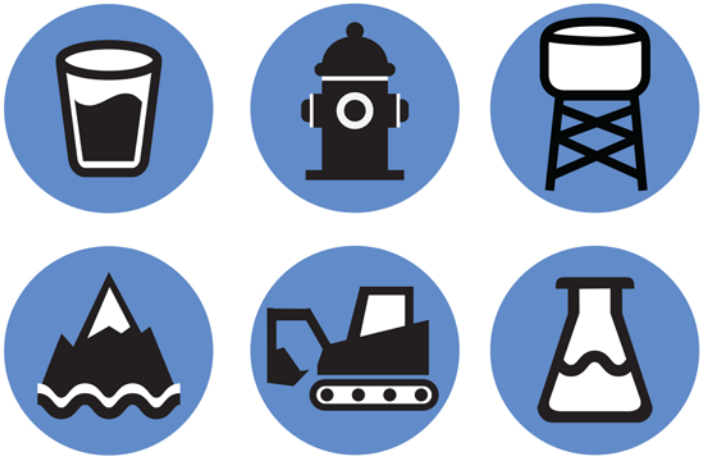
Seattle Public Utilities

2019 WATER SYSTEM PLAN



Our Water. Our Future.

APPENDICES

Volume 2

August 2019

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Seattle Public Utilities

2019 Water System Plan

Revised Final
August 2019

VOLUME 2
APPENDICES

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SEATTLE PUBLIC UTILITIES
2019 WATER SYSTEM PLAN

APPENDIX A

WATER RESOURCES

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SEATTLE PUBLIC UTILITIES
2019 WATER SYSTEM PLAN

A. WATER RESOURCES

APPENDIX A-1
Official Yield Estimate and Long-Range Water Demand Forecast

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Seattle Public Utilities
Official Yield Estimate and
Long-Range Water Demand Forecast

Inputs and Assumptions for the Firm Yield Estimate

Firm yield of the water supply system is estimated using a simulation model developed by Seattle Public Utilities called the Conjunctive Use Evaluation (CUE) model. Additional details of the model and inputs are documented in the preliminary draft report titled *Firm Yield of Seattle's Existing Water Supply Sources*, December 1, 2016, prepared by Seattle Public Utilities (SPU).

Model Inputs and Assumptions

⇨ Firm yield is based on the **98% reliability standard**—two shortfalls occur in the 87.5 years of historic record.

⇨ **Historic weekly inflows** reconstructed for water year 1929 through part of 2016 (October 1, 1928 through March 30, 2016) are used.

⇨ **Total system demand** is shaped on a monthly demand pattern based on the average of actual deliveries from calendar year 2006 through 2014.

⇨ **Sources of supply are operated conjunctively as a single system.**

⇨ **Operational assumptions include:**

- Cedar River System:
  Meet Cedar River Habitat Conservation Plan instream flow commitments below Landsburg, assuming flashboards in place on Overflow Dike.
  Fixed rule curve for Cedar Reservoir of 1550' for October-December and 1563' for March-August.
  Minimum levels for Chester Morse Lake: 1532'; Masonry Pool: 1510'
  Meet diversion limits specified by the 2006 Agreement with the Muckleshoot Indian Tribe.
- South Fork Tolt System:
  Meet instream flows from 1988 Tolt Settlement Agreement (with treatment project).
  Fixed rule curve 1754' for October-January; 1765' for March-August.
  Minimum level for South Fork Tolt Reservoir: 1710'
  Treatment/Transmission capacity: 120 MGD
- Seattle Well Fields:
  10 MGD withdrawn for 14 weeks as needed from July-December.
  5 MGD recharged for 14 weeks from January-March.

Results

Based on the above, **the system-wide firm yield is 172 million gallons per day**.

Inputs and Assumptions for the Water Demand Forecast Model

SPU is using the same basic water demand forecast model that was developed and for the 2007 and 2013 Water System Plans. Following a 2006 literature review of demand forecast models used by other utilities, SPU settled on a "Variable Flow Factor" approach. As with simpler fixed flow factor models, current water demand flow factors are calculated by sector (single and multi- family residential, non-residential) for Seattle and each individual wholesale customer. However, like an econometric model, the Variable Flow Factor model reflects the impacts of variables such as price, income, and conservation on water flow factors for each sector over time. This approach takes advantage of past econometric analysis to provide estimates of how some of the variables (price and income) affect demand. SPU's Code, Standards & Market Transformation ("code" for short) Savings model, as well as estimates of programmatic conservation savings, are then used to estimate the impacts of code and programmatic conservation on the flow factors over time. The structure of the demand forecast model is summarized in the flow chart on the next page while the model inputs and assumptions are outlined, below.

The structure of the water demand forecast model is represented in the flow chart on the following page. Intermediate steps and final results are shown as rectangles. Model inputs are shown as ovals with the gray shaded ovals indicating which inputs are subject to uncertainty and modeled using Monte Carlo simulations.

Model, Inputs and Assumptions

⇨ **Weather adjusted base year consumption:**

By sector
- single family residential
- multifamily residential
- manufacturing non-residential
- non-manufacturing non-residential

By service area
- Seattle retail service area
- Individual wholesale customers

Base Year
- 2016

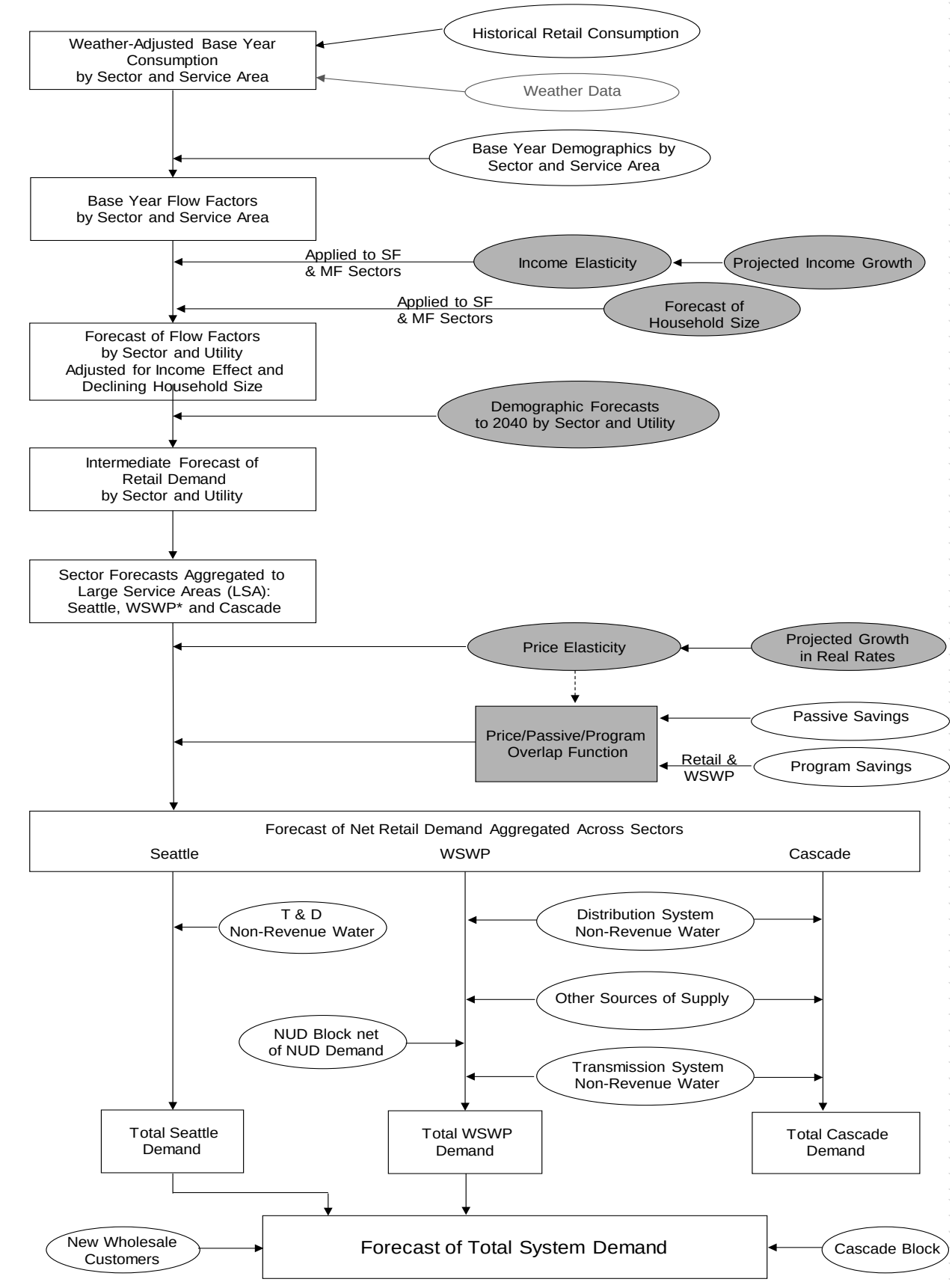
Weather
- Sea-Tac Airport monthly average daily temperature and total precipitation

Sources: SPU billing data, Annual Purveyor Surveys, NOAA

⇨ **Demographics: Current and projected single- and multi-family households and employment:** The model uses the Puget Sound Regional Council (PSRC) Land Use Baseline census-tract-level forecasts of population, households and employment to 2040 apportioned[1] to Seattle retail and individual wholesale service areas. (The forecast was published in 2014 and is the most recent version available. An update is expected in 2018.) A straight-line extrapolation of average annual growth between 2030 and 2040 is used to forecast beyond 2040. The base year for the water demand forecast is 2016. Several sources of information were used to estimate base year demographics. A first approximation was obtained by interpolating between the 2010 actuals and the 2020 forecasts in the PSRC forecast. This was compared to actual meter counts from SPU and wholesale customers for single family households as well as annual estimates of population

[1] The Land Use Baseline Forecast uses a parcel-based UrbanSim model. This made it possible for PSRC to calculate what percent of each census tract is within each utility's service area based on boundaries provided by SPU. These percents were then used to apportion the demographic forecasts to each utility.

WATER DEMAND FORECAST MODEL STRUCTURE



* WSWP = Wholesale members of the Saving Water Partnership

and households by census tract by the Washington State Office of Financial Management (OFM). Where there were significant discrepancies between the interpolated base-year forecasts of population and households and the estimates of 2016 actuals, adjustments were made to the base and early year demographic forecasts.

In the first table below is displayed PSRC's forecast of population, households, and employment in King County. The tables that follow contain these forecasts as they have been apportioned into water service areas. Separate tables are provided for all of King County, SPU's retail service area, and the service area of Full and Partial Contracts (F&P) wholesale customers.

Actual[2] & PSRC Forecasts of Population, Households, & Employment

King County

		Households			
	Population	Single Family	Multifamily	Total	Employment
2000	1,737,379	453,567	257,479	711,046	1,151,214
2010	1,931,249	497,853	291,379	789,232	1,181,537
2016	*2,105,100*	*525,028*	*334,476*	*859,504*	*1,375,054*
2020	2,169,389	539,741	357,808	897,549	1,467,620
2030	2,341,532	570,233	394,806	965,039	1,627,059
2040	2,527,589	600,611	470,624	1,071,235	1,897,261
2016-2040					
Growth	422,489	75,583	136,148	211,731	522,207
% Change	20%	14%	41%	25%	38%
Annual Rate	0.8%	0.6%	1.4%	0.9%	1.4%

As Apportioned to SPU's Retail Service Area and Full and Partial Contracts Wholesale Service Area[3]

		Household			
	Population	Single Family	Multifamily	Total	Employment
2000	1,012,625	260,529	173,859	434,388	750,861
2010	1,102,573	276,583	195,016	471,600	692,438
2016	*1,189,546*	*288,315*	*219,172*	*507,487*	*801,406*
2020	1,238,165	297,247	236,386	533,633	853,529
2030	1,317,522	307,628	257,721	565,349	938,206
2040	1,406,213	316,681	301,942	618,622	1,061,993
2016-2040					
Growth	216,668	28,366	82,770	111,136	260,587
% Change	18%	10%	38%	22%	33%
Annual Rate	0.7%	0.4%	1.3%	0.8%	1.2%

[2] Census data used for 2000 and 2010 population and households. 2010 employment is based on latest (2014) PSRC estimate of 2010 employment.

[3] This excludes the service areas of Northshore Utility District and Cascade Water Alliance members.

As Apportioned to SPU's Retail Service Area[4]

	Population	Household Single Family	Household Multifamily	Household Total	Employment
2000	617,104	151,741	128,450	280,191	569,311
2010	662,635	159,146	145,669	304,815	509,171
2016	*743,796*	*162,005*	*162,839*	*324,844*	*592,115*
2020	750,000	165,396	175,396	340,791	626,889
2030	777,374	166,322	190,618	356,941	686,909
2040	817,906	168,293	214,991	383,284	762,232
2016-2040					
Growth	74,110	6,288	52,152	58,440	170,117
% Change	10%	4%	32%	18%	29%
Annual Rate	0.4%	0.2%	1.2%	0.7%	1.1%

As Apportioned to the Full and Partial Contracts Wholesale Service Area[5]

	Population	Household Single Family	Household Multifamily	Household Total	Employment
2000	395,521	108,788	45,409	154,197	181,550
2010	439,938	117,437	49,348	166,785	183,267
2016	*474,492*	*126,310*	*56,333*	*182,643*	*209,290*
2020	496,911	131,851	60,990	192,842	226,640
2030	540,148	141,306	67,103	208,408	251,297
2040	588,308	148,387	86,951	235,338	299,761
2016-2040					
Growth	113,816	22,077	30,618	52,695	90,470
% Change	24%	17%	54%	29%	43%
Annual Rate	0.9%	0.7%	1.8%	1.1%	1.5%

In the 2013 Water System Plan forecast, household size was calculated for single and multifamily households in Seattle and for wholesale customers over the forecast period based on PSRC projections of single and multifamily households and population. Since the number of households was projected to grow faster than population through 2040, household size was projected to decrease significantly. Per household flow factors were then reduced each year by the percent change in household size times the elasticity of demand with respect to household size. This elasticity was estimated to be 0.38 based on data from an end-use study conducted by the Seattle Water Department in the mid-1990s. The same methodology is used in the current forecast though it has much less impact because PSRC's most recent demographic forecast has population and households growing at the same rate so there's very little change in household size over time.

⇨ **Base Year Flow Factors:** Base year flow factors are obtained by dividing the weather-adjusted base year consumption for each sector (e.g. single family residential) and service

[4] SPU's retail service area includes the City of Seattle and portions of the cities of Shoreline, Lake Forest Park and Burien, as well as portions of unincorporated King County south of the City of Seattle.

[5] For the two wholesale customers with block contracts, Cascade Water Alliance and Northshore Utility District, the total number of households is forecast to increase by 30% and 34%, respectively, from 2016 to 2040. Over the same period, employment is forecast to grow 54% within Cascade and 48% in Northshore.

area (e.g. Bothell) by the corresponding number of households or employees in the base year.

- **Elasticity of residential demand to changes in real (inflation adjusted) household income:** Household income is generally expected to have a positive effect on water demand. A review of the literature revealed a range of estimated income elasticities. An elasticity value of **0.27**, representing the middle of this range, was chosen. (This means that a 10% increase in household income would be expected to cause a 2.7% rise in residential demand.)

  Source: Results of 2006 literature review.

- **Forecast of annual growth in real median household income:** Beginning with the 2013 WSP demand forecast, the model has used *median* rather than *average* household income. The past 40 years has seen a widening gap between growth in average and median income. Both national and local time series on *real* per capita personal income (i.e., *average* per capita income) show rates of growth averaging about 2.0% per year. However, *median* household income in Washington State and King County adjusted for inflation has been essentially flat since reporting began in 1989.[6] There is additional evidence that this is not just true for the median household but for most households except those at the very top of the income distribution. Analysis by economists Saez and Piketty based on 90 years of IRS data reveals that *average* household income for the bottom 90% of households has had zero real growth since 1970. Over the same 4 decades, the top 10%, 1%, 0.1%, and 0.01% of households has seen their real incomes increase twofold, threefold, fivefold and eightfold, respectively. If that trend continues with all income growth going to the top 10%, median income – and the income of all but the top 10% of households – will remain flat in real terms. More optimistic scenarios would have this pattern of increasing income inequality (1) slowing down, (2) stopping, or (3) even reversing. Those conditions would correspond to rates of median income growth (1) greater than zero but less than the growth rate in average income, (2) equal to the average growth rate, or (3) greater than the average growth rate. For the demand forecast, it is assumed that household income will grow at **0.9%** per year based on the median or about half the historical growth rate in per capita personal income based on averages.

  Sources: U.S. Bureau of Economic Analysis, U.S. Census Bureau, Washington State Office of Financial Management, Dick Conway & Associates, Emmanuel Saez of UC-Berkeley.

- **Elasticity of demand to changes in real water rates (prices):** A considerable body of literature has developed concerning the effect of price upon water demand and the inverse relationship predicted by economic theory is now well established. However, a number of complications summarized in the literature review (complex rate structures, conservation impacts, etc.) have made it difficult to estimate price elasticity with much confidence. As a result, there is a wide range of estimates in the literature but as with the income elasticity, values towards the middle of the range have been chosen for this model. These are shown below. (The value of -0.20 for single family households means that given a 10% increase in water prices, demand would be expected to decline by 2%.)

[6] Note that real median household income hit a low in 2011 and has been growing since then. In 2015, it finally surpassed what is was in 1989.

	Single Family	Multifamily	Non-Residential
Price Elasticity	-0.20	-0.10	-0.225

Sources: Results of 2006 literature review, Seattle's 1992 econometric model.

⇨ **Forecast of annual growth in real water rates (prices)**: Seattle and its wholesale customers have different water rates and different rate structures. Most customers face different marginal rates depending on whether they're residential or non-residential, what consumption block they fall in and what season it is. There is no single price of water. However, the model abstracts from all these complexities by using the average price of water, i.e., revenue requirements divided by billed consumption.

The model takes into account the increases in water and sewer[7] rates already adopted through 2017 and the Strategic Business Plan rate path through 2023 as projected by the SPU Rates Unit in September 2017. After 2023, it is assumed that inflation-adjusted retail water/sewer rates and wholesale customer water rates will average about 0.6% per year.

Historical and Projected Annual Growth in Average Water Rates

	Seattle Retail*	Wholesale Customers*
1974-1995	2.9%	NA
1995-2016	4.0%	1.8%
2016-2023	2.1%	1.6%
2024+	0.6%	0.6%

* Seattle Retail reflects historical and anticipated increases in water and sewer rates. Wholesale is water rates only.

Sources: Historical rate and consumption data; Paul Hanna, SPU Rates 09/08/17.

⇨ **Conservation - Reductions in Water Use due to Code, Standards and Market Transformation (code):** Some conservation savings occur each year without SPU intervention due to federal and state plumbing codes setting efficiency standards for showerheads, toilets, aerators, and clothes washers. As old fixtures and appliances are replaced with new ones in existing buildings and new fixtures and appliances are installed in new construction, water use efficiency improves and conservation savings accrue. In addition, fixtures and appliances available from the market at competitive prices often become increasingly more efficient than is required by codes, especially as more years have passed since the codes were updated. "Market transformation" refers to this phenomenon along with savings from standards adopted by manufacturers. The same model developed for the 2013 WSP forecast was used to estimate these savings through 2060.

The model takes account of federal fixture and appliance codes adopted in 1992, 2002, 2007, 2012 and 2015.[8] The model also reflects the current proportion of fixtures and

[7] Because sewer bills in Seattle are based on metered water consumption, both water and sewer rates are assumed to impact water demand in the model. This is only the case for the retail service area, however. Many different cities and sewer districts provide sewer service in Seattle's wholesale water service area, each with different sewer rates and rate structures. Unlike Seattle's sewer rates that are entirely volume based, most other sewer providers have large fixed charges with much less of their revenue generated by volume rates. For that reason, as well as lack of information on past, current and anticipated sewer rates in the wholesale service area, the demand model for wholesale customers does not include sewer rates.

[8] The US Department of Energy adopted a two-phase residential clothes washer efficiency standard, with the first phase effective March 7, 2015, and the second, more stringent phase, effective for January 1, 2018.

appliances sold in the market that meet the more stringent Energy Star, Water Sense, and Consortium for Energy Efficiency (CEE) standards, as well as how those proportions are expected to continue shifting in the direction of higher efficiency over time. The model assumes that aerators, showerheads, clothes washers and toilets are, on average, replaced every 5, 10, 12 and 30 years, respectively.

Projected Savings from Code, Standards & Market Transformation in MGD

	Single Family	Multi-family	Non-Residential	Total
2020	1.2	0.8	0.2	2.2
2030	4.1	3.1	0.8	8.0
2040	5.9	4.8	1.4	12.0
2050	6.7	6.0	1.7	14.5
2060	7.1	6.8	2.1	15.9

Sources: Water Research Foundation, "Residential End Uses of Water," April 2016; U.S. EPA Office of Water; Alliance for Water Efficiency; Al Dietemann (personal communication)

⇨ **Conservation - Reductions in Water Use due to Programmatic Savings:** Based on an analysis of CIP spending and savings achieved during the 2012-2016 period, the Water Conservation office estimates savings from hardware (CIP) programs of **0.1 mgd** per year from 2017 through 2028. There are assumed to be no additional CIP program savings after 2028. These conservation savings only apply to Seattle and other members of the Saving Water Partnership. As is explained below, the Cascade Water Alliance has a block contract with SPU which limits its demand from the Seattle system. While Cascade is expected to pursue its own conservation programs, that doesn't affect the forecast of its demand from SPU which is assumed not to exceed the block.

⇨ **Price/Code & Standards/Programmatic Conservation Overlap:** In past forecasts, total conservation savings were adjusted downwards to account for the overlap between different types of conservation.[9] However in this iteration of the forecast, the "overlap function," which had resulted in an approximate 14% reduction in the estimate of total conservation savings, was turned off in order to offset the lack of estimates for several other types of conservation. The model does not include estimates of behavioral conservation savings from SPU public messaging and educational programs, or from outside sources of information and encouragement for the public to adopt water efficiency measures and develop a stronger conservation ethic. Neither has there been an attempt to explicitly capture the potential future impacts on water use of new technologies, green buildings, and decentralized systems. As a rough approximation, these other sources of conservation are taken into account by eliminating the overlap calculation.

⇨ **Non-Revenue Water:** Combined transmission and Seattle distribution system non-revenue water is assumed to start at **7** mgd in 2015 and increase uniformly to **9** mgd by 2060. This increase is expected to be caused by a growing number of leaks that will probably occur as the distribution system ages.

⇨ **Wholesale Customer Demands:**

- Wholesale customer distribution system non-revenue water is assumed to be a constant **6%** of retail water demand in the wholesale service area over the forecast period. This is added to the forecast of wholesale customers' retail demand.

  Source: Annual Surveys of Wholesale Customers, 1994-2016.

[9] The "overlap function" assumed that half of the price effect overlapped with code and programmatic savings as long as the total amount of overlap represented less than half of total code and programmatic conservation. However, if the price effect exceeded combined code and programmatic conservation, the amount of overlap was capped at 50%.

- Some wholesale customers have their own wells or surface water sources in addition to what they purchase from SPU. Water that wholesale customers expect to obtain from other sources of supply is subtracted from the forecast of their demand from the SPU system. This amount is currently about **19** mgd and is projected to level off at **21** mgd by 2040. Historically, Renton's water purchases from SPU have been negligible, but that is expected to change over time under the new contract as its demand begins to exceed its peak day capacity. Renton's estimated requirements from SPU are forecast to ramp up to 1 mgd by 2040. Highline states they plan to be purchasing 1 mgd from Lakehaven by 2019, augmenting their own groundwater supply and reducing demand from SPU.

Water Obtained from Other Sources of Supply in MGD: 2016-2040

	2016	2020	2030	2040
Cascade Total	**9.1**	**9.3**	**9.8**	**9.8**
Redmond	2.9	3.1	3.6	3.6
Skyway	0.3	0.3	0.3	0.3
Issaquah	1.4	1.4	1.4	1.4
Sammammish Plateau	4.5	4.5	4.5	4.5
F&P Total	**9.8**	**10.8**	**11.0**	**11.5**
Cedar River	0.1	0.1	0.1	0.1
Highline	1.8	2.7	2.7	2.7
Olympic View	0.4	0.4	0.4	0.4
WD 90	0.5	0.5	0.5	0.5
Renton	7.0	7.0	7.3	7.8
Total Wholesale	**18.9**	**20.1**	**20.8**	**21.3**

Sources: 2017 Survey of Wholesale Customers, Cascade Water Alliance Member Survey (Paula Anderson), direct communication with individual wholesale customers.

- Contract with the Cascade Water Alliance (Cascade). Under the Cascade contract as amended on May 30, 2013, Seattle will provide a fixed block of **33.3** mgd to Cascade through 2039. The block will then be reduced by **2** mgd per year for the three years beginning in 2040, and **1** mgd per year thereafter until it reaches **5.3** mgd in 2064. This has been incorporated into the forecast by subtracting the projected demand of Cascade members that are currently Seattle wholesale customers, and adding the Cascade block.

  The following cities and districts are members of Cascade[10]:
  - Bellevue
  - Kirkland
  - Issaquah
  - Redmond
  - Sammamish Plateau
  - Skyway
  - Tukwila

- Block contract with Northshore Utility District. Northshore Utility District also has a block contract under which Seattle will reserve a fixed block of **8.6** mgd for Northshore through the contract period which terminates in 2060. This has been incorporated into the forecast by subtracting Northshore's projected demand and adding the Northshore block. Note that current Northshore demand is about 3 mgd less than its block. By 2060, actual Northshore demand is expected to have grown to 7.4 mgd, still less than its block by more than 1 mgd.

- Forecasts of demand from potential new wholesale customers are based on data provided by them on their projected demand and existing supplies. In the past, Ames

[10] Covington Water District left Cascade Water Alliance in 2012.

Lake Water Association, the City of Carnation, and the City of Snoqualmie expressed interest in becoming new wholesale customers and purchasing treated water from SPU and their potential demand was added to the 2013 WSP forecast. However more recently, only Ames Lake has maintained its expression of interest. Demand from Ames Lake is expected to begin at zero ramping up to 0.5 mgd by 2033 and remaining constant thereafter.

Source: email from Robert Pancoast, Ames Lake Water Association dated 12/13/2016.

Results

The water demand forecast remains considerably below SPU's current firm yield of 172 mgd through 2060. The demand forecast starts out at **130** mgd, higher than actual demand in 2016 because the forecast includes the Cascade and Northshore blocks that currently exceed the actual demand of those customers by 9 mgd. Total demand is forecast to gradually increase to **136 mgd by 2039** and then decline with the initial reductions in Cascade's block. Water demand is then forecast to slowly decline for several years and then **stay relatively flat at about 132 mgd through 2060** as reductions in Cascade's block offset what would otherwise be a modest amount of growth in demand.

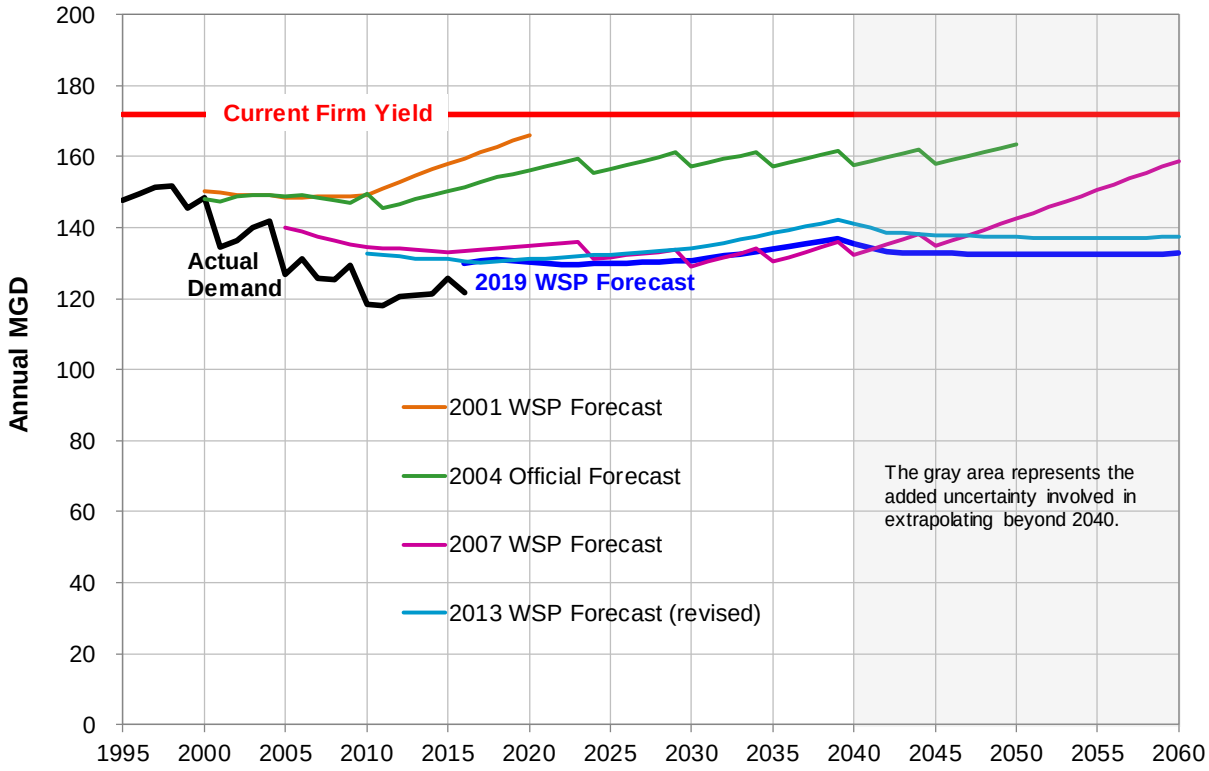
The 2017 Official Forecast broken down by sector is shown in the table and graphs below. The first graph shows the forecast of demand and supply out to 2060 along with previous WSP forecasts. The gray area between 2040 and 2060 represents the additional uncertainty involved in forecasting out more than 25 years. The second graph shows the various components that add up to the total demand forecast: Seattle retail, full and partial contract wholesale customers, the amounts specified in the Northshore and Cascade block contracts, and non-revenue water.

Components of Actual and Forecast Water Demand
All figures in millions of gallons per day (MGD)

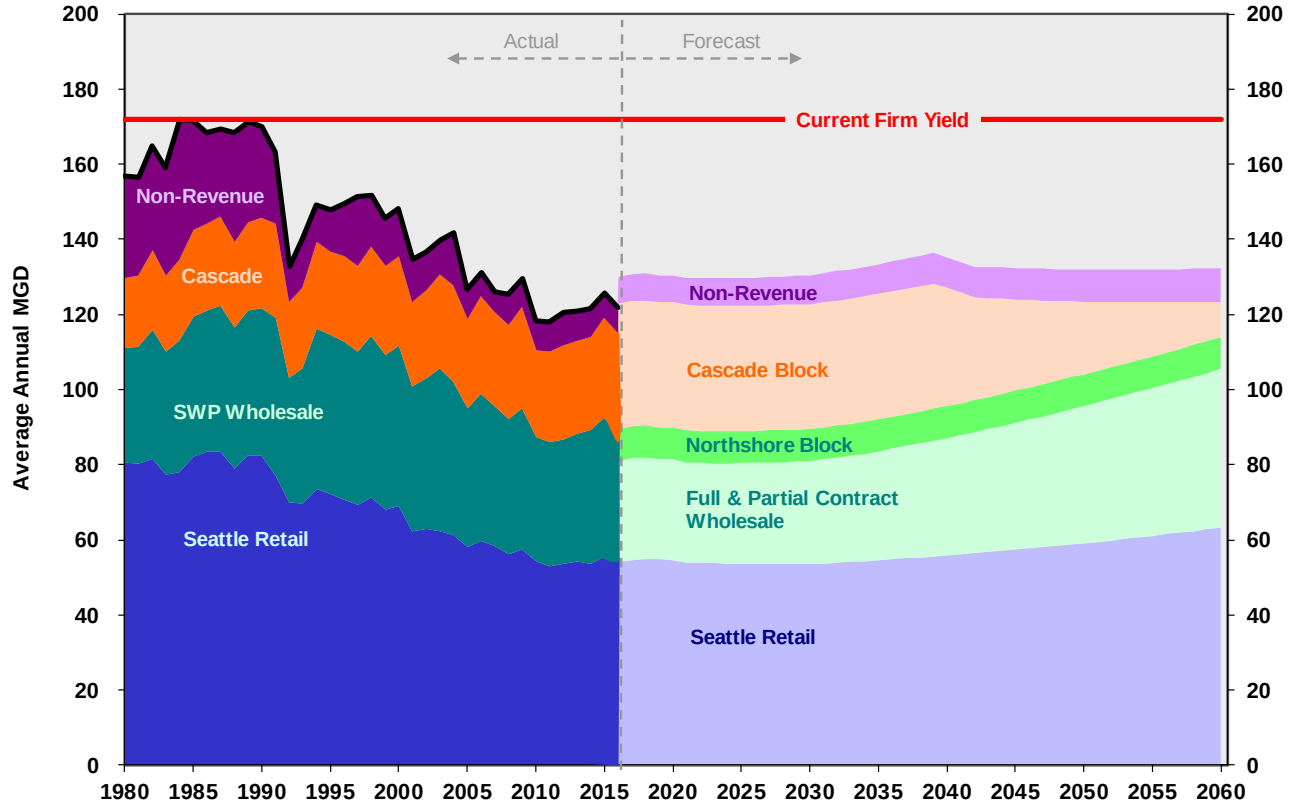
	Year	Billed Demand								Non-Revenue Water	Total System Demand	
		Seattle Retail				Wholesale					Annual Average[2]	Peak Day[4]
		SF Res	MF Res	Non-Res	Subtotal	F&P[1]	Block[2]	New[3]	Subtotal			
ACTUAL	2000	26.9	14.5	27.7	69.1	34.3	31.7	0.0	66.0	13.2	148.2	241.9
	2001	24.0	13.7	24.6	62.3	31.4	29.3	0.0	60.7	11.6	134.6	204.0
	2002	24.8	13.1	24.9	62.8	32.8	31.2	0.0	63.9	9.8	136.5	222.6
	2003	24.9	12.8	24.6	62.3	35.2	33.1	0.0	68.2	9.4	139.9	250.2
	2004	24.2	12.5	24.6	61.3	33.3	33.2	0.0	66.5	14.0	141.7	246.8
	2005	22.6	12.2	23.2	58.1	30.1	30.8	0.0	60.9	7.7	126.7	210.4
	2006	23.6	12.3	23.7	59.6	32.0	33.3	0.0	65.3	6.3	131.2	236.8
	2007	22.7	12.0	23.6	58.3	30.5	31.9	0.0	62.4	5.2	125.9	227.6
	2008	22.0	11.8	22.5	56.2	29.3	31.5	0.0	60.8	8.2	125.3	202.0
	2009	23.2	11.6	22.6	57.4	30.7	34.0	0.0	64.7	7.5	129.5	241.9
	2010	21.4	11.4	21.6	54.4	26.6	29.4	0.0	56.0	8.0	118.4	197.9
	2011	20.5	11.2	21.2	52.9	26.9	30.5	0.0	57.4	7.6	117.9	177.7
	2012	20.9	11.4	21.3	53.7	26.8	31.3	0.0	58.0	8.8	120.5	200.6
	2013	21.0	11.5	21.6	54.1	27.3	31.6	0.0	58.9	7.9	120.9	189.6
	2014	20.8	11.3	21.5	53.6	28.1	32.2	0.0	60.3	7.6	121.5	196.4
	2015	21.4	11.5	22.7	55.6	29.7	33.6	0.0	63.3	6.7	125.6	212.1
	2016	20.6	11.6	22.2	54.3	28.5	32.3	0.0	60.8	6.6	121.7	194.7
FORECAST	2016	20.7	11.6	22.0	54.3	26.6	41.9	0.0	68.5	7.0	129.9	259.7
	2017	20.7	11.6	22.3	54.6	27.1	41.9	0.0	69.0	7.1	130.7	261.4
	2018	20.7	11.7	22.6	55.0	26.9	41.9	0.0	68.8	7.1	130.9	261.7
	2019	20.5	11.8	22.5	54.8	26.7	41.9	0.0	68.5	7.2	130.5	261.0
	2020	20.2	11.9	22.5	54.6	26.8	41.9	0.0	68.7	7.2	130.5	260.9
	2021	19.9	11.8	22.3	54.0	26.7	41.9	0.0	68.6	7.3	129.8	259.7
	2022	19.7	11.7	22.4	53.9	26.6	41.9	0.1	68.5	7.3	129.7	259.4
	2023	19.6	11.7	22.6	53.8	26.6	41.9	0.1	68.6	7.4	129.7	259.4
	2024	19.4	11.6	22.7	53.7	26.7	41.9	0.2	68.7	7.4	129.8	259.6
	2025	19.3	11.6	22.8	53.6	26.8	41.9	0.2	68.8	7.4	129.9	259.8
	2026	19.2	11.6	22.9	53.6	26.9	41.9	0.2	69.0	7.5	130.1	260.1
	2027	19.0	11.5	23.0	53.6	27.0	41.9	0.3	69.1	7.5	130.2	260.5
	2028	18.9	11.5	23.1	53.6	27.1	41.9	0.3	69.3	7.6	130.4	260.8
	2029	18.8	11.5	23.2	53.6	27.2	41.9	0.3	69.4	7.6	130.6	261.2
	2030	18.7	11.5	23.4	53.6	27.3	41.9	0.4	69.6	7.7	130.8	261.7
	2031	18.6	11.6	23.6	53.8	27.6	41.9	0.4	69.9	7.7	131.4	262.7
	2032	18.6	11.6	23.7	53.9	27.9	41.9	0.5	70.2	7.8	131.9	263.9
	2033	18.5	11.7	23.9	54.1	28.2	41.9	0.5	70.6	7.8	132.5	265.1
	2034	18.5	11.8	24.1	54.4	28.5	41.9	0.5	70.9	7.8	133.1	266.2
	2035	18.4	11.9	24.3	54.6	29.0	41.9	0.5	71.3	7.9	133.8	267.6
	2036	18.4	11.9	24.5	54.8	29.4	41.9	0.5	71.8	7.9	134.5	269.1
	2037	18.3	12.0	24.7	55.1	29.9	41.9	0.5	72.2	8.0	135.3	270.5
	2038	18.3	12.1	24.9	55.3	30.3	41.9	0.5	72.7	8.0	136.0	272.0
	2039	18.3	12.2	25.1	55.6	30.8	41.9	0.5	73.1	8.1	136.8	273.5
	2040	18.2	12.3	25.3	55.8	31.3	39.9	0.5	71.6	8.1	135.5	271.1
5	2045	18.3	12.7	26.3	57.3	33.8	32.9	0.5	67.1	8.3	132.8	265.5
	2050	18.3	13.2	27.5	59.1	36.5	27.9	0.5	64.8	8.6	132.4	264.8
YR	2055	18.4	13.9	28.7	61.1	39.2	22.9	0.5	62.6	8.8	132.4	264.8
	2060	18.6	14.7	30.0	63.3	42.1	17.9	0.5	60.4	9.0	132.7	265.4

1. F&P refers to Full and Partial contracts wholesale customers.
2. The forecast of demand from Cascade Water Alliance (Cascade) and Northshore is equal to their blocks while the historical consumption data reflects water actually purchased from SPU by Cascade members and NUD. The blocks exceeded actual water purchases from SPU of Cascade members and NUD by 9.5 mgd in 2016.
3. Potential new wholesale customers (Ames Lake Water Association)
4. The forecast of peak day demand is based on a peak day factor of 2.0, the ratio of peak day to average annual demand in 2009 with a 5% allowance for hot, dry weather. The forecast of average annual demand under average weather conditions is multiplied by the peak day factor to estimate peak day demand with hot, dry weather.

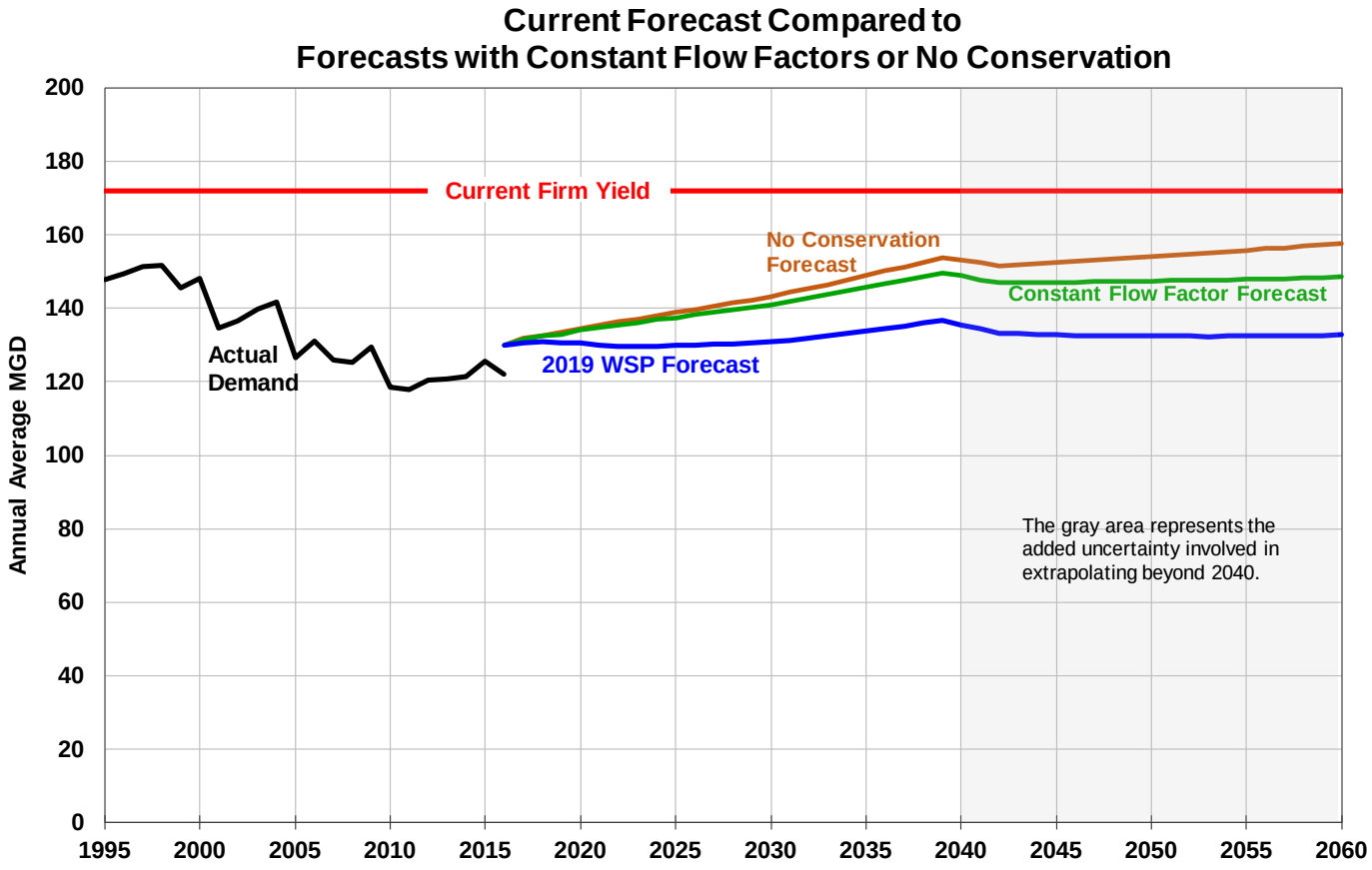
Current Forecast Compared to Earlier Forecasts



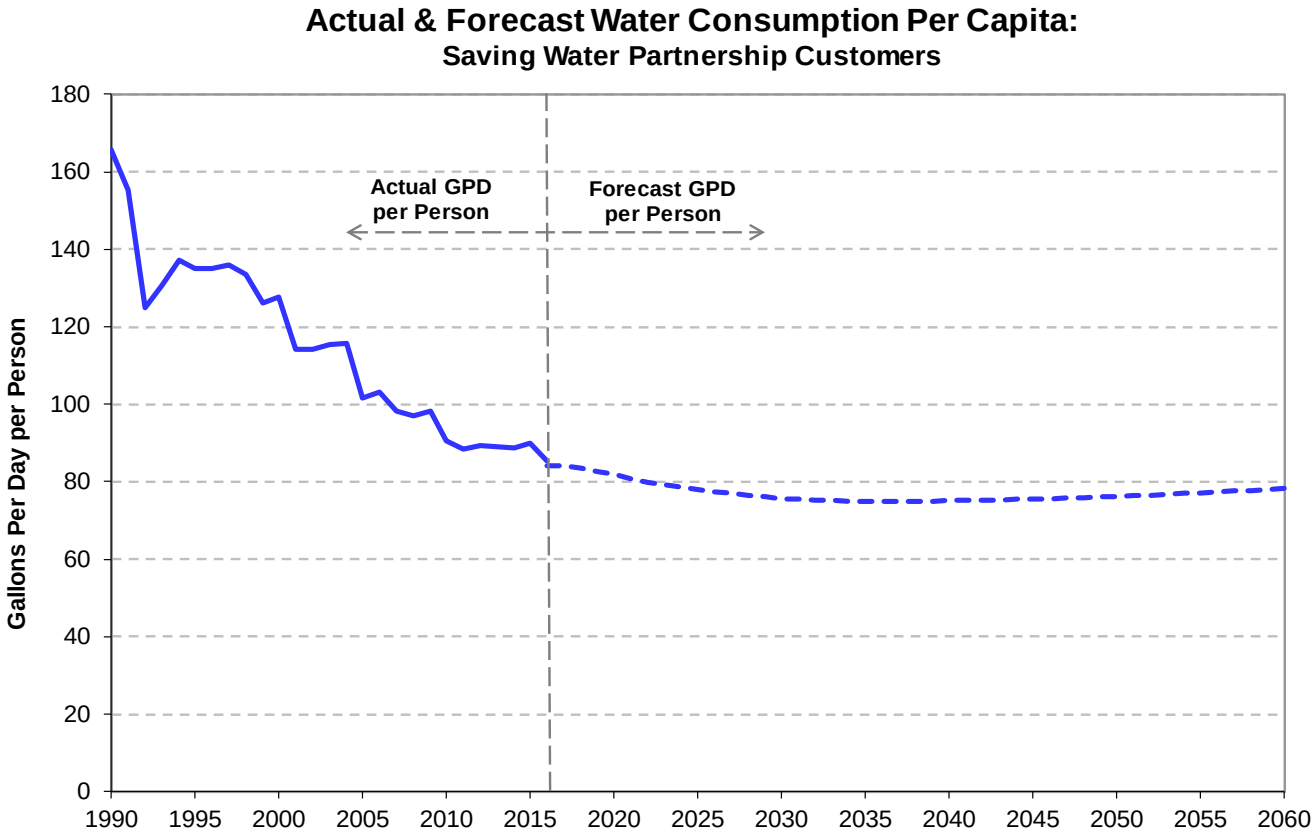
Components of Actual and Forecast Demand: 1980-2060



The graph below contrasts the official demand forecast with what it would be with constant flow factors and with no future conservation of any kind (i.e., no price effect, no code savings, and no programmatic savings). Note that the forecast with "no conservation" is slightly higher than the forecast holding water flow factors constant over time because the "no conservation forecast" includes the impact of income growth and changes in household size, which net to a small increase in flow factors. For the 2019 WSP forecast, all sources of conservation are estimated to produce a total reduction in water demand of about 25 mgd by 2060.



Finally, the implications of the new demand forecast for total system per capita water consumption are shown in the graph below. Due to anticipated programmatic conservation, code savings, and water and sewer rate increases, per capita consumption is forecast to continue declining over the next 20 years though at a slower rate than in the past. By 2033, per capita consumption is expected to level off at about 75 gpd (compared to 85 gpd currently) before slowly increasing after 2040 as the income effect begins to dominate the diminishing impacts of conservation. In contrast, between 1990 and 2016, total and per capita water consumption for Seattle and its non-Cascade wholesale customers declined 48% from 166 gallons per day (gpd) to 85 gpd.



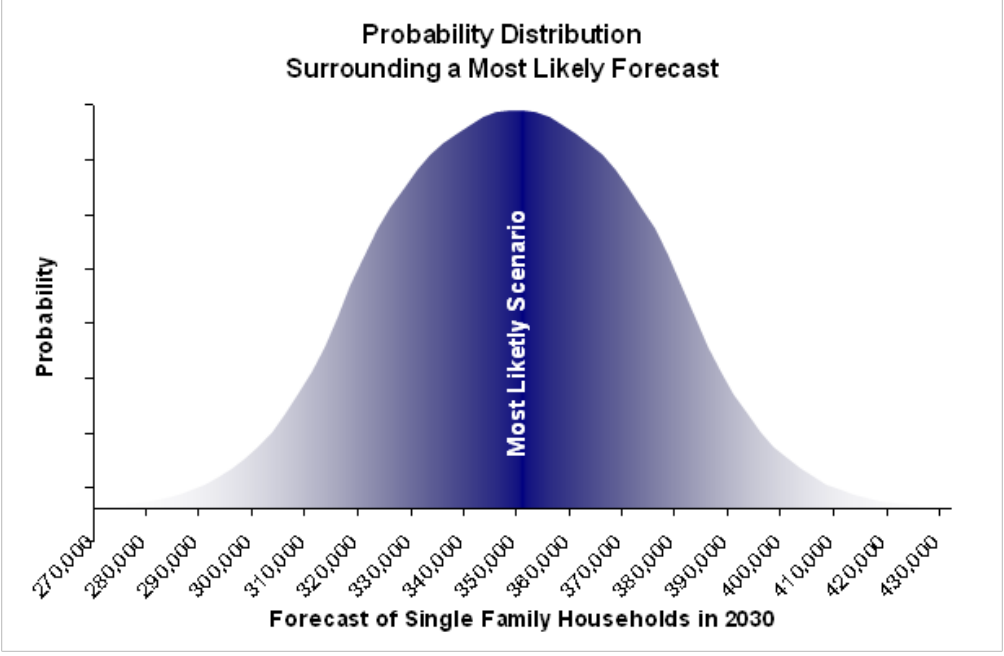
Forecast Uncertainty

What is most certain about a forecast out to 2060 is that it will be wrong. Actual demand in 2040 or 2060 is highly unlikely to be exactly what was forecast back in 2019. The official water demand forecast is itself based on forecasts of income, water prices, households and employment – all subject to uncertainty. Additional uncertainty surrounds the forecast model's assumptions about price and income elasticities, future conservation, wholesale customers' other sources of supply, and whether SPU will gain new customers and/or lose existing customers.

The Official Demand Forecast represents both SPU's policy intentions and its expectations of the future. However, it is prudent, especially in long-term planning, to consider the many uncertainties that could cause demand to be different from what's projected in the official forecast. These uncertainties fall into two categories – discrete and continuous – and are handled in two different ways.

The first category refers to those uncertainties that result from discrete events that produce significant and sometimes abrupt changes in customer demand. Discrete uncertainties represent occurrences that either happen or don't. They're on or off, yes or no (though there can be more than two conditions). An example of a discrete uncertainty is the block contract with Cascade Water Alliance. This and other discrete uncertainties are thought to be best handled by running individual "what-if scenarios" through the demand forecast model.

The second category consists of the continuous uncertainty that surrounds the various inputs to the model. An example would be the forecast of household growth. Actual growth over the forecast period could turn out to be lower or higher than forecast. These types of uncertainties can be represented by a continuous probability distribution around a mean or most likely value as illustrated below.



Modeling Continuous Uncertainty

A number of model inputs were identified as being subject to continuous uncertainty. (These are shown in the model structure flowchart on page 2 shaded in gray.) They include forecasts of single and multi-family households and employment; average annual growth rates for water prices and household income; price and income elasticities; the impact of code savings; and the extent to which price-induced conservation overlaps with code and programmatic conservation. Each uncertainty was modeled by specifying a probability distribution around the mean value of each variable. Many sources were consulted to define the range of uncertainty[11] and the shape of the distributions. The sources and assumptions used to characterize continuous uncertainties are outlined below.

Forecasts of Households and Employment: Two different sources were consulted to establish uncertainty ranges around the forecasts of long term demographic growth. In 2007 and again in 2012, the Washington State Office of Financial Management (OFM) produced high and low forecasts of population by county based on historical variability in net migration rates. Dick Conway and Associates developed high and low alternatives around the 2002 PSRC long term regional forecasts of population and employment (but not households) based on optimistic and pessimistic scenarios for the local and national economies[12]. In earlier uncertainty analysis for the demand forecast, the greater geographical specificity of the OFM forecasts was combined with the more rigorous methodology and wider range between low and high provided by Dick Conway's analysis. Unfortunately, there have been no updates to Conway's uncertainty ranges since 2002. However, the latest set of OFM uncertainty ranges is very similar to the earlier set (2007). Therefore, the same uncertainty ranges for demographic variables used in the 2013 WSP forecast are used here after being calibrated to 2016 so that low, medium and high forecasts all start of from the same point. The ranges of uncertainty around the projections of households, employment and population used in the demand forecast model are shown in the table, below.

Uncertainty Ranges Around Mean Values
Associated with High and Low Demographic Growth Scenarios

	2030		2060	
	Low	High	Low	High
Single Family Households	-4%	6%	-9%	16%
Multifamily Households	-11%	18%	-25%	42%
Employment	-5%	8%	-12%	21%
Population	-8%	12%	-18%	30%

The ranges around single and multi-family households were derived from the reported high and low population values and the assumption that variability around the single family forecast is less than for the forecast of multifamily households. Note that the potential variation from forecast values is expected to be greater on the high side than on the low side.

Growth in the Price of Water: System water rates are obtained by dividing each year's projected revenue requirement by projected demand. Uncertainty about future water prices derives from variability in both of these terms. The baseline assumption is that after significant increases in water and sewer rates already adopted or anticipated through 2023,

[11] Each range is characterized by a high and low value representing two standard deviations from the mean.
[12] Scenarios developed by Global Insights, Inc.

growth in inflation-adjusted retail water rates will ramp down to 0.6% per year by 2025 and remain there through the forecast period. This is slower than the average historical rate of growth. The range of uncertainty around this is skewed very much on the high side, **minus 67% to plus 200%,** resulting in projected annual growth rates in real prices of between **0.2%** and **1.8%**.

The model handles the impact on price of different levels of projected demand in a different way. Given the same set of revenue requirements, lower demand results in higher water prices and vice versa. That means that price effects would be expected to amplify swings in demand. For example, higher-than-projected demographic growth would cause demand to be higher than the official forecast, resulting in reduced prices and an additional boost in demand. The amount of the boost is determined by the price elasticity of demand and the amount by which prices fall. Incorporating this demand-price-demand-etc. feedback loop explicitly into the model isn't feasible because, as is explained in more detail below, the uncertainty analysis involves running 10,000 iterations of the demand model. However, the feedback loop has been approximated by widening the range of uncertainty around growth in households and employment. The amounts by which the ranges have been increased are **5.2%** on the high side and **5.3%** on the low side[13].

Price Elasticity: The uncertainty ranges around price elasticity represent a synthesis of the various estimates of price elasticity reported in the literature review. These are **plus or minus 50%** for single and multi-family elasticities and **plus or minus 33%** around the non-residential elasticity.

Uncertainty Ranges Around Mean Price Elasticities

	Single Family	Multi-Family	Non-Residential
Low	-0.10	-0.05	-0.15
Mean	-0.20	-0.10	-0.225
High	-0.30	-0.15	-0.30

Growth in Real Household Income: There is some uncertainty about future growth in average income but much more uncertainty around the distribution of that growth. As explained above, there has been a decoupling of average and median income growth over the past 4 decades. While overall per capita income has averaged 1.8% annual growth since 1970, median income and in fact, the income of the bottom 90% of households has grown very little if at all in real terms. Practically all the growth in national income has gone to households at the very top of the income scale in the last 40 years - the top 10%, 1%, 0.1%, and 0.01% of households seeing their real incomes rise twofold, threefold, fivefold and eightfold, respectively. The baseline assumption in the demand forecast is that median income will grow at **0.9%** annually, about half the rate expected for average income. This scenario represents a slowing of the rate at which the distribution of income gets worse. The continuation of present trends with all income growth going to the top 10% and **zero** income growth for median households is the most pessimistic scenario in the uncertainty analysis. At the high end is the assumption that income grows proportionally across all households and the increasing skewness in the income distribution comes to a halt. Here, annual growth in average income equals that for median income equals **1.8%.**

[13] These percents were obtained by calculating the percent changes in 2060 water prices that would result from the high and low growth scenarios relative to the baseline scenario and multiplying them by the average price elasticity.

Income Elasticity: As with price elasticity, the uncertainty band around income elasticity was derived from the various estimates of income elasticity in the literature review. A range of income elasticities from **0.19** to **0.35** (i.e., **plus or minus 30%**) around the mean value of 0.27 was chosen.

Savings from Code, Standards and Market Transformation (code): Code savings could be more or less than modeled. If market transformation towards fixtures and appliances that exceed code occurs slower than anticipated, code savings could be less than estimated for the baseline forecast. Alternatively, if additional codes are passed in the future, market transformation takes place more quickly, and green buildings become the norm for new construction, code savings could be more than estimated for the baseline forecast. A range of code savings from **9.5** to **22.3 mgd** (i.e., **plus or minus 40%**) around the mean value of 15.9 mgd was chosen.

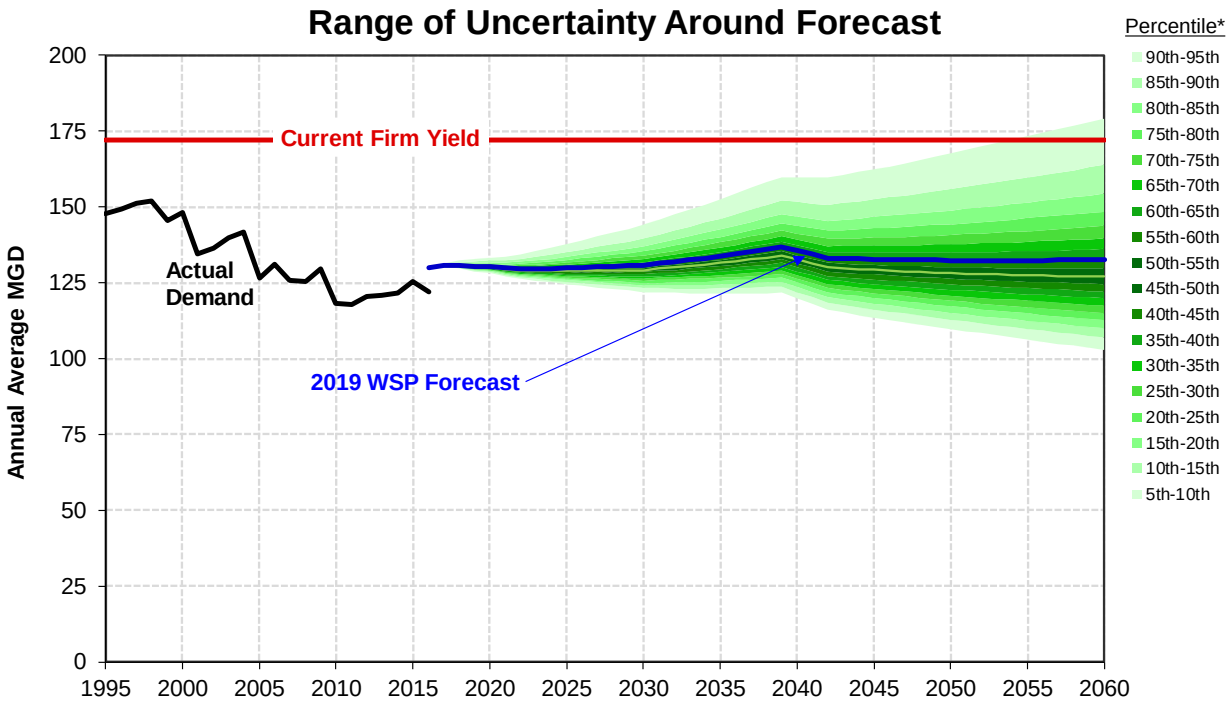
Modeling Uncertainty with @Risk: The uncertainty ranges described above are assumed to have normal or log-normal distributions,[14] with the endpoint values representing two standard deviations from the mean. These probability distributions become inputs to an aggregate uncertainty model using @Risk software (an add-in to Excel) which employs Monte Carlo simulation to characterize uncertainty around the official demand forecast. During each individual run of the Monte Carlo simulation, a value is randomly selected for each input variable based on the probability density function specified for that variable[15]. Then, the complete set of input values for that iteration is used to produce a water demand forecast. The simulation procedure performs a large number (10,000) of independent iterations, each generating a separate demand forecast. These forecasts are then pooled to obtain a probability distribution of forecast water demand through 2060.

The results of the Monte Carlo simulation are displayed in the graph on the next page. The green bands indicate the range of uncertainty around the official forecast with each band representing a 5% change in probability. For example, the bottom of the lowest band represents the 5th percentile. That means it's estimated there's a 5% chance actual demand will be below that point (and, thus, a 95% chance it will be above). The top band is the 95th percentile which corresponds to an estimated 95% probability that actual demand will be below that point. Taking a cross-section of the graph at 2060 produces the probability distribution around the official forecast shown below.

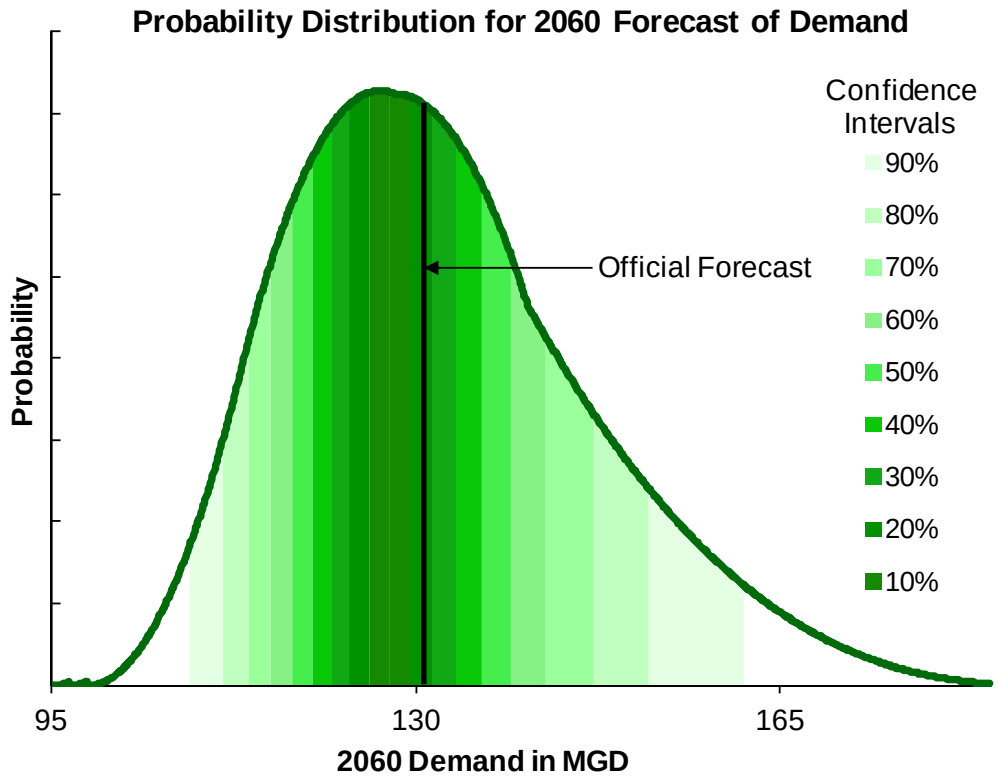
The uncertainty model represents a significant refinement over simply compounding all the high or all the low assumptions to create extreme high and extreme low scenarios. In the extreme high scenario, everything that could possibly cause demand to be higher than forecast is assumed to happen at the same time. The extreme low scenario is just the opposite with all low side assumptions applied simultaneously. These extreme scenarios overstate the actual uncertainty surrounding demand because they represent two highly unlikely combinations of events with essentially zero probability of occurring. The Monte Carlo simulation provides narrower bands of uncertainty and information about their estimated probabilities.

[14] Log normal distributions are used for the uncertainty around household and employment growth and average annual rate of growth in water prices because the high and low ranges exhibit positive skewness (i.e., the highs are higher than the lows are low).

[15] All variables with uncertainty are assumed to be independent except for growth in households and employment. These are linked in the model because they would be expected to move together.

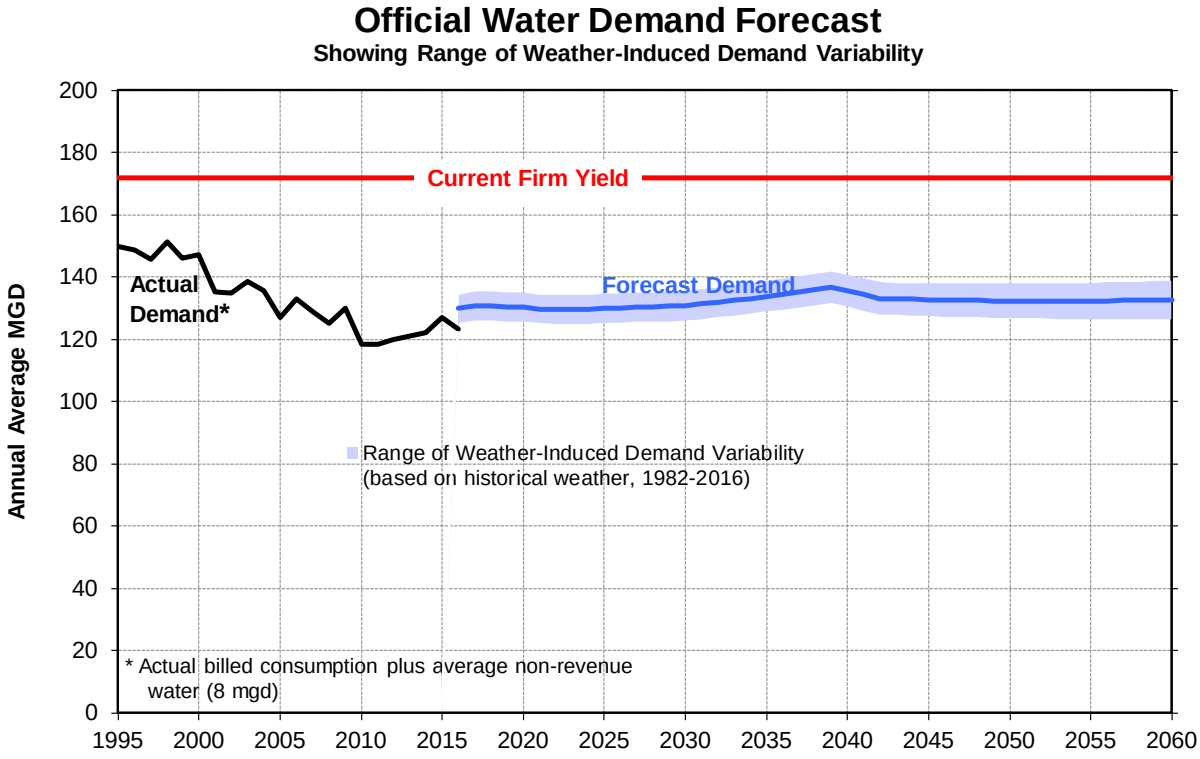


* Percentiles represent the probability that demand is less than the value shown. Ranges reflect uncertainty in projected household, employment, price and income growth; price and income elasticities; and conservation. Note that the Official Forecast is at about the 60th percentile.



Implications: Given the current firm yield estimate for SPU's existing supply resources and the official demand forecast, a new source of supply will not be needed until well after 2060. Even when taking demand uncertainty as modeled above into consideration, there is more than a 90% probability that a new water source will not be necessary before 2060. This analysis does not explicitly calculate the possible impact of the "discrete" category of uncertainties mentioned in the introduction, nor the potential impacts of all possible sources of uncertainty. Some additional sources uncertainty that could affect future water demand but which have not been accounted for in the uncertainty analysis are described below.

Weather-Induced Demand Variability: Another source of "haziness" in the forecast is weather-induced demand variability. This is not strictly a matter of uncertainty however because there is no doubt that summer weather will continue to vary from year to year, and that this variation will cause water demand to fluctuate around the trend. Because base year flow factors are calculated from weather-adjusted consumption data, the forecast represents demand under average weather conditions. In any one year though, summer weather variability would be expected to boost or depress demand relative to the forecast under average weather. Analysis of daily consumption data back to 1982 shows a maximum variability of about plus or minus **5%**. In other words, an extremely hot, dry summer would be expected to increase annual consumption *in that year* by up to 5% above the average trend. An extremely cool, wet summer would be expected to do the opposite, reducing that year's annual consumption by about 5% below the average trend. The amount by which actual demand is expected to be higher or lower than forecast due to variation in summer weather is shown as the blue band around the forecast in the graph below. Note this is based on historical weather variation and water use by customers. If the amount of weather variation around the average increases in the future due to climate change, the range of weather-induced demand variability might be expected to widen as well.



Climate Change: The water demand forecast model does not explicitly account for the potential impact of climate change on future demand, another source of future uncertainty. Climate modeling[16] suggests that by 2060, what now represents the high end for daily high summer temperatures could be the average weather condition (i.e., approximately 80°F over the three summer months). This means that in its hottest and driest years, the region has already experienced what could become average weather in 40 or 50 years of future climate change. Assuming the relationship between summer weather and water demand in the future remains similar to what it is now,[17] climate change might be expected to increase the forecast of *average-weather* water demand by approximately 5% over the forecast period, the upper end of the uncertainty band shown in the above graph of weather-induced demand variability under historic weather conditions. However, the climate models also project that weather variability will increase over time with a wider spread of summer temperatures from year to year. So, while climate change is not expected to bump *average* demand higher by more than the current range of weather-induced demand variability, weather variability – and therefore demand variability – will likely be greater in the future with wider fluctuations from year to year, again assuming no change in customer water use behavior.

The global impact of climate change could also bring about other significant but hard-to-predict changes to local water demand. For example, the Pacific Northwest could attract large numbers of people migrating from areas of the world hit harder by the deleterious effects of climate change. Loss of agricultural capacity worldwide could boost the importance of urban agriculture in the region and the demand for irrigation water. On the other hand, technological innovations in how we use water and energy could significantly reduce the demand for water from SPU's existing sources. Accounting for these types of uncertainty are beyond the scope of this analysis.

[16] The PUMA project, referenced in Section 2.4.1.3 of the WSP, involved downscaling climate projections from 20 different Global Climate Models (GCMs) run with two greenhouse gas emissions scenarios – one high (RCP8.5) and one low (RCP 4.5) – to several point locations in the Central Puget Sound region. Averaging the projections for SeaTac Airport from the 20 models using the high emissions scenario (RCP8.5) indicates that average air temperatures will be approximately 80 degrees Fahrenheit over in the June through August time period by 2060. Note that since this is the average of the high emissions projections, some of the models predict even higher increases in summer temperatures by 2060.

[17] Of course, that relationship could change and get stronger or weaker over time. On the one hand, the widespread practice of allowing lawns to go brown could become untenable as higher temperatures result in grass dying rather than going dormant without irrigation. On the other hand, hotter drier summers could induce people to plant more drought-tolerant landscaping or prod compensating public policies, programs or other efforts to help dampen water demand.

SEATTLE PUBLIC UTILITIES
2019 WATER SYSTEM PLAN

A. WATER RESOURCES

APPENDIX A-2
Water Right Self-Assessment

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Seattle Public Utilities
Water Right Self-Assessment Form for Water System Plan

March 2018

Water Right Permit, Certificate, or Claim # *If water right is interruptible, identify limitation in yellow section below	WFI Source # If a source has multiple water rights, list each water right on separate line	Existing Water Rights Qi= Instantaneous Flow Rate Allowed (GPM or CFS) Qa= Annual Volume Allowed (Acre-Feet/Year) This includes wholesale water sold				Current Source Production – Most Recent Calendar Year **2016** Qi = Max Instantaneous Flow Rate Withdrawn (GPM or CFS) Qa = Annual Volume Withdrawn (Acre-Feet/Year) This includes wholesale water sold				10-Year Forecasted Source Production (determined from WSP) This includes wholesale water sold **2028**				20-Year Forecasted Source Production (determined from WSP) This includes wholesale water sold **2038**			
		Primary Qi Maximum Rate Allowed	Non-Additive Qi Maximum Rate Allowed	Primary Qa Maximum Volume Allowed	Non-Additive Qa Maximum Volume Allowed	Total Qi Maximum Instantaneous Flow Rate Withdrawn	Current Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume Withdrawn	Current Excess or (Deficiency) Qa	Total Qi Maximum Instantaneous Flow Rate in 10 Years	10-Year Forecasted Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume in 10 Years	10-Year Forecasted Excess or (Deficiency) Qa	Total Qi Maximum Instantaneous Flow Rate in 20 Years	20-Year Forecasted Excess or (Deficiency) Qi	Total Qa Maximum Annual Volume in 20 Years	20-Year Forecasted Excess or (Deficiency) Qa
1. S1-068624CL	01 CEDAR RIVER Cedar River and Chester Morse Lake	Not specified (note 1)		138,898 AF/Yr (note 1)		280 CFS (181 MGD)		89,454 AF/yr									
2. S1-068623CL	01 CEDAR RIVER Lake Youngs	N/A		*33,770 Acre-Feet (Storage)*		N/A		N/A									
3. R1-00748C	02 TOLT RIVER South Fork Tolt Reservoir	N/A		*57,830 Acre-Feet (Storage)*		N/A		N/A									
4. S1-10602P	02 TOLT RIVER South Fork Tolt Diversion	280 CFS (181 MGD)		168,000 AF/yr		85 CFS (55 MGD)		47,408 AF/yr									
5. G1-24621P (temporary permit)	03 RIVERTON HTS #1 05 RIVERTONHTS #2 06 RIVERTON HTS WF	4,000 GPM (5.8 MGD)		Not specified		0		0									
6. G1-24619P (temporary permit)	04 BOULEVARD	4,000 GPM (5.8 MGD)		Not specified		0		0									
7. S1-28477P	Rainwater Harvesting (note 2)	N/A		23,150 AF/yr		N/A		N/A									
	TOTALS =	(see note 1)		306,898 AF/yr excludes storage, wells and rainwater harvesting		365 CFS (236 MGD)	---	136,862 AF/yr (122 MGD)	170,036 AF/yr excludes storage, wells and rainwater harvesting	400 CFS (259 MGD) MDD assuming 2*ADD	---	144,946 AF/yr (129.4 MGD)	161,952 AF/yr excludes storage, wells and rainwater harvesting	418 CFS (270 MGD) MDD assuming 2*ADD	---	151,219 AF/yr (135.0 MGD)	155,679 AF/yr excludes storage, wells and rainwater harvesting
Column Identifiers for Calculations:		A		B		C	=A-C	D	=B-D	E	= A-E	F	=B-F	G	=A-G	H	=B-H

PENDING WATER RIGHT APPLICATIONS: Identify any water right applications that have been submitted to Ecology.

Application Number	New or Change Application?	Date Submitted	Quantities Requested			
			Primary Qi	Non-Additive Qi	Primary Qa	Non-Additive Qa
1. S1-*04254 North Fork Tolt River Diversion	New, held in abeyance	7/14/1936	280 CFS			
2. G1-27384 Snoqualmie Aquifer	New	1/19/1994	41,600 GPM			
3. S1-27877 Snoqualmie River	New	1/29/1998	100 CFS		72,000 AF/yr	
4. G1-24619 Boulevard Park	New	3/7/1985	4,000 GPM To be modified to 2,900 GPM		2,200 AF/yr To be modified to 1,200 AF/yr	
5. G1-24620 Glacier Well	New	3/7/1985	4,000 GPM		2,200 AF/yr	
6. G1-24621 Riverton Heights	New	3/7/1985	4,000 GPM To be modified to 6,300 GPM		2,200 AF/yr To be modified to 3,200 AF/yr	
7. G1-24824 Riverton Heights	New	4/14/1986	4,000 GPM		2,200 AF/yr	
8. G1-24825 Boulevard Park	New	4/14/1986	4,000 GPM		2,200 AF/yr	
9. R1-28168 Aquifer Storage	New	6/29/2005	N/A		4,800 AF (storage)	

ADDITIONAL COMMENTS:

Note 1: Cedar River Claim is for a total Qa of 336,650 AF/yr, with no stated Qi. Under the 2006 Agreement with the Muckleshoot Indian Tribe, the City of Seattle agreed to limit diversions to 124 million gallons per day on an annual average basis (138,898 AF/yr) and to donate the portion of the perfected water right above this amount to the Washington State Trust Water Right Program. CS1-068624CL Trust Water Right Temporary Donation provides for 22,403 AF/yr, the amount that has been perfected through diversions at Landsburg, to be donated to the Washington State Trust Water Right Program to benefit instream flows in the Cedar River.

Note 2: Permit S1-28477P allows for rainwater harvested from rooftops to be stored in tanks, cisterns or rain barrels and used on site for non-potable municipal purposes. Place of use includes properties in the City of Seattle's retail service area that are served by the combined and partially combined sewer systems, but not those served by just the sanitary sewer system. Reporting is to occur with Water System Plan updates; see Attachment 1.

Seattle Public Utilities does not use interties as a normal supply source.

RAINWATER HARVESTING USE REPORT

March 2018

Permit S1-28477P allows for rainwater harvested from rooftops to be stored in tanks, cisterns or rain barrels and used on site for non-potable municipal purposes. Reporting is to occur with Water System Plan updates, and is to include the location, purpose of use, roof size, and storage capacity of each system, as well as total number of systems in operation.

Larger Systems in Operation

Table 1 shows larger rainwater harvesting systems currently in operation within the permitted place of use. These systems are large facilities that Seattle Public Utilities is aware of that meet the conditions of the permit. Other facilities, especially smaller systems, may also exist that meet the criteria of the permit, that SPU does not have data to report on at this time.

Table 1
Large Rainwater Systems in Operation

	Location	Purpose of Use	Roof Size (square feet)	Storage Capacity (gallons)
1	600 4th Ave. (City Hall)	Toilet flushing Irrigation	42,898	224,400
2	950 NW Carkeek Park Rd. (Carkeek Park Environmental Learning Center)	Toilet flushing Irrigation	2,640	3,850
	TOTAL		45,538 (1 acre)	225,250

RainWise Facilities

SPU's RainWise program, which was established in April 2010, provides financial assistance to homeowners who install rainwater harvesting devices, such as cisterns and rainbarrels, that contribute to SPU's goal of reducing combined sewer overflows. The cisterns and rainbarrels installed under this program may also be used to collect rainwater for **irrigation** purposes. Table 2 below lists the facilities that have been installed under this program in the permitted place of use.

Table 2

RainWise Program Facilities

Installed 2010-2016

#	Site Address	Type of Facility	Roof Square Footage to Facility	Roof Square Footage to Cistern	Roof Square Footage to Cistern to Rain Garden	Cistern Total Gallons	Date of Post Inspection
1	8331 Jones Ave NW	Rain Garden & Cistern	950.0		497.0	200	23-Sep-10
2	2839 NW 67th St	Rain Garden & Cistern	1,720.0		410.0	200	14-Oct-10
3	7529 19th Ave NW	Rain Garden & Cistern	1,486.0		776.0	1,000	04-Nov-10
4	8071 Earl Ave NW	Rain Garden & Cistern	1,872.0		936.0	200	16-Nov-10
5	2811 NW 80th Street	Cistern overflowing to Rain Garden	1,010.0		1,010.0	550	07-Dec-10
6	7047 Earl Ave NW	Cistern overflowing to back to Sewer	588.0	588.0		200	14-Dec-10
7	8323 28th Ave NW	Rain Garden & Cistern	1,348.0		1,133.0	200	16-Dec-10
8	7558 28th Ave NW	Rain Garden & Cistern	1,239.0		729.0	200	21-Dec-10
9	8319 28th Ave NW	Cistern	896.0	896.0		200	11-Jan-11
10	2837 NW 68th St	Rain Garden & Cistern	909.0		438.0	200	20-Jan-11
11	8017 16th Ave NW	Cistern overflowing to back to Sewer	532.0	532.0		200	17-Feb-11
12	7525 17th Ave NW	Rain Garden & Cistern	1,315.0		284.0	55	01-Mar-11
13	7530 23rd Ave NW	Rain Garden & Cistern	749.0		450.0	200	08-Mar-11
14	2807 NW 68th St	Rain Garden & Cistern	1,168.0		456.0	200	14-Mar-11
15	2703 NW 73rd St	Cistern	1,470.0	1,470.0		1,235	12-May-11
16	6750 27th Ave NW	Cistern overflowing to Conveyance Furrow	1,701.0	1,701.0		820	17-May-11
17	7540 30th Ave NW	Cistern overflowing to back to Sewer	1,681.0	1,681.0		820	27-Jun-11
18	8035 26th Ave NW	Rain Garden & Cistern	1,168.0		600.0	200	21-Jul-11
19	6511 23rd Ave NW	Cistern overflowing to Rain Garden	1,149.0		1,149.0	410	04-Aug-11
20	8060 23rd Ave NW	Rain Garden & Cistern	766.0		226.0	200	27-Sep-11
21	8012 21st Ave NW	Rain Garden & Cistern	1,028.0		497.0	200	27-Sep-11
22	7727 26th Ave NW	Cistern overflowing to Rain Garden	1,269.0		1,269.0	615	01-Oct-11
23	7559 Jones Ave NW	Rain Garden & Cistern	982.0		945.0	620	12-Oct-11
24	6737 27th Ave NW	Cistern overflowing to back to Sewer	2,229.0	2,229.0		820	12-Oct-11
25	7703 26th Ave NW	Rain Garden & Cistern	1,540.0		1,363.0	1,030	28-Oct-11
26	6516 Jones Ave NW	Rain Garden & Cistern	1,011.0		944.0	400	08-Nov-11
27	7713 26th Ave NW	Rain Garden & Cistern	1,621.0		1,223.0	620	17-Nov-11
28	7723 27th Ave NW	Cistern overflowing to back to Sewer	1,424.0	1,424.0		600	01-Dec-11
29	7056 19th Ave NW	Rain Garden & Cistern	801.0		453.0	200	21-Dec-11
30	7303 22nd Ave NW	Cistern overflowing to Rain Garden	1,763.0		1,763.0	620	04-Jan-12
31	3002 75th Ave NW	Cistern overflowing to Conveyance Furrow	1,497.0	1,497.0		600	04-Jan-12
32	24th Ave NW	Rain Garden & Cistern	1,885.0		1,023.0	1,235	02-Feb-12
33	6552 24th Ave NW	Cistern overflowing to Rain Garden	1,518.0		1,518.0	1,030	07-Feb-12
34	2832 NW 73rd St	Rain Garden & Cistern	1,331.0	255.0	1,076.0	820	17-Feb-12

#	Site Address	Type of Facility	Roof Square Footage to Facility	Roof Square Footage to Cistern	Roof Square Footage to Cistern to Rain Garden	Cistern Total Gallons	Date of Post Inspection
35	3002 NW 68th St	Cistern overflowing to Conveyance Furrow	738.0	738.0		200	29-Feb-12
36	7553 27th Ave NW	Cistern	1,793.0	1,793.0			29-Feb-12
37	7341 22nd Ave NW	Cistern overflowing to back to Sewer	427.0	427.0		200	29-Feb-12
38	2843 NW 67th St	Rain Garden & Cistern	1,404.0		702.0	200	08-Mar-12
39	7322 17th Ave NW	Cistern overflowing to Rain Garden	819.0		819.0	410	05-Apr-12
40	7545 Earl Ave NW	Rain Garden & Cistern	1,647.0	600.0	1,047.0	1,440	10-Apr-12
41	6542 21s Ave NW	Rain Garden & Cistern	630.0	420.0		820	19-Apr-12
42	7506 Jones Ave NW	Rain Garden & Cistern	872.0		420.0	200	08-May-12
43	7322 Jones Ave NW	Cistern overflowing to Rain Garden	1,439.0		1,439.0	615	10-May-12
44	7710 27th Ave NW	Rain Garden & Cistern	1,105.0		600.0	620	22-May-12
45	7056 23rd Ave NW	Cistern overflowing to back to Sewer	1,542.0	1,542.0		620	05-Jun-12
46	6714 21st Ave NW	Cistern overflowing to Rain Garden	1,083.0		1,083.0	200	06-Jun-12
47	2428 NW 56th St	Cistern overflowing to back to Sewer	1,966.0	1,966.0		1,745	21-Jun-12
48	8200 34th Ave NW	Cistern	986.0	986.0		400	10-Jul-12
49	3224 NW 59th St	Cistern	1,825.0	1,825.0			17-Jul-12
50	6540 18th Ave NW	Cistern	993.0	993.0		620	19-Jul-12
51	9033 13th Avenue SW	Rain Garden & Cistern	1,624.0		128.3	1,000	23-Jul-12
52	2034 NW 60th St	Rain Garden & Cistern	2,308.0	638.0	1,670.0	1,435	02-Aug-12
53	2846 NW 63rd Street	Rain Garden & Cistern	936.0		936.0	200	25-Sep-12
54	7030 38th Avenue NE	Cistern	615.0	615.0		200	02-Oct-12
55	2836 NW 62nd Street	Cistern	1,380.0	1,380.0		200	05-Oct-12
56	7358 25th Avenue NW	Rain Garden & Cistern	1,339.0		475.0	205	12-Oct-12
57	8045 17th Avenue NW	Rain Garden & Cistern	1,740.0		702.0		24-Nov-12
58	6520 Jones Avenue NW	Rain Garden & Cistern	1,716.0		1,098.0	410	29-Nov-12
59	5057 37th Avenue NE	Cistern overflowing to Rain Garden	1,465.0		1,465.0	200	04-Dec-12
60	7043 Jones Avenue NW	Rain Garden & Cistern	1,368.0	667.0		205	04-Dec-12
61	6512 23rd Avenue NW	Rain Garden & Cistern	5,000.0		760.0	410	06-Dec-12
62	7326 Jones Avenue NW	Cistern overflowing to Rain Garden	1,393.0		1,393.0	825	11-Dec-12
63	7525 31st Avenue NW	Cistern	1,448.0	1,448.0		1,690	11-Dec-12
64	7752 20th Avenue NW	Rain Garden & Cistern	1,440.0		500.0	205	18-Dec-12
65	6804 28th Avenue NW	Rain Garden & Cistern	1,335.0		210.0	205	18-Dec-12

#	Site Address	Type of Facility	Roof Square Footage to Facility	Roof Square Footage to Cistern	Roof Square Footage to Cistern to Rain Garden	Cistern Total Gallons	Date of Post Inspection
66	7533 29th Avenue NW	Rain Garden & Cistern	1,468.0		731.0	205	20-Dec-12
67	6045 43rd Avenue NE	Cistern overflowing to back to Sewer	2,436.0	2,436.0		1,145	27-Dec-12
68	6709 Earl Avenue NW	Rain Garden & Cistern	2,567.0	749.0		530	14-Jan-13
69	3850 NE 85th Street	Rain Garden & Cistern	1,954.0	678.0	663.0	735	24-Jan-13
70	7359 20th Avenue NW	Rain Garden & Cistern	1,792.0	645.0		530	24-Jan-13
71	3037 NW 73rd Street	Cistern	1,325.0		502.0	205	30-Jan-13
72	4312 NE 60th Street	Cistern overflowing to back to Sewer	1,033.0	1,033.0		1,060	14-Feb-13
73	9018 13th Avenue SW	Cistern overflowing to Rain Garden	981.3		981.3	600	21-Feb-13
74	8016 20th Avenue NW	Rain Garden & Cistern	1,100.0		167.0	205	28-Feb-13
75	5746 37th Avenue NE	Rain Garden & Cistern	1,271.5		901.0	50	12-Mar-13
76	2633 NW 64th Street	Rain Garden & Cistern	1,717.0		397.0	205	02-Apr-13
77	6541 Jones Avenue NW	Rain Garden & Cistern	4,028.8	2,004.3	2,024.5	4,520	02-Apr-13
78	5518 Ann Arbor Avenue NE	Rain Garden & Cistern	1,839.8	650.0		530	04-Apr-13
79	7707 19th Avenue NW	Cistern overflowing to back to Sewer	830.5	830.5		530	09-Apr-13
80	3220 NW 74th Street	Cistern overflowing to back to Sewer	1,320.0	1,320.0		1,060	11-Apr-13
81	5004 38th Avenue NE	Rain Garden & Cistern	2,215.0	735.0		205	16-Apr-13
82	7538 27th Ave NW	Cistern overflowing to Rain Garden	1,676.0		1,676.0	530	21-May-13
83	7715 Jones Avenue NW	Cistern overflowing to Rain Garden	1,550.0		1,290.0	1,145	21-May-13
84	5816 Ann Arbor Ave NE	Rain Garden & Cistern	2,171.0	674.0		265	06-Jun-13
85	3911 NE 82nd Street	Cistern overflowing to back to Sewer	455.0	455.0		205	01-Jul-13
86	7737 16th Avenue NW	Cistern	753.0	753.0		205	09-Jul-13
87	3164 NE 84th Street	Rain Garden & Cistern	1,515.7	476.0		205	23-Jul-13
88	6556 37th Avenue NE	Rain Garden & Cistern	2,079.0	1,170.0	909.0	1,735	31-Jul-13
89	7738 34th Ave NW	Cistern	2,805.2				15-Aug-13
90	3216 NE 80th Street	Rain Garden & Cistern	1,272.6	696.1		205	20-Aug-13
91	8021 31st Avenue NE	Cistern overflowing to Rain Garden	933.5		933.5	205	21-Aug-13
92	3116 NE 81st St	Cistern overflowing to back to Sewer		447.8		205	27-Aug-13
93	7700 21st Ave NW	Cistern overflowing to Rain Garden	1,097.5		1,097.5	530	24-Sep-13

#	Site Address	Type of Facility	Roof Square Footage to Facility	Roof Square Footage to Cistern	Roof Square Footage to Cistern to Rain Garden	Cistern Total Gallons	Date of Post Inspection
94	7035 Jones Avenue NW	Rain Garden & Cistern	1,877.8		1,877.8	410	07-Oct-13
95	3016 NW 58th Street	Rain Garden & Cistern	902.0		412.5	205	07-Oct-13
96	9038 14th Ave SW	Cistern overflowing to Rain Garden	2,798.5		1,346.0	840	31-Oct-13
97	4303 NE 56th St	Rain Garden & Cistern	1,935.3	710.0		205	12-Nov-13
98	7048 17th Ave SW	Cistern overflowing to back to Sewer	472.0			420	31-Dec-13
99	2817 E. Park Drive	Cistern overflowing to back to Sewer	942.0	942.0		795	22-Jan-14
100	1131 NW 65th St	Cistern overflowing to back to Sewer	586.8	586.8		205	23-Jan-14
101	7757 21st Ave NW	Cistern overflowing to back to Sewer	1,644.0	1,644.0		940	06-Feb-14
102	1840 E. Hamlin St	Cistern overflowing to Conveyance Furrow	728.0	728.0		265	15-Apr-14
103	3007 NW 72nd St	Cistern overflowing to Rain Garden	996.0		996.0	510	01-May-14
104	5816 S Pilgrim St	Rain Garden & Cistern	3,075.4		1,996.5	410	20-May-14
105	4829 NE 75th St	Cistern overflowing to Rain Garden	986.0		986.0	865	21-May-14
106	6833 44th Ave NE	Rain Garden & Cistern	1,578.3	750.0		265	22-May-14
107	9749 Arrowsmith Ave S	Cistern overflowing to Conveyance Furrow	1,641.0	1,641.0		410	30-Jul-14
108	6038 S Pilgrim St	Cistern	3,025.0	3,025.0		1,025	30-Jul-14
109	6023 S Roxbury St	Cistern overflowing to back to Sewer	1,684.0	1,684.0		615	07-Aug-14
110	9035 12th Ave SW	Cistern overflowing to Rain Garden	1,984.0		1,984.0	830	14-Aug-14
111	3046 NW 61st St	Rain Garden & Cistern	1,134.0		469.8	205	28-Aug-14
112	1504 SW Trenton St	Cistern overflowing to back to Sewer	2,409.0	2,409.0		615	29-Aug-14
113	1500 SW Trenton	Cistern overflowing to Rain Garden	1,931.0		1,931.0	410	16-Sep-14
114	5215 38th Ave NE	Cistern overflowing to back to Sewer	1,364.0	1,364.0		470	25-Sep-14
115	326 N 45th St						02-Oct-14
116	2432 NW 63rd St	Rain Garden & Cistern	1,526.8		763.4	265	07-Oct-14
117	4615 Aurora Ave N	Cistern overflowing to Rain Garden	1,145.0		1,145.0	1,320	07-Oct-14
118	5529 S. Morgan St	Cistern overflowing to back to Sewer	1,681.0	1,681.0		1,715	22-Oct-14
119	7532 Earl Ave NW	Rain Garden & Cistern	1,045.3		527.0	205	23-Oct-14
120	7711 13th Ave SW	Cistern overflowing to Conveyance Furrow	1,634.0	1,634.0		615	28-Oct-14
121	6710 20th Ave NW	Rain Garden & Cistern	1,232.5		1,232.5	1,060	30-Oct-14
122	3036 NW 69th St	Rain Garden & Cistern	1,044.0		384.0	265	04-Nov-14
123	1500 SW Myrtle St.	Cistern	2,003.5	2,003.5		410	20-Nov-14
124	4607 S. Chicago St	Cistern	2,076.0	2,076.0		930	24-Nov-14

#	Site Address	Type of Facility	Roof Square Footage to Facility	Roof Square Footage to Cistern	Roof Square Footage to Cistern to Rain Garden	Cistern Total Gallons	Date of Post Inspection
125	10621 68th Ave S	Cistern overflowing to back to Sewer	2,018.0	2,018.0		615	25-Nov-14
126	7350 16th Ave NW	Cistern	481.0	481.0		265	09-Dec-14
127	2115 NW 75th St	Cistern overflowing to Rain Garden	1,497.3		1,497.3	530	09-Dec-14
128	8652 17th Ave SW	Cistern	625.0	625.0		530	15-Dec-14
129	6716 17th Ave NW	Cistern overflowing to Rain Garden	1,414.0		707.0	265	16-Dec-14
130	5501 37th Ave NE	Cistern overflowing to Rain Garden	1,119.5		1,119.5	625	18-Dec-14
131	7941 48th Ave S	Cistern overflowing to back to Sewer	1,546.0	1,546.0		615	24-Dec-14
132	6556 52nd Ave NE	Cistern	1,722.2	1,722.2		1,060	02-Jan-15
133	9421 18th Ave SW	Rain Garden & Cistern	2,152.0	560.0		205	08-Jan-15
134	3610 Ashworth Ave N	Cistern	460.0	460.0		430	13-Jan-15
135	7951 16th Ave SW	Cistern	704.0	704.0		205	20-Jan-15
136	8309 49th Ave S	Cistern overflowing to Rain Garden	1,503.0		1,503.0	205	27-Jan-15
137	7929 50th Ave S	Cistern overflowing to Rain Garden	1,727.1		1,182.6	410	10-Feb-15
138	10256 Renton Ave S	Cistern overflowing to back to Sewer	1,120.0	1,120.0		205	10-Feb-15
139	8323 Renton Ave S	Cistern	1,327.0	1,327.0		265	10-Feb-15
140	9656 Waters Ave S	Cistern overflowing to back to Sewer	7,225.0	7,225.0		4,605	10-Feb-15
141	1220 SW Orchard St	Rain Garden & Cistern	1,820.0		702.0	205	17-Feb-15
142	7813 48th Ave S	Cistern overflowing to Rain Garden	1,904.0		1,904.0	205	17-Feb-15
143	4440 S. Warsaw St.	Cistern	1,500.0	1,500.0		410	17-Feb-15
144	4432 S. Warsaw St.	Cistern	1,522.0	1,522.0		615	17-Feb-15
145	6326 47th Ave S	Cistern overflowing to back to Sewer	2,158.0	2,158.0		615	24-Feb-15
146	7920 46th Ave S	Cistern overflowing to Rain Garden	905.0		905.0	520	10-Mar-15
147	6545 40th Ave NE	Cistern overflowing to Rain Garden	1,484.0		1,484.0	530	31-Mar-15
148	8100 32nd Ave SW	Cistern overflowing to Rain Garden	1,620.0		1,620.0	205	31-Mar-15
149	7047 50th Ave NE	Cistern				470	17-Apr-15
150	1620 SW Austin	Rain Garden & Cistern	1,940.0				23-Apr-15
151	1626 SW Austin St	Rain Garden & Cistern	1,889.0	849.0		205	01-May-15
152	6320 47th Ave S	Rain Garden & Cistern	2,878.7	1,850.0		940	05-May-15
153	5218 Greenwood Ave N	Cistern	1,492.5			530	12-May-15
154	5602 30th Ave NW	Cistern	1,197.5	1,197.5		410	19-May-15
155	5420 57th Ave S	Cistern overflowing to back to Sewer	861.5	861.5		530	19-May-15
156	3856 41st Ave S	Rain Garden & Cistern	1,522.5	652.5		530	19-May-15
157	4614 S Chicago	Cistern overflowing to Rain Garden	750.8		750.8	625	02-Jun-15

#	Site Address	Type of Facility	Roof Square Footage to Facility	Roof Square Footage to Cistern	Roof Square Footage to Cistern to Rain Garden	Cistern Total Gallons	Date of Post Inspection
158	1504 SW Trenton	Cistern	2,409.0			515	16-Jun-15
159	9403 18th Ave SW	Cistern overflowing to back to Sewer	2,789.4	2,789.4		2,170	16-Jun-15
160	10064 Arrowsmith Ave S	Cistern	1,525.5	1,525.5		1,395	30-Jun-15
161	9751 62nd St	Rain Garden & Cistern	2,513.0		988.0	865	30-Jun-15
162	2851 NW 64th St	Cistern	546.0	546.0		410	02-Jul-15
163	9306 Lima Terrace S	Cistern	1,161.5	1,161.5		1,525	21-Jul-15
164	4804 S Snoqualimie St	Cistern	1,020.0	1,020.0		865	21-Jul-15
165	5241 S Graham St	Cistern overflowing to back to Sewer	1,660.0	1,660.0		1,060	21-Jul-15
166	9334 53rd Ave S	Cistern overflowing to back to Sewer	975.5	975.5		410	28-Jul-15
167	8021 29th Ave NW	Rain Garden & Cistern	1,102.5		204.0	410	28-Jul-15
168	5039 49th Ave S	Cistern	790.0	790.0		420	04-Aug-15
169	4120 48th ave s	Cistern	2,064.0	2,064.0		675	04-Aug-15
170	6502 51st Ave S	Rain Garden & Cistern	1,055.0	435.0		205	11-Aug-15
171	1853 E Hamlin St	Cistern	1,012.0	1,012.0		410	18-Aug-15
172	4255 Graham St	Cistern	1,675.0	1,675.0		615	18-Aug-15
173	4255 Graham St	Cistern	1,675.0			615	18-Aug-15
174	6908 46th Ave S	Cistern overflowing to back to Sewer	1,632.0	1,632.0		410	25-Aug-15
175	4004 50th Ave NE	Cistern	1,284.0	1,284.0		735	25-Aug-15
176	9224 14th Ave SW	Cistern	899.0	899.0		530	01-Sep-15
177	6044 51st Ave NE	Cistern overflowing to back to Sewer	936.5	936.5		265	01-Sep-15
178	7943 46th Ave S	Cistern	1,316.0	1,316.0		530	15-Sep-15
179	8314 19th Ave NW	Cistern	540.0	540.0		630	22-Sep-15
180	7310 23rd Ave NW	Cistern	672.0	672.0		265	22-Sep-15
181	4610 S. Holly Street	Cistern	2,597.0	2,597.0		675	22-Sep-15
182	6548 NE Windermere Rd	Cistern overflowing to back to Sewer	1,062.0	1,062.0		410	29-Sep-15
183	8038 30th Ave NW	Cistern	1,569.0	1,569.0		470	30-Sep-15
184	4302 NE 56th St	Cistern overflowing to back to Sewer	522.5	522.5		205	05-Oct-15
185	6030 28th Ave NE	Cistern	680.0	680.0		205	07-Oct-15
186	7551 22nd Ave NW	Rain Garden & Cistern	1,275.0		945.0	735	08-Oct-15
187	6549 40th Ave NE	Cistern	1,580.0	1,580.0		1,060	15-Oct-15
188	7542 16th Ave NW	Rain Garden & Cistern	1,001.0		512.0	265	21-Oct-15
189	8059 Loyal Way NW	Rain Garden & Cistern	839.0		839.0	735	22-Oct-15
190	4335 Baker Ave NW	Cistern	1,259.0	1,259.0		1,060	23-Oct-15
191	2847 NW 64th St	Cistern	1,402.0	1,402.0		530	26-Oct-15
192	4920 NE 65th St	Rain Garden & Cistern	2,407.0	999.0	1,408.0	950	29-Oct-15
193	6128 S Pilgrim St	Cistern overflowing to back to Sewer	3,496.0	3,496.0		2,630	30-Oct-15
194	6739 21st Ave NW	Rain Garden & Cistern	1,828.5		1,828.5	205	02-Nov-15
195	5134 S Morgan St	Cistern overflowing to back to Sewer	795.0	795.0		205	05-Nov-15
196	4242 S Frontenac St	Cistern	1,540.0	1,540.0		470	09-Nov-15

#	Site Address	Type of Facility	Roof Square Footage to Facility	Roof Square Footage to Cistern	Roof Square Footage to Cistern to Rain Garden	Cistern Total Gallons	Date of Post Inspection
197	6230 Wilson Ave S	Cistern overflowing to back to Sewer	1,440.5	1,440.5		410	12-Nov-15
198	7519 S Taft St	Cistern overflowing to back to Sewer	1,899.0	1,899.0		795	17-Nov-15
199	10200 63rd Ave S	Rain Garden & Cistern	1,306.0		706.0	265	23-Nov-15
200	7753 33rd Ave NW	Cistern overflowing to back to Sewer	1,309.0	1,309.0		470	24-Nov-15
201	1209 N 46th St	Cistern	1,230.0	1,230.0		530	11-Dec-15
202	5509 NE 63rd St	Rain Garden & Cistern	1,401.3	869.5		205	15-Dec-15
203	6548 21st Ave NW	Cistern overflowing to back to Sewer	619.0	619.0		265	22-Dec-15
204	1025 N 36th St	Cistern overflowing to back to Sewer	1,295.0	1,295.0		1,060	07-Jan-16
205	7316 56th Ave NE	Cistern	2,236.0	2,236.0		1,060	13-Jan-16
206	4609 49th Ave S	Cistern	898.0	898.0		625	19-Jan-16
207	8838 15th Ave SW	Cistern overflowing to back to Sewer	1,312.5	1,312.5		1,060	02-Feb-16
208	4106 Woodland Park Ave N	Cistern overflowing to back to Sewer	471.0	471.0		205	04-Feb-16
209	4203 NE 74th St	Cistern overflowing to back to Sewer	2,052.0	2,052.0		1,060	08-Feb-16
210	5526 S. Holly St	Rain Garden & Cistern	1,413.0		645.0	1,440	09-Feb-16
211	5218 38th Ave NE	Cistern overflowing to Rain Garden	972.0		466.0	205	18-Feb-16
212	7046 55th Ave NE	Cistern overflowing to Conveyance Furrow	1,364.0	1,364.0		820	19-Feb-16
213	4013 NE 62nd St	Rain Garden & Cistern	1,695.0		1,695.0	530	23-Feb-16
214	4015 Dayton Ave S	Cistern	418.5	418.5		205	03-Mar-16
215	6048 40th Ave NE	Cistern overflowing to back to Sewer	1,124.5	1,124.5		530	03-Mar-16
216	6219 47th Ave S	Cistern	1,067.0	1,067.0		530	10-Mar-16
217	5727 S Cooper St	Cistern	1,634.0	1,634.0		840	14-Mar-16
218	5149 S Graham St	Cistern overflowing to back to Sewer	1,521.0	1,521.0		840	14-Mar-16
219	7018 50th Ave NE	Cistern	3,627.0	3,627.0		1,420	15-Mar-16
220	4425 41st Ave S	Cistern overflowing to Rain Garden	945.0	425.0		205	16-Mar-16
221	4742 48th Ave NE	Cistern overflowing to Conveyance Furrow	1,992.0	1,992.0		1,110	17-Mar-16
222	6607 58th Ave NE	Cistern overflowing to back to Sewer	1,558.5	1,558.5		1,060	23-Mar-16
223	3023 NW 64th St	Cistern overflowing to back to Sewer	1,507.5	1,507.5		1,060	23-Mar-16
224	7555 22nd Ave NW	Cistern overflowing to back to Sewer	577.0	577.0		205	01-Apr-16
225	4246 NE 74th St	Cistern overflowing to back to Sewer	488.0	488.0		205	01-Apr-16
226	7721 28th Ave NW	Cistern overflowing to back to Sewer	1,594.0	1,594.0		615	01-Apr-16

#	Site Address	Type of Facility	Roof Square Footage to Facility	Roof Square Footage to Cistern	Roof Square Footage to Cistern to Rain Garden	Cistern Total Gallons	Date of Post Inspection
227	604 N 39th St	Cistern overflowing to back to Sewer	488.0	488.0		265	01-Apr-16
228	4230 Greenwood Ave N	Cistern overflowing to back to Sewer	613.0	613.0		205	01-Apr-16
229	5817 28th Ave NW	Cistern overflowing to back to Sewer	672.0	672.0		205	04-Apr-16
230	6043 44th Ave NE	Rain Garden & Cistern	1,946.0	559.0	752.0	1,060	18-Apr-16
231	6050 44th Ave NE	Cistern overflowing to back to Sewer	462.0	462.0		530	20-Apr-16
232		Cistern overflowing to back to Sewer	949.0	949.0		205	21-Apr-16
233	5503 NE 63rd St	Cistern overflowing to back to Sewer	585.0	585.0		205	21-Apr-16
234	6003 17th Ave NW	Cistern overflowing to back to Sewer	2,011.0	2,011.0		615	21-Apr-16
235	3668 Dayton Ave N	Cistern overflowing to back to Sewer	949.0	949.0		205	21-Apr-16
236	11439 71st Pl S	Cistern overflowing to back to Sewer	799.0	799.0		530	25-Apr-16
237	6706 Earl Ave NW	Cistern overflowing to back to Sewer	461.0	461.0		205	26-Apr-16
238	405 N 41st St	Cistern overflowing to back to Sewer	750.0	750.0		865	27-Apr-16
239	4905 S Rose St	Rain Garden & Cistern	1,617.0	808.5		205	29-Apr-16
240	4317 S Holden St	Cistern overflowing to back to Sewer	1,850.0	1,850.0		1,680	11-May-16
241	2356 N 61st St	Rain Garden & Cistern	1,271.0	488.5		205	23-May-16
242	4623 46th Ave S	Cistern	1,050.0	1,050.0		820	06-Jun-16
243	7703 22nd Ave NW	Rain Garden & Cistern	1,162.0		553.0	205	10-Jun-16
244	6825 47th Ave NE	Rain Garden & Cistern	1,165.0	689.0		265	13-Jun-16
245	7728 25th Ave NW	Rain Garden & Cistern	919.0		457.0	265	29-Jun-16
246	7324 56th Ave NE	Cistern overflowing to back to Sewer	1,021.0	1,021.0		1,060	30-Jun-16
247	5735 S Cooper St	Cistern	1,562.0	1,562.0		410	01-Jul-16
248	4103 Francis Ave N	Cistern overflowing to back to Sewer	1,485.0	1,485.0		1,325	05-Jul-16
249	3841 Interlake Ave N	Rain Garden & Cistern	1,407.0	660.0		205	06-Jul-16
250	2828 NW 69th St		792.0		483.0	205	06-Jul-16
251	4757 23rd Ave SW		1,529.0	1,529.0		1,060	13-Jul-16
252	813 N 43rd St	Cistern overflowing to back to Sewer	1,062.0	1,062.0		410	14-Jul-16
253	4916 S Angeline St	Cistern	3,436.0	3,436.0		2,420	18-Jul-16
254	7719 27th Ave NW	Rain Garden & Cistern	1,190.0		1,190.0	470	19-Jul-16
255	1275 SW Orchard St	Cistern overflowing to back to Sewer	1,426.0	1,426.0		530	20-Jul-16
256	6703 17th Ave NW	Cistern	1,664.0	1,664.0		410	25-Jul-16
257	4610 46th Ave S	Cistern overflowing to back to Sewer	1,293.0	1,293.0		840	09-Aug-16
258	2456 24th Ave E	Cistern overflowing to back to Sewer	1,165.0	1,165.0		410	09-Aug-16

#	Site Address	Type of Facility	Roof Square Footage to Facility	Roof Square Footage to Cistern	Roof Square Footage to Cistern to Rain Garden	Cistern Total Gallons	Date of Post Inspection
259	8112 11th Ave SW	Rain Garden & Cistern	1,362.0		1,362.0	205	10-Aug-16
260	3415 36th Ave S	Cistern overflowing to back to Sewer	1,036.0	1,036.0		840	23-Aug-16
261	9421 14th Ave SW	Cistern overflowing to back to Sewer	834.0	834.0		205	23-Aug-16
262	4208 3rd Ave NW	Cistern overflowing to back to Sewer	1,470.0	1,470.0			31-Aug-16
263	4710 S Ferdinand St	Cistern overflowing to back to Sewer	1,250.3	1,250.3		530	06-Sep-16
264	6119 47th Ave S	Cistern overflowing to back to Sewer	1,486.0	1,486.0		265	06-Sep-16
265	6121 47th Ave S	Cistern overflowing to back to Sewer	1,159.5	1,159.5		530	06-Sep-16
266	6017 47th Ave S	Cistern overflowing to back to Sewer	1,412.0	1,412.0		410	06-Sep-16
267	4800 49th Ave S	Cistern overflowing to back to Sewer	1,703.0	1,703.0		1,680	14-Sep-16
268	4800 49th Ave S	Cistern overflowing to Conveyance Furrow	1,703.0	1,703.0		1,680	14-Sep-16
269	6610 46th Ave S	Cistern overflowing to back to Sewer	1,653.0	1,653.0		530	20-Sep-16
270	5919 S Roxbury St	Cistern overflowing to back to Sewer	1,410.0	1,410.0		410	20-Sep-16
271	4034 Dayton Ave N	Cistern	725.0	725.0		265	21-Sep-16
272	1802 SW Elmgrove St	Cistern overflowing to back to Sewer	917.0	917.0		410	21-Sep-16
273	1838 E Shelby St	Cistern	1,742.0	1,742.0		410	22-Sep-16
274	9800 59th Ave S	Rain Garden & Cistern	1,330.0		1,330.0	205	22-Sep-16
275	8300 21st Ave NW	Rain Garden & Cistern	1,076.5		514.0	205	28-Sep-16
276	4112 41st Ave S	Cistern overflowing to back to Sewer	1,092.0	1,092.0		1,150	29-Sep-16
277	9823 63rd Ave S	Cistern	1,292.0	1,292.0		530	04-Oct-16
278	5739 S. Cooper St	Rain Garden & Cistern	1,748.3	1,748.3		1,260	05-Oct-16
279	7316 Jones Ave NW	Rain Garden & Cistern	1,437.0	1,437.0		840	05-Oct-16
280	4031 Francis Ave N	Cistern overflowing to back to Sewer	780.0	780.0		1,060	11-Oct-16
281	3819 38th Ave S	Cistern overflowing to back to Sewer	1,300.0	1,300.0		530	25-Oct-16
282	5814 22nd Ave NW	Cistern	6,281.0	6,281.0		5,650	25-Oct-16
283	9757 61st Ave S						26-Oct-16
284	5015 S Brandon St	Cistern overflowing to back to Sewer	689.0	689.0		420	01-Nov-16
285	4511 Cascadia Ave S	Cistern overflowing to Conveyance Furrow	1,144.0	1,144.0		530	01-Nov-16
286	3042 NW 64th St	Cistern overflowing to Conveyance Furrow	1,066.0	1,066.0		410	02-Nov-16
287	4420 2nd Ave NW	Cistern overflowing to back to Sewer	1,625.0	1,625.0		1,060	02-Nov-16
288	4219 Ashworth Ave N	Rain Garden & Cistern	1,956.0		1,601.0	205	16-Nov-16

#	Site Address	Type of Facility	Roof Square Footage to Facility	Roof Square Footage to Cistern	Roof Square Footage to Cistern to Rain Garden	Cistern Total Gallons	Date of Post Inspection
289	8207 31st Ave NE	Cistern overflowing to Rain Garden	1,008.3		1,008.3	530	16-Nov-16
290	5500 NE 63rd St	Cistern overflowing to Rain Garden	1,619.0		652.0	530	16-Nov-16
291	4219 Ashworth Ave N	Rain Garden & Cistern	1,956.0		1,601.0	205	16-Nov-16
292	6518 27th Ave NW	Cistern overflowing to back to Sewer	1,559.5	1,559.5		470	22-Nov-16
293	7556 40th Ave NE		1,150.0				22-Nov-16
294	5131 S Frontenac St	Cistern overflowing to back to Sewer	1,360.0	1,360.0		820	23-Nov-16
295	4201 37th Ave S	Rain Garden & Cistern	1,240.0		1,240.0	420	23-Nov-16
296	4632 44th Ave S	Cistern	768.0	768.0		960	23-Nov-16
297	9271 Ithaca Pl S	Cistern overflowing to back to Sewer	868.0	868.0		265	23-Nov-16
298	4226 46th Ave S	Cistern overflowing to back to Sewer	542.5	542.5		205	29-Nov-16
299	1616 SW Elmgrove St	Cistern overflowing to back to Sewer	1,325.0	1,325.0		660	01-Dec-16
300	5117 S Lucile St	Cistern	931.0	931.0		1,060	06-Dec-16
301	8022 20th Ave NW	Cistern overflowing to back to Sewer	478.5	478.5		205	07-Dec-16
302	3029 NW 59th St	Cistern	1,554.5	1,554.5		530	07-Dec-16
303	5516 40th Ave NE	Rain Garden & Cistern	2,020.0	730.0		205	12-Dec-16
304	3213 E Alder St	Cistern overflowing to back to Sewer	1,930.0	1,930.0		2,185	13-Dec-16
305	7723 13th Ave SW	Cistern overflowing to back to Sewer	1,647.3	1,647.3		1,260	13-Dec-16
306	5121 S Medley Ct	Cistern	1,802.0			530	20-Dec-16
307	6610 46th Ave S						20-Dec-16
308	8324 19th Ave NW	Cistern overflowing to back to Sewer	516.8	516.8		530	22-Dec-16
309	8322 48th Ave S						28-Dec-16
310	141 Euclid Ave	Cistern overflowing to back to Sewer	1,694.0	1,694.0		865	28-Dec-16
310	Sum totals		434,821.8 (10 acres)	253,632.2	101,294.3	186,535	

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SEATTLE PUBLIC UTILITIES
2019 WATER SYSTEM PLAN

A. WATER RESOURCES

APPENDIX A-3
Groundwater Elevations at Seattle Well Fields

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Groundwater Elevations at Seattle Well Fields

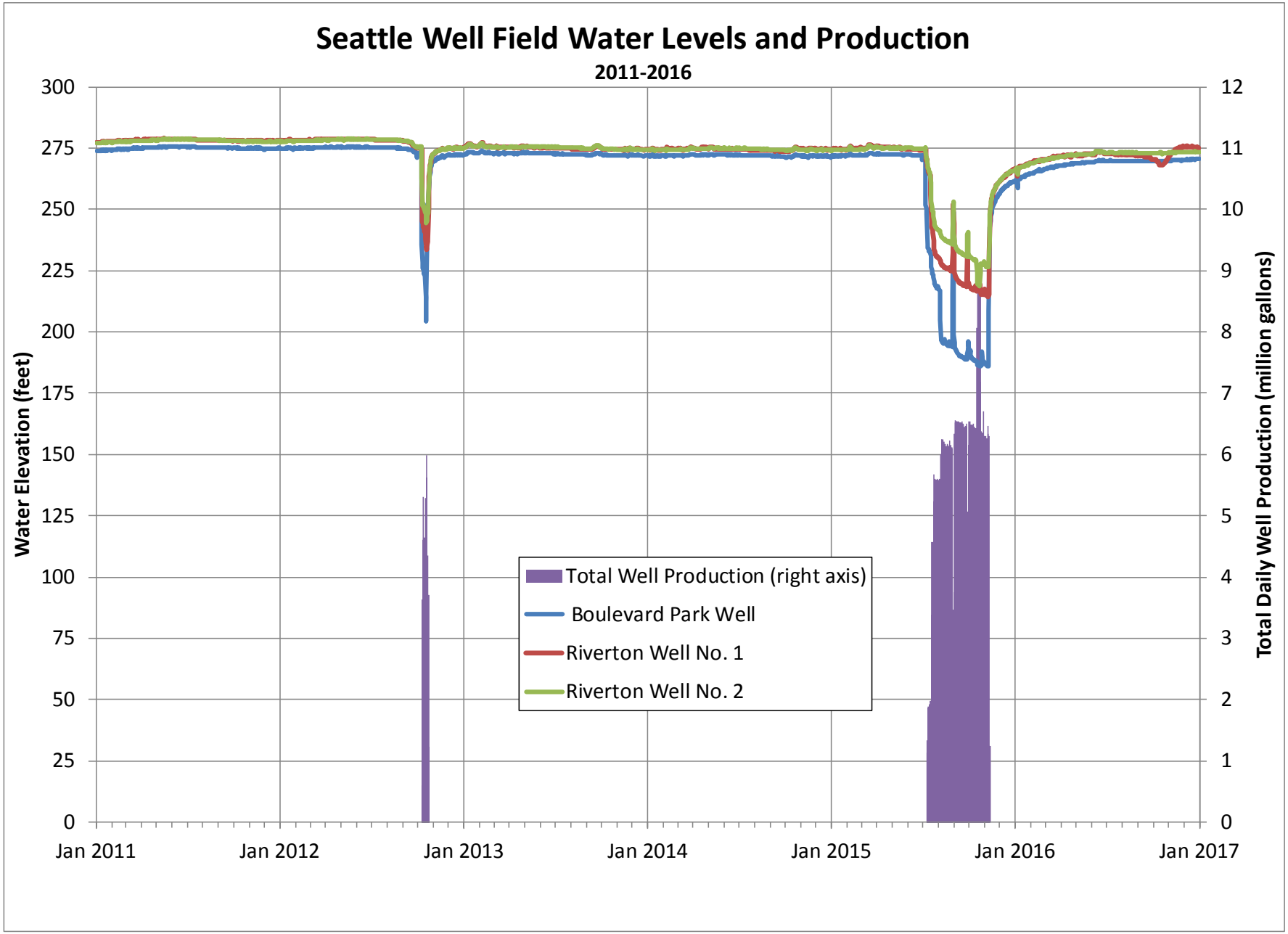
September 2017

SPU monitors groundwater levels in the vicinity of the Riverton and Boulevard Park Well Fields as part of its management of this supply source. Underlying the area are three water-bearing, sand and gravel formations now known as the Shallow, Intermediate and Deep Aquifers. The aquifers are arranged in layers and separated by much less pervious silt and clay layers which act as aquitards. At the land surface, over much of the area, is a highly-compacted layer composed of glacial till. SPU has three production wells tapped into the Intermediate Aquifer.

In addition to the production wells, SPU has a network of six monitoring wells in the Well Fields. Three of these wells can monitor water levels in the intermediate aquifer, two in the shallow aquifer, and one in the deep aquifer. Data loggers collected continuous elevation data from the monitoring wells from late 1991 through late 1999, primarily during and immediately after the ASR demonstration project. In the absence of recharge operations, it was felt that levels recorded continuously in the three production wells by the SCADA system would adequately track trends in the intermediate aquifer. Routine collection of water level data from the observation wells was suspended in early 2000, but was reactivated in 2015 during and after pumping to collect data for calibration of a groundwater model to support water rights permitting. Data are available from this system starting in January 2003 and from SPU's I-SCADA IMS Data Portal starting in April 2005.

The graph below shows the groundwater elevations from the SCADA system at the Riverton and Boulevard Park productions wells from January 2011 through December 2016. Also shown in the graph is total daily production from the three wells. No long-term trends appear in the data. Short-term declines occurred in 2012 and 2015 when the wells were used, but levels quickly recovered when pumping ceased.

SPU will continue to monitor the elevations in the production wells for any trends, and will re-activate the monitoring well network if recharge operations are undertaken.


Seattle Well Field Water Levels and Production
2011-2016
Water Elevation (feet)
Total Daily Well Production (million gallons)
300
275
250
225
200
175
150
125
100
75
50
25
0
12
11
10
9
8
7
6
5
4
3
2
1
0
Jan 2011
Jan 2012
Jan 2013
Jan 2014
Jan 2015
Jan 2016
Jan 2017
Total Well Production (right axis)
Boulevard Park Well
Riverton Well No. 1
Riverton Well No. 2

SEATTLE PUBLIC UTILITIES
2019 WATER SYSTEM PLAN

A. WATER RESOURCES

APPENDIX A-4
Monthly Production Data by Source

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Monthly Production Data by Source
Average Monthly Production in million gallons per day

	2011				2012				2013			
	Cedar	**Tolt**	**Wells**	**Total**	**Cedar**	**Tolt**	**Wells**	**Total**	**Cedar**	**Tolt**	**Wells**	**Total**
January	62	42	0	105	66	38	0	103	67	36	0	103
February	64	39	0	103	64	38	0	102	68	36	0	104
March	68	37	0	104	67	37	0	104	67	37	0	104
April	65	40	0	106	65	39	0	104	56	47	0	103
May	64	44	0	108	68	50	0	117	64	56	0	120
June	68	55	0	123	66	55	0	121	76	65	0	141
July	76	68	0	144	88	56	0	144	98	74	0	172
August	96	67	0	163	103	67	0	170	98	64	0	162
September	86	59	0	146	91	61	0	151	73	53	0	126
October	71	38	0	108	60	58	2	120	65	41	0	106
November	67	37	0	104	68	38	0	106	65	37	0	102
December	65	37	0	102	66	35	0	101	64	39	0	103
Total	**71**	**47**	**0**	**118**	**73**	**48**	**0**	**121**	**72**	**49**	**0**	**121**

	2014				2015				2016			
	Cedar	**Tolt**	**Wells**	**Total**	**Cedar**	**Tolt**	**Wells**	**Total**	**Cedar**	**Tolt**	**Wells**	**Total**
January	59	42	0	101	66	36	0	102	69	33	0	102
February	65	35	0	100	65	36	0	102	68	34	0	102
March	62	39	0	100	67	37	0	104	66	36	0	101
April	62	41	0	102	68	37	0	105	67	45	0	111
May	68	50	0	118	82	46	0	128	85	45	0	130
June	75	69	0	144	105	70	0	175	98	51	0	149
July	95	78	0	173	110	77	3	190	101	53	0	154
August	96	69	0	165	96	65	6	166	111	56	0	168
September	80	56	0	136	74	41	6	122	84	47	0	131
October	69	40	0	109	66	36	7	109	70	38	0	109
November	69	37	0	106	66	37	2	104	70	32	0	102
December	66	35	0	101	60	41	0	101	66	37	0	102
Total	**72**	**49**	**0**	**121**	**77**	**47**	**2**	**126**	**80**	**42**	**0**	**122**

Note: Sums of amounts shown may not equal Total due to rounding.

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SEATTLE PUBLIC UTILITIES
2019 WATER SYSTEM PLAN

A. WATER RESOURCES

APPENDIX A-5
Water Reclamation Evaluation Checklist

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For questions, call Kristina Westbrook,
King County Reclaimed Water Program Manager at (206) 296-5279
www.kingcounty.gov/reclaimedwater

King County

Water Reclamation Evaluation Checklist
For Systems with 1,000 or more Connections

The County and State recognize that changing conditions could initiate a need to respond in new ways to future water quality standards, wastewater discharge requirements, take advantage of advances in treatment technologies and/or allow our region to be positioned to respond to changes associated with climate change and population growth.

In 2003, Chapter 90.46 of the Revised Code of Washington (RCW) was amended to require public water systems serving 1,000 or more connections to evaluate opportunities for reclaimed water when completing their water system plans. Please use this checklist to meet King County consistency requirements in responding to this legislation.

Please use this checklist, including the inventory template, to ensure that your water system plan includes sufficient information about opportunities for reclaimed water and your system's efforts to develop those opportunities. If a question is not applicable or the information is unavailable, then answer, "unknown" or "n/a." King County will consider the checklist completed if each answer is filled in with the best available information, even if the utility states that it is not aware of any reclaimed water opportunities within its service area.

Water System Name: Seattle Public Utilities
Date: 3/1/2018
PWS ID# 77050 Y
Contact: Joan Kersnar

1. **Identifying Potential Future Demand for Reclaimed Water:** King County maintains a database and map of potential reclaimed water users for evaluating future projects. Please use the template below, or similar table, to provide information to assist King County in further researching these potential uses.
   - **Large Utility Water Users** (choose one):
     - ☐ Attached is an inventory of twenty large (above 20,000 gallons/month on average), non single-family residential, water users served by our utility that have a potential for reclaimed water use, or
     - ☑ Attached is an inventory of our utility's top twenty water users, or
     - ☐ The information requested is unknown or not available.

       Additional Comments: _____
   - **Large Self Suppliers** (choose one):
     - ☐ Attached is an inventory of large, self-supplied water users within our water utility's service boundaries - especially those near wastewater treatment plants, mainlines, outfalls, and pump stations or similar reclaimed water facilities), or
     - ☑ The information requested is unknown or not available.

       Additional Comments: _____
   - **Other** (choose one):
     - ☐ Attached is an inventory of other water users (such as those that are clustered near one another and could be served by a single system) that may be likely candidates for reclaimed water use, or
     - ☐ The information requested is unknown or not available.

       Additional Comments: See SPU, "An Economic Analysis of the North Seattle Reclaimed Water Project," September 2010.

2. **Environmental Commitment**: Are you a city/town, or providing water service to a city/town, that has made commitments within resource management plans, salmon recovery plans, or other environmental initiatives for which there is a potential opportunity for using reclaimed water to assist in meeting commitments? (choose one)

☐ Yes, here are plans that have potential for reclaimed water use in our service area to meet the above commitments:

_____

_____

☑ The information requested is unknown, not available.
Additional Comments: _____

3. **Identifying Areas of Potential Use of Reclaimed Water for Environmental Benefit:**
Below are ***examples*** of uses of reclaimed water ***that comply with State, Federal and other reclaimed water environmental, health and safety standards***. All of these uses are currently in effect somewhere in Washington State. To the best of your knowledge, are any of these potential uses for reclaimed water applicable to your area?

River Augmentation (choose one):

☐ Yes, our water rights are limited by instream flows. For more information, King County may contact:

_____

_____

☐ The information requested is unknown, or not available.
Additional Comments: There is adequate water supply with existing instream flow conditions being met.

Groundwater Recharge (choose one):

☐ Yes, we withdraw water from an aquifer that is in a groundwater management area, or from a declining aquifer, where water levels may need to be replenished or to maintain aquifer storage. For more information, King County may contact:

_____

☐ The information requested is unknown, or not available.
Additional Comments: See pending water right permit application for Seattle Well Fields.

Water Rights Mitigation (choose one):

☐ Yes, our area is pursuing, or planning to pursue, new or additional water rights, and there may be an opportunity to use reclaimed water for mitigation of those new water rights. For more information, King County may contact:

_____

☑ The information requested is unknown, or not available.
Additional Comments: _____

Potential Areas of Environmental Need (choose one):

☐ Yes, parts of our service area include potential environmental enhancement locations, such as wetlands enhancement, aquifer recharge, stream flow augmentation, that might be candidates for reclaimed water use. For more information, King County may contact:

_____

☑ The information requested is unknown, or not available.
Additional Comments: _____

4. **Local Reclaimed Water Legislation**: If water reclamation is mandated for this water system through local government agreement, contract, local regulations, ordinances, or other mechanisms, please provide a copy of the governing mechanism (choose one).

   ☐ Yes, local legislation exists in our area in support of reclaimed water use. The following relevant legislation is attached (please list titles of documents):

   _____

   _____

   ☑ No water reclamation legislation exists, or is known to exist, at a local level in our service area.

5. **Coordination with Local Wastewater Utility:** Include a brief description of your interactions with any wastewater or reclaimed water utility (King County or other) adjacent to your service area to evaluate any potential opportunities to develop reclaimed water (choose one).

   ☑ Describe if applicable:
   Coordination with King County occurs through ongoing participation in the MWPAAC on development of the BRET, and evaluation of potential opportunities such as described in SPU list of potential reclaimed water projects.

   ☐ None. Additional Comments: "An Economic Analysis of the North Seattle Reclaimed Water Project," September 2010.

Template for
Inventory of Water Users and Identification of Potential Reclaimed Water Users

Site Owner or Site Name	Site Address (for general mapping purposes)	Estimated Annual Water Use	Water uses not requiring potable water[1]	Is this a Potential Reclaimed Water Customer?
SEE NEXT PAGE				

[1] See Washington State Reclamation and Reuse Standards, September 1997, Section 1, Articles 1-5 for allowable uses of reclaimed water.
http://www.ecy.wa.gov/PROGRAMS/WQ/reclaim/standards.html

Seattle Public Utilities
Inventory of Water Users and Identification of Potential Water Users

Site Owner or Site Name	Site Address (for general mapping purposes)	Estimated Annual Water Use (Total 2016)	Water uses not requiring potable water[1]	Is this a Potential Reclaimed Water Customer?
PORT OF SEATTLE (SeaTac Airport)	2011 S 160TH ST	298,244 ccf	Possible landscape irrigation, fire fighting and protection, cooling water make-up, pavement washing, toilet and urinal flushing.	Unknown
UNIVERSITY OF WASHINGTON (Husky Stadium)	3900 MONTLAKE BLVD NE	203,341 ccf	Possible landscape irrigation, fire fighting and protection, pavement washing, toilet and urinal flushing.	Unknown
UNIVERSITY OF WASHINGTON (UW Animal Research and Care Facility)	1450 NE BOAT ST	183,033 ccf	Site under construction in 2016.	Unknown
CERTAINTEED GYPSUM	5931-37 E MARGINAL WAY S	108,993 ccf	Possible cooling water make-up, fire fighting and protection, pavement washing, and toilet and urinal flushing.	Unknown
NUCOR STEEL SEATTLE	4001 28TH AVE SW	92,720 ccf	Possible industrial process, cooling water make-up, dust control, fire fighting and protection, pavement washing, and toilet and urinal flushing.	Unknown
PORT OF SEATTLE	2031 W HALLADAY ST	82,654 ccf	Possible cooling water make-up, ship ballast, fire fighting and protection, toilet and urinal flushing.	Unknown
DARIGOLD	4058 RAINIER AVE S	77,987 ccf	Possible landscape irrigation, fire fighting and protection, pavement washing, toilet and urinal flushing.	Unknown
UNIVERSITY OF WASHINGTON	2235-45 NE 45TH ST	68,601 ccf	Possible landscape irrigation, fire fighting and protection, cooling water make-up, pavement washing, toilet and urinal flushing.	Unknown
ENWAVE SEATTLE (formerly Seattle Steam Company)	1319 WESTERN AVE	61,791 ccf	Possible industrial boiler feed, fire fighting and protection, pavement washing, and toilet and urinal flushing. Also has own well and several customers re-use condensate.	Unknown
V A MEDICAL CENTER 04 SITE 663	4441 BEACON AVE S	59,568 ccf	Possible landscape irrigation, fire fighting and protection, cooling water make-up, pavement washing, toilet and urinal flushing.	Unknown
KING COUNTY FACILITIES MANAGEMENT (King County Correctional Facility - Seattle)	500 5TH AVE	53,146 ccf	Possible cooling water make-up, landscape irrigation, fire fighting and protection, pavement washing, toilet and urinal flushing.	Unknown
SEATTLE SHERATON HOTEL	1400-32 6TH AVE	50,341 ccf	Possible cooling water make-up, fire fighting and protection, pavement washing, toilet and urinal flushing.	Unknown
UNIVERSITY OF WASHINGTON (UW Consolidated Laundry)	2901 27TH AVE S	45,858 ccf	Possible cooling water make-up, fire fighting and protection, pavement washing, toilet and urinal flushing. Extensive re-use on-site for laundry.	Unknown
SEATTLE TUNNEL PARTNERS	811 1ST AVE S	45,202 ccf	Possible construction and dust control. (Short-term use to support Alaska Way Viaduct Tunnel construction.)	Unknown
SWEDISH MEDICAL CENTER	801 BROADWAY	44,401 ccf	Unknown	Unknown
UNIVERSITY OF WASHINGTON	1901 NE 45TH ST	41,865 ccf	Possible landscape irrigation, fire fighting and protection, cooling water make-up, pavement washing, toilet and urinal flushing.	Unknown
WOODLAND PARK ZOOLOGICAL SOCIETY	5500 PHINNEY AVE N	41,192 ccf	Possible landscape irrigation, fire fighting and protection, pavement washing, toilet and urinal flushing.	Unknown
CALPORTLAND	5975 E MARGINAL WAY S	39,513 ccf	Possible cooling water make-up fire fighting and protection, pavement washing, and toilet and urinal flushing.	Unknown
SHOREWOOD HEIGHTS	3209 SHOREWOOD DR, MERCER ISLAND	35,746 ccf	Possible landscape irrigation, fire fighting and protection, pavement washing, toilet and urinal flushing.	Unknown
HEDREEN LLC (Grand Hyatt Seattle)	721 PINE ST	35,572 ccf	Possible cooling water make-up, fire fighting and protection, pavement washing, toilet and urinal flushing.	Unknown

SEATTLE PUBLIC UTILITIES
2019 WATER SYSTEM PLAN

A. WATER RESOURCES

APPENDIX A-6
Water Shortage Contingency Plan

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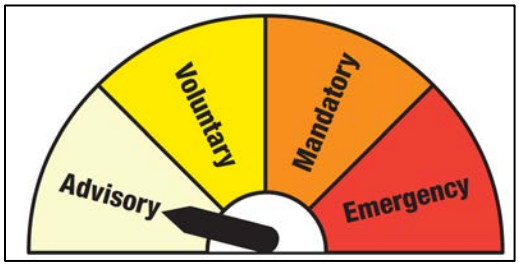
SEATTLE PUBLIC UTILITIES

WATER SHORTAGE CONTINGENCY PLAN

March 2018



SUPPLEMENT TO THE SEATTLE PUBLIC UTILITIES
2019 WATER SYSTEM PLAN

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Acronym List

DOH	Washington State Department of Health
Ecology	Washington State Department of Ecology
EJSE	Environmental Justice and Service Equity
GM/CEO	General Manager / Chief Executive Officer
HFAM	Hydrocomp Forecast and Analysis Model
ICS	Incident Command System
NRCS	Natural Resources Conservation Service
NOAA	National Oceanic and Atmospheric Administration
SPU	Seattle Public Utilities
SMC	Seattle Municipal Code
USGS	U.S. Geological Survey
WSAG	Water Shortage Advisory Group
WSCP	Water Shortage Contingency Plan

1. Introduction

1.1. Purpose

This Water Shortage Contingency Plan (WSCP) provides guidelines for Seattle Public Utilities (SPU) to manage water supply and demand in the event of a water shortage. The plan enables SPU to maintain essential public health and safety and minimize adverse impacts on economic activity, environmental resources and the region's water use preferences. Water shortages could result from forecasted, progressive events such as droughts, as well as immediate crises such as system failures like a major infrastructure break.

This document supplements SPU's 2019 Water System Plan, and updates SPU's 2006 Water Shortage Contingency Plan. The WSCP will be reviewed and revised as needed during the next water system plan update anticipated in 2028, or may be updated as appropriate.

1.2. Plan Organization

This plan is comprised of the following chapters:

1. **Introduction:** This chapter provides a general overview of the WSCP, including a description of the water shortage response stages and the WSCP implementation process.
2. **Implementation Considerations:** This chapter provides context for many of the elements in Chapters 3 and 4 and describes the background, details, and nuances of many aspects of the plan. The organization of this chapter largely mirrors that of Chapters 3 and 4.
3. **Implementation for a Progressive Event:** This chapter describes how the WSCP would be used in a progressive event, such as a drought, and is intended to be operational in nature. It describes what needs to be done in each water shortage response stage and assigns implementation responsibilities. A bullet format is used to aid in comprehension and navigation. For each stage, the following subjects are covered:
    - Triggers
    - Objectives
    - Stage Activation
    - Demand Reduction Goal
    - Key Public Messages
    - Coordination and Communication Actions

- Water Quality and Supply Management Actions
- Retail Customer Demand Actions
- Wholesale Customer Actions

4. **Implementation for an Immediate Crisis:** This chapter is similar to Chapter 3, however it focuses on implementing the WSCP when an event, such as a system failure, hinders SPU's ability to supply enough water to meet customer demands, and requires immediate action.

1.3. Overview of Water Shortage Response Stages

The WSCP has four water shortage response stages – Advisory, Voluntary, Mandatory, Emergency – which are typically implemented progressively depending on the magnitude of the water shortage. In the event of an immediate crisis, the plan may be activated at one of the more aggressive stages. Each stage contains a variety of strategies for managing aspects such as supply, utility operations, customer actions, and communications. The four stages of the WSCP are described below. The key aspects of each stage are provided in Table 1.

- **Advisory Stage** – The plan typically begins in the Advisory Stage when SPU recognizes there is a serious potential for a water shortage. At this stage, SPU implements supply management actions, as well as formal planning activities including formation of its internal Water Shortage Response Team and coordination with other City of Seattle departments, State agencies, and wholesale customers. No customer action is requested at this stage. However, customers and the media may start to inquire about the potential for a water shortage and SPU should be ready to answer questions. The authority to enter the Advisory Stage, which in most cases will activate the WSCP, lies with the SPU General Manager and Chief Executive Officer (GM/CEO).
- **Voluntary Stage** - If supply conditions worsen, the plan moves to the Voluntary Stage. This stage relies on the voluntary cooperation and support of customers to meet target reduction goals. During the Voluntary Stage, specific voluntary actions are suggested for residential and commercial customers. The suggested customer actions are a combination of standard conservation practices (e.g., avoid watering mid-day) and curtailments that require customers to reduce their water use, which may result in sacrifice (e.g., take a shorter shower). The level of that sacrifice will depend on the severity of the water shortage. The authority to enter the Voluntary Stage lies with the City of Seattle Mayor, based on the recommendation of the SPU GM/CEO.
- **Mandatory Stage** - If the Voluntary Stage does not produce needed water use reductions, or if supply conditions worsen, the Mandatory Stage would be implemented. This stage prohibits or limits certain actions, which may be accompanied by an enforcement plan, which could include fines for repeated

violation, as well as exemptions. The customer actions in this stage reflect a more aggressive approach that requires deeper levels of customer sacrifice (e.g., restricting irrigation). This stage may also include rate surcharges, although careful consideration would be required of the impacts of those charges compared to the balance in SPU's Revenue Stabilization Fund. The authority to enter the Mandatory Stage lies with the City of Seattle Mayor, based on the recommendation of the SPU GM/CEO.

- **Emergency Stage** - This stage addresses the most severe need for demand reduction and includes a combination of mandatory actions and rate surcharges. This would be the last stage used to address a progressive situation, such as a drought of increasing severity, or to respond to an immediate crisis, such as a major facility failure. The authority to enter the Emergency Stage lies with the City of Seattle Mayor, based on the recommendation of the SPU GM/CEO, unless there is an immediate emergency, in which the SPU GM/CEO may authorize these actions according to SMC 21.04.500 and 21.04.505.

1.4. Overview of Implementation Process

After determining that a serious potential for a water shortage exists, implementation of the WSCP begins with activation of the plan, which includes three steps. The first step is for the SPU GM/CEO to identify a SPU staff member to lead the water shortage response effort. The second step is to form the Water Shortage Response Team, which is a team of SPU staff whose role is to evaluate conditions, advise the GM/CEO on supply and demand actions, and make assignments to SPU staff as needed to respond to the shortage. The team should consist of representatives from a broad range of work groups that can provide insight and will be impacted including, but not necessarily limited to, supply, operations, demand management, communications, and finance. Suggested team roles to be filled are provided in Appendix A. The third step is for the GM/CEO to communicate the nature and scope of WSCP stage actions and strategies to the Mayor and the Seattle City Council (prior to activating the WSCP) and receive their input.

Once the WSCP is activated, the Water Shortage Advisory Group (WSAG) should be formed. The WSAG is a team of key customers and stakeholders whose role is to advise the Water Shortage Response Team on requests or actions made to customers regarding utility water shortage response actions and programs. The WSAG should consist of representatives from a broad range of perspectives that can provide insight and will be impacted including, but not necessarily limited to, wholesale water customers, residential customers, the landscape community, the business community, and environmental (instream) interests. Suggested membership is provided in Appendix B.

Once the WSCP is activated, a two-prong effort ensues. One prong is focused on implementing the initial stage (typically the Advisory Stage). The other prong is to begin planning for possible implementation of a subsequent stage. Typically, a minimum of two weeks is recommended before moving to a new stage, although four weeks may be more realistic to allow for carefully considered decision-making and appropriate planning time.

When considering moving from one stage to another, the decision inputs are the same as for initiating the WSCP and include consultation with the Water Shortage Advisory Group and evaluation of customer response.

A key aspect of implementing the WSCP is determining how and when to ramp down the stages and/or exit the plan. As soon as actual and forecasted supply conditions substantially improve, SPU will either inform the public of the return to normal use of water, or inform them that the utility is moving to a lesser stage of this plan. This latter process would occur until there was a return to normal operations. Stages could be skipped in this process as conditions and forecasts warrant.

Table 1 Summary of Water Shortage Contingency Plan[1]

Component	Stage			
	Advisory	**Voluntary**	**Mandatory**	**Emergency**
Hallmark	• Formal planning internally & w/ key stakeholders • Supply mgmt. actions • No customer outreach	• Voluntary customer demand reductions	• Mandatory water use restrictions • Potential fines and/or rate surcharges	• Mandatory water use restrictions • Potential fines and/or rate surcharges
Trigger	• Serious potential for water shortage	• Supply conditions worsen	• Supply conditions worsen	• Supply conditions worsen
Objective	• Prepare for Voluntary • Stretch supply	• Achieve demand reduction • Stretch supply • Prepare for Mandatory	• Achieve demand reduction • Stretch supply • Prepare for Emergency	• Achieve demand reduction • Stretch supply
Stage Activation	• SPU GM/CEO	• Mayor	• Mayor	• Mayor, if progressive • SPU GM/CEO, if immediate
Demand Reduction Goal	• None (stage is internally focused)	• Determined by Water Shortage Response Team	• Determined by Water Shortage Response Team	• Determined by Water Shortage Response Team
Key Public Messages	• Anticipate public and media inquiries and be ready to answer questions	• Moving to Voluntary • Need customer assistance to meet demand reduction goal • Request suggested demand reduction actions	• Moving to Mandatory • Mandatory water use restrictions & potential rate surcharge • Certain exemptions apply	• Moving to Emergency • Increased water use restrictions & potential rate surcharge

Component	Stage			
	Advisory	**Voluntary**	**Mandatory**	**Emergency**
Coordination & Communication	• Form Water Shortage Response Team • Form Water Shortage Advisory Group • Develop communication/outreach plan	• Implement communication/outreach plan • Implement coord. w/ key stakeholders	• Implement communication/outreach plan • Implement coord. w/ key stakeholders	• Implement communication/outreach plan • Implement coord. w/ key stakeholders
Water Quality & Supply Management	• Optimize supply • Ready emergency supplies	• Ready or activate emergency supplies, as appropriate • Investigate interties	• Activate emergency supplies and interties	• Activate emergency supplies and interties
Retail Customer Demand Actions	• None for general public (stage is internally focused) • Seattle Parks activates their WSCP	• Request voluntary demand reduction actions • Request demand reduction actions from City departments • Restrict new hydrant permits	• Provide mandatory demand reduction actions (& exemptions) • Require demand reduction actions from City departments • Rescind hydrant permits • Potential rate surcharges	• Provide mandatory demand reduction actions (& exemptions) • Require demand reduction actions from City departments • Potential rate surcharges
Wholesale Customer Actions	• Activate their WSCPs	• Move to Voluntary in their WSCPs • Outreach to their retail customers • Activate alternative sources, if appropriate	• Move to Mandatory in their WSCPs • Outreach to their retail customers, including enforcement as appropriate • Activate alternative sources, if not already done	• Move to Emergency in their WSCPs • Outreach to their retail customers, including enforcement as appropriate • Activate alternative sources, if not already done

1. This table reflects how the WSCP would be implemented for a progressive event, such as a drought. As described in Chapter 4, the stages may be different for an immediate crisis.

2. Implementation Considerations

2.1. WSCP Principles

SPU has learned a great deal over the years about how best to operate the utility during water shortage events, while minimizing impacts to customers and instream resources. This knowledge is reflected in this WSCP, and articulated in the following principles:

- **Plan Should be Flexible:** Each water shortage situation has enough unique characteristics that a plan cannot specifically define all the scenarios and specific supply and demand management actions. The usefulness of a Water Shortage Contingency Plan lies in planning the range of supply and demand management actions in advance of the situation, and in defining the communication mechanisms by which decisions will be made during the event.
- **Shortage Should Be Shared:** A key assumption of this plan is that shortage and risk must be shared among all beneficiaries of the water resource. For example, instream flow levels below normal minimums at locations specified in the Tolt and Cedar agreements are resorted to only after human water consumption is curtailed. Additionally, all water utilities obtaining water from the Seattle regional water supply system should participate in management of the shortage. Similarly, all customer sectors should participate.
- **Conservation Versus Curtailment:** Given the highly-effective long-term regional conservation program operated by SPU, it is important to distinguish between the short-term curtailment actions necessitated by a water shortage event, and the conservation actions SPU regularly promotes to its customers. Conservation focuses on long-term efficiencies which do not adversely affect customers' accustomed use of water, whereas curtailment actions involve short-term water use reductions or restrictions that can create hardships.
- **Voluntary Preferred Over Mandatory:** Customers prefer the opportunity to meet targeted demand reduction levels through voluntary compliance actions. The decision to move to mandatory restrictions is more acceptable if the voluntary approach has been tried first, but has not resulted in sufficient demand reduction.
- **Safeguard Water Quality**: It is essential to closely monitor water quality during water shortages and particularly during a warm weather drought. This applies to water quality in rivers as well as to the drinking water provided to customers. Water quality issues must be considered for drinking water and instream uses when supply management decisions are made. The SPU water distribution system is designed to carry a large capacity of water during summer peak months and for potential fire fighting. If demand is significantly lowered, coupled with warmer temperatures, water quality can significantly degrade and should be monitored and managed more carefully than typical.

2.2. Types of Drought

Droughts are the most common reason this WSCP would be implemented. Droughts are naturally occurring, unpredictable weather events of varying frequency, duration and severity. The area served by the Seattle regional water supply system has experienced several short-term droughts. Available data indicate a very low probability of a multi-year drought.

To understand the impact of drought, it is important to understand how the mountain storage reservoirs in the Seattle regional water supply system are operated. Those reservoirs operate with an annual refill and drawdown cycle. During the winter, the reservoirs are kept low to provide a "flood pocket" to reduce downstream flooding and river scour. In the spring, they are refilled by melting snow and rain. During the summer, their levels decrease because water use outstrips replenishment from rain. During the fall, their levels increase as water use decreases and fall rains return. Drought affects this cycle and can cause water shortages.

The types of droughts that affect the Seattle regional water supply system range from poor snowpack accumulation in the winter, to dry hot summers, to delayed onset of rains in the fall. Details on these three types of droughts are provided below. Since the nature of these droughts varies, SPU's response will also vary. Examples of past drought events that resulted in SPU activating its WSCP are provided in Appendix C.

2.2.1. Winter/Spring Drought (Low Snowpack)

Droughts in the winter and spring are characterized by low snowpack. While low snowpack may not lead to poor water supply conditions if ample spring rains occur, caution is used in managing the water supply in these situations because rainfall is inherently difficult to forecast. Low snowpack can occur when mountain temperatures are warm, when precipitation is below average, when intense rainfall events melt low to mid-elevation snow, or through a combination of these factors.

SPU attempts to manage for these types of droughts in several ways. Tracking El Niño events, which are typified in the Pacific Northwest by warmer and drier than average winter conditions, can alert water managers to the increased potential of a winter/spring drought. SPU's use of the dynamic rule curve – varying reservoir storage targets based on real-time snowpack measurements and soil moisture estimates – in these types of droughts helps to ensure that our reservoirs are as close to full as possible at the start of the summer drawdown cycle.

When winter/spring drought conditions result in low water supply availability, implementation of the WSCP may be necessary because the potential for water use reductions by customers is greater in the spring and summer, there is much uncertainty about impending summer weather which is so influential on demand, and weather forecasts of when the fall rains will begin are not reliable. These conditions generate

uncertainty about whether water stored in the spring will be sufficient to meet demands until supplies are replenished in the fall. This can make implementation of the WSCP in the spring and summer necessary, despite the fact that in some of these years no water shortfall actually develops.

2.2.2. Summer/Fall Drought (Hot, Dry Temperatures)

Droughts in the summer and fall are characterized by drier conditions and hotter temperatures. This typically results in both decreased supply and increased demand. Supply is decreased because less rain results in less inflow into the reservoirs. Demand is increased because outdoor water use (mostly irrigation) is higher at this time of year.

SPU attempts to manage for these types of droughts by carefully monitoring summer demands and water supply. Unfortunately, it is not possible to accurately predict in advance the timing and amount of the fall rains. A key management tool for this type of drought is helping customers to reduce irrigation use.

2.2.3. Fall/Early Winter Drought (Delayed Fall Rains)

Droughts in the fall and early winter are characterized by the fall rainy season developing later than normal. This can result in storage reservoirs being depleted to minimum levels.

Fall droughts are particularly challenging because that is when water demands for fish habitat needs are especially high and when the ability for people to reduce water use is limited since the irrigation season is ending.

SPU attempts to manage for these types of droughts using a number of water supply tools, including using emergency pumping plants at Chester Morse Lake to access water stored in the lake that cannot flow out by gravity.

2.3. Trigger Considerations

SPU continuously monitors water supply conditions to meet the operational objectives of providing water for municipal use, instream aquatic habitat (fisheries), flood management, and hydropower production. To deal with hydrologic uncertainty in real-time and in longer term planning horizons, SPU uses a number of informational and data gathering sources and forecasting tools.

SPU contracts with the U.S. Geological Survey (USGS) to provide continuous streamflow monitoring and data collection services. Strategic placement of USGS stream gauging stations provides real-time information for understanding the hydrologic state of the water supply and river systems. SPU also contracts with the Natural Resources Conservation Service (NRCS) to provide real-time snow monitoring and weather data collection services.

Through the National Oceanic and Atmospheric Administration (NOAA), SPU regularly monitors daily weather forecasts (National Weather Service Seattle Forecasting Office), mid-range weather forecasts (National Centers for Environmental Prediction), 30- and 90-day and multi-season climate outlooks (Climate Prediction Center), and daily hydrometeorological forecasts (Northwest River Forecast Center in Portland, Oregon). The internet provides access to vast amounts of additional useful information to assist SPU in forecasting. For example, NOAA's web information on El Niño/La Niña provides a wealth of timely information on current and forecasted El Niño and La Niña conditions with enough lead time for water resource managers to prepare for such events.

SPU also uses an in-house reservoir management and streamflow forecasts computer model known as the Hydrocomp Forecast and Analysis Model (HFAM). The HFAM model is regularly updated with hourly meteorological and hydrological data, and simulates the current state of the watershed (including snowpack, soil moisture, aquifer storage, and streamflows) and water supply system. The model is used to analyze and assess various future reservoir operating scenarios, both in real time and in near- and long-term operational planning, based on probabilistic analysis of nearly 90 years of historic weather.

SPU intensifies ongoing monitoring of water supply conditions during potential water shortage. This information is used to determine when to activate the WSCP and when to move between stages. The following factors may be considered in these decisions:

- Total supply availability, including groundwater, interties, and modified instream flow releases
- Rate of decline in total reservoir storage compared with typical rates
- Short- and long-term weather and hydrologic forecasts
- Computer modeling of streamflow and reservoir storage, for different weather and demand assumptions
- Trends and forecasts of the system's daily water demands
- Demand reduction goals
- Estimated margin of safety provided by the demand reduction, compared with the level of risk assumed if no action is taken
- Recommendations from the Cedar River Instream Flow Commission and the Tolt Fisheries Advisory Committee
- Increased operating costs of potential actions and the value of lost water sales revenue, compared with the increased margin of reliability

2.4. Goal Setting Considerations

Providing a demand reduction goal signals to the public the severity of the situation and provides a metric for which to measure success. The demand reduction goal should be set

so that it can reasonably be achieved with the demand reductions actions requested or required. Because the level of demand reductions and actions will vary for each event, the WSCP does not prescribe a metric or reduction level. Metrics and goals used in past water shortage events can be considered for future events. Factors to consider in selecting a metric and goal are:

- **Measurable:** Data need to be readily available to report out in a timely fashion on achievement towards the goal.
- **Understandable:** The metric and goal should be easy to explain to customers and the media, and performance should be easy to communicate via simple graphics. Customers should be able to understand how their actions will help achieve the goal.
- **Meaningful:** The goal should be set at a level matching the severity of the event, especially to demonstrate significate customer participation prior to any lowering of instream flows to below normal minimum.
- **Reasonableness:** The goal should reflect the reduction potential associated with the demand reduction actions and time of year. If there are key uncertainties, consider using a range instead of an absolute number.
- **Scalable:** If conditions worsen to the next stage, then the goal should be changed to reflect the need for greater demand reductions, given the time of year.
- **Consistency:** As appropriate, use a metric and goals that are consistent with neighboring utilities.

2.5. Coordination and Communication Considerations

2.5.1. Relationship to Wholesale Customers' WSCPs

There are more than 1.4 million people living in the areas served by SPU and our wholesale water customers. SPU provides water to utilities in much of King County and a small part of Snohomish County. SPU has contracts with 18 wholesale customers, plus the Cascade Water Alliance which wholesales water to five cities and two water districts in the region. Additionally, the City of North Bend receives mitigation water from SPU. Water shortages affect SPU's retail customers as well as SPU's wholesale customers and their respective retail customers.

SPU's water wholesale contracts include a provision that wholesale customers will assist and support actions required to manage demand during a shortage or an emergency. When SPU activates its WSCP, it will request that each wholesale customer also activate their WSCP. This plan has been developed by SPU, in consultation with its wholesale customers and other participants, based on the premise that an effective demand management strategy must be regionally consistent. This is based on several considerations:

- **Shortage Should Be Shared:** Shortage and risk must be shared among all beneficiaries of the water resource, including all water utilities obtaining water from the Seattle regional water supply system.
- **Unified Message:** A unified/regional message and approach is easier to understand and distribute through the media, which is key in communicating information to the public.
- **Consistency Aids Forecasting:** Consistency makes it easier for SPU to forecast demand reductions, which is essential to effectively manage the system during a water shortage.

2.5.2. Coordination With Key Resource Management Agencies

The Washington State Department of Ecology has authority regarding statewide drought declaration. Early and consistent communication with Ecology, which advises the Governor's Office, is important to ensure that the actions and public messages take into account conditions of the Seattle regional water supply system. SPU should participate in the meetings of the State's Water Supply Advisory Committee to better understand state-wide drought conditions, coordinate on messages, and provide input on the status of the Seattle regional water supply system.

SPU's Water Resources Management staff also works closely with members of other city, local, state, federal and tribal resource agencies, including Seattle City Light, King County, Washington State Department of Fish and Wildlife, Washington State Department of Ecology. U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, National Marine Fisheries Services, Muckleshoot Indian Tribe, and Tulalip Tribes. This coordination typically occurs at the Cedar River Instream Flow Commission and the Tolt Fisheries Advisory Committee.

2.5.3. Coordination with Neighboring Jurisdictions

SPU will communicate and coordinate with neighboring jurisdictions – especially Tacoma and Everett – to ensure, to the extent practical, that the timing of plan activation and requests to customers are linked when appropriate and provide opportunities for regional messaging.

2.6. Water Quality and Supply Management Considerations

2.6.1. Managing Instream Flows

The management of stream flows downstream of SPU's water storage and diversion facilities is a critical consideration in managing water resources during water shortages. In addition to meeting the needs of SPU's retail and wholesale customers, the Cedar and South Fork Tolt rivers are managed to protect instream resources.

SPU has ongoing formal and informal agreements with state, federal and local resource agencies, Indian Tribes and the U.S. Army Corps of Engineers that help guide how it manages streamflows. Streamflow management in the South Fork Tolt is governed by the South Fork Tolt River Settlement Agreement. Cedar River flows are governed by the Cedar River Instream Flow Agreement, a component of the Cedar River Watershed Habitat Conservation Plan (HCP). These agreements provide guaranteed flow regimes, as well as adaptive features to ensure that water is released from SPU's storage reservoirs in a manner that provides beneficial conditions for salmon and other species downstream of the reservoirs. The protective provisions of the governing agreements are particularly important during droughts and associated periods of low stream flow.

Additionally, salmon and steelhead redd surveys are undertaken during seasonal fish spawning events that enable informed management decisions to be made that seek to ensure adequate flow levels are provided during fish incubation and emergence periods.

The Cedar River also provides approximately half of the inflow to Lake Washington on an annual average basis. The U.S. Army Corps of Engineers manages Lake Washington lake levels as part of its Lake Washington Ship Canal Project (Hiram Chittenden Locks in Ballard) which connects Lake Washington to the saltwater of Puget Sound. Their management objectives include providing water flows at the Locks for navigation, fish passage, and control of the salt water intrusion caused by operation of the Locks.

2.6.2. Reservoir Management

Operational flexibility of SPU's mountain reservoirs is key, with operating plans changing as conditions and forecasts change. SPU has developed "dynamic rule curves" to operate its mountain reservoirs in the winter season. The dynamic rule curves are used to adjust operations to actual watershed conditions and to help manage risk and uncertainty. These rules set target reservoir surface water levels that vary with watershed snowpack and soil moisture conditions. At times when there is little snowpack and low soil moisture, the reservoir surface water level target will be set higher than normal flood management levels, and vice versa.

2.6.3. Alternative Water Supplies

Depending on the nature and timing of a water shortage, alternative or emergency water supplies may be useful to supplement existing supplies. SPU has several options available:

- **Chester Morse Extra Storage:** SPU's primary storage reservoir has a natural, gravity fed outlet. When the reservoir is low, its water surface elevation can fall below the natural outlet, but still contain a substantial amount of high-quality water. As of 2016, a new Morse Lake Pump Plant was installed to replace two existing floating pump plants, and one of the existing floating pump plants was refurbished as a backup plant. These plants can be used to pump the lower elevation water over

the natural outlet and into the river, thereby augmenting both instream flows and water availability for customer use.

- **Interties:** Since water supply problems may not affect all water suppliers in the region to the same extent, it is sometimes feasible for SPU and its wholesale customers to obtain water from other providers through interties.
- **Reclaimed Water:** Reclaimed water is highly-treated effluent that may be used instead of potable water for irrigation, street washing, construction purposes, etc., in order to reduce demand for potable water and lessen the impact of shortages on the community. Since 2013, King County's Brightwater Treatment Plant has been providing Class A reclaimed water for off-site irrigation, street cleaning, and sewer flushing.

2.7. Demand Reduction Considerations

2.7.1. Demand Reduction Actions

A key strategy to managing a water shortage event is having customers reduce their water use. The WSCP does not pre-identify specific demand reduction actions for each stage. Rather a comprehensive list of potential actions customers can take to reduce water use is provided in Appendix E. The actual actions requested or required for each stage will depend on the severity, likely duration, and timing of the shortage, as well as the demand reduction needed.

There are several criteria for deciding which demand reduction actions are appropriate during a water shortage:

- **Magnitude of Savings:** Will the action result in enough savings to make a meaningful difference?
- **Timing**: Can the action produce results in the necessary timeframe?
- **Duration of Event**: What is the anticipated duration of the event (e.g., customers may tolerate certain mandatory curtailments if the event is expected to last a few weeks rather than months)?
- **Season**: Is the action relevant to the time of year (e.g., banning lawn watering during summer irrigation season vs. during non-irrigation season)?
- **Costs**: How severe are the cost implications of the action to the customer relative to the need for action?
- **Enforcement:** For mandatory curtailment actions, is it desirable and practical to enforce the action?
- **Equity:** Do the suite of actions cover all customer sectors and types of uses?

2.7.2. Exemptions

Appendix G provides background and a framework for developing and implementing exemptions to customer water use restrictions that are part of the Mandatory and Emergency stages of the WSCP.

2.8. Financial Considerations

Reducing water demand as needed to address a water shortage event can reduce revenues at a time when there is an increased need for these funds to cover costs associated with implementing the WSCP. This can be exacerbated by other factors such as reductions in block contract allocations. Accordingly, the following issues should be considered.

- **Reprioritize Current Revenue:** This consists of reducing revenue contributions to the capital program and lowering the year end operating cash target. These are the most flexible resources to offset revenue and expenditure problems.
- **Reprioritize Expenses:** Reducing planned operations and maintenance expenditures can ease the demand on revenues or free up money to meet unexpected needs.
- **Revenue Stabilization Subfund:** The City of Seattle has established a Revenue Stabilization Subfund for the water fund. The target balance is $9 million, which can serve as a source of revenue during moderate droughts. Withdrawals from the Subfund require City Council approval.
- **Rate Surcharge:** In the mandatory and emergency stage, rate surcharges can be used to send a strong signal to customers to reduce water use. Rate surcharges can also help to make-up revenues lost due to decreased demand.
- **Block Contract Credits**: The block wholesale water contracts that SPU has with Northshore Utility District and Cascade Water Alliance have provisions that reduce their block allocations in proportion with all other wholesale customers, thereby reducing their required payments to SPU.
- **State Drought Relief Funds**: In a Washington State emergency drought declaration, funds in the form of grants or loans may be available to SPU to mitigate the impacts of a water shortage.

3. Implementation for a Progressive Event

For each stage, the following information is provided. Note that if a particular stage is not entered into progressively, actions listed in the previous stage(s) may be appropriate as well.

1. **Triggers** – Describes the general, qualitative conditions that would trigger the stage. Note there are no pre-determined, quantitative conditions that trigger stages.
2. **Objectives** – Describes the overall objective of the stage.
3. **Stage Activation** – Describes who has the authority to enter the stage (either the SPU GM/CEO or the Mayor).
4. **Demand Reduction Goal** – Discusses the general, qualitative nature of the goal for the stage. Note there are no pre-determined, quantitative demand reduction goals for each stage.
5. **Key Public Messages** – Describes the key public messages for the stage. The messaging work is led by the Communications Lead.
6. **Coordination and Communication Actions** – Describes a variety of work necessary to coordinate and communicate with key stakeholders such as WSAG, wholesale customers, Ecology, Department of Health, natural resource agencies, tribes, City employees, the general public, etc. The overall work is led by the Water Shortage Response Team Lead, who makes assignments as appropriate.
7. **Water Quality and Supply Management Actions** – Describes work necessary to safeguard water quality and to maximize supply. This work is led by the Supply Management Lead.
8. **Retail Customer Demand Actions** – Describes work necessary to reduce customer demand. This work is led by the Demand Management Lead.
9. **Wholesale Customer Actions -** Describes actions required by each wholesale customer. Communication and monitoring of these actions is done by the Wholesale Customers Lead.

3.1. Advisory Stage

3.1.1. Triggers

- Supply conditions and supply forecasts raise significant concerns about the utility's ability to meet demand later in the year.

3.1.2. Objectives

- Prepare the Department, City, and relevant agencies for a potential water shortage thereby allowing all parties adequate planning and coordination time in the event there is a need to move to the Voluntary Stage.
- Stretch available supply through supply management actions.

3.1.3. Stage Activation

- The authority to enter the Advisory Stage, which in most cases is effectively activating the WSCP, lies with the SPU GM/CEO.

3.1.4. Demand Reduction Goal

- None, as described earlier, the Advisory Stage is an internally focused stage that does not include outreach to customers.

3.1.5. Key Public Messages

Although the Advisory Stage is not intended to be a public stage, SPU should be prepared to answer inquiries from the public and media as follows:

- **Planning:** Due to the potential for a water shortage, SPU has entered the planning phase of the WSCP to coordinate actions in the event we need to move to the Voluntary Stage.
- **Supply Conditions:** Report on supply conditions and forecasts.
- **No Customer Action:** At this time, customers are not being asked to take special action. (If pressed: SPU has an ongoing conservation program and always encourages customers to use water wisely. See www.savingwater.org for ways to use water wisely, indoors as well as outdoors during the summer irrigation season.)
- **Future Customer Action May Be Needed:** Customers <u>may</u> be asked to reduce their water use if conditions worsen and we move to the next stage (Voluntary Stage).

3.1.6. Coordination and Communication Actions

- **Water Shortage Response Lead & Team:** Identify the lead and team members for the Water Shortage Response Team. Consider using an Incident Command System to organize the response.
- **Wholesale Customers:** Inform wholesale customers about current water supply conditions, that the Advisory Stage has been triggered, and that planning is underway in the event that elevation to the Voluntary Stage is needed. Request their cooperation, as identified under the Wholesale Customer Actions section. Request a wholesale customer representative for the WSAG.
- **WSAG:** Form the Water Shortage Advisory Group (WSAG), as described earlier. Early meetings will focus on explaining the role of WSAG and educating the WSAG about the water system, particularly the relationship of weather patterns to supply and demand, and the customer base. For this stage, the role of the WSAG is to provide input on WSAG membership, potential customer demand reduction strategies, and on outreach strategy and materials.
- **Ecology:** Participate on Ecology's Water Supply Advisory Committee to keep informed about the State drought response and to provide Ecology with updates on forecasts for the Seattle regional water supply system.
- **DOH:** Update the DOH on the shortage response and the likelihood of moving to the Voluntary Stage.
- **Public Agencies:** Coordinate with other City departments and public agencies (e.g., county, state and federal resource agencies, tribes, and other regional water suppliers, including Cascade Water Alliance and the Cities of Everett and Tacoma) about water supply conditions, projections, and potential actions.
- **Outreach:** Develop the initial communication and outreach plan, focusing primarily on the Voluntary Stage. As described in the Communication and Outreach Framework in Appendix D, the plan should include the overall purpose, goals, audiences, and tools (e.g., FAQs, press releases, tips flyers).

3.1.7. Water Quality and Supply Management Actions

- **Data Collection:** Increase data collection actions (e.g., streamflows, snowpack conditions) and monitoring weather forecasts.
- **Modeling:** Increase SPU's computer modeling runs of projected supply, storage, demand and revenue scenarios.
- **Water Quality:** Assess water quality in reservoirs and in the distribution system to identify areas that may experience degradation with reduced consumption. Increase monitoring if appropriate. Additionally, assess current water main flushing and reservoir cleaning activities to determine whether they should be

accelerated to be completed prior to the peak season or reduced to conserve supply.

- **Instream Flows:** In coordination with state and federal resource agencies and tribes, review supply and fisheries conditions to determine appropriate instream flow levels, including whether to provide supplemental flows or reduce to flows below normal minimum. (See Cedar Instream Flow agreement and Tolt settlement agreement.)
- **Optimize Supplies:** Identify and implement supply side management techniques to optimize existing sources (e.g., reducing Masonry Pool seepage, Tolt/Cedar split, etc.).
- **Emergency Supplies:** Ready emergency supplies, such as the wellfields and Morse Lake Pump Plants, for use and activate if appropriate.

3.1.8. Retail Customer Demand Actions

- **General Customer Actions:**
  - No demand reduction actions will be requested of general customers for the Advisory Stage. Some proactive outreach to customers may occur reminding them to use water wisely.
  - Determine the list of customer demand reduction actions that would be requested if the WSCP advances to the Voluntary Stage. A list of potential actions customers can take to reduce water use is provided in Appendix E. The actual actions selected for use in the Voluntary Stage will depend on the severity, likely duration, and timing of the shortage, as well as the demand reduction needed.
- **City Departments:** Request that the Parks and Recreation Department activate their Water Shortage Response Plan.

3.1.9. Wholesale Customer Actions

- **Activate Plans:** Activate their own WSCPs, in a manner consistent with SPU.
- **Plan for Voluntary:** Work with SPU to plan for the potential to move to the Voluntary Stage. Additionally, plan for their internal process needed to enter the Voluntary Stage.
- **Alternative Sources:** Determine feasibility of activating independent or emergency supply sources, as appropriate.
- **Flushing:** Assess current water main flushing and reservoir cleaning activities to determine whether they should be accelerated to be completed prior to the peak season or reduced to conserve supply.

3.2. Voluntary Stage

3.2.1. Triggers

- The Voluntary Stage will be implemented when: 1) supply conditions have not improved or have worsened, and/or 2) demand levels need to be reduced.

3.2.2. Objectives

- Achieve the demand reduction goals by voluntary customer action, as well as by utility actions.
- Stretch available supply through supply management actions.
- Prepare for potentially moving to the Mandatory Stage.

3.2.3. Stage Activation

- The authority to enter the Voluntary Stage lies with the Mayor, based on the recommendation of the SPU GM/CEO. This is the case whether entering the Voluntary Stage is done as the initial activation of the WSCP or as a progressive step if the WSCP is activated at a lower stage.

3.2.4. Demand Reduction Goal

- Set demand reduction goal based on supply conditions and demand reduction potential and, if appropriate, consistent with neighboring utilities. The metric for the goal will be determined by the Water Shortage Response Team.

3.2.5. Key Public Messages

- **Moving to Voluntary:** We are moving to the second stage of our WSCP, the Voluntary Stage, because our supply conditions have worsened.
- **Meet Demand Reduction Goal:** We are asking customers to voluntarily reduce their water use to meet the demand reduction goal.
- **Customers Choose Methods:** How customers achieve that reduction is up to them. A full list of options is on our website www.savingwater.org.
- **Top Suggestions:** Top suggestions include the following: *(to be determined in the previous stage; e.g., let your lawn go dormant and limit plant watering to twice a week, assuming shortage is during irrigation season)*.
- **Cooperation Lessens Possibility of Mandatory Restrictions:** If everyone cooperates, we may avoid moving to the Mandatory Stage where specific water use restrictions are mandated.

3.2.6. Coordination and Communication Actions

- **Wholesale Customers:** Update wholesale customers about current water supply conditions and that the Voluntary Stage has been formally triggered. Note that in the Advisory Stage, wholesale customers would have been involved in planning for the potential of moving to the Voluntary Stage. SPU will give wholesale customers advanced notice of the intent to formally move to the Voluntary Stage, so wholesale customers can do final preparations (e.g., get their website ready). The advanced notice will likely be short in order to reduce the risk of unintended leaks to the press, which would complicate the process. Request continued cooperation, as identified under the Wholesale Customer Actions section.
- **WSAG:** SPU will provide updates on the water supply status and customer demand. For this stage, the role of the WSAG is to provide input on implementation of customer demand reduction aspects of the Voluntary Stage, as well as input on planning for the customer demand reduction aspects of the Mandatory Stage.
- **Ecology:** Continue participation on Ecology's Water Supply Advisory Committee to keep informed about the State drought response and to provide Ecology with updates on forecasts for the Seattle regional water supply system. Petition the State to include the Seattle regional water supply system service area in a State declaration of drought, if not already included.
- **DOH:** Update the DOH on the shortage response and the likelihood of moving to the Mandatory Stage.
- **Public Agencies:** Continue and intensify coordination with other City departments and public agencies (e.g., state and federal resource agencies, tribes, and other regional water suppliers, including Cascade Water Alliance and the Cities of Everett and Tacoma) about water supply conditions, projections, and potential actions.
- **Outreach:** Implement the communication and outreach plan elements developed for the Voluntary Stage. Also, develop the elements (including any exemptions and enforcement) for the Mandatory Stage. See the Communication and Outreach Framework in Appendix D.
- **SPU Employees:** Establish a regular communication mechanism to keep Department employees up to date on goals, conditions, and actions.
- **Customer Inquiries:** Establish a systematic way to respond to and track customer inquiries in a timely way. Note that customer inquiries could show up in various ways, including social media, which may require a different strategic communication approach.

- **Revenue:** Assess revenue implications and potential remedies, including reprioritizing expenses and potential withdrawals from the revenue stabilization fund.
- **Block Contracts:** Initiate block contract credit process.
- **City Legislation:** Request Council to adopt legislation on water use restrictions, enforcement and any surcharges, if anticipate needing for the Mandatory Stage and not already in place.

3.2.7. Water Quality and Supply Management Actions

- **Data Collection:** Continue increased data collection actions (e.g., streamflows, snowpack conditions) and monitoring weather forecasts.
- **Modeling:** Continue increased SPU's computer modeling runs of projected supply, storage, demand and revenue scenarios.
- **Instream Flows:** Continue coordination with state and federal resource agencies and tribes, to review supply and fisheries conditions to determine appropriate instream flow levels, including whether to provide supplemental flows or flows below normal minimum. (See Cedar Instream Flow agreement and Tolt settlement agreement.)
- **Flushing:** If necessary, implement flushing to maintain water quality. Include flushing information in public communication and outreach so the public understands it is essential for drinking water quality.
- **Emergency Supplies:** Ready emergency supplies, such as the wellfields and Morse Lake Pump Plants, for use and activate if appropriate.
- **Interties:** Investigate using existing interties to increase supply availability and activate if appropriate.

3.2.8. Retail Customer Demand Actions

- **General Customer Actions:**
    - Implement the Voluntary Stage customer demand reduction actions (that were determined in the Advisory Stage).
    - Determine the list of customer demand reduction actions that would be requested if the WSCP advances to the Mandatory Stage. A list of potential actions customers can take to reduce water use is provided in Appendix E. The actual actions selected for the Mandatory Stage will depend on the severity, likely duration, and timing of the shortage, as well as the demand reduction needed. Additionally, establish appropriate exemptions for the Mandatory Stage. Appendix G includes possible exemptions to water use restrictions for SPU to consider in creating

actual exemptions at the time of the event. Finally, determine appropriate enforcement strategies.

- **City Departments:** Request that City departments reduce their water use. The specific actions requested for this stage will be determined during implementation of the WSCP, however likely actions include the following:
    - **All Departments:**
        - Let lawns go dormant and limit plant watering to twice a week. Avoid mid-day watering. Post explanatory signage if these recommendations cannot be implemented. (Certain exemptions will apply.)
        - Wash fleet vehicles only if using facilities that recycle the water
        - Do not wash plazas, foyers, sidewalks, etc. with a hose. Use a broom instead. (Certain exemptions will apply where necessary for health and safety.)
        - Any applicable actions requested of general retail customers
    - **Finance and Administrative Services:**
        - Turn off decorative fountains
        - Post signage throughout buildings to encourage City employees (and the public where applicable) to reduce their water use.
    - **SPU:**
        - Suspend meter testing
        - Accelerate schedule to fix distribution system leaks
    - **Parks:** Move to the Voluntary Stage of their WSCP and implement the associated demand reduction actions
    - **Transportation:** Suspend street washing
    - **Fire Department:** Limit training exercises that use water
- **Hydrant Permits:** Restrict new hydrant permits for temporary water service to essential purposes.

3.2.9. Wholesale Customer Actions

- **Move to Next Stage:** Implement the Voluntary Stage of their WSCPs, in a manner consistent with SPU.
- **Plan for Mandatory:** Work with SPU to plan for the potential to move to the Mandatory Stage. Additionally, plan for their internal process needed to enter the Mandatory Stage.
- **Outreach to Retail Customers:** Outreach to their retail customers, as documented in Appendix F.

- **Flushing:** Assess current water main flushing and reservoir cleaning activities to determine whether they should be accelerated to be completed prior to the peak season or reduced to conserve supply.
- **Alternative Sources:** Activate alternative supply sources, if appropriate.

3.3. Mandatory Stage

3.3.1. Triggers

- The Mandatory Stage will be implemented when: 1) supply conditions have not improved, or have worsened, and/or 2) demand levels need to be further reduced.

3.3.2. Objectives

- Achieve the demand reduction goals by restricting specific water uses.
- Further stretch available supply through additional supply management actions.
- Prepare for potentially moving to the Emergency Stage.

3.3.3. Stage Activation

- The authority to enter the Mandatory Stage lies with the Mayor, based on the recommendation of the SPU GM/CEO. This is the case whether entering the Mandatory Stage is done at the initial activation of the WSCP or as a progressive step if the WSCP is activated at a lower stage.

3.3.4. Demand Reduction Goal

- Set demand reduction goal based on supply conditions and demand reduction potential consistent with water use restrictions and, if appropriate, adjust with neighboring utilities. The metric for the goal will be determined by the Water Shortage Response Team.

3.3.5. Key Public Messages

- **Moving to Mandatory:** We are moving to the third stage of our WSCP, the Mandatory Stage, because our supply situation has worsened and/or the voluntary approach in the previous stage has not resulted in the necessary demand reduction.
- **Mandatory Water Restrictions:** It is necessary to impose mandatory restrictions on certain water uses. Those restrictions are as follows: *(to be determined in the previous stage)*. There are exemptions for the following: *(to be determined in the previous stage).*
- **Rate Surcharge:** If applicable, the rate surcharge is as follows: *(to be determined in the previous stage)*.

3.3.6. Coordination and Communication Actions

- **Wholesale Customers:** Update wholesale customers about current water supply conditions and that the Mandatory Stage has been formally triggered. Note that in the Voluntary Stage, wholesale customers would have been involved in planning for the potential of moving to the Mandatory Stage. SPU will give wholesale customers advanced notice of the intent to formally move to the Mandatory Stage, so wholesale customers can do final preparations (e.g., get their website ready). The advanced notice will likely be short in order to reduce the risk of unintended leaks to the press, which would complicate the process. Request continued cooperation, as identified under the Wholesale Customer Actions section.
- **WSAG:** SPU will provide updates on the water supply status and customer demand. For this stage, the role of the WSAG is to provide input on implementation of customer demand reduction aspects of the Mandatory Stage, as well as provide input on planning for the customer demand reduction aspects for the Emergency Stage, if likely needed.
- **Outreach:** Implement the communication and outreach plan elements developed for the Mandatory Stage. Also, develop the elements for the Emergency Stage, if likely needed. See the Communication and Outreach Framework in Appendix D.
- **Ecology:** Continue participation on Ecology's Water Supply Advisory Committee to keep informed about the State drought response and to provide Ecology with updates on forecasts for the Seattle regional water supply system.
- **DOH:** Update the DOH on the shortage response and the likelihood of moving to the Emergency Stage.
- **Public Agencies:** Continue and intensify coordination with other City departments and public agencies (e.g., state and federal resource agencies, tribes, and other regional water suppliers, including Cascade Water Alliance and the Cities of Everett and Tacoma) about water supply conditions, projections, and potential actions.
- **SPU Employees:** Continue regular communication with Department employees to keep them up to date on goals, conditions, and actions.
- **Customer Inquiries:** Continue responding to customer inquiries, using the strategy established in the Voluntary Stage. Note that customer inquiries could show up in various ways, including social media, which may require a different strategic communication approach.
- **Revenue:** Continue assessing revenue implications and potential remedies, including reprioritizing expenses and potential withdrawals from the revenue stabilization fund.
- **Block Contracts:** Ensure block contract credits are initiated.

- **City Legislation:** Request Council to adopt legislation on water use restrictions, enforcement and any surcharges, if anticipate needing for the Emergency Stage and not already in place.

3.3.7. Water Quality and Supply Management Actions

- **Data Collection:** Continue increased data collection actions (e.g., streamflows, snowpack conditions) and monitoring weather forecasts.
- **Modeling:** Continue increased SPU's computer modeling runs of projected supply, storage, demand and revenue scenarios.
- **Instream Flows:** Continue coordination with state and federal resource agencies and tribes, to review supply and fisheries conditions to determine appropriate instream flow levels. (See Cedar Instream Flow agreement and Tolt settlement agreement.)
- **Emergency Supplies:** Activate emergency supplies, such as the wellfields and Morse Lake Pump Plants, as appropriate.
- **Interties:** Activate interties, if not already implemented.
- **Reclaimed Water:** Promote reclaimed water availability to tanker trucks for street cleaning, construction projects, landscape irrigation, dust control, etc.

3.3.8. Retail Customer Demand Actions

- **General Customer Actions:**
    - Implement the Mandatory Stage customer demand reduction actions (that were determined in the Voluntary Stage).
    - Determine the list of customer demand reduction actions that would be requested if the WSCP advances to the Emergency Stage. A list of potential actions customers can take to reduce water use is provided in Appendix E. The actual actions selected for the Emergency Stage will depend on the severity, likely duration, and timing of the shortage, as well as the demand reduction needed.
- **City Departments:** Require that City departments reduce their water use. The specific actions requested for this stage will be determined during implementation of the WSCP, however likely actions include the following (if not already implemented under the Voluntary Stage):
    - **All Departments:**
        - Let lawns go dormant and limit plant watering to twice a week. Avoid mid-day watering. Post explanatory signage if these recommendations cannot be implemented. (Certain exemptions will apply.)

        - Wash fleet vehicles only if using facilities that recycle the water
        - Do not wash plazas, foyers, sidewalks, etc. with a hose. Use a broom instead. (Certain exemptions will apply where necessary for health and safety.)
        - Any applicable actions required of general retail customers
    - **Finance and Administrative Services:**
        - Turn off decorative fountains
        - Post signage throughout buildings to encourage City employees (and the public where applicable) to reduce their water use.
    - **SPU:**
        - Suspend meter testing
        - Accelerate schedule to fix distribution system leaks
    - **Parks:** Move to the Mandatory Stage of their WSCP and implement the associated demand reduction actions
    - **Transportation:** Suspend street washing
    - **Fire Department:** Limit training exercises that use water
- **Hydrant Permits:** Rescind hydrant permits for temporary water service, unless necessary for public health.
- **Exemptions from Water Use Restrictions:** Implement the exemptions for the Mandatory Stage water use restrictions. Determine appropriate exemptions for the Emergency Stage water use restrictions. Appendix G includes possible exemptions to water use restrictions for SPU to consider in creating actual exemptions at the time of the event.
- **Rate Surcharges**: Consider implementing rate surcharges to accelerate customer compliance with the restrictions and/or recover lost revenue.

3.3.9. Wholesale Customer Actions

- **Move to Next Stage:** Implement the Mandatory Stage of their WSCPs, in a manner consistent with SPU.
- **Plan for Emergency:** Work with SPU to plan for the potential to move to the Emergency Stage. Additionally, plan for their internal process needed to enter the Emergency Stage.
- **Outreach to Retail Customers:** Outreach to their retail customers, as documented in Appendix F.
- **Enforcement:** Enforce water use restrictions within their own service areas.

- **Flushing:** Assess current water main flushing and reservoir cleaning activities to determine whether they should be accelerated to be completed prior to the peak season or reduced to conserve supply.
- **Alternative Sources:** Activate alternative supply sources, if appropriate.

3.4. Emergency Stage

At this stage, SPU recognizes that a critical water situation exists and that, without additional significant curtailment actions, a shortage of water for public health and safety is imminent. This type of situation has never occurred in the SPU water system's history.

This stage is characterized by two basic approaches. First, increasingly stringent water use restrictions are established. Secondly, significant rate surcharges are used to increase customer compliance. A surcharge is a key component to the success of this stage.

3.4.1. Triggers

- The Emergency Stage will be implemented when: 1) supply conditions have worsened, 2) demand levels need to be further reduced, and/or 3) the prospects of a water shortage are imminent if immediate action is not taken.

3.4.2. Objectives

- Achieve the demand reduction goals by additional restrictions on water use, recognizing that for this stage customers' lives and businesses may be significantly impacted.
- Stretch available supply through supply management actions.

3.4.3. Stage Activation

- The authority to enter the Emergency Stage lies with the Mayor, based on the recommendation of the SPU GM/CEO, unless there is an immediate emergency, in which the SPU GM/CEO has the authority to enter this stage according to SMC 21.04.500 and 21.04.505.

3.4.4. Demand Reduction Goal

- Set demand reduction goal based on supply conditions and demand reduction potential consistent with water use restrictions and, if appropriate, adjust with neighboring utilities. The metric for the goal will be determined by the Water Shortage Response Team.

3.4.5. Key Public Messages

- **Moving to Emergency:** We are moving to the fourth (and final) stage of our WSCP, the Emergency Stage, because our supply situation has worsened and/or the approach in the previous stage has not resulted in the necessary demand reduction.

- **Additional Water Restrictions**: There are additional water restrictions as follows: *(to be determined in the previous stage)*. There are exemptions for the following: *(to be determined in the previous stage)*.
- **Rate Surcharge:** If applicable, the rate surcharge is as follows: *(to be determined in the previous stage)*.
- **Taste & Odor:** If applicable, taste and odor water quality problems may occur with system-wide reduced water consumption.
- **Pressure Reduction**: If applicable, pressure reduction problems may occur with system-wide reduced water consumption.

3.4.6. Coordination and Communication Actions

- **Formal Declaration of Emergency:** SPU GM/CEO declares a water supply emergency including instituting formal procedures for declaration.
- **Wholesale Customers:** Update wholesale customers about current water supply conditions and that the Emergency Stage has been formally triggered. Note that in the Mandatory Stage, wholesale customers would have been involved in planning for the potential of moving to the Emergency Stage. SPU will give wholesale customers advanced notice of the intent to formally move to the Emergency Stage, so wholesale customers can do final preparations (e.g., get their website ready). The advanced notice will likely be short in order to reduce the risk of unintended leaks to the press, which would complicate the process. Request continued cooperation, as identified under the Wholesale Customer Actions section.
- **WSAG:** SPU will provide updates on the water supply status and customer demand. For this stage, the role of the WSAG is to provide input on the implementation of the Emergency Stage.
- **Outreach:** Implement the communication and outreach plan elements developed for the Emergency Stage.
- **Ecology:** Continue participation on Ecology's Water Supply Advisory Committee to keep informed about State drought response and to provide Ecology with updates on forecasts for the Seattle regional water supply system.
- **DOH:** Update DOH on the shortage response and the need to be in the Emergency Stage.
- **Public Agencies:** Continue and intensify coordination with other City departments and public agencies (e.g., state and federal resource agencies, tribes, and other regional water suppliers, including Cascade Water Alliance and the Cities of Everett and Tacoma) about water supply conditions, projections, and potential actions.

- **SPU Employees:** Continue regular communication with Department employees to keep them up to date on goals, conditions, and actions.
- **Customer Inquiries:** Continue responding to customer inquiries, using the strategy established in the Voluntary Stage. Note that customer inquiries could show up in various ways, including social media, which may require a different strategic communication approach.
- **Revenue:** Continue assessing revenue implications and potential remedies, including reprioritizing expenses and potential withdrawals from the revenue stabilization fund.
- **Block Contracts:** Ensure block contract credits are initiated.
- **Police & Fire Enforcement:** Coordinate with police and fire departments requesting their assistance in promoting and enforcing emergency water restrictions.

3.4.7. Water Quality and Supply Management Actions

- **Data Collection:** Continue increased data collection actions (e.g., streamflows, snowpack conditions) and monitoring weather forecasts.
- **Modeling:** Continue increased SPU's computer modeling runs of projected supply, storage, demand and revenue scenarios.
- **Instream Flows:** Continue coordination with state and federal resource agencies and tribes, to review supply and fisheries conditions to determine appropriate instream flow levels. (See Cedar Instream Flow agreement and Tolt settlement agreement.)
- **Emergency Supplies:** Activate emergency supplies, such as the wellfields and Morse Lake Pump Plants, as appropriate. Consider drawing down Lake Youngs to meet supply needs.
- **Interties:** Activate interties, if not already implemented.
- **Reclaimed Water:** Continue promoting reclaimed water availability to tanker trucks for street cleaning, construction projects, landscape irrigation, dust control, etc.

3.4.8. Retail Customer Demand Actions

- **General Customer Actions:**
    - Implement the Emergency Stage customer demand reduction actions (that were determined in the Mandatory Stage).
- **City Departments:** Require that City departments reduce their water use including, but not limited to:

- **All Departments:**
  - Continue letting lawns go dormant and limiting plant watering to twice a week. Continue avoiding mid-day watering. Post explanatory signage if these recommendations cannot be implemented. (Certain exemptions will apply.)
  - Suspend all washing of fleet vehicles.
  - Continue not washing plazas, foyers, sidewalks, etc. with a hose. Use a broom instead. (Certain exemptions will apply where necessary for health and safety.)
  - Any applicable actions required of general retail customers
- **Finance and Administrative Services:**
  - Continue keeping decorative fountains off.
  - Continue using signage throughout buildings to encourage City employees (and the public where applicable) to reduce their water use.
- **SPU:**
  - Continue to suspend meter testing.
  - Continue to accelerate schedule to fix distribution system leaks.
- **Parks:** Move to the Emergency Stage of their WSCP and implement the associated demand reduction actions.
- **Transportation:** Continue suspension of street washing.
- **Fire Department:** Suspend training exercises that use water.

- **Exemptions from Water Use Restrictions:** Implement the exemptions for the Emergency Stage water use restrictions.
- **Rate Surcharges**: Consider implementing rate surcharges to accelerate customer compliance with the restrictions and/or recover lost revenue.

3.4.9. Wholesale Customer Actions

- **Move to Next Stage:** Implement the Emergency Stage of their WSCPs, in a manner consistent with SPU.
- **Outreach to Retail Customers:** Outreach to their retail customers, as documented in Appendix F.
- **Enforcement:** Continue to enforce water use restrictions within their own service areas.

- **Flushing:** Assess current water main flushing and reservoir cleaning activities to determine whether they should be accelerated to be completed prior to the peak season or reduced to conserve supply.
- **Alternative Sources:** Activate alternative supply sources, if appropriate.

4. Implementation for an Immediate Crisis

4.1. Background

This chapter focuses on implementing the WSCP when an event, such as a system failure, hinders SPU's ability to supply enough water to meet customer demands, and requires immediate action. Implementing the WSCP under these circumstances has both differences and similarities from implementation for a progressive event such as a drought.

Implementation of the WSCP for an immediate crisis is different in the following ways:

- **Lack of Preparation Time:** In a typical progressive event, SPU has weeks or months to prepare for action. In an immediate crisis, there is typically little to no preparation time and SPU takes actions within minutes, hours, and/or days.
- **Initial Stage:** In a typical progressive event, the WSCP is activated at the Advisory Stage and progresses sequentially through stages as necessary. In an immediate crisis, the WSCP is activated at one of the more aggressive stages, likely either the mandatory or emergency stage.
- **Larger Volume:** The volume of the water shortage for an immediate crisis could be more significant, thereby requiring larger-scale demand reductions.
- **Localized:** The immediate crisis could be very localized, thereby requiring demand reduction for only a limited geographic area.
- **Heightened Public Health & Safety:** The need to protect water quality and availability to support public health and safety are heighted, including issues such as minimizing any outages and having sufficient water and pressure for fire fighting.
- **SPU/City Emergency Response Plans:** Implementation of the WSCP would likely dovetail with implementation of other higher-level and/or more specific SPU and/or City of Seattle emergency response plans. Both SPU and the City have broader, all-hazards plans, such as SPU's Emergency Operations Plan and the City's Comprehensive Emergency Management Plan, that describe how their emergency management system is organized and managed in order to prepare for, prevent, mitigate, respond to, and recover from emergencies. SPU has numerous hazard-specific (e.g., earthquake) and site-specific (dams) emergency response plans that might be applicable.
- **Incident Command System:** The response would most likely be implemented under an Incident Command System (ICS), which is a nationally-sanctioned, standardized approach to the command, control, and coordination of emergency response. ICS is integral to the SPU and City emergency response plans mentioned above.

Implementation of the WSCP for an immediate crisis is similar to that of a progressive event in many of the considerations and principles discussed in Chapter 2 such as the need for flexibility, sharing the burden of the shortage, and the importance of addressing financial implications.

There are numerous crisis situations that could necessitate implementing the WSCP. Several examples are described below. Note that each of these situations has in fact occurred, yet they did not trigger formal activation of the WSCP due to mitigating circumstances. The need to activate the WSCP would depend on the amount of the supply impacted, the amount of time needed to restore the system to normal functions, how easily water could be re-routed to customers in the affected area, and the amount of water being used by customers given the season.

- **Major Transmission Pipeline Break:** A major transmission pipeline break from either the Tolt or the Cedar River supplies could require activation of the WSCP in an immediate crisis mode. Two major pipeline failures have occurred since 1987; however, they had minor impacts on customers due to system redundancy.

- **Temporary Treatment Plant Shut Down:** A temporary unplanned shut down of either the Cedar or the Tolt water treatment plants could require activation of the WSCP in an immediate crisis mode. In 2003, the Tolt Treatment Facility was shut down for approximately one week when a raw water inlet valve malfunctioned causing flooding of the plant. Because this occurred during the winter when demands were low, all retail and most wholesale customers were provided water from the Cedar system without disruption; a few wholesale customers were supplied from water stored at the plant's clearwell.

- **Major River Flooding Leading to High Turbidity:** Substantial flooding on the Cedar or Tolt Rivers could lead to high turbidity which might cause SPU to temporarily stop using that supply. This is particularly the case for the Cedar if major flooding occurred at the same time Lake Youngs was at or below normal minimum operating levels. In 1990, such an event occurred on the Cedar, when flooding exceeded the 100-year event. With the addition of filtration on the Tolt supply and the change in intake location on the Cedar supply, SPU's supply sources are much less vulnerable to impacts of turbidity than in the past.

4.2. Components

The following nine components are discussed below. (The definitions are repeated here so this chapter functions as a stand-alone chapter, which may be important in a crisis.) These are the same components as Chapter 3 (a progressive event) and the content is a hybrid of content from all four stages in Chapter 3. Therefore, while a stage is declared when implementing the WSCP for an immediate crisis, that stage may look slightly different than under a progressive event.

1. **Triggers** – Describes the general qualitative conditions that would trigger the stage. Note there are no pre-determined, quantitative conditions that trigger stages.
2. **Objectives** – Describes the overall objective of the stage.
3. **Stage Activation** – Describes who has the authority to enter the stage (either the SPU GM/CEO or the Mayor).
4. **Demand Reduction Goal** – Discusses the general, qualitative nature of the goal for the stage. Note there are no pre-determined, quantitative demand reduction goals for each stage.
5. **Key Public Messages** – Describes the key public messages for the stage. The messaging work is led by the Communications Lead.
6. **Coordination and Communication Actions** – Describes a variety of work necessary to coordinate and communicate with key stakeholders such as , wholesale customers, Ecology, Department of Health, natural resource agencies, tribes, City employees, the general public, etc. The overall work is led by the ICS Incident Commander, who makes assignments as appropriate.
7. **Water Quality and Supply Management Actions** – Describes work necessary to safeguard water quality and to maximize supply. This work is led by the Supply Management Lead.
8. **Retail Customer Demand Actions** – Describes work necessary to reduce customer demand. This work is led by the Demand Management Lead.
9. **Wholesale Customer Actions -** Describes actions required by each wholesale customer. Communication and monitoring of these actions is done by the Wholesale Customers Lead.

4.2.1. Triggers

- The appropriate stage (Voluntary, Mandatory, or Emergency) will be implemented when an event occurs that would prevent SPU from supplying enough water to meet customer demands and requires immediate action. (The selection of the appropriate stage will be based on the severity of the shortage.)

4.2.2. Objectives

- Maximize the amount of water delivered to customers and restore full supply capabilities as soon as possible.
- Achieve the demand reduction goals by voluntary or mandatory customer action. If activated at the Emergency Stage, restrictions may significantly impact customers' lives and businesses.
- Prepare for potentially moving to the next aggressive stage, if not already in the Emergency Stage.

4.2.3. Stage Activation

- The authority to declare a water supply emergency and activate the WSCP for an immediate crisis lies with the SPU GM/CEO according to SMC 21.04.500. However, the underlying event may warrant a proclamation of civil emergency, which would be declared by the Mayor per SMC 10.02.

4.2.4. Demand Reduction Goal

- Set demand reduction goal based on supply conditions and demand reduction potential consistent with any water use restrictions.

4.2.5. Key Public Messages

- **Activated WSCP:** We have activated the WSCP due to an immediate crisis. The details of the crisis are as follows (*to be developed at the time of the crisis*).
- **Meet Demand Reduction Goal:** We are asking customers to reduce their water use to meet the demand reduction goal.
- **Mandatory Water Restrictions (If Activating at the Mandatory or Emergency Stage):** It is necessary to impose mandatory restrictions on certain water uses. Those restrictions are as follows: *(to be determined at the time of the crisis)*. There are exemptions for the following: *(to be determined at the time of the crisis).*
- **Rate Surcharge:** If applicable, the rate surcharge is as follows: *(to be determined at the time of the crisis)*.
- **Water Quality:** If applicable, customers may find taste, odor or discolored water issues with their water due to changes in water supply operations *(be more specific if appropriate)*. While the water may not be pleasing, it is safe to drink.
- **Pressure Reduction**: If applicable, customers may experience a loss of pressure due to system operations. Customers with no water should call SPU at (*TBD*).

4.2.6. Coordination and Communication Actions

- **Formal Declaration of Water Supply Emergency and/or Civil Emergency:** Depending on the event, the GM/CEO and/or Mayor make formal declarations of emergencies and activation of the WSCP.
- **Incident Commander & Team:** Identify the incident commander and the team members. An Incident Command System organizational chart is provided in Appendix A. Note that the functions of the Water Shortage Response Team used during a progressive application of the WSCP are incorporated into the Incident Command System.

- **Wholesale Customers:** Inform wholesale customers about the crisis and that the WSCP has been activated. Request their cooperation, as identified under the Wholesale Customer Actions section.
- **WSAG:** Formation of WSAG is not appropriate unless the event is anticipated to be of long duration. If formed, the role of the WSAG is to provide feedback on implementation of customer demand reduction actions. Early meetings will focus on explaining the crisis, the role of the WSAG, and educating the WSAG about the water system and the customer base.
- **DOH:** Inform the DOH about the crisis and the activation of the WSCP.
- **Public Agencies:** Coordinate with other City departments and public agencies (e.g., county, state and federal resource agencies, tribes, and other regional water suppliers, including Cascade Water Alliance and the Cities of Everett and Tacoma) as appropriate.
- **Outreach:** Develop and implement the initial communication and outreach plan. As described in the Communication and Outreach Framework in Appendix D, the plan should include the overall purpose, goals, audiences, and tools (e.g., FAQs, press releases, tips flyers). Additional outreach tools such as highway message boards, social media, or dial out phone systems might be used in an immediate crisis.
- **SPU Employees:** Establish a regular communication mechanism to keep Department employees up to date on goals, conditions, and actions.
- **Customer Inquiries:** Establish one point of contact for responding to customer inquiries.
- **Revenue:** Assess revenue implications and potential remedies, including reprioritizing expenses and potential withdrawals from the revenue stabilization fund.
- **Block Contracts:** Ensure block contract credits are initiated.
- **City Legislation:** Request Council to adopt legislation on water use restrictions, enforcement and any surcharges, if anticipate needing and not already in place.
- **Police & Fire Enforcement:** Coordinate with police and fire departments requesting their assistance in promoting and enforcing any water restrictions, if entering the Emergency Stage.

4.2.7. Water Quality and Supply Management Actions

- **Maximize Supplies:** Make system operational changes as needed to maximize the amount of water delivered to customers and restore system to normal operations.
- **Wells:** Begin to ready wellfields for use and activate, if appropriate.

- **Morse Lake Pump Plants:** Ready the pumping plants on Chester Morse Lake and commence pumping when gravity flow is no longer sufficient, if appropriate.
- **Interties:** Investigate using existing interties to increase supply availability and activate if appropriate.
- **Reclaimed Water:** Promote reclaimed water availability to tanker trucks for street cleaning, construction projects, landscape irrigation, dust control, etc.
- **Water Quality:** Assess water quality in reservoirs and in the distribution system to identify areas that may experience degradation with reduced consumption or changes to system operations. Increase monitoring if appropriate.
- **Instream Flows:** If reductions in instream flows would mitigate the impact of the event or are necessary, coordinate with state and federal resource agencies and tribes, to review supply and fisheries conditions and determine appropriate instream flow levels, including whether to provide supplemental flows or reduce to below normal minimum flows. (See Cedar Instream Flow agreement and Tolt settlement agreement.)

4.2.8. Retail Customer Demand Actions

- **General Customer Actions:**
    - Determine and implement the list of customer demand reduction actions requested/required. A list of potential actions customers can take to reduce water use is provided in Appendix E. The actual actions selected will depend on the severity, likely duration, and timing of the shortage, as well as the demand reduction needed. Additionally, establish and implement appropriate exemptions. Appendix G includes possible exemptions to water use restrictions for SPU to consider. Finally, determine appropriate enforcement strategies, if appropriate.
- **City Departments:** Request that City departments reduce their water use in affected areas. The specific actions requested will be determined during implementation of the WSCP, however likely actions include the following:
    - **All Departments:**
        - Let lawns go dormant and limit plant watering to twice a week. Avoid mid-day watering. Post explanatory signage if these recommendations cannot be implemented. (Certain exemptions will apply.)
        - Either wash fleet vehicles only if using facilities that recycle the water or suspend all washing of fleet vehicles, depending on the severity of the crisis.
        - Do not wash plazas, foyers, sidewalks, etc. with a hose. Use a broom instead. (Certain exemptions will apply where necessary for health and safety.)

        - Any applicable actions requested of general retail customers
    - **Finance and Administrative Services:**
        - Turn off decorative fountains
        - Post signage throughout buildings to encourage City employees (and the public where applicable) to reduce their water use.
    - **SPU:**
        - Suspend water main flushing and reservoir cleaning unless needed to support restoration to normal operations
        - Suspend meter testing
        - Accelerate schedule to fix distribution system leaks
    - **Parks:** Request that the Parks and Recreation Department activate their Water Shortage Response Plan.
    - **Transportation:** Suspend street washing
    - **Fire Department:** Either limit or suspend training exercises that use water, depending on the severity of the crisis.
- **Hydrant Permits:** New hydrant permits for temporary water service will be either restricted to essential services or rescinded (unless necessary for public health), depending on the severity of the crisis.
- **Rate Surcharges**: Consider implementing rate surcharges to accelerate customer compliance with the restrictions and/or recover lost revenue.

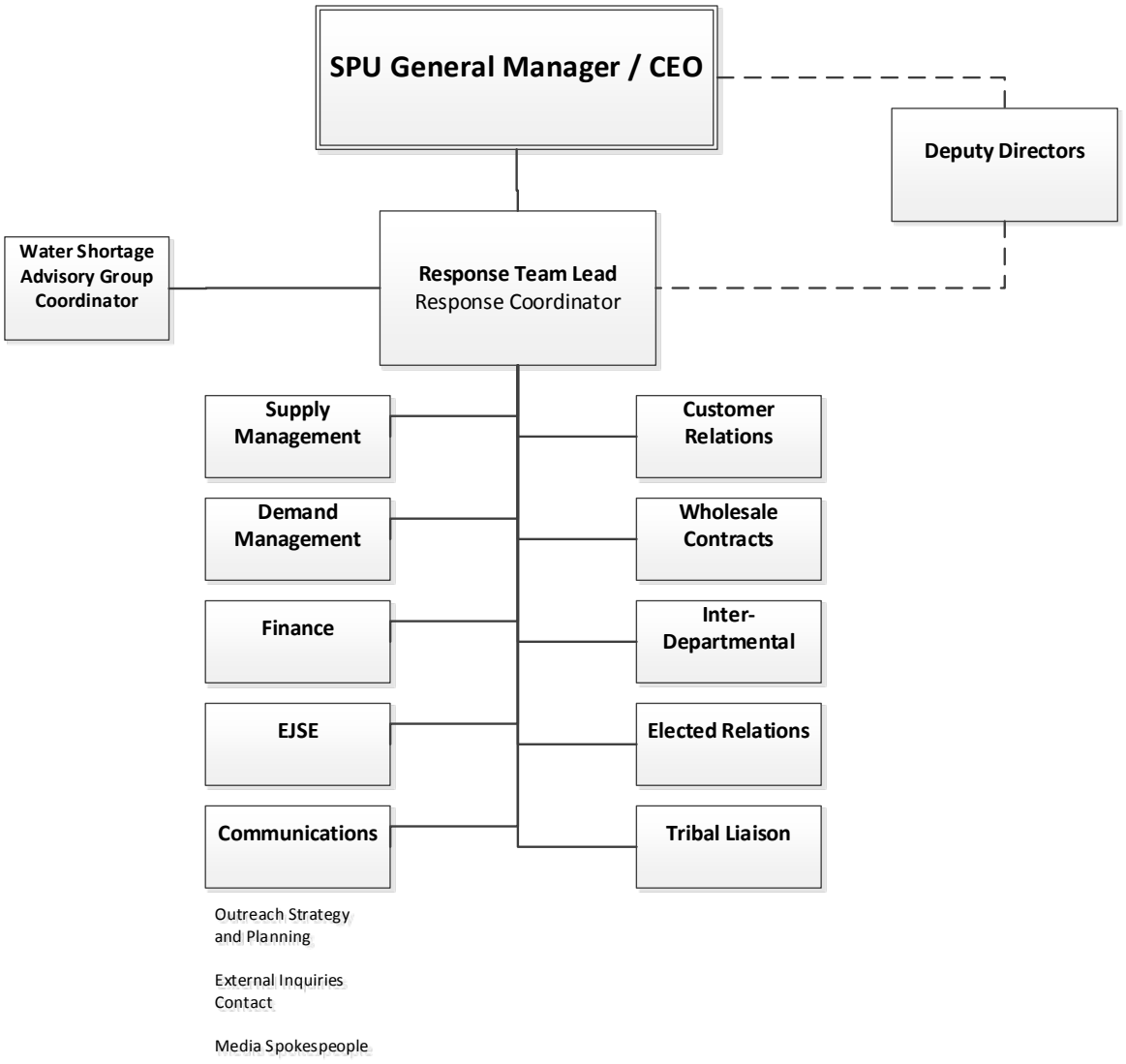
4.2.9. Wholesale Customer Actions

- **Activate Plans:** Activate their own WSCPs, in a manner consistent with SPU, if in affected area.
- **Alternative Sources:** Activate alternative supply sources, if appropriate and necessary.
- **Flushing:** Assess current water main flushing and reservoir cleaning activities to determine whether they should be suspended.
- **Outreach to Retail Customers:** Outreach to their retail customers, as documented in Appendix F.
- **Enforcement:** Enforce any water use restrictions within their own service areas.

Appendix A – Water Shortage Response Team Membership and Roles

Water Shortage Response Team

The Water Shortage Response Team is SPU's internal team whose role is to evaluate conditions, advise the SPU General Manager/CEO on supply and demand actions, coordinate with other parties, and make assignments to SPU staff as needed to respond to the shortage. The Team is appointed by the SPU GM/CEO. An organizational chart and an explanation of the roles is provided below.

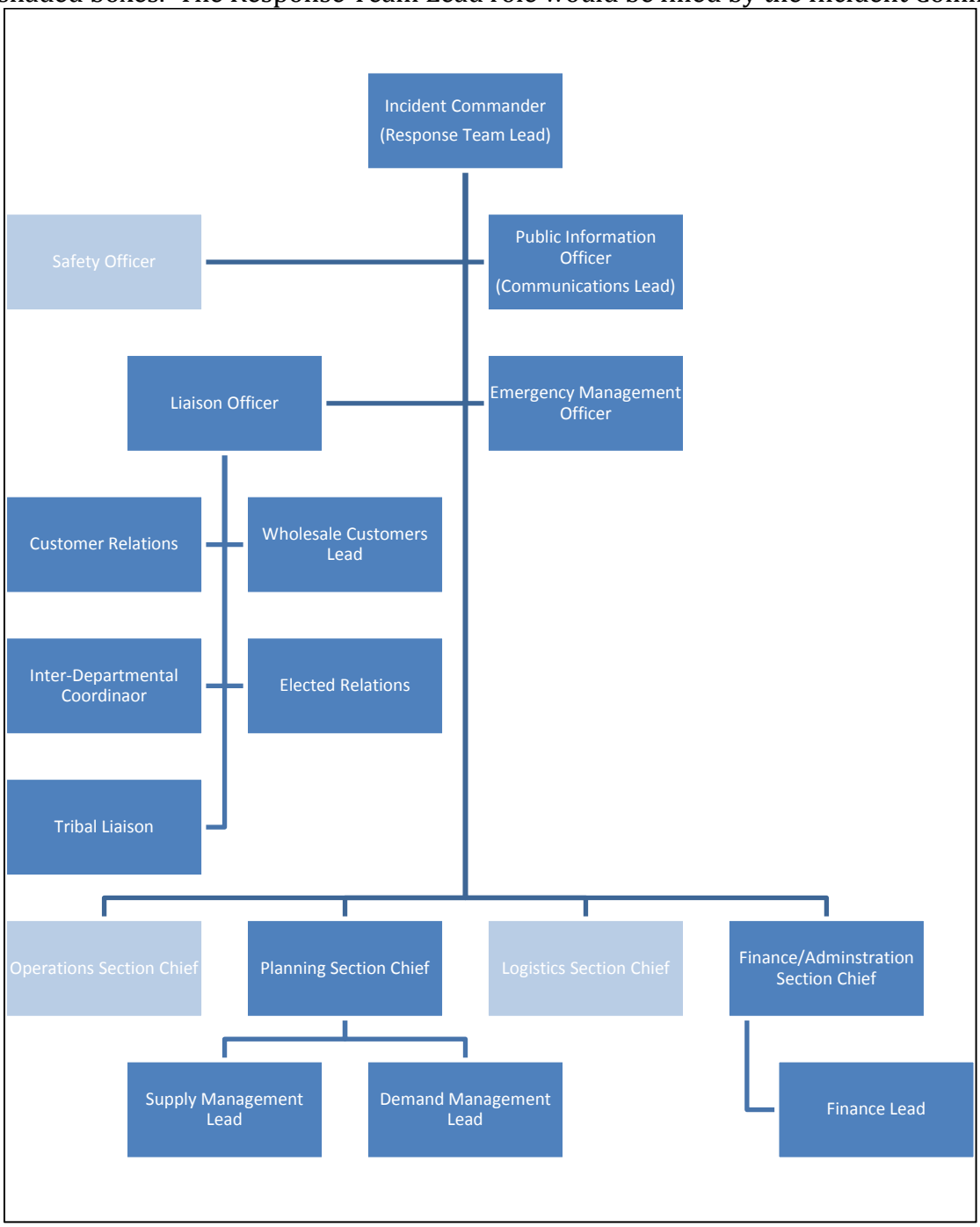


- **SPU GM/CEO** – Overall direction on the response. Weighs in on Team recommendations for moving through response stages, demand management actions, and key messages.
- **Deputy Directors (Executive Team)** – Input to SPU GM/CEO for response. May include Chief Administrative Executive and Water Line of Business Executive.
- **Response Team Lead** – Lead the overall water shortage response effort including issue coordination, information gathering and dissemination, key support staff assignments, role clarification, and communication with broad array of interested parties.
- **Water Shortage Advisory Group Coordinator** – Purpose and membership of the Water Shortage Advisory Group (WSAG) is described in Appendix B. The WSAG Coordinator works with SPU GM/CEO to identify and invite members, and facilitates meetings and communications with WSAG.
- **Supply Management Lead** – Overall guidance on supply management, drinking water quality and operations, status of non-revenue water use in operations, and issues related to potential alternative supplies/interties. Provide guidance regarding watershed activities that may impact water supply. Provide water supply condition reports, forecasts, production reports, operational needs, and modeling identification and oversight. Provide guidance regarding instream flows/fisheries, river analyses, river biological assessments, and coordinate with Cedar River Instream Flow Commission and Tolt Fisheries Advisory Committee. Prepare for use of and report on issues related to the Morse Lake Pump Plants.
- **Demand Management Lead** – Customer water use reduction actions management and messaging, estimates of water use savings, implementation cost estimates, and communication with landscapers, nurseries and large water users (commercial and residential). Provides water consumption tracking, reporting and forecasting.
- **Finance Lead** – Expected lost revenue estimates, budgets and charge number set-up for shortage-related activities, and process necessary to access revenue stabilization fund, if needed.
- **Environment Justice and Service Equity Lead** – Ensure EJSE objectives are addressed in WSAG, demand management, customer relations and communication activities.
- **Communications Lead** – Messaging, employee communication, media relations, press releases, marketing, advertising, social media, key contact for interagency Public Information Officers (PIOs), and coordination on messaging with Cascade Water Alliance and the Cities of Everett and Tacoma.
    - **Outreach Strategy and Planning Lead** – Responsible for defining outreach goals, objectives and strategies early in event.
    - **Media Spokespeople** – Small group of subject matter experts (e.g., supply management, demand management) for media interviews.
    - **External Inquiries Contact** – Point person for all customer inquiries, responsible for timely and consistent response.

- **Customer Relations Lead** – Communicate with and assist with message development for the call center and key accounts.
- **Wholesale Contracts Lead** - Provide coordination with wholesale customers. Work with Finance on block contract billing adjustments.
- **Inter-Department Coordinator** -- Point person for inter-city department coordination, separate from customer relations, to work with one-city perspective and coordination with Council and Mayor's Office.
- **Elected Relations** – Coordinate briefings with City Councilmembers and Mayor, and any legislation needed.
- **Tribal Liaison** – Coordinates with key Tribes.

Water Shortage Response Team Integrated in Incident Command System

During an immediate crisis, the underlying event would most likely trigger an incident command response by SPU. In this instance, the functions of the Water Shortage Response Team can be integrated into the Incident Command System as shown below by the darker shaded boxes. The Response Team Lead role would be filled by the Incident Commander.



Appendix B – Water Shortage Advisory Group Membership

The Water Shortage Advisory Group (WSAG) is a team of key customers and stakeholders whose role is to advise the Water Shortage Response Team on requests or actions made to customers regarding utility water shortage response actions and programs. Membership should represent diverse perspectives. Potential members are shown in the table below. The total number should be no more than 20 organizations.

Category	Potential Member
Wholesale Customers	• Water Supply Operating Board representative • Cascade Water Alliance
State and County Agencies	• Department of Health, NW Regional Office • Department of Ecology • Washington Department of Fish and Wildlife • King County Department of Natural Resources
Federal Agencies	• US Army Corps of Engineers • National Marine Fisheries Service
Landscape and Nursery Industry	• Washington State Nursery and Landscape Association • Washington Association of Landscape Professionals • Larger Nurseries (e.g., Molbaks, Sky, Swansons)
Business Community	• Seattle Chamber of Commerce • Port of Seattle or Seattle/Tacoma Port Alliance • Manufacturing Industrial Council of Seattle
Environmental	• Cedar River Council or Friends of the Cedar • Washington Environmental Council • Environmental Coalition of South Seattle
Tribal	• Muckleshoot Indian Tribe • Tulalip Tribes
General Public	• Water System Advisory Committee Chair
City Departments	• Facilities and Administrative Services • Seattle Parks and Recreation • Seattle City Light • Transportation
Franchisees	• City of Shoreline
Regional Water Suppliers	• Tacoma Water • City of Everett
SPU Staff	• Water Shortage Response Team Lead • Demand Management Lead • Communications Lead • ESJE Lead

Appendix C – Previous WSCP Implementations

SPU has implemented its Water Shortage Contingency Plan (WSCP) six times. Each implementation was due to drought, however each of those implementations was different due to the unique characteristics of each drought. SPU has modified both the WSCP and system operations during drought based on lessons learned from these previous implementations.

The table below highlights a few key aspects of each implementation. More detailed summaries are provided below.

Year	Furthest Stage	Type of Drought	Duration	Statewide Drought
2015	2. Voluntary	Winter/Spring (low snowpack) and Summer (hot/dry temperature)	Late-July to late-Nov	Yes
2005	1. Advisory	Winter/Spring (low snowpack)	Mid-Mar to early-July	Yes
2002	2. Voluntary	Fall/Early Winter (late fall rains)	Late-Oct 2002 to January 2003	No
2001	2. Voluntary	Winter/Spring (low snowpack)	Mid-March to early-Sept	Yes
1992	3. Mandatory	Winter/Spring (low snowpack)	Mid-May to mid-Oct	No
1987	3. Mandatory	Summer/Fall (hot/dry temperature) and Fall/Early Winter (late fall rains)	Early August 1987 to February 1988	N/A

2015 Drought

Very low snowpack levels caused statewide concerns about drought. To account for the lack of snow, the Tolt and Chester Morse Reservoirs were operated to store more rainfall than typical during the late winter and early spring, reaching refill targets earlier than normal. By mid-May, the Governor had declared a statewide drought emergency, but noted that the large municipal water suppliers in the Puget Sound region, such as Seattle, Tacoma and Everett, had adequate reservoir storage to meet their customers' needs and did not anticipate water shortages. Subsequently, the region experienced historical hot and dry conditions causing rapid drawdown of storage at the reservoirs. SPU, in close coordination with Everett and Tacoma, activated the Advisory Stage of their water shortage contingency plans in late July. In August, the three utilities entered the Voluntary Stage of their plans and requested customers to reduce their water use by 10 percent, which was achieved. By late October, water levels in the Chester Morse Reservoir were at lower than typical levels, and SPU used its new pumping plant on Morse Lake to access water stored there. Pumping lasted for five days, when significant rains occurred. During the drought SPU was able to maintain stream flows above the normal guaranteed levels at all times except for 7 days between October 24th and October 30th. During this 7-day period, with the approval of the Cedar River Instream Flow Commission, stream flows were managed to provide flow volumes that were below low normal flows and above critical flows. In November, the three utilities moved back into the Advisory Stage of their water shortage contingency

plans, and then deactivated their plans, when regional water supply conditions returned to normal.

2005 Drought

SPU watersheds experienced the lowest snowpack in 60 years, one of the driest winters on record, and warmer than normal winter temperatures. Water managers responded by activating the Advisory Stage of the WSCP, reducing system water use and maximizing the amount of water held in storage using the dynamic rule curve. In effort to help better position supply for meeting instream resource needs during the summer and fall, the Cedar River Instream Flow Commission agreed to forgo allocation of non-firm supplemental stream flows during the spring. As a result of this active management and nearly average rainfall in the spring, SPU was able to return to normal operations by summer that year.

2002 Drought

The fall rains failed to materialize at the usual time and SPU began mobilizing the pumps on Morse Lake. The Voluntary Stage of the water shortage contingency plan was activated, the public was made aware that supplies were low, and there was the possibility of water restrictions if dry weather continued.

2001 Drought

Snowpack appeared to be very similar to that of 1992, and water supply forecasts made through the end of the year looked dire in early March. Snowpack ended up peaking at 65% of normal, and reservoirs were full or nearly full by June. Nonetheless, with a statewide drought emergency in effect, Seattle asked customers starting in early April, to voluntarily reduce water use by 10 percent. This was rescinded in early August.

1992 Drought

The winter was unusually warm, and snowpack and flows into the storage reservoirs were at record low levels. In late February, it was evident that there was insufficient snowpack to fill the storage reservoirs, and that the likelihood of recovery by June 1 due to rainfall was low. A number of measures were taken to maximize available supply (e.g., reducing system flushing, adjusting stream flow levels, etc.) and to reduce demand. In May, a number of mandatory curtailment actions were implemented, including a ban on lawn watering. This resulted in an average consumption reduction of 25 to 30 percent below normal throughout the summer. Tribes, state resource agencies and the Army Corps of Engineers played a significant role in cooperating to maximize available water supply. In addition, other measures were taken to increase available supply including initiating an intertie with Renton and accelerating the construction of a second pump plant for use of "dead storage" at Chester Morse Lake. The mandatory restrictions were rescinded in September as supply levels returned to normal with the onset of fall rains.

1987 Drought

Storage reservoirs were at normal levels on June 1, but the summer weather was unusually warm and dry. Higher than normal outdoor water use accelerated the drawdown of the storage reservoirs. To reduce demand, in early August lawn watering was restricted to no

more than once every three days and customers were urged to voluntarily curtail other water uses. These actions reduced demand by approximately 10 percent. In early fall, an emergency pumping station was installed at the Chester Morse Lake reservoir to pump "dead storage" in case the reservoir level fell below the lake's natural outlet.

Throughout the fall, precipitation continued to be below normal. The water supply system was managed and adjusted to obtain the maximum supply available (e.g., relying on Lake Youngs more than normal). In November 1987 and January 1988, the Chester Morse Reservoir was low enough to require pumping, and it was not until February 1988 that rainfall began refilling the storage reservoirs.

Appendix D – Communication and Outreach Framework

This document is intended to provide a framework for communication and outreach efforts during implementation of the Water Shortage Contigency Plan. The actual communication and outreach plan will be develpped during implementation of the WSCP. The initial plan will be developed in the Advisory Stage, during which SPU plans for the potential of moving into the Voluntary Stage. The communication and outreach plan will be modified as implementation of the WSCP continues, especially if SPU moves into the Mandatory and/or Emergency Stage.

The communication and outreach plan should include the following elements: overall purpose, goals, audience, and tools. More information on each of these elements is provided further below. Selected examples of tools used during the 2015 WSCP implementation are also included.

The following steps should be used to develop the communication and outreach plan:

1. Confirm/modify the overall purpose
2. Confirm/modify the goals
3. Identifiy which audiences to target and/or to prioritize
4. Identify which tools to develop
5. Match the audiences and the tools
6. Identify staff responsible for developing the tools
7. Identify staff responsible for implementing the communication/outreach
8. Track the implementation
9. Modify as necessary

Overall Purpose

The overall purpose of the communication and outreach effort is to make sure everyone is aware of the "drought/shortage message", which consists of the following components:

1. We are experiencing a drought/shortage
2. We are asking everyone to help by…….(*to be determined for appropriate WSCP stage*)
3. We have suggestions/requirements on how to reduce water use
4. Also see the “key public messages” under each WSCP stage

Goals

There are three goals of the communication and outreach effort, as follows:

1. Build awareness
2. Create a community presence
3. Targeted messaging

Audiences

There are a variety of audiences for the communication and outreach efforts. Some audiences are broad in nature, while others are very specific. The seven main audiences, including locations/organizations/other subcategories, are as follows:

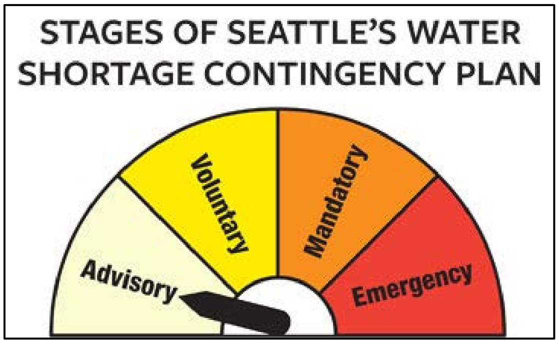
1. General Public
    - City of Seattle community centers
    - City of Seattle libraries
    - City of Seattle neighborhood service centers
    - City of Seattle Department of Neighorhoods
    - SPU community advisory committee
    - Community events
    - Farmers markets
    - Multifamily property management associations
    - Churches
2. Irrigation Community
    - Area parks and recreation departments
    - Schools (if shortage occurs during the school year when irrigation of ballfields is most likely)
    - Prominent nurseries
    - Professional landscape/nursery organizations
    - Garden Hotline
    - 3rd billing tier customers (assumed to be high irrigation users)
3. Large Users (other than irrigation community)
    - SPU key services account representatives
4. Business Community
    - Chambers of commerce
    - Business improvement districts
    - Commerical building operator associations
    - Hotel and restaurant association(s)
    - City of Seattle Office of Economic Development
5. Environmental Community
6. Non-English Speakers
    - Ethnic organizations
    - SPU affinity groups
7. City of Seattle Employees

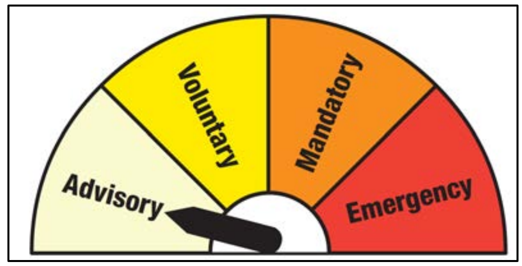
Tools

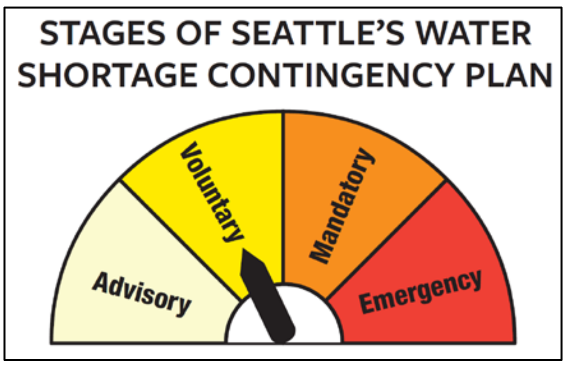
There are a variety of tools that can be used for the communication and outreach efforts. Tools used, or considered, for previous WSCP implementations are show below. The list includes both paid and "earned" media. Note that tools may change over time, expecially as changes occur in technology and customers' preferences.

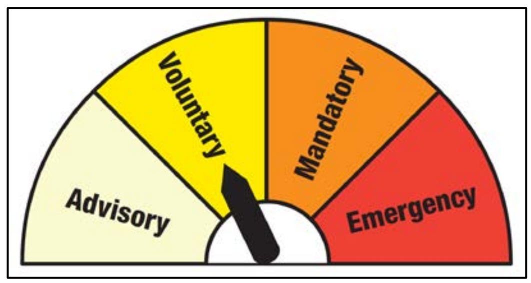
1. 4-Stages graphic
2. Utility website
3. Tips/restrictions flyer
4. Regular utility publication (bills, bill inserts, newsletters, etc)
5. Press release
6. FAQ
7. Print ad
8. Television ad
9. Radio ad
10. Web ad
11. Social media posting (Facebook, Twitter, Nextdoor, blogs, etc)
12. Signage (building, vehicle, park, etc)
13. Email
14. Letter/postcard
15. Phone call
16. Presentation at meeting
17. Industry newsletter
18. Drought message in email signature line
19. Recording for on-hold callers to utility customer service phone number

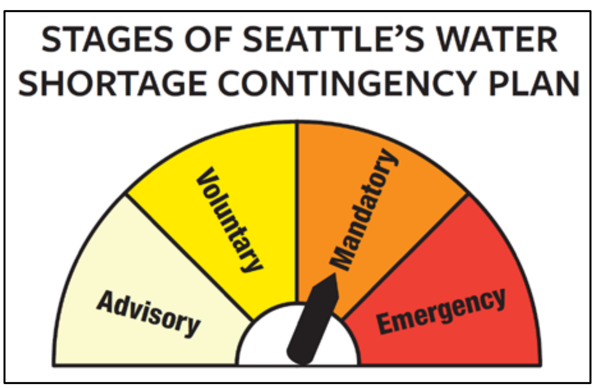
4-Stages Graphic (Branded for Seattle and unbranded for others)

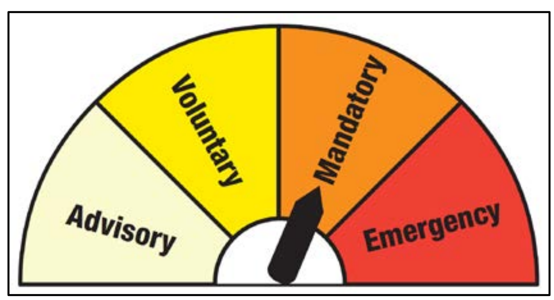




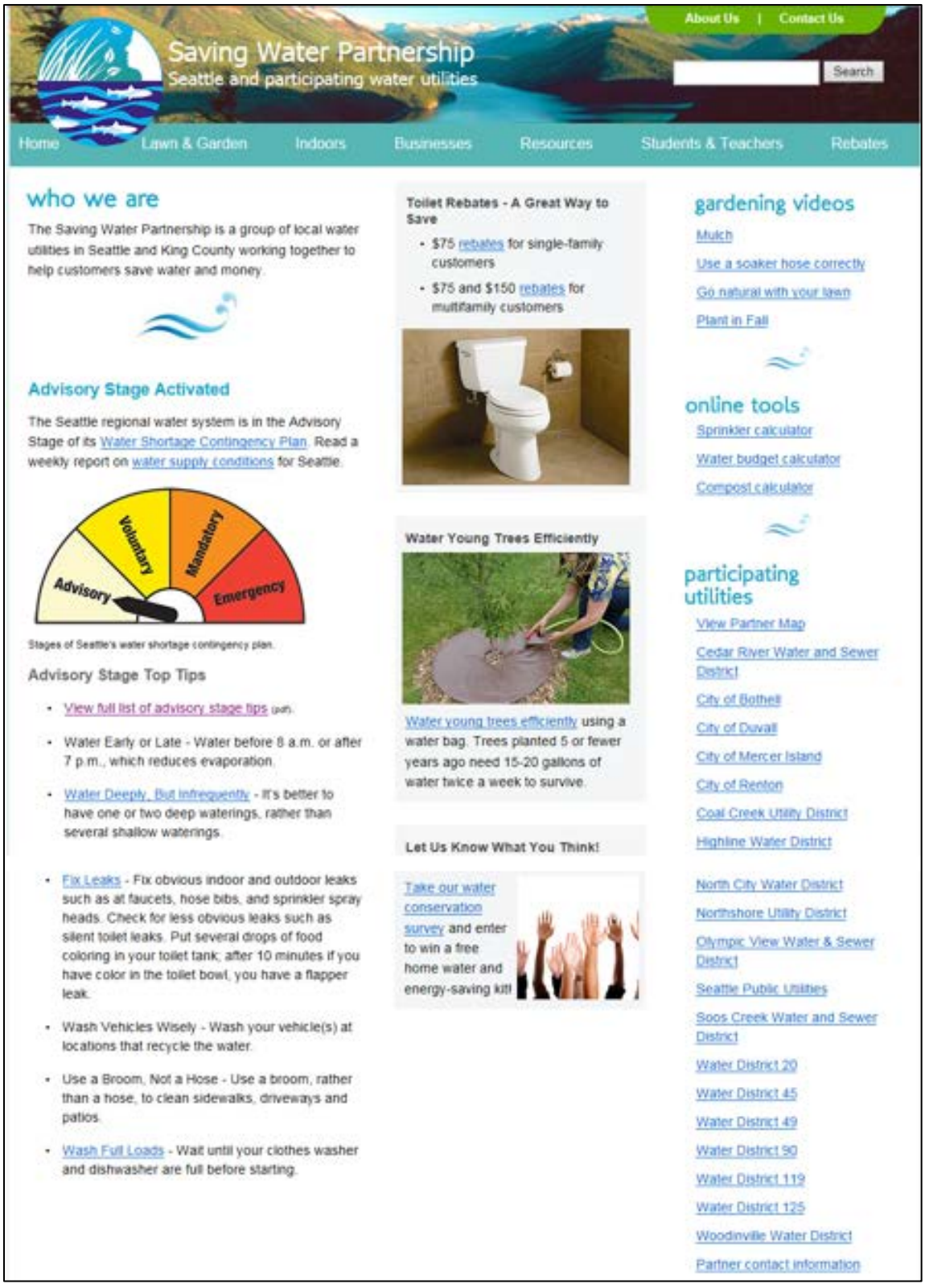








Website


About Us | Contact Us
Saving Water Partnership
Seattle and participating water utilities
Search
Home
Lawn & Garden
Indoors
Businesses
Resources
Students & Teachers
Rebates
who we are
The Saving Water Partnership is a group of local water utilities in Seattle and King County working together to help customers save water and money.
Advisory Stage Activated
The Seattle regional water system is in the Advisory Stage of its Water Shortage Contingency Plan. Read a weekly report on water supply conditions for Seattle.
Advisory
Voluntary
Mandatory
Emergency
Stages of Seattle's water shortage contingency plan.
Advisory Stage Top Tips
View full list of advisory stage tips (pdf).
Water Early or Late - Water before 8 a.m. or after 7 p.m., which reduces evaporation.
Water Deeply, But Infrequently - It's better to have one or two deep waterings, rather than several shallow waterings.
Fix Leaks - Fix obvious indoor and outdoor leaks such as at faucets, hose bibs, and sprinkler spray heads. Check for less obvious leaks such as silent toilet leaks. Put several drops of food coloring in your toilet tank; after 10 minutes if you have color in the toilet bowl, you have a flapper leak.
Wash Vehicles Wisely - Wash your vehicle(s) at locations that recycle the water.
Use a Broom, Not a Hose - Use a broom, rather than a hose, to clean sidewalks, driveways and patios.
Wash Full Loads - Wait until your clothes washer and dishwasher are full before starting.
Toilet Rebates - A Great Way to Save
$75 rebates for single-family customers
$75 and $150 rebates for multifamily customers
Water Young Trees Efficiently
Water young trees efficiently using a water bag. Trees planted 5 or fewer years ago need 15-20 gallons of water twice a week to survive.
Let Us Know What You Think!
Take our water conservation survey and enter to win a free home water and energy-saving kit!
gardening videos
Mulch
Use a soaker hose correctly
Go natural with your lawn
Plant in Fall
online tools
Sprinkler calculator
Water budget calculator
Compost calculator
participating utilities
View Partner Map
Cedar River Water and Sewer District
City of Bothell
City of Duvall
City of Mercer Island
City of Renton
Coal Creek Utility District
Highline Water District
North City Water District
Northshore Utility District
Olympic View Water & Sewer District
Seattle Public Utilities
Soos Creek Water and Sewer District
Water District 20
Water District 45
Water District 49
Water District 90
Water District 119
Water District 125
Woodinville Water District
Partner contact information

Tips Flyer (Voluntary Stage; co-branded for SPU, Everett & Tacoma)

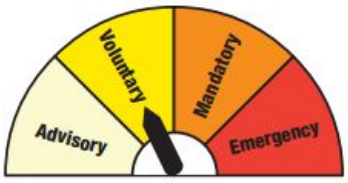
VOLUNTARY STAGE TOP TIPS

Seattle Public Utilities

EVERETT

TACOMA WATER
TACOMA PUBLIC UTILITIES

STAGES OF WATER SHORTAGE CONTINGENCY PLAN



Seattle, Everett and Tacoma are asking customers to voluntarily reduce water use by 10 percent. We are working together to help manage water supplies for people and fish during this unprecedented hot and dry weather and higher-than-normal water use. Here are some great tips to help you achieve that 10% reduction. For more information visit www.savingwater.org.

Please consider doing the following:

Outdoors Tips

- Let your lawn go dormant and limit plant watering to twice a week.
- Water plants before 8am (best) or after 7pm.
- Wash your vehicle(s) at locations that recycle the water.
- Do only essential pressure washing.
- Minimize refilling swimming pools and hot tubs.
- Turn off water features.
- Fall is the best time for planting.

More Outdoor Tips click below
www.savingwater.org/LawnGarden/index.htm

Limit plant watering to twice a week.

Water plants before 8am (best) or after 7pm.

Indoors Residential Tips

- Reduce your showering time.
- Check for and fix leaks.
- Wash only full loads of laundry and dishes.
- Turn off the tap while brushing your teeth or shaving.
- Don't pre-rinse dishes.
- If purchasing fixtures/equipment, choose water-efficient models.

More Indoor Residential Tips click below
www.savingwater.org/Indoors/index.htm

Reduce your showering time.

Wash only full loads of laundry and dishes.

Indoors Businesses Tips

- Encourage reduced showering times at your facilities.
- Serve water only on request.
- Check for and fix leaks.
- Wash only full loads of laundry and dishes.
- Provide new towels only on request.
- Check cooling towers for overflow and excessive blowdown.
- If purchasing fixtures/equipment, choose water-efficient models.

More Indoor Business Tips click below
www.savingwater.org/Businesses/index.htm

Serve water only on request.

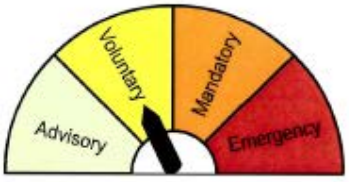
8/10/15

Tips Flyer (Voluntary Stage; branded by wholesale customer)

Voluntary Stage Top Tips

Woodinville Water District
17238 NE Woodinville-Duvall Rd
P O Box 1390
Woodinville WA 98072
(425) 487-4100

STAGES OF WATER SHORTAGE CONTINGENCY PLAN



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www.savingwater.org/LawnGarden/index.htm

Indoors Residential Tips

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- Don't pre-rinse dishes.
- If purchasing fixtures/equipment, choose water-efficient models.

More Indoor Residential Tips click below
www.savingwater.org/Indoors/index.htm

Indoors Businesses Tips

- Encourage reduced showering times at your facilities.
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- Check for and fix leaks.
- Wash only full loads of laundry and dishes.
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More Indoor Business Tips click below
www.savingwater.org/Businesses/index.htm


limit plant watering to twice a week.


Water plants before 8am (best) or after 7pm.


reduce your showering time.


Wash only full loads of laundry and dishes.


Serve water only on request.

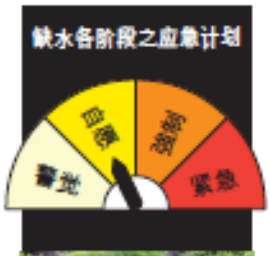
8/10/15

Tips Flyer (Voluntary Stage; translated; co-branded for SPU, Everett & Tacoma)

VOLUNTARY STAGE TOP TIPS
自願性階段省水妙招

Seattle, Everett and Tacoma are asking customers to voluntarily reduce water use by 10 percent. We are working together to help manage water supplies for people and fish during this unprecedented hot and dry weather and higher-than-normal water use. Here are some great tips to help you achieve that 10% reduction. For more information visit www.savingwater.org.

西雅图，埃弗雷特市 (Everett) 和塔克玛市 (Tacoma) 请求各用户自愿性地减少 10% 的用水。 我们正面临史无前例的干热天气，以及比平常更高的用水需求，我们需要合作管理，以满足居民和鱼类的需要。 以下为您列出一些能达到省水 10% 的妙招。 欲进一步了解，请参考以下网站：www.savingwater.org.



Please consider doing the following:

Outdoors Tips

- Let your lawn go dormant and limit plant watering to twice a week.
- Water plants before 8am (best) or after 7pm.
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- Do only essential pressure washing.
- Minimize refilling swimming pools and hot tubs.
- Turn off water features.
- Fall is the best time for planting.

More Outdoor Tips click below
www.savingwater.org/LawnGarden/index.htm


每周浇水限于两次。

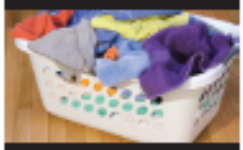

早上 8 点前（最佳时机）或晚上 7 点后再浇水。

Indoors Residential Tips

- Reduce your showering time.
- Check for and fix leaks.
- Wash only full loads of laundry and dishes.
- Turn off the tap while brushing your teeth or shaving.
- Don't pre-rinse dishes.
- If purchasing fixtures/equipment, choose water-efficient models.

More Indoor Residential Tips click below
www.savingwater.org/Indoors/index.htm


减少淋浴时间。


洗衣机和洗碗机满了才洗。

Indoors Businesses Tips

- Encourage reduced showering times at your facilities.
- Serve water only on request.
- Check for and fix leaks.
- Wash only full loads of laundry and dishes.
- Provide new towels only on request.
- Check cooling towers for overflow and excessive blowdown.
- If purchasing fixtures/equipment, choose water-efficient models.

More Indoor Business Tips click below
www.savingwater.org/Businesses/index.htm


客人提出要求时才送水。

请参考以下建议：

户外妙招

- 让您的草坪休眠，每周浇水限于两次。
- 早上 8 点前（最佳时机）或晚上 7 点后再浇水。
- 到能回收水的洗车站洗车。
- 不到必要时不用高压冲洗。
- 将游泳池和热水池换水的频率降到最低。
- 将景观水关掉。
- 秋天是种植的最佳时机。

更多户外省水妙招，请参考以下网站：
www.savingwater.org/LawnGarden/index.htm

室内居家妙招

- 减少淋浴时间。
- 检查和修理漏水的地方。
- 洗衣机和洗碗机都等到满了再开启。
- 刷牙和剃须时请把水关掉。
- 洗碗前不要预冲。
- 购买家具或家电时，选择有省水设计的产品。

更多室内居家省水妙招，请参考以下网站：
www.savingwater.org/Indoors/index.htm

室内商家妙招

- 鼓励客人在您的设施内减少淋浴时间。
- 客人提出要求时才送水。
- 检查和修理漏水的地方。
- 洗衣机和洗碗机都等到满了再开启。
- 客人提出要求时才提供新毛巾。
- 检查冷却水塔是否有溢出或过多的蒸气排放。
- 购买家具或家电时，选择有省水设计的产品。

更多室内商家省水妙招，请参考以下网站：
www.savingwater.org/Businesses/index.htm

Seattle Public Utilities

Free interpretation available. (206) 684-3000
若需免费口译之服务，请拨打 (206) 684-3000

Simplified Chinese 6/18/15

Regular Utility Publication (SPU "@ Your Service" utility bill insert Sept-Oct)

Seattle Public Utilities

September - October

@Your SERVICE

Information about your water, drainage, wastewater and solid waste utility services.

The record breaking hot summer has left many Seattle residents looking forward to fall and winter rains. Until those steady rains return, Seattle Public Utilities asks that you manage your water use thoughtfully by doing the following:

- Put two inches of mulch on planting beds and around trees.
- If you are still watering outdoors, do so before 8 a.m. or after 7 p.m.
- Wash only full loads of laundry and dishes.
- Wash vehicles only at a location that recycles water.
- Use a broom – not a hose to clean decks, patios, driveways and sidewalks.
- Turn off the tap while brushing your teeth or shaving.
- Fix leaking toilets and dripping sinks.

For more tips on using water wisely, visit www.savingwater.org.

Using Water Carefully Benefits Salmon

What do salmon and saving water have to do with each other? Conserving water in the summer and fall helps leave water in the rivers for salmon and wildlife. Your actions can help save money on your water bill and protect salmon and their freshwater habitat. You can see your efforts pay off when salmon make their annual migration home to our local streams. Find out when and where salmon are returning by visiting **www.kingcounty.gov/salmon** and clicking on "**Salmon SEEson.**"

See Salmon at Carkeek Park

See the hundreds of chum salmon return to Piper's Creek in Carkeek Park. Join volunteers from the Salmon Stewards program Saturdays and Sundays, November 7 – December 6, from 11 a.m. to 2 p.m and learn how you can help keep salmon habitat healthy. There will be children's activities, food, hot drinks, and music at the Piper's Creek Salmon Celebration, Friday, November 27, from 11 a.m. to 1 p.m.

Visit **www.seattle.gov/protectourwaters** to learn more.

Questions? Email Bill Malatinsky at **bill.malatinsky@seattle.gov** or call 206-684-5999 or visit **http://bit.ly/SalmonStewards**

Fall Garden and Landscaping Water Conservation Tips

Fall is an ideal time to prepare your landscape and garden for next year.

- Add 2 to 3 inches of mulch (fall leaves, woodchips or compost) to the surface of bare soils. Mulch helps protect plant roots during freezing weather.
- Turn off your automatic sprinkler system. Watering your plants in the fall can delay them from preparing for dormancy, making them more susceptible to early freezes.
- Plant new trees, shrubs or perennials! Cooler air and warm soil help plants develop strong roots ahead of our dry summers.

Gardening questions?

Contact the Garden Hotline at (206) 633-0224 or email from **www.gardenhotline.org**.

Go to **www.savingwater.org** for a compost calculator, fall planting video and much more.

Green Seattle Day

Join us for the 10th Annual Green Seattle Day on Saturday, November 7 to plant the future forest of Seattle in your favorite park! This will be a celebration of Seattle's urban forest and everyone can help! Help us to plant trees and other plants in parks throughout the City, to keep Seattle healthy and green into the future. For more information and to sign up, visit us at **www.greenseattle.org**, or call (206) 905-6943.

Regular Utility Publication (SPU "Curb Waste & Conserve" newsletter Fall)

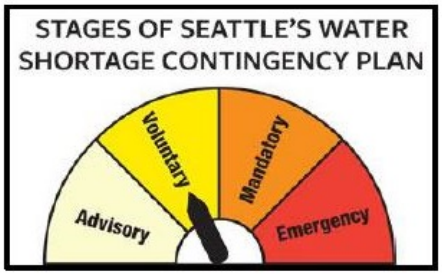
Print Ads (Seattle Times)

Signage (Kitchens in many City of Seattle buildings)

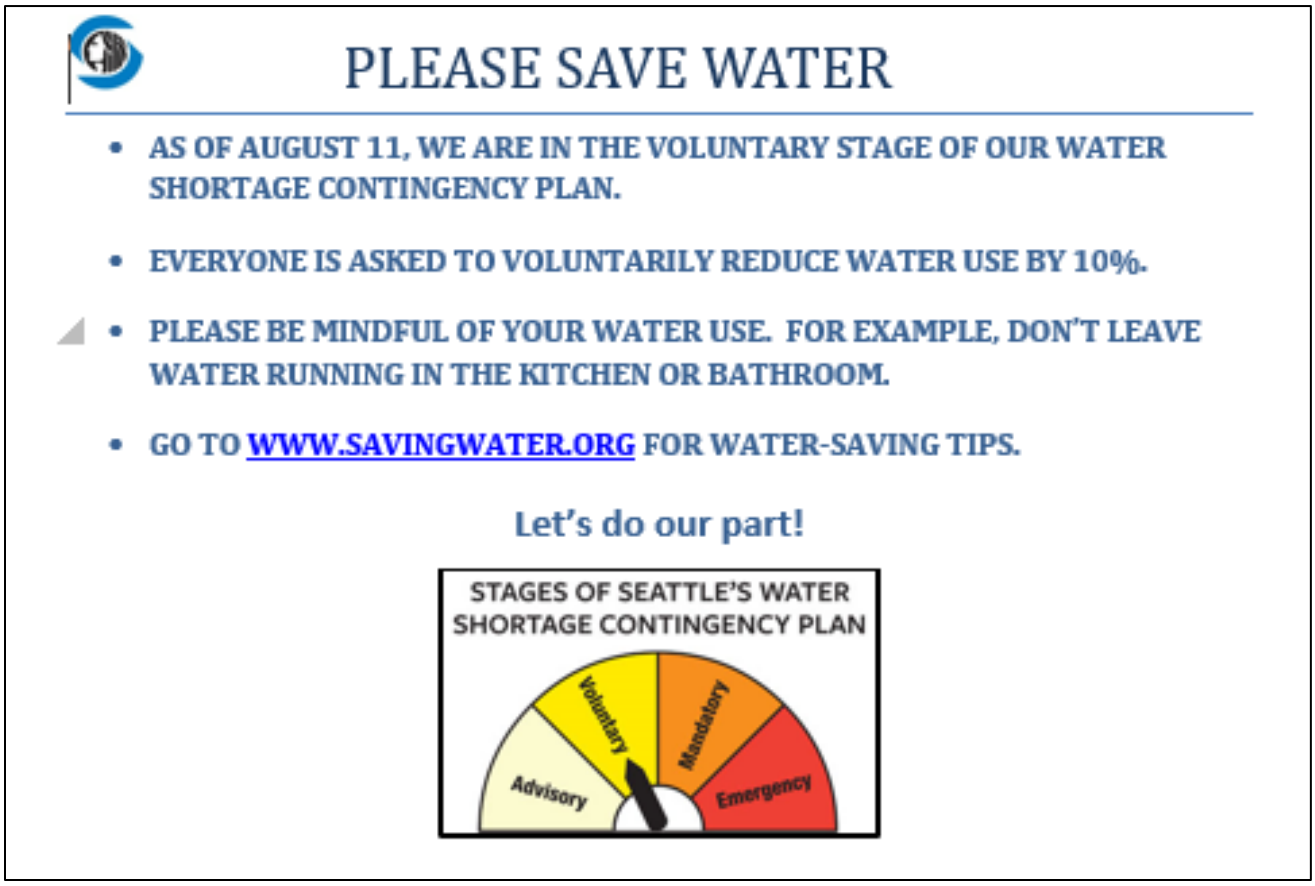
REMINDER TO CITY EMPLOYEES

- **AS OF AUGUST 11, WE ARE IN THE VOLUNTARY STAGE OF OUR WATER SHORTAGE CONTINGENCY PLAN.**
- **EVERYONE IS ASKED TO VOLUNTARILY REDUCE WATER USE BY 10%.**
- **PLEASE BE MINDFUL OF YOUR WATER USE. FOR EXAMPLE, DON'T LEAVE WATER RUNNING IN THE KITCHEN OR BATHROOM.**
- **GO TO WWW.SAVINGWATER.ORG FOR WATER-SAVING TIPS.**

Our customers are stepping up to the plate.....let's do our part!



Signage (Doors of many City of Seattle buildings)



Signage (Lobbies of many City of Seattle buildings)

Signage (City Hall and Municipal Court fountains)

Signage (Wholesale customer building)

Appendix E – Potential Customer Demand Reduction Actions

Potential Customer Demand Reduction Actions[1] (See the footnotes to understand how to use this list)									
#	End Use[2]	Behavior vs Hardware[3]	WSCP Stage[4]	Indoor vs Outdoor[5]	Season[6]	Sector[7]	Demand Reduction Action[8]	Enforce[9]	Potential Exemption[10]
1	Clothes Washing	Behavior	N/A - Conservation	Indoor	Year Round	NR	**Towels On Request:** Provide new towels only on request.	No	
2	Clothes Washing	Hardware	N/A - Conservation	Indoor	Year Round	SF & MF	**Efficient Clotheswashers:** If buying a new clotheswasher, select a water-efficient model. Clotheswashers are the second largest water users in homes.	No	
3	Clothes Washing & Dish Washing	Behavior	N/A - Conservation	Indoor	Year Round	All	**Wash Full Loads:** Wash only full loads of laundry and dishes.	No	
4	Cooling Towers	Behavior	N/A - Conservation	Indoor	Year Round	NR	**Check Cooling Towers:** Check cooling towers for overflow and excessive blowdown.	No	
5	Dish Washing	Behavior	N/A - Conservation	Indoor	Year Round	SF & MF	**Don't Pre-Rinse Dishes:** Don't pre-rinse dishes unless heavily soiled. Most new dishwashers don't require pre-rinsing.	No	
6	Faucets	Behavior	N/A - Conservation	Indoor	Year Round	SF & MF	**Turn Off Tap:** Turn off the tap while brushing your teeth or shaving.	No	
7	Faucets	Behavior	N/A - Conservation	Indoor	Year Round	All	**Minimize Garbage Disposal:** Put food waste in your compost bin, rather than using your garbage disposal.	No	
8	Faucets	Behavior	N/A - Conservation	Indoor	Year Round	NR	**Thaw in Fridge:** Thaw frozen food in the refrigerator, rather than under running water.	No	

Potential Customer Demand Reduction Actions[1] (See the footnotes to understand how to use this list)									
#	End Use[2]	Behavior vs Hardware[3]	WSCP Stage[4]	Indoor vs Outdoor[5]	Season[6]	Sector[7]	Demand Reduction Action[8]	Enforce[9]	Potential Exemption[10]
9	Faucets	Hardware	N/A - Conservation	Indoor	Year Round	SF & MF	**Efficient Faucets:** Replace older bathroom faucet aerators with WaterSense models, which use far less water. (Note: There are different flow rates for residential vs non-residential. This is the residential version.)	No	
10	Faucets	Hardware	N/A - Conservation	Indoor	Year Round	NR	**Efficient Faucets:** Replace older bathroom faucet aerators with newer, more-efficient models that use 0.5/1.0 gallon per minute or less. (Note: There are different flow rates for residential vs non-residential. This is the non-residential version.)	No	
11	Faucets	Behavior	Voluntary	Indoor	Year Round	NR	**Water On Request:** Serve water only on request, and then ask before refilling.	No	
12	Fire Lines	Behavior	Mandatory	Indoor	Year Round	NR	**No Fire Line Testing:** Fire line testing within buildings is prohibited. (Note: Confirm w/ Fire Department this is reasonable.)	No	Yes
13	Hose	Behavior	N/A - Conservation	Outdoor	Year Round	All	**Use a Broom Not Hose:** Use a broom, rather than a hose, to clean sidewalks, driveways, and patios.	No	
14	Hose	Behavior	N/A - Conservation	Outdoor	Year Round	All	**Hose Shut-Offs:** Never leave a hose running; always use a shut-off nozzle.	No	
15	Hose	Behavior	Mandatory	Outdoor	Year Round	All	**No Hose Washing:** Using a hose to clean sidewalks, driveways, and patios is prohibited. Use a broom instead.	Yes	Yes

Potential Customer Demand Reduction Actions[1] (See the footnotes to understand how to use this list)									
#	End Use[2]	Behavior vs Hardware[3]	WSCP Stage[4]	Indoor vs Outdoor[5]	Season[6]	Sector[7]	Demand Reduction Action[8]	Enforce[9]	Potential Exemption[10]
16	Irrigation - Frequency	Behavior	N/A - Conservation	Outdoor	Summer	All	**Water Deeply, But Infrequently:** It's better to have one or two deep waterings, rather than several shallow waterings.	No	
17	Irrigation - Frequency	Behavior	Voluntary	Outdoor	Summer	All	**Eliminate One Watering Day:** Cut one day from your typical weekly watering schedule (except for young trees as noted elsewhere). (Note: The similar "Water X Times A Week Maximum" series might be preferred wording, but this is included as an option.)	No	
18	Irrigation - Frequency	Behavior	Voluntary	Outdoor	Summer	All	**Eliminate Two Watering Days:** Cut two days from your typical weekly watering schedule (except for young trees as noted elsewhere). (Note: The similar "Water X Times A Week Maximum" series might be preferred wording, but this is included as an option.)	No	
19	Irrigation - Frequency	Behavior	Voluntary	Outdoor	Summer	All	**Eliminate Three Watering Days:** Cut three days from your typical weekly watering schedule (except for young trees as noted elsewhere). (Note: The similar "Water X Times A Week Maximum" series might be preferred wording, but this is included as an option.)	No	
20	Irrigation - Frequency	Behavior	Voluntary	Outdoor	Summer	All	**Water Twice A Week Maximum:** Limit plant watering to twice a week.	No	

Potential Customer Demand Reduction Actions[1] (See the footnotes to understand how to use this list)									
#	End Use[2]	Behavior vs Hardware[3]	WSCP Stage[4]	Indoor vs Outdoor[5]	Season[6]	Sector[7]	Demand Reduction Action[8]	Enforce[9]	Potential Exemption[10]
21	Irrigation - Frequency	Behavior	Voluntary	Outdoor	Summer	All	**Water Once A Week Maximum:** Limit plant watering to once a week (except for young trees as noted elsewhere).	No	
22	Irrigation - Frequency	Behavior	Mandatory	Outdoor	Summer	All	**Water Twice A Week Maximum:** Plant watering is only allowed twice a week, in accordance with the published schedule by address.	Yes	
23	Irrigation - Frequency	Behavior	Mandatory	Outdoor	Summer	All	**Water Once A Week Maximum:** Plant watering is only allowed once a week, in accordance with the published schedule by address.	Yes	
24	Irrigation - Method	Behavior	N/A - Conservation	Outdoor	Summer	All	**Tune Up Automatic Systems:** Do an efficiency tune up of your automatic irrigation system such as fixing overspray onto sidewalks and ensuring sprinkler heads reach adjacent sprinkler heads.	No	
25	Irrigation - Method	Behavior	N/A - Conservation	Outdoor	Summer	All	**Get Water to the Roots:** Use soaker hoses, drip irrigation, or watering wands to deliver water where it's needed.	No	
26	Irrigation - Method	Behavior	N/A - Conservation	Outdoor	Summer	All	**Water Young Trees Efficiently:** Water young trees efficiently using a water bag. Trees planted 5 or fewer years ago need 15-20 gallons of water twice a week to thrive.	No	

Potential Customer Demand Reduction Actions[1] (See the footnotes to understand how to use this list)									
#	End Use[2]	Behavior vs Hardware[3]	WSCP Stage[4]	Indoor vs Outdoor[5]	Season[6]	Sector[7]	Demand Reduction Action[8]	Enforce[9]	Potential Exemption[10]
27	Irrigation - Method	Behavior	Voluntary	Outdoor	Summer	All	**Water Young Trees Efficiently:** Water young trees efficiently using a water bag. Trees planted 5 or fewer years ago need 15-20 gallons of water once a week to survive. (Note: This is only appropriate if the maximum temperatures are in the low 70s w/ occasional showers and not peak daylight hours.)	No	
28	Irrigation - Method	Hardware	N/A - Conservation	Outdoor	Summer	All	**Upgrade Automatic Systems:** Consider efficiency upgrades to your automatic irrigation system such as weather-based or soil-based controllers.	No	
29	Irrigation - Method	Behavior	Mandatory	Outdoor	Summer	All	**No Automatic Irrigation:** Use of automatic irrigation systems is prohibited. Watering by hand, soaker hose, and/or drip irrigation is allowed.	Yes	Yes
30	Irrigation - Other	Hardware	N/A - Conservation	Outdoor	Summer	All	**2 Inches of Mulch:** Put 2 inches of mulch on planting beds and around trees, which reduces evaporation. Keep the mulch a hands-width away from the trunk.	No	
31	Irrigation - Other	Behavior	Mandatory	Outdoor	Summer	All	**No Irrigation:** Irrigation is prohibited.	Yes	Yes
32	Irrigation - Plant Material	Behavior	N/A - Conservation	Outdoor	Summer	All	**Mow High**: Set your lawn mower blade to cut grass 2 inches high, which reduces evaporation.	No	

Potential Customer Demand Reduction Actions[1] (See the footnotes to understand how to use this list)									
#	End Use[2]	Behavior vs Hardware[3]	WSCP Stage[4]	Indoor vs Outdoor[5]	Season[6]	Sector[7]	Demand Reduction Action[8]	Enforce[9]	Potential Exemption[10]
33	Irrigation - Plant Material	Behavior	Voluntary	Outdoor	Summer	SF & MF	**Let Lawn Go Dormant:** If your lawn isn't already dormant (brown), let it go dormant until the fall rains return. Just water deeply once each month to keep roots alive.	No	
34	Irrigation - Plant Material	Hardware	Voluntary	Outdoor	Summer	All	**Plant in Fall:** Consider delaying new plantings. Fall is the best time for planting new trees, shrubs and perennials, since rain provides natural irrigation.	No	
35	Irrigation - Plant Material	Behavior	Mandatory	Outdoor	Summer	All	**No Lawn Watering:** Watering of lawns is prohibited.	Yes	Yes
36	Irrigation - Timing	Behavior	N/A - Conservation	Outdoor	Summer	All	**Water Early or Late:** Water before 8am or after 7pm, which reduces evaporation.	No	
37	Irrigation - Timing	Behavior	Mandatory	Outdoor	Summer	All	**Water Early or Late:** Watering between 8am and 7pm is prohibited, due to high evaporation.	Yes	
38	Kitchen	Hardware	N/A - Conservation	Indoor	Year Round	NR	**Commercial Kitchen Equipment:** If buying new food steamers, dishwashers, or ice machines, select water-efficient models.	No	
39	Leaks	Behavior	N/A - Conservation	Outdoor	Summer	All	**Fix Leaks:** Check for and fix outdoor leaks, such as at hose bibs, spray heads, valves, and broken pipes.	No	

Potential Customer Demand Reduction Actions[1] (See the footnotes to understand how to use this list)									
#	End Use[2]	Behavior vs Hardware[3]	WSCP Stage[4]	Indoor vs Outdoor[5]	Season[6]	Sector[7]	Demand Reduction Action[8]	Enforce[9]	Potential Exemption[10]
40	Leaks	Behavior	N/A - Conservation	Indoor	Year Round	SF & MF	**Fix Leaks:** Check for and fix indoor leaks, such as at faucets. Also, check your toilets for silent leaks. Put several drops of food coloring in your toilet tank. After 10 minutes, if you have color in the toilet bowl, you have a flapper leak. (Note: For the non-residential sector, specify for "tank" toilets for the toilet check.)	No	
41	Other	Behavior	N/A - Conservation	Indoor	Year Round	NR	**Equipment Not in Use:** Turn off water-using equipment when not in use, including dishwashers, garbage disposals, and food troughs.	No	
42	Other	Behavior	N/A - Conservation	Both	Year Round	NR	**Employee Awareness:** Increase employee awareness about using water wisely and encourage their suggestions.	No	
43	Other	Hardware	N/A - Conservation	Indoor	Year Round	NR	**Other Water-Using Equipment:** Consider upgrading any other water-using equipment to models that are more efficient.	No	
44	Pools & Hot Tubs	Behavior	N/A - Conservation	Outdoor	Year Round	All	**Pool & Hot Tub Covers:** Use covers on swimming pools and hot tubs when not in use to reduce evaporation.	No	
45	Pools & Hot Tubs	Behavior	Voluntary	Outdoor	Year Round	All	**Minimize Filling Pools & Hot Tubs:** Minimize refilling swimming pools and hot tubs.	No	
46	Pools & Hot Tubs	Behavior	Mandatory	Outdoor	Year Round	All	**No Pools & Hot Tubs:** Filling swimming pools and hot tubs is prohibited. (Note: Add a statement about safety around empty pools/tubs.)	Yes	Yes

Potential Customer Demand Reduction Actions[1] (See the footnotes to understand how to use this list)									
#	End Use[2]	Behavior vs Hardware[3]	WSCP Stage[4]	Indoor vs Outdoor[5]	Season[6]	Sector[7]	Demand Reduction Action[8]	Enforce[9]	Potential Exemption[10]
47	Pressure Washing	Behavior	Voluntary	Outdoor	Year Round	All	**Minimize Pressure Washing:** Do only essential pressure washing.	No	
48	Pressure Washing	Behavior	Mandatory	Outdoor	Year Round	All	**No Pressure Washing:** Pressure washing is prohibited.	Yes	Yes
49	Showers	Hardware	N/A - Conservation	Indoor	Year Round	All	**Efficient Showerheads:** Replace older showerheads with WaterSense models, which use far less water.	No	
50	Showers	Behavior	Voluntary	Indoor	Year Round	SF & MF	**Shorter Showers (a):** Reduce your showering time. (Note: This was the "shorter showers" action that was promoted during the 2015 WSCP implementation.)	No	
51	Showers	Behavior	Voluntary	Indoor	Year Round	SF & MF	**Shorter Showers (b):** Reduce your showering time by one minute.	No	
52	Showers	Behavior	Voluntary	Indoor	Year Round	SF & MF	**Shorter Showers (c):** Reduce your showering time, by two minutes.	No	
53	Showers	Behavior	Voluntary	Indoor	Year Round	SF & MF	**Shorter Showers (d):** Limit showers to five minutes or less.	No	
54	Toilets	Hardware	N/A - Conservation	Indoor	Year Round	All	**Efficient Toilets:** If buying a new toilet, look for a WaterSense or Premium WaterSense model, which use far less water than older models. Toilets are the largest water users in homes. (Note: For the non-residential sector, add urinals.)	No	
55	Toilets	Behavior	Mandatory	Indoor	Year Round	SF & MF	**Less Toilet Flushing:** Flush your toilet less often. As the saying goes, "If it's yellow, let it mellow." Toilet flushing is the largest water use inside the home.	No	

Potential Customer Demand Reduction Actions[1]

(See the footnotes to understand how to use this list)

#	End Use[2]	Behavior vs Hardware[3]	WSCP Stage[4]	Indoor vs Outdoor[5]	Season[6]	Sector[7]	Demand Reduction Action[8]	Enforce[9]	Potential Exemption[10]
56	Vehicle Washing	Behavior	N/A - Conservation	Outdoor	Year Round	All	**Wash Vehicles Wisely:** Wash your vehicle(s) at locations that recycle the water.	No	
57	Vehicle Washing	Behavior	Voluntary	Outdoor	Year Round	All	**Minimize Vehicle Washing:** Reduce the frequency of, or eliminate, washing vehicles.	No	
58	Vehicle Washing	Behavior	Mandatory	Outdoor	Year Round	All	**No Vehicle Washing:** Washing of vehicles is prohibited, unless at a location that recycles the water.	Yes	Yes
59	Water Feature	Behavior	Voluntary	Outdoor	Year Round	All	**Turn Off Water Features (a):** Turn off non-recirculating water features such as fountains.	No	
60	Water Feature	Behavior	Voluntary	Outdoor	Year Round	All	**Turn Off Water Features (b):** Turn off all water features such as fountains. (Note: This was the "turn off water features" action that was promoted during the 2015 WSCP implementation.)	No	
61	Water Feature	Behavior	Mandatory	Outdoor	Year Round	All	**No Water Features (a):** Use of non-recirculating decorative water features such as fountains is prohibited.	Yes	
62	Water Feature	Behavior	Mandatory	Outdoor	Year Round	All	**No Water Features (b):** Use of decorative water features such as fountains is prohibited.	Yes	

1. This is a list of potential actions that customers can take to reduce their water use. The actual actions requested/required for each stage will depend on the severity, likely duration, and timing of the shortage, as well as the demand reduction needed. The list is in Excel, to allow for sorting and filtering, which should help develop the actual list of actions to be implemented. The list is sorted by 1) end use, 2) behavior vs hardware, 3) WSCP stage.

2. The end use is how the water is being used and is typically a type of water-using fixture/equipment (e.g., showers).

3. The requested/required list of actions should include both hardware and behavior actions in order to: 1) increase the demand reduction potential, 2) ensure every customer type has actions they can do, and 3) minimize the cost to participate. For example, since some customers do not have control

Potential Customer Demand Reduction Actions[1] (See the footnotes to understand how to use this list)									
#	End Use[2]	Behavior vs Hardware[3]	WSCP Stage[4]	Indoor vs Outdoor[5]	Season[6]	Sector[7]	Demand Reduction Action[8]	Enforce[9]	Potential Exemption[10]

over their water-using hardware, it is important to make sure they have behavior actions. Similarly, since behavior actions are typically free, it is important to include many of them.

4. The stage designation is a suggestion, but may be appropriate to change due to circumstances of a particular shortage. Note the following about the stage designations:
   - **N/A - Conservation:** None of the actions are designated as Advisory since that stage is internally focused and is not intended to include outreach to customers. However, some actions are identified as Conservation for two reasons. First, if the public/press become aware that SPU has activated the WSCP (at the Advisory Stage level), SPU may be asked to provide suggested customer actions. In that case, the Conservation actions (things SPU recommends continually and do not involve customer sacrifice) would be appropriate. Second, many of the Conservation actions can be promoted in the higher stages since some customers may choose not to follow these recommendations and, thus, while technically conservation actions, can be used as curtailment actions.
   - **Voluntary/Mandatory:** The Voluntary and Mandatory actions are true curtailment.
   - **Emergency**: No Emergency actions are identified, however they would likely be the Mandatory actions, without most exemptions.
5. The requested/required list of actions should include both indoor and outdoor actions in order to: 1) increase the demand reduction potential, and 2) ensure every customer type has actions they can do. For example, since apartment dwellers won't be able to implement most outdoor actions, it is important to make sure there is a sufficient number of indoor actions for them.
6. The seasonality of the action is important to consider in regards to the timing of the shortage. For example, if the shortage does not occur during the summer, it is unlikely that the Summer actions (mostly irrigation-related) would be useful.
7. SF = single family; MF = multifamily; NR = non-residential (commercial, industrial, institutional). The requested/required list of actions should include options for all sectors in order to: 1) increase the demand reduction potential, and 2) ensure every customer type has actions they can do.
8. The specific language for each measure has been carefully crafted, based on previous implementations of the WSCP. However, the language is still just a suggestion and can be edited for many reasons including length. Note that some end uses have several, similar sounding actions. In some cases, it is to provide options for the team to consider (e.g., the number of days to restrict irrigation to). In other cases, it is to provide actions for several stages (e.g., minimize vehicle washing for voluntary and prohibit vehicle washing in mandatory.)
9. The column indicates whether SPU would likely enforce the action. Enforcement is only applicable to the Mandatory (and the eventual Emergency) actions. Outdoor actions are typically stronger candidates for enforcement, compared to indoor actions, since SPU staff can more readily see outdoor water uses (e.g., irrigation, hose use, car washing, etc.).
10. Some Mandatory (and the eventual Emergency) actions will have exemptions associated with them, such as for irrigation restrictions. This column indicates a potential exemption. See a separate appendix for more details regarding exemptions.

Appendix F – Utility Customer Outreach Checklist

This checklist is intended to be used by every utility that is part of the Seattle Water Supply System (wholesale customers of SPU) during implementation of the Water Shortage Contingency Plan. The checklist differentiates between actions that SPU will perform on behalf of its wholesale customers and actions that each individual utility is responsible for.

Utility Name: _____

Check Box	Customer Outreach Action
SPU Does For the Region	
	Statewide Actions and Messaging: Coordinate with Ecology, Health, and Governor's Office.
	Tri-County Actions and Messaging: Coordinate with Tacoma and Everett, as needed.
	Seattle Water Supply System Actions and Messaging: Lead coordination of the Operating Board and the Conservation Technical Forum.
	Regional Press Release: Issue regional press releases to major media outlets (& conduct subsequent media interviews).
	Regional Traditional Media: Purchase regional traditional media ads such as tv, radio, print, as appropriate.
	Regional Drought Website: Host a website to serve as the main drought website. This would likely be www.savingwater.org, with a link to the SPU Water Supply page.
	Tips Flyer - Create: Create a flyer that helps customers: 1) understand there is a shortage situation and 2) understand ways to reduce their water use.
	Landscaping Community: Outreach to key landscaping community contacts including nurseries (e.g., Molbaks, Sky, Swansons), industry organizations (WALP, WSNLA), the Garden Hotline, and parks/recreation departments. For contacts that are in wholesale customers' service areas, SPU will coordinate the outreach with the appropriate wholesale customer.
Expected By Each Utility	
	Utility Websites: Post drought information prominently on the utility's homepage and link to the regional drought website.
	Tips Flyer - Utilize: Make the tips flyer readily available (e.g., on utility website, in utility lobby, distribute in public areas such as community centers, libraries, etc.).
	Utility Bill / Insert / Newsletter: Include drought messages in existing utility "publications" such as bills, bill inserts, newsletters, etc.
	Social Media: Include drought messages in any social media vehicles used by the utility such as Facebook, twitter, Next Door, etc.

	Signage: Post signage in appropriate locations (e.g., at utility buildings, on utility vehicles, in key locations in service area).
	Brief Staff: Brief utility staff regarding the drought, using the SPU-produced FAQ as one tool.
	Events: Highlight the drought message at any community events the utility is participating in.
Suggested For Each Utility	
	Key Customers: Contact key customers directly (e.g., large water users, significant irrigators, highest billing tier, etc.).
	Local Press Release: Issue press releases to local media outlets (& conduct subsequent media interviews).
	On-Hold Message: Put a drought message to the telephone "on hold" messages for customers.
	Email Signature Line: Add a drought message in the email signature for utility staff.

Appendix G – Potential Exemptions for Water Use Restrictions

This document provides a framework for developing and implementing exemptions to customer water use restrictions that are part of the Mandatory and Emergency stages of the WSCP.

Background

Water use restrictions are key components of the Mandatory and Emergency Stages of the WSCP. For some water use restrictions, exemptions for continued water use may be appropriate. Exemptions can be useful in balancing the need to reduce overall water demand with minimizing hardships imposed on customers and certain industries, as well as protecting health and safety. For example, in the Mandatory stage, SPU may prohibit irrigation for established plants, while allowing irrigation for newly planted landscapes because of their need for water to survive their establishment period.

The importance of exemptions, and effective implementation of them, was learned from the 1992 implementation of the WSCP, which advanced to the Mandatory Stage. Lawn watering was banned and initially there were no clear exemptions. Prohibiting lawn watering is a sensitive issue, and doing so without clear exemptions made the situation even more difficult. Both individual customers and the professional landscaping industry were extremely frustrated. SPU's long-term relationship with the landscape industry, which is important to advancing SPU's water, drainage, and solid waste goals, suffered as a result. One lesson learned from the 1992 drought was to minimize exemptions and to advertise them up front.

As described previously, the WSCP does not pre-identify specific demand reduction actions for each stage. Rather a comprehensive list of potential actions customers can take to reduce water use is provided in Appendix E. The actual actions requested or required for each stage will depend on the severity, likely duration, and timing of the shortage, as well as the demand reduction needed.

Similarly, the exact exemptions for the water use restrictions eventually selected for implementation in the Mandatory and Emergency Stages are not pre-identified. Rather this document provides a framework to be used during each implementation of the WSCP for how to develop and implement the restrictions.

Potential Exemptions

Potential exemptions that should be considered include, but are not limited to, the following:

- **Irrigation (Lines 29, 31 and 35 in Appendix E)**
    - Newly planted landscapes (Will need to define "new" which could be within 12 months, within the calendar year, or something else. For lawns, likely clarify that "new" does not include overseeding. Need to be clear that plantings done after restrictions are announced are not eligible unless done as part of a capital project and necessary for a function purpose such as slope stabilization rather than for aesthetics.)
    - Sports fields (because they contribute to physical and psychological benefits of children and adults, and can be dangerous if not kept watered)
    - Golf course tees and greens (restrictions would apply to the fairways)
    - High traffic turf in parks
    - Trees (because they cannot be quickly or inexpensively replaced)
    - Plant nurseries and garden centers watering plant inventory
    - Food crops
    - Disabled gardeners who cannot hand water (applicable to prohibition of automatic systems; likely do not publicize)
- **Vehicle Washing (Line 58 in Appendix E)**
    - Vehicle washing at a commercial car washing facility. (The default potential restriction for vehicle washing is "washing of vehicles is prohibited, unless at a location that recycles the water".) This potential exemption is essentially changing that restriction to be "washing of vehicles is prohibited, unless at a commercial facility" and is a recognition that the former might have a significant negative financial impact on car washes that do not recycle the water.
- **Pressure Washing (Line 48 in Appendix E)**
    - Pressure washing necessary to protect public health and safety (not for aesthetic purposes), such as washing downtown parks/sidewalks to clear trash, food, and human waste.
    - Pressure washing that is part of scheduled building rehabilitation, such as preparing a surface for painting.

- **Hose Washing (Line 15 in Appendix E)**
    - Hose washing necessary to protect public health and safety (not for aesthetic purposes), such as washing downtown parks/sidewalks to clear trash, food, and human waste.
- **Swimming Pools and Hot Tubs (Line 46 in Appendix E)**
    - Health care facilities such as hospital physical therapy pools
    - Commercial businesses where swimming pools or hot tubs are central to their business and shutting them down would have a significant negative financial impact.
    - Public swimming and wading pools, since they serve a large number of people and can offset the use of private, personal pools that serve a small number of people.
- **Fire Line Testing (Line 12 in Appendix E)**
    - Testing necessary to protect public health and safety.
- **Private Wells / Reclaimed Water**
    - Any use of water that is not from the public water system but is from private wells or reclaimed water. SPU does not have the authority to restrict use of these sources. SPU could encourage users to post signs to indicate that alternative sources of water are being used.

Development Process

The recommended process to develop and implement the exemptions is as follows:

- Once the water use restrictions have been determined, develop any associated exemptions. The development of the exemptions should include input from the impacted parties. This can be done through the Water Shortage Advisory Group and/or outreach to specific industries such as landscaping, car washing, and building management.
- Decide whether each exemption will require pre-approval by SPU.
- Develop the process and systems necessary for processing exemption requests.
    - Customer contacts SPU
        - Need to determine SPU contact
        - Need to determine submission method (e.g., email, phone, website)

        - Need to determine submission contents (e.g., name, address of water use, water account number, description of how they fit the exemption, any required proof)
    - Enter request into tracking system
        - Need to develop tracking system (e.g., Excel spreadsheet)
    - Determine whether request qualifies or not
        - Need to set criteria to be considered for qualifying exemptions, with some discretion on behalf of SPU (e.g., undue financial hardship, public health and safety, etc.).
        - Need to determine who can authorize exemptions (the primary contact or higher level?)
    - Notify customer of result
        - Need to determine notification method (e.g., email, phone, website)
        - Need to determine whether customer will be required to post notice of exemption from SPU.
- Publicize the exemptions and the process to request an exemption when the restrictions are announced, including noting that exemptions may be revoked if the water supply situation worsens.