GeoEngineers

Memorandum

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To:	Ingria Jones, Washington State Department of Ecology
From:	Bridget August and John Monahan (GeoEngineers, Inc.)
Date:	December 9, 2019
File:	00504-161-00
Subject:	WRIA 7 Growth Projections - DRAFT

INTRODUCTION

GeoEngineers, Inc. (GeoEngineers) 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) 7, 8 and 9. This memorandum provides a summary of the deliverable for Work Assignment GEO102, Task 3, WRIA 7 Growth Projections.

BACKGROUND AND CONTEXT

The Streamflow Restoration Act (SRA, Chapter 90.94 Revised Code of Washington) specifies that by June 30, 2021, Ecology must establish a WRE Committee and adopt a WRE Plan in the Snohomish Watershed (WRIA 7). The WRE Plan needs to address impacts on streamflows from consumptive use from new domestic permit-exempt wells anticipated between January 19, 2018 and January 18, 2038.

The WRE Plan must estimate growth projections for the watershed for January 2018 through January 2038 (at a minimum). Based on the projected growth, the plan will estimate the amount of rural growth and associated water use from new permit exempt well connections.

Ultimately, WRE Plan growth projections need to address the following two primary questions:

1. How many new permit-exempt domestic well connections (PE wells[1]) could be installed throughout the watershed over the next 20 years?
2. Where could the PE sourced growth occur at the subbasin level?

WRIA 7 includes parts of unincorporated King and Snohomish County and 18 incorporated cities and towns. The methods used to estimate the number and location of new wells in unincorporated and incorporated areas in WRIA 7 are summarized below.

[1] "PE wells" is used to refer to new homes associated with new permit-exempt wells and also new homes added to existing wells, including homes on group systems relying on permit-exempt wells.

GROWTH PROJECTION METHODS

GeoEngineers worked with the WRIA 7 – Snohomish WRE Committee to define growth projection methods and growth projections for WRIA 7. The WRIA 7 growth projection methods included using King and Snohomish County historical building permit and year-built data to predict potential PE well growth over the 20-year planning horizon. This methodology assumes that the rate and general location of past growth will continue over the 20-year planning horizon. Using past building permits to predict future growth is one of Ecology's recommended methods (Ecology 2019). King and Snohomish County completed their analyses in-house and the methods are described in detail in Attachments A and B, respectively, and summarized below.

GeoEngineers also completed an analysis of potential PE well growth within the incorporated and unincorporated Urban Growth Areas (UGAs) using Ecology's well log database. The methods and assumptions are also described below and GeoEngineers data tables are included in Attachment C.

In addition, King County also completed a PE Well Potential Assessment which identified potential parcels where growth could occur within rural King County. Snohomish County completed a similar assessment which they have referred to as a Rural Capacity Analysis. The PE Well Potential Assessment and Rural Capacity Analysis results were used to assess whether a subbasin (as identified by the WRE Committee) has the capacity to accommodate the number of PE wells in the 20-year growth projection. In those areas where the number of projected PE wells exceeded the potential parcels available, the wells were reallocated to the nearest subbasin with similar growth patterns and parcel capacity. The King County PE Well Potential methods are described in Attachment A and summarized below. The Snohomish County Rural Capacity Analysis methods are described in Attachment B and summarized below. The assumptions King and Snohomish County used for these analyses are included in Attachment D.

King County Unincorporated Area Past Trends Analysis

King County elected to complete the WRIA 7 historic growth analysis for the King County portion of the WRIA in-house using 2000 to 2017 building permit data from the King County Assessor's office. The analysis was completed to estimate the number of recently built homes that relied on PE wells as their water source in unincorporated King County, both inside and outside of water service areas. GeoEngineers then used the King County historic growth results to estimate the number of potential new PE wells per subbasin over the 20-year planning horizon. This method is referred to as the King County Past Trends Analysis and the general methodology used was as follows:

King County:

- Obtain available King County building permit and parcel data (2000 to 2017).
- Use centroid of parcel data to determine location information (e.g. WRIA, inside or outside water district service areas, King County stream basin, WRIA 7 subbasin, etc.).
- Link building permit data and parcel data.
- Use King County building permit parcel attribute data to determine public versus private water source (private water sources are PE wells).

- Determine the number of building permits that are:
  - Public (pub) water
  - Private (pvt) water (PE wells)
  - Other (unknown/null)
    - The "other" category includes parcels listing their water source as "unknown" (likely vacant land) and where building permit data and parcel attribute data did not match. King County used the "other" category to calculate an error of 6 percent (of the total number of building permits).
- Calculate the percentage of building permits for each type of water source (pub, pvt or other).

GeoEngineers:

- Use the annual average number of permits per year multiplied by the past percentage of growth per subbasin and percentage of building permits using a private water source (well) per subbasin to determine a projected number of PE wells per year for each subbasin.
- Multiply the number of PE wells per year per subbasin by 20 to calculate the estimated total of PE wells projected over the 20-year planning horizon for each subbasin.
- Add 6 percent error to 20-year growth projections per subbasin (error is based on the "other/null" category as described above).
- Tabulate the total growth projected over the 20-year planning horizon, including the 6 percent error, for each subbasin and sum to get the total of PE wells projected over the 20-year planning horizon in rural unincorporated King County.

King County historic growth projection data tables are provided in Attachment A for reference. King County used the time period 2000 through 2017 because those data were available. The building permit data for 2000 through 2017 includes both periods of high growth and periods of low growth. King County compared this data with information from Vision 2040 and population data and is confident in using the average of this time period to project into the future. This methodology assumes that the rate and location of past growth will continue over the 20-year planning horizon.

Snohomish County Unincorporated Past Trends Analysis

Snohomish County elected to complete the WRIA 7 growth projection analysis for the Snohomish County portion of the WRIA in-house. Snohomish County developed two growth projection scenarios by: 1) looking at past development trends in PE well areas for each HUC12[2] within its portion of WRIA 7 and using those trends to estimate the number and location of new homes over the planning horizon, and 2) using population projections from the Snohomish County 2015 Comprehensive Plan to estimate the number and location of new homes relying on wells over the planning horizon. The subbasins in the Snohomish County portion of WRIA 7 generally correspond to individual HUC12s or an aggregation of multiple HUC12s (Attachment B) and, for the purpose of growth projections in WRIA 7, the terms are used interchangeably. Similarly, the term "Housing Unit (HU)" refers

[2] HUC 12 is a level of Hydrologic Unit Code.

to a new home or new single-family residence that would rely on a PE well. The following sections will refer to HUs and PE wells per subbasin, for consistency.

In addition to the growth projection scenarios, Snohomish County developed a Rural Capacity Analysis that identified the total number of parcels that could be developed with a home relying on a PE well in each subbasin. The Rural Capacity Analysis was used to identify whether the number of available parcels that could be developed with homes relying on a PE well could accommodate the projected growth in each subbasin.

At the request of the WRE Committee, GeoEngineers developed a third growth projection scenario using the population growth rate from the 2012 Office of Financial Management (OFM) high population forecast for Snohomish County.

The WRE Committee discussed the three scenarios and agreed to move forward with the first scenario, the Snohomish County Past Trends Analysis, as the 20-year growth projection method for the Snohomish County portion of WRIA 7. The general methodology is as follows:

- Obtain available year-built data from the Snohomish County Assessor's Office for all new single-family residences (i.e. HUs) in the WRIA built between 2008 and 2018.
- Use parcel data to determine location information (e.g. WRIA, cities, UGAs, national and state forest lands, government property, tribal lands, subbasin, etc.).
- Assign the 2008-2018 HUs to "Public Water Service Areas" or "P_E Well areas" based on the distance to existing water mains (data derived from water system comprehensive plans).
    - HUs designated to "Public Water Service Areas" (i.e. will not rely on a PE well) include:
        - New homes that are not part of a subdivision and any portion of the property boundary is located within 100 feet of a water main.
        - New homes that are part of a rural cluster subdivision (RCS) and located within ¼ mile of a water main.
    - All other HUs designated to "P_E Well areas."
- Determine the number of HUs per subbasin for each type of water source (Public Water Service Areas and P_E Well Areas).
- Calculate the percentage of HUs per subbasin for each type of water source.
- Divide the total number of HUs for WRIA 7 by 11 to calculate the average number of SFRs per year over the past 11 years (2008-2018).
- Multiply the average number of HUs per year by 20 to calculate the estimated total of HUs projected over the 20-year planning horizon for rural unincorporated Snohomish County.
- Apply HU projections to WRIA 7 subbasins based on the past percentage of growth per subbasin and past percentage of HU for each type of water source.
- The projection of HUs located within P_E Well Areas represents the total number of PE wells projected over the 20-year planning horizon in rural unincorporated Snohomish County.

Snohomish County historic growth projection data tables are provided in Attachment B for reference. Year-built data was derived from the County's permit data as provided to the Assessor by Snohomish County Planning and Development Services (PDS) and includes all new single-family residences in the WRIA built between 2008 and 2018, located outside of cities, UGAs, national and state forest lands, government property and tribal lands. Snohomish County used the time period 2008 through 2018 because those data were available. This methodology assumes that the rate and location of past growth will continue over the 20-year planning horizon.

GeoEngineers UGA Well Log Spot Check

As described above, the King and Snohomish County Past Trends Analysis focused on the potential for PE wells to be installed within rural, unincorporated King and Snohomish Counties. The King and Snohomish County methods do not account for potential PE wells in cities or UGAs. However, early in the growth projection planning process, the WRIA 7 WRE Committee recommended looking at potential growth within UGAs. GeoEngineers completed an analysis of potential PE well growth within the incorporated and unincorporated UGAs using Ecology's Washington State Well Report Viewer database. The general methodology used was as follows:

- Obtain tabular and spatial data from Ecology's Washington State Well Report Viewer database (1998 through 2018). Ecology's complete Well Report Viewer database was filtered for water wells greater than 30 feet deep and 6- to 8-inch-diameter, which are typical depths and dimensions for domestic wells. Ecology does not have the ability to filter for permit-exempt domestic wells. Information in the database is based on records submitted by the well driller.
- Filter database for wells located within UGAs. Note that well locations were estimated to the nearest ¼-¼ section.
- Review randomly selected water well reports and note the well type (e.g. domestic, industrial, municipal, irrigation, test well, or other), and well location (physical address and/or parcel number).
- Determine the number of wells that were:
  - Domestic (assumed to be PE Wells)
  - Irrigation
  - Other (test, municipal, dewatering, industrial, mitigation, UIC, deepened or refurbished wells)
  - Incorrect (location, date, etc.)
- Calculate the percentage of each type of well (domestic, irrigation, other and incorrect).
- Multiply the percentage of domestic wells by the total number of wells located within UGAs to estimate the number of domestic wells installed over the past 20-year period.
- Cross-check the physical address of the wells with the UGA boundary to determine which subbasin the domestic wells were located in.
- Multiply the total number of domestic wells per subbasin by 20 to calculate the estimated number of PE wells located within the UGA projected over a 20-year period for each WRIA 7 subbasin.

UGA well log spot check data tables are included in Attachment C.

King County PE Well Potential Assessment

King County also completed a PE Well Potential Assessment which evaluated the parcels available for future growth in unincorporated King County. The purpose of the PE Well Potential Assessment was to determine if there would be enough parcels to accommodate the 20-year growth projection at the WRIA and subbasin level. In those areas where the number of projected PE wells exceeded the potential parcels available, GeoEngineers reallocated those wells to the nearest subbasin with similar growth patterns and parcel capacity. The general methodology used was as follows:

King County:

- Use assumptions and screening criteria to identify parcels with potential for future growth by subbasin. A table of assumptions made by King County are provided in Attachment D.
- Use centroid of parcel data to determine location information (e.g. WRIA, inside or outside water district service areas, WRIA 7 subbasin, etc.).
- Use King County parcel attribute data to determine total number of parcels and dwelling units per subbasin. A dwelling unit (DU) is a rough estimate of subdivision potential based on parcel size and zoning (e.g. a 22-acre parcel zoned RA-5 is assumed to have 4 dwelling units).
- Determine the number of parcels and dwelling units that would be inside or outside water district service boundaries.
- Calculate water use projections for public connections and PE sourced parcels:
  - Public connection parcels would be those located within water district service boundaries and were calculated based on historic rates of connection to public water within each subbasin.
  - The remaining number of parcels located within water district service boundaries that exceeded the historic rate of public water connection were assigned to be PE sourced (e.g. served by a PE well).
  - PE sourced parcels were calculated based on the number of parcels located outside water district service boundaries plus the remaining parcels from “inside” water district boundaries, as described above.
- Calculate the shortfall or surplus of available parcels to be sourced by PE wells by taking the total PE sourced DUs minus the 20-year growth projection from the King County past trends analysis.

GeoEngineers:

- If the projected PE well growth exceeds the total number of available PE sourced parcels, reallocate shortfall to adjacent subbasin with similar growth patterns and parcel capacity.

King County used historic rates of connection to water service because the County does not have county-wide information on the location of water lines. King County PE well potential data tables are included in Attachment A.

Snohomish County Rural Capacity Analysis

Snohomish County completed a Rural Capacity Analysis in 2011 that resulted in an assigned future capacity for each parcel in the rural area. Snohomish County updated their 2011 analysis for the purpose of WRE planning to determine if there would be enough parcels to accommodate the 20-year growth projection at the WRIA and subbasin level. In those areas where the number of projected PE wells exceeded the potential parcels available, GeoEngineers reallocated those wells to the nearest subbasin with similar growth patterns and parcel capacity. The general methodology used was as follows:

Snohomish County:

- Use assumptions and screening criteria to identify parcels with potential for future growth by subbasin. A table of assumptions made by Snohomish County are provided in Attachment D.
- For each parcel, obtain or calculate total acres, buildable acres, percent buildable acres and density based on land use designation (i.e. HUs per acre).
- Assign development status (e.g. vacant, partially used or re-developable).
- Calculate basic capacity based on development status and density (e.g. if vacant, future capacity = total acres x density).
- Deduct new HUs built after 2011 from the 2011 available capacity to create an estimate of the capacity remaining as of 2019.
- Assign parcels to "Public Water Service Areas" or "P_E Well Areas" per the methodology described in the Past Trends Analysis.
- Aggregate capacity data by subbasin. Parcels located on HUC boundaries were assigned based on the centroid of the parcel.
- Calculate the shortfall or surplus of available parcels to be sourced by PE wells by taking the total PE sourced parcels (P_E Well Areas) minus the 20-year growth projection from the Snohomish County past trends analysis.

GeoEngineers:

- If the projected PE well growth exceeds the total number of available PE sourced parcels, reallocate shortfall to adjacent subbasin with similar growth patterns and parcel capacity.

The parcels included in the Snohomish County Rural Capacity Analysis were selected based on a set of assumptions, which are outlined in Attachment D. The Snohomish County Rural Capacity methods and data tables are included in Attachment B.

GROWTH PROJECTON RESULTS

The King and Snohomish County Past Trends Analysis and GeoEngineers UGA Well Log Spot Check results were combined to determine the total number of projected PE wells per subbasin within WRIA 7. Using the King County PE Well Potential Assessment and Snohomish County Rural Capacity Analysis, total growth was reallocated to adjacent subbasins where potential growth in the unincorporated area exceeded the number of PE sourced parcels available for future growth. The results are summarized in Table 1 and shown on Figure 1.

GeoEngineers estimates 3,389 new permit-exempt domestic well connections in WRIA 7 over the 20-year planning horizon. The following is a brief summary of the calculations used to complete the WRIA 7 growth projection analysis:

- King County used the average number of building permits per year (104) for the 18-year period from 2000 to 2017, multiplied by the historic percentage of homes using PE wells (44.7 percent) to determine a projected number of new PE wells per year (46) in the WRIA 7 portion of rural unincorporated King County. The number of PE wells per year (46) was then multiplied by 20 to determine the estimated total of PE wells projected over the 20-year planning horizon (926) for rural unincorporated King County. (Note that due to rounding, the total number is 926).
- To estimate the 20-year PE well projection per subbasin, GeoEngineers used the average number of building permits per year (104), multiplied by the historic distribution of growth per subbasin. The average building permits per subbasin was then multiplied by the historic percentage of homes using PE wells to estimate the average number of PE wells per year per subbasin. The number of PE wells per year per subbasin was then multiplied by 20 to calculate the estimated total of PE wells over a 20-year period per subbasin. A 6 percent error was then added to each subbasin total. The total number of estimated PE wells, including the 6 percent error, is 980. See Attachment A for detailed results.
- Snohomish County used the total number of HUs built during the 11-year period from 2008-2018 (238), divided by 11 to determine the average number of HUs built per year (249) for rural unincorporated Snohomish County. The average number of HUs per year (249) was multiplied by 20 to estimate the total number of HUs projected over the 20-year planning horizon (4,980) for the Snohomish County portion of WRIA 7.
- The total number of HUs (4,980) was then multiplied by the historic percentage of HUs in P_E Well Areas per subbasin. The number of HUs in P_E Well Areas per subbasin was added together to determine the estimated total of PE wells (equivalent to HUs in P_E Well Areas) over a 20-year period in rural unincorporated Snohomish County (2,059).
- GeoEngineers also completed a UGA Well Spot Check for wells from the Ecology Well Report Viewer database that plot within the Urban Growth Area. When wells were plotted in WRIA 7, 126 wells were located within the UGA for 1998 through 2018. GeoEngineers checked about 61 percent of the wells by looking at the well logs and noting whether the wells were identified as being for domestic, irrigation, or other purposes (e.g. test, industrial, errors, etc.). About 30 percent of the wells were for domestic use.
- GeoEngineers took the number and distribution of wells from the 1998-2018 data and projected the same rate and distribution per subbasin for the 20-year planning horizon. The estimated number of PE wells within the UGA over the 20-year period is 38. See Attachment C for detailed results.
- King County completed a PE Well Potential Assessment and Snohomish County completed a Rural Capacity Analysis to determine whether a subbasin has capacity for the number of wells in our 20-year projection.
- The PE Well Potential Assessment showed a capacity shortfall of 22 parcels in the Upper Snoqualmie subbasin. Therefore, 22 of the projected PE wells in the Upper Snoqualmie subbasin were reallocated to the adjacent Snoqualmie South subbasin.

- The Snohomish County Rural Capacity Analysis did not show a capacity shortfall in any of the subbasins within the Snohomish County portion of WRIA 7. However, the Snohomish County past trends projection was modified by GeoEngineers based on information provided by the Snohomish County, Ecology, and the Tulalip Tribes.

- GeoEngineers added 275 new permit-exempt well areas to Snohomish County's Past Trends Analysis estimate based on the following assumptions:

    - Half of the projected growth for water service areas in the Quilceda-Allen subbasin (26) will use PE wells (part of the Quilceda area has water provided by Marysville/City of Everett and part of the area is within Seven Lakes water system service area, which is unable to extend service to new customers at this time).

    - All of the growth forecast for water service areas in the Tulalip subbasin (249) will use PE wells to account for the inability of the Seven Lakes water system to expand service at this time. The total exceeds the PE well areas, since it includes the potential for PE wells in the water service area.

    - Includes estimate of 20 potential new PE wells on Tulalip Tribal owned lands in the Quilceda-Allen subbasin and 15 potential new PE wells on Tulalip Tribal owned lands in the Tulalip subbasin.

TABLE 1. GROWTH PROJECTIONS FOR NEW PE WELLS IN WRIA 7 – SNOHOMISH 2018 TO 2038

Subbasins	King County Past Trends[1]	Snohomish County Past Trends[2]	UGA Well Log Spot Check[3]	Total PE Wells[4] per Subbasin[5]
1 - Tulalip	--	468	0	468
2 - Quilceda-Allen	--	330	8	338
3 - Estuary/Snohomish Mainstem	--	322	9	331
4 - Little Pilchuck	--	289	5	294
5 - Pilchuck	--	278	2	280
6 - Woods	--	224	0	224
7 - Sultan	--	53	2	55
8 - Lower Mid-Skykomish	--	60	0	60
9 - Skykomish Mainstem	0	183	2	185
10 - Upper Skykomish	48	53	2	103
11 - Cherry-Harris	200	11	3	214
12 - Snoqualmie North	240	98	0	338
13 - Snoqualmie South	147	0	0	147
14 - Patterson	104	--	0	104
15 - Raging	73	--	2	75
16 - Upper Snoqualmie	168	--	5	173
Totals	980	2,369	40	3,389

Notes:

1 = Based on 20-year estimate of potential new PE wells in unincorporated King County, plus 6% error.

2 = Based on 20-year estimate of potential new PE wells in unincorporated Snohomish County using the "past trends scenario." Assumes half of the projected growth for water service areas in the Quilceda-Allen subbasin (26) will use PE wells (part of the Quilceda area has water provided by Marysville/City of Everett.) Assumes all of the growth forecast for water service areas in the Tulalip subbasin (249) will use PE wells to account for the inability of the Seven Lakes water system to expand service at this time. The total exceeds the PE well areas, since it includes the potential for PE wells in the water service area. Includes estimate of 20 potential new PE wells on Tulalip Tribal owned lands in the Quilceda-Allen subbasin and 15 potential new PE wells on Tulalip Tribal owned lands in the Tulalip subbasin.

3 = Based on spot-check of Ecology Well Report Viewer database. Accounts for potential wells within the incorporated and unincorporated Urban Growth Areas (UGAs) over the 20-year planning period.

4 = "PE Wells" is used to refer to new homes associated with new permit-exempt wells and also new homes added to existing wells on group systems relying on permit-exempt wells.

5 = Includes redistribution of 22 wells from Upper Snoqualmie subbasin to Snoqualmie South subbasin in the King County portion of WRIA 7.

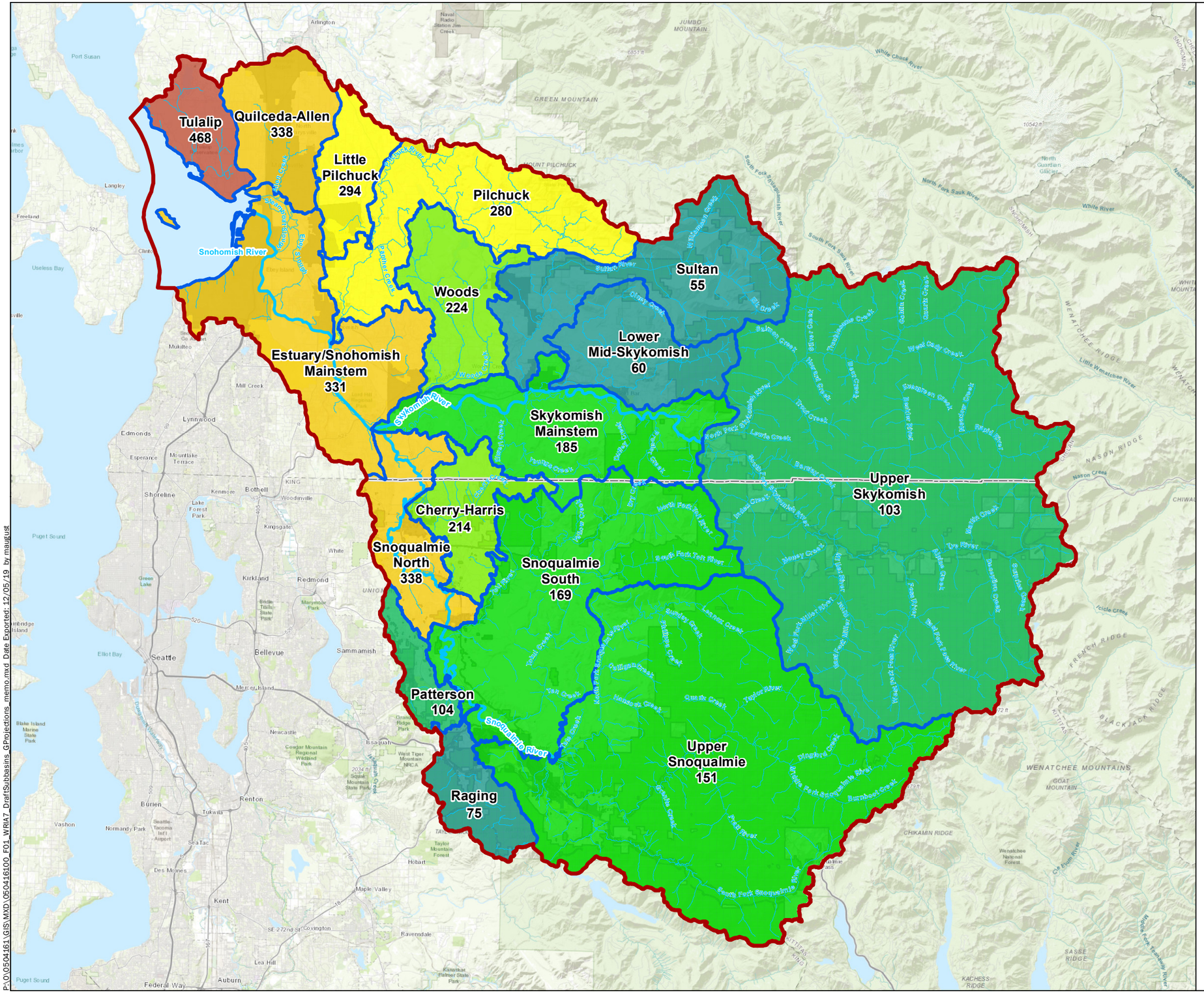
NEXT STEPS

- The WRIA 7 WRE Committee agreed to move forward with the WRIA planning process using 3,389 as the WRIA 7 20-year PE well growth projection without holding a formal vote. The Committee can revisit the growth projections later in the planning process, if needed.
- The Committee can also decide to apply an additional "safety factor" after estimating consumptive use.

REFERENCES

Department of Ecology, 2019. Final Guidance for Determining Net Ecological Benefit, GUID-2094 Water Resources Program Guidance. Washington State, Department of Ecology, Publication 19-11-079, p. 131.

Attachments:
Figure 1. WRIA 7 Distribution of Projected Permit-Exempt Wells 2018-2038
Attachment A. King County Growth Projections and Permit Exempt Well Potential Methods and Data Tables
Attachment B. Snohomish County Growth Projections and Rural Capacity Analysis Methods and Data Tables
Attachment C. GeoEngineers UGA Well Log Spot Check Data Tables
Attachment D. King and Snohomish County PE well Potential Assessment and Rural Capacity Analysis Assumptions Matrix



Legend

- WRIA 7 Boundary
- WRIA7 Proposed Subbasins

Washington State City Urban Growth Areas 2018

- Unincorporated
- Incorporated

Estimated Permit-Exempt Well Potential

- 0
- 1 - 50
- 51 - 100
- 101 - 150
- 151 - 200
- 201 - 250
- 251 - 300
- 301 - 350
- 351 - 400
- 401 - 450
- >450

Projected WRIA 7 PE Well Total = 3,389

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI Topographic Map Base

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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WRIA 7 Distribution of Projected Permit-Exempt Wells 2018-2038

Watershed Restoration and Enhancement Plan
Snohomish and King Counties, Washington

GeoEngineers

Figure 1

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ATTACHMENT A

King County Growth Projections and Permit Exempt Well Potential Methods and Data Tables

King County - Unincorporated WRIA 7 Growth Projections

Draft 10/17/19

WRIA (Ecology Coverage)	(KC building permiting data)			permits
	2000-2009	2010-2017	total	per year
7	1495	369	1864	104

% of county-wide total
32%

WRIA 7	PE/yr	20 yr est
Future PE wells	46	926

Water District info	2000-2009	2010-2017	total
total	1495	369	1864
wtr dst (within water district)	1349	342	1691
no dst (outside water district)	146	27	173

APD	permits	% of WRIA total
WRIA 7	51	3%

FPD	permits	% of WRIA total
WRIA 7	29	2%

Historic		
Percentages	pub	0.490
	pvt	0.447

Water service info	(derived from KC parcel attribute data)		
public water system (pub)	762	152	914
well - private water (pvt)	706	127	833
other	27	90	117
total	1495	369	1864

Existing	2000-2009	2010-2017	
PE wells	706	127	833
error	2%	24%	6%

WRIA 7 - Snohomish - Historic Growth and Water Use by Sub-basin

Sub-basin delineation *v.17Oct2019*

Sub-basin (# of stream basins)	Number of permits	Distribution of growth
Snoqualmie - North (3)	399	21%
Cherry/Harris (2)	354	19%
Snoqualmie - South (6)	251	13%
Patterson (1)	310	17%
Raging (1)	90	5%
Upper Snoqualmie (4)	412	22%
Upper Skykomish (5)	48	3%
total	1864	100%

Water use by basin

pub	pvt	oth	%pub	%pvt
163	204	32	41%	51%
162	170	22	46%	48%
107	125	19	43%	50%
208	88	14	67%	28%
20	62	8	22%	69%
250	143	19	61%	35%
4	41	3	8%	85%
914	833	117	total	1864

WRIA 7 - 20 year PE Well Projection by Subbasin

permits/year 104

Calculations based on GeoEngineers work:

Permits per year	Wells per year (pvt)	Wells per year + 6% error	Total wells in 20 years + 6%	**20 year well total + 6% (rounded)**	Sub-basin	Distribution of PE Wells
22.2	11.3	12.0	240.3	**240**	Snoqualmie - North	24%
19.7	9.4	10.0	200.2	**200**	Cherry/Harris	20%
13.9	6.9	7.4	147.2	**147**	Snoqualmie - South	15%
17.2	4.9	5.2	103.6	**104**	Patterson	11%
5.0	3.4	3.7	73.0	**73**	Raging	7%
22.9	7.9	8.4	168.4	**168**	Upper Snoqualmie	17%
2.7	2.3	2.4	48.3	**48**	Upper Skykomish	5%
104	46	49	981.1	**980**		

WRIA 7 - Permit-Exempt Well Potential Assessment

Assessment of potential parcels for future growth *v:17Oct2019*

Sub-basin (number of stream basins)	Number of parcels	Number of Dwelling units (DU)	Water district boundaries: located inside parcels	located inside DU	located outside parcels	located outside DU
Snoqualmie - North (3)	348	547	280	453	68	94
Cherry/Harris (2)	421	702	264	409	157	293
Snoqualmie - South (6)	304	627	252	502	52	125
Patterson (1)	223	342	210	323	13	19
Raging (1)	116	141	105	128	11	13
Upper Snoqualmie (4)	251	347	238	331	13	16
Upper Skykomish (5)	163	227	0	0	163	227
total	1826	2933	1349	2146	477	787

Sub-basin	Water Use Projection: public connection parcels	public connection DU	PE sourced parcels	PE sourced DU	20 year well total + 6% (rounded)	Shortfall *(red if present)* in 20 year well projection	**Redistribution - 20 year well projection***
Snoqualmie - North	114	185	234	362	240	122	240
Cherry/Harris	121	187	300	515	200	315	200
Snoqualmie - South	107	214	197	413	147	266	**169**
Patterson	141	217	82	125	104	21	104
Raging	23	28	93	113	73	40	73
Upper Snoqualmie	144	201	107	146	168	***-22***	**146**
South Fork Sky	0	0	163	227	48	179	48
total	651	1032	1175	1901	980	---	980

total parcels 1826 | total DU 2933

total parcels 1826 | total DU 2933

*Moves 22 projected PE wells from Upper Snoqualmie subbasin to Snoqualmie - South Subbasin to account for a shortfall in available dwelling units in Upper Snoqualmie subbasin.

ATTACHMENT B

Snohomish County Growth Projections and Rural Capacity Analysis Methods and Data Tables

Snohomish County Methodology – housing unit growth forecasts by WRIA

1) Using year-built statistics from the Assessor database. This data is derived from the county's permit data as provided to the Assessor by Planning and Development Services (PDS).
    a. All new single-family residences (SFRs) in the WRIA (by HUC 12) built between 2008 and 2018, located outside of the cities, UGAs, national and state forest lands, government property and tribal lands.
2) Assigning the 2008-2018 SFRs to "Public Water Service Areas" or to "P_E Well areas"
    a. Depending on distance to existing water main – water main data is derived from system comprehensive plans:
        i. New homes not part of a subdivision located within 100' of a water main.
            1. 100' is selected due to lot sizes in the rural area, cost to extend water service, buy-in from rural water utilities as a reasonable assumption, and requirements in the county's draft water code.
        ii. New homes that were part of a rural cluster subdivision (RCS) within ¼ mile
            1. As of April, 2009, this is a requirement in county code for rural cluster subdivisions – (however, most RCS that have been built were grandfathered to the previous rules which did not include this requirement to connect to public water)
3) The distribution of future growth by WRIA and by HUC12 is assumed to mirror the distribution observed from past growth using (1) a straight line forecast, and (2) a forecast based on an adopted control total. The number of new homes expected over the next twenty years looks at two options:
    a. A straight line forecast based on the past housing unit change: average annual change 2008-2018 extended out an additional 20 years;
    - or -
    b. Housing Unit forecast based on County-adopted growth targets (2015 comprehensive plan), urban/rural growth share policy and observed (2008-2018) growth shares for each WRIA. Table 1 shows HU forecasts by WRIA for "PE Well Areas" and "Water Service Areas."

Table 1-2015 Comprehensive Plan Growth Forecast: Urban/Rural Growth Share and Projected New Housing Units in PE Well and Water Service Areas by WRIA

2015 Snohomish County Comp Plan			**Snohomish County population growth forecast (Pop. Change) 2018 to 2038**	**2016 Countywide Planning Policy Population Allocation**		**Rural/Resource growth share by WRIA (Based on rural growth share) 2008-2018**		
2011	**Adopted Growth Target 2035**	**Avg. Annual increase 2011-2035**		**Urban share 92.1%**	**Rural share 7.9%**	**WRIA 3 & 5 (33%)**	**WRIA 7 (62%)**	**WRIA 8 (5%)**
717000	955257	9927	198548	182862	**15685**	5176	9725	784
New Housing Units (HUs) by WRIA 2018-2038: (Rural Avg HU size* = 2.75)						1882	**3536**	**285**
Allocation of NEW HU based on SnoCounty Model for likely "Water Service Areas" and "P-E Well Areas"			Total Available HU Capacity (Sheet 1)				13994	646
			Growth Share in "Water Service Area" (Sheet 1)				59%	52%
			Growth Share in "P-E Well Area" (Sheet 1)				41%	48%

	New HU in "Water Service Area" 2018- 2038		2086	148
	New HU in "P-E Well Area" 2018- 2038		**1450**	**137**

* Rural Avg Housing Unit (HU) size is based on adopted growth targets; based on Population and HU increase 2011-2035.

Parcels included in the future capacity analysis were selected based on the following criteria:

1) All parcels .5 acre or larger marked as "vacant", or with "0" or "Null" in the improvement value field in the Assessor data base located within the unincorporated rural and resource areas (outside of cities and outside of the unincorporated UGA) –
   a) Includes agricultural areas and private forest lands (non-state and non-federal). Does not include tribal lands within the Tulalip Reservation – development in this area is under Tribal planning and jurisdiction.
   b) The lot size of .5 acre or larger will likely meet requirements for accommodating both a well and a septic system (sewer hook-up is not allowed outside the UGA). Wells and septic systems must be separated from each other a specified distance – this includes separation on a single parcel and from the systems on adjacent parcels. Lots under .5 acre in size are somewhat unusual in the rural area due to zoning code – most likely to occur as lot fragments created by right-of-way, or located around lakes due to legacy zoning (Waterfront Beach = WB).
   c) Within cities and UGAs, residential lot sizes are small (typically the minimum necessary to meet front, back and side yard setback requirements) and public water and sewer are available. The likelihood of new permit-exempt wells for domestic use is very low and possibly zero. County data since the state legislation was passed (RCW 90.94) in January 2018, shows that there have been zero new wells inside the unincorporated UGA; 99 new wells outside of the UGA. Cities typically report that new wells for domestic use are not allowed within city limits.
2) All parcels that are underdeveloped and large enough to subdivide (i.e. one house on ten or twenty acres in an R-5 acre zone)
3) All subdividable parcels where assumed to develop using the rural cluster option – this option achieves the highest density.
4) Parcels were assigned to "Public Water Service Areas" or to "P_E Well areas" per the methodology described above.
5) Land capacity analysis conducted in 2011 was used to assign the number of new housing units that could potentially be built on each parcel. This analysis considered future land use designation from the comprehensive plan with reductions for critical areas.
6) Capacity data was aggregated by HUC12 assigning parcels on HUC boundaries according to parcel centroid.
7) At the HUC12 level, new housing units built after 2011 were deducted from the 2011 available capacity to create an estimate of the capacity remaining as of 2019.

2011 Rural Capacity Analysis

The rural capacity analysis conducted using the 2011 Assessor data resulted in an assigned future capacity for each parcel in the rural area. It should be noted that this analysis of the rural area employed a similar, but less robust model than is used to determine future capacity within the UGAs.

The rural land capacity analysis is summarized as follows:

1) For each parcel the following data was obtained or calculated:
    a. Total acres
    b. Buildable acres (total acres less critical areas)
    c. Percent buildable acres (buildable / total) – if percent buildable is less than 35%, additional capacity is reduced per "f" below.
    d. Density based on land use designation (dwelling units per acre)
        i. For land use designations where Rural Cluster Subdivisions are allowed, density assumes maximum potential under RCS.
    e. Development status was assigned:
        i. Vacant = Improvement value less than $2000
        ii. Partially used = existing home and less than 1000 sq ft commercial
        iii. Redevelopable = improvement value / land value ratio is less than 1
    f. Calculate basic capacity:
        i. If vacant, future capacity = total acres * density (dwelling units/acre)
        ii. If partially used or redevelopable, future capacity = total acres * density – existing dwelling units (DUs)
        iii. If buildable area is less than 35% of total area, capacity is reduced to 75% and will be reduced further if buildable area is less than 20% (50% capacity); and further still if less than or equal to 10% (.25%)
        iv. If buildable area is zero, capacity is assigned as 1 (reasonable use criteria per property rights laws)
        v. Old substandard lots over ½ acre not otherwise accounted for in above steps, capacity = 1
        vi. Assign 0 new residential capacity for:
            1. Areas where residential is not allowed
            2. Existing use codes are incompatible with residential
            3. Government property
            4. Open space or Native Growth Protection Area (NGPA)
            5. Land value is less than $500
            6. Conservation Futures restrict residential development
            7. Other development moratoriums related to potable water availability
        vii. Pending project capacity from actual project applications

SNOHOMISH COUNTY WRIA 7 - HUC 12 Name	Growth Forecast Scenarios - New Homes						2019 Available Capacity			Capacity Surplus or Shortfall Current Trends Scenario			Capacity Surplus or Shortfall Comp Plan Targets		
	Current Trends			V 2040 Comp Plan Targets											
	Total	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas
Little Pilchuck River	525	236	289	373	168	205	2142	834	1308	1617	598	1019	1769	666	1103
Quilceda Creek (1)	302	51	251	214	36	178	1213	466	747	911	415	496	999	430	569
Lower Pilchuck River	789	560	229	560	397	163	2309	1488	821	1520	928	592	1749	1091	658
Woods Creek	713	489	224	506	347	159	1904	1206	698	1191	717	474	1398	859	539
Tulalip Creek - Frontal Possession Sound (1)	453	249	204	321	177	145	603	379	224	150	130	20	282	202	79
French Creek	416	293	124	296	208	88	1093	904	189	677	611	65	797	696	101
Snohomish River - Frontal Possession Sound	480	362	118	341	257	84	574	382	192	94	20	74	233	125	108
Elwell Creek - Skykomish River	149	33	116	106	23	83	593	156	437	444	123	321	487	133	354
Evans Creek - Snohomish River	333	220	113	236	156	80	889	659	230	556	439	117	653	503	150
Peoples Creek - Snoqualmie River	116	18	98	83	13	70	404	50	354	288	32	256	321	37	284
McCoy Creek - Skykomish River	91	24	67	65	17	48	297	60	237	206	36	170	232	43	189
Wallace River	78	18	60	55	13	43	454	182	272	376	164	212	399	169	229
Lower Sultan River	145	93	53	103	66	37	254	82	172	109	-11	119	151	16	135
Upper Pilchuck River	327	278	49	232	197	35	1012	800	212	685	522	163	780	603	177
Lower South Fork Skykomish River	38	0	38	27	0	27	96	0	96	58	0	58	69	0	69
Lower North Fork Skykomish River	15	0	15	10	0	10	70	0	70	55	0	55	60	0	60
Cherry Creek - SnoCo Portion	11	0	11	8	0	8	35	0	35	24	0	24	27	0	27
Olney Creek	0	0	0	0	0	0	5	0	5	5	0	5	5	0	5
Upper Sultan River	0	0	0	0	0	0	2	0	2	2	0	2	2	0	2
Middle North Fork Skykomish River	0	0	0	0	0	0	45	0	45	45	0	45	45	0	45
Total WRIA 7	4981	2924	**2059**	3536	2075	**1463**	13994	7648	6346	9013	4724	4287	10458	5573	4883

(1) Connections to public water are likely to be over-estimated due to capacity issues with Seven Lakes Water Association.

Excluded HUCs: (all urban or all forest) Powder Mill Gulch - Frontal Possession Sound, Middle Sultan River, Upper North Fork Skykomish, Upper Beckler River, Lower Beckler River, Rapid River, Upper North Fork Tolt (SnoCo portion).

SNOHOMISH COUNTY WRIA 8 - HUC 12 Name	Growth Forecast Scenarios - New Homes						2019 Available Capacity			Capacity Surplus or Shortfall - Current Trends Scenario -			Capacity Surplus or Shortfall - Comp Plan Targets -		
	Current Trends			V 2040 Comp Plan Targets											
	Total	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas
North Creek (2)	0	0	0	0	0	0	7	5	2	7	5	2	7	5	2
Bear Creek - Sammamish River	275	100	175	181	66	115	393	275	118	118	175	-57	212	209	3
Bear Creek	159	126	33	105	83	22	253	145	108	94	19	75	148	62	86
Total WRIA 8	434	226	208	286	149	137	653	425	228	219	199	20	367	276	91

(2) North Creek is located entirely within the county's Southwest Urban Growth Area (SWUGA) where connection to water providers is nearly certain. Providers have verified capacity in their water system comprehensive plans.

Additional changes to forecast not reflected here:

1. Revise allocations in HUCs where forecast exceeds available capacity.
2. Revise allocations within UGAs to add potential for limited number of new wells based on GeoEngineers analysis.
3. Revise connections to public water system in HUCs where public water service is already at capacity due to water rights.
4. Add growth forecasts from Tulalip Planning for WRIA 7.

Snohomish County - Unincorporated WRIA 7 Growth Projections

Draft 9/24/2019

Snohomish County-WRIA 7 HUC 12	SCENARIO 1 Past Trends			SCENARIO 2 V 2040 Comp Plan Targets			SCENARIO 3 OFM High Forecast (Developed by GeoEngineers)			SCENARIO 4 2019 Available Capacity			Capacity Surplus or Shortfall - Past Trends Scenario -			Capacity Surplus or Shortfall - Comp Plan Targets -			Capacity Surplus or Shortfall - OFM High Forecast* -			GeoEngineers Proposed PE Well Allocation
	Total[1]	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas	Total[1]	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas	Total PE Wells[2,3]
Little Pilchuck River	525	236	289	373	168	205	695	313	382	2142	834	1308	1617	598	1019	1769	666	1103	1447	521	926	289
Quilceda Creek[1]	302	51	251	214	36	178	399	67	332	1213	466	747	911	415	496	999	430	569	814	399	415	297
Lower Pilchuck River	789	560	229	560	397	163	1044	741	303	2309	1488	821	1520	928	592	1749	1091	658	1265	747	518	229
Woods Creek	712	488	224	506	347	159	943	647	296	1904	1206	698	1192	718	474	1398	859	539	961	559	402	224
Tulalip Creek - Frontal Possession Sound[3]	453	249	204	321	177	145	599	330	269	603	379	224	150	130	20	282	202	79	4	50	-45	468
French Creek	416	293	124	296	208	88	551	387	164	1093	904	189	677	611	65	797	696	101	542	517	25	124
Snohomish River - Frontal Possession Sound	480	362	118	341	257	84	635	479	156	574	382	192	94	20	74	233	125	108	-61	-97	36	118
Elwell Creek - Skykomish River	149	33	116	106	23	83	197	43	154	593	156	437	444	123	321	487	133	354	396	113	283	116
Evans Creek - Snohomish River	333	220	113	236	156	80	440	291	149	889	659	230	556	439	117	653	503	150	449	368	81	113
Peoples Creek - Snoqualmie River	116	18	98	83	13	70	154	24	130	404	50	354	288	32	256	321	37	284	250	26	224	98
McCoy Creek - Skykomish River	91	24	67	65	17	48	120	31	89	297	60	237	206	36	170	232	43	189	177	29	148	67
Wallace River	78	18	60	55	13	43	103	24	79	454	182	272	376	164	212	399	169	229	351	158	193	60
Lower Sultan River	145	92	53	103	66	37	192	123	70	254	82	172	109	-10	119	151	16	135	62	-41	102	53
Upper Pilchuck River	327	278	49	232	197	35	433	368	65	1012	800	212	685	522	163	780	603	177	579	432	147	49
Lower South Fork Skykomish River	38	0	38	27	0	27	51	0	51	96	0	96	58	0	58	69	0	69	45	0	45	38
Lower North Fork Skykomish River	15	0	15	10	0	10	19	0	19	70	0	70	55	0	55	60	0	60	51	0	51	15
Cherry Creek - SnoCo Portion	11	0	11	8	0	8	14	0	14	35	0	35	24	0	24	27	0	27	21	0	21	11
Olney Creek	0	0	0	0	0	0	0	0	0	5	0	5	5	0	5	5	0	5	5	0	5	0
Upper Sultan River	0	0	0	0	0	0	0	0	0	2	0	2	2	0	2	2	0	2	2	0	2	0
Middle North Fork Skykomish River	0	0	0	0	0	0	0	0	0	45	0	45	45	0	45	45	0	45	45	0	45	0
Total WRIA 7	4980	2922	2059	3536	2075	1463	6590	3867	2723	13994	7648	6346	9014	4726	4287	10458	5573	4883	7404	3781	3623	2369

Snohomish County Analysis Excluded HUCs: (all urban or all forest)

Powder Mill Gulch - Frontal Possession Sound

Middle Sultan River

Upper North Fork Skykomish

Upper Beckler River

Lower Beckler River

Rapid River

Upper North Fork Tolt River - Sno Co Portion

Notes:

Growth Forecast Scencarios - New Homes - Past Trends and 2019 Available Capacity prepared by Snohomish County.

Total new home forecast (4980) = calculated new residential dewllings per year (249) x WREC planning time period (20 years)

[1]Total Past Trends values for Woods Creek, French Creek, and Lower Sultan River adjusted to match Forecasts by HUC tab in Snohomish County data spreadsheet.

[2]Assume half of the Quilceda HUC growth will use PE wells (26). Part of the Quilceda area has water provided by Marysville/City of Everett and part is within Seven Lakes water service area. Includes an estimate of 20 potential new permit exempt wells on Tulalip tribal owned lands in Quliceda HUC.

[3]Assume all of the water service area growth forecast in the Tulalip HUC (249) will use PE wells to account for the Seven Lakes water system inability to expand service at this time.
Note that PE Well allocation exceeds PE Well Areas 2019 Capacity by 229. Includes an estimate of 15 potential new permit exempt wells on Tulalip tribal owned lands in Tulalip HUC.

ATTACHMENT C
GeoEngineers UGA Well Log Spot Check Data Tables

GeoEngineers - Incorporated (UGA) WRIA 7 Growth Projections

Draft 8/20/19

GeoEngineers - UGA Well Log Spot Check						
Period	Total	Total Spot Checked	Domestic (includes municipal and community wells)	Irrigation	Other (Test, Dewatering, Industrial, Mitigation, UIC, Deepened or Refurbished)	Incorrect (Location, Date, etc.)
1998-2007	80	46	17	2	13	14
2008-2018	46	31	6	6	8	11
Totals	126	77	23	8	21	25
Percent of Total		61%	30%	10%	27%	32%
Potential number of new wells based on percentage of past 20 year total (126)						
WRIA 7			**38**	**13**	**34**	**41**

GeoEngineers - Incorporated (UGA) WRIA 7 Growth Projections

Draft 8/20/19

	Spot Checked 1998-2007	Spot Checked 2008-2018	Total	Total Potential Wells in UGA in 20 years	Total Rounded	City UGA
King County Stream Basin						
Ames Lake	0	0	0	0.00	0	
Cherry Creek*	1	1	2	3.30	3	Duvall UGA
Coal Creek (Snoq.)*	0	0	0	0.00	0	
Griffen Creek	0	0	0	0.00	0	
Harris Creek	0	0	0	0.00	0	
Lower Tolt River*	0	0	0	0.00	0	
Middle Fork Snoqualmie River*	0	0	0	0.00	0	
Miller River	0	0	0	0.00	0	
North Fork Snoqualmie River	0	0	0	0.00	0	
Patterson Creek*	0	0	0	0.00	0	
Raging River*	1	0	1	1.65	2	Snoqualmie UGA
Snoqualmie River*	0	0	0	0.00	0	
South Fork Skykomish	1	0	1	1.65	2	Skykomish UGA
South Fork Snoqualmie River*	2	1	3	4.95	5	North Bend UGA
Tokul Creek	0	0	0	0.00	0	
Tuck Creek	0	0	0	0.00	0	
Snohomish County HUC 12						
Little Pilchuck River	2	1	3	4.95	5	Marysville UGA
Quilceda Creek	5	0	5	8.25	8	Marysville and Arlington UGAs
Lower Pilchuck River	0	0	0	0.00	0	
Woods Creek*	0	0	0	0.00	0	
Tulalip Creek - Frontal Possession Sound	0	0	0	0.00	0	
French Creek*	1	0	1	1.65	2	Monroe UGA
Snohomish River - Frontal Possession Sound	3	1	4	6.60	7	Snohomish and Lake Stevens UGAs
Elwell Creek - Skykomish River	0	0	0	0.00	0	
Evans Creek - Snohomish River	0	0	0	0.00	0	
Peoples Creek - Snoqualmie River	0	0	0	0.00	0	
McCoy Creek - Skykomish River	1	0	1	1.65	2	Sultan UGA
Wallace River	0	0	0	0.00	0	
Lower Sultan River*	0	1	1	1.65	2	Sultan UGA
Upper Pilchuck River	0	1	1	1.65	2	Granite Falls UGA
Lower South Fork Skykomish River	0	0	0	0.00	0	
Lower North Fork Skykomish River	0	0	0	0.00	0	
Cherry Creek - SnoCo Portion	0	0	0	0.00	0	
Olney Creek	0	0	0	0.00	0	
Upper Sultan River	0	0	0	0.00	0	
Middle North Fork Skykomish River	0	0	0	0.00	0	
Totals	17	6	23	37.95	40	

Notes:

This tables includes data for wells in Ecology's Well Report database, filtered for a depth greater than 30 feet and diameter 6-8 inches. Ecology does not have the ability to filter for permit-exempt domestic wells. Information in the database is based on records submitted by the driller. Well Report Data and Images released from the Department of Ecology are provided on an "AS IS" basis, without warranty of any kind.

* = a portion of this basin in the urban area

ATTACHMENT D

King and Snohomish County PE Well Potential Assessment and Rural Capacity Analysis Assumptions Matrix

DRAFT Permit-Exempt Well Potential Assessment and Rural Capacity Analysis - Assumptions Matrix

Based on parcel-scale GIS identification and classification of lands with potential for development of homes that will rely on a permit-exempt well. Requires a number of assumptions regarding how specific land categories are treated.

Screening Category	King County PE Well Potential Assessment	Justification	Snohomish County Rural Capacity Anlaysis	Justification
Current on-site development	<$10k appraised improvements[1]	Used as a proxy for vacant land that is unlikely to have an existing home or well	under developed parcels and vacant parcels[3]	
Current zoning	no exclusions		no exclusions	
Growth area	outside UGAs (incl cities)	Counties have jurisdiction for permitting in unincorporated areas. UGAs include both incorporated and unincorporated areas, however unincorporated areas inside UGAs are typically developed at high densities and accompanied by urban infrastructure, including public water service, roads, and drainage infrastructure. UGA boundaries have beeen relatively stable over 20 years, allowing time for water providers to install service lines.	outside UGAs (incl cities)	Counties have jurisdiction for permitting in unincorporated areas. UGAs include both incorporated and unincorporated areas, however unincorporated areas inside UGAs are typically developed at high densities and accompanied by urban infrastructure, including public water service, roads, and drainage infrastructure. UGA boundaries have beeen relatively stable over 20 years, allowing time for water providers to install service lines.
Water service	% within water service area likely to connect[2]	King County does not have county-wide data on water system infrastructure. They will look at historic rates of connection to water systems within water service areas in order to come up with a likelihood of connection for future development.	>100 ft from water distribution lines (single-family lot, not subdividable); >1/4 mi from water distribution lines (subdividable)[4]	Snohomish County has water system infrastructure data available for internal use only. Water purveyors think that 100 feet is a very conservative assumption for single-family connections.
Public ownership	not owned by public agencies		outside government property and parks	
Forest lands	outside forest production districts	King county has purchased development rights in many of the forest production districts. Zoning in those areas is very low density (80 acres).	outside state/national forest lands	
Agricultural lands	outside agricultural production districts; not enrolled in Farmland Preservation Program		did not exclude agricultural lands. Snohomish county does not have agricultural production districts.	
Critical areas	≥1 ac of parcel area outside floodway and severe channel migration hazard areas	Based on parcel size assumption and restrictions on building in critical areas.	Outside critical areas: wetlands, steep slopes, stream corridors, stream buffers. Did not exclude flood plains.	In most cases, would be restricted from building in critical areas.
Easements			Did not exclude TDR and easements. Snohomish County TDR program covers a smaller land area.	
Subdivision/zoning changes	"Parcel" PE well potential based on one unit per parcel. "Dwelling Unit" PE well potential based on subdividing to maximum density allowed by current zoning.		maximum density allowed by current zoning	
Parcel size	no parcels <1 acre	Based on assumption from water availability study, that it would be difficult to site a home, septic system, and well on a lot less than 1 acre.	no parcels under 1/2 acre	Snohomish County assumed it would be difficult to site a home, septic and well on a lot less than 1/2 acre.

[1] Information from County Assessor data.

[2] King County reviewed historic building permits and assessors data to estimate % of homes likely to connect to water service within water service areas. Parcels withoutside water service areas are projected to rely on a well.

[3] Information from County Assessor data; allows differentiation of permit data (e.g. residence vs. garage). Under developed parcels e.g. where there is one existing house on a 20-acre parcel in R5 zone, parcel is not vacant but could be divided into four separate parclels allowing three additional homes to be built. Capacity analysis would include these three homes.

[4] 1/4 mile for rural cluster subdivisions was enacted in code in 2009; 100 foot buffer is proposed code and would be from any boundary line (not the centroid)

DRAFT - Updated 10/18/19

Prepared by GeoEngineers from technical workgroup meeting notes. DRAFT - for internal used by WRIA 7, 8, & 9 WRECs and technical workgroups.