WALLA WALLA RIVER BI-STATE FLOW STUDY

2019 FLOW STUDY UPDATE
Results of Feasibility, Data Analysis, Data Gaps, Project Packaging, and Environmental Review

Prepared for:
Office of Columbia River

Prepared by:
Walla Walla Watershed Flow Study Steering Committee

Submitted by:
Walla Walla Watershed Management Partnership

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<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>AF</td>
<td>Acre-feet</td>
</tr>
<tr>
<td>afy</td>
<td>acre-feet per year</td>
</tr>
<tr>
<td>ASR</td>
<td>Aquifer Storage and Recovery</td>
</tr>
<tr>
<td>BPA</td>
<td>Bonneville Power Administration</td>
</tr>
<tr>
<td>cfs</td>
<td>cubic feet per second</td>
</tr>
<tr>
<td>CRPE</td>
<td>Columbia River Pump Exchange</td>
</tr>
<tr>
<td>CTUIR</td>
<td>Confederated Tribes of the Umatilla Indian Reservation</td>
</tr>
<tr>
<td>DNS</td>
<td>Determination of Non-Significance</td>
</tr>
<tr>
<td>DS</td>
<td>Determination of Significance</td>
</tr>
<tr>
<td>Ecology</td>
<td>Washington State Department of Ecology</td>
</tr>
<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>ESA</td>
<td>Endangered Species Act</td>
</tr>
<tr>
<td>ES-IT</td>
<td>Early Snow Melt-Increased Temperature Scenario</td>
</tr>
<tr>
<td>Flow Study</td>
<td>Walla Walla Basin Integrated Flow Enhancement Study</td>
</tr>
<tr>
<td>FWUA</td>
<td>Fruitvale Water Users Association</td>
</tr>
<tr>
<td>GFID</td>
<td>Gardena Farms Irrigation District No. 13</td>
</tr>
<tr>
<td>gpd</td>
<td>gallons per day</td>
</tr>
<tr>
<td>HBDIC</td>
<td>Hudson Bay District Improvement Company</td>
</tr>
<tr>
<td>IFIM</td>
<td>Instream Flow Incremental Methodology</td>
</tr>
<tr>
<td>LS-IT</td>
<td>Low Snow-Increased Temperature Scenario</td>
</tr>
<tr>
<td>MAR</td>
<td>Managed Aquifer Recharge</td>
</tr>
<tr>
<td>MOA</td>
<td>Memorandum of Agreement</td>
</tr>
<tr>
<td>NEPA</td>
<td>National Environmental Policy Act</td>
</tr>
<tr>
<td>NFMS</td>
<td>National Marine Fisheries Service</td>
</tr>
<tr>
<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
</tr>
<tr>
<td>NLW</td>
<td>Northwest Land &amp; Water, Inc.</td>
</tr>
<tr>
<td>OAR</td>
<td>Oregon Administrative Rules</td>
</tr>
<tr>
<td>OCR</td>
<td>Office of Columbia River</td>
</tr>
<tr>
<td>OWEB</td>
<td>Oregon Watershed Enhancement Board</td>
</tr>
<tr>
<td>OWRD</td>
<td>Oregon Water Resources Department</td>
</tr>
<tr>
<td>OSWC</td>
<td>Oregon State Water Commission</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>PCR</td>
<td>Pine Creek Reservoir</td>
</tr>
<tr>
<td>SEPA</td>
<td>State Environmental Policy Act</td>
</tr>
<tr>
<td>Study Partners</td>
<td>WWWMP and WWBWC collectively</td>
</tr>
<tr>
<td>SVF</td>
<td>seasonally varying flow</td>
</tr>
<tr>
<td>TMDL</td>
<td>Total Maximum Daily Load</td>
</tr>
<tr>
<td>TWG</td>
<td>Technical Workgroups</td>
</tr>
<tr>
<td>USBR</td>
<td>United States Bureau of Reclamation</td>
</tr>
<tr>
<td>USFWS</td>
<td>United States Fish and Wildlife Service</td>
</tr>
<tr>
<td>WAC</td>
<td>Washington Administrative Code</td>
</tr>
<tr>
<td>WARS</td>
<td>Water Availability Reporting System</td>
</tr>
<tr>
<td>WWBWC</td>
<td>Walla Walla Basin Watershed Council</td>
</tr>
<tr>
<td>WWRID</td>
<td>Walla Walla River Irrigation District</td>
</tr>
<tr>
<td>WWWMP</td>
<td>Walla Walla Watershed Management Partnership</td>
</tr>
<tr>
<td>WWRRM</td>
<td>Walla Walla River Response Model</td>
</tr>
<tr>
<td>WY</td>
<td>Water Year (October through September)</td>
</tr>
</tbody>
</table>
Executive Summary

Scope of the 2019 Flow Study Update
This report documents the current status of the Walla Walla Basin Integrated Flow Enhancement Study (Flow Study) completed in December 2019. This second phase of the Flow Study builds upon over a decade of work by multiple basin stakeholders documented in the Walla Walla Basin Integrated Flow Enhancement Study (November 2017). The 2017 report identified the Flow Study geographical context, objectives, stakeholders, and documented the process where over 100 water supply projects were evaluated and focused to five specific water supply alternatives to improve flows in the mainstem Walla Walla River. The current phase of the project adds new evaluations of storage and pump exchange options, fisheries information, and basin environmental data, which were studied in the context of four water supply alternatives and further refined to two preferred water supply alternatives.

Flow Study Objectives
The primary objective of the Flow Study is to improve streamflows in the Walla Walla River mainstem to support harvestable populations of native fish species, while maintaining the long-term viability of agricultural, municipal, commercial, and residential uses of water. This study focuses on the Walla Walla River mainstem extending from the controlled diversion into the Little Walla Walla River near Cemetery Bridge in Milton-Freewater, Oregon, to the confluence with the Columbia River upstream of McNary Dam near Wallula, Washington (Figure 1).

In 2017, the Flow Study Steering Committee agreed by consensus to the instream flow targets summarized in Table ES-1. These targets represent a significant improvement relative to current low flows of 0 to 20 cubic feet per second (cfs), but are less than minimum instream flows adopted in Washington in 2007 (WAC 173-532). The minimum instream flow values govern new water rights and changes to existing rights only, whereas the Flow Study Target Streamflow values are intended to be achieved while also satisfying existing water right demands.

Table ES-1. Walla Walla River Streamflow Targets

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Flow Study Target Streamflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 1—June 15</td>
<td>150 cfs</td>
</tr>
<tr>
<td>June 16—June 30</td>
<td>100 cfs</td>
</tr>
<tr>
<td>July 1—November 30</td>
<td>65 cfs</td>
</tr>
</tbody>
</table>
Figure 1. Proposed Alternatives Map
**Evaluation of Alternatives**

By reviewing preliminary technical information, cost estimates, potential environmental impacts, and performance of projects relative to the mainstem Walla Walla River flow improvement goals, the Steering Committee has focused over 100 proposed streamflow restoration projects to the four primary alternatives summarized in Table ES-2. Each of these four alternatives were designed to meet the Flow Study Target Streamflow values in Table ES-1. In some water years, or in some reaches, some of the alternatives do not completely meet the goals, but the Steering Committee believes they should continue to be advanced because:

1. They offer substantial improvements to existing flows.
2. The deviations from the goals are likely within the margin of error on what can be estimated at this time due to the limits of current knowledge.
3. The deviations from the goals could be further reduced through additional smaller projects over time.

### Table ES-2. Flow Study Alternatives Summary

<table>
<thead>
<tr>
<th>Alt #</th>
<th>Alternative Description</th>
<th>Cost</th>
<th>Aggregate Score</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Construction</td>
<td>O&amp;M</td>
</tr>
<tr>
<td>1</td>
<td>Columbia River Pump Exchange (160 cfs)</td>
<td>$254.2M</td>
<td>$2.52M/yr</td>
</tr>
<tr>
<td>2</td>
<td>Pine Creek Reservoir (34k AF)³</td>
<td>$384.7M</td>
<td>$0.19M/yr</td>
</tr>
<tr>
<td>3</td>
<td>Pine Creek Reservoir (34k AF)³ plus City of Walla Walla ASR⁴</td>
<td>$384.7M</td>
<td>$0.46M/yr</td>
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<tr>
<td>4</td>
<td>Columbia River Pump Exchange (120 cfs)</td>
<td>$227.3M</td>
<td>$2.55M/yr</td>
</tr>
</tbody>
</table>

**Notes:**

1. Life Cycle Net Present Value (NPV) cost represents construction cost and O&M costs over 100-year evaluation period with periodic repair and replacement costs assuming 2.875% discount rate for future costs.
2. Aggregate Score reflects the Evaluation Tool Scoring described in Section 4.5 and Appendix 4-E. The scores presented are draft based solely on the consultant’s score assignment. The scores will be evaluated and further refined by the Steering Committee during the 2020-2021 biennium phase of the Flow Study.
3. Following the technical evaluation of the 34,000 AF Pine Creek Reservoir project, the landowner of the site informed the Walla Walla Basin Watershed Council that they do not presently support selling a portion of their land for this reservoir use. Another site further downstream on Pine Creek has been identified and will be evaluated as part of the 2020-2021 biennium phase of the Flow Study.
4. The construction cost associated with the City of Walla Walla ASR project is assumed to be paid for by funding sources outside of the Flow Study.
5. The Draft Aggregate Scores for Alternative 1 and Alternative 4 were identical based solely on the consultant’s score assignment, but will be evaluated and refined further based in 2020-2021.
The Steering Committee met on October 16, 2019 to review the anticipated performance of the four alternatives and to discuss and prioritize these alternatives for further study. The Steering Committee concluded that Alternatives 1 and 3 are the two Preferred Alternatives at this time, although additional feasibility analyses are needed. In this context, “preferred” means that a quorum of voting members of the Steering Committee voted that, based on the information available at that time, Alternatives 1 and 3 were judged to be most feasible to accomplish the Flow Study objectives.

The Steering Committee noted that the proposed Pine Creek Reservoir does not appear to be able to fully satisfy the stated Flow Study streamflow targets as a standalone project. Additional complementary projects must be combined with the Pine Creek Reservoir to fully satisfy the streamflow targets.

The selection of Alternative 1 at 160 cfs relative to Alternative 4 at 120 cfs was made because there was not a significant drop off in cost relative to reduced aggregate score, and the additional capacity could help meet secondary objectives in the basin that are anticipated to be defined or vetted through environmental review and/or Walla Walla Water 2050. Walla Walla 2050 is a new planning initiative authorized by SSSB 5352 which directs the WWWM, in collaboration with Ecology to “develop a thirty-year integrated water resource management strategic plan”. A primary objective of the Walla Walla Water 2050 initiative is to take a holistic perspective on the compelling water challenges in the Walla Walla Basin to ensure that resources are appropriately distributed for more equitable and sustainable resource distribution throughout the watershed community, with consideration of all current and anticipated water-related challenges in the Walla Walla Basin.

**Recommendations and Next Steps**

The Steering Committee has secured additional funding from OCR for the 2019-2021 biennium and is pursuing additional funding with USBR and the Oregon Water Resources Department (OWRD). The goal of this funding is to address data gaps and continue progress toward selecting a Preferred Alternative for design and construction. The Steering Committee has recommended the following key next steps to select a Preferred Alternative:

1. **Coordinate with Walla Walla Water 2050 (WWW2050):** SSSB 5352 specifically directs the WWWM, in collaboration with Ecology, to advance the Flow Study within the 30-Year framework. On October 3-4, 2019, Ecology and WWWMP hosted a WWW2050 workshop to initiate this planning effort and scope the extent of the basin planning. At the time of this report, coordination between the Flow Study and WWW2050 is under development.

2. **Environmental Review:** Washington State Environmental Policy Act (SEPA) scoping and development of a National Environmental Policy Act (NEPA)/SEPA integration strategy is being planned by the Steering Committee in 2020. The Steering Committee anticipates execution of a Programmatic Environmental Impact Statement (PEIS) in conjunction with the Walla Walla Water 2050 initiative. The Flow Study will likely be an Early Action Item identified in the PEIS for WWW2050.
3. **Expanded Outreach:** The Flow Study already benefits from a robust stakeholder process. However, execution of the PEIS under the WWW2050 initiative will involve expanding outreach to a broader audience. In 2020, the Study Partners will extend formal invitations to new Washington and Oregon stakeholders who can help local constituencies shape the selection of a Preferred Alternative in the context of the PEIS.

4. **Feasibility Studies and Data Gaps:** The Preferred Alternatives include projects that need additional analysis to thoroughly evaluate their feasibility. Examples of remaining data gaps, addressed in detail in Section 5, include:

   a. How the potential fault and need for borrow material could affect the viability of the Pine Creek Reservoir
   
   b. The degree to which instream flow limits can be impacted during the winter for water storage, availability and timing of available streamflow in the Columbia River
   
   c. The degree to which project water can be legally protected in Washington and Oregon
   
   d. Ownership of proposed infrastructure
   
   e. Fiscal responsibility for operation and maintenance of proposed projects.

   The Steering Committee continues to maintain and prioritize a targeted list of actions for each Alternative.

5. **Initiate Design of Preferred Alternative:** Once the feasibility analyses have been completed to a degree that the Steering Committee is able to select a Preferred Alternative, the Steering Committee shall initiate a more detailed design of the Preferred Alternative.

6. **Legislation / Legal Coordination:** A critical path item common to all the Alternatives is to ensure that newly developed water supplies will be protected instream through both Oregon and Washington to the mouth of the Walla Walla River and confluence with the Columbia River. The Steering Committee and three Sovereigns (CTUIR, Ecology and OWRD) are actively exploring how to meet this need, either through existing statutory authorities or via Legislative change. A pilot strategy to protect flows across state lines is also being considered as well as the use of Agreement Not to Divert. Legal coordination is also a critical component of evaluating availability of streamflow for diversion, management and use, both within the Walla Walla watershed and from the Columbia River after flowing out of the Walla Walla watershed.

7. **Funding Coordination:** Implementing a Preferred Alternative of the magnitude shown in Table ES-2 will require a combination of federal, state, and local partners. The Study Partners have been successful in coordinating funding for initial phases of this work with Ecology and USBR. Understanding how local irrigators and municipalities will benefit from a Preferred Alternative may help shape the degree to which local funding is available (e.g. potential cost-share of
O&M costs). Capital funding tends to be easier to obtain than long-term O&M funding, which is a significant factor for some of the alternatives. All these issues are being actively evaluated by the Steering Committee.

**Anticipated Timeline**

The Steering Committee's primarily focus is now on the 2019-2021 biennium, for which it has secured funding from the Washington Legislature to continue implementation of the Flow Study. In 2017, the Steering Committee proposed implementing a Preferred Alternative over a 10-year planning horizon. Table ES-3 summarizes the remaining eight years of this planning period.

**Table ES-3. Projected Flow Study Timeline**

<table>
<thead>
<tr>
<th>Biennium</th>
<th>Description</th>
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<tbody>
<tr>
<td>2021 - 2023</td>
<td>Advance Design of Preferred Alternative, Final Resolution of Legal Issue to Protect Bi-State Flows, Implementation of Early Action Items</td>
</tr>
<tr>
<td>2023 - 2025</td>
<td>Construction of Preferred Alternative, Monitoring of Successes of Early Action Items</td>
</tr>
<tr>
<td>2025 - 2027</td>
<td>Construction of Preferred Alternative, Monitoring of Successes of Early Action Items</td>
</tr>
</tbody>
</table>

**Notes:**

1. This proposed timeline may be affected by various factors, including the degree of community support and time required to pursue and secure implementation funding.
1 Introduction

The Walla Walla River and its tributaries provide for agricultural production, support thriving communities and sustain resident and anadromous fish populations. The Walla Walla River flows from its headwaters in Oregon to its confluence with the Columbia River in Washington (Figure 1). As in many western river basins, the Walla Walla Basin is over-appropriated, meaning instream and out-of-stream water demands often exceed available supplies.

Watershed attributes are summarized below in Table 1-1.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Size (square miles)</td>
<td>1,758</td>
</tr>
<tr>
<td>Counties Involved</td>
<td>Walla Walla (WA), Columbia (WA), Umatilla (OR), Wallowa (OR), Union (OR)</td>
</tr>
<tr>
<td>Primary Waterbodies</td>
<td>Walla Walla River, Mill Creek, Touchet River</td>
</tr>
<tr>
<td>Headwaters</td>
<td>Blue Mountains</td>
</tr>
<tr>
<td>Elevation Range (feet)</td>
<td>265 (mouth of Walla Walla River) – 5,900 (mountain crests)</td>
</tr>
<tr>
<td>Avg. Annual Runoff (ac-ft)</td>
<td>462,000</td>
</tr>
<tr>
<td>Prominent Vegetation</td>
<td>Grassland, shrub-steppe, agricultural, evergreen forest</td>
</tr>
<tr>
<td>Ownership</td>
<td>Private (90%), Federal/State Agencies (9%)</td>
</tr>
<tr>
<td></td>
<td>Umatilla Indian Reservation (&lt;1%)</td>
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Notes: Watershed attributes were published in the preceding Walla Walla Basin Integrated Flow Enhancement Study, November 2017.

1.1 Purpose of Flow Study

The objective of the Walla Walla Basin Integrated Flow Enhancement Study (Flow Study) is to achieve streamflow targets for native fish species in the Walla Walla River mainstem while maintaining the long-term viability and water availability for irrigated agriculture, residential, and urban use. The Flow Study identifies a strategy to meet instream flow demands while providing opportunities to protect and enhance municipal and agricultural needs.

Over the last 20 years, stakeholders within the Walla Walla Basin have made substantial efforts toward meeting instream flow demands. While individual efforts and attempts at larger-scale flow restoration planning efforts have made small, incremental improvements, the restorative change desired by basin stakeholders has not been achieved. The Flow Study represents a focused initiative to develop an integrated solution that has a greater potential for substantive instream flow improvement.
In 2014, the Walla Walla Watershed Management Partnership (WWWMP) and the Walla Walla Basin Watershed Council (WWBWC) collectively referred to as the Study Partners, convened a steering committee (Steering Committee) to develop strategies to build on previous efforts to meet instream flow objectives while preserving existing diversionary requirements.

### 1.2 Flow Study Scope and Instream Flow Targets

An important initial step of the Steering Committee was to establish, by consensus agreement, the geographic scope of the Flow Study and the instream flow targets for the specified stream reach.

As illustrated in Figure 1, the Flow Study focuses on the reach of the mainstem Walla Walla River from the vicinity of Cemetery Bridge and Little Walla Walla River diversion in Milton-Freewater, Oregon, to the mouth of the Walla Walla River and confluence with the Columbia River near Wallula, Washington.

Final Flow Targets for this study reach are summarized in Table 1-2.

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Flow Study Target Streamflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 1—June 15</td>
<td>150 cfs</td>
</tr>
<tr>
<td>June 16—June 30</td>
<td>100 cfs</td>
</tr>
<tr>
<td>July 1—November 30</td>
<td>65 cfs</td>
</tr>
</tbody>
</table>

The Steering Committee established the final flow targets in February 2017, through careful consideration of nearly a dozen studies and evaluations on flow and habitat in the Walla Walla River. In 2017, the Confederated Tribes of the Umatilla Indian Reservation (CTUIR) compiled and summarized foundational findings from the studies that guided determination of the final flow targets (CTUIR, 2017a). This document is included as Appendix 1-A of this report. In March 2019, Oregon Water Resources Department (OWRD) issued a response to these recommended streamflows which is included as Appendix 1-B.

These flow targets optimize streamflow conditions for several key species of fish and various life stages of these species. They are intended to be met while also satisfying existing water right demands and represent profound improvements to instream flows and habitat in the Walla Walla River.

These targets represent a significant improvement relative to current low flows of 0 to 20 cubic feet per second (cfs), but are less than minimum instream flows adopted in Washington in 2007 (WAC 173-532). The minimum instream flow values govern new water rights and changes to existing rights only, whereas the Flow Study Target Streamflow values are intended to be achieved while also satisfying existing water right demands.
The Flow Study aims to achieve and sustain these flow targets throughout the study reach through monitoring at eight management points on the Walla Walla River that divide the study reach into management reaches. The location of these management points, in relation to major irrigation diversions, are illustrated in Figure 1.

The Steering Committee acknowledges that, starting in 2000, water users made significant efforts to conserve and manage water in ways that resulted in voluntary bypass of streamflow past authorized points of diversion in order to sustain base streamflow in the mainstem Walla Walla River. One assumption of the Flow Study is that alternatives to restore and sustain the stated streamflow targets include the intention to sustain out-of-stream water uses at the rates and volumes typically experienced prior to the start of voluntary bypasses in 2000. To this end, the voluntary bypass flows agreed to by WWRID/HBDIC and GFID will be restored through replacement flows supplied from the anchor project.

The Steering Committee also acknowledges that additional water-related concerns exist outside of the scope of the Flow Study. For example, other tributaries of the Walla Walla River, such as the Little Walla Walla River, Mill Creek, Touchet River and spring-fed streams, also suffer from low flow, diminished habitat, and curtailment of existing water right holders that used to enjoy a more abundant water supply. The Steering Committee supports exploration of these issues, either in the future or in concurrent (parallel) efforts, provided they do not compromise or decelerate progress on the Flow Study. In the 2019-2021 biennium, the Steering Committee will coordinate with Walla Walla Water 2050, a new Ecology initiative focused on conducting the expanded outreach and environmental review necessary to consider holistic and integrated management and stewardship of water resources throughout the Walla Walla Basin.

1.3 Stakeholders and Process

This Flow Study is the culmination of nearly 20 years of planning and study and reflects recommendations of the Steering Committee on the current state of the planning effort. Throughout the 2017-2019 biennium, significant work was done to evaluate over 100 proposed streamflow restoration projects and address various feasibility questions and data gaps to narrow the focus toward one Preferred Alternative. The Walla Walla Basin Integrated Flow Enhancement Study (November 2017) described in detail the Study Partners, roles and makeup of the current Steering Committee and the process toward implementing the Preferred Alternative. This section summarizes and updates the comprehensive information provided in the 2017 Flow Study report.

1.3.1 Study Partners

The WWWMP and the WWBWC, collectively referred to as the Study Partners, are the two entities responsible for co-chairing Flow Study efforts.

- The WWWMP is a local water management pilot program which was legislatively authorized through RCW 90.92 in 2009. The WWWMP is the recipient of OCR and Ecology grants that support the Flow Study.
- WWBWC is a locally organized, voluntary, non-regulatory group authorized through ORS 541.351 and established by the Umatilla County Commissioners in
1994 to improve conditions of watersheds in their local area. Over time, WWBWC has broadened their focus to participate in watershed stewardship activities in both the Oregon and Washington portions of the watershed. WWBWC is the primary grant manager for the USBR WaterSmart grant which has also supported execution of the Flow Study.

1.3.2 Steering Committee and Technical Work Groups
The Steering Committee consists of tribal, state, and local governments, as well as irrigation, municipal, and environmental interests that help guide strategy and project development. The Steering Committee began formal meetings in 2014, although basin stakeholders have been actively collaborating on instream flow and water supply options for more than 15 years. The Steering Committee operates with respect to a consensus-based decision-making process described in detail in the 2017 Flow Study report. The Steering Committee meets at least quarterly to provide guidance and decision-making on the Flow Study.

To evaluate projects and strategies for flow improvement, the Steering Committee assembled eight Technical Workgroups (TWGs), whose function is to evaluate the timing, location, magnitude, costs and benefits of proposed flow improvement strategies. TWG responsibilities range from the development of potential projects to the prioritization, screening and assembling of various project packages into Recommended Alternatives (Alternatives).

In Summer 2018, the Monitoring TWG was formed as an additional TWG to coordinate and expand efforts to monitor various parameters associated with ecological health, habitat and populations of aquatic species of interest.

Details regarding current Steering Committee and TWG membership are available online.¹

1.3.3 Walla Walla River Irrigation District Withdrawal
On July 24, 2019, the Walla Walla River Irrigation District (WWRID) submitted a letter to the Steering Committee communicating their decision to withdraw from participating in the Flow Study and associated TWGs. The letter, attached as Appendix 1-C, cited WWRID concerns that, given the substantial scope and anticipated impact of the Flow Study, greater attention should be given to legal aspects and ramifications of the proposed alternatives, as well as integrated management of streamflow in the Walla Walla River and the various branches of the Little Walla Walla River system based on careful consideration of the relative seniority of water rights. Specifically, WWRID reiterated calls for convening of the Legal TWG to clarify who will receive water from the proposed alternatives and when they will receive it. WWRID indicated that they will continue to monitor progress of the Flow Study planning efforts and, along with Little Walla Walla River water users, will re-engage during the NEPA scoping process.

¹ Steering Committee and TWG membership: http://www.wwbwc.org/assessment/57-wwflow.html
1.4 Planning Phases

The Flow Study is the culmination of nearly 20 years of planning and study by many parties in the Walla Walla Basin. A reference library and bibliography of relevant studies and plans, along with links to key documents, are maintained on the Flow Study website.\(^2\) Aggregating and organizing access to this body of documentation is an important part of informing and facilitating the support of stakeholders throughout the Walla Walla Basin, and is a key element of the Environmental Review (SEPA/NEPA) processes discussed in Section 5.

The primary purpose of this 2019 Flow Study Update is to build upon information in the Flow Study Summary Report and Appendices completed in 2017, including more detailed investigation of the feasibility of selected anchor projects, identifying and filling data gaps, identifying and refining the focus of preferred anchor projects, and initiating the environmental review process to identify one Preferred Alternative for the ongoing Flow Study.

This report documents the second phase of the Flow Study, building on and refining the results of the initial study phase documented in the Walla Walla Basin Integrated Flow Enhancement Study (November 2017) that evaluated over one hundred alternatives for restoring streamflow in the mainstem Walla Walla River.

\(^2\) Flow Study Website: http://www.wwbwc.org/assessment/57-wwflow.html
2 Water Availability

Achieving the streamflow targets of this Flow Study will require substantial changes to the ways that water flows are currently managed in the Walla Walla Basin. Depending on the alternative selected for implementation, it will either be necessary to store streamflow during periods of relative abundance for use during periods of relative scarcity or providing water from alternative sources in lieu of diverting from the Walla Walla River mainstem.

Availability of water for allocation to new patterns of use is a key factor in the feasibility of the proposed alternatives. Water sources can only be utilized to the degree that the state water management agencies find them available for appropriation at the proposed times and locations.

This section summarizes the respective state agencies’ considerations on water availability in Oregon and Washington.

2.1 Oregon

In Oregon, water availability is defined in OAR 690-310 as the amount of water that can be appropriated from a stream for new out-of-stream consumptive uses. It is determined by subtracting existing instream water rights and out-of-stream consumptive uses from the natural streamflow. The methodology is detailed in a 2002 publication by OWRD titled Determining Surface Water Availability in Oregon (Open File Report SW 02-002)\(^3\).

To ensure that new applicants use surface water with minimal regulatory conflict, OWRD generally limits new appropriations from Oregon streams as follows:

1. Consumptive use from allocations for out-of-stream uses can total no more than the 80-percent exceedance natural stream flow, and
2. Allocations for instream flows can be no more than the 50-percent exceedance natural stream flow.

OWRD maintains a database of the amount of surface water available for allocation for most of the waters of the state. The database is used to evaluate applications for new uses of surface water. A report of water availability for a specified stream reach can be accessed using the Water Availability Reporting System (WARS) on the OWRD website\(^4\).

In Oregon, the Walla Walla Flow Study has primarily been focused on the rates and volumes of water available for storage in the Pine Creek Reservoir. The conceptual plan for the reservoir involves impounding and storing some streamflows from Pine Creek and diverting a portion of winter and early springtime streamflow from the Walla Walla River, conveying the water for storage in the Pine Creek Reservoir, and then releasing the stored water to serve out-of-stream demands in late spring, summer and fall.

\(^3\) [https://www.oregon.gov/OWRD/WRDPublications1/DeterminingSurfaceWaterAvailabilityInOregon.pdf]

\(^4\) [https://apps.wrd.state.or.us/apps/wars/wars_display_wa_tables/search_for_WAB.aspx]
Table 2-1 summarizes the rates and volumes of water currently reported by WARS to be available on the Walla Walla River (above the Little Walla Walla River diversion) and Pine Creek (above the confluence with Dry Creek) at the 50 percent exceedance natural streamflow, which is the standard used by OWRD for evaluating water availability for water storage projects.

Table 2-1. Water Availability for Walla Walla River and Pine Creek

<table>
<thead>
<tr>
<th>Month</th>
<th>Walla Walla River (above Little WW River)</th>
<th>Pine Creek (above Dry Creek)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOV</td>
<td>26.3 cfs</td>
<td>1.06 cfs</td>
</tr>
<tr>
<td>DEC</td>
<td>38.3 cfs</td>
<td>6.54 cfs</td>
</tr>
<tr>
<td>JAN</td>
<td>52.3 cfs</td>
<td>14.10 cfs</td>
</tr>
<tr>
<td>FEB</td>
<td>102.0 cfs</td>
<td>31.60 cfs</td>
</tr>
<tr>
<td>MAR</td>
<td>134.0 cfs</td>
<td>40.60 cfs</td>
</tr>
<tr>
<td>APR</td>
<td>201.0 cfs</td>
<td>17.70 cfs</td>
</tr>
<tr>
<td>MAY</td>
<td>193.0 cfs</td>
<td>N/A</td>
</tr>
<tr>
<td>JUN</td>
<td>31.0 cfs</td>
<td>N/A</td>
</tr>
<tr>
<td>JUL-OCT</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>TOTAL VOLUME</td>
<td>46,800 acre-feet</td>
<td>6,660 acre-feet</td>
</tr>
<tr>
<td>TOTAL VOLUME</td>
<td>53,460 acre-feet</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Source: OWRD Water Availability Reporting System (WARS)
2. Tabulated rates and volumes reflect 50 percent exceedance, which is the standard used by OWRD for evaluating water availability for water storage projects.

This information suggests there are 53,460 acre-feet available annually to support new appropriations on the subject streams. Although the Flow Study is focused on “re-timing” water flows rather than new, additional appropriations of water, the relative magnitude of the streamflow considered available to new appropriations is relevant to the Flow Study.

In 2014, the Oregon Water Resources Commission (OWRC) published a draft report titled *A Proposed “Percent of Flow” Approach for Water Storage Projects in Oregon* proposing a new approach for evaluating the rates at which water can be diverted from a stream while protecting the natural variability of streamflow critical to ecosystem function.

In 2018, the Steering Committee engaged in a detailed negotiation with OWRD to clarify the rates and volumes that could be diverted from the Walla Walla River and Pine Creek for storage in the proposed Pine Creek Reservoir. The details of this negotiation are documented in Appendix 2-A (Water Availability in Oregon).

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The negotiations with OWRD focused primarily on the utility and legal necessity of establishing a seasonally varying flow (SVF) limit to ensure that new surface water diversions do not solve the problem of low streamflow in one season, by compromising streamflow-related ecosystem functions in another season. CTUIR supported the negotiations with OWRD by providing analyses and recommendations of instream flows to support fisheries habitat and floodplain function.

While substantial progress was made on the subject, OWRD concluded that the information available at this point of conceptual analysis and design is not yet enough to inform conclusive decisions regarding ecological winter flows and allowable rates of diversion for the proposed water storage projects (see Appendix 2-B).

The Jacobs Team proceeded with working assumptions of minimum base streamflow, channel maintenance flows, and maximum rates of streamflow diversion. Remaining data gaps were also documented that must be addressed for OWRD to establish a formal SVF if the Steering Committee decides to advance the Pine Creek Reservoir alternative.

### 2.2 Washington

In 2012, Ecology published a focus sheet summarizing water availability in WRIA 32 on the Washington side of the Walla Walla watershed (Publication No. 11-11-036). Like Oregon, Washington water availability is also determined by subtracting existing instream water rights and out-of-stream consumptive uses from the natural streamflow. Much of the water in the Walla Walla watershed has already been allocated. All rivers and streams in the basin are seasonally closed to any further consumptive appropriation from late spring, through the summer and into early fall (generally May 1 through November 30 depending on the stream reach in question). Further, future permits to withdraw surface water during non-closure periods are limited to environmental enhancement projects as described in WAC 173-532-055.

On the Washington side of the Walla Walla Basin, the Flow Study is currently focused on water availability in Mill Creek and the Columbia River.

#### 2.2.1 Mill Creek

Two Flow Study projects propose changes to the way streamflow is managed in Mill Creek, including increased storage of wet-season streamflow in Bennington Lake and/or the basalt groundwater aquifer system through expansion of the City of Walla Walla aquifer storage and recovery (ASR) program.

##### 2.2.1.1 Bennington Lake

The primary function of the Mill Creek Flood Control Project is to mitigate the risk of flooding in the City of Walla Walla. During peak streamflow events, the United States Army Corps of Engineers (USACE) operates the project to divert peak streamflow from Mill Creek for temporary detention in Bennington Lake, an off-channel reservoir.

Due to concerns regarding the integrity of Mill Creek Dam, the USACE evacuates a portion of the stored water as quickly as possible to minimize risk of dam failure. The

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integrity of the dam has been a subject of multiple investigations and treatments over the past two decades.

Proposed expansion of storage in Bennington Lake would involve increased diversion of streamflow from Mill Creek during the winter and increased seasonal storage of this water in Bennington Lake for summer withdrawal and use to augment instream flows and out-of-stream diversions. During this phase of the Flow Study, the Steering Committee focused on engaging with Ecology and the USACE to investigate and evaluate the feasibility of increasing storage in Bennington Lake. The details of this coordination effort are documented in Appendix 2-C (Water Availability in Washington - Bennington Lake Reoperation Assessment).

The USACE is currently engaged in a General Investigation (GI) study evaluating opportunities to reduce existing flood risks to the City of Walla Walla. The USACE considers enhancement of water storage capacity for the water management objectives of the Flow Study to be competitive with similar opportunities to reduce flood risk.

The potential to divert streamflow from Mill Creek into Bennington Lake for temporary storage and release later in the season is limited by the timing of surplus water supply and the safe-fill limitations of the reservoir. Typically, streamflow peaks exceeding the ecological flow requirements occur prior to the historical safe-fill dates, particularly in dry years when the need for water storage would be most beneficial. The 50 percent exceedance volume in Mill Creek is only 1,600 acre-feet after maintaining recommended ecological flows. Even with the instream flow requirement reduced to 25 and 50 cfs, the water supply after the safe-fill dates does not allow for a reliable storage volume.

The best opportunity to increase water storage at Bennington Lake for benefits beyond the scope of flood control is to create additional storage capacity by excavating the bottom of the reservoir and repairing the dam to enable longer-term storage of water. Because of the current singular focus of the USACE on reducing flood risk, the additional storage should not be included or factored into USACE flood mitigation. Having water supply storage independent of flood mitigation substantially reduces the administrative and regulatory obstacles making the project feasible.

2.2.1.2 City of Walla Walla ASR

The second Mill Creek project involves expansion of the City of Walla Walla Aquifer Storage and Recovery (ASR) program, which features diversion and storage of streamflow from Mill Creek during the winter for withdrawal and use during the summer. Increased reliance of stored water in the deep basalt groundwater aquifer for summer withdrawal would correspond to decreased summer diversions.

The City initiated their ASR program in the 1990’s to counter declining water levels in the basalt groundwater aquifer system. The City diverts streamflow from Mill Creek at the existing City intake, routes it through the City hydropower generation facility, treats it to drinking water standards, then injects and stores it in fault-confined blocks of the basalt groundwater aquifer underlying portions of the City.

The City has operated their ASR program using Well No. 1 since 1999, and Well No. 6 since 2003. The system currently has capacity to store and recover approximately 2,310 acre-feet per year using these two active ASR wells.
On June 2, 2016, Ecology issued Reservoir Permit (R3-30526) which authorizes the City to store up to 11,750 acre-feet and recover up to 7,050 acre-feet per year. The permit also authorizes the City to develop seven wells for water injection and recovery.

The reservoir permit included a condition requiring the City to work with key Mill Creek stakeholders to jointly develop an overall Mill Creek water plan. In May 2018, the City, in collaboration with CTUIR and WDFW, issued the Mill Creek Report (Appendix 2-D) which identified several opportunities to enhance the water balance between municipal water demands and instream flows in Mill Creek.

Development of the City ASR program to the full extent of the reservoir permit may increase base streamflow in Mill Creek by 20-to-25 cfs for four to six months. The current working assumption is that the augmented streamflow will be routed through Mill Creek then Yellowhawk Creek and protected to the confluence with the Walla Walla River. An alternative to potentially convey the flow in a new pipeline to replace irrigation diversions further upstream on the Walla Walla River (in Oregon) also has potential.

This add-on project rose fairly late in the process for the 2019 Flow Study Update and much remains to be considered in evaluating the merits and feasibility of this option. For example, further evaluation is required to study operations and routing of the ASR exchange flows to best meet the quantities and timing of fish flow needs, as well as water right permitting options and impacts/benefits on third party water users. If viable, this City ASR could potentially be included with any anchor project to provide supplemental flows in the Walla Walla River downstream of the Yellowhawk Creek confluence.

### 2.2.2 Columbia River

The primary project associated with the Columbia River is the Columbia River Pump Exchange, featuring diversion of streamflow from the Columbia River (McNary Pool near Wallula, WA) to replace water in the Walla Walla River Basin.

The Columbia River system is a very large and complex system subject to interactions between natural hydrology, as well as a diverse array of operational factors, including Columbia River Treaty negotiations, hydropower, transportation, water supply and ecological functions. Streamflow in the McNary Pool reach can vary by orders of magnitude from one year to another. This complexity presents challenges to anticipating the rate and volume of flow available for additional allocation for the Flow Study.

According to an informational notice issued in September 2019 (included as Appendix 2-E), the USACE, USBR and BPA are midway through a multi-year effort to update the federal plan for the long-term operation, maintenance and configuration of the Columbia River System. The co-lead agencies are developing an Environmental Impact Statement and have identified five alternatives that are designed to meet the purpose and need for action, and multiple study objectives. They are now studying the potential environmental and socioeconomic impacts of these actions.

As with the Flow Study, the National Environmental Policy Act (NEPA) requires federal agencies to consider a reasonable range of alternatives before deciding to act on a preferred alternative. For each of the five alternatives being studied, the agencies are evaluating the costs, benefits and tradeoffs regarding the congressionally authorized purposes of the federal projects: flood risk management, hydropower generation,
irrigation, navigation and fish and wildlife conservation. The final EIS will inform how the agencies balance the multiple purposes of the system while complying with all relevant environmental laws and regulations. The agencies plan to release the draft EIS for public comment in February 2020 and the final EIS in June 2020. The outcome of this planning effort will help inform Columbia River availability for the Flow Study.

The Columbia River Pump Exchange is primarily envisioned as a “water budget neutral” approach, based on assumptions that: (a) streamflows in the Columbia River system are fully appropriated, and Walla Walla water users cannot withdraw any more water from the Columbia River than they bypass; and (b) diversions from the Columbia River cannot exceed the rate at which water is flowing out of the Walla Walla.

In practice, deferred Walla Walla River water will likely not perfectly match supply from the Columbia River. Most of the water left in the Walla Walla River will likely reach the Columbia River on a daily timestep. This assumes that Oregon and Washington are able to reach a joint legal protection mechanism to protect that water from junior appropriators. However, even with these protections, some deferred surface water will seep into groundwater and either be evapotranspired by riparian vegetation, diverted as groundwater withdrawals, or added to baseflow in the Columbia on a longer timestep (monthly or annually). The quantity that will not “immediately” reach the Columbia is currently unknown. It is expected to be modeled in future investigations under the Flow Study.

In order to receive a permit for the Columbia River Pump Exchange, consultation will have to occur with Columbia River stakeholders. That consultation can either place pumping restrictions on the project to address the diminishment or retiming of Columbia River flows. Alternatively, stakeholders could respond to Ecology that the environmental benefits in the Walla Walla outweigh the small retiming impacts on the Columbia River. Such consultation would likely come first in SEPA scoping and be more formalized when a new water right application is filed with Ecology’s Office of Columbia River.

The primary objective of the Flow Study is to improve flows on the Walla Walla River mainstem. After the primary objective has been fulfilled or when evaluating multiple alternatives that can meet the primary objective, the Steering Committee has recognized a Preferred Alternative may also meet secondary objectives. The Steering Committee believes secondary objectives are most likely to be best addressed through the Walla Walla Water 2050 effort (see Section 5.2.2). An important distinction in this Flow Study is that a Preferred Alternative should meet the primary objective but not cause third party harm or impacts. If impacts are determined during environmental review, feasibility, or stakeholder scoping, then the Preferred Alternative should include mitigation sufficient to offset the impacts. If the Preferred Alternative provides secondary opportunities after the primary objective has been met, then the cost/benefit ratio of the project could further increase. These secondary opportunities could include:

1. Additional environmental benefit in tributaries in the Walla Walla Basin.
2. Extending or restoring existing water rights that are curtailed due to local availability.
3. Restoring flows to springs that historically aided in local water availability.
These secondary objectives could be met if additional water supply on the Columbia River were available. In 2008, the USBR completed the Final Planning Report and Environmental Impact Statement for the Yakima River Basin Water Storage Feasibility Study (excerpt included as Appendix 2-F). This report included modeling of Columbia River flows to determine what surplus water was available and under what water years to supply additional pump storage to the Yakima Basin. This is analogous to the Columbia River Pump Exchange project.

The 2008 Yakima Storage report suggests that, in some months and some years, substantial quantities of water are potentially available in the Columbia River (McNary Pool) in excess of other instream and out-of-stream demands on the Columbia. If this is still the case, then a Columbia River Pump Exchange could opportunistically divert some fraction of these quantities, in addition to the quantities discharging into the Columbia Pool from the Walla Walla River. The potentially available quantities are large enough that they merit more detailed investigation and quantification, as well as clarification of the process required to request allocation to supplement out-of-stream uses in the Walla Walla Basin. This option is slated for future investigation in the next biennium in conjunction with Walla Walla Water 2050.
3 Flow Management Alternatives

3.1 2017 Alternatives Analysis Process

During the initial phase of the Flow Study, the Steering Committee identified and evaluated over 100 projects to meet the instream flow targets identified in Section 1.2. The strategies included conservation, increasing aquifer recharge, water markets, developing surface reservoirs, and pumping water from the Columbia River.

In 2017, to evaluate each project toward adoption of a Preferred Alternative, the Steering Committee developed a sequential process and set of tools to aid TWGs and the Project Pairing Subcommittee to propose science-based recommendations. This section describes the process and tools created for evaluating and narrowing the projects considered for adoption of a Preferred Alternative, and updates to this process over the last two years.

First, the Steering Committee established a process for evaluating proposed alternatives to select a Preferred Alternative. Next, a project proposal review template was created to standardize project evaluations. TWGs used this template to review each project and recommend promising alternatives for Steering Committee review. The Steering Committee then used a numerical ranking system to score the effectiveness of each project to meet Flow Study goals while also considering secondary benefits and project costs.

Finally, two spreadsheet tools were developed to enable Steering Committee members to contrast the anticipated effects of each project. One spreadsheet model was built on a simplified water budget whose findings would then be modeled in the Integrated Water Flow Model (IWFM) for verification. Projects were then added in different stream reaches to simulate instream flow improvement. This tool was then converted into a second spreadsheet that allowed a user to “turn on” and “turn off” specific projects that had been reviewed through the TWG process. A detailed description of this process, and copies of the original tools and project templates are documented in the 2017 Flow Study.

3.2 Summary of 2017 Alternatives

With tools and process in place, the Steering Committee formed a Project Pairing Subcommittee focused on selecting groups of projects capable of meeting Flow Study objectives. This subcommittee met five times in late 2016 to early 2017 to consider projects. Through this process, the Steering Committee advanced several alternatives for further consideration summarized in Table 3-1. As a result of these meetings, the Steering Committee agreed that one of two Anchor Projects, and a combination of smaller complementary projects would likely be needed to reach flow targets. The Project Pairing Subcommittee then combined these projects into five alternatives, and compared the construction cost, O&M cost, and performance in the eight reaches of the Walla Walla River mainstem. These five Alternatives are shown in Table 3-2.
<table>
<thead>
<tr>
<th>Project Name</th>
<th>Description</th>
<th>Target Flow Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Anchor Projects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pine Creek Reservoir</td>
<td>Construct a new reservoir on Pine Creek in OR. Several storage sizes were evaluated (33.1K, 45.8K, and 65K afy). Several filling sources were considered: Walla Walla River, Columbia River, and Mill Creek.</td>
<td>Active storage from 26.6K – 58.5K afy</td>
</tr>
<tr>
<td>Columbia River Exchange</td>
<td>Construct a new pump station on the Columbia River near the mouth of the Walla Walla River. Pipe water to irrigators in exchange for leaving water in the Walla Walla River. Scenarios included a large option delivering water to both OR &amp; WA and a smaller WA-only option.</td>
<td>13.6K – 30.9K afy</td>
</tr>
<tr>
<td><strong>Smaller Complementary Projects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managed Aquifer Recharge</td>
<td>Infiltrate streamflow into shallow alluvial aquifers at multiple locations to improve streamflow temperature and increase streamflow by increasing surface water inputs, retiming base flow, elevating groundwater levels, and decreasing river seepage.</td>
<td>3.1 – 7.8 cfs</td>
</tr>
<tr>
<td>Aquifer Storage and Recovery</td>
<td>Directly infiltrate and/or inject treated streamflow or shallow groundwater into shallow alluvial aquifers and/or deep basalt aquifers or infiltrate river water into shallow alluvial aquifers for active recovery creating a source exchange so summer water rights can be left instream.</td>
<td>5 – 12 cfs</td>
</tr>
<tr>
<td>Telemetry</td>
<td>Improve water management through automation to reduce demand and add savings to instream flow.</td>
<td>2 cfs</td>
</tr>
<tr>
<td>Water Market</td>
<td>Incentivize water right transfers to meet Flow Study objectives.</td>
<td>1 cfs</td>
</tr>
<tr>
<td>GFID Conservation</td>
<td>Pipe portions of the Upper GFID Ditch to conserve water and reduce storage/exchange demands.</td>
<td>10+ cfs</td>
</tr>
<tr>
<td>Lowden Ditch Conservation</td>
<td>Pipe portions of the Lowden #2 Ditch to conserve water and reduce storage/exchange demands.</td>
<td>2 – 5 cfs</td>
</tr>
<tr>
<td>Bennington Lake Reoperation</td>
<td>Modify Bennington Lake operations for approximately 1 month by releasing available storage into Mill Creek and/or Russel/Yellowhawk Creek to help meet Flow Study objectives in the Walla Walla River.</td>
<td>1,900 – 3,900 afy</td>
</tr>
<tr>
<td>White Ditch Conservation</td>
<td>Pipe portions of the White Ditch to conserve water and reduce storage/exchange demands.</td>
<td>5.6 cfs</td>
</tr>
<tr>
<td>Other Projects</td>
<td>Other conceptual-level projects include upgrades to the City of Walla Walla municipal system, restoring habitat in the Nursery Channel reach, additional pump exchange projects for HBDIC, GFID, and Lower Touchet irrigators, and enlarging Bennington Lake (see Chapter 3 of the main text for additional detail).</td>
<td>TBD</td>
</tr>
</tbody>
</table>

**Notes:** afy = acre-feet per year; cfs = cubic feet per second; K = thousand; TBD = to be determined
### Table 3-2. Flow Study Alternatives Summary

<table>
<thead>
<tr>
<th>Alt #</th>
<th>Alternative Description</th>
<th>Cost $</th>
<th>Meets Target?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Construction</td>
<td>Unit</td>
</tr>
<tr>
<td>1</td>
<td>Pump 25.5K afy of Columbia River water from Lake Wallula near the mouth of the Walla Walla River to exchange WWRID, HBDIC, GFID and Lowden 4 irrigation systems, leaving instream the exchanged quantities plus efficiencies gained</td>
<td>$163M³</td>
<td>$161/afy</td>
</tr>
<tr>
<td>2</td>
<td>Alternative 1 + Complementary Projects (White Ditch Conservation, ASR, MAR, and Bennington Re-operation, 32.6+ afy)</td>
<td>$169M</td>
<td>$359/afy</td>
</tr>
<tr>
<td>3</td>
<td>45.8K afy (39.3K active) Pine Creek Reservoir from Walla Walla River</td>
<td>$310M</td>
<td>$202/afy</td>
</tr>
<tr>
<td>4</td>
<td>33.1K afy (26K active) Pine Creek Reservoir from Walla Walla River + Lowden Ditch Conservation, GFID Pump Loop, and Water Market</td>
<td>$275M</td>
<td>$265/afy</td>
</tr>
<tr>
<td>5</td>
<td>Anchor Project Hybrid 5.1b: 33.1K afy (26K active) Pine Creek Reservoir from Walla Walla River + 13.7K Columbia River Pump Exchange</td>
<td>$338M</td>
<td>$362/afy</td>
</tr>
<tr>
<td></td>
<td>Anchor Project Hybrid 5.2b: 35.1K afy (28.6K active) Pine Creek Reservoir from Walla Walla River and Mill Creek + 13.7K afy Columbia River Pump Exchange</td>
<td>$354M</td>
<td>$331/afy</td>
</tr>
</tbody>
</table>

**Notes:**

1. Unit per acre-foot cost is construction cost and O&M costs over 50-year lifespan, assuming 3% inflation and a 3% discount rate for future costs. O&M costs are appraisal-level estimates at this stage.
2. The Steering Committee used a spreadsheet model to evaluate the efficacy of each alternative to meet the Flow Targets. Follow up work with the hydrologic model for the Walla Walla Basin is planned under the USBR grant. If an alternative met the Flow Study objectives within a reasonable margin of error, it received a “Yes” when determining whether it met flow targets.
3. The cost of Alternative 1 (2017) is not directly comparable to the cost of Alternative 1 (2019) as the conceptual designs and cost estimates were performed by different parties using different criteria.
3.3 Summary of 2019 Alternatives Analysis Process

When the Steering Committee embarked on the 2019 Flow Study Update, it scoped specific refinements to the process and data that would help inform a narrowing of the five alternatives reached at the end of 2017, including:

1. Resolving key technical gaps on the Anchor Projects.
2. Advancing the merits of smaller add-on projects including Mill Creek ASR.
3. Broadening the audience of those informing the Steering Committee to include the public and other local, state, and federal agencies and tribes through SEPA scoping to initiate environmental review on the goals and alternatives being considered.

These priorities began to change throughout the 2017-2019 biennium in response to complications in budget and schedule, and the introduction of new parallel priorities. For example, the need to investigate an active fault as a potential fatal flaw for the Pine Creek Reservoir site required additional budget, which de-prioritized the smaller add-on projects. Additionally, the passage of SSSB 5352 created new obligations on environmental review that re-prioritized scope and budget from SEPA Scoping to resolving other data gaps.

Based on these changes in priorities, throughout the 2017-2019 biennium, the consultant team and the Steering Committee focused on refining critical data gaps necessary to clarify the feasibility of the two Anchor Projects. This work culminated in several investigations intended to update key project elements, refine understanding of performance and cost, and narrow data gaps to maintain progress toward a Preferred Alternative.

The following sections provide an overview of the overall process and a brief summary of each major step. Each of the steps was closely coordinated with the Steering Committee and Technical Workgroup (TWG) with presentations and meetings to solicit needed input to build upon.

- **Data Gaps:** A characterization of significant data gaps was performed regarding the Oregon water supply and Bennington Lake. These are presented in detail in Section 2, Water Availability. Remaining data gaps were identified, and approaches / assumptions established to allow progression of the flow study. These are presented in supporting appendices for Section 5, Data Gaps and Next Steps.

- **Project Criteria Development:** Developing the project criteria was a coordinated effort with the focus on achieving minimum instream flows targets for the mainstem while maintaining current policy for irrigation diversions. Examples of needed criteria include:
  - Determining the available water supply for reservoir filling
  - Establishing target instream flows
  - Defining irrigation demands and location for flow deliveries
• Establishing the voluntary bypass flows previously agreed to by the WWRID/HBDIC and GFID for project replacement flows

• **River Seepage Estimate Refinement:** The 2017 analysis showed river seepage compromised feasibility of projects by losing as much as 43 percent of additional flows supplied by projects. The estimated losses were reduced with further analysis. The details of this 2019 river seepage refinement analysis are presented in detail in Section 4.1.1, Walla Walla River Seepage Refinement.

• **Develop a Utility for Determining Project Requirements and Measuring Performance:** Project requirements needed to be defined with some confidence for varying extremes of water supply; specifically, representation of dry years with low water supply. Water demand quantity, location, and timing in the watershed are also complicated. A utility, the Walla Walla River Response Model (WWRRM), that utilized measured instream flows was improved and refined. A detailed description is presented in Section 4.1.2, Walla Walla River Response Model.

Project performance was evaluated using hydrological data for five years representing various water supply conditions. Statistical evaluation for 48 years (1970 to 2018) of historical Walla Walla River gage data determined that the five years from 2014 through 2018 includes flow data for all management points and serves as a representative sample for the analysis. Of these years, 2014 is considered average, 2015 and 2016 are considered dry years, and 2017 and 2018 are considered wet years.

• **Standardization of Standalone Projects:** With the project requirements standardized, the next step was further development of the stand-alone Anchor Projects. In advancing the two stand-alone projects, the project team focused on key technical design issues, performance, and costs. The baseline stand-alone projects were a 160 cfs CRPE that would meet all the flow requirements and a PCR with an active storage of 27,400 AF. This provided valuable data points for the TWG and SC to make decisions on refinements needed for alternatives to be carried forward.

• **Project Packaging:** The baseline stand-alone projects informed the development of ultimately four alternatives for 2019 project packaging. Performance and operational costs were the primary drivers that necessitated changes and refinements to the stand-alone Anchor Projects to align with SC/TWG input as described in the following section.

### 3.4 Alternatives Carried Forward

The process described above yielded the selection of three alternatives for IWFM modeling. These three alternatives, plus a fourth, were also evaluated for overall performance using WWRRM. Cost estimates were developed for all four alternatives. The following is a brief description of the configuration of each alternative:
3.4.1 Alternative 1 – 160 cfs Columbia River Pump Exchange (CRPE)
Alternative 1 is a CRPE concept diverting Columbia River water at a rate designed to meet all achievable flow requirements (refer to Section 4.2.1 for a description of the Instream Flow Metric of Achievable Flows), with a capacity of 160 cfs and 39.9 miles of pipeline ranging from 20-66 inches in diameter (PVC 36 inch diameter and smaller, and welded steel for pipeline larger than 36-inch diameter). The CRPE includes one main pump station, three booster pump stations, and a fish screen at the Columbia River intake designed for 160 cfs. The water level difference from the Columbia River (El 340) to the furthest delivery point in Oregon (The Frog) (EL 980), is 640 feet. At the design flow of 160 cfs, the total dynamic head is approximately 880 feet. Drawings depicting the associated facilities are provided in Appendix 3-A.

3.4.2 Alternative 2 – 34,000 AF Pine Creek Reservoir (PCR)
Alternative 2 consists of a Pine Creek Reservoir, updated since the 2017 Pine Creek Study to an optimized capacity of 34,000 AF for filling and meeting project demands.

The following are the main components and brief description of the PCR alternatives, including the dam and the conveyance facilities required to transfer water:

- Dam with a structural height of 230 feet
- Reservoir with 34,000 acre-feet of active storage and a conservation pool with 6,300 AF
- River intake and fish screens with an expanded capacity of 270 cfs
- 78-inch main conveyance pipeline that is 8.7 miles in length and capable of bi-directional flow to allow for both filling and emptying the reservoir
- 18-to-32-inch distribution pipeline that is 1.9 miles in length that conveys flow from the reservoir at low water levels
- Irrigation turnouts with control valves and flow meters
- Booster Pump Station to deliver 5 to 17 cfs flows from the distribution pipeline to “The Frog” at low water levels in the reservoir

Drawings depicting the associated facilities are provided in Appendix 3-B.

The reservoir operational model developed in 2017 was modified to include consideration of 2019 criteria developed to recognize flow management points downstream of Nursery Bridge. Recognizing downstream flows increased the demands and restricted the diversions for filling the reservoir in the winter and spring. The primary flow management points controlling reservoir filling are Beet Road and McDonald Road that are immediately downstream of GFID and Lowden irrigation diversions, respectively. Project simulation for 48 years of historical flows (water years 1970 thru 2018) were used to determine that a reservoir volume of 34,000 AF could be filled

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7 “The Frog” is a colloquial term referring to a diversion structure where streamflow in the Little Walla Walla River is routed to the Hudson Bay Canal, Pleasant View Ditch and multiple forks of the Little Walla Walla River.
approximately 70 percent of the time (see Figure 3-1). This is consistent with the USBR approach to reservoir sizing for water supply.

Besides changing the dam size, the type of dam was also revised from a roller-compacted concrete (RCC) dam to an earth-core rockfill dam. The change in the type of dam was necessitated by the presence of a potential active fault at the site, which makes an RCC dam infeasible. Changing to an earth-core rockfill dam concept provides a greater opportunity for being feasible in the presence of a fault if not too large and active. To better characterize the significance of the potential active fault, an investigation was performed. The other requirement for the earth-core rockfill concept was that the core material be clay and not silt. Clay is resistant to erosion and allows for deformation from some fault movement in the foundation. Information on the fault investigations and locating a potential borrow source for the clay core are summarized in Appendices 3-C and 3-D, respectively.

Recent landowner issues have prompted the desire to reinvestigate a viable lower site for Pine Creek Dam in 2020. The landowner for the current reservoir site (upper site) has recently expressed no desire to allow access or selling the land. This has resulted in a new data gap to investigate the viability of the lower site to be substituted for the alternatives. More information on this new data gap is presented in Section 5.1.5, Pine Creek Reservoir Siting.
3.4.3 **Alternative 3 - 34,000 AF PCR with City of Walla Walla Aquifer Storage and Recovery (ASR)**

Alternative 3 is the same as Alternative 2, with the addition of the City of Walla Walla ASR project also referred to as “Max Mill”, suggesting the maximum contribution to streamflow currently projected for Mill Creek. The Pine Creek Dam and Reservoir and related facilities are unchanged, so the following description and associated reference material in Appendix 2-D (Mill Creek Report) are specific to the additional ASR element of Alternative 3.

The “Max Mill” add-on ASR project consists of making an additional flow up to 25 cfs available in Mill Creek (a tributary to the Walla Walla River) as a result of the City of Walla Walla implementing an expanded ASR program. This program would allow the City to pump municipal water supply from a series of basalt groundwater wells in lieu of their current surface water diversion from Mill Creek. The total expanded ASR capacity is estimated at about 12,000 AF with the limitation of a 60% withdrawal in a given year. The exchange for increasing Mill Creek flows would be about 7,200 AF which equates to 20 cfs for 6 months, 25 cfs for approximately 5 months, or a lesser rate of flow for a longer period. There should be flexibility in operating the ASR exchange with either increased flows down Yellowhawk Creek and/or lower Mill Creek to best meet the quantities and timing of fish flow needs.

3.4.4 **Alternative 4 – 120 cfs CRPE**

Alternative 4 was developed to examine the performance and cost of a CRPE with a smaller flow capacity. The flow capacity was developed based on meeting all but short-term high demands as illustrated in yellow in Figure 3.2 below. The configuration is the same as the 160 cfs CRPE except for a reduction in size of all the main components. Drawings depicting the associated facilities are provided in Appendix 3-E.
Figure 3-2. Comparing the project flow demands for multiple years with the two proposed flow capacities for the CRPE alternative.
4 Performance and Cost

4.1 Performance Evaluation Tool and Cost Updates

Over the course of the Flow Study, two tools have been developed and refined to support evaluation of the performance of alternative water management strategies. In combination, these tools allow the Steering Committee to simulate and evaluate how water is anticipated to flow through the interrelated surface streams and alluvial/sedimentary groundwater aquifer system. The following sections summarize progress that has been made regarding the anticipated performance and estimated costs of water management alternatives.

4.1.1 Walla Walla River Seepage Refinement

Seepage of streamflow from the stream channel into the alluvial groundwater aquifer is a primary variable reducing the quantity of water flow added to meet instream flow targets in the Walla Walla River, although it does have a secondary beneficial aquifer recharge effect. Historical seepage loss estimates, developed from low flow data in the summer and fall (approximately 25 to 35 cfs), potentially overestimates river seepage for the higher streamflow represented by minimum instream flow targets for proposed flow enhancement projects (greater than 65 cfs).

To improve the accuracy of Walla Walla River seepage estimates, new estimates were developed from flow data ranging from approximately 30 cfs to over 150 cfs. Detailed documentation of the analysis methods and results are provided in Appendix 4-A.

Estimates of seepage from the Walla Walla River from April through November were derived for river reaches between 15th Avenue Bridge (upstream of Cemetery Bridge near Walla Walla River Road) and Detour Road. The estimates relate seepage loss to reach streamflow and establish a range of maximum seepage values that may be used to determine the sensitivity of river seepage on the flow requirements for a flow augmentation project. It is important to note that the seepage estimates do not address potential reduced seepage from management activities such as managed aquifer recharge, floodplain/channel restoration or reduction of groundwater pumping.

4.1.2 Walla Walla River Response Model Refinement

The Walla Walla River Response Model (WWRRM) is the foundation of the Flow Study as it quantifies flow requirements for projects and allows for standardization of the performance of the 2019 Alternatives. It was originally developed by Anton Chiono with CTUIR as a utility for flow quantification and as a metric for the 2017 evaluation. The concept of using measured flow at the management point simplifies a very complicated system of water accounting. It works under the premise that the stream gages reflect stream flows after diversions of available water and only need to track the protected water from project inputs at the irrigation diversions. The 2017 utility was mainly compromised by using median flows at the gages for different periods and having data gaps. The 2019 evaluation faced the same problem of fragmented gage data and concerns of not having good representation of a dynamic water supply. After looking at available recent gage data to eliminate crippling data gaps and statistical comparison with the long-term flow records, it was decided to use WY 2014 thru 2018 for the analysis. The
statistical evaluation for 48 years (1970 to 2018) of historical Walla Walla River gage data determined that the five years from 2014 through 2018 contained one average water year (2014 – 51st percentile), two back-to-back drought years (2015 – 80th percentile and 2016 – 78th percentile), and two back-to-back wet years (2017 – 10th percentile and 2018 18th percentile) thereby containing very representative water years within this five-year period of record.

The spreadsheet model uses this period of historical stream gage data for each year at each management point and compares with instream flow targets to estimate the deficit. Replacement flows of irrigation diversion are input at three primary irrigation diversion locations (WWRID/HBDIC, GFID, L4) to allow water to remain in the Walla Walla River with the assumption that the instream flows will be legally protected from other irrigation diversions downstream.

The gage data also represents stream flows with hydrologic connectivity to groundwater and the interconnected system with respect to irrigation operation and practices at that time. A limitation of the WWRRM is that impacts to stream flows or groundwater resultant from water management changes caused by an anchor project having a different distribution system or additional irrigation water through voluntary bypass flow replacement are not characterized. The IWFM (Section 4.1.3) has the potential to account for these changes in water management.

The project team leveraged the concept of utilizing measured stream flows from the original WWRRM and incorporated several updates. The model updates improve the analysis, evaluation, and output to characterize the resultant response of the Walla Walla River resulting from replacement of irrigation flows. The following refinements and improvements were performed for WWRRM:

- Used WY 2014 through WY 2018 as the period of record for evaluation. As previously stated, this is the most significant improvement to the analysis that was otherwise being compromised with fragmented average values.
- Expanded the model from 8 months to year-round by including the winter months.
- Incorporated ability to evaluate individual years.
- Revised the minimum instream flow targets to reflect current understanding (per Section 1.2).
- Incorporated the voluntary bypass flows previously agreed to by the WWRID/HBDIC and GFID, as verbally conveyed to the project team, into the WWRRM to factor these in as project replacement flows to be returned to WWRID/HBDIC and GFID.
- Incorporated the refined approach to calculating projected river seepage (per Section 4.1.1).
- Added functionality to cross-reference replacement flow inputs to historical diversion records, based on current information available to the project team, to avoid replacing more flows than historically diverted during the evaluation period.
• Developed multiple summary output formats and added chart generation functionality.

4.1.3 Integrated Water Flow Model Refinement

In 2015, GeoSystems Analysis, Inc. (GSA), collaborated with WWBWC to develop an application of the Integrated Water Flow Model (IWFM) (Dogrul 2013) calibrated for the Walla Walla Basin. IWFM is a numerical surface water-groundwater finite element model used as a tool for evaluating the potential impacts of proposed water management scenarios on hydrological conditions in the basin. The model was developed utilizing data sources to define basin geology, precipitation, groundwater and surface water conditions, land use classification, agricultural and urban water demand, and soil properties. The model boundary, defined by the areal extent of the alluvial basin deposits, encompasses 239 square miles and extends to a maximum depth of 940 feet below ground surface. A detailed description of the Walla Walla Basin IWFM model, including model development and calibration, is provided in GSA (2017).

The Walla Walla Basin IWFM model was applied, using streamflow data from the 2016 water year, to predict surface water and groundwater conditions in the basin resulting from a baseline condition based on current management practices in comparison with three alternative management scenarios:

1. Columbia River Pump Exchange Alternative scenario in which Walla Walla River water is bypassed at diversion points for Hudson Bay District Improvement Company and Walla Walla River Irrigation District (HBDIC/WWRID), Gardena Farms Irrigation District (GFID), and Lowden (L4) canal, and water is pumped from the Columbia River at a rate up to 160 cfs and distributed to irrigators at selected locations. The managed aquifer recharge program is assumed to continue under this alternative.

2. Pine Creek Reservoir Alternative scenario in which a 34,000 acre-foot reservoir is built on Pine Creek and filled during high-flow periods by impoundment of Pine Creek and diversion of streamflow from the Walla Walla River. In turn, Walla Walla River water is bypassed during lower-flow periods at HBDIC/WWRID, GFID, and L4 canal diversion points and water stored in the reservoir is distributed to irrigators at HBDIC/WWRID, GFID, and L4 locations. This alternative assumes that the managed aquifer recharge program would be discontinued.

3. Pine Creek Reservoir Alternative scenario (same as 2) with the addition of expansion of the City of Walla Walla Aquifer Storage and Recovery (ASR) Program. Under this scenario, the City of Walla Walla is assumed to leave approximately 2,400 acre-feet of streamflow in Mill Creek in May through September. This streamflow is assumed to route from the City Intake on Mill Creek downstream to the Yellowhawk/Garrison Creek Division, then routed down Yellowhawk Creek to the confluence with the Walla Walla River. This alternative assumes that the managed aquifer recharge program would be discontinued.
The 2016 water year was selected for analysis because a version of the model with 2016 water year data already existed and this water year represented warmer than average winter temperatures, reduced snow pack, and reduced spring and summer stream flows relative to long-term climate change predictions (GSA, 2017).

4.1.4 Cost Estimating Updates/Refinement

Based on the changes to the Anchor Projects as described in Section 3 and additional detail developed during this phase of the study, the Consultant Team developed updated estimates of construction cost and operations and maintenance (O&M) cost. Further, as a means of assessing the total cost of the alternatives over the course of their project life and comparing alternatives that vary greatly in terms of capital cost, power, and O&M, the team completed life cycle cost analysis.

4.1.4.1 Construction Cost

A Class IV cost estimate as defined by AACE International was developed for the four Anchor Project alternatives. Cost estimates at this conceptual design phase aid strategic planning, project screening, alternatives analysis, confirmation of economic and or technical feasibility, and preliminary budgeting for proposed projects. This estimate is prepared based on limited field and design-specific information where the conceptual engineering is less than 15 percent complete. Estimating methods include equipment and/or system process factors, scale-up factors, and parametric techniques. The expected accuracy ranges for this class of estimate are -15 percent to -30 percent on the low range side and +20 percent to +50 percent on the high range side. The costs presented in Appendix 4-D include general conditions, contractor overhead and profit, and a 30 percent contingency. The contingency is intended to account for changes in the project scope and items that have not been defined at the conceptual level of project design. Cost are presented in third quarter 2019 dollars and no escalation has been provided.

4.1.4.2 O&M Cost

Estimates of annual O&M cost for each alternative, presented in Appendix 4-D, were prepared to account for consumption of power, general facility service and upkeep, repair and replacement of minor items, inspection and monitoring, dedicated staff, and other project-specific elements. Factors were developed from past project experience and are generally derived as a percent of the capital cost for each facility or as direct cost line items. For pumping power costs, 2019 rate schedules were obtained from Columbia Rural Electric Association (Columbia REA). Columbia REA rate schedule 5.0 for Large Irrigation Service was utilized for Alternative 1 and 4 with a $350 per month facility charge, energy charge of 5.2 cents per kilowatt-hour, and demand charges of $9.25 per kilowatt and $2.50 per kilowatt for peak period and off-peak period use, respectively. Columbia REA rate schedule 4.0 for Small Irrigation Service was utilized for the City of Walla Walla ASR portion of Alternative 3 with a $82 per month facility charge, energy charge of 4.35 cents per kilowatt-hour, and demand charges of $3.60 per kilowatt.

For the Pine Creek Reservoir alternatives, annual power required for pumping would be highly variable depending on water-year type. In a wet-to-average year, no pumping would be required, and the power cost would be zero. In a dry year, pumping will be required intermittently. For this estimate of average annual O&M costs, power costs for pumping were not included due to the low value associated with this cost on average.
Power costs for the CRPE alternatives were calculated using the rate schedule values stated and the semi-monthly irrigation replacement flow values with an assumed 70 percent pumping efficiency for the main Columbia River Intake Pumping Plant and the three booster pump stations. Power consumption for the CRPE alternatives greatly exceeds that for the PCR alternatives because CRPE would be a fully pumped delivery system.

4.1.4.3 Life Cycle Cost

The large differences in capital, power, and other O&M costs necessitated the development of an economic analysis tool to help compare the alternatives. The Jacobs Team completed a Life Cycle Cost model that combines total capital cost, annual O&M costs including power, periodic refurbishment/replacement of major equipment over an assumed 100-year project life (Appendix 4-D).

Life cycle cost analysis can be used to estimate Net Present Value (NPV). The NPV is the value of all future cash flows (positive and negative) over the entire life of an investment, discounted to the present. Using a discount rate of 2.875% and the investments in project construction (initially), O&M (annually), and intermittent refurbishment/replacement, the NPV of each alternative was estimated.

4.1.5 Project Alternative Evaluation Tool

As one product of the November 2017 report from the Walla Walla Basin Integrated Flow Enhancement Study, a series of tables were prepared to show the relative performance of a series of “paired” projects against several criteria. These criteria, qualitative scoring against primary and secondary objectives, and the resulting Tables 23-27 from that report were prepared by the Project Pairing Subcommittee. These tables also included assessments of capital cost, O&M cost, unit cost, and total annual flows achieved by each alternative, based on information available at that time.

During this current phase of the project, these tables from the 2017 report have been updated and refined to reflect ongoing input from the Steering Committee and the results of further analysis of the alternatives. Primary enhancements to the tool are summarized as follows:

- Adding several categories of criteria, labeled as primary and secondary project benefits and considerations, to be scored.
- Integrating model results to enumerate success in meeting flow objectives, rather than coarse graphical representations.
- Revising how projects are scored by adding importance factors to each of the criteria.
- Updating cost estimates and building them into the criteria as an element to be scored.
- Adding/updating average annual flow input replacement volume for WY 2014 through WY 2018 achieved by each alternative in acre-feet per year.
Appendix 4-B provides an example of the Alternatives Evaluation Tool from the November 2017 report, more details regarding the enhancements made during the current phase of the project, and formal definitions of the evaluation criteria for scoring.

4.2 Performance Results from the WWRR Model

Performance and cost were the primary parameters of interest to inform the Flow Study Steering Committee. A special comparison is made of these parameters which are also provided in the Comparison of 2019 Alternatives in Section 4.5 using the Project Alternative Evaluation Tool. The following sections illustrate and compare the performance estimated from the results of the Walla Walla River Response Model (WWRRM) for the four 2019 Alternatives. The project team developed multiple ways to compare how the different alternatives perform:

- Annually under different conditions of wet, normal, and dry water supply
- Temporarily through the year
- Quantify as a percentage of the flow metric

4.2.1 Instream Flow Metric of Achievable Flows

The instream flow targets for the mainstem of the Walla Walla River described in Section 1.2 are the river goals established to optimize streamflow conditions for several key species of fish and various life stages of these species. However, there are time periods throughout a given water year depending on natural hydrologic conditions that these flow targets are not met as the project flows are limited by the amount of irrigation water being diverted. The minimum instream flow targets are greater than the maximum potential flow streams. For these situations it is not a deficiency of the project but a hydrologic limit of what is achievable. Given these situations happen, particularly during low water years, the decision was made to evaluate the performance of a project in terms of its ability to meet the “achievable” flow for the river segments at each management point. The “achievable” flow values were established by developing a WWRM that replaces 100 percent of the historical irrigation flow diversions for the three primary irrigation diversion locations based on historical diversion records and estimates. The difference between target flows and achievable flows (100%) is illustrated in Figure 4-1 for WY 2015. Percentages of the achievable flow with a qualitative description of good, acceptable, and poor are also shown to provide brackets for assessing performance in the following sections.
Figure 4-1. Illustration of Attainable Flows (100%) compared against the Minimum Instream Flow Targets for WY 2015

In conclusion, regardless of the flow capacity, each alternative is limited by the flows that can be achieved. The performance of each alternative was evaluated in comparison to the achievable flows.

4.2.2 Performance Comparison of Replacement Volumes

The flow performance of the 2019 Alternatives is illustrated as a total replacement volume by water year in Figure 4-2. To more readily compare, the total shortage volume by water year is illustrated in Figure 4-3. The shortage volume is the difference of the replacement volume of the alternative from the achievable volume. All the projects perform well on the average and wet years (2014, 2017, and 2018). It is the dry years (2015 and 2016) that challenge the alternative performance. Particularly the alternatives with the PCR as the anchor project where the water supply to fill PCR is limited and the demands are typically greater. Alternative 1 (160 cfs CRPE) is the only project capable of meeting the achievable flows for all the studied water years.
Figure 4-2. Comparison of the Annual Replacement Volumes for the 2019 Alternatives
For Alternative 2 and Alternative 3 that have PCR, shortages occur during dry years, such as 2015, when the river is not able to fill the reservoir and the demand volume is highest. The shortages in water year 2016 are also the result of insufficient water storage in 2015 resulting in shortages in October and November of 2015 which are months in water year 2016. It is anticipated that dry years (e.g. 2015) when the reservoir does not fill will correspond with years that the water need is greatest. The calculated frequency is presented in detail in Section 3.2. Additionally, a small portion of the shortages for the PCR alternatives is caused by the limitation of the distribution system to only provide a maximum of 15 cfs through an existing pipeline to replace flows for GFID and L4. This reduces the total volume of water that can be replaced for the lower reaches of the river.

For Alternative 2 and Alternative 3 that have PCR, additional water remains in storage on average and wet years (approximately 70% of the time) that could be utilized by the region or used as carry over storage as shown in Figure 4-4. With average and wet years being more frequent than dry years, surplus water is anticipated for a high percentage of the water years. Note that Figure 4-4 presents the remaining volume by calendar year. Contrary to water demands typically ending by October, water demands from the reservoir extend into October and November and extend into the following water year so
remaining storage needed to be determined in December to be representative of residual storage. Unfortunately, this makes it confusing when comparing to the water year shortages as explained in the preceding paragraph. The remaining storage was not included to standardize the comparison of performance for meeting the minimum instream targets. Examples of an additional benefit could be that this additional water is utilized to augment irrigation water giving greater project incentives to stakeholders, have the volume transposed with more beneficial periods of use for irrigation with periods to fill the reservoir (i.e. use in September in trade for filling in late November), or for carry over storage to provide for greater opportunity to fill if the following year is a dry year.

![Figure 4-4. Remaining Storage in Pine Creek Reservoir Alternatives](image)

**4.2.3 Performance Metric Tables**

A table providing the percent achievable replacement flows at each management point on the river for each biweekly period of the critical months of April through November in WY 2015 was developed. The purpose of the table is to compare the performance of the 2019 Alternatives temporally over the entire reach of the river rather than just looking at annual volumes. Recognizing that 2015 presented the greatest performance challenge, Table 4-1 only shows the breakdown of performance for 2015. To assist with the illustration, the cells are color coded for each percentage bracket of attainable flow (e.g. good, acceptable, poor). Alternatives 2 and 3, with the PCR as the anchor project, show
Pepper Bridge and McDonald Bridge typically representing the controlling management points on the river.

### Table 4-1. Performance Metric Tables for WY 2015

<table>
<thead>
<tr>
<th>Project/Component</th>
<th>Percent Attainable Flow Met at Management Points (2015-Data)</th>
<th>Minimum Percent Attainable by Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2014</td>
<td>2015</td>
</tr>
<tr>
<td>Alternative 1  Columbia River Pump Exchange (160 cfs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>100%</td>
</tr>
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<tr>
<td></td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Alternative 2  Pine Creek Reservoir (34K AF Active Storage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>99%</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>89%</td>
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<tr>
<td></td>
<td>100%</td>
<td>89%</td>
</tr>
<tr>
<td></td>
<td>97%</td>
<td>53%</td>
</tr>
<tr>
<td>Project/Component</td>
<td>Percent Attainable Flow Met at Management Points (2015-Day)</td>
<td>Minimum Percent Attainable by Year</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Alternative 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five Creek Reservoir - City of Walla Walla ASR (944 AFs)</td>
<td>100% 99% 100% 86% 100% 100% 90% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100%</td>
<td>100% 75% 100% 100% 100% 100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alternative 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Columbia River Pump Exchange (625 af)</td>
<td>100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100%</td>
<td>99% 99% 99% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100% 100%</td>
</tr>
</tbody>
</table>
4.2.4 Performance Comparison of Hydrographs

With the primary performance objective being Walla Walla River streamflow, hydrographs provide a good means of comparing the 2019 Alternatives. Hydrographs were developed at Pepper Bridge and McDonald Road management points to represent anticipated stream flows for each of the 2019 Alternatives. Figure 4-5 and Figure 4-6 are for the dry years of 2015 and 2016, respectively.

Figure 4-5. WY 2015 Hydrographs at Pepper Bridge and McDonald Road Management Points for the 2019 Alternatives.

Figure 4-6. WY 2016 Hydrographs at Pepper Bridge and McDonald Road Management Points for the 2019 Alternatives.
4.3 IWFM Performance Comparison of Alternatives

A comparative review of the predicted influence of these alternative management scenarios on surface water flows and groundwater storage is provided in Appendix 4-C. Model results for the management alternatives improved Walla Walla River flows relative to the 2016 baseline scenario and predicted flows generally met or exceeded target or achievable flows (whichever was less) at all Walla Walla River management points, with the following notable exceptions:

- April at Beet Road for both Reservoir scenarios.
- May at Pepper Bridge (Columbia River Exchange scenario), Beet Road. (Columbia River Exchange and both Reservoir scenarios), and McDonald Road (Columbia River Exchange and both Reservoir scenarios).
- First half of June at Pepper Bridge (Columbia River Exchange and both Reservoir scenarios), Beet Road. (Columbia River Exchange and Reservoir scenario), and McDonald Road (Reservoir scenario). Note that June achievable and minimum flow targets were developed for the first half and second half of the month.
- July at Pepper Bridge (both Reservoir scenarios) and McDonald Road (Reservoir scenario)

Relative to 2016 baseline model conditions, predicted spring and tributary flow trends were as follows:

- Under both Reservoir scenarios, spring and tributary streamflow generally decreased due to discontinuation of the managed aquifer recharge program, though flows increased at locations nearer the mainstem Walla Walla River where increased channel seepage from the Walla Walla River emerges as groundwater discharge.
- Under both Reservoir scenarios, streamflow in Pine Creek decreased from December through April due to filling of the reservoir.
- Under the Columbia River Exchange scenario, spring and tributary streamflow increased.
- Under the Columbia River Exchange scenario, groundwater storage was predicted to increase by 0.2 percent relative to 2016 baseline model. Under the Reservoir scenarios, groundwater storage was predicted to decrease by 0.3 percent due to discontinuation of the managed aquifer recharge program.
4.4 Cost of Alternatives

As previously stated, performance and costs were the primary parameters of interest to inform the Flow Study. A special comparison is made of costs that are included in the Comparison of 2019 Alternatives in Section 4.5 using the Project Alternative Evaluation Tool. The tables below present summaries of the project costs and project unit costs. See Appendix 4-D for the detailed cost estimates.

### Table 4-2. Estimated Project Costs

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Construction</th>
<th>O&amp;M</th>
<th>Life Cycle NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT 1 - 160 cfs CRPE</td>
<td>$254,202,000</td>
<td>$2,517,800</td>
<td>$357,060,000</td>
</tr>
<tr>
<td>ALT 2 – 34k AF PCR</td>
<td>$384,663,000</td>
<td>$187,400</td>
<td>$399,180,000</td>
</tr>
<tr>
<td>ALT 3 – 34k AF PCR with ASR</td>
<td>$384,663,000</td>
<td>$257,000</td>
<td>$401,500,000</td>
</tr>
<tr>
<td>ALT 4 - 120 cfs CRPE</td>
<td>$227,320,000</td>
<td>$2,553,200</td>
<td>$328,800,000</td>
</tr>
</tbody>
</table>

### Table 4-3. Estimated Unit Project Costs

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Average Input</th>
<th>Construction</th>
<th>O&amp;M</th>
<th>Life Cycle NPV</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT 1 - 160 cfs CRPE</td>
<td>30,508 AF</td>
<td>$8,332</td>
<td>$82.5</td>
<td>$11,704</td>
</tr>
<tr>
<td>ALT 2 – 34k AF PCR</td>
<td>25,369 AF</td>
<td>$15,162</td>
<td>$7.4</td>
<td>$15,735</td>
</tr>
<tr>
<td>ALT 3 – 34k AF PCR with ASR</td>
<td>27,521 AF</td>
<td>$13,977</td>
<td>$9.3</td>
<td>$14,589</td>
</tr>
<tr>
<td>ALT 4 - 120 cfs CRPE</td>
<td>29,743 AF</td>
<td>$7,643</td>
<td>$85.8</td>
<td>$11,055</td>
</tr>
</tbody>
</table>

AF = acre-feet

The construction cost and annual O&M unit cost were of key interest to the evaluation. These estimated costs are illustrated in Figure 4-7 and Figure 4-8, respectively.
Figure 4-7. Comparison of the Construction Cost Estimates for the 2019.

Figure 4-8. Comparison of the Annual Unit O&M Cost Estimates for the 2019 Alternatives.
4.5 Comparison of 2019 Alternatives

Section 4.1.5 describes how the Project Alternative Evaluation Tool has been refined during this phase of the study. Section 4.2.3 describes the development of the performance metric tables incorporated into the Project Alternative Evaluation Tool. Evaluations for the updated alternatives, as summarized in Section 4.2 and 4.4, produced the performance and cost information needed to populate the Evaluation Tool and inform the scoring for the various primary and secondary criteria.

Appendix 4-E presents the completed Evaluation Tool for each Alternative. Based on the aggregate scores provided in Table 4-4 below, Alternatives 1 and 4 (Columbia River Pump Exchange alternatives) have equivalent scores and appear to be higher ranking alternatives at this stage of the study. The Steering Committee identified Alternatives 2 and 3 (Pine Creek Reservoir alternatives) as priorities for further study, but this predates recent primary landowner discussions that affect both Pine Creek Reservoir alternatives. The key differentiators are ability of the project to meet the flow objectives, water source reliability, and project costs.

Table 4-4. Evaluation Tool Scoring Summary for the 2019 Alternatives

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Aggregate Score (DRAFT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT 1 – 160 cfs CRPE</td>
<td>76.7³</td>
</tr>
<tr>
<td>ALT 2 – 34k AF PCR²</td>
<td>49.8</td>
</tr>
<tr>
<td>ALT 3 – 34k AF PCR² with ASR</td>
<td>59.4</td>
</tr>
<tr>
<td>ALT 4 – 120 cfs CRPE</td>
<td>76.7³</td>
</tr>
</tbody>
</table>

Notes:
1. Aggregate Score reflects the Evaluation Tool Scoring provided in Appendix 4-E. The scores presented are draft based solely on the consultant’s score assignment. The scores will be evaluated and further refined by the Steering Committee during the 2020-2021 biennium phase of the Flow Study.
2. Following the technical evaluation of the 34k AF Pine Creek Reservoir project, the landowner of the site informed the Walla Walla Basin Watershed Council that they do not presently support selling a portion of their land for this reservoir use. Another site further downstream on Pine Creek has been identified and will be evaluated as part of the 2020-2021 biennium phase of the Flow Study.
3. The Draft Aggregate Scores for Alt 1 and Alt 4 were identical based solely on the consultant’s score assignment.
5 Data Gaps and Next Steps

5.1 Data Gaps Update

In February 2019, the Jacobs Team produced a memo detailing a comprehensive list of remaining data gaps identified during the early stages of the 2019 Flow Study Update. The memo (Appendix 5-A) identified 12 specific topics requiring further investigation, several of which contained multiple unresolved issues within a topic.

Examples of key data gaps include:

- How the potential fault and need for borrow material could affect the viability of the Pine Creek Reservoir.
- Whether minimum instream flow limits in Washington can be impacted during the winter for storage as part of an environmental enhancement project to restore summer flows.
- How competing instream and out-of-stream demands for water available from the Columbia River can affect the Columbia River Pump Exchange, which could be resolved through federal and tribal consultations.
- How closely a water budget neutrality definition will be administered by Ecology for the Columbia River Pump Exchange, which could be resolved through federal and tribal consultations.
- Whether legal protection of project waters will be possible through joint agreement between Washington and Oregon, and how that will affect individual diversions in the Walla Walla Basin for which insufficient information is known on historic practices.
- Who will own proposed infrastructure.
- Who will pay for operation and maintenance components of the projects.
- The degree to which surface water and groundwater will interact in the future under various possible scenarios of integrated water management, and the resulting impacts to groundwater withdrawals and river seepage will affect project design and performance.
- How potential unmitigated groundwater diversions in the Walla Walla Basin could diminish water supply improvements resulting from implementation of Flow Study projects.
- Whether proposed projects will be designed only to meet the primary purpose of mainstem Walla Walla River flow recovery, or whether other secondary objectives in the basin will also be integrated into the design criteria.

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As of December 2019, the Steering Committee anticipates that this uncertainty will be addressed through a comprehensive groundwater study currently being scoped by USGS in partnership with OWRD and Ecology.
Each data gap identified was accompanied by the corresponding information and course of action needed to close the gap and/or resolve the outstanding issue. These issues were then prioritized for action based on the highest demand for attention to avoid additional work or contract modification. Among highest priority issues were topics related to broadening the narrowly defined Flow Study goals to secure multi-stakeholder support and deciding which of the complimentary projects are the most technically viable for inclusion in the Alternatives.

As the 2019 Flow Study Update progressed, the Jacobs Team updated the list as additional data gaps were identified and/or details were refined. Updated data gaps were discussed in Steering Committee meetings to receive direction on how best to approach them both for the 2019 Flow Study Update and long-term. When SEPA funding was reprioritized following the launch of Walla Walla Water 2050, some of these issues were prioritized for work in this report. The following sections summarize this additional work.

5.1.1 Pine Creek Reservoir Expanded Desktop Borrow Source Material Evaluation
In October 2019, WWWMP and Ecology-OCR authorized the Jacobs Team to perform an expanded desktop evaluation of potential borrow material source locations within a larger study area from the site. The findings of this evaluation are provided in Appendix 5-B Expanded Borrow Source Desktop Study – Pine Creek Dam.

5.1.2 Unmitigated Groundwater Investigation
In October 2019, WWWMP and Ecology-OCR authorized the Jacobs Team to investigate the potential impacts of unmitigated uses of groundwater on restored flows in the Walla Walla River. This investigation addressed the concern of the Steering Committee that withdrawals of water from unmitigated, permit-exempt groundwater wells could potentially impact restored streamflow in the Walla Walla River.

Over the past 10 years, a total of nearly 500 new wells have been constructed in WRIA 32, many of which are permit-exempt. However, only 5 mitigation certificates have been issued by the WWWMP. Some reasons for this difference are the WWWMP mitigation program is limited to:

- Mitigation for outdoor use only, not indoor use.
- Wells withdrawing from the shallow alluvial aquifer, not deeper aquifers.
- Limited to parcels of 10 acres or less.
- The geographic extent of the program does not include the entire Walla Walla Basin.
- Some owners of new domestic wells subject to WAC 173-532 mitigation requirements for outdoor use of water are ignoring the mitigation requirement.

Ecology’s guidance for mitigation of permit-exempt groundwater wells in the Walla Walla is provided in Appendix 5-C.

These data suggest that recent and ongoing development and use of unmitigated groundwater wells could potentially diminish streamflow in the Walla Walla River.
system. The Jacobs Team investigated this concern by identifying and locating unmitigated, permit-exempt groundwater wells developed on the Washington and Oregon sides of the Walla Walla Basin after September 5, 2007 (the launch date of the WWWMP permit-exempt well mitigation program), estimating the impacts of these wells on Walla Walla River streamflow, and extrapolating these results to estimate additional impacts of continued development for the next 10 years.

5.1.2.1 Methodology
To assess this risk, the Jacobs Team completed the following:

- Collected well log and well drilling data from Washington and Oregon from September 5, 2007 to present. Well logs were reviewed to exclude monitoring wells and pre-2007 wells that were deepened or reconditioned since the launch date of the permit-exempt well mitigation program.

- Used GIS to map the location-data for this information where available. In many cases, this data is only available to the nearest quarter-quarter section.

- Established estimated aquifer depths versus well drilling depths to identify likely target aquifers for the wells and reviewed available well logs for estimated aquifer identification. Note that this is a coarse estimate and does not identify the specific aquifer(s) developed for each well. However, it does provide a general sense of the aquifers in which the wells are apparently developed.

- Established total water use estimates for each well. In the Walla Walla Instream Flow Rule (WAC 173-532-050(2)(a)), domestic users within the mitigation program area are limited to 1250 gpd (excluding stockwater). For the 2019 Flow Study Update, we assumed 250 gpd for indoor use at 10 percent consumptive use, and the balance as outdoor use at 80 percent consumptive use. These assumptions are based on Ecology Publication 19-11-079 (Appendix A), which provides guidance for determining consumptive use from exempt wells statewide. We then applied these assumptions to the entirety of the number of wells drilled since 2007. Rates in gpd were converted to cfs for comparison to Flow Study goals.

- Estimated future exempt well use anticipated over the next 10 years, based on projection of the historic growth rate from 2007 to 2019, through to 2030.

5.1.2.2 Results
Table 5-1 summarizes the total number of wells drilled since 2007, potential future wells from 2020 to 2030, and the total use and consumptive use estimated in association with past and future well development. Figure 5-1 shows the location of wells drilled since 2007.
Figure 5-1. Unmitigated Groundwater Wells
Table 5-1. Estimated Impact of Unmitigated Groundwater Wells

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Alluvial</strong></td>
<td>72</td>
<td>235</td>
<td>76</td>
<td>270</td>
</tr>
<tr>
<td><strong>Basalt</strong></td>
<td>59</td>
<td>179</td>
<td>62</td>
<td>205</td>
</tr>
<tr>
<td><strong>Total Use 2007-2019 (cfs)</strong></td>
<td>0.14</td>
<td>0.45</td>
<td>0.15</td>
<td>0.52</td>
</tr>
<tr>
<td><strong>Consumptive Use 2007-2019 (cfs)</strong></td>
<td>0.09</td>
<td>0.30</td>
<td>0.09</td>
<td>0.34</td>
</tr>
<tr>
<td><strong>Alluvial</strong></td>
<td>0.075</td>
<td>0.23</td>
<td>0.08</td>
<td>0.26</td>
</tr>
<tr>
<td><strong>Basalt</strong></td>
<td>0.11</td>
<td>0.35</td>
<td>0.12</td>
<td>0.40</td>
</tr>
<tr>
<td><strong>Total Use 2020-2030 (cfs)</strong></td>
<td>0.17</td>
<td>0.52</td>
<td>0.12</td>
<td>0.46</td>
</tr>
<tr>
<td><strong>Consumptive Use 2020-2030 (cfs)</strong></td>
<td>0.08</td>
<td>0.34</td>
<td>0.08</td>
<td>0.26</td>
</tr>
</tbody>
</table>

Notes:
1. If water users outside the mitigation area are using 5,000 gpd provided under permit-exempt rules, water use could be up to 4 times these values.
2. Oregon well data was populated from the OWRD GWIS database, which is not representative of every well in the state but is at present, the best resource for locating permit-exempt wells.

It is important to note that the predicted impacts to the aquifers in Table 5-1 could change depending upon the daily use quantity used to derive the impact estimate. What if lawn sizes are larger? What if daily indoor uses are higher? For example, if a daily use rate of 5,000 gpd (historic Washington exempt well limit) were used, then total use impacts could reach up to 1.82 cfs and 0.56 cfs in the alluvium in Washington and Oregon, respectively and 1.38 cfs and 0.46 cfs in the basalt.

Another way to consider this range is by volume in acre-feet. The total combined impact in Table 5-1 in the alluvium and basalt in Washington and Oregon from 2007 to 2030 is 1.465 cfs. Over the course of a year, this equates to a volume of 1,058 acre-feet. For comparison, Kittitas County agreed to mitigate for all historic exempt well uses predating 2009 by buying and retiring 800 acre-feet of consumptive use senior water rights.

Effects of well drilling on instream flows are challenging to estimate because location, aquifer, water year, and other assumptions all affect hydraulic continuity with the Walla Walla River and Columbia River. The consumptive use estimates of 0.70 (2007 – 2019) and 0.77 (2020 – 2030) are likely to represent the long-term cumulative impacts of these sources. However, because return flows from septic tanks and irrigation likely benefit the alluvial aquifer and not the basalt aquifer, the values in Table 5-1 likely over-predict the depletions from the alluvial aquifer and underpredict the water budget for the basalt aquifer. For example, total depletions from the basalt aquifer in Washington and Oregon are 0.35 cfs and 0.11 cfs, respectively. However, the deeper aquifer depletions likely have

9 The effects from well drilling in the alluvial aquifer are more likely to have a direct impact on springs and tributaries but given the connectivity of the system, the long-term result would be an impact on the Walla Walla River.
a more disconnected and attenuated impact on instream flows. These impacts can be modeled or estimated further in the future. The policy implications of additional unmitigated exempt wells should be considered by the Steering Committee.

5.1.3 Diversion Location Audit

In October 2019, WWWMP and Ecology-OCR authorized the Jacobs Team to investigate the number, location and attributes of diversion facilities that must be considered in the implementation of any of the proposed streamflow restoration alternatives.

This investigation addressed the concern of Steering Committee members that the intended allocation and protection of restored streamflow will require a detailed understanding of the location, authority, and historic use of all the diversion facilities that could potentially divert streamflow within the study reach of the Walla Walla River. Steering Committee members have expressed concern that streamflow restoration efforts could be undermined if existing diversion operators change their operational practices in response to restored levels of streamflow in the Walla Walla River. Effective operation and regulation of streamflow diversions requires a sound and timely understanding of:

- Locations of all streamflow diversion facilities.
- Contact information for all diversion owners and operators.
- Rate(s) and volume(s) that water users are authorized to divert by priority date.
- Rate(s) and volume(s) that water users have typically taken in both drought and non-drought years.
- Dates when water users have typically been curtailed in both drought and non-drought years.
- Rate(s) and volume(s) water users used before bypass flows (introduced in Section 1.2) in 2000 began to artificially inflate supply.

5.1.3.1 Methodology

The Jacobs Team investigated this concern by designing a geographic information system (GIS) framework to audit the location and characteristics of diversion facilities. The GIS geodatabase was populated to the degree possible with data obtained from the following data sources:

- GIS coverages of diversion location data
  - National Hydrography Dataset (NHD) published by USGS
- GIS coverages of relevant water right authority data
  - Authorized Points of Diversion (PODs) provided by Ecology and OWRD
- GIS parcel coverage data for diversion ownership
  - Parcel data published by Walla Walla County (WA) and Umatilla County (OR)
- Metering requirements for surface diverters
Data not yet secured or integrated

- Metered water use data
  - Data not yet secured or integrated
- Curtailment cutoff dates for drought and non-drought years
  - Data not yet secured or integrated

The list of information by diversion is not complete based on agency records. However, this GIS framework will allow information to be populated over time. Starting in 2020, a foundation of water use data and curtailment dates should be initiated to better understand how legal mechanisms to protect developed water supplies will intersect with natural flow availability and diversion owner use patterns.

### 5.1.3.2 Results

For the Walla Walla River mainstem, there are 119 documented surface water diversions in Washington from River Mile 5 to 45 and 63 surface diversions in Oregon from River Mile 45 to 55. An additional 25 diversions occur on the Little Walla Walla River between the WWRID/HBDIC diversion and The Frog. Readily available data for each of these diversions were incorporated into a GIS database delivered to the WWWMP and Ecology. The biggest data gap observed is the lack of metering and curtailment data for water users that can help inform future policy discussion regarding legal protection of water supplies developed by the Steering Committee.

### 5.1.4 New Data Gap - Pine Creek Reservoir Siting

The original siting of Pine Creek Dam was performed by USACE as part of a screening evaluation of 45 potential sites to locate reservoir storage (USACE, 2005). The conclusion of the screening reduced the potential sites to two sites on Pine Creek, an upper and lower site. The 2017 Concept Study of Pine Creek Reservoir selected the upper site for the following reasons:

- Water storage at the lower site was limited by topography to 28,000 AF.
- The right abutment of the lower dam is a narrow ridge about 500 feet across and has an increased risk of excessive seepage and internal erosion.
- The elevation band of the active storage at the lower site requires pumping for most of the irrigation deliveries (not a gravity system).

The landowner of the upper PCR site recently expressed that they are no longer willing to consider selling the property thereby compromising the potential for siting the dam at the upper site and creating new interest in reinvestigating the lower site. Though there does not appear to be the landowner concerns, the lower site has the challenges described above and the same concerns as the upper site of a potential active fault and uncertainties related to a borrow source. Further investigation is needed to determine the significance of the additional challenges and the viability of the lower site. However, this further investigation will need to be performed as part of a future phase of the Flow Study.
5.2 Environmental Review

Environmental Review refers to a formal review process that is required for any local, state or federal action that is not categorically exempt from the process. The purpose of the process is to review the potential impacts of a proposed public project to determine whether it meets local, state and federal environmental standards.

In Washington State, the Environmental Review process incorporates two related processes: the State Environmental Policy Act (SEPA); and the National Environmental Policy Act (NEPA). SEPA pertains to state-level review of a proposed action that involves permitting, land ownership and/or funding at the state level (referred to as having a state project “nexus”). Similarly, NEPA pertains to federal-level review of a proposed action that involves permitting, land ownership and/or funding at the federal level (referred to as having a federal project “nexus”).

Oregon state law does not include a State Environmental Policy Act, so SEPA does not apply to proposed projects in Oregon. However, for projects in Oregon that include a federal nexus, NEPA does apply.

Since two-thirds of the Walla Walla basin is in Washington State, subject to Washington State regulations and permits, and the State of Washington is funding a portion of the Flow Study and other related projects, the Flow Study is subject to the SEPA process.

Since the alternatives under consideration in the Flow Study represent large projects that involve natural resources law and policies administered by Federal government agencies, will trigger federal permits or involve federal land ownership, and are likely to be funded in part by Federal government agencies, the Flow Study alternatives are also subject to NEPA.

SEPA can proceed before, after, or concurrently with NEPA. However, since SEPA funding is currently available, NEPA funding is not, and the lead agencies for SEPA are closer to being selected than lead agencies for NEPA, SEPA will proceed prior to NEPA. A programmatic approach to SEPA will help inform alternative selection and data gaps and build an environmental review foundation to streamline a subsequent NEPA process.

For an integrated planning effort like the Flow Study, it is appropriate to initiate SEPA when an agency is presented with an application or has a goal, is actively preparing to make a decision on one or more alternative means of accomplishing that goal, and environmental effects can be meaningfully evaluated. It is desirable to initiate SEPA at the earliest possible time to ensure that planning and decisions reflect environmental values, seek to resolve potential problems and avoid delays later in the process.

The NEPA timeline will be set after the Flow Study Steering Committee meets with federal agencies and determines the NEPA lead (during SEPA scoping), and Federal funding is budgeted to launch the NEPA process. The appropriate Federal agency(s) to lead NEPA will be determined during the SEPA scoping process. SEPA scoping and potentially a SEPA EIS may be completed by the time NEPA is underway.
5.2.1 Environmental Review Process

The SEPA process includes the following primary steps:

1. **Selection and Commitment of Lead Agencies.** For integrated projects like the Flow Study, a local and State co-lead arrangement is typical. Ecology OCR and the WWWMP have been proposed as co-lead agencies for the Flow Study SEPA process. A Memorandum of Understanding (MOU) has been drafted to formalize this proposed arrangement and is included as Appendix 5-D.

2. **Environmental Checklist.** The second product produced under the SEPA process is an Environmental Checklist summarizing the Flow Study goals and each alternative under consideration to achieve the stated goals. An Environmental Checklist has been drafted and is included as Appendix 5-E.

3. **Threshold Determination.** The third product produced under the SEPA process is a Threshold Determination summarizing whether the anticipated impacts of the project(s) evaluated in the Environmental Checklist are significant enough to merit development of an Environmental Impact Statement (EIS). If the anticipated impacts are not considered significant enough, a Determination of Non-Significance (DNS) is prepared. If the anticipated impacts are considered significant enough, a Determination of Significance (DS) is prepared. In this case, the anticipated impacts are considered significant and a DS has been drafted and included as Appendix 5-F. Subject to Ecology review and approval, this DS will be finalized and published, circulated to the SEPA register and made available to the public.

4. **Resource Library.** The fourth product produced under the SEPA process is a resource library which includes a bibliography and a comprehensive collection of all the preceding studies, planning and project documents that are considered relevant to inform the EIS. These relevant studies are compiled and made available for the public to review. A resource library has been assembled for future hosting on the WWBWC website. The bibliography has been drafted and included as Appendix 5-G. A similar resource library is being developed as an element of the Walla Walla Water 2050 initiative.

5. **Environmental Impact Statement (EIS).** The fifth product produced under the SEPA process is an EIS. In the case of a complex plan like the Flow Study that involve multiple interrelated projects, it is anticipated that a Programmatic EIS will be initially developed, with a Supplemental EIS or NEPA EIS to follow. Some initial effort was made to initiate public outreach with prospective community stakeholders to inform the process of preparing appropriate outreach materials. However, due to the passage of Senate Bill 5352 (SSSB 5352) discussed in the next section, no formal outreach materials have been created, and no formal public and stakeholder meetings have been conducted. At the appropriate time, formal outreach will be conducted, followed by a formal review period during which public comments on the goals, alternatives, and data gaps will be solicited, accepted and processed. The Jacobs team outlined an initial budget estimate for this effort (also discussed in the following section) and public comments will be summarized to finalize the EIS scope and budget.
Originally, the Jacobs Team was scoped to initiate Programmatic EIS scoping in late 2018. However, this process was delayed based on the passage of SSSB 5352 and the launch of Walla Walla Water 2050.

5.2.2 Programmatic EIS for Walla Walla Water 2050

On April 19, 2019, the Washington State Senate approved SSSB 5352 amending the legislative authority for the WWWMP. SSSB 5352 extends the Walla Walla watershed management pilot program for two years (through June 30, 2021) and authorizes the WWWMP to perform internal and external evaluations of performance and financials, build upon previous pilot program efforts, continue Walla Walla River flow enhancement technical work, and restructure the WWWMP to develop a thirty-year integrated water resource management strategic plan.

SSSB 5352 specifically directs the WWWMP to:

- Continue working with Ecology, CTUIR and other participants to advance the Flow Study and its recommendation, including any necessary environmental reviews for near-term actions.
- Collaborate with Ecology in the development of a thirty-year integrated water resource management strategic plan, including a draft and final programmatic environmental impact statement, and explore interstate agreements to maximize integrated water resource management.
- By November 1, 2020, jointly develop with Ecology a report to the legislature recommending the scope and scale of an integrated water resource management strategic plan, including a funding approach and organization structure, to achieve the desired outcome of improved and sustainable flows for fish, adequate water supplies for agriculture, municipal, and domestic water users, and improved habitat and floodplain functionality in the Walla Walla watershed.
- Coordinate with Ecology OCR to request funding to complete tasks required during the transition period.

A key issue for the Flow Study environmental review is to what extent it will be integrated into the Programmatic EIS, called for in SSSB 5352. This issue was discussed at several Steering Committee meetings in 2019. There is an opportunity for integration that could reduce the funding impact of two PEISs that have at least one overlapping goal: mainstem Walla Walla River flow improvement. Because the Flow Study is specifically called out in SSB 5352, it is also likely the Washington Legislature considered them an interrelated part of the same proposal. The central concern of some members of the Steering Committee is that the momentum of the Flow Study not be slowed by such an integration. To inform organization and orchestration of the Programmatic EIS, the Jacobs Team outlined an initial budget estimate for this effort which is attached as Appendix 5-H.

To announce and initiate the Walla Walla Water 2050 program, Ecology organized an initial two-day public outreach event on October 3-4, 2019 and begin soliciting input from local stakeholders throughout the Walla Walla watershed. Ecology has established a
At the time of this report, the proposed approach from OCR and the Partnership is to integrate the Flow Study environmental review as an Early Action Item under the WWW2050 PEIS.

5.3 Recommendations and Next Steps

5.3.1 Funding Prioritization for 2019 - 2021

The Steering Committee continues investigating and evaluating the feasibility and performance of the restoration alternatives. To ensure that available funding is optimally allocated to address priority issues, the Steering Committee assigned the Policy Advisory Working Group (PAWG) to prioritize the funding available in the 2019-2021 biennium, primarily from Ecology OCR. OCR identified that current available budget was limited to $300,000 for Flow Study related work. The Steering Committee met and approved the following initial budget in Table 5-2 to launch work starting in 2020.

Table 5-2. Steering Committee Approved Funding List for 2020

<table>
<thead>
<tr>
<th>Description</th>
<th>Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROJECT MANAGEMENT</strong></td>
<td></td>
</tr>
<tr>
<td>Contract Administration by WWWMP and WWBWC</td>
<td>$35,000</td>
</tr>
<tr>
<td>Facilitation</td>
<td>$30,000</td>
</tr>
<tr>
<td>Steering Committee and TWG Technical Support</td>
<td>$35,000</td>
</tr>
<tr>
<td><strong>CONTINGENCY</strong></td>
<td></td>
</tr>
<tr>
<td>Contingency</td>
<td>$75,000</td>
</tr>
<tr>
<td><strong>FEASIBILITY STUDIES AND DATA GAPS</strong></td>
<td></td>
</tr>
<tr>
<td>Operation and Maintenance Funding Action Plan, including consultation with potential funding entities, and conceptual investigation of alternative power sources (e.g. wind, solar).</td>
<td>$15,000</td>
</tr>
<tr>
<td>Columbia River Impact Analysis to evaluate and consult on timing and magnitude of impacts to the Columbia River.</td>
<td>$20,000</td>
</tr>
<tr>
<td>Columbia River Water Availability Study to evaluate and consult on water diversions that can be coordinated with biological opinion flows and competing water demands on the Columbia River.</td>
<td>$50,000</td>
</tr>
<tr>
<td>28,000 acre-foot reservoir conceptual review for lower site to bring parity of cost and performance up-to-date with alternatives in this report.</td>
<td>$25,000</td>
</tr>
<tr>
<td><strong>ENVIRONMENTAL REVIEW AND OUTREACH</strong></td>
<td></td>
</tr>
<tr>
<td>Engage and coordinate environmental review activities with Walla Walla Water 2050 initiative</td>
<td>$10,000</td>
</tr>
<tr>
<td>Develop outreach materials for stakeholder coordination</td>
<td>$5,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$300,000</td>
</tr>
</tbody>
</table>

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10 https://ecology.wa.gov/Water-Shorelines/Water-supply/Water-supply-projects-EW/Walla-Walla-2050
5.3.2 Legislation / Legal Coordination

Protection of restored streamflow remains critical to the long-term viability of the proposed alternatives that remain under consideration. The Steering Committee has developed a two-prong strategy for advancing this issue.

First, the Steering Committee has requested engagement from the tribal government and state agencies (CTUIR, Ecology, and OWRD) to agree upon a strategy to meet this need, either through existing statutory authorities or via Legislative change. During the 2019 Flow Study Update, CTUIR and the two state agencies formed a Sovereign Review Team and initiated meetings and cooperative efforts to address this need. If existing laws and policies are not adequate to address this need, the governments may attempt a pilot program to administer and protect existing water savings from previous conservation projects. If new law is needed, they may consider how legislation could be framed that would be most successful. The Sovereigns have cautioned that these pathways are likely to be difficult and time-consuming to accomplish.

Second, the Steering Committee is tracking outcomes of a WWWMP-led pilot of their authority to implement voluntary agreements not to divert. For example, if downstream water users contractually agree to bypass new water supplies made available from the selected Flow Study alternative, existing contract law could be used to implement the Flow Study Objectives. The Steering Committee plans to continue addressing this challenge in 2020 and beyond.

5.3.3 Timeline Moving Forward

Looking forward, the Steering Committee is focused primarily on the 2019-2021 biennium, for which it has secured funding from the Washington Legislature to continue implementation of the Flow Study. Additional complementary funding is also being pursued. Table 5-3 presents the updated implementation timeline for the next 10 years.

<table>
<thead>
<tr>
<th>Biennium</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 - 2019</td>
<td>Targeted feasibility studies and data gaps, environmental scoping, expanded outreach, NEPA/SEPA integration strategy, Bi-State Caucus formation, and pilot strategy to protect Bi-State flows</td>
</tr>
<tr>
<td>2021 - 2023</td>
<td>Advance Design of Preferred Alternative, Final Resolution of Legal Issue to Protect Bi-State Flows, Implementation of Early Action Items</td>
</tr>
<tr>
<td>2023 - 2025</td>
<td>Construction of Preferred Alternative, Monitoring of Successes of Early Action Items</td>
</tr>
<tr>
<td>2025 - 2027</td>
<td>Construction of Preferred Alternative, Monitoring of Successes of Early Action Items</td>
</tr>
</tbody>
</table>

Note: This proposed timeline may be affected by various factors, including the degree of community support and time required to pursue and secure implementation funding.
References


NOTE: A more comprehensive list of references included in the 2017 Flow Study is available for additional background information.
Limitations

Work for this project was performed for the Walla Walla Water Management Partnership (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

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