CHAPTER 1

NEED AND PURPOSE

The need for this Sewer Plan derives from two primary factors. The existing City of Bonney Lake (City) Sewer Plan is out-of-date. In addition, extensive changes regarding the City's sewer physical plant, service area and policy context have occurred.

EXISTING PLAN

Bonney Lake's most recent sewer plan was prepared in 2005 by RH2 Engineering (RH2), which updated a previous version of the plan prepared by Kennedy/Jenks Consultants in 1996. This plan was amended almost immediately in November 1996 by another Kennedy/Jenks Consultants-prepared document entitled "Amendment to Sewer Comprehensive Plan." Together these documents represented the City's efforts to reconcile its sewer planning with the recently adopted Growth Management Plans and Policies of both Pierce County and the City. These documents also focused on strategies for Bonney Lake to divest itself from providing sanitary sewer service via transfer (sale) of its sewer system assets to Pierce County.

Less than four years later, in April 2000, another amendment (Amendment 2) to the Sewer Comprehensive Plan was prepared by RH2 Engineering, Inc. This amendment addressed both technical and policy issues including:

1. Acquisition of Pierce County's sewer system assets in the vicinity of the City (opposite the approach of the 1996 plan and amendment);
2. Changes to the Urban Growth Area and sewer service area boundaries;
3. Changes in unit flow calculations and estimations;

4. The then on-going process to complete the Pierce County Unified Sewer Plan;
5. Endangered Species Act issues; and
6. A Capital Facilities Plan.
7. Imminent construction of the Waste Water Treatment Plant (WWTP) at Sumner.

Also in 2000, RH2 Engineering, Inc. prepared another report that considered the feasibility of wastewater reuse via the construction of a new treatment plant on the plateau. This effort was spurred in part by Puget Sound Energy's (PSE) announcement that it would likely abandon its power generation plant that is supplied by Lake Tapps. Since then, PSE has finalized its decision to abandon the White River Project (as it is formally named) opening a new chapter regarding water resource issues in the basin. This includes the possibility of purchase of the project (and its associated water rights) by the Cascade Water Alliance as a source of drinking water for its members. This development is one of many that also drive the need for development of a new sewer plan for the City of Bonney Lake.

ACTIVITIES AFFECTING BONNEY LAKE'S SEWER SYSTEM

Numerous and sometimes dramatic developments have occurred since 2005 that significantly impact Bonney Lake's sewer planning context and responsibility. Some of these developments have been driven/initiated by Bonney Lake and perhaps just as frequently have been initiated by others.

Bonney Lake has grown substantially since 1995 both from new development and just as importantly by annexing additional areas to the City. **Figure 1-1** shows the areas that have been annexed to the City between 1995 and 2008. The area annexed totals more than 1,600 acres.

In addition, Bonney Lake's potential for growth through annexation has expanded as about 50 acres have been added to the City's Urban Growth Area since 1995. **Figure 1-2** illustrates the location of revisions to Bonney Lake's Urban Growth Area. **Table 1-1 - *Changes to Bonney Lake's Corporate Limits and Urban Growth Area 1995-2008 (in acres)*** summarizes in tabular form the changes displayed in **Figure 1-1** and **Figure 1-2**.

Table 1-1
Changes to Bonney Lake's Corporate Limits and Urban Growth Area 1995 – 2008 (in acres)

	City Limits	Urban Growth Area
2008	4,674	4,831
1995	3,059	4,780
Difference	1,615	51

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. As part of this agreement, the City paid

Pierce County $1.03 million. In addition, Bonney Lake assumed responsibility for planning and providing sewer service to specific areas of Pierce County's sewer service area on the Lake Tapps plateau. **Figure 1-3** show 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) This agreement supersedes the previous 1984 between Bonney Lake, Sumner and other parties and recognizes that the two cities are now the sole remaining owners of the WWTP at Sumner. The agreement provides for equal sharing of the costs associated with the Treatment Plant. It also provides terms and conditions for utilization of the Plant's capacity. This point is developed in more depth in **Chapter 2**.

The 2002 Treatment Plant agreement provides the means to implement the 1999 Sumner Wastewater Treatment Facility Comprehensive Facility Plan (Kennedy/Jenks Consultants) and the 2000 Wastewater Treatment Facility Final Comprehensive Facility Plan Addendum 1 (Gray and Osborne). These plans, as approved by Department of Ecology provide for an upgrade and expansion of the plant to about 4.6 MGD design flow (Maximum Month) (see **Appendix C** for a copy of the current Sumner Wastewater Treatment Plant NPDES Permit). Bonney Lake's share of this capacity is discussed in more detail 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 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 historic lake levels in during periods of peak water demand).

PURPOSE

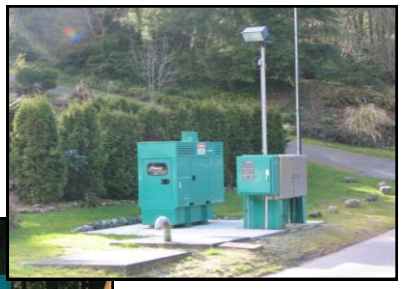
Taken together, the factors enumerated above build a compelling need to prepare a new Comprehensive Sewer Plan for the City of Bonney Lake. The objectives of this plan include:

1. Compilation of previous disparate sewer planning efforts into a single document;
2. Recognize and address the physical, policy and programmatic changes that have occurred since 1995;
3. Provide the facilities and improvements necessary to support Bonney Lake's and the region's plans for growth, economic development, water resource stewardship, protection of the public health, and preservation of environmental quality; and
4. Conform to Ecology' sewer system planning requirements.

The following chapters of the plan will provide an overview of the City's system and its setting followed by an analysis of what should be done to meet the plans objectives in prudent and responsible way.

CHAPTER 2

DESCRIPTION OF EXISTING SYSTEM



INTRODUCTION

In 1910, the Puget Sound Power & Light Company (Puget Power) diverted water from the White River to raise the level of Lake Tapps to generate electricity. The project merged Tapps, Kirtley, Crawford and Church Lakes and some marshes into the Lake Tapps reservoir. Residential subdivisions were built around Lake Tapps beginning in 1940. Early residents commuted to industrial jobs in nearby cities. After World War II, the City of Bonney Lake (City) grew rapidly in response to greater mobility and the allure of cheaper land and quieter lifestyles. Commercial development occurred along SR 410. Bonney Lake's earliest, and still most diverse, commercial/civic center developed around the intersection of SR 410 and the Old Sumner-Buckley Highway. The Lake Tapps Development Company sold recreational sites on the west shore of Lake Tapps beginning in 1954. Later they marketed their lots as permanent residential sites. The company donated 20 acres to create Allan Yorke Park; Kenneth and Bertha Simmons acquired a 1,000 acre parcel from a "rodeo man" named George Logan in 1946. In 1949, the Simmons family caused the City of Bonney Lake to be incorporated. The initial population was 275. Kenneth Simmons served three terms as Mayor. Simmons, Chet and Clarence Roberts, Robert Wheeler, Bert Filkins, and others built the concrete block building on Locust Street in the downtown district that served as community club, city hall, and fire hall. By 1950 the new town had paved streets, a water system, electric and telephone lines, refuse disposal and a blood bank. By 1957, there were 12 businesses in the downtown district. Urban development continues to change the community and heighten demand on its facilities and services.

In 1995, the City adopted its first GMA comprehensive plan. It called for compact, pedestrian-oriented development and innovative design. Implementation of this planning concept requires the provision of sanitary sewer service. This document provides the framework, analysis and direction to help achieve Bonney Lake's vision.

This chapter describes City's existing sewer system and service area. The term "service area" refers to the area that Bonney Lake is responsible for providing sanitary sewer service consistent with the City's plans and the Sanitary Sewer System Transfer Agreement between Bonney Lake and Pierce County executed in 2002. (See **Appendix A** for a copy of the agreement)

The following sections provide an overview of Bonney Lake's sewer system history, the geography of its service area and summaries of the various facilities that comprise the existing City's system.

HISTORY OF BONNEY LAKE'S SEWER SYSTEM

Bonney Lake's sewer system has a history that is convoluted, contentious and colorful. It includes tales of political fratricide and financial brinksmanship. It is only recently that the City's sewer system has evolved into a system where ownership, governance and operations are relatively clear and unambiguous.

Until the 1980s, the City's wastewater disposal system consisted solely of individual subsurface disposal systems. On 18 February 1975, Bonney Lake, Pierce County and South Hill Sewer District joined together under the auspices of an interlocal agreement to develop a "Facilities Plan" to meet their regional wastewater treatment needs. Federal and State moneys were received and the City served as the lead agency for grant administration and regulatory compliance.

In 1977, the "Section 201"[1] Lake Tapps Sewerage Facilities Plan was completed. The Facilities Plan identified the "Koperski/Alderton" location as the site for construction of a regional wastewater treatment facility, discharging into the Puyallup River. This plan was approved by the Pierce County Board of Commissioners on 15 February 1977 and by the U.S. Environmental Protection Agency (EPA) by letter dated 28 February 1977.

Design and construction of the Bonney Lake's sanitary sewer system began in the late 1970s. Many of the City's residential grinder pump station, sewage collection lines, lift stations and interceptors were installed during the period 1977 through 1981. Grant moneys were obtained from the Environmental Protection Agency through the Washington Department of Ecology for design and construction of these facilities and work was proceeding when the Pierce County Planning Commission denied an unclassified use permit for the proposed wastewater treatment plant site located on the Puyallup River near Alderton, derailing further work on the project.

Immediately thereafter, an addendum was prepared to the Facilities Plan specifying land treatment as the alternative to the Koperski/Alderton treatment plant. This approach was later abandoned in the face of delays caused by growing environmental concerns.

[1] Section 201 refers to the section of the federal Clean Water Act that was a large source of grant funding for sewer planning and construction throughout the 1970's and 1980's.

Finally, in 1979, an Addendum 3 to the Facilities Plan was prepared that proposed conveyance of the City's wastewater to Sumner's treatment plant. This concept included expanding the Sumner Treatment Plant to accommodate the additional wastewater flows. In addition to the expansion of the treatment plant, this alternative included a gravity transmission line to the treatment plant, plus lift stations and related interceptors. This addendum was approved by the Pierce County Board of Commissioners on 26 March 1979 and by the US EPA by letter dated 19 July 1979.

In January 1980, Bonney Lake, Sumner, Pierce County and South Hill Sewer District consummated an interlocal agreement providing for implementation of the Facility Plan as amended. It provided for the design, construction and operation of these regional facilities.

Later in 1980, changes in the grant funding prospects for the project from Ecology and EPA increased the amount of local matching share that would be required from 10 percent to 25 percent. This increase led Pierce County to reevaluate and withdraw from its participation in the project.

Bonney Lake also began to study local, non-regional alternatives for treatment of its wastewater. In 1982-83, the City selected an alternative entailing construction of a small independent wastewater treatment facility and interceptor with capacity to serve only Bonney Lake. A local improvement district was formed to finance the construction of these facilities, but it was rejected by the voters in 1983, effectively eliminating that alternative. During this period, a recall campaign against the Mayor of Bonney Lake was initiated based primarily on the issues revolving around the City's failed attempts to complete its sewer system. Upon the recall, a majority of the City Council resigned. These two actions completely changed the political complexion of the City. The new mayor and City council announced abandonment of efforts to develop a sanitary sewer system.

This prompted a decision by the EPA to terminate its wastewater facility grant to Bonney Lake and require repayment of more than $3 million already expended. Bonney Lake appealed EPA's decision to an appeal board established for this purpose by EPA. Bonney Lake and South Hill also filed suit against Pierce County in an effort to avert the financial disaster associated with immediate repayment of the canceled EPA grants.

Settlement discussions between Pierce County and the City of Bonney Lake and the EPA eventually led to a resolution of both the litigation between the City and Pierce County, and also the EPA Grant appeal. The Sumner Wastewater Treatment Plant (WWTP) Expansion Alternative was resuscitated, Pierce County agreed to participate, and the parties entered into another interlocal agreement. In November 1984, the Intergovernmental Contract for Wastewater Facilities Management agreement between Bonney Lake, Pierce County, Sumner and the South Hill Sewer District was finalized. This agreement provided for the development of interceptor conveyance facilities and for expansion of the existing sewage treatment plant in Sumner.

The principal interceptor to the wastewater treatment facility, together known as the Joint Facilities, was designed and constructed, starting in 1979, as the Lake Tapps Sewage Interceptor System Project. This interceptor was funded primarily by grants from the USEDA, HUD and WDOE, and by local matching share from the City of Bonney Lake and Pierce County, and, in part, by the South Hill

Sewer District. Under this agreement, the City of Bonney Lake was the lead agency responsible for the construction of these facilities.

During the mid-1980s, the City of Bonney Lake oversaw the construction of Lift Stations 8, 11, 12, 13, 14 and 17, as well as the Church Lake and SR 410 interceptors. These new facilities joined up with the existing Fennel Creek, Debra Jane Lake and the Bonney Lake Interceptors. By mutual agreement, these Joint Transmission Lines were operated and maintained by the City of Bonney Lake and jointly owned by the City of Bonney Lake and Pierce County. South Hill Sewer District owned a small portion of the interceptor sewer near the Sumner Wastewater Treatment Plant.

Sewer service for the City of Bonney Lake was established in 1987 with the completion of the primary interceptors comprising the Joint Transmission Lines and the expansion of the Sumner Sewage Treatment Plant, known as the Joint Sewage Treatment Plant. While the City of Bonney Lake, Pierce County and the South Hill Sewer District each paid for the expansion of the Sumner Wastewater Treatment Plant, it was agreed that the City of Sumner would own and operate the expanded plant, and the other entities would each pay for and own a share of capacity at that plant based upon the design capacity increase apportioned in accordance with population projections within their respective service areas.

In the mid-1990's Bonney Lake was re-evaluating its role as a provider of sanitary sewer service. Simultaneously it was developing land use plans in conformance with the Growth Management Act and Pierce County's Countywide Planning Policies. These processes converged with development of the Sewer Comprehensive Plan and Amendment to the Sewer Comprehensive Plan both completed in 1996 and prepared by Kennedy/Jenks Consultants. These plans included the recommendation that the City divest itself of its sewer system by transferring it to Pierce County.

Shortly thereafter Pierce County commenced development of its Unified Sewer Plan in 1997. This countywide planning effort involved cities and other stakeholders throughout Pierce County in what turned out to be a five year process culminating in the adoption of the Unified Sewer Plan by the Pierce County Council in 2002. As an outgrowth of the Unified Sewer Planning process, both Bonney Lake and Pierce County evaluated and re-evaluated their respective roles, capabilities and responsibilities with regard to sanitary sewer service on the Lake Tapps plateau. These deliberations resulted in a reversal of the City's 1996 mindset regarding sewer service and execution of the Sanitary Sewer System Transfer Agreement between Bonney Lake and Pierce County executed in 2002. (See **Appendix A** for a copy of the agreement)

This agreement dramatically expanded Bonney Lake's sewer service area by adding significant territories both south and north of the city limits. These areas are discussed and depicted in more detail in **Chapter 5**.

SEWER SERVICE AREA

Geography

Bonney Lake lies on the southwest shore of Lake Tapps in north central Pierce County. The City is southwest of Sumner, its nearest municipal neighbor, and about four miles south of Auburn, its nearest municipal neighbor in King County. **Figure 2-1** provides a visual perspective of the proximity of

Bonney Lake's city limits with the corporate limits of nearby cities such as Puyallup, Sumner, Auburn; of Pierce County; as well as the County Urban Growth Boundaries.

Topography

Elevations within the service area range from approximately 100 feet to 710 feet above sea level. However, the majority of the service area is located on top of the Lake Tapps plateau which is bounded by the White River on the east and north, the Puyallup River on the west, and Fennel Creek on the South. The plateau is dominated by the Lake Tapps reservoir with a normal high water level of 543 feet above sea level. Several other small lakes are located throughout the service area, including Bonney Lake, Debra Jane Lake, Hidden Lake, Church Lake, and Prinz Basin. There are also a number of wetlands and small creeks throughout the service area. The terrain on the plateau is undulating with numerous depressions of lakes and former lakebeds. Most of the undeveloped areas are heavily forested. The largest transportation corridor within the City's service area is SR 410, which runs east/west through the southern portion of the service area.

Climate

The climate of the service area is typical Puget Sound weather. Rainfall is monitored on a daily basis at the Sumner Wastewater Treatment Plant (WWTP). However, for this plan, historic weather data from the Buckley Station was used since it is located on a plateau. Average annual rainfall in the service area from 1998 through 2007 was approximately 44 inches. Historically, the June through October period is the driest. For the years 1998-04, average monthly rainfall during July, August, and September was approximately 1.32 inches.

Geology

The geology of the service area is the result of two major geologic events: the glaciation of the last glacial epoch and the Osceola mudflow. During the glacial period at least two separate and distinct glacial events occurred. The advance and recession of major ice fields that carved many valleys and ridges into the terrain defined these two periods. The Osceola mudflow occurred about 4,800 year ago and smoothed the area by filling many of the valleys with mud and silt.

Water Supply Sources within the Sewer Planning Area

Many well and spring sources of potable water exist within Bonney Lake's sewer service area. Some of these are quite significant, including the City's own sources of Victor Falls Springs, Grainger Springs and the Tacoma Point Wellfield. In addition, both the cities of Sumner (County Springs and Sumner Springs) and Puyallup (Salmon Springs) have major water supply sources in the City's sewer planning area. **Figure 2-2** shows the location of known Group A and Group B sources of supply in the vicinity of Bonney Lake's sewer service area.

Wastewater Treatment Facilities

As previously described, Bonney Lake jointly owns the Sumner Wastewater Treatment Plant with the City of Sumner (see **Appendix B** for a copy of the agreement between Bonney Lake and Sumner). This plant is the destination for all wastewater currently generated within Bonney Lake's service area. It is also the planned destination for projected future flows for at least the next ten to fifteen years (see **Chapter 5**). There are seven other wastewater treatment plants within 20 miles of Bonney Lake. Their general locations are shown on **Figure 2-3**. None of these other seven plants currently represents a reasonable alternative for treatment of wastewater from Bonney Lake's sewer service area.

Other Sewer Utilities

Several other sewer utilities exist in the area including the City of Auburn, City of Puyallup, the City of Pacific, and the South Prairie Sewer District. Both Auburn and Pacific send their respective wastewater flows north to the King County-East Division Reclamation Plant in Renton. The City of Puyallup and the Town of South Prairie both own and maintain their own wastewater treatment facilities. Further east, the City of Enumclaw and the City of Buckley each have their own collection and treatment facilities.

Existing Land Use

Existing land use within the City's sewer service area is predominantly residential. **Figure 2-4** displays the distribution of existing land use within the service area. **Table 2-1 – *Existing Land Use within Bonney Lake's Sewer Service Area (in Acres)*** tabulates these same uses by type. While most of the service area is not currently connected to sanitary sewers, for those areas that are connected residential flows are even more dominant. Residential customers comprise the vast majority of the City's sewer accounts. Roughly 98 percent of connections are residential customers (this includes both single and multi-family customers).

Table 2-1
Existing Land Use within Boney Lake's Sewer Service Area (in Acres)

	Sewer Service Area			
	North	Core	South	Total
Land Use	Area (Acres)	Area (Acres)	Area (Acres)	Area (Acres)
Commercial/Industrial	17	204	0	**221**
Industrial	0	7	0	**7**
Public/Open Space or Resource Land	56	578	12	**646**
Single Family Residential	1,063	2,056	604	**3,723***
MultiFamily Residential	29	41	6	**76**
Other Residential	55	411	230	**696**
Transportation/Communication/Utilities	203	148	33	**384**
Vacant or Unknown	219	1,246	767	**2,232**
Total	**1,642**	**4,691**	**1,652**	**7,985**

*Based on August 2006 County GIS Data

The City of Bonney Lake is located on an undulating plateau about 400 feet above the valley of the Puyallup River, two miles upstream of that river's junction with the White River. The slope into the valley ranges from 40 to 50 percent. The City boundary is irregularly shaped. The south shores of Lake Tapps frame the City on the north. Fennel Creek and its associated wetlands and farmlands divide the north and west portions of Bonney Lake from the southeast portion.

As of 2007 the city limits included about 7.3 square miles or 4,674 acres. Land use for this Plan was based on Pierce County Assessor-Treasurer Records, accessed from the County view database on August 2006. Land use designations for the three service areas (North, Core, and South) are summarized in **Table 2-2 – *Existing Land Use by Area***.

Table 2-2
Existing Land Use by Area

	Sewer Service Area			
	North	Core	South	Total
Land Use	% of Total Area	% of Total Area	% of Total Area	% of Total Area
Commercial/Industrial	1.0%	4.3%	0.0%	2.8%
Industrial	0.0%	0.1%	0.0%	0.1%
Public/Open Space or Resource Land	3.4%	12.3%	0.7%	8.1%
Single Family Residential	64.8%	43.9%	36.6%	46.6%
MultiFamily Residential	1.8%	0.9%	0.4%	1.0%
Other Residential	3.3%	8.8%	13.9%	8.7%
Transportation/Communication/Utilities	12.4%	3.2%	2.0%	4.8%
Vacant or Unknown	13.3%	26.5%	46.4%	27.9%
Total	**100%**	**100%**	**100%**	**100%**

*Based on August 2006 County GIS Data

As alluded to above, Bonney Lake is predominately a single-family residential community. It has much vacant land, but not all of it is developable. Vacant and public lands are scattered throughout the City. Commercial uses are primarily located along SR 410. There is very little industry. As of 2007, the gross residential density inside the city limits is 2.12 dwelling units per acre. (This represents acres of residentially zoned, non-vacant land divided by the number of households. The number of households was derived by dividing the April 2007 OFM population estimate by the 2000 Census's average household size of 2.9645). After deducting the area of streets, critical areas, and other unbuildable areas the net density is approximately 2.60 units per acre. (The net density calculation is based on the 2007 Pierce County Buildable Lands Report). These residential densities are far below the minimum of four units per acre required under GMA according to the Central Puget Sound Growth Management Hearings Board. However, recent plats have been developed at much higher densities than pre-existing neighborhoods.

Proposed Land Use

With the execution of the Sanitary Sewer System Transfer Agreement between Bonney Lake and Pierce County, the City's service area now includes the entire city limits plus extensive areas of unincorporated Pierce County. The total acreage in the City's service area is now about 8,000. Of

this area, the North Sewer Service Area accounts for approximately 1,642 acres, the Core Area includes approximately 4,691 acres and the South Sewer Service Area includes approximately 1,652 acres. Land Use planning for this area is divided between the City and the County. **Figure 2-5** and **Figure 2-6** show proposed land uses for the City's sewer service area both within the City and in the unincorporated areas.

The City's Comprehensive Plan calls for a City with compact, pedestrian-oriented development and innovative design. This pattern of development requires sanitary sewer service.

Bonney Lake's unincorporated sewer service area includes land that is both inside and outside of the Urban Growth Boundary. The City's unincorporated sewer service area that lies within the Urban Growth Area (the "South Service Area", see **Chapter 5**) is planned for urban levels of development. Pierce County's adopted Comprehensive Plan calls for "a range and scale of urban land uses within the designated Urban Growth Areas."[2]

Bonney Lake's unincorporated sewer service area that lies outside the Urban Growth Boundary (the "North Service Area, see **Chapter 5**) is largely developed with suburban single-family homes along and near the west shores of Lake Tapps. This service area is a legacy service area transferred by the county to the City in 2002. Service to this area is required as a consequence of contracts and agreements entered into between Pierce County and state and federal agencies in the 1980's. (See the Pierce County Unified Sewer Plan for a more extensive discussion of this topic.)

EXISTING WASTEWATER FLOW CHARACTERISTICS

Connections

Bonney Lake's sewer system grew from about 2,628 connections in 1995 to over 5,180 connections in 2007. As mentioned previously approximately 98 percent of these connections are residential (either single or multi-family). This rate of growth is much higher than Pierce County as a whole and cannot be sustained over the life of this plan. **Table 2-3 – *Sewer Connections by Type (Number of Accounts)*** shows the changes in numbers of connections by year and by type from 1995 through 2007.

Table 2-3
Sewer Connections by Type (Number of Accounts)

Customer Class	1995	1996	1997	1998	1998	200	2001	2002	2003	2004	2005	2006	2007	June 2008
Commercial / Public	60	62	65	68	71	71	79	84	91	94	101	106	112	117
Single-Family	2,521	2,591	2657	2738	2858	3001	3,123	3,465	3,766	3,956	4,370	4,755	4,971	5,033
Multi-Family	39	46	51	60	60	118	120	40	42	65	75	83	88	92
Parks	4	4	5	5	5	5	5	5	5	6	4	4	4	5
Schools	4	4	4	4	4	4	4	4	5	7	8	8	8	8
Total Connections	**2,628**	**2,707**	**2,782**	**2,875**	**2,998**	**3,199**	**3,331**	**3,598**	**3,909**	**4,128**	**4,558**	**4,956**	**5,183**	**5,255**
Total Residential Connections	2,560	2,637	2,708	2,798	2,918	3,119	3,243	3,505	3,808	4,021	4,445	4,838	5,059	5,125
Percent Residential	*97%*	*97%*	*97%*	*97%*	*97%*	*97%*	*97%*	*97%*	*97%*	*97%*	*98%*	*98%*	*98%*	*98%*

[2] See PCC 19A.30.010.J; Land Use Objective 8, among others.

Quantity

Flows within the Bonney Lake system are typical of what would be expected from a predominantly residential system.

As described previously, flows from the City's service area are predominantly residential in character. With no significant commercial, manufacturing or industrial wastewater generators currently being served, flow patterns follow the typical diurnal curve of a peak in the morning hours between about 6:00 am and 9:00 am followed by a somewhat higher flow peak in the evening hours between about 4:00 pm and 8:00 pm. As expected with this type service area, flows are at there lowest between the hours of about midnight and 4:00 am.

Residential Equivalency

To facilitate system analysis and planning, a value for the amount of wastewater generated by a typical single-family unit have been calculated. This number is called a "Residential Equivalent" or "RE". For the Bonney Lake sewer system, this value is 275 gallons per single-family unit per day. A number of components and considerations go into development of this value. Some of them include the amount of water (as measured from Bonney Lake water system accounts) used by a typical single-family residence in the wintertime. Another component is household size – the number of people that typically reside in a single-family residence. Household size is a variable that has been declining for decades and also must be considered when developing both population and household forecasts (see **Chapter 5** for a discussion of the forecasting methodologies used in this plan). Another component of the RE value is the quantity of rain or stormwater that makes its way into the sewer system. This water is called Infiltration and Inflow (I&I). Infiltration is stormwater that leaks into the system through cracks, joints and manholes. Inflow is stormwater that is routed into the system primarily through illegal connection of roof drains or cross-connection of stormwater pipes with the sanitary collection system.

For the Bonney Lake system, a typical residential unit generated, on average, about 195 gallons of wastewater flow per day (based on average annual flows at the Sumner WWTP for the period of July 2006 to June 2008). Over that same period, the minimum month flow per residential unit was 162 gallons per Residential Equivalent per day, and the maximum month flow per residential unit was 275 gallons per Residential Equivalent per day. Subtracting these two numbers results in a rough estimate of 113 gallons per Residential Equivalent per day of I&I flow. **Table 2-4 – *Residential Equivalency Components for the Bonney Lake's Sewer System*** displays these values in tabular form.

Table 2-4
Residential Equivalency Components for the Bonney Lake's Sewer System

Parameter	Flow (Gal/RE/Day)
Average Daily Flow	195
Max Month Flow	275
Min Month Flow	162
I&I	113

Quality

Bonney Lake's influent quality as measured at the Sumner Treatment Plant is also typical of residential flows. For the period from July 2006 to June 2008 Biochemical Oxygen Demand (BOD) averaged about 246 mg/l and Total Suspended Solids (TSS) averaged about 269 mg/l. The high-low monthly extremes for these parameters ranged from 287 to 190 mg/l BOD and 320 to 215 mg/l for TSS. See **Table 2-5 – *Mean Monthly Water Quality for Bonney Lake's Wastewater at the Sumner Treatment Plant*.**

Table 2-5
Mean Monthly Water Quality for Bonney Lake's Wastewater at the Sumner Treatment Plant

Parameter	Concentration (mg/L)
Biochemical Oxygen Demand	246
Total Suspended Solids	269

Existing Collection System

Bonney Lake's existing system is comprised of about 81 miles of gravity sewers and force mains. Within the current collection system wastewater flow is generally routed from the northern and southern areas of the Bonney Lake UGA to the SR 410 interceptor. **Figure 2-7** provides an overview of the City's collection system. Most of the wastewater collected in the system routes through at least one of the 22 lift stations serving the system. **Figure 2-7** is color coded to show which sections of pipe are linked to which lift station. Enlarged versions of this figure will be presented in **Chapter 4**.

This interceptor then carries all flow from the Lake Tapps plateau to the Sumner WWTP to be treated prior to discharge to the White (Stuck) River. The interceptor to the treatment plant is about four miles long and includes sections of 16, 18, 24 and 30 inch diameter pipe. **Figure 2-7** shows the configuration of this interceptor as it descends down the steep edge of the Lake Tapps plateau to the Sumner WWTP.

Table 2-6 – *Inventory of Sewer System Pipes by Size and Type* summarizes the pipes comprising the Bonney Lake system by size and type.

Table 2-6 Inventory of Sewer System Pipes by Size and Type					
Diameter	**Force Main**	**Gravity**	**WWTP Interceptor**	**Total**	**Percent**
1 1/4-inch	1,079 ft.	-	-	1,079 ft.	0%
2-inch	6,584 ft.	-	-	6,584 ft.	2%
2 1/2-inch	605 ft.	-	-	605 ft.	0%
3-inch	6,253 ft.	-	-	6,253 ft.	1%
4-inch	20,019 ft.	-	-	20,019 ft.	5%
6-inch	21,007 ft.	-	-	21,007 ft.	5%
8-inch	5,627 ft.	268,210 ft.	-	273,838 ft.	64%
10-inch	7,589 ft.	22,138 ft.	-	29,727 ft.	7%
12-inch	-	16,715 ft.	-	16,715 ft.	4%
16-inch	-	-	13,842 ft.	13,842 ft.	3%
18-inch	-	10,919 ft.	3,539 ft.	14,458 ft.	3%
24-inch	-	6,665 ft.	967 ft.	7,633 ft.	2%
30-inch	-	9,058 ft.	7,902 ft.	16,960 ft.	4%
Total	68,763 ft.	333,707 ft.	26,250 ft.	428,719 ft.	100%
	13 miles	63 miles	5 miles	81 miles	

As is common with sewer systems of Bonney Lake's character, the majority of the systems pipes (over 60 percent) are gravity 8-inch diameter pipes. Because of the undulating topography of the City's service area, Bonney Lake also operates 22 lift stations of varying sizes and configurations. The characteristics of these lift stations are summarized in **Table 2-7 – *Sewage Lift Stations*.**

Table 2-7
Sewage Lift Stations*

Lift Station	Location	GPM per Pump	TDH per Pump (ft)	HP	Pump Type	Pump Model
1	95th St Loop	120	68	7.5	CS	Flyght 3127
2	Sky Island	88	221	32	CS	Pumpex Model K-89 VE1211
3	BL Elementary	135	44	5	CS	Flyght 3102
4	Lake Bonney	145	43	5	CS	Flyght 3102
5	Myers Road	120	75	10	CS	Flyght 3127
6	Debra Jane South	100	47	5	CS	Flyght 3102
7	McGhee	120	46	5	CS	Flyght 3102
8	Debra Jane West	140	65	10	CS	Flyght 3127
9	Mt. Creek	120	89	18	CS	Flyght 4" 3153
10	White River	298	91.5	18	CS	Flyght N-3153
11	Interlake Island	145	30	3	CS	Flyght 3085
12	Inlet Island	270	63	10	CS	Flyght 3127
13	Church Lake Drive	820	58	20	CS	Flyght 3152
14	Flume	720	40	20	CS	Flyght 3152
15	Vandermark	100	47	5	CS	Flyght 3102
16	Maple Point	100	47	5	CS	Flyght 3102
17	SR 410	1200	155	75	CS	Paco 5k65dp6413 415-15
18	Safeway	500	68	20	CS	Flyght 3152
19	Willowbrook	1200	160	75	VS	FM D5434M
20	Spring Haven	381	89	18	CS	Flyght
21	Panorama West	300	195	50	VS	Flyght
22	Brookfield	174	88.3	10	CS	Flyght

* GPM - gallons per minute
TDH - Total Dynamic Head
HP - Horse Power
CS - Constant Speed
VS - Variable Speed

Treatment Plant

As described previously, Bonney Lake conveys all of its sewage to the Sumner Wastewater Treatment Plant. Bonney Lake is a partner with the City of Sumner in the expansion, ownership and operation of this plant. This plant was recently upgraded in 2005 to have a design flow (maximum month) of 4.89 MGD. The average annual flow for the plant is 3.43 MGD as described in the Plant's NPDES Permit (see **Appendix C**). Bonney Lake's agreement with Sumner allows it to use up to 55 percent of the plant's capacity (subject to payment of capital and O&M costs). This presents an upper capacity limit for Bonney Lake of about 2.53 MGD. Currently, the cities of Sumner and Bonney Lake are undergoing planning and design efforts to increase plant capacity again. The planning, design and reports for this upgrade will be completed by others. This report will not duplicate those recent efforts. However to summarize, the plant (as currently being designed) will have a design flow (maximum month) of 6.10 MGD. Bonney Lake will have a 50 percent ownership stake in the plant capacity, with an option to purchase an additional 5 percent for a total ownership of 55 percent of the plant.

CHAPTER 3

POLICIES AND DESIGN CRITERIA

INTRODUCTION

This chapter outlines general sewer policies that are for the City of Bonney Lake (City) to manage its sewer system. These policies are based on laws, regulations, and guidelines set forth by Federal, State and County agencies, as well as by the City of Bonney Lake. These policies can be divided into five general categories:

1. Sewer Service Policies
2. Service Area Policies
3. Facility Policies
4. Organizational Policies
5. Financial Policies

Each of these policy categories will be described in detail in this chapter.

1) Sewer Service Policies

This section addresses the criteria used to establish adequate level of service standards for the City of Bonney Lake's sewer service.

Wastewater Treatment

- *Waters of the state shall be of the highest possible quality. Regardless of the quality of the waters of the state, all wastes and other materials and substances proposed for discharge into said waters shall be provided with all known, available, and reasonable methods of treatment prior to discharge. (WAC 173-221-020)*
- *All treated wastewater to be used as reclaimed water should meet standards outlined in Chapter 90.46 RCW and the Criteria for Sewage Works Design, Department of Ecology, 1998. Whichever guidelines provide the more stringent requirements should govern.*
- *Treated effluent disposed to surface waters should also meet standards outlined in applicable State Law and the Criteria for Sewage Works Design, Department of Ecology, 1998. Whichever guidelines provide the more stringent requirements should govern.*
- The City shall endeavor to find the most cost effective, timely, reliable and efficient wastewater treatment methods available.
- When treatment methods prove to be non-cost effective, timely, reliable and/or efficient, or another treatment method is more feasible, then alternative treatment methods should be explored, including but not limited to, other existing facilities, new conventional facilities, lagoons and drainfields.
- Septic tanks and community drainfields may be used as an interim solution to central sewer systems in the following circumstances:
  - Access to the existing sewer system would require extensive pumping due to topography.
  - Access to the existing sewer system would require the extension of over one mile of sewer main. In this case the development must install dry sewers and pay all connection charges at time of building permit.
- A proposed single-family residence on a single parcel must connect to the existing sewer system if a sewer main is within 300 feet of the property.

Conservation

- *The City shall require the use of efficient water fixtures in all new construction (RCW 19.27.170).*
- The City will promote the efficient and responsible use of water and will conserve during a water shortage.
- Alternative sources of water, including but not limited to, reclaimed water, shall be obtained if financially, environmentally and physically feasible.

2) Service Area Policies

Annexations

- Areas annexed without existing collection facilities will be served by the City of Bonney Lake at the customers' expense unless accepted by City Council.
- In both annexations and existing service areas, the City's policy requires that sewer mains be extended across frontage to far property boundary.
- The value of water resources on the plateau shall be considered when evaluating sewer service to new areas and to areas currently served by septic drainfields.
- Areas annexed with existing facilities must meet the City of Bonney Lake's sewer standards unless accepted by City Council.
- The City will follow State guidelines in the assumption of facilities in annexation areas.

Service Area

- The City of Bonney Lake's sewer system shall serve all users of sewer within the City and within the City's sewer service area subject to appropriate statutes and ordinances and subject to the limitations of the sewer collection system.
- New developments will be required to pay for system extensions. Provisions for latecomer agreements will be allowed.
- The City is the lead agency within its service area boundary as designated by applicable Pierce County requirements and agreements.
- As lead agency, the City accepts ultimate responsibility for providing sewer service within its service area.
- The City will not provide sewer service to other utilities on a wholesale basis.

3) Facility Policies

This section details the design criteria to be used to establish an optimum behavior level and a standard of quality for the sewer system.

Sewer Mains

- All sewer designs should follow the standards outlined in the City's most current *Development Policies and Public Works Design Standards Manual*.
- All sewers shall be designed and constructed to have a mean velocity of not less than two feet per second (fps). This criteria shall apply for average day flows for the sewer at the time the facility is first brought online.
- *Velocity in force mains shall not exceed 8 feet per second (fps). Optimum velocities for reducing maintenance costs and preventing accumulation of solids range between 3.5 and 5 fps. Criteria for Sewage Works Design, Department of Ecology, 1998.*

- *Where velocities greater than 15 fps are expected, special provision shall be made to protect against internal erosion. Criteria for Sewage Works Design, Department of Ecology, 1998.*
- No sewer shall be less than eight inches in diameter except that, in special cases, the City of Bonney Lake may approve six-inch diameter sewer lines.
- *An "n" value of 0.013 shall be used in Manning's formula for the design of all sewer facilities (regardless of pipe material) except inverted siphons, where an "n" value of up to 0.015 can be used. Criteria for Sewage Works Design, Department of Ecology, 1998.*
- *Accepted material for sewers, such as ductile iron and PVC will be given consideration, but the material selected should be adapted to local conditions. Criteria for Sewage Works Design, Department of Ecology, 1998.*
- *All required separations from water mains, water supply wells, and other existing utilities are applicable as outlined in the Criteria for Sewage Works Design, Department of Ecology, 1998.*

Lift Stations

- *Lift stations should be designed to allow the station to provide the peak design flow with the largest pump out of order.*
- *Lift station shall be designed by the City.*
- *Lift stations should be designed for the typical 20-year design life.*
- *The City will not assume maintenance responsibility for any additional grinder pressure sewer pumps. However, the City will consider maintaining additional pressure sewer mains located within right-of-ways.*

Maintenance

- Equipment breakdown is given highest maintenance priority, and repairs should be made even if overtime labor is involved.
- Equipment should be replaced when it becomes obsolete.
- Worn parts should be repaired, replaced, or rebuilt before they represent a high failure probability.
- Equipment that is out of service should be returned to service as soon as possible.
- A preventive maintenance schedule shall be established for all facilities, equipment and processes.
- Spare parts shall be stocked for all equipment items whose failure will impact the ability to meet other policy standards.
- Tools shall be obtained and maintained to repair all items whose failure will impact the ability to meet other policy standards.

- Dry, heated shop space shall be available to all maintenance personnel to maintain facilities.
- All maintenance personnel shall be trained in the procedures and techniques necessary to efficiently perform their job descriptions.
- Written records and reports will be maintained on each facility and item of equipment showing operation and maintenance history.

Temporary and Emergency Services

- Compliance construction standards but not quality standards may be deferred for temporary sewer service.
- Compliance with standards may be deferred for emergency sewer service.

Reliability

- The City shall ensure that the sewer system is constructed, operated and maintained to protect against failures of power supply, treatment process, equipment, or structure with appropriate backup facilities.
- System demand planning will use historical customer data and assume all available land will be developed at saturation.

Joint Use

- All joint use facilities must comply with City policy and design standards.
- Joint use facilities will be pursued only in those areas that improve reliability or operating costs.

4) Organizational Policies

Structure

- The sewer utility shall be operated as an "enterprise utility" which means that it will be financially self-supporting.
- The Public Works Department managers accomplish sewer utility management.
- The sewer utility shall operate to administer only the municipal sewer system. The sewer utility does not administer stormwater, water and other utilities.
- The Public Works Department performs sewer utility customer service (except for billings).
- The sewer utility has the responsibility for adequate system operation.
- Planning, design, operations and maintenance, and construction will be accomplished or overseen by the sewer utility.

Staffing

- The sewer utility staffing levels are established by the City Council based on the financial resources of the City and needs of the sewer utility.
- Personnel certification will comply with State established standards.

Relationship with Other Departments

- The Finance Department is responsible for customer billing, payment collection, project cost accounting, and fund activity reporting.
- The Administrative Services Department is responsible for employee records and salary schedules.
- The East Pierce Fire and Rescue District is responsible for emergency responses to hazardous events at sewer system facilities.
- The Police Department and Public Works Department are responsible for enforcing violations of the City's sewer ordinances.
- The Water Department is responsible for shutting off water service if a customer does not pay their sewer bill.
- The Sewer Department will participate in the implementation of the Water Department's conservation program.

Planning and Regional Participation

- The City will update the Comprehensive Sewer System Plan (as defined in WAC 173-240-020) and submit for approval from the State every six years.
- The City will review the Comprehensive Sewer System Plan every two years and update as necessary.
- The City will stay up-to-date on regional collection activities that reduce the cost of service and that improve reliability, service and effluent quality.

5) Financial Policies

- Rates and additional charges established for the City should be:
    1. *Cost-based* rates that recover historical, current, and future costs associated with the City's sewer system and its services.
    2. *Equitable* charges to recover costs from sewer customers commensurate with the benefits they receive.
    3. *Adequate and stable* source of funds to cover the current and future annual cash needs of the sewer utility.
    4. *Easily understood* and administered by the customer.

- The existing customers of the City will pay the direct and indirect costs of operating and maintaining the sewer facilities through user rates. In addition, the user rates will include debt service incurred to finance the capital assets of the utility.
- To further improve the equitability of rates, the City will consider implementing a flow based rate structure.
- New customers seeking to connect to the sewer system will be required to pay an "equitable share of system charge" or Capital Facilities Charge for an equitable share of the cost of the system's capital facilities plan. This revenue will be used to finance the Capital Facilities Program.
- The term "connection charge" refers to all Capital Facility Charges, Frontage Charges, and any other charge for connecting to the City's system, paid by a property owner when connecting to the sewer system.
- New and existing customers will be charged for extra services through a separate ancillary charge based on the cost to provide the service. Ancillary charges can increase equitability and increase operating efficiency by discouraging unnecessary demand for services by the customers. Revenue from ancillary charges will be used to finance annual operations and maintenance.
- The City will maintain information systems that provide sufficient financial and statistical information to ensure conformance with rate-setting policies and objectives.
- There are two widely-used, generally accepted methods for determining the total revenue requirements of a sewer utility; the cash basis and the utility basis. The sewer rates will be developed using the cash basis, which is a method commonly used by publicly owned utilities.
- The user charges must be sufficient to provide cash for the expenses of operating and maintaining the utility. To ensure the fiscal and physical integrity of the utility, an amount should be set aside each year for capital expenditures from retained earnings. That is, an amount should be set aside to cover some portion of the depreciation of the physical plant. The amount may be transferred from the operating fund to the construction fund for general purposes or for specific purposes such as to create a reserve for main replacement.
- A Working Capital Reserve will be maintained to cover unanticipated emergencies, bad debts and fluctuations in cash flow. The cash reserve will be equal to 45 days for the operating fund and 60 days or longer for the construction fund-based on the amounts being expended.
- Customers should be classified as single-family, multi-family, commercial, industrial, irrigation and schools. These are the existing customer classes for the utility.
- The criteria used to project demand and size facilities will be based on the "worst case" comparison of: 1) historical or 2) comprehensive planning statistics. This will result in conservative financial planning.
- The City will use generally accepted cost allocation principles for all cost allocation purposes.

- The sewer rates will be based on the cost of providing the sewer service. Service requirements relate to the total volume of water used, peak rates of use, and other factors.
- The City's fees and charges should be calculated for the service area as a whole.
- The City will not discriminate between customers inside the City, as compared to customers outside the City.
- The City will charge customers for extra service through a separate ancillary charge based on the cost to provide the service. The charges should be reviewed regularly and updated annually based on increases in the Consumer Price Index for the City area.
- The owners of properties which have not been assessed or charged or borne an equitable share of the cost of the sewer collection and sewer treatment facilities shall pay prior to connection to a sewer main one or more of four special charges:

    1. *Cost Recovery Agreements* – Cost recovery agreements are granted to developers, owners, and the City for the reimbursement of a pro rata portion of the original costs of sewer systems.
    2. *Special Assessment Charge* – The special assessment is a charge for the historical costs for the sewer collection system. This shall include the sewer collection mains that lie adjacent to or near properties that would benefit directly from sewer mains that were not installed by Local Improvement Districts (LIDs) or by a private developer under a Latecomers Agreement. The latecomers will pay an additional 10 percent administration fee.
    3. *Capital Facilities Charge* – The Capital Facilities Charge shall be assessed against any property connecting to the sewer system. This charge is for the major facilities that deliver the sewage to a treatment facility and for the facilities to treat and dispose of the sewage. This charge is for reimbursement of customers who have paid for the facilities described and for building capacity to accommodate growth.
    4. *Inspection and Approval Fees*. – Inspection and approval fees will be based on a time and expense basis.

CHAPTER 4

Existing System Evaluation

INTRODUCTION

This chapter evaluates and discusses topics and issues related to the current City of Bonney Lake (City) sewer system. **Chapter 5** will discuss service to forecasted growth in the City's service area, as well as, service to existing homes and businesses within Bonney Lake's overall sewer service area. In

this chapter we will discuss the City's collections system, its lift stations and the interceptor conveying all of its flows to the treatment plant, as well as, the Sumner Treatment Plant itself.

Collection System

The Bonney Lake sewer collection system has been evaluated most recently in 1995 (Kennedy/Jenks Consultants) then in 2000 and 2005 (RH2 Engineering, Inc.). When the Bonney Lake sewer collection system was first modeled in 1995, the following results were found:

1) All gravity sewers had a depth/Diameter (d/D) ratio of less than 0.5 at peak flow rates, therefore having significant capacity for future connections.

2) Many gravity pipes had low flow velocities (less than two feet per second), and frequent flushing might be necessary.

3) Low velocity in several pressure sewers probably requiring flushing of these pipes.

4) The force mains had adequate flow capacity, and their velocities were between the acceptable values of three and eight fps.

5) All lift stations had capacity for existing and future customers.

RH2 Engineering's work in 2000 and 2005 generally confirmed these same results with three caveats. The analyses indicated a need to monitor three components of the collection system:

1) Angeline Road/Sky Island trunk lines;

2) SR 410 trunk lines; and

3) WWTP Interceptor.

Since 2005, while large numbers of connections have been added to the system, the location and distribution of these new connections have been such that the recommendations related to these pipe segments are still valid.

Angeline Road/Sky Island Trunk Line

One area of concern is the trunk system that leads from the Sky Island development to SR 410. Currently, a 12-inch diameter gravity sewer collects wastewater flow from this area. By the year 2012, approximately 1,800 feet of this main will need to be monitored as the (d/D was calculated to reach 0.84 by the modeling program. HYDRA© also calculated these pipes to have a d/D of 1.0 (completely full) by the year 2017. To solve this problem immediately, the recommended replacement pipe size would be 15 inches in diameter. However, by buildout, flows in the area will be such that 18-inch diameter sewer will be necessary to collect flows adequately. Therefore, when replacement becomes necessary, it is recommended that this pipe reach be replaced with an 18-inch diameter main.

SR 410 Trunk Line

The trunk system along SR 410 serves as the primary interceptor for flows from the southern portions of the city limits to Lift Station 17. Modeling indicates a capacity question in the SR 410 trunk upstream of the Lift Station 17 to about South Prairie. As growth continues, especially in the southern portions of the UGA, this interceptor will reach capacity. It is recommended that these pipes be replaced with 18- and 21-inch diameter pipes to accommodate flows.

WWTP Interceptor

Another interceptor that needs to be monitored is the one that carries flows from the Lake Tapps plateau to the Sumner WWTP. By buildout, this line is calculated to reach a d/D of 0.8. By some standards this ratio is still a reasonable value. However, the variability of flows that could be generated on the Lake Tapps plateau greatly influences the timing of this project. Two other factors influence the importance of this project; first, the physical condition of this interceptor has been compromised by the high concentrations of hydrogen sulfide in the main, and second, this interceptor is the only way to get wastewater to the WWTP at Sumner. Several repairs have been completed in the last three years including the sliplining of approximately 7,200 feet and replacement of approximately 835 feet of the interceptor. The WWTP is located approximately three miles away from Lift Station 17 and wastewater from the entire Bonney Lake sewer system flows through this line. It is recommended that these pipes be replaced with 18- and 21-inch diameter pipes to accommodate flows and that a second line be considered to address the issue of redundancy.

Individual Grinder Pumps

Currently the City of Bonney Lake owns and operates about ninety individual grinder pumps for homeowners. These pumps are a legacy of a past city policy. The approximate location of these grinder pumps is shown on **Figure 4-2**. They also represent a complex array of problems related to both maintenance and liability. Most sewer utilities do not own and maintain individual grinder pumps because of such issues. Bonney Lake should commence a program to develop a strategy and set of policies to gradually phase out of the business owning and operating individual grinder pumps.

Lift Stations

The Bonney Lake System currently has 22 lift stations (see **Table 2-7 – *Sewage Lift Stations*** for a summary of the City's lift stations). **Figure 4-1** shows which sections of the City's collection system flow to which lift station (lift station indicated by basin number). **Table 4-1 – *Bonney Lake's Sewer Lift Station Locations and Capacities*** summarizes data related to the City's lift stations regarding location, upstream and downstream connections and capacity.

Table 4-1 Bonney Lake's Sewer Lift Station Locations and Capacities					
Lift Station	**Location**	**Downstream Lift Station(s)**	**Upream Lift Station(s)**	**Capacity Per Pump (gpm)**	**Station Design Capacity (gpm)**
1	95th St Loop	None	None	120	102
2	Sky Island	17	21	88	75
3	BL Elementary	17	None	135	115
4	Lake Bonney	17	None	145	123
5	Myers Road	17	None	120	102
6	Debra Jane South	17	None	100	85
7	McGhee	17	None	120	102
8	Debra Jane West	17	None	140	119
9	Mt. Creek	20 & 17	None	120	102
10	White River	17	None	298	253
11	Interlake Island	17	None	145	123
12	Inlet Island	14, 13 & 17	None	270	230
13	Church Lake Drive	17	15,14,16,12	820	697
14	Flume	13 & 17	16 & 12	720	612
15	Vandermark	13 & 17	None	100	85
16	Maple Point	14, 13 & 17	None	100	85
17	SR 410	None	All except 1	1,200	3,060
18	Safeway	17	None	500	425
19	Willowbrook	17	None	1,200	1,020
20	Spring Haven	17	9	381	324
21	Panorama West	2	None	300	255
22	Brookfield	17	None	174	148

Analysis of the city's lift stations is hampered by the lack of flow meters at each station. Assessment of lift station performance and capacity is therefore limited to inferences drawn from pump run-time data and loading from Residential Equivalent calculations for each basin using GIS data. This deficiency should be rectified by the installation of flow meters with totalizers connected to the city's telemetry system at each of the City's lift stations. This would enhance the city's ability to detect and respond to I&I issues.

The functioning of lift stations from a capacity perspective were evaluated in two ways. First, estimated flows from the connections contributing to each lift station (including flows from upstream basins) were compared to the design capacity of the lift station. This comparison revealed that most of the City's lift stations were functioning at less than 50 percent of design. Seven lift stations (Numbers 8, 9, 13, 14, 17, 18 and 20) were operating between 50 percent of 100 percent of design capacity (design capacity is assumed to be 85 percent of firm capacity) and Lift Station 12 was operating at over its design capacity. **Table 4-2 – *Bonney Lake's Sewer Lift Station Capacities Compared to Existing Flows*** summarizes the results of this comparative analysis.

Table 4-2 Bonney Lake's Sewer Lift Station Capacities Compared to Existing Flows					
Lift Station	**Location**	**Station Design Capacity (gpm)**	**Peak Flow Rate (gpm)**	**Percent of Design Capacity**	**Status**
1	95th St Loop	102	12	12%	OK
2	Sky Island	75	34	46%	OK
3	BL Elementary	115	47	41%	OK
4	Lake Bonney	123	26	21%	OK
5	Myers Road	102	7	7%	OK
6	Debra Jane South	85	9	11%	OK
7	McGhee	102	36	35%	OK
8	Debra Jane West	119	68	57%	OK
9	Mt. Creek	102	66	65%	OK
10	White River	253	68	27%	OK
11	Interlake Island	123	34	27%	OK
12	**Inlet Island**	**230**	**241**	**105%**	**Over Capacity**
13	Church Lake Drive	697	366	52%	OK
14	Flume	612	315	51%	OK
15	Vandermark	85	16	18%	OK
16	Maple Point	85	17	20%	OK
17	SR 410	3,060	2,560	84%	OK
18	Safeway	425	233	55%	OK
19	Willowbrook	1,020	476	47%	OK
20	Spring Haven	324	207	64%	OK
21	Panorama West	255	14	6%	OK
22	Brookfield	148	57	39%	OK

In addition to considering rated lift station capacity versus flows from existing development, each lift station was also considered in the context of expected new growth with its contributing area (including upstream basins). This was done by comparing the capacity remaining in the each lift station in terms of Residential Equivalents to the type and amount of planned growth for each lift station's contributing sub-basin(s). However, proposed basins were not considered as the flow routing of these areas cannot yet be determined accurately. The flows estimated and Listed in **Table 4-3** represent anticipated flows with a peaking factor assigned as determined by Ecology's *Criteria for Sewage Works Design*. The results of these computations are presented in **Table 4-3 – *Bonney Lake's Sewer Lift Station Capacities Compared to Forecast Growth Flows***, which shows in addition to the capacity issue at Lift Station 17 shown in **Table 4-2 – *Bonney Lake's Sewer Lift Station Capacities Compared to Existing Flows***, that Lift Station 2 is facing a capacity challenge from potential developments that exceed the lift station's capacity. It should be noted that the projected flows are based on build-out development levels and that a significant reduction in I&I would prolong the life of the lift stations.

Table 4-3 Bonney Lake's Sewer Lift Station Capacities Compared to Forecast Growth					
Lift Station	**Estimated RE Capacity***	**Estimated RE Served**	**Remaining RE Capacity**	**Planned Growth (RE)****	**Status**
1	175	21	154	2	OK
2	**130**	**60**	**71**	**140**	**Capacity Issues**
3	206	84	122	4	OK
4	216	45	171	10	OK
5	173	12	161	11	OK
6	145	16	129	0	OK
7	181	64	117	3	OK
8	217	125	92	18	OK
9	186	120	66	0	OK
10	463	125	338	0	OK
11	218	60	158	2	OK
12	**458**	**481**	**-23**	**17**	**Capacity Issues**
13	1,245	654	592	3	OK
14	1,070	551	519	43	OK
15	147	27	120	3	OK
16	147	29	118	0	OK
17	7,538	6,306	1,232	520	OK
18	845	463	382	198	OK
19	2,179	1,017	1,163	254	OK
20	619	395	224	91	OK
21	440	24	415	203	OK
22	268	104	164	2	OK

*Capacity based on Peak Hour Flows

**Forecast growth is based on Core Area Growth Build-Out

Lift Station Design Review

Analysis of available lift station data indicates the need for additional detailed investigation and study related to apparent excessively high seasonal flows at Lift Stations 12, 17 and 18.

The dry well configuration of Lift Station 17 requires long drive shafts on the pumps and creates both maintenance and pump life issues. Addressing these issues should occur concurrently with metering and other planned improvements at Lift Station 17.

A final issue related to Lift Station is the question of reliability and contingency planning. Preparation of an Emergency Response Plan (ERP) for the sewer system is programmed for 2009. This effort is likely to include recommendation regarding back-up power and other redundancy and contingency measures. These recommendations need to be programmed into an updated Capital Improvement Program (See **Chapter 6**) when the ERP is completed. The City should continue to strengthen the lift

station reliability by adding standby power generation to Lift Station 16. Presently, standby power generation capability is installed at all other stations.

Sumner Wastewater Treatment Plant

The Sumner Treatment Plant is currently undergoing and the planning for a capacity upgrade. Bonney Lake is a partner in this construction with the City of Sumner. Bonney Lake believes improvements and additional capacity resulting from this project will provide sufficient capacity to accommodate planned growth in the City's sewer service area for perhaps the next decade. Options to bring additional wastewater treatment capacity on-line to accommodate planned growth beyond the next ten years or so are discussed in **Chapter 5**.

CHAPTER 5

FUTURE SERVICE AREA AND PLANNED IMPROVEMENTS

INTRODUCTION

This chapter builds on and expands the analysis, discussion and recommendations from **Chapter 4**. The initial section of the chapter presents an overview of the four interrelated and somewhat overlapping sub-areas of Bonney Lake's sewer area. Subsequently the basis and results of the growth forecast work will be presented. This discussion will include presentation of the basis for establishing population, employment, sewer service conversion rates and Residential Equivalency (RE) values, including I&I. In addition, opportunities for wastewater reuse will be presented in conceptual form.

Application of the RE factors to forecast population and employment growth present implications for improvements to the City's system in each of the four sub-areas of the sewer service area. These planned improvements, along with alternatives where appropriate, are presented in the final sections of this chapter.

EXISTING AND FUTURE SERVICE AREAS

Existing City Service Area (Neighborhoods, Downtown and Midtown)

The properties currently served by the City's sewer system are mostly single-family neighborhoods. These predominately residential areas can be divided into two main areas: 1) north of SR 410; and 2) south of SR 410. The area north of SR 410 (which bisects the current sewer service area) includes neighborhoods along the shores of Church Lake (an inlet on Lake Tapps), Lake Bonney, Debra Jane Lake and other nearby residential areas. The area south of SR 410 includes neighborhoods that lie primarily east and west of Angeline Road, such as Sky Island, Willowbrook and Ashton Wood.

Along the SR 410 corridor itself, and located between these single-family service areas, are the "Downtown" and "Midtown" neighborhoods that include a mix of single-family, multi-family and commercial development. **Figure 5-1** shows the location of the existing sewer system and includes a notation of the locations of "Eastown, Midtown and Downtown" which are the current focus of new and re-development activities for the City.

Eastown

The Eastown community lies along SR 410 from about 214th to 234th Avenue East. It is a unique area of the City because of the high proportion of undeveloped land and the availability for light industrial as well as commercial development. Eastown represents a peninsula of Bonney Lake corporate limits and sewer service area surrounded by rural areas somewhat distant from residential concentrations. Eastown is expected to remain a highway-oriented commercial area.

South Sewer Service Area

Bonney Lake acquired its South Sewer Service Area as part of the transfer of Pierce County's system to the City (see **Appendix A**). The South Sewer Service Area is a large percentage of the County's Urban Growth Area between Bonney Lake and Orting. A very large portion of the South Sewer Service Area has been developed with single-family residences utilizing on-site sewage disposal systems. There are some large tracts of vacant land planned for future residential development that will require sanitary sewer service; for example land that has the potential to develop into about 2,500 homes in Section 15, Township 19, Range 5 near the southern limits of this service area.

North Sewer Service Area

Bonney Lake also acquired its North Sewer Service Area with the execution of the transfer agreement with Pierce County (**Appendix A**). In contrast to the South Sewer Service Area, the North Sewer Service Area lies primarily outside the Urban Growth Boundary. Sewer service to the North Sewer Service Area is mandated by a 1983 U.S. EPA Order (**Appendix D**). This Order from the EPA to Pierce County was part of a directive to Pierce County to assist with the expansion of the Sumner Wastewater Treatment Plant. The Order required that sufficient capacity in the expanded Sumner Treatment Plant be provided to service what was then called the "West Lake Tapps Area."

In the mid-1970s, the EPA water quality planning process identified the West Lake Tapps area (Bonney Lake's current North Service Area) as part of the Lake Tapps service area requiring sanitary sewer service. This was due to the large number of urban density lots next to the west shore of Lake Tapps and the prevalence of surfacing sewage from failed on-site sewer systems in the area. This service area contains 2,401 parcels; only two of which are currently connected to sewers. The majority of these parcels are less than ½ acre in size and are located close to the lake. **Figure 5-2** shows the limits of Bonney Lake's North, Core and South Sewer Service Areas.

FORECAST SEWAGE FLOWS AND PLANNING CONSIDERATIONS

Forecast growth in population and employment is the primary driver for planned improvements to the City's sewer system. The Growth Management Act and adopted City and Pierce County Policies require that growth forecasts and capital facility planning (e.g. for sanitary sewers) be done in a manner that supports planned growth and is consistent with anticipated rates and types of growth. To achieve that end, this plan bases its growth forecasts on regional forecasts prepared by Pierce County, which is consistent with the Puget Sound Regional Council (PSRC).

Forecast Growth Methodology

PSRC Source Data

The PSRC prepares comprehensive growth forecasts for the four-county region to support both growth management and transportation planning efforts. These forecasts are developed using demographic models that incorporate U.S. Census data, actual development activity data, vacant land data and adopted Growth Management Policies of the Counties and Cities in the four county area.

For the Bonney Lake Sewer Planning effort the "2007 Pierce County Buildable Lands Report" (the most recent available) provided the foundational data for development of forecasts. The population and employment analyses contained in this document are based on PSRC Forecast Analysis Zones (FAZ). A FAZ is a compilation of Census Tracts from the 2000 Census. The Census provides the baseline numbers for the PSRC Growth Forecasts.

Pierce County GIS Data

The Pierce County GIS database provided critical information upon which to base forecasts. Examples of this included data regarding parcel size and development patterns. This data was used to estimate the number of households that currently exist within the Bonney Lake Sewer Service Area (SSA) – a foundational component of the forecast process.

GIS data also allowed calculation of the portion of the sewer service area lying either inside or outside the UGA. This is an important consideration because, as mentioned previously, under growth management the majority of new development has and is forecast to occur within the UGA.

Forecast Conversions to Sanitary Service

Efforts were made to determine historic rates of conversion of existing home from on-site systems to sanitary service in the Bonney Lake SSA. Data developed for this objective were conflicting and unreliable. It was ultimately determined, based on experience from other sewer agencies, that the rate of conversion to sanitary service would be small. Therefore, the forecasts for new connections to the system developed for this plan assume all lots will convert to sewer service over a period of 30 years.

Forecast Residential Equivalents

For the purposes of sewer system planning, growth forecasts (population, employment and other elements of growth) are typically converted to a common factor called a Residential Equivalent (RE). An RE is the amount of wastewater generated by a typical single-family home. The value assigned to an RE is the product of a series of calculations based on standard design guidelines and the actual functioning of the sewer system in question. The details of the RE flow values developed for the Bonney Lake Sewer Plan are presented in a subsequent section of this chapter.

The RE flow values are applied to the forecast numbers of REs for the SSA. In order to determine future numbers of REs, a series of calculations were made and summarized here. Detailed descriptions and tables regarding this effort can be found in **Appendix E.**

Forecast Flow and Distribution

Forecasted development will generate increases in wastewater flow throughout the City's SSA. The flows generated are dependent on the amount of wastewater generated by a Residential Equivalent. A Residential Equivalent represents the amount of wastewater generated by a "typical" single-family residence within the Bonney Lake SSA. Using the concept of an RE allows a common basis for forecasting flows across the range of existing and forecast development (e.g. single-family, multi-family, commercial and institutional). RE flow values for the Bonney Lake system were computed based on flow data obtained from the Sumner WWTP and the City's water system.

As summarized in **Table 5-1 – *Population Forecast Data***, an annual average population growth rate was calculated from the population and employment forecasts included in the Pierce County Buildable Lands Report for the City of Bonney Lake and it's UGA. This growth rate was applied to the existing REs and projected through the year 2022 (the latest year for which population projections are available) and used for flow projections. This methodology assumes that sewer flow characteristics do not change in the future. Given the information available, this approach seems reasonable.

Table 5-1
Population Forecast Data

Average Persons per Household (2000 Census Data)	2.9645
Current (2007) Population of Core Service Area[1]	15,740
Projected 2022 Population of Core Service Area[2]	23,690
Adjusted Average Annual Population Growth Rate[3]	2.76%

[1]Per County Buildable Lands Report (BLR). Current CSA is assumed to be the City Limits. BLR data is for April 1, 2006 (15,230 from table on pg. 30). Data was adjusted forward to end of 2007 at 1.9% annual growth rate.

[2]Per BLR population of municipal UGA is 20,510 (Table 7 on pg. 39) and population of unincorporated UGA is 3,180 (Fig. 2 on pg. 6) for a total of 23,690 for the future sewer CSA.

[3]Annual growth rate for the City per the BLR is 1.9% (15,230 to 20,510 in 16 years). The adjusted annualized growth rate for the sewer CSA is 2.76% (15,740 to 23,690 in 15 years).

RE Flow Components and Calculations

The RE value for the Bonney Lake sewer system is comprised of two main components; wastewater and I&I. Data used to compute these elements was interpreted from the most recent multi-year flow data (July 2006 through June 2008) from the Sumner Wastewater Treatment Plant.

A summary of these data series is presented in **Appendix E**. The data generated a range of possible values for an RE ranging from about 171 (for July 2007 to June 2008) to 209 (for July 2006 to June 2007) gallons per day per RE. Ultimately, it was decided that the most representative values for sewer planning purpose were the two-year average values given that this value best reflects the current condition of the sewer system and flow characteristics of the existing customer base.

Table 5-2
Data Used to Calculate Population Values for Period 2006 - 2008

Avg REs	Persons per RE	Avg Population Served
5,950	2.9645	17,640

The two-year average RE value was calculated from the City of Bonny Lake's ADF at the Sumner Wastewater Treatment Plant for the two-year period of July 2007 through June 2008. This value is 1.16 million gallons per day. This value was divided by the average number of REs served (5,950) over the two-year period, resulting in the average wastewater flow generate per RE in the system, which yields a value of 275 gallon per day per RE.

The 275 gpd number includes all components of flow including I&I. In order to calculate the component of this value that represents I&I, flow values for the same two-year period for Minimum Dry Weather Flow were subtracted from Maximum Wet Weather Flow. This yielded a value of 0.67 mgd, or 113 gallons per day per RE. **Table 5-2 – *Data Used to Calculate Population Values for Period 2006-2008*** provides a summary of the demographic data used in the RE calculations. **Table 5-3 – *Residential Equivalent Value Calculations Based on 2-Year Averages (2006-2008)***,presents an array of the flow data and value calculations for a RE in the Bonney Lake sewer system including total RE flows and the estimated value for I&I for the system.

Table 5-3
Residential Equivalent Value Calculations Based on 2-Year Averages (2006 – 2008)

Parameter	Flow (MGD)	Flow (Gal/RE/Day)
Average Daily Flow	1.16	195
Max Wet Weather Flow	1.59	275
Min Dry Weather Flow	0.92	162
I&I	0.67	113

The I&I value of 113 gallons per day per RE represents about 41 percent of the total RE value. This percentage is within the acceptable range for I&I as specified in Ecology guidelines. However, it should be noted that lift station data for the Bonney Lake system indicate that there may be areas of the system experiencing excessive I&I (greater than 50 percent). This could be due to the nature of the data available for analysis at this time (pump run times instead of actual flow meter data for the lift stations). However, given that the age of system is less than 20 years old, I&I ratios in excess of 50 percent should not be occurring. Given the difficulties and costs associated with providing treatment capacity, it would be prudent for the City to further investigate the I&I question across the system on a sub-basin basis.

Forecast Flow Values

The forecast population and employment numbers and the calculated RE values can be multiplied to estimate the quantities of total flow that are expected for the Bonney Lake Core and South SSAs over time. For the purposes of this plan, it was assumed that the North Sewer Service Area would not connect to sewers until after the South Sewer Service Area was served with sewers. **Chart 5-1** graphically presents the results of these calculations. The chart was generated by multiplying the calculated RE values by the forecast growth in population and employment from Pierce County data.

Forecast flows are affected by the changing demographics of the forecasts. For example, household size in the service area will decline over time reducing the values for REs due to the fact that flows are a direct function of the number of people residing in a household. Another factor that dampens the forecast flow increases over time is the growing proportion of households living in multi-family units. Multi-family households are consistently smaller, on average, than single-family households. This means two things. First, more multi-family households will be created to house the same number of people. Second, the amount of wastewater generated per household will be less because of the smaller size.

As indicated in **Chart 5-1**, the limiting factor for sewer flows at the Sumner WWTP is TSS. Forecast TSS levels are expected to cross average annual flow capacity owned by Bonney Lake by about the year 2019. This date could be affected by at least two factors. One is if the rate of growth continues at its current high pace for the next five to ten years. This could have the effect of reaching treatment plant capacity sooner. Another is if and the cause of the recent (over the last three years) large increase in TSS is corrected. This could have the effect of delaying the time when capacity is reached.

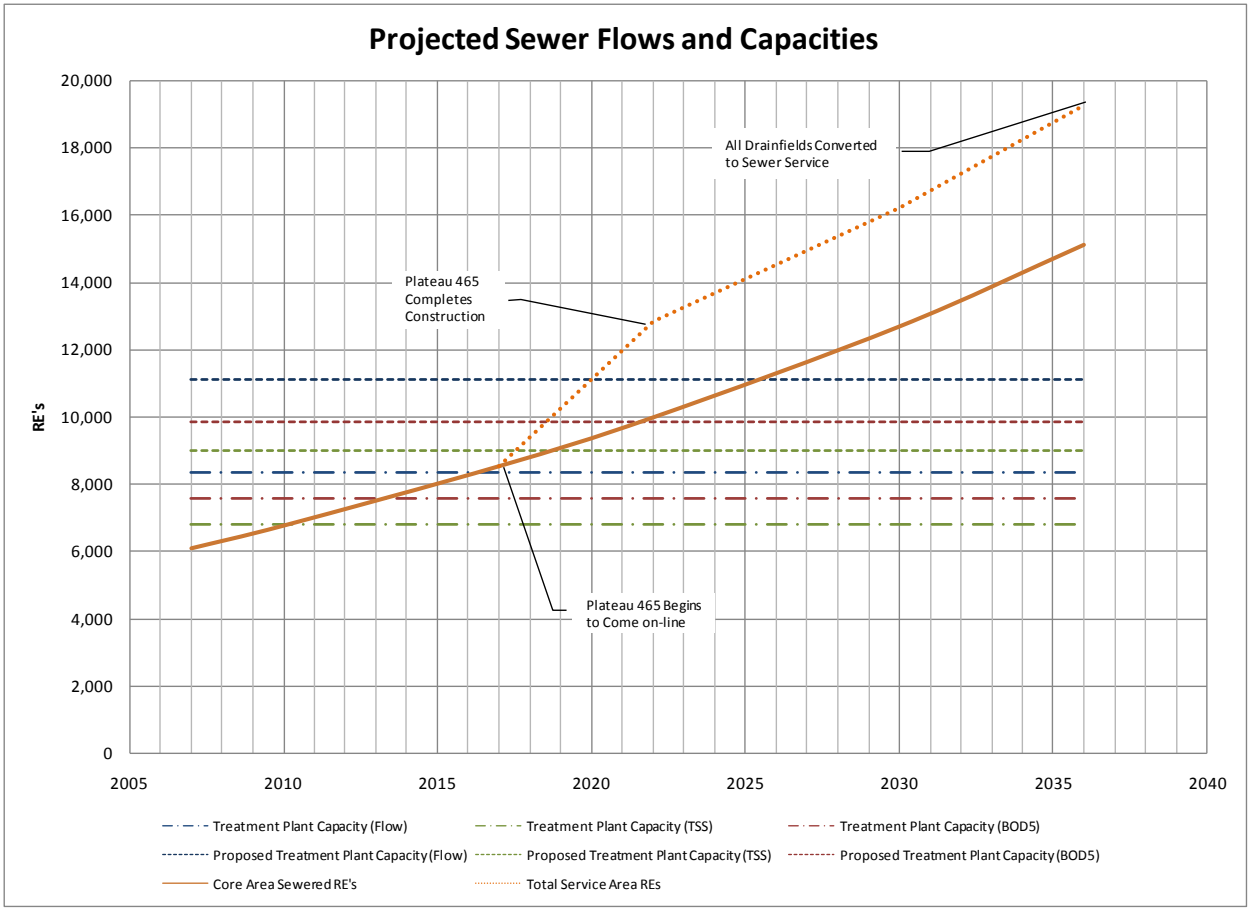
The RE and population growth in the Core Area are shown in **Table 5-4 – *Core Area Growth Projections***. The RE values include REs from all use billing classes including non-residential accounts. The populations listed in the table are based on an average of 2.59 persons per RE, which was calculated from the estimated 2007 population and number of sewer accounts. Based on this calculation, the populations listed in **Table 5-4 – *Core Area Growth Projections*** include employee populations and do not reflect the population estimated to reside in Bonney Lake, which is discussed elsewhere in this chapter. However, **Table 5-4 – *Core Area***

Table 5-4
Core Area Growth Projections

Year	RE	Population	Growth Rate
2007	6,089	15,740	4.6%
2008	6,307	16,182	3.6%
2009	6,532	16,636	3.6%
2010	6,765	17,103	3.6%
2011	6,994	17,581	3.4%
2012	7,230	18,073	3.4%
2013	7,473	18,578	3.4%
2014	7,725	19,098	3.4%
2015	7,986	19,632	3.4%
2016	8,255	20,181	3.4%
2017	8,534	20,746	3.4%
2018	8,806	21,324	3.2%
2019	9,087	21,919	3.2%
2020	9,376	22,530	3.2%
2021	9,675	23,158	3.2%
2022	9,984	23,804	3.2%
2023	10,288	24,466	3.0%
2024	10,601	25,147	3.0%
2025	10,923	25,846	3.0%
2026	11,256	26,565	3.0%
2027	11,598	27,303	3.0%
2028	11,951	28,063	3.0%
2029	12,315	28,843	3.0%
2030	12,690	29,645	3.0%

Growth Projections does accurately reflect the number of REs the City may be required to serve in the future.

Chart 5-1



Reuse Potential

Bonney Lake's options for reuse are limited. Options include seasonal irrigation at parks and playfields; discharge to Lake Tapps to maintain lake levels or Aquifer Storage and Recovery to enhance the reliability of the City's water supply sources.

Seasonal Irrigation

Approximately 12 parks and school playfields exist in or near the Bonney Lake SSA. The potential for reuse at these locales is restricted by two main factors. One is the highly dispersed nature of the sites. This makes the cost of the infrastructure needed to deliver highly treated (Class A) water problematic.

A second factor affecting the feasibility of irrigation is that is seasonal. From a practical standpoint, creating and delivering Class A treated effluent for irrigation during the summer months does very little to reduce the pressures on the sewer system during peak flow periods (the winter). A detailed

cost evaluation of seasonal irrigation reuse was not conducted for this report and is not recommended at this time.

Augmentation of Lake Tapps

At the present time the future of Lake Tapps is somewhat clouded by Puget Sound Energy's decision to abandon the White River Power Project. Lake Tapps was created by PSE as the source of water for the White River Project. PSE has entered into an agreement with the Cascade Water Alliance (CWA) to sell a portion of its water rights for the White River Power Project to the CWA for the purpose of creating a new drinking water source for the region. However, the quantity of water that the CWA has acquired is only a small fraction of the water used for the power project, raising the possibility that diversions to Lake Tapps might be curtailed and the lake level drop.

One possible response to this potentiality is to treat and discharge wastewater to Lake Tapps to augment the volume of water in the lake and maintain lake levels. RH2 conducted an analysis of this option in 2000. From this analysis, it appears that the quantities of wastewater that could be generated for this purpose would be insufficient to make any measurable difference in the level of Lake Tapps. For context, potential wastewater flows would be only a small fraction of the amount of water known to be lost from Lake Tapps due to bed leakage and evaporation. Further pursuit of this option may be warranted if the CWA was interested in participating. However, at this time pursuit of augmentation of Lake Tapps is not recommended.

Aquifer Storage and Recovery (ASR)

Bonney Lake relies on groundwater from springs and wells to supply its water system customers. Maintaining flows from the City's primary springs is a high priority objective. To that end the City has invested in programs and systems (e.g. Wellhead Protection and Stormwater Management) to protect and support its water supply sources.

One product of these efforts is the notation of area in the City that appears to be both geologically suited and properly located in relation to one of the City's springs to be a candidate for an ASR project. The location of this area is shown on **Figure 5-3**. The advantages of an ASR project are that reuse water could be "skimmed" on a relatively continuous basis; shaving peak flows at the treatment plant. This has the serendipitous benefit of conforming to the preferred flow regime for membrane treatment plants – the most likely treatment technology to be employed for an ASR effort. Since a project of this character has the potential to benefit both the City's sewer system and its water system, it merits at least a feasibility fatal-flaw assessment.

PLANNED IMPROVEMENTS TO ACCOMMODATE FORECAST FLOWS AND PLANNED DEVELOPMENT

Eastown

The existing sewer system along SR 410 extends east to Lift Station 18. This lift station currently serves a mobile home park, a small residential development, Safeway, Fred Meyers and a few other local businesses. However, additional wastewater load will be entering the lift station from the proposed residential and commercial development of Eastown. This proposed development is to be located east of the SR 410 and 214th Avenue East intersection.

Three preliminary alignment alternatives were evaluated to determine the feasibility of serving Eastown area with a gravity sewer system. The designs were based on the following assumptions.

- Proposed building pads were based on existing topography.
- The sewer will serve at least one building within each existing parcel.
- The building will be located near the low point of the parcel.
- The lateral invert is 6 feet below finished floor elevation.
- Laterals have a minimum slope of 2 percent to the property line.
- 8-inch sewers have a minimum slope of 0.6 percent.
- 12-inch sewers have a minimum slope of 0.33 percent.
- 8-inch submains are placed along property lines.
- Sewers inverts are placed a minimum of 5 feet below ground surface.
- Drops across manholes were not factored into the analysis.
- Sewer lines can be placed outside the city limits but within the UGA (or proposed UGA).
- The existing sewer along 214th Avenue East can be modified as necessary.
- The invert entering Lift Station 18 (LS-18) is 610.1 feet.
- Parcels within wetlands will not be developed.
- The proposed lift station will be located along 96th Street East.
- Sewer depths were based on sewer inverts rounded down to the nearest foot.

The preferred alternative is show in **Figure 5-4**. The central and western portion of Eastown can be served by a gravity system which flows into a lift station located along 96th Street East, from where the wastewater would be pumped to Lift Station 18. The eastern side of Eastown is able to utilize the existing gravity system along 214th Avenue East, which flows by gravity to Lift Station 18.

A preliminary capacity analysis has been completed for Lift Stations 17 and 18 and the associated conveyance system. This preliminary analysis indicates that expansions to both Lift Stations 17 and 18 would be required to accommodate forecast Eastown flows. Furthermore, increased capacity in both downstream force-mains and gravity sewers will also be required to accommodate forecast Eastown wastewater flows.

Routing flows through Lift Station 17 will increase the City's vulnerability to possible failure of that facility (see **Chapter 4** discussion). The most prudent approaches to adding required conveyance and Lift Station capacity to accommodate forecast Eastown flows should be the subject of more detailed pre-design investigation and analysis.

South Sewer Service Area

Service options for the future South Sewer Service Area parallel the options for the North Sewer Service Area. That is, there are fundamentally two options: 1) transmit the flows to an existing treatment plant or site; and 2) construct a new WWTP to serve the South Sewer Service Area .

South Sewer Service Area Wastewater Flows

Flow forecasts for the South Sewer Service Area were not segregated from the total forecast flows for the planning area. However, the South Sewer Service Area has much more potential to generate more flows more quickly than the North Sewer Service Area due the much higher proportion of vacant and under-developed property. For example, the planned development of Section 15 with about 2,500 new residences would generate about 688,000 gallons ADF of new wastewater. Based on considerations like this, flows from the South Sewer Service Area would reasonably be expected to exceed the one million gallons per day expected from the North Service Area. Note that at this time the City does not plan to serve the Falling Water development and therefore, this area was not included in any forecasting for this Plan.

Pump to Core Area and Sumner WWTP

One option for treating expected flows from the South Sewer Service Area would be to pump them north into Bonney Lake's Core Service Area and then ultimately to the existing Sumner Treatment Plant. Implementation of this option would require construction of about seven new lift stations with their attendant force mains along with several gravity trunks. The conceptual locations and flow paths of these facilities are illustrated on **Figure 5-5a**.

The advantages of this option include its simplicity and straight-forwardness from an engineering perspective. Detailed pre-design work would be required to properly site, size and layout the needed components of the systems. But these components are all very common elements of sanitary systems.

The fundamental disadvantage of this option is that further exacerbates the City's reliance on Lift Station 17, through which virtually all flows to the Sumner WWTP now go.

Flow to New Bonney Lake WWTP

This option would involve siting and constructing a new membrane bio-reactor treatment plant within the South Sewer Service Area. Implementation of this option would require construction of at least one less lift station than the previous option. Attendant force mains and gravity sewers would be required similar to the Pump to Core Area option. The conceptual locations and flow paths of the conveyance system along with the WWTP are illustrated on **Figure 5-5b**.

The advantages of this option include avoiding expanding dependence on Lift Station 17. In addition, this option would be congruent with the Reuse strategy option discussed in a previous section of this Chapter. A third advantage of this option would be increasing the level of control by the City over its wastewater treatment options.

The fundamental disadvantage of this option lies in the difficulties associated with siting and permitting a wastewater treatment facility. Such an endeavor would be quite expensive and time-consuming.

New Interceptor to Sumner WWTP

This option would involve constructing a new interceptor to serve the South Sewer Service Area. The interceptor would route flows to the south, then west and ultimately discharge at the Sumner WWTP. The conceptual locations and flow paths of the conveyance system along with the WWTP are illustrated on **Figure 5-5c**.

The advantage of this option is that it reduces the reliance on the existing interceptor and Lift Station 17. It also accomplishes redundancy and could potentially be designed to allow flow from some of the Core Area to be routed through either interceptor during an emergency.

The fundamental disadvantage of this option lies in the difficulties associated with funding and constructing a long interceptor. The City could fund portions (or a majority) of this interceptor when development occurs in the South Sewer Service Area through connection fees or developer funded improvements.

Recommended Option

This plan recommends pursuit of the New Interceptor to Sumner WWTP option for the South Sewer Service Area. The initial step in this option should be completion of a conceptual fatal flaw analysis as to whether there are design, regulatory, environmental or other similar factors that would prevent implementation of this option.

North Sewer Service Area

The City of Bonney Lake's North Sewer Service Area includes the area that was delineated for sewer service in the 1984 agreement, which was a condition of Federal Funding for the construction of the WWTP located in Sumner. Roughly, this area is located along the western and northern shores of Lake Tapps and is delineated in **Figure 5-2**.

Service options for the future North Sewer Service Area parallel the first two options for the South Sewer Service Area. That is, there are fundamentally two options: 1) transmit the flows to an existing treatment plant or site; and 2) construct a new WWTP to serve the North Service Area.

The area north of Lake Tapps has experienced very rapid growth in recent years, most notably with the construction of the Lakeland Hills neighborhood. It is expected that this area will continue to develop at urban densities. Examples of recent and planned developments in the North Sewer Service Area include:

- Fairweather Cove (served by Bonney Lake);
- Kersey III (served by Auburn);
- Forest Canyon Highlands (served by Sumner);
- Terrace View Estates (served by Auburn);
- Lakeridge III (served by Bonney Lake); and
- Grand Ridge II (served by Bonney Lake).

North Sewer Service Area Wastewater Flows

The expected flows and service options for the North Sewer Service Area were most recently analyzed in the 2005 Sewer System Plan and are summarized here. Expected flows, locations and basins for each of these developments were considered when evaluating options, as it is likely that cost sharing opportunities would exist with the development of these properties.

The North Sewer Service Area is expected to generate wastewater flows in the range of one million gallons per day (MGD). This is an estimate of average design flow (ADF) based on previous discussions with the City regarding existing and proposed development as well as zoning throughout the area. A peaking factor of four is used to determine the peak design flow (PDF). The actual flow and peaking factor experienced may be significantly more or less, depending on a number of factors, including the area served. However, these approximations provide a basis for comparison.

The following criteria are discussed when comparing the various options for providing sewer service.

- ✓ cost
- ✓ timing
- ✓ capacity
- ✓ potential for growth
- ✓ environmental factors

In March 2005, a preliminary report was prepared to begin addressing the issues associated with providing sewer service to the North Sewer Service Area. This report is included at the end of this document and ranks the alternatives by the various criteria. As more information is obtained, and if permitting and environmental regulations change, the variables and the rank of each alternative should be reevaluated.

Three options for serving the North Sewer Service Area are discussed in this section.

- ✓ Metro/King County Wastewater Treatment Plant (WWTP)
- ✓ Bonney Lake/Sumner WWTP
- ✓ New Bonney Lake WWTP

Metro/King County WWTP

One option of wastewater treatment is to route the wastewater northward to Metro/King County's facilities. Currently, Metro/King County owns and operates the Lakeland Hills Pump Station, which is located just north of Oravetz Road and south of the White River. The City could either build a new interceptor through Auburn, owned and maintained by the City of Bonney Lake, or negotiate an agreement with Auburn for a joint-venture interceptor to the pump station. Either way, the City of Bonney Lake would need a new franchise agreement with Auburn. The upstream portions of potential alignments for routing the wastewater to the Lakeland Hills Pump Station are shown in **Figure 5-6a**.

Currently, the City of Auburn plans to provide sewer service to Lake Tapps Elementary and Fairweather Cove. Auburn may extend their sewer service area further, after the City of Bonney Lake has completed the updated Comprehensive Sewer Plan.

Metro/King County is currently planning a new treatment plant to serve south Snohomish County and north King County. The new Brightwater Treatment Plant is necessary to expand Metro/King County's treatment capacity and will be located northeast of Woodinville. Regardless of the treatment option selected, the proposed Brightwater plant will not likely be treating flows from the Bonney Lake area. However, the addition of the plant will free capacity in Metro/King County's Renton plant, potentially benefiting residents within the Bonney Lake sewer area. Due to the existing capacity restrictions, if the new plant is not built by 2010, a system-wide building moratorium may be imposed to Metro/King County's service area.

Advantages

- Metro/King County would be responsible for all treatment.
- Capacity in the Sumner plant would be expended at a later date.
- Economy of scale is achieved.
- The City would not rely on one treatment facility for entire system.

Disadvantages

- Water would be removed from the Lake Tapps plateau (interbasin transfer).
- Several interagency agreements and franchises would be required.

Unknowns

- Terms of agreement with Auburn.
- Timing of Metro/King County's Brightwater plant.

Timing

Design of this alternative could commence when agreements are reached with Auburn and Metro, the alignment is determined and funding is acquired. It is estimated that it would be at least two years before design and construction would be completed and the interceptor would be online.

Cost

The expected cost of this option is the capital cost, plus any franchise and permit fees to Auburn. In addition, new properties will have connection charges to both the Cities of Auburn and Bonney Lake as well as Metro/King County. Metro/King County will also charge new connections with a capacity charge. The capital costs for this option vary depending on the alignment and potential cost sharing with Auburn and/or developers, but are estimated to be between five and eight million dollars, without developer contributions.

Metro/King County Interceptor Options

The two options for routing the wastewater through Auburn are discussed below. The first option involves the City of Bonney Lake building a new interceptor through Auburn, which would be owned and maintained by the City of Bonney Lake. The second option is negotiating an agreement with Auburn for a joint-venture interceptor to the pump station.

Option 1 - Interceptor Built Solely by Bonney Lake

Under this alternative, the City of Bonney Lake would design, construct, own and maintain an interceptor through Auburn to Metro/King County's Lakeland Hills Pump Station. There would be no cost sharing with the City of Auburn. This line would only need to be sized to serve Bonney Lake's needs and would not include service customers within Auburn service area.

One potential alignment for the new interceptor would be along Lakeland Hills Parkway, East Valley Highway and Oravetz Road. This alignment would likely require an additional lift station on East Valley Highway, as well as, approximately 33,900 feet of force main and 8,700 feet of gravity pipe.

Another potential alignment is along Kersey Way. This route would require approximately 23,100 feet of force main and 15,200 feet of gravity pipeline.

Option 2 - Interceptor Built as a Joint Venture Between Auburn and Bonney Lake

Under this alternative, the City of Bonney Lake would partner with the City of Auburn in the design, construction and maintenance of an interceptor to Auburn's sewer system. If Auburn extends their service area, the length of pipe that the City of Bonney Lake is responsible for would be reduced. The alignments for this option are the same as for Bonney Lake constructing its own interceptor. The difference is that costs for this option would be shared with developers and the City of Auburn, achieving a more reasonable economy of scale. It is likely that Auburn's system, between the new tie-in and Metro/King County's Lakeland Hills Pump Station would have to be upsized for the additional flow.

Design of an interceptor along Lakeland Hills Parkway, East Valley Highway and Oravetz Road would be coordinated with the developer for Terrace View Estates, a proposed 400-unit multi-family development that will be located north of the Parkway and east of East Valley Highway. This development is being designed by Pacific Engineers and its completion date is unclear. This alignment would require the construction of a new lift station at the bottom of the Parkway to pump to Oravetz Place. According to the City of Auburn, the existing 15-inch sewer from Oravetz Place through the school easements would need to be upsized. Close coordination with the school district would be required for this construction, so as not to interfere with school activities.

With the second alignment along Kersey Way, the City of Bonney Lake would share costs with the City of Auburn and the developer for the Kersey Three property, located on approximately 170 acres between the Lakeland development and Kersey Way. Currently, the developer of this property prefers to pump into existing pipes in the Lakeland Hills development on an interim basis. However, even if the developer pumps to Lakeland, they will have to pay for a portion of the cost of the Kersey Way sewer main, as shown in Auburn's Comprehensive Sewer Plan. If the Kersey Way interceptor is not constructed as part of the Kersey Three development, it will probably not be constructed until large adjacent properties, such as the Segale property, are developed, which may not happen in the next 15 to 20 years.

Bonney Lake/Sumner WWTP

Another option for treatment of the City of Bonney Lake's wastewater is to send it to the Bonney Lake/Sumner treatment plant. Three options will be considered: 1) the City of Bonney Lake constructing and maintaining its own interceptor through Sumner; 2) the City of Bonney Lake participating in a joint venture with the City of Sumner, partially funded by a developer; and 3) the

City of Bonney Lake routing wastewater through its existing facilities. Potential alignments for the first two options are shown in **Figure 5-6b.**

The Cities of Sumner and Bonney Lake have upgraded their treatment facility to a capacity of 6.10 million gallons per day. The City of Bonney Lake's current share of this plant is 50 percent, yielding a total capacity of 3.05 million gallons per day available to the City. It is estimated that the City of Bonney Lake's existing capacity in the Sumner plant will be fully utilized by 2019 (see **Chart 5-1**) depending on a number of variables. If the City's North Sewer Service Area flows to the plant, the capacity will be expended even sooner.

Advantages

An advantage of sending the wastewater to the Bonney Lake/Sumner Treatment Plant is cost, as Bonney Lake has already paid for the plant and capacity. Another advantage is control over future growth, since the Bonney Lake, along with Sumner, has control over the capacity of the plant.

Disadvantages

The following are disadvantages to treating the wastewater in the Bonney Lake/Sumner plant.

- The upgraded treatment plant capacity would be reached sooner than it would with other options.
- There is interbasin transfer of the water as it is removed from the plateau, reducing the recharge of local aquifers.
- Continuing to treat all of Bonney Lake's wastewater in the Sumner Plant does not provide a redundant treatment facility.
- City of Sumner and Bonney Lake must agree on timing of improvements and cost sharing.
- City of Bonney Lake must rely on Sumner to design, construct, and obtain necessary permits in a timely manner.

Timing

Design of this alternative could commence when an agreement is reached with Sumner, alignments are determined and funding permits are acquired. It is estimated that it would be at least two years before design and construction would be completed for any of the three options considered.

Cost

The expected cost of routing to the Bonney Lake/Sumner Treatment Plant is the capital cost plus any franchise and permit fees to Sumner. In addition, new properties will have a connection charge to the City of Bonney Lake. The capital costs for this option vary depending on the alignment and potential cost sharing with Sumner and/or developers. Without developer contributions, costs are expected to be between seven and eight million dollars for this option.

Sumner Plant Interceptor Options

The three options for routing the wastewater through Sumner are discussed below.

Option 1 - Interceptor Built Solely by Bonney Lake

Under this alternative, the City of Bonney Lake would design, construct, own and maintain an interceptor through Sumner to the Bonney Lake/Sumner Treatment Plant. There would be no cost sharing with the City of Sumner under this alternative.

A potential alignment for the new interceptor is down Sumner-Tapps Highway then along 60th Street East to the treatment plant. This alignment would likely require an additional lift station on 60th Street East, approximately 38,800 feet of force main and 8,400 feet of gravity pipe.

Another potential alignment for the new interceptor is along Forest Canyon Road, 24th Street East, 142nd Avenue East and West Main Street to the treatment plant. This alignment would likely require an additional lift station on 24th Street, approximately 26,000 feet of force main and 10,100 feet of gravity pipe.

Option 2 - Interceptor Built as a Joint Venture Between Sumner and Bonney Lake.

Under this alternative, the City of Bonney Lake would partner with the City of Sumner in the design, construction and maintenance of an interceptor to Sumner's sewer system. An advantage of this option is shared costs with the developer of the Forest Canyon Highlands property and the City of Sumner, achieving a more reasonable economy of scale.

The alignment for this option would be down Forest Canyon Road, East Valley Highway and 24th Street East and would require a lift station at the intersection of East Valley Highway and 24th Street East. The interceptors from Bonney Lake to the intersection of 24th Street East and 142nd Avenue East would be new construction.

With this option, some of Sumner's system will likely have to be upsized between the intersection of 24th Street East and 142nd Avenue East and the treatment plant. Sumner already has plans to increase the capacity of their 142nd Street Pump Station, though it is not scheduled in their CIP until the years 2018 to 2020. If the City of Bonney Lake routes flow from the North Sewer Service Area through this pump station, improvements will probably be necessary sooner, depending on expected flows. It is also likely that lift station and 6-inch force main at 142nd Street will have to be upsized to accommodate the additional flow.

In addition to the upgrades to Sumner's system, this alignment would likely require a lift station on 24th Street and approximately 26,000 feet of force main and 10,100 feet of gravity pipe.

Option 3 - Bonney Lake's Existing Interceptor to the WWTP

Under this alternative, the City of Bonney Lake would use the existing facilities to route wastewater to the Bonney Lake/Sumner treatment plant. According to the City of Bonney Lake's 1996 Sewer Comprehensive Plan, the capacity of Lift Station 17 is approximately 5 million gallons per day (mgd). The capacity of one of the 16-inch force mains from Lift Station 17 ranges from 2.7 mgd at a velocity of 3 feet per second to 7.2 mgd at a velocity of 8 feet per second. As discussed above, the City of Bonney Lake's share of the treatment plant is currently 3.05 million gallons per day. From the 2007 Treatment Plant facility plan, the average daily maximum month flow at buildout is projected to be 4.59 MGD and the peak hourly flow at buildout is 14.43 MGD, for a plant peaking factor of 3.14. Using Bonney Lake's share of the existing plant capacity, which is 3.05 MGD, the peak hourly flow capacity can then be calculated at 9.59 MGD. However, since flow is not currently expected to be the

limiting factor, efforts should be undertaken to reduce the City's TSS loading. Improvements required for this alternative include routing flow from the City of Bonney Lake's North Sewer Service Area south into its existing system. Potential alignment is shown in **Figure 5-6c**. This alignment would likely require improvement to the City's existing collection system, an expansion of Lift Station 17 and approximately 27,700 feet of force main.

New Bonney Lake WWTP

This option involves the construction of a new wastewater treatment plant to serve the Bonney Lake area. The *Bonney Lake Wastewater Reclamation Preliminary Feasibility Report* from 2000 discusses this option in further detail by evaluating potential participants, wastewater discharge or use alternatives, potential treatment plant locations and project costs and timing. For this analysis, the proposed treatment plant will serve only the North Sewer Service Area and will be located on the west side of Lake Tapps, as shown in **Figure 5-6d**. Total length of force main for this option is in the range of 22,000 lineal feet.

Advantages

Building a new treatment plant to serve the Bonney Lake service area would allow the City of Bonney Lake to control costs and timing of future expansions. This option would also give the City full control over how quickly growth can occur within its service area. Other benefits include retaining the water on the plateau rather than transferring it to another basin, maintaining a high level of control over water quality and being able to use the reclaimed water.

Disadvantages

The fundamental disadvantage of this option lies in the difficulties associated with siting and permitting a wastewater treatment facility. Such an endeavor would be quite expensive and time-consuming.

Unknowns

It is unknown whether this alternative could meet or address the range of regulatory and approval requirements and standards.

Recommended Option

This plan recommends pursuit of the Bonney Lake WWTP option for the North Service Area. The initial step in this option should be completion of a conceptual fatal flaw analysis as to whether there are regulatory, environmental or other similar factors that would prevent implementation of this option.

Core Service Area (Downtown, Midtown and the Neighborhoods)

The properties currently served by the City's sewer system (the Core Service Area) are mostly single-family neighborhoods. North of SR 410 (which bisects the current sewer service area) served neighborhoods lie along and near the shores of Church Lake (an inlet on Lake Tapps), Lake Bonney,

Debra Jane and other nearby residential areas. South of SR 410, served neighborhoods primarily lie east and west of Angeline Road East and includes such areas as Sky Island, Willow Brook and Ashton Heights.

Along the SR 410 corridor intervening between these single-family service areas are the "Downtown" and "Midtown" neighborhoods that include a mix of single-family, multi-family and commercial developments. **Figures 2-7** show the configuration of the current collection system operated by the City. In **Figure 2-7** the collection system is color coded by the lift station that receives the flow from each pipe segment. As is evident from this figure, the Bonney Lake system is highly dependent on lift stations; especially Lift Station 17 that receives virtually all the system's flow.

Currently identified improvements to the existing system were discussed in **Chapter 4**. In addition to the improvements discussed in **Chapter 4** extensive additional improvements are expected to occur within the current service area in the form of Developer Extensions to serve growth, new development and redevelopment planned by the City. These Developer Extensions will be designed and constructed in conformance with the Development Policies and Design Standards of the City (See **Appendix F**).

Figure 4-1 presents the current service area and the current UGA which combined form the Core Service Area. This figure also identifies the existing sewer system, the proposed not yet built sewer system, and the proposed but not yet designed sewer system.

The parcels within the Core Service Area not yet serviced were analyzed to create basis for sewer system planning and designing. For analysis purposes, 12 basins within the Core Service Area were identified as potential developing land in a short coming future or already developed not yet serviced land. These basins are identified in **Figure 4-1** as proposed basins A through L.

The analysis based its design criteria on the *2008 Criteria for Sewage Works Design, Water Quality Program* by the Washington State Department of Ecology and applied a Safety Factor of 1.5 for minimum slope designs. In addition, the analysis contemplated design criteria such as:

- Servicing the most number of customers per sewer main;
- Minimizing the need for new Lift Stations;
- Avoiding the crossing of major roads (i.e. SR 410);
- Locating proposed sewer main in existing right of way and city owned property;
- Avoiding proposed sewer main depths greater than 20 feet; and
- Minimum collector and lateral diameters as possible, 6 inches and 8 inches respectively.

The analyses results are shown in **Figure 5-7** as Proposed Sewer Main and Proposed Force Main. As previously stated, the proposed basins include already developed land not yet serviced and not yet developed (or vacant) land. Note that the level of detail in the results of these analyses reflects this characterization as well. The already developed not yet serviced land results have greater level of detail (i.e. sewer main alignment and flow direction). Whereas, the vacant land plans are presented in a broader conceptual manner (i.e. flow direction along the parcel's topography). In addition, it is important to note that several new lift stations will be required to properly service Eastown and the proposed basins.

Interceptor Improvements

This plan includes specific improvements to the existing interceptor to the Sumner WWTP. However, as noted throughout this plan, the existing interceptor is nearly totally dependent on the continuous reliable functioning of Lift Station 17. This represents the primary point of vulnerability for the Bonney Lake system. One way to mitigate this vulnerability would be to construct a second interceptor from the Bonney Lake service area to the Sumner WWTP. One possible alignment for such an interceptor would be along Rhodes Lake/Angeline Road. An interceptor along this corridor could convey by gravity large portions of Bonney Lake's wastewater flows. This plan recommends that a reconnaissance level study be conducted of feasibility and benefits of an additional interceptor from Bonney Lake to the Sumner WWTP.

Treatment Plant Improvements

The Sumner WWTP is currently undergoing planning for capacity upgrades.

Investigation of WWTP improvements for the North and South Sewer Service Areas are recommended by this plan and discussed above in those sections of the plan.

Summary of Recommended Improvements

Figure 5-7 presents a visual summary of the range of improvements recommended in this plan such as treatment plants, force mains and lift stations.

CHAPTER 6

CAPITAL IMPROVEMENT PROGRAM

INTRODUCTION

This chapter presents proposed improvements to the City of Bonney Lake's (City) sewer system that are necessary to resolve existing system deficiencies and accommodate the projected growth of sewer customers. The sewer system improvements were based on the evaluation of the existing sewer system.

A Capital Improvement Program (CIP) was developed and included as part of this update. The CIP is needed to order the progression of sewerage extensions and improvements, including wastewater treatment costs, at an affordable rate and still meet the needs of the City.

As new developments occur within the City's sewer service area they will be responsible for making improvements necessary to maintain an adequate level of service within the sewer system. Developers will be required to construct the facilities necessary to adequately serve their new developments. They will then donate them to the City or contribute their share of the project cost to the City. Sometimes it is prudent to require that the Developer provide facilities beyond what is necessary for a specific development in order to provide extensions beyond the development, or to plan for future growth. The City can then reimburse the developer for the cost of the additional facilities through direct outlay, cost recovery charges or other reimbursement agreements.

A Capital Improvement Program number, herein referred to as a CIP number, has been assigned to each improvement. The improvements are organized and presented in this chapter according to the following categories.

- General and Planning (G)
- Facility including Treatment and Buildings (F)
- Lift Stations (LS)
- Collection System (C)
- Annual Program (A)

DESCRIPTION OF IMPROVEMENTS

This section provides a general description of each group of improvements and an overview of the deficiencies that they will resolve. Most of the improvements are necessary to upgrade the system and improve reliability, including treatment, lift station and collection system. The CIP list is shown in **Table 6-1 – *Proposed Improvements Implementation Schedule (6-Year CIP)***. A 10-year CIP is included in **Table 6-2 – *Proposed Improvements Implementation Schedule (10-Year CIP)*** for calculation of the Capital Facilities Charge. Another 10 years of CIP is also included to complete a 20-year CIP in **Table 6-3 – *Proposed Improvements Implementation Schedule (20-Year CIP)*** for budget planning purposes.

Table 6-1
6-Year CIP (2008 - 2013)

CIP #	Description	Type	Size	Cost	Estimated 2008 Cost	Year	Total by Year
G-01	Sewer Planning	General	1 each	$10,000/ea	$10,000	2008	
C-01	SR410 Interceptor Replacement	Replacement	1,175 LF	$340/LF	$400,000	2008	
C-02	SR162 and RR Interceptor Replacement	Replacement	1,410 LF	$540/LF	$760,000	2008	
A-01	Lift Station Improvements	System Upgrade	1 each	$16,000/ea	$16,000	2008	
A-02	Unscheduled Projects	Replacement/Expansion	1 each	$290,000/ea	$290,000	2008	
A-03	Septic System Reduction Program	Increase Capacity	1 each	$250,000/ea	$250,000	2008	
A-04	Equipment Upgrade	System Upgrade	1 each	$32,000/ea	$32,000	2008	
A-05	Manhole Rehabilitation	System Upgrade	1 each	$ 91,000/ea	$91,000	2008	
A-06	Sewer Main Videoing Program	System Upgrade	1 each	$ 21,000/ea	$21,000	2008	$1,870,000
G-02	I&I Study	General	1 each	$ 150,000/ea	$150,000	2009	
G-03	Grinder Pump Planning	System Upgrade	1 each	$ 10,000/ea	$10,000	2009	
C-03	Church Lake Drive Sewer Trench Repair	Replacement	3,600 LF	$125/LF	$450,000	2009	
G-04	Emergency Response Plan	System Upgrade	1 each	$ 75,000/ea	$75,000	2009	
G-05	Lift Station Capacity Analysis	Increase Capacity	1 each	$50,000/ea	$50,000	2009	
F-01	Public Works Building (Phase 1)	General	1 each	$350,000/ea	$350,000	2009	
G-06	Rhodes Lake Interceptor Study	Increase Capacity	1 each	$ 10,000/ea	$10,000	2009	
C-04	Interceptor Replacement Program (Phase 1)	Replacement	6,100 LF	$340/LF	$2,080,000	2009	
A*	Annual Programs				$561,000	2009	$3,736,000
G-07	South Sewer Area Implementation Strategy	Increase Capacity	1 each	$40,000/ea	$40,000	2010	
C-05	I&I Program (Phase 1)	Replacement/Expansion	2,200 LF	$340/LF	$750,000	2010	
C-06	Interceptor Replacement Program (Phase 2)	Replacement	5,280 LF	$340/LF	$1,800,000	2010	
LS-01	Fennel Creek Lift Station	Increase Capacity	1 each	$ 850,000/ea	$850,000	2010	
LS-02	Lift Station #17 Improvements	System Upgrade	1 each	$137,000/ea	$137,000	2010	
F-02	Public Works Building (Phase 2)	General	1 each	$ 1,000,000/ea	$1,000,000	2010	
G-08	Lift Station Consolidation Evaluation	System Upgrade	1 each	$ 25,000/ea	$25,000	2010	
A*	Annual Programs				$561,000	2010	$5,163,000
LS-03	Lift Station Capacity Improvements	Increase Capacity	4 each	$ 300,000/ea	$1,200,000	2011	
F-03	Sumner WWTP Expansion	Increase Capacity	1 each	$4,566,000/ea	$4,566,000	2011	
A*	Annual Programs				$561,000	2011	$6,327,000
C-07	SR 410 (Mid-Town) Interceptor Improvement	Replacement	4,400 LF	$325/LF	$1,430,000	2012	
G-09	North Sewer Area Implementation Strategy	Increase Capacity	1 each	$40,000/ea	$40,000	2012	
A*	Annual Programs				$561,000	2012	$2,031,000
C-08	Mt Creek Force Main Replacement	Replacement	5,000 LF	$100/LF	$500,000	2013	
C-09	192nd Sewer Main Extentions	Increase Capacity	2,200 LF	$182/LF	$400,400	2013	
A*	Annual Programs				$561,000	2013	$1,461,400
	TOTAL						**$20,588,400**
A*	Annual Programs				$561,000		
A-01	Lift Station Improvements	System Upgrade	1 each	$16,000/ea			
A-02	Unscheduled Projects	Replacement/Expansion	1 each	$160,000/ea			
A-03	Septic System Reduction Program	Increase Capacity	1 each	$250,000/ea			
A-04	Equipment Upgrade	System Upgrade	1 each	$20,000/ea			
A-05	Manhole Rehabilitation	System Upgrade	1 each	$ 75,000/ea			
A-06	Sewer Main Videoing Program	System Upgrade	1 each	$ 20,000/ea			
A-07	Sewer Main Flusing Program	System Upgrade	1 each	$ 20,000/ea			

Table 6-2
10-Year CIP (2008 - 2017)

CIP #	Description	Type	Size	Cost	Estimated 2008 Cost	Year	Total by Year
G-01	Sewer Planning	General	1 each	$10,000/ea	$10,000	2008	
C-01	SR410 Interceptor Replacement	Replacement	1,175 LF	$340/LF	$400,000	2008	
C-02	SR162 and RR Interceptor Replacement	Replacement	1,410 LF	$540/LF	$760,000	2008	
A-01	Lift Station Improvements	System Upgrade	1 each	$16,000/ea	$16,000	2008	
A-02	Unscheduled Projects	Replacement/Expansion	1 each	$290,000/ea	$290,000	2008	
A-03	Septic System Reduction Program	Increase Capacity	1 each	$250,000/ea	$250,000	2008	
A-04	Equipment Upgrade	System Upgrade	1 each	$32,000/ea	$32,000	2008	
A-05	Manhole Rehabilitation	System Upgrade	1 each	$ 91,000/ea	$91,000	2008	
A-06	Sewer Main Videoing Program	System Upgrade	1 each	$ 21,000/ea	$21,000	2008	$1,870,000
G-02	I&I Study	General	1 each	$ 150,000/ea	$150,000	2009	
G-03	Grinder Pump Planning	System Upgrade	1 each	$ 10,000/ea	$10,000	2009	
C-03	Church Lake Drive Sewer Trench Repair	Replacement	3,600 LF	$125/LF	$450,000	2009	
G-04	Emergency Response Plan	System Upgrade	1 each	$ 75,000/ea	$75,000	2009	
G-05	Lift Station Capacity Analysis	Increase Capacity	1 each	$50,000/ea	$50,000	2009	
F-01	Public Works Building (Phase 1)	General	1 each	$350,000/ea	$350,000	2009	
G-06	Rhodes Lake Interceptor Study	Increase Capacity	1 each	$ 10,000/ea	$10,000	2009	
C-04	Interceptor Replacement Program (Phase 1)	Replacement	6,100 LF	$340/LF	$2,080,000	2009	
A*	Annual Programs				$561,000	2009	$3,736,000
G-07	South Sewer Area Implementation Strategy	Increase Capacity	1 each	$40,000/ea	$40,000	2010	
C-05	I&I Program (Phase 1)	Replacement/Expansion	2,200 LF	$340/LF	$750,000	2010	
C-06	Interceptor Replacement Program (Phase 2)	Replacement	5,280 LF	$340/LF	$1,800,000	2010	
LS-01	Fennel Creek Lift Station	Increase Capacity	1 each	$ 850,000/ea	$850,000	2010	
LS-02	Lift Station #17 Improvements	System Upgrade	1 each	$137,000/ea	$137,000	2010	
F-02	Public Works Building (Phase 2)	General	1 each	$ 1,000,000/ea	$1,000,000	2010	
G-08	Lift Station Consolidation Evaluation	System Upgrade	1 each	$ 25,000/ea	$25,000	2010	
A*	Annual Programs				$561,000	2010	$5,163,000
LS-03	Lift Station Capacity Improvements	Increase Capacity	4 each	$ 300,000/ea	$1,200,000	2011	
F-03	Sumner WWTP Expansion	Increase Capacity	1 each	$4,566,000/ea	$4,566,000	2011	
A*	Annual Programs				$561,000	2011	$6,327,000
C-07	SR 410 (Mid-Town) Interceptor Improvement	Replacement	4,400 LF	$325/LF	$1,430,000	2012	
G-09	North Sewer Area Implementation Strategy	Increase Capacity	1 each	$40,000/ea	$40,000	2012	
A*	Annual Programs				$561,000	2012	$2,031,000
C-08	Mt Creek Force Main Replacement	Replacement	5,000 LF	$100/LF	$500,000	2013	
C-09	192nd Sewer Main Extentions	Increase Capacity	2,200 LF	$182/LF	$400,400	2013	
A*	Annual Programs				$561,000	2013	$1,461,400
C-10	Angeline Road Force Main Replacement	Replacement	7,600 LF	$170/LF	$1,300,000	2014	
G-10	Sewer Comprehensive Plan Update	General	1 each	$150,000/ea	$150,000	2014	
A*	Annual Programs				$561,000	2014	$2,011,000
C-11	I&I Program (Phase 2)	Replacement/Expansion	1,750 LF	$340/LF	$600,000	2015	
A*	Annual Programs				$561,000	2015	$1,161,000
C-12	I&I Program (Phase 3)	Replacement/Expansion	1,750 LF	$340/LF	$600,000	2016	
A*	Annual Programs				$561,000	2016	$1,161,000
C-13	I&I Program (Phase 4)	Replacement/Expansion	1,750 LF	$340/LF	$600,000	2017	
A*	Annual Programs				$561,000	2017	$1,161,000
	TOTAL						**$26,082,400**
A*	Annual Programs				$561,000		
A-01	Lift Station Improvements	System Upgrade	1 each	$16,000/ea			
A-02	Unscheduled Projects	Replacement/Expansion	1 each	$160,000/ea			
A-03	Septic System Reduction Program	Increase Capacity	1 each	$250,000/ea			
A-04	Equipment Upgrade	System Upgrade	1 each	$20,000/ea			
A-05	Manhole Rehabilitation	System Upgrade	1 each	$ 75,000/ea			
A-06	Sewer Main Videoing Program	System Upgrade	1 each	$ 20,000/ea			
A-07	Sewer Main Flusing Program	System Upgrade	1 each	$ 20,000/ea			

Table 6-3
20-Year CIP (2018 - 2027)

CIP #	Description	Type	Size	Cost	Estimated 2008 Cost	Year	Total by Year
						2018	
	Replacement Program	Replacement	3,600 LF	$300/LF	$1,080,000	2018	
A*	Annual Programs				$1,381,000	2018	$2,461,000
						2019	
	Replacement Program	Replacement	3,600 LF	$300/LF	$1,080,000	2019	
A*	Annual Programs				$1,381,000	2019	$2,461,000
						2020	
	Replacement Program	Replacement	3,600 LF	$300/LF	$1,080,000	2020	
G-11	Sewer Comprehensive Plan Update	General	1 each	$100,000/ea	$100,000	2020	
A*	Annual Programs				$1,381,000	2020	$2,561,000
						2021	
	Replacement Program	Replacement	3,600 LF	$300/LF	$1,080,000	2021	
A*	Annual Programs				$1,381,000	2021	$2,461,000
						2022	
	Replacement Program	Replacement	3,600 LF	$300/LF	$1,080,000	2022	
A*	Annual Programs				$1,381,000	2022	$2,461,000
						2023	
	Replacement Program	Replacement	3,600 LF	$300/LF	$1,080,000	2023	
A*	Annual Programs				$1,381,000	2023	$2,461,000
						2024	
	Replacement Program	Replacement	3,600 LF	$300/LF	$1,080,000	2024	
A*	Annual Programs				$1,381,000	2024	$2,461,000
						2025	
	Replacement Program	Replacement	3,600 LF	$300/LF	$1,080,000	2025	
A*	Annual Programs				$1,381,000	2025	$2,461,000
						2026	
	Replacement Program	Replacement	3,600 LF	$300/LF	$1,080,000	2026	
G-12	Sewer Comprehensive Plan Update	General	1 each	$100,000/ea	$100,000	2026	
A*	Annual Programs				$1,381,000	2026	$2,561,000
						2027	
	Replacement Program	Replacement	3,600 LF	$300/LF	$1,080,000	2027	
A*	Annual Programs				$1,381,000	2027	$2,461,000
	TOTAL						**$24,810,000**
A*	Annual Programs				$561,000		
A-01	Lift Station Improvements	System Upgrade	1 each	$16,000/ea			
A-02	Unscheduled Projects	Replacement/Expansion	1 each	$160,000/ea			
A-03	Septic System Reduction Program	Increase Capacity	1 each	$250,000/ea			
A-04	Equipment Upgrade	System Upgrade	1 each	$20,000/ea			
A-05	Manhole Rehabilitation	System Upgrade	1 each	$ 75,000/ea			
A-06	Sewer Main Videoing Program	System Upgrade	1 each	$ 20,000/ea			
A-07	Sewer Main Flusing Program	System Upgrade	1 each	$ 20,000/ea			

Sewer Main Improvements

The following sewer main improvements were identified from the results of the system evaluation and discussions with Operations and Maintenance (O&M) and Public Works staff. Most of the sewer main improvements in the CIP address interceptors that are the backbone of the City's system.

CIP C-01, C-02, C-04, and C-06: LS 17 to WWTP Interceptor Evaluation and Upgrade

Deficiency: Major sections of the interceptor between Lift Station 17 and the Waste Water Treatment Plant (WWTP) in Sumner operate as pressure pipe systems which are prone to solids build-ups and deterioration from hydrogen sulfide. The interceptor has been deteriorating and certain sections have already been replaced. Additional sections need to be replaced in order to prevent costly failures. The City had the entire length of interceptor evaluated to determine its condition and make recommendations on what improvements will be required to ensure adequate and reliable service from this line.

Improvement: Based on the results of the interceptor evaluation the City has divided improvements into four sections, including: replacement of sections under SR 162 and the railroad, sections of 16-inch along SR 410, sections of 18-inch and 24-inch along SR 410, and sections of 30-inch across the valley floor.

CIP C-03: Church Lake Drive Sewer Main Replacement

Deficiency: The road surface along Church Lake Drive as it loops between the west side and east side of 71st Street East is a continuing maintenance issue. It is suspected that this is due to settlement of the sewer main and inadequate compaction of the sewer trench backfill.

Improvement: The City will evaluate the need to replace the sewer main or just the trench backfill to stabilize the road surface. Replace sewer main and trench backfill, as required. This project should be scheduled to coincide with water system improvements in the area.

CIP C-05, C-11, C-12 and C-13: I&I Program – Phases 1 through 4

Deficiency: The City must frequently monitor and evaluate the level of Infiltration and Inflow (I&I) in its system to ensure that adequate capacity exists to handle plan flow rates. Preliminary evaluations of lift station pumping records done as part of this comprehensive planning effort indicated that I&I is becoming more of a problem within the City's collection system.

Improvement: This program will be divided into two phases and will conduct flow monitoring within selected collection basins, additional metering and analysis of lift station pumping records, and other I&I evaluation measure to assess the problem areas and determine required improvements. Improvements will be prioritized and constructed based on available funding. The City will conduct wet weather flow tests and other I&I tests and make improvements as required to reduce I&I loads.

CIP C-07: SR 410 (Mid-Town) Interceptor Improvements

Deficiency: Growth along the SR 410 corridor will increase flow in this interceptor to beyond its design capacity.

Improvement: Analysis will be conducted to determine when this capacity will become critical and if and how new developments should participate in the upsizing of the sewer mains along SR 410 between 214th Street and Lift Station 17. This project is scheduled during the 6th year of the CIP for this plan but may be brought forward in the CIP if required by increases in flows. This project could also be completed as a developer extension projects as necessary to accommodate upstream developments.

CIP C-08: Mt. Creek Force Main Replacement

Deficiency: When the Mt. Creek area was developed it was determined that existing capacity in sewer mains along SR 410 were needed to serve the commercial areas. Therefore, this development was routed to the Church Lake interceptor (via the Spring Haven Lift Station) where excess capacity existed. The existing force main is over 13,000 lineal feet (LF) and over time will be expensive to operate and maintain. The City plans to increase capacity along SR 410 which will enable flows from the Mt. Creek development to be rerouted along a much shorter alignment to Lift Station 17.

Improvement: Replace the force main from the Mt. Creek lift station gravity main just the proposed gravity main along 96th Street East. The proposed lift station for Eastown will need to have enough capacity to accommodate flows from the Mt. Creek area. It is estimated that up to 5,000 LF of force main may be required.

CIP C-09: 192nd Sewer Main Extension

Deficiency: Neighborhoods along 192nd Avenue East south of SR 410 and north of Rhodes Lake Road do not have gravity sewer service. The City plans to do road improvements throughout this area. Prior to the roadway work the City plans to install or replace all major utilities so as not to disturb the new pavement in the future.

Improvement: Extend sewer main from SR 410 based on the extents of the proposed roadway improvements. It is estimated that approximately 2,200 LF of sewer main will be required.

CIP C-10: Angeline Road Force Main Replacement

Deficiency: The force main from the Willowbrook lift station that was installed by Pierce County in the 1990's has failed in numerous locations over the past few years. The City has determined that the best solution is to replace the entire line using better materials and construction methods.

Improvement: Replace the force main from the Willowbrook lift station to Lift Station 17. It is estimated that approximately 7,600 LF of force main will be required.

Lift Station Improvements

Lift stations require the most attention from the City's maintenance and operations staff due to their complexity and mechanical equipment. The following projects address the reliability and capacity of several of the City's major lift stations.

CIP LS-01: New Fennel Creek Lift Station

Deficiency: Low areas in the Town Center area near Fennel Creeks and along Sumner-Buckley Highway East are isolated from gravity flow to Lift Station 17.

Improvement: To help promote the development of the Town Center area the City will install a new lift station near Fennel Creek and Sumner-Buckley Highway East to route flows under the creek and to Lift Station 17.

CIP LS-02: Lift Station 17 Improvements

Deficiency: Growth throughout the City's collection system especially along the SR 410 corridor and in areas that are pumped to Lift Station 17, such as Angeline Valley, will require capacity upgrades at this station.

Improvement: The City will make both reliability and wet well capacity improvements to this station to increase its ability to safely handle increased peak flow rates.

CIP LS-03: Lift Station Capacity Improvements

Deficiency: Preliminary evaluation of available lift station pumping records indicated that several lift station may have capacity issues associated with I&I, especially in the Inlet Island and SR 410 area.

Improvement: Based on the evaluation of I&I and growth related capacity issues, the City should either increase the holding capacity or the pumping capacity of the lift stations to address the deficiencies and increase the capacity of the system.

Facility Improvements

The City has outgrown the effective use of its O&M yard and Public Works offices. Expansion of the existing wastewater treatment plant in Sumner will be needed to increase capacity to accommodate growth.

CIP F-01 and T-02: Public Works Building

Deficiency: The City O&M yard is undersized and out-of-date which will interfere with the City's ability to efficiently run the sewer system and other utilities. In addition, staff from the O&M and Public Works departments are spread apart at two locations in the City.

Improvement: The City will expand the O&M yard and consolidate O&M and Public Works onto one site (currently proposed at the City's Peaking Storage site).

CIP F-03: Sumner WWTP Expansion

Deficiency: Improve effluent quality and increase treatment capacity.

Improvement: The City participates jointly with the City of Sumner in the funding of this project. The project is managed by the City of Sumner.

Planning and General Improvements

The following are planning efforts and operational program elements that are required to comply with various State water regulations and improve the system's operations.

CIP G-01: Sewer Planning

Deficiency: The City's will continue its Comprehensive Sewer System Plan effort.

Improvement: The City will complete the update of its Comprehensive Sewer System Plan.

CIP G-02: I&I Study

Deficiency: Flow data suggests that the City's I&I component has increased over the last several years. I&I costs the City money in pumping and treatment and ties up capacity that could be used to serve new customers.

Improvement: The City will analyze the collection system to determine the location and extend of its I&I problem. This may involve video inspections, smoke testing, and pressure testing of gravity mains and manholes. Sections of sewer main will be identified and prioritized for replacement.

CIP G-03: Grinder Pump Planning

Deficiency: The City owns over 90 grinder pumps located in private homes. This places the burden of operation and maintenance, as well as the risk exposure to failures and flooding, on the City.

Improvement: The City will continue to evaluate the potential for legally and technically divesting itself of these publicly owned facilities.

CIP G-04: Emergency Response and O&M Manual

Deficiency: The City should have a plan in place for handling system failures.

Improvement: The City will prepare an Emergency Response Plan. In addition, the City will prepare an O&M Manual.

CIP LS-05: Lift Station Capacity Analysis

Deficiency: Preliminary evaluation of available lift station pumping records indicated that several lift station may have capacity issues associated with I&I, especially in the Inlet Island and SR 410 area. An evaluation of these deficiencies, and how best to correct them, should be conducted.

Improvement: Based on the evaluation of the capacity issues, the City should either reduce I&I in the tributary basin or increase the holding capacity or the pumping capacity of the lift stations to address the deficiencies and increase the capacity of the system.

CIP G-06: Rhodes Lake Interceptor Study

Deficiency: Since the majority of sewage flows through Lift Station 17, this is a critical facility for the City and must be evaluated for reliability and back-up alternatives. One alternative is to route sewage via gravity down the Angeline Valley, down Rhode Lake Road, and across the Puyallup Valley to the WWTP at Sumner.

Improvement: The City will evaluate the technical and economic issues associated with this alternative.

CIP G-07 & 09: North and South Sewer Service Areas Implementation Strategy

Deficiency: As the need to provide sewer service into the North and South Sewer Service Areas grows the City will need to continue its planning effort on how sewer and water can most effectively be provided to this area.

Improvement: The City has budgeted $80,000 to facilitate additional planning and coordination efforts to ensure that these goals are accomplished and adequately funded by the developments in these areas. Separate rate studies and structures will be evaluated and create for these areas.

CIP G-08: Lift Station Consolidation Evaluation

Deficiency: There are six existing lift stations located in the Springhaven/Inlet Island area and two to three more proposed in the future. This is a fairly large number of stations per customer served and is a result of the phased build-out of a topographically difficult area to serve.

Improvement: The City will evaluate the options of reconfiguring portions of the collection system to a more centralize location to reduce the number of lift stations required to serve this area.

CIP G-10: Comprehensive Sewer System Plan Update

Deficiency: The City's Comprehensive Sewer System Plan should be updated every six years to be concurrent with the City's Water System Comprehensive Plan and the City's Land Use Comprehensive Plan as required by GMA.

Improvement: The City will update its Comprehensive Sewer System Plan every six years. In addition, the City will perform a check of the Plan at the three year mark and adjust the projections as necessary.

Annual Programs

The following programs will be performed on an annual basis.

CIP A-01: Lift Station Improvements

Deficiency: Lift station equipment needs to be replaced before it wears out and creates a system failure.

Improvement: The City will replace equipment as it begins to cause concerns or problems in the operation of the lift stations. The City budgets $16,000 per year for this program.

CIP A-02: Unscheduled Projects

Deficiency: Unforeseen issues with the sewer system will arise over the life of this CIP.

Improvement: Based on needs assessed by the City sections of the sewer system will be replaced, expanded, or extended to better serve the City customers. The City budgets $160,000 per year for this program.

CIP A-03: Septic System Reduction Program

Deficiency: Main areas within the City Limits are served by drainfields since no gravity sewer systems are available locally.

Improvement: The City will evaluate and prioritize areas of the City that are currently on drainfields and extend gravity sewers to serve them. Projects will be selected on a matrix of items including public health concerns, environmental degradation, water and street projects, and planned growth. The City will budget $250,000 per year for this program.

CIP A-04: Equipment Upgrades

Deficiency: Rolling stock and other sewer system equipment needs to be replaced before it wears out and is no longer available for operation and maintenance of the City's sewer system.

Improvement: The City will replace equipment as it begins to cause concerns or problems. The City budgets $20,000 per year for this program.

CIP A-05: Manhole Rehabilitation

Deficiency: Many manholes throughout the sewer system need to be regrouted to reduce seepages into the system and maintain the structural integrity of the structures. Manholes in high groundwater areas or in areas more susceptible to hydrogen sulfide deterioration will be targeted first.

Improvement: The City will hire a firm that specializes in the refurbishment of manholes to address 25 to 50 manholes per year. The City budgets $75,000 per year for this program.

CIP A-06: Sewer Main Videoing Program

Deficiency: Sewer mains settle and shift due to age or inadequate construction, causing increases in I&I and also potential solids buildups.

Improvement: The City will have sections of sewer main surveyed with video equipment to evaluate their condition. Sections will be replaced as necessary to correct problems. The City will budget $20,000 per year for this program.

CIP A-07: Sewer Main Flushing Program

Deficiency: Sewer mains can deteriorate from solids buildups.

Improvement: The City will prioritize and flush sections of sewer main. The City will budget $20,000 per year for this program.

ESTIMATING COSTS OF IMPROVEMENTS

Project costs for the proposed improvements were estimated based on costs of similar, recently constructed sewer projects in Bonney Lake and around the Puget Sound area, and are presented in 2008 dollars. The cost estimates include the estimated construction cost of the improvement as well as indirect costs. The unit costs for each sewer main size are based on estimates of all construction-related improvements, such as materials and labor for the sewer main installation, side sewers, manholes, trench restoration, asphalt surface restoration, and other work for a complete installation, and are based on an average trench depth of 10 feet. Additional costs were added to some sewer main improvements to cover anticipated, increased costs related to the project location and degree of difficulty. The construction cost estimates include a 10 percent contingency and sales tax of 8.8 percent. The indirect costs were estimated at 35 percent of the construction cost and include engineering preliminary design, final design, and construction management services, permitting, legal, and administrative services.

Construction cost estimates for sewer main projects were determined from the sewer main unit costs (i.e. cost per foot length) shown in **Table 6-4 – *Sewer Main Unit Costs*** and the proposed diameter and approximate length of each improvement. Unit costs for certain projects were adjusted based on project specific conditions that would impact the standard unit cost approach (e.g. not pavement restoration required, borings, right-of-way issues).

Table 6-4
Sewer Main Unit Costs

Sewer Main Diameter	Unit Cost (2008 dollars)
8-inch Gravity	$300/LF
12-inch Gravity	$425/LF
4-inch FM	$100/LF
8-inch FM	$170/LF

CHAPTER 7

OPERATION AND MAINTENANCE

INTRODUCTION

A comprehensive maintenance program allows the City to use the existing collection system and pumping facilities for their maximum design life at their fullest capacity. The same facilities will therefore accommodate greater flow rates from more customer connections, which minimize the need to construct new facilities. A properly maintained facility is also less likely to fail. Operating costs of the utility are reduced because of lower damage compensation costs and overtime costs for maintenance personnel. An effective maintenance program also protects the environment and the public health by minimizing the potential for sewage overflows.

The current Operation and Maintenance (O&M) program discussed in this chapter consists of routine operations, preventative maintenance and emergency procedures.

NORMAL OPERATIONS

Normal operation of the City's sewer system is managed by the Operations Division of the Public Works Department.

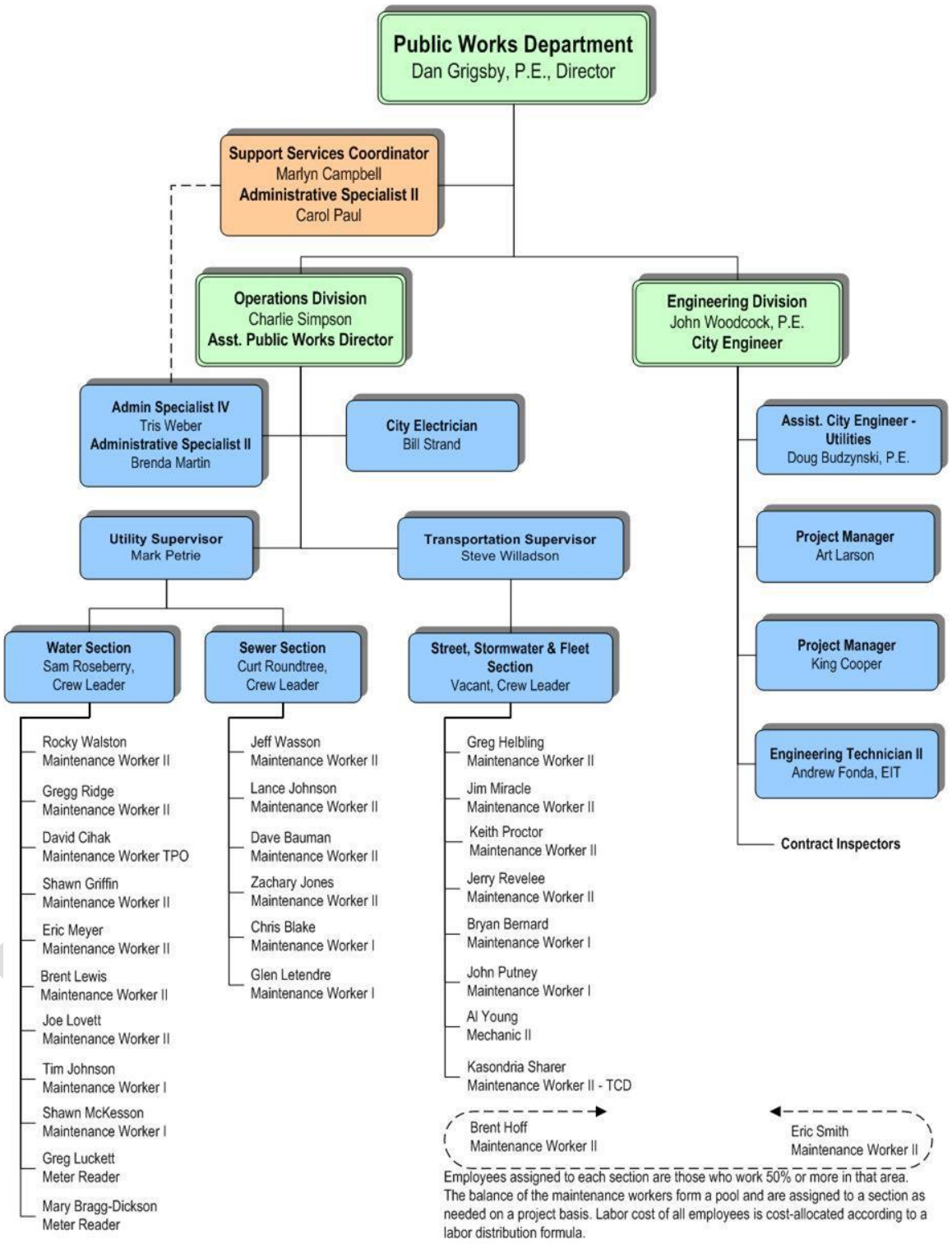
Organizational Structure

The Operations Division is under the direction of the Assistant Public Works Director, Mr. Charlie Simpson. He reports to the City's Public Works Director, Mr. Dan Grigsby. The sewer operations section of the Operations Division is staffed by a Lead Sewer Worker (Curt Roundtree) with four Maintenance Workers and one Laborer. In addition, if necessary, other support staff and equipment is available to sewer operations from the water and storm – streets operations sections. **Chart 7-1** illustrates the organization of Bonney Lake's Public Works Department.

Training is offered through such organizations as the APWA (local section), various trade organizations, Washington Environmental Training Center, Green River Community College and by industrial training specialists. The City will continue its policy of supporting and promoting training.

The level of staff training will need to keep pace as the complexity of the system and the number of customers increase. New employees need orientation and basic information; while more experienced employees need continued training. The City utilizes cross-training between the sewer and water systems to ensure personnel are available for emergencies in any City system.

Chart 7-1
Organizational Structure



Communication

To function efficiently, an operations and maintenance team must be able to communicate on a regular basis and in an effective manner. The normal channels of communication available to City staff are:

- Vehicular two-way radios;
- Cellular Phones;
- Daily work assignment meetings;
- Emergency phone numbers for "on-call" employees;
- Pagers; and
- Regular staff meetings.

Equipment

The equipment available for daily use includes rolling stock, shop tools, and incidental equipment as well as other portable equipment for field use. The primary equipment is described in **Table 7-1 – *Sewer Department Equipment List***.

The City is investigating the purchase of a new equipment truck for sewer maintenance. This would replace one of the City's older existing trucks. The City is also considering purchasing an additional portable generator.

Routine Operations and Preventative Maintenance

Maintenance schedules should meet or exceed manufacturer's recommendations for all critical components in the sewer system. The following sections list the City's existing operations and maintenance requirements for all facilities.

Lift Station Maintenance

Each lift station is maintained weekly, monthly, semi-annually and annually.

Weekly Lift Station Maintenance (All Lift Stations)

General: Inspect for abnormalities such as asphalt depressions, hatch openings and signs of vandalism.

Wet Well: Check structure, catwalk and ventilation; check for unusual odors (e.g. paint, solvents).

Table 7-1 Sewer Department Equipment List
1995 Freightliner Dump Truck
1988 Case Backhoe Model 580K
2005 Chevorlet 2500 Flatbed Truck
2006 Godwin Pump
2007 1 ton Service Body 4x4
2007 1.5 ton Drop Side Dump Truck
2005 Ford Ranger Pickup Truck #1
2005 Ford Ranger Pickup Truck #2
2005 Ford Ranger Pickup Truck #3
Portable Message Board
Portable Message Board
1986 Cummins Generator 50 kW
1986 Cummins Generator 50 kW
1999 Chevrolet Silverado 1/2 Ton Pickup Truck
2005 Chevrolet Silverado Pickup Truck
Trailer Wood Box Sides
1993 Chevrolet 3/4 Ton 4X4 Pickup Truck
1998 Vactor Ford Truck
Miscellaneous small tools, etc.
Communications Equipment
Two-Way Radios in All Vehicles
Cell Phones with Two-Way Radios
Equipment Available from Water Operations
2000 Ford Ranger Pickup
1991 Ford Ranger Pickup
1982 Concrete Cutter
1998 Pavement Cutter
1995 Ford F250 3/4 Ton Pickup Truck
1994 Chevrolet S-10 Pickup Truck (meter van)
2003 Chevrolet S10 Pickup
2003 Chevrolet S10 Pickup
2002 XAS 96 JD Portable Air Compressor
2002 John Deere 410 G Backhoe
1998 Brush Mower
1995 Ford F350 1 Ton Flatbed Truck
1980 GMC 7000 Series Boom Truck
1995 Ford F350 1 Ton Service Box Truck
1987 Eager Beaver Trailer
1999 Ford Ranger Excab Pickup Truck
1975 GMC 5 Yard Dump Truck
1975 GMC 5 Yard Dump Truck
2002 5 Yard Dump Truck
1989 GMC Vandura 3/4 Ton Van
1994 Chevrolet Pickup Truck
1999 4900 International Dump Truck
1999 Paros Trailer PET 71612
225 kW Emergency Generator
15 kW Emergency Generator
Jack Hammers (2 each)
Portable Compactor (Case)
Miscellaneous small tools, etc.

Dry Well: Inspect for telemetry malfunctions and general cleanliness, paint, etc.; check level controls for float operation and bubbler system failures and check pumps for any operating abnormalities; ensure that all pumps are operating on automatic; record in log weekly operating time for each pump and note any differences from previous week.

Weekly Maintenance

Check grate at top of the interceptor going down SR 410 (near Myers Road).

Monthly Lift Station Maintenance

Start up and check generator at:

- All lift stations with generators (all except Lift Stations 5 and 16).
- Portable generators.

Quarterly Lift Station Maintenance

Extract wet well grease from:

- Lift Station 18.

Check levels of Bioxide at:

- Lift Station 9;
- Lift Station 10;
- Lift Station 19.

Semi-annual (twice a year) Lift Station Maintenance

Extract wet well grease from:

- Lift Station 17.

Yearly Lift Station Maintenance

Grease and lube all pumps (all lift stations).

Change oil in generator and check anti-freeze level at:

- All lift stations with generators (all except Lift Stations 5 and 16); and
- Portable generators.

Clean and Inspect all City owned Grinder Pumps.

- 90 grinders city wide.

Check cathodic protection of underground fuel tank at:

- Lift Station 17.

Every 2 to 5 Years Lift Station Maintenance

Change odor control filter at:

- Lift Station 14.

Leak test underground fuel tank at:

- Lift Station 17 (every 3 years).

Pipeline Maintenance

Pipeline maintenance consists of pipeline cleaning as necessary. City vactor truck is used to clean pipelines. In the past, the City has cleaned about a quarter of the system each year. Its current goal is to clean half of the system each year.

Manhole Maintenance

Maintenance staff periodically inspects manholes to determine the need for maintenance and/or repairs. Manholes should be inspected once every two years in conjunction with the City's pipeline cleaning program.

Safety

The City participates in a Safety Operations Resource Team (SORT) with other cities through the Water and Sewer Risk Management Pool. SORT creates safety programs to ensure a safe work environment as well as compliance with OSHA and WISHA regulations. The City designates one employee as a Safety Officer (currently, Mr. Dave Bauman). This employee is responsible for conducting safety meetings which are held with the crew on a monthly basis, acting as the City's SORT representative, inspecting and maintaining safety equipment and reviewing safety incidents. The City also has a Safety Committee which meets monthly.

Inspections

City staff inspects connections to and extensions of the sewer system for conformance with City standards. In addition, City staff inspects the construction of City facilities.

Records

Adequate records are an essential tool in City management and operation, providing the supporting data for operations assessment and long-term planning, while saving time and reducing difficulty when trouble arises.

The City keeps the following types of records.

Lift station logs on operation, maintenance and repair.

- Personnel
- Facility maintenance and repair
- Regularly kept work logs
- Inspection reports

- Work orders
- Safety meeting minutes
- Plat maps and as-built drawings
- Material Safety Data Sheet (MSDS) listings
- Confined space entry records
- Telemetry recordings

Up-to-date maps of the sanitary sewer system are essential for operation and maintenance. The City's consulting engineers create and update the City's maps. Changes or additions to the sanitary sewer system are added to system maps as they occur. Plat maps and as-built drawings show the gravity and force-main sizes and locations; manhole locations, numbers and elevations; clean out locations; pipe types; valve and air-vac locations; and tee and side sewer stub locations. Construction drawings provide information on lift station facilities such as wet well and dry well sizes, ventilation equipment, electrical information, easement locations, etc. Plat maps and construction drawings for new sanitary sewer extensions and facilities will continue to be recorded.

Staffing

The hours of labor and supervisory activity required to effectively conduct on-going maintenance and operations form the basis for identifying needed staffing levels.

The current staff organization is illustrated in **Chart 7-1**. There are five operation and maintenance employees, including the leadworker and utility maintenance workers. The tasks performed include inspecting and repairing system facilities, routine preventive maintenance, record keeping, administrative tasks, construction inspection and corrective action during emergencies.

The hours of work required to adequately maintain the sanitary sewer system are shown in **Table 7-2 – *Staffing Requirements***. The annual hours total approximately 11,600, or approximately 222 crew hours per week. This requires six crew members working full time (i.e., 40 hours per week) excluding vacation, sick leave and any task not related to preventive maintenance.

Table 7-2
Staffing Requirements

Description	Total Units In System	Frequency (Times/Year)	Time/Unit (Hours)	Time/Year (Hours)
Preventive Maintenance				
Lift Stations				
-Daily	22	260	2	520
-Monthly	22	260	6	1,560
-Quarterly	6	16	6	96
-Semi-Annually	1	2	12	24
-Annually	22	22	15	330
Grinder Pumps	90	90	4	360
Community Drainfield (Falling Water)	1	52	8	416
Sewer Main Flushing	81 miles	50%/yr	28	1,134
Manhole Inspection	1656	50%/yr	1.5	1,242
Sewer Main TV Inspection	81 miles	25%/yr	16	324
Manhole Rehabilitation	1656	10%/yr	2	331
Grate Inspection	1	104	1	104
I & I Monitoring	N/A	30	2	60
Safety	N/A	260	0.5	130
Construction Inspection	N/A	260	2	520
Record Keeping	N/A	260	1	260
Vehicle and Equipment Upkeep	N/A	260	0.5	130
Operations				
Monitor System	22	260	0.25	1,430
False Alarm Response	1	12	2	24
Groundskeeping	22	12	1	264
Inventory	1	1	40	40
Service Connections	150	1	1	150
Main Connections	5	1	12	60
Administration	1	260	8	2,080
Total Requirements				
Total Hours Required				11,589
Total Full Time Staff Required (based on 1,540 hours per person per year)				**8**
Time Availabe Per Year Per Person				
Beginning Hours Available				2,080
Less average vacation of 3 weeks per year				-120
Less average sick leave of 2 weeks per year				-80
Less holidays of 10 days per year				-80
Less average training of 40 hours per year				-40
Less average small tasks other than above of 1 hour per day				-220
Net Total Available Hours Per Year Per Person				**1,540**

If the utility considers the hours necessary for vacation, holiday, illness, meetings, training, on-the-job travel and startup time, then the total number of hours available for performing the work of operation and maintenance diminishes to a level of approximately 1,540 hours per year, or 30 hours per week per crew member. At this rate, a staff of eight full-time maintenance crew members is necessary.

Emergency Operations Plan

The City plans to develop an Emergency Response Plan to provide proper manpower and equipment response upon the failure of City facilities, the interruption of service due to power outages/catastrophic event. Currently, during off hours, at least one staff member is on-call in case of an emergency.

The sewer lift stations are the most vulnerable. In order to provide time to respond, the stations have additional capacity in the wet well or in separate overflow chambers. During power failures, the regional lift stations have emergency generators, and the City's mobile generator is used to provide temporary power in the event a dedicated emergency generator fails.

Sewer System Construction Standards

The City has standard construction specifications and details for sewer improvements to the system (**Appendix I**). These standards are regularly improved based on the availability of new technology (materials and methods) and performance of the existing facilities. Through the active involvement of the maintenance staff, the standards are revised to increase the longevity and reduce the maintenance of the City's sewer facilities.

OPERATION AND MAINTENANCE EVALUATION

Currently, preventive maintenance of sewer system facilities consists of standard lift station maintenance, periodic manhole inspection and pipeline flushing. Additional preventive maintenance of the system is necessary in order to reduce the number of emergency situations which currently occur and to optimize system reliability.

Deficiencies and Recommendations

Manhole inspection and rehabilitation, odor control and wet well cleaning are additional standard maintenance procedures necessary to optimize the sewer system operation.

Manhole Inspection and Rehabilitation

Deficiency

Based on the I&I values for the system, it is likely that a number of manholes in the City are subject to inflow and infiltration problems. The City needs to identify manholes with I&I problems and raise or seal the manholes.

Recommendation

Clean and rehabilitate existing manholes based on a manhole inspection program. Rehabilitation includes I&I prevention; frame and cover replacement; raising or sealing; and ladder replacement. The City's manhole maintenance standard should be to inspect all manholes yearly.

Manhole Inflow Reduction Program

Deficiency

Some manholes within the sewer system are submerged during extreme rainfall events acting like catch basins draining roadway runoff into the sewer system. This stormwater inflow stresses the existing sewer system, causing several facilities and pipelines to reach capacity.

Recommendation

The City needs to initiate a program to locate and identify where these manholes are and takes steps to seal these manholes. The first step is to identify areas which are subject to flooding during extreme rainfall events. Manholes in these areas subjected to submergence should be waterproofed using frame and cover gaskets and sealing compounds. The City should continue to identify manholes experiencing inflow problems and correct the leaks as part of an annual inflow reduction effort.

Odor Control

Deficiency

The City has odor control systems at Lift Station 14 and Bioxide injections systems at Lift Stations 9, 10 and 19, to help reduce hydrogen sulfide generation in the City’s longer force mains. The City does receive some odor complaints from residents near Lift Stations 12 and 13.

Recommendation

The City should monitor the odor concerns at these lift stations and determine whether odor control systems are warranted.

Pipeline Video Inspection Program

Deficiency

The City needs to have an updated understanding of the condition of its collections system.

Recommendation

The City should continue its annual video inspection program with the objective of maintaining a sewer system condition data base for prioritizing eventual system replacement. Also, the video inspection program will enable the City to identify potential problems and correct them prior to an accident occurring, such as an overflow. This program will improve the system's overall reliability. Older areas of the sewer system with concrete pipe and pipelines with flat slopes should be inspected first.

Critical Pipe Section Monitoring Program

Deficiency

As I&I loading on the City's system increase, some portions of the collection system will approach their design capacity. In an effort to prevent overflow during extreme rainfall events, the City needs to understand which parts of its system are particularly susceptible to capacity limitations.

Recommendation

The City should monitor wastewater flows within the sewer system at key locations during wet weather periods, namely November through February. For each monitoring location, the City should also collect dry weather baseline flow data for 7 to 14 days to allow evaluation of I&I. Specifically, the City should utilize its flo-totes to monitor flows in pipelines expected of having capacity problems as identified in the proposed I&I program. The City should monitor these pipe sections to identify the extent of the problem. If any capacity problems are discovered, the City should review pipe capacity and pump rate information to determine the most effective way to eliminate the capacity problem.

Standard Procedures and Recordkeeping

Deficiency

The City should have a clear understanding of how I&I impacts capacity at each lift station. The City's telemetry system records pumping information and times; however, only a few of the City's lift stations have flow totalizing meters (including: Lift Stations 2, 9, 10, 19, and 20).

Recommendation

The City should install flow meters at each lift station and have them monitored by the telemetry system. City staff should review this information on a regular basis and compare with manual readings at the lift station. This should help identify any problems with telemetry equipment or possible pump malfunctions on a more timely basis.

Power or Equipment Failures at Lift Stations

Deficiency

All but one of the City's existing lift stations have back up power generation capability. In addition, only the newest lift stations (Lift Stations 2, 9, 10, 19 and 20) have bypass pumper ports. These pumper ports allow for a portable pump to be used to by pass lift stations in the event of either equipment or power failures.

Recommendation

The City has plans for having a generator installed at Lift Station 16. The City should install pumper ports at all stations that do not currently have one.

Flushing Program

Deficiency

Many sections of sewer main may be susceptible to physical deterioration and loss of flow capacity due to solids build up in the pipe. This can be caused when minimum scouring velocities are not achieved in a pipe section due to lower than design flow rates being experienced as the system builds out or to inadequate pipe slopes.

Recommendation

The City should prepare and implement a sewer main flushing program to prioritize pipe sections that are the most susceptible to degradation from sediment deposits. Parameters should include low flows, shallow slopes, pipe material, and the critical importance factor of each main section (i.e. collector versus regional interceptor). The program should address requirements such as staff hours, scheduling, and flushing equipment.