CHAPTER 2 – BASIC PLANNING DATA

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CHAPTER 2

BASIC PLANNING DATA

This chapter presents basic planning data essential for the assessment of King County Water District No. 49's water system. In order to forecast future water demands it is necessary to evaluate the current state of the existing water system and to determine future needs based on foreseeable demographic trends over the next 20 years. This is accomplished by a study of the population trends and land use which may impact the capacity and placement of future system improvements.

The water system analysis includes the study of historical growth and water demands for the system and population projections based on current and future land use designations from the Cities of Burien, SeaTac, and Normandy Park. These projections are used to determine the potential population and ultimate development of the District's service area.

2.1 EXISTING CONDITIONS

The District covers approximately 3.32 square miles of mostly developed urban land located largely within the City of Burien with smaller portions located in the Cities of Normandy Park and SeaTac. The District's service area is primarily residential with localized commercial developments, including retail stores, shops, and restaurants. There are also some existing industrial and warehouse complexes within the service area. Figure 2-1 shows the existing land use within the District's boundary.

2.1.1 Current Residential Population

The District's service area encompasses a portion of the largely developed urban area of southwestern King County. Population projections have been prepared from source materials put forth by the United States Census Bureau, the Washington State Office of Financial Management (OFM), and the Puget Sound Regional Council (PSRC). None of the above sources identifies data that is specific to the District's service area. Therefore, an interpretation of the available data has been done to estimate the actual population served by the District.

The U.S. Census Bureau groups population information into census tracts. The District's service area covers portions of nine census tracts (274.00, 275.00, 276.00, 278.00, 279.00, 280.00, 284.02, 285.00 and 286.00). Figure 2-2 shows the census tracts within the District boundary.

The PSRC takes the census data and forecasts future population based on a specific set of criteria. The PSRC released an update to its package of long-range forecast products in April 2014. This release, Maintenance Release 1 (MR1), updates both of the future land datasets: the Land Use Baseline and the Land Use Targets. For the

purposes of this Plan, the Land Use Targets dataset was utilized, which is consistent with what the City of Burien used in their 2017 Comprehensive Plan Update. More information about forecast population can be found in Section 2.2.2.

Table 2.1 summarizes the areas and percentages of the census tracts within the District's boundary.

TABLE 2.1
PERCENTAGE OF THE CENSUS TRACTS
WITHIN DISTRICT BOUNDARY

Census Tract	Area[1], acres	Area in District, acres	% of Census Tract in District Boundary
274.00	822	11	1.4
275.00	551	51	9.2
276.00	1,027	26	2.5
278.00	907	404	44.5
279.00	868	796	91.8
280.00	518	177	34.3
284.02	2,057	58	2.8
285.00	867	390	45.0
286.00	2,065	210	10.2

[1]Information provided by Puget Sound Regional Council

The service area population was estimated by taking the percentage of the census tract within the District boundary and multiplying it by the estimated population for each census tract. Table 2.2 summarizes existing service area population for 2010.

Table 2.3 summarizes the historical population trends for the District from two different sources. Population data shown for the years 1990 and 2000 are based on population data from the US Census Bureau. Data shown for the years 2007 and 2010 are based on revised estimates put forth by the PSRC. The District's estimated population as of December 31, 2010 was 11,718 people.

TABLE 2.2
POPULATION FOR 2010

Census Tract	2010 Census Tract Population[1]	% of Census Tract in District Boundary	2010 Estimated Service Area Population
274.00	5,417	1.4	75
275.00	4,707	9.2	432
276.00	4,641	2.5	115
278.00	3,288	44.5	1,464
279.00	6,507	91.8	5,972
280.00	3,363	34.3	1,153
284.02	5,123	2.8	145
285.00	3,845	45.0	1,730
286.00	6,215	10.2	632
		Total Population	**11,718**
		Service Area, acres	**2,124**

[1]From estimates put forth by the PSRC (LUT-MR1, released April 2014)

TABLE 2.3
HISTORICAL POPULATIONS

Year	Total ERUs[1]	Total Population[2]	King County Population	County Population/ Household
1990	4,900	12,162	1,507,319	2.40
2000	6,921	12,923	1,737,044	2.39
2007	7,020	13,152	1,861,226	2.41
2010	7,055	11,718	1,931,249	2.39

[1] Equivalent Residential Units based on water use for single-family, multi-family and commercial customers.
[2] 1990 and 2000 population information from Census data

2.1.2 Total Service Connections

The District's current number of connections (December 2018) is 4,209 including residential (R), commercial (C) and irrigation (IRR and IRC). All connections are metered with meter sizes ranging from 5/8" for a typical single-family residence up to 10" for the Port of Seattle[1].

[1] The District provide potable water and fire suppression service to Port facilities/buildings situated west of the Sea-Tac Third Runway, as a direct retail service.

The District's billing system records accounts in three categories. Irrigation meters are included as subcategories of commercial account totals. For this Plan, all meters are considered to be capable of supplying full time water use. The number of service connections in each of the three categories as of December 2018 is:

Single Family Residence	3,204 (76%)
Multi-Family Residence	391 (9%)
Commercial/Industrial	614 (15%)
Total	4,209

2.1.3 Water Use Data Collection

The Washington State Department of Health's *Water Use Efficiency Guidebook* establishes data collection and reporting requirements.

Monthly reporting of quantities of water purchased from SPU is provided by SPU through monthly invoices. Individual customer service meters are read by District staff bimonthly, with approximately one half of the District meters being read each month. Readings are input into the District's billing system by office personnel who in turn generate monthly invoices.

The District has kept accurate water use records for many years and uses that information to establish consumption trends and forecast District water demands. The historical information is used in order to calculate future water system demands as required by SPU, the historical information about the water use (purchased versus sold) and the percentage of distribution system leakage or non-revenue water.

Table 2.4 shows the available historical information for WD 49 since 1993. Non-revenue water is the water that is the difference between what the District purchases and what they sell. This value is calculated each spring for the previous year. This amount includes water used for fire flows and water main testing.

Negative values for non-revenue water in the table are believed to be the result of inaccuracies of the SPU water meters. The volumes purchased in 2011 and 2012 are unusually high, resulting in high non-revenue water percentage. This purchased water data is likely erroneous due to meter issues. These meters were replaced in 2013.

TABLE 2.4
Historical Water Supply and Sales[1]

Year	WD 49 Water Purchased from SPU	WD 49 Water Purchased Wholesale[4]	WD 49 Water Sold Retail	Non-Revenue Water[2]	% Of Non-Revenue Water[3]
1993	478,733,083	-	500,257,531	(21,524,448)	(4.50)
1994	523,938,613	10,527,336	540,812,422	(6,346,473)	(1.21)
1995	532,633,221	10,833,289	543,794,157	(327,647)	(0.06)
1996	570,193,660	10,665,725	512,587,672	68,271,714	11.97
1997	515,658,425	7,027,949	515,731,735	6,954,639	1.35
1998	515,639,724	6,697,310	494,396,543	27,940,490	5.42
1999	512,690,903	5,079,273	500,044,336	17,725,840	3.46
2000	503,985,822	1,576,894	490,354,070	15,253,528	3.03
2001	461,281,777	-	458,457,881	2,823,896	0.61
2002	467,615,534	-	459,470,744	8,144,790	1.74
2003	457,797,351	[10]	482,505,509	(24,715,638)	(5.40)
2004	479,136,283	-	456,943,824	22,192,459	4.63
2005	439,473,069	-	453,259,668	(13,786,598)	(3.14)
2006	448,798,286	-	464,200,676	(15,402,391)	(3.43)
2007	476,432,823	-	450,755,190	25,677,633	5.39
2008	438,202,129	-	423,369,754	14,832,375	3.38
2009	440,687,158	-	429,299,562	11,387,596	2.58
2010	416,427,832	97,247	402,037,555	14,487,523	3.48
2011	477,451,670	-	401,314,189	76,137,481	15.95
2012	456,487,512	27,678	402,310,594	54,204,596	11.87
2013	421,033,588	36,655	401,828,849	19,241,394	4.57
2014	453,846,008		417,526,868	36,319,140	8.00
2015	467,871,725		428,339,956	39,531,769	8.45
2016	472,006,700		424,562,504	47,444,196	10.05
2017	450,857,748		423,521,340	27,336,408	6.06
2004-2017 Average % Non-Revenue Water					**5.66**
2007-2017 Average % Non-Revenue Water					**5.77**

[1]Water volumes are in gallons (gal).

[2]Non-revenue water is defined as all water not sold retail or wholesale. Discrepancies may occur with WUE information as this table includes all forms of authorized non-revenue consumption, not just system leakage.

[3]Percent Non-revenue water is a percentage of total water purchased. Averages do not include results for negative values or for years 2011 and 2012.

[4]Water purchased from and [sold to] to Highline Water District from 1993 through 2013 and Water District No. 20 from 2008 through 2013. Usage events were for planned maintenance activities where local supply was limited, and some usage is attributed to the PRV settings allowing intertie supply during local flushing conditions. The settings have since been refined.

2.1.4 Equivalent Residential Unit

An equivalent residential unit (ERU) is a unit of measure used to equate multi-family and commercial or non-residential water use to an equivalent amount of water consumed by a typical single family residence. The ERU amount changes each year based on the water usage for single family customers in a given calendar year.

Calculation of the District's historical ERU values for the period 1993 – 2017 is summarized in Appendix E. ERU values for 2002 – 2017 are shown in Table 2.5.

The District's water use data for single family residences since 2012 was evaluated. The average day demand (ADD) for single family residences was determined for each year in the period from 2002 through 2017. The average ADD per residential connection during this period is 169 gallons per ERU per day. For the ten year period 2008 through 2017, average usage was 158 gallons per ERU per day.

The value of 165 gpd/ERU was selected as the ADD for the District. The average value of 165 gpd/ERU is used because it is slightly higher than recent actual usage and it provides a small contingency for prudent forecasting. This value was then used to determine the equivalent number of residential units for multi-family and commercial customer classes. The results are shown as 2013 Adjusted data in Table 2.5 below and were used as the basis for the water usage forecast presented later in this chapter.

TABLE 2.5
ERU VALUES By Customer Type

Year, gpd/ERU, ERUs	Single Family	Multi-Family	Commercial	TOTAL
2002				
Average Use	189			
ERUs	3,143	1,757	1,761	6,661
2003				
Average Use	199			
Estimated ERUs	3,143	1,684	1,814	6,641
2004				
Average Use	190			
ERUs	3,047	1,708	1,826	6,581
2005				
Average Use	177			
ERUs	3,150	1,825	2,038	7,013
2006				
Average Use	196			
ERUs	3,201	1,667	1,622	6,490
2007				
Average Use	176			
ERUs	3,198	1,884	1,938	7,020
2008				
Average Use	161			
ERUs	3,274	2,050	1,880	7,204
2009				
Average Use	171			
ERUs	3,279	1,894	1,710	6,883
2010				
Average Use	156			
ERUs	3,263	1,999	1,793	7,055
2011				
Average Use	154			
ERUs	3,209	2,115	1,821	7,145
2012				
Average Use	157			
ERUs	3,148	2,079	1,798	7,025
2013 Adjusted (Used for Forecast)				
Average Use	165			
ERUs	3,147	1,974	1,798	6,919

2014				
Average Use	154			
ERUs	3,171	2,235	2,021	7,427
2015				
Average Use	157			
ERUs	3,166	2,179	2,128	7,473
2016				
Average Use	155			
ERUs	3,198	2,147	1,930	7,275
2017				
Average Use	165			
ERUs	3,210	1,988	2,079	7,277

Average Use and Growth Rate Data

Year Range	Single Family Average Use (gpd/ERU)	Single Family Average Growth Rate (%)	Multi-Family Average Growth Rate (%)	Commercial Average Growth Rate (%)
2015 – 2017	159	0.41%	-3.79%	1.24%
2013 - 2017	157	0.39%	-0.64%	3.22%
2008 - 2017	158	0.04%	0.76%	0.92%

The District water use records were also used to determine the maximum day demand (MDD). The District collects daily source meter data from its SPU interties. Gaps in the data were found for years prior to 2014. Therefore, the 2014 SPU daily source meter data was used to calculate actual MDD for the system. The ratio of MDD/ADD was calculated and it was 1.5 for 2014.

For the purposes of the District's demand forecast, a ratio of 2.0 was used, which is consistent with previous planning data and still conservative compared to the actual 2014 MDD/ADD ratio of 1.5.

Actual flow data for peak hour demand (PHD) for the District is not available. Therefore, DOH equation 5-1 was used to develop PHD. PHD is a function of MDD and the number of service connections for systems with more than 500 connections.

The following equation from the DOH Water System Design Manual (WSDM) was used:

$$PHD = (MDD/1440)[(1.6)(\#\ ERU's) + 225] + 18 \qquad \{WSDM\ Equation\ 5\text{-}1\}$$

The resulting ratio of PHD to MDD, with appropriate unit conversion is 1.64 through 2026 and 1.63 from 2027 through 2038.

2.1.5 Winter and Summer Seasonal Water Use

Due to a change in the billing system in Fall 2012, there is no seasonal data available for years 2008 through 2012. Because of this, the seasonal water use was not analyzed for this period. The observations for years 2002 through 2007 are included below. The seasonal water use will be evaluated during the next WSP update when sufficient data is available for updated analysis.

The water usage records for years 2002 through 2007 were examined for winter and summer seasonal usage for the single-family residential, multi-family residential and commercial customer classes. Historical monthly water billing data for each customer class from 1993-2007 is shown in Appendix E. Water volume billed each month is for water usage for the previous two months. For example, customers billed in December are actually being billed for water used in October and November.

The summer season is assumed to be the months of April through September. Usage for these months is billed in the months of June through November. The winter season is the months of October through March which are billed December through May.

Figure E-1 shows the average water usage for the summer season as compared to the winter season for the three customer classes. The graphs are the average usage for the summer and winter seasons for years 2002 through 2007.

Average yearly usage for the multi residential class shows a fairly constant uniform usage between summer and winter seasons. Maximum summer average usage is about 25% higher than the lowest winter average. This is attributed to the fact that few multi residential developments have separate irrigation systems.

Maximum yearly summer average for the commercial accounts shows approximately a 52% increase over the minimum winter usage primarily due to separate irrigation systems.

Maximum average summer usage for the single family residential class shows the greatest increase over the minimum winter average. Summer usage is approximately double that of the winter usage. This large increase is due to individual irrigation systems and increased outdoor activities at home.

2.1.6 Largest Water Users

The top twenty water users for the District in 2018 are shown in Table 2.6.

TABLE 2.6
LARGEST WATER USERS IN 2018

No.	Customer	Annual Sales Average 2018 (mcf)[1]
1	Highline Medical Center	1.511
2	Merrill/Legacy at Burien MF, LLC	0.795
3	Cambridge Square - West	0.674
4	Cambridge Square - East	0.604
5	Burien Town Square, LLC	0.462
6	Highline School District - High School	0.430
7	LA Fitness	0.411
8	Wizards Casino	0.408
9	Highline School District - Sylvester	0.382
10	Merrill Gardens at Burien	0.375
11	Seatac's Best Laundromat, LLC	0.350
12	Navos Irrigation	0.309
13	Safeway Stores, Inc. #434	0.299
14	Ring Yuba City Company	0.297
15	Courtyard Apartments	0.282
16	Burien Development Group	0.266
17	Simkus, Inc.	0.265
18	Normandy Park Assisted Living	0.243
19	Highline School District - Performing Arts	0.241
20	Highline School Dist - Sunnydale	0.241
	Total	**8.845**

[1] million cubic feet

2.2 COMMUNITY AND WATER USAGE PROJECTIONS

2.2.1 Projected Land Use

The area within the service boundary of the District is under the jurisdiction of three separate municipalities and, therefore, is subject to the comprehensive land use plans and zoning codes of the City of Burien, the City of SeaTac and the City of Normandy Park. Land use is classified as residential, multi-family, industrial, commercial, office, aviation and parks and open space and is shown in Figure 2-1.

2.2.2 Projected Population and Water Demand

As discussed in previous sections, the District's service area covers a mostly developed urban area of southwest King County. The service area lies mainly within the boundary of the City of Burien with small portions in the Cities of SeaTac and Normandy Park.

As mentioned in Section 2.1.1, the PSRC Maintenance Release 1 of the Land Use Targets dataset was utilized for the purposes of forecasting population in this Plan.

The Land Use Targets is a companion product to the Land Use Baseline that provides long-range future land use dataset based on local growth targets developed (or being developed) by each county to align with VISION 2040's regional growth strategy.

VISION 2040 is an integrated growth management, environmental, economic and transportation strategy which focuses new employment and housing in vibrant urban centers. The PSRC adopted VISION 2040 in April 2008.

Table 2.7 summarizes the estimated projected residential population served by the District for the years 2019-2038. The percent of the census tract area within the District boundary was applied to the population in each tract for each year forecast by PSRC (2025, 2030, 2031 and 2035). Populations between the years forecast by PSRC were then determined linearly and are presented in Table 2.7 below. Data for 2036-2038 was extrapolated three additional years based on growth forecast from 2031 to 2035.

TABLE 2.7
FORECAST RESIDENTIAL POPULATION

Census Tract	2019	2028	2033	2038
274	79	83	86	90
275	454	479	497	513
276	118	123	128	132
278	1,462	1,490	1,539	1588
279	7,492	8,690	8,998	9310
280	1,247	1,341	1,395	1449
284.02	163	185	200	215
285	1,922	2,100	2,183	2267
286	640	647	652	657
Total	**13,577**	**15,138**	**15,678**	**16,221**

The District has seen significant changes in the number of accounts over the past ten years but relatively small changes in water use over the same period. The annual water use by customer class for 1993-2018 is shown in Tables E.1 and E.2 based on the SPU annual wholesale customer summaries. The calculated non-revenue water is shown for each year also.

Annual water demands will vary with population and in response to climatic and economic conditions. Section 2.2.3 below discusses the growth in demand by customer class in more detail.

2.2.3 Projected Growth of Customer Class

The 2013 adjusted ERUs presented in Table 2.5 were used as the basis for the water demand forecasts presented later in this chapter.

The forecast residential population within the District boundary, based on the PSRC Land Use Targets dataset, is expected to increase from 11,718 to 16,331 people from 2010 to 2036. This is equivalent to an increase of 1.285% annually through 2036. This percentage increase was applied to the single-family ERUs for 2014-2036. The same rate of growth was used to extrapolate ERU growth from 2036 through 2038.

The multi-family growth rate for the years 2016 through 2018 is based on a large increase in living units planned or now under construction as the Merrill Gardens at Burien and the Burien Town Square Apartments developments. Approximately 353 additional units are expected over the next few years corresponding to an annual growth rate of 3.5%.

Census tract 279.00 encompasses a large portion of the City of Burien's Urban Center Boundary, where there is a heightened focus on future commercial and multi-family residential growth in the next 20 years. The forecast annual increase in residential population within census tract 279.00 is 1.75% annually through 2036. This percentage increase was applied to the multi-family ERUs for 2014-2015 and 2019-2038.

The forecast annual increase in employment within the City of Burien is 1.9% in their most current Comprehensive Plan update. The increase in employment directly corresponds to the growth in commercial ERUs and therefore this 1.9% increase was applied to the commercial ERUs for 2014-2038.

Table 2.8 is a summary of projected growth rates by customer class.

TABLE 2.8
PROJECTED GROWTH RATE BY CUSTOMER CLASS

Customer Type	Projected Annual Growth Rate (percent)
Single Family Residential	1.285%
Multi-Family Residential	
2016-2018	3.5%
2014-2015, 2019-2038	1.75%
Commercial	1.9%

2.2.4 Projected Non-Revenue Water and Wholesale Water Sales

Monthly billing statements are provided by SPU for total volumes registered through its meters. The District calculates non-revenue water volumes as the difference between the quantity sold to customers and quantity purchased from SPU. Included in the non-revenue water is water used for fire hydrant flushing, fire demands, leaks and other losses and water main testing. These volumes of water were first estimated by the District for 2007 and will continue into the future.

The amount of non-revenue water, as calculated by the above method, has generally been less than 6% since 1993 except in 1996, 2011 and 2012. This amount is considered very low and represents a well-managed District in terms of controlling distribution system leakage. In addition, the District's ongoing capital improvement program results in the replacement of aging water mains which may experience leaks.

Based on the above information, the District's percentage of non-revenue water usage is projected to remain relatively constant throughout the planning period. For purposes of this Plan, non-revenue water will be estimated at a constant 6% of the total District average day demand.

The District does not normally buy or sell water to any adjacent purveyor. Water exchange between districts is on an emergency basis only. For purposes of this Plan, no wholesale water is forecast to be bought or sold by the District, except for purchases from SPU.

2.2.5 Water Rates and Rate Impacts on Water Demand

The District's current rate structure is included in Chapter 9. The District bills approximately one half of the accounts each month resulting in a bimonthly billing cycle for each customer. The customer's bill reports the previous meter reading and the current reading along with the difference shown as the current usage amount.

The total amount due includes the total water charge (including both base charge and the usage charge) and the charge for street lighting. The District performs various administration duties related to street lighting including answering customer questions and verifying outages. Seattle City Light charges the District for each street light which is paid for by the money collected by the District.

In 2007, the District completed a rate study. The results of the study were updated in 2008 to reflect the impact of newly-announced SPU rate increases. New rates were adopted to cover the SPU rate increases and the increasing costs for District expenses and projects. The block rate structure was added to encourage water conservation by charging more for larger users. Rates have been reviewed periodically since then and adjusted when determined to be appropriate by the District Board of Commissioners.

A detailed rate study was completed in 2017 following adoption of the 2017 Water System Plan. The study recommended a series of additional rate increases. The Board adopted the rate increases effective January 2017 and January 2018. Future increases will be considered following completion of this 2019 Water System Plan.

The 2018 water rate structure includes the base rate which is billed by meter size for each customer class and a water usage rate. For single family customers, the usage rate is a three-tiered structure. For 0 to 10 ccf, the rate is $3.58 per ccf, for 11 to 16 ccf it is $4.41 and for 17 ccf and more, the rate is $6.06. Usage rate for multi-family and commercial accounts is constant at $4.13 per ccf. Discount accounts are billed at a rate of $3.58 per ccf, irrigation accounts at a rate of $6.06 per ccf and unmetered water is billed at a rate of $5.24 per ccf.

2.2.6 Water Demand Forecasting

Factors affecting the District's water demand forecast have been discussed in this chapter. Table 2.5 shows a summary of historical demands by customer type from 2002 through 2018. Tables 2.9 and 2.10 below summarize the demand projections through the year 2038 utilizing the projected average usage per ERU. Table 2.9 uses a constant average daily demand of 165 gallons per day per ERU. Table 2.10 assumes a 0.75% per year reduction in demand through 2018 (reduced to 159 gpd/ERU), and then a 0.25% per year reduction in demand through 2022 (reduced to 157.4 gpd/ERU). The average daily use is then calculated by multiplying the number of ERUs by the daily demand. Non-revenue water is estimated at a constant 6% of the total District demand. MDD is calculated using a MDD/ADD ratio of 2.0. PHD is calculated using the DOH WSDM Equation 5.1. The complete projected water demand forecasts, without and with conservation benefit, can be found in Appendix E, Tables E-4 and E-5.

As noted in Section 2.1.2, the count of single family connections (also ERUs) at the end of 2018 was 3,204. Table E.4 indicates the forecast count of single family ERUs, as developed for the 2017 Water System Plan, is 3,354. This indicates that the forecast prepared for the 2017 Plan is somewhat conservative, or that growth early in the planning period is lagging behind the forecast by over four percent, at this point in time.

TABLE 2.9
PROJECTED WATER DEMAND 2019 – 2038
Average Day, Maximum Day, Peak Hour
(Without Additional Projected Savings)

Type	2019	2020	2021	2022	2023	2024
Single-Family Residential	560,505	567,765	575,025	582,450	589,875	597,465
Multi-Family Residential	380,655	387,255	394,020	400,950	408,045	415,140
Commercial	332,145	338,415	344,850	351,450	358,050	364,815
Dist. System Leakage	76,398	77,606	78,834	80,091	81,358	82,645
ADD (mgd)	**1.35**	**1.37**	**1.39**	**1.41**	**1.44**	**1.46**
MDD (mgd)	**2.62**	**2.66**	**2.71**	**2.75**	**2.79**	**2.84**
PHD (gpm)	**2,986**	**3,032**	**3,078**	**3,126**	**3,175**	**3,224**

Type	2025	2026	2027	2028	2033	2038
Single-Family Residential	605,220	612,975	620,895	628,815	670,395	714,615
Multi-Family Residential	422,400	429,825	437,415	445,005	485,430	529,155
Commercial	371,745	378,840	386,100	393,360	432,135	475,035
Dist. System Leakage	83,962	85,298	86,665	88,031	95,278	103,128
ADD (mgd)	**1.48**	**1.51**	**1.53**	**1.56**	**1.68**	**1.82**
MDD (mgd)	**2.88**	**2.93**	**2.98**	**3.02**	**3.27**	**3.54**
PHD (gpm)	**3,274**	**3,325**	**3,377**	**3,429**	**3,706**	**4,005**

Notes:

1. Flow in gallons per day for each customer class/category

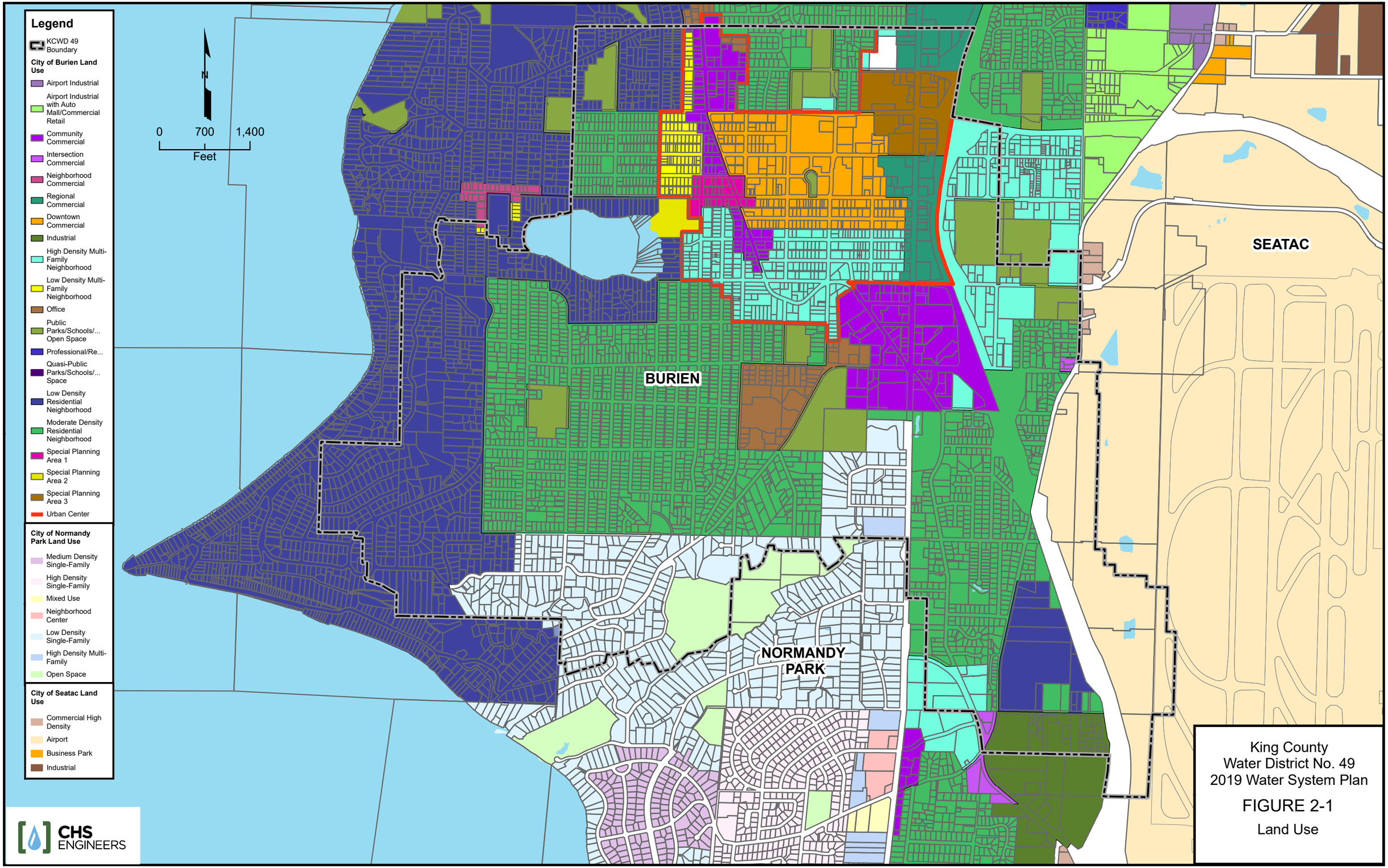
TABLE 2.10
PROJECTED WATER DEMAND 2019 – 2038
Average Day, Maximum Day, Peak Hour
(With Additional Projected Savings)

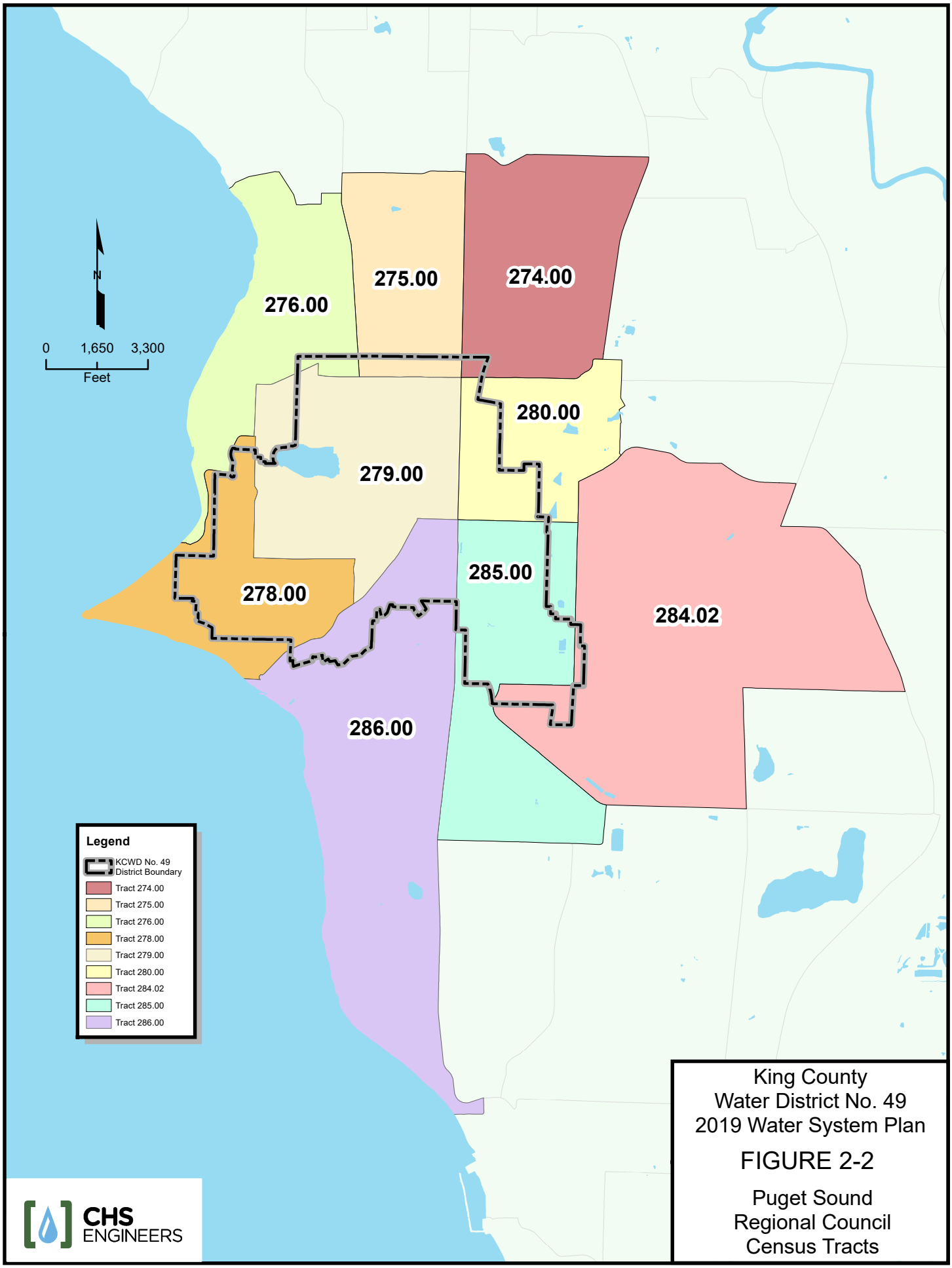
Type	2019	2020	2021	2022	2023	2024
Single-Family Residential	538,764	544,366	549,933	555,622	562,705	569,945
Multi-Family Residential	365,890	371,295	376,826	382,482	389,250	396,018
Commercial	319,262	324,468	329,802	335,262	341,558	348,011
Dist. System Leakage	73,435	74,408	75,394	76,402	77,611	78,839
ADD (mgd)	**1.30**	**1.31**	**1.33**	**1.35**	**1.37**	**1.39**
MDD (mgd)	**2.52**	**2.55**	**2.59**	**2.62**	**2.66**	**2.71**
PHD (gpm)	**2,870**	**2,907**	**2,945**	**2,983**	**3,029**	**3,076**

Type	2025	2026	2027	2028	2033	2038
Single-Family Residential	577,343	584,741	592,296	599,851	639,516	681,699
Multi-Family Residential	402,944	410,027	417,267	424,508	463,071	504,782
Commercial	354,622	361,390	368,316	375,242	412,231	453,155
Dist. System Leakage	80,095	81,370	82,673	83,976	90,889	98,378
ADD (mgd)	**1.42**	**1.44**	**1.46**	**1.48**	**1.61**	**1.74**
MDD (mgd)	**2.75**	**2.79**	**2.84**	**2.88**	**3.12**	**3.38**
PHD (gpm)	**3,124**	**3,173**	**3,222**	**3,272**	**3,536**	**3,822**

Notes:

1. Flow in gallons per day for each customer class/category


Legend
KCWD 49 Boundary
City of Burien Land Use
Airport Industrial
Airport Industrial with Auto Mall/Commercial Retail
Community Commercial
Intersection Commercial
Neighborhood Commercial
Regional Commercial
Downtown Commercial
Industrial
High Density Multi-Family Neighborhood
Low Density Multi-Family Neighborhood
Office
Public Parks/Schools/... Open Space
Professional/Re...
Quasi-Public Parks/Schools/... Space
Low Density Residential Neighborhood
Moderate Density Residential Neighborhood
Special Planning Area 1
Special Planning Area 2
Special Planning Area 3
Urban Center
City of Normandy Park Land Use
Medium Density Single-Family
High Density Single-Family
Mixed Use
Neighborhood Center
Low Density Single-Family
High Density Multi-Family
Open Space
City of Seatac Land Use
Commercial High Density
Airport
Business Park
Industrial
N
0
700
1,400
Feet
BURIEN
NORMANDY PARK
SEATAC
CHS ENGINEERS
King County
Water District No. 49
2019 Water System Plan
FIGURE 2-1
Land Use


N
0
1,650
3,300
Feet
276.00
275.00
274.00
280.00
279.00
278.00
285.00
284.02
286.00
Legend
KCWD No. 49 District Boundary
Tract 274.00
Tract 275.00
Tract 276.00
Tract 278.00
Tract 279.00
Tract 280.00
Tract 284.02
Tract 285.00
Tract 286.00
CHS ENGINEERS
King County
Water District No. 49
2019 Water System Plan
FIGURE 2-2
Puget Sound
Regional Council
Census Tracts