CHAPTER 6

Existing System Evaluation

INTRODUCTION

This chapter evaluates and discusses issues related to the current City of Bonney Lake (City) sewer system, including the City's collections system, lift stations and main interceptor conveying all flows to the wastewater treatment plant (WWTP).

Collection System

The Bonney Lake sewer collection system was evaluated 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) Most 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 feet per second (fps).
5) All lift stations had capacity for existing and future customers.

RH2's work in 2000, 2005, and today generally confirm these same results with four caveats. The analyses indicate a need to monitor four components of the collection system:

1) Angeline Road/Sky Island trunk lines;
2) SR 410 trunk lines;
3) Lift station capacity for several basins that will experience growth, and
4) WWTP Interceptor.

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. Approximately 1,800 feet of this main needs to be monitored as the d/D was calculated at 0.84 by the modeling program HYDRA© and it was projected that these pipes will 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 Eastown area, 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 Bonney Lake Plateau to the Sumner WWTP. By buildout of the CSSA, 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 Bonney Lake Plateau greatly influences the timing of this project. Three other factors influence the importance of this project; first, the physical condition of this interceptor will continue to be compromised by the high concentrations of hydrogen sulfide in the main (because of this issue the interceptor form Main Street to the WWTP was recently slip-lined or replaced with HDPE), second, this interceptor is currently the only way to get wastewater to the WWTP at Sumner (this equates to a lack of reliability and redundancy), and third, this interceptor does not have the capacity to accommodate the SSSA and NSSA. 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 87 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 6-1 – *City Owned Individual Grinder Pumps***. 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. However, state regulations (WAC 173-240-104) require that domestic wastewater facilities (such as these) be under public ownership, with limited exceptions, for reasons related to public health. It is RH2's recommendation that the City consult Pierce County regarding its policies and practices regarding grinder pumps. We understand that Pierce County no longer assumes ownership of new pumps but maintains an oversight function for both new and existing grinder pumps not under county ownership. Bonney Lake should commence a program to develop a strategy and set of policies to gradually phase out of the business of owning and operating individual grinder pumps, similar to Pierce County.

Lift Stations

The City's system currently has 25 lift stations (see **Table 2-6 – *Sewage Lift Stations*** for a summary of the City's lift stations). **Figure 6-2 – *Individual Sewer Basins*** shows which sections of the City's collection system flow to which lift station (lift station indicated by basin number). **Table 6-1 –*Sewer Lift Station Locations and Capacities*** summarizes data related to the City's lift stations regarding location, upstream and downstream connections and capacity.

Table 6-1
Sewer Lift Station Locations and Capacities

Lift Station	Location	Downstream Lift Station(s)	Upstream Lift Station(s)	Capacity Per Pump	Lift Station Design Capacity	
				(gpm)	(gpm)	(RE)
1	95th St Loop	None	None	120	102	190
2	Sky Island	17	None	88	**75**	148
3	BL Elementary	17	None	135	115	219
4	Lake Bonney	17	None	145	123	237
5	Myers Road	17	None	120	102	189
6	Debra Jane South	17	None	100	85	157
7	McGhee	17	None	120	102	196
8	Debra Jane West	17	None	140	119	236
9	Mt. Creek	20 & 17	None	120	102	202
10	White River	17	25	298	253	546
11	Interlake Island	17	None	145	123	236
12	Inlet Island	14, 13 & 17	None	270	230	489
13	Church Lake Drive	17	15,14,16,12	820	697	1,700
14	Flume	13 & 17	16 & 12	720	612	1,407
15	Vandermark	13 & 17	None	100	85	160
16	Maple Point	14, 13 & 17	None	100	85	158
17	SR 410	None	All except 1 & 24	1,200	3,060	10,530
18	Safeway	17	23	500	425	997
19	Willowbrook	17	21	1,200	1,020	2,468
20	Spring Haven	17	9	381	324	714
21	Panorama West	17 & 19	None	300	255	522
22	Brookfield	17	None	174	148	291
23	Eastown	17 & 18	None	460	391	902
24	Fennel Creek	None	None	330	281	608
25	Bonney Lake Estates	10 & 17	None	284	241	508

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 (RE) 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 Infiltration and Inflow (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 (approximately 60 percent) of the City's lift stations were functioning at less than 50 percent of design. Eight lift stations (Numbers 2, 8, 9, 12, 13, 14, 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 17 was operating at over its design capacity. **Table 6-2 –*Sewer Lift Station Capacities Compared to Existing Flows*** summarizes the results of this comparative analysis.

Table 6-2
Sewer Lift Station Capacities Compared to Existing Flows

Lift Station	Location	Lift Station Design Capacity (gpm)	Existing Peak Flow Rate (gpm)	Percent of Design Capacity	Status
1	95th St Loop	102	11	11%	OK
2	Sky Island	75	46	62%	OK
3	BL Elementary	115	26	23%	OK
4	Lake Bonney	123	29	23%	OK
5	Myers Road	102	7	7%	OK
6	Debra Jane South	85	9	10%	OK
7	McGhee	102	34	33%	OK
8	Debra Jane West	119	64	54%	OK
9	Mt. Creek	102	61	60%	OK
10	White River	253	63	25%	OK
11	Interlake Island	123	30	24%	OK
12	Inlet Island	230	183	80%	OK
13	Church Lake Drive	697	606	87%	OK
14	Flume	612	381	62%	OK
15	Vandermark	85	14	17%	OK
16	Maple Point	85	11	13%	OK
17	SR 410	3,060	3,278	107%	Over Capacity
18	Safeway	425	258	61%	OK
19	Willowbrook	1,020	451	44%	OK
20	Spring Haven	324	239	74%	OK
21	Panorama West	255	24	9%	OK
22	Brookfield	148	57	39%	OK
23	Eastown	391	0	0%	OK
24	Fennel Creek	281	0	0%	OK
25	Bonney Lake Estates	233	0	0%	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 REs 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 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 6-3 –*Sewer Lift Station Capacities Compared to Forecast Growth Flows***, which shows in addition to the capacity issue at Lift Station 17 that Lift Station 18 is also facing a capacity challenges from potential developments that exceed the lift stations' capacities. 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 6-3
Sewer Lift Station Capacities Compared to Forecast Growth Flows

Lift Station	Location	Existing			Future		
		Estimated Capacity[1]	Estimated Capacity Used	Status	Remaining Capacity Available	Planned Growth[2]	Status
		(RE)	(RE)		(RE)	(RE)	
1	95th St Loop	190	21	OK	169	1	OK
2	Sky Island	148	90	OK	58	27	OK
3	BL Elementary	219	50	OK	169	4	OK
4	Lake Bonney	237	55	OK	182	9	OK
5	Myers Road	189	13	OK	176	5	OK
6	Debra Jane South	157	16	OK	141	0	OK
7	McGhee	196	65	OK	131	0	OK
8	Debra Jane West	236	127	OK	109	5	OK
9	Mt. Creek	202	120	OK	82	0	OK
10	White River	546	125	OK	421	342	OK
11	Interlake Island	236	57	OK	179	2	OK
12	Inlet Island	489	390	OK	99	15	OK
13	Church Lake Drive	1,700	1,465	OK	235	105	OK
14	Flume	1,407	870	OK	537	57	OK
15	Vandermark	160	27	OK	133	3	OK
16	Maple Point	158	21	OK	137	0	OK
17	SR 410	10,530	10,652	Capacity Issues	-123	4,117	Capacity Issues
18	Safeway	997	567	OK	430	555	Capacity Issues
19	Willowbrook	2,468	1,051	OK	1,417	419	OK
20	Spring Haven	714	520	OK	194	84	OK
21	Panorama West	522	45	OK	477	180	OK
22	Brookfield	291	113	OK	178	0	OK
23	Eastown	902	0	OK	902	635	OK
24	Fennel Creek	608	0	OK	608	495	OK
25	Bonney Lake Estates	342	0	OK	342	342	OK

Notes:
[1]Capacity based on future peaking factors.
[2]Forecasted growth is based on maximum for Core Area under current zoning.

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 stations is the question of reliability and contingency planning. Preparation of an Emergency Response Plan (ERP) for the sewer system is programmed for 2017. This effort is likely to include recommendations regarding back-up power and other redundancy and contingency measures. These recommendations need to be programmed into an updated Capital Improvement Program (See **Chapter 8 – *Sewer System Improvements***) 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.

Wastewater Treatment Plant

The WWTP just underwent a capacity upgrade. Bonney Lake was a partner in this construction with the City of Sumner. Bonney Lake believes the improvements and additional capacity resulting from this upgrade will provide sufficient capacity to accommodate planned growth in the City's CSSA for perhaps the next decade. Options to bring additional wastewater treatment capacity on-line to accommodate planned growth beyond the next ten years and for the SSSA and NSSA are discussed in **Chapter 8 – *Sewer System Improvements***.

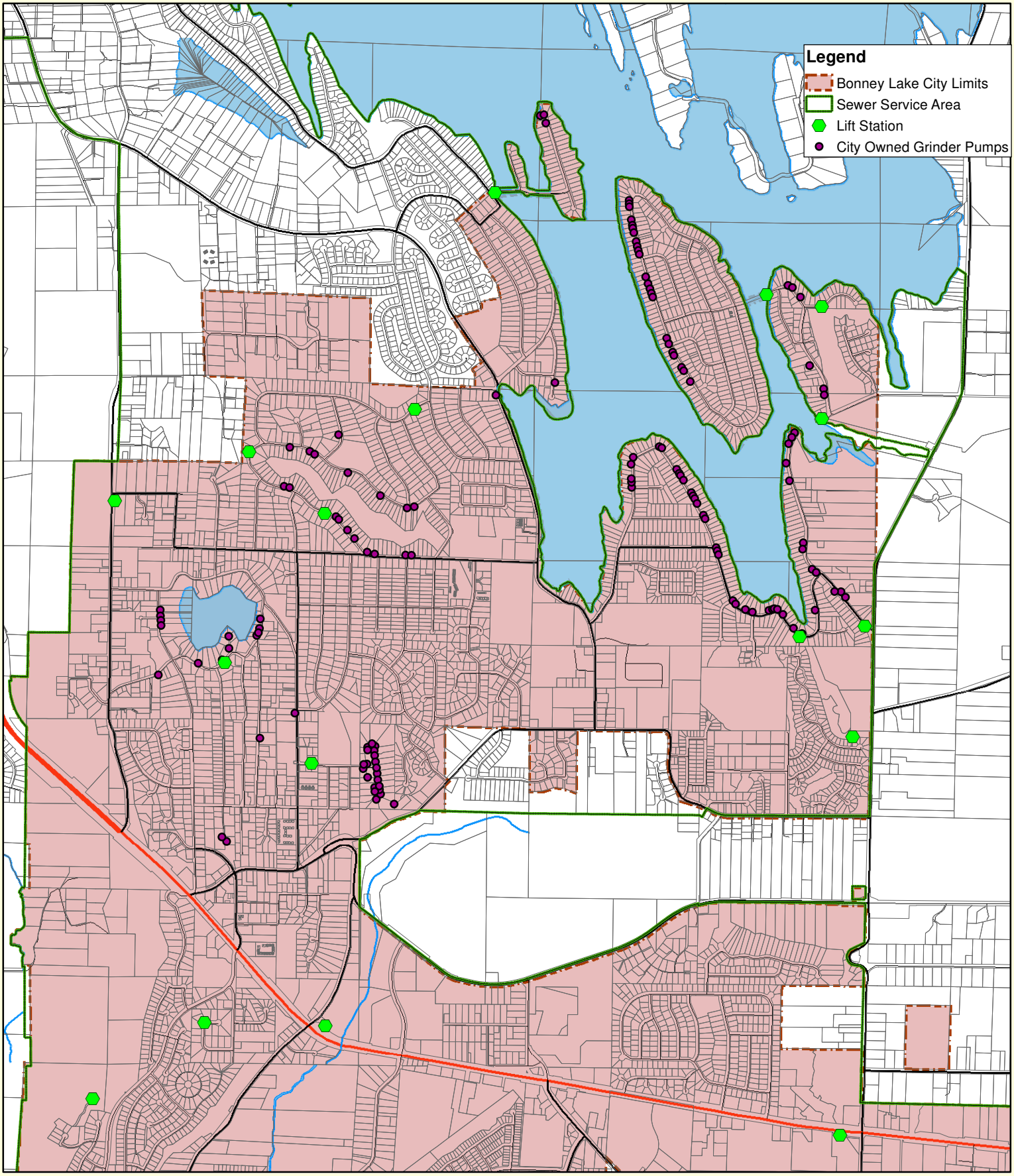

Figure 6-1
City Owned Individual Grinder Pumps
City of Bonney Lake
General Sewer System Plan

1 inch = 2,000 feet

0 Feet 2,000

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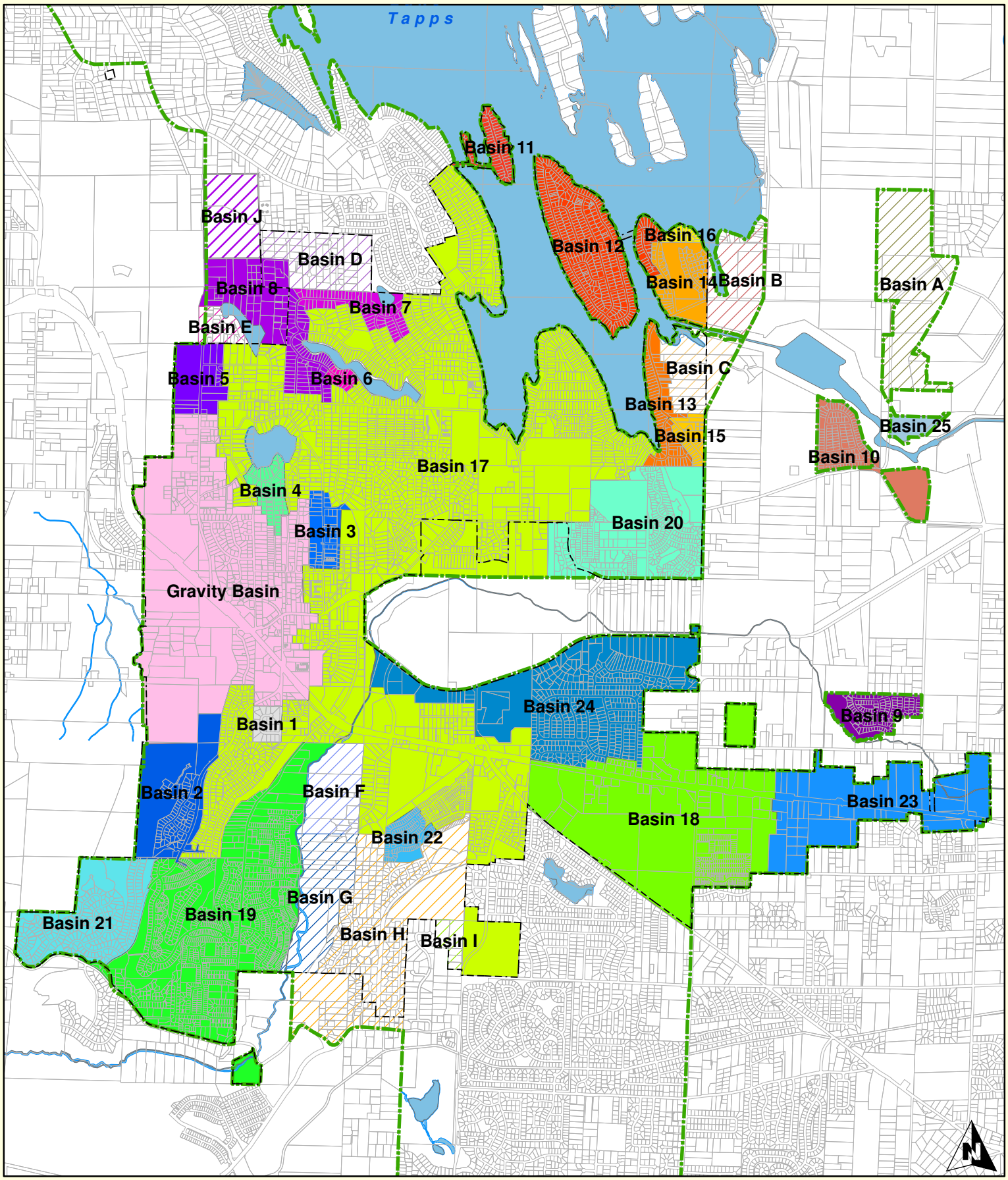

Figure 6-2
Individual Sewer Basins
City of Bonney Lake
General Sewer System Plan

Legend
- Sewer Service Area
- Bonney Lake City Limits

1 inch = 3,000 feet

0 — 3,000 Feet

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