McKay Creek Restoration and Prioritization Plan

Prineville, Oregon

for

Crooked River Watershed Council

July 16, 2014

GeoEngineers

Earth Science + Technology

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1101 South Fawcett Avenue, Suite 200
Tacoma, Washington 98402
253.383.4940

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Prepared for:

Crooked River Watershed Council
498 SE Lynn Boulevard
Prineville, Oregon 97754

Attention: Garry Sanders

Prepared by:

GeoEngineers, Inc.
1101 South Fawcett Avenue, Suite 200
Tacoma, Washington 98402
253.383.4940

Adam L. Wright
Staff Biologist

Joseph O. Callaghan, MS, PWS
Associate Biologist

ALW:JOC:cam

GeoEngineers

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INTRODUCTION

Preface

Watershed assessments and action plans are increasingly relied upon by government agencies and private foundations as a source of context and background data, and as a well-organized rationale to justify grant proposals and funding requests. The summary and analysis of resource conditions provided by watershed assessments is critical to developing a strategy for the restoration, monitoring, and education efforts conducted by watershed councils and other non-governmental organizations. This restoration prioritization plan follows the Lower Crooked river Watershed Assessment produced by the Crooked River Watershed Council (CRWC) (2008), focusing on specific restoration actions that can be accomplished in the McKay Creek watershed to improve watershed conditions while maintaining the agricultural resources within the watershed. This planning assistance facilitates the enhancement of resource values, improves the stewardship capacity of both public agencies and private landowners, and benefits the public good.

This restoration prioritization plan is being created to act as a compendium to similar long term planning activities being conducted by the Ochoco National Forest, including the "McKay Watershed Analysis Rapid Landscape Assessment" (USDA 2006) and the McKay Creek Watershed Action Plan (USDA 2010). The goal of the McKay Watershed Analysis was:

> "to identify possible activities that will move the McKay Watershed toward the desired conditions contained in the Ochoco National Forest Land and Resource Management Plan as amended (Forest Plan).
>
> By identifying possible activities to move the existing condition toward the desired condition, this document will help managers formulate a program of work to satisfy multiple resource inventory and project-planning needs simultaneously. The intent of this assessment is not to impose a rigid prescription for management actions but to serve as a continuously-improved guide for adaptive management of the watershed." (p.1)

After the initial assessment, the recent draft Watershed Action Plan developed by the Ochoco National Forest was created to guide the Forest toward improved aquatic habitats and fish production. The Watershed Action Plan used a seven step process that will be used for long term planning to implement restoration actions that will work toward whole watershed restoration for the McKay Creek watershed on lands managed by the Ochoco National Forest. Working together, the Watershed Action Plan from the Ochoco National Forest and the Restoration Prioritization Plan from the CRWC will work together to address the limiting factors in the McKay Creek watershed and focus on specific projects to address those limiting factors.

Project Overview

The Crooked River Watershed Council (CRWC) contracted GeoEngineers, Inc. (GeoEngineers) to complete an existing conditions assessment and restoration prioritization plan for McKay and Allen Creeks near the town of Prineville, Oregon (Appendix A, Figure 1). McKay Creek drains the Ochoco Mountains southwest to its confluence with the Crooked River. Allen Creek is a tributary to McKay Creek. Minimal investigation of Allen Creek was performed due to a widespread lack of landowner permission. This report serves as a

summary of our data collection efforts and details recommending conservation and restoration treatments. Per our scope of work, included with the description of each sub-reach will be found:

- Overview of upland, riparian, and channel conditions.
- Summary of unstable bank areas and existing bank stabilization structures.
- Summary of fish passage and screening barriers.
- Description of any high quality instream and riparian habitat and areas of dynamic river conditions.
- Influence of river conditions on fish habitat.

Watershed Overview

Scale is an important issue in watershed analysis. The hierarchical structure of watersheds allows for the systematic identification of increasingly nested drainages, as described in the *Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis* (Regional Ecosystem Office, 1995) and OWEB *Oregon Watershed Assessment Manual* (Watershed Professionals Network, 1999). The US Geological Survey (USGS) developed a watershed classification system called the Hydrologic Unit Code (HUC). Watersheds and the streams, creeks, and rivers they contain are identified by HUC numbers. Fine scale headwaters streams are classified as 1st field HUCs, while larger main rivers and sub-basins are classified as lower order HUCs. Watersheds are nested so that 1st field HUCs combine to create 2nd field HUCs; 2nd field HUCs combine to create 3rd field HUCs and so on.

McKay Creek is a 5th field sub-watershed, with a total area of 63,508 acres, a minimum elevation of 2,828 feet and a maximum elevation of 5,925 feet. The Lower Crooked River Watershed is within the John Day ecological province, with the semiarid John Day/Clarno Uplands forming a ring of dry foothills surrounding the western perimeter of the Blue Mountains. The province is characterized by extensive geologically eroded dissected hills of thick, ancient sedimentary materials interspersed with buttes and plateaus capped with basalt ortuffaceous rock (Anderson et al. 1998). Elevations in the province range from about 1,000 feet near Lake Billy Chinook to 7,360 feet at Fields Peak in the Ochoco Mountains. The soils of the John Day province are derived from ancient sedimentary and tuffaceous parent materials and are finely textured, sticky when wet, and highly susceptible to precipitation driven erosion. Irrigated agriculture occurs in this province around Prineville, but cropland in the rest of the province is limited to narrow irrigated valleys. The dominant land use within this province is for the production of livestock and livestock forage. In much of the assessment area the current vegetative communities are departed from their historic conditions due to the expansion of western juniper and other invasive weed species.

Ecoregion 11a has a continental climate moderated somewhat by marine influence. The continental climate is tempered by a marine influence; it is not as dry, nor are temperature extremes as great, as in the Continental Zone Highlands. According to a 1936 State of Oregon Forest Type Map, approximately 50% of the John Day ecological province was once covered in pine, fir, and mixed conifer forests. About 40% of the province was non-forested, with sagebrush-grassland communities dominant at the lower elevations. Historically, frequent low intensity fires reduced fuel loading in forests of widely spaced old-growth ponderosa pine. Today, after years of fire suppression and high grade logging, land managers attempt to emulate historical fire regimes to reverse the trend toward dense thickets of young growth that carry hot, stand-replacing fires.

Less than 10% of the province was occupied by Western Juniper woodland according to the 1936 map. The portion of the John Day ecological province with historical juniper distribution is within the Crooked River Watershed. The concentration of juniper within this area is likely a result of the seed source provided by junipers in the adjacent Mazama province, as juniper is considered a climax species for the pumice soil type characteristic of the Mazama province (Anderson et al 1998). Notably, Western Juniper has spread rapidly throughout the John Day ecological province. The spread of this species is the result of three factors including climate, livestock grazing, and fire exclusion (Miller et al. 2005). In addition, juniper has an affinity for calcium, and the clayey ancient sediments of the John Day province are typically calcareous (Anderson et al., 1998).

Methods and Data Collection

Prior to conducting field investigation, GeoEngineers compiled and reviewed as much background information as readily available. Data sources provided by the CRWC included Crooked River Watershed Assessments, Natural Resource Conservation Service soils data, Oregon Department of Fish and Wildlife Aquatic Habitat Inventory data, historic and recent aerial photographs, and other field data such as mapped fish passage barriers, channel profiles, noxious weed survey data, and land use/ownership information.

A mobile GIS platform was developed to support field data collection. The channel centerline was drawn onto an aerial photograph backdrop and measured by river-mile (RM) from the Crooked River confluence upstream to the US Forest Service boundary (Appendix A, Figure 1). These RM values will be used throughout this report to locate specific features and observations. Additional background information loaded included parcel boundaries with access granted/no access noted, previously mapped/known fish passage barriers, and noxious weed surveys.

A walking survey was then performed on privately owned reaches of McKay Creek. At select locations, cross section and channel profile measurements were collected with non-survey grade equipment. This data was used to conduct hydraulic modeling and map fish passage barriers, typically at siphon withdrawals or boulder dams. Throughout the field assessment in-channel, riparian, and upland condition data were input into mobile GIS software on iPad devices. Overall goals of this survey included:

- Provide an opportunity to better understand the river corridor.
- Identify existing high quality habitats.
- Identify potential limiting factors of high quality habitat and identify sources of limiting factors.
- Locate potential restoration, conservation, and resource protection sites.

Typical data gathered included:

- Channel cross sections and bed sediment information.
- Channel planform measurements.
- Ground photographs.
- Existing bank stabilization locations and characteristics.
- Potential fish passage and screening barriers.
- Characterization of existing riparian vegetation conditions.
- Potential treatment descriptions and locations.

Following the completion of field investigations, data was compiled and examined to identify potential restoration sites. The most viable sites were used to create a prioritization matrix attempting to measure and rank the overall value of each project. This value was based on factors such as the potential to increase or improve juvenile fish rearing habitat, reduce bank erosion, activate floodplain acreage, cost, owner participation, and fish passage benefit. This prioritization matrix will be discussed in sections below and can be found in its entirety in Appendix C.

Reach Delineation

We divided the length of McKay Creek investigated into six representative reaches. These reaches were typically broken down along property boundaries and where a transition in stream or riparian conditions existed. Current conditions and proposed projects will be discussed individually by reach in sections below. The reach breakdown is included in Table 1.1 below.

TABLE 1.1. MCKAY CREEK REACH BREAKDOWN BY RIVER-MILE

Reach	River Miles	Tax Parcel(s)	Notes
1	0.0-2.2	1415260000500; 1415260000601; 1415260000602; 1415260000100; 1415260000105; 1415260000101; 1415260000103; 14152B002102	Dense residential, heavy confinement, spotty access
2	2.2-4.35	1415240000102; 1415130000100; 1416190000202; 1416180000300; 1416180000400; 1416180000107; 1416070000125; 1416070000112	Areas of high quality habitat
3	4.35-6.35	1416000000900	Extensive bank erosion and stabilization
4	6.35-7.8	1416040000101; 1416040000100; 1316330000700; 1316330000600	High off-channel potential
5	7.8-10.9	1316330000201; 1316280000201; 1316000004000	Includes Allen Creek Confluence

Hydrology

GeoEngineers has developed cursory hydrologic data and a hydraulic model for the entire project reach. Current hydrologic conditions in McKay Creek are highly variable due to hydromodification throughout the system (diversion, irrigation, etc.). Peak flows were estimated using stochastic methods, such as USGS and Oregon State regression algorithms. Summer and fall flows are highly dependent on regulation and can be intermittently dry. Future hydrology in McKay Creek will likely be further adjusted through the potential implementation of a water banking project. As projects are selected and move toward design in the future, hydrology will be a key variable requiring additional review. GeoEngineers is currently in discussions with CRWC and the Deschutes River Conservancy to evaluate the potential influence of water banking on habitat restoration opportunities in McKay Creek.

We developed a two-dimensional hydraulic model of the entire project reach using RiverFlo 2D. Ground topography and channel bathymetry were obtained using light detection and ranging (LiDAR) data. The model is functional and has been provided to CRWC as a stand-alone product. Hydraulic modeling was not used in project identification or prioritization for this phase of work. The model will be a key tool in future work once projects move from concept to design.

CURRENT CONDITIONS

Reach 1 – River Miles 0.0 to 2. 2

Photos show typical channel and riparian conditions within Reach 1. The riparian channel conditions include occasional trees and shrub cover but dominated by grasses, and the channel conditions are overall straightened and simplified. Project locations within this reach can be found in Appendix A, Figure 2.

McKay Creek meets the Crooked River about ½ mile southeast of Highway 26. This confluence was deemed river mile (RM) 0.0 and our survey was completed walking upstream from this point. Access was not granted for much of the area above RM 1.1, as such minimal data collection and discussion will be included for the upper half of this reach.

Channel Conditions

Through this reach, the creek channel is typically straightened, approximately 15 to 20 feet in width and cut off from its floodplain by earthen berms. Gates and cattle tracks indicate direct livestock access from the south. Overall channel complexity was low, with few significant pools or riffles noted. Two fish passage barriers were surveyed in this reach, both resulting from irrigation siphons.

Riparian Conditions

The overall width of riparian buffer through this reach is rather low at 50 to 100 feet maximum. In many areas, roads or irrigated fields come within 25 feet of the channel centerline. Overhanging tree and shrubby cover is spotty, typically dominated by rose, willow, and some alder. Grasses dominate the bank cover in most areas with limited overhanging tree and shrub cover. This zone is typically bounded by unpaved roads on both sides and the potential for expanding the creeks riparian corridor in the existing configuration appears low. Where possible, establishing more significant native woody vegetation cover would benefit channel water temperatures and continued bank stability.

Areas of higher quality habitat exist where local land use is less intense adjacent to the riparian zone. Woody cover was highest just south of Lamonta Road and at the northern extent of this reach, surrounding RM 2. These more mature riparian zones appeared to be subjected to less strenuous tilling or grazing pressure. These high quality riparian areas could be expanded into a more continuous vegetated corridor by establishing plantings and/or using passive restoration efforts such as exclusion fencing in areas with more intense land use.

Upland Conditions

Actively managed fields border most of the riparian zone through this area. The lower portion to the north does not appear irrigated or actively worked. This area is dominated by weedy vegetation such as common teasel (*Dipsacus sylvestris),* rush skeletonweed *(Chondrilla juncea)*, leafy spurge (*Euphorbia esula),* and cow parsley (*Anthriscus* sylvestris) and is bounded by a small, raised, unpaved road. A ditch with standing water runs along this road and discharges through a culvert to the Crooked River approximately 1,000 feet north of the main confluence. In some areas, this ditch appears to lose slope to wider wetland areas; potential for off-channel habitat and floodplain creation exists here.

Near the upstream end of this reach, upland land use becomes more densely residential. A large plot of minimally used upland area exists north of approximately RM 0.6 to RM 0.9.

Bank Stabilization and Erosion Sites

Minor erosion was noted on the right bank just above RM 0.7. Vegetation is minimal at this point, which forces the channel to turn near 90 degrees into a more southerly direction. Riprap banks are occasionally common through this reach, particularly where maintained roadways run parallel to the creek, including most of the straighter sections south of the highway and downstream of the siphon at RM 0.6. In the immediate vicinity of the siphon, small lengths of channel have been regulated via concrete retaining walls. A full list of these sites can be found below in Table 2.1.

TABLE 2.1. BANK STABILIZATION AND EROSION SITES IN REACH 1

Type	River Mile	Side (R/L)	Approximate Height (Feet)	Approximate Length (Feet)
Riprap	0.3	Right	N/A	200
Riprap	0.5	Left	N/A	120
Riprap and concrete	0.6	Left	N/A	400
Cut Bank	0.7	Right	5	40

Fish Passage and Screening Barriers

Channel-spanning drops in association with irrigation withdrawals comprised the screening barriers in Reach 1.

Two passage barriers were assessed in this reach. The lower barrier occurs at a siphon withdrawal just above RM 0.6. A 2-foot channel spanning drop occurs at a concrete V-weir and another, smaller drop spans the channel about 90 feet downstream. The upper barrier occurs at an irrigation canal crossing just above RM 1.0. At this location, the channel substrate has been modified with concrete grade control, ending with a 1.5-foot drop. The channel through this area is quite straight and fairly shallow, and the shallow plunge pool likely creates a barrier to upstream migration.

TABLE 2.2. FISH PASSAGE BARRIERS LOCATED IN REACH 1

River Mile	Type	Drop Height	Notes
0.6	Irrigation withdrawal; concrete v-weir	2 feet	Frequent concrete and riprap armoring
1.0	Irrigation withdrawal; concrete weir	1.5 feet	Siphon at canal crossing

These points of diversion are managed by the Ochoco Irrigation District, who has worked with the Oregon Department of Fish and Wildlife and other local agencies to implement fish passage. This site was modified previously to meet State and Federal criteria for fish passage and the modifications were approved by all applicable agencies. If the site currently does not meet State and Federal criteria, modifications may be necessary to obtain fish passage that meets all applicable criteria."

Reach 2 – River Miles 2.2 to 4.35

Typical conditions observed in Reach 2. Habitat quality variability is high, with some areas of grass and riprap dominance and others with thick shrub cover and heavy beaver activity. Reach 2 project locations can be found in Appendix A, Figure 3.

Within this reach, residential development is less dense and agricultural land uses dominate. The channel flows roughly southwest with some areas of highly straightened, constricted floodplain and riparian corridor. Multiple passage barriers and potential restoration sites were located as well as other areas of high quality habitat.

Channel Conditions

At lower points in this reach, the channel abuts a somewhat steep slope to the west, exposing bedrock in places. Pool/riffle complexes exist around RM 2.3 up to and just above a surveyed passage barrier, at approximately RM 2.6. This point approximately marks a parcel boundary where land use becomes more intense on each side of the channel.

The mid-section of this reach is characterized by simplified riffles and glides, with occasional braiding and infrequent pools. Channel sinuosity is good until about RM 3.0, where the channel form becomes much straighter with simple habitat features. Armoring is common between RM 2.5 and 3.0, placed mainly on susceptible banks on the outside edge of meanders.

Minimal access was granted between about RM 3.3 (Grimes Road crossing) and RM 3.9, where a bridge crossing provides access to multiple homes west of the creek. Channel conditions were therefore difficult to identify; however, given the straight and confined nature of the channel, similar simple riffle/glide features are likely.

Just above RM 4.0, channel conditions become much more complex. Beaver activity in this area is very high, with significant backwater pools and off-channel habitat. Multiple beaver dams fully spanned the channel; some appeared long-term while others were more likely seasonal in duration.

Riparian Conditions

The lower portion of this reach exhibits some of the highest-quality riparian habitat found in the lower McKay corridor. Setbacks from tilled fields are mostly in excess of 100 feet, with trees and overhanging woody vegetation frequent. Between RM 2.4 and 2.5, a relic channel was found in the open floodplain area channel-right. Some of this area is dry and weedy, dominated by teasel, thistles (*Cirsium ssp.),* and puncturevine (*Tribulus terrestris*). The majority of this zone also features native woody vegetation, most prominently sandbar willow (*Salix exigua*), nootka rose (*Rosa nutkana*), and golden currant (*Ribes aureum*).

Just upstream of a passage barrier around RM 2.55, riparian conditions revert to a more typical state – tilled fields within 100 feet of the creek, occasional armoring, and less frequent shrubby and overhanging bank vegetation. Roads running parallel to the creek are uncommon throughout this reach; but several rock-armored road crossings do exist in specific locations.

More favorable conditions exist above RM 4.0 up to the reach's end just beyond RM 4.3, at the McKay Road crossing. Thick, mature stands of willow often grow over the water's edge, and beaver activity has created many pools and side channels. Some areas of bank failure exist where this riparian vegetation is lacking and would benefit from revegetation.

Upland Conditions

Upland land use is predominately tilled fields and agriculture. Occasional homes, driveways, and roads occur near the creek. Some arid pockets of upland sagebrush steppe vegetation remain, most notably upstream and channel-right of a bridge at RM 3.9. Crop production appears to preclude livestock grazing in surrounding uplands, and fencing is infrequent through a majority of this reach.

Bank Stabilization and Erosion Sites

Several tall cut banks were observed within Reach 2.

Bank erosion and armoring occurs throughout this area, and in some areas there is as much as 20 feet of vertical erosion. Most often these sites are noted where riparian vegetation is lacking and banks are exposed with no root mass. A full list of locations and types can be found in Table 2.3 below.

TABLE 2.3. BANK STABILIZATION AND EROSION SITES IN REACH 2

Type	River Mile	Side (R/L)	Approximate Height (Feet)	Approximate Length (Feet)
Riprap	2.6	Both	N/A	Intermittent, 500+ feet
Cut Bank	2.45	Right	20	75
Cut Bank	3.9	Right	13	100
Cut Bank	4.05	Left	8	150
Cut Bank	4.15	Right	7	40
Cut Bank	4.2	Right	15	300

Fish Passage Barriers

Two passage barriers were located within Reach 2, both associated with irrigation withdrawals.

Two passage barriers were surveyed through this area. At approximately RM 2.55, a boulder "J-hook" has been constructed off the left bank. Localized armoring surrounds this structure, which could present a passage barrier at some flow levels.

Further north at NW Grimes Road, a canal crossing and a concrete weir has been constructed to allow siphon withdrawal. Just downstream of this crossing a large (about 6-foot-diameter) culvert returns irrigation water to the stream. The vertical drop downstream of this structure was measured at 1.3 feet, with very shallow flows both above and below.

TABLE 2.4. FISH PASSAGE BARRIERS LOCATED IN REACH 2

River Mile	Type	Drop Height	Notes
2.55	Irrigation withdrawal; rock J-hook	N/A	Potential barrier at low flows. To be addressed by CRWC during fall 2014.
3.35	Irrigation withdrawal; concrete weir	1.3 feet	This siphon is managed by the Ochoco Irrigation District, who has worked with the Oregon Department of Fish and Wildlife and other local agencies to implement fish passage. This site was modified to meet State and Federal criteria for fish passage and the modifications were approved by all applicable agencies. If the site currently does not meet State and Federal criteria, modifications may be necessary to obtain fish passage that meets all applicable criteria.

Reach 3 – River Miles 4.35 to 6.35

Land use pressures were high in Reach 3. Channel enhancement activities were occasionally noted, riparian vegetation quality was generally thin and low quality, with irrigated and fallow upland encroaching upon the channel. Reach 3 project locations can be found in Appendix A, Figures 4 and 5.

Channel Conditions

The channel conditions in Reach 3 were heavily impacted by recent flood events in the winter of 1997 and the spring of 1998. A warm, mid-winter, rain on snow precipitation event in the winter of 1997 resulted in high peak flows which created high rates of erosion. This event was followed in 1998 by a precipitation event in late May which brought approximately 7 inches of rain over a 24 hour period to the Prineville area. Flows on Ochoco Creek from Ochoco Reservoir increased from 100 cubic feet per second (cfs) to 600 cfs in two days, with extensive flooding along Ochoco Creek and throughout Prineville. Although McKay Creek did not have a flow gauge at the time of the flood event, multiple landowners reported similar flow increases in McKay Creek. In addition, irrigation canals within the Ochoco Irrigation District were opened all the way during the flood event to try to alleviate flood damage to the City of Prineville. Because of this activity, one section of the Ochoco Main Canal which runs adjacent to McKay Creek failed, discharging large amounts

of water and sediment into McKay Creek within the lower section of Reach 3. This sediment and increased flow resulted in a multitude of channel changes throughout this section.

After the flood events, there were several follow-up restoration projects initiated by landowners and local agencies to improve the instream and riparian conditions in the lower part of Reach 3. As a result of the restoration efforts channel complexity is fairly high starting from the lower end of the reach. Large woody debris (LWD) placed along banks and mid-channel has created significant areas of local scour, creating a diverse set of pools and riffles. Riprap was occasionally noted along banks and near low-water crossings. One such low-water crossing was noted near RM 4.6 as a potential passage barrier, with large rock grade control creating a drop in excess of 1 foot with a shallow plunge pool below. This crossing is fenced with what appears to be wood pallets hung with metal wire just above the streambed. A similar low-water crossing exists further upstream at RM 5.0. This crossing doesn't have boulder grade control and the fence is strung higher above the creek substrate. Between these two low-water crossings, large areas of riprap armoring and installed LWD protect banks; in areas without protection, vertical cut banks 2 to 3 feet are common.

Upstream of RM 5.0, side channels and cut banks are both common. LWD installations are still present but appear less frequently. Overall the channel becomes much wider from this point up to and beyond Jones Dam. A third, fenced low-water crossing was noted here near RM 5.9. Riffle/pool/run complexity remains high-quality.

Upstream of Jones Dam (RM 5.95) previous restoration work again is quite common. CREP plantings, bank root wads, cross vanes, and lengths of high cut banks were all commonly noted. Channel complexity remained generally high, exhibiting quality pool/riffle sequences.

Riparian Conditions

Throughout this reach, the riparian corridor averages around 50 feet in width. Much of this area is vegetated by grasses, forbs, and short shrubs. Common species include cheatgrass (*Bromus* tectorum), ventenata (*Ventenata dubia*), great mullein (*Verbascum Thapsus*), and yarrow (*Achillea millefolium*). Occasional juniper trees have grown down near the creek banks in places throughout. Woody vegetation, typically willow, redosier dogwood (*Cornus sericea*), and snowberry (*Symphocarpos albus*) is generally lower in the downstream sections of this reach.

CREP plantings were frequently found, especially upstream of Jones Dam. The success of these efforts varied from low to moderate. Signs of herbivory and desiccation, likely due to black woven textile fabric left over the soil surface, are some potential causes of high mortality. The lack of vegetation in some areas has caused many creek bends to exhibit vertical failures in excess of 10 feet tall and 100 feet long.

Upland Conditions

Land use surrounding the creek is intense through this reach. Typical distances from channel centerline to irrigated field are less than 100 feet. The transition from field to channel is typically buffered by a thin, dry area that gives way to another thin strip of riparian vegetation. In some areas this dry zone is much larger, particularly from RM 5.3 up to Jones Dam. Much of this area is fenced, with livestock access relegated to specific low-water crossing areas. Thistle, teasel, bromes, yarrow, and mullein have colonized many of the un-managed upland areas of this reach.

Bank Stabilization and Erosion Sites

Common bank armoring and failure within Reach 3.

This reach featured the most frequent bank failures and subsequent stabilization measures of all the reaches surveyed. In most locations, the creek directly abuts an irrigated field on one or both sides; preserving this land by preventing further erosion is of primary concern through this area. In several locations, bank LWD has been installed previously; however, there are many areas where erosional impacts need to be addressed. A full list of location and size for these features is found in Table 2.5 below.

TABLE 2.5. BANK STABILIZATION AND EROSION SITES IN REACH 3

Type	River Mile	Side (R/L)	Approximate Height (Feet)	Approximate Length (Feet)
Cut Bank	4.4	Left	6	110
Cut Bank	4.8	Right	3	90
Cut Bank	4.85	Left	2	70
Cut Bank	5.2	Left	3	70
Cut Bank	5.25	Left	3	100
Cut Bank	5.3	Right	3	65
Cut Bank	5.5	Left	1.5	370
Cut Bank	5.65	Left	4	75
Cut Bank	6.15	Left	5	140
Cut Bank	6.2	Left	10	160
Cut Bank	6.3	Left	6	85

Type	River Mile	Side (R/L)	Approximate Height (Feet)	Approximate Length (Feet)
Riprap	4.35	Left	N/A	45
Riprap	4.45	Left	N/A	50
Riprap	4.55	Left	N/A	110
Riprap	4.9	Left	N/A	210
Riprap	4.95	Right	N/A	100
Riprap	5.0	Left	N/A	100
Riprap	5.2	Right	N/A	30
Root Wad	6.1	Both	N/A	Intermittent, 500+ feet

Fish Passage Barriers

While channel complexity and associated fish habitat appeared high through this reach, three passage barriers were discovered that could limit full utilization of this reach. In two locations, large angular rock placed mid-channel has created sharp drops with minimal pool development downstream, creating difficult passage at some flows. At Jones Dam, returns from an irrigation canal enter the stream directly opposite a fish ladder designed to allow upstream passage. Depending on management of these features, it could produce an impediment to or fully block fish passage upstream.

Fenced low-water crossing areas can become passage barriers with disrepair.

TABLE 2.6. FISH PASSAGE BARRIERS LOCATED IN REACH 3

River Mile	Type	Drop Height	Notes
4.6	Rock grade control	1 feet	At fenced low-water crossing
5.7	Cross Vane	1 feet	Needing repair

Reach 4 – River Miles 6.35 to 7.8

Mature cottonwood and riparian shrub vegetation becomes more common by Reach 4. Project locations within this reach are shown in Appendix A, Figure 6.

Channel conditions through this reach remain fairly consistent with other nearby locations. Channel width varies between 10 and 20 feet, with frequently diverse pool/riffle complexes. A low-water ford exists just above RM 6.4. Just below RM 6.7, recent in-channel restoration work was noted, extending upstream through a long, wide bend. Recent excavation and mesh-guarded plantings were found throughout this zone. The channel appears to be quite dynamic through this area, with racking noted within multiple high-flow channel areas.

Frequent grade control rock weirs slow flows between RM 6.95 and 7.2. Some pools retained water during late-fall site visits; however, much of this reach had run dry prior to field efforts. Unstable bank areas become less common in the upstream portion of this reach.

Starting around RM 7.2, in-channel habitat becomes more simplified, as lateral pools lack significant depth or complexity between riffles. LWD is frequent in the form of bank and channel-spanning logs, including one large jam just above RM 7.5. Riprap was infrequently found, mainly guarding human infrastructure such as bridge abutments and a pump-out just above RM 7.4. A diversion dam has also been constructed at approximately RM 7.65 with an included fish bypass channel visible from aerial photography. This channel was rock-lined on the upper banks and appeared to be recently constructed.

Riparian Conditions

This reach continues the transition to higher-elevation conditions: thinner irrigated corridor, more numerous mature-sized trees, and increasingly frequent zones of arid steppe and pine/juniper forest. Stands of willow, alder, and cottonwood become denser and more frequent within the upper reach's riparian zone. A zone of high beaver activity was noted around RM 6.8, with significant backwater and side channel activation. This condition extended onto a small parcel that was not accessed due to lack of landowner consent (Tax Lot #1316330000701). Above this parcel (approximately RM 6.95 to 7.15), the creek corridor mostly exceeds 200 feet and has multiple stands of mature cottonwood with alder and juniper also present.

In the upstream half of this reach, canopy cover and corridor width are both quite high. Much of this area could benefit from revegetation work, as the understory is bare in many areas. While most of the creek is fenced through this area, it appears grazing is frequent within the riparian zone, likely limiting natural understory revegetation.

Upland Conditions

The lower portion of this reach begins quite similar to upper sections of the previous reach. A rather thin riparian corridor is bordered by dry, sparsely vegetated upland eventually transitioning to irrigated fields. Near RM 6.7 a brief gap in irrigation occurs channel-left for approximately 0.2 river miles. Occasional pockets such as this occur more frequently higher in the system as the creek valley narrows and juniper trees, sagebrush, and steeper slopes move closer to the channel.

By the upper extent of this reach, the actively farmed valley corridor surrounding the creek has thinned to less than 2,000 feet wide. While land use still appears to be limiting channel migration and riparian vegetation in many areas, fewer bank instabilities and overall higher quality habitat is found upstream of this reach.

Bank Stabilization and Erosion Sites

Coinciding with improved riparian conditions, bank erosion was much less common in Reach 4.

While less numerous than Reach 3, unstable banks and occasional armoring or woody stabilization structures were still infrequently found through this reach. A full list of these features can be found below in Table 2.7. Overall, it appears the increasing frequency of mature trees and the wider riparian corridor has reduced the forces exerted on bank areas prone to erosion.

TABLE 2.7. BANK STABILIZATION AND EROSION SITES IN REACH 4

Type	River Mile	Side (R/L)	Approximate Height (Feet)	Approximate Length (Feet)
Root wad	6.7	Both	N/A	Intermittent, 400+ feet
Riprap	6.75	Right	N/A	20
Riprap	6.85	Left	N/A	60

Riprap	7.25	Both	N/A	40
Riprap	7.45	Left	N/A	20
Cut Bank	7.0	Left	2	90

Fish Passage Barriers

Passage barriers through this reach were associated with channel-spanning rock weirs lacking scour holes or other design features to ensure consistent fish passage. Coinciding with the gradual reduction in upland irrigation needs and overall land use intensity, passage barriers were less commonly found in higher reaches of McKay Creek.

TABLE 2.8. FISH PASSAGE BARRIERS LOCATED IN REACH 4

River Mile	Type	Drop Height	Notes
6.8	Grade Control	1 feet	
7.0-7.1	Grade Control	0-1 feet	Series – some with very shallow/no plunge pool

Reach 5 – River Miles 7.8 to 10.9

Previous restoration work included high-flow channels, irrigation withdrawal improvements, bank LWD, and rock v-weirs. Project locations within this reach can be found in Appendix A, Figure 6.

This reach encompasses parcels where significant previous restoration work has already been conducted. The channel was walked and surveyed for habitat features, unstable banks, and passage barriers but further projects are not proposed. Earlier restoration projects were accessed and checked to ensure full function.

Channel Conditions

Throughout this reach the channel displays more significant meanders than lower sections. In-stream habitat quality appears high through much of the area, with shaded pools transitioning to frequent riffles and runs of various lengths.

Riparian Conditions

Vegetation structure and overall corridor size is quite variable as the creek runs through this property. Tree and larger shrub cover is higher in the lower and upper portions, particularly around the landowner's home. Mature cottonwood (*Populus* balsamifera), ponderosa pine (*Pinus ponderosa)* dominate the overstory. A large middle section of this reach (approximately RM 8.75 to RM 9.55) has a very thin riparian zone lacking significant cover vegetation. Conditions improve between RM 9.6 to 9.8 and RM 10.0 to 10.3; however, access was not granted to these parcels. Small fish were frequently noted in pools throughout this upper area.

Upland Conditions

Much of the upland areas surrounding the channel appear to focus on livestock production. High grazing intensity has kept understory vegetation to a minimum. Fencing was mostly consistent throughout the reach and included watering areas for cattle access to the creek.

Bank Stabilization and Erosion Sites

Erosion, riprap, and woody revetments were mostly uncommon through this reach. A full inventory of these features was not conducted as many were recently installed by GeoEngineers and CRWC.

TABLE 2.9. BANK STABILIZATION AND EROSION SITES IN REACH 5

Type	River Mile	Side (R/L)	Approximate Height (Feet)	Approximate Length (Feet)
Longitudinal LWD	10.55	Left	N/A	10
Longitudinal LWD	10.6	Left	N/A	25

Fish Passage Barriers

The sole major passage barrier through this reach was associated with a boulder dam located near RM 8.1. Over time, the dam has retained much sediment and currently supports vegetative growth.

Although no fish passage barriers exist found in Reach 5, there are a number of unscreened irrigation diversions which impact the fisheries of McKay Creek. Currently, the Deschutes River Conservancy (DRC) and Ochoco Irrigation District (OID) are working with other partners and State and Federal Agencies to implement a large scale irrigation project to pump water up the McKay Creek valley that could be used for irrigation. The project would expand the OID boundaries to include all properties within the McKay valley that currently have water rights from McKay Creek. OID would supply water from the Ochoco Main Canal which currently receives water from Ochoco Reservoir and Prineville Reservoir by way of the Crooked River and a series of distribution canals and pumps. In return, irrigators who currently have water rights from McKay Creek would become patrons of OID, and their water rights from McKay Creek would be transferred to the State of Oregon and would become instream water rights. This would increase instream flows in McKay Creek but it would also remove the need for any points of diversion (and associate fish screens) on McKay Creek. At this point, the CRWC and other partners are waiting for a resolution on the water switch project before addressing fish screens on McKay Creek. If the water switch does not move forward, the CRWC will work with all landowners to implement fish screens at every diversion that will meet State and Federal criteria. If the water switch moves forward, all diversions and pumps upstream of river mile 5.95 will be decommissioned and screens will not be needed.

Reach 6 – River Miles 10.9 to 13.3

Typical conditions within Reach 6 – dense shrub cover in places, occasional juniper and pine in nearby upland. Project locations within Reach 6 can be found in Appendix A, Figure 7.

Due to inconsistent landowner consent, this reach contains a roughly 1/3-mile gap between approximately RM 11.2 and 11.6. This unexplored section appears to have significant woody vegetation surrounding the channel but minimal riparian buffers. Areas of potential unstable or armored banks and channel-spanning features are visible from aerial photographs, but on the ground investigations of these areas were not conducted. Where possible, conditions were assessed from the up or downstream parcel boundary onto un-accessed private property.

Channel Conditions

Channel complexity is high through the lower section of this reach (approximately RM 10.9 to 11.2), as frequent side channels and floodplain wet areas were found. One passage barrier was noted at RM 11, where a rock weir has been constructed for an irrigation diversion. The drop measured 2 feet and the left bank withdrawal is guarded by three large tractor tires.

Sections of the creek through the upper half of this reach (about RM 11.6 to 13.3) are extremely straightened and confined by large berms upstream of the landowner residence. According to local landowners these features were installed during the 1970s. The channel spans roughly 15 feet with frequent installed LWD and occasional cut banks. In areas with a wider riparian corridor, in-channel complexity is often high.

Much of the installed LWD and riparian vegetation throughout this reach is the result of past restoration efforts by the CRWC and other local partners and agencies. The CRWC worked with several landowners from 2002-2004 to install LWD at several sites to improve bank habitat and prevent erosion. In addition, this reach was heavily planted with native woody shrubs to improve bank condition, reduce erosion, and improve channel dimensions throughout this reach.

Riparian Conditions

Ponderosa pine has grown down and across the riparian zone through this reach. Much of the channel bed is covered overhead either by tree canopy or dense shrub growth. Areas lacking significant mature tree

growth are mostly dominated by willows, growing either in loose patches or dense thickets. While significant woody vegetation, predominantly willow, rose, currant, and choke cherry (Prunus virginiana) exists through most of this reach, cut banks were still commonly found throughout, especially around the driveway culvert crossing (RM 12.2).

The historical significance of beaver to McKay Creek was considerable. Beavers are a keystone species whose presence regulates ecological processes. The presence of beaver impacts water quality and quantity; sediment transport, deposition, and production; wetland processes; vegetation; and fish habitat.

Beaver build and maintain elaborate dam structures that alter the hydrologic regime. The structures and the alteration in flow attenuate peak flows, reduce hydraulic energy on stream banks, retain water in wetlands and wet meadows, create pools and ponds, increase groundwater recharge, maintain and raise the water table, increase water available for discharge during dry periods, create both terrestrial and aquatic habitat that increases fish and wildlife populations, and the build of the soil profile through sediment deposition. Furthermore, the creation of wetlands and ponds allows for the filtering of suspended solids and minerals which improves water quality. Beaver were largely extirpated from central Oregon before Euro-American settlement began in earnest. Although beaver populations have rebounded or recolonized extirpated areas, the extent of change to the hydrologic system due to the change in beaver populations is not known.

Installed LWD was found in the upper sections near RM 12.9 and was cabled to the bank in places. Just above this zone, a large log jam had also been installed mid-channel. A large cut bank has developed on the left side leading up to this log jam.

Upland Conditions

Land use intensity is much lower through this reach. The valley-bottom has constricted significantly as the creek approaches the Forest Service boundary. Active pasture and forested hillslopes characterize the upland through this reach. Mapped noxious weeds within this reach include spotted knapweed (Centaurea maculosa) and milk thistle (Silybum marianum). By the north end of this parcel, cleared/irrigated fields no longer exist surrounding the creek. The creek crosses into US Forest Service lands at approximately RM 13.6; our study continued up to about RM 13.3.

Bank Stabilization and Erosion Sites

Cut banks frequently found around RM 12, generally small in height.

Most of the streambank degradation was centered around a driveway culvert crossing just below RM 12.2. Heavy vegetation has developed in many of these areas, likely limiting the overall extent of erosion at this location.

TABLE 2.11. BANK STABILIZATION AND EROSION SITES IN REACH 6.

Type	River Mile	Side (R/L)	Approximate Height (Feet)	Approximate Length (Feet)
Cut Bank	11.2	Right	3	80
Cut Bank	11.7	Left	3	135
Cut Bank	12.1	Right	1.5	35
Cut Bank	12.15	Left	3	60
Cut Bank	12.15	Right	1	30
Cut Bank	12.15	Left	2	20
Cut Bank	12.2	Left	2	50
Cut Bank	12.95	Left	5	25
Rock and earthen berm	12.2	Right	3	400
Rock and earthen berm	12.6	Both	6	800
Rock and earthen berm	12.9	Right	3	280

Fish Passage Barriers

Irrigation withdrawals and a culvert crossing create fish passage barriers in Reach 6.

Multiple passage barriers were found in this reach. In the lower section just above RM 12, a channel diversion head-gate was found with a simple flashboard control lacking any screening. Further upstream just below RM 12.2, the creek passes under the landowner's driveway through two culverts. The outfall drop was minimal, however the lack of substrate and probable high flow velocities likely create a passage barrier. Another unscreened diversion was found at RM 12.75, where a 3-foot corrugated metal pipe fed an irrigation ditch running roughly along the forested boundary.

Similar to Reach 5, the unscreened diversions in this reach may be impacted by the water switch project that is currently planned by the DRC and OID. For more information on the details of this water switch and how it would affect screening needs in Reach 6, please refer to the section in Reach 5 on Fish Passage Barriers.

TABLE 2.12. FISH PASSAGE BARRIERS LOCATED IN REACH 6.

River Mile	Type	Drop Height	Notes
11.0	Rock weir	2 feet	In channel for old diversion
11.7	Rock dam	1.5 feet	
12.0	Channel diversion	N/A	Not screened – flash board controlled
12.2	Culvert	N/A	Double-barrel, small outfall drop, corrugated bottom
12.75	Channel diversion	N/A	3 feet CMP, no screen, flows to irrigation ditch

RESTORATION AND PRIORITIZATION PLAN

Introduction

Following completion of field data collection, GeoEngineers began developing a system to define, locate, and prioritize restoration treatments within the project area. In keeping with the defined scope of work, at least twenty potential treatment sites were ranked within McKay Creek according to a range of parameters. Fields considered included fish habitat and passage benefits, landowner interest, riparian vegetation and floodplain improvement, cost, and bank stability potential. The full list of fields and values for which each project was evaluated upon are included below in Table 3.1.

TABLE 3.1 PROJECT PRIORITIZATION CATEGORIES FOR MCKAY CREEK RESTORATION.

Score	Owner Participation	Rearing Habitat Benefit	Bank Erosion Reduction	Riparian Vegetation Improvement	Floodplain Enhancement	Cost
0	None	None	None	None	None	>200k
1	Hesitant	Isolated improvement	Low bank-low risk	Invasive Removal	Planting	<200k
2	Conditional	>100 feet improvement	High bank-low risk	Off-Channel planting	<0.10 acre activate	<150k
3	Will allow	>500 feet improvement	Low bank-high risk	Bank Planting	<0.5 acre activate	<75k
4	Will advocate	>1,000 feet improvement	High bank-high risk	Exclusion Fencing	>1 acre activate	<40k

An additional category (fish passage benefit) was considered with a weighted score (0, 2, 3, 4, 5) and therefore did not fit the table above. This field was weighted because removing passage barriers and allowing local fish populations to access a wider range of habitats will ultimately create more beneficial, long-term improvements within the watershed and should be considered a priority above other treatments.

Typical Project Treatments

We have developed six basic categories/examples of project treatments to implement within the watershed. Individual projects will require specific design considerations to fit local site conditions. While each of these treatments individually presents an opportunity to improve fish habitat, the most effective option in most cases is some combination of multiple treatment categories. Each of the proposed treatments are aimed at increasing fish habitat, improving access and diversity, stabilizing eroding banks to preserve landowner properties, and enhancing the riparian community for shading, wildlife habitat, and reduced sediment loading. A brief synopsis of the methods and benefits of each treatment is included in the sections below.

Remove Passage Barrier

Multiple fish passage barriers of various types were encountered during field analysis. These barriers not only limit dispersal into potentially high-quality habitats but can also strand fish in low-quality areas where they are vulnerable to predation, malnutrition, or high temperatures.

Each specific barrier will require individual assessment and design to ensure a successful project. Some barriers, such as unscreened irrigation diversions, can be improved with minimal engineering and earthwork; others may become much more complicated requiring rigorous engineering design, and construction techniques. If the barrier is associated with an irrigation withdrawal, design must not remove or lower the effectiveness of such features.

Roughened Channels

Roughened channels are typically constructed following the removal of a passage barrier or where the channel lacks diverse depths, flow velocities, and backwater refugia. By strategically placing large wood and rock, the channel will develop large, central scour pools and high-flow areas near wood and rock-armored banks. Changing the angle of wood placement will create highly variable, complex flows to ensure habitat parameters are met for a variety of fish life stages. One significant benefit to this type of project is the possibility to create a small floodplain area outside of the main bankfull channel area. This not only relieves pressure on banks in entrenched channels but provides additional habitat for birds, mammals, and fish. Hyporheic connections are improved, raising the water table and stabilizing flows. These zones can be planted with water-tolerant tree and shrub species to increase shading and lower summer water temperatures. While these types of in-channel projects are not always completed or considered necessary in conjunction with bank stabilization or riparian grading projects, completing these tasks in conjunction with other projects, as equipment is already mobilized, can have significant habitat benefits at minimal cost. A typical example of this project type can be found in Appendix B, Figure 1.

Bank-Protection: LWD Placement

One of the simpler and more widely applied treatments in riparian restoration today is the installation of large woody debris (LWD). LWD can disperse flow energy, stabilize channel banks, increase aquatic habitat, reduce width/depth ratio, increase localized sediment deposition, form pools, and route flood water away

from vulnerable or valuable areas. In areas of bank erosion, placing LWD will deflect flow away from the streambank and promote vertical channel scour, creating deep, shaded pool habitat. Placement techniques vary; typically logs are partially buried, pinned together, anchored with large rock, or pinned between mature trees. When used to combat erosion, logs are usually buried and anchored with rock due to the more intense forces present along the outside of channel bends. LWD can also be placed in off-channel (floodplain, side channel, and backwater habitat) areas, which require less intense structure anchoring methods. Examples of typical LWD placement are presented in Appendix B, Figure 2.

Bar Enhancement

Encouraging gravel deposition can create or improve salmonids spawning habitat. Gravel deposition can be encouraged through the strategic placement of LWD structures. Scour holes are created by placed wood and flow is redirected to the inside bank of the channel bend rather than pushing against the outer edge. Gravel begins to deposit along this inside bank, creating a shallow grade of spawning-sized substrate. This type of project has multiple benefits: flows are slowed and redirected away from vulnerable outside banks, substrate composition is improved, and pool microhabitats develop. As this treatment requires excavation and backfill to bury logs, floodplain planting and re-grading can be readily incorporated into design. Typical treatment examples for this project can be found in Appendix B, Figure 3.

Side-Channel Creation/Restoration

Off-channel habitat areas such as side channels can become important rearing areas for juvenile salmonids and increase ecological function of the system as a whole. These zones are typically located in areas with shallow groundwater influence, regulating summer high and winter low temperatures. Some key features to note when considering side channel restoration/creation include:

- Channel length and proximity to mainstem.
- Groundwater depth.
- Hydrology.
- Riparian vegetation condition (shading).
- Proximity to other project locations or high-value habitats.

The locations where side channels connect to the main creek are a critical location in this type of treatment. Ideally, the downstream connection will occur at a low-velocity flow area, allowing fish to more easily locate the side-channel's input of cool water. Also, confluences must be designed so fish are not stranded in off-channel areas without access to the main-stem creek. An example figure of such restoration is included in Appendix B, Figure 4.

Floodplain Activation/Enhancement

Floodplain connectivity projects are identified in locations where there is currently little to no floodplain activation during extreme high flows. Where the riparian corridor allows, these areas can be graded to create a more natural transition from channel to bank to riparian/floodplain vegetation to upland areas. During high-flow events, activation of these areas lowers flow velocity downstream, reducing potential for further streambank erosion and spawning gravel scour. Flooded backwater areas left after receding storm flows increase wildlife habitat diversity. Improving riparian vegetation by planting water-tolerant species such as willow, alder, and cottonwood increases channel shading and natural wood recruitment. These

projects can also reduce channel entrenchment and improve hyporheic interactions, raising groundwater to more natural levels. Care must be made during project design to ensure fish stranding does not occur in these floodplain areas between high-water events. An example figure for this project treatment is included in Appendix B, figure 5.

Riparian Vegetation

Riparian and upland planting can occur independently or in combination with any of the above listed treatment options. Riparian vegetation provides immense benefits for the river corridor, including preventing further erosion and ensuring installed wood and rock remain in place long term. A fully developed and healthy riparian community benefits both wildlife and human interests. Different types of vegetation provide different abilities to retain streambank slopes. Deep, penetrating roots of herbaceous plants provide structural support while thicker, harder roots of woody plants protect streambanks against bank scouring by floods and ice jams.

Prioritization Matrix

Included below in Table 3.2 is an abridged version of our restoration treatment priority matrix. The full table including field values, scores, and project types is included as Appendix C. Scoring categories and values were developed with consideration to limiting factors within the watershed, habitat needs of target fish species, and stakeholder interests. Each proposed project will be discussed in brief by reach in the sections below. Project location figures are included in Appendix A.

TABLE 3.2. PROPOSED PROJECTS SIMPLIFIED PRIORITY MATRIX

Project Number	Owner Participation	Passage Benefit	Rearing Habitat Benefit	Bank Erosion Reduction	Riparian Vegetation Improvement	Floodplain Enhancement	Cost	Rank
5	2	3	2	2	3	3	1	**1**
7	2	3	2	2	3	3	1	**1**
8	2	3	2	2	3	3	1	**1**
9	2	3	2	2	3	3	1	**1**
10	2	3	2	2	3	3	1	**1**
11	2	3	2	2	3	3	1	**1**
12	2	3	2	2	3	3	1	**1**
15	2	3	2	2	3	3	1	**1**
20	1	3	4	1	3	3	1	**1**
21	1	3	3	1	3	3	2	**1**
23	3	3	2	0	2	2	4	**1**
1	2	3	4	0	1	4	1	**12**
3	2	5	2	2	0	3	1	**12**
6	2	5	1	0	3	0	4	**12**
13	2	3	2	4	3	0	1	**12**
19	1	3	2	0	2	3	4	**12**

Project Number	Owner Participation	Passage Benefit	Rearing Habitat Benefit	Bank Erosion Reduction	Riparian Vegetation Improvement	Floodplain Enhancement	Cost	Rank
22	1	3	2	0	2	4	3	**12**
24	2	5	1	0	0	3	4	**12**
4	2	3	2	2	1	3	1	**19**
14	2	3	2	0	3	3	1	**19**
16	2	3	2	1	2	3	1	**19**
17	2	3	2	1	2	3	1	**19**
26	2	4	2	1	1	3	1	**19**
2	2	5	2	0	0	3	1	**24**
18	2	3	2	0	2	3	1	**24**
27	2	2	1	0	0	1	4	**26**
25	2	2	1	0	0	0	4	**27**

Project Locations and Information

Reach 1

The confluence of McKay Creek and the Crooked River offers a unique and prime restoration opportunity. Much of the channel through the lower ¼–mile of stream is straightened with variable low-quality riparian vegetation and occasional armoring. Residential development within this reach is high and potential restoration projects will be quite visible to the public. Bank instability is not a major concern within this reach. Projects should aim to increase habitat diversity and riparian ecosystem function as a whole. Reach 1 project locations are included in Appendix A, Figure 2.

Project 1 (RM 0, Rank 12): The activation of a historic side channel bordering a nearby fallow field would create diverse habitat conditions in the lower creek, enticing fish to migrate up McKay Creek. This side channel could be designed as permanently flowing or seasonally activating during high flows.

Project 2 (RM 0.6, Rank 24): Just upstream of Highway 26 exists a fish passage barrier barely 0.6 river miles from the confluence with the Crooked River. A concrete-guarded siphon has been constructed to support irrigation on nearby parcels. The channel-spanning drop in this location is over 1 foot in height and grade controls have removed any pool habitat to assist fish dispersal upstream. Concrete-walled banks and parallel-running access roads limit potential to add meanders or bank features in this location. The main weir could simply be reconfigured or reconstructed with large rock and wood to promote local scour.

Project 3 (RM 1, Rank 12): Another major irrigation withdrawal exists at RM 1 where a canal crossing perpendicular to the creek. This siphon features a channel-spanning concrete pad that drops vertically more than 1 foot. Similar to the project below, grade controls have removed the potential for resting areas downstream of this feature. In this case the banks are either vegetated with mature trees and medium shrubs or armored with riprap in places. Removing this barrier will require specific design considerations to ensure no net loss of landowner property or water withdrawal potential.

Removing passage barriers upstream of the confluence (RM 0.6 and 1) would then allow new colonization into much higher reaches of McKay Creek. While some stretches of the lower creek were not investigated, removing these two barriers could present fish with multiple miles of new habitat to occupy.

While these lower-creek projects scored in the bottom half of our prioritization matrix, the potential large-scale and long-term improvements provided by these projects should lend them extra consideration.

Reach 2

Two passage barriers and one habitat improvement project are proposed within this reach. Project locations are included in Appendix A, Figure 3.

Project 4 (RM 2.55, Rank 19): This diversion creates a potential barrier with low flows and could benefit from re-design to ensure the irrigation withdrawal is maintained while improving fish mobility. One potentially ambitious method would be to activate a historic channel that begins upstream of this diversion and creating permanent floodplain ponds and improved riparian conditions over a rather large area. This side-channel reunites with the main creek just above a large bank that has eroded down to bedrock. A simpler project would involve widening the channel slightly leading into the J-hook, re-grading the weir, and ensuring an adequate downstream plunge pool. This would allow fish to bypass the diversion even at low flows.

Project 5 (RM 3, Rank 1): Just upstream, armored banks are common and riparian conditions degraded. Replacing riprap with bank LWD and bank planting would increase habitat values in this lower reach and reduce river power at vulnerable meanders downstream.

Project 6 (RM 3.35, Rank 12): Further upstream at the Grimes Road crossing another, more significant irrigation withdrawal creates a passage barrier. A canal runs parallel to the road through this crossing and a siphon removes water above a channel-spanning drop. Flows were fast and shallow at the time of our visit, likely impeding upstream fish passage. This project would require careful design to ensure no degradation to the irrigation infrastructure. Also, given the close proximity to a major local road, a restoration project in this area could be accompanied by educational signage and events, raising awareness to land use and fish habitat issues.

Reach 3

Reach 3 suffered most significantly from bank erosion and degraded riparian conditions, causing projects within this reach to score very highly in the prioritization system. Several areas of unstable banks and riprap armored slopes have high potential for restoration success. Previous LWD revetments were found through this parcel and appeared to be functioning correctly. Increasing the frequency and diversity of these structures (include bar enhancement and mid-channel structures) would create a more complete set of fish habitat opportunities. Project locations are included in Appendix A, Figures 4 and 5.

Project 7 (RM 4.3, Rank 1): Riparian conditions are highly degraded as the creek approaches the McKay Road crossing. Riprap guarding bridge abutments extends upstream for about 100 feet, the upper extent of which could be replaced with LWD. Unstable banks and armoring continue upstream to approximately RM 4.45, offering an ideal length of restoration potential.

Project 8 (RM 4.6, Rank 1): At this location a low-water crossing has created a minor passage barrier due to the large rock and wood fencing constructed in channel. Here, placed LWD and rock exist both upstream and downstream, and improving the ford crossing to allow easier migration would benefit local fish populations.

Project 9 (RM 5.1, Rank 1): Both banks through this reach could benefit from adding LWD and removing riprap. Occasional-placed wood was found through this section at low densities, creating more significant bank protection with root wads that prevent further land loss while adding channel complexity and habitat quality.

Project 10 (RM 5.3, Rank 1): This location features less significant bank erosion but could still benefit from added wood in places. A side channel was noted just downstream of the photo included on Figure 4 of Appendix A. Reconfiguring and/or activating this channel would add some habitat complexity and slow flows in a largely straightened section of creek.

Project 11 (RM 5.4, Rank 1): Riparian vegetation and channel complexity is minimal through this reach. The channel is predominately a long, wide glide through this project area and banks feature minimal overhanging cover. The pools created by bank LWD installations would greatly increase the habitat value in this area, especially coinciding with riparian planting efforts.

Project 12 (RM 5.65, Rank 1): The left bank at this location offers a prime location for woody revetments (Figure 5, Appendix A). The vertical cut is more than 3 feet tall with unmanaged lands behind. It could be beneficial to consider increasing the meander size here to further lower river power at vulnerable downstream locations.

Project 13 (RM 6.15, Rank 12): At the upstream end of this reach, one project (RM 6.15) is located at an extremely tall and vulnerable cut bank (10+ feet) and would require a more complex structure than simple root wad revetments. Installing some sort of crib wall could prevent this bank from further encroaching onto valuable property.

Reach 4

Proposed project locations in Reach 4 can be found in Appendix A, figure 6.

Project 14 (RM 6.7, Rank 19): The landowner has previously worked with the CRWC and the Crook County Soil and Water Conservation District to implement instream and riparian restoration activities, including instream placement of LWD, installation of rock weirs, riparian planting, and installation of riparian fencing. This past work has been largely successful, and there is the opportunity to build upon this past work. Where this previous work ties into the original channel, a high-flow, seasonal channel could be activated and enhanced to bypass the large meander and lessening erosional forces on vulnerable banks. High amounts of placed LWD and channel braiding were noted through this area.

Project 15 (RM 6.75, Rank 1): There is an existing remnant berm on the channel-left side of the channel at this project site, most likely from past channel straightening activities after the flood event of 1964-1965. Removing the berm on river channel-left could increase channel sinuosity and be completed to add floodplain ponds and increase the riparian buffer width. Beaver activity appeared high around this area; increasing backwater areas and wood density would benefit local wildlife.

Project 16 (RM 6.85, Rank 19): Just upstream of a driveway bridge crossing, several channel-spanning weirs were noted, controlling grade and slowing flows through a simple pool/riffle sequence. The area right of the channel appears prime for activation as a high-flow side channel, increasing channel complexity and reducing the need for grade controls.

Project 17 (RM 6.95, Rank 19): A cut bank channel left and wide area for potential floodplain restoration offers solid potential for restoration treatment. Wood can be added to protect vulnerable banks and riparian grading/planting allow for more natural floodplain activation.

Project 18 (RM 7.0, Rank 24): This area offers prime riparian width for floodplain activation and enhancement. Levee setback or complete removal would allow more full utilization of the riparian corridor through this highly straightened section of creek.

Project 19 (RM 7.1, Rank 12): This project would be similar in scope the number 18 while offering a fully forested riparian zone right and wide, levee-protected floodplain left. This area would benefit from added creek meanders and more natural floodplain activation.

Project 20 (RM 7.25, Rank 1): Upstream of a driveway bridge crossing the channel flows southwest through a straightened, confined riparian corridor. While quality vegetation is minimal and floodplains protected by levees, the potential corridor width is high and restoration treatments designed to more fully utilize the available area.

Project 21 (RM 7.4, Rank 1): This project should focus on expanding the riparian/floodplain zone to incorporate the intermittent mature canopy into riparian habitat. Removing channel-confining berms and replanting thin understory vegetation would have immediate benefits to aquatic habitat.

Project 22 (RM 7.6, Rank 12): The fish-bypass channel constructed around a diversion dam could be expanded further upstream through this project area. This zone is largely unvegetated and borders a large stand of mature cottonwood. Increasing the length of this bypass channel and adding riparian vegetation would create a large area of high-quality habitat.

Reach 5

Project 23 (RM 7.85, Rank 1): Several restoration projects have already been conducted within this reach, and it was decided to lower priority for further restoration here. One area that has proposed treatment is located at the very bottom of this reach, approximately RM 7.85 (Appendix A, Figure 6). A wide side-channel swale has developed with degraded connections to the main stem. The riparian corridor is quite wide on this side of the stream and the potential for success appears high. A healthy stand of mature trees has developed at this site and should be preserved for the valuable shading provided.

Reach 6

Proposed project locations within reach 6 can be found in Appendix A, Figure 7.

Project 24 (RM 11, Rank 12): This degraded rock weir creates a passage barrier and features an unscreened diversion just upstream. Reconfiguring the diversion dam and adding protection to the culvert would prevent fish from being stranded below the dam or diverted into irrigation systems.

Project 25 (RM 12.0, Rank 27): This project could simply involve adding screens or other barriers to fish access into the irrigation ditch. Riparian habitat quality is relatively high in this area with some revegeation potential channel-left.

Project 26 (RM 12.2, Rank 19): This driveway crossing features 2 corrugated metal squash culverts roughly 4 feet in width and 2 feet in height. No substrate exists within the pipes and gradient appeared moderately high. Downstream of these pipes cut banks and channel complexity is high, with little developed pool habitat. Upstream, cut banks and rock/earth berms are common. Redesigning this crossing with a bridge or larger, single box culvert focusing on fish passage would allow better utilization of local high-quality habitats.

Project 27 (RM 12.75, Rank 26): Another unscreened diversion exists at this location, feeding a ditch channel-left that runs south roughly parallel to the creek up to the driveway. This 3-foot corrugated metal pipe lacks any screening or other features constructed to prevent fish from being diverted into irrigation infrastructure.

CONCLUSION

While major land-use changes within the McKay Creek watershed are not considered likely at this time, the potential for improving fish habitat and populations in conjunction with livestock and agriculture production still appears high. An assessment of the lower, privately owned reaches of McKay Creek was completed in the fall of 2012 to evaluate potential restoration, conservation, and enhancement opportunities. Proposed treatments were developed and prioritized for the accessed parcels within the six delineated reaches. Actions emphasize connecting areas of high quality habitats, improving habitat diversity and condition, and restoring more natural floodplain and off-channel processes.

Restoration treatments were prioritized based on their various potential benefits and the potential for project implementation. Projects with higher cost to implement or risk of failure were rated lower than simple or off-channel treatments where success is more predictable. Implementing projects on a reach scale is preferable to maximize ecological benefits and lower costs. Strong landowner interest and involvement will be required to develop projects in such a manner.

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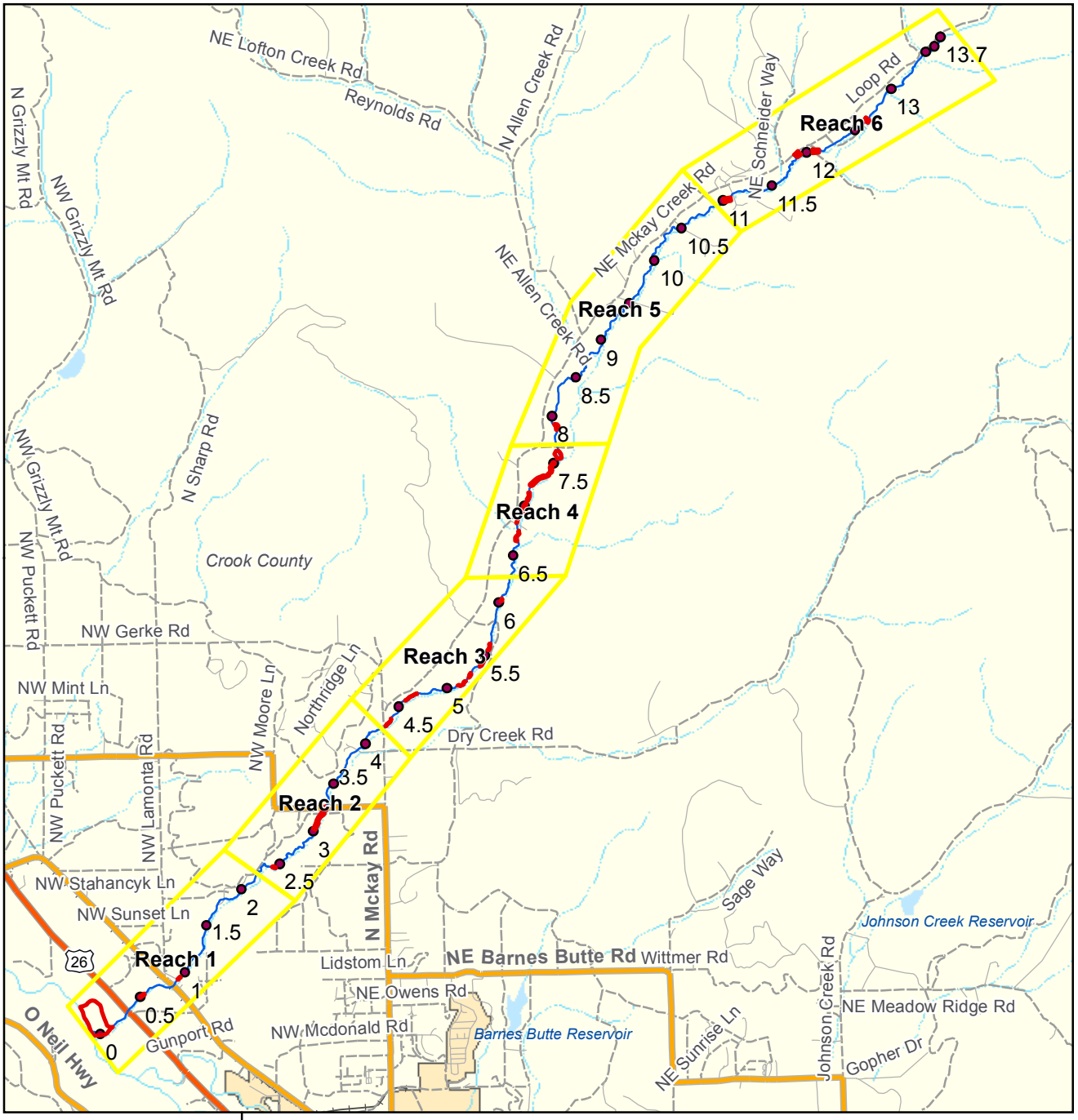
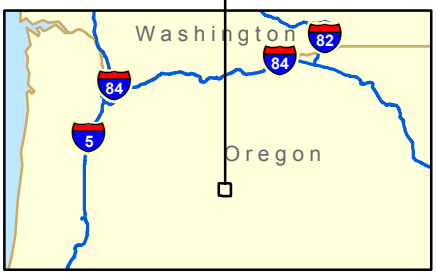
APPENDICES

GeoEngineers

APPENDIX A
Project Locations





Reach Breaks
Restoration Sites
River Mile
McKay Creek

N
W
E
S

0 0.5 1 2 3 4
Miles

Notes:
1. The locations of all features shown are approximate.
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Data Sources: ESRI Data & Maps

Projection: WGS 1984 Web Mercator Auxiliary Sphere

Restoration Overview

McKay Creek Watershed

GeoEngineers

Figure 1

Office: TAC Path: W:\Bellingham\Projects\18\18435001 Boise PortOrchard\04\GIS\MXD\Restoration Overview.mxd Map Revised: 15 July 2014 smahugh

Map Revised: 15 July 2014 smahugh

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Office: SEA

Reach 1

King Rd
NW Sunset Ln
NW Sunset Ln
NW Lamonta Rd
Lamonta Rd
Lamonta Rd
Business Evans Rd
Business Evans Rd
NW Grass Ln
NW Mcbeth Ct
NW Mcbeth Ct
Mc Kay Creek
Mc Kay Creek
1.5
0.5
0
Crooked River
NW Gumpert Rd
NW Gumpert Rd
NW Brookfield Ln
NW Lamonta Rd NW Lamonta Rd
Gunport Rd
Gunport Rd
Ochoco Creek
Crook County
26
26

Legend

- Culvert
- Fish Barrier
- Irrigation Pump
- LWD
- River Mile
- Stream
- Restoration Sites
- Reach Breaks

N
W E
S

800 0 800
Feet

Projection: NAD 1983 StatePlane Oregon South FIPS 3602 Feet

Notes:
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Restoration Prioritization

McKay Creek Watershed

GeoEngineers

Figure 2

Reach 2

Reach 1

3

2.5

2

1.5

Crook County

Mc Kay Creek

NW Grimes Rd

NW Grimes Rd

N Mckay Rd

N Mckay Rd

Mckee Dr

Mckee Dr

Lidstrom Rd

Lidstrom Rd

NW Garden Ln

NW Garden Ln

N Mckay Rd

N Mckay Rd

NE Brennan Ln

NE Brennan Ln

NE Mckay Dr

Legend

- Culvert
- Fish Barrier
- Irrigation Pump
- LWD
- River Mile
- Stream
- Restoration Sites
- Reach Breaks

N

W E

S

800 0 800

Feet

Map Revised: 15 July 2014 smahugh

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Projection: NAD 1983 StatePlane Oregon South FIPS 3602 Feet

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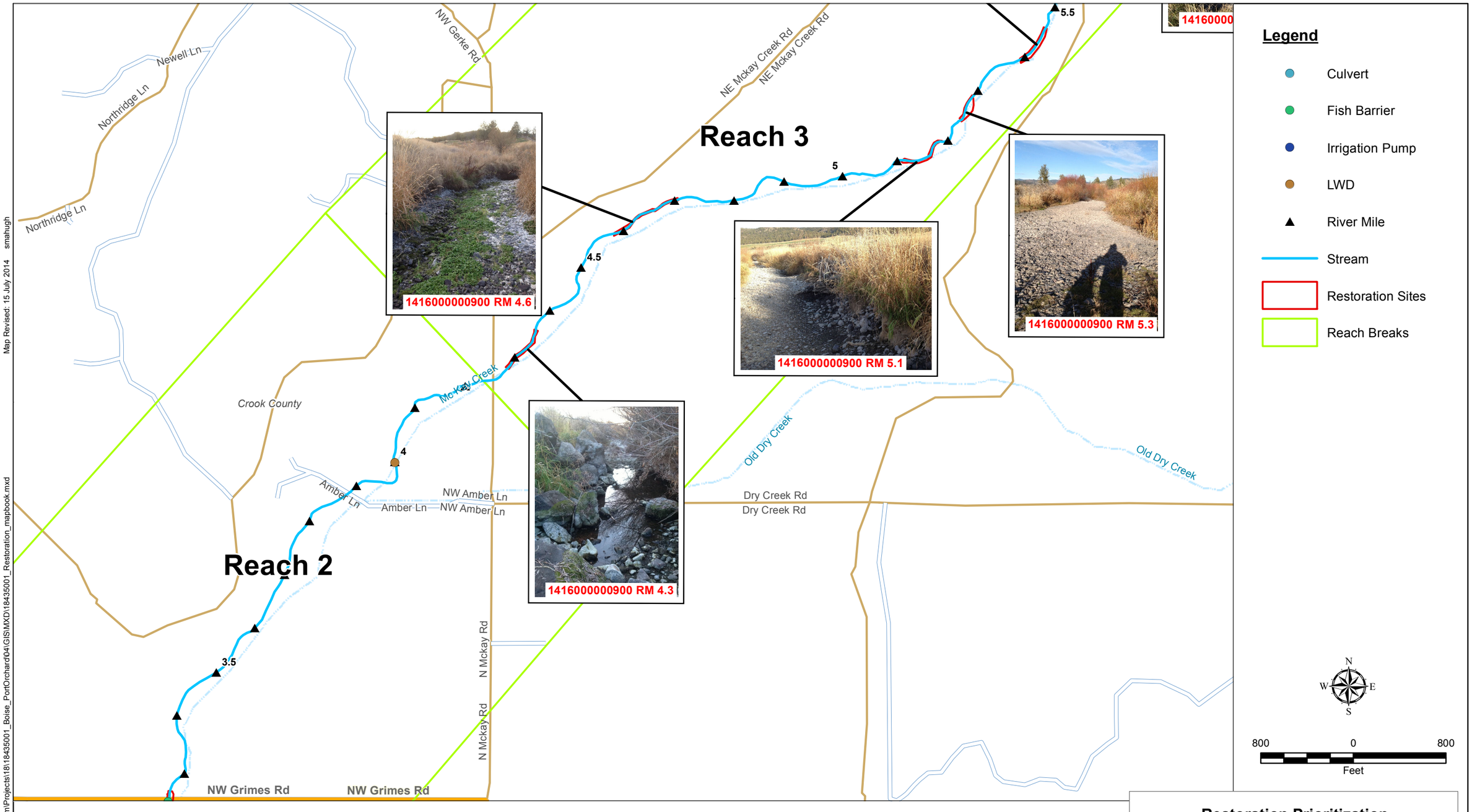
Restoration Prioritization

McKay Creek Watershed

GeoEngineers

Figure 3



Map Revised: 15 July 2014 smahugh

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Projection: NAD 1983 StatePlane Oregon South FIPS 3602 Feet

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Restoration Prioritization

McKay Creek Watershed

GeoEngineers

Figure 4

Legend

- Culvert
- Fish Barrier
- Irrigation Pump
- LWD
- River Mile
- Stream
- Restoration Sites
- Reach Breaks

N
W E
S

800 0 800
Feet

Projection: NAD 1983 StatePlane Oregon South FIPS 3602 Feet

Notes:
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Restoration Prioritization

McKay Creek Watershed

GeoEngineers

Figure 5

Map Revised: 15 July 2014 smahugh
Path: W:\Bellingham\Projects\18\18435001_Boise_PortOrchard\04\GIS\MXD\18435001_Restoration_mapbook.mxd
Office: SEA

Reach 5

Reach 4


1316330000600 RM 7.6


1316330000201 RM 7.85


1316330000700 RM 7.0


1316330000600 RM 7.25


1316330000600 RM 7.4


1316330000600 RM 7.1


1316330000700 RM 6.85


1316330000700 RM 6.95


1416040000101 RM 6.7


1416040000101 RM 6.75

Crook County

McKay Creek

7

6.5

Map Revised: 15 July 2014 smahugh

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Office: SEA

Legend

- Culvert
- Fish Barrier
- Irrigation Pump
- LWD
- River Mile
- Stream
- Restoration Sites
- Reach Breaks

N

W E

S

800 0 800

Feet

Projection: NAD 1983 StatePlane Oregon South FIPS 3602 Feet

Notes:
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Restoration Prioritization

McKay Creek Watershed

GeoEngineers

Figure 6

Map Revised: 15 July 2014 smahugh

Path: W:\Bellingham\Projects\18\18435001_Boise_PortOrchard\04\GIS\MXD\18435001_Restoration_mapbook.mxd

Office: SEA

Reach 6

Reach 5

Crook County

NE Schneider Way

Schnieder Way

NE Mckay Creek Rd

Loop Rd

Mc Kay Creek

Cerysa Ln

Sealy Creek

Caryson Ln

13

12.5

12

11.5

11

Unscreened Diversion

Unscreened Diversion

Culvert Crossing

Rock Weir

Legend

- Culvert
- Fish Barrier
- Irrigation Pump
- LWD
- River Mile
- Stream
- Restoration Sites
- Reach Breaks

N

W E

S

800 0 800

Feet

Projection: NAD 1983 StatePlane Oregon South FIPS 3602 Feet

Notes:
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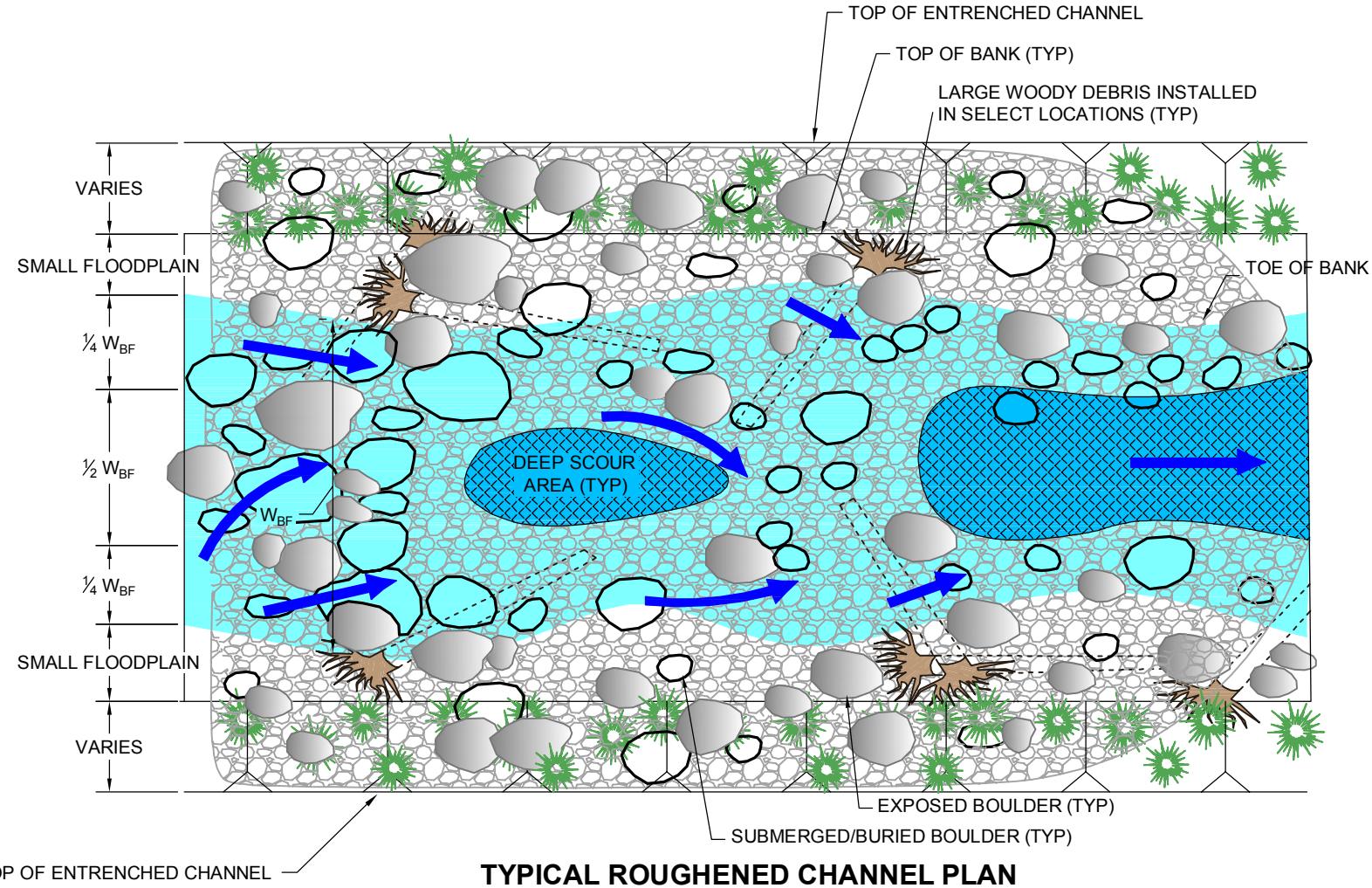
Restoration Prioritization

McKay Creek Watershed

GeoEngineers

Figure 7

APPENDIX B
Example Treatment Types



TYPICAL ROUGHENED CHANNEL PLAN

NOT TO SCALE

NOTE: CONSTANT ROUGHENED CHANNEL TO APPEAR AND FUNCTION NATURALLY

Revision No:	Date:	Description:	Initials:	Designed: JJF/ALW Drawn: MGF/SCY Checked: JOC Date: 10/30/13 Project No: 18435-001-04	McKay Creek Restoration Prioritization Prineville, OR Crooked River Watershed Council	GeoEngineers 1101 S. Fawcett Ave. Suite 200 Tacoma, Washington 98402	Typical Details Fish Habitat Enhancement Design Plans	Sheet B-1

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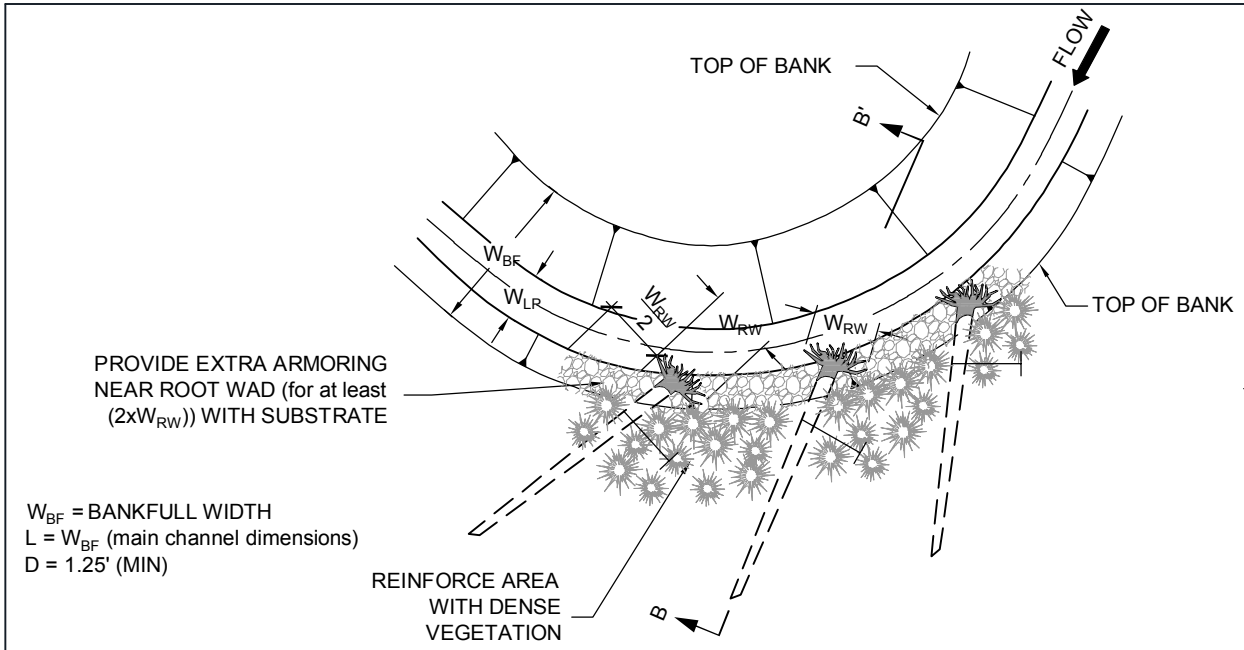


TYPICAL ROOT WAD BANK PROTECTION DETAIL PLAN

NOT TO SCALE

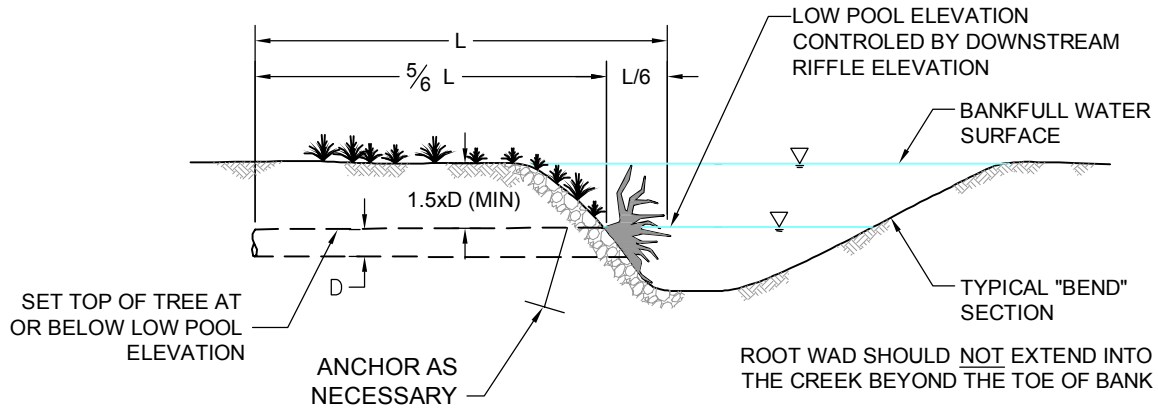
NOTES:

Purpose:

- Increases pool depth.
- Inhibits lateral migration.
- Prevents bank erosion.

Design Specifics:

- Orient root wads so the creek's flow attacks them "head on" as much as possible. Anchors should be oriented towards flow.
- Top of rootwad (roots) should not extend more than ½-ft above top of bank.
- Bottom members shall extend below calculated scour depth.
- Place root wads along outside of bends.
- Install vegetation among armoring and root wads while installing root wads.
- Irrigate vegetation as required.
- Rootwad diameter = Pool Depth. If greater than depth, bury deeper.



TYPICAL ROOT WAD BANK PROTECTION DETAIL SECTION B-B'

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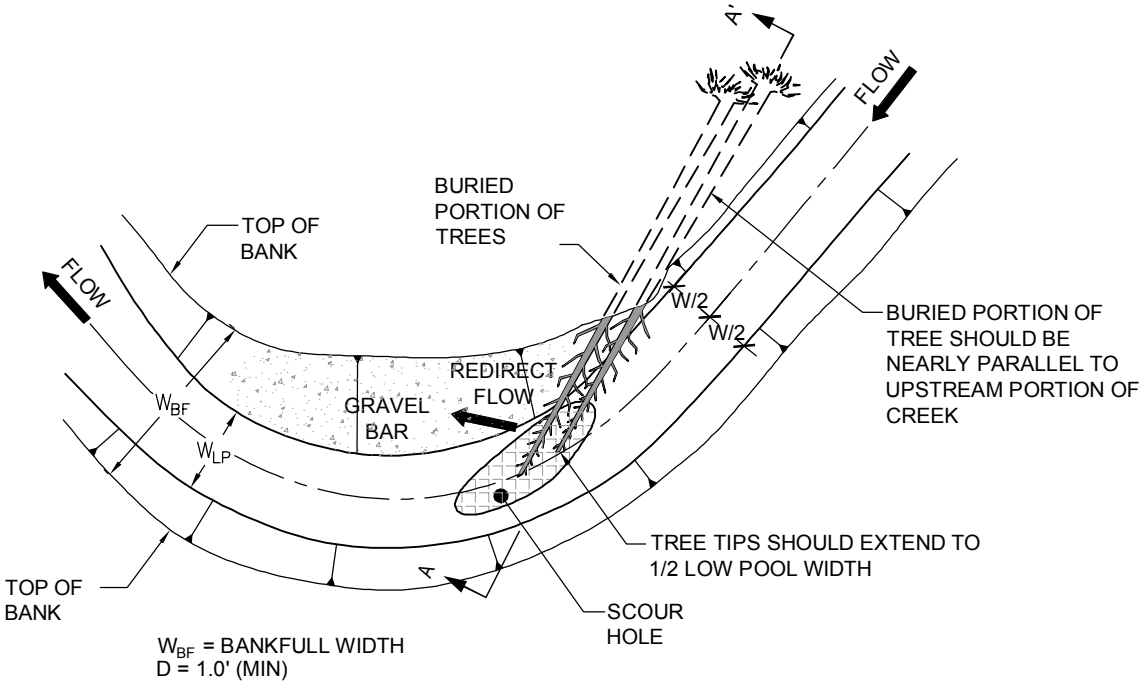
McKay Creek Restoration Prioritization
Prineville, OR
Crooked River Watershed Council

GeoEngineers
1101 S. Fawcett Ave. Suite 200
Tacoma, Washington 98402

Typical Details

Fish Habitat Enhancement Design Plans

Sheet
B-2



NOTES:

Purpose:

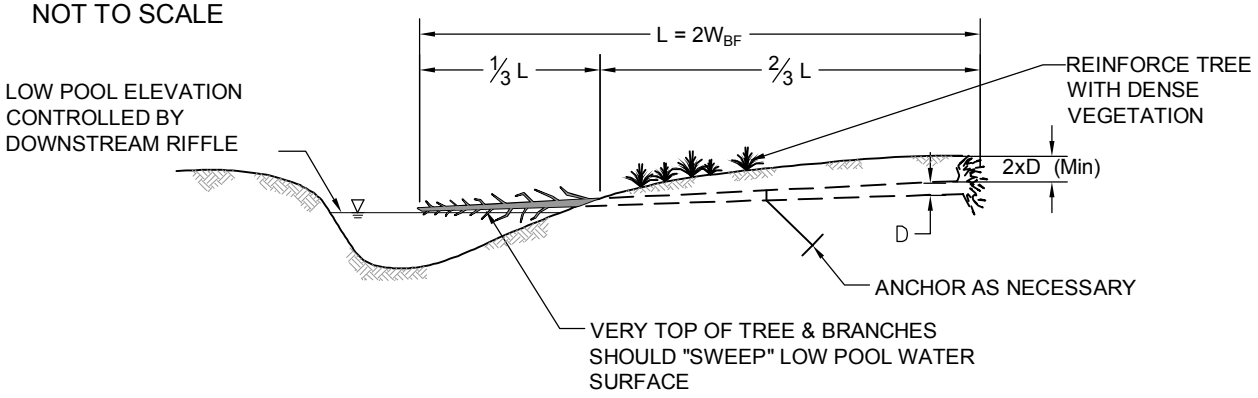
- Redirects flow.
- Creates scour holes.
- Encourages gravel deposition.

Design Specifics:

- Bury at least 2/3 of the tree length and root wad or secure "dry" end of log with anchors.
- Place sweeper at upstream end of bend.
- Trees with branches or multiple trunks preferred.

TYPICAL BAR ENHANCEMENT DETAIL PLAN

NOT TO SCALE



TYPICAL BAR ENHANCEMENT DETAIL SECTION A-A'

NOT TO SCALE

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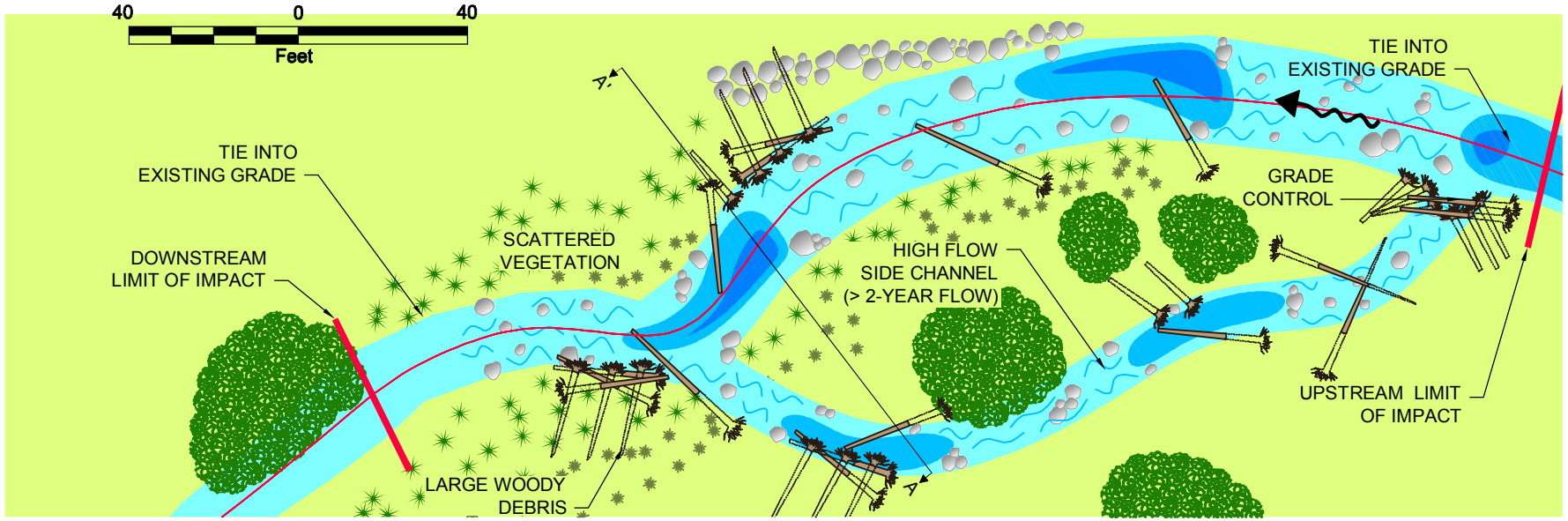
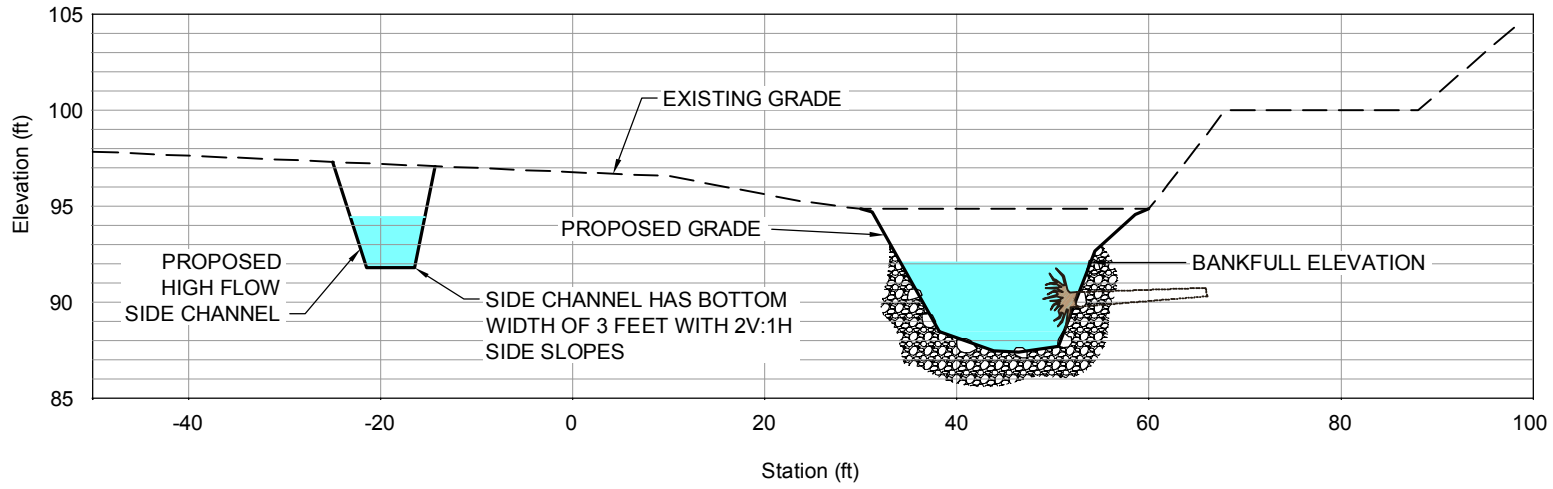


PLAN



Horizontal Scale: 1"=20'
Vertical Scale: 1"=10'

SECTION A-A'

Revision No:	Date:	Description:	Initials:	Designed: JJF/ALW Drawn: MWJ/SCY Checked: JOC Date: 10/30/13 Project No: 18435-001-04

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Prineville, OR
Crooked River
Watershed Council

GeoEngineers
1101 S. Fawcett Ave. Suite 200
Tacoma, Washington 98402

Typical Details

Fish Habitat Enhancement
Design Plans

Sheet
B-4

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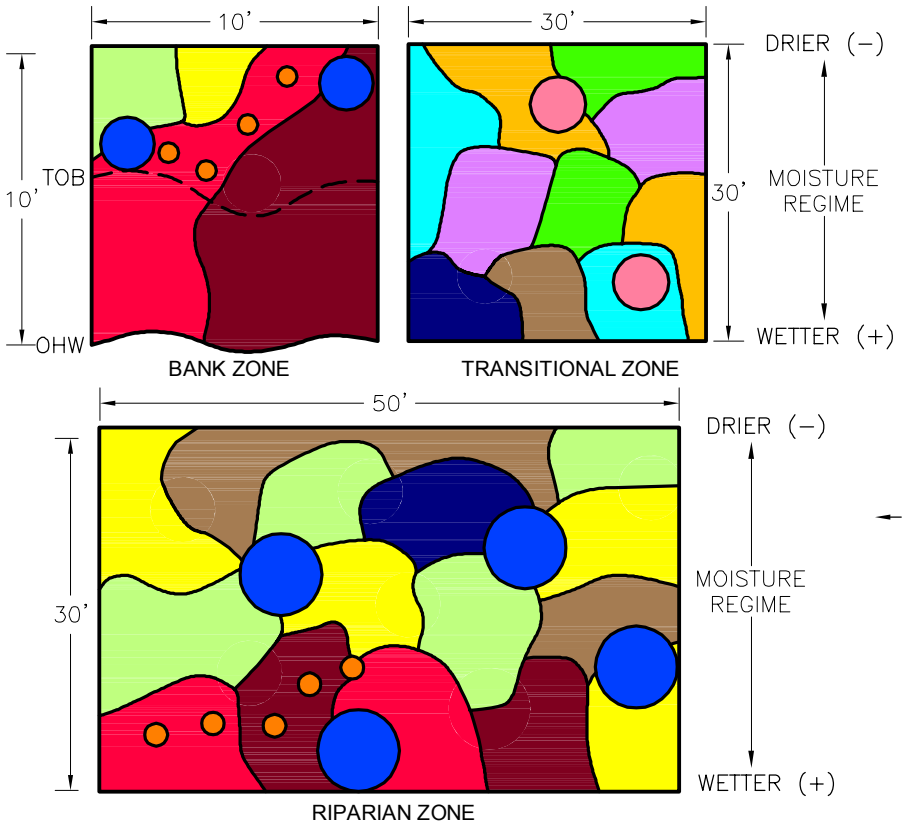
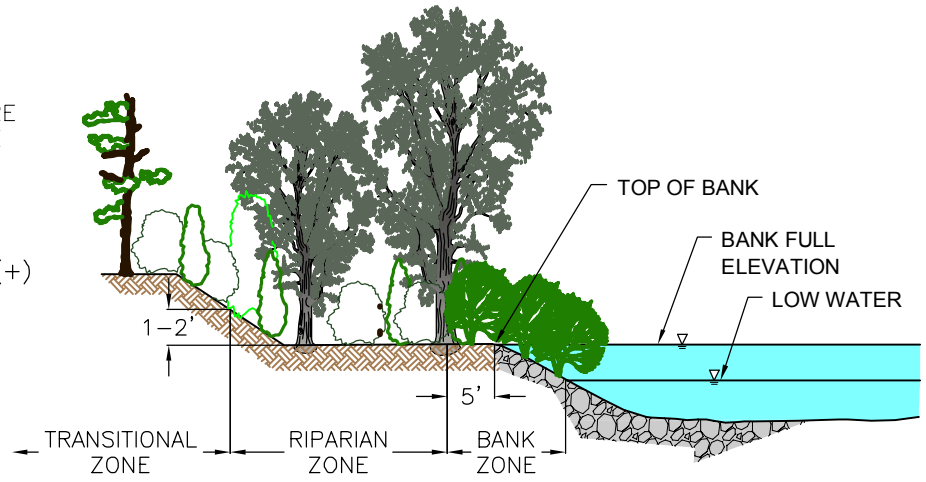
TYPICAL REVEGETATION PLANTING CONFIGURATIONS





REFER TO TABLE BELOW TO DETERMINE PLANTING APPLICATIONS.

TYPICAL FLOODPLAIN ENHANCEMENT PLAN

NOT TO SCALE

NOTES:
TOB = TOP OF BANK
OHW = ORDINARY HIGH WATER

LEGEND:

- BLACK COTTONWOOD
- PONDEROSA PINE
- TRANSPLANTED MATERIALS
- RED OSIER DOGWOOD
- COYOTE WILLOW
- MOUNTAIN ASH
- WOODS ROSE
- MOUNTAIN ALDER
- GOLDEN CURRANT
- SNOWBERRY
- CHOKECHERRY
- BLUE ELDERBERRY
- SERVICEBERRY

Revision No:	Date:	Description:	Initials:	Designed: JJF/ALW Drawn: MGF/SCY Checked: JOC Date: 10/30/13 Project No: 18435−001−04	McKay Creek Restoration Prioritization Prineville, OR Crooked River Watershed Council	GeoEngineers 1101 S. Fawcett Ave. Suite 200 Tacoma, Washington 98402	Typical Details Fish Habitat Enhancement Design Plans	Sheet B-5

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APPENDIX C
Restoration Priority Matrix

APPENDIX C. RESTORATION PRIORITIZATION MATRIX

Site	Rank	#	Description	Owner/Participation Potential	Passage Benefit	Rearing Habitat Improvement	Bank erosion reduction	Riparian Vegetation Benefit	Floodplain enhancement	Approx. Cost	Average Score
1416180000400 Habitat RM 3	**1**	*5*	Bank LWD	Conditional	Added Hydraulic complexity	>100 ft improvement	high bank- low risk	Bank Planting	<0.5 acre activate	<200K	2.2857
1416000000900 RM 4.3	**1**	*7*	Bank LWD	Conditional	Added Hydraulic complexity	>100 ft improvement	high bank- low risk	Bank Planting	<0.5 acre activate	<200K	2.2857
1416000000900 RM 4.6	**1**	*8*	Bar Enhancement, Bank LWD	Conditional	Added Hydraulic complexity	>100 ft improvement	high bank- low risk	Bank Planting	<0.5 acre activate	<200K	2.2857
1416000000900 RM 5.1	**1**	*9*	Bar Enhancement, Bank LWD	Conditional	Added Hydraulic complexity	>100 ft improvement	high bank- low risk	Bank Planting	<0.5 acre activate	<200K	2.2857
1416000000900 RM 5.3	**1**	*10*	Bank LWD, Side Channel Enhancement	Conditional	Added Hydraulic complexity	>100 ft improvement	high bank- low risk	Bank Planting	<0.5 acre activate	<200K	2.2857
1416000000900 RM 5.4	**1**	*11*	Bank LWD	Conditional	Added Hydraulic complexity	>100 ft improvement	high bank- low risk	Bank Planting	<0.5 acre activate	<200K	2.2857
1416000000900 RM 5.65	**1**	*12*	Bank LWD	Conditional	Added Hydraulic complexity	>100 ft improvement	high bank- low risk	Bank Planting	<0.5 acre activate	<200K	2.2857
1416040000101 RM 6.75	**1**	*15*	Levee setback, floodplain enhancement, Bank LWD	Conditional	Added Hydraulic complexity	>100 ft improvement	high bank- low risk	Bank Planting	<0.5 acre activate	<200K	2.2857
316330000600 RM 7.25	**1**	*20*	Levee setback, floodplain enhancement, LWD	Hesitant	Added Hydraulic complexity	>1000 ft improvement	low bank-low risk	Bank Planting	<0.5 acre activate	<200K	2.2857
316330000600 RM 7.4	**1**	*21*	Levee setback, floodplain enhancement, Bank LWD	Hesitant	Added Hydraulic complexity	>500 ft improvement	low bank-low risk	Bank Planting	<0.5 acre activate	<150K	2.2857
1316330000201 RM 7.85	**1**	*23*	Side Channel Enhancement	Will Allow	Added Hydraulic complexity	>100 ft improvement	None	Off-channel planting	<0.10 acre activate	<40K	2.2857
Side Channel @ Mouth RM 0	**12**	*1*	Side channel activation, floodplain enhancement	Conditional	Added Hydraulic complexity	>1000 ft improvement	none	Invasive Removal	>1 acre activate	<200K	2.1429
OID Siphon RM 1	**12**	*3*	Fish Passage Enhancement	Conditional	Removed Channel Spanning Drop	>100 ft improvement	high bank- low risk	None	<0.5 acre activate	<200K	2.1429
1416180000400 Siphon RM 3.35	**12**	*6*	Fish Passage Enhancement	Conditional	Removed Channel Spanning Drop	Isolated improvement	None	Bank Planting	None	<40K	2.1429
1416000000900 RM 6.15	**12**	*13*	Cribwall, Bank LWD	Conditional	Added Hydraulic complexity	>100 ft improvement	high bank- high risk	Bank Planting	None	<200K	2.1429
1316330000600 RM 7.1	**12**	*19*	Levee setback, floodplain enhancement, LWD	Hesitant	Added Hydraulic complexity	>100 ft improvement	None	Off-channel planting	<0.5 acre activate	<40K	2.1429
1316330000600 RM 7.6	**12**	*22*	Side Channel Enhancement	Hesitant	Added Hydraulic complexity	>100 ft improvement	None	Off-channel planting	>1 acre activate	<75K	2.1429
131622A000101 Rock weir RM 11	**12**	*24*	Fish Passage Enhancement	Conditional	Removed Channel Spanning Drop	Isolated improvement	None	None	<0.5 acre activate	<40k	2.1429
1416190000202 Diversion RM 2.55	**19**	*4*	Fish Passage Enhancement	Conditional	Added Hydraulic complexity	>100 ft improvement	high bank- low risk	Invasive Removal	<0.5 acre activate	<200K	2.0000
1416040000101 RM 6.7	**19**	*14*	Side Channel Enhancement	Conditional	Added Hydraulic complexity	>100 ft improvement	None	Bank Planting	<0.5 acre activate	<200K	2.0000
1416040000101 RM 6.85	**19**	*16*	Side channel activation	Conditional	Added Hydraulic complexity	>100 ft improvement	low bank-low risk	Off-channel planting	<0.5 acre activate	<200K	2.0000
1316330000700 RM 6.95	**19**	*17*	Floodplain enhancement, Bank LWD	Conditional	Added Hydraulic complexity	>100 ft improvement	low bank-low risk	Off-channel planting	<0.5 acre activate	<200K	2.0000
1316000001800 Double Culverts RM 12.2	**19**	*26*	Fish Passage Enhancement	Conditional	Decreased pathway gradient	>100 ft improvement	low bank- low risk	Invasive Removal	<0.5 acre activate	<200K	2.0000
1415260000101 Siphon RM 0.6	**24**	*2*	Fish Passage Enhancement	Conditional	Removed Channel Spanning Drop	>100 ft improvement	None	None	<0.5 acre activate	<200K	1.8571
1316330000700 RM 7.0	**24**	*18*	Levee setback, floodplain enhancement, Bank LWD	Conditional	Added Hydraulic complexity	>100 ft improvement	None	Off-channel planting	<0.5 acre activate	<200K	1.8571
1316000001800 Unscreened Diversion RM 12.75	**26**	27	Fish Passage Enhancement	Conditional	Remove Unscreened Withdrawal	Isolated improvement	none	None	None	<40k	1.4286
1316000001800 Unscreened Diversion RM 12.0	**27**	*25*	Fish Passage Enhancement	Conditional	Remove Unscreened Withdrawal	Isolated improvement	none	None	None	<40k	1.2857

Owner Participation		Fish Passage Benefit (Weighted 1 pt)		Rearing Habitat Benefit		Bank Erosion Reduction		Riparian Vegetation Improvement		Floodplain Enhancement		Cost	
Modification	*Score*	*Description*	*Score*	*Description*	*Score*	*Description*	*Score*	*Description*	*Score*	*Description*	*Score*	*Price*	*Score*
None	0	None	0	None	0	None	0	None	0	None	0	>200K	0
Hesitant	1	Remove unscreened withdrawal	2	Isolated improvement	1	low bank-low risk	1	Invasive Removal	1	Planting	1	<200K	1
Conditional	2	Added Hydraulic complexity	3	>100 ft improvement	2	high bank- low risk	2	Off-channel planting	2	<0.10 acre activate	2	<150K	2
Will Allow	3	Decreased pathway gradient	4	>500 ft improvement	3	low bank- high risk	3	Bank Planting	3	<0.5 acre activate	3	<75K	3
Will Advocate	4	Removed Channel Spanning Drop	5	>1000 ft improvement	4	high bank- high risk	4	Fencing	4	>1 acre activate	4	<40K	4

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GeoEngineers

McKay Creek Restoration and Prioritization Tour Guide
August 13, 2014

Led by: Crooked River Watershed Council, Deschutes River Conservancy, GeoEngineers

Stop 1 – Mill Creek, Bauersfeld Ranch

Stop Highlights

- Similarities to McKay Creek
- Past restoration successes
- Use of many restoration "tools"

Mill Creek flows into Ochoco Reservoir which empties into Ochoco Creek and the Crooked River. It originates on the western flank of the Ochoco Mountains with the East Fork flowing through an U.S. Forest Service wilderness area. Mill Creek is typical of most streams in the Crooked River watershed in that it suffered from 125 years of poor land management practices ranging from excessive timber harvest in the headwaters to overgrazing and channelization in the lower valleys which collectively resulted in stream channels in poor functioning condition.

The landowner purchased the property in 1992 and immediately embarked in a series of restoration projects which continued through the mid-2000s. The landowner paid for some of the first restoration work and riparian fencing (now grazing on a limited basis), and then partnered with ODFW and the CRWC to complete later projects. After a significant flood in 1996, this reach of stream was one of the only sections on Mill Creek without significant flood damage, and the neighbors began to take notice and also inquire about partnership restoration projects. Since 1996, the CRWC, ODFW, and Crook County SWCD have worked with at least three landowners to treat approximately five miles of Mill Creek. In addition, landowners have also been involved with flow restoration efforts with the DRC and land easements with the DBLT. The landowner of this property has seen increases in forage because of the improved management practices, including increased forage in the riparian area due to restoration and better management, and increased hay production from the use of sprinklers versus flood irrigation.

The restoration projects involved the addition of large wood in the form of logs and rootwads and boulders to the stream channel. The wood structures were placed along the edge of the channel in natural scour pools to add channel complexity and improve fish habitat. Boulders were placed next to the wood to serve as anchors for cabling. Additional boulder structures were placed in the channel in the form of J-hook deflector structures and low elevation cross veins. These structures reduce stream velocity and bank erosion while improving floodplain interaction and fish habitat through the formation

of pools and the capture of spawning gravel. In addition, where practical, remnant berms from past channelization activities were leveled to allow the stream access to its natural floodplain. These projects have improved channel conditions, riparian vegetation and instream habitat on the majority of Mill Creek. For before and after photos of one site, please see Figure 1, on next page.

Figure 1. Before and after photos of two restoration sites on Mill Creek implemented by the CRWC.

We have selected this site because of the similarities between the Mill and McKay Creek watersheds, and because of the past successes in the Mill Creek watershed and the use of multiple tools from the "restoration tool kit" (active habitat restoration, passive land conservation). There is also one key difference between the watersheds – the number of riparian landowners, and this is critical from a habitat restoration perspective because of the additional coordination involved when planning a project across multiple ownerships and because of the "tragedy of the commons" effect that can occur with many landowners. For a detailed comparison of the watersheds, please see Table 1.

Table 1. A comparison of significant characteristics of the McKay and Mill Creek Watersheds.

Characteristic	McKay Creek Watershed	Mill Creek Watershed
HUC	1707030505	1707030503
Acres	63,500	46,000
Stream length (mainstem)	19.5	19
Private lands stream length	13	9.5
Riparian area landowners	~50 (McKay and Allen Creeks)	~10
Floods of recent record	150 cfs (April 2011)	270 cfs (April 2011)

Stop 2 – McKay Creek, Parga Ranch

Stop Highlights

- Successful fish passage
- Positives of beaver activity
- Potential for future habitat restoration
- Potential for flow restoration via the McKay Water Switch
- CRP as a restoration tool

The CRWC worked with the owner of the ranch from 2008-2012 to remove six fish passage barriers and replace them with engineered passage structures that meet State and Federal criteria. These projects were engineered by GeoEngineeers (also leading this planning effort) and the areas were replanted with help from Crook County High School and Trout Unlimited. The landowner has also worked with the DRC with limited water leasing in the past and the riparian area is now enrolled in the NRCS Conservation Reserve Program.

This reach of stream is active with beaver and their dams have helped to aggrade bedload material and create significant pool habitats during the low flow part of the summer. There is the potential for future habitat restoration with the removal of remnant berms and by accessing former channels and side channel habitats which would reconnect the floodplain and provide off-channel habitat areas for fish

during periods of high flow. Below is an excerpt from the McKay Creek Restoration and Prioritization Plan discussing one potential site:

"Project 23 (RM 7.85, Rank 1): Several restoration projects have already been conducted within this reach, and it was decided to lower priority for further restoration here. One area that has proposed treatment is located at the very bottom of this reach, approximately RM 7.85 (Appendix A, Figure 6). A wide side-channel swale has developed with degraded connections to the main stem. The riparian corridor is quite wide on this side of the stream and the potential for success appears high. A healthy stand of mature trees has developed at this site and should be preserved for the valuable shading provided." (p.30)

In addition, this reach of McKay Creek is critical for the McKay Water Switch as it is seasonally dry and would probably benefit from the addition of water during critical spawning and migration periods for fish.

Stop 3 – McKay Creek, Semas Ranch

Stop Highlights

- Successful fish passage
- Potential for future habitat restoration
- Potential for flow restoration via the McKay Water Switch

Similar to the last stop, the CRWC worked with the owner of this ranch in 2012 to improve fish passage at an irrigation dam. Fish passage was provided using a natural bypass channel which was designed to meet State and Federal criteria.

This reach of stream has tremendous potential for future habitat restoration with the removal of remnant berms and by accessing former channels and side-channel habitats which would reconnect the floodplain and provide off-channel habitat areas for fish during periods of high flow (Figure 2). Below is a description of the suite of habitat restoration actions that could potentially occur on this site, taken from the McKay Creek Restoration and Prioritization Plan (p.30)

"Project 18 (RM 7.0, Rank 24): This area offers prime riparian width for floodplain activation and enhancement. Levee setback or complete removal would allow more full utilization of the riparian corridor through this highly straightened section of creek.

Project 19 (RM 7.1, Rank 12): This project would be similar in scope to number 18 while offering a fully forested riparian zone right and wide, levee-protected floodplain left. This area would benefit from added creek meanders and more natural floodplain activation.

Project 20 (RM 7.25, Rank 1): Upstream of a driveway bridge crossing the channel flows southwest through a straightened, confined riparian corridor. While quality vegetation is minimal and floodplains protected by levees, the potential corridor width is high and restoration treatments designed to more fully utilize the available area.

Project 21 (RM 7.4, Rank 1): This project should focus on expanding the riparian/floodplain zone to incorporate the intermittent mature canopy into riparian habitat. Removing channel-confining berms and replanting thin understory vegetation would have immediate benefits to aquatic habitat.

Project 22 (RM 7.6, Rank 12): The fish-bypass channel constructed around a diversion dam could be expanded further upstream through this project area. This zone is largely unvegetated and borders a large stand of mature cottonwood. Increasing the length of this bypass channel and adding riparian vegetation would create a large area of high-quality habitat."

In addition, this reach of McKay Creek is also critical for the McKay Water Switch as it is seasonally dry and would probably benefit from the addition of water during critical spawning and migration periods for fish.

Stop 4 – McKay Creek, Jones Dam and Santucci Ranch

Stop Highlights

- Successful fish passage
- Difference between middle and lower McKay Creek reaches
- Potential for flow restoration via the McKay Water Switch
- CRP as a restoration tool

Jones Dam marks the divide between the middle McKay Reach and lower McKay Reach. At Jones Dam, the Ochco Irrigation District's Ochoco Main Canal crosses under McKay Creek via a siphon that was installed in the early 2000s. The siphon allows unimpeded flow of McKay Creek and was installed toimprove fish passage. OID uses the site to take water from McKay Creek if needed, so a fish ladder was installed in 2009 to allow for fish passage when the flashboards are installed for water withdrawals. If the flashboards are not in place, stream flow can follow the natural channel through the site. In addition, this site is a point where OID diverts water from the Ochoco Main Canal into McKay Creek to be delivered downstream to OID patrons for irrigation. Water may also be released that is not needed for irrigation depending on the irrigation demands from the water users. Because of this, McKay Creek downstream of Jones Dam has stream flow for almost the entire year which results in significant hydrologic and geomorphic differences between the two reaches.

Santucci Ranches owns the property surrounding Jones Dam and they have partnered with the CRWC on instream habitat restoration projects in the past which have been very successful, and they are now

enrolled in the NRCS CRP program. There is the potential for more habitat restoration in the future as indicated by the comments from the McKay Creek Restoration and Prioritization Plan (p.28-29)

"Project 7 (RM 4.3, Rank 1): Riparian conditions are highly degraded as the creek approaches the McKay Road crossing. Riprap guarding bridge abutments extends upstream for about 100 feet, the upper extent of which could be replaced with LWD. Unstable banks and armoring continue upstream to approximately RM 4.45, offering an ideal length of restoration potential.

Project 8 (RM 4.6, Rank 1): At this location a low-water crossing has created a minor passage barrier due to the large rock and wood fencing constructed in channel. Here, placed LWD and rock exist both upstream and downstream, and improving the ford crossing to allow easier migration would benefit local fish populations.

Project 9 (RM 5.1, Rank 1): Both banks through this reach could benefit from adding LWD and removing riprap. Occasional-placed wood was found through this section at low densities, creating more significant bank protection with root wads that prevent further land loss while adding channel complexity and habitat quality.

Project 10 (RM 5.3, Rank 1): This location features less significant bank erosion but could still benefit from added wood in places. A side channel was noted just downstream of the photo included on Figure 4 of Appendix A. Reconfiguring and/or activating this channel would add some habitat complexity and slow flows in a largely straightened section of creek.

Project 11 (RM 5.4, Rank 1): Riparian vegetation and channel complexity is minimal through this reach. The channel is predominately a long, wide glide through this project area and banks feature minimal overhanging cover. The pools created by bank LWD installations would greatly increase the habitat value in this area, especially coinciding with riparian planting efforts.

Project 12 (RM 5.65, Rank 1): The left bank at this location offers a prime location for woody revetments (Figure 5, Appendix A). The vertical cut is more than 3 feet tall with unmanaged lands behind. It could be beneficial to consider increasing the meander size here to further lower river power at vulnerable downstream locations.

Project 13 (RM 6.15, Rank 12): At the upstream end of this reach, one project (RM 6.15) is located at an extremely tall and vulnerable cut bank (10+ feet) and would require a more complex structure than simple root wad revetments. Installing some sort of crib wall could prevent this bank from further encroaching onto valuable property."

Attachment 2
North Fork Beaver Creek Water Improvement Project

Channel and instream improvement designs developed with USBR grant funds can be found on the next pages.

Upper Beaver Creek Instream Habitat Improvement

Roughened Riffle and Large Wood Designs

Crooked River Watershed Council, Prineville, Oregon

Project Description

Beaver Creek is a tributary of the Crooked River approximately 80 miles east of the city of Prineville in Crook County Oregon. The North Fork of Beaver Creek is formed by the confluence of Rager, Powell, and Tamarack Creeks just outside of the Ochoco National Forest. North Fork of Beaver Creek is joined approximately 1 mile downstream by Beaver Dam Creek and approximately 2 miles further by the South Fork of Beaver Creek. The riparian landscape on the North Fork of Beaver Creek begins as a alluvial fan then transitions to a classic wet meadow complex. This area is dominated by beaver dams, multi-thread channels, a diverse and vigorous riparian vegetation community, and excellent fish and beaver habitat. However, as the stream channel flows downstream the valley narrows in this section the North Fork of Beaver Creek has incised anywhere from 3-12 feet because of channel changes downstream. The incision continues after the confluence of the North and South forks. The channel incision has disconnected the floodplain, reduced the amount of riparian and floodplain vegetation, and increased channel velocities and channel discharges during high flow events. The combination of these effects has resulted in no beaver activity in this section of the channel which only further degrades the channel over time.

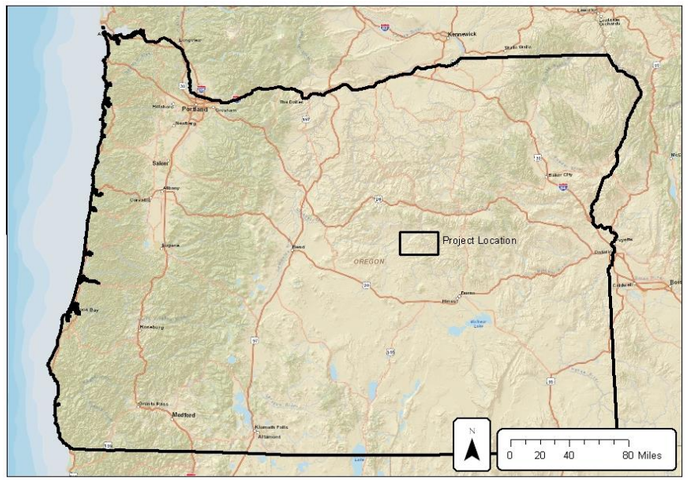
Three roughened riffles will be constructed in the project area using larger rock intermixed with smaller rock to create a natural riffle feature within the stream. The objectives for these design features are to:

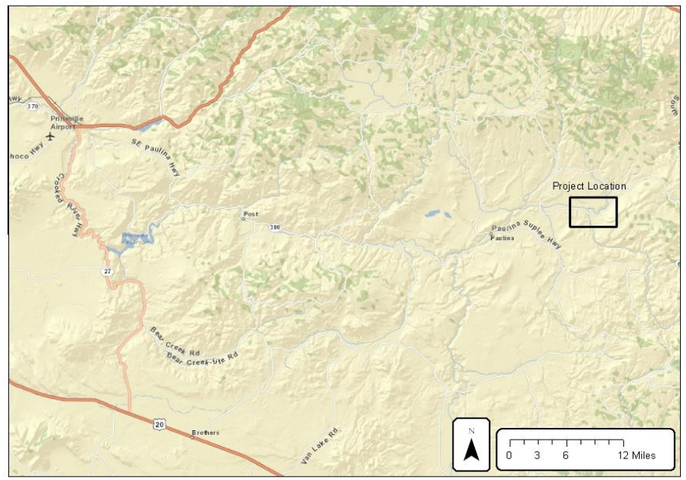
1) add roughness to the stream channel which currently lacks instream roughness;
2) provide a channel grade control for sediment aggradation;
3) provide riffle habitat for aquatic organisms;
4) allow high flows to activate the floodplain and side channel habitat;
5) provide suitable dam building habitat for beavers.

Project Team

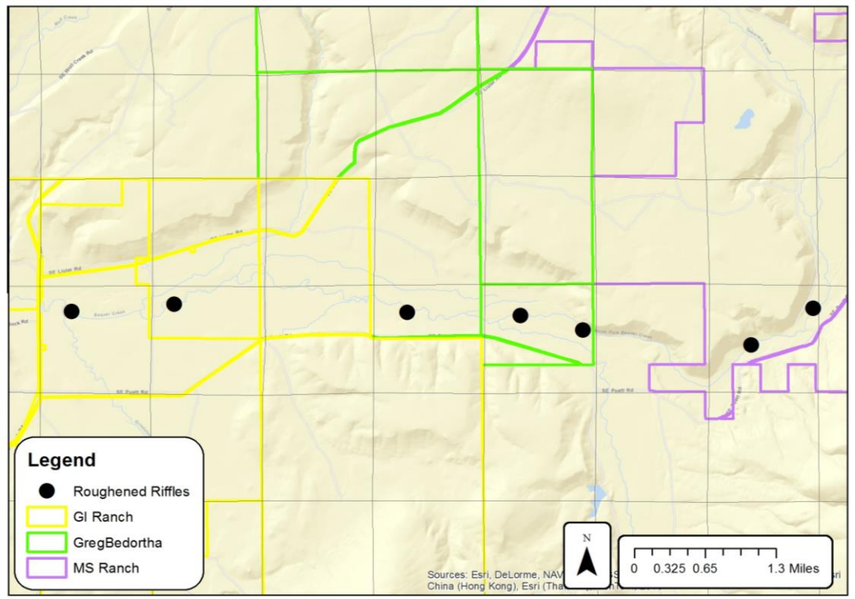
Landowners	
Bedortha Ranches	Greg Bedortha, Owner
GI Ranch Corporation	Casey Thomas, Ranch Manager
MS Ranch	Ray Sessler, Owner
Agency Staff	
Garry Sanders	CRWC Project Manager
Libby Stahancyk	SWCD Conservation Technician
Diane Hopster	CRWC Hydrologist
Dirk Renner	USFWS Fish Biologist

Project Vicinity Maps





Project Locations



Sections 22 and 24 of T. 16S, R. 24E and sections 19 and 21 of T. 15S, R. 24E

Upper Beaver Creek HUC 1707030308

Crook County, Oregon

USGS Quadrangle maps Mud Spring and Powell Mountain

Designed	TGS	Date	6/9/2014
Drawn	TGS	Date	6/9/2014
Project Name	Upper Beaver Creek		
Grant Number	NA		

Cover Sheet and Notes

Upper Beaver Creek Roughened Riffle Design

Crook County, Oregon; HUC 1707030308

Drawing No. **NA**

Sheet _1_ of _6_

Roughened Riffle Description

The simplest form of a grade control structure consists of placing natural stone or other erosion resistant elements across the channel to form a hard point. Construction of bed sills is sometimes accomplished by placing the rock along the streambed to act as a hard point to resist the erosive forces within the degradational zone. In other situations, a trench may be excavated across the streambed and then filled with rock. A unique type of loose rock structure is used by Newbury and Gaboury (1993). These are often referred to as Newbury riffles (roughened riffles). The structures are placed at 5 to 7 channel widths spacing to emulate the spacing of natural riffles. Loose rock structures are generally most effective for drop heights that are less than about 2 to 3 feet.

Structure type	Advantages	Disadvantages
Loose rock structures	Economical to design and build Limited environmental impacts Ease of construction	Generally limited to less than about 3 ft drop heights Potential for displacement of rock due to seepage flows

-- Taken from NRCS Stream Restoratin Design Handbook pages TS14G5-6

Beaver Creek Reach Characteristics

	North Fork	South Fork	Main Stem
Drainage Area (mi.^{2})	66	103	169
Average Reach Slope	0.00301	NA*	0.00427
Bankfull Width (ft.)	24	NA*	42
2 year flow (cfs)	556	397	692
10 year flow (cfs)	1180	1181	2176
25 year flow (cfs)	1560	1749	3284
100 year flow (cfs)	2200	2782	5356
In-water work period		July 1-October 31	

* -- South Fork Beaver Creek was not surveyed for this project

Completed Roughened Riffles with LWD and Scour Pools

Designed	TGS	Date	6/9/2014
Drawn	TGS	Date	6/9/2014
Project Name	Upper Beaver Creek		
Grant Number	NA		

Design Data

Upper Beaver Creek Roughened Riffle Design
Crook County, Oregon; HUC 170703080

CRWC
Crooked River Watershed Council

Drawing No. **NA**

Sheet _2_ of _6_

Beaver Creek, Bedortha Ranches, Site 1 (downstream)

Beaver Creek, Bedortha Ranches, Site 2 (middle)

Beaver Creek, Bedortha Ranches, Site 3 (upstream)

Designed	TGS	Date	6/9/2014
Drawn	TGS	Date	6/9/2014
Project Name	Upper Beaver Creek		
Grant Number	NA		

Site Photos

Upper Beaver Creek Roughened Riffle Design
Crook County, Oregon; HUC 170703030

CRWC
CROOKED RIVER WATERSHED COUNCIL

Drawing No. **NA**

Sheet _3_ of _6_

Beaver Creek, MS Ranch, Site 1 (downstream)

Beaver Creek, MS Ranch, Site 2 (upstream)

Beaver Creek, GI Ranch, Site 1 (downstream)

Beaver Creek, GI Ranch, Site 2 (upstream)

Designed	TGS	Date	6/9/2014
Drawn	TGS	Date	6/9/2014
Project Name	Upper Beaver Creek		
Grant Number	NA		

Site Photos

Upper Beaver Creek Roughened Riffle Design
Crook County, Oregon; HUC 170703030 8

CRWC
CROOKED RIVER WATERSHED COUNCIL

Drawing No. **NA**

Sheet _4_ of _6_

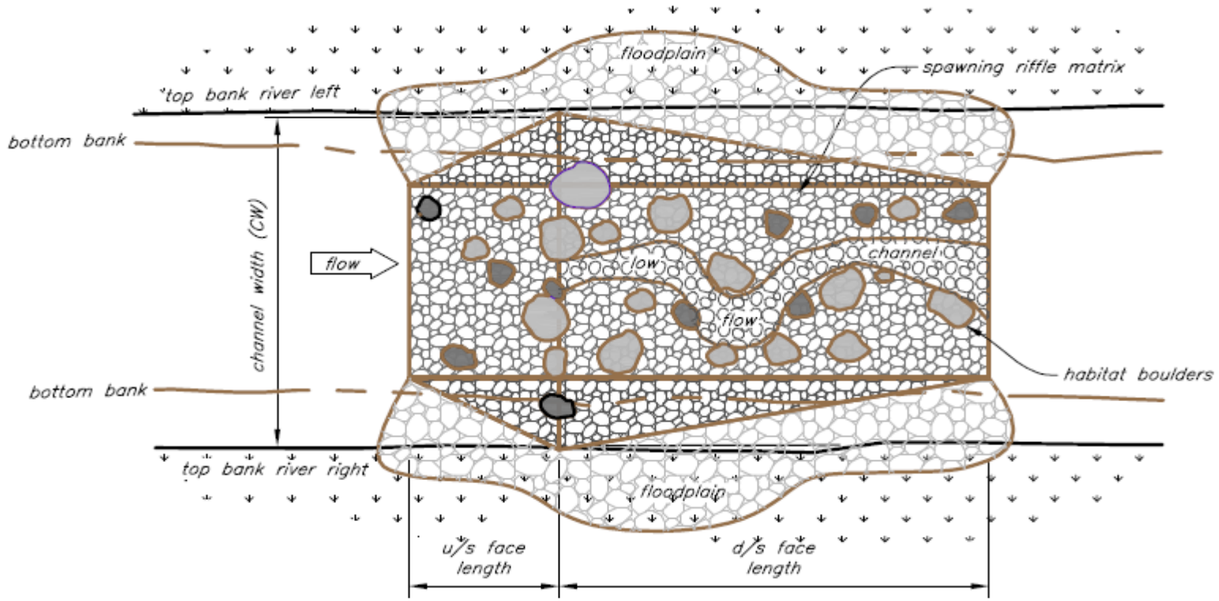
Conceptual roughened riffle design with a 12:1 downstream slope and a 4:1 upstream slope.

Construction Notes

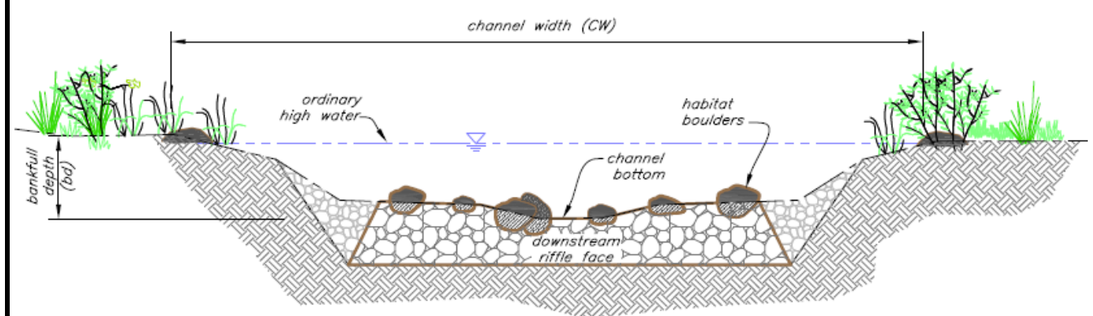
- All construction areas will be isolated using sediment curtains, coffer dams, or bulk bags and salvaged for fish before construction begins.
- Overexcavate project site 12” before construction and retain native streambed material for top dressing of fill. Top dress geomorphic weir with native material to simulate natural riffle.
- Roughened riffle should be constructed in 6" lifts with fines added and washed in by filling the excavator bucket with water and washing the matrix of rock and fines. Successful washing in will be determined by minimization of voids in the rock matrix and ponding of water on the surface of the lift with minimal percolation into the matrix.
- Boulder elements should be placed in random patterns that replicate natural stream conditions and boulders should be embedded at least ½ of diameter size.
- Habitat boulders will be placed as a component of the riparian restoration in reaches where the stream bed consists predominantly of coarse gravels or cobbles. Boulder placement may not exceed 25% of the cross-sectional area of the low flow channel or be placed to shift the flow to a single flow pattern in the middle or to the side of the stream.
- Boulder placement increases habitat diversity and complexity, improves flow heterogeneity, provides substrate for aquatic invertebrates, and provides velocity refugia for fish during high flows. Boulders provide large scale roughness during high glow and hydraulic variability under low flow conditions. Hydraulic effect includes spawning material retention and deposition along upstream riffle face. Elements placed along the riffle face provide disruption of average velocity gradients and serve a grade control function for the overall geomorphic unit.

Estimated Structure Size and Materials Quantities

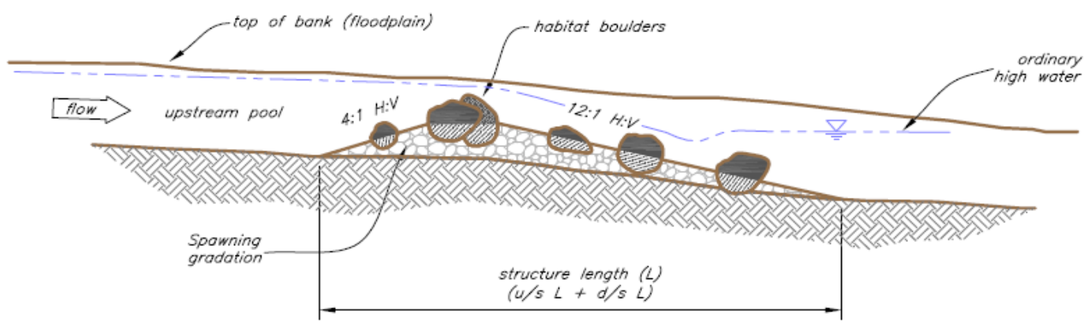
Location	Bankfull Width (ft.)	Total Height (ft.)	Riffle Length (ft.)	Volume/Structure	Total Volume (yd^3)
North Fork (3 riffle)	24	3	36	96	288
Mainstem (4 riffles)	42	2	24	75	300
Total Material For Project					588



PLAN



SECTION



PROFILE

Designed	TGS	6/9/2014
Drawn	TGS	6/9/2014
Project Name	Upper Beaver Creek	
Grant Number	NA	

Roughened Riffle Design
Upper Beaver Creek Roughened Riffle Design
Crook County, Oregon; HUC 170703308

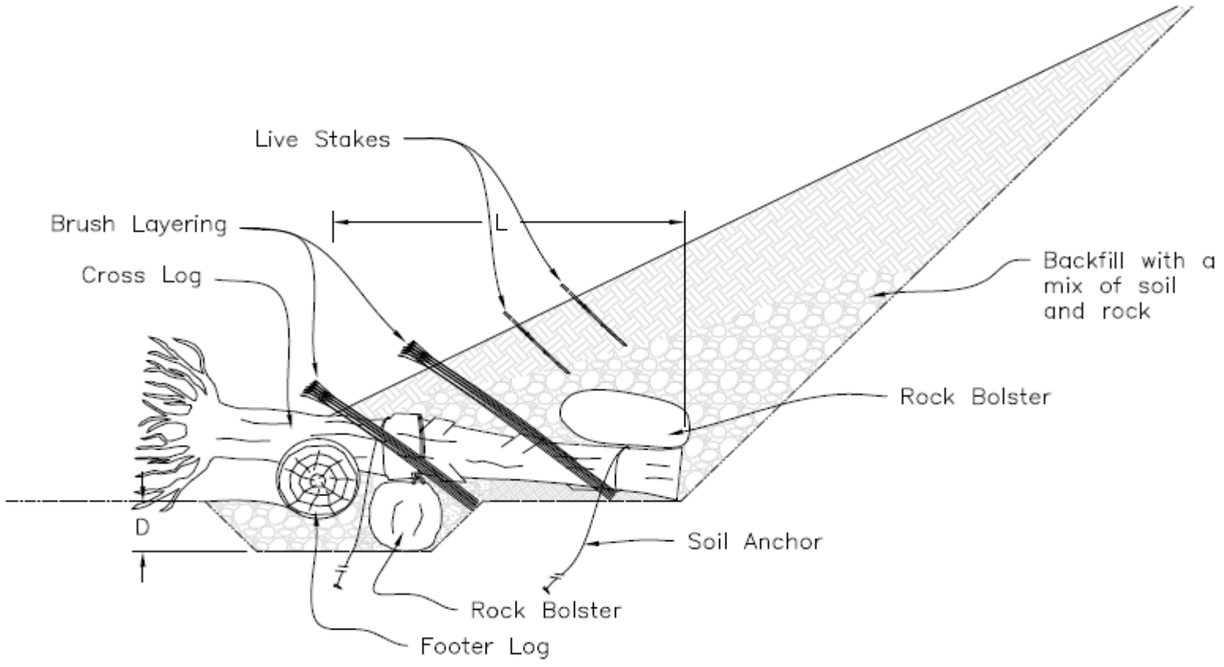
CRWC
CROOKED RIVER WATERSHED COUNCIL

Drawing No. **NA**

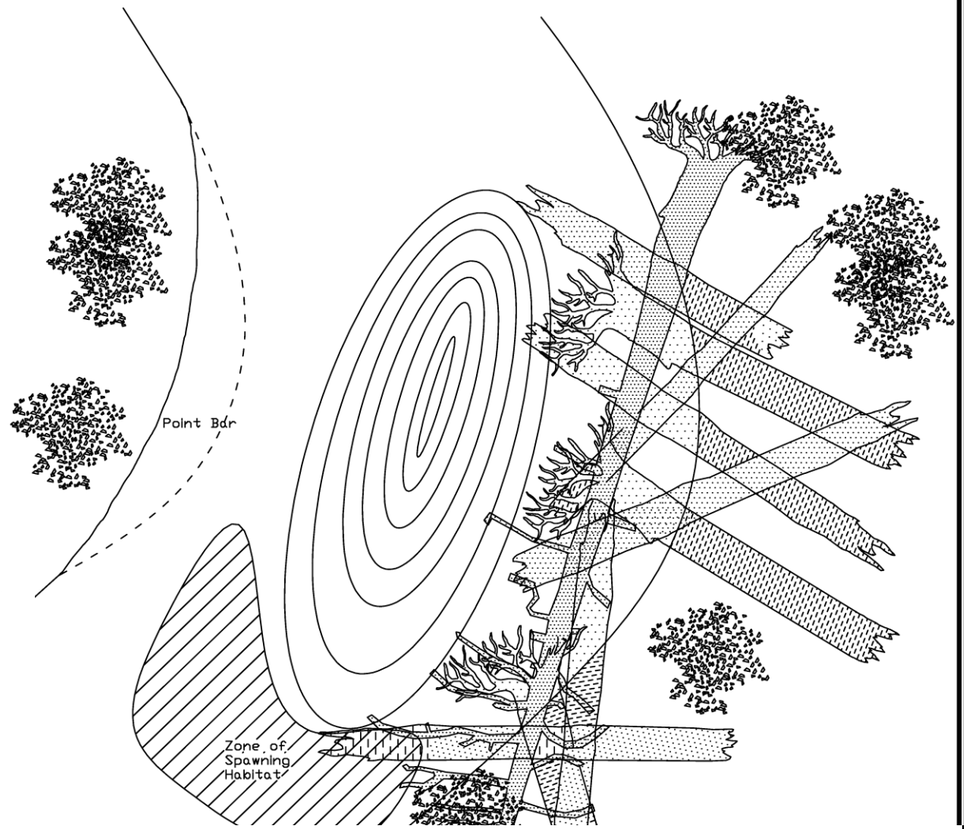
Sheet _5_ of _6_

Construction Notes

- All construction areas will be isolated using sediment curtains, coffer dams, or bulk bags and salvaged for fish before construction begins.
- Excavate bank to base of existing slope before placement of the footer log(s). Retain bank material for backfilling and shaping of bank once wood is placed.
- Logs should be placed in random patterns that replicate natural log jams and logs should be embedded at least 2/3 of bole length into the bank to ensure enough ballast to prevent movement.
- Boulders will be placed as ballast at key points in the log jam complex.
- Bank jams should be built in lifts, with the top of the log jam at the bankfull or ordinatry high water level to ensure adequate bank protection. Bank jams will be constructed alongside the roughened riffles and extended up and downstream to ensure bank protection around the instream habitat features and to prevent high flows from eroding around the roughened riffles.
- Log size should be a minimum of 12" diameter at the base with an attached root wad of 6' minimum. Log bole length should be 16' minimum. Branches and limbs can be used to fill voids and for brush packing within the jam and around the key log pieces.
- Logs will be anchored with soil and rock only and will not be pinned or cabled together
- Footer logs will not have rootwads attached
- All logs used for construction must be western juniper



SECTION



PLAN

Revegetation Notes

- Live stakes of willows will be harvested on site and planted 2' on center around LWD throughout the log jam complexes.
- Live stakes will be embedded at a minimum of 18" to ensure access to the water table at low flow.
- Brush layering and the placement of live cuttings will occur during backfill to increase success of revegetation.
- Soil anchors WILL NOT BE USED, instead, logs will be sized to withstand high flows and the logs will be ballasted with a combination of rock and soil.
- Bank shaping will be at a slope of 3:1 or less, with a target slope of 1:2.

Designed	TGS	Date	6/9/2014
Drawn	TGS	Date	6/9/2014
Project Name	Upper Beaver Creek		
Grant Number	NA		

Bank Log Jam Design

Upper Beaver Creek Roughened Riffle Design

Crook County, Oregon; HUC 170703080

CRWC
CROOKED RIVER WATERSHED COUNCIL

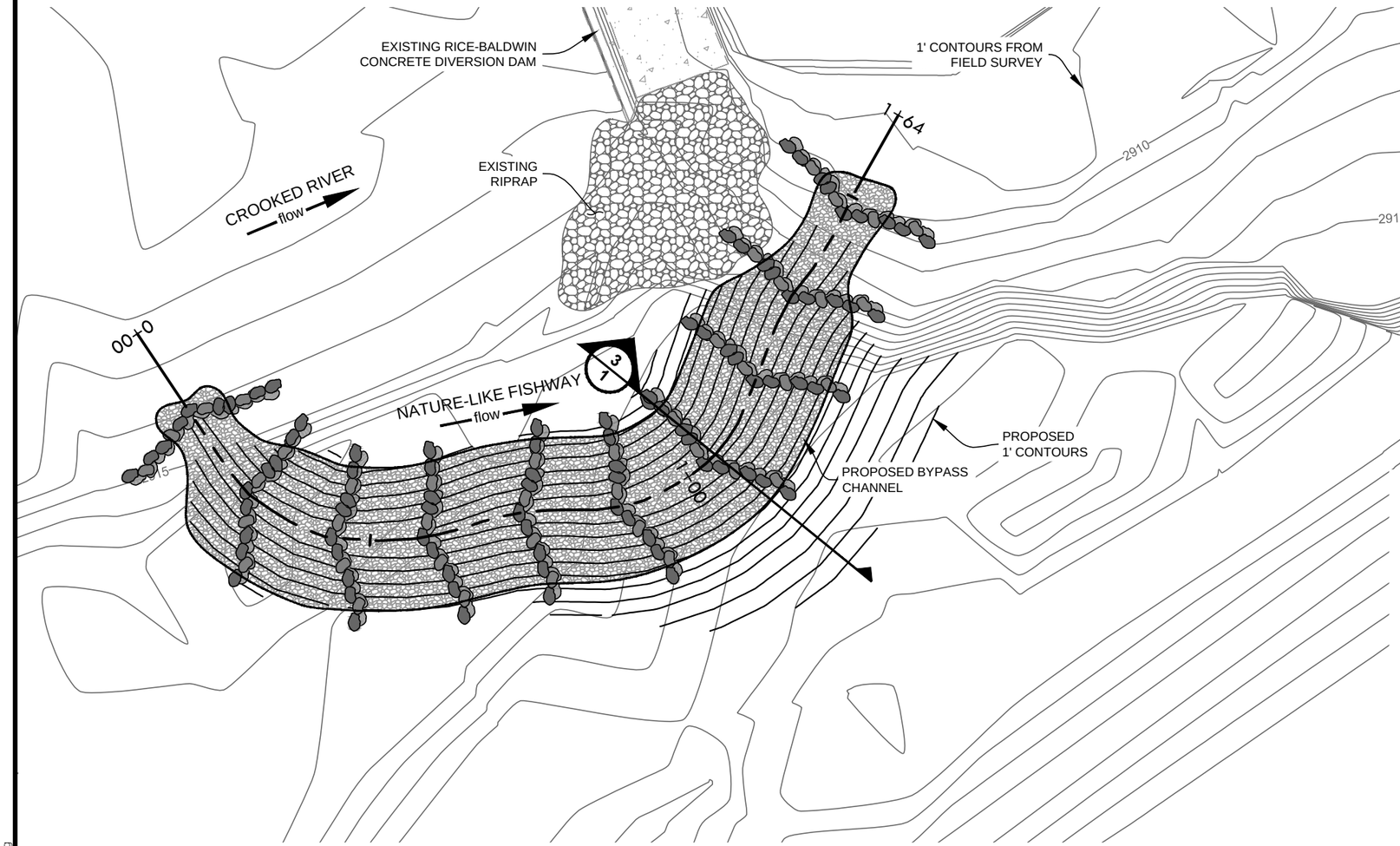
Drawing No. **NA**

Sheet _6_ of _6_

Attachment 3
Rice-Baldwin Dam Fish Passage & Water Efficiency Project

Three conceptual level alternatives for fish passage at the site

ALTERNATIVE 1



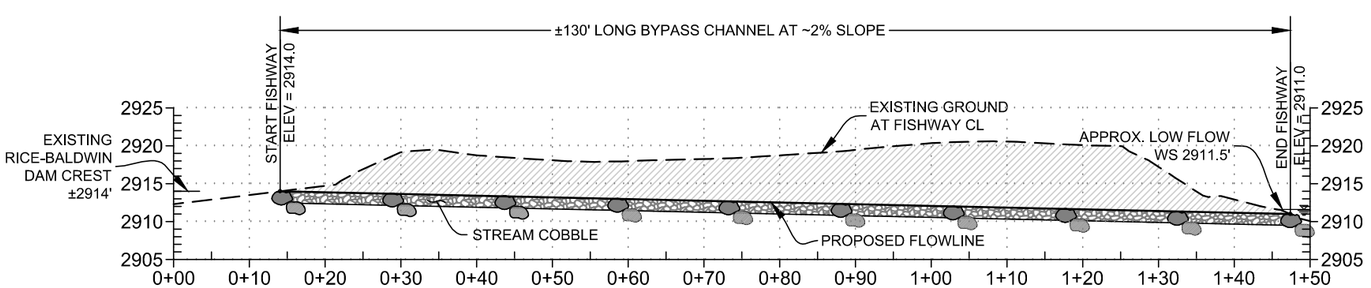
GENERAL NOTES: NATURE-LIKE FISHWAY

ALTERNATIVE WOULD INCLUDE LEAVING THE EXISTING DAM STRUCTURE IN PLACE AND CONSTRUCTING A NEW NATURE-LIKE FISH BYPASS CHANNEL AROUND THE SOUTH END OF THE DAM STRUCTURE.

ROUND ROCK WOULD BE USED TO CREATE THE MATRIX MATERIAL FOR THE CHANNEL WITH FINER GRAVELS AND COBBLE USED TO SEAL THE BED MATERIAL TO PREVENT DEWATERING DURING LOW FLOWS.

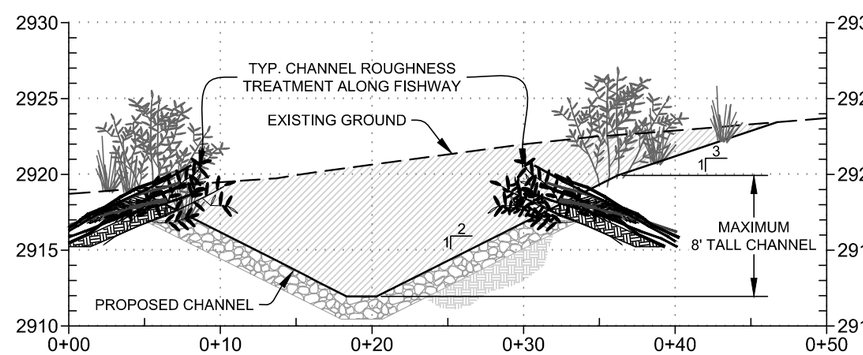
1 NATURE-LIKE FISH WAY

1" = 20'



2 SOUTH FISHWAY PROFILE

HORIZ 1" = 20'
VERT 1" = 20'



3 TYPICAL FISHWAY SECTION

HORIZ 1" = 10'
VERT 1" = 10'

RIVER DESIGN GROUP, INC.
236 Wisconsin Avenue
Whitefish, MT 59937
406.862.4927
311 SW Jefferson Avenue
Corvallis, OR 97333
541.738.2920

FISH PASSAGE ALT 1
NATURE-LIKE FISHWAY (RIGHT)
RICE-BALDWIN FISH PASSAGE
CROOKED RIVER - PRINEVILLE, OREGON

NO.	DATE	BY	DESCRIPTION	CHK
1	09/15/14	TF	DRAFT	SW

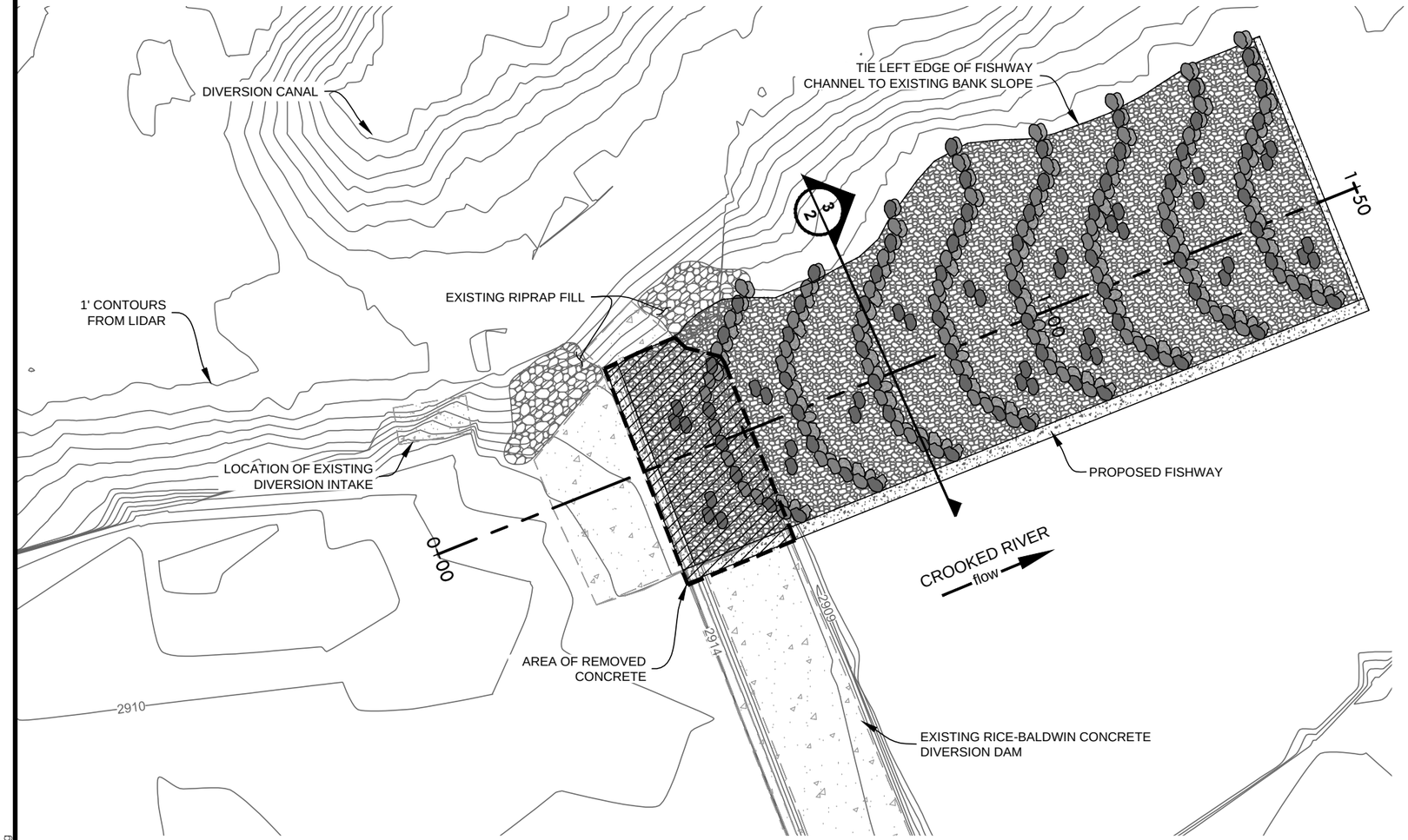
PROJECT NUMBER
RDG-14-051

DRAWING NUMBER
1

Drawing 1 of 3

M:\Client-Data\2014\RDG-14-051 Rice-Baldwin Dam Fish Passage\CAD\10-(Rice Baldwin).dwg

ALTERNATIVE 2



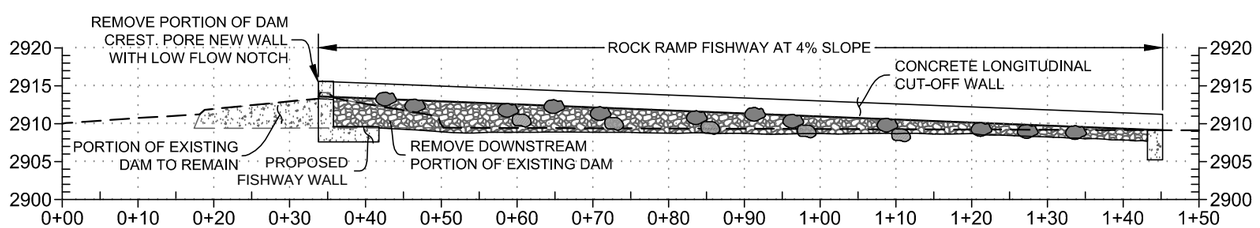
1 ROCK RAMP FISHWAY LAYOUT

1" = 20'

GENERAL NOTES: ROCK RAMP FISHWAY

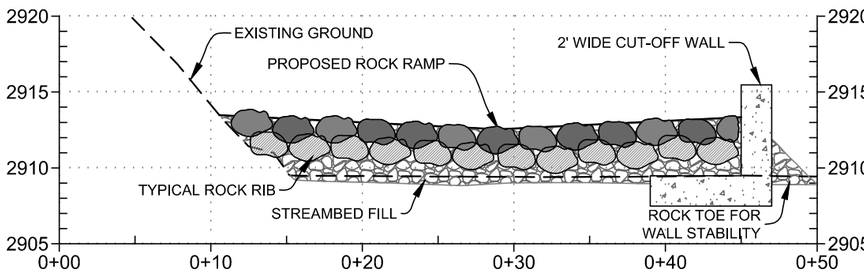
ALTERNATIVE WOULD INCLUDE CONSTRUCTING A LOW FLOW NOTCH IN THE RIVER-LEFT SIDE OF THE EXISTING DAM AND INSTALLING A FISHWAY (ROCK RAMP).

A LONGITUDINAL CUT-OFF WALL WOULD BE BUILT TO PARTITION THE ROCK RAMP FROM THE REST OF THE CHANNEL. THE PARTITION WALL WOULD EXTEND DOWNSTREAM FROM THE DAM IN ORDER TO CREATE A GRADUAL ENOUGH SLOPE TO ENSURE ROCK RAMP STABILITY AND MEET MAXIMUM SLOPE CRITERIA FOR PASSAGE. LARGE BOULDERS (>2 FT DIAMETER) WOULD BE IMPORTED TO CREATE THE INTERNAL FRAMEWORK OF THE ROCK RAMP. A CONCRETE CUT-OFF WALL WOULD BE CONSTRUCTED AT THE DOWNSTREAM END TO MAINTAIN ROCK RAMP BED MATERIAL STABILITY. ANGULAR ROCK WOULD BE USED TO CREATE THE MATRIX MATERIAL FOR THE STRUCTURE WITH FINER GRAVELS AND COBBLE USED TO SEAL THE ROCK RAMP BED TO PREVENT DEWATERING DURING LOW FLOWS.



2 TYPICAL RAMP PROFILE

HORIZ 1" = 20'
VERT 1" = 20'



3 TYPICAL RAMP SECTION

HORIZ 1" = 10'
VERT 1" = 10'

RIVER DESIGN GROUP, INC.
236 Wisconsin Avenue
Whitefish, MT 59937
406.862.4927
311 SW Jefferson Avenue
Corvallis, OR 97333
541.738.2920

FISH PASSAGE ALT 2
ROCK RAMP FISHWAY
RICE-BALDWIN FISH PASSAGE
CROOKED RIVER - PRINEVILLE, OREGON

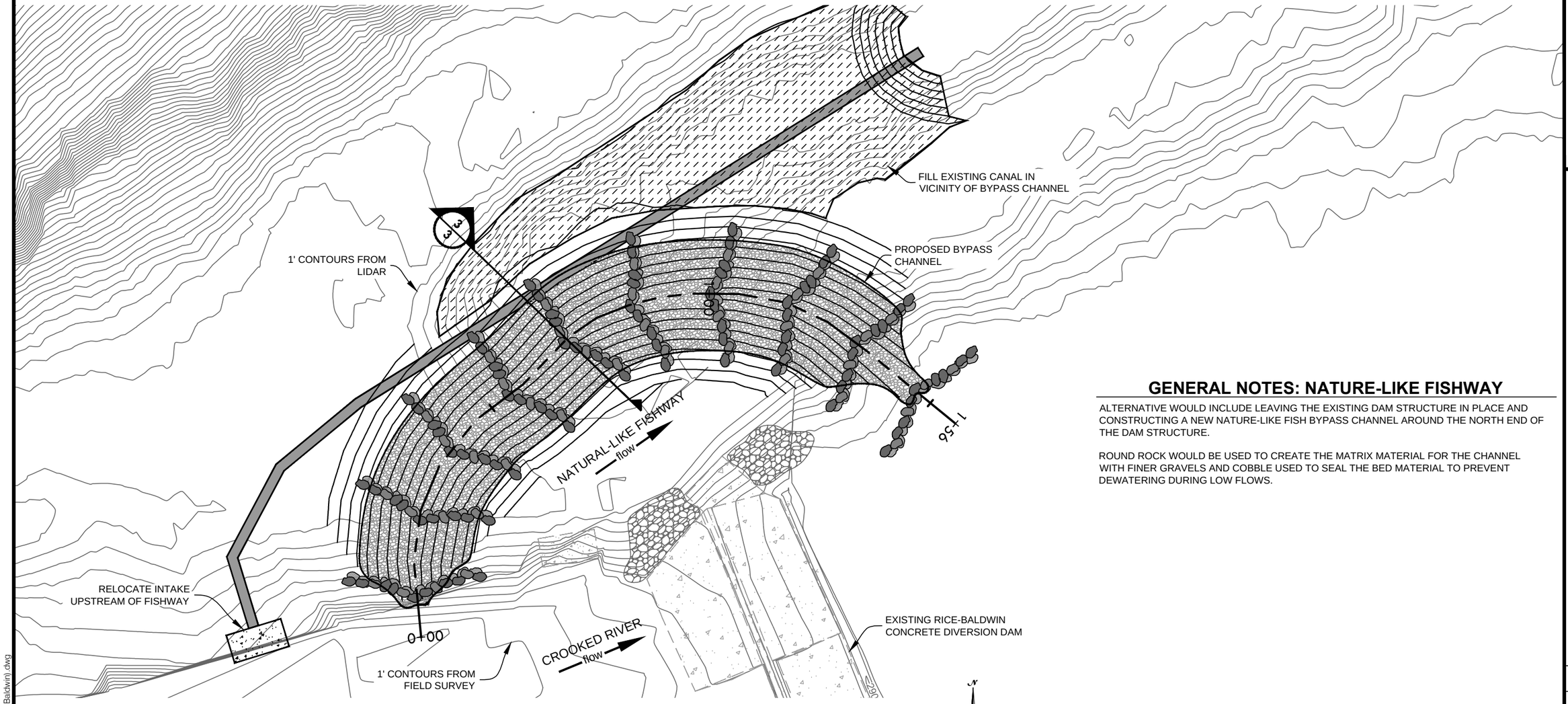
NO.	DATE	BY	DESCRIPTION	CHK
1	09/15/14	TF	DRAFT	SW

PROJECT NUMBER
RDG-14-051

DRAWING NUMBER
2

M:\Client-Data\2014\RDG-14-051 Rice-Baldwin Dam Fish Passage\CAD\10-(Rice_Baldwin).dwg

ALTERNATIVE 3



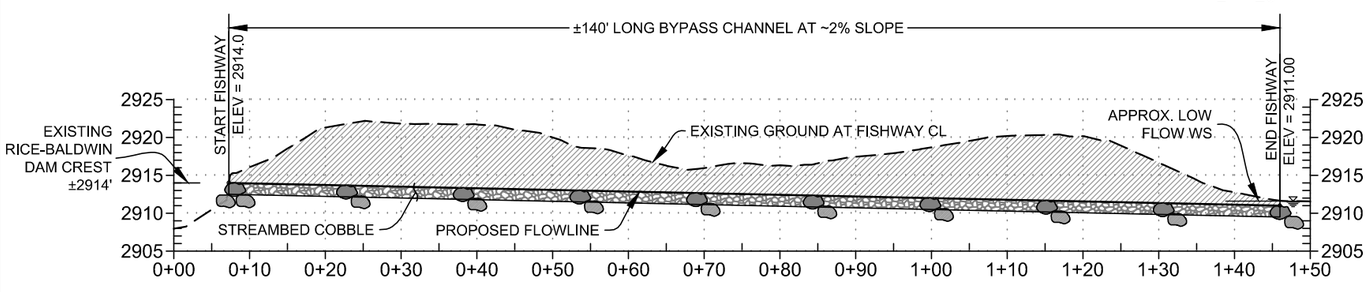
1 NATURE-LIKE FISHWAY

1" = 20'

GENERAL NOTES: NATURE-LIKE FISHWAY

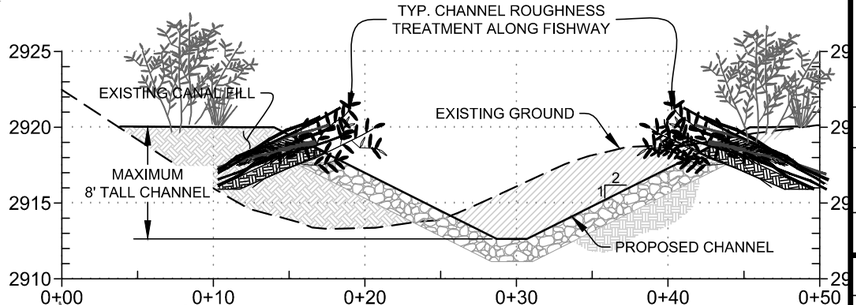
ALTERNATIVE WOULD INCLUDE LEAVING THE EXISTING DAM STRUCTURE IN PLACE AND CONSTRUCTING A NEW NATURE-LIKE FISH BYPASS CHANNEL AROUND THE NORTH END OF THE DAM STRUCTURE.

ROUND ROCK WOULD BE USED TO CREATE THE MATRIX MATERIAL FOR THE CHANNEL WITH FINER GRAVELS AND COBBLE USED TO SEAL THE BED MATERIAL TO PREVENT DEWATERING DURING LOW FLOWS.



2 NORTH FISHWAY PROFILE

HORIZ 1" = 20'
VERT 1" = 20'



3 TYPICAL FISHWAY SECTION

HORIZ 1" = 10'
VERT 1" = 10'

RIVER DESIGN GROUP, INC.
311 SW Jefferson Avenue
Corvallis, OR 97333
541.738.2920
236 Wisconsin Avenue
Whitefish, MT 59937
406.862.4927

FISH PASSAGE ALT 3
NATURE-LIKE FISHWAY (LEFT)
RICE-BALDWIN FISH PASSAGE
CROOKED RIVER - PRINEVILLE, OREGON

NO.	DATE	BY	DESCRIPTION	CHK
1	09/15/14	TF	DRAFT	SW

PROJECT NUMBER
RDG-14-051

DRAWING NUMBER
3

Drawing 3 of 3

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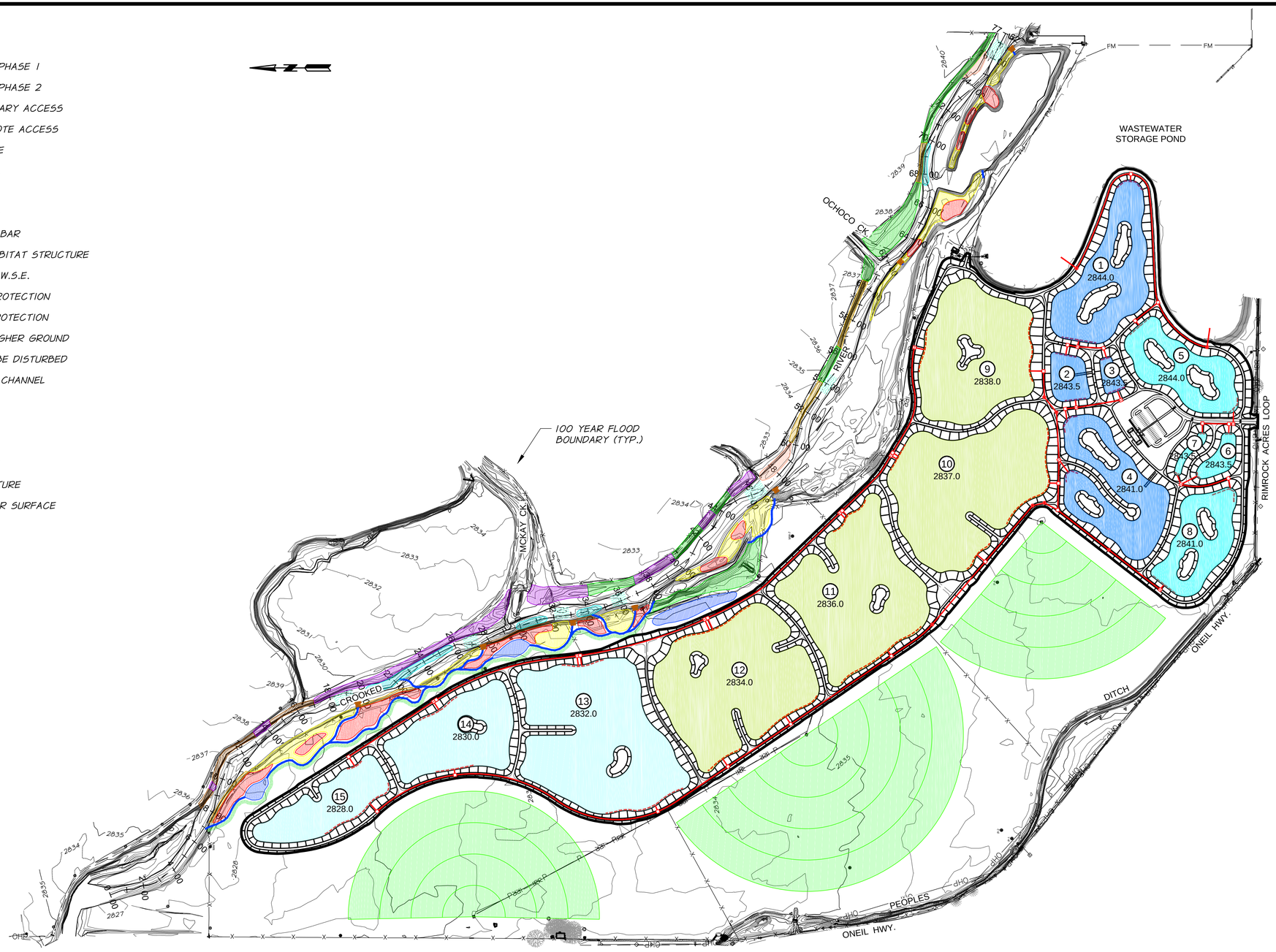
Attachment 4
City of Prineville Wetland Project

a. Final Design layout (summary level)
b. Cross section view of conceptual changes
c. Outreach overview for public

LEGEND

- CONSTRUCTED WETLANDS - PHASE 1
- CONSTRUCTED WETLANDS - PHASE 2
- DISPOSAL WETLANDS - PRIMARY ACCESS
- DISPOSAL WETLANDS - REMOTE ACCESS
- PIVOT IRRIGATION COVERAGE
- RIPARIAN - PROPOSED POOL
- RIPARIAN - PLANTINGS
- RIPARIAN - EXISTING RIFFLE
- RIPARIAN - EXISTING POINT BAR
- RIPARIAN - LARGE WOOD HABITAT STRUCTURE
- RIPARIAN - CUT TO 2 YEAR W.S.E.
- RIPARIAN - TYPE 2 BANK PROTECTION
- RIPARIAN - TYPE 1 BANK PROTECTION
- RIPARIAN - UNDISTURBED HIGHER GROUND
- RIPARIAN - AREAS NOT TO BE DISTURBED
- RIPARIAN - PROPOSED SIDE CHANNEL
- PIPING
- PERFORATED PIPE
- MANHOLE
- LEVEL CONTROL STRUCTURE
- DIVERSION CONTROL STRUCTURE
- (10) 2837.5 — WETLAND NUMBER AND WATER SURFACE ELEVATION



			300 0 300 600 900 SCALE IN FEET	THIS DRAWING HAS BEEN REDUCED 50%. ADJUST SCALE ACCORDINGLY. BARSCALE SHOWN IS ACCURATE.	anderson perry & associates, inc. engineering • surveying • natural resources LA GRANDE, OR. WALLA WALLA, WA.
REVISION	BY	DATE	HORZ. SCALE 1"=300'	VERT. SCALE	
DESIGNED BY	XREFS: TB-Prineville.dwg		JOB NUMBER 1260-10	DATE 2013	
DRAWN BY D. CHRISTMAN			ACAD FILE: ProjectDisplay.dwg		
REVIEWED BY			COPYRIGHT 2013 BY ANDERSON PERRY & ASSOC., INC.		

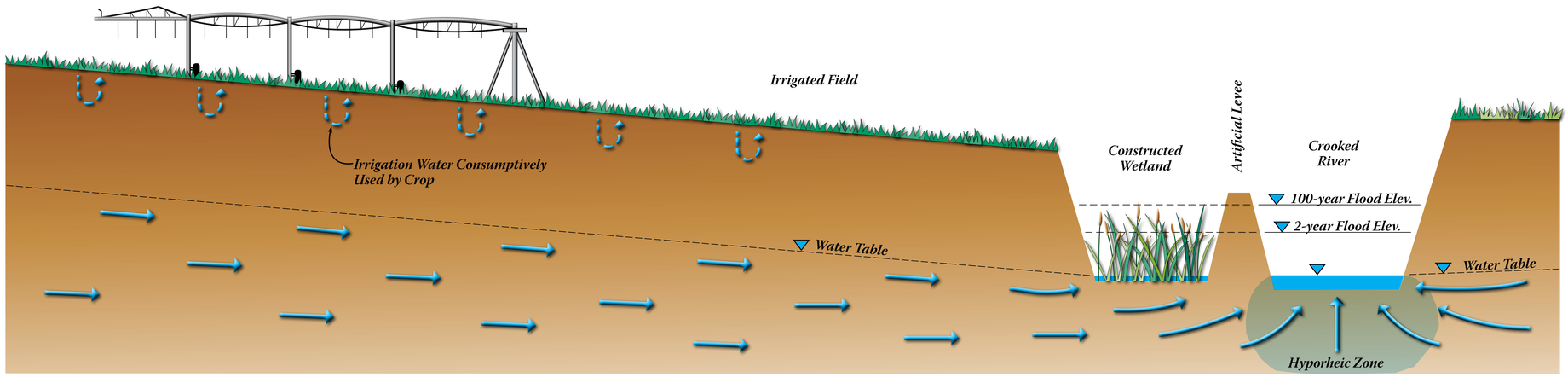
PRELIMINARY

CITY OF PRINEVILLE

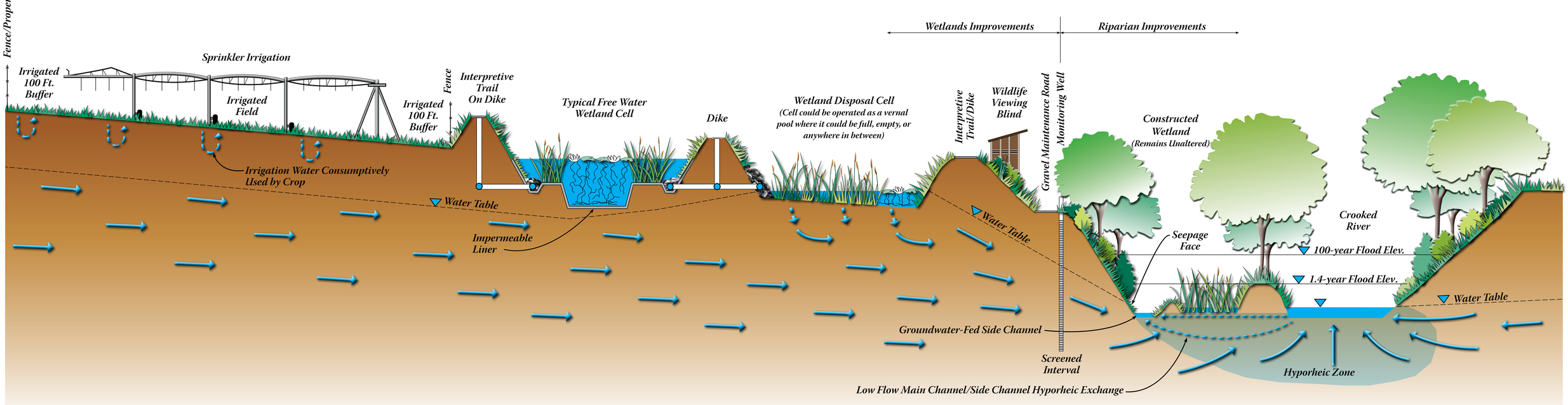
WASTEWATER SYSTEM IMPROVEMENTS

SITE PLAN

SHEET



Existing Site Profile



Conceptual Wetlands Profile - Option 1

CITY OF
PRINEVILLE, OREGON
CROOKED RIVER WETLANDS PROJECT

anderson perry & associates, inc.
engineering · surveying · natural resources

Crooked River Wetland Project

The City of Prineville recently began investigating an alternative effluent disposal processes that would enhance the existing lagoon treatment system at its Wastewater Treatment Plant. Wetland based water reclamation (reuse) systems are currently being used by some Oregon communities to dispose of wastewater effluent in an efficient and ecologically sound fashion. Throughout Oregon, cities are successfully using constructed wetlands to beneficially utilize effluent and improve environmental values. The first of these cities to utilize "wetland" disposal was La Grande, which developed the Ladd Marsh Wastewater Disposal Facility in 2003. Effluent from La Grande's facility now travels through a constructed wetland network where it is acted upon by plants and naturally occurring microbes further improving water quality. This project was successful in developing extensive wetland areas and wildlife habitat. Governor Kulongoski awarded this project the "Award of Excellence" in 2003.

Once Prineville identified this environmentally beneficial process for its effluent disposal, studies were undertaken to confirm that the City owned pasture lands, located adjacent to the Crooked River, would support a constructed wetland. The City conducted a soil characteristic analysis, a hydraulic balance and a preliminary groundwater assessment, all with positive results. At build out, this constructed wetland is expected to release 2,000,000 gallons of cooler, cleaner water into the Crooked River each day through percolation from the wetlands to the river. This will improve habitat for the recently reintroduced Steelhead by augmenting stream flows during the summer months.

The Crooked River Wetland will be located on approximately 280 acres of city owned property. The project will include several miles of hiking trails for the citizens of Prineville and visitors alike. Educational opportunities will abound, benefiting local school districts. Related improvements to three miles of riparian habitat along the Crooked River will be completed as well. This will be an outstanding project for the local community.

Project implementation is planned to occur over the next several years. The permitting, archeological, environmental and design stage is estimated at $450,000. Total construction costs are estimated at approximately $8,500,000. The City needs to identify project partners. Despite the City's severe financial limitations, it has budgeted $75,000.00 for this effort for the next several years. If funding partners are identified this year, full design and planning could be complete by 2014, with construction estimated to be complete in 2017 or sooner.

Attachment 5
Fin Safe Program

a. Copy of complete draft OWEB Technical Assistance grant application
b. Scope of Work for design phase

CRWC
CROOKED RIVER WATERSHED COUNCIL

498 SE Lynn Blvd.
Prineville, Oregon 97754

Phone: (541) 447-8567 **Fax**: (541) 416-2115

contact@crwc.info
www.crookedriver.deschutesriver.org

Juniper Davis
Special Investments Program Coordinator- OWEB
775 Summer Street NE, Suite 360
Salem, OR 97301-1290

July 28, 2014

Ms. Davis,

Please accept this cover letter as part of our technical assistance grant application materials. I would like it included in the materials reviewed by the technical review team.

The grant application requests $31,500 in OWEB support for a design project that will total $42,000. In addition to the core work of designing universally-fitting fish screening solutions for the 30-plus private irrigation diversions in the target geography, we will also be conducting a pilot project to field test initial designs. These pilot projects will recruit both a large and small diversion pump landowner to reflect the range of sizes that will be encountered in the program at implementation.

We will also be initiating some general information outreach to all qualified landowners in the target geography, but I wanted to let you know we plan to execute these activities primarily with in-kind match resources. In an effort to compress time and get this program to implementation quickly so as to better respond to reintroduced anadromous fish present in the Crooked River, we are attempting to address design needs while concurrently deploying some outreach and awareness materials to support the upcoming programs implementation phase.

With regards to the CRWC in-kind and cash match contributions, I want the team to know that these commitments are supported by resources we received from Portland General Electric in support of the Fin Safe program (donation letter attached to application). This very generous contribution will be used, in part, to meet the CRWC match levels.

Lastly, I also want the team to be aware that the final application and budget reflect our response to some preliminary concerns for costs expressed by Brett Hodgson, ODFW- Bend. Hodgson was concerned that the design phase was too expensive relative to the proposed OWEB investment level. Incorporating this informal feedback by adding more match and reworking some of the key budget lines allowed us to reduce the OWEB request by 42.8%. Even though Hodgon's concern was not specifically quantified, we feel and hope that this reduction addressed his concerns for OWEB investment level.

Installation of screens that meet current fish screening criteria and, more importantly, protect smaller-sized fish from entering irrigation delivery systems, is a critical task and need that must be addressed to support reintroduction in the larger Deschutes Basin. The Crooked River system, as part of this geography, is documented as being the preferred destination for incoming anadromous adults.

Chris M. Gannon
Director
Crooked River Watershed Council

TECHNICAL ASSISTANCE GRANT APPLICATIONS

Revised
January 2014

OWEB's Mission
To help protect and restore healthy watersheds and natural habitats that support thriving communities and strong economies.

All sections of applications, including the new budget form, must be completed using the January 2014 application forms. Applications submitted using previous forms will not be accepted.

GENERAL INSTRUCTIONS

1. **OWEB requested amount cannot exceed $50,000 on any technical assistance application.**
2. Read the "Instructions for Completing Technical Assistance Grant Applications" before beginning your application.
3. Please use **8½″ x 11″** paper. A double-sided application and materials are **optional** except for oversized maps and designs or multiple sets for reviewers. All materials included with the application should be **single-spaced** wherever possible, **unstapled and unbound**.
4. Avoid color and detail that will not photocopy clearly, with the exception of one color map (see below*).
5. Complete Sections I, II and III.
6. Complete the required forms and attachments: Section IV and Attachments A and B.
7. Read and sign the Technical Assistance Grant Application (Section I Certification).

*** IMPORTANT:** Submit **one COLOR project location map** on 8½″ x 11″ paper. The required color map will be used to track project locations, and a color map provides the identifying features that are not legible in black and white. **If there are photo(s), maps(s) or design(s) that you want the reviewers to see in color, supply 25 copies of each. If more than one map/photo/design is included, assemble and staple as a set; provide 25 sets for distribution to reviewers. This is the only exception to the use of staples.**

SUBMISSION OF GRANT APPLICATIONS

Grant applications may be submitted to OWEB by hard copy via mail or delivery to our Salem office.
No faxes or e-mails will be accepted.

Oregon Watershed Enhancement Board
775 Summer Street NE Ste 360
Salem Oregon 97301-1290
Phone: (503) 986-0178

Section I

APPLICANT INFORMATION

Type the information for Sections I and II**.**

Name of project: Fin Safe Program- Design & Pilot

OWEB funds requested: $31,500.00 **Total cost of project**†: $42,000.00

† *This dollar amount refers only to the total cost of the technical assistance activity, and does not include the subsequent planned restoration work.*

PROJECT LOCATION:

This project occurs in one region only. Region 1 ☐ **Region 2** ☐ **Region 3** ☐ **Region 4** ☒ **Region 5** ☐ **Region 6** ☐

This project occurs in multiple regions. Check all that apply. Region 1☐ **Region 2**☐ **Region 3**☐ **Region 4**☐ **Region 5**☐ **Region 6**☐

This project occurs statewide / in all regions. ☐

This project occurs at (check one): ☐ **Site unknown at this time** ☐ **A single site** ☒ **Multiple sites**

Watershed Name(s)	County or Counties
Crooked River	Crook

Township, Range, Section(s) (e.g., T1N, R5E, S12)	Longitude, Latitude (e.g., -123.789, 45.613) (required for federal/state reporting)	Watershed code(s) – Please note the 10-digit hydrologic unit code, previously 5th Field HUC
see Attachment I for site locations & map	see Attachment I for site locations & map	17070305

Applicant	**Project Manager**
Organization: Crooked River Watershed Council	**Name:**Eric Tucker
Address:498 SE Lynn Blvd, Prineville, OR 97754	**Organization:**Crooked River Watershed Council
	Address:498 SE Lynn Blvd, Prineville, OR 97754
Phone:541.447.8567	
Fax:541.416.2112	**Phone:**541.447.8567
Email: chris@crwc.info	**Fax:**541.416.2112
Contact Person: Chris Gannon	**Email:** eric@crwc.info

Fiscal Agent

Organization: Crooked River Watershed Council
Address:498 SE Lynn Blvd, Prineville, OR 97754
Phone:541.447.8567
Fax:541.416.2112
Email: eric@crwc.info
Contact Person: Eric Tucker

CERTIFICATION:

I certify that this application is a true and accurate representation of the proposed work for watershed restoration and that I am authorized to sign as the Applicant or Co-Applicant. By the following signature, the Applicant certifies that they are aware of the requirements (***see Application Instructions***) of an OWEB grant and are prepared to implement the project if awarded.

Applicant Signature: _____ Date: 7/28/2014

Print Name: Chris Gannon Title: Council Coordinator

Co-Applicant Signature: _____ Date: _____

Print Name: _____ Agency: _____

Section II
PROJECT SUMMARY

1. Summary. Give a brief summary (max. 150 words) of the proposed technical assistance activity *only* (do not confuse the technical assistance with planned restoration). Be sure to mention partners and how OWEB funds will be used. Activities include landowner outreach, inventory verification, designs, and pilot projects at four sites leading to full implementation of the program in 2016. This approach will apply OWEB funding all four phase I design and outreach elements in coordination with ODFW passage & protection program, and Ochoco Irrigation District in-kind support. Funds for full program implementation phases will be supported by USBR, OWEB, and Pelton Fund sources.

Outreach and design acitivities are anticipated through June 2015, with cost-share program implementation scheduled for 2015 to 2025, depending on available funds. It is expected that over 30 sites located in the lower Crooked River area, inlcuding McKay and Ochoco Creeks, will be screened under the implementation stage.

2. What type of technical assistance are you applying for (see Instructions first):

☒ TA#1 Project Design ☐ TA#2 Implementation ☐ TA#3 Landowner Recruitment

3. What type of support are you seeking? (select only one)

☐ Part-time or full-time in-house support ☐ Part-time or full-time outside contract support ☒ Both

4. Was this application submitted previously? ☐ **Yes** ☒ **No**
If yes, what was the month and year, or application number?

5. Does this application propose a grant for a property in which OWEB previously invested funds for purchase of fee title or a conservation easement; or is OWEB currently considering an acquisition grant for this property? ☐ **Yes** ☒ **No**

If yes, what is the grant number(s)?

6. Is this project a continuation of a previously OWEB-funded project(s)? ☐ **Yes** ☒ **No**
If yes, what was the month and year, or application(s) number?

7. Do you plan to submit a restoration grant application to OWEB as a result of this technical assistance project? ☒ **Yes** ☐ **No**

8. What are the proposed start and end dates for the technical assistance project?
Start: August 1, 2014 End: December 31, 2015

9. Is this project related to a proposed or funded Oregon State Weed Board grant application(s)? ☐ **Yes** ☒ **No**
If yes, list the month and year, or grant application(s) number, and briefly describe how this project is related to the Weed Board application or grant.

10. Project Partners. Show all anticipated funding sources, and indicate the dollar value for cash or in-kind contributions. Be sure to provide a dollar value for each funding source. If the funding source is providing in-kind contributions, briefly describe the nature of the contribution in the Funding Source Column. Check the appropriate box to denote if the funding status is secured or pending. In the Amount/Value Column, provide a total dollar amount or value for each funding source. Match should be directly related to the technical assistance project and not for the restoration phase.

Funding Source Name the Partner and what their	Cash	In-Kind	Secured (x)	Pending (x)	Amount/Value

contribution is.					
OWEB	$31,500.00	$	☐	☒	$31,500.00
Landowner(s) or other partners: Landowners; mulitple (see Attachment I)	$	$1,000.00	☐	☒	$1,000.00
ODFW Passage & Protection Program	$	$2,000.00	☒	☐	$2,000.00
Ochoco Irrigation District	$	$5,000.00	☒	☐	$5,000.00
CRWC	$	$2,500.00	☒	☐	$2,500.00
	$	$	☐	☐	$
	$	$	☐	☐	$
	$	$	☐	☐	$
	$	$	☐	☐	$
	$	$	☐	☐	$
Total Estimated Funds (add all amounts in the far-right Column):					*$42,000.00

***The total should equal the total cost of the project on page 1 of the application.

11. Have any conditions been placed on match funds from other sources that may affect project completion?
☐ **Yes** ☒ **No**

If yes, explain:

*12. Salmon/Steelhead Populations Targeted and Expected Benefits to Salmon/Steelhead

The information provided will be used to by OWEB to better meet federal and state reporting requirements. Completion of this section is required but will not be used to evaluate this application for funding.

☐ This project is **NOT** specifically designed to benefit salmon or steelhead.

► If you check this box, STOP here and GO TO Section III – Project Desciption.

12(a) Targeted Salmon/Steelhead Populations: Select one or more of the salmon ESUs (Evolutionary Significant Unit) or steelhead DPSs (Distinct Population Segment) that the project will address/benefit. For species where the ESU/DPS name is not known or determined, use the species name with unidentified ESU (e.g., Chinook salmon – unidentified ESU). Additional information on the designation and location of the salmon/steelhead populations can be found at http://www.westcoast.fisheries.noaa.gov/maps_data/species_population_boundaries.html.

Chinook Salmon (*Oncorhynchus tshawytscha*)		**Coho Salmon** (*O. kisutch*)	
☒	Deschutes River summer/fall-run ESU	☐	Lower Columbia River ESU
☐	Lower Columbia River ESU	☐	Oregon Coast ESU
☐	Mid-Columbia River spring-run ESU	☐	Southern Oregon/Northern California ESU
☐	Oregon Coast ESU	☐	unidentified ESU
☐	Snake River Fall-run ESU	**Steelhead** (*O. mykiss*)	
☐	Snake River Spring/Summer-run ESU	☐	Klamath Mountains Province DPS
☐	Southern Oregon and Northern California Coastal ESU	☐	Lower Columbia River DPS
☐	Upper Klamath-Trinity Rivers ESU	☒	Middle Columbia River DPS
☐	Upper Willamette River ESU	☐	Oregon Coast DPS
☐	unidentified ESU	☐	Snake River Basin DPS
Chum Salmon (*O. keta*)		☐	Washington Coast DPS (SW Washington)
☐	Columbia River ESU	☐	Upper Willamette River DPS
☐	Pacific Coast ESU	☐	Steelhead/Trout unidentified DPS
☐	unidentified ESU		

12(b) Expected Benefits: Write a brief description of the goals and purpose of the project and how it is expected to benefit salmon/steelhead or salmon/steelhead habitat. This answer should be no longer than 2000 characters which is

approximately 330 words) **See Application Instructions for examples and ideas on how to calculate the number of words or characters in your answer.**

This technical assitance grant will support the direct protection needs of reintroduced Chinook salmon and Middle Columbia steelhead. These needs are centered on keeping fish, especially younger age classes, out of irrigation water conveyances (canals, pipes, ditches, and ponds) in the lower Crooked River below both reservoirs, and including McKay and Ochoco Creeks. There are approximately 30-plus private diversions of various sizes that will be qualified for this cost-share program. Screens will meet both state and federal mesh size criteria, and will be designed to convey the legal water right amount associated with each property.

The target anadromous fish species will benefit by being physically restricted from entering irrigation infrastructure which often leads to stranding, dessication, and ultimate mortality. The value of younger size classes to the overall re-establishment of self-sustaining fish runs of these species cannot be overstated. Based on the most current data available, survival rates of younger age class individuals are low. Any actions we can take to eliminate hazards for them can significantly increase overall success of the reintroduction effort. Current tracking data indicate over 98% of returning adult fish are preferentially selecting the Crooked River over two other choices so it is imperative that we proactively prepare safe passage and reduce hazards throughout the target area via the Fin Safe program.

Section III

PROJECT DESCRIPTION

Check one box only and answer the set of questions that applies to the type of technical assistance for which you are applying. **Refer to the Application Instructions for clarification and helpful examples.**

You may use the application form to respond to the questions, using additional sheets of paper as necessary **OR** answer the questions on separate pages. Be sure to include the question numbers and text of the questions before you begin typing your answers to assist the reviewers in evaluating your application.

Use 8½″ x 11″ paper. A double-sided application and materials are **optional** except for oversize maps and designs or multiple sets for reviewers. All materials should be single-spaced wherever possible, unstapled and unbound, except for sets of maps/photos/designs (see Page 3 of the application instructions for assembling multiples for reviewers). Use an 11-pt type size to answer the questions and a 10-pt type size for tables. Do not use color highlights for text emphasis or in tables as the highlight turns black when the application is scanned. Instead, use **bold face** and *italics* for emphasis only. Use bullets where appropriate. If the project involves multiple sites, be specific for each. If the question is in parts (e.g., "a" and "b"), make sure your answer is in parts.

☒ TA#1 PROJECT DESIGN

Technical Assistance Activity

1. Describe the problem (not the solution). The technical assistance for which you are seeking support will address which specific watershed priority(ies) or limiting factor(s) and benefit which specific resource(s)? If the technical assistance need is identified in an existing watershed-scale assessment or action plan, or in a subbasin plan, identify the plan and page number.

   The problem to be addressed ultimately is one of fish protection. In particular, the two anadromous fish species that are the target of reintroduction efforts in the Deschutes (the explicit goal of OWEB's Deschutes SIP) are the primary beneficiaries of this project. Smaller fish are vulnerable to unscreened diversions, of which the target areas contains at least 30 that fit the criteria for needed action. This problem impacts the critical life history stages associated with all individuals below about 2cm in length. Fish production in the Crooked is constrained by many factors, some of which cannot be influenced by local efforts (ocean conditions, for example). Given this limitation, the CRWC and its project partners strongly believe that addressing these needs now ensures a shorter list of constraints into the future. Protecting especially sensitive life stages is necessary to ensure the highest probability of success.

   Specifically, this project will address our watershed priority associated with reintroducing and supporting anadromous species to their former home waters. Our overarching goal is to re-establish self-sustaining populations of Chinook salmon and Middle-Columbia steelhead. The benefits will be shared across all fish species in the size class ranges that are most susceptible to unscreened diversion impacts, but the primary target fish species are the two listed above.

   The specific plans that support and callout this comprehensive screening need include:

   - Deschutes Habitat Conservation Plan (*in development though 2015*),
   - Conservation and Recovery Plan for Oregon Steelhead Populations in the Middle Columbia River Steelhead Distinct Population Segment; 2010, pgs. I-24 & I-29
   - Lower Crooked River Watershed Assessment; 2008, pg. 208

2. Describe the solution (not the problem). What is the technical *design* solution (not the *restoration* solution)? What range of alternatives will be evaluated?

   The primary solution is to work with landowners that have qualified unscreened diversions (located in the target area, unscreened or screens do not meet current NMFS screening criteria) to identify the appropriate alternative for each of their unique circumstances. Each and every active diversion in the target area needs to be screened applying current screening criteria. The technical design solution will be developed with the assistance of a specialty engineering firm in the region that has experience with the diversion pumps, delivery infrastructure, and the landowners in this specific target area.

   The designs developed under this grant are expected to meet site conditions at all 30+ sites taking into account variability in size of pipes, pumps, pumping height, and other on-site features. We anticipate about four or five basic screen designs will fit all the pump sites within the program, although each could have a slightly different installation and set-up given the range of variability in site conditions, pump types, and electrical services on site.

   A schedule of activities with assigned roles from within the collaborative team is summarized and presented in Attachment II, at the end of this application.

3. What specific technical assistance expertise will you need? How will the technical assistance provider be selected?

   This design stage of the Fin Safe Program will require special expertise in relatively smaller-scale irrigation diversions and types of screens associated with them, Special skills are required to meet the design challenges associated with site conditions, local practices, and off-season storage and maintenance schedules for the pumping equipment.

   This skill set exists in the local area. The project will utilize the engineering firm selected by Ochoco Irrigation District (OID) to ensure all solutions will physically connect to existing infrastructure without undue hardship or long term maintenance costs for the landowner. One of the primary design objectives is to develop and offer screening solutions that do not add additional costs to the landowner, either up front or over the long term.

   More specific to the selected contractor, a fully transparent process was applied and is described here:

   The District (OID) went through the Quality Based Selection (QBS) process to select an engineer of record. The process involved advertising for and requesting proposals from local engineers who would be interested in performing engineering tasks for the District. We reviewed RFP's from four local firms and selected Black Rock Consulting. Ochoco Irrigation District signed a contract with Black Rock Consulting in 2011. The District has been very satisfied with the professional work performed and with the timeliness and affordability provided.

4. Who will provide guidance for and supervise the technical assistance provider? How will this guidance and supervision be ensured?

   Our primary project partner, OID, will provide the guidance to the selected design contractor in both contract language and day-to-day guidance and oversight. The actual contract will be between Black Rock Consulting and the CRWC with OID acting as our contract officer. Ochoco Irrigation District personnel have a great deal more direct experience in this arena than CRWC staff and given the project is directed to their patrons, it will be important for OID to take lead coordination role. Much of this dedicated time contributed by OID will fulfill the match amounts allocated in this application.

5. How will the success of the completed technical assistance phase be determined? What technical review and design criteria will you employ to evaluate success?

   Success of the design phase supported by this grant application will be evaluated using two pilot projects in 2015. Designs for both a small and large diversion developed in 2014 and through the winter of 2014/2015 will be field-tested by installing prototypes at two typical sites randomly selected from the full population of sites in the program. Pilot testing will include trouble-shooting of any problems, and where applicable detailed notes, field observations,

and measurements will be collected to define the problem in the context of revising designs. This process will ensure that once the pilot testing is completed, any necessary modifications can be readily made before full implementation stage in 2015, and beyond.

At the implementation stage, success will be measured and evaluated annually using the simple metric of completion as a percentage of the total need. For example, if there are 30 sites that need screens and we plan to install five per year as a minimum production target, annual evaluations of the program will include the number of sites completed (qualification is they must meet current criteria and fully function as an active diversion site). Additional success ratings will be determined by the number of landowner rejections we receive on the basic offer to provide a screen on their diversion. This declination rate will evaluate the effectiveness of our outreach efforts and indirectly provide feedback about the overall acceptance level by landowners in our area to install fish screens.

In terms of technical review and design criteria, the CRWC will utilize the skills and experience of ODFW Passage & Screening Program staff in The Dalles to ensure screens will meet ODFW requirements, have relatively low maintenance demands, and will function as designed into the future for a minimum period of 20 years. Staff at ODFW's The Dalles screen shop have direct experience with a wide range of screen types, site conditions, stream bottom materials, pump types and power ranges, and lift heights. Using this collaborative partner's skills in this regard will provide a high level of certainty that the design phase will be successful.

Design criteria applied to this phase of the overall project will be guided by the NOAA National Marine Fisheries Service (NMFS) screening criteria found in the document titled, *Anadromous Salmonid Passage Facility Design, National Marine Fisheries Service, Northwest Region; February 2008*. We will also actively consult with ODFW staff as preliminary designs are produced to further ensure designs meet ODFW requirements and can be implemented.

Resulting Restoration Project

6. Briefly (a) describe the proposed restoration project practice(s) and priorities to result from the technical assistance grant; (b) state measurable objective(s); (c) provide a brief but detailed description of the project; and (d) specify the expected ecological benefits from the project.

   (a) The proposed restoration projects that will flow from this technical assistance support are well-documented and supported within the fisheries science field. Fish screens have long been used with success across the Pacific Northwest. This method to protect smaller size classes of fish has proved beneficial and cost-effective as screening facilities tend to provide fish exclusion benefits over a very long service life, often with minimal maintenance.

   Priorities for this work have been established in ODFW recovery plans for Middle Columbia Steelhead that call for <u>all diversions</u> to be adequately screened in the Crooked River system. Recent returning adult fish data collected by Portland General Electric and the Warm Springs Tribe indicate that over 98% of all returning anadromous fish are preferentially selecting the Crooked River system over two other available choices; the Metolius River and the Whychus Creek. Given this pattern, the priority to screen all active diversions becomes even more pressing.

   (b) Measurable objectives are clear for this program. We have a fixed number of sites that need to be screened over time. Installation of an agency-approved screen (per documented design criteria) at each of the approximately 30 locations will meet the objective of the program. Upon completion in 5-10 years (based on resource availability), the Fin Safe program will result in the Lower Crooked River and its two primary anadromous tributaries, McKay and Ochoco Creeks, being completely screened for fish protection purposes. We must provide ample and effective protection for these fish species most vulnerable life stages to prevent individuals being removed from the system via unscreened diversions.

   (c) The larger project supported by this TA design grant will work with landowners to install fish screens at their diversions. Most of these are pumps, so the screens will be fitted to the withdrawal end of the pipe under the water surface, but in most cases some distance off the river bottom to preclude poor performance issues associated with sediment intake. Part of this effort includes landowner outreach. This task will be led by our

primary project partner, OID, as part of their contributed match. Several designs will be developed that will fit all 30-plus sites. Two sites, one small (< 1cfs diversion) and one large (>1 cfs), will be field tested in 2015 as pilot projects. Working in close coordination with ODFW staff during the pilot testing stage will ensure any problems encountered will benefit from the assembled experience and solutions will be readily generated. By the end of 2015, all pilot testing should be concluded. Any necessary design modifications will be made through the winter of 2015-2016 so that full program implementation can begin as soon as 2016, depending on available funds. The total program to screen 30-plus sites should be completed no later than 2025. In addition to OWEB, support will come from PGE Pelton Fund, USBR WaterSMART grant program, USFWS Partners Program, Ochoco Irrigation District, ODFW Passage & Protection Program, NOAA National Marine Fisheries Service, and The Deschutes Habitat Conservation Plan principles.

(d) The expected ecological outcomes derived from this program at full implementation will be a fully screened and protected safe fish zone in the reintroduction area in the Crooked River system. All fish species will benefit from these new screens. They will not be subject to entering irrigation conveyance systems (canals, pipes, sprinklers) where they can only find a quick demise. Smaller sized individuals in particular will directly benefit over an expected minimum of 20 years of service life for each screen. Keeping fish of these age classes and sizes in the system to their full production level and extent is an important recovery element that will support necessary population dynamics, recruitment, and sustainable reproduction.

A secondary, and indirect benefit is also realized wherein the amount of water necessary to meet irrigation demands is lowered when the screen is installed. This occurs because the screens also act as physical barriers to aquatic vegetation, such a filamentous algae and phytoplankton, that limit intake volumes and cause water waste and excessive electrical power use to obtain the same amount of irrigation water.

7. Provide evidence of the commitment to implement a restoration project(s) resulting from the project design/development of the technical assistance grant (e.g., what sites and are landowners committed to project implementation?).

Historical evidence exists for support from landowners in the target geography for implementing fish screens under a program like this (cost-share approach). In cases where an identified need is presented to landowners in an effective manner, we have experienced a high level of engagement and commitment to implement. Take the case of the fish passage projects in McKay Creek circa 2008-2009. Landowners embraced the assistance offered and in some cases went beyond the project objectives to provide an even larger beneficial impact and outcome.

For the Fin Safe Program, we anticipate an initial landowner rejection rate of about 20%, with the other 80% ready to implement on the initial schedule. We also expect that some portion of the original 20% will view the program more favorably once implementation is underway and they can witness firsthand that the program works for their interests and is cost-effective. As this is strictly a volunteer program, we expect that we will not get 100% participation until towards the end of the implementation schedule with the last few hold outs coming to the program in the last years. Our plan is to implement the Fin Safe Program one biennium at a time relative to site lists, priorities, and available resources. We also believe that this is the best approach given we do not want to make errors that could jeopardize landowner support and capacity limitations dictate a slower, more methodical approach to implementation. In this way, we will target the largest diversions first to ensure we get the bulk of the problem addressed in the event some landowners ultimately opt out.

The sites and their locations are listed in Attachment C, at the back of this application.

8. Discuss in general terms the process and schedule for implementing the restoration project design(s) that will result from the technical assistance grant. Be sure to include whether permits are required.

The process for implementing the restoration projects associated with this TA grant support includes the following summary steps, in general:

1- Compile, review and rectify multiple diversion data sets- There are three sets of data housed and maintained by OID at present that relate to the unscreened diversions targeted in this program. Oregon Water Resources Department maintains a fourth data set for the same locations. The first step in the TA grant work will be to

generate a single data set from the common information found in all four databases. We must ensure that all unscreened diversions that are qualified will be included in the program. This task will be completed by OID staff and represent part of their match contribution. Outcome- single, universal data set for all the targeted and qualified diversions that will included in the Fin Safe program. These can be tracked into the future for evaluating long term program success. To be completed- 10/31/2014, depending on grant agreement date.

2- Contact all landowners listed in final rectified database- Formal letter will be developed and mailed to all diversion owners on the qualified list describing the Fin Safe Program and inviting them to participate in the cost-share screening program. We will follow up the letters with phone calls and home visits to offer additional details, collect any concerns, and generate a schedule for implementation. We believe some landowners will be more ready at the beginning and some will come into the program a bit alter as their comfort levels, trust, and knowledge about the need to screen increase. This task will be completed by CRWC with support from PGE donation. Outcome- generation of a plan and schedule for design work, pilot project location, and full implementation. The first focus will be a formal "sign-up" list of landowners ready to proceed. We expect there will be a need to contact those that do not sign-up on the initial list. We perceive landowner interest will increase over time, so following up with similar efforts to contact those remaining on the list every two years through the restoration project implementation period will be necessary until all landowners have committed, or affirmed that they are not going to be interested. To be completed- two stages; first targeting two pilot sites, and second for all qualified landowners. Dates are 10/31/2014, and 12/31/2014, respectively.

3- Active design development- Identification of two qualified landowner diversions for the pilot testing phase will be the first step. Contractor will work with the two landowners, one small-sized pump and the other large, to better understand design parameters, site constraints, landowner preferences relative to solution options, and other key design criteria that will used to develop pilot project designs. Outcome- Two pilot projects (field tests) will be completed to provide design feedback and ensure the full suite of designs will function and perform at high levels at all 30-plus diversion sites in the program. To be completed- 7/1/2015.

4- Implementation of the full program- Address all 30-plus diversion sites that need compliant fish screens will be the ultimate outcome of this TA assistance grant. Following successful pilot testing and after any necessary design modifications are completed, we plan to collaborate with partners and landowners to secure funding, landowner agreements, and develop a schedule for individual sites to be completed. We anticipate direct support from ODFW Passage & Protection Program, USBR WaterSMART screening funds, and PGE Pelton Fund through time. Other program partners may emerge through time. Outcome to be completed- We plan to complete 3-5 diversion screens on average per year until the inventory of qualified unscreened diversions is exhausted. To be completed in its entirety no later than 2025.

☐ TA#2 IMPLEMENTATION

1. Describe the problem (not the solution). The technical assistance for which you are seeking support will address which specific watershed priority(ies) or limiting factor(s) and benefit which specific resource(s)? If the technical assistance need is identified in an existing watershed-scale assessment or action plan, or in a subbasin plan, identify the plan and page number.

2. Describe the project to be developed and how specific sites and/or activities will be selected, and what form of analysis will be conducted.

3. What specific technical assistance expertise will you need? How will the technical assistance provider be selected?

4. Who will provide guidance for and supervise the technical assistance provider? How will this guidance and supervision be ensured?

5. How will the success of the completed technical assistance project be determined? What technical review will you employ to evaluate success?

6. What specific result do you expect from the successful completion of this technical assistance grant, and what do you anticipate doing about it in the future? If possible, provide a tentative timeline for future action.

☐ TA#3 LANDOWNER RECRUITMENT

1. Describe the problem (not the solution). The technical assistance for which you are seeking support will address which specific watershed priority(ies) or limiting factor(s) and benefit which specific resource(s)? If the technical assistance need is identified in an existing watershed-scale assessment or action plan, or in a subbasin plan, identify the plan and page number.

2. Describe the method(s) of landowner recruitment. How will recruiting landowners address the watershed priority(ies)/limiting factor(s) described in #1 above?

3. Which watershed restoration program or landowner assistance program are you seeking to enroll landowners in? Have you identified targets for numbers of landowners and acres (or stream miles, etc.)? If so, what are the targets and how many are they? Provide a tentative timeline for enrolling landowners.

4. What specific technical assistance expertise will you need? How will the technical assistance provider be selected?

5. Who will provide guidance for and supervise the technical assistance provider? How will this guidance and supervision be ensured?

6. How will the success of the completed technical assistance phase be determined? What technical review will you employ to evaluate success?

Section IV
TECHNICAL ASSISTANCE BUDGET

IMPORTANT: Read the application instructions and January 2014 Budget Categories Definitions and Policy Document.

Add additional lines, if necessary.

Totals automatically round to the nearest dollar

A	B	C	D	E	F	G
Itemize projected costs under each of the following categories.	**Unit Number**	**Unit Cost**	**OWEB Funds**	**Cash Match***	**In-Kind Match***	**Total Costs**
	(e.g., # of hours)	(e.g., hourly rate)				(add columns D, E, F)
SALARIES, WAGES AND BENEFITS. List position titles, include only costs of employees charged to this grant.						
CRWC Coordinator	60 hours	$53/hour	2,680		500	3,180
CRWC Project Manager	120 hours	$36/hour	4,320			4,320
		SUBTOTAL (1)	7,000	0	500	7,500
CONTRACTED SERVICES. Labor, supplies, and materials to be provided by *non-staff* for project implementation.						
Landowners participating in pilot proejct (2)	40 hours	$25/hour			1,000	1,000
Black Rock Consulting (BRC)	150 hours	$100/hour	15,000			15,000
ODFW Passage & Protection Program	25 hours	$80/hour			2,000	2,000
Ochoco Irrigation District (inspections and landown	100 hours	$68/hour	3,000		3,800	6,800
		SUBTOTAL (2)	18,000	0	6,800	24,800
TRAVEL. Mileage, per diem, lodging, etc. Must use current State of Oregon rates.						
BRC travel (to two pilot sites; 6 trips each, plus 4 additional sites; one trip each)	300 miles	$0.565/mile	170			170
Ochoco Irrigation District (inspections and landowner follow up; two pilot sites)	80 miles	$0.565/mile			45	45
		SUBTOTAL (3)	170	0	45	215
MATERIALS/SUPPLIES. Refers to items that are "used up" in the course of the project. Costs to OWEB must be directly related to the implementation of this grant.						
Fish screen fabrication materials for two pilot sites; one large and one small-sized	2 screens	$1,400 average	1,645		1,155	2,800
						0
		SUBTOTAL (4)	1,645	0	1,155	2,800
EQUIPMENT/SOFTWARE. List portable equipment costing **$300** or more per unit. Must remain property of a governmental entity, tribe, watershed council, SWCD, institution of higher learning or school district.						
						0
						0
		SUBTOTAL (5)	0	0	0	0
OTHER. Costs must be necessary and reasonable for successful completion of this grant.						
Landowner outreach materials- postage, printing, and envelopes	45 information packets	$8.50/packet	183	0	200	383
						0
		SUBTOTAL (6)	183	0	200	383
[Add all subtotals, (1-6) above]		**CATEGORY TOTALS (7)**	26,998	0	8,700	35,698

GRANT ADMIN. Not to exceed **15% of Category Totals (7) Funds**. Compute by multiplying by 0.15 or less. See the January 2014 Budget Categories Definitions at http://www.oregon.gov/OWEB/forms/2014-01budget_category_defs.pdf for eligible costs. Indicate which billing method will be used for this grant by checking one appropriate box.						
X direct billing ☐ direct cost allocation ☐ indirect costs (if checked, attach copy of the Federal Indirect Cost Negotiation agreement)			4,502		1,800	6,302
		SUBTOTAL (8)	4,502	0	1,800	6,302

A	B	C	D	E	F	G
Itemize projected costs under each of the following categories.	**Unit Number**	**Unit Cost**	**OWEB Funds**	**Cash Match***	**In-Kind Match***	**Total Costs**
	(e.g., # of hours)	(e.g., hourly rate)				(add columns D, E, F)

GRANT BUDGET TOTAL **Totals automatically round to the nearest dollar**

GRANT BUDGET TOTAL (9) **[Add Category Totals (7), Grant Admin Subtotal (8)]**	31,500	0	10,500	42,000

* The totals for these two columns must mirror the match totals provided in Section II(10) of the application and on the Match Funding form (Attachment A). Match should be for the technical assistance phase only and not for the restoration phase.

ATTACHMENT B

Technical Assistance Project - Proposed Metrics Form

OWEB receives a portion of its funds from the federal government and is required to report how its grantees have used both federal and state funds. The information you provide in the following form will be used for federal and state reporting purposes.

Please provide specific values, do not enter values like "2-3" or "<100". Enter your best approximation of what the project will accomplish.

If you have any questions, please contact Cecilia Noyes, OWEB Federal Reporting Coordinator at 503-986-0204, cecilia.noyes@state.or.us or Ginger Lofftus, PCSRF Reporting Assistant at 503-986-5372, ginger.lofftus@state.or.us.

Step 1 – Use the type of Technical Assistance (TA#1, TA#2, or TA#3) selected for this application to determine the sections of this metrics form to complete.

Section II (Project Summary) – question 2 and Section III (Project Description) of this application show the type of Technical Assistance selected for this application. The Application Instructions for Section II, Question 2 provide descriptions of the three types of technical assistance.

TA#1 Project Design applications must complete metrics questions in Sections ***A, B,*** & ***C*** of this form.

TA#2 Implementation applications must complete metrics questions in Sections ***A, B***, & ***C*** of this form.

TA#3 Landowner Recruitment applications must complete metrics questions in Section D of this form.

Section A

TA#1 or TA#2 Technical Assistance Project: Restoration Planning/Coordination Activities

1. Will this technical assistance project conduct one or more of the restoration planning/coordination activities listed below for question 2?

   ☒ **Yes** ☐ **No** If you answer No, skip to Section B.

2. Select the ***primary*** restoration planning/coordination activities to be conducted by this project. For each of the selected activities indicate whether the project will be developing or implementing a plan (e.g. Recovery plan, Subbasin Plan, restoration action plan, watershed assessment, limiting factor analysis) and provide the name and description of the plan. If the selected activity is neither developing a plan nor implementing an existing plan enter 'None' as the plan name.

   Do not select activities that will result from the planning/coordination activities. For example, a project will conduct a habitat restoration scoping/feasibility study to be used in developing engineering/designs for restoration, but the project itself will not produce the designs; for this example you would not report engineering/design work.

Restoration Planning/Coordination Activity	Name of Plan (Author, date, title, name, source, source address.	Description and scope of Plan including extent, purpose and application of the plan (limited to 4000 characters).
☒ Engineering/design work for restoration projects. This includes developing information necessary for permits or other requirements to implement restoration projects.	Plan to be Implemented Middle Columbia Steelhead Conservation & Recovery Plan (ODFW; 2008)	This State planaddresses the historic area occupied by Middle Coulumbia steelhead. It's pupose is to guide restoration priorities as related to recovering this species. It lists limiting factors in each water body related to recovery of steelhead. It precribes general solutions and indicates where, by river mile, the constraining feature occurs.
☐ Habitat restoration scoping and feasibility studies. This includes analysis and consideration of alternatives or recommendations for future restoration.	Plan to be Implemented_____	_____
☐ Develop a restoration/action plan	Not Required at Proposed	Not Required at Proposed
☐ Develop monitoring plans or sampling protocols	Not Required at Proposed	Not Required at Proposed
☐ Evaluate/analyze restoration plans and projects. This includes technical reviews and selection processes to ensure priority restoration projects are implemented.	Plan to be Implemented_____	_____
☐ Design/maintain restoration data systems	Plan to be Implemented_____	_____
☒ Other Planning/Coordination Activities. This can be used if a significant planning /coordination activity to be conducted by this project is not defined by any of the activities listed above. Description: _____	Plan to be Developed or Implemented: Middle Columbia Steelhead Conservation & Recovery Plan (ODFW; 2008)	This State planaddresses the historic area occupied by Middle Coulumbia steelhead. It's pupose is to guide restoration priorities as related to recovering this species. It lists limiting factors in each water body related to recovery of steelhead. It precribes general solutions and indicates where, by river mile, the constraining feature occurs

Section B

TA#1 or TA#2 Technical Assistance Project: Assessment/Survey Activities

3. Assessment Document/Report: Will this project assess or evaluate salmonids and/or their habitat (e.g., by completing a limiting factors analysis or an evaluation of past restoration measures) and summarize the results in a document or report?

☐ **Yes** ☒ **No**

4. Will this project conduct salmonid surveys or assess/survey streams or habitat?

☐ **Yes** ☒ **No** If you answer No skip to Section C.

5. Check all of the stream assessment/survey activities to be conducted

☐ Salmonid presence/absence survey	☐ Habitat use by salmonids assessed/surveyed
☐ Instream habitat condition assessment	☐ Rapid Bioassessment
☐ Fish passage impediments assessed/inventoried	☐ Other (explain):_____

6. _____ Estimated total miles of stream(s) assessed/surveyed (to nearest 0.01 mile) [*do not double count areas of overlap]*

7. _____ Estimated number of fish passage impediments/barriers to be assessed/surveyed/inventoried.

8. Will this project conduct habitat assessments or surveys?

☐ **Yes** ☐ **No** If you answer No skip to Section C.

9. Check all of the habitat assessment/survey activities to be conducted

☐ Riparian condition	☐ LiDAR other remote sensing
☐ Road condition/inventory	☐ Landscape mapping
☐ Upland habitat conditions	☐ Floodplain mapping
☐ Wetland habitat conditions	☐ Forest inventories
☐ Estuarine/nearshore habitat conditions	☐ Overall watershed condition assessment or mapping
☐ Invasive species	☐ Stream typing
	☐ Other (explain):_____

10. _____ Estimated total acres of habitat to be assessed/surveyed (to nearest 0.1 acre) [*do not double count areas of overlap]*

Section C

TA#1 or TA#2 Technical Assistance Project: Summary Metrics

These summary metrics apply to ***all*** of the restoration planning/coordination, and assessment/survey activities reported for this technical assistance project under Sections A and B (above).

11. 3.0 Estimated acres of habitat encompassed or affected by this technical assistance project (to nearest 0.1 acre)

12. 9.5 Estimated miles of stream encompassed or affected by this technical assistance project (to nearest 0.01 mile)

13. 0 Estimated number of fish passage barriers expected to be addressed by this technical assistance project.

14. Report the percentages of the total project cost for the activities reported in Section A and for activities reported in Section B; ***the two percentages should sum to 100%.***

    a. 100 Estimated percentage of the total project cost for the Restoration/Planning activities reported in Section A.

    b. 0 Estimated percentage of the total project cost for Assessment/Survey activities reported in Section B.

Section D

TA#3 Technical Assistance Project: Landowner Recruitment.

15. _____ Estimated number of landowners/managers to be contacted for the purpose of assisting them in future watershed conservation, protection or restoration projects

16. _____ Estimated cost of the habitat restoration to be applied as a result of this TA#3 Landowner Recruitment Technical Assistance project.

17. Select one or more of the following types of habitat restoration expected to be applied as a result of this landowner recruitment project. If you do not expect habitat restoration to result from this project select 'None'

☐ Fish Screening	☐ Riparian Habitat	☐ Urban-Impact Reduction
☐ Fish Passage	☐ Upland Habitat	☐ Other (explain):_____
☐ Instream Flow	☐ Wetland	☐ None
☐ Instream Habitat	☐ Estuarine/Nearshore	

ATTACHMENT A

MATCH FUNDING FORM

Document here the match funding shown on the budget page of your grant application

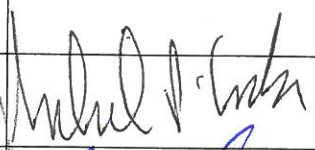
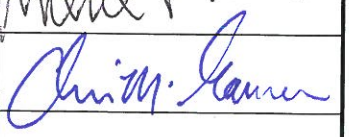
OWEB accepts all non-OWEB funds as match. An applicant may not use *another OWEB grant* to match an OWEB grant; this includes ODA Weed Board projects because they are funded through OWEB grants. However, an applicant who benefits from a pass-through OWEB agreement with another state agency, by receiving either staff expertise or a grant from that state agency, may use those benefits as match for an OWEB grant. (Example: A grantee may use as match the effort provided by ODFW restoration biologists because OWEB funding for those positions is the result of a pass-through agreement).

At the time of application, match funding for OWEB funds requested does not have to be *secured*, but you must show that at least 25% of match funding has been *sought*. On this form, you do not necessarily need to show authorized signatures ("secured match"), but the more match that is secured, the stronger the application. Identify the type of match (cash or in-kind), the status of the match (secured or pending), and either a dollar amount or a dollar value (based on local market rates) of the in-kind contribution.

If you have questions about whether your proposed match is eligible or not, see Allowable Match document in OGMS http://apps.wrd.state.or.us/apps/oweb/fiscal/nologin.aspx under Technical Assistance application or contact your local OWEB regional program representative (contact information available in the instructions to this application).

Project Name: Fin Safe Program- Design & Pilot

Applicant: Crooked River W.C.

Match Funding Source	Type (√ one)	Status (√ one)*	Dollar Value	Match Funding Source Signature/Date*
Target Landowners (multiple)	☐ cash ☒ in kind	☐ secured ☒ pending	$1,000.00	
ODFW Passage & Protection Program	☐ cash ☒ in kind	☐ secured ☒ pending	$2,000.00	
Ochoco Irrigation District	☐ cash ☒ in kind	☒ secured ☐ pending	$5,000.00	
Crooked River W.C.	☐ cash ☒ in kind	☒ secured ☐ pending	$2,500.00	
	☐ cash ☐ in kind	☐ secured ☐ pending		
	☐ cash ☐ in kind	☐ secured ☐ pending		
	☐ cash ☐ in kind	☐ secured ☐ pending		
	☐ cash ☐ in kind	☐ secured ☐ pending		

* **IMPORTANT:** If you checked the "Secured" box in the Status Column for any match funding source, you must provide either the signature of an authorized representative of the match source in the final Column, or attach a letter of support from the match funding source that specifically mentions the dollar amount you show in the Dollar Value Column.

July 21, 2014

Chris Gannon
Crooked River Watershed Council
498 SE Lynn Blvd.
Prineville, OR
97754

Re: OWEB SIP Technical Assistance grant

Trout Unlimited enthusiastically supports the Crooked River Watershed Council's plans to address fish screening for diversions on the Crooked River.

The salmon and mid-Columbia steelhead reintroduction program in the Deschutes basin represents a huge investment by many stakeholders over many years. The challenges have proven to be formidable. Many issues have been identified in Upper Deschutes basin studies to date, including impacts and losses caused by diversions. The CRWC has done an admirable job on fish passage barriers. It is hoped that the 4 remaining barriers of the original 12 will be resolved in the next few years. Screening to reduce fish loss into diversions will be an important contribution towards success of the reintroduction program.

The CRWC has documented 30, perhaps up to 90 diversions, that are unscreened. The proposal to approach this with a well planned program to update the data base and then undertake careful studies of technical issues to solve screening challenges at these diverse sites in the lower Crooked River and McKay and Ochoco Creeks has clear merit. The proposal has enlisted multiple partners, and as such is to be lauded for its inclusive approach. This should be a priority for the reintroduction project.

Trout Unlimited is a national organization with more than 150,000 members nation-wide and 600 members in the Deschutes Chapter. Our mission is to restore, reconnect and sustain cold water fisheries. We are committed to do whatever we can to help the salmon and steelhead reintroduction project in the Deschutes and Crooked River basins.

Sincerely

Michael Tripp
Conservation Chair
Deschutes Chapter of Trout Unlimited

Darek Staab
Project Manager
Upper Deschutes Home Rivers Initiative

NORTH UNIT IRRIGATION DISTRICT

2024 N.W. Beech Street
Madras, Oregon 97741

(541) 475-3625
(541) 475-3652
Fax (541) 475-3905
nuid@northunitid.com

July 22, 2014

Oregon Watershed Enhancement Board
775 Summer Street NE, Suite 360
Salem, OR 97130-1290

Subject: Crooked River Watershed Council Fin Safe Program Grant Application

The North Unit Irrigation District submits this letter in support of the Crooked River Watershed Council's Fin Safe Program. As I understand it the Fin Safe Program will begin to address the existing need for fish screens at private irrigation diversion sites in the lower Crooked River including parts of Ochoco Creek and lower sections of McKay Creek. Through successful completion of the program diverters will continue to be able to rely on much needed diversions while allowing fish to remain safely in stream.

I appreciate the opportunity to provide support for this valuable project and urge you to approve this grant application.

Please feel free to contact me directly should you have any questions.

Sincerely

Mike Britton
District Manager

United States Department of the Interior

BUREAU OF RECLAMATION
1375 SE Wilson Avenue, Suite 100
Bend, Oregon 97702-2607

IN REPLY REFER TO

BFO-1421
ENV-1.10

JUL 17 2014

Oregon Watershed Enhancement Board
775 Summer Street NE, Suite 360
Salem, OR 97130-1290

Subject: Crooked River Watershed Council Fin Safe Program Grant Application to Oregon Watershed Enhancement Board

The Bureau of Reclamation supports the Crooked River Watershed Council's Fin Safe Program. Reclamation, through our WaterSMART grant program, provided funding for the initial project scoping under a Cooperative Watershed Management Program Grant to the Crooked River Watershed Council. The intent of this Fin Safe Program is to review and potentially screen diversions from tributaries on the Crooked River System. This may allow diverters to take a much needed water supply and consequently allow fish to remain safely in the stream.

We appreciate the opportunity to provide support for this valuable project and urge you to approve this grant application. Thank you for considering this proposal.

If you have any questions, or have additional concerns or comments, please call me at (541) 389-6541 ext 226 or by email at ddeflitch@usbr.gov.

Sincerely,

Douglas DeFlitch, Manager
Bend Field Office

United States Department of the Interior

BUREAU OF RECLAMATION
1375 SE Wilson Avenue, Suite 100
Bend, Oregon 97702-2607

IN REPLY REFER TO:

BFO-1421
ENV-1.10

JUL 17 2014

Oregon Watershed Enhancement Board
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If you have any questions, or have additional concerns or comments, please call me at (541) 389-6541 ext 226 or by email at ddeflitch@usbr.gov.

Sincerely,

Douglas DeFlitch, Manager
Bend Field Office

Portland General Electric Company
121 SW Salmon Street • Portland, Oregon 97204
PortlandGeneral.com

June 12, 2014

Chris Gannon
Crooked River Watershed Council
498 SE Lynn Blvd
Prineville, OR 97754-2840

Dear Mr. Gannon,

Portland General Electric is pleased to present the Crooked River Watershed Council with a check in the amount of $2,500. The check is in support of the Fin Safe Program.

PGE only contributes to organizations that do not discriminate on the basis of age, race, religion, nationality, ethnicity, sex, disability, marital status, sexual orientation, gender identity or veteran status. Your acceptance of this contribution certifies that you are in compliance with our policy in your organization's service and hiring practices.

PGE appreciates being recognized for the support we provide to community organizations such as yours. Digital formats of our logo are available upon request by contacting Rachel DeRosia at 503-464-8599 or rachel.derosia@pgn.com. We prefer that you use a digital format of the logo when creating materials where you recognize our company. It is very important that you send us an advance copy of the materials where the PGE logo appears or where Portland General Electric is referenced.

Sincerely,

Kregg Arntson
Manager, Corporate Social Responsibility

cc: Scot Lawrence

CRWC
CROOKED RIVER WATERSHED COUNCIL

498 SE Lynn Blvd.
Prineville, Oregon 97754

Phone: (541) 447-8567 **Fax**: (541) 416-2115

contact@crwc.info
www.crookedriver.deschutesriver.org

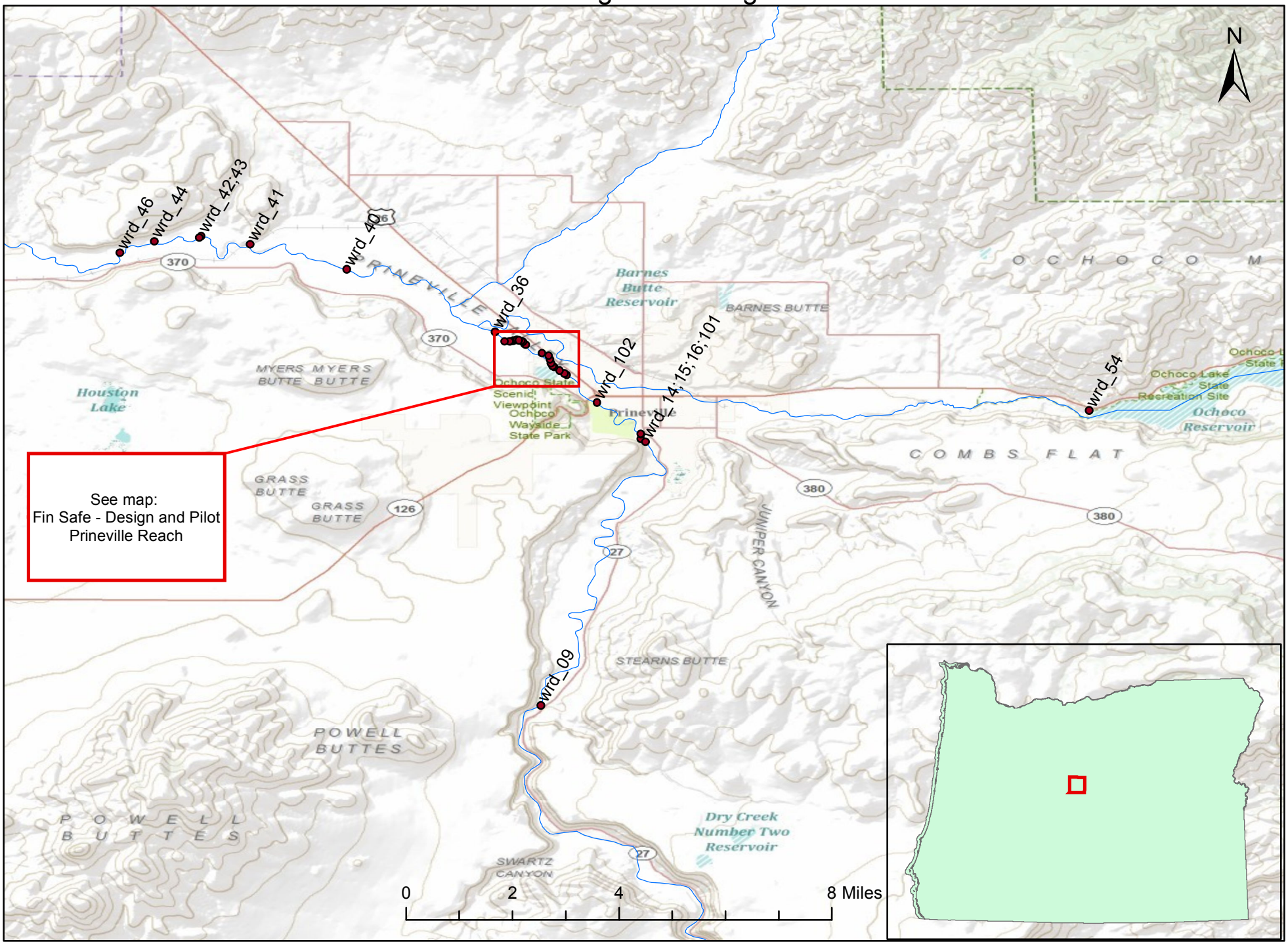
Attachment I
Site Locations & Map

Private Diversions in LCR Area

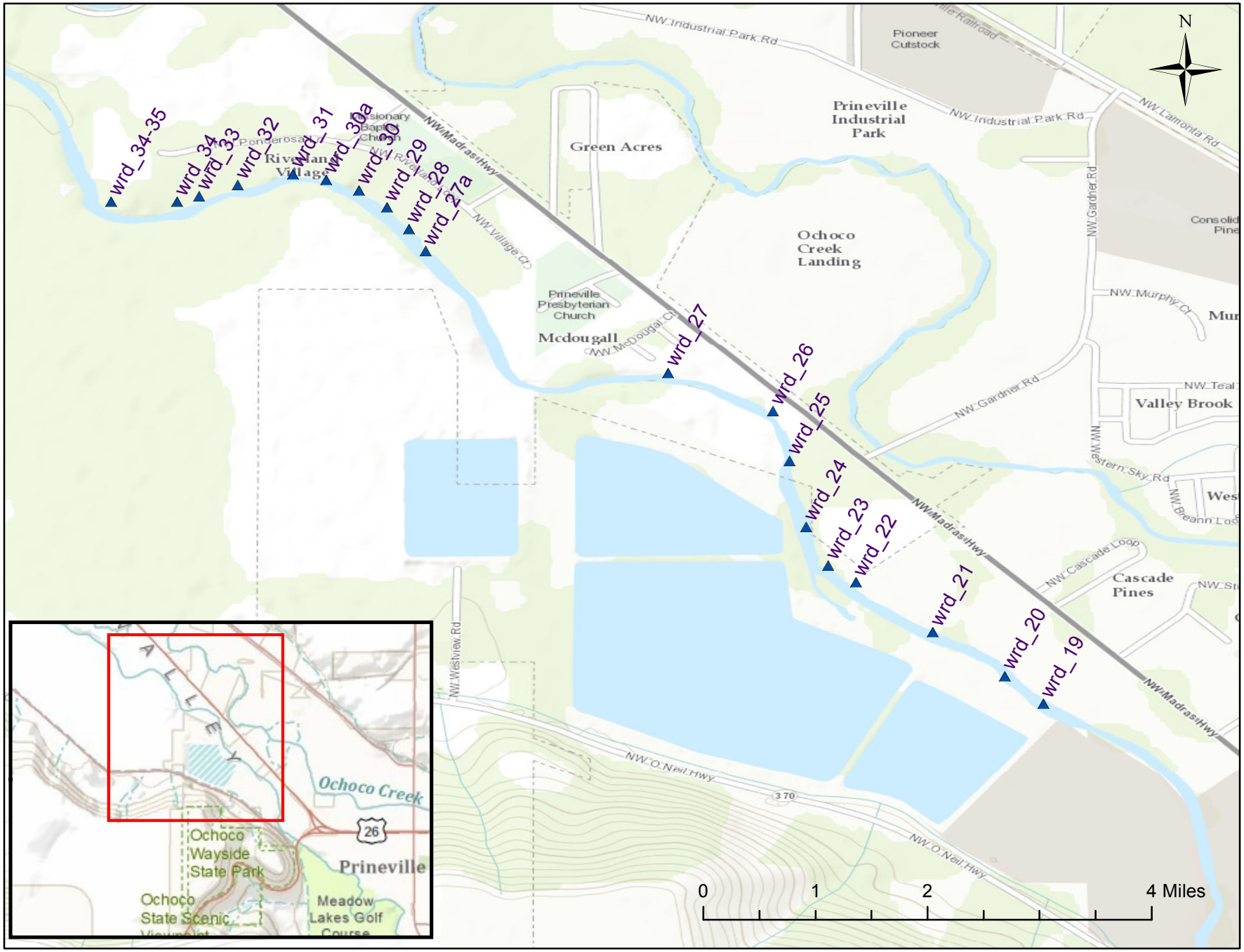
Owner	Pod Name	twn	rng	sec	qq	distance	Latitude	Longitude
Blanchard	wrd_14	15	16	6	SESE	100 FEET NORTH & 50 FEET WEST FROM SE CORNER, SEC. 6	44.2910	-120.8474
Freeman	wrd_15	15	16	6	SESE	560 FEET NORTH & 60 FEET WEST FROM SE CORNER, SEC. 6	44.2923	-120.8473
Tocher	wrd_16	15	16	6	SESE	640 FEET NORTH & 80 FEET WEST FROM SE CORNER, SEC. 6	44.2924	-120.8474
Apperson	wrd_19	14	15	36	SESE	1210 FEET NORTH & 180 FEET WEST FROM SE CORNER, SEC. 36	44.3084	-120.8675
Puckett	wrd_20	14	15	36	NESE	1260 FEET SOUTH & 350 FEET WEST FROM E1/4 CORNER, SEC. 36	44.3089	-120.8682
McCarthy	wrd_21	14	15	36	NESE	970 FEET SOUTH & 680 FEET WEST FRIOM E1/4 CORNER, SEC. 36	44.3097	-120.8695
Teuscher	wrd_22	14	15	36	NESE	680 FEET SOUTH & 1230 FEET WEST FROM E1/4 CORNER, SEC. 36	44.3106	-120.8709
Bartlett	wrd_23	14	15	36	NESE	540 FEET SOUTH & 1260 FEET WEST FROM E1/4 CORNER, SEC. 36	44.3109	-120.8714
Moore	wrd_24	14	15	36	NESE	290 FEET SOUTH & 1320 FEET WEST FROM E1/4 CORNER, SEC. 36	44.3116	-120.8718
Hall	wrd_25	14	15	36	SWNE	110 FEET NORTH & 1340 FEET WEST FROM E1/4 CORNER, SEC. 36	44.3128	-120.8721
Shotwell	wrd_26	14	15	36	SWNE	460 FEET NORTH & 1520 FEET WEST FROM E1/4 CORNER, SEC. 36	44.3137	-120.8724
Hemphill	wrd_27	14	15	36	SWNE	700 FEET NORTH & 2060 FEET WEST FROM E1/4 CORNER, SEC. 36	44.3144	-120.8743
Stigall	wrd_28	14	15	36	NENW	950 FEET SOUTH & 510 FEET WEST FROM N1/4 CORNER, SEC. 36	44.3170	-120.8790
Burge	wrd_27a	14	15	36	NENW	1150 FEET SOUTH & 2250 FEET EAST FROM NW CORNER, SEC. 36	44.3166	-120.8787
Schlaman	wrd_29	14	15	36	NENW	720 FEET SOUTH & 740 FEET WEST FROM N1/4 CORNER, SEC. 36	44.3174	-120.8794
Ewing	wrd_30	14	15	36	NENW	640 FEET SOUTH & 890 FEET WEST FROM N1/4 CORNER, SEC. 36	44.3177	-120.8799

Casey	wrd_32	14	15	36	NWNW	630 FEET SOUTH & 1280 FEET EAST FROM NW CORNER, SEC. 36	44.3178	-120.8821
Caraway & Forester	wrd_31	14	15	36	NENW	590 FEET SOUTH & 1110 FEET WEST FROM N1/4 CORNER, SEC. 36	44.3180	-120.8811
Crakes	wrd_30a	14	15	36	NENW	600 FEET SOUTH & 1700 FEET EAST FROM NW CORNER, SEC. 36	44.3179	-120.8805
Weiderholt	wrd_33	14	15	36	NWNW	700 FEET SOUTH & 1140 FEET EAST FROM NW CORNER, SEC. 36	44.3176	-120.8828
Conklin	wrd_34	14	15	36	NWNW	770 FEET SOUTH & 980 FEET EAST FROM NW CORNER, SEC. 36	44.3175	-120.8832
Philips, Kelley, Davis Portable Pumping	wrd_34-35	14	15	36	NWNW	770 FEET SOUTH & 980 FEET EAST FROM NW CORNER, SEC. 36, portable	44.3175	-120.8844
George, Jerry	wrd_36	14	15	26	SESE	100 FEET NORTH & 60 FEET WEST FROM SE CORNER, SEC. 26	44.3202	-120.8870
Quail Valley III	wrd_40	14	15	21	SESE	1060 FEET NORTH & 80 FEET WEST FROM SE CORNER, SEC. 21	44.3372	-120.9273
Shanafelt	wrd_41	14	15	20	SWNE	860 FEET NORTH & 1700 FEET WEST FROM E1/4 CORNER, SEC. 20	44.3439	-120.9536
Shanafelt	wrd_42	14	15	20	NWNW	940 FEET SOUTH & 30 FEET EAST FROM NW CORNER, SEC. 20	44.3462	-120.9669
Shanafelt	wrd_43	14	15	19	NENE	1050 FEET SOUTH & 30 FEET WEST FROM NE CORNER, SEC. 19	44.3458	-120.9674
Shanafelt	wrd_44	14	15	19	SENW	1490 FEET SOUTH & 2080 FEET EAST FROM NW CORNER, SEC. 19	44.3447	-120.9797
Shanafelt	wrd_46	14	14	24	SENE	2630 FEET SOUTH & 510 FEET WEST FROM NE CORNER, SEC. 24	44.3417	-120.9890
Crook County Parks and Rec.	wrd_101	15	16	8	NWNW	140 FEET SOUTH & 300 FEET EAST FROM NW CORNER, SEC. 8	44.2903	-120.8461
Ochoco Feed Canal, Ochoco Dam Outlet	wrd_54	15	17	5	SWNW	500 FEET NORTH & 250 FEET EAST FROM THE W1/4 CORNER, SEC. 5	44.2988	-120.7256
Crook County Library	wrd_102	15	16	6	SENW	1540 FEET SOUTH & 3165 FEET WEST FROM NE CORNER, SEC. 6	44.3010	-120.8593
Crooked River Feed Canal	wrd_09	15	15	36	SWSE	60 FEET NORTH & 1940 FEET WEST FROM THE SE CORNER, SECTION 36	44.2186	-120.8746

Fin Safe Program - Design & Pilot



Fin Safe Program - Design & Pilot



CRWC
CROOKED RIVER WATERSHED COUNCIL

498 SE Lynn Blvd.
Prineville, Oregon 97754

Phone: (541) 447-8567 **Fax**: (541) 416-2115

contact@crwc.info
www.crookedriver.deschutesriver.org

Attachment II
Schedule of Activities & Assigned Roles

This section summarizes the primary activities, provides a schedule for completing activities, assigns roles, and identifies match contributions from the assigned.

Activity	Schedule	Assigned Role	Grant Match
Rectify multiple data sets (three) to generate a single, accurate list of qualified diversions	By 10/31/2014	Ochoco Irrigation District (OID)	Yes; $1,500
Targeted landowner outreach to secure two pilot sites (letters, site visits, meetings)	By 10/31/2014	CRWC Crooked River Watershed Council (CRWC)	Yes; $300
Landowner outreach (letters with description of the program to publicize opportunity)	By 12/31/2014	CRWC	Yes; $400
Meet with landowners that engage at their sites to scope range of pump types and site conditions that will inform designs.	By 3/1/105	OID lead with design engineer to attend Landowners	Yes; $1,345 Yes; $1,000
Coordination with screen vendors on design fit, costs, and long term maintenance schedules.	By 3/1/2015	Black Rock Consulting (BRC; design engineer) Oregon Department of Fish & Wildlife (ODFW)	No Yes; $1,000
Development of two draft design concepts, for large and small pumps, to be evaluated by OID, ODFW, OWRD, landowner, and CRWC.	By 6/1/2015	OID BRC ODFW	Yes; $1,000 No Yes; $1,000
Refine concepts to actionable designs based on feedback and costs for two pilot sites.	By 7/1/2015	BRC	No
Install two pilot screens, one large and one small pump system. Evaluate performance, collect information, and refine designs.	By 8/15/2015	BRC OID	No Yes; $1,155
Final designs developed based on pilot performance. Designs will fit all other pumps and diversions in the program.	By 9/15/2015	BRC	No
Installation plan and schedule developed for all sites in the program. A guidance table will be generated indicating screen solution option for each pump site.	By 9/30/2015	BRC	No
Grant Administration, Reporting, Accounting	Through grant final reporting and close-out	CRWC	Yes, $1,800
PROGRAM IMPLEMENTATION Installation of screens at all 30+ sites at approximately 3-5 per year until complete, depending on funding availability. Includes program oversight and administration	From 10/15/2015 to 2025 (estimated)	OID CRWC	NA. To be determined prior to implementation stage

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Attachment III
Detailed In-Kind Match Descriptions

This section presents the detailed description of all activities supported by the in-kind contributor.

Contributor & Amount	In-Kind Activities Supported
Ochoco Irrigation District (OID) $5,000	1- Rectify multiple data sets (three) to generate a single, accurate list of qualified diversions, 2- Assist CRWC with both levels of landowner outreach; first to secure pilot sites, one large, one small, and the second to broadly publicize the future cost-share opportunity to qualified landowners in the target geography 3- Provide oversight of and direction to consulting engineer (Black Rock Consulting) 4- Assist CRWC in final reporting as requested 5- Meet with landowners that engage at their sites to scope range of pump types and site conditions that will inform designs.
Oregon Department of Fish & Wildlife (ODFW) $2,000	1- Coordination with OID, CRWC and BRC on possible screen vendors and direct experience working with the variety of screen types available on the commercial market as related to performance under conditions in the Crooked River system. 2- Review draft designs from BRC; provide comments. 3- Assist with installation and data collection for two pilot project sites in 2015. 4- Review and comment on the guidance table generated by BRC indicating the best screen solution option for each pump site.
Crooked River Watershed Council (CRWC) $2,500	1- Targeted landowner outreach to secure two pilot sites (letters, site visits, and meetings) 2- Landowner outreach (letters with description of the program to publicize opportunity) 3- Meet with landowners that engage at their sites to scope range of pump types and site conditions that will inform designs. 4- Grant Administration, Reporting, Fiscal Management, and Record Keeping
Landowners (2; subset of the 30-plus) $1,000	1- Host site visit with project principles explaining the diversion operations, maintenance issues, scheduled replacement of components, operational regimes and any other screen-related concerns unique to their site that will inform pilot designs. 2- Review proposed pilot design with BRC Engineer prior to installation and testing.

CRWC
CROOKED RIVER WATERSHED COUNCIL

Attachment IV
Sample Photographs of Diversion Sites

This attachment presents a short set of sample photographs illustrating the range of site conditions, pump types, and visual location for the CRWC Fin Safe Program.

Small-sized diversion pump on Ochoco Creek

Diversion pipes with electrical supply on the Crooked River

Diversion set-up on the Crooked River and a subject of the Fin Safe Program to screen diversions

Diversion pump on Lower Crooked River (note the current "screen" at the right)

Diversion site pump, electrical supply, and intake pipe in the Lower Crooked River.

Pump and pipe parts stored for off-season period (note “screen” in middle of photo)

BLACK ROCK
CONSULTING

March 5, 2014

Mr. Mike Kasberger, Manager
Ochoco Irrigation District
1001 NW Deer Street
Prineville, OR 97754

SUBJECT: SCOPE OF SERVICES AND FEE ESTIMATE FOR PHASE I SERVICES – CROOKED RIVER PUMP INTAKE SCREENING

Dear Mr. Kasberger:

Per our meeting between Mr. Chris Gannon, Coordinator of the Crooked River Watershed Council (CRWC), you, and myself, I gained an understanding of the need for pump intake improvements along the Crooked River. Details of that understanding and a Scope of Services for Phase I of improvements is provided below.

BACKGROUND

The Ochoco Irrigation District holds a variety of water rights including rights for direct withdrawals by individual pumps along the Crooked River within the District Boundary area. The water rights and the associated pump sizes range from very small pumping systems to fairly large systems (i.e. fractional horsepower to 60 horsepower). In its continuing program of overall system improvements, the District and the CRWC have identified pump intake improvements as a necessary measure to reduce potential impacts to the existing native fish resources and newly introduced anadromous fish resources in the Crooked River.

Currently, approximately 30-40 direct pump withdrawal systems are operated under OID water rights. Largely, the suction end of these systems are not protected with screens that meet current fish protection standards. Since the Crooked River is known to move sediments, carry algae, and run during the summer months with minimal water depth, the solution to pump intake protection is likely not as simple as just adding intake screens. Cleaning of the intake screens and proper placement of the screens in the river channel must be carefully considered and should be tested in a beta program prior to full implementation of screens across the entire group of pump intakes.

Based upon the above, the District and the CRWC requested that Black Rock Consulting develop the following Scope of Services to evaluate the issues in the field, coordinate with screening vendors, and to develop design(s) for two pump intake systems that may

20380 Halfway Road Suite #1
Bend, Oregon 97701
(541) 480-6257 (866) 591-1513 Fax

be replicable across a broader range of intakes. The initial two systems would be implemented first and tested for effectiveness and observed for any issues. Adjustments could then be incorporated prior to the broader roll-out of the pump intake improvement program.

SCOPE OF SERVICES

(1) OID to arrange a site visit with certain District patrons to observe existing pump withdrawal systems. BRC to attend site visit to document, measure, photograph the details of these systems and, to the extent possible, to observe the withdrawal area of the bank or bed of the Crooked River. ($840)

(2) BRC will coordinate with screening vendors regarding potential products for fish compliant screening on pump intakes. ($840)

(3) BRC will develop draft concepts for two pump intake systems (i.e. a small pump intake and a larger pump intake). These concepts will be developed on 11x17 sized paper and will be drafted in AutoCAD format. ($1,760)

(4) BRC will submit concepts to OID and CRWC for review and will follow-up with a meeting to discuss ideas and comments related to the draft concepts. ($490)

(5) BRC will update the concepts into actionable designs on 11x17 sized paper, drafted in AutoCAD format. ($1,320)

(6) BRC will provide a cost estimate for the concepts and provide to the OID and the CRWC. ($560)

(7) BRC will visit the installations on two occasions over the irrigation season that they are implemented. BRC will visit with the landowners, OID and CRWC to discuss the beta installations and any adjustments that may be incorporated to improve the installations. ($1,120)

(8) BRC will make the associated adjustments to the installation drawings per the lessons-learned with the first two installations. Drawings will be produced in AutoCAD format on 11x17 sized paper. ($1,320)

(9) BRC will develop a table to indicate pump screen solutions for a range of pump sizes and submit to OID and the CRWC with the final drawings. ($560)

Total Budget: $8,810

Should you have any questions on this scope and budget, please call. We look forward to serving OID and the CRWC on this important project.

Sincerely,

BLACK ROCK CONSULTING

Kevin L. Crew, P.E.
Principal

Wilken, Shaun <swilken@usbr.gov>

Re: R12AP80921 CRWC - Final Reports

1 message

Kihara, Katherine <kkihara@usbr.gov> Wed, Nov 26, 2014 at 11:45 AM
To: "Wilken, Shaun" <swilken@usbr.gov>

Shaun

I approve and accept the final reports for Grant No. R12AP80921 from the Crooked River Watershed Council.

Katherine Kihara

On Wed, Nov 26, 2014 at 10:18 AM, Wilken, Shaun <swilken@usbr.gov> wrote:

> Yes, ma'am.
>
> No hurry. :)
>
> Shaun
>
> On Wed, Nov 26, 2014 at 11:17 AM, Kihara, Katherine <kkihara@usbr.gov> wrote:
>
> > So you just need a concurrence or acceptance email from me to go in the file?
> >
> > On Wed, Nov 26, 2014 at 10:13 AM, Wilken, Shaun <swilken@usbr.gov> wrote:
> >
> > > I did get them. The combined file is just too large.
> > >
> > > On Wed, Nov 26, 2014 at 11:12 AM, Kihara, Katherine <kkihara@usbr.gov> wrote:
> > >
> > > > Were you able to get any of the reports? I could try forwarding them since that would be within the Reclamation perimeter. I could also try sharing them on Google Drive
> > > >
> > > > Kathy K
> > > >
> > > > On Wed, Nov 26, 2014 at 10:07 AM, Wilken, Shaun <swilken@usbr.gov> wrote:
> > > >
> > > > > Kathy,
> > > > >
> > > > > Given the size of the final report it won't fit in the email, but you'd already received them from Chris.
> > > > >
> > > > > Please let me know if they're acceptable.
> > > > >
> > > > > Thank you,
> > > > >
> > > > > Shaun
> > > > >
> > > > > --
> > > > > Shaun M. Wilken, Sr.
> > > > > Grants Management Specialist
> > > > > Financial Assistance Services
> > > > > Phone: 303-445-3697
> > > > > Fax: 720-544-4767
> > > > > Email: swilken@usbr.gov