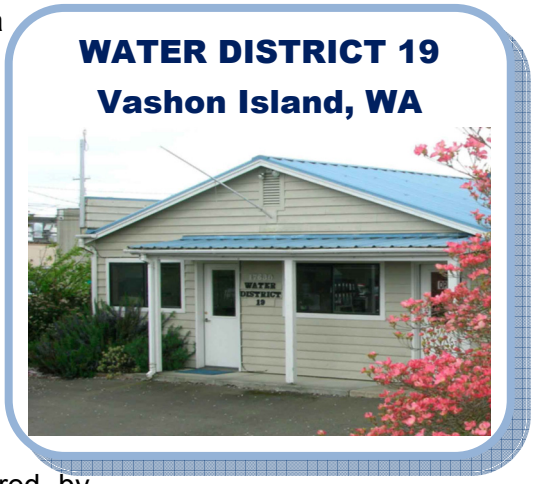
# EXECUTIVE SUMMARY
## 2007 WATER SYSTEM PLAN




Water District 19's 2007 Water System Plan represents a compilation of planning and engineering studies completed by PACE Engineers, Inc., District staff, and the Board of Commissioners. The purpose of the Plan is to determine the adequacy of Water District 19's existing water system to meet the existing and projected needs of the customers of the District. The Plan also provides a long-range planning document that addresses the regulations and concerns associated with operating a public water system within the community of Vashon Island. The Plan supersedes and updates the District's current water system plan, the year 2000 King County Water District 19 Water System Plan prepared by Gray & Osborne, Inc. and incorporates a variety of information and findings from that document and other planning and engineering studies prepared for the District by other consulting firms.

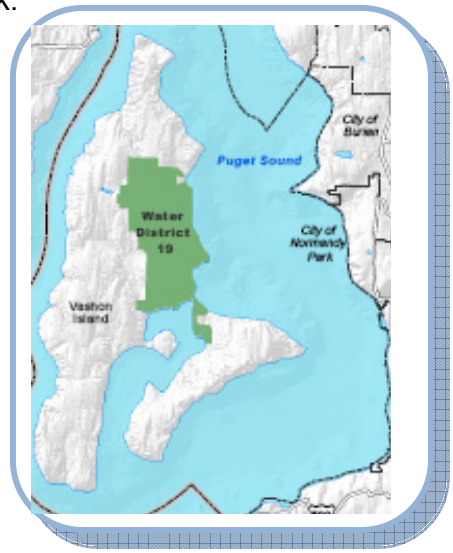
The 2007 Water System Plan has been prepared in accordance with the rules and regulations governing the operation of public water and sewer systems as administered by the State of Washington Departments of Health and Ecology (DOH and DOE respectively), King County, and the codes and policies of all other agencies having jurisdiction. In accordance with regulatory requirements and District needs, the Plan includes a summary of existing District policies, a complete analysis of demographic trends and projections for the service area, documentation of past water use trends and future demand projections, a complete inventory of the water system, establishment of minimum design criteria in accordance with the most current DOH standards, evaluation of the system under current criteria, presentation of recommended improvements in the form of a prioritized Capital Improvement Program, and a summary of financial alternatives for implementing the recommendations presented. In addition, State regulations and especially the recently enacted Municipal Water Law (HB 1338) require documentation of various operational aspects of the District, including the current water quality monitoring schedules and programs, emergency response activities, water rights self assessment and documentation related to water use efficiency programs.

### WATER DISTRICT 19 HISTORY AND LOCATION

Water District 19 is the only Group A Public water System on Vashon Island and operates under the authority and requirements of RCW Title 57 – Sewer and Water Districts. The District was established in 1925 by special election and at the time, encompassed only one square mile surrounding the unincorporated town of Vashon. Through annexations and the Coordinated Water System Plan service area agreement process in the late 1980's, the District has grown to include a retail service area and corporate boundary of just over six square miles. All residents

within the corporate area vote for the Board of three Commissioners, elected at-large from the community.

The original distribution system consisted of about 2 miles of dipped and wrapped wrought iron pipe. Storage consisted of a 20,000 gallon elevated wood tank. The original source of supply consisted of two small dams just to the north of the mouth of Beall Creek. In 1969, Island Mutual Water Company was annexed into the District and brought an additional source online.




Improvements to the system over the years have included development of additional sources of supply, storage reservoirs and extension of transmission and distribution system lines to serve the current service area. In addition, several sources of supply and associated treatment and pumping facilities have been abandoned and/or replaced. Of particular note is that water supply sources have required replacement as water yield decreased from the original facilities.

As of January 2007, the District serves 1,421 connections, up from 1,293 as of the 2000 Water System Plan. Service is accomplished through three groundwater wells, two surface water sources, a water treatment plant, 1.725 million gallons of water storage capacity and many miles of transmission and distribution mains ranging in size from ¾-inch to 16-inches in diameter. The 6.2 square mile service area generally extends from SW 160th Street on the north to a small area on the northern portion of Maury Island on the south. On the east the District is bounded by Puget Sound and on the west, the service area extends to approximately 115th Avenue SW and 103rd Avenue SW. In the southernmost portion of the District the service area extends onto Maury Island, to SW 240th Street and Dockton Road. It is important to note that not all properties within the service area receive water from Water District 19 and instead rely on the use of private wells.

## POPULATION AND EMPLOYMENT

As part of the planning process, the current (2006) and projected population and employment within Water District 19's retail water service areas were estimated. In order to estimate the population and employment figures, District planning documents and billing records were reviewed as well as current projections from the Puget Sound Regional Council (PSRC) and King County. The population data used in developing the projections is based on 2000 US Census and 2005 PSRC block group data.

Currently an estimated 3,400 people reside within the water service area and approximately 1,300 people are employed within the same area. While most of the businesses and employees within the service area are served by the District (excluding some home occupations), the number of residents actually served requires consideration of private wells within the service

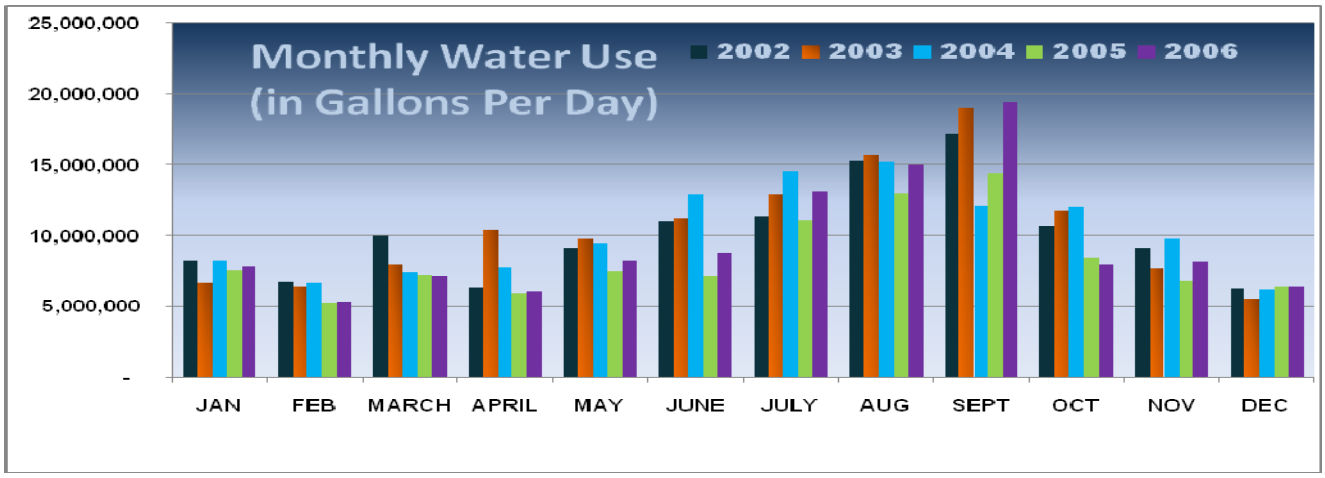
area. By multiplying the number of active residential accounts by the average household size, it is estimated that approximately 2,975 people of the total 3,400 residents are actually served by Water District 19.

The total population and employees within the service area is expected to increase to approximately 3,800 and 1,480 (respectively) by the twenty-year planning horizon of 2026

## WATER DEMANDS

Identification of historical and projected water system demands is a critical element of the planning process. The demand projections are used in the evaluation of the water system's ability to meet the needs of current and future populations of the District's water service area and provide the basis for water system modeling and analysis.

Water District 19 produces all of the water sold to customers through its existing supply facilities and treatment plant. The District's non-revenue water, which is water lost through leaks in the system, operational water uses (flushing mains, etc.), water used for construction purposes and unauthorized water withdrawals from hydrants, is estimated at 8%. This number, while well within the State guideline of 10%, is constantly monitored and reviewed by the District as a means of protecting the finite resource and maintaining efficiency of the system.




The District supplies water to approximately 1,202 single-family residential, 20 multi-family residential, 159 commercial and 31 public connections. Evaluation of water use by customer class is accomplished by expressing multi-family, commercial and school customers in Equivalent Residential Units or ERUs and at the end of 2006, the District's 1,421 connections was equal to an estimated 1,621 ERUs. The average day demand from 2002 to 2006 was 197 gallons per day per ERU, excluding unaccounted for water. Adding the average unaccounted for water amount to this results in an average demand of 213 gallons per day per ERU. Based on historical data, the maximum day demand peaking factor of 2.88 is applied to average day demand numbers to arrive at the peak day usage that is required for evaluation of system facilities and the ability to meet water demands under all circumstances. The relatively high peaking factor (compared to regional norms) is a result of rural summer water usage, and is the

limiting factor on system expansion. It is the subject of considerable discussion in the plan and is the basis for the District's Water Use Efficiency (or Conservation Program).

Future demands were projected with and without conservation, based on Department of Health requirements and are summarized in the following graph. Although an aggressive Water Use Efficiency program is proposed to assist in conservation of resources and reduction in peak day demands, the water system has been evaluated without consideration of conservation. As the conservation goals are met and documented by water use figures, consideration of additional evaluation under reduced water use per connection may be warranted.

## WATER SYSTEM ANALYSIS

Analysis of the existing water system was completed to determine the requirements for the maintenance of high quality water supply and service at a reasonable cost to the ratepayers of the system.

### *SOURCE OF SUPPLY*

The source of supply analysis indicates that water rights are sufficient to meet the current and anticipated needs of the District through the six and twenty-year planning periods. Water supply is limited, however, by the inability of the existing sources of supply to keep up with historic peak water system demands. While the existing sources of supply are adequate to meet projected average day demands, difficulties in meeting peak day demand with the existing facilities is the limiting system factor prohibiting the addition of new connections to the system. Table 6-1 (shown below and detailed in Section 6 of this Plan) outlines the discrepancy between existing water rights and yields.

**TABLE 6-1**
**INSTANTANEOUS PRODUCTION ANALYSIS**

| Source | Instantaneous Water Right gpm) | Winter Production Capacity (gpm) | Summer Production Capacity (gpm) |
|---|---|---|---|
| **Wells 1,2 & 4** | 250 | 150 | 150 |
| **Beall Well** | 180 | (1) | (1) |
| **Beall Creek** | 404 | 404 | 300 (2) |
| **Ellis Creek** | 224 | 224 | 150 (2) |

(1) Depends on the District's ability to perfect the water right.
(2) Limited by summer creek flows.

Several alternatives have been identified and pursued by the District over recent years, the most promising of which is development of the Beall Well to produce approximately 80 gallons per minute of peak day supply and augment existing supply. While this small

yield is not expected to alleviate the restricted water supply issue, it will contribute to the ability to meet summer peak demands. Final development of the well is proposed for 2008. Water Use Efficiency measures may also contribute to reducing summertime peak demands but are dependent on customer acceptance and willingness to recognize and conserve water as a finite resource. The possible transfer of existing groundwater rights to the Morgan Hill well and recommended addition of booster pump at the existing storage reservoirs may also increase peak summer supply. Longer term water supply alternatives that have been indentified and recommended for further analysis include development of additional wells, or construction of a new source through a desalinization plant, impoundment of rainwater at an open pond or reservoir, or piping from an off-island source. It is noted that a pipeline from off-Island sources is specifically restricted in current King county planning policies, and would require an enormous investment for a District of this size.

### WATER RESOURCE PROTECTION

Documentation of the District's water resource protection program has been accomplished as part of the planning process and no additional recommendations to the existing program have been identified.

### STORAGE ANALYSIS

The storage analysis of the system indicated that sufficient storage is in place to meet current and anticipated storage requirements. A large quantity of water in the existing storage configuration is unavailable for use due to hydraulic grade-lines. In other words, the elevation of the storage water is below what is required to deliver water at the minimum of 30 psi. This quantity of water is common in water storage reservoirs and is referred to as "dead storage". It is typically used to offset the expense of constructing elevated water reservoirs. Through pumping improvements, it is recommended that the District convert the dead storage to usable storage and in doing so, make the water available for emergency conditions and to help meet summer peak day conditions. Additional analysis of this alternative through development of an engineering report and pre-design study is recommended to obtain a DOH position on using dead storage as a means of supplementing water supply.

### TRANSMISSION AND DISTRIBUTION

Analysis of the transmission and distribution system was accomplished with the use of a hydraulic model. The modeling results indicate that there are several areas in the District that will require system upgrades to meet the minimum fire flow requirement. In addition, there is a significant amount of pipe within the system that is either undersized for current standards, is beyond its useful life and/or is of material that is cannot be expected to operate without leaks or future breaks. Of particular concern is Asbestos Cement (AC pipe) that was installed in the 1950's and 1960's. This pipe material has not lived up to

the expected life of pipe and tends to fail catastrophically rather than exhibit small leaks and cracks. Undersized and AC mains should be prioritized in the District's ongoing renewal and replacement strategy.

## CAPITAL FACILITIES PLAN

Section 9 of the Plan presents a capital facilities plan for the proposed water system improvements. The cost estimates are based on 2007 prices and reflect total project costs, including construction costs plus contingency and overhead costs such as District administration, engineering, legal fees, taxes, etc. A summary of the projects prioritized for the six-year planning horizon is presented below.

1. **Treatment Plant Chlorination project –** *Estimated cost -$10,000.* This project will improve chlorination control by adding chlorine monitoring at the end of surface water treatment process. Implementation is planned for late 2007 – 2008.

2. **Beall Well Implementation project** – *Estimated cost $100,000 - $200,000.* The Beall test well has been completed. This project covers engineering services and infrastructure implementation to add this source to the distribution system and integrate the well with the existing SCADA control system. Implementation is planned for 2008. In addition, ongoing analysis of source alternatives is proposed.

3. **Tank Farm Booster Station** – *Estimated cost $100,000 - $500,000*. The fire flow at areas near the two main tanks can be increased by boosting the pressure at the tanks. This will also enable more of the storage in the million gallon tank to be used to meet peak day demand. Implementation is planned for 2008.

4. **On-going Water Main Replacement projects** – *Estimated average cost $100,000 per year.*

## FINANCING AND IMPLEMENTATION

Financing of water system improvements is a key element of any water system planning effort. It is recommended that the District complete a full rate study and connection charge assessment following adoption of this Plan. The rate study should focus on implementation of prioritized projects, maintenance of a sufficient emergency reserve, equity of rates between customer classes and the stated goal of achieving water conservation during the peak season months.

In addition to rates, the District should review all available sources of external grants and financing. The size and rural nature of the community lends itself well to a federally assisted grant and loan program administered by the federal government through the Rural Development agency. Although the portion of grant funding available the RD program is income dependent, that requirement is mitigated through consideration of existing rates in relation to income levels. Other programs that may prove viable for financing are the grant and low interest loan programs associated with the State Revolving Fund and Public Works Trust Fund.

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# GLOSSARY

## *ACRONYMS*

| | |
|---|---|
| AC | Asbestos-Cement |
| ADD | Average Daily Demand |
| APWA | American Public Works Association |
| AWWA | American Water Works Association |
| ccf | One hundred cubic feet |
| cfs | Cubic Feet per second |
| CFP | Capital Facilities Plan |
| CI | Cast Iron |
| CRWSD | Cedar River Water and Sewer District |
| CT | Census Tract |
| CWD | Covington Water District |
| CWSP | Coordinated Water System Plan |
| CWSSA | Critical Water Supply Area |
| DI | Ductile Iron |
| DOE | Washington State Department of Ecology |
| DOH | Washington State Department of Health |
| DOT/APWA | Standard Specifications for Road, Bridge, and Municipal Construction, Washington State Department of Transportation and the American Public Works Association, 2006 Edition |
| EPA | United States Environmental Protection Agency |
| ERU | Equivalent Residential Unit |
| ES | Equalizing Storage |
| FAZ | Forecast Analysis Zone |
| FF | Fire Flow |
| FSS | Fire Suppression Storage |
| gpcd | Gallons per capita per day |
| gpd | Gallons per day |
| gpm | Gallons per minute |
| GFC | General Facility Charge |
| GMA | Growth Management Act |
| HGL | Hydraulic Grade Line |
| LFC | Local Facility Charge |
| MCL | Maximum Contaminant Level |
| MDD | Maximum Daily Demand |
| MG | Million Gallons |
| MGD | Million gallons per day |
| mg/l | Milligrams per liter |
| OFM | Office of Financial Management |
| PHD | Peak Hour Demand |
| PSRC | Puget Sound Regional Council |
| PRV | Pressure Reducing Valve |
| psi | Pounds per square inch |

| | |
|---|---|
| PVC | Polyvinyl Chloride |
| RCW | Revised Code of Washington |
| SDWA | Safe Drinking Water Act |
| SEPA | State Environmental Policy Act |
| UBC | Uniform Building Code |
| UPC | Uniform Plumbing Code |
| ULID | Utility Local Improvement District |
| USGS | United State Geological Survey |
| WAC | Washington Administrative Code |
| WFI | Water Facility Inventory and Report Form (DOH form) |
| WSDOT | Washington State Department of Transportation |
| WSRB | Washington Surveying and Rating Bureau |
| WUCC | Water Utility Coordinating Committee |
| WUTC | Washington Utilities and Transportation Commission |

***TERMS***

**Annual Demand** - Total water system demand for one calendar year, expressed in millions of gallons (MG), including all uses and unaccounted for water.

**Average Daily Demand (ADD)** - The annual demand divided by the number of days per year, expressed in million gallons per day (MGD).

**Cross Connection** - A physical arrangement connecting a public water system, directly or indirectly, with anything other than another potable water system, and capable of contaminating the public water system.

**Dead Storage** - The volume of stored water not available to all customers at the minimum design pressure in accordance with WAC 246-290-230 (5) and (6).

**Equalizing Storage** - The volume of water required to meet hourly variations in demand in excess of the available rate of supply.

**Equivalent Residential Units (ERU)** - The amount of water consumed by a typical full-time single family residence. Used for converting users other than single family residences into an equivalent number for the purpose of demand forecasting, system analysis and facility sizing.

**Fire Flow** - The rate of water flow, in gpm, required to fight fires under WAC 246-293-640 or adopted city or county standards.

**Fire Suppression Storage** - The volume of water required to accommodate fire demand.

**Franchise Area** - A designated area within which the utility system is permitted, by franchise, to own, operate and maintain facilities within public rights-of-way.

**Legal Boundary** - The corporate boundary established for the District. Extension of service beyond the District's legal boundary requires annexation to the District or specific agreement for the provision of such service. Also referred to as corporate area.

**Maximum Contaminant Level (MCL)** - The maximum permissible level of a contaminant in water the purveyor delivers to any public water system user.

**Maximum Daily Demand (MDD)** - The highest water demand anticipated for any given day, expressed in MGD.

**Operational Storage** - The volume of the reservoir devoted to supplying the water system while, under normal operating conditions, the source(s) are in “off” status.

**Peak Hour Demand (PHD)** - The maximum rate of water use, excluding fire flow, which has occurred, or is expected to occur, over a one hour period of time. Typically expressed in gallons per minute.

**Potable** - Water suitable for drinking by the public.

**Pressure Zone** - A water supply or distribution subsystem operating at a uniform hydraulic gradient.

**Service Area** - The recognized area within which Cedar River Water and Sewer District intends to provide water service.

**Standby Storage** - The volume of water required to augment the available supply of water during a period of partially or fully restricted flow from the supply source, due to such things as pipeline or pump failure or power outages.

**Usable Storage** - That portion of the total available storage, which is available on a continuous basis, either by gravity flow or by reliable pumping facilities.