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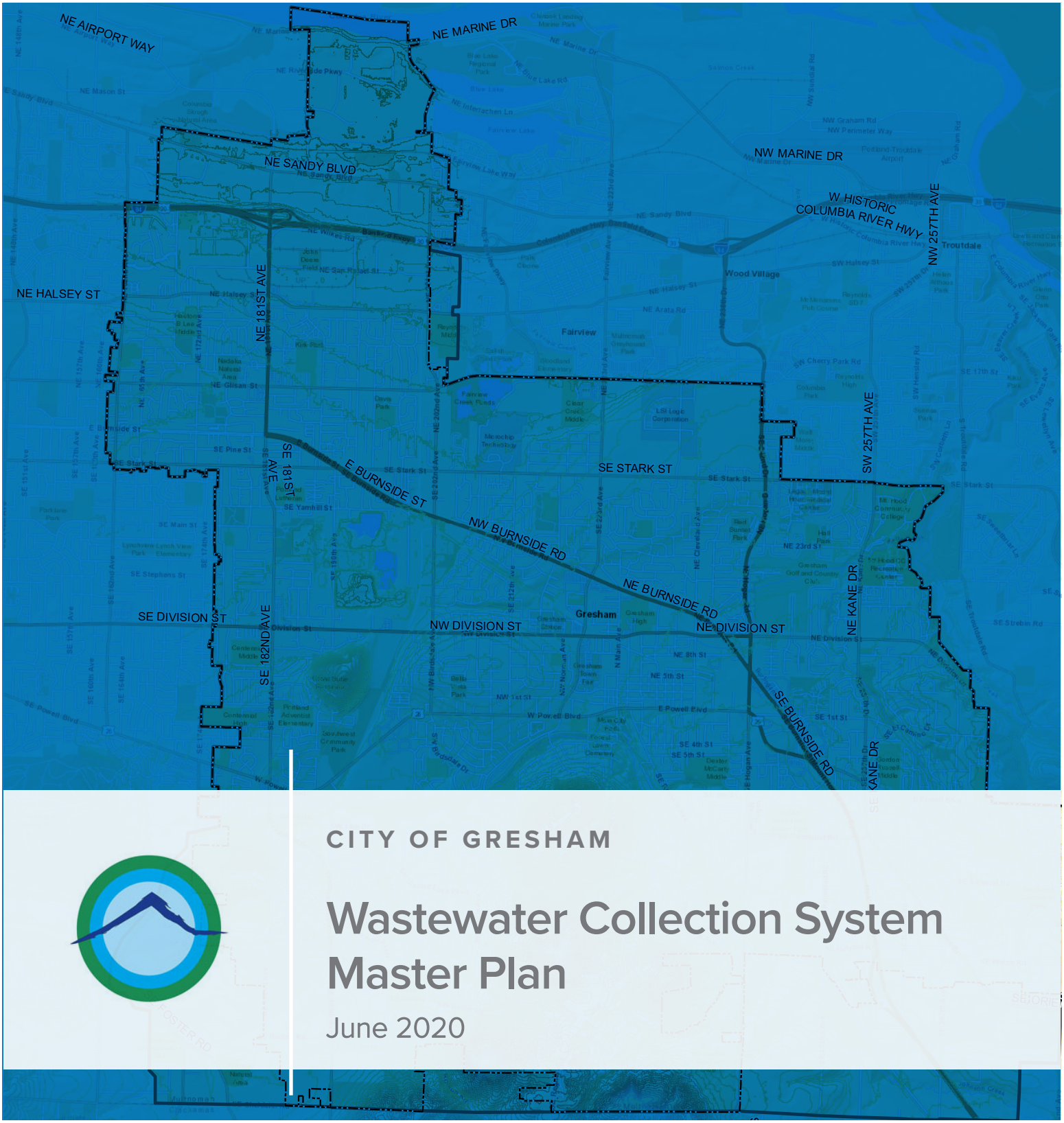

CITY OF GRESHAM

Wastewater Collection System Master Plan

June 2020

Wastewater Collection System Master Plan

City of Gresham

June 2020

Murraysmith

888 SW 5th Avenue
Suite 1170
Portland, OR 97204

Acronyms & Abbreviations

A	
AACEI	Association for the Advancement of Cost Engineering
APWA	American Public Works Association
C	
CCTV	closed-circuit television
CIP	capital improvement program
CIPP	cured-in-place pipe
CWA	Clean Water Act
D	
DEQ	Oregon Department of Environmental Quality
DWF	Dry Weather Base Flow
E	
EPA	US Environmental Protection Agency
F	
FE	Food Establishments
FEMA	Federal Emergency Management Agency
FOG	fats, oils, and grease
G	
gpcd	gallons per capita per day
GPM	gallons per minute
gpnad	gallons per net acre per day
GWI	Groundwater Infiltration
H	
HDPE	high density polyethylene
HGL	hydraulic grade lines
M	
MGD	million gallons per day
MS4	Municipal Separate Storm Sewer System
msl	mean sea level
N	
NASSCO	National Association of Sewer Service Companies
NPDES	National Pollutant Discharge Elimination System
O	
OAR	Oregon Administrative Rules
P	
PFP	public facility plan
POTW	publicly owned treatment works

PSMP	Pump Station Master Plan
PWS	Public Works Standards
R	
RDII	Rainfall-Derived Infiltration and Inflow
RLIS	Regional Land Information System
S	
SDC	system development charges
SSO	Sanitary Sewer Overflow
SSOAP	Sanitary Sewer Overflow Analysis and Planning
T	
TMDLs	Total Maximum Daily Loads
U	
UGB	Urban Growth Boundary
W	
WCSMP	Wastewater Collection System Master Plan Update
WSMP	Water System Master Plan
WWTP	Wastewater Treatment Plant

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Executive Summary

Executive Summary

Introduction

This Wastewater Collection System Master Plan Update (WCSMP) provides the City of Gresham (City) with an updated capital improvement program (CIP). This study was completed in parallel and coordination with a separate seismic risk study.

The study includes evaluating the wastewater collection system and making recommendations for improvements and upgrades throughout the City's facilities. Recommendations will be based on 20-year (2040) demands, with consideration of ultimate build-out in the City and will include near-term and long-term projects that can be incorporated into the City's CIP to provide adequate system capacity. This CSMP has been completed in accordance with Oregon Administrative Rule (OAR 660-011).

The scope of this study includes the following.

- *Gather and Review Information* -- Compile and review currently available information relative to the wastewater collection system.
- *Develop Planning Criteria* -- Develop planning criteria regarding land use, population, and wastewater collection performance requirements to be used to analyze the existing collection system and design future system improvements. Consider City land use and population forecasts for the 10 and 20-year time frames and build-out of the UGB.
- *Review Regulatory Requirements* -- Review all applicable regulatory requirements that must be met by recommended improvements for wastewater collection and conveyance.
- *Develop Collection System Map* -- Develop a comprehensive map of the City's wastewater collection system including collection system piping, pumping stations, force mains, and treatment facilities.
- *Existing Wastewater Collection System Description* -- Present a technical inventory and description of all wastewater collection and conveyance facilities in the study area. Descriptions will include the current operational strategy.
- *Wastewater Collection System Model Development* – Update system hydraulic model from GIS. Calibrate model for dry and wet weather flows based on flow monitoring data. Dry weather loading developed based on flow monitoring, water consumption, and land use data.

- *Design Storm Selection* – Perform a flow frequency analysis using historic precipitation record and the calibrated hydraulic model.

- *Population, Employment and Flow Forecasting –* Future population, employment, and dry weather loading is forecast in 5-year intervals to the 20-year planning horizon based on the City's Buildable Land Inventory.

- *Characterize Existing and Future Collection System Capacity Deficiencies* -- Using the calibrated collection system model, design storm, and planning design criteria, identify existing and 20-year system deficiencies.

- *System Rainfall-derived Infiltration and Inflow (RDII) Characterization –* Estimate RDII flow contributions by meter basin.

- *Coordination with Seismic Resiliency Study –* Coordinate with seismic resiliency study including exchanging information on conveyance infrastructure hydraulic capacity, condition, and characteristics.

- *Alternatives Development and Recommendation –* Develop up to three system-wide improvement alternatives to address capacity, condition, and seismic risks during existing and future flow conditions.

- *Master Plan Documentation* -- Prepare wastewater collection system master plan report document, appendices, and maps which describe and illustrate the results of the study.

Study Area Characterization

Gresham's wastewater system service area is approximately 23 square miles divided into seven drainage basins. The City's system also receives wastewater flows from the cities of Fairview, Wood Village, and Portland under intergovernmental agreements with each jurisdiction.

The study area for this master plan is the existing City of Gresham wastewater service area and the Pleasant Valley, Kelley Creek Headwaters, and Springwater plan areas on the City's southern border. The study area contains a total of approximately 27 square miles with land uses as presented in Table ES-1.

Table ES-1
Existing Land Use by Category

Land Use Category	Area (acres)
Civic and School	790
Commercial	940
Industrial	1,270
Mixed Use	10
Office	100
Parks and Open Space	1,870
Parking	80
Residential	6,250
Transportation	50
Farm and Forest	1,260
Undeveloped	1,950
Other[1]	103
Right-of-Way	2,447
Total	**17,120**

Notes

1. "Other" represents tax lots without a specified existing land use. Review of these properties found they include power line routes, mobile home parks and vacant properties.

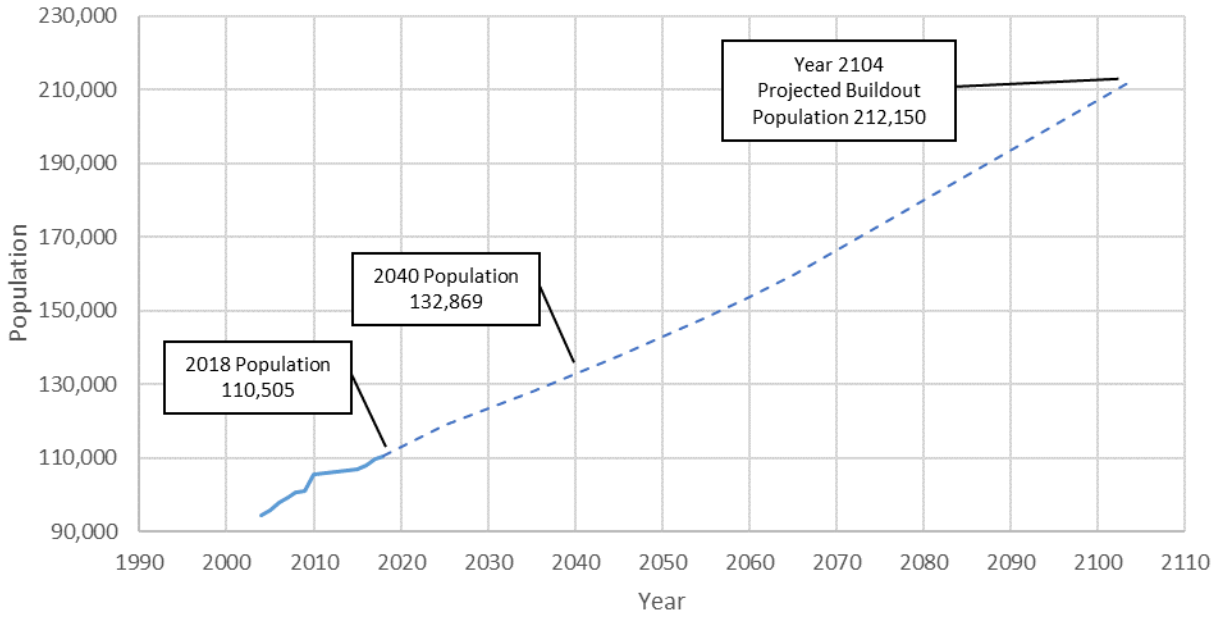
Future Service Areas

Pleasant Valley, Springwater, and Kelley Creek Headwaters Plan areas were brought into the UGB by Metro Council in 2002. The Pleasant Valley, Springwater, and Kelley Creek Headwaters Plan Areas are composed primarily of undeveloped, rural land with current wastewater disposal provided by on-site septic systems. As urban development progresses and these areas are annexed into the City of Gresham, the City will need to provide infrastructure for collecting and conveying wastewater flows.

Current Population

Gresham is the fourth most populous city in Oregon, with an estimated population of 110,505 in 2018. Current and historical population estimates for the State of Oregon are developed by Portland State University's (PSU) Population Research Center (PRC). Gresham historical population is shown below.

Figure ES-1
Historic and Projected Population



Population Forecasts

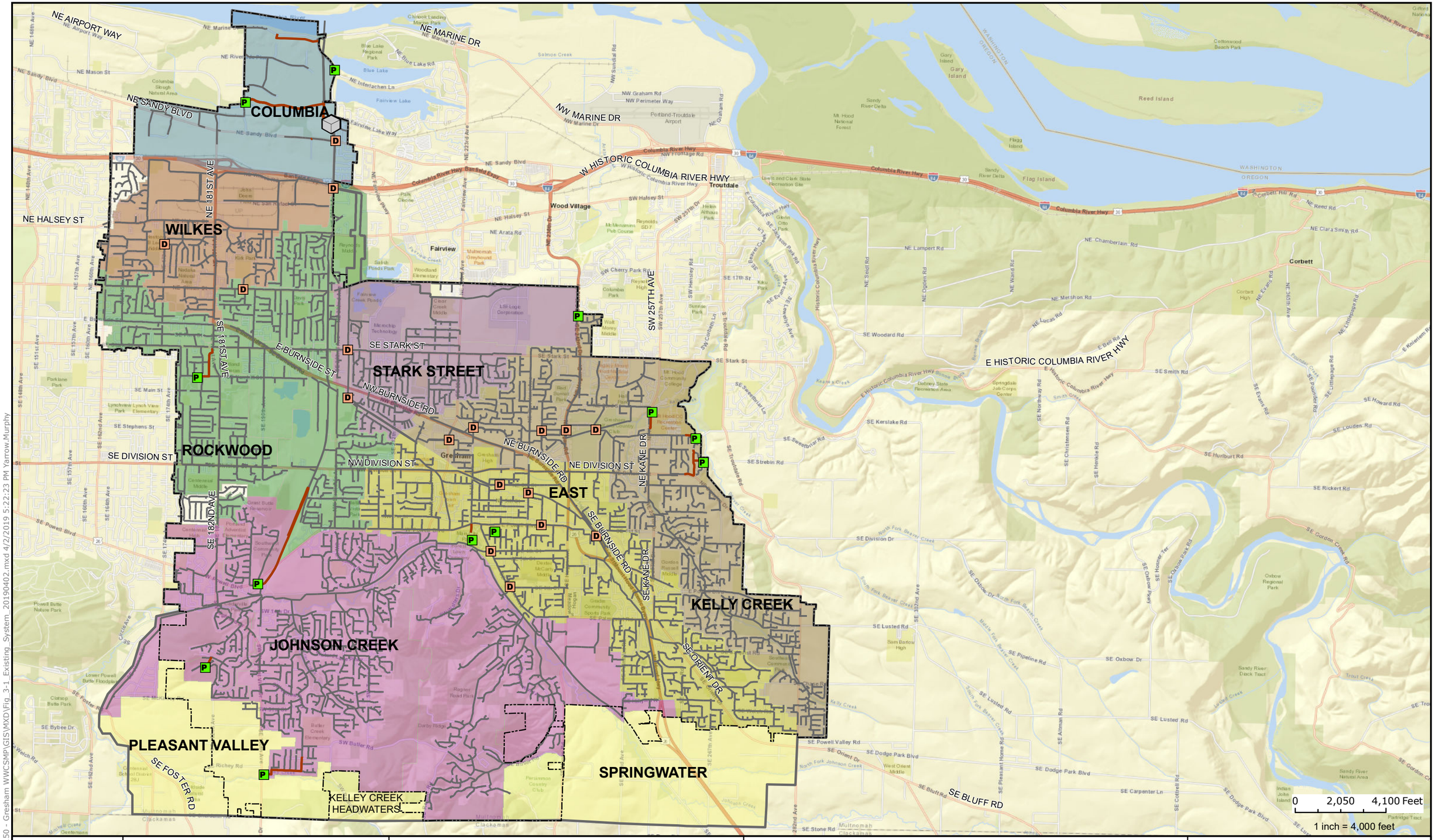
The buildout year is established by finding the year in which the population, based on growth rates from PSU PRC, reaches the buildout population. The addition of the buildout populations from the plan areas to the projections of the population within current city limits brings the total buildout population to approximately 212,150, based on estimated growth rates after 2040 at 0.65 percent per year.

Existing Wastewater Collection and Conveyance System

System Overview

The seven major drainage basins of Gresham's existing wastewater service area described above are served by approximately 290 miles of gravity sewer piping, 16 diversions, seven pump stations and five miles of force mains. Together, these facilities convey wastewater to the City's WWTP located between NE Sandy Boulevard and NE Fairview Lake Way, west of NE 201st Avenue. The City's WWTP treats wastewater from the cities of Gresham, Wood Village, and Fairview. According to the March 2011 WWTP Master Plan Update, the plant's maximum hydraulic capacity is 58,000 GPM (75 million gallons per day (MGD)).

The existing drainage basins and wastewater conveyance facilities are illustrated on Figure ES-2.



WWTP
Pump Station
Diversion

Sewer Mains
Force_Main
Study Area
City_Limits

Basins
1
2
3
4
5
6
7
Future Service Areas
Connects to Other System

City of Gresham, Oregon
Wastewater System Facility Plan

Figure ES-2
Existing System

January 2019 17-2150

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Regulations and Policies

This WCSMP was created in compliance with the following federal, state, and local requirements.

Federal Statutes, Regulations, and Permits	▪ NPDES Permit ▪ National Pretreatment Program
Oregon Statutes, Regulations, and Permits	▪ Oregon Administrative Rule, Chapter 340 ▪ Oregon Revised Statute, Chapter 224 ▪ Oregon Revised Statute, Chapter 223
Local Sewer Ordinances, Agreements, and Related Planning Policies	▪ METRO 2040 Regional Framework Plan ▪ Multnomah County ▪ City of Gresham, Stormwater Master Plan ▪ City of Gresham, Water System Master Plan (2012)
Sewer Ordinances	▪ City of Gresham Revised Code ▪ City of Gresham Community Development Code ▪ City of Gresham Public Works Standards (2019)

System Capacity Analysis

A computer model of the sanitary sewer system was developed to evaluate the capacity of the various system components under peak wastewater flows. To maximize both the qualitative and quantitative accuracy of the analysis, the model was calibrated for dry and wet weather conditions. The model was used to characterize system sensitivity to peak flows and provide an overall range of capacity-related improvements anticipated to be necessary as the City develops towards build-out.

The system analysis identified components which do not meet minimum criteria, as defined by the City's *Public Works Standards (2019) and Oregon Department of Environmental Quality Design Guidelines (1994).* Design criteria focus on a maximum water depth of 80 percent during dry weather conditions and minimizing surcharging above the pipe crown during the design storm event.

The calibrated sanitary sewer model was used to identify system hydraulic response to existing and build-out flows during the 5-year design storm. The build-out analysis considered sanitary sewer service within the existing UGB.

The peak sanitary sewer flow is a combination of dry weather flow (DWF), groundwater infiltration (GWI), and wet weather flow (WWF). Varying throughout the day in response to personal habits and business operations, DWF is the assumed wastewater base flow contributed by residents and businesses. Also known as rainfall-derived infiltration and inflow (RDII), WWF is stormwater inflow entering the collection system either during or immediately following a precipitation event. This water enters the system through leaky manhole covers, defective underground pipes, and illegal direct connections, such as roof drains, yard and area drains, and storm drains.

Existing system flows were developed from existing winter-time water consumption and flow monitoring data. Existing DWF was estimated from average dry flow conditions between January and March 2013, when flow monitoring data was available. Existing WWF estimation relied on localized flow monitoring data to extract peak RDII rates and unit hydrographs from local storm events to extrapolate the 5-year design storm.

Future flow projections were based on unit flow factors derived from water consumption data and Metro land use data applied at the parcel level to all vacant lands. Future WWF projections utilized the existing extrapolated RDII peak rates for the 5-year design storm for future parcels. A summary of existing and build-out flows is presented in **Table ES-2**.

Table ES-2
Estimated Peak Flows at Build-out

Meter Basin	Average DWF (GPM)	Peak DWF (GPM)	GWI (GPM)	Peak RDII[1] (GPM)	Total Buildout Peak Flow[2] (GPM)
Columbia					
185th PS	160	240	45	230	510
East					
3252-7-005	930	1,460	200	4,250	5,910
3352-7-006	400	580	0	4,550	5,130
3556-7-008	370	580	45	1,760	2,390
Johnson Creek					
3451-4-004	2,860	4,530	0	5,110	9,640
Linneman PS	2,800	3,670	0	6,320	9,990
Kelly Creek					
3155-6-002	120	180	0	60	240
3252-6-041	590	810	0	3,950	4,760
3356-6-002	610	1,160	0	2,640	3,800
Rockwood					
3050-3-009	1,080	1,820	0	1,520	3,340
Stark					
2951-5-010	690	810	0	540	1,350
3051-5-008	390	560	0	580	1,140
3051-5-018	650	950	0	80	1,030
Wilkes					
2850-2-005	590	880	0	4,170	5,050
Subtotal (metered)	**12,240**	**18,230**	**290**	**35,760**	**54,280**
Unmetered (WWTP)	1,291	1,240	0	7,160	8,400
Total	**13,530**	**19,470**	**290**	**42,920**	**62,680**

Notes
1. WWF assumes 5-year design storm.
2. Total Flow = Peak DWF + Peak GWI + Peak WWF.

Results of Capacity Analysis

Existing Collection System Evaluation

The collection system model was used to identify system hydraulic and RDII response to existing dry and wet weather flows.

Results of the analysis indicate hydraulic deficiencies in the existing Kelly Creek Basin and East Basin trunk sewers with the calibrated existing flows model extrapolated to the 5-year design storm.

Future (2040) System Capacity Evaluation

With the 2040 flow condition design storm peak flows, the major capacity risks are found in the gravity trunk sewers in the following.

- Upper Kelly Creek Basin Trunk Improvement
- East Basin Trunk Improvement
- Lower Kelly Creek Basin Trunk Improvement
- Lower Johnson Creek Trunk Improvement
- East Basin and Kelly Creek Basin.
- Buildout Projected Dry and Wet Weather Flow Summary by Meter Basin

Seismic Resilience

The City recently developed a *Wastewater Seismic Resilience Plan* (2019) which evaluates treatment and collection system seismic risks. Critical backbone is defined as collector and trunk sewers 12 inches and larger as well as smaller piping that provides service to critical facilities. Critical customers and wastewater facilities serving them are separated into two tiers to help prioritize the collection system pipe projects. The recommended improvements reduce seismic risk over a 45-year implementation period and are prioritized based on critical community facilities such as hospitals.

The recommendations for wastewater collection system improvements relative to seismic resilience discussed in the City's *Wastewater Seismic Resilience Plan* (2019) are summarized in this section. In order to prioritize the collection system pipe projects, sewer trunks were separated into two tiers based on critical community facilities such as hospitals, and their risks are defined based on proximity to liquefiable soils and landslide hazard. Tier 1, which includes improvements to infrastructure serving critical community emergency facilities, includes 31,000 linear feet of gravity pipe improvements and reconstruction of the WWTP outfall, at an estimated total cost of $25.18 million in 2018 dollars. The recommended improvements for Tier 2 include 111,000 linear feet of gravity pipe improvements, two stream crossing pipes, the Jenne Road siphon, and improvement of seven pump stations with an estimated total cost of $85.2 million.

Some of the pipelines identified for proposed seismic improvements also require upgrades to address capacity. These include the Upper Kelly Creek Trunk and the Lower Kelly Creek Trunk.

Capital Improvement Program

The capacity and seismic improvement analysis were used to develop a 20-year CIP. Improvements were prioritized into three timeframes, including the short-term (0-5 years), medium-term (6-10 years), and long-term (11-20 years).

All improvements are funded by utility revenues generated from wastewater rates and are allocated through the City's Sewer Operating Fund. Capital improvements for future development (i.e. growth) are funded through Sewer Development Charges (SDCs), as dictated by Oregon Revised Statute 223.297 through 223.314 and allocated by the City's Sewer SDC Fund.

The total cost for all City improvements are summarized and presented in **Table ES-3** and equate to $139,000,000 over the 20-year planning horizon (in 2019 dollars).

Gravity Pipe Capacity Improvements

Capacity improvements include upgrades to existing trunk sewers to increase capacity for existing and future services. The major improvement projects in this category are listed below.

- Upper Kelly Creek Basin Trunk Improvement
- East Basin Trunk Improvement
- Lower Kelly Creek Basin Trunk Improvement
- Lower Johnson Creek Trunk Improvement

Gravity Sewer Extensions

New gravity sewer mains 10 inches and larger in diameter are recommended to serve the Springwater, Pleasant Valley, and Kelley Creek Headwaters Plan Areas.

Table ES-3
CIP Summary Table

Project Type	Estimated Cost (2019$)[1, 2]			Total Cost (2019$)[1, 2]
	Near-term	Medium-term	Long-term	
Plan Area Extensions	$12,064,000	$11,673,000	$2,738,000	$26,475,000
Capacity Improvements	$4,009,000	$2,937,000	$0	$6,946,000
Seismic Resilience	$9,744,000	$16,397,000	$80,393,000	$106,534,000

Table ES-4
CIP Table

Project ID No.	Project Information				Estimated Cost (2019$)[1, 2]	Driver	Associated Projects & Coordination Notes	Percent Related to Resilience[3]
	Name	Type	Description	Project Limits				
0 - 10 Year (Near-term) Timeframe								
E1	East Basin Trunk Improvement	Gravity Pipe Capacity Improvement	1,500 LF Burst Upsize to 15" Ø	From South of SE Anderson Ave to SE Palmquist Rd	$666,638	Existing system deficiency Infiltration and Inflow		0%
KC1	Upper Kelly Creek Basin Trunk Improvement	Gravity Pipe Capacity Improvement/Seismic Resilience	350 LF Burst Upsize to 21" Ø	From North of SE El Camino Dr to NE 8th St	$208,613	Existing system deficiency Infiltration and Inflow	Partially overlaps with "C-14 Tier 2 Upgrades" seismic resiliency project	35%
KC2	Lower Kelly Creek Basin Trunk Improvement	Gravity Pipe Capacity Improvement/Seismic Resilience	2,220 LF Burst Upsize to 18" to 21" Ø 3,640 LF Open Trench Upsize to 27" Ø	From NE 17th St to NE 18th St	$4,024,793	Existing system deficiency Infiltration and Inflow	Partially overlaps with "C-15 Tier 1 Upgrades" seismic resiliency project	32%
JC4	Upper Johnson Creek Trunk Improvement	Replacement	2480 LF Open Trench Replacement of 21" Ø	Two Pipe Segments North to Springwater Corridor and SE 252nd Ave	$2,726,325	Invert requirement for service extension		18%
PV4	PV Lower Kelley Creek Trunk	Gravity Pipe Service Extension	7,000 LF from 12" to 24" Ø Includes 1970 LF Boring	From SE 182nd Ave to SE Foster Rd and SE Jenne Rd	$7,119,143	Growth		0%
PV6	PV Upper Kelley Creek Trunk	Gravity Pipe Service Extension, decommissioning Brookside Pump Station	3,560 LF from 10" to 12" Ø	From SE 190th Ave to SE 182nd Ave	$2,149,519	Growth		0%
SB1	Stark Basin Improvement	Gravity Pipe Service Extension	2,030 LF 12" Ø	Private property south of NE Glisan to Glisan near NE 238th Pl	$694,196	Growth		0%
C-08	Jenne Road Siphon Project	Seismic Resilience		Stream crossing 880 ft west of Highland Dr on Springwater Corridor Trail	$470,000	Critical Backbone Seismic Resilience		100%
C-09	Johnson Creek Flyovers	Seismic Resilience		Between SW Highland Dr and SW Pleasant View Dr	$1,527,000	Critical Backbone Seismic Resilience		100%
C-10	Outfall replacement	Seismic Resilience	Improvements to Existing 48-inch HDPE Piping (installing restrained joints at structures if needed)		$184,000	Critical Backbone Seismic Resilience		100%
C-13	Bridge Crossing at NE 185th	Seismic Resilience		Stream crossing Between NE Portal Way and Sandy Blvd	$197,492	Critical Backbone Seismic Resilience		100%
C-15	Tier 1 Upgrades	Seismic Resilience			$7,727,856	Critical Backbone Seismic Resilience	Partially overlaps with "KC2 Lower Kelly Creek" capacity project	100%
M-01	Large Diameter Inspection and Cleaning	Gravity Pipe Service and Reliability	Clean, CCTV and sonar 130,300 LF pipe > 18" Ø	City-wide	$2,000,000			
Subtotal 0 - 10 Year (Near-term) Timeframe					**$29,695,575**			

Project ID No.	Project Information				Estimated Cost (2019$)[1, 2]	Driver	Associated Projects & Coordination Notes	Percent Related to Resilience[3]
	Name	Type	Description	Project Limits				
11-20 Year (Medium-term) Timeframe								
E1	East Basin Improvement	Gravity Pipe Capacity Improvement	1,860 LF Burst Upsize to 18" 1,420 LF Open Trench Upsize to 18" Ø	From South of SE Anderson Ave to SE Palmquist Rd	$1,535,830	Existing system deficiency Infiltration and Inflow	Project extent includes pipes in the East Basin Improvement Phase 2 CIP Project (CIP319100) yet to be implemented. Note different size recommendations.	0%
KC1	Upper Kelly Creek Improvement	Gravity Pipe Capacity Improvement/Seismic Resilience	490 LF Burst Upsize to 21" 1510 LF Open Trench Upsize to 27"	From North of SE El Camino Dr to NE 8th St	$1,534,500	Existing system deficiency Infiltration and Inflow	Partially overlaps with "C-14 Tier 2 Upgrades" seismic resiliency project	27%
KC2	Lower Kelly Creek Improvement	Gravity Pipe Capacity Improvement/Seismic Resilience	170 LF Burst Upsize to 18" Ø	From NE 17th St to NE 18th St	$85,763	Existing system deficiency Infiltration and Inflow	Partially overlaps with "C-15 Tier 1 Upgrades" seismic resiliency project	30%
JC1	Lower Johnson Creek Improvement	Gravity Pipe Capacity Improvement/Seismic Resilience	2110 LF Burst Upsize to 21" Ø	SE Ambleside Dr from SE Hogan Rd to north of SE Liberty Ave	$1,160,938	Existing system deficiency Infiltration and Inflow	Partially overlaps with "C-14 Tier 2 Upgrades" seismic resiliency project	35%
PV3	Lower Giese Rd Trunk	Gravity Pipe Service Extension	2,040 LF from 10" to 24" Ø	From SE 182nd SE Foster Rd	$634,026	Growth		0%
PV7	Foster Road Trunk	Gravity Pipe Service Extension	2,100 LF from 10" to 12" Ø	SE Foster Rd from SE Richey Rd to SE Dahlquist Rd	$752,108	Growth		0%
SW1	Telford Road Trunk	Gravity Pipe Service Extension	5,260 LF from 12" to 21" Ø	Between SE 252nd Ave and SE 267th Ave	$1,948,082	Growth		0%
SW2	Jeanette Road Trunk	Gravity Pipe Service Extension	1,970 LF 10" to 12" Ø	From SE Jeannette St to SE Telford Rd	$552,495	Growth		0%
SW3	Orient Trunk	Gravity Pipe Service Extension	4,020 LF from 10" to 12" Ø	From SE Orient Dr 800 ft north of SE Carl St to SE Callister Rd and SE Telford Rd	$1,666,010	Growth		0%
SW4	Village Center Trunk	Gravity Pipe Service Extension	720 LF 10" Ø	SE 252nd Ave and SE Telford Rd	$361,377	Growth		0%
SW6	Rugg Road Trunk	Gravity Pipe Service Extension	4,270 LF 10" Ø	From SE Hogan Rd to SE Telford Rd	$1,534,352	Growth		0%
SW8	Orient Trunk Bore	Gravity Pipe Service Extension	370 LF Boring 12" Ø	Mount Hood Highway crossing 700 ft north of SE Callister Rd	$1,140,160	Growth		0%
SW9	Jeanette Road Trunk Bores	Gravity Pipe Service Extension	370 LF Boring 10" Ø	Mount Hood Highway crossing 900 ft south of SE 267th Ave	$1,155,430	Growth		0%
SW11	Village Center Trunk North Creek Crossing	Gravity Pipe Service Extension	80 LF Boring 10" Ø	Stream crossing 300 ft east of SE 252nd Ave and Springwater Corridor	$254,500	Growth		0%
SW12	Village Center Trunk South Creek Crossing	Gravity Pipe Service Extension	220 LF Boring 10" Ø	Stream crossing 300 ft south of SE 252nd Ave and SE Telford Rd	$690,204	Growth		0%
SW13	Telford Road Trunk Bore	Gravity Pipe Service Extension	100 LF Boring 10" Ø	Stream crossings between SE Jeanette Rd and SE Orient St	$311,508	Growth		0%

Project ID No.	Project Information				Estimated Cost (2019$)[1, 2]	Driver	Associated Projects & Coordination Notes	Percent Related to Resilience[3]
	Name	Type	Description	Project Limits				
C-12	Johnson Creek Large Diameter Mains Replacement	Seismic Resilience	HDPE replacement or lining (Trenchless Installation)		$12,820,692	Critical Backbone Seismic Resilience		100%
C-15	Tier 1 Upgrades	Seismic Resilience			$3,973,693	Critical Backbone Seismic Resilience	Partially overlaps with "KC2 Lower Kelly Creek" capacity project	100%
Subtotal 10 – 20 Year (Medium-term) Timeframe					**$32,111,676**			
Beyond 20-Year (Long-term) Timeframe								
JC3	Upper Regner Road Trunk	Gravity Pipe Service Extension	7,000 LF from 12" to 24" Ø Includes 1970 LF Boring	SE Regner Rd from south of SE 48th Terrace to SE 45th Terrace	$2,535,938	Growth		0%
C-11	Jenne Road Replacement	Seismic Resilience	Jenne Road Sewer Improvements – Lining with HDPE (Trenchless Installation)	SE Jenne Rd between SE McKinley and SE Jenne Ln	$6,221,000	Critical Backbone Seismic Resilience		100%
C-14	Tier 2 Upgrades	Seismic Resilience	Columbia Basin, Wilkes Basin, Rockwood Basin, Birdsdale Trunk, Butler Creek Trunk and East Basin Trunk Upgrades		$60,697,324	Critical Backbone Seismic Resilience	Partially overlaps with "KC1 Upper Kelly Creek" capacity project	100%
C-15	Tier 1 Upgrades	Seismic Resilience	Lower Kelly Creek Trunk, Burnside Trunk and NE 201st Trunk Upgrades		$13,435,978	Critical Backbone Seismic Resilience	Partially overlaps with "KC2 Lower Kelly Creek" capacity project	100%
Subtotal, Beyond 20 Year (Long-term) Timeframe					**$82,890,240**			
Total					**$144,697,411**			

Notes:

1. Cost estimates represent a Class 5 budget estimate, as established by the Association for the Advancement of Cost Engineering in 2019 dollars. This preliminary estimate class is used for conceptual screening and assumes project definition maturity level below two percent. The expected accuracy range is -20 to -50 percent on the low end, and +30 to +100 percent on the high end, meaning the actual cost should fall in the range of 50 percent below the estimate to 100 percent above the estimate. The cost estimates are consistent with the definition of OAR 660-011-0005(2) and OAR 660-011-035. They are intended to be used as guidance in establishing funding requirements based on information available at the time of the estimate.
2. Cost estimates for existing system upgrades and new infrastructure improvements assume unit costs for new materials and construction and exclude the cost of laterals. All cost estimates include markups for construction contingency, owner administrative costs, and contract costs.
3. The percentage assigned to seismic resilience is as follows: For the pipes needing both capacity and seismic resilience improvements, the resilience portion is the ratio of the cost for CIPP lining the existing pipe to the cost of upsizing with fused HDPE. If there are no seismic resilience improvements needed, the value will be 0 percent, and where there is only seismic improvement, the value is 100 percent. Service extensions are considered 0 percent seismic resilience.

Section **1**

Section 1

Introduction

1.1 Overview

This Wastewater Collection System Master Plan Update (WCSMP) provides the City of Gresham (City) with an updated capital improvement program (CIP) and rate and system development charges (SDC) study. This study was completed in parallel and coordination with a separate seismic risk study. Collection system capital improvements are recommended based on several risk factors, including but not limited to capacity, condition and seismic resiliency. The emphasis of this update is to evaluate the wastewater collection system capacity to accommodate anticipated population growth within the City's service area, to further develop concepts for proposed infrastructure that will serve anticipated new development and to incorporate consideration of seismic risk and pipe condition into the recommendations.

1.2 Background

This document is an update to the WCSMP completed in November 2012 and follows a series of master planning documents for the City's wastewater collection system, summarized below.

- 2012 – WCSMP, focused exclusively on collection system in the existing service area and the Springwater, Pleasant Valley, and Kelley Creek Headwaters Plan Areas
- 2010 – Wastewater Treatment Plant Master Plan Update
- 2008 – Pump Stations
- 2005 – Wastewater Collection and Conveyance System Master Plan Update. Addressed wastewater system improvements required to serve the Springwater and Pleasant Valley Plan Areas south of the current city limits but within the City's Urban Growth Boundary (UGB)
- 2001 – Final Wastewater System Master Plan

Previous wastewater master planning included a 2005 update titled *The Wastewater Collection and Conveyance System Master Plan Update*, which was an update following the Final Wastewater System Master Plan prepared in 2001. The 2005 update addressed wastewater system improvements required to serve the Springwater and Pleasant Valley Plan Areas south of the current city limits. The 2012 update laid out extensions of wastewater infrastructure to serve anticipated development in the Kelley Creek Headwaters Plan Area and verified the system improvements needed to serve Springwater and Pleasant Valley Plan Areas. The City expects to

continue to grow through increased density within the current city limits and expansion into its UGB and subsequent development of the Springwater, Pleasant Valley and Kelley Creek Headwaters Plan Areas. This Wastewater Collection System Master Plan Update will further develop the concepts for these growth areas that were first laid out in previous plans.

1.3 Purpose and Compliance

This WCSMP will evaluate the wastewater collection system and make recommendations for improvements and upgrades throughout the City's facilities. Recommendations will be based on 20-year (2040) demands, with consideration of ultimate build-out in the City and will include near-term and long-term projects that can be incorporated into the City's CIP to provide adequate system capacity. This CSMP has been completed in accordance with Oregon Administrative Rule (OAR 660-011).

1.4 Study Area and Study Period

The study area for this WCSMP is the entire area within the City's current UGB including the current collection system service area within the city limits and the Pleasant Valley, Springwater, and Kelley Creek Headwaters Plan Areas. The study period for this plan is to the year 2040. System capacity analysis will be completed for 5-year increments through 2040 and build-out population and flow projections.

1.5 Scope

The scope of this study includes the following.

- *Gather and Review Information* -- Compile and review currently available information relative to the wastewater collection system including prior City studies, plans and reports, available planning guidance documents and design standards, operation and maintenance reports, inspection records, pump station data, flow monitoring data, record drawings, mapping and Geographic Information System (GIS) information, land use information, and population forecast data.

- *Develop Planning Criteria* -- Develop planning criteria regarding land use, population, and wastewater collection performance requirements to be used to analyze the existing collection system and design future system improvements. Consider City land use and population forecasts for the 10- and 20-year time frames and build-out of the UGB.

- *Review Regulatory Requirements* -- Review all applicable regulatory requirements that must be met by recommended improvements for wastewater collection and conveyance.

- *Develop Collection System Map* -- Develop a comprehensive map of the City's wastewater collection system including collection system piping, pumping stations, force mains, and treatment facilities. Mapping will also include digital topography, rights-of-way, tax lots, land use, zoning, and service area boundaries.

- *Existing Wastewater Collection System Description* -- Present a technical inventory and description of all wastewater collection and conveyance facilities in the study area. Descriptions will include the current operational strategy.

- *Wastewater Collection System Model Development* – Update system hydraulic model from GIS. Calibrate model for dry and wet weather flows based on flow monitoring data. Dry weather loading developed based on flow monitoring, water consumption, and land use data.

- *Design Storm Selection* – Perform a flow frequency analysis using historic precipitation record and the calibrated hydraulic model. Storm analysis is presented to City staff for selection of a 5- to 10-year design storm event used to evaluate system capacity deficiencies and recommend improvements.

- *Population, Employment and Flow Forecasting* – Future population, employment and dry weather loading is forecast in 5-year intervals to the 20-year planning horizon based on the City's Buildable Land Inventory. Future growth areas are assigned basin-specific dry weather peaking. Wet weather impacts are extrapolated to future growth areas by applying calibrated unit hydrographs and the design storm to new development.

- *Characterize Existing and Future Collection System Capacity Deficiencies* -- Using the calibrated collection system model, design storm, and planning design criteria, identify existing and 20-year system deficiencies. The hydraulic grade lines (HGL) for each modeled pipe segment during peak dry and peak wet weather conditions are evaluated against freeboard and flow depth criteria. Pump station capacity and gravity trunk capacity related to pump stations are determined based on firm pumping capacity compared to peak contributing flow.

- *System Rainfall-derived Infiltration and Inflow (RDII) Characterization* – Estimate RDII flow contributions by meter basin. Evaluate previous RDII reduction projects and correlated reduction in RDII. Identify operations and maintenance opportunities to reduce RDII. Develop a recommended RDII reduction plan based on the evaluation.

- *Coordination with Seismic Resiliency Study* – Coordinate with seismic resiliency study including exchanging information on conveyance infrastructure hydraulic capacity, condition, and characteristics. The CSMP will include mapping, overlaying the seismic scoring, condition, and capacity results which will be used to identify, prioritize, and recommend capital improvement projects.

- *Alternatives Development and Recommendation* – Develop up to three system-wide improvement alternatives to address capacity, condition, and seismic risks during existing and future flow conditions. Capital project costs will be developed for each alternative. Murraysmith will collaborate with City staff to develop alternatives evaluation criteria, including cost and non-cost factors. Using evaluation criteria developed with City staff, projects are prioritized in a draft CIP list, which includes the project description, driver(s),

implementation notes, time frame and Class 5 cost estimate for each recommended project.

- *Master Plan Documentation --* Prepare wastewater collection system master plan report document, appendices, and maps which describe and illustrate the results of the study. Electronic copies of the compiled draft report will be provided to the City for review. Responses to the City's comments will be prepared, and where applicable, incorporated into the final draft document. Murraysmith will assist staff in presenting the WCSMP in a public meeting.