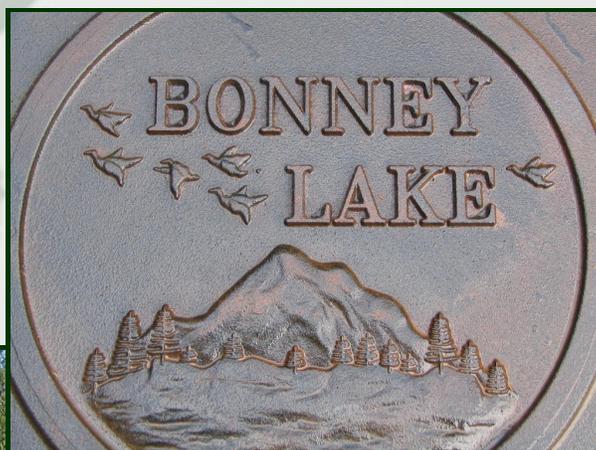




# CITY OF BONNEY LAKE COMPREHENSIVE SEWER SYSTEM PLAN

*Final  
February 2009*



Prepared by:  
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# ***City of Bonney Lake Comprehensive Sewer System Plan***

***Final  
February 2009***

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## Certification

This Comprehensive Sewer System Plan for the City of Bonney Lake was prepared under the direction of the following registered professional engineers.

This plan was adopted by the City of Bonney Lake Council on December 22, 2009 via Ordinance No. 1341.



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# ***EXECUTIVE SUMMARY***

The 2008 City of Bonney Lake Comprehensive Sewer System Plan outlines improvement strategies and programs to respond to the dynamic requirements of wastewater service in a rapidly growing area. Since the last complete sewer planning effort, there have been dramatic changes in the City's service area (both geographically and population-wise), sewer infrastructure and policies. This document provides the foundational analysis and planning direction consistent with Washington Department of Ecology and Growth Management Act (GMA) requirements and can be used by the City to adequately operate and maintain its sanitary sewer system.

## **SERVICE AREA CHANGES**

Bonney Lake's sanitary sewer service area has changed dramatically. Since the completion of the last plan in 1995, over 1,600 acres have annexed to the City. In addition, the City acquired all of Pierce County's sanitary service area in the Lake Tapps vicinity, dramatically expanding its service area both north and south of the City (see **Chapter 2** for more details).

Meanwhile, growth in and around Bonney Lake has proceeded at a nearly frenetic pace, leading to an increase of almost 100 percent in the number of connections to the City's system (see **Table 2-3**) from 1995 to today. Puget Sound Regional Council's (PSRC) forecasts of population and employment used in the development of this plan indicate that the rapid growth of recent

## EXECUTIVE SUMMARY

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years will slow down. Nevertheless, connections to the system are still forecasted to nearly double over the next 20 years to more than 11,500 residential equivalents (see **Table 5-4**).

### INFRASTRUCTURE CHANGES

To accommodate the increase in customers served by the system, the City has made multiple and significant improvements to its sewer system. The most dramatic improvement and upgrade is the expansion of the Wastewater Treatment Plant (WWTP) at Sumner. Improvements at the WWTP, which is jointly owned by the Cities of Bonney Lake and Sumner, included increasing capacity to about 4.6 million gallons per day (MGD) for maximum month flow. Bonney Lake's share of the expanded plant is 50 percent of capacity, or about 2.3 MGD (see **Chapter 2**). This capacity, along with currently proposed improvements, will provide capacity for both Bonney Lake's existing and planned new customers in the core area through the year 2017.

While the improvements to the WWTP are visible and critical, other improvements to the Bonney Lake system, in the form of new lift stations, force mains and collection mains, have been added continuously since the last plan preparation in 1995 (see **Table 2-6** and **Table 2-7**).

### POLICY AND PROGRAMMATIC CHANGES

Numerous and sometimes dramatic developments have occurred since 1995 that significantly impact Bonney Lake's sewer planning context and responsibility. Some of these developments have been initiated by Bonney Lake and, perhaps just as frequently, by others.

In June 2002, Pierce County completed and adopted a Unified Sewer Plan that established new county policy regarding sewer service in the Bonney Lake area. The completion and adoption of the Unified Sewer Plan was the catalyst for two momentous agreements. The first, executed in March 2002, was a Sanitary Sewer System Transfer Agreement between Bonney Lake and Pierce County (See **Appendix A** for a copy of the agreement). This agreement transferred Pierce County's sewer system assets in the vicinity of Bonney Lake and the County's share of its capacity in the WWTP at Sumner to Bonney Lake. **Figure 1-3** shows the former County sewer service areas that are now part of the Bonney Lake's sewer service area.

Execution of the agreement with Pierce County set the stage for consummation of a new agreement with the City of Sumner regarding the upgrade and expansion of the WWTP at Sumner (See **Appendix B** for a copy of the agreement). The agreement provides for equal sharing of the costs associated with the WWTP. It also provides terms and conditions for utilization of the Plant's capacity. This point is developed in more depth in **Chapter 2**.

A final array of activities that influences Bonney Lake's need to assess its sewer system planning revolve around the conversion of Puget Sound Energy's White River Project from a power generation project to a potable water supply. This long-term project spearheaded by the Cascade Water Alliance (CWA) could affect the amount, manner and timing of diversions from the White River into Lake Tapps (the primary water body adjacent to Bonney Lake). These potentialities raise questions related both to water quality (potential substandard septic systems along Lake Tapps) and water quantity (supplemental flows to maintain lake levels).

### PLAN STRATEGY

The strategies, programs, improvements and facilities recommended in the 2008 Bonney Lake Comprehensive Sewer System Plan address the following three major principles.

1. Safety and Reliability
2. Resource Stewardship
3. GMA Consistency

These principles are addressed while presenting a plan that conforms to the Washington State Department of Ecology's requirements for plans of this type.

#### ***Ensure Safety and Reliability***

This Plan addresses safety and reliability in two fundamental ways. First, from an operational perspective, it carefully looked at the system's components, its vulnerabilities and its reliabilities. Based on these assessments, the Plan recommends a number of steps, including adding additional staff to the Sewer Utility to properly address the day-to-day operational needs of a system that relies heavily on mechanical components (see **Chapter 7**). In addition, the Plan recommends adding back-up power and making other improvements to the existing system to improve reliability (see **Chapter 4**).

Second, also related to reliability, the Plan recognizes the nearly total dependence of the system on the continuous and nearly flawless operation of Lift Station 17. Unless alternatives are developed, dependency on Lift Station 17 will increase with concomitant increases in risk associated with any failure of the station. Accordingly, the Plan recommends both short and long-term steps to improve the system's safety and reliability as it relates to Lift Station 17. In the near term, improvements in and around Lift Station 17 are recommended to better prepare for possible failure or shut-down. Long term, the plan recommends further detailed analysis of the construction of decentralized wastewater treatment plants in both the South and North Service Areas (see **Chapter 5**) and alternative ways in conveying flows to the WWTP in Sumner. Decentralized WWTPs would allow the City to divert flows that would otherwise need to go through Lift Station 17 to the new WWTPs. The Plan also recommends evaluating the option of constructing a secondary interceptor to the Sumner WWTP along Angeline and Rhodes Lake Road East (see **Chapter 5**).

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### ***Promote Stewardship of Water Resources***

Bonney Lake's responsibility for water resource stewardship extends beyond safely and reliably managing wastewater collection and treatment. Bonney Lake also operates and protects a major potable water supply system that is largely dependent on local groundwater resources. Bonney Lake also borders a major water body (Lake Tapps) that, in reality, is a man-made storage reservoir created for hydro-power generation. As a general purpose local government, Bonney Lake also has obligations to protect and preserve surface water quality and hydrology. It is in this context that the City's Sewer Plan includes provisions to wisely manage wastewater resources.

To that end, this Plan includes specific recommendations regarding wastewater reuse. These include investigation of artificial aquifer storage and recovery (ASR) that could, if feasible, retain water in a more natural hydrologic cycle on the Lake Tapps plateau, rather than piping it down the hill for treatment and direct discharge to surface water.

In concert with the concept of ASR, as well as in support of improved safety and reliability, the Plan recommends the option of constructing at least two membrane bio-reactor wastewater treatment plants that could produce high quality water (Class A effluent), which would be suitable for reuse. Reuse options include relatively straight-forward applications, such as irrigation, as well as more technically challenging options, such as ASR or surface water augmentation.

### ***Support Planned Growth and Development***

Bonney Lake's sewer service area includes all of the City and its designated Urban Growth Area, as well as two large areas of unincorporated Pierce County. Both the City and Pierce County have adopted comprehensive plans under the Growth Management Act (GMA) that call for and plan for residential and employment growth that is dependent on sanitary sewer service. This Plan was developed using the most current land use plans and GMA forecasts from the PSRC. The infrastructure improvements programmed in the Capital Improvement Program (CIP) and the studies and reports recommended throughout the plan are consistent with and support the GMA goals and policies of both the City and Pierce County.

### **Glossary**

Average Annual Flow (AAF). Average daily flow computed from year-long flow records.

Average Design Flow (ADF) (Maximum Month). Average monthly flow of the maximum month, estimated for the design year of the sewage works.

Average Dry Weather Flow (ADWF). Average daily flow occurring in wet weather seasons.

Biochemical Oxygen Demand (BOD). A measurement of dissolved oxygen used by microorganisms in the biochemical oxidation of organic matter, typically measured over a 5-day period.

Diurnal curve. The curve or graphical representation of the cyclical rise and fall of wastewater flow during a 24-hour period in response to variation in water usage. When used in a general sense, it does not include inflow from storm events.

Diurnal. Occurring during a 24-hour period.

Fecal Coliform. The group of coliform bacteria of fecal origin. *Escherichia coli* is generally used as the measure of fecal contamination.

Firm Capacity. The available capacity when the largest unit is out of service.

Infiltration. Groundwater that enters the sewer system through cracks, service connection, footing drains and other sources.

Joint Facilities. Shall mean those wastewater facilities designed or constructed to transport, treat and dispose of sewage from one or more of City of Bonney Lake, Pierce County and South Hill Sewer District.

Maximum Daily Flow. Greatest total flow in a single day.

Minimum Daily Flow. Lowest total flow in a single day.

Most Probable Number (MPN). A measurement of coliform density based on a statistical analysis of the number of positive and negative results obtained when testing multiple portions of equal volume and in portions constituting a geometric series for the presence of coliform bacteria.

Peak Design Flow (PDF). Peak Wet Weather Flow (PWWF). Largest estimated flow rate sustained over a 60-minute period in the design year of the sewage works.

Peak Dry Water Flow (PDWF). Peak 60-minute flow rate occurring in a dry weather season.

Sewage. The water-carried human wastes from residences, buildings, industrial establishments or other places together with such industrial wastes or underground, surface, storm or other water, as may be present. The terms sewage and wastewater are used interchangeably.

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Suspended Solids (SS). And approximate measure of the quantity of sludge that will be removed from wastewater by sedimentation (clarification), typically expressed as mg/l. Suspended solids include solids that will settle to the bottom of a cone-shaped container in a 60-minute period.

Volatile Suspended Solids. The organic content of suspended solids. Volatile solids are that portion which will oxidize and be driven off as gas at 600 degrees Celsius.

Wastewater. See sewage.

### **Abbreviations/Acronyms**

AAF	Average annual flow
ADF	Average design flow
ADWF	Average dry weather flow
ASCE	American Society of Civil Engineers
ASR	Aquifer Storage and Recovery
avg	Average
AWWF	Average wet weather flow
BOD	Biochemical oxygen demand
cfm	Cubic feet per minute
CIP	Capital Improvement Program
CWA	Cascade Water Alliance
cu ft	Cubic feet
DAFT	Dissolved air floatation thickener
d/D	depth/Diameter ratio
deg	Degrees
DO	Dissolved oxygen
Ecology	Washington Department of Ecology (DOE)
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
ESA	Endangered Species Act
F:M	Food to microorganism ratio

## Executive Summary

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FAZ	Forecast Analysis Zone
fps	Feet per second (ft/sec)
ft	Feet
gal	Gallon
GIS	Geographic Information System
GMA	Growth Management Act
gpcd	Gallons per capita per day
gpd	Gallons per day
gpm	Gallons Per Minute
HP	Horsepower
hr	Hour
I&I	Infiltration and Inflow
in	Inch
lb	Pound
LF	Lineal Feet
MGD	Million Gallons per day
mg/l	Milligrams per liter
min	Minute
MLSS	Mixed liquor suspended solids
MLVSS	Mixed liquor volatile suspended solids
MPN	Most probable number
NMFS	National Marine Fisheries Service
NPDES	National Pollution Discharge Elimination System
NPW	Non-potable water
O&M	Operations and maintenance
O <sub>2</sub>	Oxygen

## EXECUTIVE SUMMARY

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OFM	Washington State Office of Financial Management
OSHA	Occupational Safety and Health Administration
PCC	Pierce County Code
PDF	Peak design flow
PDWF	Peak dry weather flow
PSE	Puget Sound Energy
PSRC	Puget Sound Regional Council
PSRP	Process to significantly reduce pathogens
PUD	Planned Unit Development
PWWF	Peak wet weather flow
RCW	Revised Code of Washington
RE	Residential Equivalent
sec	Second
SO <sub>2</sub>	Sulfur dioxide
SORT	Safety Operational Resource Team
sq ft	Square feet
SSA	Sewer Service Area
TMDL	Total maximum daily load
TSS	Total suspended solids
UGA	Urban Growth Area
ULID	Utility Local Improvement District
USEPA	United States Environmental Protection Agency
WAC	Washington Administrative Code
WAS	Waste activated sludge
WDFW	Washington Department of Fish & Wildlife
WDOE	Washington Department of Ecology (see also “Ecology”)

WEF	Water Environment Federation
WFM	Intergovernmental Contract for Wastewater Facilities Management, 11/84
WISHA	Washington Industrial Safety and Health Act
WWTP	Wastewater Treatment Plant