

Peterson Dam Removal Project

80 Percent Design

Prepared for:



Umatilla Basin Watershed Council
920 SW Fraser Ave #210
Pendleton, OR 97801

Prepared by:



19803 North Creek Parkway
Bothell, WA 98011
Tel 425-482-7600 Fax 425-482-7652

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Preface

This basis of design report for the Peterson Dam Removal Project (Project) is based on the most recent General Project Data Summary Requirements Basis of Design Report template for Bonneville Power Administration (BPA) Habitat Improvement Program (HIP) projects (BPA 2023). Some formatting changes have been made to the template but the sections and requested information follow the template structure. The design process for the Project was established by the Umatilla Basin Watershed Council (UBWC) in partnership with the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) and includes the following steps and review junctures:

- Alternatives Analyses (15 Percent) conceptual drawings (Tetra Tech 2023a),
- Preliminary 30 percent Basis of Design Report (Tetra Tech 2023b),
- 80 percent Basis of Design Report (this submittal),
- Final (100 percent) implementation plan and drawings.

1. Project Background

The Project is intended to improve fish passage and habitat for Endangered Species Act (ESA)-listed and non-listed fish while also benefitting channel morphology and instream processes on Birch Creek. The Project site includes a degraded concrete water diversion structure (Peterson Dam) that has not been used in recent years (Figure 1-1). Project funding is anticipated to come from the Oregon Watershed Enhancement Board (OWEB) and the Bonneville Power Administration (BPA). As such, the Project will be reviewed according to the BPA Habitat Improvement Program (HIP) review process to ensure that it meets the requirements established in the HIP Handbook (BPA 2023). Additional criteria for fish passage established by the Oregon Department of Fish and Wildlife (ODFW 2023) and the National Marine Fisheries Service (NMFS 2022) will also be incorporated into the design.

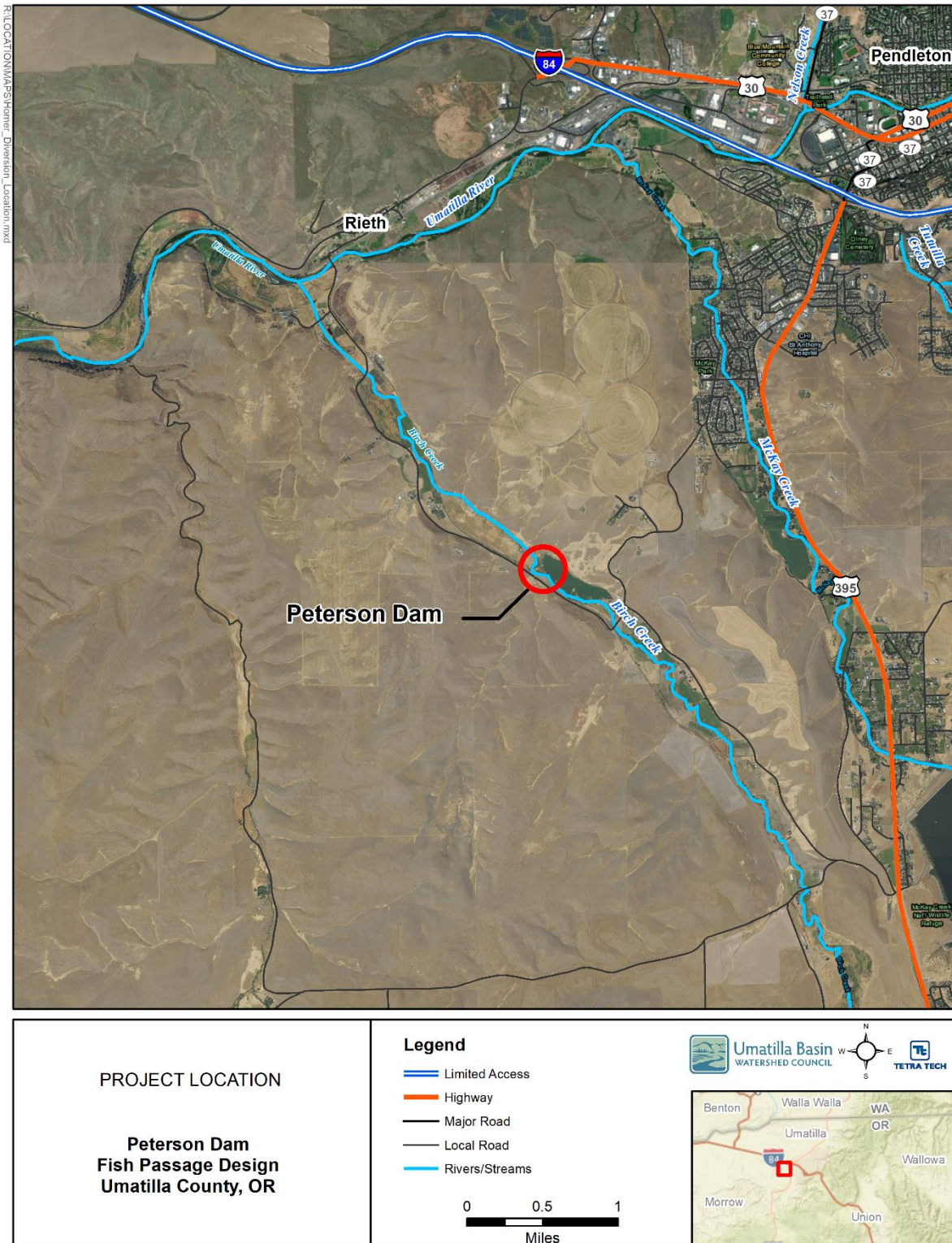


Figure 1-1. Project Location

1.1 NAME AND TITLES OF SPONSOR, FIRMS AND INDIVIDUALS RESPONSIBLE FOR DESIGN

Project Name:	Peterson Dam Removal
Project Location:	Umatilla County, Oregon
Sponsor:	Umatilla Basin Watershed Council
Engineering firm:	Tetra Tech, Inc. (Tetra Tech) 19803 North Creek Parkway, Bothell, WA 98011
Project Manager:	Jeremy Andrews, PE
Water Resources Engineer:	Spencer Harvey, EI

1.2 LIST OF PROJECT ELEMENTS THAT HAVE BEEN DESIGNED BY A PROFESSIONAL ENGINEER

Project Design Drawings (see Appendix A).

Engineering Analyses (see Appendix B).

Construction Specifications Outline (see Appendix C).

Engineer's Cost Estimate.

1.3 EXPLANATION AND BACKGROUND ON FISHERIES USE (BY LIFE STAGE - PERIOD) AND LIMITING FACTORS ADDRESSED BY PROJECT

The Project is located on Birch Creek, a tributary of the Umatilla River, approximately 3 miles upstream of the confluence. Focal species include ESA-listed steelhead (*Oncorhynchus mykiss*), and coho salmon (*Oncorhynchus kisutch*). Other species include Pacific lamprey (*Entosphenus tridentatus*), and resident redband trout (*O. mykiss gairdneri*). Data from StreamNet (2023) indicates that Birch Creek currently provides habitat for several aquatic species and life stages as summarized in Table 1-1.

Table 1-1. Species and life stages present in Birch Creek.

Species	Life Stages Present
Summer Steelhead	Spawning and Rearing
Coho Salmon	Spawning and Rearing
Pacific Lamprey	--
Redband Trout	Year-round

Source: StreamNet Mapper 2023

Steelhead in the Umatilla River and tributaries belong to the Umatilla-Walla Walla major population group, part of the federally threatened Middle Columbia River (MCR) steelhead distinct population segment (DPS) (NMFS 2009). The MCR DPS of steelhead was listed as threatened on March 25, 1999, and the threatened status was reaffirmed on August 15, 2011 (76 FR 50448). Lamprey were considered extirpated from the Umatilla River Subbasin following rotenone treatments by the Oregon Department of Fish and Wildlife (ODFW) in 1967 and 1974, until CTUIR lamprey reintroduction efforts began in 2000 (Close et al 2004; Close et al 2009). Redband trout are identified as present year-round.

Fish use and timing of life stages for species present are illustrated in Figure 1-2. Fish periodicity charts were developed based on information from several data sources, including Close (2004), NPCC (2005), Contor (2016), and CTUIR (2016). Shades of dark blue indicate periods of most common or peak use, and high certainty that the life stage is present. Shades of light blue indicate periods of less frequent use or less certainty that the life stage is present.

The Umatilla/Willow Subbasin Plan (NPCC 2005) lists 16 limiting factors for anadromous species that were assessed in the Ecosystem Diagnosis and Treatment (EDT) modeling of the Umatilla River Subbasin and are listed in Table 1-2. The results of the general subbasin-wide analysis indicate that the key limiting factor for coho salmon and steelhead was high water temperature.

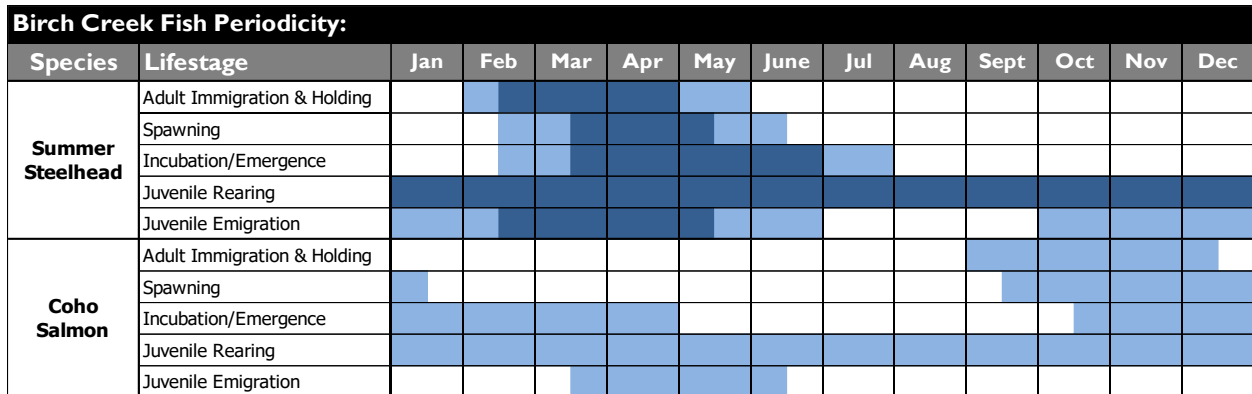


Figure 1-2. Fish Periodicity Chart for Aquatic Species in Birch Creek

Table 1-2. Limiting Factors for Anadromous Species in the Umatilla River Subbasin

Limiting Factors	
Flow	Water Temperature
Channel Stability	Habitat diversity
Key Habitat Quantity	Obstructions
Withdrawals	Sediment Load
Oxygen	Chemicals
Food	Hatchery Competition
Resident Competition	Predation
Pathogens	Harassment/poaching

Source: NPCC 2005

The 2008 Fish Accords (Three Treaty Tribes-Action Agencies 2008) lists five primary limiting factors for Umatilla River Summer Steelhead in Birch Creek (Table 1-3).

Table 1-3. Primary Limiting Factors for Umatilla River Summer Steelhead in Birch Creek

Primary Limiting Factors
In-channel Characteristics
Passage / Entrainment
Riparian/Floodplain
Sediment
Water Quality - Temperature

Source: Three Treaty Tribes-Action Agencies 2008

The Birch Creek Watershed Action Plan (CTUIR 2016) lists five limiting factors for the reach, identified in the plan as Reach B1, which extends from RM 0.0 to approximately RM 5.0 on Birch Creek (Table 1-4).

Table 1-4. Limiting Factors for Birch Creek Reach B1

Limiting Factor
Temp Max (daily maximum stream temperature)
Wood (quantities relative to index)
Flow High (average peak annual discharge compared to index)
Riparian Function (percent of reach degraded)
Fine Sediment (percent fines in spawning substrates)

Source: CTUIR 2016

1.4 LIST OF PRIMARY PROJECT FEATURES INCLUDING CONSTRUCTED OR NATURAL ELEMENTS

The primary design features were selected based on the goal and objectives described in Section 1.4.1. Project features were revised or refined at each design stage based on reviews by the design review team comprised of staff from the UBWC, CTUIR, and the BPA HIP review team.

1.4.1 Project Purpose, Goal, and Objectives

The Project goal is to restore volitional fish passage for adult and juvenile salmonids and other aquatic organisms throughout the year. Objectives and decision criteria were developed to help weigh the pros and cons of different alternatives.

Objectives include:

- Restore aquatic organism passage (AOP),
- Restore geomorphology and floodplain connectivity for future habitat restoration,
- Restore sediment transport, and
- Improving aquatic and riparian habitat.

Decision criteria include:

- Solution is self-sustaining,
- Solution provides low risk and low maintenance, and
- Solution considers design and construction cost.

A comparison of the alternatives and their ability to meet the objectives is provided in the following section.

1.4.2 15 Percent Design Alternatives

Following onsite surveys conducted by Tetra Tech in July 2023, alternatives were considered. The alternatives considered for the Project, with the exception of the No Action Alternative, would involve a barrier removal and would be covered under the HIP Category 1: Fish Passage Restoration, “1a – Dams, Water Control Structures, or Legacy Structures Removal.” Additionally, Alternative D involves actions to control grade and improve instream habitat. These actions would be covered under HIP “Category 1c – Headcut and Grade Stabilization”, “Category 2d – Install Habitat-Forming Instream Structures (Large Wood, Small Wood and Boulders,” and “2e – Riparian and Wetland Vegetation Planting” (HIP 2023). At the time of the Project survey the configuration of the concrete dam created a channel-spanning concrete sill with a 3-foot vertical drop in water surface elevation. At some point in time, persons unknown attempted to modify the dam by creating a narrow notch that is a 2.3-foot vertical drop in water surface elevation. Both the sill and notch are barriers to upstream fish migration under most flow conditions (Figure 1-3).



Figure 1-3. Existing Conditions at Peterson Dam Structure

Alternative A – No Action: The No Action Alternative would leave the existing structure in place. This alternative was considered but would not meet the Project goal of improving fish

passage at the site. Without modification, the concrete structure would continue to block migration indefinitely.

Alternative B – Simple Barrier Removal: Under this alternative, restoration actions would be focused on restoring fish passage solely through removal of the existing concrete barrier. Once the structure is removed, the stream would eventually regrade on its own. This alternative is the lowest cost option for achieving the Project goal; however, its primary drawback is that it would continue to impede upstream fish passage until the next high flow event with enough stream power to move the relatively coarse sediment. This alternative also represents a high risk of a headcut propagating upstream and creating a new fish passage barrier(s).

Alternative C – Barrier Removal with Regrading: This alternative would remove the existing concrete barrier and then regrade the stream profile using local native bed material from upstream. This alternative represents a mid-level cost option that would immediately achieve the goal of restoring fish passage. However, it creates uncertainty about the stability of the stream bed over time; and thus, uncertainty about the long-term performance of the Project to provide fish passage. Similar to Alternative B, the risk of a headcut is considered moderate.

Alternative D – Barrier Removal with Regrading, Stabilization, and Habitat Additions: This alternative includes removing the concrete barrier, regarding the channel profile, and using oversized streambed material to control the final grade. A roughened riffle would be installed with rock weirs spaced approximately 150 feet apart for additional stability. Three channel spanning Large Wood Debris (LWD) structures would be added downstream for habitat and to further encourage bed aggradation. The LWD structures and rock weirs would minimize the risk of a headcut. While this alternative represents the highest cost of the alternatives considered, it also represents the highest likelihood of success in achieving fish passage goals over the long-term.

Summary of Alternatives in Relation to Objectives and Decision Criteria

The alternatives were considered in relation to the Project objectives and given a relative rating of Good, Fair, Poor, or Not Applicable (N/A). These ratings are summarized in Table 1-5 and the preferred alternative is discussed in the section below.

Table 1-5. Objectives, Decision Criteria, and Ratings

Objective/ Design Criteria	Birch Creek			
	Alt. A	Alt. B	Alt. C	Alt. D
Restore Fish Passage	Poor	Fair	Good	Good
Restore Geomorphology & Floodplain Connectivity	Poor	Fair	Fair	Good
Restore Sediment Transport	Poor	Good	Good	Good
Improve Aquatic and Riparian Habitat	Poor	Poor	Fair	Good
Self-Sustaining	Poor	Poor	Fair	Good
Low Risk and Low Maintenance	N/A	Poor	Fair	Good
Design and Construction Cost	N/A	Good	Fair	Poor
OVERALL RATING	Poor	Poor	Fair	Good

Preferred Design Alternative

BPA HIP review comments were provided on October 5, 2023, and additional discussions occurred, resulting in the selection of Alternative D – Barrier Removal with Regrading, Stabilization, and Habitat Additions for the Project.

1.4.3 30 Percent Conceptual Design

Based on the comments received on the 15 Percent Design Alternative submittal (Tetra Tech 2023a), site survey data collected, and the analyses discussed in Section 2 and Section 3, the design was advanced to the 30 Percent Conceptual stage with the preferred design alternative.

The 30 percent design for Peterson Dam Removal included removal of a nonfunctioning concrete diversion structure fish barrier and regrading of the stream channel to a fish passable step-pool configuration. A roughened riffle and four boulder weirs help maintain channel stability and restore fish passage by limiting the water surface height at each step to 6-inches. Three LWD structures were proposed using a bank habitat structure type to increase habitat diversity, provide sediment sorting, and increase bank roughness.

1.4.4 80 Percent Preliminary Design

Based on the comments received on the 30 Percent Design Alternative submittal (Tetra Tech 2023b), site survey data collected, and the analyses discussed in Section 2 and Section 3, the design was advanced to the 80 Percent Preliminary Design (this submittal).

Existing Concrete Diversion Removal

Removal of all parts of the existing concrete diversion structure fish barrier including the existing concrete sill, abutments and wall, foundations, and any other material connected to the diversion that would obstruct the construction of the proposed conditions in Birch Creek.

Roughened Riffle and Boulder Weirs

The design includes a roughened riffle with streambed sediment constructed using lifts of a well-graded mix of cobbles, gravels, and fines. Additional fines will be washed into each lift until ponding occurs. The boulders for the boulder weirs will provide channel bed stability at the 100-year flow. Habitat boulders will be installed within the roughened riffle to provide fish habitat and additional erosion and scour control.

Four boulder weirs are proposed, two downstream of the existing diversion and two upstream, and will include 3.0-foot diameter boulders in a footer-and-header configuration. These boulder weirs will include step pools and will facilitate fish passage by maintaining the grade of the riffle and provide hydraulic resting areas and small jump pools.

Bank Habitat LWD

A bank LWD habitat structure is proposed and will mimic naturally occurring LWD in Birch Creek. The habitat structure will be placed on the bank with the rootwad in the wetted channel and may require minimal trenching of the tree stem. The structure will be placed to increase bank roughness, promote natural aggradation and sorting of sediment, and provide increase local habitat diversity.

1.5 DESCRIPTION OF PERFORMANCE / SUSTAINABILITY CRITERIA FOR PROJECT ELEMENTS AND ASSESSMENT OF RISK OF FAILURE TO PERFORM, RISK TO INFRASTRUCTURE, POTENTIAL CONSEQUENCES AND COMPENSATING ANALYSIS TO REDUCE UNCERTAINTY

Design and performance criteria are provided in this section and were developed to address the objective described in Section 1.4. Fish passage criteria, (e.g., velocities, jump height, flows) including NMFS fish passage criteria provided in Anadromous Salmonid Passage Facility Design (NMFS 2022) and ODFW fish passage criteria provided in Oregon Administrative Rules (OAR) Division 412 (OAR 2023), are provided in Table 1-6. Performance criteria for Project design components, associated risks to infrastructure or failure to perform, and compensating analyses are summarized in Table 1-7. Performance criteria and habitat benefits for LWD structures are provided in Table 1-8.

1.5.1 Fish Passage

Design criteria detailed below was used to evaluate fish passage actions and include the following:

- Removal of the existing dam structure and regrading of the channel at the location of the structure as well as upstream and downstream.
- Installation of a series of rock weirs with large wood structures to provide habitat:
 - Compliant with the most recent HIP general and activity-specific conservation measures (i.e., streambed material, and HIP-compliant structure materials).
 - Rock Weirs designed to be stable up to the 100-year flow event.
- Meeting fish passage criteria (see Table 1.6 below):
 - NMFS fish passage criteria provided in Anadromous Salmonid Passage Facility Design (NMFS 2022).
 - ODFW Fish Passage criteria (ODFW 2023)
- Material utilized as natural channel simulation material (NCSM) will be placed and compacted in lifts and fines pressure-washed in until surface flow is apparent and subsurface flow is absent or minimal.

Table 1-6. NMFS and ODFW Fish Passage Criteria.

Fish Passage Criteria (Salmonids)		
Criteria	NMFS	ODFW^{3/}
Category	5.10 Nature-Like Fishways^{2/}	635-412-0035 (1) – Roughened Channel Fishway
Method	Streambed Simulation Design	Stream Simulation Option
Channel Width	Entrenched – bankfull or greater	Equal or greater than active channel width, taken from stream crossing requirements
Channel Slope	Less than 6%	Less than 6%
Max Length	150 feet	NA
Fill Materials	An appropriate mix of bed materials are used such that flow depths of at least 1 foot can be maintained	Similar size and composition as the surrounding stream or supplemented to address site-specific needs
Water Depth	Resemble existing stream	Resemble existing stream
Water Velocity	Maximum velocity at 5% exceedance flow < 5 feet-per-second	Resemble existing stream

1/ Guidelines for Salmonid Stream Crossings in WA, OR and ID (NMFS 2022)

2/ Anadromous Salmonid Passage Design Manual (NMFS 2022)

3/ ODFW Chapter 635, Division 412, Fish Passage (ODFW 2023)

Table 1-7. Design Components, Design Criteria, Risk Assessments, and Compensating Analyses or Measures

Project Actions	Performance Criteria	Risk Assessment	Compensating Analyses or Measures
Roughened Riffle	<ul style="list-style-type: none"> Riffle boulders stable to proposed 100-year flood hydraulic conditions. Maintenance of surface flow. 	<ul style="list-style-type: none"> Potential for head cutting or avulsions in Birch Creek channel. 	<ul style="list-style-type: none"> Streambed aggregate will be placed and compacted in lifts and fines washed in until surface flow or ponding is apparent. Vertical stability analyses will be provided at the next design phase.
Weir Boulders	<ul style="list-style-type: none"> Stable to proposed 100-year flood hydraulic conditions. 	<ul style="list-style-type: none"> Undersized boulders could move or become buried but are generally a low risk. Addition of large quantities of boulders can increase roughness and raise flood stage. 	<ul style="list-style-type: none"> Boulder sizing was based on observations of the largest, immobile boulders present under existing conditions and on sizing calculations. Extended length of armoring along bankfull margins where needed to prevent lateral migration of the channel Proposed conditions hydraulic model will incorporate habitat boulder roughness if necessary.
Revegetation	<ul style="list-style-type: none"> Revegetation of all disturbed areas 12-month plant survival of >75%. 	<ul style="list-style-type: none"> Potential for low survival. Noxious weed infestations. 	<ul style="list-style-type: none"> Use site appropriate native vegetation. Technical specifications for plant handling, care, installation, and survival. Noxious weeds shall be monitored and removed.

Table 1-8. LWD Structure Performance Criteria and Habitat Benefits

LWD Structure	Primary Purpose	Performance Criteria	Risk Assessment	Compensating Analyses or Measures	Habitat Benefits
Bank Habitat Structure	<ul style="list-style-type: none"> Sediment sorting Vegetation establishment (e.g., microhabitats, browse protection) Creation of high-flow velocity refugia and cover 	<ul style="list-style-type: none"> Increased local roughness and deposition 	<ul style="list-style-type: none"> The proposed structure could restrict flow down the existing channel alignment To function properly for longer terms may require ballast anchoring 	<ul style="list-style-type: none"> Log structure stability calculations to be completed at the next design phase 	<ul style="list-style-type: none"> Enhance existing or create local scour pools, increase instream hiding cover, provide velocity refugia

1.6 DESCRIPTION OF DISTURBANCE INCLUDING TIMING AND AREAL EXTENT AND POTENTIAL IMPACTS ASSOCIATED WITH IMPLEMENTATION OF EACH ELEMENT

Construction is anticipated to occur during the in-water work window of July 1 to September 30, and a detailed construction schedule (see Section 4.5) will be developed as a component of the implementation plan. The areal extent of disturbance is approximately 0.6 acres. Staging areas are anticipated to be located on the left bank between the existing railroad and the bedrock outcropping, or downstream in Project Area 4 Birch Creek Instream Enhancement and Floodplain Restoration (PA 4 Project) (Tetra Tech 2021). The extent of disturbance is based on the results of construction plan designs (see Appendix A) and hydraulic modeling (see Section 3.5).

Potential impacts are expected to be minimal due to the remote location of the site. Construction may result in temporary turbidity releases to the stream, minor impacts to resident fish populations from defishing activities, possible spills from construction equipment, dust transport, colonization of disturbed ground by invasive vegetation, and short-term transportation patterns for road users.

2. Resource Inventory and Evaluation

2.1 DESCRIPTION OF PAST AND PRESENT IMPACTS ON CHANNEL, RIPARIAN AND FLOODPLAIN CONDITIONS

The geomorphic conditions of Birch Creek are tightly linked to anthropogenic impacts. The current degraded ecological condition of Birch Creek is documented in the Birch Creek Watershed Action Plan (CTUIR 2016) as well as in prior assessments and recovery planning documents such as the Umatilla/Willow Subbasin Plan (NPCC 2005). Collectively, when compared to historic conditions reported (CTUIR 2016) these impacts have resulted in:

- Decreased channel complexity with uniform morphology,
- Decreased quantity and quality of habitat diversity, especially large wood and pools,
- Decreased sediment sorting and routing,
- Decreased stream velocity diversity at both low and high flows,
- Minimal instream thermal diversity throughout the year,
- Decreased floodplain connectivity and frequency of inundation,
- Decrease in riparian extents and function and native vegetation, and
- Decreased areas suitable for adult spawning and juvenile fish rearing.

The diversion structure within Birch Creek is located just downstream of a bend and has resulted in sediment accumulation on the upstream side and scouring on the downstream side of the structure. The structure has been modified to include a flow notch in the approximate center of the structure to allow additional flow through, but the structure still poses a fish passage barrier within the reach. This portion of Birch Creek is constrained by agricultural lands on the right bank as well as Birch Creek Road and a railroad line running on the left bank of the creek. The Project must also consider potential impacts to restoration efforts located approximately 2,000 feet downstream as part of the PA 4 Project (Tetra Tech 2021), which has an anticipated completion date of 2024.

2.2 INSTREAM FLOW MANAGEMENT AND CONSTRAINTS IN THE PROJECT REACH

As documented in a Freshwater Trust (2010) report and the CTUIR Birch Creek Action Plan (CTUIR 2016), low flow conditions in Birch Creek are exacerbated in magnitude and duration by upstream water withdrawals and the overallocation of water rights.

It is important to note, however, that low and zero flows in lower Birch Creek are historically normative conditions. For example, in 1860, General Land Office (GLO) surveyors documented dry channel conditions in lower Birch Creek (GLO 1860). The Peterson Dam Removal Project is not expected to have significant impacts to these low and zero flow conditions.

2.3 DESCRIPTION OF EXISTING GEOMORPHIC CONDITIONS AND CONSTRAINTS ON PHYSICAL PROCESSES

Field surveys were conducted and collected data was used for hydrologic and geomorphic analyses, performing hydraulic modeling, evaluating and identifying physical habitat features present in the Project areas, and developing engineering designs. Geomorphic

conditions and constraints on physical processes for the Project are described below, and additional geomorphic data are included in Section 3.

Birch Creek has a drainage area of approximately 285 square miles with a maximum elevation of 3,020 feet and a minimum elevation of 951 feet. The valley is relatively wide and flat. With RM 0.0 to 6.9 assessed at only 29 percent of fully functional (CTUIR 2016), lower Birch Creek is disconnected from its floodplain and historic alluvial fan, lacks LWM, has limited riparian vegetation and recruitment, has compromised longitudinal connectivity from physical and flow passage barriers, and has inadequate water quality and quantity.

2.4 DESCRIPTION OF EXISTING RIPARIAN CONDITION AND HISTORICAL RIPARIAN IMPACTS

Past and present land uses in and adjacent to the Project area include grazing and tilling for agricultural purposes; channelization; irrigation diversions; the building of houses, barns, and other structures; and the construction of road, railway, and bridge infrastructure. Collectively, these land uses have significantly altered the hydrology of the site and the physical characteristics necessary to support robust native riparian vegetation communities.

The riparian vegetation includes a mix of hardwood trees and shrubs. Species commonly found within the riparian areas include black cottonwood (*Populus balsamifera*), alder (*Alnus* sp.), and chokecherry (*Prunus virginiana*). Herbaceous species commonly observed included alfalfa (*Medicago sativa*), western Canada goldenrod (*Solidago lepida*), horseweed (*Conyza canadensis*), and poison hemlock (*Conium maculatum*). Invasive species include thickets of blackberry (*Rubus* sp.), reed canary grass (*Phalaris arundinacea*), and Russian olive (*Elaeagnus angustifolia*) along channel margins. Figure 2-1 provides photos of the riparian conditions upstream and downstream of the barrier.



Figure 2-1. Riparian Vegetation upstream of barrier(left) and downstream (right)

The National Wetlands Inventory (NWI) shows a single band of R4SBC (Riverine) wetlands identified along the entire length of the Birch Creek.

2.5 DESCRIPTION OF LATERAL CONNECTIVITY TO FLOODPLAIN AND HISTORICAL FLOODPLAIN IMPACTS

Birch Creek in the Project area is severely limited compared to the historic conditions. The primary limitations include confinement by the agriculture fields, development, berms, and natural confinement by valley hillslopes. The left bank is confined by the valley wall, while the right bank is constrained by agricultural uses, and other anthropogenic influences.

3. Technical Data

3.1 INCORPORATION OF HIP SPECIFIC ACTIVITY CONSERVATION MEASURES FOR ALL INCLUDED PROJECT ELEMENTS

The most recent BPA HIP Handbook (BPA 2023) identifies General Aquatic Conservation Measures Applicable to all Actions and includes:

- Project Design and Site Preparation,
- Work Area Isolation & Fish Salvage,
- Construction and Post-Construction Conservation Measures,
- Staged Rewatering Plan,
- HIP Turbidity Monitoring Protocol,
- Stormwater Management Guidance; and
- Terrestrial Plants, Wildlife, and Aquatic Invertebrates.

Action categories and risk levels applicable to the Project identified by the BPA Restoration Review Team (RRT) following the 15 percent design review included:

- 1a – Dams, WCS or Legacy Structure Removal (High),
- 1c – Headcut and Grade Stabilization (Medium),
- 2d – Install Habitat-Forming Natural Material Instream Structures (Medium), and
- 2e – Riparian Vegetation Planting (Low).

Conservation measures applicable to each action type will be included in the contract documentation for construction, and relevant items will be included in the design drawings,

construction specifications, and implementation plan. The overall design will be compliant with all HIP general and activity conservation measures.

3.2 SUMMARY OF SITE INFORMATION AND MEASUREMENTS (SURVEY, BED MATERIAL, ETC.) USED TO SUPPORT ASSESSMENT AND DESIGN

The following sections describe site information that was collected to support the assessment and design alternatives.

3.2.1 Topographic Survey and Surface Development

Site survey data for the Project were collected on July 11th through July 12th, 2023, and included stream channel topographic and bathymetric northing, easting, and elevation Global Positioning System (GPS) coordinates, as well as geomorphic and habitat assessments. Additional GPS locations and descriptions of key features including roads, bridges, fences, and other points of interest were collected during field surveys.

A total of 932 GPS points were collected on Birch Creek using a Trimble R12 real-time kinematic (RTK) GPS with Global Navigation Satellite System (GLONASS) receivers. The survey control points utilized during the survey were based on previously established control points for the Reach 4 Project, where the base stations were established by collecting raw static GPS data for a minimum of 4 hours. The data were submitted to the Online Positioning User Service (OPUS) for post-processing and conversion to the preferred coordinate system: North American Datum (NAD) 83, Oregon State Plane, North Zone for the horizontal projection, and the North American Vertical Datum (NAVD) 88, using International Feet as the vertical projection. The on-site GPS survey data were merged with previously collected data for the PA 4 Project as well as 2019 light detection and ranging (LiDAR) data (QSI 2019) to provide a final surface for hydraulic modeling and design development. Comparisons of GPS points versus the LiDAR data were made at fixed areas such as highways or gravel roads and indicated no need to make any horizontal or vertical adjustments to the LiDAR data.

3.2.2 Geomorphic and Habitat Data Collection and Observations

Geomorphic and habitat field surveys were conducted to characterize current in-channel and riparian habitat, establish baseline conditions, and identify potential fish passage restoration opportunities. Specific attention was given during field surveys to making observations related to sediment transport and response conditions, channel incision and channel stability trends (erosion or aggradation), substrate characteristics (e.g., size, distribution, supply), the

abundance and influence of instream wood, floodplain connectivity, the influence of human alterations, and the interaction of the stream with riparian ecological processes. Site observations, potential restoration actions, photographs, and related notes were recorded on iPads equipped with GNSS receivers for georeferencing of all data.

The topographic surveys included longitudinal profiles covering 1,437 feet of Birch Creek. The channel thalwegs were surveyed at an average of 5-foot spacing capturing all major breaks in slope along the bed profiles. Thalweg profile data were classified by channel features (pools, riffles, runs, and glides) to aid in classifying habitat and geomorphic characteristics. Left and right water edges and bankfull indicators were also included in channel profiles. The profiles show an average slope of 0.94 percent in Birch Creek (Figure 3-1).

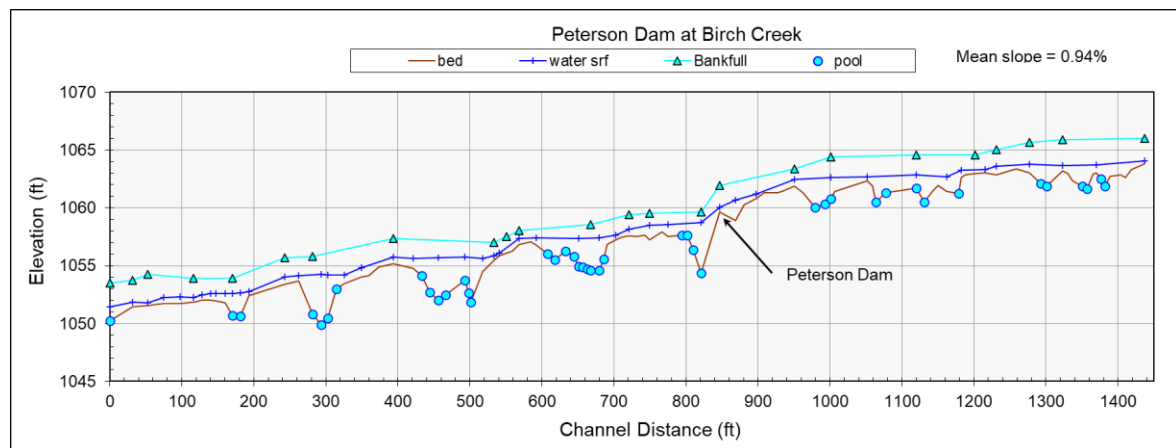


Figure 3-1. Longitudinal Profiles of Birch Creek at Peterson Dam

Channel features identified for cross sections included channel left and right terraces, tops and toes of banks, left and right bankfull indicators, thalweg, intermediate channel bottom points, gravel bars, and waters edges. Cross sections were collected at representative locations up and downstream of the fish barrier.

Birch Creek exhibited little variable channel conditions above and below the fish barrier. In riffle sections, the stream was falling into an F4 classification based on the Rosgen (1996) classification system. Typical conditions are represented at riffle Station 1+00 (Figure 3-2 upper), where the bankfull width was 33.7 feet and cross-sectional area was 64.3 square feet. The entrenchment ratio was 0.6 and width to depth ratio was 17.6.

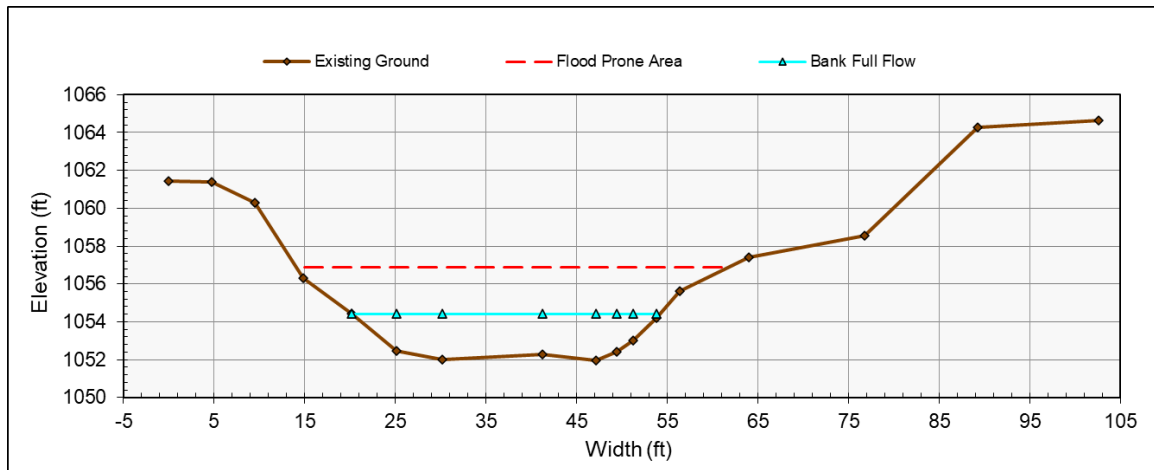


Figure 3-2. Representative Cross Sections in Birch Creek Below and Above Peterson Dam The existing channel morphology (Montgomery and Buffington 1997), stream type (Rosgen 1996), and other geomorphic and habitat characteristics were evaluated based on field data and observations, and are summarized in Table 3-1.

Table 3-1. Geomorphic and Habitat Existing Conditions Characteristics

Stream Characteristic	Birch Creek
Stream Length (feet)	1,437
Channel Gradient (percent)	0.92
Sinuosity	2.0
Bankfull Width (feet)	34.7 (23.5 - 36.6)
Bankfull Mean Depth (feet)	2.4
Bankfull Cross Sectional Area (square feet)	78.15
Width-to-Depth Ratio	13.9 (10.2 - 17.6)
Floodprone Width (feet)	47.0
Entrenchment Ratio	0.8
Channel Morphology	Plane-Bed
Rosgen Stream Type	F4
Pool-to-Pool Spacing (feet)	2.8 - 170
Percent Run	0.5
Percent Riffle	55.2
Percent Glide	11.8
Percent Pool	32.5

Additional geomorphic data collected during field surveys included pebble counts using sampling methods similar to those described in Bunte and Abt (2001). The pebble count substrate samples were collected upstream and downstream, and out of the influence of the barrier. Table 3-2 contains the sediment characteristic metrics such as the percentages based on size categories (percent fines, gravels, cobbles, boulders, and bedrock) and the characteristic grain sizes (e.g., D_{50} , D_{84}) of the bed material for both sample locations. The

sediment grain size distributions are shown in Figure 3-3 for upstream of the barrier, and in Figures 3-4 for downstream of the barrier.

Table 3-2. Substrate Size Characteristics Based on Pebble Counts

Substrate Size Characteristics	Upstream of Barrier	Downstream of Barrier
Silt/Clay (percent)	3	0
Sand (percent)	2	2
Gravel (percent)	93	97
Cobble (percent)	2	1
Boulder (percent)	0	0
D ₁₆ (mm)	16	12
D ₃₅ (mm)	22	17
D ₅₀ (mm)	29	21
D ₆₅ (mm)	37	28
D ₈₄ (mm)	50	40
D ₉₅ (mm)	61	54

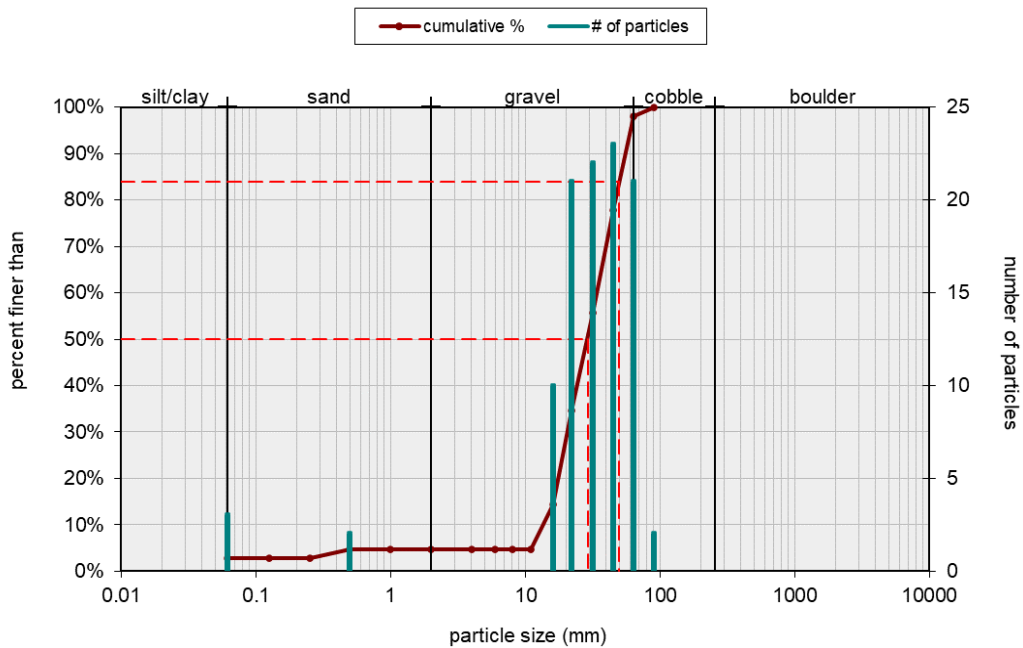


Figure 3-3. Substrate Grain Size Distribution for Birch Creek Upstream of Barrier

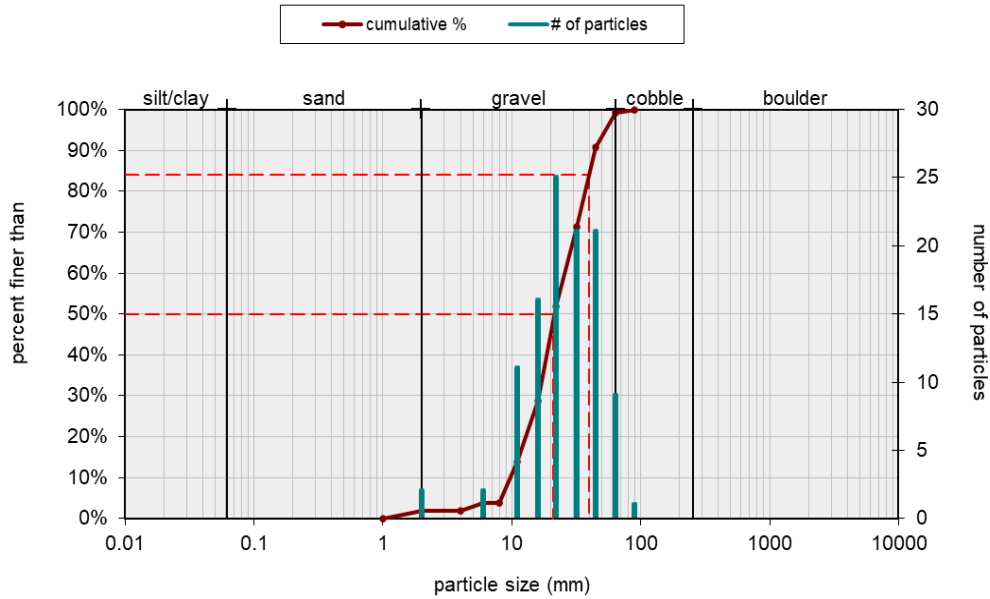


Figure 3-4. Substrate Grain Size Distribution for Birch Creek Downstream of Barrier

3.3 SUMMARY OF HYDROLOGIC ANALYSES CONDUCTED, INCLUDING DATA SOURCES AND PERIOD OF RECORD INCLUDING A LIST OF DESIGN DISCHARGE (Q) AND RETURN INTERVAL (RI) FOR EACH DESIGN ELEMENT

The Project area is located within a FEMA Approximate Zone A floodplain as shown on the Flood Insurance Rate Map (FIRM) panel 41059C1013G (FEMA 2010a). The Flood Insurance Study (FIS) for Umatilla County, Oregon and Incorporated Areas (FEMA 2010b) reports how the study defined peak flow data for Birch Creek. The peak flow data calculated for Birch Creek utilized a regional relationship between basin characteristics and streamflow statistics. The peak flow values utilized in the FIS are tabulated below (Table 3-3).

Table 3-3. FIS Birch Creek Peak Flows

Return Period (years)	Birch Creek Flow (cfs)
10	2,775
50	4,500
100	5,310
500	7,570

cfs – cubic feet per second

The hydrologic analysis began by utilizing the Oregon Water Resources Department (OWRD) Peak Discharge Estimation Mapping Tool, to determine the peak flows for Birch Creek. USGS 14025000 is located near the Taylor Lane bridge on Birch Creek, and is

downstream of the Project limits and was identified as an inactive site on Birch Creek near Rieth, Oregon. The gage recorded streamflow data for a period of 47 years from 1928 to 1976. The recorded data for this gage was used to determine the peak flows on Birch Creek utilizing Hydrologic Engineering Center's Statistical Software Package (HEC-SSP) to perform a flood flow frequency analysis based on *Guidelines for Determining Flood Flow Frequency Bulletin 17C*, a generalized frequency analysis of flow data, volume frequency analysis on high and low flows, duration analysis, coincident frequency analysis, and a balanced hydrograph analysis (USGS 2018). Results of the HEC-SSP Bulletin 17C analysis are tabulated below (Table 3-4).

Table 3-4. Birch Creek Peak Flows

Return Period (years)	Peak Flow (cfs)
2	573
5	1,090
10	1,570
25	2,360
50	3,050
100	3,800

cfs – cubic feet per second

The FIS peak flows are significantly higher when compared to the Bulletin 17C derived peak flows. For the purposes of this project, it was determined that the 47 years of gage recorded data analysis product a more accurate representation of the Birch Creek peak flows, rather than a regional regression equation analysis. Therefore, the peaks flows in Table 3-4 will be used in the hydraulic modeling for the Project.

In addition to evaluating peak flow values, the 5- and 95-percent flow exceedance values were evaluated for any potential fish passage conditions. The High Fish Passage Design Flow (HFPDF) is defined by ODFW as the mean daily average stream discharge that is exceeded 5-percent of the time during the period when ODFW determines that native migratory fish require fish passage. It is assumed that year-round passage is required. The Low Fish Passage Design Flow (LFPDF) is defined by ODFW as the mean daily average stream discharge that is exceeded 95-percent of the time, during the period when ODFW determines that native migratory fish require fish passage. Utilizing flow-duration statistics, USGS StreamStats program (USGS 2016), the following fish passage design flows were identified (Table 3-5).

Table 3-5. Birch Creek Fish Passage Flows

Flow Duration (percent)	Flow (cfs)
5	487
95	3.04

cfs – cubic feet per second

3.4 SUMMARY OF SEDIMENT SUPPLY AND TRANSPORT ANALYSES CONDUCTED, INCLUDING DATA SOURCES INCLUDING SEDIMENT SIZE GRADATION USED IN STREAMBED DESIGN

Under natural conditions, alluvial river systems tend towards a balanced state in which some erosion and deposition occurs during sediment transporting events but no net change in dimension, pattern, and profile occurs over the course of years (Montgomery and Buffington 1997; Rosgen 1996). Changes in the boundary conditions including sediment supply, channel form modification, flow, or bank strength can upset the balance, leading to a trend of aggradation or incision (Montgomery and Buffington 1997). In the case of Birch Creek, channel form modifications in the past, including the installation of a concrete diversion structure, caused channel incision, resulted in a loss of floodplain connectivity, and altered sediment transport processes.

An analysis of the existing channel sediment mobility (threshold of motion grain size) and proposed channel sediment mobility is provided in Section 3.6.1.

3.5 SUMMARY OF HYDRAULIC MODELING OR ANALYSES CONDUCTED AND OUTCOMES – IMPLICATIONS RELATIVE TO PROPOSED DESIGN

Restoration designs require a fundamental model to evaluate the hydraulic behavior of the existing and proposed channel conditions. A detailed two-dimensional (2D) model utilizing GeoHECRAS version 4.1.0.2858 was generated for the Project site, coupled with AutoCAD Civil 3D (Civil 3D) 2022 as the primary software applications. GeoHECRAS combines Geographic Information Systems (GIS) and Hydraulic Engineering Center – River Analysis System (HEC-RAS) software into one user interface for efficient task management, while Civil 3D was used as the main engine behind surface generation. An existing surface was created with field collected topographical survey data described in Section 3.2. The data set was inserted into Civil 3D to build a surface that represents existing conditions. The existing conditions surface was inserted into GeoHECRAS to create a terrain for the 2D hydraulic model.

3.5.1 Existing Conditions Hydraulic Modeling

Existing conditions hydraulic modeling was conducted for flow recurrences for the OHW, 2-, 10-, 25-, and 100-year peak flows as well as the low fish flow estimate, as described in Section 3.3. The topographic surface created with the survey data described in Section 3.2.1 was used to develop a detailed existing condition modeling terrain. The Geolocation feature within GeoHECRAS was used to overlay an aerial map on the Project extents. Based on the aerial map, a land cover file was generated for Manning's roughness values, see Table 3-6. The existing channel roughness was estimated at 0.040 based on site observations and engineering judgement.

Table 3-6. Manning's Roughness Values by Land Use

Land Use/Land Cover	Manning's n Value
Scrub	0.050
Road	0.020
Agriculture	0.040
Residential	0.100
Channel	0.040
Wetland	0.045
Large Wood	0.150

Boundary conditions were set for each terminus, including inflow at the upstream end representing the recurrence interval flow rate, and normal depth at the downstream end representing the energy slope measured downstream. After entering the geometry and hydraulic parameter information, unsteady flow analyses were computed to review geometry input parameters and model results.

Several unsteady flow analyses were performed to estimate and calibrate the model to OHW. A flow rate of 375 cfs was identified as approximately matching with OHW survey points recorded during field activities discussed in Section 3.2. Figure 3-5 below illustrates the hydraulic model inundation extents under the OHW and 100-year flows.

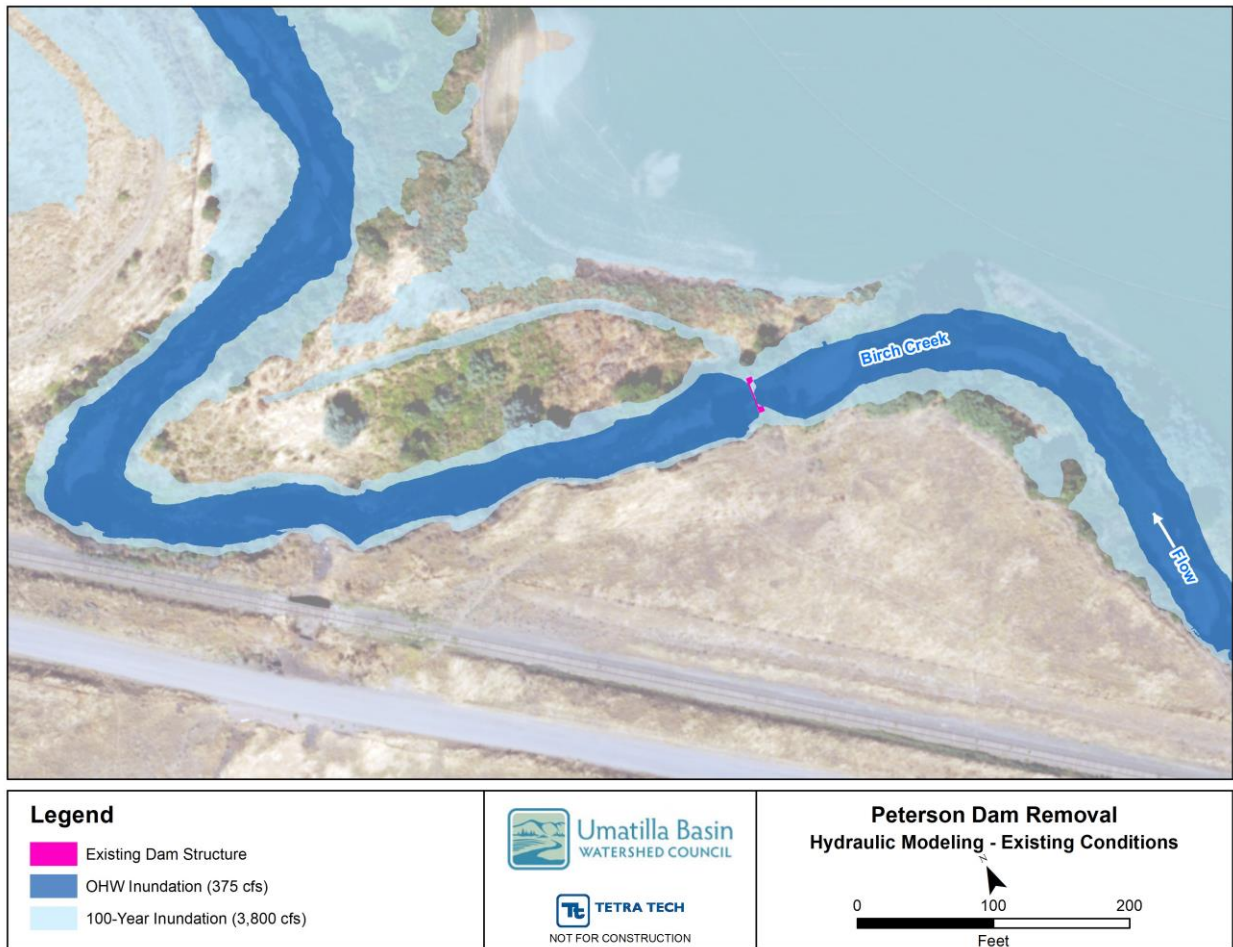


Figure 3-5. Existing Conditions Hydraulic Model Inundation Results Under the OHW and 100-year Flows

The 2D hydraulic model has the capability to export depth raster data sets. Maps were generated for the LPDFDF, OHW, 2-, 10-, 25-, and 100-year scenarios. Hydraulic modeling results for the existing conditions can be found in Appendix B.

3.5.2 Proposed Conditions Hydraulic Modeling

Proposed design conditions were modeled at the LPDFDF, OHW, 2-, 10-, 25- and 100-year modeled flow events to identify outcomes of proposed actions. Roughness values were not modified from the existing conditions as the proposed changes to the streambed sediment, floodplain, and LWM structures in the streambank do not appreciably modify roughness. Modeling results of the proposed conditions are used in the vertical stability analyses in Section 3.6 below. See Appendix B for detailed comparisons of modeled existing and proposed inundation depth and velocities.

3.6 STABILITY ANALYSES AND COMPUTATIONS FOR PROJECT ELEMENTS, AND COMPREHENSIVE PROJECT PLAN

Appendix B documents the calculations and design for channel stability, including gravel and boulder sizing for the channel structures at the LFPDF, OHW, 2-, 10-, and 100-year modeled flow events, and covers the following:

- Sizing of the proposed conditions roughened riffle streambed sediment and gravel;
- Sizing of the boulders for channel grade control;

The subsequent sections provide a summary of Appendix B.

3.6.1 Vertical Stability

The existing and proposed streambed material was evaluated for vertical stability using incipient motion at several recurrence intervals, including the LFPDF, OHW, 10-, 25-, and 100-year events. The results suggest that under existing conditions, the sampled bed material is transported at flow events at and above the OHW and is consistent with the current incised channel geometry observed at the project location and specifically at the existing concrete diversion dam where a physical vertical drop of 2-3 feet occurs.

3.6.1.1 Sediment Mobility

The sediment mobility analysis is based on the proposed stream simulation material, channel geometry, and incipient motion calculations. Incipient motion calculations evaluate the effective hydraulic shear stress on the channel bed by calculating the force required to mobilize the streambed materials (e.g., critical shear). The shear stress required for bed material mobilization was estimated using Shields relationship for particle motion (Shields 1936).

The Shields relationship is represented by:

$$\tau_c = \tau^*(\gamma_s - \gamma_w)D_{50}$$

Where:

τ_c = critical shear stress for particle motion

τ^* = dimensionless Shields Parameter

γ_s = unit weight of the sediment

γ_w = unit weight water

D_{50} = median particle size of the bed material

In gravel and cobble dominated streams, when the critical shear stress for the median particle size is exceeded, the bed is mobilized and all sizes up to about five times the median size are capable of being transported by the flow (Parker et al. 1982, Andrews 1984).

Values for the Shields parameter (τ^*) can range from 0.02 for frequently moved, loosely packed gravel to 0.12 for tightly packed, imbricated material that results when transport is infrequent and the framework gravel is in-filled with fines (Hey 1979). In this analysis of the proposed stream simulation material, a value of $\tau^* = 0.050$ was used to represent the “threshold” or “incipient” motion (IM) condition while a value of $\tau^* = 0.054$ was used to represent a low but measurable transport (MT) condition.

Based on the data in Section 3.2.2, the existing channel material has an average D_{50} of 25 millimeters (mm) or 1.0 inch. Based on the existing sediment size, field observations indicating an incised channel, and existing conditions hydraulic model results, the Project site is a transport reach. The proposed stream simulation material has a D_{50} of 52 mm or 2.1 inches and a D_{100} of 152 mm or 6.0 inches (Table 3-2).

Table 3-7. Summary of Grain Size Distribution for the Proposed Streambed Material

Grain Size Distribution	Grain Size (millimeters)
D_{16}	12.7
D_{50}	52.4
D_{84}	127
D_{100}	152

The results of the incipient motion evaluation indicates that for flows less than bankfull, such as the low fish flow, the modeled shear stress is below or near the IM threshold shear estimates for the stream simulation material. For flows at or exceeding bankfull flow the majority of the material smaller than D_{50} begins to be mobilized. However, larger material, (e.g., larger than the D_{84} or 127mm) will maintain hydraulic conveyance through the project reach and not aggrade. For flows above the 25-year flow, the average channel shear stress is greater than 2.5 pounds per square-foot (lbs/ft²), mobilizing all material in the channel. See Section 3.6.1.3 for discussion on the sizing of the step pool rock weirs. Detailed sediment mobility analyses results are provided in Appendix B.

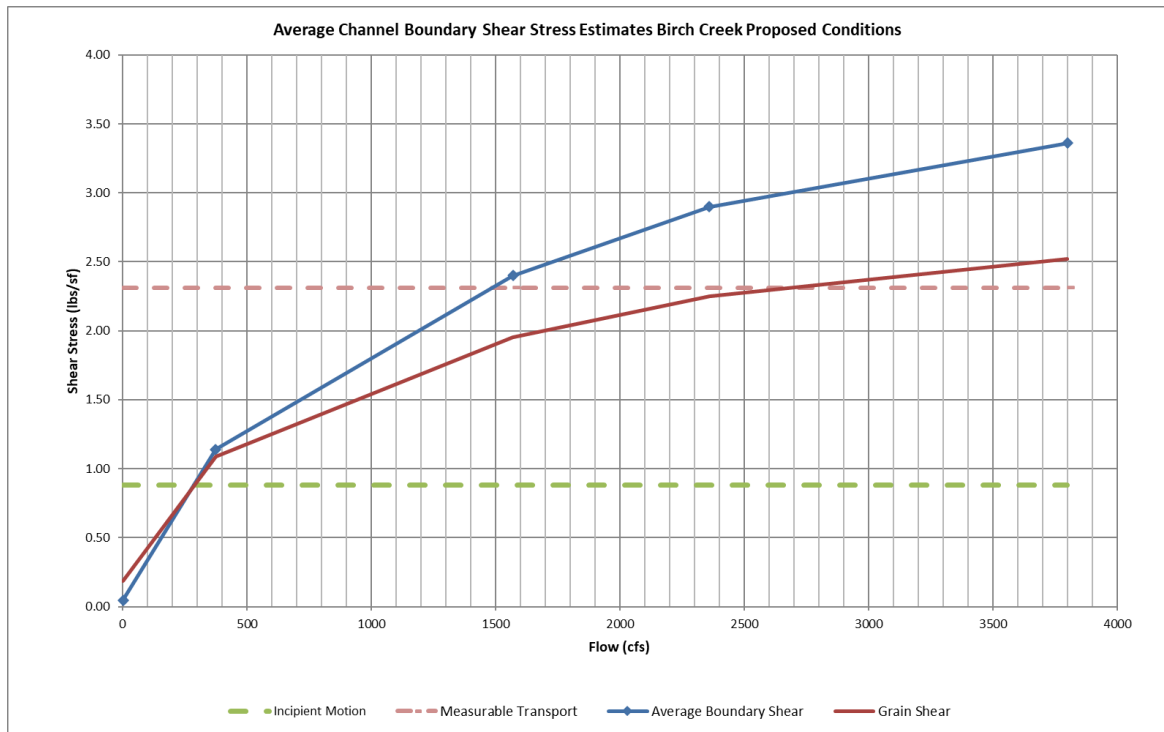


Figure 3-6. Proposed Conditions Average Boundary Shear Stress and Grain Shear Stress

3.6.1.2 Rock Weir and Habitat Boulder Sizing

The proposed channel improvements include step pool rock weirs with a header and footer boulder configuration. The streambed material along with the boulders will allow the proposed conditions to locally scour in the designed pools and transport bed material while maintaining the grade via the rock weirs. The incipient motion analysis suggests that material will be transported from upstream and through the Project reach during all flow events above the bankfull event while step pool boulder weirs will remain stable and hold the channel grade.

The two analyses used in sizing the boulders are based on the National Cooperative Highway Research Board (HRB 1970) and the force balance method (Equation 7-1) from the US Department of Interior Bureau of Reclamation (USBR) Rock Ramp Design Guidelines (USBR 2007) and show a minimum Factor of Safety (FOS) of about 1.7 and 1.4, respectively for 3.0-foot spherical diameter rocks and minimum weight of 2,333 pounds. Table 3-8 summarizes the FOS for the boulder sizing. Detailed boulder sizing results are provided in Appendix B.

Table 3-8. Summary of Factor of Safety for 3.0-ft Diameter Step Pool Weir Boulder

Method	FOS
HRB	1.7
USBR	1.4

3.6.1.3 Scour Potential at Step Pool Weirs

The design of the step pool rock weirs includes sizing the boulders to prevent scour from undermining the structure foundation and is based on the scour depth as a function of mean-weir height equation found in the USBR Rock Weir Design Guidance (USBR 2016). Based on this method the predictive scour is 3.2 feet. The header/footer boulder configuration (e.g., stacked at a batter and not vertical) assumes a total structure depth to bottom of rock weir is 4.8 feet. This gives an FOS of 1.5 for scour depth to structure depth (See Table 3-9). Detailed rock weir scour depth analyses results are provided in Appendix B.

Table 3-9. Summary of Factor of Safety for Rock Weir Scour

Method	FOS
USBR	1.5

3.6.1.4 General Scour

General scour refers to all types of scour that are not local, occurring over the entire channel reach. General scour includes contraction and bend scour and depends on site-specific conditions (NRCS 2007). For this analysis the general scour estimate is based on equations TS14B-21, -22, and -23 found in the US Department of Agriculture Natural Resources Conservation Service (NRSC) National Engineering Handbook Technical Supplement 14B Scour Calculations (NRCS 2007) and the observed and empirical relationships between streambed sediment, design discharge, and channel geometry.

The Project average general scour depths are estimated to be between 0.6 feet to 4.2 feet, with an average scour depth of 2.3 feet and is consistent with existing pool depth surveyed in the geomorphic assessment (See Section 3.2.2). The proposed streambed thickness is 2.0 feet and will be placed on top of existing streambed sediment material. Both existing and proposed streambed material will be transported from upstream and through the Project reach as detailed in the incipient motion analyses, and step pool boulder weirs will remain stable and hold the channel grade. Detailed general scour depth analyses results are provided in Appendix B.

3.6.2 LWD Stability

The LWD bank habitat structure was not evaluated for stability. The proposed LWD structure placements follow the most recent BPA HIP conservation measures for Category

2d (Install Habitat-Forming Natural Material Instream Structures [Large Wood, Boulders, and Spawning Gravel]). In addition, the proposed bank habitat structure follows placement strategies and size requirements outlined in the Oregon Guide to Placement of Wood, Boulders, and Gravel for Habitat Restoration (ODFW/ODF 2010), and the National Large Woody Material – Risk Based Design Guidelines (USBR 2014). The bank habitat structure was designed to be surface placed with specific functions to engage flow along the riverbanks where local aggradation, sediment sorting, and complex habitat development are desired.

The structures are not intended to create geomorphic forcing processes such as floodplain connectivity, flow splitting, redirect channels, and dispersal of high-flow energy and thus are not evaluated for stability. In addition, the risk to infrastructure due to mobilization of the LWD is low-to-moderate based on the newly constructed restoration project immediately downstream that includes floodplain connectivity, low gradient reaches, and geomorphically stable channel spanning LWD structures that are designed to rack and reduce mobilized wood interacting with infrastructure further downstream.

3.7 DESCRIPTION OF HOW PRECEDING TECHNICAL ANALYSIS HAS BEEN INCORPORATED INTO AND INTEGRATED WITH THE CONSTRUCTION – CONTRACT DOCUMENTATION

The contract documentation (design drawings, construction specifications, and implementation plan) will include all relevant items from the preceding technical analyses.

3.8 FOR PROJECTS THAT ADDRESS PROFILE DISCONTINUITIES (GRADE STABILIZATION, SMALL DAM AND STRUCTURE REMOVALS): A LONGITUDINAL PROFILE OF THE STREAM CHANNEL THALWEG FOR 20 CHANNEL WIDTHS UPSTREAM AND DOWNSTREAM OF THE STRUCTURE SHALL BE USED TO DETERMINE THE POTENTIAL FOR CHANNEL DEGRADATION

As described in Section 3.2 above, a 1,350-foot longitudinal profile of the stream channel was collected upstream and downstream of the existing barrier, and this profile will be used to determine the potential for channel degradation. It is proposed that profile continuity and channel stability will be provided through a series of roughened riffle structures in order to remove the existing concrete irrigation sill that currently inhibits fish passage on Birch Creek.

3.9 FOR PROJECTS THAT ADDRESS PROFILE DISCONTINUITIES (GRADE STABILIZATION, SMALL DAM AND STRUCTURE REMOVALS): A MINIMUM OF THREE CROSS-SECTIONS – ONE

DOWNSTREAM OF THE STRUCTURE, ONE THROUGH THE RESERVOIR AREA UPSTREAM OF THE STRUCTURE, AND ONE UPSTREAM OF THE RESERVOIR AREA OUTSIDE OF THE INFLUENCE OF THE STRUCTURE) TO CHARACTERIZE THE CHANNEL MORPHOLOGY AND QUANTIFY THE STORED SEDIMENT

As described in Section 3.2 above, three cross sections above and below the existing barrier were collected and used to characterize the channel morphology and quantify the stored sediment.

4. Construction – Contract Documentation

4.1 INCORPORATION OF HIP GENERAL AND CONSTRUCTION CONSERVATION MEASURES

The full conservation measures will be included in the contract documentation for construction, and relevant items will be included in the design drawings, construction specifications, and implementation plan. The overall design will be compliant with all HIP activity conservation measures for the identified action categories.

4.2 DESIGN – CONSTRUCTION PLAN SET INCLUDING BUT NOT LIMITED TO PLAN, PROFILE, SECTION AND DETAIL SHEETS THAT IDENTIFY ALL PROJECT ELEMENTS AND CONSTRUCTION ACTIVITIES OF SUFFICIENT DETAIL TO GOVERN COMPETENT EXECUTION OF PROJECT BIDDING AND IMPLEMENTATION

The Project plan sheets are attached as Appendix A.

4.3 LIST OF ALL PROPOSED PROJECT MATERIALS AND QUANTITIES

An estimate of project materials and quantities is provided in the Engineer's Cost Estimate.

4.4 DESCRIPTION OF BEST MANAGEMENT PRACTICES THAT WILL BE IMPLEMENTED AND IMPLEMENTATION RESOURCE PLANS INCLUDING:

4.4.1 Site Access Staging and Sequencing Plan

The site access and staging plan are provided in Appendix A. Construction sequencing is expected to follow this general order of operations:

1. Complete clearing and grubbing,
2. Place erosion control, install work area isolation, and conduct fish salvage measures,

3. Remove existing concrete dam,
4. Regrade channel, fill ditch,
5. Install roughened riffles and rock weirs,
6. Install LWD structures,
7. Restore and re-vegetate work areas, and
8. Remove erosion control measures, work area isolation, and fish salvage measures.

4.4.2 Work Area Isolation and Dewatering Plan

Plans for work area isolation and dewatering were developed in compliance with HIP general conservation measures. Staged rewatering of dewatered areas will occur following the steps outlined in the HIP handbook (BPA 2023). The work area isolation and dewatering plan is provided in Appendix A.

4.4.3 Erosion and Pollution Control Plan

The erosion and pollution control plan is provided in Appendix A.

4.4.4 Site Reclamation and Restoration Plan

The site reclamation and restoration plan is provided in Appendix A.

4.4.5 List proposed equipment and fuels management plan

The equipment and fuels management plan is provided in appendix A.

4.5 CALENDAR SCHEDULE FOR CONSTRUCTION/IMPLEMENTATION PROCEDURES

A detailed construction schedule will be provided in the final design/implementation plan. A proposed construction sequence to complete the Project in a single year of construction is provided below.

Before in-water work window (prior to July 1):

- Complete pre-construction activities:
 - Construction staking, flagging of sensitive areas, contractor submittals, etc.,
 - Mobilize to site and site preparation,
 - Install temporary erosion and sediment controls (TESC).
- Acquisition, hauling, and staging of materials, and

- Remove pipe and concrete irrigation division elements, and fill irrigation channel above Ordinary High Water (OHW).

In-water work window (July 1 to September 30):

- Install block nets and salvage fish (work to be completed by CTUIR),
- Install and monitor TESC,
- Install work area isolation and dewater work areas,
- Excavate and haul off concrete material of the existing barrier,
- Install roughened riffles, boulders, streambed mix, and wash in fines,
- Install LWD structures,
- Prewash work areas and pump turbid water to an approved location and monitor to ensure no turbid water returns to the stream,
- Slowly reintroduce flow to the work areas, monitoring for turbidity, and
- Remove work area isolation, block nets, TESC.

After in-water work window (after September 30):

- Complete any excavation remaining above OHW,
- Seed and mulch all disturbed areas, and
- Site clean-up and demobilization.

SITE OR PROJECT SPECIFIC MONITORING TO SUPPORT POLLUTION PREVENTION AND/OR ABATEMENT

No site or Project specific monitoring for pollution prevention and/or abatement will be required.

5. Monitoring and Adaptive Management Plan

If required, a Monitoring and Adaptive Management Plan will be developed by the UBWC and will be provided as a separate document.

6. References

- Andrews, E.D. 1984. Bed Material Entrainment and Hydraulic Geometry of Gravel-bed Rives in Colorado. Geological Society of America Bulletin 95, 371-378, March.
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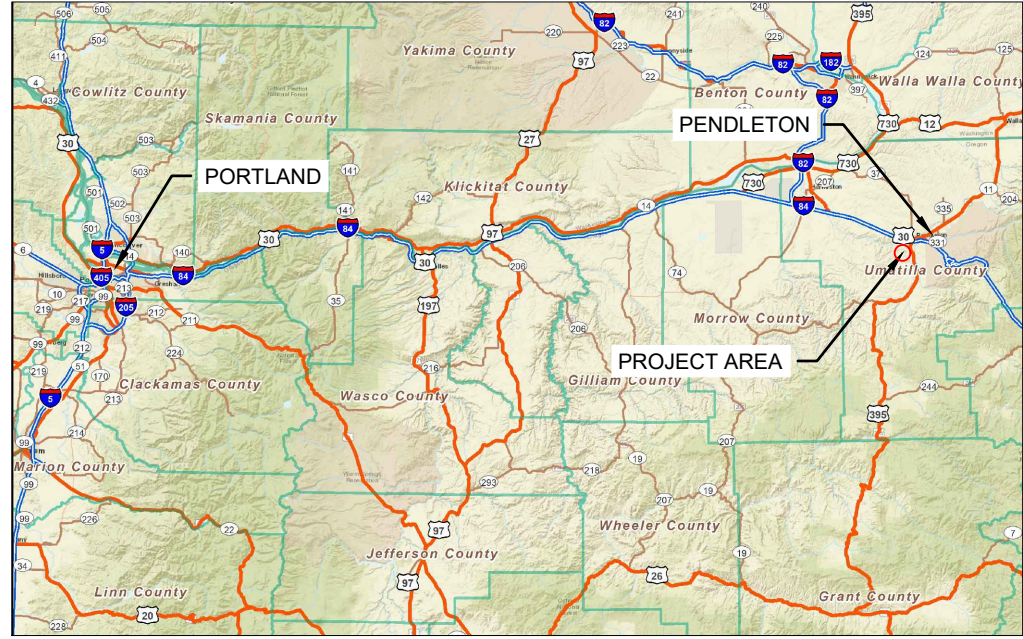
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ATTACHMENT A
PROJECT DESIGN DRAWINGS



UMATILLA BASIN WATERSHED COUNCIL PETERSON DAM REMOVAL 80 PERCENT DESIGN



LOCATION MAP
SCALE: NTS



VICINITY MAP
SCALE: NTS

SHEET LIST	
DWG #	TITLE
G-001	COVER SHEET
G-002	GENERAL NOTES
G-003 - G-005	GENERAL NOTES - HIP CONSERVATION MEASURES
E-101	EXISTING CONDITIONS
C-101 - C-103	PROPOSED CONDITIONS - PLAN, PROFILE, AND SECTIONS
C-104 - C-105	PROPOSED CONDITIONS - TYPICAL DETAILS
C-201	DETAILS - TESC
C-202	DETAILS - FISH SALVAGE, DEWATERING, AND REWATERING
C-301	DETAILS - LARGE WOOD
C-401	REVEGETATION PLAN

Z:\PROJECTS\104-121\0-002\UBWC HOMER DIVERSION FISH PASSAGE\80%\SHEET11-COVERSHEET AND NOTES.DWG
PLOT DETAILS: HARVEY SPENCER March 23, 2024 12:41 PM

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

NOT FOR
CONSTRUCTION



		PLAN SHEET SIZE ANSI B (11" X 17")					
REV.	DATE	REVISION DESCRIPTION		DRW	ENG	CHK	APP
3	3/29/24	80 PERCENT DESIGN		SH	JA	CM	JA
2	11/22/23	30 PERCENT DESIGN		SH	JC	AD	JA
1	3/31/23	CONCEPTUAL DESIGN		AD	AD	JA	JA

<p>PETERSON DAM REMOVAL</p> <p style="font-size: 1.5em; font-weight: bold;">COVER SHEET</p>	<p>DWG. NO.:</p> <p style="font-size: 1.2em; font-weight: bold;">G-001</p> <p>CREATED: 3/21/2024</p> <p>SHEET: 1 of 15</p>
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ABBREVIATIONS

1H:1V	HORIZONTAL TO VERTICAL EXAGGERATION	IN, "	INCH
µS	MICRO SECONDS	L	LENGTH
µS/CM	MICRO SECONDS PER CENTIMETER	LBS	POUNDS
°C	DEGREE CELSIUS	LiDAR	LIGHT DETECTION AND RANGING
%	PERCENT	LT	LEFT
Ø	DIAMETER	LWD	LARGE WOODY DEBRIS
ALBC	ALUMINUM BOX CULVERT	M	METER
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	MAX	MAXIMUM
APP	APPROVED BY	MI	MILE
APPROX	APPROXIMATE	MIN	MINIMUM
BMP	BEST MANAGEMENT PRACTICE	MJR	MAJOR
BPA	BONNEVILLE POWER ADMINISTRATION	MNR	MINOR
CHK	CHECKED BY	MS	MILLISECONDS
CMP	CORRUGATED METAL PIPE	N/A	NOT APPLICABLE
CO	COUNTY	NAVD	NORTH AMERICAN VERTICAL DATUM OF 1988
CP	CONTROL POINT	NEPA	NATIONAL ENVIRONMENTAL POLICY ACT
CWA	CLEAN WATER ACT	NMFS	NATIONAL MARINE FISHERIES SERVICE
CY	CUBIC YARDS	NHPA	NATIONAL HISTORIC PRESERVATION ACT
D	DEPTH	NTS	NOT TO SCALE
DBH	DIAMETER AT BREAST HEIGHT	NTU	NEPHELOMETRIC TURBIDITY UNIT
DC	DIRECT CURRENT	PDC	PULSED DIRECT CURRENT
DIA	DIAMETER	ODFW	OREGON DEPARTMENT OF FISH AND WILDLIFE
DWG	DRAWING	OHW	ORDINARY HIGH WATER
DRW	DRAWN BY	OWRD	OREGON WATER RESOURCES DEPARTMENT
EC	ENVIRONMENTAL COMPLIANCE	PCF	PROJECT COMPLETION FORM
EG	FOR EXAMPLE (LATIN: EXEMPLI GRATIA)	PREFAB	PREFABRICATED
ENG	ENGINEERED BY	PRO	PROPOSED
EQIV	EQUIVALENT	RT	RIGHT
ESA	ENDANGERED SPECIES ACT	STA	STATION
ETC	ET CETERA	TEMP	TEMPORARY
EX	EXISTING	TESC	TEMPORARY EROSION AND SEDIMENT CONTROL
FEMA	FEDERAL EMERGENCY MANAGEMENT AGENCY	TYP	TYPICAL
FMO	FISHERIES MANAGEMENT ORGANIZATION	UPRR	UNION PACIFIC RAILROAD
FT, '	FOOT	USACE	UNITED STATES ARMY CORPS OF ENGINEERS
HARN	HIGH ACCURACY REFERENCE NETWORK	USFS	UNITED STATES FOREST SERVICE
HEC-RAS	HYDRAULIC ENGINEERING CENTER RIVER ANALYSIS SYSTEM	USFWS	UNITED STATES FISH AND WILDLIFE SERVICE
HIP	HABITAT IMPROVEMENT PROGRAM	V	VOLTS
HUC	HYDROLOGIC UNIT CODE	W/	WITH
HZ	HERTZ	WDFW	WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
ID	IDENTIFICATION	WSEL	WATER SURFACE ELEVATION
IE	THAT IS (LATIN: ID EST)	XS	CROSS SECTION
		YR	YEAR

CONSTRUCTION SEQUENCING:

- BEFORE IN-WATER WORK WINDOW (PRIOR TO JULY 1):
 - MOBILIZE TO SITE AND SITE PREPARATION.
 - INSTALL TESC.
 - EARTHWORK IN THE FLOODPLAIN ABOVE OHW.
 - INSTALL BRIDGE BYPASS
- IN-WATER WORK WINDOW (JULY 1 TO SEPTEMBER 30):
 - SALVAGE FISH (WORK TO BE COMPLETED BY OUTSIDE PARTY/OTHERS).
 - INSTALL AND MONITOR TESC, WORK AREA ISOLATION AND DEWATER WORK AREAS.
 - DEMO DAM
 - CONSTRUCT BOULDER WEIRS, BRIDGE, AND ROUGHENED RIFFLES.
- AFTER IN-WATER WORK WINDOW (ON OR AFTER OCTOBER 1):
 - COMPLETE ANY EXCAVATION REMAINING ABOVE OHW.
 - REVEGETATE ALL DISTURBED AREAS.
 - SITE CLEAN-UP AND DEMOBILIZATION.

GENERAL NOTES:

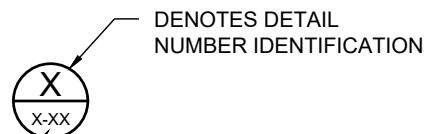
- HORIZONTAL PROJECTION: NAD83 OREGON STATE PLANES, NORTH ZONE, INTERNATIONAL FOOT.
- VERTICAL PROJECTION: NAVD88.
- PROJECT ALIGNMENT, ELEVATION, AND STATIONING BASED 2019 LiDAR TOPOGRAPHIC DATA AND SUPPLEMENTED BY BATHYMETRIC FIELD SURVEYS COMPLETED BY TETRA TECH IN JUNE 2023.
- PROPOSED PROJECT DESIGN, CONSTRUCTION ACTIVITIES, AND MATERIALS SUBJECT TO APPROVAL BY LANDOWNER.
- AERIAL IMAGERY PROVIDED BY UNITED STATES DEPARTMENT OF AGRICULTURE, NATIONAL AGRICULTURE IMAGERY PROGRAM, UMATILLA COUNTY, 2022.

GENERAL CONSTRUCTION NOTES:

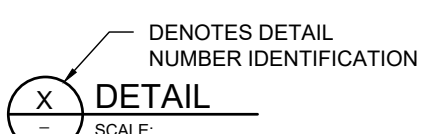
- THE CONTRACTOR SHALL CONSTRUCT THE RESTORATION DESIGN ELEMENTS IN ACCORDANCE WITH THE PLANS STAMPED "ISSUED FOR CONSTRUCTION". THESE PLANS WILL BE PROVIDED TO THE CONTRACTOR BY THE CONTRACTING AGENCY PRIOR TO CONSTRUCTION. WORK SHALL NOT BE DONE WITHOUT THE CURRENT SET OF APPROVED CONSTRUCTION PLANS.
- THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE BPA HIP TERMS & CONDITIONS.
- CONTRACTOR SHALL CONTACT THE OREGON UTILITY NOTIFICATION CENTER 1-800-332-2344 (OR 811) BEFORE ANY EXCAVATION WORK BEGINS.
- THE CONTRACTOR SHALL PURSUE WORK IN A CONTINUOUS AND EFFICIENT MANNER TO ENSURE TIMELY COMPLETION OF THE PROJECT.
- ALL WORK WITHIN THE ACTIVE CHANNEL SHALL OCCUR WITHIN THE ALLOWABLE FISH WINDOW (JULY 1 - SEPTEMBER 30). THE CONTRACTOR SHALL CONFIRM IN-WATER WORK WINDOW DATES WITH ODFW AND OWNER'S REPRESENTATIVE PRIOR TO BEGINNING WORK.
- ALL CONSTRUCTION ACTIVITIES SHALL MINIMIZE DISTURBANCE TO AND MAXIMIZE RE-USE OF EXISTING RIPARIAN VEGETATION.
- THE CONTRACTOR SHALL PROTECT ALL CONTROL POINTS DURING CONSTRUCTION ACTIVITIES.
- CONTRACTOR SHALL PROVIDE AN EROSION AND SEDIMENT CONTROL AND DEWATERING PLAN TO OWNER WITHIN TEN (10) BUSINESS DAYS OF NOTICE TO PROCEED.

SYMBOLS

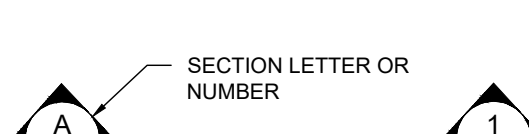
DETAILS ARE REFERENCED IN THE FOLLOWING MANNER:



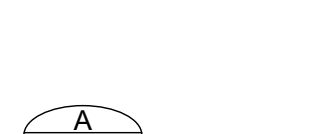
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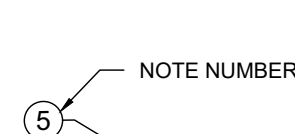
SECTIONS ARE REFERENCED IN THE FOLLOWING MANNER:



CONSTRUCTION DETAILS ARE REFERENCED IN THE FOLLOWING MANNER:



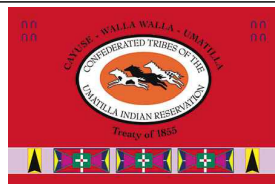
NOTES ARE REFERENCED IN THE FOLLOWING MANNER:



Z:\PROJECTS\104-121\0-002 LIBWC HOMER DIVERSION FISH PASSAGE\80%\SHEET11-COVERSHEET AND NOTES.DWG March 20, 2024 12:41 PM



NOT FOR CONSTRUCTION



		PLAN SHEET SIZE ANSI B (11" X 17")					
REV.	DATE	REVISION DESCRIPTION		DRW	ENG	CHK	APP
3	3/29/24	80 PERCENT DESIGN		SH	JA	CM	JA
2	11/22/23	30 PERCENT DESIGN		SH	JC	AD	JA
1	3/31/23	CONCEPTUAL DESIGN		AD	AD	JA	JA

PETERSON DAM REMOVAL

GENERAL NOTES

DWG. NO.:
G-002
CREATED: 3/21/2024
SHEET: 2 of 15

HIP GENERAL CONSERVATION MEASURES APPLICABLE TO ALL ACTIONS

THE ACTIVITIES COVERED UNDER THE HIP ARE INTENDED TO PROTECT AND RESTORE FISH AND WILDLIFE HABITAT WITH LONG-TERM BENEFITS TO ESA-LISTED SPECIES. THE FOLLOWING GENERAL CONSERVATION MEASURES (DEVELOPED IN COORDINATION WITH USFWS AND NMFS) WILL BE APPLIED TO ALL ACTIONS OF THIS PROJECT.

PROJECT DESIGN AND SITE PREPARATION.

1. STATE AND FEDERAL PERMITS.

- A. ALL APPLICABLE REGULATORY PERMITS AND OFFICIAL PROJECT AUTHORIZATIONS WILL BE OBTAINED BEFORE PROJECT IMPLEMENTATION.
- B. THESE PERMITS AND AUTHORIZATIONS INCLUDE, BUT ARE NOT LIMITED TO, NATIONAL ENVIRONMENTAL POLICY ACT, NATIONAL HISTORIC PRESERVATION ACT, THE APPROPRIATE STATE AGENCY REMOVAL AND FILL PERMIT, USACE CLEAN WATER ACT 404 PERMITS, CWA SECTION 401 WATER QUALITY CERTIFICATIONS, AND FEMA NO-RISE ANALYSES.

2. TIMING OF IN-WATER WORK.

- A. APPROPRIATE STATE (OREGON DEPARTMENT OF FISH AND WILDLIFE (ODFW), WASHINGTON DEPARTMENT OF FISH AND WILDLIFE (WDFW), IDAHO DEPARTMENT OF FISH AND GAME (IDFG), AND MONTANA FISH WILDLIFE AND PARKS (MFWP)) GUIDELINES FOR TIMING OF IN-WATER WORK WINDOWS (IWW) WILL BE FOLLOWED.
- B. CHANGES TO ESTABLISHED WORK WINDOWS WILL BE APPROVED BY REGIONAL STATE BIOLOGISTS AND BPA'S EC LEAD.
- C. BULL TROUT. FOR AREAS WITH DESIGNATED IN-WATER WORK WINDOWS FOR BULL TROUT OR AREAS KNOWN TO HAVE BULL TROUT, PROJECT PROPONENTS WILL CONTACT THE APPROPRIATE USFWS FIELD OFFICE TO INSURE THAT ALL REASONABLE IMPLEMENTATION MEASURES ARE CONSIDERED AND AN APPROPRIATE IN-WATER WORK WINDOW IS BEING USED TO MINIMIZE PROJECT EFFECTS.
- D. LAMPREY. WORKING IN STREAM OR RIVER CHANNELS THAT CONTAIN PACIFIC LAMPREY WILL BE AVOIDED FROM MARCH 1 TO JULY 1 FOR REACHES <5,000 FEET IN ELEVATION AND FROM MARCH 1 TO AUGUST 1 FOR REACHES >5,000 FEET. IF EITHER TIMEFRAME IS INCOMPATIBLE WITH OTHER OBJECTIVES, THE AREA WILL BE SURVEYED FOR NESTS AND LAMPREY PRESENCE, AND AVOIDED IF POSSIBLE. IF LAMPREYS ARE KNOWN TO EXIST, THE PROJECT SPONSOR WILL UTILIZE DEWATERING AND SALVAGE PROCEDURES (SEE FISH SALVAGE AND ELECTROFISHING SECTIONS) TO MINIMIZE ADVERSE EFFECTS.
- E. THE IN-WATER WORK WINDOW WILL BE PROVIDED IN THE CONSTRUCTION PLANS.

3. CONTAMINANTS.

- A. EXCAVATION OF MORE THAN 20 CUBIC YARDS WILL REQUIRE A SITE VISIT AND DOCUMENTED ASSESSMENT FOR POTENTIAL CONTAMINANT SOURCES. THE SITE ASSESSMENT WILL BE STORED WITH PROJECT FILES OR AS AN APPENDIX TO THE BASIS OF DESIGN REPORT.
- B. THE SITE ASSESSMENT WILL SUMMARIZE:
 - 1. THE SITE VISIT, CONDITION OF THE PROPERTY, AND IDENTIFICATION OF ANY AREAS USED FOR VARIOUS INDUSTRIAL PROCESSES;
 - 2. AVAILABLE RECORDS, SUCH AS FORMER SITE USE, BUILDING PLANS, AND RECORDS OF ANY PRIOR CONTAMINATION EVENTS;
 - 3. INTERVIEWS WITH KNOWLEDGEABLE PEOPLE, SUCH AS SITE OWNERS, OPERATORS, OCCUPANTS, NEIGHBORS, OR LOCAL GOVERNMENT OFFICIALS; AND
 - 4. THE TYPE, QUANTITY, AND EXTENT OF ANY POTENTIAL CONTAMINATION SOURCES.

4. SITE LAYOUT AND FLAGGING.

- A. CONSTRUCTION AREAS TO BE CLEARLY FLAGGED PRIOR TO CONSTRUCTION.
- B. AREAS TO BE FLAGGED WILL INCLUDE:
 - 1. SENSITIVE RESOURCE AREAS, SUCH AS AREAS BELOW ORDINARY HIGH WATER, SPAWNING AREAS, SPRINGS, AND WETLANDS;
 - 2. EQUIPMENT ENTRY AND EXIT POINTS;
 - 3. ROAD AND STREAM CROSSING ALIGNMENTS;
 - 4. STAGING, STORAGE, AND STOCKPILE AREAS; AND
 - 5. NO-SPRAY AREAS AND BUFFERS.

5. TEMPORARY ACCESS ROADS AND PATHS.

- A. EXISTING ACCESS ROADS AND PATHS WILL BE PREFERENTIALLY USED WHENEVER REASONABLE, AND THE NUMBER AND LENGTH OF TEMPORARY ACCESS ROADS AND PATHS THROUGH RIPARIAN AREAS AND FLOODPLAINS WILL BE MINIMIZED.
- B. VEHICLE USE AND HUMAN ACTIVITIES, INCLUDING WALKING, IN AREAS OCCUPIED BY TERRESTRIAL ESA-LISTED SPECIES WILL BE MINIMIZED.
- C. TEMPORARY ACCESS ROADS AND PATHS WILL NOT BE BUILT ON SLOPES WHERE GRADE, SOIL, OR OTHER FEATURES SUGGEST A LIKELIHOOD OF EXCESSIVE EROSION OR FAILURE. IF SLOPES ARE STEEPER THAN 30%, THEN THE ROAD WILL BE DESIGNED BY A CIVIL ENGINEER WITH EXPERIENCE IN STEEP ROAD DESIGN.
- D. THE REMOVAL OF RIPARIAN VEGETATION DURING CONSTRUCTION OF TEMPORARY ACCESS ROADS WILL BE MINIMIZED. WHEN TEMPORARY VEGETATION REMOVAL IS REQUIRED, VEGETATION WILL BE CUT AT GROUND LEVEL (NOT GRUBBED).
- E. AT PROJECT COMPLETION, ALL TEMPORARY ACCESS ROADS AND PATHS WILL BE OBLITERATED, AND THE SOIL WILL BE STABILIZED AND REVEGETATED. ROAD AND PATH OBLITERATION REFERS TO THE MOST COMPREHENSIVE DEGREE OF DECOMMISSIONING AND INVOLVES DECOMPACTING THE SURFACE AND DITCH, PULLING THE FILL MATERIAL ONTO THE RUNNING SURFACE, AND RESHAPING TO MATCH THE ORIGINAL CONTOUR.
- F. HELICOPTER FLIGHT PATTERNS WILL BE ESTABLISHED IN ADVANCE AND LOCATED TO AVOID TERRESTRIAL ESA-LISTED SPECIES AND THEIR OCCUPIED HABITAT DURING SENSITIVE LIFE STAGES.

6. TEMPORARY STREAM CROSSINGS.

- A. EXISTING STREAM CROSSINGS OR BEDROCK WILL BE PREFERENTIALLY USED WHENEVER REASONABLE, AND THE NUMBER OF TEMPORARY STREAM CROSSINGS WILL BE MINIMIZED.
- B. TEMPORARY BRIDGES AND CULVERTS WILL BE INSTALLED TO ALLOW FOR EQUIPMENT AND VEHICLE CROSSING OVER PERENNIAL STREAMS DURING CONSTRUCTION. TREATED WOOD SHALL NOT BE USED ON TEMPORARY BRIDGE CROSSINGS OR IN LOCATIONS IN CONTACT WITH OR DIRECTLY OVER WATER.
- C. FOR PROJECTS THAT REQUIRE EQUIPMENT AND VEHICLES TO CROSS IN THE WET:
 - 1. THE LOCATION AND NUMBER OF ALL WET CROSSINGS SHALL BE APPROVED BY THE BPA EC LEAD AND DOCUMENTED IN THE CONSTRUCTION PLANS;
 - 2. VEHICLES AND MACHINERY SHALL CROSS STREAMS AT RIGHT ANGLES TO THE MAIN CHANNEL WHENEVER POSSIBLE;
 - 3. NO STREAM CROSSINGS WILL OCCUR 300 FEET UPSTREAM OR 100 FEET DOWNSTREAM OF AN EXISTING REDD OR SPAWNING FISH; AND
 - 4. AFTER PROJECT COMPLETION, TEMPORARY STREAM CROSSINGS WILL BE OBLITERATED AND BANKS RESTORED.

7. STAGING, STORAGE, AND STOCKPILE AREAS.

- A. STAGING AREAS (USED FOR CONSTRUCTION EQUIPMENT STORAGE, VEHICLE STORAGE, FUELING, SERVICING, AND HAZARDOUS MATERIAL STORAGE) WILL BE 150 FEET OR MORE FROM ANY NATURAL WATER BODY OR WETLAND. STAGING AREAS CLOSER THAN 150 FEET WILL BE APPROVED BY THE EC LEAD.
- B. NATURAL MATERIALS USED FOR IMPLEMENTATION OF AQUATIC RESTORATION, SUCH AS LARGE WOOD, GRAVEL, AND BOULDERS, MAY BE STAGED WITHIN 150 FEET IF CLEARLY INDICATED IN THE PLANS THAT AREA IS FOR NATURAL MATERIALS ONLY.
- C. ANY LARGE WOOD, TOPSOIL, AND NATIVE CHANNEL MATERIAL DISPLACED BY CONSTRUCTION WILL BE STOCKPILED FOR USE DURING SITE RESTORATION AT A SPECIFICALLY IDENTIFIED AND FLAGGED AREA.
- D. ANY MATERIAL NOT USED IN RESTORATION, AND NOT NATIVE TO THE FLOODPLAIN, WILL BE DISPOSED OF OUTSIDE THE 100-YEAR FLOODPLAIN.

8. EQUIPMENT.

- A. 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).
- B. EQUIPMENT WILL BE STORED, FUELED, AND MAINTAINED IN A CLEARLY IDENTIFIED STAGING AREA THAT MEETS STAGING AREA CONSERVATION MEASURES.

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

9. EROSION CONTROL.

- A. TEMPORARY EROSION CONTROL MEASURES INCLUDE:
 - 1. TEMPORARY EROSION CONTROLS WILL BE IN PLACE BEFORE ANY SIGNIFICANT ALTERATION OF THE ACTION SITE AND APPROPRIATELY INSTALLED DOWNSLOPE OF PROJECT ACTIVITY WITHIN THE RIPARIAN BUFFER AREA UNTIL SITE REHABILITATION IS COMPLETE;
 - 2. 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;
 - 3. TEMPORARY EROSION CONTROL MEASURES MAY INCLUDE SEDGE MATS, FIBER WATTLES, SILT FENCES, JUTE MATTING, WOOD FIBER MULCH AND SOIL BINDER, OR GEOTEXTILES AND GEOSYNTHETIC FABRIC;
 - 4. 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;
 - 5. SEDIMENT WILL BE REMOVED FROM EROSION CONTROLS ONCE IT HAS REACHED 1/3 OF THE EXPOSED HEIGHT OF THE CONTROL; AND
 - 6. ONCE THE SITE IS STABILIZED AFTER CONSTRUCTION, TEMPORARY EROSION CONTROL MEASURES WILL BE REMOVED.
- B. EMERGENCY EROSION CONTROLS. THE FOLLOWING MATERIALS FOR EMERGENCY EROSION CONTROL WILL BE AVAILABLE AT THE WORK SITE:
 - 1. A SUPPLY OF SEDIMENT CONTROL MATERIALS; AND
 - 2. AN OIL-ABSORBING FLOATING BOOM WHENEVER SURFACE WATER IS PRESENT.

10. DUST ABATEMENT.

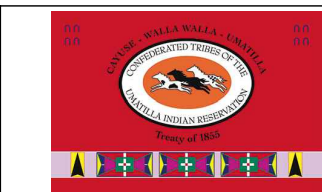
- A. THE PROJECT SPONSOR WILL DETERMINE THE APPROPRIATE DUST CONTROL MEASURES BY CONSIDERING SOIL TYPE, EQUIPMENT USAGE, PREVAILING WIND DIRECTION, AND THE EFFECTS CAUSED BY OTHER EROSION AND SEDIMENT CONTROL MEASURES.
- B. WORK WILL BE SEQUENCED AND SCHEDULED TO REDUCE EXPOSED BARE SOIL SUBJECT TO WIND EROSION.
- C. DUST-ABATEMENT ADDITIVES AND STABILIZATION CHEMICALS (TYPICALLY MAGNESIUM CHLORIDE, CALCIUM CHLORIDE SALTS, OR LIGNINSULFONATE) WILL NOT BE APPLIED WITHIN 25 FEET OF WATER OR A STREAM CHANNEL AND WILL BE APPLIED SO AS TO MINIMIZE THE LIKELIHOOD THAT THEY WILL ENTER STREAMS. APPLICATIONS OF LIGNINSULFONATE WILL BE LIMITED TO A MAXIMUM RATE OF 0.5 GALLONS PER SQUARE YARD OF ROAD SURFACE, ASSUMING MIXED 50:50 WITH WATER.
- D. 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).
- E. SPILL CONTAINMENT EQUIPMENT WILL BE AVAILABLE DURING APPLICATION OF DUST ABATEMENT CHEMICALS.
- F. PETROLEUM-BASED PRODUCTS WILL NOT BE USED FOR DUST ABATEMENT.

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

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CONSTRUCTION



		PLAN SHEET SIZE ANSI B (11" X 17")					
REV.	DATE	REVISION DESCRIPTION		DRW	ENG	CHK	APP
3	3/29/24	80 PERCENT DESIGN		SH	JA	CM	JA
2	11/22/23	30 PERCENT DESIGN		SH	JC	AD	JA
1	3/31/23	CONCEPTUAL DESIGN		AD	AD	JA	JA

PETERSON DAM REMOVAL

G-003

GENERAL NOTES

HIP CONSERVATION MEASURES

DWG. NO.: G-003
CREATED: 3/21/2024
SHEET: 3 of 15

PROJECT DESIGN AND SITE PREPARATION (CONTINUED).

11. SPILL PREVENTION, CONTROL, AND COUNTER MEASURES.

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

12. INVASIVE SPECIES CONTROL.

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

WORK AREA ISOLATION AND FISH SALVAGE.

1. WORK AREA ISOLATION.

- A. ANY WORK AREA WITHIN THE WETTED CHANNEL WILL BE ISOLATED FROM THE ACTIVE STREAM WHENEVER ESA-LISTED FISH ARE REASONABLY CERTAIN TO BE PRESENT, OR IF THE WORK AREA IS LESS THAN 300-FEET UPSTREAM FROM KNOWN SPAWNING HABITATS.
- B. WORK AREA ISOLATION AND FISH SALVAGE ACTIVITIES WILL COMPLY WITH THE IN-WATER WORK WINDOW.
- C. DESIGN PLANS WILL INCLUDE ALL ISOLATION ELEMENTS AND AREAS (COFFER DAMS, PUMPS, DISCHARGE AREAS, FISH SCREENS, FISH RELEASE AREAS, ETC.).
- D. 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.

2. FISH SALVAGE.

- A. MONITORING AND RECORDING WILL TAKE PLACE FOR DURATION OF SALVAGE. THE SALVAGE REPORT WILL BE COMMUNICATED TO AGENCIES VIA THE PROJECT COMPLETION FORM (PCF).
- B. SALVAGE ACTIVITIES SHOULD TAKE PLACE DURING CONDITIONS TO MINIMIZE STRESS TO FISH SPECIES, TYPICALLY PERIODS OF THE COOLEST AIR AND WATER TEMPERATURES WHICH OCCUR IN THE MORNING VERSUS LATE IN THE DAY.
- C. SALVAGE OPERATIONS WILL FOLLOW THE ORDERING, METHODS, AND CONSERVATION MEASURES SPECIFIED BELOW:
 - 1. SLOWLY REDUCE WATER FROM THE WORK AREA TO ALLOW SOME FISH TO LEAVE VOLITIONALLY.
 - 2. BLOCK NETS WILL BE INSTALLED AT UPSTREAM AND DOWNSTREAM LOCATIONS AND MAINTAINED IN A SECURED POSITION TO EXCLUDE FISH FROM ENTERING THE PROJECT AREA.
 - 3. 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 AS LONG AS PASSAGE REQUIREMENTS ARE MET.
 - 4. NETS WILL BE MONITORED HOURLY DURING IN-STREAM DISTURBANCE.

- 5. IF BLOCK NETS REMAIN IN PLACE MORE THAN ONE DAY, THE NETS WILL BE MONITORED AT LEAST DAILY TO ENSURE THEY ARE SECURED AND FREE OF ORGANIC ACCUMULATION. IF BULL TROUT ARE PRESENT, NETS ARE TO BE CHECKED EVERY 4 HOURS FOR FISH IMPINGEMENT.
- 6. CAPTURE FISH THROUGH SEINING AND RELOCATE TO STREAMS.
- 7. WHILE DEWATERING, ANY REMAINING FISH WILL BE COLLECTED BY HAND OR DIP NETS.
- 8. SEINES WITH A MESH SIZE TO ENSURE CAPTURE OF THE RESIDING ESA-LISTED FISH WILL BE USED.
- 9. MINNOW TRAPS WILL BE LEFT IN PLACE OVERNIGHT AND USED IN CONJUNCTION WITH SEINING.
- 10. ELECTROFISH TO CAPTURE AND RELOCATE FISH NOT CAUGHT DURING SEINING PER ELECTROFISH CONSERVATION MEASURES.
- 11. CONTINUE TO SLOWLY DEWATER STREAM REACH.
- 12. COLLECT ANY REMAINING FISH IN COLD-WATER BUCKETS AND RELOCATE TO THE STREAM.
- 13. LIMIT THE TIME FISH ARE IN A TRANSPORT BUCKET.
- 14. MINIMIZE PREDATION BY TRANSPORTING COMPARABLE SIZES IN BUCKETS.
- 15. BUCKET WATER TO BE CHANGED EVERY 15 MINUTES OR AERATED.
- 16. BUCKETS WILL BE KEPT IN SHADED AREAS OR COVERED.
- 17. DEAD FISH WILL NOT BE STORED IN TRANSPORT BUCKETS, BUT WILL BE LEFT ON THE STREAM BANK TO AVOID MORTALITY COUNTING ERRORS.

D. SALVAGE GUIDELINES FOR BULL TROUT, LAMPREY, MUSSELS, AND NATIVE FISH.

- 1. CONDUCT SITE SURVEY TO ESTIMATE SALVAGE NUMBERS.
- 2. PRE-SELECT SITE(S) FOR RELEASE AND/OR MUSSEL BED RELOCATION.
- 3. SALVAGE OF BULL TROUT WILL NOT TAKE PLACE WHEN WATER TEMPERATURES EXCEED 15 DEGREES CELSIUS.
- 4. IF DRAWDOWN LESS THAN 48 HOURS, SALVAGE OF LAMPREY AND MUSSELS MAY NOT BE NECESSARY IF TEMPERATURES SUPPORT SURVIVAL IN SEDIMENTS.
- 5. SALVAGE MUSSELS BY HAND, LOCATING BY SNORKELING OR WADING.
- 6. SALVAGE LAMPREY BY ELECTROFISHING (SEE ELECTROFISHING FOR LARVAL LAMPREY SETTINGS AND LARVAL LAMPREY DRY SHOCKING SETTINGS).
- 7. SALVAGE BONY FISH AFTER LAMPREY WITH NETS OR ELECTROFISHING (SEE ELECTROFISHING FOR APPROPRIATE SETTINGS).
- 8. REGULARLY INSPECT DEWATERED SITE SINCE LAMPREY LIKELY TO EMERGE AFTER DEWATERING AND MUSSELS MAY BECOME VISIBLE.
- 9. MUSSELS MAY BE TRANSFERRED IN COOLERS.
- 10. MUSSELS WILL BE PLACED INDIVIDUALLY TO ENSURE ABILITY TO BURROW INTO NEW HABITAT.

3. ELECTROFISHING.

- A. INITIAL SITE SURVEY AND INITIAL SETTINGS.
 - 1. IDENTIFY SPAWNING ADULTS AND ACTIVE REDDS TO AVOID.
 - 2. RECORD WATER TEMPERATURE. ELECTROFISHING WILL NOT OCCUR WHEN WATER TEMPERATURES ARE ABOVE 18 DEGREES CELSIUS.
 - 3. IF POSSIBLE, A BLOCK NET WILL BE PLACED DOWNSTREAM AND CHECKED REGULARLY TO CAPTURE STUNNED FISH THAT DRIFT DOWNSTREAM.
 - 4. INITIAL SETTINGS WILL BE 100 VOLTS, PULSE WIDTH OF 500 MICRO SECONDS, AND PULSE RATE OF 30 HERTZ.
 - 5. RECORDS FOR CONDUCTIVITY, WATER TEMPERATURE, AIR TEMPERATURE, ELECTROFISHING SETTINGS, ELECTROFISHER MODEL, ELECTROFISHER CALIBRATION, FISH CONDITIONS, FISH MORTALITIES, AND TOTAL CAPTURE RATES WILL BE INCLUDED IN THE SALVAGE LOG BOOK.

B. ELECTROFISHING TECHNIQUE.

- 1. SAMPLING WILL BEGIN USING STRAIGHT DC. POWER WILL REMAIN ON UNTIL THE FISH IS NETTED WHEN USING STRAIGHT DC. GRADUALLY INCREASE VOLTAGE WHILE REMAINING BELOW MAXIMUM LEVELS.
- 2. MAXIMUM VOLTAGE WILL BE 1100 VOLTS WHEN CONDUCTIVITY IS <100 MILLISECONDS, 800 VOLTS WHEN CONDUCTIVITY IS BETWEEN 100 AND 300 MILLISECONDS, AND 400 VOLTS WHEN CONDUCTIVITY IS >300 MILLISECONDS.
- 3. IF FISH CAPTURE IS NOT SUCCESSFUL USING STRAIGHT DC, THE ELECTROFISHER WILL BE SET TO INITIAL VOLTAGE FOR PDC. VOLTAGE, PULSE WIDTH, AND PULSE FREQUENCY WILL BE GRADUALLY INCREASED WITHIN MAXIMUM VALUES UNTIL CAPTURE IS SUCCESSFUL.
- 4. MAXIMUM PULSE WIDTH IS 5 MILLISECONDS. MAXIMUM PULSE RATE IS 70 HERTZ.
- 5. ELECTROFISHING WILL NOT OCCUR IN ONE AREA FOR AN EXTENDED PERIOD.
- 6. THE ANODE WILL NOT INTENTIONALLY COME INTO CONTACT WITH FISH. THE ZONE FOR POTENTIAL INJURY OF 0.5 M FROM THE ANODE WILL BE AVOIDED.
- 7. SETTINGS WILL BE LOWERED IN SHALLOWER WATER SINCE VOLTAGE GRADIENTS LIKELY TO INCREASE.
- 8. ELECTROFISHING WILL NOT OCCUR IN TURBID WATER WHERE VISIBILITY IS POOR (I.E. UNABLE TO SEE THE BED OF THE STREAM).
- 9. OPERATIONS WILL IMMEDIATELY STOP IF MORTALITY OR OBVIOUS FISH INJURY IS OBSERVED. ELECTROFISHING SETTINGS WILL BE REEVALUATED.

C. SAMPLE PROCESSING.

- 1. FISH SHALL BE SORTED BY SIZE TO AVOID PREDATION DURING CONTAINMENT.
- 2. SAMPLERS WILL REGULARLY CHECK CONDITIONS OF FISH HOLDING CONTAINERS, AIR PUMPS WATER TRANSFERS, ETC.
- 3. FISH WILL BE OBSERVED FOR GENERAL CONDITIONS AND INJURIES
- 4. EACH FISH WILL BE COMPLETELY REVIVED BEFORE RELEASE. ESA-LISTED SPECIES WILL BE PRIORITIZED FOR SUCCESSFUL RELEASE.

D. BULL TROUT ELECTROFISHING.

- 1. ELECTROFISHING FOR BULL TROUT WILL ONLY OCCUR FROM MAY 1 TO JULY 31. NO ELECTROFISHING WILL OCCUR IN ANY BULL TROUT OCCUPIED HABITAT AFTER AUGUST 15. IN FMO HABITATS ELECTROFISHING MAY OCCUR ANY TIME.
- 2. ELECTROFISHING OF BULL TROUT WILL NOT OCCUR WHEN WATER TEMPERATURES EXCEED 15 DEGREES CELSIUS.

E. LARVAL LAMPREY ELECTROFISHING.

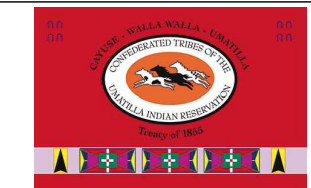
- 1. PERMISSION FROM EC LEAD WILL BE OBTAINED IF LARVAL LAMPREY ELECTROFISHER IS NOT ONE OF FOLLOWING PRE-APPROVED MODELS: ABP-2 "WISCONSIN", SMITH-ROOT LR-24, OR SMITH-ROOT APEX BACKPACK.
- 2. LARVAL LAMPREY SAMPLING WILL INCORPORATE 2-STAGE METHOD: "TICKLE" AND "STUN".
- 3. FIRST STAGE: USE 125 VOLT DC WITH A 25 PERCENT DUTY CYCLE APPLIED AT A SLOW RATE OF 3 PULSES PER SECOND. IF TEMPERATURES ARE BELOW 10 DEGREES CELSIUS, VOLTAGE MAY BE INCREASED GRADUALLY (NOT TO EXCEED 200 VOLTS). BURSTED PULSES (THREE SLOW AND ONE SKIPPED) RECOMMENDED TO INCREASE EMERGENCE.
- 4. SECOND STAGE (OPTIONAL FOR EXPERIENCED NETTERS): IMMEDIATELY AFTER LAMPREY EMERGE, USE A FAST PULSE SETTING OF 30 PULSES PER SECOND.
- 5. USE DIP NETS FOR VISIBLE LAMPREY. SIENES AND FINE MESH NET SWEEPS MAY BE USED IN POOR VISIBILITY.
- 6. SAMPLING WILL OCCUR SLOWLY (>60 SECONDS PER METER) STARTING AT UPSTREAM AND WORKING DOWNSTREAM.
- 7. MULTIPLE SWEEPS TO OCCUR WITH 15 MINUTES BETWEEN SWEEPS.
- 8. POST-DRAWDOWN "DRY-SHOCKING" WILL BE APPLIED IF LARVAL LAMPREY CONTINUE TO EMERGE. ANODES TO BE PLACED ONE METER APART TO SAMPLE ONE SQUARE METER AT A TIME FOR AT LEAST 60 SECONDS. FOR TEMPERATURES LESS THAN 10 DEGREES CELSIUS, MAXIMUM VOLTAGE MAY BE GRADUALLY INCREASED TO 400 VOLTS (DRY-SHOCKING ONLY).

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

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PLAN SHEET SIZE ANSI B (11" X 17")						
REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
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PETERSON DAM REMOVAL

G-004

GENERAL NOTES

HIP CONSERVATION MEASURES

DWG. NO.: G-004
CREATED: 3/21/2024
SHEET: 4 of 15

WORK AREA ISOLATION AND FISH SALVAGE (CONTINUED).

4. DEWATERING.

- A. DEWATERING WILL OCCUR AT A RATE SLOW ENOUGH TO ALLOW SPECIES TO NATURALLY MIGRATE OUT OF THE WORK AREA.
- B. WHERE A GRAVITY FEED DIVERSION IS NOT POSSIBLE, A PUMP MAY BE USED. PUMPS WILL BE INSTALLED TO AVOID REPETITIVE DEWATERING AND REWATERING.
- C. WHEN FISH ARE PRESENT, PUMPS WILL BE SCREENED IN ACCORDANCE WITH NMFS FISH SCREEN CRITERIA. NMFS ENGINEERING REVIEW AND APPROVAL WILL BE OBTAINED FOR PUMPS EXCEEDING 3 CUBIC FEET PER SECOND.
- D. DISSIPATION OF FLOW ENERGY AT THE BYPASS OUTFLOW WILL BE PROVIDED TO PREVENT DAMAGE TO THE STREAM CHANNEL AND RIPARIAN VEGETATION.
- E. SEEPAGE WATER WILL BE PUMPED TO A TEMPORARY STORAGE AND TREATMENT SITE INTO UPLAND AREAS TO ALLOW WATER TO PERCOLATE THROUGH SOIL AND VEGETATION PRIOR TO REENTERING THE STREAM CHANNEL.

CONSTRUCTION AND POST CONSTRUCTION CONSERVATION MEASURES.

1. FISH PASSAGE.

- A. FISH PASSAGE WILL BE PROVIDED FOR ADULT AND JUVENILE FISH LIKELY TO BE PRESENT DURING CONSTRUCTION UNLESS PASSAGE DID NOT EXIST BEFORE CONSTRUCTION, THE STREAM IS NATURALLY IMPASSABLE, OR PASSAGE WILL NEGATIVELY IMPACT ESA-LISTED SPECIES OR THEIR HABITAT.
- B. FISH PASSAGE ALTERNATIVES WILL BE APPROVED BY THE BPA EC LEAD UNDER ADVISEMENT BY THE NMFS HABITAT BIOLOGIST.

2. CONSTRUCTION AND DISCHARGE WATER.

- A. SURFACE WATER MAY BE DIVERTED TO MEET CONSTRUCTION NEEDS ONLY IF DEVELOPED SOURCES ARE UNAVAILABLE OR INADEQUATE.
- B. DIVERSIONS WILL NOT EXCEED 10% OF THE AVAILABLE FLOW.
- C. CONSTRUCTION DISCHARGE WATER WILL BE COLLECTED AND TREATED TO REMOVE DEBRIS, NUTRIENTS, SEDIMENT, PETROLEUM HYDROCARBONS, METALS, AND OTHER POLLUTANTS.

3. TIME AND EXTENT OF DISTURBANCE.

- A. EARTHWORK REQUIRING IN-STREAM MECHANIZED EQUIPMENT (INCLUDING DRILLING, EXCAVATION, DREDGING, FILLING, AND COMPACTING) WILL BE COMPLETED AS QUICKLY AS POSSIBLE.
- B. MECHANIZED EQUIPMENT WILL WORK FROM TOP OF BANK UNLESS WORK FROM ANOTHER LOCATION WILL RESULT IN LESS HABITAT DISTURBANCE (TURBIDITY, VEGETATION DISTURBANCE, ETC.).

4. CESSATION OF WORK.

- A. PROJECT OPERATIONS WILL CEASE WHEN HIGH FLOW CONDITIONS MAY RESULT IN INUNDATION OF THE PROJECT AREA (FLOOD EFFORTS TO DECREASE DAMAGES TO NATURAL RESOURCES PERMITTED).
- B. WATER QUALITY LEVELS EXCEEDED. SEE CWA SECTION 401 WATER QUALITY CERTIFICATION AND TURBIDITY MEASURES.

5. SITE RESTORATION.

- A. DISTURBED AREAS, STREAM BANKS, SOILS, AND VEGETATION WILL BE CLEANED UP AND RESTORED TO IMPROVED OR PRE-PROJECT CONDITIONS.
- B. PROJECT-RELATED WASTE WILL BE REMOVED.
- C. TEMPORARY ACCESS ROADS AND STAGING WILL BE DECOMPACTED AND RESTORED. SOILS WILL BE LOOSENEED IF NEEDED FOR REVEGETATION OR WATER INFILTRATION.
- D. THE PROJECT SPONSOR WILL RETAIN THE RIGHT OF REASONABLE ACCESS TO THE SITE TO MONITOR AND MAINTAIN THE SITE OVER THE LIFE OF THE PROJECT.

6. REVEGETATION.

- A. PLANTING AND SEEDING WILL OCCUR PRIOR TO OR AT THE BEGINNING OF THE FIRST GROWING SEASON AFTER CONSTRUCTION.

- B. A MIX OF NATIVE SPECIES (INVASIVE SPECIES NOT ALLOWED) APPROPRIATE TO THE SITE WILL BE USED TO REESTABLISH VEGETATION, PROVIDE SHADE, AND REDUCE EROSION. REESTABLISHED VEGETATION SHOULD BE AT LEAST 70% OF PRE-PROJECT CONDITIONS WITHIN THREE YEARS.
- C. VEGETATION SUCH AS WILLOWS, SEDGES, OR RUSH MATS WILL BE SALVAGED FROM DISTURBED OR ABANDONED AREAS TO BE REPLANTED.
- D. SHORT-TERM STABILIZATION MEASURE MAY INCLUDE THE USE OF NON-NATIVE STERILE SEED MIX (WHEN NATIVE NOT AVAILABLE), WEED-FREE CERTIFIED STRAW, OR OTHER SIMILAR TECHNIQUES.
- E. SURFACE FERTILIZER WILL NOT BE APPLIED WITHIN 50 FEET OF ANY STREAM, WATER BODY, OR WETLAND.
- F. FENCING WILL BE INSTALLED AS NECESSARY TO PREVENT ACCESS TO REVEGETATED SITES BY LIVESTOCK OR UNAUTHORIZED PERSONS.
- G. INVASIVE PLANTS WILL BE REMOVED OR CONTROLLED UNTIL NATIVE PLANT SPECIES ARE WELL ESTABLISHED (TYPICALLY THREE YEARS POST-CONSTRUCTION).

7. SITE ACCESS AND IMPLEMENTATION MONITORING.

- A. THE PROJECT SPONSOR WILL PROVIDE CONSTRUCTION MONITORING DURING IMPLEMENTATION TO ENSURE ALL CONSERVATION MEASURES ARE ADEQUATELY FOLLOWED, EFFECTS TO LISTED SPECIES ARE NOT GREATER THAN PREDICTED, AND INCIDENTAL TAKE LIMITATIONS ARE NOT EXCEEDED.
- B. THE PROJECT SPONSOR OR DESIGNATED REPRESENTATIVE WILL SUBMIT THE PCF WITHIN 30 DAYS OF PROJECT COMPLETION.

8. CWA SECTION 401 WATER QUALITY CERTIFICATION.

- A. THE PROJECT SPONSOR OR DESIGNATED REPRESENTATIVE WILL COMPLETE AND RECORD WATER QUALITY OBSERVATIONS (SEE TURBIDITY MONITORING) TO ENSURE IN-WATER WORK IS NOT DEGRADING WATER QUALITY.
- B. DURING CONSTRUCTION, WATER QUALITY PROVISIONS PROVIDED BY THE OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY, WASHINGTON DEPARTMENT OF ECOLOGY, IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY WILL BE FOLLOWED.

STAGED REWATERING PLAN.

- A. WHEN REINTRODUCING WATER TO DEWATERED AREAS AND NEWLY CONSTRUCTED CHANNELS, A STAGED REWATERING PLAN WILL BE APPLIED.
- B. THE FOLLOWING WILL BE APPLIED TO ALL REWATERING EFFORTS. COMPLEX REWATERING EFFORTS MAY REQUIRE ADDITIONAL NOTES OR A DEDICATED SHEET IN THE CONSTRUCTION DETAILS.
 - 1. TURBIDITY MONITORING PROTOCOL WILL BE APPLIED TO REWATERING EFFORTS.
 - 2. PRE-WASH THE AREA BEFORE REWATERING. TURBID WASH WATER WILL BE DETAINED AND PUMPED TO THE FLOODPLAIN OR SEDIMENT CAPTURE AREAS RATHER THAN DISCHARGING TO FISH-BEARING STREAMS.
 - 3. INSTALL SEINE NETS AT UPSTREAM END TO PREVENT FISH FROM MOVING DOWNSTREAM UNTIL 2/3 OF TOTAL FLOW IS RESTORED TO THE CHANNEL.
 - 4. STARTING IN EARLY MORNING INTRODUCE 1/3 OF NEW CHANNEL FLOW OVER PERIOD OF 1-2 HOURS.
 - 5. INTRODUCE SECOND THIRD OF FLOW OVER NEXT 1 TO 2 HOURS AND BEGIN FISH SALVAGE OF BYPASS CHANNEL IF FISH ARE PRESENT.
 - 6. REMOVE UPSTREAM SEINE NETS ONCE 2/3 FLOW IN REWATERED CHANNEL AND DOWNSTREAM TURBIDITY IS WITHIN ACCEPTABLE RANGE (LESS THAN 40 NTU OR LESS THAN 10% BACKGROUND).
 - 7. INTRODUCE FINAL THIRD OF FLOW ONCE FISH SALVAGE EFFORTS ARE COMPLETE AND DOWNSTREAM TURBIDITY VERIFIED TO BE WITHIN ACCEPTABLE RANGE.
 - 8. INSTALL PLUG TO BLOCK FLOW INTO OLD CHANNEL OR BYPASS. REMOVE ANY REMAINING SEINE NETS.
 - 9. IN LAMPREY SYSTEMS, LAMPREY SALVAGE AND DRY SHOCKING MAY BE NECESSARY.

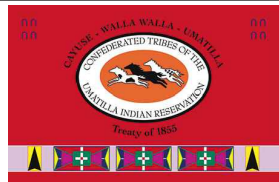
TURBIDITY MONITORING.

- A. RECORD THE READING, LOCATION, AND TIME FOR THE BACKGROUND READING APPROXIMATELY 100 FEET UPSTREAM OF THE PROJECT AREA USING A RECENTLY CALIBRATED TURBIDIMETER OR VIA VISUAL OBSERVATION (SEE THE HIP HANDBOOK TURBIDITY MONITORING SECTION FOR A VISUAL OBSERVATION KEY).
- B. RECORD THE TURBIDITY READING, LOCATION, AND TIME AT THE MEASUREMENT COMPLIANCE LOCATION POINT.
 - 1. 50 FEET DOWNSTREAM FOR STREAMS LESS THAN 30 FEET WIDE.
 - 2. 100 FEET DOWNSTREAM FOR STREAMS BETWEEN 30 AND 100 FEET WIDE.
 - 3. 200 FEET DOWNSTREAM FOR STREAMS GREATER THAN 100 FEET WIDE.
 - 4. 300 FEET FROM THE DISCHARGE POINT OR NONPOINT SOURCE FOR LOCATIONS SUBJECT TO TIDAL OR COASTAL SCOUR.
- C. TURBIDITY SHALL BE MEASURED (BACKGROUND LOCATION AND COMPLIANCE POINTS) EVERY 4 HOURS WHILE WORK IS BEING IMPLEMENTED.
- D. IF THERE IS A VISIBLE DIFFERENCE BETWEEN A COMPLIANCE POINT AND THE BACKGROUND, THE EXCEEDANCE WILL BE NOTED IN THE PCF. ADJUSTMENTS OR CORRECTIVE MEASURES WILL BE TAKEN IN ORDER TO REDUCE TURBIDITY.
- E. IF EXCEEDANCES OCCUR FOR MORE THAN TWO CONSECUTIVE MONITORING INTERVALS (AFTER 8 HOURS), THE ACTIVITY WILL STOP UNTIL THE TURBIDITY LEVEL RETURNS TO BACKGROUND. THE BPA EC LEAD WILL BE NOTIFIED OF ALL EXCEEDANCES AND CORRECTIVE ACTIONS AT PROJECT COMPLETION.
- F. IF TURBIDITY CONTROLS (COFFER DAMS, WADDLES, FENCING, ETC.) ARE DETERMINED INEFFECTIVE, CREWS WILL BE MOBILIZED TO MODIFY AS NECESSARY. OCCURRENCES WILL BE DOCUMENTED IN THE PCF.
- G. FINAL TURBIDITY READINGS, EXCEEDANCES, AND CONTROL FAILURES WILL BE SUBMITTED TO THE BPA EC LEAD USING PCF.

Z:\PROJECTS\104-121\0-002\UBWC HOMER DIVERSION FISH PASSAGE\80%\SHEET11-COVERSHEET AND NOTES.DWG March 23, 2024 12:41 PM



NOT FOR CONSTRUCTION



		PLAN SHEET SIZE ANSI B (11" X 17")			
REV.	DATE	DRW	ENG	CHK	APP
3	3/29/24	SH	JA	CM	JA
2	11/22/23	SH	JC	AD	JA
1	3/31/23	AD	AD	JA	JA

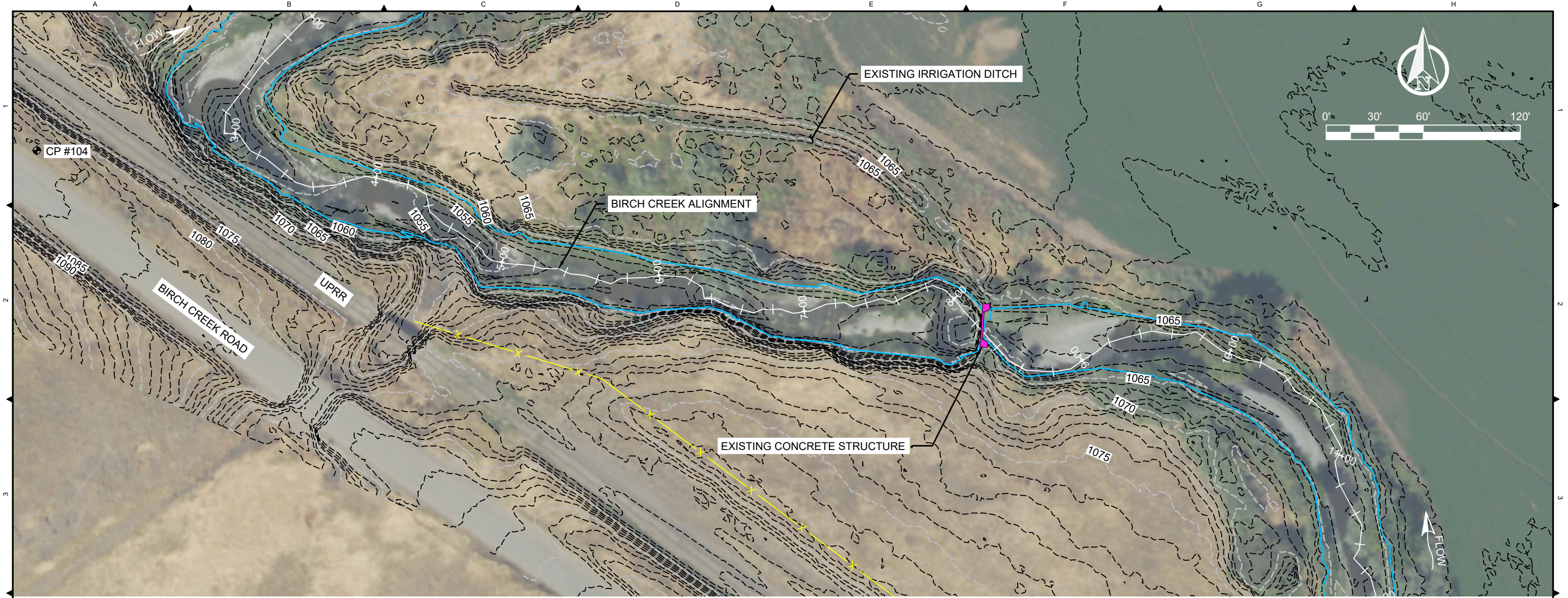
PETERSON DAM REMOVAL

DWG. NO.: **G-005**

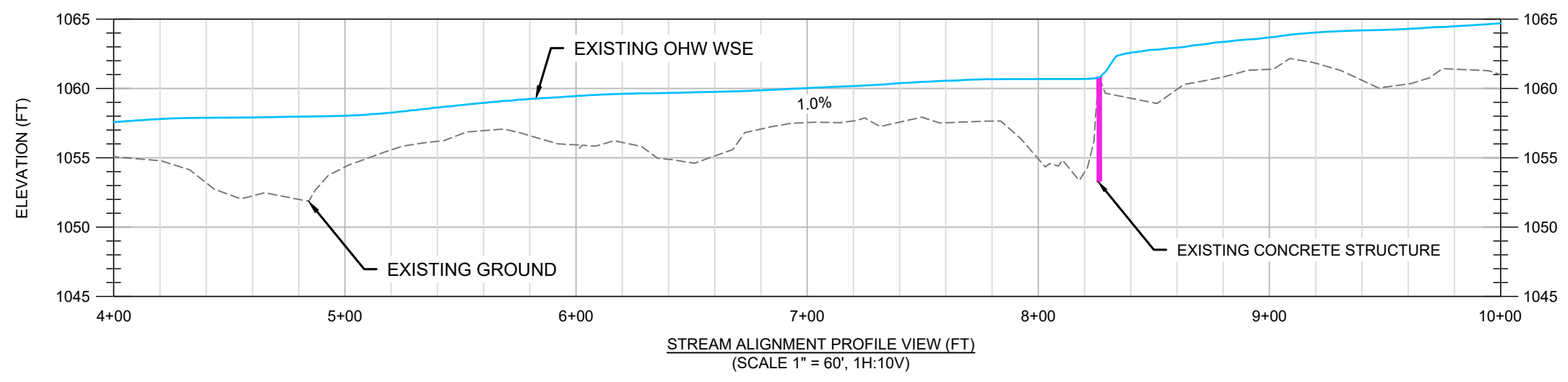
GENERAL NOTES
HIP CONSERVATION MEASURES

CREATED: 3/21/2024

SHEET: 5 of 15



Z:\PROJECTS\194-121\0-002 LIBWC HOMER DIVERSION FISH PASSAGE\80%\SHEET2-EXISTING CONDITIONS OVERVIEW.DWG
 1:00 PM
 March 20, 2024
 PLOT DETAILS: HARVEY SPENCER



- LEGEND**
- EXISTING 1-FOOT CONTOUR
 - EXISTING 5-FOOT CONTOUR
 - █ EXISTING CHANNEL ALIGNMENT
 - █ EXISTING FENCE
 - EXISTING OHW WSE
 - ⊙ SURVEYED CONTROL POINT
 - █ EXISTING CONCRETE STRUCTURE

CONTROL POINT TABLE			
POINT #	NORTHING	EASTING	ELEVATION
102	721572.08	8620994.98	1035.41
104	719227.39	8623920.51	1083.86

- NOTES**
- CP #102 OUT OF PLAN VIEW LIMITS.

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PLAN SHEET SIZE ANSI B (11" X 17")						
REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
3	3/29/24	80 PERCENT DESIGN	SH	JA	CM	JA
2	11/22/23	30 PERCENT DESIGN	SH	JC	AD	JA
1	3/31/23	CONCEPTUAL DESIGN	AD	AD	JA	JA

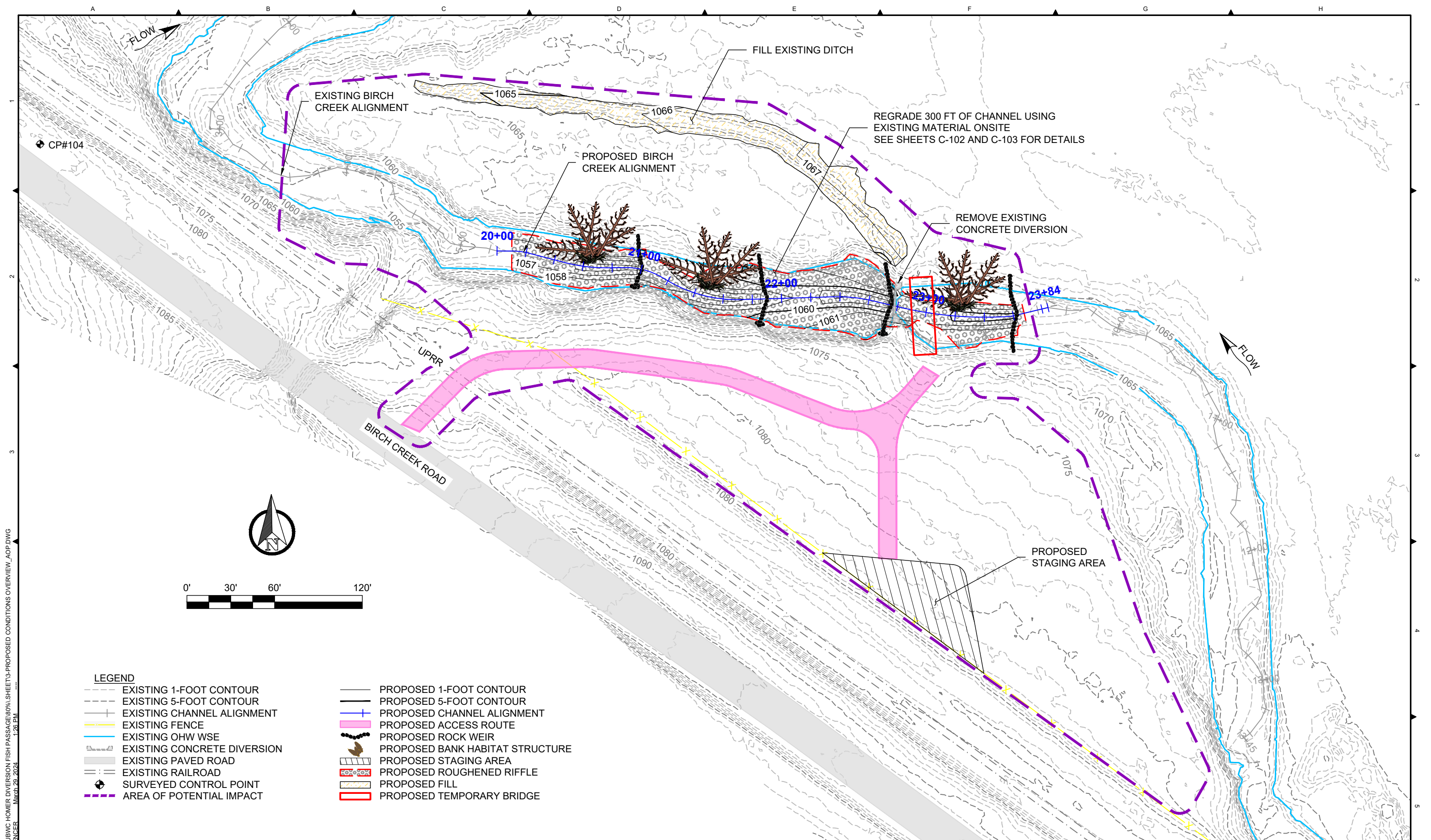
PETERSON DAM REMOVAL

EXISTING CONDITIONS

DWG. NO.:
E-101

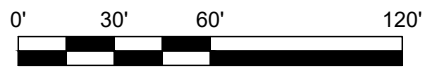
CREATED: 3/21/2024

SHEET: 6 of 15



FLOW

FLOW



LEGEND

- EXISTING 1-FOOT CONTOUR
- EXISTING 5-FOOT CONTOUR
- - - EXISTING CHANNEL ALIGNMENT
- - - EXISTING FENCE
- EXISTING OHW WSE
- EXISTING CONCRETE DIVERSION
- EXISTING PAVED ROAD
- EXISTING RAILROAD
- ⊕ SURVEYED CONTROL POINT
- - - AREA OF POTENTIAL IMPACT
- PROPOSED 1-FOOT CONTOUR
- PROPOSED 5-FOOT CONTOUR
- PROPOSED CHANNEL ALIGNMENT
- PROPOSED ACCESS ROUTE
- PROPOSED ROCK WEIR
- PROPOSED BANK HABITAT STRUCTURE
- PROPOSED STAGING AREA
- PROPOSED ROUGHENED RIFFLE
- PROPOSED FILL
- PROPOSED TEMPORARY BRIDGE

Z:\PROJECTS\194-121\0-002 LIBWC HOMER DIVERSION FISH PASSAGE\80%\SHEET\3-PROPOSED CONDITIONS OVERVIEW_AOP.DWG March 20, 2024 1:26 PM PLOT DETAILS: HARVEY, SPENCER

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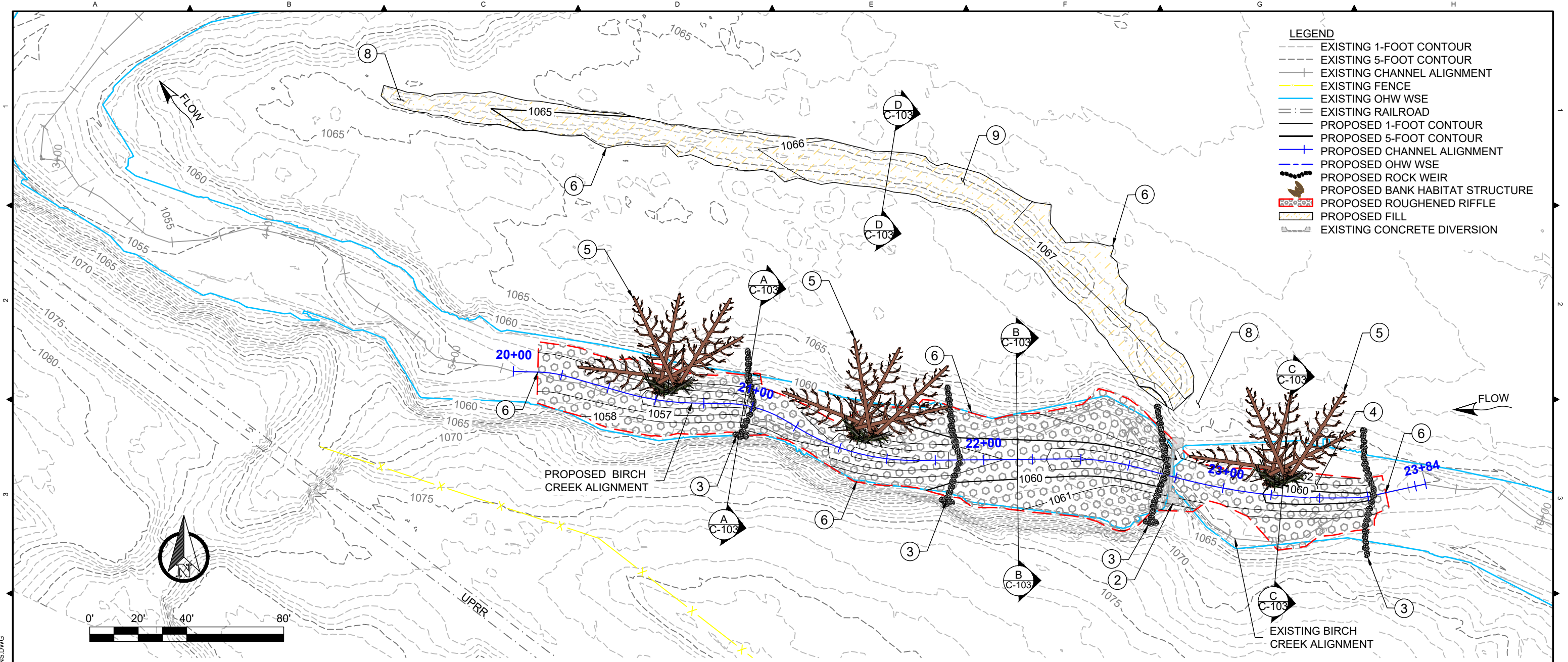
PLAN SHEET SIZE ANSI B (11" X 17")

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1	3/31/23	CONCEPTUAL DESIGN	AD	AD	JA	JA

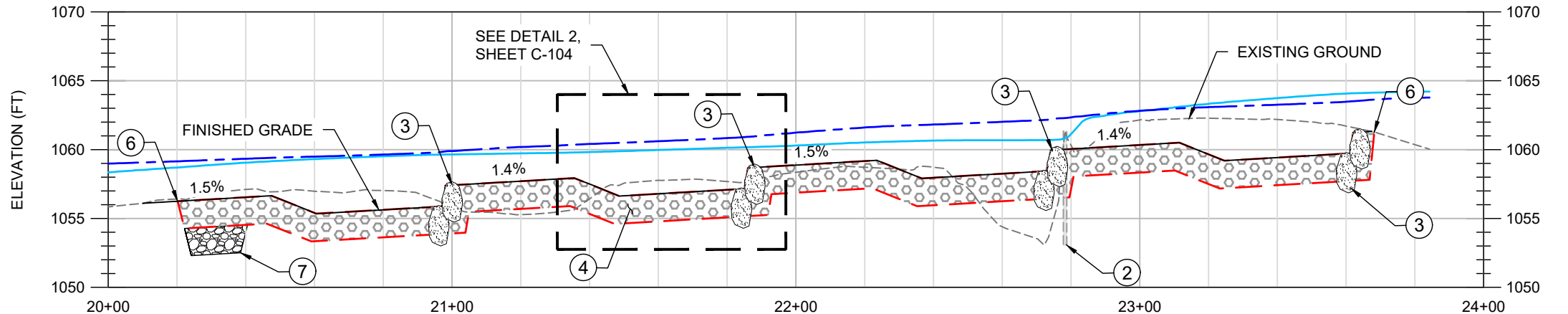
PETERSON DAM REMOVAL

PROPOSED
CONDITIONS
OVERVIEW

DWG. NO.:	C-101
CREATED:	3/21/2024
SHEET:	7 of 15



- NOTES:**
1. SITE ACCESS VIA BIRCH CREEK ROAD.
 2. REMOVE CONCRETE DIVERSION STRUCTURE AND UTILIZE EXISTING MATERIALS ONSITE TO REGRADE CHANNEL.
 3. INSTALL 3-FT BOULDERS AS STEP POOL ROCK WEIRS. KEY STRUCTURES 8 FT INTO BANK. USE ADDITIONAL FOOTER BOULDERS WHERE STRUCTURE ABUTS BEDROCK WALLS AND CANNOT BE KEYED IN. SEE SHEET C-104 FOR ROCK WEIR AND STEP POOL DETAILS. INSTALLATION OF ROCK WEIRS TO BE COORDINATED IN THE FIELD WITH OWNER'S REPRESENTATIVE.
 4. INSTALL STREAMBED SEDIMENT AND COBBLES AS ROUGHENED RIFFLE. SEE SHEET C-105 FOR ROUGHENED RIFFLE DETAILS.
 5. INSTALL BANK HABITAT STRUCTURES. SEE SHEET C-301.
 6. DAYLIGHT TO FINISHED GRADE TO MATCH EXISTING GROUND.
 7. INSTALL SCOUR CUTOFF MATERIAL PER DETAIL 3 ON SHEET C-104.
 8. REMOVE EXISTING 2-FT DIAMETER WATER PIPE. REMOVE AND DISPOSE OF ANY REMAINING DIVERSION INFRASTRUCTURE.
 9. FILL EXISTING IRRIGATION DITCH.

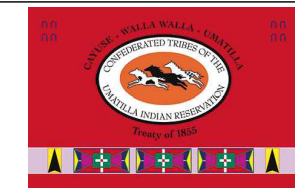


STREAM ALIGNMENT PROFILE VIEW (FT)
(SCALE 1" = 40', 1H:4V)

Z:\PROJECTS\104-121\0-002 LIBWC HOMER DIVERSION FISH PASSAGE\80%\SHEET\14-PROPOSED CONDITIONS.DWG
PLOT DETAILS: HARVEY SPENCER
March 23, 2024
1:26 PM

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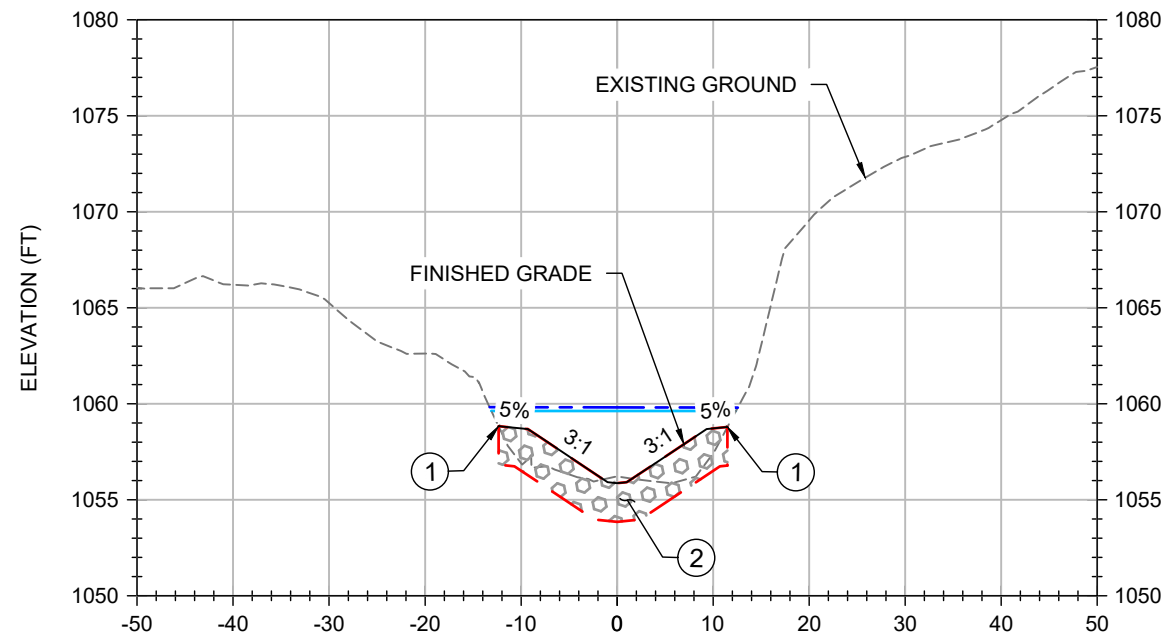
NOT FOR CONSTRUCTION



REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
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1	3/31/23	CONCEPTUAL DESIGN	AD	AD	JA	JA

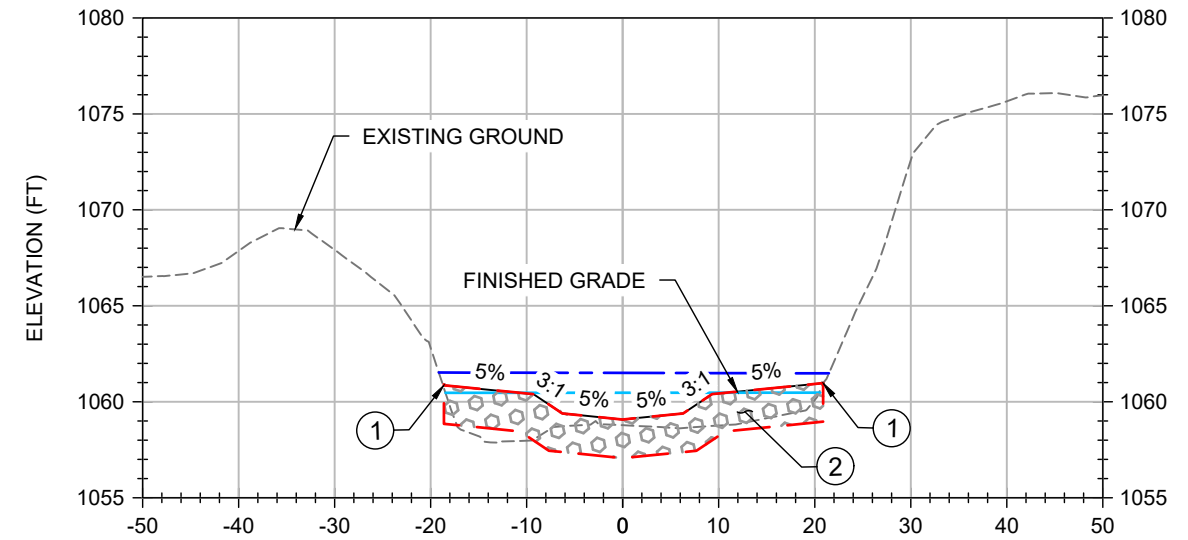
PETERSON DAM REMOVAL
PROPOSED CONDITIONS
PLAN, PROFILE, AND SECTIONS

DWG. NO.: **C-102**
CREATED: 3/21/2024
SHEET: 8 of 15



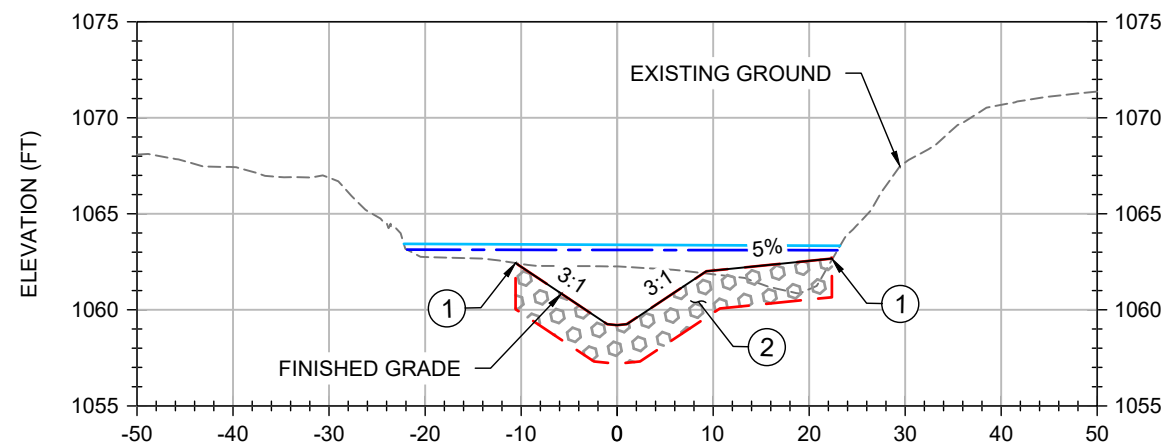
A
C-102 PROPOSED BIRCH CREEK SECTION VIEW
1" = 20' 1H:2V

- LEGEND**
- EXISTING GROUND
 - EXISTING OHW WSE
 - PROPOSED OHW WSE
 - FINISHED GRADE
 - ▨ PROPOSED ROUGHENED RIFFLE
 - ▨ PROPOSED FILL

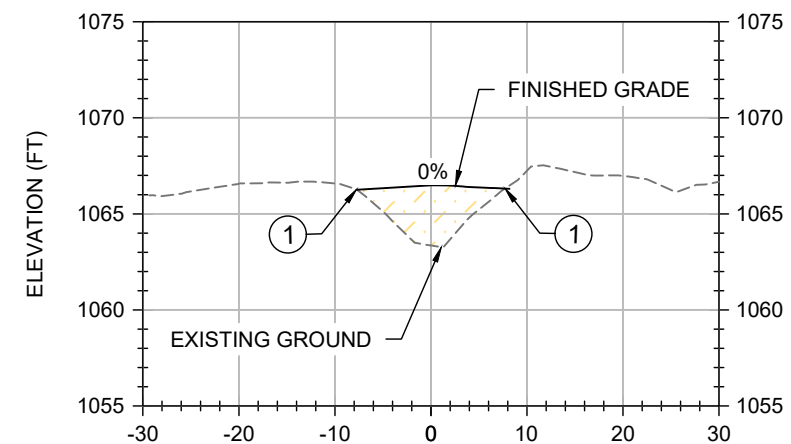


B
C-102 PROPOSED BIRCH CREEK SECTION VIEW
1" = 20' 1H:2V

- NOTES:**
1. DAYLIGHT TO FINISHED GRADE TO MATCH EXISTING GROUND.
 2. INSTALL STREAMBED SEDIMENT AND COBBLES AS ROUGHENED RIFFLE. SEE SHEET C-104 FOR ROUGHENED RIFFLE DETAILS.



C
C-102 PROPOSED BIRCH CREEK SECTION VIEW
1" = 20' 1H:2V

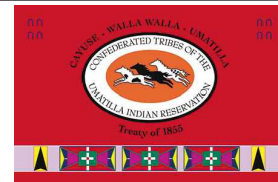


D
C-102 PROPOSED FILL SECTION VIEW
1" = 20' 1H:2V

Z:\PROJECTS\104-121\0-002 LIBWC HOMER DIVERSION FISH PASSAGE\80%\SHEET\14-PROPOSED CONDITIONS.DWG March 20, 2024 1:26 PM PLOT DETAILS: HARVEY SPENCER



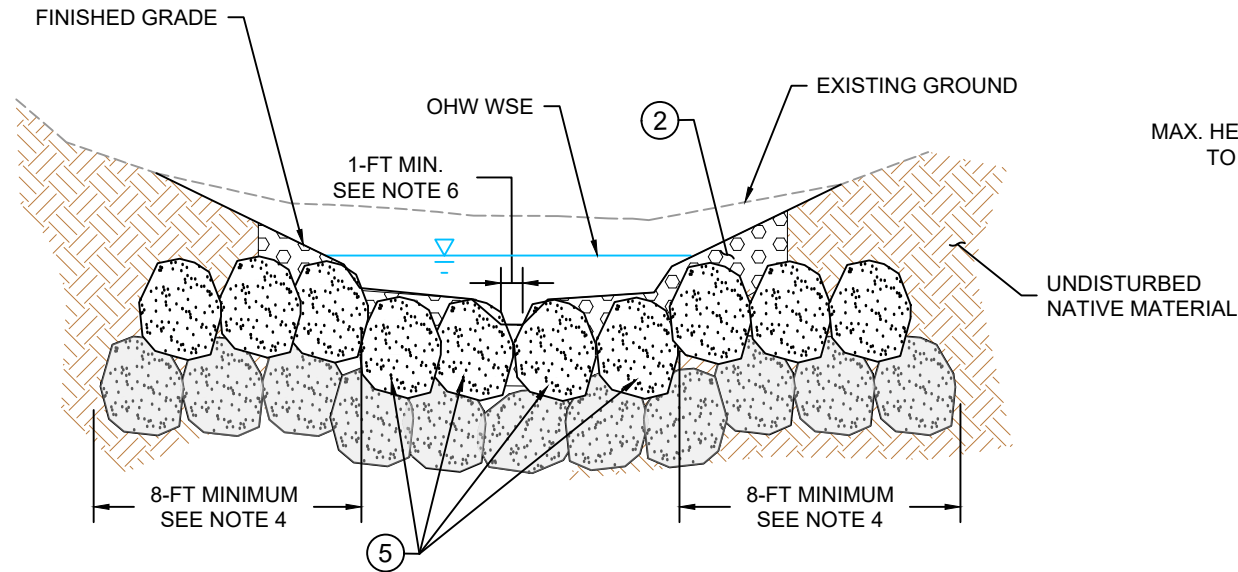
NOT FOR CONSTRUCTION



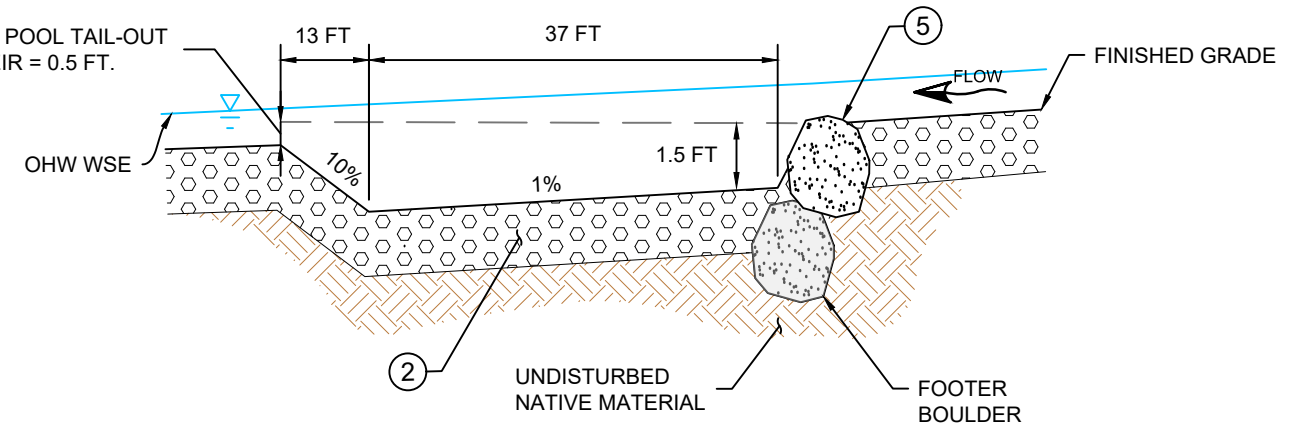
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1	3/31/23		CONCEPTUAL DESIGN	AD	AD	JA	JA

PETERSON DAM REMOVAL
PROPOSED CONDITIONS
PLAN, PROFILE, AND SECTIONS

DWG. NO.:
C-103
CREATED: 3/21/2024
SHEET: 9 of 15



1 BOULDER STEP WEIR - TYPICAL SECTION VIEW
NTS



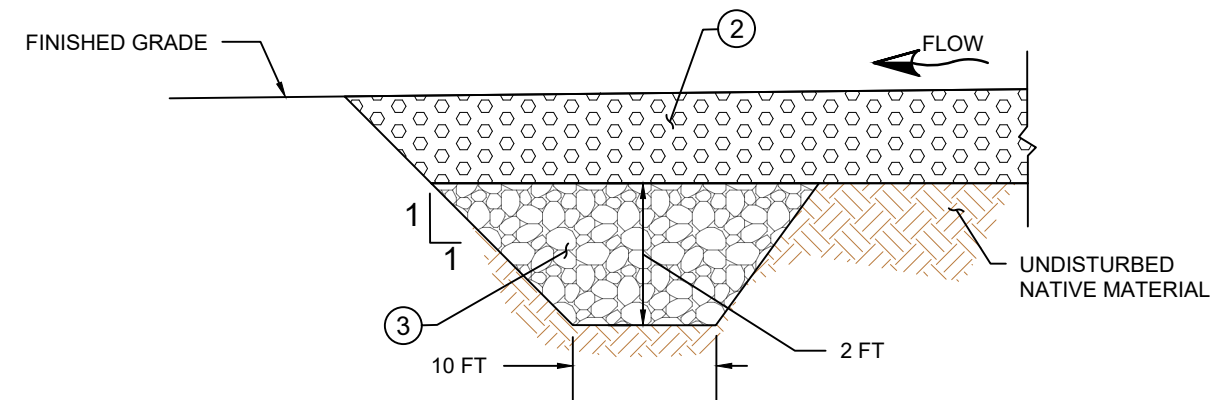
2 BOULDER STEP WEIR - TYPICAL PROFILE VIEW
NTS

NOTES:

1. 3-FT DIAM. MIN HEADER AND FOOTER BOULDERS.
2. PROPOSED ROUGHENED RIFFLE STREAMBED SEDIMENT/COBBLE MIX. 2-FT DEPTH MAX. MATERIAL TO BE PLACED IN LIFTS AND SURFACE WASHED WITH FINES UNTIL PONDING OF WATER IS OBSERVED.
3. PROPOSED STREAMBED COBBLE FOR SCOUR CUTOFF TRENCH.
4. BOULDER WEIR SHALL BE TRENCHED 8 FT. MIN. INTO BANKS TO KEY STRUCTURES INTO PROPOSED CHANNEL BANKS. USE ADDITIONAL FOOTER BOULDERS WHERE STRUCTURE ABUTS BEDROCK WALLS AND CANNOT BE KEYED IN.
5. HEADER BOULDER TO BE BURIED 50% MIN./90% MAX. OF HEIGHT AND BE COMPLETELY SUBMERGED DURING THE OHW FLOW.
6. 1 FT MINIMUM LOW FLOW SLOT IN CENTER OF BOULDER WEIR FOR FISH PASSAGE.

LEGEND

- EXISTING GROUND
- OHW WSE
- UNDISTURBED NATIVE MATERIAL
- FINISHED GRADE
- PROPOSED SCOUR PROTECTION MATERIAL
- PROPOSED ROUGHENED RIFFLE
- PROPOSED HEADER BOULDER
- PROPOSED FOOTER BOULDER

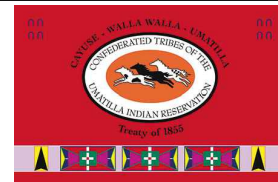


3 SCOUR PROTECTION MATERIAL DETAIL
NTS

Z:\PROJECTS\104-121\0002\LIBWC_HOMER DIVERSION_FISH PASSAGE\100%\SHEET15-PROPOSED CONDITIONS TYPICALS.DWG 3:34 PM March 20, 2024 PLOT DETAILS: S. ANDREWS, JEREMY



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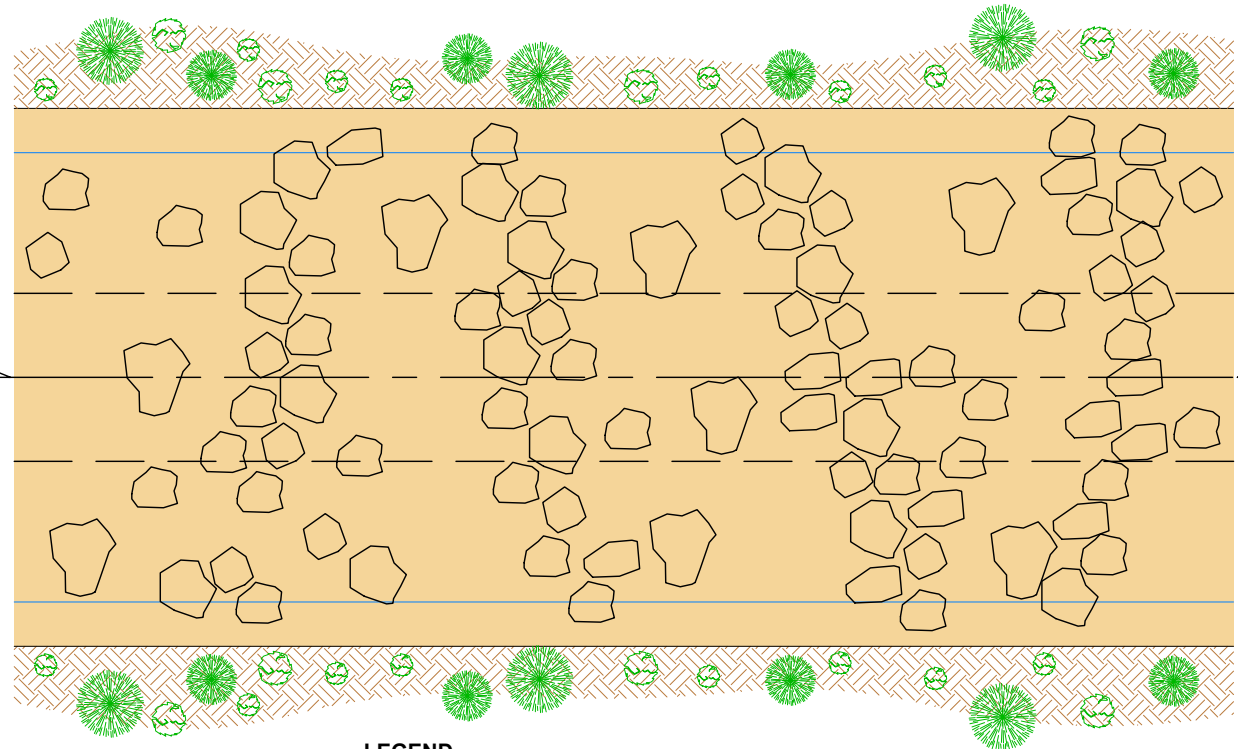


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1		3/31/23	CONCEPTUAL DESIGN	AD	AD	JA	JA

PETERSON DAM REMOVAL

PROPOSED CONDITIONS
TYPICAL DETAILS

DWG. NO.:
C-104
CREATED: 3/21/2024
SHEET: 10 of 15



LEGEND
 — OHW WSE
 UNDISTURBED NATIVE MATERIAL
 PROPOSED STREAMBED COBBLE/SEDIMENT MIX

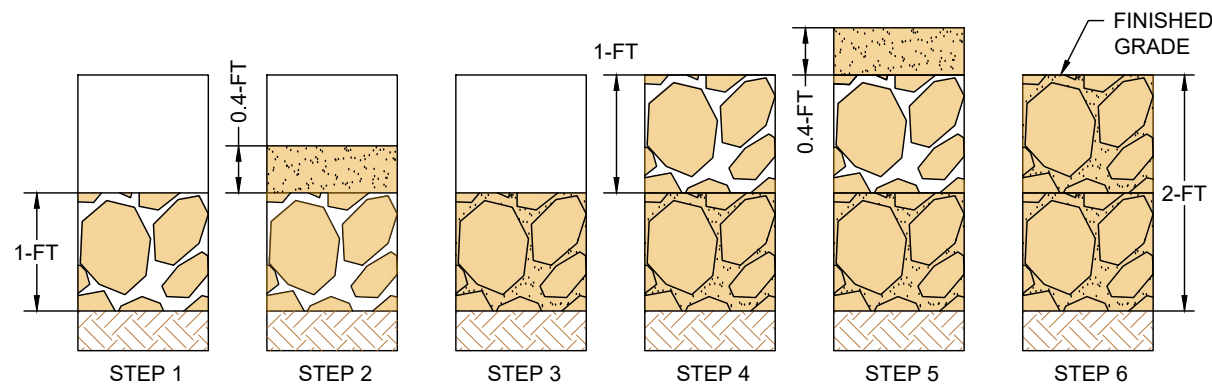
TYPICAL STREAMBED PLAN VIEW NOTES:

1. PLACE STREAMBED COBBLE/SEDIMENT MIX THROUGHOUT PROPOSED CHANNEL BED TO MIMIC NATURAL CHANNEL VARIABILITY OBSERVED UPSTREAM AND DOWNSTREAM OF THE PROPOSED CHANNEL ALIGNMENT.
2. REFERENCE REACH PHOTO SHOWN FOR INFORMATION ONLY.



1
-
TYPICAL STREAM SIMULATION BETWEEN CHANNEL FEATURES PLAN VIEW
NTS

2
-
REFERENCE REACH CHANNEL WITH STREAMBED COBBLE/SEDIMENT VARIABILITY
SOURCE: TETRA TECH 2019



STREAMBED COBBLE/SEDIMENT MIX INSTALLATION NOTES:

- STEP 1 - EXCAVATE CHANNEL TO ACCOMMODATE STREAMBED COBBLE/SEDIMENT MIX PLACEMENT AND PLACE LIFT OF STREAMBED COBBLE 12" GRADATION.
- STEP 2 - PLACE LIFT OF STREAMBED SEDIMENT UNIFORMLY OVER STREAMBED COBBLES.
- STEP 3 - APPLY WATER TO WASH SEDIMENT INTO COBBLES UNTIL PONDING OF WATER IS OBSERVED.
- STEP 4 - PLACE LIFT OF STREAMBED COBBLE 12" GRADATION.
- STEP 5 - PLACE LIFT OF STREAMBED SEDIMENT UNIFORMLY OVER STREAMBED COBBLES.
- STEP 6 - APPLY WATER TO WASH SEDIMENT INTO COBBLES UNTIL PONDING OF WATER IS OBSERVED.

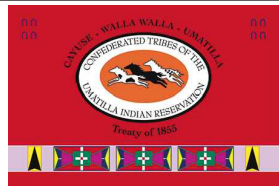
LIFT THICKNESS FOR STEP 2 AND STEP 5 BASED ON ASSUMED VOID RATIO OF 0.35 FOR STREAMBED COBBLES. ACTUAL STREAMBED SEDIMENT LIFT THICKNESS TO FILL VOIDS WITH STREAMBED SEDIMENT MAY VARY.

3
-
STREAMBED COBBLE/SEDIMENT MIX INSTALLATION
NTS

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REV.		DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
3	3/29/24		80 PERCENT DESIGN	SH	JA	CM	JA
2	11/22/23		30 PERCENT DESIGN	SH	JC	AD	JA
1	3/31/23		CONCEPTUAL DESIGN	AD	AD	JA	JA

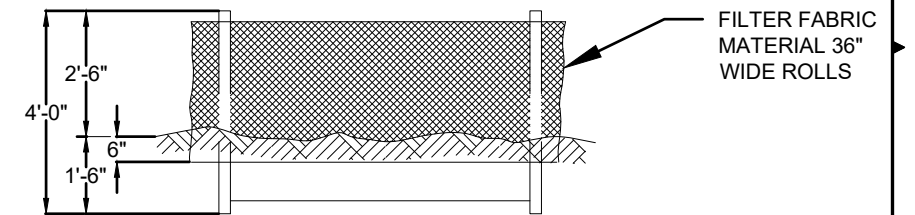
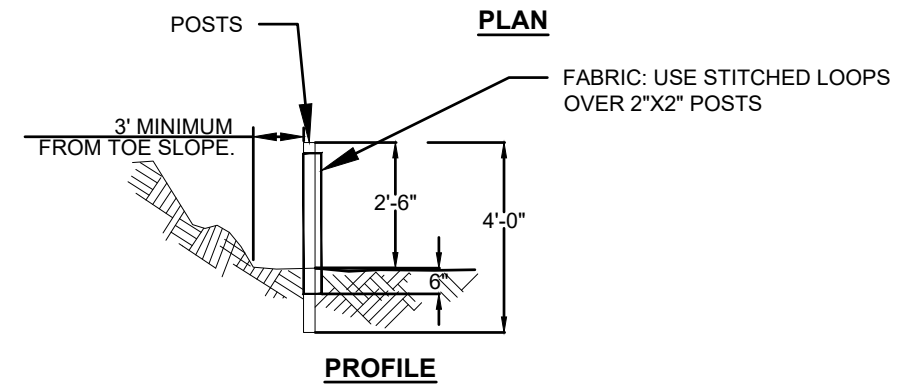
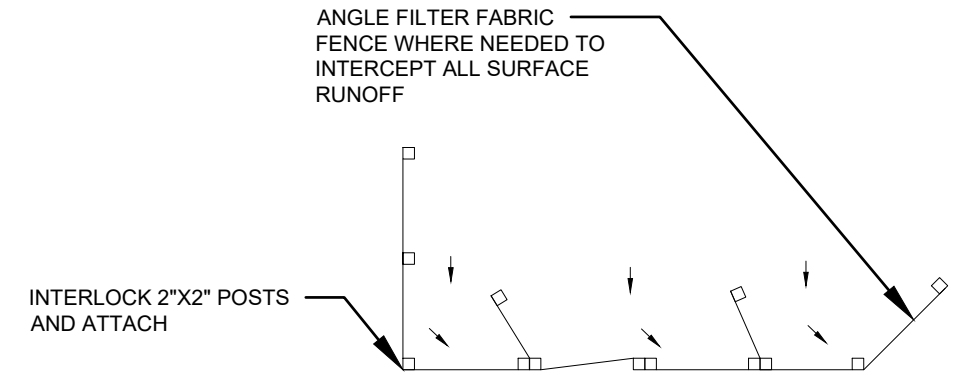
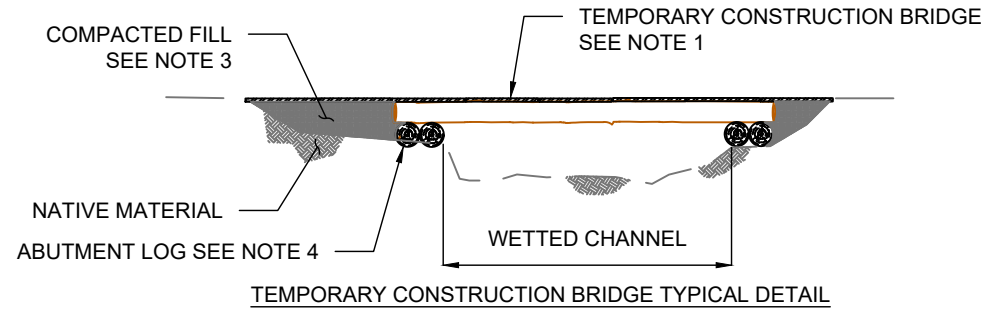
PETERSON DAM REMOVAL

PROPOSED CONDITIONS
 PLAN AND PROFILE

DWG. NO.:
C-105
 CREATED: 3/21/2024
 SHEET: 11 of 15

TEMPORARY CONSTRUCTION BRIDGE NOTES:

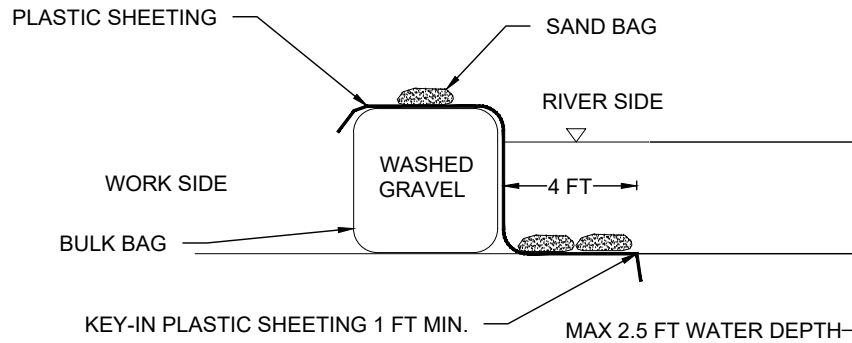
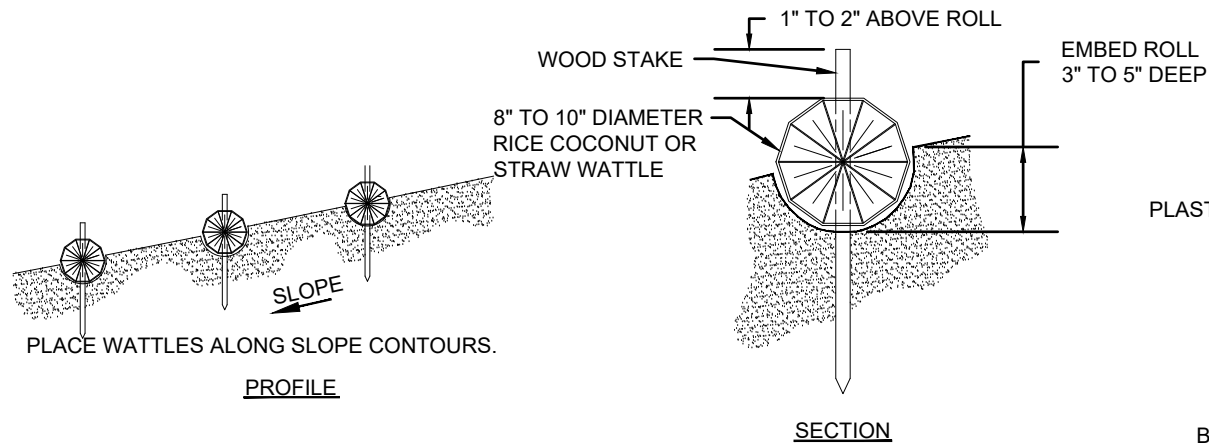
1. PLACE TEMPORARY CONSTRUCTION BRIDGE. CONTRACTOR TO COORDINATE TEMPORARY BRIDGE DIMENSIONS, MATERIAL SIZE, AND LOCATION WITH OWNER'S REPRESENTATIVE.
2. BRIDGE MATERIALS AND INSTALLATION SHALL BE COMPLIANT WITH HIP III TERMS AND CONDITIONS
3. COMPACTED FILL MAY BE REQUIRED OUTSIDE OF TEMPORARY CONSTRUCTION BRIDGE TO PROVIDE SMOOTH TRANSITION FROM BRIDGE TO EXISTING GROUND. (SHOWN IN SECTION DETAIL)
4. SILL LOGS SHALL BE MINIMUM OF TWO LOGS PER ABUTMENT SIMILAR IN SIZE AND SHAPE, AND BE PLACED ON FIRM AND UNYIELDING NATIVE SOIL.
5. AFTER COMPLETION OF WORK AND REMOVAL OF BRIDGE, SUBSOIL SHALL BE RIPPED TO PROVIDE SUITABLE SURFACE FOR PLANTING.



TEMPORARY SILT FENCE TYPICAL DETAIL NTS

SILT FENCE NOTES:

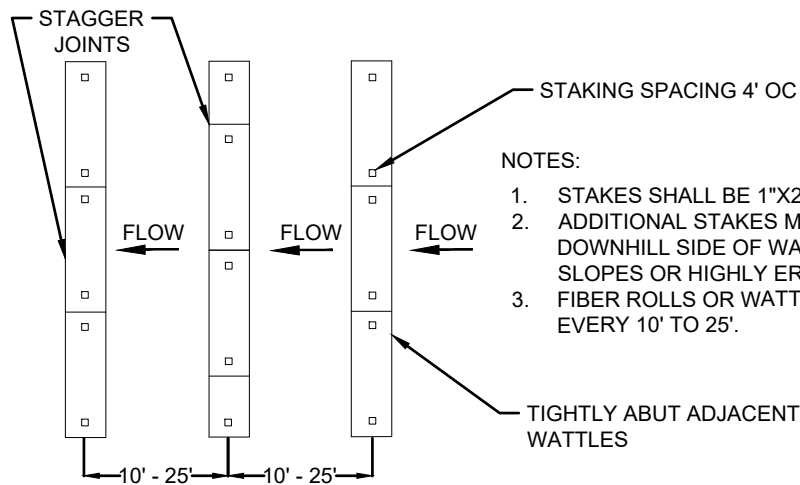
1. SILT FENCE SHALL BE INSTALLED ON A LINE OF EQUAL ELEVATION.
2. BOTTOM EDGE OF SILT FENCE SHALL BE BURIED MIN 6".
3. POSTS MAY BE 2"X2" FIR, PINE OR STEEL.
4. POSTS TO BE INSTALLED ON UPHILL SIDE OF SLOPE.
5. COMPACT BOTH SIDES OF FILTER FABRIC TRENCH.
6. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATION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



TEMPORARY COFFERDAM SECTION TYPICAL DETAIL NTS

COFFERDAM NOTES:

1. ALL WORK IN CHANNEL SHALL ONLY OCCUR BETWEEN JULY 1 AND SEPTEMBER 30.
2. IN-WATER WORK AREAS SHALL BE ISOLATED BY COFFERDAMS.
3. ISOLATED AREAS REQUIRE FISH SALVAGE ACTIVITIES PRIOR TO THE INITIATION OF CONSTRUCTION.
4. FISH SALVAGE TO BE PERFORMED BY QUALIFIED FISH BIOLOGIST.
5. FILL BULK BAG WITH WASHED GRAVEL.
6. SAND BAGS, ECO-BLOCKS, OR SIMILAR MAY BE SUBSTITUTED FOR WASHED GRAVEL BULK BAG.



PLAN VIEW

FIBER ROLLS/WATTLES - TYPICAL DETAIL NTS

NOTES:

1. STAKES SHALL BE 1"X2" WOODEN STAKES.
2. ADDITIONAL STAKES MAY BE INSTALLED ON DOWNHILL SIDE OF WATTLES, ON STEEP SLOPES OR HIGHLY EROSIVE SOILS
3. FIBER ROLLS OR WATTLES TO BE INSTALLED EVERY 10' TO 25'.

Z:\PROJECTS\104-121\0-002 LIBWC HOMER DIVERSION FISH PASSAGE\80%\SHEET16 - TESC DETAILS.DWG March 23, 2024 1:30 PM



NOT FOR CONSTRUCTION



REV.		DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
3	3/29/24		80 PERCENT DESIGN	SH	JA	CM	JA
2	11/22/23		30 PERCENT DESIGN	SH	JC	AD	JA
1	3/31/23		CONCEPTUAL DESIGN	AD	AD	JA	JA

PETERSON DAM REMOVAL

DWG. NO.: C-201

DETAILS
TESC

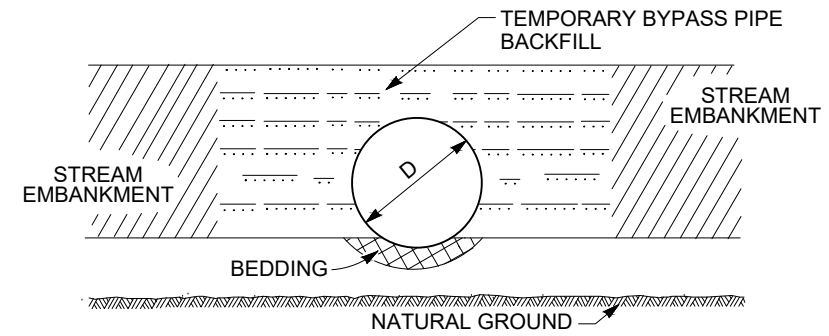
CREATED: 3/21/2024

SHEET: 12 of 15

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 GUIDELINES.

- A) 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.
- B) DEWATERING AND INSTALLATION:
INSTALL COFFERDAM AND DEWATER ISOLATED WORK AREA. ALL ISOLATION WORK AND DEWATERING ACTIVITIES SHALL BE IN ACCORDANCE WITH HIP GUIDELINES AND PROJECT SPECIFICATIONS.
- C) REWATERING:
WHEN NECESSARY PERFORM STAGED REWATERING PROCESS WITH THE RECENTLY EXCAVATED CHANNEL. PREWASH EXCAVATED CHANNEL AND DETAIN AND RELEASE TURBID WATER TO THE FLOODPLAIN RATHER THAN FISH BEARING WATER.
- D) SITE RESTORATION:
STREAMBANKS AND DISTURB AREA SHALL BE RESTORED AS NECESSARY USING ONSITE NATIVE MATERIAL AND ALL PROJECT WASTE MATERIAL REMOVED.



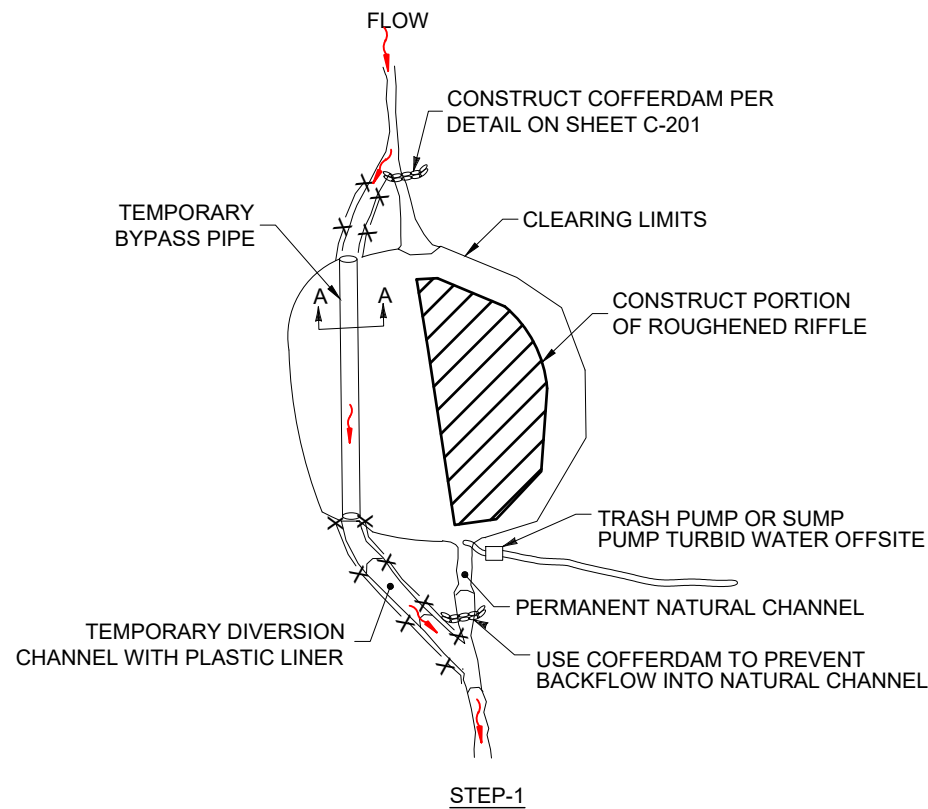
⊙ A TEMPORARY BYPASS PIPE SECTION VIEW
NTS

GENERAL FISH SALVAGE NOTES:

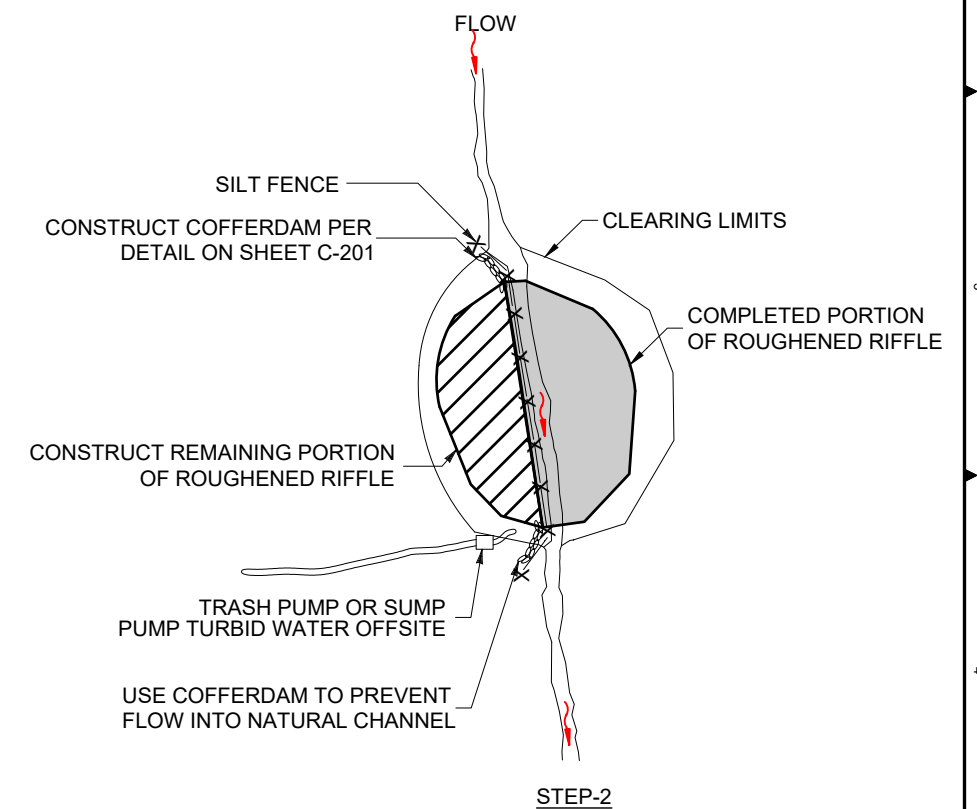
1. PROPOSED PROJECT DESIGN, CONSTRUCTION ACTIVITIES, AND MATERIALS SUBJECT TO APPROVAL BY OWNER.
2. CONTRACTOR TO PROVIDE EROSION AND SEDIMENT CONTROL PLAN PER PROJECT PLAN AND SPECIFICATIONS.
3. CONTRACTOR TO PROVIDE DEWATERING PLAN PER PROJECT PLANS AND SPECIFICATIONS.
4. THE CONTRACTOR SHALL CONSTRUCT THE RESTORATION DESIGN ELEMENTS IN ACCORDANCE WITH THE PLANS STAMPED "ISSUED FOR CONSTRUCTION" AS PROVIDED TO THE CONTRACTOR BY THE OWNER PRIOR TO CONSTRUCTION.
5. ALL WORK WITHIN THE ACTIVE CHANNEL SHALL OCCUR DURING THE APPROVED FISH WINDOW. ALL CONSTRUCTION ACTIVITIES SHALL MINIMIZE DISTURBANCE TO AND MAXIMIZE RE-USE OF EXISTING RIPARIAN VEGETATION.
6. ALL TEMPORARY ACCESS ROUTES SHALL BE LAID OUT TO MINIMIZE DISTURBANCE TO EXISTING VEGETATION AND FINAL LOCATION WILL BE VERIFIED BY OWNER.
7. 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 GUIDELINES.
8. OWNER SHALL BE RESPONSIBLE FOR FISH SALVAGE EFFORTS.
9. CONSTRUCTION WORK IN THE IMMEDIATE VICINITY OF FISH SALVAGE EFFORTS SHALL BE DELAYED (TYPICALLY 2 TO 24 HOURS) DURING SALVAGE. DELAYS MAY BE LONGER IN SOME CASES.

ROUGHENED RIFFLE BYPASS NOTES:

1. COORDINATE FISH SALVAGE WITH OWNER'S REPRESENTATIVE.
2. USE PLASTIC LINER ALONG THE ENTIRE LENGTH AND WIDTH OF THE TEMPORARY DIVERSION CHANNEL.
3. ALL PIPES SHALL BE SIZED TO HANDLE A MINIMUM OF TWICE THE SEASONAL BASEFLOW AS DIRECTED BY THE ENGINEER..
4. CONSTRUCT CHANNEL AT A MINIMUM GRADE OF 0.5 PERCENT. DO NOT CONSTRUCT WITH LONGITUDINAL JOINTS IN PLASTIC LINER. BURY THE UPSTREAM EDGE OF THE LINER A MINIMUM OF 6 INCHES DEEP AND SECURE WITH SANDBAGS.
5. ALL PUMPS SHALL BE SCREENED FOR FISH EXCLUSION PER NMFS ANADROMOUS SALMONID PASSAGE DESIGN MANUAL (NMFS 2022) OR MOST CURRENT.
6. ALL WORK WITHIN THE ACTIVE CHANNEL SHALL OCCUR WITHIN THE ALLOWABLE FISH WINDOW (JULY 1 - SEPTEMBER 30)



STEP-1



STEP-2

⊙ 1 ROUGHENED RIFFLE BYPASS
NTS

Z:\PROJECTS\104-121\0-002 LIBWC HOMER DIVERSION FISH PASSAGE\80%\SHEET17 - DEWATERING & STREAM BYPASS DETAILS.DWG 1:43 PM March 23, 2024 PLOT DETAILS: HARVEY SPENCER



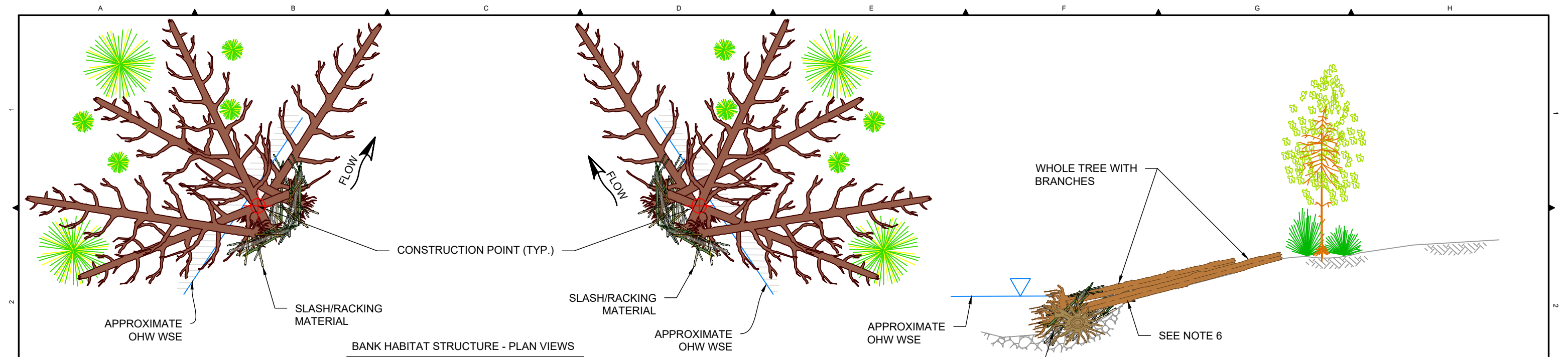
NOT FOR CONSTRUCTION



REV.		DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
3		3/29/24	80 PERCENT DESIGN	SH	JA	CM	JA
2		11/22/23	30 PERCENT DESIGN	SH	JC	AD	JA
1		3/31/23	CONCEPTUAL DESIGN	AD	AD	JA	JA

PETERSON DAM REMOVAL
DETAILS
FISH SALVAGE, DEWATERING, AND REWATERING

DWG. NO.:	C-202
CREATED:	3/21/2024
SHEET:	13 of 15



BANK HABITAT STRUCTURE - PLAN VIEWS

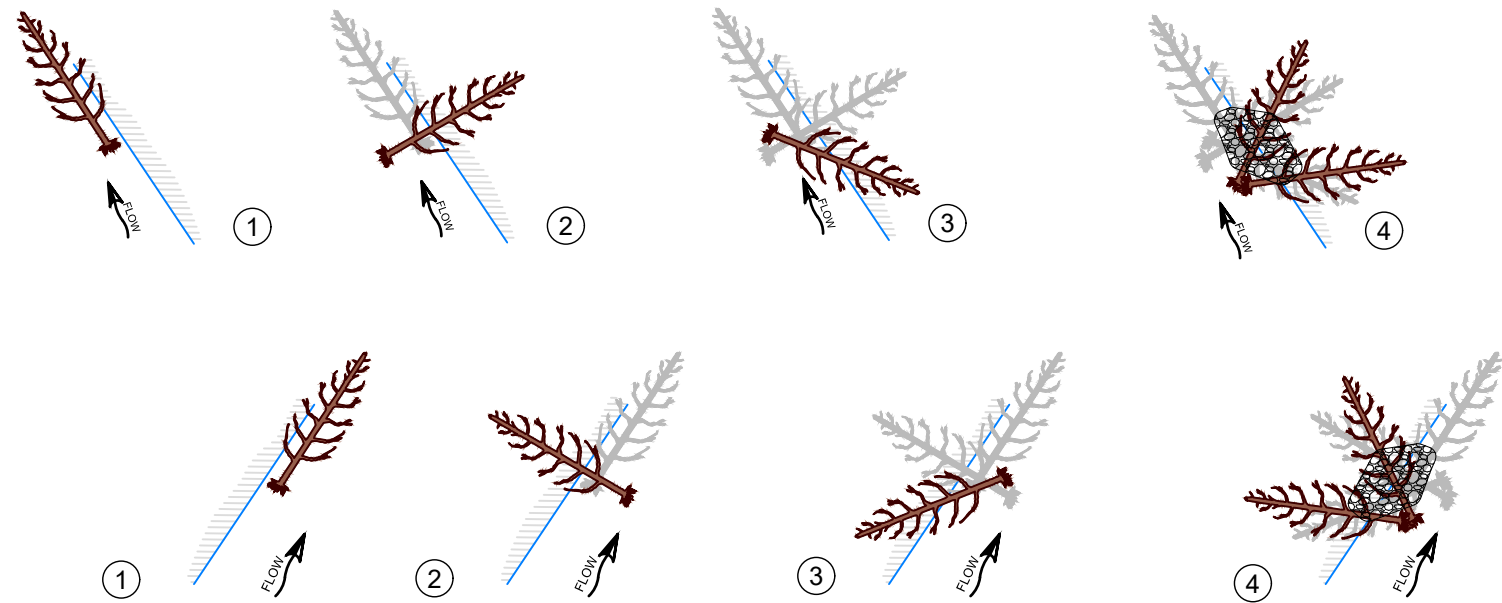
BANK HABITAT STRUCTURE - SECTION VIEW

BANK HABITAT STRUCTURE NOTES:

1. INSTALL TEMPORARY COFFERDAM TO ISOLATE WORK AREA.
2. FISH SALVAGE TO BE SUPERVISED BY QUALIFIED FISH BIOLOGIST.
3. ANY SPOILS FROM EXCAVATION SHALL BE USED TO BACKFILL STRUCTURE AS CONSTRUCTION PROGRESSES OR PLACED AS DIRECTED BY ENGINEER OR OWNER'S REPRESENTATIVE. MATERIAL SHALL BE COMPACTED WITH EXCAVATOR BUCKET.
4. APPROXIMATE OHW WSE 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.
5. ADD SLASH/RACKING MATERIAL TO HELP STABILIZE KEY MEMBERS AND FILL INTERSTITIAL SPACE. RACKING MATERIAL MAY CONSIST OF TOPS AND LIMBS OF WHOLE TREES CLEARED EXISTING TREE VEGETATION, AND/OR SMALL WHOLE TREES WITH ROOTWADS.
6. TO PLACE ROOTWAD IN WETTED CHANNEL, MINIMAL TRENCHING OUTSIDE THE WETTED CHANNEL MAY BE REQUIRED. DETERMINATION WILL BE MADE IN THE FIELD AND AS DIRECTED BY ENGINEER OR OWNER'S REPRESENTATIVE.

CONSTRUCTION QUANTITIES:

COMPONENT	DESCRIPTION	QUANTITY
WHOLE TREE WITH ROOTWAD	18" MIN. DBH, 40' MIN, 4' MIN ROOTWAD	5
SLASH/RACKING MATERIAL	MISC. (2-10" DBH, 6-16')	20 CY

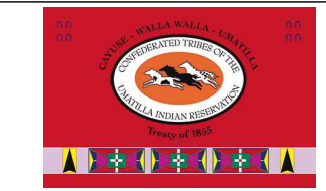


BANK HABITAT STRUCTURE - LOG PLACEMENT SEQUENCING

Z:\PROJECTS\104-121\0-002 LIBWC HOMER DIVERSION FISH PASSAGE\80%\SHEET18 - LARGE WOOD DETAILS.DWG March 20, 2024 1:45 PM

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

NOT FOR CONSTRUCTION



REV.		DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
3		3/29/24	80 PERCENT DESIGN	SH	JA	CM	JA
2		11/22/23	30 PERCENT DESIGN	SH	JC	AD	JA
1		3/31/23	CONCEPTUAL DESIGN	AD	AD	JA	JA

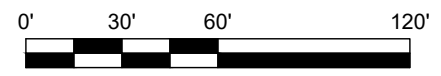
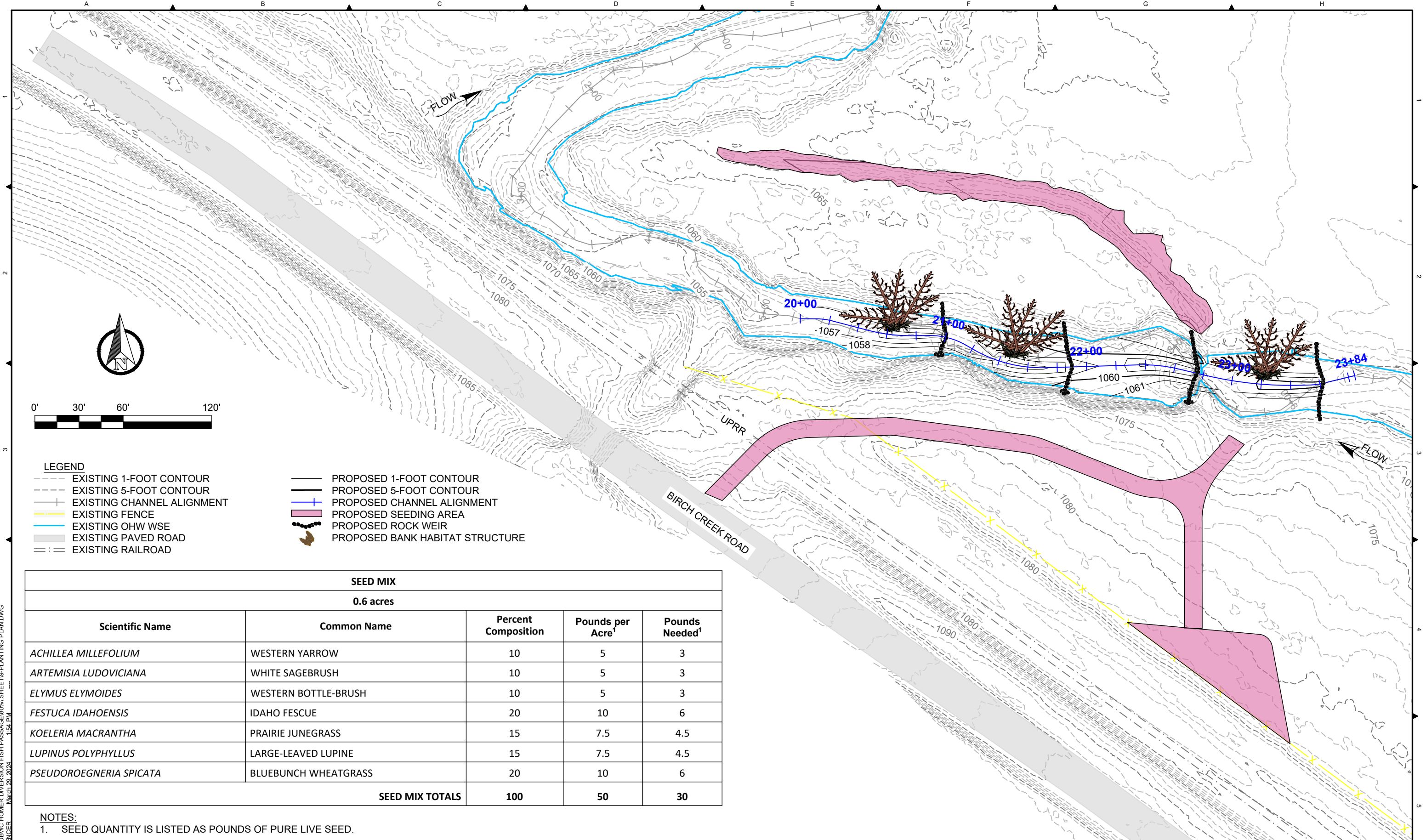
PETERSON DAM REMOVAL

**DETAILS
LARGE WOOD**

DWG. NO.: **C-301**

CREATED: 3/21/2024

SHEET: 14 of 15



LEGEND	
	EXISTING 1-FOOT CONTOUR
	EXISTING 5-FOOT CONTOUR
	EXISTING CHANNEL ALIGNMENT
	EXISTING FENCE
	EXISTING OHW WSE
	EXISTING PAVED ROAD
	EXISTING RAILROAD
	PROPOSED 1-FOOT CONTOUR
	PROPOSED 5-FOOT CONTOUR
	PROPOSED CHANNEL ALIGNMENT
	PROPOSED SEEDING AREA
	PROPOSED ROCK WEIR
	PROPOSED BANK HABITAT STRUCTURE

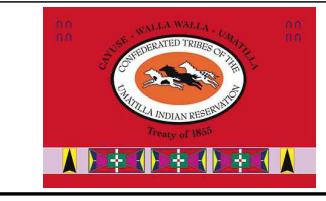
SEED MIX				
0.6 acres				
Scientific Name	Common Name	Percent Composition	Pounds per Acre ¹	Pounds Needed ¹
<i>ACHILLEA MILLEFOLIUM</i>	WESTERN YARROW	10	5	3
<i>ARTEMISIA LUDOVICIANA</i>	WHITE SAGEBRUSH	10	5	3
<i>ELYMUS ELYMOIDES</i>	WESTERN BOTTLE-BRUSH	10	5	3
<i>FESTUCA IDAHOENSIS</i>	IDAHO FESCUE	20	10	6
<i>KOELERIA MACRANTHA</i>	PRAIRIE JUNEGRASS	15	7.5	4.5
<i>LUPINUS POLYPHYLLUS</i>	LARGE-LEAVED LUPINE	15	7.5	4.5
<i>PSEUDOROEGNERIA SPICATA</i>	BLUEBUNCH WHEATGRASS	20	10	6
SEED MIX TOTALS		100	50	30

NOTES:
 1. SEED QUANTITY IS LISTED AS POUNDS OF PURE LIVE SEED.

Z:\PROJECTS\104-121\0-002\UBWC_HOMER_DIVERSION_FISH_PASSAGE\80%\SHEET\9-PLANTING_PLAN.DWG March 20, 2024 1:54 PM PLOT DETAILS: HARVEY SPENCER

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

NOT FOR CONSTRUCTION



REV.	DATE	REVISION DESCRIPTION	DRW	ENG	CHK	APP
3	3/29/24	80 PERCENT DESIGN	SH	JA	CM	JA
2	11/22/23	30 PERCENT DESIGN	SH	JC	AD	JA
1	3/31/23	CONCEPTUAL DESIGN	AD	AD	JA	JA

PETERSON DAM REMOVAL
REVEGETATION PLAN

DWG. NO.:
C-401
 CREATED: 3/21/2024
 SHEET: 15 of 15

APPENDIX B
ENGINEERING ANALYSES



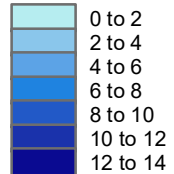
HYDRAULIC MODELING OUTPUTS





Legend

Depth (in feet)



Existing Dam Structure



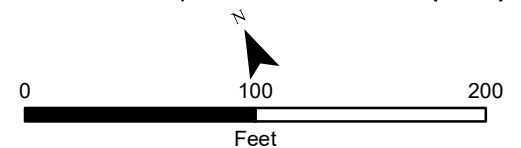
Umatilla Basin
WATERSHED COUNCIL

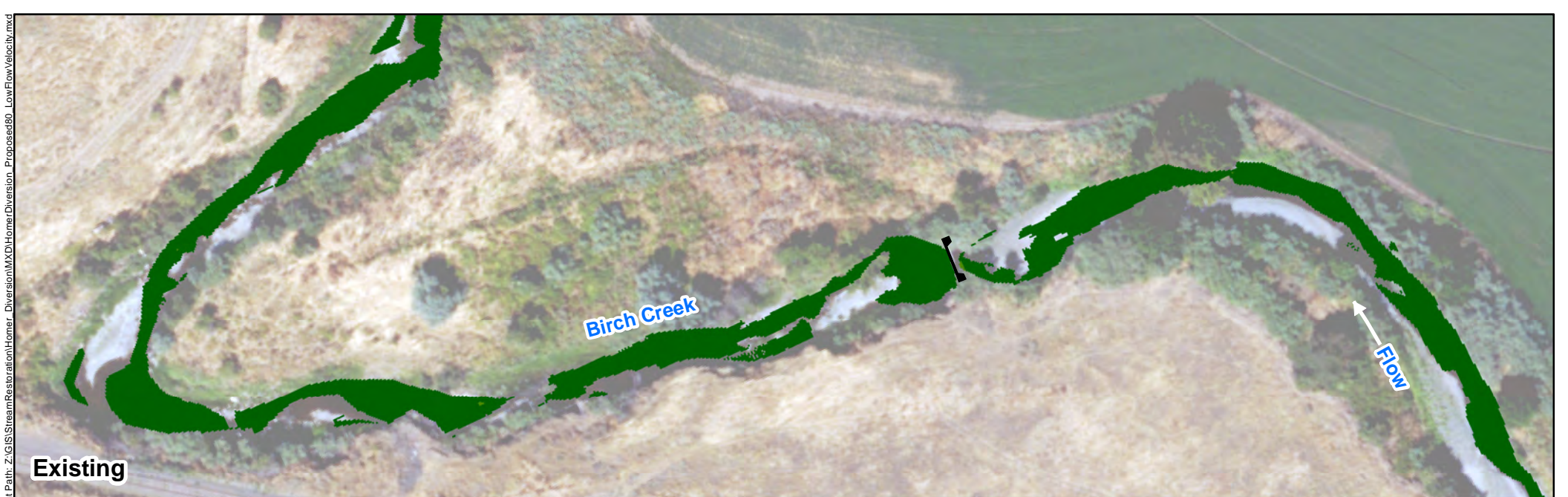


TETRA TECH

NOT FOR CONSTRUCTION

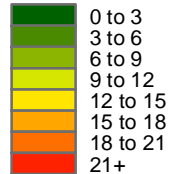
Peterson Dam Removal
Hydraulic Modeling Comparison of Existing vs Proposed
Inundation Depth - Low Fish Flow (3 cfs)





Legend

Velocity (in feet per second)



Existing Dam Structure



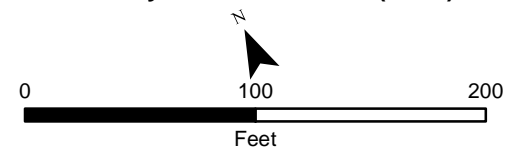
Umatilla Basin
WATERSHED COUNCIL



TETRA TECH

NOT FOR CONSTRUCTION

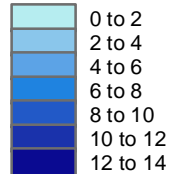
Peterson Dam Removal Hydraulic Modeling Comparison of Existing vs Proposed Velocity - Low Fish Flow (3 cfs)





Legend

Depth (in feet)

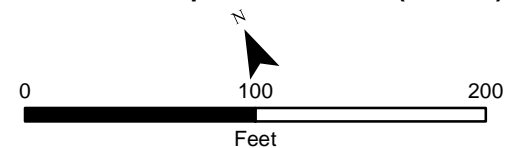


Existing Dam Structure



NOT FOR CONSTRUCTION

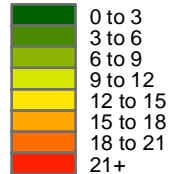
**Peterson Dam Removal
Hydraulic Modeling Comparison of Existing vs Proposed
Inundation Depth - OHW Flow (375 cfs)**





Legend

Velocity (in feet per second)



Existing Dam Structure



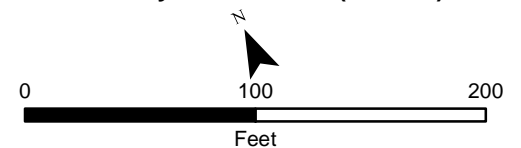
Umatilla Basin
WATERSHED COUNCIL



TETRA TECH

NOT FOR CONSTRUCTION

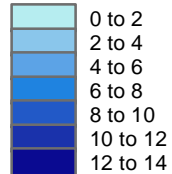
Peterson Dam Removal
Hydraulic Modeling Comparison of Existing vs Proposed
Velocity - OHW Flow (375 cfs)





Legend

Depth (in feet)

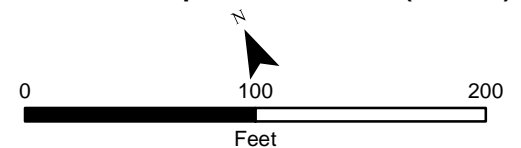


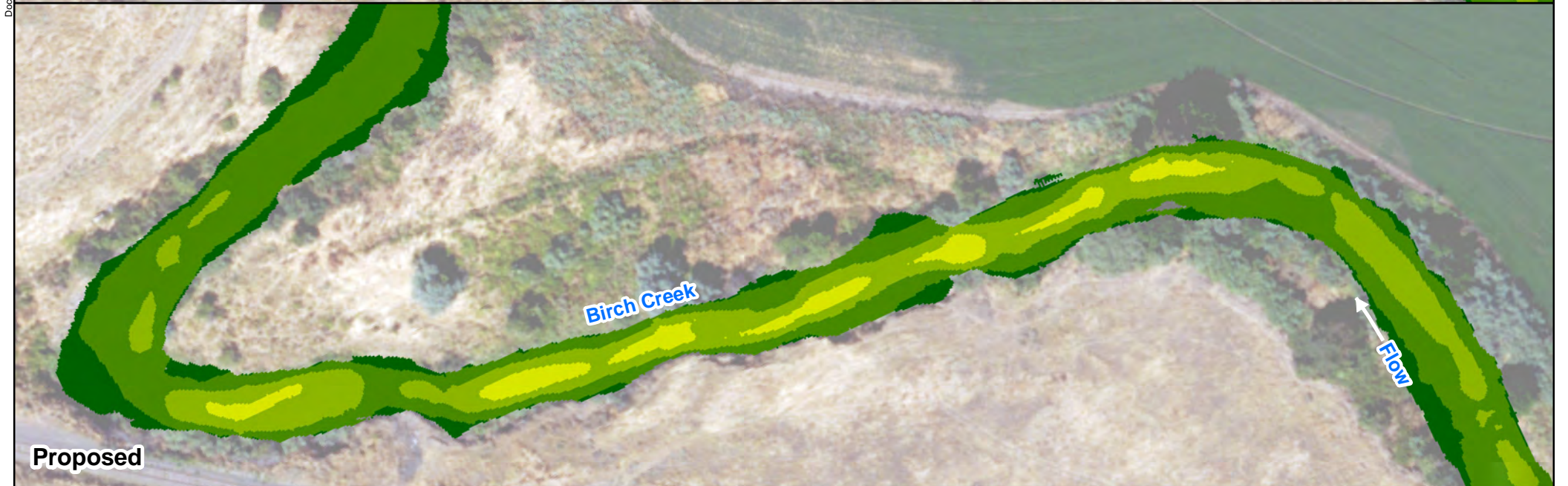
Existing Dam Structure



NOT FOR CONSTRUCTION

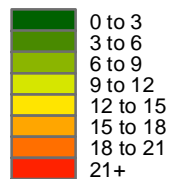
**Peterson Dam Removal
Hydraulic Modeling Comparison of Existing vs Proposed
Inundation Depth - 2-Year Flow (573 cfs)**





Legend

Velocity (in feet/second)



Existing Dam Structure



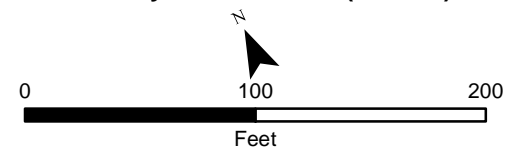
Umatilla Basin
WATERSHED COUNCIL



TETRA TECH

NOT FOR CONSTRUCTION

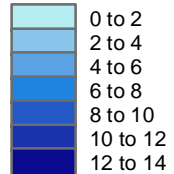
Peterson Dam Removal
Hydraulic Modeling Comparison of Existing vs Proposed
Velocity - 2-Year Flow (573 cfs)





Legend

Depth (in feet)

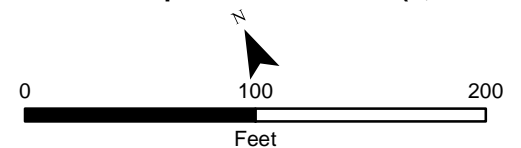


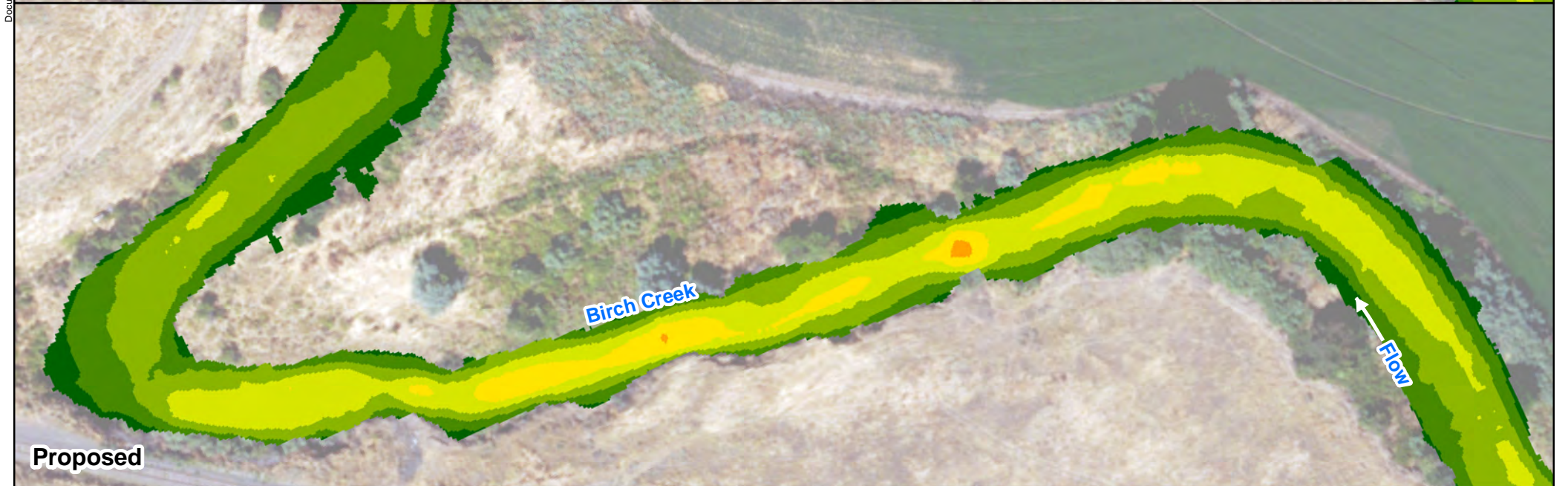
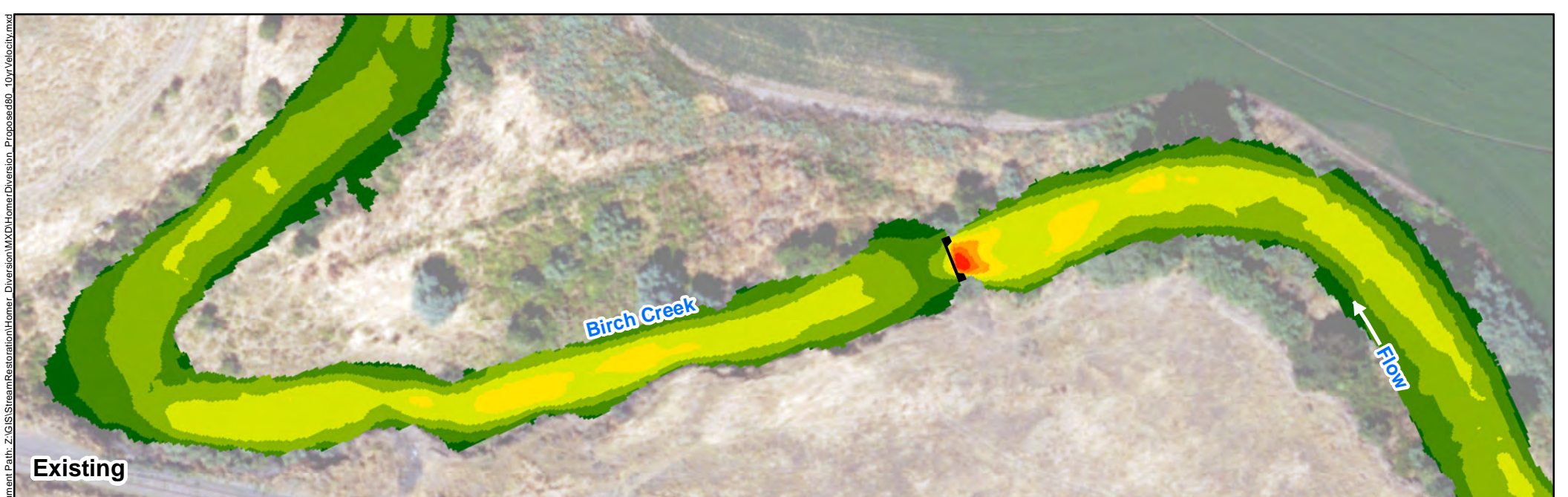
Existing Dam Structure



NOT FOR CONSTRUCTION

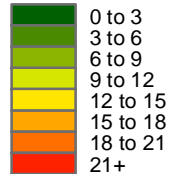
Peterson Dam Removal
Hydraulic Modeling Comparison of Existing vs Proposed
Inundation Depth - 10-Year Flow (1,570 cfs)





Legend

Velocity (in feet per second)



Existing Dam Structure



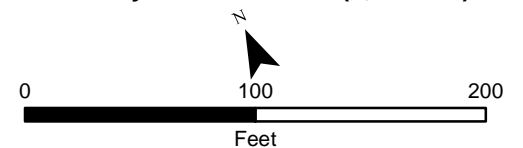
Umatilla Basin
WATERSHED COUNCIL

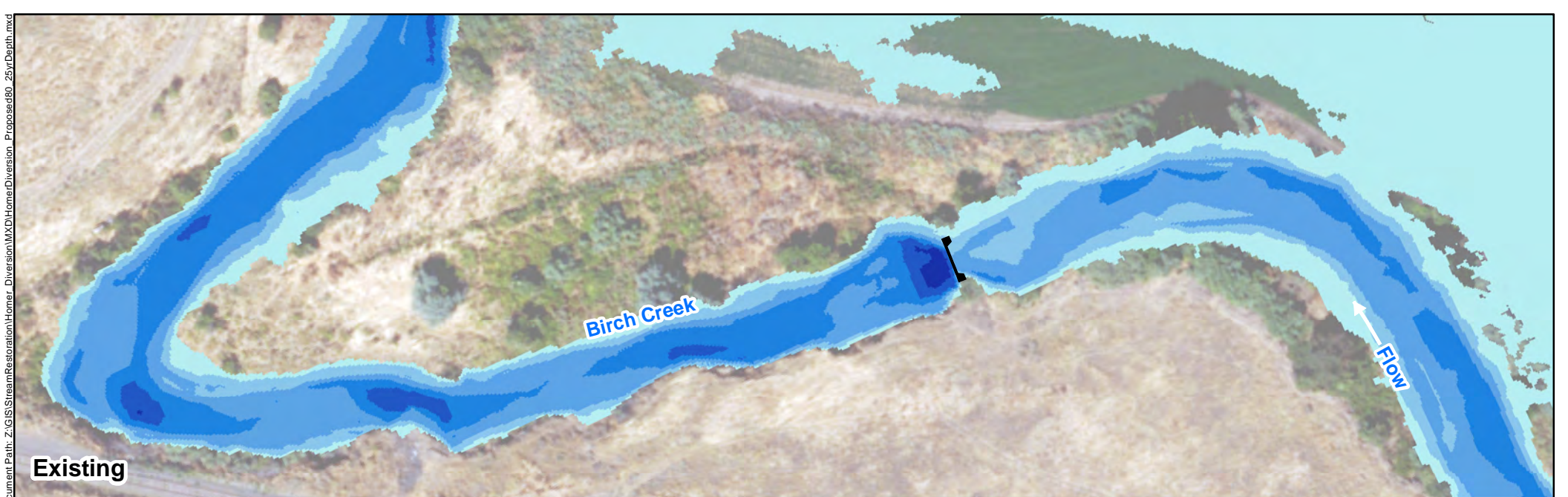


TETRA TECH

NOT FOR CONSTRUCTION

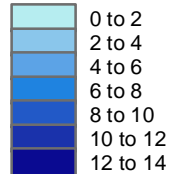
Peterson Dam Removal
Hydraulic Modeling Comparison of Existing vs Proposed
Velocity - 10-Year Flow (1,570 cfs)





Legend

Depth (in feet)



Existing Dam Structure



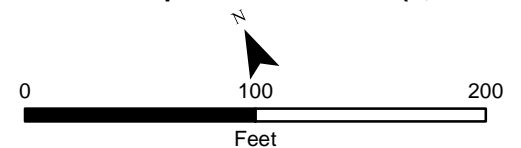
Umatilla Basin
WATERSHED COUNCIL

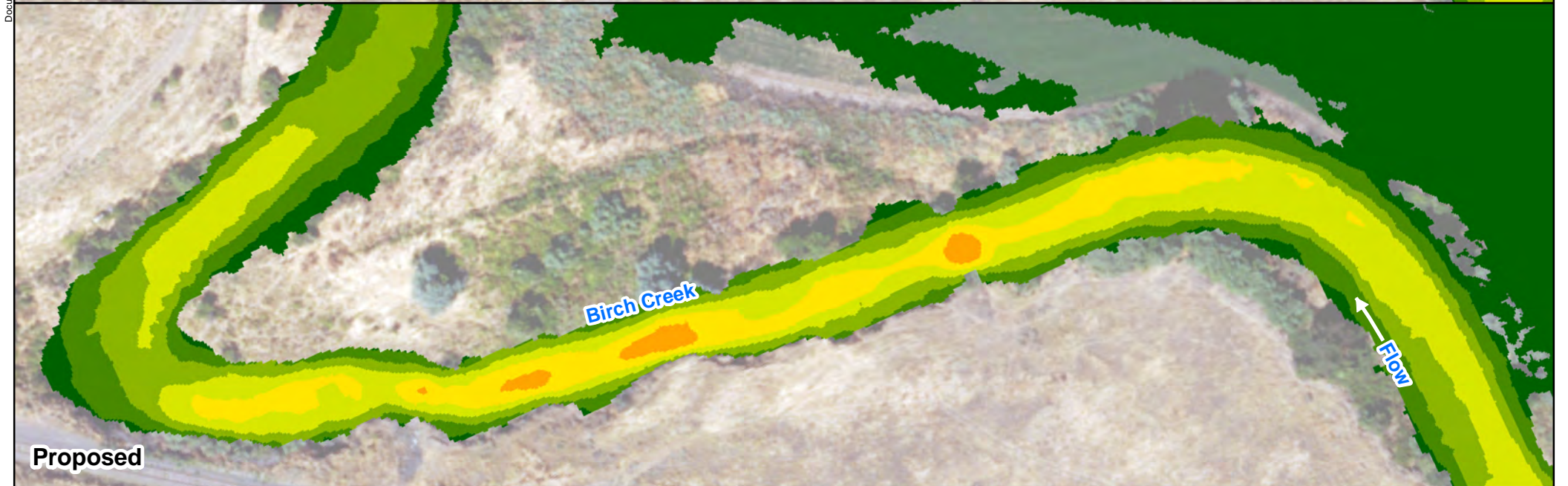
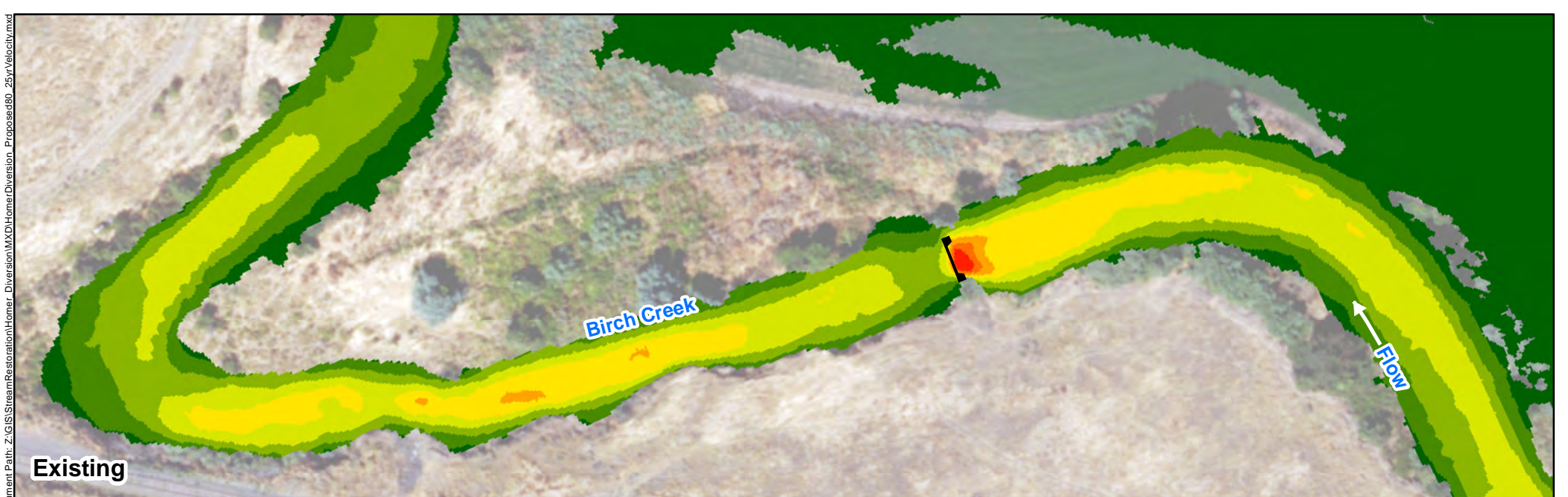


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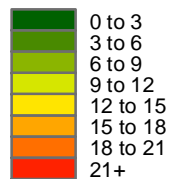
Peterson Dam Removal
Hydraulic Modeling Comparison of Existing vs Proposed
Inundation Depth - 25-Year Flow (2,360 cfs)





Legend

Velocity (in feet per second)



Existing Dam Structure



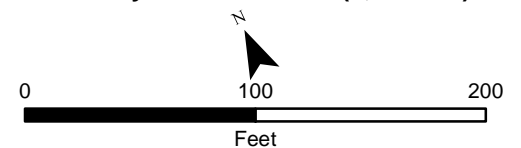
Umatilla Basin
WATERSHED COUNCIL

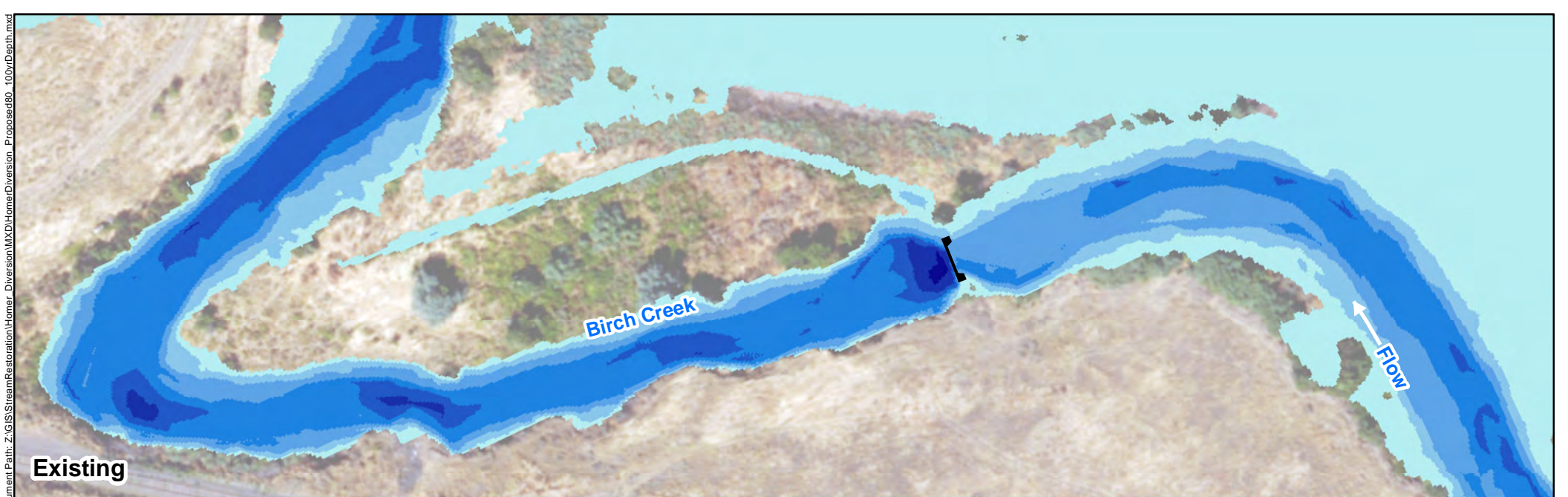


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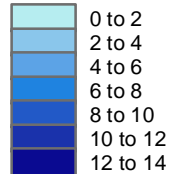
Peterson Dam Removal
Hydraulic Modeling Comparison of Existing vs Proposed
Velocity - 25-Year Flow (2,360 cfs)





Legend

Depth (in feet)



Existing Dam Structure



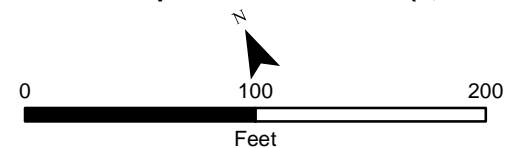
Umatilla Basin
WATERSHED COUNCIL

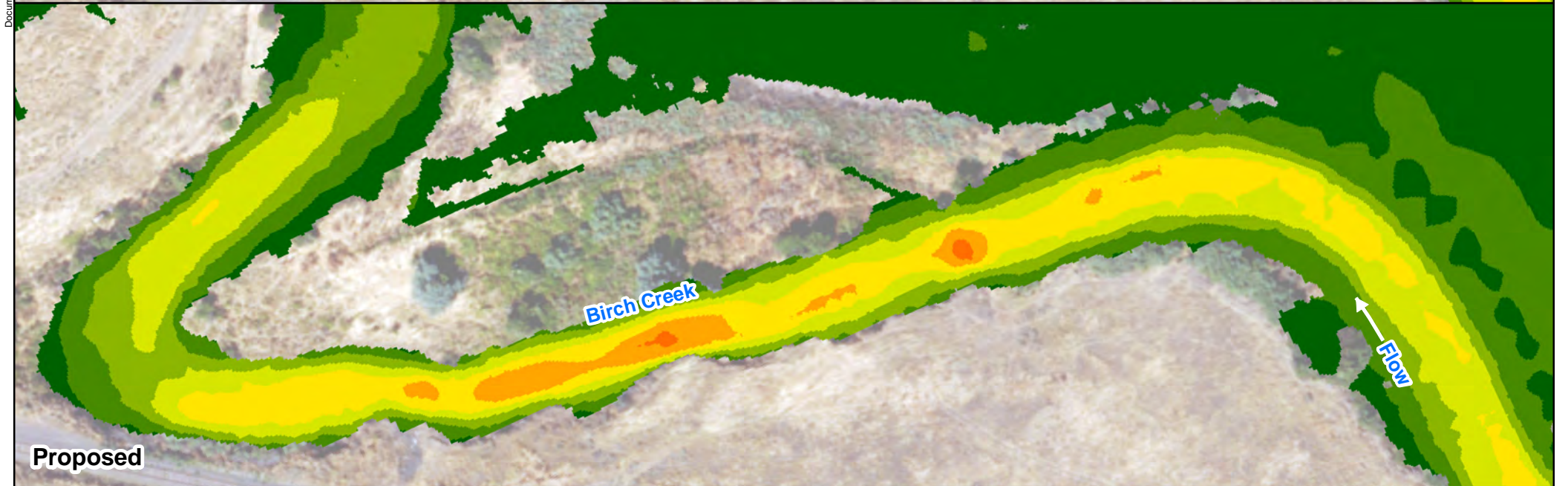
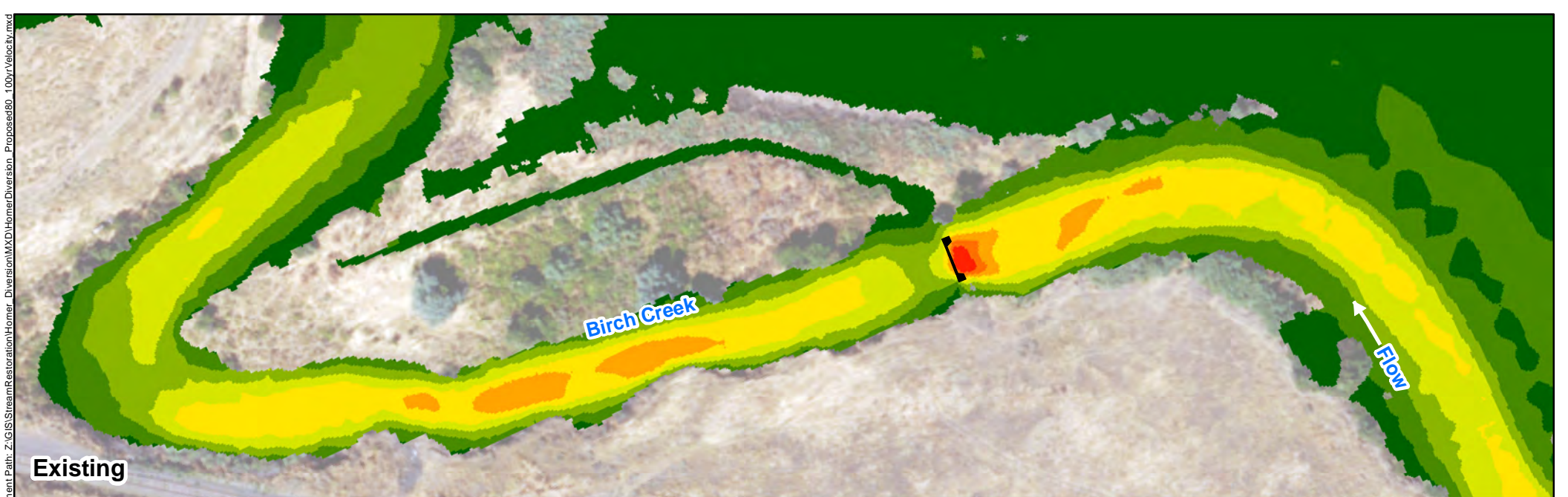


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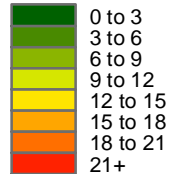
Peterson Dam Removal
Hydraulic Modeling Comparison of Existing vs Proposed
Inundation Depth - 100-Year Flow (3,800 cfs)





Legend

Velocity (in feet per second)



Existing Dam Structure



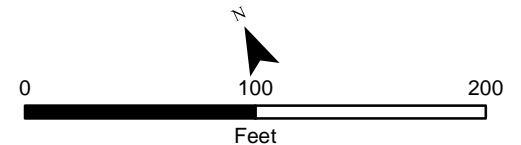
Umatilla Basin
WATERSHED COUNCIL



TETRA TECH


NOT FOR CONSTRUCTION

Peterson Dam Removal
Hydraulic Modeling Comparison of Existing vs Proposed
Velocity - 100-Year Flow (3,800 cfs)



BOULDER SIZING CALCULATIONS



 TETRA TECH	PROJECT Peterson Dam Removal				Project Number 194-1210-0002
	SUBJECT Boulder Stability Calculations				Scale NA
	Designed By SH	Date 3/25/2024	Checked By JA	Date 3/29/2024	Sheet No: 1 of 2

Objective: Determine Boulder Size for Step Pool Boulder Weirs

References: HRB (Highway Research Board). 1970. Tentative Design Procedure for Riprap-Lined Channels. National Academy of Sciences, National Cooperative Highway Research Program, Report 108.
 USBR (United States Department of the Interior Bureau of Reclamation, 2007. Rock Ramp Design Guidelines. https://www.usbr.gov/tsc/techreferences/mands/mands-pdfs/RockRampDesignGuidelines_09-2007_508.pdf

Define Input Parameters

Average Boundary Shear = 7.2 psf Based on 2D HECRAS model
 Boulder Size (D50) = 3.0 ft
 Boulder Weight = 1.2 tons

Calculate Minimum Boulder Size Using HRB Method

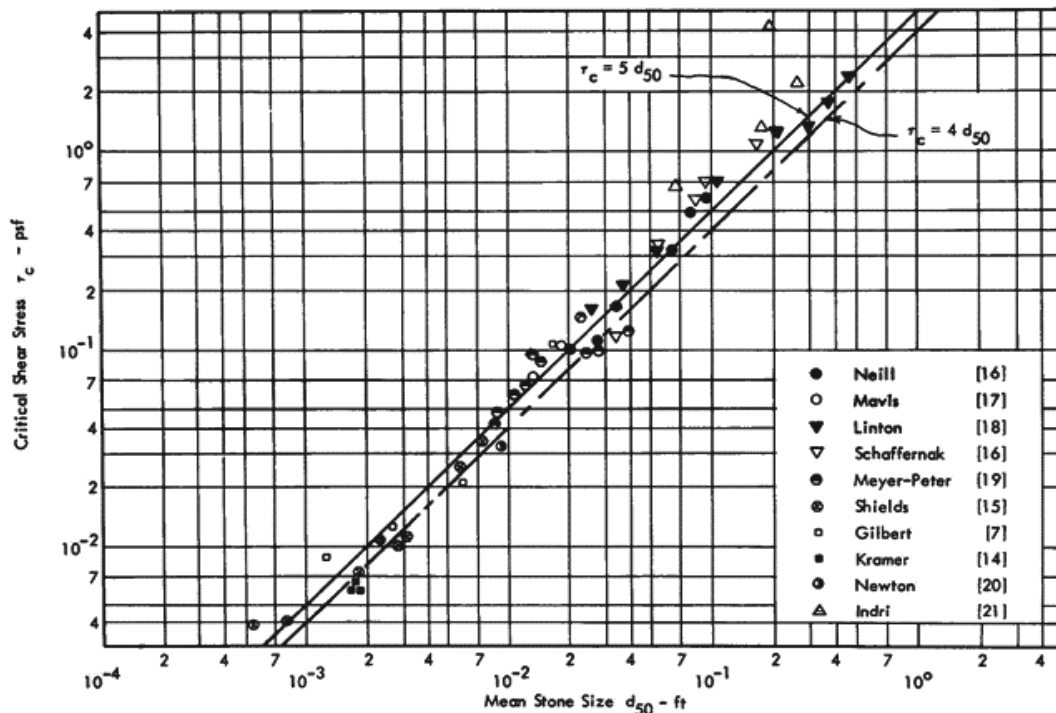


Figure 8 Critical boundary shear at incipient movement of riprap in terms of effective size

Based on the figure above, a linear relationship is observed between boulder diameter and the boundary shear stress required to move the material. The below relationship is recommended by HRB for stable material:

$$\tau_c = 4 d_{50}$$

Using this relationship for boundary shear, the minimum boulder size for stability is equal to 1.80 ft

Conclusion

Safety Factor = 3 / 1.8 = 1.7 OK

The selected boulder size is sufficient for the average boundary shear anticipated in the stream simulation channel segment for the 100-yr peak flow adjusted for climate change (100-yr 2080).



TETRA TECH

PROJECT		Peterson Dam Removal		Project Number		194-1210-0002	
SUBJECT		Boulder Stability Calculations		Scale		NA	
Designed By	Date	Checked By	Date	Sheet No:			
SH	3/25/2024	JA	3/29/2024	2		of 2	

Objective:	Determine Boulder Size for Step Pool Boulder Weirs
References:	HRB (Highway Research Board). 1970. Tentative Design Procedure for Riprap-Lined Channels. National Academy of Sciences, National Cooperative Highway Research Program, Report 108. USBR (United States Department of the Interior Bureau of Reclamation, 2007. Rock Ramp Design Guidelines. https://www.usbr.gov/tsc/techreferences/mands/mands-pdfs/RockRampDesignGuidelines_09-2007_508.pdf

Define Input Parameters

D_s = boulder Size (D50) =	3	ft	
θ_o = longitudinal bed slope =	0.015	ft/ft	Based on channel design
θ_1 = bank side slope	0.33	ft/ft	Based on channel design
ϕ = angle of repose =	42	deg	Based on USBR guideline
λ = angle of vertical stream line deviation from horizontal =	0	deg	Based on USBR guideline
τ_o = bed shear stress =	7.2	psf	Based on 2D HECRAS model

Calculate Safety Factor of Proposed Boulder Size Using USBR Method

Use Equation 7-1 from USBR:

$$SF = \frac{a_\theta \cdot \tan(\phi)}{\eta_1 \cdot \tan(\phi) + \sqrt{1 - a_\theta^2} \cdot \cos(\beta)}$$

$$a_\theta = \sqrt{\cos^2(\theta_1) - \sin^2(\theta_o)}$$

$$\theta = \tan^{-1}\left(\frac{\sin(\theta_o)}{\sin(\theta_1)}\right)$$

$$\eta_1 = \eta_o \left[\frac{\left(\frac{A}{B}\right) + \sin(\lambda + \beta + \theta)}{1 + \left(\frac{A}{B}\right)} \right] \cong \eta_o \left[\frac{1 + \sin(\lambda + \beta + \theta)}{2} \right]$$

$$\eta_o \cong \frac{18 \cdot \tau_o}{(\gamma_s - \gamma_w) \cdot D_s}$$

$$\beta = \tan^{-1} \left(\frac{\cos(\lambda + \theta)}{\frac{(A+B) \cdot \sqrt{1 - a_\theta^2}}{B \cdot \eta_o \cdot \tan(\phi)} + \sin(\lambda + \theta)} \right) \cong \tan^{-1} \left(\frac{\cos(\lambda + \theta)}{\frac{2 \cdot \sqrt{1 - a_\theta^2}}{\eta_o \cdot \tan(\phi)} + \sin(\lambda + \theta)} \right)$$

$$A = \left(\frac{l_4}{l_2}\right) \cdot \left(\frac{F_L}{F_s}\right)$$

$$B = \left(\frac{l_3}{l_4}\right) \cdot \left(\frac{F_D}{F_s}\right)$$

$$\frac{A}{B} \approx 1$$

θ = down-slope angle including bed and bank slope;
 η_o = shear force acting on the rock;
 β = correction for side slope, bed slope, and secondary currents;
 η_1 = correction for side slope, bed slope, and secondary currents; and
 $l_{1,2,3,4}$ = moment arms between riprap particles (canceled through lift and drag assumptions).
 A, B = lever arm ratios. The ratio A/B is assumed to equal 1.

$\eta_o = 0.4896$ $\beta = 34.836$ $\eta_1 = 0.388$ **SF = 1.41 OK**

Conclusion

Using the USBR Method, the selected boulder size provides a sufficient Safety Factor for stability in the stream simulation channel segment for the 100-yr peak flow adjusted for climate change (100-yr 2080).

SCOUR CALCULATIONS



Summary of Scour Calculations

Project: Peterson Dam Removal
 Date: 2/25/2024
 Computed: JA
 Checked: SH

Resources:

NRCS, 2007. Technical Supplement 14B, Scour Calculations

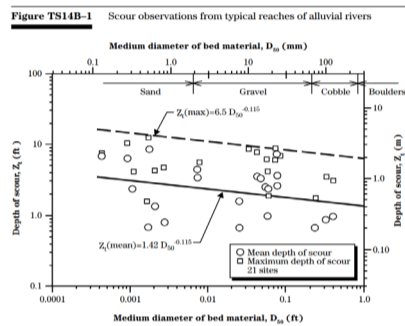
Objectives:

Calculate General Scour

Design Assumptions:

Design 10yr	1,570 cfs
Flow Width at Design Discharge W _f	50 ft
Median Size of Bed Material D ₅₀	52 mm

NRCS Technical Supplement 14B



Blodgett (1986)

K _{mean}	1.42
K _{max}	6.5
Z _t (mean)	1.0 ft
Z _t (max)	4.2 ft

$$z_t(\text{mean}) = K D_{50}^{-0.1} \quad (\text{eq. TS14B-21})$$

$$z_t(\text{max}) = K D_{50}^{-0.11} \quad (\text{eq. TS14B-22})$$

Average	2.6 ft
---------	--------

where:

- z_t(mean) = best fit curve (fig. TS14B-1) for observed scour depth, ft
- z_t(max) = enveloping curve (fig. TS14B-1) for maximum scour depth, ft
- K = coefficient = 1.42 and 6.5 for z_t mean and z_t max, respectively (0.84 and 3.8 for SI units), and D₅₀ is the median size of the bed material, ft (mm)

NRCS Technical Supplement 14B

Pemberton and Lara (1984)

Lacey (1931)

K	0.097
Straight	
a	1/3
b	0
c	-1/6
Z _t	0.6 ft

$$z_t = K Q_d^a W_f^b D_{50}^c \quad (\text{eq. TS14B-23})$$

where:

- z_t = maximum scour depth at the cross section or reach in question, ft (m)
- K = coefficient (table TS14B-8)
- Q_d = design discharge, ft³/s (m³/s)
- W_f = flow width at design discharge, ft (m)
- D₅₀ = median size of bed material (mm)
- a, b, c = exponents (table TS14B-8)

Blech (1970)

K	0.53
Straight	
a	2/3
b	-2/3
c	-0.1092
Z _t	3.4 ft

Z _t (avg)	2.0 ft
----------------------	--------

Table TS14B-8 Constants for Lacey and Blech relations, U.S. units (D₅₀ in mm)

Condition	Lacey				Blech			
	K	a	b	c	K	a	b	c
Straight reach	0.097	1/3	0	-1/6	0.530	2/3	-2/3	-0.1092
Moderate bend	0.195	1/3	0	-1/6	0.530	2/3	-2/3	-0.1092
Severe bend	0.292	1/3	0	-1/6	0.530	2/3	-2/3	-0.1092
Right angle bend	0.389	1/3	0	-1/6	1.105	2/3	-2/3	-0.1092
Vertical rock wall	0.487	1/3	0	-1/6				

Project: Peterson Dam Removal
 Date: 2/25/2024
 Computed: JA
 Checked: SH

Resources:
 U.S. Department of the Interior Bureau of Reclamation, Rock Weir Design Guidance (2016)

Objectives: Calculate General Scour

BOR 2016, SCOUR DEPTH AS A FUNTION OF MEAN-WEIR HEIGHT CHECK

Birch Creek Mean Weir Height (FT)		0.75
Boulder Diameter (FT)		3.00
PREDICTED SOUR DEPTH (FT)		3.2
Depth to base of footer rock (FT)		4.8
	Δ , (Delta)	1.7
	FOS	1.5

Check if depth to base of footer is greater than scour depth:	Good-to-go
--	-------------------

6.4.2.6 Scour-Depth as a Function of Mean-Weir Height

Design of rock weirs to prevent scour from undermining the structure foundation requires a universal design methodology. It was shown that approaches proposed by Scurlock (2009) and subsequent analyses using the laboratory data are limited to ranges spanned by the test matrix. Reclamation (2009b) methods may prove to apply well in prototype scenarios, but currently, not enough data exist to determine if they apply beyond the two sites considered. A method incorporating a factor of safety and relying on prediction of scour depth with a simple relationship derived from a readily determined parameter offers a good design option provided the current level of available data. Such a methodology should apply to all laboratory and prototype cases available in order to provide designers with the most reliable tool to prevent structure failure, regardless of structure type and design choices such as interstitial flow.

The maximum scour for each laboratory configuration tested was identified and tabulated with the field data scour depths and mean weir height of each geometry. The ratio of the maximum scour depth to the mean weir height was determined for each case and data are provided in Table 6.4. On average, the scour depth was found to be 3.4 times the mean weir height of the structure. The predicted scour depth (y_{SE}) at the 95-percent confidence interval was 4.2 times the mean weir height (z_i), which mathematically can be expressed as:

$$y_{SE} = 4.2z_i \quad (6.25)$$

Rock Weir Design Guidance

Table 6.4 – Scour depth as a function of mean weir drop height.

Test	Shape	y_{SE} M	z_i m	y_{SE}/z_i
29	A	0.41	0.09	4.70
38	A	0.36	0.09	3.83
44	A	0.40	0.09	4.17
22	U	0.13	0.10	1.23
25	U	0.54	0.09	5.81
35	U	0.24	0.10	2.41
31	W	0.45	0.09	4.96
41	W	0.32	0.10	3.16
50	W	0.35	0.11	3.19
Entiat RM 5.1	U	1.25	0.70	1.78
East Fork Salmon 7-8	U	1.43	0.71	2.01

INCIPIENT MOTION CALCULATIONS



Incipient Motion - Existing Conditions Birch Creek

	% Finer	Average Streambed Gravel (mm)	Average Streambed Gravel (in)	Critical Shear (lb/sq ft)
D10	10	NA	NA	NA
D16	16	14.0	0.6	NA
D50	50	25.0	1.0	0.40
D84	84	45.0	1.8	0.76
D90	90	57.0	2.2	NA

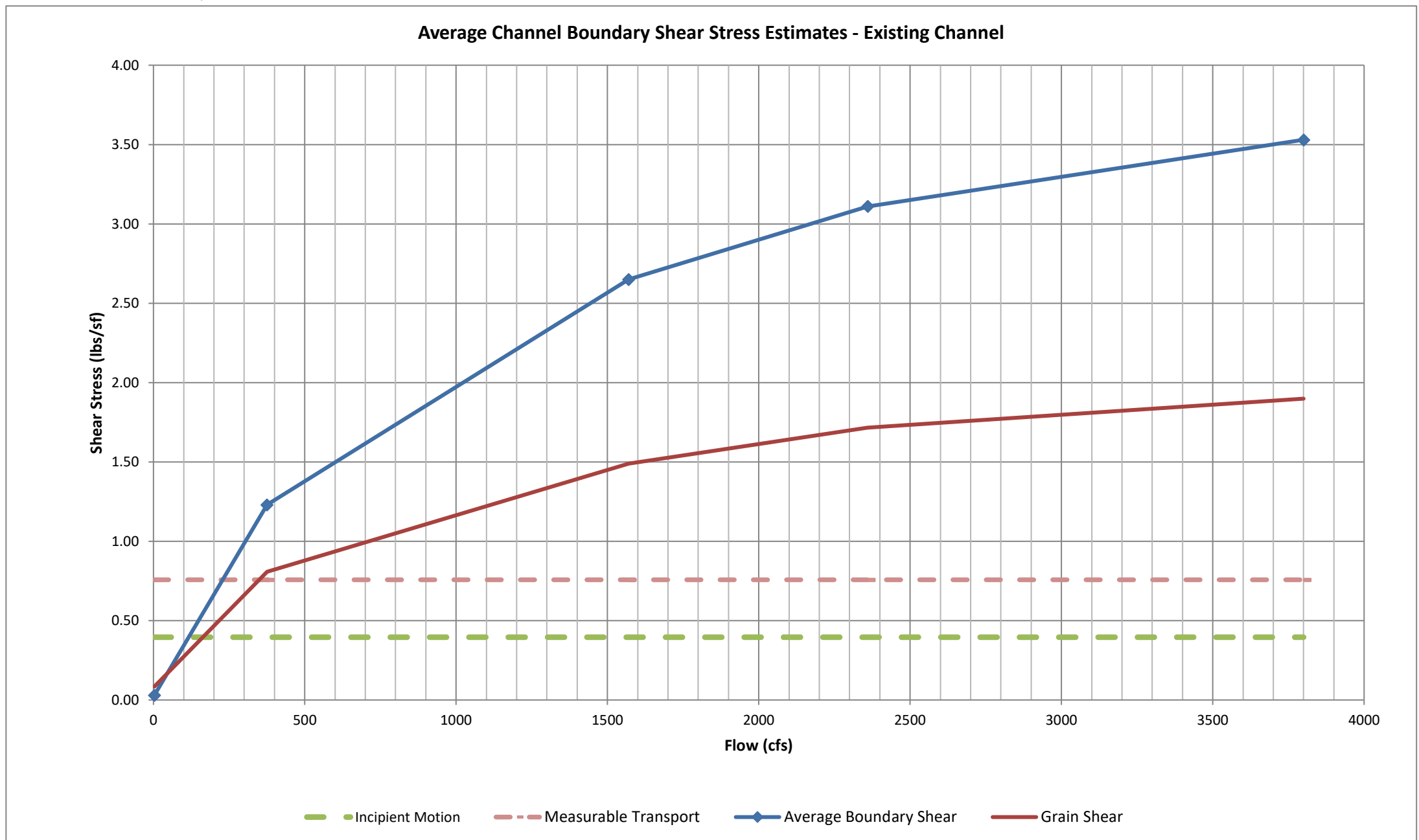
Low Fish Flow Mean Channel Shear (psf)	OHW Mean Channel Shear (psf)	10-Year Mean Channel Shear (psf)	25-Year Mean Channel Shear (psf)	100-Year Mean Channel Shear (psf)
Main Channel	Main Channel	Main Channel	Main Channel	Main Channel
0.03	1.23	2.65	3.11	3.53
Surplus Total Shear				
0.37	-0.83	-2.25	-2.71	-3.13
0.73	-0.47	-1.89	-2.35	-2.77

1: IM = Incipient Motion ($\tau^* = 0.047$)
 2: MT = Measureable Transport ($\tau^* = 0.05$)

k_s - 3.5 D84 (ft) "ks" 0.517
 Mean Riffle Slope 0.0120 ft/ft

Method I ³ Grain Shear Calculations													Surplus Grain Shear
Q	V	R'	V*	V/V* Log Fxn I	V/V*	Diff	τ'	τ'/τ	ϕ'				
3	0.5	0.11	0.209	2.455	2.455	0.000	0.084	7%	0.21				-0.3
375	5.2	1.08	0.645	8.094	8.094	0.000	0.807	66%	2.04				0.4
1570	8.4	1.99	0.876	9.623	9.623	0.000	1.489	121%	3.76				1.1
2360	9.4	2.29	0.940	9.976	9.976	0.000	1.715	139%	4.34				1.3
3800	10.1	2.53	0.989	10.230	10.230	0.000	1.899	154%	4.80				1.5

Notes: 1: IM = Incipient Motion
 3: $\phi' = \tau'/\tau_c$



Incipient Motion - Proposed Conditions Birch Creek

	% Finer	Average Streambed Gravel (mm)	Average Streambed Gravel (in)	Critical Shear (lb/sq ft)
D10	10	NA	NA	NA
D16	16	26.9	NA	NA
D50	50	52.4	2.1	0.88
D84	84	127.0	5.0	2.31
D90	90	150.0	NA	NA

1: IM = Incipient Motion ($\tau^* = 0.050$)
 2: MT = Measureable Transport ($\tau^* = 0.054$)

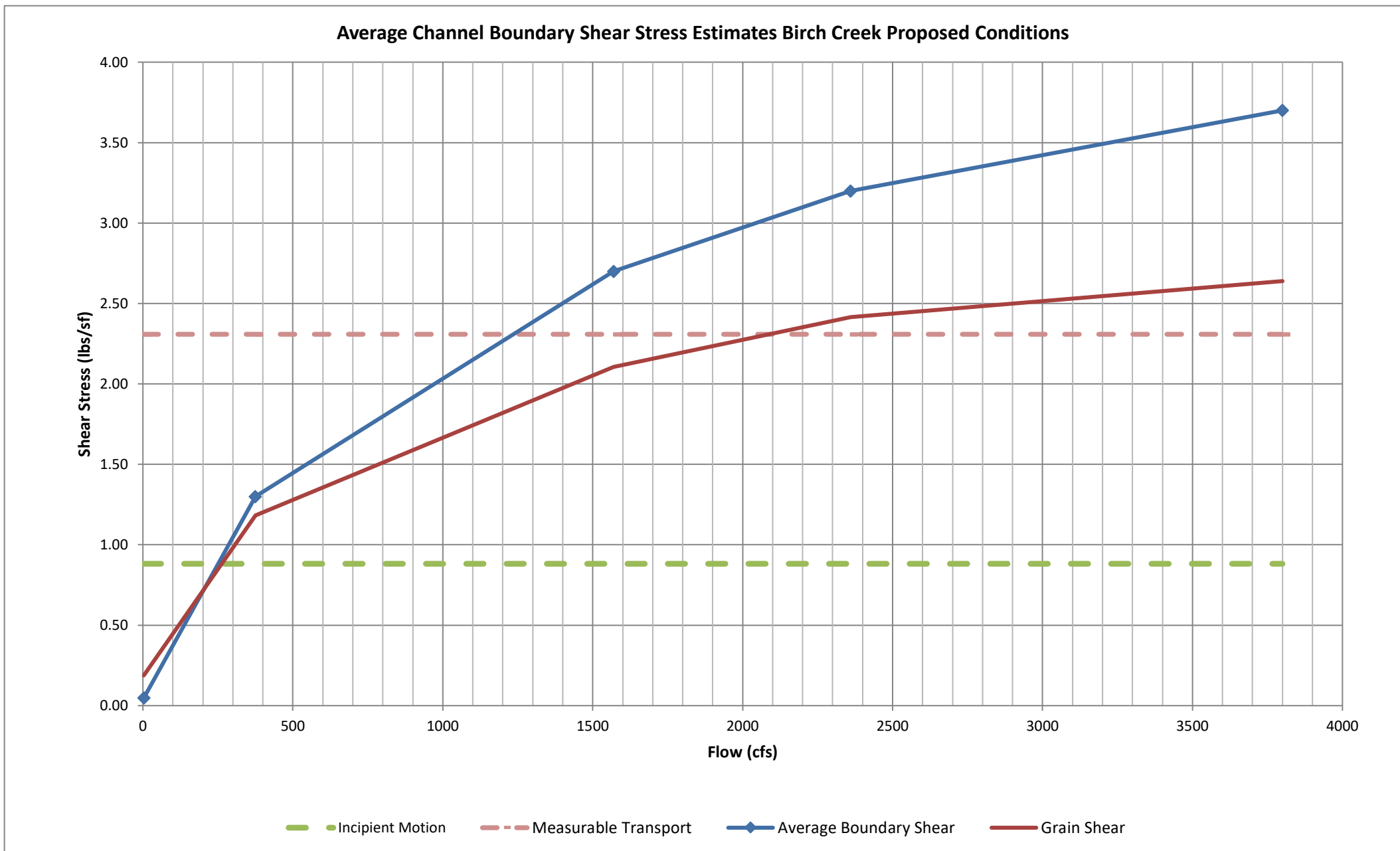
k_s - 3.5 D84 (ft) "ks" 1.458
 Mean Riffle Slope 0.0100 ft/ft

Low Fish Flow Mean Channel Shear (psf)	OHW Mean Channel Shear (psf)	10-Year Mean Channel Shear (psf)	25-Year Mean Channel Shear (psf)	100-Year Mean Channel Shear (psf)
Main Channel	Main Channel	Main Channel	Main Channel	Main Channel
0.05	1.30	2.70	3.20	3.70
Surplus Total Shear				
0.83	-0.42	-1.82	-2.32	-2.82
2.26	1.01	-0.39	-0.89	-1.39

IM
 MT

Method I ³ Grain Shear Calculations													Surplus Grain Shear
Q	V	R'	V*	V/V* Log Fxn I	V/V*	Diff	τ'	τ'/τ_c	ϕ'				
3	0.7	0.30	0.311	2.320	2.320	0.000	0.188	14%	0.21				
375	5.4	1.89	0.781	6.914	6.915	0.001	1.183	91%	1.34	IM			
1570	8.7	3.37	1.042	8.352	8.353	0.001	2.105	162%	2.39	IM			
2360	9.7	3.86	1.116	8.695	8.695	0.001	2.414	186%	2.74	IM			
3800	10.4	4.22	1.166	8.917	8.917	0.000	2.639	203%	2.99	MT			

Notes: 1: IM = Insipient Motion
 3: $\phi' = \tau'/\tau_c$



APPENDIX C
CONSTRUCTION SPECIFICATIONS





Peterson Dam Removal
80% Construction Specifications

Submittal To:

Umatilla Basin Watershed Council

920 SW Fraser Ave #210

Pendleton, OR 97801

Prepared By:

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

March 2023

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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 Peterson Dam Removal Project (Project) is located approximately 2.8 miles south of Rieth, Oregon. The Project site includes a degraded concrete water diversion structure that has not been used in recent years. Contract work for the Project consists of removing the concrete diversion structure, construction of new Birch Creek channel, including stabilization elements such as roughened riffles; construction of step pools; LWD structures; and revegetation and planting of disturbed areas. Construction shall require isolating work areas from water and aquatic organisms. Construction access shall require temporary stream crossings, including a temporary bridge. Upon completion of construction, disturbed areas within the project area shall 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 as shown on the drawings and 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.

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

1.02 WORK COVERED BY CONTRACT DOCUMENTS

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

- Clearing and Grubbing within Project Area
- Installation of Temporary Construction Fencing
- Installation of Temporary Construction Access Routes
- Installation of Temporary Construction Bridge
- Installation and Maintenance of Construction Area BMPs
- Construction and Maintenance of Material Storage Areas
- Removal of existing concrete diversion dam
- Installation of In-stream Structures
- Channel Regrading
- Finish Grading and Decompaction of Compacted Access Routes and Staging Areas
- Installation of Revegetation Materials
- 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 shall be completed separately from activities in the wetted channel. Activities in the floodplain shall occur between May and November, whereas work in the wetted channel, or that requires crossing the wetted channel, shall occur within approved the Oregon Department of Fish and Wildlife (ODFW) in-water work period. No in-stream work shall be conducted outside the approved in-water work period for Birch Creek. The Contractor shall notify the Owner's Representative in writing 10 calendar 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 controlling 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 1 to September 30 during the construction period.

B. Restricted Work Areas

- 1. The Contractor and the Umatilla Basin Watershed Council (UBWC) shall coordinate the project work schedule in order to notify the property owners of when the work activities on their property will occur.
- 2. Access to both sites requires work on private property and must be coordinated in advance with the UBWC.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF WORK RESTRICTIONS

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 shall 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 Drawings.

B. Directions to Project Work Site

1. The (Project) is located approximately 2.8 south Rieth, Oregon. From Interstate 84 (I-84), take exit 207 toward US-30/Airport/Pendleton City Center. Head southwest on County 1300 Rd/McKennon Rd and continue on County 1300 Rd for 1.5 miles. Turn left onto Birch Creek Rd and continue for 2.8 miles and cross the Union Pacific Railroad (UPRR) tracks to access the site.

C. Restricted Access Areas

1. Permission to access is granted by the private landowner to the UBWC. The Contractor shall make arrangements with the UBWC to access the project site through private land.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF ACCESS TO SITE

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 shall access the project sites from the Birch Creek Road at locations identified on the Drawings and by direct coordination with Owner's Representative.
2. The project site is located on private 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 October 31. 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 is gated and fenced. The project site area is closely monitored by Owner's personnel. A list of all employees for the Contractor, suppliers, and vendor Representatives shall 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 shall 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.

1.05 COORDINATION WITH UTILITIES

- A. Prior to beginning work, the Contractor shall coordinate with the Oregon Utility Notification Center about any utility lines running adjacent to or through the property. Information to be obtained includes type and voltage of lines and requirements for crossing under the lines.
- B. The Contractor is responsible for the immediate repair of any damage caused by construction activities.

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.

B. Sequence of Work

1. The project consists of a single Project Area. The Project Area cut and fill quantities do not balance. Coordination for transport of material between the Project Area and off-site hauling or stockpiling is required.

C. Recommended Construction Sequence

1. Floodplain Work: November – May
 - Clear and grub proposed temporary access roads.
 - Separate and stockpile in the staging area or areas directed by Owner's Representative or Engineer, earth, and rock materials for future use.
 - Revegetate all disturbed areas.
 - Final grading and shaping of floodplain areas, and grade and subsoil compacted temporary access roads.
2. Active Channel (SECTION 01 14 00 PART 1.02 for in water work dates)
 - Install temporary bridges or fish-excluded crossings of the wetted channel as directed by Owner's Representative or Engineer.

-
- Isolate work areas, re-route stream, and conduct fish salvage, if needed, to remove any stranded fish where necessary as directed by Owner's Representative or Engineer.
 - Construct channel where temporary bridges or fish-excluded crossings in the wetted channel are required.
 - Demolition of concrete diversion structure, step pool boulder weir installation, and channel grading.
 - Remove temporary bridges or fish-excluded crossings in the wetted channel,

3. Stabilize Site, Seed, and Plant

- Remove All Temporary Construction Controls and Measures
- Complete Project Area Cleanup and Repairs

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 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

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 shall 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. This method of payment shall constitute complete compensation for all work shown on the Contract Drawings and provided in the Specifications or other Contract documents, and for all costs of accepting the general risks, liabilities, and obligations expressed or implied.

1.02 SCHEDULE OF VALUES

- A. Contractor shall prepare and submit a Schedule of Values at the pre-construction meeting corresponding to the project specification sections and any other major work items to be used as a basis for monthly pay requests. The construction quantities in the Schedule of Values shall be updated weekly and verified and signed off by both the Contractor and Owner's Representative.
- B. Contractor shall 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 Values. The contract quantity shall 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. Owner's Representative reserves the right to review all Contractor submitted actual quantity measurements for review and payment.
- D. Contractor shall submit copies of the Schedule of Values to Owner's Representative at earliest possible date, but no later than 15 calendar 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 shall 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. The weekly construction quantities in the Schedule of Values that are updated weekly and verified and signed off by the Contractor and the Owner's Representative shall be used as the basis of the estimate. Owner's Representative shall verify all measurements and monthly estimate and provide for approval to the Owner within 30 calendar days of receiving monthly estimate.

1.04 DESCRIPTION OF BID ITEMS

- A. This is a lump sum bid with unit price pay items; therefore, the total lump sum price and all lump sum and unit price pay items submitted on the bid form shall constitute full compensation for furnishing all labor, materials, and equipment, and performing any associated Contractor quality control, environmental protection, meeting safety requirements, test and reports, and shall include all Contractor costs, overhead, and profit needed to perform all work required for each of the lump sum and unit price items.
- B. Contract lump sums shall be adjusted only when the variation in the bid item quantities 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 Owner's Representative. Owner's Representative 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 shall be made for mobilization in a lump sum. Payment for mobilization shall be retained until 10 percent of the original contract amount is earned from other bid items. Upon completion of 10 percent of the original contract amount from other bid items, 100 percent of the mobilization item may be paid.
- E. Payment for lump sum bid items may be made in accordance with the verified monthly estimate of percentage of work accomplished (see 1.03.B above).

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, within seven (7) calendar days, 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 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 shall complete a review of the materials.
- B. Review of the submitted materials shall be completed by the Owner's Representative within seven (7) calendar 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 the review, the Owner's Representative shall contact the Contractor within seven (7) calendar days from the date of the submittal.
- D. A response to the Contractor's submittal by the Owner's Representative shall be required within seven (7) calendar 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 calendar 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 shall identify the monthly submittal date for invoices to be submitted by the Contractor. This date shall 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 shall 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 shall present a draft invoice to the Owner's Representative. This draft invoice shall show the percentage complete of schedule of value items included in the payment request.
- D. The total percent complete shown on the draft invoice shall 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 shall be reviewed.
- B. The Contractor's invoice shall be forwarded to the UBWC Accounts Payable Section only upon verification of the total percent complete and with signed approval form completed by the Owner's Representative.
- C. The UBWC Accounts Payable Section shall have two (2) working days to review and approve or reject the invoice.

1.04 OWNER'S REPRESENTATIVE APPROVAL

- A. The Owner's Representative shall be expected to attend and participate in the Weekly Progress Meetings and keep current on the project implementation activities. Per Section 01 31 19.23.

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- B. Upon receipt of the approved invoice from the Owner's Representative, the UBWC Accounts Payable Section shall review the submitted invoice and construction implementation spreadsheet.
 - C. The UBWC Accounts Payable Section shall have two (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 shall prepare all necessary administrative forms to initiate payment processing within the UBWC Accounts Payable Section.
 - E. The Owner's Representative shall have three (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 shall follow the standard operating procedures of the UBWC Accounts Payable Section.
- B. The UBWC Accounts Payable Section shall reimburse the Contractor for correctly submitted invoices within 35 calendar days of receipt.
- C. Invoices needing correction shall be reimbursed within 35 calendar days of receipt of the corrected invoice.
- D. Payment on disputed invoices shall be delayed until the dispute has been resolved to the UBWC's satisfaction.

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 five (5) calendar days after a Notice to Proceed has been issued to the Contractor, but earlier if practicable, a mandatory pre-construction meeting shall be scheduled by the Owner's Representative or Engineer. This meeting shall occur not less than 10 calendar days prior to work commencing.
- B. The Owner's Representative or Engineer shall preside at the pre-construction meeting.
- C. Contractor attendees shall include at minimum the Project Superintendent, a representative with full contract authority for each sub-Contractor, and other Contractor representatives as appropriate.
- D. The Owner's Representative and other invited parties shall be present as required.
- E. Proceedings of the meeting shall 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 shall be held at the job site during construction.
- B. The Owner's Representative or Engineer shall preside at Progress Meetings.
- C. Proceedings of meetings shall be recorded and distributed to interested parties.

1.02 MEETINGS

- A. Meetings other than Weekly Progress Meetings (if required) shall be scheduled each week at mutually agreed times.
- 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. Product qualification test results as applicable.
 - 4. Intended submission/resubmission date(s).
 - 5. Order release date.
 - 6. Lead time to delivery/anticipated delivery date(s).
 - 7. 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 shall 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 shall 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 shall 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 (3) 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 effected and concerned Subcontractors, suppliers, and fabricators; and to effected 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 shall be reviewed for conformance with requirements of the Contract Documents. Review of a separate item shall not constitute review of an assembly in which the item functions. Review shall 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 shall indicate the reviews of submittals and the action taken by means of the review stamp. The review stamp shall be affixed by the Engineer, the action block shall be marked, and the stamp shall be signed and dated.
- C. The review-stamp action-block marks shall have the following meanings:
 1. The mark NO EXCEPTIONS TAKEN means that every illustration and description appear 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 appear 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 appear 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 shall 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 shall 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. Schedule of Values
 2. Construction schedule
 3. Weed-free material source certification
 4. Spill Prevention, Control, and Countermeasures (SPCC) Plan
 5. Stormwater Pollution Prevention Plan (SWPPP) and Oregon Department of Environmental Quality (ODEQ) 1200-C Permit
 6. Erosion and Sediment Control (ESC) Plan
 7. Storm Contingency Plan
 8. Material Storage/Staging Plan

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9. Dewatering, Stream Diversion, and Work Area Isolation Plan
 10. Large Wood and Streambed Material source and tree size
 11. Seed Mix Certification
 12. Surveyor credentials
 13. Oregon Department of Forestry (ODF) Notification of Operation
 14. Temporary Bridge Crossing Design
 15. Temporary Traffic Control Plan
 16. Final Record Drawings

END OF SUBMITTAL PROCEDURES

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. The Owner shall obtain permits for Section 7 of the Endangered Species Act, Section 106 of the National Historic Preservation Act, Sections 401 and 404 of the Clean Water Act, and Oregon Department of State Lands Removal-Fill.
2. Contractor shall be responsible for complying with all permit requirements including HIP 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.
3. Contractor shall keep copies off all contract documentation, permits, and approved submittals onsite during all construction activities and available for inspection.

C. Notification

1. Owner's Representative or Engineer shall 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, ODEQ 1200-C Permit, and ESC Plan

- a. The Contractor shall secure the project area at the end of every workday in an effort to stabilize the project area to minimize impacts in case a high-water storm event occurs. The Contractor shall be required to prepare and implement the SWPPP to keep sediment from entering the channel during rain events.
- b. Contractor shall submit a SWPPP, ODEQ 1200-C Permit, 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's Representative.
- 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 shall 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 shall 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 occurs in water, Contractor shall immediately notify the Owner's Representative and appropriate state agencies.

1.04 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

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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 one (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 Contractor's 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 and embankments for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.

1.05 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 Birch 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 shall 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 shall 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 shall be cleaned of external oil, grease, dirt and mud, prior to arriving at the project site. All equipment shall be inspected by the Owner's Representative before unloading at the site. Any leaks or accumulations of grease shall be corrected before entering streams or areas that drain directly into waterways.
 2. All equipment shall be fueled outside of stream-adjacent riparian areas and wetland areas. Specific fueling areas may be approved and designated by the Owner's Representative. When not in use, vehicles and fueling equipment shall be stored in a designated staging area. The staging area shall be in an area that shall 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, shall 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 shall 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 shall be reported to the ODEQ and cleanup shall 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 shall 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. This process shall occur over sufficient time as to prevent excessive turbidity downstream of the work area.

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.
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.

1.06 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 shall 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.

1.07 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 co-mingled 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 of any materials or debris onsite is prohibited.

1.08 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.

1.09 FIRE CONTROL

- A. The Contractor shall immediately extinguish, without expense to the UBWC, 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 the closed fire season period, as specified by State law, the Contractor shall comply with each of the following provisions to the extent applicable.
 1. Fire Tools. The Contractor shall 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:

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 shall 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 shall 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.

1.10 POST-CONSTRUCTION CLEANUP

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

1.11 RESTORATION OF LANDSCAPE DAMAGE

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

1.12 TRAINING OF CONTRACTOR PERSONNEL

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- A. Contractor shall advise their 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

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- 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
 - 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.

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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 shall be smoothed as work progresses.
3. Dig small trenches across the slope on contour, to place rolls in. The trench shall be deep enough to accommodate half the thickness of the roll. When the soil is loose and uncompacted, the trench shall be deep enough to bury the roll 1/3 of its thickness.
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. Steeper slopes require shorter distances between trenches.
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.

C. 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

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1. Disturbed areas that remain unworked for longer than one week shall have straw mulch applied.
 2. Minimum Straw Mulch Application Rate: 3 tons per acre (3 bales per 1,000 square foot, or 3 inches thick)
 3. Straw Mulch Securement Method: "Crimp" straw into soil by operating tracked vehicle (or straw crimping equipment) parallel to slope (up and down slope), and/or discing the straw into the soil.

B. Maintenance

1. Stockpiled straw: have available on-site sufficient straw to replace 10 percent of covered area.
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 shall be required to clean all equipment prior to entry onto UBWC 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 UBWC shall be allowed to operate within the work area. The inspection shall be pre-arranged by the Contractor and shall 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 UBWC with a statement of certification prior to unloading the bales.

END OF ENVIRONMENTAL PROTECTION

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 Birch 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

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 site or Owner.

1.02 SUBMITTALS

- A. None.

1.03 AVAILABILITY AND USE OF UTILITY SERVICES

A. Temporary Water and Electricity

1. Municipal water and electricity are not available at the project site. Contractor shall arrange for drinking water, potable water, and power at the project site as needed and coordinate with the Owner's Representative for drinking water, potable water, and power 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 areas 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 areas and the allowable load limit on these roads. Contractor shall be responsible for the repair of any damage to roads and parking areas 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.

C. Residential Access

1. Contractor shall coordinate with Owner and local residents to develop a traffic control plan sufficient to provide access throughout the duration of construction.
2. No less than 10 working days prior to construction, Contractor shall submit for review a Temporary Traffic Control Plan to the Owner's Representative and Engineer. The Temporary Traffic Control Plan submittal shall include, but not be limited to, the following:

A timeline summary of planned temporary traffic control sequencing.

Traffic control plan drawings showing locations of temporary traffic control infrastructure, signage, signals, and flaggers.

Additional details required for implementation of the Temporary Traffic Control Plan.

3. Contractor shall not commence work until written approval of the Temporary Traffic Control Plan submittal is received from the Owner's Representative or Engineer.

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 shall 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. 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 temporary access roads based on the Drawings. This plan shall be developed using the proposed equipment weights and methods to ensure the location will support the equipment and anticipated loads.

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 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 shall then be placed on the filter fabric to complete the access pad.
- B. Compaction of the temporary roads shall be completed using a dozer to spread the rock material, dump trucks delivering additional material, or an excavator after the rock is installed.
- C. The length of the individual temporary construction access roads shall vary depending on the site conditions.

3.04 BRIDGE INSTALLATION

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

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 Contractors 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 verify if the disturbed areas are 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 shall be required to restore heavily compacted subgrade. Subsoiling shall be performed with a dozer ripper, or equivalent, subsoiling grabble rake (SGR) or subsoiling excavator bucket (SEB) and shall 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

SECTION 01 56 23
TEMPORARY FENCING

PART 1 GENERAL

1.01 DESCRIPTION

- A. Work in this section consists of removing and replacing the 4-strand barbless wire fence along the property to facilitate construction activities in the stream channel. Existing 4-strand barbless wire fence and gates removed prior to construction must be saved and set aside for installation after construction is completed.
- B. Work in this section also 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 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.

3.07 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.
 - b. As-built drawings and records in accordance with Section 01 78 39 RECORD DRAWINGS.

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 Drawings and any necessary supporting data and 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 at locations approved by Owner's Representative or Engineer. No payment shall 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 professional engineer or professional 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 by Contractor personnel and 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 shall 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, and access roads, the Contractor's Surveyor shall 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 shall 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 of all disturbed areas, using a grid at a minimum of 25-foot centers plus key grade breaks, to document the final channel configuration, drops and pools, and all major structures (such as boulders) 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 shall be incidental and included in the lump sum price for the work.

END OF FIELD SURVEYING

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 shall be completed when needed during and at the end of construction, including for as-directed and hourly work.
- C. Review and acceptance of work shall be completed for the excavation of new channels, installation of riffle boulders, installation of habitat boulders, fill of existing channel, or other distinct stand-alone project feature shown on the Drawings.
- D. A Record of Review and Acceptance of work shall 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 shall 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 shall 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 shall 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 shall complete each of the tasks identified by the Owner's Representative or Engineer.
- E. Work on the tasks shall 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 shall prepare a punch-list of tasks to complete work at each of the work sites.
- B. The Owner's Representative shall update the completion punch-list regularly to assist the Contractor in completing the work in an efficient manner. This shall 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 shall 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 shall 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 shall 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 shall schedule a time to be on-site to complete the review.
- C. After the completion of the review, the Owner's Representative shall 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 shall have two (2) working days to prepare a punch-list of items to be completed prior to approval. This punch-list shall be submitted to the Contractor and the Engineer.

1.05 PROJECT APPROVALS

- A. Project approvals shall be completed at the end of construction.
- B. Upon acceptance of final review of the punch-list by the Engineer and Owner's Representative, the construction work shall be accepted as completed.

1.06 PROJECT CLEANUP AND REPAIRS

- A. Cleanup and repair of work area shall 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. All paved and unpaved access and staging areas shall be restored to their pre-project condition.

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, also known as "As-built" or "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 shall review all Field Record Drawings for accuracy and clarity. The Field Record Drawings shall 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 clean marked-up 11x17 hard copy and 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 11-inch x 17-inch hard copy prints of the 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 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 descriptions 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 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 Drawings or Specifications allow options, only the option actually used in the construction shall be shown on the Field Record Drawings. The option not used shall be deleted.

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- C. These deviations shall be shown in the same general detail utilized in the 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 shall 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 UBWC.
 2. Removing designated trees and protecting from harm any trees or other objects selected to remain by Owner's Representative.

1.02 HISTORICAL ITEMS

- A. Historical 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 the Owner's 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 UBWC 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.

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- 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 shall 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.

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- B. Existing utility and water 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 24 inches or greater.
 - 2. Diameter 18 to 24 inches.
 - 3. Diameter 12 to 18 inches.
 - 4. Diameter 6 to 12 inches.
 - 5. Diameter 6 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. Peterson Dam in Birch Creek:
 - 1. The concrete wall, sill, and apron are currently selected for demolition.
- B. Irrigation Diversion Pipe
 - 2. 2-ft diameter irrigation pipe remnant.
- B. If additional structures are selected for demolition in the field, temporary erosion and sedimentation control features shall be in place before demolition.

3.08 SALVAGED ITEMS

- A. Carefully dismantle and remove salvaged items.

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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 shall coordinate staging and stockpiling areas on-site to stockpile streambed aggregate and boulders for later use in the project.
- B. If additional stockpile areas are required to complete the Project on schedule, the Contractor shall arrange off-site stockpile areas. No additional payments shall 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 site grading, channel grading, and existing channel fill and compaction.

1.02 JOB CONDITIONS

- A. Environmental requirements: Construction shall progress only when weather conditions do 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 shall 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 per Section 01 14 00 WORK RESTRICTIONS. All in-channel work activities must be completed within this period due to spawning and incubation periods of lamprey, steelhead, and chinook. 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 or terrace fill materials to a density considered firm and unyielding.
- C. Structural Fill: Imported or available Fill material ODOT Standard Specifications for Construction Section 00510 and free of organic and other unsuitable material.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

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- 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 shall be no steeper than 1 vertical to 1 horizontal. Permanent slopes shall be no steeper than 1 vertical to 2 horizontal. Cover exposed slopes if erosion or raveling threatens.

3.03 EQUIPMENT

- A. Construction of the rock weir structures, removing existing berms, loading and hauling material to stockpiles, backfilling the floodplain, and placing fill requires various types of heavy equipment. These equipment types include, but are not limited to, medium to large excavators with bucket thumb, front end loaders, off-road dump trucks, rollers, and dozers with 6-way blades.

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 backfilled with the same material to the same density as the undisturbed excavation 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 and 01 35 43.20 CARE AND DIVERSION OF WATER during all excavation and backfill operations.

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- B. The Contractor is responsible for complying with all permit 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.
- 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 Birch Creek without prior, written consent of the Owner's Representative.

3.07 EXCAVATION OF EXISTING CHANNEL

- A. Existing Channel shall be excavated to the dimensions and extents as shown on the Drawings.
- B. Excavation shall begin at the downstream end of the channel to prevent working in accumulated seepage flow in the pilot channel.

3.08 EXCAVATED MATERIAL STOCKPILES

- A. Excavated excess material shall be hauled offsite to an appropriate disposal site at the Contractor's expense.
- B. Additional location of the excavated material stockpile sites are to be determined by Owner's Representative or Engineer.
- C. Contractor shall be responsible for managing the volume, shape, and weather protection for the stockpile site.
- D. The Contractor is responsible for keeping the stockpiled material protected to prevent any major erosion off the piles.
- E. 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 CHANNEL BACKFILL

- A. Channel backfill shall be placed at the locations and the dimensions indicated on the Drawings.
- B. Channel backfill shall be installed on site using 9-to-12-inch lifts using a dozer or tracked excavator to spread and track compact the fill. The Contractor shall wash in fines from selected on site materials approved by the Owner's Representative to seal the gravels to keep the introduced water on the surface and avoid having the creek go underground through the new stream bed. Fines shall be washed in until ponding occurs on the surface of each lift prior to placing next lift.

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- C. Water that flows off the stream bed during the wash-in process shall be properly disposed of in accordance with the approved Temporary Erosion and Sediment Control Plan.
 - D. Once fines have been washed in, the surface shall be flushed so flows coming off the new stream bed do not increase the turbidity over existing levels in the upstream creek, as approved by the Owner's Representative.

3.10 IRRIGATION DITCH BACKFILL

- A. Irrigation ditch backfill shall be placed at the locations and the dimensions indicated on the Drawings.
- B. Irrigation ditch backfill shall be installed on site using 9-to-12-inch lifts using a dozer or tracked excavator to spread and track compact the fill.

3.10 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. 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.

END OF EXCAVATION AND FILL

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 boulder 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 UWBWC at least 10 calendar days prior to beginning work.

PART 2 PRODUCTS

2.01 DIVERSION STRUCTURE

- A. The Contractor shall use a sandbag/bulkbag/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 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 shall 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 Terms and Conditions.

PART 3 EXECUTION

3.01 GENERAL

- A. All channel dewatering systems shall be approved by the Owner' Representative, 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 Conservation Notes in Drawings if any fish salvage operation is required. Construction work in the immediate vicinity of fish salvage shall be delayed, typically for 2 to 24 hours but longer in some cases.

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- D. Turbid water or sediment must not be released into the channel downstream.
 - 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 boulder 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 shall 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 regraded to match surrounding topography and reseeded, if needed, as specified in Section 32 90 00 SEEDING.

3.02 FISH TRANSFER

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

3.03 CHANNEL REWATERING

- A. Upon project completion, the construction site shall 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 re-watering, the site shall be monitored to prevent stranding of aquatic organisms below the construction site. Rewatering shall be completed under the direct supervision of the Owner's Representative. Refer to HIP Conservation Notes in 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, grasses, ground cover, or wetland areas outside the limit of disturbance shown on the Drawings shall be restored by Contractor at no additional cost to the Owner.

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 (6) 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 shall 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.
- 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 as shown on the Drawings.

**TABLE 2.01-1
UPLAND SEED MIX AND COMPOSITION**

COMMON NAME	SCIENTIFIC NAME	COMPOSITION (% OF MIX)
Western Bottle-brush	<i>Elymus Elymoides</i>	10
Western Yarrow	<i>Achillea Millefolium</i>	10
White Sagebrush	<i>Artemisia Ludoviciana</i>	10
Prairie Junegrass	<i>Koeleria Macrantha</i>	15
Large-Leaved Lupine	<i>Lupinus Polpyllus</i>	15
Bluebunch Wheatgrass	<i>Pseudoroegneria Picata</i>	20
Idaho Fescue	<i>Festuca Idahoensis</i>	20

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.

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

PART 3 EXECUTION

3.01 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.

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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:
 - 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.

3.02 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 shall 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 Birch Creek stream channel and descriptions of the stream structures and ancillary materials required to complete the restoration.
- B. Stream restoration components include additions of LWD (Section 35 49 50 LWD AND CHANNEL STRUCTURES) in the new stream channels, and excavation of a new main channel regrading (Section 31 23 00 EXCAVATION AND FILL).

PART 2 PRODUCTS

2.01 LARGE WOOD MATERIAL

- A. The Contractor shall utilize the large wood material logs of the type shown on the Drawings and as specified herein. See Section 35 49 50 LWD AND CHANNEL STRUCTURES for specifications.

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

- A. Refer to Section 31 23 00 EXCAVATION AND FILL for specifications on excavation and fill of channels and floodplain areas. Refer to Section 35 49 50 LWD AND CHANNEL STRUCTURES for specifications of large wood material structures. Construction schedule constraints in performing various portions of the work are provided in Section 01 14 20 SITE-SPECIFIC REQUIREMENTS.
- B. Refer to Section 31 23 19 CHANNEL DEWATERING, FISH TRANSFER, AND CHANNEL REWATERING for specifications on work area isolation, fish salvage, dewatering, and rewatering.

END OF STREAM RESTORATION

SECTION 35 49 50
LWD AND CHANNEL STRUCTURES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

- A. Work under this section consists of the boulders and logs for the bank habitat structure. This section includes descriptions of the stream structure and ancillary materials required to complete the improvements.

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. Whole tree with rootwad
2. Streambed Sediment
3. Streambed Cobble
4. Scour Protection material
5. Boulders For Step Pool Rock Weir

1.03 REFERENCES

- A. ODOT Standard Specifications for Construction 2024 or most current.

PART 2 PRODUCTS

2.01 LARGE WOOD DEBRIS

- A. The UBWC requires whole trees for use in this restoration project for promoting fish habitat. This includes limbs, treetops, and rootwads. Harvested trees are to be pushed over after loosening the soils around the tree roots to maximize root wad size and minimize handling damage to the tree roots and bole. Whole trees shall be excavated to retain the entire rootwad, with rootwad diameters meeting the specifications shown in Table 2.01-1 (see below). Soil lodged around the roots shall be displaced to the extent practical without destroying the integrity of the roots. Trees must be handled with care to remain as intact as possible and Contractors shall avoid excess handling of the rootwads to minimize breakage. Tree branches shall be retained intact with minimal breakage during transport and placement. These are critical details to the contract, and Contractors shall include details of the methods used to achieve the desired results.
- B. All treetops, limbs, and other woody material created from the harvest and loading of the trees are also to be delivered to the project. These materials may be used for slash/racking as may be called for in the large wood structure drawings or specifications. Racking and slash material must be fresh (green) and flexible, not dry and brittle.

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- C. Contractor must obtain their own sources for trees. Whole trees shall be conifers and must be of high quality, green, sound, and free of checks and defects that would affect structural integrity or accelerate decay. Trees shall not be comprised of rotten or punk wood. The following species, in order of preference, are acceptable: Spruce, Grand or White fir, Douglas fir, Lodgepole pine, Ponderosa pine, and juniper. Juniper trees must be from a dense stand that promoted height instead of limb development. Juniper trees need to have a minimum stem diameter of six inches at the top and still meet minimum length requirements. Junipers must not have excessive thick limbs, but rather shall only have smaller limbs from being grown in a shaded forest stand environment. Western larch (tamarack) may also be used for large wood structures that do not require trees with limbs (e.g., for buried footer logs or revetment trees). Bidders must identify the species on the bid form, and if mixed species are to be provided, then the percentage of each species shall be identified.
 - D. In some cases, whole trees may be harvested near the project site, such as those that must be removed for site access. In those cases, trees must be obtained from outside of the immediate work area and must not be removed from areas within 100 feet of a stream channel.
 - E. All trees must be alive when harvested with the following exception. Signs of light scorching are acceptable on large trees if confined only to the outer bark. Dead, dried out, or brittle trees are not acceptable.
 - F. Acceptable trees may have defects such as crooks, multiple forks, bends, etc., if the tree is alive (green) when harvested and as long as minimum stem and top diameters and lengths are still met. These defects shall not affect the structural integrity of the tree, and trees that end up broken during transportation or handling as a result of these defects may be rejected by Owner's Representative or Engineer. The maximum percentage of trees with these types of irregularities shall be no more than 30 percent in any size class.
 - G. Whole tree and log specifications are as follows:

TABLE 2.01-1 TREE SIZE REQUIREMENTS			
Tree Type	Minimum DBH¹ (inches)	Minimum Length (feet)	Minimum Rootwad Diameter (feet)
Whole tree with rootwad	18 Min.	40	4
Slash/Racking material	2 – 10	6 - 16	na

^{1/} DBH = Diameter at Breast Height, measured at 4.5 feet above the ground and with bark intact. If the tree splits into multiple trunks below that point the trunk is measured at its narrowest point beneath the split.

Note: Stem diameters at the top end for whole trees is a minimum of 8 inches (6 inches for Juniper) for all size classes.

- H. Any trees that naturally exceed the required minimum length may be shortened so long as they meet the minimum length for each size class. Leaving trees longer than the minimum length is also acceptable. Trees requiring shortening must be snapped or broken off rather than cut with a chainsaw for a more natural appearance. Breaking trees in this manner must not result in splintering or weakening of the treetop.
- I. Trees shall be marked in a manner that specifies length. Markings shall be visible around the whole tree at any one point, and can be accomplished using tree marking paint, chalk, or similar.
- J. Trees must be handled to avoid damage to rootwads, stems, and limbs at all stages of the harvest and delivery process. Limbs that are broken off the trees are required for delivery to the staging site but may be hauled separately. Limbs on juniper trees may require cutting to allow transportation but leaving limb stabs of at least 18 inches is preferable.
- K. Contractor shall not cut limbs flush to the bole, except where needed to allow for legal and safe transport.
- L. All harvested trees and logs are subject to inspection by Owner's Representative or Engineer.
- M. Upon delivery, Owner's Representative reserves the right to reject any trees or logs failing to meet the specifications and requirements herein.

2.02 STREAMBED SEDIMENT

- A. The excavated channel bed material shall consist of native alluvium consisting of finer material to seal the bed. If the native floodplain alluvium does not contain sufficient sediment to seal the newly excavated channel, the Contractor shall furnish streambed sediment with the following gradation:
 1. Streambed sediment shall be clean, naturally occurring, water-rounded gravel material. Streambed sediment shall have a well-graded distribution of aggregate sizes and conform to the grading in Table 2.02-1:

TABLE 2.02-1 STREAMBED SEDIMENT	
Approximate Size	Percent Passing
2½"	99-100
2"	65-95
1"	50-85
No. 4	26-44
No. 40	16 max.
No. 200	5.0-9.0

2. The grading of the material shall be determined by the Owner's Representative or Engineer through visual inspection of the load before it is dumped into place, or, if so ordered by the Owner's Representative, dumping individual loads on a flat surface and sorting and measuring the individual rocks contained in the load.
3. The excavated channel and floodplain areas consist of native alluvium. Following excavation to proposed grade the existing bed material shall be inspected by the Owner's representative or Engineer to ensure that materials meet minimum size requirements. If finer material is encountered and not suitable for the channel bed material, in the areas designated by the Owner's representative or Engineer, the Contractor shall furnish and install streambed sediment.
 - B. Place streambed sediment in one or more layers with a layer depth less than 1½ times the maximum dimension of the streambed sediment, but no greater than 1 foot. Placement shall be by methods that do not cause segregation or damage to the prepared surface. Place or rearrange individual cobbles to obtain a uniformly dense, compact, low permeability mass. Fill voids by machine or hand tamping before placing the next lift. Compact bed materials by mechanical means such as plate compactors, loaders, etc.
 - C. Fill all voids left during placement of streambed sediment as shown on the Drawings. Use water pressure, metal tamping rods, and similar hand-operated equipment to force material into all surfaces and subsurface voids between the structure and rocks, and between individual rocks.
 - D. All streambed sediment shall consist of screened material free from adherent coatings. The materials shall be washed thoroughly to remove clay, loam, alkali, organic matter, or other deleterious substances.

2.03 STREAMBED COBBLE

- A. The excavated channel bed material shall consist of native alluvium similar to Birch Creek. If finer material is encountered and not suitable for the channel bed material Contractor shall furnish streambed cobbles with the following gradation:
 1. Streambed cobbles shall be clean, naturally occurring, water-rounded gravel material. Streambed cobbles shall have a well-graded distribution of cobble sizes and conform to the grading in Table 2.03-1:

TABLE 2.03-1 STREAMBED COBBLE	
Approximate Size	Percent Passing
6"	99-100
5"	70-90
2"	20-50
3/4"	10 max

2. The grading of the cobbles shall be determined by the Owner's Representative or Engineer through visual inspection of the load before it is dumped into place, or, if so ordered by the Owner's Representative, dumping individual loads on a flat surface and sorting and measuring the individual rocks contained in the load.

2.04 SCOUR PROTECTION MATERIAL

- A. Grade stabilization material shall be rock to rock contact of material conforming to the gradation in Table 2.04-1 and shall be with voids filled with streambed sediment after placement of grade stabilization material. Place grade stabilization material in one or more layers with a layer depth no greater than 1 foot. Placement shall be by methods that do not cause segregation or damage to the prepared surface. Place or rearrange individual cobbles to obtain a uniformly dense, compact, low permeability mass. Fill voids by machine or hand tamping before placing the next lift. Compact bed materials by mechanical means such as plate compactors, loaders, etc. Grade stabilization material shall be placed at the locations and the dimensions indicated on the Drawings or as directed by the Engineer.

TABLE 2.04-1 SCOUR PROTECTION MATERIAL	
Approximate Size	Percent Passing
10"	99-100
8"	70-90
3.5"	30-60
3/4"	10 max

- B. Fill all voids left during placement of grade stabilization material as shown on the Drawings. Use water pressure, metal tamping rods, and similar hand-operated equipment to force material into all surfaces and subsurface voids between the structure and rocks, and between individual rocks.
- C. All grade stabilization material shall consist of screened material free from adherent coatings. The materials shall be washed thoroughly to remove clay, loam, alkali, organic matter, or other deleterious substances.

2.05 BOULDERS FOR STEP POOL ROCK WEIR

- A. Boulders include large rocks (i.e., riffle rocks, ballast rocks) placed as rock weir step pool grade control for the proposed roughened riffle in Birch Creek. 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 sub-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 2.05-1 and size requirements in Table 2.05-2. Nominal diameters refer to the intermediate axis of the boulder. 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 2.05-1 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 2.05-2 BOULDER SIZE REQUIREMENTS		
Boulder Type	Intermediate Axis (feet)	Average Weight (lbs)
Boulders	2.5	1,350

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.
- B. Refer to Section 31 23 19 CHANNEL DEWATERING, FISH TRANSFER, AND CHANNEL REWATERING for specifications on work area isolation, fish salvage, dewatering, and rewatering

3.02 CHANNEL LWD STRUCTURES

- A. Installation of LWD structure shall occur at locations shown on the Drawings and shall be as directed in the field by Engineer or Owner's Representative.
- B. Refer to the Drawings for sequence and specified dimensions of whole trees with rootwads and branches and logs without rootwads or branches to be installed.
- C. Orientation and placement of the LWD may be adjusted depending on the type of structure being installed and upon the discretion of the Owner's representative.

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- D. Excavated material from installation trenches shall be used as backfill and compacted around the structure to provide required ballast volume. Compaction shall be completed using the excavator bucket to a firm and unyielding surface. Finish grade shall be blended into the surrounding floodplain.

3.03 STREAMBED COBBLE

- A. Streambed cobble shall be placed at the locations and the dimensions indicated on the Drawings if native alluvium is not suitable for channel bed material.
- B. Once all the streambed cobble materials have been placed and before the stream bed is open to stream flows, the Contractor shall wash in fines from selected on site materials approved by the Owner's Representative to seal the gravels to keep the introduced water on the surface and avoid having the creek go underground through the new stream bed. Fines shall be washed in until ponding occurs on the surface of each lift prior to placing next lift.
- C. Water that flows off the stream bed during the wash-in process shall be properly disposed of in accordance with the approved Temporary Erosion and Sediment Control Plan.
- D. Once fines have been washed in, the surface shall be flushed so flows coming off the new stream bed do not increase the turbidity over existing levels in the upstream creek, as approved by the Owner's Representative.

3.04 SCOUR PROTECTION MATERIAL

- A. Scour protection material shall be placed at the locations and the dimensions indicated on the Drawings.
- B. Once all the scour protection material has been placed and before the stream bed is open to stream flows, the Contractor shall wash in fines from selected on site materials approved by the Owner's Representative to seal the gravels to keep the introduced water on the surface. Fines shall be washed in until ponding occurs on the surface of each lift prior to placing next lift.
- C. Water that flows off the scour protection material during the wash-in process shall be properly disposed of in accordance with the approved Temporary Erosion and Sediment Control Plan.
- D. Once fines have been washed in, the surface shall be flushed so flows coming off the new scour protection material do not increase the turbidity over existing levels in the upstream creek, as approved by the Owner's Representative.

END OF CHANNEL STRUCTURES

APPENDIX D
CONSERVATION MEASURES



Chapter 3: General Conservation Measures

3.1 General Conservation Measures Applicable to all Actions

These measures will be implemented on all projects covered under the HIP.

3.1.1 Project Design and Site Preparation

3.1.1.1 *State and Federal Permits*

- A. All applicable regulatory permits and official authorizations will be obtained by the Sponsor before project implementation.
- B. These permits and authorizations include, but are not limited to, National Environmental Policy Act (NEPA), National Historic Preservation Act, appropriate state agency removal and fill permits, USACE Clean Water Act (CWA) 404 permits, CWA Section 401 water quality certifications, FEMA no-rise analyses.

3.1.1.2 *Timing of in-water work*

- A. Formal recommendations published by state agencies such as the Oregon Department of Fish and Wildlife (ODFW), Washington Department of Fish and Wildlife (WDFW), Idaho Department of Fish and Game (IDFG), and Montana Fish Wildlife and Parks (MFWP), or informal recommendations from the appropriate state Fishery Biologist in regard to the timing of in-water work, will be followed. A maximum of one week past the recommended in-water work window shall be considered and approved by the BPA EC Lead.
- B. The regional state biologist shall approve changes exceeding one week to in-water work.
- C. Bull trout – In Bull Trout spawning and rearing areas, eggs, alevin, and fry are present nearly year round. In Bull Trout habitats designated as foraging, migration, and overwintering (FMO) habitats, juvenile and adult bull trout may be present seasonally. Some project locations may not have designated in-water work windows for bull trout, or if they do, they may differ from the in-water work windows for salmon and steelhead. If this is the case, the Project Sponsor will contact the appropriate USFWS field office to ensure that all reasonable implementation measures are considered and an appropriate in-water work window is applied to minimize project effects.
- D. Lamprey – To minimize disturbance to migrant adults, the Project Sponsor and/or their contractors will avoid working instream or river channels that contain Pacific lamprey from March 1 to July 1 in low- to mid-elevation reaches (<5,000 feet). In high-elevation reaches (>5,000 feet), the Project Sponsor will avoid working instream or river channels from March 1 to August 1. If either timeframe is incompatible with other objectives, the area will be surveyed for nests and lamprey presence, and avoided if possible. If lampreys are known to exist, the

Project Sponsor will utilize best management practices (BMPs) for dewatering and salvage as outlined in LTW 2020¹, or most recent guidance. Salvage should include salvage of larval lamprey from sediments. See conservation measures for fish salvage and electrofishing.

- E. The final project in-water work window shall be indicated in the project drawings.

3.1.1.3 Contaminants

- A. The Project Sponsor will complete a site assessment to identify the type, quantity, and extent of any potential contamination for any action that involves excavation of more than 20 cubic yards of material.
- B. The site assessment, stored with the project files, will summarize:
 - 1. The site visit, condition of property, and identification of areas used for various industrial processes;
 - 2. Available records, such as former site use, building plans, and records of any prior contamination events;
 - 3. Interviews with knowledgeable people, such as site owners, operators, and occupants, neighbors, or local government officials; and
 - 4. The type, quantity, and likelihood of potential contaminants and sources present at the site.

3.1.1.4 Site layout and flagging

- A. The project area will be clearly flagged prior to construction.
- B. Areas to be flagged include:
 - 1. Sensitive resource areas, such as areas below ordinary high water (OHW), spawning areas, springs, and wetlands;
 - 2. Equipment entry and exit points;
 - 3. Road and stream crossing alignments;
 - 4. Staging, storage, and stockpile areas; and
 - 5. No-herbicide-application areas and buffers.

3.1.1.5 Temporary access roads and paths

- A. Existing access roads and paths will be preferentially used whenever possible, and the number and length of temporary access roads and paths through riparian areas and floodplains will be minimized to lessen soil disturbance, soil compaction, and impacts to vegetation.

¹ Lamprey Technical Workgroup. 2020. Best management guidelines for native lampreys during in-water work. Original Version 1.0, May 4, 2020. 26 pp. + Appendices.
Available: <https://www.fws.gov/pacificlamprey/LTWGMainpage.cfm>

- B. Vehicle use and human activities, including walking in areas occupied by terrestrial ESA-listed species, will be minimized.
- C. Temporary access roads and paths will not be built on slopes where grade, soil, or other features suggest a likelihood of excessive erosion or failure. If slopes are steeper than 30%, the road will be designed by a civil engineer with experience in steep road design.
- D. The removal of riparian vegetation during construction of temporary access roads will be minimized. When temporary vegetation removal is required, vegetation will be cut at ground level (not grubbed).
- E. At project completion, all temporary access roads and paths will be obliterated and the soil will be stabilized and revegetated. Road and path obliteration refers to the most comprehensive degree of decommissioning and involves decompacting the surface and ditch, pulling the fill material onto the running surface and reshaping to match the original contour.
- F. Helicopter flight patterns will be established in advance, and located to avoid terrestrial ESA-listed species, including their occupied habitat and appropriate buffers, during sensitive life stages (i.e. nesting and critical breeding periods). See species-specific conservation measures for each listed species that may occur within the project area for more information.

3.1.1.6 Temporary stream crossings

- A. Existing stream crossings, fords, or bedrock will be used whenever possible, and the number of temporary stream crossing will be minimized.
- B. If an existing stream crossing is not accessible, temporary crossings will be installed. Treated wood shall not be used on temporary bridge crossings or in locations in contact with or over water.
- C. For projects that require equipment and vehicles to cross in the wet:
 - 1. The location and number of all wet crossings must be approved by BPA and clearly indicated on design drawings;
 - 2. Vehicles and machinery will cross streams at right angles to the main channel wherever possible;
 - 3. No stream crossings will occur 300 feet upstream or 100 feet downstream of an existing redd or spawning fish; and
 - 4. After project completion, temporary stream crossings will be obliterated, and the banks restored.

3.1.1.7 Staging, storage, and stockpile areas

- A. Staging areas (used for construction equipment storage, vehicle storage, fueling, servicing, and hazardous material storage) will be 150 feet or more from any natural waterbody or wetland, or on an adjacent established road area in a location and manner that will preclude erosion into, or contamination of, the stream or floodplain. Staging

areas may be closer than 150 feet if the area is above (elevation) the 100-yr floodplain or spill prevention measures are approved by the BPA EC Lead.

- B. Natural materials used for implementation of aquatic restoration, such as large wood, gravel, and boulders, may be staged within 150 feet if clearly indicated in plans. Recommend referring to area as “Natural Material Stockpile Area” with a note that states vehicle storage, equipment storage, hazardous materials, fueling, and servicing not permitted in this area.
- C. Any large wood, topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration at a specifically identified and flagged area.
- D. Any material not used in restoration, and not native to the floodplain, will be removed to a location outside of the 100-year floodplain for disposal.

3.1.1.8 Equipment

- A. 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).
- B. Equipment will be stored, fueled, and maintained in a clearly identified staging area that meets staging area conservation measures.
- C. Refueled in a vehicle staging area located 150 feet or more from a natural waterbody or wetland, or in an isolated hard zone, such as a paved parking lot or adjacent, established road (this measure applies only to gas or diesel-powered equipment with tanks larger than 5 gallons);
- D. Biodegradable lubricants and fluids² shall be used on equipment operating in the stream channel and live water.
- E. Inspected daily for fluid leaks before leaving the vehicle staging area for operation within 150 feet of any natural water body or wetland; and
- F. Thoroughly cleaned before operation below ordinary high water (OHW), and as often as necessary during operation, to remain free of grease.

² For additional information and suppliers of biodegradable hydraulic fluids, motor oil, lubricant, or grease. See, Environmentally Acceptable Lubricants by the U.S. EPA (2011); e.g., mineral oil, polyglycol, vegetable oil, synthetic ester; Mobil® biodegradable hydraulic oils, Total® hydraulic fluid, Terresolve Technologies Ltd.® biobased biodegradable lubricants, Cougar Lubrication® 2XT Bio engine oil, Series 4300 Synthetic Bio-degradable Hydraulic Oil, 8060-2 Synthetic Bio-Degradable Grease No. 2, etc.

3.1.1.9 Erosion control

- A. Erosion control best management practices (BMPs) will be prepared and carried out, commensurate with the scope of the action. Temporary erosion control measures include:
1. Temporary erosion control BMPs shall be in place before any significant alteration of the action site, and shall be appropriately installed downslope of project activity within the riparian buffer area until site rehabilitation is complete.
 2. 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.
 3. Temporary erosion control measures may include sedge mats, fiber wattles, silt fences, jute matting, wood fiber mulch with soil binder, or geotextiles and geosynthetic fabric. Biodegradable netting may be used so that they can decompose on site.
 4. 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.
 5. Sediment will be removed from erosion control once it has reached 1/3 of the exposed height of the control.
 6. Once the site is stabilized following construction, temporary erosion controls will be removed.
- B. Emergency erosion controls. The following materials for emergency erosion control will be available at the work site:
- a. A supply of sediment control materials; and
 - b. An oil-absorbing floating boom whenever surface water is present.

3.1.1.10 Dust abatement

- A. The Project Sponsor will determine the appropriate dust control measures by considering soil type, equipment usage, prevailing wind direction, and the effects caused by other erosion and sediment control measures. In addition, the following criteria will be followed:
- B. Work will be sequenced and scheduled to reduce exposed bare soil subject to wind erosion.
- C. Dust-abatement additives and stabilization chemicals (typically magnesium chloride, calcium chloride salts, or lignin sulfonate) will not be applied within 25 feet of a natural waterbody or wetland and will be applied so as to minimize the likelihood that they will enter streams. Applications of lignin sulfonate will be limited to a maximum rate of 0.5 gallons per square yard of road surface, assuming a 50:50 (lignin sulfonate to water) solution.
- D. 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 chemicals to a waterbody (typically these would be areas within 25 feet of a natural waterbody or wetland; distances may be greater where vegetation is sparse or slopes are steep).

- E. Spill containment equipment will be available during application of dust abatement chemicals.
- F. Petroleum-based products will not be used for dust abatement.

3.1.1.11 Spill prevention, control, and counter measures

- A. A description of hazardous materials (fuel, lubricants, hydraulic fluid³, or other contaminants) that will be used, including inventory, storage, and handling procedures, will be available on-site.
- B. Written procedures for notifying environmental response agencies will be posted at the work site.
- C. Spill containment kits (including instructions for cleanup and disposal) adequate for the types and quantity of hazardous materials used at the site will be available at the work site.
- D. Workers will be trained in spill containment procedures and will be informed of the location of spill containment kits.
- E. Any waste liquids generated at the staging areas will be temporarily stored under an impervious cover, such as a tarpaulin, until they can be properly transported to, and disposed of, at a facility that is approved for receipt of hazardous materials.
- F. Pumps used adjacent to water shall use spill containment systems.

3.1.1.12 Invasive species control

- A. Prior to entering the site, all vehicles and equipment will be power-washed, allowed to dry fully, and inspected to make sure no plants, soil, or other organic material adheres to the surface.
- B. Watercraft, waders, boots, and any other gear to be used in or near water will be inspected for aquatic invasive species.
- C. Wading boots with felt soles are not to be used due to their propensity for aiding in the transfer of invasive species unless decontamination procedures have been approved by the EC Lead.

³ For additional information and suppliers of biodegradable hydraulic fluids, motor oil, lubricant, or grease. See, Environmentally Acceptable Lubricants by the U.S. EPA (2011); e.g., mineral oil, polyglycol, vegetable oil, synthetic ester; Mobil® biodegradable hydraulic oils, Total® hydraulic fluid, Terresolve Technologies Ltd.® biobased biodegradable lubricants, Cougar Lubrication® 2XT Bio engine oil, Series 4300 Synthetic Bio-degradable Hydraulic Oil, 8060-2 Synthetic Bio-Degradable Grease No. 2, etc.

3.1.2 Work Area Isolation & Fish Salvage

3.1.2.1 *Work Area Isolation*

- A. Any work area requiring excavation or mobilization of sediment within the wetted channel will be isolated from the active stream whenever ESA-listed fish are reasonably certain to be present, or if the work area is less than 300-feet upstream from known ESA-listed fish spawning habitats. If the work area isolation practices would cause greater impacts than it would prevent, is located in deep or swiftly flowing water, or if fish can be effectively excluded by nets or screens, then an approval from a NMFS habitat biologist may be pursued.
- B. **Work area isolation & fish salvage activities are considered incidental to construction-related activities and shall occur during the state-recommended in-water work windows.**
- C. When work area isolation is required, design plans will include all isolation elements, fish release areas, a pump to be used to dewater the isolation area, and, when fish are present, a fish screen that meets NMFS's fish screen criteria (NMFS 2011⁴, or most current). Wider mesh screens may be used after all fish have been removed from the isolated area.
- D. Work area isolation and fish capture activities 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.

3.1.2.2 *Fish Salvage*

- A. Monitoring and recording will take place for the duration of salvage activities. The salvage report will be communicated to the Agencies via the project completion form (PCF).
- B. Salvage activities should take place during conditions to minimize stress to fish species, typically periods of the coolest air and water temperatures which occur in the morning versus late in the day.
- C. A fish biologist will determine an operational plan to remove ESA-listed fish, with least harm to the fish, before in-water work begins. This will involve either passive movement of fish out of the project reach through slow dewatering, or actively removing the fish from the project reach. Should active removal be warranted, a fish biologist will clear the area of fish before the site is dewatered using one or more of a variety of methods including seining, dipping, or electrofishing, depending on specific site conditions. Salvage operations will follow the ordering, methods, and conservation measures specified as follows:

⁴ NMFS. 2011. Anadromous salmonid passage facility design. Northwest Region. Available online at: http://www.habitat.noaa.gov/pdf/salmon_passage_facility_design.pdf

1. Slowly reduce water from the work area to allow some fish to leave the work area voluntarily. If dewatered area contains large fine/ sandy sediment deposits, larval lamprey could be present, and potentially in large numbers. If so, consider electrofishing using lamprey electrofishing settings (which do not affect bony fish) prior to or during drawdown. See electrofishing conservation measures.
2. Block nets will be installed at upstream and downstream locations and maintained in a secured position to exclude fish from entering the project area.
3. 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 as long as passage requirements are met.
4. Nets will be monitored hourly anytime there is instream disturbance.
5. 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.
6. Capture fish through seining, and relocate to streams.
7. While dewatering, any remaining fish will be collected by hand or dip nets.
8. Seines with a mesh size to ensure capture of the residing ESA-listed fish will be used.
9. Minnow traps may be left in place overnight and used in conjunction with seining.
10. Electrofish to capture and relocate fish not caught during seining. This step is to be used as a last resort; after all passive techniques have been exhausted. See electrofishing conservation measures.
11. Continue to slowly dewater the stream reach.
12. Collect any remaining fish in cold-water buckets and relocate to the stream;
13. Limit the time fish would be in a transport bucket, and release them as quickly as possible.
14. The number of fish within a bucket will be limited, and fish will be of relatively comparable size to minimize predation.
15. Aerators for buckets will be used, or the bucket's water will be frequently changed with cold, clear, water at 15 minute, or more-frequent, intervals.
16. Buckets will be kept in shaded areas; or if in exposed areas, covered by a canopy.
17. Dead fish will not be stored in transport buckets but will be left on the streambank to avoid mortality counting errors.

D. In areas occupied by bull trout, lamprey, mussels⁵, or native fish, the following salvage guidelines shall be met. See USFWS 2010, “Conservation Measures for Salvage of Native Fish, Lamprey and Mussels” (LTW 2020⁶) and guidance developed by the Xerces Society (Blevins et al. 2018, 2019) or most recent guidance for additional information. Salvage guidelines are as follows:

1. Conduct native mussel and lamprey presence and absence surveys; approximate numbers for salvage to aid in planning for salvage.
2. Pre-select site(s) for release and/or mussel bed relocation.
3. Salvage of bull trout will not take place when water temperatures exceed 15 degrees Celsius.
4. If drawdown less than 48 hours, salvage of lamprey and mussels may not be necessary if temperatures support survival in sediments.
5. Salvage mussels by hand after locating by snorkeling or wading. If mussels are numerous (or staff is limited), it may be necessary to do this step in the days before drawdown, as relocation/placement can be time consuming.
6. Salvage lamprey by electrofishing. See electrofishing conservation measures for lamprey and larval lamprey dry shock settings.
7. Salvage bony fish after lamprey with nets or electrofishing (see electrofishing conservation measures for appropriate settings).
8. Regularly inspect dewatered site since lamprey likely to emerge and mussels may become visible after dewatering.
9. Mussels may be transferred in coolers.
10. Mussels will be placed individually to ensure ability to burrow into new habitat.

3.1.2.3 *Electrofishing Based on NMFS’s Electrofishing Guidelines (NMFS 2000⁷)*

A. Initial Site Surveys and Equipment Settings

1. 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.
2. Prior to the start of sampling at a new location, water temperature and conductivity measurements shall be taken to evaluate electrofisher settings and

⁵ For mussels, Blevins et al. 2018. Conserving the Gems of Our Waters: Best Management Practices for Protecting Native Western Freshwater Mussels, and Blevins et al. 2019. Mussel-Friendly Restoration. Both available online at <https://xerces.org/western-freshwater-mussels/>

⁶ Lamprey Technical Workgroup. 2020. Best management guidelines for native lampreys during in-water work. Original Version 1.0, May 4, 2020. 26 pp. + Appendices. Available: <https://www.fws.gov/pacificlamprey/LTWGMainpage.cfm>

⁷ <https://www.fisheries.noaa.gov/resource/document/additional-agency-guidance>

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.

3. Whenever possible, a block net should be placed below the area being sampled to capture stunned fish that may drift downstream.
4. Each electrofishing session must start with all settings (voltage, pulse width, and pulse rate) set to the minimums needed to capture fish (Table 1).
5. 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. Records for conductivity, water temperature, air temperature, electrofish settings, electrofisher model, electrofisher calibration, fish conditions, fish mortalities, and total capture rates shall be included in the salvage log book.

Table 1 Guidelines for initial and maximum settings for backpack electrofishing for salmonids.

	Initial Settings	Maximum Settings	
Voltage		<u>Conductivity</u>	<u>Max Voltage</u>
	100V	<100	1100 V
		100-300	800 V
		>300	400 V
Pulse Width	500 μS	5 mS	
Pulse Rate	30 Hz	70 Hz	



B. Electrofishing Technique

1. 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 while remaining below maximum levels.
2. Maximum voltage will be 1100 volts when conductivity is less than 100 milliseconds, 800 volts when between 100 and 300 milliseconds, and 400 volts when less than 300 milliseconds (Table 1).
3. 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) within maximum values (Table 1).
4. Maximum pulse width is 5 milliseconds. Maximum pulse rate is 70 hertz.
5. Electrofishing will not occur in one area for an extended period. 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. 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.
6. The anode should not intentionally contact fish. The zone of potential injury for fish of 0.5 m from the anode shall be avoided.
7. Settings will be lowered in shallower water since voltage gradients are likely to increase.
8. Electrofishing will not occur in turbid water where visibility is poor (i.e. unable to see the bed of the stream).
9. 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. If mortality or obvious injury (defined as dark bands on the body, spinal deformations, de-scaling of 25% or more of body, and torpidity or inability to maintain upright attitude after sufficient recovery time) occurs during electrofishing, operations will be immediately discontinued, machine settings, water temperature, and conductivity checked, and procedures adjusted or electrofishing postponed to reduce mortality.

C. Sample Processing

1. Fish shall be sorted by size to avoid predation during containment.
2. Samplers must be aware of the conditions in the containers holding fish; air pumps, water transfers, etc. to maintain safe conditions. All sampling procedures must have a protocol for protecting held fish.
3. Fish should be observed for general condition and injuries (e.g., increased recovery time, dark bands, and visually observable spinal injuries).
4. Fish should be processed as soon as possible after capture to minimize stress. This may require a larger crew size. 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. Every attempt should be made to process and release ESA-listed specimens first.



D. Bull Trout Electrofishing Conservation Measures

1. For salvage operations in known bull trout spawning and rearing habitat⁸, electrofishing shall only occur from May 1 to July 31. In FMO⁹ habitats, electrofishing may occur any time of year.
2. Bull trout are very temperature sensitive and generally should not be electrofished or otherwise handled when temperatures exceed 15°C in spawning and rearing habitats.

E. Electrofishing settings for larval Lamprey

1. Electrofishing should be performed in a manner that minimizes harm to fishes. Handling techniques as described in NMFS Electrofishing Guidelines are protective of lamprey. If there is a conflict between conservation measures for ESA-listed salmonids and lamprey/mussels notify BPA EC Lead and prioritize protections towards the ESA-listed fish. Verify electrofisher model with EC Lead if not one of the following:
 - a. AbP-2 “Wisconsin” electrofisher (ETS Electrofishing, Verona, WI)
 - b. Smith-Root LR-24 model electrofisher with lamprey settings;
 - c. Smith Root Apex Backpack electrofisher with lamprey settings.
2. Electrofishers used for larval lamprey sampling should be set with two wave forms, a lower frequency “tickle” wave form to coax larval lampreys out of the substrate and a higher frequency “stun” wave form to immobilize larval lampreys for netting (Table 2).
3. First stage: use 125V direct current with a 25 percent duty cycle applied at a slow rate of 3 pulses per second, to induce larval lampreys to emerge from the sediment. At low water temperature (<10C°), voltage may need to be raised (150-200V) to maintain its effectiveness (gradually increase voltage to find the appropriate setting to avoid the risk of electronarcosis). Use a pattern of 3 slow pulses followed by a skipped pulse (burst pulse) helps larval lampreys to emerge.
4. Second stage: immediately after larval lampreys emerge, use a fast pulse setting of 30 pulses per second to immobilize and net them. It is not necessary to stun lamprey for netting for experienced netters. Avoid exposing larval lampreys to extended periods of electrofishing as it has also been linked to electronarcosis. Recovery from electronarcosis takes about 15 minutes.
5. Use dip nets to capture larval lampreys where they are readily visible. Where not visible, seines may be effective. Using fine mesh nets to “sweep” the water (“blind-netting”) may increase the number of small larvae collected.

⁸ Bull Trout Spawning and Rearing habitat is not foraging, migrating, and overwintering (FMO) habitats.

⁹ Bull Trout Spawning and Rearing habitat is not foraging, migrating, and overwintering (FMO) habitats.

6. Within each reach, electrofishing should be conducted in a downstream to upstream direction (for the purpose of reducing turbidity/maintaining visibility) with one person operating the electrofisher and at least one person netting larval lampreys. Each reach should be thoroughly and slowly sampled (60-90 sec/m), with more effort directed at suitable lamprey rearing habitat and less effort in areas with hard substrates or high water velocity.
7. Multiple electrofishing passes should be made to ensure a more complete removal of larval lampreys. A fifteen-minute break between passes should be taken to reduce the chance of electronarcosis. Some research indicated on average, only 30% lamprey emerge per pass, thus the need for multiple passes.
8. Post-Drawdown: Larval lamprey may continue to emerge from sediments after drawdown. The following “Dry- Shocking” Guidelines can be used to encourage larvae to emerge from the sediments so they can be salvaged.
 - a. During and after dewatering, dewatered areas where lamprey may be burrowed should be shocked, aka “dry-shocking.” Dry shock in depositional areas of fine and sandy sediment for larval lamprey. Juveniles (eyed migrants) and adults are sometimes found buried in rockier areas, and those areas should also be shocked if other these life stages may be present.
 - b. Dry-shock a square meter at a time. Place the anodes about 1 meter apart and tickle-pulse for 60 to 90 seconds. Remove emerged lamprey once the shocking has stopped. Move to next square meter and continue. Adjust to local conditions – in some instances, 60 seconds of shocking will be sufficient; in other areas 90 seconds is needed. In cold temperatures, it can be beneficial to raise the voltage to increase efficiency. A general guideline is at temperatures less than 100C, the voltage can be increased to 150-175 V. If emergence is really slow (or on the last salvage pass prior to complete dewatering), the voltage can be increased to 200 V initially, and up to 400 V if lower voltage is not effective (dry shocking only).

Table 2: Electrofishing Guidelines for Larval Lampreys.

	“Tickle” Burst Slow Pulse Primary Wave Form	“Stun” Standard Fast Pulse Secondary Wave Form
Voltage	125 v	125 v
Pulse Frequency	3 Hz	30 Hz
Duty Cycle	25%	25%
Burst Pulse Train	3:1	X
Maximum duration/set	60-90 seconds	



3.1.2.4 Dewatering

- A. 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.
- B. Diversion around the construction site may be accomplished with a cofferdam and a bypass culvert or pipe, or a lined, non-erodible diversion ditch. Where gravity feed is not possible, a pump may be used, but must be operated in such a way as to avoid repetitive dewatering and rewatering of the site. Impoundment behind the cofferdam must occur slowly through the transition, while constant flow is delivered to the downstream reaches.
- C. All pumps will have fish screens to avoid juvenile fish impingement or entrainment, and will be operated in accordance with NMFS's current fish screen criteria (NMFS 2011, or most recent version). If the pumping rate exceeds 3 cubic feet per second (cfs), a NMFS Engineering review will be necessary. If the screen is in an isolated area with no fish (salmonids or larval lamprey), a larger mesh screen may be used.
- D. Dissipation of flow energy at the bypass outflow will be provided to prevent damage to riparian vegetation and/or stream channel.
- 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.

3.1.3 Construction and Post-Construction Conservation Measures

3.1.3.1 Fish passage

- A. Fish passage will be provided for any adult or juvenile fish likely to be present in the project area during construction, unless passage did not exist before construction, or the stream is naturally impassable at the time of construction, or if it shall increase negative effects on ESA-listed species or their habitat.
- B. Fish passage alternatives shall be approved by BPA EC lead under advisement by NMFS habitat biologist.

3.1.3.2 Construction and discharge water

- A. Surface water may be diverted to meet construction needs, but only if developed sources are unavailable or inadequate.
- B. Diversions will not exceed 10% of the available flow.
- C. All construction discharge water will be collected and treated using the best available technology suitable for site conditions. Treatments to remove debris, nutrients, sediment, petroleum hydrocarbons, metals and other pollutants likely to be present will be provided.

3.1.3.3 *Time and extent of disturbance*

- A. Earthwork (including drilling, excavation, dredging, filling and compacting) in which mechanized equipment is used in stream channels, riparian areas, and wetlands will be completed as quickly as possible.
- B. 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.

3.1.3.4 *Cessation of work*

- A. Project operations will cease when high flow conditions may result in inundation of the project area, except for efforts to avoid or minimize resource damage.
- B. Project operations will cease when allowable water quality levels are exceeded as defined by the state CWA section 401 water quality certification or HIP Turbidity Monitoring Protocol. See CWA Section 401 Water Quality Certification for more information.

3.1.3.5 *Site restoration*

- 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 decompacted and re-contoured. When necessary for revegetation and infiltration of water, compacted areas of soil will be loosened.
- D. 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.

3.1.3.6 *Revegetation*

- A. Planting and seeding will occur prior to or at the beginning of the first growing season after construction.
- B. Use a mix of species, appropriate to the site that will achieve establishment, shade, and erosion control objectives. These would, preferably be forb, grass, shrub, or tree species native to the project area or region.
- C. Vegetation, such as willow, sedge and rush mats, will be salvaged from disturbed or abandoned floodplains, stream channels, or wetlands, and replanted at the site in appropriate locations.

- D. 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.
- E. Surface fertilizer will not be applied within 50 feet of any stream channel, waterbody, or wetland.
- F. Fencing will be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons.
- G. Invasive species will not be used. Invasive plants will be removed or controlled until native plant species are well-established (typically within 3 years post-construction to achieve 70% of pre-project conditions).

3.1.3.7 *Site access and implementation monitoring*

- A. 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. Project Sponsor staff or their designated representative will provide implementation monitoring to ensure:
 - a. General conservation measures are adequately followed.
 - b. Effects to listed species are not greater than predicted and incidental take limitations are not exceeded.
 - c. Turbidity monitoring is being conducted in accordance with the HIP turbidity monitoring protocol.
- B. The Project Sponsor or designated representative will submit the Project Completion Form (PCF) to ensure compliance with the applicable BiOp.

3.1.3.8 *CWA section 401 water quality certification*

- A. The Project Sponsor or designated representative will complete and record water quality observations to ensure that in-water work is not degrading water quality.
- B. 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.

3.2 Staged Rewatering Plan and Conservation Measures

- A. When appropriate, the Project Sponsor shall implement a staged rewatering plan for projects that involve introducing streamflow into recently excavated channels under activity category 2a) Improve Secondary Channel and Wetland Habitat or 2f) Channel Reconstruction. This plan may be altered according to site specific conditions with coordination and feedback from BPA and the Services.
- B. The following will be applied to all rewatering efforts. Complex rewatering may require additional notes or a dedicated sheet in the construction details.
1. Turbidity monitoring protocol will be applied to rewatering efforts.
 2. Pre-wash the newly-excavated channel before rewatering¹⁰. Turbid wash water will be detained and pumped to the floodplain or into a reach with sediment capture devices, rather than discharging into fish-bearing waters.
 3. Install seine nets at upstream end to prevent fish from moving downstream until 2/3 of total flow is restored to the channel.
 4. Starting in the early morning, introduce 1/3 of the flow into the new channel over a period of 1-2 hours.
 5. Introduce the second 1/3 of the flow over the next 1-2 hours. Salvage fish from the old channel at this time, so that the old channel is fish-free before dropping below 1/3 of the flow. *Note: the fish will be temporarily blocked from moving downstream into either channel until 2/3 of the flow has been transitioned to the new channel. This blockage to downstream fish passage is expected to persist for roughly 12 to 14 hours, but fish will still be able to volitionally move out of the channel in the downstream direction.* Perform monitoring as in #3 above.
 6. After the second 1/3 of flow is introduced over 2 hours, and turbidity is within 10% of the background level, remove seine nets from the new channel, and allow fish to move downstream back into the channel.
 7. Introduce the final 1/3 of flow. Once 100% of the flow is in the new channel, install plug to block flow into the old channel and remove seine nets from the old channel. Additional efforts to salvage larval lamprey emerging from fine sediment deposits should be conducted after the flow is gone and possibly for a few hours after flow is gone, as the larvae will continue to emerge.
 8. Install plug to block flow into old channel or bypass if not part of project. Remove any seine nets.
 9. In lamprey systems, lamprey salvage and dry shocking may be necessary.

¹⁰ The contractor may find it useful to have prewashed gravel bags available onsite to control the flow of water.

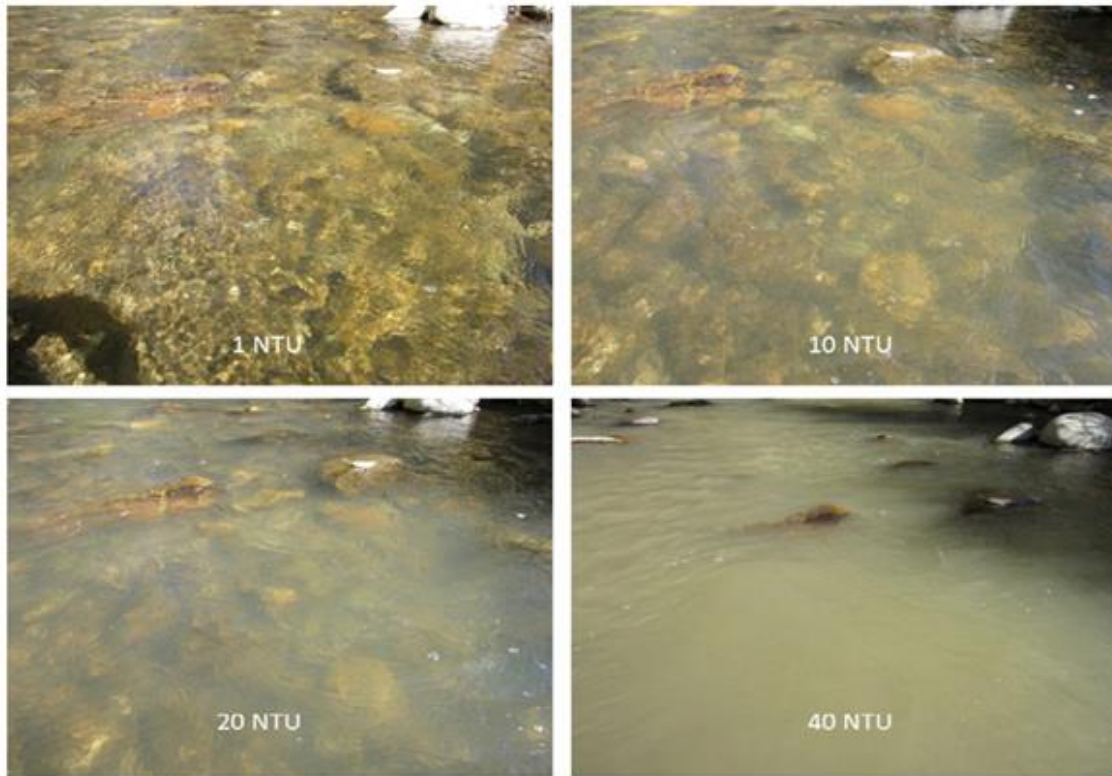


3.3 HIP Turbidity Monitoring Protocol and Conservation Measures

The Project Sponsor is responsible for monitoring turbidity during implementation. If the geomorphology of the project area (e.g., silty or claylike materials) or the nature of the action (e.g., large amounts of bare earth exposure) shall preclude the successful compliance with these triggers, notify the BPA EC Lead in advance of the likelihood of an exceedance and seek additional recommendations. Turbidity protocol is as follows:

- A. Take a background turbidity measurement approximately 100 feet upstream from the project area using a recently-calibrated turbidimeter or estimated using visual observations (Figure 1). Note the turbidity level, location, and time of the background measurement.
- B. Record the turbidity measured using a calibrated turbidimeter or estimated by visual observation (Figure 1) before work begins at the downstream point, known as the measurement compliance point. Note the turbidity level, location, and time. The compliance point shall be located downstream of the disturbance area, approximately:
 1. 50 feet downstream for streams that are less than 30 feet wide;
 2. 100 feet downstream for streams between 30 and 100 feet wide;
 3. 200 feet downstream for streams greater than 100 feet wide; and
 4. 300 feet from the discharge point or nonpoint source for locations subject to tidal or coastal scour.
- C. Turbidity shall be measured by turbidimeter or estimated by visual observation (Figure 1) at the background and compliance points every **4 hours** while work is being implemented.
- D. If there is a visible difference between a compliance point and the background then an exceedance (10% or more) has occurred and must be noted in the PCF. Adjustments or corrective measures must be taken in order to reduce turbidity.
- E. If exceedances occur for more than **two consecutive monitoring intervals** (after 8 hours), the activity must stop until the turbidity level returns to background, and the BPA EC Lead must be notified after the project is concluded. The BPA EC Lead shall document the reasons for the exceedances and the corrective measures taken. This is very important as BPA is required to report to the Services upon all exceedances.
- F. If at any time, monitoring, inspections, or observations/samples show that the turbidity controls are ineffective, immediately mobilize work crews to repair, replace, or reinforce controls as necessary. Document those occurrences in the Project Completion Form (PCF).
- G. The Project Sponsor shall submit a summary of readings, exceedances, control failures, adaptive measures to BPA using the HIP Project Completion Form (PCF).

Figure 1 Suggested Visual Observational Differences in Turbidity



NOTE: A visual observation of a difference between compliance points shall be assumed to be about a 10% increase in natural stream turbidity.



4.1.1 Category 1a) Dams, Water Control Structures, or Legacy Structures Removal

Description

HIP provides ESA coverage for BPA funded fish passage projects that restore more natural channel and flow conditions by removing small dams, channel-spanning weirs, earthen embankments, subsurface drainage features, spillway systems, tide gates, outfalls, pipes, instream flow redirection structures (e.g., drop structure, gabion, groin), or similar devices used to control, discharge, or maintain water levels.

“Small dams” include instream structures with active channels less than 75 feet, and (1) up to 15 feet in height (as measured at the maximum difference between water surface elevations upstream and downstream of the dam during low flow) for streams with a slope less than 4%¹² downstream, or (2) up to 16.4 feet in height for streams with a slope greater than 4%.

Guidelines for Risk

- **Low Risk:** Removal of structures such as subsurface drainage features, tide gates, outfalls, pipes, small dams with total head measurement less than 3 feet that do not require fish isolation or flow diversion during implementation (for example, an abandoned structure in the floodplain or intermittent and ephemeral channels).
- **Medium Risk:** Removal of instream structures less than 3 feet.
- **High Risk:** Removal of small dams greater than or equal to 3 feet and less than 15 feet in height for streams with a slope less than 4%, or greater than 3 feet and less than 16.4 feet in height with a slope greater than 4%.



¹² Measured over 10 bankfull widths upstream and 10 bankfull widths downstream

Guidelines for Review

- BPA Functional review required for all risk levels.
- BPA Technical review required for medium and high risk projects.
- NMFS Engineering review required for all instream barriers greater than or equal to 3 feet.
- Interagency review required for high risk projects.
- USFWS Field Office Supervisor review required if passage improvement increases connectivity between bull trout and non-native species.

Conservation Measures

- 1) If the structure being removed contains material (i.e. large wood, boulders, etc.) that is typically found within the stream or floodplain at that site, the material can be reused to implement habitat improvements. Any such project shall adhere to appropriate conservation measures for all activities in Category 2: River, Stream, Floodplain, and Wetland Restoration.
- 2) Tide gates can only be removed, but not modified or replaced, under this activity category. See activity category 2b) Set-back or Removal of Existing Berms, Dikes and Levees for tide gate relocation.
- 3) If the legacy structures (log, rock, or gabion weirs) were placed to provide grade control, evaluate the site for potential headcutting and incision due to structure removal by using the appropriate guidance.¹³ If headcutting and channel incision are likely to occur due to structure removal, additional measures must be taken to reduce these impacts. See grade control options described under activity category 1c) Headcut and Grade Stabilization.
- 4) In the design plans, the profile of the stream channel thalweg shall be shown to provide enough information to clearly demonstrate project impacts to the stream channel and the potential for channel degradation, for a minimum of 10 upstream and 10 downstream channel widths from the upstream and downstream boundaries of the project.
- 5) Sediment characterization must be performed and demonstrate the proportion of coarse sediment (>2mm) stored in the reservoir area. Reservoirs with a D35 greater than 2 mm (i.e., 65% of the sediment by weight exceeds 2 mm in diameter) may be removed without excavation of stored material, if the sediment contains no contaminants. Reservoirs with a D35 less than 2 mm (i.e., 65% of the sediment by weight is less than 2 mm in diameter) will require partial removal of the fine sediment to create a pilot channel, in conjunction with stabilization of the newly exposed streambanks with native vegetation.

¹³ Castro, J. 2003. Geomorphologic Impacts of Culvert Replacement and Removal: Avoiding Channel Incision. Oregon Fish and Wildlife Office, Portland, OR. Available at: <http://library.fws.gov/pubs1/culvert-guidelines03.pdf>

- 6) Estimate volume of potentially mobile material and perform an assessment of potential downstream impacts. Surveys must be taken of any downstream spawning areas that may be affected by sediment released due to removal of the water control structure or dam.
- 7) Following removal of the structure, restore all bank lines and fill in all holes with native materials to natural contours of streambank and floodplain. Compact the fill material adequately to prevent washing out of the soil during over-bank flooding. Do not mine material from the stream channel to fill in “key” holes. When removal of buried (keyed) structures could result in substantial disruption to riparian vegetation and/or the floodplain, consider leaving the buried structure sections within the streambank.
- 8) If the structure is being removed because it has caused an over-widening of the channel, consider implementing other HIP restoration categories to decrease the width-to-depth ratio of the stream at that location to a level similar to the natural and representative upstream and downstream sections of the stream, within the same channel type.

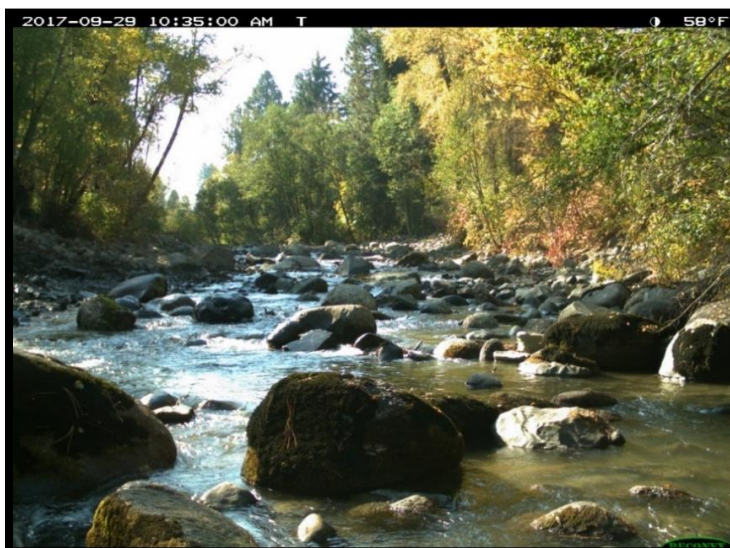


4.1.3 Category 1c) Headcut and Grade Stabilization

Description

HIP provides ESA coverage for BPA funded restoration of fish passage and grade control (i.e., headcut and grade stabilization) with geomorphically-appropriate structures. Structures may include engineered riffles, rock weirs, log weirs, and large wood (LW). If geomorphic conditions are appropriate, consideration should be given towards use of a roughened channel or constructed riffle to minimize the potential for future development of a passage (jump height) barrier.

For wood-dominated systems, grade control engineered log jams (ELJs) should be considered as an alternative. Grade control ELJs are designed to arrest channel downcutting or incision, retain sediment, lower stream energy, and increase water elevations to reconnect floodplain habitat and diffuse downstream flood peaks. Unlike hard weirs or rock grade control structures, a grade control ELJ is a complex broad-crested structure that dissipates energy more gradually.



Guidelines for Risk

- **Low Risk:** N/A, see Section 2.4 Risk Determination for low risk consideration.
- **Medium Risk:** Grade control structures that address headcuts less than 18 inches in height as measured from the streambed (18 inches refers to the total height of the headcut(s), rather than height of individual structures).
- **High Risk:** Grade control structures that address headcuts greater than or equal to 18 inches in height as measured from the streambed (18 inches refers to the total height of the headcut(s), rather than height of individual structures).

Guidelines for Review

- BPA Functional review required for all risk levels.
- BPA Technical review required for medium and high risk levels.
- NMFS Engineering review required for headcut or grade stabilization actions greater than or equal to 18 inches in height.
- Interagency review required for high risk projects.
- USFWS Field Office Supervisor review required if passage improvement increases connectivity between bull trout and non-native species.

Conservation Measures (General)

- 1) All structures will be designed to the design benchmarks set forth in NMFS 2011¹⁶ (or most recent version).
- 2) For grade control structures that are greater than or equal to 18 inches in height, provide the profile of the stream thalweg for a minimum for of (10) upstream and (10) downstream channel widths beyond the extent of the proposed construction. The design documentation shall provide enough information to clearly demonstrate project impacts to the stream channel and the potential for channel degradation.

Conservation Measures (Boulder and log weirs)

- 1) For the use of wood, see additional conservation measures in activity category 2d) Install Habitat-Forming Instream Structures (Large Wood, Small Wood and Boulders).
- 2) Install weirs low in relation to channel dimensions so that they are completely overtopped during channel-forming flow events (approximately a 1.5-year flow event).
- 3) Weirs are to be placed perpendicularly across the channel or in upstream pointing “V” or “U” configurations (with the apex oriented upstream). The apex should be lower in elevation than the structure wings to support low flow consolidation.
- 4) Weirs are to be constructed to allow upstream and downstream passage of all native fish species and life stages that occur in the stream. This can be accomplished by providing plunges no greater than 6 inches in height, allowing for juvenile fish passage at all flows.
- 5) Key the weirs into the streambed (preferably at least 2.5 times their exposure height) to minimize structure undermining due to scour. The weir should also be keyed into both banks in a manner that prevents water from cutting around the structure.
- 6) Include fine material in the weir material mix to help seal the weir/channel bed, thereby preventing subsurface flow. Geotextile material can be used as an alternative approach to prevent subsurface flow.
- 7) Material used to construct weirs shall be durable and of suitable quality to ensure permanence in the climate in which it is to be used.

¹⁶ NMFS. 2011. Anadromous Salmonid Passage Facility Design. NMFS, Northwest Region, Portland, Oregon. Available at: http://www.westcoast.fisheries.noaa.gov/publications/hydropower/fish_passage_design_criteria.pdf

- 8) For boulder weirs, the use of gabions, cable, or other mechanical connections to prevent the movement of individual boulders in a weir are not allowed.

Conservation Measures (Headcut stabilization and roughened riffles)

- 1) Provide fish passage over stabilized head-cut or constructed riffle according to NMFS 2011¹⁷ (or most recent version). Passage can be provided through a series of log or rock weir structures or a roughened channel.
- 2) Armor features intended for grade stabilization with sufficiently-sized and amounts of material to provide a structure capable of withstanding a 100-year flow event (or other approved design flow) without further progressing the headcut or substantially degrading the riffle.
- 3) Headcut stabilization structures and roughened riffles will be constructed utilizing an engineered stream simulation bed material, which will be pressure-washed into place until surface flow is apparent and minimal subsurface material to ensure fish passage immediately following construction (if natural flows are sufficient). Successful washing will be determined by minimizing voids within placed matrix such that ponding occurs with little to no percolation losses.
- 4) For grade stabilization efforts, design considerations should extend beyond the control structure to include the plunge pool downstream and the upstream approach. Also consider floodplain return flows and flanking that could create potential new headcut conditions, and potential changes in bank erosion conditions due to structure placement.
- 5) Minimize lateral migration of the channel around the head cut or riffle (“flanking”) by designing the downstream face with a lower elevation in the center of the channel cross section to direct flows to the middle of channel.
- 6) Materials used for construction can be native to the area if gradation is shown to be appropriate.

¹⁷ NMFS. 2011. Anadromous Salmonid Passage Facility Design. NMFS, Northwest Region, Portland, Oregon. Available at: http://www.westcoast.fisheries.noaa.gov/publications/hydropower/fish_passage_design_criteria.pdf

4.2 Category 2: River, Stream, Floodplain, and Wetland Restoration

HIP provides ESA coverage for BPA funded river, stream, floodplain, and wetland restoration actions with the objective of providing appropriate habitat conditions required for foraging, rearing, and migrating ESA-listed fish.

Projects utilizing habitat restoration actions outlined within this activity category shall be related to limiting factors identified within the applicable sub-basin plan for the watershed, a recovery plan for ESA-listed species, or shall be prioritized by recommended restoration activities identified within a localized region by a technical oversight and steering committee (e.g., the Columbia River Estuary). Individual projects may utilize a combination of the activities listed in the River, Stream, Floodplain, and Wetland Restoration activity category.

The following activity categories address projects that improve fish habitat: (a) Improve Secondary Channel and Floodplain Connectivity; (b) Set-back or Removal of Existing Berms, Dikes, and Levees; (c) Protect Streambanks Using Bioengineering Methods; (d) Install Habitat-Forming Instream Structures (Large Wood, Small Wood and Boulders); (e) Riparian and Wetland Vegetation Planting; (f) Channel Reconstruction; and (g) Install Habitat Forming Natural Materials (Sediment and Gravel).



4.2.4 Category 2d) Install Habitat-Forming Instream Structures (Large Wood, Small Wood, and Boulders)²⁶

Description

HIP provides ESA coverage for BPA funded restoration projects that include placement of instream structures comprised of natural habitat-forming materials to provide instream complexity and to support spawning, rearing, and resting habitat for salmonids and other aquatic species. Anthropogenic activities have altered riparian habitats, reduced instream habitat complexity, and eliminated or reduced features like pools, cover, and bed complexity that Salmonids need for rearing, feeding, and migrating. To offset these impacts, in-stream structures consisting of large wood, small wood, and boulders will be placed in stream channels either individually or in combination. Structures may be placed to create rearing habitat and pool formation; promote spawning gravel deposition; reduce siltation in pools; reduce the width/depth ratio of the stream; decrease flow velocities; and to connect floodplain areas for natural vegetation recruitment, habitat diversity, and high-flow refugia.

Instream structures are prone to having unintended consequences; caution must be exercised when using this approach. Structures have the potential to affect hydraulics, sediment transportation, and wood transport. The degree to which these effects achieve the desired results or place nearby habitat, infrastructure, property, and public safety at risk depends on a number of important variables that affect the way in which a structure functions in the stream.



²⁶ descriptions of each technique refer to the WDFW Stream Habitat Restoration Guidelines: <http://wdfw.wa.gov/publications/00046/>, the USACE's EMRRP Technical Notes, Stream Restoration: <http://el.ercd.usace.army.mil/publications.cfm?Topic=technote&Code=emrrp>, or the NRCS National Engineering Handbook Part 654, Stream Restoration: <http://policy.nrcs.usda.gov/viewerFS.aspx?id=3491>

Large Wood Placements

Large wood placements are projects or structures that use trees greater than one foot in diameter at breast height, (DBH), are 15 feet or greater in length, and are used as the primary pieces within the placement or structure. These criteria do not preclude the use of materials with dimensions less than this size class for racking, woven, or slash that may be incorporated into the structure.

Placement of large woody debris (wood) and other structures in streams is one of the most widespread and common techniques to improve riverine fish habitat. Techniques for wood placement include falling, pushing, hauling trees from the riparian zone, and construction of highly engineered structures such as logjams (Roni et al. 2014).

Structure design criteria should be focused on balancing biological benefit and structural resiliency. Benefits should focus on enhancing watershed driven processes including floodplain connectivity. Increasing the system-wide placement and longitudinal extent of process forming friction elements may be more effective in many reaches than individual, large scale structures. The placement of large wood should be viewed as an interim solution - a short-term improvement providing habitat as natural rates of woody debris recruitment are restored through riparian forest regeneration.



Small Wood Placements

Small wood placements are defined herein as projects or structures that use trees that are less than one foot in diameter DBH and 15 feet or less in length.

This activity includes the installation of small wood in-channel structures that improve habitat by flattening local stream gradients, increasing interactions between the stream and floodplain, increasing floodplain groundwater storage, capturing of relatively fine sediment in the channel, pool formation, hyporheic exchange, and riparian recovery. Structures consist of porous channel-spanning or partial spanning structures comprised of small diameter woody debris (including whole trees) riparian cuttings and other inert materials that are structurally reinforced with small diameter driven posts. Structures include spaces between posts that allow water, sediment, fish, and other aquatic organisms to move through the structure.

Variation of this restoration treatment may include small, whole tree placement, beaver dam analogues (BDA), post assisted log structures (PALS), post lines only, post lines with wicker weaves, construction of starter dams, reinforcement of existing active beaver dams, and reinforcement of abandoned beaver dams as described by Pollock et al. (2012).



Boulder Placements

Boulders may be placed to restore habitat diversity in plane bed streams from which boulders have been removed, to alter plain bed channels that were historically dominated by wood, and to add habitat complexity in new or altered stream reaches. Boulder placements increase habitat diversity and complexity, improve flow heterogeneity, provide substrate for aquatic vertebrates, moderate flow disturbances, and provide refuge for fish during high flows.

Guidelines for Risk

- **Low Risk:** N/A, see Section 2.4 Risk Determination for low risk consideration.
- **Medium Risk:** Habitat structures to start as medium risk. See Section 2.4 for other risk level considerations.
- **High Risk:** See Section 2.4 Risk Determination for high risk consideration.

Guidelines for Review

- BPA Functional review required for all risk levels.
- BPA Technical review required for medium and high risk.
- NMFS Engineering review is not required.
- Interagency review required for high risk projects.

A Monitoring and Adaptive Management Plan is required for process-based projects that require multi-year treatments. Scale and risk may also be considered.

Conservation Measures (Large Wood)

- 1) Large wood placements for primary purposes other than habitat restoration or enhancement are excluded from this consultation. Large wood placements incorporated with bank protection and slope stability shall adhere to activity categories 1c) Headcut and Grade Stabilization and 2c) Protect Streambank Using Bioengineering Methods.
- 2) Large wood placements must be designed to mimic the process and function of natural accumulations of large wood in the channel, estuary, or marine environment and address defined limiting factors.
- 3) Large wood anchoring shall not utilize cable. Pinning to boulders shall not be practiced in streams with recreational use.
- 4) The utilization of structural connections (biodegradable rope or pins) should be used minimally. Structural connections for large wood shall only be used if hydraulic conditions warrant use. Rationale for structural anchorage shall be justified and demonstrated in the Basis of Design Report and will be evaluated as a component of the HIP Technical Review.
- 5) If pins are used, protruding ends of rebar shall be cut flush with log or bent in order to prevent impaling fish, people, or wildlife.
- 6) Treated wood, copper- or zinc-plated hardware shall not be used in construction of habitat features. ASTM A615 and/or black steel hardware (or approved similar steels) shall be used.

- 7) Ballast (sediment, boulders, other logs) for structural stability of large wood shall only be used if hydraulic conditions warrant use. Rationale for structural ballast shall be justified and demonstrated in the Basis of Design Report and will be evaluated as a component of the HIP Technical Review.
- 8) Installation of large wood that requires ballast, excavation, or structural connections shall be designed by a licensed engineer unless BPA Technical Lead review member confirms project is low risk according to Section 2.4. Rationale for structural anchorage shall be justified and demonstrated in the Basis of Design Report. In addition, the Basis of Design Report shall include structural stability calculations (An appendix is acceptable).
- 9) Large wood must be intact, hard, and undecayed to partly decaying and should preferably include untrimmed root wads when available to provide functional refugia habitat for fish. Large wood includes whole trees with rootwad and limbs attached, pieces of trees with or without rootwads and limbs, and cut logs. Use of decayed or fragmented wood found lying on the ground or partially sunken in the ground is not acceptable for key pieces but may be incorporated to add habitat complexity.
- 10) Riparian buffer strips associated with streambank protection shall extend from the bankfull elevation towards the floodplain a minimum distance of 35 feet.
- 11) If non-federal laws or ordinances require specific stability requirements, federal supremacy does not apply. Design shall include stability for primary LWD elements including base, key and anchorage members (logs larger than 15 feet long and greater than one foot in diameter). These pieces are assumed to comprise ~ 50% of the overall structure. Woven, racking, matrix, and recruited material are expected to be transient and dynamically interact with the fluvial system. If specific stability evaluation of a structure result in criteria more conservative than that presented above, then a risk – benefit analyses is expected to ascertain the appropriateness of the subject structure. This assessment will be used to determine the benefits to fish habitat and may result in forgoing or modification of the project element.
- 12) Rock may be used for ballast but should be limited to what is needed to anchor the large wood. Use of rock shall be justified in Basis of Design Report, and stability calculations are required.
- 13) Piling shall consist of wood piles; steel piles are not to be used under any circumstance. Drive each piling as follows to minimize the use of force and resulting sound pressure.
 - a) Use a vibratory head to drive the piles; an impact hammer may only be used in the dry.
 - b) Select areas with soft substrate rather than rocky hard substrate; avoid bedrock, and
 - c) Isolate the work area if possible to minimize acoustic disturbance.

Conservation Measures (Small Wood)

- 1) Small wood placements shall be conducted by hand or small machinery not to exceed 15,000 lbs. operating weight. If heavy equipment is required, project shall adhere to Large Wood conservation measures.

- 2) Small wood placements shall be constructed for floodplain reconnection in stream systems less than 4% stream gradient.
- 3) Additional potential effects of structures may include channel aggradation and associated channel widening, bank erosion, increased channel meandering, and decreased channel depth. The Basis of Design Report must demonstrate how these potential impacts have been addressed.
- 4) Structures must be porous, must provide for a water surface differential of no more than one-foot at low flows, or otherwise provide a clear path for fish passage over, through or around the structure during low flows.
- 5) Structures shall have crest elevations that extend no more than 3 feet above the stream bed. Vertical posts (if utilized) shall be cut flush and not extend above the proposed crest elevation.
- 6) Vertical posts (if utilized) must be driven to a depth at least 1.5 times the expected scour depth of the waterway or a ratio of 2:1 for exposed – embedded length whichever is more conservative. A minimum 1.5-foot clear space is recommended between posts.
- 7) For incised channels, an adaptive management approach using lower elevation structures that trap sediment and aggrade the channel, with future and subsequent project phases is preferred over tall structures with excessive drop and increased risk of failure.
- 8) All primary materials used in small wood placements must consist of non - treated wood (e.g. fence posts) and must be constructed from a materials source collected outside the riparian area.
- 9) Placement of inorganic material is limited to the minimum quantity necessary to prevent under-scour of structure and manage pore flow sufficient to ensure adequate over-topping flow and side flow to facilitate fish passage where required.
- 10) No cabling, wire, mortar or other materials that serve to affix the structure to the bed, banks or upland is allowed.
- 11) Structures cannot unreasonably interfere with use of the waterway for navigation, fishing or recreation.

Conservation Measures (Boulder Placement)

- 1) Boulder placements for purposes other than habitat restoration or enhancement are not covered under this activity.
- 2) Boulder clusters should only be applied where a biologic or geomorphic need has been identified. Rationale for boulder placements shall be justified and demonstrated in the Basis of Design Report.
- 3) Boulder placements will be limited to reaches with a streambed that consists predominantly of coarse gravel or larger sediments and will address identified limiting factors.

- 4) The cross-sectional area of boulder placements may not exceed 25% of the cross-sectional area of the low-flow channel.
- 5) Boulder placements may not be installed with the purpose of shifting the stream flow to a single flow pattern in the middle or to the side of the stream.
- 6) Boulders will be machine-placed (no end dumping allowed) and will rely on the size of boulder, rather than anchoring, for stability.
- 7) Boulders will be installed in a low position in relation to channel dimensions so that they are completely overtopped during channel-forming flow events (approximately a 2-year flow event).



4.2.5 Category 2e) Riparian and Wetland Vegetation Planting

Description

HIP provides ESA coverage for BPA funded restoration projects that include vegetation planting to restore natural plant species composition and structure to recover associated watershed processes and functions. Under this activity category, the Project Sponsors would plant native trees, shrubs, herbaceous plants, and/or grasses to help stabilize soils and restore riparian plant communities. Native plant species and seeds will be obtained from local sources to ensure plants are adapted to local climate and soil chemistry.

Vegetation management strategies will be utilized that are consistent with local native succession and disturbance regimes and specify seed/plant source, seed/plant mixes, and soil preparation. Planting will address the abiotic factors contributing to the sites' succession (i.e., weather and disturbance patterns, nutrient cycling, and hydrologic condition). Only certified noxious weed-free seed (99.9%), straw, mulch or other vegetation material for site stability and revegetation projects will be utilized.

Guidelines for Risk

- ***Low Risk:*** Riparian vegetation planting is considered low-risk.
- ***Medium Risk:*** N/A.
- ***High Risk:*** N/A.

Guidelines for Review

- BPA Functional review required for all risk levels.
- BPA Technical review is not required.
- NMFS Engineering review is not required.
- Interagency review is not required.

Conservation Measures

- 1) An experienced silviculturist, botanist, ecologist, or associated technician shall be involved in designing vegetation treatments.
- 2) Species to be planted must be of the same species that would naturally occur in the project area and be appropriate for site specific hydrologic conditions.
- 3) Transplant material shall come from outside the bankfull width, and where such plants are abundant, and preferably be salvaged from areas where excavation is planned.
- 4) Sedge and rush mats should be sized and anchored to prevent their movement during high flow events.
- 5) Species distribution shall mimic natural distribution in the riparian and floodplain areas and be adapted for the hydrologic conditions.
- 6) Plantings shall utilize appropriate stock and be installed in a manner that maximizes access to groundwater sources to improve survival.

- 7) Plantings shall be installed during dormant periods with sufficient time for root development to improve survival (typically Fall/Winter).
- 8) Livestock shall be excluded from the planting area. If necessary, riparian exclusion fencing for grazing shall be installed in accordance with activity category 9b) Construct Fencing for Grazing Control.

