Appendices

WRIA 10 Puyallup-White Watershed

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Appendix B – Glossary

Acronym	Definition
AE	Application Efficiency
AFY	Acre-Feet per Year
CFS	Cubic Feet per Second
CU	Consumptive Use
CUF	Consumptive Use Factor
GPD	Gallons per Day
GIS	Geographic Information System
IR	Irrigation Requirements
LID	Low Impact Development
LIO	Local Integrating Organization
MAR	Managed Aquifer Recharge
NEB	Net Ecological Benefit
PE	Permit-Exempt
RCW	Revised Code of Washington
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resource Inventory Areas

Acre-feet (AF): A unit of volume equal to the volume of a sheet of water one acre in area and one foot in depth. (USGS)

Adaptive Management: An iterative and systematic decision-making process that aims to reduce uncertainty over time and help meet project, action, and plan performance goals by learning from the implementation and outcomes of projects and actions. (NEB)

Annual Average Withdrawal: RCW 90.94.030 (4)(a)(vi)(B) refers to the amount of water allowed for withdrawal per connection as the annual average withdrawal. As an example, a homeowner could withdraw 4,000 gallons on a summer day, so long as they did not do so often enough that their annual average exceeds the 950 gpd.

Beaver Dam Analogue (BDA): BDAs are man-made structures designed to mimic the form and function of a natural beaver dam. They can be used to increase the probability of successful beaver translocation and function as a simple, cost-effective, non-intrusive approach to stream restoration. (From Anabranch Solutions)

Critical Flow Period: The time period of low streamflow (generally described in bi-monthly or monthly time steps) that has the greatest likelihood to negatively impact the survival and recovery of threatened or endangered salmonids or other fish species targeted by the planning group. The planning group should discuss with Ecology, local tribal and WDFW biologists to determine the critical flow period in those reaches under the planning group's evaluation. (NEB)

Cubic feet per second (CFS): A rate of the flow in streams and rivers. It is equal to a volume of water one foot high and one foot wide flowing a distance of one foot in one second (about the size of one archive file box or a basketball). (USGS)

Domestic Use: In the context of Chapter 90.94 RCW, "domestic use" and the withdrawal limits from permit-exempt domestic wells include both indoor and outdoor household uses, and watering of a lawn and noncommercial garden. (NEB)

ESSB 6091: In January 2018, the Legislature passed Engrossed Substitute Senate Bill (ESSB) 6091 in response to the Hirst decision. In the Whatcom County vs. Hirst, Futurewise, et al. decision (often referred to as the "Hirst decision"), the court ruled that the county failed to comply with the Growth Management Act requirements to protect water resources. The ruling required the county to make an independent decision about legal water availability. ESSB 6091 addresses the court's decision by allowing landowners to obtain a building permit for a new home relying on a permit-exempt well. ESSB 6091 is codified as Chapter 90.94 RCW. (ECY)

Evolutionarily Significant Unit (ESU): A population of organisms that is considered distinct for purposes of conservation. For Puget Sound Chinook, the ESU includes naturally spawned Chinook salmon originating from rivers flowing into Puget Sound from the Elwha River (inclusive) eastward, including rivers in Hood Canal, South Sound, North Sound and the Strait of Georgia. Also, Chinook salmon from 26 artificial propagation programs. (NOAA)

Foster Pilots and Foster Task Force: To address the impacts of the 2015 Foster decision, Chapter 90.94 RCW established a Task Force on Water Resource Mitigation and authorized the Department of Ecology to issue permit decisions for up to five water mitigation pilot projects. These pilot projects will address issues such as the treatment of surface water and groundwater appropriations and include management strategies to monitor how these appropriations affect

instream flows and fish habitats. The joint legislative Task Force will (1) review the treatment of surface water and groundwater appropriations as they relate to instream flows and fish habitat, (2) develop and recommend a mitigation sequencing process and scoring system to address such appropriations, and (3) review the Washington Supreme Court decision in Foster v. Department of Ecology. The Task Force is responsible for overseeing the five pilot projects. (ECY)

Four Year Work Plans: Four year plans are developed by salmon recovery lead entities in Puget Sound to describe each lead entity's accomplishments during the previous year, to identify the current status of recovery actions, any changes in recovery strategies, and to propose future actions anticipated over the next four years. Regional experts conduct technical and policy reviews of each watershed's four year work plan update to evaluate the consistency and appropriate sequencing of actions with the Puget Sound Salmon Recovery Plan. (Partnership)

Gallons per day (GPD): An expression of the average rate of domestic and commercial water use. 1 million gallons per day is equivalent to 1.547 cubic feet per second.

Group A public water systems: Group A water systems have 15 or more service connections or serve 25 or more people per day. Chapter 246-290 WAC (Group A Public Water Supplies), outlines the purpose, applicability, enforcement, and other policies related to Group A water systems. (WAC)

Group B public water systems: Group B public water systems serve fewer than 15 connections **and** fewer than 25 people per day. Chapter 246-291 WAC (Group B Public Water Systems), outlines the purpose, applicability, enforcement, and other policies related to Group B water systems.(WAC)

Growth Management Act (GMA): Passed by the Washington Legislature and enacted in 1990, this act guides planning for growth and development in Washington State. The act requires local governments in fast growing and densely populated counties to develop, adopt, and periodically update comprehensive plans.

Home: A general term referring to any house, household, or other Equivalent Residential Unit. (Policy and Interpretive Statement)

Hydrologic Unit Code (HUC): Hydrologic unit codes refer to the USGS's division and sub-division of the watersheds into successively smaller hydrologic units. The units are classified into four levels: regions, sub-regions, accounting units, and cataloging units, and are arranged within each other from the largest geographic area to the smallest. Each unit is classified by a unit code (HUC) composed of two to eight digits based on the four levels of the classification in the hydrologic unit system (two digit units are largest and eight digits are smallest). (USGS)

Impact: For the purpose of streamflow restoration planning, impact is the same as new consumptive water use (see definition below). As provided in Ecology WR POL 2094 "Though the statute requires the offset of 'consumptive impacts to instream flows associated with permit-exempt domestic water use' (RCW 90.94.020(4)(b)) and 90.94.030(3)(b)), watershed plans should address the consumptive use of new permit-exempt domestic well withdrawals. Ecology recommends consumptive use as a surrogate for consumptive impact to eliminate the

need for detailed hydrogeologic modeling, which is costly and unlikely feasible to complete within the limited planning timeframes provided in chapter 90.94 RCW. ” (NEB)

Instream Flow: A designated flow (also in cfs) that is set by rule as the amount of water needed to protect beneficial uses and used for determining whether there is water available for appropriation. Flow levels set as Instream Flows do not reflect the actual amount of water flowing at a given time. They are designated, or administrative numbers (flow levels) that are set for periods of time (bi-weekly to several months) throughout the year. The instream flows vary by season and account for different instream resource needs (such as fish spawning, rearing and migration). When (actual) stream flow is lower than the Instream Flow, there is not water available for appropriation (Instream Flows are not being met) and water users whose water rights are junior to the Instream Flows must discontinue water use under that right.

Instream Flow Rule: An administrative rule that establishes Instream Flows. (ECY)

Instream Resources Protection Program (IRPP): The IRPP was initiated by the Department of Ecology in September 1978 with the purpose of developing and adopting instream resource protection measures for Water Resource Inventory Areas (WRIAs) (see definition below) in Western Washington as authorized in the Water Resources Act of 1971 (RCW 90.54), and in accordance with the Water Resources Management Program (WAC 175-500).

Instream Resources: Fish and related aquatic resources. (NEB)

Large woody debris (LWD): LWD refers to the fallen trees, logs and stumps, root wads, and piles of branches along the edges of streams, rivers, lakes and Puget Sound. Wood helps stabilize shorelines and provides vital habitat for salmon and other aquatic life. Preserving the debris along shorelines is important for keeping aquatic ecosystems healthy and improving the survival of native salmon. (King County)

Lead Entities (LE): Lead Entities are local, citizen-based organizations in Puget Sound that coordinate salmon recovery strategies in their local watershed. Lead entities work with local and state agencies, tribes, citizens, and other community groups to adaptively manage their local salmon recovery chapters and ensure recovery actions are implemented. (Partnership)

Listed Species: Before a species can receive the protection provided by the Endangered Species Act (ESA), it must first be added to the federal lists of endangered and threatened wildlife and plants. The List of Endangered and Threatened Wildlife (50 CFR 17.11) and the List of Endangered and Threatened Plants (50 CFR 17.12) contain the names of all species that have been determined by the U.S. Fish and Wildlife Service (Service) or the National Marine Fisheries Service (for most marine life) to be in the greatest need of federal protection. A species is added to the list when it is determined to be endangered or threatened because of any of the following factors: the present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its survival. (USFWS)

Local Integrating Organizations (LIO): Local Integrating Organizations are local forums in Puget Sound that collaboratively work to develop, coordinate, and implement strategies and actions

that contribute to the protection and recovery of the local ecosystem. Funded and supported by the Puget Sound Partnership, the LIOs are recognized as the local expert bodies for ecosystem recovery in nine unique ecosystems across Puget Sound. (Partnership)

Low Impact Development (LID): Low Impact Development (LID) is a stormwater and land-use management strategy that tries to mimic natural hydrologic conditions by emphasizing techniques including conservation, use of on-site natural features, site planning, and distributed stormwater best management practices (BMPs) integrated into a project design. (ECY)

Managed Aquifer Recharge (MAR): Managed aquifer recharge projects involve the addition of water to an aquifer through infiltration basins, injection wells, or other methods. The stored water can then be used to benefit stream flows, especially during critical flow periods. (NEB)

National Pollutant Discharge Elimination System (NPDES): The NPDES permit program addresses water pollution by regulating point sources that discharge pollutants to waters of the United States. Created by the Clean Water Act in 1972, the EPA authorizes state governments to perform many permitting, administrative, and enforcement aspects of the program. (EPA)

Net Ecological Benefit (NEB): Net Ecological Benefit is a term used in ESSB 6091 as a standard that watershed plans (see below for definition) must meet. The outcome that is anticipated to occur through implementation of projects and actions in a plan to yield offsets that exceed impacts within: a) the planning horizon; and, b) the relevant WRIA boundary. See *Final Guidance for Determining Net Ecological Benefit - Guid-2094 Water Resources Program Guidance.* (NEB)

Net Ecological Benefit Determination: Occurs solely upon Ecology's conclusion after its review of a watershed plan submitted to Ecology by appropriate procedures, that the plan does or does not achieves a NEB as defined in the Net Ecological Benefit guidance. The Director of Ecology will issue the results of that review and the NEB determination in the form of an order. (NEB)

Net Ecological Benefit Evaluation: A planning group's demonstration, using NEB Guidance and as reflected in their watershed plan, that their plan has or has not achieved a NEB. (NEB)

New Consumptive Water Use: The consumptive water use from the permit-exempt domestic groundwater withdrawals estimated to be initiated within the planning horizon. For the purpose of RCW 90.94, consumptive water use is considered water that is evaporated, transpired, consumed by humans, or otherwise removed from an immediate water environment due to the use of new permit-exempt domestic wells. (NEB)

Office of Financial Management (OFM): OFM is a Washington state agency that develops official state and local population estimates and projections for use in local growth management planning. (OFM)

Offset: The anticipated ability of a project or action to counterbalance some amount of the new consumptive water use over the planning horizon. Offsets need to continue beyond the planning horizon for as long as new well pumping continues. (NEB)

Permit exempt wells: The Groundwater Code (RCW 90.44), identified four "small withdrawals" of groundwater as exempt from the permitting process. Permit-exempt groundwater wells often provide water where a community supply is not available, serving single homes, small developments, irrigation of small lawns and gardens, industry, and stock watering.

Permit-exempt uses: Groundwater permit exemptions allow four small uses of groundwater without a water right permit: domestic uses of less than 5,000 gallons per day, industrial uses of less than 5,000 gallons per day, irrigation of a lawn or non-commercial garden, a half-acre or less in size, or stock water. Although exempt groundwater withdrawals don't require a water right permit, they are always subject to state water law. (ECY)

Planning groups: A general term that refers to either initiating governments, in consultation with the planning unit, preparing a watershed plan update required by Chapter 90.94.020 RCW, or a watershed restoration and enhancement committee preparing a plan required by Chapter 90.94.030 RCW. (NEB)

Planning Horizon: The 20-year period beginning on January 19, 2018 and ending on January 18, 2038, over which new consumptive water use by permit-exempt domestic withdrawals within a WRIA must be addressed, based on the requirements set forth in Chapter 90.94 RCW. (NEB)

Projects and Actions: General terms describing any activities in watershed plans to offset impacts from new consumptive water use and/or contribute to NEB. (NEB)

Puget Sound Acquisition and Restoration (PSAR) fund: This fund supports projects that recover salmon and protect and recover salmon habitat in Puget Sound. The state legislature appropriates money for PSAR every 2 years in the Capital Budget. PSAR is co-managed by the Puget Sound Partnership and the Recreation and Conservation Office, and local entities identify and propose PSAR projects. (Partnership)

Puget Sound Partnership (Partnership): The Puget Sound Partnership is the state agency leading the region's collective effort to restore and protect Puget Sound and its watersheds. The organization brings together hundreds of partners to mobilize partner action around a common agenda, advance Sound investments, and advance priority actions by supporting partners. (Partnership)

Puget Sound Regional Council (PSRC): PSRC develops policies and coordinates decisions about regional growth, transportation and economic development planning within King, Pierce, Snohomish and Kitsap counties. (PSRC)

RCW 90.03 **(Water Code)**: This chapter outlines the role of the Department of Ecology in regulating and controlling the waters within the state. The code describes policies surrounding surface water and groundwater uses, the process of determining water rights, compliance measures and civil penalties, and various legal procedures.

RCW 90.44 **(Groundwater Regulations)**: RCW 90.44 details regulations and policies concerning groundwater use in Washington state, and declares that public groundwaters belong to the public and are subject to appropriation for beneficial use under the terms of the chapter. The rights to appropriate surface waters of the state are not affected by the provisions of this chapter.

RCW 90.54 **(Groundwater permit exemption)**: This code states that any withdrawal of public groundwaters after June 6, 1945 must have an associated water right from the Department of Ecology. However, any withdrawal of public groundwaters for stock-watering purposes, or for the watering of a lawn or of a noncommercial garden not exceeding one-half acre in area, or for single or group domestic uses in an amount not exceeding five thousand gallons a day, or for an industrial purpose in an amount not exceeding five thousand gallons a day, is exempt from the provisions of this section and does not need a water right.

RCW 90.82 **(Watershed Planning)**: Watershed Planning was passed in 1997 with the purpose of developing a more thorough and cooperative method of determining what the current water resource situation is in each water resource inventory area of the state and to provide local citizens with the maximum possible input concerning their goals and objectives for water resource management and development.

RCW 90.94 **(Streamflow Restoration)**: This chapter of the Revised Code of Washington codifies ESSB 6091, including watershed planning efforts, streamflow restoration funding program and the joint legislative task force on water resource mitigation and mitigation pilot projects (Foster task force and pilot projects).

Reasonable Assurance: Explicit statement(s) in a watershed plan that the plan's content is realistic regarding the outcomes anticipated by the plan, and that the plan content is supported with scientifically rigorous documentation of the methods, assumptions, data, and implementation considerations used by the planning group. (NEB)

Revised Code of Washington (RCW): The revised code is a compilation of all permanent laws now in force for the state of Washington. The RCWs are organized by subject area into Titles, Chapters, and Sections.

Salmon Recovery Funding Board (SRFB): Pronounced "surf board", this state and federal board provides grants to protect and restore salmon habitat. Administered by a 10-member State Board that includes five governor-appointed citizens and five natural resource agency directors, the board brings together the experiences and viewpoints of citizens and the major state natural resource agencies. For watersheds planning under Section 203, the Department of Ecology will submit final draft WRE Plans not adopted by the prescribed deadline to SRFB for a technical review (RCO and Policy and Interpretive Statement).

Section 202 or Section 020: Refers to Section 202 of ESSB 6091 or Section 020 of RCW 90.94 respectively. The code provides policies and requirements for new domestic groundwater withdrawals exempt from permitting with a potential impact on a closed water body and potential impairment to an instream flow. This section includes WRIAs 1, 11, 22, 23, 49, 59 and 55, are required to update watershed plans completed under RCW 90.82 and to limit new permit-exempt withdrawals to 3000 gpd annual average.

Section 203 or Section 030: Refers to Section 203 of ESSB 6091 or Section 030 of RCW 90.94 respectively. The section details the role of WRE committees and WRE plans (see definitions below) in ensuring the protection and enhancement of instream resources and watershed

functions. This section includes WRIAs 7, 8, 9, 10, 12, 13, 14 and 15. New permit-exempt withdrawals are limited to 950 gpd annual average.

SEPA and SEPA Review: SEPA is the State Environmental Policy Act. SEPA identifies and analyzes environmental impacts associated with governmental decisions. These decisions may be related to issuing permits for private projects, constructing public facilitates, or adopting regulations, policies, and plans. SEPA review is a process which helps agency decision-makers, applications, and the public understand how the entire proposal will affect the environment. These reviews are necessary prior to Ecology adopting a plan or plan update and may be completed by Ecology or by a local government. (Ecology)

Stream Flow: a specific flow level measured at a specific location in a given stream, usually described as a rate, such as cfs. Stream flow is the actual amount of real water at a specific place and at a given moment. Stream flows can change from moment to moment.

Subbasins: A geographic subarea within a WRIA, equivalent to the words "same basin or tributary" as used in RCW 90.94.020(4)(b) and RCW 90.94.030 (3)(b). In some instances, subbasins may not correspond with hydrologic or geologic basin delineations (e.g. watershed divides). (NEB)

Trust Water Right Program: The program allows the Department of Ecology to hold water rights for future uses without the risk of relinquishment. Water rights held in trust contribute to streamflows and groundwater recharge, while retaining their original priority date. Ecology uses the Trust Water Right Program to manage acquisitions and accept temporary donations. The program provides flexibility to enhance flows, bank or temporarily donate water rights. (ECY)

Urban Growth Area (UGA): UGAs are unincorporated areas outside of city limits where urban growth is encouraged. Each city that is located in a GMA fully-planning county includes an urban growth area where the city can grow into through annexation. An urban growth area may include more than a single city. An urban growth area may include territory that is located outside of a city in some cases. Urban growth areas are under county jurisdiction until they are annexed or incorporated as a city. Zoning in UGAs generally reflect the city zoning, and public utilities and roads are generally built to city standards with the expectation that when annexed, the UGA will transition seamlessly into the urban fabric. Areas outside of the UGA are generally considered rural. UGA boundaries are reviewed and sometimes adjusted during periodic comprehensive plan updates. UGAs are further defined in RCW 36.70.

WAC 173-566 **(Streamflow Restoration Funding Rule)**: On June 25, 2019 the Department of Ecology adopted this rule for funding projects under RCW 90.94. This rule establishes processes and criteria for prioritizing and approving grants consistent with legislative intent, thus making Ecology's funding decision and contracting more transparent, consistent, and defensible.

Washington Administrative Code (WAC): The WAC contains the current and permanent rules and regulations of state agencies. It is arranged by agency and new editions are published every two years. (Washington State Legislature)

Washington Department of Ecology (DOE/ECY): The Washington State Department of Ecology is an environmental regulatory agency for the State of Washington. The department

administers laws and regulations pertaining to the areas of water quality, water rights and water resources, shoreline management, toxics clean-up, nuclear and hazardous waste, and air quality.

Washington Department of Fish and Wildlife (WDFW): An agency dedicated to preserving, protecting, and perpetuating the state's fish, wildlife, and ecosystems while providing sustainable fish and wildlife recreational and commercial opportunities. Headquartered in Olympia, the department maintains six regional offices and manages dozens of wildlife areas around the state, offering fishing, hunting, wildlife viewing, and other recreational opportunities for the residents of Washington. With the tribes, WDFW is a co-manager of the state salmon fishery. (WDFW)

Washington Department of Natural Resources (WADNR or DNR): The department manages over 3,000,000 acres of forest, range, agricultural, and commercial lands in the U.S. state of Washington. The DNR also manages 2,600,000 acres of aquatic areas which include shorelines, tidelands, lands under Puget Sound and the coast, and navigable lakes and rivers. Part of the DNR's management responsibility includes monitoring of mining cleanup, environmental restoration, providing scientific information about earthquakes, landslides, and ecologically sensitive areas. (WADNR)

Water Resources (WR): The Water Resources program at Department of Ecology supports sustainable water resources management to meet the present and future water needs of people and the natural environment, in partnership with Washington communities. (ECY)

Water Resources Advisory Committee (WRAC): Established in 1996, the Water Resources Advisory Committee is a forum for issues related to water resource management in Washington State. This stakeholder group is comprised of 40 people representing state agencies, local governments, water utilities, tribes, environmental groups, consultants, law firms, and other water stakeholders. (ECY)

Watershed Plan: A general term that refers to either: a watershed plan update prepared by a WRIA's initiating governments, in collaboration with the WRIA's planning unit, per RCW 90.94.020; or a watershed restoration and enhancement plan prepared by a watershed restoration and enhancement committee, per RCW 90.94.030. This term does not refer to RCW 90.82.020(6). (NEB)

Watershed Restoration and Enhancement Plan (WRE Plan): The Watershed Restoration and Enhancement Plan is directed by Section 203 of ESSB 6091 and requires that by June 30, 2021, the Department of Ecology will prepare and adopt a watershed restoration and enhancement plan for WRIAs 7, 8, 9, 10, 12, 13, 14 and 15, in collaboration with the watershed restoration and enhancement committee. The plan should, at a minimum, offset the consumptive impact of new permit-exempt domestic water use, but may also include recommendations for projects and actions that will measure, protect, and enhance instream resources that support the recovery of threatened and endangered salmonids. Prior to adoption of an updated plan, Department of Ecology must determine that the actions in the plan will result in a "net ecological benefit" to instream resources in the WRIA. The planning group may recommend out-of-kind projects to help achieve this standard.

WRIA: Water Resource Inventory Area. WRIAs are also called basins or watersheds. There are 62 across the state and each are assigned a number and name. They were defined in 1979 for the purpose of monitoring water availability. A complete map is available here: https://ecology.wa.gov/Water-Shorelines/Water-supply/Water-availability/Watershed-look-up.

Appendix C – Committee Roster

Entity	Representative
Tribes	
Muckleshoot Tribe	Henry Martin
Muckleshoot Tribe	Carla Carlson
Puyallup Tribe	Russ Ladley
Puyallup Tribe	Char Naylor
County	
Pierce County	Dan Cardwell
Pierce County	Austin Jennings
Pierce County	Tom Kantz
Cities	
City of Auburn	Lisa Tobin
City of Auburn	Jeff Tate
City of Auburn	Susan Fenhaus
City of Bonney Lake	Ryan Johnstone
City of Bonney Lake	Andrew Fonda
City of Edgewood	Jeremy Metzler
City of Enumclaw	Scott Woodbury
City of Enumclaw	Chris Searcy
City of Enumclaw	Jeff Lincoln
City of Fife	Lorna Fuller
City of Fife	Russ Blount
City of Orting	Greg Reed
City of Orting	Mark Barfield
City of Pacific	Jim Morgan
City of Puyallup	Paul Marrinan
City of Puyallup	Ryan Rutkosky
City of Sumner	Michael Kosa
City of Sumner	Robert Wright
City of Tacoma	Merita Trohimovich
City of Tacoma	Stephanie Seivert Wilson
Water Purveyor	
Lakehaven Water and Sewer District	Tim Osborne
Lakehaven Water and Sewer District	John Bowman
Building Industry Representative	
Master Builder Association of Pierce County	Jessie Gamble
Master Builder Association of Pierce County	Kurt Wilson
Master Builder Association of Pierce County	Chuck Sundsmo
Environmental Representatives	
Puyallup River Watershed Council	Carrie Hernandez

Entity	Representative
Agriculture Representative	
Pierce Conservation District	Allan Warren
Pierce Conservation District	Ryan Mello
WA Department of Fish and Wildlife	
WDFW	Liz Bockstiegel
WDFW	Tristan Weiss
Department of Ecology	
Department of Ecology	Rebecca Brown
Department of Ecology	Angela Johnson
Department of Ecology	Mike Noone
Ex Officio	
WRIA 10/12 Salmon Recovery Lead Entity	Lisa Spurrier

Appendix D – Operating Principles

Operating Principles and Charter

Watershed Restoration Enhancement Committee

Water Resource Inventory Area (WRIA) 10

Approved Version February 6, 2019

Effective ___, 2019

Contents

SECTION 1. PURPOSE AND BACKGROUND

Purpose

The purpose of the operating principles and charter is to establish the watershed restoration and enhancement committee (Committee), as authorized under RCW 90.94.030, for the purpose of developing the watershed restoration and enhancement plan. The document sets forward a process for meeting, participation expectations, procedures for voting, structure of the Committee, communication and other needs in order to support the Committee in reaching agreement on a final plan.

Background

On January 19, 2018, the Governor signed Engrossed Substitute Senate Bill (ESSB) 6091 into law. This law establishes a planning process in fifteen watershed basins across Washington State to project rural growth and identify projects to offset consumptive use from new permit-exempt wells constructed after January 19, 2018. In eight basins with instream flow rules that do not address permit-exempt wells and that did not complete watershed planning under RCW 90.82, the legislature established watershed restoration and enhancement committees. ESSB 6091 is codified as 90.94 RCW.

The law directs each watershed restoration and enhancement committee to develop a watershed restoration and enhancement plan that includes recommendations for projects and actions that measure, protect, and enhance instream resources, and offset impacts to instream flows associated with permit exempt domestic water uses. The plan must include estimates of the cumulative impact of water use over the next 20 years and an estimate of the cost for offsetting the water use. All members of the Committee must approve the plan, and Ecology must determine that the plan results in a net ecological benefit before Ecology can adopt the plan. Relevant language from RCW 90.94.030 is in Appendix C.

SECTION 2. AGREEMENT AND AMENDMENTS TO THE OPERATING PRINCIPLES

The formal establishment of an agreement to the operating principles will take place via a member vote, with all members of the watershed restoration and enhancement committee (Committee) approving the operating principles. Participants will work in good faith to productively participate in the development of the operating principles. By approving the operating principles, members of the Committee agree to uphold the principles as outlined in this document. Any member of the Committee may bring forward a recommendation for an amendment to the operating principles. The Committee, by a 2/3 majority vote of those in attendance at the meeting, may decide to review the operating principles and consider amendments periodically. Amendments will be brought for discussion when a quorum is present and take effect only if voted on unanimously by the full Committee for inclusion in the operating principles.

Nothing contained in this Agreement or in any amendment developed under the Agreement shall undermine the legal claims of any party listed in Appendix A. Participation in this planning process shall not override any party's authority or the reserved or other rights of tribal governments.

SECTION 3. PARTICIPATION EXPECTATIONS AND GROUND RULES

Participation expectations

All members of the Committee are expected to work together to make decisions and recommendations to support the preparation of a watershed restoration and enhancement plan that all Committee members support by the deadline of June 30, 2021. Committee members will, in good faith and using their best professional judgement:

- Actively participate in Committee meetings;
- Review materials in preparation for the meetings;
- Review materials following the meetings;
- Engage in workgroups (if applicable);

- Come prepared for discussions and to make decisions (when applicable); and
- Commit to implementing the Committee ground rules (see below).
- Take ownership of their "home" entity's decision-making process.
- Notify the Chair when members and alternates will not be able attend meetings.

The chair will ensure that committee members have adequate time to review materials. The chair will provide meeting materials at least 7 days before meetings, and attempt to provide 14 days review time for longer documents and documents that require a decision or discussion of foundational elements. The agenda will identify when a vote or decision is expected to allow entities to prepare for that decision. Members may request a delay in the vote or decision.

The chair understands that members may need to discuss decisions with their organizations prior to voting/approval and will work with committee members to establish reasonable review time for materials prior to calling for a vote or decision. When possible, Committee members will provide the chair reasonable notice if additional review time is needed prior to a vote or decision.

Committee meetings will take place on a monthly basis for an initial period, with the interval of meetings being modified as needed to meet the deadlines (either more or less frequently). The chair will attempt to hold meetings at a convenient location. Meetings are expected to last for approximately 4 hours, with the length modified as needed to meet deadlines.

In Person and Remote Participation

It is the expectation that Committee representatives shall attend all meetings in person. The Committee chair will allow for remote participation (e.g. via phone, web, video conference) if:

- Notice is provided to the chair or facilitator at least 1 week in advance of the meeting, AND
- Representative and alternates are not available to attend in person, AND
- Meeting room accommodates remote participation, AND
- Agenda content allows for remote participation.

Remote participants must ensure that they can actively and effectively engage in the discussion and decision-making. If remote participation becomes an issue (such as more participants on the phone than in person, ongoing technological issues) the committee will reconsider the remote participation protocols in these Operating Principles.

If less than half (or 10) of the committee members or alternates are available to attend a meeting, the Chair, at her discretion, may cancel that meeting. The Chair will provide as much advance notice as possible if she cancels a meeting.

Ground Rules

Water management is inherently complicated and the Committee is striving for full agreement on the watershed restoration and enhancement plan. Therefore, given the range of members' diverse perspectives, the Committee has established the following to ensure good faith and productive participation amongst its members:

- Be patient, direct, and honest in respectful consideration of each other's views.

- Take responsibility for our own issues and problems.
- Be sensitive to different communication styles and needs.
- Come prepared to use meeting time productively.
- Be present and engaged throughout the meeting.
- Provide sufficient notice if unable to make a scheduled meeting.
- Strive to reach common ground.
- It is okay to agree to disagree.
- Phones on silent (take phone calls away from the meeting).
- Take turns speaking.
- Listen to each other.
- Be respectful.
- Keep an open mind.
- Ask questions to understand.
- Give people time to respond.
- Separate personalities from the opinion/idea.

Conflict Resolution

In the event a conflict arises amongst members or established workgroups of the Committee, the following steps should be taken by individuals:

1. Communicate directly with the person or persons whose actions are the cause of the conflict.
2. If the circumstance is such that the person with a conflict is unable or unwilling to communicate directly with the person or persons whose actions are the cause of the conflict, the person shall speak with the Committee chair and facilitator.
3. The conflict should first be brought up verbally. If this does not lead to satisfactory resolution, the conflict should be described in writing to the chair.
4. If such matters are brought to the chair and facilitator, the chair in consultation with the facilitator, will address the conflict as appropriate and may seek outside or independent assistance as needed.

SECTION 4. ALTERNATES, CAUCUSES, AND NEW MEMBERSHIP

Ecology invited every entity listed in RCW 90.94.030(2) to participate in the Committee. Each entity that responded indicating their commitment to participate shall identify a representative and up to two alternates to participate on the Committee. Those entities that have committed to participate are voting members in the committee, and each entity has one vote. Entities must give the chair written notice when they wish to update or change a representative or alternate.

Alternates

If the primary representative cannot attend a meeting, they should, if possible, send an alternate and, in any event, notify the Committee chair and the facilitator as early as possible. It is the responsibility of the primary representative to brief the alternate on previous meetings and key topics arising for discussion in order for the alternate to participate productively. Alternates may actively participate in committee discussion whether they are at the table to fill in for the primary representative, or attending

the meeting in addition to the primary representative. Alternates' input should add value to the discussion, not repeat points that have already been made.

If the primary representative and alternates are no longer able to attend (staffing change, ongoing scheduling conflicts), the government or organization shall work with the chair to quickly identify a new representative from the same government or organization. If no alternate representative is available from the government or organization, an alternate entity that can represent the same interest is allowed and shall be brought forward to the chair for approval. The alternate entity will be subject to the Latecomers provisions as listed below.

Caucuses

Cities have the option of participating in the Committee through a caucus. The caucus representative's attendance and vote/decision will represent the participation and vote/decision of all members of the caucus. The caucus will have one vote on decisions that do not require approval by all Committee members. The caucus members will determine their internal voting procedures and share caucus voting procedures with the Committee.

For decisions that require approval by all Committee members (adopting or amending the operating principles and charter, final plan approval), each caucus member will have one vote, which can be provided directly to the chair or through the caucus representative.

A caucus participant can decide to leave the caucus and resume individual participation in the Committee by sending notification in writing to the caucus representative and chair at least two weeks in advance of the next meeting.

Ex-Officio Members and Technical Experts

The Committee may decide, by a supermajority, to invite an additional entity to join the Committee as an ex officio non-voting member. Ex Officio members are invited to sit at the Committee table, participate actively in discussions and review of documents, but shall not vote/decide on any items[1]. Ex-officio members are expected to participate as regular members—and adhere to the operating procedures—except that they do not vote/decide.

The Committee may decide by super majority to invite an individual or organization to participate in selected meetings or agenda items where additional expertise or perspective is desired. These technical experts will sit at the Committee table, participate actively in discussions and review documents for the specified agenda items. They may not vote/decide on any items.

Latecomers

Ecology has invited all governments and organization identified in 90.94.030 to participate on the Committee. Invited entities who originally decided not to participate on the Committee (per written

[1] Ecology leadership has determined that additional voting members will not be invited to join the committees in order to stay true to the legislation and keep the Committee size manageable. However, the Committee may decide to include non-voting members if they choose.

acknowledgement on the commitment letter or lack of responsiveness) are allowed to join the Committee at a later date under the following conditions:

1. The entity cannot veto, request a re-vote, or revisit items previously decided on by the Committee;
2. The entity signs an intent to participate, provides a primary and alternate Committee member;
3. The entity agrees to and abides by the operating principles; and
4. The entity joins the Committee and participates in meetings for a minimum of six months leading up to the vote on the plan.

SECTION 5. ROLE OF THE CHAIR AND COMMITTEE SUPPORT

RCW 90.94.030 (2b) states that "The department shall chair the watershed restoration and enhancement committee…" Ecology's streamflow restoration implementation lead chairs the Committee on behalf of the agency. The chair shall vote and participate in decision-making on all items coming before the Committee.[2] The role of the chair is to write the plan in collaboration with the Committee with the goal to attain full agreement from the Committee members. If full agreement cannot be obtained, the chair shall ensure all opinions inform future decision making for the final plan.

In the event that the chair is unable to attend a scheduled meeting due to illness or other unanticipated absence, Ecology will designate as interim chair another Ecology staff to avoid cancelling the meeting.

Ecology may provide the Committee a facilitator. The role of the facilitator is to focus on process and support the Committee in productive discussions and decision-making. Ecology will provide administrative support for the Committee as well as technical assistance through Ecology staff and consultants.

Ecology will seek input from the Committee on consultant selection prior to entering into contract.

SECTION 6. DECISION MAKING

This planning process, by statutory design, brings a diversity of perspectives to the table. It is therefore important the Committee identifies a clear process for how it will make decisions. The Committee shall always strive for consensus, and when consensus cannot be reached, the chair and facilitator will document agreement and dissenting opinions. The reason why the Committee will strive for consensus is that the authorizing legislation requires that final plan itself must be approved by all members of the Committee prior to Ecology's review (RCW 90.94.030[3] "…all members of a watershed restoration and enhancement committee must approve the plan prior to adoption"). Therefore, consensus during the foundational votes, or decisions, upon which the plan is constructed will serve as the best indicators of the Committee's progress toward an approved plan. In the event consensus is not reached on

[2] RCW 90.94 (3) states that "the department shall prepare and adopt a watershed restoration and enhancement plan for each watershed listed under subsection (2)(a) of this section, in collaboration with the watershed restoration and enhancement committee. Except as described in (h) of this subsection, all members of a watershed restoration and enhancement committee must approve the plan prior to adoption." Based on input from the Attorney General's office, because Ecology is a member of the Committee and must ultimately vote on whether or not to approve the plan, Ecology shall vote on all items coming before the Committee.

foundational elements of the plan in time to keep the process moving forward consistent with deadlines, the Committee can make decisions with supermajority approval.

Quorums and Voting

A quorum is established when two-thirds of the voting members of Committee are present (either in person or on the phone), excluding cities participating through a caucus. The Committee may not vote unless a quorum is established.

The Committee may choose to hold a temporary vote if a quorum is not present. The Chair will follow up with absent members within 3 full business days of the temporary vote to obtain their vote. If the decision passes, tallying the votes from the meeting and the follow up, then the temporary vote will be considered validated and final.

Voting Protocol

The Committee agenda will clearly identify Items anticipated for voting in advance. When voting occurs, the chair or facilitator will call for the vote. Committee members will signal their vote in the following ways:

- Thumbs up – approval
- Thumbs down – disapproval
- Thumbs sideways – accept, can live with, will not block.
- Five fingers – abstain

The facilitator will record all votes. Where there are dissenting votes or approvals with reservations, the facilitator will record who dissents or has reservations and the reasons for the dissent or reservations, and remaining concerns.

Consensus

Consensus is a group process where the input of everyone is carefully considered and an outcome is crafted that best meets the needs of the group as a whole. The root of consensus is the word consent, which means to give permission to. When members consent to a decision, they are giving permission to the group to go ahead with the decision. Some members may disagree with all or part of the decision, but based on listening to everyone else's input, all members agree to let the decision go forward because the decision is the best one the entire group can achieve at the current time.

The Committee will strive toward consensus. The levels of consensus include:

- I can say an unqualified "yes"!
- I can accept the decision.
- I can live with the decision.
- I do not fully agree with the decision; however, I will not block it.

Minority reports will be allowed for all decisions. In addition, committee meeting summaries and other relevant documents will highlight the pros and cons of the actions discussed by the members. Committee members shall abstain from decision-making if they have a personal financial interest in a decision.

Approval by Supermajority

Decisions that do not require consensus can be approved if two-thirds (66%) of those voting are either thumbs up or thumbs sideways. Members abstaining will be counted as present for purposes of the quorum, but abstentions will not be included in calculating the two-thirds for voting.

Voting on Routine Decisions

The Committee can approve routine Committee items such as meeting summaries with a simple majority approval and no further decision-making needed.

Voting on Elements Foundational to the Plan

The Committee prefers to reach consensus on foundational elements of the plan (e.g. growth scenarios, inclusion of individual projects, etc. – See Appendix B) in order to facilitate agreement on the final plan. In order to meet deadlines, foundational decisions leading up to the plan may be voted on as a way of assessing and recording the extent of agreement and remaining items to be resolved. If consensus on a foundational element of the plan is not achieved within the necessary timeline (see Appendix B) the chair or facilitator may call for a vote and move forward on decisions that obtain supermajority approval. These votes will be advisory in nature and will serve to clearly document areas of agreement and remaining differences.

When there is not consensus on a foundational element of the plan, the chair and facilitator will document dissenting opinions and the Committee will make a plan for when and how to revisit this element and how to reach consensus. The plan may include tasking a workgroup to come up with options for the group to decide on with a deadline for decisions. As discussed below, at the end of the process, all entities participating on the Committee must approve the plan for Ecology to accept it for net ecological benefit review and adoption.

If agreement cannot be reached after a reasonable effort or by the deadline, the facilitator or chair may call for an approval by supermajority.

Parking Lots

A “parking lot” may be used to capture ideas that the group cannot agree on or would like to return to at a later date for further discussion; however this will not jeopardize meeting deadlines by postponing issues which must be resolved so deliberations can move forward. Committee members will work together to establish schedules and deadlines to ensure that final plans can be completed on time.

Conflicts of Interest

Committee members shall abstain from voting if they have a personal financial interest in a decision.

Informal Voting

From time to time, the chair or the facilitator may ask for an informal vote or straw poll to gather information on group needs. These informal votes do not need to follow the formal voting protocols of this section. Informal votes will be used solely for information-gathering and will not result in a decision.

Electronic voting

In the case a decision is needed prior to the next Committee meeting, the chair can request an electronic vote or straw poll via non-private survey. Electronic voting will only be used to measure the direction the committee wants to head, gauge interest for meeting topics, times, or locations, consider opening these Operating Principles, follow up on temporary votes, or gather input for other time-critical items that do not include the foundational elements of the plan. The Department of Ecology will allow a minimum of 3 working days for responses. A non-response is considered an "abstention" vote.[3] An electronic vote is invalid if fewer than 2/3rd of the Committee Members respond, excluding cities participating in a caucus.

The chair will report the result of an electronic vote at the next Committee meeting and the chair or facilitator may request a procedural vote to reaffirm the electronic vote.

Voting on the final approval of the plan

RCW 90.94 (3) states that "… all members of a watershed restoration and enhancement committee must approve the plan prior to adoption." This means that each and all committee members get a vote and that all committee members must vote "yes" in support of a plan in order for it to be approved and provided to Ecology for "net ecological benefit" review and potential adoption.

The vote on the final plan approval will be shown by hands:

Voting:

- Thumbs up – approval
- Thumbs down – disapproval

The facilitator will record all votes.

SECTION 7. USE OF MATERIALS DEVELOPED BY CONTRACTORS

As needed and agreed to by the Committee, Ecology may hire outside consultants to develop studies or reports.

The Committee shall recognize that the materials are for the sole and exclusive purpose of providing the background information necessary to assist the committee with developing the Watershed Restoration and Enhancement Plan.

Materials developed by other contractors (e.g. Committee member's contractors) may be shared with the Committee if provided to Ecology with an adequate time to review, provide any necessary feedback,

[3] If an 'out of office' message is received for the primary representative, the alternate representative(s) will be contacted to cast their vote. The chair and facilitator will make at least 3 points of contact with each Committee member before marking their vote as an abstention (e.g. phone, email, text).

and integrate into the appropriate meeting agenda. Ecology must review any information or materials used to justify Net Ecological Benefits.

SECTION 8. PUBLIC COMMENTS AND PUBLIC MEETING NOTICE

The agenda will provide time for public comment at each meeting. The chair and facilitator will determine the time and extent of the public comment period based on the agenda for each meeting, with input from the Committee. While the Committee is not explicitly required to follow the requirements of the Open Public Meetings Act, reasonable efforts will be made to post information and materials on the pertinent website in a timely manner to keep the public informed.

SECTION 9. ESTABLISHMENT OF WORKGROUPS, ADVISORY GROUPS AND SUBCOMMITTEES

The Committee may establish workgroups or subcommittees as it sees fit. Workgroups may be temporary, established to achieve a specific purpose within a finite time frame, or a standing workgroup addressing the goals of the Committee. The decision to form a workgroup is a procedural decision, as it is not required by the legislature, and may be developed at the discretion of the Committee or the chair in order to support Committee decision making. All Committee workgroups are workgroups of the whole, meaning their role is to support the efforts of the Committee and all Committee members are welcome to participate in any workgroup formed by the Committee. The chair or Committee may also invite non-Committee members to participate on the workgroups if they bring capacity or expertise not available on the Committee. No binding decisions will be made by the workgroups. The workgroups will communicate all issues discussed to the Committee as either recommendations or findings as appropriate and the workgroups will produce meeting summaries to distribute to the full committee. The Committee may, or may not, act on these workgroup outcomes as it deems appropriate.

SECTION 10. COMMITTEE AND MEDIA COMMUNICATION

To support clear communication with the Committee, Ecology will:

1. Operate an electronic mailing list for Committee members and interested parties
2. Develop and manage a website for members of the Committee to access documents such as agendas, meeting summaries, technical reports, calendar, and other items as requested by the Committee

The facilitator and Ecology shall prepare a written meeting summary for each Committee meeting within 10 business days of the last Committee meeting. The chair will distribute the meeting summary to the Committee via an email and the facilitator or Ecology will post the summary on the Committee webpage. The summary, at a minimum, will include a list of attendees, decisions, discussion points, assignments, and action items. If comments are cited in such summaries, each speaker will be identified. Meeting summaries will capture areas of agreement and disagreement within the group. The Committee will approve the meeting summary by a vote at the following meeting.

Communication with the media

When speaking to the media or other venues, the Committee members will clearly identify any opinions expressed as their personal opinions and not necessarily those of the other Committee members or the Committee as a whole. The Committee members will not attempt to speak for other members of the group or to characterize the positions of other members to the media or other venues. Comments to the media will be respectful of other Committee members.

Following significant accomplishments, the Committee may request Ecology to issue formal news releases or other media briefing materials. All releases and information given to the media will accurately represent the work of the Committee. Ecology will make every effort to provide the Committee with materials in advance for input, recognizing that media timelines may not allow for adequate review by the Committee.

When interacting with the media, the Committee members agree to abide by the protocol established by this agreement.

APPENDIX A: GOVERNMENT AND ORGANIZATIONAL MEMBERSHIP

Membership

The legislation identifies the membership of the Committee (RCW 90.94.030[2]):

(b) The department [of Ecology] shall chair the watershed restoration and enhancement committee and invite the following entities to participate:

(i) A representative from each federally recognized Indian tribe that has reservation land within the water resource inventory area;

(ii) A representative from each federally recognized Indian tribe that has a usual and accustomed harvest area within the water resource inventory area;

(iii) A representative from the department of fish and wildlife, appointed by the director of the department of fish and wildlife;

(iv) A representative designated by each county within the water resource inventory area;

(v) A representative designated by each city within the water resource inventory area;

(vi) A representative designated by the largest irrigation district within the water resource inventory area;

(vii) A representative designated by the largest publicly owned water purveyor providing water within the water resource inventory area that is not a municipality;

(viii) A representative designated by a local organization representing the residential construction industry within the water resource inventory area;

(ix) A representative designated by a local organization representing environmental interests within the water resource inventory area; and

(x) A representative designated by a local organization representing agricultural interests within the water resource inventory area."

Table 1 Participating entities, representatives, and alternates

	Entity	Representative	Alternate	Alternate
Tribes with reservation land or Usual and Accustomed Harvest Area	Puyallup Tribe	Russ Ladley	Char Naylor	
	Muckleshoot Tribe	Henry Martin	Carla Carlson	
WA Department of Fish and Wildlife	WDFW	Liz Bockstiegel	Matt Curtis	
County	Pierce County	Dan Cardwell	Tiffany Odell	Tom Kantz

	Entity	Representative	Alternate	Alternate
City	City of Auburn	Lisa Tobin	Jeff Tate	Susan Fenhaus
	City of Bonney Lake	Ryan Johnstone	Andrew Fonda	
	City of Edgewood	Jeremy Metzler		
	City of Enumclaw	Scott Woodbury	Chris Searcy	Jeff Lincoln
	City of Fife	Ken Gill	Russ Blount	
	City of Orting	Greg Reed	Mark Barfield	
	City of Pacific	Jim Morgan	Chuck Hendricksen	
	City of Puyallup	Paul Marrinan		
	City of Sumner	Michael Kosa	Robert Wright	Jason VanGilder
	City of Tacoma	Merita Trohimovich	Stephanie Seivert-Wilson	
Publically-owned water purveyor	Lakehaven Water and Sewer	Stan French	John Bowman	Tim Osborne
Residential Construction Industry	Master Builder Association of Pierce County	Jessie Gamble	Kurt Wilson	Chuck Sundsmo
Environmental Interests	Puyallup River Watershed Council	Carrie Hernandez		
Agricultural Interests	Pierce Conservation District	Ryan Mello	Allan Warren	
Irrigation District	N/A			
Ex Officio Members	Tacoma-Pierce County Health Department	Michelle Harris	Kelly Racke	Jeremy Bush
	Salmon Recovery Lead Entity	Lisa Spurrier		
	Cascade Water Alliance	Michael Gagliardo		
Declined to participate	King County			
	City of Milton			
	City of Buckley			
	City of Carbonado			
	City of Federal Way			
	City of South Prairie			
	City of Algona			
	Town of Wilkeson			

APPENDIX B: ANTICIPATED MAJOR DECISION POINTS TO BE BROUGHT FORWARD FOR VOTING BY THE COMMITTEE[4]

2018 – Charter and Operating Principles

2019 –Sub basins, 20-year rural growth, estimated water use for projected new permit-exempt wells (i.e. consumptive use)

2020 – Projects to offset water use

2020 or 2021 – Plan approval

Table 2 Plan Development Timeline (proposed)

Minimum Deliverables	2018	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2
Committee forms, orientation	x										
Approval of charter and operating principles	x										
Committee trainings and field visits	x	x	x								
Decision on sub basins		x	x								
Decision on growth projection scenarios			x								
Decision on 20 year growth			x								
Decision on consumptive use formula			x								
Decision on consumptive use amount to offset				x							
Orientation to project types and field visits				x	x	x					
Project identification and development					x	x	x				
Determination if projects offset consumptive use and initial net ecological benefit review/ determination (if possible)						x	x	x			
Local jurisdiction review and vetting								x	x		
Final approval of plan by committee									x		

[4] Initial list. Other major items may be brought to vote by the committee such as recommended changes to instream flow rules, recommended changing in building permit fee, recommended daily water use allowance

Minimum Deliverables	2018	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2
Ecology net ecological benefit review and determination										x	x

APPENDIX C: BACKGROUND LANGUAGE OF 90.94.030

"(3) By June 30, 2021, the department shall prepare and adopt a watershed restoration and enhancement plan for each watershed listed under subsection (2)(a) of this section, in collaboration with the watershed restoration and enhancement committee. Except as described in (h) of this subsection, all members of a watershed restoration and enhancement committee must approve the plan prior to adoption.

(a) The watershed restoration and enhancement plan should include recommendations for projects and actions that will measure, protect, and enhance instream resources and improve watershed functions that support the recovery of threatened and endangered salmonids. Plan recommendations may include, but are not limited to, acquiring senior water rights, water conservation, water reuse, stream gaging, groundwater monitoring, and developing natural and constructed infrastructure, which includes but is not limited to such projects as floodplain restoration, off-channel storage, and aquifer recharge. Qualifying projects must be specifically designed to enhance streamflows and not result in negative impacts to ecological functions or critical habitat.

(b) At a minimum, the plan must include those actions that the committee determines to be necessary to offset potential impacts to instream flows associated with permit-exempt domestic water use. The highest priority recommendations must include replacing the quantity of consumptive water use during the same time as the impact and in the same basin or tributary. Lower priority projects include projects not in the same basin or tributary and projects that replace consumptive water supply impacts only during critical flow periods. The plan may include projects that protect or improve instream resources without replacing the consumptive quantity of water where such projects are in addition to those actions that the committee determines to be necessary to offset potential consumptive impacts to instream flows associated with permit-exempt domestic water use.

(c) Prior to adoption of the watershed restoration and enhancement plan, the department must determine that actions identified in the plan, after accounting for new projected uses of water over the subsequent twenty years, will result in a net ecological benefit to instream resources within the water resource inventory area.

(d) The watershed restoration and enhancement plan must include an evaluation or estimation of the cost of offsetting new domestic water uses over the subsequent twenty years, including withdrawals exempt from permitting under RCW **90.44.050**.

(e) The watershed restoration and enhancement plan must include estimates of the cumulative consumptive water use impacts over the subsequent twenty years, including withdrawals exempt from permitting under RCW **90.44.050**.

(f) The watershed restoration and enhancement plan may include:

(i) Recommendations for modification to fees established under this subsection;

(ii) Standards for water use quantities that are less than authorized under RCW **90.44.050** or more or less than authorized under subsection (4) of this section for withdrawals exempt from permitting;

(iii) Specific conservation requirements for new water users to be adopted by local or state permitting authorities; or

(iv) Other approaches to manage water resources for a water resource inventory area or a portion thereof.

(g) After adoption of a watershed restoration and enhancement plan, the department shall evaluate the plan recommendations and initiate rule making, if necessary, to incorporate recommendations into rules adopted under this chapter or under chapter **90.22** or **90.54** RCW. Any modification to fees collected under subsection (4) of this section or standards for water use quantities that are less than authorized under RCW **90.44.050** or more or less than authorized under subsection (4) of this section for withdrawals exempt from permitting may not be applied unless authorized by rules adopted under this chapter or under chapter **90.54** RCW.

(h) If the watershed restoration and enhancement committee fails to approve a plan by June 30, 2021, the director of the department shall submit the final draft plan to the salmon recovery funding board established under RCW **77.85.110** and request that the salmon recovery funding board provide a technical review and provide recommendations to the director to amend the final draft plan, if necessary, so that actions identified in the plan, after accounting for new projected uses of water over the subsequent twenty years, will result in a net ecological benefit to instream resources within the water resource inventory area. The director of the department shall consider the recommendations and may amend the plan without committee approval prior to adoption. After plan adoption, the director of the department shall initiate rule making within six months to incorporate recommendations into rules adopted under this chapter or under chapter **90.22** or **90.54** RCW, and shall adopt amended rules within two years of initiation of rule making."

Appendix E – Aquifer Units in WRIA 10

The local hydrogeology has previously been described by the U.S. Geological Survey (USGS) in a hydrogeologic framework report for the Puyallup River Watershed (Welch and others, 2015). The USGS describes the hydrogeologic units of the area as being comprised of either water-bearing ("aquifer") and non-water-bearing ("aquitard" or "confining layer") sediments. The layer definition is focused solely on these hydrogeologic properties without regard to geologic origin or age. The USGS definitions are based on previous studies and published reports for both King and Pierce Counties. Major groundwater aquifers are found in the unconsolidated glacial and interglacial sediments throughout the central and lower regions of the watershed.

The USGS study breaks the hydrogeology of the watershed into 12 units, typically alternating between aquifer and non-aquifer layers. The upper seven layers of the USGS definitions are the most likely units to be encountered by new permit-exempt wells. This includes four aquifer units (Aquifers AL1, A1, A3, and C) that are present through the majority of the lower and central areas of the watershed (See Table 1: Aquifer Units within WRIA 10, below). These aquifers are the most likely to be sources for new permit-exempt wells. They will also be the main source of direct recharge or baseflow to the surface water system.

Table 18: Aquifer Units within WRIA 10

Aquifer	Description	Typical Thickness
AL1	Often present at land surface, the upper alluvial aquifer is found throughout the Puyallup River, Carbon River, and White River valleys (Qal, Qa, Qp, af). The unit primarily consists of alluvial silt, sand, gravel deposits, and local lenses of clay. Where saturated, the unit represents a water-table aquifer. However, local lenses of clay can create confined conditions.	100 feet thick and can exceed 240 feet thick where the Puyallup River meets Commencement Bay
AL2	The lower alluvial aquifer primarily consists of Holocene alluvium and deltaic deposits from estuarine margins of the ancestral Puyallup River. The unit is confined by the overlying MFL confining unit but can be unconfined when the MFL unit is not present.	110 feet
A1	Often present at land surface, this aquifer primarily consists of stratified silt, sand, and gravel deposits of Vashon recessional outwash (Qvr) of the Frasier glaciation. Locally, this unit includes very coarse outwash gravels of the Steilacoom Gravel (Qvs) in broad plains to the west and in the bottoms of outwash channels (the channels were originally described by Walters and Kimmel, 1968).	A few feet up to about 50 feet thick. Where saturated, the unit represents a water-table aquifer and is often in direct continuity with surface-water bodies.

Aquifer	Description	Typical Thickness
C	Sometimes also called the "sea-level aquifer" due its coincident elevation, this system is usually sand and gravel deposits of pre-Olympia age glacial drift, but lower-permeability deposits of silt, clay, or till are sometimes encountered.	70 to 150 feet thick in most places in the area. Productive zones in this unit seem to be more discontinuous across the region than is the case with Aquifer A3 or Aquifer E.

The remaining five units become thinner or are not present in large portions of the central or eastern areas of the watershed and are not anticipated to be the primary target supply for future permit-exempt wells. These deeper units include three aquifer sources (Aquifers E and G, plus the bedrock).

Appendix F – WRIA 10 Subbasin Delineation Memo

Technical Memorandum
WRE Committees Technical Support

To:	Angela Johnson, Washington State Department of Ecology
From:	Bob Montgomery, Anchor QEA; Chad Wiseman, HDR
Copy:	
Date:	June 26, 2019
Subject:	WRIA 10 Draft Subbasin Delineation (Work Assignment WA-01, Task 2)

1.0 Introduction

HDR is providing technical support to the Washington State Department of Ecology (Ecology) and the Watershed Restoration and Enhancement (WRE) committee for Water Resource Inventory Area (WRIA) 10. The Streamflow Restoration law (Revised Code of Washington [RCW] Chapter 90.94) requires that WRE plans include actions to offset new consumptive-use impacts associated with permit-exempt domestic water use. RCW 90.94.030(3)(b) states, "The highest priority recommendations must include replacing the quantity of consumptive water use during the same time as the impact and in the same basin or tributary." Therefore, delineations must be developed for the subbasins in WRIA 10 that will be used as a spatial framework for growth projections, consumptive-use estimates, and priority offset projects. The Net Ecological Benefit (NEB) evaluation will also be based on this framework. This technical memorandum addresses the basis for subbasin delineation in WRIA 10 (Puyallup-White).

2.0 Subbasin Delineation

This section explains the initial and draft delineations for WRIA 10.

2.1 Initial Delineation

The WRIA 10 workgroup (a subcommittee of the WRE committee) was tasked to delineate subbasin boundaries for discussion at a WRE committee meeting. The workgroup met on March 8, 2019 to discuss potential subbasin boundaries. Workgroup members discussed four different potential subbasin delineations during that meeting. The four options were then presented to the WRE committee on April 3, 2019 and further discussed. A summary of the initial discussion of subbasin boundaries is as follows:

- To better determine where the subbasin boundaries should be, the maps should be overlaid with urban growth areas, existing water system boundaries, stream gage sites, and hatcheries.
- A geographic information system (GIS) analysis map with the above layers will be presented at the next meeting.
- Question: Is there a potential for forestland to be developed? Answer: one subdivision per 80 acres so we are not going to see many houses.

- Upper Puyallup, Carbon, and South Prairie Creek will have the most permit-exempt wells as they are located in the band between the forestland and the water purveyors (the middle subbasins will have the most projects).
- Boise Creek is very important for fish and could be its own subbasin.
- More segregation of the White River subbasins may be good (as seen on maps 3A and 4A).
- The input of the Puyallup Tribe is needed before a decision is made.

At the April 3 meeting, the WRE committee narrowed the options down to Options 3 and 4. The difference between Options 3 and 4 is the number of subbasins within the White River basin. Option 3 splits the White River basin into three subbasins (Upper, Middle, and Lower) while Option 4 splits the White River into five subbasins (Upper, Greenwater River, Middle, Mud Mountain, and Lower). The other subbasins identified are the Upper Puyallup, Carbon River, South Prairie Creek, and Lower Puyallup River. The workgroup met again in April 2019 to compare and discuss those two options and agreed to recommend option 3 to the WRE committee in the May 1, 2019 meeting.

At the May 1 WRE committee meeting, the options for subbasins were further discussed. The following considerations were discussed:

- The watershed plan is required to offset water use WRIA-wide with projects that address net ecological benefit (NEB). Priority projects will occur in the subbasin where the water withdrawal is occurring, but it is not required to offset all use in the same subbasin.
- The workgroup met and recommended Option 3, which has three subbasins for the White River: Lower, Middle, and Upper.
- The Lower and Upper subbasins will not see a lot of new permit-exempt wells and will not have many projects.

The WRE committee agreed by consensus at the May 1 meeting to adopt Option 3 as the subbasin delineation. Option 3 is shown on the attached Figure 1.

3.0 Conclusion

The WRIA 10 WRE committee delineation of subbasins will be used as an organizational framework for growth projection and consumptive-use scenarios. The subbasins are shown in Figure 1.

4.0 References

Revised Code of Washington (RCW). 2019. Watershed Planning, Chapter 90.82 RCW. Accessed on June 23, 2019, at https://app.leg.wa.gov/rcw/default.aspx?cite=90.82.

RCW. 2019. Streamflow Restoration, Chapter 90.94 RCW. Accessed on June 23, 2019, at https://app.leg.wa.gov/RCW/default.aspx?cite=90.94.

U.S. Geological Survey and U.S. Department of Agriculture, Natural Resources Conservation Service (USGS). 2013. Federal Standards and Procedures for the National Watershed Boundary Dataset (WBD) (4 ed.): Techniques and Methods 11–A3, 63 p., https://pubs.usgs.gov/tm/11/a3/.

Figure 1. WRIA 10 Draft Subbasin Delineation

WRIA Boundary

Subbasin

- Carbon River
- Lower Puyallup River
- Lower White River
- Middle White River
- South Prairie Creek
- Upper Puyallup River
- Upper White River

- Incorporated City
- Unincorporated Urban Growth Area
- River or Creek
- County

Preliminary delineation of subbasins, for discussion purposes only. Subbasins were delineated using surface water boundaries and other considerations and do not represent groundwater basins.

Kent
Maple Valley
Covington
Black Diamond
Auburn
Gig Harbor
Ruston
Federal Way
Algona
Pacific
Tacoma
Fife
Fircrest
University Place
Steilacoom
Lakewood
Sumner
Bonney Lake
Buckley
Enumclaw
South Prairie
Wilkeson
Carbonado
Orting
Roy
Yelm
Eatonville
King County
Kitsap County
Yakima County
Pierce County
Thurston County
Lewis County
Lower White River
Lower Puyallup River
Middle White River
South Prairie Creek
Upper White River
Upper Puyallup River
Carbon River
White River
Rocky Run
Clearwater River
Greenwater River
West Fork White River
South Prairie Creek
Voight Creek
Puyallup River
Carbon River
Ohop Creek
Mowich River
North Mowich River
South Mowich River
North Puyallup River
South Puyallup River
99
516
18
509
16
163
705
5
161
167
164
169
512
704
162
165
410
507
7
702
123

WRIA 10

0 2.5 5 Miles

DATA SOURCES: USGS, WA DEPT. OF ECOLOGY, WSDOT

DATE: 6/26/2019

Appendix G – WRIA 10 Permit-Exempt Growth and Consumptive Use Summary

Technical Memorandum DRAFT

To:	Angela Johnson, Washington State Department of Ecology
From:	Chad Wiseman, HDR; Malia Bassett, HDR
Copy:	Lisa Dally Wilson (DE) and Bob Montgomery (Anchor QEA)
Date:	December 18, 2020
Subject:	WRIA 10 Permit-Exempt Growth and Consumptive Use Summary (Work Assignment 2, Tasks 2 and 3)

1.0 Introduction

HDR is providing technical support to the Washington State Department of Ecology (Ecology) and the Watershed Restoration and Enhancement (WRE) committees for Water Resource Inventory Areas (WRIAs) 10, 12, 13, 14, and 15. This memorandum provides a summary of the analytical methods used for Work Assignment 2 Task 2: Consumptive Use (CU) Estimates, and the final estimates of CU per WRIA.

Under RCW 90.94, consumptive water use by permit-exempt connections occurring over the planning horizon must be estimated to establish the water use that watershed restoration plans and plan updates are required to address and offset. This memorandum summarizes permit-exempt connections and related CU of groundwater that is projected to impact WRIA 10 over the planning horizon.

This memorandum includes:

- A summary of WRIA 10 baseline permit-exempt growth and an alternative scenario of permit-exempt growth.
- A summary of WRIA 10 baseline and alternative scenario consumptive use using two different methods.

2.0 WRIA 10 Permit-Exempt Growth Projection Methods

Because WRIA 10 is comprised of two counties, King and Pierce counties, individual county growth projections were combined at the WRIA scale and organized by subbasin. The WRIA growth projection that was composed of the counties' best estimate is considered the baseline.

Portions of the Lower, Middle, and Upper White River subbasins are within King County; the remainder of the WRIA lies within Pierce County.

The WRIA 10 WRE committee agreed to develop high and low growth projection scenarios based on varying Pierce County projections. King County projections remained constant. The WRIA 10 WRE committee agreed to use different time periods in the historical TPCHD well database to project baseline, high, and low permit-exempt connection growth during the 20-year planning horizon in the Pierce County portion of WRIA 10. The 1999–2008 time period was a time of relatively high permit-exempt connection growth and was selected for a "high growth" scenario. The 2009–2018 time

period was a time of relatively low permit-exempt connection growth and was selected to represent the rate of permit-exempt growth for the “low growth” scenario. King County did not vary their growth projection of 81 wells or connections in this area.

2.1 King County

The following methods were used to project growth over the planning horizon:

1) Compile 18 years (2000–2017) of building permit data for new residential structures then subdivide into two periods (2000–2009 and 2010–2017) for high and low growth range.
2) Use GIS to provide location-based information about building permits.
3) Link building permits and parcel data layers to assess percentage of parcels using public versus private water with parcel attribute data.
4) Determine the number of building permits/parcels that have a water source.
5) Calculate the percentage of building permits for each type of water source for the entirety of King County, by WRIA and its subbasins.
6) Use the annual average number of permits per year multiplied by the percentage of permits/parcels on private water to determine a projected number of permit-exempt wells per year. Multiply the number of permit-exempt wells by 20 to calculate the estimated total of permit-exempt wells projected over the 20-year period.

King County growth projections did not change from the initial projections on December 16, 2019 (Attachment C).

2.2 Pierce County

The following methods were used to project growth over the planning horizon:

1) Calculate historical growth rates of permit-exempt connections for each subbasin using the Tacoma-Pierce County Health District (TPCHD) well database (1999–2018).
2) Forecast growth of future permit-exempt connections for the 20-year planning horizon, based on the subbasin-specific historical growth rate.
3) Develop heat map of most likely areas for new permit-exempt connections within each subbasin, based upon spatial analysis of parcels available for development (i.e., parcel must be outside of UGA, not in a water and wastewater system boundary, not already built upon, must have zoning category that allows for domestic use, and outside of commercial forest and federal lands).

3.0 WRIA 10 Consumptive Use Methods

Under RCW 90.94, consumptive water use (consumptive use) by permit-exempt connections that are forecast to be installed over the planning horizon to service rural growth must be estimated to establish the water offsets required under the Streamflow Restoration law. The following definitions from the *Final Guidance for Determining Net Ecological Benefit - ESSB 6091 - Recommendations for Water Use Estimates* (Ecology’s Final NEB Guidance) are used in this memorandum as a guide to estimate consumptive water use by permit-exempt connections (Ecology 2019).

- Consumptive use: water that evaporates, transpires, is consumed by humans, or otherwise removed from an immediate water environment.
- Domestic Use: includes both indoor and outdoor household uses, and watering of a lawn and noncommercial garden.
- New Consumptive Water Use: The consumptive water use from the permit-exempt domestic groundwater withdrawals estimated to be initiated within the 20-year planning horizon (2020–2040) (planning horizon). The required water offset is equal to new consumptive water use.
- Net Ecological Benefit: The outcome that is anticipated to occur through implementation of projects and actions in a plan to yield offsets that exceed impacts within: a) the planning horizon; and, b) the relevant WRIA boundary.
- Water Offsets: Projects that put water back into aquifers or streams that offset new consumptive water use.

Ecology has provided guidance for estimating indoor and outdoor consumptive water use in Ecology's Final NEB Guidance (Ecology 2019).

Consumptive use estimates are divided into two components: the indoor and outdoor portions of use. The use patterns and consumptive portions of indoor versus outdoor use associated with permit-exempt connections are different; therefore, separate approaches within each method that account for these differences are used to estimate consumptive use.

Ecology's indoor consumptive water use guidance includes literature-based assumptions on per-capita indoor water use and the consumptive proportion. Outdoor consumptive water use guidance includes methods for the estimation of irrigated area, assumed irrigation requirements, irrigation efficiency, and the consumptive proportion. Ecology's guidance also recommends local corroboration using water system meter data for both indoor and outdoor estimates (Ecology 2019). For purposes of this technical memorandum, Ecology's method for estimating consumptive use by estimating irrigated area and amount of irrigation is called the Irrigated Area method, and estimation of consumptive use using local water system meter data is called the Water System Data method.

Ecology's guidance also describes using the legal limit to estimate consumptive use, but notes that this method is less accurate because most people do not use 950 gallons per day all year round. This method is referred to as the Legal Limit method.

Consumptive use of water from projected permit-exempt connection growth was estimated using three different methods; 1) the Irrigated Area Method, 2) the Water System Data Method, and the Legal Limit Method.

Consistent with the Final NEB guidance, the Committee assumed impacts from consumptive use on surface water are steady-state, meaning impacts to the stream from pumping do not change over time. This assumption is based on the wide distribution of future well locations and depths across varying hydrogeological conditions.

3.1 Irrigated Area Method

Based on Ecology's Final NEB Guidance (Ecology 2019), estimating indoor and outdoor consumptive water use included literature-based assumptions for both the per capita indoor water use and indoor and outdoor use proportions.

3.1.1 Indoor Consumptive Use – Irrigated Area Method

The following assumptions were used to estimate indoor consumptive water use by occupants of a dwelling unit (Ecology 2018, 2019):

- 60 gallons per day per person within a household
- 2.5 persons per household (or as otherwise defined by the Counties)
- 10 percent of indoor use is consumptively used

Most homes served by a permit-exempt connection use septic systems for wastewater (Ecology 2019). This method assumes 10 percent of water entering the septic system will evaporate out of the septic drain field and the rest will be returned to the groundwater system. The legal limit for water use in WRIA 10 is 950 gallons per day annual average use per connection.[1]

Assuming that there is one permit-exempt connection per dwelling unit, a "per permit-exempt connection" consumptive use factor was applied to the growth projections forecast in each subbasin to determine total indoor consumptive use per subbasin. This method is summarized by the following equation:

$$HCIWU\ (gallons\ per\ year) = 60\ gpd\ x\ 2.5\ people\ per\ household\ x\ 365\ days\ x\ 10\%\ CUF$$

or

$$HCIWU\ (afy) = 60 gpd * \ 2.5\ people\ per\ house * 365\ days * 0.00000307\ AF/gallon * 10\%\ CUF$$

Where:
HCIWU = Household Consumptive Indoor Water Use (gpd)
CUF= Consumptive use factor

This estimate of indoor consumptive water use per household per day can be annualized and converted to gallons per day (gpd) or cubic feet per second (cfs).

Conversion Factors:

gpd = afy / 0.001120

cfs = afy / 723.97

3.1.2 Outdoor Consumptive Use – Irrigated Area Method

Ecology (2019) recommends estimating future outdoor water use based on an evaluation of the average outdoor irrigated area for existing dwelling units served by permit-exempt connections. To calculate the consumptive portion of total outdoor water required per connection, Ecology recommends:

- Estimating the average irrigated lawn area (pasture/turf grass) per parcel in each WRIA (this analysis assumes a single connection per parcel),

[1] This is an enforceable limit, not an estimate of actual water use.
The legal limit in WRIA 10 for indoor and outdoor use is as follows:
Indoor Use = 60 gpd per person * 2.5 people per household= 150 gallons per day
Indoor CU = 60 gpd per person * 2.5 people per household * 10% consumptively used = 15 gallons per day
Outdoor Use = 950 -150 = 800 gallons per day
Outdoor CU = 800 gallons per day * 80% consumptively used = 640 gallons per day

- Applying crop irrigation requirements,
- Correcting for application efficiency (75 percent efficiency recommended by Ecology guidance) to determine the total outdoor water required over a single growing season, and
- Applying a percentage of outdoor water that is assumed to be consumptive (80 percent outdoor consumptive use recommended).

The WRIA 10 Committee was given the opportunity to adjust variables used in the analysis. The WRIA 10 Committee chose to use a 95 percent upper confidence limit of the average irrigated lawn area instead of the average irrigated lawn area.

3.1.3 Estimation of Average Irrigated Area per Connection

HDR conducted an average irrigable area analysis for WRIA 10 to account for the variability in size of irrigated area among parcels in each WRIA. The analysis included 80 parcels identified as containing a dwelling unit served by a permit-exempt well per WRIA. Irrigated areas of the 80 parcels were delineated to estimate a sample distribution. Ultimate selection of irrigated area for the calculation of outdoor consumptive use was based on that sample distribution. To select the 80 parcels in WRIA 10, a parcel "selection pool" of all candidate parcels was developed. The final 80 parcels were determined from the parcel selection pool, as described below.

3.1.4 Parcel Selection

Differing socioeconomic landscapes within and between the WRIAs is a key factor influencing variance in the average irrigable area per dwelling unit (Green 2010). In order to capture those differences, HDR analyzed the range and distribution of property values throughout WRIA 10 and randomly selected 80 parcels representative of the distribution pattern of property values.

3.1.5 Parcel Selection Pool

HDR populated the parcel selection pool for WRIA 10 using direct selection. Direct selection involves joining spatial data of permit-exempt connections to a parcel database, thereby identifying all parcels with known permit-exempt connections (Table 1 and 2).

Pierce and King Counties provided geospatial datasets containing individual permit-exempt connection locations. These points were joined to their respective County parcel datasets to isolate the parcels known to be served by a permit-exempt connection.

Once parcels in each County were added to the selection pool, new parcel datasets were developed to reorganize the selected parcels into WRIA-specific selection pools at the WRIA level.

3.1.6 Parcel Analysis

A single technician conducted the entire irrigated area analysis to standardize the approach and minimize bias. Irrigated areas on each selected parcel were delineated using Google Earth aerial imagery taken during drier summer months (i.e., July and August) from 2000 through 2018. Unirrigated lawns (pasture/turf) go dormant in the dry summer months and turn brown. As such, areas that remain green in the summer imagery were considered irrigated. To aid in this determination, aerial imagery from winter months was reviewed alongside summer imagery to reveal which lawn areas change from green to brown. Those areas that do not change color, or moderately change color but remain green, were considered irrigated. Additionally, the technician reviewed imagery across multiple years (where available) to further corroborate the irrigated area delineation.

Yard areas may be obscured in aerial imagery by tree canopies or shadows; the technician used best professional judgment to interpolate the irrigated area under a tree canopy or across a shadow.

Septic drain fields are a potential non-irrigation source of water that may cause turf to remain green during summer months. Therefore, the technician considered additional indicators of intentional lawn irrigation such as artificially precise boundaries between green and brown grass, and shapes of green grass indicative of an irrigation system. Irregular shapes and mottled grass were included or excluded at the discretion of the technician based on proximity to a visible septic system and similarity to other, more pronounced irrigation signatures. Analyses conducted by other WRE planning groups included areas that appear to be "minimally irrigated," and were also included in this analysis. See Attachment A for additional details concerning the irrigated area delineation analysis.

Upon completion of analysis for 80 parcels, irrigated area was averaged for the WRIA for use in the outdoor consumptive use estimate. The average irrigated area was 0.17 acre. Over 50 percent of the parcels did not have any evidence of irrigation and were assigned a value of zero irrigated acres. To account for potential methodological limitations on detecting irrigation, a minimum value of 0.05 acres of irrigation was assumed to occur, even if there were no indications of irrigation from aerial photo interpretation. This value was approximately the minimum value of detected irrigation in the data set.

The WRIA 10 Committee calculated confidence limits around the average irrigated area to evaluate uncertainty in the estimate. The 95 percent upper confidence limit (UCL) average yielded an irrigated area of 0.27 acre. The 95 percent upper confidence limit represents the upper bound of the average irrigated area, with a 95 percent confidence that the irrigated area is equal to or less than 0.27 acre (Table 1). The irrigated area data set did not have a normal distribution, because over half of the parcels had zero irrigated area (i.e., the data were left-censored). However, when the zero values were replaced with 0.05-acre values (as an imputed detection limit), the data followed a gamma distribution. For gamma distributed detected data, UCLs may be computed using gamma distribution on a Kaplan-Meier (KM) statistic, using a Chi Square approximation (USEPA 2015). The WRIA 10 committee chose to use the 95 percent UCL of 0.27-acre irrigated area for outdoor consumptive use estimates.

3.1.7 Irrigation Requirements and Application Efficiency

Once average irrigable acreage per connection was determined for WRIA 10, water use was calculated based on irrigation requirements and application efficiency. Crop irrigation requirements were estimated for pasture/turf grass from the Puyallup and Buckley weather stations as provided in the Washington Irrigation Guide (NRCS-USDA, 1997). A weighted average of 16.1 inches per year was calculated based on the number of connections closest to the stations. An irrigation application efficiency was applied to account for water that does not reach the turf. Ecology (2019) recommends using a 75 percent application efficiency factor. The consumptive portion of total amount of water used for outdoor use was assumed to be 80 percent. This method is summarized in the following equation:

$$hHCOWU\ (afy) = A\ (acres) * IR(feet) * AE * CUF$$

Where:

HCOWU = Household Consumptive Outdoor Water Use (gpd)
A = Irrigated Area (acres)

IR = Irrigation Requirement over one irrigation season (feet)
AE = Application efficiency; assumed to be 75% (factor expressed as 1/0.75)
CUF= Consumptive use factor; assumed to be 80% (factor expressed as 0.80)

This estimate of outdoor consumptive water use per household per day can be annualized and converted to gallons per day (gpd) or cubic feet per second (cfs).

Conversion Factors:
gpd = afy / 0.001120
cfs = afy / 723.97

Outdoor Use = 950 -150 = 800 gallons per day
Outdoor CU = 800 gallons per day * 80% consumptively used = 640 gallons per day

4.0 Water System Data Method

Consumptive use by permit-exempt connections may also be estimated using metered connections from water systems. HDR requested data from WRE Committee members for water systems that use (or have used) a flat rate billing structure and were similar in character to the rural environments in which households may connect to permit-exempt connections. The Spanaway Water System, which operates under a tiered rate structure in WRIA 12, was used in the WRIA 10 analysis because smaller water system data were unavailable in WRIA 10. The Spanaway Water System may be representative of the rural environments where households typically rely on permit-exempt connection for domestic supply.

4.1 Indoor Use

Average daily use in December, January, and February is representative of year-round daily indoor use. Average daily system-wide use is divided by the number of connections (assuming all connections are residential), to determine average daily indoor use per connection. A 10 percent consumptive use factor was applied to the average daily use in the winter months to determine the consumptive portion of indoor water use per connection.

4.2 Outdoor Water Use

Average daily use in December, January, and February is representative of year-round daily indoor use. Total annual indoor use was subtracted from total annual use by a water system to estimate total annual outdoor use. An 80 percent consumptive factor was applied to determine the consumptive portion of outdoor use.

4.3 Seasonal Outdoor Water Use

Outdoor consumptive use was also estimated on a seasonal basis. The Washington Irrigation Guide reports irrigation requirements between the months of April and September for all weather stations representative of WRIA 10. Therefore seasonal outdoor water use was assumed to occur over a period of six months (April through September). Average daily indoor use was multiplied by the number of days in the irrigation season to calculate total indoor use for the irrigation season. Total irrigation season indoor use was then subtracted from total season use to determine total outdoor use for the irrigation season. The value was proportionally allocated to each month in the irrigation season using the requirements from the Washington Irrigation Guide. An 80 percent consumptive factor was applied to determine the consumptive portion of outdoor use.

5.0 Results

5.1 Permit-Exempt Connection Growth

Baseline permit-exempt connection growth is projected to be 688 connections (Table 1). The alternative "Higher Permit-Exempt Connection Growth" scenario is projected to have 230 additional connections, for a total of 918 permit-exempt connections. Growth is predicted to occur primarily along the midsection of the WRIA between Enumclaw and Orting, and east of Lake Tapps (Figure 1).

Table 1. WRIA 10 Alternative Growth Projection Scenarios (King and Pierce Counties)

Number of Permit-Exempt Connections Added between 2018 and 2038									
Subbasin	Baseline Growth (1999–2018)			High Growth (1999–2008)			Low Growth (2009–2018)		
	King	Pierce	Total	King	Pierce	Total	King	Pierce	Total
Carbon River	--	109	109	--	142	142	--	87	87
Lower Puyallup River	--	102	102	--	153	153	--	53	53
Lower White River	24	52	76	24	67	91	24	42	66
Middle White River	57	--	57	57	--	57	57	--	57
South Prairie Creek	--	167	167	--	229	229	--	122	122
Upper Puyallup River	--	165	165	--	242	242	--	104	104
Upper White River	--	12	12	--	4	4	--	20	20
Total	81	607	688	81	838	919	81	429	510

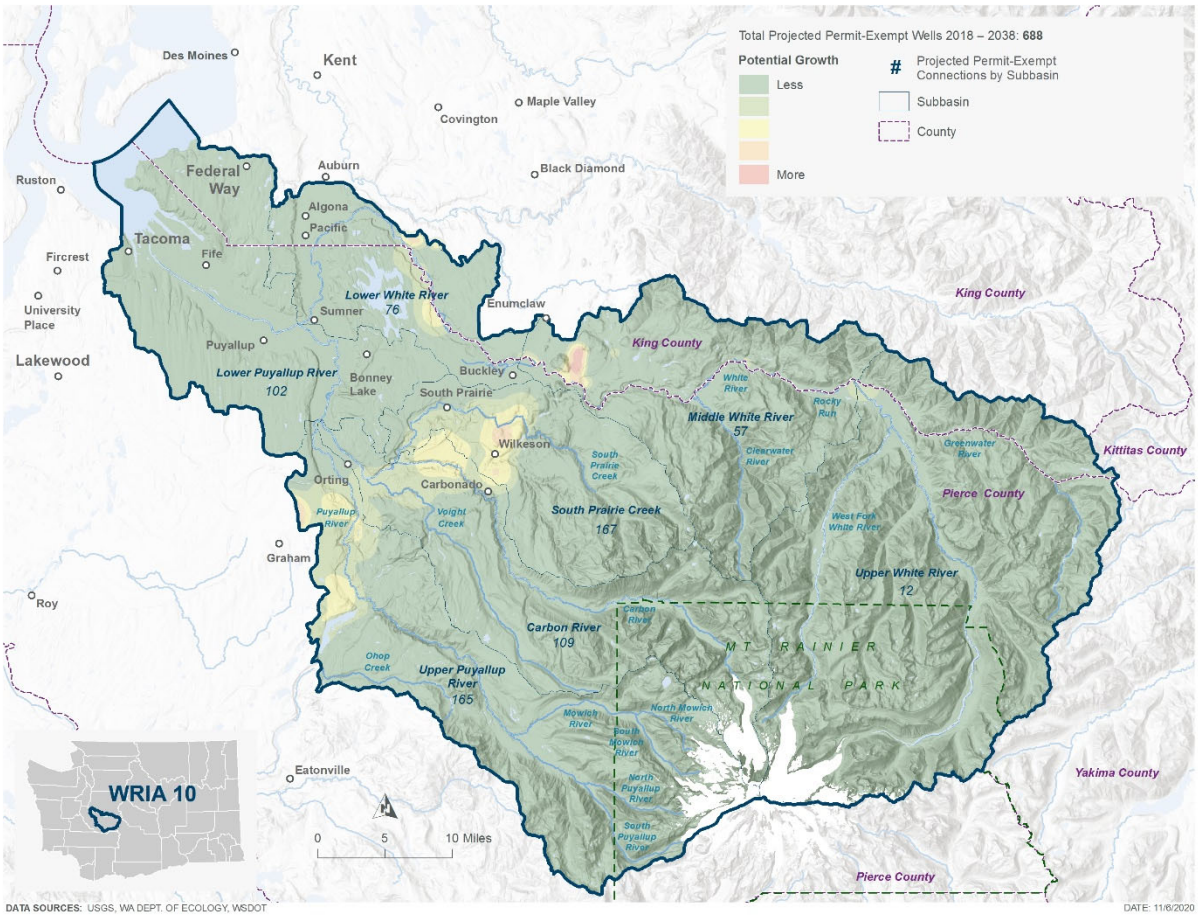

Figure 1. WRIA 10 projected permit-exempt connection growth.

5.2 Consumptive Use

Consumptive water use within WRIA 10 was estimated using the Irrigated Area method, with the Water System Data method serving as comparison. The WRIA 10 committee chose not to modify the irrigation efficiency or indoor and outdoor consumptive factors that Ecology recommends to calculate consumptive use via the Irrigated Area method.

At the November 6, 2019, WRE Committee meeting, the committee agreed to a preliminary consumptive use estimate using an average outdoor irrigation area of 0.27 acre, which is the 95 percent confidence limit based upon the analysis of irrigated area on existing parcels with permit-exempt connections. The 95 percent confidence limit was discussed, and it was generally agreed that the outdoor irrigation area for new permit-exempt connections are likely to be smaller than 0.27 acre. At the April 1, 2020, Committee meeting, the consumptive use estimate based on the Irrigated Area method with an average irrigated area of 0.27 acre was approved. Using this method, indoor, outdoor, and total consumptive use was 150, 210, and 360 gallons per day, respectively. This total consumptive use per permit-exempt connection equates to 0.00056 cubic-feet per second (cfs) and 0.4 acre-feet per year (afy).

Therefore, the consumptive use estimate approved is 0.3838 cfs average annual rate and a total volume of 277 afy. The estimates of annual average consumptive use in WRIA 10 using the Irrigated

Area method range from 0.2839 cfs to 0.5121 cfs between the low and high growth scenarios. The average annual consumptive use for the baseline scenario is 0.3838 cfs. In all growth scenarios, the primary difference in total consumptive use between the water system data method and the Irrigated Area method is due to differences in estimates of the quantity of water used outdoors during months where irrigation occurs. In comparison, consumptive use projections ranged from 0.0418 cfs to 0.0754 cfs between the low and high growth scenarios, when using the Water System Data method. The average annual consumptive use for the baseline scenario is 0.0565 cfs.

For the WRIA 10 scenarios, consumptive use is 35 percent higher in the baseline scenario than the low growth scenario, and 33 percent higher in the high growth scenario than the baseline scenario. The estimates of consumptive use using the Irrigated Area method are approximately seven times higher than the Water System Data estimates.

Table 22, 3, and 4 present the consumptive use projections for WRIA 10.

Table 2. Annualized Average Consumptive Use Estimates for WRIA 10 (2020–2040) – Baseline Growth

Subbasin	Projected Permit-Exempt Connections	Annual Consumptive Use: Water System Estimate			Annual Consumptive Use: Irrigated Area Estimate (per Ecology Guidance)		
		AFY	GPM	CFS	AFY	GPM	CFS
Carbon River	109	6.5	4.0	0.0090	43.9	27.2	0.0608
Lower Puyallup River	102	6.1	3.8	0.0084	41.1	25.5	0.0569
Lower White River	76	4.5	2.8	0.0062	30.6	19.0	0.0424
Middle White River	57	3.4	2.1	0.0047	23.0	14.2	0.0318
South Prairie Creek	167	9.9	6.1	0.0137	67.3	41.7	0.0932
Upper Puyallup River	165	9.8	6.1	0.0136	66.5	41.2	0.0920
Upper White River	12	0.7	0.4	0.0010	4.8	3.0	0.0067
Totals	**688**	**40.8**	**25.3**	**0.0565**	**277.4**	**171.9**	**0.3838**

Table 3. Annualized Average Consumptive Use Estimates for WRIA 10 (2020–2040) – Low Growth

Subbasin	Projected Permit-Exempt Connections	Annual Consumptive Use: Water System Estimate			Annual Consumptive Use: Irrigated Area Estimate (per Ecology Guidance)		
		AFY	GPM	CFS	AFY	GPM	CFS
Carbon River	87	5.2	3.2	0.0071	35.1	21.7	0.0485
Lower Puyallup River	53	3.1	2.0	0.0044	21.4	13.2	0.0296
Lower White River	66	3.9	2.4	0.0054	26.6	16.5	0.0368
Middle White River	57	3.4	2.1	0.0047	23.0	14.2	0.0318
South Prairie Creek	122	7.2	4.5	0.0100	49.2	30.5	0.0681
Upper Puyallup River	104	6.2	3.8	0.0085	41.9	26.0	0.0580
Upper White River	20	1.2	0.7	0.0016	8.1	5.0	0.0112
Totals	**509**	**30.2**	**18.7**	**0.0418**	**205.2**	**127.2**	**0.2839**

Table 4. Annualized Average Consumptive Use Estimates for WRIA 10 (2020–2040) – High Growth

Subbasin	Projected Permit-Exempt Connections	Annual Consumptive Use: Water System Estimate			Annual Consumptive Use: Irrigated Area Estimate (per Ecology Guidance)		
		AFY	GPM	CFS	AFY	GPM	CFS
Carbon River	142	8.4	5.2	0.0117	57.2	35.5	0.0792
Lower Puyallup River	153	9.1	5.6	0.0126	61.7	38.2	0.0854
Lower White River	91	5.4	3.3	0.0075	36.7	22.7	0.0508
Middle White River	57	3.4	2.1	0.0047	23.0	14.2	0.0318
South Prairie Creek	229	13.6	8.4	0.0188	92.3	57.2	0.1277
Upper Puyallup River	242	14.4	8.9	0.0199	97.6	60.5	0.1350
Upper White River	4	0.2	0.1	0.0003	1.6	1.0	0.0022
Totals	**918**	**54.5**	**33.8**	**0.0754**	**370.1**	**229.4**	**0.5121**

6.0 Seasonal Use

Monthly outdoor water use was calculated as part of the consumptive use analysis for the Irrigated Area method. Seasonal water use by month is reported by subbasin and scenario (Table 5). The month of July has the highest irrigation requirement, resulting in the highest monthly consumptive use impact. This information may be used when evaluating projects designed to offset subbasin- and season-specific impacts.

Table 5. WRIA 10 Monthly Consumptive Water Use

Subbasin	Projected No. Permit Exempt Connections (Baseline)	Consumptive Use by Month (cfs)											
		Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Carbon River	109	0.0010	0.0010	0.0010	0.0381	0.1004	0.1363	0.1993	0.1413	0.0852	0.0010	0.0010	0.0010
Lower Puyallup River	102	0.0009	0.0009	0.0009	0.0356	0.0939	0.1275	0.1865	0.1322	0.0797	0.0009	0.0009	0.0009
Lower White River	76	0.0007	0.0007	0.0007	0.0265	0.0700	0.0950	0.1390	0.0985	0.0594	0.0007	0.0007	0.0007
Middle White River	57	0.0005	0.0005	0.0005	0.0199	0.0525	0.0713	0.1042	0.0739	0.0445	0.0005	0.0005	0.0005
South Prairie Creek	167	0.0016	0.0016	0.0016	0.0583	0.1538	0.2088	0.3054	0.2164	0.1305	0.0016	0.0016	0.0016
Upper Puyallup River	165	0.0015	0.0015	0.0015	0.0576	0.1519	0.2063	0.3017	0.2139	0.1289	0.0015	0.0015	0.0015
Upper White River	12	0.0001	0.0001	0.0001	0.0042	0.0110	0.0150	0.0219	0.0156	0.0094	0.0001	0.0001	0.0001
Totals	**688**	**0.0064**	**0.0064**	**0.0064**	**0.2402**	**0.6335**	**0.8602**	**1.2581**	**0.8917**	**0.5375**	**0.0064**	**0.0064**	**0.0064**
Subbasin	**Projected No. Permit Exempt Connections (Low Growth)**	**Consumptive Use by Month (cfs)**											
		Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Carbon River	87	0.0008	0.0008	0.0008	0.0304	0.0801	0.1088	0.1591	0.1128	0.0680	0.0008	0.0008	0.0008
Lower Puyallup River	53	0.0005	0.0005	0.0005	0.0185	0.0488	0.0663	0.0969	0.0687	0.0414	0.0005	0.0005	0.0005
Lower White River	66	0.0006	0.0006	0.0006	0.0230	0.0608	0.0825	0.1207	0.0855	0.0516	0.0006	0.0006	0.0006
Middle White River	57	0.0005	0.0005	0.0005	0.0199	0.0525	0.0713	0.1042	0.0739	0.0445	0.0005	0.0005	0.0005
South Prairie Creek	122	0.0011	0.0011	0.0011	0.0426	0.1123	0.1525	0.2231	0.1581	0.0953	0.0011	0.0011	0.0011
Upper Puyallup River	104	0.0010	0.0010	0.0010	0.0363	0.0958	0.1300	0.1902	0.1348	0.0812	0.0010	0.0010	0.0010
Upper White River	20	0.0002	0.0002	0.0002	0.0070	0.0184	0.0250	0.0366	0.0259	0.0156	0.0002	0.0002	0.0002
Totals	**509**	**0.0047**	**0.0047**	**0.0047**	**0.1777**	**0.4687**	**0.6364**	**0.9308**	**0.6597**	**0.3977**	**0.0047**	**0.0047**	**0.0047**
Subbasin	**Projected No. Permit Exempt Connections (High Growth)**	**Consumptive Use by Month (cfs)**											
		Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Carbon River	142	0.0013	0.0013	0.0013	0.0496	0.1307	0.1775	0.2597	0.1840	0.1109	0.0013	0.0013	0.0013
Lower Puyallup River	153	0.0014	0.0014	0.0014	0.0534	0.1409	0.1913	0.2798	0.1983	0.1195	0.0014	0.0014	0.0014
Lower White River	91	0.0008	0.0008	0.0008	0.0318	0.0838	0.1138	0.1664	0.1179	0.0711	0.0008	0.0008	0.0008
Middle White River	57	0.0005	0.0005	0.0005	0.0199	0.0525	0.0713	0.1042	0.0739	0.0445	0.0005	0.0005	0.0005
South Prairie Creek	229	0.0021	0.0021	0.0021	0.0799	0.2109	0.2863	0.4188	0.2968	0.1789	0.0021	0.0021	0.0021
Upper Puyallup River	242	0.0023	0.0023	0.0023	0.0845	0.2228	0.3026	0.4425	0.3137	0.1891	0.0023	0.0023	0.0023
Upper White River	4	0.0000	0.0000	0.0000	0.0014	0.0037	0.0050	0.0073	0.0052	0.0031	0.0000	0.0000	0.0000
Totals	**918**	**0.0085**	**0.0085**	**0.0085**	**0.3205**	**0.8453**	**1.1478**	**1.6787**	**1.1898**	**0.7172**	**0.0085**	**0.0085**	**0.0085**

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Attachment A
Irrigated Area Comparability Study

Technical Memorandum

To:	Angela Johnson, Rebecca Brown, Ingria Jones, Stephanie Potts, Stacy Vynne McKinstry, John Covert, and Tom Culhane (Ecology)
From:	Chad Wiseman (HDR) and Bridget August (GeoEngineers)
Date:	January 16, 2020
Subject:	Draft Irrigated Acreage Comparability Study

1.0 Executive Summary

The purpose of this technical memorandum is to summarize the Draft Irrigated Acreage Comparability Study undertaken as a joint exercise by the GEI and HDR technical teams and to provide a recommendation to Ecology on whether variability between GEI and HDR irrigated area delineations warrants data qualification or updates. This study was conducted at the request of the Ecology team indicated as the recipients of this memo. The Ecology team requested we undertake this study as part of on-going quality assurance work associated with development of products for use by the Watershed Restoration and Enhancement (WRE) committees. The need for this specific study was identified because of perceived differences in specific draft, interim results from the two firms related to the analysis of outdoor irrigation area of existing homes served by permit-exempt (PE) wells. The goals of this study were to: 1) to determine if there was a difference in the mean irrigated areas between the HDR and GEI delineations, 2) to identify the reasons for those differences, and 3) to determine the implications, if any, of these differences for the work of the WRE committees. This memorandum details the reasons for the differences and ultimately concludes that the differences will not have an impact on the work of the WRE committees and the WRE committees may accept the irrigated area results completed by the GEI and HDR without qualification. The results of the comparability study, and subsequent review with Ecology, indicate the following:

- It is our recommendation that Ecology and the WRE committees should accept the irrigated area results completed by the GEI and HDR teams. The differences will have no impact on the work of the WRE committees. Furthermore, our analysis and comparability results indicate there is no need for a systematic reevaluation of the primary data sets or methodologies. The GEI and HDR teams have confidence in their completed work and, notably, in each other's work for their respective WRIAs.
- The outdoor irrigation method is conservative because it assigns outdoor watering rates equivalent to those for crops described in the Washington Irrigation Guide such as to produce commercial pasture/turf grass.
- There is inherent subjectivity and variability associated with estimating irrigated areas from manual aerial photo interpretation.
- There are a continuum of possibilities between slightly watered areas and those have been watered at rates similar to those presented in the Washington Irrigation Guide, and because

of this range there are also ranges of “correct” answers to the question of which outdoor watering areas should be counted.

- While it can be relatively straight-forward to delineate the irrigated footprints for parcels on the extreme – either brown lawns or lush, golf-course green lawns- it can be much harder to make delineations for the rest of the parcels.

2.0 Introduction

GeoEngineers, Inc. (GEI) and HDR, Inc., (HDR) are providing technical support to the Washington State Department of Ecology (Ecology) and the Watershed Restoration and Enhancement (WRE) committees. GEI is providing support for Water Resource Inventory Areas (WRIAs) 7, 8, and 9, while HDR is supporting WRIAs 10, 12, 13, 14, and 15.

Under RCW 90.94, consumptive water use by new permit-exempt (PE) domestic wells must be estimated to establish the water use that watershed restoration and enhancement (WRE) plans are required to address and offset. Consumptive use is water that evaporates, transpires, is consumed by humans, or otherwise removed from an immediate water environment. Appendix A in the *Final Guidance for Determining Net Ecological Benefit* (July 2019) recommends using more than one method for calculating consumptive water use: a method based on analysis of outdoor irrigation; and a method based on location-specific small- to medium-sized water system data. GEI and HDR are developing results for both methods in each of the WRIAs. This memo only addresses a quality review for the outdoor irrigation method. The outdoor irrigation method is based, in part, on an estimate of the average irrigated area anticipated for new PE wells. This average irrigated area is estimated by delineating the apparent irrigated area of existing homes served by PE domestic wells.

Both HDR and GEI drew from the recent building permit or well databases in selecting parcels for irrigated area delineations. HDR delineated the irrigated area for 80 parcels in each of its assigned five WRIAs, and GEI delineated 393, 153 and 221 parcels in WRIAs 7, 8 and 9, respectively. One analyst from each firm conducted the delineations for consistency, and each analyst followed the prescribed methodology outlined in their respective consumptive use methodology memoranda (excerpts included in Attachments A and B). Following the delineation for each parcel, the irrigated area was calculated, then the mean irrigated area for each subbasin was calculated. The results of this work for all the WRE WRIAs are summarized in Table 1.

The average irrigated footprint results for WRIAs 7, 8, and 9 were generally higher than those for WRIAs 10, 12, 13, 14, and 15. Because of this difference, Ecology asked GEI and HDR to conduct a blind comparability study on a subset of common parcels. The objectives of the comparison were to determine if there was a difference in the mean irrigated areas between the HDR and GEI delineations and to identify the reasons for those differences, if they occurred. This memo further describes the methods and results of the comparison study and provides a recommendation on how Ecology and the WRE Committees can move forward.

Table 1. Irrigated acreage statistical summary.

WRIA	GEI			HDR				
	7	8	9	10	12	13	14	15
Sample Size (PE Parcels)	393	153	221	80	80	80	80	80
Mean Irrigated Area per Parcel	0.21	0.32	0.30	0.17	0.15	0.06	0.07	0.08

3.0 Methods

All irrigated area delineations were done on the Google Earth platform. HDR and GEI each provided a Google Earth spatial data file (KMZ file) containing a randomly selected subset of 10 PE parcels from one WRIA that had been delineated as part of the original irrigated area analysis. GEI provided HDR a KMZ file with 10 parcels from WRIA 9, and HDR provided GEI a KMZ file with 10 parcels from WRIA 10. Only parcel numbers and boundaries were provided in the KMZ file; the results of the original irrigated area delineations from each analyst were not provided to the other consultant.

Each consultant delineated irrigated areas for the 10 parcels provided by the other consultant, using the same analyst and methods as was used for the original WRIA analyses (Attachments A and B). In general, the irrigated areas included turf (residential lawn or pasture), gardens, and landscaping. Unirrigated lawns go dormant in the dry summer months and turn brown. Consultants used summer and winter imagery publically available in Google Earth to determine which areas of the parcel were dormant in the summer. Two or more years of aerial imagery was used when available. Consultants compared winter imagery, when precipitation turns lawns green naturally, to summer imagery, when the study areas receive little to no precipitation and lawns that are not irrigated typically go brown. Areas that remained green in the summer imagery were considered irrigated. Those areas that did not change color from winter to summer, or moderately changed color but remained green through the summer months, were considered irrigated. Consultants also compared each subject parcel to surrounding parcels with managed turf to differentiate the irrigated versus non-irrigated color signatures. Each analyst took notes detailing the rationale for inclusion or exclusion of an area for each delineation and documented the date(s) of the aerial photography utilized to make that determination.

After the analysts completed the additional delineations, HDR and GEI provided their delineated areas (KMZ files and tabular data) and notes to the other consultant to compare results. A conference call with a shared screen was held with Ecology on November 12, 2019, to discuss the delineated areas on Google Earth and calculated acreage results on a parcel by parcel basis. The rationale for inclusion or exclusion of an area from an irrigated footprint delineation was discussed.

After this initial conference call, analysts from HDR and GEI were each asked to re-delineate all 20 parcels a second time to determine if the delineated acreage from each consultant would be closer in value following this reconciliation of differences in methodology by parcel. A conference call was held with Ecology after this second delineation on November 26, 2019, to compare the new mean irrigated acreage between HDR and GEI.

4.0 Results

On average, GEI delineated larger irrigated areas than HDR during both rounds of comparative analyses. The first round had the largest differences. GEIs irrigated areas were estimated to be 0.27 and 0.14 acre larger than HDRs estimates for WRIAs 10 and 9, respectively (Table 2). While most of the delineated areas were similar (i.e., within 0.10 acre) between analysts, there were large differences (i.e., greater than 0.10 acre difference) in five parcels in WRIA 10 and three parcels in WRIA 9. The complete results table with notes is included in Attachment C. During the November 12, 2019 meeting, the following differences in evaluation accounted for most of these differences in irrigated acreages:

- Per GEI's methods (Attachment A), landscaping outside of but adjacent to irrigated lawn areas were included within irrigated acreage. HDR excluded these areas per their methods (Attachment B).
- GEI was more inclusive of additional acreage under the tree canopy within the irrigated footprint.
- HDR did not identify some gardens that should have been included within the irrigated footprint.
- HDR utilized a more restrictive seasonal range of aerial photography to determine irrigated versus dormant turf (residential lawn and pasture) color signatures. For some parcels, GEI used more recent June and early July imagery, if available, to determine if an area was irrigated. HDR only used imagery from late July to early September to differentiate dormant versus irrigated turf. The different aerial imagery being evaluated by GEI and HDR resulted in some different interpretations of irrigated acreage.
- In some cases, there was a difference in analyst interpretation of areas that would plausibly be managed as irrigated turf (i.e., based off of fence lines and apparent uses).
- In some cases, there was a difference in analyst interpretation of whether or not the turf in the subject parcel was "greener" than turf in the surrounding parcels that was also managed (i.e. as residential yards or pastures) but was not irrigated (assuming that at least some people do not irrigate their lawns and pastures). For example, if the subject parcel had green grass in their yard, but other yards in the area had brown grass (indicating dormancy from no irrigation), the green area in the subject parcel would be delineated. These comparisons and decisions can be subjective.

Following the discussion on November 12, 2019, outlining these differences in methodology and subsequent re-delineation of the 20 parcels, the average irrigated acreages calculated by HDR and GEI were much closer in value, with a difference on average of 0.05 and 0.06 acre in WRIA 9 and 10 respectively (Table 2). GEI reduced the irrigated area, particularly under tree canopies, while HDR slightly expanded irrigated areas for gardens and turf. The GEI mean irrigated areas were reduced by 0.2 and 0.03 acre for WRIAs 10 and 9, respectively. The HDR mean irrigated areas were increased by 0.02 and 0.05 acre for WRIAs 10 and 9, respectively.

Table 2. GEI and HDR irrigated area comparability study results.

Parcel No.	WRIA	Delineated Irrigated Acreage Initial Comparison Analysis			Delineated Irrigated Acreage following Methodology Reconciliation		
		GEI	HDR	Difference	GEI	HDR	Difference
A	10	0.50	0.09	0.41	0.09	0.09	0.00
B	10	0.00	0.00	0.00	0.00	0.00	0.00
C	10	0.00	0.00	0.00	0.00	0.00	0.00
D	10	0.82	0.13	0.68	0.38	0.22	0.16
E	10	0.29	0.31	-0.02	0.23	0.36	-0.13
F	10	0.15	0.15	0.01	0.15	0.15	0.01
G	10	0.10	0.00	0.10	0.10	0.05	0.06
H	10	0.25	0.00	0.25	0.25	0.01	0.24
I	10	0.31	0.00	0.31	0.02	0.01	0.01
J	10	0.91	0	0.91	0.12	0.00	0.12

Parcel No.	WRIA	Delineated Irrigated Acreage Initial Comparison Analysis			Delineated Irrigated Acreage following Methodology Reconciliation		
		GEI	HDR	Difference	GEI	HDR	Difference
K	9	0.23	0.21	0.02	0.23	0.21	0.01
L	9	0.42	0.44	-0.02	0.42	0.54	-0.13
M	9	0.46	0.37	0.09	0.46	0.38	0.09
N	9	0.00	0.00	0.00	0.00	0.00	0.00
O	9	0.65	0.00	0.65	0.48	0.00	0.48
P	9	2.28	1.92	0.36	2.28	1.95	0.34
Q	9	0.18	0.09	0.09	0.18	0.09	0.09
R	9	0.34	0.22	0.12	0.25	0.23	0.02
S	9	0.00	0.00	0.00	0.00	0.00	0.00
T	9	0.11	0.05	0.05	0.11	0.06	0.05
WRIA 10 Average		**0.33**	**0.07**	**0.27**	**0.13**	**0.09**	**0.05**
WRIA 9 Average		**0.47**	**0.33**	**0.14**	**0.44**	**0.38**	**0.06**

5.0 Discussion

What became evident during this exercise is that while it can be relatively straight-forward to delineate the irrigated footprints for parcels on the extreme – either brown lawns or lush, golf-course green lawns- it can be much harder to make delineations for the rest of the parcels. Studies from municipal water suppliers around North America have shown that many homeowners apply outdoor water sparingly, with just enough to prevent landscaping from dying or at least far short of what is needed for maximum growth (DeOreo, et al., 2016. Residential End Uses of Water, Version 2)..

Another important conclusion that can be made from this work is that in many cases using remote sensing to delineate outdoor water areas will not resolve all questions about what outdoor areas were irrigated. This is because that answer depends on how much outdoor watering needs to have occurred in order to be counted. For example, if a lawn has been watered just once during a dry season or just 5 times, and it is not dormant but far from green, is that sufficient to call that area an outdoor watered area? And, if so, is it reasonable to expect a technician to be able to delineate that area using aerial images? In reality, there are a continuum of possibilities between slightly watered areas and those have been watered at rates similar to those presented in the Washington Irrigation Guide (WAIG). Because of this range in watering, there are also ranges of “correct” answers to the question of which outdoor watering areas should be counted.

One important implication of variable watering rates is that the outdoor irrigation method described in Appendix A of the *Final Guidance for Determining Net Ecological Benefit* and the method used by both GEI and HDR for calculating consumptive use is conservative. This is because it assigns outdoor watering rates equivalent to those for crops described in the WAIG, such as for the production of commercial pasture/turf grass. Many of the lawns that are delineated as “irrigated” may not apply water at these rates, resulting in conservatively high consumptive use estimates. At the subbasin and WRIA scale, we are confident that our estimate of the water used for outdoor watering is larger than what is actually being used by permit-exempt domestic well owners. This assumption was corroborated with a comparison of irrigated areas in specific parcels that had metered water use data (HDR 2019).

Based on the above considerations and the results of this comparison exercise, there is inherent subjectivity and variability associated with estimating irrigated areas from manual aerial photo interpretation. Although these results indicate that additional training (or cross-training) may have reduced this variability between analysts, differences are still to be expected. Furthermore, the original differences in mean irrigated areas are generally within the 95 percent confidence interval for the primary data sets. Therefore, these comparability results do not indicate a need for a systematic reevaluation of the primary data sets. The GEI and HDR teams have confidence in their completed work and in each other's work for their respective WRIAs. It is GEI's and HDR's opinion that Ecology and the WRE committees may accept the irrigated area results completed by the GEI and HDR teams without qualification. The WRE committees may consider investigating the sensitivity of consumptive use based on mean irrigated areas for each WRIA and/or at upper or lower 95 percent confidence limits.

Attachment A

GEI Irrigated Footprint Analysis Methods

Irrigated Footprint Analysis Methods

The GEI team conducted an aerial photo-based analysis of irrigated lawn and garden area for 393 parcels in the 16 WRIA 7 subbasins, 153 parcels in seven of the WRIA 8 subbasins, and 211 parcels in eight of the WRIA 9 subbasins. Parcels used for the irrigated footprint analysis were selected based on recent (2006–2017) building permits for new single-family residential homes not served by public water. Permits for accessory dwelling units (ADUs) or reconstruction/remodel were excluded. All new home building permit sites in WRIA 9 were included in the analysis, however, a subset of building permits were selected for WRIAs 7 and 8. The target sample size for WRIAs 7 and 8 was set to provide a 95 percent confidence level (i.e., 95 percent certainty of the sample capturing the true mean of the population). Sample parcels were selected by assigning a random number to each building permit, and then evaluating sites in rank order up to the target sample size. Using a random selection from the permit list avoids the bias that could be introduced if selecting from the imagery.

Each parcel was evaluated visually in Google Earth for irrigated lawn areas. Google Earth's historical imagery collection allowed for clearer identification of irrigated areas than available orthophotos because it was possible to compare aerial photos spanning multiple seasons and years. Late summer imagery was particularly helpful in determining boundaries of irrigated (green) vs. non-irrigated (brown) grass areas. Often, the parcels did not demonstrate such a clear-cut distinction between green and brown spaces. It appears that many homeowners irrigate enough to keep lawns alive but not lush (or comparable to commercial turf grass/golf course green). Delineating these irrigated spaces is subjective and the GEI team minimized potential for additional bias to the results by having one GIS analyst evaluate all of the permit parcels in the WRIA. The irrigated area was delineated for each parcel based on several key assumptions:

- Landscaped shrub/flower bed areas were included in the irrigated footprint (not just lawn areas).
- Homes that did not show visible signs of irrigation were tracked as zero irrigated footprint, and this was included in the calculated results.
- Homes or landscaping still under construction in the most recent Google Earth imagery were excluded.
- Native forest or unmaintained grass/pasture were not included in the irrigated footprint.
- Pre-existing agricultural land use was not considered part of the residential irrigation footprint.

The following examples illustrate selected delineations.

Figure 1 shows examples of irrigated area delineation for two representative parcels in the Patterson (left) and Upper Skykomish (right) subbasins in WRIA 7. On each photo, the parcel boundary is shown in yellow and the area identified as irrigated in white. Large homes and extensive irrigated lawn and garden areas were much more common in the Patterson, Pilchuck, and Raging subbasins compared to the rest of the WRIA.

Figure 1. Example Irrigated Area Delineations, Patterson subbasin (left) and Upper Skykomish subbasin (right), WRIA 7

Figure 2 shows examples of irrigated area delineation for two parcels in the Bear/Evans subbasin in WRIA 8. On each photo, the parcel boundary is shown in light blue and the area identified as irrigated in white. For the example on the left, photos at different times of year showed a clear break between irrigated and non-irrigated grass.

Figure 2. Example Irrigated Area Delineations, Bear/Evans subbasin, WRIA 8

Figure 3 shows examples of irrigated area delineation for two parcels in the Covington Creek subbasin in WRIA 9. On each photo, the parcel boundary is shown in orange and the area identified as irrigated in white. For the example on the left, photos at different times of year showed a clear break between irrigated and non-irrigated grass.

Figure 3. Example Irrigated Area Delineations, Covington Creek Subbasin, WRIA 9

Attachment B

HDR Irrigated Area Analysis Methods

Irrigated Area Analysis Methods

1. The GIS technician selected four sample parcels from the WRIA 13 parcel selection pool to draft preliminary delineations. Parcels that displayed a range of potential irrigation situations (e.g., unirrigated lawns, lawns requiring tree/shadow interpolations, minimally irrigated area) were selected for the preliminary analysis.
2. Polygons were created in Google Earth representing the irrigated area within a given tax parcel. The GIS technician made several judgments and assumptions:
    a. Landscaped shrub/flower bed areas within a larger irrigated footprint were included. Shrub and flower bed areas outside of the irrigated footprint were excluded.
    b. If the irrigated area extends beyond the parcel boundary, those areas were included.
    c. Parcels with no visible signs of irrigation were tracked as zero irrigated footprint.
    d. Areas that appeared to be native forest or unmaintained grass were not included in the irrigated footprint.
    e. Parcels with homes under construction in the most recent Google Earth imagery were excluded from the analysis.
    f. New construction due to additional dwelling units (ADUs) were not counted.

    The following examples illustrate example delineations.

Figure 1. No irrigated areas visible in most recent google earth aerial imagery.

Figure 2. Area in white includes maintained grass. Residence constructed between June 2017 and July 2018. Therefore, historical irrigation of property is unavailable in GoogleEarth imagery.

Figure 3. Irrigated area includes landscaped area in driveway, maintained yard around residence, garden area, and maintained grass near garden area.

Figure 4. No irrigated area. Assumption that green vegeation on southern portion of parcel is due to proximity to Spurgeon Creek since clear delineation of irrigated area is not present on aerial. Green area near residence appears to be tree and shrubs, not maintained landscaping and is excluded.

Attachment C

Results Table

Parcel	WRIA	GEI Notes	HDR Notes	Geo Acres	*HDR Acres*	Diff	Geo Adj Acres	*HDR Adj Acres*	Adj Diff	Geo Adjusted Notes	HDR Adjusted Notes
A	10	8/2006 ; 8/2011 - difficult to distinguish if western portion of home are is irrigated	Front yard delineated based on 9/2009 and 8/2011 imagery.	**0.50**	*0.09*	0.41	**0.09**	*0.09*	0.00	tightened lawn area, omitted truck/boat parking	No change
B	10	No apparent irrigation, landscaping not established yet	zero irrigated footprint	**0.00**	*0.00*	0.00	**0.00**	*0.00*	0.00	no change	No change
C	10	No apparent irrigation ; 7/2014 ; 7/2012	zero irrigated footprint (9/2009 and 8/2011)	**0.00**	*0.00*	0.00	**0.00**	*0.00*	0.00	no change	No change
D	10	6/2016 - extensive landscaping and garden area, difficult to discern extent of irrigated lawn ; 7/2014 ; 7/2012	area delineated	**0.82**	*0.13*	0.68	**0.38**	*0.22*	0.16	tightened lawn area to within fenceline, omitted truck/boat area	Garden area SW of home included
E	10	6/27/2016 - areas outside of the riding ring near the house are landscaped and appear irrigated ; 7/2014 - lawn area - compare to western pasture inside parcel	delineated yard area (8/2006 image)	**0.29**	*0.31*	-0.02	**0.23**	*0.36*	-0.13	tightened lawn area to within fenceline, omitted area near garage/barn	reduced front yard area
F	10	7/2014 ; 7/2012 - compare to neighboring lawns	Yard area delineated. 7/2018 image	**0.15**	*0.15*	0.01	**0.15**	*0.15*	0.01	no change	No change
G	10	7/2014 - small hayfield? compare lawn/landscaping (NE of corner of house) area around house to neighbor to the WNW ; 7/2012 - compare to neighbor's lawn to the NW ; 9/2009 - blurry but hayfield area is bright green	zero irrigated footprint. 7/2018 and 7/2006, 9/2009 imagery	**0.10**	*0.00*	0.10	**0.10**	*0.05*	0.06	no change	Added garden bed northwest
H	10	8/2011 - compare lawn to NW portion of property, lawn areas to the NE, particularly the watered lawn to the NE, SW side of house	zero irrigated area 9/2009	**0.25**	*0.00*	0.25	**0.25**	*0.01*	0.24	no change	Added garden area between barn and shop
I	10	7/2014 - garden area and lawn tight to house 6/2016 - compare to house/lawn to the southeast	zero irrigated footprint. 8/2011 and 11/2011	**0.31**	*0.00*	0.31	**0.02**	*0.01*	0.01	only included raised garden bed	Added garden bed northeast of house
J	10	8/2011 - compare to lawn at home 750ft E 7/2012 - home to the NW across street is brown comparatively	zero irrigated footprint	**0.91**	*0*	0.91	**0.12**	*0.00*	0.12	hard to discern lawn area, kept tight to house where grass is green compared to house to west 7/2014	no change
K	9	moderate gardening area	maintained lawn areas and garden area delineated.	**0.23**	*0.21*	0.02	**0.23**	*0.21*	0.01	no change	Addition of garden area on north section of lawn
L	9		area irrigated based on 4/2015 imagery. Although not summer, clear area of irrigation defined.	**0.42**	*0.44*	-0.02	**0.42**	*0.54*	-0.13	no change	Slightly expanded irrigated in the backyard further east.
M	9	includes golf practice green	area delineated 7/13/2017 imagery. Golf bunkers not included. Vegetation on east side of partial either dormant or unmaintained and well as vegetation between irrigated lawn and golf area.	**0.46**	*0.37*	0.09	**0.46**	*0.38*	0.09	no change	Slightly expanded area near golf bunkers. No other change.

Parcel	WRIA	GEI Notes	HDR Notes	Geo Acres	*HDR Acres*	Diff	Geo Adj Acres	*HDR Adj Acres*	Adj Diff	Geo Adjusted Notes	HDR Adjusted Notes
N	9	No apparent irrigation	zero irrigated footprint. Lawn dormant in 7/30/2006, 8/17/2006, 9/10/2009 photo. Green patches of lawn in 7/13/2017 not clearly defined and could be drain field	**0.00**	*0.00*	0.00	**0.00**		0.00	no change	No change
O	9		zero irrigated footprint. Only early July summer imagery available. In HDR analysis, would've selected new parcel.	**0.65**	*0.00*	0.65	**0.48**	*0.00*	0.48	removed western portion of property beyond fenceline	No change
P	9	large 2ac+ landscaped home	area delineated 8/2011 imagery. Eastern portion of parcel excluded, not maintained and vegetation dormant. Landscaping outside of footprint not included	**2.28**	*1.92*	0.36	**2.28**	*1.95*	0.34	no change	Slightly expanded area in backyard to include irrigated area near patio.
Q	9	front half of yard apparently hardscaped	area delineated based on 8/2011 and 5/2018 imagery. Front yard is completely landscaped and not included in irrigated footprint.	**0.18**	*0.09*	0.09	**0.18**	*0.09*	0.09	no change	No change
R	9		Area delineated. However, early 7/2014 was only summer imagery available. Backyard partially obscured by tree canopy. In HDR analysis, would've selected new parcel to delineate due to lack of summer imagery.	**0.34**	*0.22*	0.12	**0.25**	*0.23*	0.02	tightened up area along tree line	Expanded eastern boundary of delineation
S	9	No apparent irrigation	zero irrigated footprint. No maintained vegetation. Drainage ditch appears to traverse southern portion of parcel. Vegetation color matches vegetation on undeveloped parcel adjacent to the east.	**0.00**	*0.00*	0.00	**0.00**	*0.00*	0.00	no change	No Change
T	9		area delineated based on 9/10/2009 imagery showing area of green near front of home and 7/10/2012 imagery of maintained green lawn near home. Area of green south of home looks to be unmaintained.	**0.11**	*0.05*	0.05	**0.11**	*0.06*	0.05	no change	Slightly expanded area in front yard.
			WRIA 10 Total	**3.34**	***0.68***	**2.66**	**1.35**	***0.88***	**0.47**		
			WRIA 9 Total	**4.66**	*3.30*	**1.36**	**4.41**	*3.46*	**0.95**		
			WRIA 10 Average	**0.33**	*0.07*	**0.27**	**0.13**	*0.09*	**0.05**		
			WRIA 9 Average	**0.47**	*0.33*	**0.14**	**0.44**	*0.38*	**0.06**		

	GEI	*HDR*
WRIA 10 Change	**-0.20**	*0.02*
WRIA 9 Change	**-0.03**	*0.05*

Attachment B
Estimation of Average Irrigated Area

Methods

1. 80 parcels representing an existing dwelling served by a permit-exempt well or connection was defined.
    a. A pool of parcels with an existing dwelling served by a permit-exempt well or connection was defined.
    b. The selection pool was classified by property value. The classes were 1) Under $350,000, 2) $350,000 – $600,000, and 3) over $600,000.
    c. 80 parcels were randomly drawn from the selection pool, weighted by the proportion of property value class membership.
    d. Additional parcels were randomly selected as alternates, in case any of the primary (80) samples were able to be interpreted to irrigated area.
    e. All parcels were provided in a Google Earth .kmz file.
2. The irrigated area in each parcel was delineated according to the following procedure:
    a. Used a single technician to minimize operator variability.
    b. Irrigated area delineations were made using Google Earth aerial imagery taken during drier summer months (i.e., July and August). Unirrigated lawns (pasture/turf) go dormant in the dry summer months and turn brown. As such, areas that remain green in the summer imagery were considered irrigated.
    c. Aerial imagery from winter months was reviewed alongside summer imagery to reveal which lawn areas change from green to brown. Those areas that do not change color, or moderately change color but remain green, were considered irrigated.
    d. If available, multiple years of aerial imagery were used to corroborate the irrigated area delineation.
    e. Landscaped shrub/flower bed areas within a larger irrigated footprint were included. Shrub and flower bed areas outside of the irrigated footprint were excluded.
    f. If the irrigated area extended beyond the parcel boundary, those areas were included.
    g. Parcels with no visible signs of irrigation were assumed to have zero irrigated acres.
    h. Areas that appeared to be native forest or unmaintained grass were not included in the irrigated footprint.
    i. Parcels with homes or ADUs under construction in the most recent Google Earth imagery were excluded from the analysis, and an alternate parcel was evaluated.

    Figures B-1 through B-4 illustrate some example delineations.

Figure B-1. No irrigated areas visible in most recent google earth aerial imagery.

Figure B-2. Area in white includes maintained grass. Residence constructed between June 2017 and July 2018. Therefore, historical irrigation of property is unavailable in GoogleEarth imagery.

Figure B-3. Irrigated area includes landscaped area in driveway, maintained yard around residence, garden area, and maintained grass near garden area.

Figure B-4. No irrigated area. Assumption that green vegeation on southern portion of parcel is due to proximity to Spurgeon Creek since clear delineation of irrigated area is not present on aerial. Green area near residence appears to be tree and shrubs, not maintained landscaping and is excluded.

Results

Eighty parcels were evaluated for irrigated acreage (Figure B-5). Average irrigated acreage was 0.15 acre (Table B-1). In all WRIAs evaluated, most of the parcels had zero irrigated acres (Figure B-6). The distribution of irrigated acreages for all WRIAs were skewed, because of the large percentage of parcels that had zero irrigated acres. Some parcels had an irrigated area nearly an order of magnitude larger than the mean, resulting in a large standard deviation. The 95 percent upper confidence limit of the mean could only be fit with a non-parametric distribution and was about two times the quantity of the calculated arithmetic mean.

Figure B-5. Parcels selected in WRIA 10 with existing PE connections that were delineated for apparent irrigated areas.

Table B-1. Irrigated acreage delineation results

Statistic	Units	WRIA 12
PE Parcel Sample Pool	Parcels	978
Sample Size	Parcels	80
Mean (with zero acreage values)	Acres	0.17
Standard Deviation (with zero acreage values)	Acres	0.31
Mean (with minimum 0.5 acre)	Acres	0.20
Standard Deviation (with minimum 0.5 acre)	Acres	0.30
95% UCL (with minimum 0.5 acre)	Acres	0.27

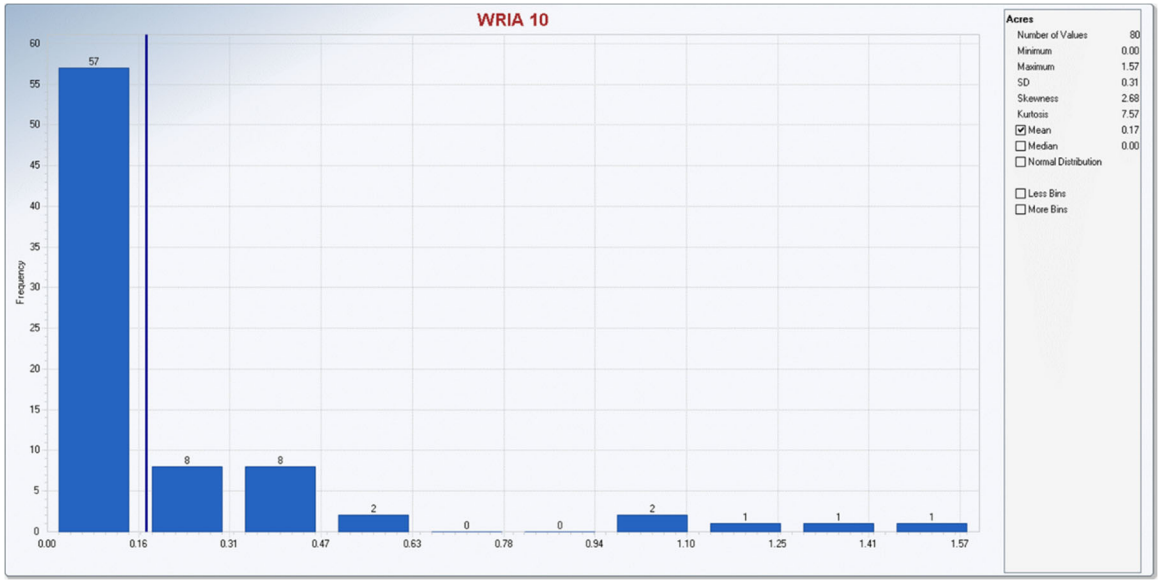

Figure B-6. Histogram of WRIA 10 irrigated acreage delineation results.

Attachment C
King County Growth Projections Memo

King County
Water and Land Resources Division
Department of Natural Resources and Parks
King Street Center
201 South Jackson Street, Suite 704
Seattle, WA 98104-3855
206-477-4800 Fax 206-296-0192
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TECHNICAL MEMORANDUM

December 16, 2019

TO: Stephanie Potts, Ingria Jones, Rebecca Brown, and Stacy Vynne McKinstry, Streamflow Restoration Implementation leads, Water Resources Program, Washington State Department of Ecology

FM: Eric Ferguson, LHG, Science and Technical Support Section, Water and Land Resources Division, Department of Natural Resources and Parks

RE: King County Growth Projections for all Watershed Restorations and Enhancement Committees – WRIAs 7, 8, 9 , 10, and 15

This memorandum summarizes the work that King County did in support of generating 20-year growth projections in the rural areas of the county for Watershed Restoration and Enhancement committee (WREC) work. This effort will be incorporated into another technical memorandum that is area specific for each Watershed Resource Inventory Area (WRIA). The additional memorandum will be authored by consultants working for the Washington State Department of Ecology.

Introduction

King County is participating in five WRECs, one for each of the WRIA within its boundary. King County is providing growth projections for each area that assesses a two-part question:

A. How much potential growth could occur during the 20-year (2018-2038) planning period?

B. Where could that growth occur at a sub-basin/watershed scale within each WRIA?

Principles

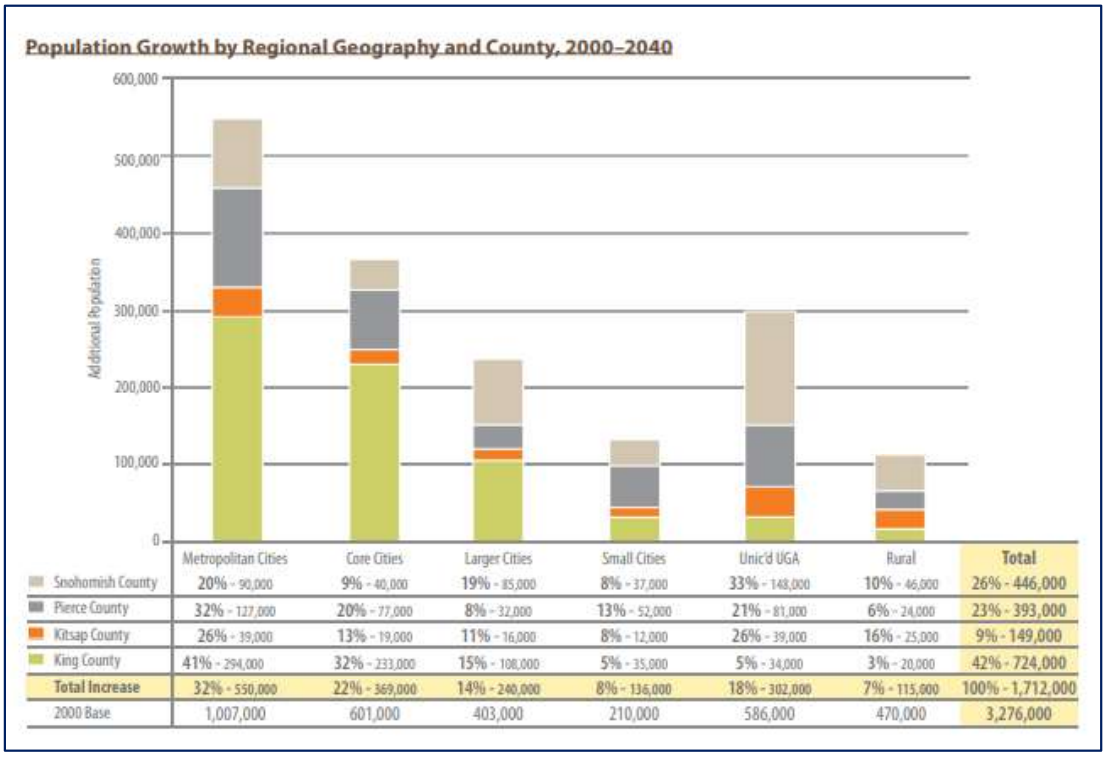
King County does not have growth targets for unincorporated rural areas in the county. All growth targets are for the urban growth area (UGA). No changes to the UGA boundary are intended during the 20-year planning period.

The following are highlights from planning policies:

- Accommodate most recent 20-year population forecast from OFM, and 20-year jobs forecast from Puget Sound Regional Council.
- Plan for growth consistent with Regional Growth Strategy
  - Focus growth in cities with major centers, and in other large cities
  - Limit development in Rural Areas, protect Resource Lands

Source: Policy DP-11 in Countywide Planning Policies, 2012

Population growth in the unincorporated rural area is estimated to be about 20,000 people or ~3% of overall population from Vision2040, Figure 1.



	Metropolitan Cities	Core Cities	Larger Cities	Small Cities	Unic'd UGA	Rural	Total
Snohomish County	20% - 90,000	9% - 40,000	19% - 85,000	8% - 37,000	33% - 148,000	10% - 46,000	26% - 446,000
Pierce County	32% - 127,000	20% - 77,000	8% - 32,000	13% - 52,000	21% - 81,000	6% - 24,000	23% - 393,000
Kitsap County	26% - 39,000	13% - 19,000	11% - 16,000	8% - 12,000	26% - 39,000	16% - 25,000	9% - 149,000
King County	41% - 294,000	32% - 233,000	15% - 108,000	5% - 35,000	5% - 34,000	3% - 20,000	42% - 724,000
Total Increase	32% - 550,000	22% - 369,000	14% - 240,000	8% - 136,000	18% - 302,000	7% - 115,000	100% - 1,712,000
2000 Base	1,007,000	601,000	403,000	210,000	586,000	470,000	3,276,000

Figure 1. Estimated population growth for rural King County from 2000-2040 is 20,000, King County, Vision 2040.

Note: the updated Vision (2050) document is due to be adopted in May 2020. The updated growth for rural King County is planned to be about 1% during 2017–2050 period (or ~6,000 people).

Methods

The first part of the growth projection assessment was performed in order to respond to the question: "How many new single-family permit-exempt well connections will be installed throughout each watershed over the next 20 years?" King County does not have a growth target

for the unincorporated rural area (as noted above) and therefore decided to use building permit data (for new residential structures) as its chosen method to assess future growth potential.

The following is the methodology used to assess the potential growth:

1. Compiled 18 years (2000–2017) of building permit data for new residential structures;
    a. This data was subdivided into two periods: 2000–2009 and 2010–2017, Table 1; each period has a range of low to high growth.

Table 1. Building permits from 2000-2017; new residental structures only

Building permits (unincorporated rural KC)	
2000-2009	4595
2010-2017	1252
Total	5847

2. Used GIS to provide location based information about building permits
    a. Use centroid of the building permit/parcel to assess location relative to other boundaries such as WRIA boundaries, stream basins, water district service areas, sub-basin delineations.
    b. Assess the number of permits per each WRIA, Table 2

Table 2. Building permits by WRIA

WRIA*	Total permits	Permits per year	Percentage of total
7	1864	104	32%
8	1836	102	31%
9	1430	79	24%
10	100	6	2%
15	617	34	11%

* = WRIA boundaries are delineated by Ecology coverage

3. Linked building permits and parcel data layers to assess percentage of parcels using public versus private water with parcel attribute data.
4. Determined the number of building permits/parcels that have a water source as:
    a. Public (pub) water
    b. Private (pvt) water (Permit-Exempt wells)
    c. Other (unknown/null)
        i. “unknown” refers to parcels with no assigned water source (likely unoccupied structure)
        ii. “null” refers to those building permits that did not link to existing parcels.

iii. This category can be used as an "error" since it refers to the amount of information that is undetermined and could potentially be private sourced.

5. Calculated the percentage of building permits for each type of water source (i.e. public, private or other) for entirety of King County as shown in Table 3 below as well as by WRIA and its sub-basin delineations.

Table 3. Water source by parcel/permit

Type of water use	Total permits	Percentage of total
Public	3113	53%
Private	2369	40%
Other -unknown	73	1%
Other - null	292	5%

6. Used the annual average number of permits per year multiplied by the percentage of permits/parcels on private water to determine a projected number of Permit Exempt (PE) wells per year, Table 4.

   Multiplied the number of PE wells per year by 20 to calculate the estimated total of PE wells projected over a 20-year period for unincorporated rural King County, Table 4.

Table 4. Average number of permit exempt well users by WRIA for the planning period.

WRIA*	Permit-exempt well/year^	20-year estimate	Error®
7	46	926	6%
8	35	698	6%
9	29	578	6%
10	4	81	2%
15	18	368	4%

* = WRIA boundaries are delineated by Ecology coverage
^ = WRIA specific percentage of private well users
® = Error calculated from percentage of building permits with "other" water service

Projected number of permit-exempt wells for time period (01/18/2018 to 01/18/2038) for all of King County is 2650. Each WRIA has a series of tables of this specific information, see Tables.

The second part of the growth projection assessment was performed in order to respond to the question: "Where will the well connections be installed?" The PE potential assessment is a GIS assessment of current (2019) parcel data. This work used a series of assumptions to assess potential area of growth within the county, specifically at the sub-basin scale as defined by the WREC for each WRIA.

The following are the assumptions used to refine the parcels:

- Outside Urban Growth Boundary
- Outside Forest Production District
- Outside Agriculture Production District
- Not Encumbered by K`C Parks or TDR conservation easements
- Not enrolled in Farmland Preservation Program
- Not Owned by Public Agencies
- Vacant land (with appraised improvements <$10,000)
- Have at least 1 acres of land outside 100 year Floodway and Severe River Channel Migration Hazard Areas.
- Parcel size – 1 acre or greater.
- Zoning – no exclusion and maximum density allowed by current zoning

7. Used centroid of the refined parcel data to determine location information, similar to step 2 (above).
8. Linked parcel and assessor attribute data to determine total number of parcels and dwelling units per sub-basin. A dwelling unit (DU) is a rough estimate of subdivision potential based on parcel size and zoning (e.g., a 22-acre parcel zoned RA-5 is assumed to have 4 dwelling units).
9. Determined the number of parcels and DUs that are inside or outside water district service boundaries.
10. Calculated water use projections for public connections and PE sourced parcels:
    a. Public connection parcels are located within water district service boundaries and are calculated based on historic rates of connection to public water within each sub-basin, assessed in step 5 (above).

    b. Any remaining number of parcels located within water district service boundaries are assigned to be PE sourced.

    c. PE sourced parcels were calculated based on the number of parcels located outside water district service boundaries plus the remaining parcels from “inside” water district boundaries, as described above, Table 5.

Table 5. Permit exempt (PE) estimate along with PE potential assessment data.

WRIA*	PE 20yr estimate^	Parcel^	DU
7	926	1175	1901
8	698	819	1070
9	578	746	1077
10	81	72	82
15	368	788	888

* = WRIA boundaries are delineated by Ecology coverage
^ = WRIA specific percentage of private well users
DU = Dwelling unit as noted in step 9.

WRIA specific data along with sub-basin assessments can be found in the Tables.

References

King County Countywide Planning Policies
https://www.kingcounty.gov/depts/executive/performance-strategy-budget/regional-planning/CPPs.aspx

https://www.kingcounty.gov/~/media/depts/executive/performance-strategy-budget/regional-planning/CPPs/2012-CPPsAmended062516withMaps.ashx?la=en

Vision 2040 link:
https://www.kingcounty.gov/~/media/depts/executive/performance-strategy-budget/regional-planning/Comp%20Plan/VISION_2040_-_2008.ashx?la=en

King County Growth Projection data tables by WRIA (Watershed Resource Inventory Area)

WRIA 10 - Puyallup-White

WRIA (Ecology Coverage)	(KC building permiting data)				permits
	2000-2009	2010-2017		total	per year
10	92	8		100	6

% of county-wide total
2%

WRIA 10	PE/yr	20 yr est
Future PE wells	**4**	**81**

Water District info	2000-2009	2010-2017		total
total	92	8		100
wtr dst (within water district)	67	7		74
no dst (outside water district)	25	1		26

Ag PD	permits	% of WRIA total
WRIA 10	69	69%

Forest PD	permits	% of WRIA total
WRIA 10	4	4%

Historic Percentages		
	pub	**0.230**
	pvt	**0.730**

Water service info	(derived from KC parcel attribute data)			
public water system (pub)	22	1		23
well - private water (pvt)	68	5		73
other	2	2		4
total	92	8		100

Existing	2000-2009	2010-2017	total
PE wells	68	5	73
error	2%	25%	4%

WRIA 10 - Permit-Exempt Well Potential Assessment

Assessment of potential parcels for future growth

Sub-basins	Number of parcels	Number of Dwelling Units (DU)
Lower White River	18	24
Middle White River	60	64
total	78	88

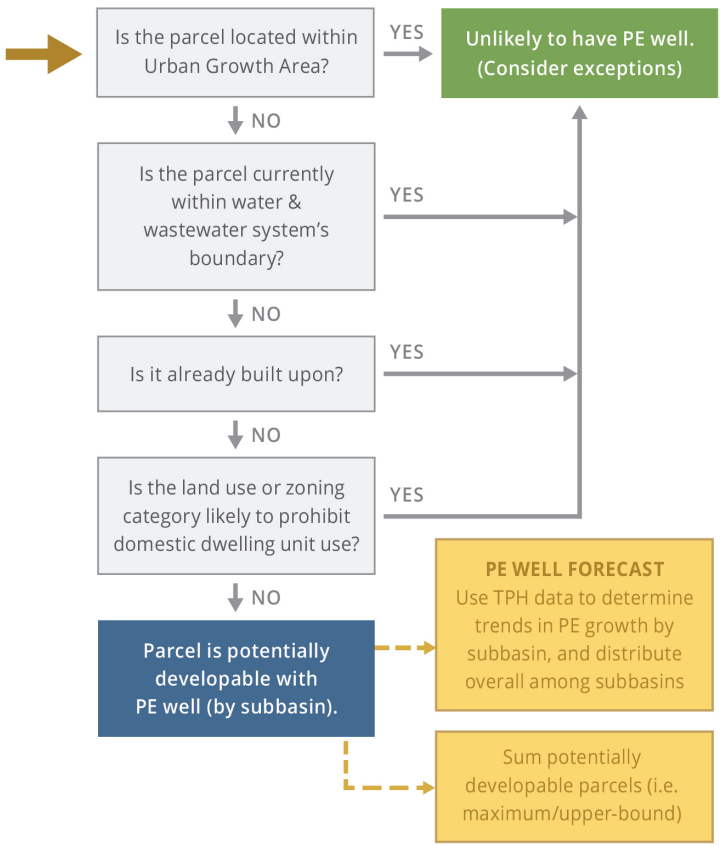
Water district boundaries				subbasin	Water Use Projection					
Inside		Outside			public connection		PE sourced			
parcels	DU	Parcels	DU		parcels	DU	parcels	DU	20 year well total	Shortfall *(red if present)* in 20 year well projection
0	0	18	24	Lower White River	0	0	18	24	24	0
26	28	34	36	Middle White River	6	6	54	58	57	1
26	28	52	60		6	6	72	82	81	----------

total parcels	78	total DU	88		total parcels	78	total DU	88		

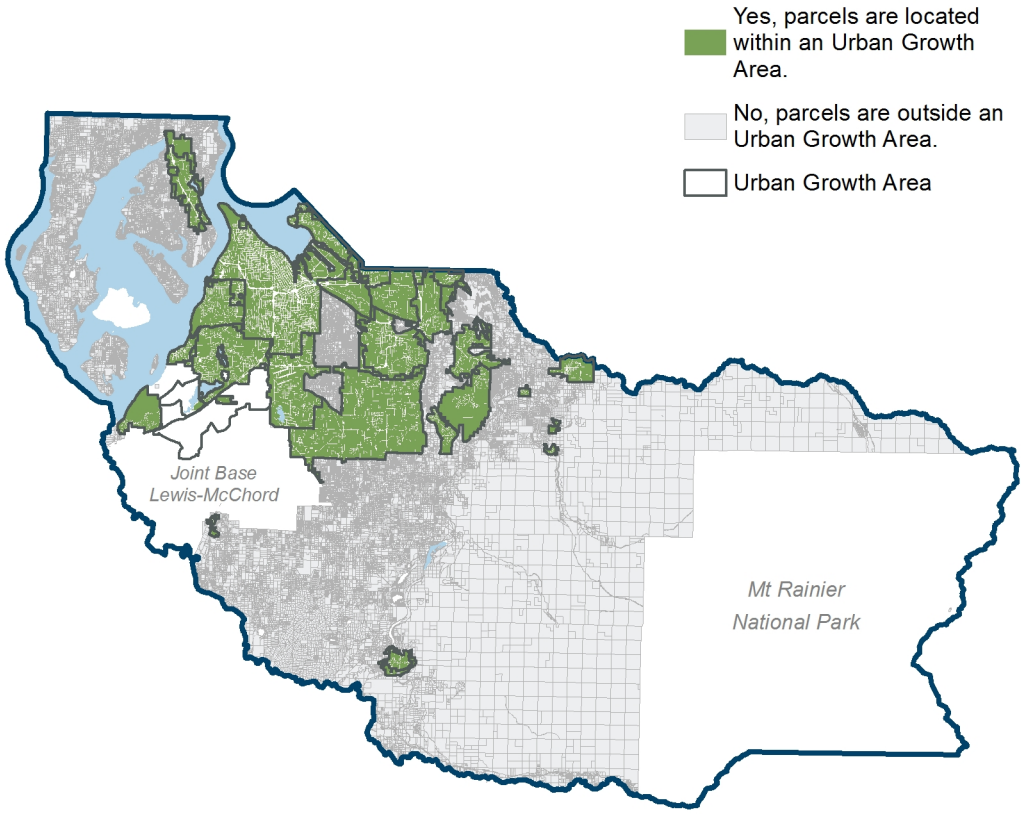
Attachment D

Pierce County PE Growth Methods and Buildable Lands Analysis

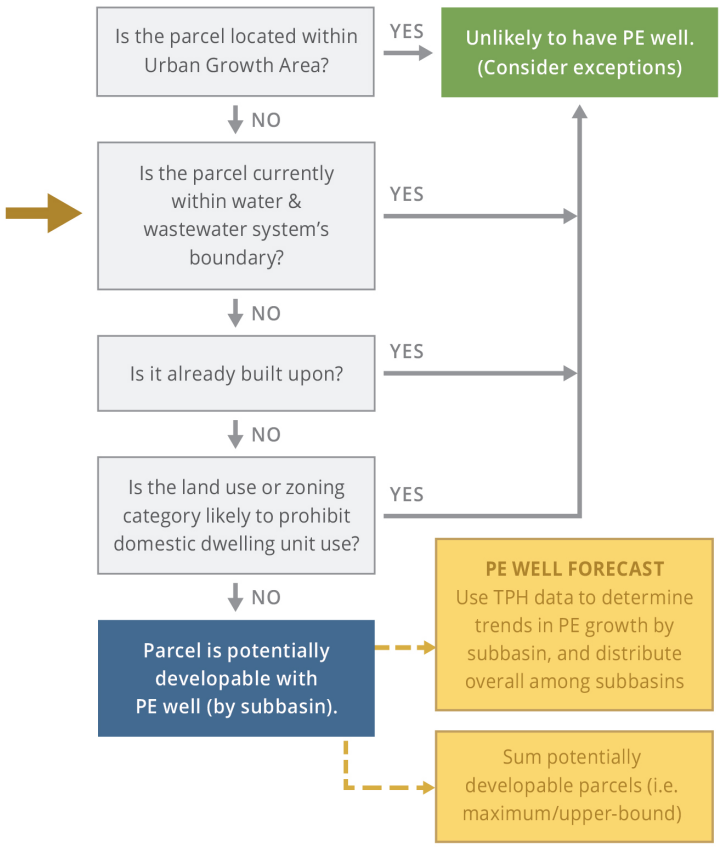
Phase 2: Parcel Inventory



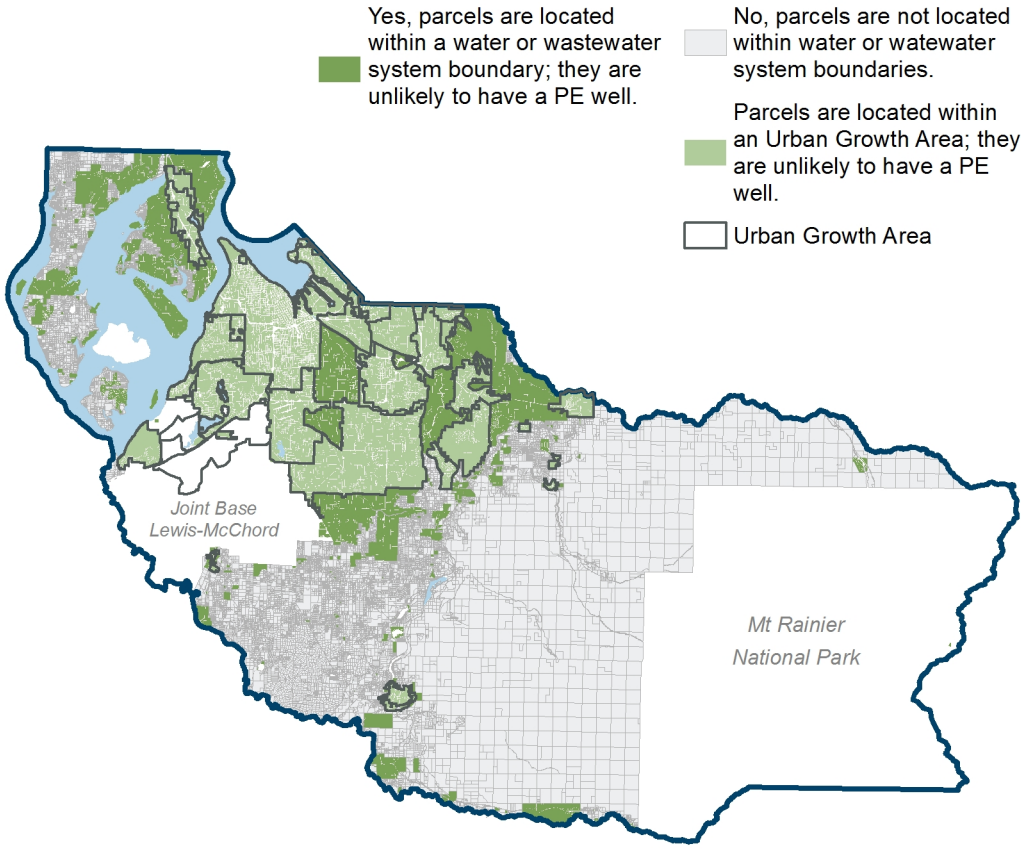
Is the parcel located within an Urban Growth Area (UGA)?



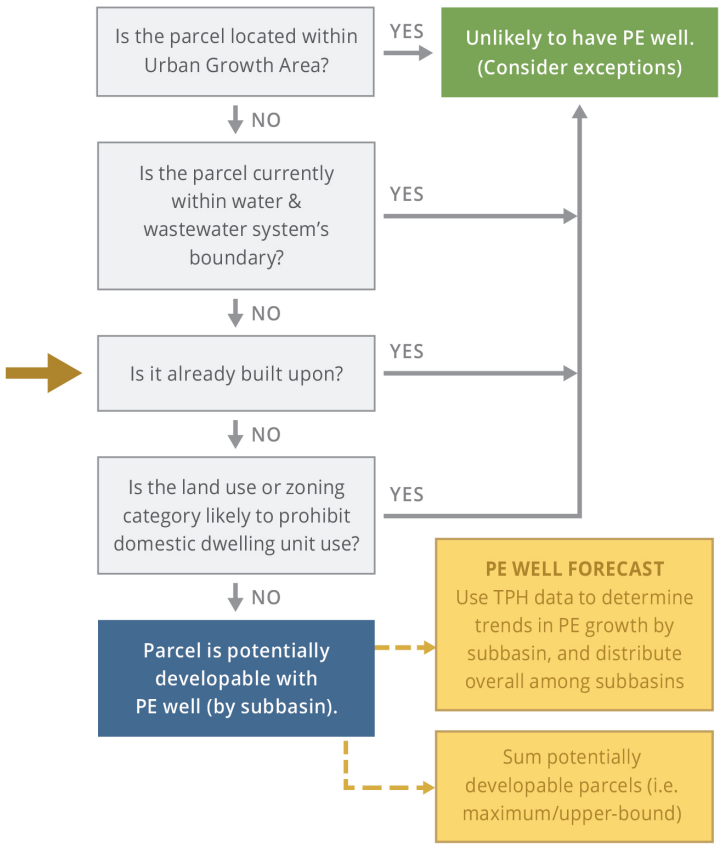
Phase 2: Parcel Inventory



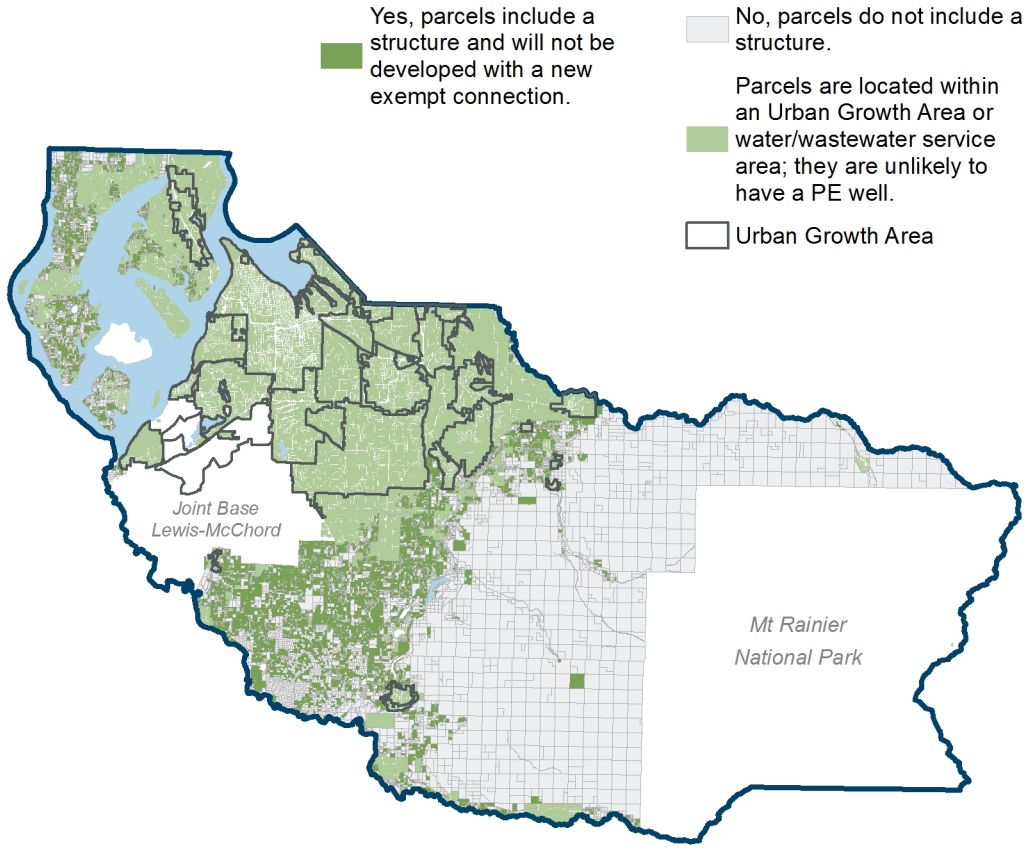
Is the parcel located within a water or wastewater system boundary?



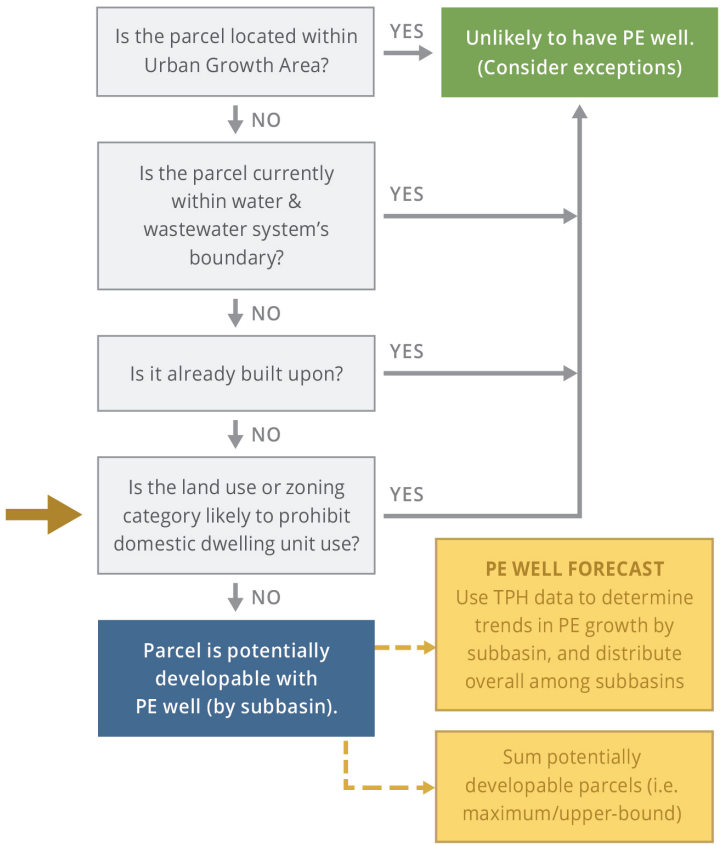
Phase 2: Parcel Inventory



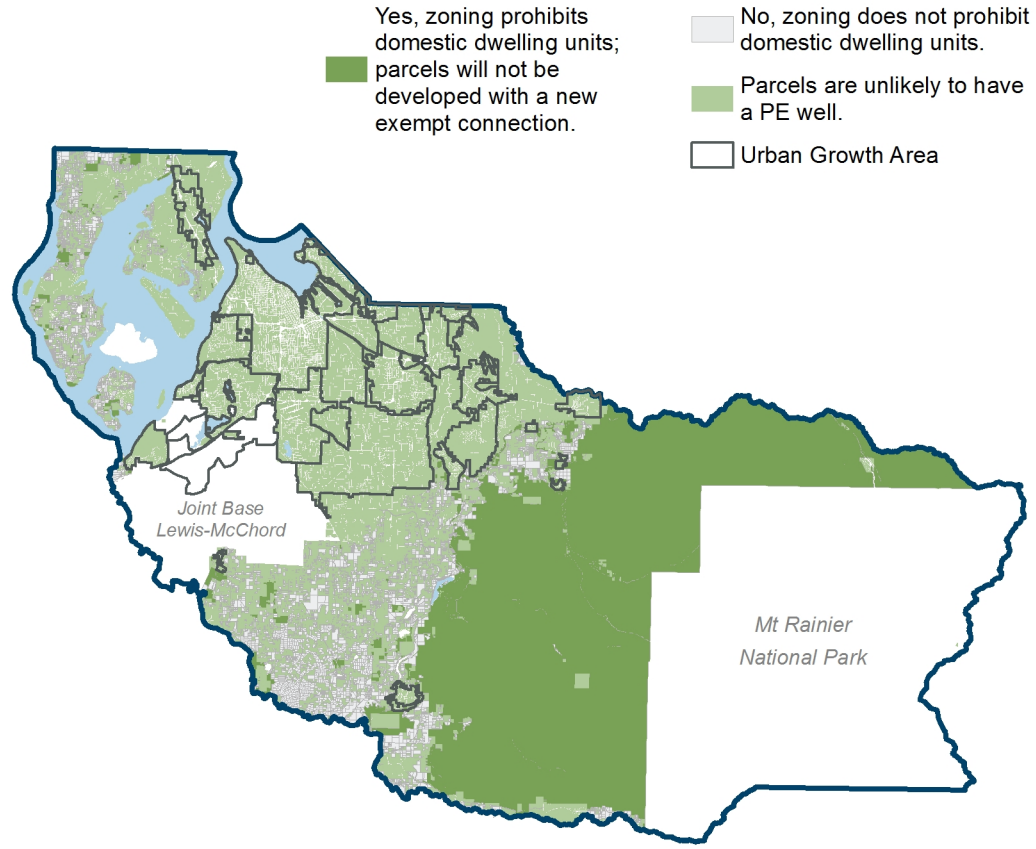
Is the parcel already built upon?

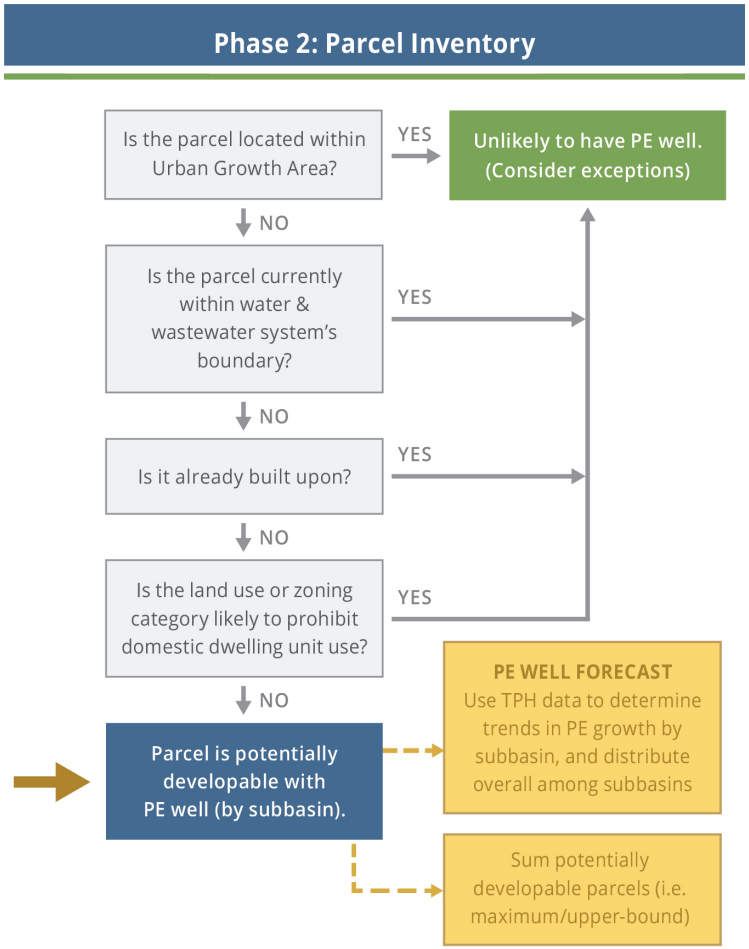


Phase 2: Parcel Inventory

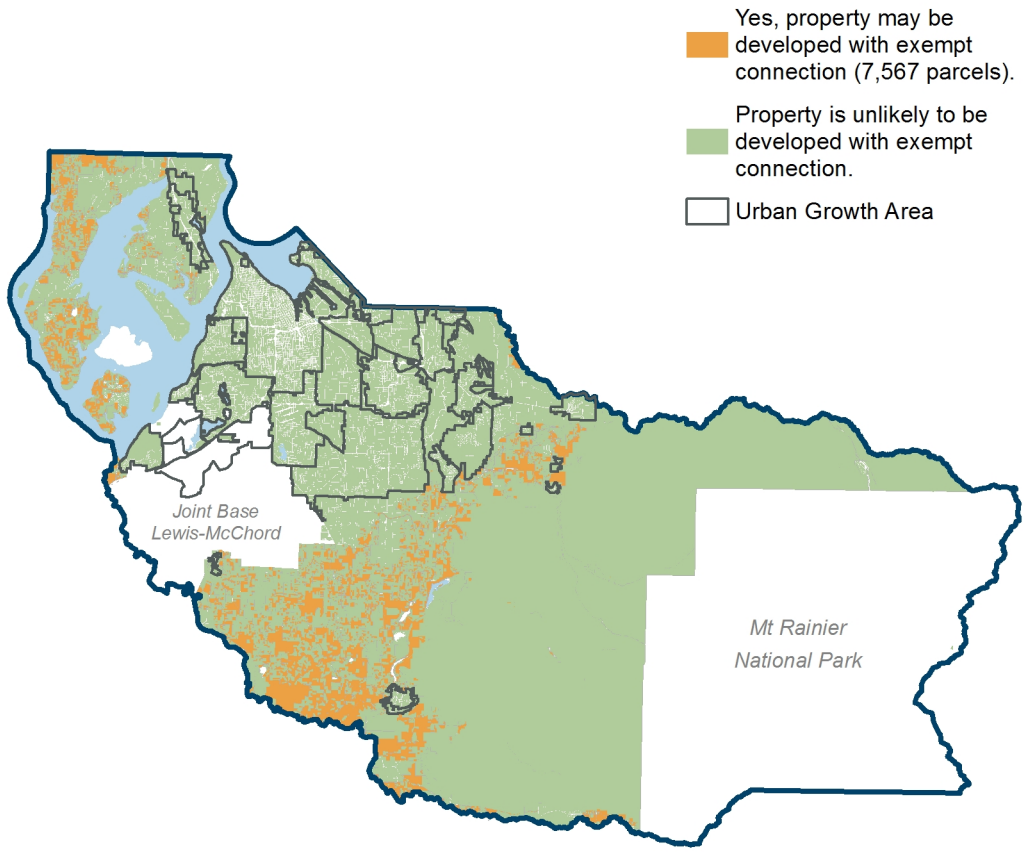


Does the land use or zoning prohibit domestic dwelling units?

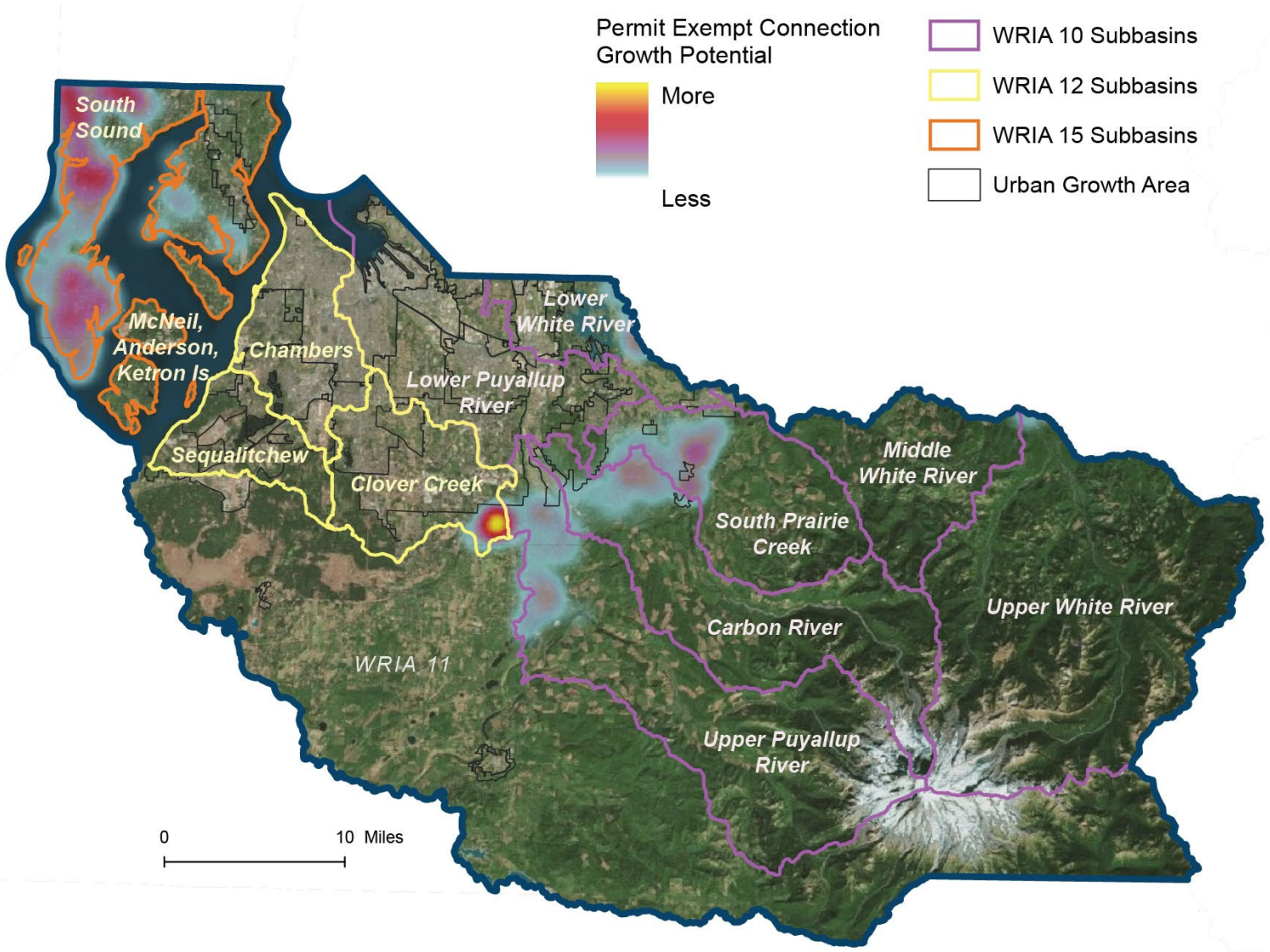




Parcel is potentially developable with PE well.



Pierce County Growth Projection Analysis



Appendix H – Projects

Appendix H – Projects

WRIA 10 Project Inventory

Project Number	Project Name	Project Type and Brief Description	Water Offset (AFY)	Timing of Water Offset	Additional Benefits	Project Sponsor	Tier (Offset Projects Only)	Project Stage	Estimated Water Offset Cost	Estimated Total Project Cost
Carbon River (CR)										
10-CR-W4	Alward Road	Levee Setback. Property acquisition and restoration of 150 acres of floodplain. Includes decommission of 20 PE wells	8	Year-round	Restoration of 150 acres of floodplain, flood hazard reduction	Pierce County	1	Feasibility Study	$ 21,000	$ 14,000,000
10-CR-W3	Carbon River Levee Setback and Acquisition	Water Right and Levee Setback. Purchase a property as part of a larger levee setback project and acquire associated water right.	14.3	Irrigation Season	Habitat restoration.	Pierce County	2	Assessment	$ 37,000	$ 19,000,000
Lower Puyallup (LP)										
10-LP-W6	Potential MAR	MAR. Construct an MAR in a gravel pit supplied with Tacoma Water. Three potential locations are identified in the Lower Puyallup.	300	Year-round		None	2	Conceptual	$ 1,100,000	$ 1,100,000
10-LP-W10	Bond	Water Right. Acquire water right as part of a larger property transfer and protection with the City of Puyallup	30	Irrigation Season		City of Puyallup	2	Outreach	$ 80,000	$ 80,000
10-LP-H5	Deer Creek Stream Bed Relocation	Relocate the creek bed to allow for a better connection to the floodplain, restore habitat in the adjacent areas.	N/A	N/A	Improve habitat and provide flood storage.	City of Puyallup	H	Design	N/A	TBD
10-LP-H6	Swan Creek Channel and Bank Stabilization	In-channel stabilization and restoration measures including installation of woody material and streambed gravel.	N/A	N/A	Restore 2.5 miles of Swan Creek.	Pierce County and Puyallup Tribe	H	Design	N/A	$ 3,700,000
10-LP-H7	Silver Creek bank Stabilization	Restoration. Stabilize slopes of Silver Creek to stop channel incision.	N/A	N/A	Habitat restoration.	City of Puyallup	H	Conceptual	N/A	TBD
10-LP-H8	Puyallup River (Union Pacific) Setback Levee (RM 2.6-3.0) - Acquisition	Levee setback. Acquire up to 30 acres of floodplain and former intertidal habitat.	N/A	N/A	Habitat restoration.	Pierce County	H	Conceptual		$ 8,500,000
10-LP-H9	Clear Creek RM 2.9 Acquisition and Levee	Levee setback and floodplain reconnection. Construct a new 13,600' levee along Clear Creek and remove flood gate. Reconnect up to 500 acres of floodplain.	N/A	N/A	Habitat restoration.	Pierce County	H	Conceptual		$ 5,473,802
10-LP-W18	Troutlodge Source Switch	Switch hatchery water right from surface diversion to groundwater.	N/A	N/A	Barrier removal	Pierce County, Puyallup Tribe	2	Conceptual	TBD	TBD
10-LP-H10	Fennel Creek Phase 3	Floodplain restoration This project will restore the Fennel Creek right bank floodplain to a more natural state. Project	N/A	N/A	Restore 14 acres of floodplain.	Pierce County	H	Design		$ 1,662,329

Project Number	Project Name	Project Type and Brief Description	Water Offset (AFY)	Timing of Water Offset	Additional Benefits	Project Sponsor	Tier (Offset Projects Only)	Project Stage	Estimated Water Offset Cost	Estimated Total Project Cost
		may include a small offset by removing existing PE wells.								
10-LP-W9	Puyallup R. # 1	Water right acquisition would result in an additional 0.75 cfs in 10 miles of the Puyallup River.	82.82	Irrigation Season		TBD	2	Conceptual	$ 212,930	$ 212,930
10-LP-W10	Puyallup R. # 3	Water right acquisition would result in an additional 0.3 cfs in 6.5 miles of the Puyallup River.	36.23	Irrigation Season		TBD	2	Conceptual	$ 93,147	$ 93,147
10-LP-W11	Puyallup R. # 4	Water right acquisition would result in an additional 0.38 cfs in 1.5 miles of Clarks Creek and 6.7 miles of Puyallup River.	19.92	Irrigation Season		TBD	2	Conceptual	$ 51,214	$ 51,214
10-LP-W12	Fennel Cr - Puyallup R. #5	Water right acquisition would result in an additional 0.22 cfs in 16 miles of the Puyallup River.	23.55	Irrigation Season		TBD	2	Conceptual	$ 60,547	$ 60,547
10-LP-W13	Hylebos Cr - Fr Comm Bay #1	Water right acquisition would result in an additional 0.67 cfs in 6 miles of Wapato Creek.	34.35	Irrigation Season		TBD	2	Conceptual	$ 88,314	$ 88,314
Lower White (LW)										
10-LW-H14	Jovita Creek Habitat Project	Restoration actions to address channel confinement, and that restore habitat and habitat forming processes.	N/A	N/A	Habitat restoration.	City of Edgewood	H	Feasibility	N/A	$ 250,000
10-LW-H15	Pacific Right Bank	Levee setback The proposed project will remove a levee and other artificial floodplain fill, allowing for off-channel habitat and floodplain restoration. The total project area available for restoration is estimated at 32 acres.	N/A	N/A	Habitat restoration, floodplain reconnection.	King County Flood Control District	H	Design	N/A	$ 79,000,000
10-LW-H16	White River LB RM 2.9-4.2 Restoration	Habitat restoration. White River Restoration will restore sustainable instream, floodplain, and wetland habitats within a 170 acre area along the Lower White River between river miles 2.9 and 4.2. The tailrace between RM 3 and RM 3.5 is part of the Foster Pilot Project and not included as part of the offset and NEB accounting.	N/A	N/A	Restore sustainable instream, floodplain, and wetland habitats within a 170 acre area along the Lower White River between river miles 2.9 and 4.2.	City of Sumner	H	Design	N/A	$ 25,000,000

Project Number	Project Name	Project Type and Brief Description	Water Offset (AFY)	Timing of Water Offset	Additional Benefits	Project Sponsor	Tier (Offset Projects Only)	Project Stage	Estimated Water Offset Cost	Estimated Total Project Cost
10-LW-H17	White River Bridge (Stewart Road) replacement RM 4.9	The project will consist of replacing the existing Stewart Road Bridge with a new bridge. The existing bridge is a restriction along the river, and a new bridge will allow the river more room to move naturally, allowing better utilization of instream habitat beneath the bridge. The current bridge also limits the flow of large woody debris, while a new bridge will let them large woody debris flow downstream and accumulate naturally through the rest of the lower White River.	N/A	N/A	Habitat restoration.	City of Sumner	H	Design	N/A	$ 30,000,000
10-LW-H18	White River Setback LB RM4.4-4.8 Stewart	The project consists of a levee setback on the left bank between RM 4.4 - RM 4.8. This project Improve Rearing Opportunity by creating slow water habitat, increased number/depth of pools, engaged floodplain food webs. Better High Flow Refuge with floodplain wetlands, and greater main channel roughness. Restore riparian forests. The project will reconnect about 20 acres of floodplain.	N/A	N/A	Habitat restoration. Reconnect 20 acres of floodplain.	City of Sumner	H	Design	N/A	$ 7,000,000
10-LW-H19	Pacific Pointbar	The project consists of a levee setback on the left bank between RM 4.4 - RM 4.8. This project will improve rearing opportunity by creating slow water habitat, increased number/depth of pools, and engaged floodplain food webs. Better High Flow Refuge with floodplain wetlands, and greater main channel roughness. Restore riparian forests. The project will reconnect about 25 acres of floodplain.	N/A	N/A	Habitat restoration. Reconnect 25 acres of floodplain.	City of Sumner	H	Design	N/A	$ 18,000,000
Middle White (MW)										
10-MW-W7	CWA purchase	Water Right. Acquire a portion of the Cascade Water Alliance water right to place in trust.	277	Year-round		Ecology	1	Outreach/Negotiation	$ 750,000	$ 750,000
10-MW-H13	Enumclaw Golf Course Restoration	Stream restoration to move Boise Creek back to its historic channel adjacent to the Enumclaw Golf Course.	N/A	N/A	Increased habitat complexity and channel roughness.	City of Enumclaw and Puyallup Tribe	H	Design	N/A	$ 2,300,000
10-MW-W14	Boise Cr - White R # 2	Water right acquisition would result in an additional 0.22 cfs in 24.7 miles of White River and 10.5 miles of Puyallup River.	53.86	Irrigation Season		TBD	2	Conceptual	$ 138,474	$ 138,474

Project Number	Project Name	Project Type and Brief Description	Water Offset (AFY)	Timing of Water Offset	Additional Benefits	Project Sponsor	Tier (Offset Projects Only)	Project Stage	Estimated Water Offset Cost	Estimated Total Project Cost
10-MW-W15	Boise Cr - White R # 3	Water right acquisition would result in an additional 0.3 cfs in 0.2 miles of Cyclone Creek, 24.3 miles of White River, and 10.5 miles of Puyallup River.	47.06	Irrigation Season		TBD	2	Conceptual	$ 120,991	$ 120,991
10-MW-W16	Boise Cr - White R # 4	Water right acquisition would result in an additional 0.3 cfs in 3 miles of Boise Creek, 23.4 miles of White River, and 10.5 miles of Puyallup River.	4.706	Irrigation Season		TBD	2	Conceptual	$ 12,099	$ 12,099
South Prairie Creek (SPC)										
10-SPC-W2	Old Inglin Dairy	Water Right. Floodplain restoration of former dairy, and place water rights into trust after plants are established.	89.09	Irrigation Season	Floodplain restoration/reconnection, habitat enhancement.	Pierce Conservation District	1	In progress	$ 230,000	$ 230,000
10-SPC-H2	Implement habitat projects based on SPC study.	Habitat improvement projects. Identify and design protection and restoration actions for the lower 15.5 miles of South Prairie Creek and the lower 6 miles of Wilkeson Creek.	N/A	N/A	Habitat restoration, water quality improvements, fish passage improvements.	Pierce Conservation District, Puyallup Tribe, South Puget Sound Salmon Enhancement Group	H	Planning study funded	N/A	$ 469,000
10-SPC-H3	Stubbs Project	In-channel stabilization and restoration measures including installation of woody material and streambed gravel. Slight chance of a water right acquisition included in this project.	N/A	N/A	Habitat restoration.	Pierce Conservation District	H	Conceptual	TBD	TBD
10-SPC-H4	South Prairie Creek RM 4.0-4.5 Floodplain Planting	Habitat improvement. Continue planting efforts on the South Prairie Creek Preserve property between river mile 4.0 and 4.5 to maintain and in-fill existing plantings on the property.	N/A	N/A	Habitat restoration and establishment of 50-55 acres of forested floodplain.	Pierce Conservation District, South Puget Sound Salmon Enhancement Group (SPSSEG)	H	In progress	N/A	$ 369,000
10-SPC-H22	South Prairie Creek Floodplain Reconnection, RM 2.7-2.8 Phase 1	Floodplain restoration. Acquire 73 acres and implement a multi-benefit floodplain reconnection project that would reduce flood risk and maintenance costs, restore vital salmon habitat, and keep the property in agricultural production.	N/A	N/A	Habitat restoration. Water quality improvements.	Pierce Conservation District	H	Conceptual	N/A	$ 1,239,000
Upper Puyallup (UP)										

Project Number	Project Name	Project Type and Brief Description	Water Offset (AFY)	Timing of Water Offset	Additional Benefits	Project Sponsor	Tier (Offset Projects Only)	Project Stage	Estimated Water Offset Cost	Estimated Total Project Cost
10-UP-W1	Orville Road Revetment Phase 2C Year 1	Floodplain Reconnection/Levee Setback. Purchased and decommission a PE well that served 3 homes as part of this project.	1.2	Year-round	Habitat restoration. 1,500 Linear Feet of setback revetment, 19 engineered log jams.	Pierce County	1	In progress/complete	$ 3,100	$ 2,200,000
10-UP-H1	Orville Road Revetment at Kapowsin Creek	This project will construct a setback revetment along the left bank Puyallup River near RM 26.3 from Kapowsin Creek confluence upstream. May allow for re-connection of approximately 25-acres of forested floodplain between Puyallup River and Orville Road.	N/A	N/A	Habitat restoration. Reconnect 25 acres of floodplain.	Pierce County	H	Preliminary Design	N/A	$ 3,880,306
10-UP-W17	Fiske Cr - Puyallup R. #3	Water right acquisition would result in an additional 0.45 cfs in 23 miles of the Puyallup River.	72.15	Irrigation Season		TBD	2	Conceptual	$ 185,498	$ 185,498
Upper White (UW)										
10-UW-H11	Greenwater Phase 4 Implementation	Reach scale restoration to restore instream complexity and floodplain connectivity.	N/A	N/A	Restore 1.2 miles of Greenwater River.	SPSSEG	H	Design	N/A	$ 1,500,000
10-UW-H12	West Fork White Floodplain Project	Floodplain restoration project to restore habitat and habitat-forming processes.	N/A	N/A		SPSSEG	H	Conceptual	N/A	$ 3,000,000
WRIA-Wide (WW)										
10-WW-W8	Green Stormwater Infrastructure	Stormwater infiltration. Support Green Stormwater Infrastructure retrofits for both individual property owners and jurisdictions. Goal of 10 projects per year.	27	Year-round	Water quality improvements	Pierce Conservation District	2	Planning	$ 900,000	$ 900,000
10-W9-W17	WWT assessment	Water Right. Acquire 10% of the water rights identified through Washington Water Trust assessment. These rights are listed individually in this table.	41.71	Irrigation Season		Unknown	2	Conceptual	$ 110,000	$ 110,000
10-WW-H20	Land acquisition, water right acquisition, and restoration	Seek out opportunities for land and water right acquisitions and large scale habitat restoration and floodplain reconnection/levee setbacks.	N/A	N/A	Habitat restoration, habitat protection.	Multiple	2	Conceptual	TBD	TBD
10-WW-W19	General source switches for ag producers	Ag producers switch from surface to groundwater rights. More water in the stream during the low flow periods. Individual projects would need to be evaluated for Foster impacts, and might not be legal until the Foster is addressed.	N/A	N/A	Improved water quality for agriculture producers.	PCC Farmland Trust	2	Conceptual	TBD	TBD

Project Number	Project Name	Project Type and Brief Description	Water Offset (AFY)	Timing of Water Offset	Additional Benefits	Project Sponsor	Tier (Offset Projects Only)	Project Stage	Estimated Water Offset Cost	Estimated Total Project Cost
10-WW-H21	Levee setbacks	Implement projects included on the Pierce County Levee Setback Feasibility Study as opportunities arise. The study lists levees in Pierce County that may be set back to improve floodplain function and habitat. Any of these levee setback projects would contribute to NEB as well as small but difficult to calculate water offsets by allowing for additional infiltration during high flow events.	N/A	N/A	Floodplain reconnection, habitat restoration.	Pierce County	H	Conceptual	N/A	TBD

ALWARD ROAD ACQUISITION AND RESTORATION

Narrative description, including goals and objectives.

Pierce County has been acquiring property along Alward Road near Orting since 1989, in the Carbon River sub-basin (WRIA 10). This proposal would complete the acquisition and construct a setback levee and make other restoration improvements which will reconnect 150 acres of floodplain adjacent to the Carbon River. Proposed actions at the Site include removing approximately 8,925 linear feet of existing levee located along the left (south) bank of the Carbon River. An armored levee of approximately 9,850 linear feet would be constructed and set back from the Carbon River to the south, encompassing an area of approximately 6,190,596 square feet (142 acres). Engineered log jams (ELJs) would be constructed alongside Alward Road to protect it from erosion. Riparian restoration would also occur in floodplain areas. A total of 30 properties will need to be acquired. An ongoing phase of the project (Phase 3) will purchase 10 of those properties.

The goals of the project include the following:

- Remove the existing river levee and reconnect the Carbon River left bank floodplain which will allow salmon and trout species to access an additional 150 acres of off-channel habitat.
- Allow for more natural floodplain inundation and function respective to frequency, depth and duration without obstruction.
- Facilitate the restoration of natural watershed and conserve the properties for habitat in perpetuity.

The objectives of the project are:

- Acquire thirty Carbon River Alward Road reach floodplain properties
- Remove structures on purchased property
- Remove existing levee and install setback levee
- Install ELJs alongside Alward Road
- Restore floodplain areas with riparian plantings

An estimated 20 residential structures will be acquired and removed, potentially providing a water offset benefit equal to 20 new permit-exempt wells. The water offset benefit will occur when the structures are acquired, likely within the next five years.

Qualitative assessment of how the project will function.

The project will function by allowing natural processes to develop in a large floodplain area currently isolated by a levee.

Conceptual-level map of the project and location.

The acquisition area of the proposed project is located along the north side of Alward Road between river miles 6.8 and 8.0 of the left bank side of the Carbon River. This segment of river lies between 226th AVE CT E and the end of Alward Road. Figure 1, prepared by Pierce County, shows the vicinity of the project. Figure

2 shows the parcels needing to be acquired and includes the ten parcels being acquired as part of Phase 3. Figure 3, prepared by GeoEngineers, shows an overview of the 30% design of the levee setback portion of the project. (The full set of 30% design drawings are available on Box.)

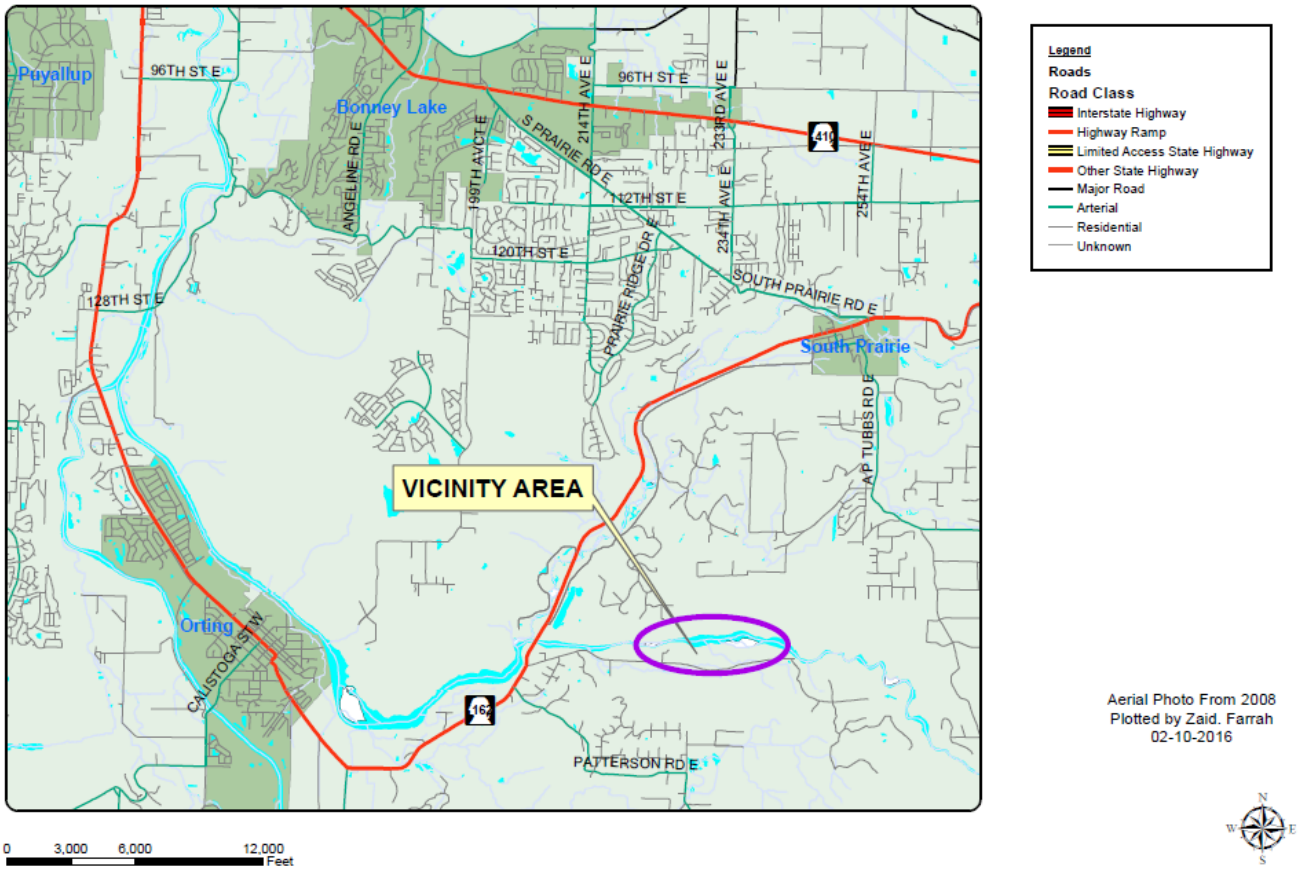


Figure 1. Alward Road Acquisition Project (from Pierce County, 2016)

Performance goals and measures.

The performance goal is to acquire 30 parcels between river miles 6.4 and 8.4 of the Carbon River. All existing structures will be removed, and all properties will be retained as open space in perpetuity. An existing levee will be removed and a setback levee constructed. Floodplain areas will be restored. This project builds upon SRFB project 13-1422 and other County efforts to acquire all floodplain parcels within the project reach.

Description of the anticipated spatial distribution of likely benefits.

Benefits to river processes will occur in the project area between river mile 6.4 and 8.4; side channel and other habitat features formed as a result of this project will benefit a variety of salmonid species as described in the next paragraph. Salmonids in the lower Carbon River and in the Puyallup River will benefit from increased habitat and reduced peak flow and sediment input.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

The Carbon River supports a variety of salmonid species including ESA threatened Chinook, Steelhead, and Bull Trout. Other salmonid species on the Carbon River that would receive benefit from this project include Coho, fall chum, and pink salmon, and Cutthroat Trout. The Carbon River fall Chinook salmon run is also listed as one of 22 unique species, or Evolutionarily Significant Units (ESUs), in Puget Sound. The salmonids and other aquatic species in the Greenwater River are subject to the current limiting factors present.

According to the Limiting Factors Report for the Puyallup Watershed by Kerwin (1999), limiting factors that may be addressed by the project include the following:

- Loss of floodplain habitat, wetlands, and connectivity to hyporheic zone
- Loss of bank stability
- Loss of off channel and side-channel habitat
- Loss of instream habitat complexity and connectivity due to large wood
- Loss of riparian habitat

Removal of the existing levee will promote the creation of a variety of habitat types including side channels, backwater channels, deep complex pools, spawning habitat and summer and winter rearing habitat by promoting the creation of a variety of habitat types and hydrologic features. ELJs would be placed strategically to promote lateral migration of the river. These complex habitats provide protection from flood events and act as riparian cover and rearing habitat, which supports juvenile salmonids and provides areas for fry to colonize. Coho salmon may also spawn in low velocity side channels. Deep complex pools would also be created. These provide cover and prey availability during migratory periods for adult salmonids and cover for juveniles when log jams are present. Deep pools are also generally colder than other in-water environments, providing appropriate temperatures and acting as a refuge. As new, sinuous channels develop, there will be a significant increase in the development of shallow edge habitat along the expanding channel system, providing shade and cover for fry and juvenile salmon during rearing. Invertebrates colonizing the edge habitat are also a prey source for juveniles. A more sinuous river will result in a slower velocity system where a greater range of sediment and substrate types are available due to the complexity of habitats present. Spawning salmonids would benefit from a range of substrate sizes. It should also be noted that habitat restoration is extremely important for Steelhead stocks due to the extended period of time they spend in freshwater. The functions and benefits of the habitat and hydrologic features that would be created by the project address many of the limiting factors currently present in the Carbon River.

Identification of anticipated support and barriers to completion.

This project builds upon other County efforts to acquire all floodplain parcels within the project reach. Prospective property owners have been contacted and Landowner Acknowledgment Forms have been signed for the Phase 3 portion of the project (acquisition of 10 parcels). All property owners in the Phase 3 project have indicated their willingness to sell their properties. The project is sponsored by Pierce County and supported by the Lead Entity.

Priority actions within the WRIA 10/12 Lead Entity Strategy include levee setbacks with highest priority to reestablish floodplain connectivity and to restore stream processes. Setbacks are identified as a Near Term Action and a High priority because they can result in re-connecting large areas of floodplain to the main river. They allow natural processes to create side-channel and off-channel habitat areas. The WRIA 10/12 Lead Entity Strategy additionally states that this type of action will provide the greatest restoration benefit to Puyallup/White River Chinook abundance. The Puget Sound Chinook Recovery Plan identified levee and dike setbacks as both a near-term and a long-term strategy to reduce further degradation of the mainstem rivers. Chapter 3 of the WRIA 10/12 Lead Entity Strategy and/or the PS Chinook Recovery Plan states, "Based on the tremendous benefits that floodplain reconnection projects will have for Chinook in WRIA 10/12, we think that our focus on freshwater habitat restoration in the lower Puyallup, lower Carbon and lower White River floodplains is an appropriate strategy."

Potential budget and O&M costs (order of magnitude costs).

The funding requested to complete acquisitions, removal of structures, levee setback, levee construction, and restoration of floodplain habitat is approximately $14 million. This cost estimate is based on acquisition and construction estimates that were completed in 2014. Some parcels have been acquired (RCO, 2020) which may reduce the cost; however, costs are likely higher due to inflation. A revised cost estimate will be needed.

No O&M costs have been identified for structure removal and levee removal. Levee installation and floodplain restoration may require some O&M to maintain riparian plantings and the new setback levee. These costs have not been estimated.

The costs of just decommissioning the existing wells to provide a water offset is not known; a unit cost of $2571 per acre-foot is recommended by Washington Department of Ecology for water right acquisitions (Melcher, 2020) and was used for this project. For 20 wells with an average water offset of 0.4 acre-feet per year, the total cost would be approximately $20,600. That cost is preliminary and is used just for purposes of estimating costs of water offset projects for the watershed plan.

Anticipated durability and resiliency.

Levee setback and floodplain restoration projects are durable as they restore natural processes to a reach of the river, allowing flooding and channel migration to occur unimpeded. Instream wood placement projects are also durable; they support natural processes and encourage accumulation of smaller debris. Given the changing climate conditions, that anticipates receding glaciers, and increases in precipitation, rain-on-snow events, and channel aggradation, setback projects that provide the river with more room to meander are important solutions to implement to restore watershed processes and to provide resiliency from a changing climate.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Pierce County is the project sponsor and is ready to implement the project as property owners have indicated their willingness to sell their properties. The overall project can likely be implemented within the next five years.

Documentation of sources, methods, and assumptions.

The following references were used:

Puyallup and Chambers Watersheds Salmon Recovery Lead Entity (Lead Entity). 2018. Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds. June. https://www.piercecountywa.org/ArchiveCenter/ViewFile/Item/6075

Kerwin, J. 1999. Salmonid Habitat Limiting Factors Report for the Puyallup River Basin. Washington Conservation Commission.

GeoEngineers, 2008. Levee Setback Project Carbon River - Alward Road Site River Mile Post 8.30 To 6.40 Left Bank 30% Design Plans.

GeoEngineers, 2008. Levee Setback Feasibility Analysis Puyallup River Watershed Pierce County, Washington. Prepared for Pierce County Public Works & Utilities, June 19, 2008

Mary Ann Reinhart & Tim Abbe, December 29, 2014. Flood Plain Reconnection Feasibility Study Puyallup, Carbon, White Rivers Pierce County, Washington. Prepared for: Puyallup River and Chambers Creek Lead Entity Technical Advisory by Natural Systems Design, Inc.

Melcher, Austin (Washington Department of Ecology). Memo regarding: Water Offset Project Potential Cost Estimate Methodology. Sent to Ingria Jones, John Covert. September 17, 2020

Pierce County, Alward Road Setback Levee Fact Sheet. Undated

Washington State Recreation and Conservation Office (RCO), 2020. Alward Rd. Acquisition Phase 3. PRISM Project #17-1355. Available from: https://secure.rco.wa.gov/prism/search/projectsnapshot.aspx?ProjectNumber=17-1355

Figure 2 [Attached]. Alward Road Parcels Map

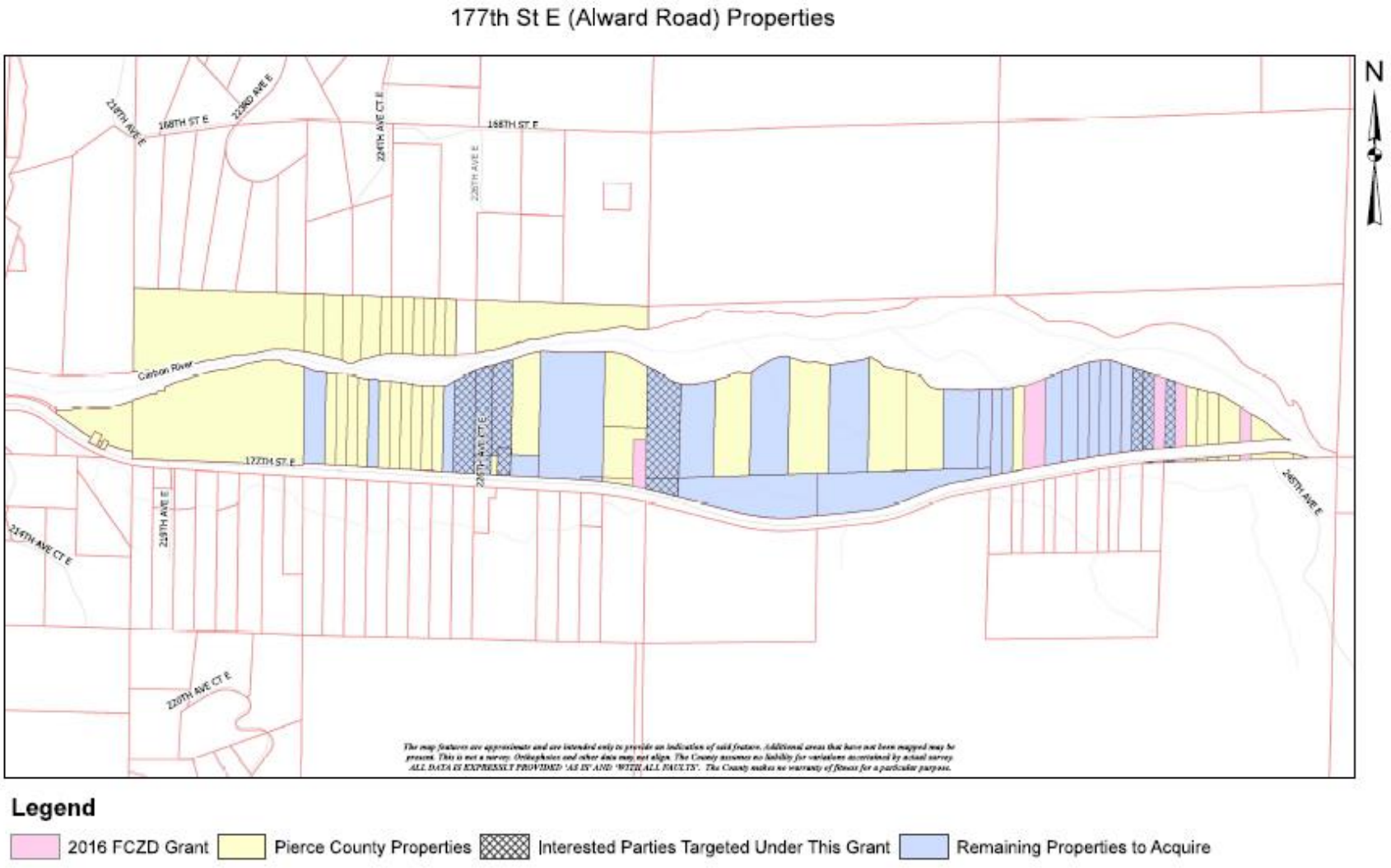
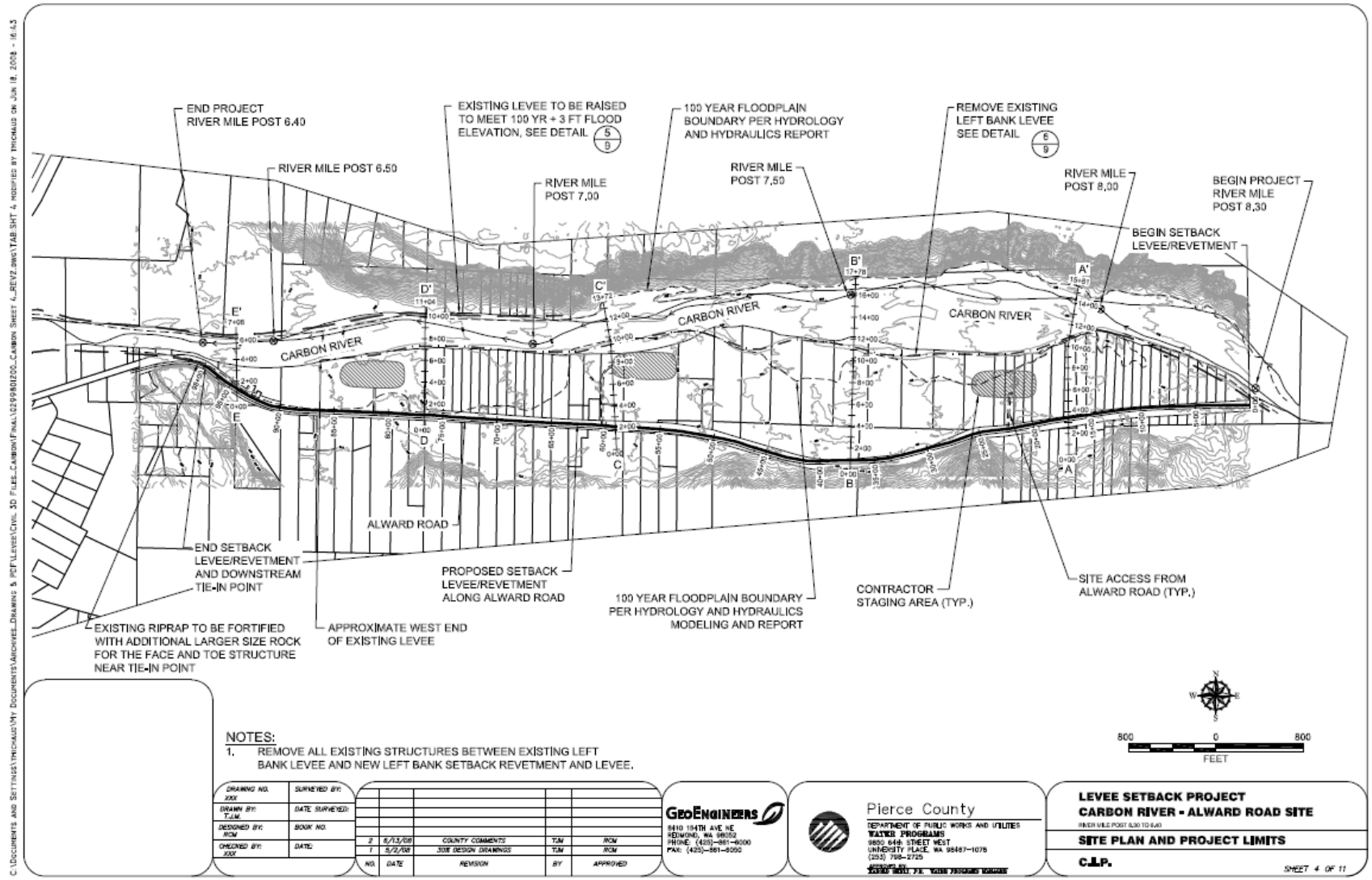


Figure 3 [Attached]. Alward Road 30% Design Drawings Overview (Page 4 from GeoEngineers, 2008)



WRIA 10 CASCADE WATER ALLIANCE WATER RIGHTS ACQUISITION
PROJECT DESCRIPTION – DECEMBER 28, 2020

Description

Cascade Water Alliance (CWA) currently serves communities north of WRIA 10 in the Green River and Lake Washington Watersheds. They acquired the Lake Tapps project from Puget Sound Energy and obtained water rights for future municipal use. This project would acquire a portion of the water rights from CWA and place it in the State's Trust Water Rights Program to contribute to streamflow while protecting the water right from relinquishment.

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

CWA were granted water rights (Permit S2-29920(A)) with a priority date of June 20, 2000 for withdrawal of up to 1,000 cfs and 54,300 acre-feet from the White River. The purpose of use is municipal. The place of use for this water right is shown in Figure 1. This project would acquire 277 acre-feet from the municipal permit held by CWA and place that quantity in the State's Trust Water Right Program. The streamflow benefit will likely occur year-round.

Description of the anticipated spatial distribution of likely benefits

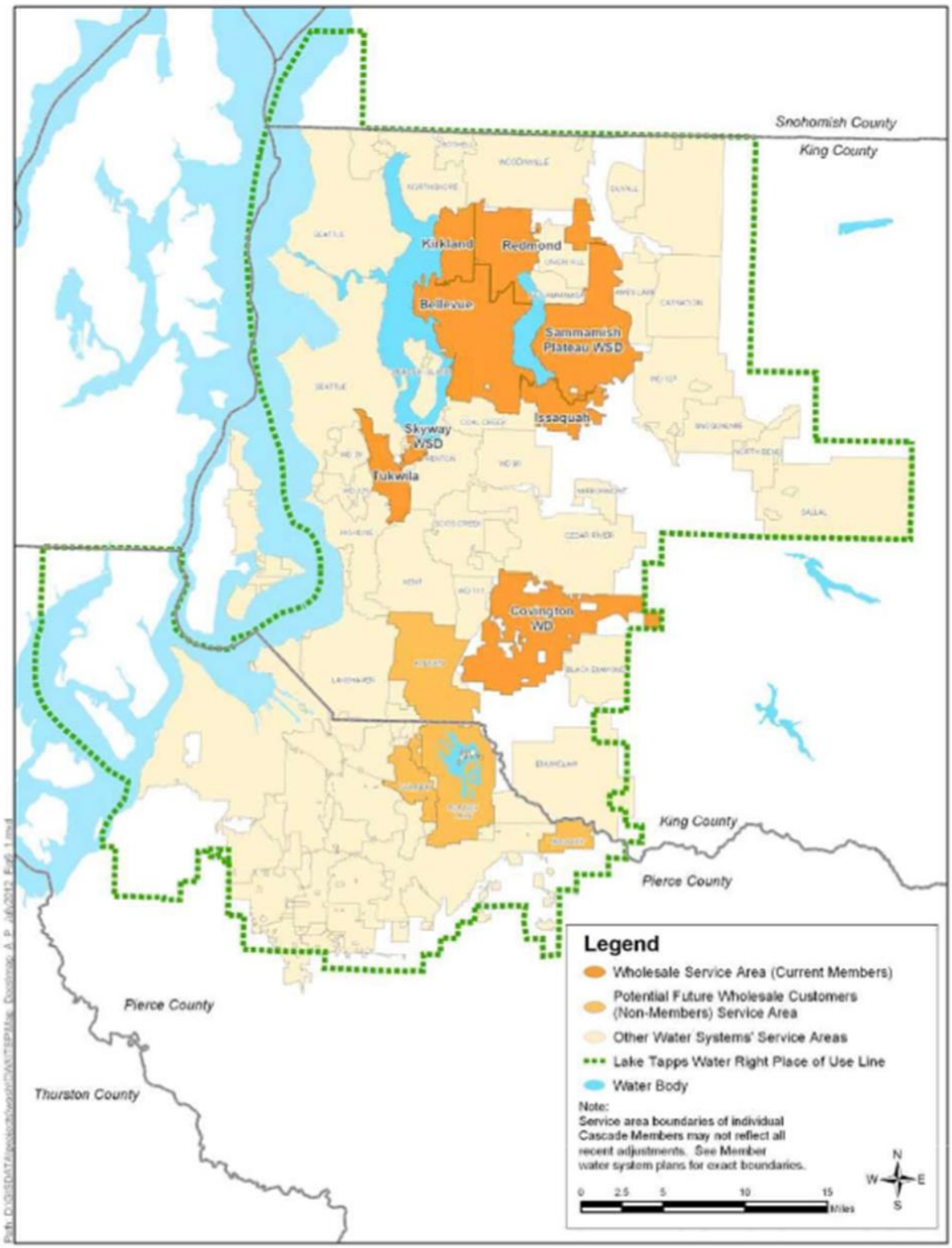
The water is currently diverted from the White River at river mile 24.3, held in Lake Tapps and released at river mile 3.6. The benefits on the White River could extend from the diversion dam at river mile 24.3 to its confluence with the Puyallup River at river mile 0.0 and on the Puyallup River from its river mile 10.4 to river mile 0.0. Those reaches of the White and Puyallup rivers are within WRIA 10. Figure 2 provides a schematic of the White and Puyallup river stream reaches.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

This project will slightly increase instream flow. The primary limiting factors in the Puyallup Watershed (Kerwin, 1999; Lead Entity, 2018) which would be addressed through this project include:

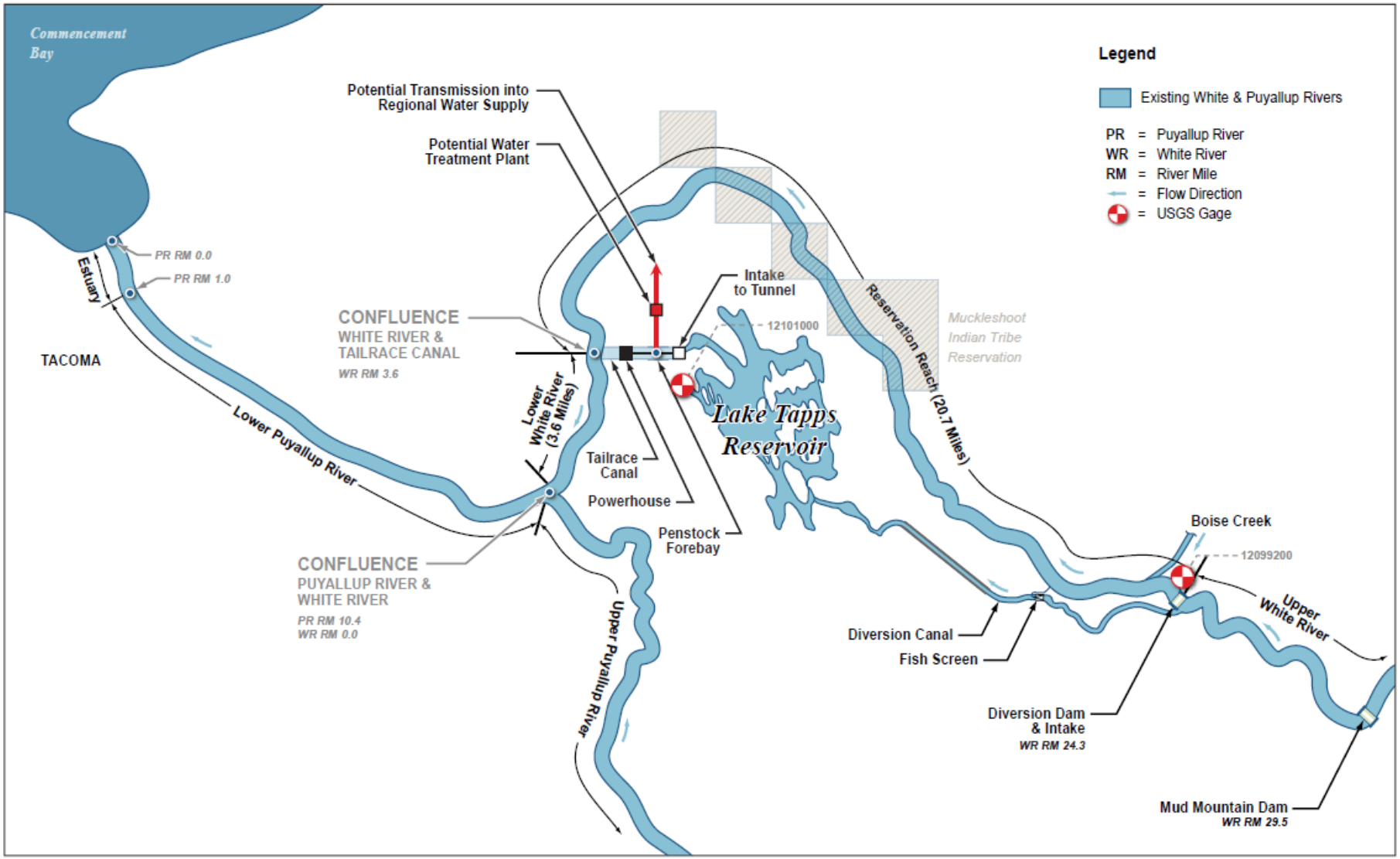
- Loss of upstream, downstream, and lateral fish passage
- Loss of spawning and rearing habitat
- Loss of good water quality, including appropriate temperature

Figure 1. Cascade Water Alliance Water Right Place of Use



Source: Cascade Water Alliance Transmission and Supply Plan, July 2012, Figure 6-1

Figure 2. Stream Reaches of the White and Puyallup Rivers



Source: Lake Tapps Reservoir Water Rights and Supply Project Draft Environmental Impact Statement January 29, 2010

Identification of anticipated support and barriers to completion.

The project is supported by the Watershed Restoration and Enhancement Committee and the barriers to completion would be negotiation of the water right acquisition from CWA and obtaining funding to purchase the water right. CWA has indicated a willingness to discuss the acquisition.

Potential budget and O&M costs.

No agreement or purchase price has been discussed with CWA. For planning purposes, a cost of $2,571 per acre-foot was used, resulting in an estimated cost of $750,000. The unit cost was obtained from an Ecology memo titled Water Offset Project Potential Cost Estimate Methodology (Melcher, 2020). No O&M costs would likely be incurred with this project.

Anticipated durability and resiliency.

The project would have lasting benefits as the Trust Water Right would be in perpetuity.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Washington Department of Ecology would be the project sponsor and would be ready to proceed immediately if acquiring a trust water right is feasible.

Sources of Information

Kerwin. 1999. Salmon Habitat Limiting Factors Report for the Puyallup River Basin (Water Resources Inventory Area 10). Washington State Conservation Commission. Olympia, WA.

Melcher, Austin. Memo regarding: Water Offset Project Potential Cost Estimate Methodology. Sent to Ingria Jones, John Covert. September 17, 2020

Puyallup and Chambers Watersheds Salmon Recovery Lead Entity (Lead Entity). 2018. Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds. June.

Managed Aquifer Recharge Project Portfolio for WRIA 10
December 28, 2020

Summary

Managed Aquifer Recharge (MAR) projects are being considered in WRIA 10 as a method to increase infiltration to aquifers to improve streamflow and to offset the water use from future permit exempt (PE) wells in the watershed. The planning and implementation of MAR projects is complex, leading to uncertainty as to their potential use as water offset projects and inclusion in the Watershed Restoration and Enhancement Plan. A potential approach to addressing uncertainty is to include a portfolio of MAR projects that have different locations, project sponsors, water sources, and size.

Potential WRIA 10 MAR Projects

There are different types of MAR projects. Aquifer Storage and Recovery (ASR) projects are a type of MAR project that actively injects water into aquifers for storage and recovery by pumping later. Passive MAR projects infiltrate water into shallow aquifers, with the intent that water discharges from the shallow aquifer into streams on a delayed basis and improves streamflow during low-flow periods. For WRIA 10, only passive MAR projects are being considered.

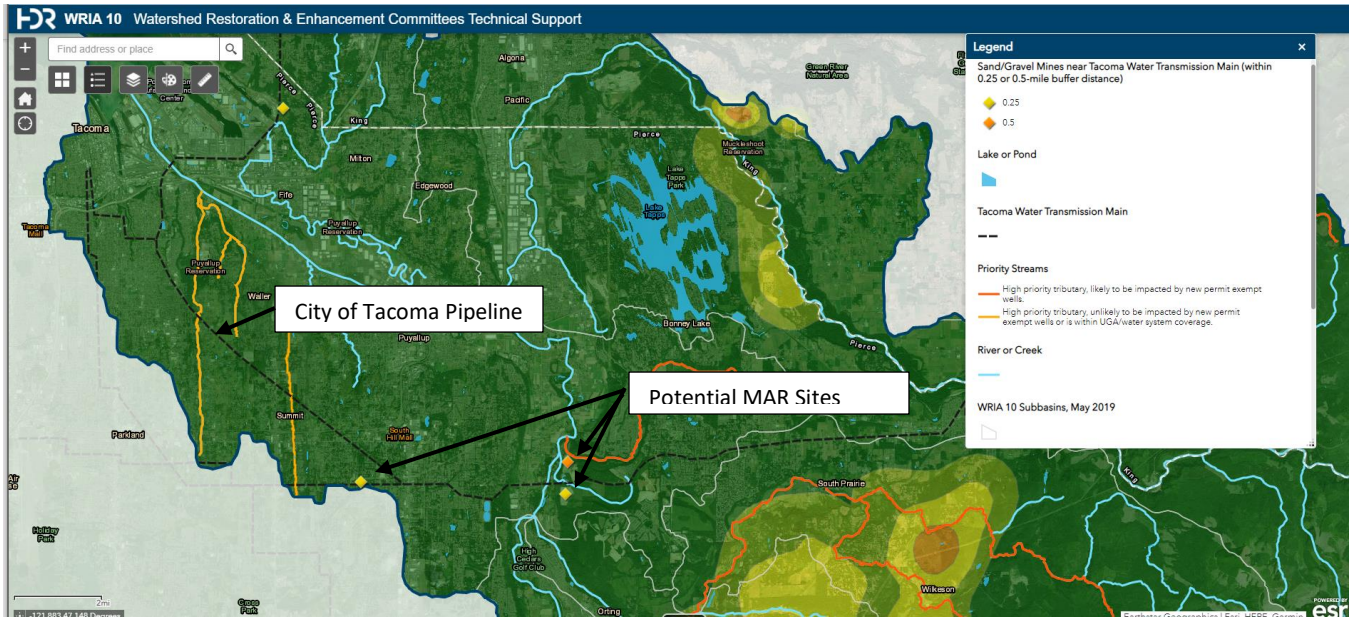
Passive MAR projects have the potential to recharge a significant volume of water into shallow aquifers, greater than the estimated consumptive use of PE wells forecast for the next 20 years in WRIA 10. The estimated consumptive use for future PE wells in WRIA 10 is 277 acre-feet per year.

The source of water for passive MAR projects in WRIA 10 may be stormwater, diverted surface water or water obtained from a City of Tacoma pipeline that delivers drinking water from the Green River watershed. Recycled water (highly treated wastewater) could be a source but at this time no source for recycled water was identified in WRIA 10 that is located outside of the Tacoma urban area.

The Watershed Restoration and Enhancement Committee expressed an interest in using City of Tacoma water supplied by their pipeline as it would be a clean and reliable source of water and may be easier to implement a project with that water source. A high-level screening of potential MAR sites was performed by PGG and HDR by searching for permitted sand and gravel mining operations located within a ½ mile distance of the pipeline. Three were found within ¼ mile and one within ½ mile. All the sites are located in the Lower Puyallup River subbasin. Three sites are included in this project description. The other site was located close to Commencement Bay and infiltration at that location would not provide a streamflow benefit. These sites have potential for MAR, however other sites not yet identified may also be suitable. A more intensive screening of sites should be performed if a MAR project is needed to provide water offsets for the Watershed Plan.

The location of the 3 sites and the City of Tacoma pipeline are shown in Figure 1.

Figure 1. Location of Potential MAR Sites



Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

Preliminary calculations of the potential size and infiltration capacity if a suitable gravel pit site is located were performed. A MAR facility may only need a footprint of 2 acres to infiltrate 300 acre-feet per year, using a conservative assumption of 2 feet/day for the infiltration rate. It was assumed that infiltration would occur during winter months as the City of Tacoma pipeline has excess capacity during winter. A flow rate of 1 cfs (450 gallons per minute) would be required from the City of Tacoma pipeline to infiltrate 300 acre-feet during the winter season. If several sites are feasible, the selection of how many are used and how much water is infiltrated at each would be a decision of the Watershed Restoration and Enhancement Committee. A MAR project can be scaled to the desired water offset or streamflow benefit.

A preliminary review of geology was performed for the sites. Geologic maps are shown in Figures 2 and 3. All three sites are in formations that would be suitable for infiltration. However additional geologic and geotechnical analyses are required before determining whether MAR projects would be feasible at those sites. The additional analyses are also required to determine the timing of the offset benefit. Water infiltrated at the two sites located just east of the Puyallup River would likely reach the adjacent streams (Fennel Creek, Canyonfalls Creek or the Puyallup River) more quickly than the third site which is located in the headwaters of Clarks Creek and Swan Creek. At this time, assuming the MAR facilities operate all but summer time, some streamflow benefit will likely occur

year-round.

Figure 2. Geology Map for MAR Sites East of Puyallup River near Bonney Lake

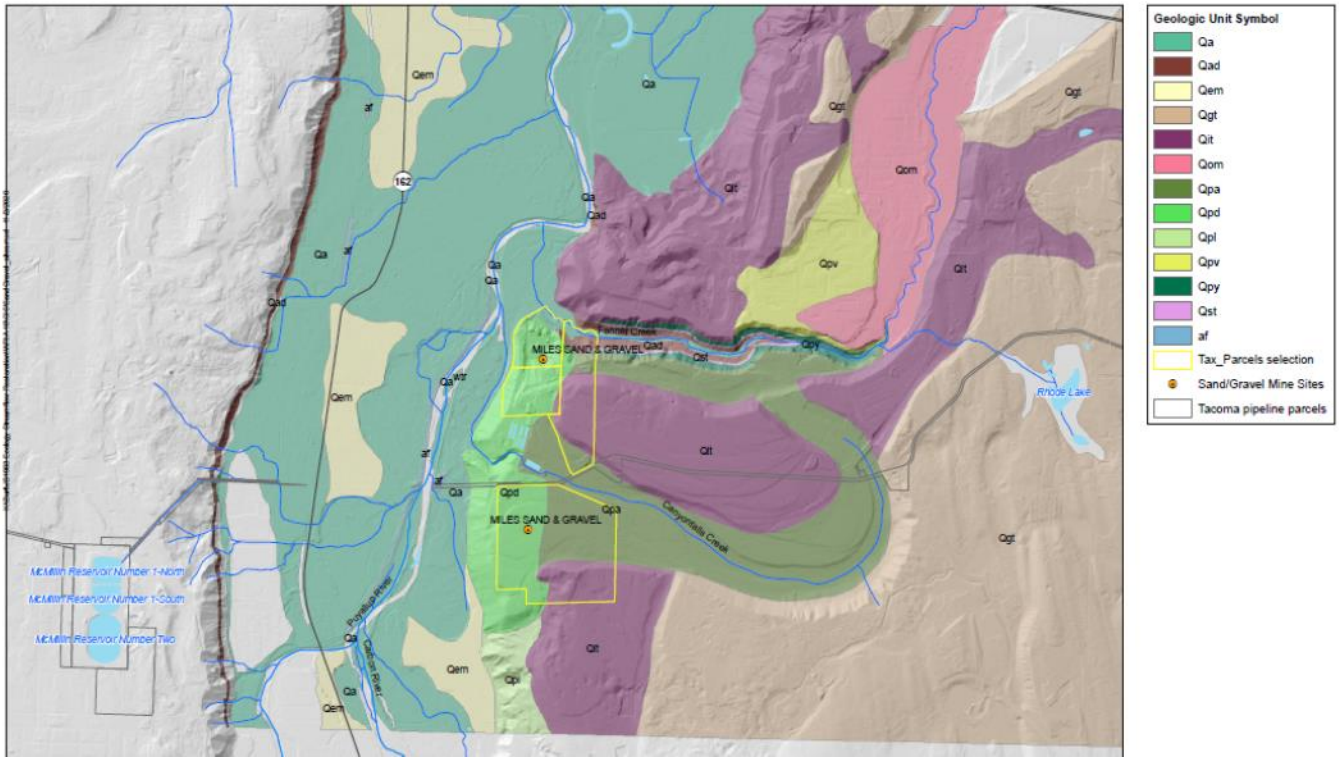
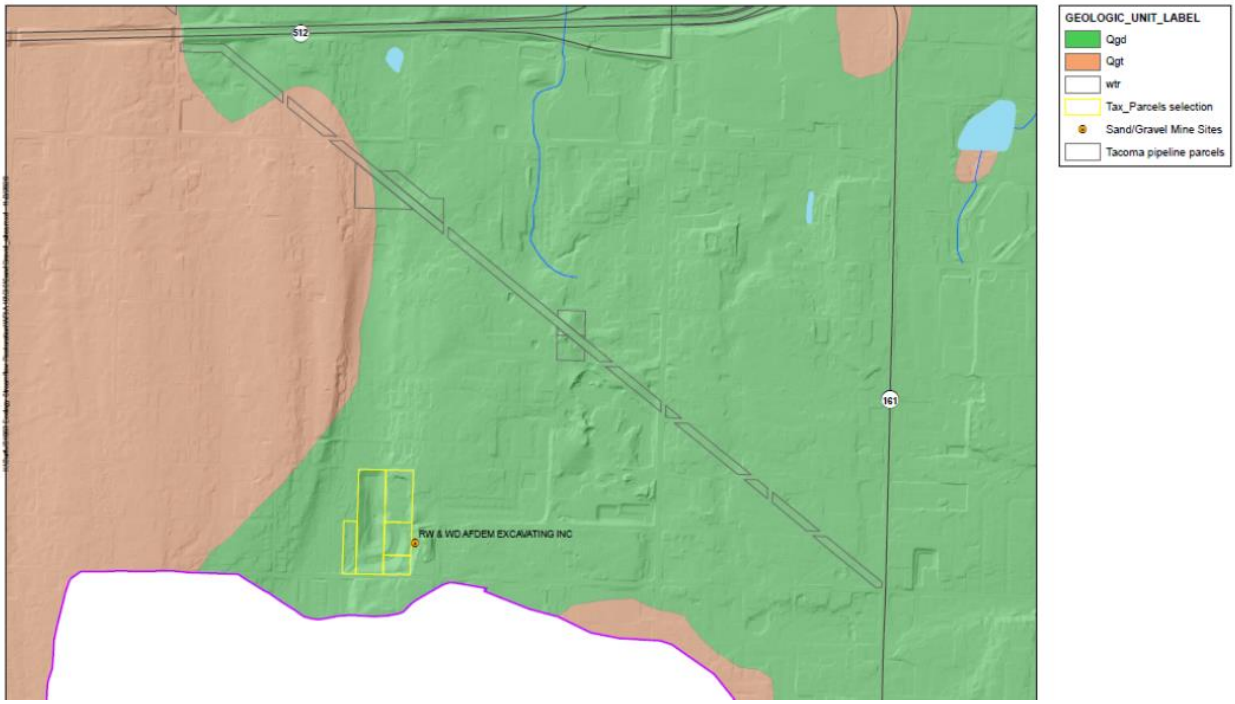


Figure 3. Geology Map for MAR Site in South Hill Area of Unincorporated Pierce County



Description of the anticipated spatial distribution of likely benefits

Two of the sites are active gravel pits located about ½ mile east of the Puyallup River near the City of Bonney Lake. Water infiltrated at those sites may improve stream flow conditions in the lower reach of Fennel Creek and Canyonfalls Creek or the Puyallup River. The length of the Puyallup River downstream of the sites is about 17 miles.

The third site is in unincorporated Pierce County in the South Hill area. Water infiltrated at that site may benefit Clarks Creek or possibly Swan Creek. Since the project is in the headwaters of those two creeks, a longer reach of the creeks may be benefitted. Clarks and Swan Creek merge together and flow into the Puyallup River approximately 5.8 miles from its mouth.

To assess the streamflow benefits of each project more detailed geologic mapping and hydrogeologic studies is needed. That work could be performed in a feasibility study of a site.

Locations relative to future PEW demand

Figure 1 also shows the heat map, with yellow to red colors indicating the geographic areas that are predicted to have the highest concentration of new permit-exempt wells. All the potential MAR sites are in locations with lower potential for growth in permit-exempt wells.

Performance goals and measures.

The volume of water purchased from the City of Tacoma will be measured and recorded using totalizing flow meters. The infiltration volume can be tracked through the amount of water purchased. A goal for infiltration can be established at the outset of the project and tracked at any time scale required. The amount and timing of water infiltrated can also be adjusted to time streamflow benefits to maximize benefits for fish.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

Projects that infiltrate water will increase groundwater recharge, provide more baseflow in summer and fall by increasing groundwater discharge, reduce summer and fall stream temperatures because of increased groundwater discharge and increase groundwater availability to riparian and near-shore plants.

The primary limiting factors in the Puyallup Watershed (Kerwin, 1999; Lead Entity, 2018) which would be addressed through this program include:

- Loss of riparian corridors, including marine riparian, and floodplain forests
- Loss of spawning and rearing habitat
- Loss of good water quality, including appropriate temperature

Two of the streams that may benefit from MAR are Fennel Creek and Swan Creek. Both were

identified by the committee as being high priority streams.

Identification of anticipated support and barriers to completion.

There is no sponsor currently. The barriers to implementing the project are finding a sponsor, landowner willingness and the availability of funding for the analysis, design and construction of a MAR project.

Potential budget and O&M costs.

The construction cost for a MAR project was preliminarily estimated using guidance from Ecology (Melcher, 2020). The cost per acre-foot for a MAR project is estimated to be $3442, resulting in a total estimated cost of $1.03 million. Much more analysis and design are needed to provide more certainty on the costs.

Anticipated durability and resiliency.

The projects could have lasting benefits, assuming a project sponsor is found. The City of Tacoma water supply would be a reliable source of water.

Project sponsor(s) (if identified) and readiness to proceed/implement.

No project sponsor has been identified and the projects will need additional analysis and design before being ready to proceed. The successful implementation of a MAR project is complex and involves several critical steps prior to actual construction (Covert, 2019):

- Identification of potential locations that:
- Have available aquifer capacity such that water infiltration can occur without creating overflows to the surface,
- Have soils and underlying geology with suitable hydraulic properties,
- Are located such that enough infiltrated water will discharge to surface water during low streamflow periods, and
- Are available for permanent use through acquisition or easements.
- Identification of a physically and legally available water source.
- Characterization and evaluation of site-specific hydrogeologic properties.
- Assessment of source water and aquifer compatibility, potential water quality changes during infiltration, and other water quality considerations.
- Development of preliminary MAR project designs and implementation cost estimates.
- Identification of project permitting requirements and potential hurdles.
- Assessment of ongoing operation and maintenance (O&M) costs, and identification of potential funding sources to support O&M.

Sources of Information

Covert, John. Presentation to Watershed Restoration and Enhancement Committee WRIA 15. Managed Aquifer Recharge Opportunities, January 14, 2019

Kerwin. 1999. Salmon Habitat Limiting Factors Report for the Puyallup River Basin (Water Resources Inventory Area 10). Washington State Conservation Commission. Olympia, WA.

Melcher, Austin. Memo regarding: Water Offset Project Potential Cost Estimate Methodology. Sent to Ingria Jones, John Covert. September 17, 2020

Puyallup and Chambers Watersheds Salmon Recovery Lead Entity (Lead Entity). 2018. Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds. June.

WRIA 10 RAIN GARDEN AND GREEN STORMWATER INFRASTRUCTURE PROGRAM PROJECT DESCRIPTION DECEMBER 28, 2020

Description

Rain gardens and Green Stormwater Infrastructure (GSI) retrofit projects could be applied to existing homes and driveways, roadways, parking lots and other impervious areas that generate stormwater. The techniques include rain gardens, planter boxes, bio-infiltration swales, permeable pavement and reducing the footprint of roadways and replacing with GSI (green streets).

Rain gardens are small stormwater facilities that collect, store, and filter rainwater and stormwater runoff from lawns, rooftops, sidewalks, driveways and other impervious surfaces. Designed as shallow, sunken planting beds with rain garden soil, runoff flows into them from nearby hard surfaces and connected downspouts. The rain gardens can also be designed to infiltrate water.

Planter boxes are urban rain gardens with vertical walls and either open or closed bottoms. They collect and absorb runoff from sidewalks, parking lots, and streets and are ideal for space-limited sites in dense urban areas and as a streetscaping element.

Bioswales are vegetated, mulched, or xeriscaped channels that provide treatment and retention as they move stormwater from one place to another. Vegetated swales slow, infiltrate, and filter stormwater flows. As linear features, they are particularly well suited to being placed along streets and parking lots. Bio-infiltration swales are specifically designed to infiltrate stormwater.

Permeable pavements infiltrate, treat, and/or store rainwater where it falls. They can be made of pervious concrete, porous asphalt, or permeable interlocking pavers. Permeable pavements can be installed in sections of a parking lot and rain gardens and bioswales can be included in medians and along the parking lot perimeter.

Green streets are created by integrating green infrastructure elements into their design to store, infiltrate, and evapotranspire stormwater. Permeable pavement, bioswales, planter boxes, and trees are among the elements that can be woven into street or alley design.

In WRIA 10, Pierce Conservation District and City of Puyallup have assisted residences in rain garden design and construction and the Conservation District has indicated they would be willing to help implement a program of additional rain garden and GSI construction. Links to information on these techniques:

- https://piercecd.org/244/Rain-Gardens

- https://www.cityofpuyallup.org/192/Puyallup-Rain-Gardens
- https://www.co.pierce.wa.us/2812/Rain-Gardens
- https://kitsapcd.org/programs/raingarden-lid/rgbasics
- https://fortress.wa.gov/ecy/publications/publications/1310027.pdf
- http://www.seattle.gov/utilities/your-services/sewer-and-drainage/green-stormwater-infrastructure
- https://www.epa.gov/green-infrastructure

The goal of this project would be to support the implementation of rain gardens and GSI across WRIA 10, with an emphasis on subbasins that will experience the most growth and/or contain priority streams, as defined by the WRIA 10 Committee.

Quantitative or qualitative assessment of how the project will function, including anticipated offset benefits, if applicable. Show how offset volume(s) were estimated.

The draft Watershed Restoration and Enhancement Committee identified rain gardens and GSI projects as having potential for implementation to help meet water offsets. The Committee set the goal for implementation at 10 projects per year.

The water offset from rain gardens and GSI projects was estimated using analyses performed for a Mason County rooftop runoff infiltration analysis. To estimate the potential water offset, the soil type, impervious area rain is collected from, the rain garden size and annual precipitation is required. For planning purposes, it is assumed Type B soils are present, a rooftop or driveway area of 2,000 square feet is directed to a rain garden, the rain garden has a 200 square feet infiltration area and the annual precipitation is between 40 and 50 inches. The estimated infiltration volume is 0.14 acre-feet per year for annual precipitation of 40 inches and 0.17 acre-feet per year for annual precipitation of 50 inches. Calculations are shown in the Appendix. The timing of the streamflow will depend on the location of the project and geologic conditions. With a number of rain garden and GSI projects implemented, it is expected their would be a range of timing of benefits and benefits would occur year-round.

The water offset benefit of adding 10 rain garden type projects per year is about 1.5 acre-feet per year, using an average of the 40- and 50-inch precipitation values. Over 18 years of plan implementation, the water offset benefit would add up to 27 acre-feet per year. If GSI projects were implemented that have greater impervious area, the water offset would be higher.

Description of the anticipated spatial distribution of likely benefits

The projects can occur in any subbasin and this program is described in the Watershed Restoration and Enhancement Plan as a WRIA-wide project. A committee goal is to focus the program on subbasins that will experience the most growth and/or contain priority streams. Figure 1 shows

WRIA 10 with the areas of highest growth in permit-exempt wells in yellow to red and priority stream in orange and yellow.

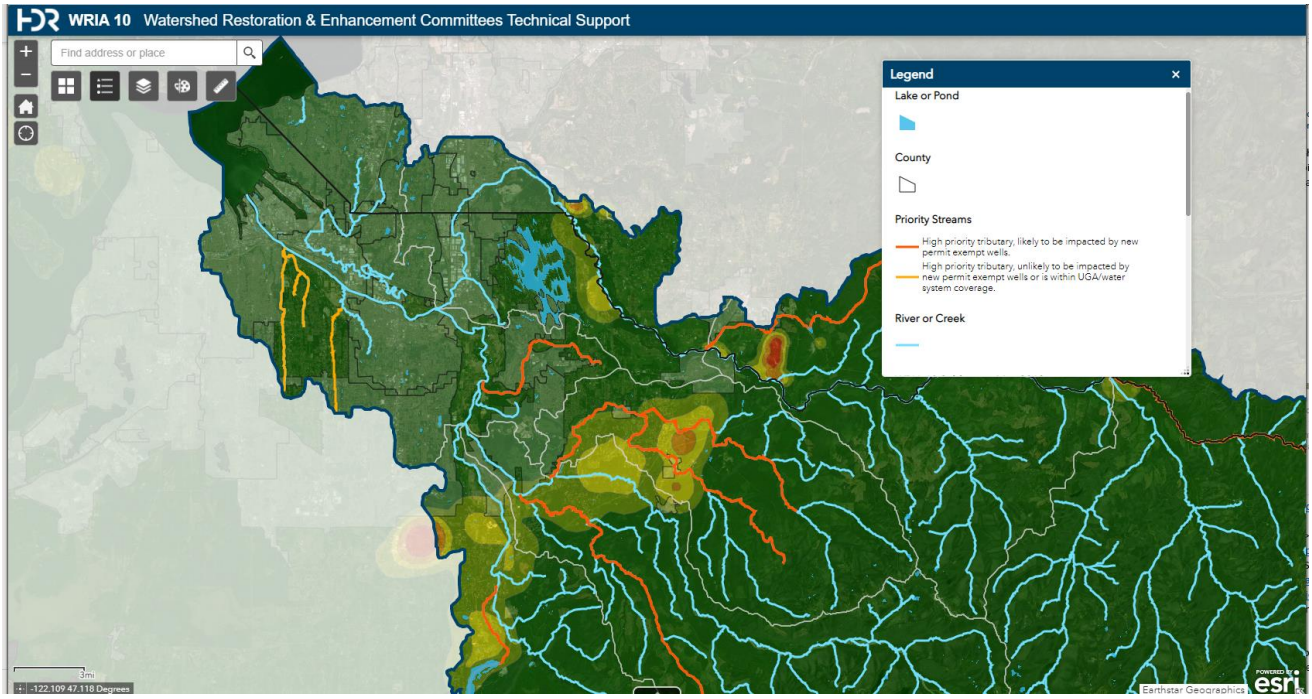


Figure 1. WRIA 10 permit exempt well potential growth and priority streams

Performance goals and measures.

This project would be measured by the number of functional raingardens or GSI projects installed within WRIA 10, which is planned to be 10 per year. The number may vary depending on factors such as finding suitable areas to retrofit, funding and capacity of project sponsors.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

Projects that infiltrate water will increase groundwater recharge, provide more baseflow in summer and fall by increasing groundwater discharge, reduce summer and fall stream temperatures because of increased groundwater discharge and increase groundwater availability to riparian and near-shore plants.

The primary limiting factors in the Puyallup Watershed (Kerwin, 1999; Lead Entity, 2018) which would be addressed through this program include:

- Loss of riparian corridors, including marine riparian, and floodplain forests
- Loss of spawning and rearing habitat
- Loss of good water quality, including appropriate temperature

Identification of anticipated support and barriers to completion.

Pierce Conservation District is primary sponsor and supports this program. The primary barrier is the availability of funding for the construction of rain gardens and GSI projects. Other barriers include private landowner willingness and potentially a limited number of projects in basins with higher estimated growth in permit-exempt wells and priority streams.

Potential budget and O&M costs.

The construction cost for a rain garden or GSI project is $15-$30 per square foot of infiltration trench constructed. Assuming a 200 square foot infiltration trench, the construction cost would be $3,000 - $4,500 each. Additional costs for program management would be incurred. For planning purposes, a cost of $5,000 each is likely conservative. For construction of 10 per year, the annual cost would be about $50,000.

Anticipated durability and resiliency.

The projects would have lasting benefits. Pierce Conservation District and other entities will manage the implementation of rain gardens and GSI projects.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Pierce Conservation District would be the main project sponsor and would be ready to proceed immediately if the program were supported. Pierce Conservation District has been successfully installing rain gardens and GSI projects. If funding is increased, the primary barrier would be private landowner willingness to install projects

Sources of Information

Kerwin. 1999. Salmon Habitat Limiting Factors Report for the Puyallup River Basin (Water Resources Inventory Area 10). Washington State Conservation Commission. Olympia, WA.

Puyallup and Chambers Watersheds Salmon Recovery Lead Entity (Lead Entity). 2018. Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds. June.

Appendix

Infiltration Volume Calculations

Estimated Water Offset for Typical Pierce Conservation District Raingarden Projects
December 28, 2020

Introduction

The purpose of this document is to estimate the water offset for future Pierce Conservation District (Pierce CD) rain garden projects. Calculations of the annual recharge are presented that are based upon hydrologic modeling performed by HDR for the Mason County Rooftop Infiltration Project (HDR, 2020). For these calculations it is assumed rain gardens will be installed on houses that are currently connected to a storm drainage system, so that the entire infiltration volume will be counted as a water offset. A lesser infiltration volume and water offset would be realized for houses that are not currently connected to a storm drainage system as roof downspouts may splash onto the ground and partially or totally infiltrate.

Calculations

Calculations are provided using a range of potential rain garden sizes. To allow an estimate of the potential water offset, an estimate of the average infiltration trench area and impervious area captured is required. Data from the Kitsap Conservation District (KCD) shows the average rain garden they have constructed since 2010 has an infiltration trench area of 200 square feet (sf) and captures 1,900 sf of impervious surface which are roofs, driveways and other impervious surfaces. They have constructed 320 rain garden projects since 2010. That is the best information we have on rain garden installations in the Puget Sound region.

To provide a range of potential Infiltration volumes are calculated using rain garden sizes of 100, 150, and 200 sf, as well as impervious surfaces of 1,600, 2,000 and 2,800 sf. The Mason County Rooftop Infiltration Project assumed 2,800 sf as the impervious surface that would be captured, based upon an average roof and driveway size. The infiltration rate used in the calculations corresponds to Group B soils as rain gardens use amended soils which are similar to Group B. The infiltration rate used for Group B soils is 2 inches/hour.

HDR's hydrologic modeling estimated the average annual recharge for an infiltration trench that is 80 sf to be 0.14 acre-feet/year. That was part of their calculation of baseline conditions assuming a minimum trench size of 80 sf under current regulations. The modeling was performed using an annual average of 70 inches precipitation, which occurs in Mason County. The average annual recharge equates to 26 inches per year over the 2,800-sf impervious surface.

A larger infiltration trench will infiltrate more water; there is a proportional relationship between infiltration area and infiltration capacity. There is also a proportional relationship to the amount of runoff to the impervious area, assuming all the runoff is captured. A limit to the amount of infiltration is the volume of annual precipitation minus potential losses due to evaporation. To estimate the amount of water that will be infiltrated in a Pierce CD rain garden the HDR results were proportionally scaled up by the amount of infiltration area (100 – 200 sf)

and scaled down by the amount of impervious area (1,600 – 2,800 sf). Those calculations are summarized in Table 1.

Table 1. Percentage Change in Infiltration Capacity and Corresponding Infiltration Volume

Impervious Surface Captured, sf	Infiltration Trench Size, sf/Infiltration Volume, acre-feet							
	80 (Mason County Study)		100		150		200	
	%	Volume	%	Volume	%	Volume	%	Volume
1,600	64%	0.090	80%	0.113	121%	0.169	161%	0.225
2,000	71%	0.100	89%	0.125	134%	0.188	179%	0.250
2,800	100%	0.140	125%	0.175	188%	0.263	250%	0.350

The equivalent values in terms of rainfall infiltrated is provided in Table 2.

Table 2. Volume of Rainfall Potentially Infiltrated

Infiltration Trench Size, sf			
80 (Mason County Study)	100	150	200
26 inches	32.7 inches	49.0 inches	65.3 inches

The calculations indicate that the rain gardens KCD is installing have, on average, the capacity to infiltrate 65.3 inches of precipitation, or 0.25 acre-ft per installation per year, based upon an infiltration trench size of 200 sf. The amount infiltrated is less than the capacity when precipitation is less than 65 inches.

The same calculation applies to Pierce County and demonstrates that the infiltration capacity of a 200 sf infiltration trench is not limited by the amount of precipitation that occurs in most areas of Pierce County, which is 40-50 inches per year. Table 3 provides infiltration volumes for varying precipitation volumes and an average impervious area of 2,000 sf. To be conservative, 10% loss due to evaporation or other losses are assumed.

Table 3. Estimate of Annual Volume Infiltrated for Pierce CD Rain Garden Projects

Average Annual Precipitation, inches	Annual Volume Infiltrated, Inches	Annual Volume Infiltrated, acre-feet
40	36	0.138
50	45	0.172
60	54	0.207

These volumes can be used as estimates of the water offset quantity for Pierce CD rain garden projects. The actual values will need to be tracked during implementation, but the quantities shown in Table 3 provide a planning-level estimate of water offsets from rain garden projects that capture 2,000 sf of impervious area and are constructed using a 200 sf infiltration trench is Group B soils. It is recommended that the average of the volume infiltrated between 40- and 50-inches annual precipitation be used for estimating water offsets in WRIA 10. That equals 0.15 acre-feet per rain garden.

References

HDR, 2020. Spreadsheet: WRIA14-Projects-Supplemental Data-RooftopRunoff_MGSFlood Results.xlsx. Accessed through Box at https://app.box.com/s/c2858d6mjdtoo41i4ahxqj55hz66mbzf

SWAN CREEK CHANNEL AND BANK STABILIZATION

Narrative description, including goals and objectives.

Pierce County Surface Water Management and the Puyallup Tribe propose to implement in-channel stabilization and restoration measures along Swan Creek, within the Lower Puyallup River sub-basin (WRIA 10). In the lower reaches of Swan Creek, the channel is incised and eroding the streambanks due to increased stormwater runoff, undersized culverts, and insufficient stormwater detention and loss of flood storage. This project proposes to use a combination of woody material, streambed gravel, and plantings to stabilize streambeds and banks and provide sediment recruitment capacity within the channel. The intention is to slow erosion and allow the channel to return to a more natural state. The proposed project reach begins immediately downstream of the 64th Street East culvert crossing and extends to Pioneer Way.

The goals of the project are as follows:

- Stabilize streambed and banks
- Provide sediment recruitment capacity

The objectives of the project are:

- Install woody material and riparian plantings
- Install streambed gravel

No estimate of the potential water offset was provided at this time as monitoring is proposed that would determine the offset.

Qualitative assessment of how the project will function.

The project will function by reducing stream power and streambed and streambank erosion.

Conceptual-level map of the project and location.

The proposed project is located along Swan Creek just downstream of the 64th St East culvert crossing at Pioneer Way. Figured 1 (Attached) shows the project location within the Swan Creek Watershed and Figure 2 shows an overview of the 90% design drawings. (The full set of design drawings are available on Box.)

Performance goals and measures.

Performance measures would be determined once a final design is selected.

Description of the anticipated spatial distribution of likely benefits.

Benefits to stream processes will occur in the project area downstream of the 64th street east culvert. The channel and habitat features improved as a result of this project will benefit a variety of salmonid species as described in the next paragraph. In the areas of Swan Creek downstream of this project, such as the floodplain, reduced sediment input from erosion will also improve habitat conditions and benefit salmonids.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

Salmonids in Swan Creek will benefit from decreased stream power downstream of the culvert, reduced rates of erosion, increased riparian habitats, and cool temperatures associated with groundwater recharge. The most abundant salmonids in Swan Creek are chum and coastal cutthroat trout but the stream also supports Coho and Chinook in limited quantities; and steelhead are very rarely observed (Pierce County, 2015). Lamprey and sculpin are also present in the creek. The salmonids and other aquatic species in Swan Creek are subject to the current limiting factors present.

According to the Limiting Factors Report for the Puyallup Watershed by Kerwin (1999), limiting factors that may be addressed by the project include the following:

- Loss of instream habitat complexity and connectivity
- Loss of large wood
- Increase in river channelization
- Increase in sediment load
- Loss of channel (substrate) stability
- Loss of spawning and rearing habitat
- Loss of good water quality, including appropriate temperature

Streambank stabilization, woody material addition, and replacement of streambed gravel would address these limiting factors and slow down Swan Creek, decreasing sediment load to the downstream portion of the creek and improving channel stability. Increased riparian vegetation and instream wood would improve rearing habitat for fishes by providing protection from flood events and acting as riparian cover and rearing habitat. Invertebrates colonizing the edge habitat are also a prey source for juvenile salmonids. Creating a slower velocity system would make a greater range of sediment and substrate types available as spawning habitat and as habitat for non-salmonids. While the ESA-listed Chinook and steelhead species are not as commonly observed in Swan Creek as Chum, cutthroat trout, and coho, the exceptionally cold water in Swan Creek (Pierce County, 2015) may become increasingly important for these species when temperatures in other tributaries are warmer. The functions and benefits of the habitat and hydrologic features that would be created by the project address many of the limiting factors currently present in Swan Creek. Addressing these limiting factors will help support salmonids at various life stages and increase presence, recruitment, and survival in the area of the project.

Identification of anticipated support and barriers to completion.

This project builds upon previous restoration actions in and around Swan Creek and is sponsored by the Puyallup Tribe and Pierce County and supported by the Lead Entity, Puyallup and Chambers Watersheds Salmon Recovery Lead Entity, and Metro Parks Tacoma. Swan Creek Park is one of Metro Parks Tacoma's capital improvement projects. The 2019 Master Plan for the park includes

habitat restoration work, stormwater management, and public interest in salmon ecology and restoration. Community meetings emphasize the public interest in restoration work in Swan Creek, with one park user stating, “salmon are a user group!” (Metro Parks Tacoma, 2020). This proposed project furthers restoration actions undertaken and planned by Metro Parks Tacoma in the same area.

The WRIA 10/12 Lead Entity Strategy identifies priority tributaries and actions within the Lower Puyallup and Nearshore Estuary watersheds. Clear Creek (of which Swan Creek is a tributary) is identified as a high priority system. Three of the high priority actions within this area are directly addressed by this project: “Restore normal flow regimes,” “restore riparian function,” and “restore and protect rearing, foraging, osmoregulatory habitats for juvenile salmonids, particularly Chinook salmon” (Lead Entity 2018). There are no anticipated barriers to completing this project due to its alignment with regional and basin-wide goals.

Potential budget and O&M costs (order of magnitude costs).

The funding requested to complete restoration treatments is approximately $3.7 million. No O&M costs have been identified.

Anticipated durability and resiliency

Streambank stabilization and instream wood placement projects are durable because they help restore natural processes to a reach of the stream. Given the changing climate conditions, that anticipates increases in precipitation, rain-on-snow events, and channel aggradation, stabilization and restoration projects that provide increased cover and habitat and more ways to hold water for longer are important solutions to implement to restore watershed processes and to provide resiliency from a changing climate.

Project sponsor(s) (if identified) and readiness to proceed/implement.

Pierce County and the Puyallup Tribe are the project sponsors and are ready to implement the project as soon as funding is made available. The project could be implemented within 5 years, which accounts for design and construction.

Attachments

Figure 1. Swan Creek Bank Stabilization at 64th St Outfall Repair project location (annotated from Swan Creek Watershed Characterization and Action Plan)

Figure 2. Sheet 5 of 90% Design Drawings for Swan Creek Channel Restoration (Prepared by Natural Systems Design)

Documentation of sources, methods, and assumptions.

The following references were used:

Metro Parks Tacoma. 2020. Swan Creek Improvements. Accessed June 30, 2020. https://www.metroparkstacoma.org/project/swan-creek-improvements/

Pierce County. 2015. Swan Creek Watershed Characterization and Action Plan. Prepared by: Pierce County Surface Water Management. September 2015. Available from: https://www.piercecountywa.gov/ArchiveCenter/ViewFile/Item/4798

National Marine Fisheries Service (NMFS). 2007. Puget Sound Salmon Recovery Plan. Plan adopted by NMFS on January 19, 2007. Submitted by the Shared Strategy Development Committee. Available from: https://repository.library.noaa.gov/view/noaa/16005

Natural Systems Design. 2018. Basis of Design Report Swan Creek. Prepared for Puyallup Tribe of Indians.

Puyallup and Chambers Watersheds Salmon Recovery Lead Entity (Lead Entity). 2018. Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds. June. https://www.piercecountywa.org/ArchiveCenter/ViewFile/Item/6075

Kerwin, J. 1999. Salmonid Habitat Limiting Factors Report for the Puyallup River Basin. Washington Conservation Commission.

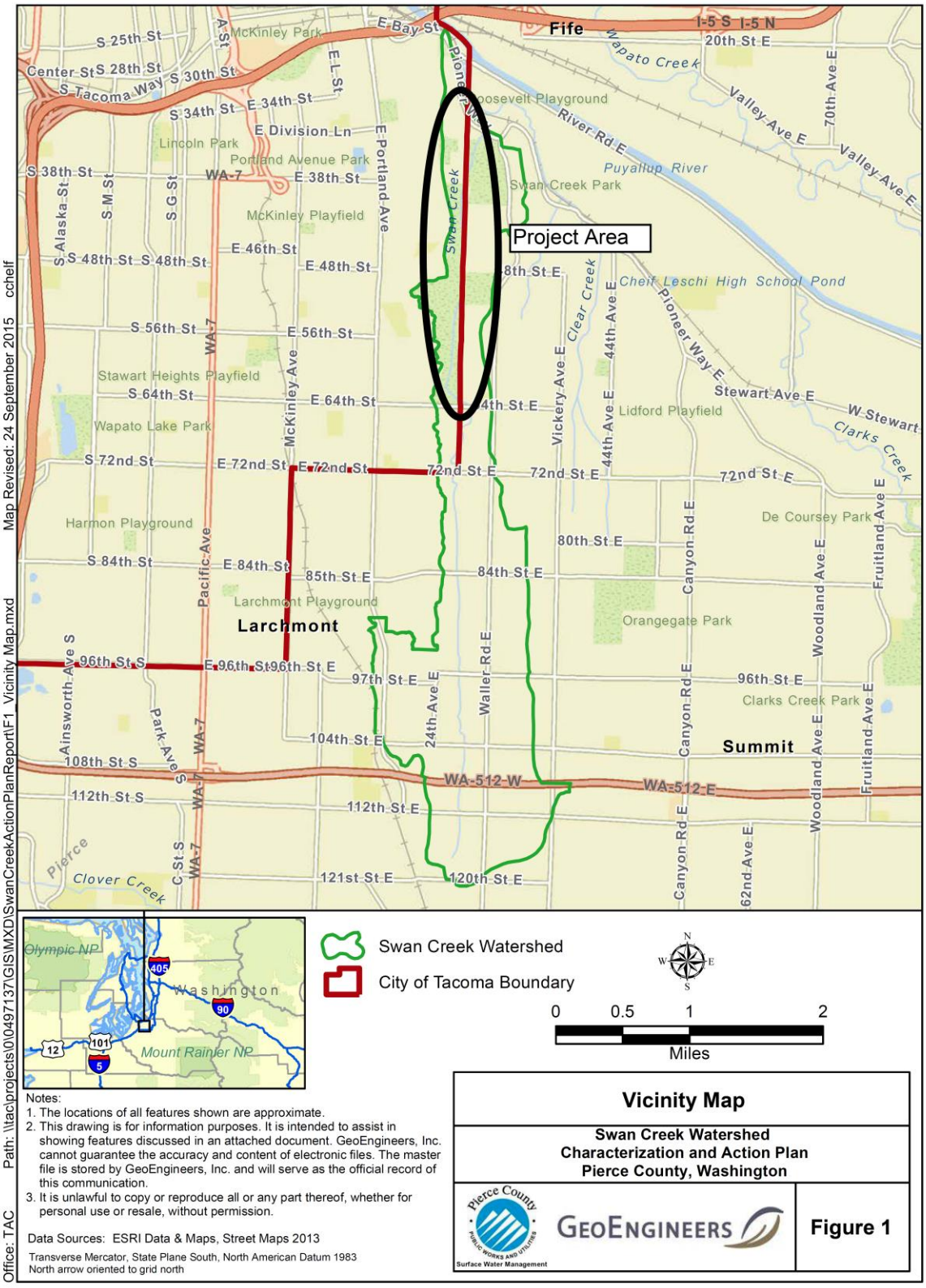


Figure 1. Swan Creek Project Vicinity Map. Source: Pierce County 2015.

JOVITA CREEK HABITAT PROJECT

Narrative description, including goals and objectives.

The City of Edgewood proposes to prepare a feasibility study to identify potential restoration actions in Jovita Creek, within the Lower White River sub-basin (WRIA 10). Recommended actions contained in the study would be implemented. This project area is Jovita Creek upstream of the culvert at Highway 167, up to 114th Ave E. Assessment efforts would focus on evaluating geomorphic impacts from Jovita Boulevard (which is adjacent to the stream), channel bed and bank restoration in the mainstem of Jovita Creek, and replacement of a fish passage barrier (culvert at 114th street) on a tributary to Jovita Creek. The feasibility study would result in identification of priority multi-benefit restoration project(s) that restore habitat and habitat forming processes while improving the flow of pedestrians and vehicles through the area by potentially changing the alignment of Jovita Blvd and completing a connection to the Interurban Trail that currently terminates at 114th Ave E.

The goal of the project is as follows:

- Evaluate stream processes in Jovita Creek and identify potential restoration actions.
- Implement restoration actions.
- Complete the Interurban Trail from 114th Ave E to West Valley Highway

The objectives of the project are:

- Complete a reach-scale feasibility study including an evaluation of the constriction caused by Jovita Boulevard and the fish passage barrier at 114th street.
- Identify and implement multi-benefit actions that would restore habitat and habitat-forming processes.

Qualitative assessment of how the project will function.

The feasibility study has no identified functions. The functions of restoration actions would depend on the type of restoration project implemented. One primary issue in Jovita Creek is channel confinement due to Jovita Boulevard, causing channel erosion from high velocities. Restoration actions that address this channel confinement would function by providing space for the creek to meander, wood to stabilize the creek bed and connection to the limited amount of off-channel habitat in the floodplain. There are no anticipated offset benefits related to the project because there are no identified permit exempt wells in the project area.

Conceptual-level map of the project and location.

The proposed project is located along Jovita Creek and its tributaries upstream of Highway 167, along approximately 1.0 stream miles of habitat. Figure 1 shows the approximate project location.

Figure 1. Jovita Creek Feasibility Study

Performance goals and measures.

The performance goals are to complete a reach-scale feasibility study of Jovita Creek and identify potential multi-benefit restoration projects. Performance measures for restoration projects would be determined once projects are identified.

Description of the anticipated spatial distribution of likely benefits.

Depending on the results of the feasibility study, benefits to stream processes may occur in the project area upstream of the culvert at highway 167. Salmonids in Jovita Creek and its tributaries have the potential to benefit from restoration actions.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

Jovita Creek supports a variety of salmonid species including chum and coho salmon, steelhead, sea run cutthroat and resident trout as identified by WSDOT (2017). SalmonScape additionally identifies fall Chinook and pink salmon as potentially present in Jovita Creek (WDFW, 2020). The salmonids and other aquatic species in the Jovita Creek are subject to degraded ecosystems due to limiting factors present at the site.

According to the Limiting Factors Report for the Puyallup Watershed by Kerwin (1999), Jovita Creek has the following limiting factors:

- Loss of floodplain connectivity
- Loss of bank stability
- Loss of instream habitat complexity and connectivity due to loss of large wood
- Loss of side-channel habitat
- Loss of riparian habitat
- Loss of pool habitat

- Loss of sediment fines
- Loss of good water quality and quantity

Restoration projects would address these limiting factors by promoting the creation of a variety of habitat types and hydrologic features. Reducing or removing constraints, streambank stabilization, woody material addition, and replacement of streambed gravel would address these limiting factors. and slow down Jovita Creek, decreasing sediment load to the downstream portion of the creek and improving channel stability. Increased riparian vegetation and instream wood would improve rearing habitat for fishes by providing protection from flood events and acting as riparian cover and rearing habitat. Invertebrates colonizing the edge habitat are also a prey source for juvenile salmonids. Creating a slower velocity system would make a greater range of sediment and substrate types available as spawning habitat and as habitat for non-salmonids.

Replacing the culvert at 114th Street E. would additionally provide more access to habitat upstream of the culvert. The functions and benefits of the habitat and hydrologic features that would be created by the project address many of the limiting factors currently present in Jovita Creek.

Along with the habitat restoration actions already undertaken in the Lower White River sub-basin, addressing these limiting factors will help support salmonids at various life stages and increase presence, recruitment, and survival in the area of the project.

Identification of anticipated support and barriers to completion.

This project builds upon previous restoration actions in the Lower White River sub-basin. The project is sponsored by the City of Edgewood and supported by the Lead Entity, Puyallup and Chambers Watersheds Salmon Recovery Lead Entity.

The WRIA 10/12 Lead Entity Strategy identifies priority tributaries and actions within the Lower Puyallup Watershed (which includes the lower White River sub-basin). Jovita Creek is a tributary to the Milwaukee Canal, which drains to the Lower White River. The White River is identified as a high priority tributary in the Lead Entity Strategy. One of the high priority actions within this area are directly addressed by this project: “restore natural geomorphic processes and riparian functions where they are compromised, degraded, or severed” (Lead Entity 2018). This habitat restoration project would build upon previous work completed by Washington State Department of Transportation—the culvert where Jovita Creek passes under Highway 167 was replaced in 2016 to allow for improved fish passage into the upper portions of Jovita Creek (WSDOT, 2017). The previous culvert presented hydraulic barriers to fish passage, and the new culvert allows unimpeded access to 2.53 miles of habitat in Jovita Creek including the proposed project area. There are no anticipated barriers to completing this project due to its alignment with regional and basin-wide goals.

Potential budget and O&M costs (order of magnitude costs).

No cost estimates for the feasibility study and projects that would be implemented are available. No O&M costs have been identified. A formal project description has not yet been written.

Anticipated durability and resiliency.

Habitat restoration projects are durable as they restore natural processes to a stream. Given changing climate conditions that are forecast to increase peak precipitation rates and erosion,

channel bed restoration projects will retain sediment and reduce aggradation near the mouth of the creek where slopes are flatter.

Project sponsor(s) (if identified) and readiness to proceed/implement.

The City of Edgewood is the project sponsor and is ready to implement the study as soon as funding is made available. The assessment would also include outreach to determine landowner willingness and potential for easements in the area of the potential projects. The study could be completed within 2 years of obtaining funding; the projects recommended for implementation will take longer, likely 10 years depending on availability of funding.

Documentation of sources, methods, and assumptions.

The following references were used:

Ecology, 2003. Mt. Baker-Snoqualmie National Forest, Upper White Watershed Sediment and Temperature TMDL for Aquatic Habitat. Submittal Report, Publication No. 03-10-032. Available from: https://fortress.wa.gov/ecy/publications/documents/0310032.pdf

National Marine Fisheries Service (NMFS). 2007. Puget Sound Salmon Recovery Plan. Plan adopted by NMFS on January 19, 2007. Submitted by the Shared Strategy Development Committee. Available from: https://repository.library.noaa.gov/view/noaa/16005

Puyallup and Chambers Watersheds Salmon Recovery Lead Entity (Lead Entity). 2018. Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds. June. https://www.piercecountywa.org/ArchiveCenter/ViewFile/Item/6075

WDFW, 2020. SalmonScape. Washington Geospatial Open Portal. Available from: http://geo.wa.gov/datasets/1e56a648718543ab952e75ff9971f086?fullScreen=true

WSDOT, 2017. Fish Passage Performance Report, 2016. June 30, 2017. Available from: https://www.wsdot.wa.gov/publications/fulltext/projects/FishPassage/2017FishPassageAnnualReport.pdf

Kerwin, J. 1999. Salmonid Habitat Limiting Factors Report for the Puyallup River Basin. Washington Conservation Commission.

City of Edgewood, 2020. Parks and Recreation: Interurban Trail. Available from: http://www.cityofedgewood.org/government/parks_and_recreation/interurban_trail_and_jovita_crossroads_trailhead_park.php

ENUMCLAW GOLF COURSE PROJECT

Narrative description, including goals and objectives.

The City of Enumclaw and the Puyallup Tribe propose to implement reach-scale stream restoration actions in Boise Creek, within the Middle White River sub-basin (WRIA 10). This project would move Boise Creek back to its historic channel adjacent to the Enumclaw Golf Course. Additionally, large woody material would be added to increase habitat complexity and channel roughness, diversifying habitats available to fish. The project is proposed to occur from river miles 3.7 to 4.2. A 30% design was completed for this project in 2010, and the proposed project would include finalizing the design and moving forward with construction.

The goals of the project are as follows:

- Improve habitat conditions in Boise Creek
- Address flooding on the golf course and nearby properties.

The objectives of the project are:

- Realign the creek with its historic channel.
- Restore habitat and increase channel roughness, diversifying instream fish habitat

Qualitative assessment of how the project will function.

The project will function by restoring the natural channel and improving habitat conditions, which will allow natural processes to develop in Boise Creek. A related project with water offset benefits would be the placement of water rights for a portion of the golf course in trust. Washington Water Trust estimated the offset benefits as 47 acre-feet and 0.2 cfs (90 gallons per minute).

Conceptual-level map of the project and location.

The proposed project is located along Boise Creek between river miles 3.7 and 4.2 and borders the Enumclaw Golf Course. The 30% designs (Attachment A) shows the project location and restoration plan. Figure 1 shows the vicinity of the project.

Figure 1. Enumclaw Golf Course Project Vicinity (circled in red, annotated from Watershed Restoration and Enhancement Committees Technical Support Web Map)

Performance goals and measures.

The performance goals are to complete final design of the project and implement reach-scale habitat restoration and channel realignment. Performance measures would be determined once a final design is selected.

Description of the anticipated spatial distribution of likely benefits.

Benefits to river processes will occur in the project area between river miles 3.7 to 4.2; habitat features formed as a result of this project will benefit a variety of salmonid species as described in the next paragraph.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

Boise Creek supports a variety of salmonid species and is one of the most productive salmon stream systems in the Puyallup/White River basin. No other stream in the basin, except for South Prairie Creek on the Puyallup River, is as productive in terms of both spawning density (number of spawners per mile) and total escapement size (Marks et al. 2013). Boise Creek continues to support steelhead as well as spring and fall Chinook (all ESA-listed), coho, pink, chum, sockeye and cutthroat trout. Bull trout have also been observed in the mouth of Boise Creek up to river mile (RM) 0.1 (RCO, 2020). The salmonids and other aquatic species in Boise Creek are subject to degraded ecosystems due to limiting factors present at the site.

According to the Limiting Factors Report for the Puyallup Watershed by Kerwin (1999), Boise Creek has the following limiting factors:

- Loss of floodplain connectivity

- Loss of bank stability
- Loss of instream habitat complexity and connectivity due to loss of large wood
- Loss of side-channel habitat
- Loss of riparian habitat
- Loss of pool habitat
- Loss of substrate fines
- Loss of good water quality and quantity

This project will benefit all life stages of salmonids present. Adults will have greater cover, depth and cooler fall water temperatures. Eggs and alevins will benefit through improved survival rates associated with improved channel stability and greater channel length, which reduces average velocity and therefore lessens scour losses and retains more variety in substrate size. Juveniles will benefit from the additional habitat length, cover, channel complexity and reduced summer rearing temperatures that will provide a new norm and greater overall habitat suitability. Coho and steelhead which reside for over 1 year in freshwater will be the two species most likely to benefit from these improvements. The functions and benefits of the habitat and hydrologic features that would be created by the project address many of the limiting factors currently present in Boise Creek.

Along with the habitat restoration actions already undertaken in the Middle White River sub-basin, addressing these limiting factors will help support salmonids at various life stages and increase presence, recruitment, and survival in the area of the project.

Identification of anticipated support and barriers to completion.

The project is supported by King County and the Puyallup and Chambers Watersheds Salmon Recovery Lead Entity.

The WRIA 10/12 Lead Entity Strategy identifies priority tributaries and actions within the Middle Puyallup Watershed (which includes the middle White River sub-basin). Boise Creek is identified as a high priority tributary in the Lead Entity Strategy. Two of the high priority actions within this area are directly addressed by this project: “restore natural geomorphic processes and riparian functions where they are compromised, degraded, or severed,” and “increase large wood inputs” (Lead Entity 2018). This habitat restoration project would build upon previous design work completed in 2010 (RCO, 2020; Attachment A).

There are no anticipated barriers to completing this project due to its alignment with regional and basin-wide goals.

Potential budget and O&M costs (order of magnitude costs).

The funding requested to complete final design and implement restoration treatments is approximately $2.3 million. The project can likely be implemented within the next five years provided funding is available.

No O&M costs have been identified as the project should not pose any maintenance obligations.

Anticipated durability and resiliency.

This project is anticipated to be durable because it would restore the stream to its historic channel. Habitat improvements would increase floodplain connection. Given the changing climate conditions, that anticipates increases in peak precipitation, rain-on-snow events, and channel aggradation, floodplain reconnection projects that provide the river with more ways to hold water for longer are important solutions to implement to restore watershed processes and to provide resiliency from a changing climate.

Project sponsor(s) (if identified) and readiness to proceed/implement.

The Puyallup Tribe is the project sponsor and is ready to implement the project as soon as funding is secured, and property owner permissions are obtained. The construction season would need to be coordinated with the Enumclaw Golf Course, which is owned by the City of Enumclaw.

Attachments

Attachment A: 30% Design of Boise Creek Golf Course Restoration Plan is in the Box folder with this project description.

Documentation of sources, methods, and assumptions.

The following references were used:

Washington Water Trust. 2020. WRIA 10 Water Rights Final Report Update. Presentation to WRIA 10 Workgroup on July 1, 2020.

Washington Water Trust, McCormick Water Strategies, and BlueWater GIS. 2020. WRIA 10 Puyallup-White Priority Water Rights Projects Report. Prepared for: WRIA 10 Workgroup. June 29, 2020.

National Marine Fisheries Service (NMFS). 2007. Puget Sound Salmon Recovery Plan. Plan adopted by NMFS on January 19, 2007. Submitted by the Shared Strategy Development Committee. Available from: https://repository.library.noaa.gov/view/noaa/16005

Puyallup and Chambers Watersheds Salmon Recovery Lead Entity (Lead Entity). 2018. Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds. June. https://www.piercecountywa.org/ArchiveCenter/ViewFile/Item/6075

Kerwin, J. 1999. Salmonid Habitat Limiting Factors Report for the Puyallup River Basin. Washington Conservation Commission.

Marks, E. L., R.C. Ladley, B.E. Smith, A.G. Berger, J.A. Paul, T.G. Sebastian and K. Williamson. 2013. 2012-2013 Annual Salmon, Steelhead, and Bull Trout Report: Puyallup/White River Watershed--Water Resource Inventory Area 10. Puyallup Tribal Fisheries, Puyallup, WA

RCO, 2020. Project Search. Middle Boise Creek Restoration. Available from: https://secure.rco.wa.gov/prism/search/ProjectSnapshot.aspx?ProjectNumber=16-1552

GREENWATER PHASE 4 IMPLEMENTATION

Narrative description, including goals and objectives.

South Puget Sound Salmon Enhancement Group proposes to implement reach-scale restoration actions in the Greenwater River, within the Upper White River sub-basin (WRIA 10), between river mile 2 and 4 to restore instream complexity and floodplain connectivity. This proposed phase 4 project builds upon work completed in 2010, 2011, and 2014 (phases 1-3) on upper sections of the Greenwater River between river mile 6 and 8. During these projects, 17 log jams were installed and 1 mile of road was removed from the floodplain. As part of the proposed phase 4 project, more road and fill would be removed and additional structures would be installed in the 2-mile project reach, increasing the functional habitat on the Greenwater River. These structures will provide relatively stable, instream structure currently lacking in the Greenwater system due to a legacy of aggressive timber harvest practices between the late 1950s to early 1970s.

The goal of the project is as follows:

- Rehabilitate lost processes that are provided by large instream wood accumulations, which benefits adult spawning and juvenile rearing salmon populations on the Greenwater River.

The objectives of the project are:

- Remove relic logging roads, fill, and armor restricting floodplain processes.
- Install mid-channel and floodplain structures.

Qualitative assessment of how the project will function.

The project will function by creating large stable structures that will trap mobile debris and sediment, increase floodplain connectivity and off channel habitat, increase number of pools with overhead cover, decrease median substrate size, and overall improve spawning and rearing conditions for salmonids in the Greenwater River. The proposed structures will accelerate and maintain system-wide natural processes while providing habitat for fish. Removing roads, fill, and armor will additionally allow natural processes to develop in a large floodplain. There are no anticipated offset benefits related to the project because there are no identified permit exempt wells in the project area. Additionally, the potential for the project to increase groundwater recharge has not been estimated.

Conceptual-level map of the project and location.

The proposed project is located along the Greenwater River between river miles 2 and 4. Figure 1 shows the approximate project location and the previous phases of the project.

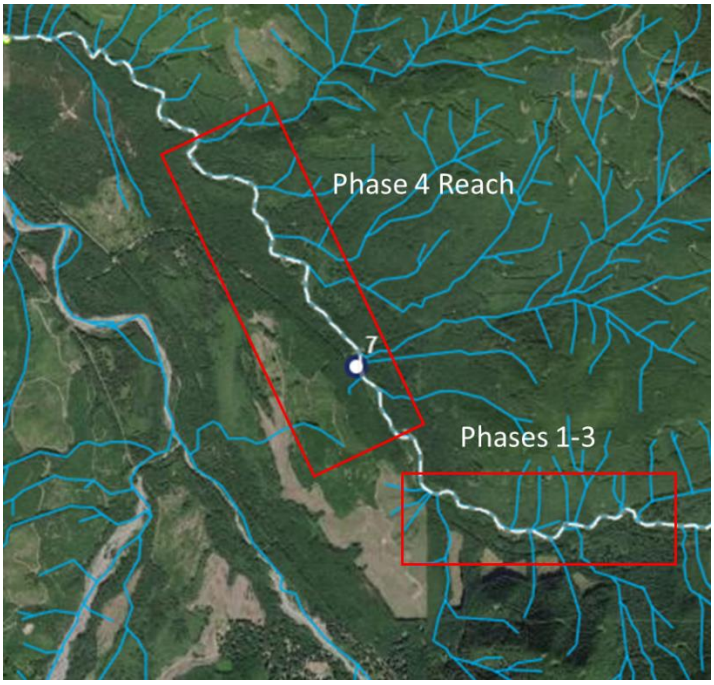


Figure 1. Greenwater Phase 4 Implementation Project (annotated from Watershed Restoration and Enhancement Committees Technical Support Web Map)

Performance goals and measures.

The performance goals are to complete a reach-scale assessment of river miles 2 to 4 of the Greenwater River and implement restoration treatments including road and fill removal and log jam installation . Performance measures would be determined once a final design is selected.

Description of the anticipated spatial distribution of likely benefits.

Benefits to river processes will occur in the project area between river mile 2 and 4; side channel and other habitat features formed as a result of this project will benefit a variety of salmonid species as described in the next paragraph. Salmonids in the Greenwater River and in the White River will benefit from increased habitat and reduced peak flow and sediment input.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

The Greenwater River supports a variety of salmonid species including Endangered Species Act-listed Chinook, Steelhead, and Bull Trout. Other anadromous salmonid species on the Greenwater River that would benefit from this project include Coho, Pink salmon, and coastal cutthroat trout. The White River supports an early returning population of White River spring Chinook which spawn in the upper and lower White River and is the most distinctive Chinook stock in central and south Puget Sound (NMFS, 2007). The USFWS has also identified five local bull trout populations within the Puyallup basin, one of which occurs in the Greenwater River. The salmonids and other aquatic species in the Greenwater River are subject to the current limiting factors present.

According to the Limiting Factors Report for the Puyallup Watershed by Kerwin (1999), limiting factors that may be addressed by the project include the following:

- Loss of floodplain habitat, wetlands, and connectivity to hyporheic zone
- Loss of off-channel and side-channel habitat
- Loss of instream habitat complexity and connectivity
- Loss of large wood
- Increase in river channelization
- Increase in sediment load
- Loss of channel (substrate) stability
- Loss of spawning and rearing habitat
- Loss of good water quality, including appropriate temperature

Removal of the existing road, fill, and armor, and installation of logjams would address these limiting factors by promoting the creation of a variety of habitat types and hydrologic features. Side channels, backwater channels, and off-channel habitat would develop because the jams would be placed strategically to promote lateral migration of the river. These habitats provide protection from flood events and act as riparian cover and rearing habitat, which supports juvenile salmonids and provides areas for fry to colonize. Coho salmon may also spawn in low velocity side channels. Deep complex pools would also be created. These provide cover and prey availability during migratory periods for adult salmonids and cover for juveniles when log jams are present. Deep pools are also generally colder than other in-water environments, providing appropriate temperatures and acting as a refuge. Shallow edge habitat would also be created when areas of fill and road are removed. These provide shade and function as cover and rearing habitat for fry and juvenile salmonids. Invertebrates colonizing the edge habitat are also a prey source for juveniles. Removal of the road and fill will also increase the sinuosity of the river, creating a slower velocity system where a greater range of sediment and substrate types are available due to the complexity of habitats present. Spawning salmonids (Chinook, steelhead, and Coho) would benefit from a range of substrate sizes. The functions and benefits of the habitat and hydrologic features that would be created by the project address many of the limiting factors currently present in the Greenwater River.

Along with the habitat restoration actions already undertaken in the Greenwater River and Upper White River sub-basin, addressing these limiting factors will help support salmonids at various life stages and increase presence, recruitment, and survival in the area of the project. And, for ESA-listed ESUs, restoring these areas would contribute to the VSP parameters of abundance, productivity, spatial structure, and diversity.

Identification of anticipated support and barriers to completion.

This project builds upon previous restoration actions in the Greenwater River and Upper White River sub-basin. The project is sponsored by South Puget Sound Salmon Enhancement Group and supported by the Lead Entity, Puyallup and Chambers Watersheds Salmon Recovery Lead Entity.

The WRIA 10/12 Lead Entity Strategy identifies priority tributaries and actions within the Upper Puyallup Watershed (which includes the upper White River sub-basin). The Greenwater River is

identified as a high priority tributary. Three of the high priority actions within this area are addressed by this project: “restore natural geomorphic processes and riparian functions where they are compromised, degraded, or severed,” “address failing roads to reduce sediment load,” and “increase large wood inputs (Lead Entity 2018). The WRIA 10/12 Lead Entity Strategy additionally states that this type of action will provide the greatest restoration benefit to Puyallup/White River Chinook abundance. In addition, The Puget Sound Salmon Recovery Plan specifically calls out the Greenwater River as a key area to increase protection and restoration. As a priority action for White River spring Chinook it identifies, “large woody debris [and] riparian restoration projects in the Upper White… including the Greenwater River and Huckleberry Creek restoration projects” (NMFS 2007). Pierce County (2012, 2018) also identifies the reach of the project as a priority area within their Flood Hazard Management Plan and completed a channel migration zone study within the reach of the project in 2017.

There are few anticipated barriers to completing this project given that three phases of the project have already been implemented.

Potential budget and O&M costs (order of magnitude costs).

The funding requested to complete reach-scale assessment efforts, inventory existing wood loading rates, assess habitat quantity and quality, map geomorphic features, assess hydraulic conditions, and implement restoration treatments based on these analyses is approximately $1,500,000.

No O&M costs have been identified as the project should not pose any maintenance obligations. The project reach is on Muckleshoot Indian Tribe property and the entire Greenwater Valley through the project reach is protected under a riparian reserve designation.

Anticipated durability and resiliency.

Floodplain reconnection projects are durable as they restore natural processes to a reach of the river, allowing flooding and channel migration to occur unimpeded. Instream wood placement projects are also durable; they support natural processes and encourage accumulation of smaller debris. Given the changing climate conditions, that anticipates receding glaciers, and increases in precipitation, rain-on-snow events, and channel aggradation, floodplain reconnection and instream placement projects that provide the river with more room to meander and more ways to hold water for longer are important solutions to implement to restore watershed processes and to provide resiliency from a changing climate.

Project sponsor(s) (if identified) and readiness to proceed/implement.

South Puget Sound Salmon Enhancement Group is the project sponsor and is ready to implement the project as soon as funding is made available. The project can likely be implemented within the next five years provided funding is available.

Documentation of sources, methods, and assumptions.

The following references were used:

National Marine Fisheries Service (NMFS). 2007. Puget Sound Salmon Recovery Plan. Plan adopted by NMFS on January 19, 2007. Submitted by the Shared Strategy Development Committee. Available from: https://repository.library.noaa.gov/view/noaa/16005

Puyallup and Chambers Watersheds Salmon Recovery Lead Entity (Lead Entity). 2018. Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds. June. https://www.piercecountywa.org/ArchiveCenter/ViewFile/Item/6075

Pierce County. 2018. Rivers Flood Hazard Management Plan 2017-2018 Update. Prepared by: Pierce County Public Works and Utilities Surface Water Management Division. Available: https://www.piercecountywa.org/1837/Rivers-Flood-Hazard-Management-Plan

Pierce County. 2012. Final Environmental Impact Statement for: Rivers Flood Hazard Management Plan. Prepared by: Pierce County Public Works and Utilities Surface Water Management Division. Available: https://www.piercecountywa.org/1837/Rivers-Flood-Hazard-Management-Plan

Kerwin, J. 1999. Salmonid Habitat Limiting Factors Report for the Puyallup River Basin. Washington Conservation Commission.

Recreation and Conservation Office. 2020. PRISM Project Search: Greewanter River Restoration Phase 3. Accessed June 24, 2020. https://secure.rco.wa.gov/prism/search/ProjectSnapshot.aspx?ProjectNumber=12-1288

WEST FORK WHITE FLOODPLAIN PROJECT

Narrative description, including goals and objectives.

South Puget Sound Salmon Enhancement Group proposes to implement reach-scale floodplain restoration actions in the West Fork White River, within the Upper White River sub-basin (WRIA 10). This project would complete assessment, feasibility, design, and construction of a floodplain restoration project on the lower 6 miles of the West Fork White River. Initial efforts would focus on a reach-scale assessment of the lower White River from river miles 2.4 to 5.7. Assessment efforts would evaluate geomorphic threats from a road (which is adjacent to the stream) to floodplain processes, instream flow velocities, and habitat structure and the assessment efforts would prescribe and implement restoration treatments to remove fill and armor and restore habitat and habitat forming processes.

The goal of the project is as follows:

- Rehabilitate lost processes that are provided by floodplain reconnection.

The objectives of the project are:

- Complete a reach-scale assessment including an evaluation of threats from an adjacent road.
- Remove fill and armor from the floodplain.
- Restore habitat and habitat-forming processes.

Qualitative assessment of how the project will function.

The project will function by removing fill and armor, which will allow natural processes to develop in a large floodplain. There are no anticipated offset benefits related to the project because there are no identified permit exempt wells in the project area. Additionally, the potential for the project to increase groundwater recharge has not been estimated.

Conceptual-level map of the project and location.

The proposed project is located along the West Fork White River between river miles 0 and 6, with an initial focus on river miles 2.4 to 5.7. Figure 1 shows the approximate initial project location.

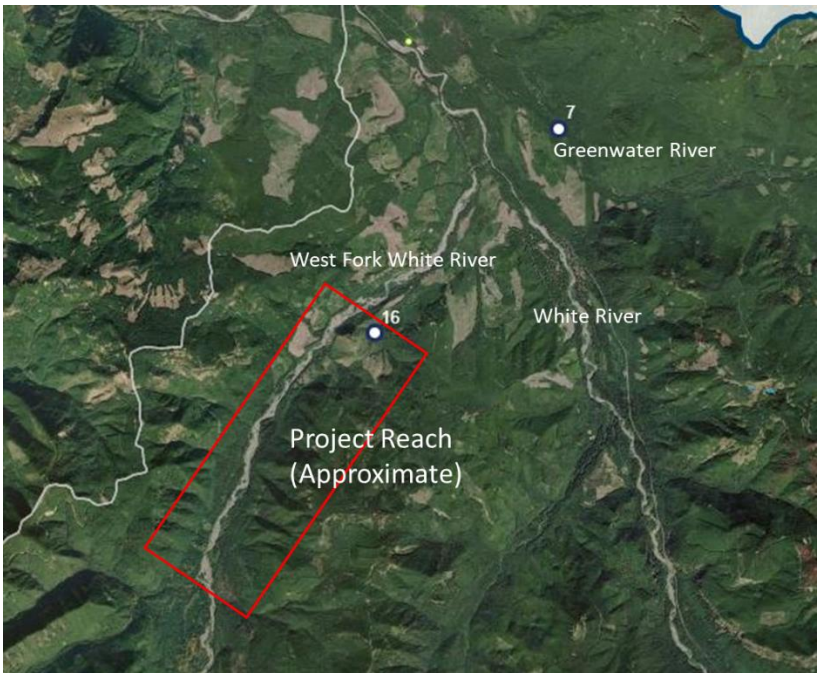


Figure 1. West Fork White Floodplain Project (annotated from Watershed Restoration and Enhancement Committees Technical Support Web Map)

Performance goals and measures.

The performance goals are to complete a reach-scale assessment of river miles 2.4 to 5.7 of the West Fork White River and implement restoration treatments including fill and armor removal. Performance measures would be determined once a final design is selected.

Description of the anticipated spatial distribution of likely benefits.

Benefits to river processes will occur in the project area between river miles 2.4 to 5.7; side channel and other habitat features formed as a result of this project will benefit a variety of salmonid species as described in the next paragraph. Salmonids in the West Fork White River and in the White River will benefit from increased habitat and reduced peak flow and sediment input.

Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.

The West Fork White River supports a variety of salmonid species including Endangered Species Act-listed Chinook, Steelhead, and Bull Trout. Other anadromous salmonid species on the West Fork White River that would benefit from this project include Coho, Pink salmon, and coastal cutthroat trout. The White River supports an early returning population of White River spring Chinook which spawn in the upper and lower White River and is the most distinctive Chinook stock in central and south Puget Sound, and this population may spawn in the West Fork White River (NMFS, 2007). The USFWS has also identified five local bull trout populations within the Puyallup basin, one of which occurs in the West Fork White River and Upper White River (NMFS, 2007). The salmonids and other aquatic species in the West Fork White River are subject to the current limiting factors present.

According to the Limiting Factors Report for the Puyallup Watershed by Kerwin (1999), limiting factors that may be addressed by the project include the following:

- Loss of floodplain habitat, wetlands, and connectivity to hyporheic zone
- Loss of off-channel and side-channel habitat
- Loss of instream habitat complexity and connectivity
- Loss of large wood
- Increase in river channelization
- Increase in sediment load
- Loss of channel (substrate) stability
- Loss of spawning and rearing habitat
- Loss of good water quality, including appropriate temperature

Removal of the existing fill and armor would address these limiting factors by promoting the creation of a variety of habitat types and hydrologic features. Side channels, backwater channels, and off-channel habitat would develop because the river would be allowed to move laterally within the floodplain. These habitats provide protection from flood events and act as riparian cover and rearing habitat, which supports juvenile salmonids and provides areas for fry to colonize. Coho salmon may also spawn in low velocity side channels. Shallow edge habitat would also be created where areas of fill are removed. These provide shade and function as cover and rearing habitat for fry and juvenile salmonids. Invertebrates colonizing the edge habitat are also a prey source for juveniles. Removal of the armor and fill will also increase the sinuosity of the river, creating a slower velocity system where a greater range of sediment and substrate types are available due to the complexity of habitats present. Spawning salmonids (Chinook, steelhead, and Coho) would benefit from a range of substrate sizes. The functions and benefits of the habitat and hydrologic features that would be created by the project address many of the limiting factors currently present in the West Fork White River.

Along with the habitat restoration actions already undertaken in the Upper White River sub-basin, addressing these limiting factors will help support salmonids at various life stages and increase presence, recruitment, and survival in the area of the project. And, for ESA-listed ESUs, restoring these areas would contribute to the VSP parameters of abundance, productivity, spatial structure, and diversity.

Identification of anticipated support and barriers to completion.

This project builds upon previous restoration actions in the Upper White River sub-basin. The project is sponsored by South Puget Sound Salmon Enhancement Group and supported by the Lead Entity, Puyallup and Chambers Watersheds Salmon Recovery Lead Entity.

The WRIA 10/12 Lead Entity Strategy identifies priority tributaries and actions within the Upper Puyallup Watershed (which includes the upper White River sub-basin). The West Fork White River is

identified as a high priority tributary. Two of the high priority actions within this area are directly addressed by this project: “restore natural geomorphic processes and riparian functions where they are compromised, degraded, or severed,” and “address failing roads to reduce sediment load.” Additionally, lateral channel migration has the potential to recruit nearby trees and address a third high priority action: “increase large wood inputs” (Lead Entity 2018). The WRIA 10/12 Lead Entity Strategy additionally states that this type of action will provide the greatest restoration benefit to Puyallup/White River Chinook abundance. The Puget Sound Salmon Recovery Plan also calls out the Upper White River sub-basin as a priority area for White River spring Chinook and suggests actions such as “large woody debris [and] riparian restoration projects in the Upper White River” (NMFS 2007). There are no anticipated barriers to completing this project due to its alignment with regional and basin-wide goals.

Potential budget and O&M costs (order of magnitude costs).

The funding requested to complete reach-scale assessment efforts, evaluate geomorphic threats natural processes, and prescribe and implement restoration treatments based on these analyses is approximately $3,000,000.

No O&M costs have been identified as the project should not pose any maintenance obligations. The initial project reach is on National Forest property. The entire West Fork White River through the national forest is protected under a riparian reserve designation (Ecology 2003).

Anticipated durability and resiliency.

Floodplain reconnection projects are durable as they restore natural processes to a reach of the river, allowing flooding and channel migration to occur unimpeded. Given the changing climate conditions that anticipates receding glaciers, increases in precipitation and rain-on-snow events, and channel aggradation, floodplain reconnection projects that provide the river with more room to meander and more ways to hold water for longer are important solutions to implement to restore watershed processes and to provide resiliency from a changing climate.

Project sponsor(s) (if identified) and readiness to proceed/implement.

South Puget Sound Salmon Enhancement Group is the project sponsor and is ready to implement the project as soon as funding is made available. The overall project can likely be implemented within the next five years provided funding is available.

Documentation of sources, methods, and assumptions.

The following references were used:

Ecology, 2003. Mt. Baker-Snoqualmie National Forest, Upper White Watershed Sediment and Temperature TMDL for Aquatic Habitat. Submittal Report, Publication No. 03-10-032. Available from: https://fortress.wa.gov/ecy/publications/documents/0310032.pdf

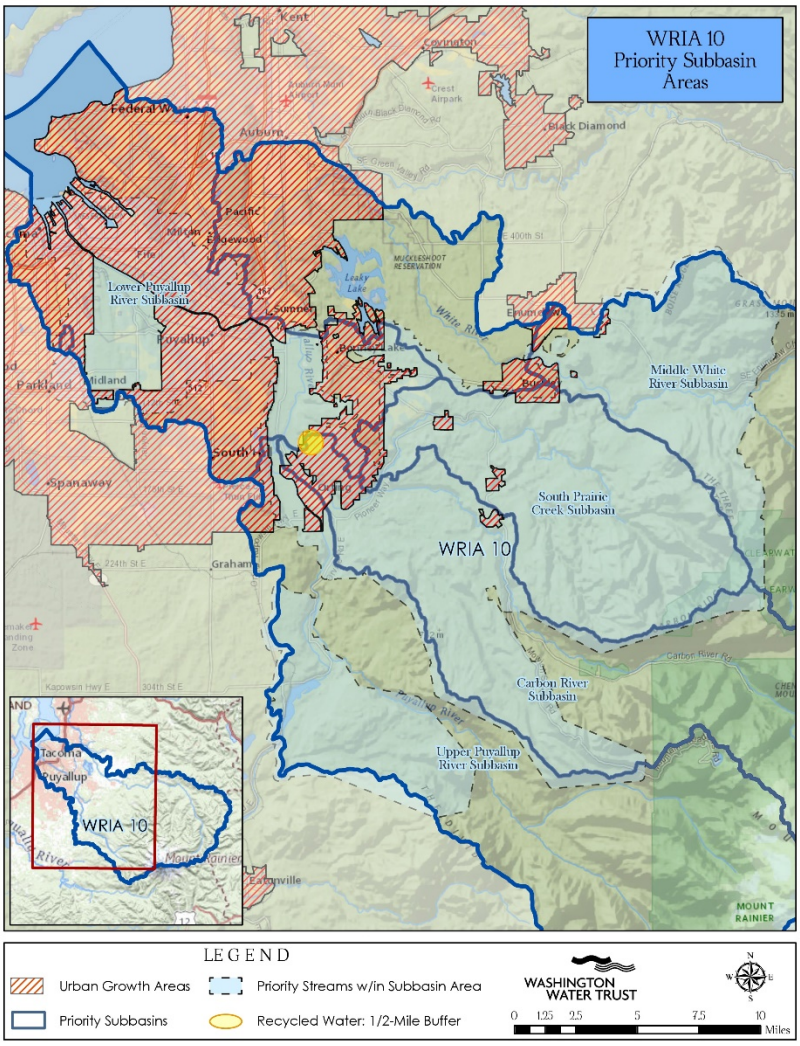
National Marine Fisheries Service (NMFS). 2007. Puget Sound Salmon Recovery Plan. Plan adopted by NMFS on January 19, 2007. Submitted by the Shared Strategy Development Committee. Available from: https://repository.library.noaa.gov/view/noaa/16005

Puyallup and Chambers Watersheds Salmon Recovery Lead Entity (Lead Entity). 2018. Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds. June. https://www.piercecountywa.org/ArchiveCenter/ViewFile/Item/6075

Kerwin, J. 1999. Salmonid Habitat Limiting Factors Report for the Puyallup River Basin. Washington Conservation Commission.

Appendix I – Washington Water Trust Report

WRIA 10 Puyallup-White
Priority Water Right Projects Report



WASHINGTON WATER TRUST

MWS

Blue Water GIS

Prepared for WRIA 10 Water Resources Enhancement Committee

June 29, 2020

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GIS Data Credits:
Washington State Department of Ecology Water Rights Tracking System, King County Parcel Data, and National Agricultural Imagery Program.

Washington Water Trust

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Table of Contents

List of Attachments

1 Introduction

The Washington State Legislature passed the Streamflow Restoration Act, Chapter 90.94 RCW, in January 2018. This legislation required 15 different Water Resource Inventory Areas (WRIA), including WRIA 10 Puyallup-White, to update or adopt watershed plans with projects identified to offset the impact of new rural well development over a 20-year period from 2018 to 2038. The legislation directed the formation of Water Resources Enhancement Committees (WREC) to oversee the watershed plans as well as the identification of consumptive use offset projects. One potential source of these projects is water rights acquisition.

The Washington State Department of Ecology (Ecology) tasked Washington Water Trust (WWT) to undertake a water rights assessment in WRIA 10 utilizing prioritization criteria adopted by the WREC in order to identify at least 10 potential water right projects. The WREC is to identify potential projects to achieve a consumptive use offset of 277.4 acre-feet per year (afy).

The WWT project team, including BlueWater GIS (BWGIS) and McCormick Water Strategies (MWS), consulted with Ecology staff and the WREC to produce the following products in support of project development:

- WRIA 10 Preliminary Water Rights Analysis-Update[1];
- WRIA 10 Irrigation Assessment Dashboard[2];
- WRIA 10 Water Rights Assessment Due Diligence Technical Memo[3]; and
- WRIA 10 Puyallup-White Priority Water Right Projects Report.

Each product listed above has subsequently informed the product that follows. The first product, WRIA 10 Preliminary Water Rights Analysis-Update, shared the specific categories of water rights the WWT team was to analyze, provided initial irrigation analysis results, and presented water right selection criteria for WREC approval. The second product, WRIA 10 Irrigation Assessment Dashboard (Dashboard), is an ArcGIS tool that expedites water rights review and prioritization, while providing a visual display of the spatial distribution of potential projects. In total, the Dashboard identified 50 water right projects, with 11 recommended to WREC for development of Project Opportunity Profiles. The third product, WRIA 10 Water Rights Assessment Due Diligence Technical Memo (Technical Memo), demonstrated how selection criteria was applied, shared brief summaries of potential water right projects, and recommended water right projects on which to conduct additional due diligence to develop Project Opportunity Profiles. The final product, WRIA 10 Puyallup-White Priority Water Right Projects Report (Report), provides a summary of due diligence details in Project Opportunity Profiles (Profiles) for the selected priority projects.

This Report provides an overview of the project objective, methodology, project profiles, outreach discussion, and includes the first three products listed above as attachments. The project profiles summarize estimated beneficial use and review the water rights record. This summary and review

[1] Attachment 1: WRIA 10 Preliminary Water Rights Analysis-Update
[2] Attachment 2: WRIA 10 Irrigation Assessment Dashboard
[3] Attachment 3: WRIA 10 Water Rights Assessment Due Diligence Technical Memo

will inform water right holder outreach and project development. The outreach section reports any outreach to date, as well as general guidelines for engaging water right holders to develop a project.

2 Assessment

The Technical Memo reviewed several sources of water rights as selected by Ecology and the WREC, delineated potential irrigation, and performed preliminary water right record review to recommend potential projects for further due diligence. The water right sources include:

- *Trust Water*: Assess up to 7 trust water temporary donations in the WRIA that could be changed to permanent donations.
- *Other Water Rights*: Assess up to 10 water right acquisition opportunities per WRIA as identified by Ecology.
- *Recycled Water/Irrigation Analysis*: Within 1/2 mile of a recycled water facility in WRIA 10, identifying up to 10 properties that could change to recycled water service.
- *Irrigation Analysis*: Assess water rights in priority sub-basin Areas. Identify private properties of 5 acres or greater of irrigation with beneficially used water rights within the Fennel Creek, Lower Greenwater River, Hylebos Creek, Fiske Creek, Voight Creek, Kapowsin Creek, Wilkeson Creek, Boise Creek, Puyallup River, Upper Greenwater River, and South Prairie Creek, drainages; and
- *Golf Course and Tree Farm Irrigation Analysis*: Identify golf courses or tree farms inside Urban Growth Area Boundaries, within priority subbasins, that are utilizing surface or groundwater rights.

In addition, based on input from the WREC, Ecology requested to exclude from consideration those water right projects that were fully or partially within Pierce County Agricultural Resource Land and Rural Farm Land zoning.

Additionally, the assessment included an analysis of aerial photos to identify if irrigation was likely occurring and if an underlying water right document supported that use. Ecology's Water Right Tracking System database includes nearly 3,900 water right documents within WRIA 10, which are certificates, claims, or change record of examinations (ROE's). The water rights were pared down by focusing on documents where irrigation is a purpose of use and where there is likely beneficial use as assessed through review of aerial photography from the National Agricultural Imagery Photography (NAIP).

2.1 Water Right Selection Criteria

Selection criteria approved by the WREC prioritized due diligence review for water rights most likely to have been beneficially used and potentially contribute to the offset portfolio.

The criteria includes:

- **Water Right Document Type:** Certificates and claims receive preference.
- **Irrigated Acreage:** Water rights with less than 5 acres of authorized or asserted use are excluded from further consideration as they would not offer enough water to be viable offset projects. Water rights with more identified irrigated acreage receive preference.

- **Confidence of Irrigated Acreage:** Water rights with places of use seeing higher and more frequent (2013 and 2017) irrigation confidence receive preference.
- **Priority Date:** Water rights with more senior priority dates receive preference. (Puyallup/White Instream Flow Rule – March 1980).
- **Distance Upstream:** Water rights higher in the sub-basin receive preference.
- **Purpose of Use:** Irrigation water rights receive preference due to ability to demonstrate beneficial use.
- **Qa/Qi Annual and Instantaneous Quantity on Water Right:** Water rights with greater quantities receive preference.[4]

2.2 Irrigation Analysis Methods

The GIS based irrigation analysis first involved identifying irrigated areas through review of aerial photography for the years 2013 and 2017 from United States Department of Agriculture (USDA) NAIP imagery. Potential irrigation areas were delineated into polygons, which were reviewed by utilizing publicly available GIS data to correlate ownership and water right records.

2.2.1 Data

The following types of data were used in WRIA 10 water rights analysis:

- Geographical Water Rights Information System Place of Use Polygons (Ecology)
- Water Rights Tracking System (Ecology)
- USGS Topographic Data
- National Agriculture Imagery Program Aerial Orthophotography (2013 and 2017 only; 2015 NAIP imagery was not used due to drought year conditions.)
- King and Snohomish County Parcel and Ownership Information
- WRIA 10 WREC Subbasins (Ecology)
- Washington State National Hydrography Dataset (Ecology)
- GIS analysis used ArcGIS Pro 2.4.0 and a coordinate system of AD_1983_StatePlane_Washington_South_FIPS_4602_Feet

2.2.2 Target Areas

The WREC and Ecology instructed WWT to focus on the following target areas for irrigation analysis:

- Fennel Creek – Puyallup River sub-basin
- Lower Greenwater River sub-basin
- Hylebos Creek – Frontal Commencement Bay (includes Wapato/Simon Creek) sub-basin
- Fiske Creek – Puyallup River (includes Horsehaven Creek) sub-basin
- Voight Creek sub-basin
- Kapowsin Creek sub-basin

[4] Quantities asserted in water right documents may overestimate water need or provide no quantities at all (claims). Ecology may apply a tentative determination to claim, but formal confirmation of a claim can only be determined in an adjudication, a formal process to evaluate all water rights within a specific watershed and provide legal determination of those water rights.

- Wilkeson Creek sub-basin
- Boise Creek – White River sub-basin
- Puyallup River (includes Clear Creek and Rody) sub-basin
- Upper Greenwater River sub-basin
- South Prairie Creek sub-basin
- Within ½ mile of the Tehaleh Wastewater Treatment Plant

2.2.3 BWGIS Assessment

To assess water rights within the identified project area, BWGIS:

- Identified the water rights within the priority subbasins with at least 5 acres of irrigation.
- Reviewed the attributes of those water rights.
- Estimated the amount of irrigation associated with each water right with aerial photos (2013 and 2017).

2.2.4 Selections and Ranking

This methodology resulted in 51 candidates for priority projects. The 51 candidates met the subbasin irrigation analysis and recycled water selection criteria. Additional selections included 2 water right projects pre-identified by Ecology. In total, the selections and rankings resulted in 53 candidates. These candidates are displayed in the Dashboard.

The projects reviewed in the irrigation analysis consisted of the 51 candidates. These were ranked in the following tiers:

Tier 1 - Priority Water Right Acquisition

- Water right document type listed as Certificate.
- Water right purpose of use of irrigation.
- Water right documents with more than 5 acres irrigation listed.
- More than 5 acres of delineated acreage.
- Priority date senior to the March 1980 Puyallup River Instream Flow Rule.
- Located higher in the sub-watershed.

Tier 2 - Non-Priority Water Right Acquisition

- Water right document type listed as Certificate
- Water right purpose of use of irrigation.
- Water right documents with *more* than 5 acres irrigation listed.
- *More* than 5 acres of delineated acreage.
- Generally located lower in the sub-watershed.

Tier 3 – Undesirable Water Right Acquisition

- Water right purpose of use of irrigation.
- *More* than 5 acres of delineated acreage, but a smaller acreage relative to other delineations in the same sub-watershed.
- Generally located lower in the sub-watershed.

In summary, the Technical Memo presented an overview of the selection process and recommended water right projects to pursue for further due diligence. These recommended water rights were further refined in consultation with the WREC and Ecology, as well as some initial outreach to some pre-identified water right projects, resulting in the final list of 11 water right project opportunities.

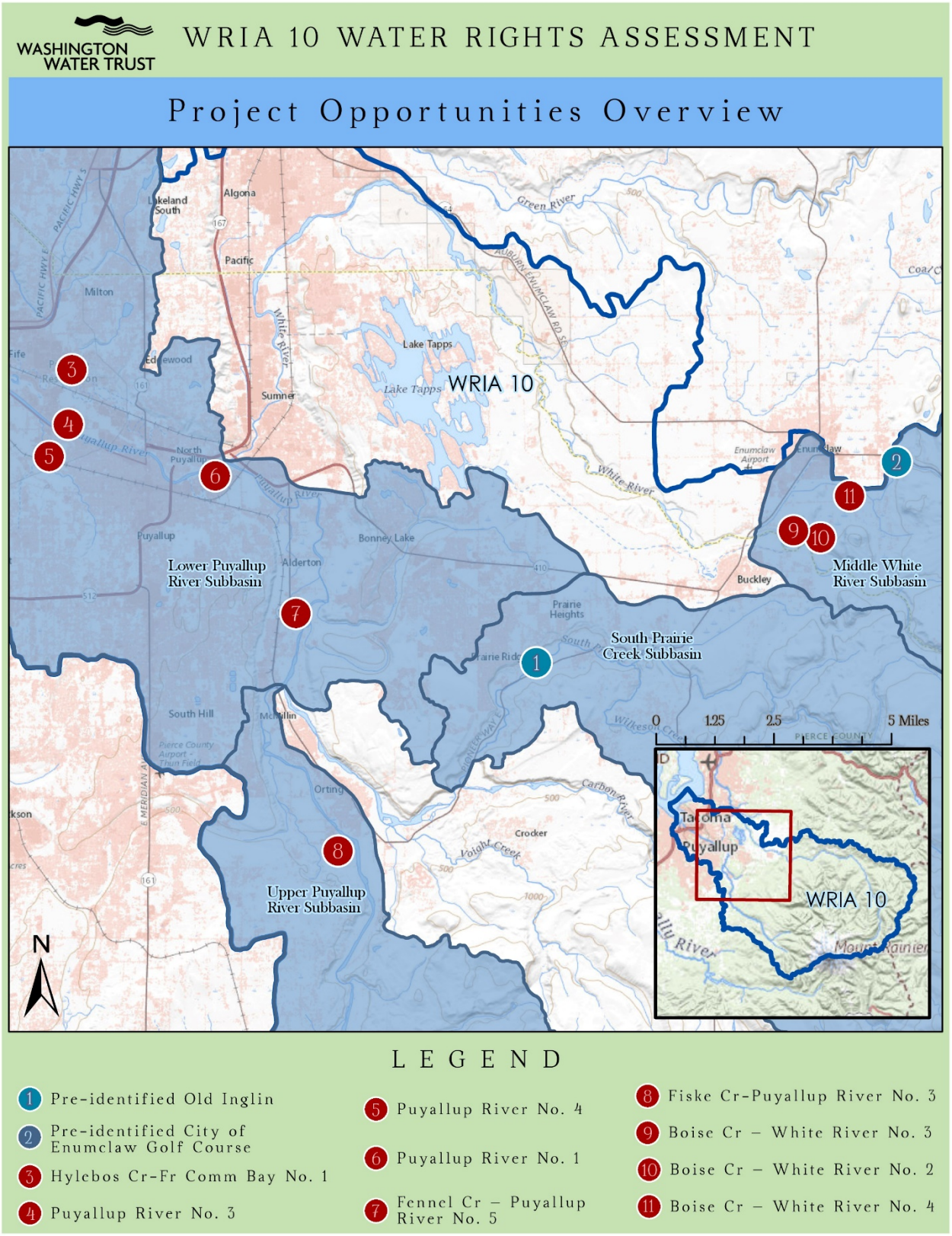
3 Project Opportunity Profiles and Findings

The Project Opportunity Profile (Profile) is a document that aids the development of a potential water right project. The Profile presents a summary of information related to the recent historic use of a water right, a review of the Ecology water right record, land use underlying the water right, an estimate of consumptive use, and a project assessment. An entity seeking to engage a water right holder in a transaction may utilize the Profile as a foundation of information.

The 11 Profiles for WRIA 10 are shown in Figure 1, on the following page. In the development of these 11 Profiles, two additional years of delineations were added, 2015 and 2019. The Profiles do not include water right holder, landowner names, or water right numbers for confidentiality. The projects are named by their subbasin location with a number indicating their location relative to the headwaters of the stream/river. Those water right opportunities identified by means other than irrigation analysis are referred to as "Pre-Identified #X".[5]

[5] Attachment 4: Project Opportunity Profiles

Figure 1: Project Opportunity Profile Areas.



3.1 Profile Information

Each Profile contains specific information related to the opportunity it represents, as listed below:

- *Flow Benefit*: estimated flow benefit by quantity and river mile
- *Priority Subbasin:* project location
- *Estimated Offset:* estimated consumptive use of project
- *Water Right Priority Date:* priority date of certificate or claim
- *Instream Flow Rule:* whether and where instream flow is established
- *ESA Listed Fish:* species and ESA listing status
- *Outreach Per Level of Landowner Engagement*: None, Initial, Interested, or Uninterested
- *Project Description*: summary of project opportunity including potential barriers
- *Watershed Context*: watershed conditions including limiting factors to salmonid recovery
- *Land Use and Ownership:* zoning and land use, summary history of recent ownership, and observed use
- *Delineation Irrigation Table*: estimated irrigation within water right places of use (2013, 2015, 2017, and 2019)
- *Water Rights:* summary of water right characteristics (certificate/claim, priority date, purpose, Qa, Qi, and source)
- *Water Right History:* summary review of Ecology water right record and decisions
- *Metering Records:* confirmation of meter records availability and for what period
- *Conclusion:* summary of the Profile and opportunity
- *Project Map:* display water right(s), estimated irrigation, point(s) of diversion, and location within WRIA

3.2 Profile Next Steps

This Report is largely a desktop process, which has not involved significant outreach to water right holders. Outreach could provide important corroborating information related to water use or non-use. The data sources that could confirm water use include: pump records, meter readings, electrical records, photographs, and affidavits.[6] There may be information or irrigation delineation within these profiles, which suggest non-use of all or a portion of a water right or potential relinquishment. Again, with direct landowner engagement, potential gaps in beneficial use may be explained as resulting from the timing of the aerial photograph, a lack of understanding of the water management practices on the ground, or if there is non-use, a circumstance among the sufficient causes for non-use.[7]

In the estimation of consumptive use for the Profiles, calculations are made using the highest year of delineated acreage (2013, 2015, 2017, and 2019) or the water right document authorization, whichever is most appropriate. These calculations utilize the pasture/turf crop irrigation requirement duty from the Washington Irrigation Guide from the Kent, Washington station.

The information provided in the Profiles is a reasonable start to finding potential water rights to serve project needs. It is up to the WREC to determine the level of corroboration and investigation needed for a water offset project included in a plan under RCW 90.94. The authority for determining (or

[6] *Changing or Transferring an Existing Water Right*, Department of Ecology, 98-1802-WR, 2008.
[7] RCW 90.14.140

adjudicating) the extent and validity of water rights is the purview of Superior Courts, Ecology, or other entities with jurisdiction under Washington State law.

3.3 Profile Findings

As a result of assessing many attributes, delineations, and data sources specific to the properties and water rights associated with a Profile, WWT validated water right record data from Ecology's Water Right Tracking System, and developed a consumptive use estimate for each Profile, Table 1. In total, WWT estimates 480.73 afy of consumptive use associated with the 11 Profiles. This finding is an estimate; additional due diligence is required, and despite conservative estimates, our experience has proven that this number is likely to further decrease following administrative review.

Table 1: Profile Summary

Project Name	Document Source	Priority Date	Qa CU (estimate)	Qi CFS	Subbasin
Boise Cr – White R No. 2	Groundwater	2/19/1971	52.86	0.22	Middle White River
Boise Cr – White R No. 3	Cyclone Creek	4/29/1952	48.15	0.30	Middle White River
Boise Cr – White R No. 4	Boise Creek	4/20/1948	49.25	0.30	Middle White River
Fennel Cr – Puyallup R No. 5	Groundwater	6/22/1950	23.55	0.22	Lower Puyallup River
Fiske Cr - Puyallup R No. 3	Groundwater	3/27/1968	72.15	0.45	Upper Puyallup River
Hylebos Cr – Fr Comm Bay No. 1	Groundwater	11/23/1949	34.35	0.67	Lower Puyallup River
Puyallup R No. 1	Groundwater	11/6/1951	0.75	0.45	Lower Puyallup River
	Puyallup River	3/18/1963		0.30	Lower Puyallup River
Puyallup R No. 3	Puyallup River	2/7/1950	36.23	0.30	Lower Puyallup River
Puyallup R No. 4	Groundwater	9/29/1952	19.92	0.38	Lower Puyallup River
Pre-Identified Old Inglin	South Prairie Creek	10/9/1944	89.09	0.40	South Prairie Creek
	South Prairie Creek	6/27/1974		0.36	South Prairie Creek
Pre-Identified City of Enumclaw Golf Course	Chappel Spring of Boise Creek	9/3/1940	54.43	0.2	Middle White River
Tier Selection Totals	**-**	**-**	***480.73***	***4.55***	**-**

4 Project Types

The following are flow restoration project types available to use with willing landowners. Selecting a project type will derive from existing water and land management practices, history of beneficial use, and landowner interest. There are non-permanent project types identified which may not provide a permanent offset immediately, but may serve as an introduction to water saving projects and result in permanent acquisition.

The objective with these water rights projects is a partial or full acquisition to provide permanent water offset. In some cases, there may be other unique opportunities, such as surface water source switches, groundwater source switches, conservation and efficiency upgrades associated with water rights, or temporary transactions. Source switches, unless to an alternative source (i.e. recycled or municipal water), are not prioritized to secure an offset.

4.1 Purchase/Lease

A water right purchase may include a whole water right or portion of a water right acquisition from a willing seller. There are firms who can conduct valuations to estimate the price range of the potential purchase with pricing based on cost/acre-foot. A lease, while not a permanent solution to support the offset target, often serves as a first step towards a permanent acquisition. A lease may be partial or full season for a duration determined by the agreement.

4.2 Irrigation Efficiency

Irrigation efficiency projects are generally developed in partnership with Conservation Districts and landowners, relying on funding from either Natural Resources Conservation Service programs (Environmental Quality Incentive Program)[8] or Washington Conservation Commission (Irrigation Efficiencies Grant Program).[9] The Washington Conservation Commission program operates within the 16 fish critical basins, provides up to 85% cost sharing, and requires that saved water be placed in the Trust Water Rights Program.

Irrigation efficiency may reduce consumptive use by improving conveyance of water and reducing evaporative loss. The majority of water savings in irrigation efficiency projects tend to be non-consumptive use.[10] The WREC should evaluate whether the consumptive gains of an irrigation efficiency project merit the project costs.

4.3 Change in Crop Type

A change in crop type may directly result in a reduction in the consumptive use of water (i.e. switching from turf grass to vegetable row crops). This saved water could be placed in trust and a superseding certificate issued, constraining the new Qa available under the water right.

[8] https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/
[9] https://scc.wa.gov/iegp/
[10] Attachment 5: Water Rights 101

4.4 Source Switch

The change of water sources on a water right is a flow tool used to lessen the flow impact on a small stream by moving to a larger stream. Changing to a source of new water, i.e. recycled water, can replace existing water needs, thus making existing water rights available for transaction and the consumptive portion available for an offset.

5 Outreach and Next Steps

5.1 Overview

Engagement with a water right holder is the essential component to understand landowner willingness, cultivate project partnership relationships, and successfully implement streamflow restoration projects. Outreach includes several strategic steps leading up to securing signed agreements with willing project partners and working with them to document the extent of beneficial use available for transfer to instream flows or offset. Executing a water right transaction is often the result of a multi-year process of reaching the landowner, cultivating trust, providing confidentiality, and establishing what types of project fit their needs/interest. Landowner agreements form with a thorough understanding of existing water use practices and identification of the project type which meets both landowner and restoration objectives. Permanent acquisition of water is typically built on mid-range steps such as letters of intent, short-term leases, or donations that ensure that both the landowner's and the stream's needs are best captured in the final project.

In some basins, water right transactions are a new tool, where long-term projects build on incremental steps. For example, short-term agreements afford the landowner an opportunity to evaluate the costs and benefits of how reduced water use affects operations and consequently, bottom line. Short-term agreements provide the funder information on stream impacts before making larger capital investments. Incremental steps towards a transaction include short-term leases, option agreements, and participation in dry year leasing programs or irrigation efficiency projects. Trust and relationship building is required in the realm of water right transactions, because water rights are generally closely held as valuable, critical to agricultural production, and subject to loss if unused.

This combination of conditions and vulnerability around water rights can make some landowners understandably concerned about initiating a conversation about water rights. In order to navigate these concerns, it remains important to identify the entity best suited to build trust with and engage this conversation in a confidential manner. Further, any conversation is an opportunity to share and learn information about the user and their water needs, information about the water right beneficial use, as well as the risks and opportunities of engaging in a project. Confidential and transparent communication builds trust and increases the likelihood of developing a viable project.

This WRIA 10 Puyallup-White Priority Water Rights Projects Report and the Project Opportunity Profiles provide a foundation of information to understand how the paper water right quantities compare to beneficially used water right quantities available for transaction. To make best use of the Project Opportunity Profiles, this report provides guidance on engaging landowners.

5.2 Guidelines

The following are general guidelines to develop an outreach program.

5.2.1 Who Knows Who?

- *Network:* Knowing or having an existing relationship, or knowing someone who does, enables the best opportunity to secure a first meeting or call with a water right holder. Share the Profiles with a WREC workgroup, share landowner names, and identify if there is someone who can either directly engage or make an introduction.

- *Conservation History:* A water right holder who has participated in other conservation programs with local agency representatives, an NGO or a conservation district, may be more willing to discuss a water right transaction. Confirm with your local Conservation District, NGO partners, or local government responsible for conservation programs as to whether they are familiar with the water right holders. The CD or local government may be willing to make an introduction or facilitate a meeting.

- *No Contact Information:* In the absence of an introduction through a mutual contact, the entity may need to rely on a cold contact. Cold contact can take the form of either phone call, email, or a direct mailing to the address available on the assessor's website.[11]

- *Local Meeting:* If there are sufficient (more than 5) landowners within a priority area, an entity may choose to invite them to a meeting to learn more about the watershed planning effort, water rights in general and conservation programs. While this is a less direct appeal, it may offer an opportunity for the most interested of the landowners to participate. Targeting outreach efforts more narrowly to pre-selected water rights holders allows project implementation tailored to the audience most likely to see the benefits of the program to their individual needs.

5.2.2 Meeting

- *Call:* If you can reach out to a water right holder via phone, introduce the larger project and your interest in discussing water rights. The purpose of the call is to schedule an in-person meeting. The call and the in-person meeting necessitate a baseline understanding of water rights and guided towards sharing information and learning about the interests, concerns, and questions of the landowner.

- *Meeting:* When you schedule and attend the meeting, bring the project map from the Project Opportunity Profile. The project map provides a valuable and accessible way for the project proponents and prospective landowners to discuss important details of how the project will match up with their existing farm management objectives.

- *The Follow-Up:* Landowners are often not ready to sell their water rights or engage in a transaction after the first meeting. Successive follow-up meetings should be oriented toward building the relationship and making valuable use of time to orient towards water right transactional opportunities, funding, and transactional benefits. It is important to clarify and communicate actionable steps that are likely to lead up to that goal and incorporate those

[11] Attachment 6: Sample Letter

milestones into the project development strategy. This could include a landowner letter of intent, a short-term agreement, or a feasibility study or alternatives analysis frequently used in larger irrigation efficiency projects. These milestones allow project proponents to establish realistic timelines for implementation of permanent acquisitions, and keep the landowner engaged in the project development process.

5.2.3 Additional Due Diligence-Formal Quantification of Water Right

- *Information:* The Profile will provide desktop estimates of irrigated acres, crop type, and irrigation method. Confirm these estimates and assumptions with the water right holder. While the aerial maps may provide some evidence of beneficial use, additional corroborating information may include crop receipts, pump records, electrical records, and diversion records, affidavits by water user/neighbors, or historic photos. If aerial photographs indicate potential non-use, work with the landowner to understand if that non-use may fit into the Sufficient Causes for Non-Use. The estimation of consumptive use follows Ecology Guidance Document 1210.

- *Project Selection:* Once the water use is better understood, begin a general discussion to identify which project type to develop and how the landowner may be willing to participate. *See Section 4. Project Types*

- *Letter of Intent:* If the water right use is documented and a project type has been selected, a project can be further secured by requesting that the landowner sign off on a letter of intent (LOI). This LOI will be a form of commitment and be necessary in many funding requests to support the project development. [12]

As with each phase along the way, it is important to provide clear information to the water right holder and manage expectations on funding and timelines. Following the above guidelines as best practices will increase the likelihood of successful project development. Additional on-line resources are available to support landowner engagement and project development.[13]

5.3 WRIA 10 Outreach Update and Next Steps

Outreach to water right holders is an important next step in project development. Initial outreach by WWT has already occurred on 4 of the 11 Profiles discussed in this Report. Below is a status update and WWT's recommended next steps.

5.3.1 WWT Outreach Log

Pre-Identified Old Inglin: WWT has conducted initial outreach to this water right holder. The water right holder has expressed interest in a water right transaction in the next three-five years when they will no longer require use of the water rights. There may be as much as 89.09 afy consumptive use.

Next Steps: If the WREC selects this project, Ecology or assigns would meet with the water right holder to clarify water use, secure data to confirm water use, identify the consumptive use portion, and begin project development.

[12] Attachment 7: Letter of Intent
[13] Attachment 8: Additional Resources

Pre-Identified City of Enumclaw Golf Course: WWT has contacted this water right holder. The water right holder is in the process of switching sources to municipal water and it is anticipated this will be completed in 2020. Once the source switch has occurred, the water right holder has indicated that will no long require use of the water right and are interested in a water right transaction.

Next Steps: If the WREC selects this project, Ecology or assigns would meet with the water right holder to clarify water use, secure data to confirm water use, identify the consumptive use portion, and begin project development.

5.3.2 Outreach Conclusion

For all other water rights where outreach has not yet occurred, we recommend following the outreach guidelines as included in this Report and consulting the network or WREC committee as to who might know or be best suited to engage with the water right holder. Under the current contract, Washington Water Trust is available for further consultation through July 31, 2020.

Attachment 1: WRIA 10 Preliminary Water Rights Analysis-Update

TO: Rebecca Brown, Ecology

FR: Jason Hatch, Washington Water Trust

DT: April 1, 2020

RE: WRIA 10 Preliminary Water Rights Analysis-Update

WASHINGTON WATER TRUST

1500 Westlake Ave N Suite 202
Seattle, WA 98109
www.washingtonwatertrust.org
206-675-1585

Washington Water Trust (WWT) is nearing completion of the irrigation assessment for WRIA 9 as the first step in their Preliminary Water Rights Analysis.

WWT was enlisted to undertake a water rights assessment in WRIA 10. The assessment was to identify water right acquisition opportunities that could serve in a rural well offset portfolio for new uses through 2038. The source of water right opportunities would include: irrigation analysis in specific subbasins; water rights currently held in temporary trust with DOE; pre-identified water rights (some held by local jurisdictions); water rights/water use within 1 mile of the distribution line of the Cascadia Treatment Plant (recycled water facility) and other water rights identified through the course of the assessment.

Specifically, WWT was asked to evaluate:

- *Trust Water:* Assess Up to 15 trust water temporary donations in WRIA that could be changed to permanent donation;
- *Water Rights:* Assess up to 10 water right acquisition opportunities per WRIA as identified by Ecology;
- *Recycled Water:* Irrigation Analysis-Within 1 mile from distribution line of the Cascadia Wastewater Treatment Plant for WRIA 10, identify up to 10 properties with water rights that could change to recycled water service; and
- *Irrigation Analysis:* Up to 20 water right opportunities through identifying private properties of 5 acres or greater with beneficially used water rights within: Boise Creek, Fennel Creek, Greenwater River, South Prairie Creek-Wilkeson Creek, Voights Creek, Kapowsin Creek/Ohop Creek, Rody Creek, Wapato/Simons Creek, and Horsehaven Creek drainages.

This assessment would include aerial photo analysis and underlying preliminary records review. WWT would in coordination with the DOE Watershed Planner, share findings and solicit feedback, resulting in 10 project profiles of water rights which could contribute to the offset portfolio if the water rights holder (s) were willing sellers.

Water Rights

An irrigation analysis helps identify through aerial photo analysis where irrigation is likely occurring and where an underlying water right document supports that use. The Department of Ecology's WRTS database provides for **675 water right documents** within WRIA 10 priority basin, which are certificates, claims, or change record of examinations (ROE's). This number will be significantly pared down by focusing on documents which include irrigation as a purpose of use and demonstrate likely beneficial use through analysis of aerial photography from NAIP (National Agricultural Imagery Photography).

WWT is nearing completion of an irrigation analysis, which involves utilizing ArcGIS and measuring (delineating) areas of water use in 2013 and 2017. 2015 NAIP imagery was not used due to drought conditions that year. The irrigation analysis identifies water rights places of use with aerial imagery which aligns with the water use. The GIS analyst will assign high, medium, and low irrigation confidence. After water use and water right place of use is matched, the next phase of the water rights analysis is to use irrigation analysis results to prioritize and select water rights in each area to undergo a due diligence review.

Recommended and conventionally used selection criteria include:

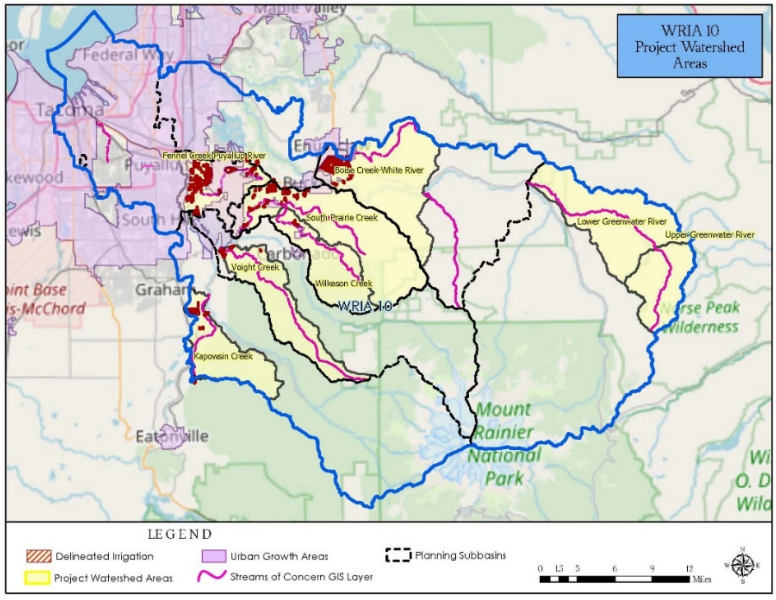
- Water Right Document Type- Certificates and claims receive preference.
- Irrigated Acreage- Water rights with less than 5 acres of authorized or asserted use should be excluded from further consideration as they would not offer enough water to be viable offset projects. Water rights with more irrigated acreage identified receive preference.
- Confidence of Irrigated Acreage- Water rights with places of use seeing higher and more frequent (2013 and 2017) irrigation confidence receive preference.
- Priority Date- Water rights with more senior priority dates receive preference. (Puyallup-White Instream Flow Rule-3/21/80).
- Distance Upstream- Water rights higher in the sub-basin receive preference.
- Purpose of Use- Irrigation water rights receive preference due to ability to demonstrate beneficial use.
- Qa/Qi Annual and Instantaneous Quantity on Water Right- Water rights with greater quantities receive preference.

Geography Area Initial Findings

WRIA	Name	Number of Total Water Rights	Sum of Irrigated Acres on WR	Delineated Irrigation Count	Delineated Irrigation Acres
10	Boise Creek-White River	38	686	71	972
10	Fennel Creek-Puyallup River	106	1,213	106	1,208
10	Kapowsin Creek	5	-	10	264
10	Lower Greenwater River	18	-	0	0
10	South Prairie Creek	44	417	73	469
10	Upper Greenwater River	17	-	0	0
10	Voight Creek	15	355	7	119
10	Wilkeson Creek	3	44	3	38
	TOTAL	**246**	**2715**	**270**	**3070**

WRIA	PENDING
10	Rody Creek
10	Clear Creek
10	Wapato/Simon Creek
10	Horsehaven Creek

The findings above identify water rights within the basin, the authorized acres allowed with those water rights as well as the number of areas of delineated irrigation and the corresponding likely beneficially used acres. The next step is to align these irrigated acres with a water right (s) which authorizes this use.



Trust Water and Pre-identified Water Rights

At the direction of DOE, WWT was provided a list of 10 water right opportunities along with 15 water rights in temporary trust. WWT has conducted preliminary due diligence on the 10 water right opportunities, 3 of which have insufficient recent irrigation history, 1 meets recent irrigation history of 5 acres or great, 5 require further review and potential outreach to project contacts. Continued review is being conducted on the 15 water rights identified in temporary trust, one of which overlaps and is within the 10 water right opportunities as well. WWT will follow up with other water right holders as directed.

Recycled Water Source Substitute

WWT was instructed to identify up to 10 properties within a 0.5 mile radius of the service line for Cascadia Wastewater Treatment plant. Cascadia WTP currently produces upwards of 300,000 gallons per day (336 AFY) to a Class B standard and is discharged into a drain field east of the plant. There is future potential to serve landscaping needs for adjacent subdivision. In addition there may be potential if plant is upgraded and sufficient output to produce Class A for agricultural properties to the west and adjacent to the Carbon River.

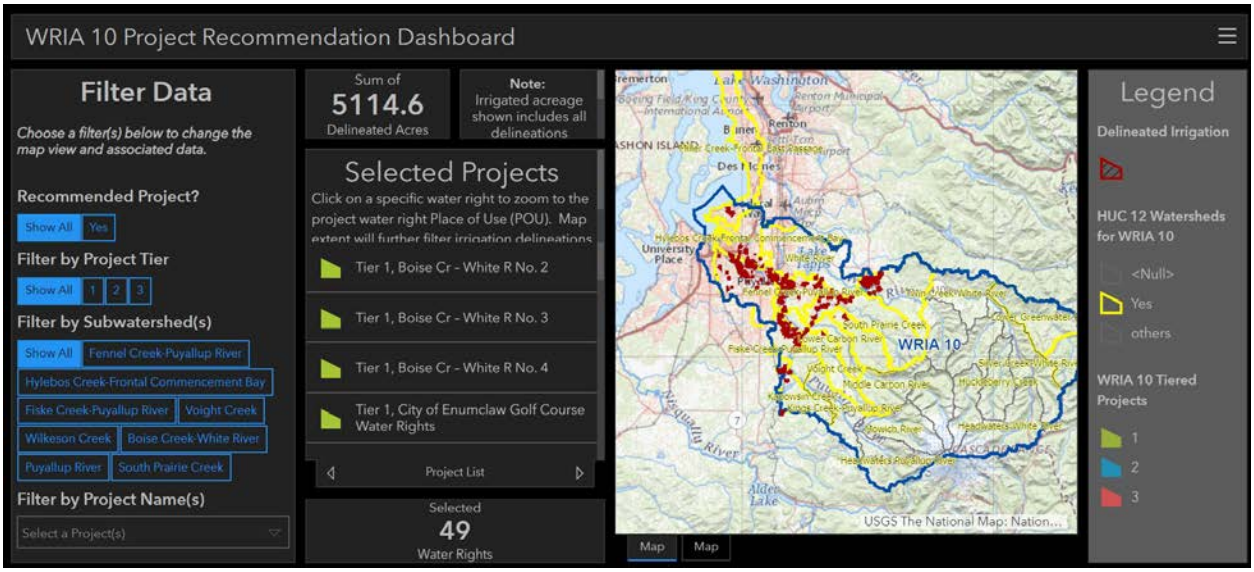
Next Steps

- The irrigation analysis will be complete in the subbasins identified including those pending, prioritizing up to 20 water rights for consideration of further due diligence. Water rights and their corresponding places of use (POU) will be evaluated with water use.
- Water right opportunities which require further review will continue.
- Trust water right opportunities will be reviewed and initial letters of inquiry may be sent at the direction of watershed planner.

WWT will screen and provide a recommended prioritization of up to 10 water rights to pursue more substantial due diligence upon. At direction of DOE and WREC, WWT will proceed with this water right record review and develop project profiles of the 10 water rights which highlight opportunity, water rights and estimated consumptive use.

Attachment 2: WRIA 10 Irrigation Assessment Dashboard

WRIA 10 IRRIGATION ASSESSMENT DASHBOARD



Weblink: https://bit.ly/WRIA10-Project-Rec-Dashboard

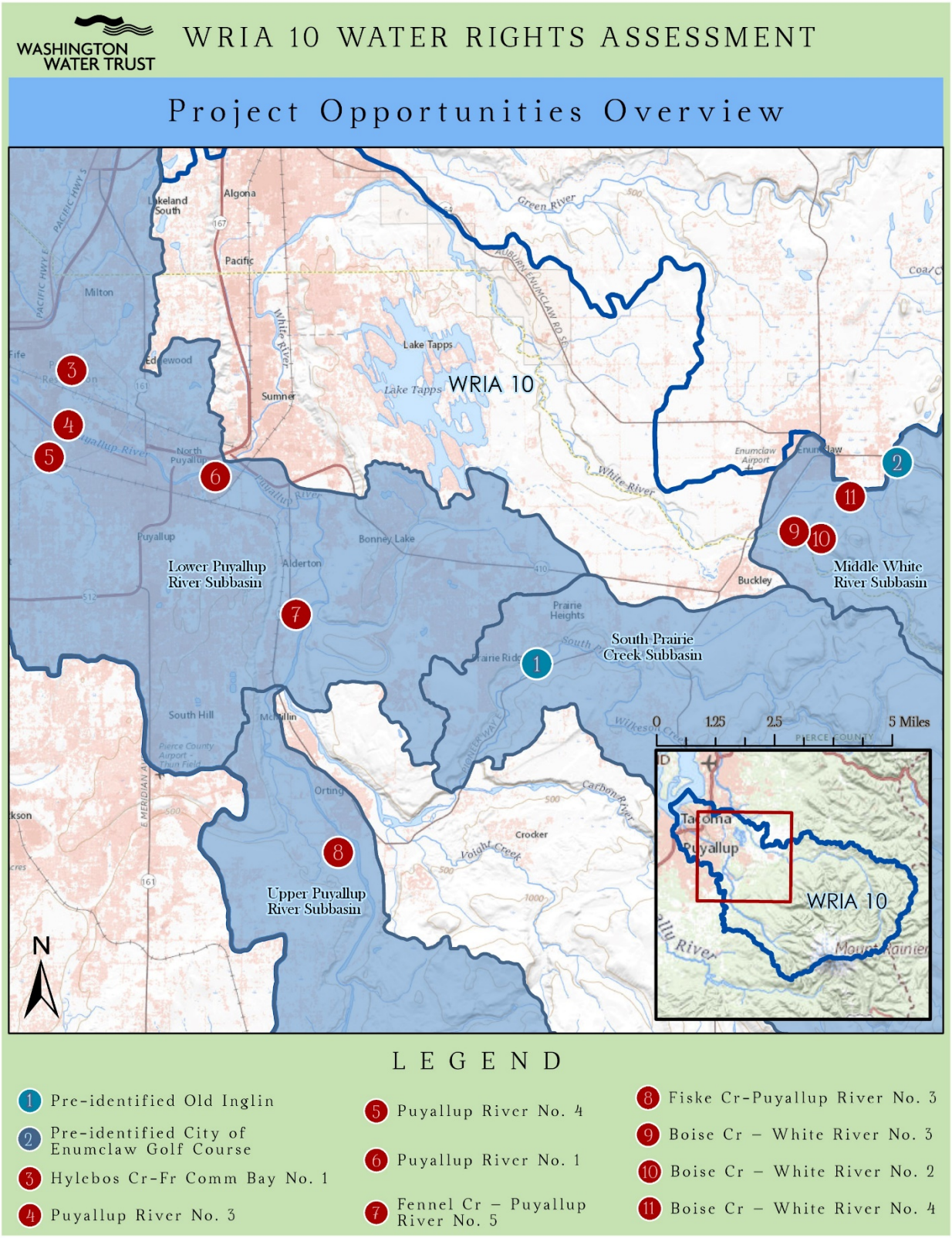
NOTE: Login information is available from Ecology.

Attachment 3: WRIA 10 Water Rights Assessment Due Diligence Technical Memo

WRIA 10 WATER RIGHTS ASSESSMENT DUE DILIGENCE TECHNICAL MEMO

This document is available through Ecology.

Attachment 4: Project Opportunity Profiles


WASHINGTON WATER TRUST
WRIA 10 WATER RIGHTS ASSESSMENT
Project Opportunities Overview
WRIA 10
Lower Puyallup River Subbasin
Middle White River Subbasin
South Prairie Creek Subbasin
Upper Puyallup River Subbasin
Lake Tapps
Green River
White River
Puyallup River
Milton
Algona
Pacific
Sumner
Edgewood
Puyallup
Bonney Lake
Alderton
Buckley
Prairie Heights
South Hill
McMillin
Orting
Crocker
Voight Creek
Carbon River
Enumclaw Airport
Tacoma
0 1.25 2.5 5 Miles
N
LEGEND
1 Pre-identified Old Inglin
2 Pre-identified City of Enumclaw Golf Course
3 Hylebos Cr-Fr Comm Bay No. 1
4 Puyallup River No. 3
5 Puyallup River No. 4
6 Puyallup River No. 1
7 Fennel Cr – Puyallup River No. 5
8 Fiske Cr-Puyallup River No. 3
9 Boise Cr – White River No. 3
10 Boise Cr – White River No. 2
11 Boise Cr – White River No. 4

Project Opportunity Profiles

Table of Contents:

WRIA 10 Project Opportunity Profile –

Pre-Identified Old Inglin

Project Summary

FLOW BENEFIT: Additional 0.76 cfs in 5 miles of South Prairie Creek, 6 miles of Carbon River, and 18 miles of Puyallup River.

PRIORITY SUBBASIN: South Prairie Creek

ESTIMATED OFFSET: 89.09 afy consumptive

SUBBASIN CONSUMPTIVE USE ESTIMATE: 67.3 afy

PRIORITY DATE(S): 10/9/1944 and 6/27/1974

INSTREAM FLOW RULE (1980): Puyallup River Basin Instream Resources Protection Program, established in 1980.[1]

ESA LISTED FISH: Spring, Summer, and Fall Chinook (Threatened), Coho (Species of Concern), Winter and Summer Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: Interested

Project Description

The Pre-Identified Old Inglin was included in the WRIA 10 water rights analysis by Ecology Request. The water rights and underlying land, had historically been used for the Inglin dairy. The project is located west of South Prairie, WA on the north side of Pioneer Way East. In 2005, the former dairy farm known as Inglin Farm was sold with the fee and title held by the Pierce Conservation District (PCD) and the development rights held by Cascade Land Conservancy (CLC), now known as Forterra. Since the purchase, PCD has begun site restoration overseen by the South Puget Sound Salmon Enhancement Group with the project site now called the South Prairie Creek Preserve.

When the property was sold to PCD, Inglin withheld the two irrigation water rights appurtenant to the property from the sale with priority years of 1974 and 1944. PCD sought funding through multiple sources to purchase the two irrigation water rights.

Shortly after the property sale, it appears that PCD acquired the 1974 water right in a separate transaction with a Salmon Recovery Funding Board (SRFB) grant. Inglin retained the 1944 water right and put the

[1] WAC 173-510-030

full water right in trust from 2005-2009. In 2008, PCD planned to purchase this water right in the near future using funds from the Interagency Committee for Outdoor Recreation (IAC), now Recreation and Conservation Office (RCO). WWT has engaged with PCD to confirm water rights purchase and use history.

As part of restoration of the project site South Prairie Creek Reserve, the conservation district will require partial use of water right(s) for the next three to five years to establish plantings and trees. After this time period, the conservation district is interested in selling the water rights.

Watershed

Pre-Identified Old Inglin are part of the South Prairie Creek sub-basin and the water right diversions are located in South Prairie Creek. The project is located at approximately river mile (RM) 5 of South Prairie Creek. South Prairie Creek flows in to the Carbon River at RM 6 and the Carbon River joins the Puyallup River at RM 18 before flowing into Commencement Bay. The Puyallup River has an instream flow established in this downstream reach, and "loss of natural habit-forming flow regimes" is a limiting factor cited for the Puyallup Watershed in the 2018 Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds.[2]

Land Use & Ownership

According to the Pierce County Assessor, the current land use designation is Agricultural Resource Land with the present use 9100-Vacant Land Undeveloped and 1101-Single Family Dwelling. Pierce Conservation District purchased the land underlying the Pre-Identified Old Inglin water right (s) from the Inglin family on 2/10/2005. The conservation district owns three adjacent parcels totaling 104.32 acres that are part of the South Prairie Creek Preserve.

A review of the WSDA 2019 Agricultural Land Use map identifies a total of 39.93 acres of hay/silage. Irrigation delineation indicates that as much as 56.8 acres were irrigated in 2013. It is possible that the difference of estimated irrigated acres between years analyzed maybe explained based the result of the timing of the aerial photograph, specific water use practices or from sufficient causes for non-use (RCW 90.14.140). These details would be better understood through direct conversation with the water user.

[2] https://www.co.pierce.wa.us/ArchiveCenter/ViewFile/Item/6075, page 5-40

Table 1: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	56.8
2015	0.0
2017	13.3
2019	21.5

Water Right

Table 2: Current Water Rights

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	-	0.4 cfs	10/9/1944	Irrigation	40	South Prairie Creek
Certificate	80 af	0.36 cfs	6/27/1974	Irrigation	40	South Prairie Creek

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

Pre-Identified Old Inglin is comprised of two water rights with adjacent non-overlapping places of use.

The first water right was issued for the irrigation of 40 acres. This water right has a priority date of 10/9/1944, listed purpose of use irrigation, with a Qi of 0.4 CFS and an unquantified Qa. The water right authorizes diversion from South Prairie Creek. This water right was placed in temporary trust from 1/1/2005 – 12/31/2009.

The second water right certificate was issued for the irrigation of 40 acres with a priority date of 6/27/1974, listed purpose of use irrigation, a Qi of 0.36 CFS and 80 acre feet identified as the Qa. The water right authorizes diversion from South Prairie Creek.

Metering Records:

Metering records were not available in the Ecology Water Resources Explorer database and a request to Ecology found no records.

Conclusion

This project was identified by Ecology as a potential acquisition opportunity. No metering records exist for this water right. From 2004 to current, a complete accounting of beneficial use and periods of non-use would be necessary for each water right if this project was selected.

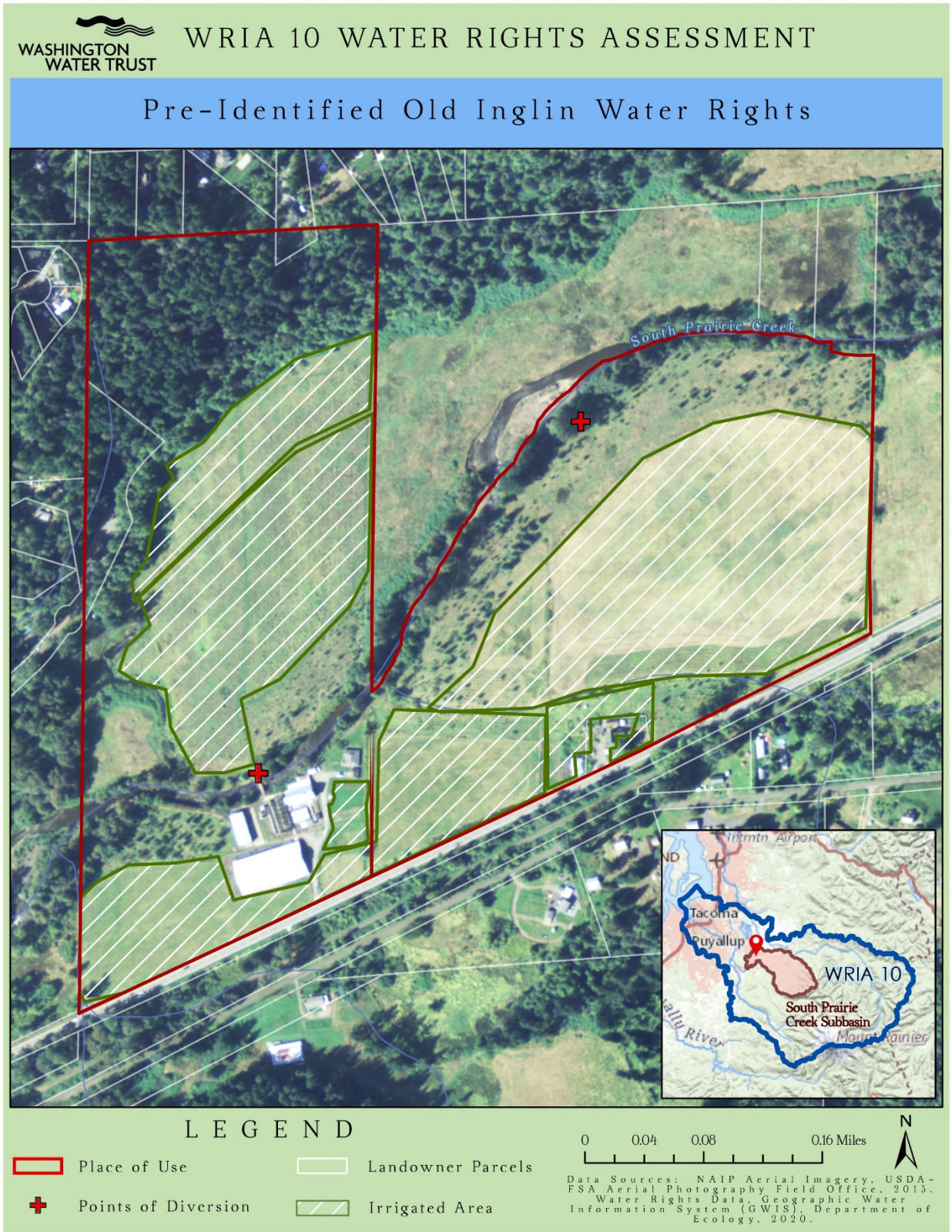
Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which estimate as much as 56.8 irrigated acres. WWT utilized the delineated acreage to estimate the potential consumptive use quantity that may be available to serve as an offset. An estimate is developed based on the pasture water duty (16.6 inches) found in the Washington Irrigation Guide (Puyallup station, Appendix A) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on the 56.8 delineated acres and assuming pasture and sprinkler irrigation, 89.09 afy consumptive is the estimated quantity available for trust water transaction.[3]

The Pre-Identified Old Inglin water rights have priority dates of 10/9/1944 and 6/27/1974, which are senior to the establishment of the Puyallup Basin Instream Resources Protection Program in 1980. These water right certificates do not have instream flow provisions.

[3] This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Figure 1: Project Map



WWT, MWS, and BWGIS, 2020

WRIA 10 Project Opportunity Profile –

Pre-Identified City of Enumclaw Golf Course Water Right

Project Summary

FLOW BENEFIT: Additional 0.2 cfs in flow in 4.5 miles of White River tributaries (Chapel Springs and Boise Creek), 23.4 miles of White River, and 10.5 miles of Puyallup River.

PRIORITY SUBBASIN: Middle White River

ESTIMATED OFFSET: 47.06 afy

SUBBASIN CONSUMPTIVE USE ESTIMATE: 23 afy

PRIORITY DATE(S): 9/3/1940

INSTREAM FLOW RULE (1980): Puyallup River Basin Instream Resources Protection Program, established in 1980.[1]

ESA LISTED FISH: Spring, Summer, and Fall Chinook (Threatened), Coho (Species of Concern), Winter and Summer Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: Interested

Project Description

The Pre-Identified City of Enumclaw Golf Course water right was included in the WRIA 10 water rights analysis by Ecology request. The land, and underlying water rights, have been used for the 18-hole Enumclaw Golf Course. The property is located just off State High 410 east of the City of Enumclaw. The Enumclaw Golf Course front nine holes were developed in the 1950s and the back nine holes in the 1970s. In 2003 the golf course was transferred from King County ownership to the City of Enumclaw. Since 2003, the golf course has been in continual operation by the City or by a contracted operator. From 2005 to 2012, the City invested close to $150,000 in irrigation system and other improvements at the Golf Course, and in 2018 the City replaced the irrigation controller.

The City of Enumclaw, as of 6/2020, is in the process of switching their source of irrigation for the front nine of the Golf Course from their surface water right to municipal water which is anticipated to be completed in July 2020. Once the connection to the municipal water supply is completed, the City has stated that they will no longer need this surface water right. The City of Enumclaw Public Works department has expressed interest in this water right being transacted to serve as part of the WRIA 10

[1] WAC 173-510-030

offset portfolio. Public works indicated that the water right has been the source of irrigation for the front nine of the golf course during its operation and while pump records associated with this water right are not available electrical records should be available which can be used to calculate consumptive use.

Irrigation on the entire City of Enumclaw Golf Course occurs under multiple water rights, however this project profile is constrained to reviewing the surface water right which the City anticipates making available for a water transaction.

Watershed

This project is located in the Middle White River Subbasin and the water right diversion is located on Chappel Springs that feeds into Boise Creek. Boise Creek flows into the White River at river mile (RM) 23.4 and the White River joins the Puyallup River at RM 10.5 before flowing into Commencement Bay. The Puyallup River has an instream flow established in this downstream reach, and "loss of natural habit-forming flow regimes" is a limiting factor cited for the Puyallup Watershed in the 2018 Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds.[2] The White River and all tributaries are closed to new surface water appropriations but do not have an instream flows established in Chapter 173-510 WAC.

Land Use & Ownership

According to the King County Assessor, the current land use designation is Incorporated City (City of Enumclaw Public) with the present use as a golf course. The land and the subject water right are owned by the City of Enumclaw. The City owns two adjacent parcels totaling 187 acres which comprise the golf course and adjacent sports fields.

A review of the WSDA 2019 Agricultural Land Use map identifies a total of 69.71 acres of turfgrass under sprinkler irrigation for the entire golf course and 35 acres in the target water right's place of use. Irrigation delineation estimates as much as 34.7 acres were irrigated in 2013**.** It is possible that the difference of estimated irrigated acres between years analyzed maybe explained as the result of the timing of the aerial photograph, specific water use practices or from sufficient causes for non-use (RCW 90.14.140), which would be best understood through direct conversation with the water user. These details would be better understood through direct conversation with the water user.

[2] https://www.co.pierce.wa.us/ArchiveCenter/ViewFile/Item/6075, page 5-40

Table 3: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	34.7
2015	18.7
2017	22.5
2019	24.2

Water Right

Table 4: Current Water Rights

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	-	0.2 cfs	9/3/1940	Domestic Multiple, Irrigation	30	Chappel Springs of Boise Creek

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The original water right certificate was issued for domestic supply and irrigation of 30 acres with the water right application listing water application for a golf course, baseball park, football field, tennis courts, surrounding grounds, and field house. This water right has a priority date of 9/3/1940, Qi of 0.2 cfs and an unquantified Qa. The water right holder submitted a change application with Ecology to move the point of diversion from Boise Creek to Chappel Spring in 1951 that was approved. The water is diverted from Chappel Springs.

Further, there is a second irrigation water right that has two places of use, one of which overlaps the place of use of the above City of Enumclaw water right. Given the underlying land ownership and communication with the City of Enumclaw, there is no evidence that there is irrigation occurring on the golf course under a water right that the city does not own.

Metering Records:

Metering records were not available in the Ecology Water Resources Explorer database and a request to Ecology found no records.

Conclusion

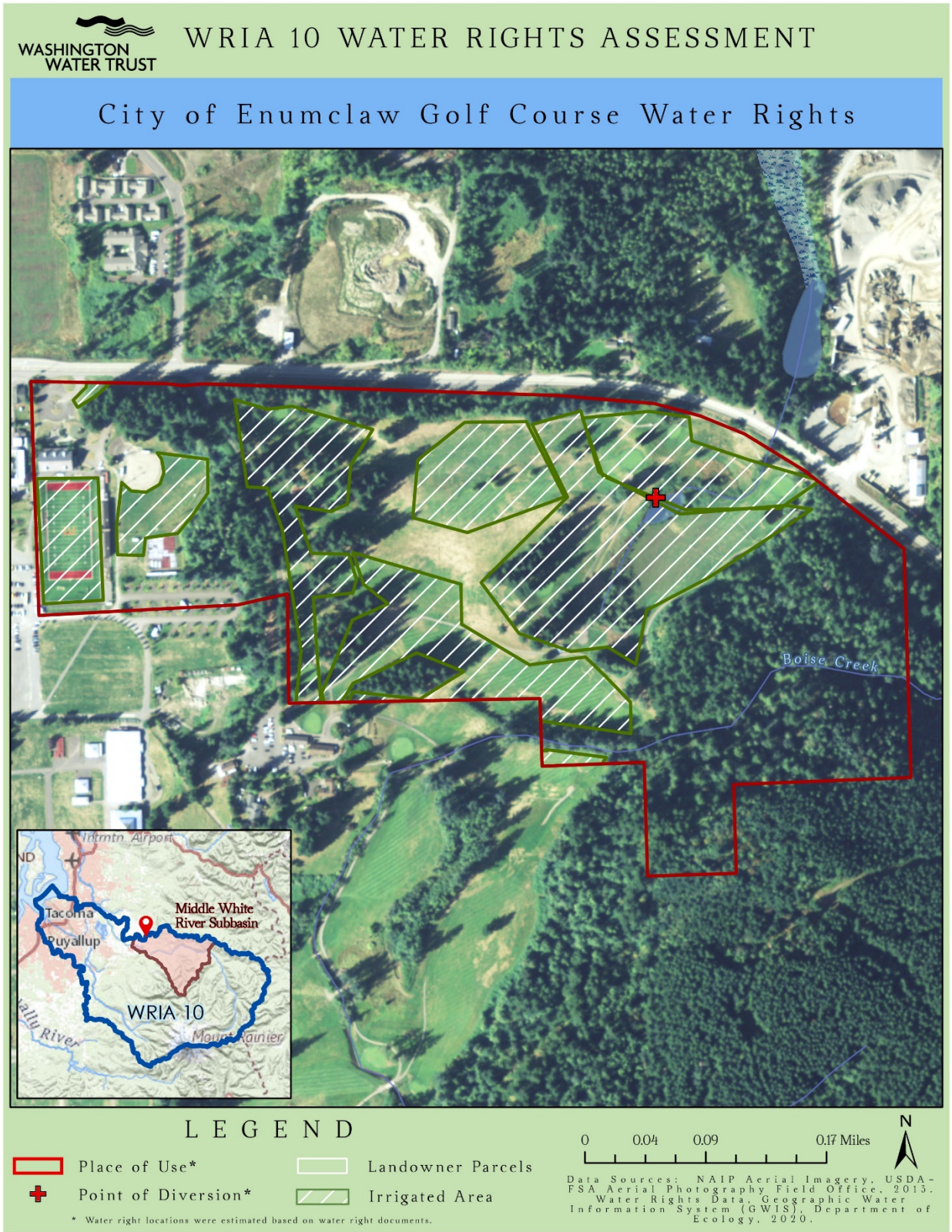
This project was identified by Ecology as a potential acquisition opportunity and the City of Enumclaw has expressed interest in a transaction for the water right with a priority date of 9/3/1940. The water right original application included the irrigation of a golf course as one of its purpose of uses and it appears that this water right has been put to beneficial use since this time for the irrigation of the front nine of the City of Enumclaw Golf Course. No metering records exist for this water right. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which indicate areas as great as 34.7 acres irrigated. The subject water right authorizes 30 acres of irrigation. WWT utilized the authorized acreage to estimate the potential consumptive use quantity that may be available to serve as an offset. An estimate is developed based on the pasture water duty (16.6 inches) found in the Washington Irrigation Guide (Puyallup station, Appendix A) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on the authorized irrigation of 30 acres on the water right, 47.06 afy consumptive is the estimated quantity available for trust water transaction.[3]

The Pre-Identified City of Enumclaw Golf Course Water Right has a priority date of 9/3/1940, which is senior to the establishment of the Puyallup Basin Instream Resources Protection Program in 1980. This water right certificate does not have instream flow provision.

[3] This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Figure 2: Project Map



WWT, MWS, and BWGIS, 2020

WRIA 10 Project Opportunity Profile –

Hylebos Creek - Frontal Commencement Bay No. 1

Project Summary

FLOW BENEFIT: Additional 0.67 cfs in 6 miles of Wapato Creek.[1]

PRIORITY SUBBASIN: Lower Puyallup River

ESTIMATED OFFSET: 34.35 afy consumptive

SUBBASIN CONSUMPTIVE USE ESTIMATE: 41.1 afy

PRIORITY DATE(S): 11/23/1949

INSTREAM FLOW RULE (1980): Puyallup River Basin Instream Resources Protection Program, established in 1980.[2]

ESA LISTED FISH: Spring, Summer, and Fall Chinook (Threatened), Coho (Species of Concern), Winter and Summer Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: None

Project Description

Hylebos Creek - Frontal Commencement Bay No. 1 (Hylebos Cr - Fr Comm Bay No. 1) was included in the WRIA 10 water rights analysis due to the prioritization factors utilized in the Irrigation Analysis (e.g. priority sub-basin, acres of irrigation, etc). Hylebos Cr - Fr Comm Bay No. 1 is located north of Puyallup off Valley Ave East. Based on aerial imagery review there is strong evidence of irrigation occurring and there appears to be beneficial use related to this water right. A barrier to acquisition may be the ability for the owner to change their land use, multiple landowners within the place of use or viable alternative source of water. The project included two parcels, both in public ownership. To our knowledge, there has been no outreach to the water right holders by any entity at this time.

[1] Dependent on hydraulic continuity
[2] WAC 173-510-030

Watershed

This project is located in the Lower Puyallup River Subbasin at approximately river mile (RM) 6 of Wapato Creek that flows into Commencement Bay. Wapato Creek is highly channelized and straightened in its lower reach and the Port of Tacoma and Puyallup Tribe of Indians are working to restore multiple sites including the downstream Lower Wapato Creek Habitat. Water quantity is an identified habitat limiting factor for Wapato Creek in salmon recovery plans. Wapato Creek is closed to new surface water appropriations as are new groundwater appropriations that show a direct, and measurable, impact on stream flows. Wapato Creek does not have an instream flow established in Chapter 173-510 WAC.

Land Use & Ownership

According to the Pierce County Assessor, the current land use is Commercial Land with Single Family Residential and is zoned as Municipal (City of Fife Community Commercial). The land underlying Hylebos Cr - Fr Comm Bay No. 1 is two parcels under public ownership. The first Pierce County parcel is 16 acres and was transferred between public entities to its current owner on 9/13/2004. The second Pierce County parcel is 15.15 acres and was transferred between public entities to its current owner on 9/13/2004.

A review of the WSDA 2019 Agricultural Land Use map identifies 21.86 acres of vegetables with sprinkler irrigation. Irrigation delineation indicates that as much as 21.9 acres were irrigated in 2013, 2015, and 2017. Details related to water use practice and actually irrigated acres would be better understood through direct conversation with the water user.

Table 5: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	21.9
2015	21.9
2017	21.9
2019	0.0

Water Right

Table 6: Current Water Right

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	32 afy	0.67 cfs	11/23/1949	Irrigation	32	Groundwater

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The original certificate was issued for the irrigation of 32 acres. This water right has priority date of 11/23/1949, listed purpose of irrigation, with a Qi of 0.67 cfs (300 GPM) and 32 acre feet annually identified as the Qa. The water is pumped out of a well.

Well Information:

Using a map search on Ecology's well database, one well log was identified as potentially related to this project, by correlating the names on the well logs which reflected current ownership and names on water rights documents. The identified well was drilled August 1950 and is a 10 inch diameter 500 foot deep well.

Metering Records:

Metering records were not available in the Ecology Water Resources Explorer database and a request to Ecology found no records.

Conclusion

This project was identified as a potential acquisition opportunity using the Irrigation Analysis prioritization factors. No metering records exist for this water right. Current land use is as Commercial Land with Single Family Residential. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which indicate areas as great as 21.9 acres irrigated. WWT utilized the delineated acreage to estimate the potential consumptive use quantity that may be available to serve as an offset. An estimate is developed based on the pasture water duty (16.6 inches) found in the Washington Irrigation Guide (Puyallup station, Appendix A) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on the 21.9 delineated acres and assuming pasture and sprinkler irrigation, 34.35 afy consumptive is the estimated quantity available for trust water transaction.[3]

The Hylebos Cr - Fr Comm Bay No. 1 water right has a priority date of 11/23/1949, which is senior to the establishment of the Puyallup Basin Instream Resources Protection Program (Instream Flow Rule) in 1980. This water right certificate does not have instream flow provisions.

[3] This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Figure 3: Project Map

WRIA 10 Project Opportunity Profile –

Puyallup River No. 3

Project Summary

FLOW BENEFIT: Additional 0.3 cfs in 6.5 miles of the Puyallup River.

PRIORITY SUBBASIN: Lower Puyallup River

ESTIMATED OFFSET: 36.23 afy consumptive

SUBBASIN CONSUMPTIVE USE ESTIMATE: 41.1 afy

PRIORITY DATE(S): 2/7/1950

INSTREAM FLOW RULE (1980): Puyallup River Basin Instream Resources Protection Program, established in 1980.[1]

ESA LISTED FISH: Spring, Summer, and Fall Chinook (Threatened), Coho (Species of Concern), Winter and Summer Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: None

Project Description

The Puyallup River No. 3 (Puyallup R No. 3) was included in the WRIA 10 water rights analysis due to the prioritization factors utilized in the irrigation analysis (e.g. priority sub-basin, acres of irrigation, etc). Puyallup R No. 3 is located in southeastern extent of the City of Fife on the north side of the Puyallup River adjacent to the City of Fife Levee Pond Park. The current land use, based on aerial imagery review, appears to be irrigated row cropping and there appears to be beneficial use related to this water right. A barrier to acquisition may be the ability for the owner to change their land use, multiple landowners within the place of use or viable alternative source of water. The project includes five parcels under common public ownership. To our knowledge, there has been no outreach to the water right holders by any entity at this time.

[1] WAC 173-510-030

Watershed

This project is located in the Puyallup River Subbasin and the property is located at approximately river mile (RM) 6.5 of the Puyallup River that flows in Commencement Bay. The Puyallup River has an instream flow established in this downstream reach, and "loss of natural habit-forming flow regimes" is a limiting factor cited for the Puyallup Watershed in the 2018 Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds.[2]

Land Use & Ownership

According to the Pierce County Assessor, the current land use code is 7600-Parks and is zoned as Single Family Residential. The land underlying Puyallup R No. 3 is five parcels totaling 42.32 acres under common public ownership.

A review of the WSDA 2019 Agricultural Land Use map estimates 18.3 acres of vegetable crops. Irrigation delineation estimates as much as 23.1 irrigated acres in 2015 and 2019. Details related to water use practices and actual irrigated acres would be better understood through direct conversation with the water user.

Table 7: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	20.3
2015	23.1
2017	23.0
2019	23.1

Water Right

Table 8: Current Water Right

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	-	0.3 cfs	2/7/1950	Irrigation	28.76	Puyallup River

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

[2] https://www.co.pierce.wa.us/ArchiveCenter/ViewFile/Item/6075, page 5-40

Water Right History:

The original certificate authorized the irrigation of 28.76 acres. This water right has priority date of 2/7/1950, listed purpose of irrigation, with a Qi of 0.3 cfs and an unspecified Qa. The authorized diversion is from the Puyallup River.

Metering Records:

Metering records were not available in the Ecology Water Resources Explorer database and a request to Ecology found no records.

Conclusion

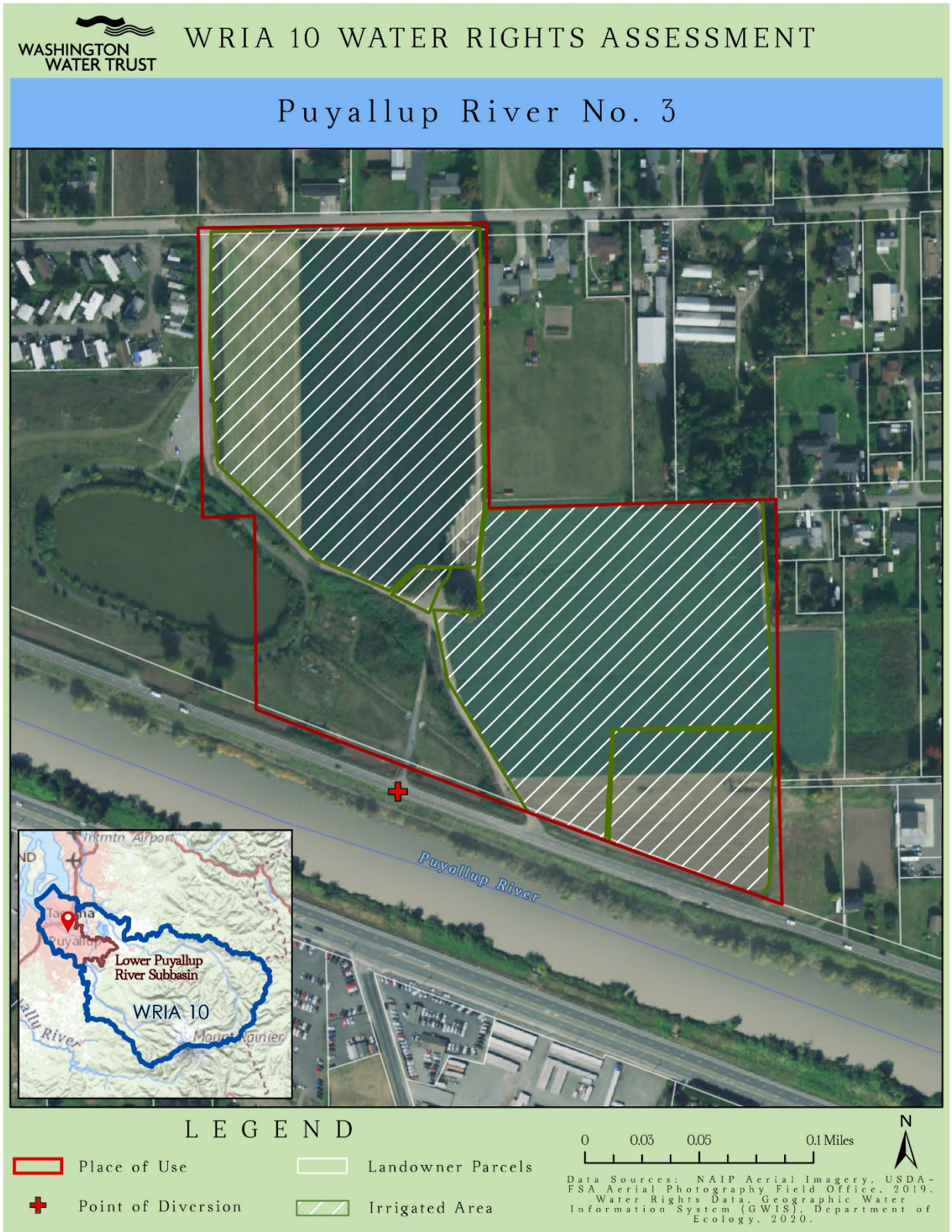
This project was identified as a potential acquisition opportunity using the irrigation analysis prioritization factors. No metering records exist for this water right. While the current land use code is park it appears as if irrigation is occurring in the water right place of use. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which estimate as much as 23.1 acres irrigated. WWT utilized the delineated acreage to estimate the potential consumptive use quantity that may be available to serve as an offset. An estimate is developed based on the pasture water duty (16.6 inches) found in the Washington Irrigation Guide (Puyallup station, Appendix A) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on the 23.1 delineated acres and assuming pasture and sprinkler irrigation, 36.23 afy consumptive is the estimated quantity available for trust water transaction.[3]

The Puyallup R No. 3 water right has a priority date of 2/7/1950, which is senior to the establishment of the Puyallup Basin Instream Resources Protection Program in 1980. This water right certificate does not have instream flow provisions.

[3] This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Figure 4: Project Map



WWT, MWS, and BWGIS, 2020

WRIA 10 Project Opportunity Profile –

Puyallup River No. 4

Project Summary

FLOW BENEFIT: Additional 0.38 cfs in 1.5 miles of Clarks Creek and 6.7 miles of Puyallup River.[1]

PRIORITY SUBBASIN: Lower Puyallup River

ESTIMATED OFFSET: 19.92 afy consumptive

SUBBASIN CONSUMPTIVE USE ESTIMATE: 41.1 afy

PRIORITY DATE(S): 9/29/1952

INSTREAM FLOW RULE (1980): Puyallup River Basin Instream Resources Protection Program, established in 1980.[2]

ESA LISTED FISH: Spring, Summer, and Fall Chinook (Threatened), Coho (Species of Concern), Winter and Summer Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: None

Project Description

Puyallup River No. 4 (Puyallup R No. 4) was included in the WRIA 10 water rights analysis due to the prioritization factors utilized in the irrigation analysis (e.g. priority sub-basin, acres of irrigation, etc). Puyallup R No. 4 is located south of the City of Fife between W Stewart Ave and the Puyallup River. The current land use, based on aerial imagery review, appears to be pasture with a small amount of other crops and there appears to be beneficial use related to this water right. A barrier to acquisition may be the ability for the owner to change their land use, a viable alternative water source or multiple landowners within the place of use. The project includes eight parcels all with irrigation. To our knowledge, there has been no outreach to the water right holders by any entity at this time.

[1] Dependent on hydraulic continuity
[2] WAC 173-510-030

Watershed

This project is located in the Lower Puyallup River Subbasin and the property is located at approximately river mile (RM) 1.5 of Clark Creek that flows into the Puyallup River at RM 6.7 before flowing into Commencement Bay. The Puyallup River has an instream flow established in this downstream reach, and "loss of natural habit-forming flow regimes" is a limiting factor cited for the Puyallup Watershed in the 2018 Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds.[3] Clark Creek is closed to new surface water appropriations and new groundwater appropriations that show a direct, and measurable, impact on stream flows. Clark Creek does not have an instream flow established in Chapter 173-510 WAC.

6 Land Use & Ownership

According to the Pierce County Assessor, the current land zoning is Moderate Density Single-Family (MSF). The land underlying Puyallup R No. 4 is eights parcels. The largest parcel is 10.38 acres with current use of 8300-CU Farm and Agriculture and this is where the majority of irrigation occurs. The remaining parcels have a current use of 1101-Single Family Dwelling, 1155-Mobile Home Title Elimination, or 9100-Vacant Land Undeveloped and are under individual ownership. Irrigation of residential landscaping on these parcels may not be occurring under this water right, a deed review for these parcels would indicate if the water right is included.

A review of the WSDA 2019 Agricultural Land Use map identifies 9.3 acres of unspecified crops. Irrigation delineation estimates as much as 12.7 irrigated acres in 2017. It is possible that the difference of estimated irrigated acres between years analyzed maybe explained as the result of the timing of the aerial photograph, specific water use practices or from sufficient causes for non-use (RCW 90.14.140), which would be best understood through direct conversation with the water user.

Table 9: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	12.1
2015	0.4
2017	12.7
2019	12.3

[3] https://www.co.pierce.wa.us/ArchiveCenter/ViewFile/Item/6075, page 5-40

Water Right

Table 10: Current Water Right

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	34 AF	0.38 cfs	9/29/1952	Irrigation	30	Groundwater

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The original certificate authorized the irrigation of 17 acres. This water right has priority date of 9/29/1952, listed purpose of irrigation, with a Qi of 0.38 cfs (170 GPM) and 34 acre feet annually identified as the Qa. The water is pumped out of a well.

Well Information:

Using a map search on Ecology's well database, one well log was identified as potentially related to this project, by correlating the names on the well logs and names on water rights documents. The identified well has three two-inch diameter driven casings at a depth of 115 feet, 140 feet, and 120 feet respectively with a static water level of 6 feet.

The well record in the supporting documents for the water right, shows the same well as having been completed 9/25/1952 with three two-inch diameter driven casings at a depth of 115 feet, 140 feet, and 120 feet respectively.

Metering Records:

Metering records were not available in the Ecology Water Resources Explorer database and a request to Ecology found no records.

Conclusion

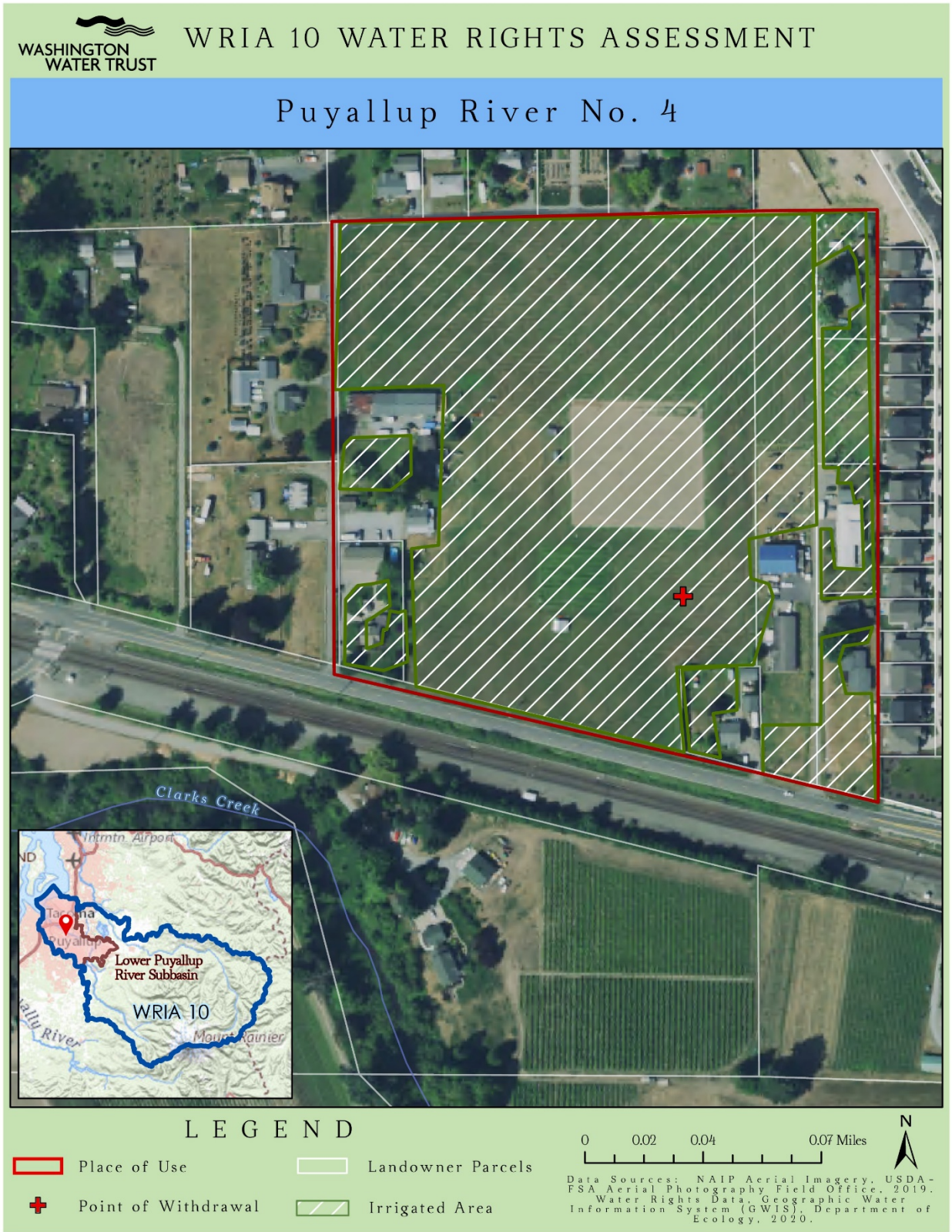
This project was identified as a potential acquisition opportunity using the irrigation analysis prioritization factors. No metering records exist for this water right. Current land use is CU Farm and Agriculture and Single Family. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which estimate as 12.7 irrigated acres irrigated. This irrigation occurs predominantly on one larger parcel with seven other residential parcels showing irrigated landscaping. WWT utilized the delineated acreage to estimate the potential consumptive use quantity that may be available to serve as an offset. An estimate is developed based on the pasture water duty (16.6 inches) found in the Washington Irrigation Guide (Puyallup station, Appendix A) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on the 12.7 delineated acres and assuming pasture and sprinkler irrigation, 19.92 afy consumptive is the estimated quantity available for trust water transaction.[4]

The Puyallup R No. 4 water right has a priority date of 9/29/1952, which is senior to the establishment of the Puyallup Basin Instream Resources Protection Program in 1980. This water right certificate does not have instream flow provisions.

[4] This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

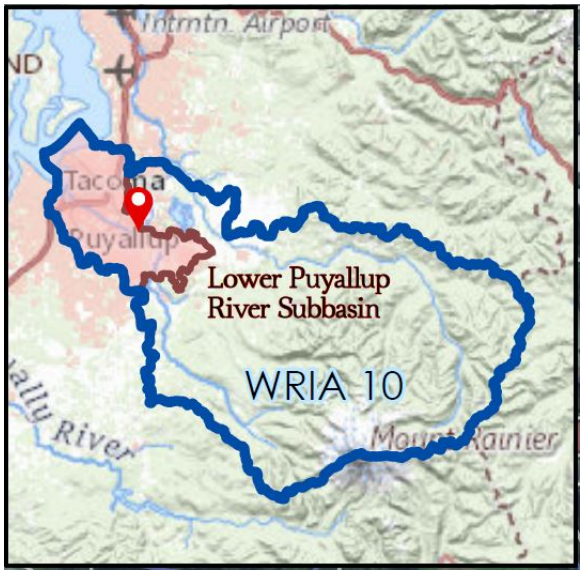
Figure 5: Project Map



WRIA 10 Project Opportunity Profile –

Puyallup River No. 1

Project Summary



FLOW BENEFIT: Additional 0.75 cfs in 10 miles of the Puyallup River.

PRIORITY SUBBASIN: Lower Puyallup River

ESTIMATED OFFSET: 82.82 afy consumptive

SUBBASIN CONSUMPTIVE USE ESTIMATE: 41.1 afy

PRIORITY DATE(S): 11/6/1951 (groundwater), 3/18/1963 (surface water)

INSTREAM FLOW RULE (1980): Puyallup River Basin Instream Resources Protection Program, established in 1980.[1]

ESA LISTED FISH: Spring, Summer, and Fall Chinook (Threatened), Coho (Species of Concern), Winter and Summer Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: None

Project Description

Puyallup River No. 1 (Puyallup R No. 1) was included in the WRIA 10 water rights analysis due to the prioritization factors utilized in the Irrigation Analysis (e.g. priority sub-basin, acres of irrigation, etc). Puyallup R No. 1 includes water rights appurtenant to a golf course and country club, and a berry farm. The golf course and country club have been in operation for more than 90 years. A portion of the golf course operates on land leased from an early homesteading family with the current lease agreement valid through 2045. Additionally, the Puyallup R No. 1 water rights are appurtenant to what appears to be a berry farming operation and farm stand.

There appears to be beneficial use related to these water rights. The irrigated area is found on a single parcel. A barrier to acquisition may be the ability for the owner to change their land use multiple landowners within the place of use or a readily available alternative water supply. To our knowledge, there has been no outreach to the water right holder by any entity at this time.

[1] WAC 173-510-030

Watershed

This project is located in the Lower Puyallup River Subbasin and the water right diversion is at approximately river mile (RM) 10 of the Puyallup River that flows into Commencement Bay. The Puyallup River has an instream flow established in this downstream reach, and "loss of natural habit-forming flow regimes" is a limiting factor cited for the Puyallup Watershed in the 2018 Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds.[2]

Land Use & Ownership

The land underlying Puyallup R No. 1 includes numerous parcels with multiple owners covering a golf course, residential development, and farmed area.

According to the Pierce County Assessor, the land utilized as a golf course is zoned Municipal Area (City of Puyallup RM-20 High Density Multiple-Family Residential) and the current land use is listed as CU Open Space. Five parcels are for the golf course and country club, under group account 391.

According to the Pierce County Assessor, the land utilized as farm is zoned Municipal Area (City of Puyallup ML – Limited Manufacturing with an Agricultural Zoning Overlay) and the current land use is listed as CU Farm and Agriculture and Vacant Industrial Land. There are two parcels with different owners in the farmed area.

A review of the WSDA 2019 Agricultural Land Use map identifies 47.37 acres of turfgrass under sprinkler irrigation and 4.7 acres of berries for a total of 52.07 acres of irrigation. Irrigation delineation estimates as much as 52.8 irrigated acres in 2013 and 2019. It is possible that the difference of estimated irrigated acres between years analyzed maybe explained based the result of the timing of the aerial photograph, specific water use practices or from sufficient causes for non-use (RCW 90.14.140). These details would be better understood through direct conversation with the water user.

Table 11: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	52.8
2015	46.7
2017	50.0
2019	52.8

[2] https://www.co.pierce.wa.us/ArchiveCenter/ViewFile/Item/6075, page 5-40

Water Right

Table 12: Current Water Right

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	50 af	0.45 cfs	11/6/1951	Domestic Single, Irrigation	25	Groundwater
Certificate	60 af	0.3 cfs	3/18/1963	Irrigation	30	Puyallup River

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

Puyallup R No. 1 is comprised of two water rights with adjacent non-overlapping places of use.

The groundwater right was issued for the irrigation of 25 acres. This water right has a priority date of 11/6/1951, listed purpose of use domestic single and irrigation, with a Qi of 0.45 cfs (200 GPM) and 50 acre-feet identified as the Qa. The water is diverted from a groundwater well.

The surface water certificate was issued for the irrigation of 30 acres. This water right has priority date of 3/18/1963, listed purpose of irrigation, with a Qi of 0.3 cfs and 60 acre feet identified as the Qa. The water is diverted from Puyallup River.

Well Record

A signed *Record by Well Driller* report, found in the documentation attached to the water right certificate, shows that a well was completed 10/25/1951 and is an eight-inch diameter 169 foot deep well with a static water level of 52 feet.

Metering Records:

Metering records were not available in the Ecology Water Resources Explorer database and a request to Ecology found no records.

Conclusion

This project was identified as a potential acquisition opportunity using the Irrigation Analysis prioritization factors. No metering records exist for this water right. The current land use with irrigation is CU Open Space, CU Farm, Agriculture and Vacant Industrial Land. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which estimate as much as 52.8 acres irrigated. WWT utilized the delineated acreage to estimate the potential consumptive use quantity that may be available to serve as an offset. An estimate is developed based on the pasture water duty (16.6 inches) found in the

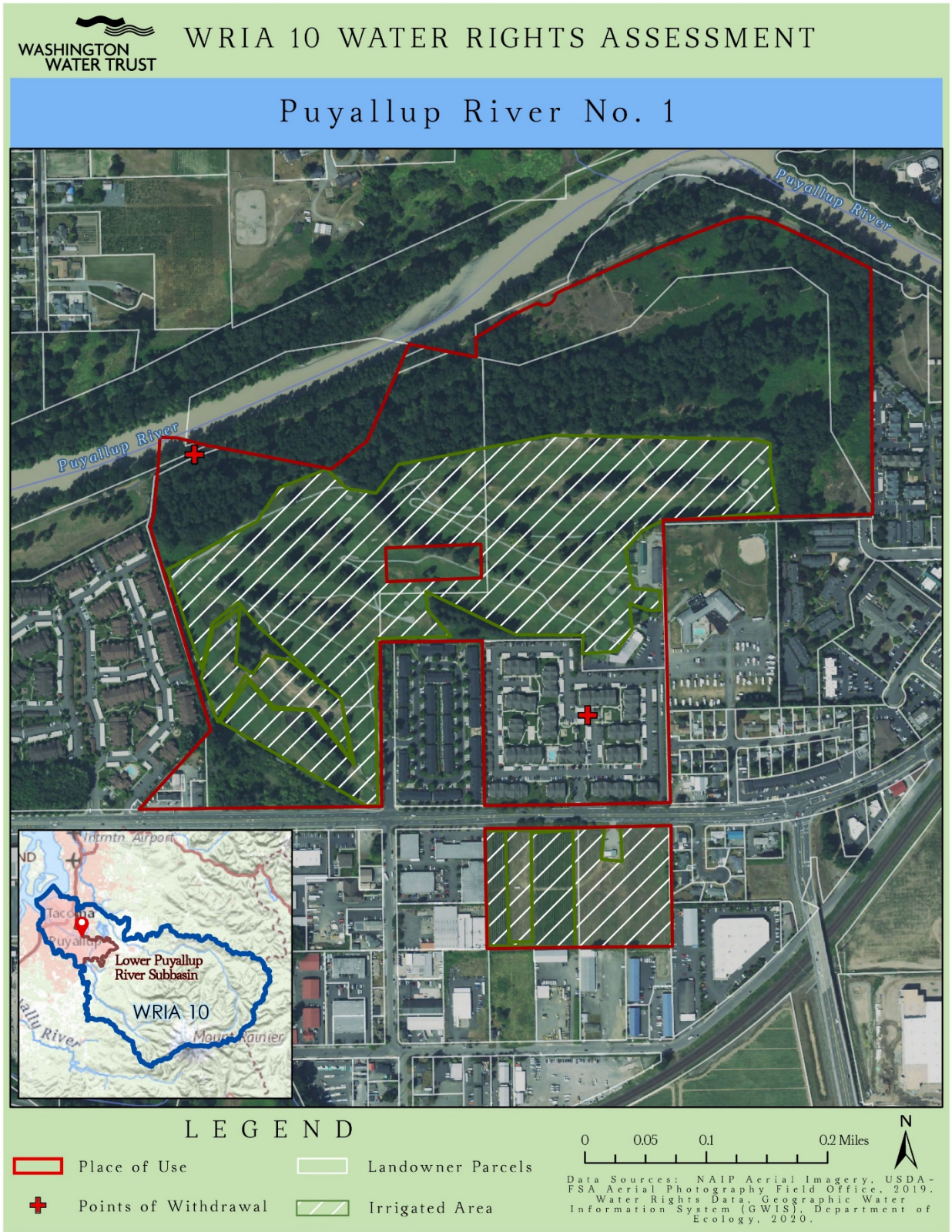
Washington Irrigation Guide (Puyallup station, Appendix A) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on the 52.8 delineated acres and assuming pasture and sprinkler irrigation, 82.82 afy consumptive is the estimated quantity available for trust water transaction.[3]

The Puyallup R No. 1 water rights have a priority date of 3/18/1963 and 11/6/1951, which are senior to the establishment of the Puyallup Basin Instream Resources Protection Program in 1980. These water right certificates do not have instream flow provision.

[3] This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

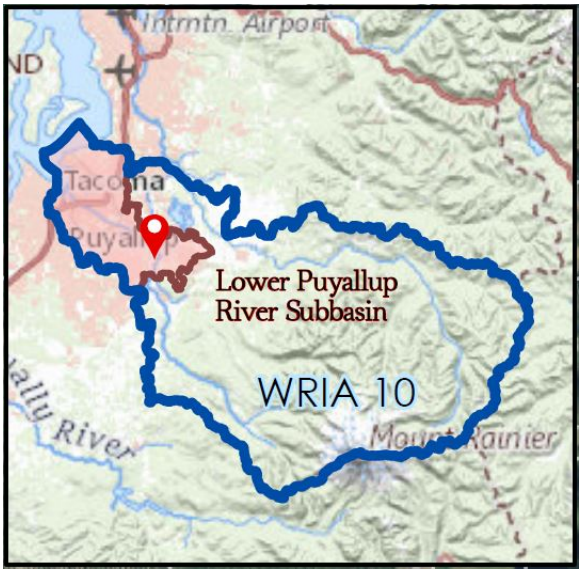
Figure 6: Project Map



WRIA 10 Project Opportunity Profile –

Fennel Creek – Puyallup River No. 5

Project Summary



FLOW BENEFIT: Additional 0.22 cfs in 16 miles of the Puyallup River.[1]

PRIORITY SUBBASIN: Lower Puyallup River

ESTIMATED OFFSET: 23.55 afy

SUBBASIN CONSUMPTIVE USE ESTIMATE: 41.1 afy

PRIORITY DATE(S): 6/22/1950

INSTREAM FLOW RULE (1980): Puyallup River Basin Instream Resources Protection Program, established in 1980.[2]

ESA LISTED FISH: Spring, Summer, and Fall Chinook (Threatened), Coho (Species of Concern), Winter and Summer Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: None

Project Description

The Fennel Creek - Puyallup River No. 5 (Fennel Cr - Puyallup R No. 5) was included in the WRIA 10 water rights analysis due to the prioritization factors utilized in the irrigation analysis (e.g. priority sub-basin, acres of irrigation, etc). Fennel Cr - Puyallup R No. 5 is located one mile north-northeast of McMillian WA. The current land use, based on aerial imagery review, appears to be irrigated row cropping and there appears to be beneficial use related to this water right.. The project includes four parcels with the irrigated area found on two parcels under common ownership. To our knowledge, there has been no outreach to the water right holders by any entity at this time.

[1] Dependent on hydraulic continuity
[2] WAC 173-510-030

Watershed

This project is located in the Fennel Creek – Puyallup River Subbasin and the property is located at approximately RM 16 of the Puyallup River. The Puyallup River has an instream flow established in this downstream reach, and "loss of natural habit-forming flow regimes" is a limiting factor cited for the Puyallup Watershed in the 2018 Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds.[3]

Land Use & Ownership

According to the Pierce County Assessor, the current land use is listed as 9400-CU Open Space and is zoned as Rural 10. The land underlying Fennel Cr – Puyallup R No. 5 is four parcels, but irrigation only appears to occur on two of the parcels that are under common ownership. The two Pierce County parcels that show irrigation comprise a total of 15.42 acres and were sold by the original water right holder to the current land owner on 3/11/2011.

A review of the WSDA 2019 Agricultural Land Use map identifies 14.47 acres of vegetable crops. Irrigation delineation indicates that as much as 15 acres were irrigated in 2019. While the scale of difference between years may be marginal, it is possible that the difference of estimated irrigated acres between years analyzed maybe explained based on the sufficient causes for non-use (RCW 90.14.140), or result of the timing of the aerial photograph. The details of water use may be better understood through direct conversation with the water user.

Table 13: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	14.8
2015	14.7
2017	14.7
2019	15.0

Water Right

Table 14: Current Water Right

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	30 afy	0.22 cfs	6/22/1950	Irrigation	20	Groundwater

[3] https://www.co.pierce.wa.us/ArchiveCenter/ViewFile/Item/6075, page 5-40

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The original certificate was issued for the irrigation of 20 acres. This water right has priority date of 6/22/1950, listed purpose of irrigation, with a Qi of 0.22 cfs (100 GPM) and 30 acre feet identified as the Qa. The water is pumped out of a groundwater well.

Well Information:

Using a map search on Ecology's well database, one well log was identified as potentially related to this project, by correlating the names on the well logs and names on water rights documents. The identified well was drilled 6/19/1950, and is a 6 inch diameter 120 foot deep well with a static water level of 17 feet.

Metering Records:

Metering records were not available in the Ecology Water Resources Explorer database and a request to Ecology found no records.

Conclusion

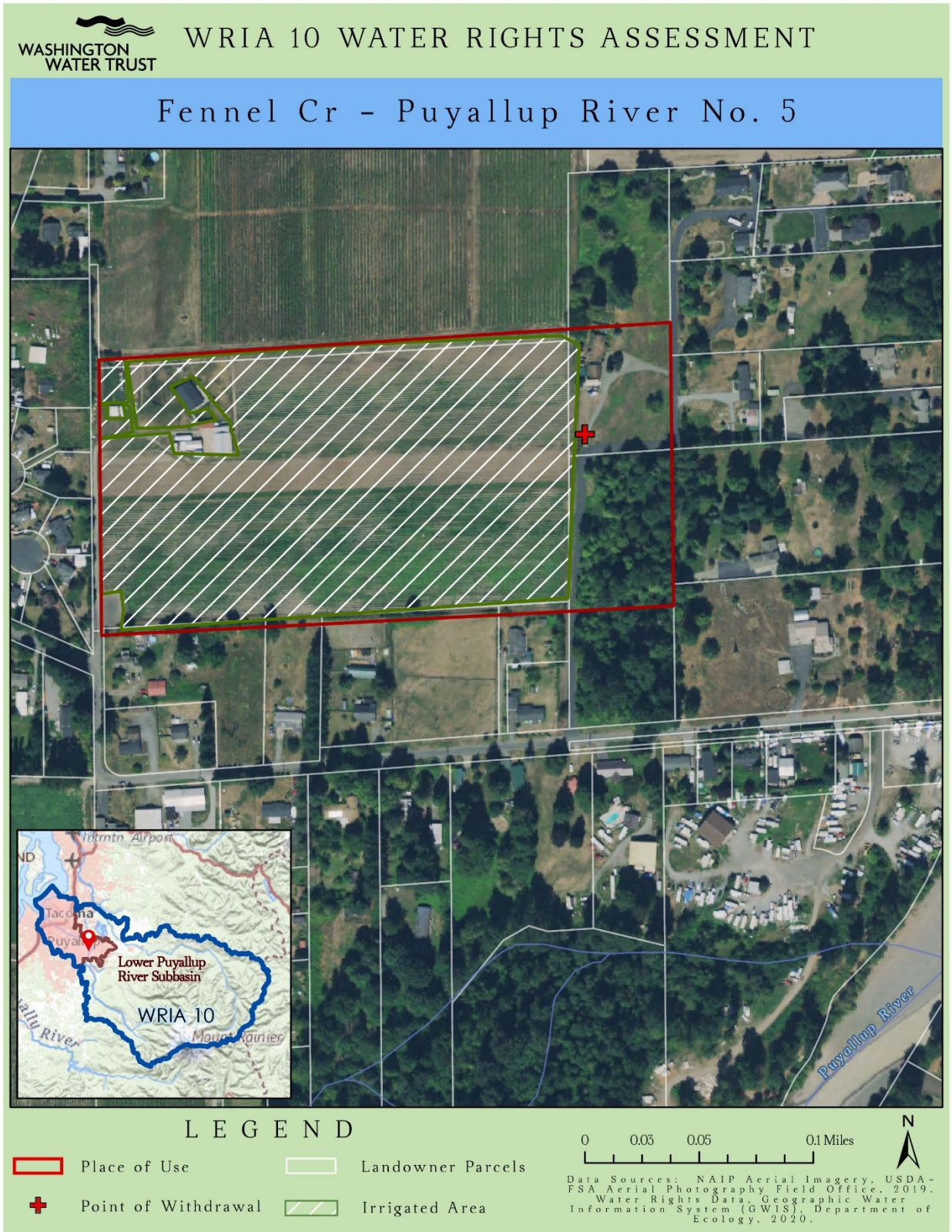
This project was identified as a potential acquisition opportunity using the irrigation analysis prioritization factors. No metering records exist for this water right. Current land use is 9400-CU Open Space. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which estimate as much as 15 acres irrigated. WWT utilized the delineated acreage to estimate the potential consumptive use quantity that may be available to serve as an offset. An estimate is developed based on the pasture water duty (16.6 inches) found in the Washington Irrigation Guide (Puyallup station, Appendix A) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on the 15 delineated acres and assuming pasture and sprinkler irrigation, 23.53 afy consumptive is the estimated quantity available for trust water transaction.[4]

The Fennel Cr – Puyallup R No. 5 water right has a priority date of 6/22/1950, which is senior to the establishment of the Puyallup Basin Instream Resources Protection Program in 1980. This water right certificate does not have instream flow provisions.

[4] This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Figure 7: Project Map



WWT, MWS, and BWGIS, 2020

WRIA 10 Project Opportunity Profile –

Fiske Cr – Puyallup R No. 3

Project Summary

FLOW BENEFIT: Additional 0.45 cfs in 23 miles of the Puyallup River.[1]

PRIORITY SUBBASIN: Upper Puyallup River

ESTIMATED OFFSET: 72.15 afy consumptive

SUBBASIN CONSUMPTIVE USE ESTIMATE: 66.5 afy

PRIORITY DATE(S): 3/27/1968 and 4/30/1982

INSTREAM FLOW RULE (1980): Puyallup River Basin Instream Resources Protection Program, established in 1980.[2]

ESA LISTED FISH: Spring, Summer, and Fall Chinook (Threatened), Coho (Species of Concern), Winter and Summer Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: None

Project Description

Fiske Cr – Puyallup R No. 3 was included in the WRIA 10 water rights analysis due to the prioritization factors utilized in the irrigation analysis (e.g. priority sub-basin, acres of irrigation, etc). Fiske Cr – Puyallup R No. 3 is located in the southeast corner of the City of Orting south of the Puyallup River. The irrigated area associated with these water rights occurs on two parcels that are owned by the WA Department of Veteran Affairs and include part of the Washington Soldiers Home Orting. Of the two water rights in this project, the place of use for the senior water right also includes a subdivision to the north. Based on aerial imagery review, there appears to be beneficial use related to this water right. To our knowledge, there has been no outreach to the water right holder by any entity at this time.

[1] Dependent on hydraulic continuity
[2] WAC 173-510-030

Watershed

This project is located in the Upper Puyallup River Subbasin at approximately river mile (RM) 23 on the Puyallup River that flows into Commencement Bay. The Puyallup River has an instream flow established in this downstream reach, and "loss of natural habit-forming flow regimes" is a limiting factor cited for the Puyallup Watershed in the 2018 Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds.[3]

Land Use & Ownership

According to the Pierce County Assessor, the current land use associated with the irrigated area is listed as Governmental Services and is zoned as Municipal (City of Orting Public Facilities). The land underlying Fiske Cr – Puyallup R No. 3 includes a subdivision to the north and two parcel owned by the WA Department of Veteran Affairs that total 146.98 acres.

A review of the WSDA 2019 Agricultural Land Use map identifies 41.32 acres of commercial tree with big gun irrigation and 3.22 acres of other for a total of 44.54 acres of irrigation. Irrigation delineation estimates as much as 46 irrigated acres in 2019. It is possible that the difference of estimated irrigated acres between years analyzed may be explained as the result of the timing of the aerial photograph, specific water use practices or from sufficient causes for non-use (RCW 90.14.140), which would be best understood through direct conversation with the water user.

Table 15: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	40.3
2015	38.6
2017	37.0
2019	46.0

[3] https://www.co.pierce.wa.us/ArchiveCenter/ViewFile/Item/6075, page 5-40

Water Right

Table 16: Current Water Right

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	90 afy	0.45 cfs	3/27/1968	Irrigation	60	Groundwater
Certificate	66 afy (34 for DM and 32 for Irr)	0.36 cfs	4/30/1982	Domestic Multiple, Irrigation	16	Groundwater

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The original groundwater certificate was issued for the irrigation of 60 acres. This water right has priority date of 3/27/1968, listed purpose of irrigation, with a Qi of 0.45 cfs (200 GPM) and 90 acre feet identified as the Qa. The water is diverted from a groundwater well.

A non-additive/supplemental groundwater water right also exists for 16 acres. This water right has a priority date of 4/30/1982, listed purpose of use of domestic multiple and irrigation, with Qi of 0.36 cfs (160 GPM) and 66 acre feet identified as the Qa. The Qa is split with 34 acre feet for the domestic multiple use and 32 acre feet for irrigation. In 2013, an additional well was added to this water right under a showing of compliance (RCW 90.44.100(3)). The water is diverted from two groundwater wells.

Well Records:

A signed *Water Well Report* found in the documentation attached to the primary water right certificate, is for a well drilled 6/30/1967, that is an 8 inch diameter 124 foot deep well with a static water level of 13ft.

Using a map search on Ecology's well database, 2 wells were identified as potentially related to the non-additive/supplemental water right, by correlating the names on the well logs which reflected current ownership and names on water rights documents. The first was for the construction of a well 11/4/2002, which is an 8 inch diameter 260 foot deep well that was then decommissioned on 4/23/2013.

The second well is reported in the post certificate documents as having been added to the water right through a *Showing of Compliance* form 5/15/2013. This well was completed 4/16/2013 and is a 16 inch diameter 119 foot deep well with a static water level of 6.6 ft.

Metering Records:

Metering records were not available in the Ecology Water Resources Explorer database and a request to Ecology found no records

Conclusion

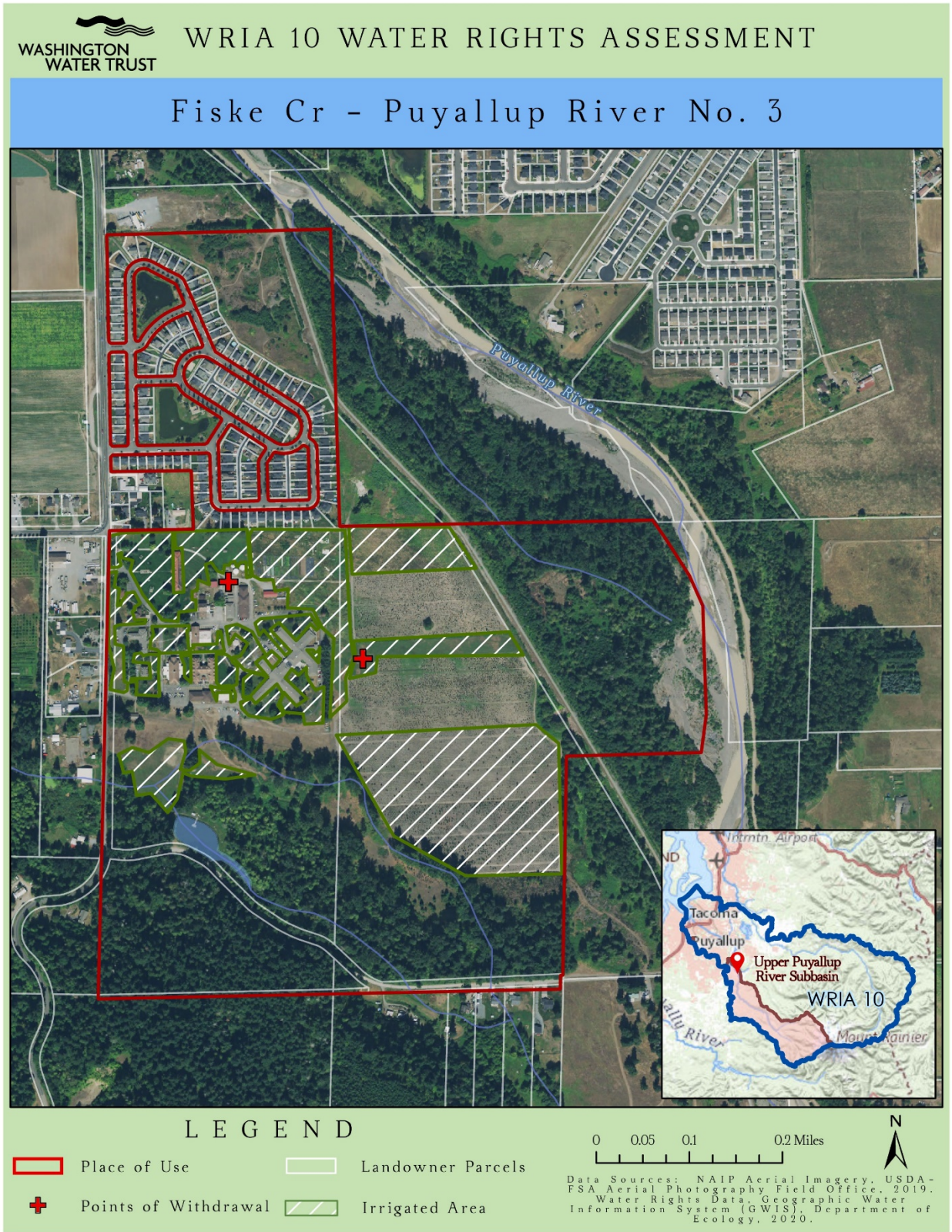
This project was identified as a potential acquisition opportunity using the irrigation analysis prioritization factors. No metering records exist for this water right. Current land use with irrigation is Governmental Services. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which estimate as much 46 acres irrigated. WWT utilized the delineated acreage to estimate the potential consumptive use quantity that may be available to serve as an offset. An estimate is developed based on the pasture water duty (16.6 inches) found in the Washington Irrigation Guide (Puyallup station, Appendix A) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on the 46 delineated acres and assuming pasture and sprinkler irrigation, 72.15 afy consumptive is the estimated quantity available for trust water transaction.[4]

The Fiske Cr – Puyallup R No. 3 water rights have a priority dates of 3/27/1968 and 4/30/1982, which are senior and junior respectively to the establishment of the Puyallup Basin Instream Resources Protection Program in 1980. These water right certificates do not have instream flow provision. A barrier to acquisition may be the ability for the owner to change their land use.

[4] This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Figure 8: Project Map



WWT, MWS, and BWGIS, 2020

WRIA 10 Project Opportunity Profile –

Boise Creek – White River No. 3

Project Summary

FLOW BENEFIT: Additional 0.3 cfs in 0.2 miles of Cyclone Creek, 24.3 miles of White River, and 10.5 miles of Puyallup River.

PRIORITY SUBBASIN: Middle White River

ESTIMATED OFFSET: 47.06 afy consumptive

SUBBASIN CONSUMPTIVE USE ESTIMATE: 23 afy

PRIORITY DATE(S): 4/29/1952

INSTREAM FLOW RULE (1980): Puyallup River Basin Instream Resources Protection Program, established in 1980.[1]

ESA LISTED FISH: Spring, Summer and Fall Chinook (Threatened), Coho (Species of Concern), Winter and Summer Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: None

Project Description

Boise Creek – White River No. 3 (Boise Cr – White R No. 3) was included in the WRIA 10 water rights analysis due to the prioritization factors utilized in the irrigation analysis (e.g. priority sub-basin, acres of irrigation, etc). Boise Cr – White R No. 3 is located two miles south of the City of Enumclaw and to the west of Pinnacle Peak Park. There appears to be beneficial use related to this water right. The irrigated area is found on two parcels with two different owners. To our knowledge, there has been no outreach to the water right holder by any entity at this time.

[1] WAC 173-510-030

Watershed

This project is located in the Middle White River Subbasin and the property is just upstream of the confluence of Boise Creek with the White River. The White River joins the Puyallup River at RM 10.5 before flowing into Commencement Bay. The Puyallup River has an instream flow established in this downstream reach, and "loss of natural habit-forming flow regimes" is a limiting factor cited for the Puyallup Watershed in the 2018 Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds.[2] The White River and all tributaries are closed to new surface water appropriations but do not have an instream flow established in Chapter 173-510 WAC.

Land Use & Ownership

According to the King County Assessor, the current land use is listed as Single Family and is zoned as A-35 (agricultural, one DU per 35 acres). The land appurtenant to Boise Cr – White R No. 3 is two parcels with two owners. The first King County parcel is 31.79 acres and has had multiple owners with the current owner having acquired the property through a quit claim deed on 12/24/2013. The second King County parcel is 1.87 acres and has had multiple owners with the last sale occurring 10/22/2013**.**

A review to the WSDA 2019 Agricultural Land Use map identifies 26.5 acres of hay/silage. Irrigation delineation indicates that as much as 30.7 irrigated acres in 2013. It is possible that the difference of estimated irrigated acres between years analyzed may be explained as the result of the timing of the aerial photograph, specific water use practices or from sufficient causes for non-use (RCW 90.14.140), which would be best understood through direct conversation with the water user.

Table 17: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	30.7
2015	0.0
2017	0.0
2019	3.0

[2] https://www.co.pierce.wa.us/ArchiveCenter/ViewFile/Item/6075, page 5-40

Water Right

Table 18: Current Water Right

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	-	0.3 CFS	4/29/1952	Irrigation	30	Cyclone Creek

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The original certificate was issued for the irrigation of 30 acres. This water right has priority date of 4/29/1952, listed purpose of irrigation, with a Qi .3 cfs and an unidentified Qa. The water is diverted from Cyclone Creek.

Metering Records:

Metering records were not available in the Ecology Water Resources Explorer database and a request to Ecology found no records

Conclusion

This project was identified as a potential acquisition opportunity using the irrigation analysis prioritization factors. No metering records exist for this water right. The current land use is Single Family. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which estimate as much as 30.7 irrigated acres. WWT utilized the delineated acreage to estimate the potential consumptive use quantity that may be available to serve as an offset. An estimate is developed based on the pasture water duty (16.6 inches) found in the Washington Irrigation Guide (Puyallup station, Appendix A) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

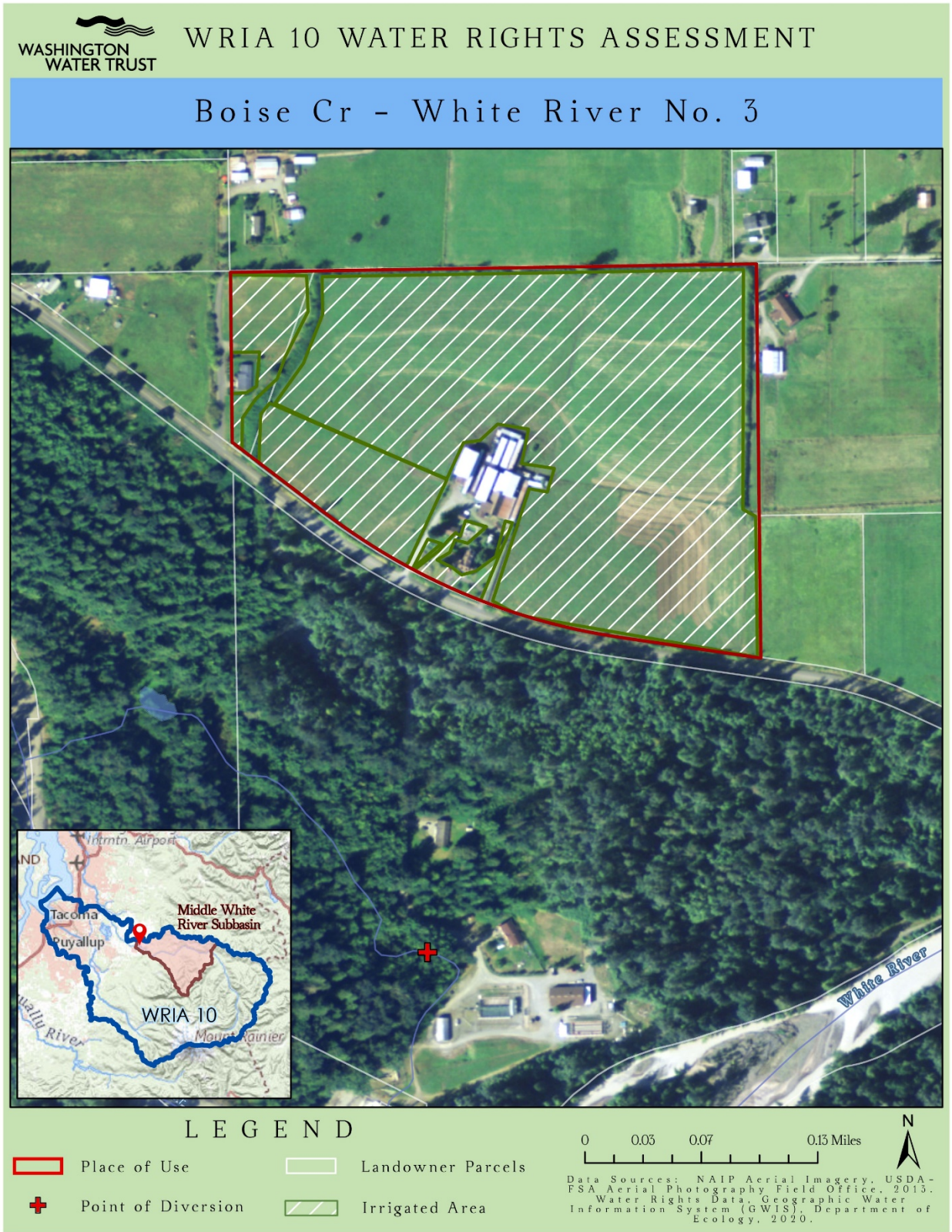
- Based on the 30.7 delineated acres and assuming pasture and sprinkler irrigation, 48.15 afy consumptive is the estimated quantity available for trust water transaction.[3]
- Based on the water right document, which authorizes 30 acres of irrigation and assuming pasture and sprinkler irrigation, 47.06 afy consumptive is the estimated quantity available for trust water transaction.

Based on the 30 acres of authorized irrigation on the water right certificate, the consumptive quantity for offset may be as much as 47.06 afy. The Boise Cr – White R No. 3 water right has a priority date of 4/29/1952, which is senior to the establishment of the Puyallup Basin Instream Resources Protection

[3] This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Program in 1980. This water right certificate does not have instream flow provision. . A potential barrier to acquisition may be the ability for the owner to change their land use or multiple landowners within the place of use.

Figure 9: Project Map



WWT, MWS, and BWGIS, 2020

WRIA 10 Project Opportunity Profile –

Boise Creek – White River No. 2

Project Summary

FLOW BENEFIT: Additional 0.22 cfs in 24.7 miles of White River and 10.5 miles of Puyallup River.[1]

PRIORITY SUBBASIN: Middle White River

ESTIMATED OFFSET: 52.86 afy consumptive

SUBBASIN CONSUMPTIVE USE ESTIMATE: 23 afy

PRIORITY DATE(S): 2/19/1971

INSTREAM FLOW RULE (1980): Puyallup River Basin Instream Resources Protection Program, established in 1980.[2]

ESA LISTED FISH: Spring, Summer, and Fall Chinook (Threatened), Coho (Species of Concern), Winter and Summer Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: None

Project Description

Boise Creek – White River No. 2 (Boise Cr – White R No. 2) was included in the WRIA 10 water rights analysis due to the prioritization factors utilized in the irrigation analysis (e.g. priority sub-basin, acres of irrigation, etc). Boise Cr – White R No. 2 is located two miles south of the City of Enumclaw, just to the west of Pinnacle Peak Park. Based on aerial imagery review, there appears to be beneficial use related to this water right. The irrigated area is found on two parcels with different ownership. To our knowledge, there has been no outreach to the water right holders by any entity at this time.

[1] Dependent on hydraulic continuity
[2] WAC 173-510-030

Watershed

This project is located in the Middle White River Subbasin and the property is just upstream of the confluence of Boise Creek with the White River. The White River joins the Puyallup River at RM 10.5 before flowing into Commencement Bay. The Puyallup River has an instream flow established in this downstream reach, and "loss of natural habit-forming flow regimes" is a limiting factor cited for the Puyallup Watershed in the 2018 Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds.[3] The White River and all tributaries are closed to new surface water appropriations but do not have an instream flow established in Chapter 173-510 WAC.

Land Use & Ownership

According to the King County Assessor, the current land use is listed as Single Family and is zoned as A-35 (agricultural, one DU per 35 acres). The land appurtenant to Boise Cr – White R No. 2 is two parcels with two owners. The first King County parcel is 34.77 acres and has had multiple owners with the current owner having purchased the property on 10/23/2016 and then transferred the property to their LLC in 2017 through a quitclaim deed. The second King County parcel is 49.75 acres and has had multiple owners with the last sale occurring 4/8/2019.

A review of the WSDA 2019 Agricultural Land Use map identifies 44.3 acres of pasture. Irrigation delineation estimates as much as 33.7 irrigated acres in 2019.

It is possible that the difference of estimated irrigated acres between years analyzed maybe explained as the result of the timing of the aerial photograph, specific water use practices or from sufficient causes for non-use (RCW 90.14.140), which would be best understood through direct conversation with the water user.

Table 19: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	30.7
2015	0.0
2017	0.0
2019	33.7

[3] https://www.co.pierce.wa.us/ArchiveCenter/ViewFile/Item/6075, page 5-40

Water Right

Table 20: Current Water Right

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	40 af	0.22 cfs	2/18/1971	Irrigation	50	Groundwater

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The original certificate was issued for the irrigation of 50 acres. This water right has a priority date of 2/18/1971, listed purpose of irrigation with a Qi of 0.22 cfs (100 GPM) and 40 acre-feet identified as the Qa. The water is pumped out of a groundwater well.

Well Information:

Using a map search on Ecology's well database, one well log was identified as potentially related to this project by correlating the names on the well logs, which matched current ownership and names on water rights documents. The identified well was drilled 6/14/1972, and is an eight-inch diameter 134 foot deep well.

A signed *Water Well Report* found in the documentation attached to the water right certificate, appears to be for the same well and shows that the well was completed 6/14/1972 and is an eight-inch diameter 134 foot deep well with a static water level of 52 feet.

Metering Records:

Metering records were not available in the Ecology Water Resources Explorer database and a request to Ecology found no records

Conclusion

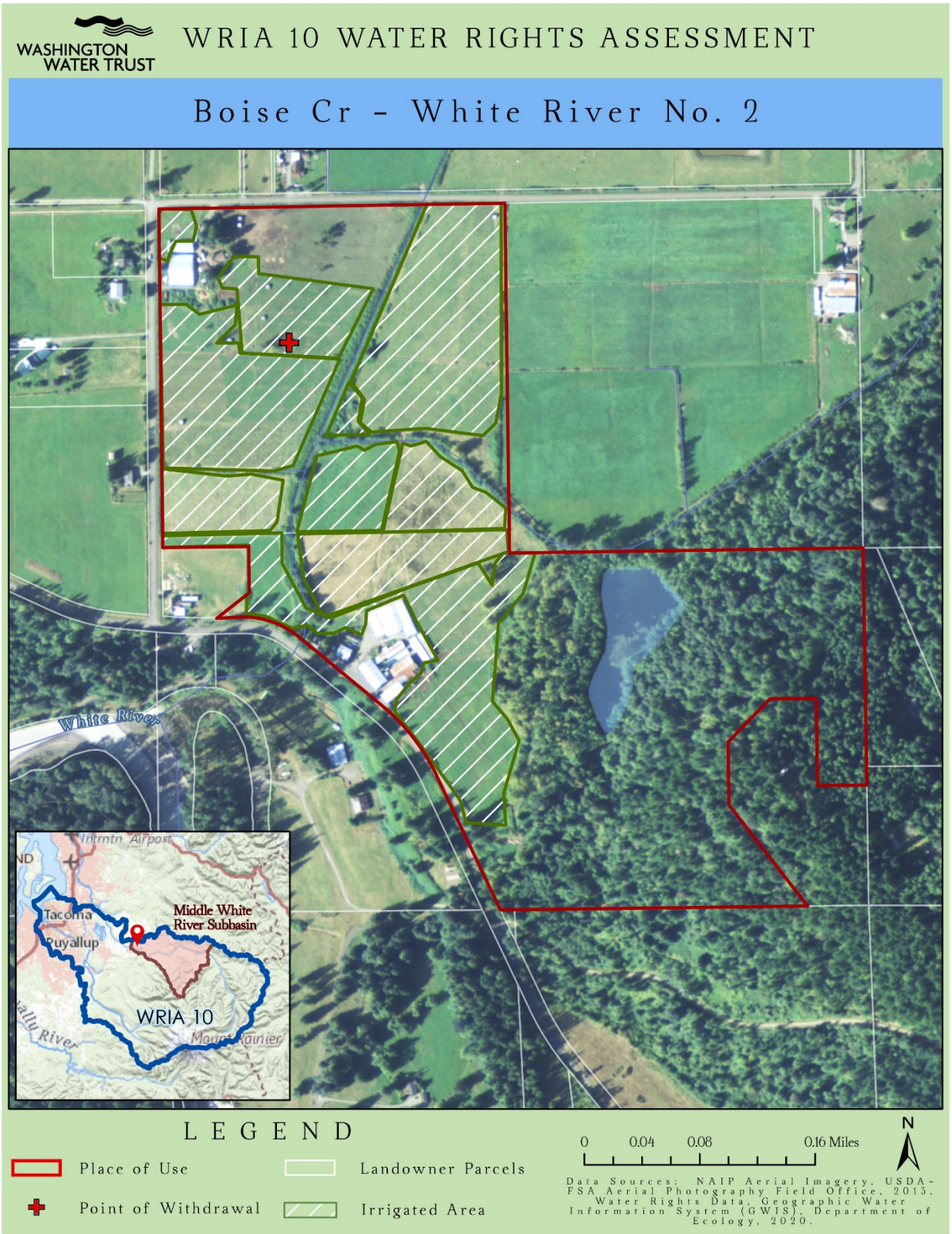
This project was identified as a potential acquisition opportunity using the Irrigation Analysis prioritization factors. No metering records exist for this water right..The current land use is Single Family. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which estimate as much as 33.7 acres irrigated. WWT utilized the delineated acreage to estimate the potential consumptive use quantity that may be available to serve as an offset. An estimate is developed based on the pasture water duty (16.6 inches) found in the Washington Irrigation Guide (Puyallup station, Appendix A) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

- Based on the 33.7 delineated acres and assuming pasture and sprinkler irrigation, 52.86 afy consumptive is the estimated quantity available for trust water transaction.[4]

The Boise Cr – White R No. 2 water right has a priority date of 2/19/1971, which is senior to the establishment of the Puyallup Basin Instream Resources Protection Program in 1980. This water right certificate does not have instream flow provisions. A potential barrier to acquisition may be the ability for the owner to change their land use or multiple landowners within the place of use.

[4] This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

Figure 10: Project Map



WWT, MWS, and BWGIS, 2020

WRIA 10 Project Opportunity Profile –

Boise Creek – White River No. 4

Project Summary

FLOW BENEFIT: Additional 0.3 cfs in 3 miles of Boise Creek, 23.4 miles of White River, and 10.5 miles of Puyallup River.

PRIORITY SUBBASIN: Middle White River

ESTIMATED OFFSET: 47.06 afy consumptive

SUBBASIN CONSUMPTIVE USE ESTIMATE: 23 afy

PRIORITY DATE(S): 4/20/1948

INSTREAM FLOW RULE (1980): Puyallup River Basin Instream Resources Protection Program, established in 1980.[1]

ESA LISTED FISH: Spring, Summer, and Fall Chinook (Threatened), Coho (Species of Concern), Winter and Summer Steelhead (Threatened), Bull Trout (Threatened)

OUTREACH STATUS: None

Project Description

Boise Creek – White River No. 4 (Boise Cr – White R No. 4) was included in the WRIA 10 water rights analysis due to the prioritization factors utilized in the irrigation analysis (e.g. priority sub-basin, acres of irrigation, etc). Boise Cr – White R No. 4 is located one mile south-southeast of the City of Enumclaw and to the north of Pinnacle Peak Park. There appears to be beneficial use related to this water right. The property appears to be operated as a dairy farm. The irrigated area is found on a single parcel. To our knowledge, there has been no outreach to the water right holder by any entity at this time.

[1] WAC 173-510-030

Watershed

This project is located in the Middle White River Subbasin and the water right diversion is at approximately river mile (RM) 3 on Boise Creek. Boise Creek flows into the White River at RM 23.4 and the White River joins the Puyallup River at RM 10.5 before flowing into Commencement Bay. The Puyallup River has an instream flow established in this downstream reach, and "loss of natural habit-forming flow regimes" is a limiting factor cited for the Puyallup Watershed in the 2018 Salmon Habitat Protection and Restoration Strategy for Puyallup and Chambers Watersheds.[2] The White River and all tributaries are closed to new surface water appropriations but do not have an instream flow established in Chapter 173-510 WAC.

Land Use & Ownership

According to the King County Assessor, the current land use is listed as Single Family and is zoned as A-35 (agricultural, one DU per 35 acres). The land appurtenant to Boise Cr – White R No. 4 is a single parcel and owner. The King County parcel is 38.22 acres and has had multiple owners with the current owner having acquired the property on 12/10/2009.

A review to the WSDA 2019 Agricultural Land Use map identifies 7.51 acres of hay/silage, 7.92 acres of pasture, and 15.86 acres of cereal grain utilizing big gun irrigation or a total of 31.29 irrigated acres. Irrigation delineation estimate as much as 31.4 irrigated acres in 2013. It is possible that the difference of estimated irrigated acres between years analyzed may be explained as the result of the timing of the aerial photograph, specific water use practices or from sufficient causes for non-use (RCW 90.14.140), which would be best understood through direct conversation with the water user.

Table 21: Delineated irrigation in each year (2013, 2015, 2017, 2019)

Year	Total Irrigated Acres (Med/High Confidence)
2013	31.4
2015	17.5
2017	18.5
2019	23.0

[2] https://www.co.pierce.wa.us/ArchiveCenter/ViewFile/Item/6075, page 5-40

Water Right

Table 22: Current Water Right

Document Type	Qa	Qi	Priority Date	Purpose of Use	WR Acres	Source
Certificate	-	0.3 CFS	4/20/1948	Irrigation	30	Cyclone Creek

These quantities only reflect what is shown on the water right document, and do not represent any beneficial use assessment by Ecology.

Water Right History:

The original certificate was issued for the irrigation of 30 acres. This water right has priority date of 4/20/1948, listed purpose of irrigation, with Qi of 0.3 CFS and an unidentified Qa. The water is diverted from Cyclone Creek.

Metering Records:

Metering records were not available in the Ecology Water Resources Explorer database and a request to Ecology found no records

Conclusion

This project was identified as a potential acquisition opportunity using the irrigation analysis prioritization factors. No metering records exist for this water right. The current land use is listed as Single Family. Four years of irrigation delineations were undertaken (2013, 2015, 2017, 2019) which estimate as much as 31.4 irrigated acres. WWT utilized the delineated acreage to estimate the potential consumptive use quantity that may be available to serve as an offset. An estimate is developed based on the pasture water duty (16.6 inches) found in the Washington Irrigation Guide (Puyallup station, Appendix A) and irrigation method assumed to be sprinkler (75% irrigation efficiency, 10% application efficiency).

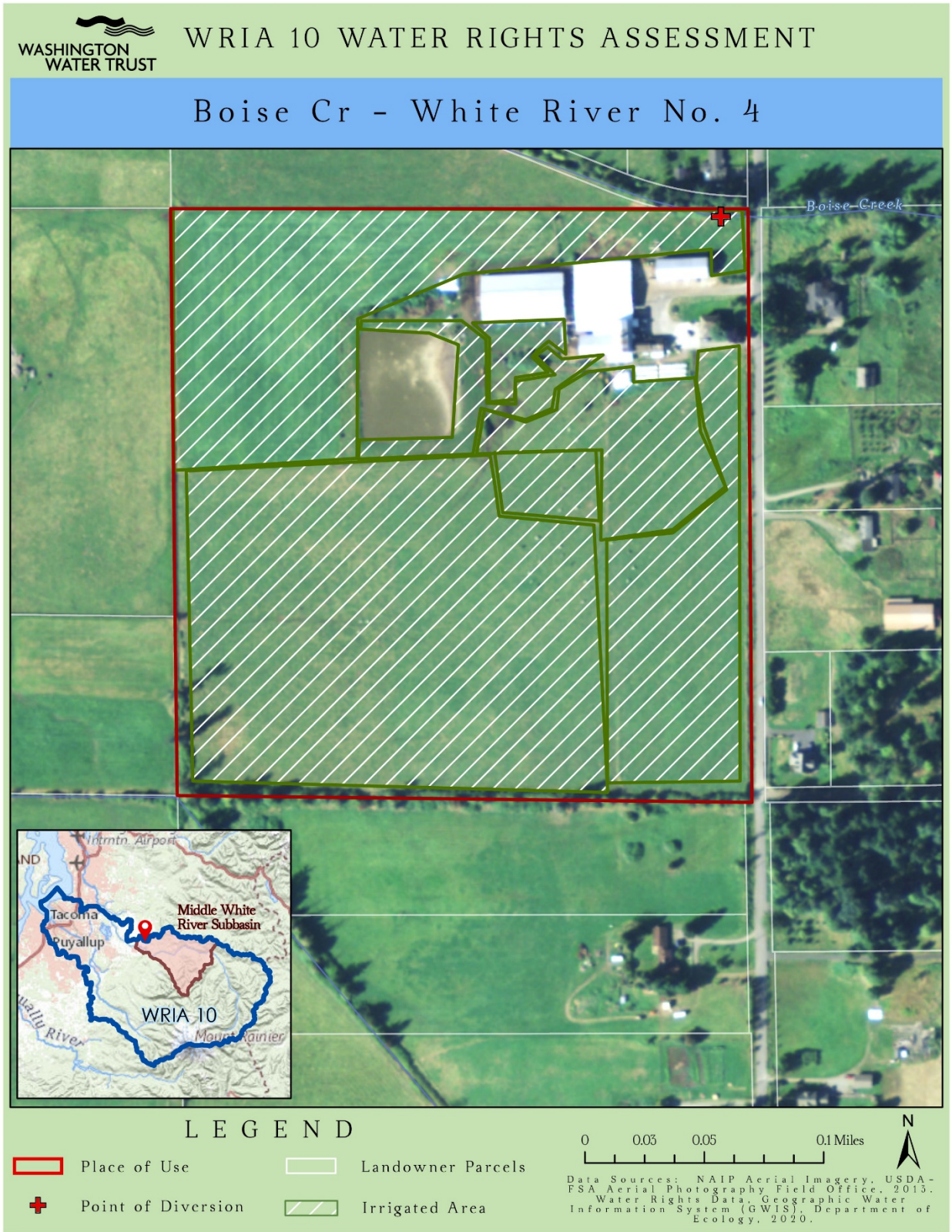
- Based on the 31.4 delineated acres and assuming pasture and sprinkler irrigation, 49.25 afy consumptive is the estimated quantity available for trust water transaction.[3]
- Based on the water right document, which authorizes 30 acres of irrigation and assuming pasture and sprinkler irrigation, 47.06 afy consumptive is the estimated quantity available for trust water transaction.

Based on the 30 acres of authorized irrigation on the water right certificate, the consumptive quantity for offset may be as much as 47.06 afy. The Boise Cr – White R No. 4 water right has a priority date of

[3] This is only an estimate of consumptive use quantity. An extent and validity determination by Ecology would be required to determine the actual quantity available for acquisition.

4/29/1952, which is senior to the establishment of the Puyallup Basin Instream Resources Protection Program (Instream Flow Rule) in 1980. This water right certificate does not have instream flow provision.

Figure 11: Project Map



Attachment 5: Water Rights 101

WATER RIGHTS 101

WHAT IS A WATER RIGHT?

•A water right is a:
–Legal authorization to use a quantity of public water for a designated, beneficial, purpose and in the quantities and place of use specified.
–Usufructuory property right – right to use a public resource.
•Managed and regulated by the Washington Department of Ecology (Ecology) based on Washington water law Title 90 RCW, administrative rules (Title 173 WAC), and water resources case law.

WATER RIGHTS TYPES

•*Water right claim*
–Predates the water permitting system (1917 for surface water, Chapter 90.03 RCW; 1945 for groundwater, Chapter 90.44 RCW).
–1967 Claims Registration Act –water right claims must be filed with State (Chapter 90.14 RCW).
•*Water right permit*
–Unperfected water right in development (put to beneficial use); it is not a final water right and must be perfected.
– Rettkowski v. Ecology (1993) Adjudication required as stated in Chapter 90.03 RCW –Ecology manages permits via "tentative" determinations.
•*Water right certificate*
–Ecology issues a certificate after confirming that all the conditions of the permit have been met. Water right "perfected".
–A Certificate of Water Right is a private use-based right ("Usufructuory") connected to the land (appurtenant).

WATER RIGHT FUNDAMENTALS

•*First in time, first in right:*	Priority based on seniority (prior appropriation)
•*No Impairment:*	Water use or new water use may not impede the ability of senior water right users to access their legally authorized water quantities
•*Use it or lose it:*	5 years or more of nonuse = relinquishment (Chapter 90.14 RCW), subject to "Sufficient Causes"
•*Beneficial use:*	A use of water approved in state law as providing value to the state - irrigation, domestic, municipal, stock, industrial, and others
•*Consumptive use:*	The portion of water diverted from a stream or withdrawn from groundwater, needed for plant growth, consumed by people/animals or evaporated during beneficial use.
•*Non-Consumptive use:*	The portion of water diverted or withdrawn, which conveys the consumptive use water, which is not consumed by beneficial use and reenters the watershed through return flow

•*Place of use:*	The authorized place where a water right may be used
•*Point of diversion:*	The authorized location where water may be withdrawn or diverted.
• *Water Right Change:*	Water right elements (purpose, points of diversion/withdrawal, place of use) may be changed through application to Ecology
• *Qi*	The instantaneous quantity of water use measure in gallon per minute (gpm) for groundwater sources and cubic feet per second (cfs) for surface water uses
• *Qa*	The annual quantity of water use measured in acre-feet per year (afy)

Attachment 6: Sample Letter

SAMPLE LETTER

Ms. Common Name
PO Box XXXX
City WA 9XXXX

July 25, 202X

Dear Ms. Name:

We hope this letter finds you well.

The Water Resources Enhancement Committee (WREC) is contacting you related to our Watershed Planning efforts within the Puyallup-White River basin. We are reaching out to a specific group of Puyallup-White River basin water right holders to explore opportunities to enhance flows in the river and improve community water security with the purchase of water rights at fair market value.

In 2018, the Washington State Legislature passed a law, the Streamflow Restoration Act, which required counties and basin stakeholders to develop watershed plans to accommodate new rural wells for the next 20 years. This law directed that these plans identify water rights in good standing which may be able to offset the stream impact of new wells. We are reaching out to you as a water right holder and potential partner in supporting improved watershed health and community water security.

The WREC is comprised of a wide variety of stakeholders representing different interests. The WREC committee members are [this paragraph introduces who is reaching out to the water right holder].

If you are willing, we would appreciate the opportunity to discuss water rights and your potential interest in water conservation efforts in the Puyallup-White River basin. You may be reach me at the contact information below.

Sincerely,

First Name Last Name
Project Sponsor Organization
Address
Email
Phone

Attachment 7: Sample Letter of Intent

LETTER OF INTENT

Date

This letter documents intent (this "LETTER OF INTENT") by the signatory (the "PROPERTY OWNER") to work exclusively with PROJECT SPONSOR for the purpose of negotiating an agreement to (proposed project)

This agreement is hereby entered into as of _____ (the "EFFECTIVE DATE").

The names, address, telephone and fax numbers of the parties to this LETTER OF INTENT are as follows

PROPERTY OWNER Representative Address Phone number	PROJECT SPONSOR Representative Address Phone number

The PROPERTY OWNER hereby acknowledges the intent to continue in good faith negotiations from the EFFECTIVE DATE, for the express purpose of developing a mutually acceptable Project as generally described in the proposal entitled **"Title"** (the "PROPOSAL"), as more particularly described on Exhibit A, attached hereto and incorporated herein by this reference, for a period of not more than one hundred eighty (180) days (the "EXCLUSIVE NEGOTIATING PERIOD"). The PROPERTY OWNER further acknowledges that it will not enter into negotiations with other entities for the sale, lease, or other transaction associated with the water right identified above during the EXCLUSIVE NEGOTIATING PERIOD.

This LETTER OF INTENT is not binding and is not an offer, but is only an expression of some aspects of the PROPOSAL. Any or all of the terms of this LETTER OF INTENT, including the PROPOSAL may be reversed, modified or clarified by the PROPERTY OWNER or PROJECT SPONSOR through the negotiation of an agreement to effectuate the details of the PROPOSAL (the "AGREEMENT"). In the event the PROPERTY OWNER and WWT wish to enter into the AGREEMENT, this LETTER OF INTENT shall be superseded and replaced by the AGREEMENT.

[*Signatures to follow*]

PROPERTY OWNER:

By: _____ Date: _____

Name: _____

Its: _____

PROJECT SPONSOR:

By: _____ Date: _____

Name:_____ _____

Attachment 8: Additional Resources

ADDITIONAL RESOURCES

Water Rights FAQ

https://ecology.wa.gov/Water-Shorelines/Water-supply/Water-rights

Landowners Guide to Water Rights

https://appswr.ecology.wa.gov/docs/WaterRights/wrwebpdf/landownerguide-2019.pdf

Sufficient Causes for Non-Use

https://app.leg.wa.gov/RCW/default.aspx?Cite=90.14.140

DETERMINING IRRIGATION EFFICIENCY AND CONSUMPTIVE USE-Guidance 1210-Ecology

https://appswr.ecology.wa.gov/docs/WaterRights/wrwebpdf/guid1210.pdf

Washington Irrigation Guide-Appendix A

https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_033608.pdf

Appendix J – Priority Streams for Water Right Acquisitions

Appendix J WRIA 10 Priority Streams

Proposed Selection for WR review	STREAM NAME	Tributary to	High Priority Tributary in WRIA 10/12 Salmon Recovery Strategy	Subbasin	PE Well Projection	Spawning Reach	Fish Utilization
X	Boise Creek	White River	X	Middle White	81	Lower 4.5 miles	CH, CO, PK, ST, SK, BT (NON-SPAWNING)
X	Fennel Creek	Puyallup River	X	Lower Puyallup	102	Lower 2 miles	CH, CO, PK CM, ST, BT (NON-SPAWNING)
X	Greenwater River	White River	X	Upper White	12	throughout	CH, CO, PK, ST, BT (NON-SPAWNING)
X	South Prairie Creek - ask to combine with Wilkeson Creek	Carbon River	X	South Prairie Creek	167	Lower 15 miles	CH, CO, PK, CM, ST, BT (NON-SPAWNING)
X	Wilkeson Creek - ask to combine with South Prairie	South Prairie Creek	X	South Prairie Creek	167	Lower 6.2 miles	CH, CO, PK, CM, ST
X	Voights Creek	Carbon River	X	Carbon	109	Lower 0.5 miles	CH, CO, PK, ST
X	Kapowsin Creek/Ohop Creek	Puyallup River	X	Upper Puyallup	165	all 3.6 miles	CH, CO, PK, ST, BT (NON-SPAWNING)
X	Rody Creek	Clarks Creek	X	Lower Puyallup	102	Lower 0.6 miles	CO, PK, CM
X	Clear Creek (tribs: Canyon Creek, Squally Creek, Swan Creek)	Puyallup River	X	Lower Puyallup	102	RM 1.7 - 1.9	CH, CO, CM, PK, ST, BT (NON-SPAWNING)
	Clearwater River	White River	X	Middle White	81	Lower 3.6 miles	CH, CO, PK, ST, SK, BT (NON-SPAWNING)
	Meeker Creek	Clarks Creek	X	Lower Puyallup	102	lower 0.2 miles	CM, CO
	Salmon Creek/Salmon tributary	White River		Lower White	52	Lower 0.5 miles/Lower0.13 miles	CH, CO, PK, CM
	Hylebos Creek	Puget Sound		Commencement bay (P.S)	102		CH, CO, CM, PK
X	Wapato/Simons Creek	Puget Sound		Lower Puyallup	102		CM, CO, ST
	Canyonfalls Creek	Puyallup River		Lower Puyallup	102	Lower 0.5 miles	CH, CO, CM, PK, ST, BT (NON-SPAWNING)
	Fox Creek	Puyallup River		Upper Puyallup	165	Lower 1 miles	CH, CO, PK, ST
X	Horsehaven Creek	Puyallup River		Upper Puyallup	165	unknown	CM, ST, CO
							CH: CHINOOK, **CO**: COHO, **CM**: CHUM, **SK**:SOCKEYE **PK**: PINK, **ST**: STEELHEAD, **BT**: BULL TROUT

High Priority trib/likely to be impacted by new permit exempt wells
High priority trib, unlikely to be impacted by new permit exempt wells or within UGA/water system coverage
Not a high priority tributary in the Strategy