CHEHALIS WATERSHED (WRIA 22/23) RESPONSE TO 2018 STREAMFLOW RESTORATION LAW

ADDENDUM TO THE CHEHALIS WATERSHED MANAGEMENT PLAN

Approved by Chehalis Basin Partnership on November 17, 2020

Prepared for:

Chehalis Basin Partnership

With assistance from Ecology Grant No. GHCoPS-00021

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EXECUTIVE SUMMARY

This Addendum to the Chehalis Basin Watershed Management Plan was developed under the guidance of the Chehalis Basin Partnership (Partnership) to comply with the State Streamflow Restoration law (Chapter 90.94 RCW). It addresses a core issue identified in the adopted 2004 Chehalis Basin Watershed Management Plan (Plan), which was also developed by the Partnership (Chehalis Basin Partnership, 2004) – evaluating and managing the effects associated with water uses from permit-exempt domestic water wells. The Streamflow Restoration law mandated that the Partnership develop and approve a Watershed Plan Update that addresses the following elements:

- Estimates of consumptive domestic water use from future permit-exempt domestic groundwater withdrawals over the planning timeframe (through 2040)
- Identify the potential impacts of those forecast withdrawals on streamflows
- Develop projects and actions to offset those impacts. Offsets are also required to provide a Net Ecological Benefit (NEB) to the entire basin.

The deadline for Ecology adoption of the Plan Addendum is February 1, 2021, after which Ecology is required to initiate rulemaking to meet the requirements of the law. This Addendum adds to the original Watershed Plan; it does not replace it.

The Partnership divided WRIAs 22/23 into 19 subbasins and developed projections for new permit-exempt wells and associated consumptive use through 2040. Permit-exempt well projections are shown in Table ES-1 and the distribution of consumptive use estimates is shown in Figure ES-1. Chapter 90.94 RCW requires that projected consumptive water use from new permit-exempt wells be offset at the basin scale rather than at the subbasin scale. However, to be protective of streamflow, the Partnership focused on developing projects in subbasins with the highest projected consumptive use. That emphasis is illustrated in Figure ES-2, which shows the four highest projected streamflow impact subbasins – Black, Newaukum, Scatter Creek, and Skookumchuck – have water offset projects in respective subbasins with water benefit potential ranging from 145 percent of impact (Black) to 2,762 percent of impact (Skookumchuck). The Addendum includes several basinwide conceptual projects that allow for projects of specified types to be sited adaptively as suitable site conditions and subbasin-level permit-exempt well impacts are better understood.

Streamflow is a major component and foundation of the ecology of the basin. However, other conditions such as healthy riparian areas, water quality, and instream habitat diversity are also necessary to the overall ecosystem function, structure, and composition. The NEB evaluation utilized ecological priorities identified by the two major aquatic habitat restoration programs in the basin:

- Chehalis Basin Salmon Restoration and Preservation Strategy (Lead Entity Program)
- Chehalis Basin Aquatic Species Restoration Program

Table ES-2 summarizes the instream habitat improvements that will be provided to aquatic species through the suite of habitat projects in this Addendum, totaling 121 miles of instream restoration, 2,180 acres of riparian and upland habitat protected, and over 40 miles of reconnected habitat.

The Partnership finds that this Addendum complies with the Streamflow Restoration law requirements to identify projects and actions to offset streamflow impacts from new permit-exempt well connections and provide NEB to the basin. This finding is based on the combined value of medium- and high-certainty water offset projects, aquatic habitat restoration projects that address key aquatic needs distributed throughout the basin, and the framework of cooperative partnerships already in place in the Chehalis Basin. Nearly 70 percent of the consumptive use from new permit-exempt wells is anticipated to occur in four of the 19 subbasins, and estimated water benefit potential from offset projects in those four subbasins exceed subbasin-level consumptive use estimates. In addition, the largest water offset project – acquisition of a portion of surface water right from the retiring TransAlta coal-fired power plant – is located in one of these subbasins (Skookumchuck) and could provide eight times the estimated consumptive use.

Implementation, Adaptive Management, and Additional Recommendations

The Partnership intends to continue its work with implementation and adaptive management for the Streamflow Restoration law response described in this Addendum. Ecology has recently awarded Streamflow Restoration grant funding for feasibility work on the TransAlta water right acquisition project referenced above. However, the Partnership does not have dedicated funding and will need permanent, stable, administrative support. The Partnership requests base administrative funding from the state to enable the Partnership to transition seamlessly into implementation. The Partnership recommends that the state Legislature provide administrative support funding and a structure to monitor plan implementation (including tracking of new permit-exempt wells and project implementation by subbasin) and to develop a process to adaptively manage implementation if NEB is not being met as envisioned by this Plan Addendum. In the interim, the Partnership requests that available well fees be directed to Grays Harbor County as fiscal agent to fund the watershed coordinator position and costs related to Partnership meetings and coordination.

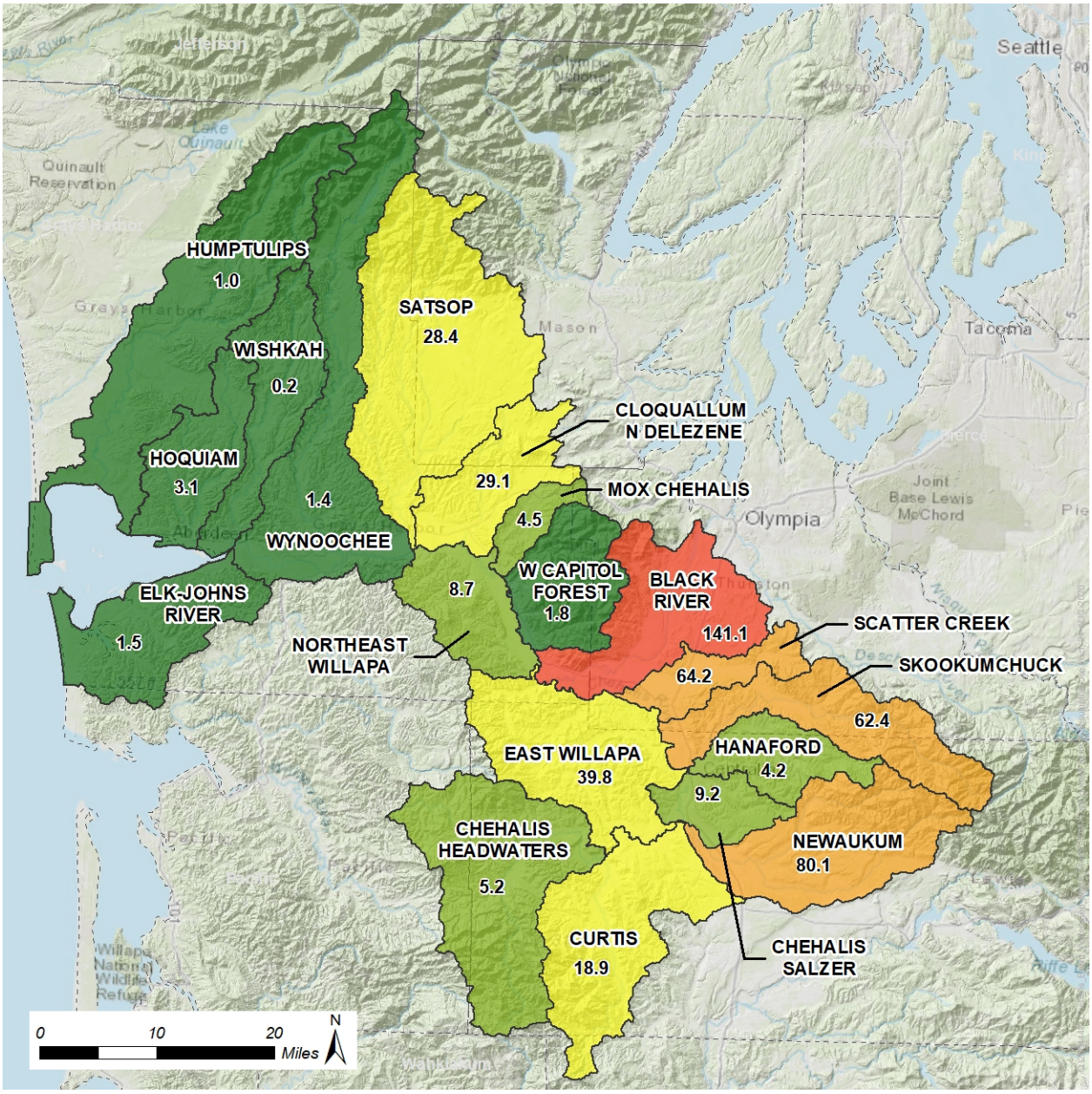

Figure ES-1 Consumptive Use Estimates (acre-feet per year) from new Permit-Exempt Well Connections for Chehalis Basin Subbasins for 2018-2040.

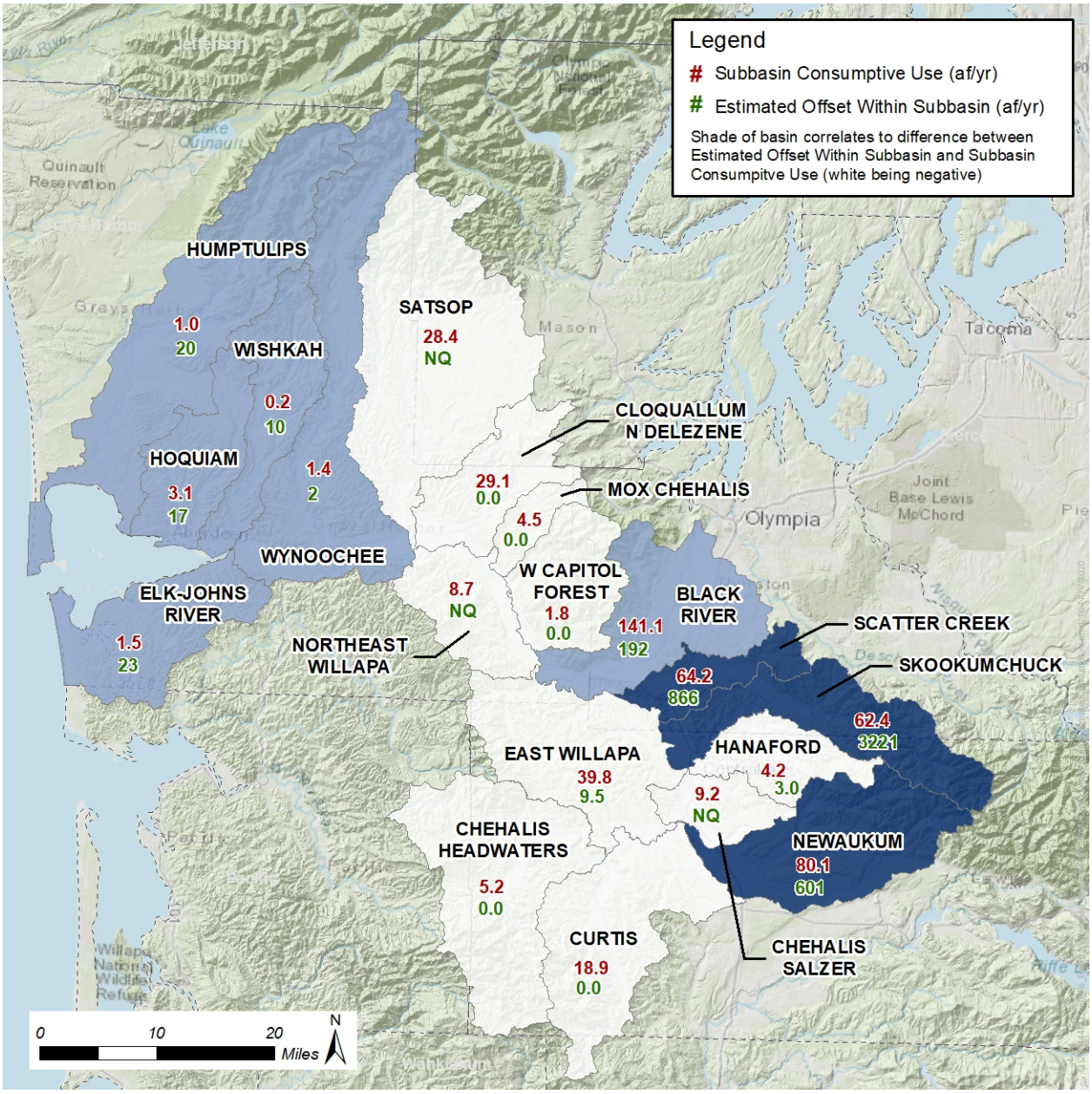

Figure ES-2 Water Offset vs. Consumptive Use by Subbasin

Table ES-2 Other Ecological Benefits for Included Projects

Subbasin	Proposed Habitat Projects	Reach Length Enhanced/ Restored[1] (mi)	Riparian/ Upland Area Protected[2] (ac)	Habitat Reconnected[3] (mi)
Black River	6	0.0	55.0	5.0
Chehalis - Salzer	3	0.0	10.0	1.8
Chehalis Headwaters	1	0.3	0.0	0.0
Cloquallum - N Delezene	5	1.0	15.6	8.3
W Capitol Forest	0	0.0	0.0	0.0
Elk - Johns River	1	0.0	178.7	0.0
East Willapa	2	0.0	0.0	0.8
Hanaford	2	0.7	33.0	0.0
Hoquiam	6	0.3	394.4	3.5
Humptulips	2	0.0	157.1	5.3
Mox Chehalis	0	0.0	0.0	0.0
Newaukum	13	36.3	1.3	16.2
Satsop	4	6.8	137.0	0.0
Scatter Creek	5	13.8	788.0	0.0
Curtis	1	2.6	0.0	0.0
Skookumchuck	2	40.3	17.0	0.0
Northeast Willapa	0	0.0	0.0	0.0
Wishkah	1	0.0	75.2	0.0
Wynoochee	3	3.8	17.5	0.0
WRIA 22/23 Total[4]	**62**	**121**	**2,180**	**41**

1. Actions include instream restoration, large wood addition, etc.
2. Actions include protecting land for conservation purposes, riparian restoration, floodplain reconnection and habitat creation
3. Actions include fish passage improvements
4. Includes basinwide projects not assigned to individual subbasins.

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ASRP	Aquatic Species Restoration Plan
BDA	Beaver Dam Analog
CBP	Chehalis Basin Partnership
CFS	Cubic Feet per Second
EDT	Ecosystem Diagnosis and Treatment salmon habitat model
ESA	Endangered Species Act
ESSB	Engrossed Substitute Senate Bill
MAR	Managed Aquifer Recharge
NEB	Net Ecological Benefit (RCW 90.94.020)
OFM	Office of Financial Management
RCO	Recreation and Conservation Office (State of Washington)
RCW	Revised Code of Washington
SFR	Single Family Residence
SRP	Salmon Recovery Portal
TRPC	Thurston Regional Planning Council
UGA	Urban Growth Area
WAIG	Washington Irrigation Guide
WAU	Watershed Administrative Unit
WDFW	Washington Department of Fish and Wildlife
WRIA	Water Resource Inventory Area
USGS	United States Geological Survey

1 INTRODUCTION AND BACKGROUND

This Addendum to the Chehalis Basin Watershed Management Plan was developed under the guidance of the Chehalis Basin Partnership (Partnership) to comply with the State Streamflow Restoration law (Chapter 90.94 RCW). It addresses a core issue identified in the adopted 2004 Chehalis Basin Watershed Management Plan (Plan), which was also developed by the Chehalis Basin Partnership (Chehalis Basin Partnership, 2004) – evaluating and managing the effects associated with water uses from permit-exempt domestic water wells.

1.1 Chehalis Watershed Planning History

The Partnership was formed through an intergovernmental agreement on August 31, 1998 (https://chehalisbasinpartnership.org/wp-content/uploads/2019/04/CBP-Intergovernmental-Agreement.pdf) and consists of tribes, counties, cities, water supply utilities, state agencies, major stakeholder interests, and citizens-at-large from each county. The Partnership works collaboratively on water management issues to promote environmentally sound, economical, and equitable management of the water in the Chehalis Basin (Water Resource Inventory Areas [WRIA] 22 and 23). The Partnership is unique in the Chehalis Basin, with inclusive membership that spans governmental agencies, tribes, and stakeholder interests and a full consensus decision-making model.

Acting under authority of the 1998 Watershed Management Act (chapter 90.82 RCW), with Grays Harbor County as the Lead Agency, the Partnership developed and approved the Plan on April 13, 2004 (Chehalis Basin Partnership, 2004), which was adopted by each of its participating counties. It was the second watershed plan adopted by a local Planning Unit in the state, highlighting the successful collaborative nature of the Partnership. As a follow-up to the Plan, the Partnership developed and approved the Detailed Implementation Plan in June 2009 (Chehalis Basin Partnership, 2009), further outlining a comprehensive approach for accomplishing the 2004 Plan's goals through prioritized strategies and interim milestones.

Between 2009 and 2018, the Partnership continued to meet, providing a cooperative forum for members to engage and advise on water and habitat-related topics. However, the lack of state support for watershed plan implementation hampered progress on many of the Plan's recommendations.

In January 2018, the Washington State Legislature passed ESSB 6091, a new law addressing the 2016 Whatcom County vs. Western Washington Growth Management Hearings Board Washington Supreme Court decision, commonly referred to as the "Hirst Decision". The Hirst Decision required counties, not the Department of Ecology (Ecology), to independently determine that the impacts from proposed new domestic permit-exempt well connections required for development applications would not impair senior water rights, including established minimum instream flow rules. The Legislature responded to the court ruling by passing the Streamflow Restoration law, which was codified in Chapter 90.94 Revised Code of Washington (RCW). The law directs Planning Units in each WRIA with approved watershed plans, such as the Partnership, to assess potential streamflow impacts from future permit-exempt well

use and to identify projects and actions to offset those impacts and produce a Net Ecological Benefit (NEB) to the WRIA.

The Streamflow Restoration law directs Ecology to work with the Partnership to develop the watershed plan addendum. The law also requires that each county in the Partnership record limitations associated with water supply with the property title, collect a fee of $500 from each building permit application ($350 of which is transmitted to Ecology), record the number of building permits and transmit an account of building permits and subdivision approvals subject to the law annually, and limit the withdrawal exemption for an application to a maximum annual average of 3,000 gallons per day (gpd) per connection.

The Partnership responded to the Streamflow Restoration law by re-engaging its full original membership, updating membership for stakeholder and citizen representatives, and developing its response through this Addendum. As one of the few watersheds in the state with a locally-approved and adopted watershed plan, this Addendum complies with state requirements with projects and actions that are tailored to the Chehalis Basin ecological needs and values of Partnership members.

1.2 Scope of this Watershed Plan Addendum

The Streamflow Restoration law mandated that the Partnership, acting under the authority of RCW 90.82, update the Chehalis Basin Watershed Management Plan to provide estimates of consumptive domestic water use from future permit-exempt domestic groundwater withdrawals over the planning timeframe (through 2040), identify the potential impacts of those forecast withdrawals on streamflows, and develop strategies to offset those impacts. Offset projects are also required to provide a NEB to the entire basin for as long as new well pumping continues. This Addendum contains a NEB determination made by the Partnership; Ecology will evaluate and make its own determination regarding NEB. The deadline for Ecology adoption of the Addendum is February 1, 2021, after which Ecology is required to initiate rulemaking to meet the requirements of the law. This Addendum adds to the original Watershed Plan; it does not replace it.

2 WATERSHED OVERVIEW

The Chehalis Basin is the largest river basin in western Washington, extending over eight counties and encompassing approximately 2,800 square miles. Grays Harbor County makes up approximately 50 percent of the basin area, followed by Lewis County covering 28 percent of the area, and Thurston and Mason Counties comprising 12- and 8-percent of the area, respectively. Pacific, Cowlitz, Jefferson, and Wahkiakum Counties combined make up less than 5-percent of the basin area. The basin is bounded on the west by the Pacific Ocean, on the east by the Deschutes Basin, the north by the Olympic Mountains, and the south by the Cowlitz Basin. Elevations vary from sea level at Grays Harbor to approximately 5,000 feet on Capitol Peak in the Olympic Mountains.

2.1 Hydrology, Geology, and Hydrogeology

The Chehalis Basin drainage system consists of the Chehalis River and several major river tributaries – the South Fork Chehalis, Newaukum, Skookumchuck, Black, Satsop, Wynoochee, Wishkah, and Hoquiam Rivers – and numerous tributary creeks. In addition, the Humptulips, Grays, Johns, and Elk Rivers flow directly into Grays Harbor and are considered part of the Chehalis Basin. Grays Harbor is the terminus for all rivers within the Chehalis Basin.

The region experiences mild winters with rare snow accumulation apart from the portion of the basin in the Olympic Mountains. The basin is characterized by wet winters and dry summers with a large variation in annual precipitation between the central lowlands of Lewis County (40 inches) and the headwaters of the Humptulips and Wynoochee Rivers in the Olympic Mountains (220 inches). River discharge peaks between December and March. Approximate average annual discharge for the entire basin is 11,208 cubic feet/second (cfs). Delayed runoff from snowmelt is relatively minor and is typically restricted to the Wynoochee, Satsop, and Humptulips Rivers.

The geology and associated hydrogeologic conditions of the Chehalis Basin vary widely and reflect the complex geologic history of the area, as explained in the 2004 Watershed Plan Supplement Section III (Chehalis Basin Partnership, 2004). The basin has three distinct ecoregions: the Cascade ecoregion, the Puget Lowlands, and the Coast Range. The Cascade region and Coast Range are characterized by bedrock of both sedimentary and volcanic origin that is exposed on hill slopes and ridges. More recent depositions of glacial and alluvial sediments overlie these rock units in the Puget Lowlands. Groundwater is present in substantial quantities in the glacial deposits as well as alluvial sediments in the major river valleys.

2.2 Land Use and Development

Land use in the Chehalis Basin is primarily forest, with development largely concentrated in areas close to streams and rivers. Approximately 80 percent of the basin is forestland with the remainder consisting of agricultural, urban, or industrial areas (Washington State Department of Ecology, 2017).

Commercial dairy, livestock, and crop farming operations are located mainly in the low-lying valleys adjacent to the Chehalis River and its major tributaries, including the South Fork Chehalis, Newaukum, Skookumchuck, Black, Satsop, and Wynoochee Rivers and Scatter Creek. Principal crops include hay and silage, with some vegetables and small grains. Land is also used for pasture.

The remaining land base is spread among rangelands, lakes and reservoirs, urban and rural residential, commercial, industrial, and other minor categories. The major population centers are Chehalis and Centralia in the upper basin, with development along the I-5 corridor and around Black Lake in Thurston County. In the lower basin, Aberdeen and Hoquiam are the main population centers, near the mouth of the Chehalis River. The Chehalis Indian Reservation is located near the mouth of the Black River. Although the Quinault Indian Nation's reservation was established outside the Chehalis Basin boundaries, the Nation holds treaty rights for the Chehalis Basin as its Usual and Accustomed fishing area.

Industrial development is focused mostly in the Chehalis/Centralia and Aberdeen/Hoquiam areas with isolated industrial facilities located throughout the basin. The principal industrial use of water is in the manufacturing of wood, pulp, and paper products. Grays Harbor has historically provided access to cities and ports up the Chehalis River for commercial shipping.

2.3 Aquatic Species

A diverse community of aquatic species rely on streamflow in the Chehalis Basin. This includes four species of salmon – Chinook, coho, and chum salmon, two species of anadromous trout - steelhead and coastal cutthroat trout, and many species of native fish, amphibians, freshwater mussels, birds, and semi-aquatic mammals (e.g. beaver). While the Chehalis Basin does not have any federally listed Endangered Species Act (ESA) salmon species, it does have one ESA-listed amphibian – the Oregon Spotted Frog. Oregon Spotted Frog is only known to occur in the Black River subbasin currently. In addition, critical habitat for ESA-listed bull trout includes portions of the lower basin, but little information exists about their presence and habitat use in the basin.

Chehalis Basin aquatic species rely on healthy streamflows to support habitats critical to their full life cycle, including intact spawning areas, connected floodplains, and stable headwaters. Degraded habitat conditions have a major impact on aquatic species, and efforts currently underway in the Chehalis Basin (see Chapter 7) are working toward restoring habitat conditions and building resiliency for future climate conditions. With its headwater areas in the Willapa Hills, streamflows in the Chehalis Basin is primarily rain-driven (versus snow-driven), and this amplifies the challenges for water storage and maintaining cool water temperatures needed by salmonids.

2.4 Subbasin Delineation

Consistent with Ecology guidance for the Streamflow Restoration law, the Partnership divided WRIAs 22/23 into 19 subbasins (Figure 1) specifically for this Addendum's planning purposes. These subbasins are adapted from the Washington State Department of Natural Resources Watershed Administrative

Unit (WAU) boundaries, which also form the basis for Salmon Recovery Funding Board Lead Entity watersheds. Variations from the WAU boundaries were determined by the Partnership based on the following guiding principles:

- Watershed boundaries
- Projected permit-exempt well densities (excludes most urban areas and remote forest land where development is unlikely or would be sparse)
- Practicality of lumping areas where projected permit-exempt well densities are low.

The 19 subbasins were delineated to geographically organize permit-exempt well projections, impact determinations, and offset projects.

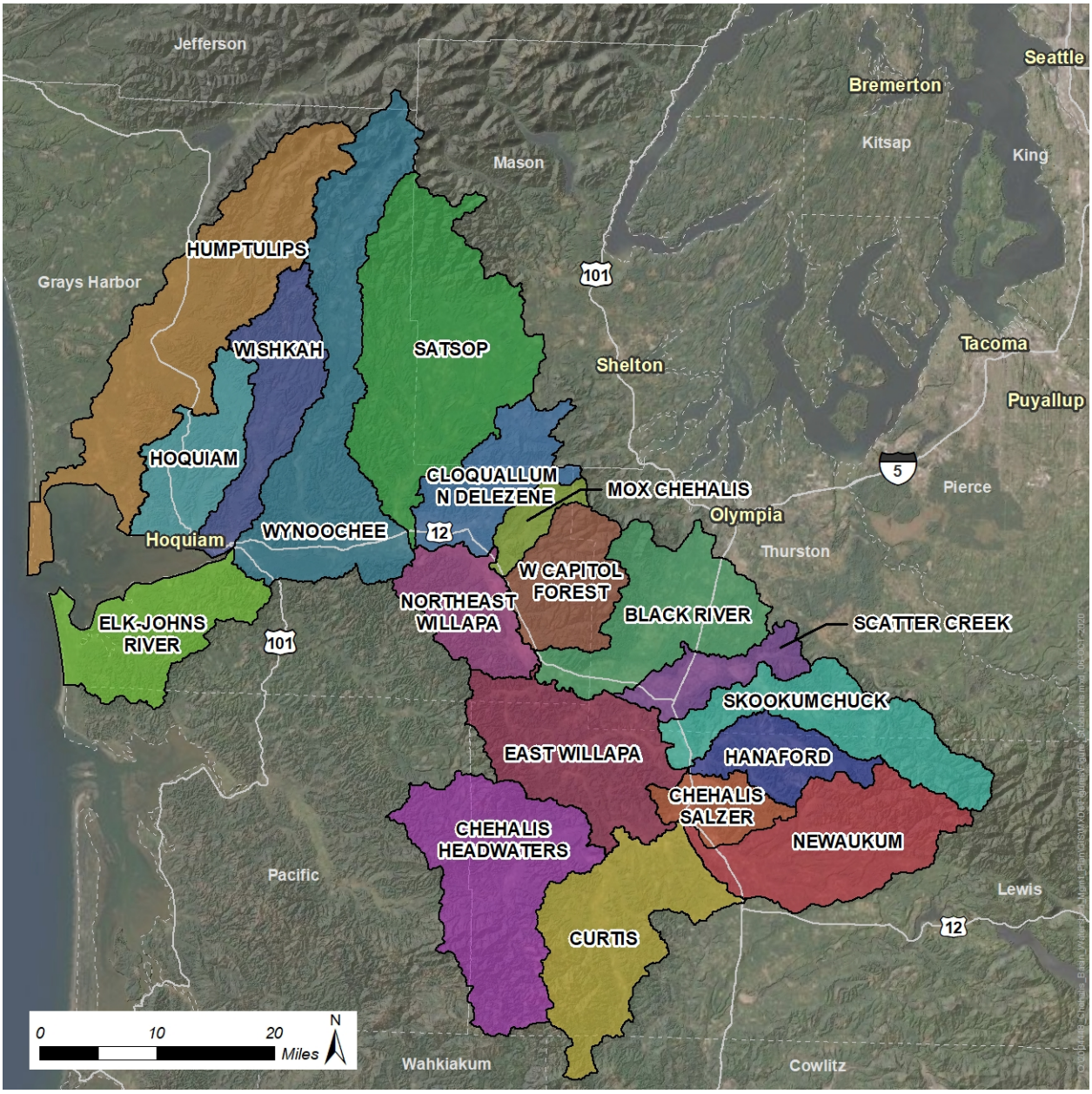

Figure 1 Chehalis Watershed Planning Subbasins

3 PROJECTION FOR NEW PERMIT-EXEMPT WELL CONNECTIONS

3.1 Introduction

The Watershed Plan Addendum must estimate the number of new permit-exempt well connections expected in the basin for the period January 2018 through January 2038 (at a minimum). For the Chehalis Basin, the Partnership selected the planning horizon to be through the year 2040 to more closely align with Washington State Office of Financial Management (OFM) forecasting. The methods used to estimate new permit-exempt well connections address two primary questions:

- How many new single family permit-exempt domestic well connections will be installed throughout the basin by 2040?
- Where will the well connections be installed (at the subbasin level)?

3.2 Population Growth Projections

Population growth projections are a foundational data source for estimating future permit-exempt well connections. The increase (or decrease) in number of people translates into a predictable number of new single family residences (SFRs) that can be expected in each subbasin. The methodology used to project the distribution of these expected new homes is described in Section 3.3.

In Thurston County, the Thurston Regional Planning Council (TRPC), a public agency governed by a 22-member council, develops population and employment forecasts for the Thurston County Region to meet the monitoring and evaluation provisions of the Growth Management Act through a Buildable Lands Program. TRPC develops countywide forecasts consistent with those prepared by the OFM; their population and households forecasts are based on demographic trends, labor force participation, migration patterns, zoning regulations, and buildable land supply. A more detailed description of the model methods and assumptions used to develop the Buildable Lands estimate can be obtained through TRPC (https://www.trpc.org/236).

For Grays Harbor, Lewis, and Mason Counties, population projections were based directly on estimates provided by the OFM. Low, medium, and high estimates are provided on a countywide level. The medium level is the calculated estimate, and the low and high estimates are considered lower and upper bounds of predicted error.

3.3 Domestic Permit-Exempt Well Connections Projection Approach

The Partnership used available forecasting, data on building and development trends, and local knowledge to develop its permit-exempt well connections projections. Three separate methods were used to develop permit-exempt well projections:

- Past trends based on building permit data - Past building permit data for single family residences in areas reliant on permit-exempt wells for residential water supply or sometimes within water service areas

- Washington State Office of Financial Management population projections

- TRPC projections - As described above, TRPC provided tailored and detailed projections for Thurston County areas. Like county comprehensive plans, TRPC uses OFM population projections as base data.

The Partnership considered additional data and local knowledge to evaluate projections from each of the three methods. The following data and information were used to cross-check projection results:

- County comprehensive planning, where available, to inform where future growth may be expected. Lewis, Mason, and Thurston Counties conduct comprehensive planning under the State Growth Management Act, which requires identification and protection of critical areas and natural resource lands, as well as areas expected to eventually be within city limits (urban growth areas or "UGAs"). Most county comprehensive plans utilize OFM projections as base data combined with other county-specific data.

- Land capacity or "developable lands" assessment that focuses on the amount of available land that could be developed as single family residences under current zoning. Unless full buildout is expected to occur within the 20-year RCW 90.94 (Streamflow Restoration law) planning horizon, land capacity would only provide an upper limit for what that 20-year projection could be. There are many uncertainties associated with a land capacity or developable lands assessment, including possible zoning changes to enable more dense development and a buildable lands analysis confirming that a site is buildable (which requires water availability). This cross-check was used only to assess whether permit-exempt well projections exceeded undeveloped parcels zoned as single family anywhere in the basin, and projections did not exceed current capacity in any subbasin.

- Well logs for single domestic water wells were screened to identify areas within city boundaries, UGAs, and water purveyor service boundaries where permit-exempt wells are currently used by single family residences.

- Local knowledge about groundwater conditions and rural residential water sources. Portions of Lewis County are known to have poor groundwater, both in quantity and quality (Brattain and Kennedy, 2020).

Each of the four counties participating in the Addendum development has different sets of factors that affect which data sources and methods are the most appropriate. Comprehensive plans are foundational documents that describe the County's vision for long-range land use and development. For the purposes of Streamflow Restoration law planning, areas within UGAs should be more likely to receive public water

over the planning horizon, and designated critical areas and natural resource areas are unlikely to develop. For Grays Harbor County, which does not have a comprehensive plan, projections relied more on past building rates, OFM projections, and the knowledge of County planning staff.

Most rural homes reliant on permit-exempt wells will be located outside of city boundaries in unincorporated county regions. However, in some cases homes within city boundaries or water service areas may rely on a permit-exempt well if water service to the site is not available. Based on well log screening in water services areas, the final permit-exempt well projections include connections to new wells within several water services areas.

Detailed descriptions of methods are provided in Appendix A. Projections based on each method are shown in Table 1.

Table 1 Projected New Permit-Exempt Well Connections for Chehalis Subbasins

	Projected New Homes by 2040					
	Past Trends[1]	OFM Forecast[2]			TRPC Forecast[3]	Total Projected PE Wells[4,5]
Subbasin	Total	Low	Medium	High	Total	
Black River	414	-120	61	273	1,172	1,215
Chehalis - Salzer	44	-6	61	164	N/A	76
Chehalis Headwaters	16	-5	50	136	N/A	50
Cloquallum - N Delezene	115	-530	331	1,322	0	333
W Capitol Forest	5	-34	18	79	0	18
Elk - Johns River	25	-50	25	114	N/A	25
East Willapa	71	-18	126	346	218	350
Hanaford	12	-1	13	35	22	35
Hoquiam	21	-93	47	211	N/A	49
Humptulips	9	-1	1	3	N/A	13
Mox Chehalis	21	-100	51	228	2	51
Newaukum	209	-74	697	1,883	N/A	703
Satsop	62	-141	289	731	N/A	289
Scatter Creek	359	See note 6 below			526	526
Curtis	92	-18	168	454	N/A	168
Skookumchuck	87	-21	199	538	306	539
Northeast Willapa	25	-185	95	423	N/A	95
Wishkah	2	-6	3	13	N/A	2
Wynoochee	18	-16	8	36	N/A	18
WRIA 22/23 Total	**1,608**	**-1,419**	**2,243**	**6,988**	**2,246**	**4,555**

1. Single family residence (SFR) building permit data obtained from OFM for 2009-2018. This data was intersected with subbasin areas and filtered to only consider SFR permits outside of UGAs and Group A water service areas. The average number of permits granted per year was calculated and multiplied to project new homes by 2040.
2. OFM forecasts prepared using data for each county provided by OFM in 2019; filters out households expected to be within UGAs and Group A water service areas. For Lewis and Mason Counties, OFM forecast was distributed based on proportion of historical building permits issued within WRIAs 22/23 over last ten years.

3. Forecasts provided by TRPC for each subbasin in 2019; filters out households expected to be within UGAs and large water service areas.
4. TRPC projections for Thurston County areas; greater of "Past Trends" and "OFM Medium" for other areas.
5. Subbasins that cross Thurston County boundaries use a weighted estimate of number of households combining TRPC forecast estimates for areas within the County, and the greater of either the Current Trend or OFM forecast for areas outside of Thurston County.
6. Scatter Creek subbasin is entirely within Thurston County; OFM projections were not calculated.

3.4 Final Permit-Exempt Well Projection for Plan Addendum

The Partnership considered each of the three methods and results described above, and evaluated which method and resulting projection they felt was the most appropriate. While no projection can provide certainty, the Partnership sought to use one that was both realistic to the local community and protective of streamflow impacts.

The selected permit-exempt well projections are shown in Table 2. For Thurston County, TRPC-based projections were selected, as these align with the population and growth planning forecasts that are used by Thurston County. There are clear development hot spots within the Thurston County portion of the basin indicated by TRPC projections. These projections are supported by the high level of active development occurring in the Grand Mound and Rochester vicinities, which are located in the Scatter Creek and Black River subbasins, respectively.

For Lewis, Mason, and Grays Harbor Counties, the Partnership evaluated the building permit-based projections versus OFM-based projections. The Partnership had greater confidence in the building permit-based projections, with data showing that building permits have tracked reasonably well with well fee data collected over the past two years. Actual growth in these three counties has tended to be at or below the OFM Medium Forecast historically, and periods of more rapid growth, as was forecast following the 2007 recession, did not materialize in Lewis County (State of Washington Office of Financial Management, 2018). To be more protective of streamflow, the Partnership selected the higher of the OFM medium and building permit-based projection for the Lewis, Grays Harbor, and Mason County portions of the basin.

Table 2 Permit-Exempt Well Projections

Subbasins	Projection for New Permit-Exempt Well Connections by 2040
Black River	1,215
Chehalis - Salzer	76
Chehalis Headwaters	50
Cloquallum - N Delezene	333
W Capitol Forest	18
Elk - Johns	25
East Willapa	350
Hanaford	35
Hoquiam	49
Humptulips	13
Mox Chehalis	51
Newaukum	703
Satsop	289
Scatter	526
Curtis	168
Skookumchuck	539
Northeast Willapa	95
Wishkah	2
Wynoochee	18
Total WRIA 22 & 23	**4,555**

4 CONSUMPTIVE USE ESTIMATES

Methods and assumptions recommended by Ecology were utilized in estimating consumptive water use from new permit-exempt well connections. The methods and results of this analysis are summarized below and described in detail in Appendix A.

4.1 Methods and Assumptions

Direct measurement of consumptive water use in any setting is difficult, and it is virtually impossible for residential groundwater use, which must account for both indoor and outdoor use. Permit-exempt wells are generally unmetered, so supply to each home is usually unknown, let alone the amount that is lost to the groundwater system. Therefore, the Partnership was limited to estimating consumptive use based upon projections of future growth, local patterns and trends in water use, and generally accepted and reasonable assumptions. Water use data from local water purveyors provided a useful check on calculated estimates though was used with caution. Homes that pay for municipal water tend to exhibit different water use behaviors, including water saving appliances and reduced landscape watering, which reduces usage compared to homes on wells.

The two major categories of household consumptive water use are indoor use and outdoor use. The methodology used to estimate these quantities for WRIA 22/23 are described in the following sections.

Indoor Consumptive Use

Indoor consumptive use was estimated consistent with Ecology guidance. There are two basic elements to estimating indoor consumptive use:

- Amount of total water used. Ecology's guidance recommends an assumption of 60 gallons per person per day as a reasonable estimate of indoor total water use. To estimate indoor usage per well, the per capita usage was multiplied by the average rural household size, which was estimated by each county: 2.5 people per household for Thurston and Grays Harbor Counties, 2.4 for Lewis County, and 2.75 for Mason County. For subbasins spanning multiple counties, a weighted value was estimated based on the number of projected permit-exempt well connections in each county.

- Percentage of consumptive water used. Ecology guidance recommends that 10 percent of the total indoor water use be considered consumptive when a home is on a septic system. (All indoor water use is considered consumptive for homes with sewer connections.) Areas projected to be served by permit-exempt wells are outside of sewer service areas, so the 10 percent assumption was applied for all projected indoor water use.

Outdoor Consumptive Use

Outdoor water use is typically the larger portion of domestic single family residential water use, with irrigation of lawn and garden being the dominant outdoor water use component. The Partnership

conducted a basin-specific assessment (see Appendix A for more detail) to determine typical size of irrigated lawn, garden, and landscaping areas associated with newer residential development and irrigation water needs, which vary by crop and climate. The consumptive use estimate assumes that current rural residential landscaping practices will continue over the planning horizon.

The amount of irrigation water required to grow and maintain vegetation depends on the crop, season, and local climate (temperature and precipitation) and thus varies by location throughout each WRIA. The Washington Irrigation Guide (WAIG) (Natural Resources Conservation Service (NRCS), 1997) includes an appendix listing net irrigation requirements for various common crops for 89 locations throughout Washington, derived from water use and meteorological data from the 1970s and 1980s. Since lawn is a fairly water-intensive crop and a common target of residential irrigation, irrigation requirements for commercial turf production were used to estimate outdoor water needs. As commercial turf production is generally more water-use intensive than residential lawn water use, estimates based upon commercial turf water use rates will likely be more conservative than estimates based on residential lawn watering expected in the basin.

The irrigation requirement provided in the WAIG is the net amount of external water required by the crop, accounting for precipitation inputs. Since irrigation systems are not 100 percent efficient, additional water must be supplied to ensure that crop needs are met. The application efficiency varies by the type of system (drip irrigation, microsprinklers, pivot sprinklers, etc.). For the Chehalis Basin, the Ecology-recommended value of 75 percent was used to determine the water applied for irrigation.

Outdoor water use for each home was then estimated as the applied water for irrigation (computed as a depth) times the average irrigation area. Typical residential irrigated area was estimated through an aerial photo analysis, using methods described in Appendix A. Based on that analysis, the average irrigated lawn size used for the basin was 0.074 acres. The consumptive use fraction is substantially higher for outdoor use than indoor use (to a septic system) because most of the applied water is taken up by plants or evaporated. Based on the Ecology guidance, a consumptive use fraction of 80 percent was applied to the total outdoor water use, meaning that 80 percent of water used for outdoor watering does not return to the local groundwater system.

4.2 Consumptive Use Forecast

The Partnership considered two consumptive use estimate scenarios:

1. One home with average irrigated yard size of 0.074 acres per permit-exempt well. Assumes 60 gallons per day per person indoor use.

2. One home with legal maximum 0.5-acre irrigated lawn area per permit-exempt well. Assumes 60 gallons per day per person indoor use and 0.5-acre outdoor irrigation use.

Daily usage rates calculated in the consumptive use scenarios represent annual average values. While indoor use generally does not vary much from month to month, outdoor water needs range from zero

during the winter rainy season to more than three times the annual average during the peak of the summer because of yard irrigation during summer months.

Table 3 summarizes the selected consumptive use estimate, which assumes one home with the estimated basin-average yard area (0.074 acres), per permit-exempt well. Because the average yard size basinwide is small, the consumptive use scenario using 0.5 acres of irrigated yard per permit-exempt well connection was considered to be unrealistically high to the Partnership. The total consumptive use projected for the Chehalis Basin, based upon the measured average irrigated yard is 504.8 acre-feet per year. A detailed description of the consumptive use estimation methods and results is provided in Appendix A.

Table 3 Annual Consumptive Use for One Home with Average-Sized Yard

Subbasin	# PE Wells Anticipated in Subbasin	Irrigated Area per Well (ac)	Per Well Consumptive Use (gpd)			Total Consumptive Use (af/yr)
			Indoor	Outdoor	Total	
Black River	1,215	0.074	15.0	88.7	103.7	141.1
Chehalis - Salzer	76	0.074	14.4	93.5	107.9	9.2
Chehalis Headwaters	50	0.074	14.4	77.7	92.1	5.2
Cloquallum - N Delezene	333	0.074	15.2	62.7	77.9	29.1
W Capitol Forest	18	0.074	15.0	74.1	89.1	1.8
Elk - Johns River	25	0.074	15.0	38.5	53.5	1.5
East Willapa	350	0.074	14.5	87.0	101.4	39.8
Hanaford	35	0.074	14.4	91.9	106.3	4.2
Hoquiam	49	0.074	15.0	42.2	57.2	3.1
Humptulips	13	0.074	15.0	53.4	68.4	1.0
Mox Chehalis	51	0.074	15.0	63.9	78.9	4.5
Newaukum	703	0.074	14.4	87.3	101.7	80.1
Satsop	289	0.074	15.9	71.9	87.9	28.4
Scatter Creek	526	0.074	15.0	93.9	108.9	64.2
Curtis	168	0.074	14.4	86.0	100.4	18.9
Skookumchuck	539	0.074	14.6	88.8	103.4	62.4
Northeast Willapa	95	0.074	15.0	67.0	82.0	8.7
Wishkah	2	0.074	15.0	54.3	69.3	0.2
Wynoochee	18	0.074	15.0	56.1	71.1	1.4
WRIA 22/23 Aggregated	**4,555**	**0.074**	**14.8**	**84.1**	**98.9**	**504.8**

5 APPROACH TO OFFSETTING STREAMFLOW IMPACTS

Chapter 4 of this Addendum describes the consumptive use estimate by 2040 for new domestic permit-exempt well connections; however, the actual impact to streamflow must be considered as an additional step. Water drawn from groundwater that is connected to streams is assumed to have an impact on streamflow, but the magnitude and timing of that impact is not straightforward to estimate. This section describes the approach used to evaluate and plan for offsetting streamflow impacts from new permit-exempt well connections through 2040.

5.1 Assumptions Used for Determining Streamflow Impacts from Groundwater Pumping

As stated above, using water from groundwater is not the same as using water directly from a stream or river, though in most cases they are connected. Under the short timeframe and limited funding for developing this Watershed Plan Addendum, simplifying assumptions were necessary to determine how consumptive use from permit-exempt well pumping would be equated to streamflow impacts. These assumptions and the probable effect are summarized in Table 4.

Table 4 Streamflow Impacts Assumptions

Assumption	Uncertainties and Potential Consequences
Streamflow impact is equal to consumptive use	In most cases, there will be a muted effect on streamflow from pumping hydraulically-connected groundwater. This assumption likely overestimates impact.
Subbasin total consumptive use is assumed to impact all streams in subbasin along entire length	If wells are evenly distributed within a subbasin, the impacts to streamflow may be spread along significant lengths of streams. However, in areas where wells are clustered in one area, the impacts may be focused and a high impact assumption would be more accurate.
Pumping impacts to streamflow are assumed to be “steady state” or spread evenly through the year	This assumption is consistent with Ecology’s guidance, which is based, in part, on USGS analysis (Barlow and Leake, 2012) and is most applicable when wells are at least 3,000 feet away from a stream. Since we do not know where future wells will be, applying this assumption could underestimate streamflow impacts in instances where a high concentration of wells are located close to smaller streams. If these homes also had large irrigated yards, the underestimate would be even greater. The Partnership sought to identify more offset projects in such areas to provide a safety margin to ensure that impacts would be fully offset.

5.2 Geographic Distribution of Streamflow Impacts

Projected new consumptive use from domestic permit-exempt wells is not evenly distributed across the basin and neither are the streamflow impacts from those new uses (Figure 2) . The Black River, Scatter Creek, Skookumchuck, and Newaukum subbasins are projected to have the greatest increase in

consumptive water use from domestic permit-exempt wells, while most of Grays Harbor County is projected to have a relatively small increase.

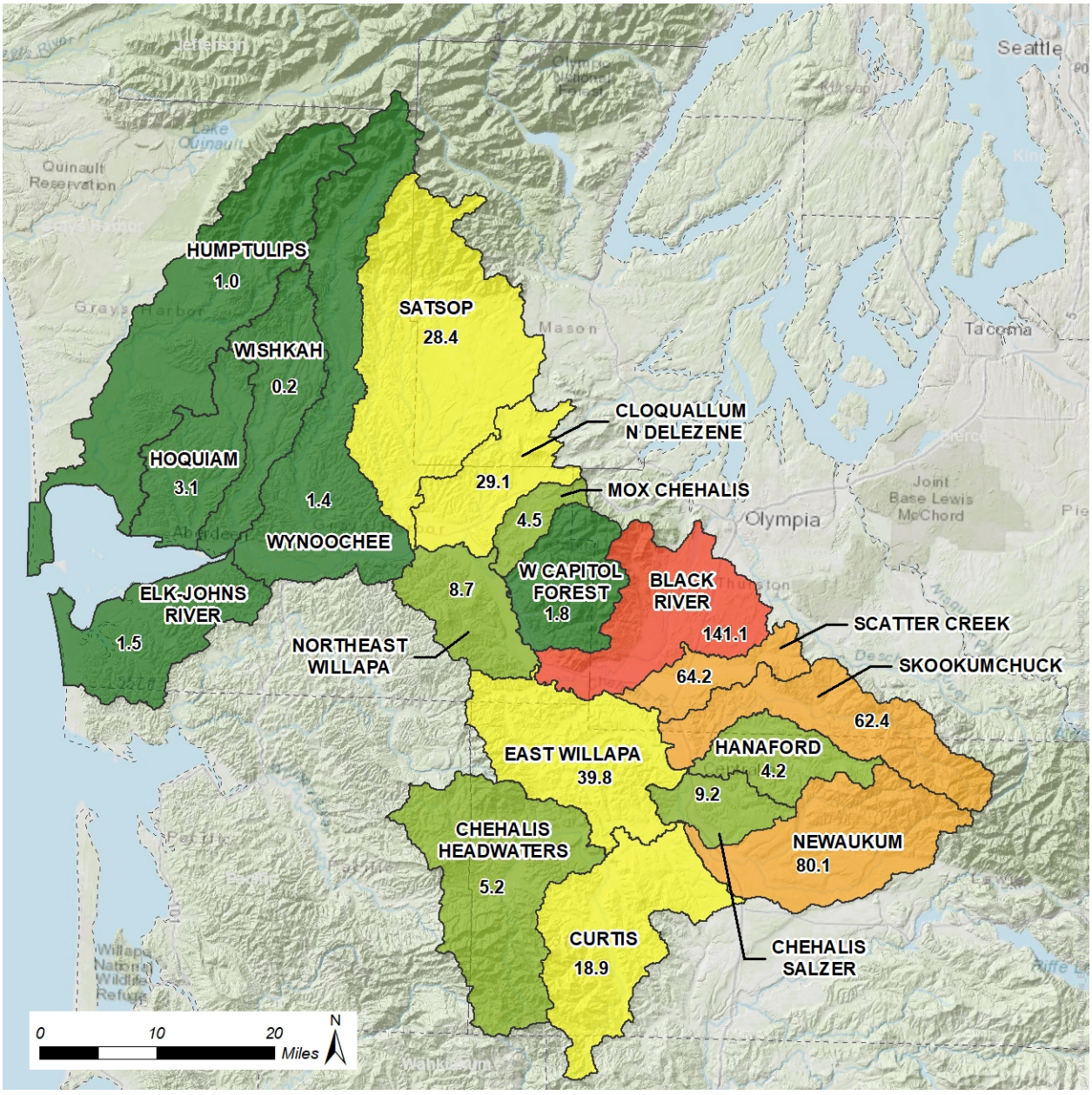

Figure 2 Consumptive Use Estimates (in acre-feet per year) for Chehalis Basin Subbasins

Within specific subbasins, the expected development patterns will vary. The distribution of single family residential building permits from 2009 to 2018 (Figure 3) was used to project expected geographic distribution of new permit-exempt wells. In the Black River and Scatter Creek subbasins, the relatively flat topography has led to distributed development, while in the Skookumchuck and Newaukum subbasins, rural residential development has tended to cluster in floodplain areas in the lower half of the

subbasin due to steep valley sides and upper subbasins that are often in managed forest land use. Development also tends to cluster in floodplain areas in Grays Harbor County (Humptulips, Hoquiam, Wishkah, Wynoochee, and Satsop subbasins) and within the upper basin (Chehalis Headwaters and Curtis subbasins). The Cloquallum-Delezene and eastern Curtis subbasins are also areas where more dense clusters of new permit-exempt wells are projected.

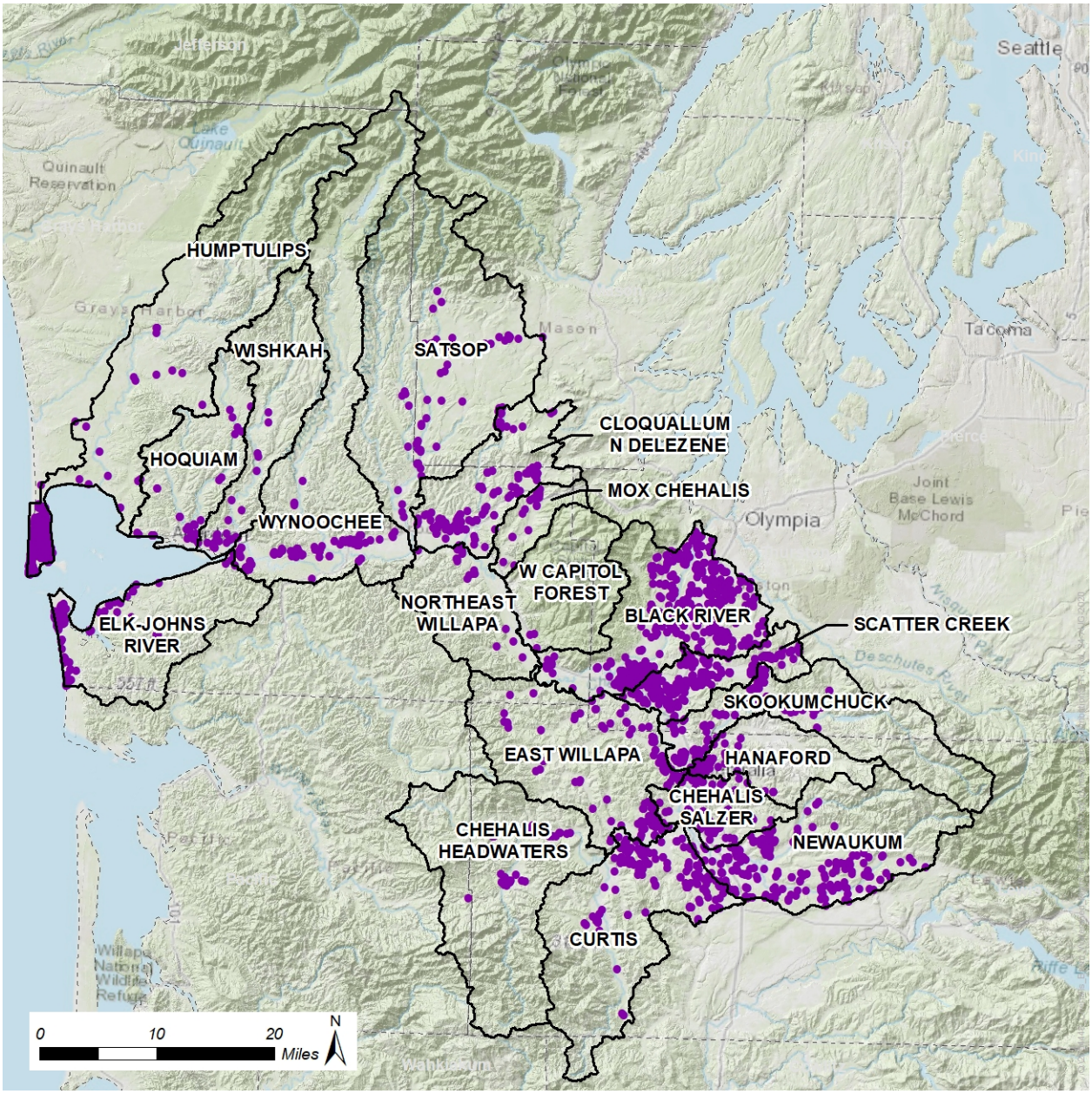

Figure 3 Distribution of Single Family Residential Homes on Permit-Exempt Wells Built 2008-2018

The Streamflow Restoration law requires that projected consumptive water use from new permit-exempt wells be offset at the basin scale rather than at the subbasin scale. However, to be protective of

streamflow, the Partnership focused on developing projects in subbasins with the highest projected consumptive use. However, it should be noted that only the Skookumchuck subbasin contains a high priority water-for-water offset in the form of a water right acquisition project that will replace the quantity of consumptive water use during the same time as the impact and in the same basin.

5.3 Consideration of Ecological Needs

Streamflow is a major component and foundation of the ecology of the basin. Other conditions such as healthy riparian areas and instream habitat diversity are also necessary to the overall ecosystem function, structure, and composition. These conditions, and actions that improve them, directly add to NEB. In the Chehalis Basin, numerous related programs have inventoried and characterized conditions and ecological needs. These include the following:

- Chehalis Basin Salmon Restoration and Preservation Strategy (Lead Entity Program)
- Chehalis Basin Aquatic Species Restoration Program

Both programs have established priority needs for salmon and other aquatic species. The major strategies are summarized in Table 5.

Table 5 Chehalis Basin Salmon/Aquatic Species Priority Strategies

Program	Priority Strategies
Chehalis Basin Salmon Restoration and Preservation Strategy (Lead Entity Program)	• Attain healthy and diverse population of wild salmonids • Restore, enhance, and protect the Grays Harbor Estuary • Restore and preserve properly functioning riparian areas • Restore habitat access • Restore properly functioning hydrology • Restore floodplain and stream channel function • Prioritize habitat projects and activities within subbasins that provide the highest benefit to priority stocks
Chehalis Basin Aquatic Species Restoration Plan	ASRP is able to benefit native aquatic and semi-aquatic species over time through implementing projects that maintain and increase: • Protection of intact habitat and function • Floodplain function • Natural habitat forming processes • Access to quality habitats

Key basinwide limiting factors targeted by both programs include water temperature, low flows, instream wood, channel complexity, riparian and floodplain habitat, and barriers. Subbasin-specific needs and how offset projects address those needs are described in Chapter 7.

6 OFFSET PROJECTS AND ACTIONS

The Addendum's offset project portfolio was developed through a collaboration of Partnership members, partners, and stakeholders. This process was guided by the Partnership, and is summarized by the following:

- Focus on developing projects that provide water offset in areas of the basin where projected consumptive use is highest.
- Seek to include projects in all areas of the basin where impacts are projected, recognizing that in some areas those projected impacts are very small and NEB may best be attained through habitat projects.
- Support project sponsors with good projects throughout the basin that could contribute to NEB even if those projects do not provide water offsets. Project sponsors who are committed to implementing projects increase the likelihood that projects will be delivered in a timely manner.
- Do not pursue acquisition of agricultural water rights as this is counter to the Partnership's support for agriculture in the Chehalis Basin.

6.1 Chehalis Basin Offset Projects - Types of Projects and Actions

All projects proposed for the Addendum were categorized into the three broad categories identified in Ecology's NEB Guidance (Ecology, 2019):

- Water right acquisitions
- Non-acquisition water projects
- Habitat and Other project types

The first two of these categories have associated water offset that have been estimated or had simplified calculations of water offset benefits, where possible, to count toward the target of matching or exceeding new consumptive use from permit-exempt wells. In some cases, project concepts have not been sufficiently developed to allow for a confident estimate of potential water offset. Those projects are classified as water offset projects, but not counted toward the offset target. Habitat and Other projects do not typically provide water offset but benefit aquatic resources in other ways. Some projects are expected to have both water offset and habitat benefits.

Projects in all three categories are encouraged in the basin to improve streamflow, whether or not they count as a water offset project. Projects must be implemented by the end of the planning timeframe (through 2040) and remain effective for as long as the new permit-exempt well pumping continues. Projects must not be required by another regulatory or legal requirement. The Partnership expects that some projects in the project portfolio may not be implemented because of negative feasibility results, landowner constraints, or funding challenges. However, there is additional potential within the listed project portfolio to develop replacement projects as well as additional projects if needed.

In total, the project portfolio contains 74 separate projects, distributed over 17 of the 19 subbasins as shown in Figure 4 (basinwide concepts not shown). The following sections describe the general types of projects included in the Addendum and provide the list of projects classified under each project type. For projects included in water offset calculations for the Addendum, the individual project contribution is listed. Full project summaries and the full project list are provided in Appendix B.

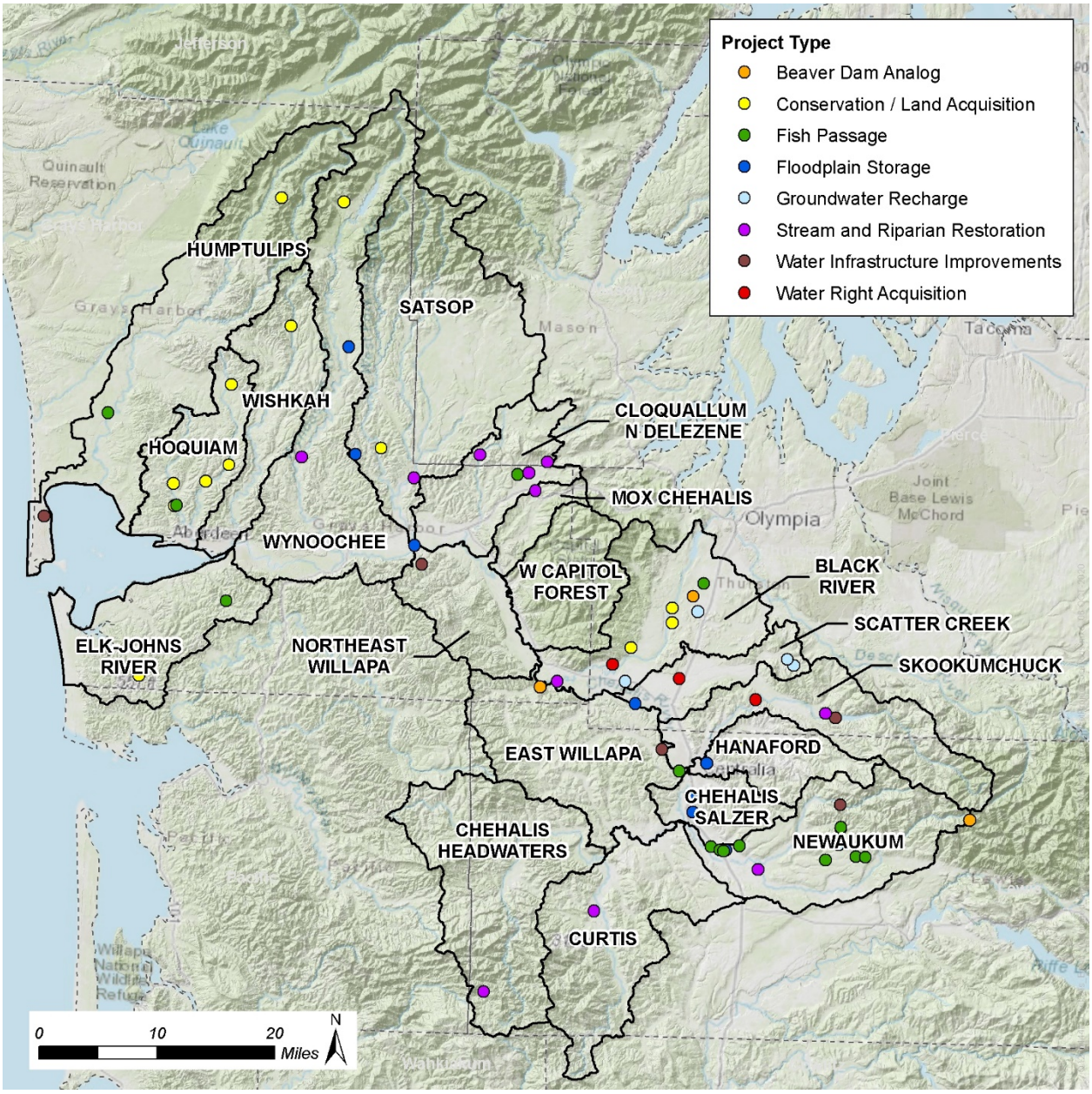

Figure 4 Proposed Project Locations

Water Right Acquisitions

Water right acquisitions with permanent dedication to instream flow purposes directly add to and restore instream flows. These projects acquire (usually through purchase) active water rights and retire all or a portion from active consumptive uses. Water associated with these rights is no longer used consumptively and remains in the stream, making offset determination very straightforward. Complexities associated with this project category include:

- Legal and administrative process to demonstrate that all or a portion of a water right is valid, has been actively used within the required timeframe, and is eligible for a change of use to instream flow
- Identification and negotiations with water right holders willing to engage in such a transaction

Chehalis Basin water right acquisition projects are listed in Table 6. The largest and highest certainty water right acquisition is a TransAlta water right acquisition on the Skookumchuck River (project ID SK-00). This water right is associated with a coal-fired power plant that is undergoing a phased closure. The Quinault Indian Nation has sponsored a streamflow restoration grant proposal for feasibility study with intent to propose acquisition of a portion of the water right.

Projects B-02 and SC-00 are two water rights owned by Cooke Aquaculture for fish rearing facilities. Both rights are currently in a temporary trust water right status. There are several project configurations for each of these projects that could provide streamflow benefit and additional NEB value. Project B-02 could be activated to provide additional cold water flow to the Black River, creating cold water refuge and additional flow, which are both urgent needs for salmon. The water right could eventually be deactivated and dedicated permanently to trust for instream flow if the flow/cold water augmentation becomes unnecessary. For Project SC-00, Thurston County has proposed a concept that includes direct streamflow augmentation to Scatter Creek combined with using some of the water for municipal supply, which would eliminate need for some projected permit-exempt wells in that area.

The final project in this category (BW-06 Trust Water Rights Acquisitions) represents a collection of potential water right acquisitions currently in the trust water right program and a separate set of active water rights identified by Washington Water Trust (Washington Water Trust, 2020) as potential opportunities. Other water right acquisition opportunities, not yet discovered, would also fit into project BW-06. These projects do not yet have a sponsor.

Table 6 Chehalis Basin Water Right Acquisition Projects

Subbasin	Project ID	Project Name	Estimated Water Offset (af/yr)
Black River	B-02	Cooke Aquaculture Water Right - Black River	141
Scatter Creek	SC-00	TC #118/119 Scatter Creek Water Right & Streamflow Augmentation	700
Skookumchuck	SK-00	TransAlta Water Right Acquisition	2,898
Basinwide	BW-06	Trust Water Rights Acquisitions	NQ
Totals			**3,739**

Water Infrastructure Improvements

These projects transfer water sources for existing water uses in order to provide benefit to streams in critical times or locations. Examples include converting existing areas served by permit-exempt wells to municipal water (within existing water rights) or relocating diversion points for existing water rights to

maintain higher flow in a sensitive stream or reach. Although the latter example provides no net addition of water to the system as a whole, flow increases at targeted locations can be significant—and provide significant benefit at the subbasin scale. Water offset quantities for this type of project are estimated based on the rate of replaced or relocated water use and the time period over which the shift would occur. These projects generally do not provide direct habitat or other aquatic resource benefits beyond flow.

Water infrastructure improvement projects are listed in Table 7. The most developed of these projects is N-00 City of Chehalis Alternate Water Supply Intake, which is sponsored by the City of Chehalis. This project would relocate an active diversion from the North Fork Newaukum River to the mainstem Chehalis closer to the City. While it would not decrease consumptive use of water, it would return streamflow to a stream segment that suffers from low flows and high water temperatures, and is one of the few core areas for the basin's most depressed salmon stock – spring Chinook (Aquatic Species Restoration Plan Steering Committee, 2019; Chehalis Basin Lead Entity, 2020).

Project BW-02 Agricultural Irrigation Efficiencies & Water Conservation is a technical assistance program sponsored by the Conservation Districts (CDs) in Lewis, Thurston, and Grays Harbor Counties. The CDs will work with landowners who are interested in improving on-farm practices for water management. The Partnership believes water conservation will result from this engagement; however, the expected conservation has not been quantified because of the uncertainties at this time.

The remaining projects are conceptual and would require a sponsor and significant technical work, legal agreements, and permits in order to be implemented.

Table 7 Chehalis Basin Water Infrastructure Improvement Projects

Subbasin	Project ID	Project Name	Estimated Water Offset (af/yr)
East Willapa	EW-01	Convert Galvin to Centralia Water	4.5
Humptulips	HT-02	Ocean Shores Water Reclamation and Reuse[1]	0
Newaukum	N-00	City of Chehalis Alternate Water Supply Intake	280
Skookumchuck	SK-01	Skookumchuck Dam Release	323
Northeast Willapa	NW-00	Satsop Business Park Water Right to Reclaimed Water	NQ
Basinwide	BW-02	Agricultural Irrigation Efficiencies & Water Conservation	NQ
Totals			**608**

1 – Project would provide local groundwater recharge but would not offset well use as defined in this Addendum.

Groundwater Recharge

Groundwater recharge projects benefit streams by directing surface water flow (e.g. flood flows, stormwater runoff) into the ground, thus providing additional storage and more gradual release to

streams. New water is not added to the system, but shifting winter runoff to groundwater increases aquifer storage so that baseflow contributions can be enhanced and may be extended longer into the summer, which is the critical flow period for most of the streams. Managed aquifer recharge (MAR) and stormwater infiltration projects fall into this category.

Water offset quantities for these types of projects can be estimated based upon anticipated increases in flow to an aquifer (based upon surface diversion for MAR or infiltration rate and area for infiltration facilities) and groundwater flow characteristics. More sophisticated, site-specific estimates can be developed where surface and/or groundwater models are available, however these still carry significant uncertainties in predicting streamflow addition. These projects do not generally provide habitat benefits as they can be distant from the stream corridor, but the increased groundwater contribution may provide reduced temperature as well as other water quantity benefits.

Groundwater recharge projects are listed in Table 8. Project B-05 Albany Street Stormwater Pond has already been implemented; it was supported through the first round of Streamflow Restoration grant funding and constructed by Thurston County.

Thurston County is interested in three MAR projects in the permeable soils of the Scatter Creek and Black River subbasins. These projects would restore groundwater levels in areas historically ditched for agricultural drainage. The MAR projects will require site-level analysis to determine their feasibility given likely high aquifer transmissivity, constraints on diversion period, and permitting complexities. Thurston PUD, which has numerous water systems in these subbasins, emphasized that aquifers in this portion of Thurston County are shallow, low gradient, and highly permeable, making them vulnerable to surface contamination and depletion that can impact streamflow.

A screening level-assessment basinwide indicated MAR opportunities in the Newaukum subbasin and the potential for additional opportunities in the Curtis, Chehalis Headwaters, and East Willapa subbasins.

Table 8 Chehalis Basin Groundwater Recharge Projects

Subbasin	Project ID	Project Name	Estimated Water Offset (af/yr)
Black River	B-01	Allen Creek MAR	26
Black River	B-05	Albany Street Stormwater Pond	11.9
Newaukum	N-09	Newaukum MAR Concepts	298
Scatter Creek	SC-02	TC #89 Upper Scatter Creek MAR	53.5
Scatter Creek	SC-03	TC #81 Sampson Wetlands Restoration and MAR	92
Basinwide	BW-04	Managed Aquifer Recharge Opportunity Assessment	200
Basinwide	BW-05	Stormwater Recharge Opportunity Assessment	10
Totals			**691**

Floodplain Storage

Floodplain storage projects involve construction or enhancement of storage capacity in floodplains with the ability to control the timing of releases of flood storage back to the stream. Flows from large floods, particularly from late season storms, can be detained in floodplain reservoirs and slowly metered back to a stream. In many areas, a portion of the stored floodwater will also infiltrate and return to the stream via groundwater. Water offsets from this type of project can be difficult to estimate without some type of modeling, as total storage volume is not a reliable indicator of water available for dry season release. Storage may be designed for large events and not fill every year or may fill and release multiple times per year.

For this Addendum, offsets were estimated using modeling where available. For Project H-00 China Creek Phase 2 Wetland Restoration, which is currently under construction, hydraulic modeling developed for the project design was available. The water benefit for this project was estimated based on one wetland filling per year, assuming a typical (not extreme) late winter or spring storm. The City of Centralia is the owner and sponsor for the China Creek project. Where modeling projections and/or site-specific data were not available, storage projects were assigned a water benefit of "Not Quantified."

Water temperature can be a concern for this type of project, as shallow surface storage warms quickly in the spring and summer if not shaded by riparian vegetation. Floodplain storage is often a component of larger floodplain restoration and reconnection projects that can also provide significant habitat benefits.

Floodplain storage projects are listed in Table 7. Three projects in the Satsop and Wynoochee subbasins (S-00, S-02, WY-02) employ large wood installations instream to raise the streambed and local water levels and induce shallow aquifer recharge and storage. Several similar projects have been implemented statewide, but results on extent of aquifer recharge and contribution to streamflow are inconclusive at this time, hence the Partnership did not quantify water benefit for these projects.

Table 9 Chehalis Basin Floodplain Storage Projects

Subbasin	Project ID	Project Name	Estimated Water Offset (af/yr)
Newaukum	N-13	Berwick Creek Flood Reduction Restoration (Port of Chehalis)	NQ
Chehalis-Salzer	CS-00	Coal Creek Floodplain Storage - City of Chehalis	NQ
Chehalis-Salzer	CS-02	Flood Hazard Reduction Master Plan and Chehalis Wastewater Treatment Plant Project	NQ
Hanaford	H-00	China Creek Flood and Habitat Mitigation Phase 2	3
Satsop	S-00	Satsop/Wynoochee Tributary Assessment	NQ
Satsop	S-02	Lower Satsop Restoration, Protection, and Aquifer Recharge-Phase II	NQ
Scatter Creek	SC-01	TC #90 Weins Farm Restoration	20
Wynoochee	WY-02	Satsop/Wynoochee Tributary Assessment	NQ
Totals			**23**

Beaver Dam Analogs

Beaver dam analogs (BDAs) seek to replicate the natural floodplain wetland setting created by beaver dams. Strategic addition of wood raises water levels and floods low-lying areas, promoting lateral infiltration into banks that effectively raises the local groundwater table. Engineered BDAs are a relatively new concept, but monitoring studies have demonstrated measurable benefits to baseflow (Yokel et al., 2018). One outstanding question is how long BDAs will last and therefore what long-term benefits they will provide. Projects in the Chehalis Basin will focus on locations likely to attract beaver and with a commitment to maintain the BDA structures long-term if not adopted by beavers. Water offset for these projects was assumed to be 2.5 acre-feet per year for each BDA complex, based on scientific study and monitoring (Dittbrenner, 2019). Beaver dam analogs also offer measurable benefits to aquatic habitat extent and quality.

Beaver and BDA projects are listed in Table 10. Several sites have been identified for BDA installation; these are in projects B-00, EW-00, N-02, and N-12. The two basinwide projects are aimed at developing projects and installing BDAs at additional locations (BW-00) and working with landowners to find compatible areas for beaver ponds (BW-03). The basinwide projects have been assigned water benefit value of “Not Quanitified” because sites and project extents have not yet been identified, although similar (or higher) water benefits will be sought from these projects.

Table 10 Chehalis Basin Beaver/Beaver Dam Analog Projects

Subbasin	Project ID	Project Name	Estimated Water Offset (af/yr)
Black River	B-00	TC #91 Holm Farm Ditch Removal and Floodplain Reconnection	13.5
East Willapa	EW-00	Garrard Creek Floodplain Restoration Opportunity Assessment	5
Newaukum	N-02	Newaukum Lake Restoration & Enhancement Planning	10
Newaukum	N-12	Beaver Dam Analog Pilot Implementation	12.5
Basinwide	BW-00	Beaver Dam Analog Implementation	NQ
Basinwide	BW-03	Eager Beaver Collaboration	NQ
Totals			**41**

Conservation and Land Acquisition

Conservation and land acquisition projects preserve and restore natural land cover and ecological function through protection of land for that purpose. These projects are generally not assumed to provide a direct water offset; however, they do contribute to NEB through protection against future development impacts, preserving existing ecological function that contributes to aquatic habitat formation and connectivity. In addition, protection of natural land cover supports hydrologic function for streamflow benefit, including delaying and storing rainwater for baseflow restoration.

Conservation and land acquisition projects are listed in

Table 11. HQ-01 and S-01 have already been funded through other grant programs. Nine acquisition or easement projects, totaling 376 acres, likely have some water benefit, but the Partnership did not quantify or claim water benefits. Five forest management projects in Grays Harbor County do include quantified water benefits. These projections are based on analysis of hydrologic effects of mature coniferous forest, which supports the theory that increasing stand age and lengthening harvest rotations to at least 40 years can have significant impacts on increasing streamflow (Hall, et al., 2018).

Table 11 Conservation/Land Acquisition Projects

Subbasin	Project ID	Project Name	Estimated Water Offset (af/yr)
Black River	B-03	Black River Basin Project Development: Oregon Spotted Frogs, farms & Wetlands Project	0
Black River	B-06	Beaver Creek Conservation Easement	0
Black River	B-07	Seiler Conservation Easement - Mima Creek	0
Elk - Johns River	EJ-01	Grays Harbor County Forest Practices and Flow Assessment	23
Hanaford	H-01	Port Blakely Hanaford Acquistion	0
Hoquiam	HQ-00	Port Blakely West Hoquiam Acquisition	0
Hoquiam	HQ-01	2020 West Hoquiam Acquisitions	0
Hoquiam	HQ-03	Grays Harbor County Forest Practices and Flow Assessment	17
Hoquiam	HQ-04	East Hoquiam - Granberg Acquisition	0
Hoquiam	HQ-05	East Hoquiam - Griswold Acquisition	0
Humptulips	HT-01	Grays Harbor County Forest Practices and Flow Assessment	20
Satsop	S-01	Tree Fever Conservation Easement	0
Scatter Creek	SC-04	TC #127 Scatter Creek Upper Basin Forestry	NQ
Wishkah	W-00	Grays Harbor County Forest Practices and Flow Assessment	10
Wynoochee	WY-01	Grays Harbor County Forest Practices and Flow Assessment	2.3
Totals			**72.3**

Stream and Riparian Restoration

These projects encompass instream and riparian corridor habitat restoration and enhancement projects, including introduction of large wood, floodplain reconnection, backwater and side channel habitat enhancement, and riparian plantings, among other actions. Some of these projects may provide limited water offset values through mechanisms similar to floodplain storage or BDAs, but offset quantities were not counted toward the Addendum target offset amount unless sufficient information was available to quantify offset based on methods like those discussed above. These projects are included in the Addendum to ensure net ecological benefit distributed throughout the subbasins; ecological benefit metrics are described in Chapter 7.

Stream and riparian restoration projects are listed in Table 12. Projects N-04, S-03, C-00, SK-02, and WY-00 are reach-scale restoration projects already in design (or construction in the case of SK-02) and address key ecological needs as described in Chapter 7. Project CH-00 (Marker 19 Oxbow Restoration) is fully funded through a partnership between ASRP and the Weyerhaeuser Corporation and planned for construction in 2021. The remaining projects are in development with committed sponsors.

Table 12 Stream and Riparian Restoration Projects

Subbasin	Project ID	Project Name	Estimated Water Offset (af/yr)	Reach Length Restored (mi)
Black River	B-04	Black River Confluence	0	TBD
Chehalis Headwaters	CH-00	Marker 19 Oxbow Restoration	0	0.3
Cloquallum - N. Delezene	CD-00	Cloquallum Creek LWD Construction	0	0.7
Cloquallum - N. Delezene	CD-01	Upper Middle Fork Wildcat Creek Restoration	0	0.4
Cloquallum - N. Delezene	CD-02	Sam's Canal Culvert Removal and Restoration	0	0.3
Cloquallum - N. Delezene	CD-03	McConkey Lane Channel Naturalization	0	TBD
Newaukum	N-04	South Fork Newaukum Early Action Reach	0	2.1
Satsop	S-03	East Fork Satsop RM 8 Early Action Reach	0	3.2
Curtis	C-00	South Fork/Stillman Creek Early Action Reach	0	2.6
Skookumchuck	SK-02	Skookumchuck Early Action Reach	0	1.1
Wynoochee	WY-00	Wynoochee River RM 14 Early Action Reach	0	1.9
Basinwide	BW-01	Chehalis Basin Cooperative Weed Management	0	15.0
Basinwide	BW-07	USGS Groundwater Discharge Zone Delineation	0	n/a
Totals			**0**	**27.6**

Fish Passage

Fish passage barrier removals can provide significant benefit to salmonids and other aquatic species by opening up high quality habitat areas that fish were previously unable to reach. These projects do not provide water offset benefit but are included in the Addendum to help ensure that ecological benefits are distributed throughout the basin. Fifteen barrier removal projects adding a total of 41.2 miles of accessible stream habitat length are included in the Addendum (Table 13) distributed throughout the basin in the Newaukum, Humptulips, Hoquiam, East Willapa, Elk-Johns River, Cloquallum-North Delezene, Chehalis Headwaters, Chehalis, and Black River subbasins. As with all other projects included in the Addendum, these fish barrier removal projects are not mandated as a result of some other legal requirement (such as Washington State's culvert case). All fish passage projects have been developed through at least preliminary design and have a committed sponsor; many are already funded for final design and/or construction. So while these projects do not contribute water offset quantities, they do contribute to other NEB factors with high certainty of implementation.

Table 13 Fish Barrier Removal Projects

Subbasin	Project ID	Project Name	Estimated Water Offset (af/yr)	Added Length of Accessible Stream Habitat (mi)
Elk - Johns River	EJ-00	Newskah Road Fish Barrier Correction	0	1.3
Black River	B-08	Jones Road Culvert Replacement	0	5
Chehalis-Salzer	CS-01	Berwick Creek at Labree Fish Passage Design	0	1.8
Cloquallum - N. Delezene	CD-04	Wildcat Road Barrier Construction	0	7.3
East Willapa	EW-02	Scammon Creek Hamilton Fish Passage Construction	0	0.8
Hoquiam	HQ-02	Middle Fork Hoquiam Tidal Restoration	0	3.5
Humptulips	HT-00	Kirkpatrick Road Fish Barrier Correction Design	0	5.3
Newaukum	N-01	MF Newaukum Trib-Kruger Fish Passage Construction	0	3.1
Newaukum	N-03	MF Newaukum at Centralia Alpha Fish Passage Construction	0	3.5
Newaukum	N-05	Lucas Creek Trib MP 4.39 - Fish Passage Construction	0	1.9
Newaukum	N-06	Lucas Creek Trib MP 4.24 - Fish Passage Construction	0	1.4
Newaukum	N-07	Berwick Creek at Hogue Fish Passage Construction	0	3.3
Newaukum	N-08	Berwick Creek at Borovec Fish Passage Construction	0	0.3
Newaukum	N-10	Knutsen Barrier Correction and BDAs	0	1.12
Newaukum	N-11	Berwick Creek at Bishop Fish Passage Construction	0	1.6
Totals			**0**	**41.2**

6.2 Offset Project Priorities

Projects that provide water offset benefit are the highest priority for the Partnership because these projects directly address the legal requirements of the Streamflow Restoration law. All projects that the Partnership believes will contribute water benefit are listed in Table 14. In considering confidence that these projects are implementable and capable of delivering the stated water benefits, the Partnership assigned qualitative ratings for certainty of implementation prior to 2040 and certainty of expected water benefit. This is described in more detail below.

In casting a wide net for water offset projects, Partnership project sponsors were interested in thinking holistically about the water gained from various types of habitat restoration, water infrastructure, and flood damage reduction projects. Most of these project types have been developed only to the concept level, such as working with irrigators to implement water conservation measures and adjusting dam

releases for increased streamflow from Skookumchuck Dam. Other project types are the subject of active scientific debate regarding the streamflow benefit, and while specific projects have been identified by the Partnership, project monitoring would be required to confirm streamflow and other ecological benefits. A few projects such as forest management for streamflow restoration require long lead times to realize benefits and are therefore less certain.

All projects were developed and analyzed by technical experts in hydrology, hydrogeology, and water resources engineering, however lacking site-specific data and analysis, significant uncertainties remain. The water offset value "NQ" or "Not Quantified" is used to convey that the Partnership believes that the project will provide a water benefit but does not currently have enough information to estimate it. These are not lower quality projects; they simply need further development and analysis before the Partnership is comfortable assigning a numerical estimate.

Implementation certainty ratings were assigned qualitatively based on project readiness, project sponsor commitments, and funding. Benefits certainty ratings are based upon whether conclusive scientific research supports streamflow benefit and level of information about site-specific conditions. Conceptual projects and those with no site-specific analysis were assigned low benefit certainty ('L') or a non-quantified water offset ('NQ'). The results of this classification and notes regarding basis of certainty ratings are shown in Table 14. The certainty ratings shown in Table 14 are not project rankings. All projects listed in this Plan Addendum are supported by the Partnership.

Table 14 Implementation and Benefits Certainty Ratings for Water Offset Projects

Project ID	Project Name	Estimated Water Offset (af/yr)	Certainty of Implementation	Certainty of Water Benefit	Basis of Certainty Ratings
Black River					
B-00	TC #91 Holm Farm Ditch Removal and Floodplain Reconnection	13.5	M	M	Partial conservation ownership; acquisition investment from CBLE; good location for enhanced surface and groundwater storage; aquatic species objectives require balancing Oregon Spotted Frog and salmon benefits; permitting challenges; no committed sponsor
B-01	Allen Creek MAR	26	L	L	Marginal location for enhanced surface and groundwater storage due to creek proximity and seasonal closure on stream diversions; aquatic species objectives require balancing Oregon Spotted Frog and salmon benefits; permitting challenges; no committed sponsor or conservation landowner.
B-02	Cooke Aquaculture Water Right - Black River Reach	141	L	H	Flow benefit attained by pumping from deep aquifer and discharging to Black River; no sponsor; ongoing pumping costs; unknown groundwater impacts
B-05	Albany Street Stormwater Pond	11.9	H[1]	H	Implemented project; streamflow benefit estimated from surface and groundwater modeling but not monitored.
Chehalis-Salzer					
CS-00	Coal Creek Floodplain Storage - City of Chehalis	NQ[2]	L	L	No sponsor; no site-specific data and analysis; similar in type and location to H-00 China Creek Phase 2 wetland restoration.
CS-02	Flood Hazard Reduction Master Plan and Chehalis Wastewater Treatment Plant Project	NQ	M	M	Committed sponsor and landowner; no site-specific data and analysis; similar in type and location to H-00 China Creek Phase 2 wetland restoration.
Elk - Johns River					
EJ-01	Grays Harbor County Forest Practices and Flow Assessment	23	L	M	No sponsor; long timeframe for benefit accrual; strong science basis for benefit; no site-specific analysis
East Willapa					
EW-00	Garrard Creek Floodplain Restoration Opportunity Assessment	5	H	M	Committed sponsor; no site-specific data and analysis; assume 2.5 af/yr water benefit, but site conditions could vary.
EW-01	Convert Galvin to Centralia Water	4.5	L	H	No sponsor; high cost; water benefit is based on eliminating consumptive use from existing homes.

Project ID	Project Name	Estimated Water Offset (af/yr)	Certainty of Implementation	Certainty of Water Benefit	Basis of Certainty Ratings
Hanaford					
H-00	China Creek Flood and Habitat Mitigation Phase 2	3	H	M	Funded, design, and permitted project; streamflow benefit estimated from modeling but is not being monitored.
Hoquiam					
HQ-03	Grays Harbor County Forest Practices and Flow Assessment	17	L	M	No sponsor; long timeframe for benefit accrual; strong science basis for benefit; no site-specific analysis
Humptulips					
HT-01	Grays Harbor County Forest Practices and Flow Assessment	20	L	M	No sponsor; long timeframe for benefit accrual; strong science basis for benefit; no site-specific analysis
HT-02	Ocean Shores Water Reclamation and Reuse[3]	0	M	L	Project located on Ocean Shores and benefits groundwater, not streamflow; interested sponsor; not included in NEB evaluation.
Newaukum					
N-00	City of Chehalis Alternate Water Supply Intake	280	M	H	Interested sponsor; permitting challenges; clear streamflow benefit to North Fork Newaukum and mainstem Newaukum from moving diversion to mainstem Chehalis
N-02	Newaukum Lake Restoration & Enhancement Planning	10	L	H	No sponsor; permitting challenges; straightforward water benefit (increased surface water storage in existing lake)
N-09	Newaukum MAR Concepts	298	L	M	No sponsor; permitting and siting challenges; strong analytical basis, but site-specific analysis necessary to gain certainty of benefits; re-timing approach utilizes high flows.
N-12	Beaver Dam Analog Implementation	12.5	H	M	Committed sponsor; no site-specific data and analysis; assume 2.5 af/yr water benefit, but site conditions could vary.
N-13	Berwick Creek Flood Reduction Restoration (Port of Chehalis)	NQ	H	M	Committed sponsor and landowner; funded project; no site-specific data and analysis; similar in type and location to H-00 China Creek Phase 2 wetland restoration.
Satsop					
S-00	Satsop/Wynoochee Tributary Assessment	NQ	H	M	Committed sponsor; pilot projects identified; monitoring funded; no scientific consensus on streamflow benefit from this project type; no site-specific data and analysis
S-02	Lower Satsop Restoration, Protection, and Aquifer Recharge-Phase II	NQ	H	M	Committed sponsor and landowner for construction; water benefits similar to floodplain reconnection; no site-specific data or analysis.

Project ID	Project Name	Estimated Water Offset (af/yr)	Certainty of Implementation	Certainty of Water Benefit	Basis of Certainty Ratings
Scatter Creek					
SC-00	TC #118/119 Scatter Creek Water Right & Streamflow Augmentation	700	L	H	No committed sponsor; clear streamflow benefit to Scatter Creek from discharge of pumped groundwater; groundwater impacts unknown.
SC-01	TC #90 Weins Farm Restoration	20	M	L	Interested sponsor; conservation landowners; acquisition funded from CBLE; no site-specific data and analysis; water benefit associated with off-channel storage from floodplain reconnection
SC-02	TC #89 Upper Scatter Creek MAR	53.5	M	M	No sponsor; conservation landowner; permitting challenges; strong analytical basis, but site-specific analysis necessary to gain certainty of benefits.
SC-03	TC #81 Sampson Wetlands Restoration and MAR	92	M	M	No sponsor; conservation landowner; permitting challenges; strong analytical basis, but site-specific analysis necessary to gain certainty of benefits.
SC-04	TC #127 Scatter Creek Upper Basin Forestry	NQ	L	M	No sponsor; long timeframe for benefit accrual; strong science basis for benefit; no site-specific analysis
Skookumchuck					
SK-00	TransAlta Water Right Acquistion	2,898	H	H	Committed sponsor; open dialogue with water right holder; straightforward streamflow benefit from eliminating part of an active diversion.
SK-01	Skookumchuck Dam Release	323	L	H	No sponsor; permitting challenges; straightforward water benefit (increased flow release from existing reservoir)
Northeast Willapa					
NW-00	Satsop Business Park Water Right to Reclaimed Water	NQ	L	L	Interested sponsor; requires commitment from new port tenant; conceptual project; no analysis available.
Wishkah					
W-00	Grays Harbor County Forest Practices and Flow Assessment	10	L	M	No sponsor; long timeframe for benefit accrual; strong science basis for benefit; no site-specific analysis
Wynoochee					
WY-01	Grays Harbor County Forest Practices and Flow Assessment	2.3	L	M	No sponsor; long timeframe for benefit accrual; strong science basis for benefit; no site-specific analysis

Project ID	Project Name	Estimated Water Offset (af/yr)	Certainty of Implementation	Certainty of Water Benefit	Basis of Certainty Ratings
WY-02	Satsop/Wynoochee Tributary Assessment	NQ	H	M	Committed sponsor; pilot projects identified; monitoring funded; no scientific consensus on streamflow benefit from this project type; no site-specific data and analysis
Basinwide Concepts					
BW-00	Beaver Dam Analog Implementation	NQ	M	M	Committed sponsor; no site-specific data and analysis; assume 2.5 af/yr water benefit, but site conditions could vary.
BW-02	Agricultural Irrigation Efficiencies & Water Conservation	NQ	L	L	Programmatic project; committed sponsors; interested landowners not yet identified
BW-03	Eager Beaver Collaboration	NQ	H	M	Committed sponsor; no site-specific data and analysis; assume 2.5 af/yr water benefit, but site conditions could vary.
BW-04	Managed Aquifer Recharge Opportunity Assessment	200	L	H	No sponsor; permitting and siting challenges; strong analytical basis, but site-specific analysis necessary to gain certainty of benefits; re-timing approach utilizes high flows.
BW-05	Stormwater Recharge Opportunity Assessment	10	M	M	Conceptual project; no sponsor; streamflow benefit estimated from modeling done elsewhere; Could be add-on to city stormwater projects; no site-specific data and analysis available.
BW-06	Trust Water Rights Acquisitions	NQ	M	H	No sponsor; no open dialogue with water right holders; water benefit is straightforward to evaluate when interested water right holders are identified.
Total - All Projects		**5,175**			

1 - Albany Street Stormwater Pond was completed in 2020.
2 - NQ: Water offset expected; insufficient data to quantify
3 - Local water benefit from project would not offset projected consumptive use.

7 NET ECOLOGICAL BENEFIT EVALUATION

According to the Streamflow Restoration law, watershed plan updates must result in a NEB in addition to offsetting new consumptive use from permit-exempt well connections over the planning horizon. Ecology's *Final Guidance for Determining Net Ecological Benefit* (Ecology, 2019) does not provide specific metrics to determine ecological benefit but recommends that each Planning Unit conduct a systematic NEB evaluation including:

1. Comparison of water offset benefit from all planned projects and actions with projected impacts of new consumptive use on streamflow.

2. Assessment of water offset benefit versus streamflow impacts within each subbasin.

3. Identification of projects and impacts that provide additional benefit to instream resources beyond offsetting consumptive use.

4. Consideration of adaptive management actions to address uncertainty.

5. A clear statement describing the basis for whether the Plan Addendum does or does not provide NEB.

The following sections describe the Partnership's approach to providing NEB for the Chehalis Basin and its subbasins through the Plan Addendum. Implementation and adaptive management are discussed in Chapter 8.

7.1 Water Offset Evaluation – Core NEB Water Benefit Projects

Chapter 6 presents and describes the suite of projects identified to meet the requirements of RCW 90.94.020 for the Chehalis Basin. As noted in Chapter 6, water offsets were estimated conservatively for projects without detailed information or modeling, and potential offsets were not counted toward the Amendment total for projects with insufficient information to develop a confident estimate. Estimated water offsets for individual projects are listed in Chapter 6 and Appendix C.

The project list shown in **Error! Reference source not found.** was used to evaluate reasonable assurance that the identified projects provide reasonable certainty of offsetting future streamflow impacts from new permit-exempt well connections. These projects have medium to high certainty of implementation. To account for uncertainty in offset benefits, water offset values in Table 15 have been scaled from the estimates shown in Table 14. The credited water offset values have been scaled to 50 percent of estimates for all projects with a medium ('M') certainty of water benefit rating or 25 percent of estimates for projects with a low ('L') water benefit certainty. Those with high ('H') certainty of water benefit have not been scaled. The total credited water offset benefit from projects with high or medium certainty of implementation is 3,290 acre-feet per year, more than six times the projected streamflow

impact of 504.8 acre-feet per year. The bulk of this comes from the TransAlta water right acquisition (project SK-00), located in the Skookumchuck subbasin. This is the highest priority project for the Partnership, and the Quinault Indian Nation has been awarded a Streamflow Restoration grant to begin feasibility work on the water right acquisition in 2021.

Table 15 Highest Certainty Projects Water Offset Evaluation

Project ID	Project Name	Credited Water Offset (af/yr)	Certainty of Implementation	Certainty of Water Benefit
Black River		**18.7**		
B-00	TC #91 Holm Farm Ditch Removal and Floodplain Reconnection	6.8	M	M
B-05	Albany Street Stormwater Pond	11.9	H[1]	M
Chehalis-Salzer		**0**		
CS-00	Berwick Creek Flood Reduction Restoration (Port of Chehalis)	NQ[2]	H	M
CS-03	Flood Hazard Reduction Master Plan and Chehalis Wastewater Treatment Plant Project	NQ	M	M
East Willapa		**2.5**		
EW-00	Garrard Creek Floodplain Restoration Opportunity Assessment	2.5	H	M
Hanaford		**1.5**		
H-00	China Creek Phase 2 wetland restoration	1.5	H	M
Humptulips		**0**		
HT-00	Ocean Shores Water Reclamation and Reuse[3]	0	M	L
Newaukum		**286.3**		
N-00	City of Chehalis Water Supply Diversion Relocation	280	M	H
N-12	Beaver Dam Analog Pilot Implementation	6.25	H	M
Satsop		**0**		
S-00	Satsop/Wynoochee Tributary Assessment	NQ	H	M
S-02	Lower Satsop Restoration, Protection, and Aquifer Recharge-Phase II	NQ	H	M
Scatter Creek		**78**		
SC-01	TC #90 Weins Farm Restoration	5	M	L
SC-02	TC #89 Upper Scatter Creek MAR	26.8	M	M
SC-03	TC #81 Sampson Wetlands Restoration and MAR	46	M	M
Skookumchuck		**2,898**		
SK-00	TransAlta Water Right Acquistion	2,898	H	H
Wynoochee		**0**		
WY-02	Satsop/Wynoochee Tributary Assessment	NQ	H	M
Basinwide Concepts		**7.5**		
BW-00	Beaver Dam Analog Implementation	NQ	M	M
BW-03	Eager Beaver Collaboration	NQ	H	M

Project ID	Project Name	Credited Water Offset (af/yr)	Certainty of Implementation	Certainty of Water Benefit
BW-05	Stormwater Recharge Opportunity Assessment	2.5	M	M
BW-06	Trust Water Rights Acquisitions	NQ	M	H
Totals		**3,290**		

1 - Albany Street Stormwater Pond was completed in 2020.
2 - NQ: Water offset expected; insufficient data to quantify
3 - Local water benefit from project would not offset projected consumptive use.

Project BW-06 (Trust Water Right Acquisitions), while not quantified due to early development, has great potential and is a high priority for development during early implementation. A preliminary review of the water rights currently flagged as being held in Trust has identified holdings in several subbasins:

- Satsop – Potentially 947 acre-feet per year (1.31 cfs)
- Skookumchuck - Potentially 17 acre-feet per year (0.02 cfs)
- Scatter - Potentially 10,390 acre-feet per year (14.4 cfs)
- Newaukum - Potentially 265 acre-feet per year (0.37 cfs)
- Curtis - Potentially 40 acre-feet per year (0.06 cfs)

The remaining projects hold high value for aquatic habitat restoration in addition to their water value. The Partnership strongly believes that with more implementation and effectiveness monitoring, these projects will be shown as necessary and fundamental to restoring streamflow in the Chehalis Basin.

7.2 Geographic Distribution of NEB

Table 16 summarizes the anticipated water offsets provided by the entire suite of projects for each subbasin and the basin as a whole. The table includes estimated offsets by subbasin for all projects, along with credited (scaled) offsets from the group of projects with the highest certainty of implementation (from Table 15). Figure 5 (estimated offset) and Figure 6 indicate the same information, with the consumptive water use numbers (in red) and offset project quantities (in green) by subbasin throughout the basin.

Table 16 Water Offset Summary for Projects

Subbasin	Consumptive Use Estimate (af/yr)	Number of Proposed Projects		Estimated Water Offset (af/yr)		Credited Water Offset (af/yr)
		Water Offset[1]	Habitat / Other	All Projects	Highest Certainty	
Black River	141.1	4	6	192	25.4	18.7
Chehalis - Salzer	9.2	2	3	NQ[3]	NQ	NQ
Chehalis Headwaters	5.2	0	1	0	0	0
Cloquallum - N Delezene	29.1	0	5	0	0	0
W Capitol Forest	1.8	0	0	0	0	0
Elk - Johns River	1.5	1	1	23	0	0
East Willapa	39.8	2	2	9.5	5	2.5
Hanaford	4.2	1	2	3	3	1.5
Hoquiam	3.1	1	6	17	0	0
Humptulips	1.0	2	2	20	0	0
Mox Chehalis	4.5	0	0	0	0	0
Newaukum	80.1	5	13	601	293	286
Satsop	28.4	2	4	NQ	NQ	NQ
Scatter Creek	64.2	5	5	866	166	78
Curtis	18.9	0	1	0	0	0
Skookumchuck	62.4	2	2	3,221	2,898	2,898
Northeast Willapa	8.7	1	0	NQ	0	0
Wishkah	0.2	1	1	10	0	0
Wynoochee	1.4	2	3	2	NQ	NQ
WRIA 22/23 Total[2]	**504.8**	**37**	**62**	**5,175**	**3,399**	**3,290**

1. Includes water right acquisitions and non-acquisition water offset projects.
2. Includes basinwide projects not assigned to individual subbasins.
3. NQ: Water offset expected; insufficient data to quantify

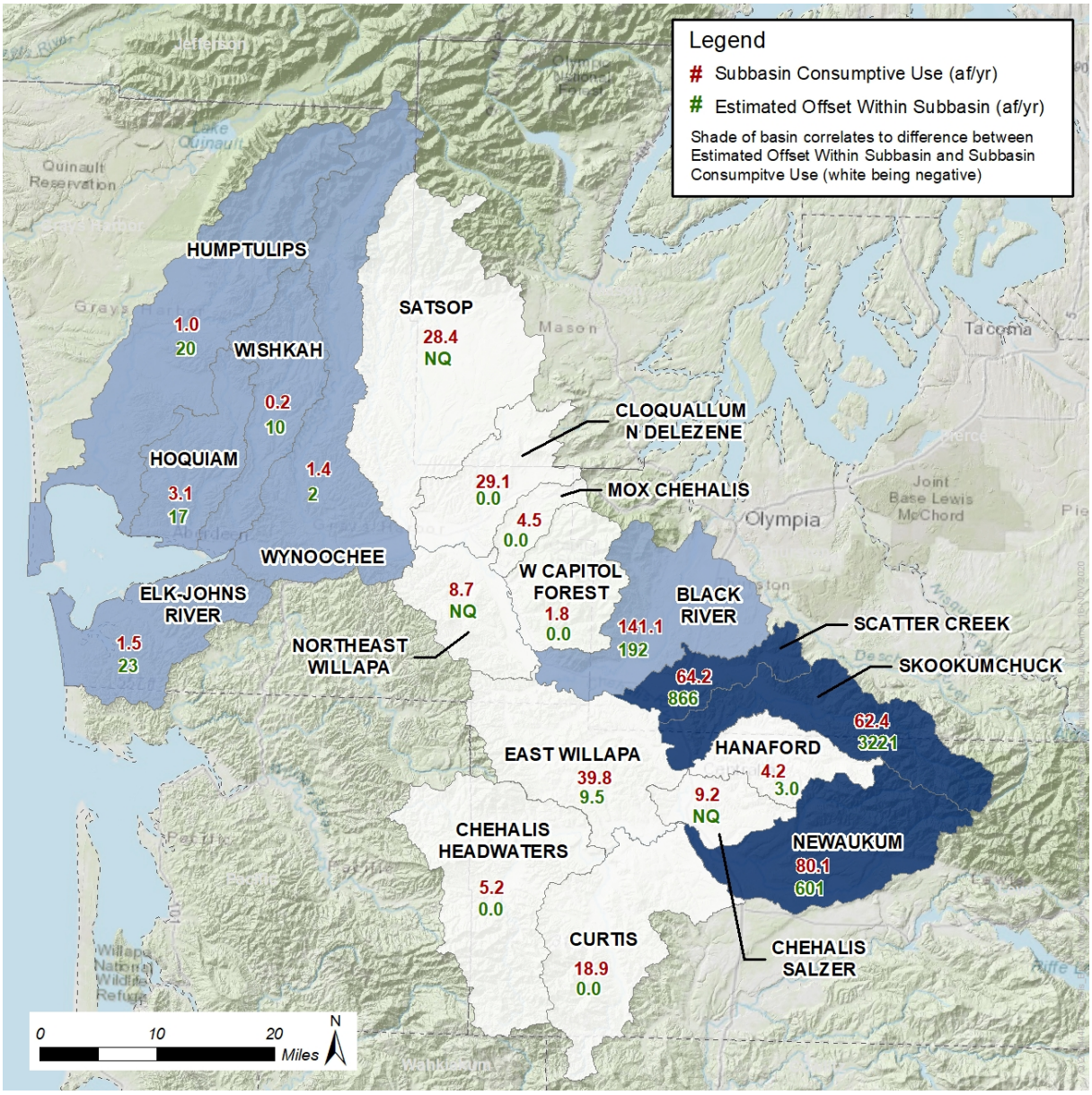

Figure 5 Estimated Water Offset vs. Consumptive Use by Subbasin for Full Suite of Projects

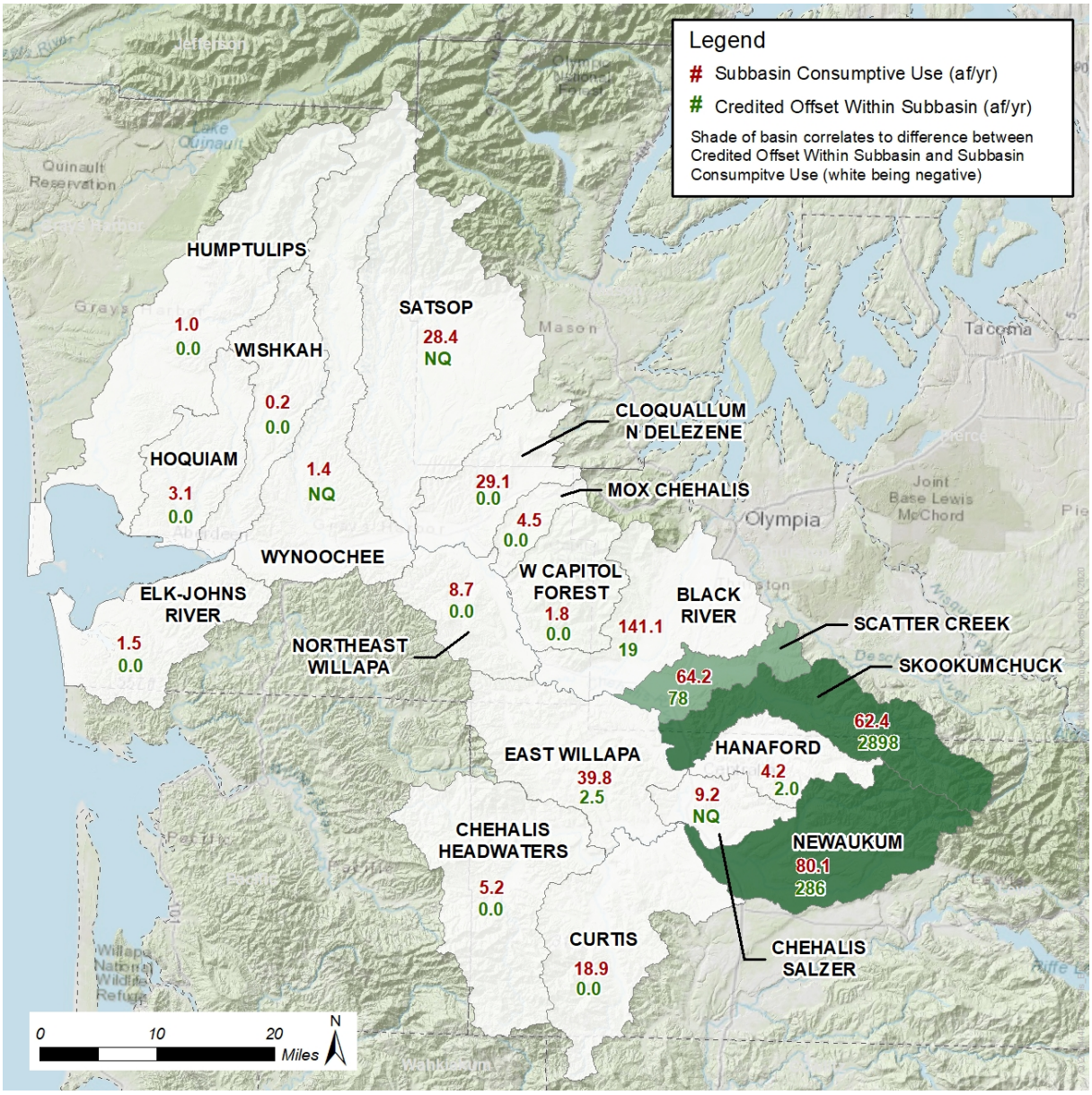

Figure 6 Credited Water Offset vs. Consumptive Use by Subbasin for High Certainty Projects

Projected new consumptive water use is concentrated in a limited number of subbasins: there are just four subbasins with 60 acre-feet per year or more of anticipated new consumptive water use (Black River, Scatter Creek, Skookumchuck, and Newaukum), and the amount of anticipated use in those subbasins comprises nearly 70 percent of all anticipated new consumptive water use. The Addendum has large water offset projects located in some of the upper reaches of the basin that will produce downstream benefits for significant portions of the basin and in some of the most critical areas for depressed salmon stocks (spring Chinook).

At the basin scale, anticipated water offsets significantly exceed projected consumptive use, even when considering only those projects already on track for implementation and adjusting for uncertainty in water offset estimates (six times the consumptive use estimate). Considering the entire project suite, water offset benefit could exceed the estimated consumptive use by a factor of ten. However, the vast majority of the water benefit would be attained through one project—the TransAlta water right acquisition—leaving a risk of not attaining the water offset requirement if that acquisition is not completed.

At the subbasin scale and based on the full suite of projects, water benefit projects are well distributed throughout the basin: 14 of 19 subbasins have at least one identified water offset project, and the four subbasins with the highest projected consumptive use impacts each have projects expected to provide offsets exceeding the target. While there are some subbasins with no water offset projects anticipated, the unmet consumptive water use in those subbasins is generally small (under 10 acre-feet).

7.3 Additional Benefits to Instream Resources

Two major salmon and aquatic species restoration programs in the Chehalis Basin identify priority needs for instream resources, and this Addendum considers these the best source of scientifically-based ecological needs and priority protection and restoration actions for instream resources:

- Chehalis Basin Salmon Restoration and Preservation Strategy (Salmon Recovery Funding Board Lead Entity Program)
- Chehalis Basin Strategy Aquatic Species Restoration Plan, Draft (ASRP)

The Chehalis Basin Salmon Restoration and Preservation Strategy identified levels of concern for seven salmonid limiting factors for more than 30 drainage basins throughout the Chehalis Basin. These ratings are aggregated by subbasin in Table 17; for subbasins with multiple rated drainages, all levels are shown. Tier 1 indicates the highest level of concern and greatest need for ecological improvement.

Water quantity is a Tier 1 level of concern in the Black, Cloquallum-North Delezene, Hanaford, Scatter Creek, Newaukum, and Satsop subbasins; all of these except Satsop are also expected to receive the majority of new permit-exempt well connections. While not called out separately by the Lead Entity limiting factors ratings, water temperature is a key issue in the Chehalis Basin (included in water quality limiting factor) and closely linked to water quantity. Actions that help cool water temperature, such as shade from riparian trees and instream restoration to create channel complexity, are high priorities for spring Chinook and other aquatic species. Detailed project summary sheets (Appendix B) describe whether each project addresses the water quantity limiting factor, and in some cases, water temperature as well.

Table 17 Level of Concern for Salmonid Limiting Factors

Subbasin	Lead Entity Tiers[1] by Indicator (Chehalis Basin Salmon Habitat Restoration and Preservation Strategy, 2011)						
	Water Quantity	Water Quality	Riparian	Floodplain	Large Woody Debris	Fish Passage	Sediment
Black River	1	1	1	3	2	2	3
Chehalis-Salzer	1/3[2]	2	1	2	3	1/2[2]	1
Chehalis Headwaters	3	2	1	3	2	1	1
Cloquallum - N. Delezene	1	3	1	2	3	1	2
W Capitol Forest	3	3	1	2	1	1	2
East Willapa	2/3[2]	1/2/3[2]	1/2[2]	1/2/3[2]	2/3[2]	1	1
Elk-Johns	3	3	1	2	2	1	1
Hanaford	1	1	1	3	3	2	2
Hoquiam	3	1/2[2]	1/2[2]	2/3[2]	2/3[2]	1	1/2[2]
Humptulips	3	1	2	2	3	1	1
Mox Chehalis	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Newaukum	1/2/3[2]	1/2[2]	1	2/3[2]	2/3[2]	1/2[2]	1/3[2]
Satsop	1/3[2]	1/2/3[2]	1/2[2]	1/3[2]	2/3[2]	1/2[2]	1/3[2]
Scatter	1	1	1	3	3	2	2
Curtis	2	1	1	3	3	2	1
Skookumchuck	2	2	1	1	3	1	1
Northeast Willapa	2	2	2	1	2	1	1
Wishkah	3	3	1	2	2	1	1
Wynoochee	3	2	1	1	3	1	2

[1] Tier 1 indicates highest level of concern and greatest need for ecological improvement.

[2] Two or more Lead Entity management units that have different limiting factors tier ratings were included in the Partnership subbasins.

The ASRP is a multispecies-focused restoration plan for aquatic and semi-aquatic species. The draft plan (Phase 1) released in 2019 presented three levels of restoration/protection scenarios with corresponding expected aquatic species benefits at each level. The ASRP is currently being refined, including development of detailed priorities and sequencing for implementation. Priority protection and restoration actions for each Partnership subbasin are shown in Table 18, based on working products from the refinement effort.

Table 18 Aquatic Species Restoration Plan Priority Needs[1]

Subbasin	Priority Protection and Restoration Actions
Black	Large wood addition, floodplain reconnection, beaver ponds
Chehalis-Salzer	Floodplain reconnection, large wood addition, riparian restoration
Chehalis Headwaters	Large wood addition, fish passage improvements
Cloquallum - N. Delezene	Large wood addition, fish passage improvements, riparian restoration
W Capitol Forest	Large wood addition, fish passage improvements
East Willapa	Large wood addition, fish passage improvements, floodplain reconnection, beaver ponds
Elk-Johns	Large wood placement, fish passage improvements, beaver ponds
Hanaford	Fish passage improvements, riparian restoration, beaver ponds
Hoquiam	Large wood addition
Humptulips	Large wood addition, floodplain reconnection, riparian restoration
Mox Chehalis	Riparian restoration
Newaukum	Large wood addition, floodplain reconnection, riparian restoration, fish passage improvements, and beaver ponds in tributaries
Satsop	Large wood addition, floodplain reconnection, and beaver ponds in tributaries
Scatter	Large wood addition, floodplain reconnection, riparian restoration, beaver ponds
Curtis	Large wood addition (primarily in upper South Fork Chehalis), riparian restoration, fish passage improvements (primarily in Stearns Creek)
Skookumchuck	Large wood addition, floodplain reconnection, riparian restoration
Northeast Willapa	Large wood addition, floodplain reconnection, riparian restoration
Wishkah	Large wood addition, floodplain reconnection
Wynoochee	Large wood addition, fish passage improvements in tributaries

[1] Source: Working products from ASRP Science and Technical Review Team, Aug, 2020.

In addition to water offsets, which will help address water quantity limitations, the Addendum includes more than 60 projects targeted primarily at addressing the ecological needs described by the Lead Entity Program for restoring, enhancing, and providing access to stream and riparian habitat throughout the Chehalis Basin. The identified projects align with the priority restoration and protection actions identified by the ASRP, and benefit habitat and instream resources by:

- Improving riparian shading and increasing groundwater contributions to reduce stream temperatures
- Improving diversity of native riparian vegetation
- Reconnecting and creating floodplain and side channel habitat
- Improving instream habitat with large woody debris, vegetated side slopes, and natural sediment transport
- Increasing groundwater storage and wetland function.

These projects include the restoration, conservation, fish passage, and floodplain storage/beaver dam analog project categories identified in Chapter 6 and Appendix B. To facilitate Ecology's determination of NEB, the Planning Unit compiled several metrics to help quantify the ecological benefit anticipated from these projects, summarized in Table 19. Ecological benefit metrics for individual projects are listed in Appendix C.

Table 19 Other Ecological Benefits for Listed Projects

Subbasin	Proposed Habitat Projects	Reach Length Enhanced/ Restored[1] (mi)	Riparian/ Upland Area Protected[2] (ac)	Habitat Reconnected[3] (mi)
Black River	6	0	55	5.0
Chehalis - Salzer	3	0	10	1.8
Chehalis Headwaters	1	0.3	0	0
Cloquallum - N Delezene	5	1.4	15.6	8.3
W Capitol Forest	0	0	0	0
Elk - Johns River	1	0	178.7	0
East Willapa	2	0	0	0.8
Hanaford	2	0.7	33	0
Hoquiam	6	0.3	394.4	3.5
Humptulips	2	0	157.1	5.3
Mox Chehalis	0	0	0	0
Newaukum	13	36.3	1.3	16.2
Satsop	4	6.8	137	0
Scatter Creek	5	13.8	788	0
Curtis	1	2.6	0	0
Skookumchuck	2	40.3	17	0
Northeast Willapa	0	0	0	0
Wishkah	1	0	75.2	0
Wynoochee	3	3.8	17.5	0
WRIA 22/23 Total[4]	**62**	**121**	**2,180**	**41**

1. Actions include instream restoration, large wood addition, etc.
2. Actions include protecting land for conservation purposes, riparian restoration, floodplain reconnection and habitat creation
3. Actions include fish passage improvements
4. Includes basinwide projects not assigned to individual subbasins.

Habitat-related projects were identified in 16 of the 19 subbasins, ensuring that ecological benefits will be distributed throughout the basin. The listed projects will enhance more than 120 miles of stream and riparian habitat, mostly in the more heavily impacted Newaukum and Skookumchuck subbasins; preserve 2,180 acres of forested uplands and riparian wetlands; and reconnect more than 40 miles of salmonid habitat by removing fish barriers. Many of the fish barrier and restoration projects included in

the Addendum were identified through the Lead Entity Salmon Restoration and Preservation Strategy and ASRP and are already funded through various stages of design and construction.

7.4 Net Ecological Benefit Summary

The Partnership finds that this Addendum meets the NEB criteria as shown in Table 20. It estimates future permit-exempt domestic water use from 2018 to 2040 and identifies actions to offset the impacts of new consumptive use and provide additional ecological benefits. This Addendum could provide a NEB to the Chehalis River Basin as required by RCW 90.94.020 by proposing projects that will fully offset, and substantially exceed, the consumptive use impacts while also addressing habitat and temperature issues in the basin in conjunction with other basinwide planning efforts. When implemented, the Partnership understands that these projects must remain effective for as long as the new permit-exempt well pumping continues. This finding is based on the combined value of medium/high certainty water offset projects, aquatic habitat restoration projects that address key aquatic needs distributed throughout the basin, and the framework of cooperative partnerships already in place in the Chehalis Basin.

Table 20 Addendum Compliance with Ecology NEB Criteria

Ecology NEB Guidance Criteria	Chehalis Basin Watershed Plan Addendum
3.2.3.1 Clear and Systematic Logic Watershed plans must be prepared with implementation in mind.	Plan Addendum prepared through collaborative process with longstanding Watershed Planning Unit – the Chehalis Basin Partnership. This group has been actively working together since 1998 and is committed to implement this Addendum. Offset projects are strong actions to both restore streamflow and contribute ecological benefits that are identified needs in the basin.
3.2.3.2 Delineate Subbasins Planning groups must divide the WRIA into suitably-sized subbasins to allow meaningful analysis of the relationship between new consumptive use and offsets.	The Partnership divided the basin into 19 subbasins that reflect manageable and meaningful management units for tracking permit-exempt well development, streamflow impacts, and offset with projects that address impacts in those areas. Subbasin delineation is described in Section 2.4.
3.2.3.3 Estimate New Consumptive Water Uses Watershed plans must include a new consumptive water use estimate for each subbasin, and the technical basis for such estimate.	Consumptive use estimates were developed using basin-specific data and accepted Ecology references. Consumptive use estimate is described in Chapter 4.
3.2.3.4 Evaluate Impacts from New Consumptive Water Use Watershed plans must consider both the estimated quantity of new consumptive water use from new domestic permit-exempt wells initiated within the planning horizon … and how those impacts will be distributed.	The distribution of consumptive use from new permit-exempt well connections was based on regional growth modeling (Thurston County), spatial distribution of recently-built self-supplied single family homes, and availability of supply from water purveyors. This is described in Chapters 3 and 4, and in Appendix A.
3.2.3.5 Describe and Evaluate Projects and Actions for their Offset Potential Watershed plans must, at a minimum, identify projects and actions intended to offset impacts	This Watershed Plan Addendum identifies 72 projects that could provide water and/or instream flow benefits to support NEB. 36 projects total, and 13 medium-high certainty projects are included that could provide water benefit. This project suite far exceeds the estimated consumptive use and streamflow impact, and when implemented will result in a NEB to the basin.

Nearly 70 percent of the consumptive use from new permit-exempt wells is anticipated to occur in four of the 19 subbasins shown in Table 21. High certainty water offset projects in the Newaukum River, Scatter Creek, and Skookumchuck subbasins far exceed projected consumptive use there. In addition, the largest water offset project—acquisition of a portion of surface water right from the retiring TransAlta coal-fired power plant—is located in one of these subbasins (Skookumchuck) and could provide over eight times the estimated consumptive use in these high growth areas. While that project would not benefit the Black River, Newaukum, or Scatter Creek subbasins directly, it could contribute to cooler water temperatures in the mainstem Chehalis, where most salmon in the Chehalis Basin migrate through, and in some cases hold, during the summer. More work is needed in the Black River to ensure that near-term project development focuses on this area, identifying sponsors and sites for high quality projects. The Partnership's strategy for this is described in Chapter 8.

Table 21 Water Offset Summary for Proposed Projects in Areas of Highest Anticipated New Water Use

Subbasin	Consumptive Use Estimate (af/yr)	Number of Proposed Projects		Estimated Water Offset (af/yr)	
		Water Offset	Habitat/ Other	All Projects	Highest Certainty Projects
Black River	141.1	4	6	192.4	25.4
Newaukum	80.1	5	13	600.5	292.5
Scatter Creek	64.2	5	5	866	166
Skookumchuck	62.4	2	2	3,221	2,898
Total	**347.8**			**4,880**	**3,382**

The suite of habitat projects is coordinated with ecological needs identified by the two major aquatic restoration programs in the basin. These needs have been developed through limiting factors analysis conducted for the Lead Entity Program (Smith and Wenger, 2001) and Ecosystem Diagnosis and Treatment (EDT) and NOAA Life Cycle habitat modeling conducted for the ASRP. The community of habitat sponsors and practitioners including the Lead Entity Program, ASRP, and many dedicated project sponsor organizations is the institutional foundation that will advance implementation of the project list and adaptive management to ensure that the projected benefits are attained.

8 IMPLEMENTATION AND ADAPTIVE MANAGEMENT

When the Chehalis Basin Watershed Plan Addendum is approved by the Partnership and adopted by Ecology, the Planning Unit will move into Implementation Phase. While the Streamflow Restoration law is silent on implementation and adaptive management, the Partnership must meet the reasonable assurance standard described in the NEB guidance. The state Legislature authorized $300 million for streamflow restoration grants over the next 20 years to partially support implementation of offset projects through a competitive statewide grant program. Additionally, the Partnership may request that up to $350 of the $500 well fees collected by counties within the Chehalis Basin be provided to the Planning Unit (or implementation lead organization).

8.1 Lead Organization for Implementation

The Partnership will continue to lead and coordinate implementation and adaptive management for this Watershed Plan Addendum. With its membership and participation, including the four counties with projected new permit-exempt well connections, most cities, Chehalis Tribe, Quinault Indian Nation, and stakeholder representatives, the Partnership is well-suited to this role. Ecology has indicated commitment to continuing its support to the Partnership through policy and technical staff participation.

8.2 Implementation Approach

The Partnership wishes to ensure that the projects and actions described within this Plan Addendum meet the intent and requirements of RCW 90.94.020. In addition to "implement[ing] plans to restore streamflows to levels necessary to support robust, healthy, and sustainable salmon populations,"[1] the Legislature intended the law to ensure that impacts to streamflows from new, permit-exempt well use is adequately offset. The law (90.94.020) requires the replacement of the quantity of water necessary to offset potential impacts to instream flows associated with domestic permit-exempt well water use, and requires that a NEB to instream resources occur within the basin after accounting for new projected uses of water over the planning horizon.

This Watershed Plan Addendum lays out projections for future permit-exempt well connections and associated streamflow impacts and a portfolio of projects to offset those impacts and provide NEB to the basin. To ensure that the Addendum achieves its intended purpose, the following needs exist during implementation:

1. Work with project sponsors to implement offset projects. At a project level, this will require cultivating sponsor interest, project development, administrative support for acquiring project design and construction funding, and support during project implementation. Assistance to the

[1] ESSB §304, 2018.

Partnership at a program level will be needed to assist the Partnership in prioritizing projects and geographic areas within the basin to further support project implementation.

2. Track new permit-exempt well connections basinwide (these are identified and recorded by counties at the building permit stage) and compare magnitude and locations against projections. If actual numbers vary significantly from projections, the Partnership will adapt project implementation priorities in areas with higher densities of new permit-exempt well connections to address impacts in these areas.

3. Monitor project effectiveness in achieving expected benefits and adapt to address identified deficiencies. Monitoring is a crucial, but difficult-to-fund element of project implementation. The Partnership will continue to collaborate with the Lead Entity Program and ASRP to leverage monitoring efforts within the basin and apply learnings to new projects.

4. Integrate learnings from studies conducted inside and outside the basin that reflect on the effectiveness of project types in this Watershed Plan Addendum. For example, scientists and practitioners are actively researching, testing, and monitoring the effects from BDAs, alluvial aquifer storage, managed aquifer recharge, and wet meadow restoration. Understanding about the water and overall ecological benefits from these project types is expected to advance substantially over the next ten years.

8.3 Implementation Work Plan

Immediately following adoption of the Addendum and if funding is available, the Partnership will develop a simple Implementation Work Plan. The Implementation Work Plan will identify priority projects, project leads, work elements needed to advance project, funding strategy, and schedule. Initial project implementation sequencing goals are shown in **Error! Reference source not found.**; this will be revised as project sponsors, funding, and other necessary implementation details are resolved. Note that most implementation efforts are not currently funded and may not advance until funding is secured.

The Partnership will work with project sponsors, or to secure a project sponsor where one is not committed. The project portfolio will be managed to ensure that projects with high confidence in water benefits that substantially contribute to NEB are prioritized. With limited funding through Streamflow Restoration grants, the Partnership will coordinate with other funding programs to seek funding and advancement of high priority projects.

The Partnership also hopes to increase its knowledge about the effectiveness of project types in restoring streamflow and providing additional NEB to the basin. For example, Project N-12 Beaver Dam Analog Pilot Implementation will test five BDAs in the Newaukum River watershed during 2021-2022. Project EW-00 Garrard Creek Flood Plain Restoration Opportunity Assessment seeks to install two BDAs in 2023. If the Partnership or other basin entities are able to secure funding for and conduct effectiveness monitoring, we will have increased understanding about how these project types perform in the Chehalis Basin.

Two basinwide programmatic projects –BW-02 Agricultural Irrigation Efficiencies and Conservation Program and BW-03 Eager Beaver Collaboration – will test effectiveness at landowner engagement to encourage practices that help in restoring streamflows. By focusing on these engagement projects early in the implementation period, the Partnership believes that greater public commitment and ownership of restoring healthy streamflows can be achieved.

Table 23 describes the Partnership's initial approach to project development for projects that require additional feasibility, funding, or agreements. These projects, while only currently at the conceptual level, may yield some of the best water benefit and NEB outcomes. For example, project BW-06, Trust Water Right Acquisitions identified substantial water right acquisition opportunities that have not yet been pursued. Projects W-00, WY-01, HQ-03, HT-01 Grays Harbor County Forest Practices and Flow Assessment holds great promise to restore streamflow through managing blocks of forestland to 40+ year-old forest. Under the constrained time for development of the Plan Addendum, these projects could not be adequately analyzed to produce water estimates but are still high priorities for the Partnership.

We note that while most projects/project concepts show some activity in 2021 in both Table 22 and Table 23, it is likely that the Partnership will evaluate readiness, sponsor commitments, geographic location relative to projected consumptive use and ecological needs, and most promising projects to support for advancement, either into implementation or feasibility evaluation. It will not be feasible for all projects to move forward at the same time and prioritizing where efforts are placed will be necessary. The Partnership will likely focus on developing projects in subbasins with significant deficits relative to projected consumptive use, such as Satsop, Cloquallum-N. Delezene, East Willapa, and Curtis. Lastly, without funding, little of this implementation work will be able to occur.

Table 22 Initial Project Implementation Schedule

Project	2021	2022	2023	2024	Potential Water Benefit
B-05 Albany Street Stormwater Pond	Complete				X
B-06 Beaver Creek Conservation Easement					
B-07 Seiler Conservation Easement - Mima Creek					
B-07 Jones Road Culvert Replacement	Complete				
CS-01 Berwick Creek at Labree Fish Passage Design					
CH-00 Marker 19 Oxbow Restoration					
CD-01 Upper Middle Fork Wildcat Creek Restoration					
CD-04 Wildcat Road Barrier Construction					
EW-00 Garrard Creek Floodplain Restoration Opportunity Assessment					X
H-00 China Creek Phase 2 wetland restoration					X
EW-02 Scammon Creek Hamilton Fish Passage Construction					
HQ-02 Middle Fork Hoquiam Tidal Restoration					
HQ-04 East Hoquiam - Granberg Acquisition					
HQ-05 East Hoquiam - Griswold Acquisition					
HT-00 Kirkpatrick Road Fish Barrier Correction Design					
N-00 City of Chehalis Water Supply Diversion Relocation					X
N-01 MF Newaukum Trib-Kruger Fish Passage Construction					
N-03 MF Newaukum at Centralia Alpha Fish Passage Construction					
N-04 South Fork Newaukum Early Action Reach					
N-05 Lucas Creek Trib MP 4.39 - Fish Passage Construction					
N-06 Lucas Creek Trib MP 4.24 - Fish Passage Construction					
N-10 Knutsen Fish Barrier Correction and BDAs					
N-12 Beaver Dam Analog Pilot Implementation					X
S-00, WY-02 Satsop/Wynoochee Tributary Assessment					X
C-00 South Fork/Stillman Creek Early Action Reach					
S-03 East Fork Satsop RM 8 Early Action Reach					
SK-00. TransAlta Water Right					X
WY-00 Wynoochee River RM 14 Early Action Reach					
SK-02 Skookumchuck Early Action Reach					
BW-01 Chehalis Basin Cooperative Weed Management					
BW-02 Agricultural Irrigation Efficiencies & Water Conservation					X
BW-03 Eager Beaver Collaboration					X

LEGEND

Feasibility | Funding | Implementation

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Table 23 Initial Schedule Framework for Project Development

Project	2021	2022	2023	2024	2025	2026	Potential Water Benefit
B-00 TC #91 Holm Farm Ditch Removal and Floodplain Reconnection							X
B-01 Allen Creek MAR							X
B-02 Cooke Aquaculture Water Right - Black River Reach							X
B-03 Black River Basin: Oregon Spotted Frogs, Farms & Wetlands							
B-04 Black River Confluence							
CS-00 Coal Creek Floodplain Storage - City of Chehalis							X
CS-02 Flood Hazard Reduction / Chehalis WWTP Project							X
CD-00 Cloquallum Creek LWD Construction							
CD-02 Sam's Canal Culvert Removal and Restoration							
CD-03 McConkey Lane Channel Naturalization							
EJ-00 Newskah Road Fish Barrier Correction							
EJ-01 Grays Harbor County Forest Practices and Flow Assessment							X
EW-01 Convert Galvin to Centralia Water							X
H-01 Port Blakely Hanaford Acquisition							
HQ-01 Port Blakely West Hoquiam Acquisition							
HQ-01 2020 West Hoquiam Acquisitions							
HT-02 Ocean Shores Water Reclamation and Reuse							
N-02 Newaukum Lake Restoration & Enhancement Planning							X
N-07 Berwick Creek at Hogue Fish Passage Construction							
N-08 Berwick Creek at Borovec Fish Passage Construction							
N-09 Newaukum MAR Concepts							X
N-11 Berwick Creek at Bishop Fish Passage Construction							
N-13 Berwick Creek Flood Reduction Restoration (Port of Chehalis)							X
S-01 Tree Fever Conservation Easement							
S-02 Lower Satsop Restoration, Protection, and Aquifer Recharge-Ph II							X
SC-00 TC #118/119 Scatter Crk Water Right & Streamflow Augmentation							X
SC-01 TC #90 Weins Farm Restoration							X
SC-02 TC #89 Upper Scatter Creek MAR							X
SC-03 TC #81 Sampson Wetlands Restoration and MAR							X
SC-04 TC #127 Scatter Creek Upper Basin Forestry							X
SK-01 Skookumchuck Dam Release							X
NW-00 Satsop Business Park Water Right to Reclaimed Water							X
W-00, WY-01, HQ-03, HT-01 GHC Forest Practices / Flow Assessment							X
BW-01 Beaver Dam Analog Implementation							X
BW-04 Managed Aquifer Recharge Opportunity Assessment							X
BW-05 Stormwater Recharge Opportunity Assessment							X
BW-06 Trust Water Rights Acquisitions							X
BW-07 USGS Groundwater Discharge Zone Delineation							

LEGEND

Feasibility | Funding | Implementation

Agreements | Engineering/Permitting

8.4 Implementation Tracking

As described above, the Partnership has identified the need to track streamflow restoration projects and new domestic permit-exempt well connections. The Partnership recommends piloting the Salmon Recovery Portal (SRP) (https://srp.rco.wa.gov/about), managed by the Recreation and Conservation Office (RCO) to aid with tracking. The Partnership understands that the implementation of project tracking through a pilot program using the Salmon Recovery Portal will be coordinated by WDFW in collaboration with Ecology and RCO. University of Washington data stewards will be employed to conduct data entry, quality assurance, and quality control. The Partnership/Lead Entity Coordinator, Kirsten Harma, is already actively engaged in quality assurance of Chehalis Basin projects in the SRP. Use of this tool for tracking will allow:

- Tracking progress towards meeting project and plan goals
- Assessing project's role in meeting salmon recovery goals
- Alignment with salmon recovery projects funded through other sources
- Accounting for streamflow benefits from non-salmon recovery-related projects.

8.5 Adaptive Management Approach

Additional needs will undoubtedly arise during implementation, and maintaining the Partnership as the implementing body will enable it to adaptively manage plan implementation and provide the best assurances that future impacts to streamflow from permit-exempt wells will be offset and that a NEB is provided to the basin.

The Partnership supports an adaptive management process for implementation of this Watershed Plan Addendum. Adaptive management is defined in the NEB Guidance as:

> '*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*.

The Partnership's goals for adaptive management include the following:

1. Ensure that this streamflow restoration watershed plan addendum adequately offsets new permit-exempt well consumptive water use.

2. Ensure that NEB is achieved and sustained long-term in the Chehalis Basin.

3. Provide a transparent, verifiable process for evaluation of Plan Addendum implementation.

The recommended adaptive management framework relies on accurate and consistent monitoring and assessment of NEB. These elements are described more fully in the following sections.

Monitoring the Implementation of the Approved Watershed Plan Addendum.

Monitoring implementation of the Watershed Plan Addendum requires the following tasks:

1. Verification of new PE well water use - The Partnership recommends that Ecology track new permit-exempt well construction and keeps records of the actual location/site of water withdrawal. Records of well locations should be made available through Ecology's well records database. The Partnership further recommends that Ecology well records be regularly uploaded to the Salmon Recovery Portal database.

2. Compare actual new well development data against projections used in the development of the watershed plan addendum. If actual data agrees with projections in this Addendum, then no adjustments are needed and projections in this Addendum may continue to be used to estimate future consumptive water use. If actual data indicates that projections were inaccurate, adjust water use estimates (and estimated consumptive water use) by sub-basin accordingly.

3. Adaptive management of streamflow restoration project implementation. At five-year intervals (5-Year Review), review and assess which water offset projects are implemented or "reasonably certain" to become implemented (i.e. funded or reasonably certain to be funded). Determine what quantity of offset water is reasonably certain to occur through these projects. This offset water is assigned to appropriate subbasins.

   Based on this assessment projects may be added and/or reshaped to better address the impacts and most effective restoration methods as knowledge is gained. The basinwide conceptual projects and programs in the project suite describe the general range within which adaptation is likely to occur; specific projects and actions may be developed adaptively as needs and opportunities evolve over the 20-year plan timeframe.

   Focusing more detailed assessment and characterization studies in potentially vulnerable areas of the basin is another adaptive management need. Project BW-07 – USGS Groundwater Discharge Zone Delineation – was included in the project suite to help the Partnership hone its understanding about where groundwater use potentially has more impact to streamflow. Additional studies, not yet identified, may be needed to further refine knowledge about streamflow impacts from groundwater use and the most effective strategies to mitigate for those impacts.

4. Compare new permit-exempt water use with actual water offsets produced (or reasonably certain to be produced) for each subbasin. The Partnership will assess:

   a. Whether adequate offset water has been provided to offset all water use by new permit-exempt wells at the WRIA-scale.

   b. Where water offset deficits occur at the subbasin scale.

c. Where subbasins exhibit both offset deficits and have no operational or reasonably certain habitat projects.

d. Whether NEB is being met by projects categorized as either operational or reasonably certain to become operational.

Assessment of Net Ecological Benefit

NEB is a new term used in the Streamflow Restoration law and interpreted by Ecology for planning groups. Active discussion continues around how to estimate NEB, and the Partnership expects this discussion to be ongoing during implementation and adaptive management for this Addendum. The following approach is envisioned for assessing NEB through implementation and adaptive management of this Watershed Plan Addendum:

1. For each project in this Addendum, the project sponsor will identify the element(s) of the project that are expected to contribute to NEB, the timelines and goals associated with those elements, and the metrics for determining whether the project is achieving the predicted contribution to NEB.

2. For each project, a description of the element(s) predicted to produce ecological benefits, project timelines and goals, and the metrics used to assess benefits will be included in the project description made publicly available on the Salmon Recovery Portal.

3. At 5-year reviews, each project will be evaluated for progress of NEB contributions:

    a. Are elements(s) of the project that were expected to produce environmental improvements in place, or reasonably certain to occur?

    b. What specific elements of projects have been implemented to produce environmental benefits?

4. For each project, the results of the analysis described above will be included in the brief progress report prepared by the Partnership.

5. If projects are not providing, or are not reasonably certain to provide, the expected contribution to NEB, the resulting deficits in environmental benefit will inform future project priorities and designs, and ongoing project maintenance.

Five-Year Implementation Progress Reviews

The Partnership will prepare brief progress reports at the five-year intervals, including information on updated estimated water use, actual number of new wells, and the estimated quantities of offset water/other environmental benefits generated. **The Partnership recommends that this assessment informs Ecology Streamflow Restoration Grant funding criteria for awarding streamflow restoration**

funding in future application rounds. Preference for funding of new projects is to be given to projects in areas where offset water has not sufficiently offset permit-exempt water use.

This progress review will include cost information as follows:

1. The amount of funds awarded to projects proposed to offset new domestic consumptive water uses under RCW 90.94 for the Chehalis Basin.

2. Estimated costs of additional, still unfunded planned projects in this Addendum.

3. Estimated administrative costs associated with the remaining implementation of RCW 90.94.020.

8.6 Resources Needed for Implementation and Adaptive Management

The Partnership does not have dedicated funding and will need permanent, stable, administrative support to coordinate the tasks described above. The Partnership recommends that the state Legislature provide funding to support administrative functions of the Partnership and to facilitate the implementation and monitoring of this plan addendum (including tracking of new permit-exempt wells and project implementation by subbasin). Very importantly, the cost estimates for project implementation needs to enable the Plan Addendum to meet NEB should be provided by the legislature as currently the statewide Streamflow Restoration grant program is clearly underfunded to keep implementation on track.

Furthermore, the Partnership recommends that the state Legislature fund Ecology and the Partnership to develop a process consistent with the approach described above to adaptively manage the implementation of this plan addendum.

In the interim, the Partnership requests that well fees collected in WRIAs 22/23 be directed to Grays Harbor County as fiscal agent to fund the watershed coordinator position, costs related to Partnership meetings and coordination, and the preparation of the recurring 5-year progress review. The Partnership is a valued organization by its member groups; it has a history of meeting monthly and would like to continue to do so.

The Partnership understands that a local financial or in-kind match demonstrates member commitment to the value of a strong watershed-based organization to facilitate shared efforts and obligations. Informal polling suggests that member organizations prefer flexible support options for any local match, including in-kind contributions (such as providing meeting space). Member contributions would likely be voluntary and scaled to the size and capabilities of member organizations.

Time commitment is also needed from Partnership members to shepherd this Addendum through success. While the Partnership hopes to continue meeting monthly, a minimum commitment for members to participate in semi-annual plan implementation status oversight meetings is envisioned.

Without financial support from the State, it will be tenuous for the Partnership to adequately track, promote, and adaptively manage implementation. In that scenario, project sponsor entities will continue to pursue state grants on an individual basis, but there is no certainty that projects that are highest value and are a priority in this Addendum will go forward for funding. There will also be a lost opportunity for leveraging funding from multiple sources to implement priority projects in the plan and to adapt to improve projects as new science becomes available.

9 REFERENCES

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