US Army Corps of Engineers ®
Walla Walla District

MILL CREEK FLOOD RISK MANAGEMENT GENERAL INVESTIGATION

Draft Feasibility Study and Environmental Assessment Report

January 2020

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MILL CREEK FLOOD RISK MANAGEMENT GENERAL INVESTIGATION FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT REPORT - DRAFT

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ACRONYMS AND ABBREVIATIONS

ASR	Aquifer Storage and Recovery
BCR	benefit cost ratio
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
CSRA	Cost and Schedule Risk Analysis
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
CWA	Clean Water Act
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
Diversion Dam	Mill Creek Diversion Dam
EA	Environmental Assessment
Ecology	Washington Department of Ecology
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPA	Environmental Protection Agency
EPD	Environmental Protection Division
EQ	Environmental Quality
ER	Engineer Regulation
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FEPP	Flood Emergency Preparedness Plan
FONSI	Finding of No Significant Impact
FWCA	Fish and Wildlife Coordination Act
H	horizontal
HEC-FDA	Hydrologic Engineering Center-Flood Damage Analysis
HEC-RAS	Hydrologic Engineering Center-Remedial Action Scheme
HTRW	hazardous, toxic, and radioactive waste
ISIS	Integrated Site Information System
LER	Lands, Easements, and Rights-of-Way
LERRDs	Lands, Easements, and Rights-of-Way, Relocations, and Disposals
LUST	leaking underground storage tank
MCACES	Micro-Computer Aided Cost Estimating System
MCFCP	Mill Creek Flood Control Project
MCFCZD	Mill Creek Flood Control Zone District
NAGPRA	Native American Graves Protection and Repatriation Act
NAVD88	North American Vertical Datum of 1988
NED	National Economic Development
NEPA	National Environmental Policy Act

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NFIP	National Flood Insurance Program
NGVD29	National Geodetic Datum of 1929
NHPA	National Historic Preservation Action
NMFS	National Marine Fisheries Service
NPL	National Priority List
NRHP	National Register of Historic Properties
NWI	National Wetlands Inventory
OMRR&R	operation, maintenance, repair, replacement, and rehabilitation
OSE	Other Social Effects
PFMC	Pacific Fishery Management Council
PL	Public Law
Project (upper case)	Mill Creek Flood Control Project
RCRA	Resource Conservation and Recovery Act
RED	Regional Economic Development
SEMS	Superfund Enterprise Management System
SHPO	State Historic Preservation Office
SQRA	Semi-Quantitative Risk Analysis
Storage Dam	Mill Creek Storage Dam
TMDL	Total Maximum Daily Load
TRI	Toxic Release Inventory
TSP	Tentatively Selected Plan
USC	U.S. Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UW CIG	University of Washington Climate Impacts Group
V	vertical
WDFW	Washington Department of Fish and Wildlife
WDFW	Washington Department of Fish and Wildlife
WPA	Works Progress Administration

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SECTION 1 - INTRODUCTION

Background Photo: Mill Creek Channel Construction, 1936

Photo Credit: Walla Walla County

SECTION 1 - INTRODUCTION

The U.S. Army Corps of Engineers (Corps), Walla Walla District, and the non-Federal Sponsor, Mill Creek Flood Control Zone District (Walla Walla County), is conducting a flood risk management study to address the risks Mill Creek presents to the community of Walla Walla, Washington, and other communities within the Mill Creek watershed (adjacent lands). This draft integrated Feasibility Study and Environmental Assessment Report documents the results of the feasibility study and environmental compliance processes. It presents the process, analysis, results, and conclusions of the investigations and analysis performed to evaluate potential improvements to the existing Mill Creek Flood Control Project (MCFCP or Project).

Section 1 of this report provides background information on Mill Creek and the MCFCP, identifies the purpose and need for the proposed action, and describes the features and operations of the MCFCP. The problems and opportunities associated with the MCFPC, as well as the study objectives and constraints, are also provided in this section.

1.1 BACKGROUND

Mill Creek is a steeply graded mountain stream that drains about 200 square miles of the Blue Mountains before it flows through the city of Walla Walla, Washington. Historically, major floods have occurred when multiple storm systems combine warm wind and rain with high elevation snowpack on frozen or saturated ground. The MCFCP, which includes an off-stream storage reservoir and stabilized channel (composed of levees with stabilizers and a concrete channel through and under portions of downtown Walla Walla), has performed well in protecting the Walla Walla community for over 75 years. However, the system has declined in terms of performance, capacity, and reliability over that time. In the event flood flows either exceed the Project's capacity or cause it to fail, approximately 14,800 structures worth an estimated $3 billion could be impacted. The total financial value of property (structures, contents, vehicles, roads, and railroads) in Walla Walla and adjacent lands that is at risk of flooding is more than $7 billion. There are more than 27,000 people at risk in a major flood event, which represents about thirty-six percent of the total population in the county.

Some of the system's major components are over 80 years old and are degrading. In particular, the concrete section of the channel was constructed in the 1930s by the Works Progress Administration (WPA) using locally available materials and labor. It runs through densely populated areas and Walla Walla's downtown commercial core. In some places, it incorporates parts of building foundations and other infrastructure that are over 100 years old. The integrity of the walls cannot be determined with certainty due to their age and lack of design and construction information. The Corps and Walla Walla County have properly operated, maintained, repaired, and rehabilitated the system's components, and major work has been performed at the reservoir, and the leveed and concrete channel reaches, to preserve the system's performance, capacity, and reliability. However, maintenance costs have increased at rates that exceed typical inflation rates over the last decade, and the costs to maintain all parts of the system are expected to continue to increase as the system ages.

1.2 STUDY AUTHORITY

This study is authorized by the Flood Control Act of 1938 (Public Law [PL] 75-761), which authorizes the Secretary of the Army to execute a plan for protection of the city of Walla Walla, Washington, and states:

> *The plan for protection of the city of Walla Walla, Washington, and adjacent lands by means of a reservoir and related works, as set forth in House Document Numbered 578, Seventy-fifth Congress, third session, is approved and for the execution of this plan there is hereby authorized $1,608,000.*

House Document Numbered 578 contained a report of the Chief of Engineers, U.S. Army Corps of Engineers, recommending a comprehensive project for construction of flood-control works in the Mill Creek Basin to protect the city of Walla Walla and vicinity. The adopted plan involved construction of:

> *Two trash barriers of treated piling and floating boom sticks; diversion of excess flood waters of Mill Creek into a reservoir formed by an earth dam across a lateral valley; the subsequent withdrawal of this stored water back into Mill Creek through controlling works of the dam and a return channel from the dam to the creek; two division weirs to control the amount of water discharged into the delta streams—Mill, Garrison, and Yellowhawk Creeks; channel improvement of Mill Creek between the division works east of the city and the city limits by bank sloping, some small levees, and rock-filled wire-mesh mat revetments; improvements of Mill Creek Channel through the city by reshaping and stabilizing the bottom with wire-bound rock stabilizers; reshaping banks and bank protection by wire-mesh revetments near the west city limits; and improvement of Mill Creek Channel west of the city to the western boundary of the flood control district.*

Section 2 of the Flood Control Act of 1938 also authorized and directed the Corps to acquire title to lands, easements, and rights-of-way necessary for construction of the project, as well as to operate and maintain the dam and reservoir subsequently constructed by the Corps and the non-Federal sponsor.

Subsequently, PL 91-611, Section 216 of the Flood Control Act of 1970, authorized investigations for modification of completed projects, which states:

> *The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.*

1.3 FEDERAL POLICY AND PROCEDURES

The Corps began modernizing its planning program in 2012. That effort applies a risk-informed approach to shorten schedules and reduce the cost to complete feasibility studies by eliminating non-essential activities while still producing reports that make and adequately support prudent recommendations. The risk-informed process concentrates on collecting and presenting information related to the factors that most influence the decisions being considered and minimizing the collection, analyses, and reporting of information that does not meaningfully influence the decisions and recommendations. When appropriate, it also uses assumptions, professional judgment, and estimates instead of acquiring new data to support the decision-making process.

The six-step planning process for this feasibility study and environmental assessment was followed the SMART (Specific, Measurable, Attainable, Risk Informed, Timely) planning modernization initiative that incorporated a planning charette. The charette was a multi-day meeting held at the beginning of the process to apply a risk-informed approach to streamline the study scope and process by eliminating non-essential activities from the decision-making process. While completing studies faster and at lower costs, the modernized USACE planning process is intended to generate reports that are more concise and easier to understand but still present a thorough analysis of all important considerations. This report integrates the FR and the EA into a single document to meet the combined requirements of water resource development law and policy and the National Environmental Policy Act (NEPA). It is anticipated that the briefer format will help reduce review times and maintain the project schedule by eliminating the need to extend review and comment periods beyond standard time frames.

The Corps' planning process is defined in *Principles and Guidelines for Water and Related Land Resources Implementation Studies*. The six steps of this process are listed below:

Step 1: Identify Problems and Opportunities
Step 2: Inventory and Forecast Conditions
Step 3: Formulate Alternatives
Step 4: Evaluate Alternatives
Step 5: Compare Alternatives
Step 6: Select a Plan

This process provides a guide for decision making and is aimed at selecting a plan that meets the Federal objective. The planning process is highly iterative and involves cycling through these steps many times during the development and evaluation of a range of alternatives. This process is defined and governed by:

a) Engineer Regulation (ER) 1105-2-100: Planning Guidance Notebook.
b) Engineer Regulation 200-2-2: Procedures for Implementing NEPA.
c) Engineer Circular 1165-2-217: Review Policy for Civil Work.
d) Consolidation of Studies. Updated Implementation Guidance for Section 1002 of the Water Resources Reform and Development Act of 2014. 17 May 2015.

e) Director's Policy Memorandum Civil Works Program 2018-05, Subject: Improving Efficiency and Effectiveness in USACE Civil Works Project Delivery (Planning Phase and Planning Activities). 3 May 2018.

The NEPA and its implementing regulations supplement the planning process and ensure the project would "create and maintain conditions under which man and nature can exist in productive harmony."

This report integrates the feasibility study and environmental assessment into one document to meet the requirements of water resource development law and policy and the National Environmental Policy Act (NEPA).

1.4 FEDERAL OBJECTIVE

The Federal objective of water and related land resources project planning is to contribute to national economic development (NED) consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, treaties, and other Federal planning requirements.

Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net economic benefits that accrue in the study area and the rest of the nation. For a flood risk management study, the average annual contribution to NED is calculated by subtracting the average annual costs of constructing and operating the flood risk management project from the average annual benefit of flood damages and costs prevented by the project. For there to be Federal interest, the calculation must show that the benefits exceed the costs.

1.5 PURPOSE AND NEED FOR ACTION

This report recommends the best path forward to continue to provide flood risk management benefits to Walla Walla and the adjacent lands in the future.

The purpose of the proposed action is to reduce the susceptibility of Walla Walla and adjacent lands to flood-related property damage, financial consequences, and potential human life losses from Mill Creek over the 50-year period of analysis. The proposed action is needed because the capacity, reliability, and performance of the existing flood risk management system are degrading, and the operation and maintenance costs are increasing as the system ages. The proposed action, consistent with policies, could also incorporate compatible features to improve fish habitat and passage conditions and avoid obstructing the ability of others to make such improvements within the study area.

Alternatives considered must: (1) Reduce total flood risk to Walla Walla and surrounding areas; (2) comply with applicable treaties, laws, regulations, and executive orders; (3) not adversely affect existing water rights; (4) be capable of reasonably maximizing the contribution to

national economic development (NED), based on preliminary cost and benefit evaluations; (5) be technically and economically feasible; and (6) environmentally acceptable.

1.6 STUDY SCOPE

The feasibility study addresses flood risks holistically. It considers a broad range of measures (features or actions taken to address a problem or realize an opportunity) and alternatives that include both existing and new features. In general, the scope includes consideration of multiple options to increase both storage and conveyance capacities within the study area and to improve the reliability of the system.

1.7 STUDY AREA AND EXISTING PROJECT LOCATION

The city of Walla Walla is located along the border of southeastern Washington and northeastern Oregon (Figure 1-1).

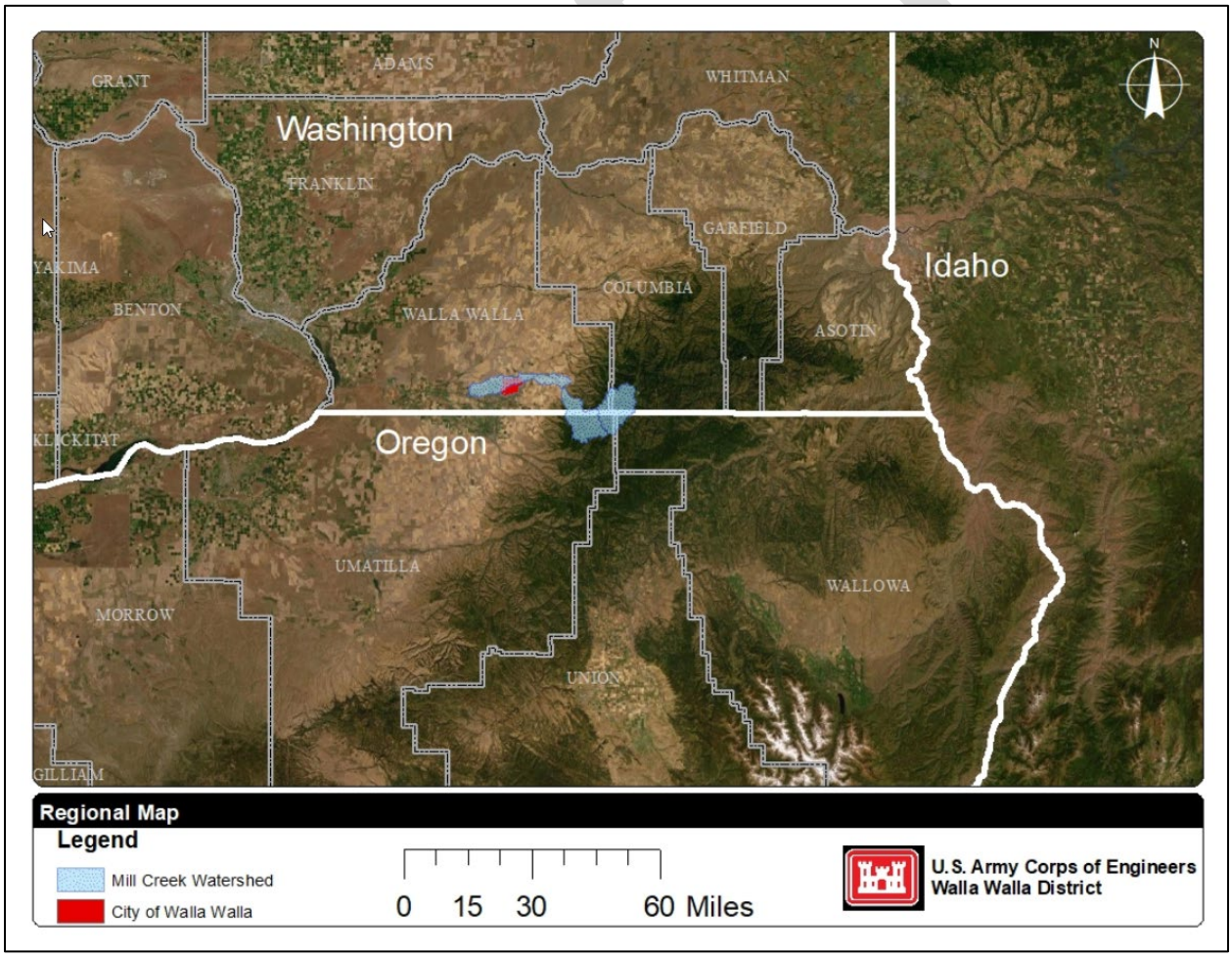


Figure 1-1. Project Location

Mill Creek originates near the border of Washington and Oregon and flows west for 33 miles before its confluence with the Walla Walla River, which flows west for 33.5 miles before entering the Columbia River. As shown in Figure 1-2, major tributaries of Mill Creek include Paradise, Tiger, Blue, and Titus Creeks, and distributaries include Titus, Yellowhawk, and Garrison Creeks (Garrison is actually a distributary of Yellowhawk, originating about 0.1 miles beyond Yellowhawk's origin). Russell Creek also can receive some water from Mill Creek during and after large floods. Most of the Mill Creek watershed is within Walla Walla County in Washington, but it also includes parts of Columbia County in Washington, and Umatilla and Wallowa Counties in Oregon.

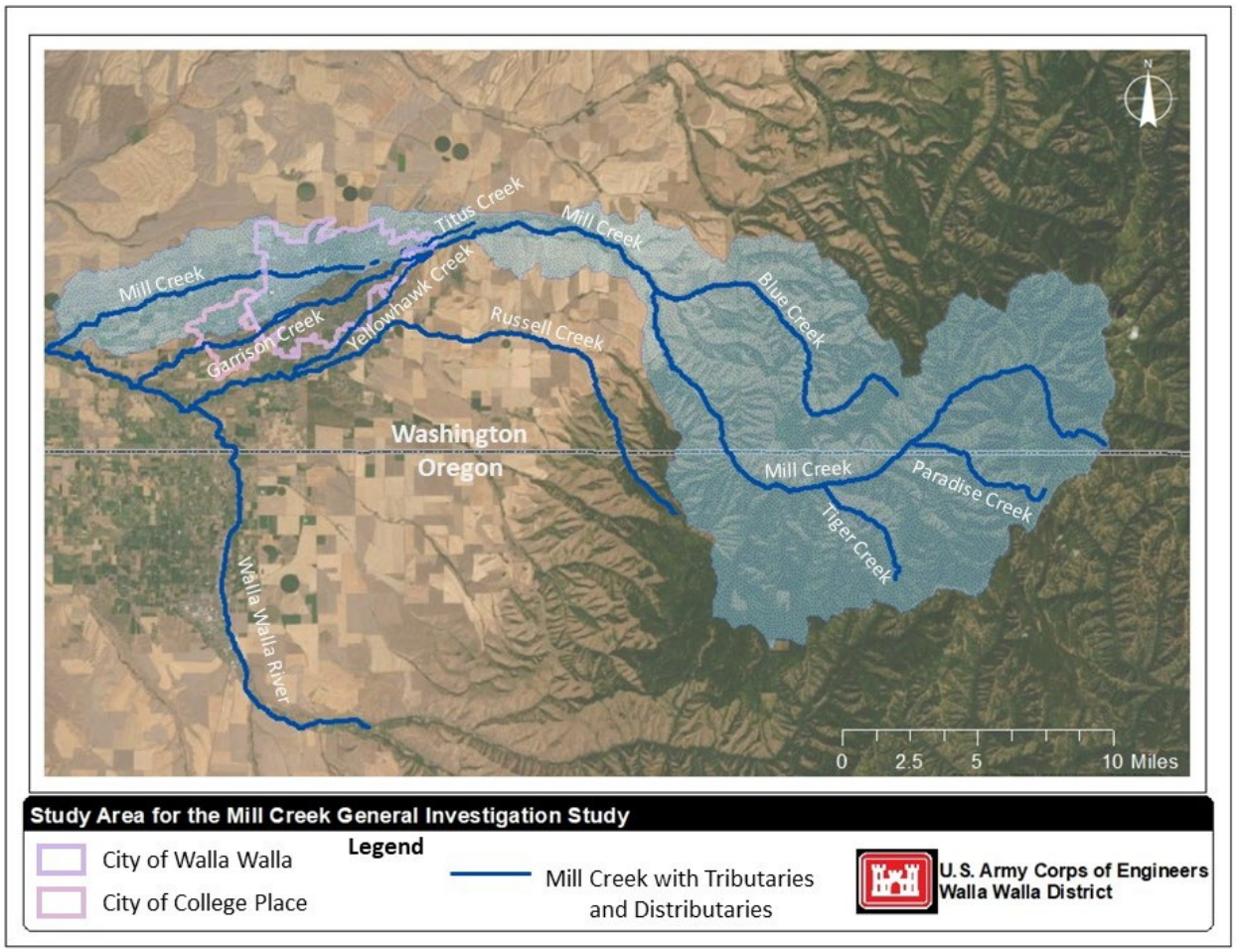


Figure 1-2. Mill Creek General Investigation Study Area

1.8 PROJECT HISTORY

Prior to 1931, flood risk management improvements in Mill Creek were accomplished by local interests (city and county governments, and individuals). These improvements consisted of intermittent concrete retaining walls bordering both sides of the channel, mostly within the Walla Walla city limits. In 1931, a large flood occurred—the largest pre-Project flood for which information is available.

To address the flooding issues, continuous retaining walls through the city were completed in 1933. Continued public concern over the frequent flooding of Walla Walla prompted Virgil B. Bennington, then president of the Walla Walla Chamber of Commerce, to lobby U.S. Congress for additional flood protection. The proposal was for a flood control reservoir, with diversion works at Mill Creek, a channel to the reservoir, a ditch from the reservoir to the division works on Mill Creek at the headwaters of Garrison and Yellowhawk, a rock filled wire-revetted channel to the city of Walla Walla, a concrete channel through the city, and a rock filled wire-revetted channel below the City.

The Mill Creek Flood Control Project was authorized by Congress in 1938 (PL 75-761) (Flood Control Act of 1938) to provide flood risk management for the city of Walla Walla and its adjacent lands. The Act approved a plan recommended by the Chief of Engineers for comprehensive flood control protection that combined channel improvements already largely completed at the time of the Act's passage and reservoir and control works to be constructed by the Corps thereafter.

Name History of Reservoir

The off-stream storage reservoir was called Mill Creek Reservoir from 1938 to 1972, and Mill Creek Lake until 1992. In 1992, the lake was renamed after the late Virgil B. Bennington.

The WPA, in partnership with local interests, had constructed channel improvements to Mill Creek from Tausick Way Bridge to Gose Street Bridge (Figure 1-3) by 1939. The Corps completed the authorized flood control project in 1943. At that time, the federally managed portion of the Project consisted of the Mill Creek Diversion Dam; the off-stream reservoir, Bennington Lake, the Mill Creek Storage Dam, and the First Division Works, which was designed to distribute some excess flow into Yellowhawk and Garrison Creeks. A concrete-lined auxiliary outlet channel from Mill Creek Storage Dam to Russell Creek was later added to the federally managed portion, along with additional drainage facilities at the toe of the storage dam. A concrete channel floor was installed in 1948 to prevent downcutting (downward erosion into the channel bed) and undermining as a result of a wall failure during minor flooding in 1945 and 1946.

On July 16, 1948, the Walla Walla County Commission established the name of the district as the Walla Walla County Mill Creek Flood Control District. On February 25, 1974, the Mill Creek Flood Control District was dissolved and the Mill Creek Flood Control Zone District (MCFCZD) was organized. The MCFCZD owns and maintains the leveed section of the channel downstream of the First Division Works to Gose Street and also maintains the concrete section of the Mill Creek Channel. The leveed section stabilizers were capped with concrete during the mid-1980s.

1.9 EXISTING PROJECT FEATURES AND OPERATIONS

1.9.1 Overview of Mill Creek Flood Control Project

The existing MCFCP is located entirely within Walla Walla County, Washington. It begins about 2 miles east of the city of Walla Walla, and ends about 7 miles downstream near the city of College Place at the Gose Street Bridge (Figure 1-3).

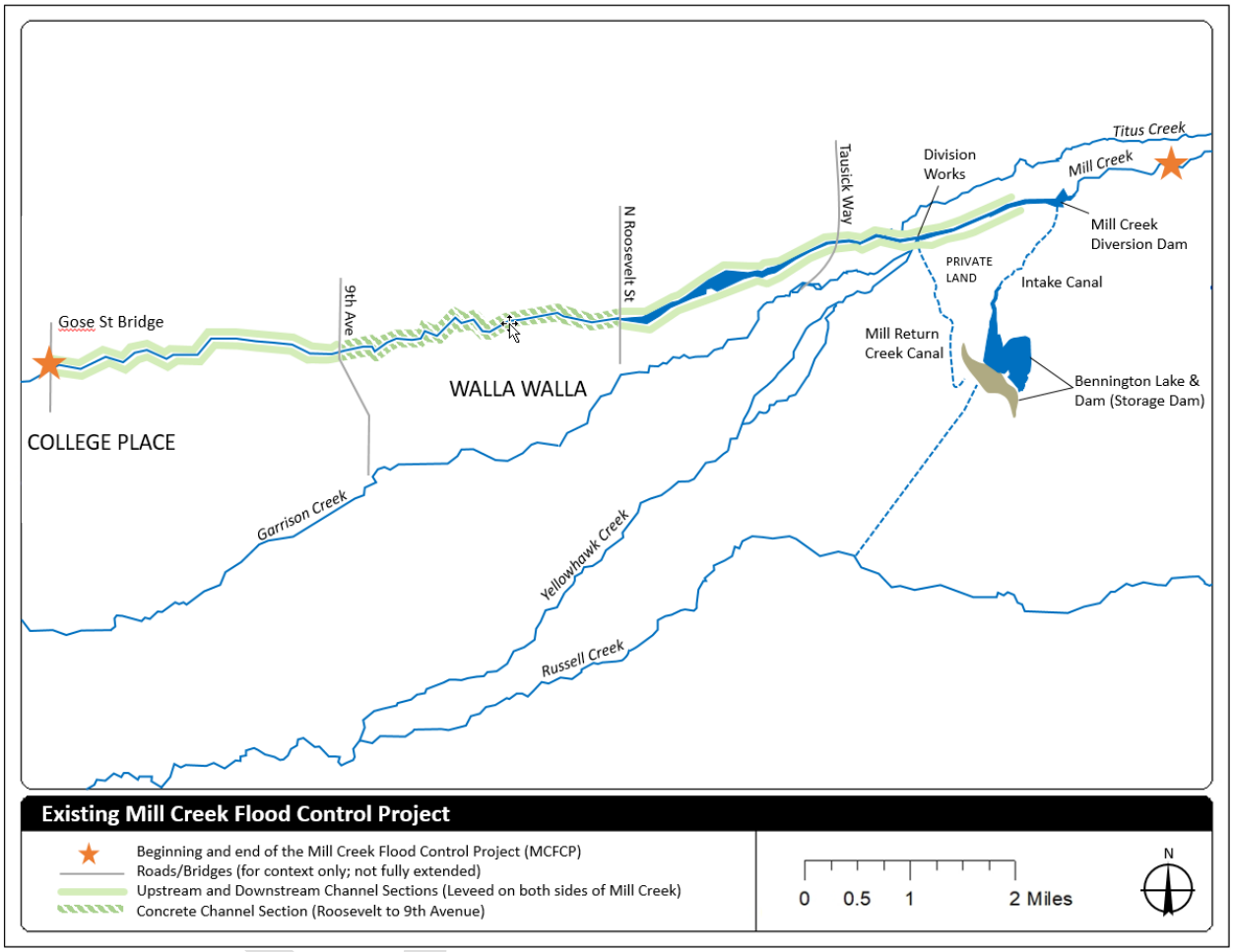
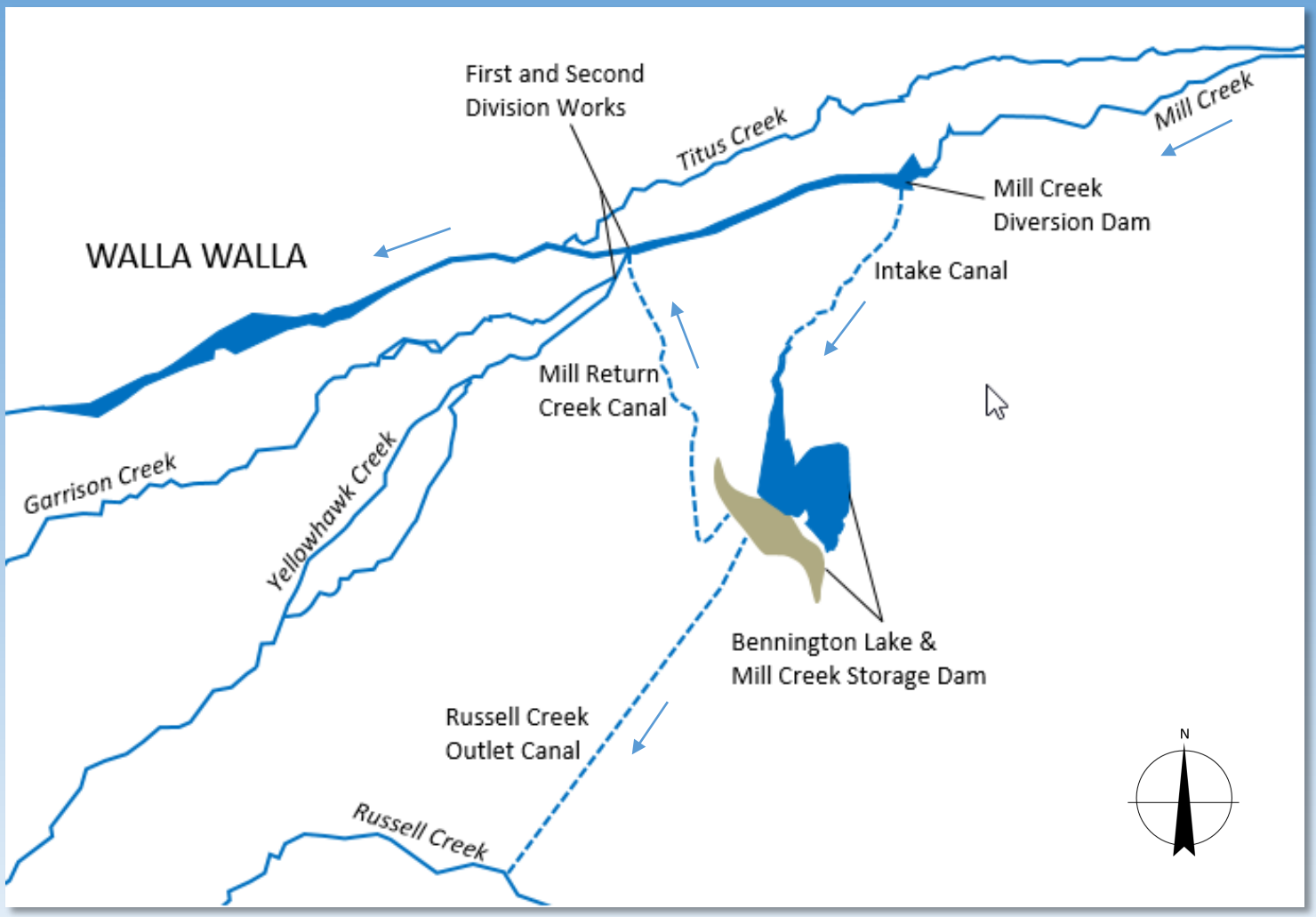


Figure 1-3. Existing Mill Creek Flood Control Project

The following graphics and text in the rest of this section lay a foundation for a better understanding of the system and how the main components of this complex system work together. Sections 1.9.2 and 1.9.3 provide more detailed descriptions of its features and operation.

MILL CREEK FLOOD CONTROL PROJECT OVERVIEW



THE BIG PICTURE

For most of the year, water in Mill Creek flows down from the Blue Mountains and either passes through or over Mill Creek Diversion Dam, flows down the Mill Creek Channel that runs through Walla Walla and College place, and empties into the Walla Walla River.

When there is a flood event, some of the water in Mill Creek is diverted to an off-stream storage reservoir, Bennington Lake, and the Mill Creek Storage Dam. When the threat of flooding is over, the water is either returned to Mill Creek through the Mill Creek Return Canal or released into Russell Creek through the Russell Creek Outlet Canal.

1. Mill Creek Flood Control Project
(aerial view looking west)

A CLOSER LOOK

Water Passing through or over the Dam

As previously mentioned, most of the year, Mill Creek flows either through or over the dam and then down the Mill Creek Channel. Water flows through the dam via the low-flow outlet *(photo 2)* on the south side of the dam *(photo 1)* or via the fish ladder, which is between the outlet and bank. The low-flow outlet is designed for flows up to 400 cubic feet per second (cfs), and the fish ladder is designed to pass flows up to 42 cfs. Gates inside the low-flow outlet and fish ladder are adjusted to control the amount of flow through the dam. When Mill Creek flow is expected to reach or exceed 400 cfs for more than 24 hours, the low-flow outlet and fish ladder gates are closed, causing the water to back up behind the dam and then flow over the Diversion Dam spillway *(photo 3).*

Flood Operations – Diverting Flow to Bennington Lake

When Mill Creek flow is forecasted to be above 1,400 cfs, which is considered flood level, excess water is diverted to Bennington Lake by opening one or more of the four intake headworks gates *(photo 4)*. Water then flows through the intake canal into the lake. The remaining water goes over the spillway and downstream through the Mill Creek Channel. The Corps refers to flows of 1,400 cfs as the **diversion trigger**, which is the forecasted flow in Mill Creek that triggers the decision process to divert flood flow to the lake.

When water goes through or over the dam, the water flowing downstream of the dam is called **unregulated flow**. When water is diverted to Bennington Lake, the remaining water flowing downstream of the dam is called **regulated flow** because the flow has been changed by operating the Project.

2. Low-Flow Outlet
(looking upstream)

3. Diversion Dam Spillway
(water flowing west)

4. Headworks Gates
(facing the intake canal)

5. Intake Tower
(from top of Storage Dam)

Mill Creek Channel Flow Capacity and Bennington Lake Capacity

The Mill Creek Channel has three main sections: an upstream and a downstream section that has levees on both sides of the creek, and a concrete section in the middle, which runs through downtown Walla Walla. Although the concrete section is designed to handle flows up to 5,400 cfs, the leveed sections of the channel only have a capacity of 3,500 cfs.

Because of the channel capacity, the Corps has a **regulated flow objective** for the Mill Creek Channel, which is to keep the regulated flow between 1,400 and 3,500 cfs to minimize flood damage as much as possible.

Bennington Lake *(photo 6)* is designed to hold water to a maximum elevation of 1,265 feet, which is a storage capacity of 8,300 acre feet.

The Corps must consider the maximum channel and lake capacities, as well as several other factors, when deciding how much water to divert to Bennington Lake and how much to send down the Mill Creek Channel. Factors include (1) the expected duration of the flood event, (2) the remaining storage available in the lake, and (3) the likelihood of a subsequent flood event.

Releasing Water from the Lake

Water can be released by opening the gates inside the intake tower *(photo 5)* located on the west end of the lake. The water goes through a conduit connected to the intake tower and through the Storage Dam. Valves located on the other side of the dam are operated to direct water either back to Mill Creek via the Mill Creek Return Canal or to Russell Creek via the Russell Creek Outlet Canal.

6. Bennington Lake and Mill Creek Storage Dam
(looking east, toward the intake canal and Diversion Dam)

1.9.2 Existing Project Features

Sections 1.9.2.1 through 1.9.2.6 provide descriptions of each of the major features of the Project. These sections are further divided to describe more detailed features, as needed.

1.9.2.1 Mill Creek Diversion Dam and Associated Structures

The Diversion Dam is located on the upstream end of the Project on Mill Creek at river mile 11.4. Associated structures consist of the low-flow outlet, fish ladder, spillway, intake canal headworks and intake canal, diversion dam dike, and debris barriers (Figure 1-4). The purpose of the diversion dam is to raise the water level behind the dam during floods to make it possible to divert floodwaters from Mill Creek through the intake canal headworks and intake canal and into the storage reservoir, Bennington Lake.

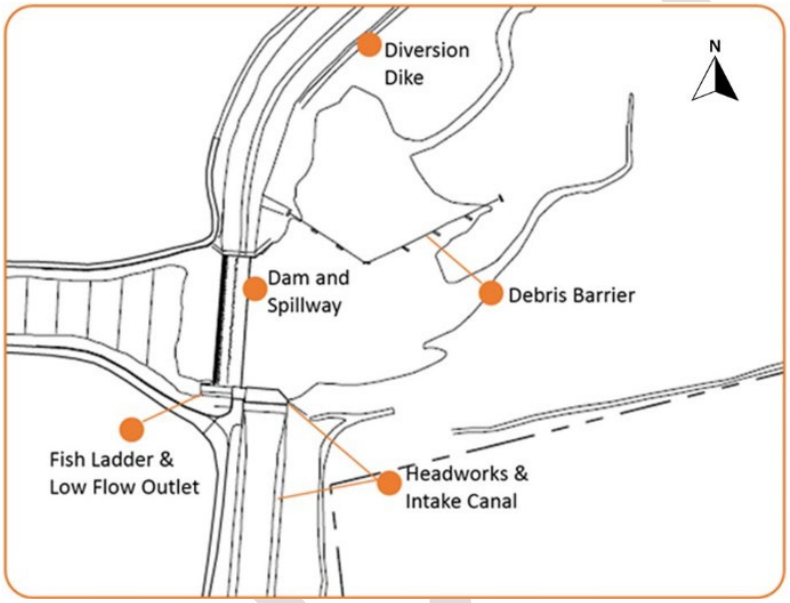


Figure 1-4. Mill Creek Diversion Dam and Associated Structures

Mill Creek Diversion Dam, Low-Flow Outlet, and Spillway

The low-flow outlet is located on the south side of the spillway and passes water through the dam into the channel. The amount of flow passing through the outlet is controlled by a radial gate. A small *stilling basin* used to reduce the energy of the water is located downstream of the low-flow outlet channel and fish ladder. The stilling basin helps prevent erosion of the south bank, which is protected by riprap (large rocks). If flow is projected to reach or exceed 400 cubic feet per second (cfs) for longer than 24 hours, the low-flow outlet is closed, the forebay fills, and water flows over the spillway.

TERMINOLOGY

A **stilling basin** is a depression below a dam to reduce the velocity and turbulence of the flow downstream of the spillway.

The spillway is 250 feet long and 14 feet high, with a crest elevation of 1,261 feet[1]. It is designed to pass 17,000 cfs at a forebay elevation of 1,268 feet. The spillway has a short

[1]All elevations included in this report are referenced to National Geodetic Vertical Datum of 1929 (NGVD29), unless otherwise stated as North American Vertical Datum of 1988 (NAVD88). The reference elevation conversion used in this report is NAVD88 = NGVD29 + 3.3 feet.

downstream concrete stilling basin with concrete energy dissipaters. It discharges into the Mill Creek Channel. The stilling basin and energy dissipaters help prevent erosion directly downstream of the dam.

Diversion Dam Fish Ladder

The Mill Creek Diversion Dam fish ladder was constructed in 1982 to allow better upstream fish passage around the dam. The ladder is 6.5 feet wide, 86 feet long, and about 6 feet high. A 24-inch-wide by 81-inch-high slide gate at the exit is designed to operate fully open under normal conditions. Water levels within the ladder vary from 0.5 to 2 feet at the entrance, to 1 to 1.5 feet at the intermediate weirs, to 1 to 2 feet at the exit. The wide range of water levels at the entrance is caused by the varying amount of flow through the low-flow outlet and the water level in the stilling basin below the entrance.

The fish ladder is designed to operate at flows less than 400 cfs and at forebay elevations ranging from 1,253 to 1,256 feet. The ladder is operated year round, except during maintenance or when flow is expected to exceed 400 cfs. During periods of higher flow, the ladder is closed to limit debris accumulation.

Intake Canal Headworks and Intake Canal

The intake canal headworks consists of four intakes, each with an 8-foot-high by 18-foot-wide gate. The total design capacity of all the gates is 7,000 cfs. The intake canal is 1,800 feet long and lined with concrete. The typical channel cross-section is trapezoidal with a 60-foot bottom width and steep side slopes. The channel floor slope is relatively flat with a total drop of 2 feet of elevation within the 1,800-foot length. The last 300 feet of the channel expands to a width of 225 feet before entering a soil and rock channel leading to Bennington Lake. The expanded section has a series of concrete energy dissipater blocks that dissipate energy to reduce erosion before the water enters the soil and rock channel.

Two rotating drum fish screens are located in front of the easternmost intake gate. The screens were installed in 2001 by the Corps and the Washington Department of Fish and Wildlife (WDFW) to avoid trapping ESA-listed fish in Bennington Lake when it is filled for public recreation. The screens can pass up to 30 cfs. They are designed to operate in water depths ranging from 4.9 feet to 6.4 feet. The screens can only operate when the forebay is at or below 1,255.5 feet and flows are less than 400 cfs.

Diversion Dam Dike

The Diversion Dam dike forms the northern boundary of the Mill Creek Diversion Dam and confines water to the main channel. The dike extends upstream 2,200 feet from the north end of the spillway. The crest width is 12 feet, and the design elevation ranges from 1,280 feet

TERMINOLOGY

A **fish screen** is a barrier across a stream to allow water to pass, but keep fish from passing.

at the abutment end and 1,270 feet where it joins the Diversion Dam spillway.

The Mill Creek Levee Extension

The Mill Creek Levee Extension is located on the right bank and is upstream of the Diversion Dam dike. The levee was constructed in 2002 to reduce the risk that Mill Creek would shift into Titus Creek. The levee extension was constructed under authority of the Flood Control Act of 1948, Section 205. It is just over one-third of a mile in length and is constructed of compacted silt. The side slopes are at a 3-foot horizontal distance to a 1-foot vertical rise (3H: 1V) and have a riprap toe revetment (protection) on the water side. The levee includes a culvert, which provides flow for Titus Creek. In the event of a flood, the riverside vertical slide gate can be shut to prevent overwhelming the downstream drainage and flooding along Titus Creek.

Debris Barriers

Two debris barriers in the forebay help keep debris from damaging or clogging Project components. The first debris barrier is a 550-foot-long, steel crib and cable structure that captures many of the floating logs. The second debris barrier is a 90-foot-long steel panel fence located at the intake canal headworks. This barrier helps limit large debris from clogging the gates and clogging the rotating drum fish screens in the intake canal headworks.

1.9.2.2 Bennington Lake and Mill Creek Storage Dam

Bennington Lake is an off-channel, flood storage reservoir created by Mill Creek Storage Dam, with a maximum water elevation of 1,265 feet with 3 to 5 feet of freeboard. This provides a designed maximum storage capacity of 8,300 acre-feet with 5,400 cfs flowing over the diversion dam. At this elevation, the maximum surface area of Bennington Lake is 225 acres. With the present release target of 3,500 cfs over the diversion dam, water can be stored at an elevation closer to 1263.5 feet with water storage of 8,000 acre-feet.

The Storage Dam, constructed with compacted soil, is 3,200 feet long and 125 feet high with a 20-foot width at the crest and 800-foot width at the base. The crest elevation is 1,270 feet.

The intake tower is located in the lake near the storage dam. It is used to release water from Bennington Lake into the Mill Creek Return Canal and the Russell Creek Outlet Canal.

Mill Creek Return Canal

The Mill Creek Return Canal is about 1-mile long and includes various sections of concrete-lined canal, corrugated metal pipe, and unlined (earthen) open canal. The canal is designed to carry a flow of up to 190 cfs. Water discharges from the canal into Mill Creek just upstream of the First Division Works and Project office.

The canal is used to return water to Mill Creek in a controlled manner when releasing water from Bennington Lake after flood diversions have filled the lake to an elevation above 1,212 feet. This occurs about every 5 to 10 years on average. The last time the return canal

was used was April 2019, and prior to that, in 1997 after a flood event. It was also used in 1996.

Russell Creek Outlet Canal

The Russell Creek Outlet Canal is a 7,300-foot-long, concrete-lined, open canal, with a design discharge capacity of 250 cfs. The canal discharges into Russell Creek, a tributary of Yellowhawk Creek, about 1.25 miles from the Mill Creek Storage Dam.

The outlet canal is used to drain the lake in a controlled manner for annual maintenance and to send water to Russell Creek after flood diversions have filled Bennington Lake. The Russell Creek Outlet Canal was last used for flood diversion in 2019 to release stored floodwaters from Bennington Lake.

1.9.2.3 First Division Works

The First Division Works is a water management structure, located just north of the Project office at river mile 10.5, where Mill Creek diverges into the Yellowhawk/Garrison canal (refer to Figure 1-3). It was originally constructed for flood risk management purposes. As originally designed, 1,400 cfs of floodwater could be diverted from Mill Creek into Yellowhawk Creek (900 cfs) and Garrison Creek (500 cfs). In 1964, the Project's Water Control Manual was revised to prohibit further use of Yellowhawk or Garrison Creeks for flood risk management purposes because of development and associated encroachments along these creeks. Yellowhawk Creek now has a flow capacity of 60 cfs and Garrison Creek has 10 cfs, which is 7 percent and 2 percent (respectively) of their original design capacity.

Currently, the First Division Works structure is used for diversions directed by the Washington Department of Ecology (Ecology) under a 2012 Memorandum of Understanding with the Corps for flow from Mill Creek to Yellowhawk and Garrison Creeks for non-flood purposes, including maintaining and improving fish habitat (Corps and Ecology 2012). The First Division Works includes four vertical lift gates, a fish ladder on Mill Creek, and a headworks to the Yellowhawk/Garrison canal with a fish passage slot on Yellowhawk Creek. The components of the First Division Works and how they operate are described in the following paragraphs.

Vertical Lift Gates

Each vertical lift gate is 25 feet wide by 2 feet high. When the gates are closed (lowered), they create a 2-foot-high weir that raises the water level to divert water through the Yellowhawk/Garrison canal headworks, while remaining flow passes over the lift gates and through the fish ladder and down the Mill Creek Channel. The gates can be raised above the First Division Works bridge deck during flood operations. The opening created by all the gates being fully raised is 97 feet wide by 6 feet high.

Headworks

The headworks is a concrete structure with three intakes, located just south of the vertical lift gates. Concrete completely seals off the left intake, which was once used to help pass floodwaters into the Yellowhawk/Garrison canal. The right intake is covered by a steel gate, with the exception of an 18-inch-wide slot to allow for fish passage. The bottom of the slot is at the same elevation as the stream bottom. A water depth of 1 to 3 feet at the slot creates water velocities ranging from about 8 to 14 feet per second, respectively.

Fish Ladder

A fish ladder was constructed at the First Division Works on the right (north) bank of Mill Creek in 1982. The ladder is 8 feet wide, 40 feet long, and 6 feet high. The three-step ladder has an 18-inch-wide vertical slot entrance, 21-inch-high intermediate weir, and 18-inch-wide vertical slot exit. A slide gate at the exit is 18 inches wide by 36 inches high and, when fully open, provides an open slot for optimal fish passage. Design capacity was 15 cfs, but a later analysis (Corps 2011) indicated that with operational adjustments the ladder can pass as little as 3.8 cfs during low-flow and 20.7 cfs during high flow of 400 cfs or more.

The ladder provides upstream fish passage when all four vertical lift gates are in the fully lowered position for diverting water into the Yellowhawk/Garrison canal.

Yellowhawk/Garrison Canal

The Yellowhawk/Garrison canal is approximately 500 feet long and 30 feet wide. It extends from the First Division Works to the second division works, where it splits into Yellowhawk and Garrison Creeks. The banks of the canal are well vegetated, and a footbridge crosses the creek between the parking lot and the Project office. The canal flows through two culverts beneath Reservoir Road before terminating at the second division works.

1.9.2.4 Second Division Works

The second division works is located at the downstream end of the Yellowhawk/Garrison canal, about 500 feet from the First Division Works and Mill Creek. It consists of a control structure that divides the flow between Yellowhawk and Garrison Creeks.

Garrison Creek Fish Screen

A stainless steel fish screen was added to the Garrison Creek intake in 2009 after it was determined that Garrison Creek did not provide adequate passage for migratory fish. It was constructed through a cooperative partnership between several agencies: the Walla Walla County Conservation District, Bonneville Power Administration, WDFW, the Washington Salmon Recovery Funding Board, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), and the Corps (Corps 2007).

Yellowhawk Weir and Fish Passage

A weir is located at the second division works where Yellowhawk Creek starts. The weir is designed to create enough water depth for the Garrison Creek fish screen to pass sufficient water volume and work properly. There is a roughened channel (made of boulders) to create small steps for fish to ascend to transition between Yellowhawk Creek and the pooled water. The roughened channel keeps water velocity low enough for fish to navigate. A small slide gate on the downstream side of the screen regulates flow into Garrison Creek.

1.9.2.5 Mill Creek Channel

The stabilized, or improved, channel portion of the MCFCP extends approximately seven miles from the Diversion Dam to the Gose Street Bridge. The channel can be divided into three sections: Upstream Channel Section, Concrete Channel Section, and the Downstream Channel Section. The three sections are described below (see also Appendix B, Section 2.1 for location information and maps).

Upstream Channel Section

The upstream channel section extends 1.9 miles from the Diversion Dam to just upstream of the Roosevelt Street Bridge. It consists of a trapezoidal section of varying bottom width, having wire bound gravel-revetted levees and concrete-capped stabilizers across the channel bottom. The stabilizers dissipate energy during high flow and limit streambed erosion. The earth fill levee embankments were constructed of local materials, which include both fine-grained silt (loess) and coarse gravel and cobble. The levees are lined with riprap to protect against high velocity flow. The levees have a crest width varying from 6 to 13 feet and water side slopes of 2-foot horizontal to a 1-foot vertical (2H:1V). Landside slopes of the levees vary from 2H:1V to 3H:1V. Spacing between channel stabilizers varies from 60 to 70 feet through this section. A portion of this section, from upstream of Wilbur Avenue down to Roosevelt Street also uses rock filled baskets (gabions) for slope and erosion protection.

Water depth over the stabilizers ranges from about 6 feet during flood events to less than 1 inch during the summer. Water depth downstream of the stabilizers varies from about 1 foot to up to 5 feet in some areas. The concrete caps were installed to protect the wire bound stabilizers from damage from bed load.

The first mile of this section is maintained by the Corps. The rest of the section (downstream of the First Division Works to Roosevelt Street) is maintained by Walla Walla County.

Prototype low-flow weirs were installed in two locations to test how well they would work, both structurally and for fish passage at low flows.

Concrete Channel Section

The concrete channel section, which is maintained by Walla Walla County, extends 2.2 miles from Roosevelt Street to 9th Street. This section is made of concrete and has vertical walls and

a sloped floor. There is a smaller channel in the center of the floor to contain low flows. The concrete channel section varies in width from 37 to 50 feet and depths from 9 to 13 feet. The sides of the channel are mainly concrete with some rubble-masonry wall construction built before the Project by individuals and by Walla Walla County. Guidewalls were constructed along sharp curves in the center of the channel. A 1,600-foot portion of this channel section extends beneath parking lots, buildings, and roads through the downtown area (referred to as the covered portion of the concrete channel section throughout this report). The original design capacity of concrete channel section is 5,400 cfs.

The risk of the concrete channel section failing is low based on the results of the 2018 Semi-Quantitative Risk Analysis (SQRA). The SQRA referenced the 1996 flood event where an estimated average of 3,800 cfs flowed through the concrete channel section with little notable damage. However, because the walls were constructed in the early 1900s with unknown materials, workmanship, and structural design, it is unlikely they meet current standards.

Downstream Channel Section

The downstream channel section, which is also maintained by Walla Walla County, extends 2.8 miles from 9th Street to the Gose Street Bridge. This section of improved channel consists of a trapezoidal cross section with a 70-foot bottom width and 2H:1V side slopes, and it is contained by wire bound gravel-revetted levee embankments. The crest width of the levees varies from 12 feet on the upstream end and increases to 13 feet downstream to Gose Street Bridge. The slope of the channel bottom is controlled by concrete-capped stabilizers 70 feet apart.

1.9.2.6 Rooks Park and Related Facilities

Rooks Park is a day-use park located adjacent to Mill Creek's north levee, next to the Diversion Dam. The 18-acre park offers multi-use recreational activities. The pond at Rooks Park is part of the original Mill Creek Channel and is filled with water from Mill Creek, which flows in a small channel through the park. Flow is maintained through the pond year around to avoid stagnation and provide nuisance vegetation abatement. Flow returns to Mill Creek through a culvert with a flapper valve.

1.9.3 Existing Project Operations

The existing MCFCP provides flood risk reduction benefits for a range of flows. The Corps begins regulating floods in Mill Creek when flows reach 1,400 cfs, which has an average reoccurrence interval of four years (Table 1-1). The Project has a regulated flow target of 3,500 cfs, capable of passing flood flows associated with about a 50-year to 175-year flood events. Flooding within the city could occur when flows exceed 3,500 cfs. Appendix A, Hydraulics and Hydrology, provides additional information on regulated flows and average reoccurrence intervals.

Table 1-1. Mill Creek Regulated Flow and Average Recurrence Interval

Flow (cfs)	% Annual Chance Exceedance Probability[1]	Average Recurrence Interval (years)[2]
1,400	25	4
2,069	5	20
3,337	2.2	46
3,500	2 – 0.57	50 – 175
4,200	0.49	204
5,005	0.4	250
7,171	0.23	435
8,640	0.18	555
9,371	0.14	714
10,604	0.1	1000

1 The probability (in %) that flow will exceed this amount in any one year.
2 The average number of years between flows of this magnitude.

1.9.3.1 Mill Creek Flows Less than 1,400 cfs

Section 1.9.2 describes the operation of the Diversion Dam, low-flow outlet, fish ladder, and spillway at flows less than 1,400 cfs. Operations of other components are described below.

Bennington Lake

After the threat of flooding, but prior to the end of the WDFW water right on June 15, the Corps may divert up to 30 cfs from Mill Creek to fill Bennington Lake for public recreation, which includes fishing for fish stocked by WDFW and others. Flow up to 30 cfs is diverted through the intake canal headworks and down the intake canal until the lake reaches an elevation of 1,205 feet. This flow is passed through two rotating drum fish screens. Filling the lake to the recreation level typically takes 10 to 15 days to complete. After that, only enough water is diverted to maintain the lake level at 1,205 feet until flow in the creek declines to 40 cfs. Diverting water to fill the lake is only necessary if it has not already been filled by winter and early spring flood flows. All valves and pipes are closed to maintain the recreational lake elevation as long as possible. Evaporation and seepage can cause the lake to fall to an elevation of about 1,185 feet (20 surface acres) by the end of summer. Each fall, the lake is drained via the Russell Creek Canal to enable inspection and maintenance of the intake tower.

Division Works

When flow is below 400 cfs, Ecology has the responsibility for flow regulation. The Ecology watermaster directs the amount of water to be diverted into the Yellowhawk/Garrison canal in order to provide flow for irrigation, fish, and fish habitat, and the Corps operates the First Division Works to maintain that flow. The vertical lift gates are lowered (closed) to fill the forebay, and the headworks is adjusted to allow approximately 30 cfs into the Yellowhawk/Garrison canal. Further adjustments are made to maintain a minimum of 0.9 foot (~ 25 cfs) in Yellowhawk Creek. Any remaining flow in Mill Creek is passed down Mill Creek through the vertical lift gates, with 10 cfs maintained in the fish ladder. When Mill Creek flow is

between 40 cfs and 70 cfs, the Corps does not make any gate changes at the First Division Works that would cause flow to change more than 5 cfs.

When flow is between 10 cfs and 40 cfs, fish downstream of the First Division Works may become trapped or placed at risk because flows are too low and water temperatures get too high. In an attempt to address this concern, the Corps manages flow (rapid, temporary flow changes), as outlined in the Fish Passage Plan (Corps 2007). The Yellowhawk/Garrison headworks is operated to decrease Mill Creek flow by 5 cfs in the morning and increase flow by 5 cfs in the evening. This fluctuation is intended to provide a signal to fish downstream of the First Division Works to move from that area before it becomes too warm.

When flow downstream of the First Division Works falls below 10 cfs, the 5-cfs fluctuation is discontinued, and a 6-inch low-flow restrictor plate is installed in the fish ladder exit. All flow is directed to the fish ladder in an attempt to improve passage at that location. During the summer low-flow season, however, the slide gate at the exit is sometimes used to partially close off the ladder to divert more water to the canal. When flows in Mill Creek exceed 400 cfs, flows in Yellowhawk Creek are maintained at approximately 25 cfs.

1.9.3.2 Mill Creek Flows Greater than 1,400 cfs

When flows in Mill Creek exceed 1,400 cfs, the Corps assumes control of all flows on Mill Creek, Yellowhawk Creek, and Garrison Creek for flood risk management purposes. The Corps operates the Project during such events according to the Water Control Manual for the Mill Creek Project (Corps 2006). The risk of property damage and loss of life caused by flooding is reduced by controlling flood flows through the system.

Diversion Dam

Starting at 400 cfs, the Corps begins emergency operation procedures, such as closing the low-flow gate and sending water over the diversion dam spillway. However, when Mill Creek flow reaches 1,000 cfs, the Corps initiates a multifaceted decision process in accordance with the Water Control Manual to determine whether to divert water to Bennington Lake and how much to divert. Factors considered in this process include the following:

- Predicted amount of precipitation.
- Snowpack data.
- Forecasted temperatures.
- Ground conditions (i.e., whether it is saturated or frozen).
- Probability of multiple storm events before the lake can be drained.
- Increases or decreases in flow levels at upstream USGS Gages 14013000 and 14013700.
- Expected or reported damage to property, structures, infrastructure, etc.
- The amount of water currently in Bennington Lake (e.g., whether empty, half full, etc.).

TERMINOLOGY

The **diversion trigger** is the initial Mill Creek flow that when exceeded will prompt the Corps to divert floodwater to Bennington Lake. It is currently set at 1,400 cfs, which is typically the starting regulated flow.

Regulated flow is the remaining downstream flow in Mill Creek after floodwater is diverted to Bennington Lake. The regulated flow is controlled by the amount of water diverted.

Although this decision process is initiated at 1,000 cfs, a diversion will not actually occur until Mill Creek flow is anticipated to exceed 1,400 cfs at the U.S. Geological Survey (USGS) Gage 14015000, Mill Creek at Walla Walla, Washington.

Throughout this report, this 1,400-cfs threshold is referred to as the diversion trigger. The remaining flow downstream of the Diversion Dam after floodwater is diverted is called *regulated flow* (natural flow – water diverted = regulated flow). The initial regulated flow is 1,400 (Table 1-2). The Corps objective is to keep the regulated flow between 1,400 cfs and 3,500 cfs, to minimize flood damage to the extent possible as described in the Water Control Manual (Corps 2006).

Table 1-2. Flood Events Requiring Regulation 1945-2017

Month	Average of Natural Peak Flow (cfs)	Average of Regulated Peak Flow (cfs)	Total Duration over 1,400cfs (hours)
Jan	2195	1716	301
Feb	2242	1740	162
Mar	1744	1400	5
Apr	0	0	0
May	0	0	0
Jun	1740	1580	16
Jul	0	0	0
Aug	0	0	0
Sep	0	0	0
Oct	0	0	0
Nov	1690	1430	3
Dec	2672	1933	131

Subsequent to the initial diversion, the Water Control Manual indicates to increase the amount being diverted as the flood progresses and Bennington Lake fills. In other words, the diversion trigger is only the starting point for diversions. The amount being diverted changes in response to actual conditions and is designed to provide the maximum flood damage reduction possible.

The National Weather Service River Forecast Center provides a river flow forecast for the Walla Walla River at Touchet, Washington, (USGS Gage 14018500) and near Kooskooskie, Washington (USGS Gage 14013000). The Corps uses the forecasts to predict the potential Mill Creek inflow. Due to the high slope of the stream and watershed, it is very difficult to accurately forecast inflow on Mill Creek.

If a flood event is forecast to be of short duration (less than 6 hours) with a peak inflow less than 2,000 cfs, the regulated flow may be held at 1,400 cfs. However, if the weather forecast

and resulting inflow forecast indicate the possibility of a higher flow or longer duration event, the Corps will increase the regulated flow up to 3,500 cfs.

Increasing the regulated flow would provide flood risk management benefits to the city of Walla Walla by filling Bennington Lake slower and leaving storage space available for subsequent floodwater. However, because increased regulated flow results in increased flooding downstream of the MCFCP, this is a carefully evaluated decision. During flood events, Corps personnel are dispatched to observe flooding and any damages. The reports of downstream damage, coupled with inflow forecasts, could be used to change the volume of water being diverted.

Diversions are coordinated to allow a regulated flow of no more than 3,500 cfs to remain in Mill Creek, while the excess is diverted into Bennington Lake via the intake canal, resulting in relatively short-duration diversions during flood flows. The channel capacity varies, but 3,500 cfs was established as the maximum flow through the levee reach. Appendix A provides further discussion related to the channel and the capacity of the stabilizers. (The 1996 flood was about 6,000 cfs, with as much as 3,800 cfs flowing through Walla Walla.) If flow exceeds 3,500 cfs, flooding within the city could occur if a stabilizer and ultimately a levee were to fail. Flow is closely monitored so adjustments can be made during high-flow events. Balancing regulated flow and diversions is carefully analyzed and coordinated.

Bennington Lake

When Mill Creek flow exceeds 1,400 cfs, floodwaters are diverted to Bennington Lake up to the maximum level (1,265 feet, or about 225 surface acres). This is the maximum water surface elevation that can be obtained by head differential from the forebay area of Diversion Dam and is dependent on the flow in the main channel. The lake should not be maintained above 1,235 feet for more than 15 days to limit high water pressures and seepage through the storage dam. Water must be rapidly released to below the impermeable cutoff wall elevation of 1,235 feet, even if some downstream flood damage could occur.

If the lake rises above elevation 1,212 feet, water is released from the lake through the intake tower to the Mill Creek Return Canal. If the lake elevation does not reach, or falls below 1,212 feet, water is released through the Russell Creek Outlet Canal. In an emergency situation, above elevation 1,212 feet, both the return canal and the outlet canal could be used at the same time. If at any point the lake elevation is higher than the Mill Creek elevation at the diversion dam (1,261 feet), water could be drained back to Mill Creek using the intake gates and spillway. In the rare occurrence that the lake is unable to take in any more floodwater, the intake canal gates would be closed so that no more water is diverted and all flood flows would pass over the spillway and down the channel.

Division Works

The Corps maintains flow to Yellowhawk and Garrison Creeks as described above. During flood events, the Corps operates the First Division Works to minimize flooding downstream areas along Yellowhawk and Garrison Creeks.

1.9.3.3 Flood Flows beyond Project Capacity or in the Event of Project Failure

Flooding would be widespread throughout town in the event a portion of the MCFCP fails upstream of town. The majority of floodwaters through town would be one foot or less and flow through the streets of town. Walla Walla was constructed with the streets at a lower elevation than most residential structures to convey flood water around housing. Floodwaters near the channel and in depressions would be much deeper, reaching up to 16 feet in some areas. Figure 1-5 shows a left side (looking downstream) levee failure if overtopped, near Yellowhawk Creek (break centered at Mill Creek cross section 11.5168). The left side was chosen because the inundation extents were greater on the left bank for a failure of the levee system than the right bank. Even though this failure mode focuses on a small portion of the flood control system, levees were constructed along the entire length of the system (except for the concrete channel section) and failure could happen anywhere in the system, albeit with less potential consequences. Total population and structures at risk in the event the MCFCP fails are discussed in Section 1.1, Background.

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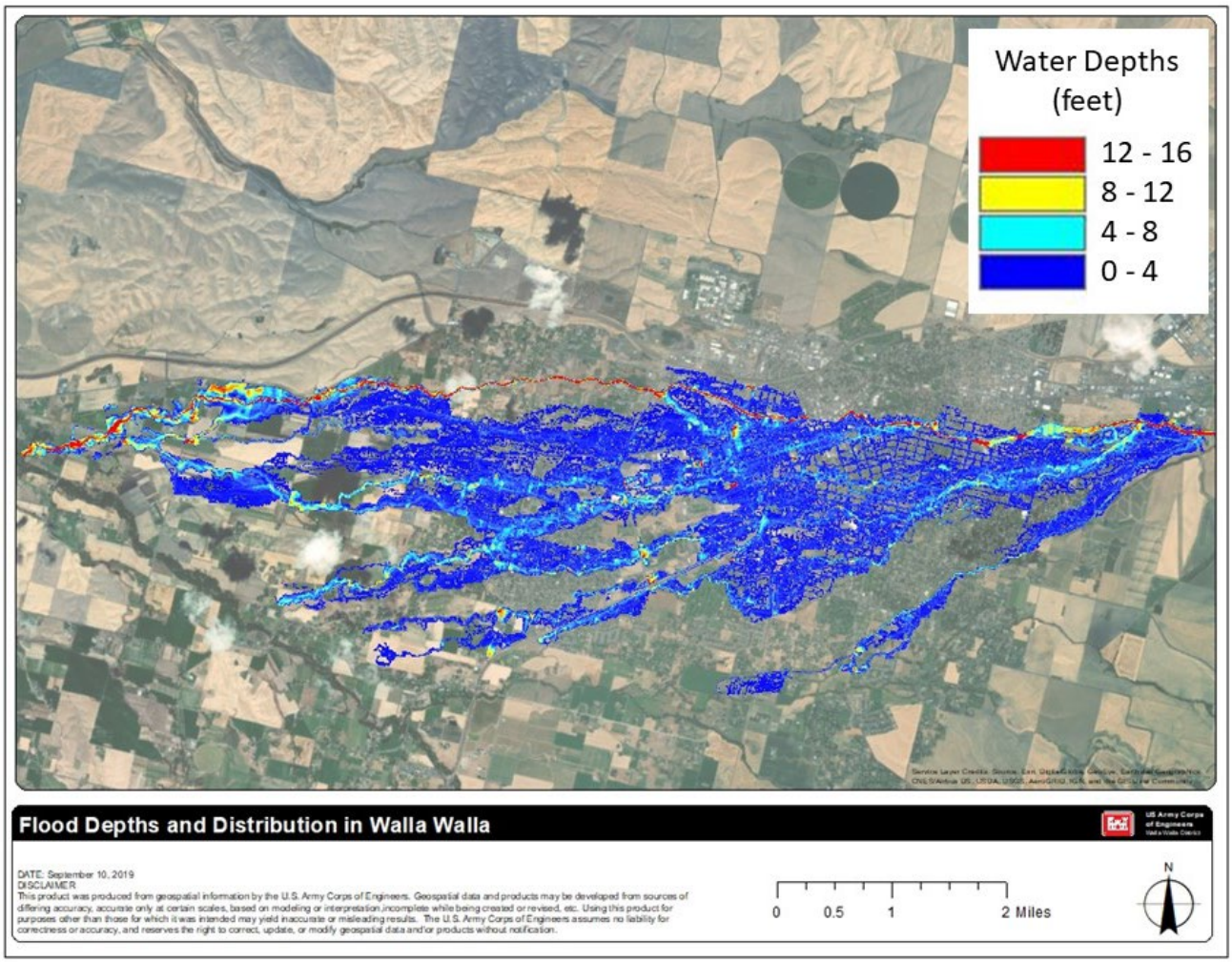

Figure 1-5. Example Inundation after Project Failure Upstream of the First Division Works from Floodwaters at 8,639 cfs

Note: 8,639 cfs is 0.18 percent annual chance of exceedance probability event.

1.10 PROBLEMS AND OPPORTUNITIES

The first step in the Corps six-step planning process is the identification of problems and opportunities. A problem is an existing condition considered for change. An opportunity is a chance to create a more desirable future condition. The identification and development of problems and opportunities specific to Mill Creek flood risk management resulted from internal discussions and workshops; external communication with the sponsor, stakeholders, resource agencies; and public interactions.

1.10.1 Problems

The concrete channel is over 80 years old. It was constructed by the WPA with locally available materials and labor. Limited information exists about project design and construction. The risks to the community associated with the system's reliability, capacity, and performance are difficult to define. An analysis and assessments are needed to verify accurate levels of protection and address other known problems within the system. The problems identified are bulleted and summarized below:

- Limited or reduced conveyance.
- Limited floodwater storage during large volume or multiple peak flood events.
- Erosion and flood damages downstream of the Project.
- Increased flood risk from degradation of adjacent structures due to age and use.
- Increased operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) costs as system ages.

The existing MCFCP has inherent design capacity limitations due to the fact that the concrete channel was designed to a capacity of 5,400 cubic feet per second (cfs) while the leveed reaches were designed for a capacity of 3,500 cfs. Additionally, analysis indicates that the levees in their present condition with present reservoir operations fall below current requirements for levee certification. Additionally, Yellowhawk and Garrison Creeks were originally intended to handle a combined diversion of 1,400 cfs; current combined capacity for Yellowhawk and Garrison Creeks is 70 cfs due to the encroachment of urban development. Flowage easements along these distributaries were not acquired at the time of construction of the project, therefore encroachments from urban development were allowed to be constructed.

A two-peak flood event in 1996 conveyed nearly 6,000 cfs of inflow from the headwaters of Mill Creek to the Diversion Dam. The Corps began diverting water into Bennington Lake when flood flows reached 1,400 cfs and Bennington Lake rapidly filled. Flows through town increased incrementally from 3,500 cfs to approximately 3,800 cfs, surpassing the designed capacity of the leveed channel, as storage capacity in the lake decreased. The Corps water manager forecasted a third flood peak causing flood risk concerns for the city of Walla Walla and adjacent lands because storage capacity in Bennington Lake was nearly reached and flood flows

through town already exceeded capacity. The 1996 flood event exposed the capacity limits of the MCFCP to handle high volume or multi-peak flood events. The inability of the system to handle these events increases flood risk to Walla Walla and adjacent lands.

There are 18 structures and 5 Walla Walla County bridges present within about 230 acres of potentially affected area downstream of Gose Street. At all river flows, erosion damages occur to the five County bridges and the right bank upstream of Wallula Road Bridge near the intersection of Highway 12. An evaluation of flows at 1,400, 2,000, 2,500, 3,000, and 3,500 cfs is documented in the draft 2011 floodplain report. For that study, it was assumed that an event at any of those levels could last for 3 days, but only one event occurs in a year. All the bridges and the bank near Highway 12 are capable of withstanding flows up to 3,500 cfs for a large flood event given the proper bank and abutment protection. However, even with adequate protection, a bridge could fail due to debris, such as trees and other organic material, collecting at the bridge and forming a dam creating high water velocities and flooding on or around the bridge that could lead to failure of the bridge. Ten of the 18 structures would be impacted by floods above 3,000 cfs through isolation, flooded property, or blocked roads. If operations required a 3,000-cfs discharge or greater, residents would be notified for evacuation to prevent them and livestock from becoming stranded and possibly cutoff from communications by emergency responders (Corps 2011).

The typical service life of an appropriately designed and constructed concrete structure is approximately 100 years and can be extended with proper maintenance and repair. The majority of the existing concrete channel is at least 80 years old. The age of the original portions of the channel flood walls that were constructed using a combination of stone, mortar, and concrete, as well as building foundations, are unknown but are likely significantly older. Therefore, the concrete structures in the channel have reached an age where the rate of deterioration will increase over time along with their associated maintenance and repair cost.

Degradation of structures located over and around the Mill Creek Channel results in vulnerabilities within the concrete channel, including the covered portion, and increases flood risks to Walla Walla and adjacent lands. Routine maintenance would not address these vulnerabilities.

Previous inspections and risk assessments have identified issues with the concrete channel walls and covered portion, in addition to the potential problems associated with age. The majority of critical deficiencies identified for the walls are associated with maintaining the stability and integrity of the structures. There are numerous holes and cracks in the wall system that have compromised the integrity at several locations. Additionally, some wall sections appear to be under structural distress and should be repaired or replaced.

The walls, spans, and building support piers of the covered portion of the concrete channel that pre-date the MCFCP are likely to be more susceptible to failure due to age and less stringent design and construction standards. The spans of the covered portion could fail and collapse during a flood event and cause partial blockage of the channel, which could lead to out-of-bank flow and flooding. Walls and piers in the covered portion of the concrete channel that support

building foundations could fail during or after a significant flood event and cause settlement of the building and possible collapse. The collapse of a building into the covered portion, particularly a downtown commercial building with high foot traffic, poses a threat to life safety in the community of Walla Walla and the resultant significant blockage of the covered portion would lead to additional flood-related damages for Walla Walla and adjacent lands.

Routine maintenance alone will not resolve the Project's increasing OMRR&R demands and associated costs as the system continues to deteriorate. Deficiencies in the Project are expected to continue to increase in frequency and severity over time. Routine field inspections and engineering analyses of the Project conducted by the Corps, Walla Walla County, and independent inspectors will continue to identify deficiencies in the system that will need to be prioritized and corrected by Walla Walla County. An increase over time in costly emergency repair work is also expected as Project components fail near the end of their useful life, and any such failures could lead to further compromising the integrity of other parts of the system and magnifying the increasing cost of OMRR&R.

1.10.2 Opportunities

Opportunities focus on desirable future conditions and potential ways to address specific problems within the study area. Several opportunities were identified during the planning process. Adjustments to the MCFCP system could provide the following opportunities:

- Increased conveyance capacity through the existing system.
- Improved emergency access to the channel.
- Increased use of Mill Creek for recreation.
- Reduced Project life cycle costs.
- Increased water storage for irrigation during times of low flow in Mill Creek.
- Improved conditions for ESA-listed species.
- Improved habitat conditions for wildlife.

The original components of the MCFCP are degrading and increasing the amount of time and money spent in OMRR&R to ensure the Project will continue to reliably reduce flood risks. Completing preemptive replacement and rehabilitation work before a need for emergency work develops would extend the life of the system and reduce the life cycle costs of the Project. Expensive, long-term solutions will be increasingly economically justified as they reduce the frequency and severity of routine and reactionary operation, maintenance, and repair costs.

Fish passage and habitat have degraded due to low summer flow, high water temperatures, lack of channel complexity, and loss of riparian vegetation along the leveed reaches. Poor fish passage for ESA-listed species and degraded habitat conditions are the most pressing problems indicated by feedback from stakeholders and the public. A prime opportunity of this project is to improve fish habitat and passage conditions throughout the MCFCP.

1.11 OBJECTIVES AND CONSTRAINTS

1.11.1 Objectives

The Federal objective of water and related land resources project planning is to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Planning objectives represent desired positive changes to the future without-project conditions. All of the planning objectives focus on activity within the study area and within a 50-year period of analysis, from year 2026 to 2076. The following planning objectives apply to this study:

- Reduce risks to public safety and public and private infrastructure due to flooding along Mill Creek.
- Reduce flood-related damages and economic consequences to the community of Walla Walla.

1.11.2 Constraints

Constraints are resource, legal, or policy considerations that limit the actions that can be implemented. Constraints limit the range of measures that can become part of alternatives. The plan formulation process strives to efficiently meet the study objectives without violating any constraints. The following are constraints specific to this study:

- Shall not increase risks to life safety.
- Shall not prevent beneficial use of existing water rights.
- Shall maintain fish passage.

1.12 REPORT ORGANIZATION

The sections of this report are listed below. Those with an asterisk are intended to meet NEPA requirements. The six step planning process is also incorporated into these sections as shown in italics.

- Section 1, Introduction*
  (Step 1: Identify Problems and Opportunities [included above])
- Section 2, Existing and Future without Project Conditions*
  (Step 2: Inventory and Forecast Conditions
- Section 3, Plan Formulation*
  (Step 3: Formulate Alternatives; Step 4: Evaluate Alternatives; Step 5: Compare Alternatives, and Identify Final Array of Alternative(s))
- Section 4, Environmental Effects*

- Section 5, Step 6: Select Tentatively Selected Plan
- Section 6, Compliance with Environmental Laws, Statutes, and Policies*
- Section 7, Consultation, Coordination, and Public Involvement*
- Section 8, References

The following technical appendices provide supporting information:

- Appendix A, Hydrology and Hydraulics
- Appendix B, Engineering
- Appendix C, Economics
- Appendix D, Cost Engineering
- Appendix E, Real Estate Plan
- Appendix F, Biological Assessment
- Appendix G, Public Involvement
- Appendix H, Finding of No Significant Impact

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SECTION 2 - AFFECTED ENVIRONMENT

Background Photo: Canada Geese on Mill Creek

Photo Credit: Jeremy Nguyen Corps

SECTION 2 - EXISTING AND FUTURE WITHOUT PROJECT CONDITIONS/NEPA AFFECTED ENVIRONMENT

This section begins with the forecast of the future without-project condition and then describes the existing affected environment (existing condition of resources) as required under NEPA. The forecast of the future without-project condition and affected environment reflect the conditions expected during the period of analysis, from year 2026 to 2076. The future without-project condition provides the basis from which alternatives are formulated, and the affected environment provides the basis for which impacts are assessed. Gathering information about potential future conditions requires forecasts, which should be made for selected years over the period of analysis to indicate how changes in economic and other conditions are likely to have an impact on problems and opportunities. This section represents the second step of the planning process, which is inventory and forecast. The Corps considered all relevant resources in the study area.

2.1 FUTURE WITHOUT-PROJECT (NO ACTION ALTERNATIVE)

2.1.1 Expected Future Operations

Future operations of the system are expected to remain how they are today. Ecology controls the water in Mill Creek when flows are below 1,400 cfs. Flows below 1,400 cfs pass either through or over the Diversion Dam and continue downstream through the MCFCP. The Corps assumes operational control of Mill Creek flow during flood operations (Corps 2019).

Excess flood flows would continue to be diverted into Bennington Lake for flood management when flow exceeds 1,400 cfs at the USGS Gage 14015000, Mill Creek at Walla Walla, Washington, in accordance with the Water Control Manual. Flows above 1,400 cfs would be diverted into Bennington Lake until the flood event is over or until the lake elevation reaches established limits. Regulated flows would be increased up to 3,500 cfs once the lake level exceeded the established limit. The Corps would continue to minimize flood damages through town and in the natural channel reach (below Gose Street Bridge) by regulating flows between 1,400 cfs and 3,500 cfs.

Climate change (discussed further in Section 4.22, Climate Change Analysis) is expected to increase rainfall intensity, but may reduce runoff caused by frozen ground. Climate change could reduce the frequency of flood diversions to Bennington Lake and increase flow through the Mill Creek Channel during the winter. Fewer diversions into Bennington Lake and decreased spring flood flows could reduce water available for filling the lake after flood season to 1,205 feet for public recreation. (This topic is discussed further in Section 4.22, Climate Change Analysis.)

2.1.2 Expected Future Maintenance

This section describes the general expected maintenance activities of each component of the Project separated into Walla Walla County's responsibilities and the Corps responsibilities. It is not an exhaustive list of all possible maintenance activities.

2.1.2.1 Walla Walla County Maintenance

Walla Walla County operates the Project from downstream of division works to the end of the Project at Gose Street. For the life of the Project, Walla Walla County would continue to operate, maintain, repair, rehabilitate, and replace Project features such as levees, concrete channel walls, stabilized channel reaches, and the covered portion of the concrete channel section through downtown Walla Walla. A majority of Project components under Walla Walla County's responsibility have been in service for 80 to 100 years and are approaching the end of their expected life. Walla Walla County's expenditures for total OMRR&R have averaged around $92,000 per year over the past 10 years, although costs were as high as $221,000 in 2012 alone (Figure 2-1). In that year, Walla Walla County spent more than $150,000 repairing and rehabilitating the covered portion of the concrete channel section through downtown Walla Walla. It is expected that costs will continue to trend upward into the future with future spikes in costs due to inspection results and emergencies that will be difficult to budget for.

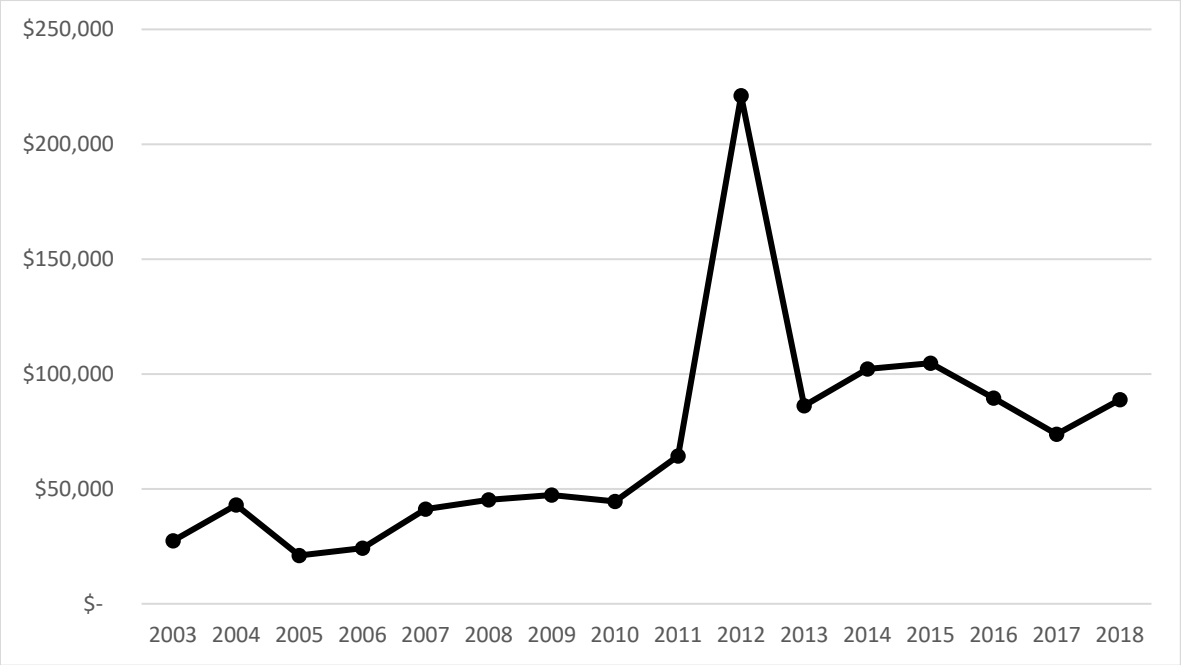

Figure 2-1. Maintenance Costs incurred by Walla Walla County between 2003 and 2018

Mill Creek Stabilized Channel

The Tri-State Steelheaders have been improving fish passage through six miles of channel in Mill Creek, including two miles of concrete channel through downtown Walla Walla. This work is expected to continue into the future and change aspects of the current conditions. The Tri-

State Steelheaders are adding v-notches to stabilizers in the channel to reduce heights required for fish to jump and improve fish passage. The Tri-State Steelheaders are also roughening the concrete channel bottom to slow water velocity, adding resting pools where fish can regain energy, and reconfiguring baffles to improve juvenile fish movements.

The levees and channel would be visually inspected each month for damage and erosion. If erosion damage is detected, repairs would be made by compacting gravel into the eroded area with heavy equipment. This would be done in the summer when flows are minimal. The channel and levees would also be inspected for excess vegetation. Excess vegetation would be removed. Culverts would be inspected every five years.

Left and Right Levee Banks

Woody vegetation would be removed from the left and right bank levee slopes annually. Any tall, grassy vegetation on the levee slopes would be mowed as needed to facilitate inspections. Exposed gabion revetments (wire mesh baskets filled with cobbles or crushed rock) on the water side slopes would also be inspected annually and repaired as needed.

2.1.2.2 Corps Maintenance

Total OMRR&R costs for the Federal portion of the Project are allocated to routine and non-routine activities. Routine OMRR&R for the Federal portion of the Project averaged $1.3 million annually in the recent past. Routine OMRR&R activities for the Federal portion of the Project are described in the sections below. Federal expenditures for non-routine OMRR&R work account for a higher percentage of the total OMRR&R cost and has been as high as $5 million in a single year. Recent examples of non-routine work include constructing new office facilities, replacing the baffles in the intake cannel, repairing rip rap, constructing a new fish ladder, making improvements to the bridge decking, and upgrading the safety rails around the First Division Works.

Lowering the Diversion Dam Forebay

The Diversion Dam forebay water level would be lowered annually in January or February, and again in August or September during low flows to inspect intake and low flow outlet gates. Lowering the forebay to an adequate level would occur when Mill Creek flows are less than 100 cfs (as measured at the USGS gage near the Project office).

Mill Creek Diversion Dam Spillway

The concrete and energy dissipaters would be inspected annually. Damaged riprap downstream of the concrete spillway would be repaired as needed by placing large rocks with heavy machinery when the area is dry.

Left and Right Levee Banks

Woody vegetation would be removed from the right and left bank levee slopes annually. The landside of the levees would continue to be mowed as needed to facilitate inspections. Exposed gabion revetment on the water side slopes would also inspected annually and repaired as needed.

Low-Flow Outlet

The low-flow outlet gate would continue to be cleaned, greased, and inspected for damage every 6 months. This work would require the forebay to be lowered and is typically completed in August or September.

Mill Creek Diversion Dam Fish Ladder

The existing Diversion Dam fish ladder can be a partial or complete fish passage barrier at some flows and does not meet current fish passage criteria (USFWS 2007 and NMFS 2011). Water velocities inside the ladder and required jump heights cause fish passage issues. The location of the low-flow outlet partially blocks the fish ladder attraction flow, and the fish ladder entrance becomes increasingly harder to locate as flows increase.

A new fish ladder that meets current fish passage criteria and operates over a wider flow range is planned for construction and is part of the future without project condition. The stilling basin may also be modified to prevent stranding adult fish and improve downstream passage conditions for juvenile fish. Although the design of a new ladder has not been determined, construction would include some in-water work and removal of a small amount of vegetation.

The ladder would be dewatered to check for and remove debris each month (twice each month from March through May). The walkway grating over the ladder partially obstructs the view into the ladder.

Lowering the forebay may be required to install and maintain fish monitoring equipment at the ladder exit. The Corps would install the equipment in January or February and remove it in August or September.

Intake Canal and Intake Canal Headworks

The concrete of the intake canal headworks and the canal would be visually inspected each year for cracks and deterioration. The gates on the intake canal headworks would be cycled (fully opened and closed) twice each year. This work would be performed when the forebay is lowered in August or September. Sediment removal from the concrete sill of the intake canal headworks and in the intake canal would also occur when the forebay is lowered.

Rotating Drum Fish Screens

Maintaining the screens would include daily checks for debris and damage when the screens are in use. Debris would be removed and damage repaired as practicable.

Debris Barriers

Debris would be removed after every high-water event of greater than 400 cfs. Normal clean-out activities would include removing debris by hand and using chainsaws to cut large debris from the debris barrier and to cut larger debris into smaller lengths. All debris would be moved downstream of the barrier and left in place until high water carries it downstream through the low-flow outlet or over the spillway. Turnbuckles on the debris cable barrier would be tightened each year.

Bennington Lake and Dam

The Corps would continue to begin to slowly drain Bennington Lake beginning on November 1 by releasing water through Russell Creek Outlet Canal. The Corps would not drain at a rate greater than 20 cfs, and it could take up to four weeks to empty the lake. The concrete portion of the intake tower would be visually inspected each year and repaired, if necessary. Gate valve maintenance would include cleaning, lubrication, and fully opening and closing the valves to ensure they work properly. The gear box would be checked each year for contamination, oil level, and leaky seals.

Mill Creek and Russell Creek Outlet Canals

Concrete structures and the canal lining would be inspected for cracking or deterioration every 6 months and repaired as necessary. Maintenance could also require chemical control of vegetation in and along the canals. Woody vegetation would cut and removed as needed. Any excess sediment build-up in the canals would be removed when needed using large equipment.

First Division Works

All gates would be fully opened and closed every 6 months. Hoist cables would be lubricated once a year. Concrete would be annually inspected and repaired as needed.

First Division Works Fish Ladder

High velocities and required jump heights in the current fish ladder are a concern, and the entrance attraction flow is poor. The Corps plans to construct a new fish ladder that meets current fish passage criteria and operates over a wider flow range. A new fish ladder at this site was made a term or condition of Biological Opinions received by the Corps from the USFWS and NMFS as a result ESA consultation (USFWS 2007 and NMFS 2011). The construction would include in-water work and could encroach into the north levee, if necessary. If that were to occur, the levee would be modified to provide the current level of flood risk management. Designs for the ladder have been drafted, but construction funding has been secured. The new

ladder would replace the existing ladder and have a slightly larger footprint. Ladder maintenance would include annually greasing the exit gate and inspecting for debris several times per week.

Yellowhawk/Garrison Canal

Woody debris would continue to be removed from culverts in the Yellowhawk/Garrison canal under Reservoir Road as needed. Debris would also be removed near the downstream Corps boundary to maintain clear passage for fish and accuracy on the Yellowhawk Creek staff gage.

Second Division Works

The second division works would be inspected and repaired each year. The untreated timber bulkheads that create the Yellowhawk forebay would also be annually inspected. The gates would be checked for debris and damage while in use.

Sediment accumulates in the forebay upstream of the Garrison Creek fish screen. The sediment would continue to be removed every 5 years.

Garrison Creek Fish Screen

The cable for the cleaner brush on the Garrison Creek fish screen would be greased each year. Any large debris that accumulates on or near the fish screen would be removed.

Yellowhawk Weir and Fish Passage

Maintenance of the Yellowhawk Creek fish ladder would consist of removing debris from the exit as needed.

2.2 AFFECTED ENVIRONMENT/EXISTING CONDITIONS

2.2.1 Hydrology

Mill Creek begins in the Blue Mountains in southeast Washington and drains an area of about 200 square miles. It flows into Oregon, then back into Washington where it flows through Walla Walla and empties into the Walla Walla River.

Major tributaries of Mill Creek include Paradise, Tiger, Blue, and Titus Creeks, and distributaries include Titus, Yellowhawk, and Garrison Creeks (Garrison, is actually a distributary of Yellowhawk, originating about 0.1 miles beyond Yellowhawk's origin). Although not a natural distributary, Russell Creek can also receive some water from Mill Creek via the Russell Creek Outlet Canal after large floods. Most of the Mill Creek watershed is within Walla Walla County in Washington, but it also includes parts of Columbia County, Washington, and Umatilla and Wallowa Counties in Oregon.

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The Diversion Dam reduces the amount of water flowing downstream of the Mill Creek Diversion Dam during large floods. The current diversion trigger is 1,400 cfs, but the regulated flow can be increased as needed (up to 3,500 cfs) to manage extremely large floods, in accordance with the Water Control Manual. If an event is predicted to be a larger event, the Corps could delay diverting to Bennington Lake to reserve capacity.

Downstream of the First Division Works, Mill Creek sometimes has minimal flow. During the summer low-flow period, almost all of the water in the creek is divided into Yellowhawk and Garrison Creeks with little flow remaining in Mill Creek. That division is requested by Ecology, under a 2012 Memorandum of Understanding with the Corps, for the primary purpose of maintaining fish and fish habitat in Yellowhawk Creek. Flows in Yellowhawk and Garrison Creeks are held relatively stable throughout the year.

Historically, major floods have occurred when multiple storm systems combine warm wind and rain with high elevation snowpack on frozen or saturated ground.

2.2.2 Water Supply

There are multiple water diversions from Mill Creek and its tributaries, mainly for drinking water and irrigation. Since 1918, the upper Mill Creek watershed (36 square miles) is managed solely for the protection of water quality. Public access to this area is restricted and the area remains pristine. Walla Walla receives 90 percent of its municipal water supply from the watershed. Mill Creek flow is reduced by about 37 cfs due to these water withdrawals, which can be approximately half of the flow during summer. When Mill Creek flow is very low during summer or when water quality is poor, the City's water supply is supplemented by seven deep wells. The City's water treatment plant is capable of producing 24 million gallons of water per day. All of the water to be treated also passes through a hydroelectric facility, which produces enough power for 1,500 homes. The City of Walla Walla maintains a water return line that enters Mill Creek between the Diversion Dam and the First Division Works. Water is periodically discharged back to Mill Creek when generating electricity or to empty the storage tanks for maintenance.

There are a few small irrigation diversions on Blue Creek, a tributary of Mill Creek, which is located about 5.6 miles upstream from the where the MCFCP boundary starts. These diversions reduce the Mill Creek flow prior to entering the MCFCP.

Titus Creek flow is diverted from Mill Creek 1.7 miles upstream from the Mill Creek Diversion Dam. This creek flows 3 miles and reenters Mill Creek about 0.25 miles downstream from the First Division Works. There are 18 irrigation pumping stations that withdraw water from Titus Creek. This diversion reduces the amount of water in Mill Creek by 3 to 10 cfs. If all of the water isn't used for irrigation, it returns to Mill Creek below the First Division Works.

Jones Ditch is a small irrigation channel that is supplied through a manually-operated gate located on the south bank of Mill Creek between the Diversion Dam and the First Division Works. The gate is operated by the adjacent water right holder. This diversion reduces the

amount of water available to lower Mill Creek or Yellowhawk Creek by about 5 cfs. Any unused flow in Jones Ditch returns to Yellowhawk Creek.

There are numerous water diversions along Yellowhawk Creek. Much of the water in Yellowhawk Creek is supplied from Mill Creek. There are also several tributaries that add water to the creek (Russell Creek, Reser Creek, Cottonwood Creek, and several other small creeks).

There are many small diversions and water withdrawals along Garrison Creek. Garrison Creek flows into the Walla Walla River 2 miles downstream of Yellowhawk Creek and 3 miles upstream from where Mill Creek enters the river.

There are also many diversions and water withdrawals along Mill Creek. The Burlingame Diversion, located on the Walla Walla River between Yellowhawk Creek and Mill Creek, historically has obtained some of its water from Mill Creek via Yellowhawk Creek. The water right was established in 1892. Most of the diversions on Yellowhawk Creek are junior to this right and can be regulated to ensure sufficient supply to the Gardena Farms Irrigation District at the Burlingame Diversion.

The WDFW holds a water right to divert up to 30 cfs from October 15 to June 15 from Mill Creek to Bennington Lake to maintain a lake elevation of 1,205 feet for fish and wildlife propagation, which supports recreation. However, diversions do not begin until the greatest threat of flooding has passed. The Corps has adopted a policy of retaining 40 cfs as the desired minimum flow in the upstream and concrete channel sections through March to accommodate adult steelhead passage. To maintain the 40-cfs minimum flow in the channel, the Corps does not always divert the full 30 cfs allowed by the WDFW if flow is too low or if the lake is filled to elevation 1,205 feet. In these situations, the Project is operated to maintain a small maintenance flow.

During the summer low-flow period, much of the water in the creek is divided at the First Division Works to Yellowhawk and Garrison Creeks, at the discretion of Ecology for the primary purpose of maintaining fish and fish habitat. Mill Creek flow remains very low for several miles below this structure.

During some summers, Mill Creek base flow reaches as low as 30 cfs. This is not enough water to support Yellowhawk, Garrison, and Mill Creek downstream of the First Division Works. In recent years, about 5 cfs has been kept in Mill Creek with the remainder distributed to Yellowhawk and Garrison Creeks. There is not enough water available to meet all of the permitted water rights as well as maintain sufficient flow for aquatic resources in Mill Creek.

Recharge to Mill Creek occurs through groundwater, storm drainage return, and irrigation return flow.

2.2.3 Water Quality

Mill Creek

Water quality in the upper reaches of Mill Creek is excellent, due largely to access restrictions in the upper watershed designed to protect Walla Walla's municipal water supply. Water quality is still of fairly high quality when the creek reaches the MCFCP. Water quality degradation worsens as it travels downstream due to water withdrawals reducing flow and there are some water pollution problems further downstream. Portions of Mill Creek, including the entire MCFCP, are included on the Ecology list of impaired water bodies under section 303(d) of the Clean Water Act because they did not meet State standards for temperature, dissolved oxygen, pH, bacteria, ammonia-n, chlorine, and instream flow.

Within the MCFCP, water quality is affected by flow diversion, the wide, shallow channel, and minimal shade. Water quality degradation occurs below the First Division Works during the summer when flow is very low. Flows are extremely low because almost all of the Mill Creek flow is diverted to Yellowhawk and Garrison Creeks for non-flood purposes, including fish habitat, and little remains in Mill Creek. Irrigation return-flow causes increased levels of pollutants. The low flow concentrates pollutants, creating poor water quality conditions. During summer, flow is reduced at the same time as air temperatures increase, causing water temperatures to increase. Evaporation of warm water further concentrates pollutants.

Mill Creek peak water temperature approaches 77 degrees Fahrenheit (°F) and even higher downstream of the First Division Works where flow is extremely low during summer. Adult salmon and steelhead typically stop migrating when water temperatures reach 70 to 72ºF. Warm water holds less dissolved oxygen that fish and other aquatic organisms need for respiration. Salmon and steelhead are more susceptible to diseases in warm water and can die directly if water conditions get too warm.

Plans to control these pollutants were developed for the entire Walla Walla watershed. Starting in about 1998, Ecology began a water quality improvement project (known as a Total Maximum Daily Load, or TMDL) in the Walla Walla watershed, including Mill Creek. By setting limits on pollutant discharges, water quality may begin to improve, but low flow and high water temperatures during summer are still major concerns for Mill Creek.

Yellowhawk and Garrison Creeks

Yellowhawk Creek is listed on Washington's 303(d) list for temperature, bacteria, and Dichlorodiphenyltrichloroethane (DDT) (and metabolites). Garrison Creek is listed for temperature, dissolved oxygen, bacteria, chlorine, hexachlorobenzene, DDT, Dichlorodiphenyldichloroethane (DDD), and Dichlorodiphenyldichloroethylene (DDE).

Bennington Lake

Water quality of Bennington Lake is primarily determined by the quality of inflow from Mill Creek. Although Mill Creek is a stream of fairly high quality, Bennington Lake is typically of poorer quality. While turbidity levels in the creek decrease when flow subsides, the water quality in the lake does not undergo a similar improvement. Water temperatures vary with season, near freezing in winter and above 80ºF in summer and fall. The lake is typically very turbid, which causes the water to be muddy and cover the bottom with silt. There is also a high nutrient concentration throughout summer. This can cause algae to overpopulate and reduce dissolved oxygen levels, which can be harmful to fish. The lake only receives flow input during the spring runoff, when sediment and nutrients in the creek can be high. These conditions cause poor water quality.

2.2.4 Aquatic Resources

Upstream of the Mill Creek Diversion Dam, the creek provides high quality riparian and aquatic habitats due to the free-flowing nature of the stream and its natural processes that remain. Below the Diversion Dam, the creek is contained within a constructed channel, bordered by levees on both sides. Water temperatures can be very high in this section of the creek. Channel stabilizers, which are built into the streambed and span the width of the channel, are designed to dissipate energy during high flow and limit streambed erosion. These structures create resting habitat, but also can be a partial fish passage barrier at low flow.

Below the Diversion Dam, the channel section is wide and shallow, with no floodplain. Pools below some of the channel stabilizers can be up to 5 feet deep and provide fish habitat even during the summer low-flow period. However, habitat conditions in this section of the creek are generally poor. The wide and shallow creek configuration and east-west orientation with little shade contribute to the high water temperature, which can exceed 80°F during the summer. Warm water holds less dissolved oxygen, which is needed by aquatic species.

Fish could be diverted from Mill Creek to Bennington Lake during a flood once every 4 years, on average, with a diversion trigger of 1,400 cfs. When flow exceeds 1,400 cfs, the intake canal gates are opened, resulting in unscreened flow to Bennington Lake. The existing rotating drum fish screens cannot operate when Mill Creek flow is above 400 cfs (they are overtopped). Fish numbers diverted to the lake are unknown, but the Corps estimates an average of less than two adult and 67 juvenile steelhead and less than four bull trout would be diverted per year (on average) (see Appendix F). However, any fish that are diverted would likely die because there is no safe outlet, and water quality conditions in the lake are poor during the summer. In addition, fish are currently blocked from passing the Diversion Dam during flows above 400 cfs, which occurs on average 10 days a year, but has occurred up to as many as 43 days a year.

Flow in Mill Creek remains very low for several miles below the First Division Works during summer when most of the flow is divided to Yellowhawk Creek, at the direction of Ecology, creating extremely poor aquatic habitat conditions below this reach. There are also negative indirect effects on aquatic habitat in Yellowhawk Creek. Flow in Yellowhawk Creek remains

stable throughout the year, but, sediment and debris build up in some areas because there is no high flow to carry the deposited material downstream.

Fish species found in Mill Creek and other streams in Walla Walla include rainbow trout/steelhead (*Oncorhynchus mykiss*), bull trout (*Salvelinus confluentus*), Chinook salmon (*Oncorhynchus tshawytscha*), northern pikeminnow (*Ptychocheilus oregonensis*), mountain whitefish (*Prosopium williamsoni*), bridgelip sucker (*Catostomus columbianus*), redside shiner (*Richardsonius balteatus*), freshwater sculpin (*Cottus* spp.), dace (*Rhinichtys* spp.), brook lamprey (*Lampetra richardsonii*), and, occasionally, other species.

Amphibians typically found in the area are Pacific tree frogs (*Hyla regila*) and bullfrogs (*Rana catesbeina*). Common aquatic insects in the creek are mayflies (*Ephemeroptera* spp.), caddisflies (*Trichoptera* spp.), dragonflies (*Odonata* spp.), and stoneflies (*Plecoptera* spp.).

Spring Chinook and steelhead are important to the region from a social, economic, environmental, and cultural standpoint. Native spring Chinook salmon went extinct from Mill Creek in about 1925, due to the Nine Mile Dam on the Walla Walla River, which was built in 1905. In 2000, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) began reintroducing hatchery adult spring/summer Chinook into Mill Creek. These fish spawned naturally, and the first adult salmon returned to Mill Creek in 2004. Small numbers of salmon have returned to Mill Creek annually. The decreased number of Chinook in the watershed reduced the amount of juvenile salmon available to bull trout as food, as well as reduced the amount of ocean-derived nutrients in the watershed, which once benefitted all of the fish species in the creek. There was no fish ladder at the Diversion Dam for 40 years. Some steelhead passage could have occurred, but it was likely at a reduced rate. The current number of steelhead is much lower than the historic population.

2.2.5 Threatened and Endangered Species

A species list from USFWS was obtained from the Oregon and Washington Fish and Wildlife field offices on August 7, 2019 (Consultation Code: 01EOFW00-2019-SLI-0087; 01EWFW00-2019-SLI-0212), identifying four ESA-listed species, all categorized as threatened, that could be found near or within the MCFCP. These species are indicated below, followed by a brief description of each.

- Middle Columbia River steelhead (*Oncorhynchus mykiss*)
- Columbia Basin bull trout (*Salvelinus confluentus*)
- Western yellow-billed cuckoo (*Coccyzus americanus*)
- Canada lynx (*Lynx canadensis*)

Middle Columbia River steelhead and Columbia Basin bull trout are known to be found in Mill Creek. Western yellow-billed cuckoo is not known to occur in the area and may no longer nest in Washington. This bird has not been identified in bird surveys conducted by the Corps within the Federal portion of the Project.

Steelhead

Middle Columbia River steelhead was listed as threatened under the ESA in 1999. Critical habitat was originally designated in 2000, was later removed, and has since been re-designated. Mill Creek and Yellowhawk Creek are designated as steelhead critical habitat. Steelhead are an anadromous salmonid, and adults can return to Mill Creek as early as September, but due to low flows, the majority of adults return from December through April to spawn in the streams where they were hatched.

After hatching and predominantly spending one or two years rearing in the area, juveniles begin their outmigration to the ocean in April and May, when flow is usually higher than average. Periodic low flow, flood management measures, irrigation diversions, and habitat destruction can negatively impact both adult and juvenile steelhead.

The two fish ladders within the MCFCP do not meet current fish passage criteria and may cause some delay to steelhead and bull trout migration as fish struggle to swim through higher than optimal water velocities and taller than optimal steps in the ladders.

Bull Trout

The USFWS listed Columbia Basin bull trout as threatened in 1998. Critical habitat was designated for bull trout in 2010, and Mill Creek and Yellowhawk Creek were included in the designation. Resident bull trout spend their entire life-cycle in the same (or nearby) streams where they were hatched. They display a high degree of sensitivity at all life stages to environmental disturbance. Bull trout growth, survival, and long-term population persistence depends on the availability of quality habitat, and they need cold water to survive.

In the early 2000s, the U.S. Forest Service conducted radio-tracking studies on bull trout in Mill Creek, which showed that adults generally move upstream, higher in the watershed, between mid-May and mid-August. Spawning takes place between mid-August and mid-October. Downstream migration of juvenile bull trout could occur any month. Rearing could also occur year round, but few bull trout are expected to be downstream of the Mill Creek Diversion Dam during summer months due to their low tolerance for high temperatures.

Some bull trout may migrate downstream of the MCFCP all the way to the Columbia River and attempt to return to the Mill Creek headwaters to spawn.

Yellow-Billed Cuckoo

Western yellow-billed cuckoos were listed as threatened in the western portion of North America in 2014. Declines were primarily due to the loss, degradation, and fragmentation of yellow-billed cuckoo riparian habitat from agricultural conversion, dam construction, river flow management, and lack of riverbank protection. Critical habitat has been proposed, though Washington is not included in the proposal.

Yellow-billed cuckoos can be found in woodlands near streams, rivers, or lakes, but occur most frequently and consistently in cottonwood forests with thick understory (Taylor 2000). Individuals may be on breeding grounds between May and August.

There are no known occurrences of yellow-billed cuckoo near the MCFCP. Surveys of the Federal portion of the Project have been conducted by Corps biologists since 2015, but none have been detected.

Canada Lynx

Canada lynx were listed as threatened in 2000. Lynx critical habitat was designated in 2006. Lynx in the contiguous United States are at the southern margins of a widely distributed range across Canada and Alaska. The center of the North American range is in north-central Canada. Lynx occur in evergreen forests that have cold, snowy winters (Aubry et al. 1999; Ruggiero et al. 1999) where snowshoe hares, which are the main food source for lynx, are numerous (Apps 1999; Mowat et al. 1999). When snowshoe hare populations are low, lynx populations also decline (Mowat et al. 1999).

There are no known occurrences of Canada lynx near the MCFCP due to the lack of suitable conifer forest habitat and snowshoe hare prey base.

2.2.6 Wetlands

Wetlands are the transitional lands between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is covered by shallow water. Wetlands must have one or more of the following three attributes: (1) at least periodically, the land must support predominantly hydrophytes (wetland plants); (2) the substrate is predominantly undrained hydric soil (i.e. adapted to a wet environment); and (3) rocky, gravelly, or sandy areas that are saturated with or covered by shallow water at some time during the growing season (Cowardin et al. 1979).

Wetlands improve water quality by filtering sediments and toxins; reducing flooding and erosion by acting like a sponge to absorb water during spring runoff and releasing it later in the year. Wetlands also provide critical habitat for fish and wildlife. More than one-third of the United States' threatened and endangered species live only in wetlands, and nearly half use wetlands at some point in their lives (https://www.epa.gov/wetlands/why-are-wetlands-important).

Wetlands in the study area are predominantly associated with Mill Creek or other streams in the watershed. There are five types of wetlands found around the MCFCP according to the National Wetlands Inventory (NWI) (https://www.fws.gov/wetlands/data/mapper.html). Freshwater forest/shrub is the most prominent type of wetland upstream of the Diversion Dam, followed by freshwater emergent, freshwater pond, and riverine. The NWI classifies the Mill Creek Channel below the Diversion Dam as Lake, which could be due to the lack of vegetation

growing in the channel or over the channel causing the surface water to appear as a lake. All wetlands are contained within the floodplain of a creek (Figure 2-2).

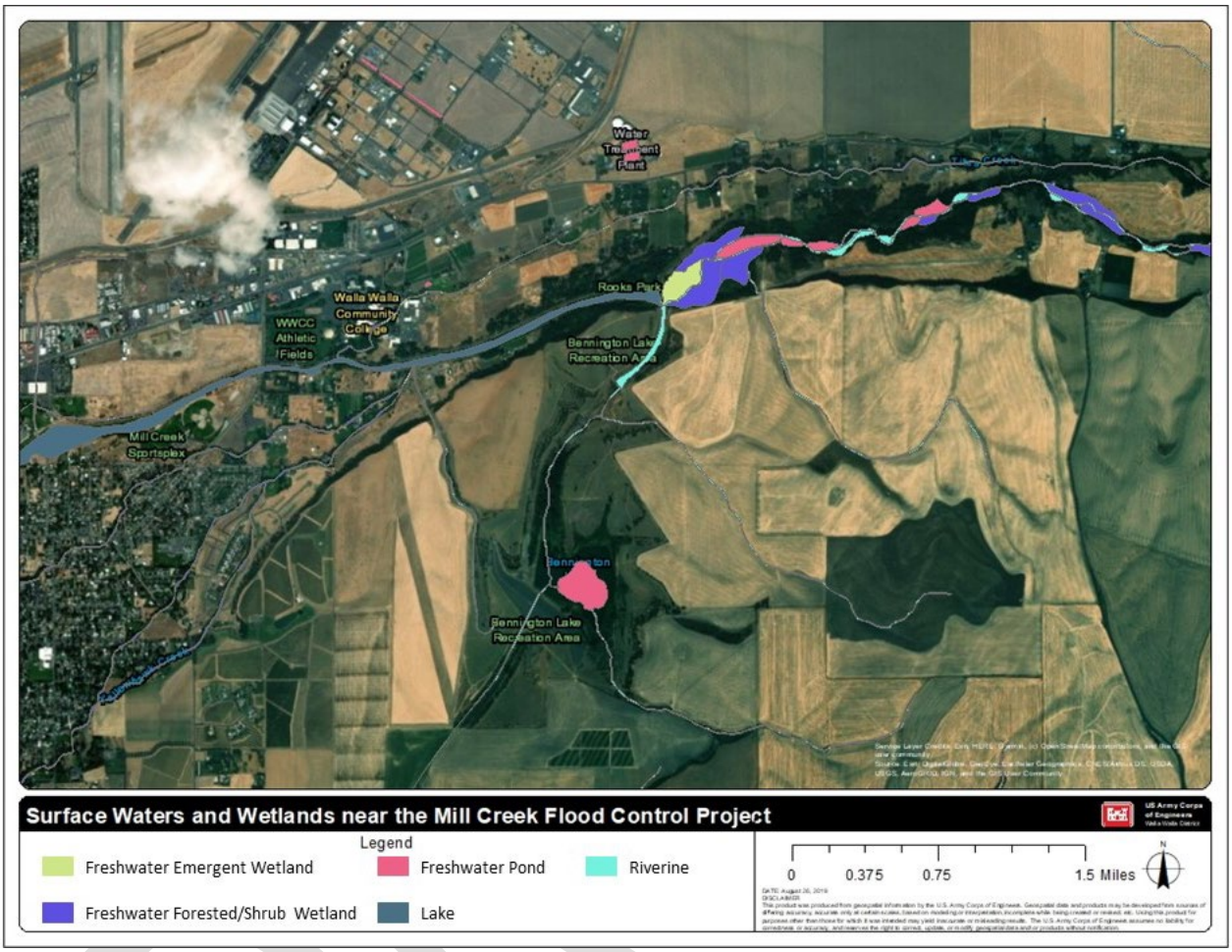

Figure 2-2. Surface Waters and Wetlands near the Mill Creek Flood Control Project

2.2.7 Terrestrial Wildlife

Many terrestrial wildlife species are abundant along the riparian corridors associated with Mill Creek. Mammals, birds, amphibians, and reptiles inhabit the area throughout the year. Mammals common to the area include white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), otter (*Lontra canadensis*), striped skunk (*Mephitis mephitis*), bats (silver-haired [*Lasioncycteris noctivagams*] and hoary [*Lasiurus cinerus*]), and a variety of small rodents (e.g., deer mouse [*Peromyscus maniculatus*] and Montane vole [*Microtus montanus*]). Bobcat (*Lynx rufus*), black bear (*Ursus americanus*), cougar (*Puma concolor*), gray wolf (*Canis lupus*), moose (*Alces alces), and elk* (*Cervus elaphus nelsoni*) are also present in the watershed.

Two hundred fifteen different bird species have been observed near Mill Creek (ebird.org for Bennington Lake). Common birds include wild turkey (*Meleagris gallopavo*), belted kingfisher (*Megaceryle alcyon*), California quail (*Lophrtyx californicus*), ring-necked pheasant (*Phasianus*

colchicus), swallows (*Tachycineta* spp. and *Hinundo* spp.), sparrows (*Melospiza melodia*), woodpeckers (*Picoides* spp.), various other songbirds, ducks (*Anas* spp.), hawks (*Buteo* spp.), osprey (*Pandion haliaetus*), and owls (common barn owl [*Tyto alba*], western screech owl [*Otus kennicotti*], great horned owl [*Bubo virginianus*], snowy owl [*Nyctea scandiaca*], northern pygmy owl [*Glaucidium gnoma*], long-eared owl [*Asio otus*], and short-eared owl [*Asio flammeus*]). Occasionally, bald eagles (*Haliaeetus leucocephalus*) can be seen. Many neo-tropical birds also migrate through the area. These birds depend on riparian vegetation for forage and shelter.

2.2.8 Vegetation

The riparian community throughout the Walla Walla River basin is dominated by black cottonwood (*Populus balsamifera ssp. Trichocarpa*), white alder (*Alnus rhombifolia*), willow (*Salix Spp.*), and various shrubs. While riparian conditions are generally excellent in the high-elevation headwaters, the historically extensive riparian zones of the lower Walla Walla subbasin have been reduced by 65 to 70 percent throughout many areas through human activities such as development, timber harvest, stock grazing, and fire management. Reductions in riparian vegetation has led to a loss of flood energy absorption capacity, as well as reduced aquatic and terrestrial habitat and stream bank stability (Walla Walla Basin Watershed Council 2004).

Vegetation along Mill Creek above the city of Walla Walla is dominated by medium-sized to mature black cottonwood-white alder stands with a subcanopy of both species and patches of smaller trees. The understory is composed mostly of herbaceous nonnative invasive species such as reed canary grass (*Phalaris arundinaceae*). Downed wood covers approximately 14 percent of the ground (Bair et al. 2010). Riparian trees decreased in the Mill Creek watershed from 50 percent cover in 1939 to 34 percent cover by 1957 in the 18 miles from the First Diversion Works to the Washington-Oregon border due to land use conversion from primarily forest and grass lands to agriculture. However, riparian tree coverage was back up to 50 percent by 1996 (Parks et al. 2010). Residential development and agricultural fields on both sides of the creek are still limiting the width and cover of riparian vegetation from reaching pre-settlement amounts (Bair et al. 2010).

Habitat planting improvements around Bennington Lake, the intake canal, and the Russell Creek Outlet Canal conducted by WDFW in the early 1980s provided food and cover for a variety of birds and mammals. WDFW planted approximately 5,000 trees and shrubs, establishing a meadow, food plot, and other wildlife habitat. Trees planted at that time included Russian olive (*Elaeagus angustifolia*), Chinese elm (*Ulmus parvifolia*), black locust (*Robinia pseudoacacia*), prune (*Prunus americana*), peach (*Prunus persica*), mugo pine (*Pinus mugo*), and Rocky Mountain juniper (*Juniperus scopulorum*). Shrubs planted included carigana (*Caragana arborescens*), honeysuckle (*Lonicera periclymenum*), and serviceberry (*Amelanchier alnifolia*). Tall wheatgrass (Agropyron elongatum) and Sherman big bluegrass (*Sherman secunda*) were added to the understory.

Non-native plants such as thistles (*Circium sp.*), morning glory (*Ipomoea purpurea sp.*), poison hemlock (*Conium maculatum*), and teasels (*Dipsacus spp.*) are well established in the lands surrounding the lake.

2.2.9 Geology and Soils

The MCFCP is located at the mouth of a deep canyon valley cut into basalt bedrock, which is part of the Columbia River Basalt Group. Overlying the valley floor, the floodplain consists of silts and silt-sand-gravel mixtures overlying a thick accumulation of older well-rounded gravels that are naturally cemented together. The older gravels overlie the basalt bedrock and consist of consolidated to semi-consolidated gravel, cobble, and boulder-size material in a matrix of sandy and silty material (Corps 1982). For additional details on the geologic setting, refer to Appendix B, Section 3.3.1.

Streams within the watershed upstream of the MCFCP rework and deposit the alluvium. This natural erosion process was severely altered with the construction of the MCFCP, which restricted lateral movement of Mill Creek and partially blocked the movement of sediment through the improved channel and has become a continuous maintenance problem. Five thousand to ten thousand cubic yards of sediment and vegetation debris is removed from the Diversion Dam forebay every 3 to 10 years. The lack of sediment movement through the MCFCP has caused the creek downstream of the MCFCP to be starved of sediment, causing downcutting and increased bank erosion below Gose Street. Currently, the eroded material is transported further downstream where it is deposited in wide areas and at restricted points such as bridge abutments. This sediment deposition can cause increased overbank flooding in some areas due to loss of channel capacity.

2.2.10 Land Use

The primary land use in Walla Walla County is cropland (81 percent). Non-cropland agricultural land uses in the area include pastureland and woodland (USDA 2017). Other land use in Walla Walla County consists of rural residences bordering Mill Creek between the upper watershed and the city of Walla Walla, and residential and commercial development, along with associated roads and parking lots within the city of Walla Walla. Open areas along streams such as Yellowhawk Creek are quickly being developed for housing. The area downstream of Walla Walla consists of more rural residences.

2.2.11 Floodplain Development

Walla Walla and adjacent areas are built on an alluvial fan, which is a fan-shaped landform created by deposited sediment where a mountain and foothills enter a valley. Historically, flooding could occur anywhere within the alluvial fan. Without the MCFCP, flooding could occur almost anywhere within the city.

Significant residential development has occurred near Mill Creek, Yellowhawk Creek, and Garrison Creek since the MCFCP was constructed. This is in part due to the lack of Flood

Insurance Rate Maps identifying flood risk zones on Yellowhawk and Garrison Creeks. Because no floodplain was mapped, County and City development regulations do not require structures to be built to withstand flooding. Flood insurance is also not mandatory in these areas.

The lack of development regulation and financial disincentive has allowed unrestricted urban and suburban encroachment into the floodplain and therefore severely impacted operation of the MCFCP. The development along Yellowhawk and Garrison Creeks has limited the MCFCP's ability to route floodwater to the south of Walla Walla. When the MCFCP was constructed, these channels could receive 900 and 500 cfs, respectively, but the capacity was later reduced to 60 cfs and 10 cfs.

2.2.12 Aesthetics/Visual Resources

Aesthetic or visual resources are the natural and cultural features of the landscape that can be seen and that contribute to the public's enjoyment of the environment. The aesthetic quality of an area is subjective. It is a measure of one's perception of how pleasing an area is. Many people enjoy the Walla Walla area because of its aesthetic value. The Blue Mountains provide a backdrop to the foothills and surrounding agriculture. The city's vibrant and historic downtown adds an aesthetic background for shopping, wine tasting, and community events.

Access to the federally managed portion of Mill Creek and Bennington Lake provides opportunities to the public to view nature, including several wildlife species. Within the city, Mill Creek has been highly altered and has less aesthetic appeal. Much of the channel has been straightened and lined with levees, and the creek is confined by concrete through downtown. Residential and commercial development has squeezed the channel into a small fraction of the width of a naturally functioning stream, eliminating the floodplain and riparian zone. Some buildings and parking lots were built over the top of the channel.

2.2.13 Recreation

Regional opportunities in the Blue Mountains include mountain biking, hiking, skiing, snowmobiling, hunting, and fishing. The Walla Walla Valley has opportunities for wine tasting, street bicycling, golf, and visiting farmers markets. Within Walla Walla there are 600 acres of public parks and approximately 20 miles of hiking trails. As part of the project, the Corps manages 612 acres available to the public for outdoor recreation, without entrance fees, and provides a wide range of all-season recreational pursuits within a few miles of Walla Walla. While portions of the Project provide users with an urban park atmosphere, much of the Project is devoted to wildlife habitat or dispersed recreational pursuits. Rooks Park is a popular summertime day-use getaway. Large open areas allow for playing games, and small secluded areas provide a quiet place to enjoy the outdoors. The Project trail system provides more than 20 miles of paved, gravel, and dirt-surface trails. Warm temperatures and low precipitation during the summer attract many visitors to the area. The Corps managed land provides many forms of recreation to the public including hiking, biking, running, dog walking, horseback riding, hunting, fishing, bird-watching, sightseeing, and boating.

Bennington Lake is the only lake open to the public within 30 miles of Walla Walla. The lake is normally partially filled for recreation near the end of the winter flood season (March or April) using water from Mill Creek. Boating on the lake is restricted to vessels not powered by gasoline. This policy protects the lake from unwanted pollutants and provides ample space for vessels compatible with the lake's small size. Picnic tables, shelters, and restrooms are available at the lake parking lot. Park benches and shelters along the trails provide resting areas to enjoy views of the lake and the Blue Mountains.

Other recreational opportunities are provided by 17 public parks in Walla Walla with about 600 acres of recreational area, and four additional public parks in College Place with 15 acres of recreational area. These parks are used by many residents of the Walla Walla, College Place, and surrounding communities.

2.2.14 Air Quality

Walla Walla County qualifies as an attainment area because the air quality is below the national ambient air quality standards set by the Environmental Protection Agency. Air quality in the Walla Walla area is generally good, but can reach unhealthy levels at some times of the year due to air stagnation. Smoke, dust, and other pollutants can become trapped near the surface and linger for days at a time. This can occur during both summer and winter and last several days.

2.2.15 Noise

The area around the MCFCP is a mix of rural and urban communities. Sources of noise within Walla Walla are vehicle traffic and airplane takeoffs and landings at the nearby Walla Walla Regional Airport. There is also periodic noise from construction equipment (e.g., dump trucks, bull dozers, excavators, etc.) and industrial noises from local businesses. Other sources of noise in the surrounding communities include noise from outdoor machinery and equipment, and agricultural-related activities occurring at nearby farm fields. Average noise levels within Walla Walla and surrounding communities are expected to be between 49 and 70 decibels adjusted.

2.2.16 Cultural and Historic Resources

Archaeological studies of the area document settlement extending back thousands of years. While a substantial list of cultural resources studies might be compiled for the area, they collectively reflect a lack of comprehensive knowledge of the pre-contact (prior to European exploration) archaeological resources. The majority of the study area is composed of private lands, which typically receive less archaeological study than those lands subject to Federal cultural resources law. However, lands managed by the Corps (MCFCP), the Walla Walla Veteran's Administration grounds and the historic Fort Walla Walla, and the Whitman Mission National Historic Site all represent limited areas of Federally managed lands that have been subjected to more intensive study (Sprague 1991).

The three previously mentioned Federal lands contain significant historic cultural resources. The MCFCP contains a number of contributing structures and features that have been determined to be eligible for listing on the National Register of Historic Places. Similarly, the Fort Walla Walla Historic District is composed of a number of buildings and landscapes listed on the National Register of Historic Places. The Whitman Mission is a National Historic Site (managed by the U.S. National Park Service). Finally, a number of individual structures within the Walla Walla community are also listed on the National Register, including private residences, The Dacres and Marcus Whitman Hotel buildings, and the U.S. Post Office.

Other studies in the area include those related to state highway and transmission line construction and maintenance. Generally, sites have consisted of isolated finds of pre-contact materials, or small scatters consistent with the notion that pre-contact use of the area was characterized by seasonal, short-term occupations. However, pre-contact burials have been discovered, and the amount of archaeological survey has not been sufficient to provide anything more than a generalization of the spectrum of pre-contact resources that may be present within the study area.

The area is most closely associated with the traditional homelands of the groups that now compose the Confederated Tribes of the Umatilla Indian Reservation. This includes the *Weyíiletpuu* (Cayuse), *Imatalamláma* (Umatilla), and *Walúulapam* (Walla Walla). These groups of people would have used the area for wintering in villages along major rivers (Kopperl 2005).

2.2.17 Socioeconomics/Environmental Justice

The total population in the county of Walla Walla in 2018 was estimated at 60,922 people by the U.S. Census Bureau. The most populated city in the county of Walla Walla is the city of Walla Walla with a population of 32,986 in 2018. Between 2010 and 2018, the population of the county grew at a slower pace (3.6 percent total growth) than the population growth in the state of Washington (12.1 percent total growth) and the nation as a whole (6.0 percent total growth). Walla Walla's population grew at an annual average rate of 0.2 percent per year between 2010 and 2018, or an average annual net increase of approximately 70 residents per year.

The county of Walla Walla has a lower percentage of working-age occupants (between the ages of 18 and 64) than the averages for the state of Washington and the United States (Table 2-1).

Table 2-1. Age Demographics in the County of Walla Walla

Age	County of Walla Walla	State of Washington	United States
Persons under 18 years	21.0%	22.1%	22.4%
Persons 18 to 64 years	60.9%	62.5%	61.6%
Persons 65 years and over	18.1%	15.4%	16.0%

The percentage of elderly people 65 years and over in the county is higher than averages for the state of Washington and the United States. The county also has a higher percentage of

residents who served in the military (8.2 percent) than the state of Washington (7.2 percent) and the nation as a whole (5.8 percent).

The county of Walla Walla has a considerably lower civilian labor force participation rate (58.3 percent) than the averages for the state (63.4 percent) and nation (63.0 percent). The civilian labor force participation rate reflects the percentage of age-eligible workers who are either employed or actively seeking employment. A lower civilian labor force participation rate implies that the local labor market has an oversupply of discouraged workers who may potentially enter or re-enter the labor market. An oversupply of eligible workers seeking employment can cause the equilibrium market rate for people who work to be lower than if the labor market conditions were tighter.

The median household income, or the 50th percentile of household earnings was $52,630 in the county and $46,650 for the city of Walla Walla in 2017. For the state of Washington, the median household income was $66,174 in 2017. The average of all earned income per individual worker in the county of Walla Walla in 2016 was $38,000. For the state of Washington, average income per worker was $58,434 in 2016.

Minimum wage rates for the state of Washington increased steadily at approximately 2.4 percent growth per year between 2000 and 2016. In 2016, Washington voters approved a ballot measure to raise the minimum wage, at an average rate of 7.1 percent growth per year, to a target minimum wage rate of $13.50 per hour beginning January 1, 2020 (Figure 2-3).

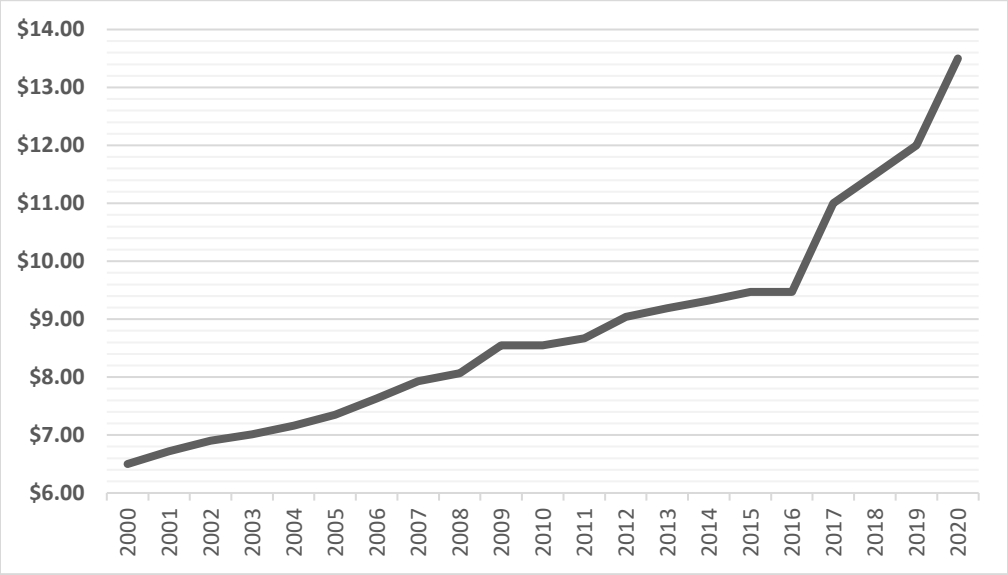

Figure 2-3. Minimum wage trends in Washington State since 2000

In 2018, there were 24,902 housing units in the county of Walla Walla. The median home price was $196,300 for the period of 2013 to 2017 (2018 U.S. Census Bureau Quick Facts). Although area incomes have recently increased, housing prices have increased at a higher rate, resulting in a peak home price-to-income ratio of 4.3 in 2019, according to Internet-based real estate

database company Zillow (available at www.zillow.com/research/data). The most affordable home price-to-income ratio for the city was in 1997 at a multiple of 2.4.

In the city of Walla Walla, 42 percent of all housing units are renter-occupied, representing a lower rate of owner-occupied homes than the statewide and national averages. Zillow estimates the median monthly rent in 2019 for a single-family housing unit in Walla Walla at $1,359. The U.S. Department of Housing and Urban Development identifies households as cost burdened when households spend more than thirty percent of their income on housing costs. For a single-family housing rental unit at the median rate of $1,359 per month, the cost burden threshold is $54,360 per year. As stated earlier, the median household income for the city of Walla Walla is $46,650, which is considerably lower than the $54,360 threshold of affordability for a single-family housing rental unit. Many Walla Walla renters likely have difficulty being able to afford basic necessities such as food, clothing, transportation, and medical care after paying for housing costs. Single-family housing rental prices increased from 2011 to 2019 at an average annual rate of 1.2 percent per year, although the average annual rate of increase recently escalated to 4.4 percent annual growth between 2017 to 2019 (Zillow).

Approximately fourteen percent of the county of Walla Walla's population and nineteen percent of the city of Walla Walla's population live below the poverty line, according to the Census. Approximately twelve percent of residents in Walla Walla rely on government assistance for food purchases through the Supplemental Nutrition Assistance Program. The city of Walla Walla also has a higher percentage of persons under the age of 65 who are not medically insured compared to the state of Washington and the United States.

The highest level of education among people 25 years or older in the county of Walla Walla is shown in Table 2-2 below. In the county of Walla Walla, the city of College Place has the highest percentage of inhabitants with a bachelor's degree or higher (33.3 percent), and it is also higher than the national average (30.9 percent).

Table 2-2. Highest Level of Education among the Total Population in Walla Walla County

Level of Education	Percent of Population
Doctorate	1.3
Professional	1.9
Master's	7.9
Bachelor's	18.1
Associate	12.1
Some College	25.6
High School	21.2
Some High School	9.9
Less than High School	1.6
None	2.7

Source: American Community Survey, 2018.

The largest racial demographic in the county of Walla Walla is White (91.3 percent), followed by African Americans (2.3 percent), Native Americans (1.4 percent), Asian (1.8 percent), and Pacific Islanders (0.4 percent), and two or more races (2.8 percent) make up the remainder of the population. Hispanics of any race represent 21.5 percent of the population (2018 U.S. Census Bureau Quick Facts for Walla Walla County). There are no federally recognized Tribal Nations within the territorial boundaries of the county of Walla Walla.

The Walla Walla area has been known historically for its agricultural economy, with wheat being the number one produced crop. Barley, corn, potatoes, asparagus, peas, soft fruit, onions, concord and wine grapes, and alfalfa hay also generate a significant part of the annual harvest. The 2017 U.S. Department of Agriculture Agricultural Census indicated that the value of farm products sold in the county of Walla Walla rose from $437 million in 2012 to $526 million in 2017, representing a 3.8 percent annual increase in value. Walla Walla has recently become a main attraction for wine and arts tourism, as indicated by national and world recognition for its quality wine. Other economic sectors representing the highest employment in the area include education and health services, government, manufacturing, and leisure and hospitality, according to the Bureau of Labor Statistics.

2.2.18 Public Utilities and Infrastructure

Critical facilities are those essential to the health and welfare of the whole population and are especially important following hazard events. Lifeline utility systems, high potential loss facilities, transportation systems, and hazardous material facilities may also be considered critical.

Critical infrastructure for emergency response in Walla Walla includes two fire stations, three police stations, and a 911 emergency operations center. Walla Walla has two hospitals and one medical clinic; there is also a Red Cross shelter located in the city. Public transportation consists of a regional airport and a Valley Transit transfer center. Infrastructure to support transportation includes a total of 20 bridges crossing over Mill Creek in the 5-mile span between Tausick Way and Hussey Street. The Mill Creek Channel is covered in downtown Walla Walla between the Colville Street Bridge and the 3rd Street Bridge. The channel is covered again between the 6th Street Bridge and the 9th Street Bridge. These bridges provide access throughout Walla Walla for emergency response units and public transportation. The hospitals, clinic, and Red Cross shelter are all located on the south side of Mill Creek, so access over the bridges during a time of emergency is crucial (Figure 2-4).

High potential loss facilities in Walla Walla include two correctional institutions, seven local government buildings, two dams, and three hazardous material facilities. There are two high schools, two middle schools, six elementary schools, four private schools, , and two colleges in Walla Walla. Utilities vital to the city include the Pacific Power substation, sewage lift stations, and water wells.

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College Place has one fire station, one police station, three schools, one university, two local government buildings, the Cascade Natural Gas station, a water treatment plant, and three water towers (Northwest Management, Inc. 2018).

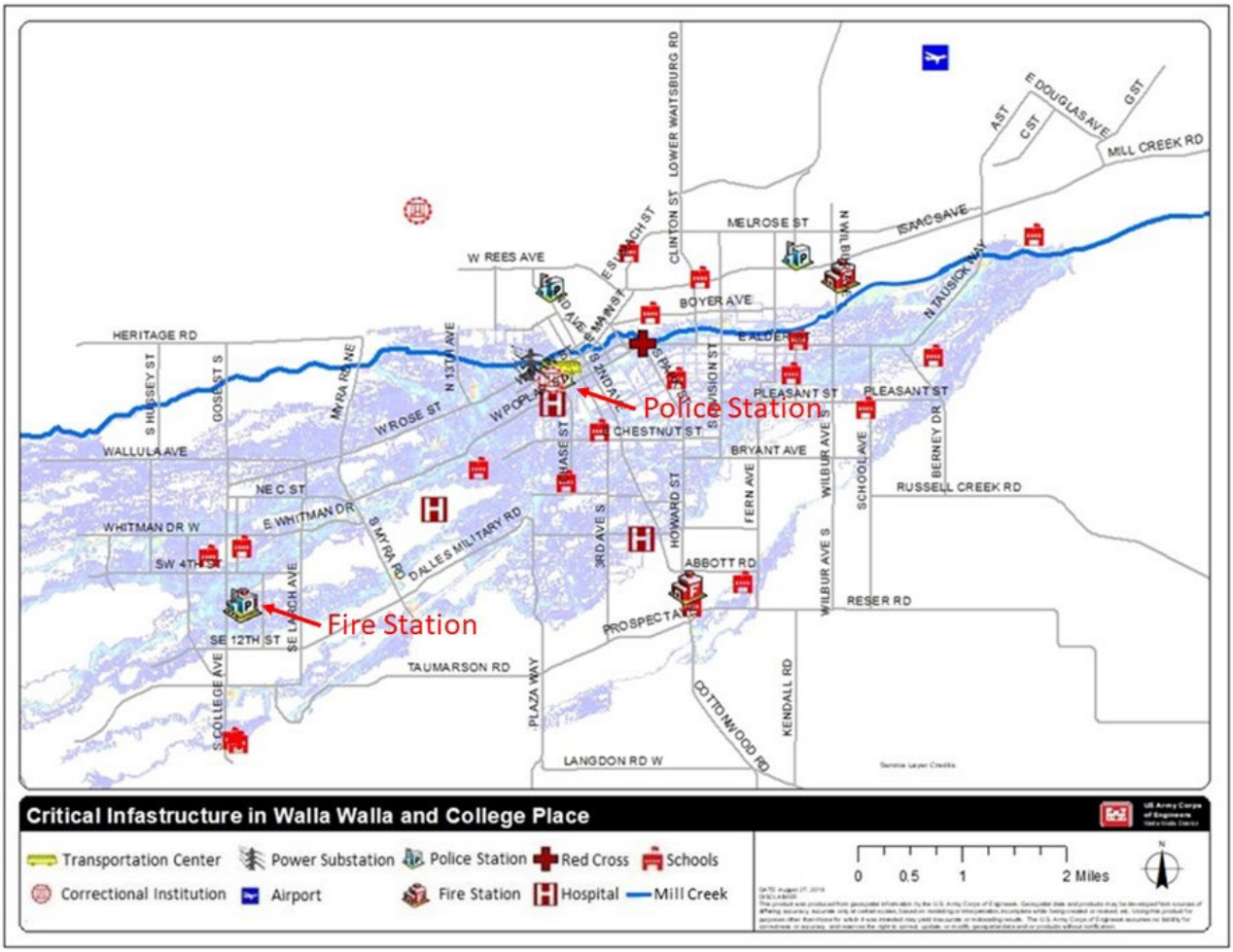

Figure 2-4. Critical Infrastructure in Walla Walla and College Place, Washington
Note: Shaded area represents an example of inundation after Project failure upstream of the First Division Works from floodwaters at 8,639 cubic feet per second.

2.2.19 Hazardous, Toxic, and Radioactive Waste

Hazardous, toxic, and radioactive waste (HTRW) comes in many forms, from nuclear material to petroleum products to paint. Different levels of risk relate to the various types of HTRW material. Publicly available HTRW records pertaining to the Walla Walla, Washington, area were reviewed to identify potential HTRW effects from the proposed project. Review of public records included searching the following databases.

Superfund Enterprise Management System (SEMS) Sites

Superfund is a program administered by the EPA to locate, investigate, and clean up the worst hazardous waste sites throughout the United States. There are no National Priorities List Superfund Sites in Walla Walla, although the following seven locations appeared in the search:

- Walla Walla District Corps of Engineers Headquarters building (EPD ID: WA0001138189).
- Stubblefield Salvage (EPD ID: WAN001002813).
- Tausick Way Dump (EPD ID: WAN001002938).
- Walla Walla gas Manufacturing Site (EPD ID: WAD981763113).
- Washington State Penitentiary (EPD ID: WASFN1002210)
- Western Farm Services Inc. (EPD ID: WAD020235420).

Washington Department of Ecology, Integrated Site Information System (ISIS) Brownfield Sites

This database provides a selection of standard reports for cleanup sites, brownfields, underground storage tanks, leaking underground storage tanks, and environmental covenants registry. The Walla Walla City Burdine Property located at 2690 East Isaacs Avenue is the only brownfield site located in Walla Walla. The 15-acre site is located about a quarter mile from Mill Creek on the right bank downstream of the Tausick Way Bridge. The status of the site is currently awaiting cleanup.

National Priority List (NPL)

This is the list of hazardous waste sites in the United States eligible for long-term remedial action (cleanup) financed under the Federal Superfund program. No records exist for Walla Walla.

Resource Conservation and Recovery Act Information (RCRAInfo)

This is a national program management and inventory system about hazardous waste handlers. In general, all generators, transporters, treaters, storers, and disposers of hazardous waste are required to provide information about their activities. Twenty-eight records exist for Walla Walla (Figure 2-5).

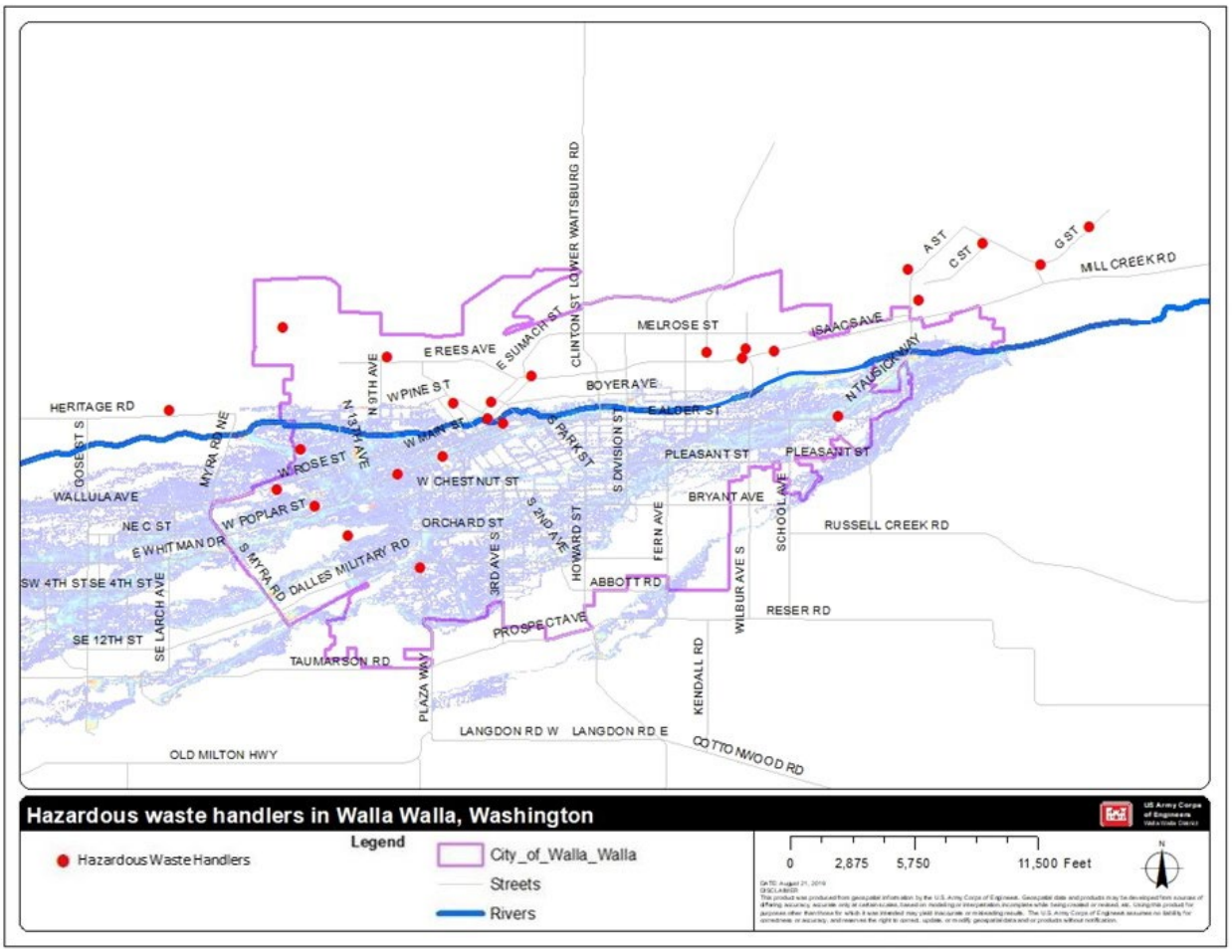

Figure 2-5. Locations of Hazardous Waste Handlers in Walla Walla, Washington
Note: Shaded area represents an example of inundation after Project failure upstream of the First Division Works from floodwaters at 8,639 cubic feet per second.

Toxic Release Inventory Program (TRI Explorer)

This database tracks the management of over 650 toxic chemicals that pose a threat to human health and the environment. Toxic chemical release results are summarized in Table 2-3. Reporting year (RY) 2017 is the most recent TRI data year available. Facilities reporting to TRI were required to submit their data to EPA by July 1, 2018.

Table 2-3. Toxic Release Inventory Program Onsite and Offsite Reported Disposed of or Otherwise Released (in pounds) for All Industries and All Chemicals in ZIP code 99362

Chemical	Total On-site Disposal or Other Releases	Total Off-site Disposal or Other Releases	Total On- and Off-site Disposal or Other Releases
Chromium	0	0	0
Copper	208	150	358
Manganese	0	0	0
Nickel	0	0	0
Total	208	150	358

Note: Data from 2017.

Washington Department of Ecology Underground Storage Tank (UST) Information

This database provides a list of underground storage tanks in Washington. Seventy-one records for Walla Walla of underground storage tanks were found for Walla Walla (Figure 2-6). Hazardous materials stored in USTs in Walla Walla are petroleum products, heavy metals, benzene, and hydrocarbons.

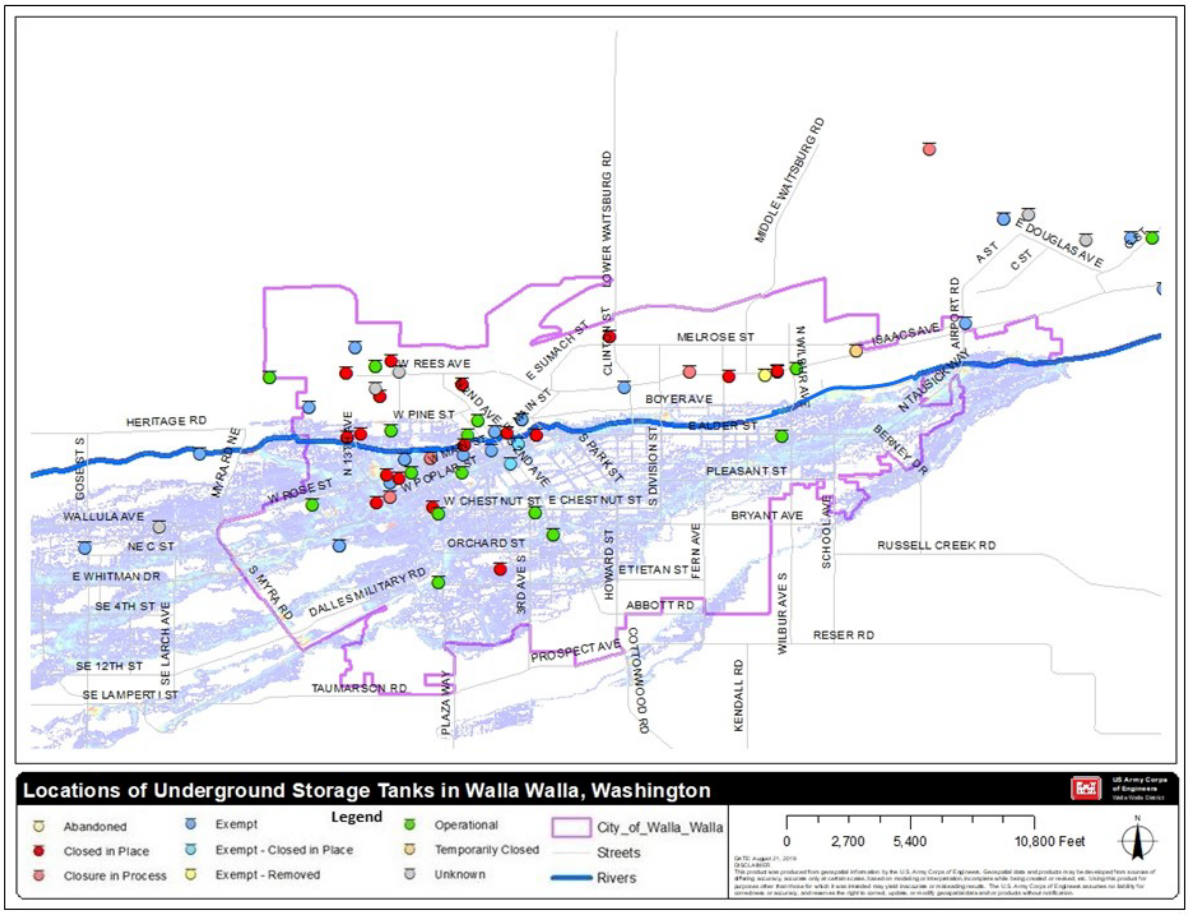

Figure 2-6. Locations of Underground Storage Tanks in Walla Walla, Washington

Note: Shaded area represents an example of inundation after Project failure upstream of the First Division Works from floodwaters at 8,639 cubic feet per second.

Washington Department of Ecology Leaking Underground Storage Tank (LUST) Information

This database provides a list of leaking underground storage tanks in Washington. There were 21 records of LUSTs in Walla Walla (Figure 2-7); some locations have multiple leaks recorded. Thirteen of the LUSTs are confirmed above cleanup levels for groundwater, and 15 leaks are confirmed above cleanup levels for soil and require no further cleanup. Two of the LUSTs are below cleanup levels for groundwater and soil (the leaked contaminants are petroleum and lead). In one case, surface water contamination with petroleum was suspected.

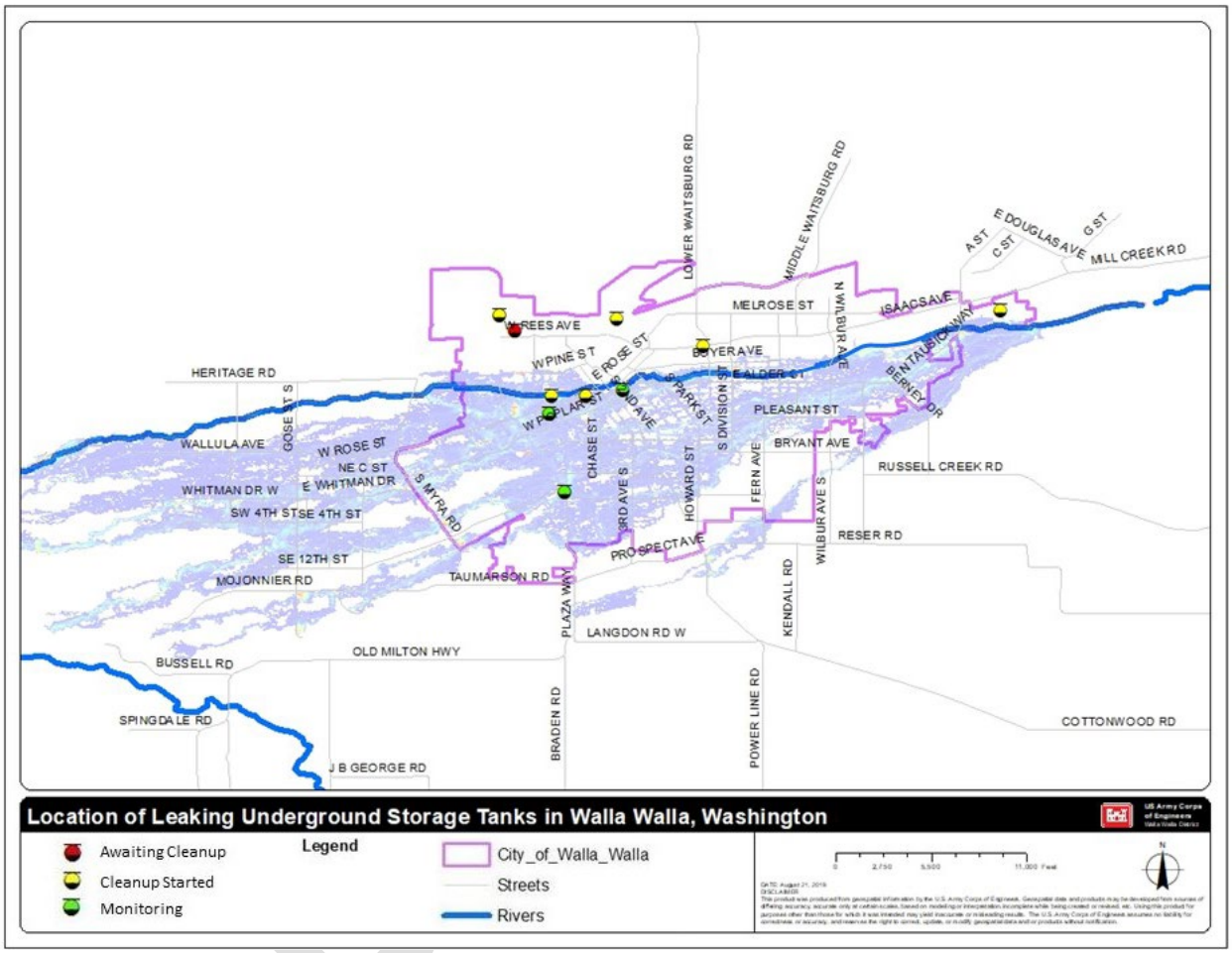

Figure 2-7. Location of Leaking Underground Storage Tanks in Walla Walla, Washington
Note: Shaded area represents an example of inundation after Project failure upstream of the First Division Works from floodwaters at 8,639 cubic feet per second.

Washington Department of Ecology Integrated Site Information System (ISIS) Database

This database provides information on contaminated sites in the state of Washington. In Walla Walla, there are 99 contaminated sites reported in ISIS (this number includes LUST sites). Of these, 10 are awaiting cleanup, 15 have started cleanup, 1 is in active operations and maintenance/monitoring, and 73 have been designated as No Further Action.

SECTION 3 - PLAN FORMULATION

Background Photo: Corps Engineers Working in the Channel

Photo Credit: Audrey Gossett, Corps

SECTION 3 - PLAN FORMULATION

This section describes the formulation, evaluation, and comparison of alternatives, which are steps three, four, and five, respectively, of the six-step planning process and referred to as plan formulation.

Plan formulation is the process of building alternatives that meet the stated purpose and need and planning objectives, without violating planning constraints. Plan formulation is a highly iterative process that involves cycling through these three steps many times during the development of a reasonable range of alternatives. Alternative are a set of one or more measures that address all planning objectives. A measure is a feature or activity that can be implemented at a specific geographic site within the study area that meets (in whole or part) the purpose and need, planning objectives and helps realize the opportunities of the study. An Alternative must completely satisfy the purpose and need statement and planning objectives, without violating any listed constraint. The plan formulation process is clearly defined in the Engineer Regulation (ER) 1105-2-100, Planning Guidance Notebook. The plan formulation process addresses the alternatives development and analysis required under NEPA.

Alternatives are also screened, refined, and compared from the perspectives of the National Economic Development (NED), Regional Economic Development, Environmental Quality, and Other Social Effects accounts to identify the alternative that best balances many factors to make a prudent decision. As part of this initial screening process, a preliminary cost and benefit determination was used to identify alternatives that would be capable of reasonably maximizing the contribution to national economic development (NED), consistent with protecting the Nation's environment. (See Table 3-5.)

Contributions to the NED account represent the anticipated increase in the value of the national output of goods and services. The NED plan is the alternative that reasonably maximizes net national economic development benefits consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Net average annual benefits are measured by subtracting the average annual costs of a project from the average annual benefits. The costs account for financial and economic resources required or displaced to achieve the plan, such as concrete and steel for building a floodwall. Benefits are increases in the net value of national outputs (goods and services) and vary by type of water resource project. The NED objective is to maximize the difference between monetized benefits and costs.

In the case of flood risk management projects (such as the MCFCP), the increase in national output is derived from three categories: (1) inundation reduction, (2) intensification benefits (net income from affected "with-project" land uses, when floodplain use is the same), and (3) location benefits (derived from activities added to the with-project floodplain). Some of the most valuable real estate in the nation is located in areas at high risk for flooding. For instance, areas near rivers are highly desirable as residential locations and tourist destinations and offer many recreational activities. The Corps flood risk management efforts reduce the risk of flood

damage to these facilities and homes as well as to vital infrastructure such as energy grids and transportation networks.

Total benefit for each alternative is the reduction in flood costs for that alternative from the total costs of floods if floodwaters exceeded the current MCFCP capacity or the MCFCP failed. Net benefits for each alternative are then calculated by subtracting the total cost to implement each alternative from the benefits that would result from implementing that alternative. Positive net benefits (where cost savings exceed implementation costs) are considered contributions to the NED account. NED benefits are normally expressed in terms of average annual net benefits that are calculated for the 50-year period of analysis. The calculations consider the timing of the expenditures and benefits by applying a discount rate that converts the dollar value of costs and benefits received at different time periods to present value.

The RED account is determined by the change in the distribution of regional economic activity (e.g., income and employment). These regional benefits are generally transfers from other parts of the country. RED benefits impact a region, not the nation as a whole.

The EQ account describes the non-monetary effects on ecological, cultural, and aesthetic resources, including the positive and adverse effects of ecosystem restoration plans.

The OSE account shows the effects on social aspects such as community impacts, health and safety, displacement, and energy conservation. Identifying the social effects of the existing and future without-project water resources condition can help provide a more complete understanding of the scope of problems, which can in turn help with the development of more complete project planning objectives. Similarly, understanding the social effects of potential solutions under consideration can lead to productive discussions about ways that undesirable social effects can be addressed either within the plan or in collaboration with others.

3.1 DEVELOPMENT OF ALTERNATIVES

In accordance with NEPA implementation regulations (40 CFR 1502.14, Alternatives Including the Proposed Action), the Corps will "rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives eliminated from detailed study, briefly discuss the reasons for their having been eliminated." A reasonable alternative must meet the purpose and need statement and objectives of the feasibility study. Alternatives will later be evaluated in Section 5 (Step 6) to determine which one maximizes overall benefits and minimizes costs in a manner that is complete, effective, efficient, and acceptable while avoiding or reducing adverse environmental and human impacts.

3.1.1 Development and Screening of Measures and Alternatives

The Corps hosted a 4-day workshop during the first week of October 2018 that included Corps personnel and the non-Federal sponsor to complete the first iteration of the six-step planning process. The Corps conducted a Stakeholder Charrette on October 16, 2018, and a Public Scoping Meeting on November 1, 2018. An initial list of 33 measures was developed by

incorporating the ideas from the Corps, the non-Federal sponsor, stakeholders, and the public. Redundant measures were removed from analysis leaving 25 structural measures and eight non-structural measures.

Structural measures are modifications designed to reduce the frequency of damaging levels of flood inundation. Examples of structural measures include: dams with reservoirs, dry dams, channelization measures, levees, walls, diversion channels, pumps, and bridge modifications. Nonstructural measures reduce flood damages without significantly altering the nature or extent of flooding. Damage reduction from nonstructural measures is accomplished by changing the way floodplains are used, or by accommodating existing uses to the flood hazard. Examples of non-structural measures include the use of warning systems, emergency management planning, flood proofing, relocation or buyout of structures, and land use planning to reduce flood risks.

Screening of Measures

Initial qualitative screening was used to determine if the measures met (at least in part) the purpose and need statement (Section 1.5), helped satisfy at least one planning objective (Section 1.11.1, Objectives), and did not violate any planning constraints (Section 1.11.2, Constraints). Economic feasibility under the purpose and need statement is viewed as contributing to NED and being within the Sponsor's cost share capability. The results of this initial screening are provided in Table 3-1 in Section 3.1.4, Initial Qualitative Screening of Measures. The remaining measures were further screened using a more quantitative set of factors to distinguish which measures should be carried forward to develop alternatives. The relative screening of measures was based on the cost-effectiveness of each measure relative to the other measures. Three quantitative screening criteria were applied: relative ranking of flood risk reduction, relative ranking of rough order of magnitude costs, and relative ranking of environmental impacts to key resources. The results from the relative screening of measures are provided in Section 3.1.7, Relative Ranking Screening of Measures.

Screening of Alternatives

Finally, measures were screened as standalone alternatives and formulated into alternatives and screened based on completeness, effectiveness, efficiency, and acceptability (Step 6), as defined in the U.S. Army Corps of Engineers Planning Guidance Notebook (ER 1105-2-100). The initial range of alternatives are screened to determine which alternatives completely satisfy the purpose and need statement and planning objectives, without violating any listed constraints. The results of the alternative screening are provided in Section 3.1.11, Alternative Formulation.

3.1.2 Assumptions for Analysis and Screening of Measures

Two sets of assumptions were used to facilitate analysis and screening of measures: (1) standard Corps Flood Damage Reduction Project assumptions, and (2) project specific assumptions.

The assumptions related to the future without-project conditions described in the Corps Planning Guidance Notebook (ER 1105-2-100) for all flood risk reduction feasibility studies include the following:

a) Existing flood hazard reduction plans are considered to be in place, considering the actual remaining economic life of existing structures. If there is a high likelihood of construction of a flood hazard reduction plan authorized for implementation but not yet constructed, the authorized plan is assumed to be in place.
b) The adoption and enforcement of land use regulations pursuant to the Flood Disaster Protection Act of 1973 is assumed.
c) For planning purposes, the Corps shall assume that communities in the floodplain outside the protected area of the existing project belong to the National Flood Insurance Program (NFIP) administered by the Federal Emergency Management Agency (FEMA).
d) Compliance with Executive Order (EO) 11988, Floodplain Management (described in paragraph 3-3b (1)), and EO 11990, Protection of Wetlands, is assumed.

The following study-specific assumptions were also developed for the Mill Creek Flood Risk Management Feasibility Study:

a) No upgrades to the MCFCP to address the performance, capacity, and reliability concerns would be performed without a Federal project.
b) Authorized operation and maintenance will be performed in the MCFCP over the period of analysis.
c) The concrete channel section of the MCFCP will continue to perform for at least another 50 years with rehabilitation.
d) Potential large flood events could exceed system design capacity with or without improvements.
e) Groundwater conditions remain the same under all alternatives.
f) Public acceptance of risk transfer if upgraded components of the Project or operational changes adversely impact areas not upgraded, such as certain areas downstream of Gose Street in the 100-year floodplain.
g) Nonstructural measures within the authority and ability of other public agencies to implement will occur. These measures include the use of insurance, forecasting, warning systems, emergency management planning, and land use planning to reduce flood risks.
h) Based on the documented good performance of the existing MCFCP over the past 70+ years and the fact that the degraded system will continue to provide meaningful levels of protection with continued good operation and maintenance efforts, potential damages prevented by performance and reliability improvements is somewhat limited.

Early screening generally assumed that measures with construction costs exceeding $100 million would not likely be economically justifiable, and measures with construction costs exceeding $200 million would be extremely unlikely to be justifiable.

3.1.3 List of Measures

As previously mentioned, there were 33 measures after removing redundant ones, 25 structural and 8 non-structural, as listed in the following two sections.

3.1.3.1 Structural Measures

Pine Creek Reservoir - A new reservoir would be constructed on Pine Creek in Oregon, 14 miles southwest of Bennington Lake. Water would be conveyed from Bennington Lake to Pine Creek Reservoir.

Mill Creek Reservoir At 5-Mile - A new reservoir would be constructed on Mill Creek, near 5-mile Road. This measure was removed because the geography in the proposed area would cause the reservoir to be extremely wide, creating a large, shallow reservoir higher in the Mill Creek watershed where stream function and riparian area are otherwise intact.

Mill Creek Watershed Reservoir - A new reservoir would be constructed on Mill Creek near the city of Walla Walla water intake.

Titus Creek as a Conveyance - Titus Creek would be used to divert some floodwater from Mill Creek. Titus Creek flows return to Mill Creek below the First Division Works.

Increase Russell Creek Outlet Canal Capacity - The capacity of the Russell Creek Outlet Canal would be increased to allow additional floodwater to be released into Russell Creek.

Increase the Capacity of the Distributaries - Yellowhawk and Garrison Creek would be modified to convey more floodwater.

Emergency Floodway - The floodway would consist of a channel upstream of the Diversion Dam that would direct floodwaters north into the outlying open fields where the floodwater would be absorbed into the ground.

Deepen Existing Mill Creek Channel - The existing concrete channel section would be deepened to increase channel capacity. The deepening of the Mill Creek Channel would also require a rebuild of the concrete walls and levees so they would not be undermined or breached.

Construct a Natural Surface at the Bottom of the Channel - The concrete bottom of the concrete channel section would be removed.

Tunnel underneath Channel for Flood Flows - A large tunnel would be bored under the existing channel to convey floodwater.

Widen Channel from Diversion Dam to Gose Street - The existing Mill Creek Channel would be widened to increase its capacity.

Extend the Levees Upstream and Downstream - The levees would be extended further upstream and downstream.

Reduce Bottlenecks in the Concrete Channel - Existing narrow points in the concrete channel section would be widened to increase the channel capacity in those areas.

Reduce Bottlenecks at Bridges - Existing bridges would be raised or removed to increase the channel capacity.

Naturally Flowing Channel Downtown and Bypass Flood Flows - Flood flows would be managed higher in the system through diversions or increased storage, and only a small amount of flow would be passed through town. This measure would include removing the concrete channel section through town, including the covered portion, and planting grass and trees along the creek. This measure is meant to improve recreational opportunities along the creek through town and increase the aesthetic value. Local businesses and the City of Walla Walla would like to add recreational features such as a river walk and outdoor seating along the creek.

Excavation of Bennington Lake to Increase Storage Capacity - The operation plan for the MCFCP would remain as it is today, with the exception that there would be additional capacity added to Bennington Lake. Lake excavation could include excavation of the northern end of Bennington Lake or the lake bottom. Larger excavations could include removing a mound of high ground within the reservoir between the intake canal outlet and left reservoir rim (facing the Storage Dam). If selected, the measure would be scaled to determine the optimal level that meets the purpose and need and planning objectives.

Construct a New Storage Reservoir on Mill Creek Just Downstream of Blue Creek - This measure is based on the Blue Creek Dam 1964 concept design for a multipurpose embankment dam located further upstream from the Diversion Dam near the confluence with Blue Creek. This new dam would add between 11,000 and 29,000 acre-feet of storage to the MCFCP. Operations assumed all flow passes the new reservoir and Bennington Lake up to 1,400 cfs, and flows over that amount would be stored. The dam would be constructed with compacted earth fill, and the intake and outlet structures would be concrete. Operations would include use of the additional reservoir storage to reduce peak flows through the urban areas to the extent possible. Water would be stored behind the dam and released later in the summer for irrigation and instream purposes.

Construct a New Small Storage Reservoir by Building a Dike near Russell Creek - A dike would be constructed downstream of the Storage Dam between two hills. The farmland between the dike and the Storage Dam would be inundated with floodwaters that passed over a constructed spillway in the Storage Dam to create extra storage capacity. The active reservoir storage capacity would be 12,800 acre-feet. An outlet channel would drain water through the dike and

into Russell Creek and then through a highly populated section of town along Yellowhawk Creek.

Mill Creek Storage Dam Raise to Increase Storage Capacity – The Mill Creek Storage Dam and possibly the Mill Creek Diversion Dam, Diversion Dam dike, intake channel, headworks, and the Mill Creek Levee Extension would be raised to increase storage and diversion capacities. If selected, the measure would be scaled to determine the optimal level that meets the purpose and need and planning objectives.

North Bypass Channel – A north bypass channel would divert flood flows north to Dry Creek, which empties into the Walla Walla River near Lowden, Washington. The bypass channel would be diverted from Mill Creek upstream from the Diversion Dam near Buroker Road. The north bypass channel would also collect flow from Dry Creek. The bypass channel would be designed to divert up to 1,800 cfs, leaving 1,400 cfs in the Mill Creek Channel through town. Any remaining flow would be stored in Bennington Lake until flows decreased.

South Bypass Channel – This measure would begin with a south bypass channel diverting all flow above 1,400 cfs to Bennington Lake. A means to pass water to the bypass channel would need to be added to the Storage Dam so that up to 5,900 cfs could be passed into the bypass channel. When the bypass flows exceed 4,500 cfs (combined flow of 5,900 cfs), Bennington Lake would store the balance up to the 0.1-percent annual chance exceedance flood. For this operation, the Corps would not use the existing rule curves, but would divert to Bennington Lake when the combined bypass and channel reach 5,900 cfs. Water would flow south through Russell Creek and then through a highly populated section of town along Yellowhawk Creek.

Rehabilitate Deteriorating Sections of the Concrete Channel - Several different types of repairs would be performed along the length of the concrete section of Mill Creek Channel. The main types of repairs would be installation of wall tiebacks using soil anchors, concrete resurfacing, center wall reinforcement, wall replacement, and removal of ceiling spans in the covered portion of the concrete section.

Wall tiebacks would be completed by core drilling holes for the anchors in the reach of the wall section to be tied back. Anchors would be installed through the holes in the wall and into the soil beyond the wall. Once the anchors are installed a lift of concrete would be placed over the anchors to finish the installation. This type of repair would be needed on approximately 4,100 feet of concrete channel wall. An example of this repair can be seen on the right bank of the channel upstream of the 6th Street Bridge. (Refer to Appendix B, Engineering, and Plate B-11 for further details.)

General resurfacing would be done in areas where deterioration of the channel surface has occurred over time. The stone masonry portion of the channel under downtown Walla Walla is the main area of concern. This repair would consist of installing anchors in the channel wall, and installing a reinforcing mat tied to the anchors on the wall. Once the reinforcement is installed, a 4- to 6-inch-thick layer of shotcrete or cast-in-place concrete would be placed on the

wall. This type of repair would be needed on approximately 950 feet of concrete channel wall. (Refer to Appendix B, Engineering, and Plate B-11 for further details.)

Center wall building support would be installed under the Die Brucke Building. Support under the building is currently constructed of steel pipe columns, with a timber plank and concrete/gravel infill between the columns. The repair would include removing the timber planks and infill and instead using a cast-in-place reinforced concrete wall constructed around the current steel pipe columns and anchored to the concrete footing below. The wall would be approximately 16 inches thick and approximately 150 feet long. This type of repair would be needed on approximately 150 feet of concrete channel wall. (Refer to Appendix B, Engineering, and Plate B-9 for further details.)

Wall replacement would occur where the wall is in poor condition. The replacement would consist of excavating behind the existing section of wall, cutting out the existing section of concrete wall, and forming a cast-in-place reinforced concrete footing and wall for that section. Once the new wall section has been fully cured, the forms would be removed and the fill behind the wall would be replaced. This type of repair would be needed on approximately 775 feet of concrete channel wall. (Refer to Appendix B, Engineering, and Plate B-11 for further details.)

Ceiling spans of the covered portion of the concrete channel section have significant deterioration in two locations and have been listed as a high priority for major rehabilitation, replacement, or removal by the City (Sargent 2016). The two locations are (1) an approximately 100-foot reach over the parking area between 2nd and 3rd Avenue (City owned), and (2) a 50-foot reach upstream of 2nd Avenue (privately owned). It is recommended for each location that the ceiling span be removed and guardrails placed around the new opening. The landowner of the location upstream of 2nd Avenue may make alternative repairs. (Refer to Appendix B, Engineering, Plates B-1, and B12 for further details.)

Setback Levees to Create an Approximately 350-Foot-Wide Floodplain – Setback levees would be constructed on both sides of Mill Creek upstream of the First Division Works. A setback levee is a levee placed further away from the channel bed than a traditional levee. They provide opportunities to increase habitat for wildlife. They also provide for more natural stream function with pooling areas and wetlands.

The right bank setback levee would extend from Rooks Park onto private land and reconnect to Mill Creek just upstream of the First Division Works. The left bank setback levee would be constructed on private property and tie into a hill on the south side of Mill Creek. The levee would reconnect with the existing Mill Creek levee about one half the distance between the First Division Works and the Diversion Dam. The toe of the hill would need to be armored with riprap to protect it from high flows. Other locations for setback levees were also explored. However, any areas below the First Division Works do not have sufficient water available during summer to maintain quality habitat due to most of the water being diverted to Yellowhawk Creek and other uses upstream.

There are two options considered for setback levees. Option 1 is to cut a notch at the upstream end of the existing levees for controlled overtopping where floodwaters could spill out onto the floodplain created by constructed setback levees. Option 2 is to lower the existing levees to the height of the channel stabilizers, to keep them anchored, and with constructed setback levees to contain floodwaters on the floodplain. Both options would also include an excavated low flow channel within the floodplain.

Levee Raise to Increase the Conveyance Capacity of the Mill Creek Channel - Levees would be raised using soil and rock to pass additional flows through the channel, reducing the flow diverted into Bennington Lake. There are a total of 20 bridges that span the channel that could need to be raised and/or modified to accommodate increased floodwater conveyance. For very large floods, the Project operations would be changed, but the diversion trigger would remain at 1,400 cfs. Materials would be placed on the crest and land side slope of the levees using heavy equipment such as frontend loaders, bull dozers, rollers, and dump trucks. No fill would be placed below the ordinary high water line. This measure is based on the assumption that the existing stabilizers can handle increased flows without modification. If selected, the measure would be scaled to determine the optimal level to meet the purpose and need and planning objectives.

Modify Project Operations - Project operations would be optimized based on structural changes to the Project resulting from implementation of this study. The current estimate is that Corps would increase the diversion trigger to 1,700 cfs, which would reserve additional flood storage space in Bennington Lake compared to the current diversion trigger of 1,400 cfs by delaying and reducing diversion flows. The estimate may change based on final analysis. During floods up to the designated diversion trigger, all flow would remain in the channel. During larger floods, up to 3,500 cfs would remain in the channel, with the remainder diverted to Bennington Lake. This would increase flood frequency and damages in limited areas downstream of the MCFCP within the 100-year floodplain. This would require a change to the Corps' Water Control Manual.

3.1.3.2 Non-Structural Measures

Relocate Emergency Services from Flood Zones - Fire stations, police stations, Red Cross shelter, and 911 emergency call center would be relocated outside of the Mill Creek flood zones.

Economically Viable Financing for Building Owners - Building owners would be reimbursed for expenses related to relocating outside of the Mill Creek flood zone.

Community Emergency Planning and Education - The emergency response procedures for multiple scenarios related to flooding including bridge or building collapse and evacuations would be updated and improved. Forums and literature would be used to educate the community on the emergency response procedures.

Update Emergency Action Plan/Hazard Maps - Local governments are encouraged by the Corps, FEMA, and other interested Federal partners to develop and maintain a Flood Emergency Preparedness Plan (FEPP). The FEPP would identify flood hazards, risks and vulnerabilities, and mitigation actions. The FEPP should incorporate the community's response to flooding, location of evacuation centers, primary evacuation routes, and post-flood recovery processes.

Address Forestry Practices in the Watershed - Floods from either snowmelt or from rainfall plus snowmelt originating on forest land are forest influenced. Forest management practices may be able to reduce peak flows and the amount of water conveyed through the MCFCP. Timber, fire, and grazing management could provide opportunities for moderating floods in the forested part of the upper Mill Creek watershed to reduce flood peak flows through the Project.

Buyout/Acquisition - This measure consists of buying structures and/or land, as well as inhibiting future development in undeveloped floodplain. Bought out structures are either demolished or sold to others and relocated outside of the floodplain. The Corps or Walla Walla County could also purchase sites to provide locations where displaced people can build new homes within an established community. Acquisitions could also include the purchase of necessary flowage easements in order to implement any measures that may increase inundation areas. This measure could reduce economic damages in the study area.

Flood Proofing - Flood proofing includes water-tight door and window seals, raising floor elevations of structures, installing check valves on gravity flow water and sewer lines, incorporating seepage controls, and sandbagging door openings during emergency situations. This measure could reduce economic damages in the study area.

Land Use Regulations - Land use regulations within a designated floodplain are effective tools in reducing flood risk and flood damage. The basic principles of these tools are based nationally in NFIP, which requires minimum standards of floodplain regulation for those communities that participate in the NFIP. For example, land use regulations may identify where development can and cannot occur and to what elevation structures should locate their lowest habitable floor.

3.1.4 Initial Qualitative Screening of Measures

The following screening criteria were used to qualitatively screen the initial list of 25 structural and 8 non-structural measures:

- <u>Must Satisfy (in part/whole) the Purpose and Need Statement</u>: The purpose and need statement (Section 1.5) includes the following criteria for alternatives development: (1) Reduce total flood risk to Walla Walla and surrounding areas; (2) comply with applicable treaties, laws, regulations, and executive orders, and regulation; (3) not adversely affect existing water rights; (4) be capable of reasonably maximizing the contribution to national economic development (NED), based on preliminary cost and benefit

evaluation[2]; (5) be technically and economically feasible; and (6) environmentally acceptable.

- Must Satisfy At Least One Planning Objective: Planning objectives described in Section 1.11.1: (1) Reduce risks to public safety and public and private infrastructure due to flooding along Mill Creek, and (2) Reduce flood-related damages and economic consequences to the community of Walla Walla.
- Does Not Violate Any Planning Constraints: Each measure was reviewed to determine whether any planning constraints, described in Section 1.11.2, would be violated if the measure was implemented.

Measures were screened out if any of the above three screening criteria were not met. As shown Table 3-1, the initial qualitative screening process resulted in screening out 22 measures and carrying forward 11 measures.

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[2] As part of this initial screening process, a preliminary cost and benefit determination was used to identify alternatives that would be capable of reasonably maximizing the contribution to NED, consistent with protecting the Nation's environment. (See Table 3-5.)

Table 3-1. Initial Qualitative Screening of Measures Summary

Measure	Satisfies Purpose and Need*	Meets Planning Objectives	Does Not Violate Planning Constraints	Carried Forward
Structural Measures				
Pine Creek Reservoir	N: (4), (5)	N	Y	
Mill Creek Reservoir at 5-Mile	N: (4), (5), (6)	N	Y	
Mill Creek Watershed Reservoir	N: (4), (5)	N	Y	
Titus Creek as a Conveyance	N: (1)	N	N	
Increase Russell Creek Outlet Canal Capacity	N: (4)	Y	N	
Increase the Capacity of Distributaries	N: (1), (4)	N	Y	
Emergency Floodway	N: (4), (5)	N	Y	
Deepen Existing Mill Creek Channel	N: (4), (5), (6)	Y	Y	
Construct a Natural Surface at the Bottom of the Channel	N: (1), (5)	N	Y	
Tunnel underneath Channel for Flood Flows	N: (1), (4), (5)	Y	Y	
Widen Channel from Diversion Dam to Gose Street	N: (4), (5)	Y	Y	
Extend the Levees Upstream and Downstream	N: (4), (6)	N	Y	
Reduce Bottlenecks in the Concrete Channel	N: (4), (5)	Y	N	
Reduce Bottlenecks at Bridges	N: (4), (5)	Y	N	
Naturally Flowing Channel Downtown and Bypass Flood Flows	N: (4), (5)	Y	N	
Excavation of Bennington Lake to Increase Storage Capacity	Y	Y	Y	✓
Construct a New Storage Reservoir on Mill Creek just Downstream of Blue Creek	N: (4), (5)	Y	Y	
Construct a New Small Storage Reservoir by Building a Dike near Russell Creek	N: (4), (5)	Y	Y	
Mill Creek Storage Dam Raise to Increase Storage Capacity	Y	Y	Y	✓
North Bypass Channel	N: (4), (5)	Y	Y	
South Bypass Channel	N: (4), (5)	Y	Y	
Rehabilitate Deteriorating Sections of the Concrete Channel	Y	Y	Y	✓
Setback Levees to Create an Approximately 350-Foot-Wide Floodplain	N: (1), (4)	Y	Y	
Levee Raise to Increase the Conveyance Capacity of Mill Creek	Y	Y	Y	✓
Modify Project Operations	Y	Y	Y	✓
Non-Structural Measures				
Relocate Emergency Services from Flood Zones	N: (4), (5)	Y	Y	
Economically Viable Financing for Building Owners	N: (4), (5)	Y	Y	
Community Emergency Planning and Education	Y	Y	Y	✓
Update Emergency Action Plan/Hazard Maps	Y	Y	Y	✓
Address Forestry Practices in the Watershed	Y	Y	Y	✓
Buyout/Acquisition	Y	Y	Y	✓
Flood Proofing	N: (4), (5)	Y	Y	
Land Use Regulations	Y	Y	Y	✓

*(1) Reduce total flood risk to Walla Walla and surrounding areas; (2) comply with applicable treaties, laws, regulations, and executive orders, and regulation; (3) not adversely affect existing water rights; (4) be capable of reasonably maximizing the contribution to national economic development (NED), based on preliminary cost and benefit evaluation; (5) be technically and economically feasible; and (6) environmentally acceptable.

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3.1.5 Justification for Eliminating Measures after Initial Qualitative Screening

The following paragraphs provide a justification for each of the 23 measures screened out by the initial qualitative screening process.

Pine Creek Reservoir - This measure was removed because Pine Creek and Mill Creek are located in different watersheds, and building a reservoir on Pine Creek would transfer the risk of flooding to other populated areas downstream of Pine Creek not equipped with the proper flood reduction infrastructure. Additionally, the cost to transfer water over 14 miles would be extremely high and would exceed expected benefits.

Mill Creek Reservoir at 5-Mile - This measure would have significant environmental impacts due to the development of floodplains and loss of riparian forest and would require extensive mitigation to remain in compliance with applicable laws, regulations, and executive orders. Due to the large footprint that would be required to store a meaningful volume of water, the costs of construction and mitigation would exceed the expected benefits?

Mill Creek Watershed Reservoir - Based on limited storage capacity due to the steep terrain and narrow canyon, this measure was eliminated because the costs of constructing a high head dam and mitigating environmental impacts would exceed the expected benefits.

Titus Creek as a Conveyance - This measure was eliminated because it does not meet the planning objectives as it is not a complete distributary. Titus Creek returns to Mill Creek above the city and therefore provides no flood protection.

Increase Russell Creek Outlet Canal Capacity - This measure was eliminated because the cost of buying out and relocating the residences that have encroached into the floodplain exceeds the expected benefits.

Increase the Capacity of Distributaries - This measure was eliminated because it would transfer flood risks and hundreds of homes would be affected and the planning objectives would not be met. Costs would exceed expected benefits if houses were bought out and relocated.

Emergency Floodway - There is a very high cost of constructing this measure because of enormous volumes would need to be excavated due to the topography. This measure was eliminated because these costs would exceed the expected benefits.

Deepen Existing Mill Creek Channel - The costs of deepening the channel over a 7 mile distance, removing and reconstructing the concrete floor, and rebuilding the channel walls would be very high. This measure was eliminated because the costs would exceed the expected benefits.

Construct a Natural Surface at the Bottom of the Channel - The concrete floor was put in to support the concrete walls and prevent undercutting, therefore removing the floor would

increase the flood risk. This measure was eliminated because it does not meet the planning objectives.

Tunnel underneath Channel for Flood Flows - This measure was eliminated because of extreme technical limitations and because the very high cost would exceed expected benefits.

Widen Channel from Diversion Dam to Gose Street - This measure was eliminated because the real estate costs and the buyout and relocation of multiple buildings and houses would exceed expected benefits.

Extend the Levees Upstream and Downstream - This measure was eliminated because it does not meet the planning objectives. This measure would only benefit the areas surrounding the levee extension, and because these are generally undeveloped areas, the costs of this measure would exceed the expected benefits.

Reduce Bottlenecks in the Concrete Channel - This measure was eliminated because the costs of relocating multiple buildings located at the bottlenecks would exceed the expected benefits.

Reduce Bottlenecks at Bridges - This measure was eliminated because it would be extremely expensive for little to no flood risk reduction benefit.

Naturally Flowing Channel Downtown and Bypass Flood Flows - This measure was eliminated because its costs exceed the expected benefits.

Mill Creek Reservoir at Blue Creek - This measure was eliminated because the costs of construction and mitigation would exceed the expected benefits.

Downstream Dike at Russell Creek - This measure was eliminated because the costs of construction and mitigation would exceed the expected benefits.

North Bypass Channel - This measure was eliminated because the costs of construction and mitigation would exceed the expected benefits.

South Bypass Channel - This measure was eliminated because the costs of construction and mitigation would exceed the expected benefits.

Setback Levees - This measure was eliminated because it does not meet the planning objectives for this flood risk management study. Furthermore, this measure was eliminated because the real estate costs and the buyout and relocation of multiple buildings and houses would exceed expected benefits. Although this measure was eliminated, it could be implemented by other entities.

Flood Proofing - Flood proofing structures located within the flood zone would provide a high level of flood protection. However, the costs of flood roofing the large number of structures located within the flood zone would greatly exceed the associated benefits. This measure may be reconsidered if operational changes adversely impact properties downstream of the project.

Relocate Emergency Services Away from Flood Zones - This measure was eliminated because costs associated with relocation critical infrastructure would be expected to exceed the associated benefits by a wide margin. All two hospitals, two police stations, and two fire stations are located within the area protected by the existing project. Instead of relocating emergency services, the Corps recommends city and county emergency officials develop an emergency action plan for police, fire, and hospitals to continue providing services in the event of a flood event that leaves the channel.

Economically Viable Financing for Building Owners - This measure was eliminated because the costs of relocating downtown local businesses out of the floodplain would be extremely high and exceed the associated benefits. Also, local businesses have not expressed an interest in relocating away from downtown Walla Walla. The City's 2018 Comprehensive Plan Update has a goal to make downtown Walla Walla full of thriving businesses to become the economic center of the community.

3.1.6 Measures Carried Forward after Initial Qualitative Screening

After the initial qualitative screening, the following 5 structural measures and 6 non-structural measures were carried forward for further analysis.

- Excavation of Bennington Lake to Increase Storage Capacity.
- Mill Creek Storage Dam Raise to Increase Storage Capacity.
- Rehabilitate Deteriorating Sections of the Concrete Channel.
- Levee Raise to Increase the Conveyance Capacity of Mill Creek.
- Modify Project Operations.
- Community Emergency Planning and Education.
- Update Emergency Action Plan/Hazard Maps.
- Address Forestry Practices in the Watershed.
- Buyout/Acquisition.
- Land Use Regulations.

3.1.7 Relative Ranking Screening of Measures

In order to better evaluate the remaining measures under criteria 4 of the purpose and need statement (reasonably maximize the contribution to NED), they were compared to each other using a more refined analysis. The measures were scaled at three different levels of flood protection to compare the relative costs and environmental impacts and determine the most effective means of meeting the purpose and need and planning objectives for the study.

The relative ranking screening focuses on the cost effectiveness of reducing flood risks, taking into account environmental considerations. Of the five structural measures carried forward

from the initial screening, the following two measure were not included in the relative ranking screening, but were carried forward for further analysis because they address reliability and performance issues rather than capacity issues. The modification of project operations and the concrete channel rehabilitation are considered to be justified on both cost effectiveness and environmental risks. The scaling of these measures will be defined based on the physical features of the Tentatively Selected Plan (TSP):

- Concrete Channel Rehabilitation - The purpose of this measure is to address reliability issues, not to increase flood risk protection (it would not change the current flood risk reduction capacity of the Project). This will be considered as a part of any TSP that relies on the reliability of the concrete channel. Therefore, this measure does not require comparison with the other measures to determine which is more cost effective at reducing flood risk. This measure has low environmental risks. This measure would be optimized to address the key reliability issues within the concrete channel, as defined in Section 3.1.9. The nature and magnitude of the work will be defined by a risk assessment in a potential failure mode analysis, as presented in Appendix B.
- Modification of Project Operations Operational changes will be considered as part of any TSP that includes changes to structural components. Project operations should be optimized in order to maximize the benefits from the new capacity of the system. This is considered a minimal cost (likely cost savings for OMRR&R) measure that maximizes the benefit of other measures, with both flood protection and environmental benefits, and therefore does not require a cost effectiveness comparison.

Three of the remaining five structural measures carried forward are associated with the capacity of the MCFCP and were scaled to common levels of flood risk management protection to allow simple and direct comparison of each measure's cost effectiveness against a range of sizes. These sizes were categorized as small, moderate, and large modification to existing Project. Relative screening determined the most cost-effective measure to meet the target flood risk protection as measures in its same category. Analysis was conducted using a rough MATLAB-based tool that assessed the proposed project's impacts to flows and flow frequencies; a brief explanation of how flood risk targets were selected is provided below (See Appendix A, Hydrology and Hydraulics, for more detail).

Small Modification to Existing Project Comparison

Small project modifications were compared to determine the most cost effective way to provide an increase in flood risk reduction. The options considered were a small levee raise, a small dam raise, and a small excavation in the reservoir pool. The comparison was made starting with a 2-foot dam raise. Mill Creek Storage Dam was originally built with this additional 2 feet. The height of the dam was reduced to accommodate the width of an access road across the dam. This modification would involve raising Mill Creek Storage Dam to its original height, and the Diversion Dam as well as associated structures. The 2-foot dam raise was determined as a 2-foot increase in the pool maximum water surface elevation of 1,265. The actual heights

of the dam may need to be raised more or less than 2 feet depending on settlement or changes in design guidance.

The equivalent excavation volume to match a 2-foot dam raise was determined using the rough models created using MATLAB. Similarly, the HEC-RAS model was used to determine the height of levee raise required to provide the increased flow to match the level of flood protection provided by the small dam raise and small excavation. In this way, the dam raise, excavation, and levee raise all would provide the same flood risk reduction benefit, from around a 0.5 percent annual chance exceedance flood (200 year) to 0.43 percent chance exceedance flood (230 year), and could be directly compared.

In addition, there are levees with less than 2 feet of freeboard with the 3,500-cfs flow rate and would not likely meet FEMA accreditation requirements in their present condition. Table 3-2 summarizes the pertinent information.

Table 3-2. Small Modification to Existing Project Comparison

	Design Flood Risk Management	Dam Raise (feet)	Reservoir Excavation (acre-feet)	Rise in Water Surface compared to 3,500 cfs (feet)	Levee Raise (feet) to get 3-foot freeboard	Flow through levee/concrete channel reach (cfs)
Small Dam Raise	0.43-Percent (230 year)	2				3,500
Small Excavation	0.43-Percent (230 year)		462			3,500
Small Levee Raise	0.43-Percent (230 year)			0.40	0.0 – 1.5 depending on location	3,700

The following are descriptions of the scaled measures categorized as small project modifications:

Storage Dam Raise: Small – Mill Creek Storage Dam and possibly the Mill Creek Diversion Dam, Diversion Dam dike, and the Mill Creek Levee Extension would be raised by 2 feet. The actual heights of the dam may need to be raised more or less than 2 feet, depending on current design and dam and levee safety criteria. This measure would increase storage capacity by 474 acre-feet.

Excavation of Bennington Lake: Small - Location of the excavation and MCFCP operations would remain as described above under the large lake excavation description. A small lake excavation would remove about 0.5 million cubic yards of material from the reservoir rim using heavy equipment such as excavators, scrapers, frontend loaders, and dump trucks. The majority of excavated material would likely have to be disposed of offsite. This would increase the current

lake capacity by 370 acre-feet from the reservoir floor adding to the storage volume available. The excavation was taken above pool elevation 1,205 and below elevation 1,265.

Levee Raise to Increase the Conveyance Capacity of Mill Creek: Small - Levees would be raised throughout the Project by up to 1.5 feet to be certifiable for the 1 percent annual chance exceedance flood of 3,700 cfs. Levees would be raised with soil and rock using heavy equipment such as frontend loaders, bull dozers, rollers, and dump trucks. No fill would be placed below the ordinary high water line. Fill would be placed on the levee crest and the landside portion of the levee. For very large floods, the Project operations would be changed to pass 3,700 cfs through the channel, rather than the current 3,500 cfs, before diverting the remainder of the flow into Bennington Lake, but the diversion trigger would remain at 1,400 cfs. The levee raise assumes that the existing stabilizers can handle increased flows without modification.

Moderate Modification to Existing Project Comparison

Moderate project modifications were compared to determine the most cost effective way to provide an increase in flood risk reduction. The options considered were a moderate levee raise, a moderate dam raise, or a moderate excavation in the reservoir pool. Scaling the moderate modification was a result of matching the levee conveyance capacity with the concrete channel maximum capacity. The comparison equated to a 5 foot dam raise. This would involve raising Mill Creek Storage Dam and the Diversion Dam as well as associated structures. The 5 foot dam raise was determined as a 5 foot increase in the pool maximum water surface elevation of 1,265. The actual heights of the dam may need to be raised more or less than 5 feet depending on settlement or changes in design guidance.

The equivalent excavation volume to a 5-foot dam raise was determined using the rough models created using MATLAB. The HEC-RAS model was used to determine the height of levee raise required to handle the increased regulated flow. The levee raise was based on the increase in water surface elevation that resulted increasing the maximum flow in the levee reach from 3,500 cfs to the new design release. In this way, the dam raise, excavation, and levee raise all would provide the same flood risk reduction benefit, which increases flood risk reduction from a 0.5 percent annual chance exceedance flood (200 year) to a 0.37 percent annual chance exceedance flood (270 year). Table 3-3 summarizes the pertinent information.

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Table 3-3. Moderate Modification to Existing Project Comparison

	Design Flood Risk Management	Dam Raise (feet)	Reservoir Excavation (acre-feet)	Rise in Water Surface compared to 3,500 cfs (feet)	Levee Raise (feet)	Flow through levee/concrete channel reach (cfs)
Moderate Dam Raise	0.37-Percent (270 year)	5				3,500
Moderate Excavation	0.37-Percent (270 year)		1,188			3,500
Moderate Levee Raise	0.37-Percent (270 year)			0.75	2.0 or greater depending on location	4,000

The following are descriptions of the scaled measures categorized as moderate project modifications:

Storage Dam Raise: Moderate – The Mill Creek Storage Dam and possibly the Mill Creek Diversion Dam, Diversion Dam dike, intake channel, headworks, and the Mill Creek Levee Extension would be raised by up to 5 feet. The actual heights of the dam and appurtenances may need to be raised more or less than 5 feet, depending on current design and dam and levee safety criteria. This measure would increase storage capacity by 1,157 acre-feet.

Excavation of Bennington Lake: Moderate - Location of the excavation and MCFCP operations would remain as described above under the large lake excavation description. A moderate lake excavation would remove up to 1.9 million cubic yards of materials from the reservoir rim using heavy equipment such as excavators, scrapers, frontend loaders, and dump trucks. The majority of excavated material would likely have to be disposed of offsite. This would increase the current lake capacity by 1,188 acre-feet above pool elevation 1,205 and below elevation 1,265.

Levee Raise to Increase the Conveyance Capacity of Mill Creek: Moderate – Several levee reaches would be raised by about up to 2 feet or greater. The reach with the largest raise is anticipated to be between 9th Street and Myra Road, on both the left and right banks. Raising levees by this amount would also allow the levees to be certifiable for the 1 percent annual chance exceedance flood of 3,700 cfs. Materials would be placed on the crest and land side slope of the levees using heavy equipment such as frontend loaders, bull dozers, rollers, and dump trucks. No fill would be placed below the ordinary high water line. For very large floods, the Project operations would be changed to pass 4,000 cfs through the channel rather than the current 3,500 cfs before diverting the remainder of the flow into Bennington Lake, but the diversion trigger would remain at 1,400 cfs. This measure is based on the assumption that the existing stabilizers can handle increased flows without modification.

Large Modification to Existing Project Comparison

Large project modifications were compared to determine the most cost effective way to provide an increase in flood risk reduction. The options considered were a large levee raise, a large dam raise, or a large excavation in the reservoir pool. The comparison was made using a maximum Mill Creek storage Dam raise of 9 feet. This would include raises to the Diversion Dam as well as associated structures. It was determined that 9 feet would be the highest increase possible without a complete reconstruction of the dam. The 9-foot dam raise was determined as a 9-foot increase in the pool maximum water surface elevation of 1,265. This equated to a maximum excavation in the Bennington Reservoir of 2,209 acre feet. The actual heights of the dam may need to be raised more or less than 9 feet depending on settlement or changes in design guidance.

The equivalent regulated flow increase was determined that would offset the dam raise or excavation using the rough models created using MATLAB. The HEC-RAS model was used to determine the height of levee raise required to handle the increased regulated flow. The levee raise was based on the increase in water surface elevation that resulted from increasing the maximum flow in the levee reach from 3,500 cfs to the new design release. In this way, the dam raise, excavation, and levee raise all provide the same flood risk reduction benefit, which increases flood risk reduction from a 0.5 percent annual chance exceedance (200 year) to a 0.32 percent annual chance exceedance flood (310 year). Table 3-4 summarizes the pertinent information.

Table 3-4. Large Modification to Existing Project Comparison

	Design Flood Risk Management	Dam Raise (feet)	Reservoir Excavation (acre-feet)	Rise in Water Surface compared to 3,500 cfs (feet)	Levee Raise (feet)	Flow through levee/concrete channel reach (cfs)
Large Dam Raise	0.32-Percent (310 year)	9				3,500
Large Excavation	0.32-Percent (310 year)		2,209			3,500
Large Levee Raise	0.32-Percent (310 year)			1.2	0 – 2.7 depending on location	4,300

The following are descriptions of the scaled measures categorized as large project modifications:

Storage Dam Raise: Large - The Mill Creek Storage Dam and the Mill Creek Diversion Dam, Diversion Dam dike, intake channel, headworks, and the Mill Creek Levee Extension would be raised by up to 9 feet to increase storage and diversion capacities. The 9-foot dam raise was determined as a 9-foot increase in the pool maximum water surface elevation of 1,265. The actual heights of the dam and appurtenances may need to be raised more or less than 9 feet,

depending on current design and dam and levee safety criteria. This measure would increase storage capacity by 2,129 acre-feet.

Excavation of Bennington Lake: Large - The operation plan for the MCFCP would remain as it is today, with the exception that there would be additional capacity added to Bennington Lake. Lake excavation would include excavation of the northern end of Bennington Lake. There is a mound of high ground within the reservoir between the intake canal outlet and left reservoir rim (looking toward the Storage Dam).

A large lake excavation would remove up to 3.5 million cubic yards of material from the reservoir rim using heavy equipment such as excavators, scrapers, frontend loaders, and dump trucks. The majority of excavated material would likely have to be disposed of offsite. This would increase the current lake capacity by 2,209 acre-feet. The current lake size at elevation 1,205 (recreational pool level) is 52 acres; there would be no change to this footprint if all excavation was done above this elevation. Flow passing the Diversion Dam would have a target flow of 3,500 cfs. There would be no change to this footprint under this measure. This measure is based on changes to the designed capacity.

Levee Raise to Increase the Conveyance Capacity of Mill Creek: Large - Levees would be raised using soil and rock to pass flows up to 4,300 cfs through the channel, rather than 3,500 cfs, before diverting the remainder of the flow into Bennington Lake. There are a total of 20 bridges that span the channel that would likely need to be raised and/or modified to accommodate the floodwater conveyance at 4,300 cfs. For very large floods, the project operations would be changed, but the diversion trigger would remain at 1,400 cfs. Materials would be placed on the crest and land side slope of the levees using heavy equipment such as frontend loaders, bull dozers, rollers, and dump trucks. No fill would be placed below the ordinary high water line. This measure is based on the assumption that the existing stabilizers can handle increased flows without modification.

Relative Ranking and Screening of Measures

After scaling each of the three structural measures relating to project performance, the nine structural measures were screened based on the cost effectiveness of reducing flood risks and taking into consideration environmental risks.

For purposes of ranking these measures, they were categorized as either high, moderate, or low based on the modeling and cost estimate data provided. The criteria are mutually exclusive and collectively exhaustive (Table 3-5):

Flood Risk Reduction Benefits (based on modeled results):

- High: less than or equal to 0.33 percent annual chance of exceedance.
- Moderate: between 0.33 and 0.42 percent annual chance of exceedance.
- Low: higher than or equal to 0.42 percent annual chance of exceedance.

Cost Ranking (based on grouping of cost engineering estimates):

- Low: less than $10 million.
- Moderate: $11 - $39 million.
- High: greater than $40 million.

Environmental Effects:

- Low: The measure would result in no impact, or the impact would not change the resource condition in a perceptible way.
- Moderate: The measure's effect to the resource would be perceptible; however, it would not be major and unlikely to result in an overall change in resource character.
- High: The measure's effect to the resource would be perceptible and could result in an overall change in resource character and the effects should be considered in the decision-making process.

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Table 3-5. Relative Ranking Screening Summary

Measures	Screening Criteria				
	Flood Protection Level (Annual Chance of Exceedance)	**Relative Ranking of Flood Risk Reduction**	**Estimated First Cost of Construction (as of November 2018)**	**Relative Ranking of Costs**	**Relative Environmental Effects**
Storage Dam Raise: Small	0.43 percent	Low	$32,790,000	Moderate	Low
Lake Excavation: Small	0.43 percent	Low	$36,976,000	Moderate	Moderate
Levee Raise: Small	0.43 percent	Low	$1,880,000	Low	Low
Storage Dam Raise: Moderate	0.37 percent	Moderate	$43,610,000	High	Low
Lake Excavation: Moderate	0.40 percent	Moderate	$97,486,000	Very High	Moderate
Levee Raise: Moderate	0.40 percent	Moderate	$4,532,000	Low	Low
Storage Dam Raise: Large	0.32 percent	High	> $59 million[1]	High	Low
Lake Excavation: Large	0.32 percent	High	$186,530,000	Very High	Moderate
Levee Raise: Large	0.32 percent	High	> $42 million[1]	High	Low

[1] No cost estimate completed.

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3.1.8 Justification for Structural Measures Screened Out by Relative Ranking

The following paragraphs provide a justification for each of the seven structural measures screened out by the relative ranking screening process.

Lake Excavation: Small - A small excavation is rated as low flood risk protection at a moderate cost. It was determined during this comparison analysis that a small or moderate levee raise would more efficiently provide the same target level of protection.

Lake Excavation: Moderate - This measure was eliminated because the cost to remove, haul, and dispose of 1.9 million cubic yards of material would be very high compared to expected benefits from this amount of additional storage. It was determined during this comparison analysis that a small or moderate levee raise would more efficiently provide the same target level of protection.

Lake Excavation: Large - This measure was eliminated because the cost to remove, haul, and dispose of 3.5 million cubic yards of material would be very high relative to the expected benefits from this amount of additional storage.

Storage Dam Raise: Small - A small storage dam raise is rated as low flood risk protection at a moderate cost. It was determined during this comparison analysis that a small or moderate levee raise would more efficiently provide the same target level of protection.

Storage Dam Raise: Moderate - This measure was eliminated because of the high cost to raise the storage dam and raise all the additional Project features (Diversion Dam, Diversion Dam dike, intake channel, headworks, and the Mill Creek Levee Extension). Additionally, flood risks reduction is moderate, but there is an increased potential flood risk caused by excess loading on the existing dam which would incrementally increase the probability and consequence of a dam failure.

Storage Dam Raise: Large - This measure was eliminated because of the high cost to raise the Storage Dam and raise all the additional Project features (Diversion Dam, Diversion Dam dike, intake channel, headworks, and the Mill Creek Levee Extension). Additionally, flood risks reduction is high, but there is an increased potential flood risk caused by excess loading on the existing dam, which would incrementally increase the probability and consequence of a dam failure.

Levee Raise: Large - This measure was eliminated because the cost associated with construction, bridge raises, and real estate would be high. Additionally, a large levee raise would also increase risk of more severe flooding (by 800 cfs) to areas protected by the levees if the levees failed. Water begins flowing out of the channel downstream of Gose Street at 1,700 cfs according to the Water Control Manual (Corps 2006). Currently, the project sends up to 3,500 cfs through the channel during high floods; an increase to 4,300 cfs would increase the

volume of water flowing out of the channel and cause more damage to some areas downstream of the project in the 100-year floodplain.

3.1.9 Structural Measures Carried Forward after Relative Ranking Screening

After the relative ranking screening, the following four structural measures were carried forward for further analysis.

Rehabilitate Existing Concrete Channel - To minimize the cost of this measure as originally described in Section 3.1.3, only the highest priority areas would be addressed. This optimized channel rehabilitation measure would include the following three repairs (the original measure had five): wall tiebacks (Plate B11), center wall reinforcement (Plate B-9), and removal of ceiling spans in the covered portion of the channel (Plates B-1 and B-12). The wall tiebacks would be for 500 feet of channel, rather than the 4,100 feet described in the original measure. The other two repairs would be the same as originally described. (Refer to Appendix B, Engineering; the plates indicated after each repair provide further details.)

Levee Raise: Moderate - This measure would increase the conveyance of floodwater through the leveed sections of the channel by 500 cfs. Four sections of levees would be raised providing flood protection to the 250-year flood protection level (0.40 percent annual chance of exceedance). There is an increased risk of more severe flooding to areas protected by the levees if the levees failed. Water begins flowing out of the channel downstream of Gose Street at 1,700 cfs, according to the Water Control Manual (Corps 2006). Currently, the Project sends up to 3,500 cfs through the channel during high floods; an increase to 4,000 cfs would increase the volume of water flowing out of the channel and cause more damage to some areas downstream of the Project in the 100-year floodplain.

Levee Raise: Small - A small levee raise would provide flood protection at the 230-year flood protection level (0.43 percent annual chance exceedance). There is an increased risk of more severe flooding to areas protected by the levees if the levees failed. Water begins flowing out of the channel downstream of Gose Street at 1,700 cfs, according to the Water Control Manual (Corps 2006). Currently, the Project sends up to 3,500 cfs through the channel during high floods; an increase to 3,700 cfs would increase the volume of water flowing out of the channel downstream and cause more damage to the unprotected areas.

Modify Project Operations - The Corps would evaluate changes in the operation of the Project as part of the selected plan. Potential changes could include an increase in the diversion trigger and/or target maximum flow rate. The benefits and downstream impacts of this measure must be analyzed and balanced with the features of the selected alternative.

3.1.10 Non-Structural Measures Carried Forward

After the relative ranking screening, the following five non-structural measures were carried forward for further analysis. Four of these measures were removed from further consideration and were instead categorized as Corps recommendations because the responsibility or jurisdiction lies with residents, local governments, and other Federal agencies.

Buyout/Acquisition - Potential buyouts would be determined by the optimization of operational changes. The scope is limited to approximately 19 non-habitable structures located downstream of the Project.

Community Emergency Planning and Education - This measure would provide a high level of flood risk protection at a low cost. The Corps assumes the city of Walla Walla and Walla Walla County will continue to provide appropriate levels of planning and education related to areas located in high flood risk locations. For that reason, the Corps will remove this measure from further screening and recommend the City of Walla Walla and Walla Walla County continue planning and providing education outreach to the community.

Update Emergency Action Plan/Hazard Maps - This measure provides a high level of flood risk protection at low costs. The Corps recommends local governments, FEMA, and other interested Federal partners to update and maintain an FEPP. The Corps will remove this measure from further screening and recommends interested parties update their current emergency plans and hazard maps when necessary.

Address Forestry Practices in the Watershed - Forestry management practices would provide low flood risk protection at low costs associated with timber, fire, and grazing management. The upper Mill Creek watershed is managed by the U.S. Forest Service and the City of Walla Walla. The Corps has recommendations for potential actions and will work with the U.S. Forest Service to assist in future decision making within the watershed to improve flood risk management over time. For that reason, the Corps will remove this measure from further screening and recommend addressing forestry practices to the U.S. Forest Service.

Land Use Regulations - Land use regulations within the floodplain would provide high levels of flood risk protection by limiting floodplain development or implementing construction guidance, such as raised platforms, for new floodplain construction. It was assumed costs associated with land use regulations could exceed $25 million in permitting fees and additional construction requirements. Walla Walla County has jurisdiction over zoning and floodplain development. For that reason, the Corps will remove this measure from further screening and recommend land use regulations to the City of Walla Walla and Walla Walla County.

3.1.11 Alternative Formulation

Four structural measures and one non-structural measure remain from which to formulate alternatives after the initial qualitative screening, the relative ranking screening, and moving

several non-structural measures from consideration to recommendations for others to implement.

An alternative is a set of one or more measures functioning together to meet the identified planning objectives (Section 1.11.1) subject to the planning constraints (Section 1.12.2).

In this section, the five remaining measures are screened both as standalone alternatives (an alternative with a single measure that can stand on its own) and in combination with other measures, according to the following four criteria (Table 3-6):

- **Completeness:** An alternative is considered complete when it provides and accounts for all necessary investments or actions (to include actions by others) to ensure the realization of the planning objectives.
- **Effectiveness:** The effectiveness of an alternative is how well an alternative addresses the problems and realizes the objectives, and it factors in whether there is substantial risk and uncertainty associated with the alternative.
- **Efficiency:** The efficiency of an alternative is determined by how cost effective the plan is at addressing the specified problems and realizing the specified objectives consistent with protecting the Nation's environment.
- **Acceptability:** An acceptable alternative is workable and viable as determined by Federal, non-Federal, and public perceptions, while complying with all applicable policies, laws, and regulations. Two primary factors for measuring acceptability are the implementability and satisfaction of the alternative.

Eight alternatives were analyzed, including the No Action Alternative. The No Action Alternative in this study is the same as the future without project conditions explained in Section 2.1. The No Action Alternative sets the baseline from which other alternatives are compared. Although the No Action Alternative is named as such, it does not mean that there would be no impacts from this alternative.

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Table 3-6. Completeness, Effectiveness, Efficiency, and Acceptability Screening Summary

Alternative		Screening Criteria			
		Complete	Effective	Efficient	Acceptable
Alternative 1	No Action	Yes	Yes	Yes	Yes
Alternative 2	Standalone Concrete Channel Rehabilitation	Yes	No	Yes	Yes
Alternative 3	Standalone Levee Raise: Moderate	Yes	No	Yes	Yes
Alternative 4	Standalone Levee Raise: Small	Yes	No	Yes	Yes
Alternative 5	Standalone Modify Project Operations	Yes	No	Yes	Yes
Alternative 6	Standalone Buyout/Acquisition	No	No	No	No
Alternative 7	Modify Project Operations Levee Raise: Small Concrete Channel Rehabilitation Buyout/Acquisition	Yes	Yes	Yes	Yes
Alternative 8	Modify Project Operations Levee Raise: Moderate Channel Rehabilitation Buyout/Acquisition	Yes	Yes	Yes	Yes

3.1.12 Justification for Structural Measures Screened Out by Completeness, Effectiveness, Efficiency, and Acceptability Screening

Five alternatives were eliminated from further consideration after the Completeness, Effectiveness, Efficiency, and Acceptability screening. The following paragraphs provide a justification for their removal.

Alternative 2: Standalone Concrete Channel Rehabilitation - Concrete channel rehabilitation was eliminated from consideration as a standalone alternative because it does not completely address the planning objectives. Rehabilitating the concrete channel would increase the reliability of the Project, but not the capacity. There would be no increased storage capacity in Bennington Lake, and the levees would still be the limiting factor in the amount of floodwater that could be conveyed through the channel. Preliminary analysis indicates that the economic benefits of the set of actions proposed would exceed the associated costs. However, the reliability of the vulnerable components is dependent on the flows that are conveyed through the system and therefore needs to be considered in combination with those flows. Each element of the channel rehabilitation would be incrementally justified in the final analysis of the refined and optimized recommended plan.

Alternative 3: Standalone Levee Raise: Moderate - A moderate levee raise was eliminated from consideration as a standalone alternative because it does not completely address the planning objectives. A moderate levee raise would slightly increase the capacity and performance of the Project, but would not increase reliability. A moderate levee raise would pass an additional 500 cfs through the system during each flood event without addressing any structural degradation of adjacent concrete structures, which would increase the likelihood of failure because the reliability issues in the channel would not be addressed.

Alternative 4: Standalone Levee Raise: Small - A levee raise of up to 1.5 feet throughout the Project was eliminated from consideration as a standalone alternative because it does not completely address the planning objectives. A small levee raise would slightly increase the capacity and performance of the Project, but would not increase the reliability of the Project. A small levee raise would not be effective because the channel conveyance capacity would only increase by 200 cfs, which is still well below the capacity of the concrete channel.

Alternative 5: Standalone Modify Project Operations - A change in the diversion trigger to 1,700 cfs was eliminated from consideration as a standalone alternative because it does not completely address the planning objectives. An operational change would increase capacity and performance, but not Project reliability. An operational change would not be effective because larger volumes of floodwater would be passed through the concrete channel section during each flood event without having reinforced the concrete, which would increase the likelihood of failure because the reliability issues in the channel would not be addressed.

Alternative 6: Standalone Buyout/Acquisition - Buying structures and land and inhibiting future development in undeveloped floodplain was eliminated as a standalone alternative because it does not meet any of the screening criteria. This measure could be added to any alternative, as necessary, to offset any increased flood frequency or potential damages from modifications to the existing Project.

3.1.13 Final Array of Alternatives

Based on the results from the third screening, the final array of alternatives includes the No Action Alternative, Alternative 7, and Alternative 8. The three alternatives are compared in Table 3-7.

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Table 3-7. Final Array of Alternatives Summary

Optimized Alternatives	Estimated First Cost of Construction (FY 2020 Price Level)	Average Annual Cost[1]	Average Annual Benefit	Benefit Cost Ratio (BCR)	Net Annual Benefit
Alternative 1 No Action	-	-	-	-	-
Alternative 7 Modify Project Operations Levee Raise: Small Channel Rehabilitation Buyout/Acquisition	$9,928,000	$345,000	$532,000	1.54	$187,000
Alternative 8 Modify Project Operations Levee Raise: Moderate Channel Rehabilitation Buyout/Acquisition	$12,580,000	$445,000	$497,000	1.12	$52,000

[1] Includes estimated net change in annual OMRR&R costs

Based on cost and benefit analysis, Alternative 7 has the highest net benefits. A detailed analysis of the environmental effects is presented in Chapter 4. However, it is worth noting that the results of the environmental analysis show that there are no significant environmental impacts and that the impacts associated with Alternative 8 are similar in nature and slightly larger in magnitude. Therefore, Alternative 7 is the NED Plan.

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SECTION 4 - ENVIRONMENTAL EFFECTS

Background Photo: Trail near Bennington Lake

Photo Credit: Audrey Gossett, Corps

SECTION 4 - ENVIRONMENTAL EFFECTS

This section provides an evaluation of the potential environmental effects of the final array of alternatives on each of the resources discussed in Section 2, Existing and Future without Project Conditions / NEPA Affected Environment.

The following descriptors are used in the body of this chapter for consistency in describing impact intensity in relation to significance.

- No or Negligible Impact: The action would result in no effect or the effect would not change the resource condition in a perceptible way. Negligible is defined as of such little consequences as to not require additional consideration or mitigation.
- Minor Impact: The effect to the resource would be perceptible; however, the effect would not be major and unlikely to result in an overall change in resource character.
- Moderate Impact: The effect to the resource would be perceptible and may result in an overall change in resource character. Moderate impacts are not significant due to their limited context (the geographic, biophysical, and social context in which the effects would occur) or intensity (the severity of the impact, in whatever context it occurs).
- Significant Impact: The effect to the resource would be perceptible and may be severe. The effect would likely result in an overall change in resource character. The determination of significant impact to any resource would require the completion of an Environmental Impact Statement.
- Direct Impacts: Direct effects are caused by the action and occur at the same time and place. Actions of the proposed project would directly effect a change and initial effects would be immediately evident.
- Indirect Impacts: Indirect effects are caused by the action and are later in time or farther removed in distance, but are still *reasonably foreseeable*. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Actions of the proposed project would not effect this change, but would enable change to occur, or change would occur later in time, or farther in distance than the actions.
- Cumulative Impacts: Cumulative impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

A clear statement regarding significance is presented at the end of each resource evaluation.

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4.1 ENVIRONMENTAL OPERATING PRINCIPLES

The Environmental Operating Principles are an essential component of the Corps' risk management approach in decision making, allowing the organization to offset uncertainty by building flexibility into the management and construction of infrastructure. The Environmental Operating Principles are as follows:

- Foster sustainability as a way of life throughout the organization.
- Proactively consider environmental consequences of all Corps activities and act accordingly.
- Create mutually supporting economic and environmentally sustainable solutions.
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the Corps, which may impact human and natural environments.
- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs.
- Leverage scientific, economic, and social knowledge to understand the environmental context and effects of the Corps' actions in a collaborative manner.
- Employ an open, transparent process that respects views of individuals and groups interested in Corps activities.

The study team considered avoiding and minimizing adverse impacts to existing environmental and cultural resources within the project area to the extent practicable during the plan formulation process. Where impacts to these resources are unavoidable, potential compensatory mitigation is identified. The project would be constructed in compliance with all applicable environmental laws and regulations.

4.2 Hydrology

4.2.1 Alternative 1: No Action

The MCFCP would continue to be operated and maintained as it is currently, but significant maintenance of the channel and structures over the creek would need to occur to ensure the flood risk management system continues to operate properly and provide the current level of protection.

Over the next 50 years, the hydrology of the watershed may change slightly due to a change in climate. Higher temperatures could lead to an increase of rain and less snow during winter. This could modify Mill Creek's annual flow pattern by increasing peak flows earlier in the year and decreasing flow in summer.

4.2.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

There would be no direct impact to unregulated inflows caused by a small raise of the levees. However, higher regulated flow through the Mill Creek Channel through Walla Walla (3,500 cfs to as much as 3,700cfs with the levee raise) would be a direct effect to regulated hydrology caused by operational changes related to raising the levees.

Concrete channel rehabilitation would be conducted during summer when flows are lowest (around 10 cfs). There would be no impact to the hydrology of the creek through town or the watershed caused by the concrete channel rehabilitation.

Under normal operations, regulation of flood related inflows would begin at approximately 1,700 cfs. This estimate may change based on refined analysis. Raising the diversion trigger would decrease the frequency and amount of unscreened flow diverted to the lake from approximately once every 4 years to once every 5 years. Changes in analysis will be reflected in the final report. This operational change would increase the amount of water in the channel from the Diversion Dam to the confluence with the Walla Walla River during flooding events with Project inflow of approximately 1,700 cfs; the peaks of floods with flows greater than approximately 1,700 cfs would be diverted into Bennington Lake. Part of the diverted and stored floodwater would be returned to Mill Creek when flooding subsides, and the rest would be passed to Russell Creek into Yellowhawk Creek. Overall, changing the diversion trigger to approximately 1,700 cfs would have a minor impact on hydrology. There is no cumulative impact to hydrology. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to hydrological resources.

4.2.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to hydrology under Alternative would have the same/similar impacts as Alternative 7.

4.3 Water Supply

4.3.1 Alternative 1: No Action

There may be more demand for water as the human population increases. The water supply during summer may decrease as the climate warms (USGCRP 2017). The amount of permitted water rights would likely remain stable as few new water rights are anticipated to be approved.

4.3.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

A small raise of the levees would have no effect on water supply/rights. There would be no direct, indirect, or cumulative impacts on this resource. There is no cumulative impact to water supply. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to water supply.

Water rights on lower Mill Creek would not be impacted during the concrete channel rehabilitation. Non-flood water from Mill Creek would be diverted to Yellowhawk and Garrison Creeks as directed by Ecology under the 2012 MOU with the Corps. Raising the diversion trigger to approximately 1,700 cfs would have negligible impacts on water supply or water rights. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to water rights.

4.3.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to water supply under this alternative would have the same/similar impacts as Alternative 7.

4.4 WATER QUALITY

4.4.1 Alternative 1: No Action

In the future, the typical water quality condition in Mill Creek, Yellowhawk/Garrison Creeks, and Bennington Lake would be maintained. Overall water quality in Mill Creek would continue to degrade in the summer due to increased air temperature and insolation as climate change continues to increase water temperature. Lower summer flow causes water temperature to increase due to the wide, shallow channel with minimal shade. Water temperature sometimes rises above the State standard.

Water quality in Bennington Lake would continue to degrade seasonally as summer progresses and temperature rises. The amount of turbidity and nutrients in the lake would vary from year to year based on the inflow from Mill Creek and whether flood flow was diverted that year. On average, at least some turbid flood flow would be diverted to Bennington Lake every 4 years. Some diversions have been as many as 12 years apart. Other years could have more than one diversion. More turbid flow would be diverted to the lake during years with large floods.

Floodwater is returned to Mill Creek after peak flow has passed, within a few weeks of it being diverted to the lake. This generally occurs when water temperatures in the creek are within an acceptable range for trout and salmon. Turbidity is often higher than normal during this time as well.

4.4.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

A small raise of the levees would not include any in-water work. Earth fill used to raise the levees would be placed on the levee crest and landside slope and compacted. There would be no direct, indirect, or cumulative impacts on water quality caused by raising the levees.

There would be negligible direct impacts on water quality from the concrete channel rehabilitation. Water would be routed through the work area in a pipe or a flume so the water

would not come in contact with the construction work (e.g., ground disturbance, fresh concrete, etc.).

Raising the diversion trigger would reduce the number of diversions to Bennington Lake. Reducing the amount of turbid water diversions would keep the water in the lake cleaner during most years. This direct beneficial effect on water quality in the lake would be minor. There would be no change to water quality in Mill Creek. There is a cumulative impact to water quality discussed further below in Section 4.21, Cumulative Effects. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to water quality.

4.4.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to water quality under Alternative would have the same/similar impacts as Alternative 7, except where noted. A moderate raise of the levees would include in-water work. Earth fill would be placed on the used to raise the levees would be placed on the levee crest and landside slope and compacted. Earth fill and rip-rap would be placed on the water side of the levee and the levee toe would be extended into the creek. There would be moderate direct and indirect impacts on water quality caused by raising the levees. Direct impacts would include increased turbidity and the potential introduction of pollutants from machinery into the water in the immediate construction area. Indirect impacts are turbidity plumes downstream of the construction site. There would be no long-term impact on water quality from Alternative 8.

4.5 AQUATIC RESOURCES

4.5.1 Alternative 1: No Action

Upstream of the Mill Creek Diversion Dam, aquatic habitat would remain much the same as the current condition. Habitat conditions within Mill Creek downstream from the Diversion Dam would remain poor. Additional fish passage improvements through the concrete channel section are likely to continue. Fish passage conditions at the Diversion Dam and First Division Works would improve once the planned new fish ladders are constructed. Fish would be better able to pass the dams at a wider range of flows. The diversion trigger would likely remain at or near 1,400 cfs during the flood season. Fish could be diverted to the lake during flood diversions, but the occurrence and potential are believed to be low. Aquatic resources would likely experience loss of functional habitats as development in the Walla Walla area continues and climate change impacts are realized.

4.5.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

There would be no in-water work for a small levee raise. Raising the levees would have no direct, indirect, or cumulative impacts on aquatic resources in Mill Creek.

Concrete channel rehabilitation would have minor negative direct impacts on aquatic resources, because the water and any aquatic organisms in the channel would be rerouted into a pipe or plastic-lined flume to isolate the work area from the flowing water of the creek.

Raising the diversion trigger would decrease the frequency and amount of unscreened flow diverted to the lake from approximately once every 4 years to once every 6 years. This would lower the probability of diverting fish to the lake. This could have a moderate positive direct effect on aquatic resources. There is no cumulative impact to aquatic resources. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to aquatic resources.

4.5.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to aquatic resources under this alternative would have the same/similar impacts as Alternative 7 except where noted. A moderate raise of the levees would include in-water work. Earth fill would be placed on the used to raise the levees would be placed on the levee crest and landside slope and compacted. Earth fill and rip-rap would be placed on the water side of the levee and the levee toe would be extended into the creek. There would be negligible direct and indirect impacts on aquatic resources caused by raising the levees. Direct impacts would include increased turbidity, the potential introduction of pollutants from machinery into the water in the immediate construction area, and the possible entrainment or crushing of organisms. Indirect impacts are turbidity plumes downstream of the construction site. There would be no long-term impact on water quality from Alternative 8.

4.6 THREATENED AND ENDANGERED SPECIES

4.6.1 Alternative 1: No Action

Fish passage conditions for steelhead and bull trout through the MCFCP would improve in the future as additional passage modifications are made and fish ladders are replaced. Fish could be diverted to Bennington Lake at the rate discussed in Section 2.2.4, Aquatic Resources. Mill Creek would continue to have high water temperatures during spring and summer, which indirectly negatively affects steelhead and bull trout.

Over the last 72 years, the majority of the diversion days occurred during the winter months January, February, and December. January had nearly double the amount of diversion days as February or December. Diversion days stayed relatively low the remainder of the year, March through November, with the exception of one flood diversion event occurring in June 1975.

Spring Chinook were detected mostly between May and July with another considerable peak in detections between September and December. Juvenile spring chinook make up the majority of the chinook detected. Adult spring Chinook were detected mostly April through July.

Summer steelhead show a similar trend to spring Chinook, except steelhead were detected sooner in the system. Adult and juvenile steelhead were detected in abundance February through June, with juvenile steelhead peak detections occurring September through December.

Adult bull trout were the most steadily detected of the three fish species. Peak adult bull trout detections occurred April through September and October through December. Juvenile bull trout detections increase March through August (Figure 4-1).

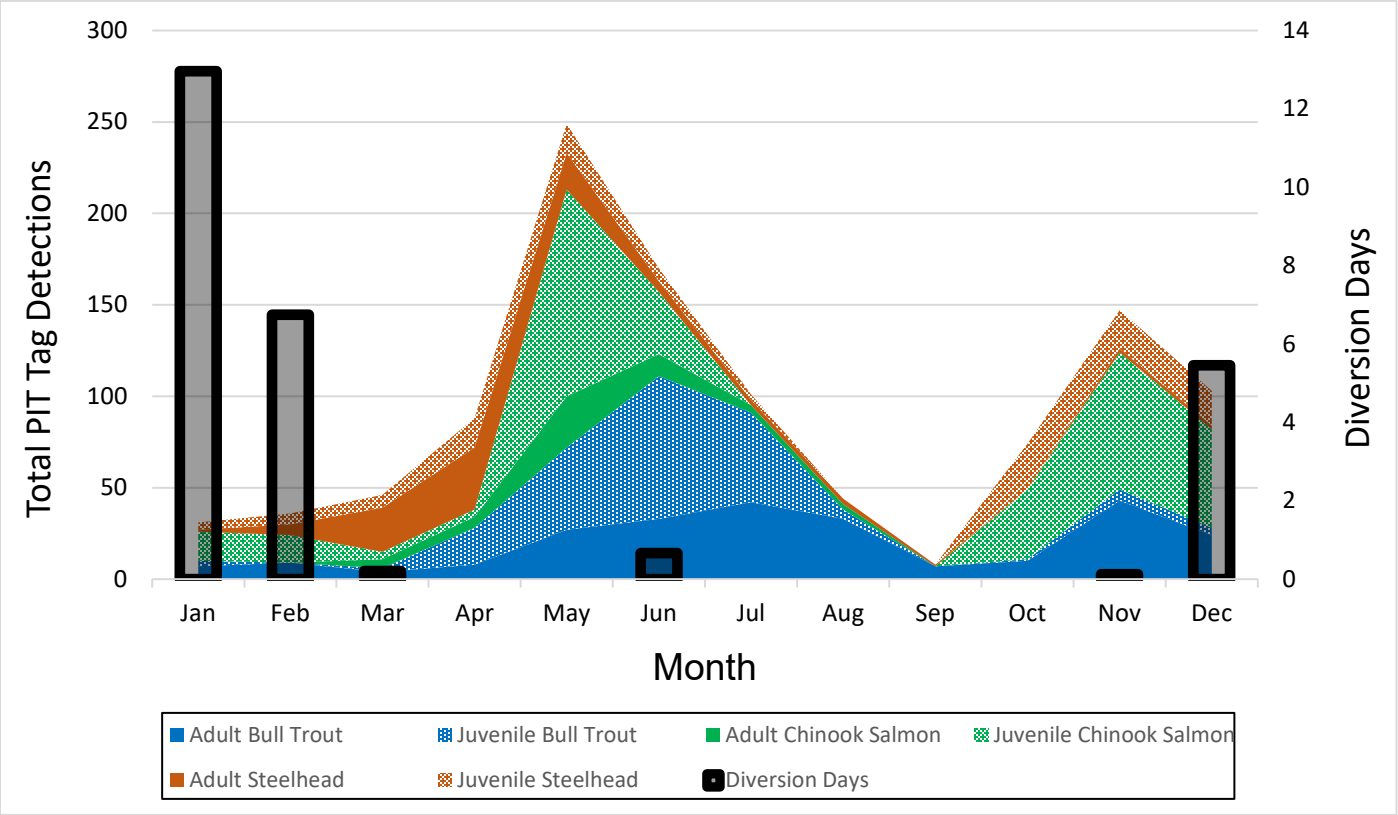

Figure 4-1. Number of Diversion Days by Month between 1945 - 2017 Overlaying Spring Chinook, Summer Steelhead, and Bull Trout Abundance.

Yellow-billed cuckoo and Canada lynx are not expected to establish populations in the Mill Creek watershed.

4.6.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

There would be no in-water work for a small levee raise. There would be no impact on adult steelhead or bull trout or their designated critical habitat. Concrete channel rehabilitation would occur within the in-water work window (July 15 - September 15) to reduce negative

impacts to juvenile steelhead. Water and any aquatic organisms in the channel would be rerouted into a pipe or plastic-lined flume to isolate the work area from the flowing water of the creek, and actions would need to be made to relocate any fish in the work area to other parts of Mill Creek that would not be affected by the construction. The work is not likely to affect bull trout because none are likely to be present in the concrete channel during summer. There would also be no effect on yellow-billed cuckoo or Canada lynx. Overall, there would be minor direct, indirect, or cumulative impacts on ESA-listed species.

A higher diversion trigger (e.g., 1700 cfs) would divert unscreened floodwater to Bennington Lake less frequently. Diversions, which now occur once every 4 years (on average), would occur once every 5 years (on average). This would reduce any fish entrainment into the lake. This could have moderate positive benefits to steelhead and bull trout. There would be no effect on yellow-billed cuckoo or Canada lynx. There is a cumulative impact to threatened and endanger species discussed further below in Section 4.21, Cumulative Effects. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to threatened and endangered species.

4.6.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to threatened and endangered species under this alternative would have the same/similar impacts as Alternative 7 except where noted. A moderate raise of the levees would include in-water work. Earth fill would be placed on the used to raise the levees would be placed on the levee crest and landside slope and compacted. Earth fill and rip-rap would be placed on the water side of the levee and the levee toe would be extended into the creek. There would be direct and indirect impacts on aquatic threatened and endangered species caused by raising the levees. Direct impacts would include increased turbidity, the potential introduction of pollutants from machinery into the water in the immediate construction area, and the possible entrainment or crushing of organisms. Indirect impacts are turbidity plumes downstream of the construction site. There would be no long-term impact on water quality from Alternative 8.

4.7 WETLANDS

4.7.1 Alternative 1: No Action

The number of wetlands in the study area is anticipated to remain relatively constant in the future due to current regulatory constraints and legal protections. The quality of existing wetlands may decline as increased development encroaches on the area surrounding wetlands and if the climate becomes drier in the summer.

4.7.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

Alternative 7 would have no direct, indirect, or cumulative impact on wetlands. There would be no in-water work associated with this alternative. There would also be no fill material placed in wetlands. There is no cumulative impact to wetlands. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to wetlands.

4.7.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to wetlands under this alternative would have the same/similar impacts as Alternative 7.

4.8 TERRESTRIAL WILDLIFE

4.8.1 Alternative 1: No Action

There would be no change in impacts to wildlife through current MCFCP operations and maintenance. Heavy human use of Rooks Parks, Bennington Lake, and hiking trails around the lake and levees can displace certain wildlife species. Most wildlife avoid high-density recreation areas, but could come into contact with humans in low-density recreation areas.

Wildlife would continue to be affected by a wide array of habitat changes and human activity as the population increases in Walla Walla and surrounding communities.

4.8.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

A small levee raise would have a minor direct negative effect on small mammals and birds near the levee during construction. There may be some loss of small mammals during excavation, but most of the species using this habitat would simply relocate to lower value habitat areas nearby. The footprint of the levee would increase a small amount. Some wildlife habitat may need to be removed and may not be replanted due to levee maintenance requirements. This would lower the abundance of wildlife species in the immediate area.

Concrete channel rehabilitation would have negligible direct impacts on wildlife. Some birds may live within the covered portion of the concrete channel and be disturbed and be flushed out of the work areas by the construction activities. The most likely bird to be affected is pigeons.

Raising the diversion trigger would have no impacts on wildlife. There is no cumulative impact to terrestrial wildlife. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to terrestrial wildlife.

4.8.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to terrestrial wildlife under this alternative would have the same/similar impacts as Alternative 7.

4.9 VEGETATION

4.9.1 Alternative 1: No Action

Residential development would continue to fill in open areas within Walla Walla and surrounding communities, replacing non-irrigated pastures and agricultural fields with homes and irrigated lawns. Some trees could also be planted on many of these parcels. Within the Federal portion of the MCFCP, vegetation in habitat management areas (e.g., food plots, burrowing owl habitat, etc.) would continue to be managed to benefit wildlife. Vegetation growth on the levees and invasive plants would continue to be controlled by mowing, goats, and herbicides.

4.9.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

A small levee raise would increase the size of the landward side of the levees. Some vegetation along the landward levee toe would be removed. This would include the loss of some trees and shrubs, which would be replaced by grasses. Additional trees could be planted in some areas at least 15 feet from the toe of the levee if there is adequate room available. The effects on vegetation from raising the levees would be moderate.

There would be no impact to vegetation from the concrete channel rehabilitation or from raising the diversion trigger to 1,700 cfs. There is no cumulative impact to vegetation. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to vegetation.

4.9.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to vegetation under this alternative would have the same/similar impacts as Alternative 7.

4.10 GEOLOGY AND SOILS

4.10.1 Alternative 1: No Action

The geologic characteristics of the Mill Creek watershed would not significantly change in the future. Eroded sediments from within the watershed would continue to be trapped behind the Diversion Dam and would need to be removed periodically. The Mill Creek Channel

downstream of Gose Street would continue to erode and downcut. Eroded sediment would be carried further downstream where it would eventually be deposited.

4.10.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

A small levee raise would have a very minor direct impact on geology and soils caused by relocating the materials necessary for construction. The soil and rock that would be used to raise the levees would come from a commercial source. The concrete channel rehabilitation would have no impacts to geology and soils. Operational change would have moderate directs impacts on geology and soils caused by downstream erosion induced by higher flood frequencies. There would be no long-term impacts from this alternative. There is no cumulative impact to geology and soils. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to geology and soils.

4.10.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to geology and soils under this alternative would have the same/similar impacts as Alternative 7.

4.11 LAND USE

4.11.1 Alternative 1: No Action

There will be no significant land use impacts caused by the current operation and maintenance of the MCFCP. Agriculture is expected to remain the top land use in the region surrounding Walla Walla. Some lands within the city and surrounding communities may continue to develop as the population increases.

4.11.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

A small levee raise would have a minor direct impact on land use. The footprint of the levee would increase slightly, and a permanent easement would be required for the expanded footprint.

Concrete channel rehabilitation would have no impact on land use.

An operational change may require the Corps to acquire a flowage easement to allow for additional flooding volume and frequency on some lands downstream of the Project within the 100-year floodplain. When not flooded, those same lands could continue to be used as they are currently. There would be moderate direct land use changes when lands are flooded and no land use changes when the land is dry. There is no cumulative impact to land use. Based on

the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to land use.

4.11.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to land use under this alternative would have the same/similar impacts as Alternative 7, except where noted. A moderate levee raise would be a direct moderate effect due to the larger footprint and need for a larger permanent easement.

4.12 FLOODPLAIN DEVELOPMENT

4.12.1 Alternative 1: No Action

Some of the currently open areas along Mill Creek and Yellowhawk Creek would likely be developed with residential properties in the future, further reducing flood risk management options.

4.12.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

The existing levees disconnect the creek from the floodplain and protect any development that has occurred within the floodplains. A small levee raise would not induce further floodplain development, but would provide a higher level of flood risk reduction to infrastructure within the floodplain. Any change to the levee footprint from the levee raise would happen on the landward side and cause minor development to the floodplain. Concrete channel rehabilitation would have no impact on floodplain development.

This alternative could discourage development on the floodplain downstream of the MCFCP because a higher regulated flow could pass through the channel due to levee raises or operational changes. Currently flood flows are regulated to 3,500 cfs. An increase in the volume of water flowing out of the channel could cause more damage to some areas downstream of the Project in the 100-year floodplain. The higher frequency of flooding could limit the amount of new development that might have otherwise occurred in the floodplains.

Overall, there would be minor direct impacts to floodplain development from this alternative. There is no cumulative impact to floodplain development. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to floodplain development.

4.12.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to floodplain development under this alternative would have the same/similar impacts as Alternative 7.

4.13 AESTHETICS/VISUAL RESOURCES

4.13.1 Alternative 1: No Action

The overall aesthetic and visual quality of the Walla Walla area would remain relatively unchanged in the future. Sections of the MCFCP that run through town would likely continue to deteriorate slowly over time. Additional parking lots and some buildings covering the channel could be condemned and require removal.

4.13.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

A small levee raise and concrete channel rehabilitation would have a short-term moderate direct negative impact on aesthetics during construction. Beneficial long-term direct impacts would also be moderate once construction is complete, because the repair of aging and worn infrastructure would improve aesthetics. Raising the diversion trigger would have no impact on aesthetics. There is no cumulative impact to aesthetics and visual resources. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to aesthetics/visual resources.

4.13.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to aesthetic/visual resources under this alternative would have the same/similar impacts as Alternative 7.

4.14 RECREATION

4.14.1 Alternative 1: No Action

The existing number and size of public parks is not likely to increase significantly in the future. As the area's population increases, there would be somewhat higher use of the public areas.

Recreational activities would continue at the Federal portion of the MCFCP similar to the way they do currently, although there may be times when trails are closed to the public due to maintenance. Recreation is an authorized Project purpose and would remain a priority. Some free recreational opportunities, such as boating, could be lost if Bennington Lake is not filled to the recreational level of 1,205 feet because of less diversions and reduced spring flow.

4.14.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

There would be short-term moderate direct impacts to recreation from a small levee raise during construction. Sections of the existing bike path along the top of the levees would be closed temporarily and bikers would be detoured along streets or trails for public safety. The

bike trail along the top of the levees would be repaved and become available for public use once construction is complete.

Concrete channel rehabilitation would have short-term moderate indirect impacts on recreation during construction. Sidewalks and streets in the vicinity of the construction may be closed temporarily and people would need to detour around the construction sites. Sidewalks and roads would reopen once construction is complete.

There would be no effect on recreation from raising the diversion trigger to 1,700 cfs. There is a cumulative impact to recreation discussed further below in Section 4.21, Cumulative Effects. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to recreation.

4.14.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to recreation under this alternative would have the same/similar impacts as Alternative 7.

4.15 AIR QUALITY

4.15.1 Alternative 1: No Action

There would be no change to air quality caused by the current operation and maintenance of the MCFCP. Air quality would remain generally good in the Walla Walla area; however, periods of poor air quality would continue periodically throughout each year, generally for short periods of a few days.

4.15.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

A small levee raise and concrete channel rehabilitation would require use of diesel-powered equipment during construction. Construction would take many months and may take more than one construction season. Air quality in the immediate construction area would be degraded due to increased dust, but this is expected to have a minor direct impact on air quality. Raising the diversion trigger would have no effect on air quality. There is no cumulative impact to air quality. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to air quality.

4.15.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to air quality under this alternative would have the same/similar impacts as Alternative 7.

4.16 NOISE

4.16.1 Alternative 1: No Action

There would be no change to noise levels caused by the current operation and maintenance of the MCFCP. Noise would continue to be generated by the operation of vehicles, airplanes, and equipment. Noise from these sources is not likely to carry very far or persist over long periods of time.

4.16.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

A small levee raise and concrete channel rehabilitation would increase noise levels along the levee alignment while the work is being conducted due to operation of large construction equipment. Noise impacts would be direct and moderate during construction; however, these effects would be localized to the immediate construction area. Raising the diversion trigger to 1,700 cfs would have no effect on noise levels in the area. There is no cumulative impact to noise. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to noise.

4.16.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to noise under this alternative would have the same/similar impacts as Alternative 7.

4.17 CULTURAL AND HISTORIC RESOURCES

4.17.1 Alternative 1: No Action

The current federally operated MCFCP, which is eligible for listing on the National Register of Historic Places, would still be maintained in accordance with Federal laws, as would all other resources located on federally owned lands. Likewise, the multitude of historic buildings located adjacent to the constructed and maintained portions of the remainder of the channel that is not federally owned would continue to be managed by their respective owners under applicable state and local requirements. The greatest risk to these properties comes from the potential, albeit low potential, for failure of the completely enclosed portions of the channel, which could result in the eventual loss of historic buildings that may become damaged or unusable.

A flood that exceeds the design capacity of the Project could also have direct significant impacts on historic structures by causing the collapse, partial collapse, or relocation of historic structures. Erosion that would result from a major flood also has the potential to expose and damage previously unrecorded pre-contact sites. Additionally, subsequent flood debris cleanup efforts could have moderate indirect impacts on historic structures or cultural resources that have been unearthed.

4.17.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

We anticipate certain elements of Alternative 7 would result in minor impacts to cultural resources. However, some of these elements would actually preserve cultural resources by preventing further damage and ensure the continued functionality of the channel. The small levee raise would increase the easement footprint by approximately 3 feet and would be accomplished with minimal impacts to both the historical levee, and to the adjacent ground surface. Furthermore, those areas adjacent to the levees are likely to have been extensively disturbed during construction of the current levees. Work within the concrete channel through the downtown areas of Walla Walla also would result in minimal impacts to cultural resources. In particular, impacts would result directly to the historical concrete channel, the pipe column supports below existing buildings, and the ceilings (floors, sidewalks, and pavement) below the buildings and hardscaped areas of downtown. Although the installation of tie-backs and stabilizing plates and the reinforcement of the existing pipe columns would require boring through and/or covering over exposed interior walls and columns within the channel, the areas affected are largely underground and not visible. These impacts can also be made less noticeable by specifying materials that retain a similar appearance to the surrounding, in-tact structure. Removal or repair of ceilings within the covered channel would also result in impacts to the underside of the building floors and be negligible. Removing the covering and exposing the channel could potentially create opportunities to enhance and beautify the historical setting of Walla Walla's downtown area.

All of the potential impacts described above would require compliance with Section 106 of the NHPA, and subsequently any impacts determined to be adverse (after efforts to avoid or minimize such effects have been made) would require mitigation.

Raising the diversion trigger would not likely have any effect on cultural resources. Any cumulative impacts to cultural resources that may result may be beneficial and would represent stabilization of otherwise deteriorating historical buildings and structures, including the functionality of the historic channel through town. There are no likely cumulative adverse impacts to cultural and historic resources. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to cultural and historic resources.

4.17.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to cultural and historic resources under this alternative would have the same/similar impacts as Alternative 7.

4.18 SOCIOECONOMICS/ENVIRONMENTAL JUSTICE

4.18.1 Alternative 1: No Action

There would be no change in the socioeconomic impact to Walla Walla and the county of Walla Walla caused by the continuation of current operations and maintenance of the MCFCP. Also, there are no concentrations of minority nor low-income populations above Environmental Justice thresholds that would be disproportionately impacted by adverse or beneficial effects of the MCFCP. Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 1994) provides for quality of life protections by identifying and addressing disproportionately high and adverse human health effects on minority communities (at least 50 percent minority population) and low-income populations (at least 20 percent of the population living below the poverty level).

Flood insurance would be required for many of the homes and businesses and adjacent areas in the event that the condition of the current MCFCP deteriorates to a condition where reliable flood risk management is no longer certified by FEMA. The average annual cost of flood insurance per policy for Walla Walla and surrounding counties is between $350 and $2,350 (https://bsa.nfipstat.fema.gov accessed May 23, 2017) and would provide an additional burden to an already cost burdened population.

The population of the city of Walla Walla is projected to grow at a faster rate than it has historically. In its statewide population projections from 2010 to 2040, the State of Washington Office of Financial Management is projecting Walla Walla County's population to continue to grow at an average rate of 0.45 percent per year (Washington State Office of Financial Management, 2017). Approximately 53 percent of the growth is due to natural population growth, which is the number of births subtracted by the number of deaths, and the remainder of the growth will come from migration into the Walla Walla area.

Beginning in 2020, the minimum wage will continue to be adjusted annually to match cost of living changes as measured in the Consumer Price Index for Urban Wage Earners and Clerical Workers.

4.18.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

A small levee raise and concrete channel rehabilitation would be performed within the general footprint of the existing MCFCP. There could be both positive and negative effects on the economics of the area. Positive effects could be derived from the increased money introduced to the local economy from the construction contract. Some negative effects could be felt by individual businesses if there are any impacts on accessing businesses during construction. These impacts would be temporary. No adverse impacts to socioeconomics or environmental justice are anticipated. However, there would be increased benefit from added flood protection.

Raising the diversion trigger and potential property or flowage easement acquisition would not adversely affect the overall economics or socioeconomics or environmental justice of the local area. There would also not be any environmental justice considerations from this action. There is no cumulative impact to socioeconomics/environmental justice. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to socioeconomics/environmental justice.

4.18.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to socioeconomics/environmental justice under this alternative would have the same/similar impacts and potential benefits as Alternative 7.

4.19 PUBLIC UTILITIES AND INFRASTRUCTURE

4.19.1 Alternative 1: No Action

The growth rate of Walla Walla has been low compared to the rest of the state. In its 2018 update to the Comprehensive Plan for 2040, the City of Walla Walla is planning for a rate of population growth equivalent to a 0.9 percent average growth rate per year from today to 2040 (https://www.wallawallawa.gov/home/showdocument?id=854). It is unlikely there would be major increases in infrastructure or utilities. However, the infrastructure along Mill Creek, including the concrete channel, is aging and needs continued maintenance to provide reliable flood risk management. In some areas, buildings, roads, and parking lots cover the channel, and some parking areas have already been condemned.

4.19.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

A small levee raise would require many truckloads of material to be hauled on public roadways in and around Walla Walla, temporarily increasing traffic congestion. Additionally, sidewalks and streets in the vicinity of the construction may be closed temporarily, and vehicles would need to detour around the construction sites. Increased traffic and detours could delay emergency vehicle response time and complicate access to critical infrastructure facilities. Sidewalks and roads would reopen once construction is complete. There would be short-term moderate indirect impacts to public utilities and infrastructure during construction.

Raising the diversion trigger could cause increased damages to bridge footings downstream of the MCFCP due to increased volume and frequency of flooding. These impacts would be negligible. There is no cumulative impact to public utilities and infrastructure. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to public utilities and infrastructure.

4.19.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to public utilities and infrastructure under this alternative would have the same/similar impacts as Alternative 7.

4.20 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

4.20.1 Alternative 1: No Action

There would be no effect on the HTRW from the current operations and maintenance of the MCFCP. The four locations still below cleanup levels will be cleaned up to the Ecology designated cleanup level or above. HTRW risks are not anticipated to increase in the future, and unless the MCFCP failed and flooded the tanks or contaminated sites, no further surface water, groundwater, or soil contamination is foreseen.

4.20.2 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

Increased flood risk protection would have a minor direct beneficial impact on HTRW, by decreasing the risk of HTRW contamination due to flooding. The plan would not have any direct impact to known HTRW sites or sources. There is no cumulative impact to hazardous, toxic, radioactive waste. Based on the context and intensity of potential effects described above, this alternative as a whole would have less than significant impacts to hazardous, toxic, and radioactive waste.

4.20.3 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

A moderate levee raise would require construction north of the Mill Creek Sports complex where Tausick Way Landfill is located and on the left bank of the creek near Myra Road where Stubblefield Salvage is located. Any disturbance of this land would require best business management practices to keep potential toxins from entering the water or escaping into the air. There would be moderate direct impacts to hazardous, toxic, radioactive waste from a moderate levee raise. Effects to hazardous, toxic, radioactive waste under this alternative would have the same/similar impacts as Alternative 7.

4.21 CUMULATIVE EFFECTS

The NEPA and the Council on Environmental Quality (CEQ) regulations require Federal agencies to consider the cumulative impacts of their actions. Cumulative effects are defined as, “the impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time” (40 CFR 1508.7). The primary goal of a cumulative effects analysis is to determine the

magnitude and significance of the environmental consequences of the preferred alternative action in the context of the cumulative effects of other past, present, and reasonably foreseeable future actions.

This section evaluates the cumulative effects of actions that could potentially affect the same environmental resources as those discussed earlier. The scope of this analysis extends beyond the MCFCP to other areas that sustain the resources of concern. A resource may be differentially impacted in both time and space. The implication of those impacts depends on the characteristics of the resource, the magnitude, and scale of the project's impacts, and the environmental setting (EPA 1999).

Although this assessment addresses the effects of alternatives on the range of resources representative of the human and natural environment, not all of those resources need to be included in the cumulative effects analysis. Only those that is relevant to the decision to be made on the preferred alternative need to be included. The Corps used the environmental effects analysis presented in this chapter to identify and focus on cumulative effects that are truly meaningful in terms of local and regional importance. The following resources were identified as being notable based on the effects analysis above and having potential for cumulative effects:

- Threatened and Endangered Species.
- Water Quality.
- Recreation.

Guidance for setting appropriate boundaries for a cumulative effects analysis is available from the CEQ (CEQ 1997) and the EPA (EPA 1999). Generally, the scope of a cumulative effects analysis should be broader than the scope of analysis used in assessing direct or indirect effects. "Geographic boundaries and time periods used in cumulative impact analysis should be based on all resources of concern and all of the actions that may contribute, along with the project effects, to cumulative impacts" (EPA, 1999). The analysis should delineate appropriate geographic areas, including natural ecological boundaries, whenever possible, and should evaluate the time period of the project's effects.

The resources assessed in this analysis have been affected by various actions within the Mill Creek watershed since the early 1900s. Actions such as construction and operations of dams and associated levee systems, agricultural development, road building, development of cities, and urbanization have both negatively and positively impacted resources and would continue to do so into the foreseeable future.

Discussed below are the past, present, and reasonably foreseeable future actions that were considered for the cumulative effects analysis, the effects of the actions on the resources assessed, and a summary of the cumulative effects of the alternatives. Table 4-1 summarizes the geographic and temporal boundaries used in this cumulative effects analysis.

Table 4-1. Geographic and Temporal Boundaries of Cumulative Effects Analysis

Resource	Geographic Boundary	Temporal Boundary
Threatened and Endangered Species	Mill Creek Watershed	pre-Project to 20 years into the future
Water Quality	Mill Creek Watershed	
Recreation	In and around City of Walla Walla Urban Area	

4.21.1 Water Quality

Actions

Mill Creek's water quality conditions range from near pristine in the headwaters to highly degraded below the Division Works Dam, through the city of Walla Walla, to the mouth. The degraded water quality largely results from past and present agricultural run-off and pollution, water withdrawals, highly modified channels, and lack of riparian vegetation due to urban development (City of Walla Walla et al. 2018).

Water withdraws for municipal and agricultural use reduce the amount of water available in lower Mill Creek and degrades water quality. The wide and shallow channel configuration with very little shade causes Mill Creek to warm considerably during the sunny, hot days of summer. Lack of floodplain connectivity reduces the amount of subsurface water flow that would normally provide cooler water to the creek. Each of these factors leads to higher water temperatures during summer which can be harmful to cold water fish.

Ecology began a water quality improvement project (known as a Total Maximum Daily Load, or TMDL) in the Walla Walla watershed, including Mill Creek in 1998. Mill Creek is on the Ecology list of impaired water bodies under section 303(d) of the Clean Water Act because it does not meet State standards for temperature, dissolved oxygen, pH, bacteria, ammonia-n, chlorine, and instream flow. By setting limits on pollutant discharges through Ecology's TMDL process, water quality is expected to improve, but low flow and high water temperatures during summer are still major concerns for Mill Creek.

There are several projects planned for the future by the city of Walla Walla that could improve water quality in Mill Creek by increasing the amount of water that remains in the creek. These projects, and the approximate timeframe they are planned are listed below.

- Water Supply System Pipes Replacement of 60 miles of pipe – 2019 to 2075.
- Aquifer Storage and Recovery (ASR) Well 6 – 2020.
- ASR Well 5 – 2021.
- ASR Well 2 – 2026.
- ASR Well 7 location change – 2036.

The City of Walla Walla's projects would decrease water losses within the city's water supply system and store water when it is plentiful, to be extracted later when water is scarce. The water available to remain in Mill Creek would increase, which would improve water quality, habitat availability, and fish survival during warm summer months and cold winter months (City of Walla Walla et al. 2018).

Effects

The preferred alternative would have minor temporary cumulative effects on Mill Creek's water quality from the concrete channel rehabilitation when water would be routed through the work area in a pipe or a flume. Water would be routed around the construction work so the water would not come in contact with ground disturbance or fresh concrete. There would be no long-term impact on water quality from the preferred alternative.

Environmental restoration measures would have minor to moderate beneficial long-term effects to water quality, dependent upon the extent and composition of restoration elements.

4.21.2 Threatened and Endangered Species

Actions

Mill Creek contains ESA-listed steelhead and bull trout. Construction and operation of the MCFCP created poor habitat and passage conditions for these and other fish species. Fish passage and habitat within Walla Walla were likely impacted early in the city's history due to channel modifications for flood risk reduction and other human uses.

From 1942 until 1982, there were no fish ladders at the Diversion Dam or the Division Works. Upstream passage for steelhead and bull trout was likely limited over this 40-year period. At the Diversion Dam, fish had to navigate through one of the two low-flow outlets if they were to pass upstream. Anecdotal information suggests there may have been a make-shift system of blocks placed in the low-flow outlets in an attempt to aid fish passage. How much the blocks may have improved passage is unknown. The system likely did not function well over the range of possible flow. Fish ladders were constructed at the Diversion Dam and the Division Works in 1982.

Other anecdotal accounts are that local fisheries groups placed steelhead eggs in baskets in upper Mill Creek in an attempt to increase steelhead numbers. The eggs may have come from any hatcheries where excess eggs were available. There may have been no genetic relationship to native Mill Creek steelhead.

Some fish are able to pass the ladders at certain flows, but passage is not as good as it could be. The fish ladders were not designed or built to today's fish passage criteria. Water velocities and heights fish must jump are higher than is currently allowable. The configuration of the low flow outlet directly adjacent to the ladder creates flow that can cause fish to bypass the ladder

entrance. This increases ladder passage times. It also causes fish to struggle against the high flow, which is stressful for the fish.

The Middle Columbia River Steelhead Distinct Population Segment ESA Recovery Plan (NMFS 2009) calls for improvement of fish passage, screening, and flow management in Mill Creek, and either alteration of the diversion trigger or screening of all flow into Bennington Lake. The plan identifies the Diversion Dam and the Mill Creek channel as significant passage obstructions. The Walla Walla Subbasin Plan (NPCC 2004) estimates a low percentage of fish passage (20 percent) for steelhead at the Diversion Dam and classifies the dam as an imminent threat. Imminent threats were defined as structures or areas likely to cause immediate mortality to migrating fish. For example, 16 adult steelhead were killed after becoming stranded in the Diversion Dam stilling basin in 2002. This was the largest one-time loss of adult steelhead known to have occurred within the Federal portion of the MCFCP.

In response to these plans, several organizations in the Walla Walla area have worked to improve fish habitat and fish passage conditions in Mill Creek. Fish passage improvements in the Mill Creek channel began in 2006 with construction of a fish ladder at Gose Street Bridge at the downstream end of the MCFCP. Prior to construction of the ladder, fish had to navigate through very high velocities and several large jumps to pass between the severely eroded natural channel and the constructed channel.

The Mill Creek Fish Passage Assessment (Burns et al. 2009) identified and prioritized problem passage areas in the channel and included conceptual designs for passage improvements. Steelhead and, to a lesser extent, bull trout (due to their lesser abundance in lower Mill Creek) benefit from the fish passage modifications. Resting areas and lower jump heights allow these fish to expend less energy to reach the upper watershed where they spawn and rear.

This assessment led to multiple fish passage improvement projects led by the Tri-State Steelheaders in the channel, which were initiated in 2011. Other Tri-State Steelheaders projects include removal of the Kooskooskie Dam and removal of partial fish passage barriers on Yellowhawk Creek. This organization works to obtain funding and complete passage improvement projects annually. One of their goals is to allow fish to successfully migrate through the entire MCFCP at a wide range of flows and these actions enabled fish to access many miles of habitat that had been partially blocked for decades.

The Corps constructed low-flow passages through three of the 87 weirs in the upstream channel section in 2012. Plans have been prepared to construct additional low-flow passages in the remaining weirs in this section (the federally managed portion) as funding is available. The Walla Walla County Conservation District and the CTUIR have also completed numerous fish passage and habitat improvement projects within the Mill Creek and Walla Walla River watersheds.

In-stream and riparian habitat improvement projects have been undertaken to restore native trees and shrubs along streams, reduce pollution in stormwater, and install fencing to control livestock access to the streams. Over 3,450 acres of riparian zone projects and around 175

miles of streams on agricultural lands had completed or in-progress restoration work through the U.S. Department of Agriculture's Conservation Reserve Enhancement Program in Walla Walla County (Washington State Conservation Commission 2016). An additional 80 riparian restoration projects along 5 miles of streams in Walla Walla and College Place are currently being conducted. These actions continue to provide benefits to ESA-listed species.

Mill Creek is classified as a priority restoration reach upstream of the Diversion Dam because the Snake River Regional Technical Team envisions that passage through lower Mill Creek will be restored (CTUIR 2017). Removing passage barriers and improving aquatic habitat has high potential to benefit ESA-listed species, as well as other species. Fish passage improvements led by the CTUIR, the Tri-State Steelheaders, Washington Department of Fish and Wildlife, the Walla Walla County Conservation District, and others would continue as funding allows. Future modifications for improved fish passage such as replacement of the Corps fish ladders and alteration of the channel stabilizers to improve fish passage during low flow are planned and project funding is currently being sought by the Corps. The overall shared goal is to create a channel where steelhead and bull trout (and Chinook salmon) can successfully pass at a wide range of flow while maintaining appropriate flood capacity.

There are several projects planned that could provide benefit to steelhead and bull trout in Mill Creek. These projects, the approximate timeframe they are planned, and the responsible organization are listed below. These projects would improve fish passage conditions in Mill Creek.

- Otis Street to Park Street channel modifications (2019) – Tri-State Steelheaders.
- City of Walla Walla water intake fish ladder (2020) – Bonneville Power Administration/CTUIR.
- Division Works Fish ladder (2020) – Corps.
- Diversion Dam Fish Ladder (2021) – Corps.
- Mill Creek Upper Basin Stream Restoration (2022) – Walla Walla Conservation District.
- Russell Creek Concrete Barrier Removal (2023) – Walla Walla Conservation District.

Effects

The preferred alternative would have a minor cumulative negative impact on Threatened and Endangered species during reconstruction of the concrete channel. During construction, as much water as possible would be routed to Yellowhawk and Garrison Creeks. Some water would need to be rerouted through the work sites within the concrete channel. There would be no in-water work to raise the levees. There would be no impact on adult steelhead or bull trout or their designated critical habitat. Concrete channel rehabilitation would occur within the in-water work window (July 15 – September 15) to reduce negative impacts to juvenile steelhead. Water and any aquatic organisms in the channel would be rerouted into a pipe or plastic-lined flume to isolate the work area from the flowing water of the creek and actions

would need to be made to relocate any fish in the work area to other parts of Mill Creek that would not be affected by the construction. The work is not likely to affect bull trout because none are likely to be present in the concrete channel during summer.

A higher diversion trigger would divert floodwater to Bennington Lake less frequently. Diversions which now occur once every 3 years (on average) would occur once every 6 years (on average). This is expected to reduce the risk of fish entrainment into the lake, and would have moderate cumulative benefits to steelhead and bull trout over the long-term.

Environmental restoration projects would have cumulatively moderate long-term benefits to ESA-listed fish and could contribute in a minor way to the recovery of Yellow-billed cuckoos.

4.21.3 Recreation

Actions

Development of city parks in Walla Walla was initiated in 1905. College Place parks development was initiated when the city was incorporated in 1945. There are currently 15 city parks and a municipal golf course in Walla Walla and two city parks in College Place. Both cities have parks that include fishing ponds. City of Walla Walla parks originally included a public swimming pool and two wading pools. The pool closed for several years until a new pool opened in 2017. The City of Walla Walla parks and recreation program would continue and may expand as the area's population increases. Walla Walla and College Place city parks and golf courses would continue to be used and managed similar to the existing condition for the reasonably foreseeable future. Population growth is likely to occur in the next 20 years and may require additional recreation facilities.

Whitman Mission National Historic Site is a United States National Historic Site located 8 miles west of Walla Walla, at the site of the former Whitman Mission at Waiilatpu. The 98-acre site provides public viewing of the historic location, hiking, picnicking, and interpretive services. The historic site was established in 1936 as Whitman National Monument and was redesignated a National Historic Site on January 1, 1963.

When the Federal lands were originally purchased for the MCFCP, the location was private land with no official public access. From 1942, when the MCFCP was completed, to 1953, there were no official recreational facilities on the Federal portion of the MCFCP. The lake (Bennington Lake) was stocked with trout by the State of Washington in 1954 and recreation began. The availability of lake recreation significantly increased visitor use. However, no formal recreational facilities were made available to the public until Rooks Park was built in 1965.

Visitation continues to increase as recreational facilities and features were added. Visitation continues to rise as facilities are improved and the area's population increases. Recreational use of the Federal portion of the MCFCP has increased over the last 20 years from 150,000 visits in 1994 to over 330,000 in 2014. The Federal portion of the MCFCP is one of the most

popular recreation locations in the area due to its close proximity to the city of Walla Walla. Visitors use the area heavily for sport fishing in Bennington Lake, hiking, biking, horseback riding, walking on the various trails, bird watching, picnicking, and sightseeing.

The Corps continues to maintain the Federal portion of the Project to provide a positive recreational experience to its visitors. Tens of thousands of people each year have free access to the many trails, open space, and other recreational amenities. The Corps has also established a partnership with Pheasants Forever, which is a non-profit organization focused on conserving wildlife habitat.

The next closest non-urban recreation facility to Walla Walla is Lewis and Clark Trail State Park, located on Highway 12, 28 miles away. The Umatilla National Forest also provides public recreation. The closest point of the forest is about 10 miles from Walla Walla, but there are multiple access points within varying distances.

Future actions affecting recreation include:

- Building Americans with Disabilities Act-compliant paved trails in Rooks Park.
- Installing additional picnic shelters on the Federal portion of the MCFCP.
- New water feature splash pads at Eastgate Lions Park and Jefferson Park.
- Various improvements to city parks and golf course.
- Re-development of Walla Walla's Heritage Square.

Effects

The preferred alternative would have a moderate negative short term cumulative impact on recreation. The levee raise would require sections of the recreation trail on top of the levee to be closed during construction. This would temporarily restrict access to the trails along the levees that provide free recreational opportunities. Trail use has been increasing in recent years and a temporary closure would decrease use. The trail would reopen once construction is complete and there would be no long-term impact on recreation from the preferred alternative.

Environmental restoration measures would generate moderate to high long-term benefits to the quality of recreational experiences in the local area through a combination of improved visual conditions and availability of wildlife for viewing and nature-related experiences.

4.22 CLIMATE CHANGE ANALYSIS

Earth's climate is now changing faster than at any point in the history of modern civilization (USGCRP 2017). Climate shapes where and how we live and the environment around us. Natural ecosystems, agricultural systems, water resources, and the benefits they provide to society are adapted to past climate conditions and their natural range of variability. A water manager may use past or current streamflow records to design flood risk reduction projects

with the expectation that investments and management practices will meet future needs. However, the assumption that current and future climate conditions will resemble the recent past is no longer valid (USGCRP 2017).

Observations collected around the world provide significant, clear, and compelling evidence that global average temperature is much higher, and is rising more rapidly, than anything modern civilization has experienced, with widespread and growing impacts. The warming trend observed over the past century can be explained by the impact that emissions of greenhouse gases have had on the climate (USGCRP 2017). Climate change is transforming where and how we live and presents growing challenges to human health and quality of life, the economy, and the natural systems that support us. Risks posed by climate variability and change vary by region and sector and by the vulnerability of people experiencing impacts. Social, economic, and geographic factors shape the exposure of people and communities to climate-related impacts and their capacity to respond (USGCRP 2017).

4.22.1 Existing Conditions

The Mill Creek watershed has seasonal variations in temperature and geographic variations in precipitation. The Mill Creek area lies in the path of prevailing westerly winds and is largely influenced by air from the Pacific Ocean. Winters are generally damp and foggy with an average daily high of 40 degrees in January. Occasionally, polar outbreaks of cold air pass over the Rocky Mountains, resulting in short periods of extremely low temperatures. Summers are hot and dry. The hot season lasts for two and a half months, with an average daily high of around 88 degrees in July. Average and extreme temperatures for January and July in the Mill Creek watershed are provided in Table 4-2. The average frost-free period extends from late March through early November, and the average growing season is about 220 days.

Table 4-2. January and July Temperatures in the Mill Creek Watershed

Month	Average Minimum	Average Maximum	Average Monthly	Extreme
January	28°F	40°F	34°F	-16°F
July	61°F	88°F	75°F	113°F

Average annual precipitation in the watershed ranges from 17.8 inches at elevation 948 feet, in the lower portion of the watershed, to 41.9 inches at elevation 2,400 feet. It is probable that mean annual precipitation exceeds 50 inches at elevations above 5,000 feet. At Walla Walla, approximately 10 percent of the normal annual precipitation falls as snow; at higher elevations, this percentage increases considerably, becoming approximately 40 percent at the 5,000-foot level. The normal annual precipitation for the watershed upstream from the Project is estimated to range from 35 to 40 inches (Corps 2006).

4.22.2 Alternative 1: No Action

Forecasts developed from regional general circulation models predict increases in temperature and variable changes in precipitation over the next century that may affect snow accumulation, snow melt, and streamflow. Indications are that average global atmospheric temperatures are trending upward over the previous several decades, and could be correlated to increased atmospheric carbon dioxide levels (USGCRP 2017).

Models and studies have estimated potential impacts to regional temperatures and precipitation patterns from climate change, but great uncertainty and variability exists in these predictions. Climate variability may affect natural flows, but the extent is unclear. In the Pacific Northwest, changes in snowpack, stream flow, and forest cover are occurring. Future climate change would likely continue to influence these changes (EPA 2016).

Climate change can affect the hydrology of the region in a number of ways. Even without changes in precipitation, changes in temperature will affect snow accumulation and melt. Temperature increases will result in more rainfall in winter, less water stored as snow, and earlier melt of these thinner snow packs. For some rivers, peak flows may no longer occur in spring, but may occur in fall and winter instead. Warmer summers may increase drought conditions, especially if less spring and summer runoff is available from mountain snow packs. Changes in precipitation may alleviate or worsen some of these impacts (UW CIG 2017).

Average annual temperature in the region is projected to increase by 3°- 10°F by the end of the century. Winter precipitation in the form of rain, not snow, is projected to increase while summer precipitation is projected to decrease (Melillo et al. 2014). In transient runoff watersheds (mid-elevation watersheds with winter and spring flows driven by both snowmelt and rainfall), like Mill Creek watershed, the magnitude and frequency of flooding is predicted to increase in the months of December and January (Elsner et al. 2010 and Mantua et al. 2010). Flooding on Mill Creek is typically the result of winter rainfall on frozen ground coupled with some snowmelt.

Climate change is expected to increase rainfall intensity, but may reduce frozen ground. Climate change could reduce the frequency of flood diversions to Bennington Lake and increase flow through the Mill Creek channel during the winter. Less diversions into Bennington Lake and reduced spring flows could reduce water available after the flood season with which to fill the lake to 1,205 feet for public recreation. Additionally, less spring and summer flow coupled with rising air temperatures would increase stream temperature and cause changes in steelhead and bull trout distribution, behavior, growth, and survival NMFS (2015). Reduced precipitation during the summer months could also impact vegetation type and quantity, resulting in changes to wildlife habitat.

4.22.3 Alternative 7: Modify Project Operations, Levee Raise: Small, Concrete Channel Rehabilitation, Buyout/Acquisition

Alternative 7 would increase the performance, capacity, and reliability of the MCFCP to provide increased flood risk reduction. Climate change is not expected to have a significant impact on the Alternative 7. The MCFCP would be repaired to provide flood protection against increased winter flow up to a 3,700-cfs flood event. There would be no additional direct positive or negative effects on climate change under Alternative 7.

Alternative 7 could impact climate change through increased use of internal combustion engines during construction. Heavy trucks and machinery would be required for the proposed construction. Increased use of internal combustion engines would result in more gasoline and diesel fuel consumption which could result in higher greenhouse gas emissions. The emissions from the Alternative 7 would be part of world-wide cumulative contributions to climate change by way of increases in greenhouse gas emission. Given the minuscule contribution of carbon dioxide emissions from construction activities during the Alternative 7 to overall global emissions, effects are considered to be small. There would be negligible effects on climate change as a result of implementing Alternative 7.

4.22.4 Alternative 8: Modify Project Operations, Levee Raise: Moderate, Concrete Channel Rehabilitation, Buyout/Acquisition

Effects to and from Climate Change under Alternative would have the same/similar impacts as Alternative 7.

4.23 ENVIRONMENTAL COMMITMENTS

The Corps has a duty to minimize impacts to environmental resources when carrying out Civil Works missions. Impact analysis for this feasibility study has not yet identified a need to mitigate for any impacts resulting from the Alternative 7.

Recommendations within the report focus on ESA-listed fish and wildlife to maintain and enhance associated habitats along Mill Creek. The report will be reviewed and incorporate recommendations from USFWS and NMFS.

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SECTION 5 – TENTATIVELY SELECTED PLAN

Background Photo: Aerial View Mill Creek Flood Control Project (Upper End)

Photo Credit: Corps

SECTION 5 – TENTATIVELY SELECTED PLAN

This section provides a description of the TSP, which is also the national economic development plan. The plan's associated construction costs, including the net change in OMRR&R costs attributed to implementing the TSP, and the flood risk reduction benefits are presented in the description. This section concludes with recommendations for additional actions that can be implemented but are outside of the Corps' authorizations.

5.1 DESCRIPTION OF THE TENTATIVELY SELECTED PLAN

5.2 PLAN SELECTION

Based on the results of the screening of measures and alternatives, and an analysis of costs and benefits for the final array of alternatives, the TSP is Alternative 7. Alternative 7 is a combination of the following measures: modification of project operations, a small levee raise of up to approximately 1.5 feet, focused rehabilitation of the concrete channel, and property buyouts/acquisitions.

The TSP is also the NED Plan as it is the alternative that maximizes the annual net benefit contribution to the national economy consistent with protecting the Nation's environment. The TSP has a 1.54 benefit-cost ratio, which is greater than the threshold value of one. The flood reduction benefits from implementing the plan are greater than the costs of constructing and operating the plan. Alternative 7 is the most complete, effective, efficient, and acceptable alternative that meets the purpose and need and planning objectives of the study.

Alternative 7 accomplishes the following:

- Improves the system's capacity by increasing the levee size along Mill Creek so the channel can convey higher flows.
- Improves the reliability of the Project by rehabilitating and reinforcing the concrete channel through downtown Walla Walla.
- Reduces life cycle costs of the MCFCP by addressing existing vulnerabilities and lowering future overall OMRR&R costs.
- Increases performance of the system by modifying project operations.

The plan formulation process used the best available information at this phase of the study to identify the TSP. During the final phase of this feasibility study, additional analyses will be completed to refine and optimize the TSP's design, costs, and benefits.

5.2.1 Tentatively Selected Plan Costs

The TSP costs are a Class 5 parametric estimate developed using the Micro-Computer Aided Cost Estimating System (MCACES), Second Generation (MII) program. The parametric cost estimates include unit pricing for features of work and estimated quantities. Unit costs are

based on historical pricing from previous contract work with similar scopes of work and similar sized projects. Developing a Class 5 estimate also relies on broad-based assumptions, cost book, and cost engineering judgment. The MII cost estimate used RSMeans, MII Cost Libraries, and vendor quotations. The cost contingencies were developed using an Abbreviated Risk Analysis based on professional judgment. The summary of the results of this risk analysis, and more detail on the cost estimate, are included in Appendix C of this report.

The estimated first cost of construction of the TSP is $9,928,000. The estimated first cost of construction is separated out by plan components (Table 5-1), described as an average annual cost (Table 5-2), compared with the plan's flood damage reduction benefits (Table 5-3), and each component of the plan is summarized in an incremental analysis (Table 5-4).

Table 5-1. TSP Estimated First Cost of Construction (Fiscal Year 2020 Price Level)

Cost Components	Cost ($)
Rehabilitation of Concrete Channel – Center Wall Reinforcement	$ 2,165,000
Rehabilitation of Concrete Channel – Ceiling Repairs	$ 3,402,000
Rehabilitation of Concrete Channel – Wall Tieback Repair	$ 2,281,000
Small Levee Raise with Operational Changes and Buyouts/Acquisitions	$ 2,080,000
Total	**$ 9,928,000**

Table 5-2. TSP Average Annual Cost Estimates (Fiscal Year 2020 Price Level)

Annualized Construction Cost	$ 373,000
Annual OMRR&R Cost (Savings)	($ 28,000)
Net Average Annual Cost	**$ 345,000**

Table 5-3. TSP Average Annual Costs and Benefits (Fiscal Year 2020 Price Level)

Average Annual Cost	$ 345,000
Average Annual Benefit	$ 532,000
Benefit-Cost Ratio	1.54
Net Average Annual Benefit	**$ 187,000**

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Table 5-4. TSP Incremental Analysis (Fiscal Year 2020 Price Level)

Increment	Without Project / Residual Expected Annual Damages	Incremental Average Annual Benefit	Incremental Average Annual Cost	Incremental BCR	Incremental Net Benefit
0 - No Action	$1,304,000	-	-	-	-
1 - Rehabilitation of Concrete Channel – Center Wall Reinforcement	$1,003,000	$300,000	$81,000	3.70	$219,000
2 - Rehabilitation of Concrete Channel – Ceiling Repairs	$928,000	$75,000	$128,000	0.59[1]	($53,000)
3 - Rehabilitation of Concrete Channel – Wall Tieback Repair	$919,000	$10,000	$86,000	0.12[1]	($76,000)
4 - Small Levee Raise with Modified Operations and Buyouts/Acquisitions	$771,000	$148,000	$51,000	2.90	$97,000

[1]Not currently justified on an incremental basis.

Although the ceiling repair and the wall tieback repair components of the TSP are not incrementally justified through the analysis presented above, they are tentatively included in the TSP because of the potential that with refinement of the HEC-RAS and FDA models, sensitivity analysis, and further scaling, some of repairs will be justified in the final analysis. Furthermore, these components of the TSP are sensitive to several assumptions and the results of the reliability analysis. These analyses only consider a sub-set of reliability concerns in the concrete channel, and significant uncertainty about the integrity of the structures remains due to age and lack of design information. It is also notable that incremental analysis is normally not applied to interdependent factors but rather mutually exclusive factors. The final version of this report will not include any components that are not justified through more refined analysis.

5.2.2 Tentatively Selected Plan Benefits

Benefits were calculated as the reduction in flood damages between the baseline No Action Alternative and the remaining residual damages after implementing the TSP. Benefits and costs derived in future years are discounted to reflect present value fiscal year 2020 price levels. The discount rate is obtained from the U.S. Department of the Treasury as the average market yield on interest-bearing marketable Treasury securities that have 15 or more years remaining to maturity, which is 2.75 percent according to Corps Economic Guidance Memorandum 20-01. The TSP would provide $532,000 in average annual benefit, which represents the average yearly reduction in flood damages for Walla Walla and adjacent lands from implementing the

plan. The net average annual benefit, or the annual contribution to the national economy, derived from the TSP plan is $187,000.

5.2.3 Operation, Maintenance, Repair, Replacement, and Rehabilitation

Implementation of the TSP does not result in major modifications or additions to existing infrastructure that would expand the current scope of OMRR&R requirements for the Project. However, the component of the TSP that modifies project operations is expected to have an impact on the annual cost of OMRR&R for both Walla Walla County and the Federal government.

By raising the diversion trigger level from 1,400 cfs to 1,700 cfs, there would periodically be higher flows of water in the portion of the Project operated by Walla Walla County, which contributes to increased wear and tear on Project structures. Therefore, it is expected that Walla Walla County's OMRR&R costs would slightly increase above the already expected increase in OMRR&R costs from operating an aging system. For example, repairs would be needed more frequently on reinforced concrete capped levee stabilizers. Increased flows would also cause sediment and debris movement which would affect migration of flood locations in unprotected areas downstream of the Project and could result in increased flooding and erosion.

The Federal portion of the Project is expected to have diversions occurring slightly less often with the higher diversion trigger level. The annual chance exceedance probability for a 1,400-cfs diversion trigger is 25 percent (4-year average recurrence interval), whereas the annual chance exceedance probability for a 1,700-cfs diversion trigger is 21 percent (approximately a 5-year average recurrence interval). There would be a reduction of stress and strain on concrete structures, including the Mill Creek Storage Dam, intake canal, intake tower, and Mill Creek and Russell Creek outlet canals.

The Federal share of OMRR&R costs represents a very high percentage of the total OMRR&R costs for the Project. The expected reduction in Federal OMRR&R expenses from raising the diversion trigger level would contribute to a net reduction in annual OMRR&R expenses for the whole Project, taking into account the expected increases in Walla Walla County's OMRR&R costs. The net effect of implementing the modification in operations as part of the TSP is an estimated reduction of $27,500 in annual costs. The actual affect in OMRR&R scope of work and associated costs would be based on the flow and duration of unregulated water entering the system.

5.2.4 Real Estate

The TSP lies within the general footprint of the existing MCFCP. The estimated value of the lands required for the project is approximately $200,000. Other real estate related costs such as utility/facility relocations and disposals have not been factored into this estimate. Perpetual easements totaling 5.4 acres and 1.9 acres of temporary easements would be required. In some instances, multiple easements may be required on the same parcel of land. Current

analysis does not indicate the need to purchase structures. Required Lands, Easements, and Rights-of-Way (LER) total 7.3 acres.

5.2.5 Plan Economics and Cost-Sharing

The estimated cost of construction of the TSP is $9,928,000. The estimated first cost of construction is cost shared; the non-Federal sponsor is responsible for 35 percent of the cost and the Federal government is responsible for 65 percent of the cost (Table 5-5).

Table 5-5. Cost Share

Estimated First Cost of Construction	**$ 9,928,000**
Federal cost share (65%)	$ 6,453,000
Non-Federal sponsor cost share (35%)	$ 3,475,000

The non-Federal sponsor would also be responsible for all costs and actions associated with buying out/acquiring private property. The non-Federal sponsor would receive in-kind credits, in accordance with Corps policy, for these costs.

5.2.6 Risk and Uncertainty

Risk and uncertainty has been explicitly factored into the flood damage reduction analysis of this project (Appendix A). A statistical-risk based damage model, Hydrologic Engineering Center-Flood Damage Analysis (HEC-FDA), was used in this study to formulate and evaluate the Project in a life-cycle approach. HEC-FDA performs an integrated engineering and economic analysis and incorporates uncertainty in both physical parameters and storms, which enables quantification of risk with respect to project evolution, economic costs, and benefits of project implementation. HEC-FDA applies a Monte Carlo simulation with 25,000 iterations to account for the uncertainty in parameters used to determine flood inundation damage.

Looking forward, climate change contributes to risk and uncertainty. An analysis of potential climate change impacts on the plan selection process and the selected plan is presented in Appendix A. In general, ongoing climate change is expected to increase rainfall intensity, particularly in the winter months. Fewer days with frozen ground may reduce the number of events driven by snowmelt and rapid runoff. Climate change could reduce the frequency of flood diversions into Bennington Lake and increase flow through the Mill Creek Channel during the winter. Fewer diversions into Bennington Lake may be anticipated but extreme events may occur more frequently than they have in the recent past. Overall, these considerations, uncertainties, and risks do not meaningfully impact the plan selection process or provide information that would alter a decision to recommend a project.

5.2.6.1 Residual Risk

Flood risk to people and structures at any location within a floodplain is a function of the flood hazard at the location and the extent of exposure and vulnerability to the flood hazard. Residual risk is the flood risk that remains even after the TSP is in place. It is the exposure to

loss remaining after other known risks have been countered, factored in, or eliminated. The Project will not be able to eliminate all flood risks to life and property. The modeled residual risk for the TSP is equivalent to average annual flood damages of $771,090. This residual risk is comprised of damages from large flood events that exceed the system's capacity and damages downstream of the Project.

5.2.6.2 Risk to Life Safety

In the SQRA report dated May 2018 (Corps 2018), it was determined with reasonable to high confidence that the incremental risk of life loss associated with a levee breach is considered to be very low. It was determined that both the Federal and non-Federal reaches of the levees appear to be in good condition and appear to be well maintained. The risk assessment team also determined with reasonable to high confidence that non-breach floods do not create conditions that present an associated life safety risk.

In the analysis of possible, although very unlikely, failure modes for the Project, a scenario was modeled where a retail building collapses into the channel that runs underneath the downtown district. This failure mode represented a risk to life safety for the community of Walla Walla, although the risk is mitigated by advanced warnings and evacuations prior to flood events. The TSP scope of work includes components that rehabilitate the concrete channel in order to reduce the risk of a building collapse that could result in public safety and life loss issues.

Flooding in Walla Walla historically has occurred in the months of December through March. The average high air temperature during these winter months is 46°F and the average low air temperature is 32°F. Typical water temperature in Mill Creek during the winter is 40°F or below. Human exposure to Mill Creek waters in a winter flood event results in an increase to the risk of life loss.

5.2.6.3 Induced Flooding

The TSP would increase the maximum discharge through the system from the current design flow of 3,500 cfs to 3,700 cfs. This would provide higher flood risk reduction to Walla Walla, but could increase the amount of flood damages downstream of the MCFCP during some large flood events. Additional flowage easements would be acquired to mitigate those damages. These easements would be primarily within undeveloped areas. Additional analysis will be performed to define the need and location of needed flowage easements.

Existing operation of the MCFCP includes initial diversion of flood flows into Bennington Lake beginning at a flow of 1,400 cfs. Operational changes associated with the TSP would increase this initial diversion flow to up to 1,700 cfs if conditions in the watershed and forecasts indicate the potential for a major flood event. Increasing this initial diversion flow would provide a higher level of flood risk reduction to Walla Walla by conveying more floodwater through the system prior to beginning diversions, but could also increase the amount of, or frequency of, flood damages in limited areas downstream of the Project. The precise operational changes

needed to optimize flood risk reduction benefits may be further defined later in this study process.

5.2.7 Optimization of the Tentatively Selected Plan

The TSP incorporates cost-effective measures scaled to appropriate levels to address problems in the existing system and maximize the NED contribution. Optimization of the TSP will be conducted if supported by the analysis from future refinement of the engineering and economic models.

5.2.8 Compliance with the National Flood Insurance Program

The existing levees, if left unchanged, will not meet FEMA levee certification requirements in the future. Therefore, the No Action Alternative would result in additional flood insurance premium costs for approximately 1,250 homeowners within the 100-year floodplain. Additional benefits provided by the TSP include an estimated $240,000 in annual savings for Walla Walla homeowners who would avoid mandatory NFIP coverage in the future. The savings are derived from the estimated administrative costs of flood insurance policies. The benefits calculation does not include savings from the insurance policy premiums as these represent a transfer of risk from an NED perspective.

5.2.9 Recommendations

The following non-structural measures fall outside of the Corps' authorizations. However, the Corps recommends consideration of the following potential actions to further reduce flood risk in the region.

Community Emergency Planning and Education - This measure was eliminated because it is assumed the City of Walla Walla and Walla Walla County would continue to provide appropriate levels of planning and education related to areas located in high flood risk locations. This could include updating and improving emergency response procedures for multiple scenarios related to flooding, including bridge or building collapse and evacuations. Use of forums and literature to educate the community on the emergency response procedures is recommended.

Update Emergency Action Plan/Hazard Maps - This measure was eliminated because the Corps has no authorization to update Emergency Action Plans and maps. Local governments are encouraged by the Corps, FEMA, and other interested Federal partners to use information from this study to develop and maintain an FEPP. The FEPP would identify flood hazards, risks and vulnerabilities, and mitigation actions. The FEPP should incorporate the community's response to flooding, location of evacuation centers, primary evacuation routes, and post flood recovery processes.

Address Forestry Practices in the Watershed - Mill Creek watershed is managed by the U.S. Forest Service. Floods from either snowmelt or from rainfall plus snowmelt originating on

forest land are forest influenced. Forest management practices may be able to reduce peak flows and the amount of water conveyed through the MCFCP. Opportunities for moderating floods in the forested part of the upper Mill Creek watershed to reduce flood peak flows through the Project could lie in timber, fire, and grazing management.

Land Use Regulations - The County has jurisdiction over zoning and land use. Land use regulations within a designated floodplain are effective tools in reducing flood risk and flood damage. The basic principles of these tools are based nationally in the NFIP, which requires minimum standards of floodplain regulation for those communities that participate in the NFIP. For example, land use regulations may identify where development can and cannot occur and to what elevation structures should locate their lowest habitable floor. The Corp recommends the County consider additional land-use regulations and enforcement to reduce future flood risk.

5.3 PLAN IMPLEMENTATION

5.3.1 Division of Responsibilities

In accordance with the cost share provisions in Section 103 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 2213), project design, and implementation are cost shared 65 percent Federal and 35 percent non-Federal. The OMRR&R requirements are considered in the economic analysis for the project. The non-Federal sponsor is responsible for 100 percent of annual OMRR&R requirements on the non-Federal portion of the Project. The Federal government is responsible for OMRR&R on the Federal portion. The Corps does not anticipate Lands, Easements, Rights-of-Way, Relocations, and Disposals (LERRDs) costs associated with the Federal portion of the project. The Non-Federal sponsor is also responsible for obtaining all LERRDs.

5.3.2 Project Schedule

The project schedule, including deadlines and milestones, is shown in Table 5-6.

Table 5-6. Mill Creek General Investigation Study Schedule

Task	Date
Execute Cost-Share Agreement	September 4, 2018
Alternative Milestone Meeting	December 4, 2018
Project Plan / Review Plan Approval	January 9, 2019
Second Stakeholders and Public Meetings	May 30, 2019
TSP Milestone Meeting	October 15, 2019
Public Review	January 15, 2020
Agency Decision Milestone	May 29, 2020
Final Report	December 15, 2020
Northwest Division Corps Transmittal	March 15, 2021
Chief Signs Report	August 2, 2021

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SECTION 6 - ENVIRONMENTAL COMPLIANCE

Background Photo: Mill Creek at Sunset

Photo Credit: Corps

SECTION 6 - COMPLIANCE WITH ENVIRONMENTAL LAWS, STATUTES, AND POLICIES

This section addresses treaties, Federal statutes, and executive orders, potentially applicable to the proposed action. The text provides a brief summary of the relevant aspects of the law or order. The conclusions on compliance are based on the impact analysis presented in Section 4, Environmental Effects. The Corps would comply with all applicable laws and regulations.

6.1 TREATIES

Treaties are legally binding contracts between sovereign nations that establish those nations' political and property relations. Treaties between Native American Tribes and the United States confirm each nation's rights and privileges. In most of these treaties, the Tribes ceded title to vast amounts of land to the United States, but reserved certain lands (reservations) and rights for themselves and their future generations. Like other treaty obligations of the United States, Indian treaties are considered to be "the supreme law of the land," and they are the foundation upon which Federal Indian law and the Federal Indian trust relationship is based.

Treaty negotiations with area Tribes were conducted quickly by Isaac Stevens, Governor of Washington Territory. Treaties with area Tribes (e.g., Treaty of June 9, 1855, Walla Walla, Cayuse, Etc., 12 Stat. 945 [1859]) explicitly reserved unto the Tribes certain rights, including the exclusive right to take fish in streams running through or bordering reservations, the right to take fish at all usual and accustomed places in common with citizens of the territory, and the right of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed lands. These reserved rights include the right to fish within identified geographical areas.

The Treaty Between the Cayuse, Umatilla, and Walla Walla Tribes, in Confederation, and the United States, June 9, 1855, (12 Stat. 945 [1859]) resulted in the ceding of at least 6.4 million acres destined for private, non-Indian land ownership and formation of a 155,000-acre reservation for the CTUIR. The Mill Creek watershed lies within the ceded lands.

The Corps does not anticipate that implementation of the TSP would result in any impacts to reserve treaty rights.

6.2 FEDERAL STATUTES

6.2.1 National Environmental Policy Act of 1969

The National Environmental Policy Act (NEPA) (42 USC 4321 et seq.) provides a commitment that Federal agencies will consider the environmental effects of their actions. It also requires that an Environmental Impact Statement (EIS) or EA be included in every recommendation or report on proposals for legislation and other major Federal actions. The EIS or EA must provide detailed information regarding the proposed action and alternatives, the environmental impacts of the alternatives, possible cumulative effects, and potential mitigation measures.

Agencies are required to demonstrate that these factors have been considered by decision-makers prior to undertaking actions.

The Corps determined that the TSP would not significantly affect the quality of the human environment and an EIS is not required. The Corps prepared this EA to inform the determination. A 30-day public/agency/tribal review and comment period of the draft FONSI and EA will occur in January 2020. The NEPA process would be considered complete upon signing of a Finding of No Significant Impact (FONSI), if determined appropriate.

6.2.2 Federal Water Pollution Control Act (Clean Water Act)

The Federal Water Pollution Control Act (33 USC 1251 et seq.) is more commonly referred to as the Clean Water Act (CWA). This Act is the primary legislative vehicle for Federal water pollution control programs and the basic structure for regulating discharges of pollutants into waters of the United States. The CWA was established to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." The CWA sets goals to eliminate discharges of pollutants into navigable water, protect fish and wildlife, and prohibit the discharge of toxic pollutants in quantities that could adversely affect the environment. The CWA has been amended numerous times and given a number of titles and codifications.

The Corps determined that the TSP would comply with this Act. Modifications to the channel would be relatively minor, with effects similar to the existing condition. (See water quality section above for more details.)

6.2.3 Clean Air Act

The Clean Air Act (CAA) (42 USC 7401 et seq.), amended in 1977 and 1990, was established "to protect and enhance the quality of the nation's air resources so as to promote public health and welfare and the productive capacity of its population." The CAA authorizes the Environmental Protection Agency to establish the National Ambient Air Quality Standards to protect public health and the environment. The CAA establishes emission standards for stationary sources, volatile organic compound emissions, hazardous air pollutants, and vehicles and other mobile sources. The CAA also requires the states to develop implementation plans applicable to particular industrial sources.

Construction activities associated with raising the levees, channel rehabilitation, and any new structures have the potential to increase dust and create other temporary air quality effects. With the implementation of best management practices, such as driving slowly and periodically wetting roadways, these activities are not anticipated to adversely affect air quality. Operation of heavy equipment (trucks, tractors, etc.) would have localized, temporary increases of emissions, but would not adversely affect air quality.

The Corps determined that the TSP would comply with this Act. Mitigation measures would be incorporated into the TSP wherever there is the potential to generate fugitive dust. Emissions from construction equipment are not expected to affect air quality noticeably.

6.2.4 US Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act of 1934, as amended (16 USC 661 through 666(c)), requires consultation with USFWS and NMFS when any natural water body is impounded, diverted, controlled, or modified. The USFWS, NMFS, and state agencies charged with administering wildlife resources are to conduct surveys and investigations to determine the potential damage to wildlife and the mitigation measures that should be taken. The Federal natural resource agencies incorporate the concerns and findings of the state agencies into a report that addresses fish and wildlife factors and provides recommendations for mitigating or enhancing impacts to fish and wildlife affected by a Federal project.

The Corps determined that the TSP would comply with this Act. The USFWS declined to coordinate under the FWCA. The NMFS originally accepted the Corps' invitation to act as a cooperating agency on FWCA coordination, and preparation of the EA, but later chose not to sign a memorandum of understanding with the Corps. On May 8, 2019, both Services verbally expressed that a Coordination Act Report would be redundant to the collaboration through coordinating agency meetings and ESA consultation. The Services plan to compile the information gathered and shared during the study to assist the Corps with their planning. The TSP will not result in any new modification control of a water body and, therefore, a Coordination Act Report is not required.

6.2.5 Endangered Species Act

The ESA (16 USC 1531-1544), amended 1988, established a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the habitat upon which they depend. Section 7(a) of the ESA requires Federal agencies to consult with USFWS and NMFS, as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their critical habitats.

There are several possible determinations on effects to ESA-listed species.

- A "no effect" determination is made for those species or critical habitats temporally or spatially separated from, and not exposed to, potential stressors of the proposed action.
- A "may affect" determination is made when there are any potential effects to a listed species from a proposed action.
- A "not likely to adversely affect" determination is made for an affected species or critical habitat when a proposed action is unlikely to have an effect or is not sufficient to reduce a listed individual's health.
- A "likely to adversely affect" determination is made for an affected species if it is likely that any listed individual's health could be reduced by a proposed action.
- A "formal consultation required" determination is made for critical habitat that could be negatively affected.

The Corps determined that the TSP "may affect, and is likely to adversely affect" ESA-listed steelhead and bull trout. In-water work in the Mill Creek Channel or work that could have notable effects to species or critical habitat led to this determination by the Corps. The Corps has prepared a Biological Assessment for this study and plans to submit the Biological Assessment (Appendix F) to NMFS and USFWS on or around January 15, 2020. The Corps will submit the Biological Assessment requesting formal consultation once it is complete. The Corps determined that the TSP would comply with this Act once formal ESA consultation is complete.

6.2.6 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (16 USC 703-712, as amended) prohibits the taking of and commerce in migratory birds (live or dead), any parts of migratory birds, their feathers, or nests. Take is defined in this Act to include by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing, or transporting any migratory bird, nest, egg, or part thereof.

The Corps would comply with this Act by implementing impact avoidance or minimization measures and removing vegetation outside the nesting season, thereby minimizing or eliminating impacts. By avoiding the destruction of nests and removing vegetation or clearing ground only outside the nesting season, the TSP would not result in taking migratory birds, their nests, eggs, or parts thereof.

6.2.7 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 USC 668-668c) prohibits the taking or possession of and commerce in bald and golden eagles, with limited exceptions (primarily for Native American Tribes). Take under this Act includes both direct taking of individuals and take due to disturbance (further defined in 50 CFR 22.3).

Bald eagles are not common to the Mill Creek watershed. There are no known bald eagle nests in the area, and they are not likely to nest near any of the proposed construction areas. Golden eagles have been observed in the surrounding area, but would not nest near any of the proposed construction areas. No take of either bald or golden eagles would occur. The Corps determined that the TSP would comply with this Act.

6.2.8 Magnuson-Stevens Fishery Conservation and Management Act

The consultation requirement of Section 305(b) of the Magnuson-Steven Fishery Conservation and Management Act directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect Essential Fish Habitat (EFH). Adverse effects include direct or indirect physical, chemical, or biological alterations of the waters or substrate, and loss of or injury to benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects to EFH may result from actions occurring within or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR

600.810). Section 305(b) also requires NMFS to recommend measures the action agency may take to conserve EFH.

The Pacific Fishery Management Council (PFMC) is one of eight regional fishery management councils established by this Act. The PFMC has designated EFH for ground fish; coastal pelagic species; and Chinook salmon, Coho salmon, and Puget Sound pink salmon. Steelhead are not protected by this Act.

Some Chinook now return to the Walla Walla River watershed, including Mill Creek; however, these fish are a reintroduced population and are not covered under this Act (79 FR 75449). The MSA does not cover any species present in Mill Creek, and therefore is not applicable to the proposed action.

6.2.9 Native American Graves Protection and Repatriation Act

The Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001 et seq.) addresses the discovery, identification, treatment, and repatriation of Native American (and Native Hawaiian) human remains, associated funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony. This Act also establishes fines and penalties for the sale, use, and transport of Native American cultural items.

Inadvertent discoveries of human remains have occurred near the project area. If human remains or associated objects are discovered, all work would stop, and the Corps would notify Native American Tribes and comply with the requirements of NAGPRA, Corps guidance, and any applicable State laws.

6.2.10 National Historic Preservation Act

Section 106 of the NHPA (16 USC 470 et seq.) requires that Federal agencies evaluate the effects of Federal undertakings on historic properties and afford the Advisory Council on Historic Preservation opportunities to comment on the proposed undertaking. To accomplish this, the Corps will be required to initiate consultation with the appropriate consulting parties, to include the Washington State SHPO, Tribes, and other interested parties. Once the consulting parties have been identified, the Corps will then complete identification of all historic properties potentially affected by the selected plan. Once this step is complete the Corps will finalize its determination of effect, and seek comment regarding those effects. Consultation will be necessary to address any effects determined to be adverse, and efforts will be made to avoid, minimize; and if necessary, mitigate for those effects.

The Corps plans to initiate the Section 106 process in February of 2020. Currently the Corps does not anticipate adverse effects resulting from the TSP, but that determination will be made after consultation, and prior to a final decision.

6.2.11 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) (42 USC 6901 et seq.) gives the Environmental Protection Agency the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also established a framework for the management of non-hazardous solid wastes.

The Corps determined that the TSP would comply with this Act. Any RCRA wastes would be handled in a manner compliant with the Act.

6.2.12 Comprehensive Environmental Response, Compensation and Liability Act (Superfund)

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC 9601 et seq.), also known as Superfund, created a tax on chemical and petroleum industries and provided Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment.

Superfund sites have been identified in the project area. Impacts sites would be avoided therefore, the Corps determined that the TSP would comply with this Act. Any CERCLA wastes would be handled in a manner compliant with the Act.

6.2.13 Safe Drinking Water Act

The Safe Drinking Water Act (Title XIV of the Public Health Service Act) (42 USC 300f through 300j-9) is the Federal law that protects public drinking water supplies throughout the nation. Under this Act, EPA sets standards for drinking water quality and implements technical and financial programs to ensure safe drinking water.

Initial measures could have affected public drinking water systems, however, the TSP does not impact drinking water. Therefore, the Corps determined that the TSP would comply with this Act. Drinking water would not be affected by the proposed actions.

6.3 EXECUTIVE ORDERS

6.3.1 Executive Order 11988, Floodplain Management

Executive Order 11988, Floodplain Management Guidelines, May 24, 1977, outlines the responsibilities of Federal agencies in the role of floodplain management. Each agency shall evaluate the potential effects of actions on floodplains and should avoid undertaking actions that directly or indirectly induce growth in the floodplain or adversely affect natural floodplain values.

The Corps determined that the TSP would meet planning objectives established by the study and be consistent with requirements of Executive Order 11988.

6.3.2 Executive Order 11990, Protection of Wetlands

Executive Order 11990, Protection of Wetlands, May 24, 1977, encourages Federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands when undertaking Federal activities and programs. It has been the goal of the Corps to avoid or minimize wetland impacts associated with their proposed actions.

The Corps determined that the TSP would comply with this Executive Order.

6.3.3 Executive Order 13751, Safeguarding the Nation from the Impacts of Invasive Species

Executive Order 13751, December 8, 2016, Safeguarding the Nation from the Impacts of Invasive Species, December 5, 2016, amends Executive Order 13112 and directs Federal agencies to "refrain from authorizing, funding, or implementing actions that are likely to cause or promote the introduction, establishment, or spread of invasive species in the United States unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions."

Through coordination with the Tribes and the Mill Creek Coalition which includes the Tribes, the Corps has ensured the requirements of the EO were met. Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations

The purpose of Executive Order 12898, February 11, 1994, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, is to focus Federal attention on the environmental and human health effects of Federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities. It directs Federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations to the greatest practicable extent and permitted by law.

The Corps determined that the TSP would comply with this Executive Order.

6.3.4 Executive Order 13175, Consultation and Coordination with Indian Tribal Governments

Executive Order 13175, November 6, 2000, Consultation and Coordination with Indian Tribal Governments, November 6, 2000, directs Federal agencies to establish regular and meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications, to strengthen the United States government-to-government relationships with Indian Tribes, and to reduce the imposition of unfunded mandates upon Indian Tribes.

The Corps has consulted regularly with tribal officials through monthly Mill Creek Coalition and Mill Creek Work Group meetings as well as independent discussions. The Corps has offered Government to Government consultation which is currently being scheduled.

6.3.5 Executive Order 13007, Native American Sacred Sites

Executive Order 13007, Native American Sacred Sites, May 24, 1996, directs Federal land managing agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites.

The Corps does not anticipate that implementation of the TSP would result in any adverse effects to Native American Sacred Sites.

6.4 EXECUTIVE MEMORANDA

Council on Environmental Quality Memorandum, August 11, 1980, Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA

Initial measures could have impacted farmlands. There are no prime or unique agricultural lands near the proposed project area. The Corps determined that the TSP would not affect prime or unique agricultural lands.

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SECTION 7 - CONSULTATION & COORDINATION

Background Photo: Windsurfer on Bennington Lake

Photo Credit: Corps

SECTION 7 - CONSULTATION, COORDINATION, AND PUBLIC INVOLVEMENT

This section explains the public and agency coordination that occurred throughout the preparation of this feasibility study.

7.1 PROJECT KICK-OFF

The Corps initiated the feasibility study with an internal workshop that took place in Walla Walla, October 1 through 5, 2018. The workshop consisted of Corps team members from the Walla Walla District and Northwestern Division, and a mediator from the Flood Risk Management Center of Expertise in Sacramento. Team members from Walla Walla County, the non-Federal sponsor, also participated. During the week-long workshop, participants brainstormed to come up with measures and alternatives that could address the potential flooding problem associated with the aging Project infrastructure.

On October 18, 2018, the Corps conducted a charrette (a collaborative session in which a group drafts a solution to a problem) for agency and Tribal stakeholders to obtain input and to capitalize on the work that had been done thus far. The objective of the charrette was to document stakeholder input and find non-flood risk management solutions that would be compatible with the selected alternative.

7.2 PUBLIC SCOPING MEETING

Scoping is the process by which the Corps gathers input from the public, Tribes, and other Federal, state, and local agencies to help determine the scope of the feasibility study alternatives and analysis. Public scoping is a critical component of the NEPA process and one of the first steps taken in developing a NEPA document, in this case, an EA. During the scoping process, the Corps informs interested parties about the overall study, including the authority, purpose and need, preliminary measures and alternatives, and possible constraints, and allows them to provide input and recommendations on what to include. Public involvement allows the Corps to identify and address important issues early in the feasibility study.

On November 1, 2018, the Corps and Walla Walla County conducted a public scoping open house to provide an overview of the study and solicit comments from interested parties regarding the scope of the study and alternatives to be addressed. Letters announcing the open house were distributed to approximately 150 agencies, Tribes, organizations, local governments, and individuals on the study mailing list. The Corps accepted scoping comments from October 15 to November 16, 2018. Approximately 76 individuals attended the scoping meeting and 34 comment documents were received.

7.3 PUBLIC AND STAKEHOLDER UPDATE MEETING

On May 30, 2019, the Corps and Walla Walla County held two meetings to update stakeholders and the public on the progress of the Mill Creek feasibility study. Twenty-six people attended the stakeholder/agency/Tribal meeting, and 37 people attended the evening public meeting. Another public and stakeholder update meeting is currently being planned for November 2019.

7.4 PUBLIC REVIEW/MEETING ASSOCIATED WITH DRAFT EA

In compliance with NEPA, the draft FONSI and EA will be available for public review and comment for at least 30 days in January 2020. A public meeting will be held during that time so that interested parties may speak directly to, and ask questions of the Corps and Walla Walla County staff members.

7.5 TRIBAL CONSULTATION

Several Corps staff members met with representatives of the CTUIR in the spring of 2019 in Mission, Oregon, to discuss the feasibility study and fish passage issues.

Rivers and aquatic resources are very important to the CTUIR. They recently prepared the Lower Mill Creek Habitat and Passage Assessment and Strategic Action Plan (CTUIR 2017) to assess existing conditions in the Mill Creek Watershed and to use the information to propose actions for improving conditions for fish while maintaining or improving flood risk management. Key issues, concerns, and visions identified for Mill Creek include:

- Preserve and maintain upper Mill Creek and its headwater conditions.
- Maintain flood risk management capacity.
- Retain and enhance Mill Creek's natural resources and functions, including habitat, fisheries, water supply, water quality, in-stream flows, and creation of an open channel.
- Retain and enhance public access, channel visibility, and outdoor recreation opportunities, including paths for pedestrians and bicyclists.

7.6 ENDANGERED SPECIES ACT CONSULTATION

The ESA requires the Corps to consult with NMFS and USFWS (collectively referred to as the Services) concerning threatened and endangered species that may exist in the proposed action area.

7.6.1 Previous ESA Consultation History

On September 14, 2018, the Corps requested formal consultation with USFWS and NMFS on the operations and maintenance of the MCFCP to complete ESA compliance for the *Draft Mill Creek Flood Control Project Operations and Maintenance Supplemental Environmental Impact Statement*. The Corps determined the proposed action "may affect, and is likely to adversely

affect" middle Columbia River steelhead and bull trout, and may affect their critical habitat. At this time (January 2020) consultation is still ongoing (NMFS # WCR-2018-00274).

7.6.2 Current ESA Consultation

The Corps initiated informal consultation/technical assistance with NMFS and USFWS in a letter dated October 10, 2018, requesting cooperating agency participation. The NMFS accepted the invitation but declined to enter into a Memorandum of Understanding as a true cooperator. The USFWS declined cooperating agency status. The Corps has been in regular communication with Services as coordinating agencies on a regularly scheduled conference call since March 13, 2019. The Corps has drafted a Biological Assessment (Appendix F) specific to the TSP and determined the Plan "may affect, and is likely to adversely affect" ESA-listed steelhead and bull trout. The Corps plans to submit the Biological Assessment to NMFS and USFWS on or around January 15, 2020. The Corps determined that the TSP would comply with this Act once formal ESA consultation is complete.

7.7 CULTURAL RESOURCES COORDINATION

Since construction of the Mill Creek Project, the Corps has consulted with Tribes and the State Historic Preservation Office (SHPO) many times regarding implementation actions. For purposes of this feasibility study specifically, the Corps included the CTUIR and the Washington SHPO in the scoping process (November 1, 2018) and met directly with the CTUIR in spring 2019. The entire consultation history informs the actions implemented subsequent to the finalization of this EA and would be subject to review in accordance with Section 106 of the NHPA and its implementing regulations, 36 CFR Part 800. Section 106 requires that Federal agencies evaluate the effects of Federal undertakings on historic properties and afford the Advisory Council on Historic Preservation opportunities to comment on the proposed undertaking. To accomplish this, the Corps will be required to initiate consultation with the appropriate consulting parties, to include the Washington State SHPO, Tribes, and other interested parties. Once the consulting parties have been identified, the Corps will then complete identification of all historic properties potentially affected by the selected plan. Once this step is complete the Corps will finalize its determination of effect, and seek comment regarding those effects. Consultation will be necessary to address any effects determined to be adverse, and efforts will be made to avoid, minimize; and if necessary, mitigate for those effects.

The Corps plans to initiate the Section 106 process in February of 2020. Currently the Corps does not anticipate adverse effects resulting from the TSP, but that determination will be made after consultation, and prior to a final decision.

7.8 CLEAN WATER ACT COORDINATION

The Federal Clean Water Act enables states to approve, condition, or deny projects proposed in waters of the United States using a system of water quality permits and Section 401 Water Quality Certification. Ecology is the agency in Washington State designated by the

Environmental Protection Agency to administer the Clean Water Act. Therefore, the Corps is required to coordinate with Ecology and must either request individual 401 Certification or be in compliance with one of the Nationwide Permits for proposed actions that involve in-water disposal of dredged or fill material (Section 404) or generate ground disturbance and resultant stormwater run-off (Section 402).

Because Ecology is a formal cooperating agency for this study (see 7.9.1 below), the Corps is already coordinating and working with them in preparation of meeting compliance requirements for the CWA.

7.9 ADDITIONAL COORDINATION, MEETINGS AND PRESENTATIONS

7.9.1 Cooperating and Coordinating Agencies

In October 2018, the Corps officially invited the following to participate in the GI Study as Cooperating Agencies under NEPA:

- Environmental Protection Agency.
- The National Marine Fisheries Service.
- The U.S. Fish and Wildlife Service.
- The U.S. Forest Service.
- The National Park Service.
- The Confederated Tribes of the Umatilla Indian Reservation.
- The Washington State Department of Ecology.
- The Washington State Historic Preservation Office.

Ecology accepted the Corps invitation on November 9, 2018, and a formal Memorandum of Understanding between the Corps and Ecology was signed in February 2019. Ecology's various programs are concerned with several issues in the feasibility study area, such as protecting existing water rights, improving water quality, and reducing flood risk and improving floodplain functions. As a cooperating agency, Ecology's role includes assisting the Corps by participating in the NEPA process, developing information, preparing environmental analyses specific to their area of jurisdiction and special expertise, and participating in document technical reviews. Ecology is also responsible for ensuring the Corps' compliance with the CWA.

The Services, the CTUIR, and the U.S. Forest Service declined formal cooperating agency status; however, they are participating as "coordinating agencies," which means that they assist the Corps in identifying issues and provide specific information, data, and analyses related to their areas of expertise.

To implement and maintain collaboration among these agencies, in March 2019, the Corps began to conduct regularly scheduled meetings by phone. The objectives of the conference

calls were to keep the cooperating and coordinating agencies informed as the study progressed, to address any questions or concerns they may have, and in general provide an avenue for check-ins twice a month. Agencies in attendance include Ecology, CTUIR, NMFS, USFWS, WDFW, and the U.S. Forest Service.

7.9.2 The Corps Local Participation

The Corps meets on a bi-weekly basis with the non-Federal sponsor, and on a monthly basis with the Tribes and the Mill Creek Coalition (which consists of the City of Walla Walla, Port of Walla Walla, Downtown Foundation, Tribes, the Department of Public Works, Walla Walla County, and local business owners).

The Corps regularly attends and presents updates at all Mill Creek Work Group meetings. The Work Group consists of state and Federal agencies, local environmental groups, CTUIR, and interested members of the public. The Corps also met with the Walla Walla Watershed Management Partnership and City Council on several occasions.

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SECTION 8 - REFERENCES

Background Photo: Mill Creek Channel, Concrete Section

Photo Credit: Audrey Gossett, Corps

SECTION 8 - REFERENCES

This section provides the reports cited in the analysis as well as a listing of prior reports and studies applicable to this study.

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