

## **SECTION 2**

### **BASIC PLANNING DATA**

#### **2.1 OVERVIEW**

This Section of the Plan provides an overview of Water District 19's service area along with its physical and demographic characteristics. Also included in this Section is a summary of land use within the area as well as documentation of past and projected population and water consumption trends. This information is critical to analysis of the system's ability to meet the needs of the current and future residents of the District's system and is the backbone of the detailed analyses presented in subsequent Sections of the Plan.

#### **2.2 SERVICE AREA CHARACTERISTICS**

The service area for Water District 19 encompasses just over 6 square miles in the east-central portion of Vashon Island in King County, Washington and includes the Unincorporated Rural Town of Vashon. The service area also extends to the south to include a small area on the northern end of Maury Island. The District is generally bounded by SW 160th Street to the north, Puget Sound to the east, 115th Avenue SW and 103rd Avenue SW to the west and to Puget Sound and Maury Island on the south. The service area on Maury Island is bordered on the south by SW 240th Street, on the east by Puget Sound and to the west by Dockton Road SW. The Interlocal Service Agreement included in the Appendices establishes these boundaries and is an outcome of an inter-jurisdictional planning effort that resulted in the Vashon Coordinated Water System Plan. Figure 2-1 presents the Boundary Map for the current service area.

##### ***2.2.2 PHYSICAL CHARACTERISTICS***

###### **2.2.2.1 Topography**

The District's topography ranges from sea level along the shoreline on the eastern boundary to an estimated maximum elevation of 415 feet on the western portion of the service area. At the upper elevations, the topography levels to gentle rolling plateaus. Exceptions to the rolling terrain of these upland plateaus occur only in a few deeply cut stream ravines. Topography within the District generally slopes toward Judd Creek on the southwestern portion of the District, toward the west shore of the Island on the northwest portion of the District and southerly toward Quartermaster Harbor on the southern portion of the District. The Island is virtually ringed by slopes exceeding 25%. Although in some places there is relatively flat land between the water and the toe of the steep slopes, this land is generally not suitable for development due to unstable soil conditions.

### **2.2.2.2 Water Surface Features**

Within the District's service area, there are several small creeks. The most prominent in terms of importance to this Plan are Beall and Ellis Creeks because they are sources of water supply to the District. Other surface water features within the District are Ellisport Creek, Gorsuch Creek, Shingle Mill Creek, Taugwalla Creek, Raab's Creek, Mileta Creek, Judd Creek, Fisher Creek, and Dillworth Creek. Beall Creek is the largest creek in the District and flows northeast to Puget Sound from the north side of SW 184<sup>th</sup> Street. Ellis Creek originates east of the High School and flows south and east to Trump Harbor.

### **2.2.2.3 Climate and Rainfall**

The average annual precipitation on the Island is approximately 40 inches. The climate is classified as Marine West Coast and is characterized by cool dry summers, mild wet winters, and a relatively small range in temperature. The prevailing wind direction in the summer time is north and south or southwest for the rest of the year.

### **2.2.2.4 Geology and Soils**

Significant geologic and hydrogeologic studies have been performed on Vashon-Maury Island over the years. Perhaps the most detailed geologic information specific to the area is based on the work of Derek B. Booth, formerly with the King County Department of Natural Resources and later with the University of Washington Civil Engineering Department. Booth's detailed analyses can be found in various documents and are summarized in the December 1998 edition of Vashon-Maury Island Groundwater Management Plan, a product of the Vashon-Maury Island Ground Water Advisory Committee. Based on Booth's work, the stratigraphic glacial deposits are named as follows:

Qvr, recessional outwash: mainly stratified sand and gravel that mantle the upper till surface.

Qvi, ice compact deposits: similar in texture to Qvr, but with collapse features and rare till lenses suggesting deposition on or near stagnant ice.

Qvt, till: mainly compact diamactions, typically 40 to 60 feet thick having low permeability.

Qva, advance outwash: commonly medium- and fine- grained sand, with some sandy gravel. Thickness of this unit varies from being absent (0 feet) to greater

than 200 feet. The shallowest water-bearing zone on the Island is probably composed of permeable Qva material.

A simplified summary of the geology and soils of Vashon/Maury Island are best described in “Vashon/Maury Island Water Resources Study” prepared by J.R. Carr/Associates in 1983. Carr’s simplified descriptions, with Booths classifications in parentheses, are presented below:

Unit I – This is the uppermost or surface layer of nearly all of the uplands of the Island. This layer Consists principally of till (Qvt), but also contains recessional outwash (Qvr) and sand lenses that yield small quantities of water to shallow dug wells. Many of the island’s drainfields are located in Unit I.

Unit II – Unit II is a sand and/or advance outwash sand and gravel (Qva) unit that is typically 50 to 100 feet thick but reaches thicknesses of several hundred feet on the southwestern shore of Maury Island and the west side of Vashon Island. This Unit contains the principal aquifer.

Unit III - Unit III comprises of all pre-established Vashon deposits, including silty layers that are presumably the Olympia Beds (Qob). This is a homogeneous blue to brown silt or clay layer that generally acts as an aquitard (aquitards are low permeability hydrostratigraphic layers where water flow is much slower than aquifers) to impede groundwater flow from Unit II. Springs are common where the two layers meet and are exposed along the Island perimeter. Discontinuous sand layers at 100 to 300 feet below sea level yield water to a number of domestic wells. These isolated pockets are referred to as the deep aquifer.

As indicated on King County Soil Survey Maps, superficial soils in the area are mostly glacial till topped with gravelly sandy silty loam. There are areas of Coastal Beaches (Cb) and Riverwash (Rh) soil types along with percent slopes varying from 0 to 30%. The King County Soil Survey does not include percent slopes for the Coastal Beaches soil type within the District. There are steep slopes along the eastern boundary of the service area that slope about 55% down to Puget Sound.

#### **2.2.2.5 Sensitive Areas**

Established sensitive areas occurring within the District service area are mapped on Figure 2-2. As indicated, a variety of hazards and environmentally sensitivities will impact the level and location of future development within the service area. These sensitive areas may present difficulties when siting new facilities and determining the most cost effective and efficient routes for new pipelines. In addition, these are areas where the District needs to take special precautions

during construction, repairs, and day-to-day operation of the system. The nature of the sensitive area may also prompt the District to initiate public education efforts in association with its Wellhead Protection, Watershed Management, and Conservation Programs. For instance, published Best Management Practices may be shared with the owners of property located within certain sensitive areas to promote watershed management and protection.

As noted, High and Medium Susceptibility Critical Aquifer Recharge Areas, Landslide Hazard Areas, and Erosion Hazard Areas are the most significant classifications impacting operation and development of the water system. Figure 2-2 also indicates more than 100 water supply wells within the District. The Department of Ecology's well log database has records of 872 wells on Vashon-Maury Island. Seventeen of those wells are at a depth of 500 feet or more and 25 are at a depth of 200 feet or more. Groundwater can be separated by host stratigraphy into four aquifers, from top to bottom of the Island is the Perched Aquifer, Principal Aquifer, Intermediate Aquifer and the Deep aquifer. Rainfall that does not directly drain from surface water bodies percolates beneath the surface to recharge first the Principal Aquifer; groundwater that does not directly supply base flows to creeks or to Puget Sound percolates to deeper aquifers. The area of recharge for the Principal Aquifer (Vashon Advance Outwash - Qva) covers approximately two-thirds of the area of Vashon Island, while the recharge area for the Deep Aquifer in nearly the entire Island.

#### **2.2.2.6 Economy**

The overall character of the service area is rural residential in nature. An exception to this is the Town of Vashon which resides along Vashon Highway SW and is centrally located within the District's service area. This densely populated area includes a few industrial and commercial businesses.

#### **2.2.2.7 Transportation**

The major transportation corridor for Vashon Island and Water District 19 is the Vashon Highway SW that transects the Island from north to south. Due to the rural nature of the Island most other roadways are narrower with lower travel speeds.

### **2.3 FUTURE SERVICE AREA**

The District does not anticipate any changes to the current service area boundary, which represents the "Retail Service Area".



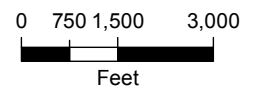
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WATER DISTRICT  
**19**



**Legend**

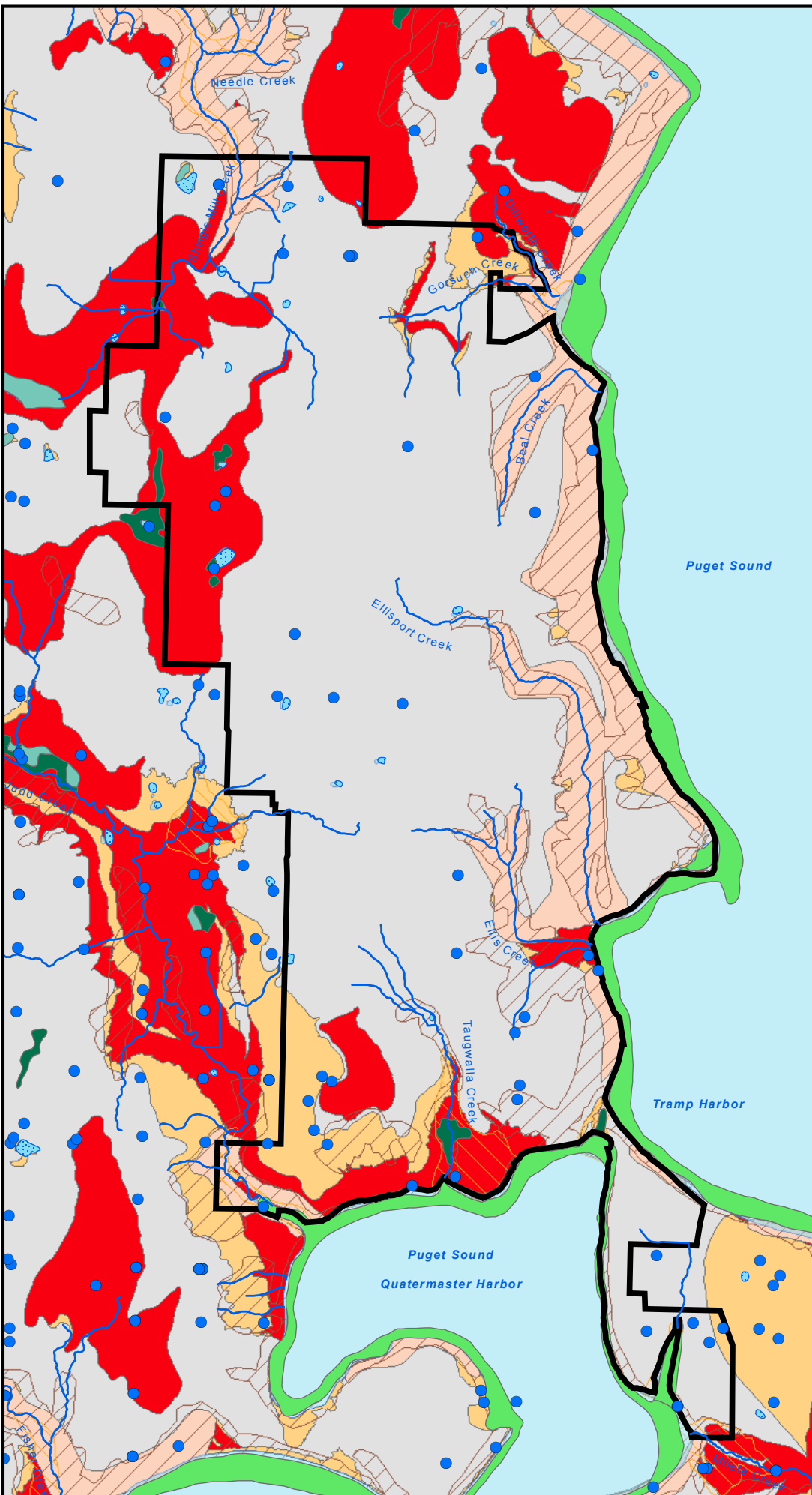
- Water District 19 Service Area
- Wells
- Streams
- Landslide Hazard Area
- Seismic Hazard Area
- Erosion Hazard Area
- National Wetland Inventory**
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Critical Aquifer Recharge Areas**
- High Susceptibility
- Medium Susceptibility
- No Classification



**Figure 2-2**

**Sensitive  
Areas  
Map**

**Water District 19  
2007  
Comprehensive  
Plan**



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## **2.4 ADJACENT PURVEYORS**

According to the 1990 Coordinated Water System Plan for Vashon Island, there are a total of seven purveyors providing water service on Vashon Island. Below is a summary of the abutting purveyors to Water District 19's service area boundary. Figure 2-1 Boundary Map shows the abutting purveyors. The District has several small Community systems within their current service area. Small Community systems within the service area are listed in the Appendices.

### ***2.4.1 HEIGHTS WATER***

Heights Water was organized as a private, non-profit mutual water association, created in 1921. The Association is located on the northern end of Vashon Island and is adjacent to WD 19's northeast boundary. Heights Water service area is approximately 4 square miles and serves 669 connections. The customers are mostly single family residents. The non-residential customers include the Washington State Ferry Facilities, Vashon Nursing Home, and the former Vashon Elementary School. Sources for the Association are one spring source with a minimum capacity of approximately 74 gpm and four ground water wells with a total capacity of 260 gpm. Height's Water system has 908,000 gallons of storage capacity. WD 19 has an intertie agreement with Heights Water. See Appendices for a copy of this agreement.

### ***2.4.2 WESTSIDE WATER ASSOCIATION***

Westside Water Association was established in 1928 as a non-profit cooperative to provide water service to the northwest side of Vashon Island. The Association is adjacent to WD 19's northwest boundary. The source of supply is a series of springs located in Shingle Mill Creek Canyon. The source can produce approximately 180 gpm. Storage capacity is approximately 253,000 gallons.

### ***2.4.3 BURTON WATER COMPANY***

Burton Water Company service area is adjacent to WD 19's southwest boundary. The Burton Water Company was established in 1950 as a private water utility. The Water Company's customers are mostly single family homes and a small neighborhood center and elementary school. Wells are the source of supply at a capacity of approximately 150 gpm. The system includes 170,000 gallons of storage.

#### **2.4.4 MAURY MUTUAL WATER COMPANY**

Maury Mutual Water Company was formed in 1952 as a water coop. The Water Company is adjacent to WD 19's southeast boundary on Maury Island. The Company's sources of supply are wells and springs with a capacity of approximately 35 gpm. The system includes approximately 130,000 gallons of storage.

#### **2.4.5 DOCKTON WATER ASSOCIATION**

Although not directly adjacent to WD 19's service area boundary, Dockton serves the south end of Maury Island. Dockton Water Association is a private non-profit organization that serves mostly residential connections with a few commercial accounts. Dockton has three sources of supply, two pressure zones, pumping facilities and five tanks.

### **2.5 LAND USE AND ZONING**

The land use and zoning is under the jurisdiction of King County, where the District's service area is zoned as Rural Area - one dwelling unit per 5 acres. The center of the District, in and around the Unincorporated Rural Town of Vashon consists of Industrial, Community Business, Neighborhood Business, Office, and Multi-Family along Vashon Highway SW. This is the most densely populated area of the Island and is in the center of WD 19's service area.

#### **2.5.1 ZONING AND FUTURE LAND USE**

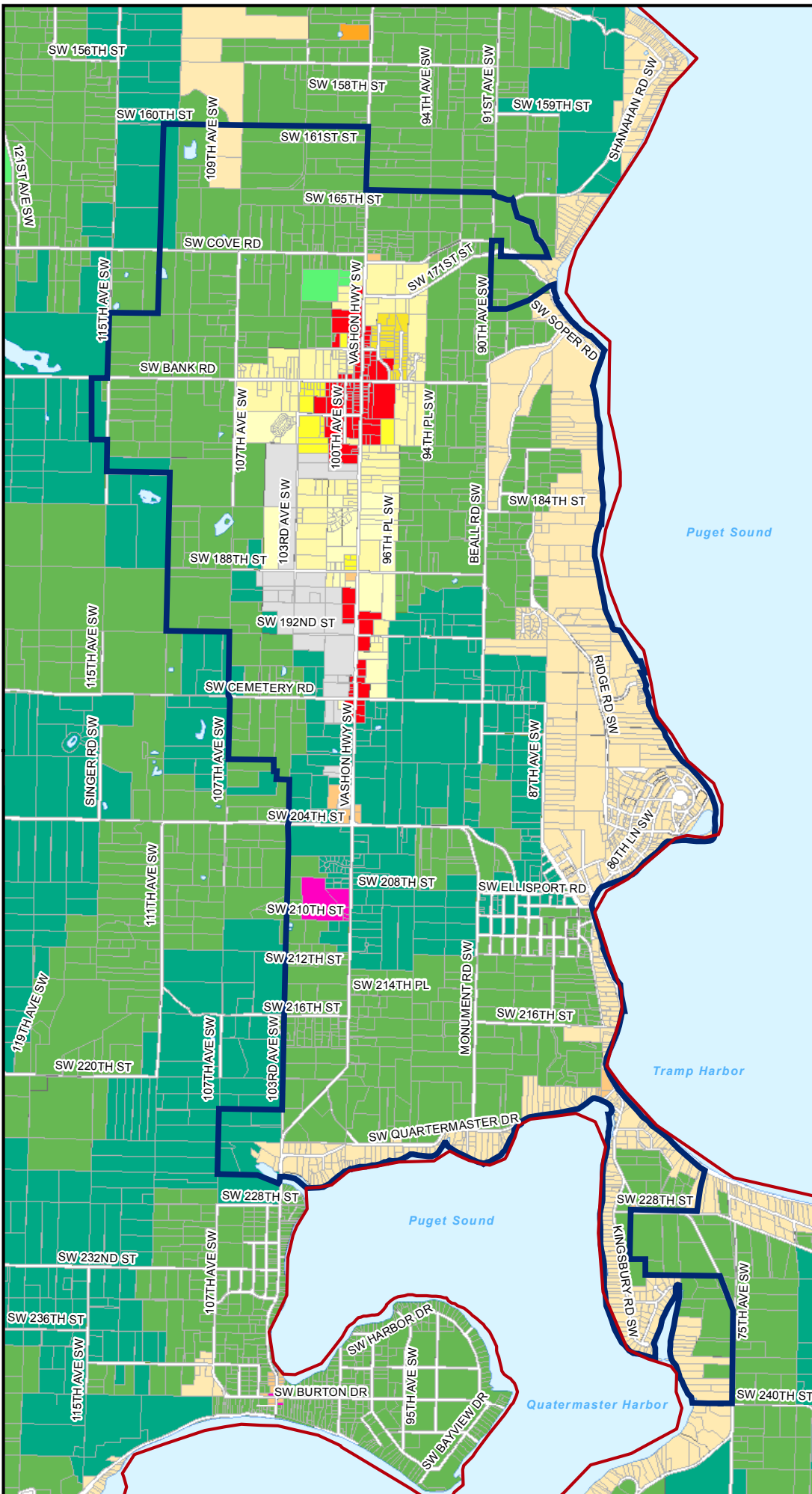
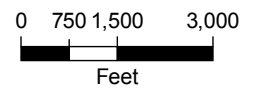
The potential for future development and growth within the District is very limited by the large lot zoning and rural designation of the Island as a whole. There is, however a considerable amount of undevelopable land within the District. These undeveloped lots are scattered throughout the District but due to the large lot zoning, are restricted from subdivision and eligible for private well installation. Figure 2-3 shows King County Zoning designations within the Water District 19 Service Area and Table 2-1 provides a summary of the breakdown of zoning designations by acre.

WATER DISTRICT  
**19**



**Legend**

- ▬ Urban Growth Boundary
- ▬ Water Service Area
- Waterbody
- Zoning**
- R-1 - Residential; one DU per acre
- R-4 - Residential; 4 DU per acre
- R-8 - Residential; 24 DU per acre
- R-12 - Residential; 12 DU per acre
- R-24 - Residential; 24 DU per acre
- RA-2.5 - Rural Area; one DU per 5 acres
- RA-5 - Rural Area; one DU per 5 acres
- RA-10 - Rural Area; one DU per 10 acres
- A-10 - Agricultural; one DU per 10 acres
- CB - Community Business
- I - Industrial
- NB - Neighborhood Business
- O - Office



**Figure 2-3**

**Zoning  
Map**

**Water District 19  
2007  
Comprehensive  
Plan**

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**TABLE 2-1  
WATER DISTRICT 19  
SERVICE AREA ZONING**

Zoning Designation	Area (acres)	Percent of Total Service Area
<b>R-1- Residential (1 DU/acre)</b>	103	2.63%
<b>R-4-Residential (4 DU/acre)</b>	176	4.48%
<b>R-8-Residential (24 DU/acre)</b>	23	0.58%
<b>R-12-Residential (12 DU/acre)</b>	16	0.41%
<b>RA-2.5-Rural Area (1 DU/5 acres)</b>	722	18.39%
<b>RA-5-Rural Area (1 DU/5 acres)</b>	1,943	49.53%
<b>RA-10-Rural Area (1 DU/10 acres)</b>	697	17.75%
<b>A-10-Agriculture (1DU/acre)</b>	14	0.35%
<b>CB-Community Business</b>	83	2.11%
<b>NB-Neighborhood Business</b>	12	0.31%
<b>O-Office</b>	18	0.45%
<b>I-Industrial</b>	118	3.01%
<b>TOTAL</b>	<b>3,924</b>	<b>100.00%</b>

## 2.6 EXISTING MORATORIUM

Water District 19 is currently under a moratorium on new connections. This is the second such moratorium instituted by the District and is authorized under District Resolution No. 723. The first moratorium was issued in September 1994 when the source capacity from all sources was estimated at 655 gpm. The limiting factor was the treatment capacity from the Beall Creek and Ellis Creek treatment facilities and the difficulty meeting peak day demands as required by the DOH. Previous District planning documents indicate that the peak day use was calculated on a per meter basis based upon production and indicated that average peak day production at that time was 782 gpd per meter. Based on this calculation and DOH requirements at the time, the peak day value of 800 gpd per connection was adopted and used for evaluating water availability. The moratorium was in effect until the current treatment plant was put online in the fall of 1995.

Upon completion of the new water treatment plant in 1995, the first moratorium was lifted and based on the increase in production capacity, approximately 200 connections were allowed. A second moratorium went into effect in February, 1996. Combining the total permitted groundwater capacity from the WD 19 wellfield (250 gpm) and permitted surface water capacity from Beall and Ellis Creeks (629 gpm), and dividing by 800 gpd estimated peak usage, the District calculated that it did not possess the capacity to serve any additional connections. However, small numbers of new connections have been authorized when unused water service units were returned to the District, and when limited amounts of water became available.

Subsequent to the 2000 Comprehensive Plan, the District has experienced capacity limits well below its permitted capacity. First, Well # 2 repeatedly failed to achieve the predicted and permitted 250 gpm capacity. Finally, in 2005, after repeated and costly attempts at re-development, Well #2 failed and the Commission took out an emergency loan to drill yet another deep well to try to achieve its permitted amount of groundwater capacity. Within months, and after pumping less than 200 gpm, the well needed to be shut down and subjected to another expensive re-development effort. Hyrdogeologists, staff and the Board of Commissioners now agree the maximum, sustainable yield from the wellfield is 150 gpm (60 percent of the DOE permit).

Secondly, measurements of summer creek flows that have been made subsequent to the 2000 Comprehensive Plan, indicate that maximum summer peak capacity of the District's surface water source is 440 gpm (two-thirds of the permitted amount).

A system analysis was undertaken in 2006 to study current and future production capacity which reaffirmed the need for the moratorium. An updated analysis, including evaluation of water rights and source of supply and consideration of potential improvement alternatives is presented in Section 6 of this plan. The importance of water supply and system issues that have led to past and current moratoriums are a key consideration for future land use planning. The District expects to play a significant role in any future revisions to the Vashon Town Plan. It is expected that his will be accomplished in partnership discussions with King County and the Vashon community.

## **2.7 POPULATION AND EMPLOYMENT**

Although Water District 19 remains in a moratorium for issuing new water service connections, the large lot zoning of the area indicates that growth will continue to occur within the service area through construction of private wells to serve individual homes and/or businesses. In some instances, it could also be possible for developing properties to construct one well to provide service to up to six individual lots. Unfortunately, and as discussed further in Section 6, allowing private well construction within the service area poses an increased threat to the single source aquifer that serves the majority of the Island.

In any event, it is necessary to project future population and employment for the service area as a starting point to determine the possible increase in number of service connection requests. The population and employment projections have been developed by analyzing past demographic trends and by utilizing the planning data developed by the Puget Sound Regional Council (PSRC).

Table 2-2 presents a summary of the anticipated population and employment base within the service area through the year 2026. The population projections have been developed

using the PSRC data for Forecast Analysis Zones (FAZ) 6930, Census Tracts 277.01 and 277.02 and six separate Block Groups. Projections have been developed using a combination of District data regarding the number and type of connections served and PSRC data regarding anticipated growth. Average household sizes used in the projections for Forecast Analysis Zones (FAZs) were obtained from the PSRC. The projections have been coordinated with the planning data put forth by King County and the State Office of Financial Management (OFM).

As indicated in Table 2-2, the current (2006) population within the total service area is approximately 3,400 and approximately 1,300 people are employed within the total service area. However, as previously noted, the District does not serve all properties within the service area. Section 2.9 provides a summary of existing and projected service connections and associated water demand rates.

TABLE 2-2 WATER DISTRICT 19 SERVICE AREA PROJECTED POPULATION AND EMPLOYMENT				
Year	Population	Projected Population Annual Growth Rate	Employment	Projected Employment Annual Growth Rate
2006	3,396	0.51%	1,302	-0.44%
2012	3,510	0.64%	1,299	0.81%
2015	3,578	0.64%	1,331	0.81%
2026	3,811	0.53%	1,477	1.10%

Notes:  
The Population Projections presented above are based on the Service Area Boundary and include lots/individuals that are served by private wells.  
Population and employment projections are based on 2006 Puget Sound Regional Council Projections.

## 2.8 NUMBER OF CONNECTIONS AND AREA SERVED

Because of privately owned wells and small community systems within the service area, the District does not serve all properties within the service area. Based on 2006 billing records, the District has 1,421 active accounts and an obligation to serve 1,724 water service units. For planning purposes, and as described in paragraph 2.9.1, equivalent residential units (ERU's) equate to the water usage of an average single family residence and are used for evaluating existing facilities as well as sizing and evaluating future water system needs. Units outnumber accounts because some connections, for example schools and industries, use a large amount of water that exceeds that of a residence, and are required to purchase multiple units proportional to estimated usage. The 1,724 water service units include 181 zero-use units, which are expected to be coming on-line over time. Currently, there are 1,202 single-family residential accounts, 20 multi-family accounts, 159 commercial accounts, 9 industrial and 31 public entities that include

schools. The number of people served by the District is based on an average household size of 2.4 people (from PSRC data) and the existing number of single family and multi-family accounts is estimated at 2,974 people.

## **2.9 WATER DEMANDS**

Review of historical water demands and projection of future demands is inherent to any water system planning process. The following paragraphs provide an overview of past demand trends and anticipated water use for the District. Although water conservation is briefly referred to in this section and demand projections with and without conservation are presented, the District's conservation program is outlined in Section 4.

### ***2.9.1 EQUIVALENT RESIDENTIAL UNIT (ERU)***

An understanding of Equivalent Residential Units or ERU's is critical to the understanding and projection of water system demands. An ERU is the average water used by full-time single family residences in the district and is defined by the Department of Health (DOH) as a unit of measure to equate, for planning purposes, non-residential water usage to a specific number of single family residences. A significant change in the methodology used to calculate ERU's has occurred since the District's previous Plan. Previously, DOH defined an ERU to simply be a peak day demand of 800 gallons per day (gpd). This value is now allowed by DOH only in the absence of system specific metering data.

The change in calculating the number of ERU's put forth in the August 2001 "*Water System Design Manual*" recognizes the significant variation in water use between water purveyors based on location, climate, customer type, age of facilities and development, conservation efforts, etc. Current DOH requirements provide for the use of actual meter data to determine average and peak day use per ERU. As indicated in Table 2-4, based on historical sales data for the past 5 years the estimated average daily use per ERU within Water District 19 is 208 gallons per ERU per day. This does not include non-revenue water. Including an 8% allowance for water loss, the estimated water required per ERU is an average of 225 gallons per day per ERU

To ensure reliability and the ability to deliver required demand under all conditions, peaking factors are applied to the average use data. Peak day demand factors are used to accommodate hot summer days when water use is typically at its highest. Peak hour demand factors are used to simulate absolute highest demand conditions and fire suppression capabilities are evaluated under these simulated peak hour conditions. Water purveyors do, however, maintain the right and responsibility to determine peaking factors and/or required storage volumes that

meet District established reliability factors. This is especially important to note for purveyors with limited source capabilities, like Water District 19.

### **2.9.2 PEAKING FACTOR**

Peak Day Demand is typically expressed by use of a peaking factor, which is applied to the average use per ERU to determine the estimated use on a hot summer day, when water use is expected to be its highest. For Water District 19, the 5-year average peaking factor has been approximately 2.4. However, the absolute maximum day over that period occurred in 2004 and indicated a peaking factor of 2.88. For the purpose of this plan and in response to the District's expressed concern for reliability the maximum peaking factor of 2.88 will be used for future planning purposes. This is consistent with industry best practices as documented in the American Water Works (AWWA) "Water Treatment Plant Design", ASCE (American Society of Consulting Engineers) McGraw Hill Handbook, and the Washington State Department of Health's "Water System Design Manual" (Sec. 1.7, pg. 1-4). The peak day calculation is critical to the evaluation of water rights, the ability of source of supply to accommodate projected demands, and calculation of storage requirements. Each of these elements of the system analysis are further discussed and detailed in Section 6 of the Plan.

### **2.9.3 HISTORICAL WATER PRODUCTION AND SALES**

To provide an overall perspective of total water consumption within the District, Figure 2-4 provides 10 years of historical water sales data. While this figure provides a wealth of information for identifying water use trends in the District, this plan is based on the past five years of historical data to accurately reflect current water use trends, implementation of the Uniform Plumbing Code and more recent conservation and water use efficiency efforts. Figure 2-4 shows both water production and the estimated maximum 24 hour capacity of the District, 851,040 gallons per day based on useable water rights, summer creek flows, sustainable well production and treatment capacity. Meeting peak demand has sometimes required using water from storage tanks.

Table 2-3 presents a historical summary of the total water produced and sold by the District for the past 5 years. The high degree of variability with regard to Peak Day Demand is indicative of the rural demographics of the system that is responsible for an above average irrigation load during hot dry periods. A similar pattern is observed if a ten year summary is utilized (reference Fig. 2-4). Although the historical MDD figures are not within 5% of each other (as stated in the Water System Design Manual page 5-10), the District has consistently experienced above average variability. Non-revenue water is also shown on Table 2-3 and

includes unscheduled and/or unauthorized water use, leaks and breaks, fires, theft, meter inaccuracies, and other unspecified losses throughout the system. The District has experienced about 8% non-revenue water in then most recent year. Inconsistency in non-revenue water in 2005-2006 may be due to billing cycle lags, however, there is indication that there may have been an issue with metering at the treatment plant. In response to this, the District has recently replaced treatment plant meters to ensure accuracy in future data recording and compliance with Municipal Water Law requirements - especially water use efficiency tracking. Source water production from creek and well sources will also be tracked.

Additional information on water use by connection type is provided in Table 2-3 to give the reader perspective of water use by customer class and assist in identifying target areas for future water conservation efforts and tracking. Water conservation is addressed in further detail in Section 4 of the Plan.

**TABLE 2-3  
WATER DISTRICT 19  
HISTORICAL ANNUAL WATER PRODUCTION AND SALES**

	2002	2003	2004	2005	2006	5-Year Average
<b>Water Production (gal)<sup>(1)</sup></b>	122,079,000	135,327,730	122,172,480	110,123,761	117,139,761	121,368,546
<b>Water Sales (gal)</b>	121,289,905	127,283,375	114,930,028	105,589,146	113,132,726	119,515,629
<b>Non-Revenue Water</b>	0.6%	5.9%	5.9%	4.1%	8% <sup>(2)</sup>	4.1%
<b>Peak Day (gpd)</b>	720,700	899,900	962,900	650,035	725,168	808,284
<b>Average Month (gal)</b>	10,173,250	11,277,311	10,181,040	9,176,980	9,761,647	10,114,046
<b>Peak Month (gal)</b>	16,495,300	21,768,500	17,370,100	15,394,816	16,935,204	17,592,784

NOTES:

<sup>(1)</sup>Source water is total from creeks and wells. Treated water is total from treatment plant and wells.

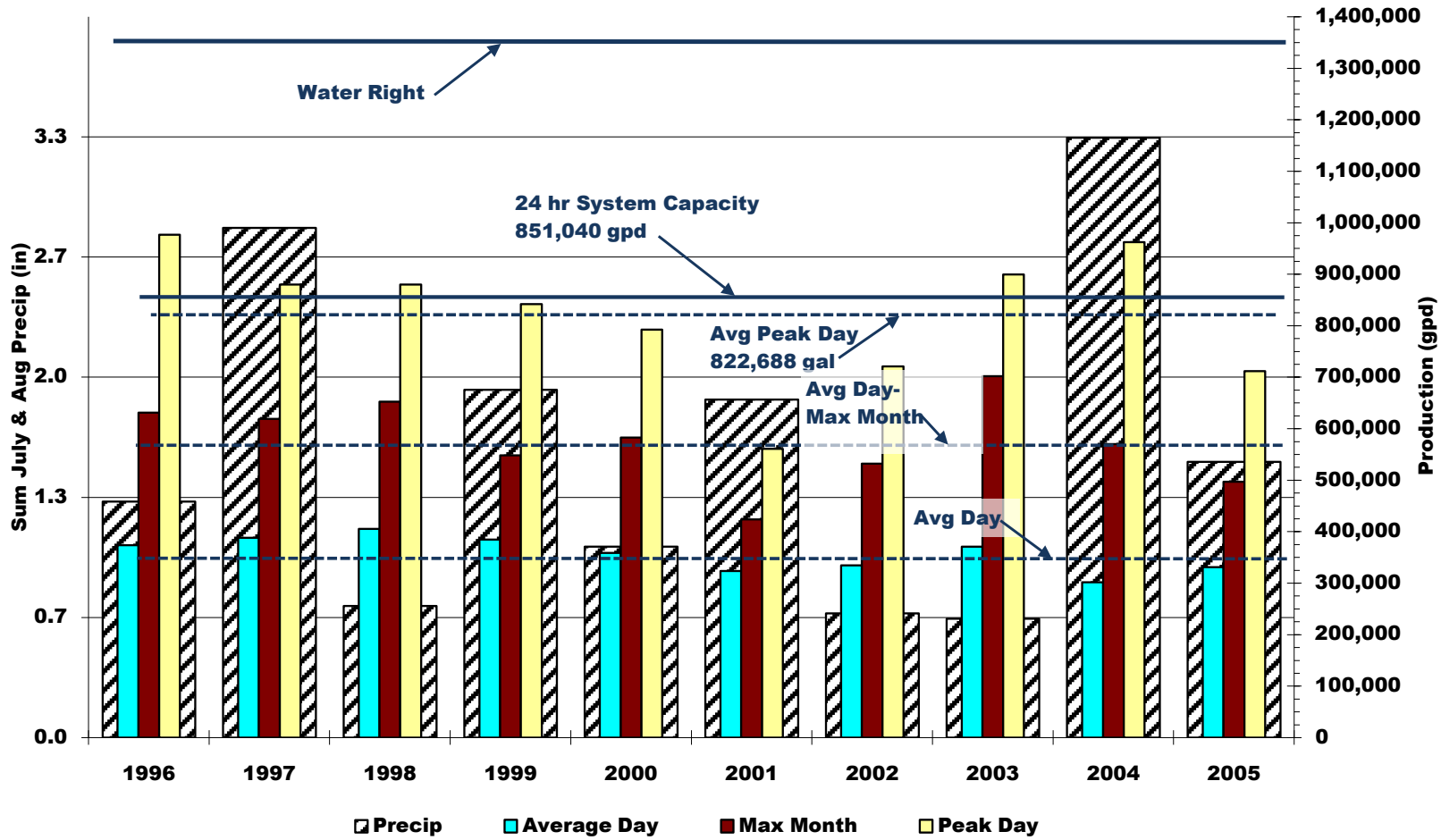
<sup>(2)</sup>In 2006, a faulty meter understated production. Total source water from creeks and wells was 121,864,427 gallons. Total non-revenue water is estimated at 8%

Daily use data for years 2002 – 2006 is included in Appendix J

**TABLE 2-4  
WATER DISTRICT 19  
HISTORICAL AVERAGE WATER USE (GPD/CONNECTION)**

	2002 Average	2003 Average	2004 Average	2005 Average	2006 Average	5-Year Average
<b>Residential</b>	205.34	224.81	211.12	178.71	220.54	208.11
<b>Commercial</b>	318.33	474.71	335.91	295.62	331.44	351.20
<b>Industrial</b>	1707.70	1315.44	1109.90	926.06	1814.48	1374.72
<b>Public</b>	1079.58	975.25	967.34	902.00	987.68	982.37
<b>Multi-Family</b>	1061.63	1003.80	952.71	934.66	987.59	988.08

**Figure 2-4  
Water District 19  
Annual Water Use Summary**



## **2.10 PROJECTED WATER DEMANDS**

Projected water demands are imperative to development of a sound water system plan that addresses the long-term needs of the residents of Water District 19. As indicated previously, Water District 19 is in a unique situation of having a relatively large service area, but does not serve all lots within that area. Due to large lot zoning, individual wells and small private water systems legally exist within the service area. The projected water system demands presented in Table 2-5 indicate the anticipated water demands for the actual area served rather than the entire service area. The demands shown include additional conservation strategies to reduce water demands and assume a reducing rate of use tapering from the five year average use per ERU of 208 gallons per day and using the historical peaking factor of 2.88. An 8% allowance for non-revenue water has been applied but will be monitored as the District obtains improved metering data from the treatment plant. Because the District is currently under moratorium, the starting point for the projections is the number of actual connections served as of December 31, 2006 and does not include the 181 accounts that have not been using water. Growth factors projected by the Puget Sound Regional Council, and put forth earlier in this section, have been applied to determine the estimated number of future connections and associated water use.

**Table 2-5  
Water District 19  
Projected Water Demands**

	2007	2008	2009	2010	2011	2012	2013	2020	2025
Residential ERUs	1102	1107	1113	1119	1124	1131	1139	1191	1223
Non-residential ERUs	520	517	515	513	511	515	519	545	575
<b>Subtotal ERUs w/ Pop. Growth</b>	<b>1621</b>	<b>1625</b>	<b>1628</b>	<b>1631</b>	<b>1635</b>	<b>1646</b>	<b>1658</b>	<b>1735</b>	<b>1798</b>
Committed Zero-use ERUs	151	121	116	111	106	101	96	61	36
Zero-use ERUs coming online	30	5	5	5	5	5	5	40	25
<b>Committed Zero-use ERUs</b>	<b>33</b>	<b>38</b>	<b>43</b>	<b>48</b>	<b>53</b>	<b>58</b>	<b>63</b>	<b>98</b>	<b>123</b>
<b>Subtotal ERUs - committed</b>	<b>1654</b>	<b>1663</b>	<b>1671</b>	<b>1679</b>	<b>1688</b>	<b>1704</b>	<b>1721</b>	<b>1833</b>	<b>1921</b>
Accessory Dwellings (New Units)	7	14	21	28	35	42	49	98	133
Accessory Dwellings (Expressed in ERUs)	3	6	9	12	15	18	22	43	59
<b>Total ERUs</b>	<b>1657</b>	<b>1669</b>	<b>1680</b>	<b>1692</b>	<b>1703</b>	<b>1723</b>	<b>1742</b>	<b>1876</b>	<b>1979</b>
<b>PROJECTED DEMAND WITHOUT CONSERVATION</b>									
Average Demand (gpd/ERU)	208	208	208	208	208	208	208	208	208
Estimated Non-Revenue Water	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Total Average Annual Demand	225	225	225	225	225	225	225	225	225
Total Annual Demand (mg)	135.894	136.830	137.768	138.710	139.656	141.247	142.845	153.857	162.295
Average Daily Demand (ADD) (mgd)	0.372	0.375	0.377	0.380	0.383	0.387	0.391	0.422	0.445
Peak Day Demand (Peak Factor 2.88) (mgd)	1.072	1.080	1.087	1.094	1.102	1.114	1.127	1.214	1.281
Peak Day per ERU	628.99	628.99	628.99	628.99	628.99	628.99	628.99	628.99	628.99
<b>PROJECTED DEMAND WITH CONSERVATION</b>									
Conservation Goal Peak Season Savings per year		2%	2%	2%	2%	2%	2%		
Average Annual Demand (gpd/ERU)	208	208	208	208	208	208	208	208	208
Estimated Non-Revenue Water	8.0%	7.5%	7.0%	6.5%	6.0%	6.0%	5.5%	5.5%	5.0%
Total Average Annual Demand (gpd/ERU)	225	224	223	222	220	220	219	219	218
Winter Average Daily Demand (gpd/ERU)	180	179	178	177	176	176	176	176	175
Summer Average Daily Demand (gpd/ERU)	314	307	299	293	287	280	273	274	267
Total Annual Demand (mg)	136.192	135.180	134.185	133.517	132.857	132.850	132.502	143.040	148.816
Average Daily Demand (ADD) (mgd)	0.373	0.370	0.368	0.366	0.364	0.364	0.363	0.392	0.408
Peak Day Demand (Peak Factor 2.88) (mgd)	1.075	1.067	1.059	1.054	1.048	1.048	1.045	1.129	1.174
	646.96	643.97	640.97	637.98	634.98	634.98	631.99	631.99	628.99

NOTES:

Accessory Dwelling Units (or "mother-in-laws") are assumed to be 44% of an ERU.

Conservation Projections are based on the District's Goal of Reducing Peak Season Demands by 2% Annually.

Calculation of Water Demands with Conservation are based on the following assumptions:

<i>Winter Use Number of Days</i>	<i>242.00</i>
<i>% of Annual Average</i>	<i>80%</i>
<i>Summer Use Number of Days</i>	<i>123.0</i>
<i>% of Annual Average</i>	<i>140%</i>