

## Forest Aquatic Restoration Project NEPA Compliance and Implementation Checklist

**Project Number:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Title & Category:** Long Creek Neal Habitat Project **Category 2:** Large Wood, Boulder, and Gravel Placement, **Category 3:** Dam, Tidegate and Legacy Structure Removal  
**Category 5:** off- and Side Channel Habitat Restoration **Category 9:** Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering **Category 14:** Riparian Vegetative Planting

**Location:** T. 10 S., R. 31 E., sec. 21.

**Project Description:** The project will authorize aquatic restoration activities within Long Creek.

**Heritage**

- Specific PDC for Heritage addressed (Heritage Surveys; Avoidance areas).

**Botany**

- Specific PDC for Botany addressed (Sensitive Plant Surveys).

- Specific PDC for Nox. Weeds addressed.

**Land Management Consistency**

- |                                  |                        |                             |   |
|----------------------------------|------------------------|-----------------------------|---|
| <input type="checkbox"/> 4A      | Big Game Winter range  | <input type="checkbox"/> 9  | Research Natural Areas                        |
| <input type="checkbox"/> 6A & 6B | Wilderness             | <input type="checkbox"/> 10 | Semi-Primitive Non-Motorized Recreation Areas |
| <input type="checkbox"/> 7       | Scenic Area            | <input type="checkbox"/> 22 | Wild and Scenic River                         |
| <input type="checkbox"/> 8       | Special Interest Areas | <input type="checkbox"/>    | Inventoried Roadless Areas                    |

**Comments:** \_\_\_\_\_

Table 1. Projects Design Criteria and Forest Plan compliance checklist.

I have reviewed this project and have determined it is within the Project Design Criteria identified for my resource.			
Resource	Signature	Date	Comments
Heritage	Kate Withee	3/29/17	USFWS is lead agency on heritage review for this project.
Botany	Joe Bynum	3/20/17	Assure weed infestations are avoided prior to starting work, Botanist will flag areas <sup>when asked</sup>
Wildlife	Justin Hallenbeck	3/20/17	remove all old fence material and wire, use wildlife friendly fence species.
Fish*	Dan Vandenberg	3/14/17	consistent with ARBO II & Aquatic, CEA PDC 5 - no issue
Hydrology*	RAA	3/17/17	Beneficial project to water users.
Range	NES		Continue coordination w/ Range & permittees
Soils	Morgan	3/23/17	Project should benefit riparian soils; adjacent upland soils disturbed by heavy machinery should recover in 1-5 years. No issues.
Recreation	Justin Dixon	3/20/2017	No concerns
Lands and Special Uses	Stewart	3/22/17	Continue coordination w/ County Rd Dept. No other lands SUP issues identified
Engineering	John LaRocca	3/29/17	check with County for proper fence placement off to Rd.
Fuels / Fire		3/20/17	No concerns
Silviculture	Manuela Pritchard	3/20/17	tip GF and DF before tipping PP and WL

\* Ensure that an experienced fisheries biologist or hydrologist is involved in the design of all projects covered by Aquatic Restoration Biological Opinion II. The experience should be commensurate with technical requirements of a project.

Line Officer Signature: David Halum

Date: 5-8-17

**Implementation Description:**

**Long Creek Neal Habitat Project**

<p><u>Category 2:</u> Large Wood, Boulder, and Gravel Placement, including tree removal for large wood placement</p> <p><u>Category 3:</u> Dam and Legacy Structure Removal</p> <p><u>Category 5:</u> Off- and Side Channel Habitat Restoration</p> <p><u>Category 9:</u> Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering</p> <p><u>Category 14:</u> Riparian Vegetative Planting</p>	<p>Lead Preparers: Allen Taylor, and Rosalinda Gonzalez (Rosie)</p>
<p>Applicant: Blue Mountain Fisheries/ Hydrology</p>	<p>NEPA Reference: DN For Aquatic Restoration EA <a href="http://www.fs.usda.gov/detailfull/malheur/landmanagement/?cid=STELPRD3817723&amp;width=full">http://www.fs.usda.gov/detailfull/malheur/landmanagement/?cid=STELPRD3817723&amp;width=full</a></p>
<p>Location: T. 10 S., R. 31 E., sec. 21. Grant County Oregon USGS Quad: Keeney Point In part of the Fox Allotment, and South Fork Pasture</p>	<p>Lease/ /Case File/ Serial #: N/A (Reference #): N/A</p>
<p>Begin Date: 3/13/17</p>	<p>Due Date: 5/01/17</p>

**Purpose/Need:**

This project is a joint effort between the Bureau of Reclamation and the Forest Service. The items analyzed in this check list only cover the portion of the project being done on Forest Service land. The purpose of the proposed project is to restore aquatic habitat, including critical habitat for the threatened Middle Columbia River steelhead, and Interior redband trout, a sensitive species, on a portion of Long Creek, a tributary to the Middle Fork John Day River, and to enable the completion of a larger project. The general intent of the larger project is to improve habitat for fish by realigning 2,500 feet of Long Creek.

The project is located about 6 miles east of the town of Long Creek. There is a need to improve aquatic habitat in Long Creek. Long Creek is spawning and rearing habitat for listed Mid-Columbia Steelhead. In this area, livestock grazing has removed most of the riparian vegetation and the width to depth ratio of the stream is unnaturally high. The stream has been simplified and over widened, and there is a lack of instream wood (Figures 5, and 6). The side channel has been bermed on one side, lacks large wood, and at the lower end is blocked from getting back to the main channel. There is a need to enhance habitat complexity, restore the stream to desired conditions, and reconnect the side channel to create slow water refuge for juvenile fish during winter high flows.

The desired conditions for the proposed treatment area includes improved (1) floodplain connectivity, (2) channel complexity, and (3) habitat to support viable populations of anadromous

Mid-Columbia River steelhead, resident fish, and wildlife. The desired condition is a state that would provide ecological resiliency in the face of a changing climate.

### **Project goals**

- Create diverse and effective juvenile Steelhead rearing habitat
- Reconnect the stream flow to the floodplain on an annual basis
- Raise the local water table to maintain higher soil moisture to support riparian species and meadow forage species.
- Restore natural stream channel process as much as possible to create and maintain diverse habitat
- Reduce the stream energy to capture and retain gravel for spawning and rearing.

### **Land Use Plan Conformance:**

The project falls under Management Area (MA) 3B “Anadromous Riparian Areas” of the Malheur National Forest Land and Resource Management Plan (LRMP). The goal of MA3B is to “Manage riparian areas to protect and enhance their value for wildlife, anadromous fish habitat and water quality... Design and conduct management in all riparian areas to maintain or improve water quality and beneficial uses” (USDA Forest Service, 1990). Long Creek is within a Category 1 Riparian Habitat Conservation Area (fish-bearing stream) as designated by PACFISH/INFISH and is listed as designated critical habitat for Mid-Columbia River steelhead by the National Marine Fisheries Service (NMFS). The project will be located within the Long Creek area (HUC 17 07 02 03 04 01). The project will improve instream and riparian habitat in order to ameliorate impacts that resulted from past land management practices.

### **Proposed Action:**

The proposed project will improve habitat on a quarter mile of Long Creek through placement of whole trees in the channel, the planting of native riparian species, the opening of a side channel that is currently blocked by a berm, and the construction of a new boundary fence. The addition of instream large wood to the stream will enhance habitat complexity and help restore the stream back to the desired condition. Removal of the berm and reconnection of the side channel will re-connect habitat for aquatic organisms, providing slow water refuge for juvenile fish during winter high flows.

Specifically the project will remove a berm blocking an existing high flow side channel and will spread the resulting material in the upland areas. A portion of the side channel will be excavated and logs will be placed in the main channel and side channel. Disturbed areas would be seeded with native species. Approximately 100 whole trees will be tipped and placed in the quarter mile reach of Long Creek. A new fence will be constructed to correct the boundary line from the county road cattle guard to the slope on the south side of the creek channel. In addition, approximately 500 ft of fence will be moved from the south side of the stream to the north side.

### **Implementation Plan:**

In-channel restoration would occur during the in-stream work window from July 15 to Aug 31. To attain the desired conditions and enable the completion of a larger restoration project, the USFS is proposing the following actions:

1. **Reconnecting a high flow side Channel** – An existing high flow side channel has been identified beginning approximately 300 feet upstream of the Forest Service boundary line and re-entering the main channel just downstream of the boundary line. A large berm of

gravel currently blocks access to the entrance which would be removed as part of the project. Due to limited access, material removed from the berm will be spread in upland areas within reach of the excavator. The downstream end of the side channel would enter the main channel on private property and will require excavation of the existing side channel through a high area which is partially on Forest Service (FS) lands. Logs placed in the main channel may be placed in such a way as to help deflect high flow into the side channel. Large wood will be placed in the side channel to increase habitat complexity. Large wood will specifically be placed near the boundary fence to help deflect flows at a sharp bend, and a small amount of will be fill placed in a low area to prevent trapping of fish. All disturbed areas would be seeded with native species. (See [Category 3](#): Dam and Legacy Structure Removal and [Category 5](#): off- and Side Channel Habitat Restoration Project Design Criteria (PDCs))

2. **Harvest and placement of whole trees (large wood placement) and riparian vegetative planting** – As part of the project, approximately 100 whole trees will be tipped from Forest Service lands along the county road and near the stream and placed randomly in the quarter mile reach of Long Creek. To prevent destabilizing the road no tipping will occur within fill of the road. Trees felled on the north side of the road, opposite of the staging area will be tipped and moved to the south side of the road with an excavator and will not require road closure. Flaggers will be used when the excavator needs to cross the road. The trees will improve stability and habitat complexity. Harvest with intact rootwads and placement will be directed by Forest Service staff and would follow the aquatics EA guidelines, Category 2: Large wood and boulder placement. Riparian plants would be strategically located on the floodplain and adjacent to the stream channel (See [Category 14](#): Riparian Vegetative Planting placement PDCs).

Please note that the county has been contacted regarding work on and near the road. Alan Hickerson, from the county office, is working with us to clear the actions that may impact the road and will be going out to the site with someone from aquatics and engineering prior to the projects implementation.

3. **Fencing** – 1) The north/south boundary fence south of the cattle guard appears to be on the correct line for about 150 feet then jogs to the west 30-40 ft. then turns south again. The existing fence is in poor condition. As part of the project it, is proposed to construct a new fence on the correct boundary line from the county road cattle guard to the slope on the south side of the creek channel. Reclamation had a licensed land surveyor mark the correct boundary line which is east of the existing fence about 15 to 20 feet. 2) Approximately 500 ft. of a fence on FS land will be moved from the south side of the stream to the north side. This is being done to protect more of the stream from cattle impacts, and will be done after large wood has been placed in the stream, since the fence will temporarily need to be moved to allow for the placement of large wood into the stream. (See [Category 9](#): Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering PDCs)
4. **Access Route** - The best access to the private meadow, where the remaining of the restoration is being done (not included in this check list), is to turn off of County Road 18 at the cattle guard, down an existing ramp onto USFS lands and enter the meadow from the east end. This access route would be used to transport materials (including logs from the north side of county road on the private land) and equipment to the site. This access route will also be used to do part of the high flow side channel and large wood placement work on Forest Service land. No improvements are expected, but some minor

deformation and rutting would be likely in addition to loss of some existing grass vegetation. On completion of the project the access route would be scarified to 6 inches depth, smoothed, and seeded with native grass species. (Please see General Aquatics Conservations Measures below. Specifically 15. Heavy equipment use, c. temporary access roads; and 16.Site Restoration)

5. **Staging Area** - Just east of the cattle guard and south of County Road 18 is a generally flat upland area that is accessible by way of the access route described above. This area appears to have been used in the past for a dispersed camping spot probably by hunters. This would mainly be used for vehicle parking; however the extreme southeast end of the staging area would be used for equipment refueling and storage and it is more than 150 feet from the existing creek. This area is preferred over the private meadow bottom because the meadow soils and sod layers are more fragile than the upland site. All disturbed areas would be smoothed and seeded with native grass species.

Archeology surveys will be completed by a heritage consulting firm for this project, this has been discussed with the forest service archeologist (Don H.) and has been agreed on. However, the details have not been finalized, so we would like to know of any known heritage concerns from the Forest Service so that the information can be passed on.

Photos of existing condition, and the location of the proposed actions and design are attached (below).

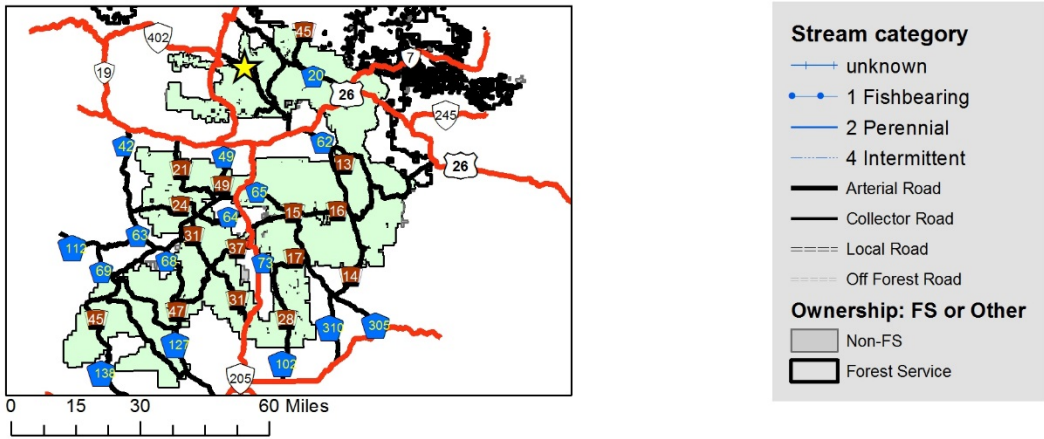
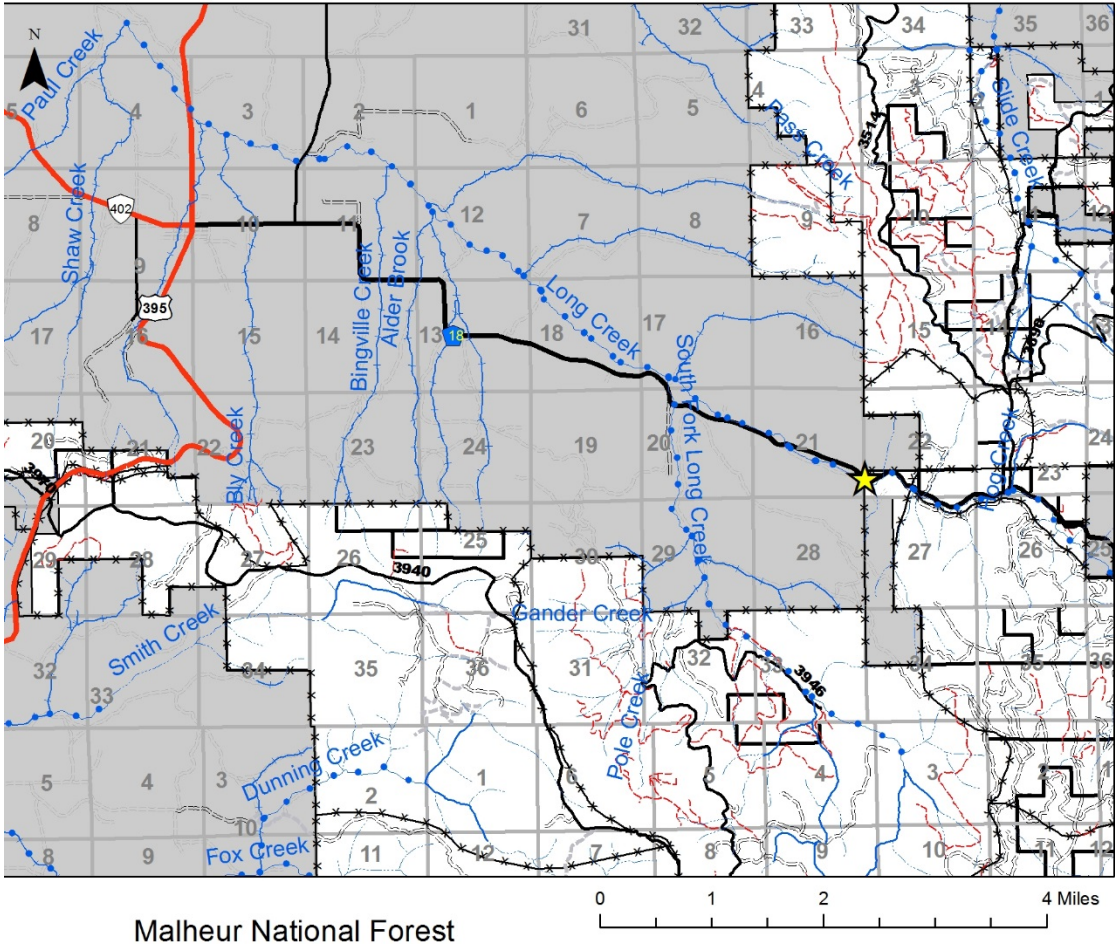


Figure 1. Long Creek Neal habitat project location indicated by star.

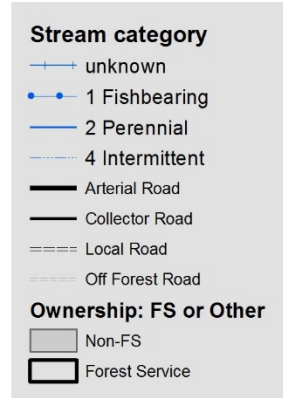
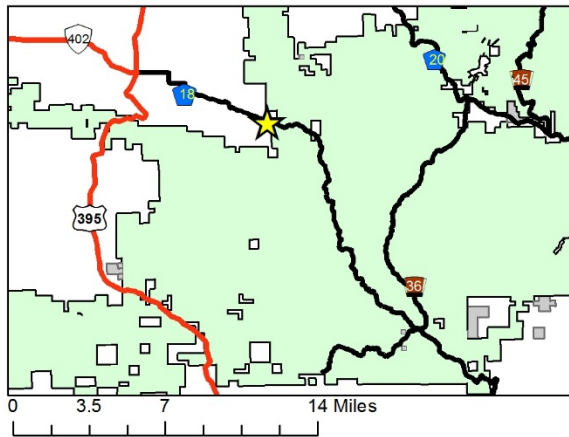
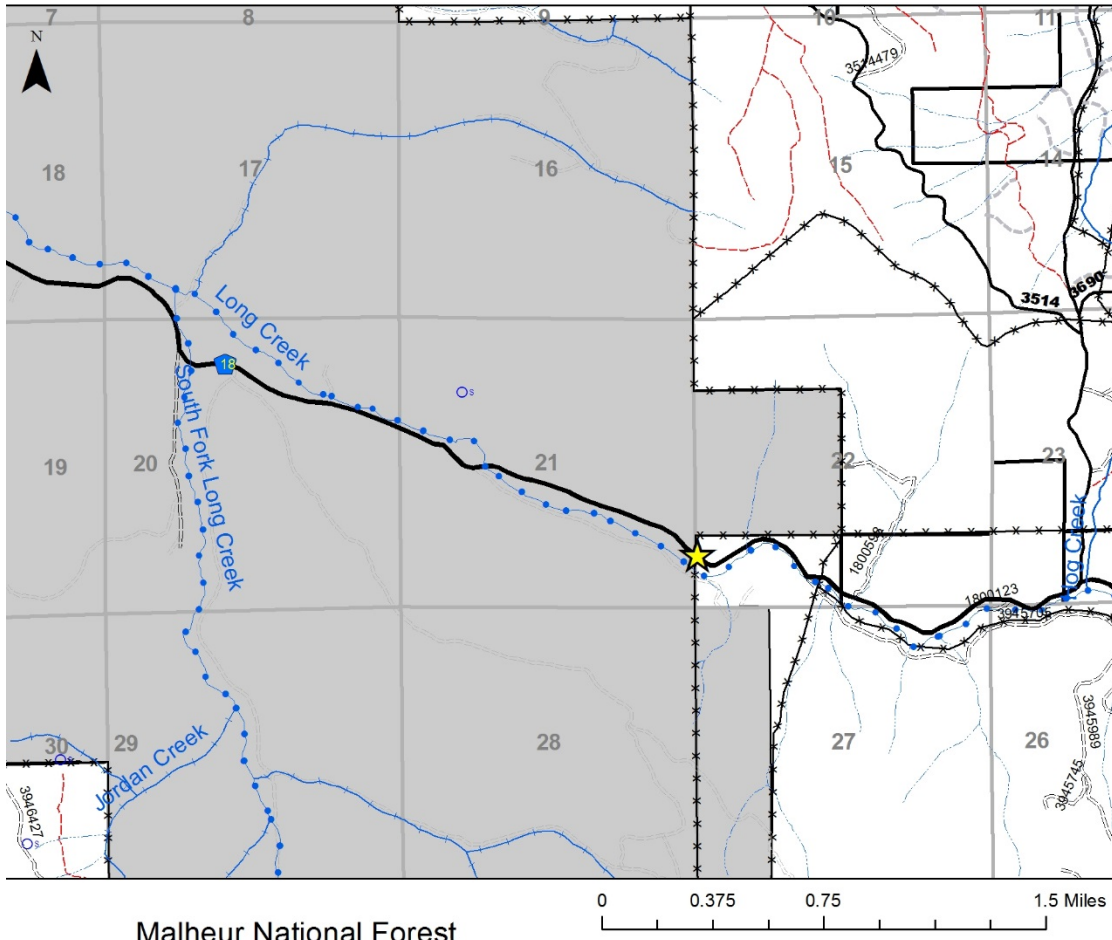


Figure 2. Zoomed in Long Creek Neal habitat project location indicated by star.

# The Long Creek Neal Habitat project

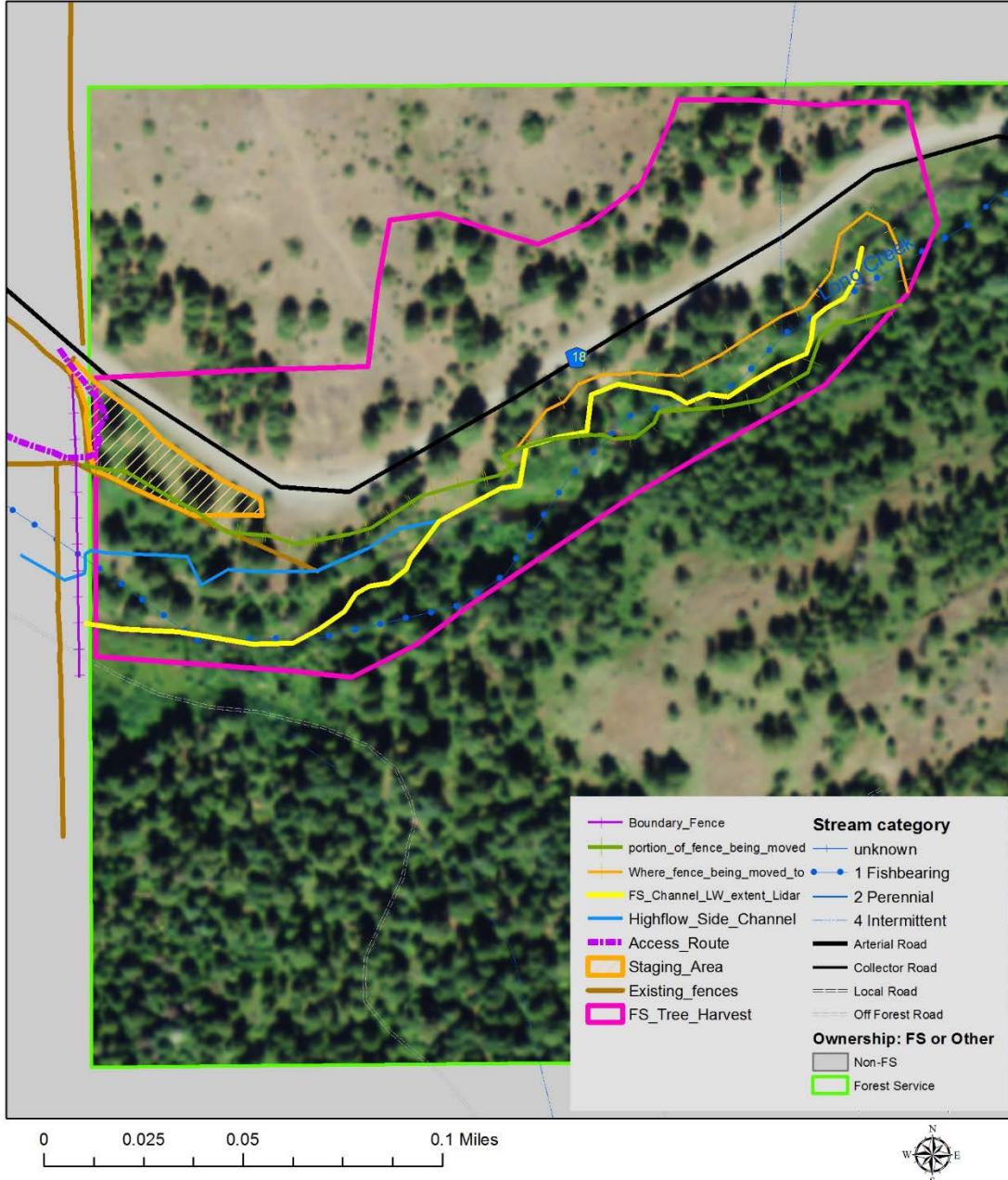


Figure 3. Proposed project area and actions.

Please note that the stream layer and the FS Channel LWD extent layers do not align at this scale.

# The Long Creek Neal Habitat project

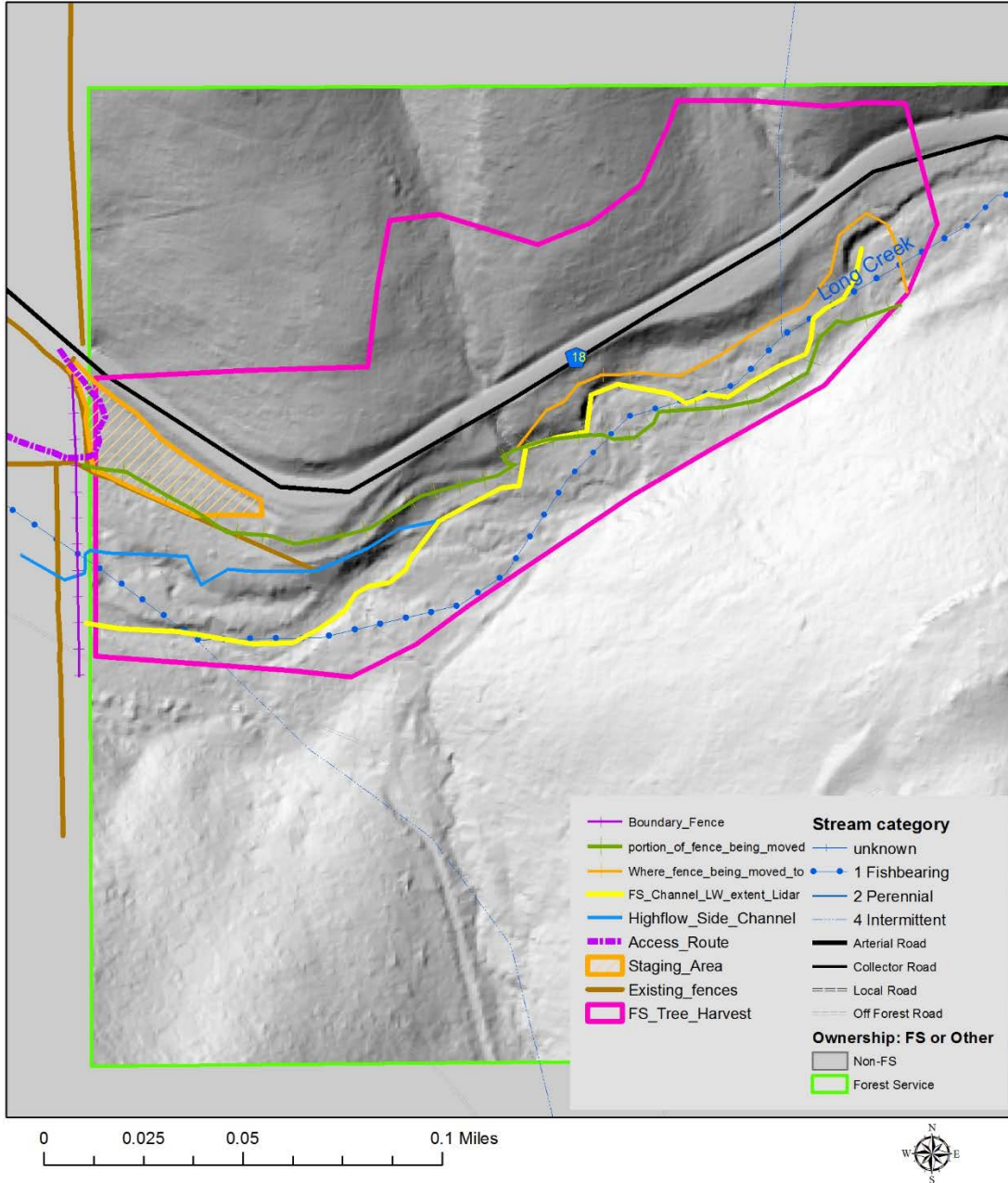


Figure 4. Lidar image of proposed project area and actions.

Please note that the stream layer and the FS Channel LWD extent layers do not align at this scale.

Location of map and the layers associated with it.

T:\FS\NFS\Malheur\Project\AquaticRestoration2014\GIS\Implementation\BMRD\FY17\LongCreek



Figure 5. Stream existing condition. Upstream of the boundary fence and just below where the high flow side channel starts, image looking downstream toward the private.



Figure 6. Stream Existing condition, channel lacks large wood.

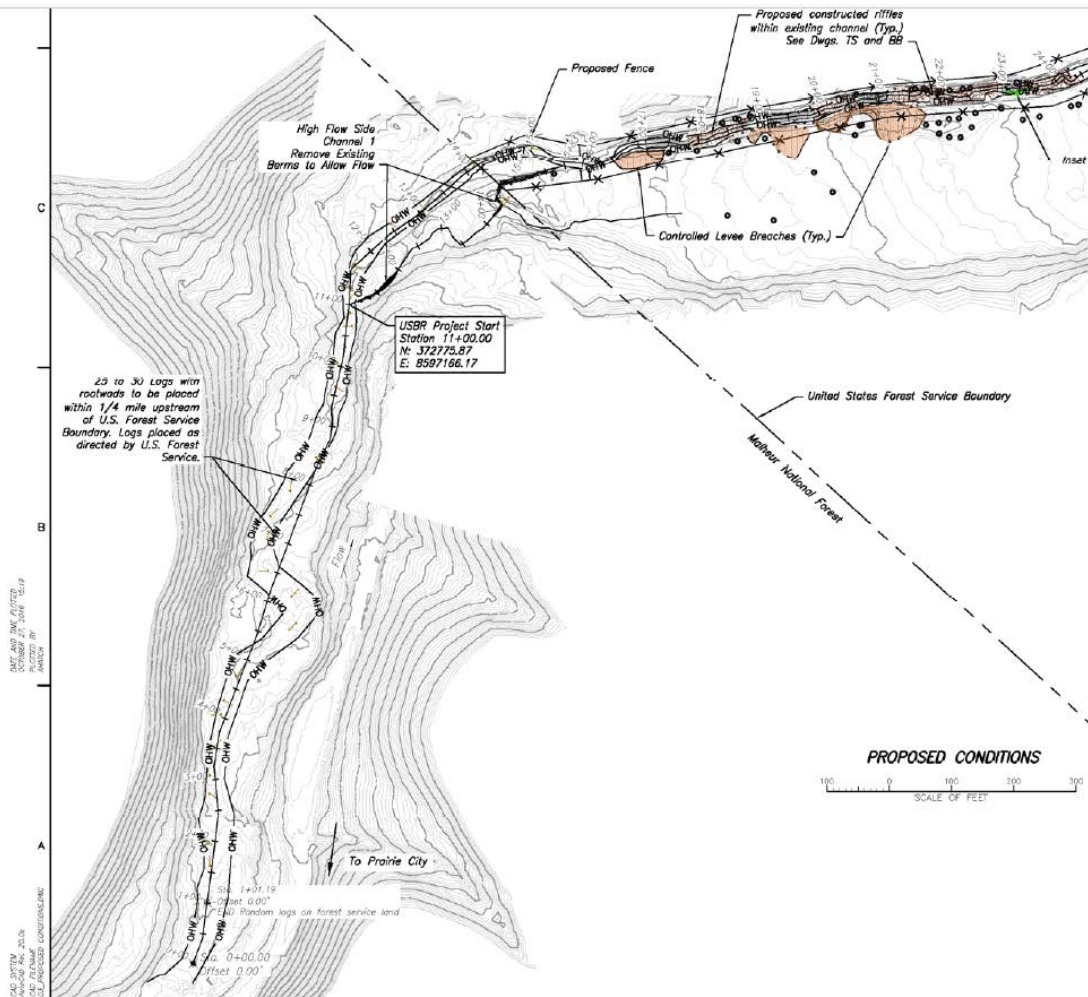


Figure 7. Long Creek existing condition at location where work is being proposed, left side of image (Image provided by the Bureau of Reclamation)

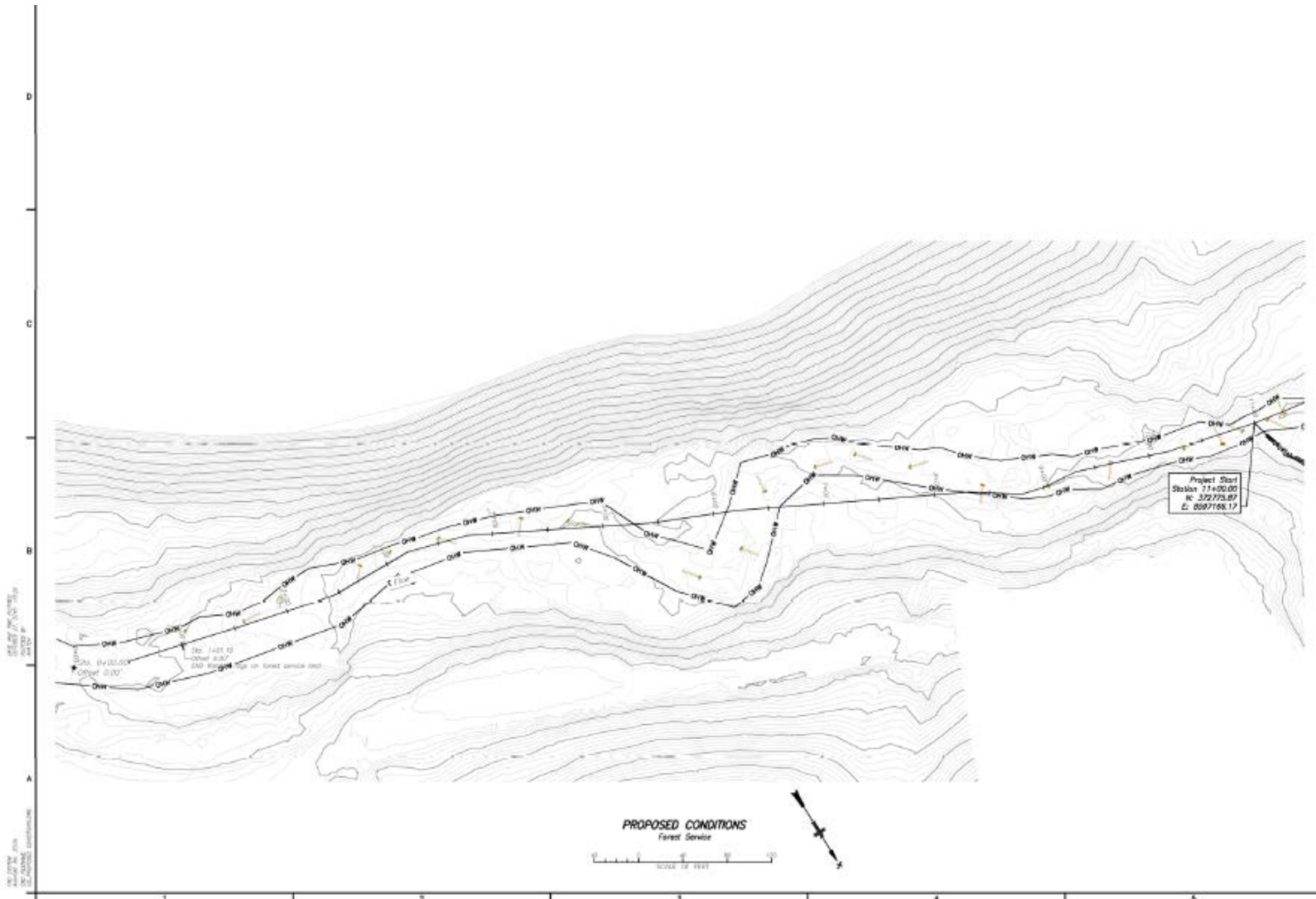


Figure 8. Zoom in on main channel where large wood will be added, existing condition. (Image provided by the Bureau of Reclamation)



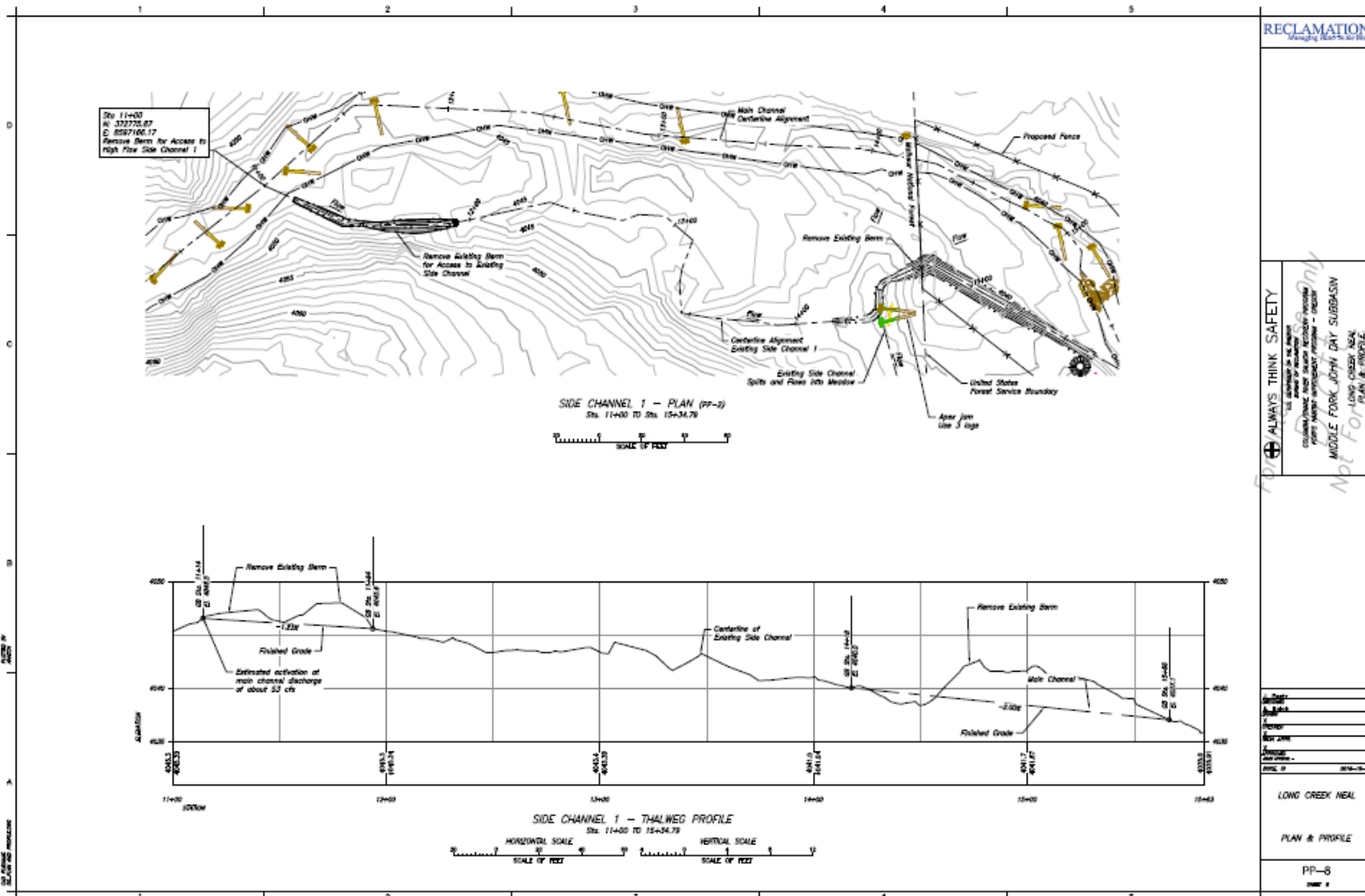


Figure 10. Side channel thalweg profile and preliminary large wood placement locations proposed for the main channel

## Appendix to the Aquatic Restoration EA Implementation Description

Project Title: Long Creek Neal Habitat Project  
Project Number: 01062017

- Category 2:** Large Wood, Boulder and Gravel Placement, including tree removal for large wood placement.  
**Category 3:** Dam and Legacy Structure Removal  
**Category 5:** Off-and Side Channel Habitat Restoration  
**Category 9:** Livestock Fencing, Stream Crossings and Off-Channel Livestock Watering  
**Category 14:** Riparian Vegetative Planting

The following information will guide actions for this project that is taking place within the bounds of the Decision Notice for the 2014 Malheur National Forest Aquatic Restoration Environmental Analysis to maintain that all conservation measures, guidelines and project design criteria (PDCs) are met under this guiding document.

### Program Administration

1. Integration of project design criteria and conservation measures and terms and conditions into project design and contract language
  - a. This document is to outline the conservation measures and PDCs that will be used during project implementation to remain compliant with the aquatic restoration BA as well as ARBO II.
2. Project notification: The following information will be provided to the NMFS Level 1 Aquatics members 30 days prior to implementation as a Project Notification Form 7.
  - a. Action identifier – 01062017
  - b. Project name – The Long Creek Neal Habitat project
  - c. Location –

Project	Long Creek Neal Habitat project
Stream Name	Long Creek
6 <sup>th</sup> field HUC	170702030401
Latitude (Decimal Degrees)	Start:-118.982,End:-118.978
Longitude (Decimal Degrees)	Start:44.68, End:44.681

- d. Agency contact – Allen Taylor, allentaylor@fs.fed.us, 541-575-3394.
- e. Timing – Work will occur when ground conditions allow for excavation while maintain a minimal impact to the surrounding resources. All instream work with equipment would occur from July 15-August 15, 2016.
- f. Activity category –  
 Category 2: Large Wood, Boulder and Gravel Placement, including tree removal for large wood placement.

Category 3: Dam and Legacy Structure Removal

Category 5: Off-and Side Channel Habitat Restoration

Category 9: Livestock Fencing, Stream Crossings and Off-Channel  
Livestock Watering

Category 14: Riparian Vegetative Planting

- g. Project description – Project description is available in the Implementation Description under the section “Implementation Plan” above.
  - h. Work will occur within Long Creek along Hwy 18, Keeney Fork Rd.
  - i. Species affected –
    - i. Listed species: Mid-Columbia River Steelhead
    - ii. Critical Habitat: Mid -Columbia River Steelhead
    - iii. MIS Species: Mid-Columbia Steelhead, Interior Columbia Redband Trout
  - j. Date of submittal – To be completed in Spring of 2017, at least 30 day prior to implementation
  - k. Site assessments – Assessment for contaminants is not required at this location.
  - l. Review – NMFS fish passage review and Restoration Review Team review are not required.
  - m. Verification – \_\_\_\_\_
  - n. SOD project notification – \_\_\_\_\_
3. Minor Variance: No variances from the criteria specified in the aquatic restoration document are being considered.
4. NMFS Fish Passage Review and Approval: This work does not require review by the NFMS level 1 team member.
5. Restoration Review Team: This work does not require review by the restoration review team.
6. Project Completion Report: To be completed after implementation
7. Annual Program Report: This project will be completed within one year, completion and annual reporting will occur in the winter of FY18 before February 15<sup>th</sup>.

### **General Aquatic Conservation Measures**

- 8. Technical Skill and Planning Requirements:
  - a. An appropriately qualified fisheries biologist or hydrologist will be involved in the design of this project.
  - b. The scope of this project is limited in both space and context. Field evaluations and site-specific surveys will require little work. Appropriate time will be allotted for these actions, prior to implementation. Planning and design will involve appropriate expertise.
  - c. The assigned fisheries biologist or hydrologist will make sure that any applicable conservation measures and project design criteria are met through the contracting process.
- 9. Climate Change: due to the small scale of this work, future climate changes impacts will not have dramatic effects on this work
- 10. In-Water Work Period: July 15-August 31. (Please note this varies with location).

11. Fish passage: Not applicable.
12. Site Assessment For Contaminants: In developed or previously developed sites, such as areas with past dredge mines, or sites with known or suspected contamination, a site assessment for contaminants will be conducted on projects that involve excavation of >20 cubic yards of material. The action agencies will complete a site assessment to identify the type, quantity, and extent of any potential contamination. The level of detail and resources committed to such an assessment will be commensurate with the level and type of past or current development at the site. The assessment may include the following:
  - a. Review of readily available records, such as former site use, building plans, records of any prior contamination events.
  - b. Site visit to observe the areas used for various industrial processes and the condition of the property.
  - c. Interviews with knowledgeable people, such as site owners, operators, occupants, neighbors, local government officials, etc.
  - d. Report that includes an assessment of the likelihood that containments are present at the site
13. Pollution and Erosion Control Measures: Implement the following pollution and erosion control measures:
  - a. Project Contact: Identify a project contact (name, phone number, an address) that will be responsible for implementing pollution and erosion control measures.
  - b. List and describe any hazardous material that would be used at the project site, including procedures for inventory, storage, handling, and monitoring; notification procedures; specific clean-up and disposal instructions for different products available on the site; proposed methods for disposal of spilled material; and employee training for spill containment.
  - c. Temporarily store any waste liquids generated at the staging areas under cover on an impervious surface, such as tarpaulins, until such time they can be properly transported to and treated at an approved facility for treatment of hazardous materials.
  - d. Procedures based on best management practices to confine, remove, and dispose of construction waste, including every type of debris, discharge water, concrete, cement, grout, washout facility, welding slag, petroleum product, or other hazardous materials generated, used, or stored on-site.
  - e. Procedures to contain and control a spill of any hazardous material generated, used or stored on-site, including notification of proper authorities. Ensure that materials for emergency erosion and hazardous materials control are onsite (e.g., silt fence, straw bales, oil-absorbing floating boom whenever surface water is present).
  - f. Best management practices to confine vegetation and soil disturbance to the minimum area, and minimum length of time, as necessary to complete the action, and otherwise prevent or minimize erosion associated with the action area.

- g. No uncured concrete or form materials will be allowed to enter the active stream channel.
- h. Steps to cease work under high flows, except for efforts to avoid or minimize resource damage.

#### 14. Site Preparation

- a. Flagging sensitive areas –Prior to construction, clearly mark critical riparian vegetation areas, wetlands, and other sensitive sites to minimize ground disturbance.
- b. Staging area –Establish staging areas for storage of vehicles, equipment, and fuels to minimize erosion into or contamination of streams and floodplains.
  - i. No Topographical Restrictions –place staging area 150 feet or more from any natural water body or wetland in areas where topography does not restrict such a distance.
  - ii. Topographical Restrictions –place staging area away from any natural water body or wetland to the greatest extent possible in areas with high topographical restriction, such as constricted valley types.
- c. Temporary erosion controls –Place sediment barriers prior to construction around sites where significant levels of erosion may enter the stream directly or through road ditches. Temporary erosion controls will be in place before any significant alteration of the action site and will be removed once the site has been stabilized following construction activities.
- d. Stockpile materials –Minimize clearing and grubbing activities when preparing staging, project, and or stockpile areas. Any large wood, topsoil, and native channel material displaced by construction will be stockpiled for use during site restoration. Materials used for implementation of aquatic restoration categories (e.g., large wood, boulders, fencing material) may be staged within the 100-year floodplain.
- e. Hazard trees –Where appropriate, include hazard tree removal (amount and type) in project design. Fell hazard trees when they pose a safety risk. If possible, fell hazard trees within riparian areas towards a stream. Keep felled trees on site when needed to meet coarse large wood objectives.

#### 15. Heavy Equipment Use

- a. Choice of equipment – Heavy equipment will be commensurate with the project and operated in a manner that minimizes adverse effects to the environment (e.g., minimally-sized, low pressure tires, minimal hard turn paths for tracked vehicles, temporary mats or plates within wet areas or sensitive soils).
- b. Fueling and cleaning and inspection for petroleum products and invasive weeds
  - i. All equipment used for instream work will be cleaned for petroleum accumulations, dirt, plant material (to prevent the spread of noxious weeds), and leaks repaired prior to entering the project area. Such equipment includes large machinery, stationary power

- equipment (e.g., generators, canes), and gas-powered equipment with tanks larger than five gallons.
  - ii. Store and fuel equipment in staging areas after daily use.
  - iii. Inspect daily for fluid leaks before leaving the vehicle staging area for operation.
  - iv. Thoroughly clean equipment before operation below ordinary high water or within 50 feet of any natural water body or areas that drain directly to streams or wetlands and as often as necessary during operation to remain grease free.
- c. Temporary access roads – Existing roadways will be used whenever possible. Minimize the number of temporary access roads and travel paths to lessen soil disturbance and compaction and impacts to vegetation. Temporary access roads will not be built on slopes where grade, soil, or other features suggest a likelihood of excessive erosion or failure. When necessary, temporary access roads will be obliterated or revegetated. Temporary roads in wet or flooded areas will be restored by the end of the applicable in-water work period. Construction of new permanent roads is not permitted.
- d. Stream crossings – Minimize number and length of stream crossings. Such crossings will be at right angles and avoid potential spawning areas to the greatest extent possible. Stream crossings shall not increase the risk of channel re-routing at low and high water conditions. After project completion, temporary stream
- e. Work from top of bank – To the extent feasible, heavy equipment will work from the top of the bank, unless work instream would result in less damage to the aquatic ecosystem.
- f. Timely completion – Minimize time in which heavy equipment is in stream channels, riparian areas, and wetlands. Complete earthwork (including drilling, excavation, dredging, filling and compacting) as quickly as possible. During excavation, stockpile native streambed materials above the bankfull elevation, where it cannot reenter the stream, for later use.

#### 16. Site Restoration

- a. Initiate rehabilitation – Upon project completion, rehabilitate all disturbed areas in a manner that results in similar or better than pre-work conditions through removal of project related waste, spreading of stockpiled materials (soil, large wood, trees, etc.) seeding, or planting with local native seed mixes or plants.
- b. 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. Short-term stabilization measures will be maintained until permanent erosion control measures are effective. Stabilization measures will be instigated within three days of construction completion.
- c. Revegetation – Replant each area requiring revegetation prior to or at the beginning of the first growing season following construction. Achieve

reestablishment of vegetation in disturbed areas to at least 70% of pre-project levels within three years. Use an appropriate mix of species that will achieve establishment and erosion control objectives, preferably forb, grass, shrub, or tree species native to the project area or region and appropriate to the site. Barriers will be installed as necessary to prevent access to revegetated sites by livestock or unauthorized persons.

- d. Planting manuals – All riparian plantings shall follow Forest Service direction described in the Regional letter to Units, Use of Native and Nonnative Plants on National Forests and Grasslands May 2006 (Final Draft), and or BLM Instruction Memorandum No. OR-2001-014, Policy on the Use of Native Species Plant Material.
- e. Decompact soils – Decompact soil by scarifying the soil surface of roads and paths, stream crossings, staging, and stockpile areas so that seeds and plantings can root.

#### 17. Monitoring

Monitoring will be conducted by Action Agency staff, as appropriate for that project, during and after a project to track effects and compliance with this opinion.

- a. Implementation
  - i. Visually monitor during project implementation to ensure effects are not greater (amount, extent) than anticipated and to contact Level 1 representatives if problems arise.
  - ii. Fix any problems that arise during project implementation.
  - iii. Regular biologist/hydrologist coordination if biologist/hydrologist is not always on site to ensure contractor is following all stipulations.
- b. 401 Certification – To minimize short-term degradation to water quality during project implementation, follow current 401 Certification provisions of the Federal Clean Water Act for maintenance or water quality standards described by the following: Oregon Department of Environmental Quality (Oregon BLM, Forest Service, and BIA); Washington Department of Ecology (Washington BLM); and the Memorandum of Understanding between the Washington Department of Fish and Wildlife and Forest Service regarding Hydraulic Projects Conducted by Forest Service, Pacific Northwest Region (WDFW and USDA-Forest Service 2012); California, Idaho, or Nevada 401 Certification protocols (BLM and Forest Service).
- c. Post project – A post-project review shall be conducted after winter and spring high flows.
  - i. For each project, conduct a walk through/visual observation to determine if there are post-project affects that were not considered during consultation. For fish passage and revegetation projects, monitor in the following manner:
  - ii. Fish Passage Projects – Note any problems with channel scour or bedload deposition, substrate, discontinuous flow, vegetation establishment, or invasive plant infestation.

- iii. Revegetation – For all plant treatment projects, including site restoration, monitor for and remove invasive plants until native plants become established.
    - iv. In cases where remedial action is required, such actions are permitted without additional consultation if they use relevant PDC and aquatic conservation measures and the effects of the action categories are not exceeded.
18. Work Area Isolation, Surface Water Withdrawals, and Fish Capture and Release – Isolate the construction area and remove fish from a project site for projects that include concentrated and major excavation at a single location within the stream channel. This condition will typically apply to the following aquatic restoration categories: Fish Passage Restoration; Dam, Tidegate, and Legacy Structure Removal; Channel Reconstruction/Relocation.
- a. Isolate capture area – Install block nets at up and downstream locations outside of the construction zone to exclude fish from entering the project area. Leave nets secured to the stream channel bed and banks until construction activities within the stream channel are complete. If block nets or traps remain in place more than one day, monitor the nets and or traps at least on a daily basis to ensure they are secured to the banks and free of organic accumulation and to minimize fish predation in the trap.
  - b. Capture and release – Fish trapped within the isolated work area will be captured and released as prudent to minimize the risk of injury, then released at a safe release site, preferably upstream of the isolated reach in a pool or other area that provides cover and flow refuge. Collect fish in the best manner to minimize potential stranding and stress by seine or dip nets as the area is slowly dewatered, baited minnow traps placed overnight, or electrofishing (if other options are ineffective). Fish must be handled with extreme care and kept in water the maximum extent possible during transfer procedures. A healthy environment for the stressed fish shall be provided—large buckets (five-gallon minimum to prevent overcrowding) and minimal handling of fish. Place large fish in buckets separate from smaller prey-sized fish. Monitor water temperature in buckets and well-being of captured fish. If buckets are not being immediately transported, use aerators to maintain water quality. As rapidly as possible, but after fish have recovered, release fish. In cases where the stream is intermittent upstream, release fish in downstream areas and away from the influence of the construction. Capture and release will be supervised by a fishery biologist experienced with work area isolation and safe handling of all fish.
  - c. Electrofishing – Use electrofishing only where other means of fish capture may not be feasible or effective. If electrofishing will be used to capture fish for salvage, NMFS’s electrofishing guidelines will be followed (NMFS 2000).
    - i. Reasonable effort should be made to avoid handling fish in warm water temperatures, such as conducting fish evacuation first thing in the morning, when the water temperature would likely be

- coolest. No electrofishing should occur when water temperatures are above 18°C or are expected to rise above this temperature prior to concluding the fish capture.
- ii. If fish are observed spawning during the in-water work period, electrofishing shall not be conducted in the vicinity of spawning fish or active redds.
  - iii. Only Direct Current (DC) or Pulsed Direct Current shall be used.
  - iv. Conductivity <100, use voltage ranges from 900 to 1100. Conductivity from 100 to 300, use voltage ranges from 500 to 800. Conductivity greater than 300, use voltage to 400.
  - v. Begin electrofishing with minimum pulse width and recommended voltage and then gradually increase to the point where fish are immobilized and captured. Turn off current once fish are immobilized.
  - vi. Do not allow fish to come into contact with anode. Do not electrofish an area for an extended period of time. Remove fish immediately from water and handle as described above (PDC 20b). Dark bands on the fish indicate injury, suggesting a reduction in voltage and pulse width and longer recovery time.
  - vi. If mortality is occurring during salvage, immediately discontinue salvage operations (unless this would result in additional fish mortality), reevaluate the current procedures, and adjust or postpone procedures to reduce mortality.
- d. Dewater construction site –When dewatering is necessary to protect species or critical habitat, divert flow around the construction site with a coffer dam (built with non-erosive materials), taking care to not dewater downstream channels during dewatering. Pass flow and fish downstream with a by-pass culvert or a water-proof lined diversion ditch. Diversion sandbags can be filled with material mined from the floodplain as long as such material is replaced at end of project. Small amounts of instream material can be moved to help seal and secure diversion structures. If ESA listed-fish may be present and pumps are required to dewater, the intake must have a fish screen(s) and be operated in accordance with NMFS fish screen criteria described below (in part e.iv) of this section. Dissipate flow energy at the bypass outflow to prevent damage to riparian vegetation or stream channel. If diversion allows for downstream fish passage, place diversion outlet in a location to promote safe reentry of fish into the stream channel, preferably into pool habitat with cover. Pump seepage water from the de-watered work area to a temporary storage and treatment site or into upland areas and allow water to filter through vegetation prior to reentering the stream channel.
- e. Surface water withdrawals
- i. Surface water may be diverted to meet construction needs, but only if developed sources are unavailable or inadequate. Where ESA-listed fish may be present, diversions may not exceed 10% of the available flow and fish screen(s) will be installed, operated, and

maintained according to NMFS's fish screen criteria (NMFS 2011e).

- ii. For the dewatering of a work site to remove or install culverts, bridge abutments etc., if ESA-listed fish may be present, a fish screen that meets criteria specified by NMFS (2011e) must be used on the intake to avoid juvenile fish entrainment. If ESA-listed salmon, steelhead, eulachon, or green sturgeon may be present, the Action Agencies will ensure that the fish screen design is reviewed and approved by NMFS for consistency with NMFS (2011e) criteria if the diversion (gravity or pump) is at a rate greater than 3 cfs. NMFS approved fish screens have the following specifications: a) An automated cleaning device with a minimum effective surface area of 2.5 square feet per cfs, and a nominal maximum approach velocity of 0.4 feet per second (fps), or no automated cleaning device, a minimum effective surface area of 1 square foot per cfs, and a nominal maximum approach rate of 0.2 fps; and b) a round or square screen mesh that is no larger than 2.38 mm (0.094 inches) in the narrow dimension, or any other shape that is no larger than 1.75 mm (0.069 inches) in the narrow dimension.
- f. Stream re-watering – Upon project completion, slowly re-water the construction site to prevent loss of surface water downstream as the construction site streambed absorbs water and to prevent a sudden release of suspended sediment. Monitor downstream during re-watering to prevent stranding of aquatic organisms below the construction site.

### **Applicable Project Design Criteria**

#### **Project Design Criteria for Aquatic Restoration Activity Categories**

2. **Large Wood, Boulder, and Gravel Placement** includes large wood and boulder placement, engineered log jams, porous boulder structures and vanes, gravel placement, and tree removal for large wood projects. Such activities will occur in areas where channel structure is lacking due to past stream cleaning (large wood removal), riparian timber harvest, and in areas where natural gravel supplies are low due to anthropogenic disruptions. These projects will occur in stream channels and adjacent floodplains to increase channel stability, rearing habitat, pool formation, spawning gravel deposition, channel complexity, hiding cover, low velocity areas, and floodplain function. Equipment such as helicopters, excavators, dump trucks, front-end loaders, full-suspension yarders, and similar equipment may be used to implement projects.
  - a. **Large Wood and Boulder Projects**
    - i. Place large wood and boulders in areas where they would naturally occur and in a manner that closely mimic natural accumulations for that particular stream type. For example, boulder placement may not be appropriate in low gradient meadow streams.

- ii. Structure types shall simulate disturbance events to the greatest degree possible and include, but are not limited to, log jams, debris flows, windthrow, and tree breakage.
- iii. No limits are to be placed on the size or shape of structures as long as such structures are within the range of natural variability of a given location and do not block fish passage.
- iv. Projects can include grade control and bank stabilization structures, while size and configuration of such structures will be commensurate with scale of project site and hydraulic forces.
- v. The partial burial of large wood and boulders is permitted and may constitute the dominant means of placement. This applies to all stream systems but more so for larger stream systems where use of adjacent riparian trees or channel features is not feasible or does not provide the full stability desired.
- vi. Large wood includes whole conifer and hardwood trees, logs, and rootwads. Large wood size (diameter and length) should account for bankfull width and stream discharge rates. When available, trees with rootwads should be a minimum of 1.5x bankfull channel width, while logs without rootwads should be a minimum of 2.0x bankfull width.
- vii. Structures may partially or completely span stream channels or be positioned along stream banks.
- viii. Stabilizing or key pieces of large wood must be intact, hard, with little decay, and if possible have root wads (untrimmed) to provide functional refugia habitat for fish. Consider orienting key pieces such that the hydraulic forces upon the large wood increases stability
- ix. Anchoring large wood –Anchoring alternatives may be used in preferential order:
  1. Use of adequate sized wood sufficient for stability
  2. Orient and place wood in such a way that movement is limited
  3. Ballast (gravel or rock) to increase the mass of the structure to resist movement
  4. Use of large boulders as anchor points for the large wood
  5. Pin large wood with rebar to large rock to increase its weight. For streams that are entrenched (Rosgen F, G, A, and potentially B) or for other streams with very low width to depth ratios (<12) an additional 60% ballast weight may be necessary due to greater flow depths and higher velocities.

**e) Tree Removal for Large Wood Projects**

- i. Live conifers and other trees can be felled or pulled/pushed over in a Northwest Forest Plan (USDA and USDI 1194a) Riparian Reserve or PACFISH/INFISH (USDA-Forest Service 1995; USDA and USDI 1994b) riparian habitat conservation area (RHCA), and upland areas (e.g., late successional reserves or adaptive management areas for northern spotted owl and marbled murrelet critical habitat) for in-channel large wood placement only when conifers and trees are fully stocked. Tree felling shall not create excessive streambank erosion or increase the likelihood of channel avulsion during high flows.
- ii. Danger trees and trees killed through fire, insects, disease, blow-down and other means can be felled and used for in channel placement regardless of live tree stocking levels
- iii. Trees may be removed by cable, ground based equipment, horses, or helicopters.

- iv. Trees may be felled or pushed/pulled into the stream or floodplain.
- v. Trees may be stockpiled for future instream restoration projects.
- vi. The project manager for an aquatic restoration action will coordinate with an action-agency wildlife biologist in tree removal planning efforts.

3. **Dam, Tidegate and Legacy Structure Removal** includes removal of dams, tidegates, **channel-spanning weirs**, legacy habitat structures, earthen embankments, subsurface drainage features, spillway systems, outfalls, pipes, instream flow redirection structures (e.g., drop structure, gabion, groin), or similar devices used to control, discharge, or maintain water levels. Projects will be implemented to reconnect stream corridors, floodplains, and estuaries, reestablish wetlands, improve aquatic organism passage, and restore more natural channel and flow conditions. Any instream water control structures that impound substantial amounts of contaminated sediment are not proposed. Equipment such as excavators, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

c. **Removal of legacy structures** –This action includes the removal of past projects, such as large wood, boulder, rock gabions, and other in-channel and floodplain structures.

d. If the structure being removed contains material (large wood, boulders, concrete, etc.) not typically found within the stream or floodplain at that site, remove material from the 100-year floodplain.

e. If the structure being removed contains material (e.g., large wood, boulders) that is typically found within the stream or floodplain at that site, the material can be reused to implement habitat improvements described under the Large Wood, Boulder, and Gravel Placement activity category in this opinion.

f. If the structure being removed is keyed into the bank, fill in “key” holes with native materials to restore contours of stream bank 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.

g. When removal of buried log structures may result in significant disruption to riparian vegetation or the floodplain, consider using a chainsaw to extract the portion of log within the channel and leaving the buried sections within the streambank.

h. If a project involves the removal of multiple barriers on one stream or in one watershed over the course of a work season, remove the most upstream barrier first if possible.

i. 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. If headcutting and channel incision are likely to occur due to structure removal, additional measures must be taken to reduce these impacts.

j. If the structure is being removed because it has caused an over-widening of the channel, consider implementing other ARBO II restoration categories to decrease the width to depth ratio of the stream to a level commensurate with the geomorphic setting.

**5. Off- and Side-Channel Habitat Restoration** projects will be implemented to reconnect historic side-channels with floodplains by removing off-channel fill and plugs. Furthermore, new side-channels and alcoves can be constructed in geomorphic settings that will accommodate such features. This activity category typically applies to areas where side channels, alcoves, and other backwater habitats have been filled or blocked from the main channel, disconnecting them from most if not all flow events. These project types will increase habitat diversity and complexity, improve flow heterogeneity, provide long-term nutrient storage and substrate for aquatic macroinvertebrates, moderate flow disturbances, increase retention of leaf litter, and provide refuge for fish during high flows. Equipment such as excavators, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

a. **Review and approve** – When a proposed side channel will contain >20% of the bankfull flow, the Action Agencies will ensure that the action is reviewed by the Restoration Review Team and reviewed and approved by NMFS for consistency with criteria in NMFS (2011e).

b. **Data requirements** – Data requirements and analysis for off- and side-channel habitat restoration include evidence of historical channel location, such as land use surveys, historical photographs, topographic maps, remote sensing information, or personal observation.

c. **Allowable excavation** – Off- and side-channel improvements can include minor excavation (< 10% of volume) of naturally accumulated sediment within historical channels. There is no limit as to the amount of excavation of anthropogenic fill within historic side channels as long as such channels can be clearly identified through field or aerial photographs. Excavation depth will not exceed the maximum thalweg depth in the main channel. Excavated material removed from off- or side-channels shall be hauled to an upland site or spread across the adjacent floodplain in a manner that does not restrict floodplain capacity.

## **9. Livestock fencing, stream crossings and off-channel livestock watering facilities**

projects will be implemented by constructing fences to exclude riparian grazing, providing controlled access for walkways that livestock use to transit across streams and through riparian areas, and reducing livestock use in riparian areas and stream channels by providing upslope water facilities. Equipment such as excavators, bull dozers, dump trucks, front-end loaders, and similar equipment may be used to implement projects.

### c. Off-channel livestock watering facilities

- i. The development of a spring is not allowed if the spring is occupied by ESA-listed species.
- ii. Water withdrawals must not dewater habitats or cause low stream flow conditions that could affect ESA-listed fish. Withdrawals may not exceed 100% of the available flow.
- iii. Troughs or tanks fed from a stream or river must have an existing valid water right. Surface water intakes must be screened to meet the most recent version of NMFS fish screen criteria (NMFS 2011e)(NMFS 2011e)(NMFS 2011e)(NMFS 2011e)(NMFS 2011e)(NMFS 2011e), be self-cleaning, or regularly maintained by removing debris buildup. A responsible party will be designated to conduct regular inspection and as-needed maintenance to ensure pumps and screens are properly functioning.
- iv. Place troughs far enough from a stream or surround with a protective surface to prevent mud and sediment delivery to the stream. Avoid steep

- slopes and areas where compaction or damage could occur to sensitive soils, slopes, or vegetation due to congregating livestock.
- v. Ensure that each livestock water development has a float valve or similar device, a return flow system, a fenced overflow area, or similar means to minimize water withdrawal and potential runoff and erosion.
  - vi. Minimize removal of vegetation around springs, wet areas.
  - vii. When necessary, construct a fence around the spring development to prevent livestock damage.

14. **Riparian Vegetation Planting** includes the planting of native riparian species that would occur under natural disturbance regimes. Activities may include the following: planting conifers, deciduous trees and shrubs; placement of sedge and or rush mats; gathering and planting willow cuttings. The resulting benefits to the aquatic system can include desired levels of stream shade, bank stability, stream nutrients, large wood inputs, increased grasses, forbs, and shrubs, and reduced soil erosion. Equipment may include excavators, backhoes, dump trucks, power augers, chainsaws, and manual tools.

- a. Experienced silviculturists, botanists, ecologists, or associated technicians shall be involved in designing vegetation treatments.
- b. Species to be planted will be of the same species that naturally occur in the project area. Acquire native seed or plant sources as close to the watershed as possible.
- c. Tree and shrub species, willow cuttings, as well as sedge and rush mats to be used as transplant material shall come from outside the bankfull width, typically in terraces (abandoned flood plains), or where such plants are abundant.
- d. Sedge and rush mats should be sized to prevent their movement during high flow events.
- e. Concentrate plantings above the bankfull elevation.
- f. Removal of native and non-native vegetation that will compete with plantings is permitted.
- g. Exclosure fencing to prevent utilization of plantings by deer, elk, and livestock is permitted.

### **Project Design Criteria by Resource**

#### **Fisheries and Hydrology**

Fisheries and Hydrology resources will follow all mitigation measures and project design criteria for aquatic restoration activities as shown in the ‘ Aquatic Restoration Project Categories, Program Administration, General Aquatic Conservation Measures, and Project Design Criteria for Aquatic Restoration Activity Categories on the Malheur National Forest.’

Additional Aquatic project design criteria were developed for the following elements: Tree Tipping and Felling, Juniper Treatments, Tree Hauling, and Prescribed Burning. In

the Camp Creek Headwaters Restoration Project design criteria for tree tipping and felling apply.

*General For Inside Riparian Habitat Conservation Areas*

All snags will be maintained within the RHCA unless deemed a hazard to the restoration activity.

*Tree Tipping and Tree Felling for Large Wood Projects*

Source trees being extracted (either by tipping or falling) as part of this project for instream restoration will not be harvested from within the primary shade zone.

**Table 1 Primary shade zone width, based on adjacent hill slope.**

	Hill Slope less than 30%	Hill Slope 30% to 60%	Hill Slope greater than 30%
Primary Shade Zone Width (slope distance)	50 ft.	55 ft.	60ft.

The Temperature Implementation Strategies allow the distances in the above table to be less (but not less than 25 ft.) if any of the following conditions applies:

The trees are located on the south facing slope (175-185 degree azimuth) and therefore do not provide stream shade;

An appropriate level of analysis is completed and documented, such as shade modelling, using site specific characteristics to determine the primary shade tree width; and or Field monitoring or measurements are completed to determine the width where optimum Angular Canopy Density (65% or greater) is achieved (see TMDL Implementation Strategies).

If trees are being felled for safety reasons they can be felled towards the stream.

Source trees should come from but are not limited to: over or fully stocked upland and riparian stands, hazard trees, trees generated from administrative sites (maintenance, expansion, or new construction), and hardwood restoration.

*There is no DBH (diameter at breast height) restriction for large wood, but consider the following before removing and placing trees.*

Diameter

The key to establishing a logjam is utilizing larger diameter wood that resists decay. These pieces of wood are often called “key pieces,” and serve as the anchors for the logjam structure. Wood can improve fish habitat only if the wood is large enough to stay, influence flow patterns, and sediment sorting. Larger diameter wood retains its size longer as abrasion and decay occurs over the years. Larger diameter wood is more effective in creating pools and complex channels that improve fish populations. The minimum diameter required for a key piece of wood depends on the bankfull width of the stream is found in the following table.

**Table 2 Bankfull widths and minimum diameter of logs to be considered key pieces.**

<b>Bankfull Width* -Feet</b>	<b>Minimum Diameter*-Inches</b>
0 to 10	10
10 to 20	16
20 to 30	18
Over 30	22

**\*This table was taken from '1995 A Guide to Placement of Large Wood in Streams.'**

### Length

The length of wood is also important to stability. To be considered a key piece a log with a rootwad still attached should be at least one and half times (1.5X) the bankfull or a log without a rootwad should be twice (2X) the length of the streams bankfull width. As the best fish habitat is formed around jams composed of 3 to 7 logs, at least 2 key pieces should be used at each structure.

Mimic natural accumulations of large woody debris based on stream type, valley setting, and community type and ensure future large wood recruitment

Tailholds as part of tree tipping operations are permitted across perennial, intermittent and ephemeral streams but the use of protective straps will be required to prevent tree damage.

### Wildlife

#### *Threatened, Endangered or Sensitive Species*

- If wolves become established (denning) while project implementation is occurring, measures will be taken to avoid activity in that vicinity
- If any evidence of wolverines is discovered during project implementation, measures will be taken to provide protection. If a den is found we would protect it from human disturbance.

#### *Raptors*

- No activities will occur within currently known goshawk or other raptor nest stands. To conserve nesting habitat and to minimize disturbance to nesting individuals, restrictions would be executed according to the requirements of the species involved.
- With all newly discovered raptor nests, a buffer zone would be established by the wildlife biologist to restrict activities near the nest area during occupancy.
- Where possible, retain trees with inactive nests that may be important to secondary nesters (e.g. Great Gray Owl).
- Any snags in riparian areas or uplands will be protected from disturbance, removal, or use in stream restoration activities unless deemed a safety hazard at a specific work site.

### Botany

Note: Pre-implementation planning project design criteria are identified.

#### *Rare and Sensitive Plants and Habitats*

- *Pre-Implementation:* Proposed restoration projects shall be completely surveyed early in the implementation planning process by a qualified botanist or rare plant technician, to identify and assess any sensitive or rare plant populations or habitats.
- *Pre-Implementation:* Proposed restoration projects shall develop restoration plans for degraded sensitive species habitats and/or mitigation plans in areas where sensitive plant populations are documented. This shall be accomplished by a journey-level Forest Service botanist in collaboration with the interdisciplinary team and other stakeholders.
- Heavy equipment, vehicle operation, road construction, staging areas, stockpile areas, piling of slash, fence construction, recreation sites, prescribed fires, fire lines, and other operational activities shall not be allowed in any documented sensitive plant sites unless it is for the demonstrated benefit or protection of the site. All sensitive plant populations should be buffered 100 ft. from all operational activities where topography does not restrict such a distance. Sensitive plant sites and associated buffers shall be identified as Areas to Protect.

#### *Sensitive and Unique Habitats*

- The integrity of unique habitats shall be maintained. Unique habitats [may] include meadows, rimrock, talus slopes, cliffs, animal dens, wallows, bogs [fens], seeps and springs. This shall be accomplished by incorporating cover buffers approximately 100 feet in width.
- Heavy equipment, vehicle operation, road construction, staging areas, stockpile areas, piling of slash, fence construction, recreation sites, prescribed fires, fire lines, and other operational activities shall not occur within, or at the interface of lithosols (scablands).
- Cutting of old-growth juniper shall be prohibited. Old-growth characteristics include: sparse limbs, dead limbed or spiked-tops, deeply furrowed and fibrous bark, branches covered with bright-green arboreal lichens, noticeable decay of cambium layer at base of tree, and limited terminal leader growth in upper branches.

#### *Groundwater-Dependent Ecosystems*

- The integrity of groundwater-dependent ecosystems shall be maintained. Spring developments shall not dewater Groundwater dependent ecosystems. Spring developments shall not be allowed if the spring is occupied by rare or sensitive plant species, or in peatlands, fens, or where histic soils are present. These sites should be buffered 100 ft. from all operational activities where topography does not restrict such a distance, and be identified as Areas to Protect.
- Heavy equipment, vehicle operation, road construction, staging areas, stockpile areas, piling of slash, fence construction, fire lines, and other operational activities shall not be allowed in springs, seeps, or any other groundwater dependent ecosystem, unless it is for the benefit or protection of the groundwater dependent ecosystems or development of the spring.

- Spring developments should not disturb the spring orifice (point where water emerges). Spring head boxes should be placed in a location that will cause the least amount of disturbance to the soils and vegetation of the groundwater dependent ecosystems. Preferable locations for spring head boxes should be in an established channel downstream from the orifice or a location where flowing water becomes subsurface.
- When necessary, construct fenced enclosures around spring developments to prevent damage from wild ungulates and livestock.
- Spring developments shall have a return flow system to minimize the diversion of surface and subsurface water from the catchment area. Consider using a float valve or similar device to reduce the amount of water withdrawn from the groundwater dependent ecosystems.
- When developing springs, place troughs far enough away from Groundwater dependent ecosystems, wetlands, and other sensitive or unique habitats to prevent erosion, compaction, or degradation to sensitive soils and vegetation due to livestock congregation.

#### *Invasive Plant Species*

- *Pre-Implementation:* Proposed restoration projects shall be surveyed for invasive plants early in the implementation planning process by a qualified invasive plant specialist /technician, to identify and assess any undocumented invasive plant infestation.
- *Pre-Implementation:* For project areas that overlap or are adjacent to invasive plant infestations, assure that there is sufficient time prior to develop a long-term site strategy for control, eradication, and revegetation of the site. This shall be accomplished by a qualified invasive plant specialist in collaboration with the interdisciplinary team and other stakeholders.
- All activities shall be conducted in a manner as to minimize or prevent the potential spread or establishment of invasive species.
- Actions conducted on National Forest System Lands that will operate outside the limits of the road prism, require the cleaning of all heavy equipment (bulldozers, skidders, graders, backhoes, dump trucks, etc.) prior to entering the National Forest. Cleaning will be inspected and approved by the forest officer in charge of administering the project.
- Assure that all materials are weed-free. Use weed-free straw and mulch for all projects conducted or authorized by the Forest Service on National Forest System Lands. If State certified straw and/or mulch is not available, individual Forests should require sources certified to be weed-free using the North American Weed Free Forage Program standards or a similar certification process.
- Inspect active gravel, fill, sand stockpiles, quarry sites, and borrow material for invasive plants before use and transport. Treat or require treatment of infested sources before any use of pit material. Use only gravel, fill, sand, and/or rock that are judged to be weed free by District or Forest weed specialists.
- Prohibit heavy equipment operation, vehicle travel, staging areas, fire-control lines, and any other operational activities in invasive plant infestations, unless the

activities are for the express purpose of eradicating the infestation or INV1 and INV2 have been completed.

- Conduct post-implementation monitoring for invasive plants. Continue monitoring, treating, and removing invasive plants until all infestations are eradicated and native plant species are well established.

### *Soils*

- For projects involving heavy machinery off roads, the project proponents shall inspect the site for existing impacts to the soil. If existing impacts appear to be heavy on the Malheur or moderate on the Ochoco, they shall contact a soil scientist, who shall determine what site specific project design criteria are necessary to meet Forest Plan and Forest Service Manual standards and guidelines. (If a soil scientist is not available, a silviculturist or hydrologist can do the work.) If standards and guidelines cannot be met, heavy machinery shall not be used.
- Erosion would be minimized by following General Aquatic Conservation Measures and by implementing the appropriate project design criteria based on the type of activity (see appendix A).
- Erosion from heavy machinery use would be minimized; by minimizing compaction and puddling, rutting would be minimized.

### *Heritage Resources*

- Compliance with Section 106 of the National Historic Preservation Act for activities authorized under this analysis will be completed and concurred with by the Oregon State Historic Preservation Office before any ground disturbing action takes place. For each potential activity the District or Zone archaeologist<sup>1</sup> will determine which of the criteria in the 2004 Programmatic Agreement with the Oregon State Historic Preservation Office best fit the particular project. This will vary somewhat project to project based on the scale of the particular activity, the location on the landscape, and the nature of associated cultural resources, if any.
- The District or Zone archaeologist will document their findings on a Programmatic Agreement form with a project description, rationale and location map which will be attached to the Forest Service Heritage Event database. The Forest archaeologist will review and sign off on the Programmatic Review form if concurred with. For appendices A, B and C projects as defined in the 2004 Programmatic Agreement, the Forest will retain the documentation and provide the Oregon State Historic Preservation Office with the annual summary of projects as described in the Preservation Act.
- For full inventories the District or Zone archaeologist will complete an inventory report meeting current Oregon State Historic Preservation Office standards which will be reviewed by the Forest archaeologist. The Forest archaeologist will forward the completed inventory report to the Oregon State Historic Preservation Office for review and concurrence signature or further discussion as appropriate.

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<sup>1</sup> Archaeology field work may be done by the Oregon Department of Fish and Wildlife per the approval of the Forest Archaeologist.

- Consultation with Native American tribes is conducted under the terms of the Memorandums of Understanding the Forest has with each individual tribe. The Forest regularly consults with the Burns Paiute Tribe, the Confederated Tribes of the Umatilla Indian Reservation and the Confederated Tribes of Warm Springs Reservation.
- For work requiring a full inventory under the terms of the 2004 Programmatic Agreement any identified cultural resources sites will generally be avoided. For cases where site avoidance is impractical mitigation procedures will be developed in consultation with the Oregon SHPO before project work begins.
- If any previously unidentified cultural resources are located during project implementation, ground disturbing work will be halted until the resources are evaluated by the District or Zone archaeologist. If the cultural resources are determined to be potentially eligible for listing on the National Register of Historic Places work will either be permanently halted or a mitigation plan will be developed in consultation with the Oregon SHPO before work continues.

### *Grazing*

#### *Protection of Government and Permittee Investments*

- All existing structural range improvements (fences, gates, spring developments, etc) and permanent ecological plots would be contractually protected.
- Maintain structural integrity of range improvements.
- If structural improvements are damaged during project operations they would be repaired to Forest Service standards prior to livestock scheduled use by the party responsible for causing the damage. Repairs would be required of the purchaser if damage were done during thinning or fuel treatment contractors or by force account where appropriate.
- Three or more splices to a single wire within a distance of 20 feet will be replaced with a single splice.
- Fence right of ways (6ft either side of fence), trails, other developments and access to them would be cleared of slash produced by project activities.

### *Notification*

- During planning stage of each individual project all potentially impacted grazing permittees will have notice of action and opportunity to provide input that may lessen impacts to their livestock operation well in advance of implementation.
- Prior to implementation all potentially impacted grazing permittees will be given notice of dates when work will start.

# LONG CREEK NEAL

## MIDDLE FORK JOHN DAY SUBBASIN

### 60% DESIGN DRAWINGS

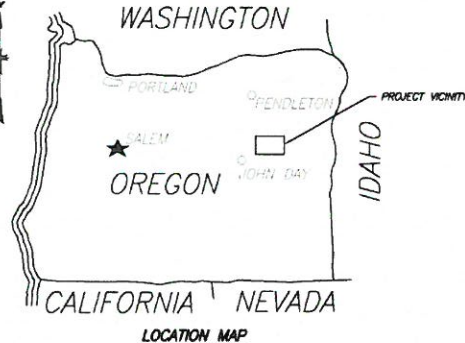
**SITE SUMMARY**  
T10S, R31E, SEC.21  
GRANT COUNTY, OREGON

- General Notes:**
- The general intent of this work is to improve habitat for fish by realigning 2,500 feet of Long Creek.
  - The above work is to be performed for Columbia/Snake Salmon Recovery Program. The Bureau of Reclamation, hereafter referred to as the Engineer, is the program's representative who has designed the project.
  - The work to be performed includes, but is not limited to, the following:
    - Mobilization and demobilization
    - Providing stormwater pollution prevention and erosion control during construction
    - Diversion and care of stream during construction
    - Earthwork for the proposed Long Creek realignment
    - Grading of floodplain to match the valley
    - Shape alcoves
    - Place large woody debris and in-stream boulders
    - Revegetate riparian floodplain areas

**LEGEND**

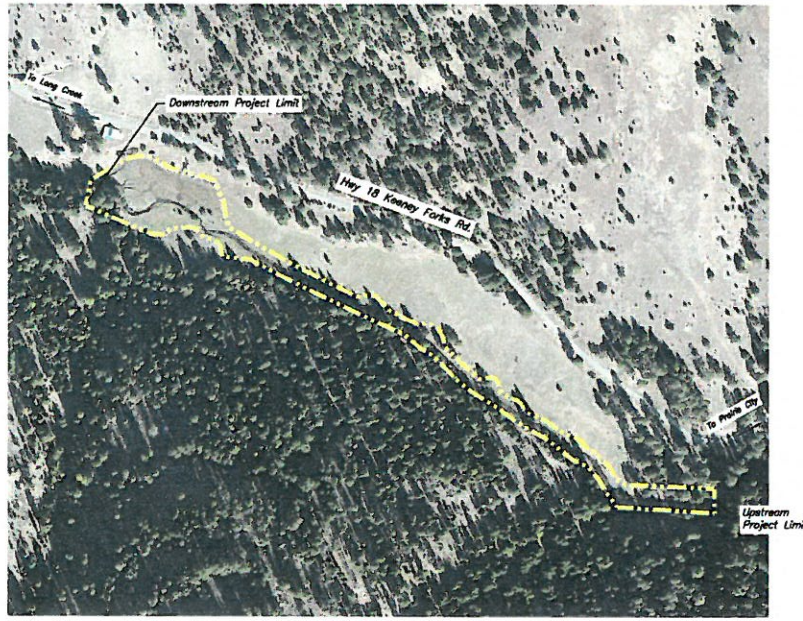
- Large Wood
- Existing Trees
- Levee Breach
- Riffle
- Pool
- Proposed Fence
- Bank Brush Treatment

SHEET INDEX		
Sheet No.	Drawing No.	Contents
1	G-1	Title Sheet & Index
2	G-2	Existing Conditions & Survey Control
3	G-3	Proposed Conditions
4	G-4	Proposed Conditions
5	G-5	Proposed Conditions
6	G-6	Proposed Conditions
7	G-7	Proposed Conditions
8	PP-1	Plan and Profile Keymap
9	PP-2	Plan and Profile - STA 1+00 to 5+00
10	PP-3	Plan and Profile - STA 5+00 to 10+00
11	PP-4	Plan and Profile - STA 10+00 to 15+00
12	PP-5	Plan and Profile - STA 15+00 to 20+00
13	PP-6	Plan and Profile - STA 20+00 to 25+00
14	PP-7	Plan and Profile - STA 25+00 to 29+28
15	PP-8	Plan and Profile - Side Channel 1
16	PP-9	Plan and Profile - Side Channels 2 & 3
17	PP-10	Plan and Profile - Groundwater Alcove, Pond and Typical Channel Section
18	TS-1	Riffle and Brush Bank Details
19	TS-2	LWM Details
20	TS-3	LWM Details
21	SP	Step Pool Detail
22	PB	Picket Baffle Plan and Detail

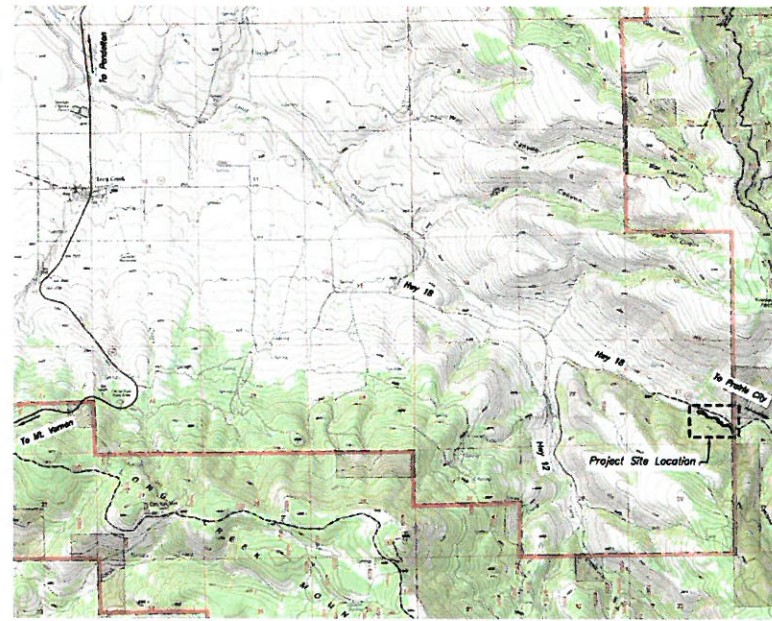


**PREPARED FOR:**  
COLUMBIA/SNAKE SALMON RECOVERY PROGRAM  
CONTACT: MARK OGDEN  
JOHN DAY - SUBBASIN LIAISON  
mroghen@usbr.gov

**PREPARED BY:**  
DESIGN GROUP  
PACIFIC NORTHWEST REGION  
BOISE, ID



**PROJECT SITE**  
SCALE: 1" = 100 FEET

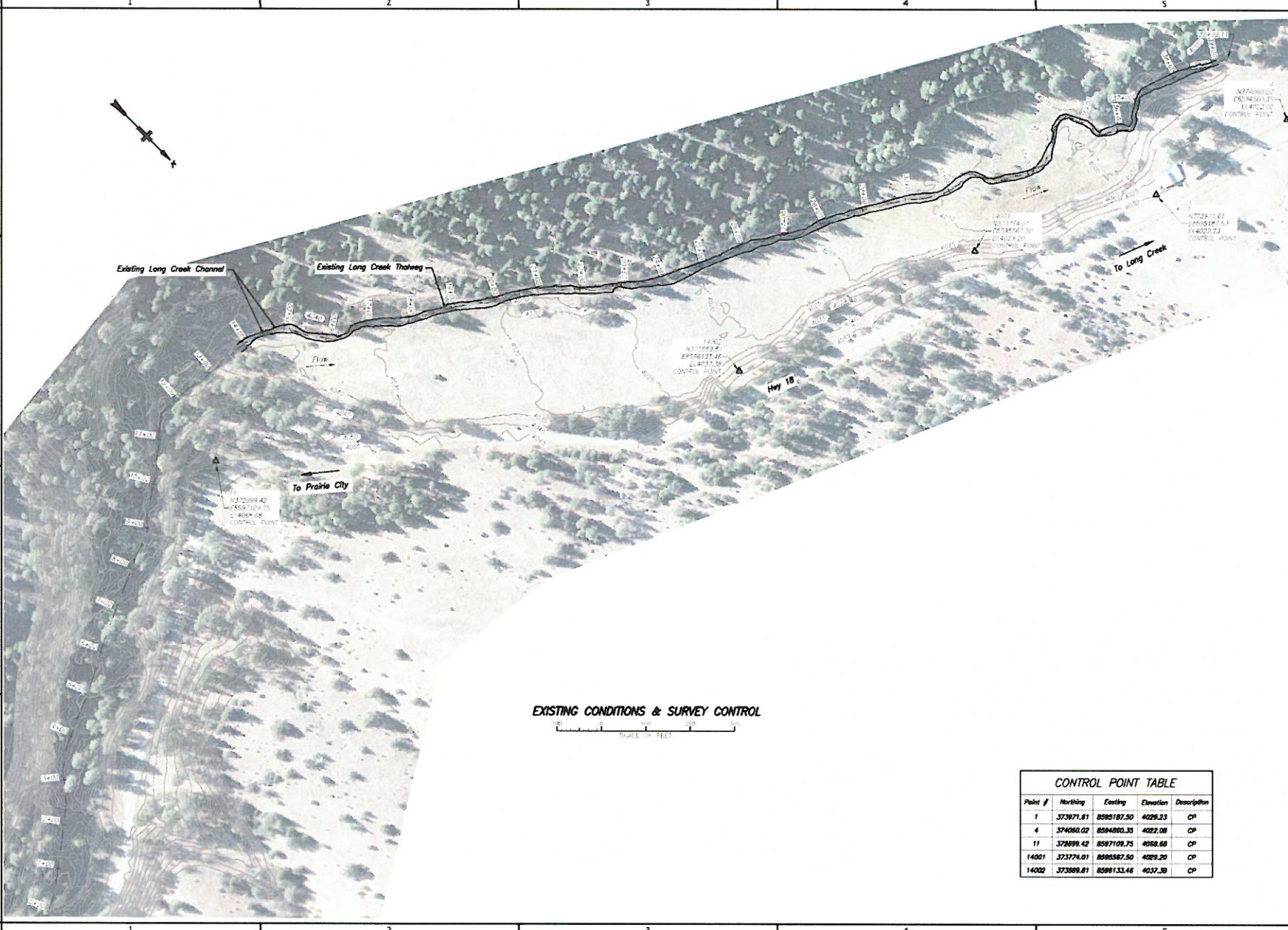


**VICINITY MAP**  
SCALE: 1" = 1 MILE

**ALWAYS THINK SAFETY**  
 U.S. BUREAU OF RECLAMATION  
 5600 N. W. RIVER ROAD  
 BOISE, IDAHO 83725  
 MIDDLE FORK JOHN DAY SUBBASIN  
 LONG CREEK NEAL

I, \_\_\_\_\_  
 A. \_\_\_\_\_  
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COVER SHEET



CONTROL POINT TABLE				
Point #	Northing	Easting	Elevation	Description
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4	374060.02	8594860.35	4023.08	CP
11	372899.42	8597109.75	4058.68	CP
14001	373774.01	8595587.50	4029.20	CP
14002	373889.81	8596133.44	4037.30	CP

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FOR YOUR PROTECTION  
 COLORADO RIVER WATER RECONSTRUCTION  
 MIDDLE FORK JOHN DAY SUBBASIN  
 LONG CREEK NEAL

J. Baragona  
 S. P. P. P.  
 C. C. C.  
 M. C. C.  
 APPROVED  
 DATE: 07/20/20

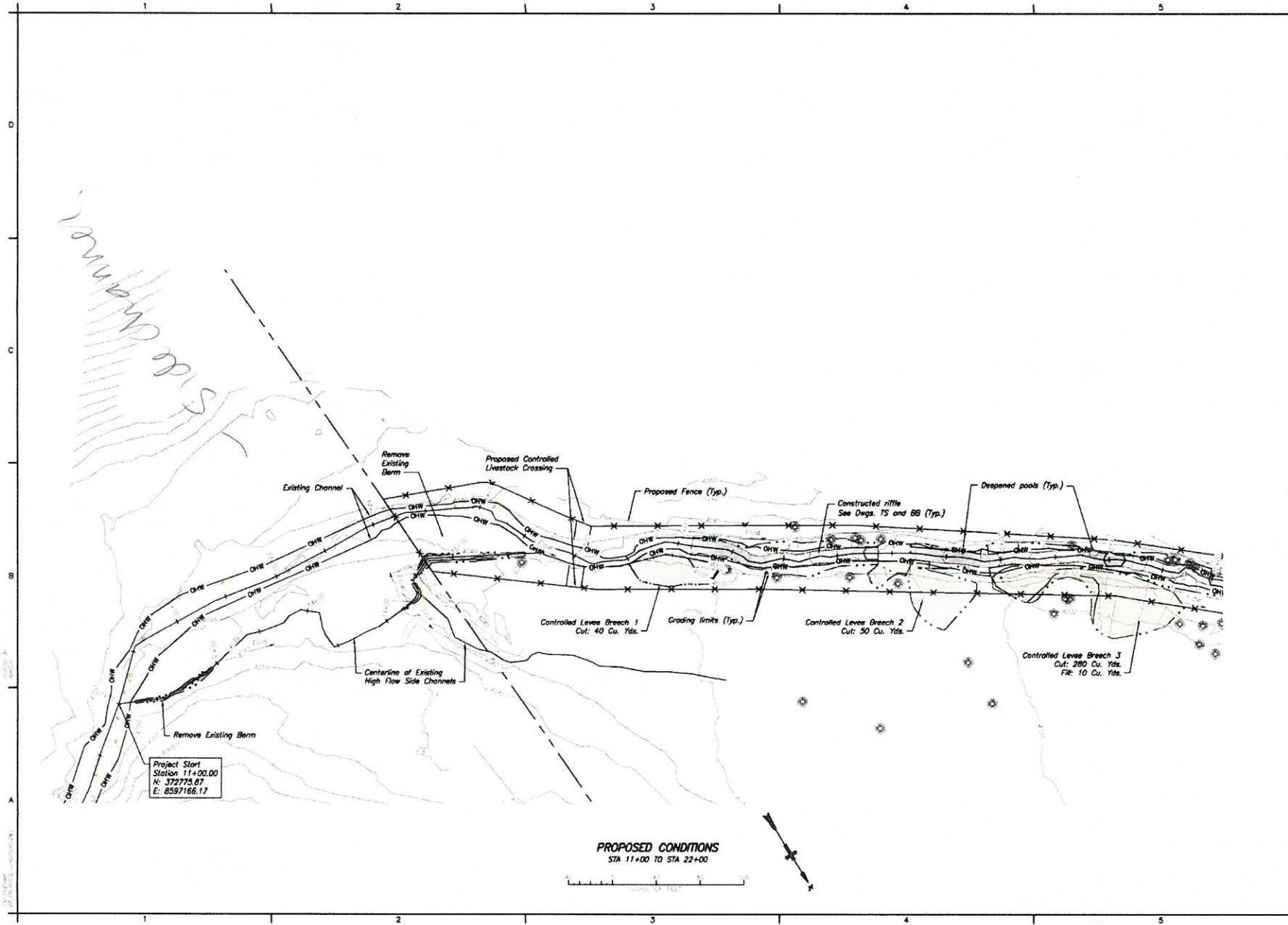
EXISTING CONDITIONS

G-2  
 SHEET 2

DATE: 07/20/20  
 DRAWN BY: J. BARAGONA  
 CHECKED BY: S. P. P. P.  
 APPROVED BY: C. C. C.  
 DATE: 07/20/20

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MIDDLE FORK JOHN DAY SUBBASIN  
LONG CREEK NEAL  
PROPOSED CONDITIONS



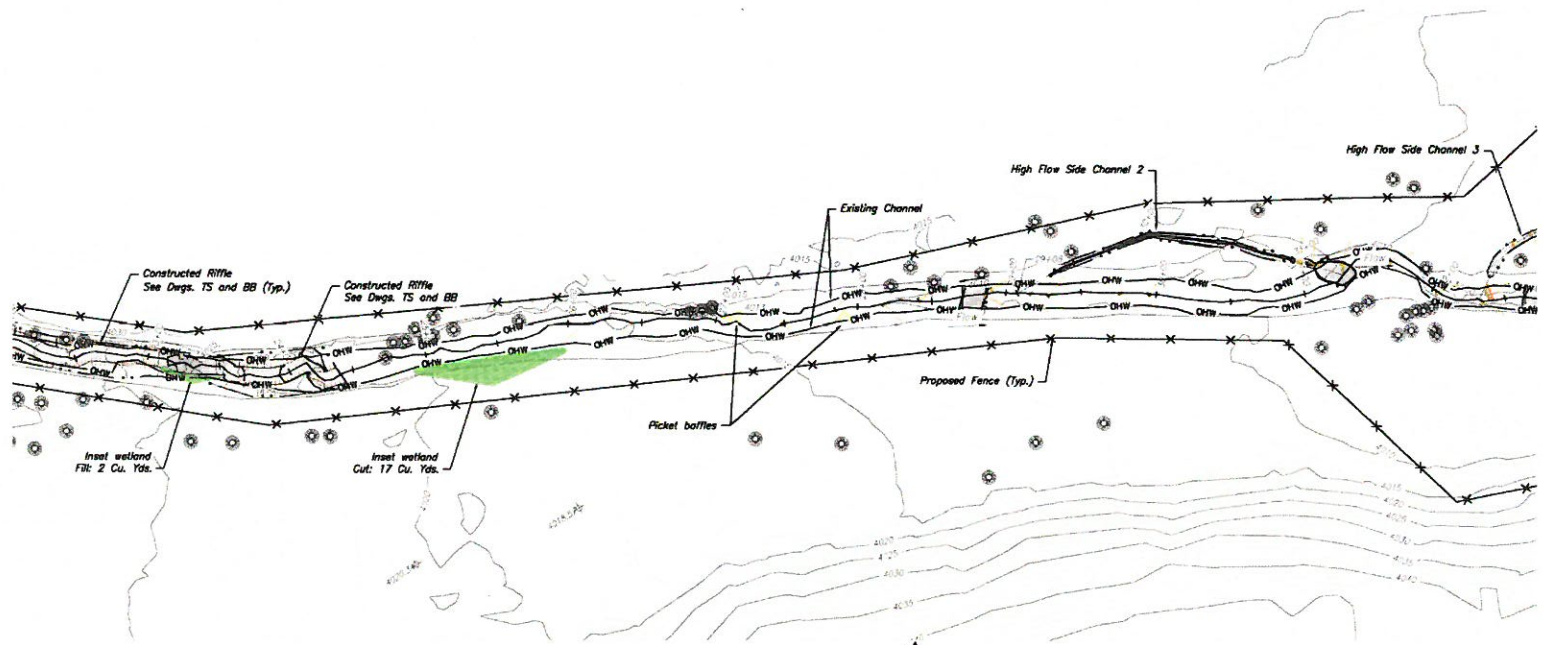
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STA 11+00 TO STA 22+00

LONG CREEK NEAL

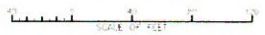
PROPOSED CONDITIONS

G-5

Sheet 4



**PROPOSED CONDITIONS**  
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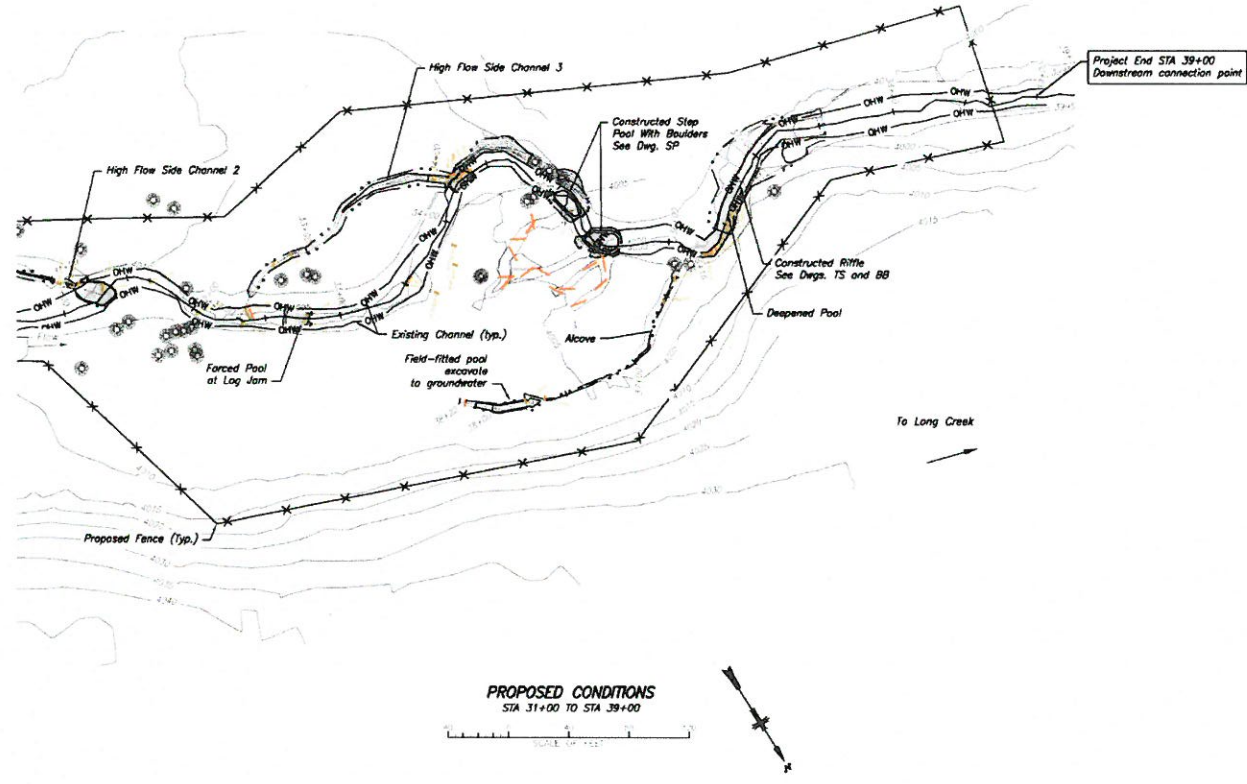
MIDDLE FORK JOHN DAY SUBBASIN  
LONG CREEK NEAL  
PROPOSED CONDITIONS


LONG CREEK NEAL  
PROPOSED CONDITIONS

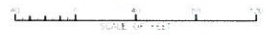
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 PROJECT: [Name]







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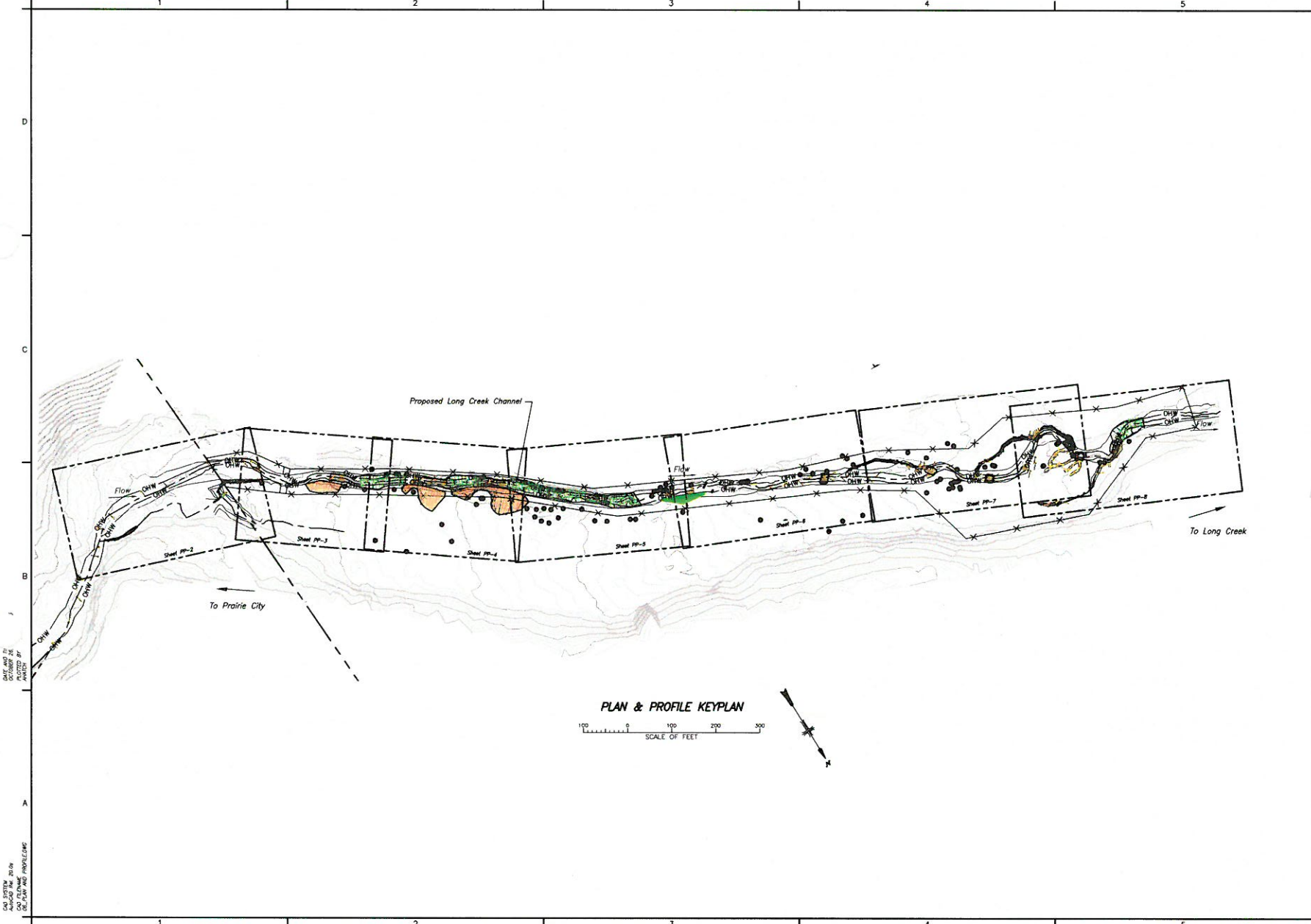


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MIDDLE FORK JOHN DAY SUBBASIN  
 LONG CREEK NEAL  
 PROPOSED CONDITIONS

LONG CREEK NEAL  
 PROPOSED CONDITIONS

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COLUMBIAN RIVER SALMON RECOVERY PROGRAM  
FEDERAL HABITAT IMPROVEMENT PROGRAM - OREGON  
MIDDLE FORK JOHN DAY SUBBASIN  
LONG CREEK NEAL  
PLAN & PROFILE

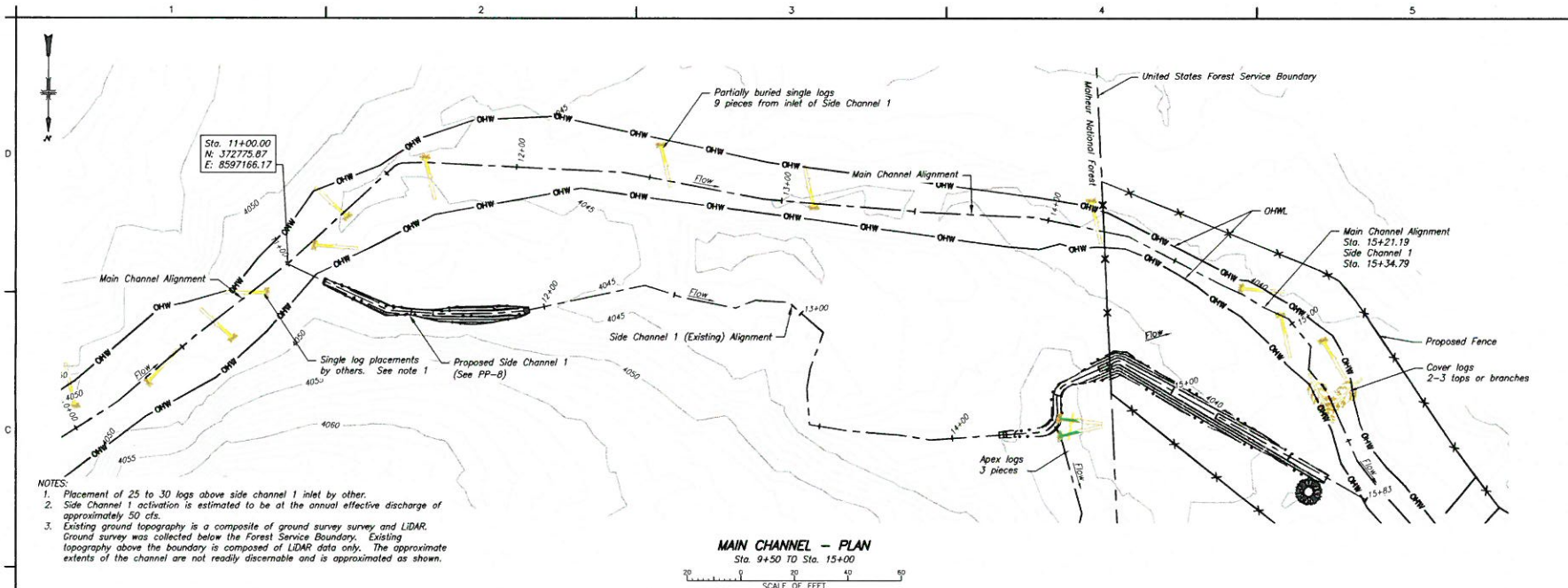


DATE AND BY  
 DRAWN BY  
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 APPROVED BY  
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 APPROVED BY

DESIGNED	
DRAWN	
CHECKED	
REVISIONS	
DATE	
BY	
APPROVED	
DATE	

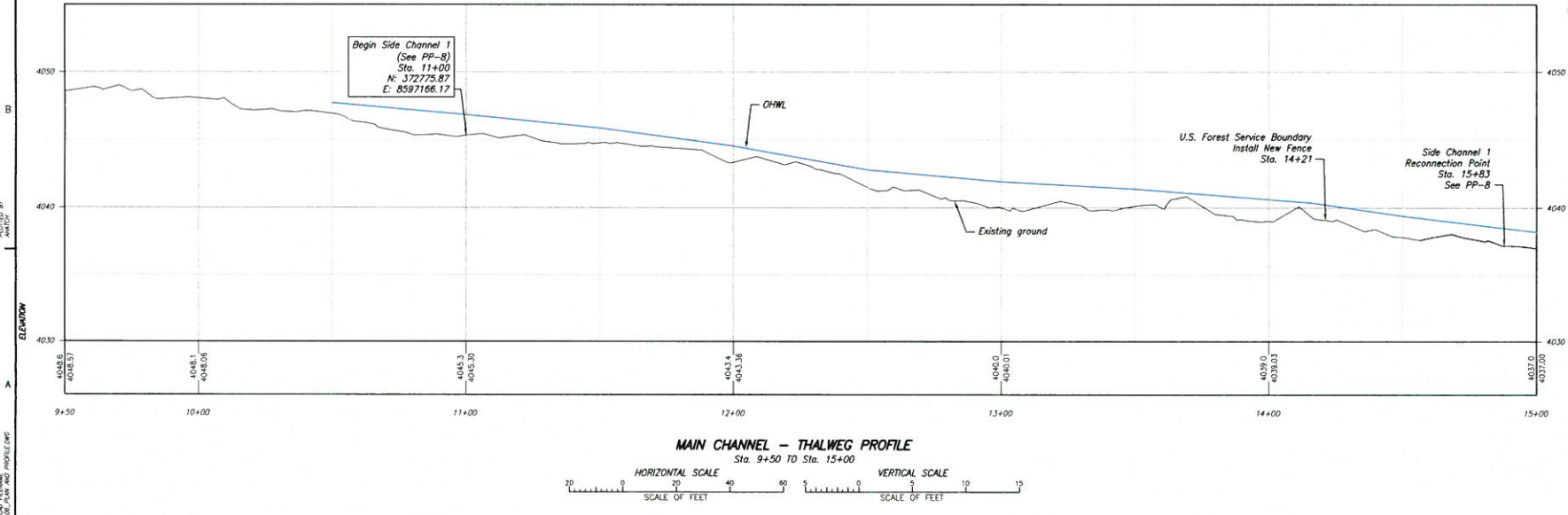
LONG CREEK NEAL  
PLAN & PROFILE  
KEYPLAN

PP-1  
SHEET 1



- NOTES:
1. Placement of 25 to 30 logs above side channel 1 inlet by other.
  2. Side Channel 1 activation is estimated to be at the annual effective discharge of approximately 50 cfs.
  3. Existing ground topography is a composite of ground survey survey and LIDAR. Ground survey was collected below the Forest Service Boundary. Existing topography above the boundary is composed of LIDAR data only. The approximate extents of the channel are not readily discernable and is approximated as shown.

**MAIN CHANNEL - PLAN**  
Sta. 9+50 TO Sta. 15+00  
SCALE OF FEET



**MAIN CHANNEL - THALWEG PROFILE**  
Sta. 9+50 TO Sta. 15+00  
HORIZONTAL SCALE: SCALE OF FEET  
VERTICAL SCALE: SCALE OF FEET

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 TIME: 15:13  
 BY: [Name]  
 CHECKED BY: [Name]  
 APPROVED BY: [Name]  
 TITLE: [Title]

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U.S. DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION  
COLUMBIAN/RIVER SALMON RECOVERY PROGRAM  
FCPS HABITAT RESTORATION PROGRAM - CROCK

**MIDDLE FORK JOHN DAY SUBBASIN**  
LONG CREEK NEAL  
PLAN & PROFILE

J. Pentz	DESIGNED
A. Hatch	DRAWN
[Name]	CHECKED
[Name]	TEST APPR.
[Name]	APPROVED
[Name]	DATE APPROV.
BOISE, ID	2018-10-29

LONG CREEK NEAL  
PLAN & PROFILE

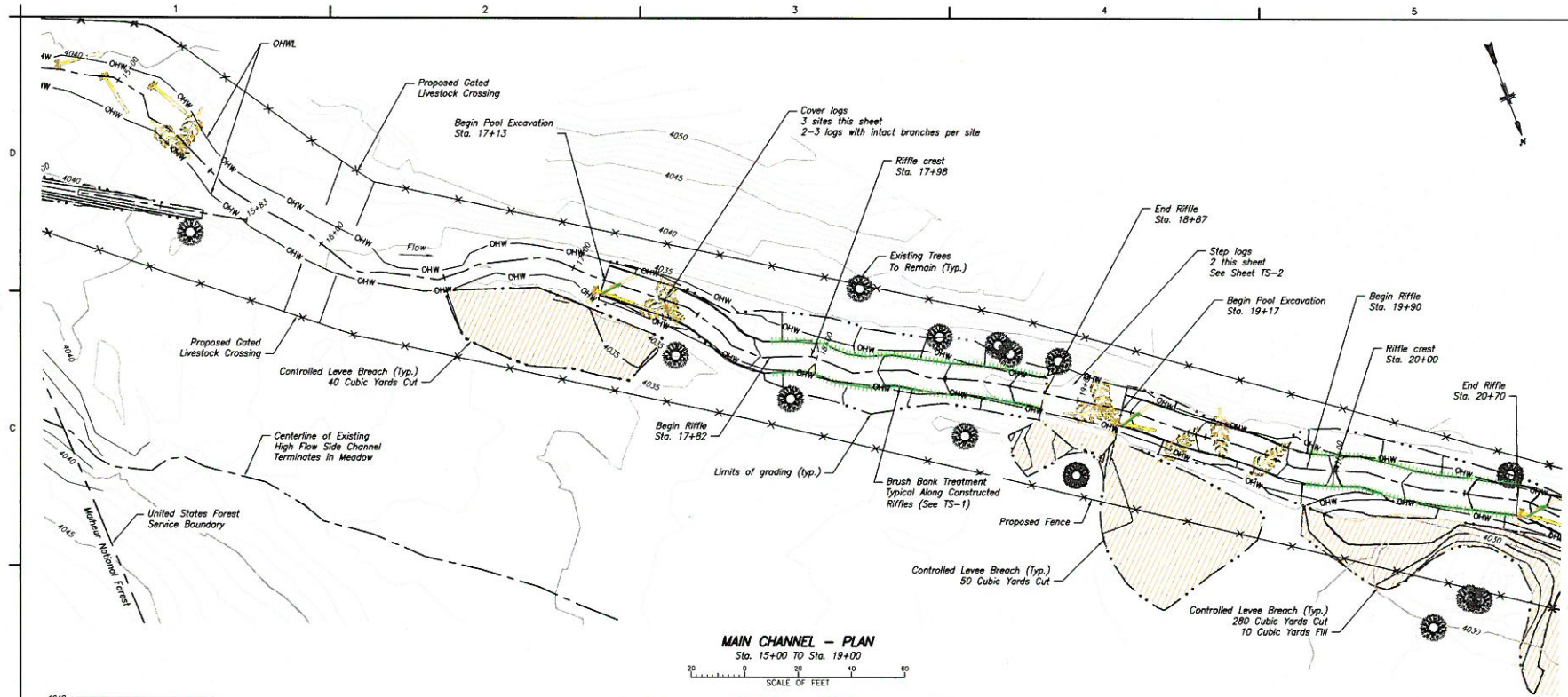
DESIGNED BY	
CHECKED BY	
IN CHARGE	
APPROVED BY	
DATE	2016-10-29
PROJECT NO.	
PROJECT NAME	

LONG CREEK NEAL

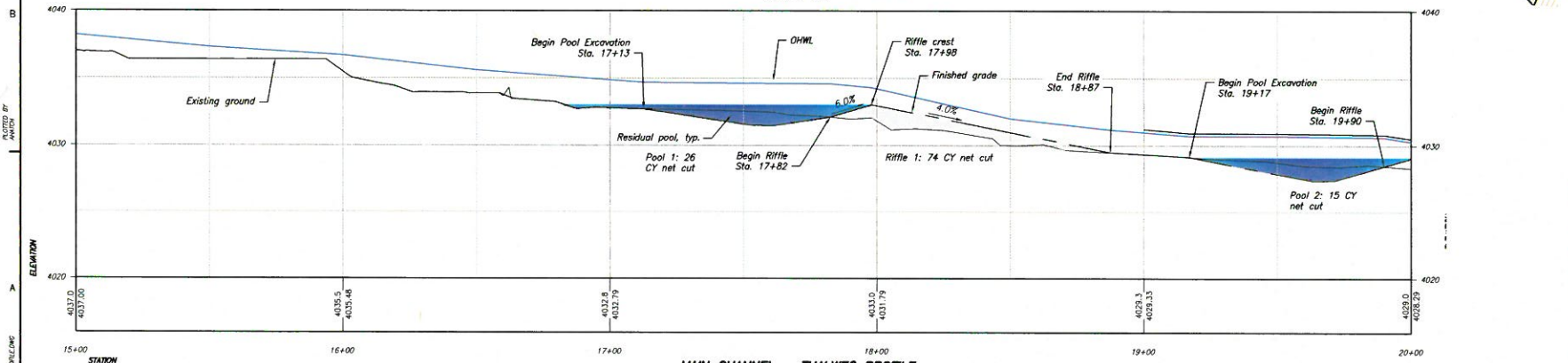
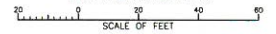
PLAN & PROFILE

PP-3

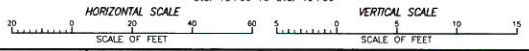
SHEET 3



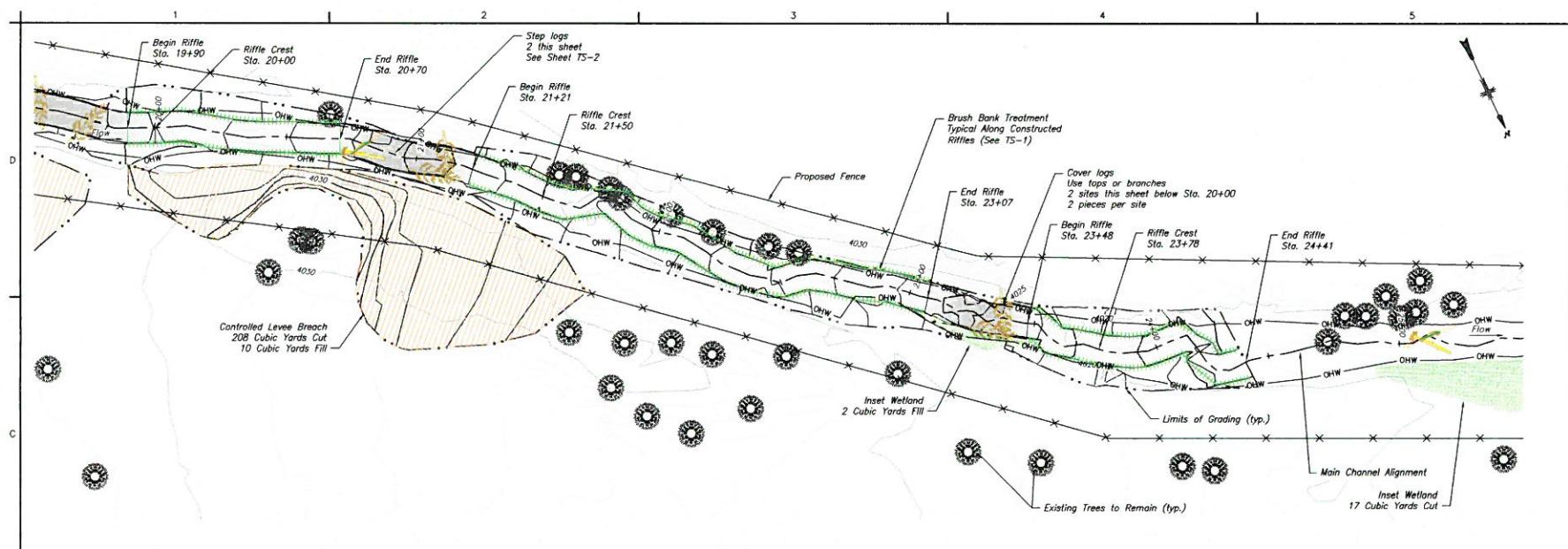
**MAIN CHANNEL - PLAN**  
Sta. 15+00 TO Sta. 19+00



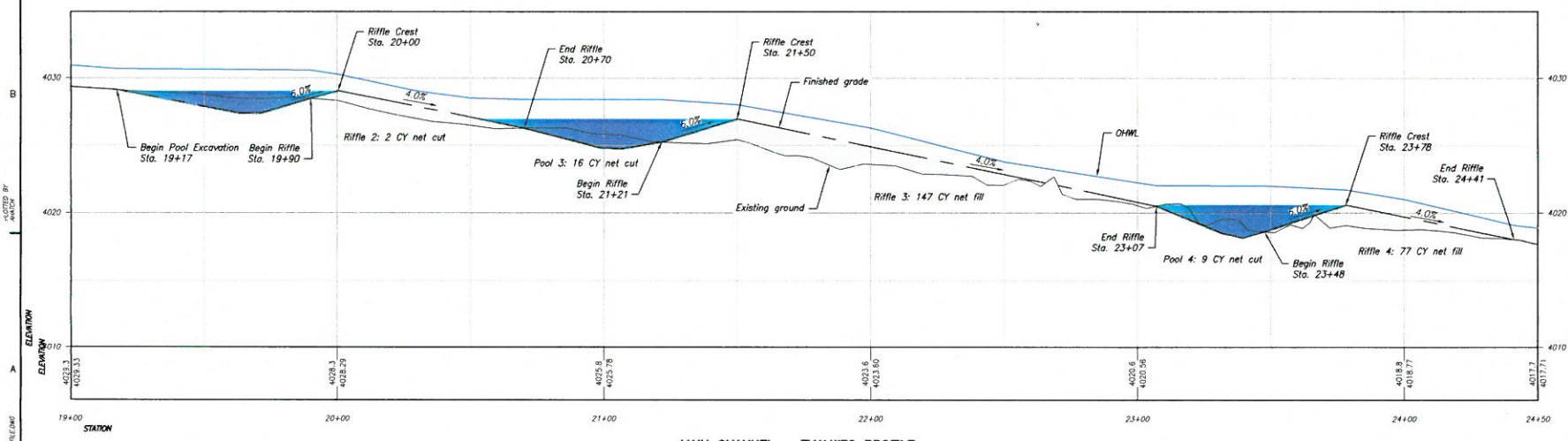
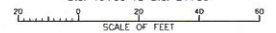
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Sta. 15+00 TO Sta. 19+00



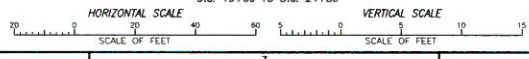
DATE PLOTTED: 10/29/16  
 PLOTTED BY: J. H. HARRIS  
 CHECKED BY: J. H. HARRIS  
 IN CHARGE: J. H. HARRIS  
 PROJECT NO.: 16-10-29  
 PROJECT NAME: LONG CREEK NEAL  
 SHEET NO.: 3



**MAIN CHANNEL - PLAN**  
Sta. 19+00 TO Sta. 24+50



**MAIN CHANNEL - THALWEG PROFILE**  
Sta. 19+00 TO Sta. 24+50

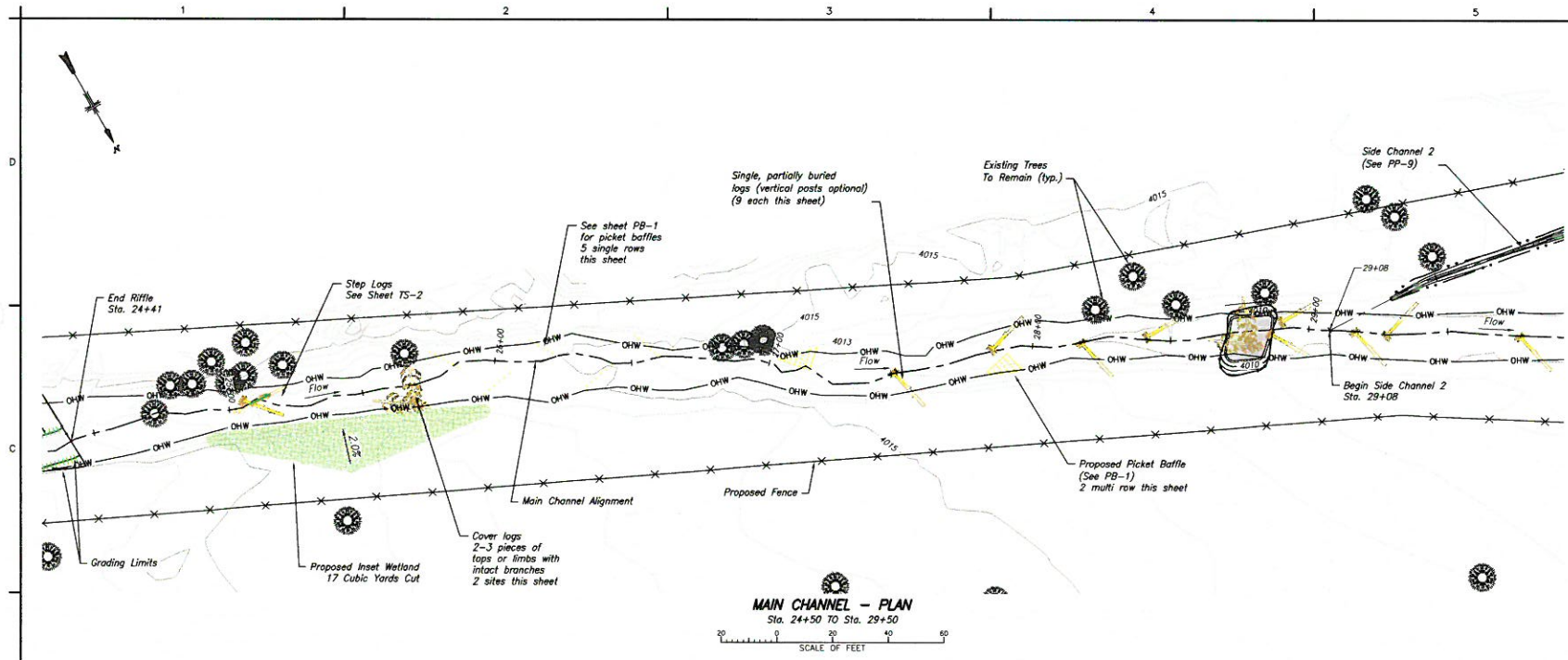


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 STATION  
 ELEVATION  
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4010  
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 APPROVED BY: [illegible]

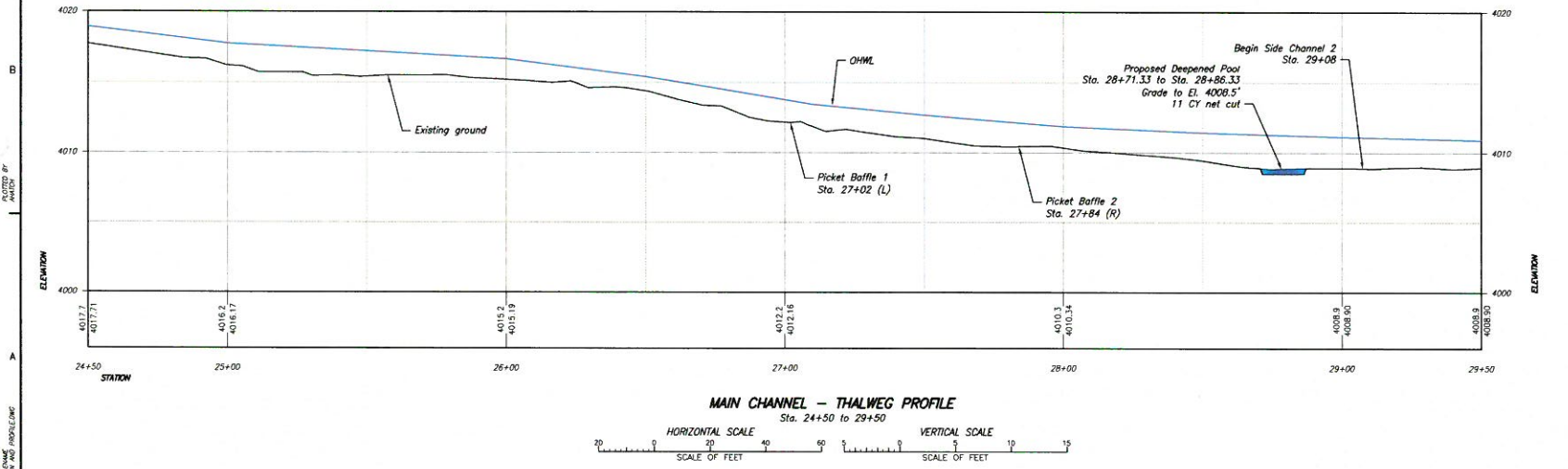
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 U.S. DEPARTMENT OF THE INTERIOR  
 BUREAU OF RECLAMATION  
 COLUMBIA/SNAKE RIVER SALMON RECOVERY PROGRAM  
 FISH HABITAT IMPROVEMENT PROJECT - GREGORY  
 MIDDLE FORK JOHN DAY SUBBASIN  
 LONG CREEK NEAL  
 PLAN & PROFILE

J. Dentz  
 Designer  
 A. Hatch  
 Drafter  
 CHECKED BY: [illegible]  
 TECH APPR: [illegible]  
 APPROVED BY: [illegible]  
 10/18/16  
 2016-10-28

LONG CREEK NEAL  
 PLAN & PROFILE



**MAIN CHANNEL - PLAN**  
Sta. 24+50 TO Sta. 29+50  
SCALE OF FEET



**MAIN CHANNEL - THALWEG PROFILE**  
Sta. 24+50 to 29+50  
HORIZONTAL SCALE SCALE OF FEET VERTICAL SCALE SCALE OF FEET

DATE: 10/15/16  
 DRAWN BY: J. P. HARRIS  
 CHECKED BY: J. P. HARRIS  
 APPROVED BY: J. P. HARRIS  
 TITLE: CIVIL ENGINEER  
 PROJECT: COLUMBIAN RIVER SALMON RECOVERY PROGRAM  
 SHEET: PP-5

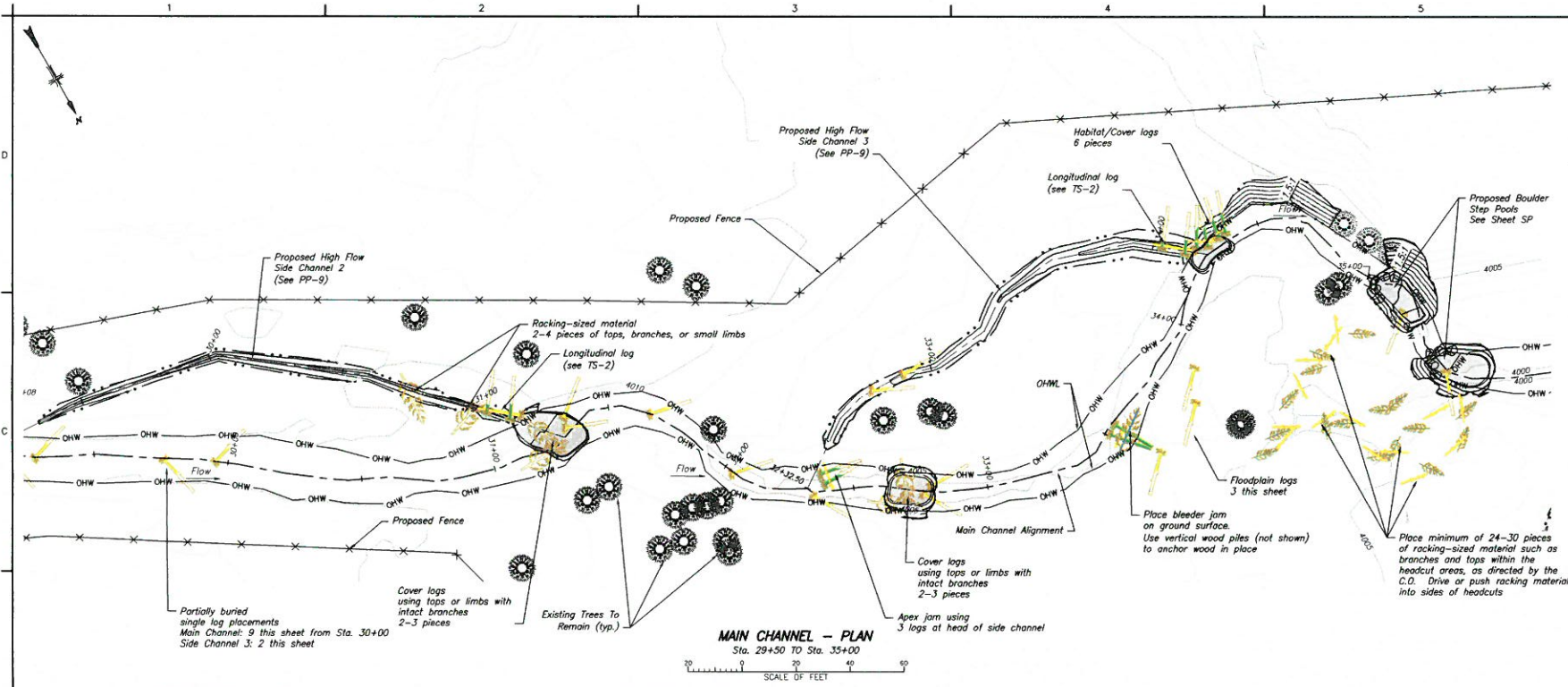
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 U.S. DEPARTMENT OF AGRICULTURE  
 BUREAU OF RECLAMATION  
 COLUMBIAN RIVER SALMON RECOVERY PROGRAM  
 FERTS HABITAT IMPROVEMENT PROGRAM - DREGON  
**MIDDLE FORK JOHN DAY SUBBASIN**  
**LONG CREEK NEAL**  
**PLAN & PROFILE**

DESIGNED	J. P. HARRIS
DRAWN	J. P. HARRIS
CHECKED	J. P. HARRIS
APPROVED	J. P. HARRIS
DATE	10/15/16
BOOK #	2016-10-29

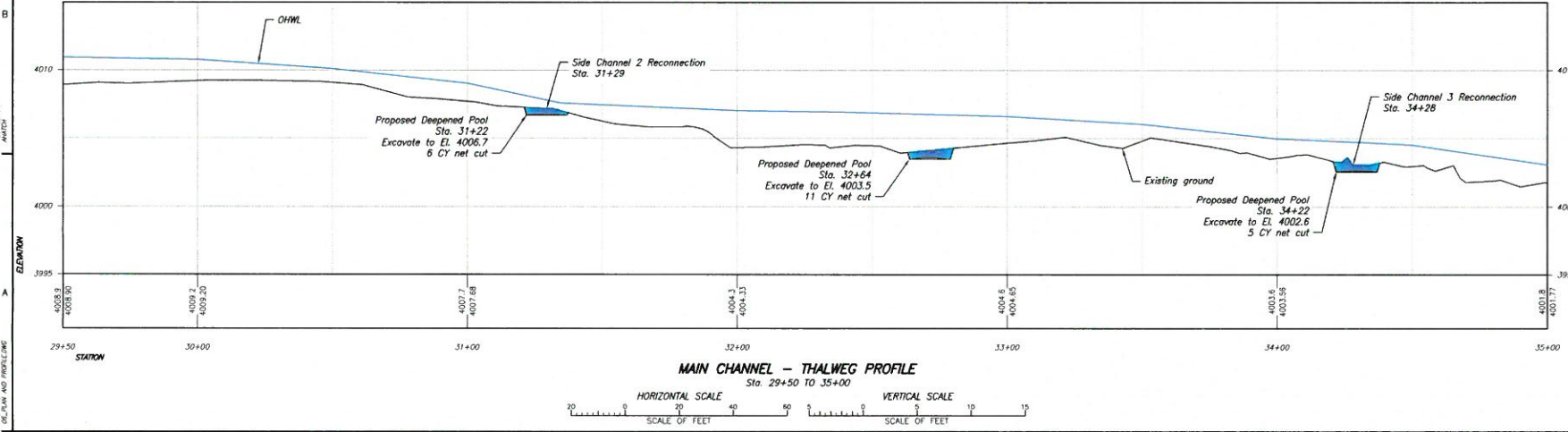
LONG CREEK NEAL

PLAN & PROFILE

PP-5  
SHEET 5



**MAIN CHANNEL - PLAN**  
Sta. 29+50 TO Sta. 35+00



**MAIN CHANNEL - THALWEG PROFILE**  
Sta. 29+50 TO Sta. 35+00

DATE OF REVISION: 08/17/2016 (10-88)  
 DRAWN BY: J. DENTZ  
 CHECKED BY: A. HATCH  
 APPROVED BY: J. DENTZ  
 DATE: 08/17/2016

J. Dentz	DESIGNER
A. Hatch	CHECKER
J. Dentz	APPROVED
08/17/2016	DATE

LONG CREEK NEAL

PLAN & PROFILE

PP-6  
SHEET 6

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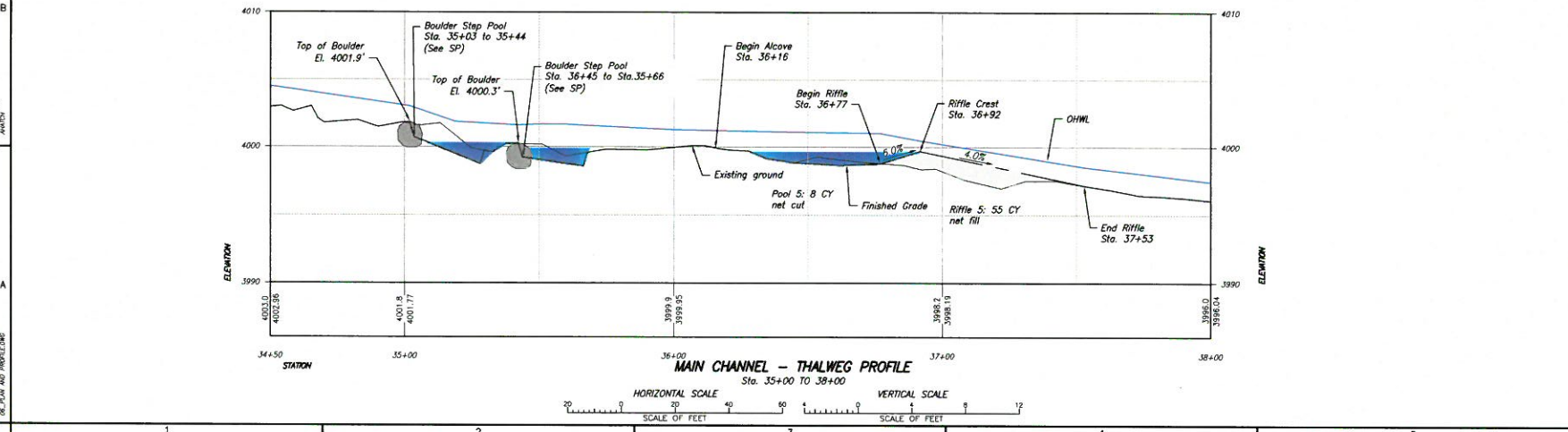
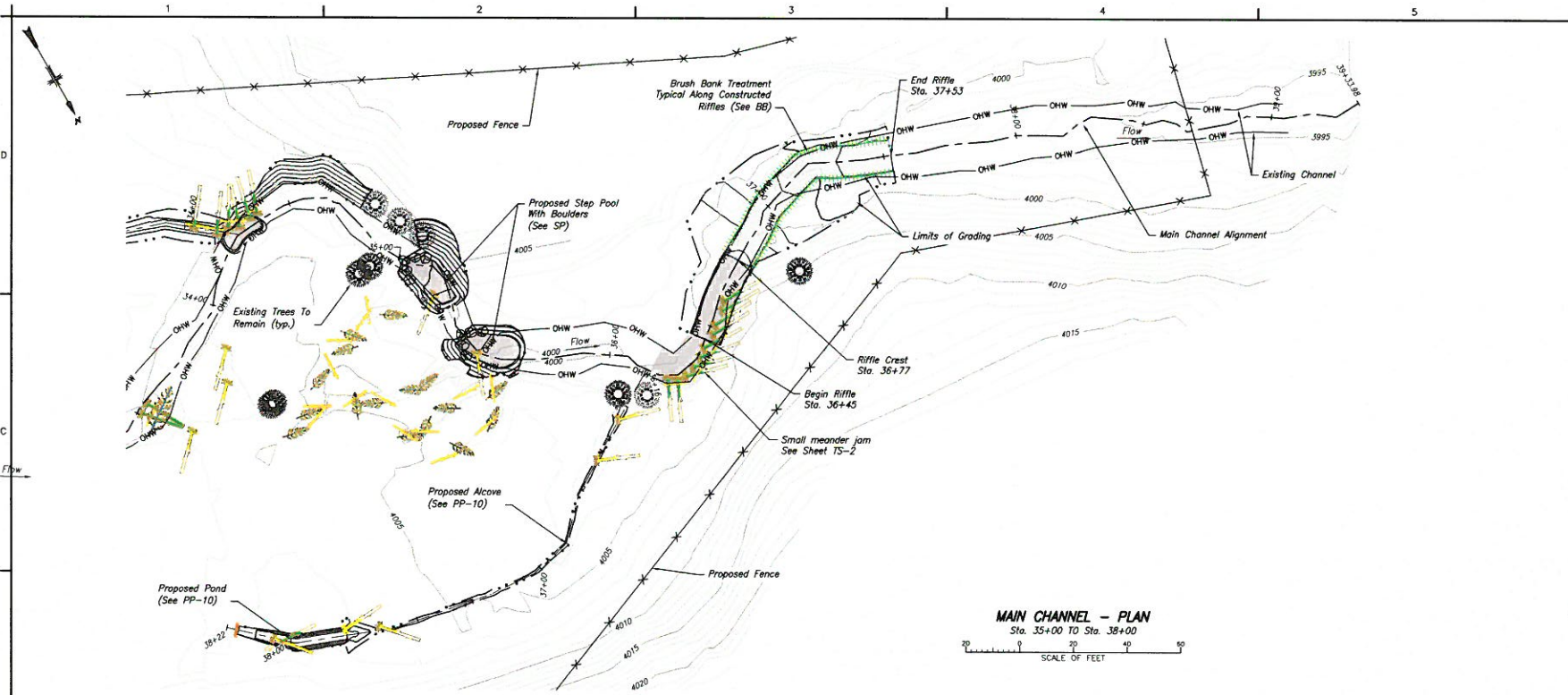
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FIELD APPR	
APPROVED	
DATE APPROVED	

BOISE ID 2016-10-29

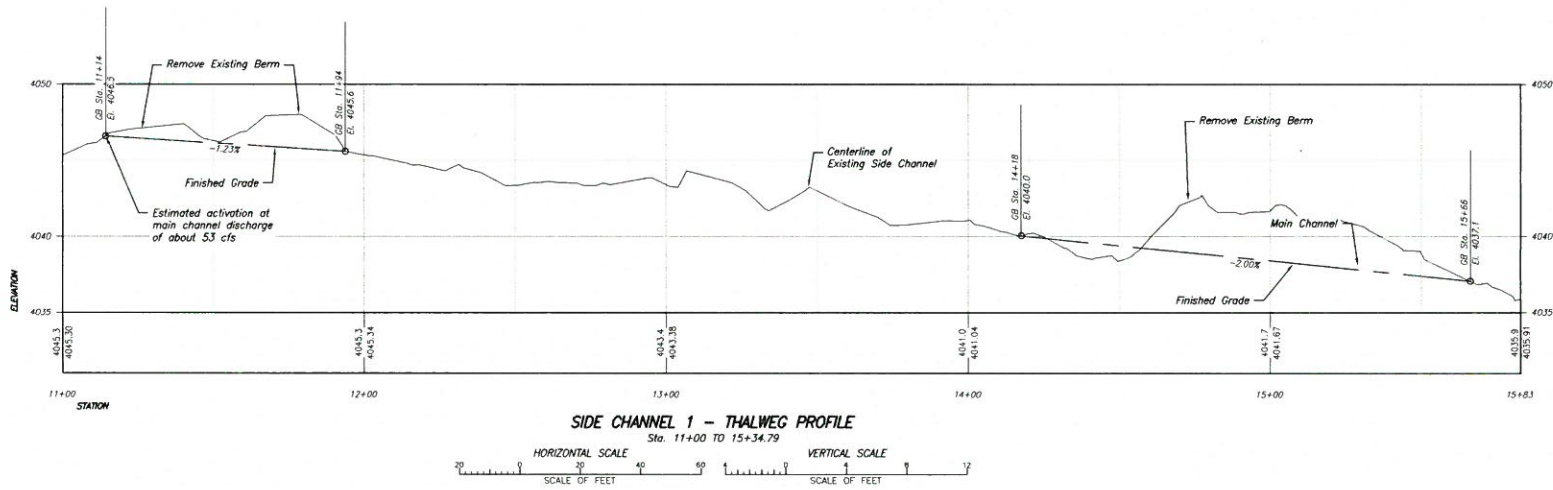
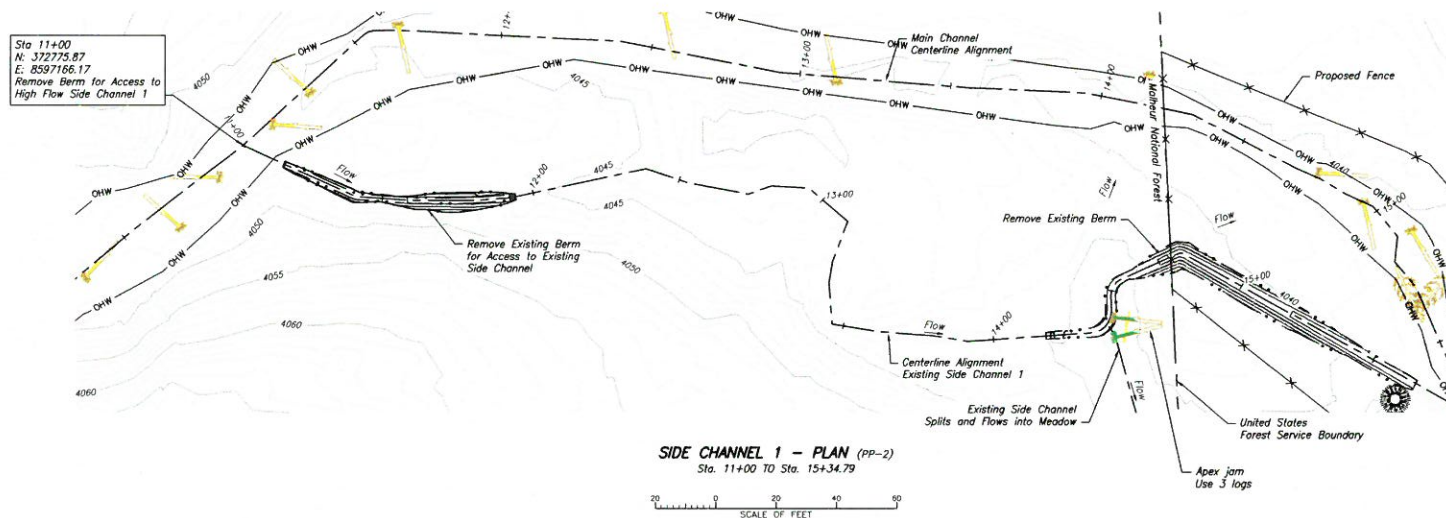
LONG CREEK NEAL

PLAN & PROFILE

PP-7  
SHEET 7



DATE: 10/27/16  
 DRAWN BY: J. FEET  
 CHECKED BY: J. FEET  
 DESIGNED BY: J. FEET  
 PROJECT: LONG CREEK NEAL  
 SHEET: PP-7

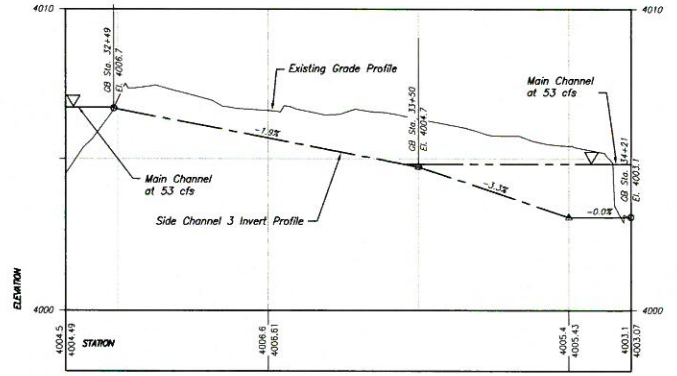
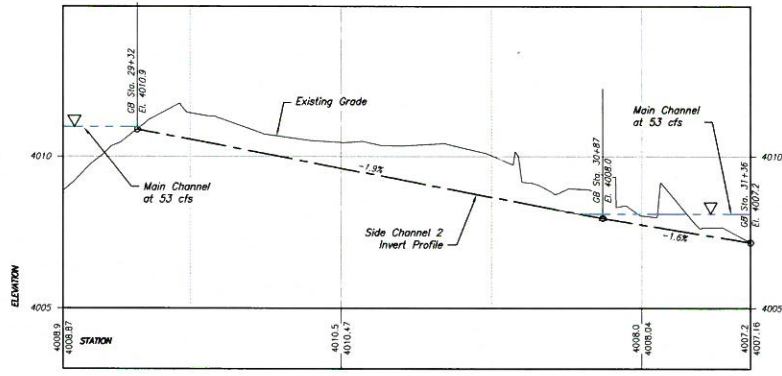
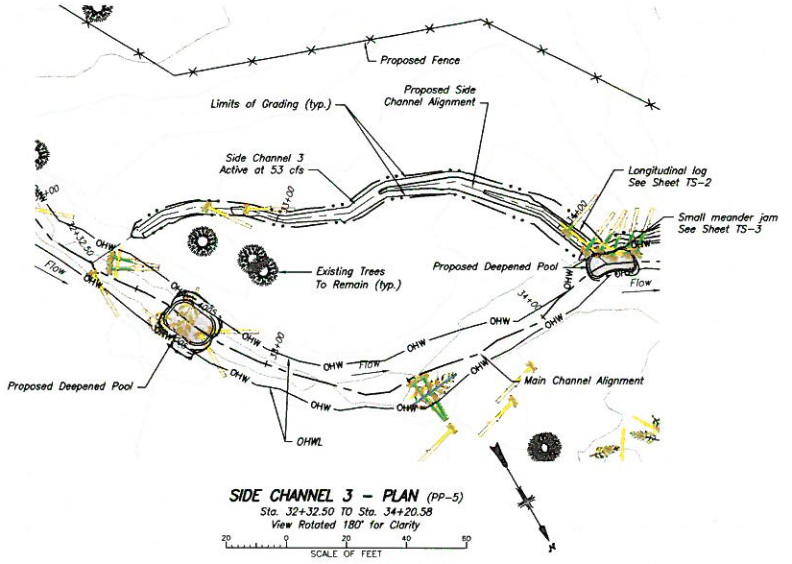
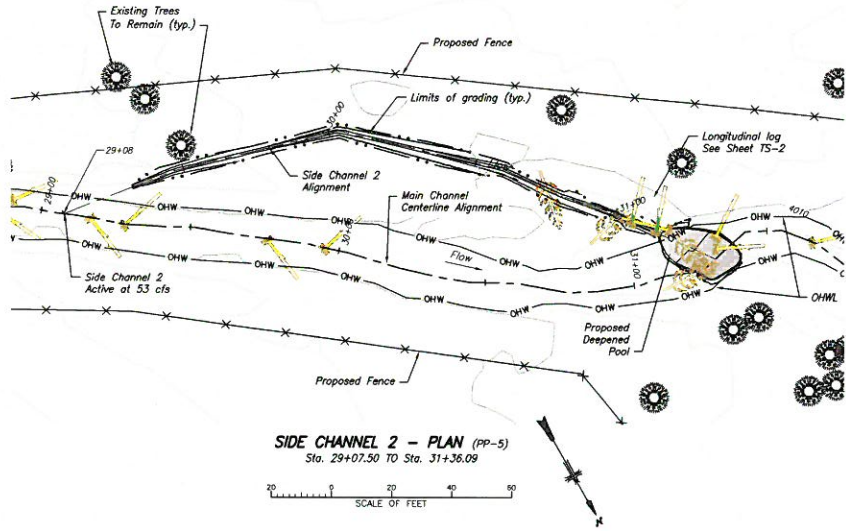


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 BUREAU OF RECLAMATION  
 COLUMBIA RIVER TREATMENT PLANT/PROJECT  
 RCPPS HABITAT IMPROVEMENT PROGRAM - ORCONY  
 MIDDLE FORK JOHN DAY SUBBASIN  
 LONG CREEK NEAL  
 PLAN & PROFILE

CHECKED BY: [Signature]  
 DATE: [Date]  
 APPROVED BY: [Signature]  
 DATE: [Date]

LONG CREEK NEAL  
 PLAN & PROFILE  
 PP-8  
 SHEET 6



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BUREAU OF RECLAMATION  
COLUMBIA/RIMMEL RIVER SALMON RECOVERY PROGRAM  
FORMS HABITAT IMPROVEMENT PROGRAM - OREGON

MIDDLE FORK JOHN DAY SUBBASIN  
LONG CREEK NEAL  
PLAN & PROFILE

DESIGNED BY	J. Peeli
CHECKED BY	A. Hsieh
IN CHARGE	
APPROVED BY	
DATE	10/26/16

BOOK: 80  
2016-10-29

LONG CREEK NEAL  
GROUNDWATER PLAN & PROFILE  
AND TYPICAL SECTIONS

DATE: 10/26/16  
 DRAWN BY: J. Peeli  
 CHECKED BY: A. Hsieh  
 IN CHARGE: [Blank]  
 APPROVED BY: [Blank]  
 DATE: 10/26/16



**LIVE WILLOW CUTTINGS**

Live Willow Cuttings shall consist of locally harvested willow cuttings. Cuttings are between approximately 1/2 inch to 1 inch in diameter depending upon species and source. Cuttings harvested with care and cut to lengths of 3 feet to 5 feet. Cuttings shall be bundled and submerged in standing water for 5 to 7 days prior to planting. Care should be taken to mark upward or downward ends of cuttings (i.e. dipped in latex paint or other) when harvesting such that they are re-planted in the appropriate direction. Harvested live-cuttings shall not be allowed to dry-out and must be planted after removal from soaking location. Cuttings should be buried by a minimum of 75% of their length and must have some small portion of their top exposed to air. Soil surrounding live cuttings must be densely compacted to avoid air pockets.

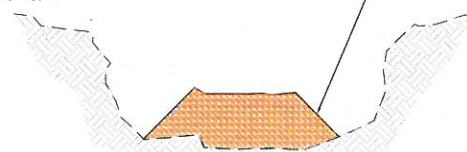
**RIFFLE CONSTRUCTION NOTES**

1. Stockpile engineered fill material per design specifications. Materials are to be stockpiled in the immediate project area or transported from the sorting area as needed.
2. Import well-mixed engineered riffle matrix material. Compact matrix material in 12-inch lifts using excavator, or similar equipment. Track on matrix material sufficiently to compact material. Add a layer of additional fines on the surface. Wash fines into matrix material using a trash pump and 2-inch fire hose with a nozzle until water ponds on the surface and approved by the C.O.
3. Live Willow Cuttings shall be placed at 6 to 12 inches on center along the base of the excavation. The cuttings shall be 1/2 inch to 1 inch in trunk diameter and from 3 to 5 feet in length. Cuttings shall retain all side branches but will have the top foot of the previous year's growth removed.
4. Install debris and slash including tree branches, stems, live cuttings, and general brush to form a compacted 8 to 10 inch thick debris layer. Material should be between 4 and 7 feet in length and consist of a range of stem diameters between 1/2 inch to 4 inches. Material can be a mixture of live and dead material.
5. Brush layering backfill shall be placed in lifts with a mixture of topsoil and alluvium as approved by C.O. Fill layer thickness prior to compaction shall not exceed 6 inches. Fill shall be compacted to a density equivalent to that of the surrounding in-situ material by means of hand tamping, power tampers, plate vibrators, or machine compaction. Final fill elevations to match design grade as identified in the plans.
6. Upstream and downstream transitions shall be constructed at the direction of the C.O.
7. Notify the C.O. of any proposed changes prior to implementation. The C.O. reserves the right to modify structure design specifications during construction if warranted due to unforeseen conditions.
8. Bottom of Live Willow Cuttings need to be 6-inches below channel thalweg as directed by C.O.
9. Boulders of various sizes are to be added to the top matrix lift to create diverse flow paths and habitat. Each boulder is to be embedded to 50% of the boulder diameter and recompact. Excavate pockets into matrix material and set boulders to 50% embedment. Wash additional fines into matrix surrounding boulders and compact with excavator bucket as directed by C.O.

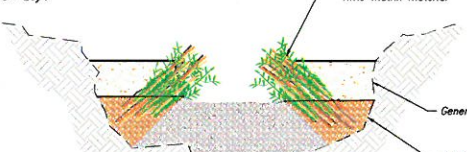
**STEP 1 - Existing Ground**



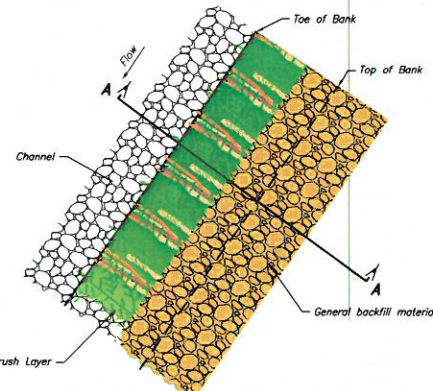
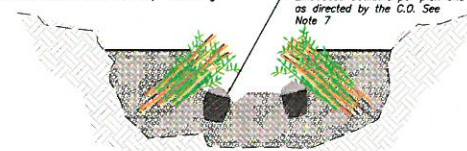
**STEP 2 - Riffle Matrix**



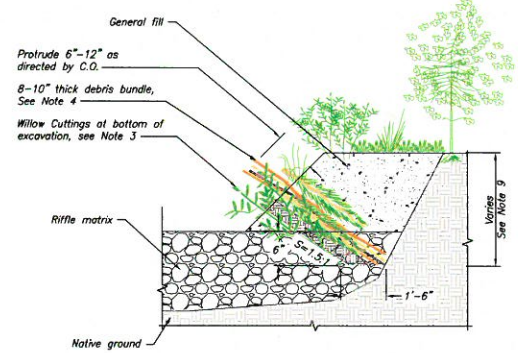
**STEP 3 - Brush Layer**



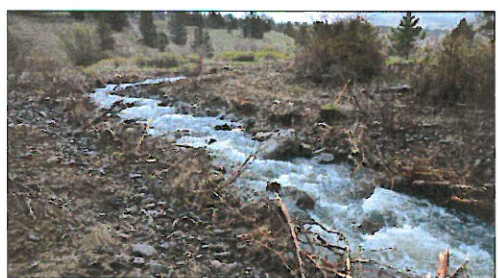
**STEP 4 - Boulder Placement and Top Dressing**



**BRUSH BANK TREATMENT PLAN**  
SCALE OF FEET



**SECTION A-A**  
SCALE OF FEET



**EXAMPLE: INSTALLED BRUSH BANK**  
Note: Brush Bank Treatment after construction and before live growth looking upstream at riffle. (Photo courtesy of S. Welch)

**RIFFLE MATRIX MIX**

Description	Size Class	Mix Percentage (By Volume)
Small Boulder	8-inch to 12-inch	20%
Large Cobble	4-inch to 8-inch	20%
Large Gravel	2-inch to 4-inch	20%
Small Gravel	2-inch minus	30%
Sands and Fines	less than 0.08-inch	10%

**BOULDERS**

Description	Size Class
Boulders	Greater than 12 inches

**NOTES**

1. Contractor shall sort materials as detailed in table for "Riffle Matrix Mix" for all channel features.
2. Materials shall be clean and native round to sub-rounded as approved by C.O.
3. Materials shall span all sizes within size class and shall be well-graded.
4. All mixes shall be well-graded and approved by C.O. prior to placement.
5. Riffles will require "dirty" sands and fines with approximately 50% sand and 50% fine material as approved by C.O.

ALWAYS THINK SAFETY  
U.S. DEPARTMENT OF THE INTERIOR  
BUREAU OF RECLAMATION

COLLEEN'S WALK RIVER SALMON RECOVERY PROGRAM  
FCRPS - H-BITC IMPROVEMENT PROGRAM - OREGON  
MIDDLE FORK WYNN DAY SUBBASIN  
LONG CREEK NZAL

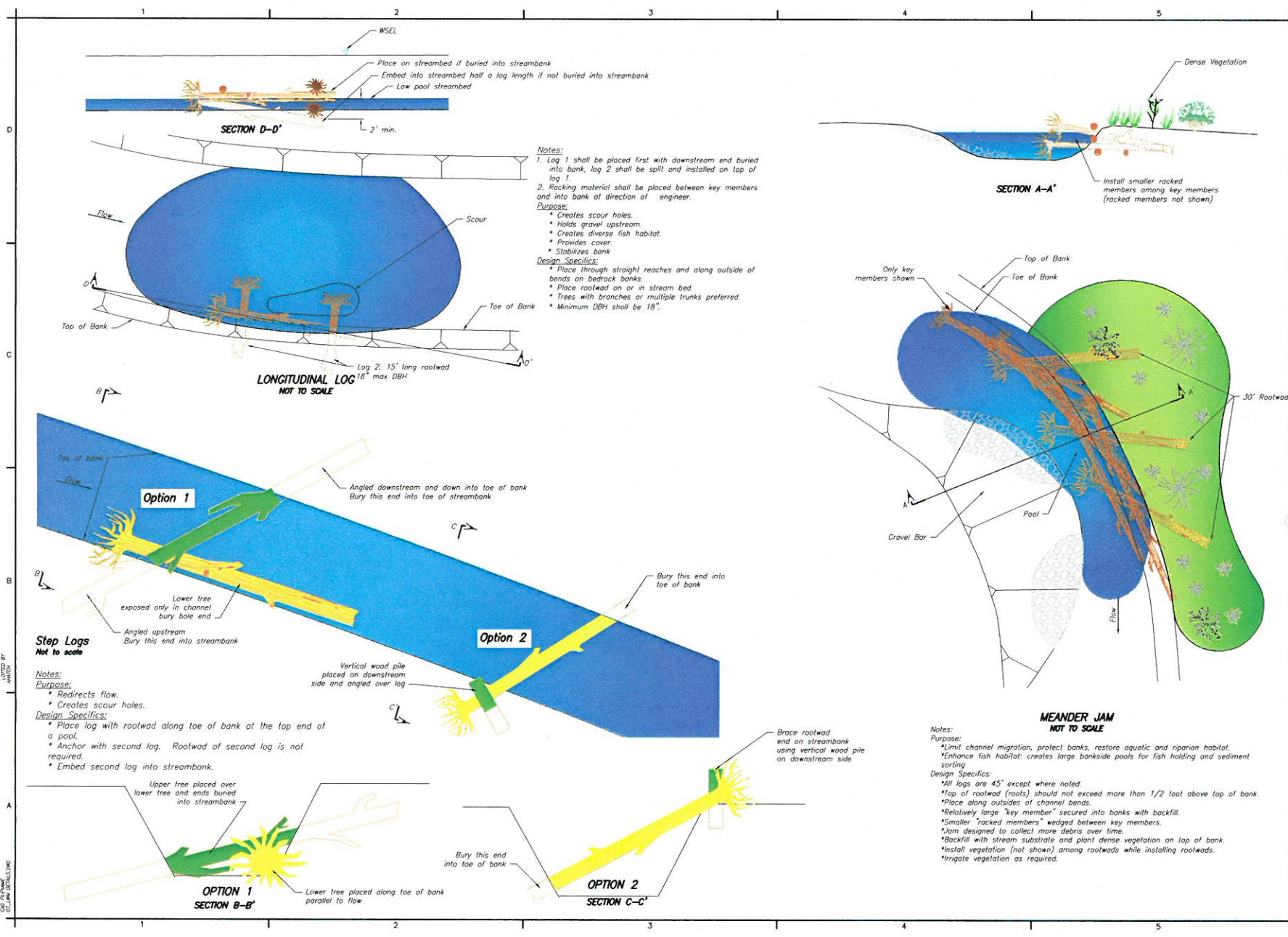
DESIGNED	DATE
CHECKED	DATE
APPROVED	DATE
DATE	

LWM DETAILS

SECTIONS AND DETAILS

TS-2

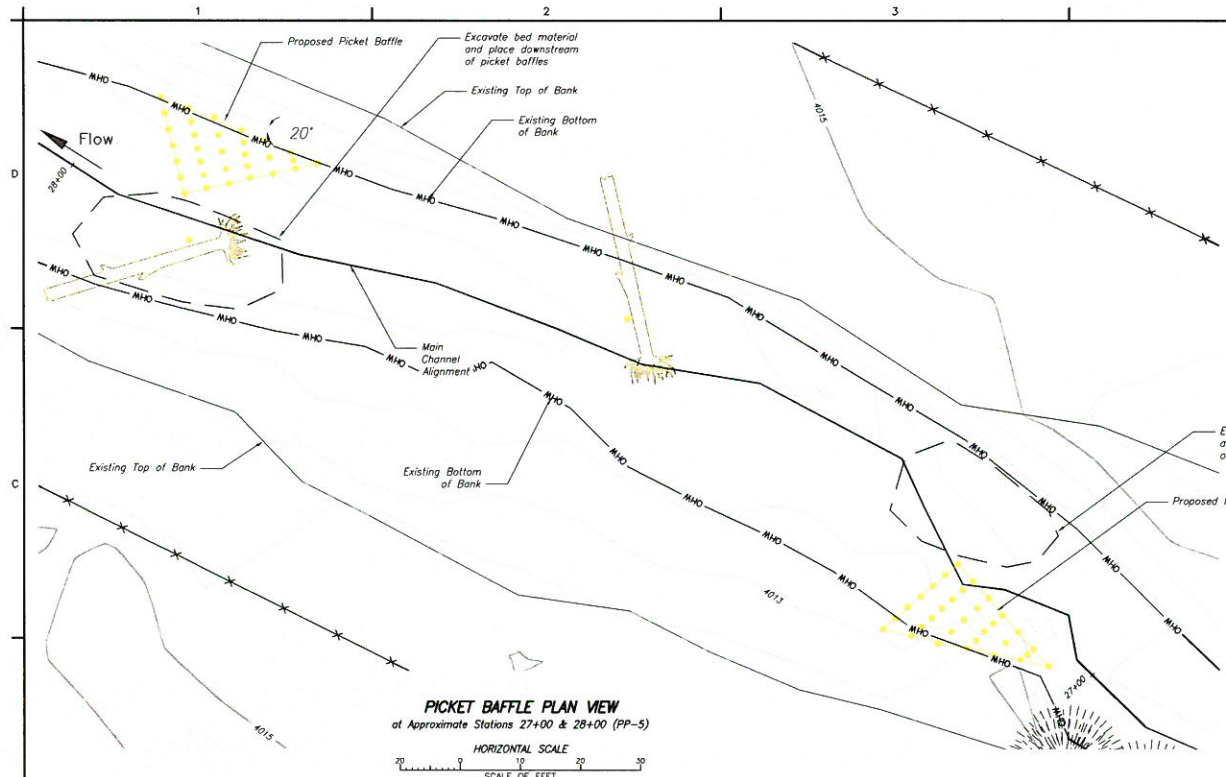
SHEET 1 OF 1



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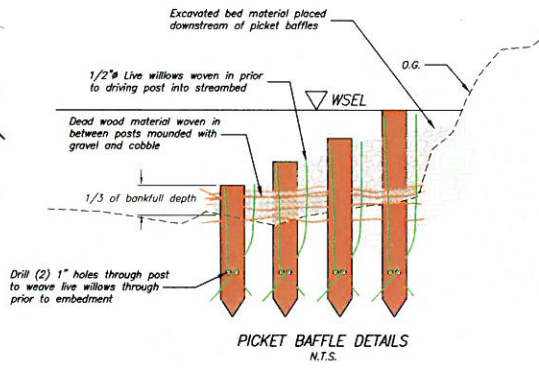




**PICKET BAFFLE PLAN VIEW**  
at Approximate Stations 27+00 & 28+00 (PP-5)  
HORIZONTAL SCALE  
SCALE OF FEET

**PICKET BAFFLE NOTES:**

1. Picket Baffles shall be constructed at locations as shown on the plans.
2. Pickets shall be made from juniper, lodgepole, and/or Douglas fir. May be available on site.
3. Pickets shall be 40 inches in length and 2-3 inches in diameter.
4. Pickets shall be driven at least 2/3 their length into the channel bottom and spaced 12-18 inches apart.
5. The height of the bottom row of pickets shall be placed to a height equal to 1/3 bankfull depth.
6. Picket baffles shall be constructed in a similar manner whether shown as single rows or multiple rows, as shown on the detail on this sheet.



ALWAYS THINK SAFETY

U.S. DEPARTMENT OF THE INTERIOR  
 COLUMBIA/SNAKE SALMON RECOVERY PROGRAM  
 FEDERAL SALMON RECOVERY PROGRAM  
**MIDDLE FORK JOHN DAY SUBBASIN**  
**(TWO LINE MAXIMUM)**  
**(LONG CREEK)**  
**(TWO LINE MAXIMUM)**

DESIGNED	
DRAWN	
CHECKED	
FIELD SUPERVISOR	
APPROVED	
DATE	2014-10-29

**PICKET BAFFLE**  
**PLAN & SECTION**  
**PB-1**  
SHEET 1

DATE PLOTTED: 10/29/14  
 DRAWN BY: J. HARRIS  
 CHECKED BY: J. HARRIS  
 FIELD SUPERVISOR: J. HARRIS  
 APPROVED BY: J. HARRIS  
 DATE: 10/29/14