Beaver Creek with 38 appropriately sized culverts. Upstream of the new culverts within pastures the project will construct on-grade channels that meet the precipitation hydrology as well as the tidal hydrology of the landscape and the BSDD DWMP. Existing engineering tools (USGS Streamstats) and engineering culvert capacity information were utilized to develop culvert and channel sizing that meets or exceeds the site hydrology and fish passage guidelines for both Federal and State jurisdictions.

I. INTRODUCTION

The Winter Lake floodplain area, at over 1,873 acres, represents one of the largest contiguous land areas in the lower Coquille River Basin with both high potential for providing Oregon Coast (OC) coho overwintering habitat and high-quality pasture grazing. Approximately 1,295 acres within the Beaver Slough Drainage District (BSDD) are below elevation 8.0ft NAVDD 88 and thus below the highest measured tides. The project area is upstream of saline influence at River Mile (RM) 21.5 in the Coquille estuary (*Figure 1*). The current proposed Phase III actions seek to address hydrologic connectivity within BSDD Units 1 and 3 and two pastures, which are 62 and 44 acres respectively in the Coaledo Drainage District (CDD) (*Figures 1 and 2*). Prior to installation of the linear canals and tidegates which eliminated tidal influence in 1908-1909; the lands were forested and contained a dense tidal channel network (Benner 1992). Native salmonids, specifically coho salmon *(Oncorhynchus kisutch)* juveniles, used these habitats heavily during fall/winter/spring months to feed and rear prior to smoltification. The habitats were also highly important for fall Chinook salmon *(O tshawytscha),* winter steelhead *(O. mykiss)* coastal cutthroat trout *(O. clarki clarki),* and tidal outflow from the dendritic tidal network of channels likely provided large quantities of macroinvertebrate food items to in-river native fish.

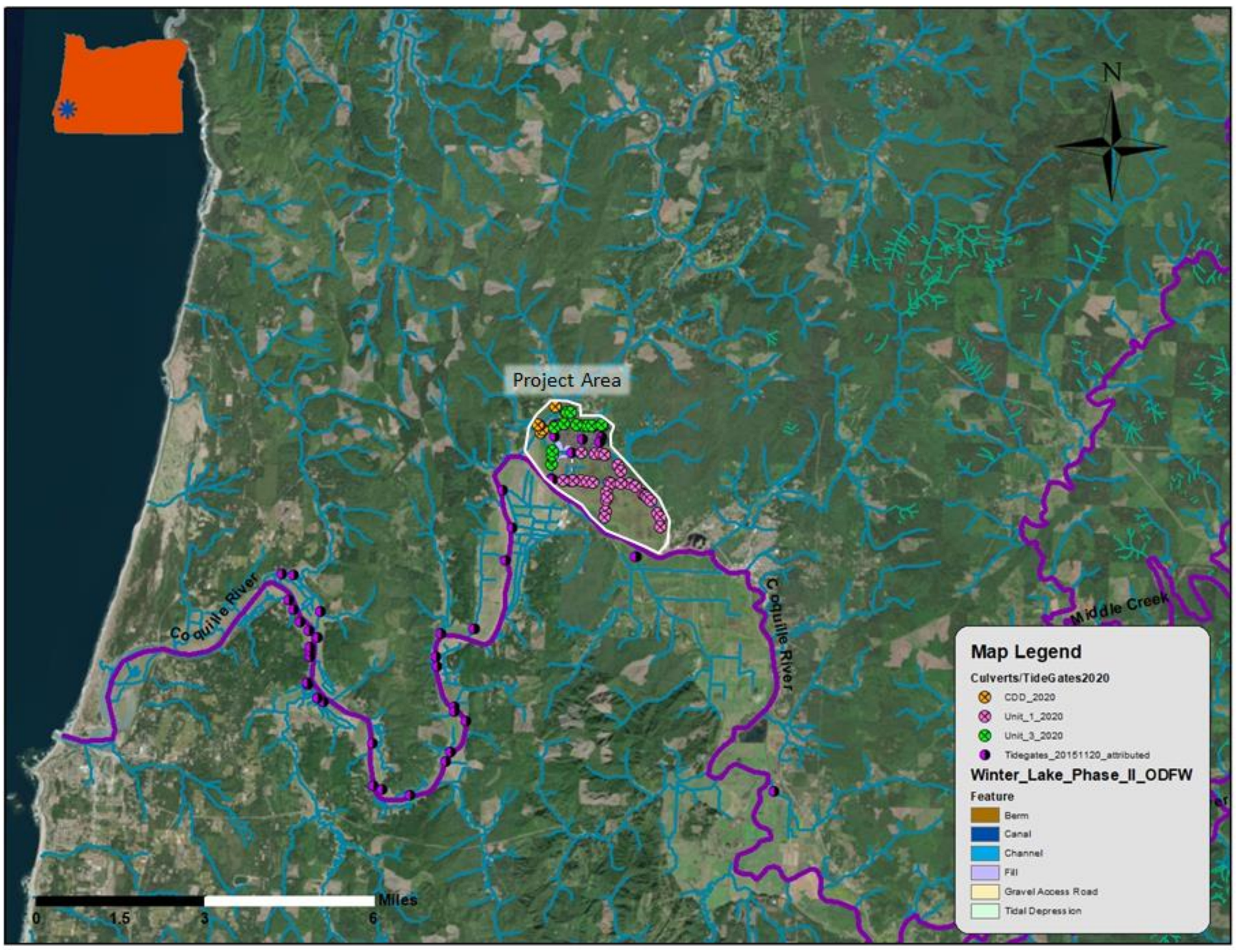

Figure 1. Coquille River estuary with demarcation of the Phase III project area at River Mile 21. 5.

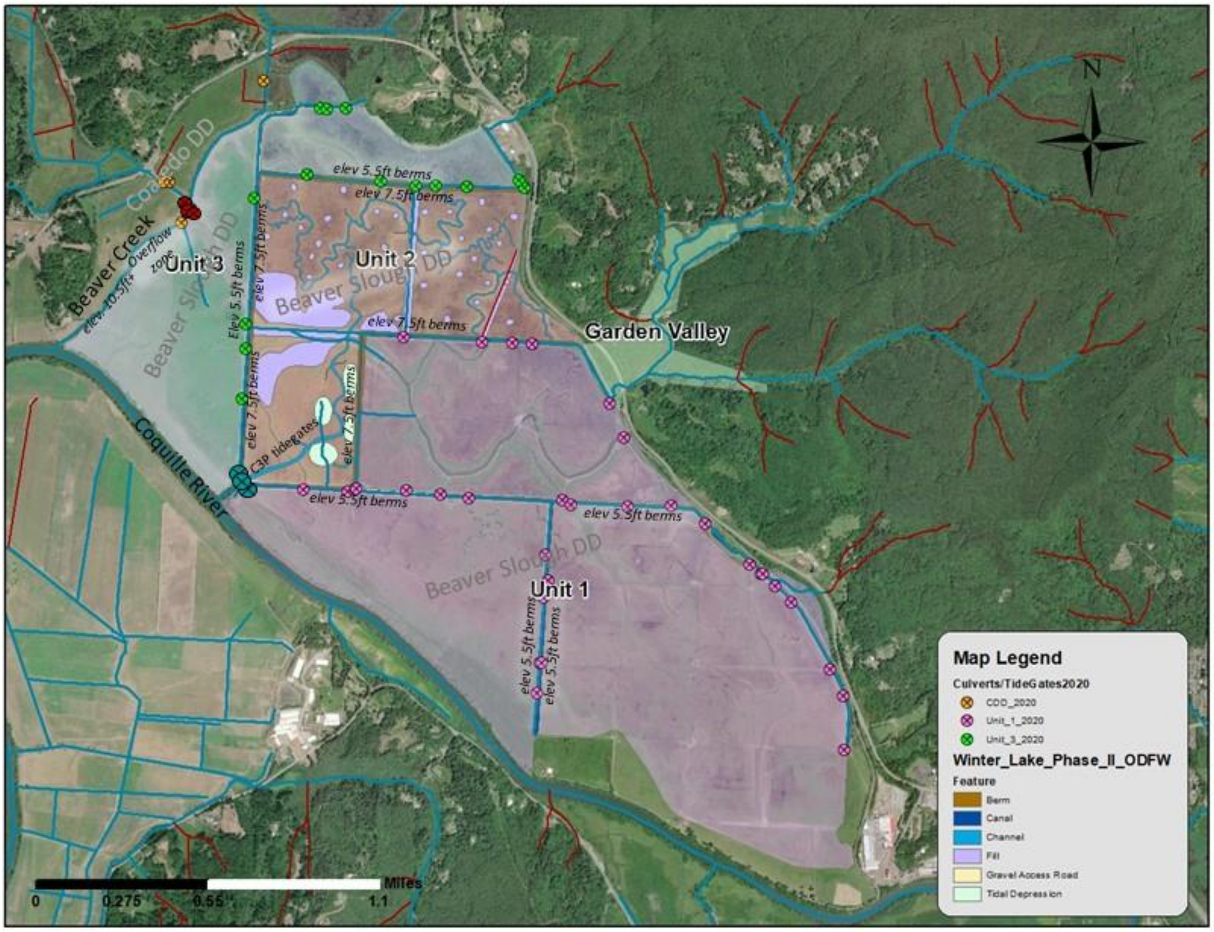

Figure 2. Winter Lake Phase I, II, and III project area and the land management Units within the Beaver Slough Drainage District. Note the two small parcels in the Coaledo Drainage District are immediately to west/northwest of Unit 3 label and are also in the Phase III project area.

II. WINTER LAKE PROJECT BACKGROUND

The “Winter Lake Phase I,” project installed seven new tidegates to replace the four previously existing undersized culverts and top-hinged gates that were failing. The four 8.0ft corrugated metal culverts (CMP’s) were originally installed in the early 1960’s on the stem channel that provides interface of the BSDD floodplain with the Coquille River. These were replaced in 2017 with seven 10.0x8.0ft concrete box culverts. New Vertical Slide Frame Tide Gates (VSFTG) were then installed on the seven concrete box culverts. On three of the VSFTG gates feeding into the BSDD (Units 1, 2, and 3), secondary side-hinged aluminum tidegates (*Figure 3*) were installed to provide a dual water management power-off backup capacity. The slide-gate water control system is currently configured with both manual and remote access control. The seven new culverts with associated tidegates are collectively referred to as the “C3P Tidegate” project. The new tidegates also have the capacity to be operated with Muted Tidal Regulator (MTR) technology, whereby they can be opened to allow for tidal inflow to a set desired level, and controlled by a computer program, which is linked to river/tidal level feedback. The seven new slide-gate tidegates have increased the capacity for water movement into and out of the 1,700acre BSDD by 300%.

The Phase I C3P tidegate construction resolved the problem of hydrologic restriction of tidal inflow/outflow from the Coquille River BSDD main canals that had existed prior to the project. The Winter Lake Phase I project resulted in potential for delivery of large volumes of tidal inflow/outflow. However, while the two main BSDD canals were sufficient in size to carry flow volumes from the new C3P tidegates into the floodplain landscape; water entry from these canals into the interior pasture channel networks within Units 1, 2, and 3 (*Figures 1 and 2*) remained unchanged following completion of Phase I.

Unit 2 lands are owned by the China Camp Gun Club and Oregon Department of Fish and Wildlife (ODFW). The China Camp Gun Club lands are managed for summer pasture grazing and recreational duck hunting during winter months. The ODFW-owned lands comprise 286 acres (northern portion of Unit 2- see *Figure 2*) with the Gun Club accounting for the remaining 121 acres that extend south to the C3P tidegates in Unit 2. In 2018, the Unit 2 restoration project or “Winter Lake Phase II” was implemented and a total of 31,000ft of tidal channel were excavated as designed by ODFW, BSDD, The Nature Conservancy (TNC), and Tetratech Engineering staff, in the 407 acre Unit 2 (*Figure 2*).
The main tidal channel upstream of the C3P tidegates (*Figure 3*) in Unit 2 was designed to have volume capacity that exceeds that of the four concrete box culverts and tidegates which feed into Unit 2. The design was based on the Hydraulic Analysis completed by Northwest Hydrology Consultants (NHC), (see Appendix A). This large channel has facilitated ability to serve water from the C3P tidegates to Unit 2 lands, provide juvenile coho and other native fish passage into the site, as well as provide for pasture irrigation on the China Camp Gun Club property. Hydrologic connectivity provided by the new Phase I and II projects in 2017-2018 is considered fully adequate to provide tidal inflow/outflow into Unit 2. The proposed Phase III project does not include any proposed actions within Unit 2.

The proposed “Winter Lake Phase III” project has been developed by a team of partners including the BSDD, the Coos Soil and Water Conservation District (Coos SWCD), and ODFW. This project is designed to complement the BSDD C3P tidegate replacement project which was completed in 2017. Phase III actions proposed within BSDD Units 1 and 3 include replacement of 42 existing undersized culverts and their associated old-style top-hinged tidegates with 38 new culverts; installation of upgraded water control structures; and redesign of the interior pasture channel network. These project actions are anticipated to maximize hydrologic connectivity, with the goal of achieving a more sustainable balance of fish/wildlife and forage production. We are incorporating designs that meet the ODFW Habitat Mitigation Policy guidelines (OAR 635-415) and National Marine Fisheries Service (NMFS) Tidal Area Restoration Project (TARP) and Standard Local Operating Procedures for Endangered Species (SLOPES V) restoration guidelines.

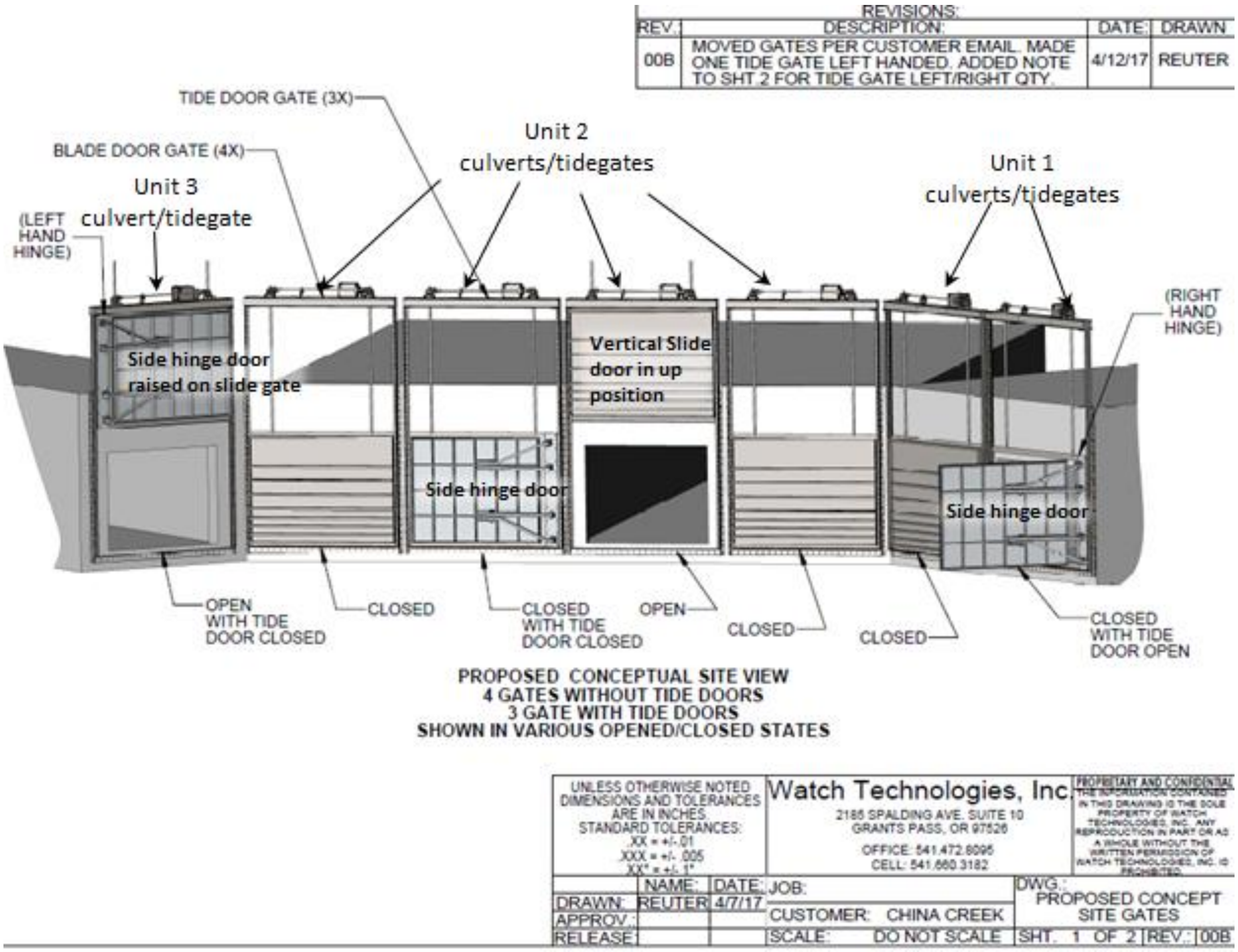

Figure 3. C3P tidegates and 10.0x8.0ft concrete box culverts configuration.

The proposed Phase III project is designed to address current insufficient hydrologic capacity and channel layout issues in both Units 1 and 3 of Winter Lake, and two parcels in the CDD (*Figure 2*). The lands within Units 1 and 3 are actively managed for agricultural production (grazed pasture) during the spring, summer, and early fall months. These lands are, however, considered to have largely unrealized capacity for rearing of juvenile coho during the late fall, winter, and early spring. Water management to date within Units 1 and 3 has relied primarily on linear channel networks that were installed in the early 1900's, with subsequent modifications implemented over time, and maintenance dredging occurring at roughly 15yr intervals to clean sediments that had accumulated in "ditches" or canals.

It is important to note that the individual landowner pastures within Units 1 and 3 are isolated up to elevation 5.5ft NAVDD88 by legacy earthen berms that run along the sides of the major canals (*Figure 2*). Culverts installed through the berms provide for hydrologic connectivity from low water elevations up to elevation 5.5ft, at which point sheet flow begins to overtop the berms. Secondary tidegate water control structures have been installed on these interior culverts to allow landowners the ability to manage water on their individual parcels, up to water elevation 5.5ft. These berms have had little or no maintenance for a number of years, and currently have substantive need for reconstruction and repair. There are five key locations where 100-200ft segments of the berms have been eroded down to heights below elevation 3.5ft. These damaged segments of berm are breached sooner by rising water, disrupting the functionality of individual pasture irrigation inflow management.

The forty-two culverts currently installed within the berms also present a major need for improvement as most are equipped with outdated, top-hinge style wooden tidegates for water control. These interior tidegates present hydrologic discontinuity issues due to being undersized, installed at incorrect elevations, and many are located in sub-optimal areas of topography. These culverts with their associated hydrologic issues impact the pasture channel network's overall capacity to move water efficiently and evenly across the landscape, thereby negatively impacting fish and wildlife values; wetland ecological function; pasture drainage for forage production; and irrigation.

III. KEY HYDROLOGY AND HABITAT CONCERNS

The Winter Lake Phase I C3P Tidegate project completed in 2017 alleviated hydrologic connectivity issues at the connection point between the BSDD overall land area and the mainstem Coquille River. In 2018, the Phase III/Unit 2 "Restoration" project installed over 31,000ft of channel, fully connecting 407 acres of land in Unit 2. The Phase II restoration actions addressed hydrologic discontinuity, limited access for fish, stranding potential, and mosquito production risk.

However, most of the land within Winter Lake Units 1 and 3 upstream of the C3P tidegate in the BSDD, and two parcels in the CDD, were not included in restoration plans for either Phase I or Phase III. These approximately 1,873 acres retain numerous dysfunctional hydrological and habitat attributes for floodplain connectivity, wetland function, and access for a native fish. There are a number of salmonid species including Oregon Coast (OC) coho juveniles; fall Chinook juveniles; winter steelhead outmigrants; and coastal cutthroat trout that would otherwise use these locations during fall, winter, and spring as temperature regimes are within preferable range. In addition, the limited hydrologic capacity/connectivity leads to poor functionality in regard to water management capability for irrigation.

A. Subsidence:

It is important to visit the issue of subsidence through time. Removal of water in 1908-1909 through tidegate installation and canal construction effectively reduced the average summer water table by around 5.0ft. Through millennia prior to 1908, soils on the floodplain forested tidal wetland developed with deposition of sediments during flood events that flowed to the extent of a highly dendritic channel networks. Not all sediment was deposited through tidal channels. A large overflow channel directly entering the Winter Lake floodplain from the Coquille River was also diked in the mid-1900s, which has prevented heavy influx of turbid waters.

No less important to subsidence has been the oxygenation of the highly organic soils, which has allowed bacterial digestion similar to a compost pile. When the wetlands were drained in 1909 thousands of years of carbon rich leaf litter from trees, layers of detritus, such as slough sedge, rushes, and other wetland plants that had reached maturity in the late summer each year, and then fallen into water directly or on the forest floor were incorporated into soils. This resulted in a very carbon rich soil profile and the constant tidal inundation resulted in limited levels of oxygen in the soil to support bacterial decomposition. Soil layers in the top 5-8ft may have been 60%+ carbon prior to dewatering. Accordingly, once dewatering allowed for oxygenation bacteria would have been able to use this carbon for energy. This condition is very prevalent in the farmlands around San Francisco Bay, where some locations have subsided over 20ft. The current condition at the Phase III project area is that the soils have likely subsided in some locations greater than 3.0ft. Subsidence has not been uniform across the floodplain and thus there are locations where water currently struggles to drain as shallow depressions are now present. Subsidence has complicated fish ingress/egress and pasture management.

B. Hydrological Issues:

1. Channel Discontinuity:

Discontinuity of channel networks due to the original historic construction of linear “ditches” in 1908-1909, which redirected flows from the sinuous native/natural channel flow paths. This results in the inability for tidal inflow/outflow to move into and out of the floodplain pastures properly.

2. Insufficient Fish Access:

Insufficient interior channel network density/acre and average channel depths in Units 1 and 3 to provide access routes for juvenile fish to feed and find sufficient depth refugia. This condition results in limited utilization of large portions of the floodplain by juvenile OC coho, except when water levels exceed roughly 3.0ft above pasture elevations.

3. Fish Stranding*:*

Low-lying land areas within individual pasture ownership that are disconnected from channel networks, which results in water retention or “ponding” when flood levels decline and resulting in high stranding risk for juvenile coho on the floodplain.

4. Restriction of Tidal Flow:

Undersized culverts connecting to the main canals within Units 1 and 3 and the CDD pastures that restrict proper tidal/flood-flow and underserve hydrologic connectivity/irrigation needs in the period when salmonid fish would use the habitats and pasture production months.

5. High Invert:

Culverts were in many locations installed with an invert elevation inappropriately high, which results in a condition where pasture channel networks at early winter water elevation levels are disconnected from main canals resulting in delayed ability for fish to enter the floodplain and resultant increased potential for stranding and predation.

6. Top-Hinged Tidegates:

Top-hinged tidegates on the existing interior culverts upstream of the C3P tidegates that are difficult to manage in the open position (Figure 4). This results in restriction of fish movements from the canals into pasture floodplain channels where food availability is higher and competition with non-native fish lower.

7. Channel Grades:

Channel networks that were not constructed on-grade and thus do not allow for sediments to be transported properly, resulting in premature accumulation, limited connectivity for fish movement, and poor drainage for landowners. Limited excavation/maintenance through time to compensate for the poor sediment transport capacity of these historical designs has led to sediment accumulation restricting inflow/outflow of these interior channels. Reconstruction or new construction is now needed to achieve the desired capacity and functionality.

8. Underserved Acres:

Poorly located linear channel networks that do not follow land elevation hydrologic paths and undersized segments, with both insufficient volume capacity, length, and or routes to provide connectivity to hundreds of acres of agricultural pastures within the BSDD resulting in highly limited ability to utilize the capacity of the new C3P tidegate for irrigation.

9. Nonnative Fish:

The main large canals are sufficiently large to serve C3P inflow/outflow capacity, however, Units 1 and 3 currently do not have ample channel lengths and volumetric capacity of interior pasture channel networks. This condition results in extremely limited ability to exchange volume when tidal influence is induced at the C3P tidegate. Resultantly, non-native fish including bullhead catfish, yellow perch, black crappie, bluegill, and mosquitofish are accommodated by the relatively slack water conditions within the canals that serve Units 1 and 3. This project will allow much greater exchange of volume in those canals reducing ecological dominance of species that are not native and move conditions towards native fish.

10. Water Quality:

The pastureland channel networks are insufficient in density and network layout to properly move water with the tidal inflow/outflow from the main C3P tidegates to manage water quality. Currently water will enter a channel and stagnate for long periods until a high flow event (Fall/Winter) or an irrigation event. Resultantly, dissolved oxygen levels deteriorate, and aquatic production reflects this poor habitat condition in affected areas. Water quality in late spring/summer/fall is largely a function of water movement into the canals and pasture channel network on incoming tide through water delivered from C3P tidegates and then outflow following high tide. Reconstructed/new channels will eliminate this issue as it will provide for direct connectivity to regular tidal inflow/outflow management at the C3P tidegates and much greater volumetric exchange of water.

11. Subsidence*:*

Two factors have contributed to subsidence of the floodplain pastures on the BSDD and CDD: 1). The historical input of sediments annually through floodflow delivery was essentially eliminated in 1909 with installation of tidegates that were not able to be opened during winter; and 2) Drying of the landscape through tidegate installation that allowed for bacterial digestion of the organic (carbon) components that comprised what were relatively peaty soils prior to 1909. Currently the C3P tidegate has restored a notable ability to deliver sediment laden floodwaters to the main canal networks. However, pastureland interior channel networks are greatly undersized, without divergences into large sections of pastures, and interior channels are linked to main canals with insufficiently sized culverts. Resultantly, the network is unable to provide for inflow of sediment rich waters to pastures reducing further subsidence and restoring this natural process.

12. Pasture Residual Water:

Channel networks that do not connect to low-lying areas properly resulting in long periods of standing water reducing pasture grass production during spring drain-out and early summer.

13. Improper Location:

Channel networks that are not located properly for individual pasture drainage/irrigation, resulting in over/under-watering of individual landowner pastures.

14. C3P Duration of Door-Open Condition:

The current interior pasture channels capacities are insufficient by several magnitudes to provide inflow volume capacity that allows a substantive timer period for inflow filling of the network prior to water reaching pasture elevation. With the C3P tidegates adjusted to allow for tidal inflow, the amount of water and the quantity of time from low tide to field height elevation is linked to the volumetric capacity of the canals and interior pasture channel networks. Increased channel capacity will allow for opportunity to keep the tidegates open a greater amount of time prior to water entering the pastures and impacting other land management needs. This duration when channel networks are able to absorb inflow is important within the DWMP for increasing the duration the slide-gates are open and fish can ingress on the incoming tide.

Figure 4. Typical top hinged flapper tidegate style currently used within Units 1 and 3.

C. Water Management:

NOTE: *The historically installed infrastructure (main tidegates and interior culverts and channels) have been used to provide both drainage and irrigation function since installation in 1909. Irrigation function has been used by ranchers within the BSDD consistently over the past 100+ years through opening of tidegates and allowing tidal inflow into pastures on high tide cycles. The new C3P tidegates installed in 2017, greatly enhanced irrigation inflow potential at the main tidegate network. Native fish have adapted to both tidal and floodwater inflow regimes. BSDD irrigation tactics utilize tidal inflow, which is a natural hydrologic pattern within native fish adaptive behavioral capacity. Native fish have used inherent adaptive genetic traits to react to tidal/floodwater cues that allow movement into floodplain habitats and retreat to channels following relatively short (6hr tidal cycles) inundation periods. Irrigation is implemented from mid-June to mid-September for the individual pastures over one to three days monthly. Coho juveniles are smolted and entering the ocean prior to the summer irrigation period. Salmonids are essentially absent from the BSDD canals and the mainstem Coquille River during summer months due to canal and river temperatures that have been measured as high as 80°F and 76° respectively. Irrigation utilizing tidal inflow during summer, is therefore considered to be companionable with the natural life-history of native fish that are present; and native salmonids are unlikely to be present during the months when irrigation is implemented within the project area.*

The Coquille River has a natural levee that developed over thousands of years as higher sediment deposition occurred in the first 100-350ft adjacent to the river channel with decreasing unloading as the floodplain extends to the north. The natural levee runs from the toe of a large point just west of Coquille on the north side of the river to the Beaver Creek natural levee ~13,600ft downstream. There are two channels that currently enter the main Coquille River through the natural levee that hydrologically connect the Winter Lake floodplain: the BSDD channel at the C3P tidegates and Beaver Creek. This levee has facilitated the ability to manage tidal water elevation within the Winter Lake floodplain up to elevation 10.5ft NAVDD88 through use of the C3P tidegate and CDD tidegate on Beaver Creek. At elevation 10.5 river waters overtop the Beaver Creek dike *(Figure 2*) and flows overland into the Winter Lake floodplain.

Tidal elevations observed in the mainstem Coquille River are softened by the riverbank friction in the length from the ocean to RM 21.5 where the C3P tidegate channel enters the main Coquille River. Despite this effect the tidal signal is substantial and generally ranges from a low of around +1.5ft on the lowest tides to highs at the C3P channel of 8.5+ft (See Northwest Hydrology Consultants "Hydraulic Analysis" in the BSDD Water Management Plan (DWMP) Appendix A)). Tidal signal is highly related to river flow and when precipitation events raise river flows the tidal signal is also dampened. River levels are able to exceed elevation 16ft NAVDD88 when major flooding events occur.

Up to elevation 10.5ft the C3P tidegates are able to resist inflow and provide water management of BSDD floodplain pastures of which ~1,295 acres are <8.0ft in elevation *(Figure 5)*. The C3P tidegate operations and water management goals within the District are based on the needs of both the upstream landowners and fish and wildlife goals, which are defined in the BSDD DWMP. The lands upstream of the C3P tidegates and the 39 BSDD culverts addressed in this **Hydrologic Assessment** are <u>subservient</u> to water management at the C3P tidegates and the BSDD DWMP, which has been reviewed and approved by the National Marine Fisheries Service (NMFS) and ODFW Fish Passage staff during the Winter Lake Phase I and II permitting process. The BSDD DWMP strategies for Units 1 and 3 are structured around seasonal agriculture pasture grazing and fish/wildlife needs with the following operational goals (*see Table 1*):

- *Winter Habitat Elevation Level:* November to March; transition in April-May
- *Spring Drain-out:* April to May
- *Summer Low Elevation:* June to October; transition in October-November

NOTE: *Individual landowners have plasticity under the District Water Management Plan to operate internal water control structures in transition periods for pasture management needs. The three culverts that will be addressed in the CDD are not under a Water Management Plan and are upstream and subservient to the Beaver Creek tidegate.*

Table 1. Beaver Slough Drainage District Water Management Plan (DWMP).

BEAVER SLOUGH DRAINAGE DISTRICT - OPERATING PROTOCOLS					
SEASON	**UNIT**	**WATER LEVEL**	**TARGET ELEVATION RANGE**		
WINTER - Oct to Mar:					
	Units 1&3				
		Basic Flush Level until first flood event or cattle are pulled	3.0	to	3.5
		After first flood event transition to Over Winter Habitat Level	4.5	to	5.5
	Unit 2				
		Complete transition to Over Winter Habitat Level	4.5	to	5.5
SPRING DRAIN OUT – Apr to May:					
	Units 1&3				
		Maximum Dry Out – maximum elevation	2.0	to	4.0
		Transition to Basic Flush Level as conditions allow	3.0	to	3.5
	Unit 2				
		Transition back to Basic Flush Level	3.5	to	4.0
SUMMER – Jun to Sep:					
	Units 1&3				
		Complete Transition from Maximum Dry Out to Basic Flush Level	3.0	to	3.5
		Irrigation Level – Every 10 to 14 days as per coordinated request from landowners	4.0	to	4.5
	Unit 2				
		Basic Flush Level	3.5	to	4.0
		Sept to October begin transition to Over Winter Habitat Level	4.5	to	5.5

1. Water Elevation Management:

***NOTE**: there currently are locations where the interior berms in Units 1 and 3 are below elevation 5.5ft NAVDD88 and in need of repair. This section discusses the water management goals with berms reconstructed to the goal height of elevation 5.5ft. The CDD tidegate (Figure 3) on Beaver Creek consists of three 6.0ft CMP's with top-hinged tidegates. There is no MTR capability at that site thus water is managed for Drain-out only. At the BSDD C3P tidegates water is able to be managed for Drain-out and inflow. At C3P VSFTG's are able to be opened to allow for inflow or outflow and secondary side-hinged aluminum tidegates allow for outflow only.*

a) When floodwaters are above elevation 10.5ft NAVDD88 water moves up Beaver Creek and subsequently flows over the low portions of the Beaver Creek levee just downstream of the CDD tidegate then moving across the pastures. At this elevation

Units 1, 2, 3, and the CDD are hydrologically connected in a lake like condition *(Figure 2)*. *(Berms that isolate Unit 2 were reconstructed to elevation 7.0ft in 2018; and berms around individual water management pastures in Units 1 and 3 are elevation 5.5ft or lower).*

b) As floodwaters recede below elevation 10.5ft the natural river levee along the Coquille serves as hydrologic control. The C3P concrete box culverts/tidegate outflow control point is through this levee and when river levels are below 10.5ft C3P is at an elevation sufficient to allow for management of water in the BSDD. From elevation 10.5ft and lower the BSDD is separated from the CDD by the natural levee along the west side along Beaver Creek (Figure 2). From 10.5ft as water recedes to elevation 7.0ft (Unit 2 berm height), Units 1, 2, and 3 are remain connected within BSDD, however, BSDD is disconnected from CDD at 10.5ft.

c) With water levels from elevation 7.0ft to 5.5ft Unit 2 is isolated from Units 1 and 3. As Unit 2 is located between Units 1 and 3 there is thus no longer connection of Units 1, 2, or 3 hydrologically below elevation 7.0ft *(Figure 2)*.

d) Below elevation 5.5ft the interior berms in Units 1 and 3 allow for individual water management on the various pastures using the interior pasture culvert water control structures and channel networks *(Figure 2)*.

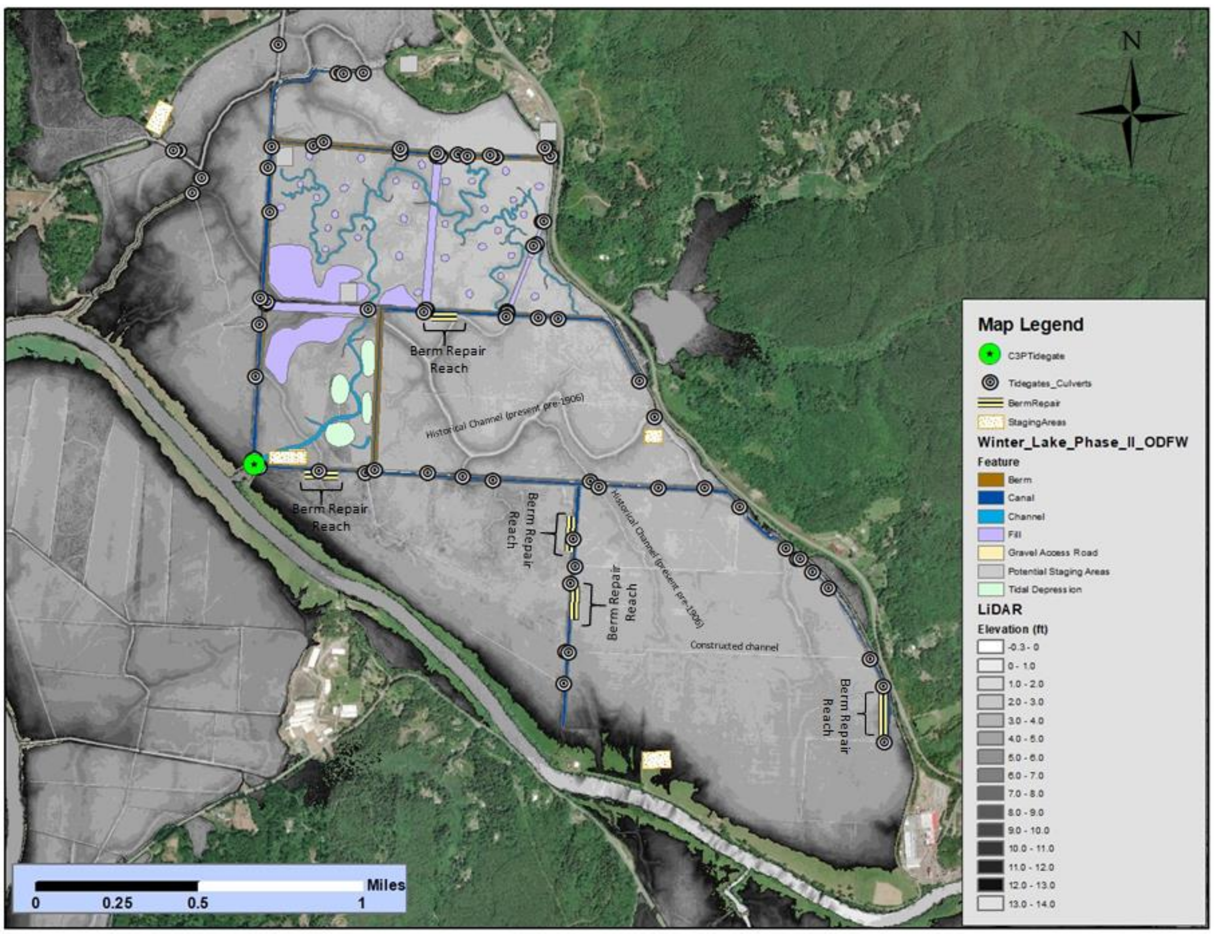

Figure 5. LiDAR elevational map and locations where berm reconstruction is needed. Grayscale depiction allows for historically installed linear pasture drainage channels to be visible.

D. Pasture Drainage Management:

NOTE: *In regards to Interior Pasture Culvert capacity it is important to keep in mind that above elevation 5.5ft water is able to move laterally over berms within the various pastures and into canals in Units 1 and 3 without dependence on or control through culverts and associated water control structures. This allows for large flood inflow/outflow volume movement independent of the culvert infrastructure when water is above elevation 5.5ft. The sizing of culverts and channels is: 1) In order to provide for fully adequate connectivity of pastures and canals below elevation 5.5ft; 2) To provide fully functional fish passage that meets State and Federal criteria in periods when water is restricted to movement through the Unit 1 and 3 culvert network below elevation 5.5ft.*

Water that is moved into the interior landscape from the C3P tidegate enters pasture floodplains through the existing undersized culverts that penetrate through earthen berms up to elevation 5.5ft whereas water is then able to sheetflow over berms. Currently the channel networks and undersized culverts connecting these channels do not provide capacity and connectivity that serves fish/wildlife and landowner needs. We have sized the new culvert infrastructure to respond to the inflow/outflow stimulus as river levels or tide levels are managed at the C3P tidegate. In the spring period when there is a strong need to provide pasture Drain-out for forage production, the proposed project will reduce the length of time needed to accommodate dewatering of pastures, which will be line with agricultural production goals.

E. Irrigation Management:

Irrigation for individual landowner pastures within Units 1 and 3 is incorporated in the period of June through September. Higher tide cycles associated with the moon phase are used to push water into the main canal networks, which is delivered to pastures through manipulation of individual water control structures on culverts through the interior pasture berms. Irrigation is able to be delivered when tides are generally above 4.0ft in elevation, through the peak of the tide. As tides subside water moves from pastures through sheetflow and the insufficient channel networks to the main canals and then back to the Coquille River through the C3P tidegate box culverts. Irrigation is generally for very short periods, e.g. three high tides over a three day period once a month. This equilibrates to roughly 6.0hrs of water delivery on a high tide cycle for three high tides over three days or a total of 18.0hrs of irrigation water delivery per month. When evaluated for the percent of hours per month that irrigation occurs, roughly 2.5% of the hours would be associated with inflow with another 6.0hrs for outflow/Drain-out or roughly 5.0% of the total hours per month. On an annual basis irrigation delivery including both inflow and outflow would account for 18hrs per month x 4 months or a total of ~72hrs per summer out of 8,760 hours per year or 0.8% of the period that fish would need to enter or emigrate from pasture channels. Flow velocities through interior culverts during irrigation events will potentially exceed 5.0ft/sec. However, due to the very limited duration annually that irrigation would be implanted and the period of year irrigation would occur, which is not a period when native migratory fish are present, we propose that the Phase III culvert sizing will meet Federal and State criteria in regards to irrigation management.

F. Culverts and Tidegates:

Historically, culverts on the project area were installed with undersized capacity for various reasons, however, often due to lower cost. There have been negative legacy effects during winter flooding for fish passage and subsequent extended drain-out in spring due to undersizing, which impacts pasture grass production. The Phase III project is designed to address the hydrologic capacity limitation associated with the culverts that are currently in place. Of the numerous channels proposed, four will also be realigned to reduce the overall culvert number needed from the current 42 to 38 through channel network consolidation. Old-style flapper tidegates predominate currently *(Figure 4)*. These will be replaced with either slide style vertical knife gate water control devices or side-hinged aluminum tidegates with a device to maintain the door open as desired. The BSDD DWMP dictates the water management strategies (Appendix A). This DWMP provides for a high degree of access for water and fish from the mainstem Coquille River during winter months. Landowners are on board with managing interior pasture channel culvert water control structures from November 1 to March 30th in alignment with the BSDD DWMP and needs for fish access and floodflow hydrology.

Note: *The BSDD DWMP provides for individual landowners to have individual water control structure management flexibility during April-May Drain-out and the pre-winter October transition period.*

G. Channels:

The existing channels in Units 1 and 3 were installed in the 1908-1990s without: a). Design that was based on microelevation topography on the landscape from interior pasture locations to delivery points with main canals; b). The drainage channels are linear along pasture or landowner boundaries; c). Channels were not constructed on grade, which promoted sediment accumulation rather than transport from deposition location downstream to main canals and to the mainstem Coquille River. *Historically, natural channels formed with on-grade morphology and transported sediments prior to installation of tidegates*; d). Channels were constructed with vertical side-wall form that accelerated natural sloughing and cattle hoof action soil deposition into the channels reducing their capacity to transport water.

These above noted factors, which are highly prevalent for existing channels in Units 1 and 3 have resulted in widespread hydrologic discontinuity, poor access for juvenile native fish to enter and leave pasture habitats, and poor drainage for production of pasture grass. There is high inherent potential for fish production within Winter Lake Units 1 and 3; however, their current hydrologic disconnection yields the issues noted in the previous ***Key Hydrology/Habitat*** section. Difficulty with obtaining permits has contributed to inability to conduct excavation maintenance in the past twenty years. Thus, for channels that were not on-grade and without proper hydrologic inflow/outflow to transport sediments (nearly the entire network) there is currently a condition where interior channel networks are clogged with sediment and vegetation and in need of reconstruction.

H. Interior Berms:

From 1908 until the mid-1990's interior berms were constructed utilizing the spoils from channel cleaning. These berms were built upstream of the C3P tidegate along the banks of the main north-south and east-west canals *(Figure 2)*. Berms have generally been elevated to 5.5ft NAVDD88, however, vary somewhat depending on the landowner/location with some short segments a bit higher. The berms in Units 1 and 3 historically provided secondary interior protection from tidegate leakage that occurred through the main CMP culverts and top hinged wooden tidegates draining Units 1, 2, and 3 into the mainstem Coquille River. Since the C3P tidegate Phase I project was installed there has been little or no leakage at the main tidegates. Culverts through interior berms predominantly have top hinged flapper style water control structures in use for providing secondary tidal inflow management. Despite the new functionality of the C3P tidegates in controlling water, the interior berms continue to have strong utility for providing water management during the late spring and early summer during Drain-out. In summer months these berms provide the ability to provide individual pasture irrigation management using the culvert and tidegate networks that enter pastures to deliver water where needed and prevent water entry into locations where livestock are grazing.

IV. WINTER LAKE PHASE III: PROPOSED PROJECT ACTIONS

A. Culvert Replacement*:*

Replacement of 38 of the existing 42 undersized pasture channel culverts and elimination of 4 on the BSDD and CDD project area. At one location, where the Messerle pasture road accesses the Winter Lake floodplain from Hwy 42, a culvert will be replaced with a bridge *(Figure 5)*. The remaining four culverts and their associated tidegates will be removed and consolidated within the remaining reconstructed 38 channel networks. The location of entry for six of these pasture channels and associated culverts to main canals will be moved in order to better configure the interior channel network to landscape topography and ground elevations. Culverts will be primarily HDPE.

B. Hydrologic Connectivity/Drainage Management:

Interior culverts and channel networks are critical for both providing adequate hydrologic connectivity to serve fish/wildlife and landowner pasture production needs. The 38 proposed new culverts have been sized to serve both water inflow and drain-out on the floodplain in order to meet both these goals. Fish access and pasture management are currently in a "poor" functional condition as ingress/egress for fish is limited and ranching operations are hurt by long durations of residual water in pasture areas that prevents proper grass growth. Water movement response time due to interior culvert and channel constrictions fails to properly reflect inflow/outflow from the C3P tidegate operations.

C. Pasture Irrigation:

There will be 12-15 irrigation management and cattle crossing culverts installed in addition to the main 38 pasture channel culverts. These will be interior to the 38 pasture channel culverts and will be sized according to equal or exceed the flow volumes at the points of the crossings. They will not restrict volume that is delivered to these deep pasture locations from the 38 downstream main pasture channel/main canal connecting culverts. As these deep interior cattle crossing culvert will meet or exceed water delivery volumes at the installation point they were not relevant for the Hydrologic Assessment calculations in relation to the C3P tidegates. These will be installed at pasture-to-channel junction points in order to provide for the ability to manipulate water into desired pastures during summer irrigation. These pipes will have associated slide/knife gate water control structures. They will be sized according to the location in the channel network based on the same methods as the main 38 channel culverts (described in Methods section). Exact locations will be finalized upon channel layout prior to construction. The water control structures will be managed to default of open, except when irrigating during high tides in summer months.

D. Water Control Structures:

The project is planning on replacement of tidegates on the 38 interior culverts with either: a). Side-hinged aluminum tidegates (Appendix B); with door brace for managing in the door open position b). Water control slide/knife gates operated manually through screw drive and wheel (Appendix B); or c). Other water control structures such as baffles or louvered gates. The individual water control types will be operated similarly and open as prescribed under the BSDD DWMP.

Note: *The team recognizes that ODFW and NMFS will have a requirement to review design drawings of non-traditional water control structures prior to approval and perhaps inspect function of a scaled down prototype model. Non-traditional water control structures will not be installed on the project until that threshold has been met in order to ensure agency staff approve that they can meet or exceed both State and Federal fish* *passage guidelines. Until that threshold has been met only traditional water control structures will be installed on the project area.*

E. Channel Reconstruction:

The Phase III project proposes reconfigure/reconstructing ~29,981ft or 5.7 miles of existing tidal channel *(Figures 6, 7, and 8)*. The majority of interior pasture channel networks are linear as is visible in Figures 5 and 6 that show the LiDAR elevations. These historically constructed channels were installed without attention to grade and inhibit the ability for fish to move successfully to and from the river without becoming vulnerable to stranding in low-lying pasture locations. This issue currently limits the use the pasture channel network by OC coho juveniles during the important fall/winter/spring rearing period.

F. New Channel Creation:

The project is planning creation of 74,670 ft or 14.1 miles of new tidal and tidal swale channels in Units 1 and 3 *(Figures 6, 7, and 8)*. These channels will encompass lessons learned from Ni-Les'tun and Unit 2 restorations including using on-grade design and bank sloping that maximizes edge habitats in order to:

- provide depth refugia for native salmonids in winter and native resident fish in summer months,
- contribute to greater utilization of the project area by juvenile coho, through increasing channel distribution on the landscape and capacity for fish penetration into the floodplain.
- provide adequate volume capacity for: **a).** A hydrologic connectivity relationship that more closely mimics water inflow/outflow management at the main C3P tidegate; **b).** Capacity that adequately provides for rain and floodwater outflow/drainage below elevation 5.5ft; and **c).** Capacity that provides for delivery of summer irrigation flows.

G. Interior Berms:

Interior pasture berms will be reconstructed to elevation 5.5ft NAVDD88 in locations where they have degraded *(Figure 5)*. Spoils from channel construction will be used to bring these locations into functional condition in order to allow for individual pasture/landowner water management up to elevation 5.5ft.

H. Habitat Uplift:

The Phase III project will incorporate a number of additional habitat uplift benefits. While these are not related to hydrology it is important to note that they will increase ecological functionality of the floodplain and reduce the potential that channels will reaccumulate sediments. These actions are more fully addressed in the Phase III project DSL/USACE 404 fill and removal permit. Proposed Phase III project actions that are designed to greatly enhance ecologic uplift include: Fencing, skip planting of trees, more appropriate channel construction bank sloping, installation of channels into current areas where fish are stranded, and other measures are noted in *Appendix D, Table 1*. The Phase III project goals include:

- Restoration of more natural fish passage from canal networks into secondary channel networks and pasture floodplain habitats.
- Increasing the quantity of water exchange as the new volume capacity of the interior pasture channel networks will provide for more inflow/outflow with main canals and the Coquille River, thus improving oxygenation.
- Improving the processing of livestock nutrients. New channels are designed with 1:1 (main channels), 2:1 (medium channels), and 4:1 (pasture swale channels). This side-sloping will

provide for greatly reduced bank erosion over traditional channels. The bottom and side slopes will be planted with a pasture seed mix. Roughly 60-70% of the channel surface in the upper 2/3 distance of these channels will be at an elevation where grasses will grow providing filtering of livestock nutrients during outflow from pasture floodplains.

- Improving the irrigation capability of the interior channel network as appropriately sized culverts feeding interior pasture channels will allow for greater volumetric delivery of water to irrigate pastures during single high tide events.

V. METHODOLOGY-Background

For any culvert or bridge replacement there is the need to determine the capacity of the new structure to accommodate the upstream flow volume that will be produced through precipitation or groundwater input. Many project sites feature naturally-formed channels that have developed morphology reflecting the hydraulic forces of the flow volume, slope, geology, and vegetative potencies. Channel size for a given watershed directly reflects the volume of water and the above noted factors. Tidal hydraulics, where the land area is well below the higher tide amplitude, result in a condition where tidal forces tend to dominate the hydraulic forces that contribute to channel evolution.

Prior to human manipulation, the Phase III project area had a dense network of channels that formed from both upland precipitation and geology, with tidal forces dominating in the lower elevations of the project area. Before the land was cleared of forest and developed into pasture, the tidal channels that were present ran largely north-northwest into Beaver Creek, where water was then transported southwest to the Coquille River. Through a combination of human intervention, hydrologic modification, and the installation of tidegates, these tidal regime forces were eliminated.

The original native channels were excavated through hand, horse, and steam powered equipment in 1908-1909. In 1908-1909 the drainage networks were circumvented for the BSDD portion of Winter Lake and converted into linear networks. The main exit point for the BSDD 1,700 acres was realigned and a new outlet was excavated through the relatively high river levee of the Coquille River at RM 21.5, where the C3P tidegate now currently exists. Channels on site currently reflect these excavated networks.

The large canals of Unit 1 and 3 were dredged with steam driven shovel methods. The canals size and capacity were more than adequate to transport rain and floodwater delivered from the pastures downstream. However, until Phase I was initiated in 2017, there was a large restriction of flow through both the original 1909 concrete culvert and its associated tidegates, and the four CMP's that were installed in the 1960's at the main Coquille River juncture. Interior pasture culverts have continuously been undersized since 1909. The 42 interior pasture culverts (39 in BSDD and 3 in CDD) that will be addressed through Phase III were essentially the best infrastructure affordable and available historically for the goals of ***a)*** agricultural production of pasture grass; and ***b)*** removing water in the late spring and early summer from the pastures to allow access for livestock grazing.

The installation of the new C3P tidegates in 2017 further illuminated the insufficiency of the interior network. The upgraded capacity and control to allow for inflow/outflow of tidal and floodflow to the main canals and interior pasture channels increased by 300% over the original 8.0ft CMPs that were replaced. The main north-south and east-west canals have been tested since the installation of the C3P tidegate and are considered fully sufficient in size to transport flows that are able to be delivered from the new slide-gate style tidegates. However, there remains a substantive bottleneck for volume delivery to the interior floodplain due to the 42 undersized culverts that currently connect pastures to the main canals.

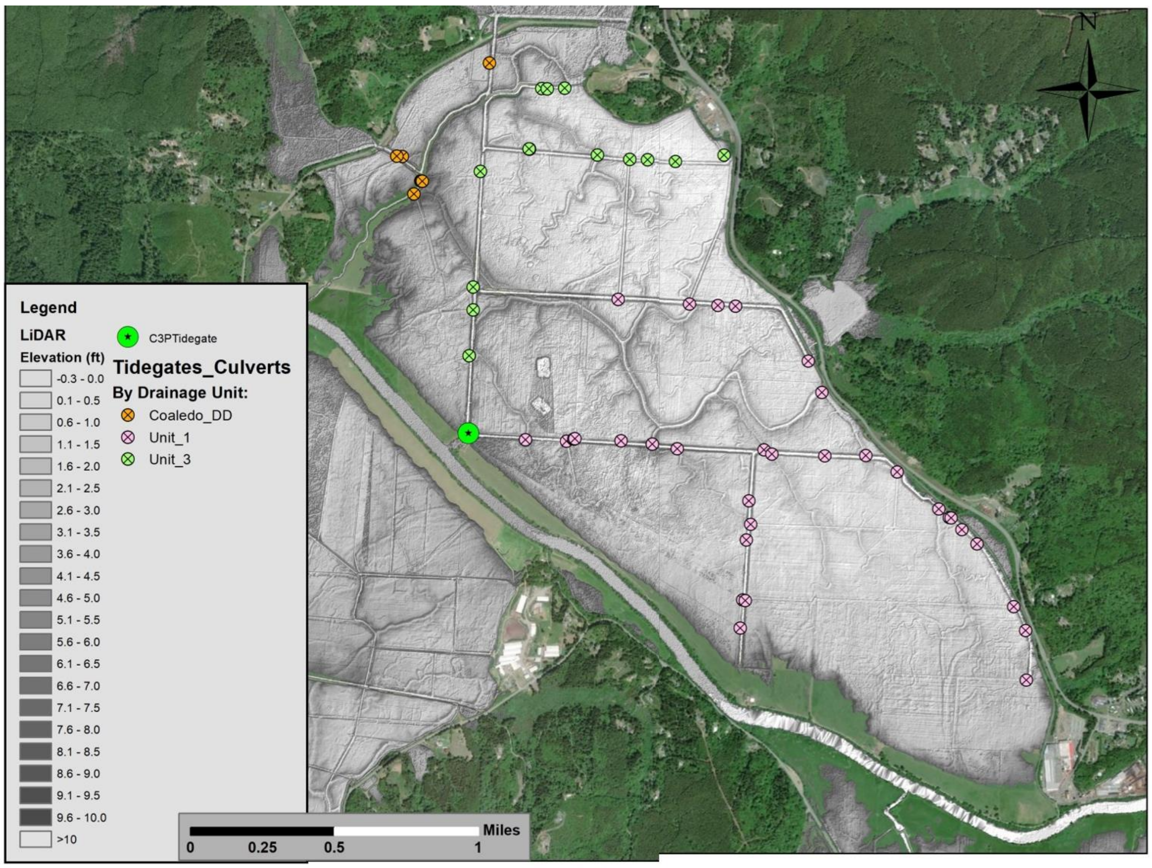

Figure 6. Grayscale Hillshade LiDAR imagery

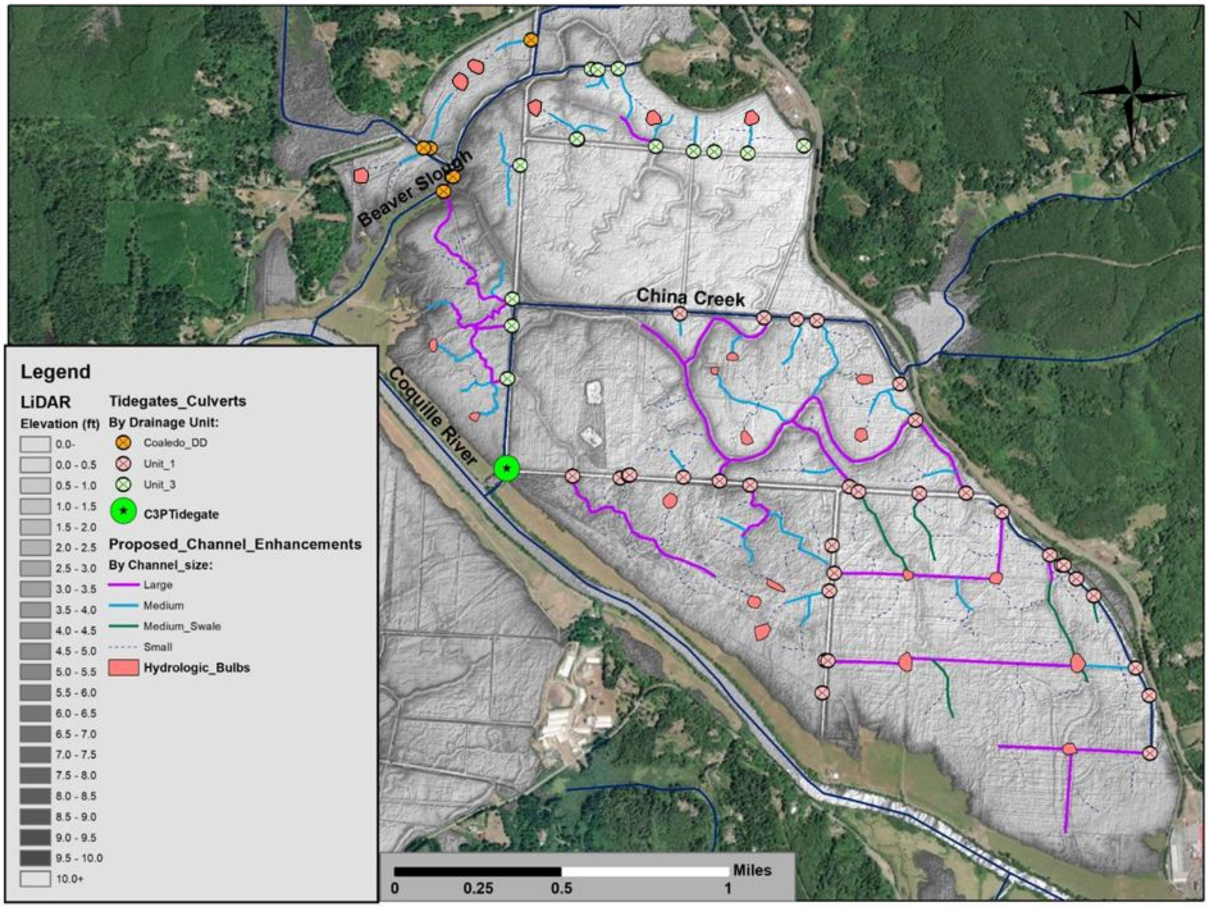

Figure 7. Grayscale Hillshade LiDAR imagery with proposed reconstructed channel network overlaid

The current floodplain pasture channels present are primarily linear shallow ditches that were constructed from 1908-current. The main tidegates downstream have for over 100yrs eliminated most of the hydraulic inflow/outflow forces due to constricted capacity where the land area water volume enters the river. Accordingly, pasture channel morphology has not been retained through time, or been further developed over time due to limited hydraulic forces; and/or does not reflect natural hydrological forces. This is an important feature for consideration in regard to the lack of ability to accurately measure Active Channel Widths (ACWs). In order to assess the proper size of culverts and associated channels that would accommodate a given inflow/outflow for the “microwatersheds” on the project area, we incorporated methodology based on a “Hydrology Logic Train” including the following Technical Tools:

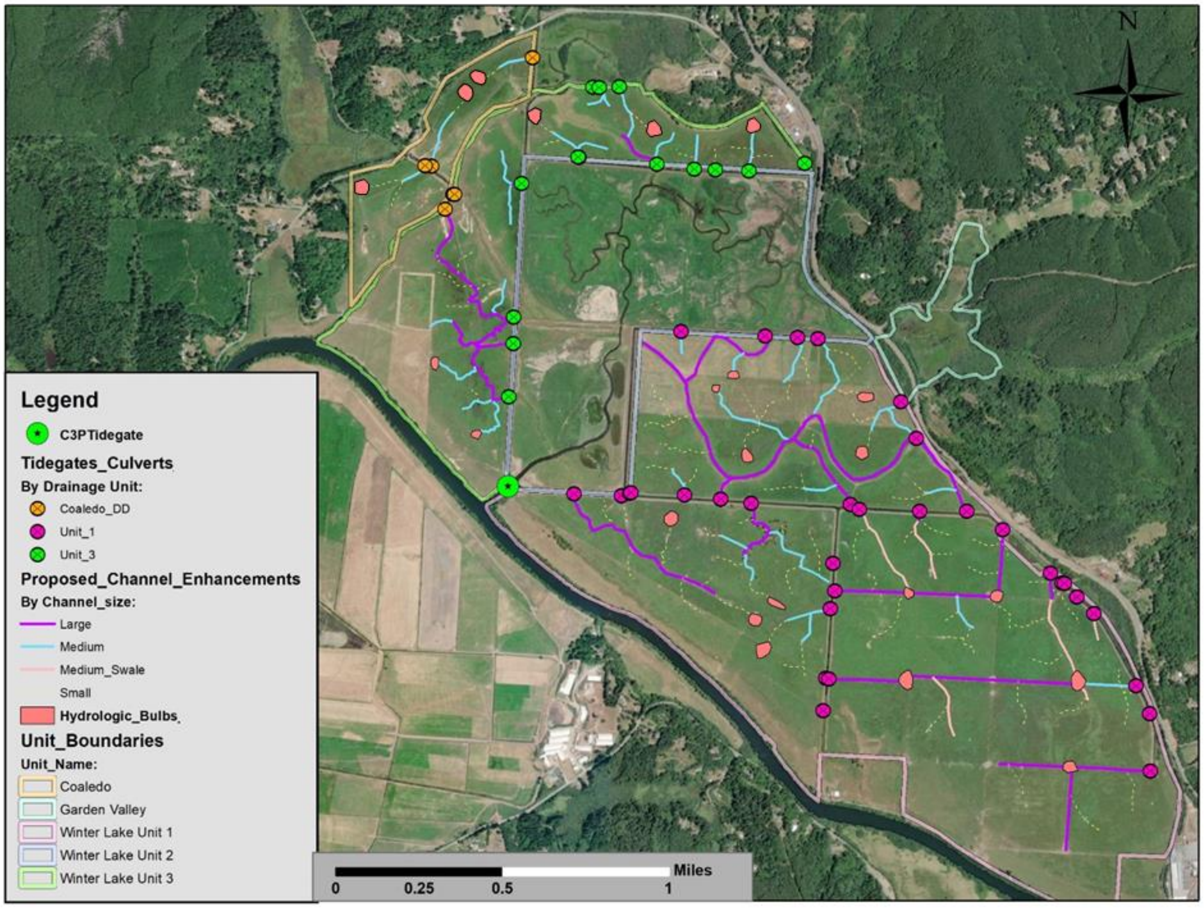

Figure 8. Winter Lake Phase III Proposed Channel Enhancements (hydrologic bulbs are not shown here)

A. Culvert Capacity per Land Area Served:

We determined the size of “microwatersheds” that would be served by the individual culverts proposed to be replaced, through use of the LiDAR, topographic drainage divides, and current culvert locations *(Figure 9)*. This was done as a technical assessment in order to better understand culvert capacity in regard to land areas.

Note: *It is important to note that these land area “microwatersheds” were for technical analysis and are not divided by substantial elevation divides and thus are either hydrologically connected continuously or with minor water elevation increases. This results in a condition whereas numerous culverts are continuously connected to a common water volume on a given pasture area.*

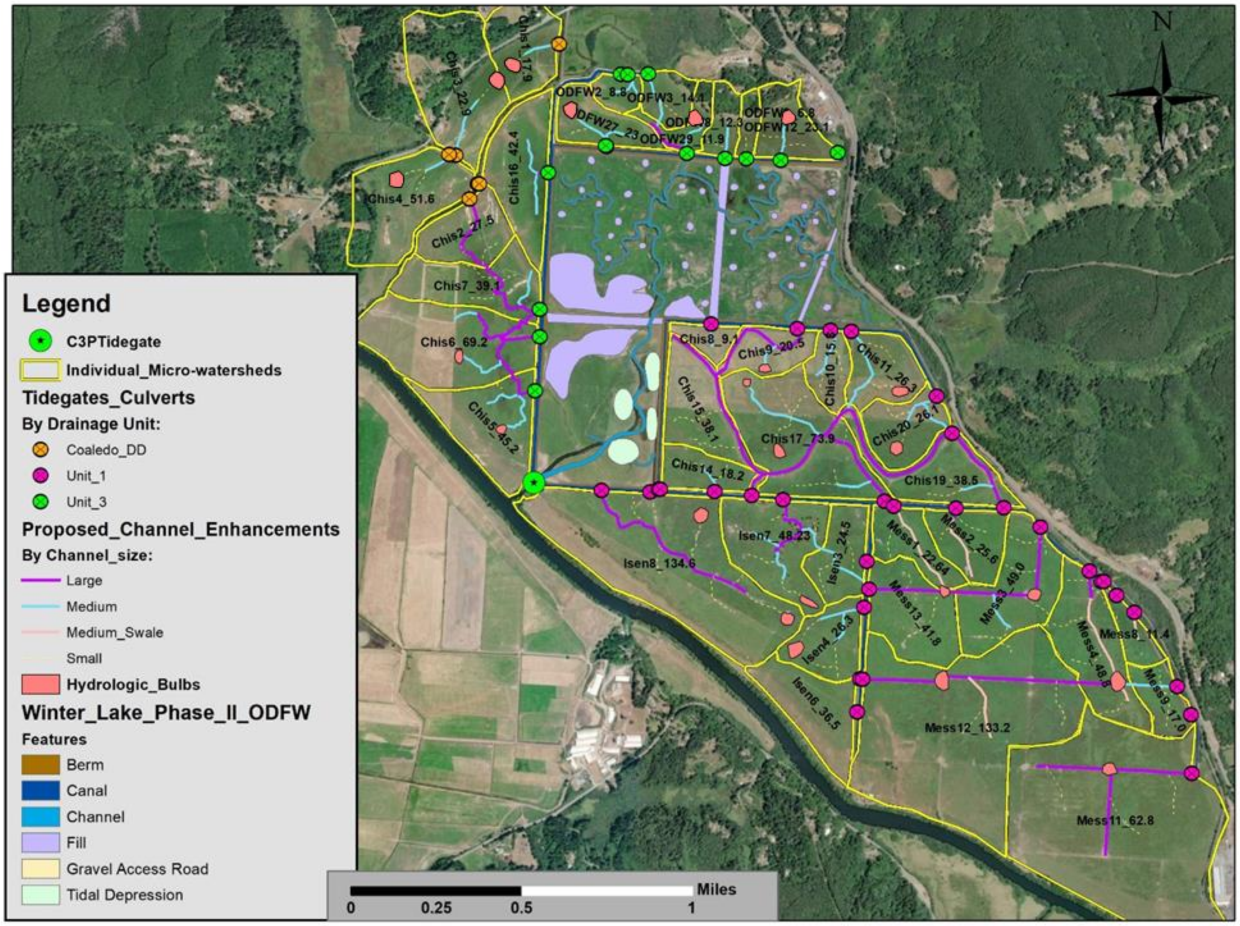

Figure 9. Phase III "microwatersheds" as delineated by LiDAR, culvert location, and main canal entry points.

B. Precipitation and Outflow Analysis:

In order to determine the volume of water that would be produced from precipitation events within the project area individual "microwatersheds" we used the local China Camp Creek watershed (Figure 10) as a surrogate. Through use of USGS streamstats (USGS 2020) regression analysis engine we determined an outflow per acre relationship. This was then applied to the individual "microwatersheds" to determine the cubic feet per second (cfs) outflow that would be expected from a precipitation event of 100yr floodflow magnitude. The 100yr precipitation event volume outflow for individual "microwatersheds" was then analyzed in regards to engineering culvert hydraulics tables in section *C. "Hydraulics Culvert Capacities."* below.

C. Hydraulic Culvert Capacities:

We used the flow volume precipitation regression to determine the cfs that would be produced for a given pastureland area for the 50yr and 100yr floodflows and then evaluated the volume/culvert relationships that would accommodate these flowing using volume tables that had been developed for fish passage (Foltz et al. 2009 and Robison et al. 1999).

D. Hydraulic Evaluation:

We used the combined Technical Tool information noted above (A-C) in our Hydraulic Evaluation to assess the volume capacity (sizing) of the 38 individual pasture culverts (35 in BSDD and 3 in CDD) that would be needed to meet flow dynamics that meet or exceed State and

Federal fish passage guidelines based on <u>an Individual Assessment and Synthesis of three methodologies:</u>

The C3P tidegate box culvert structures have been previously evaluated and approved by Federal and State Fish Passage staff to acceptably meet fish passage standards. We have designed the interior culvert and associated channel networks with capacity by Unit for Units 1, and 3 that meets or exceeds the volume capacity of the previously approved C3P 10x8ft concrete box culvert capacity (*Appendix A and Table 2*). As the interior culvert network is subservient to capacity of the C3P tidegate network and the proposed Phase III project actions result in an upgrade of capacity for interior pasture culverts and channels that exceeds C3P ability for inflow/outflow there was an assumption of fish passage compliance by default.

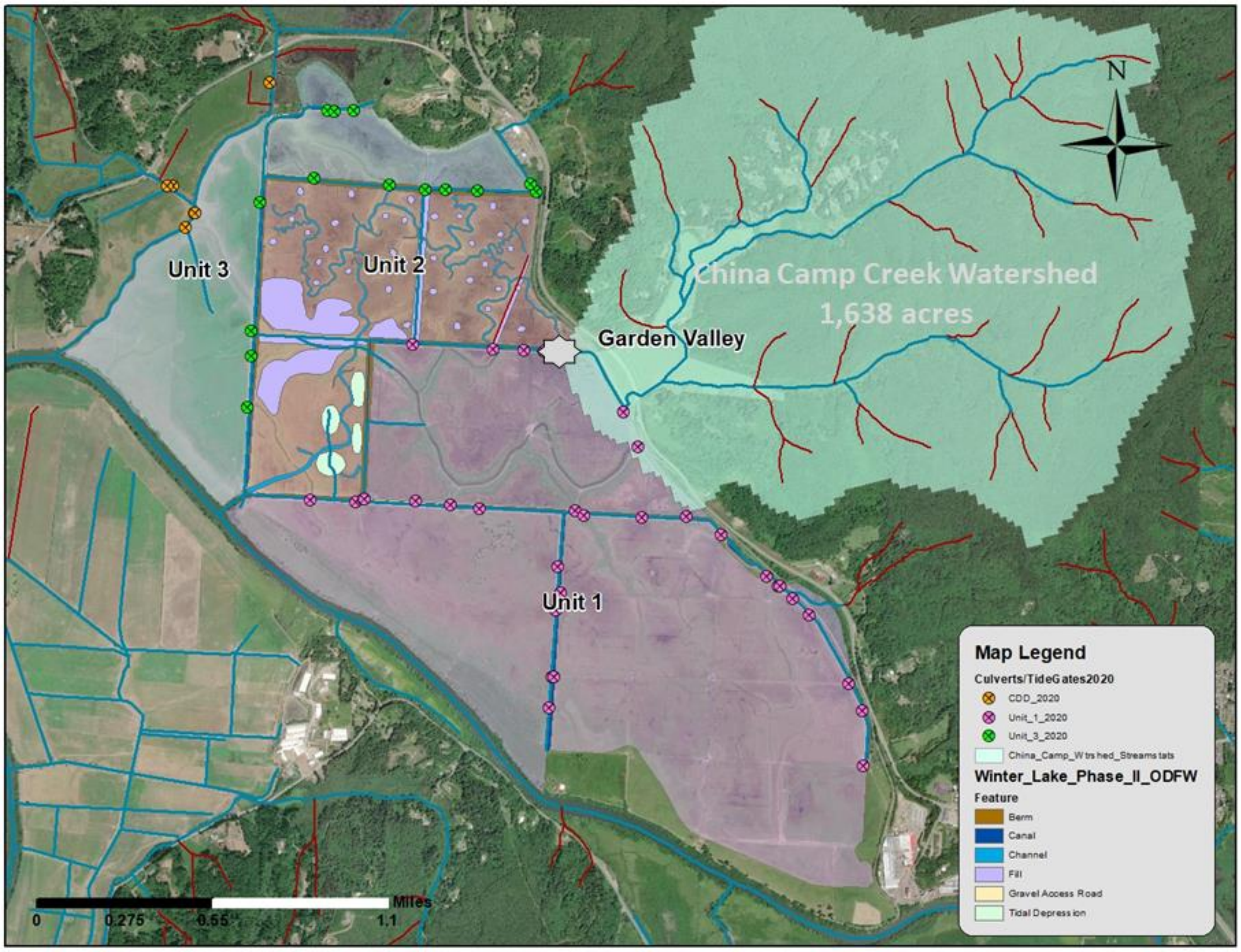

Figure 10. China Camp Creek watershed used as a surrogate for developing peakflow cfs/acre correlations.

Note: *For the CDD culverts this method was not applicable as* a) *the Beaver Creek CDD tidegate serves a large land area in addition to the two pastures within the project area; b) the Beaver Creek CDD tidegate culverts do not have MTR capability; and c) the CDD culverts were not evaluated for fish passage compliance through the Phase I project as they were outside the BSDD project area.*

We assessed the proposed interior culverts hydraulic capacity in regards to:

- Current culvert capacity in relation to proposed culvert capacity;
- Capacity of culverts to accommodate 100yr precipitation events and;
- Proposed culverts to accommodate C3P capacity.

Engineering literature was obtained pertaining to hydraulic capacity of culverts and fish passage. This information served as reference materials for evaluation including: a) Washington Department of Transportation (Barber, M. E. and R. C. Downs 1996); b) Oregon Department of Transportation (ODOT) 1990; c) Federal Highways Administration (Normann, M.N. et al. 1985), and the Oregon Department of Forestry Robison et al. 1999 (Appendix C).

ODFW Coos-Coquille Fish Passage permit information data from eight local sites in the Coos and Coquille River basins was evaluated in regard to the Active Channel Width (ACW) of streams at the location where a culvert or bridge crossing plan had been developed and the ACW had been measured. The upstream watershed size was then evaluated using USGS Streamstats and the regression analysis for a given land area was used to determine the ACW channel the watershed had naturally developed correlated with a given 100yr floodflow volume for the location in the watershed. Active Channel Widths that were naturally occurring for a given watershed size in local watersheds were then compared to the acreage areas for the Phase III "microwatersheds." The outflow volumes produced by the 100yr floodflows were in turn assessed in regards to the ACW, which would represent the size of culvert needed for a given "microwatershed."

VI. HYDROLOGIC ASSESSMENT

It is important to note for both inflow and outflow at the C3P tidegate there are very few occasions when all three vertical slide tidegate doors in Units 1 and 3 are open during water management. Thus, there is a predominant condition that interior culverts and channels upstream are subjected to flow volumes well below full capacity of the 10x8ft box culverts at the C3P tidegate. In the period from 2018-2020 the three slide-gates that serve Units 1 and 3 have only been open to their fully capacity position during short periods of very high flood flows as a measure equalize water elevations in Units 1, 2, and 3 in order to prevent overflow berm infrastructure damage in Unit 2. Water management on a daily basis predominantly involves partial opening of a single slide-gate door resulting in measured flow delivery well below full capacity. That said, we evaluated the proposed interior culvert sizing based on the methodology that C3P gates can at times be managed with full open gate door capacity. We recognize that this level of inflow/outflow assessment is several magnitudes above the standard DWMP prescriptions.

A. Culvert and Channel Size

Note: *It is worthwhile to keep in mind that substantive flood flows most often result in water elevations that are above elevation 5.5ft. Water during those events overtops the interior pasture berms nullifying culvert capacity relationships and concerns with culvert sizing until water has subsided to elevation 5.5ft. The 38 interior pasture channel culverts are <u>subservient</u> to the capacity of the C3P tidegate 10.0x8.0ft concrete box culverts and the BSDD DWMP.*

B. INFLOW Evaluation

The inflow of water to Units 1 and 3 is controlled by the C3P tidegate DWMP and day to day operations of the VSFTG slide-gates. Thus, the volume is limited by the capacity of the number of slide-gates that are open, the height of the slide-gate opening, and the head pressure of the tides. Landowners within the BSDD and CDD that within the Phase III project have agreed to an interior pasture culvert DWMP that provides for the following:

- *Pasture Grazing Season*:
  April through October; where interior pasture channel culvert water control structures will be managed open other than irrigation events. Transition period October-November.

- *Fall/Winter/Spring Flood Season:*
  November through March; interior pasture channel culvert water control structures will be managed fully open continuously. Transition period April-May.

Note: *It is important to keep in mind that individual landowners have plasticity under the DWMP to operate internal water control structures on a needed basis to provide for livestock pasture management goals during spring and fall transition periods. There is a strong need for this flexibility with varying weather and water conditions that affect operations in Units 1 and 3.*

Interior tidegates or knife/slide water control structures will be adjusted to the open position for the Fall/Winter/Spring season and operated in either closed or open during April to September as is needed for irrigation and individual pasture management of water. The core months where there is need for native fish access is during November through March. From May through September the water temperatures in interior pasture channels are generally above the tolerable range of salmonid fishes and they are no longer present inherently.

Northwest Hydrology Consultants (NHC) developed hydraulic analysis (*Appendix A*) of the capacity of the C3P tidegates during project design in order to provide information for the ODFW and NMFS review of the fish passage needs at the site. We evaluated the 23 Unit 1 interior culverts in regards to the capacity of the two 8.0x10ft concrete box C3P box culverts serving Unit 1 and the capacity of the current and proposed interior culvert sizes. The cfs capacity of the two C3P 8.0x10ft box culverts feeding into the east canal feeding Unit 1 is 600cfs x 2 or 1,200 cfs (*Table 2; reproduced from the Winter Lake DSL/USACE permit application Tetratech 2016*) with the tidegate and slide water control structures open to an elevation of 5.5ft.

The side-hinged aluminum tidegate doors at the C3P tidegates open to ~80° from when there is sufficient head pressure upstream and outflow. This angle, which is less than 90° undoubtedly produces some minimal water friction and turbulence associated with water moving past the door. We considered this headloss to be minimal, and thus assumed that the outflow with side-hinged aluminum gates will accommodate the full 600cfs capacity. However, the capacity is likely slightly less due to headloss. The estimated capacity of 600cfs per tidegate box culvert is likely slightly lower with flow through Unit 1 A and Unit 3 C3P culverts when the slide-gates are down and Drain-out reliance is on the side-hinged tidegate door. Our methodology, however, assumed full capacity of the C3P box culverts without tidegate door friction headloss.

In Unit 1 the project is proposing installation of 23 new properly sized culverts. Above elevation 5.5ft elevation water will run over the interior earthen berms and culvert capacity is no longer a limiting factor for inflow. In Unit 3 of the BSDD there are 12 culverts that will be replaced with larger culverts. In Unit 3 water is able to move over berms on the northern side of the Wheeler canal at elevation 5.0ft and culvert capacity no longer controls water flow. We assessed sizing/capacity for these culvert replacement combinations in relation to the capacity of the single 8.0x10.0ft concrete box culvert at the C3P tidegate that feeds into the north canal. The three undersized culverts will be replaced in the CDD with sizing based on relationship of the precipitation 100yr floodflow capacity, ACW and floodflow relationships, and hydraulics. Our assessment resulted in the following conclusions regarding culvert capacity by Unit, as compared to the C3P Tidegate:

1. Unit 1:

The current capacity of the two C3P 8.0x10.0ft box culverts with slide-gate tidegates serving Unit 1 with both doors open to 8.0ft in height at a water elevation of 5.5ft is 600cfs per door or 1,200cfs (Table 2). Above elevation 5.5ft water is able to move over interior berms and interior pasture culvert capacity is not a limiting factor. The capacity of the interior 23 culverts once replaced will be 1,781cfs (Table 3) at elevation 5.5ft with all of the slide/knife and side-hinged water control structures open from November through March.

2. Unit 3:

The current capacity of the single C3P 8.0x 10.0ft with the slide-gate door open to 8.0ft in height serving Unit 3 is 600cfs with water at elevation 5.5ft. Above elevation 5.0ft water moves over berms in Unit 3 and culvert capacity is not a limiting factor. The capacity of the interior 12 culverts upstream of the single tidegate of Unit 3 once replaced has been evaluated to be 654cfs (*Table 3*) at elevation 5.0ft with all the slide and side-hinged water control structures open from November through March.

Note: *Two of the interior pasture culverts in the analysis of Unit 3 were already replaced in 2018 on ODFW properties.*

3. CDD Pastures:

The two pastures where work will occur in the CDD in Phase III are served by 3 interior pasture culverts upstream of the CDD tidegate on Beaver Creek. There is not an ability to open the CDD tidegates without chaining them open and there is rarely a need presently for irrigation in the pastures they serve. Thus, there is not currently demand for inflow through the interior pasture culverts. However, an upcoming project to replace the CDD Beaver Creek tidegate is expected to be implemented prior to 2025. This new tidegate would have MTR capability and thus we considered this in our culvert and channel sizing as well for these lands. The Phase III project is proposing to increase the capacity of these three existing culverts by 200%, 160%, and 178% respectively and these were sized based on “microwatershed” size, precipitation 100yr floodflow capacity, ACW/floodflow relationships, and hydraulic culvert capacity methods.

Table 2. C3P tidegate box culvert flow volume assessment reconstructed from C3P project and Winter Lake Restoration USACE/DSL permit application; Tetratech Engineering 2016

Culvert Area (Square Feet)						
Water Surface Elevation	8-ft CMP (Invert at -4.0 feet)	10-ft x 8-ft Rectangle (Invert at -2 feet)	Difference in Area from Existing to Proposed	Four 8-ft CMP's (invert at -4.0 feet	Seven 10-ft x 8-ft Rectangles (invert at -2 feet)	Difference in Area from Existing to Proposed
6.0		80	+80		560	+560
5.0		70	+70		490	+490
4.0	50.2	60	+9.8	201	420	+219
3.0	46.8	50	+3.2	187.1	350	+162
2.0	40.4	40	-0.4	161.7	280	+118.3
1.0	33.0	30	-3.0	131.9	210	+78.1
0.0	25.1	20	-5.1	100.5	140	+39.5
-1.0	17.3	10	-7.3	69.1	70	+0.9
-2.0	9.8	0	-9.8	39.3	0	-39.3
-3.0	3.5	0	-3.5	13.9	0	-3.9
-4.0	0.0	0	0.0	0	0	0.0
Maximum Flow Volume (cfs) Conveyed by Culvert	***351***	***640***	***+289 (+82%)***	***1,407***	***4,480***	***3,073 (+218%)***

Table 3. Capacity of interior culverts proposed for Units 1 and 3 compared to C3P tidegate culverts.

Unit #		# of Culverts	Total Capacity Unit cfs	C3P Tidegate Capacity cfs	% diff Unit Clvrts to C3P
Unit 1		23	1,781	1,200	+148%
Unit 3		11 C3P/1Coaledo	654	600	+109%
	Totals	**33**	**2,435**	**1,800**	

4. Hydraulic Evaluation:

We also evaluated culvert sizing based on hydraulic assessment of the outflow volume that would be produced from the individual “microwatershed” zones with 100yr floodflow levels of precipitation. We compared eight watersheds in the Coos and Coquille River basins (*Figure 11*) where a stream location ACW had been previously measured, and then used a USGS Streamstats regression of the 100yr peakflow volume for the watershed at the location where the ACW was located (Table 4). This assessment indicated that for the majority (6 out of 8) of locations the recommendations from fish passage engineering literature for a given culvert sizing based on 100yr peakflow was larger than or similar to the ACW as measured for the individual sites (Table 4) and the two that were less than 100% were only slightly under. Using this relationship and design strategies for culvert capacity to exceed 100% capacity relationships (Table 5), we reaffirmed that the proposed culvert and channel designs were within standards for Federal and State fish passage guidelines.

Table 4. Measured Active Channel assessment in relation to hydraulically engineered fish passage culvert sizing recommendations from WashDOT, ODOT, and ODF.

Location/ Stream	SubBasin	Year Meas.	Map I.D.	Watrshed Size (Acres)	Streamstats 100yr flw (cfs)	ACW Meas. (ft)	Clvrt Size (ft) for 100yr flw Hyd Tables[1]	Difference in Size (ft) Hyd vs ACW	Percent Diff
Catching Crk	Coos R	2019	**CatchC-1**	781	278	6.8	7.3	0.5	7%
Middle Creek_Trib	NF Coquille R	2016	**Lone_Pine-1**	365	190	5.6	6.3	0.7	12%
Cunningham Crk	Mnstem Coq R	2016	**CunningC-1**	6,912	2,560	14.0	30.7	16.8	120%
Salmon Gulch	MF Coquille R	2017	**SalmonG-1**	1,203	416	5.3	8.5	3.2	60%
Four Bit Gulch	SF Coquille R	2019	**FourBitG-1**	294	154	4.1	5.8	1.7	40%
S. Twomile Creek	Floras Crk/New R	2019	**S_TwomileC-1**	826	440	8.7	8.8	0.1	1%
Fall Creek	Big Crk/MF CoqR	2019	**BigC-1**	1,453	500	9.7	9.3	-0.4	-5%
"Huff Creek"	Big Crk/MF CoqR	2019	**HuffC-1**	198	80	5.1	4.5	-0.6	-12%
[1]. Based on values from Table 6 Robison, George E., A. Mirati, and M. Allen 1999, also in Foltz et al. 2009									

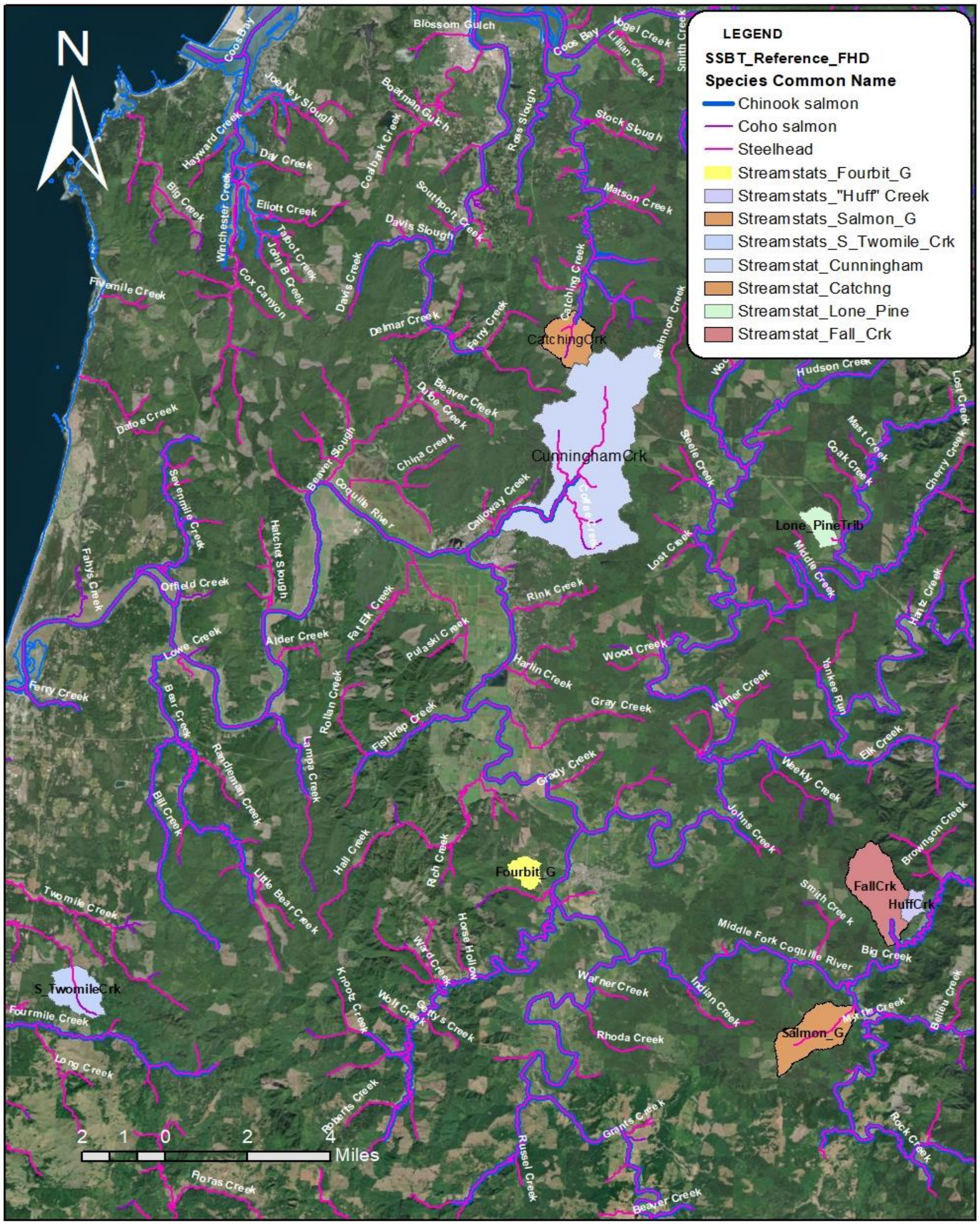

Figure 11. Stream basins where Active Channel Width to 100 Year Peakflow correlations were evaluated.

C. INFLOW Summary

It is important to keep in mind that the Phase III project is designed to provide capacity that will respond to inflow inputs from C3P in a manner that reflects appropriate capacity to mimic muted historical tidal regimes. The new and reconstructed channels will essentially repair the floodplain hydrology network that was broken in 1908-1909 when linear canals were installed that transverse the historical natural channel system, which drained to the northwest rather than the human constructed direction to the west and then south. Low elevation ponding will be connected reducing stranding potential for juvenile fish and providing hydrology regimes that increase wetland function.

We have determined that the inflow capacity of the interior 23 and 12 culverts in Units 1 and 3 once replaced exceed the delivery volume capability of the C3P tidegates in Unit 1 by 148% and 109% in Unit 3. Overall, there will be a total volume inflow capacity at elevation 5.5ft for interior culverts in Units 1 and 3 of 2,435 cfs as compared to 1,800 for the C3P three VGSTG gates that serve Units 1 and 3 respectively (Tables 2 and 3). The C3P tidegate network volume and DWMP plan have been approved by ODFW and NMFS. Accordingly, as the volume capacity for inflow of the interior culverts following Phase III will exceed the C3P box culverts capacity we are suggesting that the interior water conveyance sizing meets Federal and State fish passage guidelines. The culverts proposed for the three CDD locations were sized 200%, 160%, and 178% greater than the 100yr floodflow volume based on hydraulic methods developed from "microwatershed" and ACW relationships.

The reconstructed and new interior pasture/floodplain channels proposed for the project will have a bottom width that equals or exceeds the culvert that they are aligned with. The side-sloping of these channels will range from 1:1 for the first 200-500ft depending on the location and then will be 2:1. This side-sloping will result in channel form with *at least a minimum of 30% greater capacity than the culverts that serve them.*

D. OUTFLOW evaluation

Note: *It is important to keep in mind that individual landowners have plasticity under the DWMP to operate internal water control structures on an as-needed basis to provide for livestock management goals during spring and fall transition periods. There is a strong need for this flexibility with varying weather and water conditions that affect operations in Units 1 and 3.*

The type of water control structure on the interior 38 culverts will be determined by the project team (SWCD, BSDD, ODFW) and the individual landowners. From November through March all water control structures will be set to remain fully open. In the typically warmer/dryer months of April through September it is exceedingly rare for 100yr peak flow events to occur. Outflow capacity calculations assumed full open movement of water through the water control structures for the 38 culverts in Units 1, 3, and for the two pastures sites in the CDD. We then incorporated the volumetric and ACW/100yr floodflow relationship as a second and third methodology, respectively, in addition to the overall capacity relationship already evaluated for the C3P tidegate and interior channel culverts (previously discussed under **INFLOW Evaluation)**.

- We used the information from Barber, M. E. and R. C. Downs 1996; ODOT 1990; and Robison et al. 1999 to determine the recommended culvert sizing for the outflow associated with the 38 "microwatersheds" in the project area (Table 5) using acreage and the 100yr precipitation floodflow data. We then analyzed our proposed culverts in regards to their ability to meet or exceed the recommendations and calculations.
- We used the assessment of information from the eight ODFW fish passage sites and USGS Streamstats regression of the 100yr floodflow in those watersheds to establish the relationship of 100yr peakflow culvert size/capacity relationships to the ACW of a stream. This was then utilized to determine the ACW that would have been present for a given "microwatershed" had there not been human alterations on the Phase III project area. We then used this relationship to assess if our culvert recommendations would reflect the ACW that would be present under typical precipitation and flood regimes within the project area. We determined that the 100yr peakflow for a given acre was 0.29cfs/acre in the China Camp Creek local representative watershed.

E. OUTFLOW Summary

We determined that the 100yr floodflow capacity for the 38 culverts as recommended in the BSDD and CDD Phase III project area following replacement ranged from 159.5 to 4,274.2% larger and averaged 969.9% larger (*Table 5*) than needed to accommodate the 100yr floodflow generated from the "microwatershed" acreage. Similarly, our evaluation indicated that the culvert sizing recommendations for the project ranged from 111.1% to 320.0% larger and averaged 215.2% larger (*Table 5*) than needed using the ODFW fish passage and 100yr floodflow/ACW site relationship.

Table 5. Phase III culverts proposed size assessment in relation to hydrologic flow volume that would be associated with 100yr outflow capacity for the individual "microwatersheds." ***Note:*** *Chis2, although connected to C3P, receives inflow from Beaver Creek, thus is not included in culvert/C3P calculations.*

Unit Number	CIS_ID	Chan Size	Acres	Acres_blw 10ft_elev	Current CulvrtSize_ft	Culvert Prop. (ft)	100yr Flow Clvrt [1]	Culvert_Cap% ± Prop Ovr 100yr[1]	Culvert_Size% ± Prop Ovr 100yr
Unit-3	Chis16	M	42.4	42.4	3.0	4.0	24	+598.8%	200.0%
Unit-3	ODFW27	M	23.0	23.0	4.0	4.0	24	+957.8%	200.0%
Unit-3	ODFW2	M	8.8	8.8	1.0	3.0	15	+1212.5%	240.0%
Unit-3	ODFW3	M	14.1	13.1	1.0	3.0	18	+756.8%	200.0%
Unit-3	ODFW29	L	11.9	9.56	None Present	4.0	15	+1851.2%	320.0%
Unit-3	ODFW8	M	12.3	7.6	2.0	4.0	18	+1791%	266.7%
Unit-3	ODFW9	M	6.8	4.0	1.0	3.0	12	+1569.2%	300.0%
Unit-3	Chis2	L	27.5	25.2	4.0	4.0	21	+801.1%	228.6%
CDD	Chis1	M	31.3	17.9	3.0	4.0	24	+703.8%	200.0%
CDD	Chis3	M	60.5	22.9	4.0	4.0	30	+364.1%	160.0%
CDD	Chis4	M	51.6	41.9	3.0	4.0	27	+426.9%	177.8%
Unit-3	Chis7	L	39.1	35.3	3.0	4.0	24	+563.4%	200.0%
Unit-3	Chis6	L	69.2	47.4	4.0	4.0	30	+318.3%	160.0%
Unit-3	Chis5	L	45.2	31.4	3.0	5.0	27	+860.5%	222.2%
Unit-1	Isen8	L	134.6	112.1	None Present	5.0	42	+289.0%	142.9%
Unit-1	Isen7	L	48.23	48.23	1.0	5.0	27	+806.4%	222.2%
Unit-1	Isen3	M	24.5	24.5	1.0	4.0	21	+899.1%	228.6%
Unit-1	Isen4	M	26.3	26.3	1.0	4.0	21	+837.6%	228.6%
Unit-1	Isen6	S	36.5	23.8	1.5	3.0	24	+292.3%	150.0%
Unit-1	Mess2	M	25.6	25.6	1.0	3.0	21	416.8%	171.4%
Unit-1	Mess3	M	49.0	49.0	1.5	4.0	27	449.2%	177.8%
Unit-1	Mess4	L	48.8	48.8	1.5	4.0	27	451.0%	177.8%
Unit-1	Mess8	M	11.4	11.4	1.5	4.0	15	2078.2%	320.0%
Unit-1	Mess9	M	17.0	17.0	2.0	4.0	18	1293.9%	266.7%
Unit-1	Mess11	M	199.3	162.0	2.0	5.0	48	195.1%	125.0%
Unit-1	Mess13	M	41.8	41.8	2.0	4.0	27	527.2%	177.8%
Unit-1	Mess12	M	177.2	137.6	2.0	5.0	42	219.5%	142.9%
Unit-1	Mess1	L	22.6	22.6	2.0	4.0	21	973.0%	228.6%
Unit-3	ODFW12	M	23.1	18.9	4.0	4.0	21	+1683.8%	228.6%
Unit-1	Chis8	M	9.1	9.1	2.0	4.0	15	+4274.2%	320.0%
Unit-1	Chis14	L	18.2	18.2	2.0	4.0	18	586.3%	266.7%
Unit-1	Chis15	L	38.1	38.1	2.0	4.0	24	+578.2%	200.0%
Unit-1	Chis9	L	20.5	20.5	2.0	5.0	21	+1897.3%	285.7%
Unit-1	Chis17	L	73.9	73.9	2.0	5.0	33	+526.3%	181.8%
Unit-1	Chis10	M	15.3	15.3	2.0	4.0	18	+1439.8%	266.7%
Unit-1	Chis11	M	26.3	26.3	2.0	4.0	21	+837.6%	228.6%
Unit-1	Chis20	M	26.1	26.1	2.0	3.0	21	+408.8%	171.4%
Unit-1	Chis19	L	38.5	38.5	4.0	6.0	24	+1591.4%	300.0%

1): Based on values from Table 6 Robison, George E., A. Mirati, and M. Allen 1999, also in Foltz et al. 2009

F. Microtopography, Differential Velocities, and Fish Passage

Note: *It is important to note that while vertical slide style tidegates provide ability to manage tidal inflow at Winter Lake C3P tidegates, fish passage for juvenile fish entering the land area from the river is accomplished by a combination of traditional side-hinged aluminum mechanical tidegates on slide-gates Unit 1A, 2C, and 3A and opening slide-gates to varying elevation heights.*

The pasture areas within the Winter Lake Phase III Units 1 and 3 overall have very low microtopographic instantaneous relief (*Figure 11*). There are some historic tidal channel ridges denoted in Unit 1 Chisholm East, and a strong ridge in Chisholm West. However, within individual parcels, the majority of the pasture areas are primarily uniform steady gradient land areas where water will move between the multiple channel networks as proposed (Figure 11; new and reconstructed channels are shown). This leads to a hydrologic condition whereas the individual culverts upstream of C3P function relatively as a single "culvert" connecting to the water volume on the landscape during inflow/outflow to the pasture areas when water levels are below elevation 5.5ft. Accordingly, the project has assessed the inflow volume capacity of Phase III interior pasture culverts proposed in relation to the C3P tidegate as a single Unit with the following knowledge:

1. Microtopographic Relief

Microtopography acreage differences vary less within Unit 1 than the lands in Unit 3 (*Table 6*), however, there is a larger quantity of low-lying <3.0ft elevation pasture in the Chisholm and Messerle parcels than Isenhart/Smith (Table 6). In Unit 3 there is substantively more low-lying elevation lands in the ODFW parcel than in the Chisholm West parcel (Table 1). However, in the Winter Water management period of November 15th through March 31st, the Coquille River minimum levels predominantly do not ebb sufficiently to allow low lying area pastures below elevation 2.5-3.0ft to drain (Figures 14 and 17). This results in a pasture hydrologic connectivity of the pasture culverts and a condition where inflow/outflow hydrologic forces are largely pushing on a common mass of water within individual landowner parcel sub-units. Water is then able to move across the landscape freely due to very limited 'microtopographic' relief, which will result in a condition where individual pasture culverts feed water into landscape with similar velocities due to hydrologic elevational equilibrium.

2. Tidegate Management

Although the Winter Lake Phase III project has sized interior pasture culverts based on the capacity of the C3P tidegate the DWMP goals and need to protect infrastructure result in a condition where the C3P Unit 1A, 1B, and Unit 3A vertical slide tidegates are rarely open more than 3.0ft from the closed position, which would be elevation +1.0ft as the bottom of the box culverts are at -2.0ft. For the majority of the period during the fall/winter/spring DWMP period a single slide-gate in Units 1 and in Unit 3 is open from 0.2ft to 2.5ft. We calculated the days during the fall and overwinter DWMP from October 1 to March 31st that the Unit 1A, 1B, and Unit 3A vertical slide tidegates were open 3.0ft or more. From October 1, 2018 to March 31st, 2019 Gate 1A was open a total of 2 days more than 3.0ft in the 172 day period or 1.1% of the time.

An openness of 3.0ft for a single slide-gate door equals a C3P inflow capacity of roughly 240cfs or (13.1%) of the 1,830cfs capacity of the 23 culverts in Unit 1 and 29% of the capacity of the low-lying culverts with elevation 2.0ft pasture area upstream. In Unit 1 the culverts that would be installed into low-lying pastures with elevation 2.0-3.0ft lands in Chisholm (6 clvrts) and Messerle (4 clvrts) have a volume capacity of 770cfs or 320.8% greater capacity than C3P will deliver with a single tidegate door open to 3.0ft in height. Singly for the Chisholm parcel the low-lying culverts proposed in Phase III have a capacity that is 449cfs, which is 187.1% of the C3P capacity with a single slide-gate open to 3.0ft. On an individual basis the low-lying culverts proposed for the Phase III project serving elevation 2.0-3.0ft lands in the Messerle parcel of Unit 1 have capacity of 321cfs or 133.8% of the capacity of a single slide-gate open to 3.0ft in Unit 1. In 2019-2020 the 1A tidegate was not operational for the period and was not opened. The 1B tidegate was open 3.0ft in height or greater (+1.0ft of elevation) for a total of 7 days or 4.1% of the duration from October 1 to March 31st in 2018-2019. Days when Unit 1A or 1B tidegates were open more than 3.0ft did not coincide. Data for 2019-2020 for slide-gate 2B was not able to be sorted due to errors from computer communications.

The vertical slide-gates for Unit3A were analyzed for time of openness for the condition where the tidegate door was open more than 3.0ft in height for the October 1 to March 31st 2018-2019 period. Gate 3A was open for a total of 2 days >3.0ft in height in 2018-2019 for an openness percentage of 1.1% during the period. This equilibrates to a time of 1.1% when the settings at C3P would be at 240cfs or greater inflow capacity. Upstream culvert capacity for the sum of Unit 3 culverts proposed is 654cfs. The capacity of C3P in Unit 3 with the gate door at 3.0ft is 240cfs or 36.7% of the Unit 3 overall capacity. The capacity of the C3P tidegate water delivery in regards to those low-lying culverts in Unit 3 is 84.2% of the capacity of the 6 culverts that would serve the lowest pastures on ODFW or rather these proposed low-lying culverts have capacity that is 118.8% greater capacity than the Unit 3 slide-gate open 3.0ft. Due to an error in the mod-bus and the computer control the data for 2019-2020 for the period was not available.

We anticipate more active management of the C3P tidegates during the Winter period in future years, however, this activity will be in relation to the number of days the slide-gates are open to any level rather than greater quantity of openness >3.0ft. It is important to note that vertical slide-gates are operated most of the time with door openness of <3.0ft in height over large periods of the winter to provide fish passage, while managing for berm stability, recreational public access, and livestock safety. The WMP provides the framework for this style of management in perpetuity. Operation of the slide-gates open to the 5.5ft elevation in a non-flood condition with interior water levels <5.5ft of elevation, below interior berms, where the interior culvert capacity is needing to accommodate C3P will be very rare.

3. Precipitation and Water Elevation

Water inflow into Winter Lake canals is monitored at the C3P tidegate computer network (*Figure 12-13*). The culvert capacity at C3P and DWMP strategies as served through control at the C3P tidegate have a strong dampening effect on inflow (*Figures 12 and 13*) and do not reach Coquille River tidal and flow magnitude or elevation levels on the same time curve (*Figure 13*). Inflow filling of interior pastures is over days generally rather than hours and includes precipitation accumulation in pastures as well as inflow during the Winter Water Management Plan period (*Figures 14-19*). The precipitation accumulation from streams/springs/groundwater within pastures and upstream of C3P in addition to inflow results in a decreased volume of inflow through C3P in order for pastures to reach a particular elevation during a rainfall or flooding event. The peakflow of China Camp Creek upstream of C3P at the 2yr event is 141cfs and at the 100yr precipitation event is 476cfs. Winter Lake lands are often filling upstream of C3P from "In Watershed" generated water at a similar rate as the Coquille river due to water within the BSDD and thus there is often limited movement of water through interior pasture culverts.

4. Sheet Flow
Above elevation 5.5ft the water will sheetflow over canal/landowner parcel berms and individual pipe hydraulic capacity above that elevation will not serve as a hydrologic control.

5. Inflow and Fish Passage
Fish will be able to move through culverts into channels with the inflow of tide/flooding events as well as on outflow rather than a state where they would need to fight culvert outflow velocities to enter a pasture area. This will accommodate fish passage on inflow over the inflow velocity range and with the differences that may occur with individual culvert/channel network locations.

6. Channel Network Connectivity
The interior new/reconstructed channels will be connected with channels from other pasture zones within hydrologically connected landowner parcels at a number of junctions in the networks allowing for hydrologic equilibrium between channels and pastures where elevations are low (Figure 11). This eliminates the "microwatersheds" from being separated in regards to hydrologic elevational equilibrium.

7. Tidal Wave Form and Fish Passage
Although fish are able to fully enter the individual Units pasture channels through movement on incoming tidal inflow, the culvert sizing and tidal hydrologic waveform allows for long periods where there is a range of velocities that serve to accommodate fish passage (*Figures 12 and 13*) during outflow as well.

G. Land Elevations within Unit and Parcel
We have calculated the individual landowner acreages for elevation 2.0-3.0ft, 3.0-4.0ft and 4.0-5.0ft using GIS LiDAR elevation mapping methods. The methods used, although more coarse than individual raster evaluation, provide reasonable land area elevation relationships (Table 6). At very low (elevation 2.0-3.0ft there is a greater quantity of land area in Unit 1 comparing Messerle, Chisholm, and Isenhart/Smith. Isenhart/Smith properties have very few acres that are elevation 2.0-3.0ft, however, from 2.0-4.0ft elevation the acreages for individual landowner parcels are more similar. The Chisholm cells within Unit 3 have no 2.0-3.0ft elevation area, while ODFW lands have 26 acres. However, from elevation 2.0-4.0ft these two parcels in Unit 3 have similar quantity of acres (Table 6).

Table 6: Estimates of Winter Lake Phase III project area lands by Unit/Landowner.

Unit	Parcel	Elevation 2.0-3.0ft Acres	Elevation 3.0-4.0 ft Acres	*Tot Acres Elev 2.0-4.0ft*	Elevation 4.0-5.0ft Acres	*Tot Acres Elev 2.0-5.0ft*	Culverts/C3P Nmbr in Parcel	Culvert Capcty Proposed cfs
1	Messerle	10	266	276	167	443	9	641
1	Chisholm East	43	136	179	43	222	9	755
1	Smith/Isenhart	1	70	71	170	241	5	385
3	Chisholm West	0	7	7	46	54	4	305
3	ODFW	26	39	65	9	74	7	349
	Unit 1 Totals	54	472	526	380	906	23	1781
	Unit 3 Totals	26	46	72	56	128	11	654
	Totals	**81**	**517**	**598**	**436**	**1,034**	**34**	**2,435**

Unit	Parcel	Culverts/C3P Nmbr in Parcel	Culvert Capcty Proposed cfs	C3P Capcty 1 Door 3ft (cfs)	Clvrts Prop cfs % to C3P @ 3ft
1	**Messerle tot**	9	641	240	+267.1%
	Mess_Low_Elev [1]	4	321	240	+133.8%
1	**Chisholm East**	9	755	240	+314.6%
	Chis_E_Low_Elev [1]		449	240	+187.1%
1	**Smith/Isenhart**	5	385	240	+160.4%
	Smth_Isen_Low_Elev [1]	*N/A*	*N/A*	*N/A*	
3	**Chisholm West**	4	305	240	+127.1%
	Chis_W_Low_Elev [1]	*N/A*	*N/A*	*N/A*	
3	**ODFW**	7	349	240	+145.4%
	ODFW_Low_Elev1	6	285	240	+118.8%

1) Low-lying denotes areas served by culverts that have acreage w. elevation 2.0-3.0ft

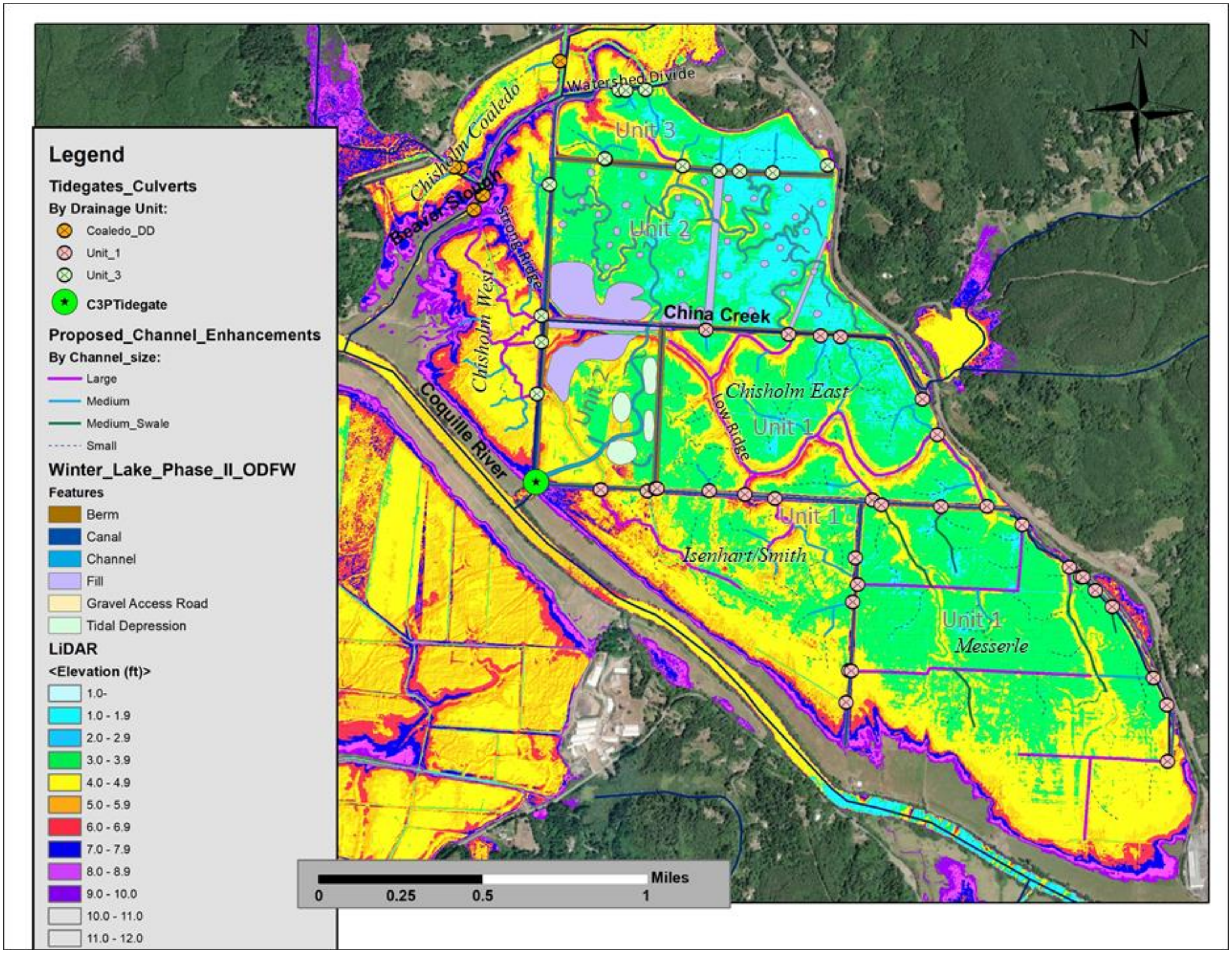

Figure 12. Winter Lake Phase III project area LiDAR depicted elevational relief with new proposed channels shown.

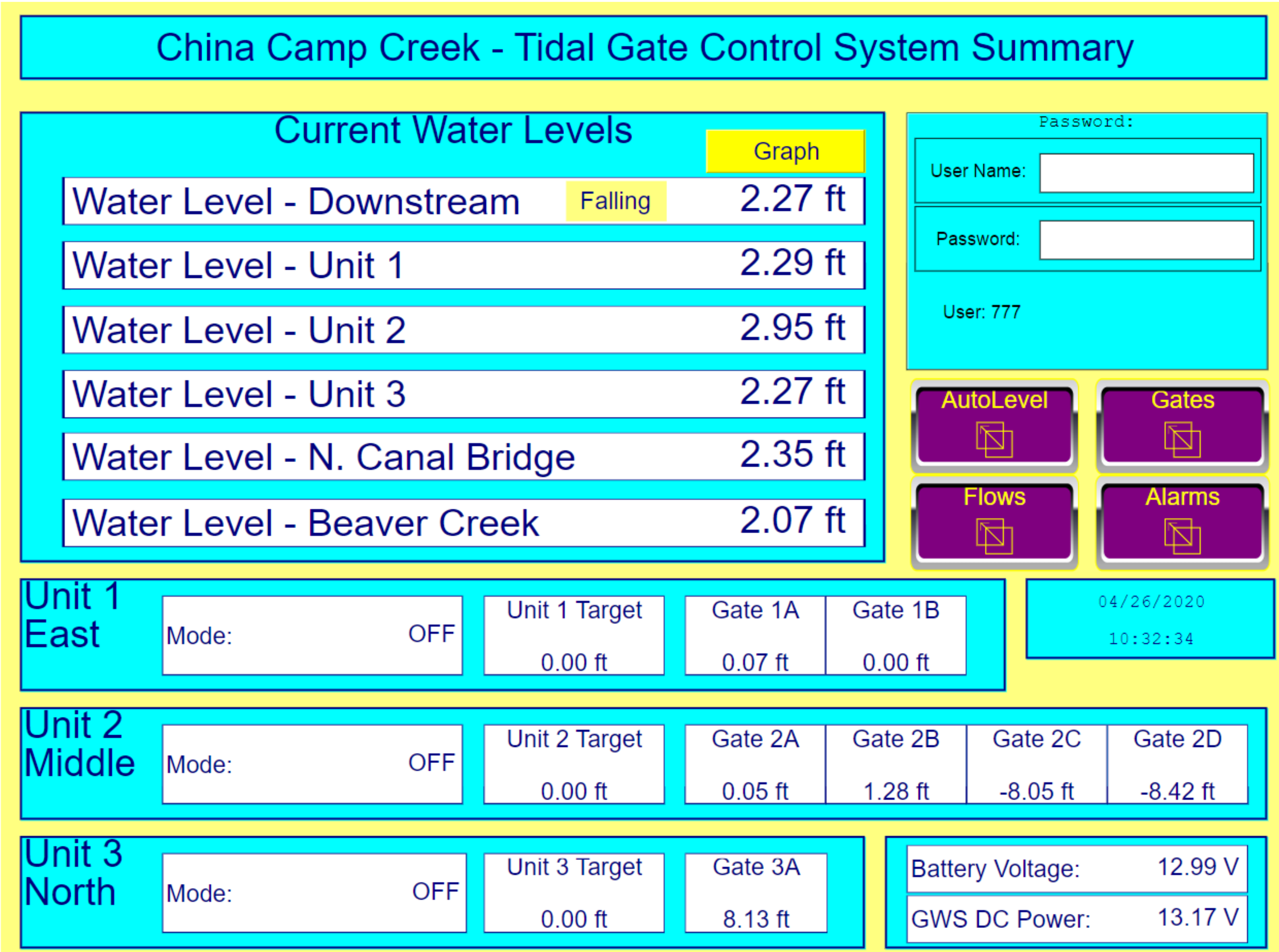

Figure 13. C3P tidegate control network readout as viewed on 04/26/20, outgoing tide 10:32hrs.

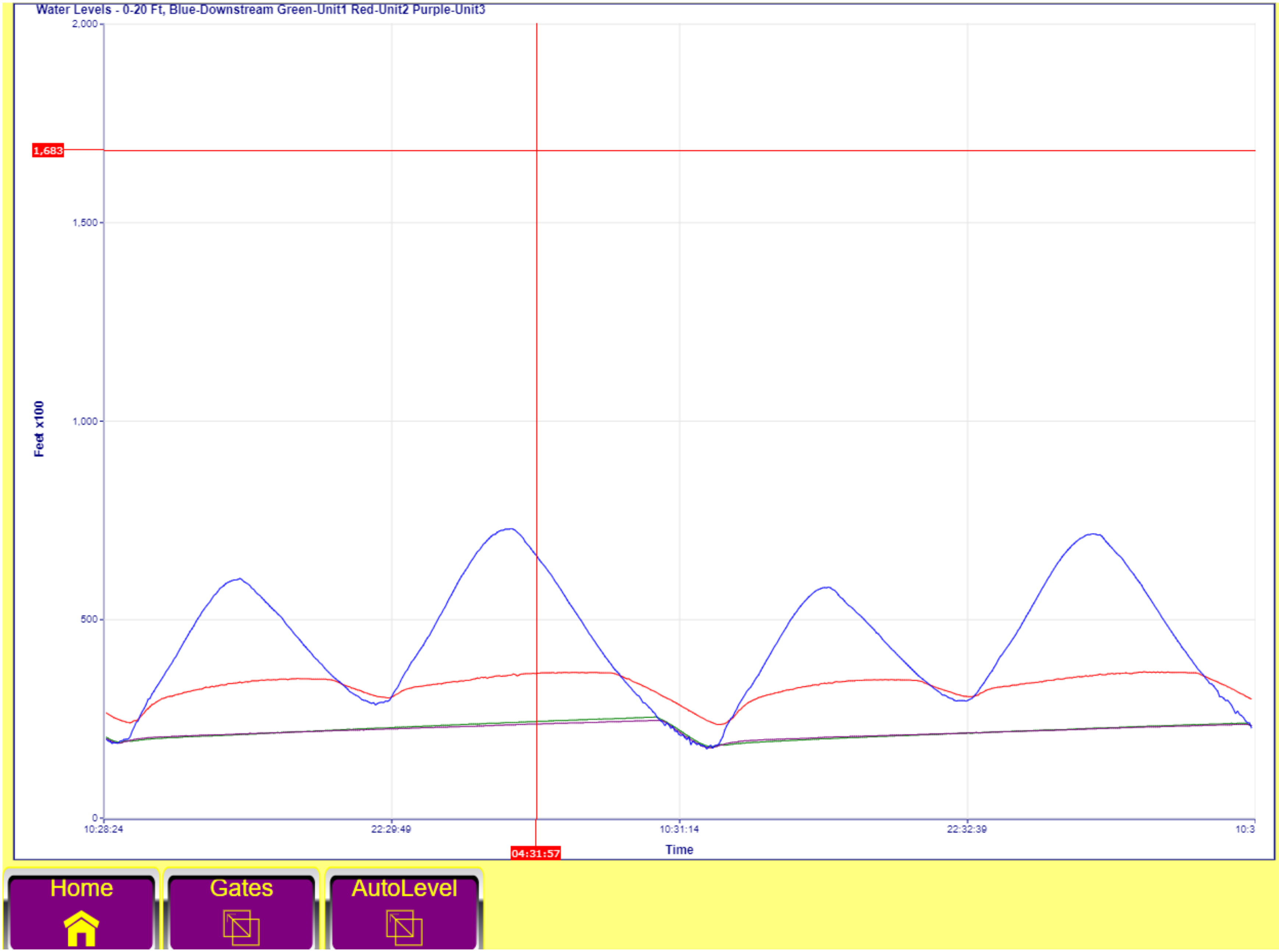

Figure 14. Water level waveforms as measured for the mainstem Coquille River and Units 1, 2, and 3 at the C3P tidegate; 04/26/20: 10:32hrs.

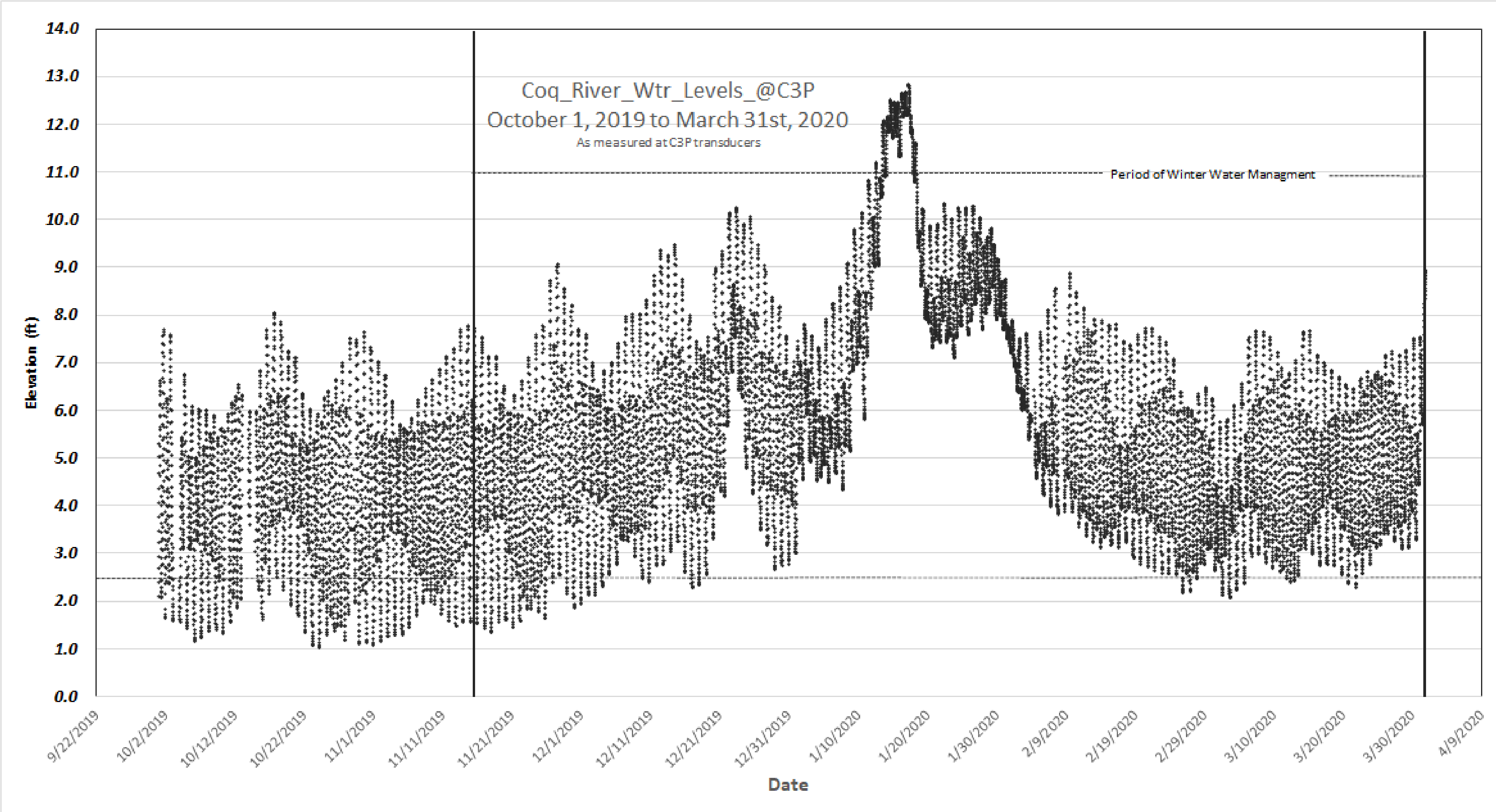

Figure 15. Coquille River Water levels as measured at the C3P tidegate from October 1, 2019 to March 31st, 2020.

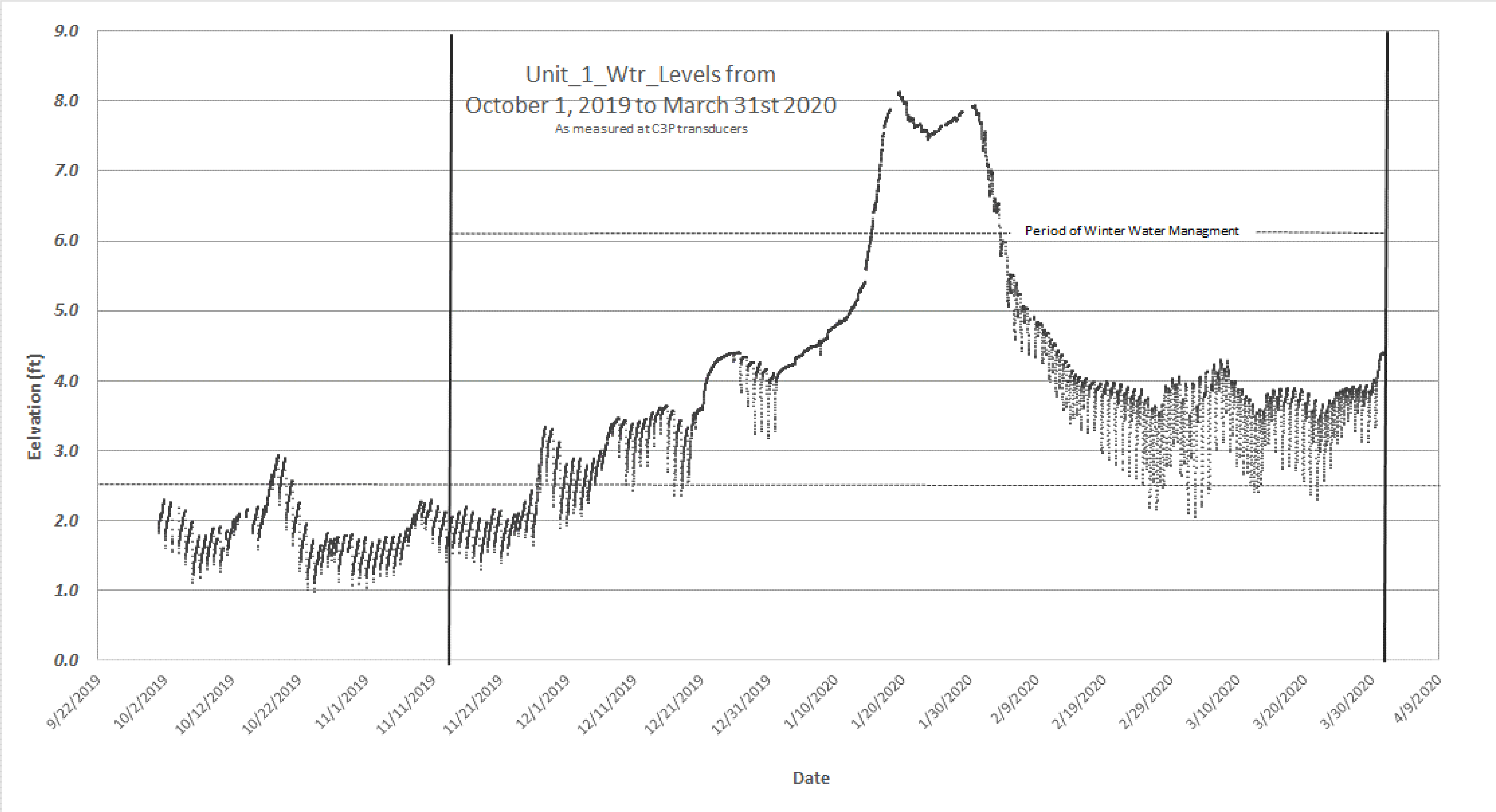

Figure 16. Unit 1 water levels from October 1, 2019 to March 31st, 2020 as measured at upstream of the C3P tidegates in Unit 1 canal.

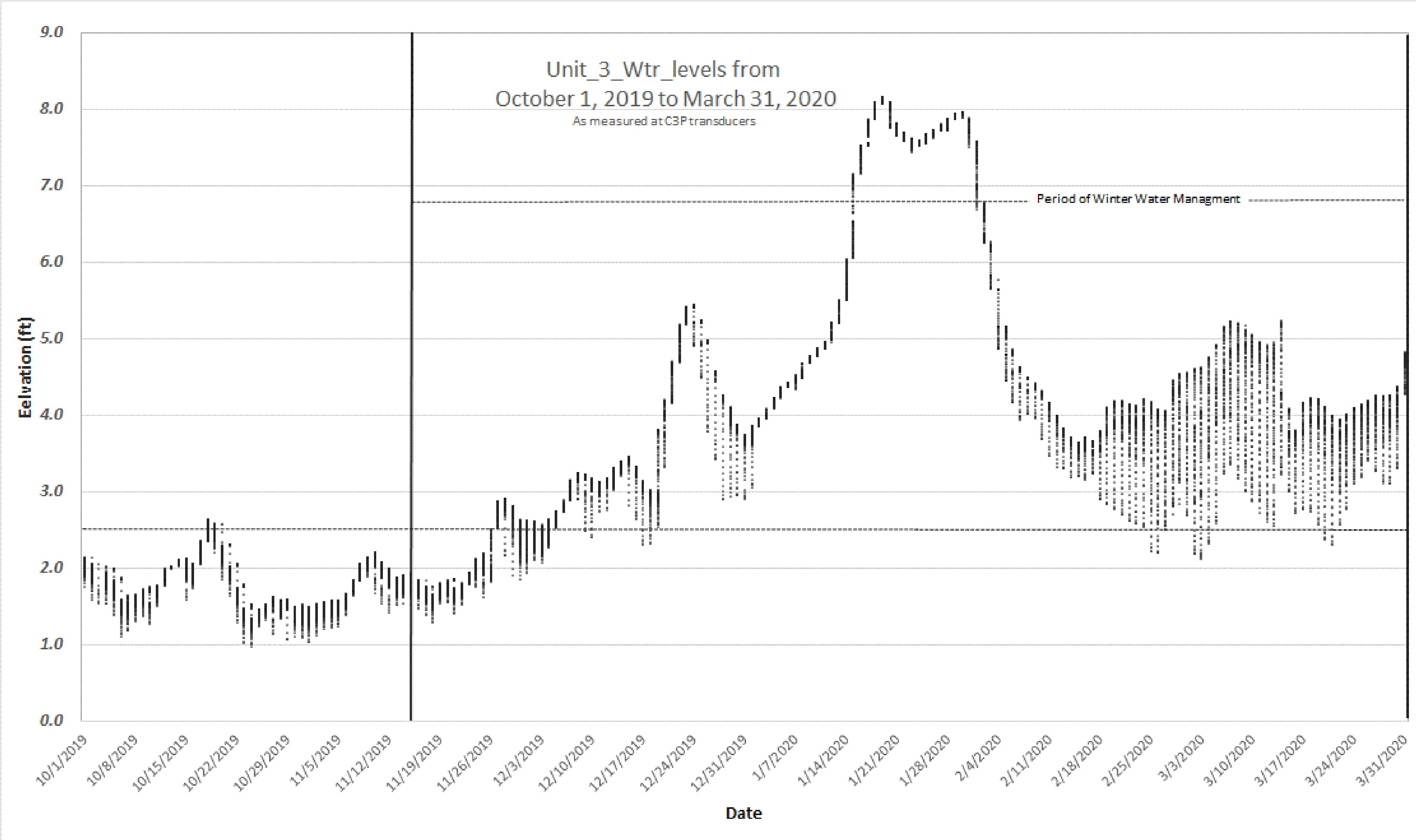

Figure 17. Unit 3 water levels from October 1, 2019 to March 31st, 2020 as measured at upstream of the C3P tidegates in Unit 3 canal.

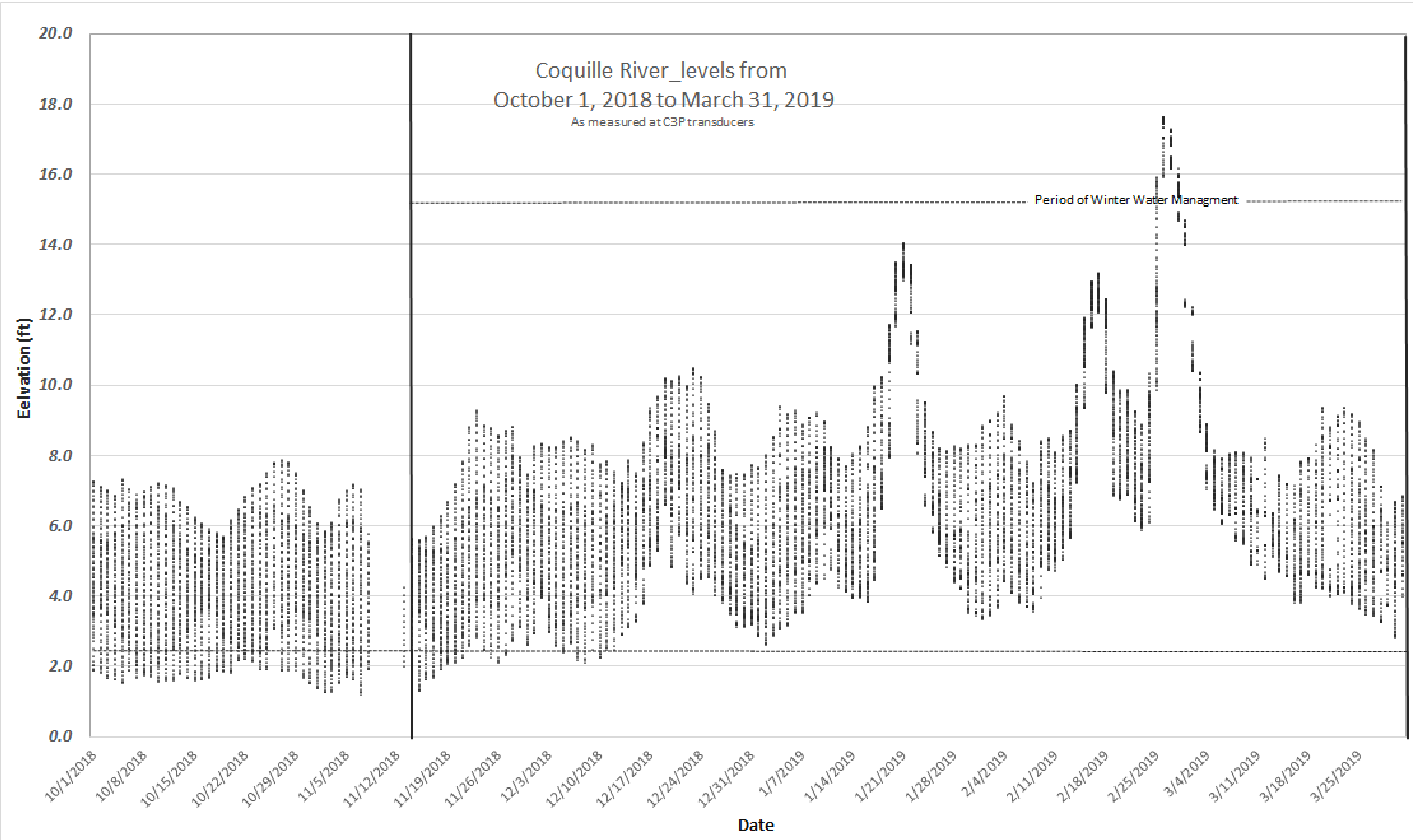

Figure 18. Coquille River water levels as measured at the C3P tidegate from October 1, 2018 to March 31st, 2019.

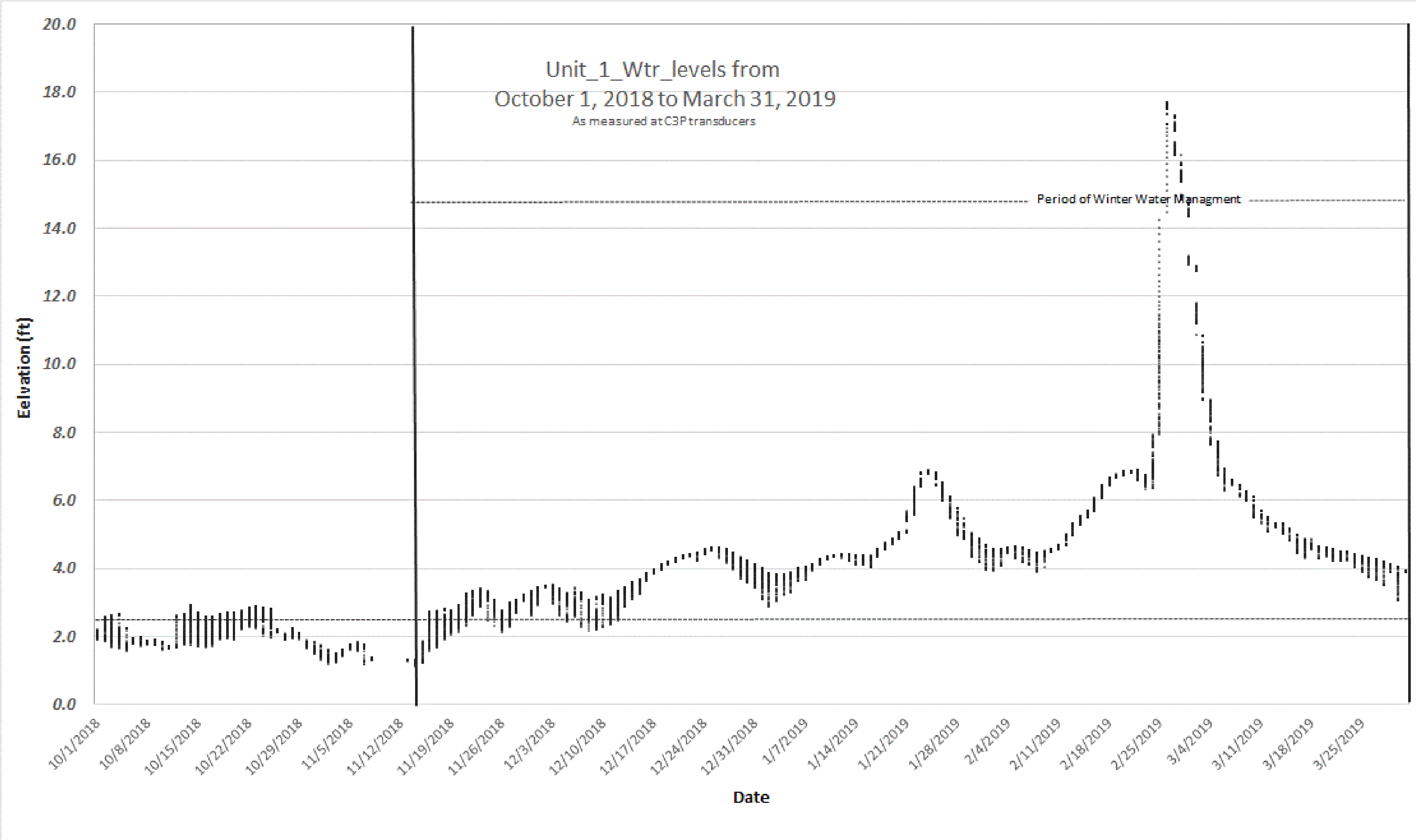

Figure 19. Unit 1 water levels from October 1, 2018 to March 31st, 2019; as measured upstream of the C3P tidegate in the Unit 1 canal.

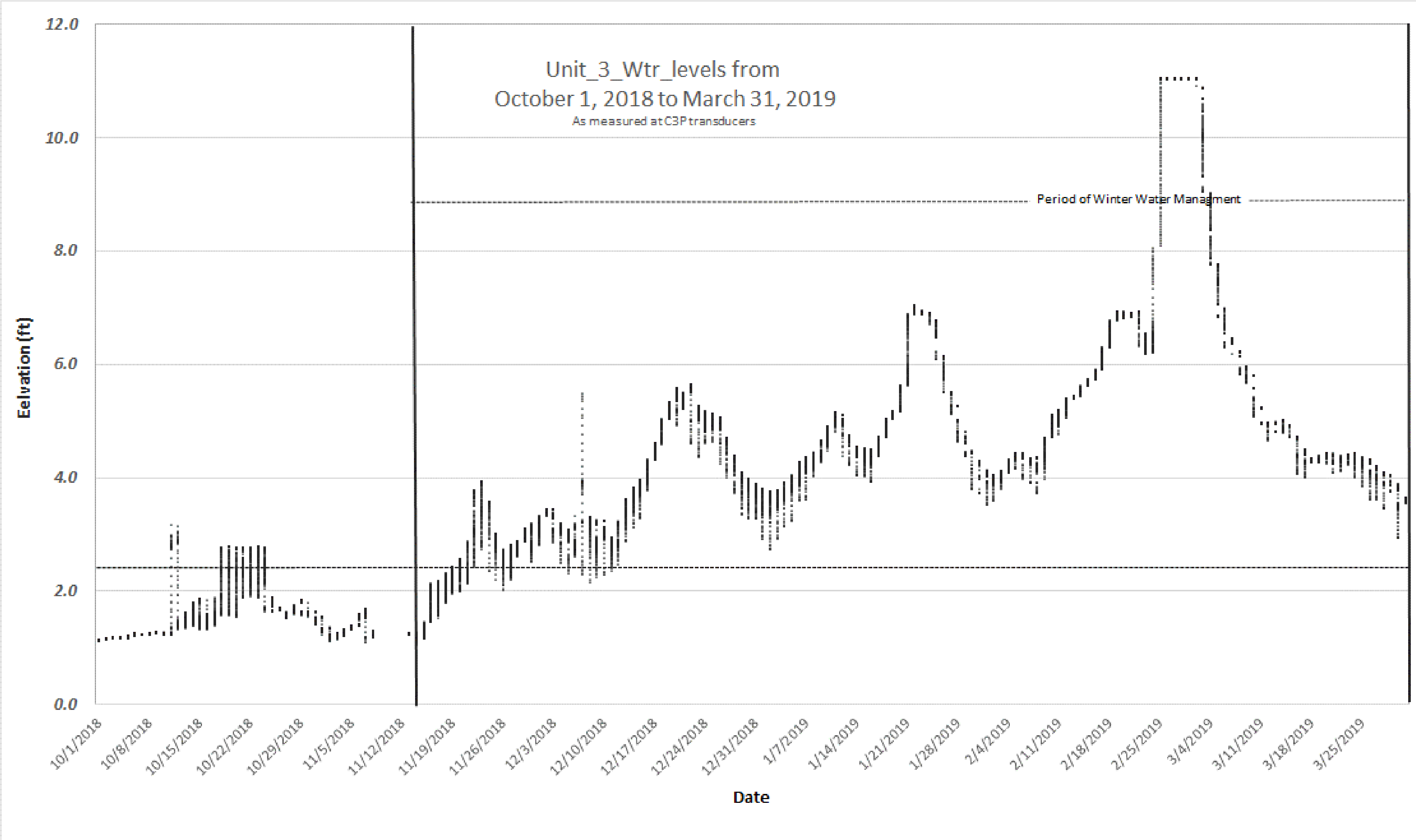

Figure 20. Unit 3 water levels from October 1, 2018 to March 31st, 2019 as measured upstream of the C3P tidegate in the Unit 3 canal.

VII. DISCUSSION

Culverts associated with interior pasture channels will be installed with invert elevation of -1.0 to 0.0ft depending on the individual culvert location on the Phase III project landscape. This will put them at an elevation where they will be backwatered continuously yearlong providing Stream Simulation conditions for fish passage that naturally occur in tidal floodplain wetlands (Appendix B Figure 1). Culverts have been sized to meet or exceed inflow/outflow needs and fish passage using three individual Technical Tactics and Synthesis of those methodologies; 1) overall C3P capacity relationships, 2) Hydraulic Capacity for 100yr floodflows, and 3). ACW relationships to 100yr floodflow and "microwatershed" pasture acreages (Streamflow and groundwater from precipitation is in the calculations). Our culvert sizing proposed exceeds the C3P tidegate inflow/outflow capacity Unit 1 by 148% and 109% in Unit 3. Using peakflow methodology the Phase III culvert sizing proposed exceeded hydraulic capacity needed on average by 215%.

Fish passage to the project area floodplain pastures is accommodated through both inflow and outflow rather than necessity for the weakest lifestage to swim against current outflow conditions as is present with culverts in in non-tidal stream environment conditions. As there is both tidal inflow directed under the DWMP and floodflow entry through the C3P tidegates, resultantly there are substantive periods when fish are able to move with flow into the main canal networks and pasture channels. We offer that this further assists when evaluating standard State and Federal fish passage criteria of 2fps flow velocity to provide for the weakest lifestage fish passage.

We evaluated the proposed interior culverts in regard to the surrogate ACW developed using USGS streamstats and known ACW relationships. The proposed Phase II culverts and channels were found to exceed surrogate ACW relationships, which is in alignment with ODFW 95th percentile fish passage criteria. The culverts on average were sized larger than ACW and we suggest also meet or exceed 1.5x ACW that would apply under NMFS passage TARP or SLOPES V restoration guidelines. Interior pasture channels have been designed with a minimum of 30% greater capacity than culverts and thus will not induce restriction of flow that has moved through appropriately sized culverts. We recognize that sizing based on ACW will fully accommodate precipitation outflow under State and Federal guidelines, however, we acknowledge that combining the afore mentioned culvert sizing methodology based on C3P capacity accommodates for tidal inflow/outflow as well.

The BSDD DWMP dictates the inflow patterns seasonally for Units 1 and 3 upstream of the C3P tidegates. The 35 proposed culverts (in the BSDD) will exceed the Unit 1 and 2 concrete 8.0x10ft box culvert capacity by 148% in Unit 1 and 109% in Unit 3. From the summer DWMP the C3P tidegates are managed to maintain water within the main canals and deeper pasture channels. Other than 18hrs per month when irrigation is likely to occur in June, July, August, and September water is not elevated onto pastures. This results in a condition where during the summer period inflow is managed minimally with water quality improvement strategies. However, interior pasture culverts are only engaged minimally. C3P tidegates are rarely operated during the fall/winter/spring period when native migratory fish are present with door openness >3.0ft from culvert floor or 240cfs inflow capacity. Low-lying culverts within Unit 1 (10 clvrts) exceed 240cfs by 320.8% and within Unit 3 (6 clvrts) by 118.8%. Accordingly, as these low-lying culverts will be connected to a common volume pasture of water they will work as a common assemblage to infill or outflow water from these pastures.

The overall capacity of culverts within Units 1 and 3 exceeds the capacity of C3P as permitted. The interior culvert capacity proposed for both Unit 1 and 3 that would be installed in the low-lying pastures exceeds C3P capacity and the low-lying culverts in both Units 1 and 3 exceed the DWMP inflow volumes that are predicted for the foreseeable future under the framework; accordingly, we would suggest*: a). as the C3P tidegate volume capacity is exceeded by the interior culverts served by C3P, and b). The hydraulic capacity and ACW relationships support the interior capacity methodology c). interior water control structures will be managed in accordance with the BSDD DWMP for the primary fish ingress/egress months of November through March; that the Phase III project aligns with prior Federal and State approvals for fish passage*. In alignment with approval of the C3P concrete box culverts and the BSDD DWMP in accordance with NMFS and ODFW fish passage guidance, we suggest that our supporting evaluation based on synthesis of three methodologies including interior culvert capacity flow volume in comparison to C3P capacity provides foundation for the Phase III project as proposed to meet Federal and State fish passage guidelines.

References

Barber, M. E. and R. C. Downs 1996. Investigation of culvert hydraulics related to juvenile fish passage. Washington State Transportation Center. Washington State University, Dept. of Civil and Environmental Engineering, Pullman, Washington. Prepared for: Washington State Transportation Commission, Department of Transportation.

Beechie et.al. 1994. Estimating coho salmon rearing habitat and smolt production losses in a large river basin, and implications for habitat restoration. North American Journal of Fisheries Management 14:797-811.

Bell, M. C. 1986. Fisheries handbook of engineering requirements and biological criteria. Fish passage development and evaluation program, Corps of Engineers, North Pacific Division, Portland, Oregon. 290 p.

Bustard, D. R. and D. W. Narver. 1975. Aspects of the winter ecology of juvenile coho Salmon *(Oncorhynchus kisutch)* and steelhead trout *(Salmo gairdneri).* Journal of the Fisheries Research Board of Canada 32:667-680.

Foltz, Randy B., P. R. Robichaud, and H. Rhee 2009. A synthesis of post-fire road treatments for BAER Teams: Methods, treatment effectiveness, and decision making tools for rehabilitation. Gen. Tech. Rep. RMRS-GTR-228. Fort Collins CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 2009: 152p.

Groot, C. and L. Margolis, eds. 1991. Pacific salmon life histories. UBC Press. University of British Columbia. Vancouver, B.C. 564 p.

Hartman, G. F. and T. G. Brown. 1987. Use of small, temporary, floodplain tributaries by juvenile salmonids in a west coast rain-forest drainage basin, Carnation Creek, British Columbia. Canadian Journal of Fisheries and Aquatic Sciences. 44:262-270.

Normann, M.N. and others. 1985. Hydraulic design of highway culverts. Report FHWA-IP-85-15. Federal Highway Administration.

Oregon Department of Transportation (ODOT) 1990. Hydraulics manual. Oregon Department of Transportation Salem, OR. https://www.oregon.gov/ODOT/GeoEnvironmental/Pages/Hydraulics-Manual.aspx.

E. George Robison, A. Mirati, and M. Allen 1999. Oregon Road/Stream Crossing Restoration Guide: Advanced Fish Passage Training Version. Oregon Department of Forestry, Salem OR. 1999:80p

Powers, P.E. et.al., 1998. Culvert hydraulics related to upstream juvenile salmon passage. June 20, 1996. Washington State Department of Fish and Wildlife Habitat Program.

Robison, George E., A. Mirati, and M. Allen 1999. Oregon Road/Stream Crossing Restoration Guide: Spring 1999. Oregon Department of Forestry 1999:80p.

Reiser, D. W. and T. C. Bjornn. 1979. Habitat requirements of anadromous salmonids. USDA Forest Service General Technical Report PNW-96. 54p.

Strahler, A. (1964) Quantitative Geomorphology of Drainage Basins and Channel Networks. In: Chow, V., Ed., Handbook of Applied Hydrology, McGraw Hill, New York, 439-476.

Schall, James D., Philip L. Thompson, Steve M. Zerges, Roger T. Kilgore, and Johnny L. Morris 2012. HYDRAULIC DESIGN OF HIGHWAY CULVERTS Third Edition. Ayres Associates 3665 JFK Parkway Building 2, Suite 200 Fort Collins, Colorado 80525. 323p.

USGS Streamstats 2020. StreamStats: Streamflow Statistics and Spatial Analysis Tools for Water-Resources Applications. https://www.usgs.gov/mission-areas/water-resources/science/streamstats-streamflow-statistics-and-spatial-analysis-tools

Appendix A:

Beaver Slough Drainage District Water Management Plan and Northwest Hydrology Consultants C3P Tidegate Hydraulic Analysis

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Appendix B:

Culvert Installation Design and Water Control Structures Proposed on Interior Culverts

Appendix B.

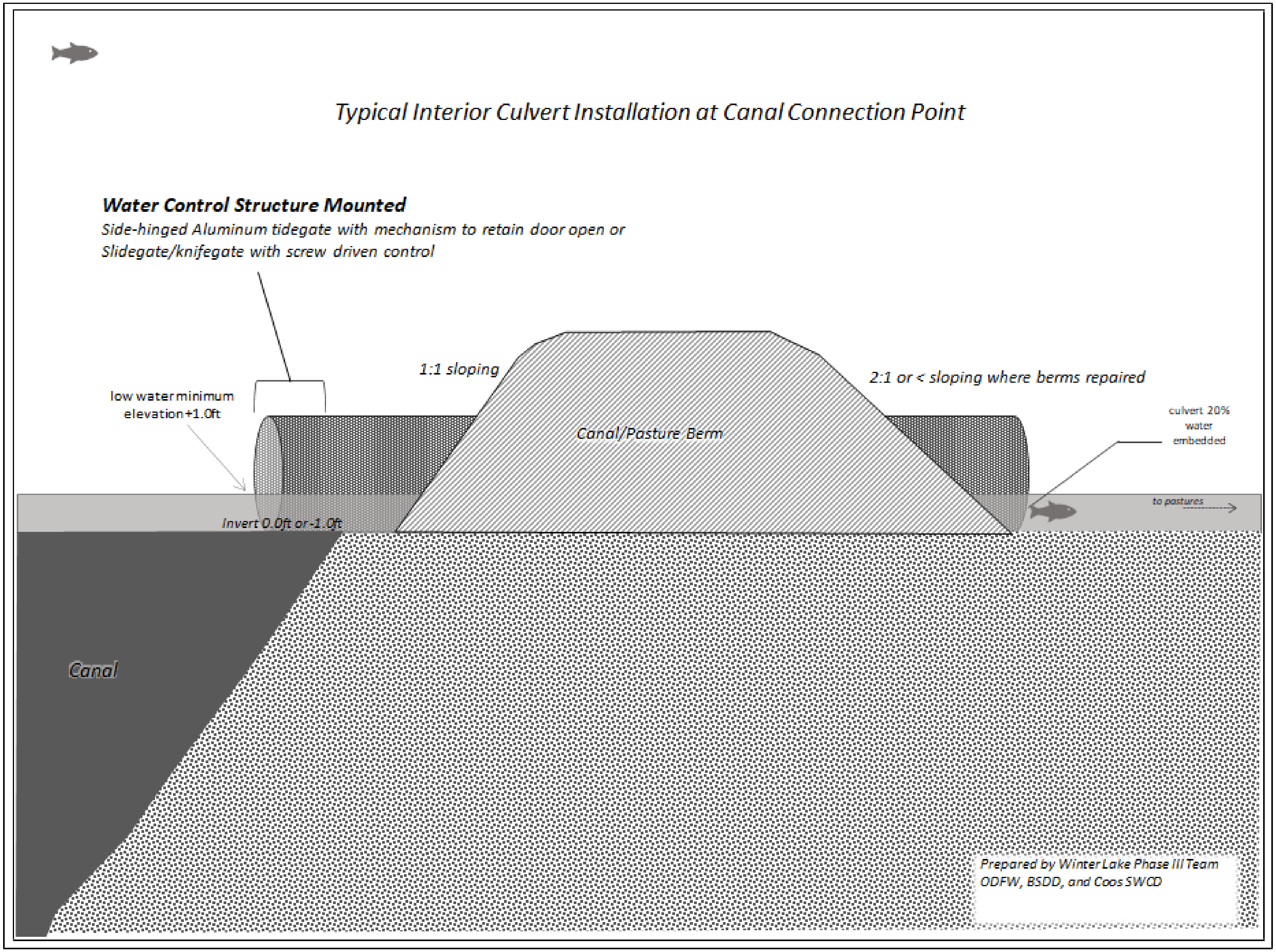

Figure 1. Winter Lake Phase III project typical interior culvert installation design.

Appendix B Cont.

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industries/product-174233-19232.html

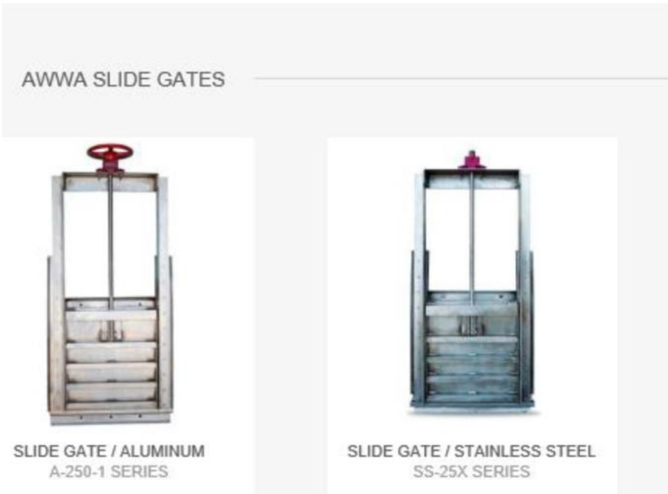


Figure 2. Slide gates proposed for selected interior pasture connection culverts.

Figure 3. Typical side-hinged aluminum tidegate mounted on 6.0ft CMP.

Appendix B Continued.

Figure 4. Side-hinged aluminum tidegate door in working location.

Figure 5. Other water control structures such as louvered gates or baffled water control structures are as of yet in the concept phase; no figure available.

Note: *The team recognizes that ODFW and NMFS will have a requirement to review design drawings of non-traditional water control structures prior to approval and perhaps inspect function of a scaled down prototype model. Non-traditional water control structures will not be installed on the project until that threshold has been met in order to assure agency staff approve that they can meet or exceed both State and Federal fish passage guidelines. Until that time only traditional water control structures will be installed.*

(To Be designed)

Appendix C:

Fish Passage Hydraulic Engineering Tables for Culvert Capacity

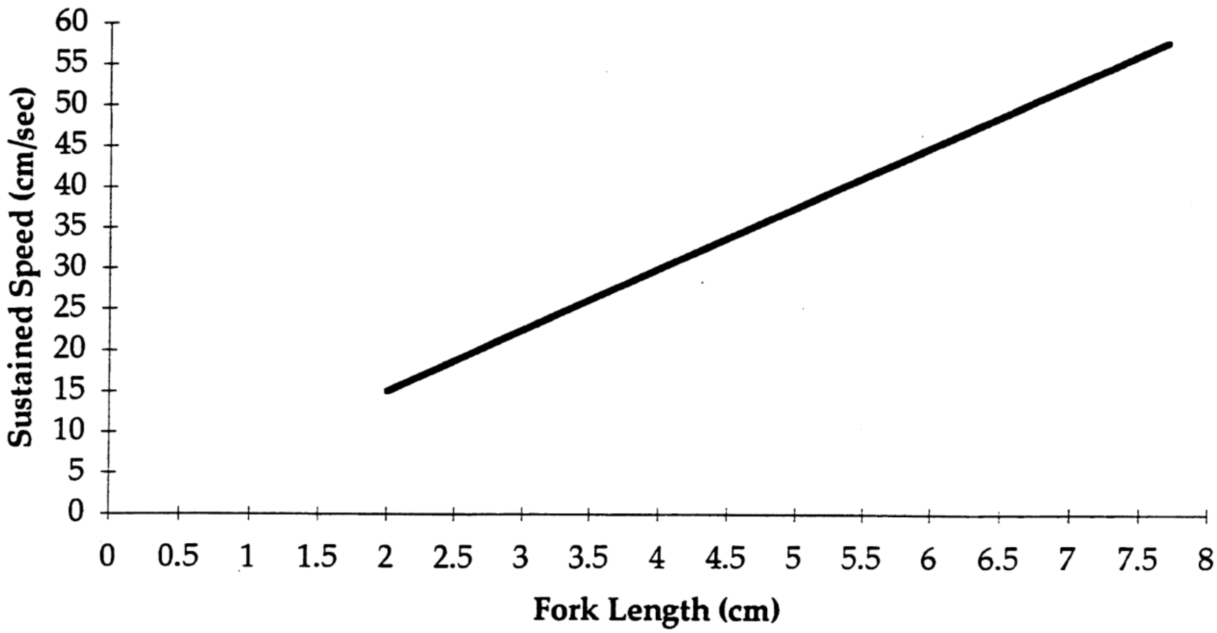


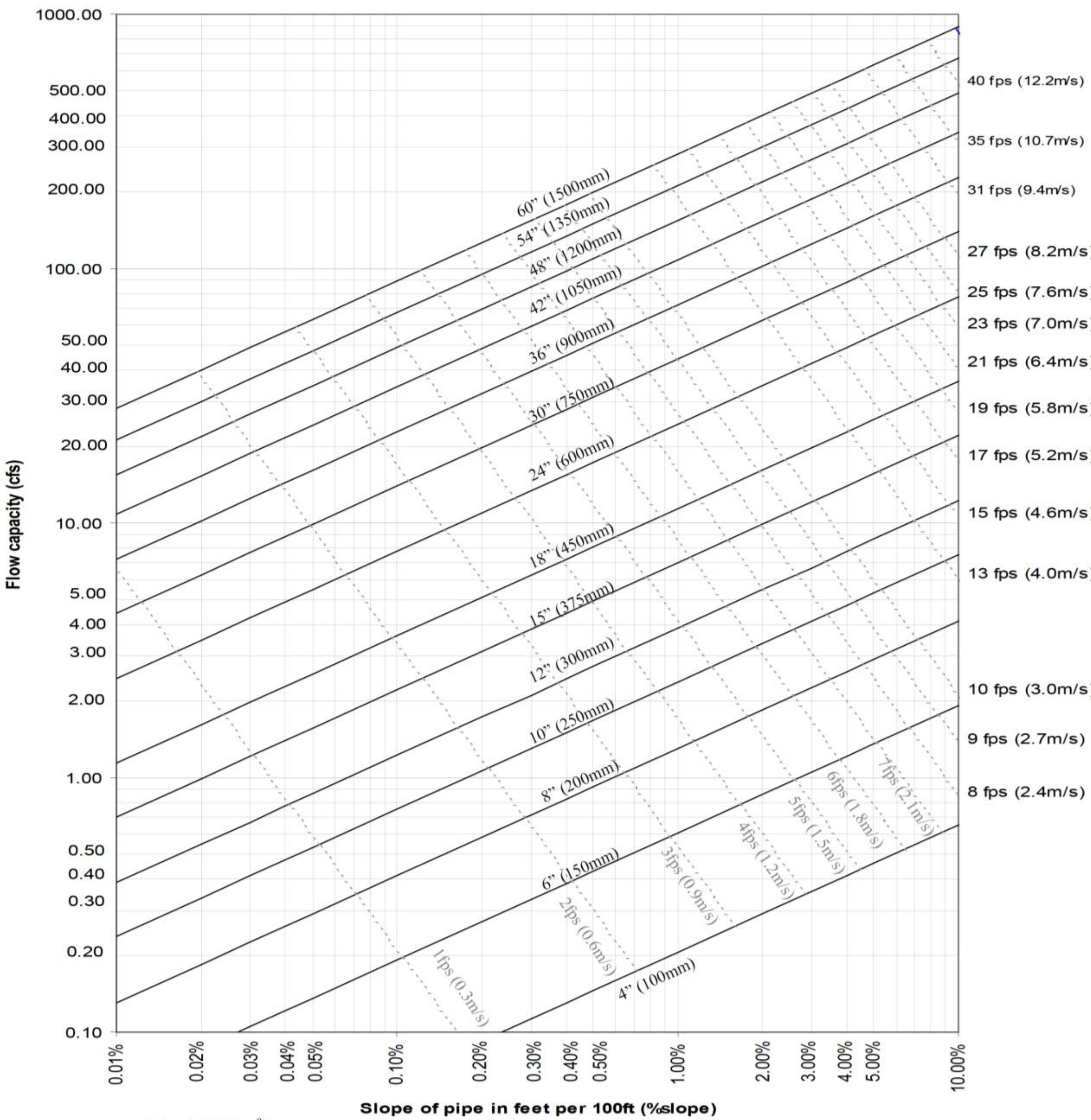
Figure 1. Sustained speed versus fork length for juvenile salmon (Modified Figure 2.2 from USDA Forest Service, 1978). From Barber, M. E. and R. C. Downs 1996.

Table 1. Flow capacity for circular and pipe-arch culverts (Robison and others 1999). Table 23 in Foltz, Randy B., P. R. Robichaud, and H. Rhee 2009. A synthesis of post-fire road treatments for BAER Teams: Methods, treatment effectiveness, and decision making tools for rehabilitation. Gen. Tech. Rep. RMRS-GTR-228. Fort Collins CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 2009: 152p.

Circular culverts[a]			**Pipe-arch culverts**[a]		
Diameter	**Cross-section area culvert**	**Maximum flow in culvert**	**Span × Rise**	**Cross-section area culvert**	**Maximum flow in culvert**
(inches)	(ft^2)	(cfs)	(ft and/or inches)	(ft^2)	(cfs)
15	1.2	3.5	22″ × 13″	1.6	4.5
18	1.8	5	25″ × 16″	2.2	7
21	2.4	8	29″ × 18″	2.9	10
24	3.1	11	36″ × 22″	4.3	16
27	4	15	43″ × 27″	6.4	26
30	4.9	20	50″ × 31″	8.5	37
33	5.9	25	58″ × 36″	11.4	55
36	7.1	31	65″ × 40″	14.2	70
42	9.6	46	72″ × 44″	17.3	90
48	12.6	64	6′-1″ × 4′-7″	22	130
54	15.9	87	7′-0″ × 5′-1″	28	170
60	19.6	113	8′-2″ × 5′-9″	38	240
66	23.8	145	9′-6″ × 6′-5″	48	340
72	28.3	178	11′-5″ × 7′-3″	63	470
78	33.2	219	12′-10″ × 8′-4″	85	650
84	38.5	262	15′-4″ × 9′-3″	107	930
90	44.2	313			
96	50.3	367			
102	56.7	427			
108	63.6	491			
114	70.9	556			
120	78.5	645			
132	95	840			
144	113.1	1,000			

Table 2. Flow Capacity for Circular Culverts and Pipe Arch culverts. Table 6 From E. George Robison, A. Mirati, and M. Allen 1999. Oregon Road/Stream Crossing Restoration Guide: Advanced Fish Passage Training Version.

CIRCULAR CULVERTS			***PIPE-ARCH CULVERTS***		
DIAMETER (inches)	Cross-Section Area Culvert (ft^2)	MAX FLOW in Culvert (cfs)	**SPAN x RISE** (feet and/or inches)	Cross-Section Area Culvert (ft^2)	MAX FLOW in Culvert (cfs)
15	1.2	3.5	22" x 13"	1.6	4.5
18	1.8	5	25" x 16"	2.2	7
21	2.4	8	29" x 18"	2.9	10
24	3.1	11	36" x 22"	4.3	16
27	4	15	43" x 27"	6.4	26
30	4.9	20	50" x 31"	8.5	37
33	5.9	25	58" x 36"	11.4	55
36	7.1	31	65" x 40"	14.2	70
42	9.6	46	72" x 44"	17.3	90
48	12.6	64	6'-1" x 4'-7"	22	130
54	15.9	87	7'-0" x 5'-1"	28	170
60	19.6	113	8'-2" x 5'-9"	38	240
66	23.8	145	9'-6" x 6'-5"	48	340
72	28.3	178	11'-5" x 7'-3"	63	470
78	33.2	219	12'-10" x 8-'4"	85	650
84	38.5	262	15'-4" x 9'-3"	107	930
90	44.2	313			
96	50.3	367			
102	56.7	427			
108	63.6	491			
114	70.9	556			
120	78.5	645			
132	95	840			
144	113.1	1000			



1cfs = 0.02832 m^3/s
1ft/s = 0.30480 m/s
1% = 0.01 ft/ft

1. Applicable products: N-12®, MEGA GREEN®, N-12 STIB, N-12 WTIB, HP STORM, SaniTIte®, SaniTite HP, N-12 Low Head

Note: Based on a design Manning's "n" of 0.012.
Solid lines indicate pipe diameters. Dashed lines indicate approximate flow velocity.
Redeveloped from FHWA HDS 3 – Design Charts for Open-Channel Flow[2]

Figure 2. Figure 3-1 in ADS Inc. Drainage Handbook; discharge rates from ADS corrugated pipe with smooth interior liner.

Appendix D:

Phase III Action Impact Benefit Table

Table 1. Analysis of Impacts and Benefits for Winter Lake Phase III proposed actions.

Note: *All disturbance actions are considered to be recovered/revegetated from disturbance 2yrs post project. Majority of attributes are designed to produce uplift that result in "Net Benefit" ecologically*

Action	Impact	Impact to Ecology Time of Construction Yes/No	Severity of Impact High/Med/Low	Healed by Year 2 Yes/No	Net Ecologic Benefit by Yr 3 Yes/No	Benefit Power Power High/Med/Low	Explanation
Installation of new proper sized culverts	Earth Work interior berms	Yes, due to soil disturbance	**Low**	**Yes**	**Yes, immediate uplift**	**High**	*New culverts allow for more natural hydrologic flow of water to interior pasture channels. greatly improved fish passage and wetland function. Net benefit strong much greater than impacts from time zero forward*
Channel construction/reconstruction; Excavation	Excavation/ soil disturbance	Yes, soil disturbance	**Medium**	**Yes**	**Yes, immediate uplift**	**High**	*New/reconstructed channels provide for more natural hydrologic flow of water to interior pastures, greatly improved fish passage and wetland function. Net benefit much greater than impacts from time zero forward.*
Channel construction/reconstruction; soil thin-spread	Soil distribution to 3" on wetlands	Yes, plant disturbance, unvegetated soils	**Medium**	**Yes**	**Neutral by year 3**	**Neutral by year 3**	*Soils that are distributed on wetland pastures will be thin-spread on average to 3" in depth; they will be integrated into pasture grasses as wetland plants are fully able to grow through this application fall of year 1 with full healing by year 2.*
Channel Reconstruction bank sloping 1:1 and 2:1	Soil disturbance	Yes, soil disturbance	**Medium**	**Yes**	**Uplift by year 2**	**Medium**	*Current pasture drainage channels have vertical banks that lead to bank sloughing and provide little if any edge habitats for fish when winter flows fill channels. Sloping of banks of channels will provide edge for growth of vegetation/fish cover, reduce erosion, and sediments*
Construction of Hydrologic Bulbs	Soil disturbance	Yes, soil disturbance	**Low**	**Yes**	**Yes, immediate uplift**	**High**	*Hydrologic bulbs will be installed at upper reaches of channel networks in selected locations. These bulbs will be excavated to an elevation that during winter months they provide long-term wetted habitat for juvenile coho. These also increase hydrologic exchange of water, which results in greater flushing of channels during tidal inflow/outflow. This prevents channels from accumulating sediments and provides long term channel life expectancy with little or no reexcavation to "clean" sediment. These bulbs also allow for greater volume capacity of channel networks duriing inflow/outflow events, which provide for exchange of water in channels and canals improving water quality.*
Berm Reconstruction		Yes, soil disturbance	**Low**	**Yes**	**Neutral by year 3**	**Neutral by year 3**	*Locations where berms are reconstructed will be be seeded/mulched. They are expected to be fully revegetated by year by end of growing season year 2.*
Fence installation	Some soil disturbance	Minimal	**Very Low**	**Yes**	**Yes**	**Medium**	*Fencing of selected segments of channels provides immediate benefits to water quality and longer term establishment of riparian vegetative and woody plants for fish habitat complexity.*
Large Woody Debris Installation large channels	Some soil disturbance	Minimal	**Very Low**	**Yes**	**Yes**	**High**	*Installation of LWD rootwads in first 500ft of larger channels will fully provide uplift through providing complexity for fish and other aquatic organisms.*
Planting of Trees on large and selected secondary channels	N/A	N/A	**N/A**	**N/A**	**N/A**	**HIgh**	*Skip planting of trees will be implemented on large and selected medium channels in segments where fence is installed. Additionally, individual caged trees will be planted. Skip planting will be three trees planted in a single 8x8ft plot every 100ft on large channels and selected medium channel reaches (Figure xxx). Tree species will be either Oregon Ash, Black Cottonwood, or Spruce.*

Net Ecological Benefit by Year 1	**Medium**
Net Ecological Benefit by Year2	**High**

Winter Lake Phase III
Tidal Restoration Project

Tidal Area Restoration Programmatic
(TARP)
Project Design Criteria - General Construction Measures Assessment

Christopher W. Claire; Oregon Dept. of Fish and Wildlife
and
Caley Sowers; Coos SWCD
02/03/23

Project Summary

The Winter Lake Phase III Tidal Restoration project developed by the Coos Soil and Water District has been specifically designed tomaximize ecological uplift while retaining early summer/summer/fall pasture grass farming operations. The site located at RM 20.5 in the Coquille River estuary. The project area is upstream of the C3P tidegates and C3P provides the overarching water control under the Beaver Slough Drainage District (BSDD) NMFS/ODFW water management plan. The land area, 1,290 acres below elevation 8.0ft and two pastures comprising 99 acres) within the Coaledo Drainage District (CDD) were historically a tidal forested freshwater complex with elevations that were predominantly below elevation 8.0ft. The project area has complex hydrology dominated by tidal amplitudes in dryer months, however, heavily influenced by rising river levels and floodwater in winter. The site plant species historically included red alder (Alnus rubra), however, predominantly Oregon ash (Fraxinus latifolia) and willow (Salix spp.). Vegetative species typified by slough sedge (Carex obnupta), small fruited bullrush (Scirpus microcarpus), and bur reed (Sparganium Americanum). This vegetative community would have in turn provided a strong detrital macroinvertebrate energy source. The site conditions as examined by LiDAR imagery indicate that there were substantial tidal channels penetrating the project area from the mainstem Coquille Riverprior to human alteration. These channels would have provided the rearing habitat for native salmonid and estuarine fish to feed within the marsh plain on the heavy loading of macroinvertebrate food items that were produced. In 1907-1908 pathways were cleared through the wetland forest, a new exit location was excavated through the Coquille River natural levee, tidegates were installed, the land area was drained during dry months and burned to create grazing land pastures.

The Project Team has proposed installing over 90,000ft of new/reconstructed channel. The project will address 42 aging culverts with fish passage obstructive top-hinged tidegates. These culverts are placed to provide for individual water management precision through interior low elevation berms. Culverts will be upsized to appropriately meet the site hydrology (see Hydrologic Assessment). Tidegates will be replaced with side-hinged aluminum tidegates fitted with devices to allow doors to be held open in the fall/winter/early spring allowing for maximization of fish passage into reconstructed channels. The full network of channels upstream of C3P main tidegates is under the BSDD Water Management Plan. Overall the project is anticipated to have a substantive ability to increase access for juvenile coho production and other native fish compared to the current conditions.

No new berm/dike will be constructed and repairs will be limited to the need for providing water management within individual water management units.

Feedback for Project Actions in Regard to TARP Guidelines

Note: *The Project Team has sought to address the Design Criteria with Specific Relevance for the project.*

Tide/Flood Gate2 Removal, Replacement, or Retrofit

This project will replace 42 culverts (consolidate 3) and associated tidegates with culverts that meet hydrology capacity for the individual pasture/water management units. Side-hinged aluminum tidegates that meet or exceed NMFS/ODFW fish passage criteria will be installed on new culverts. The winter water management strategy will be to manage the 39 tidegates in an open position during winter/spring months to maximize tidal inflow/outflow and fish access to the floodplain habitats. Overall the project is designed to meet NMFS criteria noted in TARP, "Habitat is benefited by increases in tidal inundation depth and duration during critical juvenile rearing or out-migration periods. Upstream passage is benefited by decreasing pipe velocity or increasing the duration of gate openness during critical migration periods."

#1-3. *Not applicable for this project*

#4. Review and Verification

NMFS, ODFW, other action agencies responsibility. The Project Team has previously had three Zoom style meetings on the design/development of the project with NMFS and ODFW. Additional coordination meetings are scheduled as the permitting works through USACE, DSL, NMFS, DEQ, and ODFW.

#5-7. *NMFS and coordinating agency guidance. No feedback needed.*

#8. Project Design

a). Current and regional climate considerations have been considered. With sea level rise expected to reach 1.0ft by 2032. The main C3P large 8.0ft x 10ft tidegates at the Coquille River are anticipated to continue to provide sufficient water management through 2032 for operations of the grazing, with only beneficial effects from higher base water elevations for production of fish. The creation of the new/reconstructed channel network will address access for fish to interior pasture feeding location, greatly reduce/eliminate stranding locations, and provide for increased hydrologic "breathability." Streamflows on the Oregon coast are expected to decline approximately ~30% during the drier months, however, these changes will not affect project function.

b). The project area was historically, a tidal dendritic network forest floodplain with high channel configuration per acre. The location has not been under industrial use at any point and no known chemicals that are toxic are known to exist on the site. There are few available records for the uses of the site since Euro-human development, however, anecdotal information from the long-term ranchers of the community indicates that the pastures have been in pasture grass production since tidegates were installed in the early 1900's, the forest was cleared, and pasture grasses were established.

c). The project Team has submitted or is in progress on the following permits for the project:

- *Oregon Dept. of State Lands: 404 Fill and Removal Permit application.*
- *U.S. Army Corps of Engineers: 404 Fill and Removal Permit application, Project Work Plan/Design and Engineering.*
- *State Historical Preservation Office (SHPO) archeological survey report (in development).*

- *Coos County Planning: 404 Fill and Removal Permit application*
- *Oregon Dept. of Fish and Wildlife: The project Team is coordinating with ODFW for state fish passage approval. The following additional information provides support: 404 Fill and Removal Permit application; SHPO Documentation/Eligibility forms (in development), Project Work Plan.*

#9. Site Layout and Flagging

a). Before significant ground disturbance the travel routes from the staging that will minimize impacts to work areas will be made known to the contractor. The site work areas are considered wetland status and show accordingly as wetland under the National Wetland Inventory developed by USFWS. Discussion will be incorporated with the Team and contractor(s) prior to work to ensure that tactics are employed to minimize impacts to wetlands. i. Specifically, much of the site is considered sensitive, thus contractors will be guided to perform work that minimizes permanent impacts; ii. Equipment entry and exit points are: from Hwy 42 and from N.B. Lane on the west; iii. Stream/tidal channel crossings only occur along main routes (see Additional Materials in 404 permit application); iv. Staging, storage, and stockpile areas will be denoted to contractors hired to complete work and are noted in Additional Materials.

#10. Staging, Storage, and Stockpile Areas

Staging areas are denoted as the C3P tidegate work area, the entrance off of Hwy 42, the riverbank road along the Coquille River (see the Design/Engineering and 404 Fill and Removal permit application for notation of entry/exit points and staging/stockpile locations.

a). No hazardous materials, other than fuel and hydraulic fluids will enter the project area. Fueling will occur 150ft from open water/streams. There are three entry points to the site: 1). From North Bank Lane on the west; and 2). Hwy 42 on the eastern boundary of the project area; 3). Riverbank road to through Roseburg Forest Products.

b). No permanent stockpiling of material that will be used later will occur. The project is designed to be "Zero" cut and fill balance.

c). Staging areas and stockpile sites will be seeded and mulched following the project implementation and prior to heavy winter rains.

#11. Erosion Control

a, b). The project Team has developed a Workplan that delineates the routes of travel from North Bank Lane, Hwy 42, and the Riverbank road to the project work areas. Work will occur from top of bank with the excavator. If soils are softer than will support equipment crane matting will be utilized. The project may incorporate use of a low ground pressure Maruka dump truck if deemed that a traditional truck will sink into soft pasture soils. Construction of the berm at the tidegate location will be feathered to blend with the existing berm/dike and seeded and mulched following installation of the tidegate. Disturbed soils south of the tidegate installation location will receive jute or other erosion control matting with seed either embedded or spread on berm repair area prior to installation of the matting. The project area will be dewatered and isolated from tidal inflow/outflow during the work period of July 1 to September 15th. All Work below Ordinary High Water to connect the project main channel with the mainstem Coquille River will occur on low tide and low incoming tide. These measures will work to keep turbidity at a minimum and within the work area.

c). For hire contractors will be asked to submit a workplan that: i. Denotes that all work in sensitive wetland areas will be completed efficiently and prior to fall rains and the fall deadline for the In-Water Work *window. ii. No work will occur where the excavator or other equipment is actively inundated under the tracks of machinery. Work will cease in the fall on September 15th (In-Water) unless upstream of an interior closed water control structure that prevents fish into the active work area. iii, iv, v. The Project Team will manage contractors to work within channel locations so as work will be performed in the dry or on a low incoming tide, such that turbidity is captured within the work area and not transported downstream to the Coquille River. This will minimize the duration of In-Water work that will have potential to generate turbidity. During incoming tide work will be ceased when water elevation and depth increase to the threshold where excavation begins to generate turbidity that escapes the immediate work area. vi. Water quality inspection will be completed using either "visual above background" or turbidimeter following DEQ guidelines by SWCD or ODFW staff when work will occur In-Water or where sediment may be produced near water. Seeding and mulching will be incorporated on all disturbed soils following construction. Soil stability and effectiveness of seeding/mulching will be monitored during the first substantive rain events. Additional measures to correct issues will be incorporated as necessary. A contractor spill kit will be available on site during periods when machinery with hydraulic fluid and fuels are being operated.*

#12. Hazardous Material Spill Prevention and Control

a). The contract language for all hired contractors will specify in writing that: i.- iii. The project will maintain a spill containment kit at the site during occupancy onsite. Staff trained in the use of the kit will be available at all times.

#13. Equipment, Vehicles, and Power Tools

a). We anticipate the contractor(s) will utilize a 20,000 or 30,000lb series excavator for the project, dozers, and standard dump trucks. The excavator size class will not be excessively impactive to the wetland soils and the site conditions comparably to larger machines. The culverts and tidegates will be either ferried to the installation locations with the use of the excavator or on flatbed trailers as the pasture area is sufficiently dry in summer months for vehicle travel. Track machines incur only modest impact to wetland soils due to the high level of surface area. The soils on site are relatively dry during summer months, however, if deemed necessary a Maruka style low ground pressure dump truck will be employed to move riprap from the road to the work area if wetland soils will be negatively impacted.

b). i. Equipment will be brought to the site clean, without leaks, and or seeds/plants/soils from off location. ii. Contractors and private landowner operators will be required any machine that works below Ordinary High Water (OHW) will need to be free of oil, fuel, or hydraulic leaks or operating with biodegradable hydraulic fluid.

d). Only excavators will work below OHW during to develop the new/reconstructed channels, remove/install new culverts and tidegates and place riprap.

e). All waders, boots, and hand equipment will be inspected to ensure they are free of plants, soil, or other organic material from offsite.

#14. Temporary Access Roads and Paths

a-b. Road access to work areas is from Hwy 42 on the east, North Bank Lane on the Western side of the project area, and the Riverbank Rd. through Roseburg Forest Products, which are all existing paved or gravel routes. Interior access will be gained on the road to the C3P tidegate and pasture drive pathways during periods when soils are sufficiently dry for vehicular access. c-d. No riparian vegetation is present along canals or channel locations where work will occur, thus removal of riparian vegetation is not expected. e. The site is near zero slope and any temporary access routes will be across pastures without improvements. f. There are no access routes that are steeper than 30% grade on the project area; see item e writeup. g. Seeding and mulching of soils will occur where road access results in disturbance that exceeds *the native grass on site from regrowing in the first fall period following disturbance. h. Temporary access routes will be across dry pasture location and not expected to create rutting or sufficient soil disturbance where local grasses will not regrow. However, seeding and mulching will be used to restore vegetation following disturbance. Any rutting will be recontoured to the existing wetland pasture form. The minimum number of trips needed to transport materials and equipment from the staging areas to the work locations will be incorporated to reduce wetland impacts. Following construction any excavator track furrows will be smoothed and disturbed soils seeded and mulched.*

#15. Dust Abatement

a-f. The site is currently well vegetated with pasture grass species. It is not anticipated that the quantity of travel on the pasture access drive-path will result in dust conditions that affect North Bank Lane travel or create issues with adjacent landowners. However, if dust abatement is necessary application will be completed with either use of a water truck application.

#16. Temporary Stream Crossings

a-f. No temporary stream crossings will be used for this project.

#17. **Surface Water Withdrawal**

a-b. The project does not anticipate the need for use of surface water.

#18. Construction Water Discharge

a-b. The project actions may require some pumping of water to dewater existing channels. Only clear non-sediment laden waters will be pumped to the mainstem Coquille River. Sediment laden waters from any pumping will be delivered to pasture locations where vegetation will filter the water prior to entering a stream/waterway. Waters will not contain any pollutants.

#19. Fish Passage

a. There are not anticipated to be salmonid fish present within the project area during the proposed July 1 to September 15th work period as the thermal conditions exceed tolerance (>72°F). There are no fish bearing streams that enter the project area, accordingly fish passage is not a factor within the scope work for this project. b. The new side hinged aluminum tidegates and appropriately sized culverts in regards to hydrology are anticipated to meet or exceed ODFW and NMFS fish passage criteria. The main C3P tidegate is a separate previously completed project, however, the C3P tidegate Water Management Plan guides water levels within the project area. The project will address 42 interior culverts/tidegates. During winter/early spring months interior gates will be managed fully open to maximize fish passage.

#20. Timing of In-Water Work

a). The project will be completed in the June 1 to September 15th period, with all in-water work from July 1-Sept 15. The Project Team has consulted with appropriate agencies and the project actions are considered to be within reasonable impacts and accommodated by weather conditions during July 1- Sept 15th. b. N/A, c. N/A, d. The Project Team will submit any In-Water extensions for work at least two weeks prior to the time period needed.

#21. Work Area Isolation

a-d). Work activity impact minimization for all actions below OHW will be completed through working with the tidal cycles for the site and or working in the dry from locations that are dry for new/reconstruction of channels and connecting with the minimal number of excavator buckets possible. The period chosen to complete work is July 1-Sept 15th. For the final connection of the new/reconstructed tidal channels to the main canal networks dry periods of August or September with the lowest water levels possible will be *chosen. Sequencing connections will also consider tidal amplitude as this will allow for work on low tide cycles that are sufficiently low to allow for work in minimal water depth. Work will be conducted in a manner where excavation will follow the tidal cycles downward, completing final excavation or fill/placement of riprap during the extent of low tide and incoming tide. There will not be a need for a coffer dam or isolation sheet piling for any sites with this project as the existing dikes will remain in place where culverts will be installed through to the main canals.*

- ***Excavation/installation of the new culvert/tidegates:*** *The new culverts/tidegates will be prepared as a single unit and installed simultaneously. Large amplitude tidal cycles will be chosen in late August or September for most locations where new culverts with attached tidegates will be installed to connect pasture channels to main canals. The berms/dikes will be excavated down following the declining tide and old failing culverts/tidegates will be removed and placed temporarily within pasture locations adjacent to the work area prior to disposal at an approved landfill or waste transfer. The lowest elevation earthen work will occur at the lowest ebb tides and on the low incoming tide. Work to install the culverts will be completed on a single low tide event, with riprap installed on subsequent low tide series.*

#22. Fish Capture and Release

a-i). Work below OHW will be on the declining low tide period. Salmonids and other fish are not expected to be within the active work area due to high stream temperatures (72°+F) from June 15th through September 15th. Native three spined sticklebacks will be present at some culvert/tidegate replacement locations and will be salvaged and released into the mainstem canals upstream of C3P. A qualified fisheries biologist from ODFW staff or the Coos Watershed Association will manage fish salvage and work area isolation. Electroshocking is not a viable means of fish capture due to salinities. While the project actions are designed with sequencing that will minimize fish salvage, capture of sticklebacks and other native fish in interior channels and construction locations will be completed using dipnetting and seining methods. Fish captured will be retained the minimal time possible in buckets. Aeration will be provided as needed. Fish numbers in buckets will be maintained at levels where excessive stress is not incurred. If salmonids are observed or captured, they will be released into the main China Creek canal or Beaver Creek where temperatures are amiable. For fish such as sticklebacks with a temperature tolerance range that accommodates summer regimes they will be released into main canals.

#23. Invasive and Non-native Plant Control

a-s. This project focuses on tidal channel restoration and fish passage. No herbicide spraying is planned as part of project actions. Following project actions, soils that have been disturbed will be seeded with a mixture of annual rye grass, perennial rye grass, and Kentucky bluegrass. Mulch will be also applied where there is erosion potential due to slope or poor native grass recovery. The existing grass species (largely bentgrass) present and seeding and mulching tactics are expected to fully revegetate the site. Vegetation will resist colonization of the site by non-native invasive plants. Currently there is not a problem with non-native invasive vegetation on the site. No use of herbicide or specific soil excavation to remove invasive plants is planned during the project.

#24. Piling Installation

a-d). No new piling are anticipated to be installed with this project. Poles have been inserted at most of the existing culvert/tidegate locations. As these are not needed with the new culvert/tidegate infrastructure these will be removed. Most of these are only into substrates 5-6ft and removal with an excavator is not considered likely to encounter difficulty. Non are known to have been treated with creosote..

#25. Broken or Intractable Pile
a-d. No treated piling or piling older than 50yrs in age are planned for removal. Some wooden poles may be removed. As these are not chemically treated and are natural Douglas fir, if they break off below the surface of the soil this will not result in negative effects for site environmental conditions.

#26. Projects Requiring Post-Construction Stormwater Management (PCSM)
a-d). This project is within the historical tidal floodplain. Soils are silt/clay/sand for all locations where excavation will occur. These silt/clay/sand materials are the primary constituent for repair of the berm/dike and construction of the earthen berm cirque that will encompass the new culver/tidegate. These soils will be excavated will be placed in location and compressed to construction standards that provides stability, however, their particle size and compaction levels will fully continue to allow precipitation penetration. The Project Team does not anticipate PCSM need for this project as no impermeable surface will be expanded or created. That said, as part of the project permitting actions a 1200C stormwater plan will be developed and DEQ 1200C permitting obtained.

#27. Site Restoration
a. Berm repair will occur in at least five locations within the project area and be confined to reaches on berms that are <200ft in length. Seeding and mulching is fully expected to manage restablization of soils and erosion control matting will not be needed.
b). No waste or trash will be left on the work area. The old 12" culvert removed will be ferried to the staging area in the pasture just off of North Bank Lane Hwy for later disposal at an appropriate landfill.
c). All drive paths on the project area are on existing pasture grass vegetation. No new roads will be constructed. Pasture drive paths are expected to revegetate fully following disturbance from remaining grass root-stock. As needed, seed and mulch will be applied to drive paths where soils are disturbed to the point where grasses may be substantively weakened.
d). Compacted soils will be loosened in areas that are compacted by machinery inadvertently, using the teeth on the excavator bucket. This will facilitate seed germination microsites and reestablish pasture grasses.
e). i-vi. Riparian fencing will be installed along ~30,000ft of new/reconstructed larger channels. Some reaches of new channels will be "Skip Planted (see Additional Materials) where individual cages will provide for planting of 6 native trees per cage. Within fencing native trees/shrubs will be planted (see 404 Fill and Removal app and Engineering/Design). The Project Team will be inspecting the site during construction to minimize overall disturbance and will implement vegetative recovery tactics (seeding/mulching/planting) to ensure that soils are stabilized and ecological function is maximized upon completion of soil disturbance. Monitoring photos of work will be completed on year 1 and 3 post construction to ensure that recovery is meeting goals.

#28. Revegetation
a-h). (see previous section) All disturbed soils subject to erosion as a result of the project will be seeded with the specifically designed mix including annual rye grass, perennial rye grass, Kentucky bluegrass, and tall fescue, and mulched as needed with hay or straw. The current vegetative community in pastures is comprised of primarily bentgrass with individual locations of reed canary grass on the dike. No fertilizer will be applied with the project. The effectiveness of the seeding and mulching will be inspected following the first three precipitation events with >0.5" of rainfall and as deemed necessary thereafter. If soil stability issues are noted additional measures will be incorporated to resolve the issue. Jute matting is not anticipated to be needed to develop stabilization of disturbed soils, due to minimal pasture slopes and the modest height of berm repairs, which results in minimal sloping.

***#29.* "Flexible Uplift"**

This project is designed specifically to develop substantive increase in hydrologic function and fish passage. Flexible Uplift is not considered as needed to meet project goals.

#30. Tide/Flood Gate Removal, Replacement or Retrofit

a). The USACE is the action agency, however, ODFW staff are working directly to assure the project meets both State and Federal fish passage guidelines. The new culvert and tidegates will be appropriately sized and include features such as the aperture to provide for maintaining the door open to meet water and fish passage management goals. Culverts/tidegates will either be replaced in their existing location or moved several hundred feet. No new watershed areas will be encaptured.

b). The fish passage through the existing culvert/top-hinged tidegates into pasture channels is considered "very poor" to "poor" depending on location. The top-hinged tidegate is a style that allows only a limited degree of tidegate angle openness due to gravity and the need for water forces to push the door open fully from vertical, which is the closed position. i. Culverts are primarily a mix of PVC and corrugated metal with sizes ranging from 1.5-5.0ft. ii. The site has potential to provide habitat for, coho, juveniles, cutthroat trout (adult/juvenile), and three-spined stickleback. iii. The project will establish a hub and utilize the NAVDD88 datum in order to properly set new culverts at elevations of -0.5 to -1.0 depending on location. iv. Tidal information is collected on the C3P tidegate computer network. This information is available to assist with determining the elevations on site. v. Existing passage for top-hinged tidegates is known to be poor. No side-hinged tidegates currently are in use within the project area. Accordingly the project is anticipated to develop substantial increase in functionality for native salmonid fish.

c). Historically the Winter Lake project area was strategically important for overwinter/spring rearing of juvenile coho, fall Chinook, cutthroat trout, and to some degree juvenile steelhead. This rearing occurred within the fully connected tidal channels within forested floodplain. Following tidegate installation, deforestation, and construction of linear channels that transverse historical channels; passage of juvenile fish into the site was obstructed, water quality deteriorated due to limited tidal exchange thermal conditions deteriorated during summer months, macroinvertebrate food availability decreased, and stranding potential developed in low lying disconnected locations. This project will address connectivity for juvenile fish access into the pasture floodplain through installation of new appropriately sized culverts with side-hinged aluminum tidegates that provide a much greater degree of "door openness" over current condition and reconstruction of tidal channels that are on grade. Design sloping of the channel banks will be 2:1 or 1:1, which will reduce cattle hoof actions effects. ~30,000ft of larger channels will be fenced and planted contributing to improved spring/summer/early fall temperature regimes.

d). A Hydrologic Assessment has been developed by the Project Team. All culverts were sized individually based on two methods and a third overarching factor: 1). Drainage area/elevation served and the rainfall precipitation that would emanate upstream of those culvert locations; 2). The Active Channel Width relationship to engineering culvert capacity calculations; and 3). The overall capacity of C3P. Ultimately the new culvert networks combine to provide more capacity than the main downstream control point (C3P) in a full open condition. C3P is rarely operated and only for flood equilibration in a full open condition, thus interior culverts networks combine to substantially exceed the standard Water Management Plan operations at C3P. As designed the combined culvert capacity exceeds the volumetric delivery capacity of the main C3P tidegates (see Hydrologic Assessment).

e). The goals of the project are to restore a strong degree of tidal connectivity to the project area through: i. The project culvert/tidegate inverts have been developed/designed with substantial knowledge of river *and tidal elevation information for this reach of the Coquille River. Culvert sizing will exceed the tidal inflow capacity of the main C3P tidegates that control water inflow to the interior pastures. Fish passage has been considered and management of the new tidegates will be to maximize fish access into new/reconstructed pasture tidal channels. The new infrastructure will provide for increased capacity to manage water for pasture grazing operations during the summer period when native salmonid fish are not present tidegate will be connected with an MTR to allow for controlled tidal inflow.*

ii and iii. The new tidegates will have devices to manage the 39 new side-hinged aluminum tidegates in an open condition during months when fish are needing to access habitats. The Beaver Slough Drainage District NMFS and ODFW approved Water Management plan provides the structure for tidal inflow of waters into the site. For this particular site the WMP is designed to work to increase the water inflow during winter/early spring months and time that tidegate doors are open in order to accommodate entry of native salmonid fish, primarily juvenile coho. Coos SWCD, and ODFW staff will work collaboratively to manage the adjustment of the interior 39 interior tidegates with individual landowners on this Working Landscapes Project.

The tidegate, and MTR will be maintained. The maintenance strategy includes the following information.
1). Responsible Parties: Individual landowners on land parcels
2&3). Operating and Monitoring Protocol/Frequency: Landowners of individual tidegates will be informed by BSDD of the need to have tidegate doors opened in late fall. ODFW and SWCD will work with the BSDD and landowners to reach tidegate door management goals. The BSDD WMP has framework that encompasses the interior water levels through the annual period by quarter. Water levels can be monitored by download of data at the C3P computer output. Additional notation of annual individual landowners will be documented by Coos SWCD.
3). Modification process if passage or habitat conditions fail to meet project goals: The landowner will contact Coos SWCD who will in turn contact ODFW staff and coordination will occur to resolve fish passage or the installation to fail to meet habitat water delivery goals.
4). Reporting Protocol: The landowner will report all failures in function of the tidegate to provide fish passage or function to meet habitat goals to Coos SWCD staff for initial coordination with other pertinent entities, initially ODFW.
5). Adaptive Management Process: The Coos SWCD and ODFW will coordinate with the permit holder (BSDD) to address any need to adjust tactics and day to day interior tidegate operations to fully meet project goals.

#31. Set-Back or Removal of Existing Dikes, or Levees
a., b. This project will not set-back or remove existing dikes or levees. That said the project is designed to restore floodplain hydrologic function to the degree reasonable within this Working Landscape. Channels will be constructed on grade with bank sloping that reduces cattle hoof action deterioration. Channel layout has been designed to align with historical channel locations to provide for most efficient access and limited stranding of fish into the floodplain network.

#32. Large Wood (LWD) and Engineered Logjams (ELJ)
a. i-x.The project may install ~50 pieces of Large Woody Debris (LWD) in larger channels on various landowners. LWD will be installed with rootwads in the channel crux joint of selected new/reconstructed tidal channels in alignment with the NMFS Salmonid Passage Facility Design 2011. They will be installed at a 45° angle from the vertical or less, with insertion into the soils at least to a minimum depth of eight feet. This insertion and angle will prevent horizontal leverage flotation forces from dislodging them through time. They will be installed with the rootwad upward to maximize their ability to provide cover for fish

rearing in the channels. These LWD segments will mimic historical condition logs that would have become incorporated into the soft estuarine substrates through time on transport events. These placements are well within the normal range of historical variability. Conifer species will be used for LWD, most likely Douglas fir from a local source, however, other conifer species (i.e. white fir) may be used if availability is greater.

#33. Dam and Legacy Structure Removal
No dams or large hydrologically related structures will be removed with this project. A total of 42 interior culverts with associated top-hinged tidegates will be replaced with appropriately sized (see Hydrologic Assessment) new culverts and associated side-hinged aluminum tidegates.

#34. Channel Reconstruction/Relocation
a-c). The project will install over ~90,000 of new/reconstructed tidal channel. Channels will be constructed to slowly grade from an elevation of -0.5 or -1.0ft elevation at the new culverts/tidegates to the upper extent and or hydrologic bulbs. (see Engineering/Design). Linear channels constructed on the project area in the early 1900's traversed across historical channels. This project will realign channel networks to be in locations where historical channel networks were aligned. The project is specifically designed to restore a substantive component of floodplain function and more closely mimic historical conditions. Channel design features are denoted within the project design engineering (see 404 Fill and Removal permit application). Function of all channels will be monitored initially by SWCD and ODFW staff for the first three months following construction of the project and then by the landowner seasonally (4 times annually) to ensure the channel is functioning as designed. At a minimum the following inspection will include: 1) Integrity of bank walls; 2). Sediment transport regimes; 3). Proper transport of water; 4). Overall stability and function to meet project goals.

Hired contractors will develop and provide: 1). As-built information on culverts/channels and 2). Coos SWCD and ODFW will compare these to design information. SWCD and ODFW will manage the project during implementation so as project features align with the designs. Any performance issues with the project features (Channels/Culverts/Tidegates) and or management will be addressed through Adaptive Management strategies following identification of the issue and coordination with SWCD, ODFW, and the BSDD.

#35. Off- and Side-Channel Habitat Restoration
No off-channel or side channel habitats will be created or affected by this project. All new and reconstructed channels are directly connected and functionally linked to inflow outflow hydrology of the main tidal channel network (see Engineering/Designs).

#36. Streambank Restoration
a-f). This project will not incorporate streambank restoration as a project action. Berm repairs are adjacent to canals. These locations will be seeded and mulched following disturbance. Willow or tree planting on berms/dikes can result in root penetration and damage the berm soils, thus is not considered as a strategy.

#37. Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering Facilities
a-c). Approximately 30,000ft of fence are proposed for installation on the project area following culvert/tidegate/channel restoration. Fences will have a minimum 10-12ft setback from the Ordinary Tidal Water level within the channels. a. i. Channel conditions in the floodplain are very stable and migration zone is not considered an issue. ii. The site is currently vegetated by pasture grasses and there are no trees that will be removed in order to clear for fence construction. iii. All fencing will provide for transport of LWD at various flow levels. LWD often moves vertically and then horizontally as floodwaters rise on the site. No

water gaps will be needed for this project through the fence. b. i-x. Livestock will be able to move across channel locations outside of fenced reaches. Interior culverts will be installed to facilitate crossings in a manner that reduces environmental impacts to water quality and turbidity. All interior culverts will be sized appropriately to provide for fish passage and water conveyance at the location and pasture area that is upstream of the location. c. i-viii. Nine off-site interior pasture livestock watering locations have been proposed and are noted in the 404 Fill and Removal permit app. The total number may be reduced depending on landowner preference for watering tactics. Water availability has been identified by Oregon Water Resources Proper fish screening for withdrawal from canals in order to provide water for troughs will be incorporated. Tanks will be specifically placed in locations that assist with minimizing livestock effects to channels and active flow. Individual landowners within the BSDD have water rights for irrigation. Oregon Water Law provides that livestock watering does not require a Water Right as relegated to landowners under ORS 537.141; https://oregon.public.law/statutes/ors_537.141.

#38. Piling and other Structure Removal

a-b). Removal of piling is not planned with this project. Short piling associated with tidegates on existing culverts will be removed at the individual culvert installation locations.. No piling are known to be within the project area that have been treated with creosote. It is thought that these poles that have been inserted to support chain networks for top-hinged tidegates have only been inserted to a depth of 5-6ft, thus removal with an excavator should proceed without event.

39. Beaver Habitat Restoration

This project will not incorporate Beaver Habitat Restoration as a project action. That said the development of new/reconstructed tidal channels and planting within fenced areas are anticipated to improve conditions for beaver use of the project area.

#40. Wetland Restoration

The overall goals of this project include restoration of tidal wetland function. The site grading plans (see Engineering/Designs) work with the existing landscape topography to create a connective tidal floodplain. The project is designed with "Zero" fill-removal framework where no fill is imported or hauled off-site. No wetland habitats will be converted to new upland that does not already exist. Five wetland mounds will be constructed to provide the ability to plant Sitka spruce (Picea sitkensis), which increase wetland habitat diversity. The maximum elevation of these mounds (8.0ft) will not exceed water elevations where the feature is altered to no longer be wetland habitat.

New and reconstruction of tidal channels will provide tidal network densities that mimic historical condition, while allowing for the landowners to maintain a level of pasture haying or grazing production. The excavation plan will not result in hydrology where fish will become stranded or water will be entrapped, which would produce summer salt marsh (Aedes dorsalis) mosquitoes. Grading will also not create new upland that does not already exist or eliminate habitat types that are currently found on the project area. The project area is currently Freshwater Emergent wetland PEM1Ch and PEM1Ah and Shrub Scrub.

The installation of the new culverts/tidegates will allow for tidal inflow that is controlled through the main downstream C3P tidegates. The Water Management Plan for C3P has been designed to provide for a higher elevation in winter months (see BSDD Water Management Plan) and lower elevations in late spring/summer/early fall. These elevations provide for increased access for native salmonid fishes in the winter months and pasture grazing water management in the summer/early fall. (see Hydraulic Assessment). Improved hydrologic connectivity is anticipated to improve conditions for native wetland vegetative species that historically would have been wetted twice daily by tides followed by dewatering on *low tides. The creation of the hydrologic bulbs at the upper extent of a number of channel networks will allow for more natural tidal inflow outflow providing high value juvenile coho rearing habitat more continuously during winter months due to the excavation depth below pasture level. The invert elevation of most bulbs is around +2.5ft NAVDD 88, which will continue to allow for Freshwater Emergent plant community species to develop. The bulbs will also provide hydrologic force to prevent sediment accumulation in the channel networks, and this is intended to exempt the need to reexcavate to clean channels in the future.*

All project area soils that exhibit risk for erosion or moving into water courses will be seeded and mulched where applicable following construction. No construction waste or derelict culverts or other materials will be left on site. The Water Management Plan will be administered by the BSDD with Technical Guidance of Coos SWCD and ODFW staff to ensure that hydrological goals are achieved.

Winter Lake Phase III Restoration Project

Assessment of Project Actions and Coos County Planning/Zoning

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Introduction

The Winter Lake Phase III project is a working lands infrastructure rehabilitation project proposed on 1,290 acres of the 1,790 acre Beaver Slough Drainage District and two additional parcels totaling 99 acres in the Coaledo Drainage District. The project will replace/consolidate a total of 42 pasture culverts with associated tidegates, install over 90,000ft of new and reconstructed tidal/farm drainage channel, repair five segments of failing berm, excavate deposited sediments from China Camp Creek, and install up to nine heavy use watering site troughs (see 404 Fill and Removal permit application and associated Additional Materials). The project area is fully within properties that are zoned as EFU, EFU/CREMP, and or EFU/IND. As such the proposed actions to rehabilitate drainage infrastructure for farming use are facilitatively allowed under the Coos County Planning Code. The lands are within the FEMA floodway Zone A. An engineer floodplain certification application documenting that the project complies with FEMA guidelines is in preparation for submission separately to accompany the 404 Fill and Removal permit application materials to the County Planning Dept. All potentially affected parcels are noted in Table 1. Herefore, this report is written feedback for specifically applicable planning criteria that directly guide project actions within these zoning codes. Ownership documentation in Appendix A.

Table 1. Winter Lake Phase III taxlot parcels within and included in project action area.

Owner Name	TLID	Tax Account #	Plan Zoning
BRIDGES FOUNDATION LANDS	27S13W29TL0010300	99916787	EFU , CREMP
BRIDGES FOUNDATION LANDS	27S13W20TL0150300	99916790	EFU*
BRIDGES FOUNDATION LANDS	27S13W29TL0010100	717600	EFU , CREMP
BRIDGES FOUNDATION LANDS	27S13W28TL0040000	717402	EFU
BRIDGES FOUNDATION LANDS	27S13W28TL0060000	717401	EFU
BRIDGES FOUNDATION LANDS	27S13W27TL0040000	716702	EFU
BRIDGES FOUNDATION LANDS	27S13W27TL0050000	716800	EFU
BRIDGES FOUNDATION LANDS	27S13W28TL0070000	717500	EFU
EVERETT-ONA ISENHART RANCH,INC; ETAL	27S13W33TL0010000	721202	EFU , CREMP
ISENHART, JOHN & LAURA J TTEE	27S13W33TL0020000	721200	EFU , CREMP
FRED MESSERLE & SONS, INC.	27S13W34TL0080000	722300	EFU , CREMP
FRED MESSERLE & SONS, INC.	28S13W03TL0010000	898300	EFU , CREMP
FRED MESSERLE & SONS, INC.	27S13W35CTL0090000	724600	EFU
OREGON DEPARTMENT OF FISH/WILDLIFE	27S13W21TL0240500	712904	IND, EFU
STATE OF OREGON	27S13W34TL0089900	7715000	EFU

Responses to Applicable Coos Planning Code Criterion

Criterion One

SECTION 3.3.710, pg 491 ADMINISTRATIVE CONDITIONAL DEVELOPMENT AND USE:

The following uses and their accessory uses may be allowed as administrative conditional uses in the "CREMP-EFU" zone subject to applicable requirements in Sections 3.3.730 and 3.3.740.

1. *Diking (construction and maintenance). CREMP Policies #14, #18, #19, #22, #23, and #27.*
2. *Drainage and tide-gating. CREMP Policies #14, #18, #19, #22, #23, and #27.*
3. *Fill. CREMP Policies #14, #18, #19, #22, #23, and #27. Use not permitted in Segment 26.*
5. *Dredge material disposal. CREMP Policies #14, #18, #19, #20, #22, #23, and #27. DMD is to include stabilization measures to control run-off and prevent sloughing. Use not permitted in Segment 26.*

13. Shoreland structural stabilization. Flood elevation certificate required. CREMP Policies #9, #14, #23, #27, #18, #19, and #22. Use not permitted in Segment 47.

Winter Lake Phase III Project Information in regard to Criterion One

Response items #1-5):

- *The Winter Lake Phase III project will address insufficient culvert size at 42 existing interior pasture drain culverts upstream of the Winter Lake Phase I control point large tidegates installed in 2017 and upstream of the Coaledo Tidegates upgraded last in the 1990's. Project actions are within Zoning codes EFU, EFU/IND, and EFU/CREMP. The full suite of project actions, tactics, and Best Management Practices are illuminated in detail within the 404 Fill and Removal permit application and associated Additional Materials submitted with this assessment.*
- *The project will address rehabilitation of five segments of existing dike, installation of new larger culverts and upgraded tidegates, place fill to 3" depths in accordance with Oregon Department of State Lands (DSL) and U.S. Army Corps of Engineers (USACE) guidelines, and dispose of dredge fill through 3" thinspread in alignment with DSL/USACE. All actions are designed to minimize effects to the floodplain and estuary habitat in accordance with the National Marine Fisheries Service (NMFS) Tidal Area Restoration Programmatic (TARP), which requires construction actions within tidal areas to be implemented with specific tact and measures to minimize negative effects.*
- *The project materials will include (in progress) an engineer Flood certification (in progress) for submission to the County providing documentation the project will align with the FEMA Floodway guidelines for the project area, which is designated Zone A.*

Criterion Two

SECTION 3.3.730, pg 495 CRITERIA AND REVIEW STANDARDS FOR CONDITIONAL USE PERMITS (BOTH ADMINISTRATIVE AND HEARINGS BODY)

A use may be allowed provided the following requirements are met:

1. Such uses will not force a significant change in accepted farm or forest practices on surrounding lands devoted to farm or forest use.

2. Will not significantly increase the cost of accepted farm or forest practices on lands devoted to farm or forest use.

3. Siting Standards for Dwellings and Structures in the EFU Zone. The following siting criteria shall apply to all dwellings, including replacement dwellings and structures in the EFU zone. Replacement dwellings may be sited in close proximity to the existing developed homesite. These criteria are designed to make such uses compatible with forest operations and agriculture, to minimize wildfire hazards and risks and to conserve values found on agricultural lands. These criteria may include setbacks from adjoining properties, clustering near or among existing structures, siting close to existing roads, and siting on that portion of the parcel least suited for agricultural uses, and shall be considered together with the requirements in Section 3.3.740 to identify the building site. Dwellings and structures shall be sited on the parcel so that:

a. They have the least impact on nearby or adjoining forest or agricultural lands;

b. The siting ensures that adverse impacts on forest operations and accepted farming practices on the tract will be minimized;

c. The amount of agricultural lands used to site access roads, service corridors, the dwelling and structures is minimized; and

d. The risks associated with wildfires are minimized.

Winter Lake Phase III Project Information in regard to Criterion Two

<u>Response items #1-3):</u>

- *The Winter Lake project is designed specifically to improve the functional production of forage grasses, while allowing for increased ecological productivity. The project will provide substantial benefit to the farming/ranching operations. The project is expected to improve irrigation water delivery and benefit operations costs of ranching/farming. No dwellings, barns, or similar structure will be installed/sited within the project area as part of the project.*

Criterion Three

SECTION 3.3.740, pg 496 DEVELOPMENT AND USE STANDARDS

Development Standards *All dwellings and structures approved shall be sited in accordance with this section.*

Winter Lake Phase III Project Information in regard to Criterion Three

<u>Response:</u>

- *The Winter Lake Phase III project will not implement installation of any housing, dwelling, barn, or other similar infrastructure. The project is designed to minimize removal of riparian woody vegetation. The actions of the project will include installation of 72,000ft of fencing to provide for planting of native riparian woody species (willow, cottonwood, ash) along selected reconstructed/new channels. This riparian enhancement is a critical component of the design of the project with the goal of improving water quality (temperature and dissolved oxygen).*

Criterion Four

SECTION 4.6.200, EXCLUSIVE FARM USE – USE TABLES:

Table II identifies the uses and activities in the Exclusive Farm Use (EFU) zone. The tables describe the use, type of review, applicable review standards and Section 4.6.210 Development and Siting Standards. Properties that are located in a Special Development Consideration and/or overlays shall comply with the applicable review process identified by that Special Development Consideration and/or overlay located in Article 4.11.

Winter Lake Phase III Project Information in regard to Criterion Four

Response:

- *The Winter Lake Phase III project will enhance riparian habitat through project actions which in compliance with the CREMP goals. The channel excavation, installation of interior field drain culverts/tidegates and fence construction are allowed actions under the Exclusive Farm Use.*

Criterion Five

SECTION 4.6.210, *pg 142* ADMINISTRATIVE CONDITIONAL DEVELOPMENT AND USE:

The following uses and their accessory uses may be allowed as administrative conditional uses in the "Exclusive Farm Use" zone and "Mixed Use" overlay subject to the applicable requirements in and applicable siting and development requirements. Additional conditional use review criteria can be found in § 4.6.230 and must be addressed unless otherwise specified by the ordinance.

i. Creating of, restoration of, or enhancement of wetlands. The removal of high value farmland from agricultural production for the purpose of creating wetlands except within 35 feet of the mean high water mark (extended riparian vegetation area). The applicant must address floodplain requirements.

Winter Lake Phase III Project Information in regard to Criterion Five

Response***:***

- *The project will improve inflow outflow drainage from the Beaver Slough Drainage District (BSDD) and Coaledo Drainage District (CDD) lands where work will be completed. Improvement of drainage will be accomplished by replacing undersized culverts with new appropriately sized infrastructure addressing issues at 42 locations in the Winter Lake floodplain and reconstructing/installing a greatly increased channel network.*

- *The project is designed to enhance Exclusive Farm Use and Coquille River Estuary Management Plan (EFU/CREMP) habitat function for native fish and wildlife. The improved drainage will facilitate reduced water souring of pasture soils and allow for appropriate irrigation in the summer months. Management of water during winter through the new tidegates*

- *The proposed project actions have been reviewed and evaluated for relationship to the 100 year floodflow levels. The project floodplain certification is currently in progress by the project engineer to delineate that the project will not result in greater than 1.0ft of floodwater rise associated with the 100yr flood.*

Criterion Six

SECTION 4.6.230,* 4.6.230, pg 194 *CRITERIA AND REVIEW STANDARDS FOR CONDITIONAL USE PERMITS (BOTH ADMINISTRATIVE AND HEARINGS BODY):

A use may be allowed provided the following requirements are met:

1. *Such uses will not force a significant change in accepted farm or forest practices on surrounding lands devoted to farm or forest use.*
2. *Will not significantly increase the cost of accepted farm or forest practices on lands devoted to farm or forest use.*
3. *Siting Standards for Dwellings and Structures in the EFU Zone. The following siting criteria shall apply to all dwellings, including replacement dwellings and structures in the EFU zone. Replacement dwellings may be sited in close proximity to the existing developed homesite. These criteria are designed to make such uses compatible with forest operations and agriculture, to minimize wildfire hazards and risks and to conserve values found on agricultural lands. These criteria may include setbacks from adjoining properties, clustering near or among existing structures, siting close to existing roads, and siting on that portion of the parcel least suited for agricultural uses, and shall be considered together with the requirements in § 4.6.240 to identify the building site. Dwellings and structures shall be sited on the parcel so that:*

   a. *They have the least impact on nearby or adjoining forest or agricultural lands.*

   b. *The siting ensures that adverse impacts on forest operations and accepted farming practices on the tract will be minimized.*

   c. *The amount of agricultural lands used to site access roads, service corridors, the dwelling and structures is minimized.*

   d. *And The risks associated with wildfires are minimized.*

Winter Lake Phase III Project Information in regard to Criterion Six

- *The Winter Lake Phase III project is designed to improve the drainage and irrigation capacity for the lands that are in the project area. Accordingly, the project goals will maintain or increase function for farming use. There is not forestry use on the project area. Project actions will not have offsite effects to neighboring properties.*

- *The project actions (reconstructed/new channels, culverts, water control structures) will provide infrastructure that will reduce the effort of the agricultural landowners to manage water levels that occur from flooding and rainfall on the pastures. In that context the cost to manage the lands will be maintained or reduced over current levels.*

- *No structures such as houses, barns, sheds, or other will be constructed as part of this project.*

Criterion Seven

SECTION 4.6.240,* pg 194 *DEVELOPMENT AND USE STANDARDS
Development Standards *All dwellings and structures approved shall be sited in accordance with this section.*

Winter Lake Phase III Project Information in regard to Criterion Seven
1). The Winter Lake Phase III project will not implement construction of houses, barns, or similar structures or roads, thus this Section 4.6.240, 1-9 are not applicable.

2. The project area has few if any trees, however, riparian sedges and grass vegetation will be impacted through excavation actions that will be used to construct channels, rebuild berms, and install new culverts. ODFW guidance for the project has been incorporated to develop tactics and strategies that minimize impacts to the riparian vegetation and wetlands. ODFW technical oversight is noted as an approved pathway for compliance with the county ordinance 4.6.240 (10)(d).

Criterion Eight

SECTION 4.11.125,* 4.11.125(3), pg 228 *SPECIAL DEVELOPMENT CONSIDERATIONS:
The considerations are map overlays that show areas of concern such as hazards or protected sites. Each development consideration may further restrict a use. Development considerations play a very important role in determining where development should be allowed In the Balance of County zoning. The adopted plan maps and overlay maps have to be examined in order to determine how the inventory applies to the specific site.

Winter Lake Phase III Project Information in regard to Criterion Eight
Section 1, 2, 4, and 7 not applicable
Section 3. Historical, Cultural and Archaeological Resources, Natural Areas and Wilderness (Balance of County Policy 5.7): The Winter Lake Phase III project area has legacy berms/dikes that were constructed in 1908 and 1909 when the interior pasture canals were excavated (see DSL/USACE 404 Fill and Removal permit application). These berms have been altered repeatedly over the years through repair and additional excavation events. These berms will not be permanently altered in character or nature during rebuilding as the rebuilt sections will be blended in to match with those segments that need no repair.

Section 5. 5. Non-Estuarine Shoreland Boundary (Balance of County Policy 5.10)

- *Riparian Vegetation*
- *Wetlands under agricultural use*

The Winter Lake Phase III project is designed to reconstruct and install channels, replace existing culverts, and water control structures that will improve the wetland hydrology and facilitate a more functional level of pasture management. Riparian vegetation in the project area consists of sedges and grasses. These cover types and all channel adjacent vegetation will be benefitted by the more natural inflow/outflow tidal regimes that will be able to be incorporated as a goal of the project.

Section 6. Significant Wildlife Habitat (Balance of County Policy 5.6): The wetland pastures comprise the majority of the work area (other than berms). These pastures are able to serve as high quality habitat for juvenile anadromous fish. The current undersized culverts and lack of channel networks inhibit full wetland function and access for anadromous fish. This project has as a major goal incorporated features that will improve the access for juvenile anadromous fish to rear and feed in the wetland pastures. As such the project proposed actions fully support County Planning goals in Section 6 of 4.11.125, 4.11.125(3).

Criterion Nine

SECTION 4.11.217, pg 249; PROCEDURAL REQUIREMENTS FOR DEVELOPMENT WITHIN SPECIAL FLOOD HAZARD AREAS:

4. Other Development. Includes mining, dredging, filling, grading, paving, excavation or drilling operations located within the area of a special flood hazard, but does not include such uses as normal agricultural operations, fill less than 12 cubic yards, fences, road and driveway maintenance, landscaping, gardening and similar uses which are excluded from definition because it is the County's determination that such uses are not of the type and magnitude to affect potential water surface elevations or increase the level of insurable damages.

Review and authorization of a floodplain application must be obtained from the Coos County Planning Department before "other development" may occur. Such authorization by the Planning Department shall not be issued unless it is established, based on a licensed engineer's certification that the "other development" shall not:

a. Result in any increase in flood levels during the occurrence of the base flood discharge if the development will occur within a designated floodway. or,

b. Result in a cumulative increase of more than one foot during the occurrence of the base flood discharge if the development will occur within a designated flood plain outside of a designated floodway.

Winter Lake Phase III Project Information in regard to Criterion Nine

1). The Winter Lake Phase III project designs and proposed actions have been developed by ODFW, the Coos Soil and Water District, the Beaver Slough Drainage District, and are under review by an Oregon Licensed engineer. The Oregon licensed engineer is currently developing information to support the proposed designs do not have attributes or features incorporated into the project that will: a). Not raise the base flood discharge; and b). Will not result in a cumulative increase of more than one foot during the occurrence of the base flood discharge. (see attached floodplain certification).

Criterion Ten

SECTION 4.11.231, pg 255; ALTERATION OF WATER COURSES:

If a development application proposes a stream, creek or other water body relocation or alteration, Coos County shall:

1. *Notify affected cities and the State Coordinating Agency (Department of Land Conservation and Development – DLCD) and other appropriate state and federal agencies prior to any alteration or relocation of a water course, and shall submit evidence of such notification to the Federal Insurance Administration at the following address (or if the office moves, at any subsequent address):*

   Federal Insurance Administration
   500 C Street SW

   Washington, DC 20472

2. *Require that maintenance is provided within the altered or relocated portion of said water course so that the flood carrying capacity is not diminished.*

Winter Lake Phase III Project Information in regard to Criterion Ten

Note: The Winter Lake Phase III project will realign tidal/drainage channels, however, they are within the control and upstream of the Winter Lake Beaver Slough Drainage District C3P tidegate. As such the realignment of drainage networks is subservient hydrologically to that tidegate structure and the associated Water Management Plan.

- *The project will install numerous additional on grade channels within agricultural wetland pastures that follow historical tidal channel paths and provide hydrologic connectivity that mimics conditions that were present pre-European settlement.*
- *These channels and increased culvert sizes on pasture channels will provide for improved pasture drainage and designs have been evaluated to not have potential to raise the floodflows as is specified with FEMA guidelines.*
- *There will not be impacts to adjacent properties associated with the project actions.*
- *Channels and culverts will increase the outflow capacity improving hydrologic function. Channels will be inspected by landowners annually for drainage function and if there is an accumulation of material that needs cleaned it will be addressed.*

Appendix A. Ownership documentation for parcels within the Winter Lake Phase III project area.

RECORDING REQUESTED BY:

TICOR TITLE

105 E 2nd Street
Coquille, OR 97423

Luke E. Fitzpatrick as trustee of The Bridges Foundation approves this document and conveyance

X ______________________ Dated: ______________
Luke E. Fitzpatrick, trustee of
The Bridges Foundation

GRANTOR'S NAME:
Hanna Elizabeth Hart, Successor Trustee of the Maria Concepcion Frias 1996 Revocable Trust dated August 12, 1996 as amended and restated on October 9, 2006

GRANTEE'S NAME:
The Bridges Foundation

AFTER RECORDING RETURN TO:
Order No.: 360621038553-TT
The Bridges Foundation, an Oregon non-profit corporation
Attn: Luke Fitzpatrick, Trustee, PO Box 1123
Turner, OR 97392

SEND TAX STATEMENTS TO:
The Bridges Foundation
Attn: Luke Fitzpatrick, Trustee, PO Box 1123
Turner, OR 97392

APN: 99916790
716702
716800
717402
717401
717500
717600
99916787
Map: 27S13200001503
27S13270000400
27S13270000500
27S13280000400
27S13280000600
27S13280000700
27S13290000101
27S13290000103
Vacant Land Lower Coquille River (Chisholm Tract) 528 Acres, Coos Bay, OR 97420

SPACE ABOVE THIS LINE FOR RECORDER'S USE

STATUTORY WARRANTY DEED

Hanna Elizabeth Hart, Successor Trustee of the Maria Concepcion Frias 1996 Revocable Trust dated August 12, 1996 as amended and restated on October 9, 2006, Grantor, conveys and warrants to **The Bridges Foundation, an Oregon non-profit corporation**, Grantee, the following described real property, free and clear of encumbrances except as specifically set forth below, situated in the County of Coos, State of Oregon:

SEE EXHIBIT "A" ATTACHED HERETO AND MADE A PART HEREOF

THE TRUE AND ACTUAL CONSIDERATION FOR THIS CONVEYANCE IS TWO MILLION SIX HUNDRED FORTY THOUSAND AND NO/100 DOLLARS **($2,640,000.00)**. (See ORS 93.030).

Subject to:

SEE EXHIBIT "B" ATTACHED HERETO AND MADE A PART HEREOF

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY THAT THE UNIT OF LAND BEING TRANSFERRED IS A LAWFULLY ESTABLISHED LOT OR PARCEL, AS DEFINED IN ORS 92.010 OR 215.010, TO VERIFY THE APPROVED USES OF THE LOT OR PARCEL, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES, AS DEFINED IN ORS 30.930, AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010.

STATUTORY WARRANTY DEED
(continued)

IN WITNESS WHEREOF, the undersigned have executed this document on the date(s) set forth below.

Dated: ______________________________

Hanna Elizabeth Hart, Successor Trustee of the Maria Concepcion Frias 1996 Revocable Trust dated August 12, 1996 as amended and restated on October 9, 2006

BY:______________________________
Hanna Elizabeth Hart
Successor Trustee

State of ______________
County of __________________

This instrument was acknowledged before me on __________________ by Hanna Elizabeth Hart, Successor Trustee of the Maria Concepcion Frias 1996 Revocable Trust dated August 12, 1996 as amended and restated on October 9, 2006.

____
Notary Public - State of Oregon

My Commission Expires: ____________________

COOS COUNTY ASSESSOR
REAL PROPERTY ACCOUNT NAMES

Account # 721202

Map 27S133300 00100

Owner EVERETT-ONA ISENHART RANCH,INC; ETAL
97065 LANGLOIS MOUNTAIN RD
LANGLOIS OR 97450-9668

Name Type	Name	Ownership Type	Own Pct
OWNER	EVERETT-ONA ISENHART RANCH,INC;ETAL	OWNER	100.00
OWNER	SMITH, CLATIE & ONA	OWNER	

AFTER RECORDING RETURN TO:
Law Offices of Patrick M. Terry
PO Box 630
Coos Bay, OR 97420

Coos County, Oregon		2021-13197
$91.00	Pgs=2	11/29/2021 02:25 PM
eRecorded by: PATRICK M. TERRY LAW OFFICE		
Debbie Heller, CCC, Coos County Clerk		

SEND TAX STATEMENTS TO:
John Isenhart and Laura J. Isenhart, Trustees
Isenhart Living Trust
PO Box 174
Broadbent, OR 97414

CONSIDERATION: $0.00

BARGAIN AND SALE DEED

John Isenhart and Laura J. Isenhart, hereinafter known as Grantors, do hereby grant, bargain, sell, and convey unto John Isenhart and Laura J. Isenhart, Trustee of the Isenhart Living Trust as restated in its entirety on March 18, 2014, hereinafter known as Grantees, with power of sale, the following described real property; that is, the fee shall vest in the survivor of the Grantees:

See Exhibit A

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY THAT THE UNIT OF LAND BEING TRANSFERRED IS A LAWFULLY ESTABLISHED LOT OR PARCEL, AS DEFINED IN ORS 92.010 OR 215.010, TO VERIFY THE APPROVED USES OF THE LOT OR PARCEL, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES, AS DEFINED IN ORS 30.930, AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010.

WITNESS my hand and seal this 29th day of November, 2021.

John Isenhart, by Laura J. Isenhart as Agent
Durable Power of Attorney, dated 10/24/14

Laura J. Isenhart

STATE OF OREGON
County of Coos

Before me this 29th day of November, 2021, personally appeared the above named Laura J. Isenhart, individually and in her capacity as Agent under Durable Power of Attorney dated 10/24/14 for John Isenhart, and acknowledged that she executed the foregoing instrument freely and voluntarily.

OFFICIAL STAMP
KAIRA ANNE UTTARA BURT
NOTARY PUBLIC OREGON
COMMISSION NO. 986089
MY COMMISSION EXPIRES APRIL 04, 2023

Notary Public for Oregon

COOS COUNTY ASSESSOR
REAL PROPERTY ACCOUNT NAMES

Account #	722300
Map	27S133400 00800
Owner	FRED MESSERLE & SONS, INC. 94881 STOCK SLOUGH LN COOS BAY OR 97420-6346

Name Type	Name	Ownership Type	Own Pct
OWNER	FRED MESSERLE & SONS, INC.	OWNER	100.00

COOS COUNTY ASSESSOR
REAL PROPERTY ACCOUNT NAMES

Account #	724600
Map	27S1335C0 00900
Owner	FRED MESSERLE & SONS, INC. 94881 STOCK SLOUGH LN COOS BAY OR 97420-6346

Name Type	Name	Ownership Type	Own Pct
OWNER	FRED MESSERLE & SONS, INC.	OWNER	100.00

COOS COUNTY ASSESSOR
REAL PROPERTY ACCOUNT NAMES

Account #	898300
Map	28S130300 00100
Owner	FRED MESSERLE & SONS, INC. 94881 STOCK SLOUGH LN COOS BAY OR 97420-6346

Name Type	Name	Ownership Type	Own Pct
OWNER	FRED MESSERLE & SONS, INC.	OWNER	100.00

1/7/2023 12:28:33 PM

COOS COUNTY, OREGON **2017-09908**
$81.00 **10/16/2017 10:16:00 AM**
DEBBIE HELLER, CEA, COOS COUNTY CLERK Pgs=8

SEND TAX STATEMENTS TO:
Oregon Department of Fish and Wildlife
ATTN: REALTY SERVICES (Tofte)
4034 Fairview Industrial Drive SE
Salem, OR 97302

AFTER RECORDING, RETURN TO:
same as above

AFTER RECORDING
RETURN TO
Ticor Title Company
300 West Anderson Ave. - Box 1075
Coos Bay, OR 97420-0233
60152235

WARRANTY DEED
(ORS 93.850)

RAYMOND C. WHEELER, Grantor, conveys and warrants to the STATE OF OREGON, by and through the OREGON DEPARTMENT OF FISH AND WILDLIFE, Grantee, the following described real property free of all encumbrances except as specifically set forth herein:

Land in Coos County, Oregon, as described on **Exhibit "A"** attached hereto and by this reference made a part hereof.

SUBJECT TO the encumbrances described on **Exhibit "B"** attached hereto and by this reference made a part hereof; and

The true consideration for this conveyance is $294,900.00

RESERVING UNTO THE GRANTOR, a personal, non-assignable, non-appurtenant easement for the purpose of ingress and egress to Grantor's property North and adjacent to property conveyed herein, for the term of Grantors life, forty (40) feet in width, which is twenty (20) feet on each side of the following described centerline:

Beginning on the Southerly boundary of the old Southern Pacific Railroad right-of-way at a point that bears North 73°10'14" East 864.34 feet from a 2" iron pipe per CS PB3-1 marking the Center South Sixteenth (CS1/16) corner of said Section 21, Township 27 South, Range 13 West of the Willamette Meridian, Coos County, Oregon, thence along the centerline of the herein described easement South 00°25'39" East 248.64 feet, said center line being perpendicular and offset 15 feet West of the East boundary of that property described per Warranty Deed 90-11-0535, Deed Records of Coos County, Oregon;

Thence leaving said parallel offset and continuing along said easement centerline, also being the centerline of an existing dirt road as follows:

South 36°45'37" East 187.93;
South 02°05'55" East 62.28 feet;
South 20°34'05" West 39.23 feet;
South 39°51'48" West 65.56 feet;
South 59°44'35" West 350.45 feet;
South 56°11'21 West 142.27 feet;

South 71°09'24" West 183.45 feet;
North 89°28'41" West 275.75 feet;
North 80°51'56" West 109.87 feet;
North 72°51'34" West 227.65 feet:
North 50°06'00" West 446.42 feet;
Thence North 31°35'41" West 132.96 feet to a point on the North line of that property described per said Deed Instrument 90-11-0535, said point bearing South 80°02'00" West 731.27 feet from said Center South Sixteenth (CS1/16) section corner of Section 21 and the end of the easement centerline.

All bearings based upon CS 24B78, Records of the Coos County Surveyor

BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON TRANSFERRING FEE TITLE SHOULD INQUIRE ABOUT THE PERSON'S RIGHTS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010. THIS INSTRUMENT DOES NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY THAT THE UNIT OF LAND BEING TRANSFERRED IS A LAWFULLY ESTABLISHED LOT OR PARCEL, AS DEFINED IN ORS 92.010 OR 215.010, TO VERIFY THE APPROVED USES OF THE LOT OR PARCEL, TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES, AS DEFINED IN ORS 30.930, AND TO INQUIRE ABOUT THE RIGHTS OF NEIGHBORING PROPERTY OWNERS, IF ANY, UNDER ORS 195.300, 195.301 AND 195.305 TO 195.336 AND SECTIONS 5 TO 11, CHAPTER 424, OREGON LAWS 2007, SECTIONS 2 TO 9 AND 17, CHAPTER 855, OREGON LAWS 2009, AND SECTIONS 2 TO 7, CHAPTER 8, OREGON LAWS 2010.

Dated this 12 day of Oct, 2017.

Raymond C. Wheeler
Raymond C. Wheeler

STATE OF OREGON)
) ss.
COUNTY OF Coos)

This instrument was acknowledged before me on 10/12, 2017 by Raymond C. Wheeler.

Karen Lee Tofte
Notary Public for Oregon

My commission expires: 4/29/2018

OFFICIAL SEAL
KAREN LEE TOFTE
NOTARY PUBLIC – OREGON
COMMISSION NO. 928123
MY COMMISSION EXPIRES APRIL 29, 2018

The State of Oregon, acting by and through the Oregon Department of Fish and Wildlife, accepts this conveyance in accordance with ORS 93.808.

OREGON DEPARTMENT OF FISH AND WILDLIFE:

By: ______________________________
Shannon Hurn, Deputy Director
Fish and Wildlife Programs

STATE of OREGON)
) ss.
COUNTY of Marion)

This instrument was acknowledged before me on 10/3, 2017, by Shannon Hurn, as Deputy Director of Fish and Wildlife Programs for the Oregon Department of Fish and Wildlife.

____
Notary Public for Oregon
My commission expires: 4/29/2018

OFFICIAL SEAL
KAREN LEE TOFTE
NOTARY PUBLIC - OREGON
COMMISSION NO. 928123
MY COMMISSION EXPIRES APRIL 29, 2018

COOS COUNTY ASSESSOR
REAL PROPERTY ACCOUNT NAMES

Account #	7715000
Map	27S133400 00899
Owner	STATE OF OREGON 61036 HWY 101 SOUTH COOS BAY OR 97420

Name Type	Name	Ownership Type	Own Pct
OWNER	STATE OF OREGON	OWNER	

COQUILLE INDIAN TRIBE

3050 Tremont Street, North Bend, OR 97549
Telephone: (541) 756-0904 ~ Fax: (541) 756-0847
www.coquilletribe.org

February 9, 2023

Coos Soil and Water Conservation District
Caley Sowers
info@coosswcd.org

Oregon Department of Fish and Wildlife
Christopher Claire
Christopher.w.CLAIRE@odfw.oregon.gov

Re: Winter Lake Watershed Restoration Project

Thank you for the opportunity to review the Winter Lake watershed restoration project. After various meetings, site visits, discussions, etc. we propose the following Scope of Work regarding archaeological testing:

- A maximum of thirty (30) excavation units as either shovel test probes (STPs) and/or shovel test units (STUs) would be appropriate.
- We request a cultural resources monitor to be present during the archaeological survey, with the cultural resource firm contracted for this work notifying our office a **minimum of 72 hours** in advance of the anticipated project start time.
- We further request that a cultural resources monitor may be present, as needed, during any relevant ground-disturbing activities resulting from the restoration project itself. These monitoring efforts will be further discussed via continued conversations between the Tribe and the interested parties (ODFW and SWCD).
- An Inadvertent Discovery Plan (IDP) is in place which follows the guidelines set forth on the **Treatment of Native American Human Remains Position Paper** (available on the SHPO website)
- Photographs shall not to be taken of human remains or suspected Funerary Objects.
- An electronic copy of the Final (and Interim, if applicable) Report is submitted to CIT THPO in a timely manner, with an attached artifact catalogue.
- CIT THPO is provided an opportunity to review artifacts prior to the material being turned over to the UOMNCH.

It should also be noted that archaeological investigations are destructive by nature and as such constitute an adverse effect to an archaeological site. Appropriate mitigation should be addressed through consultation with the Tribe. Thank you again and feel free to contact me if you have any questions.

CRT22490

Masi (thank you),

Gabrielle Bratt

Gabrielle Bratt, M.S.
Cultural Resources Technician

CRT22490