
To: Stephanie Potts, Washington State Department of Ecology
From: Bridget August and John Monahan (GeoEngineers, Inc.)
Date: October 23, 2019
File: 00504-161-00
Subject: WRIA 8 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 8 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 Cedar-Sammamish Watershed (WRIA 8). 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 wells¹) could be installed throughout the watershed over the next 20 years?
2. Where could the PE sourced growth occur at the subbasin level?

WRIA 8 includes parts of unincorporated King and Snohomish County and 30 incorporated cities and towns. The methods used to estimate the number and location of new wells in unincorporated and incorporated areas in WRIA 8 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 8 – Cedar-Sammamish WRE Committee to define growth projection methods and growth projections for WRIA 8. The WRIA 8 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 8 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 8 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 8 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 HUC12² within its portion of WRIA 8 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 8 correspond to the HUC12s (Attachment B) and, for the purpose of growth projections in WRIA 8, the terms are used interchangeably. Similarly, the term “Housing Unit (HU)” refers 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.

² HUC 12 is a level of Hydrologic Unit Code.

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 8. 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 8 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 8 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 County Past Trends Analysis focused on the potential for PE wells to be installed within rural, unincorporated King County. The King County method does not account for potential PE wells in cities or UGAs. However, early in the growth projection planning process, the WRIA 8 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 $\frac{1}{4}$ - $\frac{1}{4}$ 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 8 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 8 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 memo 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 8. 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 967 new permit-exempt domestic well connections in WRIA 8 over the 20-year planning horizon. The following is a brief summary of the calculations used to complete the WRIA 8 growth projection analysis:

- King County used the average number of building permits per year (102) for the 18-year period from 2000 to 2017, multiplied by the historic percentage of homes using PE wells (34.2 percent) to determine a projected number of new PE wells per year (35) in the WRIA 8 portion of rural unincorporated King County. The number of PE wells per year (35) was then multiplied by 20 to
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determine the estimated total of PE wells projected over the 20-year planning horizon (698) for rural unincorporated King County. (Note that due to rounding, the total number is 698).

- To estimate the 20-year PE well projection per subbasin, GeoEngineers used the average number of building permits per year (102), 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 740. 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 (22) for rural unincorporated Snohomish County. The average number of HUs per year (22) was multiplied by 20 to estimate the total number of HUs projected over the 20-year planning horizon (440) for the Snohomish County portion of WRIA 8.
 - The total number of HUs (440) 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 (210).
 - 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 8, 205 wells were located within the UGA for 1998 through 2018. GeoEngineers checked about 56 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 8 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 17. 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 1 well in the Upper Cedar subbasin, which is mostly protected from development. Therefore, the projected PE well in the Upper Cedar subbasin was reallocated to the adjacent Lower Cedar subbasin.
 - The Snohomish County Rural Capacity Analysis showed a capacity shortfall of 59 wells in the Little Bear subbasin. These 59 wells were reallocated to the Bear/Evans subbasin because it is adjacent and has similar growth patterns.
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**TABLE 1. GROWTH PROJECTIONS FOR NEW PE WELLS IN WRIA 8 – CEDAR-SAMMAMISH
 2018 TO 2038**

Subbasins¹	King County Past Trends²	Snohomish County Past Trends³	UGA Well Log Spot Check⁴	Total PE Wells⁵ per Subbasin⁶
Seattle/Lake Union	0	--	0	0
Puget Sound Shorelines	0	--	2	2
Swamp/North	0	0	5	5
Little Bear	0	118	0	118
Sammamish River Valley	8	--	0	8
Bear/Evans	138	92	4	234
Greater Lake Washington	0	--	4	4
May/Coal	15	--	0	15
Lake Sammamish Creeks	6	--	0	6
Issaquah	235	--	0	235
Lower Cedar	338	--	2	340
Upper Cedar	0	--	0	0
Totals	740	210	17	967

Notes:

- 1 = Subbasins from proposal approved at September 26, 2019 WRE Committee meeting.
- 2 = Based on 20-year estimate of potential new PE wells in unincorporated King County, plus 6% error.
- 3 = Based on 20-year estimate of potential new PE wells in unincorporated Snohomish County.
- 4 = 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.
- 5 = "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.
- 6 = Includes redistribution of 1 well from Upper Cedar subbasin to Lower Cedar subbasin in the King County portion of WRIA 8 and 59 wells from Little Bear subbasin to Bear/Evans subbasin in the Snohomish County portion of WRIA 8.

NEXT STEPS

- The WRIA 8 WRE Committee agreed to move forward with the WRIA planning process using 967 as the WRIA 8 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 8 Distribution of Projected Permit-Exempt Wells 2018-2038

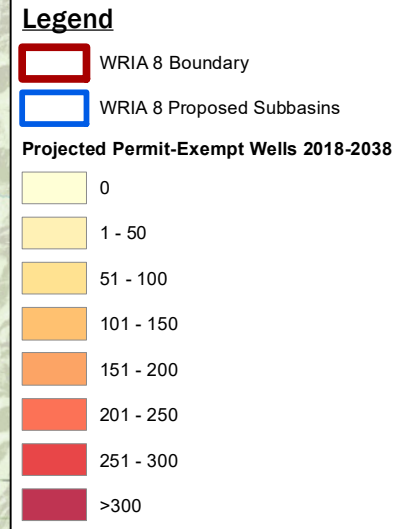
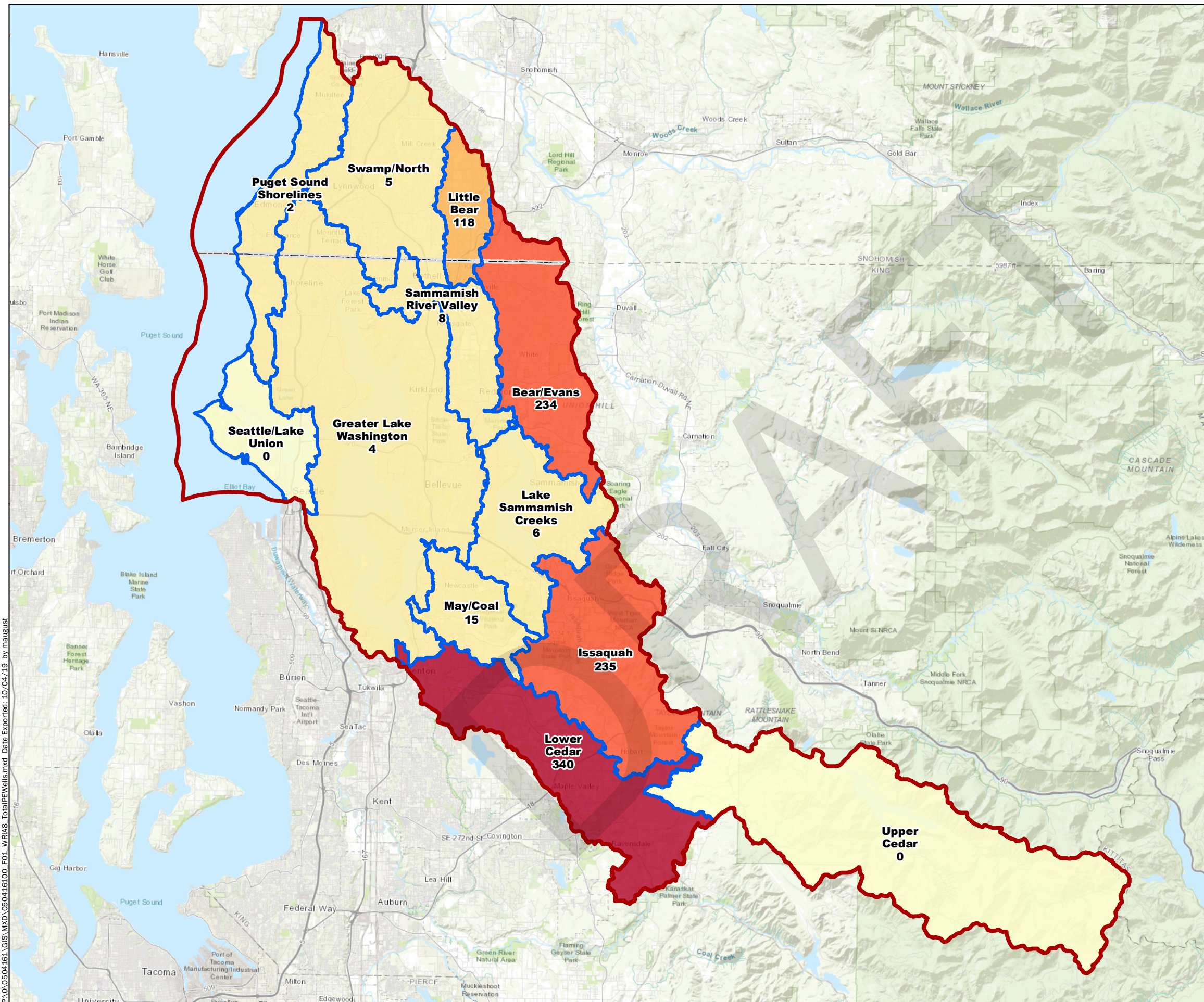
Attachment A. King County Growth Projections and Permit Exempt Well Potential Memo and Data Tables

Attachment B. Snohomish County Growth Projections and Rural Capacity Analysis Memo 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

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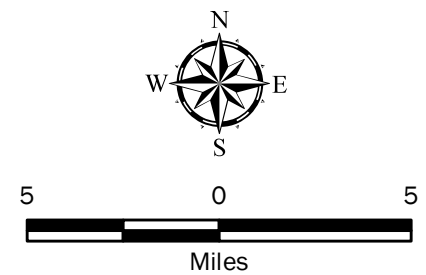


Projected WRIA 8 PE Well Total = 967

Notes:

- The locations of all features shown are approximate.
- 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



**WRIA 8 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 Memo and Data Tables**

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King County - Unincorporated

WRIA 8 Growth Projections *Draft 9/25/19*

WRIA (Ecology Coverage)	(KC building permitting data)		permits per year
	2000-2009	2010-2017	
8	1354	482	1836

% of county-wide total
31%

WRIA 8 Future Permit-Exempt wells	PE/yr	20 yr est
	35	698

Water District info	2000-2009	2010-2017	total
total	1354	482	1836
wtr dst (within water district)	1226	422	1648
no dst (outside water district)	128	60	188

Ag PD	permits	% of WRIA total
WRIA 8	2	0%
Forest PD	permits	% of WRIA total
WRIA 8	1	0%

Historic Percentages	pub	0.595
	pvt	0.342

Water service info	(derived from KC parcel attribute data)		
public water system (pub)	843	250	1093
well - private water (pvt)	498	130	628
other	13	102	115
total	1354	482	1836

Existing PE wells	2000-2009	2010-2017	Total
	498	130	628
error	1%	21%	6%

WRIA 8 - Historic Growth and Water Use by Subbasin

Sub-basin delineations v 9/25/19			Water use by basin				
Sub-basin w/ permits	Number of permits	Distribution of growth	pub	pvt	oth	%pub	%pvt
Seattle/ Lake Union	Urban	0%	0	0	0	0%	0%
Puget Sound Shorelines	Urban	0%	0	0	0	0%	0%
Swamp/North	Urban	0%	0	0	0	0%	0%
Little Bear Creek	0	0%	0	0	0	0%	0%
Samm River Valley	109	6%	96	7	6	88%	6%
Bear/Evans	516	28%	376	117	23	73%	23%
Greater Lake Washington	3	0%	3	0	0	100%	0%
May/Coal (Cedar)	134	7%	113	13	8	84%	10%
Lake Samm creeks	5	0%	0	5	0	0%	100%
Issaquah Creek	367	20%	144	199	24	39%	54%
Lower Cedar	701	38%	361	286	54	51%	41%
Upper Cedar	1	0%	0	1	0	0%	100%
total	1836	100%	1093	628	115	total	1836

WRIA 8 - 20 year PE Well Projection by Subbasin

permits/yr	102		Added by GeoEngineers:	
Average bldg. permits per year	Average wells per year (pvt)	Total wells in 20 years	Total wells in 20 years + 6% error	Total Rounded
0.0	0.0	0.0	0.0	0
0.0	0.0	0.0	0.0	0
0.0	0.0	0.0	0.0	0
0.0	0.0	0.0	0.0	0
6.1	0.4	7.8	8.2	8
28.7	6.5	130.0	137.8	138
0.2	0.0	0.0	0.0	0
7.4	0.7	14.4	15.3	15
0.3	0.3	5.6	5.9	6
20.4	11.1	221.1	234.4	235
38.9	15.9	317.8	336.8	337
0.1	0.1	1.1	1.2	1
102.0	34.9	697.8	739.6	740

WRIA 8 - Permit-Exempt Well Potential Assessment

Assessment of potential parcels for future growth

Sub-basins	Number of parcels	Number of Dwelling Units (DU)
Seattle/ Lake Union	Urban	Urban
Puget Sound Shorelines	Urban	Urban
Swamp/North	Urban	Urban
Little Bear Creek	0	0
Samm River Valley	85	88
Bear/Evans	398	526
Greater Lake Washington	0	0
May/Coal (Cedar)	142	163
Lake Samm creeks	20	21
Issaquah Creek	429	534
Lower Cedar	578	818
Upper Cedar	0	0
total	1652	2150

Water district boundaries				sub-basin	Water Use Projection							
Inside		Outside			public connection		PE sourced			Shortfall (red if present) in 20 year well projection	Redistribution - 20 year well projection	
parcels	DU	Parcels	DU		parcels	DU	parcels	DU	20 year well projection (incl error)			
0	0	0	0	Seattle/ Lake Union	0	0	0	0	0	0	0	0
0	0	0	0	Puget Sound Shorelines	0	0	0	0	0	0	0	0
0	0	0	0	Swamp/North	0	0	0	0	0	0	0	0
0	0	0	0	Little Bear Creek	0	0	0	0	0	0	0	0
85	88	0	0	Samm River Valley	75	78	10	10	8	2	8	8
398	526	0	0	Bear/Evans	290	383	108	143	138	5	138	138
0	0	0	0	Greater Lake Washington	0	0	0	0	0	0	0	0
142	163	0	0	May/Coal (Cedar)	120	137	22	26	15	11	15	15
18	19	2	2	Lake Samm creeks	0	0	20	21	6	15	6	6
242	291	187	243	Issaquah Creek	95	114	334	420	235	185	235	235
492	713	86	105	Lower Cedar	253	367	325	451	337	114	338	338
0	0	0	0	Upper Cedar	0	0	0	0	1	-1	0	0
1377	1800	275	350		833	1080	819	1070	740	-----	740	740

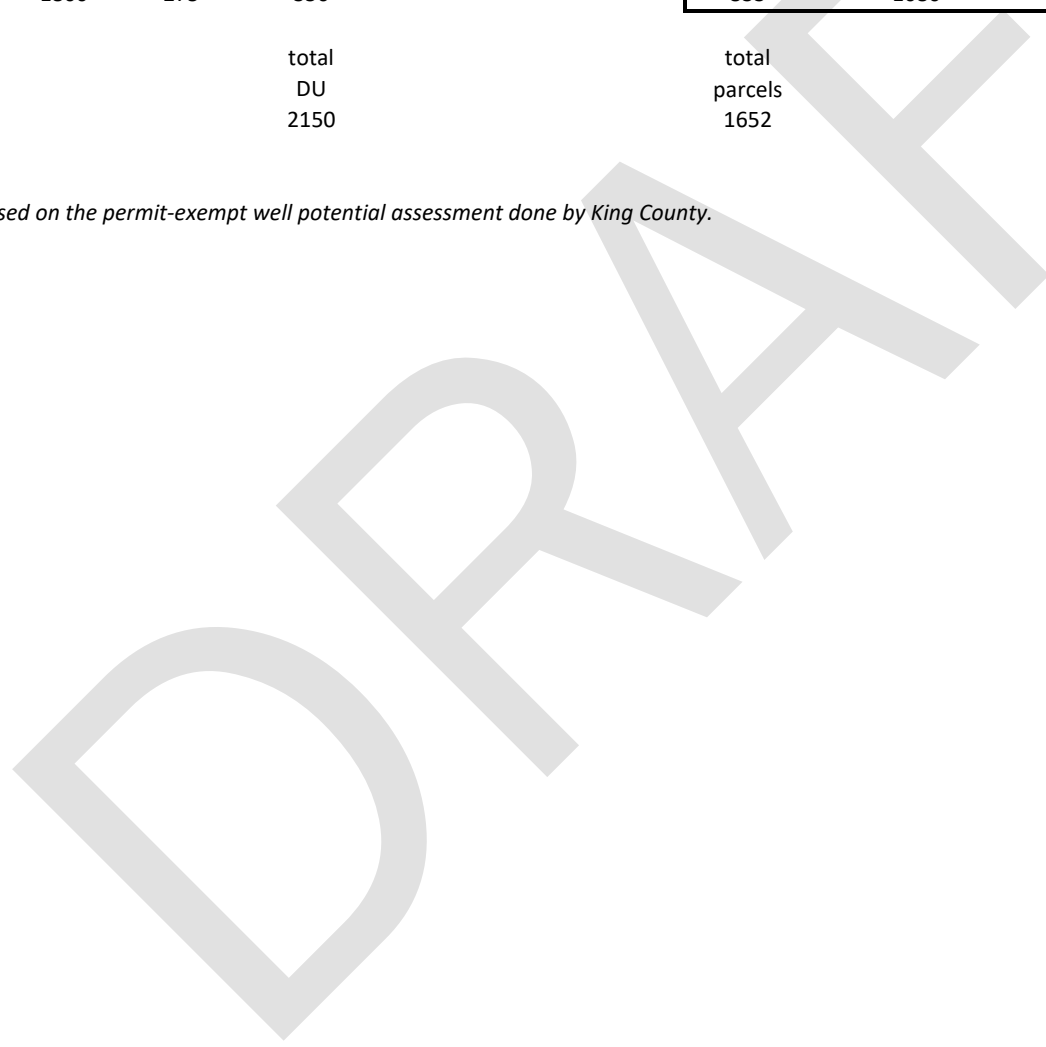
total parcels 1652
total DU 2150

total parcels 1652
total DU 2150

20 year Permit Exempt well total 740

Notes:

Columns in yellow include redistribution of wells in the 20 year growth projection, based on the permit-exempt well potential assessment done by King County.



ATTACHMENT B
**Snohomish County Growth Projections and Rural Capacity
Analysis Memo and Data Tables**

DRAFT

Snohomish County - Unincorporated WRIA 8 Growth Projections

SNOHOMISH COUNTY WRIA 8 - HUC 12 Name (proposed subbasin name)	Growth Forecast Scenarios - New Homes			2019 Available Capacity			Capacity Surplus or Shortfall Past Trends Scenario -			GeoEngineers Proposed PE Well Allocation
	Past Trends			Total	Water Service Areas	P-E Well Areas	Total	Water Service Areas	P-E Well Areas	Total PE Wells
	Total	Water Service Areas	P-E Well Areas							
North Creek (Swamp/North Subbasin)	0	0	0	7	5	2	7	5	2	0
Bear Creek - Sammamish River (Little Bear Subbasin)	279	102	177	393	275	118	114	173	-59	118
Bear Creek (Bear/Evans Subbasin)	161	128	33	253	145	108	92	17	75	92
Total WRIA 8	440	230	210	653	425	228	213	195	18	210

Notes:

Total new home forecast (440) = calculated new residential dwellings per year (22) x WREC planning time period (20 years)

Projected PE well growth exceeds capacity in the Bear Creek - Sammamish River HUC. **GeoEngineers proposes reallocating the growth to the Bear Creek HUC.**

North Creek HUC = Swamp/North Subbasin (KC proposal)

Bear Creek - Sammamish HUC = Little Bear Subbasin (KC proposal)

Bear Creek HUC = Bear/Evans Subbasin (KC proposal)

Draft 8/9/19

ATTACHMENT C
GeoEngineers UGA Well Log Spot Check Data Tables

DRAFT

GeoEngineers - Incorporated (UGA) WRIA 8 Growth Projections

Draft 8/9/19

GeoEngineers - UGA Well Log Spot Check						
Period	Total Wells	Total Wells Spot Checked	Domestic wells (includes Group B wells)	Irrigation wells	Other (Test, Municipal, Dewatering, Industrial, Mitigation, UIC, Deepened or Refurbished)	Incorrect (Location, Date, etc.)
1998-2007	129	66	7	40	14	5
2008-2018	76	48	2	11	28	7
Totals	205	114	9	51	42	12
Percent of Total		56%	8%	45%	37%	11%
<i>Potential number of new wells based on percentage of past 20 year total (205)</i>						
WRIA 8			16	92	76	22

Notes:

Domestic and Irrigation well numbers have been adjusted based on information provided by The Highlands, Olympic View Water & Sewer District, City of Redmond, City of Sammamish and cross-checking well address with UGA boundary.

A total of 21 wells logged as "domestic" are actually irrigation wells and were moved to that category.

The remaining domestic wells that have been spot checked are located in the following City UGAs: Maple Valley (1), Mukileto (1), Mill Creek (3), Maltby (1), Kirkland (1) and Seattle (1).

Service Area/City Policy Notes:

Alerwood Water and Wastewater District - expanding service rapidly.

Redmond - PE wells not allowed. No new wells for irrigation that they know of.

Sammamish - PE wells not allowed. No known areas that can not be reached by public water.

The Highlands - all public water. Most lots have wells for irrigation due to large lawn size.

Woodway - all public water. Many lots have wells for irrigation due to large lawn size.

GeoEngineers - Incorporated (UGA) WRIA 8 Growth Projections							
Proposed subbasins	Spot Checked 1998-2007	Spot Checked 2008-2018	Total	Total Potential Wells in UGA in 20 years	Total Rounded	County	City UGA
1 - Seattle/Lake Union	0	0	0	0.00	0	King	
2 - PS Shorelines	1	0	1	1.77	2	Sno co/King co	Mukilteo
3 - Swamp North	3	0	3	5.31	5	Sno co/King co	Mill Creek
4 - Little Bear	0	0	0	0.00	0	Sno co/King co	
5 - Samm Rvr Valley	0	0	0	0.00	0	King co	
6 - Bear/Evans	1	1	2	3.54	4	Sno co/King co	Maltby
7 - Greater Lake Washington	1	1	2	3.54	4	Sno co/King co	Kirkland/Seattle
8 - May/Coal	0	0	0	0.00	0	King	
9 - Lk Samm Creeks	0	0	0	0.00	0	King	
10 - Issaquah	0	0	0	0.00	0	King	
11 - Lower Cedar	1	0	1	1.77	2	King	Maple Valley
12 - Upper Cedar	0	0	0	0.00	0	King	
Totals	7	2	9	15.93	17		

Note: 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.

ATTACHMENT D
**King and Snohomish County PE Well Potential Assessment
and Rural Capacity Analysis**

DRAFT

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 Analysis	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 been 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 been 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 without 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 parcels 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)