

*Confederated Tribes of the
Umatilla Indian Reservation*

Final Design Submittal

*Desolation Creek – Upper Reach 6
(RM 10.5 to 11.8)
Habitat Restoration Design*

June 2017



Desolation Creek – Upper Reach 6 (RM 10.5 to 11.8) Habitat Restoration Design

Final Design Submittal

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APPENDICES

APPENDIX A FINAL DESIGN DRAWINGS
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ACRONYMS AND ABBREVIATIONS

2008 Fish Accords	2008 Columbia Basin Fish Accords Memorandum of Agreement between the Three Treaty Tribes and FCRPS Action Agencies
AEM	Action Effectiveness Monitoring
BPA	Bonneville Power Administration
BSR	biologically significant reach
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CTWSRO	Confederated Tribes of the Warm Springs Reservation of Oregon
DPS	distinct population segment
EDT	Ecosystem Diagnosis and Treatment
EFM	Ecotrust Forest Management
ESA	Endangered Species Act
FCRPS	Federal Columbia River Power System
GAAP	Geomorphic Assessment and Action Plan
GPS	Global Positioning System
HEC-RAS	Hydrologic Engineering Centers River Analysis System
HIP	Habitat Improvement Program
LiDAR	light detection and ranging
LWD	large woody debris
NF	National Forest
NPCC	Northwest Power and Conservation Council
ODFW	Oregon Department of Fish and Wildlife
PAA	primary assessment area
Project	Desolation Creek – Upper Reach 6 (RM 10.5 to 11.8) Habitat Restoration Design
QSI	Quantum Spatial Inc.
REM	Relative Elevation Model
RM	river mile
SAA	secondary assessment area
USACE	U.S. Army Corps of Engineers
USFS	U.S. Department of Agriculture Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1 Introduction

The Desolation Creek watershed has been impacted by forest practices, agriculture, fires, roads, and other activities that have decreased water quality and quantity along with valuable fish habitat, resulting in inhibited fish passage, altered sediment supply and sorting, reduced frequency of large woody debris (LWD) and habitat features such as high-quality pools, poor connectivity of adjacent floodplains, springs, and wetlands, and reduced water storage in upland wet meadows. To this end, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) has been working with co-managers, landowners, and stakeholders to develop the Desolation Creek Geomorphic Assessment and Action Plan ([GAAP]; Tetra Tech 2017a) as a guiding tool for restoration planning and implementation within Desolation Creek and to benefit focal fish species including steelhead (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), spring Chinook salmon (*O. tshawytscha*), and Pacific lamprey (*Entosphenus tridentatus*). The Desolation Creek GAAP included the mainstem Desolation Creek and tributaries, from its confluence with the North Fork of the John Day River to the Creek's headwaters, with emphasis on the primary assessment area (PAA) that includes approximately 10.5 miles of private land from river miles (RM) 1.8 to 12.3 owned by Desolation Creek LLC. The study area also included the balance of the remaining lands within the watershed that are under ownership of the U.S. Department of Agriculture Forest Service (USFS), and identified as the secondary assessment area (SAA). The locations of the PAA and SAA are shown in Figure 1-1.

The data and analyses in the GAAP's watershed- and reach-scale assessments were used to inform the identification and prioritization of potential projects, and to guide the development of conceptual and final designs. Potential restoration and enhancement opportunities were identified during field surveys and through desktop assessments. Following their identification, potential opportunities were prioritized using biological and physical habitat attributes and project feasibility and constraints. Project designs were then developed consistent with biological needs of the focal fish species, local geomorphology, and implementation feasibility.

The design process began with the development of conceptual (15 percent) design alternatives illustrating restoration and enhancement actions for the entire PAA and throughout the SAA (Tetra Tech 2016). Potential actions shown in the conceptual (15 percent) design alternatives were based on reviews of specific project area needs checked against a comprehensive list of 40 potential project restoration actions, and are intended to provide sustainable in-stream, riparian, and floodplain restoration features to restore natural geomorphic processes and address watershed-wide limiting factors.

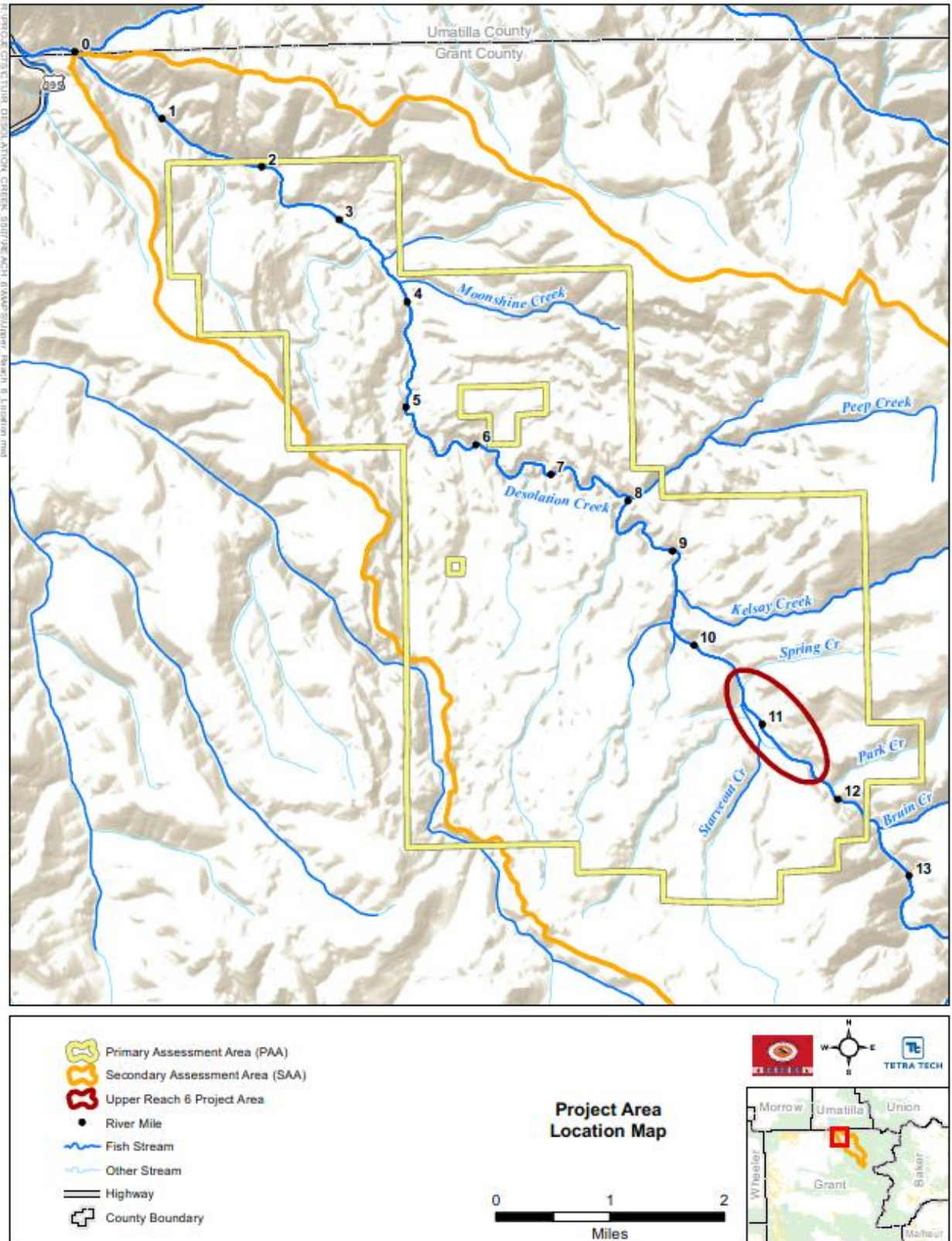


Figure 1-1. Desolation Creek Upper Reach 6 Project Area within the Primary Assessment Area

Within the PAA, Reach 6 was ranked as the highest priority area for restoration (Tetra Tech 2017a), and led to the decision to develop the conceptual (30 percent) designs for the Desolation Creek – Reach 6 (RM 9.5 to 11.8) Habitat Restoration Design (Project), in which three restoration alternatives were evaluated. These alternatives included full restoration, partial restoration, and habitat creation designs. The conceptual design documented the design process and development, and presented the results associated with the evaluation of existing site conditions that were used in evaluating design alternatives. As described in Section 4.5, the full restoration design alternative was selected to advance to the preliminary (60 percent) and final design development stages.

During the alternative selection process, Reach 6 was divided into Upper (RM 10.5 to 11.8) and Lower (RM 9.5 to 10.5) project areas. This was due to the planned relocation of the National Forest (NF)-10 Road that will include removal of the NF-10 Road bridge crossing near RM 10.0. The planned relocation of the NF-10 Road and associated actions are located in Lower Reach 6, will be completed in a later phase, and will not impact the final design for Upper Reach 6 (the Project) in this submittal. Therefore, the Project Area shown in Figure 1-1 was revised to include the upper portion of Reach 6.

1.1 GOAL AND OBJECTIVES

In 2007, the CTUIR Department of Natural Resources adopted the First Foods mission:

To protect, restore, and enhance the First Foods – water, salmon, deer, cous, and huckleberry – for the perpetual cultural, economic, and sovereign benefit of the CTUIR. We will accomplish this utilizing traditional ecological and cultural knowledge and science to inform: 1) population and habitat management goals and actions; and 2) natural resource policies and regulatory mechanisms. (Jones et al. 2008)

In support of the First Foods mission and the missions of Desolation Creek LLC and Ecotrust Forest Management (EFM) as the participating landowner and manager, respectively, the CTUIR, along with watershed co-managers and stakeholders, established an overall goal and measurable objectives for the Desolation Creek GAAP and the associated habitat restoration designs including this Project (Tetra Tech 2017a). The overarching goal is to provide rigorous, data-driven, and science-based analyses leading to prioritized restoration and enhancement projects and designs that, when implemented over time, will rehabilitate Desolation Creek to the benefit of terrestrial and aquatic First Foods including but not limited to Endangered Species Act (ESA)-listed species such as steelhead and bull trout, as well as other native species (e.g., spring Chinook salmon, lamprey, freshwater mussels [*Anodonta* sp.], and redband trout [*Oncorhynchus mykiss*]). Included in this goal is the need to understand the geomorphic and ecological processes and limiting factors affecting Desolation Creek in order to prioritize and implement restoration projects that will make quantifiable progress toward addressing the key limiting factors. Progress toward these goals should complement appropriate land management strategies of landowners and work in concert with established planning documents that include:

- CTUIR’s North Fork John Day Fisheries Enhancement Strategy, approved by the Independent Scientific Review Panel (ISRP) during the 2013 Geographic Review (ISRP 2014);

- John Day River Subbasin Plan (Northwest Power and Conservation Council [NPCC] 2005);
- 2008 Columbia Basin Fish Accords Memorandum of Agreement between the Three Treaty Tribes and Federal Columbia River Power System (FCRPS) Action Agencies (2008 Fish Accords; Three Treaty Tribes-Action Agencies 2008);
- Umatilla River Vision (Jones et al. 2008);
- John Day River Basin Watershed Restoration Strategy (Confederated Tribes of the Warm Springs Reservation of Oregon [CTWSRO] 2014);
- Middle Columbia River Steelhead Distinct Population Segment ESA Recovery Plan (NMFS 2009);
- Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (Carmichael and Taylor 2010);
- Recovery Plan for the Coterminous United States Population of Bull Trout (U.S. Fish and Wildlife Service [USFWS] 2015); and
- Decision Notice/Decision Record, Finding of No Significant Impact, Environmental Assessment for Interim Management of Anadromous Fish-Producing Watersheds on Federal Lands in Eastern Oregon, Washington, Idaho, and Portions of California (USFS and BLM 1995).

In support of this goal for the Desolation Creek GAAP and the associated habitat restoration designs, measurable objectives were identified and connected to discrete actions that can be clearly defined and the results measured over time to evaluate progress (for details of measurable objectives and metrics, see Table 3.1-1 in Tetra Tech 2017a). To address the goal above, the following objectives and associated tasks were developed:

1. Determine the factors that are negatively influencing physical and biological processes resulting in degraded physical conditions (e.g., high eroding banks, limited floodplain and riparian areas, etc.) and limiting productivity (e.g., stream temperature, in-stream flows, etc.). This objective was met by completion of the watershed- and reach-scale assessment tasks that include:
 - Descriptions of historical and current watershed processes, including land use, geology, geomorphology, water quality, hydrology, and hydraulics;
 - Identification of stream channel characteristics (primary and secondary channel lengths; channel width, depth, cross section area, gradient, incision and entrenchment, classification; habitat units and features such as pools and large wood);
 - Characterization of riparian, floodplain, wetland, and upland meadow areas (flood inundation, stream bank stability, channel migration rates, vegetative community complexity/health, and off-channel habitat);
 - Determination of sediment distribution and mobility, and identifying any concerns related to sediment transport, erosion or deposition;
 - Descriptions of current and historic fish abundance, species composition, distribution, timing, and passage-related concerns; and

- Refinements at the reach level for the geomorphic and habitat limiting factors affecting salmonid population performance.
2. Describe and develop desired future conditions that are realistic given the needs associated with private and public land uses, and the roles and responsibilities of the co-managers, landowners, and stakeholders by completing tasks that include:
 - Define co-manager and stakeholder roles and responsibilities as related to terrestrial and aquatic ESA-listed and focal species.
 - Incorporate management plans and strategies of landowners and take into consideration the objectives developed through their management plans.
 - Ensure adequate opportunities for co-manager and stakeholder involvement.
 - Determine areas of common ground and cooperation.
 3. Identify and prioritize restoration and enhancement projects and actions utilizing information from the assessments and by completing associated tasks that include:
 - Target significant stream reaches of concern (i.e., biologically significant reaches), and prepare a higher-level analysis of conditions at those locations.
 - Identify the most effective approach to address limiting factors and terrestrial/aquatic physical or biological processes.
 - Strategically identify and categorize and clearly display restoration actions or channel reaches to produce measurable benefits for aquatic species and terrestrial floodplain and riparian communities.
 4. Develop conceptual levels of designs, based on developed lists of prioritized restoration and enhancement projects, that are practical to implement and able to be adapted and scaled to multiple sites.
 - Relate the design plan components to desired future conditions based on the ranking process developed from Objective 3.
 - Aid in articulating landowner and cooperator objectives and geomorphic assessment results.
 - Compile implementable restoration and enhancement actions based on their potential to affect limiting factors and processes in a concise and commonly understandable way.
 5. Develop designs that will promote desired future conditions for the highest ranked project within the PAA to the 100 percent, construction-ready level.
 - Use data from the assessments and analyses to develop creative and effective treatments addressing watershed and reach specific processes and limiting factors within the PAA.
 - Develop permissible and fundable project opportunities based upon the project's ability to measurably influence limiting factors and processes and meet restoration goals and objectives within floodplain, riparian, and stream channel habitats.

6. Determine and measure the quantifiable and repeatable metrics to establish baseline conditions, and that can be utilized to evaluate progress toward addressing processes and limiting factors following the implementation of restoration actions (e.g., projects, land-use alterations, regulatory changes, etc.) at various scales (individual sites, reaches, and the Desolation Creek watershed).

The upper Reach 6 final designs and analyses presented in this submittal are specifically intended to address design Objectives 4 and 5 and the tasks associated with each objective, as well as the quantifiable and repeatable metrics (Objective 6) that were identified for Desolation Creek (Tetra Tech 2017a).

1.2 WATERSHED IMPACTS AND LIMITING FACTORS

For more than 10,000 years, the members of what are now the CTUIR (formed from the Walla Walla, Umatilla, and Cayuse tribes) and the CTWSRO (formed from the Wasco, Warm Spring, and Paiute tribes) used the Desolation Creek watershed seasonally for fishing, hunting, gathering, and habitation (CTUIR 1995, 2016a, 2016b; USFS 1999; CTWSRO 2016). To open the region for immigration and alleviate conflicts, in 1855 the United States Government signed the treaties that created the CTUIR and the CTWSRO (CTUIR 2016a; CTWSRO 2016). In exchange for the Tribes ceding millions of acres of land, the treaties guaranteed the right to fish in traditional and accustomed places, as well as hunting and gathering of wildlife and vegetative resources (CTUIR 2016a).

European settlement of the area began in the early 1800s with explorers and fur trappers, including the party that included John Day in 1812, and intensified after discoveries of gold in the 1840s brought many immigrants to the area (Kenny 1959; Thayer 1977; NPCC 2005). Prior to European settlement, beavers were abundant in the area, but extensive trapping nearly extirpated the local beaver populations (Demeter 2010; EFM 2015). Mining, timber harvest, and grazing have all created extensive impacts in the Desolation Creek watershed and surrounding areas, along with fire management, road building, and other activities.

Although extractive and commodity uses of the public land predominated in the past, current public land management in the watershed emphasizes scenic, recreational, and ecological values (USFS 1999, 2009). The largest private landowner, Desolation Creek LLC, owns 13,440 acres of the lower Desolation Creek watershed, with management guided by the Desolation Creek Land Management Plan (EFM 2015). Although extractive and commodity uses in the watershed have been diminished, many of the impacts of these historic uses are still affecting watershed processes. Infrastructure built for timber harvest, mining, and other activities, such as road construction and stream crossings, can impact channel stability and lead to detrimental effects to watershed health. Overall road construction in the Desolation Creek watershed has been extensive, with all but one subwatershed ranking road density as “high,” much of that from extensive road construction in the 1970s (USFS 1999). Timber harvesting began in the 1800s and accelerated during and after the 1940s with extensive clearcut logging and high grading of timber, and combined with beaver extirpation and fire exclusion has changed the forest composition (USFS 1999, 2008; EFM 2015).

In general, watershed-wide assessments and studies have listed fish passage barriers, loss of habitat complexity, habitat quantity, riparian condition, sedimentation, erosion, and temperature as limiting

conditions for the various fish species in the system. Temperature is cited as one of the key limiting factors for all species. A considerable amount of habitat alteration in lowland areas has removed riparian vegetation, altered upland characteristics and run-off patterns, increased sediment input and incision rates, isolated the river from its floodplain, and altered in-stream habitat conditions.

The Ecosystem Diagnosis and Treatment (EDT) and Quality Habitat Assessments utilized as part of the John Day Subbasin Plan (NPCC 2005) identified Desolation Creek as a priority habitat for restoration. Many of the EDT reaches received moderate to high ratings for habitat qualities, especially in the upper reaches. While ranked lower in potential benefit from restoration action, key habitat quantity, temperature, and sedimentation load were identified as factors that could be improved for steelhead (NPCC 2005). For Chinook salmon, the EDT analysis again identified protection as a high priority and potential benefit, while restoration actions received a medium priority. Identified attributes receiving medium priority were key habitat quantity and habitat complexity, while flow and temperature received low priority rankings (NPCC 2005).

The 2008 Fish Accords (Three Treaty Tribes-Action Agencies 2008) established an agreement outlining various agency and tribal commitments, including funding and implementing habitat projects to address the needs of ESA-listed fish. The 2008 Fish Accords cover the three watersheds of the North Fork John Day, and include estimates of current function for each watershed and the primary limiting factors for the Desolation Creek watershed (Three Treaty Tribes-Action Agencies 2008).

The John Day River Basin Watershed Restoration Strategy assessed the entire John Day River Basin by individual watershed for seven distinct limiting factors and how they affected anadromous populations (CTWSRO 2014). Figure 1-2 shows the distribution of the seven identified limiting factors, by reach, throughout the Desolation Creek watershed. The restoration strategy has identified Desolation Creek as a high priority for restoration based on Restoration Potential Benefit prioritization scoring (CTWSRO 2014).

The CTUIR and the CTWSRO have also worked collaboratively to further refine the limiting factor data based on factor weighting for the Upper North Fork John Day River Assessment Unit (Iverson 2015). This process utilized the standardized NOAA Ecological Concerns (NOAA 2012) with the definitions for limiting factors shown in Table 1-1 below.

Although they use differing terminology, the NOAA ecological concerns in Table 1-1, the limiting factors from the 2008 Fish Accords (Three Treaty Tribes-Action Agencies 2008), and the limiting factors identified for the John Day River Basin Watershed Restoration Strategy (CTWSRO 2014) are functionally similar and have been linked via the crosswalk shown in Table 3.1-1 of the Desolation Creek GAAP (Tetra Tech 2017a). For more information on addressing limiting factors, see Sections 4.4 and 6.2 of the Desolation Creek GAAP (Tetra Tech 2017a).

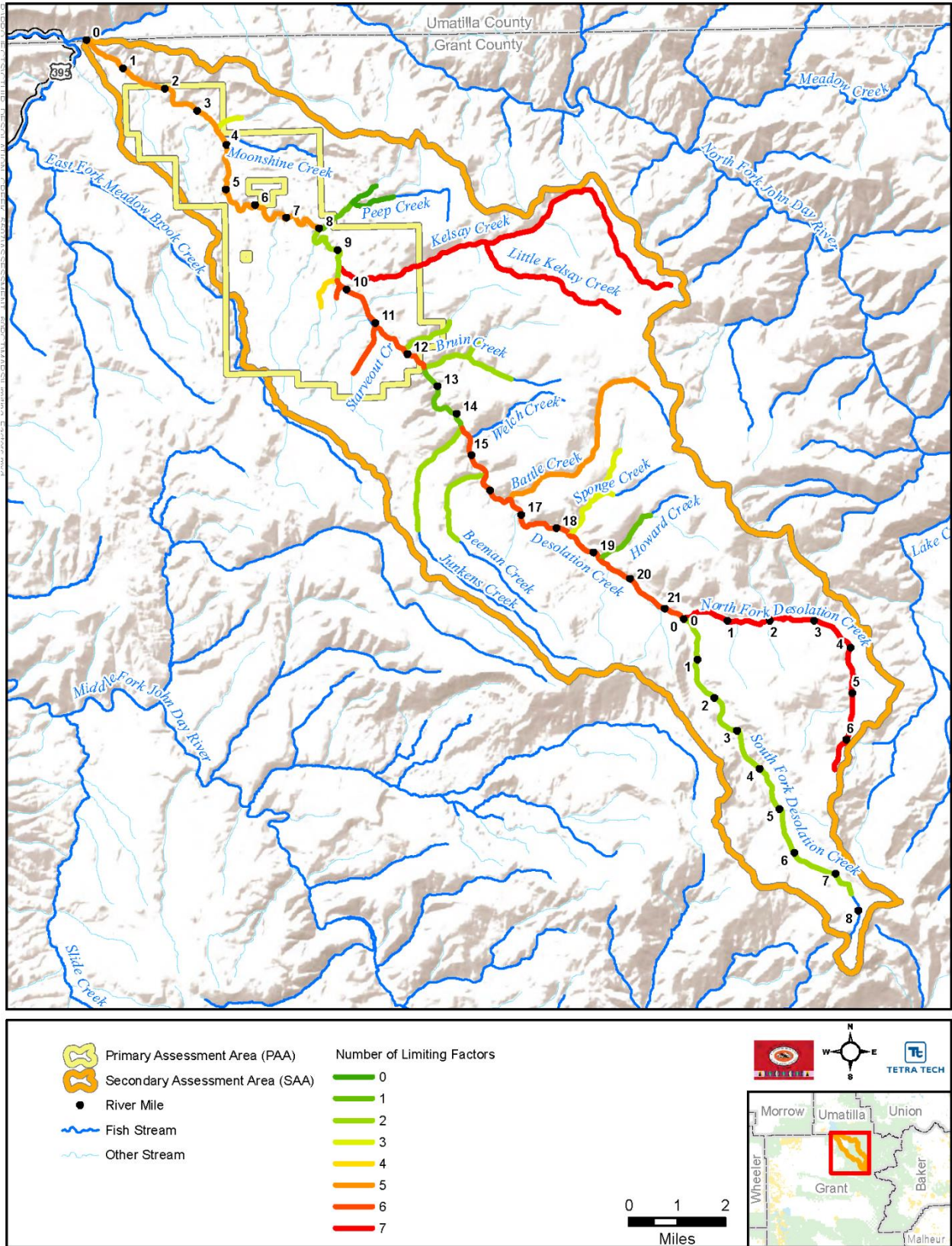


Figure 1-2. Focal Fish Species Limiting Factors in the Desolation Creek Watershed

Table 1-1. Desolation Creek Ecological Concerns Descriptions

Ecological Concern^{1/}	ID Number and Sub-category	Definition
Habitat Quantity	1.1: Anthropogenic Barriers	Loss of access to habitat and/or habitat sub-types due to anthropogenic activity. Includes partial or ephemeral barriers.
Riparian Condition	4.1: Riparian Vegetation	Disturbance to streamside ecological relationships, including but not limited to, loss of flora, erosion and increased light and temperatures.
	4.2: LWD Recruitment	Loss of mature streamside trees that may become in-stream structures and associated decline in habitat complexity
Peripheral and Transitional Habitats	5.1: Side Channel and Wetland Conditions	Degradation, elimination and loss of access to peripheral freshwater habitat, including side channels and freshwater wetlands.
	5.2: Floodplain Condition	Degradation, elimination and loss of access to the over or beyond bank habitat, of streams and rivers that is periodically inundated during high flows.
Channel Structure and Form	6.1: Bed and Channel Form	Changes to river, stream, lake, estuarine tributary and distributary channel form, including width to depth ratios, sinuosity and bedload movement such as the loss (scour) or fill (aggradation) of the channel.
	6.2: Instream Structural Complexity	Decline of the in-stream habitat quality. Based on the degree of habitat complexity and variety, includes the quantity and variability of stream depth and pools of varying size and depth.
Sediment Conditions	7.2: Increased Sediment Quantity	Increased input of sediment to the stream system.
Water Quality	8.1: Temperature	Water temperature deviations, either in intensity or duration, sufficient to have adverse effects on listed salmonids.
Water Quantity	9.2: Decreased Water Quantity	Habitat disturbances associated with abnormally (compared to background) low water flow, including but not limited to, increased temperature, loss of sediment, nutrients and barriers to passage and redd dewatering.
	9.3: Altered Flow Timing	Habitat changes associated with alterations to the background (natural) timing of water quantity in-stream.

1/ NOAA ecological concerns are commonly referred to as standardized limiting factors.
Source: NOAA 2012

1.3 FISH UTILIZATION

Publications and data sources used to develop and refine the description of fish use in this section include the John Day River Basin Watershed Restoration Strategy (CTWSRO 2014); John Day Subbasin Plan (NPCC 2005); the Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment (Carmichael and Taylor 2010); the Desolation Ecosystem Analysis (USFS 1999); and CTUIR annual reports. In addition, other sources from the Oregon Department of Fish and Wildlife (ODFW) (i.e., index redd counts, smolt trap counts near the confluence with the North Fork, etc.), the USFS, and others were reviewed.

Desolation Creek contains six salmonid species: spring Chinook salmon, summer steelhead/rainbow/redband trout, bull trout, Westslope cutthroat trout (*O. clarki lewisi*), brook trout (*Salvelinus fontinalis*), and mountain whitefish (*Prosopium williamsoni*) (USFS 1999). Middle Columbia River steelhead and Columbia River bull trout are ESA-listed as threatened. While Middle Columbia River spring Chinook salmon are not listed under the ESA, they are of key conservation interest and considered a focal fish species for this Project. Westslope cutthroat trout in the watershed are a naturalized population from individuals introduced from Deardorff Creek in 1960. Brook trout are an introduced, naturally spawning population. Brook trout can hybridize with bull trout, resulting in an overall negative impact on bull trout populations. Mountain whitefish are a native species; adults typically inhabit deep fast water and deeper pools, while juveniles tend to be present in shallower waters.

Middle Columbia River steelhead are a focal fish species present in the Desolation Creek watershed and are part of the North Fork John Day River population within the John Day major population group. Both anadromous steelhead and resident rainbow/redband trout are present in Desolation Creek and are the most abundant salmonids in the system; they are found spawning from the mouth to above Desolation Meadows (USFWS 2015). This population is part of the Middle Columbia River steelhead listed as threatened in 1999 under the ESA, which, at the time, included both anadromous and resident forms in the ESU (69 *Federal Register* 33101). Revision of species determinations resulted in the anadromous distinct population segment (DPS) being listed as Threatened on January 5, 2006 (71 *Federal Register* 834; Carmichael and Taylor 2010). The North Fork John Day population is considered a large population and of low risk for extinction (Carmichael and Taylor 2010) based on current abundance levels.

Bull trout are a focal fish species present in the Desolation Creek watershed and are part of the Columbia River bull trout DPS (63 *Federal Register* 31647), federally listed as threatened. Resident bull trout spend their life in the headwater streams, while migratory bull trout spawn and rear in the headwaters before migrating downstream to mainstem river habitats (USFWS 2002). Bull trout in Desolation Creek are part of the North Fork John Day River population. This population is considered distinct from other populations due to geography and habitat (Sankovich and Anglin 2014). In addition, there is an isolated distinct resident population above the falls on South Fork Desolation Creek that is considered an important genetic reservoir (USFWS 2002). It is assumed that the majority of the population comprises resident forms, with only a small percentage being anadromous (USFS 1999). This low anadromy rate has been observed for the entire North Fork John Day River during tagging studies as well (Sankovich and Anglin 2014).

Spring Chinook salmon are a focal fish species present in the Desolation Creek watershed. The North Fork John Day Middle Columbia River spring Chinook salmon population meets all interim population criteria: existence, distribution, abundance, productivity, independence, and hybridization (ODFW 2005).

Pacific lamprey are a species of concern present in the John Day River Subbasin, with an estimated annual run size of approximately 10,000 individuals per year (Close 2000). Presence of Pacific lamprey in the North Fork John Day River has been documented; however, the extent of use is

relatively unknown. Though there is no documented evidence of Pacific lamprey in Desolation Creek, proximity to locations of known lamprey occupancy mean that it cannot be ruled out as potential habitat for Pacific lamprey.

Anadromous fish species in Desolation Creek spend part of their life cycle migrating to and from the Pacific Ocean. There are no full passage barriers on the mainstem John Day River, thus providing migrating fish uninhibited access along the mainstem and Columbia River for fish rearing and spawning in Desolation Creek. Likewise, no full passage barriers exist on the mainstem Desolation Creek within the PAA. Table 1-2 below provides the timing for different life-stages of Chinook salmon, steelhead, and bull trout in Reach 6 of Desolation Creek.

Table 1-2. Desolation Creek Reach 6 Focal Fish Periodicity

Species	Lifestage	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sept	Oct	Nov	Dec
Spring Chinook Salmon	Adult Immigration & Holding				■	■	■	■	■				
	Adult Spawning								■	■	■		
	Incubation/Emergence	■	■	■									
	Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
	Juvenile Emigration		■	■	■	■	■	■			■	■	■
Summer Steelhead	Adult Immigration & Holding		■	■	■	■	■						
	Adult Spawning		■	■	■	■	■	■					
	Incubation/Emergence	■	■	■	■	■	■	■					
	Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
	Juvenile Emigration		■	■	■	■	■	■	■				
Bull Trout	Adult Immigration/Emigration				■	■	■	■	■	■	■	■	■
	Adult Spawning								■	■	■	■	■
	Incubation/Emergence	■	■	■	■	■	■						
	Juvenile Rearing	■	■	■	■	■	■	■	■	■	■	■	■
	Juvenile Emigration	■	■	■	■	■	■	■	■	■	■	■	■

■ = Periods of most common or peak use and high certainty that the species and life stage are present
 ■ = Periods of less frequent use or less certainty that the species and life stage are present
 □ = Periods of rare or no use

Sources: Lindsay et al. 1985; McCullough 1999; Lichatowich and Mobrand 1995; Olsen et al. 1992; Olsen et al. 1994; Starcevic et al. 2012; StreamNet 2012; CTWSRO 2014

1.4 PROJECT AREA – UPPER REACH 6 (RM 10.5 TO 11.8)

As discussed above in Section 1.0, Reach 6 was identified as the highest priority reach for enhancement and restoration. Upper Reach 6 (the Project Area) extends from RM 10.5 to RM 11.8, which includes river Station 59+00 to Station 126+00 (see Appendix A, Drawings C-02 to C-04 for river stations on both the lower and upper reaches).

The Project Area consists of one of two unconfined meadow reaches in the PAA, the other being Reach 3 (Tetra Tech 2017a). The impacts of roads and other floodplain modifications are fairly extensive in this reach as are the visible impacts from livestock grazing in the riparian area (e.g., soil compaction, damage to streambanks, vegetation impacts). A detailed description of the Project Area’s geomorphology and habitat characteristics is provided below in Section 3.5.

The CTUIR has collected habitat data for two monitoring sites on Desolation Creek, including in the Project Area, as a component of their Biomonitoring Program. The monitoring sites are also included in the Bonneville Power Administration (BPA) Action Effectiveness Monitoring (AEM) Program (BPA 2016a). The monitoring treatment reach is located between RM 11.0 (Station 89+00) and RM 12.0 (Station 105+00) in the Project Area, while the control reach is located between RM 15.0 and RM 16.0 (upstream of the PAA). These sites were surveyed for habitat conditions and geomorphic change in September 2015 and 2016. At this time, no restoration actions have been conducted on the treatment reach. The results of the monitoring on Desolation Creek, as well as additional site photos and data, are contained in the CTUIR Biomonitoring Summary for Desolation Creek (CTUIR 2016c) and can be found on the AEM website (BPA 2016a).

The rankings of biologically significant reaches (BSRs) within the Desolation Creek watershed were derived by analysis of physical and biological criteria from field surveys and desktop analyses that included geomorphic potential, current habitat condition, current stream temperature, number of focal species life history stages present, and rankings of critical fish life history stages (Tetra Tech 2017a). Through that process, Reach 6 achieved a Tier I (highest rating) and the highest overall score among the 11 designated BSRs, making it the highest ranked project area in the watershed and leading to it being selected for design and implementation.

Provided below in Section 2 are the engineering performance design criteria used to develop Project elements. Section 3 provides the design analyses that were used to identify and develop the proposed alternatives, which are described in Section 4. Section 5 describes the final design presented in Appendix A. A discussion of Project considerations and risks follows in Section 6 and references cited in this report are listed in Section 7. Project technical specifications are included in Appendix B.

2 Design Criteria

Design criteria are specific, measurable attributes of project components that have been developed to meet project objectives and that serve as measurable benchmarks for individual components of a project design (Miller and Skidmore 2003). Design criteria can be categorized as performance criteria, which define what a project will achieve and the duration of its benefits; or prescriptive criteria, which define how the project will be undertaken. Applicable engineering performance design criteria have been developed that are intended to ensure that the engineering design meets Project objectives; maintains compliance with applicable codes, standards, and established criteria; and addresses the Project risks and environmental considerations to fully achieve the Project objectives. This section identifies Project restoration action categories and the applicable design criteria needed to ensure the Project will achieve these objectives. The assessment of Project risks and environmental considerations is presented in Section 6.

2.1 RIPARIAN RESTORATION AND MANAGEMENT

In areas deficient in existing riparian vegetation, or where the Project design would result in disturbance to riparian and floodplain conditions, plantings, revegetation, or vegetation protection design criteria were incorporated into the design. Riparian planting was designed based on knowledge of existing and historical conditions. Species selection and placement was chosen to provide stream shade, bank stability, and future LWD, with the intent of creating/restoring late-successional riparian community characteristics. Design criteria for riparian vegetation included the following:

- Protect existing vegetation to the extent feasible.
- Increase riparian vegetation health and vigor with proper grazing management and site-appropriate native vegetation.
- Ensure high survival rates by planting native tree and shrub species, using local stocks to the extent possible because these stocks would be best suited and adapted to local environmental conditions.
- Develop the planting design (plant numbers, species, and locations), and include revisions at the final design stage in consultation with the CTUIR. Factors such as topography, distance to the stream, and location of the floodplain was taken into account. Specific factors to consider include the following:
 - Width of the riparian corridor to be planted was based on budget constraints, valley width, land ownership, construction disturbance, and other variables.
 - If riparian plantings are to be phased in over several years, areas will be prioritized for initial planting including areas such as constructed channels, side channels, or wetlands where bank stability is of immediate concern.

- Develop the planting design to augment survival of riparian plantings:
 - To best match species to their site conditions, final placement of plants will be chosen based on microsites after close inspection of soil properties and water table depths, which can vary over short distances.
 - Site preparation, such as removal of weeds or other species that will compete with seedlings and tilling of the soil, will occur prior to planting.
 - If necessary, soil amendment, such as biochar and mulch, will be incorporated prior to or during planting (e.g., if rocky materials are used as fill).
 - Protective measures, such as tubing and shade cloths, or other animal control techniques will be utilized to protect plants from grazing.
 - Plants will be installed in the late fall or early spring to minimize the need for supplemental water and to allow for the option of using bare root plant stock if available.
 - The site will be periodically monitored to assess seedling survival and growth and the need for additional maintenance such as weed control, improved animal control, and/or supplemental water.
- Incorporate recommendations of the wildlife staff into the planting design, whenever possible, to optimize and improve wildlife habitat.
- Incorporate riparian plantings that will support future beaver reintroduction planning and management.
- Provide noxious weed prevention and mitigation by:
 - Seeding disturbed sites that lack a canopy cover (i.e., constructed channels and berm removal sites) with a CTUIR-approved seed mix. All seeds will be certified weed-free to ensure no seeds are from the county noxious weed list. The CTUIR will include provisions in the construction contract to ensure an approved seed mix is used.
 - Planting native hardwood, conifer, and/or shrub species to provide canopy cover, which will help shade out and prevent establishment of weed species.
 - Cleaning all equipment brought onto the Project site prior to entering the Project Area to prevent introduction of new weed species. If work is conducted in areas currently infested by noxious weeds, equipment will be cleaned prior to leaving the area.
 - Controlling noxious weeds using methods (i.e., manual, mechanical, biological, and chemical) appropriate to, and during periods identified to be the most effective for, the target species. If herbicides are used, they will be approved for use by the CTUIR and must be approved for use in riparian areas.

For future post-project monitoring, these design criteria may be assessed by measuring riparian vegetation characteristics (for details of evaluation methods and metrics, see Table 3.1-1 in Tetra Tech 2017a).

2.2 FLOODPLAIN CONNECTIVITY

Specific floodplain connectivity design criteria to be included are related to the objectives of improving LWD recruitment and retention, floodplain inundation frequency, channel migration, flood scour and deposition, and abundance of floodplain habitats. A connected floodplain acts as an extension of the alluvial aquifer, attenuating stream flows as floodwaters disperse onto the floodplain and discharging stored water during drier months. This category includes removal of artificial berms or dikes that inhibit flood flows, or removing/relocating floodplain infrastructure. Design criteria for floodplain connectivity actions include the following:

- Create complex mosaics of high-quality floodplain habitat, preserving islands of existing vegetation, recreating relic patterns of side channels and off-channel habitat, and enhancing flood inundation by removing relic berms, and adding LWD in flood-prone areas.
- Increase floodplain connectivity, frequency of inundation, and groundwater exchange by installing structures intended to raise main channel water surfaces thus redirecting flows onto the floodplain, and opening inlets of remnant or under-utilized side channels to promote subsurface connectivity.
- Promote water infiltration and vegetation establishment by decompacting any existing or newly created hardened surfaces, preserving existing vegetation, and enhancing natural topography on floodplains and point bars.
- Incorporate the removal of infrastructure such as roads, berms, campgrounds, and any other identified man-made structures that inhibit the natural function of the river. Removal of these structures will be completed to the fullest extent possible while maintaining protection of existing critical infrastructure.
- Improve sediment sorting and routing, with overall transport and deposition in dynamic equilibrium.
- Decrease main channel velocities at high flows.

For future post-project monitoring, these design criteria may be assessed by measuring riparian vegetation characteristics, LWD recruitment and retention, sediment size distribution and sources, stream velocities, floodplain inundation; and road density (for details of evaluation methods and metrics, see Table 3.1-1 in Tetra Tech 2017a).

2.3 SIDE-CHANNEL AND OFF-CHANNEL HABITAT RESTORATION

Side channel and off channel habitat restoration and enhancement actions will consist of excavation of inlets of relic side channel to reconnect historic channels within the floodplain, and excavation and enhancement of relic alcoves for off-channel habitat.

Design criteria developed for side channel and off-channel habitats include the following:

- Increase channel complexity, with channel morphology closer to historical function and form.
- Increase habitat diversity, especially when combined with LWD, pools, and alcoves.

- Improve sediment sorting and routing, with overall transport and deposition in dynamic equilibrium.
- Provide stream velocity diversity at both low and high flows.
- Increase floodplain connectivity, frequency of inundation, and groundwater storage.
- Increase wetted areas and provide more habitat suitable for adult spawning and juvenile rearing.
- Provide areas of velocity diversity, which juvenile salmonids may use as refuge during high flows; these areas will mimic naturally occurring edge habitats with lower velocity and cover.
- Provide connectivity to cold-water influxes such as tributary mouths or groundwater seeps that provide high-quality, off-channel habitat and thermal diversity for juvenile salmonids, and the propensity for fine material deposition driven by recirculation eddies that may also support lamprey habitat.

For future post-project monitoring, these design criteria may be assessed by measuring geomorphic characteristics, relative abundance of habitats and features, LWD recruitment and retention, sediment size distribution and sources, stream velocities, floodplain connectivity and inundation, and riparian characteristics (for details of evaluation methods and metrics, see Table 3.1-1 in Tetra Tech 2017a).

2.4 IN-STREAM STRUCTURES AND HABITAT COMPLEXITY

In-stream structures and habitat complexity restorations actions will consist primarily of adding LWD and some selective use of native rock or boulder material. Specific design criteria focused on in-stream structures are discussed in the subsequent sections.

2.4.1 LWD Structures

LWD will be placed to mimic natural conditions (see Section 3.5.5) and will not create fish passage issues. Installation of LWD structures will generally follow the size and placement guidance requirements and assessments of risks as outlined in the *Oregon Aquatic Habitat Restoration and Enhancement Guide* (ODFW/Oregon Department of Forestry [ODF] 1999), *Oregon Guide to Placement of Wood, Boulders and Gravel for Habitat Restoration* (ODFW/ODF 2010), and *Large Woody Material – Risk Based Design Guidelines* (U.S. Bureau of Reclamation [USBR] 2014). LWD design criteria include the following:

- Increase overall quantity and average size of LWD throughout the in-stream and floodplain areas of the Project Area to replenish depleted supplies.
- Provide in-stream fish hiding cover and velocity diversity.
- Aid in creation of large, complex pools.
- Assist in splitting flows into side channels.
- Increase bank roughness and improve bank stability.

- Provide natural channel roughness elements to aid in sediment and debris sorting and routing.
- Support natural processes that allow for re-establishment of native riparian vegetation and floodplain development.

LWD structure types, locations, primary purpose, functions, and salmonid habitat benefits used in the final design are outlined in Table 2-1. LWD structure selection and placement considered anticipated stream power and site-specific stability needs to assess the effectiveness of the structures under the proposed conditions (see Section 6.1.2 below). These design criteria were assessed by measuring geomorphic characteristics, LWD recruitment and retention, and relative abundance of habitats and features (for details of evaluation methods and metrics, see Table 3.1-1 in Tetra Tech 2017a).

Table 2-1. Large Wood Structure Type, Locations, Purpose and Functions, and Associated Salmonid Benefits

Structure Name	General Structure Location	Drawing Sheet(s)	Primary Structure Purpose	Structure Functions	Salmonid Habitat Benefits ^{1/}				
					Adult Holding & Spawning			Juvenile Rearing	
					Pool Creation or Enhancement	Cover	Spawning Gravel	Main Channel Habitat	Side and Off-Channel Habitat
3-Log Cross Structure - Type 2	Alcove, at Mouth of Spring Creek	C-08	Increased Cover	Increases overhead and instream hiding cover, habitat diversity, provides velocity refugia	Excavated backwater pool	Overhead & instream hiding	--	--	Alcove habitat complexity, low velocity refugia
3-Log Cross Structure - Type 2	Side Channels	C-09, C-11, C-16, C-19, C-103	Increased Cover, Aid in Pool Formation	Increases overhead and instream hiding cover, bank roughness, hydraulic complexity, increase scour at existing pools, local sediment sorting, potential to rack additional LWD	Local scour pools	Overhead & instream hiding	In pool tailouts for steelhead	--	Side channel instream & overhanging cover
Channel Bleed Through Structure - Type 1	Side Channels	C-09, C-11, C-105	Channel Habitat Diversity, Small Pools	Increases overhead cover, adds roughness, hydraulic complexity, small scour pools at mid-channel rootwads, local sediment sorting, promote new LWD recruitment, use where channel movement is considered low risk	Local scour pools	Overhead & instream hiding	In pool tailouts for steelhead	--	Side channel instream & overhanging cover
10-Log Corner Structure	Side Channel	C-16, C-104	Channel Habitat Diversity	Increases bank roughness and stability, hydraulic complexity, habitat diversity, promotes lateral scour pool formation	Lateral scour pool	Overhead & instream hiding	In pool tailouts for steelhead	--	Side channel instream & overhanging cover
Meander Bend Structure	Main Channel - outside bends of channel	C-10, C-12, C-19, C-100	Pool Creation	Induces scour for pool creation, increases hydraulic complexity, habitat diversity, channel complexity, overhead cover, promotes sediment sorting downstream of new scour pool	Enhance existing or create large lateral scour pools	Overhead & instream hiding	In pool tailouts for Chinook & steelhead	Instream hiding & overhead cover	--
Small Complex Log Jam	Side Channel - at head of split side channels	C-14, C-102	Maintain Side Channels, Improve Floodplain Connectivity	Increases bank roughness and stability, hydraulic complexity, increase wetted perimeter, maintain split in side channel flows	--	--	--	--	Increased wetted area near existing high quality habitat
Log Jam Structure	Main Channel - Mid-channel	C-12, C-18, C-101	Flow Diversity	Enhance or create split flows or direct flows laterally, create local scour pools at structure edges, promotes gravel bar formation behind structure leading to island development	Local scour pools	Instream Hiding	In lateral margins for Chinook & steelhead	Instream hiding cover, flow & velocity diversity	--
Log Jam Structure	Main Channel - Inset to right or left bank protruding into channel	C-12, C-14, C-18, C-101	Flow Diversity	Induces channel meandering in straight reaches, increases hydraulic complexity, habitat diversity, instream hiding cover, local scour pools at downstream structure edge, local sediment sorting	Local scour pools	Instream Hiding	In pool tailouts for Chinook & steelhead	Instream hiding cover, flow & velocity diversity	--

Table 2-1. Large Wood Structure Type, Locations, Purpose and Functions, and Associated Salmonid Benefits (continued)

Structure Name	General Structure Location	Drawing Sheet(s)	Primary Structure Purpose	Structure Functions	Salmonid Habitat Benefits ^{1/}				
					Adult Holding & Spawning			Juvenile Rearing	
					Pool Creation or Enhancement	Cover	Spawning Gravel	Main Channel Habitat	Side and Off-Channel Habitat
Log Jam Structure	Main Channel - Two structures on opposite banks, downstream of inlets to side channels	C-14, C-16, C-18, C-101	Flow Diversity	Induce backwatering into side channels, reduces velocity and promotes deposition in incised reaches, promotes local scour pool formation at structure edges and local sediment sorting in pool tailouts	Local scour pools	Instream Hiding	--	Instream hiding cover	Reactivate side channels for instream & overhanging cover
Supplement Existing Jam	Main Channel - at existing log jam locations	C-09, C-10, C-16	Channel Habitat Diversity	Increases existing high quality habitat quantity and complexity, maintains/increases roughness and enhances existing log jam functions of floodplain connectivity	Enhance existing scour pools	Instream hiding & overhead cover	--	Instream hiding & overhead cover	Enhances floodplain connectivity

^{1/} Salmonid benefits may vary depending on species (spring Chinook, steelhead, or bull trout)

2.4.2 Native Rock and Boulders

Placement of individual boulders and boulder clusters may be incorporated into the riffles and runs and placed in accordance with ODFW/ODF (2010). Where used in LWD structures, native rock and/or boulders were evaluated for stability when structures were intended to remain stable at high flows. Rock and boulder design criteria include:

- Create areas of varying water depth, substrate, and velocity, thereby increasing habitat diversity.
- Increase large-scale roughness elements to improve geomorphic stability through structural resistance to high-flow energy and disruptions of velocity fields and shear stress.
- Provide small pools for cover and forage habitat for fish during low flows and resting cover during high flows.
- Aid prevention of anchor ice formation.

These design criteria may be assessed by measuring geomorphic characteristics, and relative abundance of habitats and features (for details of evaluation methods and metrics, see Table 3.1-1 in Tetra Tech 2017a).

3 Design Surveys and Analyses

This section provides the design analyses that are the scientific basis for the final design described in Section 5. The design analyses were completed for all of Reach 6 including both the lower Reach 6 from RM 9.5 (Station 0+00) to 10.5 (Station 59+00) and the upper Reach 6 (Project Area) from RM 10.5 (Station 59+00) to 11.8 (Station 126+00). The design analyses build on the work from previous projects and utilize the CTUIR Umatilla River Vision Touchstones (Jones et al. 2008), cross-walked with the Project-specific objectives, limiting factors, and quantifiable monitoring metrics. The Desolation Creek GAAP (Tetra Tech 2017a) provides quantifiable and repeatable metrics and analysis methods specific to Desolation Creek that have been used to evaluate existing and proposed geomorphic and habitat conditions to support the development of the final design.

The design analyses were used to develop a set of proposed actions, described in Section 5, that are designed to improve floodplain thermal diversity, floodplain connectivity, water quality, and ultimately overall aquatic habitat conditions. These proposed actions will create conditions suitable for the development and evolution of a more natural system in terms of geomorphic process and function.

This section includes a description of Reach 6 field surveys (Section 3.1), topographic surface development (Section 3.2), hydrology (Section 3.3), hydraulic modeling and flood inundation mapping (Section 3.4), geomorphic and habitat characteristics (Section 3.5), and proposed conditions analyses (Section 3.6).

3.1 FIELD SURVEYS

Existing conditions in Reach 6 were documented during field surveys. Two field surveys were conducted: a reconnaissance-level survey of the watershed with a focus on the PAA and a reach-scale survey of Reach 6. The reconnaissance survey, which was conducted as a component of the Desolation Creek GAAP (Tetra Tech 2017a), occurred in July 2016. The reconnaissance survey included the field verification of reaches, geomorphic and habitat data collection, and field identification of potential restoration and enhancement opportunities for prioritization. The field survey of Reach 6 was conducted in October 2016 to collect data sufficient for further developing the Project designs in this submittal. The field survey included topographic survey data collection as well as additional geomorphic and habitat data collection (described in Sections 3.5.1 to 3.5.7) to support the development of Project designs. The field surveys documented existing conditions and included collecting relevant data such as global positioning system (GPS) locations and photographs of all Project elements.

3.2 PROJECT TOPOGRAPHY

The development of digital elevation models and mapping of Project topography utilized an existing topo-bathymetric light detection and ranging (LiDAR) survey acquired by Quantum Spatial Inc. (QSI) involving a combination of traditional LiDAR and topo-bathymetric (or “green”) LiDAR merged into a single topographical surface. While the traditional LiDAR laser pulses do not

penetrate water surfaces, the topo-bathymetric sensor uses a narrow green beam laser that penetrates the water surface. The traditional LiDAR data were collected on November 14, 2015, and the topo-bathymetric LiDAR data collection was conducted on July 20, 2016. The technical data report describing topo-bathymetric LiDAR acquisition, processing, and accuracy estimates may be found in QSI (2016). The surface was used for detailed visualization of channel and floodplain features as well as for the design analyses and calculations described below.

Land-based topographic surveys using real-time kinematic GPS surveys were also conducted to cross-check the accuracy of the LiDAR, provide supplemental topographic data, identify specific features (e.g., bankfull), and, when merged with LiDAR, provide a final surface for modeling and analyses.

3.3 HYDROLOGY

Historically, the flows in Desolation Creek watershed are dominated by storm events in the winter, snowmelt in the spring and early summer, and groundwater inflow during the summer and dry cold periods in the winter (USFS 1999; NPCC 2005). Snowmelt from winter accumulations contributes the majority of the annual runoff for much of the watershed, with water levels dropping substantially for many streams during late summer and early fall months (USFS 1999, 2009). Low-flow periods generally occur between August and October, with average annual high flows peaking between April and June.

Analysis of the streamflow data was completed for the Desolation Creek GAAP (Tetra Tech 2017a) to determine characteristic flows for Desolation Creek including average annual flow, low-flow statistics, flood flows, and monthly flows (monthly mean, minimum, and maximum). Table 3-1 lists the 7-day average 10-year low flow, base flow, average annual flow, and the 2-year flood flow for Desolation Creek near the confluence with the North Fork John Day River. Monthly flows (monthly mean, minimum, and maximum) for Desolation Creek from 1949 to 1958 are shown in Figure 3-1 overlain by typical spawning and rearing periods for Chinook salmon, steelhead, and bull trout (Tetra Tech 2017a).

Table 3-1. Characteristic Discharges for Desolation Creek near the Confluence with the North Fork John Day River

Characteristic Flow	Discharge (cfs)
Measured Discharge near RM 0.1 (July 22, 2016)	8.9
7-Day Average 10-year Low Flow ^{1/}	8.3
Base Flow (August–October) ^{2/}	11.0
Average Flow (annual average)	101
2-Year Peak Flow ^{3/}	874

1/ Low flow statistics calculated following the methods of Risley et al. (2008).

2/ Base flow calculated using the Web-based Hydrograph Analysis Tool (WHAT): <https://engineering.purdue.edu/mapserve/WHAT/>

3/ Flows estimated using regional regression equations following the methods of Cooper (2006)

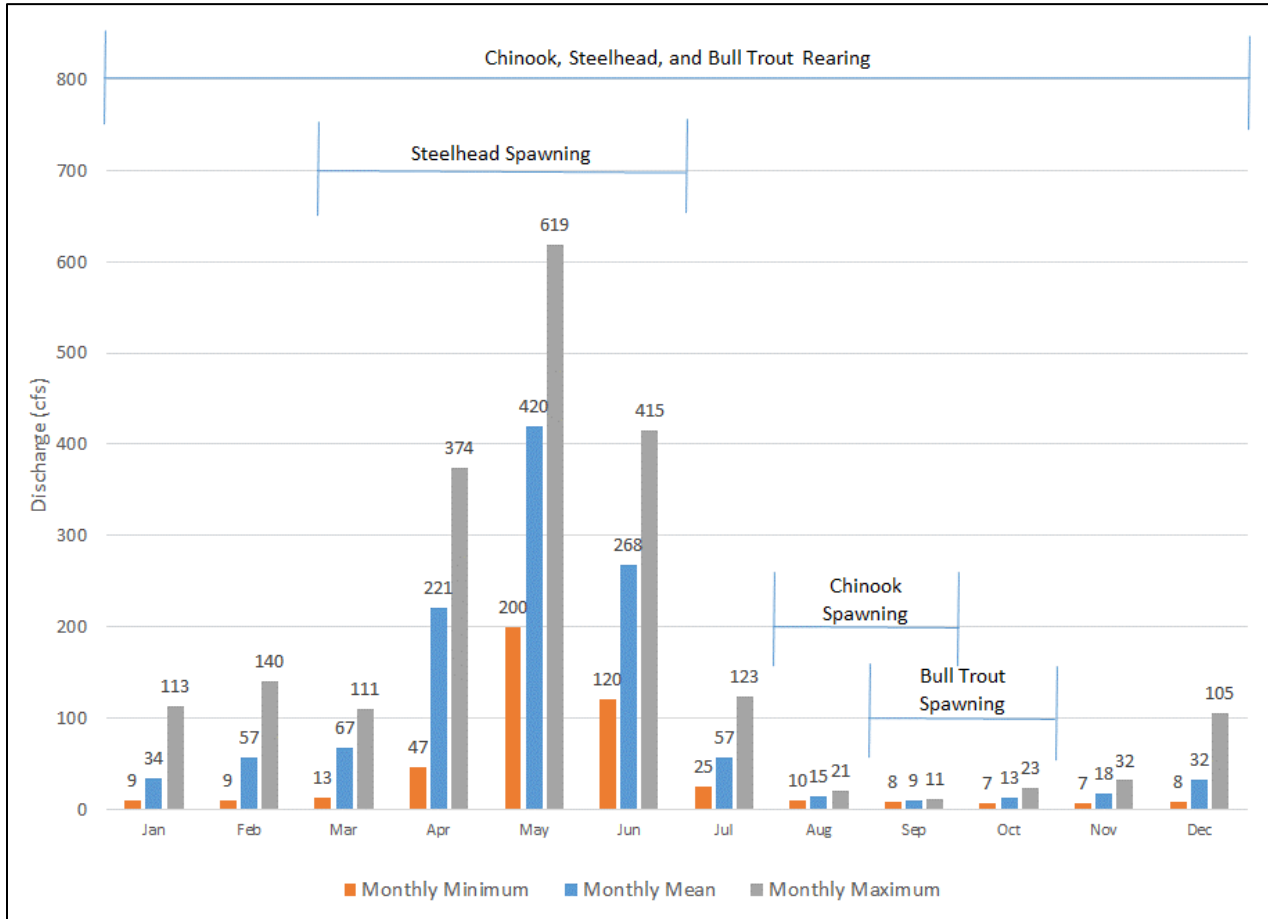


Figure 3-1. Monthly Minimum, Mean, and Maximum Flows for Desolation Creek (near the North Fork John Day River confluence) Overlain by Typical Spawning and Rearing Periods for Chinook, Steelhead, and Bull Trout

Reach 6 peak flows including the 2-, 5-, 10-, 25-, 50-, and 100-year return periods were calculated using regional regression equations following the methods described in Cooper (2006). The bankfull discharge, assumed to be equivalent to the 1.5-year return period, was “back-calculated” by comparing hydraulic model results with field survey data for bankfull location and elevation. A range of flows from 100 to 707 cubic feet per second (the 2-year return period flow) were modeled to determine the flow that best matched the field-surveyed bankfull elevation. Table 3-2 presents the peak flow estimates for Reach 6 that were used as inputs for the hydraulic model described in Section 3.4.

Table 3-2. Peak Flow Estimates for Reach 6

Peak Flow Recurrence Interval (years)						
1.5-year (cfs)	2-year (cfs)	5-year (cfs)	10-year (cfs)	25-year (cfs)	50-year (cfs)	100-year (cfs)
450	707	949	1110	1320	1480	1640

cfs – cubic feet per second

3.4 HYDRAULIC MODELING AND INUNDATION

Understanding the existing stream channel hydraulics as well as floodplain and side-channel inundation at various flows requires the use of a hydraulic model. The model used for this Project was the industry standard hydraulic modeling program developed by the U.S. Army Corps of Engineers (USACE), which is commonly referred to as HEC-RAS (Hydrologic Engineering Center's River Analysis System) (USACE 2016). As described below, the development of the existing conditions hydraulic model included identifying model inputs, model refinements, and final operation to obtain model outputs.

The hydraulic model inputs included peak-flow hydrology, topography, channel alignment, flow resistance (i.e., Manning's n), and other boundary conditions controlling channel and floodplain hydraulics.

3.4.1 Existing Conditions Modeling

The flows described in Section 3.3 were used for the input peak flow hydrology. The 2016 LiDAR topo-bathymetric data were used to develop the model topography and delineate the thalweg, which was used for the alignment. The model includes a series of 127 cross sections at approximately 100-foot spacing as shown in Figure 3-2. Bankfull elevations and the elevation of the NF-10 Road bridge deck were surveyed during ground-based topographic surveys. For other model details, the boundary conditions (e.g., levees, ineffective flow areas, etc.) were determined using AutoCAD Civil 3D by analyzing the topography in proximity to the cross sections. Manning's n was determined utilizing U.S. Geological Survey (USGS) equations (Arcement and Schneider 1989), applying field photos, pebble counts, and topographic survey data. Values of 0.045 for the active channel and 0.08 for the floodplain were selected for the model.

The hydraulic model was refined at locations to accurately represent the existing conditions. For example, the NF-10 Road bridge, in lower Reach 6, was modeled to characterize any influence the bridge features might have on existing flow conditions. This required adding the elevation of the bridge deck from field survey data. Hydraulic model outputs include hydraulic characteristics (i.e., depth, velocity, shear stress, stream power) and water surface elevations for each model flow at cross sections throughout Reach 6. The model outputs were used to assist with identifying potential restoration actions and to evaluate sediment transport characteristics, as described in Section 3.5.4. Existing conditions flood inundation mapping was completed for all model flows using GeoRAS, which is a custom interface for inundation mapping.

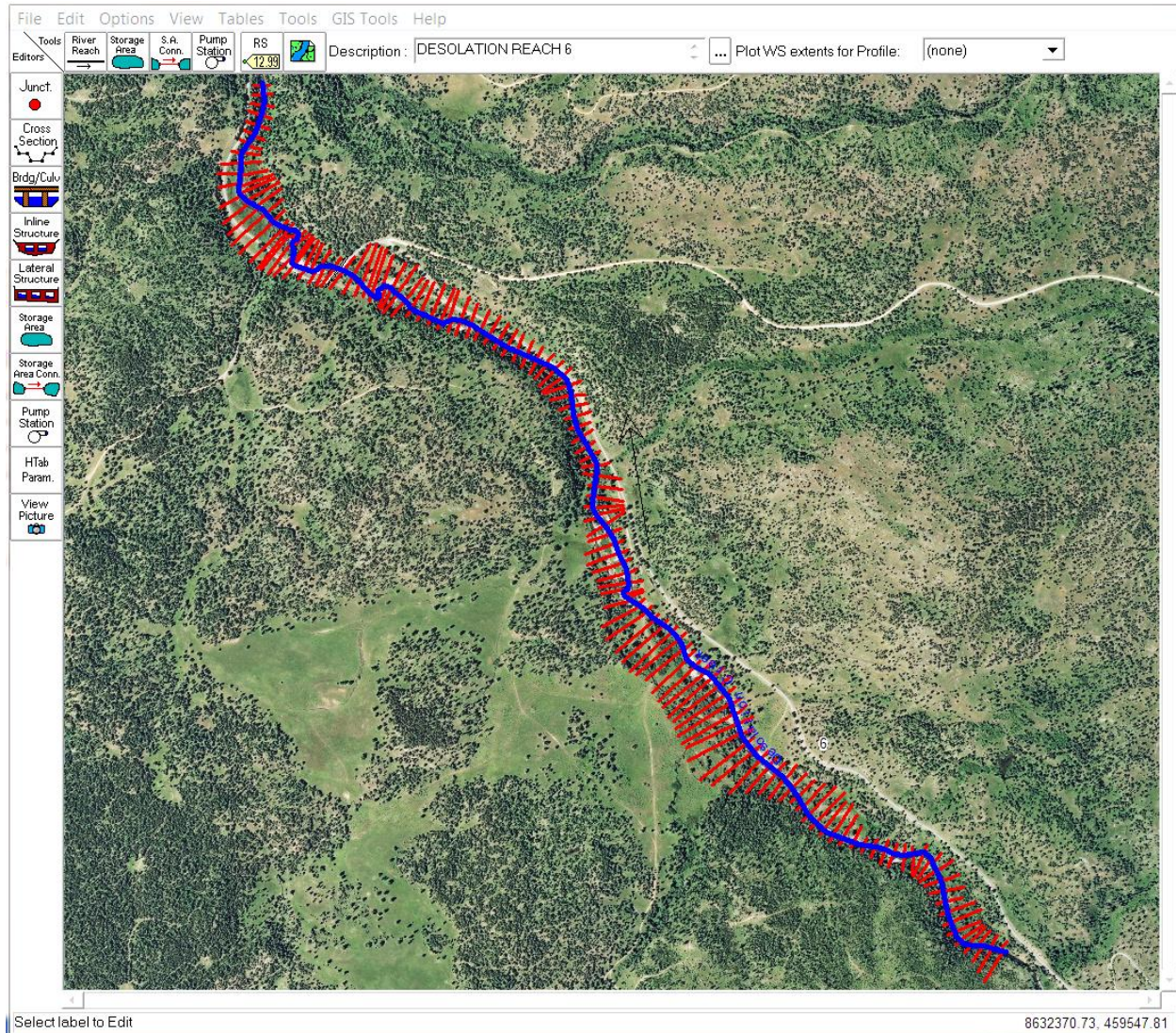


Figure 3-2. Hydraulic Model HEC-RAS Cross Sections within Reach 6

3.4.2 Proposed Conditions Modeling

The existing conditions hydraulic modeling demonstrated that degraded in-stream conditions and the constructed berm within the Project Area are disconnecting side channels and impacting floodplain connectivity. Results from hydraulic modeling and floodplain inundation mapping were used to identify proposed project actions that improve the hydrologic and geomorphic processes in Desolation Creek. The proposed conditions hydraulic modeling and inundation mapping were used to evaluate the effects of those proposed project actions including modified topographic surfaces, proposed excavations, and in-stream LWD structures on side-channel and floodplain connectivity. The results of the proposed conditions hydraulic modeling are described in Section 3.6.

The proposed model included split flows (separation of flow from a single channel to multiple channels) at four locations including the secondary channel near Station 73+00 and the side channels

near Station 96+00, Station 105+00, and Station 126+00. The split-flow conditions were modeled to effectively evaluate the proposed changes in hydraulic conditions at proposed side-channel excavation areas and one location where placement of LWD structures would promote flow into an existing secondary channel. The cross sections from the existing conditions model were divided to model proposed split-flow conditions. Flow obstructions were added to the model to account for key proposed LWD structures geometry that would increase the water surface elevation.

The proposed conditions modeling also incorporated the use of lateral structures, which allow the possibility of flow transferring between the adjacent cross sections in the model to account for lateral flow in the split-flow areas. The lateral structures assisted in transferring flow from one channel to another where flow split-flow conditions were modeled. Lateral structures also assisted in flow accounting at locations where floodplains from separate but parallel channels would overlap resulting in flow exchange.

3.5 GEOMORPHOLOGY AND HABITAT

This section presents the results of the geomorphic and habitat analyses for Reach 6 conducted as part of the Project. The geomorphic analyses include identification and modeling of historic, existing, and proposed geomorphic and habitat features, as well as calculation of the metrics described in the Desolation Creek GAAP (Tetra Tech 2017a). In order to inform the development and ensure the scientific basis of the design, the geomorphic analyses utilize existing and collected data regarding hydrologic and geomorphologic processes and landforms, features (e.g., eroding banks, berms, LWD, etc.), and management constraints as they relate to existing in-stream processes, channel morphology, and available habitat.

3.5.1 Reach Characteristics

Existing geomorphic conditions and habitat characteristics of Reach 6 are described in this section. As described in the Desolation Creek GAAP (Tetra Tech 2017a), Reach 6 lies within one of two unconfined meadow reaches in the PAA, the other being Reach 3. Spring Creek, Starveout Creek, and four unnamed tributaries enter Desolation Creek in Reach 6.

Reach 6 is slightly sinuous and unconfined except for roads and other floodplain modifications. The reach is cobble-dominated with isolated gravel bars found in areas with greater channel complexity and hydraulic conditions that allow for finer sediment storage. The habitat of Reach 6 is characterized by lower gradient riffle and glide habitat, with some pools. LWD is more abundant in Reach 6 than in downstream reaches of the PAA, with log jams and side channels present, especially in the more unconfined portions. Sediment depositional areas, including point bars, lateral bars, and mid-channel bars, are frequent in Reach 6. The floodplain in Reach 6 is complex, with existing functional side channels, good habitat, and observed fish use. Multiple abandoned off-channel areas and high-flow channels exist within Reach 6.

The geomorphic characteristics and habitat characteristics shown in Table 3-3 provide a description of channel form and processes including channel dimensions, gradient, sinuosity, valley setting,

migration process, morphology type, entrenchment, substrate, LWD, pool frequency, and stream power.

Table 3-3. Reach 6 Geomorphic Characteristics

Metric	Existing Condition
River Miles (mapped)	9.5 to 11.8
Reach Length (miles)	2.39
Valley Setting	Unconfined
Channel Morphology	Multiple channels, sinuous, sparse islands and frequent bars
Migration Process	Irregular lateral, avulsions
Rosgen Type	C3
Gradient	1.3%
Sinuosity	1.08
Bankfull Width (feet)	79
Width-to-Depth Ratio	53
Valley Bottom Width (feet)	359
Entrenchment Ratio	4.7
Substrate (dominant (%), subdominant (%))	Cobble (65), gravel (27)
LWD (pieces/mile)	72.2
Jams (jams/mile)	3.8
Pools (pools/mile)	4.2
Stream Power (watts/meter)	112

3.5.2 Floodplain Mapping

As part of the design analyses for the development of the final design, floodplain landforms and features mapping was completed to provide information about geomorphic landforms and other relevant features in the channel and on the floodplain, and to illustrate where challenges and opportunities occur.

A Relative Elevation Model (REM) was developed using the 2016 topo-bathymetric LiDAR to assist with identifying floodplain landforms and features. The REM is a powerful tool for visualizing floodplain features because it removes the slope of the valley (i.e., detrending) and reveals subtle changes in floodplain topography. The visualization provided by the REM allows for identification of landforms and floodplain features including alluvial fans, terraces, tributary channels, high-flow channels, and disconnected floodplain channels. The REM also helps to identify anthropogenic features including roads, bridges, earthen berms, and other bank protection. It assists in identifying the location of terraces and the network of abandoned and disconnected channels along with areas with a high potential for restoring side channel habitat.

The landforms and features identified in the mapping included the location of the low flow and active channels, bars, tributaries, floodplain berms, roads, and the network of abandoned and disconnected floodplain channels. Wet riparian meadow areas were not delineated separately from other floodplain areas since the exact meadow boundaries are unknown. A field-based meadow delineation using plant identification would be required to provide the most accurate meadow boundaries. Floodplain areas that are currently disconnected by the presence of roads were identified separately as disconnected floodplain.

3.5.3 Channel Migration

The Desolation Creek GAAP (Tetra Tech 2017a) describes the channel migration processes in the PAA and Reach 6. The channel migration analyses included an assessment of historic channel locations over time and the presence of bank erosion, which is a key indicator for active channel migration. The locations of eroding banks, armored banks (anthropogenic and naturally non-erodible), and floodplain berms were mapped during field surveys. The historic channel mapping utilized a series of historic aerial images as well as the high-resolution orthoimagery collected in 2016 simultaneously with the topo-bathymetric LiDAR data collection. Figure 3-3 (next page) shows the historic channel locations as mapped for 1946, 1966, 1980, 1995, 2006, 2011, and 2016.

The historic channel mapping was also used to calculate channel migration rates and the meander belt width using the Channel Migration Toolbox (Legg et al. 2014). Reach 6 had the highest rate of channel migration in the PAA (Tetra Tech 2017a) with the most active portions from RM 9.8 (Station 8+00) to 10.2 (Station 42+00) and RM 10.6 (Station 62+00) to 11.5 (Station 108+00). Table 3-4 includes channel migration characteristics and migration rates for the mapped channel locations in Reach 6.

Table 3-4. Reach 6 Channel Migration Characteristics

Sinuosity	Maximum Valley Bottom Width (feet)	Meander Belt Width (feet)	Photo Years	Average Channel Migration Rate (feet/year)	Maximum Channel Migration Rate (feet/year)
1.08	670	450	1946 to 1966	1.8	14.4
			1966 to 1980	2.4	19.4
			1980 to 1995	2.3	20.0
			1995 to 2006	1.0	4.5
			2006 to 2011	3.6	35.2
			2011 to 2016	1.1	5.1

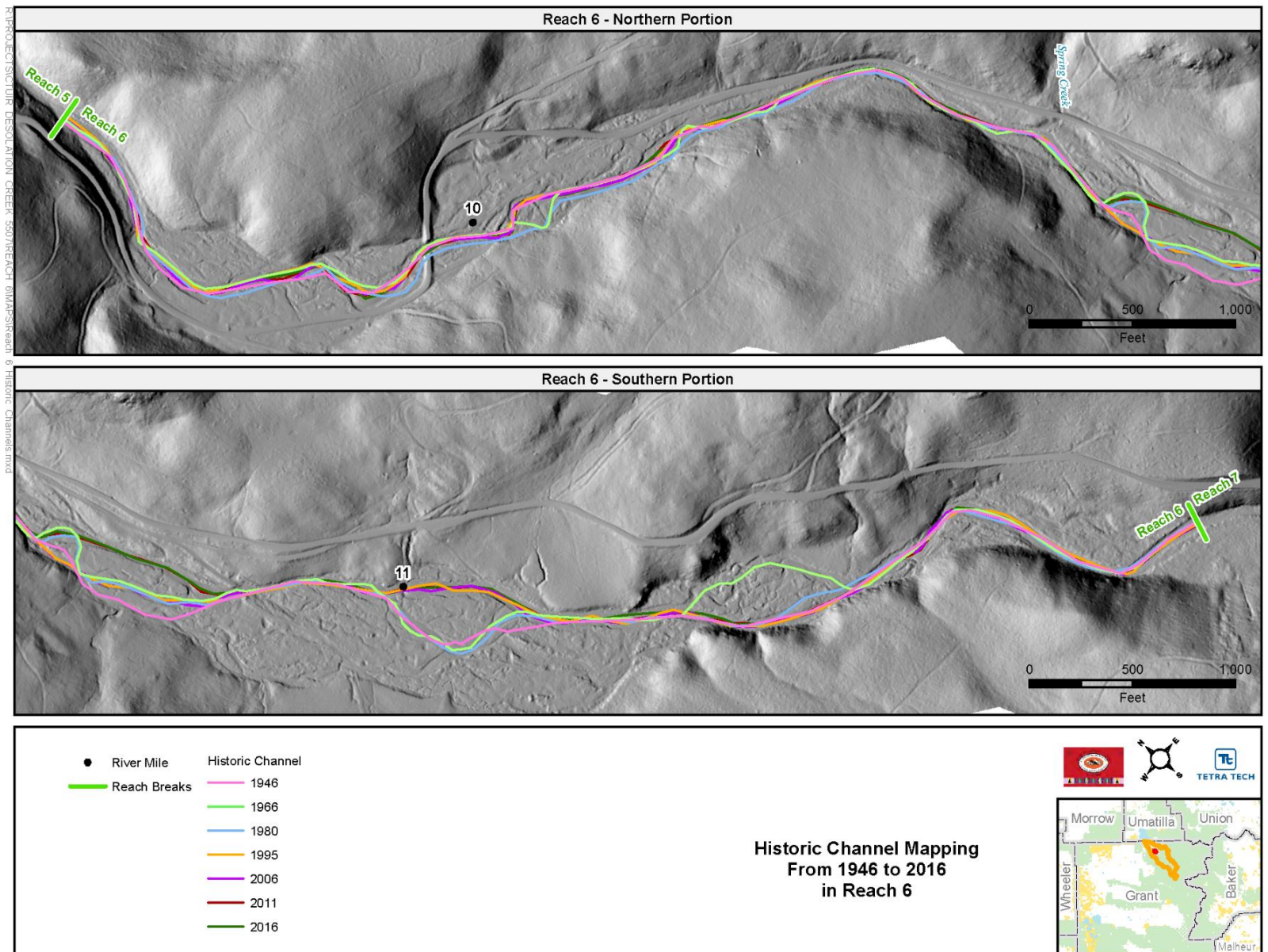


Figure 3-3. Historic Channel Mapping of Reach 6

3.5.4 Sediment

The analysis of sediment characteristics in this section is based on existing data, field survey data, observations, and modeling included in the Desolation Creek GAAP (Tetra Tech 2017a), which contains an evaluation of sediment supply and transport characteristics for the PAA and Reach 6.

A bulk sediment sample and pebble counts were collected in Reach 6 to characterize sediment grain size distributions. The bulk sediment sample was collected near RM 10.0 (Station 32+00) with a bar pebble count surface sample in the same location. An additional pebble count was collected at the upstream extent of the Project Area near RM 11.8 (Station 125+00). Sediment characteristics such as sediment grain size distribution, characteristic grain sizes (i.e., D_{16} , D_{50} , D_{84}), and the percentage of sediment in each size class (i.e., sand, gravel, cobble, and boulder) have been calculated for each sample location, as shown in Table 3-5. Sediment samples reveal a relatively consistent cobble-dominated substrate throughout most of Reach 6, with gravel-dominated substrate in isolated depositional areas. The RM 10.0 (Station 32+00) site shows an example of the sediment characteristics in depositional areas within Reach 6, while the RM 11.8 (Station 125+00) sample location is more representative of the reach-average sediment characteristics.

Table 3-5. Sediment Characteristics at Sample Locations in Reach 6

Sample Location	Characteristic Grain Size			Percent Sand	Percent Gravel	Percent Cobble	Percent Boulder
	D_{16} (mm)	D_{50} (mm)	D_{84} (mm)				
Reach 6, Station 32+00	23	49	82	0%	70%	30%	0%
Reach 6 Bulk, Station 32+00	3	35	93	12%	56%	32%	0%
Reach 6, Station 125+00	38	110	210	0%	27%	65%	7%

Sediment transport characteristics in Reach 6 were evaluated, in part, by assessing modeled channel hydraulics and flow competence, which is the ability of various flows to initiate motion of bed sediment. Flow competence was evaluated using the threshold of motion for a given bed grain size based on the Shields' number, which relates the fluid force acting on sediment to the weight of the sediment based on the hydraulic modeling results, channel gradient, and sediment size estimated from surface sediment samples. Figure 3-4 shows the variation in the hydraulic outputs throughout Reach 6. The figure illustrates that the threshold of motion grain size and shear stress varies considerably from cross section to cross section. Commonly, gravel bed streams have shear stress that is near that required for sediment entrainment at bankfull flows. These channels are referred to as threshold channels (Lisle et al. 2000). In general, the average threshold of motion grain size of 73 millimeters compared with the sampled grain size distributions in Table 3-5 indicate Reach 6 exhibits threshold channel characteristics. The wide range of threshold of motion grain sizes (from 28 to 159 millimeters) indicates there are areas more prone to deposit finer sediments (i.e., gravel) than others which is in agreement with field observations of cobble-dominated substrate with isolated gravel bar deposits.

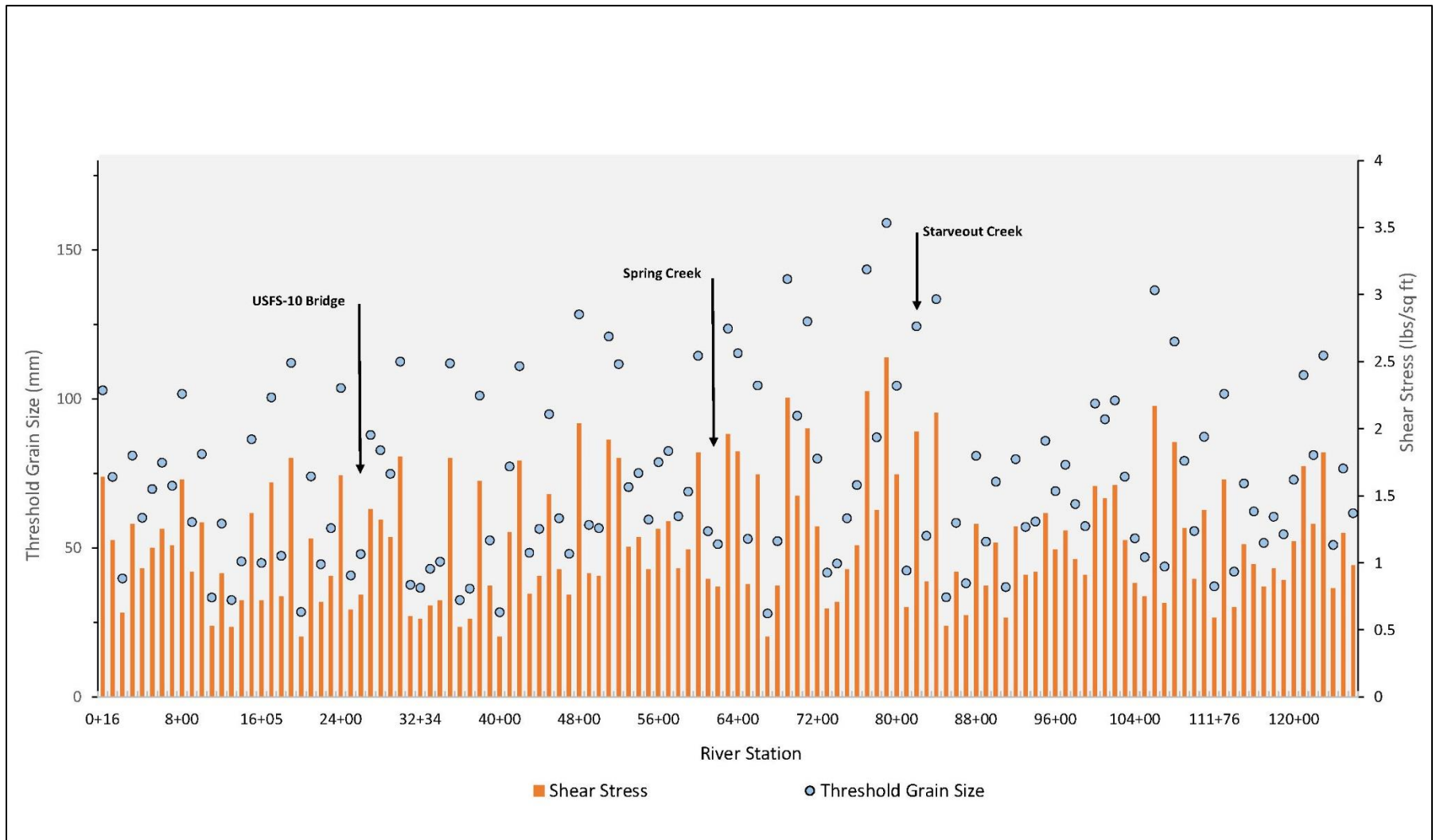


Figure 3-4. Sediment Transport Characteristics in Reach 6

Average bed material transport rates were calculated at bankfull flows for Reach 6 using standard sediment transport equations based on the median grain size of surface sediments. Transport rates were calculated with the Einstein (1950) and the Meyer-Peter and Muller (1948) equations and ranged from 0.0049 square feet per second (ft²/s) to 0.0065 ft²/s respectively for each foot of channel width transporting sediment. Assuming an average transport width of 50 feet results in daily volumetric bed material transport rates ranging from 786 to 1,036 cubic yards per day. Sediment transport rate estimates are best thought of as an idealized maximum rate during peak conditions considering the equations have been shown to frequently overpredict actual transport rates (Gomez and Church 1989).

3.5.5 LWD

The location and characteristics of LWD and log jams within the active channel were mapped and data collected during field surveys. The mapping and data collection for LWD were used to inform the design development process by identifying the distribution of existing LWD and jams and opportunities for placing additional LWD and jams.

Previous surveys of Desolation Creek by the USFS found an average of about 8 pieces per mile for the mainstem, ranging from 6.1 to 9.3 pieces per mile (USFS 2006). The LWD inventory completed for the Project identified 39 pieces per mile in the medium (greater than 12 inches in diameter and 35 feet in length) or large (greater than 20 inches in diameter and 35 feet in length) size class. Table 3-6 contains the quantity and size distribution of LWD and jams in Reach 6. The highest concentration of LWD was located near RM 11.5 (Station 105+00 to Station 110+00) including several jams.

Figure 3-5 shows an example of one of those jams.

Table 3-6. Reach 6 LWD and Log Jam Abundance

LWD ^{1/} (pieces/mile)	Log Jam Quantity	Log Jams (jams/mile)	Number and Percent of LWD by Size Class		
			Small ^{2/} LWD	Medium ^{3/} LWD	Large ^{4/} LWD
39	9	3.8	111 (54%)	70 (34%)	24 (12%)

1/ Large woody debris (LWD) per mile frequency are based on LWD larger than 12 inches diameter at breast height (dbh) and 35 feet in length (medium and large size class pieces)

2/ Small size class LWD ranged from 6 to 12 inches dbh and greater than 20 feet in length.

3/ Medium size class LWD ranged from 12 to 20 inches dbh and greater than 35 feet in length.

4/ Large size class LWD was greater than 20 inches dbh and greater than 35 feet in length.



Figure 3-5. Example Natural Log Jam near Station 110+00

The quantity of LWD in Reach 6 is higher than the federal target of 20 pieces greater than 12 inches diameter at breast height and 35 feet in length per mile (NMFS 1996; USFWS 1998). However, Fox and Bolton (2007) determined that this standard was low for larger streams east of the Cascades (16 to 164 feet bankfull width). They found that those streams had an average of over 40 pieces per mile in unmanaged forested basins while others had observed quantities up to 140 pieces per mile (Inter-Fluve 2012). Based on the description of Haas and Warren (1961) and documented impacts from previous land-use practices described in the Desolation Creek GAAP (Tetra Tech 2017a), it is likely that the current amount of naturally occurring LWD is well below historic levels due to riparian clearing, in-stream wood removal, and limited upstream recruitment potential.

3.5.6 Habitat Units

A number of existing data sources describe the reach-scale existing fish habitat and fish habitat potential in the PAA. As described in the Desolation Creek GAAP (Tetra Tech 2017a), ODFW aquatic inventory surveys were conducted throughout the PAA in 1994. An intrinsic potential analysis has been completed by Cooney and Holzer (2006), and spawning survey data are available since 2004. Habitat units, also referred to as channel units, were mapped during field surveys. The

habitat units identified were pools, riffles, and fast non-turbulent (also referred to as glides), side channels, and backwater areas.

The results of the habitat survey indicate riffles are the dominant habitat type covering approximately 70 percent of the wetted area, while pools were infrequent, with a spacing of 4.2 pools per mile. Figure 3-6 shows an example of typical riffle habitat characteristics such as high width/depth ratios and coarse substrate in Reach 6. Reach 6 is rated as having high steelhead intrinsic potential for the majority of its length (94 percent). Table 3-7 presents pool frequency (pools per mile), the percent composition of habitat units, and intrinsic potential.



Figure 3-6. Example of Typical Riffle Habitat Conditions in Reach 6

Table 3-7. Reach 6 Fish Habitat Characteristics

Pools (pools/mile)	Habitat Composition^{1/} (%)	Intrinsic Potential (%)^{2/}
4.2	Pool (2.2), Riffle (70.8), Glide (20.1), Side Channel (4.8), Backwater (2.2)	Low (0), medium (5.6), high (94.4)

1/ Field identified habitat units. Calculated as the percent area based on the wetted extent at the time of the topo-bathymetric survey.

2/ Source: Cooney and Holzer (2006). Calculated as the percent of total length.

The mapping of habitat units, in combination with geomorphic analyses, informed the design development process by identifying areas where geomorphic conditions are resulting in habitat constraints. In addition, these analyses were used to identify areas of relatively high functioning habitat under existing conditions.

3.5.7 Riparian Vegetation

The riparian vegetation in Reach 6 was assessed based on existing data sources and observations made during field surveys. Riparian vegetation canopy height was calculated from LiDAR data by comparing the bare earth surface to the highest hit returns. A remote sensing-based vegetation classification of the watershed was also conducted and the results included in the Desolation Creek GAAP (Tetra Tech 2017a).

Lowland vegetation in Desolation Creek is generally characterized by ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*), whereas grand fir (*Abies grandis*), subalpine fir (*Abies lasiocarpa*), and lodgepole pine (*Pinus contorta*) are the dominant trees in the higher elevations (USFS 2008). The National Gap Analysis Program Land Cover Data layer classifies the majority of the riparian corridor along Desolation Creek as the Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland ecological system, which corresponds to the Rocky Mountain and Great Basin Flooded & Swamp Forest National Vegetation Classification macrogroup (USGS 2016). The dominant vegetation for the Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland ecological system is listed as dominated by cottonwood (*Populus* spp.), with some conifers (typically spruce [*Picea* spp.], pine [*Pinus* spp.], or grand fir) or tall shrubs such as mountain alder (*Alnus incana*), red-osier dogwood (*Cornus sericea*), or birch (*Betula* spp.). Low shrubs, such as snowberry (*Symphoricarpos* spp.) and rose (*Rosa* spp.), and forbs, such as lady fern (*Athyrium filix-femina*), male fern (*Dryopteris filix-mas*), and meadow senecio (*Senecio* spp.), are often found in this group (USGS 2016).

Currently, riparian vegetation along Desolation Creek consists of tree species including ponderosa pine, Douglas-fir, and alder (*Alnus* spp.), as well as shrub and small trees, including hawthorn (*Crataegus* spp.), willow (*Salix* spp.), red-osier dogwood, mallow ninebark (*Physocarpus malvaceus*), and chokecherry (*Prunus virginiana*). A variety of grasses, sedges, and forbs are also present.

4 Design Alternatives

Sections 4.1 to 4.3 summarize the results from the conceptual (30 percent) design submittal (Tetra Tech 2017b), followed in Section 4.4 by a discussion of the evaluation criteria and selection framework used to select a preferred alternative. Section 4.5 presents the choice of the preferred alternative.

4.1 ALTERNATIVE 1 – FULL RESTORATION

Alternative 1 sought to restore processes that create and maintain habitats and biota in an effort to return the Project Area to its historic and normative state as described by Beechie et al. (2010). This full restoration design alternative consisted of road decommissioning, bridge removal, campground decommissioning, floodplain excavation, floodplain enhancement, alcove and off-channel habitat creation, side channel reconnection, channel realignment, wet meadow enhancement, and in-stream LWD. All of these design components have been developed to function harmoniously, with the intent of maximizing increases in in-stream, riparian, and floodplain habitat quantity, complexity, and diversity.

This design alternative included removal of approximately 2 miles of the NF-10 Road, the bridge near RM 10.0 (Station 26+00), any culverts currently acting as fish barriers, approximately 0.5 mile of the NF-406 Road, as well as decommissioning of the campground located at RM 10.0 (Station 26+00).

The floodplain excavation design component of the full restoration design alternative consisted of eight locations throughout Reach 6 Project Area that would be excavated to create mosaics of high-quality habitat. It included one large area of floodplain enhancement, which consists of existing vegetation preservation, protection or enhancement of seeps or springs, and decompaction and replanting of existing or newly created hardened surfaces to promote water infiltration and vegetation establishment.

The full restoration design alternative included reconnection of 11 relic channels to increase flow complexity by increasing stream velocity and thermal diversity. The full restoration design alternative also included three locations for alcove and off-channel habitat creation.

A total of 74 LWD structures were included in the full restoration design alternative. These in-stream structures will serve a variety of purposes to increase habitat complexity and diversity. Specific structure functions included creating flow diversity through splitting main channel flows, increased pool habitat, increased in-stream cover, and, in some instances, increased habitat diversity through creation of large log jam structures.

4.2 ALTERNATIVE 2 – PARTIAL RESTORATION

Alternative 2 used an intermediate approach to restore or improve selected processes to partially return the Project Area to its historic and normative state. This partial restoration design alternative consisted of road decommissioning, bridge removal, floodplain excavation, alcove and off-channel habitat creation, side channel reconnection, and in-stream LWD, but to a lesser degree than the

actions proposed in Alternative 1. Design components were developed to provide a substantial increase in in-stream, riparian, and floodplain habitat, quantity, complexity, and diversity.

The road decommissioning design component consists of removal of approximately 2 miles of the NF-10 road, the bridge near RM 10.0 (Station 26+00), and approximately 0.5 mile of the NF-406 Road. Included in this portion of road removal was removal any culverts currently acting as fish barriers.

The floodplain excavation design component of the partial restoration design alternative included six locations throughout Reach 6 Project Area that would be excavated to create mosaics of high-quality habitat. The partial restoration design alternative included the reconnection of six relic channels to increase flow complexity by increasing stream velocity and thermal diversity, one location for alcove creation, and one site for creation of off-channel habitat. A total of 51 LWD structures were included in the partial restoration design alternative to serve a variety of purposes to increase habitat complexity and diversity.

4.3 ALTERNATIVE 3 – HABITAT CREATION

Alternative 3 used a more passive approach to improve the quality of habitat by treating specific symptoms such as the lack of pools or LWD through the creation of locally appropriate habitat structures within the Project Area. This habitat creation alternative consisted of alcove and off-channel habitat creation, as well as in-stream LWD structures. The design components were developed to provide moderate increases in in-stream, riparian, and floodplain habitat quantity, complexity, and diversity.

The habitat creation design alternative involves creating seven alcove and off-channel areas. These alcoves and off-channel creation sites are intended to increase the amount of juvenile rearing habitat. A total of 59 LWD structures were included in the habitat creation design alternative.

4.4 DESIGN ALTERNATIVES EVALUATION CRITERIA AND SELECTION FRAMEWORK

As noted in Section 1.4, the Project Area occurs within the highest ranked (Tier I) BSR. To further identify and evaluate how Project design components meet the purpose, goal, objectives, and desired future conditions at a reach scale, the three design alternatives were evaluated using an additional set of evaluation criteria important to the long-term success of the Project. These evaluation criteria were incorporated into a project scoring matrix, and included physical, biological, and feasibility criteria as described below:

- **Restoration Actions**—Scores a restoration action based on its ability to address the number of limiting factors and their severity.
- **Natural Processes**—Prioritizes the Project alternative as a whole based on the assumption that restoration of natural processes (full restoration) is preferred over partial restoration or habitat creation. Restoration alternatives that have the ability to restore processes that create and maintain habitats and biota are preferred over those that can only improve the quality of habitat by treating specific symptoms through creation of locally appropriate habitat types. Precedence for this strategy is found in Beechie et al. (2010).

- Climate Change—Scores a restoration action based on its ability to ameliorate against temperature increases, base flow decreases, peak flow increases, and ability to increase salmon resilience. Scoring is based on criteria described in Beechie et al. (2012).
- Project Scale and Connectivity—Scores a project alternative based on the project scale (stream length treated), longitudinal benefits such as ability to increase flow, restored fish passage, and connectivity to the adjacent floodplain as well as adjacent restoration projects.
- Feasibility—Several criteria were considered for each alternative, including Landowner Willingness, Benefit/Cost Ratio, Site Access, Design and Construction Effort, Risk and Uncertainty, and Permitting Requirements. It should be noted that Landowner Willingness was the most important criterion because without landowner buyoff a design alternative could not advance.

The final selection of a preferred alternative was based on the overall Project ranking derived through the scoring matrix, and on collaborative assessment of these evaluation criteria, as described in the following section.

4.5 PREFERRED ALTERNATIVE SELECTION

Alternative 1 – Full Restoration achieved the highest score based on the results of the alternatives evaluation in Section 4.4. The landowner (Desolation Creek LLC), BPA, CTUIR, CTWSRO, ODFW, USFS, and North Fork John Day Watershed Council staff met on October 27, 2016, to discuss the conceptual (30 percent) design alternatives, offer feedback on the alternatives, and select the alternative to be carried forward. The group unanimously selected Alternative 1 – Full Restoration as the preferred alternative. It was noted that this alternative produced the most benefit toward meeting the mission, goals, and objectives of Desolation Creek LLC and EFM, as well as the CTUIR and their First Foods mission. As mentioned in Section 1, the Reach 6 design efforts were split into upper and lower Project Areas to accommodate the future decommissioning and removal of the NF-10 Road and the bridge near RM 10.0 (Station 26+00). For that reason, the proposed actions are focused on the upper section of Reach 6 (Station 59+00 to Station 126+00).

5 Final Design

This section presents a summary of the proposed actions for the preferred alternative at the final design stage, followed by a description of proposed conditions illustrating expected changes in habitat, flood inundation and partitioning into side channels, hydraulics, and sediment transport.

5.1 PROPOSED ACTIONS

This final design seeks to restore processes that create and maintain habitats and biota in an effort to return the Project Area to its historic and normative state as described by Beechie et al. (2010). The selected full restoration design alternative consists of restoration actions that include decommissioning a section of private road, excavating floodplain in three locations, enhancing floodplain, creating alcove and off-channel habitat, reconnecting side channels, and adding in-stream LWD structures as described in more detail below. The final design drawings for upper Reach 6 showing locations and details of these actions are presented in Appendix A. All of these design components are intended to address documented limiting factors and maximize increases in in-stream, riparian, and floodplain habitat quantity, complexity, and diversity.

The road decommissioning design component consists of removal of approximately 0.5 mile of the private NF-406 Road. Included in this portion of road removal will be the removal of all culverts and cross drains, if any, although none were encountered during the field survey efforts in July and October of 2015. Decommissioning will completely remove the existing road grade and restore the natural floodplain or upland conditions. This effort will consist of removing any existing road grade material, if present, and scarifying the road corridor surface to a depth of 18 inches. Once the road has been sufficiently scarified, the entire former road grade will be planted and/or seeded with approved plants and seed mix to ensure full upland and riparian recovery.

The floodplain excavation design component involves excavating at three locations within the Project Area to create mosaics of high quality habitat. To achieve these mosaics, three typical floodplain grading types will be utilized: the excavated floodplain return swale, the excavated floodplain disperse swale, and the excavated floodplain depressions and mounding. The excavated return swale targets the return of floodwaters from the floodplain to the wetted channel, whereas the excavated disperse swale targets the dispersal of floodwaters from the wetted channel to the floodplain. The excavated depressions and mounding encourage the retention of floodwaters within the excavated area to increase groundwater storage and exchange of subsurface flows in the hyporheic zone. These excavations will increase floodplain connectivity throughout the entire Project Area and will allow frequent flood events to access portions of the floodplain that have not been accessible in recent years. Two of the locations are in the vicinity of the private NF-406 Road where it previously crossed Desolation Creek. Although the crossing is no longer in use, roadway embankments are present on both sides of the creek that inhibit floodplain access. These roadway fills will be excavated to address the Peripheral and Transitional Habitats limiting factor (see Table

1-1) by allowing the 2-year storm event to inundate the newly created floodplain areas. These areas will be revegetated and reseeded with native plants and grasses.

The third floodplain excavation is located at the upstream end of Reach 6, at Station 126+00. Field surveys indicate that the creek in this area has been anthropogenically influenced by a berm system constructed on the right bank of Desolation Creek, which has inhibited the creek's ability to access a large portion of floodplain. This berm will be excavated to address the limiting factors of Habitat Quantity and Peripheral and Transitional Habitats (see Table 1-1) by allowing Desolation Creek to inundate the floodplain at the 2-year storm event and allow for access to floodplain areas that have been inaccessible for a long period of time.

One large area of floodplain enhancement is included in the Project design. In this area, existing vegetation will be preserved and seeps or springs will be protected or enhanced, but existing or newly created hardened surfaces will be decompacted to promote water infiltration and vegetation establishment. The area will also be planted with site-appropriate riparian and floodplain vegetation to restore its natural floodplain function. The decompaction and riparian plantings are intended to address the Riparian Condition limiting factor (see Table 1-1) by increasing floodplain vegetation.

The Project design includes reconnection of three relic channels to increase flow complexity by decreasing main channel velocities, redistributing flow into side channels, and allowing sediment sorting and aggradation to provide additional fish spawning and rearing habitat, thus addressing the limiting factors of Peripheral and Transitional Habitats and Sediment Conditions (see Table 1-1). These side channel reconnections are located at Station 96+00 (see Drawing C-15 in Appendix A), Station 105+00 (see Drawing C-17 in Appendix A), and Station 126+00 (see Drawing C-20 in Appendix A). Each of the identified relic channels will require excavation of the channel inlets to provide access at more frequent storm events. Each of the channel excavations was engineered to accommodate approximately 20 percent or less of the bankfull flows.

The final design includes one alcove creation location at the mouth of Spring Creek. The alcove was designed to be connected to the main channel at a variety of flows, with a pool for juvenile rearing habitat. All side channel and alcove excavation is being performed to address the Peripheral and Transitional Habitats, Channel Structure and Form, Sediment Conditions, and Water Quality limiting factors (Table 1-1).

Installation of various types of LWD structures is being proposed throughout the Project Area. A total of 47 LWD structures are included in this final design. These LWD structures will serve a variety of purposes intended to increase habitat quantity, complexity and diversity. Specific structure may serve multiple purposes and functions (see Table 2-1). For example, the log jam structure (see Drawing C-101 in Appendix A) has been designed to serve multiple roles in creating habitat complexity and diversity to address the limiting factors discussed in Section 1.2 above. This structure type is being placed at the inlet of the side-channel reconnections to address the limiting factor of Peripheral and Transitional Habitats by reconnecting relic side channels and splitting flows to improve flow diversity. Such structures are also being used in other locations throughout the

Project Area to address the limiting factors of Riparian Condition, Peripheral and Transitional Habitats, and Channel Structure and Form. They will be placed to increase pool habitat through scour pool creation around the structure, increase floodplain inundation at more frequent storm flows, and increase LWD recruitment by providing large key members that will accumulate floating debris.

Project specifications that are associated with these design elements are presented in Appendix B.

5.2 PROPOSED CONDITIONS

The design surveys and analyses described in Section 3 were used to develop the set of proposed actions described above that together represent the proposed conditions. The proposed actions are designed to provide sustainable in-stream, riparian, and floodplain habitat and to restore natural geomorphic processes that will, over time, address limiting factors.

The proposed actions will improve sediment sorting and storage, particularly in areas with relatively coarse substrate and simplified channel form. The increased floodplain connectivity and hydraulic complexity, combined with the greater abundance of in-stream LWD, will increase the frequency of inundation and increase velocity and thermal diversity at both low and high flows. The proposed actions will also increase the amount of suitable spawning and rearing habitat by reconnecting inaccessible habitats and improving the suitability of existing habitat. The amount of habitat will likely continue to increase over time with the reestablishment of more natural geomorphic processes creating channel complexity and habitat diversity.

Floodplain inundation mapping was completed to evaluate proposed conditions for the 1.5-, 2-, 10-, and 100-year return flood flow based on the hydraulic modeling, as described in Section 3.4. The results showed increased floodplain connectivity, more connected off-channel areas, and increased flows into side channels as a result of the proposed restoration actions (Tetra Tech 2017c).

The proposed conditions hydraulic modeling was also used to evaluate the distribution of flow in the main channel compared to side channels as a result of Project actions. Table 5-1 lists the percentage distribution for split-flow conditions at the side channels near Station 96+00, Station 105+00, and Station 126+00. The results indicate that Project side channels will receive bankfull flow distributions ranging from 13 to 21 percent of the total bankfull flow. The braided section near Station 73+00 has an approximately 60/40 split under proposed conditions at the bankfull flow.

Table 5-1. Distribution of Bankfull Flows in Split-Flow Proposed Conditions

Split-Flow Channels	Percent of Total Bankfull Flow	
	Main Channel	Side Channel
Side Channel Station 126+00	79%	21%
Side Channel Station 105+00	87%	13%
Side Channel Station 96+00	84%	16%

Changes in threshold grain size and shear stress resulting from Project actions were also evaluated based on proposed conditions hydraulic modeling results, as shown in Figure 5-1. The figure illustrates that the threshold of motion grain size and shear stress increased at some locations,

decreased at others, and is generally lower than current conditions at most cross sections. The cross sections with an increase in shear stress from existing to proposed conditions are associated with the proposed LWD structures that will create hydraulic diversity and scouring flows that will create and maintain pools. The cross sections with a decrease in shear stress from existing to proposed conditions are upstream of proposed LWD structures. At these locations, the backwater effect of the structures will cause a rise in water surface elevation and decrease in velocity, which will promote flow into excavated side-channel inlets. The exception to this pattern is in the cross sections from Station 65+30 to Station 73+30 that show a decreased shear stress from existing to proposed conditions that is not related to proposed Project actions. This decrease is likely due to the improved modeling of this area with the addition of a split-flow secondary channel that was not modeled in existing conditions.

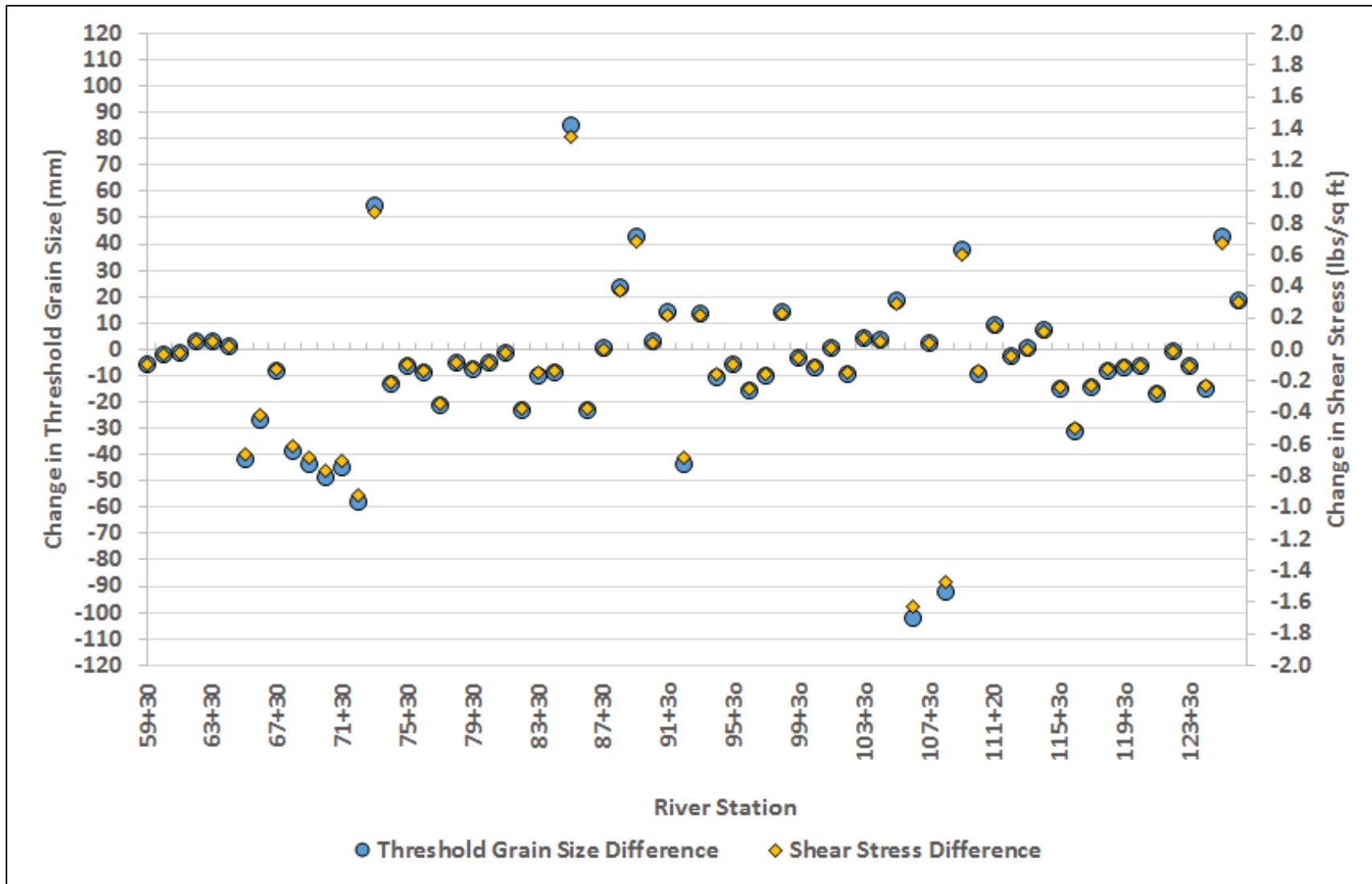


Figure 5-1. Expected Changes in Threshold Grain Size and Shear Stress from Proposed Actions in the Project Area

6 Project Risks and Environmental Considerations

The following project risks, environmental considerations, and the design criteria intended to mitigate those risks are incorporated into the Project design.

6.1 PROJECT RISKS

6.1.1 Infrastructure and Land Use Risks

The Project, which lies exclusively within private land, poses only minor risks to existing infrastructure, public safety, and existing land uses of the Project Area (i.e., livestock grazing, recreation, and timber harvest). There is limited infrastructure within the Project Area, with a 0.5-mile segment of abandoned road to be decommissioned located at RM 10.8 (Station 76+00). Downstream infrastructure includes four bridges: NF-100 Road Bridge at RM 0.9, NF-1003 Road Bridge at RM 3.4, NF-1009 Road Bridge at RM 9.1, and NF-10 Road Bridge at RM 10.0 (Station 26+00). The three lowest bridges have adequate freeboard and are unlikely to be affected by proposed Project actions, while the bridge at RM 10.0 is undersized but scheduled for removal.

6.1.2 Side Channel and Alcove Risks

In accordance with the design criteria in Section 2.3 and details as shown in the design drawings, the proposed side channels and alcove follow the HIP III conservation measures for Category 2a (Improve Secondary Channel and Wetland Habitats). All side-channel and alcove elements occur within the 100-year floodplain. Excavation of the side channels calls for blending these into existing remnant side channels at elevations above the thalweg of the main channel to minimize risk of whole channel avulsions. Risks associated with side channel activations include potential enlargement in the future through natural channel evolution, as well as potential reclosing of side channel inlets with backwater areas remaining in the downstream portions. Similarly, the constructed alcove could either enlarge through main channel migration toward the right bank, or it could fill in with sediment over time. All of these scenarios are within the realm of normal geomorphic processes for this system and are considered low risk. Risks of potential fish stranding have been minimized in side channels by constructing them with an overall down valley gradient. Fish stranding in the alcove is not of concern because Spring Creek has perennial flow.

6.1.3 Floodplain Excavation Risks

In accordance with the design criteria in Section 2.2 and details as shown in the design drawings, the proposed floodplain excavations (includes road embankment and berm removals) will follow the HIP III conservation measures for Category 2b (Set-back or Removal of Existing Berms, Dikes, and Levees). Removal of road/bridge abutment fills (at Station 75+50) and the berm (at Station 125+00) will require off-site disposal of those materials. These actions pose minimal risks as they help local dissipation of stream energy and reduce erosion potential. In the short term, they may be subject to minor erosion until vegetation becomes established.

6.1.4 LWD Structure Risks

Based on design criteria noted in Section 2.4 and details shown on the design drawings, the proposed LWD structures and associated boulder placements follow the HIP III conservation measures for Category 2d (Install Habitat-Forming natural Material instream Structures [Large Wood, Boulders, and Spawning Gravel]). In addition, all proposed LWD structures have been designed to generally follow size and placement requirements outlined in ODFW/ODF (1999), ODFW/ODF (2010), and USBR (2014). While placement of LWD structures poses minimal risk to infrastructure, public safety, or land uses, there are other risks related to fulfilling Project objectives. LWD structures can result in upstream and downstream channel adjustments such as lowering or raising the local bed, bank erosion, increased sedimentation, and potential water quality impacts that may be in conflict with Project objectives; therefore, all LWD sites and structure types should be individually evaluated for these potential effects. Site evaluations included identifying the stream type, existing habitat type, bed materials, stream bank, riparian, and floodplain conditions prior to selection of an LWD structure type. LWD structures have been designed for placement throughout the Project Area to serve a variety of purposes, and are designed to include both stable and dynamic wood structures, as described below.

Stable LWD Structures

For this Project there is only one stable, or fixed, LWD structure type, the log jam structure (see Drawing C-101 in Appendix A), which is being designed to withstand up to the 100-year flood to perform its intended functions. This structure is intended to be highly durable and serve a variety of functions within the reach (see Table 2-1), including promoting lateral connectivity and flow diversity through in-channel split flows, increasing habitat complexity by scour pool creation, and, in the case of the paired structure⁵ proposed at Station 96+00 (see Plan Detail N, Drawing C-16 in Appendix A), create structures raise water surfaces in the main channel and induce flow into an excavated inlet of a remnant side channel. To ensure these LWD structures will be long-lasting, stability calculations for this structure type were completed and provided in the preliminary (60 percent) design submittal (Tetra Tech 2017c). The methodology for the stability analysis is based on the standard force balance approach derived from D'Aoust and Millar (2000).

Dynamic LWD Structures

All other LWD structures planned for use in the Project are expected to have some degree of mobility within the riverine ecosystem, which is viewed as a natural function of the stream holistically. Historically, LWD within the river was mobile, creating meander bend wood jams, channel-spanning structures, complex log jams, and many other structures, all of which were beneficial in creating in-stream habitat for resident fish species. The strategy for constructing these dynamic structure types (see Drawings C-100, C-102 to C-105 in Appendix A) is to use large key pieces of wood in various numbers and configurations to create moderately stable structures. Stability is achieved in a variety of ways: by placing trees partially on the stream bank, burying portions of the trees, wedging some trees between existing live standing trees on the stream bank, using some boulders for ballast, or placing trees on top of other key members but without the use of

cables, anchors, rebar, or other artificial devices. By constructing structures that are semi-mobile over time, using large and durable material, Desolation Creek may interact with these structures and naturally transport them, in whole or in part, to locations where they will continue to create naturally formed habitat.

6.2 CLIMATE CHANGE IMPACTS

Changes in water quantity and temperature are expected to occur throughout the Pacific Northwest as a result of climate change (Casola et al. 2005). Changes in the timing of water availability are expected to have broad ecological and socioeconomic consequences due to numerous competing demands, including for in-stream flow management for salmonids and agriculture (Snover et al. 2013).

Ruesch et al. (2012) identified the potential for dramatic negative effects for cold-water fish species in the John Day River Basin based on the projected increase in stream temperature and the decrease in flows associated with climate change. They predicted that climate change–induced alterations in suitable summer thermal habitat would result in a sharp decline in the volume of suitable habitat by 2100. Isaak et al. (2015) provide a thorough summary of the expected effects of climate change on fish habitat and a vulnerability analysis for spring Chinook salmon, summer steelhead, bull trout, and redband trout in the Blue Mountains.

Studies that have evaluated the combined effects of climate change and habitat restoration suggest that process-based restoration projects are likely to result in a net benefit to salmonids even with future shifts in temperature and flow (Battin et al. 2007). Particularly, restoration actions that increase habitat diversity could potentially increase the resilience of populations to climate change (Beechie et al. 2012) and restore or maintain natural thermal regimes to minimize future stream temperature increases (Isaak et al. 2015). Restoration of water availability (both surface and groundwater sources), as well as connections between hyporheic and surface flows (through floodplain and wet meadow restoration and reconnection projects), may provide these moderating conditions to Desolation Creek.

The Desolation Creek GAAP (Tetra Tech 2017a) provides estimates of future climate change–related effects on flow and stream temperature specific to Desolation Creek. The final designs, presented in Appendix A, have been developed with an understanding of the predicted local climate change impacts described above, and the proposed restoration actions are expected to increase resiliency in the system in response to them.

6.3 ENVIRONMENTAL PERMITTING CONSIDERATIONS

Coordination, review, and permitting with the BPA, CTUIR, CTWSRO, ODFW, USFS, USFWS, USACE, and Oregon Department of State Lands was initiated at the conceptual (30 percent) design and continued through the final design stage. The Project has gone through the BPA Habitat Improvement Program (HIP) III programmatic permitting process for ESA Section 7 compliance, and incorporates the HIP III conservation measures (BPA 2016b) for compliance during construction (see Drawings G-03 to G-05 in Appendix A). Design specifications and drawings identify detailed

site staging and access, water control measures, fish isolation and salvage, temporary erosion and sediment control, and revegetation of disturbed areas, and include detailed descriptions of agency-prescribed best management practices and conservation measures. Temporary or permanent removal/fill quantities below the ordinary high water mark were provided to CTUIR as required for permit applications. During Project implementation, in-water construction activities must be conducted only during the ODFW in-water work window (July 15 to August 15). The final (100 percent) design submittal includes the Oregon Professional Engineer sealed drawings, general conditions, construction schedule, and technical specifications necessary and suitable to bid and construct the Project.

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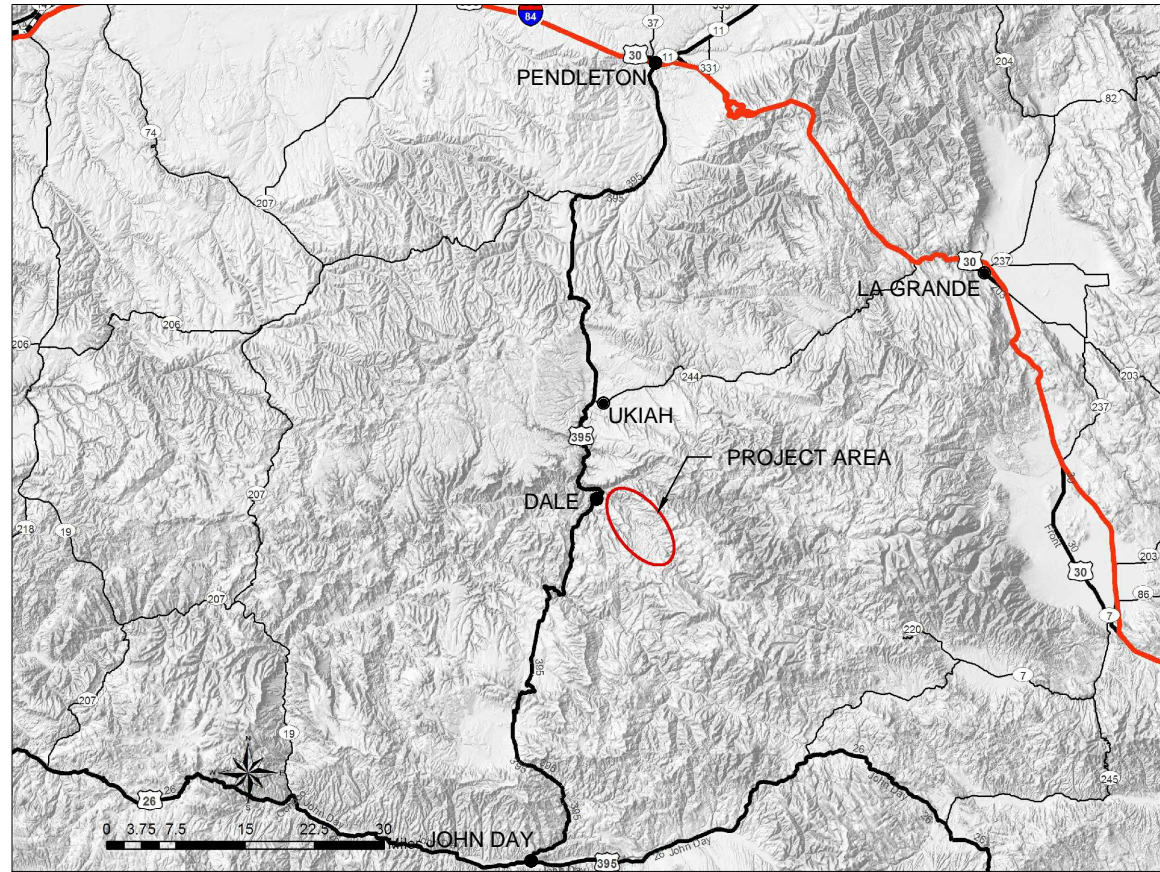
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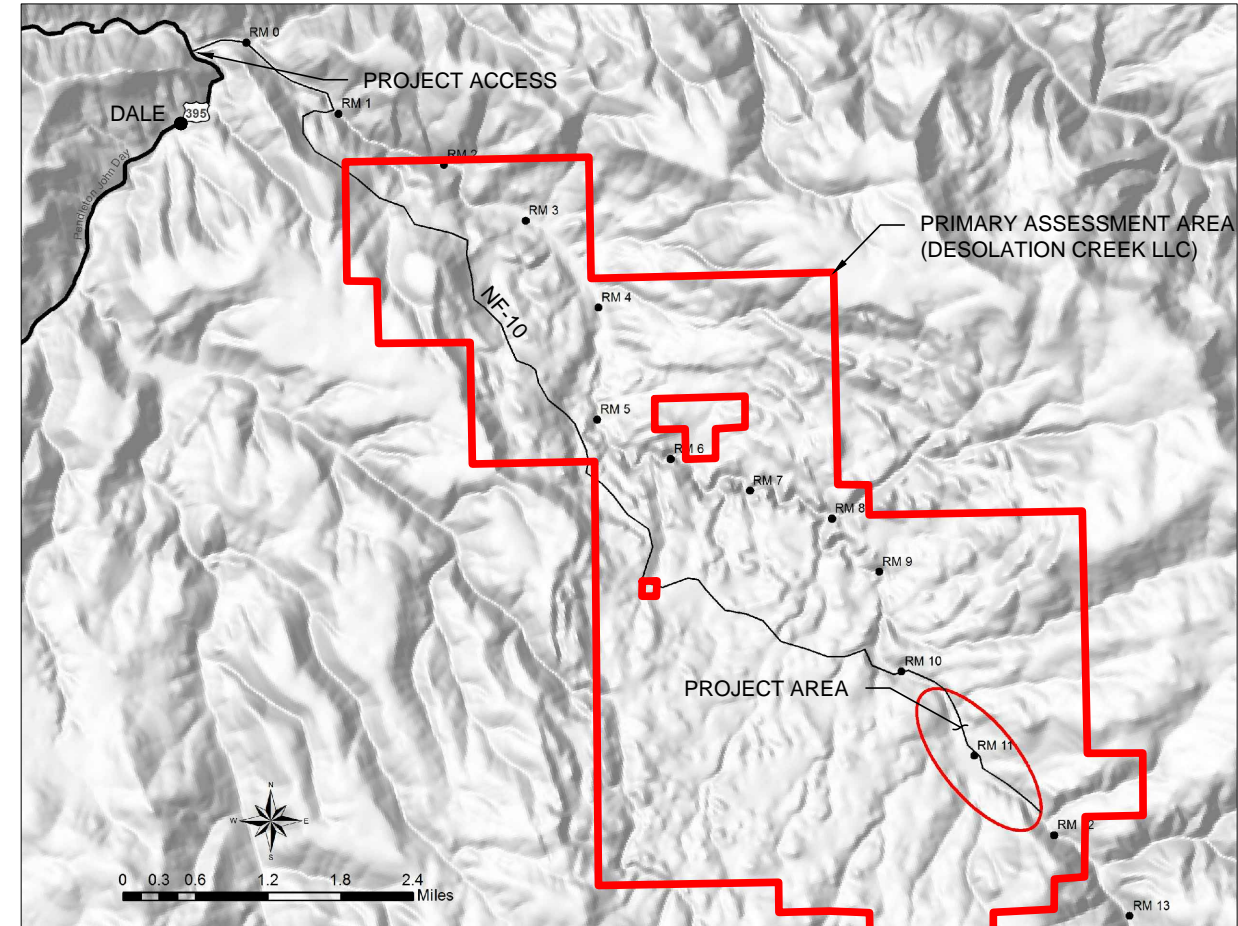
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APPENDIX A – FINAL DESIGN DRAWINGS

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION DESOLATION CREEK - UPPER REACH 6 (RM 10.5 - 11.8) HABITAT RESTORATION DRAFT FINAL DESIGN



LOCATION MAP
SCALE: AS SHOWN

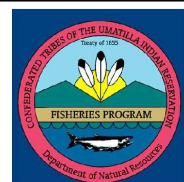


VICINITY MAP
SCALE: AS SHOWN

DRAWING INDEX	
DWG #	TITLE
GENERAL	
G-01	COVER SHEET
G-02	GENERAL NOTES
G-03 - G-06	HIP III CONSERVATION METHODS
CIVIL	
C-01	EXISTING CONDITIONS - OVERVIEW
C-02 - C-04	EXISTING CONDITIONS - TEMPORARY ACCESS & STAGING
C-05 - C-07	PROPOSED DESIGN - OVERVIEW

DRAWING INDEX	
DWG #	TITLE
C-08 - C-20	PROPOSED DESIGN - CONSTRUCTION DETAILS
C-21	PROPOSED DESIGN - ROAD DECOMMISSION PLAN
C-100 - C-105	DETAILS - LWD CONSTRUCTION
C-106	DETAILS - FLOODPLAIN MICROTOPOGRAPHY
C-107	DETAILS - EROSION AND SEDIMENT CONTROL
C-108	DETAILS - FISH SALVAGE AND DEWATERING
C-109	DETAILS - ROAD DECOMMISSION
L-100 - L-102	DETAILS - REVEGETATION TABLES

NOT FOR CONSTRUCTION



PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")					
REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

**DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN**

COVER SHEET

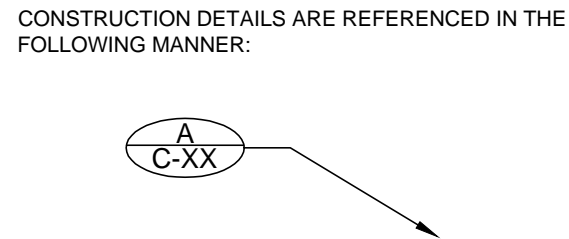
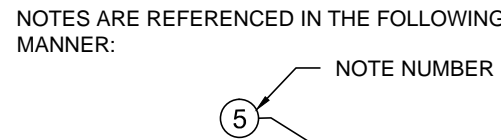
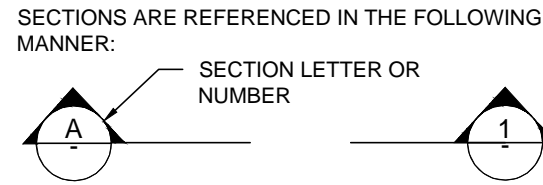
DWG. NO.:	G-01
CREATED:	12/01/16
SHEET:	1 OF 40

Z:\PROJECTS\194-6507 DESOLATION CREEK\90% DESIGN (EMPTY)\SHEET FILES\COVER_HIP III_GENERAL NOTES - REACH 6.DWG
PLOT DETAILS: STROM, ALEX JUN 7, 2017 3:03 PM

ABBREVIATIONS

1H:1V	HORIZONTAL TO VERTICAL EXAGGERATION
%	PERCENT
BPA	BONNEVILLE POWER AUTHORITY
BMP	BEST MANAGEMENT PRACTICES
CP	CONTROL POINT
CTUIR	CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
CWA	CLEAN WATER ACT
CY	CUBIC YARDS
DC	DIRECT CURRENT
DIA	DIAMETER
DWG	DRAWING
ESA	ENDANGERED SPECIES ACT
EX.	EXISTING
EXCV ALC	ALCOVE EXCAVATION POINT
FP EXC	FLOODPLAIN EXCAVATION POINT
FT, '	FOOT
HIP	HABITAT IMPROVEMENT PROGRAM
HUC	HYDROLOGIC UNIT CODE
IDFG	IDAHO DEPARTMENT OF FISH AND GAME
IN, "	INCH
IWW	IN-WATER WORK WINDOW
LT	LEFT
LWD	LARGE WOODY DEBRIS
MI	MILE
MIN	MINIMUM
MFWP	MONTANA FISH WILDLIFE AND PARKS
MJR	MAJOR
MNR	MINOR
MS	MICROSECOND
N/A	NOT APPLICABLE
NCM	NATURAL CHANNEL MATERIAL
NMFS	NATIONAL MARINE FISHERIES SERVICE
NTS	NOT TO SCALE
OWRD	OREGON WATER RESOURCES DEPARTMENT
PAA	PRIMARY ASSESSMENT AREA
PCF	POUNDS PER CUBIC FOOT
PDC	PULSED DIRECT CURRENT
PRO.	PROPOSED
PROJ CTRL	PROJECT CONTROL POINT
PT	POINT
RD	ROAD
RM	RIVER MILE
RT	RIGHT
SC THWG	SIDE CHANNEL THALWEG POINT
SEC	SECOND
STA	STATION
TESC	TEMPORARY EROSION SEDIMENT CONTROL
TYP	TYPICAL
USACE	UNITED STATES ARMY CORPS OF ENGINEERS
USFWS	UNITED STATES FISH AND WILDLIFE SERVICE
V	VOLTS
WDFW	WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
XS	CROSS SECTION
YR	YEAR

SYMBOLS



CONSTRUCTION SEQUENCING:

1. PLACE EROSION CONTROL, WORK AREA ISOLATION, AND FISH SALVAGE MEASURES.
2. COMPLETE CLEARING AND GRUBBING.
3. REMOVE EXISTING DEBRIS.
4. FELL TREES WITH ROOTWADS ATTACHED AS DIRECTED BY ENGINEER/OWNER.
5. EXCAVATE FLOODPLAIN AREAS.
6. EXCAVATE SIDE CHANNELS AND ALCOVES.
7. INSTALL LWD STRUCTURES.
8. RESTORE AND RE-VEGETATE WORK AREAS.
9. REMOVE EROSION CONTROL MEASURES, WORK AREA ISOLATION, AND FISH SALVAGE MEASURES.

GENERAL NOTES:

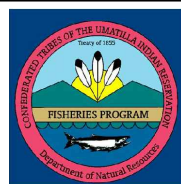
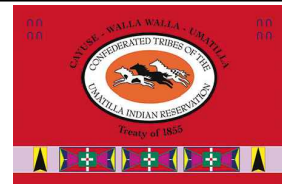
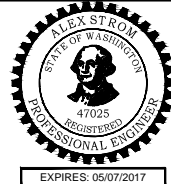
1. HORIZONTAL PROJECTION: NAD83 OREGON STATE PLANES, NORTH ZONE, INTERNATIONAL FOOT.
2. VERTICAL PROJECTION: NAVD88.
3. TOPOGRAPHIC SURFACE DATA DERIVED FROM 2016 TOPOBATHYMETRIC LIDAR DATA. TOPOGRAPHIC DATA PROVIDED IN THIS DESIGN MAY VARY FROM FIELD CONDITIONS DURING TIME OF CONSTRUCTION DUE TO CONTINUED EROSION ACTIVITIES WITHIN DESOLATION CREEK.
4. FIELD SURVEY EFFORTS COMPLETED BY TETRA TECH IN OCTOBER 2016.
5. EXISTING AND PROPOSED FLOOD ELEVATIONS CALCULATED USING HEC-RAS HYDRAULIC MODEL.
6. PROPOSED PROJECT DESIGN, CONSTRUCTION ACTIVITIES, AND MATERIALS SUBJECT TO APPROVAL BY LANDOWNER.
7. CHANNEL STATIONING HEREON REFERS TO DESOLATION CREEK EXISTING THALWEG UNLESS OTHERWISE NOTED.
8. DESOLATION CREEK STATIONING STARTS AT LOWER END OF REACH 6.
9. ALL PROJECT WORK OCCURS WITHIN DESOLATION CREEK LLC PROPERTY.

GENERAL CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL CONSTRUCT THE RESTORATION DESIGN ELEMENTS IN ACCORDANCE WITH THE PLANS STAMPED "ISSUED FOR CONSTRUCTION". THESE PLANS WILL BE PROVIDED TO THE CONTRACTOR BY THE CONTRACTING AGENCY PRIOR TO CONSTRUCTION. WORK SHALL NOT BE DONE WITHOUT THE CURRENT SET OF APPROVED CONSTRUCTION PLANS.
2. THE CONTRACTOR SHALL PURSUE WORK IN A CONTINUOUS AND EFFICIENT MANNER TO ENSURE TIMELY COMPLETION OF THE PROJECT.
3. ALL WORK WITHIN THE ACTIVE CHANNEL SHALL OCCUR WITHIN THE ALLOWABLE FISH WINDOW (JULY 15 - AUGUST 15).
4. ALL CONSTRUCTION ACTIVITIES SHALL MINIMIZE DISTURBANCE TO AND MAXIMIZE RE-USE OF EXISTING RIPARIAN VEGETATION.
5. CONTRACTOR SHALL BLEND EDGES OF ALL PROPOSED EXCAVATIONS TO MATCH EXISTING LOCAL FLOODPLAIN ELEVATIONS AND TOPOGRAPHY.
6. ALL EXCAVATED MATERIAL NOT USED ON-SITE SHALL BE DISPERSED LOCALLY ONTO ADJACENT UPPER TERRACE LOCATIONS ABOVE THE 10-YR FLOOD ELEVATION AS STAKED IN THE FIELD OR SHALL BE HAULED OFF-SITE AND PROPERLY DISPOSED OF AT AN APPROVED LOCATION AS DIRECTED BY ENGINEER..
7. THE CONTRACTOR SHALL PROTECT ALL CONTROL POINTS TO THE EXTENT POSSIBLE DURING CONSTRUCTION ACTIVITIES.
8. ALL TEMPORARY ACCESS ROUTES SHALL BE LAID OUT TO MINIMIZE DISTURBANCE TO EXISTING VEGETATION AND FINAL LOCATION WILL BE VERIFIED BY OWNER.
9. ALL EROSION CONTROL MEASURES ARE TO INDICATE WHAT IS EXPECTED IN SIMILAR GEOMORPHIC CONDITIONS. CHANNEL CONDITIONS MAY DIFFER DURING CONSTRUCTION AND WILL NEED TO BE FIELD ADJUSTED TO CONFORM WITH HIP III GUIDELINES.
10. CONTRACTOR SHALL PROVIDE AN EROSION AND SEDIMENT CONTROL AND DEWATERING PLAN TO OWNER AT LEAST TEN (10) DAYS PRIOR TO THE BEGINNING OF CONSTRUCTION ACTIVITIES.
11. ROAD DECOMMISSIONING SHALL INCLUDE REMOVAL OF ALL CULVERTS AND CROSS DRAINS ENCOUNTERED.
12. ALL ROAD FILL WITHIN STREAM CROSSINGS SHALL BE REMOVED AND STREAM CHANNEL AND BANKS SHALL BE GRADED TO MATCH EXISTING TOPOGRAPHY AS PART OF ROAD DECOMMISSIONING.
13. PRIOR TO BEGINNING ANY EXCAVATION WORK THE CONTRACTOR SHALL CALL FOR A LOCATION OF ANY UTILITIES THROUGH THE OREGON UTILITY NOTIFICATION CENTER AT 1-800-332-2344, OR 811.

NOT FOR CONSTRUCTION

Z:\PROJECTS\194-6507 DESOLATION CREEK\90% DESIGN (EMPTY)\SHEET FILES\COVER_HIP III_GENERAL NOTES - REACH 6.DWG
 PLOT DETAILS: STROM, ALEX JUN 7, 2017 3:08 PM



REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN

DWG. NO.:
G-02

GENERAL NOTES

CREATED: 12/01/16

SHEET: 2 OF 40

HIP III GENERAL CONSERVATION MEASURES APPLICABLE TO ALL ACTIONS (CONTINUED):

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

- A) STORED, FUELED, AND MAINTAINED IN A VEHICLE STAGING AREA PLACED 150 FEET OR MORE FROM ANY NATURAL WATERBODY OR WETLAND, OR ON AN ADJACENT, ESTABLISHED ROAD AREA;
- B) REFUELED IN A VEHICLE STAGING AREA PLACED 150 FEET OR MORE FROM A NATURAL WATERBODY OR WETLAND, OR IN AN ISOLATED HARD ZONE, SUCH AS A PAVED PARKING LOT OR ADJACENT, ESTABLISHED ROAD (THIS MEASURE APPLIES TO ONLY GAS-POWERED EQUIPMENT WITH TANKS LARGER THAN 5 GALLONS);
- C) BIODEGRADABLE LUBRICANTS AND FLUIDS SHOULD BE USED, IF POSSIBLE, ON EQUIPMENT OPERATING IN AND ADJACENT TO THE STREAM CHANNEL AND LIVE WATER;
- D) INSPECTED DAILY FOR FLUID LEAKS BEFORE LEAVING THE VEHICLE STAGING AREA FOR OPERATION WITHIN 150 FEET OF ANY NATURAL WATER BODY OR WETLAND; AND
- E) THOROUGHLY CLEANED BEFORE OPERATION BELOW ORDINARY HIGH WATER, AND AS OFTEN AS NECESSARY DURING OPERATION, TO REMAIN GREASE FREE.

EROSION CONTROL: EROSION CONTROL BEST MANAGEMENT PRACTICES (BMPS) WILL BE PREPARED AND CARRIED OUT, COMMENSURATE IN SCOPE WITH THE ACTION, THAT MAY INCLUDE THE FOLLOWING:

- A) TEMPORARY EROSION CONTROL BMPS.
 - I. TEMPORARY EROSION CONTROL BMPS WILL BE IN PLACE BEFORE ANY SIGNIFICANT ALTERATION OF THE ACTION SITE AND APPROPRIATELY INSTALLED DOWNSLOPE OF PROJECT ACTIVITY WITHIN THE RIPARIAN BUFFER AREA UNTIL SITE REHABILITATION IS COMPLETE.
 - II. IF THERE IS A POTENTIAL FOR ERODED SEDIMENT TO ENTER THE STREAM, SEDIMENT BARRIERS WILL BE INSTALLED AND MAINTAINED FOR THE DURATION OF PROJECT IMPLEMENTATION.
 - III. TEMPORARY EROSION CONTROL MEASURES MAY INCLUDE FIBER WATTLES, SILT FENCES, JUTE MATTING, WOOD FIBER MULCH AND SOIL BINDER, OR GEOTEXTILES AND GEOSYNTHETIC FABRIC.
 - IV. SOIL STABILIZATION UTILIZING WOOD FIBER MULCH AND TACKIFIER (HYDRO-APPLIED) MAY BE USED TO REDUCE EROSION OF BARE SOIL IF THE MATERIALS ARE NOXIOUS WEED-FREE AND NONTOXIC TO AQUATIC AND TERRESTRIAL ANIMALS, SOIL MICROORGANISMS, AND VEGETATION.
 - V. SEDIMENT WILL BE REMOVED FROM EROSION CONTROL BMP ONCE IT HAS REACHED 1/3 OF THE EXPOSED HEIGHT OF THE BMP.
 - VI. ONCE THE SITE IS STABILIZED FOLLOWING CONSTRUCTION, TEMPORARY EROSION CONTROL BMPS WILL BE REMOVED.
- B) EMERGENCY EROSION CONTROL BMPS. THE FOLLOWING MATERIALS FOR EMERGENCY EROSION CONTROL WILL BE AVAILABLE AT THE WORK SITE:
 - I. A SUPPLY OF SEDIMENT CONTROL MATERIALS; AND
 - II. AN OIL-ABSORBING FLOATING BOOM WHENEVER SURFACE WATER IS PRESENT.

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

- A) WORK WILL BE SEQUENCED AND SCHEDULED TO REDUCE EXPOSED BARE SOIL SUBJECT TO WIND EROSION.
- B) DUST-ABATEMENT ADDITIVES AND STABILIZATION CHEMICALS (TYPICALLY MAGNESIUM CHLORIDE, CALCIUM CHLORIDE SALTS, OR LIGNINSULFONATE) WILL NOT BE APPLIED WITHIN 25 FEET OF WATER OR STREAM CHANNELS AND WILL BE APPLIED SO AS TO MINIMIZE THE LIKELIHOOD THAT THEY WILL ENTER STREAMS. APPLICATIONS OF LIGNINSULFONATE WILL BE LIMITED TO A MAXIMUM RATE OF 0.5 GALLONS PER SQUARE YARD OF ROAD SURFACE, ASSUMING A 50:50 (LIGNINSULFONATE TO WATER) SOLUTION.
- C) APPLICATION OF DUST ABATEMENT CHEMICALS WILL BE AVOIDED DURING OR JUST BEFORE WET WEATHER, AND AT STREAM CROSSINGS OR OTHER AREAS THAT COULD RESULT IN UNFILTERED DELIVERY OF THE DUST ABATEMENT MATERIALS TO A WATERBODY (TYPICALLY THESE WOULD BE AREAS WITHIN 25 FEET OF A WATERBODY OR STREAM CHANNEL; DISTANCES MAY BE GREATER WHERE VEGETATION IS SPARSE OR SLOPES ARE STEEP).
- D) SPILL CONTAINMENT EQUIPMENT WILL BE AVAILABLE DURING APPLICATION OF DUST ABATEMENT CHEMICALS.
- E) PETROLEUM-BASED PRODUCTS WILL NOT BE USED FOR DUST ABATEMENT.

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

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

- B) WRITTEN PROCEDURES FOR NOTIFYING ENVIRONMENTAL RESPONSE AGENCIES WILL BE POSTED AT THE WORK SITE.
- C) SPILL CONTAINMENT KITS (INCLUDING INSTRUCTIONS FOR CLEANUP AND DISPOSAL) ADEQUATE FOR THE TYPES AND QUANTITY OF HAZARDOUS MATERIAL USED AT THE SITE WILL BE AVAILABLE AT THE WORK SITE.
- D) WORKERS WILL BE TRAINED IN SPILL CONTAINMENT PROCEDURES AND WILL BE INFORMED OF THE LOCATION OF SPILL CONTAINMENT KITS.
- E) ANY WASTE LIQUIDS GENERATED AT THE STAGING AREAS WILL BE TEMPORARILY STORED UNDER AN IMPERVIOUS COVER, SUCH AS A TARPAULIN, UNTIL THEY CAN BE PROPERLY TRANSPORTED TO AND DISPOSED OF AT A FACILITY THAT IS APPROVED FOR RECEIPT OF HAZARDOUS MATERIALS.

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

- A) PRIOR TO ENTERING THE SITE, ALL VEHICLES AND EQUIPMENT WILL BE POWER-WASHED, ALLOWED TO FULLY DRY, AND INSPECTED TO MAKE SURE NO PLANTS, SOIL, OR OTHER ORGANIC MATERIAL ADHERES TO THE SURFACE.
- B) WATERCRAFT, WADERS, BOOTS, AND ANY OTHER GEAR TO BE USED IN OR NEAR WATER WILL BE INSPECTED FOR AQUATIC INVASIVE SPECIES. WADING BOOTS WITH FELT SOLES ARE NOT TO BE USED DUE TO THEIR PROPENSITY FOR AIDING IN THE TRANSFER OF INVASIVE SPECIES.

WORK AREA ISOLATION & FISH SALVAGE:

ANY WORK AREA WITHIN THE WETTED CHANNEL WILL BE ISOLATED FROM THE ACTIVE STREAM WHENEVER ESA-LISTED FISH ARE REASONABLY CERTAIN TO BE PRESENT, OR IF THE WORK AREA IS LESS THAN 300-FOOT UPSTREAM FROM KNOWN SPAWNING HABITATS. WORK AREA ISOLATION & FISH SALVAGE ACTIVITIES ARE CONSIDERED INCIDENTAL TO CONSTRUCTION-RELATED ACTIVITIES AND SHALL OCCUR DURING THE STATE-RECOMMENDED IN-WATER WORK WINDOWS.

WHEN WORK AREA ISOLATION IS REQUIRED, DESIGN PLANS WILL INCLUDE ALL ISOLATION ELEMENTS, FISH RELEASE AREAS, AND, WHEN A PUMP IS USED TO DEWATER THE ISOLATION AREA AND FISH ARE PRESENT, A FISH SCREEN THAT MEETS NMFS'S FISH SCREEN CRITERIA (NMFS 20112, OR MOST CURRENT). WORK AREA ISOLATION AND FISH CAPTURE ACTIVITIES WILL OCCUR DURING PERIODS OF THE COOLEST AIR AND WATER TEMPERATURES POSSIBLE, NORMALLY EARLY IN THE MORNING VERSUS LATE IN THE DAY, AND DURING CONDITIONS APPROPRIATE TO MINIMIZE STRESS AND DEATH OF SPECIES PRESENT.

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

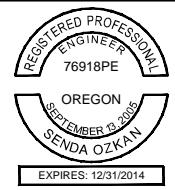
SALVAGE OPERATIONS WILL FOLLOW THE ORDERING, METHODOLOGIES, AND CONSERVATION MEASURES SPECIFIED BELOW IN STEPS 1 THROUGH 6. STEPS 1 AND 2 WILL BE IMPLEMENTED FOR ALL PROJECTS WHERE WORK AREA ISOLATION IS NECESSARY ACCORDING TO CONDITIONS ABOVE. ELECTROFISHING (STEP 3) CAN BE IMPLEMENTED TO ENSURE ALL FISH HAVE BEEN REMOVED FOLLOWING STEPS 1 AND 2, OR WHEN OTHER MEANS OF FISH CAPTURE MAY NOT BE FEASIBLE OR EFFECTIVE. DEWATERING AND REWATERING (STEPS 4 AND 5) WILL BE IMPLEMENTED UNLESS WETTED INSTREAM WORK IS DEEMED TO BE MINIMALLY HARMFUL TO FISH, AND IS BENEFICIAL TO OTHER AQUATIC SPECIES. DEWATERING WILL NOT BE CONDUCTED IN AREAS KNOWN TO BE OCCUPIED BY LAMPREY, UNLESS LAMPREYS ARE SALVAGED USING GUIDANCE SET FORTH IN USFWS 20103.

STEP 1: ISOLATE:

- A) BLOCK NETS WILL BE INSTALLED AT UPSTREAM AND DOWNSTREAM LOCATIONS AND MAINTAINED IN A SECURED POSITION TO EXCLUDE FISH FROM ENTERING THE PROJECT AREA.
- B) BLOCK NETS WILL BE SECURED TO THE STREAM CHANNEL BED AND BANKS UNTIL FISH CAPTURE AND TRANSPORT ACTIVITIES ARE COMPLETE. BLOCK NETS MAY BE LEFT IN PLACE FOR THE DURATION OF THE PROJECT TO EXCLUDE FISH.
- C) IF BLOCK NETS REMAIN IN PLACE MORE THAN ONE DAY, THE NETS WILL BE MONITORED AT LEAST DAILY TO ENSURE THEY ARE SECURED TO THE BANKS AND FREE OF ORGANIC ACCUMULATION. IF THE PROJECT IS WITHIN BULL TROUT SPAWNING AND REARING HABITAT, THE BLOCK NETS MUST BE CHECKED EVERY 4 HOURS FOR FISH IMPINGEMENT ON THE NET. LESS FREQUENT INTERVALS MUST BE APPROVED THROUGH A VARIANCE REQUEST.
- D) NETS WILL BE MONITORED HOURLY ANYTIME THERE IS INSTREAM DISTURBANCE.

NOT FOR CONSTRUCTION

Z:\PROJECTS\164-6507 DESOLATION CREEK\90% DESIGN (EMPTY)\SHEET FILES\COVER_HIP III_GENERAL NOTES - REACH 6.DWG JUN 7, 2017 3:04 PM



REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK UPPER REACH 6 - FINAL DESIGN		DWG. NO.:	G-04
GENERAL NOTES HIP III CONSERVATION METHODS		CREATED:	12/01/16
		SHEET:	4 OF 40

HIP III GENERAL CONSERVATION MEASURES APPLICABLE TO ALL ACTIONS (CONTINUED):

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

- A) REMOVE AS MANY FISH AS POSSIBLE PRIOR TO DEWATERING.
- B) DURING DEWATERING, ANY REMAINING FISH WILL BE COLLECTED BY HAND OR DIP NETS.
- C) SEINES WITH A MESH SIZE TO ENSURE CAPTURE OF THE RESIDING ESA-LISTED FISH WILL BE USED.
- D) MINNOW TRAPS WILL BE LEFT IN PLACE OVERNIGHT AND USED IN CONJUNCTION WITH SEINING.
- E) IF BUCKETS ARE USED TO TRANSPORT FISH:
 - I. THE TIME FISH ARE IN A TRANSPORT BUCKET WILL BE LIMITED, AND WILL BE RELEASED AS QUICKLY AS POSSIBLE;
 - II. THE NUMBER OF FISH WITHIN A BUCKET WILL BE LIMITED BASED ON SIZE, AND FISH WILL BE OF RELATIVELY COMPARABLE SIZE TO MINIMIZE PREDATION;
 - III. AERATORS FOR BUCKETS WILL BE USED OR THE BUCKET WATER WILL BE FREQUENTLY CHANGED WITH COLD CLEAR WATER AT 15 MINUTE OR MORE FREQUENT INTERVALS.
 - IV. BUCKETS WILL BE KEPT IN SHADED AREAS OR WILL BE COVERED BY A CANOPY IN EXPOSED AREAS.
 - V. DEAD FISH WILL NOT BE STORED IN TRANSPORT BUCKETS BUT WILL BE LEFT ON THE STREAMBANK TO AVOID MORTALITY COUNTING ERRORS.
- F) AS RAPIDLY AS POSSIBLE (ESPECIALLY FOR TEMPERATURE-SENSITIVE BULL TROUT), FISH WILL BE RELEASED IN AN AREA THAT PROVIDES ADEQUATE COVER AND FLOW REFUGE. UPSTREAM RELEASE IS GENERALLY PREFERRED, BUT FISH RELEASED DOWNSTREAM WILL BE SUFFICIENTLY OUTSIDE OF THE INFLUENCE OF CONSTRUCTION.
- G) SALVAGE WILL BE SUPERVISED BY A QUALIFIED FISHERIES BIOLOGIST EXPERIENCED WITH WORK AREA ISOLATION AND COMPETENT TO ENSURE THE SAFE HANDLING OF ALL FISH.

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

- A) THE NMFS' ELECTROFISHING GUIDELINES WILL BE USED (NMFS 2004).
- B) INITIAL SITE SURVEYS AND EQUIPMENT SETTINGS
 - I. IN ORDER TO AVOID CONTACT WITH SPAWNING ADULTS OR ACTIVE REDDS, RESEARCHERS MUST CONDUCT A CAREFUL VISUAL SURVEY OF THE AREA TO BE SAMPLED BEFORE BEGINNING ELECTROFISHING.
 - II. PRIOR TO THE START OF SAMPLING AT A NEW LOCATION, WATER TEMPERATURE AND CONDUCTIVITY MEASUREMENTS SHALL BE TAKEN TO EVALUATE ELECTROFISHER SETTINGS AND ADJUSTMENTS. NO ELECTROFISHING SHOULD OCCUR WHEN WATER TEMPERATURES ARE ABOVE 18°C OR ARE EXPECTED TO RISE ABOVE THIS TEMPERATURE PRIOR TO CONCLUDING THE ELECTROFISHING SURVEY. IN ADDITION, STUDIES BY NMFS SCIENTISTS INDICATE THAT NO ELECTROFISHING SHOULD OCCUR IN CALIFORNIA COASTAL BASINS WHEN CONDUCTIVITY IS ABOVE 350 MS/CM.
 - III. WHENEVER POSSIBLE, A BLOCK NET SHOULD BE PLACED BELOW THE AREA BEING SAMPLED TO CAPTURE STUNNED FISH THAT MAY DRIFT DOWNSTREAM.
 - IV. EQUIPMENT MUST BE IN GOOD WORKING CONDITION AND OPERATORS SHOULD GO THROUGH THE MANUFACTURER'S PRESEASON CHECKS, ADHERE TO ALL PROVISIONS, AND RECORD MAJOR MAINTENANCE WORK IN A LOGBOOK.
 - V. EACH ELECTROFISHING SESSION MUST START WITH ALL SETTINGS (VOLTAGE, PULSE WIDTH, AND PULSE RATE) SET TO THE MINIMUMS NEEDED TO CAPTURE FISH. THESE SETTINGS SHOULD BE GRADUALLY INCREASED ONLY TO THE POINT WHERE FISH ARE IMMOBILIZED AND CAPTURED, AND GENERALLY NOT ALLOWED TO EXCEED CONDUCTIVITY-BASED MAXIMA (TABLE 1). ONLY DIRECT CURRENT (DC) OR PULSED DIRECT CURRENT (PDC) SHOULD BE USED.
- B) ELECTROFISHING TECHNIQUE
 - I. SAMPLING SHOULD BEGIN USING STRAIGHT DC. THE POWER NEEDS TO REMAIN ON UNTIL THE FISH IS NETTED WHEN USING STRAIGHT DC. IF FISH CAPTURE IS UNSUCCESSFUL WITH INITIAL LOW VOLTAGE, GRADUALLY INCREASE VOLTAGE SETTINGS WITH STRAIGHT DC.
 - II. IF FISH CAPTURE IS NOT SUCCESSFUL WITH THE USE OF STRAIGHT DC, THEN SET THE ELECTROFISHER TO LOWER VOLTAGES WITH PDC. IF FISH CAPTURE IS UNSUCCESSFUL WITH LOW VOLTAGES, INCREASE PULSE WIDTH, VOLTAGE, AND PULSE FREQUENCY (DURATION, AMPLITUDE, AND FREQUENCY).
 - III. ELECTROFISHING SHOULD BE PERFORMED IN A MANNER THAT MINIMIZES HARM TO THE FISH. STREAM SEGMENTS SHOULD BE SAMPLED SYSTEMATICALLY, MOVING THE ANODE CONTINUOUSLY IN A HERRINGBONE PATTERN (WHERE FEASIBLE) THROUGH THE WATER. CARE SHOULD BE TAKEN WHEN FISHING IN AREAS WITH HIGH FISH CONCENTRATIONS, STRUCTURE (E.G., WOOD, UNDERCUT BANKS) AND IN SHALLOW WATERS WHERE MOST BACKPACK ELECTROFISHING FOR JUVENILE SALMONIDS OCCURS. VOLTAGE GRADIENTS MAY BE HIGH WHEN ELECTRODES ARE IN SHALLOW WATER WHERE BOUNDARY LAYERS (WATER

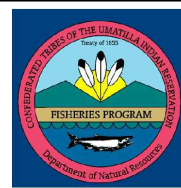
SURFACE AND SUBSTRATE) TEND TO INTENSIFY THE ELECTRICAL FIELD.

- IV. DO NOT ELECTROFISH IN ONE LOCATION FOR AN EXTENDED PERIOD (E.G., UNDERCUT BANKS) AND REGULARLY CHECK BLOCK NETS FOR IMMOBILIZED FISH.
 - V. FISH SHOULD NOT MAKE CONTACT WITH THE ANODE. THE ZONE OF POTENTIAL INJURY FOR FISH IS 0.5 M FROM THE ANODE.
 - VI. ELECTROFISHING CREWS SHOULD BE GENERALLY OBSERVANT OF THE CONDITION OF THE FISH AND CHANGE OR TERMINATE SAMPLING WHEN EXPERIENCING PROBLEMS WITH FISH RECOVERY TIME, BANDING, INJURY, MORTALITY, OR OTHER INDICATIONS OF FISH STRESS.
 - VII. NETTERS SHOULD NOT ALLOW THE FISH TO REMAIN IN THE ELECTRICAL FIELD ANY LONGER THAN NECESSARY BY REMOVING STUNNED FISH FROM THE WATER IMMEDIATELY AFTER NETTING.
- C) SAMPLE PROCESSING AND RECORDKEEPING
- I. FISH SHOULD BE PROCESSED AS SOON AS POSSIBLE AFTER CAPTURE TO MINIMIZE STRESS. THIS MAY REQUIRE A LARGER CREW SIZE.
 - II. ALL SAMPLING PROCEDURES MUST HAVE A PROTOCOL FOR PROTECTING HELD FISH. SAMPLERS MUST BE AWARE OF THE CONDITIONS IN THE CONTAINERS HOLDING FISH; AIR PUMPS, WATER TRANSFERS, ETC., SHOULD BE USED AS NECESSARY TO MAINTAIN SAFE CONDITIONS. ALSO, LARGE FISH SHOULD BE KEPT SEPARATE FROM SMALLER PREY-SIZED FISH TO AVOID PREDATION DURING CONTAINMENT.
 - III. USE OF AN APPROVED ANESTHETIC CAN REDUCE FISH STRESS AND IS RECOMMENDED, PARTICULARLY IF ADDITIONAL HANDLING OF FISH IS REQUIRED (E.G., LENGTH AND WEIGHT MEASUREMENTS, SCALE SAMPLES, FIN CLIPS, TAGGING).
 - IV. FISH SHOULD BE HANDLED PROPERLY (E.G., WETTING MEASURING BOARDS, NOT OVERCROWDING FISH IN BUCKETS, ETC.).
 - V. FISH SHOULD BE OBSERVED FOR GENERAL CONDITION AND INJURIES (E.G., INCREASED RECOVERY TIME, DARK BANDS, VISUALLY OBSERVABLE SPINAL INJURIES). EACH FISH SHOULD BE COMPLETELY REVIVED BEFORE RELEASING AT THE LOCATION OF CAPTURE. A PLAN FOR ACHIEVING EFFICIENT RETURN TO APPROPRIATE HABITAT SHOULD BE DEVELOPED BEFORE EACH SAMPLING SESSION. ALSO, EVERY ATTEMPT SHOULD BE MADE TO PROCESS AND RELEASE ESA-LISTED SPECIMENS FIRST.
 - VI. PERTINENT WATER QUALITY (E.G., CONDUCTIVITY AND TEMPERATURE) AND SAMPLING NOTES (E.G., SHOCKER SETTINGS, FISH CONDITION/INJURIES/MORTALITIES) SHOULD BE RECORDED IN A LOGBOOK TO IMPROVE TECHNIQUE AND HELP TRAIN NEW OPERATORS. IT IS IMPORTANT TO NOTE THAT RECORDS OF INJURIES OR MORTALITIES PERTAIN TO THE ENTIRE ELECTROFISHING SURVEY, INCLUDING THE FISH SAMPLE WORK-UP.
 - VII. THE ANODE WILL NOT INTENTIONALLY CONTACT FISH.
 - VIII. ELECTROFISHING SHALL NOT BE CONDUCTED WHEN THE WATER CONDITIONS ARE TURBID AND VISIBILITY IS POOR. THIS CONDITION MAY BE EXPERIENCED WHEN THE SAMPLER CANNOT SEE THE STREAM BOTTOM IN ONE FOOT OF WATER.
 - IX. IF MORTALITY OR OBVIOUS INJURY (DEFINED AS DARK BANDS ON THE BODY, SPINAL DEFORMATIONS, DE-SCALING OF 25% OR MORE OF BODY, AND TORPIDITY OR INABILITY TO MAINTAIN UPRIGHT ATTITUDE AFTER SUFFICIENT RECOVERY TIME) OCCURS DURING ELECTROFISHING, OPERATIONS WILL BE IMMEDIATELY DISCONTINUED, MACHINE SETTINGS, WATER TEMPERATURE, AND CONDUCTIVITY CHECKED, AND PROCEDURES ADJUSTED OR ELECTROFISHING POSTPONED IN ORDER TO REDUCE MORTALITY.

	INITIAL SETTINGS	MAXIMUM SETTINGS		NOTES
VOLTAGE	100 V	CONDUCTIVITY (µS/cm)	MAX. VOLTAGE	IN CALIFORNIA COASTAL BASINS, SETTINGS SHOULD NEVER EXCEED 400 VOLTS. ALSO, NO ELECTROFISHING SHOULD OCCUR IN THESE BASINS IF CONDUCTIVITY IS GREATER THAN 350 µS/cm.
		100	1100 V	
		100 - 300	800 V	
		> 300	400 V	
PULSE WIDTH	500 µs	5 ms		
PULSE RATE	30 Hz	70 Hz		IN GENERAL, EXCEEDING 40 Hz WILL INJURE MORE FISH.

NOT FOR CONSTRUCTION

Z:\PROJECTS\194-6507 DESOLATION CREEK\90% DESIGN (EMPTY)\SHEET FILES\COVER_HIP III_GENERAL NOTES - REACH 6.DWG JUN 7, 2017 3:06 PM



REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK UPPER REACH 6 - FINAL DESIGN

GENERAL NOTES
HIP III CONSERVATION METHODS

DWG. NO.: **G-05**

CREATED: 12/01/16

SHEET: 5 OF 40

HIP III GENERAL CONSERVATION MEASURES APPLICABLE TO ALL ACTIONS (CONTINUED):

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

- A) DIVERSION AROUND THE CONSTRUCTION SITE MAY BE ACCOMPLISHED WITH A COFFER DAM AND A BY-PASS CULVERT OR PIPE, OR A LINED, NON-ERODIBLE DIVERSION DITCH. WHERE GRAVITY FEED IS NOT POSSIBLE, A PUMP MAY BE USED, BUT MUST BE OPERATED IN SUCH A WAY AS TO AVOID REPETITIVE DEWATERING AND REWATERING OF THE SITE. IMPOUNDMENT BEHIND THE COFFERDAM MUST OCCUR SLOWLY THROUGH TRANSITION, WHILE CONSTANT FLOW IS DELIVERED TO THE DOWNSTREAM REACHES.
- B) ALL PUMPS WILL HAVE FISH SCREENS TO AVOID JUVENILE FISH IMPINGEMENT OR ENTRAINMENT, AND WILL BE OPERATED IN ACCORDANCE WITH CURRENT NMFS FISH SCREEN CRITERIA. IF THE PUMPING RATE EXCEEDS 3 CUBIC FEET PER SECOND, A NMFS HYDRO FISH PASSAGE REVIEW WILL BE NECESSARY.
- C) DISSIPATION OF FLOW ENERGY AT THE BYPASS OUTFLOW WILL BE PROVIDED TO PREVENT DAMAGE TO RIPARIAN VEGETATION OR STREAM CHANNEL.
- D) SAFE REENTRY OF FISH INTO THE STREAM CHANNEL WILL BE PROVIDED, PREFERABLY INTO POOL HABITAT WITH COVER, IF THE DIVERSION ALLOWS FOR DOWNSTREAM FISH PASSAGE.
- E) SEEPAGE WATER WILL BE PUMPED TO A TEMPORARY STORAGE AND TREATMENT SITE OR INTO UPLAND AREAS TO ALLOW WATER TO PERCOLATE THROUGH SOIL OR TO FILTER THROUGH VEGETATION PRIOR TO REENTERING THE STREAM CHANNEL.

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

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

CONSTRUCTION AND DISCHARGE WATER:

- A) SURFACE WATER MAY BE DIVERTED TO MEET CONSTRUCTION NEEDS, BUT ONLY IF DEVELOPED SOURCES ARE UNAVAILABLE OR INADEQUATE.
- B) DIVERSIONS WILL NOT EXCEED 10% OF THE AVAILABLE FLOW.
- C) ALL CONSTRUCTION DISCHARGE WATER WILL BE COLLECTED AND TREATED USING THE BEST AVAILABLE TECHNOLOGY APPLICABLE TO SITE CONDITIONS.
- D) TREATMENTS TO REMOVE DEBRIS, NUTRIENTS, SEDIMENT, PETROLEUM HYDROCARBONS, METALS AND OTHER POLLUTANTS LIKELY TO BE PRESENT WILL BE PROVIDED.

MINIMIZE TIME AND EXTENT OF DISTURBANCE: EARTHWORK (INCLUDING DRILLING, EXCAVATION, DREDGING, FILLING AND COMPACTING) IN WHICH MECHANIZED EQUIPMENT IS IN STREAM CHANNELS, RIPARIAN AREAS, AND WETLANDS WILL BE COMPLETED AS QUICKLY AS POSSIBLE. MECHANIZED EQUIPMENT WILL BE USED IN STREAMS ONLY WHEN PROJECT SPECIALISTS BELIEVE THAT SUCH ACTIONS ARE THE ONLY REASONABLE ALTERNATIVE FOR IMPLEMENTATION, OR WOULD RESULT IN LESS SEDIMENT IN THE STREAM CHANNEL OR DAMAGE (SHORT- OR LONG-TERM) TO THE OVERALL AQUATIC AND RIPARIAN ECOSYSTEM RELATIVE TO OTHER ALTERNATIVES. TO THE EXTENT FEASIBLE, MECHANIZED EQUIPMENT WILL WORK FROM THE TOP OF THE BANK, UNLESS WORK FROM ANOTHER LOCATION WOULD RESULT IN LESS HABITAT DISTURBANCE.

CESSATION OF WORK: PROJECT OPERATIONS WILL CEASE UNDER THE FOLLOWING CONDITIONS:

- A) HIGH FLOW CONDITIONS THAT MAY RESULT IN INUNDATION OF THE PROJECT AREA, EXCEPT FOR EFFORTS TO AVOID OR MINIMIZE RESOURCE DAMAGE;
- B) WHEN ALLOWABLE WATER QUALITY IMPACTS, AS DEFINED BY THE STATE CWA SECTION 401 WATER QUALITY CERTIFICATION, HAVE BEEN EXCEEDED; OR
- C) WHEN "INCIDENTAL TAKE" LIMITATIONS HAVE BEEN REACHED OR EXCEEDED.

SITE RESTORATION: WHEN CONSTRUCTION IS COMPLETE:

- A) ALL STREAMBANKS, SOILS, AND VEGETATION WILL BE CLEANED UP AND RESTORED AS NECESSARY USING STOCKPILED LARGE WOOD, TOPSOIL, AND NATIVE CHANNEL MATERIAL.

- B) ALL PROJECT RELATED WASTE WILL BE REMOVED.
- C) ALL TEMPORARY ACCESS ROADS, CROSSINGS, AND STAGING AREAS WILL BE OBLITERATED. WHEN NECESSARY FOR REVEGETATION AND INFILTRATION OF WATER, COMPACTED AREAS OF SOIL WILL BE LOOSENEED.
- C) ALL DISTURBED AREAS WILL BE REHABILITATED IN A MANNER THAT RESULTS IN SIMILAR OR IMPROVED CONDITIONS RELATIVE TO PRE-PROJECT CONDITIONS. THIS WILL BE ACHIEVED THROUGH REDISTRIBUTION OF STOCKPILED MATERIALS, SEEDING, AND/OR PLANTING WITH LOCAL NATIVE SEED MIXES OR PLANTS.

REVEGETATION: LONG-TERM SOIL STABILIZATION OF THE DISTURBED SITE WILL BE ACCOMPLISHED WITH RE-ESTABLISHMENT OF NATIVE VEGETATION USING THE FOLLOWING CRITERIA:

- A) PLANTING AND SEEDING WILL OCCUR PRIOR TO OR AT THE BEGINNING OF THE FIRST GROWING SEASON AFTER CONSTRUCTION.
- B) AN APPROPRIATE MIX OF SPECIES THAT WILL ACHIEVE ESTABLISHMENT, SHADE, AND EROSION CONTROL OBJECTIVES, PREFERABLY FORB, GRASS, SHRUB, OR TREE SPECIES NATIVE TO THE PROJECT AREA OR REGION AND APPROPRIATE TO THE SITE WILL BE USED.
- C) VEGETATION, SUCH AS WILLOW, SEDGE AND RUSH MATS, WILL BE SALVAGED FROM DISTURBED OR ABANDONED FLOODPLAINS, STREAM CHANNELS, OR WETLANDS.
- D) INVASIVE SPECIES WILL NOT BE USED.
- E) SHORT-TERM STABILIZATION MEASURES MAY INCLUDE THE USE OF NON-NATIVE STERILE SEED MIX (WHEN NATIVE SEEDS ARE NOT AVAILABLE), WEED-FREE CERTIFIED STRAW, JUTE MATTING, AND OTHER SIMILAR TECHNIQUES.
- F) SURFACE FERTILIZER WILL NOT BE APPLIED WITHIN 50 FEET OF ANY STREAM CHANNEL, WATERBODY, OR WETLAND.
- G) FENCING WILL BE INSTALLED AS NECESSARY TO PREVENT ACCESS TO REVEGETATED SITES BY LIVESTOCK OR UNAUTHORIZED PERSONS.
- H) RE-ESTABLISHMENT OF VEGETATION IN DISTURBED AREAS WILL ACHIEVE AT LEAST 70% OF PRE-PROJECT CONDITIONS WITHIN 3-YEARS.
- I) INVASIVE PLANTS WILL BE REMOVED OR CONTROLLED UNTIL NATIVE PLANT SPECIES ARE WELL ESTABLISHED (TYPICALLY 3-YEARS POST-CONSTRUCTION).

SITE ACCESS: THE PROJECT SPONSOR WILL RETAIN THE RIGHT OF REASONABLE ACCESS TO THE SITE IN ORDER TO MONITOR THE SUCCESS OF THE PROJECT OVER ITS LIFE.

IMPLEMENTATION MONITORING: PROJECT SPONSOR STAFF OR THEIR DESIGNATED REPRESENTATIVE WILL PROVIDE IMPLEMENTATION MONITORING TO ENSURE COMPLIANCE WITH THE APPLICABLE BIOLOGICAL OPINION, INCLUDING:

- A) GENERAL CONSERVATION MEASURES ARE ADEQUATELY FOLLOWED; AND
- B) EFFECTS TO LISTED SPECIES ARE NOT GREATER THAT PREDICTED AND INCIDENTAL TAKE LIMITATIONS ARE NOT EXCEEDED.

CWA SECTION 401 WATER QUALITY CERTIFICATION: THE PROJECT SPONSOR OR DESIGNATED REPRESENTATIVE WILL COMPLETE AND RECORD WATER QUALITY OBSERVATIONS TO ENSURE THAT IN-WATER WORK IS NOT DEGRADING WATER QUALITY. DURING CONSTRUCTION, CWA SECTION 401 WATER QUALITY CERTIFICATION PROVISIONS PROVIDED BY THE OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY, WASHINGTON DEPARTMENT OF ECOLOGY, OR IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY WILL BE FOLLOWED.

STAGED REWATERING PLAN: SEE STAGED REWATERING PLAN SHEETS, IF APPLICABLE.

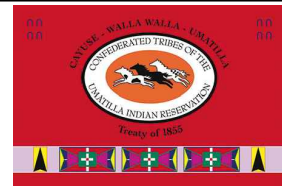
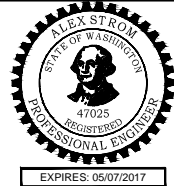
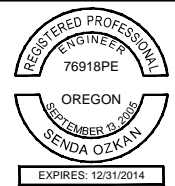
VARIANCE REQUESTS: BECAUSE OF THE WIDE RANGE OF PROPOSED ACTIVITIES AND THE NATURAL VARIABILITY WITHIN AND BETWEEN STREAM SYSTEMS, BPA (ON BEHALF OF THE APPLICANT) MAY REQUIRE VARIATIONS FROM CRITERIA SPECIFIED HEREIN. THE SERVICES WILL CONSIDER GRANTING VARIANCES, ESPECIALLY WHEN THERE IS A CLEAR CONSERVATION BENEFIT OR THERE ARE NO ADDITIONAL ADVERSE EFFECTS (ESPECIALLY INCIDENTAL TAKE) BEYOND THAT COVERED BY THE OPINION. MINOR VARIANCES CAN BE AUTHORIZED BY THE NMFS BRANCH CHIEF AND USFWS FIELD OFFICE SUPERVISOR.

VARIANCE REQUESTS MAY BE SUBMITTED AND APPROVED BY EMAIL CORRESPONDENCE AND WILL INCLUDE:

- 1) NAME AND BRIEF DESCRIPTION OF PROJECT, LOCATION OF PROJECT AND 6TH FIELD HUC NUMBER.
- 2) DEFINE THE REQUESTED VARIANCE AND THE RELEVANT CRITERION BY PAGE NUMBER.
- 3) CURRENT ENVIRONMENTAL CONDITIONS (CURRENT FLOW AND WEATHER CONDITIONS).
- 4) BIOLOGICAL JUSTIFICATION AS TO WHY A VARIANCE IS NECESSARY AND A BRIEF RATIONALE WHY THE VARIANCE WILL EITHER PROVIDE A CONSERVATION BENEFIT OR, AT A MINIMUM, NOT CAUSE ADDITIONAL ADVERSE EFFECTS BEYOND THE SCOPE OF THE OPINION.
- 5) INCLUDE AS ATTACHMENTS ANY NECESSARY APPROVALS BY STATE AGENCIES.

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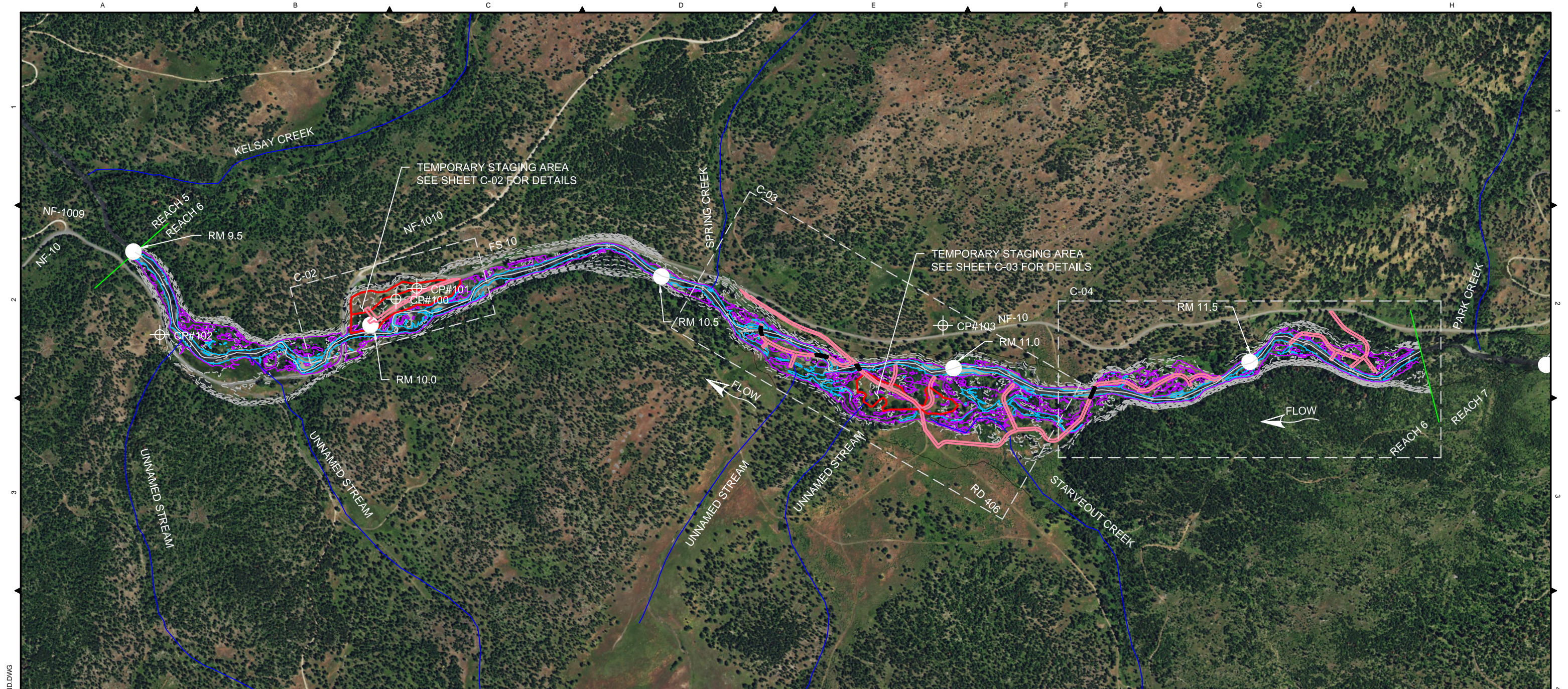


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B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

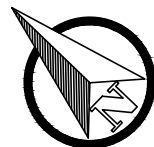
DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN

GENERAL NOTES
HIP III CONSERVATION METHODS

DWG. NO.:	G-06
CREATED:	12/01/16
SHEET:	6 OF 40



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 PLOT DETAILS: STROM, ALEX JUN 7, 2017 3:04 PM T:\BOTHMAN\GLO\OR\018



CONTROL POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP 100	461817.0	8635347.5	4075.0	PROJ CTRL
CP 101	461756.2	8635531.5	4074.8	PROJ CTRL
CP 102	462992.9	8633752.5	4067.1	PROJ CTRL
CP 103	458451.6	8638403.0	4191.5	PROJ CTRL

- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - - - SHEET BOUNDARY
 - EXISTING BANKFULL FLOW
 - EXISTING 100-YR FLOW
 - REACH BOUNDARY
 - ⊕ CONTROL POINT
 - TEMPORARY ACCESS ROUTE
 - TEMPORARY STREAM CROSSING
 - TEMPORARY STAGING AREA

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REGISTERED PROFESSIONAL ENGINEER
 76918PE
 OREGON
 SEPTEMBER 13, 2008
 SENDA OZKAN
 EXPIRES: 12/31/2014

ALEX STROM
 STATE OF WASHINGTON
 47025
 REGISTERED PROFESSIONAL ENGINEER
 EXPIRES: 05/07/2017

CHUKY, WALKA WALKA, UMATILLA
 CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
 TRIBE OF ASKS

FISHERIES PROGRAM
 UMATILLA INDIAN RESERVATION
 DEPARTMENT OF NATURAL RESOURCES

PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")

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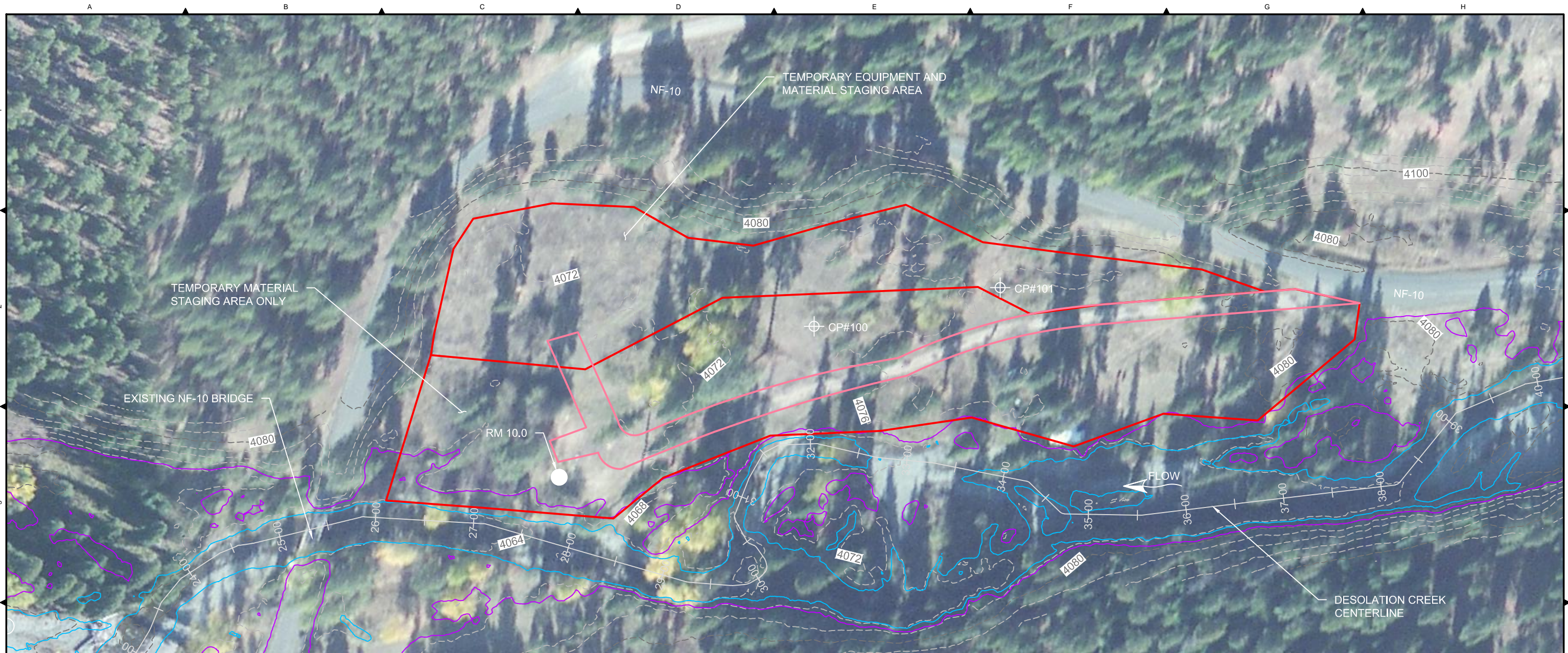
DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN

EXISTING CONDITIONS
 REACH OVERVIEW

DWG. NO.: **C-01**

CREATED: 12/01/16

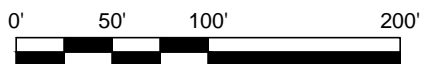
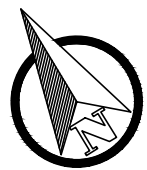
SHEET: 7 OF 40



- NOTES:**
1. TEMPORARY STAGING AREA WITHIN 150 FT OF WATERS EDGE TO BE USED AS MATERIAL STAGING ONLY.
 2. TEMPORARY STAGING AREA GREATER THAN 150 FT FROM WATERS EDGE MAY BE USED AS EQUIPMENT AND MATERIALS STORAGE AREAS.
 3. TEMPORARY ACCESS ROUTES SHOWN ON PLANS ARE PRELIMINARY. FINAL TEMPORARY ACCESS ROUTES SHALL BE CONFIRMED BY OWNER PRIOR TO BEGINNING CONSTRUCTION.
 4. TEMPORARY ACCESS ROUTES SHALL BE CONSTRUCTED PER DETAIL ON SHEET C-107 AND SECTION 01 55 13 OF THE PROJECT SPECIFICATIONS.
 5. TEMPORARY STREAM CROSSING LOCATIONS SHALL BE APPROVED BY THE OWNER PRIOR TO USE.
 6. THE NUMBER OF STREAM CROSSINGS WITH CONSTRUCTION EQUIPMENT SHALL BE MINIMIZED TO THE EXTENT PRACTICAL.

CONTROL POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
CP 100	461817.0	8635347.5	4075.0	PROJ CTRL
CP 101	461756.2	8635531.5	4074.8	PROJ CTRL

- LEGEND:**
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 - EXISTING CONTOUR - MINOR 1FT
 - - - SHEET BOUNDARY
 - EXISTING BANKFULL FLOW
 - EXISTING 100-YR FLOW
 - REACH BOUNDARY
 - ⊕ CONTROL POINT
 - TEMPORARY ACCESS ROUTE
 - TEMPORARY STREAM CROSSING
 - TEMPORARY STAGING AREA



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CHWANA WALLE WALLE UMATILLA
 CONSOLIDATED TRIBES OF THE
 UMATILLA INDIAN RESERVATION
 Treaty of 1855
 TRUSTEES OF AS&S

CONFEDERATED TRIBES OF THE UMATILLA
 FISHERIES PROGRAM
 Department of Natural Resources

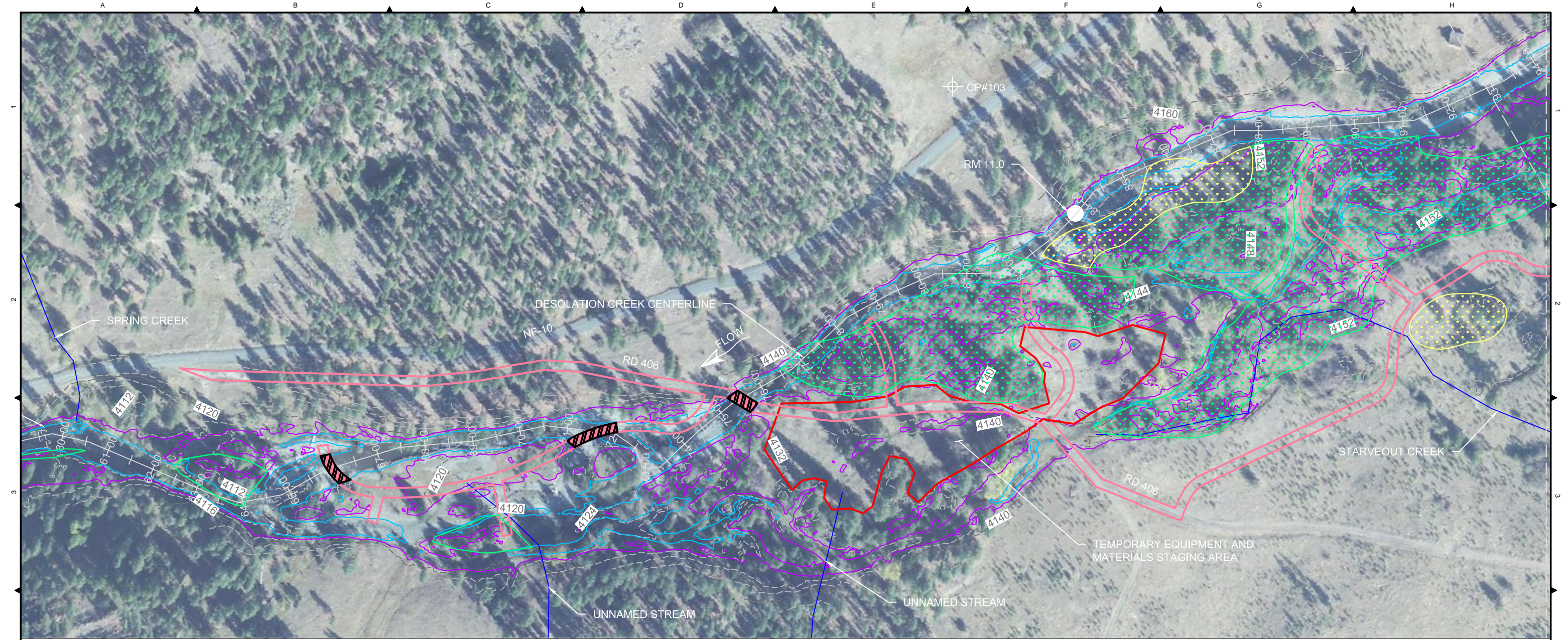
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DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN

EXISTING CONDITIONS
 TEMPORARY ACCESS & STAGING

DWG. NO.: **C-02**
 CREATED: 12/01/16
 SHEET: 8 OF 40



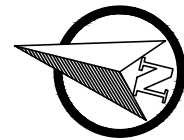
NOTES:

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3. TEMPORARY ACCESS ROUTES AND STREAM CROSSINGS SHALL BE CONSTRUCTED PER DETAIL ON SHEET C-107 AND SECTION 01 55 13 OF THE PROJECT SPECIFICATIONS.
4. TEMPORARY STREAM CROSSING LOCATIONS USING TEMPORARY CONSTRUCTION BRIDGE SHALL BE APPROVED BY THE OWNER PRIOR TO USE.
5. THE NUMBER OF STREAM CROSSINGS WITH CONSTRUCTION EQUIPMENT SHALL BE MINIMIZED TO THE EXTENT PRACTICAL.

CONTROL POINT TABLE (FT)				
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CP 103	458451.6	8638403.0	4191.5	PROJ CTRL

LEGEND:

- EXISTING CONTOUR - MAJOR 5FT
- EXISTING CONTOUR - MINOR 1FT
- - - SHEET BOUNDARY
- EXISTING BANKFULL FLOW
- EXISTING 100-YR FLOW
- REACH BOUNDARY
- ⊕ CONTROL POINT
- TEMPORARY ACCESS ROUTE
- TEMPORARY STREAM CROSSING
- TEMPORARY STAGING AREA
- PSS1A WETLAND
- PEM1A WETLAND



NOT FOR CONSTRUCTION

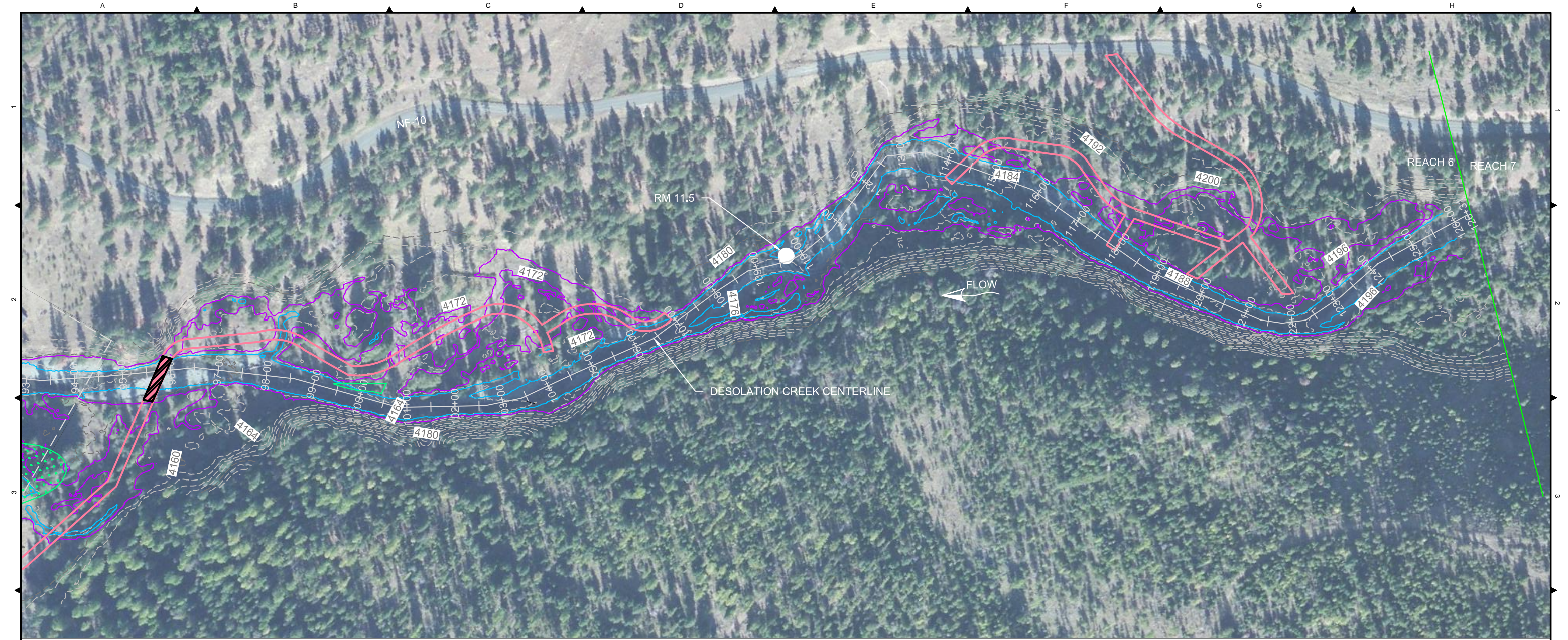
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DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN
EXISTING CONDITIONS
TEMPORARY ACCESS & STAGING

DWG. NO.: **C-03**
CREATED: 12/01/16
SHEET: 9 OF 40

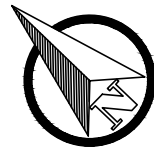


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4. THE NUMBER OF STREAM CROSSINGS WITH CONSTRUCTION EQUIPMENT SHALL BE MINIMIZED TO THE EXTENT PRACTICAL.

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- EXISTING 100-YR FLOW
- REACH BOUNDARY
- ⊕ CONTROL POINT
- ▨ TEMPORARY ACCESS ROUTE
- ▨ TEMPORARY STREAM CROSSING
- ▨ TEMPORARY STAGING AREA
- ▨ PSS1A WETLAND



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 EXPIRES: 05/07/2017

CULTURE, WALLE, WALLA, UMATILLA
 CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
 TRIBE OF ASIA

FISHERIES PROGRAM
 UMATILLA INDIAN RESERVATION
 Department of Natural Resources

PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")

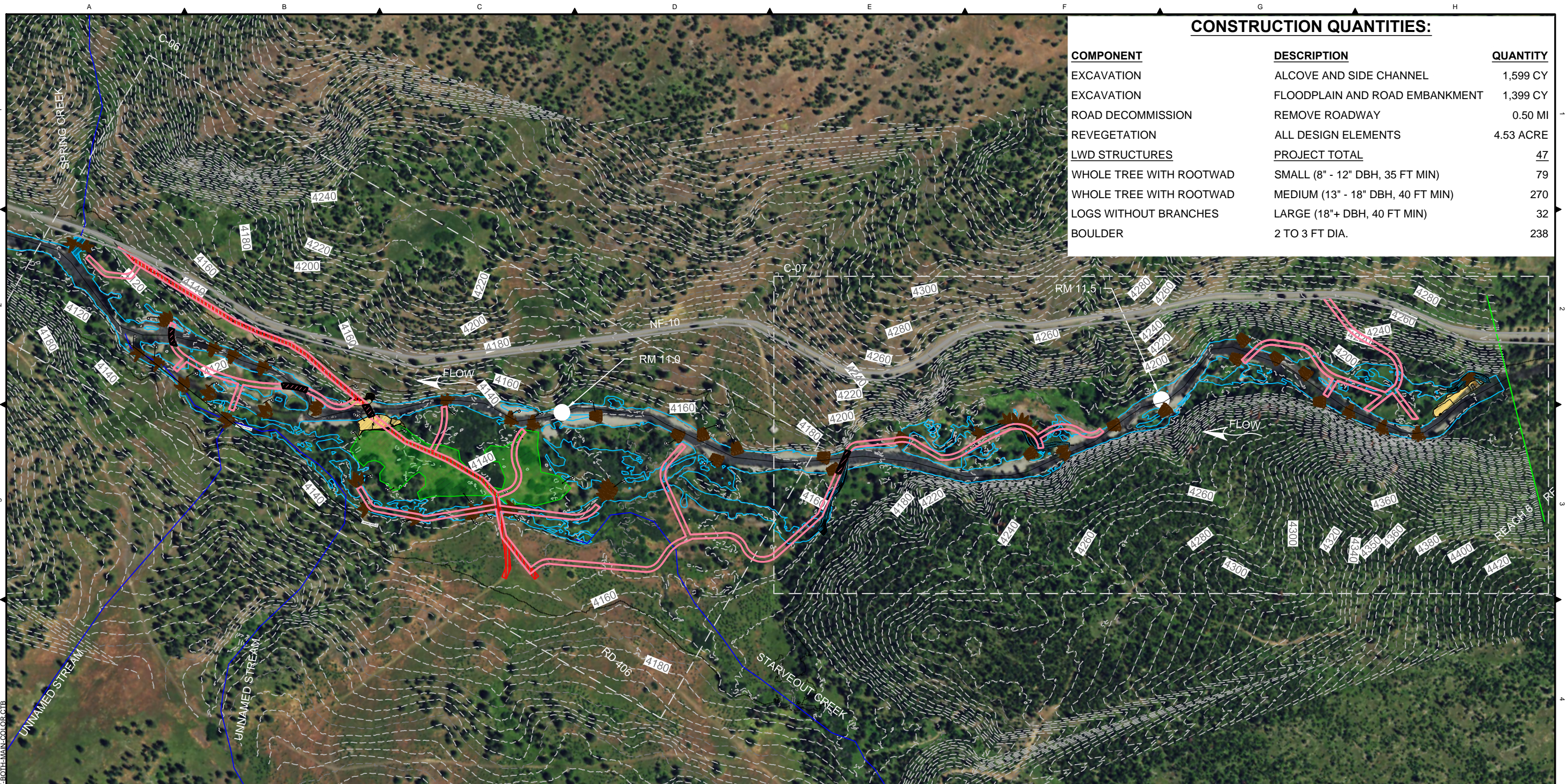
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DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN
EXISTING CONDITIONS
 TEMPORARY ACCESS & STAGING

DWG. NO.: **C-04**
 CREATED: 12/01/16
 SHEET: 10 OF 40

CONSTRUCTION QUANTITIES:

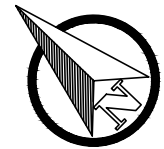
COMPONENT	DESCRIPTION	QUANTITY
EXCAVATION	ALCOVE AND SIDE CHANNEL	1,599 CY
EXCAVATION	FLOODPLAIN AND ROAD EMBANKMENT	1,399 CY
ROAD DECOMMISSION	REMOVE ROADWAY	0.50 MI
REVEGETATION	ALL DESIGN ELEMENTS	4.53 ACRE
LWD STRUCTURES		PROJECT TOTAL
WHOLE TREE WITH ROOTWAD	SMALL (8" - 12" DBH, 35 FT MIN)	47
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	79
LOGS WITHOUT BRANCHES	LARGE (18"+ DBH, 40 FT MIN)	270
BOULDER	LARGE (18"+ DBH, 40 FT MIN)	32
	2 TO 3 FT DIA.	238



LEGEND:

- EXISTING CONTOUR - MAJOR 25FT
- EXISTING CONTOUR - MINOR 5FT
- SHEET BOUNDARY
- PROPOSED 2-YR FLOW
- REACH BOUNDARY
- LWD
- SIDE CHANNEL AND ALCOVE
- EXCAVATION
- FLOODPLAIN EXCAVATION
- FLOODPLAIN ENHANCEMENT
- ROAD DECOMMISSION
- TEMPORARY ACCESS ROUTE
- TEMPORARY STREAM CROSSING

Z:\PROJECTS\194-6507 DESOLATION CREEK\90% DESIGN (EMPTY)\SHEET FILES\REACH 6 - PROP OVERVIEW.DWG
 PLOT DETAILS: STROM, ALEX JUN 7, 2017 3:04 PM



NOT FOR CONSTRUCTION

TETRA TECH
 www.tetrattech.com
 19803 North Creek Parkway
 Bothell, Washington 98011
 Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER
 76918PE
 OREGON
 SEPTEMBER 13, 2005
 SENDA OZKAN
 EXPIRES: 12/31/2014

ALEX STROM
 STATE OF WASHINGTON
 47025
 REGISTERED PROFESSIONAL ENGINEER
 EXPIRES: 05/07/2017

CHWANA, WALLA WALLA, UMATILLA
 CONFEDERATED TRIBES OF THE
 UMATILLA INDIAN RESERVATION
 TRIBE OF ASIA

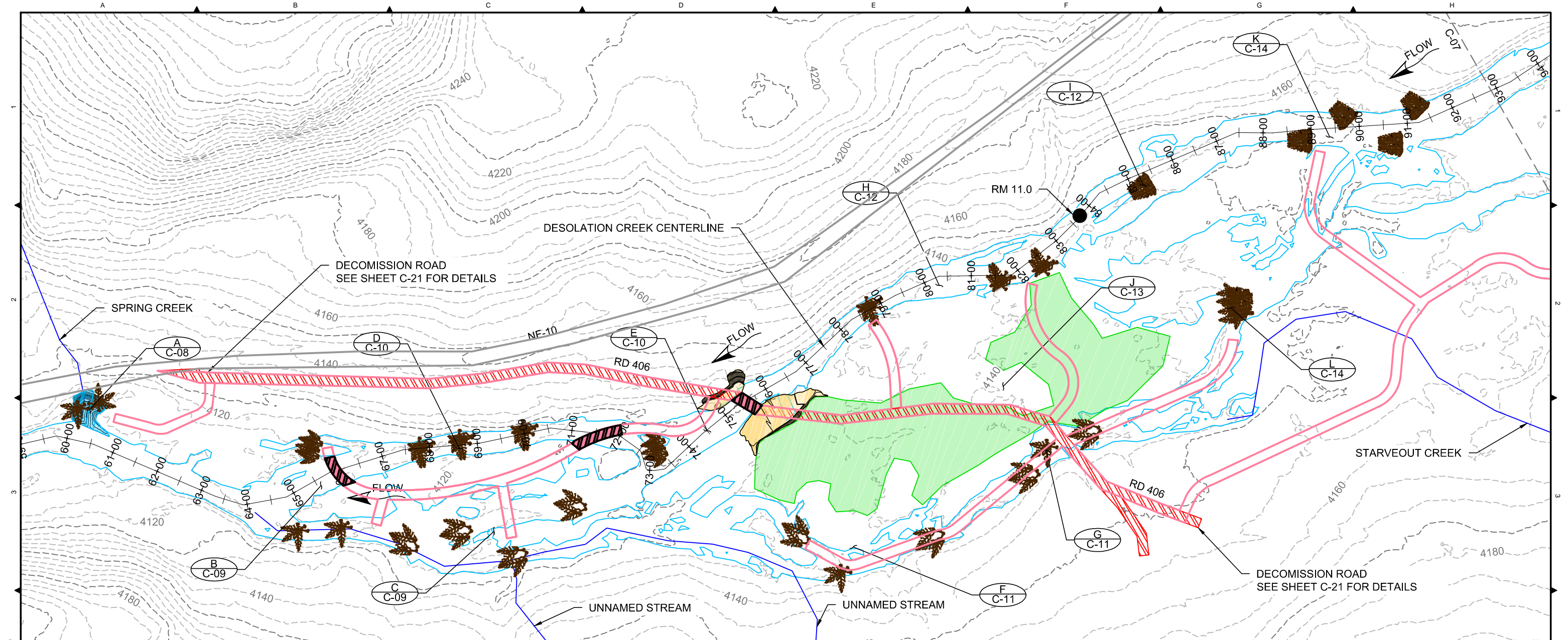
CONFEDERATED TRIBES OF THE UMATILLA
 FISHERIES PROGRAM
 Department of Natural Resources

PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")

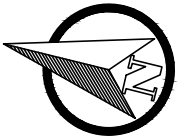
REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN
 PROPOSED DESIGN
 REACH OVERVIEW

DWG. NO.:
C-05
 CREATED: 12/01/16
 SHEET: 11 OF 40



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 PLOT DETAILS: STROM, ALEX JUN 7, 2017 3:05 PM T:\BOTHMAN\COLOR.CTB



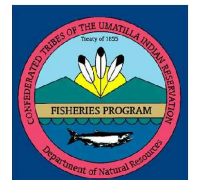
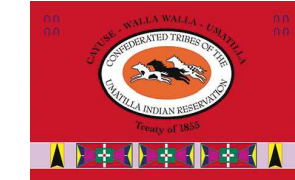
- LEGEND:**
- EXISTING CONTOUR - MAJOR 25FT
 - EXISTING CONTOUR - MINOR 5FT
 - SHEET BOUNDARY
 - PROPOSED 2-YR FLOW
 - REACH BOUNDARY
 - LWD
 - SIDE CHANNEL AND ALCOVE
 - EXCAVATION
 - FLOODPLAIN EXCAVATION
 - FLOODPLAIN ENHANCEMENT
 - ROAD DECOMMISSION
 - TEMPORARY ACCESS ROUTE
 - TEMPORARY STREAM CROSSING

NOT FOR CONSTRUCTION

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REGISTERED PROFESSIONAL ENGINEER
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 OREGON
 SEPTEMBER 9, 2008
 SENDA OZKAN
 EXPIRES: 12/31/2014

ALEX STROM
 STATE OF WASHINGTON
 47025
 REGISTERED PROFESSIONAL ENGINEER
 EXPIRES: 05/07/2017



PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

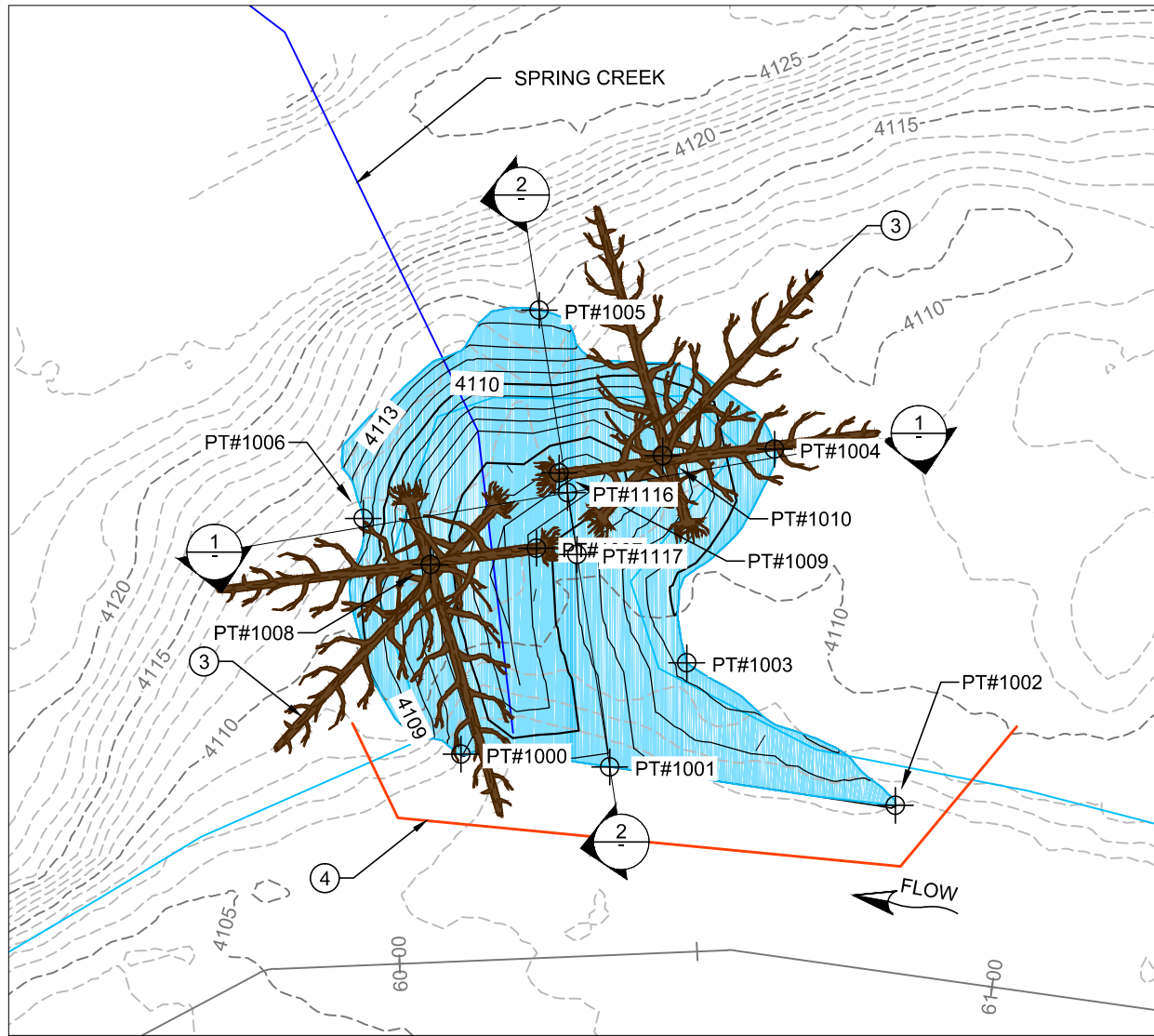
DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN

PROPOSED DESIGN
 OVERVIEW

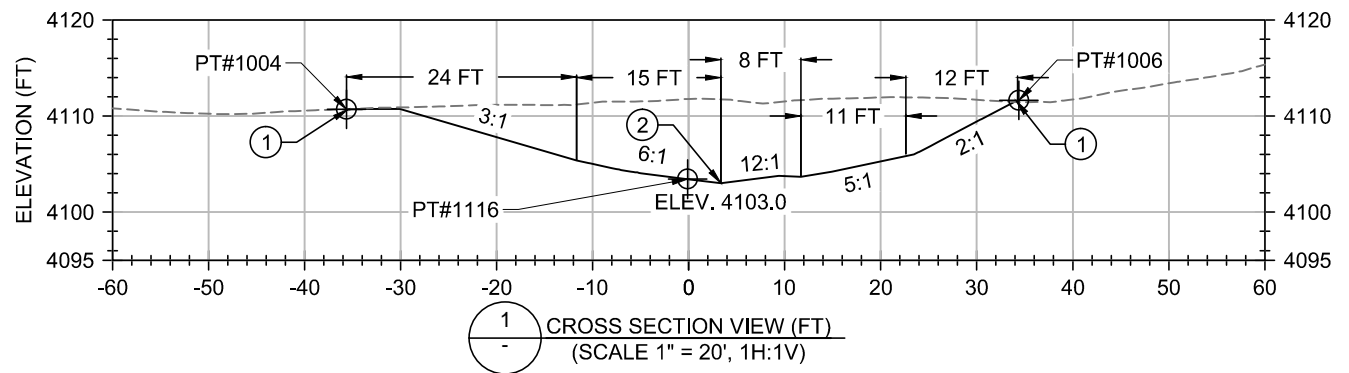
DWG. NO.: **C-06**

CREATED: 12/01/16

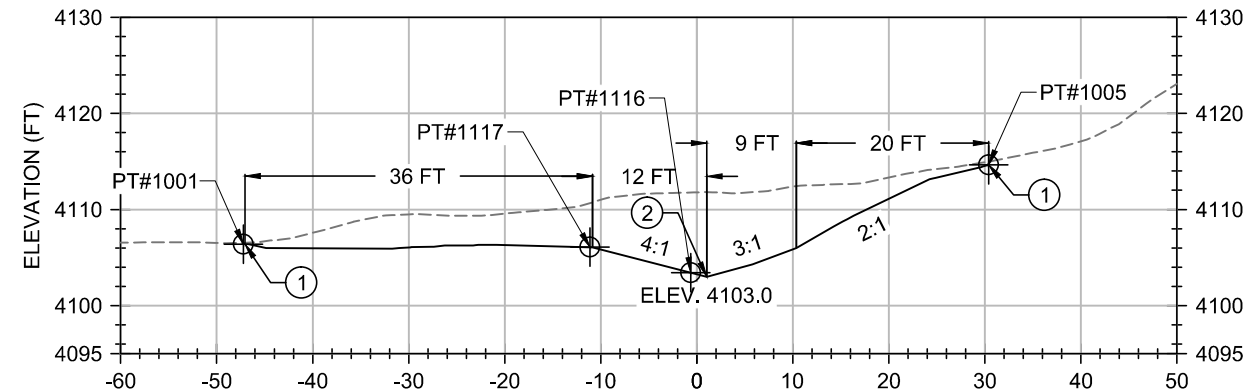
SHEET: 12 OF 40



A
C-06 SPRING CREEK ALCOVE
PLAN VIEW



1
CROSS SECTION VIEW (FT)
(SCALE 1" = 20', 1H:1V)



2
CROSS SECTION VIEW (FT)
(SCALE 1" = 20', 1H:1V)

NOTES:

1. DAYLIGHT PROPOSED ALCOVE EXCAVATION TO MATCH EXISTING GRADE.
2. POOL EXCAVATION IN ALCOVE TO PROVIDE INCREASED REARING HABITAT FOR JUVENILE SALMONIDS.
3. 3-LOG CROSS STRUCTURE - TYPE 2. SEE SHEET C-103 FOR DETAILS.
4. PLACE COFFERDAM PRIOR TO CONSTRUCTION. SEE SHEET C-107 FOR DETAILS.
5. IF UNSUITABLE CHANNEL MATERIAL IS ENCOUNTERED, SIDE CHANNEL SHALL BE OVER-EXCAVATED 1 FT AND NATURAL CHANNEL MATERIAL SHALL BE PLACED PER SECTION 35 01 60 OF THE PROJECT SPECIFICATIONS AND AS DIRECTED IN THE FIELD.
6. ALCOVE SHALL BE REPLANTED AND RESEEDED AS SHOWN IN TABLES ON SHEET L-100 AND AS DIRECTED IN THE FIELD. TOTAL ALCOVE REVEGETATION AREA IS 0.10 ACRES. ACREAGE, DENSITY PER ACRE, AND QUANTITIES ARE PRELIMINARY ESTIMATES. FINAL ACREAGE, DENSITY PER ACRE, SPECIES LIST AND QUANTITIES TO BE FINALIZED PRIOR TO CONSTRUCTION.

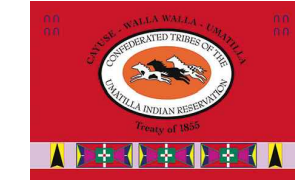
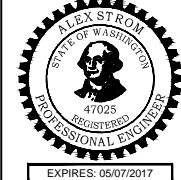
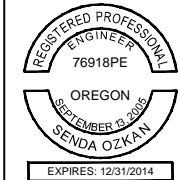
EXC CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1000	460037.2	8637259.1	4106.0	EXC ALC
1001	460012.2	8637257.0	4106.4	EXC ALC
1002	459964.2	8637250.5	4107.0	EXC ALC
1003	459999.3	8637274.5	4109.3	EXC ALC
1004	459984.5	8637310.4	4110.7	EXC ALC
1005	460024.0	8637333.7	4114.7	EXC ALC
1006	460053.6	8637298.7	4111.6	EXC ALC
1116	460019.3	8637303.1	4103.4	EXC ALC
1117	460017.7	8637292.7	4106.1	EXC ALC

LWD CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1007	460024.5	8637293.7	-	LWD
1008	460042.3	8637291.0	-	LWD
1009	460020.7	8637306.4	-	LWD
1010	460003.3	8637309.3	-	LWD

CONSTRUCTION QUANTITIES:		
COMPONENT	DESCRIPTION	QUANTITY
EXCAVATION	ALCOVE CREATION	525 CY
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	6

- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - - - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - 🌳 LWD
 - 🌊 SIDE CHANNEL AND ALCOVE
 - 🔵 EXCAVATION
 - 🔴 COFFERDAM

NOT FOR CONSTRUCTION

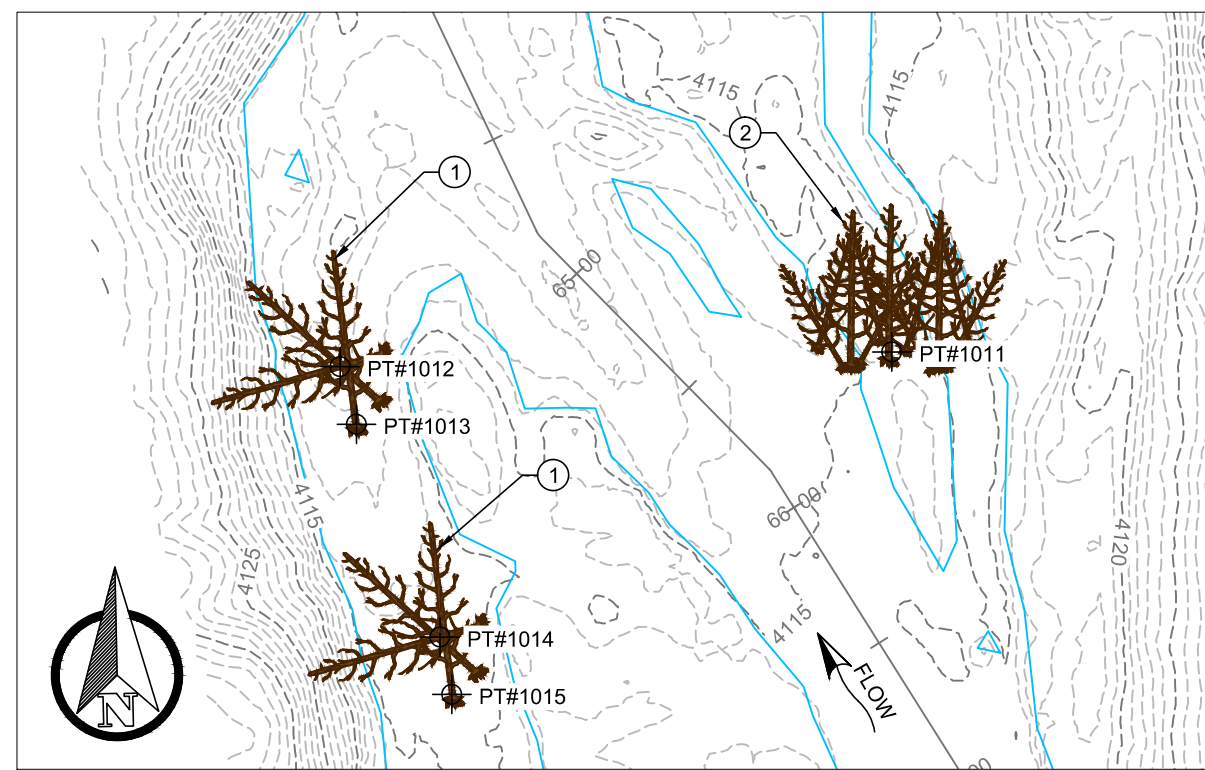


REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN
PROPOSED DESIGN
CONSTRUCTION DETAILS

DWG. NO.:
C-08
CREATED: 12/01/16
SHEET: 14 OF 40

Z:\PROJECTS\194-5507 DESOLATION CREEK\90% DESIGN\EMPTY\194-5507 SHEET FILES\REACH 6 - PROP DETAILS.DWG
PLOT DETAILS: STROM, ALEX JUN 7, 2017 3:05 PM T:\BOTHMAN\COLOR.CTB



- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - 🌳 LWD

- NOTES:**
1. 3-LOG CROSS STRUCTURE - TYPE 2. SEE SHEET C-103 FOR DETAILS.
 2. SUPPLEMENT EXISTING LOG JAM. WHOLE TREES WITH ROOTWADS ADDED TO EXISTING LOG JAM SHALL BE AS DIRECTED IN THE FIELD. TREE ADDITIONS SHALL CONSIST OF FIVE (5) SMALL TREES AND FIVE (5) MEDIUM TREES.

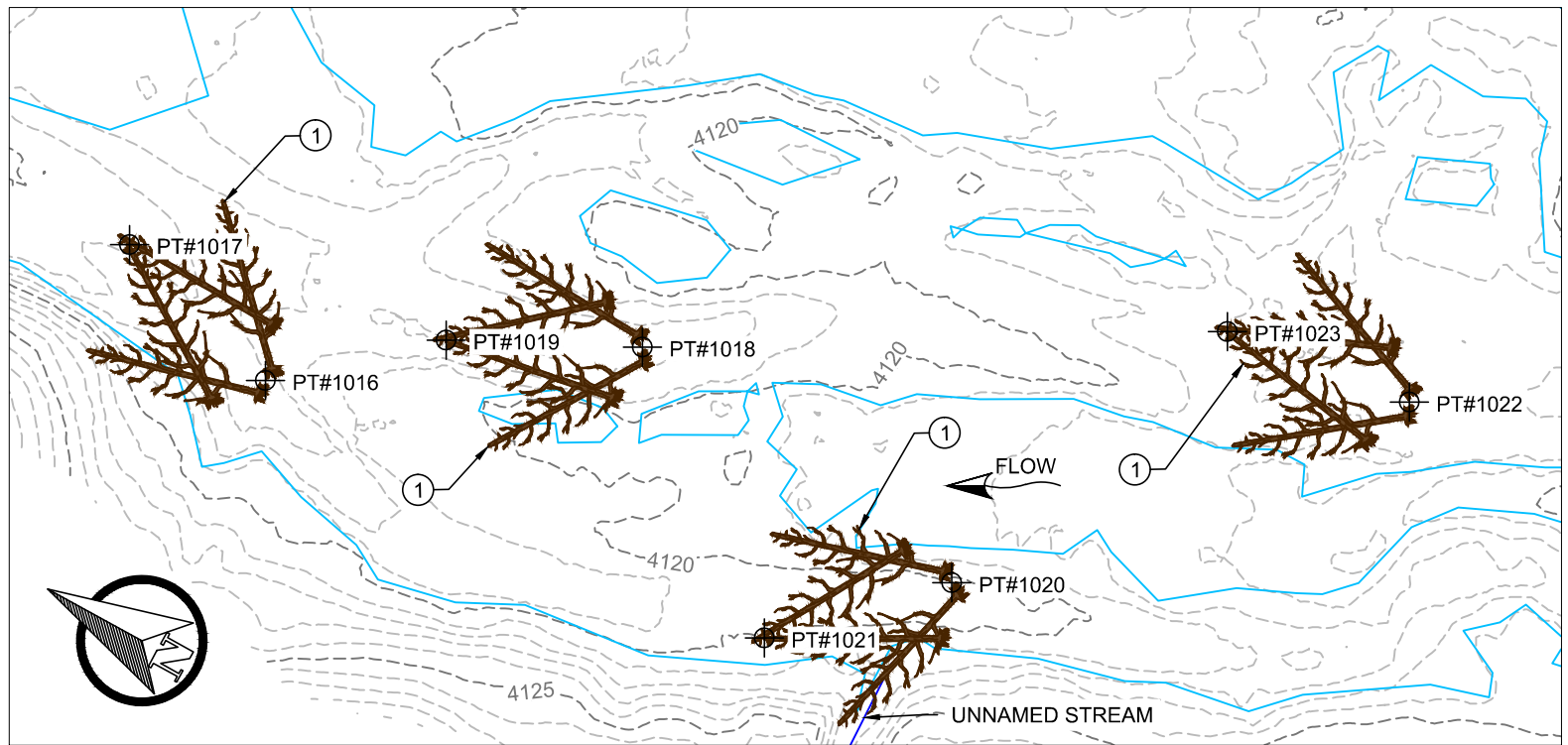
LWD CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1011	459539.5	8637334.6	-	LWD
1012	459534.9	8637162.2	-	LWD
1013	459516.9	8637167.3	-	LWD
1014	459450.4	8637193.4	-	LWD
1015	459432.5	8637197.1	-	LWD

0' 30' 60' 120'

B LWD STRUCTURES
C-06 PLAN DETAIL

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	SMALL (8" - 12" DBH, 35 FT MIN)	5
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	11



- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - 🌳 LWD

- NOTES:**
1. CHANNEL BLEED THROUGH STRUCTURE - TYPE 1. SEE SHEET C-105 FOR DETAILS.

LWD CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1016	459287.6	8637190.5	-	LWD
1017	459346.1	8637206.2	-	LWD
1018	459190.2	8637259.0	-	LWD
1019	459244.7	8637230.0	-	LWD
1020	459068.6	8637243.4	-	LWD
1021	459111.0	8637198.9	-	LWD
1022	458972.3	8637364.7	-	LWD
1023	459033.0	8637355.3	-	LWD

0' 30' 60' 120'

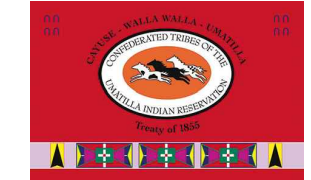
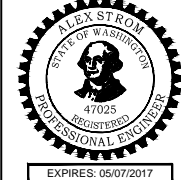
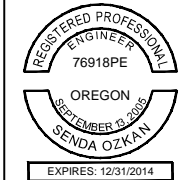
C LWD STRUCTURES
C-06 PLAN DETAIL

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	16

NOT FOR CONSTRUCTION

Z:\PROJECTS\194-5507 DESOLATION CREEK\90% DESIGN FILES\REACH 6 - PROP DETAILS.DWG
PLOT DETAILS - STROM, ALEX JUN 7, 2017 3:06 PM T:\BOTH\MANU\COLOR C1B



REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

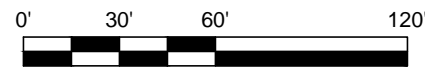
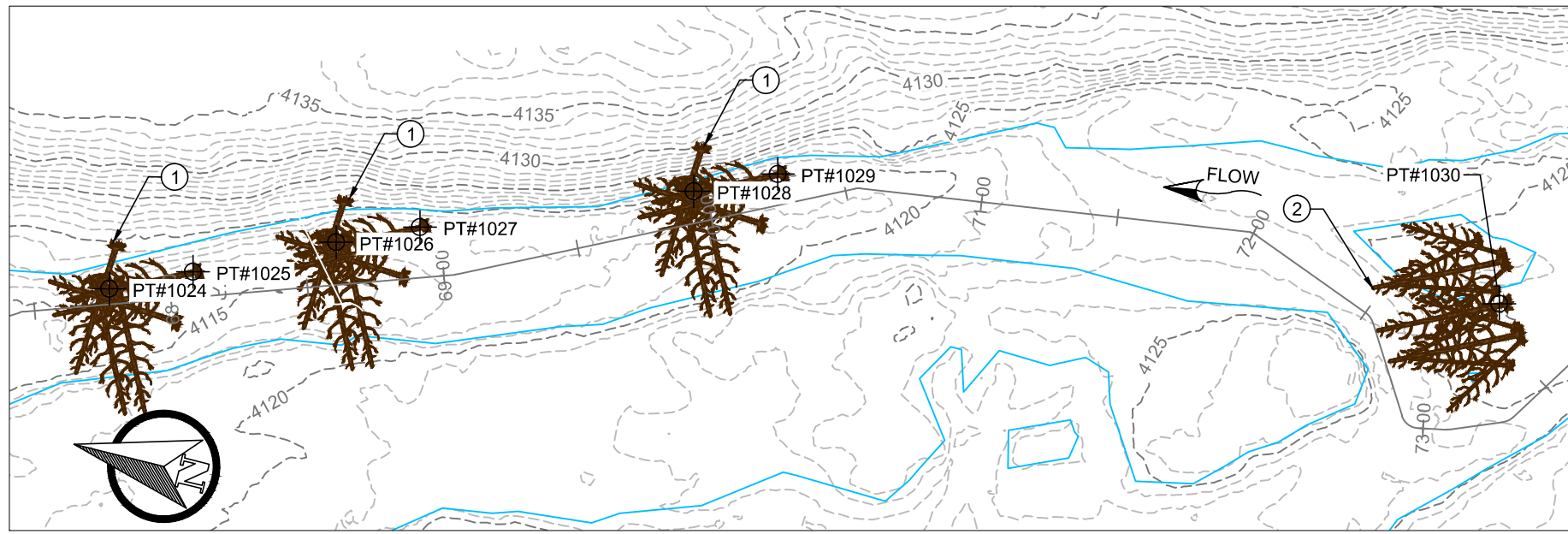
**DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN**

**PROPOSED DESIGN
CONSTRUCTION DETAILS**

DWG. NO.: **C-09**

CREATED: 12/01/16

SHEET: 15 OF 40



D LWD STRUCTURES
C-06 PLAN DETAIL

LEGEND:
 --- EXISTING CONTOUR - MAJOR 5FT
 --- EXISTING CONTOUR - MINOR 1FT
 --- PROPOSED 2-YR FLOW
 ⊕ CONSTRUCTION POINT
 🌳 LWD

NOTES:

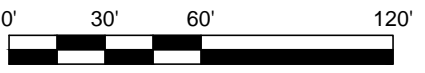
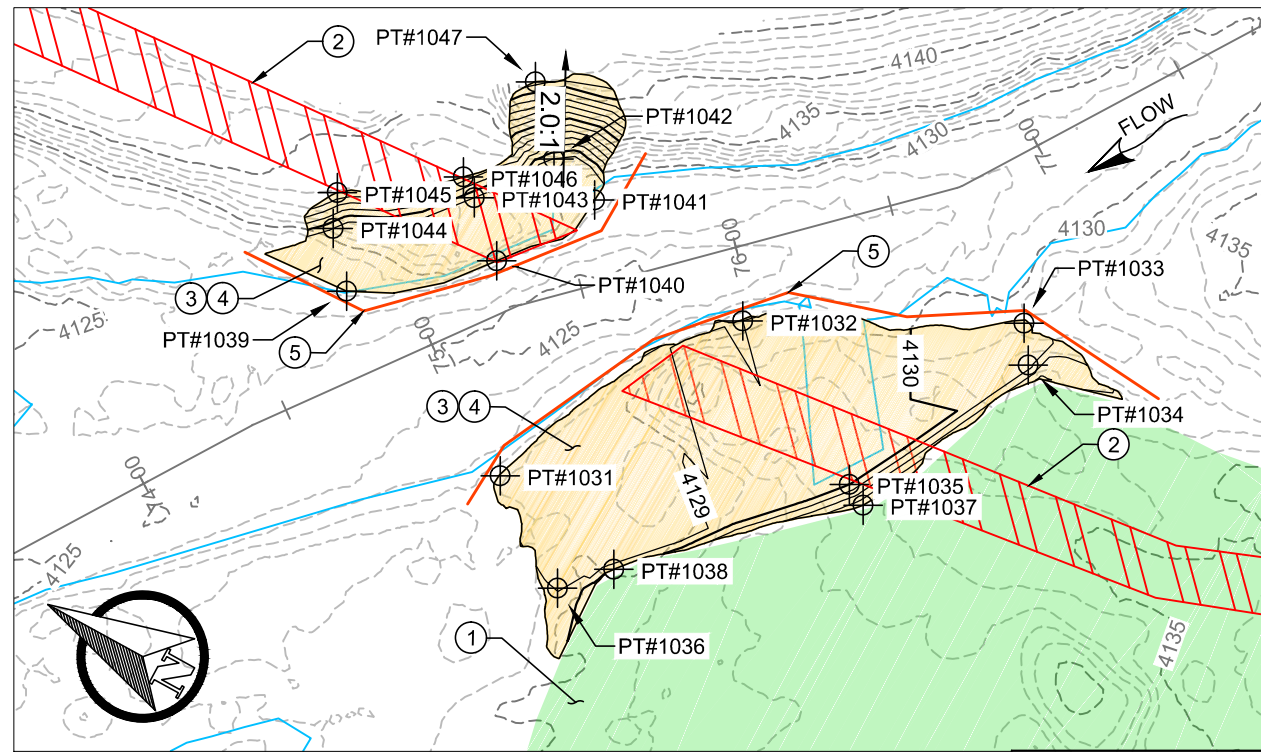
1. MEANDER BEND STRUCTURE - RIGHT BANK. SEE SHEET C-100 FOR DETAILS.
2. SUPPLEMENT EXISTING LOG JAM. WHOLE TREES WITH ROOTWADS ADDED TO EXISTING LOG JAM SHALL BE AS DIRECTED IN THE FIELD. TREE ADDITIONS SHALL CONSIST OF FIVE (5) SMALL TREES AND FIVE (5) MEDIUM TREES.

LWD CONSTRUCTION POINT TABLE (FT)

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1024	459339.3	8637397.8	-	LWD
1025	459311.4	8637411.7	-	LWD
1026	459263.6	8637435.6	-	LWD
1027	459235.5	8637449.0	-	LWD
1028	459142.3	8637487.5	-	LWD
1029	459114.3	8637501.4	-	LWD
1030	458847.4	8637523.9	-	LWD

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	SMALL (8" - 12" DBH, 35 FT MIN)	5
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	23



E FLOODPLAIN EXCAVATION
C-06 PLAN DETAIL

LEGEND:
 --- EXISTING CONTOUR - MAJOR 5FT
 --- EXISTING CONTOUR - MINOR 1FT
 --- PROPOSED 2-YR FLOW
 ⊕ CONSTRUCTION POINT
 🟩 FLOODPLAIN EXCAVATION
 🟩 FLOODPLAIN ENHANCEMENT
 🟥 ROAD DECOMMISSION
 🟥 COFFERDAM

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
EXCAVATION	REMOVE ROADWAY EMBANKMENT	898 CY

EXC CONSTRUCTION POINT TABLE (FT)

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1031	458701.7	8637599.5	4128.6	FP EXC
1032	458660.2	8637679.2	4129.0	FP EXC
1033	458583.8	8637722.6	4130.4	FP EXC
1034	458576.1	8637711.9	4130.4	FP EXC
1035	458605.8	8637651.7	4130.0	FP EXC
1036	458668.6	8637578.0	4129.0	FP EXC
1037	458598.9	8637648.2	4133.9	FP EXC
1038	458656.3	8637591.9	4129.8	FP EXC
1039	458772.0	8637625.4	4128.2	FP EXC

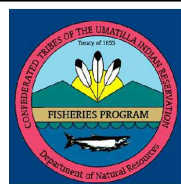
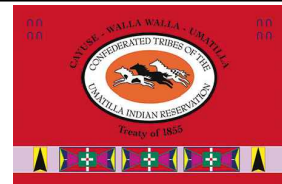
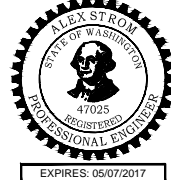
EXC CONSTRUCTION POINT TABLE (FT)

POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1040	458736.2	8637657.1	4128.6	FP EXC
1041	458719.2	8637688.8	4128.6	FP EXC
1042	458736.6	8637693.5	4129.0	FP EXC
1043	458752.1	8637670.6	4129.0	FP EXC
1044	458785.5	8637640.2	4129.0	FP EXC
1045	458790.0	8637650.6	4134.0	FP EXC
1046	458758.3	8637674.5	4132.6	FP EXC
1047	458753.7	8637711.6	4141.4	FP EXC

NOTES:

1. FLOODPLAIN ENHANCEMENT. SEE SHEET C-13 FOR DETAILS AND QUANTITIES.
2. ROAD DECOMMISSION. SEE SHEET C-21 FOR DETAILS.
3. EXCAVATE ROADWAY EMBANKMENT MATERIAL TO MATCH EXISTING FLOODPLAIN GRADE AND TOPOGRAPHY. FLOODPLAIN EXCAVATION SHALL INCLUDE MICROTOPOGRAPHY TO CREATE COMPLEXITY. SEE SHEET C-106 FOR DETAILS. EXCAVATE AT 2H:1V FROM PROPOSED FLOODPLAIN GRADE TO MATCH EXISTING GROUND.
4. ALL EXCAVATION OCCURS ABOVE ORDINARY HIGH WATER.
5. PLACE COFFERDAM PRIOR TO CONSTRUCTION. SEE SHEET C-107 FOR DETAILS
6. FLOODPLAIN EXCAVATION AREAS SHALL BE REPLANTED AND RESEED AS SHOWN IN THE TABLES ON SHEET L-100 AND AS DIRECTED IN THE FIELD. TOTAL AREA FOR REVEGETATION IS 0.28 ACRES. ACREAGE, DENSITY PER ACRE, AND QUANTITIES ARE PRELIMINARY ESTIMATES. FINAL ACREAGE, DENSITY PER ACRE, SPECIES LIST AND QUANTITIES TO BE FINALIZED PRIOR TO CONSTRUCTION.

NOT FOR CONSTRUCTION



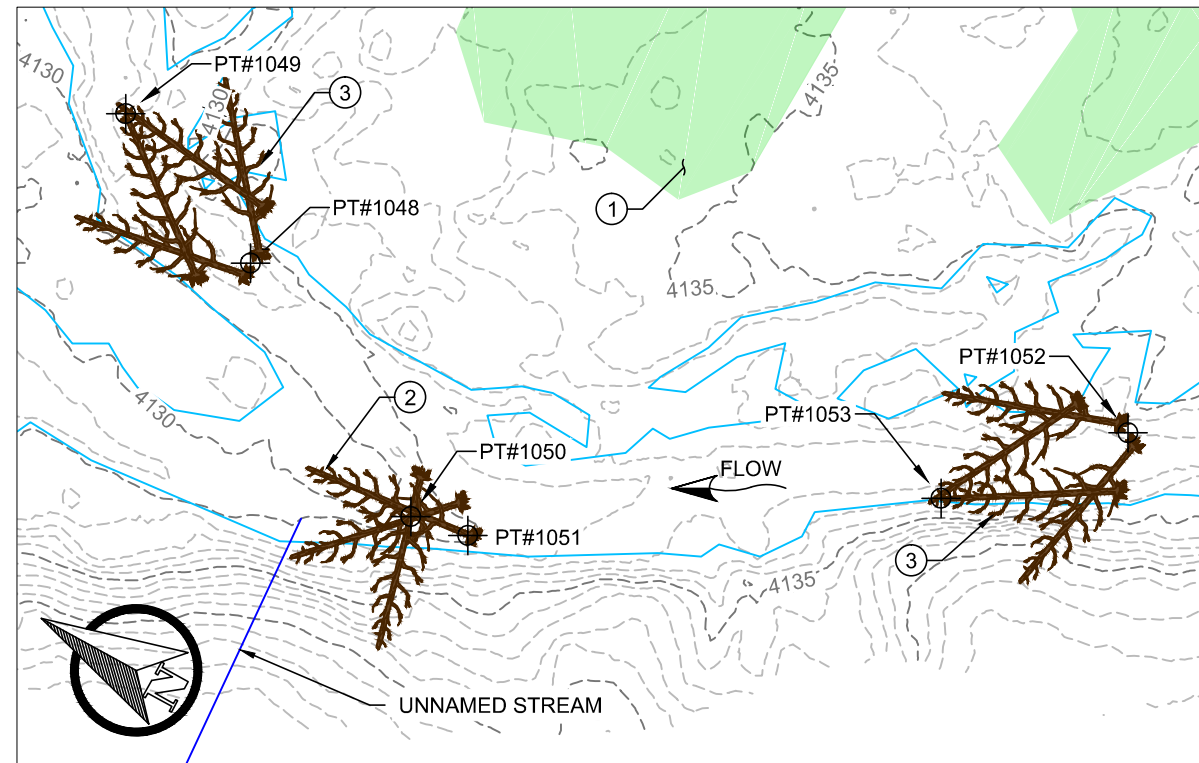
REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN

PROPOSED DESIGN
CONSTRUCTION DETAILS

DWG. NO.:
C-10
CREATED: 12/01/16
SHEET: 16 OF 40

Z:\PROJECTS\194-5507 DESOLATION CREEK\90% DESIGN\EMPTY\194-5507 SHEET FILES\REACH 6 - PROP DETAILS.DWG PLOT DETAILS - STROM, ALEX JUN 7, 2017 3:06 PM TETRATECH\COLOR C1B



- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - LWD
 - FLOODPLAIN ENHANCEMENT

- NOTES:**
1. FLOODPLAIN ENHANCEMENT. SEE SHEET C-13 FOR DETAILS AND QUANTITIES.
 2. 3-LOG CROSS STRUCTURE - TYPE 2. SEE SHEET C-103 FOR DETAILS.
 3. BLEED THROUGH STRUCTURE - TYPE 1. SEE SHEET C-105 FOR DETAILS.

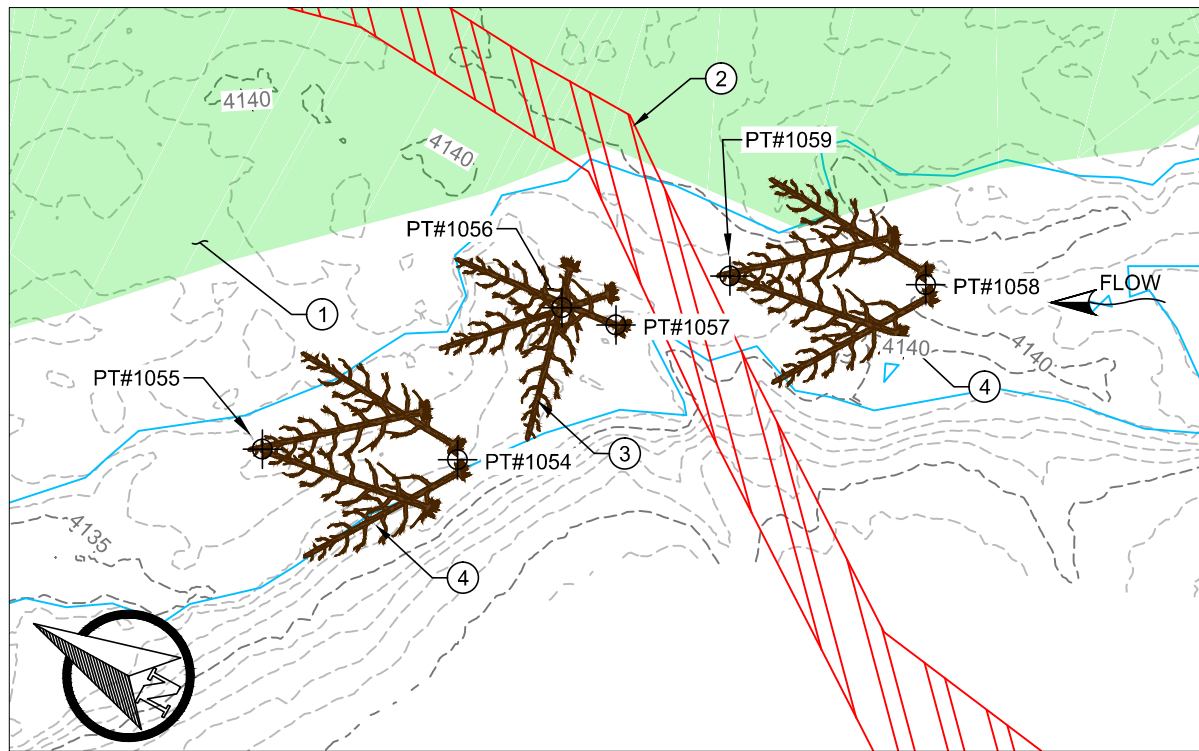
LWD CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1048	458507.7	8637414.9	-	LWD
1049	458564.8	8637435.8	-	LWD
1050	458424.7	8637371.4	-	LWD
1051	458406.4	8637375.2	-	LWD
1052	458243.7	8637506.1	-	LWD
1053	458284.1	8637459.1	-	LWD

0' 30' 60' 120'

F LWD STRUCTURES
C-06 PLAN DETAIL

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	11



- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - LWD
 - FLOODPLAIN ENHANCEMENT
 - ROAD DECOMMISSION

- NOTES:**
1. FLOODPLAIN ENHANCEMENT. SEE SHEET C-13 FOR DETAILS AND QUANTITIES.
 2. ROAD DECOMMISSION. SEE SHEET C-21 FOR DETAILS.
 3. 3-LOG CROSS STRUCTURE - TYPE 2. SEE SHEET C-103 FOR DETAILS.
 4. BLEED THROUGH STRUCTURE - TYPE 1. SEE SHEET C-105 FOR DETAILS.

LWD CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1054	458083.1	8637675.9	-	LWD
1055	458137.5	8637648.2	-	LWD
1056	458078.6	8637733.3	-	LWD
1057	458061.2	8637737.0	-	LWD
1058	457983.7	8637796.4	-	LWD
1059	458038.1	8637768.1	-	LWD

0' 30' 60' 120'

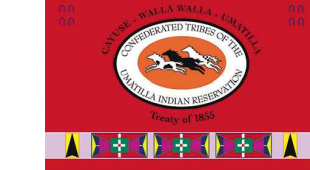
G LWD STRUCTURES
C-06 PLAN DETAIL

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	11

NOT FOR CONSTRUCTION

Z:\PROJECTS\194-5507\DESOLATION CREEK\90% DESIGN\EMPTY\194-5507 SHEET FILES\REACH 6 - PROP DETAILS.DWG
PLOT DETAILS - STROM, ALEX JUN 7, 2017 3:06 PM T:\BOTH-MANUAL\O\018



PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

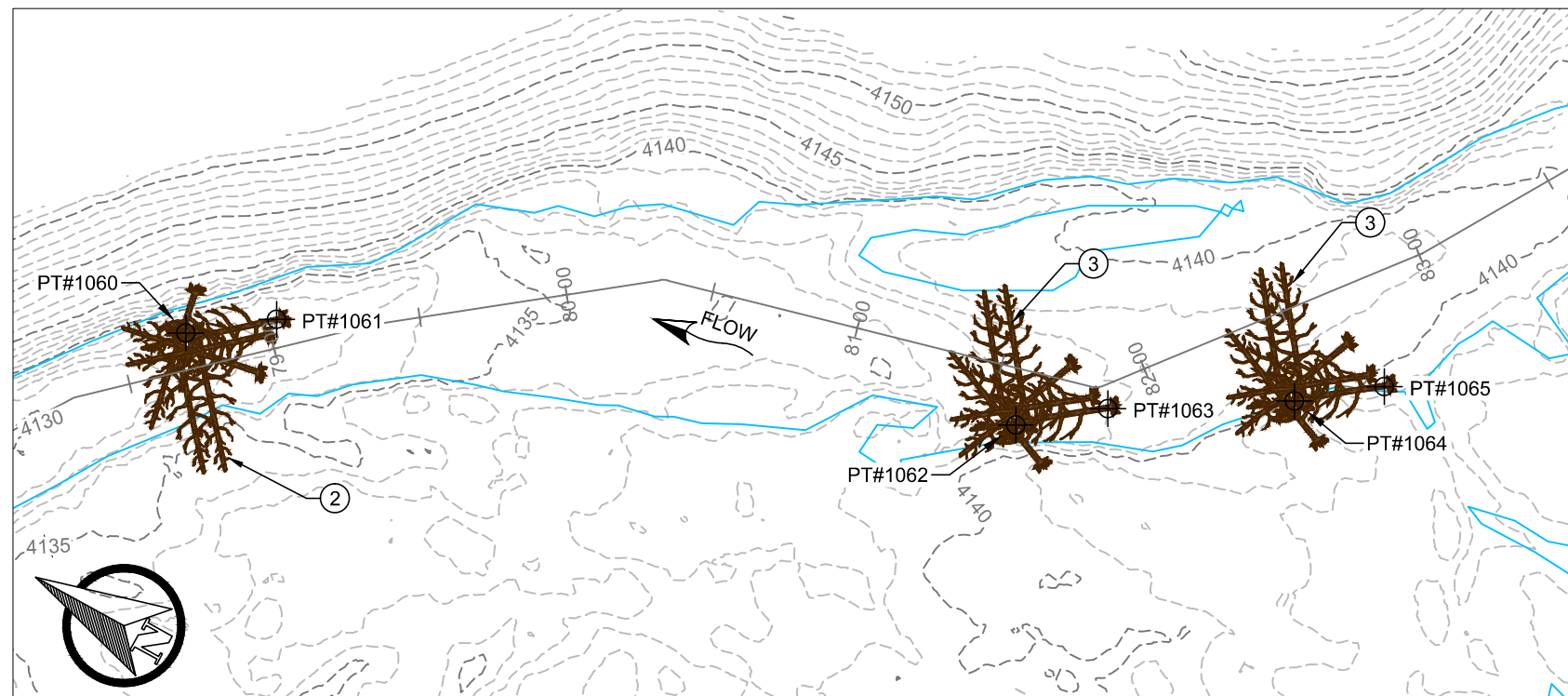
**DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN**

**PROPOSED DESIGN
CONSTRUCTION DETAILS**

DWG. NO.: **C-11**

CREATED: 12/01/16

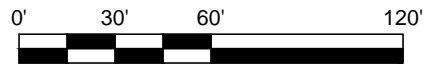
SHEET: 17 OF 40



- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - LWD

- NOTES:**
1. FLOODPLAIN ENHANCEMENT. SEE SHEET C-13 FOR DETAILS AND QUANTITIES.
 2. MEANDER BEND STRUCTURE - RIGHT BANK. SEE SHEET C-100 FOR DETAILS.
 3. MEANDER BEND STRUCTURE - LEFT BANK. SEE SHEET C-100 FOR DETAILS.

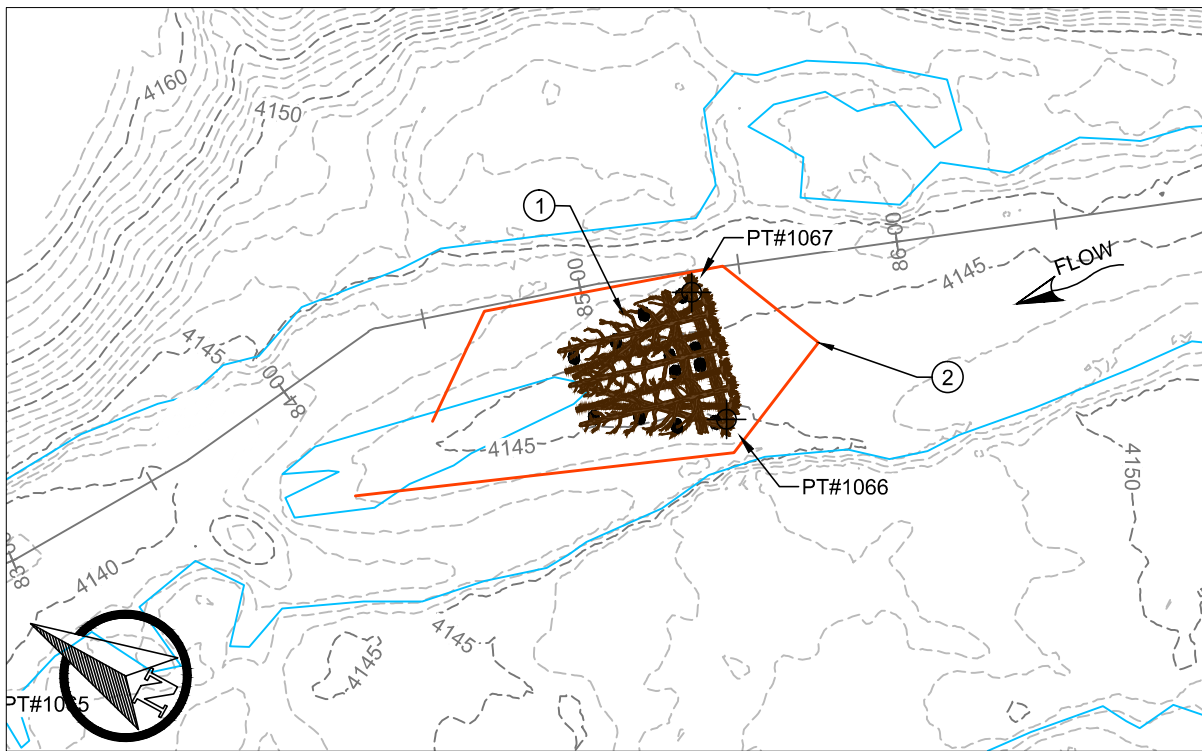
LWD CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1060	458517.2	8637921.4	-	LWD
1061	458493.0	8637940.6	-	LWD
1062	458260.2	8638034.0	-	LWD
1063	458236.3	8638054.3	-	LWD
1064	458183.2	8638087.9	-	LWD
1065	458159.5	8638107.2	-	LWD



H LWD STRUCTURES
C-06 PLAN DETAIL

CONSTRUCTION QUANTITIES:

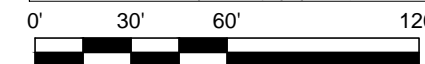
COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	18



- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - LWD

- NOTES:**
1. LOG JAM STRUCTURE. SEE SHEET C-101 FOR DETAILS.
 2. PLACE COFFERDAM PRIOR TO CONSTRUCTION. SEE SHEET C-107 FOR DETAILS.

LWD CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1066	458000.3	8638301.1	-	LWD
1067	458029.6	8638329.9	-	LWD



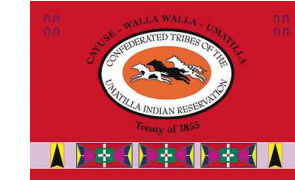
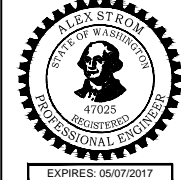
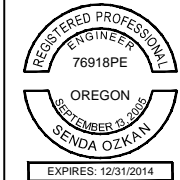
I LWD STRUCTURE
C-06 PLAN DETAIL

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	SMALL (8" - 12" DBH, 35 FT MIN)	4
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	7
LOGS WITHOUT BRANCHES	LARGE (18"+ DBH, 40 FT MIN)	2
BOULDER	2 TO 3 FT DIA.	14

NOT FOR CONSTRUCTION

Z:\PROJECTS\194-6507 DESOLATION CREEK\90% DESIGN\EMPTY\194-6507 DESOLATION CREEK UPPER REACH 6 - PROP DETAILS.DWG
DATE: 06/07/2017 11:50:25 AM



PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

**DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN**

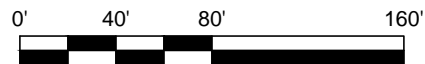
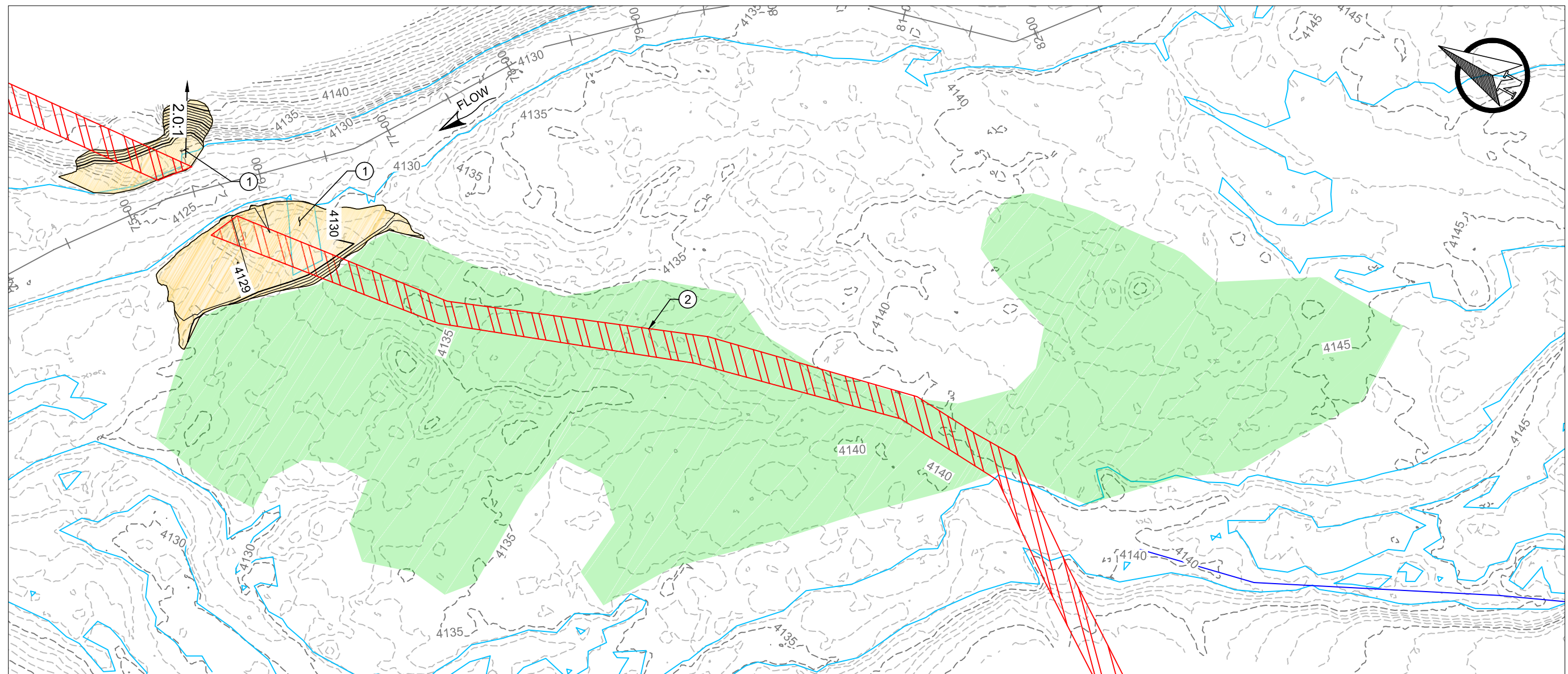
**PROPOSED DESIGN
CONSTRUCTION DETAILS**

DWG. NO.: **C-12**

CREATED: 12/01/16

SHEET: 18 OF 40

Z:\PROJECTS\194-6507 DESOLATION CREEK\90% DESIGN (EMPTY)\SHEET FILES\REACH 6 - PROP DETAILS.DWG
 PLOT DETAILS - STROM, ALEX JUN 7 2017 11:50 AM COLOR C1B



(J) FLOODPLAIN ENHANCEMENT
 (C-06) PLAN DETAIL

NOTES:

1. FLOODPLAIN EXCAVATION. SEE SHEET C-10 FOR DETAILS AND QUANTITIES.
2. ROAD DECOMMISSION. SEE SHEET C-21 FOR DETAILS.
3. EXISTING VEGETATION WITHIN FLOODPLAIN ENHANCEMENT BOUNDARY SHALL BE PRESERVED TO THE EXTENT POSSIBLE.
4. EXISTING SEEPS OR SPRINGS ENCOUNTERED IN FLOODPLAIN ENHANCEMENT AREA WILL BE FLAGGED BY THE ENGINEER PRIOR TO CONSTRUCTION AND SHALL BE PROTECTED AND PRESERVED DURING CONSTRUCTION ACTIVITIES.
5. ALL EXISTING HARDENED SURFACES WITHIN FLOODPLAIN ENHANCEMENT AREA SHALL BE DECOMPACTED TO PROMOTE WATER INFILTRATION AND VEGETATION ESTABLISHMENT. DECOMPACTION WORK SHALL CONSIST OF LOOSENING ALL SOIL WITHIN HARDENED AREA TO A DEPTH OF 18 INCHES (MIN) AND A CLOD SIZE NO LARGER THAN 8 INCHES. FOR DECOMPACTION DETAILS SEE SHEET C-109.
6. FLOODPLAIN ENHANCEMENT AREA SHALL BE PLANTED AND/OR SEEDING WITH APPROVED FLOODPLAIN VEGETATION AND SEED MIX AS SHOWN IN TABLES ON SHEET L-101 AND AS DIRECTED IN THE FIELD. TOTAL FLOODPLAIN ENHANCEMENT AREA IS 3.47 ACRES. ACREAGE, DENSITY PER ACRE, AND QUANTITIES ARE PRELIMINARY ESTIMATES. FINAL ACREAGE, DENSITY PER ACRE, SPECIES LIST AND QUANTITIES TO BE FINALIZED PRIOR TO CONSTRUCTION.

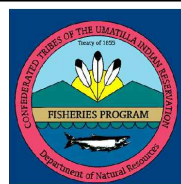
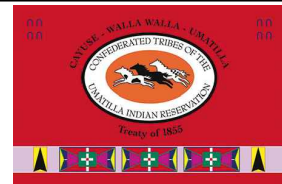
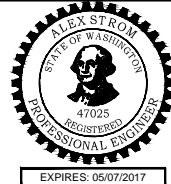
CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
REVEGETATION	FLOODPLAIN RESTORATION	3.47 ACRE

LEGEND:

- - - EXISTING CONTOUR - MAJOR 5FT
- - - EXISTING CONTOUR - MINOR 1FT
- PROPOSED 2-YR FLOW
- ⊕ CONSTRUCTION POINT
- LWD
- ▭ FLOODPLAIN EXCAVATION
- ▭ FLOODPLAIN ENHANCEMENT
- ▨ ROAD DECOMMISSION

NOT FOR CONSTRUCTION



PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

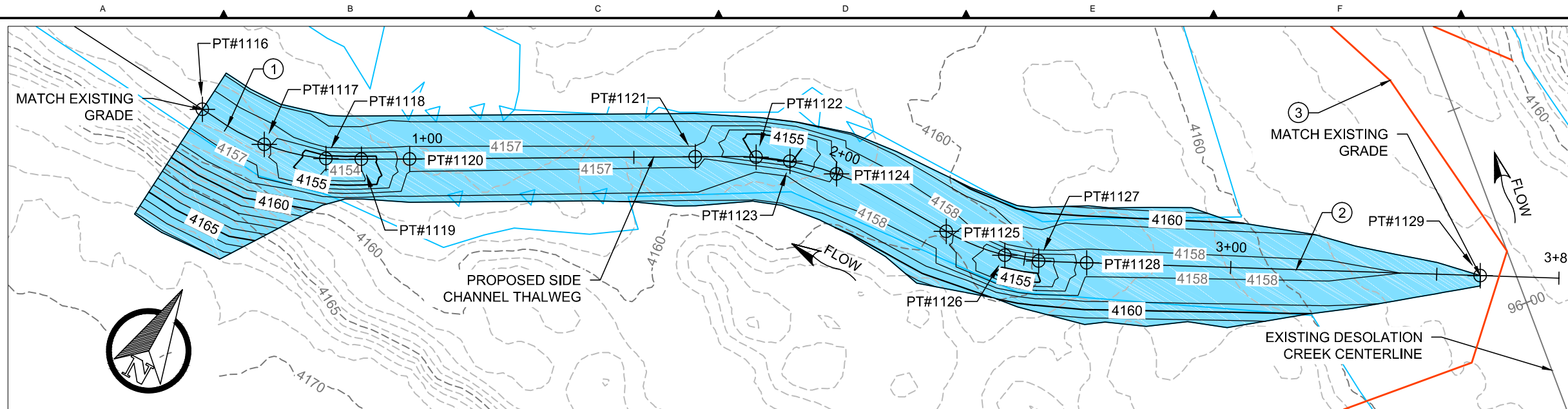
**DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN**

**PROPOSED DESIGN
 CONSTRUCTION DETAILS**

DWG. NO.: **C-13**

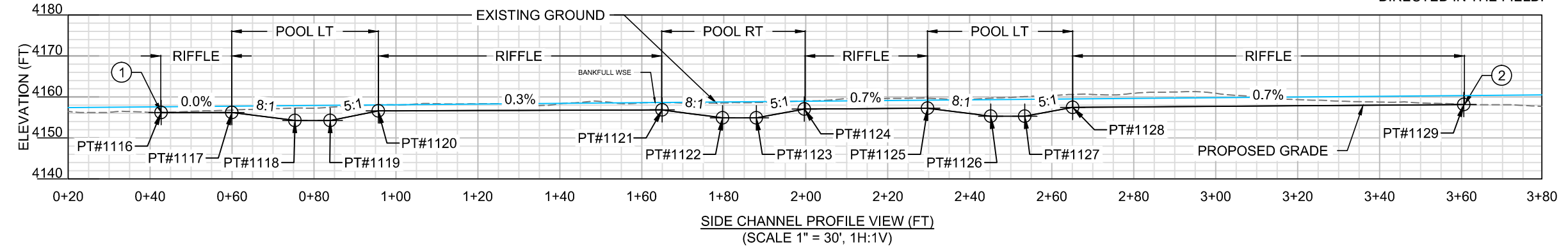
CREATED: 12/01/16

SHEET: 19 OF 40

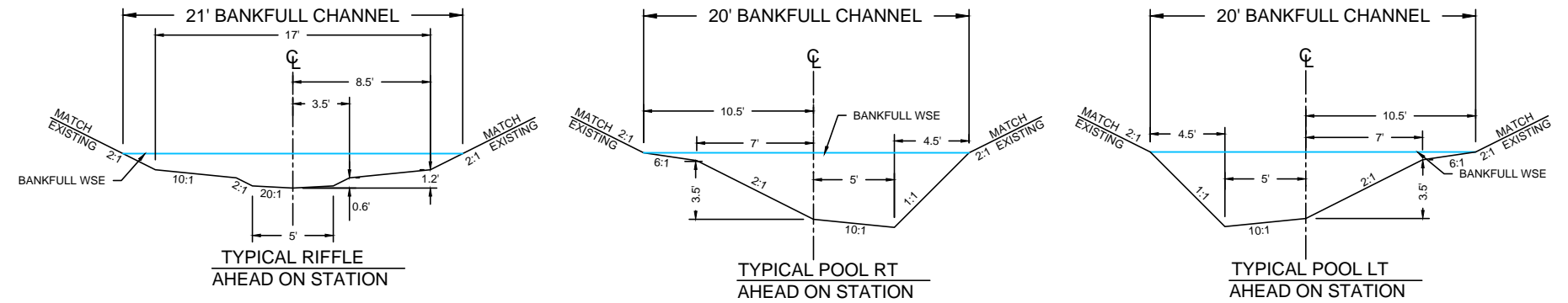


- NOTES:**
1. COMPLETE BANKFULL CHANNEL DIMENSIONS MAY NOT BE ACCOMPLISHED AT DOWNSTREAM RIFFLE SECTION OF PROPOSED CHANNEL PROFILE. CHANNEL WIDTH DIMENSION WILL VARY 17 FT TO 21 FT FROM STA. 0+42 TO 0+60.
 2. COMPLETE BANKFULL CHANNEL DIMENSIONS MAY NOT BE ACCOMPLISHED AT UPSTREAM RIFFLE SECTION OF PROPOSED CHANNEL PROFILE. CHANNEL WIDTH DIMENSION WILL VARY FROM STA. 3+00 TO 3+60.
 3. PLACE COFFERDAM PRIOR TO CONSTRUCTION. SEE SHEET C-16 FOR DOWNSTREAM EXTENT OF COFFERDAM AND SHEET C-107 FOR DETAILS.
 4. TREES FELLED DURING EXCAVATION OF SIDE CHANNEL MAY BE PLACED IN POOLS FOR INCREASED HABITAT COMPLEXITY AS DIRECTED IN THE FIELD.
 5. SIDE CHANNELS SHALL BE CONSTRUCTED PER SECTION 31 23 00 AND SECTION 31 23 19 OF THE PROJECT SPECIFICATIONS.
 6. IF UNSUITABLE CHANNEL MATERIAL IS ENCOUNTERED, SIDE CHANNEL SHALL BE OVER-EXCAVATED 1 FT AND NATURAL CHANNEL MATERIAL SHALL BE PLACED PER SECTION 35 01 60 OF THE PROJECT SPECIFICATIONS AND AS DIRECTED IN THE FIELD.

(M) SIDE CHANNEL EXCAVATION_STA. 96+00
(C-07) PLAN VIEW



EXC CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1116	457052.8	8638616.9	4156.2	SC THWG
1117	457052.9	8638634.1	4156.2	SC THWG
1118	457057.4	8638648.8	4154.3	SC THWG
1119	457061.5	8638656.3	4154.3	SC THWG
1120	457067.5	8638666.4	4156.6	SC THWG
1121	457102.5	8638726.1	4156.8	SC THWG
1122	457109.8	8638738.9	4154.9	SC THWG
1123	457113.1	8638746.5	4154.9	SC THWG
1124	457116.1	8638757.8	4157.0	SC THWG
1125	457117.3	8638787.8	4157.2	SC THWG
1126	457119.4	8638803.0	4155.3	SC THWG



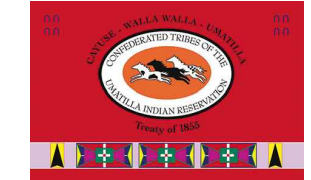
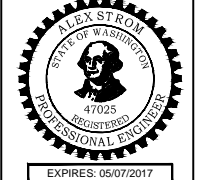
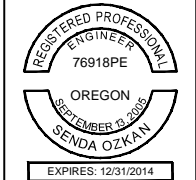
EXC CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1127	457122.3	8638810.8	4155.3	SC THWG
1128	457127.7	8638821.2	4157.5	SC THWG
1129	457172.7	8638905.3	4158.1	SC THWG

CONSTRUCTION QUANTITIES:		
COMPONENT	DESCRIPTION	QUANTITY
SIDE CHANNEL	EXCAVATION	399 CY

- LEGEND:**
- - - EXISTING CONTOUR - MAJOR 5FT
 - - - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - LWD
 - SIDE CHANNEL RECONNECTION / OFF-CHANNEL HABITAT
 - COFFERDAM

NOT FOR CONSTRUCTION

Z:\PROJECTS\194-5507 DESOLATION CREEK\90% DESIGN\FILES\REACH 6 - PROP DETAILS_2.DWG JUN 7, 2017 10:58 AM TETRA TECH



PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")					
REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

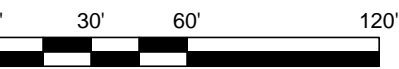
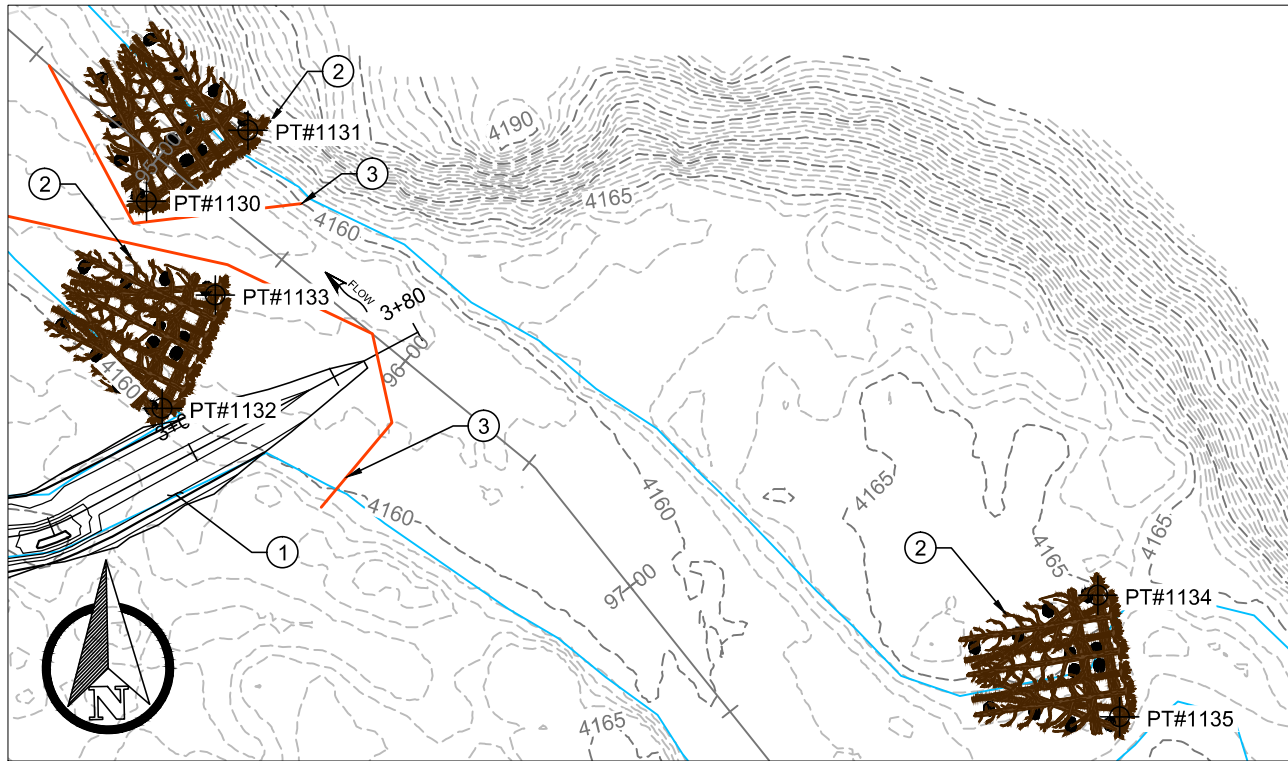
DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN

PROPOSED DESIGN
CONSTRUCTION DETAILS

DWG. NO.: **C-15**

CREATED: 12/01/16

SHEET: 21 OF 40



N
C-07 LWD STRUCTURES
PLAN DETAIL

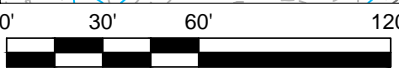
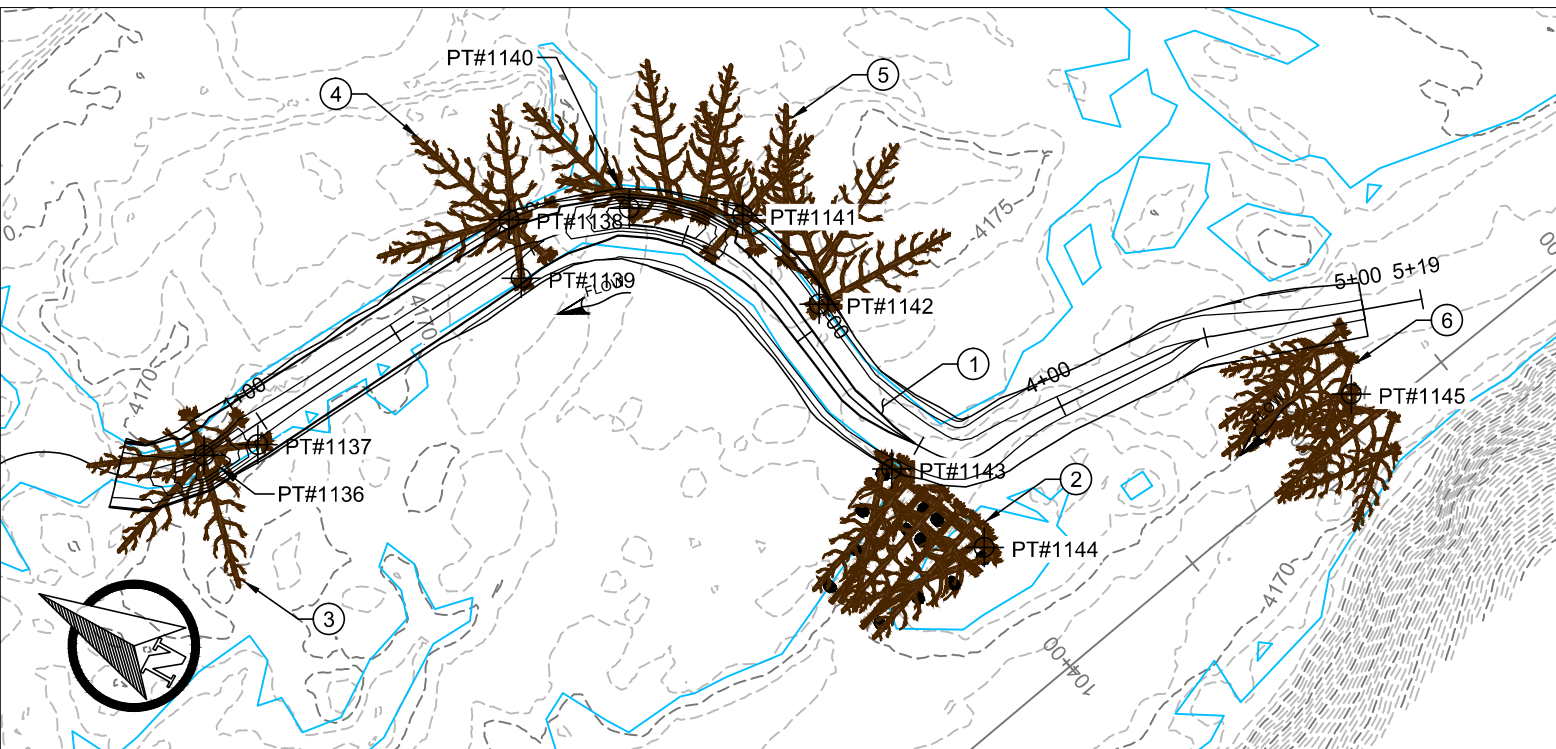
- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - LWD
 - COFFERDAM

- NOTES:**
1. SIDE CHANNEL EXCAVATION. SEE SHEET C-15 FOR DETAILS.
 2. LOG JAM STRUCTURE. SEE SHEET C-101 FOR DETAILS.
 3. PLACE COFFERDAM PRIOR TO CONSTRUCTION. SEE SHEET C-107 FOR DETAILS.

LWD CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1130	457222.5	8638837.4	-	LWD
1131	457244.8	8638869.1	-	LWD
1132	457157.9	8638842.3	-	LWD
1133	457193.3	8638858.9	-	LWD
1134	457099.5	8639134.6	-	LWD
1135	457061.5	8639141.3	-	LWD

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	SMALL (8" - 12" DBH, 35 FT MIN)	12
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	21
LOGS WITHOUT BRANCHES	LARGE (18"+ DBH, 40 FT MIN)	6
BOULDER	2 TO 3 FT DIA.	42



O
C-07 LWD STRUCTURES
PLAN DETAIL

- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - LWD

- NOTES:**
1. SIDE CHANNEL EXCAVATION. SEE SHEET C-17 FOR DETAILS.
 2. LOG JAM STRUCTURE. SEE SHEET C-101 FOR DETAILS.
 3. 3-LOG CROSS STRUCTURE - TYPE 2 LEFT BANK. SEE SHEET C-103 FOR DETAILS.
 4. 3-LOG CROSS STRUCTURE - TYPE 2 RIGHT BANK. SEE SHEET C-103 FOR DETAILS.
 5. 10-LOG CORNER STRUCTURE. SEE SHEET C-104 FOR DETAILS.
 6. SUPPLEMENT EXISTING LOG JAM. WHOLE TREES WITH ROOTWADS ADDED TO EXISTING LOG JAM SHALL BE AS DIRECTED IN THE FIELD. TREE ADDITIONS SHALL CONSIST OF FIVE (5) SMALL TREES AND FIVE (5) MEDIUM TREES.

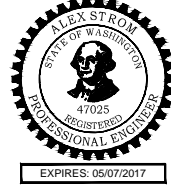
LWD CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1136	456862.9	8639370.6	-	LWD
1137	456850.0	8639381.9	-	LWD
1138	456817.2	8639482.0	-	LWD
1139	456804.7	8639468.0	-	LWD
1140	456786.4	8639503.8	-	LWD
1141	456754.6	8639519.7	-	LWD
1142	456720.0	8639507.6	-	LWD
1143	456674.6	8639474.3	-	LWD
1144	456637.3	8639467.6	-	LWD
1145	456562.0	8639566.4	-	LWD

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	SMALL (8" - 12" DBH, 35 FT MIN)	9
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	28
LOGS WITHOUT BRANCHES	LARGE (18"+ DBH, 40 FT MIN)	2
BOULDER	2 TO 3 FT DIA.	14

NOT FOR CONSTRUCTION

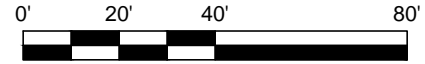
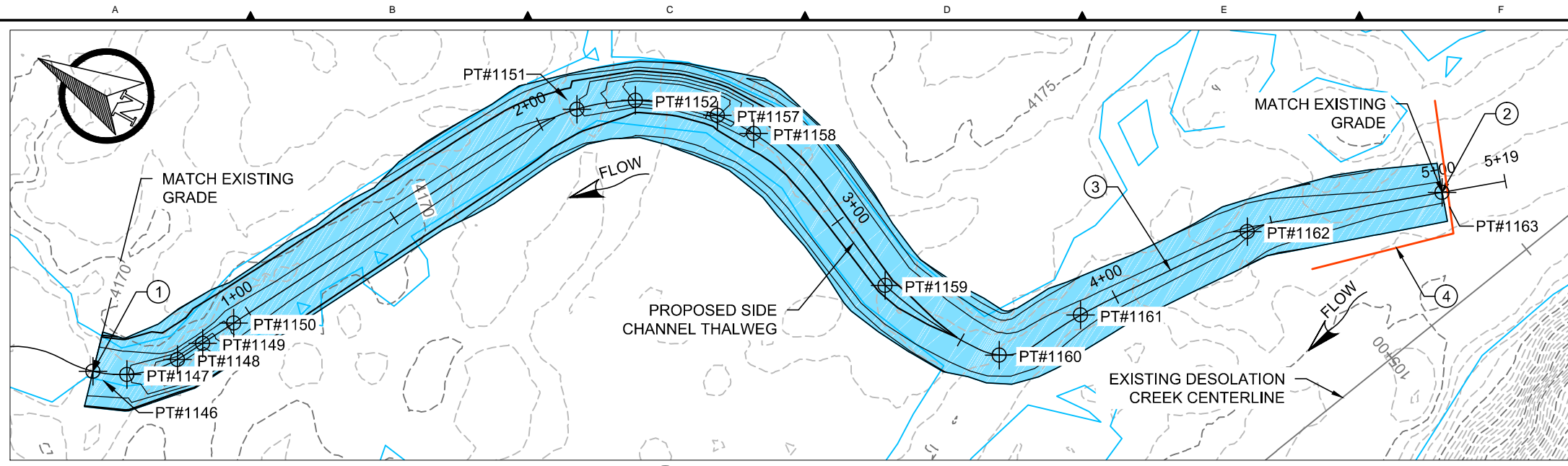
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REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

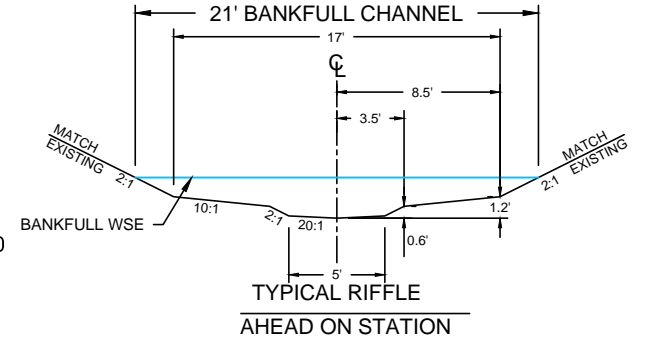
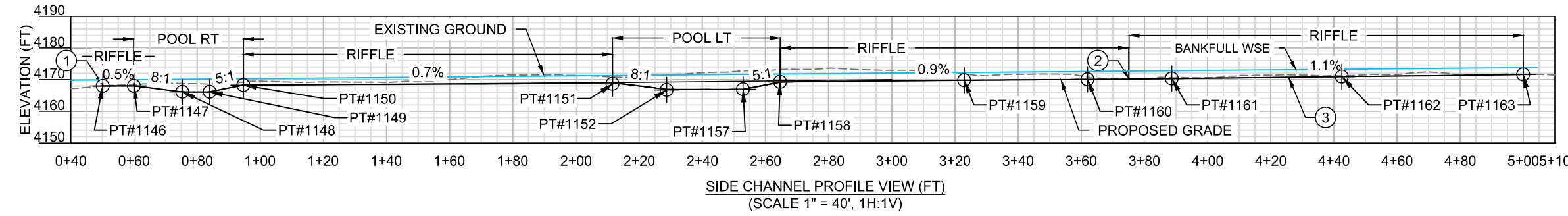
DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN
PROPOSED DESIGN
CONSTRUCTION DETAILS

DWG. NO.:
C-16
CREATED: 12/01/16
SHEET: 22 OF 40



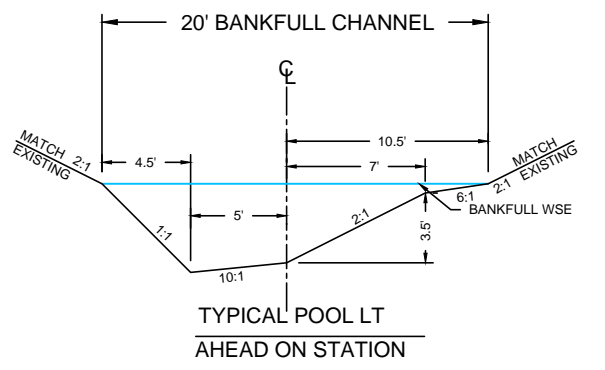
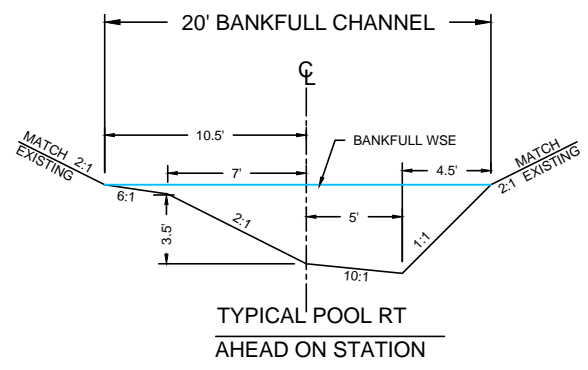
P SIDE CHANNEL EXCAVATION_STA. 105+00
C-07 PLAN VIEW

- NOTES:**
1. COMPLETE BANKFULL CHANNEL DIMENSIONS MAY NOT BE ACCOMPLISHED AT DOWNSTREAM RIFFLE SECTION OF PROPOSED CHANNEL PROFILE. CHANNEL WIDTH DIMENSION WILL VARY 17 FT TO 21 FT FROM STA. 0+50 TO 0+60.
 2. COMPLETE BANKFULL CHANNEL DIMENSIONS FOR UPSTREAM RIFFLE SECTION OF PROPOSED CHANNEL PROFILE STARTS AT STA. 3+75.
 3. COMPLETE BANKFULL CHANNEL DIMENSIONS MAY NOT BE ACCOMPLISHED AT UPSTREAM RIFFLE SECTION OF PROPOSED CHANNEL PROFILE. CHANNEL WIDTH DIMENSION WILL VARY 17 FT TO 12 FT FROM STA. 3+75 TO 5+00. THIS SECTION INCLUDES CHANNEL EXCAVATION TO PROVIDE CONNECTION TO FROM MAIN CHANNEL TO PROPOSED SIDE CHANNEL STARTING AT STA. 3+75.
 4. PLACE COFFERDAM PRIOR TO CONSTRUCTION. SEE SHEET C-107 FOR DETAILS.
 5. TREES FELLED DURING EXCAVATION OF SIDE CHANNEL MAY BE PLACED IN POOLS FOR INCREASED HABITAT COMPLEXITY AS DIRECTED IN THE FIELD.
 6. SIDE CHANNELS SHALL BE CONSTRUCTED PER SECTION 31 23 00 AND SECTION 31 23 19 OF THE PROJECT SPECIFICATIONS.
 7. IF UNSUITABLE CHANNEL MATERIAL IS ENCOUNTERED, SIDE CHANNEL SHALL BE OVER-EXCAVATED 1 FT AND NATURAL CHANNEL MATERIAL SHALL BE PLACED PER SECTION 35 01 60 OF THE PROJECT SPECIFICATIONS AND AS DIRECTED IN THE FIELD.



EXC CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1146	456883.3	8639351.8	4168.0	SC THWG
1147	456874.3	8639355.9	4168.1	SC THWG
1148	456863.9	8639366.9	4166.1	SC THWG
1149	456859.9	8639374.6	4166.2	SC THWG
1150	456855.1	8639384.1	4168.3	SC THWG
1151	456800.2	8639487.1	4169.0	SC THWG
1152	456786.9	8639497.7	4166.7	SC THWG
1157	456764.2	8639505.9	4167.3	SC THWG

EXC CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1158	456752.5	8639506.5	4169.7	SC THWG
1159	456697.8	8639487.5	4169.8	SC THWG
1160	456659.2	8639486.6	4170.1	SC THWG
1161	456644.6	8639508.3	4170.3	SC THWG
1162	456615.0	8639553.2	4170.9	SC THWG
1163	456572.0	8639591.2	4171.6	SC THWG



CONSTRUCTION QUANTITIES:		
COMPONENT	DESCRIPTION	QUANTITY
SIDE CHANNEL	EXCAVATION	439 CY

- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - █ SIDE CHANNEL RECONNECTION / OFF-CHANNEL HABITAT
 - █ COFFERDAM

NOT FOR CONSTRUCTION

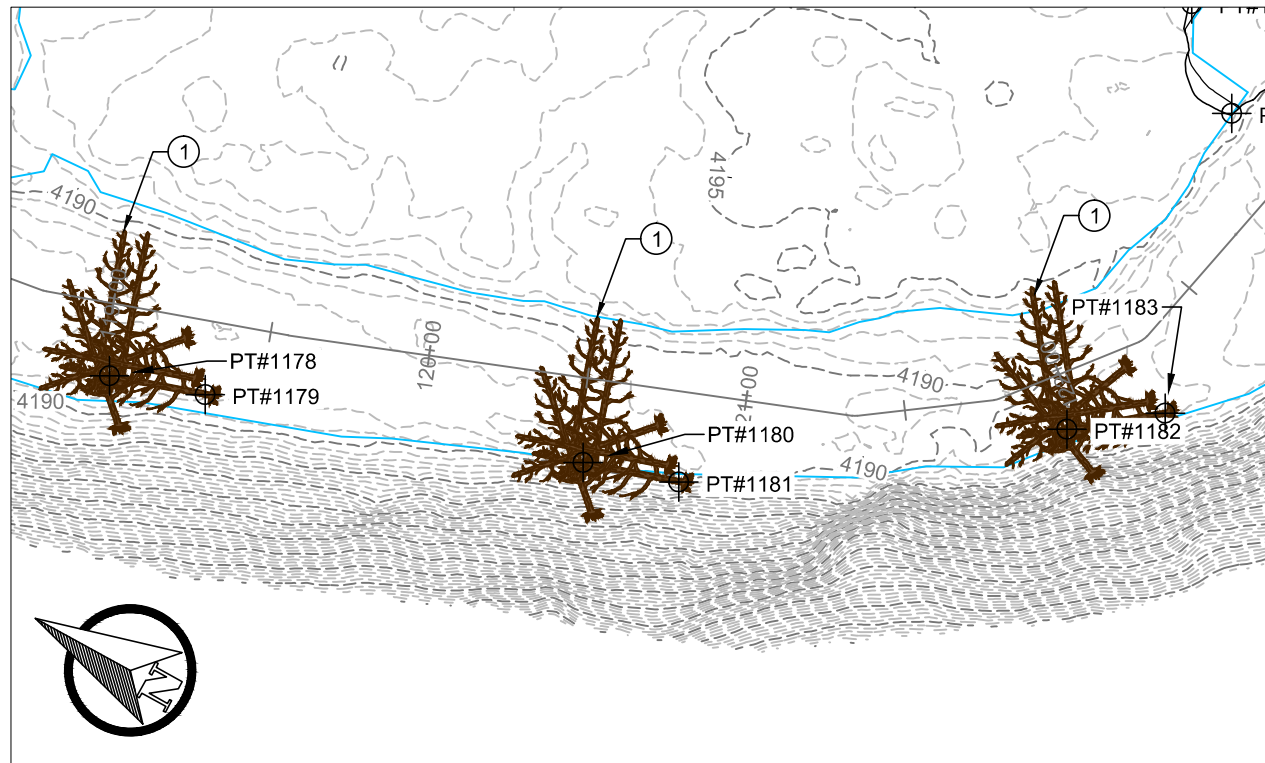
Z:\PROJECTS\194-5507 DESOLATION CREEK\90% DESIGN\EMPTY\194-5507 DESOLATION CREEK UPPER REACH 6 - PROP DETAILS_2.DWG JUN 7, 2017 3:05 PM TETRA TECH

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN

PROPOSED DESIGN
CONSTRUCTION DETAILS

DWG. NO.:	C-17
CREATED:	12/01/16
SHEET:	23 OF 40



- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - 🌳 LWD

- NOTES:**
1. MEANDER BEND STRUCTURE - LEFT BANK. SEE SHEET C-100 FOR DETAILS.

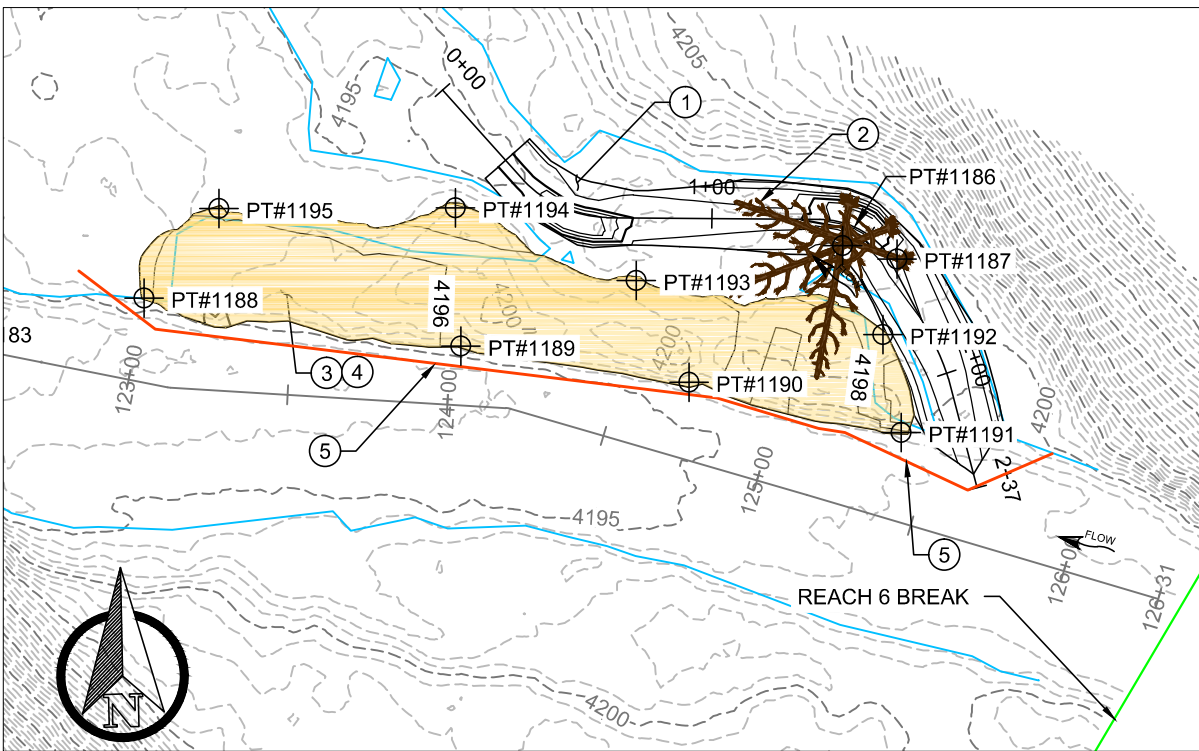
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POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1178	455854.1	8640486.0	-	LWD
1179	455825.3	8640495.9	-	LWD
1180	455712.5	8640536.5	-	LWD
1181	455683.5	8640546.1	-	LWD
1182	455586.8	8640621.0	-	LWD
1183	455562.6	8640640.8	-	LWD

0' 30' 60' 120'

S LWD STRUCTURES
C-07 PLAN DETAIL

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	18



- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - 🌳 LWD
 - 🟡 FLOODPLAIN EXCAVATION
 - COFFERDAM

- NOTES:**
1. SIDE CHANNEL EXCAVATION. SEE SHEET C-20 FOR DETAILS.
 2. 3-LOG CROSS STRUCTURE - TYPE 2 LEFT BANK. SEE SHEET C-103 FOR DETAILS.
 3. EXCAVATE FLOODPLAIN BERM MATERIAL TO MATCH EXISTING FLOODPLAIN GRADE AND TOPOGRAPHY. FLOODPLAIN EXCAVATION SHALL INCLUDE MICROTOPOGRAPHY TO CREATE COMPLEXITY. SEE SHEET C-106 FOR DETAILS.
 4. ALL EXCAVATION OCCURS ABOVE ORDINARY HIGH WATER. FLOODPLAIN EXCAVATION AREA SHALL BE REPLANTED AND RESEEDED AS SHOWN IN TABLES ON SHEET C-102 AND AS DIRECTED IN THE FIELD. TOTAL AREA FOR REVEGETATION IS 0.19 ACRES. ACREAGE, DENSITY PER ACRE, AND QUANTITIES ARE PRELIMINARY ESTIMATES. FINAL ACREAGE, DENSITY PER ACRE, SPECIES LIST AND QUANTITIES TO BE FINALIZED PRIOR TO CONSTRUCTION.
 5. PLACE COFFERDAM PRIOR TO CONSTRUCTION. SEE SHEET C-107 FOR DETAILS.

EXC CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1188	455591.5	8640732.3	4196.3	FP EXC
1189	455576.5	8640831.3	4196.2	FP EXC
1190	455565.2	8640902.5	4196.6	FP EXC
1191	455549.5	8640968.9	4197.7	FP EXC
1192	455580.1	8640963.1	4198.7	FP EXC
1193	455597.0	8640886.1	4196.9	FP EXC
1194	455619.7	8640829.5	4197.9	FP EXC
1195	455619.5	8640755.6	4196.2	FP EXC

LWD CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1186	455607.9	8640950.6	-	LWD
1187	455603.7	8640967.6	-	LWD

CONSTRUCTION QUANTITIES:

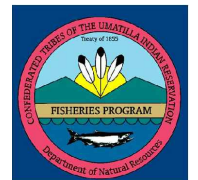
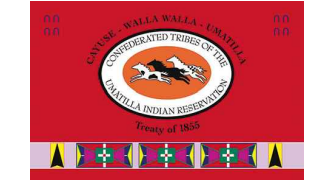
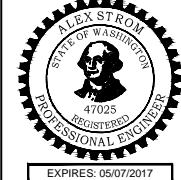
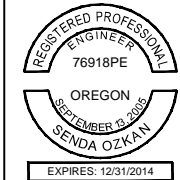
COMPONENT	DESCRIPTION	QUANTITY
FLOODPLAIN EXCAVATION	REMOVE FLOODPLAIN MATERAIL	501
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	3

0' 30' 60' 120'

T LWD STRUCTURES AND FLOODPLAIN EXCAVATION
C-07 PLAN DETAIL

NOT FOR CONSTRUCTION

Z:\PROJECTS\194-5507 DESOLATION CREEK\90% DESIGN\EMPTY\194-5507 DESOLATION CREEK REACH 6 - PROP DETAILS 2.DWG
PLOT DETAILS: STROM, ALEX JUN 7, 2017 3:08 PM T:\BOTH\MANU\COLOR.CTB



PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

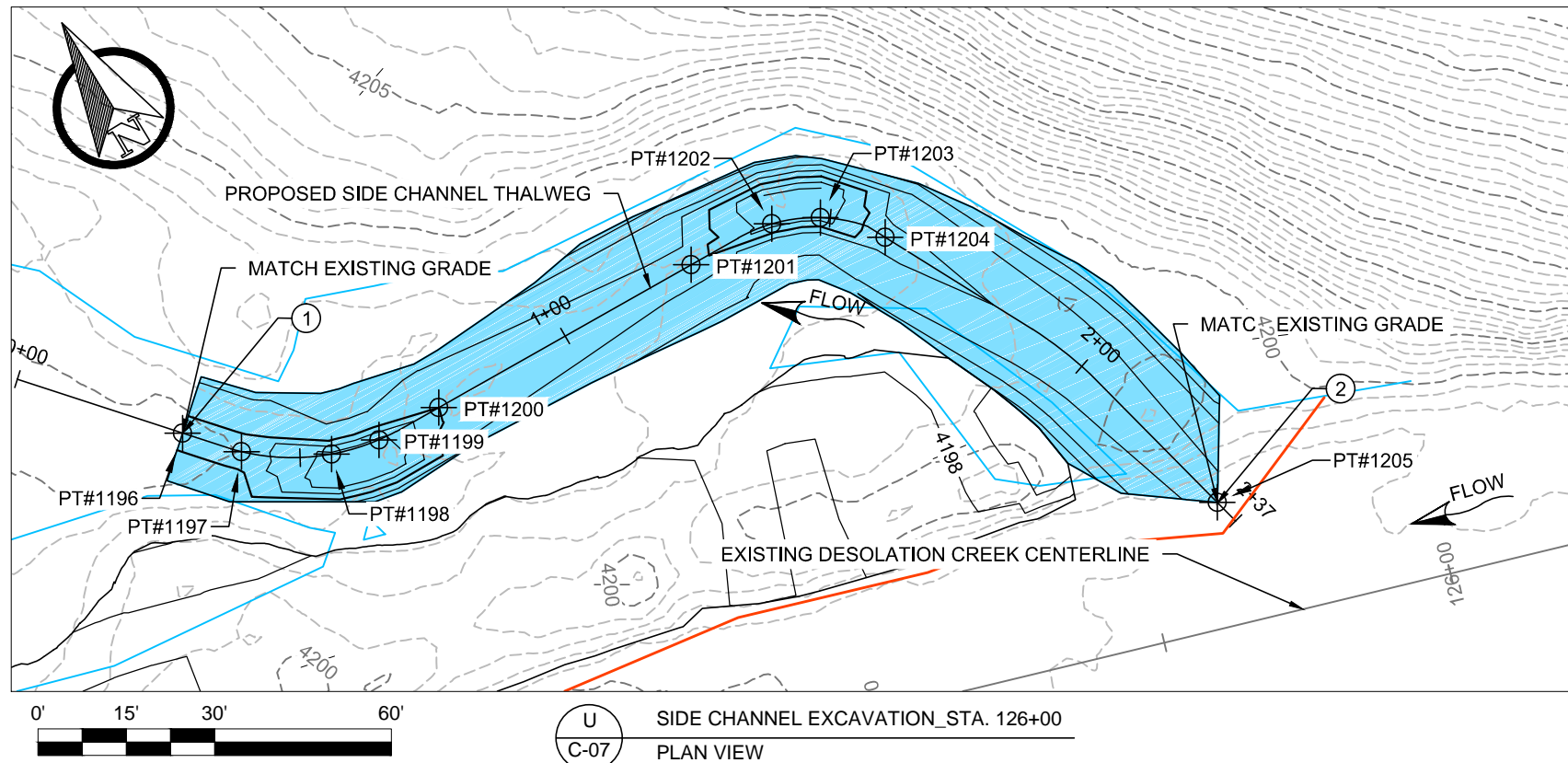
DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN

PROPOSED DESIGN
CONSTRUCTION DETAILS

DWG. NO.: **C-19**

CREATED: 12/01/16

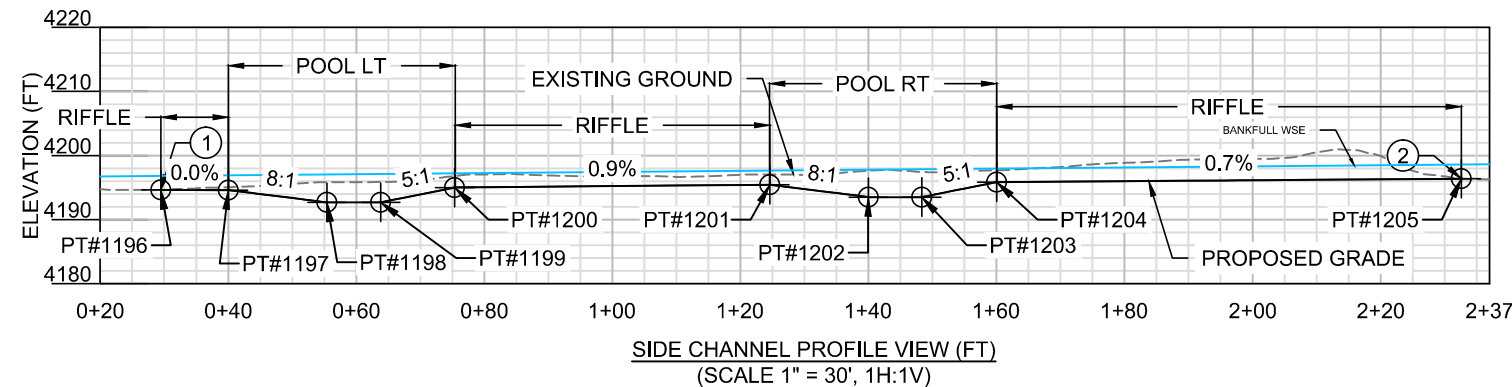
SHEET: 25 OF 40



- LEGEND:**
- EXISTING CONTOUR - MAJOR 5FT
 - EXISTING CONTOUR - MINOR 1FT
 - PROPOSED 2-YR FLOW
 - ⊕ CONSTRUCTION POINT
 - SIDE CHANNEL RECONNECTION / OFF-CHANNEL HABITAT
 - COFFERDAM

EXC CONSTRUCTION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1196	455634.6	8640845.2	4194.6	SC THWG
1197	455626.8	8640852.3	4194.6	SC THWG
1198	455618.8	8640865.3	4192.7	SC THWG
1199	455616.9	8640873.5	4192.7	SC THWG
1200	455616.6	8640885.1	4195.0	SC THWG
1201	455616.2	8640934.3	4195.4	SC THWG
1202	455615.3	8640949.6	4193.5	SC THWG
1203	455612.1	8640957.3	4193.5	SC THWG
1204	455603.7	8640965.1	4195.8	SC THWG
1205	455536.5	8640991.5	4196.4	SC THWG

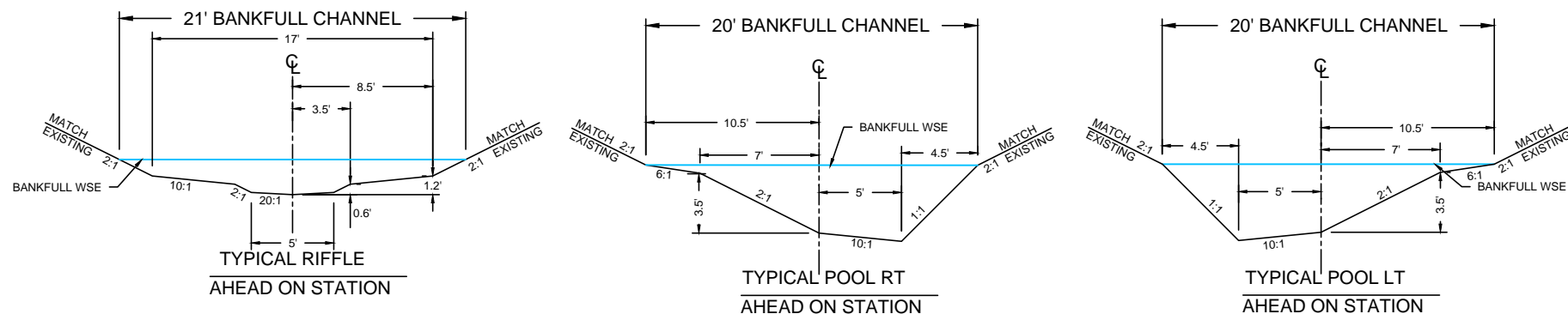
U SIDE CHANNEL EXCAVATION_STA. 126+00
C-07 PLAN VIEW



SIDE CHANNEL PROFILE VIEW (FT)
(SCALE 1" = 30', 1H:1V)

NOTES:

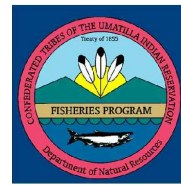
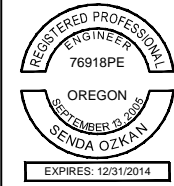
- COMPLETE BANKFULL CHANNEL DIMENSIONS MAY NOT BE ACCOMPLISHED AT DOWNSTREAM RIFFLE SECTION OF PROPOSED CHANNEL PROFILE. CHANNEL WIDTH DIMENSION WILL VARY 17 FT TO 21 FT FROM STA. 0+30 TO 0+40.
- COMPLETE BANKFULL CHANNEL DIMENSIONS MAY NOT BE ACCOMPLISHED AT UPSTREAM RIFFLE SECTION OF PROPOSED CHANNEL PROFILE. CHANNEL WIDTH DIMENSION WILL VARY 21 FT TO 3 FT FROM STA. 2+10 TO 2+30.
- PLACE COFFERDAM PRIOR TO CONSTRUCTION. SEE SHEET C-107 FOR DETAILS.
- TREES FELLED DURING EXCAVATION OF SIDE CHANNEL MAY BE PLACED IN POOLS FOR INCREASED HABITAT COMPLEXITY AS DIRECTED IN THE FIELD.
- SIDE CHANNEL SHALL BE CONSTRUCTED PER SECTION 31 23 00 AND SECTION 31 23 19 OF THE PROJECT SPECIFICATIONS.
- IF UNSUITABLE CHANNEL MATERIAL IS ENCOUNTERED, SIDE CHANNEL SHALL BE OVER-EXCAVATED 1 FT AND NATURAL CHANNEL MATERIAL SHALL BE PLACED PER SECTION 35 01 60 OF THE PROJECT SPECIFICATIONS AND AS DIRECTED IN THE FIELD.



CONSTRUCTION QUANTITIES:		
COMPONENT	DESCRIPTION	QUANTITY
SIDE CHANNEL	EXCAVATION	236 CY

NOT FOR CONSTRUCTION

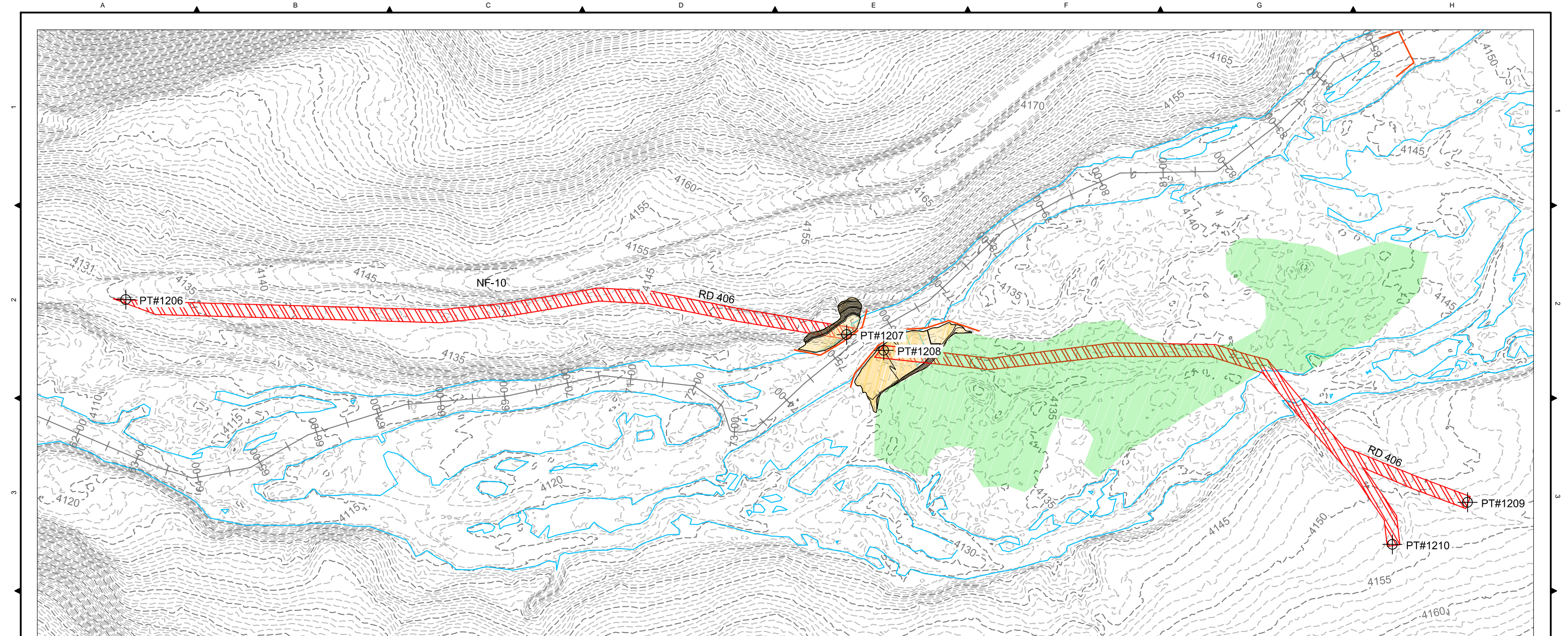
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REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN
PROPOSED DESIGN
CONSTRUCTION DETAILS

DWG. NO.:
C-20
CREATED: 12/01/16
SHEET: 26 OF 40



NOTES:

1. FLOODPLAIN EXCAVATION. SEE SHEET C-10 FOR DETAILS.
2. FLOODPLAIN ENHANCEMENT. SEE SHEET C-13 FOR DETAILS.
3. CONSTRUCTION POINTS PROVIDED FOR BEGIN AND END FOR EACH SEGMENT OF ROAD TO BE DECOMMISSIONED.
4. ROAD DECOMMISSIONING SHALL BE COMPLETED AS LAST CONSTRUCTION EFFORT OF PROJECT PRIOR TO PROJECT CLOSEOUT.
5. ROAD DECOMMISSION DETAILS PROVIDED ON SHEET C-109.

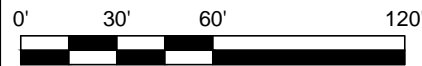
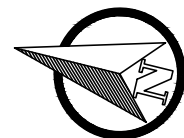
LEGEND:

- EXISTING CONTOUR - MAJOR 5FT
- EXISTING CONTOUR - MINOR 1FT
- PROPOSED 2-YR FLOW
- ⊕ CONSTRUCTION POINT
- FLOODPLAIN EXCAVATION
- FLOODPLAIN ENHANCEMENT
- ▨ ROAD DECOMMISSION

ROAD DECOMMISSION POINT TABLE (FT)				
POINT #	NORTHING	EASTING	ELEVATION	DESCRIPTION
1206	459831.0	8637426.4	-	RD DCM
1207	458733.2	8637664.2	-	RD DCM
1208	458671.0	8637655.5	-	RD DCM
1209	457732.1	8637662.2	-	RD DCM
1210	457828.2	8637568.7	-	RD DCM

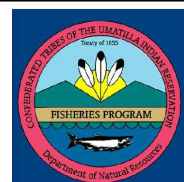
CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
ROAD DECOMMISSION	REMOVE ROADWAY	0.50 MI



NOT FOR CONSTRUCTION

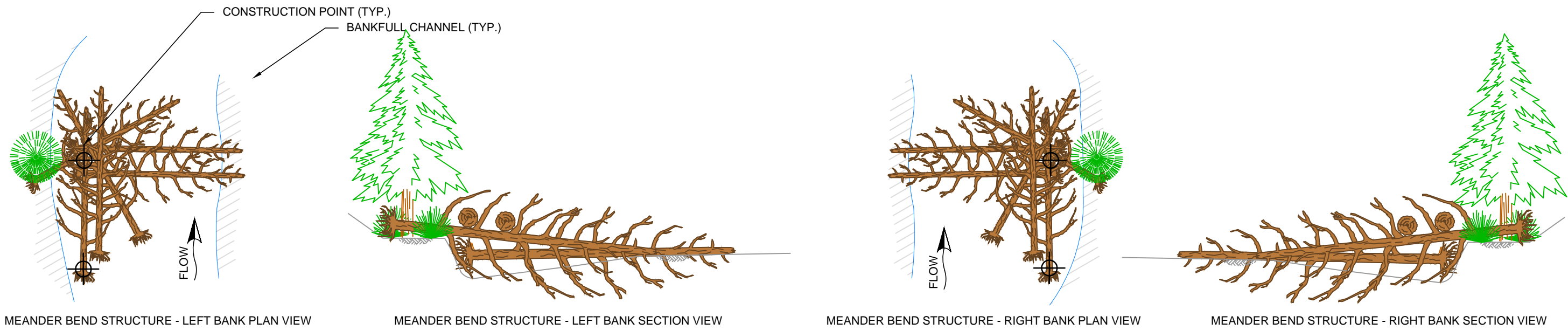
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REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN
PROPOSED DESIGN
ROAD DECOMMISSION PLAN

DWG. NO.: **C-21**
CREATED: 12/01/16
SHEET: 27 OF 40

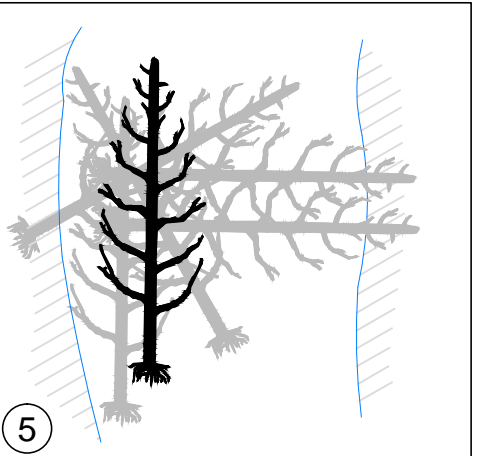
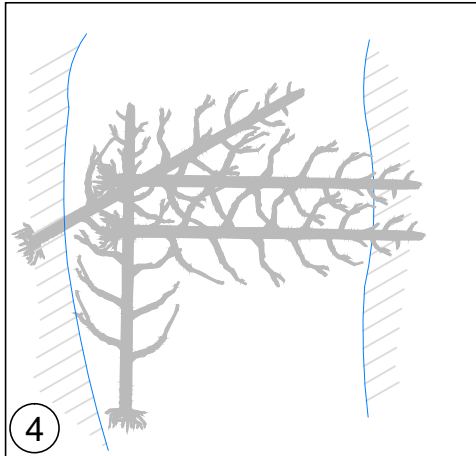
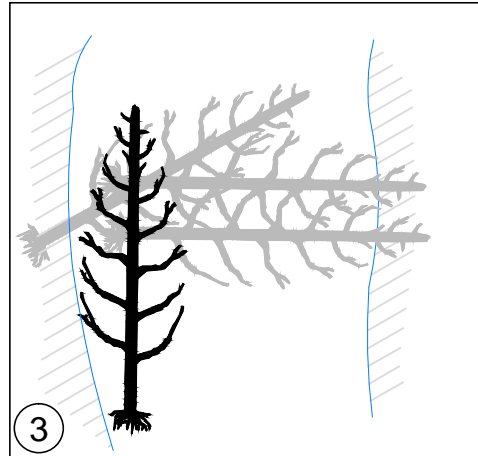
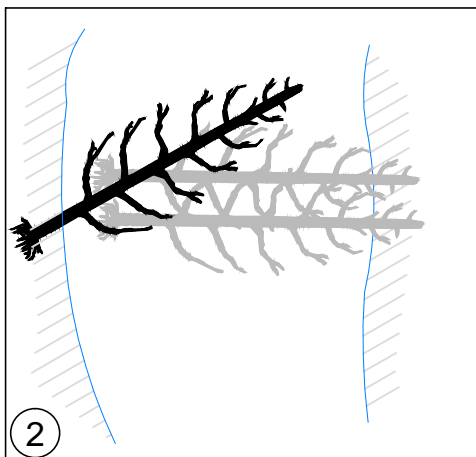
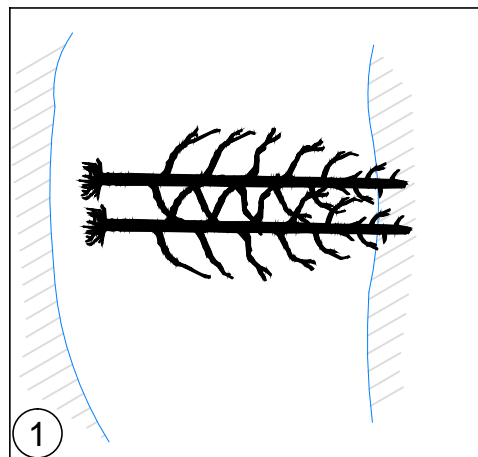


CONSTRUCTION QUANTITIES:

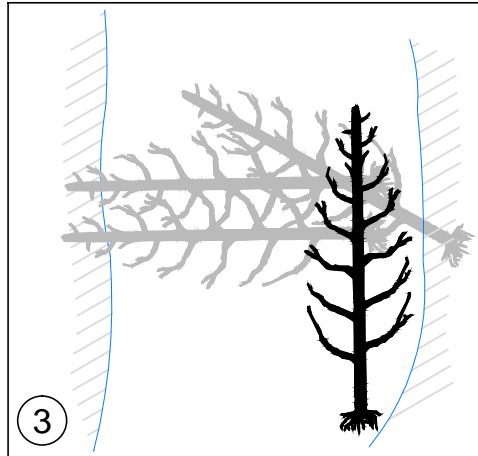
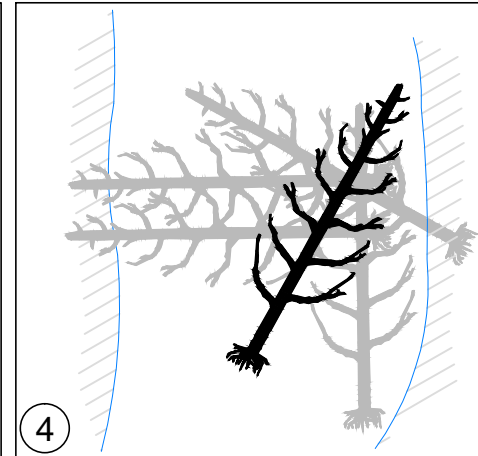
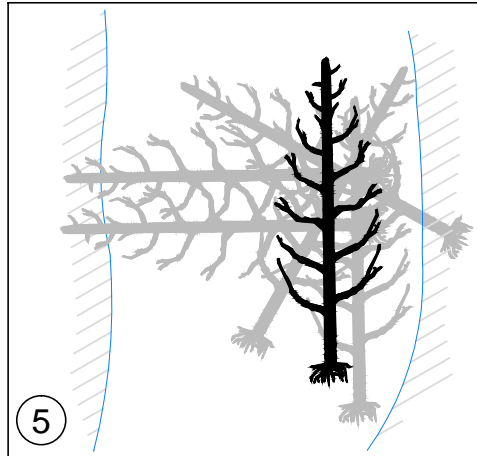
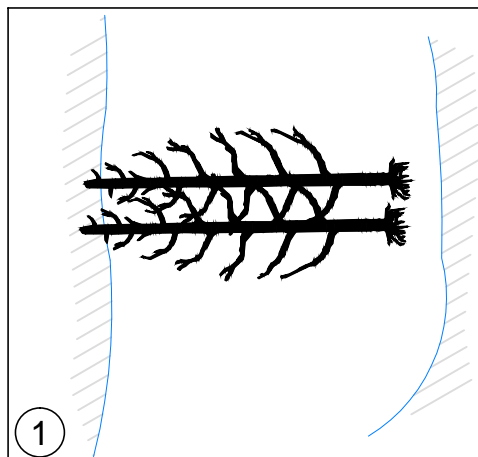
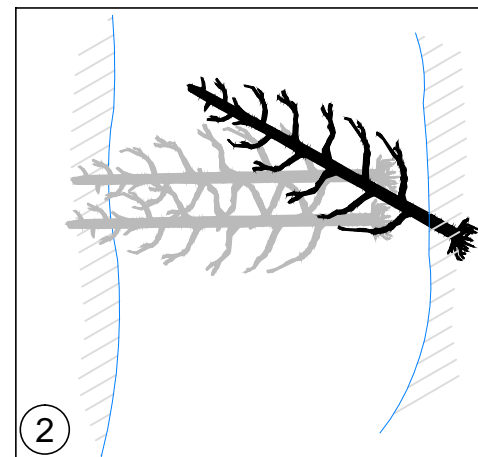
COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	6

MEANDER BEND STRUCTURE NOTES:

1. PLACE ROOTWAD OF MEDIUM TREES PLACED IN SEQUENCE #1 1 TO 2 FEET FROM BANK FACE.
2. PLACE ROOTWAD OF MEDIUM TREE PLACED IN SEQUENCE #2 ON TOP OF BANK AND UPSTREAM OF STANDING TREES, IF PRESENT.
3. PLACE ROOTWAD OF MEDIUM TREE PLACED IN SEQUENCE #3 IN CHANNEL THALWEG.
4. PLACE ROOTWAD OF MEDIUM TREE PLACED IN SEQUENCE #4 5 TO 10 FEET FROM CHANNEL THALWEG.
5. PLACE ROOTWAD OF MEDIUM TREE PLACED IN SEQUENCE #5 IN CHANNEL THALWEG.
6. BANKFULL LOCATION WITH RESPECT TO STRUCTURE LOCATION IS A TYPICAL REPRESENTATION AND MAY VARY AT EACH STRUCTURE LOCATION. FINAL CONFIGURATION OF STRUCTURE SHALL BE AS DIRECTED IN FIELD.

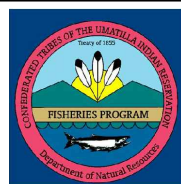
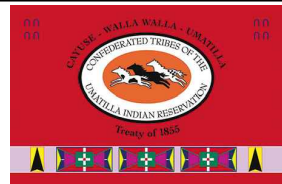


MEANDER BEND STRUCTURE - LEFT BANK LOG PLACEMENT SEQUENCING



MEANDER BEND STRUCTURE - RIGHT BANK LOG PLACEMENT SEQUENCING

NOT FOR CONSTRUCTION

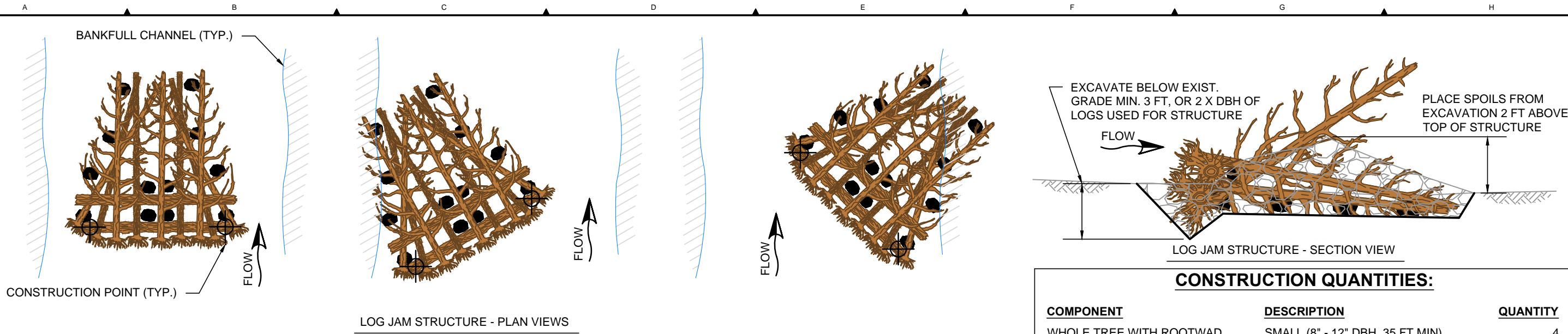


PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN
DETAILS
LWD CONSTRUCTION

DWG. NO.:
C-100
CREATED: 12/01/16
SHEET: 28 OF 40

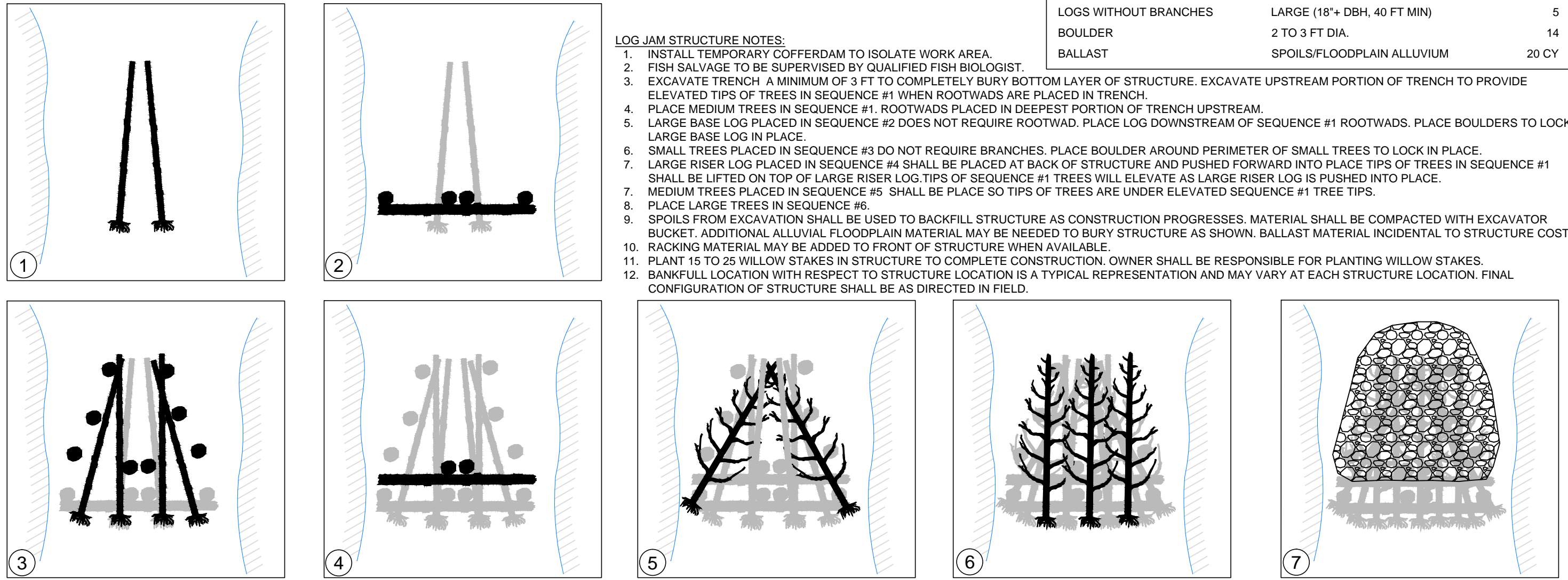


CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	SMALL (8" - 12" DBH, 35 FT MIN)	4
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	4
LOGS WITHOUT BRANCHES	LARGE (18"+ DBH, 40 FT MIN)	5
BOULDER	2 TO 3 FT DIA.	14
BALLAST	SPOILS/FLOODPLAIN ALLUVIUM	20 CY

LOG JAM STRUCTURE NOTES:

1. INSTALL TEMPORARY COFFERDAM TO ISOLATE WORK AREA.
2. FISH SALVAGE TO BE SUPERVISED BY QUALIFIED FISH BIOLOGIST.
3. EXCAVATE TRENCH A MINIMUM OF 3 FT TO COMPLETELY BURY BOTTOM LAYER OF STRUCTURE. EXCAVATE UPSTREAM PORTION OF TRENCH TO PROVIDE ELEVATED TIPS OF TREES IN SEQUENCE #1 WHEN ROOTWADS ARE PLACED IN TRENCH.
4. PLACE MEDIUM TREES IN SEQUENCE #1. ROOTWADS PLACED IN DEEPEST PORTION OF TRENCH UPSTREAM.
5. LARGE BASE LOG PLACED IN SEQUENCE #2 DOES NOT REQUIRE ROOTWAD. PLACE LOG DOWNSTREAM OF SEQUENCE #1 ROOTWADS. PLACE BOULDERS TO LOCK LARGE BASE LOG IN PLACE.
6. SMALL TREES PLACED IN SEQUENCE #3 DO NOT REQUIRE BRANCHES. PLACE BOULDER AROUND PERIMETER OF SMALL TREES TO LOCK IN PLACE.
7. LARGE RISER LOG PLACED IN SEQUENCE #4 SHALL BE PLACED AT BACK OF STRUCTURE AND PUSHED FORWARD INTO PLACE TIPS OF TREES IN SEQUENCE #1 SHALL BE LIFTED ON TOP OF LARGE RISER LOG. TIPS OF SEQUENCE #1 TREES WILL ELEVATE AS LARGE RISER LOG IS PUSHED INTO PLACE.
7. MEDIUM TREES PLACED IN SEQUENCE #5 SHALL BE PLACED SO TIPS OF TREES ARE UNDER ELEVATED SEQUENCE #1 TREE TIPS.
8. PLACE LARGE TREES IN SEQUENCE #6.
9. SPOILS FROM EXCAVATION SHALL BE USED TO BACKFILL STRUCTURE AS CONSTRUCTION PROGRESSES. MATERIAL SHALL BE COMPACTED WITH EXCAVATOR BUCKET. ADDITIONAL ALLUVIAL FLOODPLAIN MATERIAL MAY BE NEEDED TO BURY STRUCTURE AS SHOWN. BALLAST MATERIAL INCIDENTAL TO STRUCTURE COST. RACKING MATERIAL MAY BE ADDED TO FRONT OF STRUCTURE WHEN AVAILABLE.
10. PLANT 15 TO 25 WILLOW STAKES IN STRUCTURE TO COMPLETE CONSTRUCTION. OWNER SHALL BE RESPONSIBLE FOR PLANTING WILLOW STAKES.
11. BANKFULL LOCATION WITH RESPECT TO STRUCTURE LOCATION IS A TYPICAL REPRESENTATION AND MAY VARY AT EACH STRUCTURE LOCATION. FINAL CONFIGURATION OF STRUCTURE SHALL BE AS DIRECTED IN FIELD.



LOG JAM STRUCTURE - LOG PLACEMENT SEQUENCING

NOT FOR CONSTRUCTION

Z:\PROJECTS\194-6507 DESOLATION CREEK\90% DESIGN (EMPTY)\SHEET FILES\DETAILS.LWD.DWG
 JUN 7, 2017 3:08 PM

TETRA TECH
 www.tetrattech.com
 19803 North Creek Parkway
 Bothell, Washington 98011
 Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER
 76918PE
 OREGON
 SEPTEMBER 03, 2008
 SENDA OZKAN
 EXPIRES: 12/31/2014

ALEX STROM
 STATE OF WASHINGTON
 47025
 REGISTERED PROFESSIONAL ENGINEER
 EXPIRES: 05/07/2017

CHUKYAN, WALKER, WALLA, URSAPILLA
 CONSOLIDATED TRIBES OF THE UMATILLA INDIAN RESERVATION
 TRIBE OF ASIA

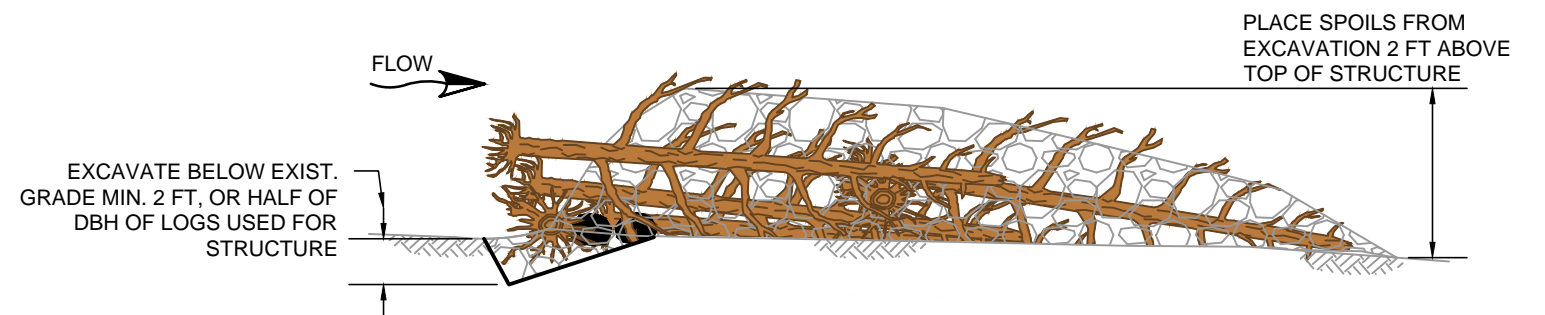
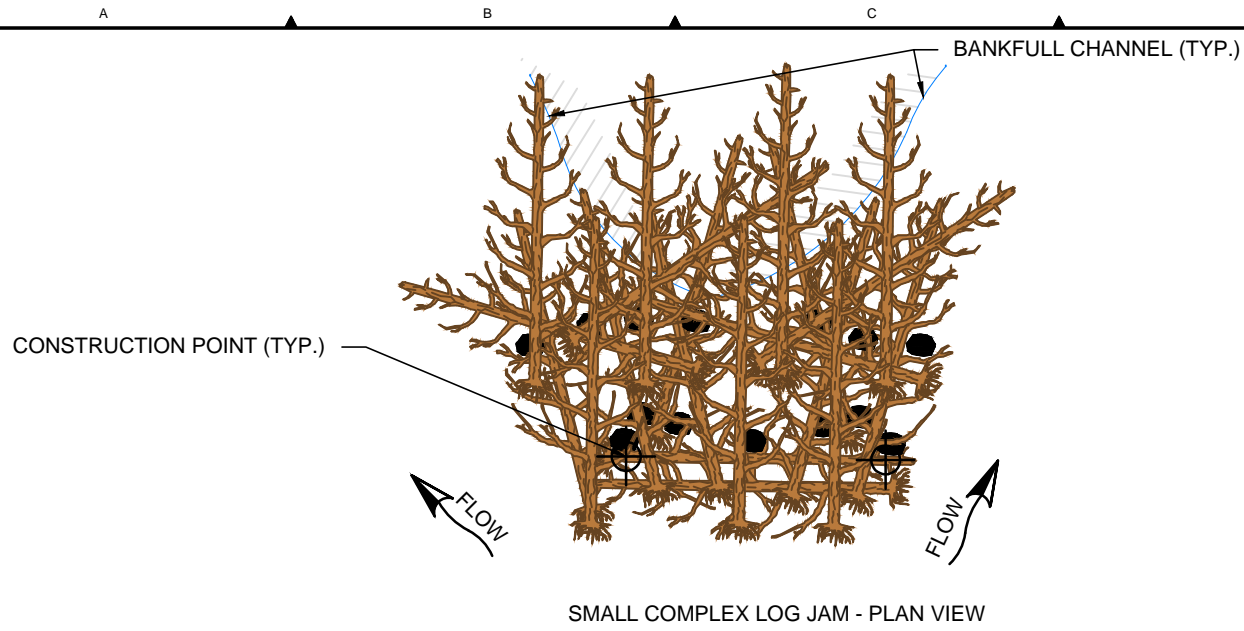
CONSOLIDATED TRIBES OF THE UMATILLA INDIAN RESERVATION
 FISHERIES PROGRAM
 DEPARTMENT OF NATURAL RESOURCES

PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")

REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN
 DETAILS
 LWD CONSTRUCTION

DWG. NO.:
C-101
 CREATED: 12/01/16
 SHEET: 29 OF 40

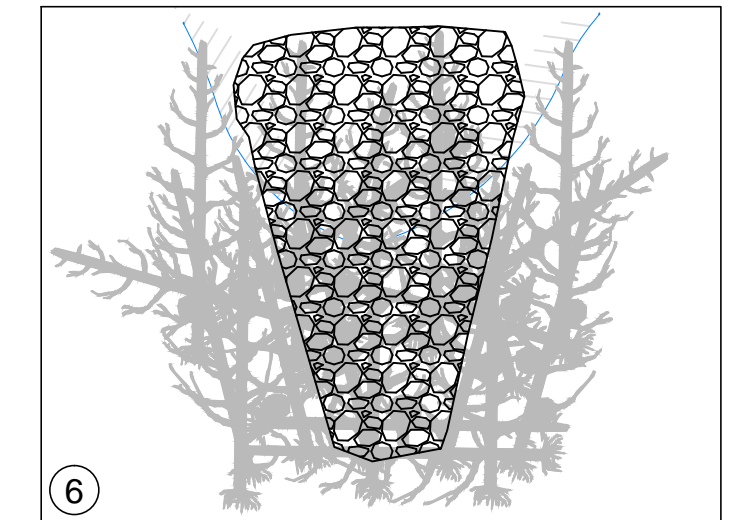
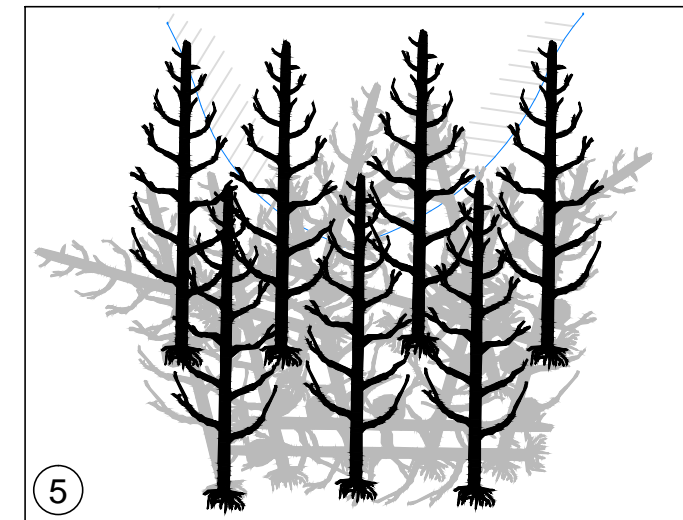
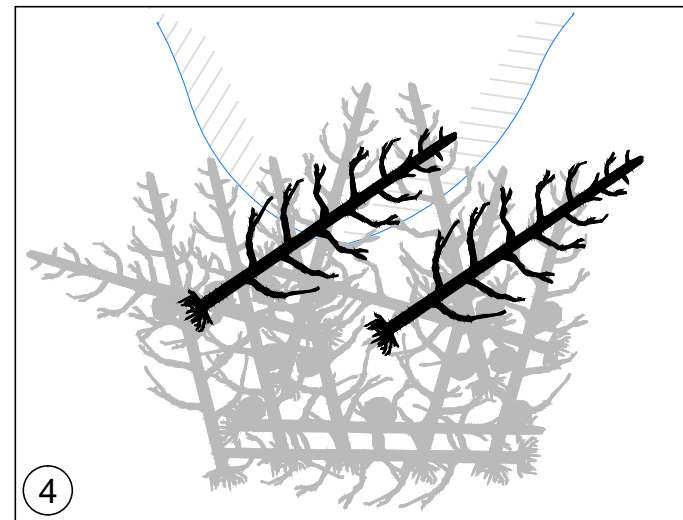
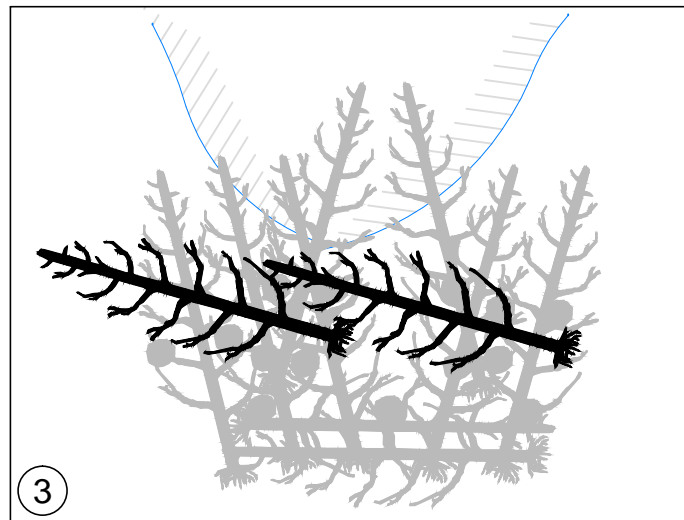
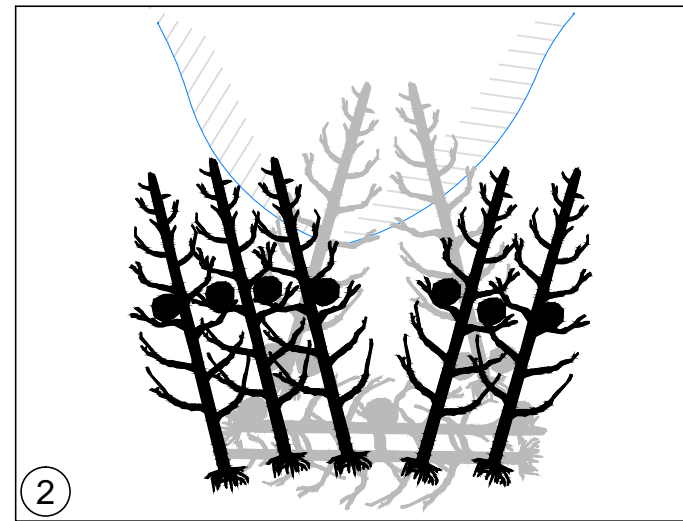
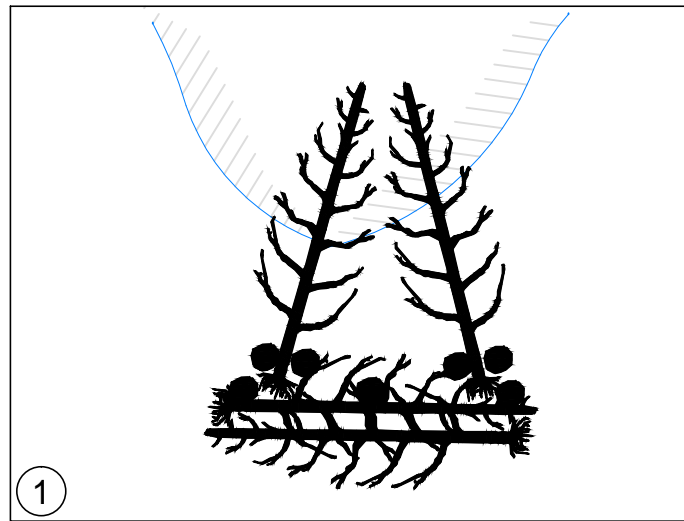


CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	20
BOULDER	2FT TO 3FT DIA.	14
BALLAST	SPOILS/FLOODPLAIN ALLUVIUM	20 CY

LWD NOTES:

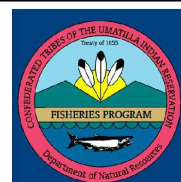
1. INSTALL TEMPORARY COFFERDAM TO ISOLATE STRUCTURE WHEN NEEDED.
2. FISH SALVAGE TO BE SUPERVISED BY QUALIFIED FISH BIOLOGIST.
3. MEDIUM TREES PLACED IN SEQUENCE #1 SHALL BE PLACED MID CHANNEL WITH BOTTOM HALF OF ROOTWADS BURIED INTO EXISTING GROUND.
4. PLACE SMALLER DIAMETER MEDIUM TREES IN SEQUENCE #2. PLACE BOULDERS ALONG STEMS OF TREES TO LOCK INTO PLACE.
5. MEDIUM TREES PLACED IN SEQUENCES #3 AND #4 PLACED FOR BALLAST AT BACK OF STRUCTURE.
6. MEDIUM TREES PLACED IN SEQUENCE #5 SHALL BE PLACED WITH ROOTWADS UPSTREAM OF TREES PLACED IN TWO PREVIOUS SEQUENCES.
7. PLACE LARGEST DIAMETER MEDIUM TREES IN SEQUENCE #6 WITH ROOTWADS UPSTREAM OF TREES PLACED IN SEQUENCE #2.
8. BURY CENTER PORTION OF STRUCTURE MIN. 2FT ABOVE TREE STEM ELEVATION WITH SPOILS FROM EXCAVATION FOR STRUCTURE BALLAST. ADDITIONAL FLOODPLAIN ALLUVIUM MAY BE NEEDED TO COMPLETE CONSTRUCTION. MATERIAL SHALL BE COMPACTED WITH EXCAVATOR BUCKET. BALLAST MATERIAL INCIDENTAL TO STRUCTURE COST.
9. ADD RACKING MATERIAL TO FRONT OF STRUCTURE AS AVAILABLE.
10. PLANT 20 TO 30 WILLOW STAKES IN STRUCTURE TO COMPLETE CONSTRUCTION. OWNER SHALL BE RESPONSIBLE FOR PLANTING WILLOW STAKES.
11. BANKFULL LOCATION WITH RESPECT TO STRUCTURE LOCATION IS A TYPICAL REPRESENTATION AND MAY VARY AT EACH STRUCTURE LOCATION. FINAL CONFIGURATION OF STRUCTURE SHALL BE AS DIRECTED IN FIELD.



SMALL COMPLEX LOG JAM - LOG PLACEMENT SEQUENCING

NOT FOR CONSTRUCTION

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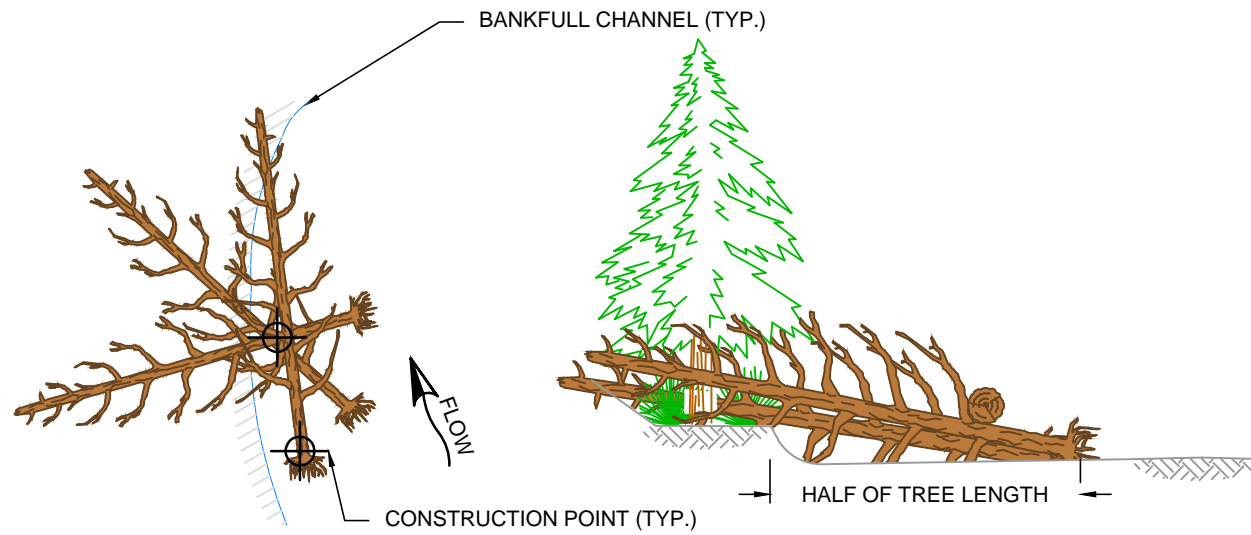
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REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN

DETAILS
 LWD CONSTRUCTION

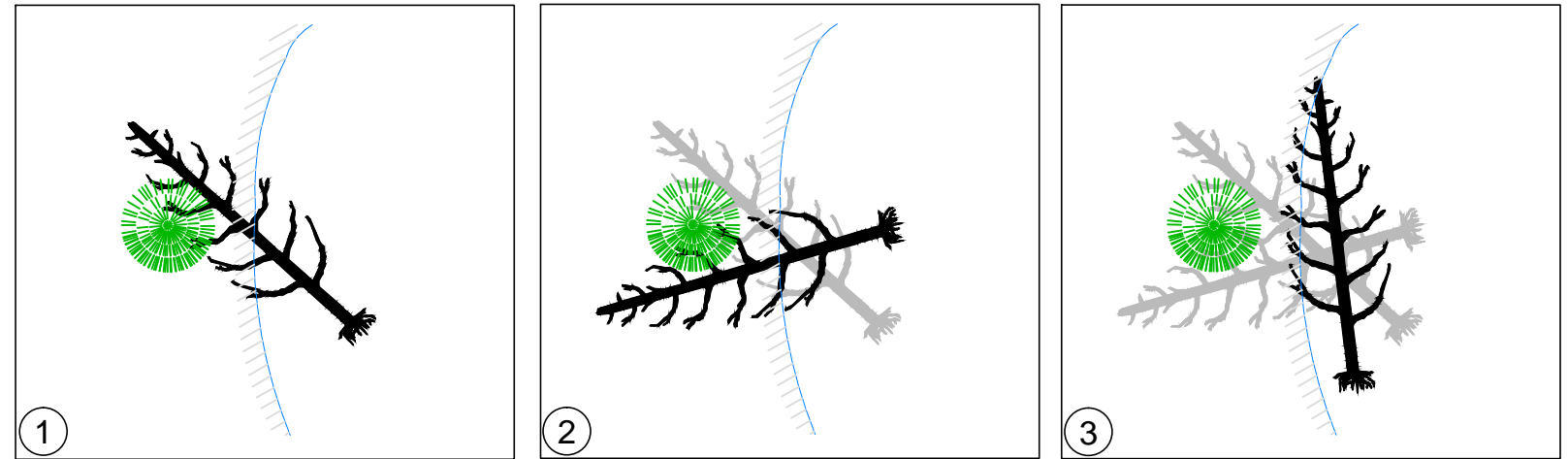
DWG. NO.:	C-102
CREATED:	12/01/16
SHEET:	30 OF 40



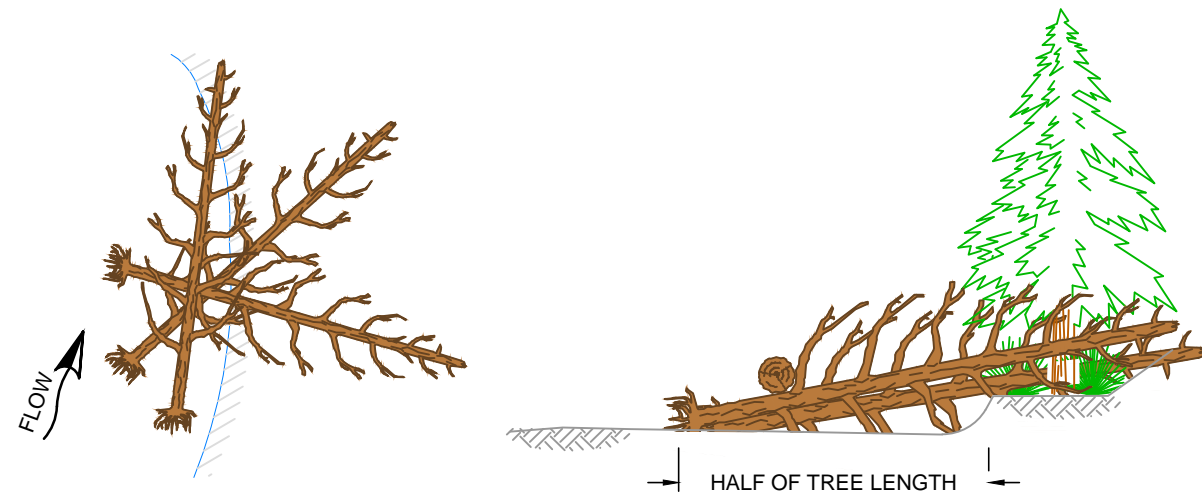
3-LOG CROSS STRUCTURE - TYPE 2 - LEFT BANK PLAN AND SECTION VIEWS

3-LOG CROSS STRUCTURE - TYPE 2 NOTES:

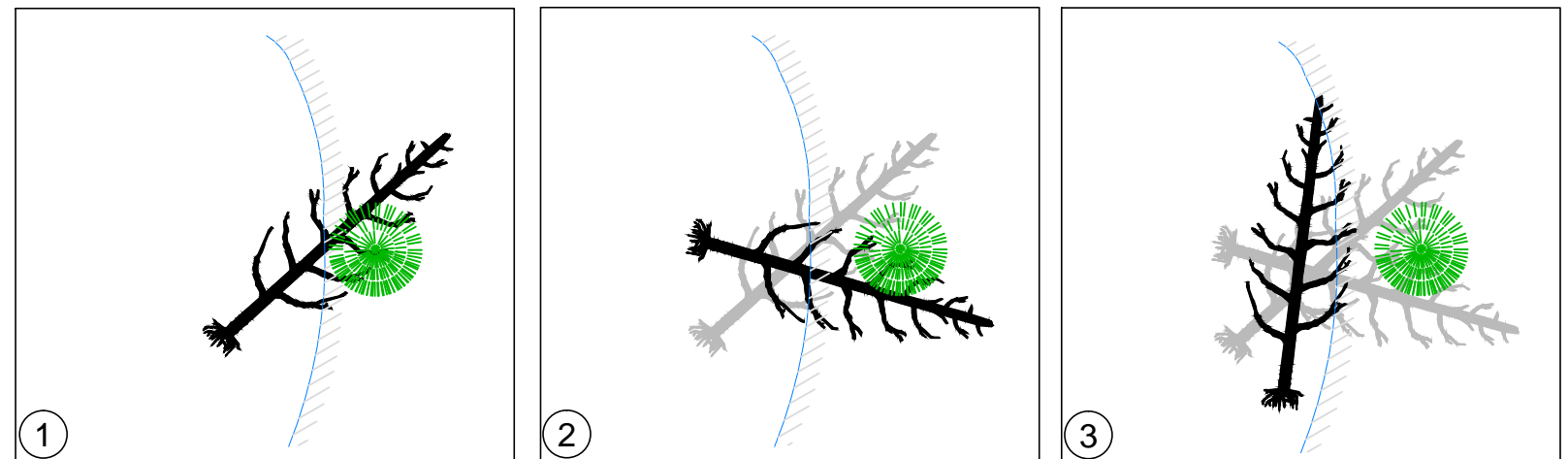
1. PLACE HALF OF THE LENGTH OF THE MEDIUM TREE IN SEQUENCE #1 WITHIN BANKFULL CHANNEL WITH TIP OF TREE DOWNSTREAM OF STANDING TREE, IF PRESENT.
2. BURY BOTTOM HALF OF SEQUENCE #1 ROOTWAD IN CHANNEL.
3. PLACE QUARTER TO HALF OF THE LENGTH OF THE MEDIUM TREE IN SEQUENCE #2 WITHIN BANKFULL CHANNEL WITH TIP OF TREE UPSTREAM OF STANDING TREE, IF PRESENT.
4. BURY BOTTOM HALF OF SEQUENCE #2 ROOTWAD IN CHANNEL.
5. PLACE ROOTWAD OF MEDIUM TREE IN SEQUENCE #3 15 FEET UPSTREAM OF SEQUENCE #1 AND #2 TREES AND PLACE STEM OF TREE ON TOP OF SEQUENCE #1 AND #2 TREE CROSSING LOCATION.
6. BURY BOTTOM HALF OF SEQUENCE #3 ROOTWAD IN CHANNEL.
7. BANKFULL LOCATION WITH RESPECT TO STRUCTURE LOCATION IS A TYPICAL REPRESENTATION AND MAY VARY AT EACH STRUCTURE LOCATION. FINAL CONFIGURATION OF STRUCTURE SHALL BE AS DIRECTED IN FIELD.



3-LOG CROSS STRUCTURE - TYPE 2 - LEFT BANK LOG PLACEMENT SEQUENCING



3-LOG CROSS STRUCTURE - TYPE 2 - RIGHT BANK PLAN AND SECTION VIEWS



3-LOG CROSS STRUCTURE - TYPE 2 - RIGHT BANK LOG PLACEMENT SEQUENCING

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	3

NOT FOR CONSTRUCTION

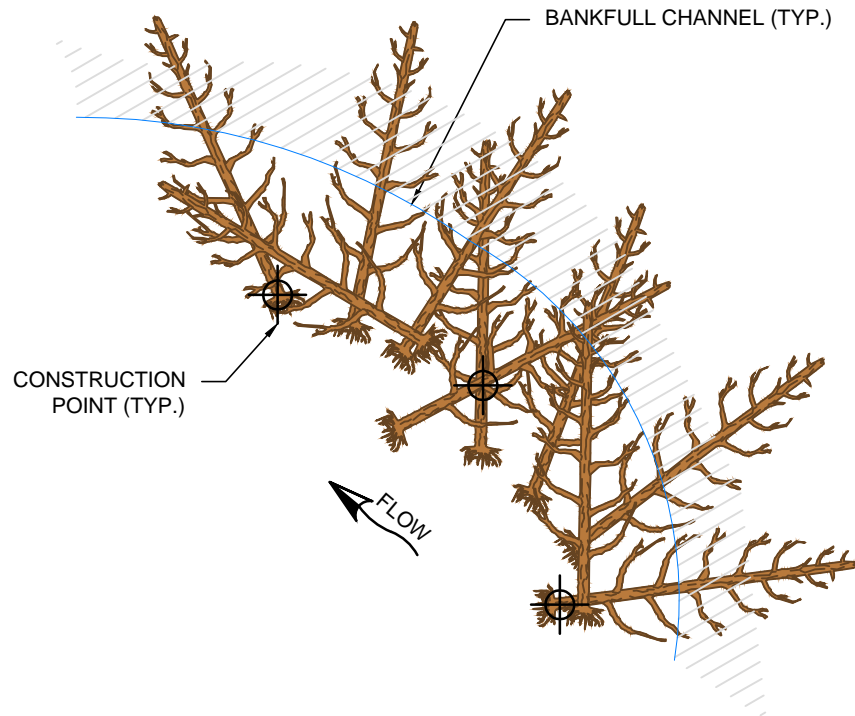
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 ALEX STROM



REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
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B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN
 DETAILS
 LWD CONSTRUCTION

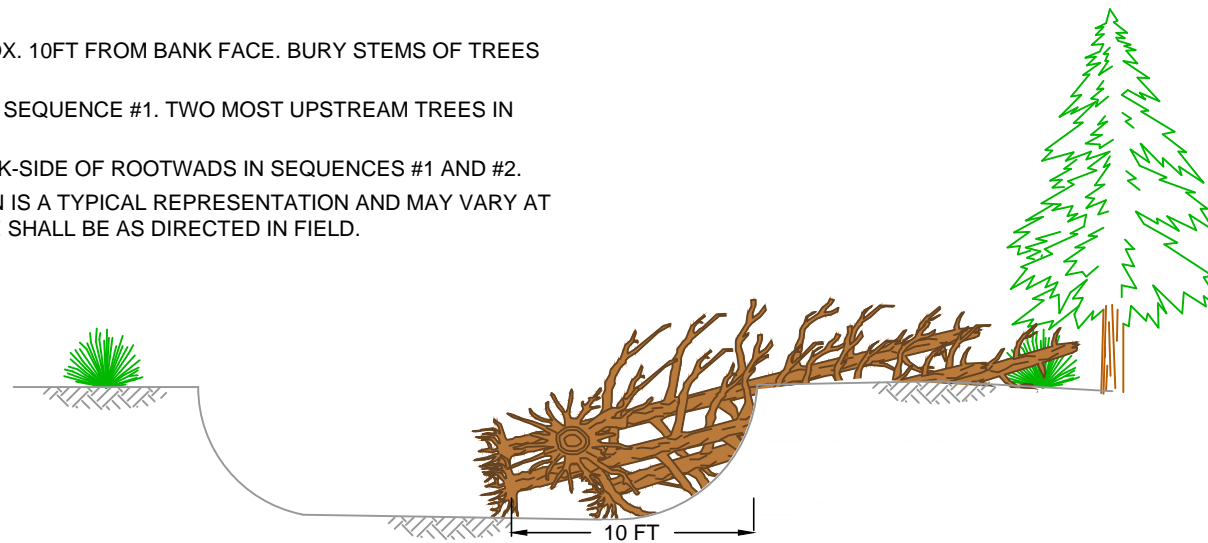
DWG. NO.:
C-103
 CREATED: 12/01/16
 SHEET: 31 OF 40



10-LOG CORNER STRUCTURE - RIGHT BANK PLAN VIEW

LWD NOTES:

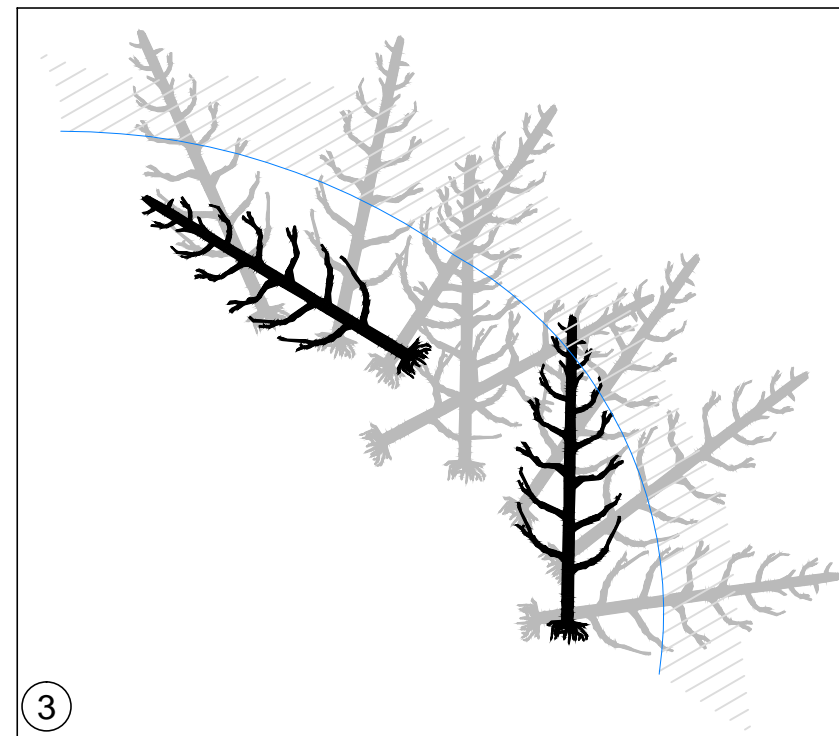
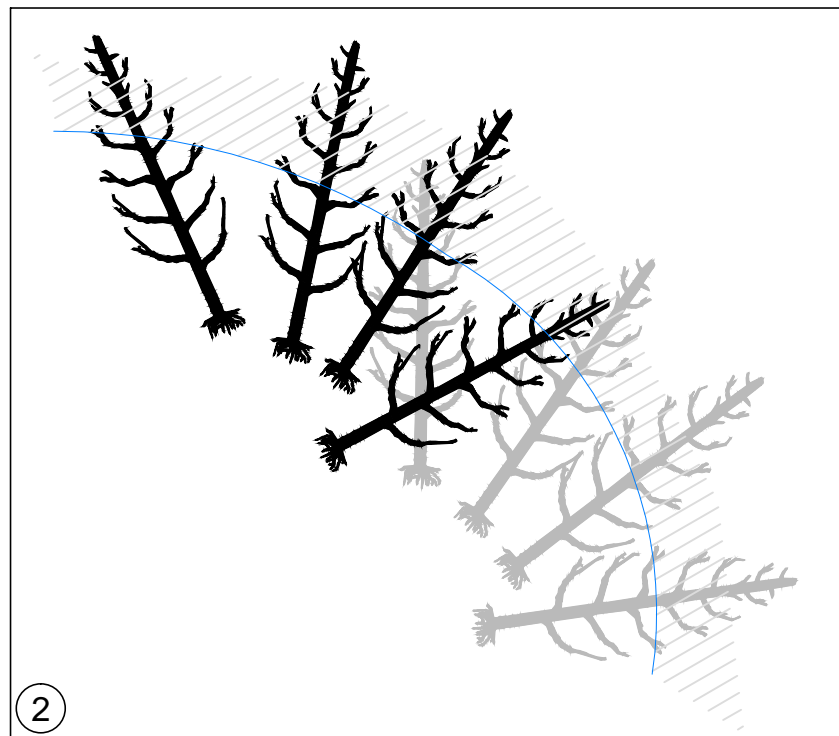
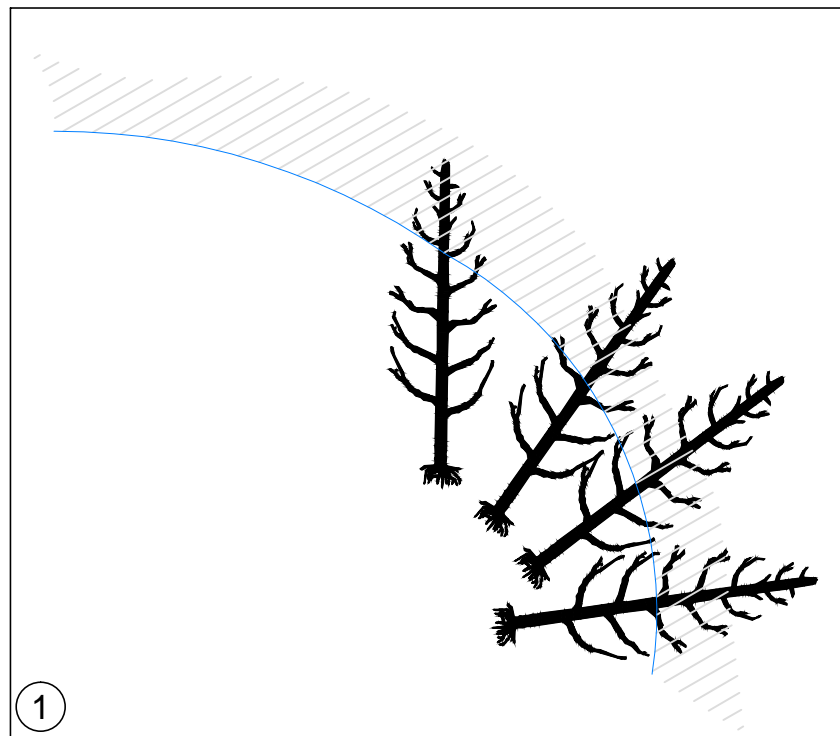
1. PLACE SMALL TREES IN SEQUENCE #1 WITH ROOTWADS APPROX. 10FT FROM BANK FACE. BURY STEMS OF TREES IN BANKS. TIPS OF TREES MAY PROTRUDE FROM SURFACE.
2. PLACE SMALL TREES IN SEQUENCE #2 TO MIMIC PLACEMENT IN SEQUENCE #1. TWO MOST UPSTREAM TREES IN SEQUENCE #2 MAY NOT BE BURIED.
3. PLACE MEDIUM TREES IN SEQUENCE #3 SO TREES ARE ON BANK-SIDE OF ROOTWADS IN SEQUENCES #1 AND #2.
4. BANKFULL LOCATION WITH RESPECT TO STRUCTURE LOCATION IS A TYPICAL REPRESENTATION AND MAY VARY AT STRUCTURE LOCATION. FINAL CONFIGURATION OF STRUCTURE SHALL BE AS DIRECTED IN FIELD.



10-LOG CORNER STRUCTURE - RIGHT BANK SECTION VIEW

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	SMALL (8" - 12" DBH, 35 FT MIN)	8
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	2



10-LOG CORNER STRUCTURE - RIGHT BANK LOG PLACEMENT SEQUENCING

NOT FOR CONSTRUCTION

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TETRA TECH
 www.tetrattech.com
 19803 North Creek Parkway
 Bothell, Washington 98011
 Phone: 425-482-7600 Fax: 425-482-7652

REGISTERED PROFESSIONAL ENGINEER
 76918PE
 OREGON
 SEPTEMBER 13, 2005
 SENDA OZKAN
 EXPIRES: 12/31/2014

ALEX STROM
 STATE OF WASHINGTON
 47025
 REGISTERED PROFESSIONAL ENGINEER
 EXPIRES: 05/07/2017

CASCADE WAJWA WALLEA UMATILLA
 CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
 TRIBE OF ASIA

CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
 FISHERIES PROGRAM
 Department of Natural Resources

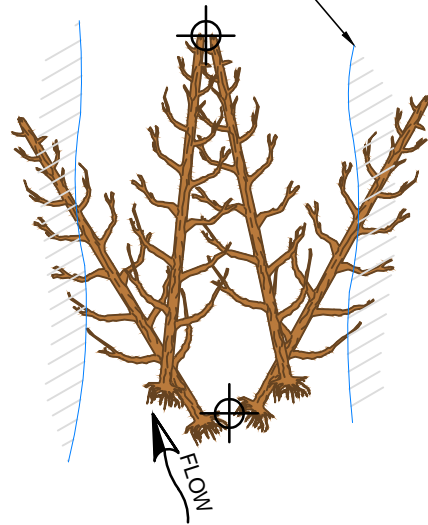
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REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
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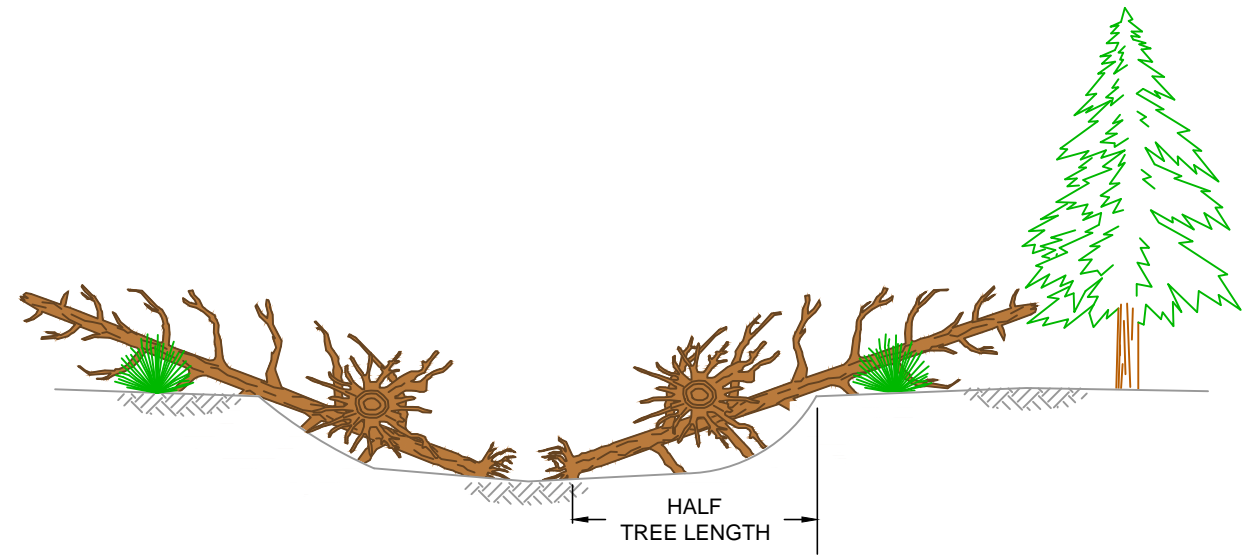
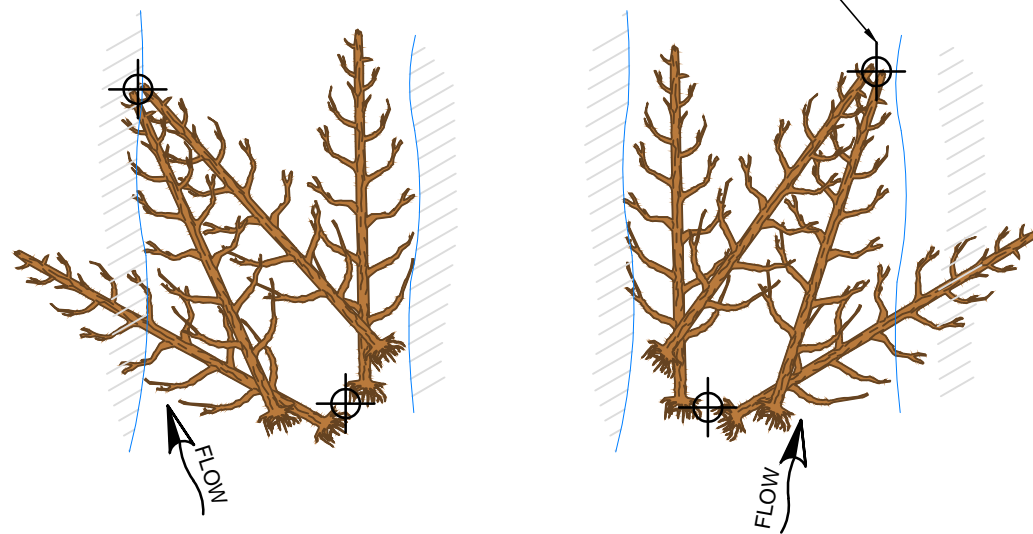
DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN
 DETAILS
 LWD CONSTRUCTION

DWG. NO.:
C-104
 CREATED: 12/01/16
 SHEET: 32 OF 40

BANKFULL CHANNEL (TYP.)

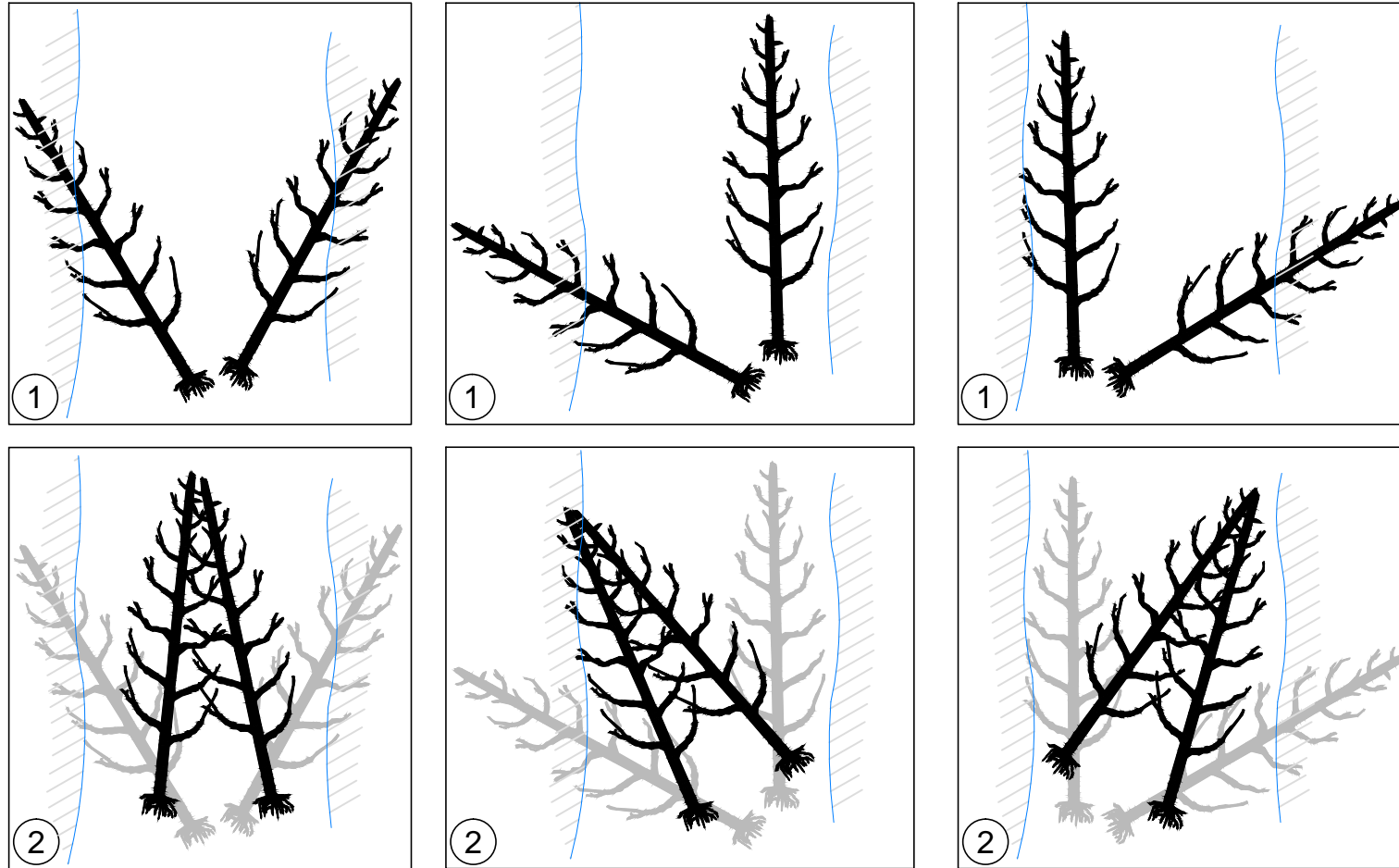


CONSTRUCTION POINT (TYP.)



CHANNEL BLEED THROUGH STRUCTURE - TYPE 1 - PLAN VIEWS

CHANNEL BLEED THROUGH STRUCTURE - TYPE 1 - SECTION VIEW



CHANNEL BLEED THROUGH STRUCTURE - TYPE 1 - LOG PLACEMENT SEQUENCING

LWD NOTES:

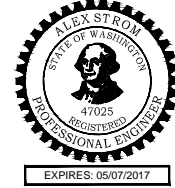
1. PLACE MEDIUM TREES IN SEQUENCE #1 WITH ROOTWADS MID-CHANNEL. BURY BOTTOM HALF OF ROOTWADS IN CHANNEL BED.
2. STEMS OF TREES IN SEQUENCE #1 MAY BE BURIED IN BANKS AS DIRECTED IN FIELD. TIPS OF TREES MAY PROTRUDE FROM SURFACE. FOR ROTATED STRUCTURES ONLY ONE TREE MAY BE BURIED IN BANK.
3. PLACE MEDIUM TREES IN SEQUENCE #2 TO BALLAST TREES IN SEQUENCE #1. FOR ROTATED STRUCTURES TIPS OF TREES MAY BE BURIED IN BANK AS DIRECTED IN FIELD.
4. BANKFULL LOCATION WITH RESPECT TO STRUCTURE LOCATION IS A TYPICAL REPRESENTATION AND MAY VARY AT EACH STRUCTURE LOCATION. FINAL CONFIGURATION OF STRUCTURE SHALL BE AS DIRECTED IN FIELD.

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	MEDIUM (13" - 18" DBH, 40 FT MIN)	4

NOT FOR CONSTRUCTION

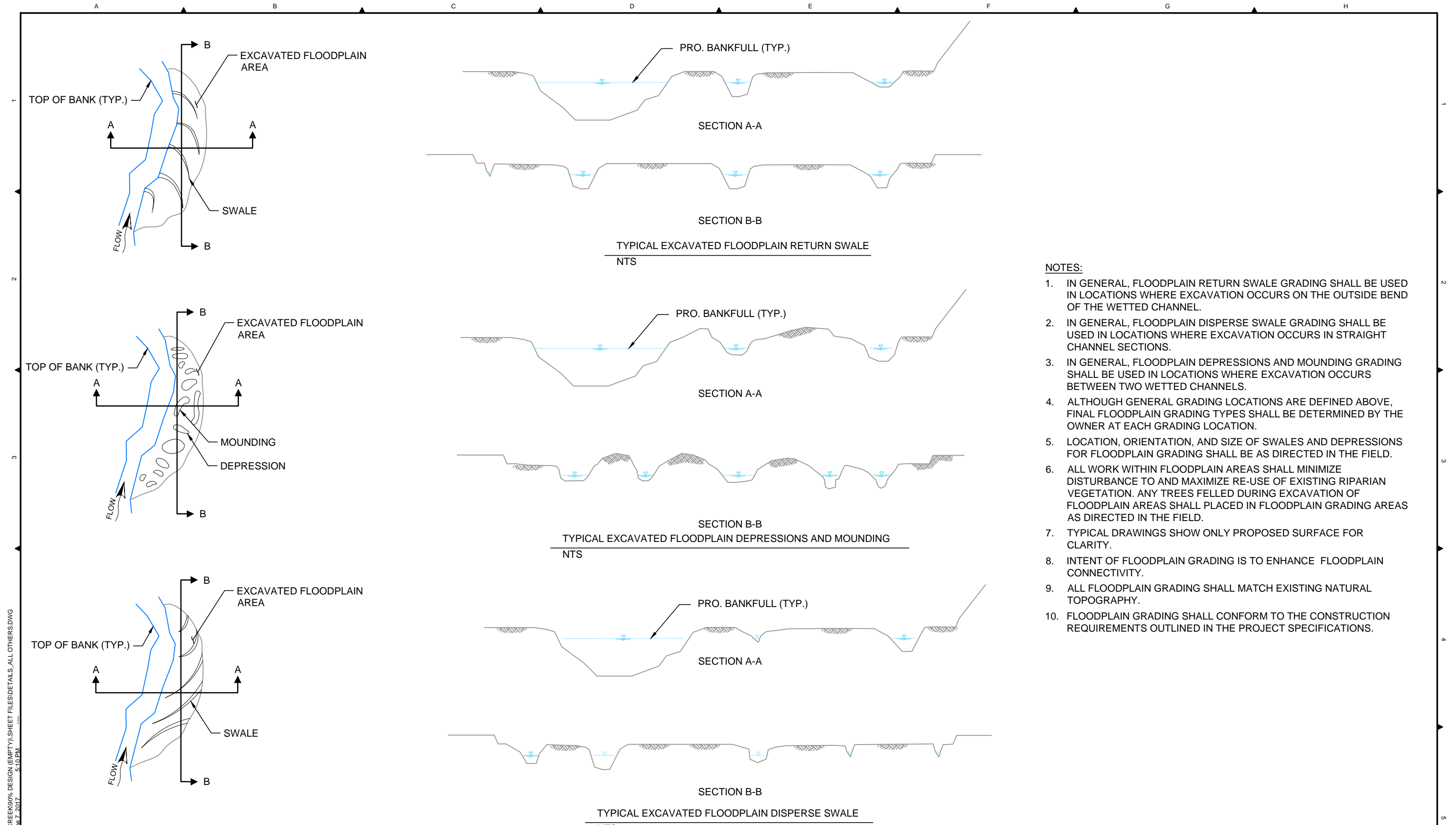
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REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN
DETAILS
 LWD CONSTRUCTION

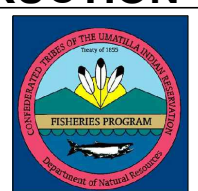
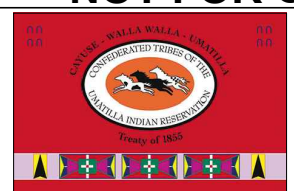
DWG. NO.:
C-105
 CREATED: 12/01/16
 SHEET: 33 OF 40



- NOTES:**
1. IN GENERAL, FLOODPLAIN RETURN SWALE GRADING SHALL BE USED IN LOCATIONS WHERE EXCAVATION OCCURS ON THE OUTSIDE BEND OF THE WETTED CHANNEL.
 2. IN GENERAL, FLOODPLAIN DISPERSE SWALE GRADING SHALL BE USED IN LOCATIONS WHERE EXCAVATION OCCURS IN STRAIGHT CHANNEL SECTIONS.
 3. IN GENERAL, FLOODPLAIN DEPRESSIONS AND MOUNDING GRADING SHALL BE USED IN LOCATIONS WHERE EXCAVATION OCCURS BETWEEN TWO WETTED CHANNELS.
 4. ALTHOUGH GENERAL GRADING LOCATIONS ARE DEFINED ABOVE, FINAL FLOODPLAIN GRADING TYPES SHALL BE DETERMINED BY THE OWNER AT EACH GRADING LOCATION.
 5. LOCATION, ORIENTATION, AND SIZE OF SWALES AND DEPRESSIONS FOR FLOODPLAIN GRADING SHALL BE AS DIRECTED IN THE FIELD.
 6. ALL WORK WITHIN FLOODPLAIN AREAS SHALL MINIMIZE DISTURBANCE TO AND MAXIMIZE RE-USE OF EXISTING RIPARIAN VEGETATION. ANY TREES FELLED DURING EXCAVATION OF FLOODPLAIN AREAS SHALL BE PLACED IN FLOODPLAIN GRADING AREAS AS DIRECTED IN THE FIELD.
 7. TYPICAL DRAWINGS SHOW ONLY PROPOSED SURFACE FOR CLARITY.
 8. INTENT OF FLOODPLAIN GRADING IS TO ENHANCE FLOODPLAIN CONNECTIVITY.
 9. ALL FLOODPLAIN GRADING SHALL MATCH EXISTING NATURAL TOPOGRAPHY.
 10. FLOODPLAIN GRADING SHALL CONFORM TO THE CONSTRUCTION REQUIREMENTS OUTLINED IN THE PROJECT SPECIFICATIONS.

NOT FOR CONSTRUCTION

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 PLOT DETAILS: STROM, ALEX



REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
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A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN

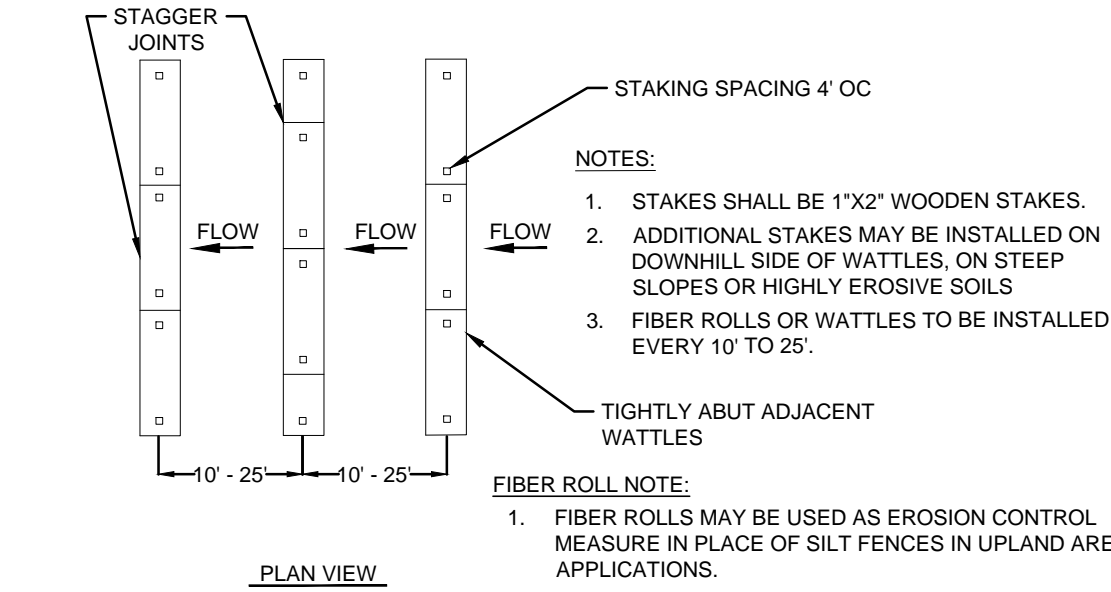
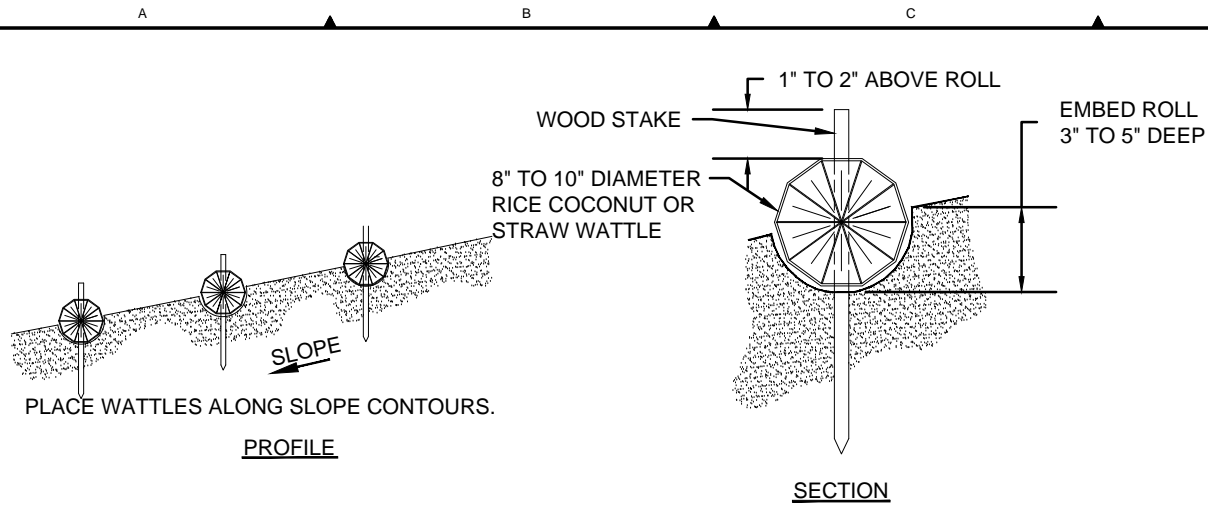
DETAILS
 FLOODPLAIN MICROTOPOGRAPHY

DWG. NO.: **C-106**

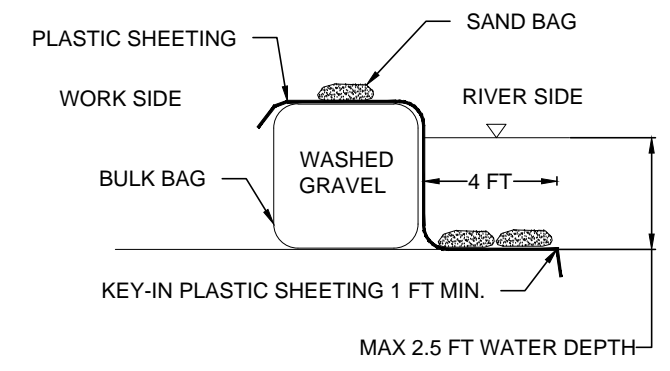
CREATED: 12/01/16

SHEET: 34 OF 40

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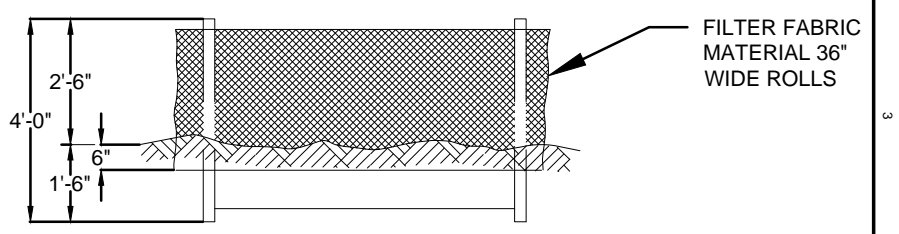
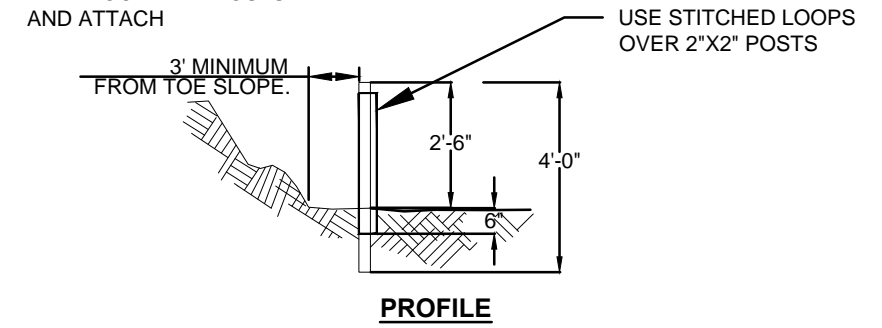
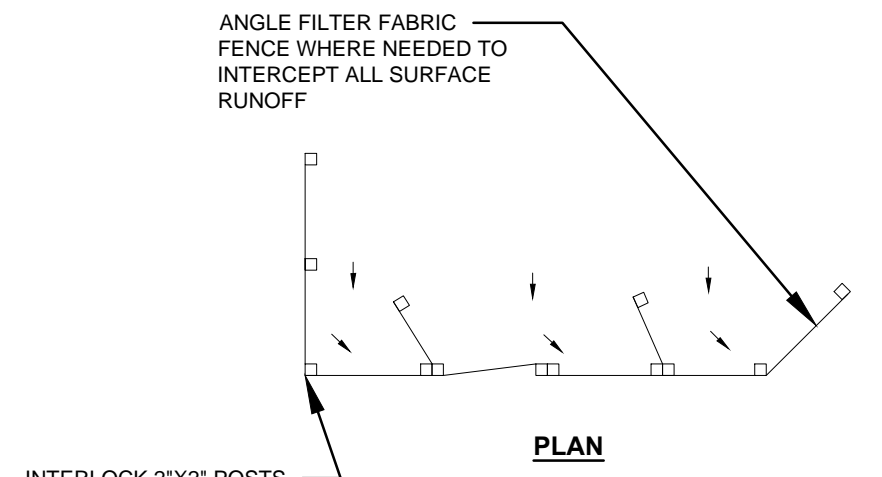


FIBER ROLL/WATTLES - TYPICAL DETAIL



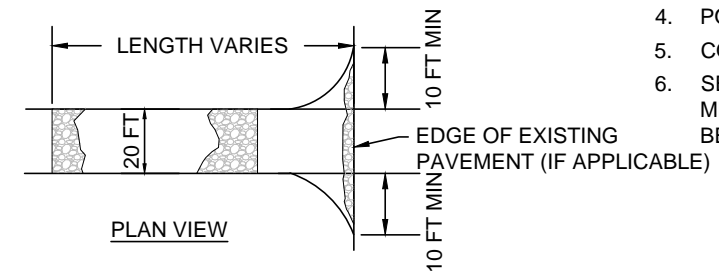
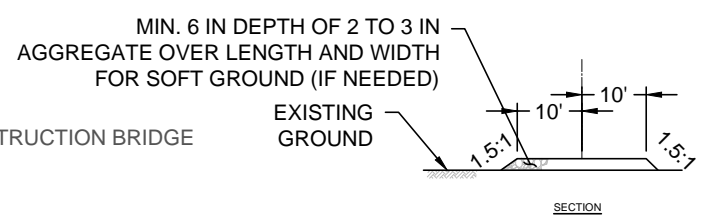
TEMPORARY COFFERDAM SECTION TYPICAL DETAIL NTS

- COFFERDAM NOTES:**
1. ALL WORK IN CHANNEL SHALL ONLY OCCUR BETWEEN JULY 15 AND AUGUST 15.
 2. ISOLATED AREAS REQUIRE FISH SALVAGE ACTIVITIES PRIOR TO THE INITIATION OF CONSTRUCTION.
 3. FISH SALVAGE TO BE PERFORMED BY QUALIFIED FISH BIOLOGIST.
 4. FILL BULK BAG WITH WASHED GRAVEL.
 5. SAND BAGS, ECO-BLOCKS, OR SIMILAR MAY BE SUBSTITUTED FOR WASHED GRAVEL BULK BAG.



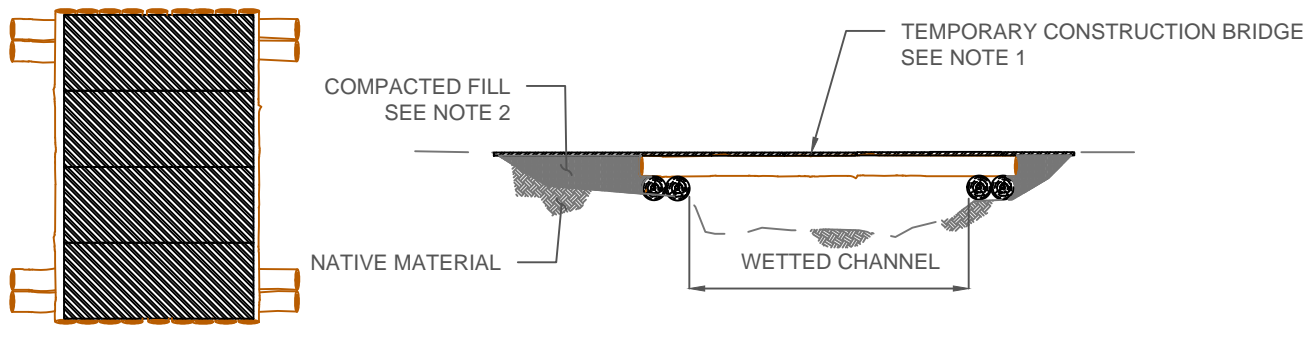
TEMPORARY SILT FENCE TYPICAL DETAIL NTS

- SEDIMENT FENCE NOTES:**
1. SEDIMENT FENCE SHALL BE INSTALLED ON A LINE OF EQUAL ELEVATION.
 2. BOTTOM EDGE OF SEDIMENT FENCE SHALL BE BURIED MIN 6".
 3. POSTS MAY BE 2"X2" FIR, PINE OR STEEL.
 4. POSTS TO BE INSTALLED ON DOWNHILL SIDE OF SLOPE.
 5. COMPACT BOTH SIDES OF FILTER FABRIC TRENCH.
 6. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATION REACHES 1/3 OF THE MEASURE HEIGHT. SEDIMENT SHALL BE DISPOSED OF TO AN AREA THAT CAN BE PERMANENTLY STABILIZED.



CONSTRUCTION ACCESS ROAD NTS

- CONSTRUCTION ACCESS ROAD NOTES:**
1. ACCESS ROAD TO BE BUILT OVER EXISTING GROUND. PLACEMENT OF ROCK TO BE DETERMINED IN THE FIELD IF SOFT GROUND CONDITIONS ARE ENCOUNTERED.



TEMPORARY CONSTRUCTION BRIDGE DETAIL NTS

- TEMPORARY CONSTRUCTION BRIDGE NOTES:**
1. PLACE TEMPORARY CONSTRUCTION BRIDGE.
 2. COMPACTED FILL MAY BE REQUIRED OUTSIDE OF TEMPORARY CONSTRUCTION BRIDGE TO PROVIDE SMOOTH TRANSITION FROM BRIDGE TO EXISTING GROUND. (SHOWN IN SECTION DETAIL)
 3. AFTER COMPLETION OF WORK AND REMOVAL OF BRIDGE, SUBSOIL SHALL BE RIPPED TO PROVIDE SUITABLE SURFACE FOR PLANTING.

NOT FOR CONSTRUCTION

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REV.	DATE	REVISION DESCRIPTION	DRW	ENG	APP
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A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN

DETAILS
EROSION AND SEDIMENT CONTROL

DWG. NO.:
C-107

CREATED: 12/01/16

SHEET: 35 OF 40

GENERAL FISH SALVAGE AND DEWATERING STEPS
 CONSTRUCTION SHALL OCCUR IN THE FOLLOWING GENERAL STEPS, WHICH CORRESPOND TO THE STEPS SHOWN ON THIS PLAN SHEET AND IN ACCORDANCE WITH HIP III GUIDELINES ON SHEETS G-04 AND G-05. **ALL WORK WITHIN THE ACTIVE CHANNEL SHALL OCCUR WITHIN THE ALLOWABLE FISH WINDOW (JULY 15 - AUGUST 15).**

STEP 1) ISOLATION AND SALVAGE:

ESTABLISH LIMITS OF EXCAVATION, STAGING AREAS AND ACCESS ROADS. INSTALL AND MAINTAIN EROSION AND SEDIMENT CONTROL MEASURES. ESTABLISH WORK AREA ISOLATION AS SHOWN ON THIS SHEET. FISH SALVAGE METHODS SHALL BE IN ACCORDANCE WITH HIP III GUIDELINES ON SHEETS G-04 AND G-05.

STEP 2) DEWATERING AND INSTALLATION:

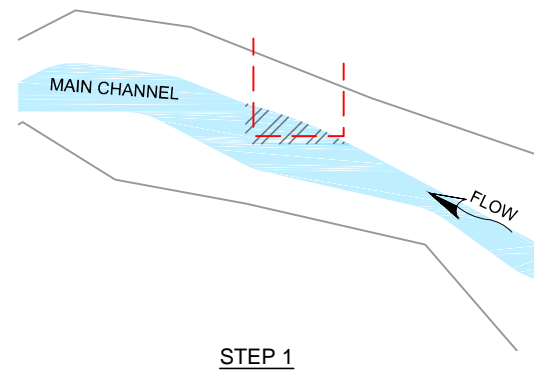
INSTALL COFFERDAM AND DEWATER ISOLATED WORK AREA. ALL ISOLATION WORK AND DEWATERING ACTIVITIES SHALL BE IN ACCORDANCE WITH HIP III GUIDELINES ON SHEETS G-04 AND G-05. EXCAVATE AND INSTALL LARGE WOODY DEBRIS (LWD) STRUCTURES AS SHOWN ON THE THE CONSTRUCTION PLAN SHEETS AND IN ACCORDANCE WITH PROJECT SPECIFICATIONS.

STEP 3) SITE RESTORATION:

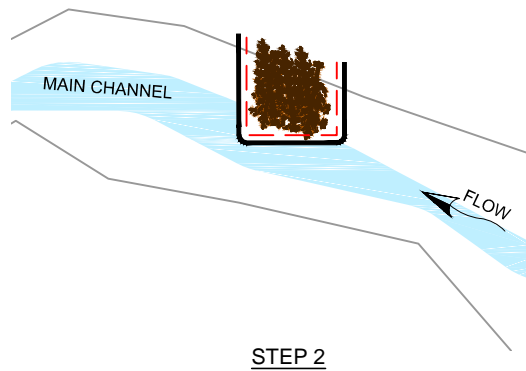
STREAMBANKS AND DISTURBED AREAS SHALL BE RESTORED AS NECESSARY USING ONSITE NATIVE MATERIAL AND ALL PROJECT WASTE MATERIAL REMOVED. ALL REWATERING ACTIVITIES, CONSTRUCTION, AND POST-CONSTRUCTION CONSERVATION MEASURES SHALL BE IN ACCORDANCE WITH HIP III GUIDELINES ON SHEETS G-04 AND G-05 AND THE PROJECT PLANS AND SPECIFICATIONS.

GENERAL FISH SALVAGE NOTES:

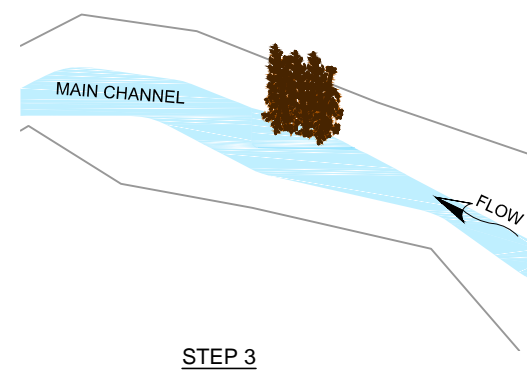
1. PROPOSED PROJECT DESIGN, CONSTRUCTION ACTIVITIES, AND MATERIALS SUBJECT TO APPROVAL BY LANDOWNER.
2. CONTRACTOR TO PROVIDE EROSION AND SEDIMENT CONTROL PLAN PER PROJECT PLAN AND SPECIFICATIONS.
3. CONTRACTOR TO PROVIDE DEWATERING PLAN PER PROJECT PLANS AND SPECIFICATIONS.
4. THE CONTRACTOR SHALL CONSTRUCT THE RESTORATION DESIGN ELEMENTS IN ACCORDANCE WITH THE PLANS STAMPED "APPROVED FOR CONSTRUCTION" AS PROVIDED TO THE CONTRACTOR BY THE CONTRACTING AGENCY PRIOR TO CONSTRUCTION.
5. **ALL WORK WITHIN THE ACTIVE CHANNEL SHALL OCCUR WITHIN THE ALLOWABLE FISH WINDOW (JULY 15 - AUGUST 15).**
6. ALL CONSTRUCTION ACTIVITIES SHALL MINIMIZE DISTURBANCE TO AND MAXIMIZE RE-USE OF EXISTING RIPARIAN VEGETATION.
7. ALL TEMPORARY ACCESS ROUTES SHALL BE LAID OUT TO MINIMIZE DISTURBANCE TO EXISTING VEGETATION AND FINAL LOCATION WILL BE VERIFIED BY OWNER.
8. ALL EROSION CONTROL MEASURES ARE TO INDICATE WHAT IS EXPECTED IN SIMILAR GEOMORPHIC CONDITIONS. CHANNEL CONDITIONS MAY DIFFER DURING CONSTRUCTION AND FIELD ADJUSTMENT SHALL BE COORDINATED WITH PROJECT OWNER AND SHALL CONFORM TO HIP III GUIDELINES.
9. CTUIR WILL BE RESPONSIBLE FOR FISH SALVAGE EFFORTS.



STEP 1

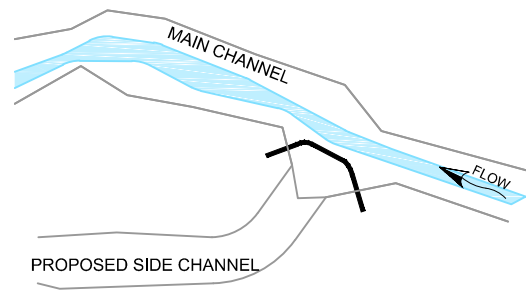


STEP 2

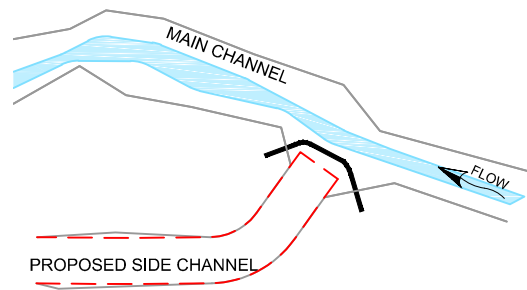


STEP 3

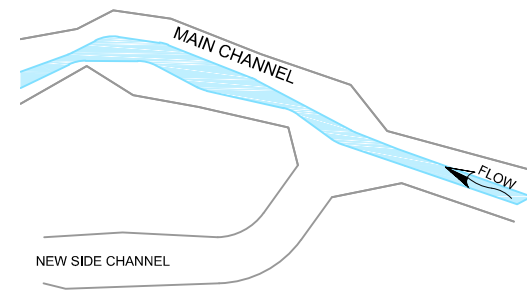
LWD INSTALLATION WITH LOCAL ISOLATION (TYP.)
(NOT TO SCALE)



STEP 1



STEP 2



STEP 3

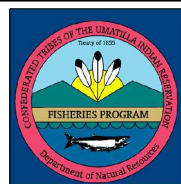
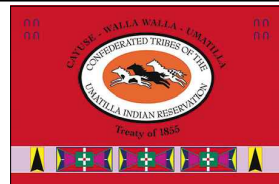
SIDE CHANNEL EXCAVATION FOR RECONNECTION (TYP.)
(NOT TO SCALE)

- LEGEND:**
- TOP OF BANK
 - LOW FLOW LINE
 - - - EXCAVATION LIMITS
 - ▨ FISH SALVAGE AREA
 - COFFER DAM
 - ✂ LWD

NOT FOR CONSTRUCTION

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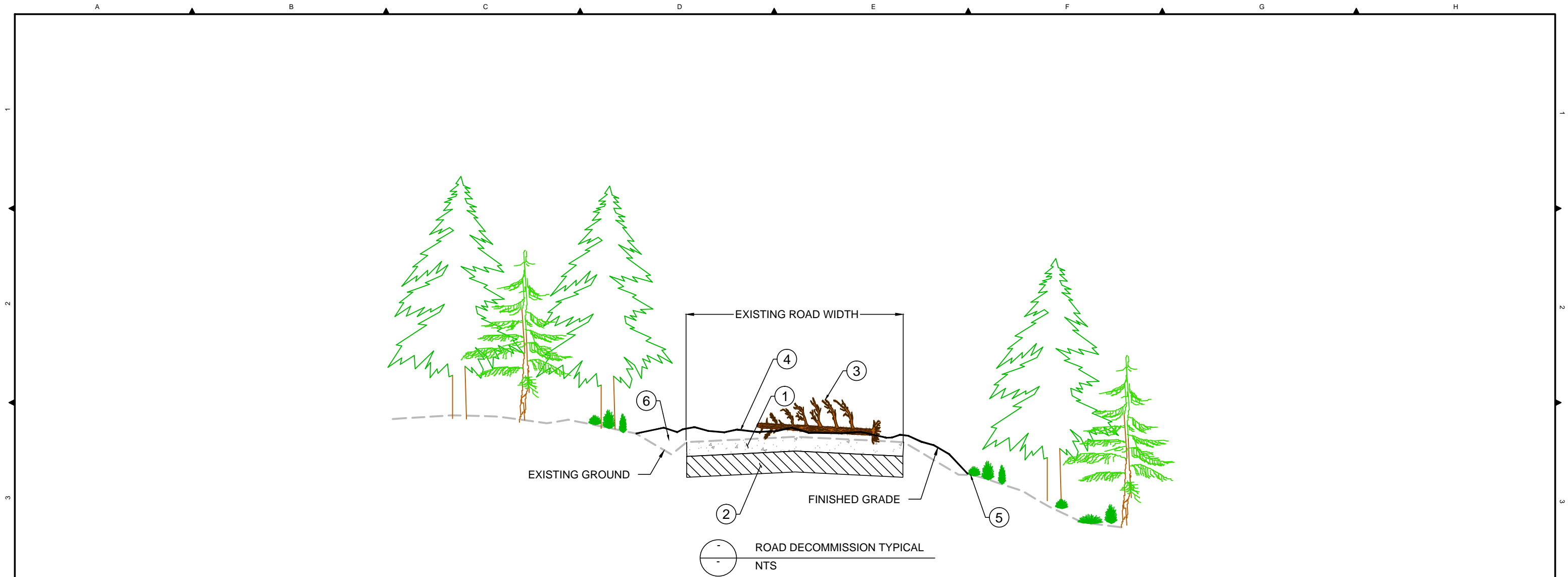
TETRA TECH
 www.tetrattech.com
 19803 North Creek Parkway
 Bothell, Washington 98011
 Phone: 425-482-7600 Fax: 425-482-7652



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B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN
DETAILS
 FISH SALVAGE AND DEWATERING

DWG. NO.: **C-108**
 CREATED: 12/01/16
 SHEET: 36 OF 40



ROAD DECOMMISSION NOTES:

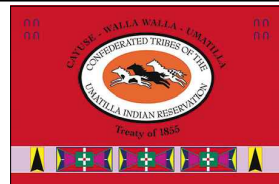
1. RECLAIM CRUSHED ROCK TOP SURFACE MATERIAL TO A 12-INCH DEPTH, IF PRESENT. MATERIAL SHALL BE USED ON-SITE AND DISPERSED LOCALLY ONTO ADJACENT UPPER TERRACE LOCATIONS ABOVE THE 10-YR FLOOD ELEVATION AS STAKED IN THE FIELD OR SHALL BE HAULED OFF-SITE AND PROPERLY DISPOSED OF AT AN APPROVED LOCATION.
2. SCARIFY ROAD EMBANKMENT, ROAD BASE TO A MINIMUM DEPTH OF 18-INCHES PRIOR TO RE-CONTOURING.
3. SCATTER SLASH MATERIAL EVENLY ON FINISHED SLOPES AND REVEGETATE ALL DISTURBED AREAS WITHIN THE ROAD CORRIDOR MEADOW PLANTINGS AND VEGETATION CLUMPS, SEE SHEET L-101 - FLOODPLAIN ENHANCEMENT AREA AND FLOODPLAIN AND CHANNEL EXCAVATION SEED MIX TABLES.
4. PLACE APPROXIMATELY 18-24 INCHES OF EXCAVATED FLOODPLAIN MATERIAL ON SCARIFIED SOIL TO THE MAXIMUM EXTENT POSSIBLE. EXCAVATED MATERIAL SHALL BE FREE FROM CRUSHED ANGULAR ROAD BASE ROCK AND OTHER UNSUITABLE MATERIAL REVEGETATE ALL DISTURBED AREAS WITHIN THE ROAD CORRIDOR WITH MEADOW PLANTINGS AND VEGETATION CLUMPS, SEE SHEET L-101 - FLOODPLAIN ENHANCEMENT AREA AND FLOODPLAIN AND CHANNEL EXCAVATION SEED MIX TABLES.
5. PROVIDE ESC MEASURES TO PROTECT WATER AND OTHER SENSITIVE AREAS. SEE SHEET C-107 FOR ESC DETAILS.
6. ROAD DECOMMISSION SHALL COMPLETELY REMOVE ROADSIDE DITCH, IF PRESENT.

LEGEND

- CRUSHED ROCK TOP SURFACE MATERIAL
- FILL MATERIAL, SEE NOTES
- EXCAVATED MATERIAL, SEE NOTES
- SCARIFY AREA, SEE NOTES
- EXISTING VEGETATION
- SLASH MATERIAL

NOT FOR CONSTRUCTION

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PLOTTED AS ANSI B (11" X 17"), PLAN SHEET FULL SIZE ANSI D (22" X 34")			DRW	ENG	APP
REV.	DATE	REVISION DESCRIPTION			
C	06/07/17	90 PERCENT FINAL DESIGN	ATS	ATS	SO
B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN

DETAILS
ROAD DECOMMISSION

DWG. NO.:	C-109
CREATED:	12/01/16
SHEET:	37 OF 40

ALCOVE REVEGETATION							
ACRES: 0.10 (4,390 SF) ¹							
GROWTH HABITAT	SCIENTIFIC NAME	COMMON NAME	PERCENT COMPOSITION ²	PROPAGATION METHOD	SPACING (FEET O.C.)	DENSITY PER ACRE ¹	QUANTITY ¹
TREE	<i>POPULUS TRICHOCARPA</i>	BLACK COTTONWOOD	50	CONTAINER	15	97	10
	<i>ALNUS INCANA</i> SUBSP. <i>TENUIFOLIA</i>	MOUNTAIN ALDER	50	CONTAINER	15	97	10
SHRUB	<i>SALIX SPP.</i>	WILLOW	40	LIVE STAKE	6	407	41
	<i>CORNUS SERICEA</i>	REDOSIER DOGWOOD	20	LIVE STAKE OR CONTAINER	6	203	20
	<i>CRATAEGUS DOUGLASII</i>	BLACK HAWTHORN	20	CONTAINER	6	203	20
	<i>ROSA WOODSII</i>	WOOD'S ROSE	20	CONTAINER	6	203	20

¹ ACRES, DENSITY PER ACRE, AND QUANTITIES ARE ESTIMATES BASED ON 60% DESIGN, THE FINAL SPECIES LIST AND QUANTITIES WILL BE DECIDED WHEN CONSTRUCTION PLANS ARE FINALIZED.
² PERCENT COMPOSITION ADDS TO 100 FOR EACH STRATA (I.E., TREE, SHRUB)

FLOODPLAIN 75+50 LB REVEGETATION							
ACRES: 0.21 (8,940 SF) ¹							
GROWTH HABITAT	SCIENTIFIC NAME	COMMON NAME	PERCENT COMPOSITION ²	PROPAGATION METHOD	SPACING (FEET O.C.)	DENSITY PER ACRE ¹	QUANTITY ¹
TREE	<i>POPULUS TRICHOCARPA</i>	BLACK COTTONWOOD	60	CONTAINER	15	116	24
	<i>ALNUS INCANA</i> SUBSP. <i>TENUIFOLIA</i>	MOUNTAIN ALDER	40	CONTAINER	15	77	16
SHRUB	<i>SALIX SPP.</i>	WILLOW	40	LIVE STAKE	6	407	83
	<i>CORNUS SERICEA</i>	REDOSIER DOGWOOD	20	LIVE STAKE OR CONTAINER	6	203	42
	<i>CRATAEGUS DOUGLASII</i>	BLACK HAWTHORN	20	CONTAINER	6	203	42
	<i>PRUNUS VIRGINIANA</i>	CHOCHECHERRY	10	CONTAINER	6	102	21
	<i>SYMPHORICARPOS ALBUS</i>	SNOWBERRY	10	CONTAINER	6	102	21

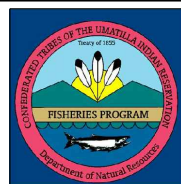
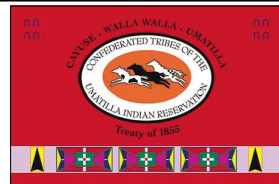
¹ ACRES, DENSITY PER ACRE, AND QUANTITIES ARE ESTIMATES BASED ON 60% DESIGN, THE FINAL SPECIES LIST AND QUANTITIES WILL BE DECIDED WHEN CONSTRUCTION PLANS ARE FINALIZED.
² PERCENT COMPOSITION ADDS TO 100 FOR EACH STRATA (I.E., TREE, SHRUB)

FLOODPLAIN 75+50 LB REVEGETATION							
ACRES: 0.08 (3,460 SF) ¹							
GROWTH HABITAT	SCIENTIFIC NAME	COMMON NAME	PERCENT COMPOSITION ²	PROPAGATION METHOD	SPACING (FEET O.C.)	DENSITY PER ACRE ¹	QUANTITY ¹
TREE	<i>POPULUS TRICHOCARPA</i>	BLACK COTTONWOOD	60	CONTAINER	15	116	9
	<i>ALNUS INCANA</i> SUBSP. <i>TENUIFOLIA</i>	MOUNTAIN ALDER	40	CONTAINER	15	77	6
SHRUB	<i>SALIX SPP.</i>	WILLOW	50	LIVE STAKE	6	508	40
	<i>CORNUS SERICEA</i>	REDOSIER DOGWOOD	25	LIVE STAKE OR CONTAINER	6	254	20
	<i>CRATAEGUS DOUGLASII</i>	BLACK HAWTHORN	25	CONTAINER	6	108	20

¹ ACRES, DENSITY PER ACRE, AND QUANTITIES ARE ESTIMATES BASED ON 60% DESIGN, THE FINAL SPECIES LIST AND QUANTITIES WILL BE DECIDED WHEN CONSTRUCTION PLANS ARE FINALIZED.
² PERCENT COMPOSITION ADDS TO 100 FOR EACH STRATA (I.E., TREE, SHRUB)

NOT FOR CONSTRUCTION

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B	03/03/17	60 PERCENT PRELIMINARY DESIGN	ATS	ATS	SO
A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN
 DETAILS
 REVEGETATION TABLES

DWG. NO.: L-100
 CREATED: 12/01/16
 SHEET: 38 OF 40

FLOODPLAIN ENHANCEMENT AREA							
ACRES: 3.47 ¹							
GROWTH HABITAT	SCIENTIFIC NAME	COMMON NAME	PERCENT COMPOSITION ²	PROPAGATION METHOD	SPACING (FEET O.C.)	DENSITY PER ACRE ¹	QUANTITY ¹
TREE	<i>POPULUS TRICHOCARPA</i>	BLACK COTTONWOOD	30	CONTAINER	15	58	201
	<i>ALNUS INCANA</i> SUBSP. <i>TENUIFOLIA</i>	MOUNTAIN ALDER	30	CONTAINER	15	58	201
	<i>PINUS PONDEROSA</i>	PONDEROSA PINE	20	CONTAINER	15	39	134
	<i>PSEUDOTSUGA MENZIESII</i>	DOUGLAS FIR	20	CONTAINER	15	39	134
SHRUB	<i>CRATAEGUS DOUGLASII</i>	BLACK HAWTHORN	20	CONTAINER	6	203	705
	<i>PHILADELPHUS LEWISII</i>	LEWIS' MOCK ORANGE	20	CONTAINER	6	203	705
	<i>ACER GLABRUM</i>	ROCKY MOUNTAIN MAPLE	10	CONTAINER	6	102	352
	<i>PRUNUS VIRGINIANA</i>	CHOKECHERRY	10	CONTAINER	6	102	352
	<i>ROSA WOODSII</i>	WOOD'S ROSE	10	CONTAINER	6	102	352
	<i>SALIX SPP.</i>	WILLOW	10	CONTAINER	6	102	352
	<i>SYMPHORICARPOS ALBUS</i>	SNOWBERRY	10	CONTAINER	6	102	352
	<i>SAMBUCUS NIGRA</i> SUBSP. <i>CAERULEA</i>	BLUE ELDERBERRY	10	CONTAINER	6	102	352

¹ ACRES, DENSITY PER ACRE, AND QUANTITIES ARE ESTIMATES BASED ON 60% DESIGN, THE FINAL SPECIES LIST AND QUANTITIES WILL BE DECIDED WHEN CONSTRUCTION PLANS ARE FINALIZED.
² PERCENT COMPOSITION ADDS TO 100 FOR EACH STRATA (I.E., TREE, SHRUB)

CHANNEL EXCAVATION 96+00 REVEGETATION							
ACRES: 0.17 (7,384 SF) ¹							
GROWTH HABITAT	SCIENTIFIC NAME	COMMON NAME	PERCENT COMPOSITION ²	PROPAGATION METHOD	SPACING (FEET O.C.)	DENSITY PER ACRE ¹	QUANTITY ¹
TREE	<i>POPULUS TRICHOCARPA</i>	BLACK COTTONWOOD	50	CONTAINER	15	97	16
	<i>ALNUS INCANA</i> SUBSP. <i>TENUIFOLIA</i>	MOUNTAIN ALDER	50	CONTAINER	15	97	16
SHRUB	<i>SALIX SPP.</i>	WILLOW	40	LIVE STAKE	6	407	69
	<i>CORNUS SERICEA</i>	REDOSIER DOGWOOD	20	LIVE STAKE OR CONTAINER	6	203	34
	<i>CRATAEGUS DOUGLASII</i>	BLACK HAWTHORN	20	CONTAINER	6	203	34
	<i>SYMPHORICARPOS ALBUS</i>	SNOWBERRY	20	CONTAINER	6	203	34

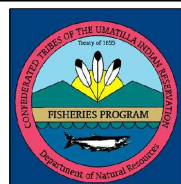
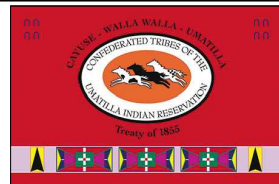
¹ ACRES, DENSITY PER ACRE, AND QUANTITIES ARE ESTIMATES BASED ON 60% DESIGN, THE FINAL SPECIES LIST AND QUANTITIES WILL BE DECIDED WHEN CONSTRUCTION PLANS ARE FINALIZED.
² PERCENT COMPOSITION ADDS TO 100 FOR EACH STRATA (I.E., TREE, SHRUB)

CHANNEL EXCAVATION 104+00 REVEGETATION							
ACRES: 0.23 (9,971 SF) ¹							
GROWTH HABITAT	SCIENTIFIC NAME	COMMON NAME	PERCENT COMPOSITION ²	PROPAGATION METHOD	SPACING (FEET O.C.)	DENSITY PER ACRE ¹	QUANTITY ¹
TREE	<i>POPULUS TRICHOCARPA</i>	BLACK COTTONWOOD	50	CONTAINER	15	97	22
	<i>ALNUS INCANA</i> SUBSP. <i>TENUIFOLIA</i>	MOUNTAIN ALDER	50	CONTAINER	15	97	22
SHRUB	<i>SALIX SPP.</i>	WILLOW	40	LIVE STAKE	6	407	93
	<i>CORNUS SERICEA</i>	REDOSIER DOGWOOD	20	LIVE STAKE OR CONTAINER	6	203	47
	<i>CRATAEGUS DOUGLASII</i>	BLACK HAWTHORN	20	CONTAINER	6	203	47
	<i>SYMPHORICARPOS ALBUS</i>	SNOWBERRY	20	CONTAINER	6	203	47

¹ ACRES, DENSITY PER ACRE, AND QUANTITIES ARE ESTIMATES BASED ON 60% DESIGN, THE FINAL SPECIES LIST AND QUANTITIES WILL BE DECIDED WHEN CONSTRUCTION PLANS ARE FINALIZED.
² PERCENT COMPOSITION ADDS TO 100 FOR EACH STRATA (I.E., TREE, SHRUB)

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DESOLATION CREEK
 UPPER REACH 6 - FINAL DESIGN
DETAILS
 REVEGETATION TABLES

DWG. NO.: **L-101**
 CREATED: 12/01/16
 SHEET: 39 OF 40

FLOODPLAIN 126+00 REVEGETATION							
ACRES: 0.19 (8,122 SF) ¹							
GROWTH HABITAT	SCIENTIFIC NAME	COMMON NAME	PERCENT COMPOSITION ²	PROPAGATION METHOD	SPACING (FEET O.C.)	DENSITY PER ACRE ¹	QUANTITY ¹
TREE	<i>POPULUS TRICHOCARPA</i>	BLACK COTTONWOOD	50	CONTAINER	15	97	18
	<i>ALNUS INCANA</i> SUBSP. <i>TENUIFOLIA</i>	MOUNTAIN ALDER	50	CONTAINER	15	97	18
SHRUB	<i>SALIX SPP.</i>	WILLOW	40	LIVE STAKE	6	407	76
	<i>CORNUS SERICEA</i>	REDOSIER DOGWOOD	20	LIVE STAKE OR CONTAINER	6	203	38
	<i>CRATAEGUS DOUGLASII</i>	BLACK HAWTHORN	20	CONTAINER	6	203	38
	<i>PRUNUS VIRGINIANA</i>	CHOCHECHERRY	10	CONTAINER	6	102	19
	<i>ROSA WOODSII</i>	WOOD'S ROSE	10	CONTAINER	6	102	19

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² PERCENT COMPOSITION ADDS TO 100 FOR EACH STRATA (I.E., TREE, SHRUB)

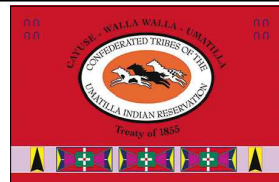
FLOODPLAIN AND CHANNEL EXCAVATION SEED MIX		
ACRES: 4.53 ¹		
TOTAL SEED MIX: 136 LBS (AT SEEDING RATE OF 30 LBS/ACRE) ¹		
SCIENTIFIC NAME ²	COMMON NAME	PERCENT COMPOSITION
<i>ELYMUS GLAUCUS</i>	BLUE WILDRYE	40
<i>DESCHAMPSIA CESPITOSA</i>	TUFTED HAIRGRASS	25
<i>BROMUS CARINATUS</i>	CALIFORNIA BROME	10
<i>FESTUCA IDAHOENSIS</i>	IDAHO FESCUE	10
<i>GLYCERIA ELATA</i>	TALL MANNA GRASS	10
<i>ACHILLIA MILLEFOLIUM</i>	COMMON YARROW	5
SEED MIX TOTALS		100

¹ ACRES AND SEED MIX REQUIRED ARE ESTIMATES BASED ON 60% DESIGN, THE FINAL SPECIES LIST AND QUANTITIES WILL BE DECIDED WHEN CONSTRUCTION PLANS ARE FINALIZED.
² OTHER NATIVE GRASSES FOUND IN THE VICINITY OF REVEGETATION AREA CAN BE SUBSTITUTED IF PREFERRED SPECIES ARE NOT AVAILABLE

CHANNEL EXCAVATION 126+00 REVEGETATION							
ACRES: 0.10 (4,210 SF) ¹							
GROWTH HABITAT	SCIENTIFIC NAME	COMMON NAME	PERCENT COMPOSITION ²	PROPAGATION METHOD	SPACING (FEET O.C.)	DENSITY PER ACRE ¹	QUANTITY ¹
TREE	<i>POPULUS TRICHOCARPA</i>	BLACK COTTONWOOD	50	CONTAINER	15	97	9
	<i>ALNUS INCANA</i> SUBSP. <i>TENUIFOLIA</i>	MOUNTAIN ALDER	50	CONTAINER	15	97	9
SHRUB	<i>SALIX SPP.</i>	WILLOW	40	LIVE STAKE	6	407	39
	<i>CORNUS SERICEA</i>	REDOSIER DOGWOOD	20	LIVE STAKE OR CONTAINER	6	203	20
	<i>CRATAEGUS DOUGLASII</i>	BLACK HAWTHORN	20	CONTAINER	6	203	20
	<i>ROSA WOODSII</i>	WOOD'S ROSE	20	CONTAINER	6	203	20

¹ ACRES, DENSITY PER ACRE, AND QUANTITIES ARE ESTIMATES BASED ON 60% DESIGN, THE FINAL SPECIES LIST AND QUANTITIES WILL BE DECIDED WHEN CONSTRUCTION PLANS ARE FINALIZED.
² PERCENT COMPOSITION ADDS TO 100 FOR EACH STRATA (I.E., TREE, SHRUB)

NOT FOR CONSTRUCTION



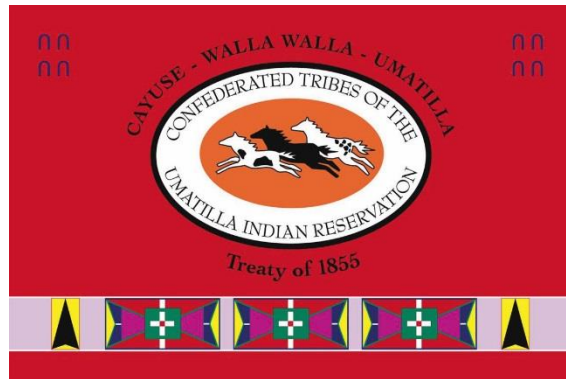
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A	01/04/17	30 PERCENT DESIGN ALTERNATIVES	ATS	ATS	SO

DESOLATION CREEK
UPPER REACH 6 - FINAL DESIGN

DETAILS
REVEGETATION TABLES

DWG. NO.: **L-102**
CREATED: 12/01/16
SHEET: 40 OF 40

APPENDIX B – PROJECT TECHNICAL SPECIFICATIONS



CONFEDERATED TRIBES OF THE UMATILLA INDIAN RESERVATION
DESOLATION CREEK
UPPER REACH 6 (RM 10.6 TO 11.8) HABITAT RESTORATION DESIGN
CONSTRUCTION SPECIFICATIONS

Submittal To:

Confederated Tribes of the Umatilla Indian Reservation
Department of Natural Resources
46411 Timine Way
Pendleton, Oregon 97801

Prepared By:

Tetra Tech, Inc.
19803 North Creek Parkway
Bothell, WA 98011

June 2017

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SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section provides a brief narrative summary of the contract work. The project is located on Desolation Creek approximately 11 miles upstream of its confluence with the North Fork John Day River. This contract work covers the upper portion of Reach 6 between river mile (RM) 10.6 and RM 11.8 and consists of reactivation of historical channels and alcoves, removing and modifying constructed berms and roadway grades that are impacting geomorphic and hydrologic process, and adding large woody debris (LWD) to improve habitat complexity to benefit the production of summer steelhead trout, spring Chinook salmon, and bull trout. Construction will require isolating work areas from water and fish. Construction access will require temporary stream crossings, including temporary bridges. Upon completion of construction, disturbed areas within the project area will be decompacted and revegetated using a mixture of native trees, shrubs, and grasses to stabilize the disturbed areas.

The Contractor shall provide all labor, equipment, supervision, transportation, operating supplies and incidentals to perform all work necessary on the areas specified herein. All aspects of the work shall be performed in an organized and systematic manner to assure that services are performed in a timely matter and comply with the technical specifications.

This summary does not provide the technical detail of the work activities, but describes the work as a whole, providing overall perspective to the separate tasks. This section shall be used in conjunction with all the other sections and the Drawings to establish the total work requirements.

- B. The project was designed in accordance with the Bonneville Power Administration (BPA) Habitat Improvement Program, Programmatic Biological Opinion (HIP III). Refer to HIP III Conservation Notes in Design Drawings.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Contractor is advised that the contract work will consist of the following:

- Clearing and Grubbing within Project Area
- Installation of Temporary Construction Fencing
- Installation of Temporary Construction Access Routes
- Installation of Temporary Construction Bridges
- Installation and Maintenance of Construction Area BMPs
- Construction and Maintenance of Material Storage Areas
- Modifying of Constructed Berms and Roadway Grades
- Decompaction and topographical roughening of Floodplain
- Road Decommissioning
- Installation of Floodplain and In-stream Structures
- Channel Excavation

Finish Grading of Floodplain and Decompaction of Compacted Access Routes and Staging Areas
Installation of Revegetation Materials by the Confederated Tribes of the Umatilla Indian Reservation (CTUIR)
Complete Project Area Cleanup and Repairs

Additionally, erosion control measures must be executed to the highest construction industry standards – great care must be taken to prevent excavated soil material from entering the stream system. To ensure integrity of the stream channel and to reduce impacts to water quality and aquatic organisms, floodplain activities will be completed separately from activities in the wetted channel. Activities in the floodplain will occur between May and November, whereas work in the wetted channel, or that requires crossing the wetted channel will occur between July 15 and August 15, during the Oregon Department of Fish and Wildlife (ODFW) in-water work period. No in-stream work will be conducted between May and June 30 or between August 16 and November. The Contractor shall notify the CTUIR in writing 10 days before beginning any work activities.

- B. For all construction activities, including those within the above listed in-stream work window, the Contractor shall be responsible for potential turbidity and sediment transport within and downstream of the physical limits of the project.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SUMMARY OF WORK

SECTION 01 14 00
WORK RESTRICTIONS

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section provides general Work Restrictions that shall be observed by the Contractor during performance of work for the duration of the Contract.

1.02 CONDUCT OF WORK

A. Restricted Work Periods

- 1. Completion of the in-stream components of the project shall be restricted to the period of July 15 to August 15 during the construction period.

B. Restricted Work Areas

- 1. The Contractor and Owner (Confederated Tribes of the Umatilla Indian Reservation [CTUIR]) will coordinate the project work schedule in order to notify the Desolation Creek LLC of when the work activities will occur in order to have the appropriate representatives on-site.
- 2. Additional qualifications and requirements to be provided by Desolation Creek, LLC.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF WORK RESTRICTIONS

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SECTION 01 14 13
ACCESS TO SITE

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section describes the location of the project site and the access routes the Contractor will use during performance of work for the duration of the Contract.

1.02 CONDUCT OF WORK

A. Location of Project Work Site

1. Overall location of the project site is shown on the Design Drawings.

B. Directions to Project Work Site

1. From the town of Dale, OR, drive north on Highway 395 to the intersection of Texas Bar Road (NF-053); turn right on Texas Bar Road and drive 0.7 miles east to the intersection of NF-10 Road. Once at NF-10 Road, turn right onto the road and drive approximately 10.6 miles south to the downstream end of the project area.

C. Restricted Access Areas

1. No camping will be permitted on the project site or Desolation LLC land. Camping may be possible on U.S. Department of Agriculture Forest Service (USFS) land by prior arrangement with the USFS.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF ACCESS TO SITE

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SECTION 01 14 20
SITE-SPECIFIC REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section provides general Site-Specific Requirements that shall be observed by the Contractor during performance of work for the duration of the Contract.

1.02 CONDUCT OF WORK

A. Coordination

1. Coordination with agencies, other on-site Contractors, and Owner shall generally be made by Contractor through the Owner's Representative or Engineer as expressed in the Contract Documents to assist Contractor with performance of the work with a minimum of interference and inconvenience. Contractor will access the project site from the NF-10 road at locations identified on the Drawings and by direct coordination with Owner's Representative management staff.
2. The project site is located on Desolation Creek, LLC lands. All work shall be coordinated with ongoing activities and not interfere with these activities except with written approval of Owner's Representative or Engineer.

B. Schedule

1. The Contractor shall propose work hours based on the Contractor's construction schedule to ensure completion of all in-stream work no later than August 15. The Contractor shall propose extended workdays and/or weekend work if necessary to meet the time constraints of the appropriate year in-water work period of time. The Contractor's proposed work schedule shall be subject to Owner's Representative or Engineer's approval. Proposed work schedule may not be approved if the Owner's Representative or Engineer is not available to be on site during the proposed work hours.

1.03 GENERAL ACCESS REQUIREMENTS

- A. The project site area is gated and fenced. The project site area is closely monitored by Owner's personnel. Contractor's personnel working at the site may be asked for appropriate identification. A list of all employees for the Contractor, suppliers, and vendor Representatives will be provided to the Owner's Representative or Engineer.

B. Irregular or Non-Routine Access

1. Access on an irregular basis and during other than established working hours will require prior approval by Owner's Representative or Engineer.

C. Maintenance of Access

1. Contractor shall not obstruct or interfere with access by others to existing facilities adjacent to the project site during the work under this Contract.

D. Vehicle Parking

1. Contractor's vehicles shall only park in approved areas as described by Owner's staff.

1.04 COORDINATION AND COOPERATION WITH OTHER CONTRACTORS

- A. Work by others may be performed in the vicinity of or adjacent to the project site in concurrence with the scheduled performance of the Work under these Contract Documents. Contractor shall coordinate construction work with Owner's Representative or Engineer.

1.06 CONSTRUCTION SCHEDULE REQUIREMENTS

A. Work Flow

1. The Work shall be planned, scheduled, and performed to complete the Work within the requirements of these Contract Documents and the requirements of appropriate Federal, State, and local agencies. Contractor shall prepare and maintain a construction schedule. Work shall be completed within the timeframe of May 1 and November 30 of 2017, or as directed in the Contract Documents.

B. Construction Sequence

1. Floodplain Work: May – November

- Clear and grub proposed temporary access roads.
- Stockpile wood material for future use.
- Modify constructed berms in floodplain where no temporary bridges or crossing of the wetted channel are required.
- Decompact identified floodplain areas.
- Decompact identified areas.
- Separate and stockpile in the staging area or areas directed by Owner's Representative or Engineer, earth, rock, and woody materials for future use.
- Construct floodplain log jams and LWD structures outside of wetted channel where no temporary bridges or crossing of the wetted channel are required.

2. Active Channel: July 15 – August 15

- Install temporary bridges or fish-excluded crossings of the wetted channel as directed by Owner's Representative or Engineer.
- Isolate work areas, and re-route stream. Fish salvage operations, if needed, will be performed by CTUIR to remove any stranded fish where necessary.
- Modify constructed berms and roadway grades where temporary bridges or fish-excluded crossings in the wetted channel are required.
- Decompact identified floodplain areas.
- Excavate proposed channels.

-
- Construct wetted channel log jams and LWD structures where temporary bridges or fish-excluded crossings in the wetted channel are required.
 - Remove temporary bridges or fish-excluded crossings in the wetted channel, final grading and shaping of floodplain areas, and grade and subsoil compacted temporary access roads.
 - Revegetate decompact floodplains and all disturbed areas.

1.07 PROTECTION OF PROPERTY

- A. Contractor shall protect all property within or in the vicinity of the work site. Contractor shall ensure that property is not removed, damaged, destroyed, or prevented from its normal use unless so designated in the Contract Documents. All property adjacent to the work shall be protected including, but not be limited to, protection from construction-generated dust, debris, water, and vibration. Property includes land, utilities, trees, shrubs, landscaping, markers and monuments, natural features, monitoring wells, buildings, structures, site and drainage improvements, and other improvements, whether shown on the Drawings or not. No work shall be conducted in any wetlands or vegetation protection areas shown on the Drawings and restricted areas unless coordinated with and approved by the Owner's Representative or Engineer.
- B. Contractor shall confine operations to within the clearing limits or other areas designated in the contract documents, and prevent the depositing of rocks, excavated materials, stumps, or other debris outside of these limits. Contractor shall retrieve material which falls outside of these limits and dispose of, or incorporate in the work, as directed by the Owner. Contractor shall preserve the scenic and natural environment along this construction project.
- C. Contractor shall not allow objectionable material to enter any stream, river, lake, or other body of water. Contractor shall retrieve material which falls in these areas and dispose of, or incorporate in the work, and repair damage to vegetation or structures outside the project limits.
- D. Contractor shall not operate equipment or otherwise disturb the natural vegetation and soil beyond the construction limits.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SITE-SPECIFIC REQUIREMENTS

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SECTION 01 22 20
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 DESCRIPTION

- A. The Bid Items described in this Section correspond with those listed on the Bid Form. Additional bid items requiring no further description may also be included on the form.
- B. Payment will be made only for those items listed on the Bid Form. All other items of work shown on the Contract Drawings or required by Specifications shall be considered incidental to the items listed.

1.02 SCHEDULE OF VALUES

- A. Contractor shall prepare and submit a schedule of values corresponding to the project specification sections and any other major work items to be used as a basis for monthly pay requests.
- B. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Specification table of contents. Provide multiple line items for subcontract amounts, where appropriate.
- C. The quantity to be paid is the quantity shown in the Schedule of Items. The contract quantity will be adjusted for authorized changes that affect the quantity or for errors made in computing this quantity. If there is evidence that a quantity specified as a contract quantity is incorrect, the Contractor shall submit calculations, drawings, or other evidence indicating why the quantity is in error and request, in writing, that the quantity be adjusted. The CTUIR reserves the right to review all Contractor submitted actual quantity measurements for review and payment.
- D. Submit copies of the schedule of values to Owner's Representative at earliest possible date, but no later than 15 days before the date scheduled for submittal of initial pay request.

1.03 PAY REQUESTS

- A. Each pay request shall be consistent with previous applications and payments as certified by Owner's Representative and paid for by Owner.
- B. It will be the Contractor's responsibility to prepare a monthly estimate of the percentage of work accomplished on each line item of the approved schedule of values. This estimate shall be submitted to the Owner's Representative each month as part of the pay request for review not later than the date established at pre-construction conference. Owner's Representative will verify all measurements and monthly estimate and provide for approval to the owner within 30 days of receiving monthly estimate.

1.04 DESCRIPTION OF BID ITEMS

- A. This is a lump sum bid; therefore, the price submitted on the bid form shall include all Contractor costs, overhead, and profit needed to complete the project.
- B. Contract quantities will be adjusted only when the variation in the bid items and actual work is of 15 percent or more.
- C. Contractor shall give a price per hour for unforeseen work that is encountered during the contract performance and not included in the other sub-items. Hourly work must be authorized in advance by the CTUIR. The CTUIR does not guarantee that any hourly work shall be ordered and reserves the right to reduce or eliminate entirely the work under these items with no adjustment in contract unit price.
- D. Mobilization: Payment will be made for mobilization in a lump sum. When 10 percent of the original contract amount is earned from other bid items, 100 percent of the mobilization item may be paid.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF MEASUREMENT AND PAYMENT

SECTION 01 25 10
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section describes the process and procedures to be followed by the Contractor and Owner in the event a contract modification is required during project implementation.
- B. A contract modification is defined as a change order or amendment to the original contract to add costs to the construction contract for expanding the scope of work or to subtract costs to the construction contract for reducing the scope of work.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall keep a copy of the construction contract and bid sheet at the construction site during the entire implementation period.
- B. During each weekly progress meeting, the Contractor shall provide a summary of work completed to date, a summary of work to be completed in the next week, and a summary of work to be completed within the next month.
- C. During the discussion of work to be completed in the next week and next month provided by the Contractor during the weekly progress meeting, any work activities not included in the current contract shall be identified by the Contractor.
- D. After the activities not included in the current construction contract have been identified by the Contractor, the Contractor shall prepare a description of the additional work required and an itemized cost to complete the additional work.
- E. The Contractor shall submit the description of work and itemized costs to the Owner's Representative for review.

1.03 OWNER'S REPRESENTATIVE REVIEW

- A. Upon receipt of the description of additional work and itemized costs, the Owner's Representative will complete a review of the materials.
- B. Review of the submitted materials will be completed by the Owner's Representative within 7 days from the date of submittal.
- C. If, during the review of the submitted materials, the Owner's Representative has questions or requires additional information to complete his/her review, they will contact the Contractor within 7 days from the date of the submittal.
- D. A response to the Contractor's submittal by the Owner's Representative will be required within 7 days from the date of the submittal.

1.04 OWNER'S REPRESENTATIVE APPROVAL

- A. After the Owner's Representative has reviewed the Contractor's submittal and verifies that the work included in the submittal is not included in the current scope of work, the Owner's Representative shall approve the submittal.
- B. After the submittal has been approved, the Owner's Representative shall complete a change order or contract amendment to cover the work items in the submittal.
- C. Any change order or contract amendment shall be completed by the Owner and ready for signature within 21 days from the date of the submittal.
- D. Adhering to the time schedule described above is necessary to keep the project implementation on schedule and prevent the Contractor from completing a critical component of the project.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF CONTRACT MODIFICATION PROCEDURES

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section describes the process and procedures to be followed by the Contractor and Owner for the preparation, submittal, and payment of monthly invoices for completed construction work.
- B. During the pre-construction meeting, the Owner's Representative will identify the monthly submittal date for invoices to be submitted by the Contractor. This date will account for submittal, review, approval, and payment processing time to expedite payments to the Contractor.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall keep a copy of the construction implementation spreadsheet at the construction site during the entire implementation period. This spreadsheet will show daily progress on schedule of value line items.
- B. During each weekly progress meeting, the Contractor shall provide a summary of work completed during the prior week and a total since the last invoice period.
- C. At the weekly progress meeting immediately before the monthly submittal date, the Contractor will present a draft invoice to the Owner's Representative. This draft invoice will show the percentage complete of schedule of value items included in the payment request.
- D. The total percent complete shown on the draft invoice will be supported by the construction implementation spreadsheet submitted with the draft invoice.

1.03 OWNER'S REPRESENTATIVE'S REVIEW

- A. During the weekly progress meetings, the total percentage of work completed recorded by the Owner's Representative and Contractor will be reconciled and approved.
- B. Upon verification of the total percent complete, Owner's Representative will sign an invoice approval form and forward the invoice to the CTUIR Accounts Payable Section.
- C. The CTUIR Accounts Payable Section will have 2 working days to review and approve or reject the invoice.

1.04 OWNER'S REPRESENTATIVE APPROVAL

- A. The Owner's Representative will be expected to attend and participate in the Weekly Progress Meetings and keep current on the project implementation activities.

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- B. Upon receipt of the approved invoice from the Owner's Representative, the CTUIR Accounts Payable Section shall review the submitted invoice and construction implementation spreadsheet.
 - C. The CTUIR Accounts Payable Section will have 2 working days to review and approve or reject the invoice after receipt from the Owner's Representative.
 - D. After approval, the Owner's Representative will prepare all necessary administrative forms to initiate payment processing within the CTUIR Accounts Payable Section.
 - E. The Owner's Representative will have 3 working days to prepare the necessary administrative forms and secure signatures to initiate the payment process.

1.05 PAYMENT PROCESSING

- A. Upon submittal of the administrative forms and Contractor invoice, payment processing will follow the standard operating procedures of the CTUIR Accounts Payable Section.
- B. If payment has not been received by the Contractor within 4 working days of the estimated payment date defined in Section 1.01 B., the Owner's Representative will contact the CTUIR Accounts Payable Section to determine the reason for the delay.
- C. The Owner's Representative will make every effort possible to resolve any issues that are holding up payment to the Contractor as quickly as possible.
- D. In the event that payment is not received by the Contractor within 30 days of the estimated payment date, the Contractor will be allowed to charge interest on the outstanding balance. This interest charge will not be part of the overall construction cost included in the construction contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF PAYMENT PROCEDURES

SECTION 01 31 19.13
PRE-CONSTRUCTION MEETING

PART 1 GENERAL

1.01 DESCRIPTION

- A. Not more than 5 days after a Notice to Proceed has been issued to the Contractor, but earlier if practicable, a mandatory pre-construction meeting will be scheduled by the Owner's Representative or Engineer. This meeting will occur not less than 10 days prior to work commencing.
- B. The Owner's Representative or Engineer will preside at the pre-construction meeting.
- C. Present to represent the Contractor shall be at least the Project Superintendent, a representative with full contract authority to speak for each of his principle subcontractors, and other representatives as he/she may deem appropriate.
- D. The Owner's Representative and other invited parties shall be present as required.
- E. Proceedings of the meeting will be recorded and distributed to interested parties.

1.02 AGENDA

- A. Both Owner's Representative and Contractor shall be prepared to speak to the following:
 - 1. Name and Field Address of Job Superintendent
 - 2. Emergency Phone and/or operator
 - 3. Date of Construction Start
 - 4. Date of Notice to Proceed
 - 5. Notification of Utilities, Concerned Fire, Police, Schools, etc.
 - 6. Coordination with other Contractors
 - 7. Permits: County, City, all Government Agencies as required
 - 8. Inspector: name, authority
 - 9. Field office (location)
 - 10. Submittals
 - 11. Responsibility for lines and grades
 - 12. Periodic progress payments including date for submittal

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13. Construction Progress Schedule (bar graph or C.P.M.)
 14. Safety Requirements and Special Hazards
 15. Insurance and Bonds
 16. Traffic Control
 17. Construction Signs
 18. Drawings revised to conform to construction records
 19. Beneficial Occupancy
 20. Retention of Contract Records
 21. Guarantees and Warranties
 22. Testing
 23. Progress Meetings
 24. Complaint Procedure
 25. Job Photos
 26. Other Matters Concerning Construction

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF PRE-CONSTRUCTION MEETING

SECTION 01 31 19.23
PROGRESS MEETINGS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Weekly Progress Meetings will be held at the job site during construction.
- B. The Owner's Representative or Engineer will preside at Progress Meetings.
- C. Proceedings of meeting will be recorded and distributed to interested parties.

1.02 MEETINGS

- A. Meetings other than Weekly Progress Meetings (if required) will be scheduled each week at mutually agreed time.
- B. Location of meetings: As designated during preconstruction conference.
- C. Attendance:
 - 1. Owner's Representative
 - 2. Engineer
 - 3. Contractor
 - 4. Other Contractors (if any)
 - 5. Subcontractors as pertinent to agenda
 - 6. Safety Representative (Optional)
 - 7. Representatives of Governmental or other Regulatory Agencies (Optional)

1.03 MINIMUM MEETING AGENDA

- A. Review and approve minutes of previous meeting.
- B. Review work progress since last meeting.
- C. Note field observations, problems and decisions.
- D. Identify problems which impede planned progress.
- E. Identify potential ways to increase construction efficiencies.
- F. Develop corrective measures and procedures to regain planned schedule.
- G. Revise Construction Schedule as indicated.

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- H. Plan progress during next work period.
 - I. Coordinate projected progress with other Contractors.
 - J. Review submittal schedules, expedite as required to maintain schedule.
 - K. Maintaining of quality and work standards.
 - L. Review proposed changes for:
 - 1. Effect on Construction Schedule
 - 2. Effect on Completion Date
 - M. Complete other current business.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF PROGRESS MEETINGS

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 DESCRIPTION

- A. This Section includes specifications for the general requirements and procedures for preparing and submitting construction information and data for information and review. Other requirements for submittals are specified under applicable Sections of the Specifications.
- B. Submittals are as specified throughout the Contract Documents and may not be included in this specification.

1.02 SUBMITTAL REQUIREMENTS

- A. Schedule of Submittals: Within 10 calendar days after the effective date of Notice to Proceed, Contractor shall submit a completed submittal schedule and list of products for all items requiring Owner's Representative's or Engineer's review, as follows:
 - 1. Work Plan, Shop Drawing, or other Submittal identification including description of the item. Include name of manufacturer, trade name, and model number, if applicable.
 - 2. Specification section references.
 - 3. Intended submission/resubmission date(s).
 - 4. Order release date.
 - 5. Lead time to delivery/anticipated delivery date(s).
 - 6. Highlight items that require expedited review to meet the project schedule, and are on the critical path.
- B. These schedules shall be presented in a form that is readily reproducible and shall be updated and sent to Owner's Representative or Engineer on a bi-weekly basis (twice per month). Identify all submittals that are required by the Contract Documents and determine the date on which each submittal will be submitted.
- C. Professional Seal Required: Submittals involving engineering expertise, such as excavation support structures, and load calculations, shall be sealed and signed by a Professional Engineer, currently registered in the State of Oregon, for the discipline involved.
- D. Review Stamp and Action Block Space: Include a 5-inch square blank space, in the lower right corner, just above the title block, in which Engineer may indicate the action taken.
- E. Review Period:

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1. Prepare submittals sufficiently in advance so that review may be given before commencement of related work.
 2. Allow 10 calendar days after receipt by Owner's Representative or Engineer for review of each submittal.
 3. Contractor shall be responsible for determining whether or not certain submittals require longer review periods. Where longer review periods are required, Contractor shall schedule the Work accordingly, so that the Work and construction schedules are not adversely impacted.
- F. Submittal Delivery: Ship submittals prepaid or deliver by hand directly to Owner's Representative or Engineer.
- G. Transmittal Form: Accompany submittals with the transmittal forms provided by Owner's Representative or Engineer.
- H. Changes in Reviewed Submittals: Changes in reviewed submittals will not be permitted unless those approved submittals with changes have been resubmitted and reviewed, in the same manner as the original submittal.
- I. Supplemental Submittals: Supplemental submittals initiated by Contractor for consideration of corrective procedures shall contain sufficient data for review. Make supplemental submittals in the same manner as initial submittals.
- J. Incomplete submittal packages will be returned without review.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Contractor's Review:

1. Each submittal shall be reviewed, stamped, and signed as reviewed and approved by Contractor prior to submission.
2. If the submittal is designated to be sent to Owner's Representative or Engineer for information, approval by the designated approval authority shall take place before submission to Owner's Representative or Engineer.
3. Contractor shall coordinate each submittal with the requirements of the Work, placing particular emphasis upon ensuring that each submittal of one trade is compatible with other submittals of that trade and with the submittals of other trades. Ensure submittal is complete with all relevant data required for review.
4. Review of drawings and associated calculations by Engineer shall not relieve Contractor from the responsibility for errors or omissions in the drawings and associated calculations, or from deviations from the Contract Documents, unless submittals containing such deviations were submitted to Engineer and the deviations were specifically called to the attention of Engineer in the letter of transmittal, and approved by Engineer as a Contract change.
5. Contractor's liability in case of deviations in the submittals from the requirements of the Contract Documents is not relieved by Engineer's review of submittals

containing deviations, unless Engineer expressly approves the deviations by issuing a Change Order.

6. Contractor shall be responsible for the correctness of the drawings, for shop fits and field connections, and for the results obtained by the use of such drawings.
- B. Submittal Quantities: Unless noted otherwise, Contractor shall submit three copies of all submittals. Where permits and licenses and other such documents are obtained in Owner's name, submit the original and five copies.
 - C. Distribution of Submittals after Review: Distribute prints or copies of reviewed submittals, bearing Engineer's or designated approval authority's stamp and signature, to affected and concerned subcontractors, suppliers, and fabricators; and to affected and concerned members of Contractor's workforce.
 - D. Maintain at the site of the work a complete, up-to-date, organized file of all past and current submittals including an index and locating system which identifies the status of each submittal:
 1. Assign a sequential number to each submittal.
 2. Assign a revision number, using an alphanumeric sequence (e.g., 15, 15A, 15B, etc.) to all resubmittals.

1.04 ENGINEER'S REVIEW

- A. Submittals will be reviewed for conformance with requirements of the Contract Documents. Review of a separate item will not constitute review of an assembly in which the item functions. Review will not relieve Contractor from Contractor's responsibility for accuracy of submittals, for conformity of submittals to requirements of Contract Documents, for compatibility of described product with contiguous products and the rest of the system, or for prosecution and completion of the Contract in accordance with the Contract Documents.
- B. Engineer will indicate its reviews of submittals and the action taken by means of its review stamp. The review stamp will be affixed by Engineer, the action block will be marked, and the stamp will be signed and dated.
- C. The review-stamp action-block marks will have the following meanings:
 1. The mark NO EXCEPTIONS TAKEN means that every illustration and description appears to conform to the respective requirements of the Contract Documents; that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed; and that the submittal need not be resubmitted.
 2. The mark EXCEPTIONS AS NOTED - RESUBMISSION NOT REQUIRED means that every illustration and description appears to conform to the respective requirements of the Contract Documents upon incorporation of the reviewer's corrections, and that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed. Submittals so

marked need not be resubmitted unless Contractor challenges the reviewer's exception.

3. The mark EXCEPTIONS AS NOTED - RESUBMISSION REQUIRED means that every illustration and description appears to conform to the respective requirements of the Contract Documents, and that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed after incorporation of the reviewer's corrections and verification by Engineer that the reviewer's corrections have been properly incorporated in the submittal. Resubmission is also required if Contractor challenges the reviewer's corrections.
 4. The mark REJECTED means that the submittal is deficient to the degree that the reviewer cannot correct the submittal with a reasonable degree of effort, has not made a thorough review of the submittal, and that the submittal needs revision and is to be corrected and resubmitted.
- D. Contractor shall attend meetings as requested by Owner's Representative or Engineer to address issues related to the review of submittals.
 - E. Owner's Representative or Engineer will return submittals to Contractor within 10 calendar days after submittals have been received.
 - F. Contractor shall include 10 calendar days in its schedule for Owner and other parties to review submittals and re-submittals.
 - G. No schedule extensions will be permitted for poorly prepared, incomplete, or inaccurate submittals.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL PROCEDURES

- A. Contractor's submittal schedule shall include the following submittals.
 1. Construction schedule
 2. Weed-free material source certification
 3. Spill Prevention Countermeasures and Control (SPCC) Plan
 4. Stormwater Pollution Prevention Plan (SWPPP)
 5. Erosion and Sediment Control (ESC) Plan
 6. Contractor Quality Control Plan
 7. Material Storage/Staging Plan
 8. Dewatering Plan

9. Stream Diversion Plan

10. Excavation Plan

11. Surveyor credentials

END OF SUBMITTAL PROCEDURES

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SECTION 01 35 43
ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section describes Environmental Protection work required to minimize environmental pollution and damage resulting from Contractor's operations during construction.

1.02 GENERAL REQUIREMENTS

- A. Contractor shall perform the work, minimizing environmental pollution and damage as the result of construction operations, in accordance with these Drawings and Specifications and applicable local, state, and federal laws. Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to all life; affect other species of importance to humankind; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of land, water, and air, and includes management of visual aesthetics, noise, solid waste, as well as other pollutants. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of this contract. Contractor shall ensure compliance with this section by Subcontractors.

B. Permits

1. Owner will obtain BPA HIP III, U.S. Army Corps of Engineers, Oregon Department of State Lands (DSL), and CTUIR permits for this project. Contractor shall be responsible for complying with all permit requirements including HIP III Terms and Conditions. Contractor shall be responsible for obtaining all other permits as may be required including Oregon Department of Environmental Quality (ODEQ) 1200-C Permit and the Oregon Department of Forestry (ODF) Permit to Use Fire or Power Driven Machinery. Contractor shall obtain all needed certifications and licenses as required by state and local jurisdictions.

C. Notification

1. Owner's Representative or Engineer will notify Contractor in writing of any observed noncompliance with the previously mentioned federal, state, or local laws or regulations, permits, and other elements of the environmental protection specifications. Contractor shall, after receipt of such notice, inform Owner's Representative or Engineer of proposed corrective action and take such action when approved. If Contractor fails to comply promptly, Owner's Representative or Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or costs or damages allowed to Contractor for any such suspensions. Failure of Owner's Representative or Engineer to notify Contractor of noncompliance does not relieve

Contractor of full responsibility of maintaining compliance conditions and work methods.

1.03 SUBMITTALS

A. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

1. SWPPP and ESC Plan

- a. The Contractor will secure the project area at the end of every work day in an effort to stabilize the project area to minimize impacts in case a high water storm event occurs. The Contractor will be required to prepare and implement the SWPPP to keep sediment from entering the channel during rain events.
- b. Contractor shall submit a SWPPP and all ESC Plans within 10 calendar days of Notice to Proceed. All erosion control plans shall be approved before work can begin. Plan shall be consistent with the requirements and meet the satisfaction of Owner.
- c. ESC Plans shall include all measures necessary to protect resources and improvements. This shall include:
 - (1) The construction activities and sequence of implementation relating to specific erosion control measures.
 - (2) The location and type of permanent controls to be implemented during construction.
 - (3) The location and type of temporary controls to be implemented during construction.
 - (4) Detailed dewatering plan.
 - (5) Description of monitoring plan.

2. SPCC Plan

- a. Contractor shall submit an SPCC Plan within 10 calendar days of Notice to Proceed. The SPCC Plan shall meet all applicable U.S. Environmental Protection Agency (EPA) requirements, must be certified by a registered professional engineer, and will include safe mobile fueling of equipment procedures, including inventory, storage, and handling. The Plan shall describe secondary containment procedures to be used during mobile fueling to protect nearby wetlands and other surface water bodies. Plan shall be consistent with the requirements and meet the satisfaction of Owner
- b. The Contractor will be required to prepare an emergency spill containment kit, to be located on the construction site at all times, and prepare a SPCC Plan, addressing prevention and cleanup of accidental spills. If a spill of petroleum product should occur in water, Contractor shall immediately notify the Owner's Representative and appropriate state agencies.

1.05 LAND RESOURCES

- A. Contractor shall confine all activities to areas defined by the Drawings and Specifications. Prior to the beginning of any construction, Contractor shall identify the land resources to be preserved within the work area. Except in areas indicated on the Drawings or specified to be cleared, Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, wetlands, and land forms without permission. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized by the Owner's Representative or Engineer. Where such emergency use is permitted, Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, earth, or other material displaced into uncleared areas shall be carefully removed and properly disposed of by Contractor at no additional cost to the Owner.
- B. Work Area Limits
1. Prior to construction, Contractor shall mark the areas that are not to be disturbed under this contract, as identified on the Drawings and by Owner's Representative or Engineer during the pre-construction meeting. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers not scheduled for abandonment on the Drawings and Specifications shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, the markers shall be visible. Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.
- C. Landscape
1. Trees, shrubs, vines, grasses, land forms, wetlands, and other landscape features indicated and defined on the Drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques.
- D. Unprotected Erodible Soils
1. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Clearing of such areas shall progress in reasonably sized increments as needed to use the developed areas as approved by Owner's Representative or Engineer.
- E. Disturbed Areas
1. Contractor shall effectively prevent erosion and control sedimentation through approved methods, which shall be included in the ESC Plan, including, but not limited to, the following:
 - a. Retardation of runoff and prevention of runoff channelization. Runoff from the construction site or from storms shall be retarded by means of site perimeter silt fencing, straw wattles, fiber rolls, straw bales, and the preservation of a vegetated buffer area around the site, and by any measures required by area-

wide Drawings under the Clean Water Act. Straw mulch, wood chips, plastic sheeting, rolled erosion control products (i.e., erosion control blankets or mats), mid-slope sediment fences, fiber rolls, or wattles shall also be employed for temporary soil stabilization if an area is to remain unworked for longer than 1 week.

- b. Erosion and sedimentation control devices. Contractor shall install temporary erosion and sedimentation control features as indicated on the Drawings or directed by the Owner's Representative or Engineer. Erosion and sedimentation control devices shall be checked daily and maintained throughout the duration of the project to prevent sediments from entering the stream channel.
- c. Cleanup of roadways. Contractor shall maintain roads and parking areas traveled by construction equipment free of debris, tracked mud, and spillage. Cleanup of roadways shall be performed daily at a minimum. Any damage to public roadways caused by Contractor's equipment shall be restored at Contractor's expense.

F. Contractor Facilities and Work Areas

- 1. Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the Drawings or as directed by the Owner's Representative. Temporary movement or relocation of Contractors facilities shall be made only when approved by the Owner's Representative. Borrow areas, if required, shall be managed to minimize erosion and to prevent sediment from entering nearby waters. Spoil areas shall be managed and controlled to limit spoil intrusion into areas designated on the Drawings and to prevent erosion of soil or sediment from entering nearby waters. Spoil areas shall only be developed with written approval of Owner's Representative or Engineer. Temporary excavation for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.

1.06 WATER RESOURCES

- A. Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. Monitoring of active streams, wetlands, and tributaries affected by construction shall be Contractor's responsibility.
- B. If at any time as a result of project activities fish are observed in distress, a fish kill occurs, or water quality problems develop (including equipment leaks or spills), operations shall cease, and the Owner's Representative and Engineer shall be notified immediately and the following agency shall be contacted:

Oregon Department of Fish and Wildlife; Contact: 503-947-6002 and 800-452-0311.

- C. The discharge or release of oil or petroleum hydrocarbons into or on the surface of waters of the state is prohibited. If visible oil sheen is observed beyond the limits of the construction activity then all appropriate actions to stop, contain, and cleanup the oil shall be taken.

D. Mobile Equipment Fueling

1. Contractor shall service all equipment only in the areas approved by the Owner's Representative. No mobile equipment fueling shall take place over or within 150 feet of the Desolation Creek stream channel. All equipment fueling shall be conducted using secondary containment to capture potential fuel spills. All mobile equipment fueling locations shall be pre-approved by the Owner's Representative.
 2. Fuel hoses, oil drums, oil or fuel transfer valves and fittings, and all other equipment, etc., shall be checked daily for drips or leaks, and shall be maintained and stored properly to prevent spills into state waters.
 3. All vehicles carrying fuel will have specific equipment and materials needed to contain or clean up any incidental spills at the project site.
 4. All pumps and generators used in or near streams will have appropriate spill containment structures and/or absorbent pads in place at all times during use.
- E. Equipment used for this project shall be well maintained and, to the maximum extent possible, prevented from leaking petroleum-based products that could result in environmental contamination.
1. All equipment used for instream work will be cleaned of external oil, grease, dirt and mud, prior to arriving at the project site. All equipment will be inspected by the Owner's Representative before unloading at the site. Any leaks or accumulations of grease will be corrected before entering streams or areas that drain directly into waterways.
 2. All equipment will be fueled outside of stream-adjacent riparian areas and wetland areas. Specific fueling areas may be approved and designated by the CO. When not in use, vehicles and fueling equipment will be stored in a designated staging area. The staging area should be in an area that will not deliver fuel, oil, etc. to streams.
 3. Oil-absorbing floating booms, and other equipment such as pads and absorbent "peanuts" appropriate for the size of the stream, will be available on-site during all phases of construction. For small streams with few pools or slack water, booms may not be effective. Use pads and straw bales to anchor booms if necessary. Booms will be placed in a location that facilitates an immediate response to potential petroleum leakage.
- F. The Contractor is solely responsible for all spills or leaks that occur during the performance of this contract. The Contractor must clean up spills or leaks in a manner that complies with Federal, state, and local laws and regulations and to the satisfaction of the Owner's Representative. Any spills resulting in a detectable sheen on water shall be reported to the EPA National Response Center (1-800-424-8802). Any spills over 25 gallons will be reported to the ODEQ and cleanup will be initiated within 24 hours of the spill. When available provide copies of all spill related clean up and closure documentation and correspondence from regulatory agencies.

G. Washing Water

1. Contractor shall ensure that wash water containing oils, grease, or other hazardous materials resulting from wash down of equipment or working areas shall be contained for proper disposal or treatment and shall not be directly discharged into state waters, storm drains, or any part of the project site.

H. Diversion Operations

1. Construction operations for dewatering and rewatering shall be controlled at all times. Contractor will be responsible for limiting the impacts of water turbidity and contaminants known to be present at the site on habitat for wildlife and on water quality for discharge and downstream use.
2. Contractor shall construct and maintain cofferdams as necessary and as shown on the Drawings to divert and de-water fish isolation areas for all work activities within the wetted channel. Water removed from within the isolated work area shall be routed to an area approved by the Owner's Representative to allow removal of fine sediment and other contaminants. The existing flow downstream from the project area shall be maintained throughout construction. The diversion and dewatering shall remain in place until in-stream restoration work is complete and Owner's Representative or Engineer approves removal of the system.
3. Rewatering of the isolated work area shall occur slowly and under the direct supervision/approval of the Owner's Representative. Rewatering shall follow guidelines set forth by BPA's HIP III Conservation Measures Handbook.

I. Fish and Wildlife

1. Contractor shall minimize interference with, disturbance to, and damage of fish and wildlife. Both resident and anadromous fish are present in the project reach on Desolation Creek.
2. Oregon Administrative Rules (OAR) Chapter 340, Division 41 for additional water quality standards and related regulations (OAR 340-041-0036) states that limited duration activities necessary to address an emergency or to accommodate essential dredging, construction, or other legitimate activities and which cause the standard to be exceeded may be authorized provided all practicable turbidity control techniques have been applied. Based on this OAR, the Owner shall get clearance to exceed State's water quality standards through a permit or certification authorized under terms of section 401 or 404 (Permits and Licenses, Federal Water Pollution Control Act) or OAR 14I-085-0100 et seq. (Removal and Fill Permits, Division of State Lands), with limitations and conditions governing the activity set forth in the permit or certificate.

- J. No excavated material shall be placed in the channel bottom that would divert the stream and cause erosion.

1.07 AIR RESOURCES

A. Equipment operation and activities or processes performed by Contractor in accomplishing the specified construction shall be in accordance with the State of Oregon air quality rules and all Federal emission and performance laws and standards. Ambient air quality standards set by the EPA shall be maintained. Monitoring of air quality shall be Contractor's responsibility. All air areas affected by the construction activities shall be monitored by Contractor.

B. Particulates

1. Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials shall be controlled at all times, including weekends, holidays, and hours when work is not in progress. Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from airborne particulates which would cause the air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type or other methods will be permitted to control particulates in the work area if approved by the Owner's Representative. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

C. Hydrocarbons and Carbon Monoxide

1. Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

D. Sound Intrusions

1. Contractor shall keep construction activities under surveillance and controlled to minimize environment damage by noise, in accordance with all applicable Federal, State, and local regulations.

1.08 WASTE DISPOSAL

A. Solid Wastes

1. Solid wastes shall be placed in containers that are emptied on a regular schedule. Handling and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste shall become commingled with solid waste. Contractor shall transport solid waste, including clearing debris, off Owner-controlled property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal.

B. Hazardous Materials Used by Contractor

1. Contractor shall take sufficient measures to prevent spillage of any materials of construction containing hazardous and toxic materials during operations (i.e. hydraulic fluid, ethylene glycol, etc.) and shall collect any such spilled materials in

suitable containers, observing compatibility. Contractor shall inform Owner's Representative of any hazardous waste generated during construction and request direction from Owner regarding proper transport and disposal. Spills of hazardous or toxic materials shall be immediately reported to Owner and Engineer. Cleanup and cleanup costs due to spills shall be Contractor's responsibility.

C. Burning

1. Burning will not be permitted.

1.09 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

- A. No archeological sites within Contractor's work area have been identified. If identified during the course of the work, Contractor shall take precautions to preserve all such resources as they existed at the time they were first pointed out. Contractor shall provide and install protection for these resources and be responsible for their preservation during the life of the contract. If during excavation or other construction activities any previously unidentified or unanticipated resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rocks or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, Contractor shall immediately notify Engineer and Owner's Representative. While waiting for instructions Contractor shall record, report, and preserve the finds in accordance with the National Historic Preservation Act and 43 Code of Federal Regulations Subtitle A Part 7, Protection of Archeological Resources.

1.10 FIRE CONTROL

- A. The Contractor shall immediately extinguish, without expense to the CTUIR, all fires on or in the vicinity of the project which are caused by Contractor's employees, whether set directly or indirectly as a result of Contractor operations. The Contractor may be held liable for all damages and costs of additional labor, subsistence, equipment, supplies, and transportation resulting from fires set or caused by the Contractor's employees or resulting from contract operations.
- B. At all times during closed fire season period, as specified by State law, the Contractor shall comply with each of the following provisions to the extent applicable to his operation under the contract.
1. Fire Tools. The Contractor will provide for each employee in the contract area at least one approved handtool of a type appropriate in the contract area, such as shovel, pulaski, or axe. Tools required and furnished under (2) and (4) below, shall count toward fulfillment of the above requirement.
 2. Fire Extinguishers and Tools on Mobile or Stationary Equipment. Each unit of powered equipment used in connection with this contract, including automobiles, trucks, tractors, etc., shall be equipped with serviceable tools and fire extinguishers as follows:

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- One - fire extinguisher, dry chemical type of not less than 2-1/2 pound capacity with a 4 BC or higher rating.
 - One - shovel, round point #0 lady or equal.
 - One - axe, 2 pounds or over, 26-inch minimum length, or one pulaski.
 - One - water container (at least 1-gallon capacity), not required with stationary equipment.
3. Spark Arresters. Each internal combustion engine shall be provided with a spark arrester or spark-arresting device.
 4. Power saws. For each power saw used in connection with this contract, the following will be provided:
 - One - shovel, round point #0 lady or equal. Shovel must be immediately available for use.
 - One - Fire extinguisher, containing not less than 8 ounces of extinguisher fluid, or a dry chemical powder-type of not less than 1-pound capacity. The extinguisher must be immediately accessible to the saw operator at all times.
 5. Smoking. Smoking shall not be permitted within the contract area except on surfaced or dirt roads, at staging areas, within closed vehicles, or at other posted places, and shall never be allowed while working or traveling on foot.
 6. Welding. Welding or use of cutting torches will be permitted only in areas that have been cleared or are free of all material capable of carrying fire. Flammable debris and vegetation must be removed from within a minimum of 10 feet radius of all welding and cutting torch operations. A shovel and a 5-gallon standard backpack water container (filled) with handpump attached shall be immediately available for use in the event of a fire start.

1.11 POST-CONSTRUCTION CLEANUP

- A. Contractor shall clean up all areas used for construction.

1.12 RESTORATION OF LANDSCAPE DAMAGE

- A. Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work areas.

1.13 TRAINING OF CONTRACTOR PERSONNEL

- A. Contractor shall advise his personnel regarding all pertinent phases of environmental protection required in the Contract Documents. The training shall include methods of detecting and avoiding pollution, proper fueling techniques at this site, familiarization with pollution standards, both statutory and contractual, and installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental pollution control.

PART 2 PRODUCTS

2.01 FILTER FABRIC FENCE

A. Geotextile

1. Manufacturer's fabric specifications must be submitted for approval and must be available on-site.
2. Geotextile shall be a woven monofilament or non-woven fabric. Slit-film fabric shall not be used.
3. Apparent opening size (AOS), American Society for Testing and Materials [ASTM] D-4751): 100
4. Water permittivity (ASTM D-4491): 0.02 sec-1 minimum
5. Grab tensile strength (ASTM D-4632): 100 pounds minimum
6. Grab tensile elongation (ASTM D-4632): 30 percent maximum
7. Ultraviolet resistance (ASTM D-4355): 70 percent minimum

B. Posts: 2- by 4-inch wood or steel fence posts

C. Wire Mesh Backing: 14 gauge with 2-inch by 2-inch square openings

2.02 SAND BAGS

- A. Sand bags shall be burlap or polypropylene and filled to a minimum weight of 30 pounds.

2.03 EROSION CONTROL BALES, WATTLES, LOGS, AND ROLLS

- A. Furnish straw bales tied with either commercial quality baling wire or string. Conform to the following:

1. Furnish certified weed free (native grass seed) straw that is free from mold or other objectionable material. Furnish straw in an air-dry condition suitable for placing with mulch blower equipment.
2. Approximate length 3.5 feet; Shape rectangular; approximate mass 70 pounds

- B. Furnish fiber wattles, logs, or rolls of curled excelsior fiber rolled into a cylindrical shape and encased in seamless photodegradable tubular netting. Conform to the following:

1. Diameter 12 inches min.; Mass 3 pounds per foot min.

- C. Furnish straw wattles that are manufactured from weed free straw and wrapped in tubular photodegradable plastic netting made from 85% high density polyethylene, 14% ethyl vinyl acetate and 1% color for ultraviolet (UV) inhibition. Conform to the following:

1. Diameter 9 inches minimum; Netting strand thickness 0.030 inches; Netting knot thickness 0.055 inches; Mass of netting 0.315 to 0.385 ounces per foot

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- D. Mulch shall be air-dried, well-seasoned, and free of undesirable seeds, noxious weeds, and all other material detrimental to plant life.

PART 3 EXECUTION

3.01 PERIMETER FILTER FABRIC FENCES

A. Construction

1. Install prior to other land-disturbing activities.
2. Silt fence trench: minimum 8 inches wide by 6 inches deep; backfill trench with compacted native soil.
3. Fence posts: Maximum separation, 6 feet.
4. Posts: Drive minimum 18 inches into ground.
5. Fabric: Staple to posts per manufacturer's recommendations.
6. Fence: Wire mesh backing.
7. Alignment: As described on Drawings.
8. Fence ends: Extend upslope perpendicular to the contour for a distance of at least 6-feet to inhibit flow around the end of the fence.
9. Fence sections: Overlap at least 10 feet.

B. Maintenance

1. Inspection: Daily. Repair damage immediately.
2. Sediment removal: If sediment is evident, remove the trapped sediment. Remove accumulated sediment at least daily.
3. Photo-degraded or damaged fabric: Replace.
4. Final site stabilization: Remove fence.

3.02 EROSION CONTROL BALES, WATTLES, LOGS, AND ROLLS

A. Erosion Control Plan

B. Application

1. Prepare the slope before the installation procedure is started.
2. Shallow gullies should be smoothed as work progresses.
3. Dig small trenches across the slope on contour, to place rolls in. The trench should be deep enough to accommodate half the thickness of the roll. When the soil is

loose and uncompacted, the trench should be deep enough to bury the roll 1/3 of its thickness because the ground will settle.

4. It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
5. Start building trenches and installing rolls from the bottom of the slope and work up.
6. Construct trenches at contour intervals 25-30 feet (8-10 meters) apart depending on the steepness of the slope. The steeper the slope, the closer together the trenches should be.
7. Lay the roll along the trenches fitting it snugly against the soil. Make sure no gaps exist between the soil and the straw wattle.
8. Use a straight bar to drive holes through the roll and into the soil for the willow or wooden stakes.
9. Drive the stake through the prepared hole, and into the soil. Leave only 1 or 2 inches (25 or 51 millimeters) of the stake exposed above roll.
10. Install stakes at least every 4 feet (1.2 meters) apart along the length of the wattle. Additional stakes may be driven on the downslope side of the trenches on highly erosive or very steep slopes.

B. Maintenance

1. Inspect the rolls and the slopes after rain events and at the frequencies as established in the SWPPP. Make sure the rolls are in contact with the soil.
2. Repair any rills or gullies promptly.
3. Reseed or replant vegetation if necessary until the slope is stabilized.

3.03 STRAW MULCH

A. Application

1. Disturbed areas that will remain unworked for longer than one week
2. Rate: 3 tons per acre (3 bales per 1,000 square foot, or 3 inches thick)
3. Secure mulch to soil: "Crimp" straw into soil by operating tracked vehicle (or straw crimping equipment) parallel to slope (up and down slope)

B. Maintenance

1. Stockpiled straw: have available on-site sufficient straw to replace 10 percent of covered area.

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2. Inspect straw mulch: after each rainfall event, repair by replacing straw and re-crimping.

3.04 NOXIOUS WEED CONTROL

- A. In order to prevent the potential spread of noxious weeds into work areas, Contractor shall be required to use weed-free equipment. The following is considered proof of weed-free equipment:
 1. The Contractor will be required to clean all equipment prior to entry onto CTUIR lands. This cleaning shall remove all dirt, animal and plant parts and material that could carry invasive species seeds or parts into the work area. Only clean equipment inspected by the CTUIR will be allowed to operate within the work area. The inspection shall be pre-arranged by the Contractor and will occur prior to entering the work area. All subsequent move-ins of equipment shall be treated in the same manner as initial move-in.
 2. For the purpose of item (1) above, equipment includes: hand tools, power tools, vehicles, all-terrain vehicle (ATV)/utility task vehicle (UTV), dump trucks, excavators, and all other heavy equipment.
- B. Straw/hay bales shall be certified as "weed free". The source field shall be inspected and certified by the county extension agent from the county that the straw/hay is grown. Each shipment into the work area shall be accompanied by a certification tag stating that it is weed free. The Contractor shall furnish the CTUIR with a statement of certification prior to unloading the bales.

END OF ENVIRONMENTAL PROTECTION

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SECTION 01 35 43.20
CARE AND DIVERSION OF WATER

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section describes the dewatering, treatment, discharge, and/or diversion of any water that might be required for performance of contract work. The work includes care and any necessary diversion of water in the vicinity of excavated banks, seepage into excavations, and water potentially generated by Contractor's project construction methods.

1.02 SUBMITTALS

- A. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

1. Construction Dewatering Water Storage, Treatment, and Discharge System

- a. Contractor shall submit a Dewatering Plan with shop drawings showing design details and layout for the Construction Dewatering, Treatment, and Discharge System, and procedures for operation. These shop drawings shall be submitted within 10 calendar days following Notice to Proceed.

2. Storm Contingency Plan

- a. Contractor shall submit, within 10 calendar days of Notice to Proceed, a Storm Contingency Plan. The Storm Contingency Plan shall detail actions to be taken in the event of an unexpected storm that could cause stormwater to collect and leave the work area.

B. Fish Passage

1. Both resident and anadromous fish utilize the project reach of Desolation Creek. Due to the in-stream work period restrictions, no provisions for fish passage are required beyond those discussed throughout this document and on the Drawings.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF CARE AND DIVERSION OF WATER

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SECTION 01 52 00
TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Construction Equipment Parking

1. Contractor shall identify a location within the project work area as an equipment parking area for daily parking and receive approval by the Owner's Representative. This area shall also be used for equipment fueling and daily maintenance and shall meet all criteria listed in Section 01 35 43 ENVIRONMENTAL PROTECTION Subsection 1.06 D, Mobile Equipment Fueling. No daily fueling or maintenance shall be completed outside this designated area.

B. Employee Parking

1. Contractor employees shall park privately owned vehicles in an area designated by the Owner's Representative. This area shall be within reasonable walking distance of the construction site. Contractor employee parking shall not interfere with existing and established parking requirements of the facility.

1.02 SUBMITTALS

- A. None.

1.03 AVAILABILITY AND USE OF UTILITY SERVICES

A. Temporary Water and Electricity

1. No municipal water or electricity will be available at the project site. Contractor shall arrange for drinking water, potable water, and power at the project site as needed and coordinate these needs with the Owner's Representative at the pre-construction meeting.

B. Sanitation

1. Contractor shall provide and maintain within the construction area field-type sanitary facilities. The number of sanitary facilities shall be matched to the maximum number of personnel working at the site as required by Federal, State, and local codes and regulations. Sanitary facilities shall be equipped with a hand-washing station.

1.04 PROTECTION AND MAINTENANCE OF TRAFFIC

- A. Contractor shall maintain and protect traffic and parked vehicles on all affected roads and parking lots during the construction period, except as otherwise specifically directed by the Owner's Representative. Measures for notification, any required hauling permits, the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the State and local authorities

having jurisdiction. The traveling public and Owner personnel shall be protected from damage to person and property. Contractor's traffic on roads selected for hauling material to and from the Site shall interfere as little as possible with public traffic. Contractor shall investigate the adequacy of existing roads and parking lots and the allowable load limit on these roads and parking lots. Contractor shall be responsible for the repair of any damage to roads and parking lots caused by construction operations.

B. Barricades

1. Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to areas such as roads or parking areas is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible, and with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.05 CONTRACTOR'S TEMPORARY FACILITIES

A. Administrative Field Offices

1. Contractor shall provide and maintain administrative field office facilities within the construction area as directed by the Owner's Representative.
2. The Contractor shall provide a clean, watertight field office with heat, electric lighting, equipped with drawing rack and drawing display table, all weather automobile access, and parking in a central location on the job site for the use of the Owner's Representative or Engineer if so directed. The field office will provide space for project meetings, with table and chairs to accommodate the appropriate number of persons. The Contractor shall provide access to the field office during normal working hours and other times to be specified by the Owner's Representative or Engineer. The Contractor shall pay all costs to set up the office, supply materials, supply electricity, provide weekly janitorial service, and maintenance for the duration of the project. The Contractor shall not use the field office for the storage of any material, equipment, tools, or supplies.

B. Appearance of Trailers

1. Trailers used by Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair.

C. Security Provisions

1. Adequate outside security lighting shall be provided at Contractor's temporary facilities as needed. Contractor shall be responsible for the security of its own equipment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF TEMPORARY CONSTRUCTION FACILITIES

SECTION 01 55 13
TEMPORARY ACCESS ROADS

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work in this section consists of the installation and removal of temporary access roads into the project work areas from the NF-10 road. Location of temporary access roads shall be field-fit as directed to protect existing vegetation to the extent practical.

1.02 SUBMITTALS

- A. Contractor shall submit a plan showing the proposed location and construction techniques to install the access road based on the Drawings. This plan shall be developed using the equipment weights and proposed usage to ensure the location and construction will support the equipment and anticipated loads over the proposed usage period of the road.

PART 2 PRODUCTS

2.01 FILTER FABRIC

- A. Installation of a filter fabric between the native soil and rock road surface may be required in places to keep the materials separate and ease the removal of the rock. If used, filter fabric shall be Mirafi 140x or approved equal.

2.02 ROCK FOR ACCESS ROADS

- A. Rock used for the access roads shall be free of soil and other extraneous materials. Materials used for the road construction shall be either quarry spalls or larger crushed rock.

2.03 TEMPORARY BRIDGES

- A. Temporary construction bridges are required at locations as shown on the Drawings.
- B. Contractor shall submit proposed bridge configuration to Owner's Representative or Engineer for approval at least a week in advance of installation.

PART 3 EXECUTION

3.01 SITE PREPARATION

- A. Site clearing and fence removal shall be completed within Section 31 10 00 SITE CLEARING and Section 01 56 23 TEMPORARY FENCING.

3.02 PRELIMINARY GRADING

- A. Once the temporary road alignments have been approved by the Owner's Representative or Engineer, preliminary grading can be completed. All materials removed during the preliminary grading shall be placed to the side of the temporary roads for use during site restoration upon completion of the project.

3.03 ROAD INSTALLATION

- A. Upon completion of the preliminary grading, filter fabric may need to be installed on the temporary roads to ease removal of access road rock. Quarry spalls or large crushed rock will then be placed on the filter fabric to complete the access pad.
- B. Compaction of the temporary roads will be completed using a dozer to spread the rock material, dump trucks delivering additional material, or an excavator after the rock is installed.
- C. Estimated total length of temporary construction access roads from NF-10 road will be approximately 9,000 feet. Length of the individual construction access roads will vary depending on the site conditions.

3.04 BRIDGE INSTALLATION

- A. Bridges to be installed at the locations shown on the Drawings.
- B. Bridges to be installed over active flowing water in the stream channel.
- C. Bridges to be installed on temporary concrete abutments or on a firm substrate.

3.04 ROAD MAINTENANCE

- A. During the use of the temporary access roads, if additional materials are needed to maintain the roads, these materials shall be of the same type that were used to originally construct the roads and pads.

3.05 ROAD REMOVAL

- A. Upon completion of the construction, the temporary access roads shall be removed.
- B. The Contractor shall remove the quarry spalls or larger crushed rock and haul this material to an off-site location. In addition, all filter fabric used shall be removed and hauled to an off-site location. It is the Contractor's responsibility to remove all of the filter fabric and rock from the temporary roads.
- C. All compacted access roads shall be subsoiled/scarified during Closeout.

3.06 SITE DECOMPACTION AND REGRADING

- A. After the filter blanket and rock have been removed from the temporary road alignment, these sites shall be evaluated for the degree of compaction by the Owner's Representative to make sure the disturbed areas will be restored to original conditions to the greatest extent practical for re-establishment of native vegetation.
- B. Subsoiling/decompaction to a minimum depth of 18 inches will be required to restore heavily compacted subgrade. Subsoiling shall be performed with a dozer ripper, subsoiling grapple rake (SGR) or subsoiling excavator bucket (SEB) and will leave no clumps larger than 8 inches in diameter when finished. Subsoiling during Closeout shall be approved by the Owner's Representative or Engineer.

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- C. After the filter blanket and rock have been removed from the temporary road alignment, these sites shall be regraded using the materials set aside during the preliminary grading. Finished grade along the road shall be as close to the original grade as possible.

3.07 SITE REVEGETATION

- A. Revegetation along the regraded road alignments shall be completed by the Owner and in Section 32 90 00 SEEDING.

END OF TEMPORARY ACCESS ROADS

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SECTION 01 56 23
TEMPORARY FENCING

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work in this section consists of installing the temporary construction fencing around the project work sites during the project.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify the location of the required construction access to the stream channel for the construction equipment needed to construct the improvements shown on the Drawings. Identify the sections of fencing and gates to be removed during the construction period.

3.02 EXISTING CONDITIONS

- A. Provide, erect, and maintain temporary construction fencing around the construction site to keep livestock out of the project work areas if required.

3.03 FENCE AND GATE REMOVAL

- A. Fence sections and gates identified for removal shall be removed in a manner that minimizes damage to the fencing material and gates. Fence posts identified for removal shall be removed and stored as stated in Section 3.04.

3.04 REMOVED FENCING AND GATES

- A. After the fencing and gates have been removed, all materials shall be stored on site during the construction period. Location of the storage area is to be determined in the field by the Engineer, Owner's Representative, and Contractor. Stored fencing and gates shall not be damaged during the installation of the channel improvements.

3.05 REINSTALLATION OF FENCE

- A. Upon completion of the channel improvements, all posts, fence sections, and gates shall be reinstalled in their former locations. After the posts have been reinstalled, all fencing and gates shall be reinstalled.

3.06 CONSTRUCTION FENCE LAYOUT

- A. Location of the construction fences are shown on the Drawings for the project.

3.07 CONSTRUCTION FENCE INSTALLATION

- A. Installation of the construction fence shall be completed before the major components of the project implementation begin.
- B. During the construction period, the construction fence shall be maintained in good condition to define the work areas of the project.

3.08 CONSTRUCTION FENCE REMOVAL

- A. At the end of construction activities, the construction fence shall be removed and hauled off-site by the Contractor.

END OF TEMPORARY FENCING

SECTION 01 71 23
FIELD SURVEYING

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work described herein for Field Surveying may be selected for contract separately from the remainder of the specifications. Owner to determine Contractor for described work.
- B. Contractor shall provide all materials, items, operations, or methods specified, listed, or scheduled on the Drawings or in the Specifications, including all materials, labor, equipment, and incidentals necessary and required to conduct proper surveys required to stake and layout the work, based on the Drawings and CAD files provided by the Owner's Representative or Engineer.
- C. Contractor shall perform surveys for layout of the work and to document final construction for "Record" Drawings.

1.02 SUBMITTALS

- A. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.
 - 1. Survey Data for Record Drawings
 - a. Within 14 calendar days of final acceptance, Contractor shall furnish Owner's Representative or Engineer field survey data documenting the completed construction.

1.03 QUALITY CONTROL

- A. All survey, layout, and related work shall be performed to the satisfaction of Owner's Representative or Engineer.

1.04 PROJECT RECORD DOCUMENTS

- A. Upon completion of the work, Contractor shall submit Field Record Documents to Owner's Representative or Engineer under the provisions of Section 01 78 39 RECORD DRAWINGS.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

- A. Contractor shall exercise care during the execution of the work to minimize any disturbance to the landscape in the areas surrounding the work site.

3.02 INSPECTION

- A. Contractor shall verify locations of existing site reference and survey control points prior to starting work. Contractor shall promptly notify Owner's Representative or Engineer of any discrepancies discovered. Contractor shall also verify layouts periodically during construction.

3.03 SURVEY REFERENCE POINTS

- A. Survey reference points have been established by prior contract at the site. Contractor shall locate and verify the accuracy of three of these reference points for coordinate location and elevations prior to using them for work performed at the site. If any discrepancies exist in the location of the existing benchmarks, Contractor shall notify Owner's Representative or Engineer prior to performing any site layout activities. Contractor may install additional reference points for his/her convenience at locations approved by Owner's Representative or Engineer. No payment will be made for any additional permanent site control installed by Contractor beyond that specified and permitted herein. Contractor shall protect survey control points prior to starting site work and preserve permanent reference points during construction. Contractor shall not relocate site reference points without prior written approval from Owner's Representative or Engineer.
- B. Contractor shall promptly report to Owner's Representative or Engineer the loss, damage, or destruction of any reference point or relocation required because of changes in grades or other reasons. Contractor shall replace dislocated survey control points based on original survey control at no additional cost to Owner. Replacement of dislocated survey control points shall be done by a licensed land surveyor in the State of Oregon. Survey accuracy used to relocate disturbed control points shall be equal to or better than that used to set the original control.
- C. Contractor shall be responsible for the accuracy of all surveys performed with his forces, including those of his subcontractors. Any work performed not conforming to the lines, grades, elevations, and locations indicated on the Contract Drawings due to survey error shall be the responsibility of Contractor, and Contractor shall repair or relocate such work to its proper location at no additional cost to Owner.

3.04 SURVEY REQUIREMENTS

- A. Contractor shall reference survey and site reference points to the provided control monuments and record locations of survey control points, with horizontal and vertical data, on Project Record Documents. Record Drawings shall include the bare earth of all grading activities and location of all installed structures to the tolerances described herein.
- B. Contractor shall with its own forces obtain working or construction lines or grades as needed.
- C. All control surveys for elevation shall be +0.1 foot and, for horizontal, control angles shall be to the nearest 20 seconds +10 seconds, and measured distances shall be to +0.1 foot. All measurement surveys for elevation shall be to the nearest 0.1 foot +0.05 foot and for horizontal distances shall be to +0.1 foot.

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- D. Contractor shall provide all materials as required to properly perform the surveys, including, but not limited to, instruments, tapes, rods, measures, mounts and tripods, stakes and hubs, nails, ribbons, other reference markers, and all else as required. All material shall be of good professional quality and in first-class condition.
 - E. All lasers, transits, and other instruments shall be calibrated and maintained in accurate calibration throughout the execution of the work. A copy of the recent calibration of all instruments will be required and available to the Engineer and Owner.
 - F. Contractor shall furnish all materials and accessories (i.e., grade markers, stakes, pins, spikes, etc.) required for the proper location of grade points and line.
 - G. All marks given shall be carefully preserved and, if destroyed or removed without Engineer's or Owner's Representative's approval, they shall be reset, if necessary, at Contractor's expense.
 - H. Upon completion of surveys for control points, channel location, structure location, fencing location, access roads and embankment, the Contractor's Surveyor will notify the Owner's Representative or Engineer for review of the survey. Upon review and approval of the survey by the Owner's Representative or Engineer, the Contractor will be notified to proceed with implementation.

3.05 SURVEY OF COMPLETED EXCAVATION

- A. Not Required.

3.06 SURVEY OF COMPLETED CONSTRUCTION

- A. At the completion of restoration in all areas, Contractor shall survey the floodplain, backfill, creek bed and banks, using a grid at a minimum of 25-foot centers plus key grade breaks, to document the final configuration, access road to remain in place, and all major structures (such as boulders and/or large woody debris) in the creek or floodplain.

3.07 PAYMENT AS AN INCIDENTAL

- A. The cost to Contractor of all work and delays occasioned by giving lines and grades, or making other necessary measurements, will be considered as having been included in the lump sum price for the work.

END OF FIELD SURVEYING

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SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 DESCRIPTION

- A. This section describes the process and procedures to be followed by the Contractor, Engineer, and Owner for the review and acceptance of work during implementation.
- B. Review and acceptance of work will be completed when needed during and at the end of construction, including for as-directed and hourly work.
- C. Review and acceptance of work will be completed for the completion of log jams, LWD structures, removal of a constructed berms, or other distinct stand-alone project feature shown on the Drawings.
- D. A Record of Review and Acceptance of work will be kept by both the Contractor and Owner's Representative or Engineer at the project site.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. During the weekly construction meetings, the Contractor will provide a summary of work completed and work under way at each of the work sites, including as-directed and hourly work.
- B. The Contractor will communicate with the Owner's Representative or Engineer on the status of work completion at each of the work sites.
- C. As work approaches completion at each work site, the Contractor will request the Owner's Representative or Engineer to review the work and prepare a punch-list of tasks to be completed at each site.
- D. Upon receipt of the punch-list, the Contractor will complete each of the tasks identified by the Owner's Representative or Engineer.
- E. Work on the tasks will continue until the Owner's Representative or Engineer accepts the completed work.

1.03 ENGINEER'S REVIEW AND APPROVAL

- A. Upon receiving a request from the Contractor, the Owner's Representative will prepare a punch-list of tasks to complete work at each of the work sites.
- B. The Owner's Representative will update the completion punch-list regularly to assist the Contractor in completing the work in an efficient manner. This will occur at a minimum of twice per week, more frequently if the task dictates more immediate action.
- C. Upon completion of the tasks included on the punch-list, the Owner's Representative or Engineer will approve the work and sign the Record of Review and Acceptance.

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- D. As work approaches completion of individual components, the Engineer will notify the Owner's Representative on project activities and request an on-site review of the work.

1.04 OWNER'S REPRESENTATIVE APPROVAL

- A. The Owner's Representative will be expected to attend and participate in the Weekly Progress Meetings and keep current on the project implementation activities.
- B. Upon receipt of the request from the Engineer for an on-site review of the completed work, the Owner's Representative will schedule a time to be on-site to complete the review.
- C. After the completion of the review, the Owner's Representative will have the option to approve, approve with conditions, or reject the work completed.
- D. When the Owner's Representative approves with conditions or rejects the completed work, the Owner's Representative will have two (2) working days to prepare a punch-list of items to be completed prior to approval. This punch-list will be submitted to the Contractor and the Engineer.

1.05 PROJECT APPROVALS

- A. Project approvals will be completed at the end of construction.
- B. Upon project approval by the Engineer and Owner's Representative, the construction work will be accepted by the Owner's Representative.

1.06 PROJECT CLEANUP AND REPAIRS

- A. Cleanup and repair of work area will be completed when needed during and at the end of construction.
- B. The Contractor is expected to keep the project work area clean and prevent the accumulation of trash and debris. Placement of a dumpster at the project trailer with regularly scheduled pickups shall be arranged by the Contractor.
- C. Additional cleanup and repair activities shall include but are not limited to road and fence repairs, general maintenance, staging area cleanup and maintenance and construction trailer maintenance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF CLOSEOUT PROCEDURES

SECTION 01 78 39
RECORD DRAWINGS

PART 1 GENERAL

1.01 DESCRIPTION

A. Field Record Drawings.

1. Field Record Drawings shall be completed and submitted to Owner's Representative or Engineer, within 14 calendar days of final acceptance. All Drawings from the original Contract Drawings set shall be included, including the drawings where no changes were made. Owner's Representative or Engineer will review all field record drawings for accuracy and clarity. The Field Record Drawings will be returned to Contractor if corrections are necessary. Contractor shall make all corrections and shall return the Field Record Drawings within 7 calendar days of receipt.

1.02 SUBMITTALS

- A. Field Record Drawings shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 FIELD RECORD DRAWINGS

- A. Contractor shall keep at the construction site two complete sets of full-size prints of the Contract Drawings, reproduced at Contractor expense, one for Contractor's use, one for Owner's Representative or Engineer. During construction, both sets of prints shall be marked to show all deviations in actual construction from the Contract Drawings. The color green shall be used to indicate all additions and red to indicate all deletions. The drawings shall show the following information but not be limited thereto:
1. The locations and description of any structures, pipelines, utility lines and other installations of any kind or description known to exist within the construction area and not previously shown on the Contract Drawings. The location includes dimensions and/or survey coordinates for permanent features.
 2. The location, orientation, topography and grade of all stream restoration features installed or affected as part of the project construction.
 3. All changes or modifications from the original design and from the last inspection.
- B. Where Contract Drawings or Specifications allow options, only the option actually used in the construction shall be shown on the record drawings. The option not used shall be deleted.
- C. These deviations shall be shown in the same general detail utilized in the Contract Drawings. Marking of the prints shall be pursued continuously during construction to

keep them up to date. The resulting field-marked prints and data shall be referred to and marked as "Field Record Drawings," and shall be used for no other purpose. They shall be made available for inspection by Owner's Representative or Engineer whenever requested during construction and shall be jointly inspected for accuracy and completeness by Owner's Representative or Engineer and a responsible Representative of Contractor prior to submission of each monthly pay estimate. Failure to keep the Field Record Drawings current shall be sufficient justification to withhold 10 percent of the final payment until satisfactory drawings are received.

3.02 PAYMENT

- A. All costs incurred by Contractor in the preparation and furnishing of Field Record Drawings shall be included in the contract price and no separate measurement or payment will be made for this work. Approval and acceptance of the Field Record Drawings shall be accomplished before final payment is made to Contractor.

END OF RECORD DRAWINGS

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work specified in this Section includes, but is not necessarily limited to, the following:
1. Removing materials from the site and delivering salvaged items to the Desolation LLC.
 2. Removing designated trees and protecting from harm any trees or other objects selected to remain by Owner's Representative.
 3. Stockpiling LWD for later use in the project.

1.02 HISTORICAL ITEMS

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value that may be encountered during site preparation shall remain Desolation LLC property. Upon such discovery or find, Contractor shall immediately notify Engineer and Owner's Representative. While waiting for instructions Contractor shall record, report, and preserve the finds in accordance with the National Historic Preservation Act and 43 Code of Federal Regulations Subtitle A Part 7, Protection of Archeological Resources.
- B. Items designated for attention of CTUIR and Desolation LLC, if discovered, shall be handled as described in Section 01 35 43 ENVIRONMENTAL PROTECTION.

1.03 SUBMITTALS

- A. Submit:
1. Procedures and operational sequence for review and acceptance by the Owner's Representative or Engineer include:
 - a. Permits for transport and disposal of debris as required.
 2. As-built drawings and records in accordance with Section 01 78 39 RECORD DRAWINGS.

1.04 DIMENSIONS AND LAYOUT

- A. The Contractor shall be responsible for installing construction fence around the construction area and resetting fencing to accommodate changes in the construction area.
- B. All work, materials, methods, and personnel shall be subject to approval by the Owner's Representative or Engineer prior to commencing construction and on a continuing basis for each phase requiring accuracy control.

C. The Contractor is responsible for preserving all benchmarks and stakes and replacing any that are displaced or missing as a result of the Contractor's operations.

D. The Contractor shall be responsible for locating all underground utilities prior to beginning any excavation or underground demolition.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. This section describes the requirements for site clearing and grubbing. Construction schedule constraints in performing various portions of the work are provided in Section 01 14 20 SITE-SPECIFIC REQUIREMENTS.

3.02 EROSION/POLLUTION CONTROL

A. Required erosion/pollution control facilities in accordance with Sections 01 35 43.20 CARE AND DIVERSION OF WATER and Section 01 35 43 ENVIRONMENTAL PROTECTION shall be in place prior to beginning the work of this Section.

3.03 EXISTING CONDITIONS

A. Protection of Facilities

1. Provide, erect and maintain temporary construction fencing around the construction area as shown on the Drawings.
2. Control construction traffic entering and leaving construction access gates to protect property.

B. Protection of Existing Improvements:

1. Provide, erect and maintain barricades, coverings, or other types of protection necessary to prevent damage to existing trees, fences, structures or buildings. Restore any improvements damaged by this work to their original condition, as acceptable to the Owner's Representative or Engineer.

3.04 TREE AND SHRUB PROTECTION

A. General:

1. Include barricades and/or fencing and other protection for trees indicated on the Drawings or directed by the Owner's Representative or Engineer to be saved and protected.
2. Maintain existing grade within root protection zone of trees to the edge of the dripline unless otherwise indicated.
3. Grubbing will be performed by cutting the vegetation at ground level while keeping the roots to the extent possible.

3.05 SITE WORK

- A. Sprinkle debris with water as necessary to limit dust to lowest practicable level. Do not use excessive water which may cause flooding, contaminated runoff, or icing.
- B. Existing utility lines within the project area shall remain in operation throughout the duration of the construction period. Protect and support all lines and meters from damage and movement.
- C. Existing utility lines, structures, and meters serving other properties shall remain in operation throughout the duration of the construction period. Protect and support all lines and meters from damage and movement.
- D. In the event the Contractor encounters utility lines not shown on the Drawings or otherwise indicated to be saved, removed, or abandoned, the location of such lines shall be marked in the field and the Owner's Representative or Engineer notified.

3.06 CLEARING LIMITS

- A. Construction fences and clearing limits for the construction activities are shown on the Drawings.
- B. Construction fences and temporary erosion control shall be installed prior to the beginning of site clearing for each construction period.
- C. All trees removed within the clearing limits shall be sorted into the following size categories:
 - 1. Diameter 18 inches or greater.
 - 2. Diameter 13 to 18 inches.
 - 5. Diameter 12 inches or less.
- D. All shrubs and other wood material shall be collected and stockpiled for use later in the project.

3.07 DEMOLITION

- A. Existing concrete structure identified in Project Area 5 is to be demolished.
- B. Temporary erosion and sedimentation control features shall be in place before demolition.
- C. Demolished material shall be treated as salvaged item.

3.08 SALVAGED ITEMS

- A. Carefully dismantle and remove salvaged items.
 - 1. The Contractor shall deliver any salvaged items to an approved location designated by the Owner's Representative.

3.09 STOCKPILING OF MATERIALS

- A. The Contractor should have sufficient area on-site to stockpile large wood material for later use in the project.
- B. If additional stockpile areas are required to complete the Project on schedule, the Contractor will arrange off-site stockpile areas. No additional payments will be made for stockpiling excavated materials off-site.
- C. Reusable materials shall be carefully segregated into material sizes defined in Section 3.06.

3.10 DISPOSAL OF MATERIALS

- A. Refuse and non-organic trash resulting from site clearing and grubbing shall be disposed of by the Contractor in a manner consistent with all government regulations.
 - 1. No burning permitted.
 - 2. Do not leave refuse material on the project site, shoved onto abutting private properties, or buried in embankments or trenches on the project site.
 - 3. Do not deposit debris in streams, bodies of water, roads, or upon private property except by written consent of the private property Owner.
 - 4. Maintain haul routes clean and free of debris resulting from work of this Section.
 - 5. All small trees, limbs, branches, bark and needles shall be buried during backfilling activities.

3.11 CLEAN-UP

- A. Upon completion of the work of this Section, remove all rubbish, trash, and debris resulting from operations.
- B. Remove equipment and tools; leave the site in a neat and orderly condition acceptable to the Owner's Representative or Engineer.

END OF SITE CLEARING

SECTION 31 23 00
EXCAVATION AND FILL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. This Section covers earthwork for constructed berm modification, site grading, road decommissioning, floodplain grading, and floodplain fill and compaction.

1.02 JOB CONDITIONS

- A. Environmental requirements: Construction shall progress only when weather conditions will not detrimentally affect the quality of the finished earthwork. If the atmospheric temperature falls below 35 degrees Fahrenheit in the shade, protect from freezing earthwork or soils-in-cut which require compaction to a specified degree.
- B. Protection of adjacent work and existing facilities is the responsibility of the Contractor and must be accomplished. Where open cuts are used in lieu of shoring, the excavation slopes should be made to the angle judged safe by the Contractor's designated competent person responsible for excavations and trenches. Regardless, temporary cuts shall be no steeper than 1 vertical to 1 horizontal and meet all applicable OSHA regulations. Permanent slopes shall be as shown on the Drawings and in no case be steeper than 1 vertical to 2 horizontal. Cover exposed slopes if erosion or riling threatens.
- C. Allowable in-stream work period will be July 15 to August 15. All in-channel work activities must be completed within this period due to spawning and incubation periods of steelhead and chinook in Desolation Creek. Extensions of the in-channel work period may be granted under certain conditions by the ODFW District Office but the Contractor shall not expect an extension due to scheduling conflicts.

1.03 DEFINITIONS

- A. Excavation: Area or material removed to provide a suitable base for improvement.
- B. Compaction: Placement of floodplain backfill materials to a density similar to the in-situ or excavated adjacent floodplain conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

- A. This section describes the requirements for excavation and backfilling. Construction schedule constraints in performing various portions of the work are provided in Section 01 14 20 SITE-SPECIFIC REQUIREMENTS.

3.02 PROTECTION OF ADJACENT WORK

- A. Protection of adjacent work, utilities and other improvements must be accomplished. Properly slope cuts to provide stability. Temporary cuts should be no steeper than one

vertical to one horizontal. Permanent slopes should be no steeper than one vertical to two horizontal. Cover exposed slopes if erosion or raveling threatens.

3.03 EQUIPMENT

- A. Construction of the log jams and LWD structures, constructed berm modification, loading and hauling material to stockpiles, and backfilling the floodplain will require numerous types of heavy equipment. This equipment will include but is not limited to medium to large excavators with bucket thumb, front end loaders, off-road dump trucks, and dozers with 6-way blade.

3.04 EXCAVATION BELOW EXISTING GRADE

- A. Unless otherwise specified, any appropriate method of excavation within the work limits shown may be employed which, in the opinion of the Contractor, is considered best, and meets applicable safety standards. The Contractor shall take whatever precautions are necessary to maintain the undisturbed state of the natural soils at and below the bottom of the excavation.
- B. Should the excavation be carried below the lines and grades indicated on the drawings or specified herein because of the Contractor's operations, the Contractor shall refill such excavated space to the proper elevation as directed by the Owner's Representative or Engineer. Should foundation materials be disturbed or loosened because of the Contractor's operations, they shall be removed and the space refilled as directed at no additional cost to the Owner.
- C. Rock Excavation is defined as the removal of all material which, by actual demonstration, cannot, in the Engineer or Owner's Representative's judgment, be reasonably excavated with equipment used for common earthwork and equipped with rippers or similar approved equipment. If bedrock is encountered that cannot be removed using the common earthwork equipment or equipment with minimum 125 Horsepower, the grading plan shall be adjusted as approved by the Engineer or Owner's Representative at no additional cost. The term Rock Excavation shall be understood to indicate a method of removal and not a geological formation.

3.05 CONTROL OF WATER

- A. The Contractor shall follow guidelines contained in Sections 01 35 43 ENVIRONMENTAL PROTECTION 01 35 43.20 CARE AND DIVERSION OF WATER during all excavation and backfill operations.
- B. The Contractor is responsible for complying with all permits conditions related to water in the stream, stormwater, and dust control during the excavation and backfill operations.

3.06 DUST CONTROL

- A. The Contractor shall be responsible for providing control of airborne dust and particulates from the work areas. Visible dust shall be limited by water, dust palliative or other approved methods.

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- B. If water is used for dust abatement, it must be brought in by the Contractor from an outside source. Water may not be used directly from Desolation Creek without prior, written consent of the Owner's Representative.

3.07 EXCAVATION OF NEW SIDE CHANNEL

- A. A pilot side channel will be excavated as shown on the Drawings.
- B. Excavation will begin at the downstream end of the side channel to prevent working in accumulated seepage flow in the pilot channel.
- C. Dimensions of the new side channel are shown on the Drawings.
- D. If unsuitable channel material is encountered, the channel shall be over-excavated to a depth of 1 foot and replaced with Natural Channel Material (NCM) per Section 35 01 60 STREAM RESTORATION.

3.08 EXCAVATED MATERIAL STOCKPILES

- A. Location of the excavated material stockpile sites are to be determined by Owner's Representative or Engineer.
- B. Contractor will be responsible for managing the volume, shape, and weather protection for each of the stockpile sites.
- C. The Contractor is responsible for keeping the stockpiled material protected to prevent any major erosion off the piles.
- D. In the event that sufficient room to store the anticipated excavated volume of material is not available in the identified stockpile sites, the Contractor can propose additional stockpile sites within the project area. Any new stockpile site must be approved by the Owner's Representative or Engineer prior to use by the Contractor.

3.09 CONSTRUCTED BERM REMOVAL OR MODIFICATION

- A. Locations of the existing berms to be removed are shown on the Drawings.
- B. Removal of the existing berms will include the removal of the riprap facing on the levee and the alluvial material above the adjacent floodplain.
- C. The riprap and alluvium must be segregated and stored in separate stockpiles as they will be used for backfilling the floodplain and constructing floodplain log jams and LWD structures in the project.

3.10 FLOODPLAIN CONTOURING

- A. Excavation and grading within floodplain areas shall be completed as shown on the Drawings, or as directed in the field by the Owner's Representative or Engineer.
- B. Excavation of swales and depressions will be completed to provide added roughness to the floodplain areas identified in the Design Drawings and as directed in the field. The swales and depressions will be of varying sizes and shapes and at various locations located within the floodplain. All excavated areas for the purpose of floodplain

contouring within the floodplains will be as directed by the Owner's Representative or Engineer.

- C. Excavated material from swale and depressions excavation will be installed on site using 9 to 12 inch lifts using a dozer to spread and track compact the fill to provide additional floodplain roughness.
- D. Smaller wood material, and extra logs with rootwads from the installation of the large wood structures will be incorporated into the floodplain contouring.
- E. Compaction of the excavated and backfilled areas shall mimic the natural floodplain condition. If excessive compaction is encountered, backfill material will be ripped or removed and replaced to compaction acceptable to Owner's Representative or Engineer at no cost to Owner.

3.11 ROAD DECOMMISSIONING/FLOODPLAIN DECOMPACTION

- A. Demolish and decompact the roadway sections identified in Design Drawings by restoring to approximate original ground contours. Remove any piping or structures, if found, and all associated fill material, down to "natural ground". Finish slopes to provide gradual transitions in slope adjustments without noticeable breaks.
- B. Any hardened road segment or surface area identified on the Design Drawings, or as directed in the field, shall be decompact to promote water infiltration and establish vegetation. This work shall consist of loosening all of the soil in the existing roadbed or staging area to a depth of 18 inches (minimum) and a clod size no larger than 8 inches or as shown on the plans. All roadway materials shall be removed from the downhill side of the road and placed on the uphill or cut side of the road. The roadway fill material shall be excavated down to the natural hillslope material. The sides of the road prism shall be blended to match the natural ground elevation to avoid trapping water. The excavation shall match the existing slope and contours of the local existing grade.
- C. Place available slash and wood material on the recontoured area, arranged to facilitate later clump planting of vegetation during revegetation as directed by the Owner's Representative.
- D. Refer to HIP III Conservation Notes for additional requirements.

3.12 FINAL GRADING AND CLEAN-UP

- A. All final surfaces shall be graded to match existing natural surface roughness, slopes, and contours.
- B. When final surfaces have been established, the Contractor shall protect the surfaces from erosion, raveling or any type of degradation, especially on surfaces that will be lined.
- C. Decommissioned roads shall be subsoiled/scarified during closeout.

D. When work is completed, the Contractor shall remove and dispose of all surplus material including stumps, trees and brush, and leave premises in condition acceptable to the Owner's Representative or Engineer.

3.13 TESTING

A. No testing for compaction is required.

END OF EXCAVATION AND FILL

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SECTION 31 23 19
CHANNEL DEWATERING, FISH TRANSFER AND CHANNEL REWATERING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Work in this section consists of the installation and removal of a streamflow diversion system to re-route the existing stream channel during the installation of temporary crossing and construction of in-channel log jams and LWD structures.

1.02 SUBMITTALS

- A. The Contractor shall provide a list of materials and equipment proposed for use during this component of the work. In addition, the Contractor shall submit the Manufacturer's data on a bypass pipe, if deemed necessary, for use during the project.
- B. The Contractor shall submit a dewatering and work area isolation plan for pre-approval to CTUIR at least 10 days prior to beginning work.

PART 2 PRODUCTS

2.01 DIVERSION STRUCTURE

- A. The Contractor shall use a sandbag/stone streamflow diversion structure or a side-channel to re-route or dewater the portion of stream for in-water construction, with fish isolated from the installation of the diversion structure, as shown in the Design Drawings and as expressed in the HIP III Terms and Conditions.
- B. The Contractor shall provide material for in-stream temporary diversion measures such as block nets, silt fencing, floating booms, sand bags, and/or other suitable means. In-stream temporary diversion shall be implemented at locations and at a duration only if approved by Engineer or Owner's Representative. The structure should include plastic liner or fine mesh silt fence to reduce the amount of fines entering the free flowing portion of the river. Block net mesh sizes and other diversion materials shall be in accordance with the National Marine Fisheries Service standards and as expressed in the HIP III Terms and Conditions.

PART 3 EXECUTION

3.01 GENERAL

- A. All channel dewatering system shall be approved by the owner, installed, and operational before any work in the channel can begin.
- B. All in-stream activities must be completed after the channel has been diverted and all fish can pass through the diverted stream channel.
- C. Refer to HIP III Conservation Notes in Design Drawings if any fish salvage operation is required. Construction work in the immediate vicinity of fish salvage will be delayed, typically for 2 to 24 hours but longer in some cases.
- D. Turbid water or sediment must not be released into the channel downstream.

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- E. If any bypass pumping is approved by Engineer or Owner's Representative, the Contractor shall also provide pumps with adequate pump capacity, hoses, and personnel as backup to the temporary stream flow bypass system in the event the system becomes non-operational, as may be required during construction when flow rates in the existing channel exceed the design capacity of the gravity bypass, or to maintain a dry work area when installing log jams and structures. Pumps and hoses may also be used to pump seepage flow through the cofferdam into the bypass pipeline to keep water out of the work area. Turbid water shall be discharged to an approved area with sufficient capacity to allow for slow infiltration and remain disconnected from active flow channel. The Contractor shall monitor pumping operation at all times.

Any pumping operation shall use a fish screen that is in accordance with the National Marine Fisheries Service standards. Pump intake screens shall be sized to prevent fish from being entrained into the pump intake or from being impinged on the intake screen. The screen face should be oriented parallel to flow for best screening performance. The screen shall be designed and used such that it can be submerged with at least one-screen-height-clearance above and below the screen.

- F. Upon removal of the temporary stream diversion, the disturbed area shall be re-graded to match surrounding topography and reseeded, if needed, as specified in Section 32 90 00 SEEDING.

3.02 FISH TRANSFER

- A. Refer to HIP III Conservation Notes in Design Drawings if fish transfer is deemed necessary.
- B. Fish salvage operations will be conducted by CTUIR staff and their partners, not the Contractor. Contractor shall provide at least three (3) days advance notice before dewatering or isolating any work area. Dewatering and rewatering shall be done in carefully controlled stages as expressed in the Design Drawings and HIP III Terms and Conditions for the purpose of inducing volitional movement out of the work area and of salvaging fish. Close coordination will be necessary with the Owner's Representative during this operation. Dewatering will take place as early in the morning as possible. No work will occur within the surrounding area until the fish salvage effort is complete. Construction work in the immediate vicinity of fish salvage will be delayed, typically for 2 to 24 hours but longer in some cases.

3.03 CHANNEL REWATERING

- A. Upon project completion, the construction site will be slowly re-watered, including pre-washing the newly excavated channel and pumping the turbid water to an approved floodplain location with no turbid water returns to the river, and incrementally increasing flow in the new channel over a period of hours to prevent loss of surface flow downstream and to prevent a sudden increase in stream turbidity. During rewatering, the site will be monitored to prevent stranding of aquatic organisms below the construction site. Rewatering will be completed under the direct supervision of the Owner's Representative. Refer to HIP III Conservation Notes in Design Drawings.

END OF CHANNEL DEWATERING, FISH TRANSFER AND CHANNEL REWATERING

SECTION 32 90 00
SEEDING

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work in this section consists of furnishing all labor, equipment, and materials to establish ground cover and grass as noted on the Drawings. Any substantive variance to this specification due to unforeseen conditions encountered on the site, weather conditions, seed availability, other construction activities, etc. must be approved by the Owner's Representative.
- B. Areas outside the limit of disturbance shall be protected from damage by Contractor. Any disturbance of trees, shrubs, grass, ground cover, or wetland areas outside the limit of disturbance shown on the Drawings shall be restored by Contractor.

1.02 SUBMITTALS

- A. Prior to use on the site, Contractor shall submit to Owner's Representative or Engineer certification of the seed mix as outlined by the State of Oregon Department of Agriculture "Rules for Seed Certification."
- B. Prior to use on the site, Contractor shall furnish to Owner's Representative or Engineer a statement signed by the Manufacturer certifying that each lot of seed has been tested by a recognized seed testing laboratory within six months of the date of delivery to the site.

PART 2 PRODUCTS

2.01 SEED

- A. Seed mix shall conform to the standards for "Certified" grade seed or better as outlined by the State of Oregon Department of Agriculture "Rules for Seed Certification." Mulch and seed mix must be certified as weed-free. The county extension agent or soils scientist will be consulted for approval of seed mixes and sources of certified weed-free mulch.
- B. Seed mix shall be obtained from local sources to ensure plants are adapted to local climate and soil chemistry.
- C. The seed mix and rate of application shall be as indicated in Table 2.01-1 and Table 2.01-2.
- D. The rate of application shall be 30 pounds Pure Live Seed per acre.
- E. Seed that has become wet, moldy, or otherwise damaged in transit or storage shall not be accepted.
- F. Seeding shall occur in floodplain and channel excavation areas shown on the Drawings.

**TABLE 2.01-1
FLOODPLAIN AND CHANNEL EXCAVATION SEED MIX AND QUANTITY**

COMMON NAME	SCIENTIFIC NAME	COMPOSITION (% OF MIX)
Blue wildrye	<i>Elymus glaucus</i>	40
Tufted Hairgrass	<i>Deschampsia cespitosa</i>	25
California Brome	<i>Bromus carinatus</i>	10
Idaho Fescue	<i>Festuca idahoensis</i>	10
Tall Mannagrass	<i>Glyceria elata</i>	10
Common Yarrow	<i>Achillia millefolium</i>	5

2.02 TACKIFIER

- A. Tackifier shall be used as a tie-down for the seed mixture.
- B. Tackifier shall be derived from natural organic plant sources containing no growth or germination inhibiting materials. Tackifier shall hydrate in water and readily blend with other slurry materials. Tackifier shall be noxious weed free and nontoxic to aquatic and terrestrial animals, soil microorganisms, and vegetation.
- C. Apply tackifier at the Manufacturer's recommended rate.

2.03 FERTILIZER

- A. Fertilizer shall not be used on this project.

2.04 WATER

- A. Water shall be the responsibility of Contractor, unless otherwise noted. Water shall not contain elements toxic to plant life.

2.05 HYDROSEEDING APPARATUS

- A. Use of a hydroseeding device for spreading seed and tackifier shall be capable of uniformly distributing the material at the Manufacturer's specified rate for that product.

2.06 EROSION CONTROL MATTING

- A. Use of any Rolled Erosion Control Product to control erosion or protect young plants shall conform to Section 01 35 43 ENVIRONMENTAL PROTECTION.
- B. Grade areas to be seeded to achieve the finished grades and grading drainage patterns indicated on the Drawings. Grading shall be accomplished in accordance with the requirements of Section 35 01 60 STREAM RESTORATION and Section 01 52 00 TEMPORARY CONSTRUCTION FACILITIES. Blend new surfaces to existing areas.
- C. The ground to be seeded shall be free of large clods or rocks, roots and other material that may interfere with the work and subsequent maintenance operations. Hand picking may be required.
- D. The Rolled Erosion Control Product shall be installed in accordance with the requirements of Section 01 35 43 ENVIRONMENTAL PROTECTION.

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- E. Seeding shall not commence until Owner's Representative or Engineer has accepted the condition of the prepared areas.

3.02 APPLICATION

A. Weather Limitations:

1. Seeding operations shall not be permitted when wind velocities exceed 15 miles per hour;
2. Seed shall be sown only when the soil is moist and in proper condition to induce growth. No seeding shall be done when the ground is unduly wet, or otherwise not in a tillable condition; and
3. Seeding shall only be completed from August 15 until December 1, preferably between October and November or as directed by Owner's Representative. Seeding at other times of the year shall only be completed with written permission from Owner's Representative or Engineer.

B. Hydroseeding

1. Seed shall be added to water and thoroughly mixed at the rates specified.
2. The seed and water shall be thoroughly mixed to produce a homogeneous slurry.
3. While the soil is still loose and moist, the seed and water slurry shall be uniformly broadcast under pressure over the nominated area at a rate of 30 pounds per acre using a hydroseeding apparatus.
4. Carefully regulate the flow rate and go over the area twice, applying half the seed with each application. The first application shall be from east to west and the second from north to south to ensure uniformity.

C. Watering:

1. Newly seeded areas shall not be watered to force seed germination, but only to sustain growth.
2. Vegetated areas shall be watered so as to provide optimum growth conditions for the establishment of the seed mix species.
3. Start watering within 5 working days after completing the seeded area, or once the seeds have germinated.
4. Run-off and puddling shall be prevented.

D. Maintenance

1. Maintain the seeded areas in a satisfactory condition until final acceptance by Owner's Representative or Engineer.
2. Maintenance shall include:

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- a. Watering vegetated areas where the establishment of the seed mix does not appear to be developing satisfactorily; and
 - b. Filling and leveling where erosion has washed an area away.
3. If in the opinion of the Owner's Representative or Engineer, repeat hydroseeding or repair is necessary due to Contractor's negligence, carelessness or failure to provide maintenance, then the work shall be at Contractor's sole expense.
 4. Repeat hydroseeding or repair required due to factors determined by Owner's Representative or Engineer to be beyond the control of Contractor shall be paid for under the appropriate contract pay items.

3.03 APPLICATION

- A. Contractor retains all ownership and responsibility for seeding until written acceptance by Owner's Representative or Engineer.
- B. Owner's Representative or Engineer will accept the seeding when:
 1. The application or installation is complete;
 2. Documentation is complete;
 3. Verification of the adequacy of all repairs, including associated vegetation, is complete; and
 4. The required written seed certification documents have been received by Owner's Representative or Engineer.

END OF SEEDING

SECTION 35 01 60
STREAM RESTORATION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Work under this section consists of the improvements included in the restoration of the Desolation Creek stream channel and descriptions of the stream structures and ancillary materials required to complete the restoration.
- B. Stream restoration components include excavation of a pilot side channel (Section 31 23 00), construction of willow spurs (this section), placing Natural Channel Material (this section), Floodplain Grading (Section 31 23 00) and construction of LWD Structures (Section 35 49 50).

1.02 SUBMITTALS

- A. For the following materials, documentation demonstrating compliance with specifications shall be submitted at least 10 calendar days prior to delivery to the site:
 - 1. Large Wood Material
 - 2. Natural Channel Material

PART 2 PRODUCTS

2.01 LARGE WOOD MATERIAL

- A. CTUIR shall furnish and the Contractor will salvage large wood material logs of the type shown on the Drawings and as specified herein. The large woody material logs shall be spruce, Ponderosa pine, grand fir, Douglas fir, Western larch, or juniper logs of recent vintage and free from insects, rot, and decay. Logs may be barked or unbarked.
- B. Large wood material logs shall consist of either a straight timber bole or a straight timber bole with rootwad attached, as shown on the Drawings. Nominal rootwad diameter shall be a minimum of two times the timber bole diameter and a maximum of four times the timber bole diameter.
- C. Each log (section) shall be anchored as described in the Drawings or as directed by the Owner's Representative or Engineer. The log shall be placed so there are no voids beneath its entire length. Minor hand excavation is permitted to accommodate localized high spots on the ground or log.
- D. Large wood material logs shall be to the dimensions as specified in the Drawings.

2.02 NATURAL CHANNEL MATERIAL (NCM)

- A. NCM shall also be used as a component of the stream channel bed in the portions of the newly excavated stream channel where unsuitable channel material is

encountered. This material shall be free of deleterious substances and consist of bank run sand, gravel, rounded cobbles with the following sizes;

Size	(mm)
D ₁₆ =	23
D ₃₅ =	36
D ₅₀ =	49
D ₆₅ =	60
D ₈₄ =	82
D ₉₅ =	120

- A. NCM shall be placed and compacted using vibratory plate compactor or similar. Fines shall be washed into the NCM to completely seal the new streambed and prevent sub-surface flows.

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

- A. Refer to Section 31 23 00 for excavation of side channel. Refer to Section 35 49 50 for specifications of habitat and bank protection structures. Construction schedule constraints in performing various portions of the work are provided in Section 01 14 20 SITE-SPECIFIC REQUIREMENTS.

3.02 NCSM MIX

- A. NCM mix shall be installed in locations containing unsuitable channel material as directed by the Owner's Representative.
- B. All materials to be used as a part of the NCM must be clean and free of dirt and organic materials.
- C. If on-site materials are to be used for NCM, the material must be screened and meet the specification described in Part 2.02 above.
- D. If off-site materials are used, these materials must be trucked to the site and stockpiled until used. Any off-site materials must also meet the specifications in Part 2.02 above. The location from which the material is harvested will be pre-approved by the Owner's Representative prior to hauling. These sites will also be treated or free of noxious weeds.

END OF STREAM RESTORATION

SECTION 35 49 50
LWD STRUCTURES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Work under this section consists of the rock and log habitat structures included in the restoration of the Desolation Creek stream channel and floodplain. This section includes descriptions of the stream structures and ancillary materials required to complete the improvements on the plan sheet or as directed in the field by the Owner's Representative or Engineer.

1.02 SUBMITTALS

- A. For the following materials, documentation demonstrating compliance with specifications shall be submitted at least 10 calendar days prior to delivery to the site:
1. Timber logs
 2. Timber logs with rootwads
 3. Timber logs with rootwads and branches
 4. Boulders

PART 2 PRODUCTS

2.01 LARGE WOOD MATERIAL

- A. If large wood material logs are not furnished by the Owner, the Contractor shall furnish or salvage large wood material logs of the type shown on the Drawings and as specified herein. The large wood material logs shall be spruce, Ponderosa pine, grand fir, Douglas fir, Western larch, or juniper logs of recent vintage and free from insects, rot, and decay. Logs may be barked or unbarked.
- B. Large wood material logs shall consist of either a straight timber bole or a straight timber bole with rootwad attached, as shown on the Drawings. Nominal rootwad diameter shall be a minimum of two times the timber bole diameter and a maximum of four times the timber bole diameter.
- C. Each log (section) shall be anchored as described in the Drawings or as directed by the Owner's Representative or Engineer. The log shall be placed so there are no voids beneath its entire length. Minor hand excavation is permitted to accommodate localized high spots on the ground or log.
- D. Large wood material logs shall be to the dimensions as specified in the Drawings.

2.02 BOULDERS

- A. Boulders include large rocks (i.e., anchor rocks, habitat boulders) placed in the structures to create habitat features and to anchor large woody debris. See drawings for number required and approximate location.
- B. Boulders shall be hard, sound, and durable. They shall be free from segregation, seams, cracks, and other defects tending to destroy resistance to weather. All Boulders shall be angular or round in shape and come from a rock quarry close to the project site or from an alluvial source. Imported boulders shall conform to the soundness requirements specified in Table 2.02-1 and size requirements in Table 2.02-2. Use of on-site boulders to be determined by the Owner's Representative or Engineer
- C. Excavated and cleaned riprap from onsite may be used in place of any boulders where size and weight requirements are satisfied.

TABLE 2.02-1 BOULDER SOUNDNESS REQUIREMENTS		
Test	Standard	Value
Specific Gravity	ASTM C-127	Min. 2.65
Soundness	AASHTO T104 (5.2.2)	Not greater than 5% loss
Accelerated Expansion	CRD-C-148	Not greater than 15% breakdown
Absorption	ASTM C-127	Not greater than 2%
L.A. Abrasion	ASTM C-131	Max. 20% loss @ 500 rev.

TABLE 2.02-2 BOULDER SIZE REQUIREMENTS		
Boulder Type	Nominal Diameter (feet)	Average Weight (lbs)
Large Wood Material Anchor	2-3	700-2,000

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

- A. The materials used for construction shall be as specified in PART 2 PRODUCTS. Construction schedule constraints in performing various portions of the work are provided in Section 01 14 20 SITE-SPECIFIC REQUIREMENTS.

3.02 FLOODPLAIN AND IN-STREAM WOOD STRUCTURES

- A. Floodplain and in-stream wood structures include floodplain wood groups, meander bend structures, bank habitat structures, log jam/bank protection structures, channel bleed through structures, channel splitting, log corner structures, and log jams.
- B. The overall plan form of all wood group structures will be constructed as shown on the Drawings or as directed in the field by Owner's Representative or Engineer.

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- C. Installation of the floodplain structures will occur at locations shown in Drawings.
 - D. A trench will be excavated in the existing or proposed floodplain at the location and elevation shown on the plans and field directed by the Owner's Representative or Engineer.
 - E. Refer to Design Drawings for sequence and specified dimensions of logs, logs with rootwads and branches to be installed in each trench
 - F. Habitat boulders at dimensions as shown in Design Drawings will be installed around each log or rootwad for stability.
 - G. Orientation and placement of the logs will be adjusted depending on the type of structure being installed.
 - H. Excavated material from the trench will be backfilled and compacted around the rootwad and boulders. Compaction will be completed using the excavator bucket. Finish grade will be blended into the surrounding flood plain.

END OF LOG AND ROCK STRUCTURES

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TETRA TECH