

Sewer System Description

1-1. INTRODUCTION

This chapter describes the City of Fife's (City) sewer service area and the existing sewer system and its individual components. The results of the evaluation and analyses of the existing sewer system are presented in **Chapters 4 and 5**.

1-2. SEWER SERVICE AREA

History

The City is located east of Tacoma, Washington and is bordered by the City of Tacoma to the north and west, the City of Milton to the northeast, the City of Edgewood to the east, the City of Puyallup to the southeast and unincorporated Pierce County to the south. The City was incorporated in 1957 and began as a small farming community. The City's initial sewer collection system, constructed in 1968, was mostly built with asbestos-cement (AC) pipe. As the City expanded, the sewer collection system increased to serve the developing areas. The City's sanitary sewer collection system consists of 13 pump stations, 7.5 miles of force main, and 28.8 miles of gravity sewer main. The properties currently served by the sewer system are generally a blending of industrial, commercial, and single-family and multi-family neighborhoods. The City's sanitary sewer is conveyed to either Pump Station 1 or Pump Station 5 located in the western portion of the City. Pump Stations 1 and 5 pump the wastewater over the Puyallup River on the City of Tacoma's Puyallup River Bridge for treatment at the City of Tacoma's Central Wastewater Treatment Plant. There are sewer customers within the northeastern portion of the City limits that are served by Pierce County. **Figure 1-1** is a map of the existing sewer system.

Geology

The City is located on the alluvial plain formed by the Puyallup River and is directly underlain by layered alluvial deposits, composed primarily of fine-grained sand, silt, and clay, with localized extensive layers of soft fibrous peat and occasional logs. The alluvial deposits are typically 40 to 70 feet thick and groundwater saturated below depths of 5 to 15 feet. Deeper geologic units consist of layers of sand, gravel and silt and localized, discontinuous layers of dense glacial till.

Topography

The topography of the City's sewer service area is essentially flat, with the grade slightly increasing to the southeast. Elevations range from 10 feet to 30 feet above sea level. Interstate 5 (I-5) runs through the northern portion of the City, from east to west, and the Pacific Highway East parallels I-5 just to the north. The Union Pacific Railroad runs through the City from the northwest to the southeast, approximately midway between I-5 and the Puyallup River. The center of the Puyallup River channel is the southern boundary of the City limits and the City's sewer service area.

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Climate

The climate of the City area is influenced by marine air masses that originate over the Pacific Ocean. Annual precipitation is approximately 40 inches per year. Most of this occurs as rainfall between the months of October and April (Ebbert, 1987). Temperatures are typically above freezing in the winter and are rarely above 90 degrees Fahrenheit in the summer.

Water Bodies

The Puyallup River is located along the southern edge of the City and is the largest surface water body in the City. Wapato Creek flows through the City and generally flows northerly into Commencement Bay. Hylebos Creek bisects the northeastern portion of the City. These water bodies are shown in **Figure 1-2**.

Stormwater Drainage

The City of Fife is located in the lower reaches of the Hylebos and Wapato creek drainage basins, adjacent to the City of Tacoma, Port of Tacoma and Commencement Bay. The City lies within an abandoned floodplain from the Puyallup River, which is located on top of an old mudflow from Mount Rainier. The topography is flat, with only a few feet elevation difference from one end of the city to the other. Surface water runoff in the City is collected and conveyed through natural and man-made drainage systems.

There are five major drainage basins in the City. Four of them, Erdahl Ditch, Wapato Creek, Fife Ditch and Hylebos Creek, drain directly into Commencement Bay. The fifth one, Ox-Bow, drains to the Puyallup River, which flows into the bay.

Many of the man-made drainage features were built by two local drainage districts: Drainage Districts 21 and 23. Drainage District 21 was dissolved within the city limits in 2009. The City of Fife now maintains the major ditches that drain into Wapato Creek from Frank Albert Road upstream to the City limits at Freeman Road. Drainage District 23 maintains the major ditches, outfall and pump station (Fife Ditch Pump Station) that form the Fife Drainage District basin.

1-3. EXISTING SEWER FACILITIES

The City is located in northern Pierce County, Washington. The City owns, operates, and maintains the wastewater collection system, which includes the collection system piping and wastewater pump stations. Wastewater treatment is provided by the City of Tacoma at its Central Wastewater Treatment Plant No. 1 through an Agreement between City of Tacoma and City of Fife for Sewage Services (**Appendix A**). The sewer service area is the same as the City limits except for several parcels located in the northeastern portion of the City that are served by Pierce County Sewer Utility as part of its Contract Service Area as shown in **Figure 1-1**.

The City's urban growth area (UGA), also shown on **Figure 1-1**, was established through close partnership with Pierce County to satisfy the Washington State Growth Management Act guidelines.

Sewer Drainage Basins

The City's existing sewer service area is comprised of several sewer drainage basins, as shown in **Figure 1-2**. In general, the sanitary sewer system flows from east to west. The sewage basins north of I-5 are conveyed to Pump Station 1 while the sewage basins south of I-5 are conveyed to Pump Station 5.

Collection Piping

The City has approximately 36.3 miles of sewer piping, including collection sewers and interceptors. There are approximately 39,608 feet of force main throughout the system. Approximately 46 percent of the system is 8-inch-diameter gravity main, totaling approximately 16.8 miles. **Table 1-1** summarizes the pipe by diameter. **Figure 1-1** illustrates pipe size and location.

PRELIMINARY

**Table 1-1
Sewer Piping Inventory**

Gravity Mains			
Diameter (inches)	Total Length (feet)	Total Length (miles)	% of Collection System
6	41	0.01	0.0%
8	88,434	16.75	46.1%
10	13,917	2.64	7.3%
12	15,060	2.85	7.9%
14	4,573	0.87	2.4%
16	13,397	2.54	7.0%
18	12,100	2.29	6.3%
20	2,317	0.44	1.2%
24	505	0.10	0.3%
36	231	0.04	0.1%
Unknown	1,440	0.27	0.8%
Total	152,015	28.79	79.3%

Force Mains			
Diameter (inches)	Total Length (feet)	Total Length (miles)	% of Collection System
4	4,359	0.83	2.3%
6	946	0.18	0.5%
8	311	0.06	0.2%
10	3,287	0.62	1.7%
12	8,796	1.67	4.6%
14	5,523	1.05	2.9%
16	5,038	0.95	2.6%
18	818	0.15	0.4%
20	4,804	0.91	2.5%
24	4,227	0.80	2.2%
Unknown	1,499	0.28	0.8%
Total	39,608	7.50	20.7%

Collection System			
Diameter (inches)	Total Length (feet)	Total Length (miles)	% of Collection System
Total	191,623	36.29	100.0%

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Pump Stations

The City currently owns, operates, and maintains 13 wastewater pump stations. The characteristics of each pump station are summarized in **Table 1-2**, and a description of each pump station follows.

**Table 1-2
Pump Station Characteristics**

Station Number	Pump Station		Pump						Approximate Station Age	On-site or Portable Engine Generator
	Type	No. of Pumps	Manufacturer	Serial Nos.	Model	TDH (feet)	Design Capacity (gpm)	Horse-power		
1	Submersible	3	Fairbanks Morse	418088	D5434MV	63	645	25	12	On-site
2	WW/DW Submersible	4	Smith and Loveless ESSCO	66940548	4B2A	40	290	7.5	>20	Portable
				66940544	4x12	50	269	10		
3	WW/DW Submersible	4	Smith and Loveless ESSCO	Unknown	Unknown	Unknown	Unknown	3	>20	Portable
								5		
4	WW/DW	2	Smith and Loveless	67541194 67541186	4B2	30	100	3	>20	Portable
5	Submersible	3	Fairbanks Morse	418375	5434MV	66	1250	40	12	On-site
6	Submersible	3	Fairbanks Morse	418425	D5434SMV	31	1630	25	12	On-site
7	Submersible	2	ESSCO	Unknown	Unknown	Unknown	Unknown	Unknown	>15	--
8	WW/DW	2	Smith and Loveless	80426 80425	6B3A	36	1200	15	6	Portable
10	Submersible	2	Smith and Loveless ESSCO	Unknown	4x12	18	250	5	1	Portable
11	WW/DW	2	Fairbanks Morse	K4B1-073430-1 K4B1-073430-0	C5446	37	850	15	20	On-site
12	Submersible	3	Fairbanks Morse	418425	D5433MV	37	850	25	12	Portable
13	Submersible	3	Fairbanks Morse	418425	D5432MV	26	370	10	12	Portable
14	Submersible	2	WILO	50218920 50218901	MTS40E95.8 Q/20-3	48/95	80	2	<5	Portable

gpm = gallons per minute

WW = wet well

DW = dry well

LS9 has been transferred to the Casino

LS10 is currently being upgraded

LS14 is new and not on-line; need info. from the City

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Pump Station 1

Pump Station 1, located at 2398 Milwaukee Way, was constructed in 2002 and was relined in 2013. It receives wastewater from pump stations and collection system pipes north of I-5 and pumps it over the Puyallup River Bridge to the Tacoma's Central Wastewater Treatment Plant No. 1. This submersible-type pump station is located at the west end of the collection system. The pump station has three pumps, each with a design capacity of 645 gallons per minute (gpm) at 63 feet of discharge head. This station has a 10-inch-diameter ductile iron (DI) force main that transitions to 18-inch along Milwaukee Way. The force main transitions to 10-inch AC as it crosses the Puyallup River Bridge. Standby power is provided via an on-site engine generator.



Pump Station 2

Pump Station 2, located at 4303 Pacific Highway East, was constructed more than 20 years ago and serves several businesses in the area. This is a submersible and wetwell/drywell lift station with four pumps. The two submersible pumps have a design capacity of 269 gpm at 50 feet discharge head while the two wetwell/drywell pumps have a design capacity of 290 gpm at 40 feet discharge head. This station has a portable engine generator connection for backup power.

Pump Station 3

Pump Station 3 is similar to Pump Station 2 and is located at 1402 46th Avenue East. It was constructed more than 20 years ago and serves several businesses in the area. This is a submersible and wetwell/drywell lift station with four pumps. The design conditions of the two submersible pumps are unknown; the two wetwell/drywell pumps have a design capacity of 300 gpm at 14 feet discharge head. This station has a portable engine generator connection for backup power.





Pump Station 4

Pump Station 4 is located at 724 54th Avenue East and serves a primarily industrial area. This is a wetwell/drywell lift station with two pumps. Each pump has a design capacity of 100 gpm at 30 feet of total discharge head. This station has a portable engine generator connection for backup power.

Pump Station 5

Pump Station 5, located at 2999 20th Street East, was constructed in 2002 and was relined in 2014. It receives wastewater from pump stations and collection system pipes south of I-5 and pumps it over the Puyallup River Bridge to Tacoma's Central Wastewater Treatment Plant No. 1. This submersible-type pump station is located at the west end of the collection system. The pump station has three pumps, each with a design capacity of 1,250 gpm at 66 feet of discharge head. This station has a 24-inch HDPE force main that transitions to 18-inch DI before it crosses the Puyallup River Bridge. Standby power is provided via an on-site engine generator.



Pump Station 6

Pump Station 6, located at 4408 20th Street East, was constructed in 2002 and was relined in 2014. It serves a primarily industrial area and receives the wastewater from Pump Station 8. This submersible-type lift station has three pumps, each with a design capacity of 1,630 gpm at 31 feet of discharge head. This station has a 20-inch DI that transitions to HDPE force main. Standby power is provided via an on-site engine generator.

Pump Station 7

Pump Station 7, located at 1219 Alexander Avenue East, was constructed more than 15 years ago and serves a handful of small businesses. This small submersible-type lift station has two pumps. The design conditions of this pump station is unknown. This station has a portable engine generator connection for backup power.



Pump Station 8



Pump Station 8, located at 6112 20th Street East, was constructed more than 20 years ago, was upgraded approximately 7 years ago and serves a mixture of industrial, commercial, and high density residential. This wetwell/drywell type lift station has two pumps, each with a design capacity of 1,200 gpm at 36 feet of discharge head. This station has a 14-inch ductile iron force main that transitions to an 14-inch HDPE. This station has a portable generator converter for standby power.

Pump Station 9

Pump Station 9 serves the Emerald Queen Casino. The pump station was previously owned by the City but it is now owned and operated by the Puyallup Tribe.

Pump Station 10

Pump Station 10, located on the north side of Industry Drive, was constructed more than 20 years ago and was re-built in 2015. This submersible-type lift station has two pumps, each with a design capacity of 250 gpm at 18 feet of discharge head. This station has a 6-inch DI force main. The recent upgrades included new pumps and electrical equipment as well as new cover slab, hatches, and weather cover over electrical area.





Pump Station 11

Pump Station 11, located at 3011 70th Avenue East, was constructed in 1994 and serves a predominately commercial area. This wetwell/drywell lift station has two pumps, each with a design capacity of 850 gpm at 37 feet of discharge head. This station has a 6-inch force main and standby power is provided via an on-site engine generator. It is important to note that the sewage from Pump Station 11 is not conveyed to Pump Station 13; it is sent to 20th Street East.

Pump Station 12

Pump Station 12, located at 333 54th Avenue East, was constructed in 2002 and serves residential developments south of I-5. This submersible-type lift station has three pumps, each with a design capacity of 850 gpm at 37 feet of discharge head. This station has a 14-inch DI force main that transitions to 16-inch HDPE and a portable engine generator connection for backup power.



Pump Station 13

Pump Station 13, located at 2130 70th Avenue East, was constructed in 2002 and was relined in 2014. It serves a mixture of commercial and industrial use. This submersible-type lift station has three pumps, each with a design capacity of 370 gpm at 26 feet of discharge head. This station has a 12-inch DI force main and a portable engine generator connection for backup power.

Pump Station 14

Pump Station 14, located at 1216 59th Avenue East, was constructed in 2011 and will serve the area in the northeast part of the service area north of I-5 and east of the casino. This submersible-type lift station has two pumps, each with a design capacity of 80 gpm at 95 feet of discharge head. This station has a 4-inch DI force



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main and a portable engine generator connection for backup power.

Wastewater Treatment and Disposal Facilities

A copy of the current National Pollutant Discharge Elimination System (NPDES) permit is located in **Appendix C**.

1-4. ADJACENT SEWER SYSTEMS

There are several nearby municipal sewer service systems, which include the Cities of Tacoma, Puyallup, Edgewood, and Milton. The Cities of Fife, Milton, and also the City of Fircrest convey their wastewater to the City of Tacoma's Central Treatment Plant No. 1 for treatment. The City of Tacoma has one additional wastewater treatment plant (North End Wastewater Treatment Plant No. 3) that treats domestic wastewater and is composed of residential and retail customers.

Per the *City of Fife 2014 Sewer System Plan Amendment* prepared by PACE Engineers, Inc. (**Appendix D**) approximately 186 acres of sanitary sewer service area will be transferred from the City of Edgewood to the City of Fife. The interlocal agreement (**Appendix E**) between the City of Fife and the City of Edgewood allows a maximum of 600 equivalent residential units (ERUs) to be served by the City of Fife's sanitary sewer system. The City of Fife anticipates that 100 ERUs will connect to the sanitary sewer collection system each year with the first year being 2016. This assumption was included in the flow analysis (**Chapter 4**) and capital improvement plan (CIP) included in **Chapter 6**.

1-5. THE CITY OF FIFE WATER SYSTEM

The City of Fife

Water service to the majority of Fife's sewer customers is provided by the City. A few sewer customers receive their water from single family wells. Historical water billing records are used to help evaluate the water consumption of the City's sewer customers. This section provides a brief description of the existing water system and the current operation of the facilities. The water service area and system facilities are included in **Appendix F**.

Pressure Zones

The City currently serves customers within an elevation range of approximately 10 feet in the northern areas of the system to approximately 30 feet in the southeastern portion of the system. The range of elevations enables the City to provide water service within a single pressure zone.

The pressure in the 220 Zone is regulated by pressure reducing valves that are located in the two Tacoma Public Utilities interties. The pressure reducing valves reduce the pressure of water entering the City's system from Tacoma's 240 Pressure Zone.

Supply Facilities

Introduction

Water supply to the City's water system is provided by one groundwater well and two wholesale interties with Tacoma Water. The City's primary source of water is from Tacoma Water through the Milwaukee Way and Taylor Way Interties.

Water Treatment

All water that is produced by the City's well sources is chlorinated to disinfect and kill harmful bacteria that may be present in the water. Chlorination is achieved through a chlorine gas disinfection system located on site at Well 5. Chlorine gas is fed into the source water to maintain a target free chlorine residual of 0.1 to 0.5 milligrams per liter (mg/L). The City has five other wells (Well 1, Well 2, Well 3, Well 4, and Well 6) that have been disconnected either due to contaminants or production decline.

Storage Facilities

The 100,000-gallon reservoir is currently offline. The steel reservoir is located near 62nd Avenue East and 7th Street East on a site adjacent and above the Wells 1 and 3 sites.

Distribution and Transmission System

The City's retail water service area contains more than 61 miles of water main ranging in size from 4 inches to 16 inches; most of the water main (approximately 96 percent) within the system is 8-inch diameter or larger. Approximately 64 percent of the water main in the system is DI. All new water main installations are required to use DI water main in accordance with the City's development and construction standards.

The life expectancy of water main is generally 40 to 50 years. Approximately 5 percent of water main within the system was constructed in the 1960s and is reaching its life expectancy. Of particular concern are the older AC pipes, which might have been installed during the 1960s.

Water System Interties

Water system interties are physical connections between two adjacent water systems. Interties are normally separated by a closed isolation valve or control valve. Emergency supply interties provide water from one system to another during emergency situations only. An emergency situation may occur when a water system loses its main source of supply or a major transmission main and is unable to provide a sufficient quantity of water to its customers. Normal supply interties provide water from one system to another during non-emergency situations and are typically supplying water at all times.

The City has two normal wholesale supply interties with Tacoma Public Utilities (TPU). The Milwaukee Way Intertie is located near Milwaukee Way and Pacific Highway East and has a 10-inch meter. The Taylor Way Intertie is located near Taylor Way and East-West Road East and was up-sized to an 8-inch meter in 2007. The interties provide the City with the physical capability to obtain 9,000 gpm from TPU.

