



MEETING SUMMARY

WRIA 15 Watershed Restoration and Enhancement

Committee Meeting

September 5, 2019 | 9:30 a.m.-12:30p.m. | [WRIA 15 Committee Webpage](#)

Location

Kitsap County
619 Division Street
Port Orchard, WA

Committee Chair

Stacy Vynne McKinstry
Svyn461@ecy.wa.gov
(425) 649-7114

Handouts

Agenda
Kitsap County Heat Map

Attendance

Committee Representatives and Alternates *

David Winfrey (*Puyallup Tribe*)
Nathan Daniel (*Great Peninsula Conservancy*)
Stacy Vynne McKinstry (*WA Dept of Ecology*)
Greg Rabourn (*King County*)
Dave Nash (*alternate*) (*Kitsap County*)
Sam Phillips (*Port Gamble S'Klallam Tribe*)
Teresa Smith (*City of Bremerton*)
Mike Michael (*City of Bainbridge Island*)
Dave Ward (*Kitsap County*)
Jacki Brown (*City of Port Orchard*)
Larry Boltz (*ex officio*) (*Mason-Kitsap Farm Bureau*)

Brienn Ellis (*City of Gig Harbor*)
Josie Cummings (*Building Industry Association of Washington*)
Alison O'Sullivan (*alternate*) (*Suquamish Tribe*)
Leonard Forsman (*Suquamish Tribe*)
Joel Purdy (*Kitsap Public Utility District*)
Dana Sarff (*alternate*) (*Skokomish Tribe*)
Joy Garitone (*Kitsap Conservation District*)
Randy Neatherlin (*Mason County*)
Paul Pickett (*alternate*) (*Squaxin Island Tribe*)
Austin Jennings (*alternate*) (*Pierce County*)
John O'Leary (*alternate*) (*Suquamish Tribe*)

Committee Representatives Not In Attendance*

Washington Water Service (*ex officio*)
City of Poulsbo

Other Attendees

Susan Gulick (*Sound Resolutions, Facilitator*)
Paulina Levy (*WA Dept of Ecology*)

Jimmy Kralj (*ESA, Information Manager*)
Chad Wiseman (*HDR*)

*Attendees list is based on sign-in sheet.

Meeting Agenda and Meeting Summary

Susan reviewed the agenda.
No revisions to the agenda.

Susan acknowledged minor revisions to the August meeting summary, including editorial and additions to some of the discussions. No concerns were shared with the revised version. Ecology will post the final meeting summary on the committee webpage.

No further refinements to the meeting summary provided.

Updates and Announcements

Stacy provided updates from Ecology.

- Brienn Ellis is the new primary representative from Gig Harbor.
- Paulina Levy recently started with Ecology and will support the Water Resources Program.
- The public comment period for the draft Streamflow Restoration Funding grant guidance closes September 8. Ecology anticipates issuing final guidance in October and opening the application period in 2020.
- Stacy met with West Sound Partners for Ecosystem Recovery (WSPER) about engagement in the project selection process.
 - They are hosting an ecosystem recovery fair on October 12 for citizens to learn about West Sound ecosystem recovery. More information and registration available: <https://www.eventbrite.com/e/west-sound-ecosystem-fair-tickets-68353706777>
 - Space is available for committee members/organizations to set up a booth. Interested committee members can contact Brittany Gordon.

Workgroup Updates

David Nash provided an update on the August 21 Technical Workgroup discussion.

- HDR presented the growth projections methods and analysis based on county information.
- Workgroup is now seeking input and feedback from other committee members.
- Squaxin Island Tribe provided a summary on the steps for different growth projection scenarios, and assumptions, and potential “buffer/safety factor” to make assumptions more conservative.
- Some committee members expressed interest in a detailed walkthrough of the growth projection data and heat map with HDR staff. Stacy will work with HDR and interested members to schedule.
- Some committee members would like to see an overlay of the heat map and a map of historical wells (similar to one shown to WRIA 12).
- Committee members raised the need for refinement of the heat map as projections may be inflated for some areas and not represent what is likely to occur. not reflect real potential.
- For consumptive use, the workgroup will need to review potential assumptions. The workgroup discussed ensuring that any application of a safety factor is based in reality.

Commented [VMSJ(1)]: Note that we are trying to move away from the term “buffer” since that is used in the case of riparian buffers and instead use the term “safety factor”.

Commented [VMSJ(2)]: Removed this reference since most members of the committee do not participate in WRIA 12.

Stacy provided an update on the WRIA-Wide Project Subgroup. Members of the subgroup are looking at project ideas across the WRIA. HDR and Ecology are looking at existing projects lists to identify potential streamflow components; Kitsap County is talking with the public works department; and KPUD is looking at opportunities for streamflow augmentation, storage and reclaimed water. The subgroup discussed the importance of having a “live” project list that committee members can access at any time.

Paul Pickett provided an update on the South Sound Subgroup. The group discussed some specific project opportunities (e.g. Port Orchard Airport) as well as some general project types to consider across the area. Great Peninsula Conservancy owns some properties that could lend themselves to a natural storage project (e.g. floodplain reconnection or Beaver Dam Analog). The group discussed concerns and opportunities associated with beaver ~~ponds~~ management. Kitsap Conservation District offered to provide support for local landowner outreach on beavers.

The West Kitsap, North Kitsap and Vason-Maury subgroups will meet in mid-September.

A concern was raised about consistency between the screening criteria HDR is working on and the grant scoring criteria. Chad from HDR noted that they are working on the screening criteria and trying to align

them. Stacy noted that the grant program is statewide, but the Plan will focus on what's good for the watershed, so they may differ.

The committee discussed the best approach for reviewing and approving projects. The project workgroup will brief the committee regularly with short summaries of project ideas and status (time for this will be allocated on each committee agenda). The project workgroup will also have dedicated meetings for diving deep into project details. Stacy will bring a proposed schedule forward to the next committee meeting. Committee members requested Ecology develop a one page summary of the project needs that can be shared with partners to generate ideas.

The committee discussed the need for clarity on the role of the project subgroups, workgroup and the role of HDR in developing and reviewing projects. Stacy will develop a proposal for the next project workgroup meeting. The committee requested the project workgroup think large scale about the types of projects needed for WRIA 15 (e.g. storage, etc.).

Net Ecological Benefit Guidance and Plan Components

Stacy provided an overview presentation on the final net ecological benefit guidance, which was released on July 31. Stacy provided an overview of the components of the plan, based on the legislation and NEB guidance.

Reference Material

- NEB Presentation (on committee webpage—link is at the beginning of this document)
- Final NEB Guidance (<https://fortress.wa.gov/ecy/publications/documents/1911079.pdf>)

Discussion

- Committee members raised questions about inclusion of the Foster pilot projects in the plan. Stacy will bring an answer to the committee.
- Committee members discussed whether there is a prioritization of wild vs hatchery fish and that the NEB guidance is not explicit on this topic. The committee will need to discuss and determine if they want to prioritize certain areas or projects that benefit different fish populations.
- The committee will need projects that offset water use as well as projects that help improve streams for fish. Projects in the same place as the projected impact are not required, but are a higher priority. The committee will need to determine what types of projects and what locations make the most sense for meeting the needs of this watershed.
- The Squaxin Island Tribe reminded the group that, because of Tribal treaty rights, the plan will need to be good for fish. The Tribe is concerned that Although Ecology says the just meeting the required minimum is all that's required for offsets and NEB is, it won't be not enough – they plan needs to provide broader benefits.
- The committee has differing opinions on whether the plan should meet the minimum requirements or go “above and beyond”. The committee needs to keep in mind the limited time and resources for completing the plan as well as the need for all members of the committee to approve the plan.
- A timeline of plan elements was presented. Members of the committee recognize that adaptive management will be a necessary component to ensure implementation and effectiveness. However it was noted that adaptive management would need to be part of a broader implementation strategy.

Growth Projections

Chad Wiseman from HDR presented on the growth and permit exempt well projection methodologies used for each county as well as alternative scenarios to consider in developing a range for projections.

Reference Material

- Growth Projections presentation (on committee webpage)
- Kitsap County heat map (on committee webpage)

Discussion

- The committee discussed whether the historical growth pattern was expected to continue into the future. There is interest from some committee members on seeing multiple scenarios in order to see the range of potential growth.
- Some committee members expressed concern about a deviation from the workflow and what was agreed upon for the growth projections process.
- Counties expressed that there are safety factors/margins of error already included in the growth projections. These are the numbers that they are managing towards.
- Concern was expressed by counties about deviating from the OFM numbers which are used in comprehensive planning (e.g. using a “low” and “high” OFM growth scenario). County electeds would unlikely be able to support a plan that alters the established county method for estimating growth.
- Some committee members expressed the need to ensure HDR has enough time for project development and not to spend too much time on growth projections.
- It was also noted that some committee members feel that a high growth estimate helps to ensure that the plan is robust and that projects are more than adequate.
- Committee members expressed a desire to refine the permit-exempt well projections based on local knowledge (e.g. especially for Bainbridge Island). HDR and the counties will work with jurisdictions and partners to make refinements.
- The committee recognized that consumptive use will have a large influence on the amount of water that needs to be offset as well.
- A question was posed about what happens if we cannot come to agreement on the method to move forward and how to direct the work of the technical consultants. We need to aim to get to agreement, and Ecology will need to decide what work is needed to get there.
- Stacy will share the population and well projections in spreadsheet form.
- There was a question about how the operating principles apply if there is disagreement. The operating principles discuss reaching consensus, so Ecology will need to determine what is necessary to get to consensus. Stacy noted that the technical workgroup will pick up the conversation on a path forward and decisions would be made at a future meeting.

Commented [VMSJ(3)]: Provided clarification

Public Comment

No public present.

Action Items for Committee Members

- Next meeting: October 3, Kitsap County Commissioner’s Chambers, Port Orchard.
- Technical workgroup will meet in September to identify a path forward for growth projections and begin discussions on consumptive use.
- Project workgroup will meet in October to discuss project development roles (HDR, workgroup, and committee), big picture project types, and project criteria.
- Provide input on permit exempt well projection refinement to counties or Stacy.

Action Items for Ecology and Consultants

- Ecology will work with the consultant to provide access to GIS layers from webmap. (carryover from June)
- Ecology will respond to questions regarding offset “credits” for different projects. (carryover from June)
- Ecology will distribute documents shared by committee members via Box once available. (carryover from June)
- Ecology will develop a proposal for the 2020 meeting schedule.
- Ecology will develop a 1 pager on projects for partners.
- The consultant will distribute population growth heat maps for King and Kitsap counties once available. They will also look into posting heat maps on their webmap application.
- Ecology will distribute the detailed growth projection and consumptive use spreadsheets.
- HDR and the counties will work with jurisdictions and partners to make refinements to well projections.
- Ecology will work with HDR and interested members to schedule a deep dive into growth projection and well data.
- Ecology will work with the project workgroup to discuss the different roles for project identification and development.

Discussion Guide: Climate Change Considerations for Watershed Planning Under RCW 90.94

V13September2019

Purpose of Discussion

This document provides considerations for the committee's discussion on whether or not to include climate change considerations in the planning process; and if a committee chooses to do so, some initial ideas on approaches.

What is Required?

Chapter 90.94.030 RCW does not require Ecology or WRE Committees to consider climate change in the planning process. Likewise, the Final Guidance on Net Ecological Benefit Determination (GUIDE-2094) released by Ecology to inform the planning process on how plans will be evaluated, does not address or require climate change.

Why might a WRE Committee consider climate change in their planning process?

Climate change will have impacts on our watersheds and water systems, which could have implications for the elements considered in our planning process: water use, consumptive water use, streamflow and process success. Considerations for climate change may support a plan that is more robust and resilient to changing conditions – whether climate related or other influences.

Background and Context

Washington State, including watersheds that are completing watershed planning under chapter 90.94.030 RCW, are facing a future climate that does not resemble historic patterns, as described by the University of Washington's Climate Impacts Group and the National Climate Assessment. Climate change is projected to enhance extreme conditions, with prolonged and more frequent drought in summer and more and heavier rains in winters.¹ The Northwest and Washington State will experience reduced snowpack, increased stream temperatures and changing ocean conditions.² These changing conditions are a significant concern for all aspects of streamflow restoration planning. The extent and frequency of flooding is projected to increase in the future, resulting in higher flood risks to human communities and further impacts to salmon populations.³ Projected lower summer flows may cause warmer water temperatures that exceed the thermal threshold for salmon.⁴ Projected shifts in temperature and precipitation regimes are likely to compound existing stressors on habitats and salmon populations.⁵ Many planning processes across the Puget Sound region are considering climate projections as they plan for management of natural resources in the future (e.g. Floodplain by Designs

¹ [Impacts, Risks, and Adaptation in the United States: The Fourth National Climate Assessment, Volume II](https://nca2018.globalchange.gov/chapter/24/) (2018) <https://nca2018.globalchange.gov/chapter/24/>

² [Impacts, Risks, and Adaptation in the United States: The Fourth National Climate Assessment, Volume II](https://nca2018.globalchange.gov/chapter/24/) (2018) <https://nca2018.globalchange.gov/chapter/24/>

³ [The Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate](#) (2009) (Climate Impacts Group)

⁴ [The Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate](#) (2009) (Climate Impacts Group, cig.uw.edu)

⁵ [The Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate](#) (2009) (Climate Impacts Group, cig.uw.edu)

funding program, Hood Canal Coordinating Council, Snohomish Forum, Local Integrating Organizations, Nooksack Indian Tribe, and many others). Many project proponents are considering how to ensure their projects are more resilient in a changing climate system (e.g. Washington Sea Grant's Coastal Resilience Project, Puget Sound Partnership's Chinook Salmon Projects and Climate Change guidance for lead entities).

Considerations for the Committee

The WRE Committee will need to determine if they want to include climate change considerations in the plan. If so, there are many options or considerations for climate change inclusions. The ideas described below are a starting point for committee discussion.

- Overall Planning Process
 - Committees could review State of Knowledge: Climate Change in Puget Sound, Climate Change Impacts and Adaptation in Washington State, and any local assessments or projections for considerations throughout the planning process. For instance, a “climate safety factor” could be applied throughout the technical components of the plan that adds additional protection or resiliency to unknown future conditions.
 - Review how water system plans are considering climate change.
 - Request a localized climate assessment and / or presentation from the Climate Impacts Group to help support further discussion and considerations.
- Consumptive Use
 - Consider an assumption of increased water use/consumptive use during warmer summers.
- Projects and Actions
 - Recognize that water timing may shift (e.g. flashier systems, more water in the winter, change from snow-dominant to rain-dominant or mixed system).
 - Consider a criteria that evaluates whether projects are resilient to changing systems (wetter winters, drier summers, flashier systems).
 - Consider restrictions on summer watering when flows are lowest.
 - Identify projects that take advantage of changing future conditions (e.g. storage of water during the wetter winters) and that focus on the timing of water availability.
 - Provide a safety factor on the amount of offset to ensure we overshoot consumptive use estimates.

Questions for committee discussion

- Does the committee want to consider climate change in the planning process?
 - If you are unsure, what additional information do you need to make a decision on whether or not to consider climate change?
- If the committee wants to consider climate change, are there specific components of the plan or the process you are particularly concerned about? (See the list above for possible considerations for the committee).
 - Does the committee or members of the committee have the required expertise and resources to address these considerations? If not, do you have suggestions on how to address this?

Pierce County PE Well Growth Projections

Subbasin	Total Number Wells Added in Period			Average Annual Number Wells Added in Period			Annual Growth of Wells Over Entire Period			Projected 2038 Total Number Wells		
	1999-2008	2009-2018	1999-2018	1999-2008	2009-2018	1999-2018	1999-2008	2009-2018	1999-2018	Based on 1999-2008 Growth Rates	Based on 2009-2018 Growth Rates	Based on 1999-2018 Growth Rates
McNeil Island, Anderson Island, Ketron Island	25	10	36	3	1	2	2.1%	0.7%	1.4%	56	22	38
South Sound	612	271	893	68	30	47	3.8%	1.3%	2.6%	1,360	602	940
Totals	637	281	929	71	31	49	3.7%	1.2%	2.6%	1,416	624	978

Mason County PE Well Growth Projection

Subbasin	UGA Connections	Rural Connections	Projected Total Connections
Hood Canal	295	770	1,065
South Sound	177	47	224
Total	472	817	1,289

Kitsap County PE Growth Projections

Subbasin	Projected Total Connections	Plus 5%	Minus 5%
Bainbridge Island	489	513	465
Hood Canal	1,133	1190	1076
South Sound	714	750	678
West Sound	2,286	2400	2172
Total	4,622	4853	4391

King County PE Well Growth Projection

Subbasin	Projected Total Connections
Vashon – Maury Island	368
Total	368

Summary of Projected Growth in Permit Exempt Wells in WRIA 15

Subbasin	Projected Total Connections					Higher Estimate	Lower Estimate
	Kitsap	Pierce	Mason	King	Totals		
West Sound	2,286				2,286	2,400	2,172
Hood Canal	1,133		1,065		2,198	2,255 (1,190+1,065)	2,141 (1,076+1,065)
Bainbridge Island	489				489	513	465
South Sound	714	940	224		1,878	2,110 (750+1,360)	1,280 (678+602)
Vashon – Maury Island				368	368	368	368
McNeil Island, Anderson Island, Ketron Island		38			38	56	22
Totals	4,622	978	1,289	368	7,257	7,702	6,448

Technical Memorandum DRAFT

WRE Committees Technical Support



To: Angela Johnson, Washington State Department of Ecology
From: Dan Graves, HDR
Copy: Chad Wiseman, HDR
Date: September 18, 2019
Subject: Consumptive Use Analytical Methods Technical Memorandum
(Work Assignment 2, Task 2)

1.0 Introduction

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

Under RCW 90.94 consumptive water use by permit-exempt (PE) domestic wells must be estimated to establish the water use that watershed restoration plans and plan updates are required to address and offset. Consumptive use is water that evaporates, transpires, is consumed by humans, or otherwise removed from an immediate water environment. Consumptive use estimates have two components, the indoor and outdoor portions of use. The use patterns and consumptive portions of indoor versus outdoor use associated with PE wells are different; therefore, separate approaches are used to estimate these two components of consumptive use.

Ecology has provided recommended guidance for estimating consumptive water use (Ecology 2018). This memorandum outlines the method recommended by Ecology (Section 2.0) and a second method using Water System data to estimate indoor and outdoor consumptive use by permit-exempt well connection (Section 3.0). WRE Committees may select additional methods for estimating consumptive use.

2.0 Department of Ecology Guidance Method

Consumptive use may be calculated by following Ecology's recommended method (Ecology 2018).

2.1 Indoor Consumptive Use – Ecology Method

Ecology Publication 18-11-007 recommends the following assumptions for estimating indoor consumptive water use:

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

- Most homes served by a PE well use septic systems for wastewater. This method assumes 10 percent of water entering the septic system will evaporate out of the septic drain field and the rest will be returned to the groundwater system.

The above assumptions are used to estimate consumptive water use by occupants of a single dwelling unit. Assuming that there is one PE well connection per dwelling unit, a “per PE well connection” consumptive use factor will be applied to the growth projections forecast in each subbasin to determine total indoor consumptive use per subbasin.

2.2 Outdoor Consumptive Use – Ecology Method

The Ecology method of estimating future outdoor water use is based on an estimate of the average outdoor watering area for existing homes served by PE domestic wells. To calculate the consumptive portion of total outdoor water required per parcel/connection over a single growing season, Ecology recommends:

- estimating the average irrigated lawn area (pasture/turf grass) per parcel in each WRIA;
- applying crop irrigation requirements;
- correcting for application efficiency (75 percent efficiency recommended by Ecology guidance) to determine the total outdoor water required over a single growing season; and
- applying a percentage of outdoor water that is assumed to be consumptive (i.e., 80 percent outdoor consumptive use recommended).

Variables used in this analysis can be adjusted based on WRE Committee input.

2.2.2 Estimation of Average Irrigated Area per Connection

HDR will conduct an average irrigable area analysis for each WRIA to account for the variability in average size of irrigated area among parcels in each WRIA. The analysis will include 80 parcels identified as containing a dwelling unit served by a PE well per WRIA. To select the 80 parcels in each WRIA, a “selection pool” of all candidate parcels will be developed. The final 80 will be determined from the selection pool as described below.

2.2.3 Parcel Selection Pool

HDR will populate the selection pool using two methods, depending on available data indicating whether a dwelling unit on a parcel is served with a PE well: direct selection and indirect selection.

Direct Selection: Pierce, Thurston, and King Counties provided geospatial datasets containing individual domestic well locations. These points will be joined to their respective County parcel dataset to isolate the parcels known to be served by a PE well.

Indirect Selection: For Counties that do not have an adequate individual well database, parcels containing a single family domestic dwelling unit, located outside of water system service areas, are assumed to be served by a PE well and added to the selection pool.

Once specific parcels in each County are added to the selection pool, a new parcel dataset for each WRIA will be developed to represent the selection pool in the WRIA frame of reference.

2.2.4 Parcel Selection

Differing socioeconomic landscapes within and between the WRIAs is a key factor influencing variance in the average irrigable area per dwelling unit. HDR will analyze the range and distribution

of property values throughout each WRIA and randomly select 80 parcels representative of the distribution pattern of property values.

2.2.5 Parcel Analysis

A maximum of two technician(s) will conduct the irrigated area analysis to minimize bias. The technician(s) will delineate irrigated lawn areas on each selected parcel using GoogleEarth aerial imagery taken during drier summer months (i.e., July and August). Unirrigated lawns (pasture/turf) go dormant in the dry summer months and turn brown. Areas that remain green in the summer imagery will be considered irrigated. To aid in this determination, aerial imagery from winter months will be reviewed alongside summer imagery to reveal which lawn areas change from green to brown. Those areas that do not change color, or moderately change color but remain green, will be considered irrigated. Additionally, the technician(s) will review imagery across multiple years (where available) to further corroborate the irrigated area delineation.

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

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

Upon completion of analysis for 80 parcels, irrigated area will be averaged per subbasin to determine the average irrigated area that will be used in the outdoor consumptive use analysis.

2.2.6 Method Confirmation

HDR will conduct the lawn area irrigation method on all parcels containing single family households within one metered group B water system in each WRIA. This will be performed to compare to results using the methodology described above to estimate outdoor water use.

2.2.7 Irrigation Requirements and Application Efficiency

Once average irrigable acreage per connection is determined for a WRIA, water use will be calculated based on irrigation requirements and application efficiency. Crop irrigation requirements will be estimated for pasture/turf grass from nearby stations as provided in the Washington Irrigation Guide (NRCS-USDA, 1997). An irrigation application efficiency will be applied to account for water that does not reach the turf. Ecology (2018) recommends using a 75 percent application efficiency factor. The consumptive portion of total amount of water used for outdoor use will then assumed to be 80 percent of the total.

3.0 Water System Consumption Data Method

Consumptive use by PE wells and connections may also be estimated using metered connections from water systems. Water systems required to plan per WAC 246-290 must install meters on all customer connections. Smaller water systems that do not have state planning requirements may choose to meter their customer connections if the system bills on a tiered rate structure (i.e., increasing costs per unit of water consumed coincident with higher total use in the billing period).

Some systems bill customers a flat rate (i.e., same bill every month regardless of consumption). The lack of a tiered rate structure reduces the financial incentive to conserve water, which may result in consumption patterns more similar to those observed on a PE well. These systems may or may not choose to meter their customers if meters are not required by law.

3.1 System Selection

Use of data from water systems that measure consumption but bill on a flat rate are preferable for estimating the water use of a PE well. HDR requested water system recommendations from WRE Workgroups and contacted multiple water systems to acquire data. Water system names or data that were provided by WRIA workgroup members include:

WRIA 10: Kapowsin (Pierce County, managed by Valley Water District)

WRIA 12: Spanaway Water District

WRIA 13: Prairie Ridge (Thurston PUD)

WRIA 14: All Mason PUD data

WRIA 15: All Kitsap PUD data combined into a single analysis

3.2 Methodology – Water System Data

3.2.1 Indoor Use

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

3.2.2 Annual Outdoor Water Use

Average daily indoor use will be multiplied by the number of days in a year to estimate total annual indoor use. Total annual indoor use will be subtracted from total annual use by a water system to estimate total annual outdoor use. An 80 percent consumptive factor (or as otherwise decided upon by the WRE Committee) will be applied to determine the consumptive portion of outdoor use.

3.2.3 Seasonal Outdoor Water Use

Additionally, outdoor consumptive use was estimated on a seasonal basis. The Washington Irrigation Guide reports irrigation requirements between the months of April and September for all weather stations representative of WRIAs 10, 12, 13, 14 and 15, therefore the seasonal outdoor water use was assumed to occur over a period of six months. Average daily indoor use is multiplied by the number of days in the irrigation season to calculate total indoor use for the irrigation season.

Total irrigation season indoor use is subtracted from total season use to determine total outdoor use for the irrigation season. An 80 percent consumptive factor (or as otherwise decided upon by the WRE Committee) will be applied to determine the consumptive portion of outdoor use.

3.3 Additional Data

Kitsap PUD noted a 2014 USGS study by Welch, Frans, and Olsen titled *Hydrogeologic Framework, Groundwater Movement and Water Budget of the Kitsap Peninsula, West-Central Washington*. This study included a survey of consumption from select water utilities, and differentiated between the indoor and outdoor portions of use. Kitsap PUD used these estimates of indoor and outdoor use to develop an additional estimate of consumptive use per PE well connection in WRIA 15.

Ecology contracted with a consultant to conduct an exempt well metering program in 2012–2013 (Einberger et al 2014). The study provides information about the parcels included in the study, including summaries of average annual indoor and outdoor daily use per property. The results of this study can be compared to the results of the various water system analyses to determine if rate structures have a significant impact on water use, and if a correction factor is needed for systems that bill on a tiered rate.

4.0 Sources

DeOreo, W., Mayer, P., Dziegielewski, B., Kiefer, J. 2016. *Residential End Uses of Water, Version 2*. Water Research Foundation, Report #4309b.

Dunn, A. B. and A. Neff., 2018. *Potential Consumptive Use Impacts of Domestic Groundwater Permit-Exempt Wells Over the Next 20 Years in WRIA 1 – Version 2 Technical Memorandum*. RH2 Engineering.

Ecology. 2018. *Recommendations for Water Use Estimates*. Washington State Department of Ecology, Publication 18-11-007.

Einberger, C., C. Pitre, and D. Banton, D. 2014. *Skagit County Exempt Well Metering Program – 2012-2013 Technical Memorandum*. Washington State Department of Ecology.

Natural Resource Conservation Service, 1997. Washington Irrigation Guide (WAIG). U.S. Department of Agriculture.

Welch, W.B, L.M. Frans, and T.D. Olsen. 2014. *Hydrogeologic Framework, Groundwater Movement and Water Budget of the Kitsap Peninsula, West-Central Washington*, Scientific Investigation Report 2014-5106.

Appendix A

Proposed Irrigated Area Estimation Method

Preliminary Analysis - Methodology and Results (9/18/2019)

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

The following examples illustrate example delineations.



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



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



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



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

Next Steps

1. Upon Ecology approval of methodology and delineation protocol, HDR will expand the parcel selection to the 80 proposed parcels for each WRIA, and conduct the full analysis, which will result in the final irrigated area estimation for each WRIA.
2. The Google Earth polygons will be imported (KMZ) into GIS, where acreages and summary statistics for the irrigated areas will be calculated.

Consumptive Use Calculator for WRIA 15 - Preliminary, Updated September 25, 2019

Instructions: the variables in the box can be changed to see the sensitivity of the Annual CU estimates to inputs of water use, irrigated area and irrigation demand

Consumptive Use Calculation Using Water System Data (see water use data tab)

Average annual indoor use	49	gallons/day/capita (from metered water system data)
Average annual outdoor use	26	gallons/day/capita (from metered water system data)
Indoor loss	10%	default is 10% (Ecology recommendation)
Outdoor loss	80%	default is 80% (Ecology recommendation)
People per household	2.5	varies by county, usually 2.5
Total Consumptive Use	64.25	gallons/day/new PE well
	0.071974147	acre-feet/year/new PE well
	0.044618056	annual average gpm/new PE well
	9.95939E-05	annual average cfs/new PE well

Consumptive Use Calculation Using USGS Data

Average annual indoor use	66	gallons/day/capita
Average annual outdoor use	26	gallons/day/capita
Indoor loss	10%	default is 10%
Outdoor loss	90%	USGS used 90%
People per household	2.5	varies by county, usually 2.5
Total Consumptive Use	75	gallons/day/new PE well
	0.084016514	acre-feet/year/new PE well
	0.052083333	annual average gpm/new PE well
	0.000116257	annual average cfs/new PE well

Consumptive Use Method Using Estimate of Landscape Area for new PE wells (Ecology Method)

Average Irrigation Requirement	18	inches/year (see WAIG tab)
Average Landscape Area/lot	0.1	acres (will be estimated using GIS)
Irrigation Efficiency	75%	%, default is 75%
Outdoor consumptive Use %	80%	%, default is 80%
Indoor use	60	gallons per day per capita, default is 60
Indoor consumptive use %	10%	%, default is 10%
Number people/household	2.5	people - default is 2.5, can vary by county
Total consumptive use:	157.8	gallons/day/new PE well
	0.176758494	acre-feet/new PE well
	0.109572167	annual average gpm/new PE well
	0.000244581	annual average cfs/new PE well

Annual Consumptive Use Estimates for WRIA 15

Subbasin	Projected No. PE Wells (See PE Growth tab)	Annual CU Using Water System Data			Annual CU Using USGS Estimates			Annual CU Using Irrigation Estimates		
		Ac-ft	gpm	cfs	Ac-ft	gpm	cfs	Ac-ft	gpm	cfs
West Sound	2286	164.5	102.0	0.23	192.1	119.1	0.27	404.1	250.5	0.56
Hood Canal	2198	158.2	98.1	0.22	184.7	114.5	0.26	388.5	240.8	0.54
Bainbridge Island	489	35.2	21.8	0.05	41.1	25.5	0.06	86.4	53.6	0.12
South Sound	1878	135.2	83.8	0.19	157.8	97.8	0.22	332.0	205.8	0.46
Vashon – Maury Island	368	26.5	16.4	0.04	30.9	19.2	0.04	65.0	40.3	0.09
McNeil Island, Anderson Island, Ketron Island	38	2.7	1.7	0.00	3.2	2.0	0.00	6.7	4.2	0.01
Totals	7257	522.3	323.8	0.7	609.7	378.0	0.8	1282.7	795.2	1.8

Annual Consumptive Use Estimates for WRIA 15 - Higher PE Growth Projection

Subbasin	Projected No. PE Wells (See PE Growth tab)	Annual CU Using Water System Data			Annual CU Using USGS Estimates			Annual CU Using Irrigation Estimates		
		Ac-ft	gpm	cfs	Ac-ft	gpm	cfs	Ac-ft	gpm	cfs
West Sound	2400	172.7	107.1	0.24	201.6	125.0	0.28	424.2	263.0	0.59
Hood Canal	2255	162.3	100.6	0.22	189.5	117.4	0.26	398.6	247.1	0.55
Bainbridge Island	513	36.9	22.9	0.05	43.1	26.7	0.06	90.7	56.2	0.13
South Sound	2110	151.9	94.1	0.21	177.3	109.9	0.25	373.0	231.2	0.52
Vashon – Maury Island	368	26.5	16.4	0.04	30.9	19.2	0.04	65.0	40.3	0.09
McNeil Island, Anderson Island, Ketron Island	56	4.0	2.5	0.01	4.7	2.9	0.01	9.9	6.1	0.01
Totals	7702	554.3	343.6	0.8	647.1	401.1	0.9	1361.4	843.9	1.9

Annual Consumptive Use Estimates for WRIA 15 - Lower PE Growth Projection

Subbasin	Projected No. PE Wells (See PE Growth tab)	Annual CU Using Water System Data			Annual CU Using USGS Estimates			Annual CU Using Irrigation Estimates		
		Ac-ft	gpm	cfs	Ac-ft	gpm	cfs	Ac-ft	gpm	cfs
West Sound	2172	156.3	96.9	0.22	182.5	113.1	0.25	383.9	238.0	0.53
Hood Canal	2141	154.1	95.5	0.21	179.9	111.5	0.25	378.4	234.6	0.52
Bainbridge Island	465	33.5	20.7	0.05	39.1	24.2	0.05	82.2	51.0	0.11
South Sound	1280	92.1	57.1	0.13	107.5	66.7	0.15	226.3	140.3	0.31
Vashon – Maury Island	368	26.5	16.4	0.04	30.9	19.2	0.04	65.0	40.3	0.09
McNeil Island, Anderson Island, Ketron Island	22	1.6	1.0	0.00	1.8	1.1	0.00	3.9	2.4	0.01
Totals	6448	464.1	287.7	0.6	541.7	335.8	0.7	1139.7	706.5	1.6

Note: Highlighted areas are user-defined input to consumptive use calculations. Modify the input to see the sensitivity of the Annual Consumptive Use estimates to inputs of indoor and outdoor demand.

Washington Irrigation Guide
Net Irrigation Requirements for Lawn/Pasture

Location	Annual Precip (inches)	May-Sept Precip (inches)	Net Irrigation Requirement (Inches)
Bremerton	50.4	7.4	16.04
Grapeview	52.3	7.9	16.62
Shelton	65.6	8.6	16.06
Sea-Tac	38.6	7	17.25
Seattle	35.5	7	18.1

Source: Washington Irrigation Guide 1985

Poulsbo Station - AgWeather Net Data
Irrigation Requirements for Lawn/Pasture

Year	Precipitation from April 18 - Oct 18, inches	ET, inches
2013	11.8	22.7
2014	11.2	21.7
2015	6.3	22.9
2016	12.6	20.5
2017	8.6	21.0
2018	6.5	21.9
Ave	9.5	21.8

Station established in 2012, period of record 2012-present

Subbasin	Projected Total Connections					Higher Estimate	Lower Estimate
	Kitsap	Pierce	Mason	King	Totals		
West Sound	2,286				2,286	2,400	2,172
Hood Canal	1,133		1,065		2,198	2,255	2,141
Bainbridge Island	489				489	513	465
South Sound	714	940	224		1,878	2,110	1,280
Vashon – Maury Island				368	368	368	368
McNeil Island, Anderson Island, Ketron Island		38			38	56	22
Totals	4,622	978	1,289	368	7,257	7,702	6,448

Kitsap PUD (WRIA 15)

	Group A		Group B	
	Indoor (GPD/HH)	Outdoor (GPD/HH)	Indoor (GPD/HH)	Outdoor (GPD/HH)
2017	125	73	123	55
2018	126	74	113	53
Average	126	73	118	54

Note: HH = household, assume 2.5 people per household to estimate per capita use

Other (TBD)

Consulting team is currently acquiring and analyzing water use from other systems in Mason and Pierce counties

Average of Water System Data

	Indoor (gpd/HH)	Outdoor (gpd/HH)	Indoor per capita (gpd)	Outdoor per capita (gpd)
Kitsap PUD	122	64	48.8	25.6
Mason County	tbd	tbd		
Pierce County	tbd	tbd		

USGS Groundwater Study

Indoor Use = 66 gpd/capita

Outdoor Use = 26 gpd/capita

Use 10% indoor and 90% outdoor consumptive use

Discussion Guide: Adaptive Management

Purpose of Discussion

The purpose of this discussion is to introduce the committee to the concept of adaptive management and begin the dialogue of how adaptive management should be addressed in the WRE plan for WRIA 15. This discussion is intended as an initial discussion to frame up options to bring back to the committee for further discussion in the spring.

Background and Context

The NEB Guidance defines Adaptive Management as follows: 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. (pg. 4)

The Guidance also states:

Planning groups may want to consider adaptive management. An adaptive management component of the plan helps demonstrate the watershed planning group's intent that the plan will be implemented, thereby bolstering the plan's reasonable assurances. Ecology will not interpret adaptive management provisions in a plan as an obligation of the planning group to continue its work or for Ecology to continue to fund the planning group. (pg. 13)

In addition, the Streamflow Restoration Policy and Interpretative Statement states that planning groups may include components which they believe help ensure that projects/actions will be completed successfully (e.g. conditions to allow for adjustment of the watershed plan in the future) as an "adaptive management" element. However, Ecology cannot include statutory-defined requirements or changes that would require rulemaking as part of adaptive management. (pg. 9)

Committee should note that at this time there is no funding for adaptive management. Consideration around adaptive management in the plan should identify potential funding sources.

Options for Committee Consideration

There are many options for the committee to consider to address the broad topic of adaptive management. A few common options include those listed below and are provided to initiate a discussion with the committee. The committee will likely want to modify the approaches, add additional approaches, or mix and match to meet their needs.

- **Track number and location of permit except wells:** Identify an approach for determining whether the assumptions for amount and location of growth/PE wells are still accurate (1-year, 2-year, 5-year, 10-year intervals). Determine potential trigger points and responses to consider if assumptions are not met (e.g. sequencing or identifying additional projects in response to actual growth patterns).
- **Track and manage project implementation:** Identify an approach for determining what projects are being implemented, where they are, what funding source they are using, and whether the offset element of the project has been included. Determine if and how new projects or new types of projects can be added to the plan.
- **Effectiveness monitoring and adaptive management at the project level:**
 - Identify pilot projects or studies to determine the offset potential of certain project types (overall or in certain basins). Using a project tiering approach to manage the project list to

- add or remove projects or project types as more is understood (e.g. floodplain reconnection projects). Use common metrics to repeat and apply lessons learned across the WRIAs.
 - Determine project performance of offset projects by monitoring flows before and after installation.
 - Determine long-term project benefits (flows and habitat improvements) by tracking specific metrics over time.
- **Effectiveness monitoring and adaptive management at the sub-basin:**
 - Implement flow and groundwater monitoring to track changes as projects and wells are installed to determine overall effectiveness of the offset program
 - Implement flow monitoring across a sub-basin or WRIA to determine overall status and trends and changes to flow from additional inputs such as impervious surface, climate impacts, logging practices, etc.
- **Incorporating new science and management frameworks:**
 - Identify data gaps: climate or groundwater studies, models (e.g. VELMA), hydropower dam management, forest management or other relevant information specific to the WRIA that may be in process or planned that could improve future plan implementation or project identification. These could be prioritized or sequenced based on relevance of informing future plan implementation.
 - Develop a process and timeline for integrating new science into project selection, project construction, long-term monitoring, or other elements of the plan.

Identifying and discussing key elements of an adaptive management program that should be considered as part of a plan implementation discussion with the committee include:

- Commitments of partner governments and stakeholders
- Long-term governance structure – does the committee continue to meet? How often and with what resources?
- The roles and responsible parties in the adaptive management program; Ecology, counties, other committee members, and internal or external support (for data collection, analysis, reporting)
- Updates and communications post 2021
- Integration into ongoing local processes (e.g. salmon recovery Lead Entity, local integrating organizations, Floodplain planning, farm/fish/flood processes, etc.)
- Coordinating implementation with non-committee members (e.g. other state agencies.)
- Triggers for reconvening the committee - does the committee meet regularly or just if a certain milestone is reached? (e.g. permit exempt wells exceed more than 5% of projections)
- Funding sources for effectiveness and implementation monitoring
- Role of the committee in supporting or selecting projects or adaptive management elements to advance for funding (e.g. preparing letters of support for priority projects)

Questions for committee discussion

- What should be the committee's role in adaptive management and/or who would participate in the adaptive management process?
- What other options should be added to the list above?
- Of these options, which do you think will be most useful for inclusion in our WRE plan?
- What additional information would you like to help you discern the best approach to adaptive management?