# **Projected Growth and Future Service Areas**



Piping in Lift Station No. 17

# INTRODUCTION

A detailed analysis of growth is crucial to a sewer system's planning effort. A future wastewater flow analysis identifies projected growth and estimates how much conveyance and treatment capacity will be needed to satisfy future sewer system growth while continuing to meet federal and state laws.

This chapter builds on and expands the analyses, discussion, and recommendations from **Chapter 3** – *Land Use and Population*. The initial section of the chapter presents an overview of the three main service areas of the City of Bonney Lake's (City) sewer system. Subsequently, the basis and results of the growth forecast work will be presented. Application of the Residential Equivalent (RE) factors to forecast growth present implications for improvements to the City's system in each of the three sub-areas of the sewer service area (SSA). Since future service to the South Sewer Service Area (SSSA) and North Sewer Service Area (NSSA) is mostly likely beyond the 6-year horizon, planned improvements for these areas, along with alternatives where appropriate, are presented in the final sections of this chapter, instead of as specific capital improvement projects presented in **Chapter 8** – **Sewer System Improvements**.

# **EXISTING AND FUTURE SERVICE AREAS**

# **Existing Core Sewer Service Area**

The properties currently served by the City's sewer system are located in the Core Sewer Service Area (CSSA) and are mostly single-family neighborhoods with the exception of the State Route (SR) 410 commercial corridor. The predominately residential areas can be divided into two main areas: north of SR 410; and south of SR 410. The area north of SR 410 (that bisects the current SSA) 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, Midtown, and Eastown neighborhoods that include a mix of single-family, multi-family, and commercial development. **Figure 4-1** – *Existing Sewer System Area* shows the location of the existing CSSA and includes a notation of the locations of Downtown, Midtown, and Eastown, which are the current focus of new and re-development activities for the City's CSSA.

The Eastown community lies along SR 410 from about 214<sup>th</sup> to 234<sup>th</sup> 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 the City's corporate limits and SSA surrounded by rural areas somewhat distant from residential concentrations. Eastown is expected to remain a highway-oriented commercial area.

# **South Sewer Service Area**

The City acquired its SSSA as part of the transfer of Pierce County's system to the City (**Appendix A** – *Sanitary Sewer System Transfer Agreement*). The SSSA is a large percentage of the County's Urban Growth Area (UGA) between Bonney Lake and Orting. A very large portion of the SSSA 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 be developed into about 2,500 homes in Section 15, Township 19, Range 5 near the southern limits of this service area.

# **North Sewer Service Area**

The City also acquired its NSSA with the execution of the transfer agreement with Pierce County (County) (**Appendix A** – *Sanitary Sewer System Transfer Agreement*). In contrast to the SSSA, the NSSA lies primarily outside any Urban Growth Boundary. Sewer service to the NSSA is mandated by a 1983 U.S. Environmental Protection Agency (EPA) Order (**Appendix D** – *EPA Order for Providing Service to West Lake Tapps*). 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 (WWTP). The order required that sufficient capacity in the expanded WWTP 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 (the City's current NSSA) 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 4-2** – *Sewer Service Area (2016)* shows the limits of the City's CSSA, SSSA, and NSSA.

# 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 (GMA) and adopted City and 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 the 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 4-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 4-county area.

For the City's sewer planning effort, the "2014 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 2010 Census. The 2010 Census provides the baseline numbers for the PSRC growth forecasts.

#### Pierce County GIS Data

The 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 City's SSA – a foundational component of the forecast process. GIS data also allowed calculation of the portion of the SSA lying either inside or outside the City limits. This is an important consideration because, as mentioned previously, under growth management, the majority of new development has and is forecast to occur outside City limits.

# **Forecast Conversions to Sanitary Service**

Efforts were made to determine historic rates of conversion of existing homes from on-site systems to sanitary service in the City's 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. The City did prepare a Septic System Abatement Plan to address this issue, which is presented in **Appendix I** – *Septic System Abatement Plan*.

# **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 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 City's 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** – **Residential Equivalency Calculations**.

# **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 an RE. An RE represents the amount of wastewater generated by a typical single-family residence within the City's 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 City's system were computed based on flow data obtained from both the WWTP and the City's water system.

# **RE Flow Components and Calculations**

The RE value for the City's sewer system is comprised of two main components; wastewater and Infiltration and Inflow (I&I). Data used to compute these elements was interpreted from the most recent multi-year flow data (January 2011 through December 2015) from the WWTP in Sumner.

A summary of these data series is presented in **Table 4-1** – *Historical Flows and Rainfall*. All data series are presented in **Appendix E** – *Residential Equivalency Calculations*. The data generated a range of possible annual values for an RE ranging from a minimum of 169 (2015) to 190 (2011) gallons per day (gpd) per RE, and shows a general decline over the last 5 years despite moderate growth in the system. Additionally, historic rainfall has been relatively consistent over the period. Although, there is a 30 percent difference in annual rainfall over the 5-year period, the year for the maximum annual rainfall did not correspond to the maximum flow year at the WWTP. Some of this can be explained by repairs made to the major sewer interceptor that carries flows from Bonney Lake across the Sumner valley to the WWTP.

Table 4-1 Historical Flows and Rainfall

Year	Average Annual Flow	Annual Rainfall	
	(gpd/RE)	(inches per year)	
2011	190	39	
2012	189	46	
2013	175	35	
2014	180	49	
2015	169	43	
Minimum	169	35	
Maximum	190	49	
Average	180	42	

Ultimately, it was decided that the most representative values for sewer planning purpose were the 5-year average values given that this value best reflects the current condition of the sewer system and flow characteristics of the existing customer base.

The 5-year average RE value was calculated from the City's Average Annual Flow (AAF) at the WWTP for the 5-year period. This value is 1.195 million gallons per day (MGD). This value was divided by the average number of REs served (6,631) over the 5-year period, resulting in the average wastewater flow generated per RE in the system, which yields a value of 180 gpd per RE.

The City's Average Design Flow (ADF) at the WWTP for the 5-year period represents the maximum month flow and is 271 gpd/RE. This value is from December 2015 and is based on 1.910 MGD. This value was divided by the average number of REs served (7,045) at that time, resulting in the average maximum monthly wastewater flow of 271 gpd per RE.

The 271 gpd per RE 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 2-year period for Minimum Dry Weather Flow were subtracted from Maximum Wet Weather Flow. This yielded a value of 142 gpd per RE. **Table 4-2**–*Residential Equivalent Values* presents an array of the flow data and value calculations for an RE in the City's sewer system, including total RE flows and the estimated value for I&I for the system.

Table 4-2 Residential Equivalent Values

Parameter	Flow				
1 at afficiet	(MGD)	(gpd/RE)			
Average Daily Flow	1.19	180			
Maximum Month Flow <sup>1</sup>	1.91	271			
Minimum Month Flow	0.90	129			
Infiltration & Inflow	1.01	142			
Note:					
<sup>1</sup> Also used as Average Design Flow (ADF)					

The I&I value of 142 gpd/RE represents approximately 52 percent of the total RE value. This percentage is within the acceptable range for I&I as specified in the Washington State Department of Ecology (Ecology) guidelines. However, it should be noted that lift station data for the City's system indicates 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**

Projected growth in the SSSA in terms of REs is shown in **Table 4-3** – *Growth Projections (REs)*. Projections for the CSSA are based on the number of customers currently served and the projected growth rates for the City. Projections for the SSSA are based on new developments within the SSSA and an estimate of how many existing customers that may connect to the City's sewer system in the future. Currently the City does not expect any connections to its system in the NSSA for the next 20 years.

Table 4-3
Growth Projections (REs)

Year	Core	South	North	Total SSA
2016	7,349	41	0	7,390
2017	7,665	76	0	7,741
2018	7,996	141	0	8,137
2019	8,340	261	0	8,601
2020	8,700	483	0	9,182
2021	9,074	894	0	9,968
2022	9,465	1,655	0	11,120
2023	9,652	1,816	0	11,468
2024	9,842	1,992	0	11,835
2025	10,036	2,186	0	12,223
2026	10,234	2,399	0	12,633
2027	10,436	2,632	0	13,068
2028	10,642	2,889	0	13,530
2029	10,851	3,170	0	14,021
2030	11,065	3,478	0	14,543
2031	11,283	3,817	0	15,100
2032	11,506	4,188	0	15,694
2033	11,732	4,595	0	16,328
2034	11,964	5,043	0	17,006
2035	12,200	5,533	0	17,733
2036	12,440	6,072	0	18,512

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.

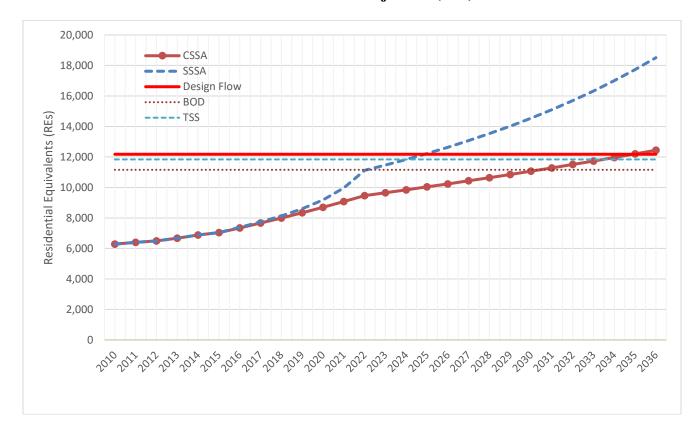
Bonney Lake's share of current treatment capacities at the existing WWTP in terms of design flow, BOD loading, and TSS loadings are summarized in **Table 4-4** – *WWTP Capacity*.

Table 4-4 WWTP Capacity

WWTP	Design Flow		BOD		TSS	
Capacity	(MGD)	(REs)	(lb/day)	(REs)	(lb/day)	(REs)
Bonney Lake	3.30	12,177	5,897	11,159	6,849	11,839

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 City's CSSA and SSSAs over time. For the purposes of this plan, it was assumed that the NSSA would not connect to sewers for at least 20 years. **Chart 4-1** – *Total Customers Served Projections (REs)* 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 County data.

Chart 4-1
Total Customers Served Projections (REs)



# **Reuse Potential**

The City'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 City's 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.

The second factor affecting the feasibility of irrigation is that it is a seasonal use. 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.

# Aquifer Storage and Recovery (ASR)

The City 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 4-3** – **Potential Reuse Locales**. 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 and water systems, it merits at least a feasibility fatal-flaw assessment.

# FORECAST FLOWS AND PLANNED DEVELOPMENT

# **Eastown**

The existing sewer system along SR 410 extends east to Lift Station 18. A new lift station, Lift Station 23, was built in 2014 on 96<sup>th</sup> Street East to serve most of the Eastown area. Lift Station 23 flows into Lift Station 18, which also currently serves a mobile home park, a small residential development, Safeway, Fred Meyers, and a few other local businesses.

A preliminary alignment study was prepared by RH2 in 2012 to determine the feasibility of serving Eastown area with a gravity sewer system.

The preferred alternative is shown in **Figure 4-4** – *Eastown Future Sewer Service Area*. The central and western portion of Eastown can be served by a gravity system, which flows into Lift Station 23 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 214<sup>th</sup> Avenue East, which flows by gravity to Lift Station 18.

A preliminary capacity analysis was completed for Lift Stations 23 and 18, and the associated conveyance system. This preliminary analysis also indicated that expansion of Lift Station 17 would also be required to accommodate forecasted Eastown flows. Furthermore, increased capacity in both downstream force mains and gravity sewers will also be required to accommodate the forecasted Eastown wastewater flows.

Routing flows through Lift Station 17 will increase the City's vulnerability to possible failure of that facility. 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 SSSA parallel the options for the NSSA. That is, there are fundamentally two options: construct a new WWTP to serve the area; or transmit the flows to an existing WWTP (either via the existing system or via a new interceptor).

#### SSSA Wastewater Flows

Flow forecasts for the SSSA were not segregated from the total forecast flows for the planning area. However, the SSSA has much more potential to generate more flows quicker than the NSSA due the much higher proportion of vacant and underdeveloped property. For example, the planned development of Section 15 with about 2,500 new residences would generate approximately 678,000 gallons ADF of new wastewater. Note, that at this time the City does not plan to serve (i.e., collection and treatment) the Falling Water development, and therefore, this area was not included in any forecasting for this Plan.

# **Pump to CSSA and WWTP**

One option for treating expected flows from the SSSA would be to pump them north into City's CSSA and then ultimately to the existing WWTP. Implementation of this option would require construction of approximately 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 4-5a** – *South Future Sewer Service Area through Bonney Lake Alternative*.

The advantages of this option include its simplicity and straight forwardness from an engineering perspective. Detailed predesign 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 it further exacerbates the City's reliance on Lift Station 17, through which virtually all flows to the WWTP now flow into.

# Flow to New Bonney Lake WWTP

This option would involve siting and constructing a new membrane bio-reactor treatment plant within the SSSA. Implementation of this option would require construction of at least one less lift station than the previous option. The conceptual locations and flow paths of the conveyance system along with the WWTP are illustrated on **Figure 4-5b** – **South Future Sewer Service Area Service to New WWTP**.

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. This option was evaluated in more detail before the Tehaleh development decided to route its wastewater to the Orting treatment plant.

# **New Interceptor to Sumner WWTP**

This option would involve constructing a new interceptor to serve the SSSA. 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 4-5c - South Future Sewer Service Area New Interceptor to Existing WWTP.

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 CSSA 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 SSSA through connection fees or developer-funded improvements.

# **Recommended Option**

This plan recommends pursuit of the new interceptor to WWTP option for the SSSA. 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's NSSA 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.

Service options for the future NSSA parallel the first two options for the SSSA. That is, there are fundamentally two options: transmit the flows to an existing WWTP or site; and construct a new WWTP to serve the NSSA.

The area north of Lake Tapps has experienced very rapid growth in the late 1990s and early 2000s, 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 NSSA 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).

#### **NSSA Wastewater Flows**

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 NSSA is expected to generate wastewater flows in the range of 1 MGD. This is an estimate of ADF based on previous discussions with the City regarding existing and proposed development, as well as zoning throughout the area. A peaking factor of 4 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; and
- Environmental Factors.

In March 2005, a preliminary report was prepared by RH2 to begin addressing the issues associated with providing sewer service to the NSSA. That 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 NSSA are discussed in this section.

- Metro/King County 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 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 4-6a – North Future Sewer Service Area through Auburn Alternative.

Currently, the City of Auburn plans to provide sewer service to Lake Tapps Elementary and Fairweather Cove. Auburn may extend their SSA further, after the City of Bonney Lake has completed the update of this Plan.

#### Advantages

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

#### Disadvantages

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

#### Unknowns

- Terms of agreement with Auburn.
- Capacity at Metro/King County's Renton WWTP.

#### 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 2 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 7 and 11 million dollars, without developer contributions.

# Metro/King County Interceptor Options

The two options for routing the wastewater through Auburn are discussed in the following sections. 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 the 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 pipeline.

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 pipeline 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 Lakeland Hills Parkway and east of East Valley Highway. This development is being designed by Pacific Engineers and its completion date is unknown. This alignment would require the construction of a new lift station at the bottom of the Lakeland Hills 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 Hills, 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 NSSA's wastewater is to send it to the Bonney Lake/Sumner WWTP. 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 4-6b** – North Future Sewer Service Area through Sumner Alternative.

The Cities of Sumner and Bonney Lake have upgraded their treatment facility to a capacity of 6.10 MGD. The City of Bonney Lake's current share of this plant is 54 percent, yielding a total capacity of 3.30 MGD available to the City of Bonney Lake. It is estimated that the City of Bonney Lake's existing capacity in the WWTP will not be fully utilized until approximately 2036 for the CSSA (Chart **4-2** – *Projected Sewer Flows and Capacities*) depending on a number of variables. If the City's SSSA flows to the WWTP, the capacity will be expended by 2031.

# Advantages

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

# Disadvantages

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

- 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 WWTP does not provide a redundant treatment facility.
- The Cities of Sumner and Bonney Lake must agree on timing of improvements and cost sharing.
- The 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 2 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 WWTP 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 10 and 11 million dollars for this option.

Sumner WWTP 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 WWTP. 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 60<sup>th</sup> Street East to the treatment plant. This alignment would likely require an additional lift station on 60<sup>th</sup> Street East, and approximately 38,800 feet of force main and 8,400 feet of gravity pipeline.

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

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 24<sup>th</sup> Street East, and would require a lift station at the intersection of East Valley Highway and 24<sup>th</sup> Street East. The interceptors from Bonney Lake to the intersection of 24<sup>th</sup> Street East and 142<sup>nd</sup> Avenue East would be new construction.

With this option, some of Sumner's system will likely have to be upsized between the intersection of 24<sup>th</sup> Street East and 142<sup>nd</sup> Avenue East, and the treatment plant. Sumner already has plans to increase the capacity of their 142<sup>nd</sup> Street Pump Station, though it is not scheduled in their Capital Improvement Plan (CIP) until the years 2018 to 2020. If the City of Bonney Lake routes flow from the NSSA 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 142<sup>nd</sup> 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 24<sup>th</sup> Street, and approximately 26,000 feet of force main and 10,100 feet of gravity pipeline.

Option 3 - Bonney Lake's Existing Facilities

Under this alternative, the City would use the existing facilities to route wastewater to the Bonney Lake/Sumner WWTP. According to the City of Bonney Lake's 1996 Sewer Comprehensive Plan, the capacity of Lift Station 17 is approximately 5 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 (fps) to 7.2 MGD at a velocity of 8 fps. As previously discussed, the City of Bonney Lake's share of the treatment plant is currently 3.30 MGD. This capacity will be exceeded to serve the CSSA and SSSA so additional capacity at that location would have to be feasible. Improvements required for this alternative include routing

flow from the City of Bonney Lake's NSSA south into its existing system. Potential alignment is shown in Figure 4-6c – North Future Sewer Service Area through Bonney Lake Alternative. 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 WWTP to serve the City's 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 NSSA and will be located on the west side of Lake Tapps, as shown in **Figure 4-6d** – *North* Future Sewer Service Area through Bonney Lake Alternative. The total length of force main for this option is in the range of 22,000 linear feet.

# Advantages

Building a new treatment plant to serve the City's service area would allow the City 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 WWTP. 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 NSSA. 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.

# CSSA (Downtown, Midtown, and the Neighborhoods)

The properties currently served by the City's sewer system (the CSSA) are mostly single-family neighborhoods. North of SR 410 (which bisects the current SSA) served neighborhoods that 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 that 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. **Figure 2-4** – *Sewer Service Basins* shows the configuration of the current collection system operated by the City. In **Figure 2-4** – *Sewer Service Basins*, the collection system is color coded to the lift station that receives the flow from each pipe segment. As is evident from this figure, the City's system is highly dependent on lift stations; especially Lift Station 17 that receives virtually all the system's flow.

Current identified improvements to the existing system were discussed in **Chapter 8** – **Sewer System Improvements**. In addition to the improvements discussed in **Chapter 8** – **Sewer System Improvements** 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 (**Appendix F** – **Standard Details**).

**Figure 4-1** – *Existing Sewer System Area* presents the current service area and the current UGA, which when combined form the CSSA. 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 CSSA not yet serviced were analyzed to create a basis for sewer system planning and design. For analyses purposes, 12 basins within the CSSA were identified as potential development land in the near future, or already-developed, not-yet-serviced land. These basins are identified in **Figure 2-4** – *Sewer Service Basins*, as proposed basins A through L.

The analysis based its design criteria on the 2008 Criteria for Sewage Works Design, Water Quality Program by 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 the 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, 6 inches and 8 inches respectively.

The analysis results are shown in **Figure 4-7** – *Future Sewer Service Area* as proposed sewer main and 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 City's system. One way to mitigate this vulnerability would be to construct a second interceptor from the City 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 the City'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.

# **WWTP Improvements**

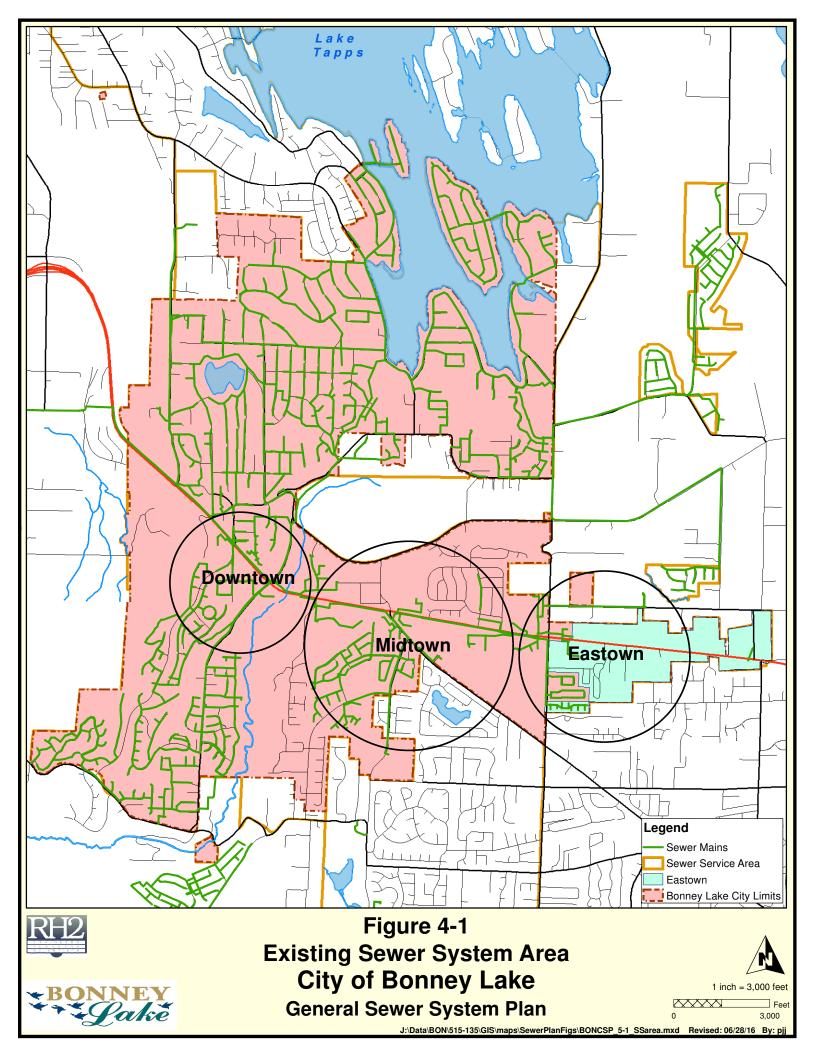
The WWTP was recently upgraded.

# **Summary of Recommended Improvements**

**Figure 4-8** – *Proposed Sewer System Improvements* presents a visual summary of the range of improvements recommended in this plan, such as treatment plants, force mains, and lift stations.

The new treatment plant in the North SSA and a new interceptor for the South SSA with treatment at the City of Sumner Treatment Plan will require agency approval.

Prior to serving these areas, the City will need to amend this General Sewer Plan to provide more detailed information on the location of trunk lines and interceptors, treatment alternatives, and expected costs. The routing of wastewater from the South SSA to the City of Sumner has the potential to make substantial inroads into the City's available treatment plan capacity (Figure ES-3) and trigger planning for facility improvements.



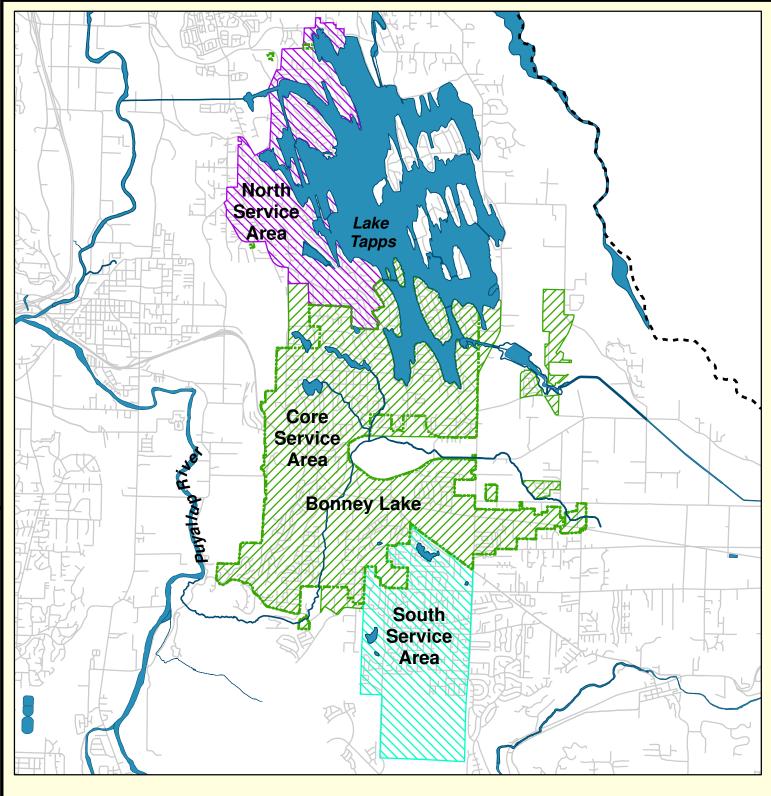
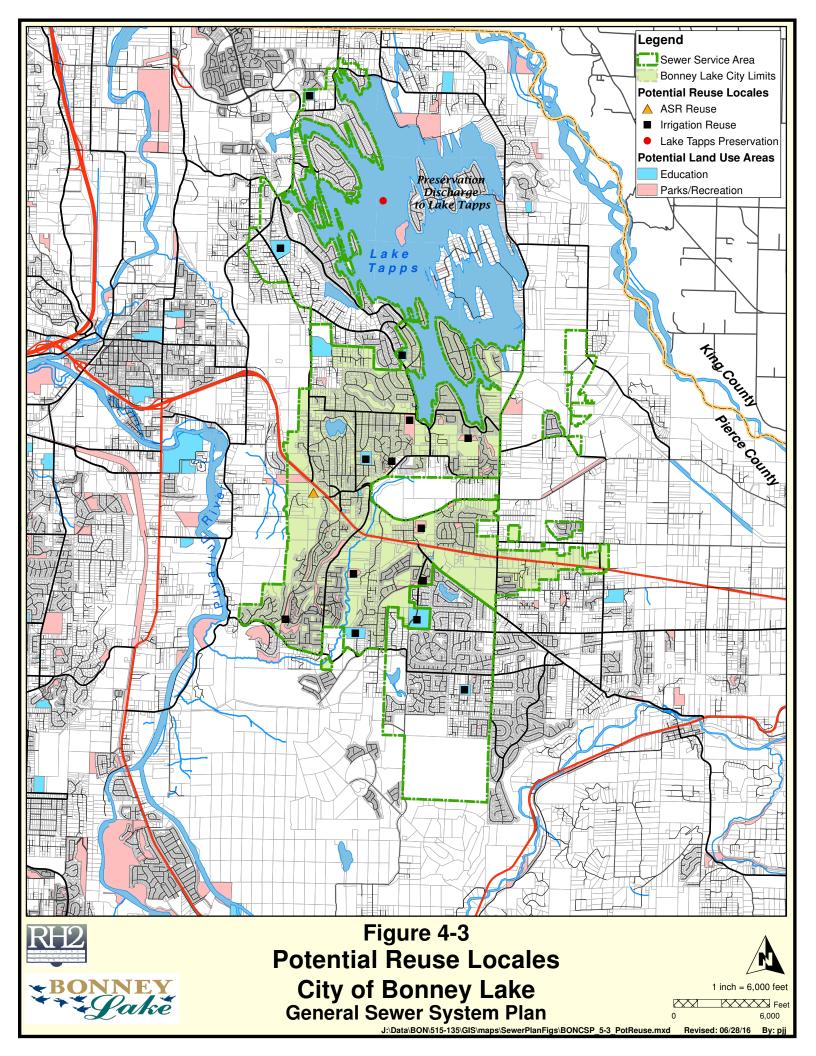


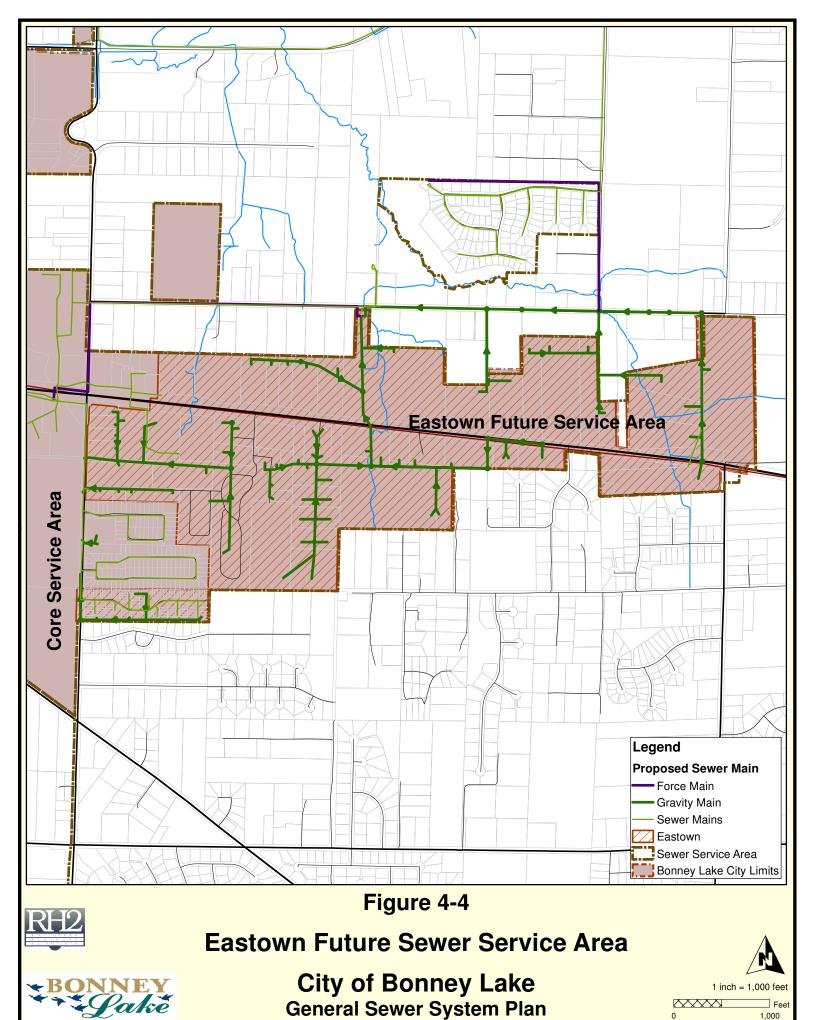


Figure 4-2
Sewer Service Area (2016)
City of Bonney Lake
General Sewer System Plan

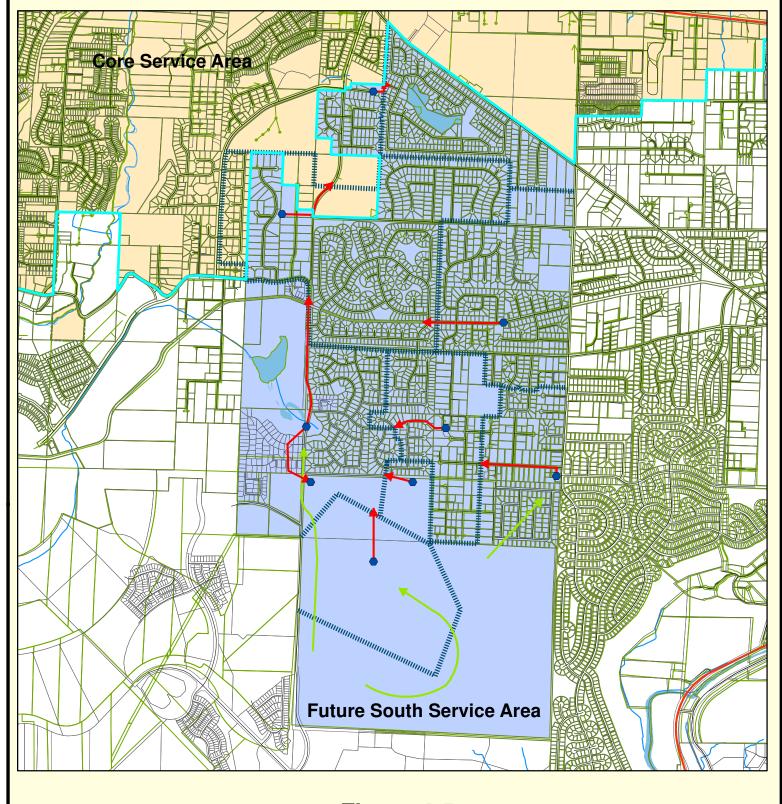


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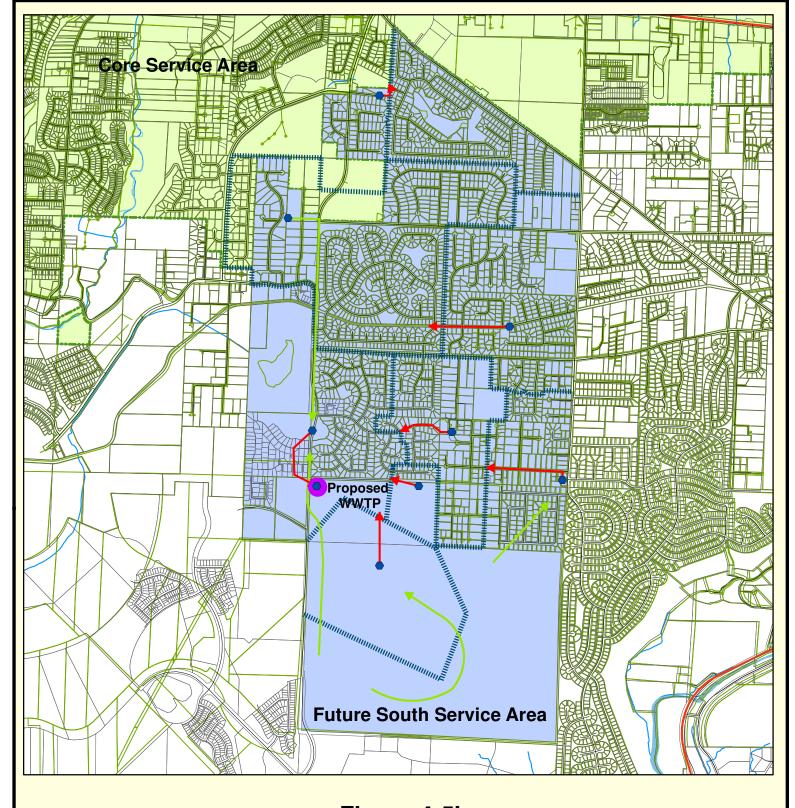


# Figure 4-5a South Future Sewer Service Area Service through Bonney Lake Alternative



**City of Bonney Lake** General Sewer System Plan



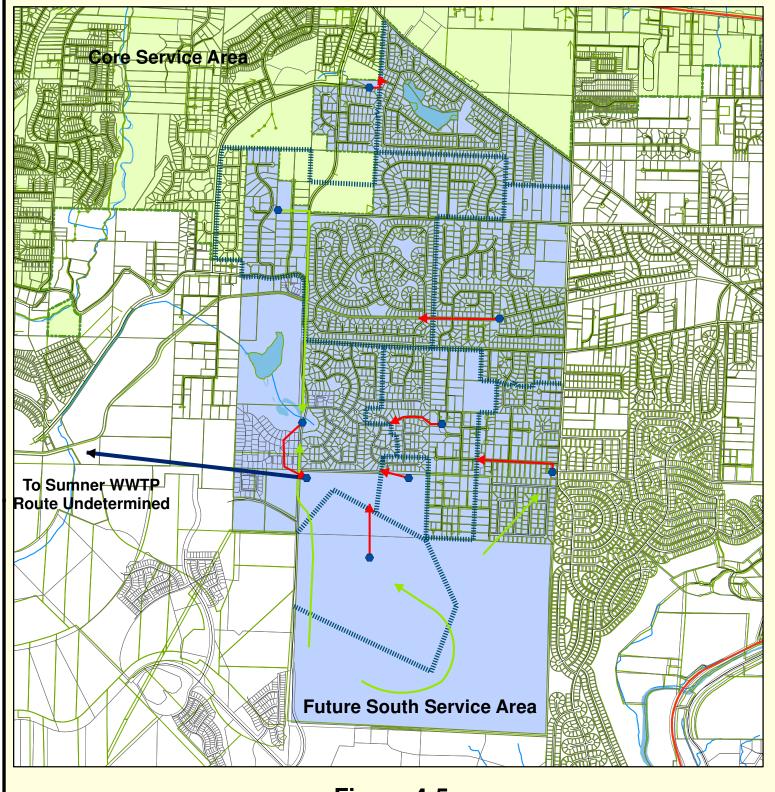


# Figure 4-5b **South Future Sewer Service Area Service to New WWTP**



**City of Bonney Lake General Sewer System Plan** 



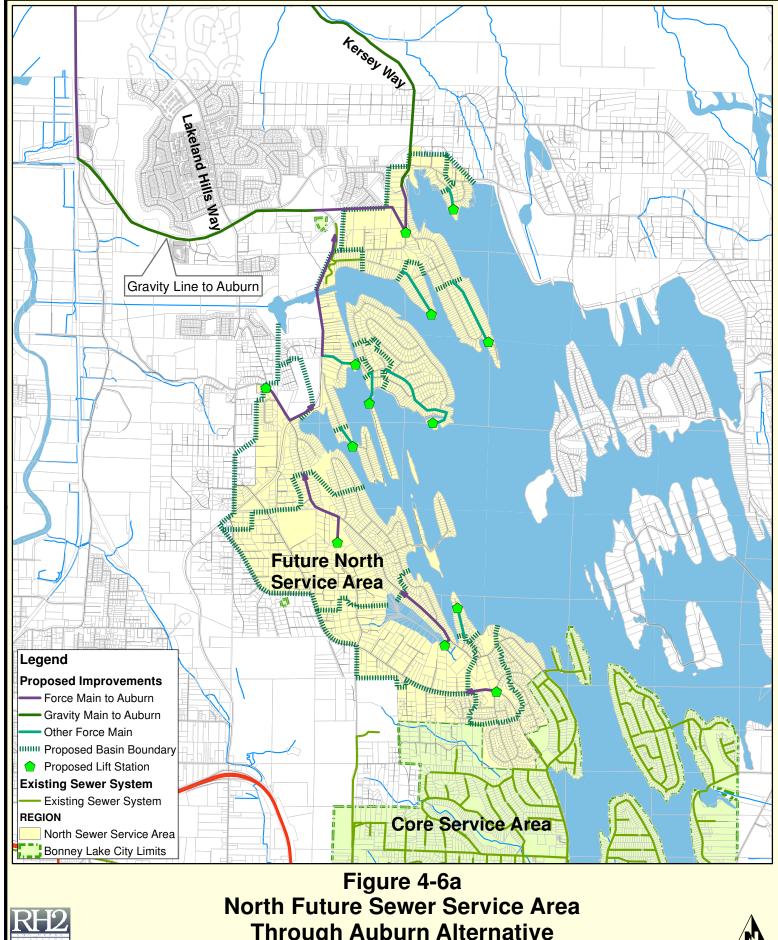


# Figure 4-5c South Future Sewer Service Area New Interceptor to Existing WWTP



**City of Bonney Lake** General Sewer System Plan



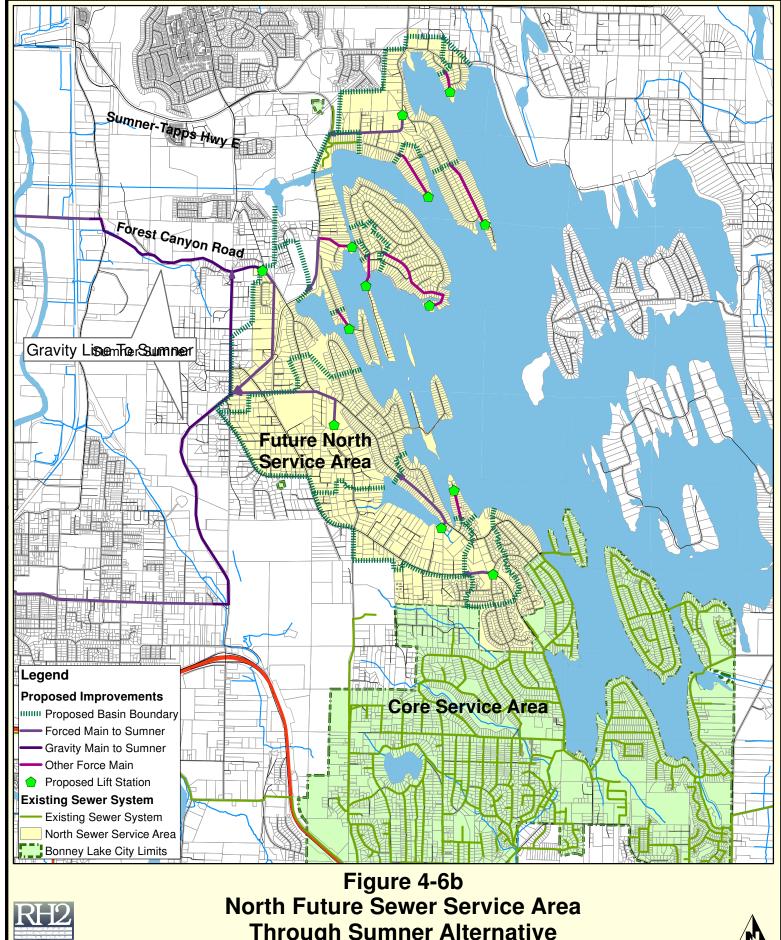




North Future Sewer Service Area
Through Auburn Alternative
City of Bonney Lake
General Sewer System Plan



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North Future Sewer Service Area
Through Sumner Alternative
City of Bonney Lake
General Sewer System Plan



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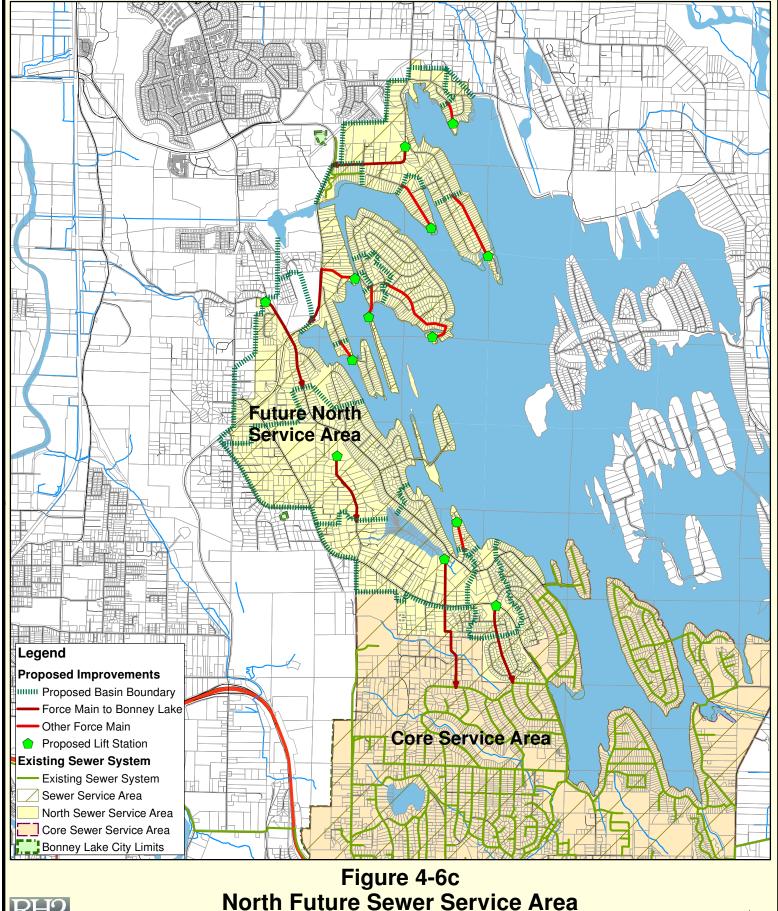
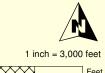


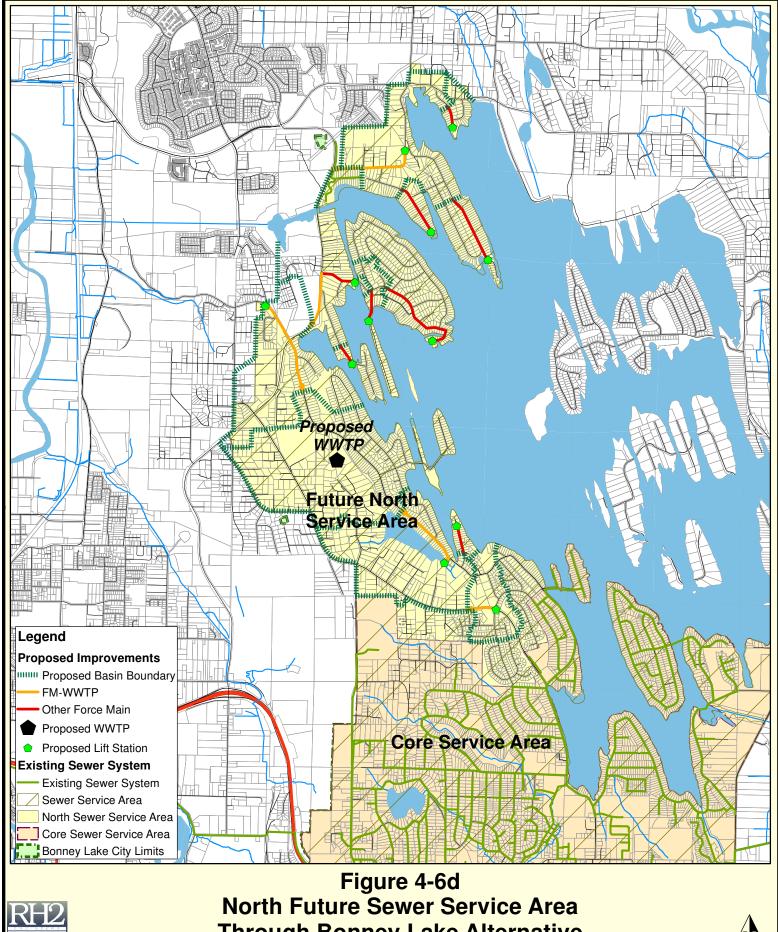




Figure 4-6c
North Future Sewer Service Area
Through Bonney Lake Alternative
City of Bonney Lake
General Sewer System Plan



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North Future Sewer Service Area
Through Bonney Lake Alternative
City of Bonney Lake
General Sewer System Plan



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