DRAFT INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL ASSESSMENT

CONTINUING AUTHORITIES PROGRAM, SECTION 1135:

PROJECT MODIFICATIONS FOR IMPROVEMENTS TO THE ENVIRONMENT

LONG TOM RIVER

MONROE, BENTON COUNTY, OREGON

US Army Corps of Engineers ®
Portland District

May 2023

EXECUTIVE SUMMARY

An Integrated Feasibility Report and Environmental Assessment was developed by the US Army Corps of Engineers, Portland District in partnership with the City of Monroe and the Confederated Tribes of Siletz Indians for the Long Tom River Ecosystem Restoration Project in Monroe, Oregon. This study was completed under Section 1135 of the Continuing Authorities Program to describe the planning process undertaken to formulate and evaluate alternatives for aquatic and floodplain ecosystem restoration activities within the project area.

The project area is located along an approximately 0.5-mile reach of the Long Tom River running along the City of Monroe Park. Alternatives were developed to address habitat connectivity and restoration of geomorphic processes disrupted by the Corps-constructed Monroe Drop Structure, located at river mile 6.9. The drop structure acts as a fish passage barrier and has resulted in the loss of upstream habitat and ecosystem function due to the historic channelization of the Long Tom River which also caused the disconnection of nearby side channels. This channelization has shortened the length of the river below the Fern Ridge Dam from 36 to 23 miles, reducing the available amount of riverine habitat suitable for Chinook salmon, cutthroat trout, and Pacific lamprey.

In addition to the No Action plan, nine alternatives were analyzed to determine the cost, benefits, and potential environmental effects of ecosystem restoration within the project area. Habitat benefits were modeled and the cost effectiveness of each plan and management measure was assessed. The Recommended Plan, total removal of the Monroe Drop Structure, would restore approximately 43 acres of aquatic and floodplain habitat, enhanced connectivity to a historic meander through installation of a larger culvert and engineered pool and riffle structure, and armoring of the OR-99 bridge piers to prevent scour caused by increased velocities upstream of the drop structure. Based on 2023 price levels, the estimated project cost is $2,486,000. The Federal share of the project first cost is estimated to be $1,864,500 and non-Federal share is estimated to be $621,500 which equates to 75% Federal and 25% non-Federal. The estimated total Federal cost of the project (including feasibility costs) is $2,434,500. The annualized construction costs over the period of project performance (50 Years) are estimated at $81,626. The Average Annual Habitat Units (AAHU) estimated for this project are 43 over the same period yielding a cost/AAHU of $1,898.

There are no significant impacts anticipated because of implementing the recommended plan. Additional monitoring and potential adaptive management actions are described in the report that would measure the outcome of implementation and ensure that the projected environmental benefits are achieved. It is recommended in the Integrated Feasibility Report and Environmental Assessment that the Recommended Plan / Preferred Alternative move forward to the design and implementation phase.

Table of Contents

Figures

Tables

Photographs

APPENDICES

1 Introduction

1.1 Study Authority

This study is being conducted under Section 1135 of the Water Resources Development Act of 1986, as amended (33 U.S.C 2309a):

When construction of a water resources project by the US Army Corps of Engineers (USACE) has contributed to the degradation of the environmental quality of an area, Section 1135 of the Continuing Authorities Program allows for implementation of measures for enhancement of the environmental quality associated with the restoration, through modifications either at the project site or at other locations that have been affected by the construction or operation the project, if such measures do not conflict with the authorized project purposes.

The Long Tom Channel Improvement Project was included as a part of the construction of the Fern Ridge Dam authorized in the Rivers and Harbors Act of 1938 (PL 75-761).

1.2 Purpose and Need

The purpose of this study is to formulate and analyze a series of ecosystem restoration alternatives to restore connectivity and ecosystem function, for ESA and culturally significant target species, in the lower reach of the Long Tom River from the Stroda Drop Structure located at river mile 10.3 to its confluence with the Willamette River.

Prior to construction of the Fern Ridge Dam, the lower Long Tom River was a low-gradient river characterized by a narrow channel with high sinuosity. After completion of the dam the downstream reaches of the Long Tom lacked the channel capacity to convey routine water releases from the reservoir. In 1943, the Corps implemented Long Tom River channel rectification project resulting in construction of a straighter, deeper, and wider channel with a series of three drop structures and four additional training structures spanning the lower 20 river miles of the Long Tom River (USACE 1943). These drop structures were built with the intent to reduce channel velocities and decrease erosion (Figure 1).

The study will consider alternatives to provide upstream fish passage at the Corps-constructed Monroe Drop Structure, located at river mile 6.9. The structure acts as the first upstream barrier to fish passage, with other efforts outside of this project being considered for fish passage at the Stroda (river mile 10.3) and Cox Butte (river mile 12.8) drop structures once passage is restored at Monroe. The Long Tom Watershed Council (LTWC) estimates that approximately 106 miles of riverine habitat will be available once upstream fish passage is available at these three drop structures (LTWC 2022).In addition, this project considers the potential restoration of historic side channels disconnected by the channel rectification project in the 1940s that shortened the length of the river below the Fern Ridge Dam from 36 to 23 miles, reducing the available amount of riverine habitat suitable for Chinook salmon, cutthroat trout, and Pacific lamprey.

The Monroe Drop Structure impedes fish passage to approximately 3.5 river miles of aquatic habitat between the Monroe and Stroda Drop Structures, which is the next fish passage barrier upstream. The additional upstream reach includes habitat that could be utilized for rearing by Endangered Species Act (ESA) listed juvenile Upper Willamette River spring Chinook salmon, as spawning and rearing habitat for native cutthroat trout. The upstream habitat is also suitable

as spawning and rearing habitat for culturally significant Pacific lamprey. In addition to these three species, at least 19 other native fish species and 13 non-native fish species are found within the Long Tom Watershed with a potential presence at the Monroe Drop Structure.

The Monroe Drop Structure has been identified as a limiting factor or opportunity for fish passage restoration in multiple planning documents:

- Lower Long Tom River Habitat Plan (Long Tom Watershed Council 2018), as a potential area for restoration
- Draft Willamette Subbasin Plan (Northwest Power and Conservation Council 2004) as a limiting factor for fish passage.
- Oregon Watershed Enhancement Board (OWEB) Basin Priorities (2005) as a priority restoration activity for improving fish passage
- National Marine Fisheries Service 2008 Biological Opinion for the Willamette Valley Project (USACE) lists the three drop structures on the Long Tom River (including the Monroe Drop Structure) as a limiting factor for ESA-listed Upper Willamette River spring Chinook salmon populations.
- The Oregon Department of Fish and Wildlife lists the Monroe Drop Structure as a priority fish passage project in the 2019 Statewide Fish Passage Priority List.

The City of Monroe and the Confederated Tribes of Siletz Indians (CTSI) have partnered to act as the Non-Federal Sponsors for this study. On August 8, 2016, the City of Monroe submitted a letter of intent to the Portland District requesting federal assistance in restoring fish and wildlife habitat in the Long Tom River, located in Benton County, Oregon. On June 30, 2020, the City of Monroe submitted an addendum letter to the Portland District stating their interest in co-sponsoring with the CTSI. The CTSI submitted a signed letter on August 31, 2020, stating approval by Tribal Council of their co-sponsorship with the City of Monroe for this project. A copy of the non-federal sponsor letters is included in Appendix A.

1.3 Study Area

The Long Tom River is a 57-mile tributary of the Willamette River. The lower mainstem Long Tom River flows north from Fern Ridge Reservoir (river mile 23.6) to join the Willamette River about 16 miles upstream of Corvallis, Oregon. The Long Tom Ecosystem Restoration study area is located within the City of Monroe, Oregon (Figure 1).

The study will consider alternatives that have a constructed features footprint located along an approximately 0.5-mile reach of the Long Tom River running along the City of Monroe Park. The study area will also include the upstream and downstream reaches of the Long Tom River to accurately describe potential benefits and assess and mitigate for bank erosion or scour caused by a recommended action.

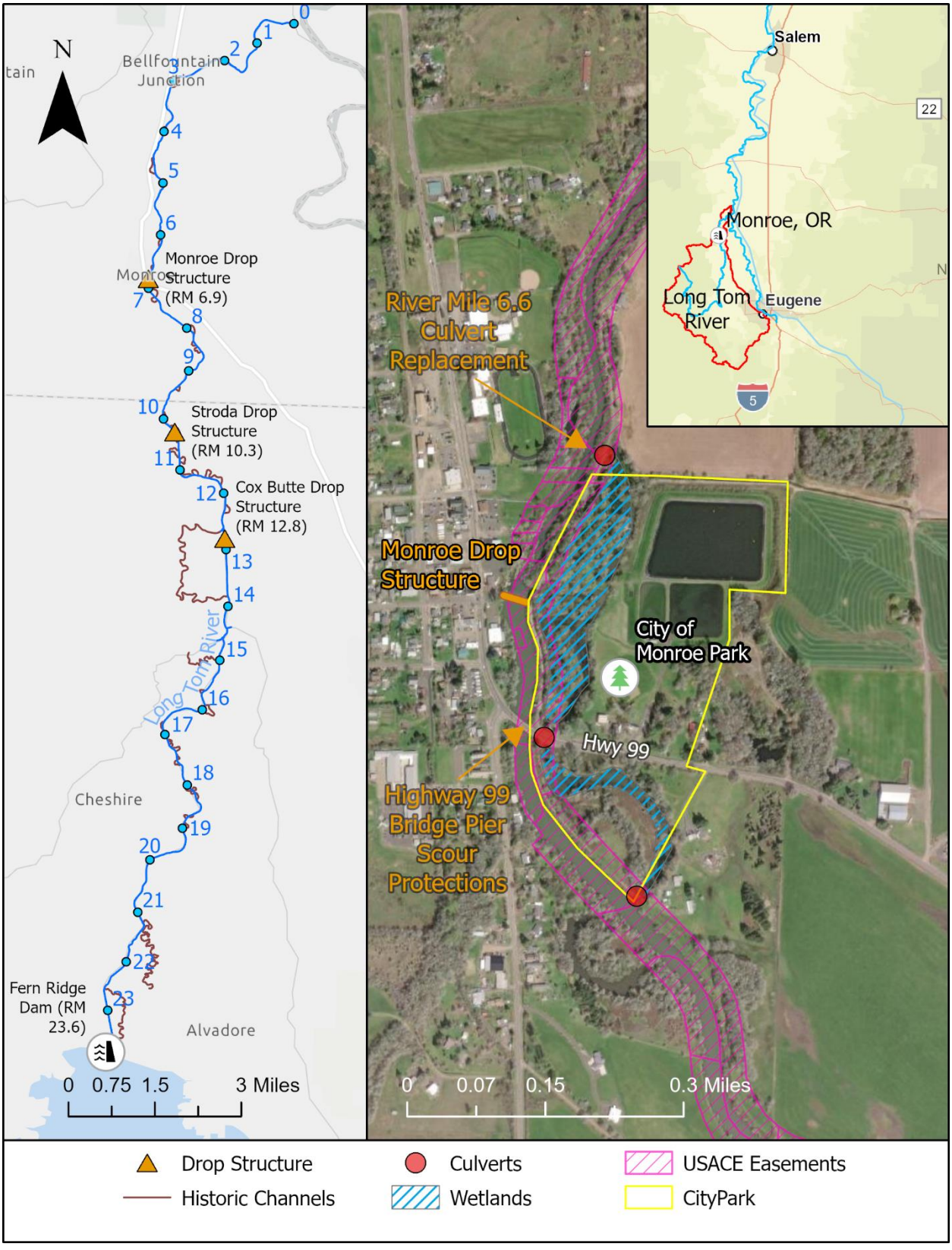

Figure 1. Map of project location and boundaries

1.4 Prior Studies, Reports, and Existing Projects

The following lists prior studies, reports, and existing projects completed within the scope of the study area. Additional literature cited can be found in Section 11 of this report.

Benton County (2007). Benton County Comprehensive Plan. March 2007.

Bureau of Land Management (2011). Environmental Assessment: DOI-BLM-OR-E050-2009-0006-EA, Long Tom Landscape Plan.

Bureau of Reclamation (2013). Junction City Water Control District Long-Term Irrigation Water Service Contract. Willamette River Basin, Oregon. PN EA 13-02, PN FONSI 13-02

City of Monroe (2018). Monroe Pedestrian Bridge Study (drawings only).

City of Monroe (2019). 2020 – 2040 Comprehensive Plan, The City of Monroe. August 2019.

City of Monroe (2020). City of Monroe Water Master Plan. Benton County, Oregon. February 2020.

City of Monroe (2021). Monroe Riverside District Master Plan: Framework for a Vibrant District in Downtown Monroe. June 2021.

Long Tom Watershed Council (2018). Lower Long Tom River Habitat Improvement Plan.

Long Tom Watershed Council (2008). Ecosystem Restoration in the Long Tom River Basin for Water Quality Improvement in the Willamette River. Preliminary Findings. Project P07-02, March 2008.

USACE (2022). Willamette Valley System Operations and Maintenance Draft Programmatic Environmental Impact Statement. U.S. Army Corps of Engineers, Portland District. November 2022

USACE 1943. Long Tom River Channel Rectification Project. U.S. Army Corps of Engineers. Portland District.

USACE 2000. Water Control Manual for Fern Ridge Lake. U.S. Army Corps of Engineers. Portland District.

USACE 2015. Historic Long Tom River Culvert Replacement Near Monroe. Phase 1. U.S. Army Corps of Engineers, Portland District. October 2015.

2 Existing Conditions

The existing conditions provide a description of the human environment within the study area and create a baseline from which potential alternatives are evaluated. The City of Monroe is a rural, agricultural community located in Benton County, Oregon, alongside the Long Tom River that flows north approximately 7 miles to its confluence with the Willamette River. The city center is located on the western side of the Long Tom River, which is between 5 and 10 feet higher in elevation than the eastern side where the City of Monroe Park and water treatment operations are located (Figure 1).

The Long Tom River in the vicinity of Monroe was largely shaped by the USACE Long Tom River channel rectification project that was completed in 1950 (USACE 1943). The channel dredging and widening, along with construction of the side embankments and drop structures were done to improve the flow conveyance capacity of the Long Tom River downstream of Fern Ridge Dam. The Monroe Drop Structure was constructed at the site of an existing mill dam that would divert high winter flows into the relic channel wetland areas that are currently a part of the City of Monroe Park. The mill dam included a headrace and fish ladder structure that was designed for low flow conditions. The headrace and fish ladder were left in place when the Monroe Drop Structure was constructed (Figure 2). The current configuration of the historic fish ladder is considered to not function properly according to the Oregon Department of Fish and Wildlife's priority barriers list (ODFW 2023).

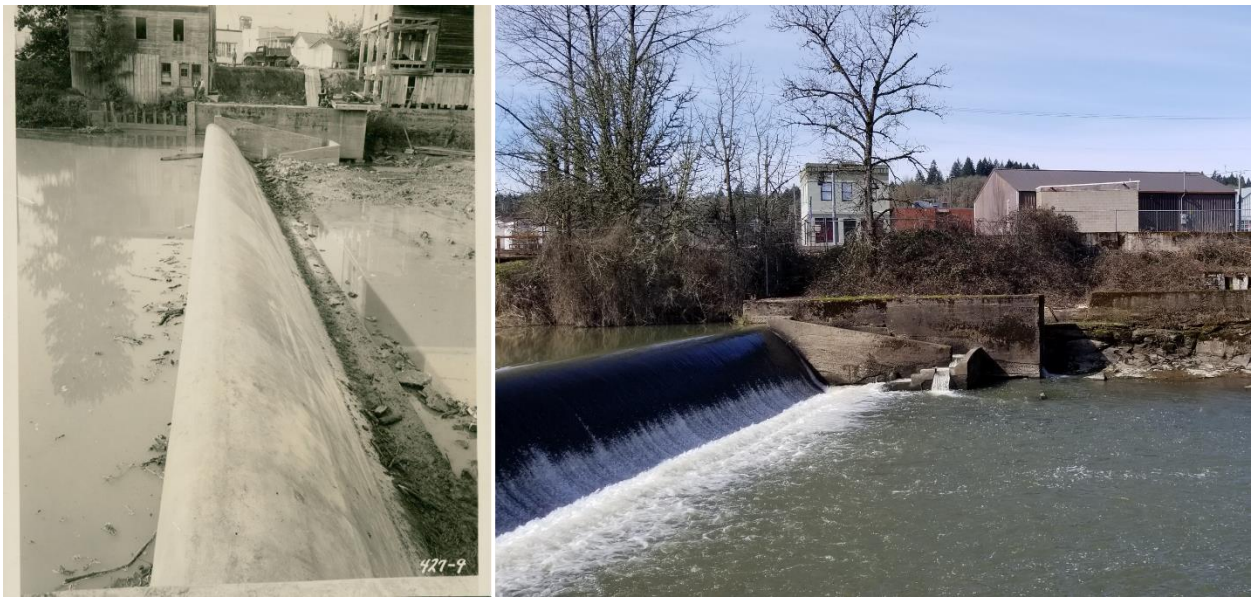

Figure 2. Photograph of the Monroe Drop Structure after construction (left) and current conditions (right)

The construction of the Monroe Drop Structure (river mile 6.9) and the channel embankments confines river flows to the Long Tom River, with connectivity to the wetland regions via embankment culverts located at river mile 6.6 and 7.2, along with a culvert under the Highway 99 roadway (Figure 3). The culverts are undersized and the wetlands are perched, or elevated higher than the culverts, relative to the downstream channel which prevents fish passage.

The City of Monroe's water supply comes from an intake pipe located in the pooled region of the Long Tom River, upstream of the Monroe Drop Structure which is permitted to withdrawal 350 gallons per minute. The intake pipe would need to be reconfigured by the city if there are any significant modifications made to the Monroe Drop Structure that would lower the water surface elevation in the pooled region. The City of Monroe's water master plan (City of Monroe 2020) noted the current intake structure would likely not work after dam modifications or outright removal of the existing dam and potential modifications will need to be made to their water supply intake if the Monroe Drop Structure were removed or modified significantly.

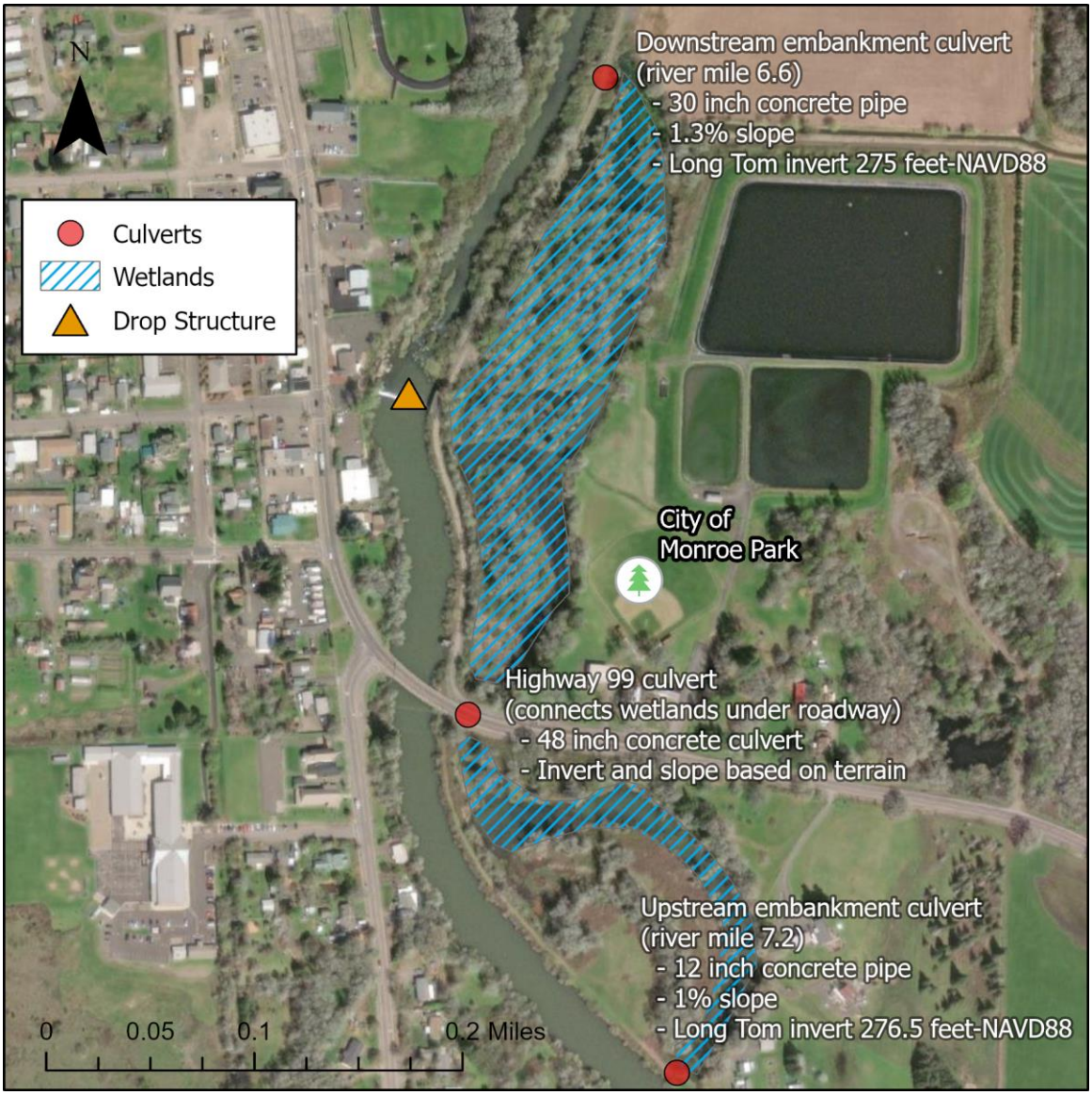

Figure 3. Map of project area showing the existing hydrologic connectivity to wetlands via embankment culverts

2.1 Climate

Topography, proximity to the Pacific Ocean, and exposure to middle latitude westerly winds are the principal climate controls for the Willamette Valley. The climate conditions of the Long Tom River Basin can be described as having warm dry summers and cool wet winters. During the winter months, high-pressure centers are characteristically to the south so that winds consistently come from the relatively warm and humid ocean surface and bring precipitation into the basin. In contrast, summer conditions typically have high-pressure centers near the west coast, which often forces the flow of air over the basin from a northerly direction. This pattern decreases relative humidity and reduces the amount of cloud cover and precipitation over the entire area during summer months. During spring and autumn, intermediate conditions occur causing alternating wet and dry periods (USACE 2000).

The average January maximum and minimum temperatures are 46 and 33°F with the average July maximum and minimum temperatures are 82 and 51°F. Annual rainfall is on the order of 55 inches per year with 70% of the annual rainfall occurring between October and February. Snow fall in the Long Tom River Basin is primarily limited to the higher elevation regions in the Coast Range Mountains. In the lower elevation regions of the basin, snow comprises between 1 and 2% of the total annual precipitation.

Current trends in climate change depict warming temperatures with increased rainfall, with most of the increased rainfall occurring in winter months. Oregon's annual average temperature has increased by 2.2°F since 1895. Days with a maximum temperature greater than 90°F have increased since 1951 with Salem, Oregon averaging over 21 days over the threshold for the 2010s compared to 15 days during the 1950s. The number of days with below freezing temperatures has not shown consistent trends across Oregon. Precipitation patterns of both rain and snow have also changed. In 17 of the last 23 years, Oregon's annual precipitation was below its long-term mean (OCCRI 2023).

The USACE climate preparedness and resilience policy dictates consideration of climate change in all projects to reduce vulnerabilities and enhance resilience of communities (USACE 2022). Appendix C describes the literature review and analyses performed that qualitatively assess the current and projected climate trends relevant to the study area.

2.2 Hydraulics and Hydrology

The Long Tom River watershed covers an area of 410 square miles of mixed forest and agricultural Lands with approximately 70% of the watershed area flowing through Fern Ridge Dam (river mile 23.6). The Long Tom River downstream of Fern Ridge Dam was extensively modified between 1943 and 1951 to increase the flow conveyance capacity of the river so that it could better accommodate releases from Fern Ridge Dam. Modifications included channel dredging, straightening, building of embankments along the channel, and the construction of three drop structures (low-head dams) that effectively reduced the Lower Long Tom River's length from 36 to 23 miles.

Flows in the Long Tom River downstream of Fern Ridge Dam are controlled by its operations and contributions from the three main tributaries Bear Creek (river mile 14.5), Amazon Creek (river mile 14.3), and Ferguson Creek (river mile 12.5). During the winter flood season, Fern Ridge is operated to maintain flood storage in the reservoir and releases such that flows stay

below the target flow of 4,650 cubic feet per second and above a minimum flow of 50 cubic feet per second at Monroe. Outflows from Fern Ridge Dam are limited to 3,000 cubic feet per second based on the conveyance capacity of the Long Tom River channel. The Water Control Manual for Fern Ridge Dam states that it is sometimes not possible to keep from exceeding the target flow at Monroe in moderate to large floods because of runoff from the uncontrolled area below the project, but that there is additional capacity in the channel with bankfull capacity near 6,000 cubic feet per second and flood stage starting near 7,000 cubic feet per second at Monroe. During summer months, the flow in the Long Tom River is predominately releases from Fern Ridge Dam, as the tributary flows decrease. The releases from Fern Ridge Dam accommodate for irrigation and other water right withdrawals with the goal of maintaining a high reservoir elevation for recreation and a minimum flow of 30 cubic feet per second in the river at Monroe for conservation purposes (USACE 2000).

2.3 Soils and Geology

The Long Tom River divides the study region topographically with the western side having elevations approximately 5 to 10 feet above the eastern side. The surficial geology of the Lower Long Tom River is that of Quaternary basin fill material comprised of clay, silt, sand, and minor gravel deposits (O'Connor et al. 2001). The western side of the Long Tom River is a part of the Quaternary middle terrace deposits with soils comprised of clay loams that are a part of the Holcomb and Malabon associations. These soils are characterized as being well drained with a depth to groundwater on the order of 6 feet. The eastern side of the Long Tom River is a part of the Quaternary lower terrace deposits with soils composed of silty clay loams that are a part of the Coburg and Conser associations. These soils are characterized as being poorly drained with a depth to ground water of less than 1 foot (USDA 2023).

2.4 Ecological Setting

2.4.1 Aquatic Resources

Below Fern Ridge Dam, the Long Tom River meanders for 24 miles before joining the mainstem Willamette River approximately seven miles downstream of Monroe (Figure 1). Portions of the Long Tom River are channelized with embankments to increase the maximum allowable release from Fern Ridge. Three smaller streams, Amazon, Bear, and Ferguson join the Long Tom River between the dam and the Long Tom-mainstem Willamette River confluence (USACE 2022).

Within the review area, aquatic resources include the Long Tom River, freshwater emergent wetlands, freshwater ponds, and freshwater forested/shrub wetlands. This includes approximately 6.1 acres of perennial stream (Long Tom River), 4 acres of forested wetland, 1.2 acres of shrub wetland, 0.73 acres of emergent wetland, and 4.6 acres of freshwater pond habitat (USFWS 2023).

Cutthroat trout and Chinook salmon are native species to the Long Tom River. Currently, the Lower Long Tom River serves as winter rearing habitat for juvenile cutthroat trout and Chinook salmon, as well as spawning, rearing, and refuge habitat for cutthroat trout. Populations of Pacific lamprey have been observed downstream of the Monroe Drop Structure, which likely serves as spawning habitat. The Monroe Drop Structure prevents upstream passage for juvenile fish and for adult fish except for large winter flood events where flows in the Long Tom River are large and downstream water elevations are elevated due to backwater of Willamette River. Undersized culverts and perched wetlands result in additional barriers to fish utilizing the

abutting pond habitat. Western Ridged Mussels have also been identified confirmed in the watershed by eDNA analysis conducted by the USFWS.

2.4.2 Resource Significance

Institutional Recognition: According to the 2018 Lower Long Tom River Habitat Improvement Plan, developed by Confluence Consulting, LLC and Long Tom Watershed Council, the Long Tom River is a priority watershed of the Willamette River Basin. This determination is based on the river's "…potential high quality juvenile salmon rearing habitat, as well as spawning and rearing habitat for cutthroat trout, lamprey and other native species…". There are many federal environmental laws (e.g., Endangered Species Act (ESA), the Essential Fish Habitat (EFH) provision of the Magnuson-Stevens Fishery Conservation and Management Act, Anadromous Fish Conservation Act of 1965, and the Fish and Wildlife Coordination Act (FWCA)) that have been used to guide previous federal actions in the Long Tom study area. Finally, multiple federally recognized tribes have cultural and historical connections to the Long Tom River and consider some of the fish and wildlife which use it to be important to their heritage.

Public Recognition: Public recognition means that some segment of the public considers the resource under consideration to be important. Pacific Lamprey are included as a target species of this study given their cultural significance as a traditional food. The number of lamprey in the Willamette Valley have declined due to damming and channelization on the tributaries. All of the land abutting the Long Tom River downstream of Fern Ridge is either privately owned, or federal and municipal lands. Most of the private lands are farms which produce a variety of crops for human and animal consumption throughout the globe. These farms use water from the Long Tom River to support their respective operations and provide products to the market. While the City of Monroe uses the Long Tom River as its sole source of drinking water, the nearby town of Junction City maintains an intake structure on the river which is currently not in use.

Technical Significance: The Long Tom River provides habitat for rearing of Juvenile upper Willamette River spring-run chinook salmon; and ESA listed species. The existing and potential habitat for Coho and Chinook salmon in the Long Tom River is designated as EFH by the NMFS. Stocks of salmon are on the decline nationwide and many efforts by multiple Federal and state agencies, tribes, and non-profits are working to preserve and increase these fishes. The scarcity of habitat for these fish from anthropogenic activities results in the need to preserve and enhance what remains. In addition to these fish species, the Long Tom River and its riparian area provide for an abundance of game species to include elk and deer; Northwestern Pond Turtles; waterfowl species such as wood duck and mallards; and fur bearing mammals like beaver and muskrat. These along with the many insect and plant species add to the biodiversity of the area which are supported by the Long Tom River.

2.5 Hazardous and Toxic Substances

A Hazardous, Toxic and Radioactive Waste (HTRW) reconnaissance of the site was performed to evaluate and identify whether hazardous substances or petroleum products may be present at the project site and to conclude whether recognized environmental conditions exist. The term "recognized environmental condition" is defined as the presence or likely presence of hazardous substances or petroleum products which indicate an existing release, past release, or a material threat of a release of hazardous substances or petroleum products into structures

on the properties or into the ground, groundwater or surface water of the project site. The review of the study area was conducted by Environmental Data Resources, Inc. (EDR). In their report dated October 24, 2022, EDR concluded, “The target property was not listed in any of the databases searched by EDR.” This indicates a low likelihood of encountering HTRW that may impact project implementation.

2.6 Impounded Sediments

An existing conditions terrain model was developed for this study as described in Appendix I. The existing conditions terrain model is a single digital elevation model (DEM) representing bare ground elevations of the floodplain, riparian, and river channel regions that was developed from a variety of topographic data sources. Based on the terrain model, the amount of sediments impounded by the Monroe Drop Structure was estimated to be between 2,000 and 5,000 cubic yards extending approximately 500 feet upstream. The impounded sediments are likely silts and sands, but the exact composition of the sediments is unknown.

Sediment sources in the Long Tom River include tributary inputs, overland erosion, and scoured sediments from the channel embankments that were created as a part of the 1940s channel rectification project. The channel embankments were largely built using localized excavated sediments from the lowering and widening of the river channel (USACE 1943). The tributary sediment load and overland erosion occurs over a predominately agricultural watershed, so the sediment supply to the Long Tom River is derived from relatively homogeneous sources of the soils described in Section 2.3. The HTRW reconnaissance of the study area did not find any contamination sources from parcels in the study area (Section 2.5). These factors suggest that the impounded sediments have a low probability of containing contaminants.

2.7 Socioeconomic and Environmental Justice

This section describes socioeconomic conditions in the study area. This includes a general description of the area, population and economy for Benton County, Oregon. The analysis of these socio-economic and demographic elements can be found in section 6.17 of the report.

Typical socio-economic and demographic data for Benton County indicate lower than average income when compared to the rest of the state. The City of Monroe, the location of the study area, makes up approximately .7 percent of the Benton County population according to the 2020 Census. Oregon’s economy is generally characterized by health care, retail trade, manufacturing, and professional sectors. Productive agricultural land, accessible water supply, abundant natural resources, and the aesthetic beauty of the region are the fundamental building blocks of the local economy. Relative to the national economy, the agriculture sector has played more of a role in Oregon, including in the study area. However, health care and social assistance emerge as a significant sector in the State.

3 Problems, Opportunities, Objectives and Constraints

3.1 Problems and Opportunities

This section identifies the problems and opportunities based on the assessment of existing and expected future without project conditions in the study area. Problems and opportunities can be viewed as local and regional conditions that could be modified in response to expressed public concern.

Problem. The Monroe Drop Structure acts as a fish barrier to ESA listed species including juvenile cutthroat trout, Chinook salmon, as well as culturally significant Pacific lamprey.

> ***Opportunity.*** Restore fish passage and habitat availability upstream of the Monroe Drop Structure
> ***Opportunity.*** Improve channel capacity, increase flood storage, and reduce pressure of channel conveyance.

Problem. The channel rectification and improvement project of the 1940s (USACE 1943) disconnected historic river segments, some of which function as off-channel wetlands but offer little habitat value to target species.

> ***Opportunity.*** Restore or create wetland and riparian habitat within the study area.
> ***Opportunity.*** Restore floodplain connections to create a more natural hydrologic regime.
> ***Opportunity.*** Implement channel restoration and in-stream habitat improvements by creating more natural channel morphology.
> ***Opportunity.*** Reconnect off channel segments and enhance in-stream riparian habitat.

Problem. The Monroe drop structure may cause negative impacts to the community resulting in safety concerns at the drop structure to recreators unfamiliar with the area and seasonally poor water quality for the City of Monroe water intake.

> ***Opportunity.*** Improved habitat to result in improved water quality for drinking water supply.
> ***Opportunity.*** Increase public access to the river and adjacent areas for recreational purposes and other development compatible with the City's land use and planning efforts.
> ***Opportunity.*** Reduce safety hazards along the river.
> ***Opportunity.*** Offer outdoor education programs for the local community.

3.2 Goals and Objectives

The following planning objectives summarize the future conditions the alternatives for this study are seeking to achieve based on the identified problems and opportunities. The potential negative impacts to the community identified as a problem above will be addressed as a planning consideration supplemental to the study's objectives.

Objective 1. Restore and/or reconnect quality habitat for native fish and wildlife species in a manner compatible with the City of Monroe's future development.

Goal. Improve year-round aquatic habitat diversity associated with in-stream features, for native fish use of spawning, rearing and overwintering habitat.
Goal. Reconnect and restore the historic disconnected channel segments to promote a more natural hydrologic regime with improved ecological responses
Goal. Restore adjacent riparian and wetland habitat.

Objective 2. Restore and emulate natural river processes, structures, and functions to improve fish passage and maintain channel conveyance.

Goal. Improve fish passage at the Monroe Drop Structure.
Goal. Maintain channel conveyance
Goal. Restore side and main channel's hydrodynamic, sediment transport and geomorphic processes to sustain long term fish passage.

3.3 Constraints

The constraints below represent restrictions on the project scope that would affect the constructability of the project due to financial, ecological, environmental, or hydrological limitations. Each of these constraints represents a condition to be avoided or minimized to the extent possible when formulating management measures and alternatives.

- All modifications to the grade control structure or in-stream features must be designed in a manner that maintains conveyance of flood flow releases and does not increase flood risk to the surrounding communities.
- The recommended plan needs to ensure the functionality of the City of Monroe's drinking water supply sourced from the Long Tom River in accordance with the City of Monroe's Water Master Plan and seek to avoid disruptions.

4 Plan Formulation

The guidance for conducting civil works planning studies, Engineer Regulation (ER) 1105-2-100, Planning Guidance Notebook, requires the systematic formulation of alternative plans that contribute to the federal objective. To ensure that sound decisions are made with respect to development of alternatives and ultimately with respect to plan selection, the plan formulation process requires a systematic and repeatable approach. This section presents the results of the plan formulation process completed through the following steps:

- Develop a future without project condition to describe the likely conditions within the study area during the period of analysis if no project was implemented and establish a baseline to compare alternative plans against.
- Identify and describe management measures, or project elements, that address the problems, opportunities, and objectives of the study.
- Evaluate management measures against screening to determine suitability for further consideration.
- Combine management measures into distinct alternatives that address identified problems and meet one or more study objective.
- Conduct modelling of each alternative to identify habitat benefits and technical considerations for implementation.
- Compare alternatives using a cost effectiveness and incremental cost analysis to determine costs per unit of habitat improved.
- Compare and select the alternative that meets the study objectives and maximizes environmental benefits in a cost-effective manner.

4.1 Future Without Project Condition Description

The future without project conditions is forecasted over a 50-year analysis period (2025 to 2074) and used to formulate and evaluate alternative plans. The forecast considers foreseeable actions, plans, and programs that are likely to be implemented in the future that may impact the problems and opportunities in the study area in absence of any USACE project.

If no Federal action is taken, the Monroe Drop Structure will remain in place and continue to impede upstream fish passage. The Long Tom River in the vicinity of Monroe was largely shaped by the USACE Long Tom River channel rectification project that was completed in 1950 (USACE 1943). The channel dredging and widening, along with construction of the side embankments and drop structures were done to improve the flow conveyance capacity of the Long Tom River downstream of Fern Ridge Dam. USACE is responsible for maintaining the drop structures and river channel and maintains a flowage, operational, and maintenance easement that typically spans 300 feet across the river and its embankments.

Future actions by USACE will likely include vegetation clearing and embankment repairs, along with clearing of embankment culverts to ensure hydrodynamic stability during flood events. Historically, maintenance of the Long Tom River channel has been piecemeal and limited by funding availability. Regular vegetation clearing along the embankments has largely ceased and erosion of the embankments and geomorphic processes have resulted in point and island bar formations that can alter the river hydraulics to increase local embankment scour. Revetments comprised of riprap have been constructed along the river's embankments by both the USACE and private landowners. USACE is currently developing an operations and maintenance manual

for the Long Tom River channel that will more clearly prescribe maintenance actions affecting vegetation, scour repairs, and the embankment culverts.

Most of the City of Monroe's buildings are located on the western side of the Long Tom River, which is between 5 and 10 feet higher in elevation than the eastern side where the City of Monroe Park and water treatment operations are located (Figure 1). The City of Monroe is a rural community with no major industries but has developed several planning documents in recent years in anticipation of growth with an emphasis of enhancing its riverside district. The City of Monroe's waterfront development plan specifies increased public access to the Long Tom River and continued coordination with USACE regarding the Monroe Drop Structure to develop solutions that combined community needs, ecosystem restoration, flood risk management, and public safety (City of Monroe 2021). There are plans to develop a pedestrian bridge across the Long Tom River that would connect its central business district to the City of Monroe Park (City of Monroe 2019). There are plans to improve and increase its water supply resources that includes developing groundwater withdrawals, adding in a prefilter to its treatment system, and improving its current intake pipe from the Long Tom River (City of Monroe 2020). The Long Tom Watershed Council (LTWC) has been actively involved with fish passage and restoration projects throughout the Long Tom River watershed that would continue over the 50-year analysis period. The LTWC's (2018) habitat improvement plan identified three goals of improving habitat connectivity, fish passage, and habitat value that all involve coordination with USACE.

Climate change is anticipated to affect the project area over the analysis period that includes warming air temperatures, increases in annual precipitation, and changes to the seasonal patterns resulting in dry summers and wet winters. The annual mean air temperature is expected to rise by 3 to 5°F over the next 50 years, which will drive increases in water temperature in the Long Tom River. Warmer temperatures correspond with increasing precipitation as far as annual amounts, but with most of the precipitation shifting to winter and spring with decreasing trends in summer and fall precipitation. The increased winter precipitation will have a higher percentage of rainfall relative to snow, which will result in lower snowpack volumes and alter winter and spring floods to being driven by intense rain events over rain-on-snow melt events. The qualitative vulnerability assessment performed for this study identified key indicators that include the loss of wetland and riparian vegetation, increased flooding, and sedimentation concerns (Appendix C).

4.1.1 Water Resources

Flows in the Long Tom River at Monroe are anticipated to be similar to the current conditions described in Section 2.2, and as stated in the Willamette Valley System Operations and Maintenance Draft Programmatic Environmental Impact Statement (Willamette Valley draft PEIS, USACE 2022). The Willamette Valley draft PEIS considered several alternatives to operations and climate change, but all scenarios suggest that flows in the Long Tom River downstream of Fern Ridge Dam would not significantly change over the study period.

Projected increases in winter precipitation will likely result in higher tributary flows from Bear Creek and Ferguson Creek that drain the Coast Range Mountains. Increased tributary flows during winter events could lead to increased flows at Monroe. The projected warmer and dryer future summer conditions will likely have little impact on summer flows in the Long Tom River at Monroe as irrigation and other water right allocations and conservations flows will still be released from Fern Ridge Dam.

Water temperatures will continue to increase over the analysis period. In the summer, the Long Tom River flows are primarily derived from releases from Fern Ridge Dam, but its reservoir is

shallow and does not provide any cold-water releases. As identified by the LTWC, the primary means to mitigating water temperatures in the Long Tom River is through riparian shading and floodplain connectivity (LTWC 2008). Water temperatures during winter months would likely increase, but with more variability as there will likely be more winter precipitation events driving flows in the Long Tom River.

4.1.2 Fish and Aquatic Resources

The future without project conditions would maintain the Monroe Drop Structure as a barrier to upstream fish passage that would continue to limit the habitat accessible by the juvenile Chinook salmon, adult cutthroat trout, and Pacific lamprey populations. Winter flows in the Long Tom River at Monroe will be like current flows but with the potential for more flood events due to more winter month precipitation resulting in increased runoff and tributary flows downstream of Fern Ridge Dam. Winter month water temperatures would continue to rise, but with increased variability driven by the changes in runoff events. These factors could increase erosion and sedimentation processes along the Long Tom River, that would adversely affect fish using the habitat for spawning but may improve habitat conditions for fish using the river for rearing and refuge. In summer months, water temperatures will continue to increase with water temperatures already reaching levels that do not support the fish populations considered in this study.

Wetland habitats are primarily located in the relic river channel of the Long Tom River that are typically connected via the embankment culverts. There is approximately 12 acres of wetlands and 10 acres of surface treatment lagoons located on the eastern side of the Long Tom River in the City of Monroe Park (Figure 1). Hydrologic connectivity between the Long Tom River and the wetlands in the City of Monroe Park is maintained by culverts located at river mile 6.6 and 7.2, along with a culvert under the Highway 99 roadway, but the culverts are undersized, and the wetlands are perched relative to the downstream channel that prevent fish passage. The qualitative climate vulnerability assessment conducted for this study identified loss of riparian and wetland vegetation as a potential threat to the Willamette Valley region, which would likely be greatest in the projected dryer and warmer summer months (Appendix C). In combination with the warmer water temperatures, the potential loss of riparian and wetland vegetation in summer months will pose the largest threat to fish species and habitat in the Long Tom River.

4.1.3 Geology and Soils

The future without project condition anticipates no changes to the geology and soils as there is minimal change expected with respect to the local hydrology and river flows, as well as minimal development in the region. Within the Long Tom River channel there will likely be continued localized embankment scour and revetment repairs that will add larger material rocks to the channel embankments. The Monroe Drop Structure will continue to accumulate sediment on the upstream side of the structure.

4.2 Management Measures to Achieve the Planning Objectives

Management measures are potential actions that could be taken to achieve the planning objectives within the project area. These measures are the building blocks of alternative plans and can be stand-alone or combined into larger projects. Initial measures were developed during a site visit in coordination with the Non-Federal Sponsors and stakeholders held on June 18, 2021. Measures identified during the initial session were further developed and are described in this section.

4.2.1 Drop Structure Removal

The complete removal of the Monroe Drop Structure would involve the removal of the existing man-made concrete structure and its foundation. The existing headrace and fish ladder located on the western side of the drop structure would remain in place for historical preservation. Prior to the Long Tom River Channel Rectification Project (USACE 1943), there was an existing mill dam at the current site of the Monroe Drop Structure as shown in the schematic depicted in Figure 4.

The project site would be dewatered with a bypass system to pass the river flow, and all elements of the structure including the concrete drop wall and the supporting foundation at its base would be demolished and removed from the project. Sediments built up on the upstream side of the structure, as well as surrounding the structure removal site would be tested for contaminants with removal as needed. There is on the order of 2,000 to 5,000 cubic yards of sediment estimated to be impounded over an area approximately 500 feet upstream of the Monroe Drop Structure (Section 2.6). It is assumed that the sediments would likely not be contaminated and could be used in regrading the river channel or allowed to wash downstream. Incorporating the course material of the impounded sediments into the regrading of the river channel would lower impacts associated with washed sediments and turbidity.

The Long Tom River channel would be regraded in the vicinity of the drop structure removal to restore the natural channel slope as much as possible. This may require augmenting the sediments on site with gravels and cobbles, as well as armoring parts of the bed and embankments Post removal, fluvial process would be allowed to assist with returning the site to as natural a state as possible. As a result, the existing fish barrier would be completely removed, and natural channel habitat would be restored.

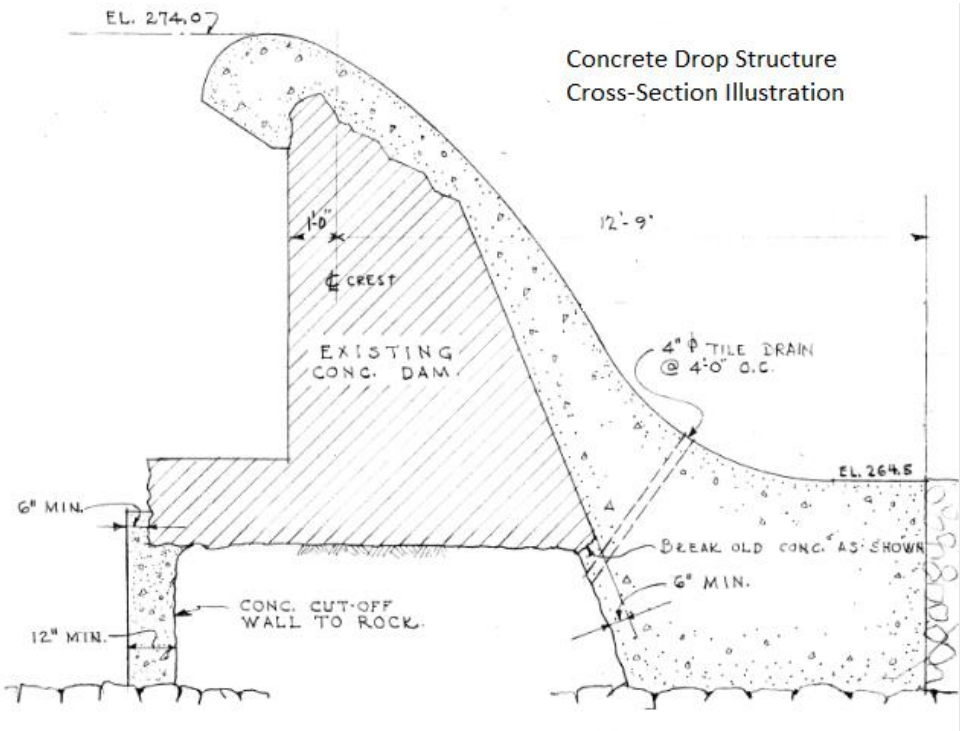

Figure 4. Cross section schematic of the Monroe Drop Structure (source: USACE 1943)

4.2.2 Notch/Lower Drop Structure with associated Rock Ramps

A rock ramp is a steep engineered riffle or step pool type structure stabilized by large immobile materials that provide fish passage (BOR 2007) (see Figure 5 for an example schematic of a rock ramp fishway). This measure involves constructing a rock ramp starting on the spillway of the Monroe Drop Structure downstream approximately 650 feet to create a slope of approximately 1.5 percent. In addition, the top of the Monroe Drop Structure would be notched to create a rectangular cut out approximately 1.5 feet in height and 70 feet wide, which would reduce the effective crest elevation of the drop structure from 275.5 feet to 276 feet within the notch (elevations are in the North American Vertical Datum of 1988, NAVD-88).

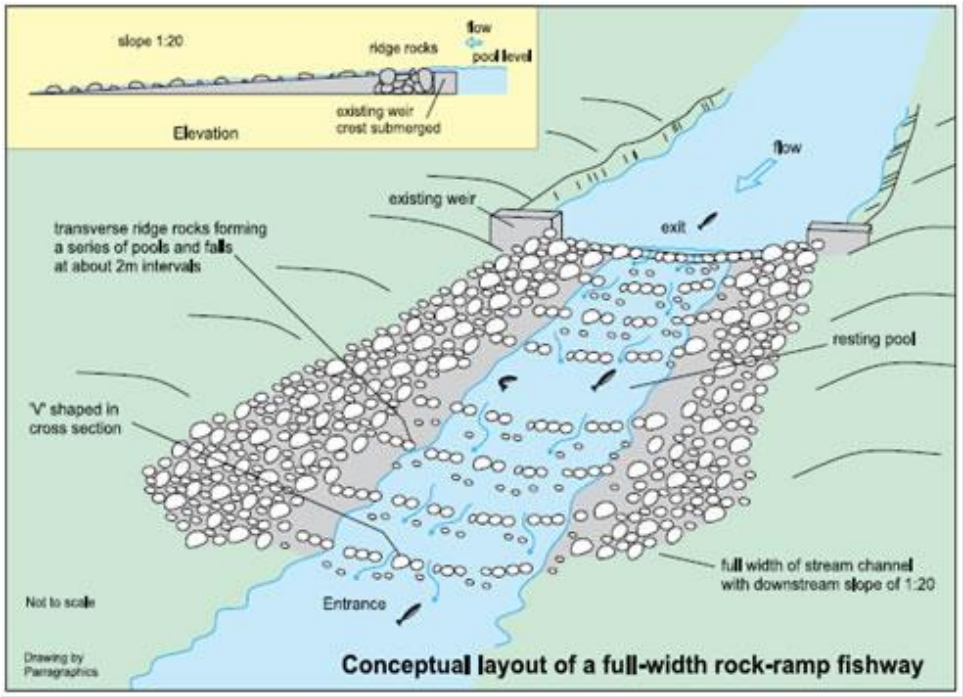

Figure 5. Conceptual schematic of a rock ramp fishway (source: Thomcraft and Harris 2000).

The project site would be dewatered with a bypass system for the river flow. The stream bed downstream of the Monroe Drop Structure has exposed bedrock suggesting that anchoring the rock ramp feature will require a significant concrete substructure to keep it in place. On top of the substructure, large rock, cobbles, and gravels would be used to create the engineered riffle or step pool features. Any step pool features will not exceed 1.5 feet in height differential according to guidelines developed by the National Marine Fisheries Service (NMFS 2022). In the end, the existing fish barrier would not be removed, but passage would be restored with the engineered riffle and step pools.

4.2.3 Bypass Channel

The bypass channel measure would create a stream channel through the City of Monroe Park on the east bank that would provide a flow pathway around the Monroe Drop Structure with three proposed routes consisting of a short, medium, and long bypass channel (Figure 6). The bypass channels were assumed to have an approximate 40-foot width with side slopes of 1 to 3 (vertical to horizontal). The bypass channels would have approximate lengths and slopes of 600

feet at 1% for the short route, 1,400 feet at 0.6% for the medium route, and 2,600 feet at 0.3% for the long route. There would likely be the need to add in several berms in the City of Monroe Park at low spots to ensure the bypassed flow does not overflow into adjacent parcels. Berms were estimated to have a top width of 30 feet, by approximately 5 feet tall, and have side slopes of 1 to 2 (vertical to horizontal). The total length of berms needed to direct flow was estimated to be 625 feet for the short bypass route and 350 feet for the medium and long bypass route. In addition, it was assumed that some armoring of banks may be needed to maintain the stability of the bypass channels. Bypass channels have the advantage of restoring fish passage and directly accessing the wetland habitat in the City of Monroe Park.

Figure 6. Maps showing routes of the short, medium, and long bypass channels

4.2.4 Downstream Rock Ramp

A downstream rock ramp measure creates an engineered riffle approximately 850 feet downstream of the Monroe Drop Structure near the current location of the downstream embankment culvert. The measure would not restore fish passage independently but would be implemented with either the removal of the drop structure or a medium bypass channel as depicted in

Figure 7. The engineered riffle would provide fish habitat and help attraction flows for fish to navigate the medium bypass channel. The engineered riffle would extend approximately 500 feet downstream and have a maximum height of 2 to 3 feet.

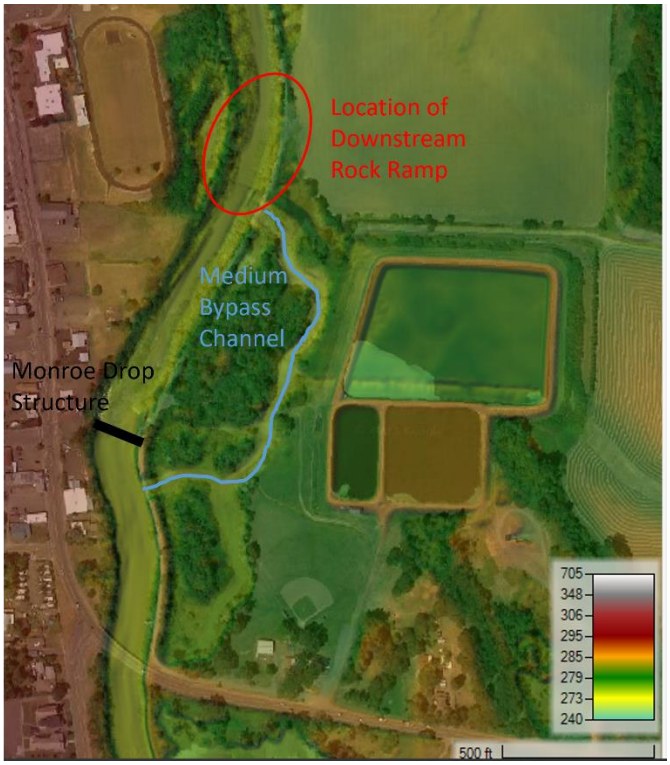

Figure 7. Map of the proposed location of a downstream rock ramp measure in

connection with medium bypass channel

4.2.5 Culvert Replacement and Improvement

This measure would look to improve or replace the embankment culverts within the project area, specifically at river mile 6.6 and 7.2.This measure would focus on habitat improvements and would be combined with another measure for upstream fish passage (i.e., rock ramp at the drop structure, total removal of the drop structure, or a bypass channel).In 2015, a phase 1 design was completed by USACE to replace the embankment culvert located at the downstream extent of the City of Monroe Park (river mile 6.6) but has not been implemented (USACE 2015). At this location, the culvert outlet is perched relative to the Long Tom River channel such that water draining from the wetland to the Long Tom River under low and normal flow conditions drains onto the embankment slope of the river which effectively cuts off fish passage. Native soils, sediment, and substrate would be placed within the culvert to form a new native ground surface. Flow velocities would be slowed and passage by aquatic organisms, including salmon and lamprey would improve at all stages of life with slower velocities through the culvert.

The embankment culvert at river mile 7.2 (upstream of the Monroe Drop Structure) is a 12-inch diameter culvert that does not allow for fish passage. Resizing this embankment culvert to allow fish passage was not considered.

4.2.6 Sediment & Substrate Modifications

This measure would involve placement of larger diameter cobbles and gravels to improve aquatic habitat for fish species. The existing substrates in the project area are largely comprised of silts and sands. These substrates are important spawning habitats for many fish species. These areas also provide habitat for macroinvertebrates which serve as prey for many smaller and juvenile fish species.

4.2.7 Woody Debris and Rock Placement

Under this measure, habitat features such as large woody debris and boulders would be placed, and anchored, if necessary, to provide additional habitat structures for fish species. Large woody debris would be gathered as part of any necessary clearing activities and placed in deeper holes, potentially within backwaters, to provide additional habitat structure. These areas provide additional habitat niches for fish species such as salmon, Pacific lamprey, and juvenile fish of multiple species. They also provide habitat for the development of macroinvertebrate communities important to many fish species and younger age classes. In addition, boulders may be brought in from off-site and placed as additional habitat features. These features help to disrupt flow patterns in the river and provide refugia for fish species downstream.

4.2.8 Riparian Forest Enhancement

This measure would look to improve the forested area of land adjacent to the water bodies within the project area by reestablishing native plants. Quality habitat would be created by reestablishing native plants, with species selected based on the recommendations of the tribes and the city in collaboration with the project team. Riparian forest improvement would assist with sediment filtering, flood control, nutrient control, pollutant control, improving water quality, stabilizing the channel, providing shade and stable water temperatures, and creating additional habitat and food.

4.2.9 Repair of the Existing Fish Ladder

The existing headrace and fish ladder structure was a part of the original mill dam prior to the construction of the Monroe Drop Structure and its design only allowed fish passage under low flow conditions. In 1997, the USACE and the Oregon Department of Fish and Wildlife (ODFW) repaired portions of the headrace and fish ladder that had been damaged by high flows from the historic 1996 flood and in its current configuration does not meet ODFW standards for fish passage.

The potential to restore the existing headrace and fish ladder structure was discussed during the early stages of the project with the cosponsors and LTWC. Options included a new fish ladder and replacement with a rock ramp type riffle. Currently the structures are located on private property and have historical designations.

4.2.10 Wetland Restoration

Connectivity of the Long Tom River to the historic channel, oxbows, and floodplain wetlands is through the embankment culverts. Section 4.2.5 describes the potential for culvert improvements to improve connectivity. The removal of invasive species, soil enhancements, and planting of desired wetland species could be done to improve the habitat quality of the near channel wetland regions.

4.3 Evaluation Criteria of Identified Management Measures

The following criteria were used to identify management measures to be considered as a stand-alone project or combined with other measures to be considered in an initial array of alternatives. Criteria ratings are categorized as Green (G) – fully meets the criteria, Yellow (Y) – partially meets the criteria, and Red (R) – does not meet the criteria. The criteria ratings for each measure are summarized in Table 1.

Completeness – The identified measure provides benefits consistent with the study objectives without further federal or non-federal action (G), the measure may require additional action to achieve or maintain project benefits through the study period (Y). The measure cannot provide benefits without additional federal or non-federal account outside of the scope of the study (R).

Efficiency – The identified measure provides a cost-effective means of resolving the specified problems (G), the measure has higher potential costs but may contribute to maximizing ecosystem benefits (Y), the measure is not cost effective in achieving the study objectives (R). Assessment of this criteria is qualitative, and efficiency will be further analyzed using the Corps of Engineers Incremental Cost Analysis Tool (CE/ICA) in Section 5.2.4 to determine cost effective and best buy plans.

Effectiveness – The identified measure resolves one of more of the identified study problems (G), the measure partially resolves or supports other measures in addressing one or more study problem (Y), the measure does not alleviate the identified study problems (R).

Acceptability – The identified measures does not violate existing applicable laws, regulations, or guidance at a state federal or local level (G), the measure may require a waiver or significant coordination to implement as described (Y), the measure violates one or more law or regulation and cannot be implemented under the study authority (R).

Real Estate Availability – The identified measure can be implemented on lands owned by the project sponsor or within the USACE easement (G), the measure can be implemented on lands owned by the sponsor, USACE or within the existing easement, but may require coordination or acquisition for modifications on private property (Y), the measure would require significant land acquisition within or outside of the study area to be implemented (R).

Restoration or Reconnection of Habitat (Objective 1) – The measures meets (G), partially meets or supports (Y), or does not meet (R) the objective of restoring fish passage within the study area.

Restoration of Riverine Processes (Objective 2) – The measure restores (G), partially restores or supports (Y), or does not restore or support (R) the objective of restoring geomorphic processes within the lower Long Tom River.

4.4 Preliminary Analysis of Management Measures

Table 1 summarizes a preliminary analysis of each of the identified management measures against the evaluation criteria. Failure to meet one or more criteria does not indicate a measure will be excluded from further consideration; however, measures that do not meet criteria will likely need to be combined with other measures to form an alternative that is acceptable for implementation.

Table 1. Evaluation of management measures based on screening criteria

	Complete	Effective	Efficient	Acceptable	Real Estate	Habitat Restoration	Riverine Process Rest.
Drop Structure Removal	G	G	G	G	G	G	G
Notch and Rock Ramp	G	G	Y	G	G	G	R
Downstream Rock Ramp	G	Y	Y	G	Y	R	Y
Bypass Channel	G	G	G	G	G	G	Y
Substrate Modification	G	R	R	G	G	R	R
Culvert Modification	G	Y	Y	G	G	Y	Y
Woody Debris and Rock Placement	G	R	Y	Y	G	R	R
Riparian Forest Enhancement	G	R	R	G	R	R	R
Wetland Restoration	G	R	Y	G	G	R	R
Repair Historic Fish Ladder	G	Y	R	G	Y	Y	R

Notes: Effectiveness criteria are color and letter coded as: Green (G) – fully meets the criteria, Yellow (Y) – partially meets the criteria, and Red (R) – does not meet the criteria

4.5 Measures Excluded from Further Consideration

Repair of the historic fish ladder – This measure was excluded due to the high costs associated with modifying the fish ladder and the Monroe Drop Structure, and acquisition of the existing structure which is privately owned. The fish ladder does not meet the needs of the target species, specifically the Pacific lamprey, and would need to be combined with other measures that would likely result in more effective fish passage at lower costs without its inclusion.

Wetland restoration – Standalone wetland restoration of the historic channel areas does not meet or support the study objectives, nor does it provide benefits to the study's target species. While environmental benefits due to wetland restoration exist, they are out of the scope of this study and meet neither the purpose nor need outlined in Section 1.2.

Woody Debris Placement – This measure was excluded from consideration because it does not directly support benefits identified in the study objective. Placement of permanent anchored wood or stones in the channel also raise concerns about its potential impacts to the authorized purpose of the Long Tom Channel Improvement Project, which was constructed to pass flows from the Fern Ridge Dam without increasing the flood risk along the river. Permanent obstructions within the channel could have negative impacts to project function and overall flood risk.

Riparian Forest Enhancement – Riparian restoration was excluded from further consideration due to its limited value in achieving the study objectives either alone or in combination with other measures. The current project area has sufficient riparian coverage in the adjacent wetland in the City of Monroe Park and further extension of riparian revegetation would require substantial real estate acquisition associated with extending the project area up and downstream.

Sediment & Substrate Modifications – This measure was removed from further consideration due to potential impacts to the authorized purpose of the Long Tom Channel Improvement project. Sediment and substrate placed as a part of this project would likely be pushed downstream during high flows, reducing or eliminating potential benefits while contributing to the O&M burden of the federal project through increased dredging requirements.

5 Development and Evaluation of Alternatives

Evaluation of the 10 management measures resulted in 5 measures being screened from further consideration and 5 measures carried forward and considered in the development of alternatives. The bypass channel measure was further divided into three configurations identified as a short, medium, and long bypass which would reconnect varying amounts of the historic meander. These measures were evaluated to determine necessary refinement, dependencies, and ecologically relevant combinations by the Project Delivery Team, the Sponsors, and coordinating agency partners before being combined into alternatives that were evaluated for implementability and estimated ecological benefits.

5.1 Formulation of Project Alternatives

Using the identified management measures, alternatives were developed that met at least one of the study objectives described in Sec. 3.2 and at least partially met each criteria described in Sec. 4.3. Alternatives considered included at least one measure to restore or reconnect habitat and enhance fish passage at the Monroe Drop Structure (Objective 1). Larger groupings of measures were developed to identify further fish passage improvements, or restoration of adjacent wetland and riparian habitat to identify the National Ecosystem Restoration (NER) plan that cost effectively maximizes ecosystem restoration benefits within the study area or maximizes comprehensive benefits. Combinations that were incompatible or not implementable were not considered (e.g., structure removal and lowering the drop structure).

Ten alternatives including No Action were developed into a focused array that was carried forward to evaluation and comparison. Table 2 lists the alternatives, includes a shortened identifier for each alternative, and a description of the considered action.

Table 2. Description of alternatives considered

Alternative	ID	Description
No action	EC	No federal action, future without project conditions
Removal of drop structure	T	Removal of the drop structure (leaving historic fish ladder), channel regrading, and riprap on Hwy. 99 bridge piers
Notch and rock ramp	R1	Notching of the drop structure (1.5 feet height by 70 feet wide) with concrete ramp and rock riffle extending 650 feet downstream.
Short bypass channel	B1	Approximately 650-foot channel through City of Monroe Park. Inlet and outlet close to drop structure
Long bypass channel	B2	Approximately 2,600-foot channel through City of Monroe Park. Inlet and outlet close to drop structure
Medium bypass channel with downstream rock ramp	B3DR	Approximately 1,400-foot channel with outlet 900 feet downstream of drop structure with small rock ramp (riffle) in channel and bypass outlet
Downstream rock ramp with	DRT	Removal of the drop structure with downstream rock ramp (riffle)

removal of drop structure		in same location as B3DR
Short bypass channel with removal of drop structure	B1T	Combination of B1 and T
Long bypass channel with removal of drop structure	B2T	Combination of B2 and T
Medium bypass channel, downstream rock ramp, and removal of drop structure	B3DRT	Combination of B3DR and T
Notes: The removal of the drop structure alternative (T) includes improvements to the embankment culverts. The alternatives that are combined with alternative T (B1T, B2T, B3DRT) do not include culvert improvements as they have bypass channels that would breach the embankment culverts and provide connectivity.		

5.2 Evaluation of Focused Array of Project Alternatives

Alternatives were evaluated based on their average annual cost per unit of habitat improved. A habitat unit (HU) is a non-monetary measure of restoration benefits within the study area and is used to quantify and compare the effectiveness of each alternative. To develop Hus for the study, benefits were quantified using a blended hydraulic-habitat suitability index model with a fish passage factor applied to the habitat values.

The primary focus for the potential restoration activities was near the Monroe Drop Structure and the City of Monroe Park. A two-dimensional blended hydraulic-habitat model was developed, which covered 2.5 square miles that included 5 river miles starting at the Stroda Drop structure (river mile 10.3) and extending downstream to river mile 4.5 (2.4 miles downstream of Monroe) to capture the fullest extent of potential upstream passage benefits. Three flow regimes were simulated based on guidance set by the National Marie Fisheries Service (NMFS 2022) that represented winter low (72 cubic feet per second), median (800 cubic feet per second), and high (4,360 cubic feet per second) flows defined by flow duration analysis of daily average flows that are exceeded 95%, 50%, and 5% of the time. These estimated benefits were then evaluated using a cost effectiveness and incremental cost analysis (CE/ICA) where the environmental benefits and estimated costs were used to produce a per unit cost of restoration. The CE/ICA produced a set of best buy plans that provide the greatest increase in environmental output for the least increase in cost.

5.2.1 Hydraulic Modelling

A two-dimensional (2D) hydraulic model was developed for this study to compare alternatives and involved creating several model components including a terrain model, a roughness layer based on land cover, a model domain, numerical grid, hydraulic structures, and an unsteady flow model. These model components were developed using existing data sources. The existing conditions and nine alternatives (listed in Table 2) were developed using the USACE Hydrologic Engineering Center's River Analysis System (HEC-RAS, version 6.1). The physical configuration of the alternatives were modifications to the existing conditions model using DEM editing tools and hydraulic structures in the model. The level of detailed applied to hydraulic

model components were for this feasibility study and do not represent any significant restoration design considerations. See Appendix I for a complete description of the model development.

The 2D hydraulic model simulations were used to identify potential limitations to upstream fish passage and to assess the overall hydraulic condition of the river and floodplain regions. The assessment of the hydraulic condition was done by examining the maps of simulated water depths, velocities, and water surface elevations, as well as longitudinal profiles of these variables along the river centerline to identify locations where the hydraulics may impede upstream fish passage. An example of the hydraulic model output is shown in Figure 8 for water velocities associated with the median winter flow of 800 cubic feet per second. The National Marine Fisheries Service (NMFS) defines several conditions that can impede upstream fish passage that include flow depths of less than 10 inches, hydraulic drops of over 1.5 feet, and flow velocities more than 12 feet per second over 90% of a stream cross section (NMFS 2022). These criteria of the hydraulic condition were used to assess the alternatives.

Overall, there were no impediments to upstream fish passage for any of the alternatives according to the parameters defined by NMFS (2022) based on hydraulic head differences, minimum water depths, and maximum velocities. The alternatives that combined the drop structure removal and bypass channel (B1T, B2T, and B3DRT) did not add any redundancy in upstream passage connectivity as the bypass channels were only connected upstream to downstream under high winter flow conditions. Under low flow conditions, there were locations where minimum water depths were not maintained but these did not extend throughout cross sections such that there were flow paths that would allow upstream fish passage. The rock ramp (R1) and short bypass (B1) had hydraulic conditions with faster velocities in the bypass route relative to the velocities of the river, whereas the other alternatives have more consistent velocities in the bypass route as the river itself. Appendix I describes the hydraulic model results in more detail.

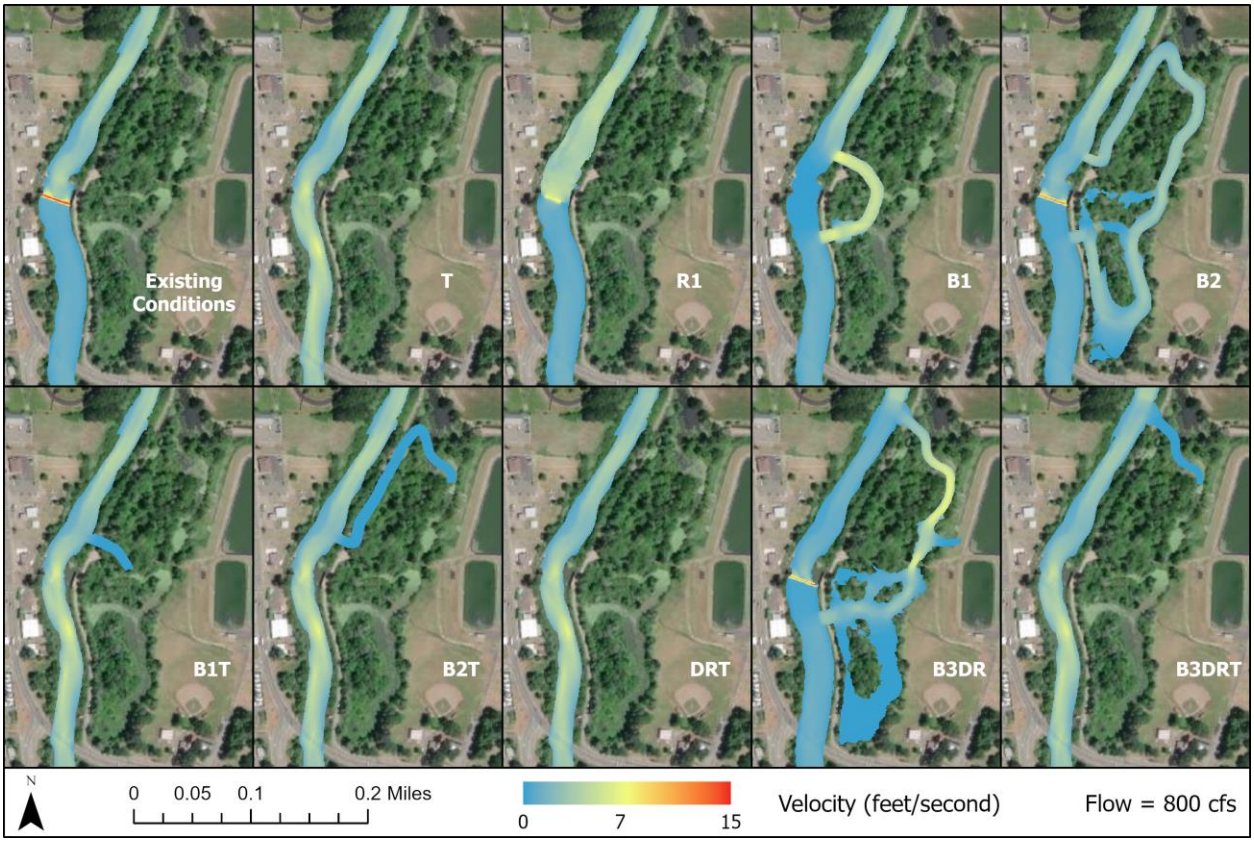

Figure 8. Map of depth-averaged velocities among alternatives at the median winter flow

5.2.2 Habitat Suitability Index Curves

Habitat Suitability Index (HSI) curves are a common method of quantifying suitable habitat criteria for species of interest. For salmonids, HSI curves are typically quantified with respect to hydraulic variables such as velocity, water depth, riverbed composition, or some combination of these variables. Four HSI curves were selected in total (Figure 9) with two representing preferred flow depth and velocity for adult cutthroat trout (Braithwaite 2011) and two representing preferred flow depth and velocity for juvenile Chinook salmon (White et al. 2022). Optimal water depth ranges from 1.3 to 2.3 feet for adult cutthroat trout and from 0.15 to 2.3 feet for juvenile Chinook salmon. Unsuitable water depth for adult cutthroat trout occurs for depths greater than 2.8 feet whereas the juvenile Chinook salmon have usable habitat at depths greater than 4 feet. The optimal flow velocity range was similar between the adult cutthroat trout and juvenile Chinook salmon with ranges between 0 to 1.4 and 0.7 to 1.25 feet per second, respectively. Unsuitable habitat was associated with flow velocities of greater than 2.1 and 3.8 feet per second for the adult cutthroat trout and juvenile Chinook salmon, respectively. Water depth and velocity preferences for Pacific lamprey would be met using the same criteria as those for the juvenile Chinook salmon as their optimal ranges overlap (LTW 2020), so there was no HSI curve for Pacific lamprey incorporated into the blended hydraulic-habitat index model.

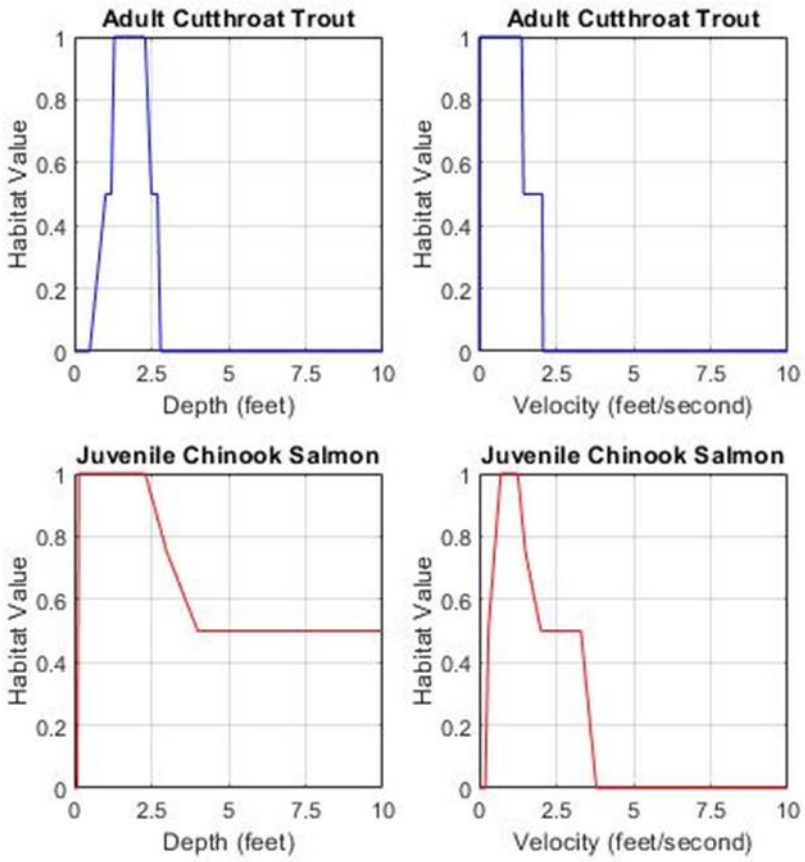

Figure 9. Habitat suitability index curves for adult cutthroat trout and juvenile Chinook salmon

5.2.3 Blended Hydraulic-Habitat Suitability Index Curve Model

The blended hydraulics-habitat suitability index model used values of water depth and velocity from the 2D hydraulic model to calculate habitat value based on the four HSI curves relevant to the species of interest. For each simulation, habitat value was calculated for each grid cell in the model. The habitat value for each grid cell was divided by the area of each cell and then summed over the model domain for each HSI curve. The summed values for each HSI curve were added together to give a total habitat value in units of habitat units per square foot. An example of the mapped habitat values for each HSI curve and the total score is shown in Figure 10 for the no action alternative.

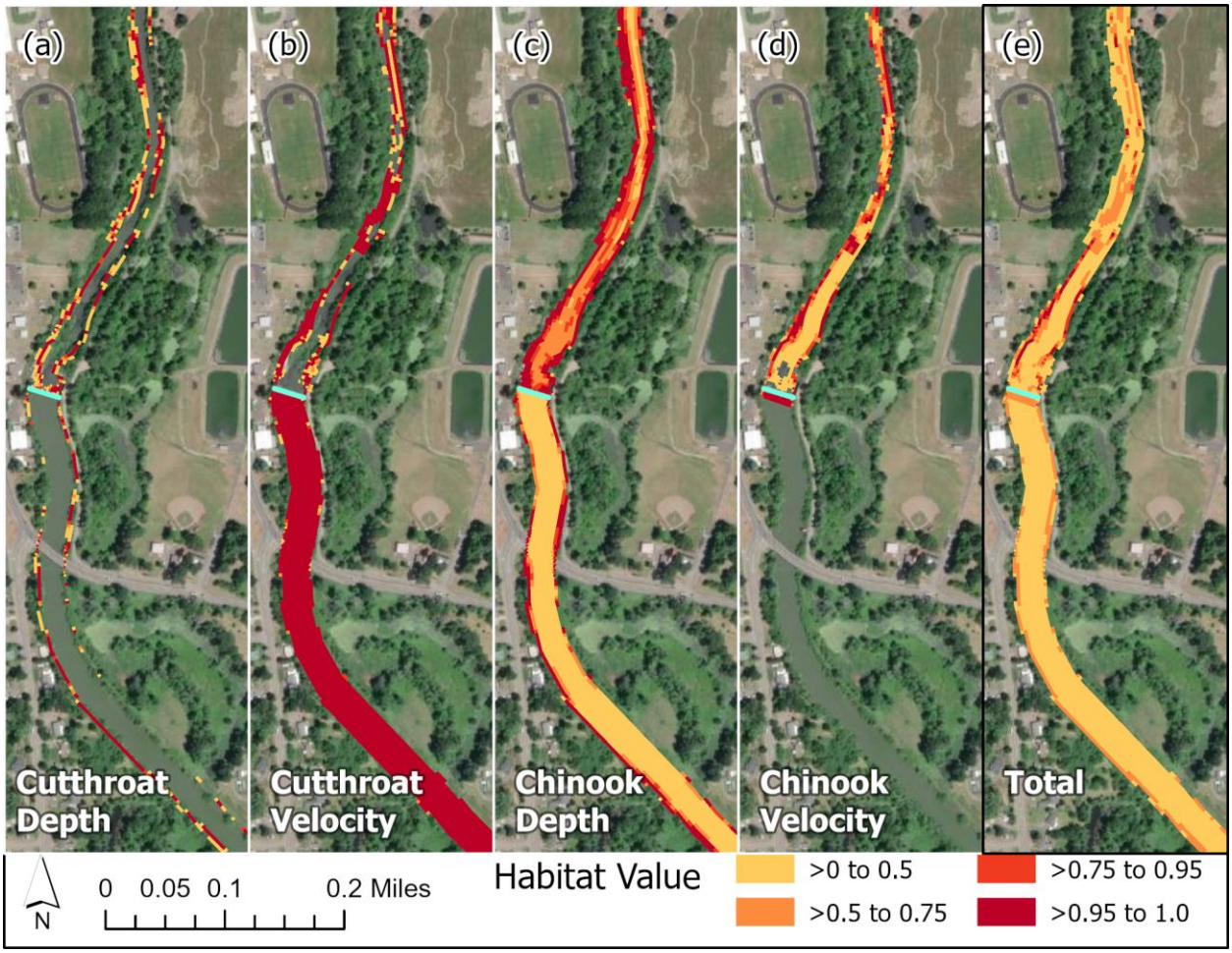

Figure 10. Maps of habitat value of each HSI curve for the no action alternative at the median winter flow

HSI curves primarily address preferred habitat for the two focal fish species and life stages (i.e., juvenile Chinook salmon and adult cutthroat) and does not directly account for upstream passage. A fish passage scaling factor was developed that ranged between 0.5 for no action to 0.95 for alternatives with full removal of the drop structure. The scaling factor was multiplied by the total habitat value to get the total habitat value (in habitat units per square feet). The fish passage scaling factor was established in consultation with USACE and sponsor fish biologists involved with the project. The rationale for setting the fish passage scaling factor was that removal of the drop structure would facilitate the most direct pathway for fish passage. It was not set to a value of one because there is rarely 100% passage of all fish under any circumstance and there could be some channel modifications involving reshaping the channel and armoring that could further reduce fish passage. The rock ramp value of 0.85 was considered to also have the direct pathway of restoring fish passage, but the engineered riffle could curtail passage more than other channel improvements. Bypass alternatives ranged from 0.75 for the short route to 0.7 for the medium and long routes. The bypass channels would require fish to navigate a new, indirect route for upstream passage and it was reasoned that the longer routes could decrease passage. The no action alternative scaling factor was set to 0.5

because under certain flow conditions, fish can navigate upstream, as indicated by sponsor-collected field data. This value is arguably high but was selected to avoid over-penalizing the no action alternative in comparison with action alternatives.

There was a total of 120 simulations that represented the various combinations of the ten alternatives, three flows rates (72, 800, and 4,360 cubic feet per second), and four HSI curves (flow and velocity curves for the adult cutthroat trout and juvenile Chinook salmon). At the median flow of 800 cubic feet per second, the top three ranked alternatives were B2T, B3DRT, and B1T (Table 3), all of which would remove the Monroe Drop Structure and include a bypass channel. These alternatives achieved the highest habitat value by restoring fish passage using the most efficient means of removing the drop structure, and increased habitat area by connecting to wetland regions adjacent to the City of Monroe Park. Figure 11 shows maps of the unscaled total habitat values among alternatives for the median flow scenario. The largest total habitat values were associated with the median and long bypass channels (B3DR and B2), but the upstream fish passage scaling factor greatly reduced their scaled total habitat value relative to the other alternatives. Appendix E lists the scaled total habitat values for the low and high flow scenarios, but the general ranking alternatives is consistent with those from the median flow scenario.

Table 3. Habitat value results for the median winter flow

Alternative	Trout Depth (HU/ft^2)	Trout Velocity (HU/ft^2)	Salmon Depth (HU/ft^2)	Salmon Velocity (HU/ft^2)	Total Habitat (HU/ft^2)	Passage Factor	Scaled Total Habitat (HU/ft^2)
B2T	15.6	27.2	49.7	34.1	126.6	0.95	120.3
B3DRT	14.7	27.3	48.5	34.5	125.0	0.95	118.8
B1T	14.9	27.2	48.4	34.1	124.7	0.95	118.4
R1	13.8	34.8	47.9	38.5	135.0	0.85	114.7
DRT	13.6	26.2	45.7	33.4	118.9	0.95	113.0
T	13.7	26.2	45.7	33.2	118.8	0.95	112.9
B3DR	14.1	51.3	50.5	37.2	153.1	0.70	107.2
B2	15.4	51.5	52.4	28.3	147.7	0.70	103.4
B1	13.0	35.9	48.2	37.8	135.0	0.75	101.2
No Action	12.4	49.6	47.3	21.5	130.8	0.50	65.4
Notes: Alternatives ranked from high to low based on the Scaled Total Habitat score; HU/ft^2 = habitat value per square feet							

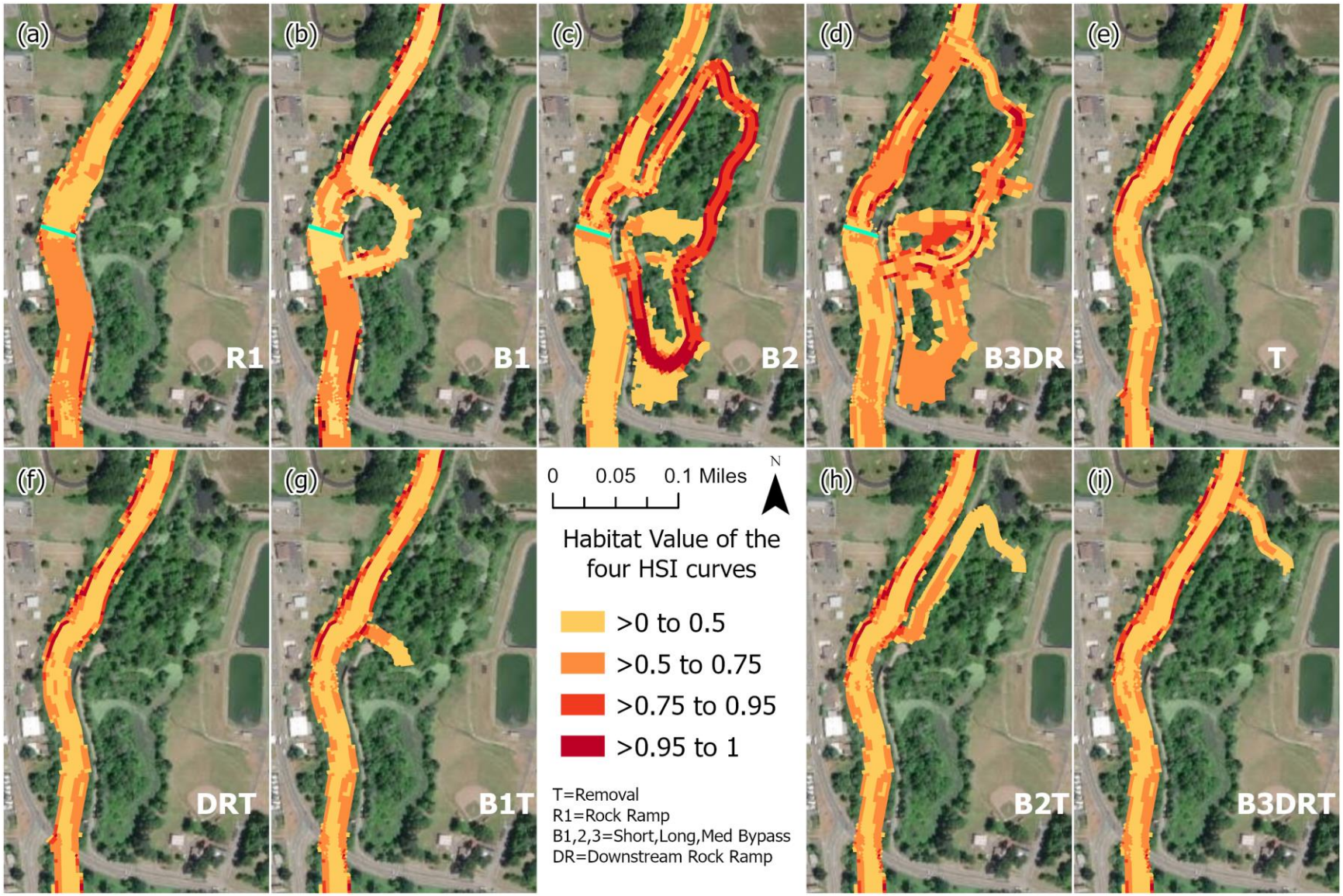

Figure 11. Maps of the total habitat values among alternatives at the median winter flow

5.2.4 Cost Effectiveness and Incremental Cost Analysis

The habitat evaluation and modeling process described above produced quantified habitat values for each of the ten alternatives included in the focused array. These anticipated habitat improvements were then compared against the future without project conditions to determine the habitat lift each provided in comparison to the no action alternative. The USACE Institute for Water Resources (IWR) developed a decision support tool, the IWR Planning Suite II, for the formulation and evaluation of ecosystem restoration alternative plans and was used to quantify the benefits and costs for the ten alternatives.

While the period of analysis was 50 years, it is anticipated that full project benefits would take 1 to 5 years to be realized depending on the alternative, so benefits were prorated in the initial years to account for lower anticipated benefits. For example, 100 percent of the 112.9 total habitat lift for the total removal alternative (T) is expected to be realized in project year 5. The total average annual habitat lift for alternative T is 43 habitat units, for the 50-year period of analysis. This number represents the difference between anticipated average annual benefits from total removal less the existing habitat conditions if no action were taken.

To compare between alternatives in the focused array, cost estimates for each were developed and include:

- Pre-construction engineering and design (PED) costs
- Construction / implementation costs
- Lands, easements, rights-of-way, relocations, and disposal areas (LERRD) costs
- Operation, maintenance, repair, replacement, and rehabilitation costs
- Monitoring or adaptive management costs
- Interest during construction
- Contingency percentages based on a cost and schedule risk analysis

This study considers a 50-year horizon of benefits average annual habitat units (AAHU) that accumulate in the study area compared to changes in average annual equivalent costs (AAEC) for each increased level of output. The cost estimates for each alternative in Table 4 were converted into AAEC for comparison to the net AAHU. Costs were converted to AAEC using a discount rate of 2.5 percent of interest during construction, and a 50-year analysis period. This analysis was performed using an economic model, the Institute for Water Resources Planning Suite (IWR-Plan). IWR-Plan involves the following steps:

- Identification of cost-effective plans. Cost effective plans are alternatives where no other alternative can achieve the same level of ecosystem benefit at the same or lower cost.
- Identification of best buy plans, which are a subset of cost-effective plans. Best buy plans are defined as those which have the lowest incremental costs per unit of benefit.
- Best buy plans are evaluated to identity the National Ecosystem Restoration (NER) plan, which is the plan that reasonably maximizes benefit compared to the cost.

The results of the cost effectiveness analysis are shown below both graphically in Figure 12 and in tabular form in Table 5. All the alternatives identified as cost effective are also considered best buy plans. This means that the identified plans have both the lowest total cost for their level of benefits, as well as the lowest incremental cost per AAHU at their various levels of output.

The results show there are four cost effective plans including the no action alternative. Detailed information supporting the costs of the measures is provided in Appendix F.

Table 4. Proposed alternatives and class 4 cost estimates

Alternative	Total	Interest During Construction (2.25%)	Total Cost	Total Average Annual Cost
No Action				
B1	$4,300,000	$7,985	$4,307,985	$144,397
B2	$9,000,000	$16,714	$9,016,714	$302,225
T	$2,433,000	$2,258	$2,435,258	$81,626
R1	$49,000,000	$90,997	$49,090,997	$1,645,450
B3DR	$5,600,000	$10,400	$5,610,400	$188,051
B1T	$5,962,000	$11,072	$5,973,072	$200,207
B2T	$16,748,000	$31,102	$16,779,102	$562,407
DRT	$2,600,000	$4,828	$2,604,828	$87,309
B3DRT	$8,000,000	$14,857	$8,014,857	$268,644

Note: Cost estimates were refined throughout the planning process. Costs presented for each alternative reflect the final iteration of cost developed for consistency and clarity.

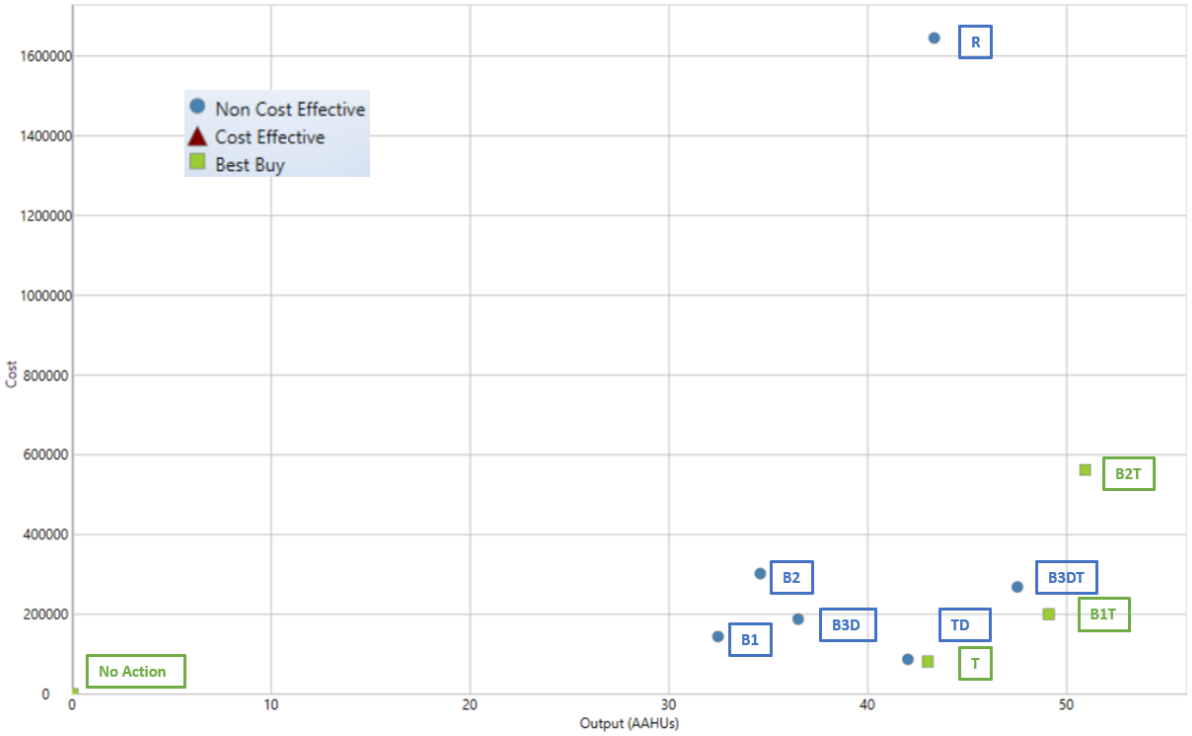

Figure 12. Results of cost effectiveness-incremental cost analysis

Table 5. Costs and benefits of alternatives

Plan	Cost (AAEC)	Output (AAHU)	Cost Effective?
No Action	$0	0	Yes, Best Buy
B1	$144,397	32.46	No
B2	$302,225	34.588	No
T	$81,626	43.006	Yes, Best Buy
R1	$1,645,450	43.336	No
B3DR	$188,051	36.494	No
B1T	$200,207	49.093	Yes, Best Buy
B2T	$562,407	50.93	Yes, Best Buy
DRT	$87,309	42.007	No
B3DRT	$268,644	47.519	No

5.3 Comparison of Final Array of Project Alternatives

Based on the outputs of the cost effectiveness analysis, the focused array of alternatives was reduced to three best buy plans highlighted in Table 5. Each of the best buy plans identified met the minimum criteria for consideration and achieved both planning objectives. This final array of alternatives is compared between each other to determine the National Environmental Restoration (NER) Plan.

The final array of alternatives includes the total removal of the drop structure (T), total removal of the drop structure with short bypass channel (B1T), and total removal of the drop structure with long bypass channel (B2T). For these alternatives, the measure descriptions were reexamined for completeness and cost estimates were refined based on further analyses into the potential costs of implementation (i.e., refinement of rock quantities needed, culvert improvements, alternations to the USGS flow gage).

For each alternative, it was assumed that construction staging would take place within the City of Monroe Park region. Construction activities in the Long Tom River channel would be accessed through the city park, which has large open areas and an access road along the embankment such that minimal disturbance would occur during the construction phase. Construction activities would take place over a 12-week period during the in-water work window of July 1st through October 31st. Further details regarding the assumed sequence of construction activities are provide in Appendix H.

5.3.1 Total Removal of the Drop Structure

The total removal of the drop structure alternative (T) involves the complete removal of the concrete structure and its foundations, with channel regrading and sediment augmentation (Section 4.2.1). In addition, alternative T includes riprap protection of the Highway 99 bridge piers (Appendix I), and embankment culvert improvements at river mile 6.6 and 7.2 to enhance connectivity to the City of Monroe wetlands (Section 4.2.5).

The removal of the drop structure would result in faster velocities in the Long Tom River flows in the vicinity of Monroe. An analysis of potential scour at the bridge piers and revetment design was performed (Appendix I). The six bridge piers of the Highway 99 bridge would be protected with revetments consisting of class 200 to class 700 riprap material spanning approximately 400 square foot regions around each pier (an estimated 300 cubic yards of riprap material would be used). The removal of the drop structure would lower water surface elevations in the region of the water supply intake for the City of Monroe. The final design configuration of the channel regrading would be coordinated with the City's project to relocate their intake pipe to ensure viability and also coordinate in construction sequencing to ensure the City's water supply is maintained throughout the construction phase.

The embankment culvert improvements would allow for fish access to the high-quality habitat in the wetlands of the City of Monroe Park. The 2015 phase 1 design report for the replacement of the embankment culvert at river mile 6.6 (USACE 2015) was used to help the design and to estimate costs for culvert improvements. The new culvert specified in the 2015 report was a 42-inch diameter culvert with five-pool engineered riffle on the Long Tom River side to facilitate fish access to the culvert during low and normal flows (see Appendix H for further details).

The embankment culvert at river mile 7.2 is smaller at 12 inches. Since fish passage would be achieved through the removal of the drop structure, it was not necessary to increase the size of the culvert at this location. However, cost estimates included costs of lowering the invert elevations of the culvert at river mile 7.2. The alterations to the flow regime would also affect the USGS flow gage at Monroe (gage number 14170000) that is currently located in the pooled region upstream of the Monroe Drop Structure. The USACE Portland District Water Management section provides funding to the USGS to maintain this gage as it is used as a control point for Fern Ridge Dam operations. The gage would likely be relocated further upstream and would require the development of a new rating curve, and cost estimates were provided by USACE Portland District Water Management.

5.3.2 Total Removal of the Drop Structure with Short Bypass Channel

The total removal of the drop structure with short bypass channel alternative (B1T) involves the complete removal of the concrete structure and its foundations, with channel regrading and sediment augmentation as needed as described in Section 4.2.1. In addition, the short bypass channel would be constructed as described in Section 4.2.3. The short bypass channel route as depicted in Figure 6 has a channel slope of 1% over 600 feet. The bypass channel would have an approximate width of 40-foot width with side slopes of 1 to 3 (vertical to horizontal). The entrance and exit of the bypass channel would require removing the embankments down to invert elevations near 274 feet NAVD-88 and 268.5 feet NAVD-88, respectively. The modeled hydraulics in the bypass channel were assessed and it was estimated that it would require the placement of some larger immobile stones along the channel toe to ensure stability of the channel. Costs associated with a preliminary estimate of the amount of rock material was added to the analysis with discussions with biologists from the USACE, LTWC, and cosponsors acknowledging that the final design would try to limit riprap in favor for more natural measures such as root wads, woody debris, and targeted vegetation for securing the bypass channel.

5.3.3 Total Removal of the Drop Structure with Long Bypass Channel

The total removal of the drop structure with long bypass channel alternative (B2T) involves the complete removal of the concrete structure and its foundations, with channel regrading and

sediment augmentation as needed as described in Section 4.2.1. In addition, the long bypass channel would be constructed as described in Section 4.2.3. The long bypass channel route as depicted in Figure 6 has a channel slope of 0.3% over 2,600 feet. The bypass channel would have an approximate width of 40-foot width with side slopes of 1 to 3 (vertical to horizontal). The entrance and exit of the bypass channel would require removing the embankments down to invert elevations near 274.5 feet NAVD-88 and 268.5 feet NAVD-88, respectively.

The modeled hydraulics in the bypass channel were assessed and it was estimated that it would require the placement of some larger immobile stones along the channel toe on the outside of bends, as well as potential revetments along the downstream extent of the bypass channel on the side adjacent to the Long Tom River to prevent erosion of the narrow embankment. It was also assumed that there would also be riprap protections spanning the bypass channel for regions where the outlet pipes from the City's treatment lagoons would be underneath the bypass channel. Costs associated with a preliminary estimate of the amount of rock material was added to the analysis with discussions with biologists from the USACE, LTWC, and cosponsors acknowledging that the final design would try to limit riprap in favor for more natural measures such as root wads, woody debris, and targeted vegetation for securing the bypass channel.

5.3.4 Evaluation of the Final Array of Alternatives

This final array of alternatives is compared between each other using an incremental cost analysis (ICA) to determine the National Environmental Restoration (NER) Plan, or plan that maximizes total ecosystem benefits in a cost-effective manner. The incremental cost is the additional cost incurred by expanding the recommended plan to the next highest cost best buy plan.

The costs for the final array of alternatives were updated based on refined estimates regarding the amounts of riprap quantities needed to protect the bridge piers and stabilize the bypass channels, as well as include costs associated with the replacement of the embankment culvert at river mile 6.6. The environmental benefits were also modeled using the blended hydraulic-habitat suitability index model for the total removal of the drop structure alternative (T) to include the effects of the replaced culvert.

Figure 13 shows a bar graph of the final array of alternatives that depicts the AAHU and average cost per HU for each of the best buy plans. Alternative T has an output of 43 AAHU at a cost of $1,898 per HU, which is the lowest incremental cost per unit of the alternatives considered. Alternative B1T would add an additional 6 HUs, each of which would cost an additional $19,481 and Alternative B2T would add 1 additional HU at a cost of $197,169. Table 6 summarizes the incremental cost increases between the plans.

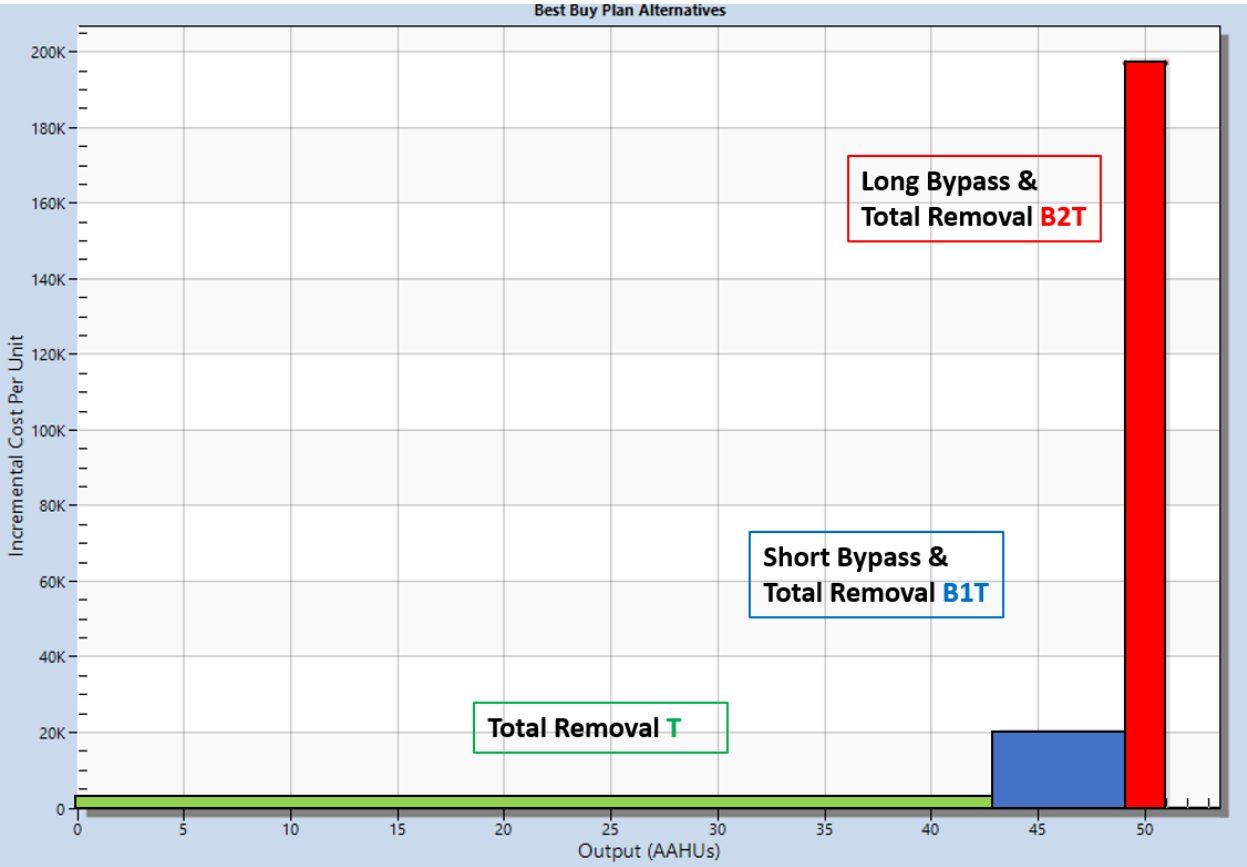

Figure 13. Incremental cost analysis results for final array of project alternatives

Table 6. Incremental costs associated with final array of project alternatives

Plan	Plan Description	AAEC	AAHU	Average Cost	Cost Effectiveness
No Action Plan	Default No Action Plan	$0.00	0	$0.00	Best Buy
T	Total Removal of Drop Structure	$81,626	43.006	$1,898	Best Buy
B1T	Total Removal and Short Bypass	$200,207	49.093	$4,078	Best Buy
B2T	Total Removal and Long Bypass	$562,407	50.93	$11,042	Best Buy

Neither cost effectiveness nor incremental cost analysis result in a single ‘correct’ alternative for recommendation and require an assessment of increased costs against the relative effectiveness of the plan, the positive impact on target species, achievement of restoration objectives and meeting non-federal sponsor goals. This section compares the remaining three action alternatives to identify the NER Plan. This information will be used to identify the best

alternative to address the identified problems and objectives.

Total Removal (T) – This alternative meets the planning objectives of restoring quality habitat for native fish and restoring natural riverine processes in the study area. Removal would reconnect 3.4 miles of upstream spawning and rearing habitat for the study's target species. The project is not technically complex, has minimal real estate acquisition requirements and low risk to implement. Modifications to the downstream culvert identified during analysis and optimization of the final array is likely to maintain connectivity to the historic meander during median and high flows in the winter and spring when it is anticipated that the target species would be present in the system. While the alternative was not remodeled it is expected that at least some of the incremental benefits identified in Alternatives B1T and B2T can be accomplished without the establishment of a full bypass channel.

Total Removal and Short Bypass (B1T) – This alternative meets both of the planning objectives of restoring quality habitat for native fish and restoring natural riverine processes in the study area; however, these objectives are primarily achieved through the removal of the drop structure. This increment would result in a 14% increase in restored habitat and an increase in total project cost from Alternative T of 145%. Along with the increase to total project cost, creation of off channel habitat through the bypass would have an expected lower rate of utilization when combined with total removal. Increased flows through the bypass have a higher risk of erosion during high flows and would require a more robust monitoring and adaptive management plan to ensure that anticipated benefits are achieved.

Total Removal and Long Bypass (B2T) – This alternative meets both of the planning objectives of restoring quality habitat for native fish and restoring natural riverine processes in the study area, however, these objectives are primarily achieved through the removal of the drop structure. This alternative would result in a 16% increase in habitat from Alternative T, and a 2% incremental increase from Alternative B1T. The increase in total project cost from Alternative T is 590%, and an increase of 181% from Alternative B1T. The total project cost is outside of the CAP Section 1135 authorized amount and would require either a waiver or an increase in the non-federal sponsor cost share percentage, which is not supported by the project sponsor.

5.4 Identification of the NER Plan

The NER plan was identified as Total Removal (T) due to its cost effectiveness and ability to meet the planning objectives for the study. The additional benefits of the next two increments would provide additional off channel habitat, but that habitat would likely have lower utilization in conjunction with the removal of the drop structure. Some of the additional benefits of alternatives B1T and B2T have also been captured through optimization of Alternative T. Modifications to the downstream culvert, necessary to avoid degradation of the wetland area, would provide access to target species during median and high flow periods creating similar off channel habitat benefits to B1T. The limited additional benefits associated with the two bypass alternatives at a significantly increased cost make Alternative T the NER plan.

5.5 Risk and Uncertainty

This study was undertaken using Risk Informed Decision Making to ensure that study, implementation, and project outcome risks were considered when formulating plans, selecting a

plan for implementation, and during feasibility-level design efforts. A discussion of risk and uncertainty allows the team to assess risks likely to be encountered as well as the consequences that could result from actions taken (or not taken) and items considered (or not considered) during each stage of the Project. The key risks and uncertainties for this project have been summarized here:

Utilization of off channel habitat: The modifications to the downstream culvert and construction of the engineered pool and riffle structure should provide access to the historic meander for use as off channel habitat during median and high flow conditions. Effectiveness of these modifications and utilization of this habitat is unknown, however project success is not dependent on high utilization as most of the project's environmental lift comes from reconnection of the main channel of the river. Utilization of this habitat is included in the monitoring plan though major modifications to this measure are unlikely as a part of an adaptive management strategy even if utilization is low.

Impounded Sediment: There is a risk to cost should the impounded sediments behind the drop structure require offsite disposal. Currently, impounded sediment will be regraded and during construction and will move downstream under normal flow conditions. Should sediment testing require removal during design and implementation total project cost may increase.

Confirmation of the new water intake compatible with the anticipated flows: This project will be implemented in conjunction with modifications to the City of Monroe's water intake structure. The sponsor has been provided with hydraulic modelling outputs developed for this study to assist in their design of a new water intake. Prior to project implementation USACE and the Non-Federal Sponsor will need to confirm the effectiveness of the water intake under the anticipated new flow conditions. Phasing of these actions will also need to be considered during design and implementation.

Scour and erosion: A scour and erosion analysis were completed as a part of this study. Anticipated impacts of scour at the Highway 99 bridge have been addressed as a part of the recommended plan. Implementation of the project should not increase the rate erosion of the Long Tom Channel embankments; however, monitoring for increase scour and erosion within the project area is included in the monitoring and adaptive management plan. Addressing embankment scour issues is a component of the Long Tom Channel project's ongoing operations and maintenance.

5.6 Selection of the Recommended Plan

Alternative T was identified as the recommended plan and the NER plan, which best maximizes ecosystem benefits in a cost-effective manner. The alternative is effective at meeting the identified planning objectives of restoration and reconnection of habitat for native fish species and restoring natural riverine processes by removing the drop structure which currently acts as a barrier to upstream habitat as well as natural movement of sediment downstream. This alternative was the most effective at meeting all the evaluation criteria, provided a highly efficient cost per habitat unit, and was identified as a Best Buy plan using CE/ICA analysis. The recommended project is within the overall federal cost investment limit for Section 1135 of $10,000,000. A more detailed cost estimate was conducted on the recommended plan, and based on 2023 prices levels, the estimated project cost is $2,486,000 which includes monitoring and adaptive management costs of $53,000. The Federal share of the project cost is estimated

to be $1,864.500 and the non-Federal share is estimated to be $621,500 which equates to 75% Federal and 25% non-Federal. The estimated total Federal cost of the project (including feasibility costs) is $2,434,500. The annualized costs over the period of project performance (50 years) are estimated at $81,626. The AAHUs estimated for this project are 43 over the same period, yielding a cost/AAHU of $1,898.

6 Affected Environment and Environmental Consequences

This section includes a description of the existing conditions (affected environment) in the study area and an evaluation and comparison of the environmental consequences of the alternatives carried forward for detailed analysis. The alternatives include the following:

Alternative 1: No Action Alternative.

Alternative 2: Total Removal. Includes, removal of the drop structure, culvert replacement and engineer riffle at River Mile X.X, and riprap around Highway 99 Bridge piers.

Alternative 3: Total Removal + Short Bypass. Includes actions in Alternative 2 with the addition of a 600-foot-long bypass described in Section 4.2.3.

Alternative 4: Total Removal + Long Bypass. Includes actions in Alternative 2 with the addition of a 2,600-foot-long bypass described in Section 4.2.3.

Table 7: Classification of effects to resources

Effects Classification	**Classification type**	**Description of effects classification**
No effect / Negligible	Magnitude	Activity would not have effects to resource or would have negligible effects that are not observable or measurable
Minor	Magnitude	Activity would have observable or measurable effects that would have minimal or effectively minimized changes to the characteristics of the resource
Moderate	Magnitude	Activity would have observable or measurable effects that would alter the overall function or characteristics of the resource to a degree that would necessitate consideration of mitigation.
Short-term	Duration	Effects to resource would have a duration of up to two years

Effects Classification	Classification type	Description of effects classification
Long-term / Permanent	Duration	Effects to resource would have a duration greater than two years or would be permanent
Local	Geographic Context	Effects would occur solely within the individual geographic unit of analysis
Regional	Geographic Context	Effects would occur within multiple geographic units of analysis or within the entire regional area of analysis

6.1 Air quality

6.1.1 Affected Environment

The U.S. Environmental Protection Agency (EPA) is required by the Clean Air Act to establish air quality standards that primarily protect human health. These National Ambient Air Quality Standards (NAAQS) regulate six criteria pollutants across the United States. When an area meets the standard for each of the six pollutants, it is called an “attainment area” for that contaminant. Areas that do not meet the standards are called “nonattainment areas.” Benton County, Oregon is classified as an attainment area for each of the six criteria pollutants and is therefore not considered an area of impaired ambient air quality (USEPA 2022).

6.1.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

The No Action Alternative would have no effect on air quality.

Alternative 2: Total Removal

The operation of heavy equipment (backhoes, excavators, dump trucks, etc.) during construction would temporarily increase vehicle emissions and slightly degrade air quality in the immediate vicinity of the project area. These emissions would occur during construction which is expected to be no more than 12 weeks and during daylight hours. The construction vehicles and equipment would have to follow Oregon Revised Statutes Chapter 468A, Air Quality Laws, which have established emissions standards for medium- and heavy-duty vehicles and construction equipment. Considering this and the 12-week construction duration, Alternative 2 would add a negligible amount of emission to the atmosphere. Effects from this Alternative would be negligible, short-term, and local.

Alternative 3: Total Removal + Short Bypass

Alternative 3 would have the same effects as those described for Alternative 2. The additional work, which is expected to be no more than an additional 10 weeks, for the 600-foot-long bypass would add a negligible amount of emissions.

Alternative 4: Total Removal + Long Bypass

Alternative 4 would have the same effects as those described for Alternative 2. The additional work, which is expected to be no more than an additional 12 weeks, for the 2600-foot-long bypass would add a negligible amount of emissions.

Cumulative Effects

The incremental effects of alternatives 2, 3, and 4, when added to the effects of other past, present, and reasonably foreseeable actions, primarily ongoing maintenance actions of the channel for erosion control and stabilization, would have a negligible cumulative effect on air quality as the construction timeframe is short (12 weeks) and air quality would return to baseline conditions immediately after construction.

Effects from the preferred alternative to Air quality: Effects not significant

6.2 Aquatic resources/wetlands

6.2.1 Affected Environment

Aquatic resources within the affected environment include the Long Tom River, freshwater emergent wetlands, freshwater ponds, and freshwater forested/shrub wetlands (Figure 14). This includes approximately 6.1 acres of perennial stream (Long Tom River), 4 acres of forested wetland, 1.2 acres of shrub wetland, 0.73 acres of emergent wetland, and 4.6 acres of freshwater pond habitat. In addition to these Waters of the United States (WOTUS), the review area also includes three water ponds for sewage treatment (9.15 acres, not WOTUS).

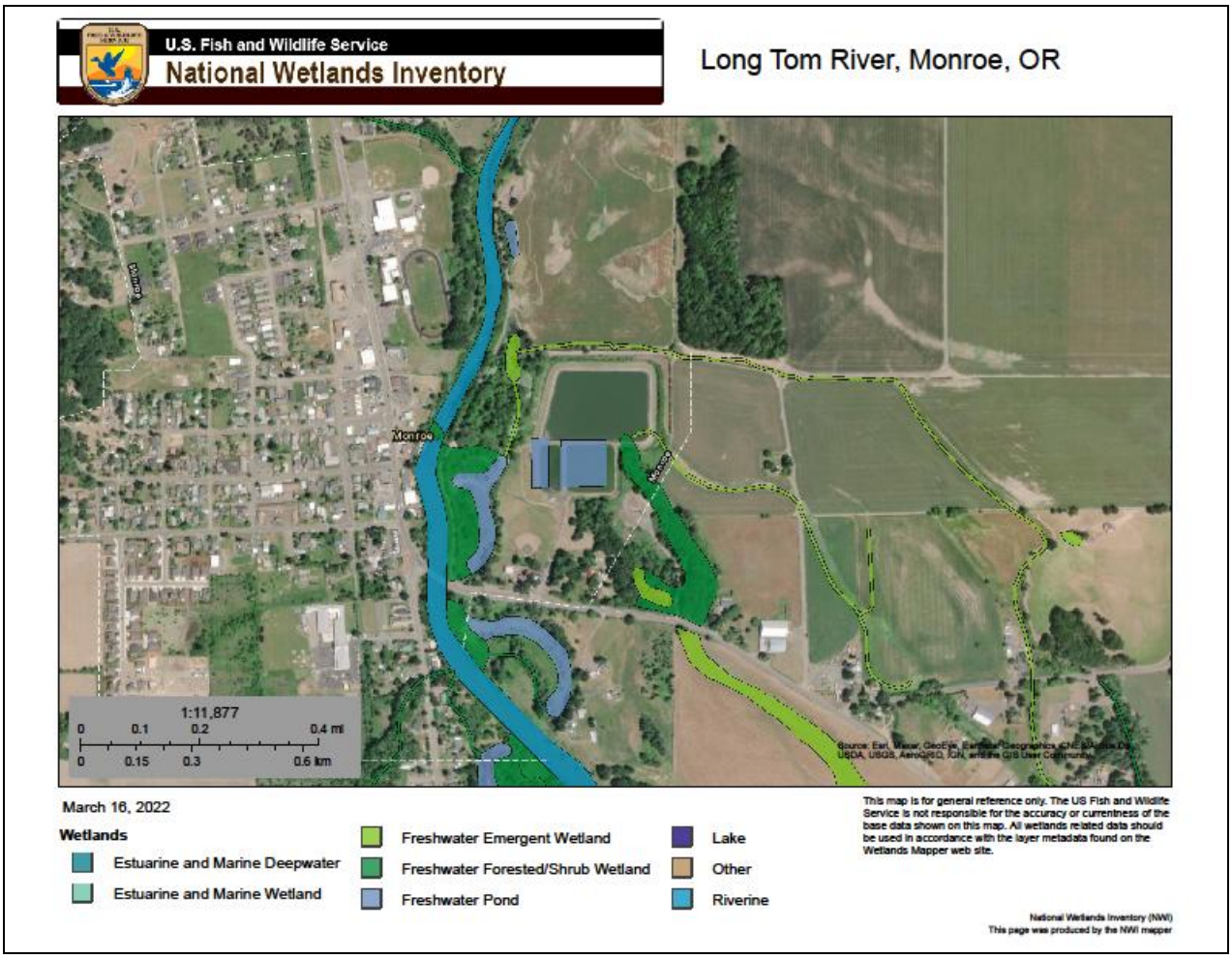

Figure 14. Map of wetland resources (Source: U.S. Fish and Wildlife Service)

6.2.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

The No Action Alternative would have no effect on aquatic and wetland resources beyond existing conditions. The channel rectification project completed in 1950 disconnected historic river segments, some of which function as off-channel wetlands but offer little habitat value to target species. The Monroe Drop Structure was constructed to slow down velocities and reduce erosion in the Long Tom River channel and acts as a fish barrier to species including juvenile cutthroat trout, Chinook salmon and Pacific lamprey.

Alternative 2: Total Removal

Removal of the 2100 square foot drop structure would have the direct effect of causing water levels immediately upstream to drop 5 to 6 feet and those downstream to equilibrate in response. This normalization of hydrology would have the indirect effect of enhancing sediment transport for the remaining reach of the Long Tom River. There would be a temporary increase in the fine sediment transport immediately after the drop structure was removed as the flow

would release some portion of the previously impounded sediments downstream. The estimated volume of impounded sediment from Section 2.6 is small such that the fine sediments transported downstream would have only temporary and small impacts regarding sedimentation on downstream wetland habitat. Other direct effects would include removal of the barrier to fish passage and provide an additional 3.5 miles of riverine habitat. Direct construction impacts are expected to include a diversion of the river to create a dry work area and installation of Best Management Practices (BMPs) to reduce downstream sedimentation and turbidity. While the exact method of construction is not known, the impacts from it would be temporary and the minimum necessary to complete the project.

Construction of the engineered riffle and replacement of the downstream culvert would be completely within an existing embankment between the Long Tom and adjacent wetland. However, direct impacts from construction would be expected to occur from BMPs within the river and wetland to ensure a dry work environment and minimize sedimentation and turbidity. While the exact method of construction is not yet defined, these impacts would be temporary, and the resulting connection would have direct permanent and beneficial effects as a result of improved hydrological connection between the two waters. These would include improved water quality (temperature, filtration, nutrient load, etc.), storage capacity, and habitat. Improved habitat and connection of these off-channel resources would also provide fish areas for rest, predation avoidance, rearing, and feeding.

The installation of riprap around 6 piers of the Highway 99 bridge would directly affect 1550 square feet of waters. This scour protection would result in a loss of 0.036 acres of riverine waters. This riprap has been designed with the minimum size necessary to meet Oregon Department of Transportation standards to ensure the safety and stability of the bridge. The amount and placement of riprap will not constrict the bankfull flow and will maintain clear, unobstructed openings between supports. While the construction method is not yet defined, direct impacts from construction would include increased water turbidity during work.

Effects from Alternative 2 would be beneficial, moderate, permanent, and local.

Alternative 3: Total Removal + Short Bypass

Alternative 3 would include effects of Alternative 2 and add 600 feet of open water channel connecting upstream and downstream portions of the Long Tom through existing wetlands abutting the east side of the drop structure. Additional aquatic and wetland area would be created with construction of a short bypass channel; however, it would require the permanent loss of wetlands for the construction of training berms to ensure the new channel remains in place. These berms are estimated to have a 30-foot wide base and be 625 feet long for a total of 18,750 square feet (0.43 acres) of wetland loss. Beneficial effects from this alternative would be like Alternative 2 with additional negative effects to wetlands which would be moderate, permanent, and local.

Alternative 4: Total Removal + Long Bypass

Alternative 4 would include effects of Alternative 2 and add 2,600 feet of open water channel connecting upstream and downstream portions of the Long Tom through existing wetlands abutting the east side of the drop structure. While similar in purpose to Alternative 3, Alternative 4 would add 2000 additional feet of habitat with greater morphology and sinuosity. However, Alternative 4 would also result in a greater permanent loss of the surrounding wetland as it

would require training berms to ensure the channel remained in place. These berms are estimated to have a 30-foot wide base and be 350 feet long for a total of 10,500 square feet (0.24 acre) of wetland loss. Beneficial effects from this alternative would be like Alternative 2 with additional negative effects to wetlands which would be moderate, permanent, and local.

Cumulative Effects

Removal of the structure would enhance local and downstream hydrologic regimes and improve riverine habitat and allow fish passage upstream for an additional 3.5 miles to the Stroda Structure. Over time there would be greater flushing of oxbow and wetlands, improved water temperatures, and allow for enhanced sediment transportation. The incremental effects of alternatives 2 along with the Long Tom Watershed Council's efforts to enhance other downstream features would have beneficial, moderate, long-term, and local and regional cumulatively effects to aquatic resources.

The incremental effects of alternatives 3 and 4 when considered with those of the LTWC proposed projects would have negligible cumulative effects.

Effects from the preferred alternative to Aquatic resources/wetlands: Effects not significant

6.3 Terrestrial habitat

6.3.1 Affected Environment

While the study area of this project includes only aquatic habitat areas, access would be from abutting uplands to the east where an existing dirt road runs from the Monroe City Park to the drop structure. This road is on the east bank of the Long Tom and separates the river from the adjacent wetlands. Other terrestrial habitats include urban lands to the west and a municipal park, sewage treatment, and farmlands to the east.

6.3.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

The No Action Alternative would have no effect on terrestrial habitat.

Alternative 2: Total Removal

This alternative would result in the temporary use of existing access roads in upland/terrestrial areas. Minor improvements or expansions could be expected as a result of this alternative. This could include vegetation removal, addition of gravel or other road materials necessary for equipment egress, and any grading, rolling, and/or maintenance necessary to complete the project. Use of the existing road would avoid the need to cut down larger woody vegetation. This would have the indirect benefit of maintaining trees for terrestrial and avian species. Additionally, the City Park is currently proposed as a temporary staging area. Effects from Alternative 2 would be negligible, temporary, and local.

Alternative 3: Total Removal + Short Bypass

This alternative would have similar effects as Alternative 2. However, it would require the construction of an unimproved road to provide equipment access to the area to be excavated for the bypass. Additional terrestrial habitat would be removed and replaced with gravel, dirt, or other materials determined to be adequate for temporary road construction. This would be

expected to be minimal as there is an existing dirt road abutting the west end of the bypass and an existing road only 110 feet from the east extent of the bypass. Additionally, the 110 feet of terrestrial habitat is currently maintained (mowed) as part of the municipal park and sewage treatment complex. Effects from Alternative 3 would be negligible, temporary, and local.

Alternative 4: Total Removal + Long Bypass

Alternative 4 would have the same effects to terrestrial habitat as Alternative 3 as the same road additions would be required. Effects from Alternative 4 would be minor, temporary, and local.

Cumulative Effects

Considering that existing roads would be used to access the site and could require minimal improvement to complete the project, there would be no incremental effects of the action when added to the effects of any other past, present, and reasonably foreseeable actions from Alternative 2. Alternatives 3 and 4 that would add an insignificant amount of new, unimproved road to an area of terrestrial habitat which is currently maintained as part of a municipal park. Cumulative effects from Alternative 3 and 4 would be negligible, local, and temporary.

Effects from the preferred alternative to terrestrial habitat: Effects not significant

6.4 Invasive species

6.4.1 Affected Environment

There are several habitat-converting wetland and aquatic invasive plant species in the Long Tom River project area. Uruguay water-primrose (*Ludwigia hexapetala*) is a species that has been a serious problem on the mainstem of the Willamette River. The Long Tom Watershed Council with the City of Eugene, along with support from the Portland District, managed infestations in Eugene, Amazon Creek (a tributary of the Long Tom River), associated canals, and the mainstem of the Long Tom River to the confluence. The treatment program was deemed a success; however, perpetual vigilance and maintenance will still be needed.

Reed canary grass (*Phalaris arundinacea*) is ubiquitous and dominant in shallow wetlands in the region, including the banks of the Long Tom River. Reed canary grass is competitive enough to keep the invasive plant purple loosestrife (*Lythrum salicaria*) from spreading. Although yellow floating heart (*Nymphoides peltata*) has not appeared in the watershed, it is on the mainstem of the Long Tom River and scattered sites in Benton, Lane, and other nearby counties. Terrestrial habitat converting species are ubiquitous, with the exotic blackberries (*Rubus bifrons* and *R. laciniata*) requiring management to maintain habitat values, as well as earthen fill structures.

Invasive animals include nutria, a rodent (*Myocastor coypus*), red-eared sliders, a turtle (*Trachemys scripta*), bullfrogs (*Rana catesbeianus*), Asian clam (*Corbicula fluminea*) and warm water game fish. Nutria are ubiquitous and can cause damage to earthen water control structures. The state wildlife area at Fern Ridge does control nutria in their impoundments. To date, there have been no issues with nutria on the Long Tom River embankments. Red-eared sliders compete with northwestern pond turtles (*Actinemys marmorata*). Suitable habitat for both are near the project area. The red-eared sliders nest earlier than the native northwestern pond turtle which may also attract predators to pond turtle nesting sites. Bullfrogs and warmwater game fish infest the Fern Ridge reservoir and the Long Tom River, preying on native species, including conservation dependent salmonids, chub, and hatchling turtles.

6.4.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

The No Action Alternative would have no effect on invasive species.

Alternative 2: Total Removal

Alternative 2 would have no potential to introduce, establish, or spread invasive species because associated activities would not extend outside the existing area. There is no evidence that invasive species are limiting opportunities below the Monroe drop structure so it is not expected that improved passage would promote dispersal of invasive species. The construction contractors will be required to clean equipment and watercraft prior to bringing it onto the project site and prior to removing it from the site to prevent the spread of invasive species. Equipment and watercraft would be free from soil residuals, egg deposits from plant pests, noxious weeds, plant seeds, aquatic plants and animals, and residual water. There are no effects expected from Alternative 2.

Alternative 3: Total Removal + Short Bypass

Alternative 3 would have the same effects as those described for Alternative 2.

Alternative 4: Total Removal + Long Bypass

Alternative 4 would have the same effects as those described for Alternative 2.

Cumulative Effects

There would be no incremental effects from any of the alternatives when added to the effects of any other past, present, and reasonably foreseeable actions from invasive species as a result of any alternative.

Effects from the preferred alternative to Invasive Species: Resource unaffected by action.

6.5 Vegetation

6.5.1 Affected Environment

Vegetation along the riverbanks and adjacent wetland consists of deciduous trees, shrubs, riparian shrubs, and emergent grasses. The vegetation in the project area is mature and established with some trees up to 12-inches Diameter at Breast Hight (DBH). Upland use along the Long Tom River is predominately agricultural, specifically grass seed fields. There are remnant native oak riparian forest areas along the unmodified portion of the Long Tom River channel especially near the City of Monroe, Oregon.

6.5.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

The No Action Alternative would have no effect on vegetation.

Alternative 2: Total Removal

Under Alternative 2, vegetation would be cleared from areas necessary to access the drop structure, downstream culvert, and Highway 99 Bridge supports. Access to the drop structure and bridge would be facilitated by an existing dirt road on its east side. Only minimal vegetation

clearance would be necessary along the banks to ensure access to the structures. The same road would be used to access the downstream culvert, however, in order to replace the culvert and construct the engineered riffle, vegetation along the entire bank within the project footprint would need to be removed. This would include grasses, shrubs, and trees up to 12-inches DBH. While the total amount of vegetation removal would be quantified during plans and specifications, it is estimated to be no more than one acre and would be limited to only that which is necessary for project completion. Upon project completion, native species would be replanted in all disturbed areas, which would result in indirect beneficial effects to the vegetation in the project area. Due to the minimal amount of vegetation removal and replanting of native species upon project completion, effects from Alternative 2 would be negligible, temporary, and local.

Alternative 3: Total Removal + Short Bypass

Alternative 3 would have similar affects as Alternative 2 with additional vegetation removal along the 600 linear feet of new aquatic habitat and the 625 feet of training berms. Native grasses would be planted within the berms to help maintain stability and prevent sloughing. Additional effects from Alternative 3 would be negligible, permanent, and local.

Alternative 4: Total Removal + Long Bypass

Alternative 4 would be similar to Alternative 3 with additional vegetation removal along the 2600 linear feet of new aquatic habitat and the 350 linear feet of training berms. Native grasses would be planted within the berms to help maintain stability and prevent sloughing. Additional effects from Alternative 4 would be negligible, permanent, and local.

Cumulative Effects

Alternative 2 would result in the least amount of vegetation loss which would be replaced after project completion. This would result in a temporal loss due to the time it would take for the new vegetation to grow. Alternatives 3 and 4 would involve the same losses as Alternative 2 with additional permanent losses of vegetation from the creation of new aquatic habitat.

The Corps conducts ongoing maintenance of the embankments which were built to straighten the Lower Long Tom River. Woody vegetation may be cleared from some areas of the channel sides, around structural features, and for access along the embankment tops to properly maintain the modified course. Considering this, vegetation clearing under Alternative 2 would be necessary for ongoing operations and would not add any cumulative loss. Cumulative effects for Alternative 2 would be negligible, temporary, and local. Alternatives 3 and 4 would add cumulative loss for the new berms which would have to be maintained. Cumulative effects under Alternatives 3 and 4 would be minor, permanent, and local.

Effects from the preferred alternative to vegetation: Effects not significant

6.6 Fish and wildlife

6.6.1 Affected Environment

<u>Aquatic</u>

The Monroe Drop Structure impedes fish passage to approximately 3.5 miles of aquatic habitat to the Stroda drop structure, which is the next fish passage barrier upstream of the Monroe Drop

Structure on the Long Tom River. At least 21 native fish species, 13 non-native fish species, including Chinook salmon (*Oncorhynchus tshawytscha*), Pacific lamprey (*Entosphenus tridentatus*), large scale suckers (*Catostomus macrocheilus*), and cutthroat trout (*O. clarkii*) are found in the river. This structure is on the ODFW 2019 Statewide Fish Passage Priority Barrier List and is a high priority fish passage barrier for the state. ODFW has on multiple occasions captured juvenile Chinook salmon immediately downstream of the structure. NMFS has not identified the Long Tom River as Critical Habitat for spring Chinook salmon, and contribution as overwintering opportunities are uncertain. However, the Pacific Fisheries Management Council has designated the Long Tom River as Essential Fish Habitat (EFH) for Coho and Chinook Salmon. This structure is a complete barrier to upstream passage for most native migratory fishes, particularly all juvenile life stages. In the 1990's and again in 2013, ODFW operated a fish trap at the top of the fish ladder. ODFW catch data indicates only large adult cutthroat trout (+20 cm) were able to negotiate the existing pool & weir fish ladder. Other native migratory fish such as large-scale suckers, Pacific lamprey, and juvenile trout and salmon were not captured in the trap. The existing fish ladder is in poor structural condition and does not meet state or federal fish passage design criteria.

Bald Eagle

Bald eagles have been recorded nesting adjacent to Fern Ridge Reservoir and along the Lower Long Tom River between Fern Ridge Dam and the confluence with the Willamette River. However, there are no active nests within the project area. Prior to construction the area will be surveyed for any new nests and if necessary, disturbances will be minimized in accordance with USFWS guidelines.

Wildlife

Approximately forty-five wildlife species were identified as "rare" that may occur in within the entire Long Tom subbasin from the Fern Ridge Reservoir to the confluence with the Willamette River.Species information was compiled using geospatial data provided by Oregon Biodiversity Information Center (ORBIC), 2019 and Information for Planning and Consultation, 2022. These species are designated under one or more laws at either the State or Federal level. Of those species identified, four are amphibians, one is a reptile, thirty-one are birds, eight are mammals, and one is an invertebrate. Along with these species, a variety of common small mammals occur in the area, including several species of squirrels, chipmunks, mice, and rabbits. Waterfowl, various shorebirds, and osprey use the area for foraging, breeding and/or wintering.

6.6.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

Under the No Action Alternative, the three lower grade control structures still function to reduce high flow velocities in the river that resulted from previous channel improvements. However, during high flows, due to the height of the existing structures, the velocities are still too strong for juvenile Upper Willamette Chinook Salmon, coastal cutthroat trout, and Pacific lamprey to effectively pass the drop structures. During low flows, the height of the drop structures acts as an obstruction. This ultimately results in preventing fish passage throughout the year. The existing habitat would not be improved to become suitable rearing habitat for juvenile salmonids traversing through the area, nor would terrestrial habitat be expanded. Though no direct adverse impacts to threatened or endangered species are anticipated under the No Action

Alternative, no benefits would be expected either. Although overwintering salmonids would likely use the side channel as a place of rest and refuge before moving down the river, there would not be an increase in habitat quality and availability for ESA-listed species, which limits their productivity and survival.

Since fish cannot migrate above the Monroe Drop Structure, they become stranded on the downstream end. This causes these fish to become easy prey for raptors, anglers, and other predators. Additionally, fish expend energy unsuccessfully attempting to pass the structure. With the proximity of the structure to City of Monroe downtown area it may lead to an increase in bird strikes.

The No Action Alternative is not expected to have any impacts to upland species.

Alternative 2: Total Removal

Alternative 2 would have the direct effect of removing the barrier to fish passage and providing access to an additional 3.5 mile of riverine habitat within the Long Tom River. Removal would also provide access to Shafer Creek and oxbows along the Long Tom between the project area and the upstream Strada Drop Structure. Removal would have the indirect effect of reduced fish predation at the structure and cause a corresponding decrease in food sources for raptors and other predators. The culvert replacement and engineered riffle would provide additional habitat area for fishes to use for resting and foraging. Indirect benefits would stem from the enhance water quality and vegetation leading to better habitat for foraging, nesting, rearing, and rest for many different fish and wildlife species. Effects from Alternative 2 would be beneficial, moderate, permanent, and local.

Alternative 3: Total Removal + Short Bypass

Alternative 3 would have similar effects as Alternative 2 but would have the direct effect of additional hydrologic connectivity between the river and an oxbow created via the short bypass. This would provide additional 600 linear feet of aquatic habitat for fish to use for resting and foraging. Effects from Alternative 3 would be beneficial, moderate, permanent, and local.

Alternative 4: Total Removal + Long Bypass

Alternative 4 would have similar effects as Alternative 3 but would have the direct effect of additional hydrologic connectivity between the river and an oxbow created via the short bypass. This would provide additional 2500 linear feet of aquatic habitat for fish to use for resting and foraging. Effects from Alternative 3 would be beneficial, moderate, permanent, and local.

Cumulative Effects

Effects from Alternatives 2, 3, and 4 would be beneficial to fish and wildlife and Alternatives 3 and 4 would provide additional benefits in the immediate vicinity of the structure with additional velocity controls, resting, and forging habitats from the creation of the bypasses. These effects combined with efforts from the Long Tom Watershed Council to restore or enhance fish passage at the Stroda Drop Structure would result in cumulative effects which would be beneficial, moderate, permanent, and local.

Effects from the preferred alternative to fish and wildlife: Effects not significant

6.7 Threatened/Endangered species/critical habitat

6.7.1 Affected Environment

The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) website and the National Marine Fisheries Service (NMFS) Protected Resources App were consulted to identify potential presence of federally listed threatened and endangered species within the action area. Species identified as potentially being present in the action area are listed in Table 9.

The additional habitat upstream of the Monroe Drop Structure includes habitat which could be utilized by ESA-listed juvenile Upper Willamette River Spring Chinook Salmon for rearing.

Table 8: Federally Listed Species Potentially Occurring at the Project Site (IPAC, 2020)

Common Name	Scientific Name	Federal Status and Agency with Jurisdiction	Critical Habitat within Project Area
Insects			
Fender's Blue Butterfly	*Icaricia icarioides fenderi*	Endangered (FWS)	No
Monarch Butterfly	*Danaus plexipuss*	Candidate (FWS)	No
Birds			
Marbled Murrelet	*Brachyramphus marmoratus*	Threatened (FWS)	No
Northern Spotted Owl	*Strix occidentalis caurina*	Threatened (FWS)	No
Streaked Horned Lark	*Eremophila alpestris strigata*	Threatened (FWS)	No
Yellow-billed Cuckoo	*Coccyzus americanus*	Threatened (FWS)	No
Fish			
Upper Willamette River Chinook Salmon	*Oncorhynchus tshawytscha*	Threatened (NMFS)	No
Flowering Plants			
Kincaid's Lupine	*Lupinus sulphureus ssp. kincaidii*	Threatened (FWS)	No
Nelson's Checker-mallow	*Sidalcea nelsoniana*	Threatened (FWS)	No
Willamette Daisy	*Erigeron decumbens*	Endangered (FWS)	No

6.7.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

Under the No Action Alternative, the three lower grade control structures still function to reduce high flow velocities in the river that resulted from previous channel improvements. However,

during high flows, due to the height of the existing structures, the velocities are still too strong for juvenile Upper Willamette Chinook Salmon to effectively pass the drop structures. During low flows, the height of the drop structures acts as an obstruction. This ultimately results in preventing fish passage throughout the year.

The existing habitat would not be improved to become suitable rearing habitat for juvenile salmonids traversing through the area. Though no direct adverse impacts to threatened or endangered species are anticipated under the No Action Alternative, no benefits would be expected either. Although overwintering salmonids would likely use the side channel as a place of rest and refuge before moving down the river, there would not be an increase in habitat quality and availability for ESA-listed species, which limits their productivity and survival.

The No Action Alternative would have no effect on federally listed insects, birds and flowering plants listed in Table 9.

Alternative 2: Total Removal

Alternative 2 would have no effect on Fender's blue butterfly, Kincaid's lupine, marbled murrelet, Willamette daisy, Northern spotted owl, streaked horned lark, yellow-billed cuckoo and Nelson's checker mallow as there is no suitable habitat present within the project area. Alternative 2 would have beneficial effects on Upper Willamette River Chinook Salmon by improving the reach to become suitable rearing habitat for juvenile salmonids traversing through the area. Removal would also prevent the congregation of fish at the structure which leads to increased predation. These effects would be expected to be beneficial, moderate, permanent, and local. Removal of the structure would have a direct beneficial effect to listed Upper Willamette River Chinook Salmon by improving the reach to become suitable rearing habitat for juvenile salmonids traversing through the area and by adding an addition 3.5 miles of riverine habitat. This would also have indirect benefits as it would prevent the congregation of fish at the structure which leads to increased predation. Construction impacts would be minimized by completing the project within established work windows for salmonoid species and implementing all Project Design Criteria required by NMFS. This alternative would have no effect to any terrestrial species because the project area does not contain appropriate habitat. These effects would be expected to be beneficial, moderate, permanent, and local.

Alternative 3: Total Removal + Short Bypass

Alternative 3 would have similar effects as Alternative 2, however, it would have additional direct benefits with the addition off channel habitat which would provide additional refuge during high flow events as well as foraging and rearing habitat. These effects would be expected to be beneficial, moderate, permanent, and local.

Alternative 4: Total Removal + Long Bypass

Alternative 4 would have similar effects as 1 and 2, however, it would add a greater amount of off channel habitat which could provide additional refuge, foraging and rearing habitat. These effects would be expected to be beneficial, moderate, permanent, and local.

Cumulative Effects:

Alternatives 2, 3, and 4 would add to the cumulative beneficial effects when combined with reasonably foreseeable habitat restoration activities by the Long Tom Watershed Council. The City of Monroe would modify the upstream water intake structure if the drop structure were

removed. While this could cause direct effects to the salmonoid species, it is reasonable to expect the City to complete the project within established work windows to limit impacts. This and other necessary BMPs would be required as a result of state and Federal permits (e.g., Section 404 permit). Thus, the alterations to the intake structure would have minor effects to listed species. The incremental effects of any of the alternatives when added to the effects of other reasonably foreseeable actions would be expected to be beneficial, moderate, permanent, and regional.

Effects from the preferred alternative to Threatened/Endangered species/critical habitat: Effects not significant

6.8 Floodplains

6.8.1 Affected Environment

The project area is designated Zone A under the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM), which indicates areas with a 1% annual chance of flooding (Figure 15). The Zone A floodplain area is delineated by the western bank of the Long Tom River and extends eastward across the flat landscape of the city park and surrounding agricultural fields. There are no base flood elevations defined and there are no designated floodways in the project area.

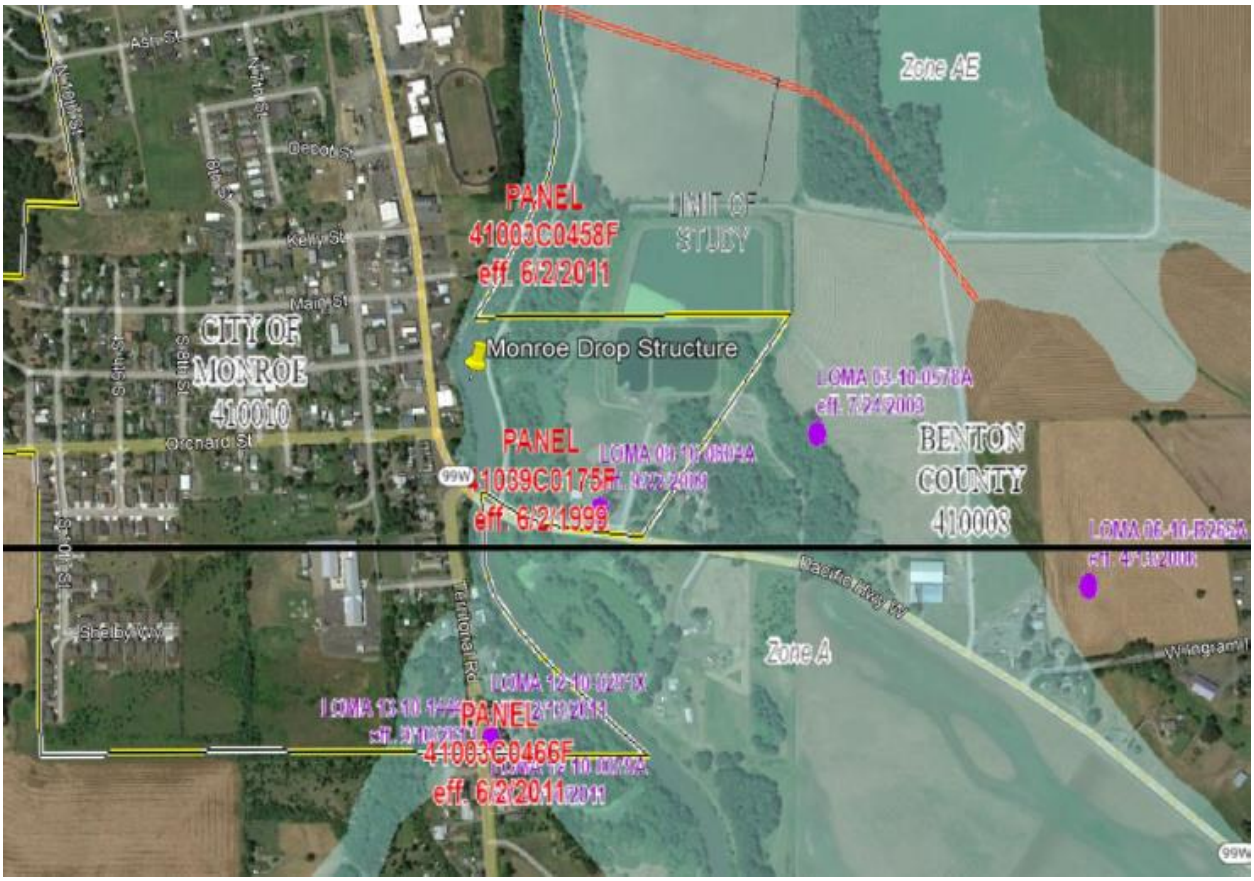

Figure 15. Map of floodplain delineations (source: FEMA 2023)

6.8.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

The No Action Alternative would have no effect on floodplains

Alternative 2: Total Removal

Construction activities would take place during the construction window of July 1st to October 31st when Long Tom River flows are low. During the removal of the drop structure, riprap of bridge piers installation, and culvert replacement, the construction areas would be dewatered using bypass features that would keep the river flow within the channel. There are no anticipated impacts associated with construction on floodplains.

Section 4.2 of Appendix I describes a feasibility-level analysis of flood impacts using a steady-state flow of 5,110 cubic feet per second that resulted in a lowering of water surface elevations over a reach of 0.5 miles upstream of the Monroe Drop Structure in comparison to the existing conditions (Figure 20, Appendix I). The maximum lowering of the water surface elevation was approximately 2 feet at the drop structure. No change in the inundation areas of the river channel and floodplain regions were simulated when compared to the existing conditions. The culvert replacement at river mile 6.6 would not affect the current hydrologic connectivity with the wetland areas of the City Monroe Park. There are no anticipated impacts associated with the Total Removal Alternative with respect to floodplains.

Alternative 3: Total Removal + Short Bypass

Alternative 3 would have similar affects as Alternative 2 with some additional inundation of the wetlands in the City of Monroe Park resulting from the bypass channel. The FEMA Zone A mapping of the base floodplain encompasses the entire City of Monroe Park suggesting that there would be no additional effects to floodplains relative to existing conditions if a bypass channel were added to the system. There are no anticipated impacts to floodplains associated with the Total Removal with Short Bypass Alternative.

Alternative 4: Total Removal + Long Bypass

The effects to floodplains of Alternative 4 would be like those described in Alternative 3.

Cumulative Effects

Section 4.2 of Appendix I examined flood impacts and showed there to not be any significant changes to water surface levels from existing conditions. All the alternatives, including the no action alternative, would not increase the hazard and risks associated with floods, nor would they restore and preserve the natural and beneficial values of any floodplain. There would be no individual or cumulative effects to floodplains because of any of the Alternatives.

Effects from the preferred alternative to Floodplains: Effects not significant

6.9 Hazardous, toxic & radioactive waste

6.9.1 Affected Environment

A Hazardous, Toxic and Radioactive Waste (HTRW) reconnaissance of the site was performed

to evaluate and identify whether hazardous substances or petroleum products may be present at the project site and to conclude whether recognized environmental conditions exist. The term “recognized environmental condition” is defined as the presence or likely presence of hazardous substances or petroleum products which indicate an existing release, past release, or a material threat of a release of hazardous substances or petroleum products into structures on the properties or into the ground, groundwater or surface water of the project site. The review of the study area was conducted by Environmental Data Resources, Inc. (EDR). In their report dated October 24, 2022, EDR concluded, “The target property was not listed in any of the databases searched by EDR.” This indicates a low likelihood of encountering HTRW that may impact project implementation. Environmental Consequences of the Alternatives

There are no known HTRW sites at the study area. There are no HTRW concerns with any of the Alternatives and there would be no incremental effects when added to the effects of other past, present, and reasonably foreseeable actions associated with HTRW.

Effects from the preferred alternative HTRW: Resource unaffected by action

6.10 Hydrology

6.10.1 Affected Environment

The hydrology of the study region is described is Section 2.2. Flows in the Long Tom River downstream of Fern Ridge Dam are controlled by its operations and contributions from the three main tributaries Bear Creek (river mile 14.5), Amazon Creek (river mile 14.3), and Ferguson Creek (river mile 12.5). During the winter flood season, Fern Ridge is operated to maintain flood storage in the reservoir and releases such that flows stay below the target flow of 4,650 cubic feet per second and above a minimum flow of 50 cubic feet per second at Monroe. Outflows from Fern Ridge Dam are limited to 3,000 cubic feet per second based on the conveyance capacity of the Long Tom River channel. The Water Control Manual for Fern Ridge Dam states that it is sometimes not possible to keep from exceeding the target flow at Monroe in moderate to large floods because of runoff from the uncontrolled area below the project, but that there is additional capacity in the channel with bankfull capacity near 6,000 cubic feet per second and flood stage starting near 7,000 cubic feet per second at Monroe. During summer months, the flow in the Long Tom River is predominately releases from Fern Ridge Dam, as the tributary flows dry up. The releases from Fern Ridge Dam accommodate for irrigation and other water right withdrawals with the goal of maintaining a high reservoir elevation for recreation and a minimum flow of 30 cubic feet per second in the river at Monroe for conservation purposes (USACE 2000).

6.10.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

Under the No Action alternative there would be no effect to existing hydrology. Water would continue to pool behind the drop structure with lower velocities and depths immediately downstream of the structure.

Alternative 2: Total Removal

Alternative 2 would not alter Long Tom River flows but the localized river hydraulics would be impacted with lower water depths upstream to the Stroda Drop Structure and faster velocities

for approximately 1 river mile upstream (Appendix I). Near the Monroe Drop Structure, the river will transform from a slack-water region to a more natural flow regime. Overall, the effects on hydrology would be minor, permanent, and local.

Alternative 3: Total Removal + Short Bypass

Alternative 3 would have similar effects as Alternative 2 along with additional decreases in water velocity and increase in storage capacity with the 600-foot-long bypass. Additional effects from Alternative 3 would be minor, permanent, and local.

Alternative 4: Total Removal + Long Bypass

Alternative 4 would have similar effects as Alternative 3 with greater decreases in water velocity and increases in capacity from the larger, 2600-foot-long, bypass. Additional effects from Alternative 4 would be minor, permanent, and local.

Cumulative Effects:

Alternatives 2, 3, and 4 would add to the cumulative beneficial effects when combined with other habitat restoration activities sought out by the Long Tom Watershed Council. These effects would be expected to moderate, permanent, and regional.

Effects from the preferred alternative to Hydrology: Effects not significant

6.11 Geology and Soils

6.11.1 Affected Environment

Soils within the study area are described further in Section 2.3. Per the Web Soil Survey, soils within the project area are mainly Consor silty clay loam which are poorly drained and classified as farmland of statewide importance (USDA 2019). The Monroe Drop Structure has built up sediment on the upstream side which it prevents from being transported downstream. This sediment would be tested and characterized prior to construction to determine if it is suitable for use within the river system. If found to be suitable, the sediment would be regraded along the river bed to restore the natural channel slope as much as possible. If the sediment is determined to be unsuitable, it would be manually removed an disposed of at an appropriate upland disposal site.

6.11.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

The No Action Alternative would have no effect on geology or soils. This alternative would continue to prevent sediment from moving downstream and therefor maintain increased sediments on the upstream side.

Alternative 2: Total Removal

If the sediment was determined to be suitable to remain in the river, then this alternative would result in the regrading and distribution of 2000-5000 cubic yards of riverine sediments. If the sediment was determined to be unsuitable, then this alternative would result in the removal of 2000-5000 cubic yards of sediment. Both outcomes would have beneficial impacts to the riverine system, either by resulting in more natural fluvial characteristic or by removing unsuitable sediments from the system. Additional direct effects would result as the barrier to the

natural flow of sediments would be removed, thus allowing for natural sediment transportation. This would have indirect impacts to downstream waters. Overtime, this enhanced sediment transport would reach the Willamette and Columbia Rivers and eventually, the Pacific Ocean. Removal could also result in localized scour of the embankments immediately upstream and downstream of the project due to increased water velocities. However, this would be temporary and only last until the river's morphology equilibrates to the new conditions. Construction may have direct impacts to soils around the project site as equipment operates. While the exact method of construction is not yet defined, these impacts would be temporary and minimized with the implementation of BMPs. Effects to geology and soils are expected to be moderate, permanent, and regional.

Alternative 3: Total Removal + Short Bypass

Effects from Alternative 3 would be similar to those from Alternative 2. However, with the addition of the 600-foot-long bypass, the sediment transport would be expected to slow with lower water velocities. This could have the added benefit of preventing sloughing of nearby, upstream banks. These added benefits would be minor, permanent, and regional.

Alternative 4: Total Removal + Long Bypass

Effects from Alternative 3 would be similar to those from Alternative 3. However, with the addition of the 2600-foot -long bypass, the sediment transport would be expected to slow with lower water velocities. This could have the added benefit of preventing sloughing of nearby, upstream banks. These added benefits would be minor, permanent, and regional.

Cumulative Effects:

Alternatives 2, 3, and 4 would add to the cumulative beneficial effects when combined with other reasonably foreseeable habitat restoration activities by the Long Tom Watershed Council (i.e., restoring the natural fluvial processes). These effects would be expected to minor, permanent, and regional.

Effects from the preferred alternative to Geology and Soils: Effects not significant

6.12 Water quality

6.12.1 Affected Environment

Section 303(d) of the Clean Water Act (CWA) requires states to identify and establish a priority ranking of those waters within its boundaries that are not able to meet applicable water quality standards. Section 303(d) also requires that states establish total maximum daily loads (TMDLs) necessary to meet the applicable water quality standards for each listed waterbody. The Long Tom River has been inventoried by Oregon Department of Environmental Quality (DEQ) as having impaired water quality and is listed on the 2018/2020 Section 303(d) list. The Long Tom River, from the Fern Ridge Dam to the confluence with the Willamette River, is impaired for multiple pesticides, industrial chemicals, heavy metals, *E. coli*, dissolved oxygen, pH, temperature, and turbidity (DEQ 2022).

6.12.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

The No Action Alternative would have no effect on water quality.

Alternative 2: Total Removal

Under Alternative 2, there would be temporary water quality impacts due to the construction of the project. Possible temporary impacts include increased turbidity from runoff over newly disturbed land cover, sloughing of banks, and removal of structures; increased nutrient concentrations due to the loss of nutrient uptake by riparian and in-channel flora; and discharges of hydrocarbons, solvents, and lubricants from equipment working in and near the river. There would be an initial increase in turbidity and fine sediment transport from the impounded sediments and regraded streambed once the drop structure is removed, but the volume of impounded sediments described in Section 2.6 is small such that the impacts to water quality would be temporary and minor. All of these impacts to water quality will be temporary and minimized with the use of BMPs. These would include measures to limit siltation, turbidity, and leachate from entering the water. All equipment would be cleaned prior to entering the water, spill protocols and supplies will be readily available, and all personnel will be trained on spotting and reacting to and minimize discharges. Additionally, visual monitoring for excessive turbidity, floating debris, trash, or oil sheen would be continuously performed to ensure water quality is being protected. All BMPs would be in accordance with the State of Oregon's, Department of Environmental Quality, Water Quality Certification and conditions of applicable Nationwide Permits.

Upon project completion, there would be direct beneficial effects to water quality including water temperature, total dissolved gasses, and turbidity. By removing the drop structure, water would no longer pool behind the structure which would result in lower water temperatures and reduced potential of harmful algal blooms that are associated with impounded water bodies. Removal would also no longer have water plunging over the spill way and therefore lower the amount of total dissolved gasses. Finally, removal of the structure would allow for enhanced sediment transportation and remedy the built up sediments behind the structure resulting in reduced turbidity. Indirectly, there would be better filtration from the connection to the wetland leading to lower nutrient loads. Other indirect beneficial impacts stem from retaining large wood vegetation (DBH greater than 12 inches) and the replanting of native species after construction. This vegetation can shade portions of the river and pull nutrients from the soil and prevent them from leaching into the water.

While there would be some minor, short term, and local impacts to water quality as a result of construction, overall effects from Alternative 2 will be beneficial, long term, and local.

Alternative 3: Total Removal + Short Bypass

Impacts under Alternate 3 would be similar to those of Alternative 2. However, with the addition of the short bypass and associated training berms, there will be an increase in amount of water quality impacts (siltation, sloughing, turbidity, etc.) which will require extending all BMPs around the increased construction area and additional monitoring. Effects from Alternative 3 will be minor, short term, and local.

Alternative 4: Total Removal + Long Bypass

Impacts under Alternate 4 would be similar to those of Alternative 2. However, with the addition of the long bypass and associated training berms, there will be an increase amount of water quality impacts (siltation, sloughing, turbidity, etc.) which will require extending all BMPs around the increased construction area and additional monitoring. Effects from Alternative 4 will be

minor, short term, and local.

Cumulative Effects:

Alternative 2, 3, and 4 would all result in incremental beneficial, permanent, and local cumulative impacts. Past impacts to water quality come mainly from the construction of Fern Ridge Dam, the straightening and deepening of the Long Tom River, and the construction of revetments, drop structures, and training structure in the river. These are the main causes of the river's high water temperatures, pH, and dissolved gasses. Reasonably foreseeable future projects would include efforts by the LTWC for additional efforts to improve water temperature and reduce pollutants and pH. The proposed project's benefits and plans by the LTWC would not be felt along the entire reach of the river and would not match the magnitude of Fern Ridge. Therefore, there would be incremental beneficial, local, and permanent effects to water quality from any of the alternatives when added to the effects of any other past, present, and reasonably foreseeably action. Effects from the preferred alternative to Water quality: Effects not significant

6.13 Climate change

6.13.1 Affected Environment

The climate conditions are described in Section 2.1 and the qualitative assessment of climate change and vulnerabilities are described in Appendix C. In general, climate change is the result of rising greenhouse gases which result in the increase of average temperatures and frequency and severity of storms, flooding and wildfires. Higher temperatures combined with dry summers is expected to cause additional and more severe summer wildfires. However, higher average temperatures could also result in longer growing seasons. Additional impacts from climate change are less snowpack and lower summer stream flows. While the bulk of the Long Tom River flows are controlled by Fern Ridge, lower flows from other tributaries will raise water temperatures and reduce habitat viability.

6.13.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

Under the No Action Alternative there would be no new emissions of greenhouse gas. Additionally, the benefits of removing the drop structure (enhanced habitat, lower water temperatures, sediment distribution, etc.) would also not occur. Under the No Action Alternative, negative impacts are likely to ensue in the study area as a result of climate change.

Alternative 2: Total Removal

Alternative 2 would require heavy equipment, trucks, personal vehicles, and motorized tools which would emit carbon dioxide, a greenhouse gas. These emissions would occur during construction which is expected to be no more than 12 weeks and during daylight hours. The construction vehicles and equipment would have to follow Oregon Revised Statutes Chapter 468A, Air Quality Laws, which have established emissions standards for medium- and heavy-duty vehicles and construction equipment. Considering this and the 12-week construction duration, Alternative 2 would add a negligible amount of greenhouse gases to the atmosphere. Effects from this Alternative would be negligible, short-term, and local.

Alternative 3: Total Removal + Short Bypass

Alternative 3 would have similar effects as Alternative 2, however, with the construction of a short bypass there would be the need for additional materials, earthwork, and access. These would add to the total emissions of greenhouse gases. However, the result would still be negligible, short-term, and local.

Alternative 4: Total Removal + Long Bypass

Alternative 4 would have similar effects as Alternative 3, however, the additional construction footprint, access roads, and berms for training the bypass would increase the total emissions of greenhouse gases. However, the result would still be negligible, short-term, and local.

Cumulative Effects

Alternatives 2, 3 and 4 would have negligible additive cumulative effects in the region due to the relatively small amount of short-term emissions associated with construction when considered in addition to past, present, reasonably foreseeable actions including ongoing operations and maintenance of the channel and potential future modifications to releases from the Fern Ridge Dam due to long term changes in rainfall within the watershed. Cumulative effects would be negligible, short-term, and local.

Effects from the preferred alternative to Climate change: Effects not significant

6.14 Aesthetics

6.14.1 Affected Environment

The aesthetic environment includes visual resources in the study area, which consist of natural and manmade features that give a particular environment its aesthetic qualities. This project is located between downtown Monroe to the west and municipal lands to the east which include a park and water treatment facility. Natural features within the project footprint include the Long Tom River, adjacent wetlands, the riparian area. Manmade feature within the project footprint includes the drop structure, fish ladder, abutments, and a gravel road.

6.14.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

The No Action Alternative would have no effect on aesthetics. All manmade structures would remain and there would be no change to the river, wetlands, or other natural areas.

Alternative 2: Total Removal

Under Alternative 2, the visual landscape would be affected during construction of the project when heavy equipment is working, materials are staged, water diversion structure is installed, and vegetation is being cleared. These would have a temporary negative effect on the scenic quality. Upon project completion, all tools, equipment, and unused materials would be removed. The end result would be the restoration of the Long Tom River to a more natural hydrologic state. Additionally, the historic fish ladder would remain in place due to its cultural appeal to the City of Monroe. This is expected to permanently enhance scenic quality within the project area. Affects to the aesthetic environment from Alternative 2 would be minor, permanent, and local.

Alternative 3: Total Removal + Short Bypass

Under Alternative 3, the effects would be similar to Alternative 2. However, there would be additional effects to the aesthetics environment by the construction of training berms with around the short bypass to train and maintain the diversion. The geometry of the short bypass and the berms would be an unnatural addition within a natural area resulting in an adverse effect to the scenic environment. The additional effect to the aesthetic environment from Alternative 3 would be minor, permanent, and local.

Alternative 4: Total Removal + Long Bypass

Under Alternative 4, the effects would be similar to Alternative 2. However, there would be additional effects to the aesthetics environment by the construction of training berms with around the long bypass to train and maintain the diversion. While the geometry of the long bypass would be more natural than that of Alternative 3, the berms needed would be larger and an unnatural addition within a natural area resulting in an adverse effect to the scenic environment. The additional effect to the aesthetic environment from Alternative 4 would be minor, permanent, and local.

Cumulative Effects

Alternative 2 along with proposed projects from the Long Tom Watershed Council and the City of Monroe's proposed River Front District improvements would result in beneficial, moderate, permanent, and local cumulative effects. Alternatives 3 and 4 would also have these effects but would include some minor negative effects as discussed above. Cumulative effects from Alternatives 3 and 4 would be minor, permanent, and local.

Effects from the preferred alternative to Aesthetics**:** Effects not significant

6.15 Noise levels

6.15.1 Affected Environment

The majority of noise generated in the project area comes from water falling over the drop structure and Highway 99 to the south and west. Highway 99 is the largest capacity road in Monroe and the main commercial throughfare. According to Bureau of Transportation Statistic's (BTS) National Transportation Noise Map, Highway 99 has 24-hour equivalent sound level (LAEQ- average of sound energy over a 24-hour period) between 45 and 60 dBA. Noise levels peak as large trucks deliver to business and traverse through Monroe. Human infrastructure adjacent to the Long Tom are commercial and industrial and includes convenience stores, restaurants, shops, and a bank. The closest residence is approximately 300 feet from the drop structure.

6.15.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

The No Action Alternative would have no effect on noise levels.

Alternative 2: Total Removal

Construction of Alternative 2 would generate a temporary increase in noise levels associated with heavy equipment. Excavators needed to remove the drop structure, trucks hauling

construction materials and equipment in and out of the site, and the placement of the riprap round the bridge piers will all create noise during the construction timeframe (12 weeks). Work is expected to occur during daylight hours only. No work would be conducted on the weekends. There are small businesses located adjacent to the project area and the nearest residences are within 300 feet of the project area. Noise associated with construction of the project would lead to temporary displacement of some wildlife species. Nesting of birds may also be discouraged within the project area. However, birds and other wildlife species are expected to return to the area following construction. Impacts from Alternative 2 are expected to be minor, temporary, and local.

Alternative 3: Total Removal + Short Bypass

Alternative 3 would have similar effects to those described above for Alternative 2. The addition of the short bypass would have no noticeable changes in noise levels from Alternative 2.

Alternative 4: Total Removal + Long Bypass

Alternative 4 would have similar effects to those described above for Alternative 2. The addition of the short bypass would have no noticeable changes in noise levels from Alternative 2.

Cumulative Effects

The of Monroe has plans to improve their River Front District. While these projects would create noise, they would not begin until after the proposed project was completed. Thus, this proposal would not add any cumulative noise impacts. Additional effects from noise beyond those of the proposed project would be from the baseline conditions of the city. The proposed project would not add any permanent noise to the environment. Therefore, cumulative impacts would be minor, local, and temporary.

Effects from the preferred alternative to Noise levels: Effects not significant

6.16 Public infrastructure

6.16.1 Affected Environment

The section of the Long Tom River within the study area has a 230-foot long by 40-foot-wide concrete bridge which is part of Oregon Highway 99W. This 2-lane bridge has six concrete support piles and provides the only crossing of the Long Tom River for the City of Monroe. The bridge is approximately 700 feet upstream of the drop structure. Oregon Department of Transportation has rated this bridge as, “3 SC – Unstable” for scour vulnerability.

The study area also includes the City of Monroe water supply intake. This intake is on the east side of the river about 630 feet upstream of the drop structure. The intake consists of a submerged pipe (15 horsepower) and strainer in the river with a pumphouse located directly above the intake pipe. The City of Monroe holds a water supply withdrawal permit equal to 350 gallons per minute, which flows to the water treatment system.

Connectivity between the river and the city park wetland areas is via a series of three culverts with a 1-foot culvert near river mile 7.2 upstream of the Highway 99 bridge, a 4-foot culvert under Hwy 99, and a 2.5-foot culvert at river mile 6.6 on the downstream portion of the city park. The downstream culvert is perched relative to the river channel downstream of the Monroe Drop Structure.

6.16.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

The No Action Alternative would have no effect on public infrastructure. Under the no action alternative, the downstream culvert would remain ineffective, no scour protection would be added to the bridge piles, and the water intake would be unaffected.

Alternative 2: Total Removal

Total removal would have direct effects to the upstream Highway 99 bridge with increased velocities which have the potential to increase scour around the bridge's piers. This would be mitigated with the installation of riprap as scour protection around each pier. Removal would also result in lower waters immediately upstream and would result in direct impacts to the City of Monroe's intake for drinking water. Again, this would be mitigated with the City's project to modify or replace the intake. The proposed project would directly result in the replacement and upgrade of a single culvert at River Mile 6.6 and minor improvements to the access road between the river and the wetlands which provides access to the intake structure, culvert and east side of the river for the remainder of the City's jurisdiction. Effects to the bridge and intake would be minor, temporary, and local. Effects to the culvert would be beneficial, permanent, and local.

Alternative 3: Total Removal + Short Bypass

Alternative 3 would have similar impacts as those described in Alternative 2. There would be no additional effects from Alternative 3.

Alternative 4: Total Removal + Long Bypass

Alternative 4 would have similar impacts as those described in Alternative 2. There would be no additional effects from Alternative 4.

Cumulative Effects

The incremental effects of any of the alternatives, when added to other past, present, and reasonably foreseeable actions, such as the redesign of the City's water intake, should be negligible. If implemented, the City of Monroe would have to redesign the intake to accommodate for the lower water levels. A new design would incorporate the latest methodologies and technologies which would be expected to result in beneficial effects to the intake. Cumulative effects would be negligible, permanent, and local.

Effects from the preferred alternative to Public infrastructure: Effects not significant

6.17 Socioeconomic Effects and Environmental Justice

6.17.1 Affected Environment

This section analyses the socioeconomic environment which includes project costs, regional economic development effects and other social effects. Environmental justice (EJ) is defined as the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies, with no group bearing a disproportionate burden of environmental harms and risks (MG Graham March 2022). This section also describes the

composition of the regional study area in terms of the race and identifies communities with EJ concerns within census block groups that intersect with a two-mile radius of the Study Area and evaluates potential impacts of the No Action and Action Alternatives on those communities.

Monroe, Oregon like the rest of Benton County, is predominantly rural residential land situated between river mile 5 and 7 of the Long Tom River. Table 15 provides an overview of the populations within the 54 block groups that intersect within a two-mile radius of the site. This two-mile radius was chosen to represent the community. This community extends beyond the project area and the City boundary, to include the neighboring cities of Alpine and Bellfountain to the northwest that even share the same Monroe School District. The population total in the project vicinity being 1649 persons, as informed by the 2020 Census redistricting data. A Census block group is the smallest geographical unit for which the U.S. Census Bureau publishes census data. Table 15 shows the potentially impacted population by race.

Table 9 Block Group Decennial Census Redistricting, 2020

Population	Mean Percentage
Hispanic or Latino	12.94
White alone, not Hispanic or Latino	73.88
Black or African American alone, not Hispanic or Latino	0.09
American Indian and Alaska Native alone, not Hispanic or Latino	2.01
Asian alone, not Hispanic or Latino	0.97
Native Hawaiian and Other Pacific Islander alone. not Hispanic or Latino	0.119
Some Other Race alone	<0.1
Two or more races, not Hispanic or Latino	9.99

Source Census 2020 DEC Redistricting Data

In the summary report using the EJ Screening tool and the Climate Economic and Justice Screening Tool, the selected socioeconomic indicators or variables are sourced from the Census Bureau's American Community Survey 5-year summary estimates. The factors for environmental justice and socioeconomics show the threshold for these populations is not met to be considered disadvantaged. More information can be found in the Socioeconomic Appendix D.

6.17.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

Within the study area there were no disadvantaged populations identified that would be negatively impacted as a result of the alternative plan. The elements of the socio-economic investigation assesses the economic effects of the alternative ecosystem restoration plans formulated in the feasibility phase of the project. The elements include project costs, regional economic development effects and other social effects The No Action Alternative would have no effect on the socioeconomics of the study area.

Alternative 2: Total Removal

Under Alternative 2, Within the study area there were no disadvantaged populations identified that would be negatively impacted as a result of the alternative plan. The elements of the socio-economic investigation assesses the economic effects of the alternative ecosystem restoration plans formulated in the feasibility phase of the project. The elements include project costs, regional economic development effects and other social effects. The access to water recreation on this section of the Long Tom river would be temporarily impacted during construction. Additionally, due to any vegetation being cleared could impact other recreation opportunities including nature walks, fishing and bird watching. This would have a temporary negative effect on the recreation quality. Upon project completion, all tools, equipment, and unused materials would be removed. Following completion access would be restored, and as a result of removal the area would see a decrease to life safety on the river. The end result would be the restoration of the Long Tom River to a more natural state, also positively impacting the recreation. This project is expected to permanently enhance scenic quality within the project area. The Monroe drop structure is the only structure being removed and there would be no change to the other components of the Willamette Valley system. It is not expected for this project to decrease in federal spending, including operations and maintenance of the drop structure, to be significant according to local maintenance mangers for the Willamette Valley system. Given the Monroe drop structure is maintained as part of a larger system, this is a safe assumption regarding costs and the NED impact. The project construction expenditures are estimated to occur during a 3-month period of FY24 and make up the regional impacts resulting from this alternative plan. Additionally project construction contributes to larger regional and watershed goals supporting community cohesion. Affects to the socioeconomics from Alternative 2 would be minor, permanent, and local.

Alternative 3: Total Removal + Short Bypass

Under Alternative 3, the effects would be similar to Alternative 2. However, there would be additional effects to the socioeconomic environment. The completed construction of training berms with around the short bypass to train and maintain the diversion provides additional hydrology, and could be an increase in the quality of wildlife viewing for recreation which would result in a postiveeffect to the environment. The additional effect to the socioeconomic environment from Alternative 3 would be minor, permanent, and local.

Alternative 4: Total Removal + Long Bypass

Under Alternative 4, the effects would be similar to Alternative 2. However, there would be additional effects to the socioeconomic environment. The completed construction of training berms with around the short bypass to train and maintain the diversion provides additional

hydrology, and could be an increase in the quality of wildlife viewing for recreation which would result in a resultingpositive effect to the environment. The additional effect to the socioeconomic environment from Alternative 3 would be minor, permanent, and local.

Cumulative Effects

Alternative 2 along with proposed projects from the Long Tom Watershed Council and the City of Monroe's proposed river walk would result in beneficial, moderate, permanent, and local cumulative effects. Alternatives 3 and 4 would also have these effects but would include some temporary negative effects as discussed above. Cumulative effects from Alternatives 3 and 4 would be minor, permanent, and local.

The proposed action will provide positive benefits to the Long Tom River ecosystem which will result in positive benefits to the City of Monroe communities and lands surrounding the project area. The proposed action will not have the potential for disproportionate health or environmental effects on minorities or low-income populations or communities and will be in full compliance with Executive Order 12898 following completion of the NEPA process.

Effects from the preferred alternative to Socio-economics and Environmental Justice: Effects not significant

6.18 Cultural Resources

6.18.1 Affected Environment

C*ultural resources* refer to the physical manifestations that represent the heritage of a place and are associated with peoples who have historic connections to that place. For the purposes of this feasibility report, cultural resources include pre-contact and historic archaeological objects, features, and deposits located above or below the ground surface that are tangible evidence of prior human occupation or use in a particular area, architecture or elements of the built environment, and places or landscapes that a group of people consider culturally important because of events or practices that have occurred at the location. Cultural resources include traditional cultural properties (TCPs) and historic properties of religious and cultural significance to Indian tribes (HPRCSITs).

Section 106 of the National Historic Preservation Act (NHPA) requires the Corps to take into consideration the effects of undertakings on historic properties. Historic properties are any "prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places [NRHP]" (36 C.F.R. § 800.16(l)(1)). Per the Section 106 implementing regulations, 36 C.F.R. part 800, the Corps must define the Area of Potential Effects (APE) and determine if there are any historic properties located within the APE, and then assess if the undertaking will result in an adverse effect to any historic properties. If there is an adverse effect on historic properties, the Corps must avoid, minimize, or mitigate those effects. The Corps must also comply with the Archaeological Resources Protection Act (ARPA), Native American Graves Protection and Repatriation Act (NAGPRA), and other laws, regulations, and executive orders pertaining to cultural resources. Corps Engineer Regulation (ER) 1130-2-540 *Environmental Stewardship Operations and Maintenance Policies* provides guidance for how the Agency will comply with ARPA, NAGPRA, and NHPA.

Since the 1920s, cultural resources specialists and archaeologists have conducted several

surveys to identify cultural resources near the Lower Long Tom River Constructed Channel (LLTRCC) and the Fern Ridge Dam and Reservoir. These survey reports and site forms are held by the Portland District, the Oregon State Historic Preservation Office (SHPO), and the University of Oregon. For a pre-contact, ethnographic, and historic context of the affected environment please refer to these resources, including Toepel and Beckham (1982), Willingham (1983), and other affected environment sections from past NEPA documents.

When construction of Fern Ridge Dam was completed in 1941, the Corps was releasing up to 3,000 cubic feet of water per second (cfs), especially during flood events. However, the winding nature of the Lower Long Tom River could only accommodate 400 cfs without flooding adjacent agricultural lands. Between 1943 and 1953, the Corps completed several modifications to the Lower Long Tom River to accommodate these higher releases. This included building embankments and revetments along the channel, relocating portions of the river, and widening and deepening the channel. Actions also included constructing the Monroe Drop Structure in same location as a 150' long concrete dam built in 1911 for a local sawmill. The existing mill race and fish ladder were retained and incorporated into the new structure.

The deep history of human habitation of the Willamette Valley and along the LTRCC has left tangible markers on the landscape. Known historic properties in the affected environment are the LLTRCC itself, which includes the Monroe Drop Structure as a contributing resource. The LLTRCC is eligible for listing under Criterion A at the local level for its association with federal flood control projects in the Willamette Valley. There have been numerous cultural resources surveys completed up and downstream from the project area, including survey of the east and west shores of the LLTRCC. Past cultural resource survey efforts have not identified any known archaeological sites within the affected environment.

6.18.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

Under the No Action Alternative, no action would take place, and, thus, there would be no "undertaking" requiring consultation under Section 106. Additionally, there would be no effect on historic properties or cultural resources within the affected environment and APE.

Alternative 2: Total Removal

Total removal of the Monroe Drop Structure is an undertaking that has the potential to effect historic properties and cultural resources that may be present within the affected environment and APE. The Corps has completed a survey of the Lower Long Tom River Constructed Channel and determined it is eligible for listing in the National Register of Historic Places and the Monroe Drop Structure is a contributing resource, though SHPO concurrence is still outstanding. Archaeological survey and identification efforts have been carried out within and near the affected environment. At this time, there are no known TCPs or HPRCSITs within the affected environment, though future identification efforts could produce additional information. Section 106 consultation and compliance will utilize the *Programmatic Agreement Among the United States Army Corps of Engineers Portland District, the Oregon State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Compliance with Section 106 of the National Historic Preservation Act for Undertakings Related to the Operation and Maintenance of the Willamette Valley Project*. This executed agreement document captures how the Corps will define the Area of Potential Effect (APE), identify historic properties, assess

effects, and, if needed, resolve any adverse effects. Effects for Alternative 2 would be minor, permanent and, local.

Alternative 3: Total Removal + Short Bypass

Like Alternative 2, Alternative 3 would also be an undertaking with the potential to effect historic properties. Section 106 consultation and compliance will utilize the *Programmatic Agreement Among the United States Army Corps of Engineers Portland District, the Oregon State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Compliance with Section 106 of the National Historic Preservation Act for Undertakings Related to the Operation and Maintenance of the Willamette Valley Project*. Effects for Alternative 3 would be minor, permanent and, local.

Alternative 4: Total Removal + Long Bypass

Like Alternative 2, Alternative 4 would also be an undertaking with the potential to effect historic properties. Section 106 consultation and compliance will utilize the *Programmatic Agreement Among the United States Army Corps of Engineers Portland District, the Oregon State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Compliance with Section 106 of the National Historic Preservation Act for Undertakings Related to the Operation and Maintenance of the Willamette Valley Project*. Effects for Alternative 4 would be minor, permanent and, local.

Cumulative Effects

The incremental effects from any of the alternatives when added to the effects of actions such as ongoing operations and maintenance activities described in Section 4.1 or modifications described in the City of Monroe's waterfront development plan would be minor, permanent, and local.

Effects from the preferred alternative to Cultural Resources: Effects not significant

6.19 Tribal trust resources

6.19.1 Affected Environment

The definition of tribal resources is multifaceted and dependent on the circumstance that requires the characterization. For the purposes of this EA, tribal resources include trust lands, natural resources, cultural resources, trust funds, or other assets held by the Federal government in trust to Indian tribes or individuals in the ancestral territories and usual and accustomed places of tribes. In the unique legal relationship between the Federal government and Indian tribes, the Federal government acts as a trustee of assets for the tribe, or beneficiary. There is a fiduciary responsibility on behalf of the federal government to ensure that those assets are managed for the benefit of Indian tribes or individuals. While the affected environment is not located on tribal trust lands, there are tribal resources that should be considered.

The affected environment is within the ancestral lands for multiple tribes since time immemorial and may include tribal resources and interest, as noted and defined above. The Corps extended an offer to engage in Nation-to-Nation consultation with the following Federally recognized tribes: the Confederated Tribes of the Grand Ronde Community of Oregon, the Confederated Tribes of Siletz Indians, and the Confederated Tribes of the Warm Springs Reservation of

Oregon. Scoping letters were sent to the above tribes on October 12, 2021. The Confederated Tribes of the Warm Springs Reservation of Oregon responded on November 10, 2021 requesting to be included on future Section 106 consultation and the Confederate Tribes of Siletz Indians have been engaged throughout the planning process as a co-sponsor. No additional responses were received. Additional letters introducing tribes to the preferred alternative, inquiring as to whether they had any concerns with the project, and determining whether they wished for more information will be sent as a part of the concurrent review process in May 2023.

6.19.2 Environmental Consequences of the Alternatives

Alternative 1: No Action

Under the No Action Alternative, the Corps would not make any modifications to the Monroe Drop Structure, and there would be no changes in impacts to tribal trust resources as compared to existing conditions.

Alternative 2: Total Removal

Total removal of the Monroe Drop Structure reduces adverse effects to tribal resources, specifically fish, when compared to the No Action Alternative. In summary, the Proposed Action will have minor, local beneficial impacts on tribal trust resources because this action will improve fish passage which is supported by the Confederated Tribes of Siletz Indians. Effects for Alternative 2 would be moderately beneficial, local, and long term.

Alternative 3: Total Removal + Short Bypass

Alternative 3 would have similar impacts as those described in Alternative 2. There would be no additional effects from Alternative 3.

Alternative 4: Total Removal + Long Bypass

Alternative 4 would have similar impacts as those described in Alternative 2. There would be no additional effects from Alternative 4.

Cumulative Effects

Future restoration activities under consideration by the Long Tom Watershed council that would restore or enhance fish passage at the Stroda Drop Structure would have positive impacts on culturally significant species including the Pacific Lamprey within the study area. The positive impacts of the project would result in permanent reconnection of upstream habitat as defined in the recommended plan for culturally significant species. Cumulative effects are moderately beneficial, local, and long term.

Effects from the preferred alternative to Tribal trust resources: Effects not significant

7 Recommended Plan

7.1 Description of Recommended Plan

The objective of an ecosystem restoration project is to contribute to NER. Contributions to These benefits are increases in the net quantity and/or quality of desired ecosystem resources. The NER Plan must reasonably maximize ecosystem restoration benefits compared to costs, consistent with the federal objective. The selected plan must be shown to be cost effective and justified to achieve the desired level of output. After analysis of all relevant environmental benefits and impacts, the Corps has identified the Tentatively Selected Plan (TSP) as the recommended plan and the preferred alternative per NEPA regulations.

The recommended is Total Removal of the Drop Structure (Alternative T), design for this project includes the removal of the drop structure, replacing a culvert to the existing wetland, and adding riprap protection around the piers of the ODOT Highway 99W bridge in Monroe, OR (Figure 16). The removal of the drop structure will include the spillway structure and its foundation. The fish ladder and headrace will be left in place on the western side of the river along with the concrete retaining wall on the eastern side for historical purposes.

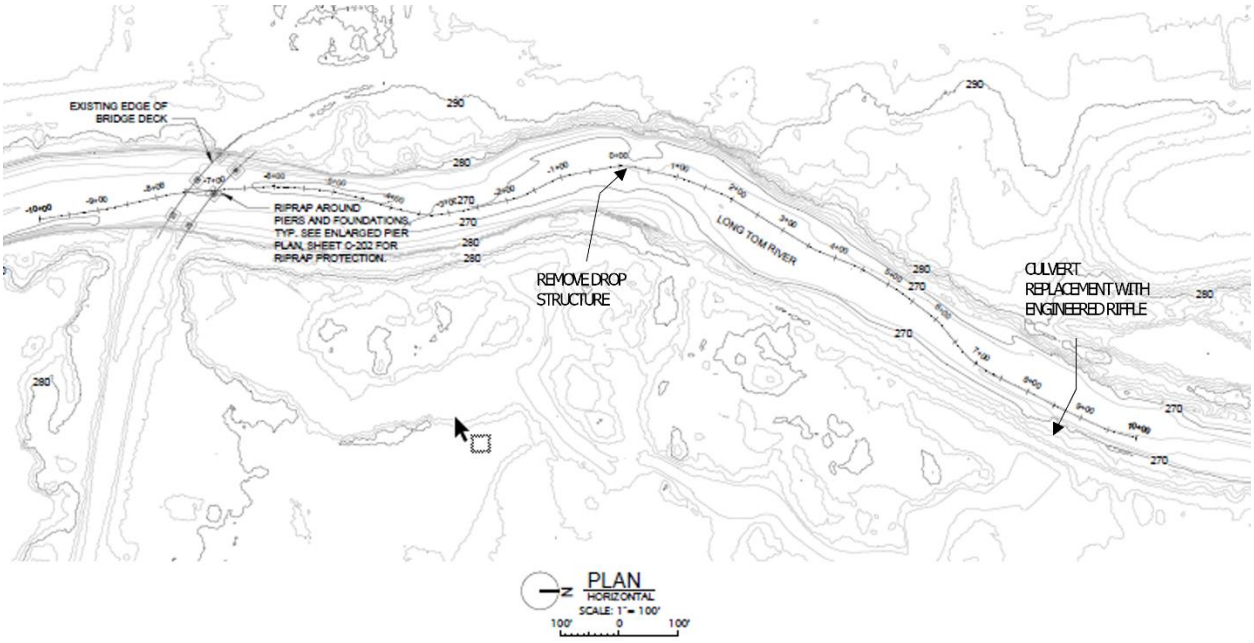

Figure 16. Plan view of the activities associated with the preferred plan

The culvert replacement is for the downstream culvert located at river mile 6.6 on the north end of the City of Monroe Park. The culvert design will be a 48-inch culvert through the embankment that connects to an engineered riffle on the river side along the embankment to allow hydrologic connectivity and spawning salmon to access the natural breeding areas on the wetland side of the culvert (Figure 17). The engineered riffle was preliminarily designed to have each pool be 2 feet deep by almost 12 feet long by almost 12 feet wide. This was used to provide preliminary

estimates for construction, but this engineered riffle will need to be further designed by the Project Delivery Team during the planning stage to ensure proper fish passage to this wetland area. See Figure 17 for the location of the engineered riffle and the 42-inch culvert.

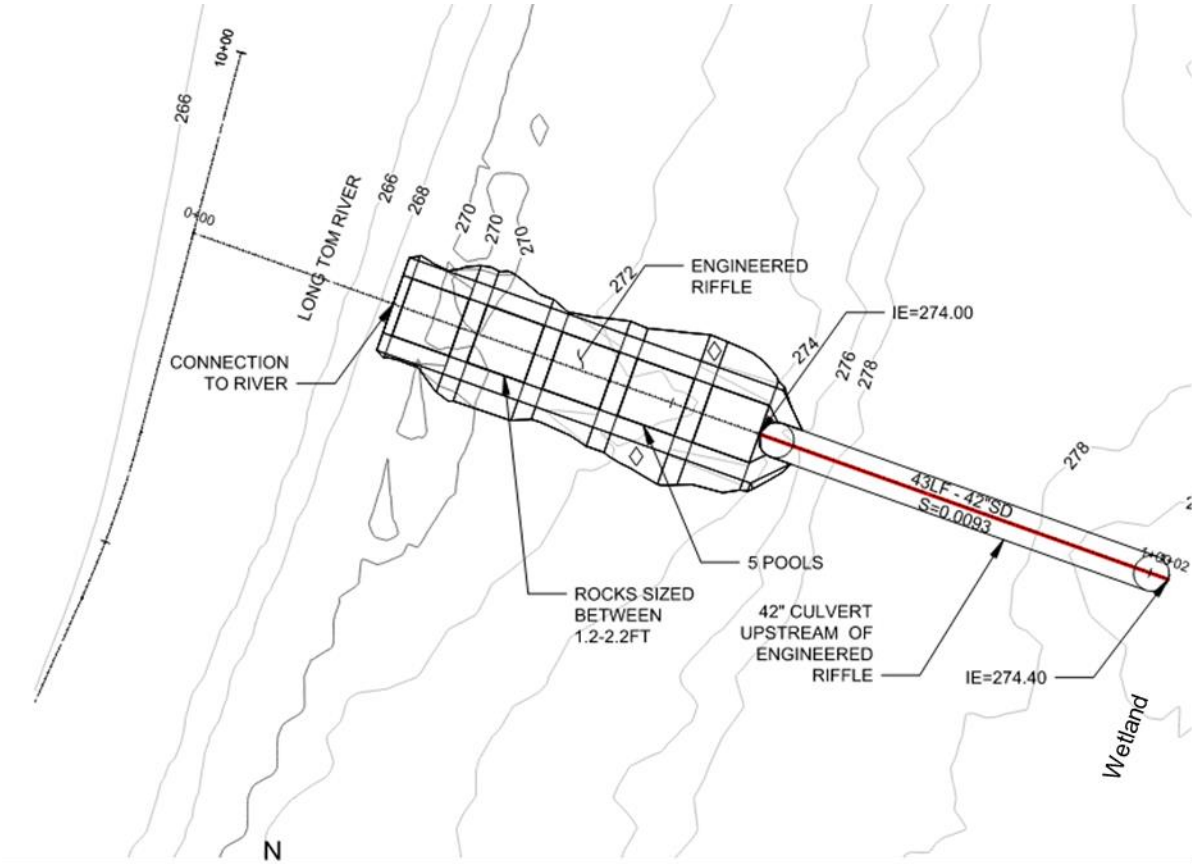

Figure 17. Replacement culvert with engineered riffle at river mile 6.6

Additional riprap protection was proposed to the existing piers of the ODOT Highway 99W bridge, to ensure their protection. Due to the increased flow of the river passing these piers once the drop structure is removed, additional scour can occur at the base of this bridge. Based on conversations with ODOT, these piers currently have shown scour since the time they were built in 1953. This Corps will provide additional protection around the piers to help ensure that future scour will be minimized around these piers. See Figure 18 for the ODOT detail used to design the riprap protection around the bridge piers. Appendix I describes the scour analysis performed to estimate the riprap sizing and design.

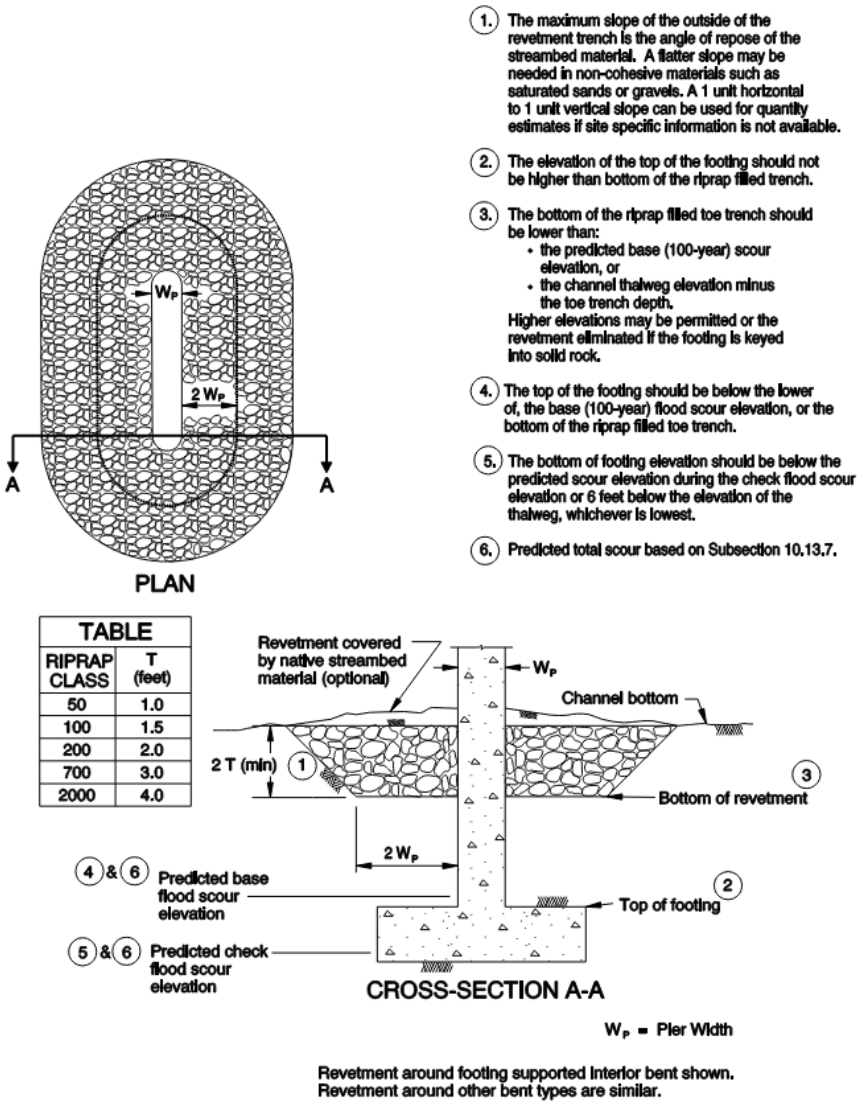

Figure 18. ODOT Bridge Pier Protection Diagram with Riprap Protection

7.2 Summary of Economic, Environmental, and Other Social Effects of the Recommended Plan

Alternatives were evaluated to determine the comprehensive benefits plan which maximizes the net total benefits across all benefit categories. The recommended plan is both the NER plan, or the plan that maximizes environmental restoration benefits in a cost-effective manner, and the comprehensive benefits plan. A summary of benefits across the four accounts, National Economic Development (NED), Regional Economic Development (RED), Environmental Quality (EQ) and Other Social Effects (OSE) shows that the recommended plan maximizes benefits associated with the Federal investment.

7.2.1 National Economic Development

Over the study period, removal of the Monroe drop structure would result in a decrease in

Federal expenditures for ongoing operations and maintenance of the drop structure. It is not expected for this decrease in spending to result in a substantial decrease in overall costs for the Long Tom Channel Improvement project as the structure is part of a larger system that will continue to be maintained in its entirety. The segment within the Willamette Valley System has federal expenditures related to vegetation removal, embankment repair and surveying. With the removal of the Monroe drop structure the costs associated with major repair and snag removal would be eliminated, while other costs to maintain the channel would remain. Lastly, it is possible that with a significant change in the river stage at the removal site, increased opportunity for vegetation growth could result in a change to maintenance practices.

7.2.2 Regional Economic Development

The project construction expenditures are estimated to occur during a 3-month period of FY24 at a total project cost of $2.4 million (FY23 prices). This estimate includes cost of planting and forestry activities, heavy construction activities, planning and compliance, as well as USACE labor and overhead. Construction activities would result in spending on goods and services (e.g., equipment and labor), and is a stimulus to the regional economy. In total, construction expenditures would support about 33 full-time equivalent jobs, $2.1 million in labor income, $2.1 million is value added, and $3.8 million in economic output in Benton County with 58 percent of that captured locally. At the State level these expenditures would support 41 full-time jobs, $2.9 million in labor income, $3 million in value added, and $5.2 million in economic output. 47 percent of that is captured locally. The economic activity supported by the project during its construction months is proportional to project expenditures in a given month (e.g., if 50% of expenditures are incurred in the first month during FY24, approximately 50% of the total economic activity is attributed to the first month during FY24).

7.2.3 Environmental Quality

The EQ effects are largely captured in the benefits evaluation described in Section 5 of this report. There would be no financial cost to communities due to the recommended changes to the system. The proposed action will provide positive benefits to the Long Tom River ecosystem which will result in positive benefits to the City of Monroe communities and lands surrounding the project area. The proposed action will not have the potential for disproportionate health or environmental effects on minorities or low-income populations or communities and will be in full compliance with Executive Order 12898 following completion of the NEPA process.

7.2.4 Other Social Effects

The removal of the Monroe Drop Structure has the potential to support additional benefits of increased community cohesion and accessibility in Monroe and on the Long Tom River. The City of Monroe supports removal and incorporation of the river into the town as part of a larger plan for the Monroe riverside. The city riverfront development plan envisions this project as supporting a vibrant downtown district, complete with a trail on the west bank of the Long Tom, a footbridge across the river, and connectivity between public use spaces. The removal alternative contributes to a decrease in life safety risk associated with the federal drop structure.

7.3 Unavoidable Adverse Environmental Effects

Under the Recommended Plan there would be no unavoidable adverse environmental effects. The plan recommends removal of a drop structure and enhanced connectivity of adjacent

wetlands. This would have the effect of enhancing the local aquatic environment and improving passage for fish species which have institutional, public, and technical significance locally, regionally, and nationally.

7.4 Mitigation for Adverse Environmental Effects

Mitigation is not proposed because the Recommended Plan would result in beneficial effects and enhancements of the aquatic resources functions and services.

7.5 Monitoring and Adaptive Management

To determine whether the project has achieved its ecological success in meeting the restoration objectives, the following monitoring and adaptive management plan would be implemented following project construction. This plan lays out the strategy for assessing project success based on clearly defined objectives and metrics, and potential adaptive management actions that could be implemented if the project fails to meet these objectives.

The degree of uncertainty surrounding whether the project benefits will be achieved is key for scaling the monitoring and adaptive management strategy. Since the project benefits are primarily achieved because of upstream reconnection the uncertainty is less with the establishment (or reconnection) of habitat than with utilization. There is also a need to validate the anticipated velocities and depths of the upstream reach, especially within the section of the study area immediately upstream of the Monroe Drop Structure.

7.5.1 Objectives

Clear articulation of a project's objectives is the foundation of the adaptive management plan; a process that iteratively compares management outcomes against these objectives and adjusts management actions or the objectives themselves based on learning over time. For this project, five objectives have been identified.

Objective 1: Presence of target fish species upstream of the Monroe Drop Structure

This objective addresses uncertainties related to species utilization and benefits associated with reconnection of the habitat upstream from the drop structure.

***Objective* 2:** Presence of target fish species in the historic meander, accessed through the engineered riffle and culvert modification

This objective considers the effectiveness of the engineered pool and riffle structure and culvert modification to provide access to off channel habitat during median and high flow conditions for the study's target species.

Objective 3: Near shore depths and velocities are consistent with modelled results for high quality habitat for target species

This objective would validate model outputs, particularly within the reach currently impounded by the Monroe Drop Structure. Habitat benefits were derived primarily based on enhancing depths and velocities that were optimal for spawning and rearing of target species.

Objective 4: *Limited establishment of invasive species on the new exposed banks within 5 years of construction completion*

This objective addresses uncertainties with survival of native species to be planted within

project area where riverbank is exposed due to drop structure removal.

Objective 5: *Minimal erosion of the Long Tom River channel in the vicinity of the Monroe Drop Structure*

This objective address uncertainties with respect to the geomorphic stability of the Long Tom River channel upstream and downstream of the study area without the Monroe Drop Structure acting as a grade control structure.

7.5.2 Monitoring

To ensure the stated objectives are met, the following monitoring is recommended:

Table 16: Proposed monitoring activities

Performance Metric	Data Gathered	Methodology	Collection Time	Associated Annual Cost	Time Frame
Fish Presence (in river and off channel)	Presence of target species	Field Observations	January	$1,000	Every Year for 5 Years
Invasive Control	Composition of native species	Field Observations	Summer	$1,000	Years 1, 3 and 5 following construction
Geomorphic stability	Visual inspection of riverbanks	Field Observations	Summer (low flow conditions)	$0 (concurrent with invasive control)	Years 1, 3, and 5 following construction

Limited annual monitoring in coordination with other monitoring efforts conducted by the Long Tom Watershed Council will be conducted at the site to determine target species presence and composition and identify areas where invasive species are present. An observer will perform visits in winter to determine if target species are utilizing upstream and off channel habitat established by this project. For invasive control, an observer would perform site visits at least once during the active growing season to examine the establishment of native plantings.

The total cost of this monitoring effort is estimated at $8,000 with potential cost savings if monitoring can be incorporated into regular operational monitoring already conducted by the federal project. Analysis and results of these efforts would be documented in an annual monitoring report.

7.5.3 Adaptive Management

Full utilization of upstream and off-channel habitat is not expected for 5 or more years after completion of the project. Depending on the rate of utilization at year 5, some modifications to the engineered fish ladder and culvert, or near shore habitat may be necessary to achieve planned project benefits. These modifications may include near shore placement of riprap or more naturalized habitat features (e.g., root wads, large woody debris). An estimated cost at year 5 for placement of materials to enhance near shore habitat is included below.

Based on the survival of species observed during the monitoring period, periodic replanting or adjustment to species composition may be necessary to avoid species that have failed during the 5-year monitoring period and plant species that have a higher likelihood of survival based on monitoring results using native plant communities associated with those species that seem to be thriving. The anticipated cost in year 5 for replanting are limited to newly exposed banks upstream of the drop structure removal site.

Table: 17 Estimated Monitoring Adaptive Management Costs

Activity	Cost	Notes
Project Modifications	$35,000	Activities are limited to areas immediately up and downstream of the existing drop structure and culvert
Native Replanting	$10,000	
Monitoring	$8,000	Monitoring activities will be completed as part of ongoing federal project operations where possible
Total Costs	$53,000	

The Corps and/or Non-Federal Sponsor will conduct monitoring and adaptive management for the first five years following implementation. Costs for these efforts will be shared 75% federal and 25% sponsor funds. If the full amount of funds ($53,000) is needed, the costs of implementing the monitoring and adaptive management plan would be $39,750 federal and $13,250 sponsor funds. Following the period of monitoring and adaptive management, the project will be operated and maintained by the non-federal sponsor to ensure the features sustain their intended benefits.

7.6 Design and Construction Considerations

Nationwide Permit General and Regional Conditions.

Design Criteria for ESA and EFH.

In-water work windows for the Long Tom River are July 1 through October 31.

7.7 Real Estate Considerations

There are several project features identified as part of the recommended plan. All of these are on lands owned by the City of Monroe or within the USACE easement. Real estate required for access and laydown areas are also on lands owned by the City of Monroe. The project will be constructed entirely on lands limited from private development by the federal project's 1944 perpetual easement along the Long Tom River. Additional details on real estate parcels and requirements for permanent features, construction laydown and access are outlined in Appendix G – Real Estate Plan.

7.8 Implementation Cost Estimate and Schedule

The full breakdown of project costs is included in Appendix F – Cost Engineering. The table below provides a summary of costs for project implementation:

Table 10: Estimated Project Cost

Project Phase	Federal	Non-Federal	Total Cost
Feasibility Phase Total	$ 570,000	$0*	$ 570,000
Design and Implementation Phase Total	$ 1,864,500	$ 621,500	$2,486,000
Pre-construction, Engineering and Design	$ 132,750	$ 44,250	$ 177,000
Construction	$ 1,419,000	$ 473,000	$1,892,000
Construction Management	$ 273,000	$ 91,000	$ 364,000
LERRDs	$ -	$ -	$ -
Monitoring and Adaptive Management	$ 39,750	$ 13,250	$ 53,000
Total Project Costs	$ 2,434,500	$ 621,500	$3,056,000

*Feasibility costs fully federal due to Tribal Cost Share Waiver

A schedule has been developed through project closeout, including the five-year monitoring and adaptive management period. The completed milestones have been identified as actual, with future milestones estimated based on funding availability and execution of a project partnership with a non-federal sponsor.

Table 11: Estimated Project Schedule

Milestone	Scheduled	Actual
Initiate Feasibility Study	Apr-20	A
Submit Federal Interest Determination	Jul-20	A
MSC Approved Federal Interest Determination	Sep-20	A
Execute Feasibility Cost Share Agreement	Oct-20	A
Tentatively Selected Plan Milestone	Jan-23	A
Initiate Concurrent Review of Draft Report	May-23	
MSC Approved Decision Document	Aug-23	
Initiate Design and Implementation Phase	Oct-23	
Execute Project Partnership Agreement	Dec-23	
Real Estate Certification	Mar-24	
Completion of Plans and Specs	Jul-24	
Construction Contract Award	Nov-24	
Construction Complete	Oct-25	
Monitoring and Adaptive Management Period	Oct-30	
Project Closeout	Nov-30	

7.9 Non-Federal Sponsor Requirements

The non-Federal sponsor(s) for this project are responsible for 25 percent of the project costs which includes fee acquisition of tracts USACE specifies are required for the project. This section describes the primary non-Federal Sponsor responsibilities in conjunction with the Federal Government to implement the recommended plan.

Development of the plans and specifications and construction of the project are shared 75 percent Federal and 25 percent non-Federal. The non-federal Sponsor shall:

• Provide all LERRDs.

• Provide, during construction, any additional costs as necessary to make the total non-Federal contributions equal to 25 percent of the total project costs. The non-Federal share is estimated at $621,500. The value of the LERRDs, if needed for the project, will be deducted from this amount.

• Operate, maintain, repair, replace, and rehabilitate the completed project or functional portion of the completed project at no cost to the Federal Government, in accordance with the applicable Federal and State laws and any specific directions prescribed by the Federal Government for so long as the project is authorized.

• Hold and save the Federal Government harmless from damages due to the construction and operation and maintenance of the project, except where such damages are due to the fault or negligence of the Federal Government or its contractors.

• Grant the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon land which the non-federal Sponsor owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purposes of completing, operating, maintaining, repairing, replacing, or rehabilitating the project.

• Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs for a minimum of three years after project closeout for which such books, records, documents, and other evidence are required.

• Prevent obstructions of, or encroachments on, the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might reduce the aquatic ecosystem restoration, hinder its operation and maintenance, or interfere with the proper function such as any new development on project lands or the addition of facilities that would degrade the benefits of the project.

• Not use Federal funds to meet the non-federal sponsor’s share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized.

8 Compliance with Other Environmental and Cultural Resources Laws, Executive Orders

The following sections demonstrate compliance with all relevant environmental and cultural laws for the proposed action outside of the NEPA compliance.

8.1 Compliance with Environmental & Cultural Resource Laws

8.1.1 Archaeological Resources Protection Act of 1979, 16 U.S.C. §§470aa-470mm

Finding: The proposed action does not require a permit for the removal or excavation of a known archaeological site. Therefore, this Act is *not applicable* to this action.

8.1.2 Bald and Golden Eagle Protection Act of 1940, 16 U.S.C. §668 *et seq.*

Finding: U.S. Fish and Wildlife Service, National Bald Eagle Management Guidelines (May 2007) and the U.S. Army Corps of Engineers Willamette Valley Project staff were aids in evaluating project impacts to bald eagles and known nest locations. The proposed action would have no impact to preferred nesting, rearing, or foraging habitat, and no 'take' of bald or golden eagles because there are no active nests within the project area. Therefore, the proposed action is *in compliance* with the Act.

8.1.3 Clean Air Act (CAA) of 1970, 42 U.S.C. §7401 *et seq.*

Finding: The proposed action would not create or result in any exceedances of State and Federal emission standards. Therefore, the proposed action is *in compliance* with this Act.

The proposed action would not involve activities involving asbestos, a regulated industry, use of an incinerator, open burning, or hazardous materials. All vehicular and mechanical equipment used to complete the proposed action would be required to meet State emissions standards. The proposed action would involve minimal effects from noise would be minimal because it is localized, low-level, and temporary. Therefore, the proposed action is in compliance with this Act.

8.1.4 Clean Water Act (CWA) of 1972, 33 U.S.C. §1251 *et seq.*

The following sections of the CWA apply to the action: Sections 401, 402 and 404

Finding: Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States and is administered by USACE. The Corps does not issue permits to itself but complies with the provisions of the Act. The proposal will be within the criteria of the following Nationwide Permits (NWP): NWP 53 – Removal of Low-Head Dams for the removal of the drop structure; NWP 27 – Aquatic Habitat Restoration, Enhancement, and Establishment Activities for the grading of the riverbed and culvert modifications; NWP 14 – Linear Transportation Projects for the scour protection for the bridge piers; therefore, an individual Clean Water Act 404(b)(1) evaluation will not be prepared. The project would implement and abide by all applicable General and Regional Conditions of these NWPs.

Section 401 – Section 401(a)(1) requires certification from the state that a discharge to

waters of the United States in that state will comply with the state's water quality standards. The EPA retains jurisdiction in limited cases. Although the Corps does not itself a permit, by regulation (33 C.F.R. § 338.2), the Corps seeks a state Water Quality Certification (WQC) when its activities result in a discharge of dredged or fill material. The Oregon Department of Environmental Quality (DEQ) is the certifying authority responsible for issuing a WQC for this proposal. DEQ has denied general WQC for all NWPs, however, they have an expedited review process for those projects which meet the terms and conditions NWPs 14, 27, and 53. General and project specific conditions will apply and be implemented as part of the WQC. This would include testing of sediments from behind the drop structure and a PSET review of sediments tested to determine if in water disposal is appropriate. The Corps will send a Letter of Intent to the Oregon DEQ seeking their concurrence with our determination that the project would qualify for an expedited WQC pursuant to NWPs 14, 27 and 53 prior to finalizing this EA.

Section 402 – The proposed action would involve construction site activities resulting in point source discharges of construction stormwater runoff regulated under Section 402 of the Act that require a construction stormwater permit from DEQ. All construction stormwater permits would be obtained by the contractor prior to project implementation as required by the contract specifications. Therefore, the proposed action is in compliance with the Act.

8.1.5 Coastal Zone Management Act (CZMA) of 1972, 16 U.S.C. §1451 *et seq.*

Finding: The proposed action is not located within the coastal zone for the state of Oregon or Washington, nor will it result in effects to coastal resources under the scope of the CZMA. Therefore, this Act is *not applicable* to the proposed action.

8.1.6 Comprehensive Environmental Response, Compensation and Liability Act – Superfund (CERCLA) of 1980, 42 U.S.C. §9601 *et seq.*

Finding: The proposed action is not located within the boundaries of a designated Superfund site as identified by the EPA, the State of Oregon or the State of Washington, and is not part of the National Priority List. Therefore, the Act is *not applicable* to the proposed action.

8.1.7 Endangered Species Act (ESA) of 1973, 16 U.S.C. §1531 *et seq.*

The current ESA USFWS Species List and NMFS Species List were reviewed for Benton County, Oregon.

Common Name	Scientific Name	Federal Status and Agency with Jurisdiction	Critical Habitat within Project Area
Insects			
Fender's Blue Butterfly	*Icaricia icarioides fenderi*	Endangered (FWS)	No
Monarch Butterfly	*Danaus plexipuss*	Candidate (FWS)	No
Birds			

Marbled Murrelet	*Brachyramphus marmoratus*	Threatened (FWS)	No
Northern Spotted Owl	*Strix occidentalis caurina*	Threatened (FWS)	No
Streaked Horned Lark	*Eremophila alpestris strigata*	Threatened (FWS)	No
Yellow-billed Cuckoo	*Coccyzus americanus*	Threatened (FWS)	No
Fish			
Upper Willamette River Chinook Salmon	*Oncorhynchus tshawytscha*	Threatened (NMFS)	No
Flowering Plants			
Kincaid's Lupine	*Lupinus sulphureus ssp. kincaidii*	Threatened (FWS)	No
Nelson's Checker-mallow	*Sidalcea nelsoniana*	Threatened (FWS)	No
Willamette Daisy	*Erigeron decumbens*	Endangered (FWS)	No

Finding: The construction footprint and effected waters up and downstream do not have the necessary habitat features for any listed terrestrial species. Therefore, we have determined that the proposed project would have No Effect to any terrestrial species. The project area contains suitable habitat for the Upper Willamette River Chinook Salmon (*Oncorhynchus tshawytscha*). We have determined that the project may affect but is not likely to adversely affect listed fish species. This determination is made using the SLOPES V Biological Opinion (BiOP), dated March 19, 2013. This determination was coordinated per the SLOPES BiOP with the NMFS on April 18, 2023. NMFS confirmed the proposed action meets the conditions of the SLOPES V BiOP via email on May 23, 2023. Therefore, the proposed action is in compliance with this Act.

8.1.8 Farmland Protection Policy Act (FPPA) of 1994, 7 U.S.C. §4201 *et seq.*

Finding: The proposed action does not involve farmland. Therefore, this Act is *not applicable* to the proposed action.

8.1.9 Fish and Wildlife Coordination Act (FWCA) of 1958, 16 U.S.C. §661 *et seq*.

Finding: The proposed action was coordinated with the U.S. Fish and Wildlife Service who provided comments via email on December 4, 2021. The FWS preferred, “removal of the structure and restoration of the river channel.” Additionally, the FWS provided anecdotal information on fish sampling conducted in the winter of 2018 and 2019 where, “juvenile Chinook were common in our catch, and found throughout the lower Long Tom right up to the dam at Monroe” and “rich native nongame fish diversity in the lower Long Tom River.” The FWS also suggested addressing fish passage at all structures within the Long Tom and stressed the need to address lateral connectivity of off-channel habitats within the Lower Long Tom River. The TSP is in alignment with the FWS preferred action, and this feasibility study included measures to address some

hydrologic connectivity beyond the main channel.

8.1.10 Magnuson-Stevens Fishery Conservation and Management Act (MSA) of 1976, 16 U.S.C. §1801 *et seq.*

Finding: EFH has been established in the project area for Chinook and Coho Salmon as defined by Appendix A to the Pacific Coast Salmon Fishery Management Plan (September 2014) to include, "The geographic extent of salmon freshwater EFH is described as all water bodies currently or historically occupied by Council-managed salmon within the USGS 4th field hydrologic units (HU) identified in Table 1." Table 1 referenced includes the entire Upper Willamette Watershed (HU 17090003).

The proposed action may adversely affect EFH but does not have the potential to cause substantial adverse effects on EFH. The proposed project, "Water Control Structure Removal" is an action covered under the SLOPES V Biological Opinion (March 19, 2013). The project design criteria included in Conservation Recommendation 4 will be included in the plans and specifications for the project. This determination was coordinated per the SLOPES BiOP with the NMFS on April 18, 2023. NMFS provided response is anticipated on or before May 18, 2023This concluded consultation. Therefore, the proposed action is *in compliance* with this Act.

8.1.11 Marine Mammal Protection Act (MMPA) of 1972, 16 U.S.C. §1361 *et seq*.

Finding: The proposed action would not be located in an area where marine mammals are found. Therefore, this Act is *not applicable* to the proposed action.

8.1.12 Marine Protection, Research and Sanctuaries Act (MPRSA) of 1972, 16 U.S.C. §1431 et seq.

Finding: The proposed action does not involve in-water disposal of materials into the ocean. Therefore, this Act is *not applicable* to the proposed action

8.1.13 Migratory Bird Treaty Act (MBTA) of 1918, 16 U.S.C. §703 et seq.

Finding: The proposed action will not result in the taking of any migratory birds. Therefore, this Act is *not applicable* to the proposed action.

8.1.14 National Historic Preservation Act (NHPA) of 1966, 54 U.S.C. § 300101 *et seq.*

Finding: Section 106 consultation and compliance will utilize the Programmatic Agreement Among the United States Army Corps of Engineers Portland District, the Oregon State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Compliance with Section 106 of the National Historic Preservation Act for Undertakings Related to the Operation and Maintenance of the Willamette Valley Project.

8.1.15 Native American Graves and Protection and Repatriation Act (NAGPRA) of 1990, 25 U.S.C. §3001 *et seq.*

Finding: The proposed action is *in compliance* with this Act because it does not involve Native American human remains or objects of cultural patrimony. In the event that any potential human remains are encountered as a result of this action, the Corps will follow the process for inadvertent discoveries found in the NAGPRA regulations 43 C.F.R. §

10.4.

8.1.15 Recourse Conservation and Recovery Act (RCRA) of 1976, 42 U.S.C. §6912 *et seq.*

Finding: The project has no potential RCRA concerns because it does not involve solid or hazardous waste. Therefore, the Act is *not applicable* to the proposed action.

8.1.16 Rivers and Harbors Act (RHA) of 1899, 33 U.S.C. §401-418

The following sections of the RHA apply to the action: Not Applicable

Finding: The proposed action has no potential to impact any navigable waters under the authority of the RHA because the action is not located within, on, or above a navigable water. Therefore, this Act is *not applicable* to the proposed action.

8.1.17 Safe Drinking Water Act (SDWA) of 1996, 42 U.S.C. §300(f) *et seq.*

Finding: The proposed action will not endanger underground aquifers and will not result in any effects on the public drinking water supply. Therefore, the proposed action is *in compliance* with this Act.

According to the *2020 City of Monroe, Water Master Plan* the City of Monroe currently utilizes a simple screened intake and a 15 HP pump on the Long Tom River approximately 600 feet upstream of the drop structure for their water supply. Removal of the drop structure and corresponding drop in water levels would adversely affect the utility of the intake. However, the water supply itself (e.g., the Long Tom River) would maintain flow rates, albeit without the pooling of water behind the dam.

8.1.18 Wild and Scenic Rivers Act (WSRA) of 1968, 16 U.S.C. §§1271-1287

Finding: The proposed action has no potential to impact a designated Wild and Scenic River because it is not located within or near a designated Wild and Scenic River nor will it result in effects to the outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values. Therefore, the Act is *not applicable* to the proposed action.

8.2 Compliance with Environmental and Cultural Resource Executive Orders

8.2.1 Executive Order 11988, Floodplain Management, 24 May 1977

Finding: The preferred alternative will be designed to comply with State and local floodplain management standards. This will include coordination with the local Floodplain Management Administrator during the design and implementation of the project. The preferred alternative will not encourage further development of the floodplain. Additionally, section 4.2 of Appendix I examined flood impacts and showed there to not be any significant changes to water surface levels from existing conditions as a result of the proposed action. Therefore, the proposed action is in compliance with the Order.

8.2.2 Executive Order 11990, Protection of Wetlands, 24 May 1977

Finding: This project will be within the Long Tom River with work and staging areas on its banks. Depending on specific construction methods, there may be some temporary

impacts to wetlands: access roads, staging, temporary fills, etc. However, any of these which may occur would be completely removed upon project completion. Additionally, the restoration of the Long Tom River would benefit wetlands with enhanced sediment transportation, hydrologic regime, and water quality. Therefore, the proposed action is in compliance with this Order.

8.2.3 Executive Order 12114, Environmental effects abroad of major Federal actions, 04 January 1979

Finding: The proposed action is not a major Federal action as defined by the Order (2-3 (a-d)), nor would it have any significant effects to the environment of nations abroad. Therefore, the Order is *not applicable* to the proposed action.

8.2.4 Executive Order 12898, Environmental Justice, 11 February 1994

Finding: The proposed action would not affect subsistence, low-income or minority communities. There would be no changes in population, economics, or other indicators of social well-being within the short- or long-term future due to the proposed action. Therefore, the proposed action is *in compliance with* the Order.

8.2.5 Executive Order 13175, Consultation and Coordination with Indian Tribal Governments, 6 November 2000

Finding: Executive Order 13175 defines the criteria in which the Agency must consult with Tribal Governments. The executive order defines such policies as, “regulations, legislative comments or proposed legislation, and other policy statements or actions that have substantial direct effects on one or more Indian tribes, or on the distribution of power responsibilities between the Federal Government and Indian tribes.” This action does not meet the criteria identified in EO 13175 that requires Agency consultation with Tribal Governments. Nevertheless, the Corps extended offers to engage in Nation-to-Nation consultation with the following Federally recognized tribes: the Confederated Tribes of the Grand Ronde Community of Oregon, the Confederated Tribes of Siletz Indians, and the Confederated Tribes of the Warm Springs Reservation of Oregon. Scoping letters were sent to the above tribes on October 12, 2021. The Confederated Tribes of the Warm Springs Reservation of Oregon responded on November 10, 2021 requesting to be included on future Section 106 consultation. No additional responses were received. The Confederated Tribes of Siletz Indians acted as co-sponsors to this study and were engaged at stages of alternative development and evaluation. Additional letters introducing tribes to the preferred alternative, inquiring as to whether they had any concerns with the project, and determining whether they wished for more information will be sent as a part of the concurrent review process in April and May 2023.

8.2.6 Executive Order 13186, Migratory Birds, 10 January 2001

Finding: The proposed action does not involve activities where there would be take of migratory birds or disturbance of their habitat. Therefore, the Order is *not applicable* to the proposed action.

8.2.7 Executive Order 13751, Safeguarding the Nation from the Impacts of Invasive Species, 5 December 2016

Finding: The proposed action would have no potential to introduce, establish, or spread invasive species because associated activities would extend the existing use area. The target species under this project have occasionally been observed upstream. There is no evidence that invasive species are limiting opportunities below the Monroe drop structure so it is not expected that improved passage would promote dispersal of invasive species. The construction contractors will be required to clean equipment and watercraft prior to bringing it onto the project site and prior to removing it from the site to prevent the spread of invasive species. Equipment and watercraft would be free from soil residuals, egg deposits from plant pests, noxious weeds, plant seeds, aquatic plants and animals, and residual water. Native plantings will be installed after construction to minimize opportunities for invasive plants to establish. Therefore, the proposed action would be *in compliance* with the Order.

9 Summary of Public Involvement, Review Process and Consultation

Stakeholders, agencies, and the public are integral in providing input for defining restoration opportunities, objectives, constraints, and for developing restoration strategies that support development of the range of alternatives to be analyzed for feasibility and environmental compliance. Public involvement activities and agency coordination are summarized in this section.

9.1 Public Scoping Process

A public scoping meeting was held virtually on 3 November 2021. The presentation was given by key members of the Project Delivery Team and Operations Project Manager for the Willamette Valley, the City of Monroe, the Confederated Tribes of the Siletz, and the Long Tom Watershed Council. Community feedback was primarily concerned with the potential to change flood risk in the community due to modifications to the drop structure and long-term goals associated with restoration of the Long Tom River up to the Fern Ridge Dam. The analysis conducted as part of this study included a flood risk analysis and scour and erosion analysis to address questions raised during scoping. The study does not address potential future projects to be considered or implemented at the Stroda and/or Ferguson drop structures by the non-Federal Sponsors or the Long Tom Watershed Council.

A public information session will be held during the public comment period, tentatively scheduled for April 27, 2023.

9.2 Integrated Feasibility Report/Environmental Assessment Public Review

A public review of the draft report will be completed concurrently with the agency technical and policy review. Public comments will be compiled and included in Appendix M. This section will be revised prior to approval of the final report.

9.3 Additional Coordination and Consultation

Scoping letters were sent to state and federal resource agencies and tribes who have an expressed interest within the study area on October 4, 2021. The recommended plan is in line with the preferred alternative expressed by U.S. Fish and Wildlife and the nature of the project and limited negative environmental impacts do not rise to the level of requiring formal consultation. Compliance with environmental and cultural resource requirements is outlined in Section 8.

The draft Integrated Feasibility Report and Environmental Assessment will be circulated from April 2023 to May 2023 for agency, stakeholder, and public review and comment to the following organizations:

- U.S. Fish and Wildlife Service
- National Marine Fisheries Service
- Environmental Protection Agency
- Oregon Water Resources Department
- Oregon Department of Environmental Quality
- Oregon Department of Transportation

In addition, Federally recognized Native American Tribes and Nations who have historic ties to the project area were invited to comment on the draft report and, if requested, enter into Nation-to-Nation consultation. Tribal coordination and/or consultation will continue throughout the design and construction phase.

9.4 Review Process

Agency technical and policy reviews will be conducted concurrently. Comments will be addressed in the draft report prior to being submitted for final review and approval. A summary of comments from the review process will be included in Appendix M.

10 Recommendation

This study has included an examination of all potential and practicable alternatives for meeting the study objectives of restoring fish passage and historic off channel habitat at and upstream of the Monroe Drop Structure on the Long Tom River. The recommended alternative provides the maximum, cost effective environmental benefit that meets the objectives outlined for this study. The recommended plan of total removal of the Monroe Drop Structure, culvert modification, and bridge pier scour protection provides important fish and wildlife benefits to target species including ESA listed Chinook population as well as essential fish habitat for spawning and rearing of this study's target species. The plan has negligible impact on flood water surface elevations and potential increased scour risk at the OR-99 bridge has been addressed as a part of the recommendation. The plan is consistent with national policy, statutes, and administrative directives. The plan has been reviewed considering overall public interest, which includes the views of the non-Federal sponsor and interested agencies. The district has concluded that the City of Monroe can meet their financial obligations and that the public interest would be served by implementation of the recommended plan.

Based on 2023 prices levels, the estimated project cost is $2,486,000 which includes monitoring and adaptive management costs of $53,000. The Federal share of the project cost is estimated to be $1,864.500 and the non-Federal share is estimated to be $621,500 which equates to 75% Federal and 25% non-Federal. The estimated total Federal cost of the project (including feasibility costs) is $2,434,500. The annualized costs over the period of project performance (50 years) are estimated at $81,626. The AAHUs estimated for this project are 43 over the same period, yielding a cost/AAHU of $1,898. It is recommended the proposed work be authorized and funding allotment of $150,000 be made available in FY24 to begin design work. A second allotment of $1,714,500 will be required in FY25 to complete design, construction, and project close-out.

The proposed work would include restoration of fish and wildlife habitat within the City of Monroe, as generally described in this report, under Section 1135 of the 1986 Water Resources Development Act, as amended. Authorization is subject to cost sharing and financing arrangements with the non-Federal sponsor, the City of Monroe, and is based on the cost sharing and financing requirements of the Section 1135 program. Prior to construction, and during the Plans and Specifications phase, the non-Federal sponsor will: (1) provide all lands, easements, and rights of way necessary for project construction and operation and maintenance; and (2) hold and save harmless the United States from damages due to the construction or operation and maintenance of the project. The non-Federal sponsor will also operate and maintain the project after construction for the life of the project (50 years).

The recommendations contained in this report reflect information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national civil works construction program nor the perspective of higher levels within the Executive Branch. Consequently, the recommendations may be modified before they are approved for implementation.

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