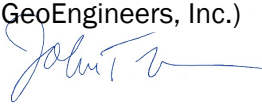


To: Ingria Jones
Washington State Department of Ecology

From: Bridget August, LG, LHG and
John Monahan, FP-C (GeoEngineers, Inc.)

Date: January 6, 2021 

File: 0504-161-00

Subject: WRIA 7 PE Well Projections



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 law (Revised Code of Washington [RCW] 90.94) specifies that by June 30, 2021, Ecology must establish a WRE Committee and adopt a WRE Plan in the Snohomish Watershed (WRIA 7). The Snohomish (WRIA 7) Watershed Restoration and Enhancement Plan (watershed plan) must address impacts on streamflows from consumptive use from new domestic permit-exempt wells (PE wells¹) anticipated between January 19, 2018 and January 18, 2038.

The watershed plan must estimate new PE wells in the watershed (growth projections) for January 2018 through January 2038 (at a minimum). Based on the projected PE wells, the plan will estimate the associated consumptive water use.

Ultimately, watershed plan PE well projections need to address the following two primary questions:

1. How many new PE wells could be installed throughout the watershed over the next 20 years?
2. Where could the PE sourced growth occur at the subbasin level?

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 Snohomish WRE Committee (WRIA 7 Committee) to define PE well growth projection methods and PE well growth projections for WRIA 7. The WRIA 7 PE well 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). Projecting future PE well growth involves accounting for populations that will be served by community water systems and municipalities (Ecology 2019). Due to data availability, King and Snohomish County used different methods to remove those populations from the PE well growth estimates. Snohomish County considered distance to existing water lines, whereas King County considered rates of connection to water service within water service area boundaries². 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 Report Viewer 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 WRIA 7 Committee (GeoEngineers 2021), 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 and assumptions are described in Attachment A and summarized below. The Snohomish County Rural Capacity Analysis methods and assumptions are described in Attachment B and summarized below.

King County PE Well Projection Methodology

King County does not have a growth target for the unincorporated rural area and therefore decided to use building permit data as its chosen method to assess future growth potential. 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 for new residential structures from the King County Assessor's office. The analysis estimated 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. 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 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 these 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.

² Water service area boundaries include areas currently served by existing water lines and may also include areas not yet served by water lines.

King County used the results from the historic growth analysis to determine the projected number of PE wells per year and over the 20-year planning horizon for unincorporated King County. GeoEngineers then used the King County historic growth results to project new PE wells per subbasin over the 20-year planning horizon. King County historic growth and PE well projection methods and data tables are provided in Attachment A for reference. This methodology assumes that the rate and location of past growth will continue 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 for new residential structures (2000 to 2017).
- Use centroid of parcel to determine location relative to other boundaries (e.g. WRIA, inside or outside water district service areas, King County stream basin, WRIA 7 subbasin, etc.).
- Assess the total number of permits and average number of permits per year for the WRIA.
- Link building permit and parcel data layers to determine water source for each building permit/parcel. The parcel database indicates the water source as “public” (pub) for buildings connected to water service, “private” (pvt) for buildings relying on a permit-exempt well, and “other” (unknown/null). The “other” category includes parcels listing their water source as “unknown,” referring to parcels with no assigned water source (likely vacant land or unoccupied structure) or “null,” referring to building permits that did not link to existing parcels. King County used the “other” category to calculate an error of 6 percent (of the total number of building permits)³.
- Determine the number of building permits/parcels inside and outside the water service areas that have a water source as:
 - Public water (pub)
 - Private water (PE wells) (pvt)
 - Other (unknown/null)
- Calculate the percentage of building permits for each type of water source (pub, pvt or other) by subbasin and the WRIA overall.
- Use the annual average number of permits per year multiplied by the percentage of permits/parcels on private water (pvt) to determine the projected number of PE wells per year.
- Multiply the number of PE wells per year by 20 to calculate the total PE wells projected over the 20-year planning horizon for unincorporated rural King County.

³ King County's percent error uses the number of unknown water use type parcels (unknown) plus those permit records that don't match parcel information (null), divided by the total number of permits for that area. The null data type, based on selected assessment of un-joined data, appears to be related to development that is not fully completed/sold. These developments are typically on public water.

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.
- Add 6 percent error to projected number of PE wells per year per subbasin (error is based on the “other and null” categories as described above).
- Multiply the number of PE wells per year per subbasin, including the 6 percent error, by 20 to calculate the estimated total of PE wells projected over the 20-year planning horizon for each subbasin.
- 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.

Snohomish County PE Well Projection Methodology

Snohomish County elected to complete the WRIA 7 growth projection analysis for the Snohomish County portion of the WRIA in-house. Snohomish County used a different methodology than King County for their past trends analysis. They developed their growth projections by using a geographic information system (GIS) model to identify areas where homes are likely to connect to water service, based on proximity to existing water distribution lines. Areas that were not proximal to existing water distribution lines were assumed to be served by a PE well. For their growth projections, they referred to these areas as “water service areas” and “PE Well Areas” respectively. Snohomish County used this spatial model, in combination with analysis of year-built data for recently built single-family residences, to develop growth scenarios.

Snohomish County developed two growth projection scenarios by: 1) looking at past development trends in PE well areas for each HUC-12⁴ within its portion of WRIA 7 and using those trends to estimate the number and location of new homes relying on PE wells 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 PE wells over the planning horizon. The subbasins in the Snohomish County portion of WRIA 7 generally correspond to individual HUC-12s or an aggregation of multiple HUC-12s (Attachment B) and, for the purpose of growth projections in WRIA 7, the terms are used interchangeably. The term “Housing Unit (HU)” refers to an individual home or single-family residence.

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 WRIA 7 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.

⁴ HUC-12 is a level of Hydrologic Unit Code.

The WRIA 7 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. 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. Snohomish County growth projection methods and data tables are provided in Attachment B for reference. The general methodology is as follows:

- Obtain available year-built data from the Snohomish County Assessor's Office for all single-family residences (i.e. HUs) in the WRIA built between 2008 and 2018.
- Use centroid of parcel to determine location of each HU relative to other boundaries (e.g. WRIA, cities, UGAs, national and state forest lands, government property, tribal lands, subbasin, water lines, zoning, 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:
 - HUs that are not part of a subdivision and any portion of the property boundary is located within 100 feet of a water main.⁵
 - HUs that are part of a rural cluster subdivision (RCS) and located within ¼ mile of a water main.⁶
 - All other HUs designated to "P_E Well areas."
- Estimate 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 HUs 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.

⁵ 100 feet 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 Snohomish County's draft water code (Attachment B).

⁶ As of April 2009, this is a requirement in Snohomish 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 (Attachment B).

Urban Growth Area PE Well Projection Methodology

As described above, the King and Snohomish County well projection methods 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 Committee recommended looking at the potential for PE well growth within UGAs. GeoEngineers completed an analysis of potential PE well growth within the incorporated and unincorporated UGAs using Ecology's Well Report Viewer database (referred to as the UGA Well Log Spot Check). UGA well log spot check data tables are included in Attachment C. The general methodology used was as follows:

- Obtain tabular and spatial data from Ecology's Well Report Viewer database (1998 through 2018). Ecology's complete Well Report Viewer database was filtered for water wells 6 to 8 inches in diameter and greater than 30 feet deep, which are typical dimensions and depths for domestic wells. PE wells greater than 8 inches in diameter are cost prohibitive and uncommon. Similarly, wells shallower than 30 feet are more susceptible to contamination and are also uncommon, especially in urban areas. 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 quarter-quarter 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, underground injection control [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 spot-checked wells that were identified as domestic wells (assumed to be PE wells) by the total number of wells located within UGAs to estimate the number of domestic wells installed over the past 20-year period within WRIA 7.
- Cross-check the physical address of the wells with the UGA boundary to determine in which subbasin the spot-checked domestic wells were located.
- Use the estimated number of domestic wells per subbasin over the past 20 years to project the number of PE wells located within the UGA over the planning horizon for each WRIA 7 subbasin.

King County PE Well Potential Assessment

King County also completed a PE Well Potential Assessment which evaluated the parcels available for future residential development 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 parcel capacity and similar growth patterns. 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 Assessment data tables are included in Attachment A. 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 list of assumptions made by King County is provided in Attachment A.
- Use centroid of parcel 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 source 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 parcel capacity and similar growth patterns.

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 watershed planning to determine if there would be enough parcels to accommodate the 20-year PE well 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 parcel capacity and similar growth patterns. The parcels included in the Snohomish County Rural Capacity Analysis were selected based on a set of assumptions, which are outlined in Attachment B. The Snohomish County Rural Capacity methods and data tables are also included in Attachment B. 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 list of assumptions made by Snohomish County are provided in Attachment B.
- For each parcel, obtain or calculate total acres, buildable acres, percent buildable acres and density based on zoning and land use designation (i.e. HUs per acre).⁷
- 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 parcel capacity and similar growth patterns.

PE WELL 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, GeoEngineers compared the total available PE sourced parcels (i.e. DUs and HUs) per subbasin with the projected growth per subbasin. In those areas where the number of projected PE wells exceeded the potential parcels available, GeoEngineers reallocated those wells to the nearest subbasin with parcel capacity and similar growth patterns. 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

⁷ All subdividable parcels were assumed to develop using the rural cluster option. This option achieves the highest density.

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. A 6 percent error was then added to each subbasin total. The number of PE wells per year per subbasin plus the 6 percent error was then multiplied by 20 to calculate the estimated total of PE wells over a 20-year period per subbasin. 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 (2,740), 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 rural unincorporated Snohomish County portion of WRIA 7. (Note that due to rounding, the total number is 4,980 vs. 4,981, as shown in Attachment B).
- The total number of HUs (4,980) was then multiplied by the historic percentage of HUs in P_E Well Areas per HUC-12. The number of HUs in P_E Well Areas per HUC-12 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 then redistributed the Snohomish County growth projection estimates into the appropriate subbasins. (Note that the values reported in Attachment B are per HUC-12 and the values reported in Table 1 are per subbasin).
 - WRIA 7 Subbasins aligned with HUC-12 sub-watersheds or were aggregates of HUC-12 subwatersheds, with one exception - the Quilceda-Allen subbasin. The Quilceda-Allen subbasin includes Quilceda Creek HUC-12 and the Allen Creek watershed, which is in the Snohomish River-Frontal Possession Sound HUC-12. To redistribute growth projections to the Quilceda-Allen subbasin, GeoEngineers estimated the portion of PE well growth in Snohomish River - Frontal Possession Sound HUC-12 that occurs within the Allen Creek watershed. GeoEngineers then transferred that growth (26 PE wells) from the Snohomish River-Frontal Possession Sound HUC-12 to the Quilceda-Allen subbasin.
- GeoEngineers also completed a UGA Well Log Spot Check for wells from the Ecology Well Report Viewer database that plot within the Urban Growth Area. Of the wells that 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.). According to the well logs, 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. (Note that due to rounding, the total number is 40 vs. 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 the 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 Snohomish County, Ecology, and the Tulalip Tribes.
 - GeoEngineers added 284 new PE well areas to Snohomish County's Past Trends Analysis estimate based on the following assumptions:
 - 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. NUMBER OF PE WELLS PROJECTED BETWEEN 2018 TO 2038 FOR THE WRIA 7 SUBBASINS

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	169	0	0	169
14 - Patterson	104	--	0	104
15 - Raging	73	--	2	75
16 - Upper Snoqualmie	146	--	5	151
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 PE wells and also new homes added to existing wells on group systems relying on PE 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 to develop consumptive use estimates.

REFERENCES

GeoEngineers, Inc. (GeoEngineers), 2021. WRIA 7 Subbasin Delineations. Technical memorandum prepared for Washington State Department of Ecology. January 2021.

Washington State Department of Ecology (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. <https://fortress.wa.gov/ecy/publications/documents/1911079.pdf>

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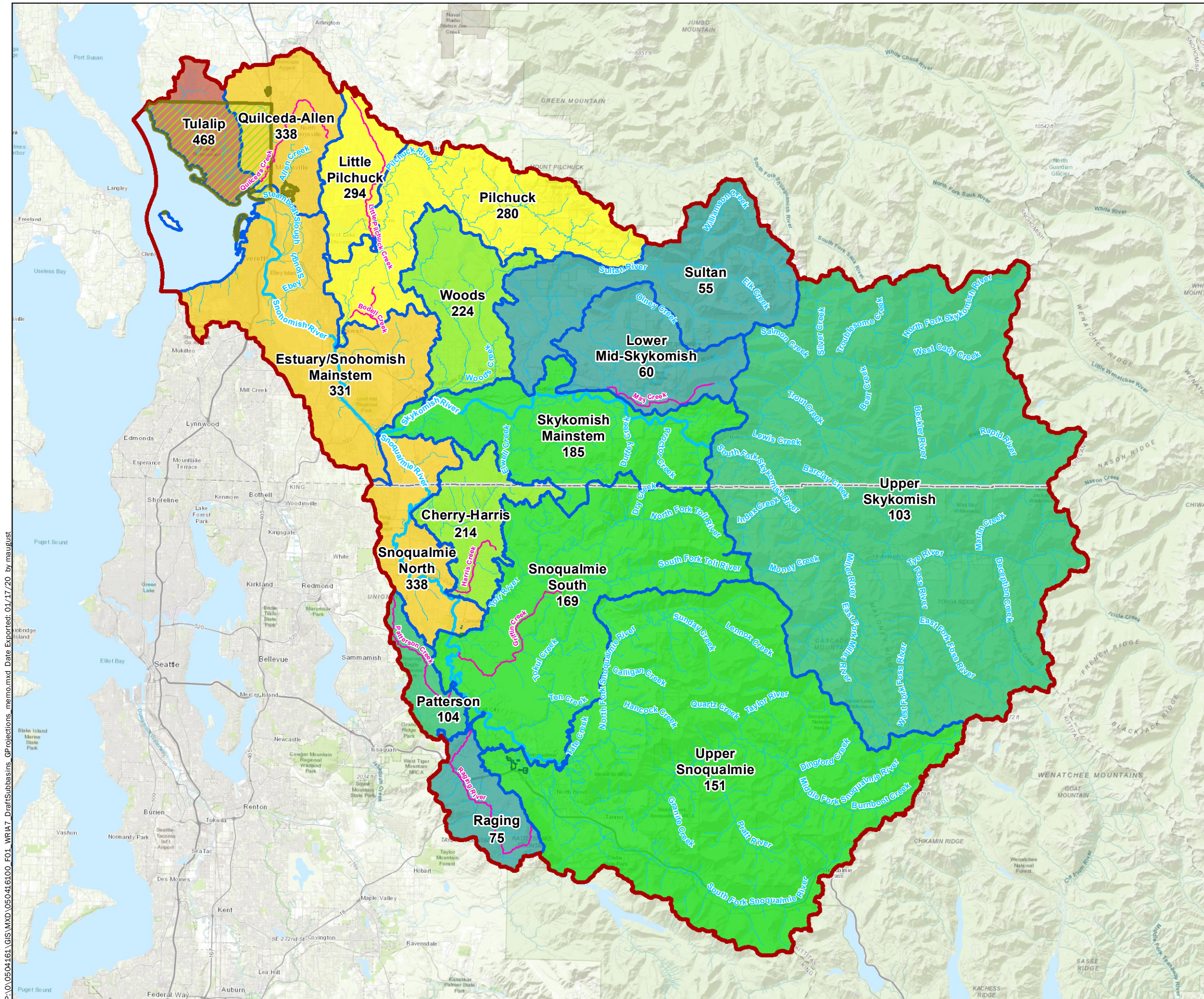
Attachments:

Figure 1. WRIA 7 Distribution of Projected Permit-Exempt Wells 2018-2038

Attachment A. King County PE Well Growth Projections and PE Well Potential Assessment Methods, Assumptions and Data Tables

Attachment B. Snohomish County PE Well Growth Projections and Rural Capacity Analysis Methods, Assumptions and Data Tables

Attachment C. GeoEngineers UGA Well Log Spot Check Data Tables



Legend

- WRIA 7 Boundary
- WRIA7 Subbasins
- Snoqualmie Tribe Reservation
- Tulalip Tribes Reservation
- Surface Water Closures³

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

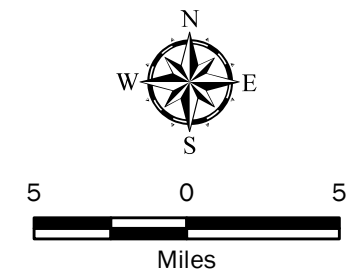
Projected WRIA 7 PE Well Total = 3,389

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.
3. Closed stream s represen t GeoEngineers' interpretation of the language in WAC 173-507 and this m ap is to only be used for plan ning purposes.

Data Source: ESRI Topographic Map Base

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet



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

Watershed Restoration and Enhancement Plan
Snohomish and King Counties, Washington

GEOENGINEERS

Figure 1

ATTACHMENT A
King County PE Well Growth Projections
and PE Well Potential Assessment Methods,
Assumptions and Data Tables



King County

Water and Land Resources Division

Department of Natural Resources and Parks

King Street Center

201 South Jackson Street, Suite 704

Seattle, WA 98104-3855

206-477-4800 Fax 206-296-0192

TTY Relay: 711

TECHNICAL MEMORANDUM

December 12, 2019

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

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

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

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

Introduction

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

- A. How much potential growth could occur during the 20-year (2018-2038) planning period?
- B. Where could that growth occur at a sub-basin/watershed scale within each WRIA?

Principles

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

The following are highlights from planning policies:

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

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

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

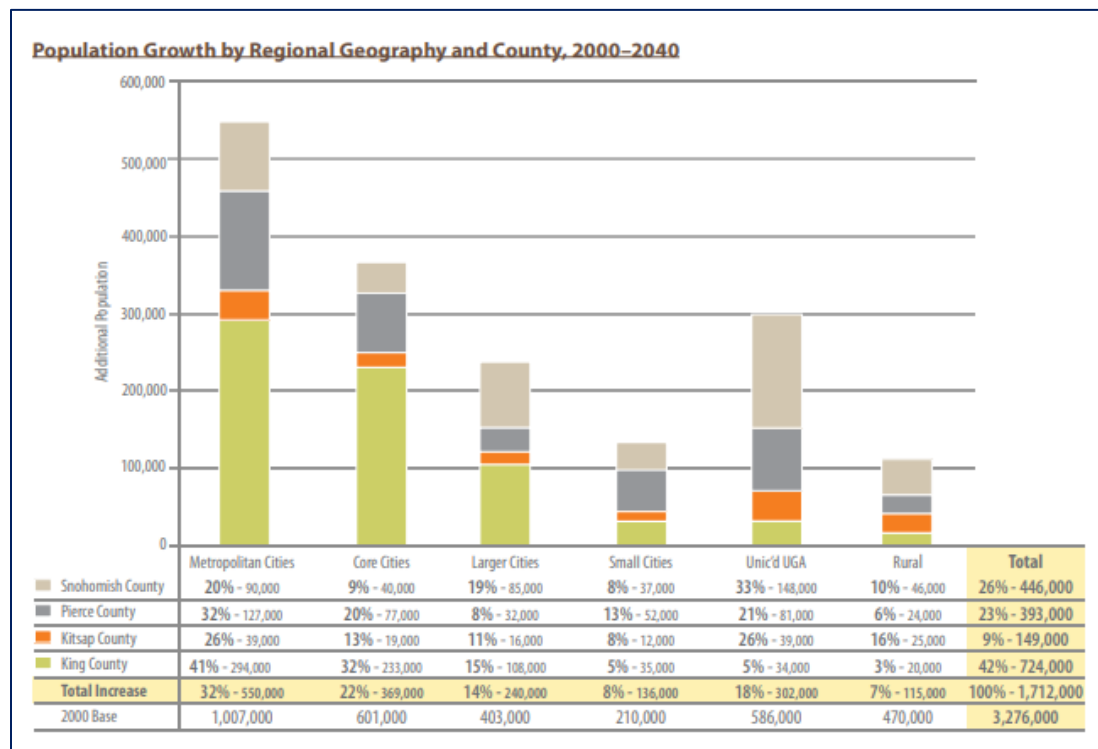


Figure 1. Estimated population growth for rural King County from 2000-2040 is 20,000, King County, Vision 2040.

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

Methods

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

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

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

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

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

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

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

Table 2. Building permits by WRIA

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

* = WRIA boundaries are delineated by Ecology coverage

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

- iii. This category can be used as an “error” since it refers to the amount of information that is undetermined and could potentially be private sourced.
5. Calculated the percentage of building permits for each type of water source (i.e. public, private or other) for entirety of King County as shown in Table 3 below as well as by WRIA and its sub-basin delineations.

Table 3. Water source by parcel/permit

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

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

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

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

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

* = WRIA boundaries are delineated by Ecology coverage

^ = WRIA specific percentage of private well users

® = Error calculated from percentage of building permits with “other” water service

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

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

The following are the assumptions used to refine the parcels:

- Outside Urban Growth Boundary
 - Outside Forest Production District
 - Outside Agriculture Production District
 - Not Encumbered by K`C Parks or TDR conservation easements
 - Not enrolled in Farmland Preservation Program
 - Not Owned by Public Agencies
 - Vacant land (with appraised improvements <\$10,000)
 - Have at least 1 acres of land outside 100 year Floodway and Severe River Channel Migration Hazard Areas.
 - Parcel size – 1 acre or greater.
 - Zoning – no exclusion and maximum density allowed by current zoning
7. Used centroid of the refined parcel data to determine location information, similar to step 2 (above).
 8. Linked parcel and assessor attribute data to determine total number of parcels and dwelling units per sub-basin. A dwelling unit (DU) is a rough estimate of subdivision potential based on parcel size and zoning (e.g., a 22-acre parcel zoned RA-5 is assumed to have 4 dwelling units).
 9. Determined the number of parcels and DUs that are inside or outside water district service boundaries.
 10. Calculated water use projections for public connections and PE sourced parcels:
 - a. Public connection parcels are located within water district service boundaries and are calculated based on historic rates of connection to public water within each sub-basin, assessed in step 5 (above).
 - b. Any remaining number of parcels located within water district service boundaries are assigned to be PE sourced.
 - c. PE sourced parcels were calculated based on the number of parcels located outside water district service boundaries plus the remaining parcels from “inside” water district boundaries, as described above, Table 5.

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

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

* = WRIA boundaries are delineated by Ecology coverage

^ = WRIA specific percentage of private well users

DU = Dwelling unit as noted in step 9.

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

References

King County Countywide Planning Policies

<https://www.kingcounty.gov/depts/executive/performance-strategy-budget/regional-planning/CPPs.aspx>

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

Vision 2040 link:

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

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

WRIA 7 - Snohomish
 v. 17Oct2019

WRIA (Ecology Coverage)	(KC building permitting data)			permits per year	% of county-wide total 32%	WRIA 7 Future Permit- Exempt wells		
	2000-2009	2010-2017					PE/yr 46	20 yr est 926
	1495	369						
7				1864	104			

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 PE wells	2000-2009	2010-2017	Total
	706	127	833

error	2%	24%	6%
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WRIA 7 - Snohomish - Historic Growth and Water Use by Sub-basin

WRIA 7 - 20 year PE Well Projection by Subbasin

Sub-basin delineation			Water use by basin					Calculations based on GeoEngineers work:						Distribution of PE
Sub-basin (# of stream basins)	Number of permits	Distribution of growth	pub	pvt	oth	%pub	%pvt	permits/year	104	Wells per year (pvt)	Wells per year + 6% error	Total wells in 20 years	20 year well total + 6% (rounded)	
Snoqualmie - North (3)	399	21%	163	204	32	41%	51%	22.2	11.3	12.0	240.3	240	Snoqualmie - North	24%
Cherry/Harris (2)	354	19%	162	170	22	46%	48%	19.7	9.4	10.0	200.2	200	Cherry/Harris	20%
Snoqualmie - South (6)	251	13%	107	125	19	43%	50%	13.9	6.9	7.4	147.2	147	Snoqualmie - South	15%
Patterson (1)	310	17%	208	88	14	67%	28%	17.2	4.9	5.2	103.6	104	Patterson	11%
Raging (1)	90	5%	20	62	8	22%	69%	5.0	3.4	3.7	73.0	73	Raging	7%
Upper Snoqualmie (4)	412	22%	250	143	19	61%	35%	22.9	7.9	8.4	168.4	168	Upper Snoqualmie	17%
Upper Skykomish (5)	48	3%	4	41	3	8%	85%	2.7	2.3	2.4	48.3	48	Upper Sky	5%
total	1864	100%	914	833	117	total	1864	104	46	49	981.1	980		

WRIA 7 - Permit-Exempt Well Potential Assessment

Assessment of potential parcels for future growth			v:24Oct2019				Water district boundaries		Water Use Projection						
Sub-basin (number of stream basins)	Number of parcels	Number of Dwelling units (DU)	located inside		located outside		Sub-basin	public connection		PE sourced				Redistribution - 20 year well projection	
			parcels	DU	parcels	DU		parcels	DU	parcels	DU	20 year well total + 6% (rounded)	Shortfall (<i>red if present</i>) in 20 year well projection		
Snoqualmie - North (3)	348	547	280	453	68	94	Snoqualmie - North	114	185	234	362	240	122	240	
Cherry/Harris (2)	421	702	264	409	157	293	Cherry/Harris	121	187	300	515	200	315	200	
Snoqualmie - South (6)	304	627	252	502	52	125	Snoqualmie - South	107	214	197	413	147	266	169	
Patterson (1)	223	342	210	323	13	19	Patterson	141	217	82	125	104	21	104	
Raging (1)	116	141	105	128	11	13	Raging	23	28	93	113	73	40	73	
Upper Snoqualmie (4)	251	347	238	331	13	16	Upper Snoqualmie	144	201	107	146	168	-22	146	
Upper Skykomish (5)	163	227	0	0	163	227	Upper Skykomish	0	0	163	227	48	179	48	
total	1826	2933	1349	2146	477	787		651	1032	1175	1901	980	-----	980	
			total parcels	1826	total DU	2933	total parcels		1826	total DU	2933				

ATTACHMENT B

Snohomish County PE Well Growth Projections and Rural Capacity Analysis Methods, Assumptions 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 were 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.

ATTACHMENT C
GeoEngineers UGA Well Log Spot Check Data Tables

GeoEngineers - WRIA 7 Urban Growth Area PE Well Projection

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%
<i>Potential number of new wells based on percentage of past 20 year total (126)</i>						
WRIA 7			38	13	34	41

GeoEngineers - WRIA 7 Urban Growth Area PE Well Projection

	Spot Checked 1998-2007	Spot Checked 2008-2018	Total	Total Potential Wells in UGA in 20 years	Total Rounded	City UGA
King County Drainage Basin						
Ames Lake	0	0	0	0.00	0	Duvall UGA
Cherry Creek*	1	1	2	3.30	3	
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	Skykomish UGA
South Fork Skykomish	1	0	1	1.65	2	
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	

Developed 8/20/2019

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