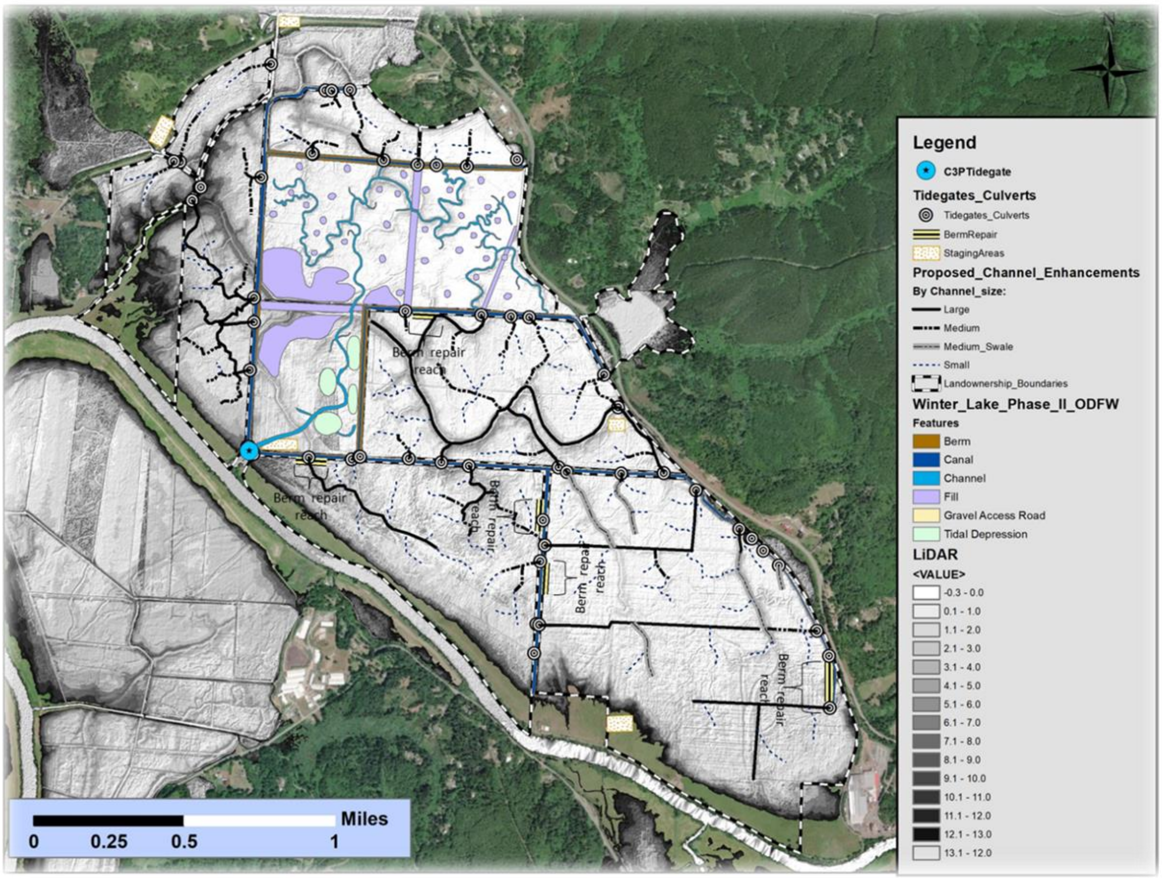
# WINTER LAKE PHASE III PROJECT
# PROJECT ACTIONS

**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.

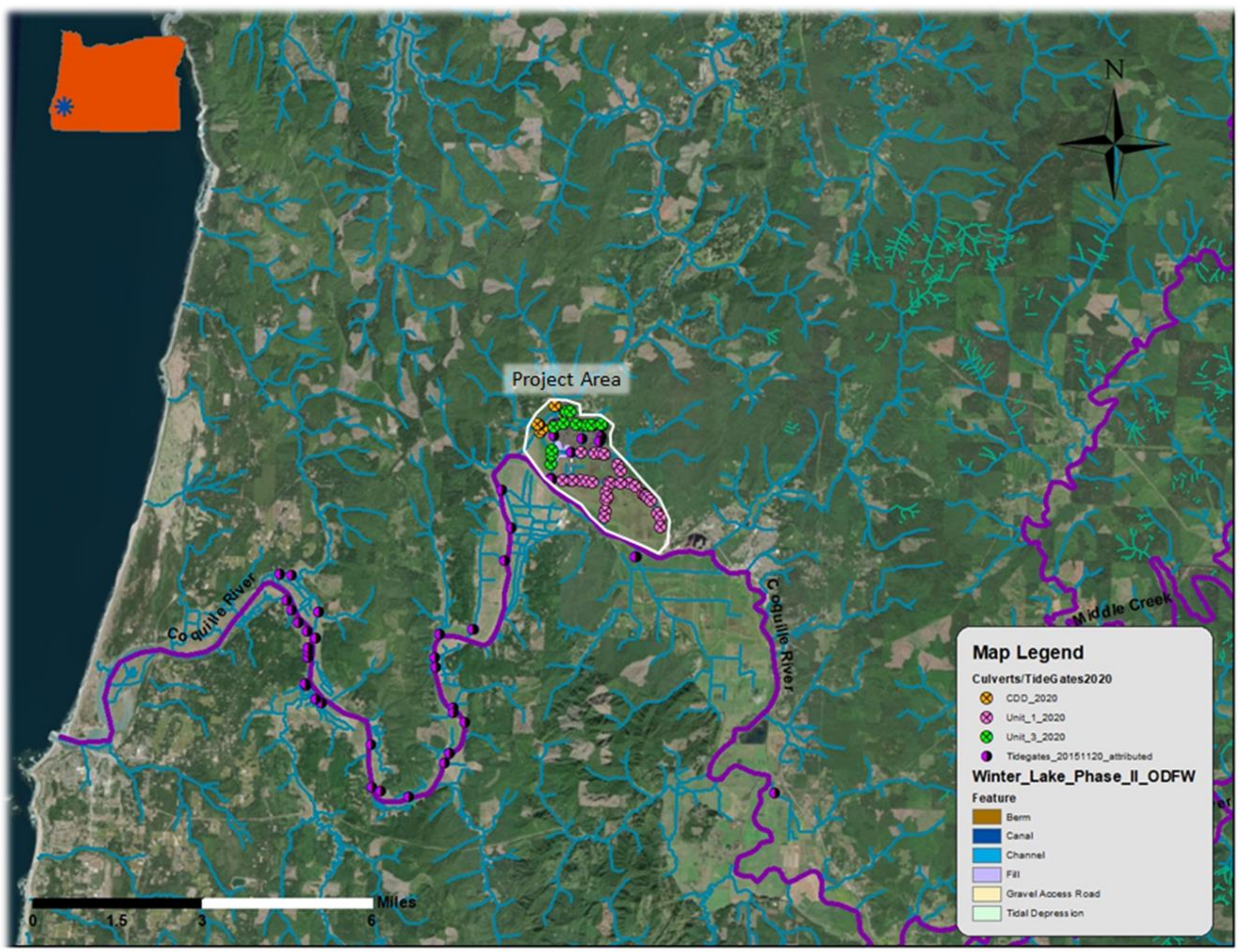



*Figure 1. Coquille River estuary with demarcation of the Phase III project area at River Mile 21. 5.*

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.

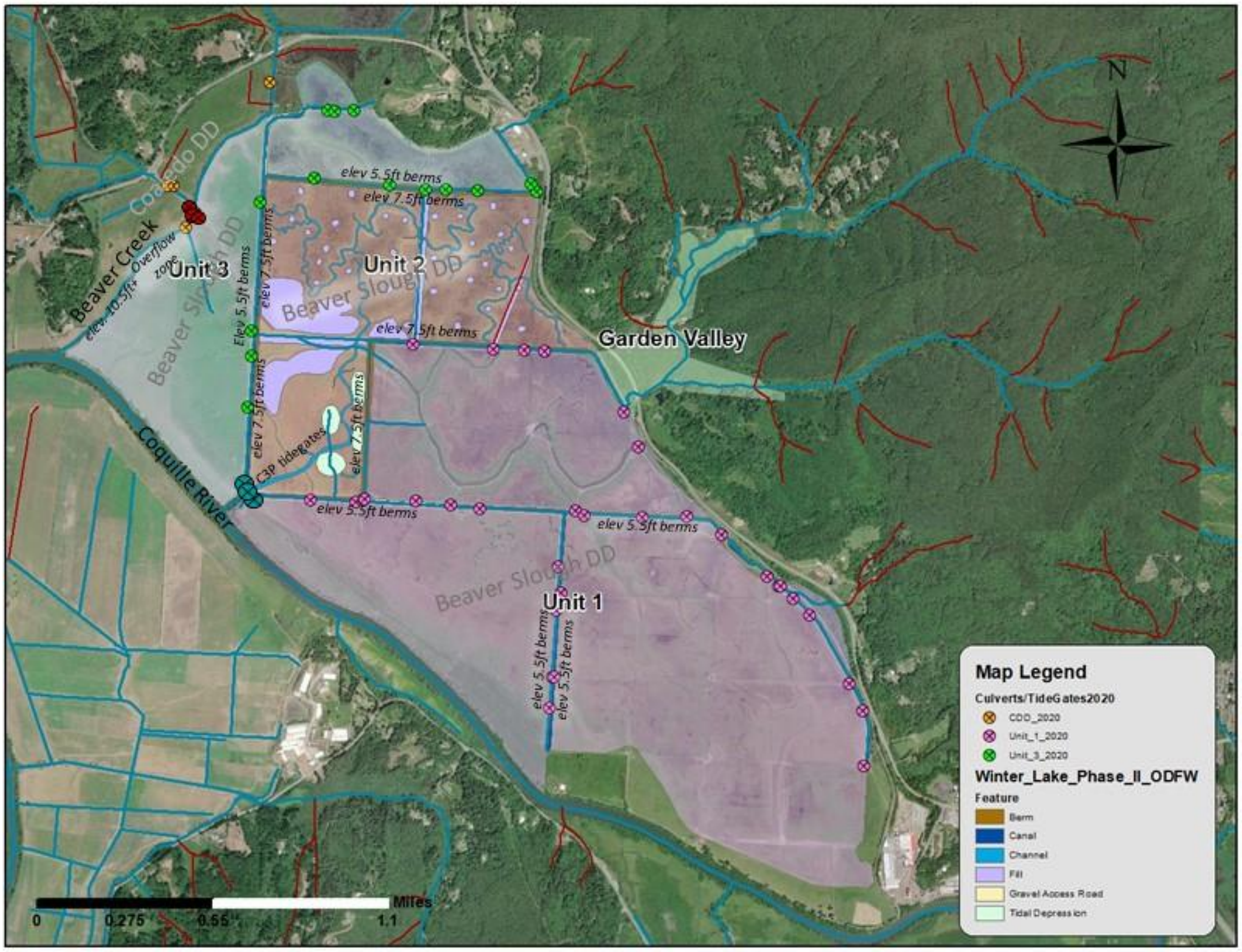



*Figure 2. Winter Lake Phase I, II, and III project area and the land management Units within the Beaver Slough Drainage District; Rm 21.5 west of Coquille OR. Note two small parcels in the Coaledo Drainage District immediately to west/northwest of Unit 3 label are also in the Phase III project area.*

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.

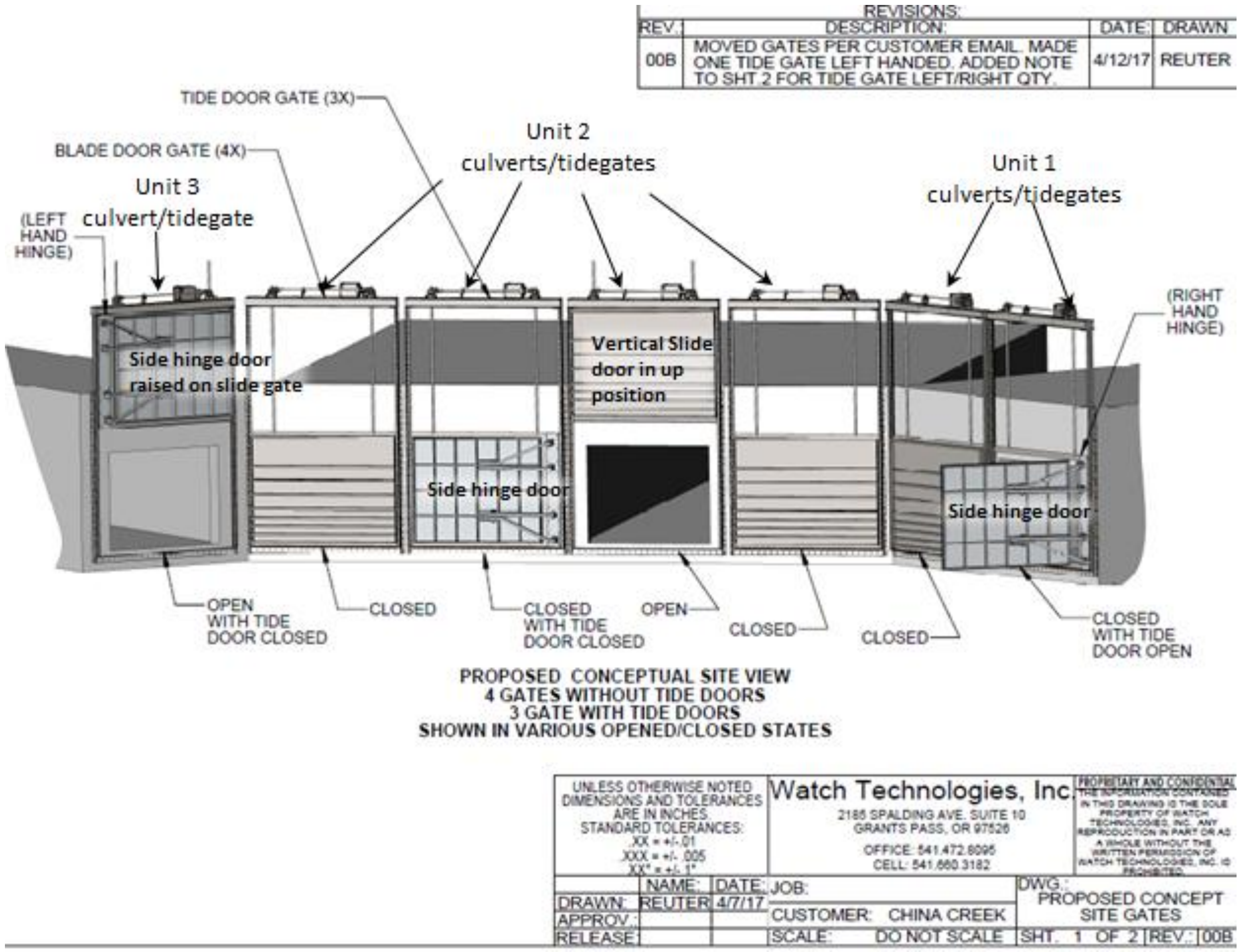


*Figure 3. C3P tidegates and 10.0x8.0ft concrete box culverts configuration.*

***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.*

*<u>Interior Berms:</u>* 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).

*<u>Excavation of Sediments China Canal and Sections of Unit 1 Southeast Canal:</u>* 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).

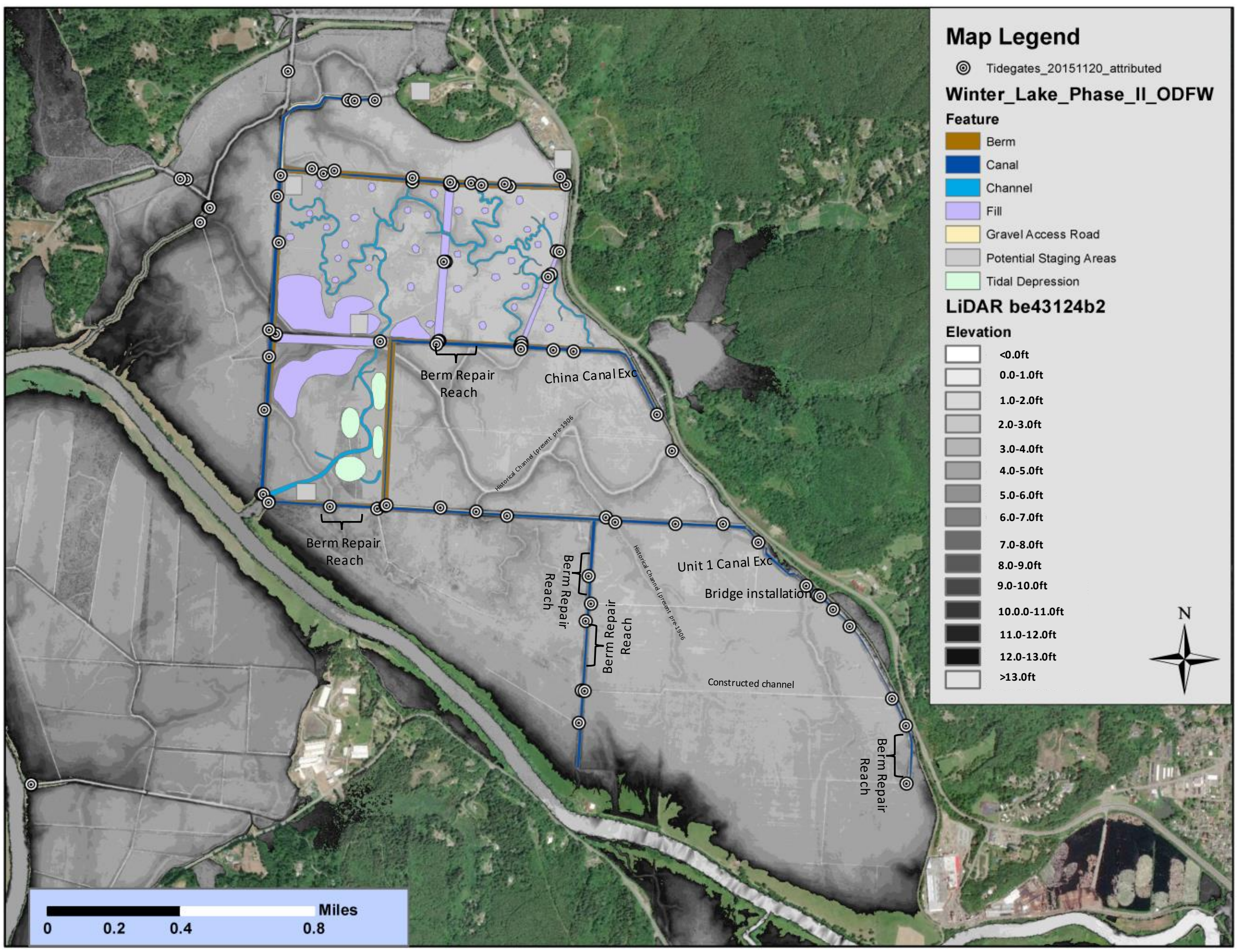



*Figure 4. LiDAR elevational map and locations where berm reconstruction is needed. Grayscale depiction allows for historically installed linear pasture drainage channels to be visible.*

*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.

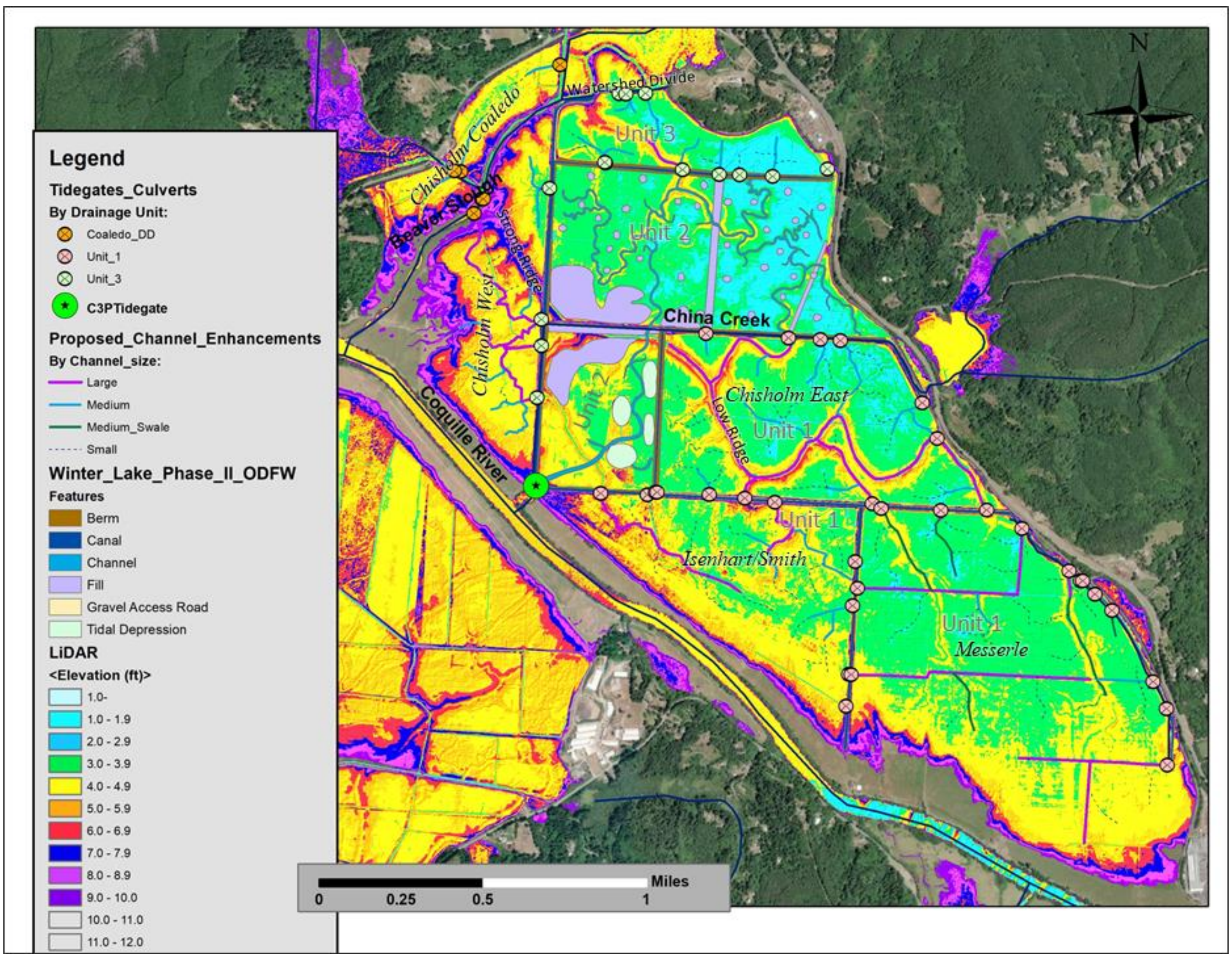



*Figure 5. LiDAR elevational map of the Winter Lake Phase III project area with new proposed channels depicted. Lands above elevation 10ft allow for the aerial imagery to show through.*

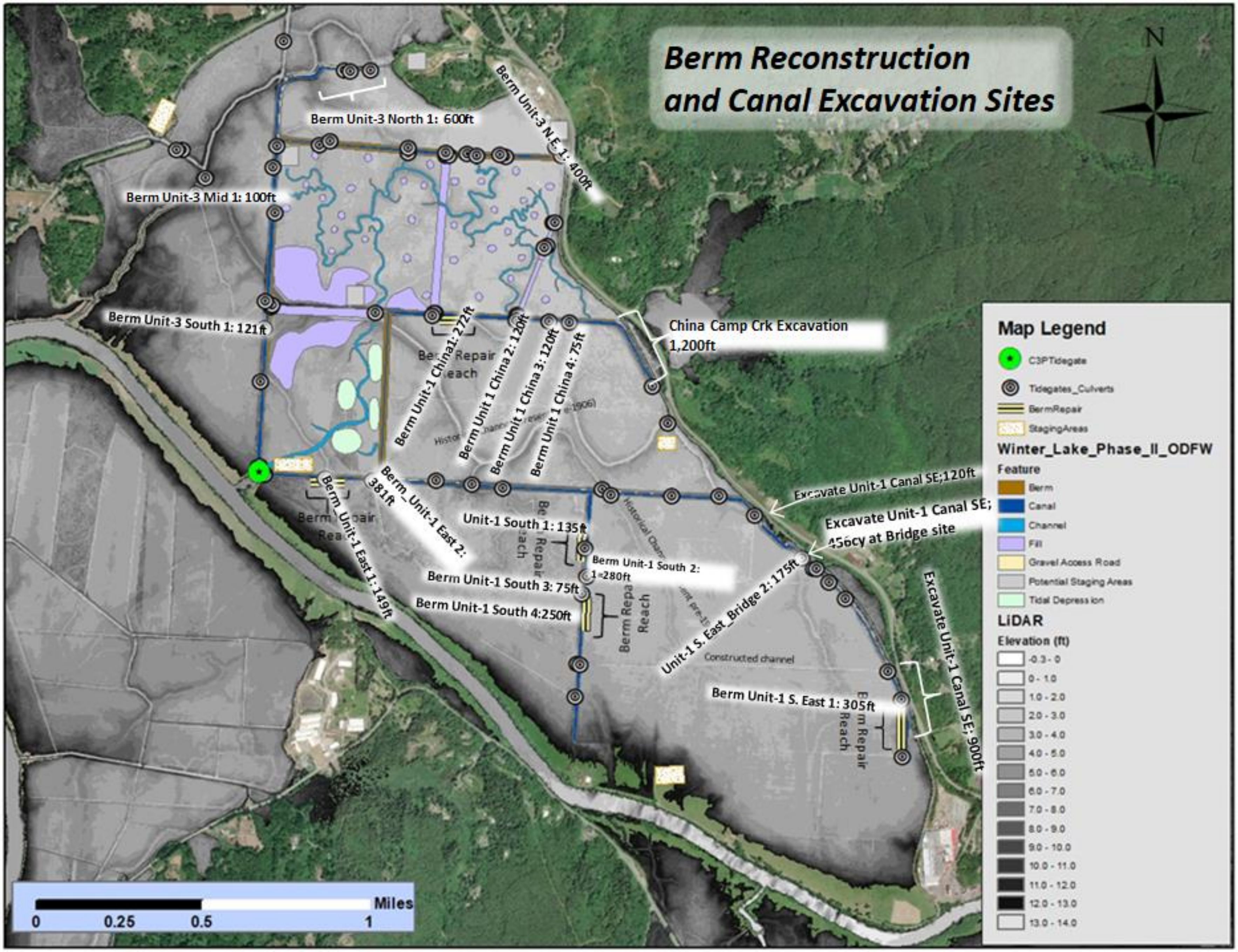



*Figure 6. Phase III proposed channel reconstruction/construction depicted with LiDAR in grayscale.*

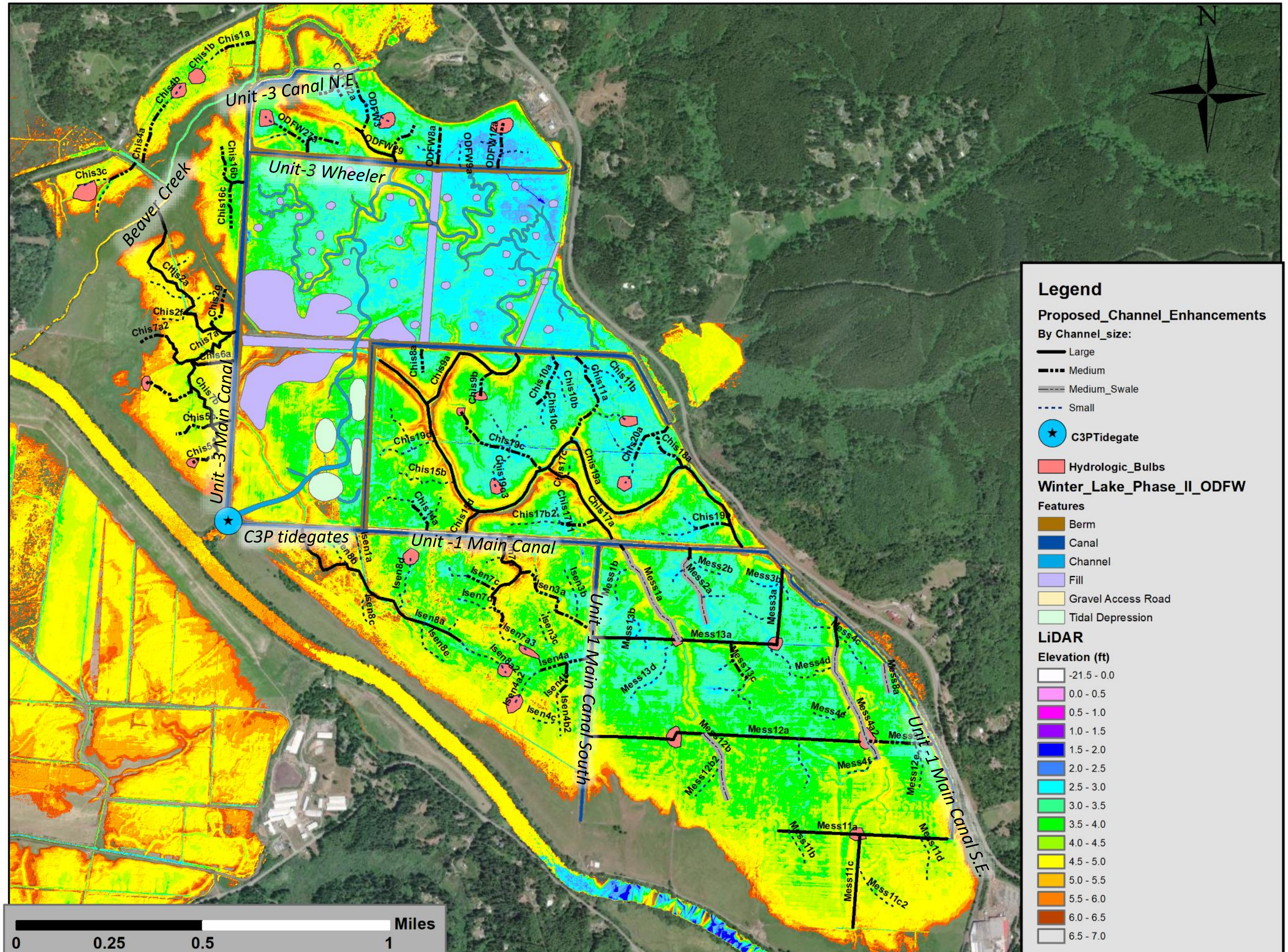



*Figure 7. Reconstructed/New channel construction I.D. and configuration.* ***Note:*** *culvert I.D. is same as channel I.D.; Large and Medium channel connection locations with main canals are culvert replacement locations.*

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

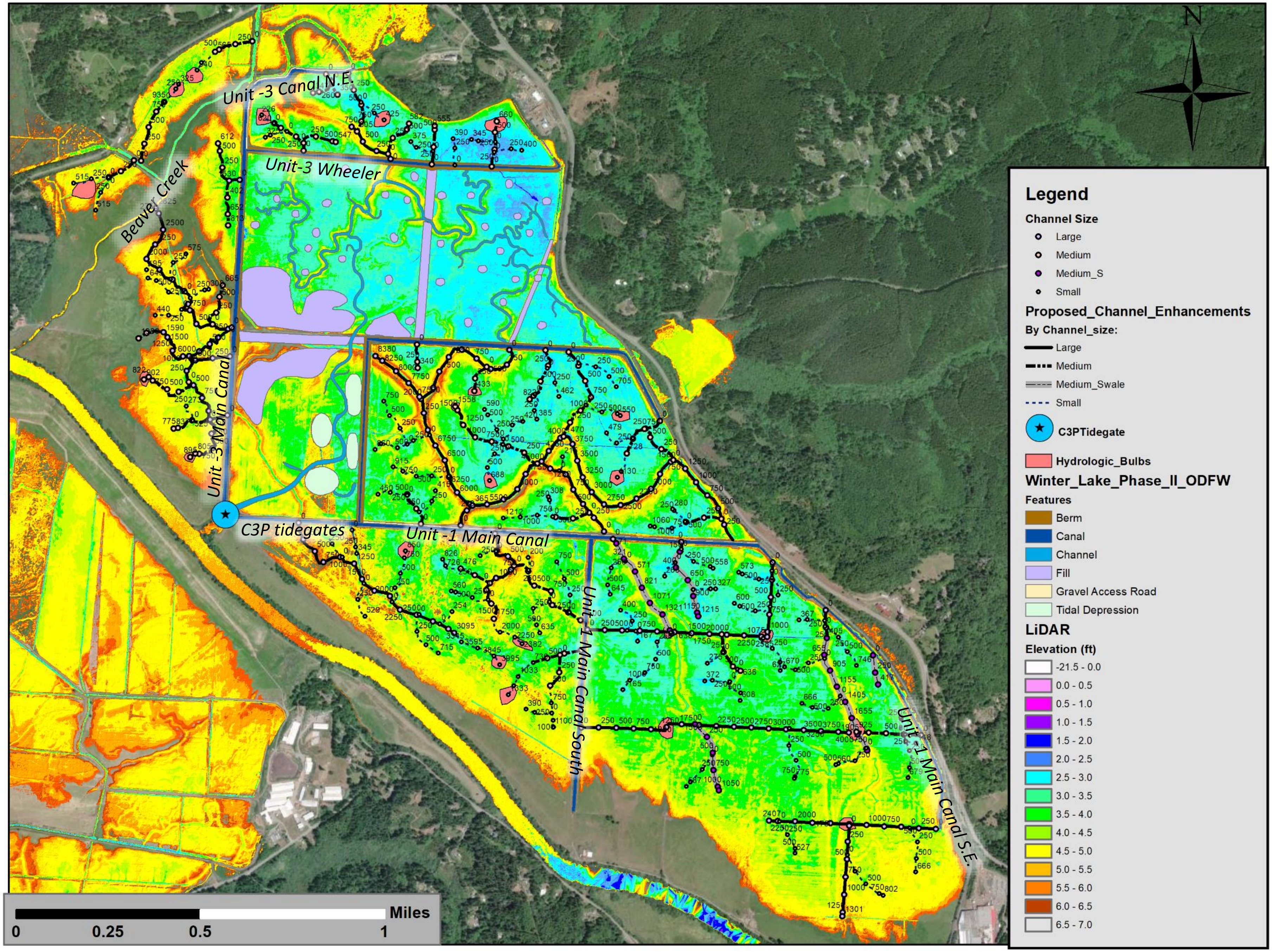
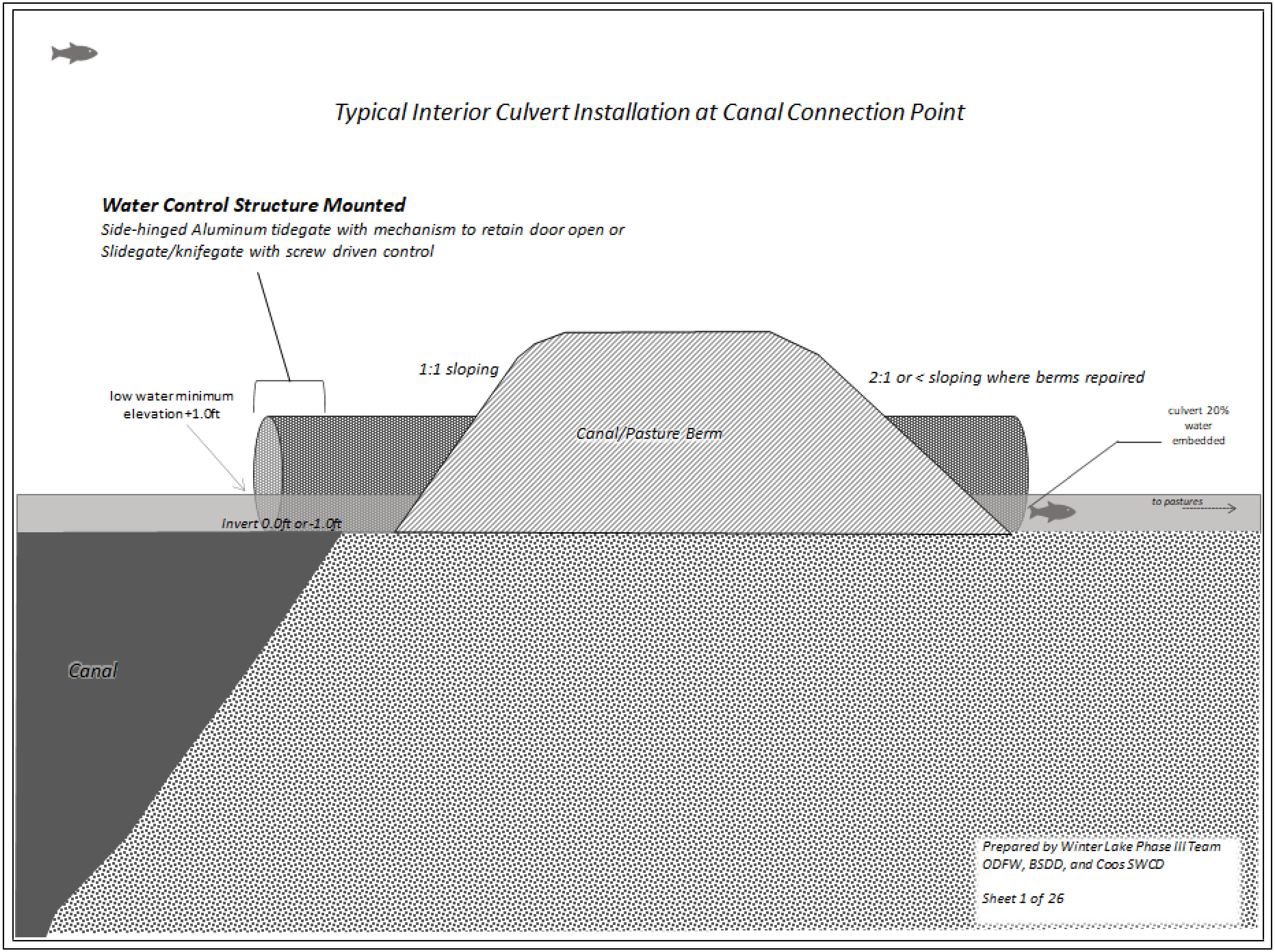
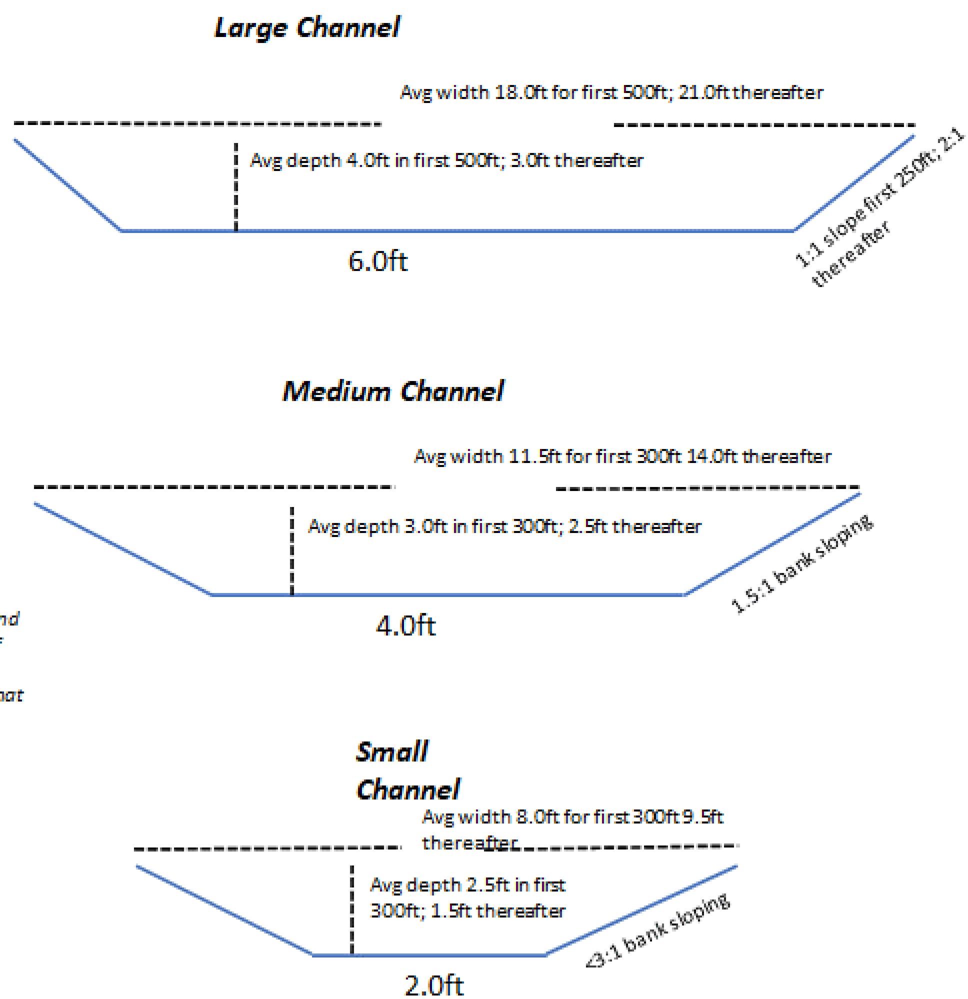



*Figure 8. Reconstruct/New channel construction distance demarcation.* ***Note:*** *Channel connection locations with main canals are culvert replacement sites.*



Typical Interior Culvert Installation at Canal Connection Point
Water Control Structure Mounted
Side-hinged Aluminum tidegate with mechanism to retain door open or
Slidegate/knifegate with screw driven control
1:1 sloping
2:1 or < sloping where berms repaired
low water minimum
elevation +1.0ft
Canal/Pasture Berm
culvert 20%
water
embedded
to pastures
Invert 0.0ft or -1.0ft
Canal
Prepared by Winter Lake Phase III Team
ODFW, BSDD, and Coos SWCD
Sheet 1 of 26

## Pasture Channel Cross-Sections




***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.*

***Note:*** *Channel drawings not to scale.*

*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

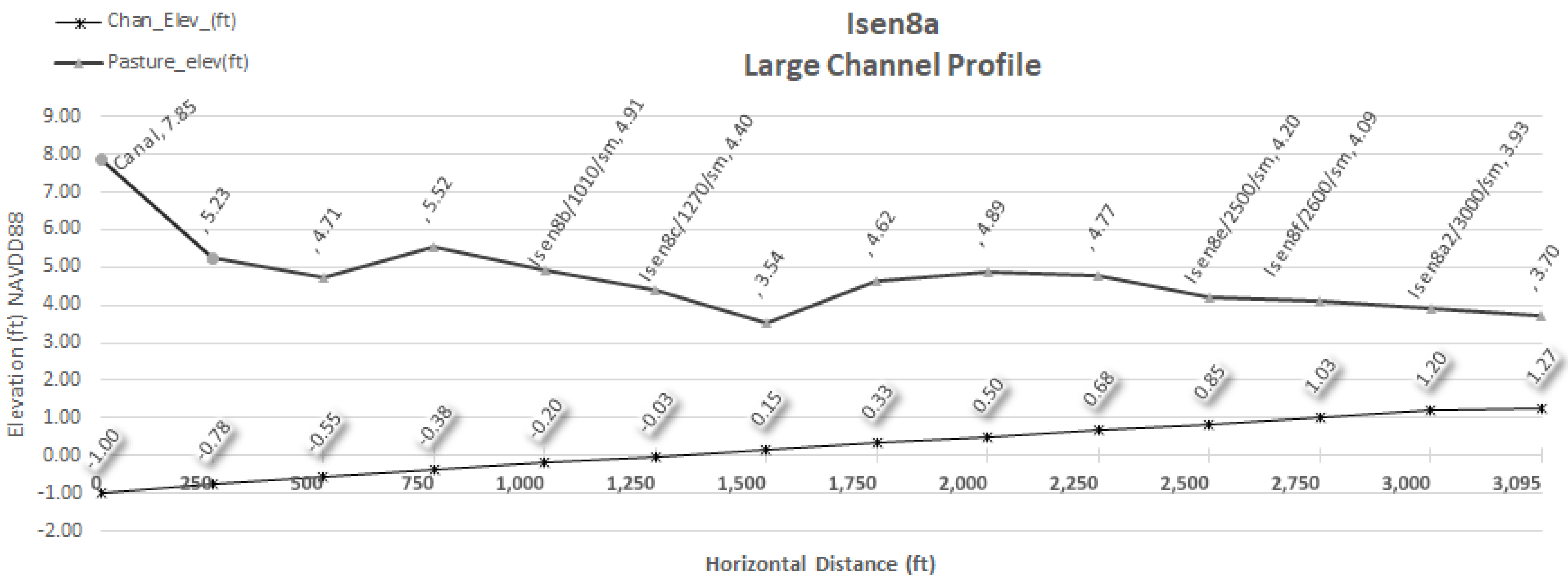
2. If left blank then channel segment <500/300ft in length

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 | | | | | | | |

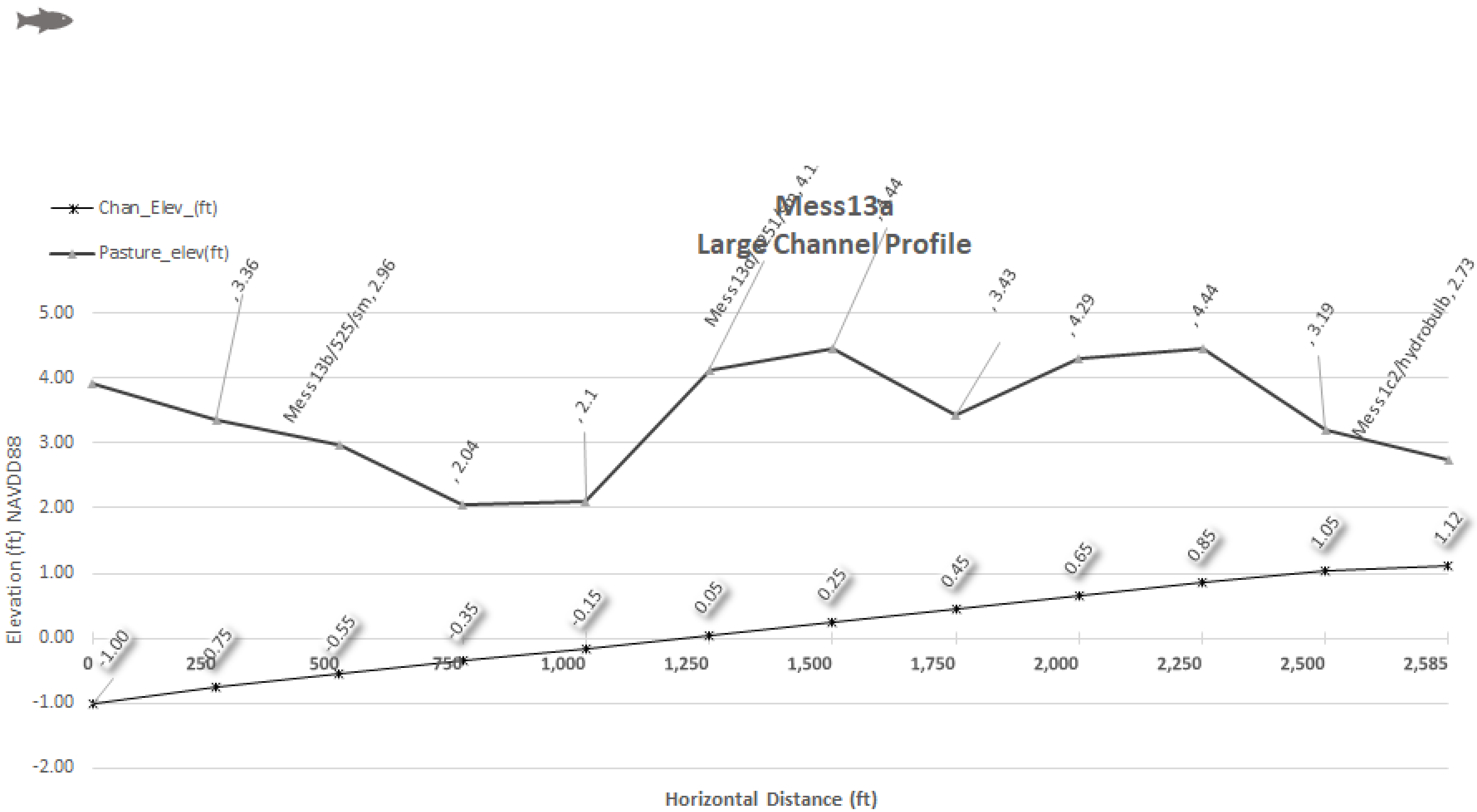
Table 2. Continued.

| 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*** | | | | | |




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

*Sheet 3 of 26*

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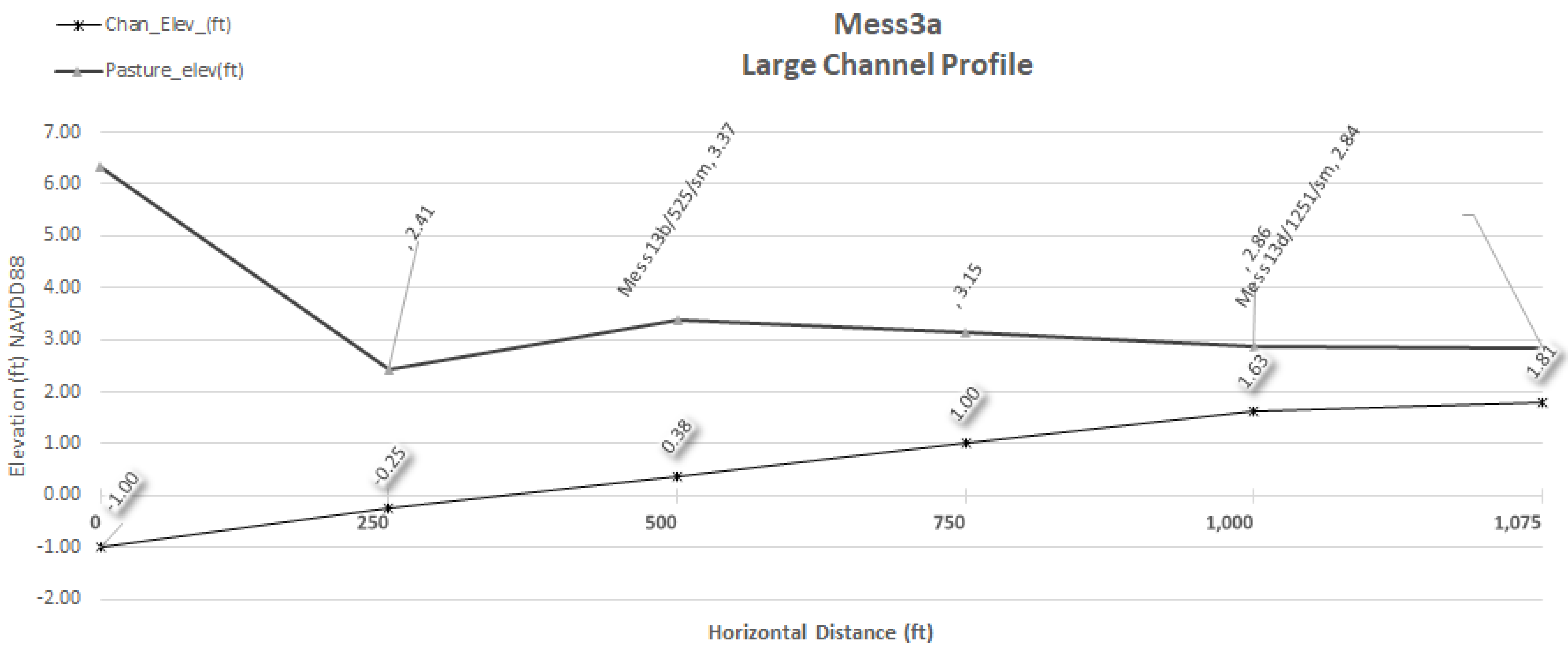
*ODFW, BSDD, and Coos SWCD*

*Sheet 4 of 26*

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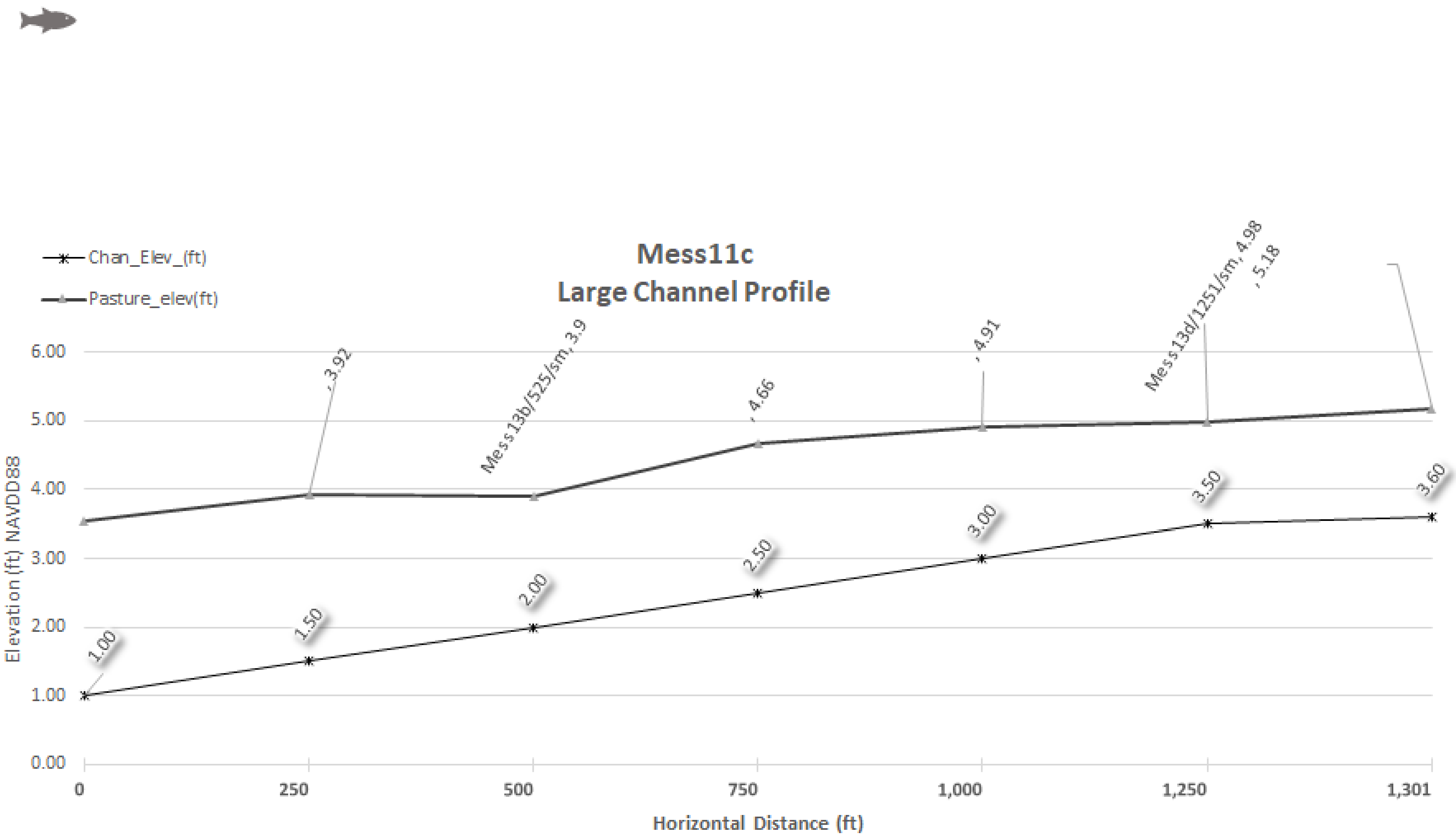
*Sheet 5 of 26*

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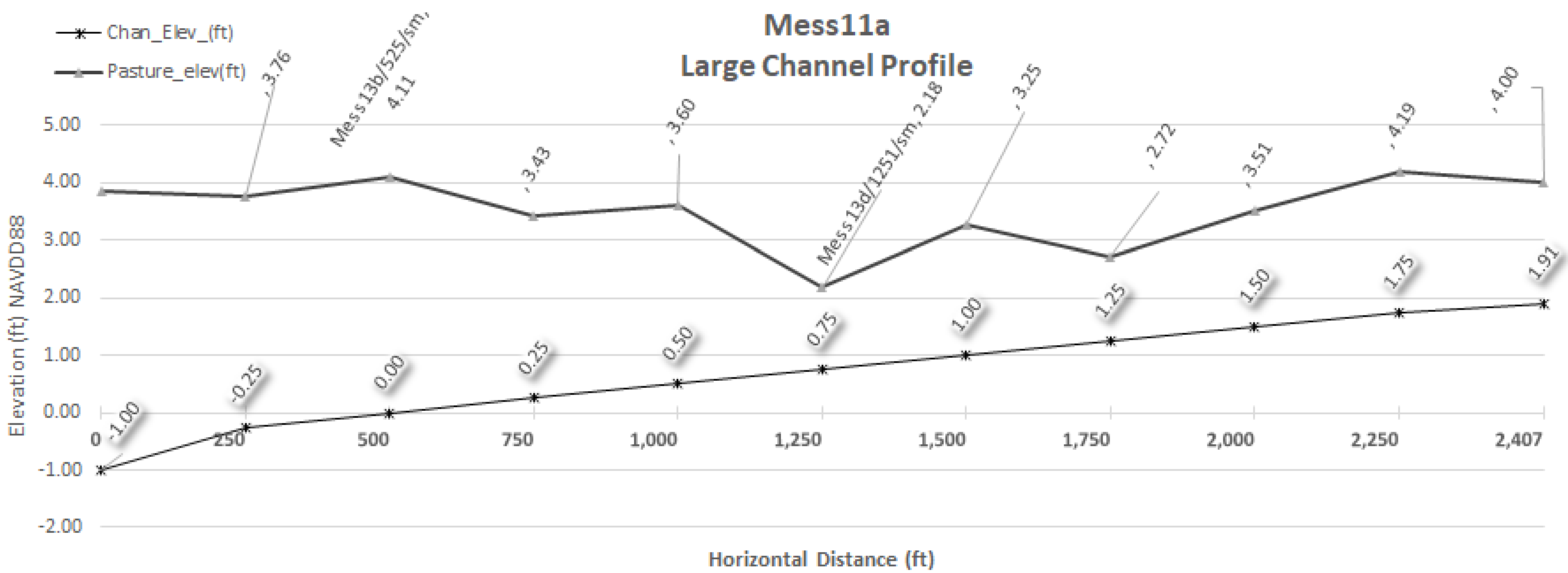
*ODFW, BSDD, and Coos SWCD*

*Sheet 6 of 26*

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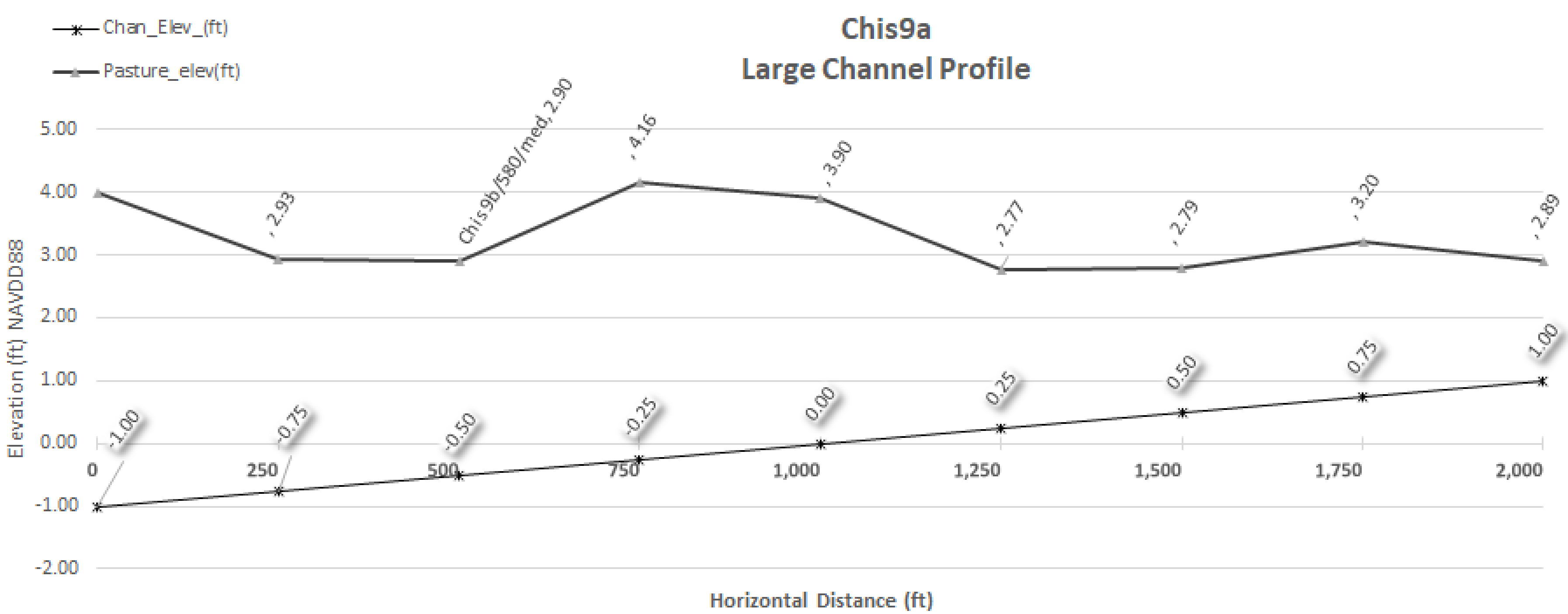
*ODFW, BSDD, and Coos SWCD*

*Sheet 7 of 26*

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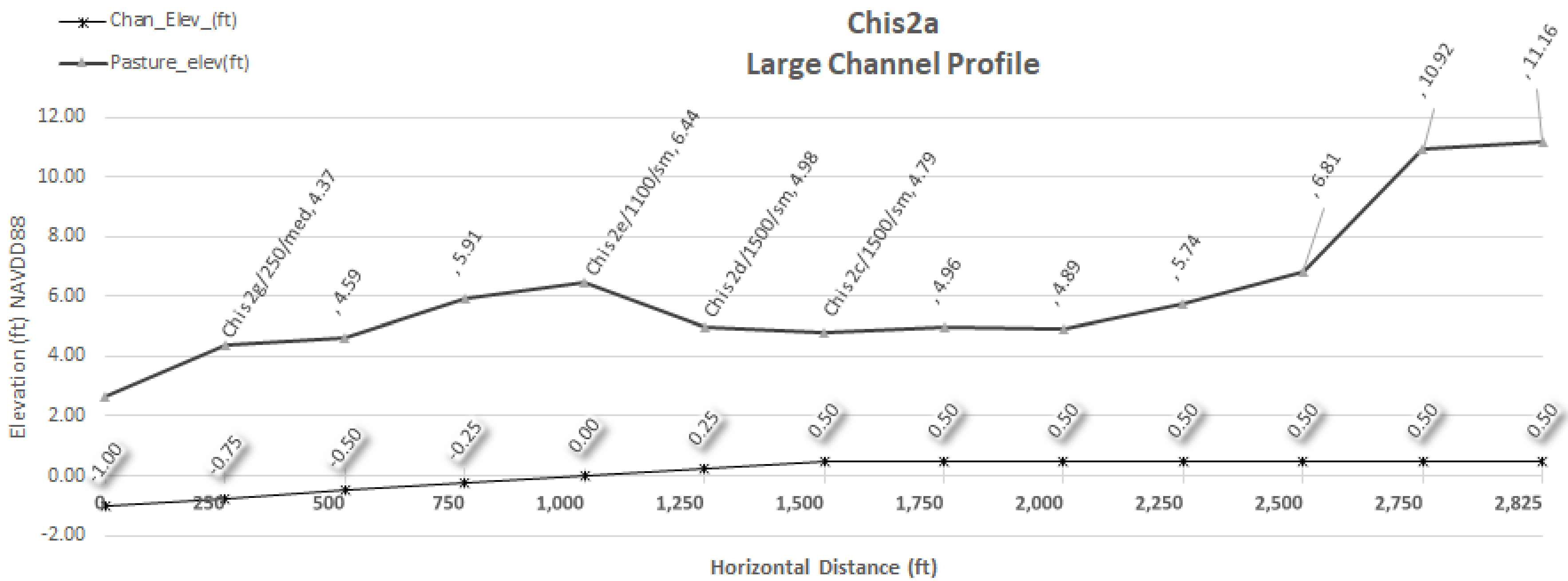
*ODFW, BSDD, and Coos SWCD*

*Sheet 8 of 26*

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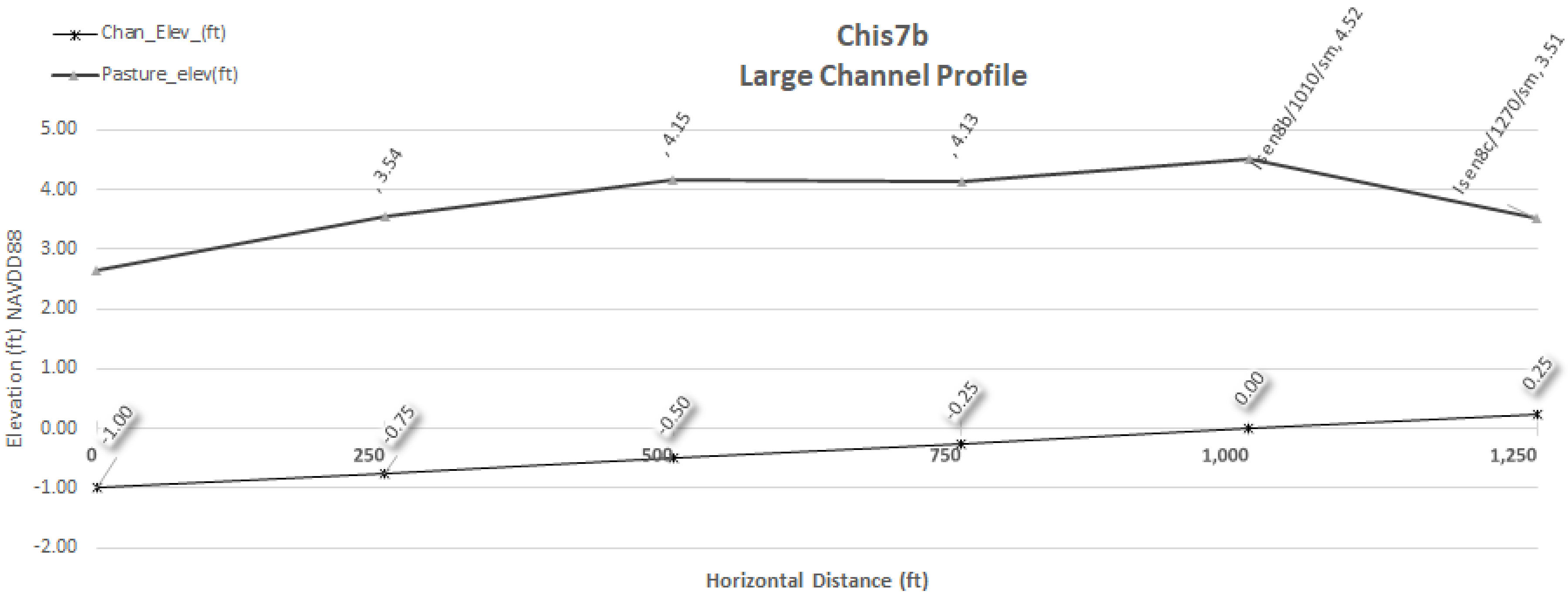
*ODFW, BSDD, and Coos SWCD*

*Sheet 9 of 26*

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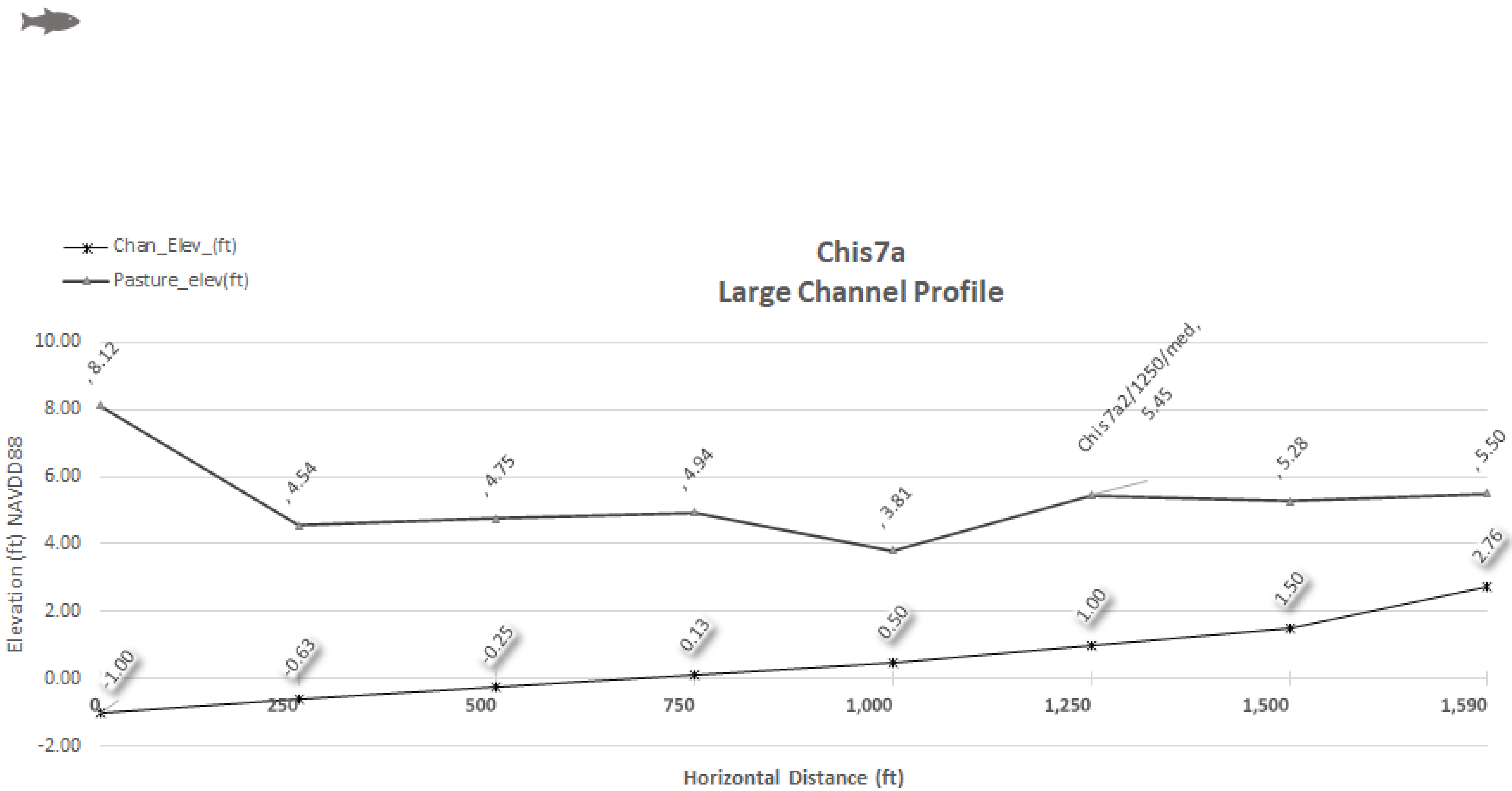
*Sheet 10 of 26*

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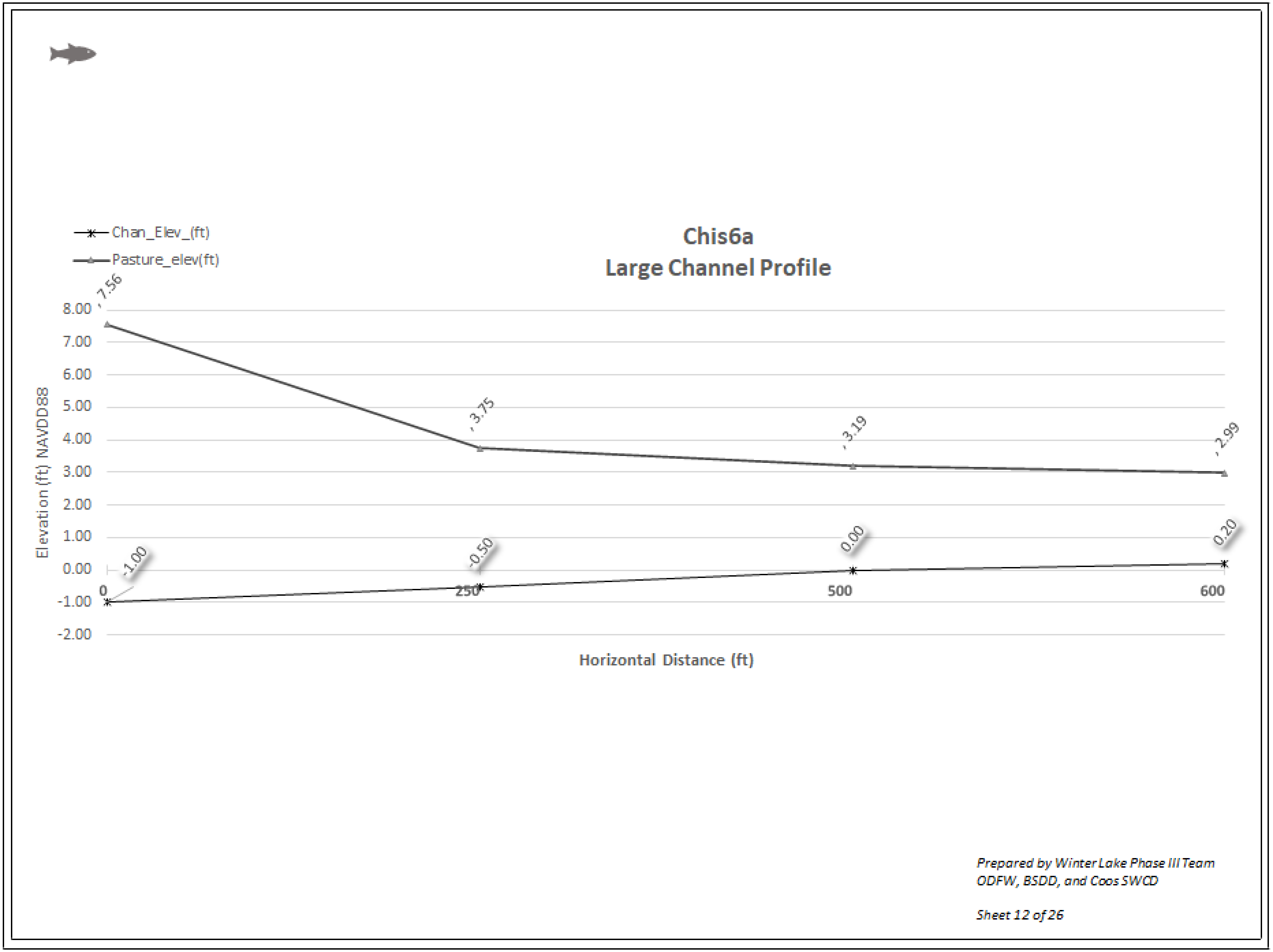
*Sheet 11 of 26*


Chan_Elev_(ft)
Pasture_elev(ft)
Chis6a
Large Channel Profile
Elevation (ft) NAVDD88
Horizontal Distance (ft)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
0
250
500
600
7.56
3.75
3.19
2.99
-1.00
-0.50
0.00
0.20
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ODFW, BSDD, and Coos SWCD
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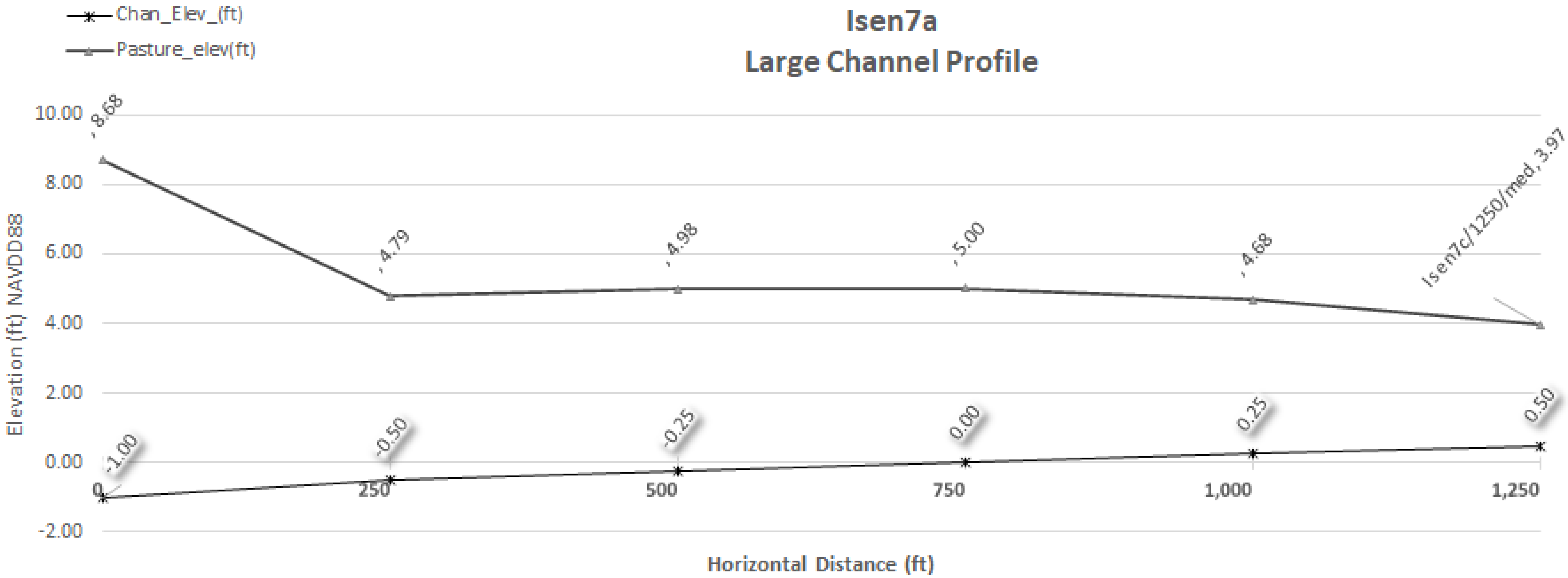
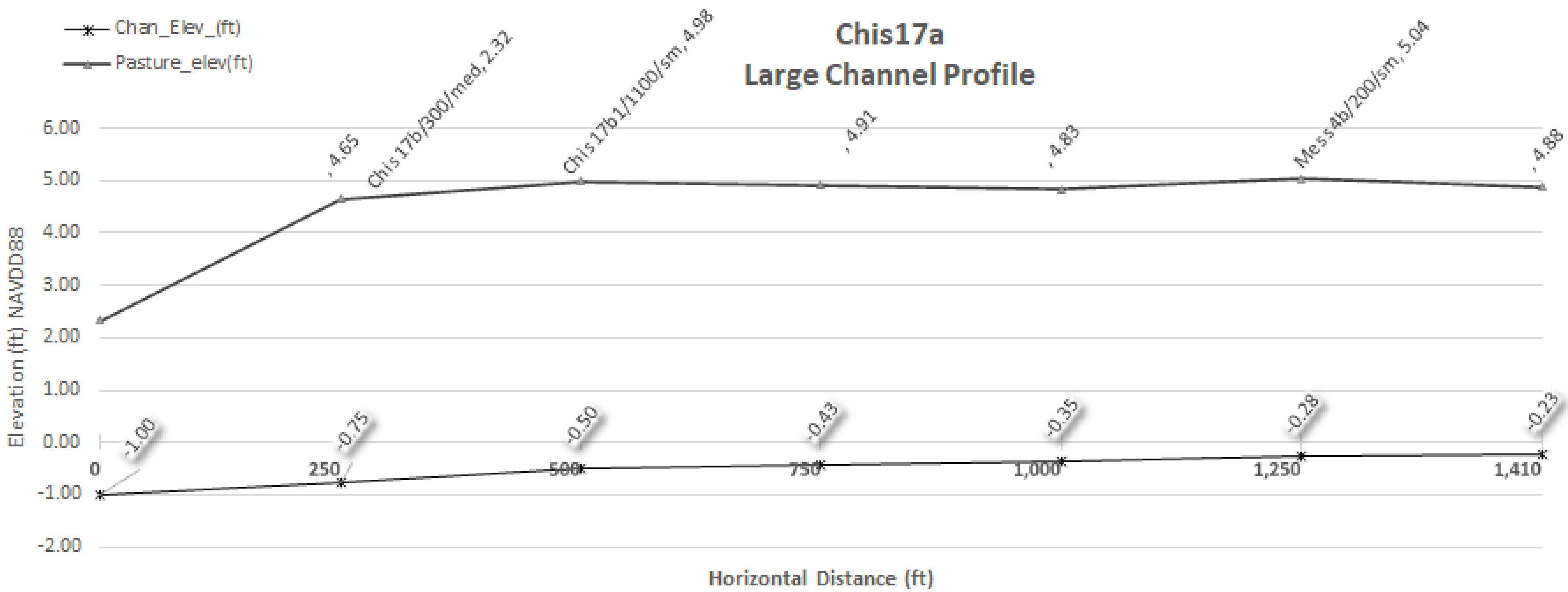



*Prepared by Winter Lake Phase III Team*
*ODFW, BSDD, and Coos SWCD*

*Sheet 13 of 26*

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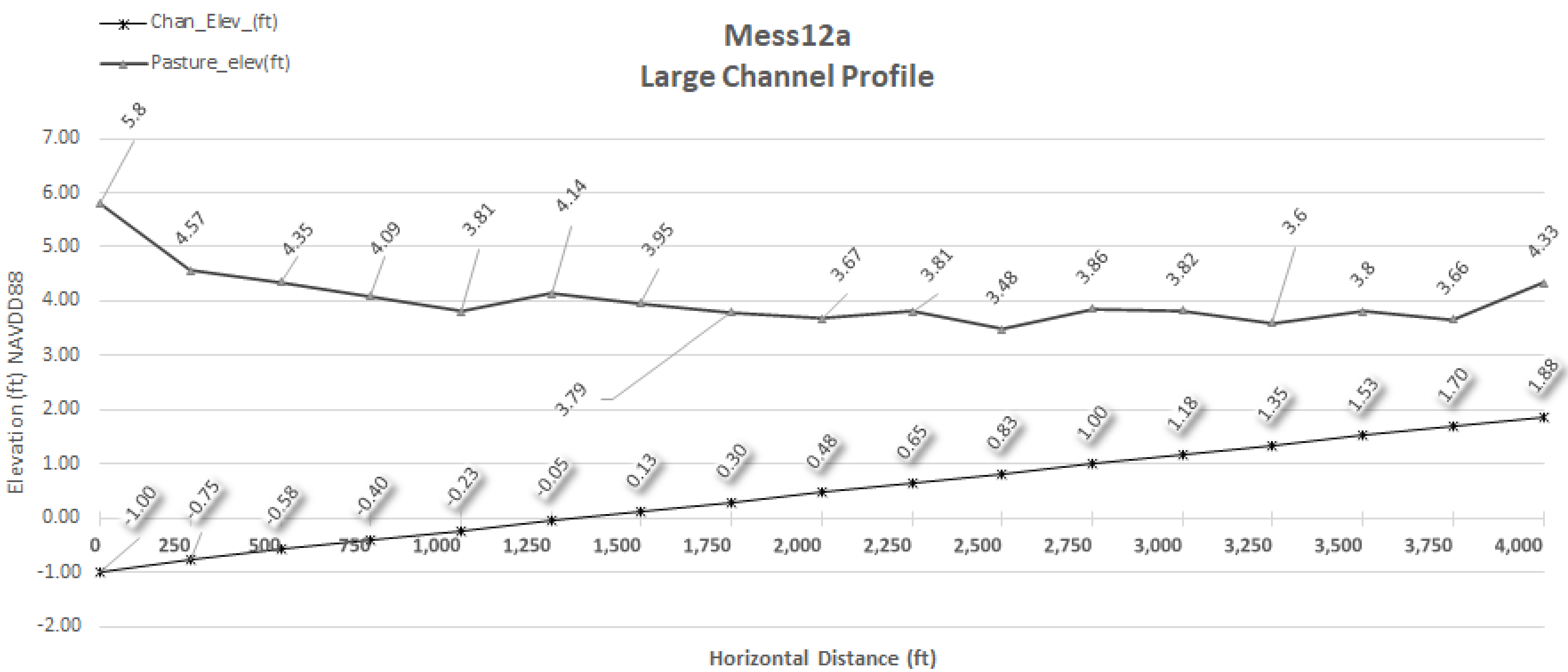
*Sheet 14 of 26*

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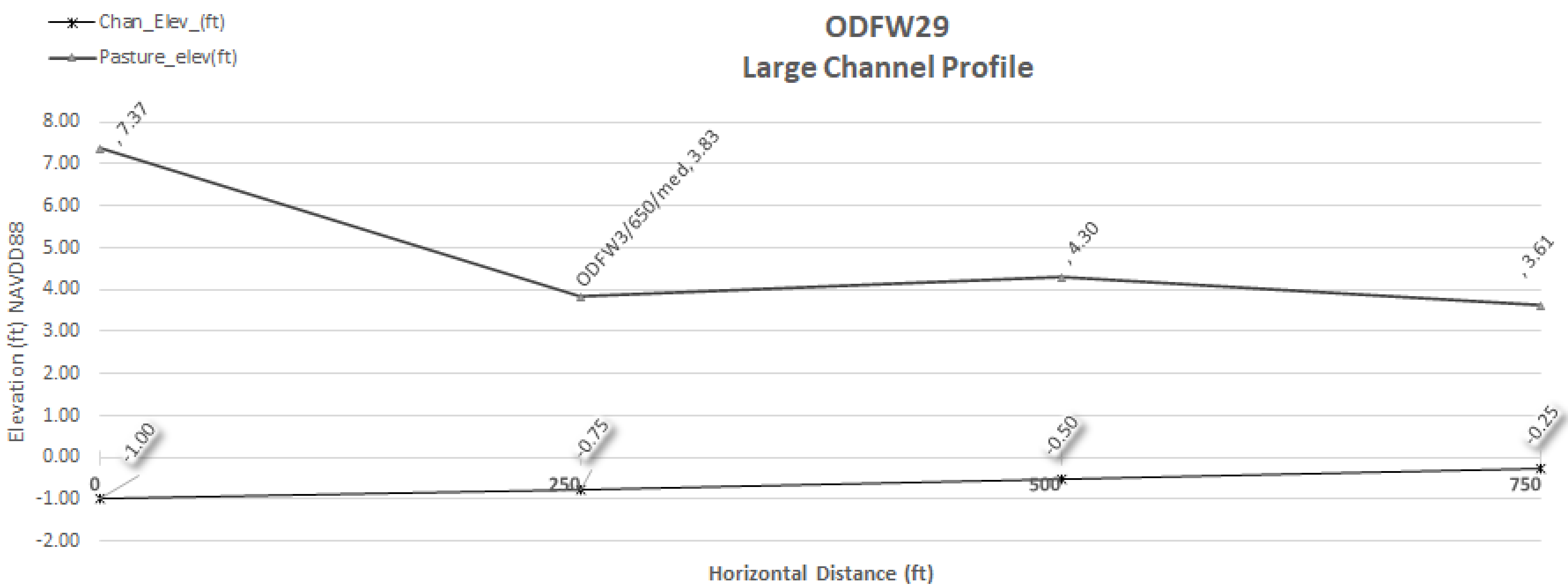
*Sheet 15 of 26*

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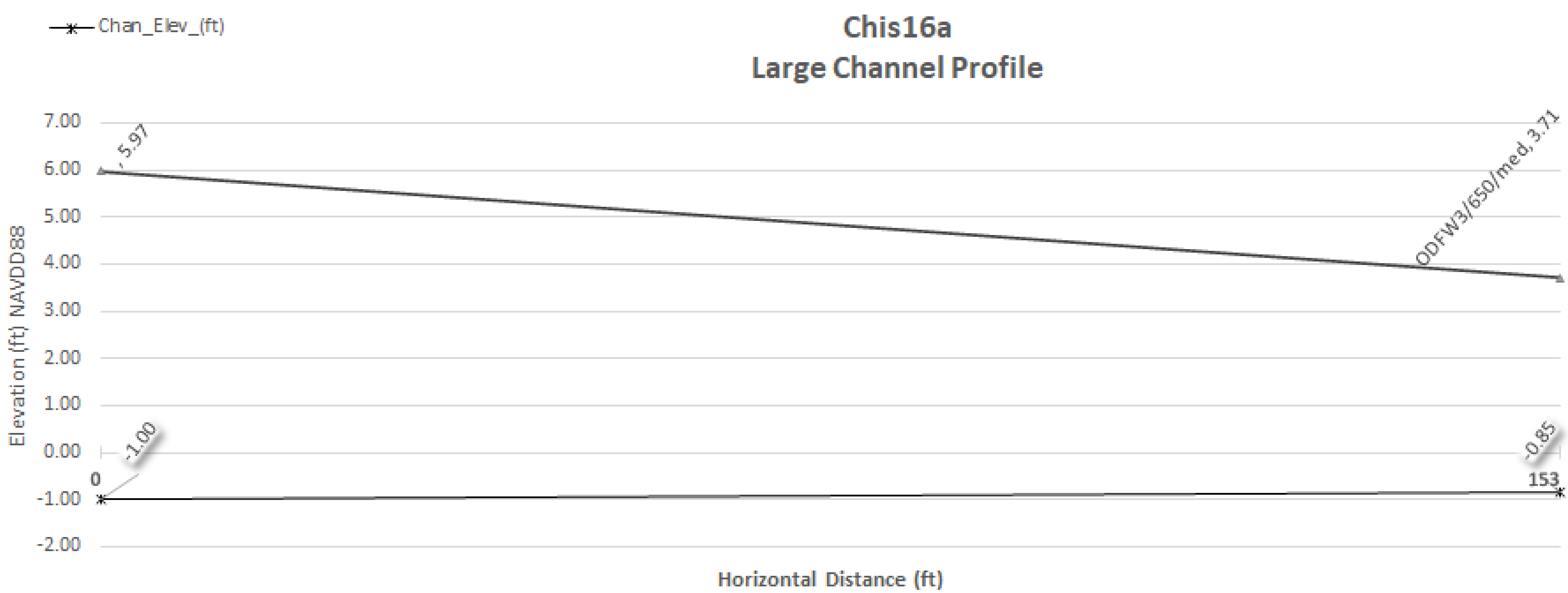
*ODFW, BSDD, and Coos SWCD*

*Sheet 16 of 26*

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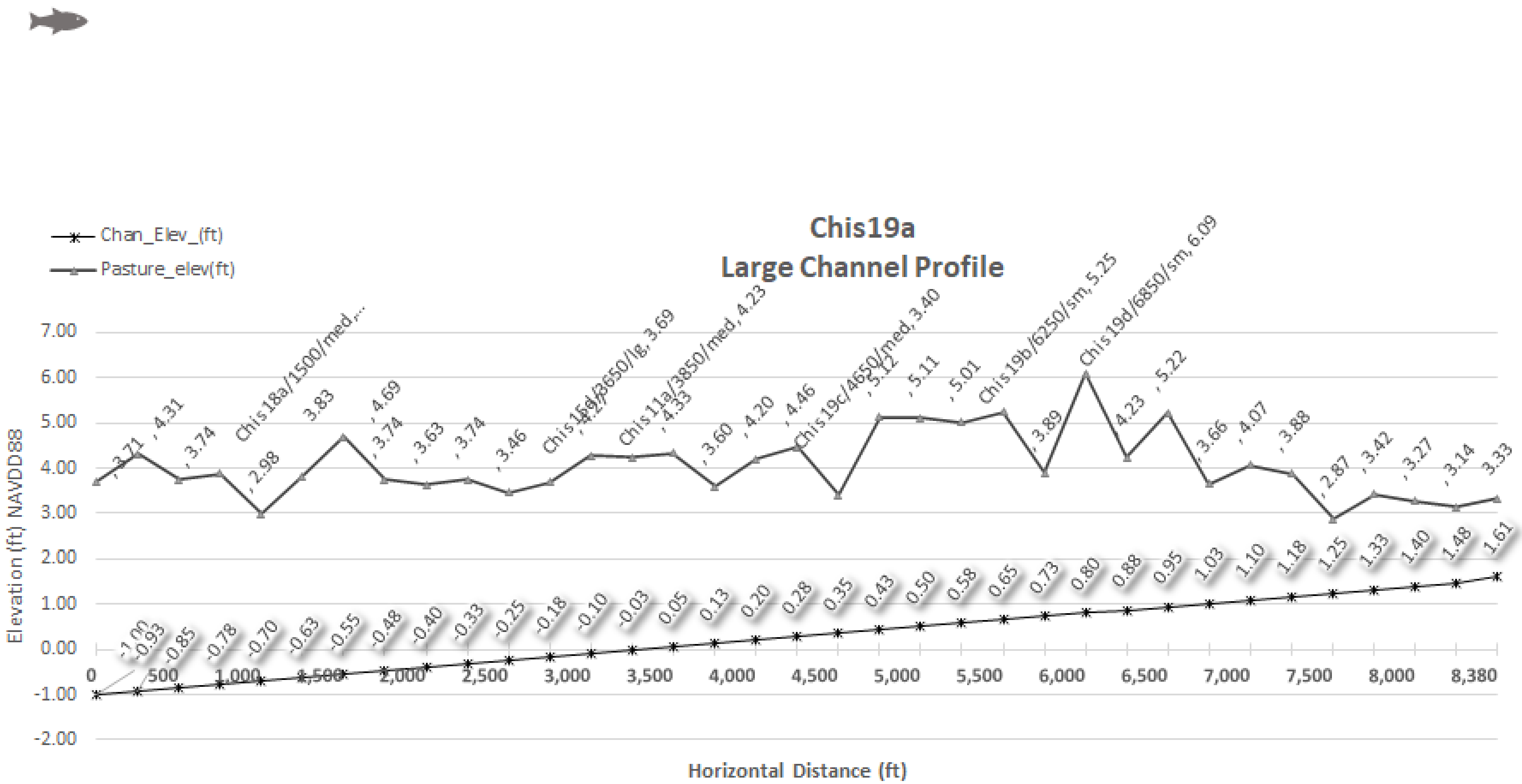
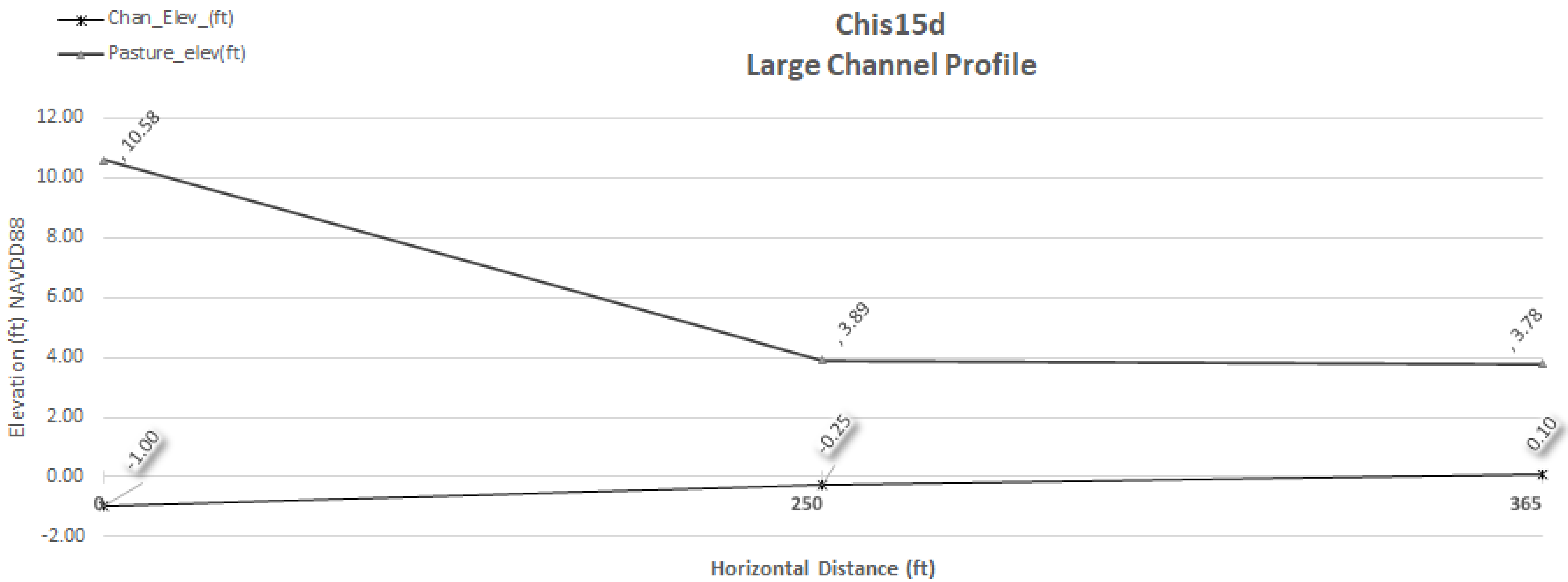
*Sheet 17 of 26*




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

*Sheet 18 of 26*




*Prepared by Winter Lake Phase III Team*
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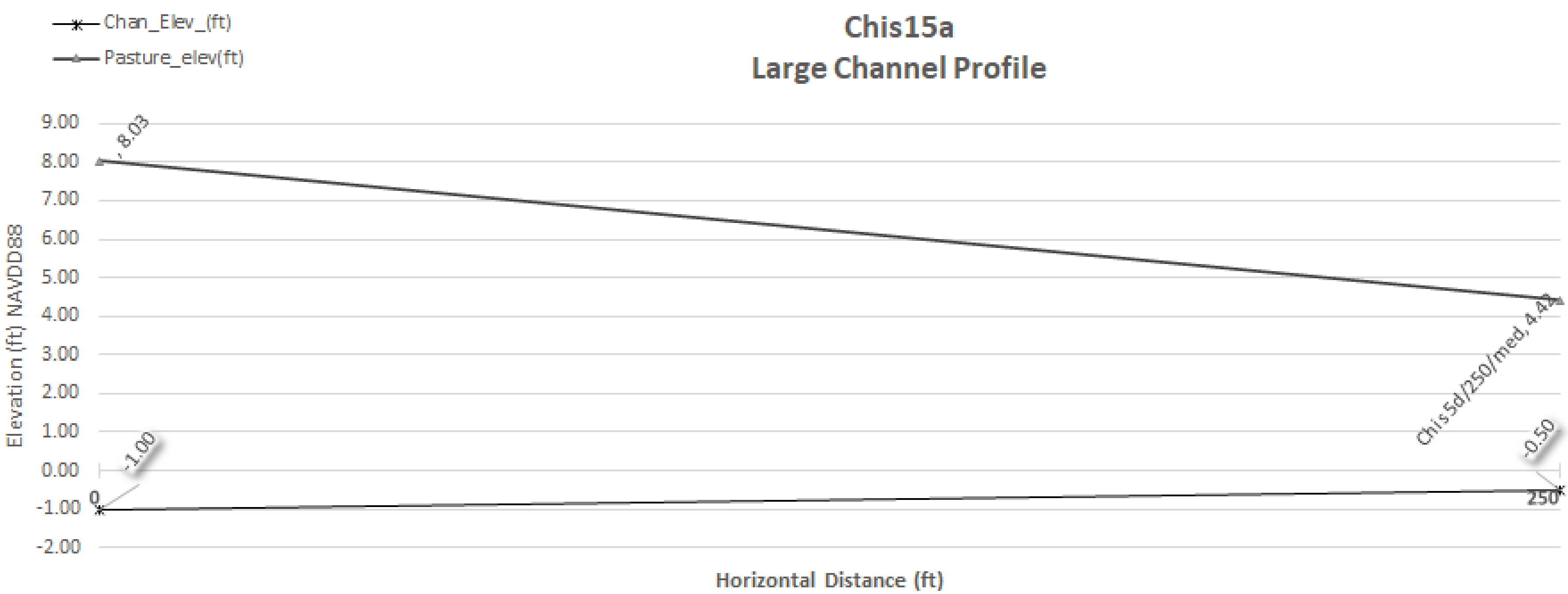
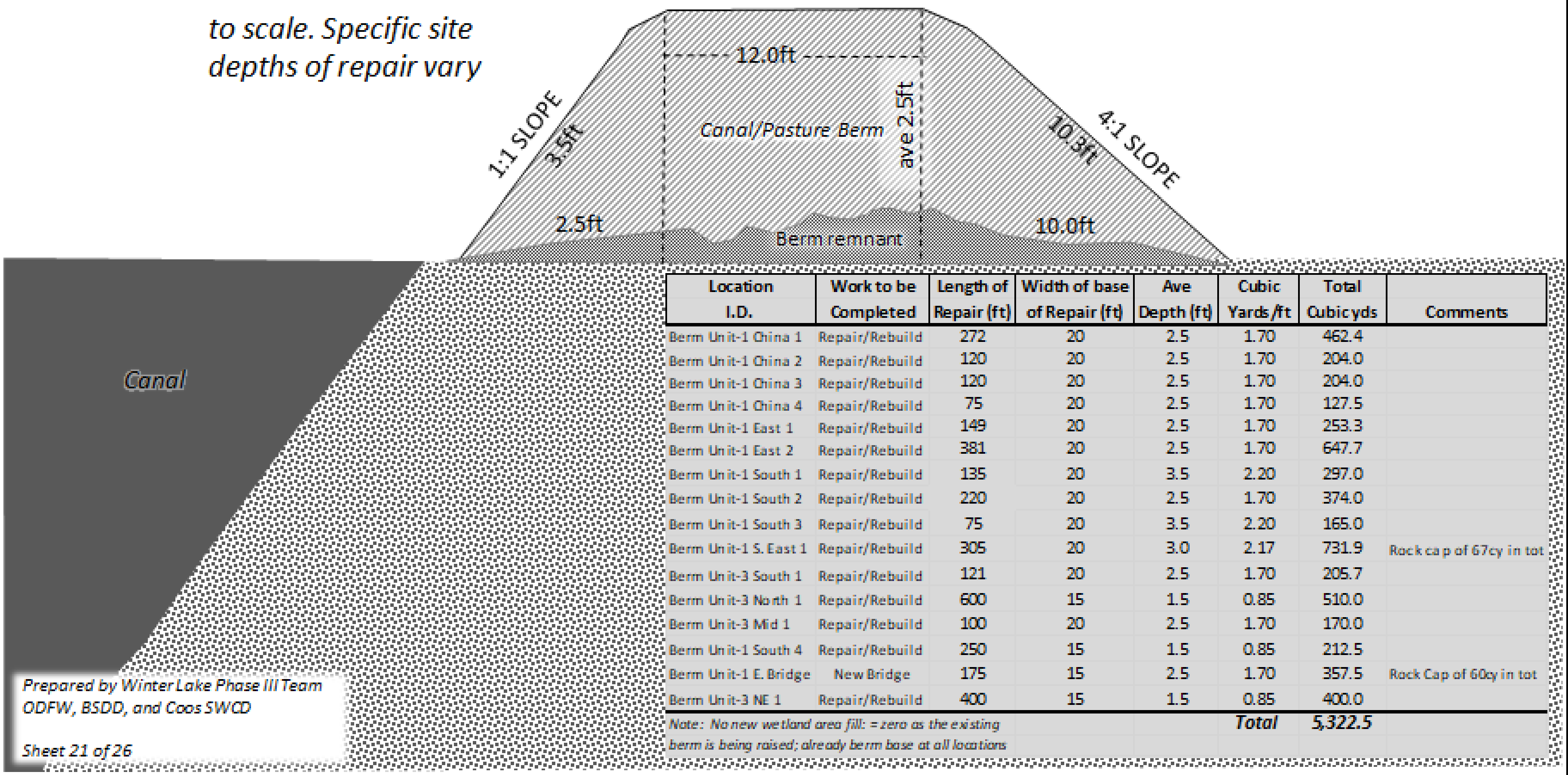



*Prepared by Winter Lake Phase III Team*
*ODFW, BSDD, and Coos SWCD*

*Sheet 20 of 26*

# TYPICAL INTERIOR PASTURE/CANAL BERM REPAIR DESIGN

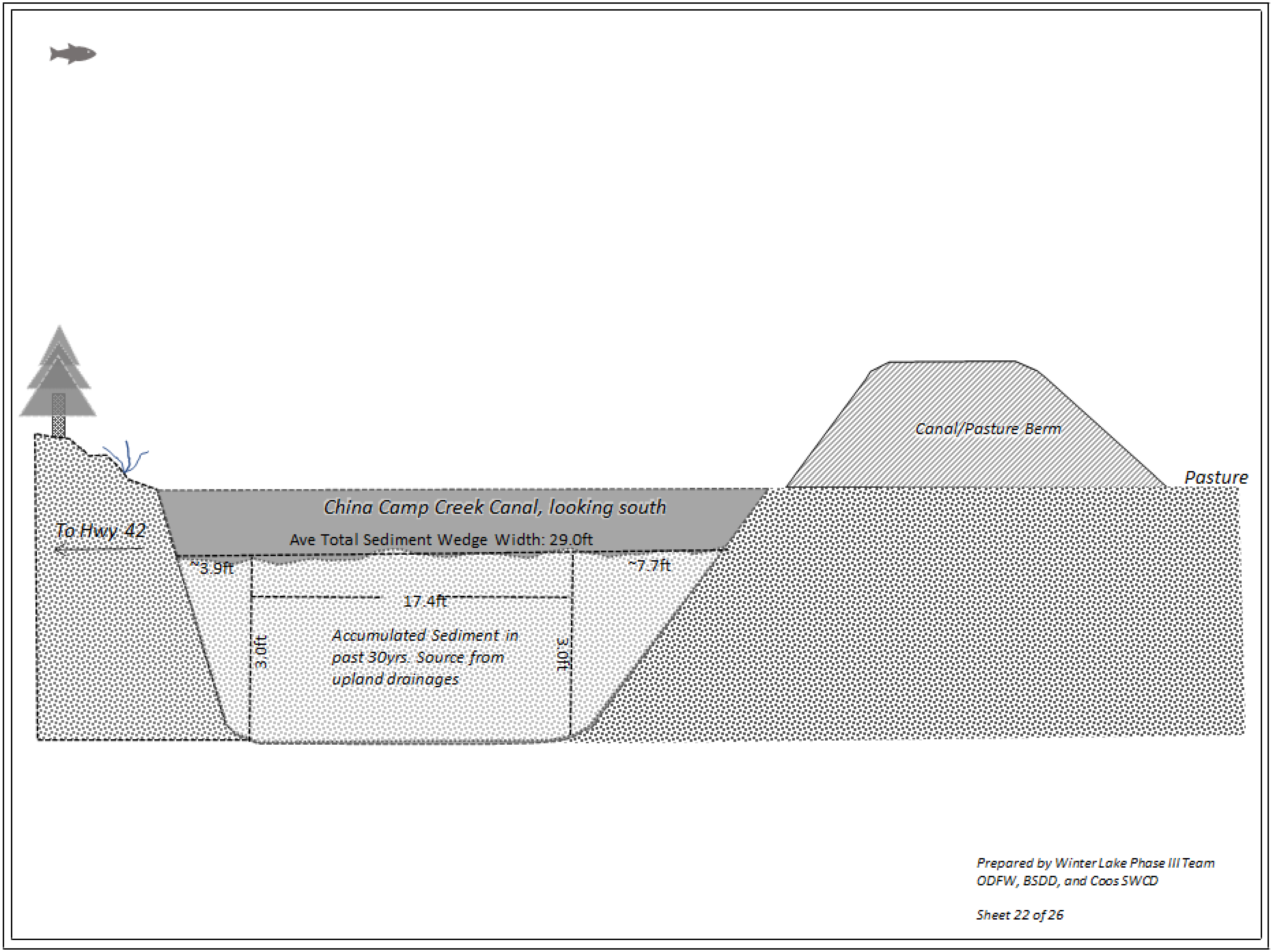
***Note:*** *Not Drawn to scale. Specific site depths of repair vary*




| 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 | |
| *Note: No new wetland area fill: = zero as the existing berm is being raised; already berm base at all locations* | | | | | ***Total*** | ***5,322.5*** | |

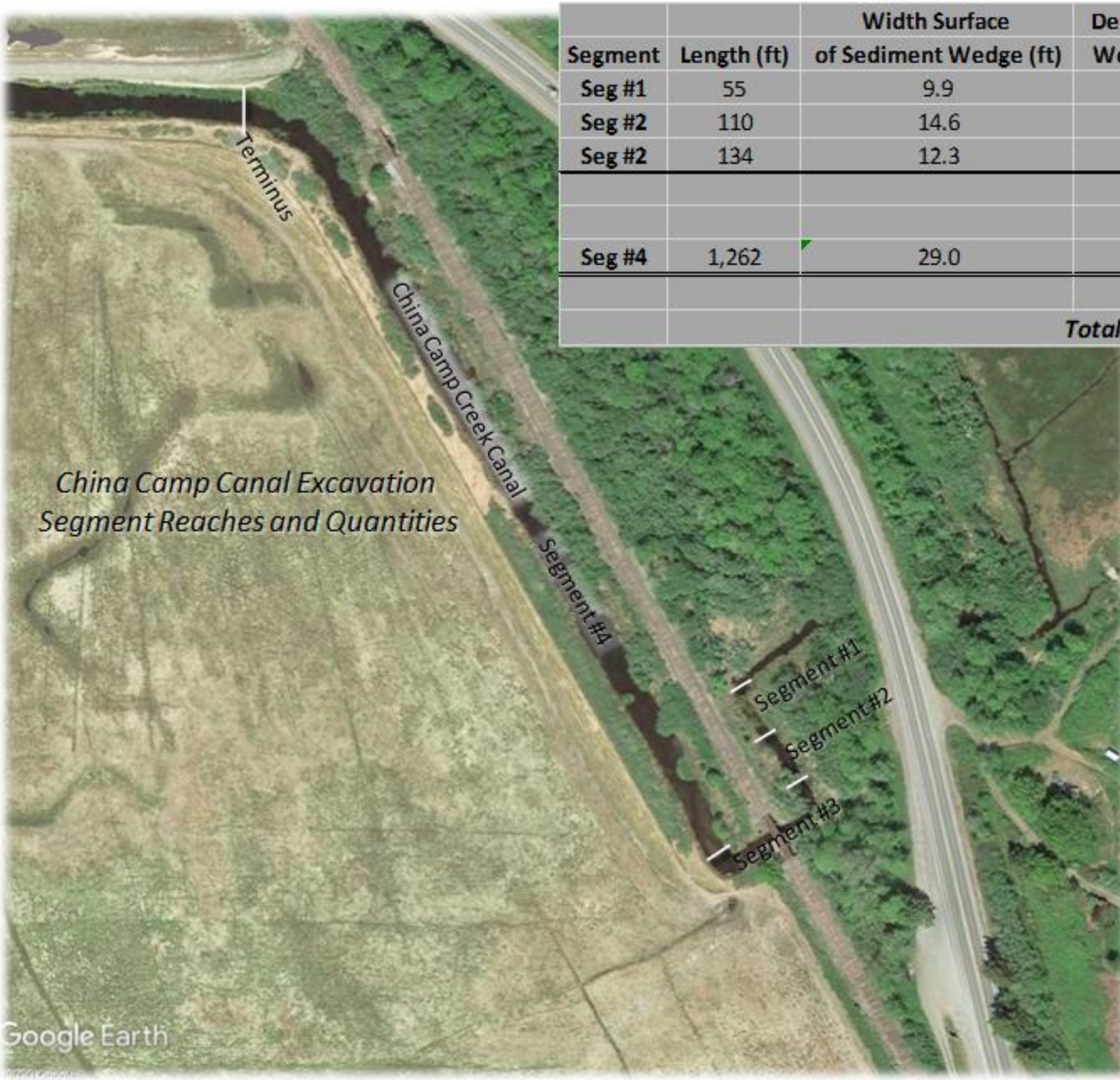
*Prepared by Winter Lake Phase III Team*
*ODFW, BSDD, and Coos SWCD*

*Sheet 21 of 26*



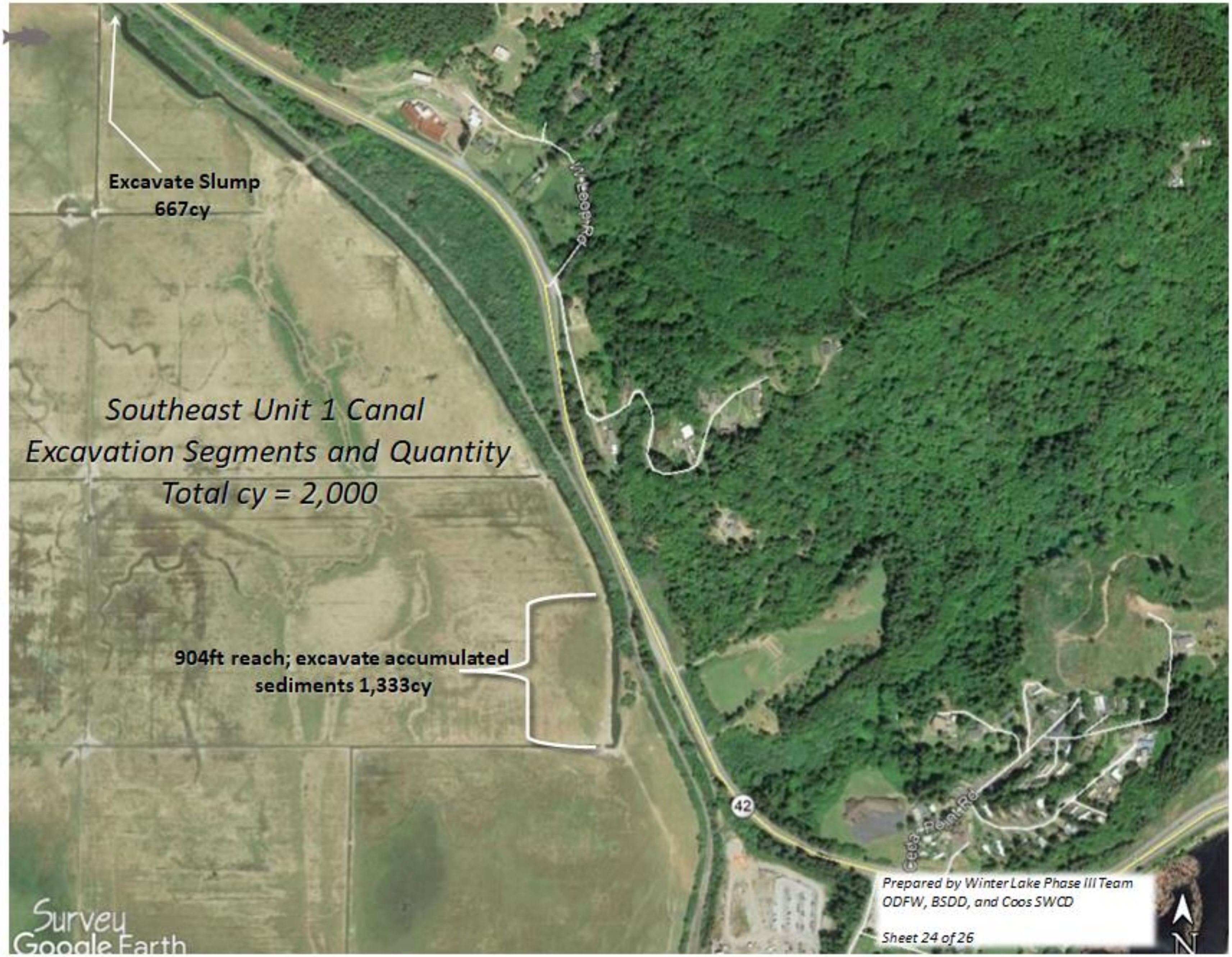
China Camp Creek Canal, looking south
To Hwy 42
Ave Total Sediment Wedge Width: 29.0ft
~3.9ft
~7.7ft
17.4ft
3.0ft
3.0ft
Accumulated Sediment in past 30yrs. Source from upland drainages
Canal/Pasture Berm
Pasture
Prepared by Winter Lake Phase III Team
ODFW, BSDD, and Coos SWCD
Sheet 22 of 26

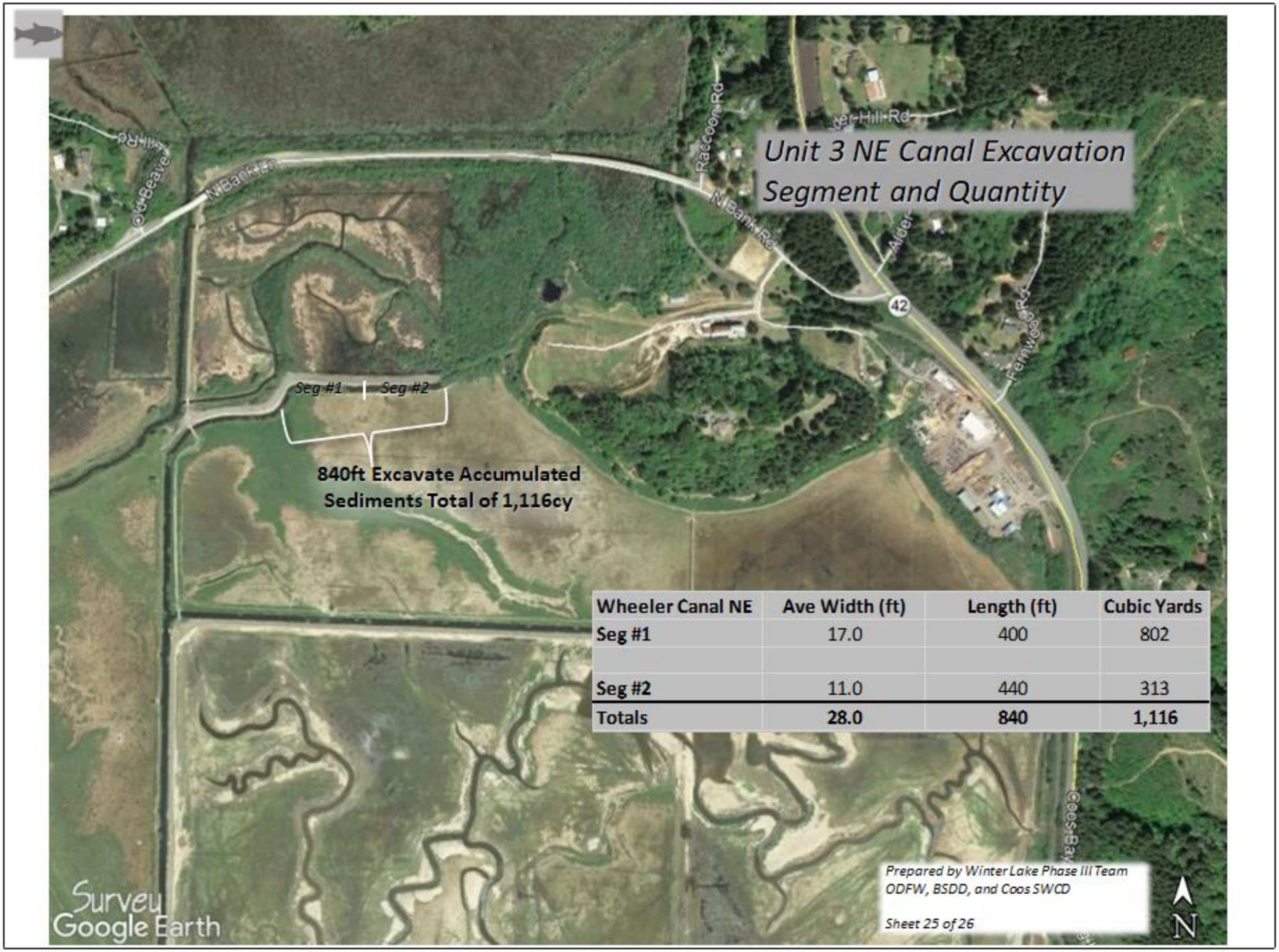
| | | Width Surface | Depth Sediment | |
|---|---|---|---|---|
| Segment | Length (ft) | of Sediment Wedge (ft) | Wedge; Ave (ft) | Total Cubic Yards |
| **Seg #1** | 55 | 9.9 | 3.0 | 60.2 |
| **Seg #2** | 110 | 14.6 | 3.0 | 178.8 |
| **Seg #2** | 134 | 12.3 | 3.0 | 183.1 |
| | | | ***SubTotal*** | **422.1**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




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

*Sheet 23 of 26*

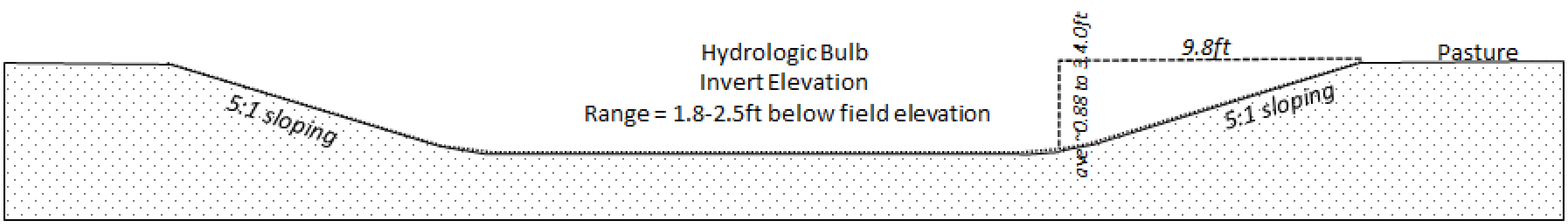

Excavate Slump
667cy
Southeast Unit 1 Canal
Excavation Segments and Quantity
Total cy = 2,000
904ft reach; excavate accumulated
sediments 1,333cy
42
Prepared by Winter Lake Phase III Team
ODFW, BSDD, and Coos SWCD
Sheet 24 of 26
N
Google Earth




| 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* |




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

*Sheet 26 of 26*

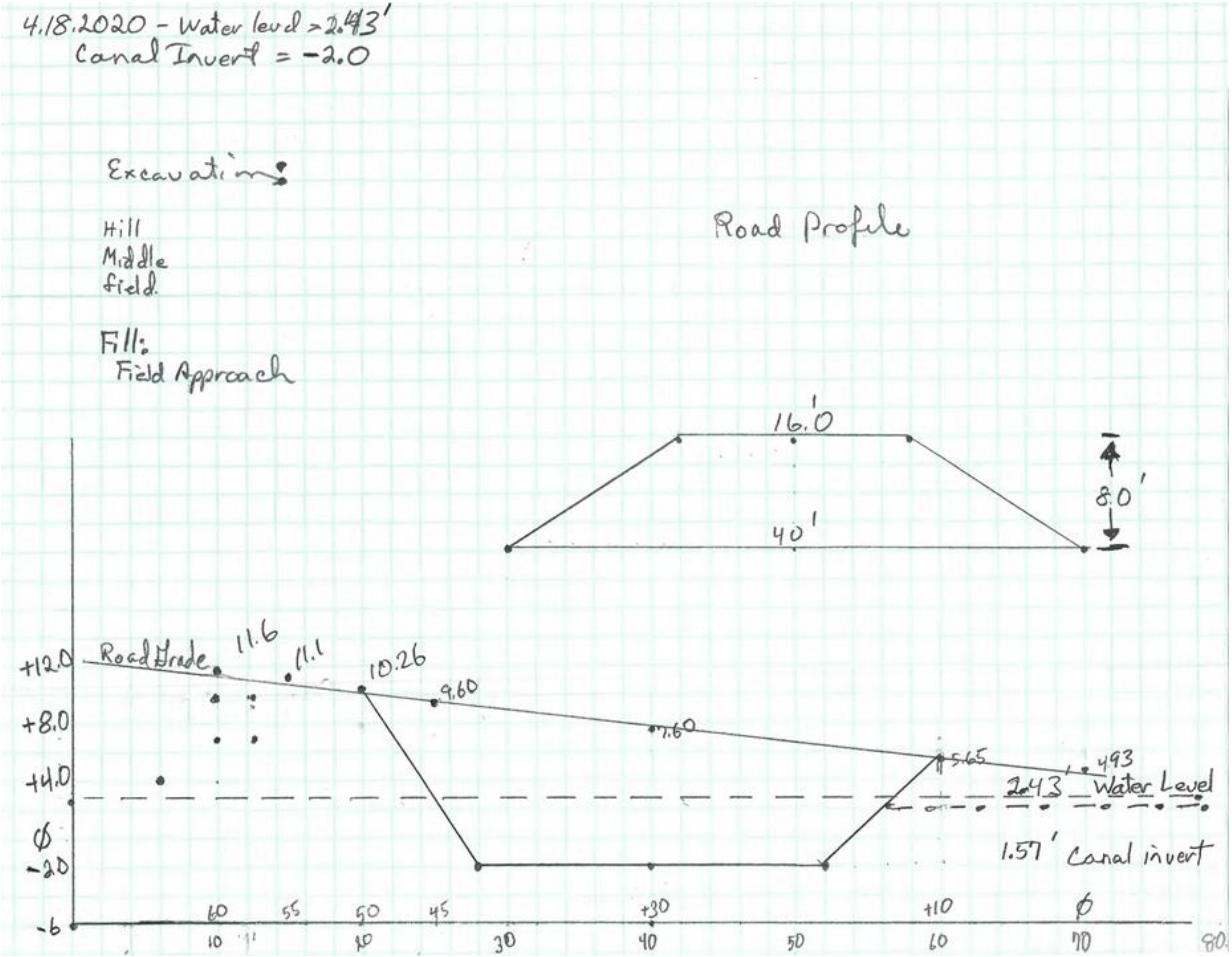



Figure 9. Unit 1 S. Canal S.E. pasture access bridge cross-section drawing profile of canal excavation and road profile.

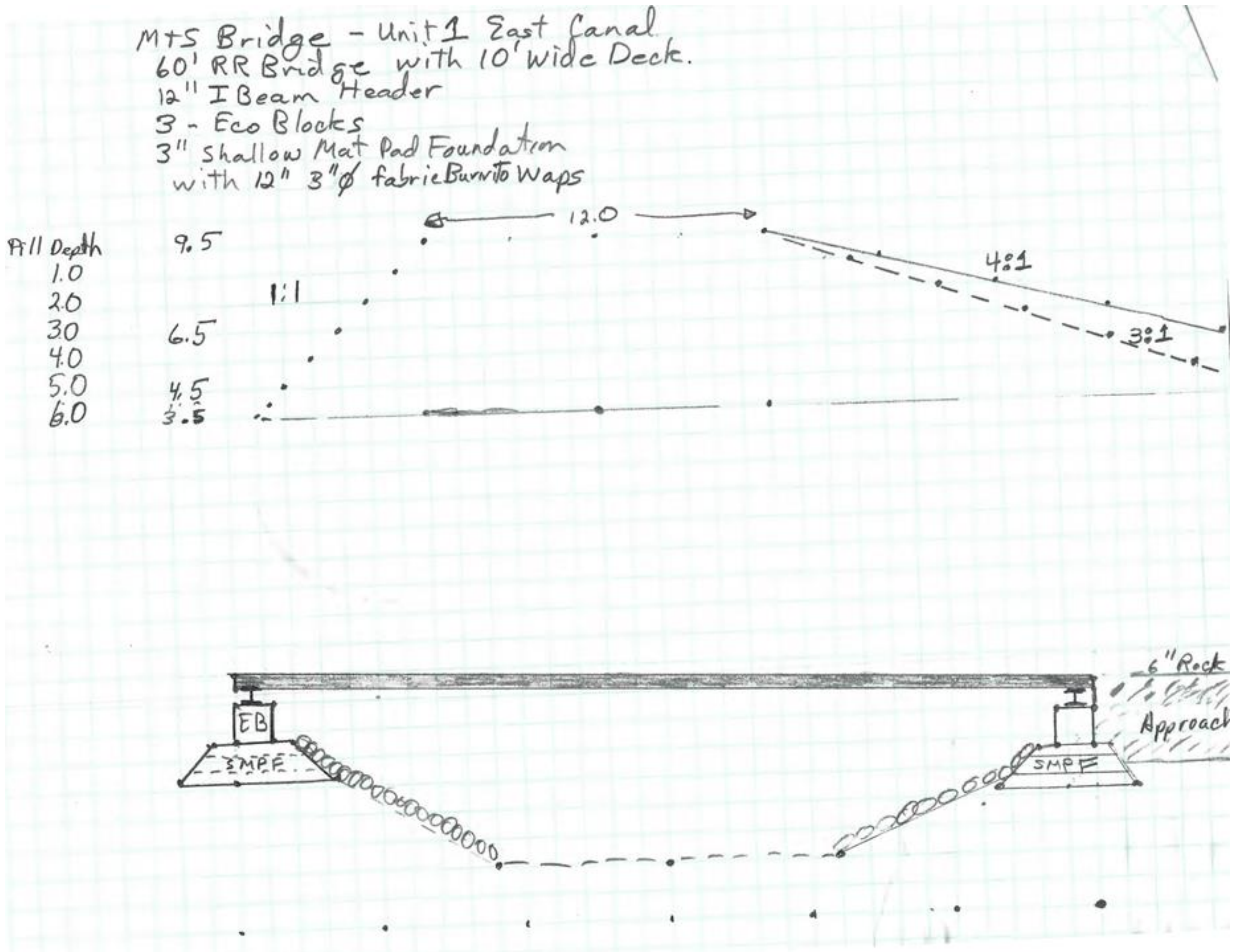



Figure 10. Unit 1 S. Canal S.E. pasture access bridge cross-section drawing.

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 | 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 |
| 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 I.D.** | **Channel Size** | **Distance frm Cnct Chan (ft)** | ***NAVDD88* Invert (ft)** | **LiDAR (ft)[1]** | **Chan Slope %[2]** | **Hydro Bulb 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 I.D. | Channel Size | Distance frm Cnct Chan (ft) | *NAVDD88* Invert (ft) | LiDAR (ft)[1] | Chan Slope %[2] | Hydro Bulb 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 I.D.** | **Channel Size** | **Distance frm Cnct Chan (ft)** | ***NAVDD88* Invert (ft)** | **LiDAR (ft)[1]** | **Chan Slope %[2]** | **Hydro Bulb 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** | **Channel** | **Distance frm** | ***NAVDD88*** | **LiDAR** | **Chan** | **Hydro Bulb** |
| **I.D.** | **Size** | **Cnct Chan (ft)** | **Invert (ft)** | **(ft)[1]** | **Slope %[2]** | **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** | **Channel** | **Distance frm** | ***NAVDD88*** | **LiDAR** | **Chan** | **Hydro Bulb** |
| **I.D.** | **Size** | **Cnct Chan (ft)** | **Invert (ft)** | **(ft)[1]** | **Slope %[2]** | **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 | Channel | Distance frm | *NAVDD88* | LiDAR | Chan | Hydro Bulb |
| I.D. | Size | Cnct Chan (ft) | Invert (ft) | (ft)[1] | Slope %[2] | 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 I.D.** | **Channel Size** | **Distance frm Cnct Chan (ft)** | ***NAVDD88* Invert (ft)** | **LiDAR (ft)[1]** | **Chan Slope %[2]** | **Hydro Bulb 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 I.D.** | **Channel Size** | **Distance frm Cnct Chan (ft)** | ***NAVDD88*** **Invert (ft)** | **LiDAR (ft)**[1] | **Chan Slope %**[2] | **Hydro Bulb 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

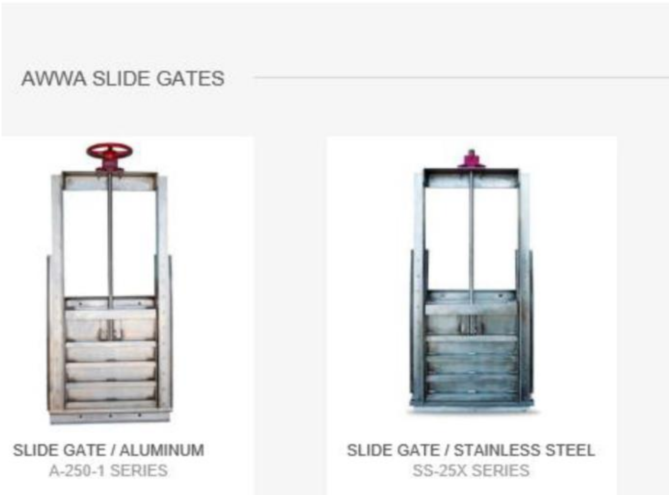



Figure 1. Slide gates proposed for selected interior pasture connection culverts.

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

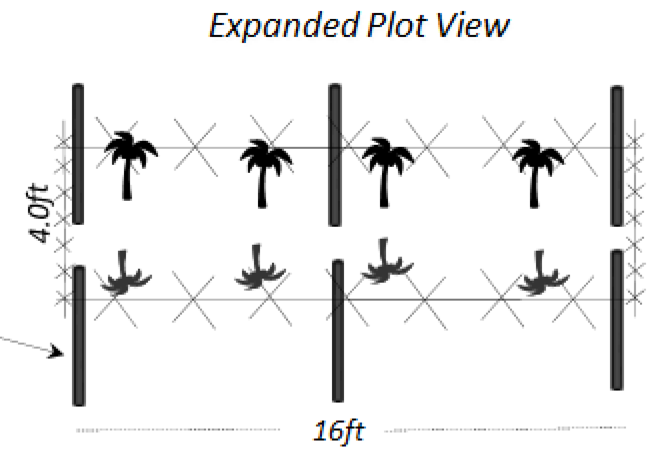
Figure 3. Side-hinged aluminum tidegate door in working location.

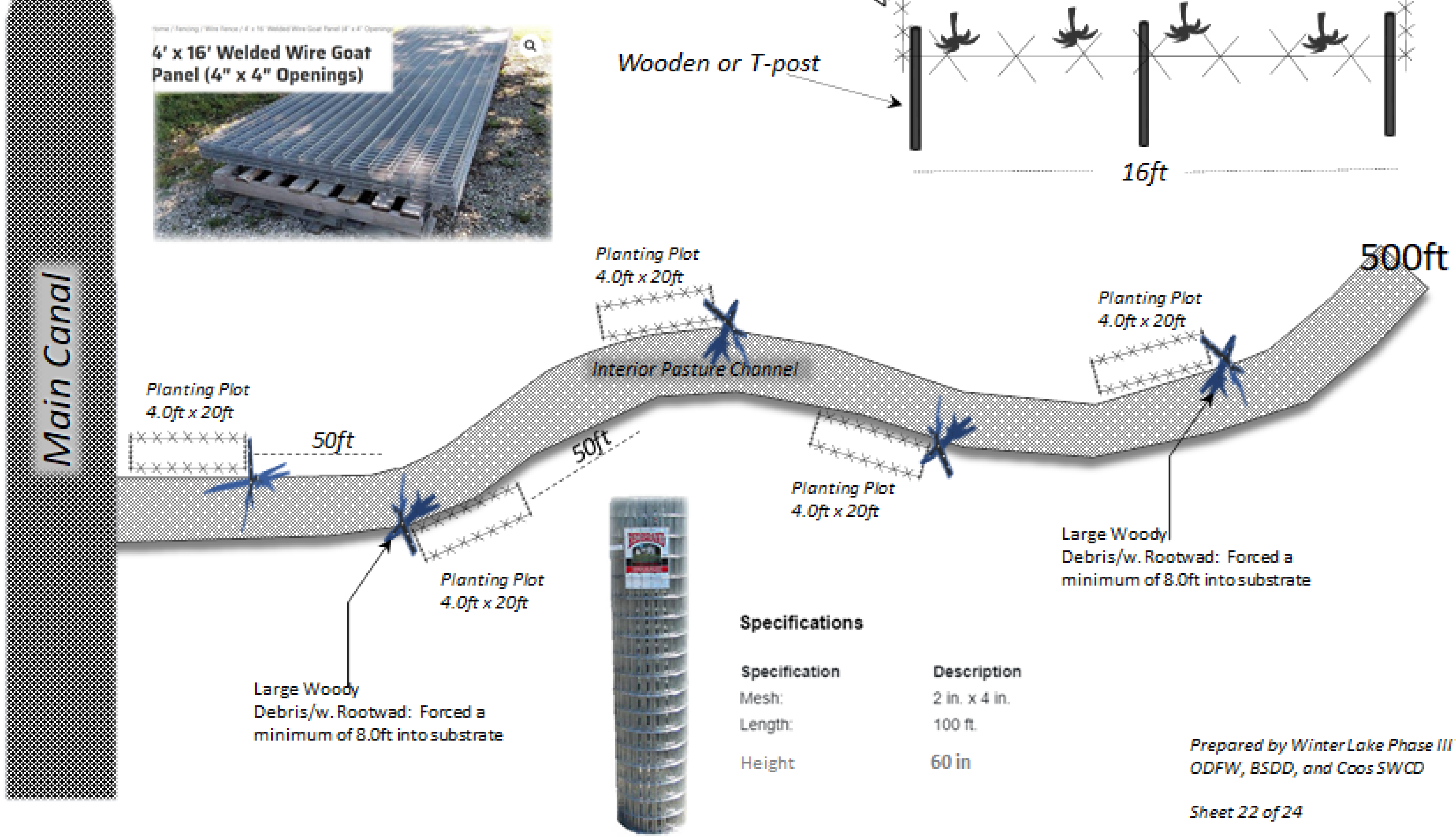
## APPENDIX C

***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.*




**Specifications**

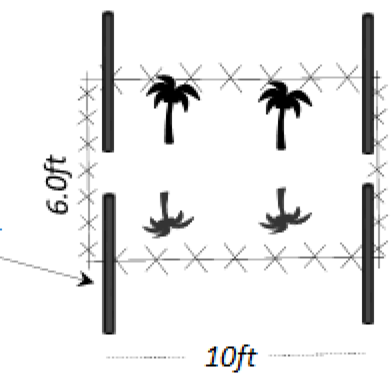
| Specification | Description |
|---|---|
| Mesh: | 2 in. x 4 in. |
| Length: | 100 ft. |
| Height | 60 in |

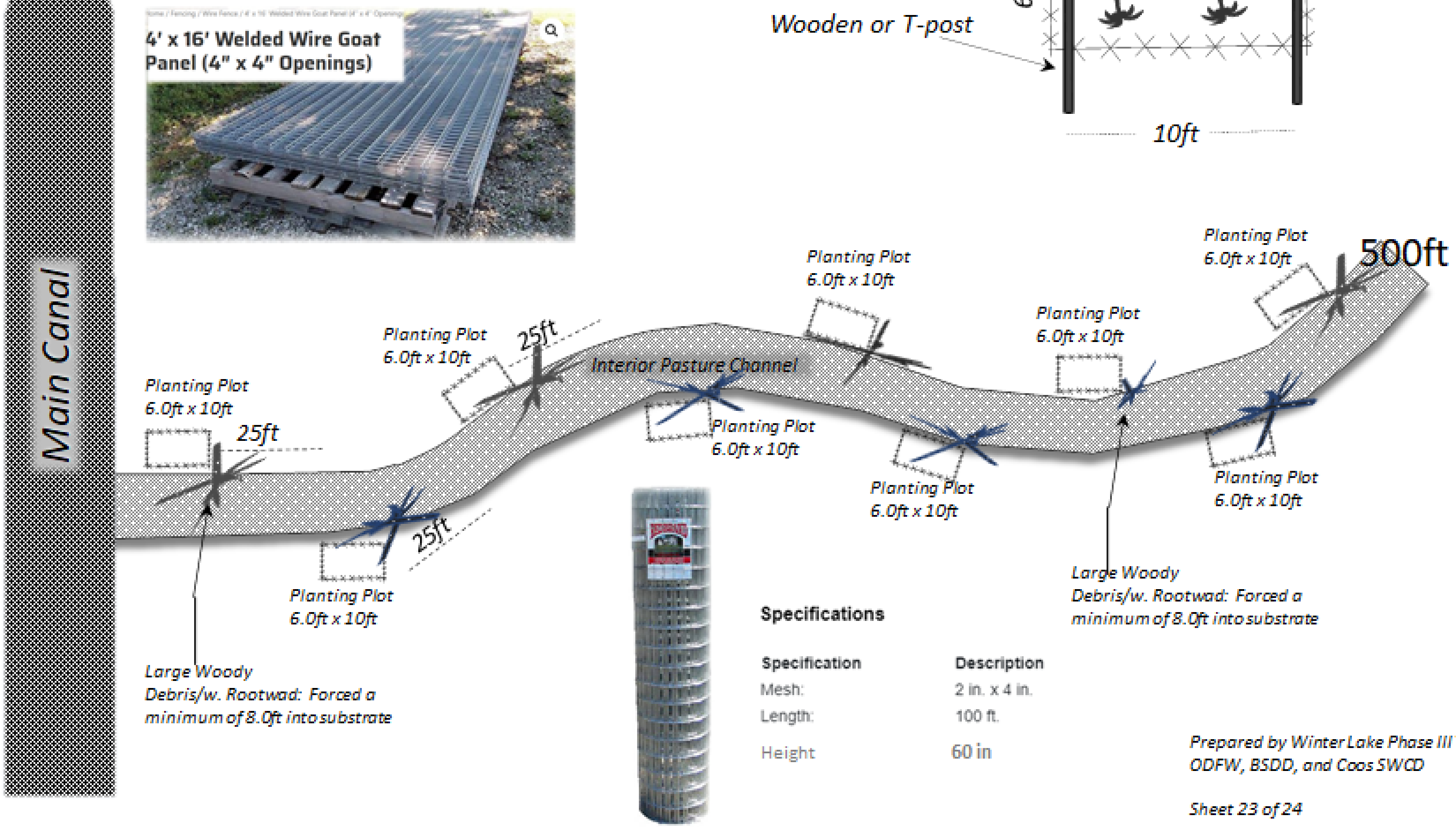
*Prepared by Winter Lake Phase III Team*
*ODFW, BSDD, and Coos SWCD*

*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 |

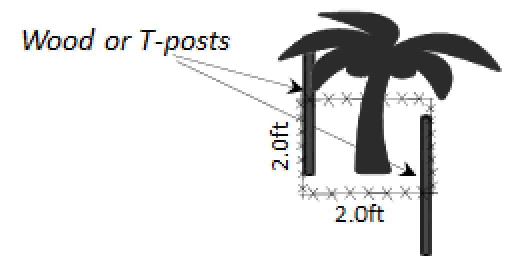
*Prepared by Winter Lake Phase III Team*
*ODFW, BSDD, and Coos SWCD*

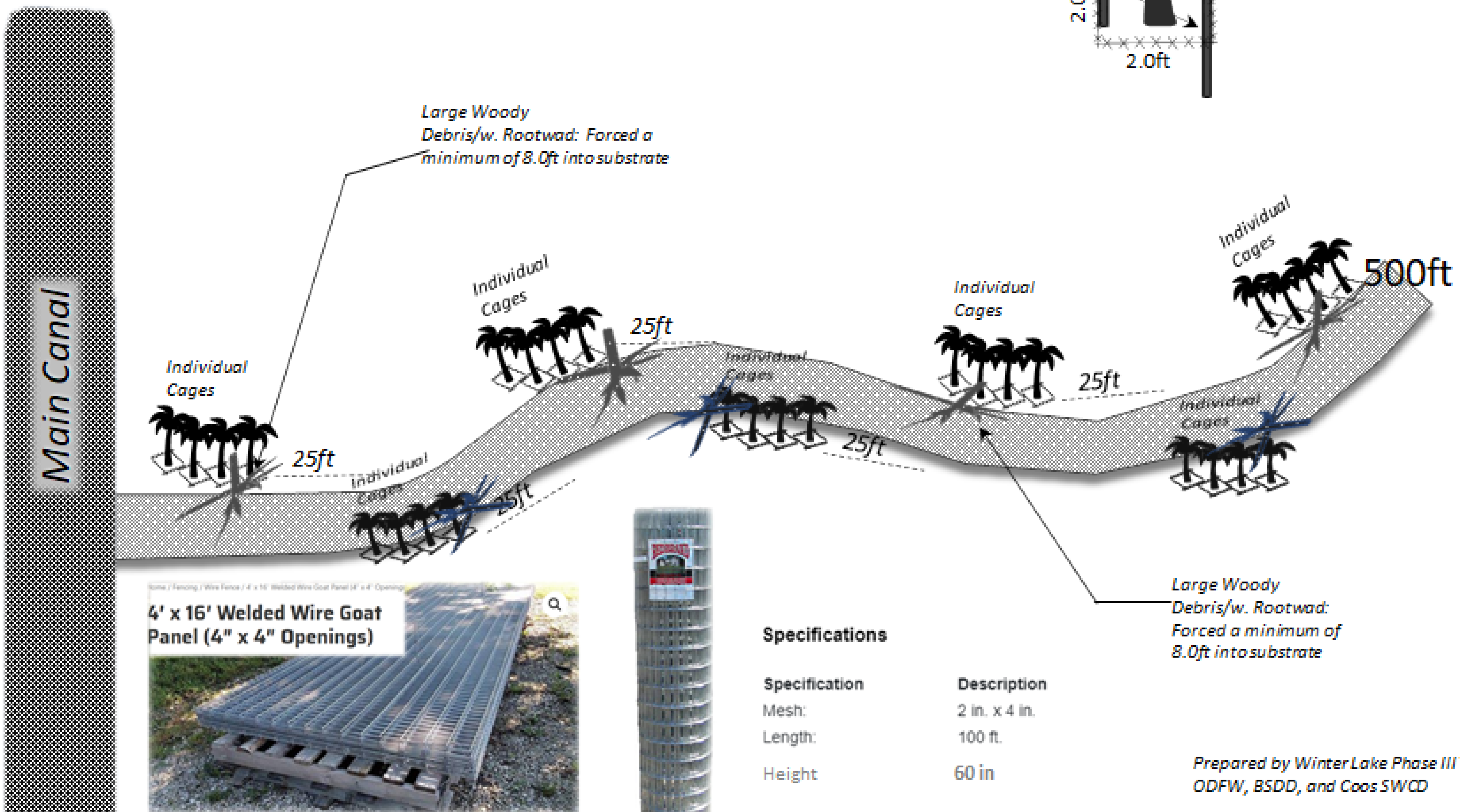
*Sheet 23 of 24*

# *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*

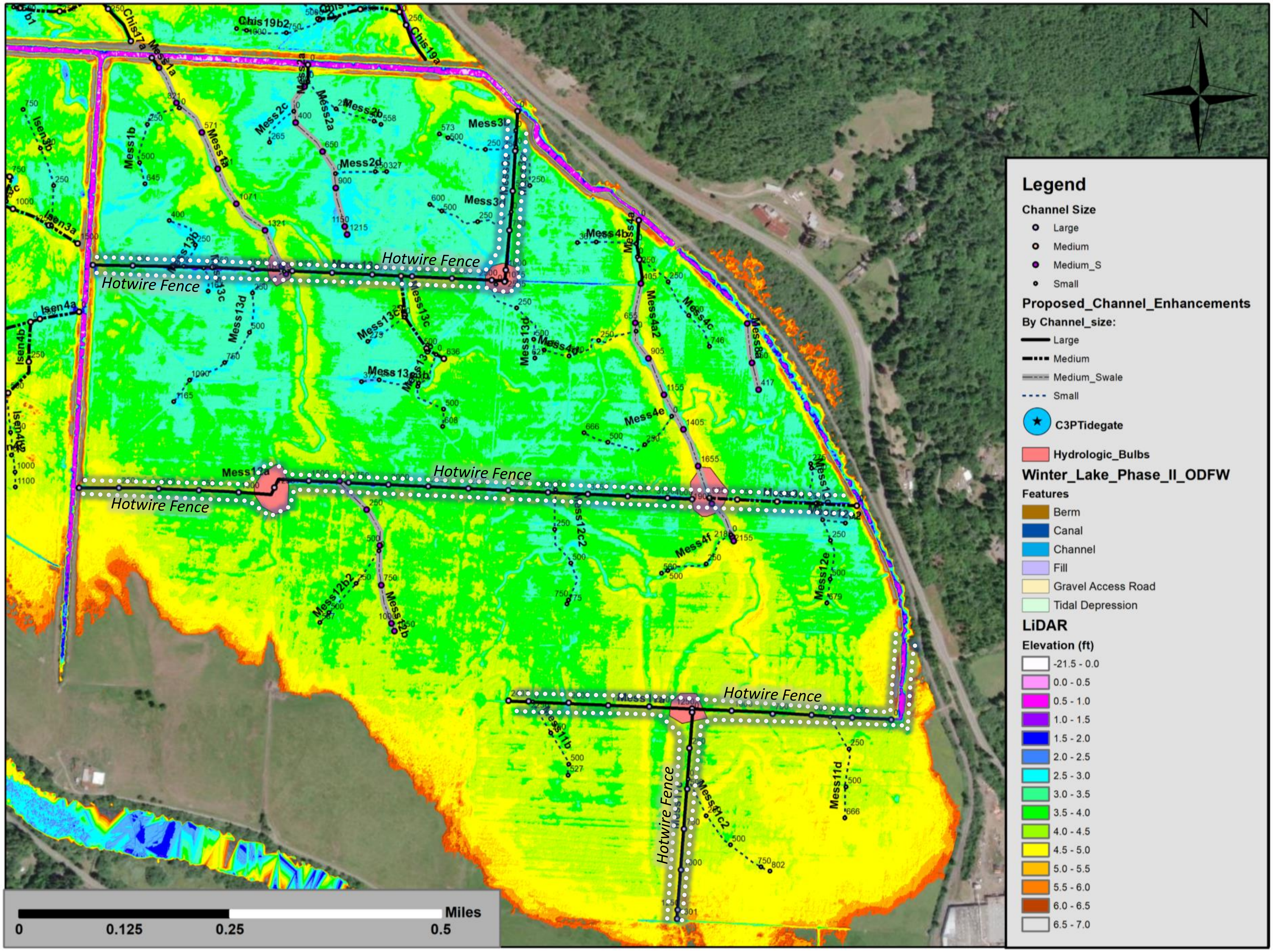
*Sheet 24 of 24*

# 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 | |


Legend
Channel Size
Large
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Medium_S
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Proposed_Channel_Enhancements
By Channel_size:
Large
Medium
Medium_Swale
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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
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6.5 - 7.0
Hotwire Fence
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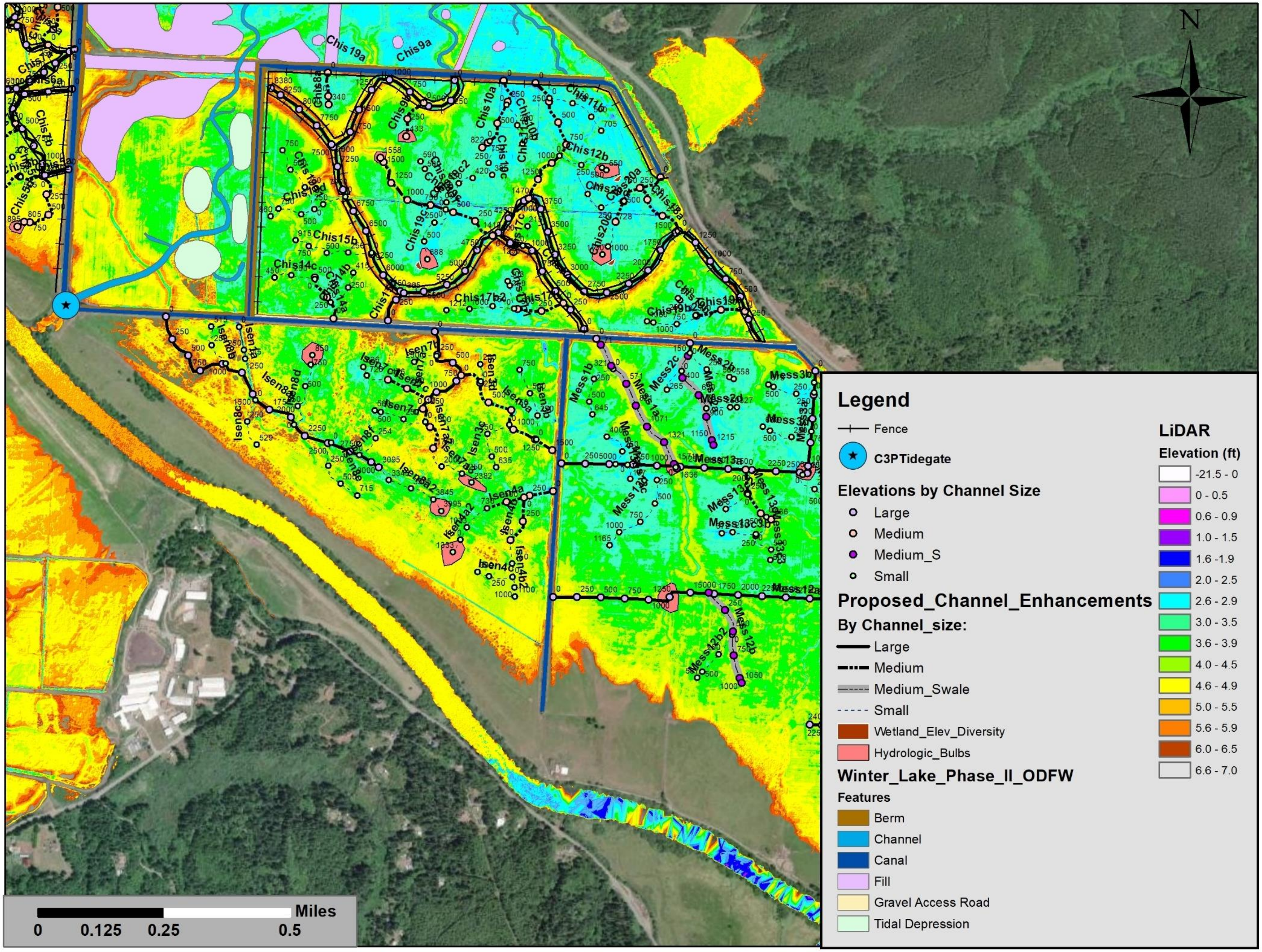

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C3PTidegate
Elevations by Channel Size
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Medium
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Proposed_Channel_Enhancements
By Channel_size:
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Medium
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
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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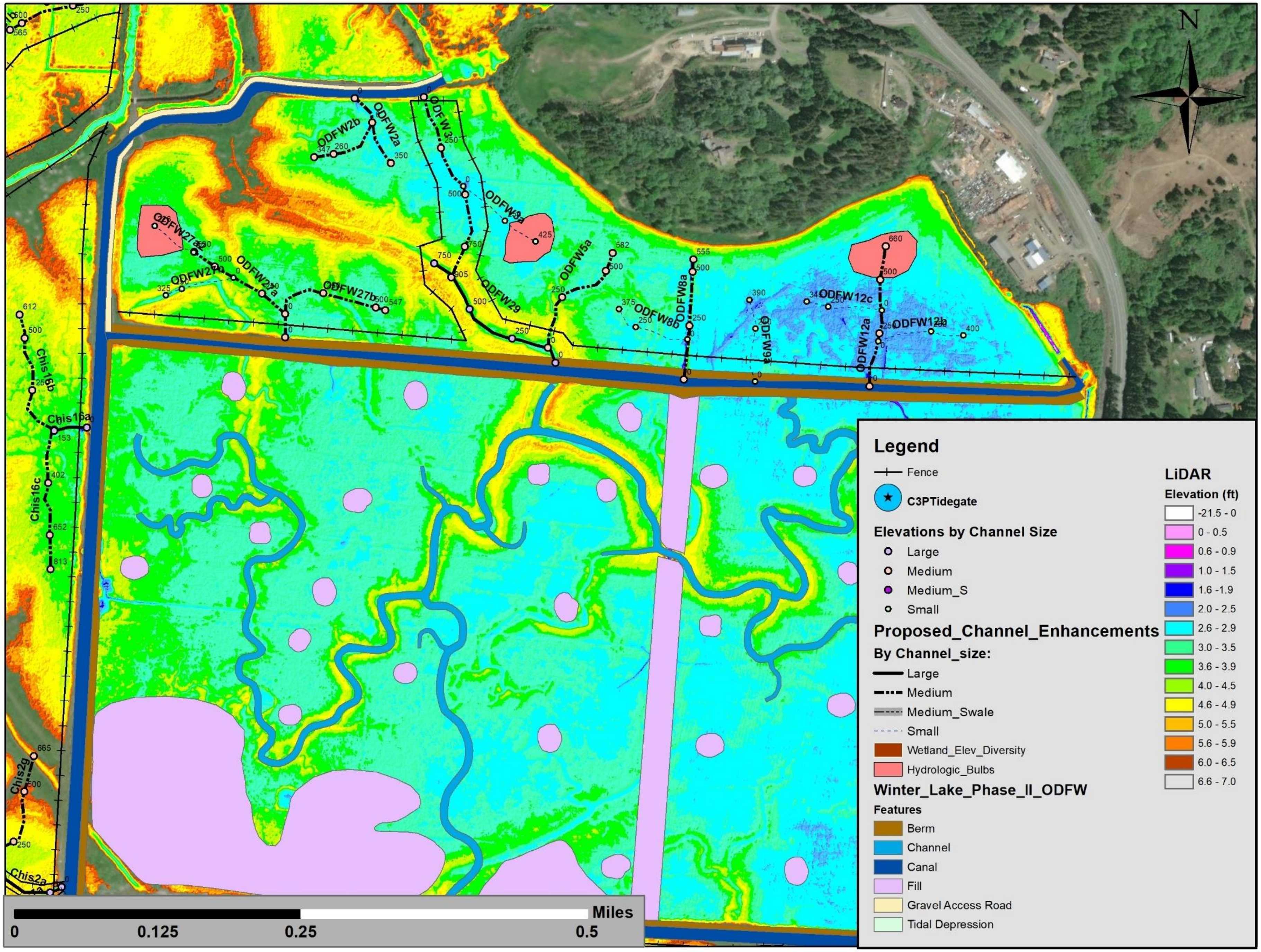

Legend
Fence
C3PTidegate
Elevations by Channel Size
Large
Medium
Medium_S
Small
Proposed_Channel_Enhancements
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Medium_Swale
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Wetland_Elev_Diversity
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Fill
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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
N
Miles
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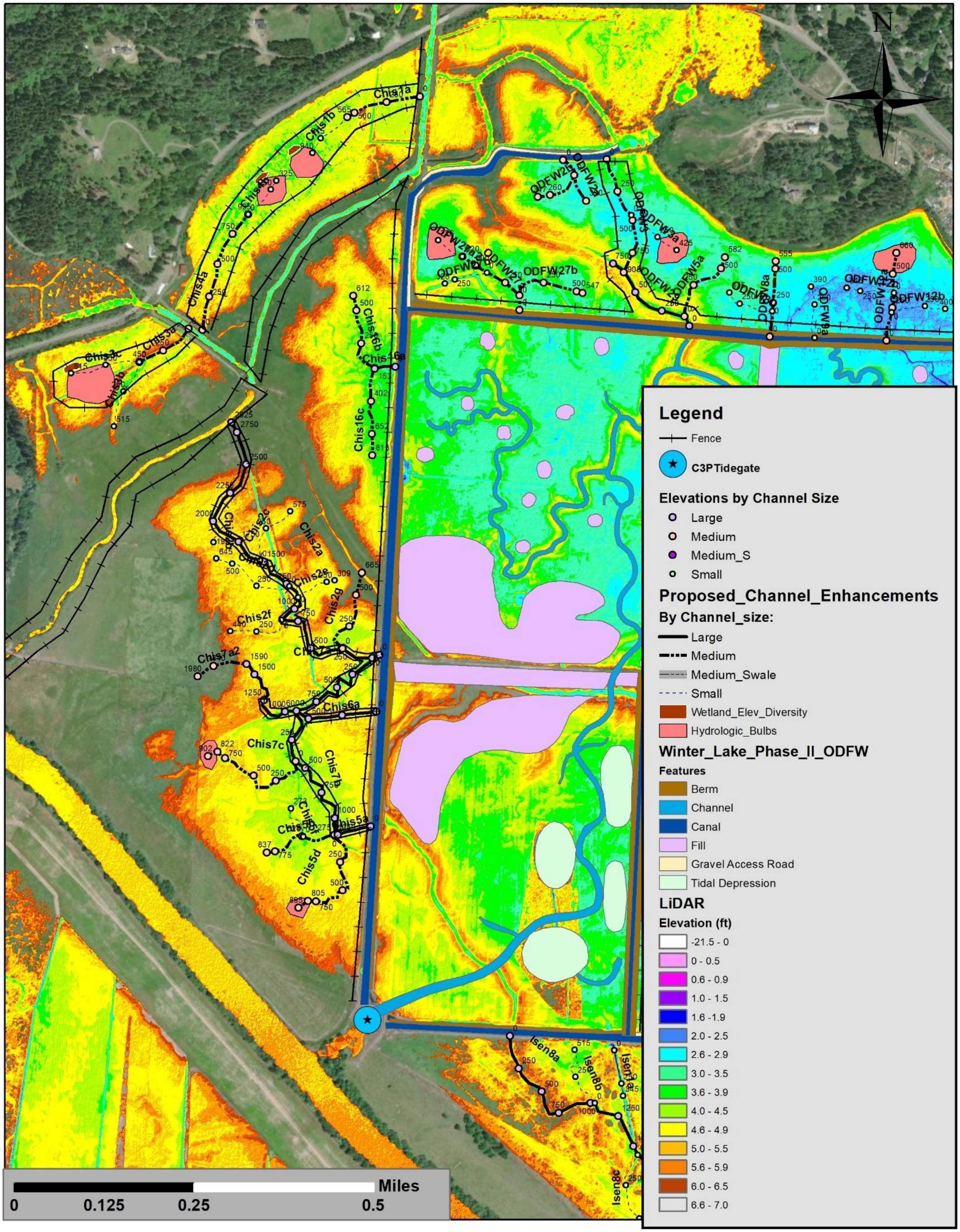
0.125
0.25
0.5
ODFW2b
ODFW2a
ODFW3
ODFW3a
ODFW5a
ODFW8a
ODFW8b
ODFW9a
ODFW12a
ODFW12b
ODFW12c
ODFW27a
ODFW27b
ODFW29
Chis16a
Chis16b
Chis16c
Chis2g
Chis2a


N
Legend
Fence
C3PTidegate
Elevations by Channel Size
Large
Medium
Medium_S
Small
Proposed_Channel_Enhancements
By Channel_size:
Large
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Medium_Swale
Small
Wetland_Elev_Diversity
Hydrologic_Bulbs
Winter_Lake_Phase_II_ODFW
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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
0
0.125
0.25
0.5