Sanitary Sewer Master Plan

Hillsboro OREGON

2024

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PUBLIC DRAFT

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Prepared for
City of Hillsboro, Oregon
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List of Abbreviations

BC	Brown and Caldwell
CMOM	capacity, management, operation, and maintenance
CIP	Capital Improvements Program (10-year)
CoF	consequence of failure
CP	Capital Project
CSZ	Cascadia Subduction Zone
CWS	Clean Water Services
DEI	Diversity, Equity, and Inclusion
E&ES	Environmental and Engineering Services
FOG	fats, oils, and grease
FSE	Food Service Establishments
FTE	full-time equivalent
GIS	geographical information system
HDPE	high density polyethylene
HOA	Homeowners Association
I/I	inflow and infiltration
IGA	Intergovernmental Agreement
LF	linear feet
LoF	likelihood of failure
LOS	level of service
LSF	Local Service Fee
MSL	mean sea level
NASSCO	National Association of Sewer Service Companies
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
PACP	Pipeline Assessment and Certification Program
PVC	polyvinyl chloride
SDC	system development charge
SSMP	Sanitary Sewer Master Plan
SSO	sanitary sewer overflow

Executive Summary

The City of Hillsboro (City or Hillsboro) has a strong commitment to protecting public health, natural resources, and the environment. The health of the city and its local waterways depend on the sanitary sewer system, which collects wastewater from the City's residential, business, and commercial users and conveys it regional wastewater treatment plants, operated and managed by Clean Water Services. The sanitary sewer system was built separate from the stormwater systems.

The 2024 Sanitary Sewer Master Plan (SSMP) is a critical element of the City continuing to provide reliable and effective sanitary services to the community by planning fiscally responsible investments. It is intended to provide guidance for collection system improvements over the next 10–15 years, and inform capital planning and utility rate studies. A summary of the SSMP is provided below. For a more detailed discussion of the information presented in this Executive Summary, please refer to the individual chapters of this SSMP.

ES.1 Introduction

The City's existing wastewater system dates to 1911 and will require repairs and upgrades to provide for significant population growth and maintain resiliency in the face of natural hazards. The City recognized the need to comprehensively understand the system's characteristics in order to prioritize investments and staffing. The City is dealing with a number of challenges related to the sanitary sewer system:

- Aging infrastructure needing to serve a growing community,
- Increasing operations and maintenance needs,
- The need to prioritize capital projects and investments to manage rate increases.

The goals of this planning effort were to identify major capital projects and O&M program needs based on existing available information in order to build a 10-year capital implementation plan. Figure ES-1 summarizes the SSMP planning process.

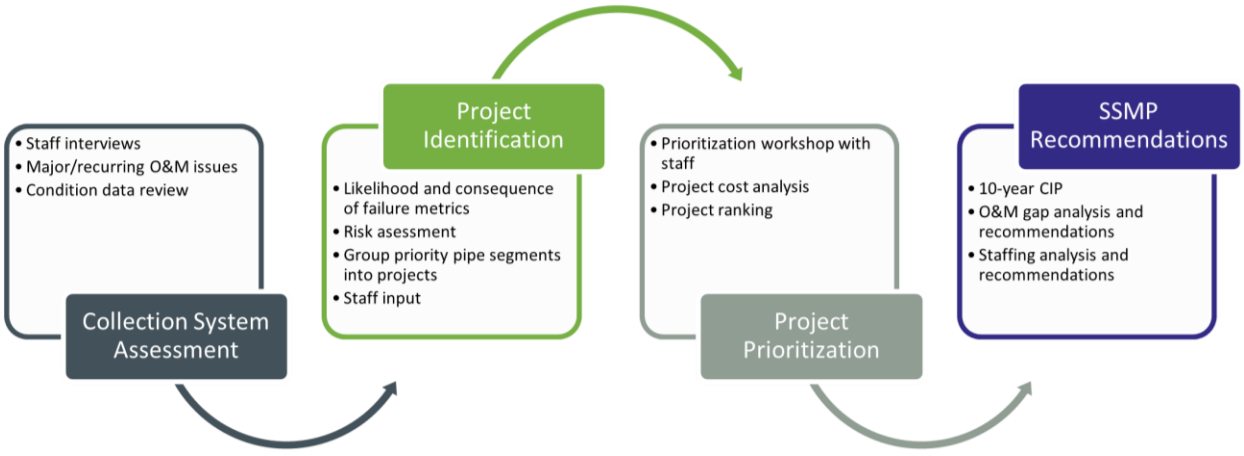

Figure ES-1. SSMP development process

ES.2 Study Area Characteristics

The City of Hillsboro is located approximately 10 miles west of Portland, Oregon and is known as the "high-tech hub of Oregon". Several major waterways flow through the city and ultimately reach the Tualatin River south of the city. The study area for the SSMP, as defined by the sanitary sewer basin boundaries, encompasses the City-operated portion of the sanitary sewer system, spanning 26 square miles within the city as shown on Figure 2-1. The City has 13 sewer basins defined by gravity and topography (Figure ES-2).

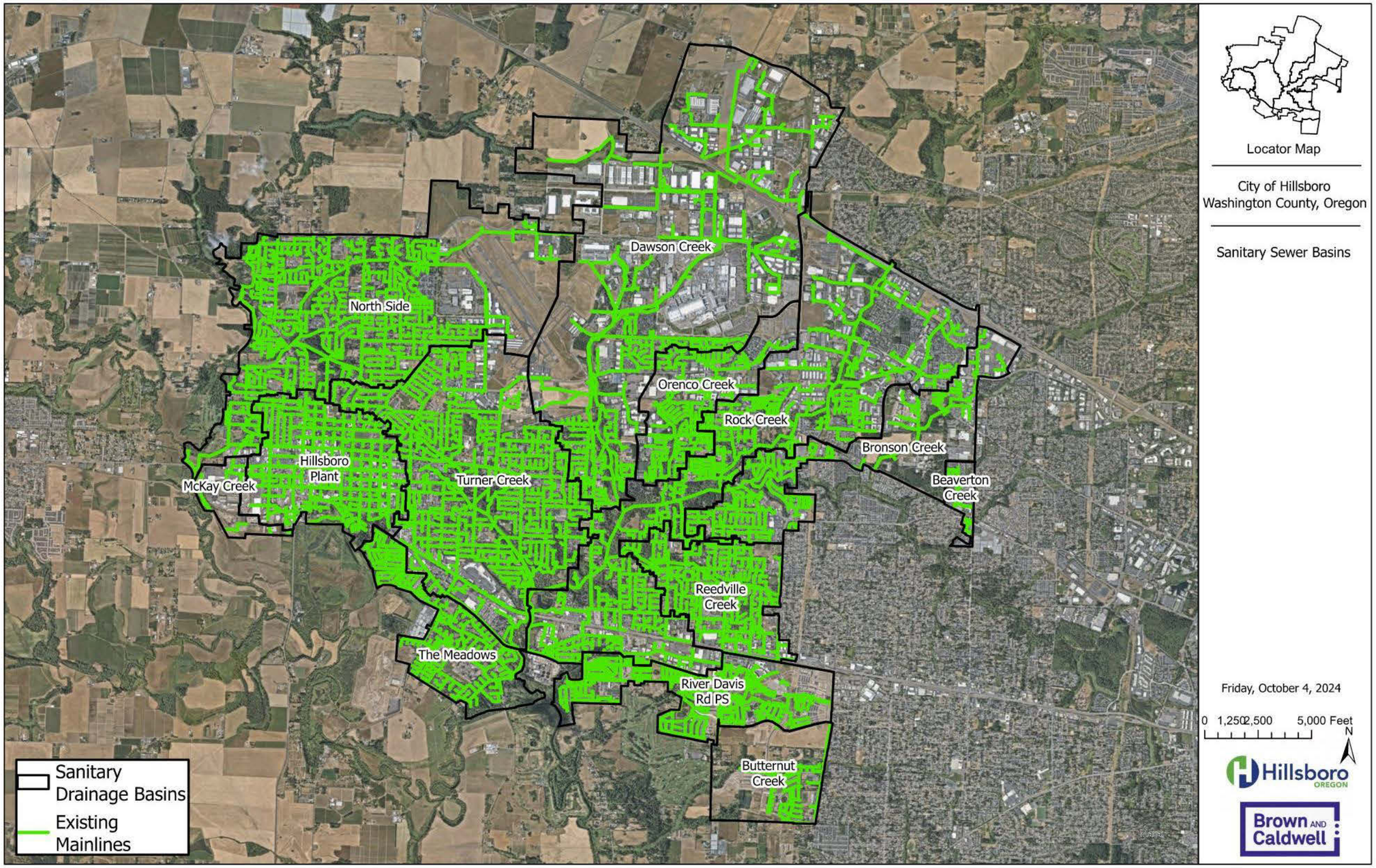

Figure ES-2. Sanitary sewer basins

As of 2022, the city of Hillsboro has a population of about 110,000[1]. Since 2010, the population has grown by 16 percent. Population growth has been projected to continue for several areas within the city as noted in the Hillsboro Comprehensive Plan (2017).

ES.3 Sanitary Sewer System

The City's sanitary sewer collection system services approximately 110,000 people spread across an area of approximately 26 square miles. The City owns and maintains over 300 miles of gravity pipeline ranging in size from 4 to 24 inches in diameter, and 8,300 manholes. CWS owns and maintains pipelines larger than 24 inches in diameter and all force mains and pump stations.

With portions of the collection system built as early as the 1910s, some of the City's gravity sewer mains are nearing the end of useful life. The pipes constructed prior to 1940, approximately 5 percent of the City's system, are due for rehabilitation or replacement. Though currently within the anticipated useful life, pipes constructed prior to 1950, approximately 7 percent of the system, will be nearing the window for replacement within the next 20-year planning period. The majority of the older pipes are located in the downtown Hillsboro area.

Overall, the City's collection system is relatively young with more than 50 percent of the pipes constructed since 1990. Newer pipe becomes more prevalent as one moves farther away from the downtown area. These pipes will not need replacement for several more decades. Figure ES-3 show the distribution of pipes by year of installation.

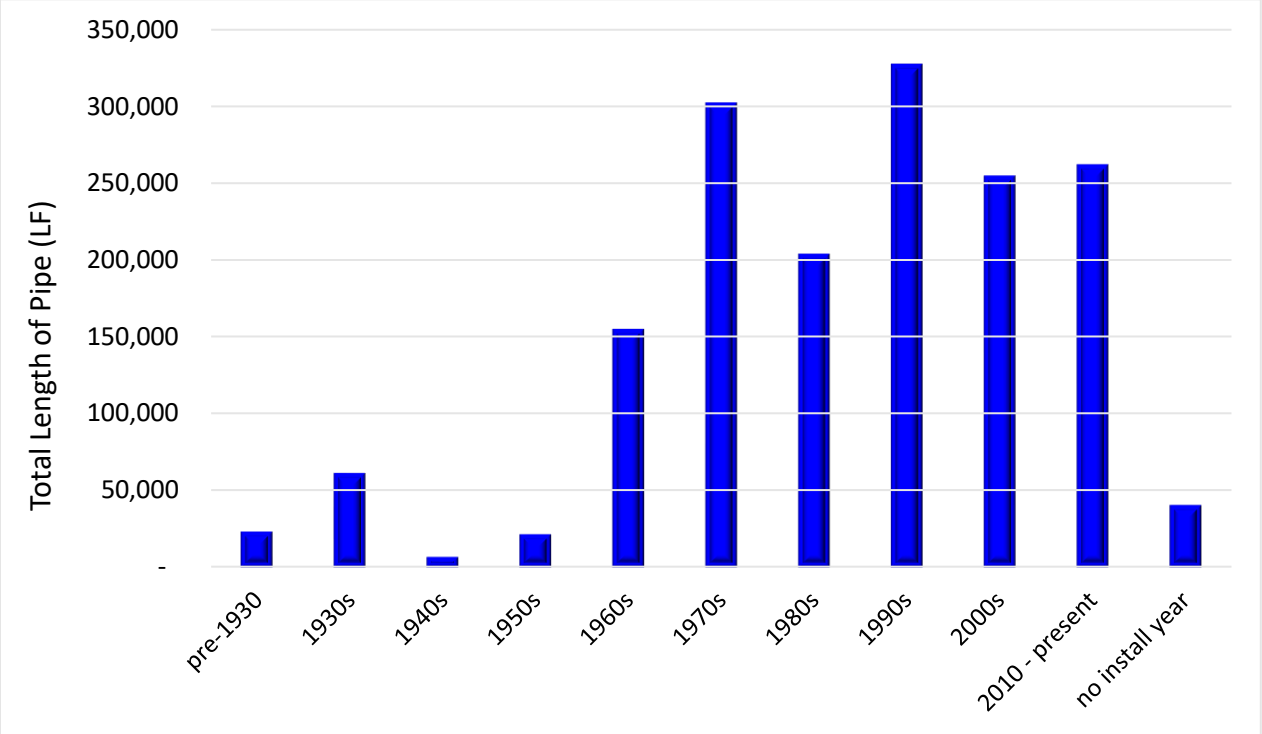

Figure ES-3. Pipe distribution by installation year

[1] City of Hillsboro Data Mosaic, 2022.

The City has a mix of residential and industrial sources of flows. The quality and quantity of wastewater can significantly vary based on source. Residential wastewater typically has organic matter, some fats, oils, and greases, and substances from household activities. Industrial wastewater may have higher volumes and can contain byproducts from manufacturing processes or other industrial activities that result higher concentrations of pollutants. Industrial wastewater can be more corrosive to pipes than residential wastewater. However, this varies widely depending on the type of industry.

Although not yet served by the sewer system, it is the City's long-term goal to reduce the number of residents on septic systems within the City's service area. The City is working to gather information on the location and number of septic systems in order to prioritize those areas for connection.

ES.4 Capital Planning Process

The City has an immediate need to more comprehensively understand the sewer system's characteristics in order to prioritize investments and staffing for the next budgeting cycle. The capital projects and recommendations developed for this plan are based on existing conditions and known issues in the sanitary sewer system. The capacity analysis currently underway by CWS was not available to the City during preparation of this SSMP. Findings related to the City's capacity needs will be incorporated into future SSMPs as appropriate.

For this SSMP, BC performed a risk-based assessment of existing assets and conducted workshops with City staff to vet the pipeline condition assessment results and incorporate other known system issues. First, BC conducted interviews to establish staff priorities. Trained and certified PACP staff reviewed and assessed the City's geodata and historic inspection PACP scoring data to identify the pipe segments with pipeline defects eligible for rehabilitation or replacement.

An assessment of the risk associated with each pipe segment was used to identify priority pipe segments. These priority pipe segments were grouped based on location to form capital projects. The projects were vetted and prioritized with operations and maintenance staff, culminating in a 10-year CIP developed with the support and collaboration of City staff. Table ES-1 summarizes the prioritization of CIP projects and programs based on the City's prioritization considerations.

Table ES 1. CIP Priority Summary

Priority Ranking	Project Title	Priority Considerations					
		Replacement of aging or failing pipes	Equity: Improves conditions in high vulnerability community [a]	I/I reduction	SSO risk reduction	Protection of sensitive areas	Replacement of concrete pipes with industrial flows
1	Inflow and Infiltration (1911/1936)		✓	✓	✓		
2	Manhole Rehabilitation Program			✓	✓		
3	Turner Creek Feasibility Study	✓		✓	✓	✓	
4	Main Street	✓	✓	✓	✓	✓	
5	NE Harewood Street				✓		
6	TV HWY		✓	✓	✓	✓	
7	Emma Jones	✓				✓	
8	SE Walnut and SE 14th	✓	✓	✓			

Table ES 1. CIP Priority Summary

Priority Ranking	Project Title	Priority Considerations					
		Replacement of aging or failing pipes	Equity: Improves conditions in high vulnerability community [a]	I/I reduction	SSO risk reduction	Protection of sensitive areas	Replacement of concrete pipes with industrial flows
9	Sunrise Lane				✓		✓
10	NW Garibaldi Street	✓	✓	✓	✓		
11	Arrington Court I/I	✓		✓			
12	NE 25th Avenue	✓		✓			
13	Rock Creek	✓					
14	Lincoln Elementary	✓		✓			
15	Walnut Street		✓		✓		
16	HDPE Weld Bead Removal				✓		
17	Replace Aging Concrete Pipes	✓	✓	✓			
18	Sanitary Sewer Master Plan Update						
19	Seismic Preparation Planning						

a. Determined using the Environmental Justice Screening and Mapping tool developed by the EPA. https://ejscreen.epa.gov/mapper/

ES.5 Sanitary System Operations and Maintenance Programs

The City has a comprehensive sanitary sewer O&M program which includes regular pipeline inspections, routine cleaning, specialty hotspot fats, oil, grease (FOG) cleaning, root removal, warranty inspections, repairs and upgrades, and trouble call response.

BC conducted a "gap analysis" to identify O&M program requirements and develop program updates to meet current and projected level of service expectations. The gap analysis showed the City is currently meeting the frequency and metric-based O&M program requirements and as-needed and on-going O&M program requirements established in the 2008 IGA[2] and 2018 CWS performance standards. However, while the City currently meets these minimum performance standards, it faces significant challenges in doing so related to staffing limitations, use of overtime, and availability of equipment. Staff have also identified additional program needs to meet service expectations.

The gap analysis resulted in recommendations for four new programs including manhole rehabilitation, flow monitoring and sampling, lateral pre/post inspection program, and lateral accuracy program and upgrades to the existing FOG program. By implementing these programs, the City will be able to provide better levels of service to its customers.

[2] Note that because the final 2023 IGA was not available during development of this analysis, the 2008 IGA was used as the basis for evaluating O&M requirements. These requirements were then confirmed once the 2023 IGA was finalized.

ES.6 Implementation

The capital improvement program (CIP) is detailed in the SSMP, providing a list of improvements to meet identified needs. Table ES-2 provides a summary of the CIP costs by project in order of priority. The projects will be spread out over the next 10–15 years. This CIP will increase the City's annual capital spending from approximately $1M to $5M. CIP project details can be found in the Fact Sheets in Appendix A.

Table ES 2. 10 year CIP Summary

Project No.	Project Title	Total Project Cost [a]
1	Inflow and Infiltration (1911/1936) [a]	$6,721,000
2	Manhole Rehabilitation Program	$1,000,000/biennium ($5,000,000 over 10 years)
3	Turner Creek Feasibility Study	$250,000
4	Main Street	$2,764,000
5	NE Harewood Street	$3,156,000
6	TV HWY	$925,000
7	Emma Jones	$634,000
8	SE Walnut and SE 14th	$2,615,000
9	Sunrise Lane	$12,365,000
10	NW Garibaldi Street	$7,248,000
11	Arrington Court I/I	$11,713,000
12	NE 25th Avenue	$2,172,000
13	Rock Creek	$4,580,000
14	Lincoln Elementary	$973,000
15	Walnut Street	$1,174,000
16	HDPE Weld Bead Removal	$743,000
17	Replace Aging Concrete Pipes	$250,000/ biennium ($1,250,000 over 10 years)
18	Sanitary Sewer Master Plan Update	$350,000
19	Seismic Preparation Planning	$100,000
	TOTAL 10-YEAR CIP COST	**$64,733,000**

Note: Project costs rounded to nearest $1,000.

a. Project is currently in progress. Dollar value shown is for anticipated construction cost prepared and provided by City engineering staff.

BC developed staffing need recommendations to support the SSMP implementation by evaluating current O&M program gaps, new O&M programs, and capital project delivery. The analysis integrated the information from the O&M Gap Analysis (Section 5.2) and CIP prioritization with City compensation plans, data on time it takes to complete activities, and interviews with City staff. The staffing needs evaluation aligns with the 10–15-year planning period of this SSMP.

The results and assumptions of the staffing evaluation are presented in Appendix C. In summary, the analysis found that the City will need to increase Operations staff to meet LOS and planned capital project delivery over the next 10 years.

The City reviewed these recommendations and developed a hiring plan. Table ES-3 summarizes the planned staffing changes by fiscal year. This staffing plan is phased over time and is based on City positions typically being full or halftime.

Table ES 3. City of Hillsboro Sanitary Sewer Staffing Plan

Planned Hires	FY25	FY26	FY27	FY28
O&M (6 FTE Total)		Senior M&O Techs (1.5 FTE)	Senior M&O Techs (3.0 FTE)	
E&ES (4.5 FTE total)	Engineering Coordinator (1.0 FTE)		Sr. Engineering Tech (1.0 FTE)	Project Manager (1.0 FTE)

The SSMP is comprised of approximately $60M in capital projects and $5M in O&M programs, plus staffing increases to support new O&M programs and CIP project delivery.

The proposed LOS as represented by this SSMP will meet minimum IGA requirements without reliance on overtime, while accounting for system growth, including additional O&M programs, and implement high-priority CIPs over the next 10–15 years. Table ES-4 summarizes current and recommended LOS by service area.

Table ES 4. Current and Recommended Levels of Service

Area	Current LOS	Recommended LOS
O&M	• Reactive system maintenance • Meets minimum requirements for existing system with reliance on overtime and borrowed equipment • Insufficient staffing for system growth	• More proactive maintenance • Meets minimum IGA requirements without reliance on overtime • Addresses anticipated increase of system assets • Implements four new programs and expands FOG program • Augments staff based on identified needs
Capital Project Implementation	• Approximately $800,000 per year • No comprehensive prioritized project list • Capital projects backlog due to staffing limitations	• ~$5M/year in project delivery • Prioritized CIP with project list based on highest needs in system • Sufficient staffing to support 10-year CIP
Benefits	• Meets permit/IGA requirements	• Proactive maintenance to help minimize future issues • Addresses known system needs and deficiencies • Provides sufficient staff resources to minimize need for overtime and borrowing resources • Provides for system growth

The City is currently working with the FCS Group to develop a sanitary sewer system financial plan including an update to the sewer local service fee based on this SSMP. The financial plan will account for the current revenue streams such as rates, connection charges, and capital cash reserves. The plan will also account for potential revenue streams such as system reinvestment funding from rates and revenue bonds to support implementation of the SSMP recommendations.

Section 1

Introduction

The City of Hillsboro (City or Hillsboro) has a strong commitment to protecting public health, natural resources, and the environment. The health of the City and its local waterways depend on the sanitary sewer system, which collects wastewater from the City's residential, business, and commercial users and conveys it regional wastewater treatment plants, operated and managed by Clean Water Services. The sanitary sewer system was built separate from the stormwater systems.

The City retained Brown and Caldwell (BC) to evaluate and make recommendations on capital improvement projects related to the City's sanitary sewer collection system. Development of this Sanitary Sewer Master Plan (SSMP) also included evaluation of engineering, environmental services, operations and maintenance programs, and staffing support. The 2024 SSMP is a critical element of the City continuing to provide reliable and effective sanitary services to the community by planning fiscally responsible investments. It is intended to provide guidance for collection system improvements over the next 10–15 years, inform capital planning and utility rate studies.

1.1 Need for the Plan

The City provides sanitary sewer collection services for approximately 110,000 residents over an area of approximately 26 square miles. This City maintains and operates approximately 300 miles of sewer pipe. The City's existing wastewater system dates to 1911 and will require repairs and upgrades to provide for significant population growth and maintain resiliency in the face of natural hazards. The City recognized the need to comprehensively understand the system's characteristics in order to prioritize investments and staffing. The City is dealing with a number of challenges related to the sanitary sewer system:

- Aging infrastructure needing to serve a growing community.
- Increasing operations and maintenance needs.
- The need to prioritize capital projects and investments to manage rate increases.

This forward-looking SSMP will allow the City to prepare for future expenditures and increase the workforce to better maintain the growing sanitary sewer system. The goals of this planning effort were to identify major capital projects and O&M program needs based on existing available information to build a 10-year capital implementation plan.

The SSMP includes:

- Identifying current system deficiencies.
- Prioritizing recommendations for improvements to rehabilitate or replace deficient parts of the system.
- Planning Capital Improvements Program (CIP) cost information for budgeting and rate planning.
- Analyzing the existing Operations and Maintenance (O&M) Program and recommendations for additional program components to address O&M needs in the existing sanitary sewer system.
- Recommending staff levels to implement proposed capital projects and O&M programs.

1.2 Approach

The approach to identifying and prioritizing sanitary sewer system capital improvement needs was grounded in a risk-based assessment of available condition information vetted by City staff who provided additional input on known issues in the system. As illustrated in Figure 1-1, SSMP Development Process, the four major steps in preparing the SSMP were collection system assessment, project identification, project prioritization, and SSMP recommendations. The SSMP recommendations include 10-year capital improvement project list and analyses and recommendations for the O&M programs and staffing for the Storm and Sanitary Sewer Division.

The capital project recommendations included in this plan are based on existing conditions and known issues in the sanitary sewer system. Updated hydraulic modeling to understand capacity needs is currently being conducted by Clean Water Services (CWS) and was not available during preparation of this SSMP. Upsizing of capacity was included in some capital projects in areas where staff identified known issues. The City anticipates future iterations of the SSMP will be informed by CWS' system capacity modeling. CWS is currently preparing an update to their West Basin Facility Plan, which will include a capacity assessment of assets located within the Hillsboro city limits. This planning exercise, actively being conducted by another consulting firm, will ultimately include a capacity assessment based on population and flow projections and hydraulic modeling.

In identifying capital project needs, BC first conducted interviews to establish staff priorities and understand ongoing O&M issues. Next, the team analyzed pipe condition information to identify the pipe segments with pipeline defects eligible for rehabilitation or replacement. An assessment of the risk associated with each pipe segment was used to identify priority pipe segments. These priority pipe segments were grouped based on proximity to form capital projects. The projects were vetted and prioritized with operations and maintenance staff, culminating in a 10-year CIP developed with the support and collaboration of City staff.

In assessing O&M program needs, BC interviewed O&M staff, analyzed historical O&M data compared to minimum O&M requirements specified in the City's cooperative agreement with CWS (IGA 2018), and reviewed projected population increases as estimated in the City's most recent Comprehensive Plan. Based on the information collected, BC developed recommendations on O&M needs including development of new programs and expansion of existing program efforts. BC worked with Operations, Engineering and Environmental Sciences staff to estimate workload and staffing requirements for sanitary sewer-related work over the next 10–15 years. These needs were compared to current staffing levels to estimate the requirements for additional staff over the next 10–15 years.

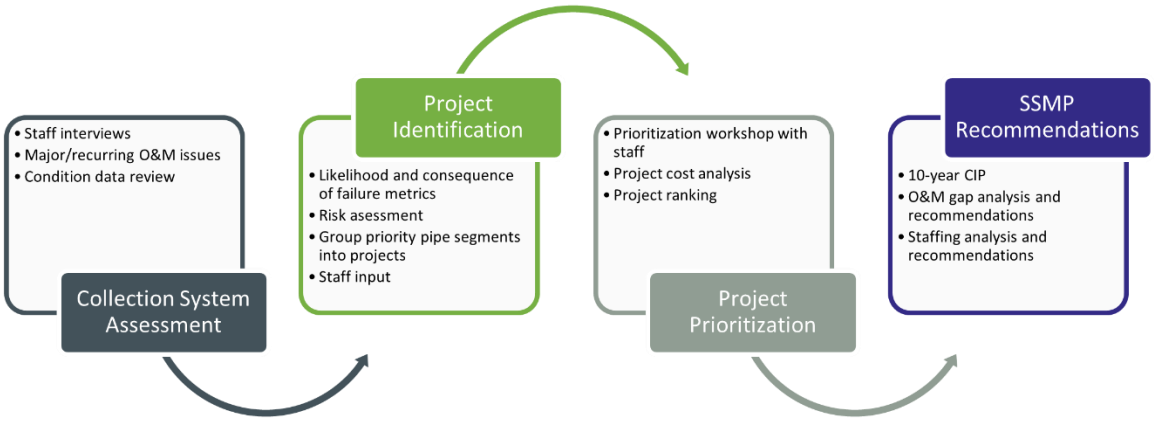

Figure 1-1. SSMP development process

1.3 Public Works Department

The City of Hillsboro Public Works Department supports the City's transportation, sanitary sewer, surface water management, and facilities infrastructure, including the design and construction of new roads and utilities. They are responsible for maintaining more than 465 curb miles of streets, over 3 million linear feet (LF) of stormwater and sanitary sewer pipelines, 40 facilities, and a fleet of 600 vehicles.

The Department is committed to providing high quality, proactive, and dependable service to keep Hillsboro running smoothly, while also being fiscally responsible. The Department provides sustainable public infrastructure along with safe and reliable services essential to the community.

As of 2024, the Department is comprised of 134 full-time employees allocated among the following divisions:

- **Administration and Finance**: Is responsible for providing department support and oversight, coordinating budget development, overseeing contracts, training, and customer service.
- **Capital and Development:** Is comprised of three sections:
  - *Capital Projects* specializes in delivering major infrastructure projects across Department Divisions.
  - *Development Services* provides permitting to the construction of public infrastructure through private development projects.
  - *GIS Mapping and Asset Management* supports effective records management of assets across the department.
- **Facilities and Fleet:** Provides services in four major areas: the planning, management, operations, and maintenance of buildings and grounds, and fleet vehicles and equipment.
- **Transportation:** Supports the management, operation, maintenance, and preservation of roadway, pedestrian, and bicycle infrastructure that allows community members and visitors to travel in and around Hillsboro either by walking bicycling, vehicle, or transit.
- **Storm and Sanitary Sewer:** Manages both utilities by actively inspecting, permitting, assessing, cleaning, and repairing the sanitary systems and the surface water management infrastructure. Responsible for planning for future development and meeting regulatory permit compliance.

1.3.1 Storm and Sanitary Sewer Division

Together with CWS, the City's Storm and Sanitary Sewer Division (Division) is responsible for operating and maintaining the storm and sanitary sewer systems. The Division is broken down into three groups: Environmental Services, Engineering, and Operations. Figure 1-2 shows the Stormwater and Sanitary Sewer Division Organizational Chart. The Division currently employs 34 full-time equivalents (FTEs) and has three vacant positions.

- **Environmental Services:** Responsible for performing regulatory storm and sanitary program and construction inspections, development review, and works with Code Enforcement to address nuisance abatement related issues. Reviews and seeks compliance with the National Pollutant Discharge Elimination System (NPDES) and the Municipal Separate Storm Sewer System (MS4) requirements in coordination with CWS and DEQ.

- **Engineering:** Responsible for carrying out CIP-related projects, performing development review, providing engineering, project, administrative, contractual, and budgetary support on projects, and conducting education and outreach for the Division. Works closely with planning and economic development to create long- and short-range utility plans for greenfield and redevelopment projects. Acts as expert when trouble shooting failures and unexpected circumstances often associated with accidents.
- **Operations:** Responsible for assessing, inspecting, cleaning, and maintaining the stormwater and sanitary sewer systems. Operation maintains the stormwater conveyance system through cleaning catch basins, pipeline cleaning and inspection. Crews perform routine inspections and maintenances on the stormwater management facilities, cleaning filter vaults, and water quality manholes. Also included in the performance standards are street sweeping and the annual fall leaf pick-up program. The sanitary sewer lines are regularly inspected and cleaned, and manhole inspections performed, and fats, oils, and grease (FOG) hotspot management. Operations also conducts utility repair and locates.

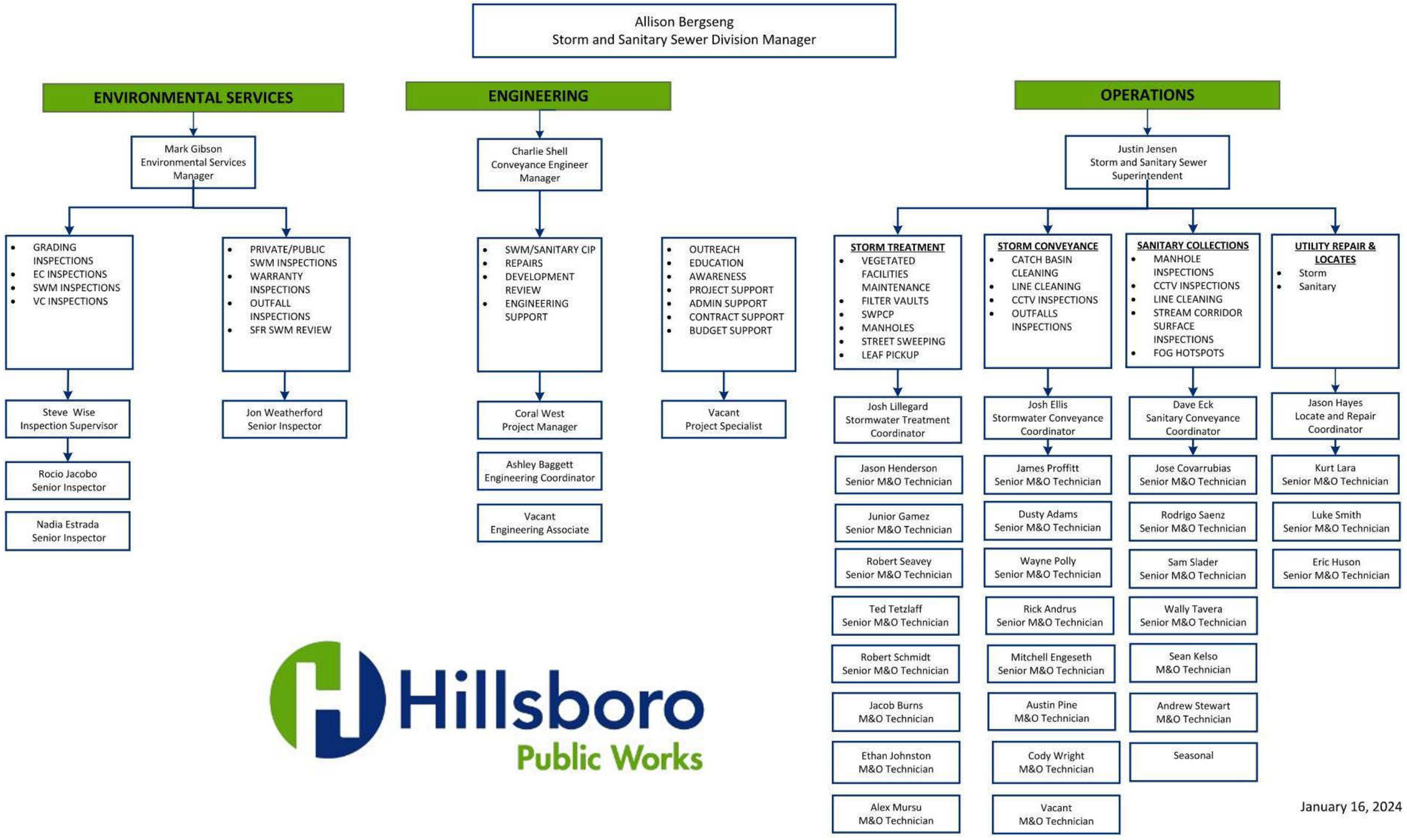

Figure 1-2. Storm and Sanitary Sewer Division organization chart

1.3.2 Relationship to Clean Water Services

CWS, formerly known as the Unified Sewerage Agency of Washington County, is a Washington County service district organized under the laws of the state of Oregon. The City and CWS have been working in partnership since 1970 to protect the environment, achieve regulatory compliance, and maintain safe and effective stormwater and sanitary sewer infrastructure.

CWS owns, operates, and maintains the water resource recovery facilities (WWTPs), portions of the public gravity sanitary conveyance and stormwater systems within the unincorporated area of it service boundaries. CWS is also responsible for components associated with the regional program within the city boundaries generally including force mains, pump stations, and large diameter pipes equal to or larger than 24 inches. Figure 1-3 illustrates how the CWS Service District collects and treats water from partner cities within the Tualatin River Watershed and discharges it to the Tualatin River

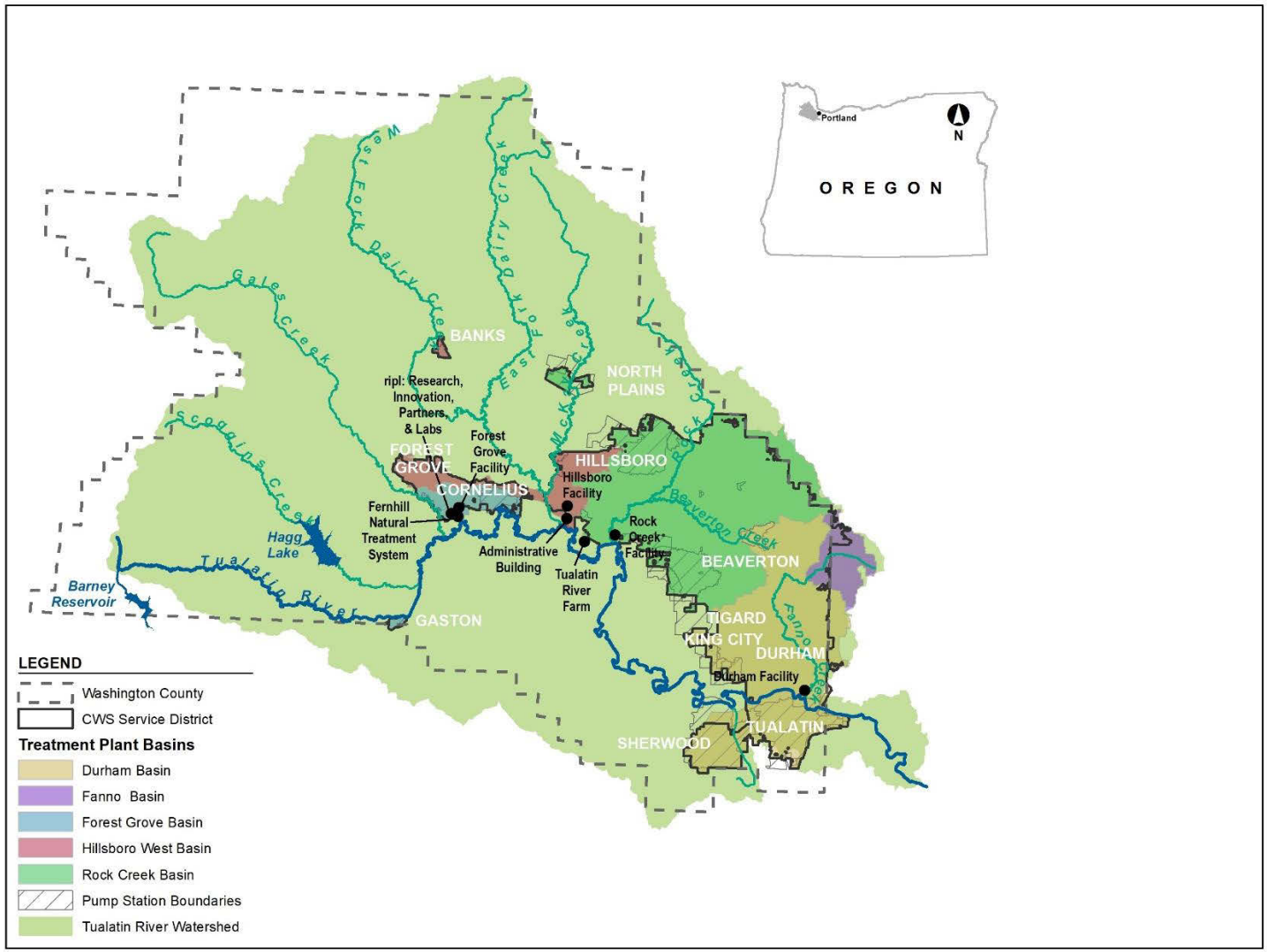

Figure 1-3 CWS service district

Source: Clean Water Services

Clean Water Services is the permit holder for the National Pollutant Discharge Elimination System (NPDES) permit (Permit). The City of Hillsboro is a co-implementer of the permit. CWS and the City work in collaboration to ensure the permit requirements are upheld. The City's sanitary sewer system conveys wastewater to either the Rock Creek Advanced Wastewater Treatment Facility or Hillsboro West Wastewater Treatment Facility for treatment. The wastewater treatment facilities are owned and operated by CWS. CWS in partnership with City of Hillsboro is responsible for meeting the requirements of that Permit. CWS is also responsible for system-wide sanitary sewer master plans, including system capacity planning although this is done in partnership with the City. The City is responsible for regulatory requirements directly pertaining to its wastewater collection system.

In addition to capacity planning, CWS is also responsible for updating the sewer system hydraulic model for projected changes to population, industry, and the business climate that would affect trunk lines coming into the wastewater treatment plants (WWTPs). CWS is currently updating the West Basin Master Plan which includes capacity modeling of pipelines in Hillsboro. The West Basin Master Plan is slated for completion in late 2024.

1.3.3 Clean Water Services Intergovernmental Agreement

The City of Hillsboro has been working with CWS (formerly Unified Sewerage Agency) since the late 1960s to improve public heath, the environment, and reduce pollution in the Tualatin River Watershed. In 2005, the City and CWS first established an Intergovernmental Agreement (IGA) to divide the regulatory responsibilities for permit implementation between the two agencies. Since then, the IGA has been updated multiple times, including 2008 and 2023. The Hillsboro City Council approved the most recent IGA on October 17, 2023. It was approved by the Washington County Board of County Commissioners (CWS oversight entity) on November 28, 2023.

The new IGA was drafted in partnership by CWS and the City after more than a year of collaborative work sessions. The City has grown in both size and sophistication, and has asked for more autonomy and flexibility to work with the growing infrastructure and increase in permit requirements. The updated IGA provides the City with more autonomy in permit review and fee setting, while offering more flexibility in permit compliance. This allows the City to set its own design and construction standards, performance standards, and wastewater management plan (referred to as the capacity management operation and maintenance (CMOM) plan in the IGA). Each plan must still meet all regulatory requirements and work in concert with other regional environmental efforts.

The rate structure is also changing as a part of the new IGA. Previously, CWS set the regional operational rate for both storm and sanitary sewer and was used by the City. The City augmented this operational rate with a Local Service Fee (LSF). The updated IGA prescribes the following change for both utilities, CWS set the regional rate and the City set a local rate. The City is undergoing a cost-of-services study for each utility to determine an appropriate local rate. This will effectively combine the local rate with the local service fee streamlining the utility bill. The results of the cost-of-service study will be brought to City Council in 2024 for approval.

The System Development Charges (SDC) structure is also changing because of the IGA. SDCs are assessed on new construction. Previously CWS set the SDCs for sanitary sewer. As a result of the collaborative process the new rate structure for SDCs are:

- CWS will set the regional Sanitary Sewer SDCs
- COH will set a local SDC for Sanitary Sewer.

The local SDCs will be established through the cost-of service study.

The new IGA encourages collaboration in the form of more regular meetings between the two agencies. The spirit of this document is to encourage interaction and collaboration on all levels. The City will continue evaluating the IGA for its effectiveness and amend it as necessary.

1.4 Hillsboro Comprehensive Plan

The most recent City-adopted Hillsboro Comprehensive Plan (Comprehensive Plan) took effect on January 2, 2018. The Comprehensive Plan is the guiding document for how the city will grow and develop over the next 30 years. This planning document directs all activities related to land use and the future of natural and constructed systems and services in the city. City leaders use the Comprehensive Plan to coordinate public investments and make decisions about new development, existing neighborhoods, transportation, and a variety of other topics including wastewater.

The City's approach to wastewater management focuses on collection and treatment, and watershed stewardship. The Comprehensive Plan includes two goals specific to wastewater:

- Wastewater (W) Goal 1–Collection and Treatment comprises of six policies that aim to provide for the collection and treatment of wastewater to meet current and future needs.
  - *Policy W 1.1 Coordination*. Coordinate wastewater collection and treatment with local and regional agencies and stakeholders.
  - *Policy W 1.2 System expansion*. Plan for the expansion of the sanitary sewer network to meet projected demand.
  - *Policy W 1.3 Capital improvement projects*. Support capital improvement projects that enhance Hillsboro's and CWS' ability to build and operate an adequate wastewater collection and treatment system for current and future users.
  - *Policy W 1.4 Industrial users*. Plan for the diverse wastewater needs of industrial water users, including high contaminant levels and heavy water user.
  - *Policy W 1.5 Aging infrastructure*. Improve and maintain the wastewater system using asset management principles to optimize preventative maintenance; reduce unplanned reactive maintenance; achieve scheduled service delivery; and protect the quality, reliability, and adequacy of services.
  - *Policy W 1.6 Resiliency*. Create and maintain a resilient system to reduce risk posed by seismic events and other hazards of various scales.
- Wastewater (W) Goal 2–Stewardship comprises of two policies that aim to provide responsible stewardship of the Tualatin River watershed.
  - *Policy W 2.1 Regulatory standards.* Support partner agency efforts to ensure that wastewater discharges meet regulatory standards.
  - *Policy W 2.2 Watershed protection*. Coordinate with local and regional stakeholders to protect the quality of the Tualatin River watershed.

Section 2

Study Area Characteristics

Hillsboro is one of Oregon's most diverse and dynamic cities, with a steadily growing population of more than 108,000 residents. During the workday, more than 50,000 employees commute to Hillsboro by car, bicycle, bus, or Light Rail train to work at companies such as Intel, Nike, and Genentech. Hillsboro is the largest city in Washington County and serves as the county seat.

Known as the "high-tech hub of Oregon" or the "tallest tree in the silicon forest," Hillsboro has some of the best land, power, and water resources in the country. With its thriving economy, Hillsboro is the home of Oregon's fourth-largest school district, two higher-education campuses, more than 30 parks, and more than 1,500 acres of designated green spaces, including Jackson Bottom Wetlands Preserve and the Orenco Woods Nature Park

The study area for the SSMP, as defined by the sanitary sewer basin boundaries, encompasses the City-operated portion of the sanitary sewer system, spanning 26 square miles within the city as shown on Figure 2-1.

2.1 Geography

Hillsboro is located in the Pacific Northwest – 10 miles west of Portland, Oregon, and immediately west of Beaverton in Washington County (Figure 2-2). Major transportation corridors of Highway 26 (Hwy 26) and Highway 8 (Tualatin Valley Highway or TV Highway) travel through the city.

The major waterways running through Hillsboro include Dairy Creek and McKay Creek, which combine into the Jackson Slough before discharging to the Tualatin River, and Dawson Creek, Rock Creek, and Beaverton Creek, which combine and ultimately discharge to the Tualatin River. The major waterways are shown on Figure 2-3. The City is entirely within the Portland regional Urban Growth Boundary, as managed by Metro.

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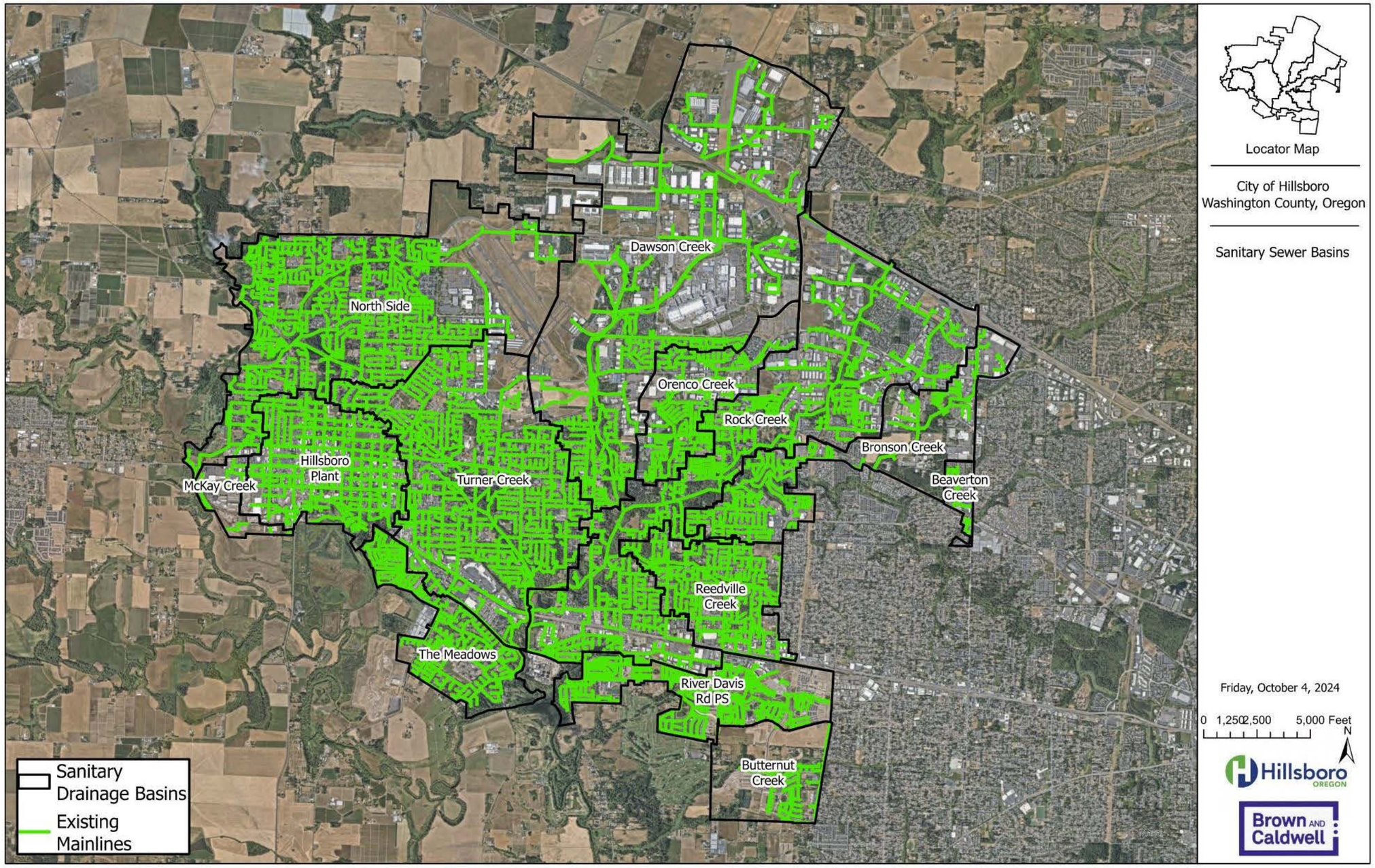

Figure 2-1. Sanitary sewer basins

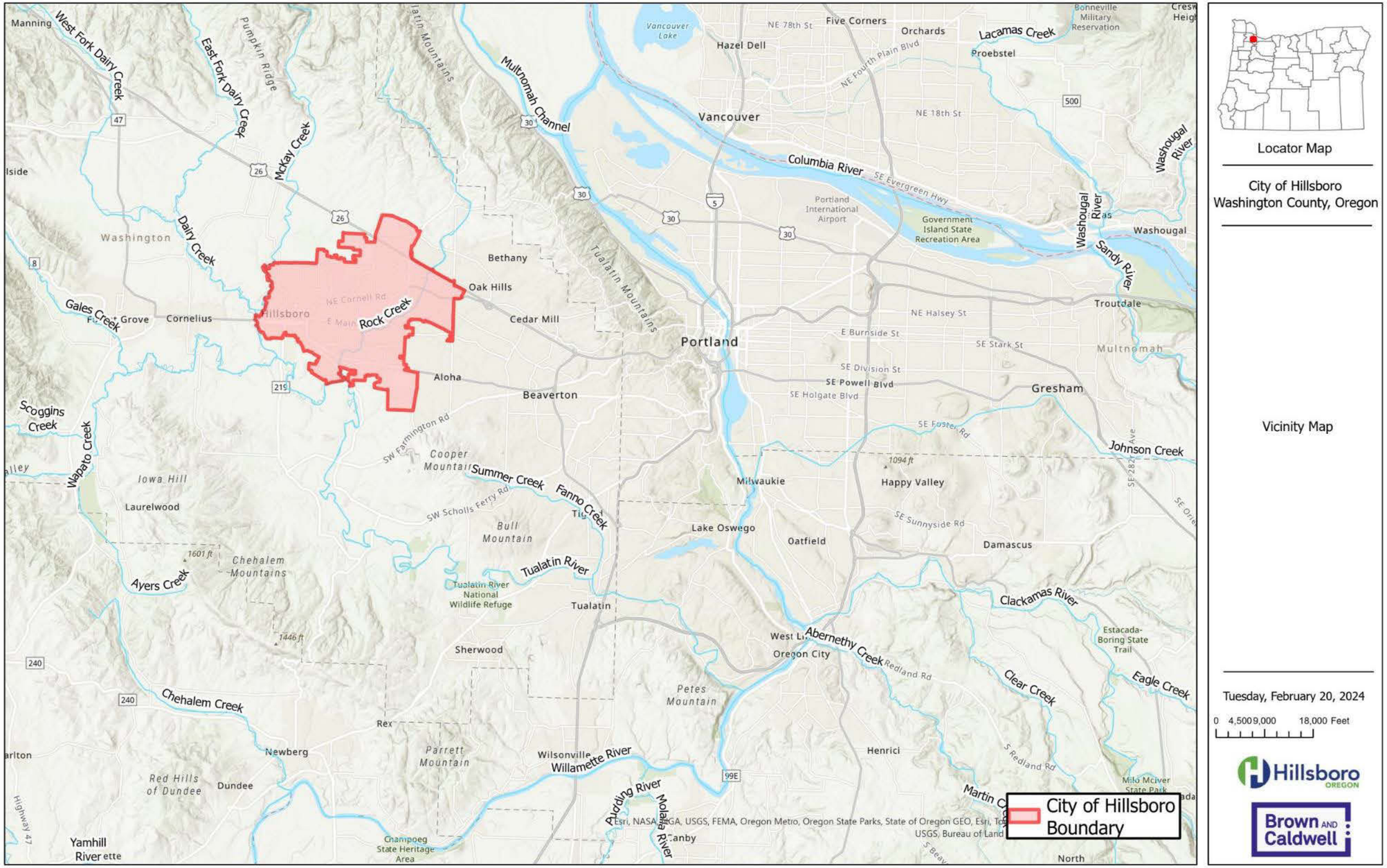

Figure 2-2. Hillsboro vicinity map

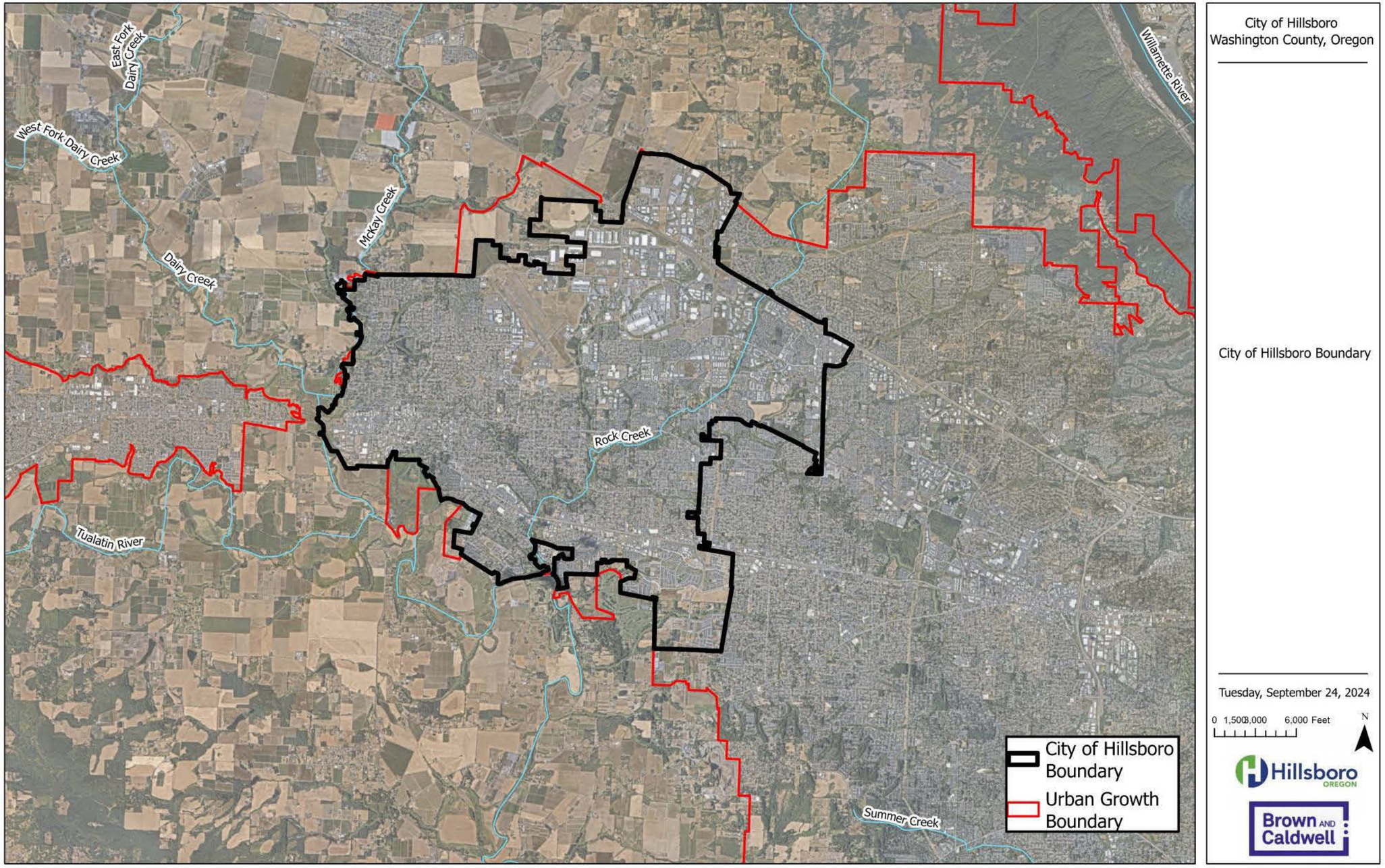

Figure 2-3. Hillsboro city limits and urban growth boundary

2.2 Topography

The City is primarily on a low, mildly sloped terrain above several adjacent major streams: Dairy Creek and McKay Creek to the west, Dawson Creek, Rock Creek, Glencoe Swale and Beaverton Creek to the northeast, and Butternut Creek to the southeast which all ultimately discharge to the Tualatin River to the south. Turner Creek travels from the northwest to the southeast portions of Hillsboro and is surrounded by greenspace and ultimately flows into Rock Creek. Ground elevations range from 120 feet above mean sea level (MSL) at the Tualatin River and the lower floodplains of Rock and Butternut Creeks, to approximately 250 feet above MSL in the northeast, where the land rises toward the Tualatin Mountains (commonly known as the west hills of Portland) along NW Cornelius Pass Road.

The Natural Resource Conservation Service (NRCS) classifies soils in the United States. Approximately 40 percent of the soils in the planning area are somewhat poorly drained soils found on valley terraces. Approximately 17 percent of the soils in the area are moderately well-drained soils on valley terraces (NCRS, 2019). The hazard of erosion of these soils is considered slight to moderate (NCRS, 1982). The soils present adjacent to Turner Creek, Glencoe Swale, Dawson Creek and low-lying areas near the Tualatin River are characterized as having a very slow infiltration rate and high runoff potential when thoroughly wet (NCRS Web Soil Survey, Hydrologic Soil Group browser).

2.3 Seismic Considerations

A major contributor to the seismic hazard in western Oregon is the Cascadia Subduction Zone (CSZ) that lies off the coast of Northern California, Oregon, Washington, and British Columbia. The CSZ is an active plate boundary from which seismologists anticipate strong shaking from a CSZ earthquake. The City's Comprehensive Plan acknowledges, out of the potential natural hazards, Hillsboro is most vulnerable to earthquakes. Nearly half of all structures in the city were built in or before 1980, using construction techniques now known to be inadequate in a seismic event. The City is actively planning to retrofit critical public facilities, including City and regional infrastructure such as transportation routes, bridges, water systems, and utilities.

The Hillsboro Comprehensive Plan (COH, 2018) includes goals to address natural hazards by minimizing the impacts on people and property, improving hazard preparation, improving coordination between public and private partners, supporting plans for greater urban resilience, and supporting hazard mitigation planning. A Comprehensive Plan policy relevant to seismic considerations and sanitary sewer collection system specifies providing infrastructure redundancies to reduce service down times and expedite recovery.

To align with the broader seismic preparation and planning goals of the City, a separate budget, planned for BY 2026–2028, for seismic planning of the sanitary system has been incorporated into the Capital Improvement Plan detailed in Section 6 (CIP 19). The seismic preparation planning activities will focus on five goals related to natural hazards: minimizing risk, increasing preparedness, improving coordination, building resilience, and mitigating hazards.

Other utilities within the City have started evaluating seismic resilience. For the past several years, Hillsboro's Water Department has been taking proactive steps to minimize the impact a major earthquake would have on the water system through pipeline design and retrofit decisions, evaluation of current level of seismic resilience, and improved emergency management. The City's 2019 Water Master Plan includes an assessment of the City's seismic resilience in relation to water infrastructure levels of service (LOS), performance criteria and a gap analysis between LOS goals, and current performance estimates. The 2019 plan also included a limited geotechnical and

vulnerability assessment on the City's backbone water infrastructure to understand system performance following a major earthquake. This assessment informed proposed changes to design standards, retrofit recommendations, and emergency response planning to increase seismic resiliency of the water system. The Water Master Plan includes an in-depth hazard analysis for the Hillsboro area.

CWS has also been considering seismic resilience. CWS formulated an approach to seismic resilience in its East Basin Facility Plan[1]. The East Basin Plan included a review of the seismic hazards in the greater "East Basin". The major conclusions from the geotechnical seismic hazards assessment from the East Basin Facility Plan is that it is not feasible to seismically retrofit existing assets because the vast majority of the assets are located in the seismic hazard zone. Instead, any new or improved pipelines should be designed to address seismic hazards. CWS is currently conducting a similar study for the West Basin Facility Plan; the "West Basin" area which is defined as the western portion of the district and includes Rock Creek, Hillsboro, and Forest Grove Wastewater Treatment Facilities. The City plans to review these findings when they are available and incorporate them into the City's CIP planning as appropriate.

2.4 Climate and Rainfall

The city's climate is moderated by a marine influence from the Pacific Ocean and is characterized by cool, wet winters, and warm, dry summers. Precipitation primarily occurs during the winter months, with most precipitation falling between October and May. On average, 40 inches of precipitation falls annually in the city. This occasionally includes snowfall. The normal mean temperature is 52 degrees Fahrenheit (°F) and ranges from an average winter low of 32 °F to an average summer high of 81 °F.

According to the Washington County National Hazard Mitigation Plan (NHMP), the city of Hillsboro is vulnerable to multiple climate threats, including rainfall flooding, extreme heat, winter storms, wildfires, and earthquakes. Extreme rainfall is expected to become more intense and frequent with climate change, resulting in increased flood magnitudes. Hillsboro's historical flood risk is "high" according to the NHMP, with a high probability of future flooding. Because the City's sewer system conveys only sanitary flows (a separate system collects stormwater flows), the primary impact of increased rainfall and flooding events is increased I/I to the sanitary sewer collection system. Due to this characterization, when working with CWS regarding capacity planning, additional I/I may need to be accounted for in future capital projects.

2.5 Population and Growth

Situated west of the Portland Metro Area, Hillsboro is one of the fastest growing cities in the area. It is the fifth largest city in Oregon[2] and is a technology and manufacturing hub for the Portland Metro region. It has earned a reputation as a highly desirable place to live. Job growth in Hillsboro is projected to continue to increase due to the high concentrations of key jobs driving economic expansion, examples include engineering, software development, and skilled production technicians.

As of 2022, the city of Hillsboro has a population of about 110,000[3]. Since 2010, the population has grown by 16 percent. In 2016, the City broke ground on South Hillsboro, the largest master-planned

[1] Clean Water Services East Basin Master Plan, 2021.

[2] City of Hillsboro Demographic and Economic Data, Demographic & Economic Data | City of Hillsboro, OR

[3] City of Hillsboro Data Mosaic, 2022.

community in Oregon's history, with housing for 20,000 new residents (2018) Population growth has been projected to continue for several areas within the City as noted in the Hillsboro Comprehensive Plan (COH, 2018). The areas identified for future population growth and higher residential densities are the Witch Hazel Village, Amber Glen, North Hillsboro Industrial Area, and South Hillsboro.

System growth was accounted for in this SSMP in the O&M analysis by assuming increases in linear feet of pipe for maintenance consistent with ongoing growth levels. The staffing analysis assumed a pipe inventory increase of 12 percent over 10 years. Upsizing was included in capital projects developed for this SSMP in areas where staff identified known issues. Updated hydraulic modeling to understand capacity needs is currently being conducted by CWS and was not available during preparation of this SSMP. Capacity related needs for the City of Hillsboro identified by CWS' analysis will be incorporated into future SSMP updates as appropriate.

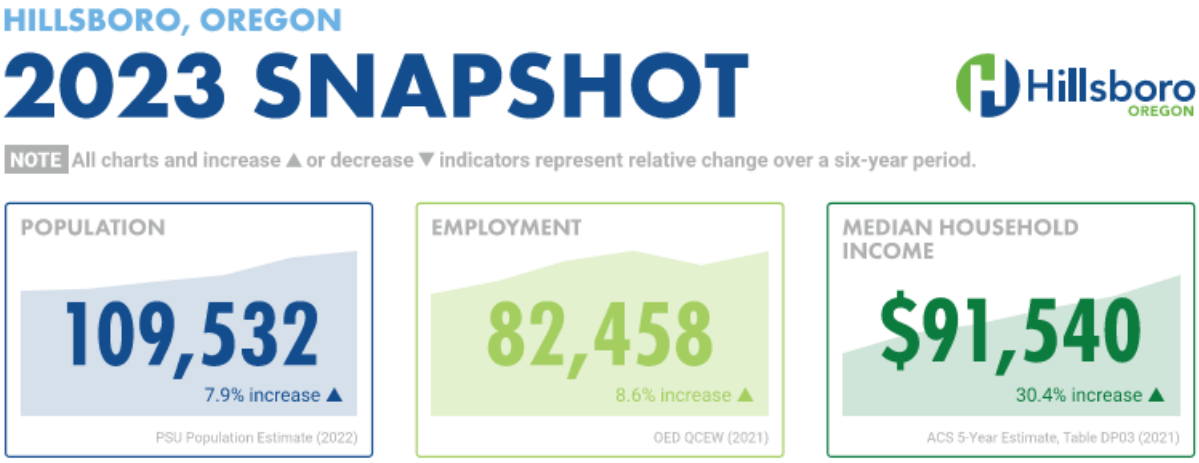

Figure 2-4. Hillsboro population snapshot

Section 3

Sanitary Sewer System

This section describes the City of Hillsboro's sanitary sewer collection system and detail the responsibilities of the City's Public Works Storm and Sanitary Sewer Division and the users that discharge to the City's collection system.

3.1 Collection System Overview

The City's sanitary sewer collection system services approximately 110,000 people spread across an area of approximately 26 square miles. The City owns and maintains over 300 miles of gravity pipeline ranging in size from 4 to 24 inches in diameter, and 8,300 manholes. CWS owns and maintains pipelines larger than 24 inches in diameter and all force mains and pump stations.

3.1.1 System Age and Size

With portions of the collection system built as early as the 1910s, some of the City's gravity sewer mains are nearing the end of useful life. Concrete pipes have a typical lifespan of 50- to 100-years depending on whether the pipe is reinforced and system conditions, which may exacerbate corrosion of concrete materials. The pipes constructed prior to 1940, approximately 5 percent of the City's system, are due for rehabilitation or replacement (Figure 3-1). Though currently within the anticipated useful life, pipes constructed prior to 1950, approximately 7 percent of the system, will be nearing the window for replacement within the next 20–year planning period. Figure 3-2 represents a heat map showing the gravity sewer assets located within City boundary by age. The oldest pipes were installed in or before the 1930s and make up a large concentration of the downtown Hillsboro sewer infrastructure.

Overall, the City's collection system is relatively young with more than 50 percent of the pipes constructed since 1990. Newer pipe becomes more prevalent as one moves farther away from the downtown area. These pipes will not need replacement for several more decades.

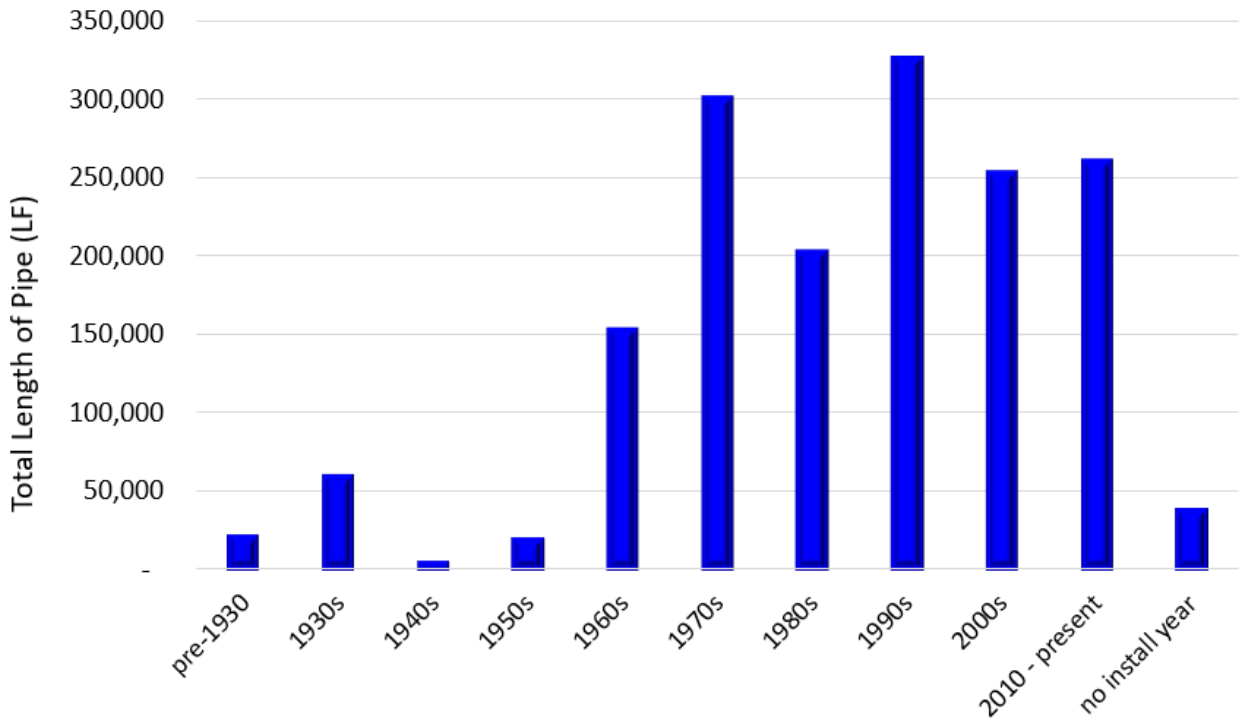

Figure 3-1. Pipe distribution by installation year

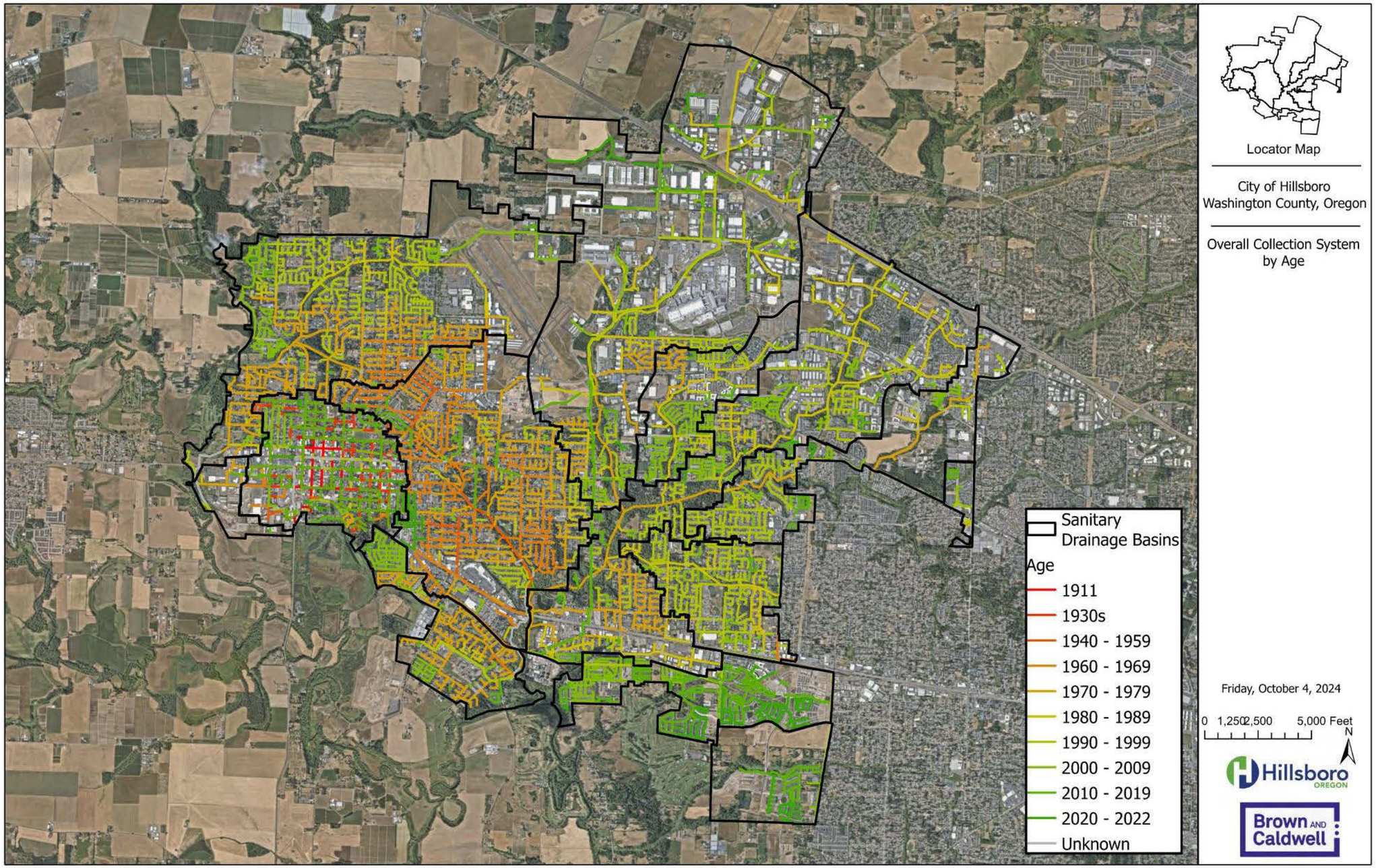

Figure 3-2. Sanitary sewer system by age

Figure 3-4 shows the size distribution of pipes comprising the sanitary sewer system. The distribution of pipe sizes in use throughout the City is based on data extracted from the City's GIS database. Approximately 87 percent of the city's sanitary sewer system consists of pipe equal to and less than 10 inches in diameter. (Pipes 24 inches and larger are owned and maintained by CWS). The remaining 13 percent collect all the flow in the system and convey the flow to major trunklines and to the two wastewater treatment facilities.

3.1.2 Pipe Material

Data collected and maintained in the City's extensive GIS database, provides a characterization of the common pipe material comprising the sanitary sewer gravity conveyance system. Figure 3-3 illustrates the distribution of pipe materials where the material data was available. A large majority of pipe is PVC, which is resistant to corrosion and is typically used in newer, smaller diameter sewer installations. Clay pipe material in the City's system correlates to aging pipe assets, mainly downtown. HDPE materials reflect more recent construction where the City has been rehabilitating sewer pipes that failed or are at the end of their useful life. HDPE is typically used in rehabilitation methods such as pipe bursting where the existing pipe (usually concrete) is burst open and a new (HDPE) pipe is pulled into its place. HDPE pipe is also corrosion resistant. Plastic pipe (HDPE and PVC) represents new pipe and newly rehabilitated pipe which can be found both in the newer and older parts of Hillsboro (Figure 3-5).

Concrete and clay pipe material were, and still are, common pipe materials. Large diameter pipe (18 inches and greater) tends to be constructed of reinforced concrete because of its strength. However, concrete is susceptible to hydrogen sulfide (H2S) corrosion from wastewater gases. Clay pipe is resistant to corrosion. However, if not installed properly, it can be easily cracked during and after construction, leading to broken pipe, infiltration, and soils washing into the pipe through holes, thus further destabilizing the soil around the pipe and compromising the pipe integrity. In the City's system, these pipe materials represent older pipes, the majority of which are located in the downtown area and were installed before 1940 (Figure 3-5).

Ductile iron (DI) pipe material is not typically used in gravity sanitary sewers unless it is coated on the inside with a corrosion resistant material.

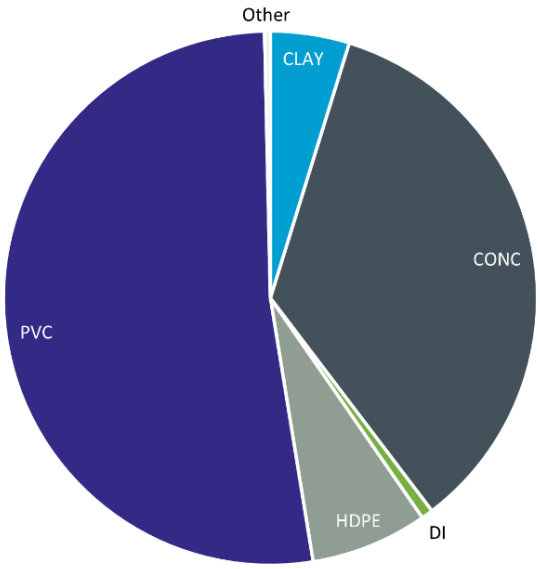

Figure 3-3. Pipe material distribution

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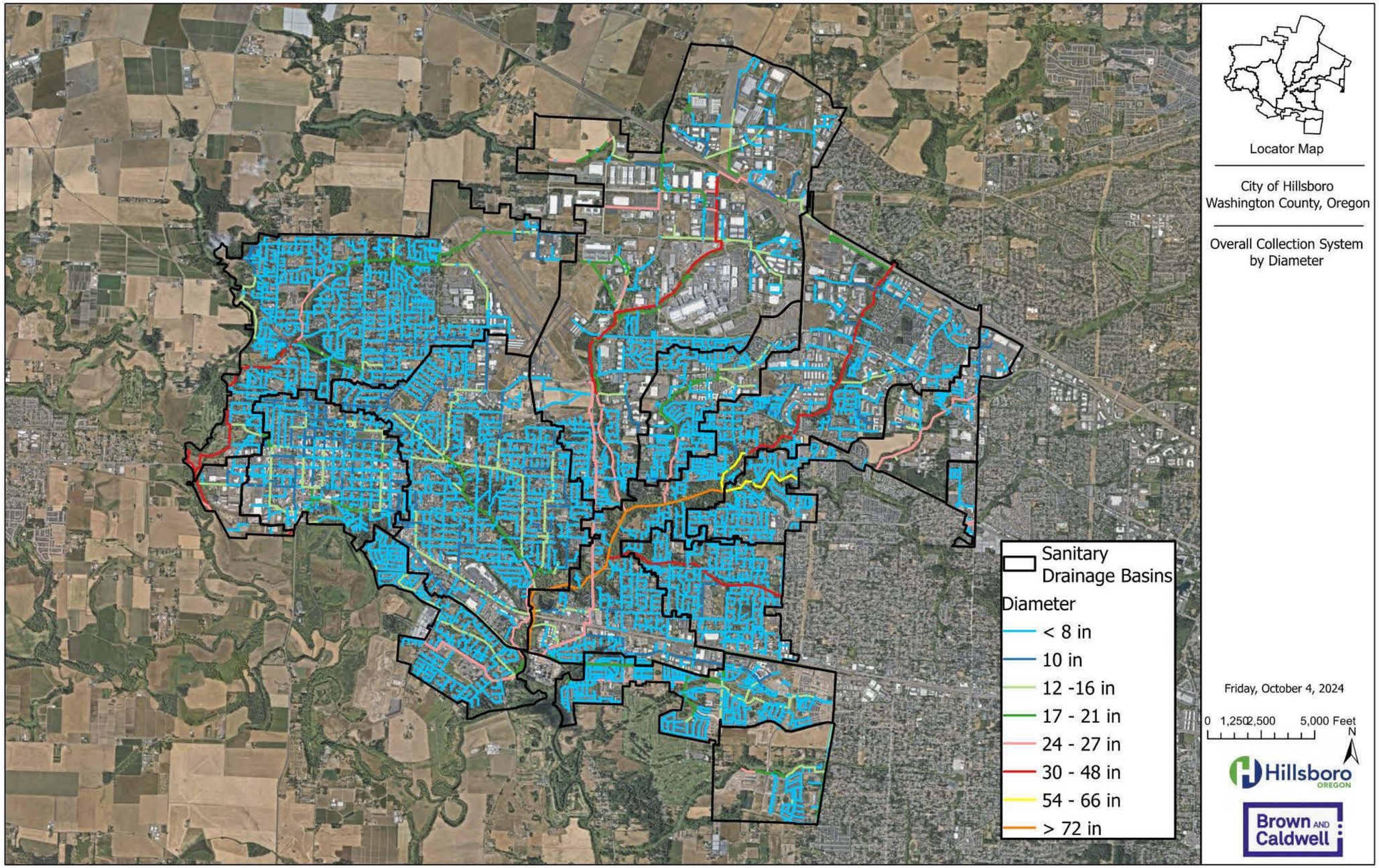

Figure 3-4. Sanitary sewer system by diameter

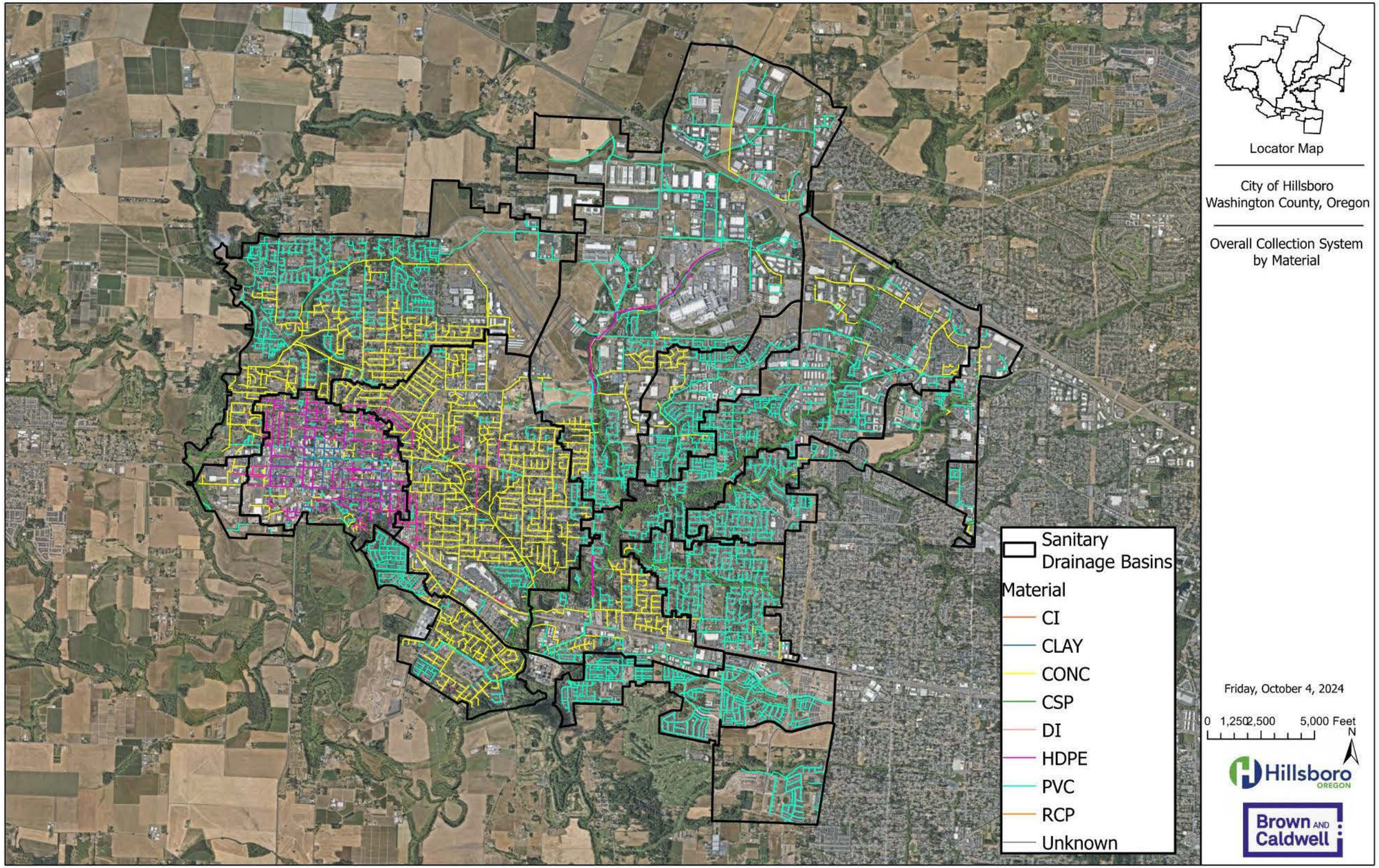

Figure 3-5. Sanitary sewer system by material

3.2 Sources of Flows

The quality and quantity of wastewater can significantly vary based on land use. Residential wastewater typically has organic matter, some fats, oils, and greases, and substances from household activities. Industrial wastewater may have higher volumes and can contain byproducts from manufacturing processes or other industrial activities that result higher concentrations of pollutants. Industrial wastewater can be more corrosive to pipes than residential wastewater. However, this varies widely depending on the type of industry. The City has a mix of residential and industrial sources of flows.

3.2.1 Residential Users

Low-density residential is the single largest land use type in Hillsboro, accounting for more than a quarter of Hillsboro's land area. Development within this land use designation is homogenous, consisting solely of suburban style neighborhoods made up of single-family homes. Medium-density, high-density, and mid-rise residential areas are dispersed throughout Hillsboro. Housing in these residential areas range from detached single-family homes and attached townhouses to three-to-five-story multifamily buildings. These different land use designations typically have different rates of wastewater production. Single-family homes typically produce more wastewater than multifamily homes on a per capita basis due to the presence of more water-consuming appliances (i.e., multiple bathrooms, dishwasher, clothes washer).

3.2.2 Industrial Users

The North Hillsboro Industrial District is an established industrial area populated by business parks and corporate campuses. The area is geared toward technology and manufacturing companies. The Industrial District is located just south of Highway 26, east of Cornelius Pass Road and west of Jackson School Road. The Industrial District is also adjacent to the Hillsboro Airport on the north side of Hillsboro. Major industrial customers include companies such as Intel, Qorvo, Thermo Fisher Scientific, Genetech, and others.

Depending on the industry, industrial wastewater can be more corrosive than domestic wastewater. Corrosivity has negative impacts on pipeline material, specifically concrete pipe which when exposed to industrial waste, can spald and crack. This corrosivity can cause segments of pipe to require replacement more frequently. The City has prioritized replacing concrete pipes which convey industrial wastewater with plastic (HDPE or PVC) pipe. Figure 3-6 indicates the current locations of the concrete pipes conveying industrial wastewater to date. The City has been routinely replacing pipe segments with upgraded materials to support these industries, and plans to continue doing so.

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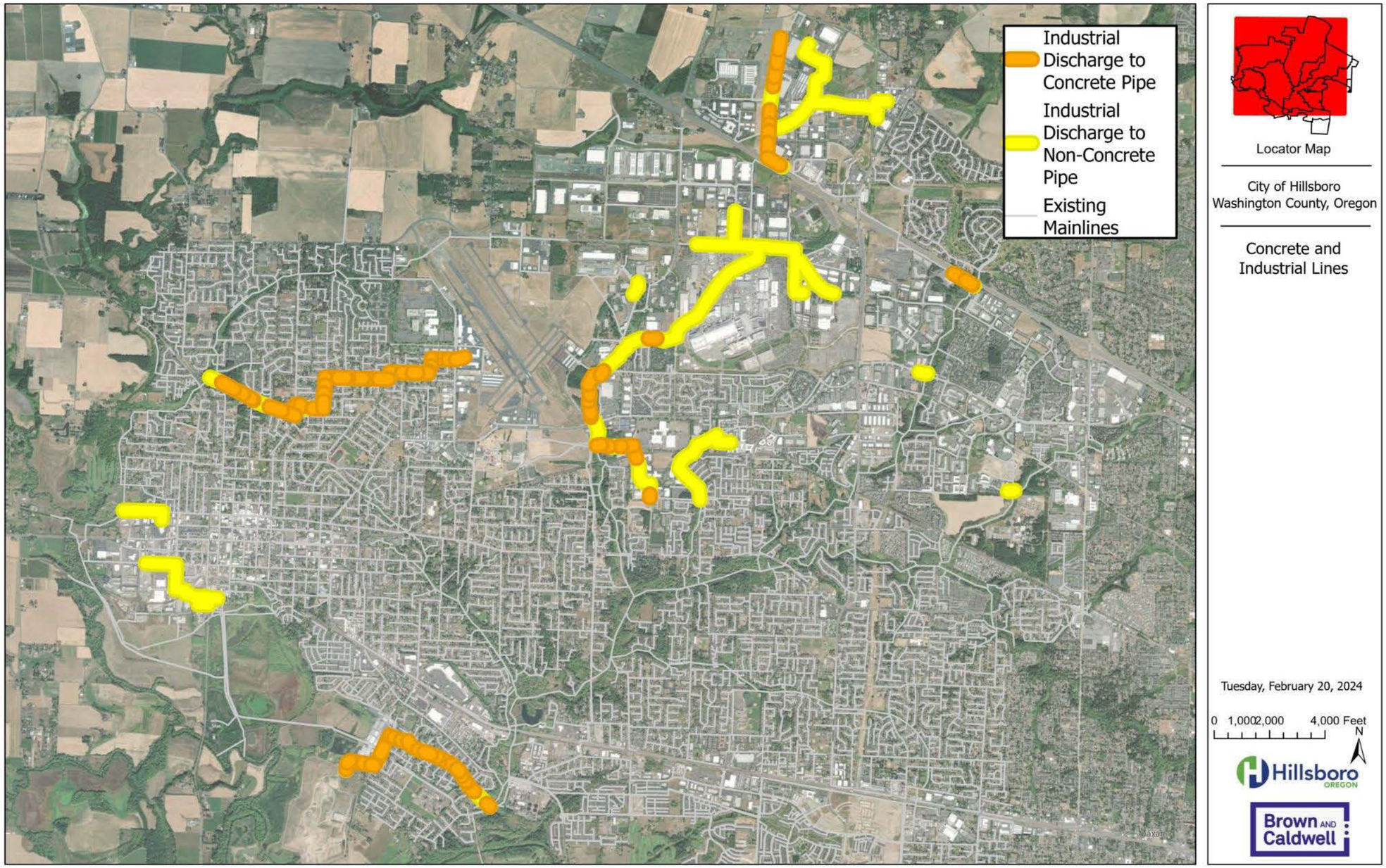

Figure 3-6. Pipelines conveying industrial wastewater

3.2.3 Septic and Private Sewer System Conversion

Before centralized wastewater treatment was established, many residents were on septic systems. As wastewater treatment facilities were built and collection systems branched out to surrounding areas, individual homes were connected, and septic tanks abandoned. A septic tank is a buried, watertight tank constructed to receive and partially treat raw domestic sanitary wastewater. Heavy solids settle to the bottom of the tank and grease and lighter solids float to the top. The solids stay in the tank while the decanted wastewater is discharged to a nearby drainfield. Solids are periodically vacuumed out of the tank by septic maintenance companies. In the drainfield, the wastewater slowly percolates through the soil, ultimately discharging to groundwater. The soil naturally removes bacteria and nutrients. When septic systems are not designed or installed to standards, or are not maintained properly, the bacteria and nutrients in domestic wastewater can negatively impact nearby drinking water sources and surface waters.

The City's long-term goal is to reduce the number of residents on septic systems within the City's service area. There are a few known pockets of residents on septic systems. The City is working to gather information on the location and number of septic systems so the Division can prioritize those areas for connection.

There are also a small number of privately-owned sewer systems within the city. These sewer systems are typically owned by entities such as Homeowners Associations (HOAs) and typically serve a whole neighborhood. The HOA organization is responsible for maintaining the sewer system. These systems eventually discharge into the City's sewer system. The City's policy is to work with private system owners to bring these systems up to city standards before the City takes ownership. The City is currently collecting data on the location and condition of these systems in order to plan for and prioritize their conversion.

3.3 Capacity Maintenance and Operations Manual

A Capacity Maintenance and Operations Manual (CMOM), as defined by the United States Environmental Protection Agency (EPA), is a flexible, dynamic framework for municipalities to identify and incorporate widely-accepted wastewater industry practices to:

- Better manage, operate, and maintain collection systems
- Investigate capacity constrained areas of the collection system
- Respond to SSO events

The CMOM approach helps municipal utility operators provide a high level of services to customers and reduce regulatory noncompliance. CMOM can help utilities optimize use of human and material resources by shifting maintenance activities from "reactive" to "predictive" often leading to cost savings through avoided overtime, emergency construction costs, increased insurance premiums, and the possibility of lawsuits. CMOM information and documentation can also help improve communications with the public, other municipal works and regional planning organizations, and regulators. In CMOM planning, the utility selects performance goal targets and designs CMOM activities to meet those goals. The CMOM planning framework covers O&M planning, capacity assessment and assurance, CIP planning, and financial management planning. Information collection and management practices are used to track how well each CMOM activity is meeting the performance goals and whether overall system efficiency is improving.

The IGA between the City and CWS acknowledges that CWS and the cities it serves have created metrics, processes, and established communication protocols that ensure compliance with the Permit requirements related to the sanitary sewer system. This information has not yet been consolidated into a single CMOM document; however, the programs as they exist and taken as a whole, provide the elements of a CMOM program. The City does not currently have an individual CMOM program.

The City is currently performing a self-assessment to evaluate its sanitary sewer programs and compare them to standard CMOM activities. This self-assessment phase is the first step in the CMOM process recommended by the EPA. The outcome of the first phase is likely to include performance-based maintenance metrics and standards and will help identify areas the City is performing well in and areas where improvement is needed. The second phase of the CMOM process will likely include more documentation of the program to include training plans, established performance metrics, and a program report. The City expects to finish the two phases of their CMOM process by the end of 2025.

3.4 Sanitary Sewer Basins

The City's sanitary sewer system is organized into 13 sewer basins (Figure 3-7). Sewer basin boundaries are defined by gravity and topography. The City's maintenance and operations work orders locations are based on these 13 sewer basin.

1. Dawson Creek: contains a large industrial park area in the northern part of Hillsboro. Wastewater from the Dawson Creek basin are treated at the Rock Creek Advanced Wastewater Treatment Facility.
2. North Side: located in the northwestern quadrant of Hillsboro, the North Side sewer basin conveys flow to the Hillsboro Water Resource Recovery Facility.
3. Orenco: Wastewater from the Orenco basin are treated at the Rock Creek Advanced Wastewater Treatment Facility.
4. Rock Creek: located in the northeastern quadrant of Hillsboro, the sewer basin contains Rock Creek and a portion of the TV Highway. Flows from this sewer basin are treated at the Rock Creek Advanced Wastewater Treatment Facility.
5. Bronson Creek: Wastewater from the Bronson Creek basin are treated at the Rock Creek Advanced Wastewater Treatment Facility.
6. Beaverton Creek: Wastewater from the Beaverton Creek basin are treated at the Rock Creek Advanced Wastewater Treatment Facility.
7. Reedville Creek: Wastewater from the Reedville Creek basin are treated at the Rock Creek Advanced Wastewater Treatment Facility.
8. River Davis Road PS: Wastewater from the River Davis Road PS basin are treated at the Rock Creek Advanced Wastewater Treatment Facility.
9. Butternut Creek: Wastewater from the Butternut Creek basin are treated at the Rock Creek Advanced Wastewater Treatment Facility.
10. The Meadows: Wastewater from The Meadows basin are treated at the Rock Creek Advanced Wastewater Treatment Facility.
11. Turner Creek: is a large sewer basin located in west central Hillsboro which contains a portion of Turner Creek. The Turner Creek Interceptor is a 15- to 24-inch-diameter trunkline that was constructed within the Turner Creek corridor. The trunkline ultimately outfalls to the Rock Creek Advanced Wastewater Treatment Facility.
12. Hillsboro Plant: located in the southwestern portion of Hillsboro, flows in this basin are conveyed to the Hillsboro Water Resource Recovery Facility. This basin includes a portion of the concrete and clay pipes installed in 1911 and 1936.
13. McKay Creek: is a small basin also located in the southwestern portion of Hillsboro. Flows are conveyed to the nearby Hillsboro Water Resource Recovery Facility. McKay Creek flows through this basin.

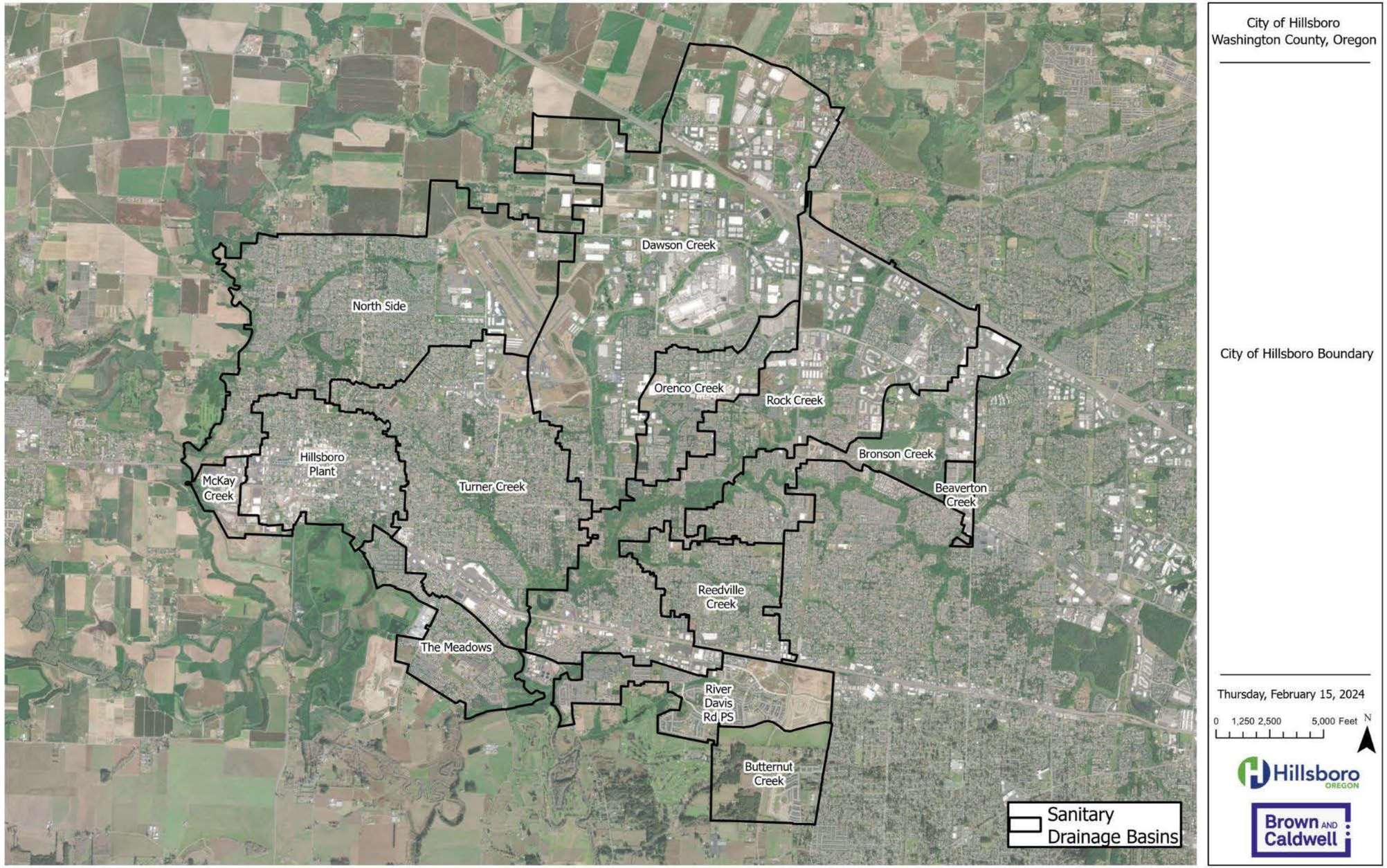

Figure 3-7. Sanitary sewer basins

Section 4

Capital Planning Process

The City has an immediate need to more comprehensively understand the system's characteristics in order to prioritize investments and staffing for the next budgeting cycle. The capital projects and recommendations developed for this plan are based on existing conditions and known issues in the sanitary sewer system. The capacity analysis currently underway by CWS was not available to the City during preparation of this SSMP. Findings related to City capacity needs will be incorporated into future SSMPs as appropriate.

For this SSMP, BC performed a risk-based assessment of existing assets and conducted workshops with City staff to vet the condition assessment and incorporate other known system issues. First, BC conducted interviews to establish staff priorities. Trained and certified PACP staff reviewed and assessed the City's geodata and historic inspection PACP scoring data to identify the pipe segments with pipeline defects eligible for rehabilitation or replacement.

An assessment of the risk associated with each pipe segment was used to identify priority pipe segments. These priority pipe segments were grouped based on location to form capital projects. The projects were vetted and prioritized with operations and maintenance staff, culminating in a 10-year CIP developed with the support and collaboration of City staff.

The overall process is shown in Figure 4-1.

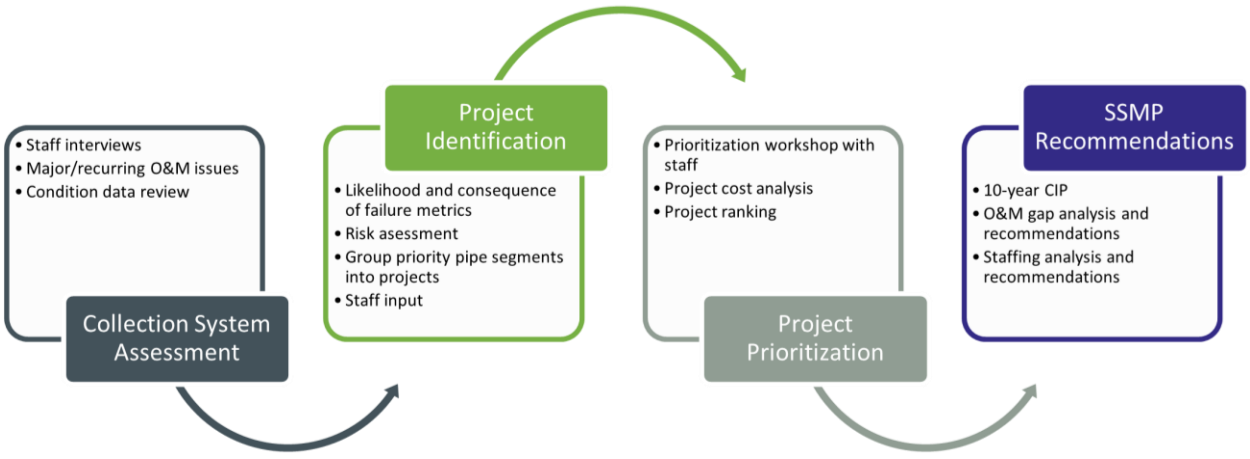

Figure 4-1 CIP planning process

4.1 Collection System Assessment

The City regularly inspects the condition of the collection system and records condition information in their GIS database.

4.1.1 Staff Interviews

Brown and Caldwell kicked off the SSMP development process by conducting interviews with City staff in July 2022 to understand known sewer issues and identify their top sanitary sewer priorities. The top issues and priorities identified in staff interview are shown graphically in Figure 4-2. Many of the issues are related to aging infrastructure with the following issues inflow and infiltration, sags, and bellies, and manhole rehabilitation. Turner Creek was identified separately as a priority due to the large amount of surcharging seen after rainfall events as well as the limited access to individual manholes along the trunkline.

Figure 4-2. Priorities identified during 2022 department interviews

4.1.2 Condition Assessment Data Review

Following the interviews, the pipeline condition assessment data in Hillsboro's geodatabase was filtered to identify pipe segments reflecting these concerns. The City inspects the collection system and uses the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program© (PACP) to identify defects and assign pipes with condition scores.

During the review of the collected data, in 2022, special attention was given to defective pipes with NASSCO PACP condition grades of four and five, and pipes with severe defects.

Table 4-1 includes priority defects identified in a series of workshops with City of Hillsboro staff. The priority defects listed comprise 13 of the approximately 220 PACP defect codes. These priority defects were identified by City staff as requiring increased attention because they correlate with some of the most significant issues in the Hillsboro system: I/I, sag/bellies, FOG, and cleaning hot spots.

Table 4 1. Priority Sewer Defects			
Description	NASSCO Code	Classification	Relevance
Deformed	D	Structural	Indicates potential pipeline failure and collapse
Deposits attached grease	DAGS	O&M	Indicates FOG
Deposits settled gravel	DSGV	O&M	Can be indication of a hole in the pipe
Deposits settled other	DSZ	O&M	Can be indication of FOG, a hole in the pipe, or larger obstacles inhibiting flow
Hole soil visible	HSV	Structural	Indicates potential for I/I and potential pipeline failure and collapse
Hole void visible	HVV	Structural	Indicates potential for I/I and potential pipeline failure and collapse
Miscellaneous camera underwater	MCU	Miscellaneous	Potential indicator of sag
Miscellaneous survey abandoned	MSA	Miscellaneous	Potential indicator of sag or pipeline obstruction
Miscellaneous water level sag	MWLS	Miscellaneous	Indicator of sag
Obstacle/Obstruction other objects	OBZ	O&M	Potential cleaning hot spot
Root ball barrel	RBB	O&M	Pipeline obstruction and hot spot indicator
Root ball joint	RBJ	O&M	Pipeline obstruction and hot spot indicator
Root ball lateral	RBL	O&M	Pipeline obstruction and hot spot indicator

4.2 Project Identification

Brown and Caldwell used the City's condition assessment information and the following risk assessment process to identify capital projects.

4.2.1 Risk Assessment

Determining assets to prioritize for rehabilitation or replacement involves balancing how likely an asset is to fail with the consequence of that failure on the system, public, and local environment. As assets age, the condition of the asset deteriorates and the probability of failure increases. To manage and prioritize assets nearing the end of their expected lives, the likelihood of failure (LoF) and the consequence of failure (CoF) can be used to quantitatively estimate whether the combined risk justifies proactive actions.

The LoF can also be described as the probability of asset failure and is based on asset age, expected life, and condition. The CoF considers the economic, environmental, and social costs should the asset fail and the impact on organizational objectives, level of service, and/or stakeholders resulting from a failure. The final qualitative risk is then estimated by multiplying the resulting LoF by the CoF. Rehabilitation and repair decisions and prioritization are based on the asset's risk of failure as described above. Risk can be used to identify assets that are critical to service delivery and can be used to develop guidelines for decisions about the use of resources related to condition assessment, maintenance, rehab/replacement planning, and spending/funding.

The City had existing LoF and CoF metrics, weights, and scoring which were discussed, adjusted and confirmed throughout the planning process in order to prioritize pipes for repair. The LoF and CoF were calculated for every pipe segment in Hillsboro's collection system. The array of resulting total risk scores per pipe segment within Hillsboro's sanitary sewer system can be seen on Figure 4-3.

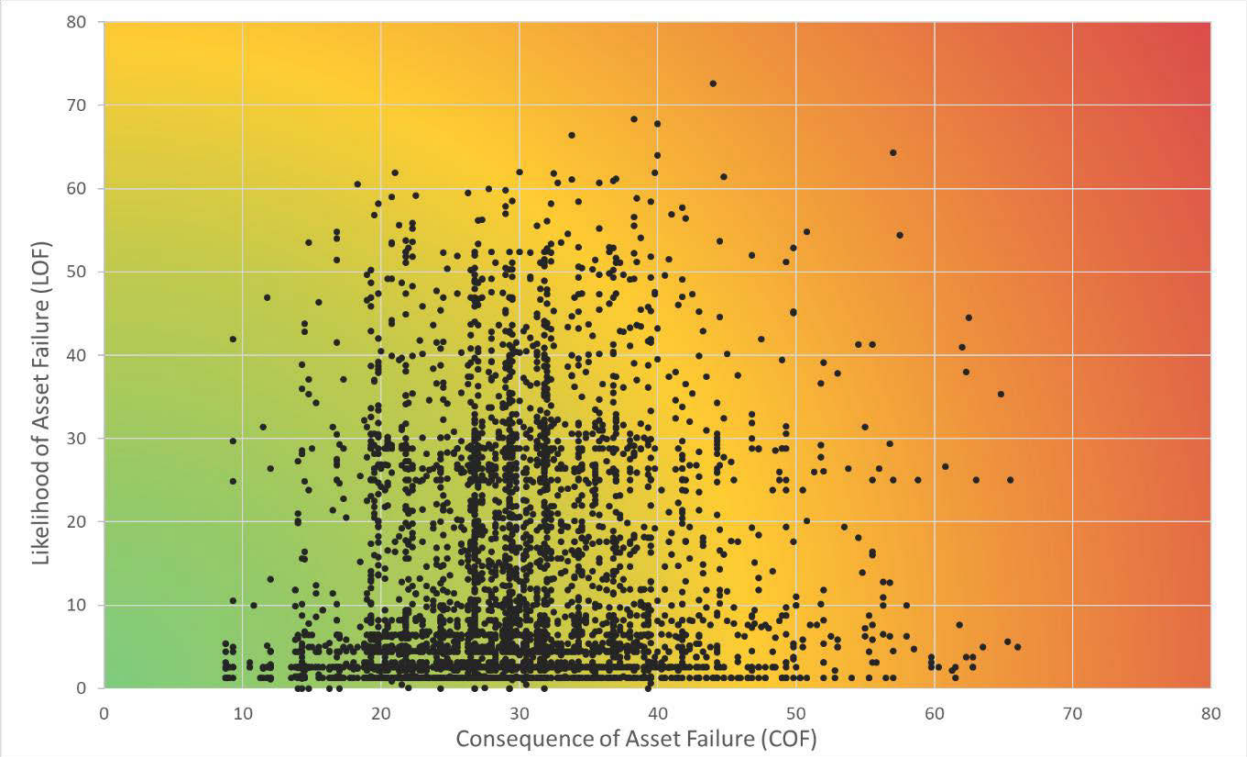

Figure 4-3. Hillsboro's asset risk range

Based on the results of this analysis, approximately 80 percent of Hillsboro's gravity sewer pipe infrastructure is considered low to medium risk (green and green/yellow area in Figure 4-3). Segments falling into the high risk and medium risk portions of the graphic were identified and filtered for possible inclusion in rehabilitation or replacement projects.

4.2.2 Capital Project Development

To create a preliminary list of capital improvement projects, the highest risk pipe segments were identified and grouped based on location. BC collaborated with the Stormwater and Sanitary Sewer Division staff through additional workshops to confirm the identified segments were aligned with institutional knowledge, identify additional surrounding segments to be included, and group pipe segments into projects.

Over the course of three workshops, Hillsboro staff provided feedback, identified gaps, and reviewed the proposed projects with operational and engineering judgement to confirm projects for CIP inclusion. A summary table of the purpose, discussion, and outcomes of these three workshops is included at the end of Appendix A. The analysis and subsequent workshops resulted in the identification of fifteen capital projects as summarized in Table 4-2 These projects will increase the resiliency and the reliability of the City's collection system through increased maintenance, replacement, and rehabilitation. Fact sheets for each of these projects, except Inflow and Infiltration (1911/1936) which is currently underway, are included in Appendix A.

Table 4 2. Capital Projects Identification		
Project Title	**Description and Objectives**	**Includes upsizing for capacity improvements**
Inflow and Infiltration (1911/1936)	Replacement of concrete and clay pipes installed in 1911 and 1936, primarily located in the North Side, Turner Creek, Hillsboro Plant and McKay Creek drainage basins. Project is currently in progress with construction planned for 2024.	
Main Street	Rehabilitate ~2,000 feet of 1960s era pipe and replace two manholes to reduce I/I and improve system resilience	
NE Harewood Street	Replace about 500 feet of concrete pipe in critical conveyance segment with known sagging issues within a wetland area	
TV HWY	Rehabilitate 360 feet of pipe to protect nearby Rock Creek from potential pipe breaks and overflows.	✓
Emma Jones	Rehabilitate ~400 feet of 1980s era concrete pipe showing signs of corrosion.	
SE Walnut and SE 14th	Rehabilitate ~2,000 feet of pipe including 1960s era concrete pipe with several priority defects to address aging infrastructure and I/I	
Sunrise Lane	Rehabilitate ~5,000 feet of 1960s era concrete pipe conveying industrial flows.	✓
NW Garibaldi Street	Rehabilitate ~2,000 feet of concrete pipe to reduce the amount of I/I in the McKay Creek Basin and reduce the amount of root intrusion.	
Arrington Court I/I	Rehabilitate ~15,000 feet of concrete pipe to reduce the amount of I/I in the Turner Creek and North Side Basins. This I/I project addresses both gravity mains and connected laterals on a large neighborhood scale.	
NE 25th Avenue	Rehabilitate ~1,500 feet of concrete pipe including broke and deteriorating pipes.	
Rock Creek	Rehabilitate ~3,500 feet of pipe that experience FOG build up and need regular root intrusion treatment.	✓
Lincoln Elementary	Rehabilitate ~700 feet of deteriorating concrete pipe that regularly need root intrusion treatment.	
Walnut Street	Rehabilitate ~500 feet of HDPE pipe that have large sags which trap grease and other debris as the water slows down flowing through the sag.	
HDPE Weld Bead Removal	Remove HDPE weld beads from ~8,500 feet of recently installed HDPE pipe to reduce the friction and potential for backups as waste can get snagged on the beads.	
Replace Aging Concrete Pipes	Systematically replace concrete pipes installed prior to 1950 as the pipe reaches the end of its useful life and before it fails.	

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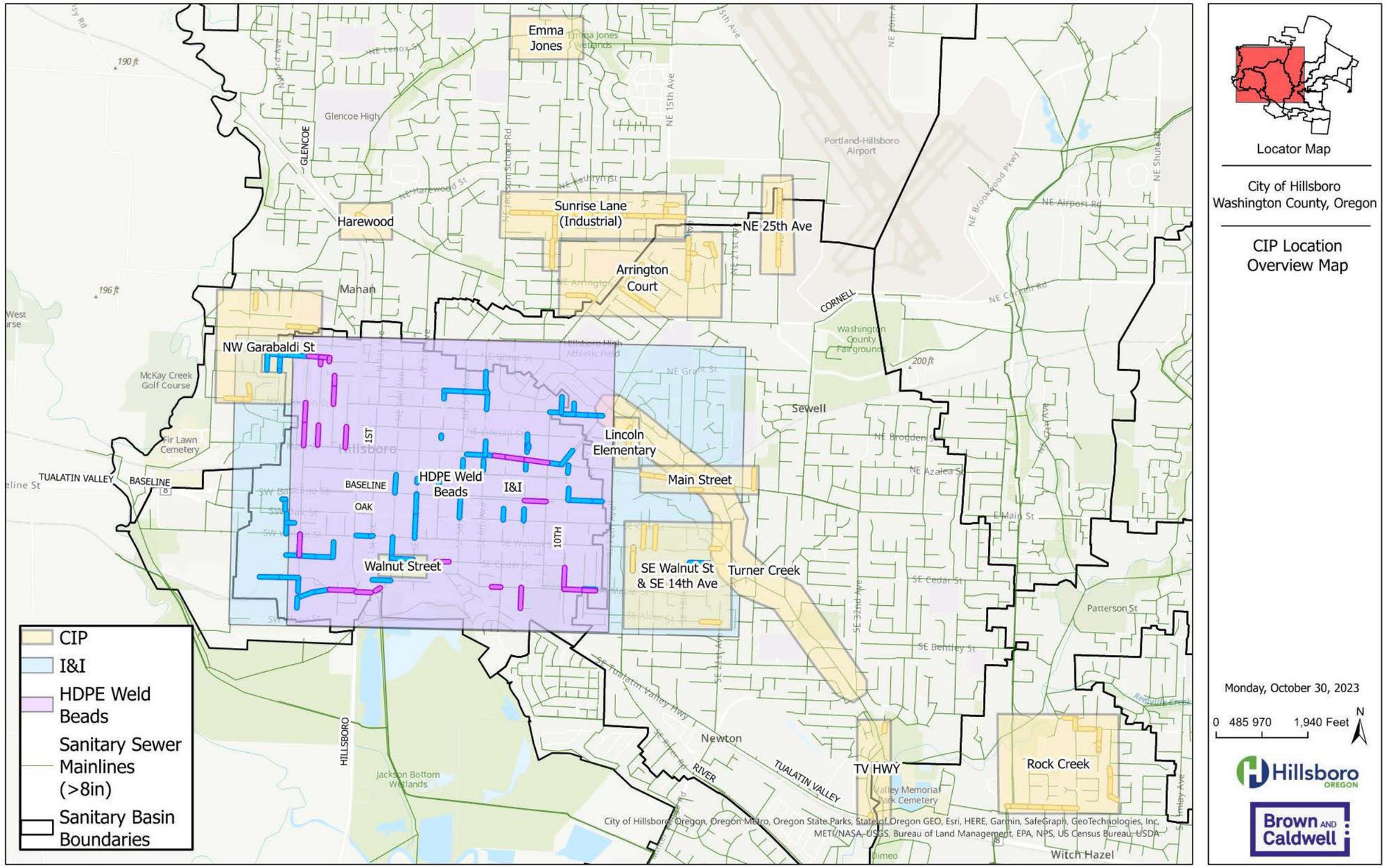
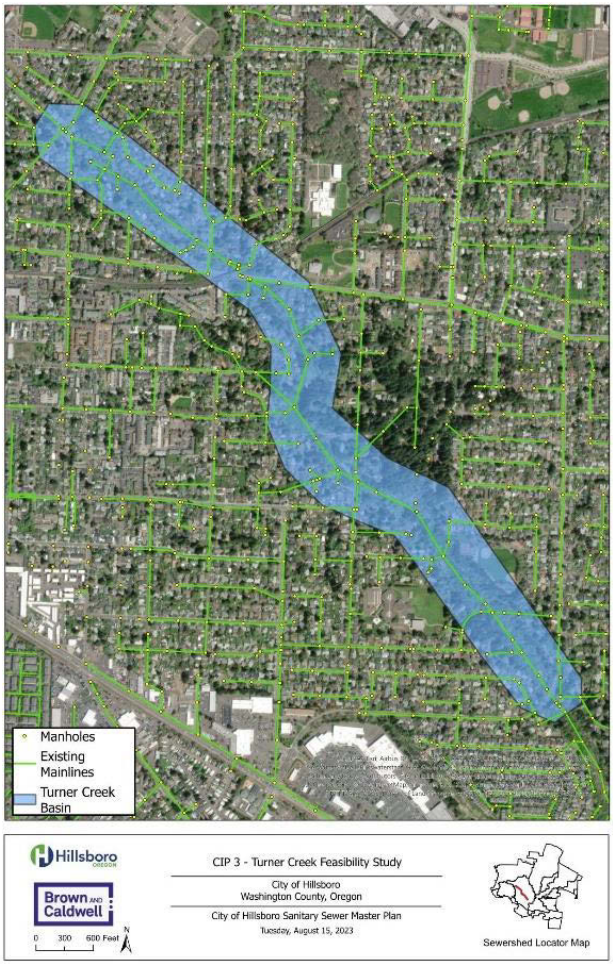


Figure 4-4. Capital improvement project locations

In addition to the identified capital projects, the workshops resulted in the identification of the need for one program and three planning studies for inclusion in the CIP as follows:

- **Manhole Rehabilitation Program.** The City's system includes about 8,300 manholes. Since 2008, the City has been pipe bursting roughly 20,000 linear feet of pipe per year to rehabilitate and replace aging infrastructure. The City's maintenance staff have reported a large number of manholes in need of rehabilitation due to damage from these pipe bursting activities and degradation from hydrogen sulfide gases. Additional concerns at manholes include material settlement, grease fills, and root intrusion. Operations teams are frequently called to respond to manhole related maintenance. This program will set aside funding to conduct condition assessments, review and identify manholes for replacement or rehabilitation, and execute manhole upgrades throughout Hillsboro. The City will select manholes to rehabilitate based on factors such as severity of defects, potential for sanitary sewer overflows, and location. The need for this program was identified as part of capital project planning and in the O&M gap assessment described in Section 5, where it is further discussed.
- **Turner Creek Feasibility Study.** Turner Creek was identified early in the process for increased capacity. The project complexity includes access constraints, varying alternatives for rehabilitation, and CWS partnership. Due to the constraints, Turner Creek rehabilitation will require a feasibility study to identify options and select the best approach for all stakeholders.



The Turner Creek pipeline is a 15- to 24-inch diameter trunkline constructed in the 1960s alongside and within the Turner Creek corridor. The trunkline ultimately outfalls into the Rock Creek Advanced Wastewater Treatment Facility, owned and operated by CWS. Since its original construction, the City has experienced several rainfall events which cause surcharging of this asset and impacts to the upstream collection basin. Lateral connection points, improperly sealed due to age or construction installation techniques, are believed to be a large source of I/I. The City wants to increase the capacity of the segment of the Turner Creek pipeline within its jurisdiction and replace improper lateral connections.

The feasibility study will determine the best construction approach to rehabilitating the trunkline given access difficulties and the surrounding wetlands and sensitive areas. Access to the trunkline is difficult, not only due to its proximity to Turner Creek, but because access to individual manholes requires entrance through private property. These access limitations impact ease of inspections, maintenance activities, and emergency response times.

The feasibility study is expected to include updating the Turner Creek Basin hydraulic model with flow projections from the surrounding area and a business case evaluation to weigh the costs and benefits of various rehabilitation construction methods. The outcome of the study will provide City with an itemization of the options and benefits as well as limitations for future design to rehabilitate or replace the trunkline. This feasibility study will then allow the City to coordinate with CWS and local stakeholders to identify a long-term strategy for this basin and develop an executable plan.

- **Sanitary Sewer Master Plan Update.** The City recognizes the need to regularly update and document sanitary sewer needs to inform the public of upcoming projects. An updated SSMP helps guide the Capital Improvements budget for the upcoming fiscal years and gives COH time to prepare for future expenditures. The updated SSMP will summarize the CIPs completed within the 2024 SSMP as well as identify the next 10-15 years of prioritized CIPs. Updates to the SSMP will capture infrastructure upgrades required as Hillsboro's population grows, city limits expand to meet the Urban Growth Boundary, and water consumption and usage habits adjust over the next decade.
- **Seismic Preparation Planning.** The City is a partner in Washington County's Multijurisdictional Natural Hazards Mitigation Plan. As part of this effort, a number of critical public facilities including regional infrastructure such as transportation routes, bridges, water systems, and utilities have been found to be vulnerable to natural disasters. The City is focusing on five goals related to natural hazards: minimizing risk, increasing preparedness, improving coordination, building resilience, and mitigating hazards. While there are no unique sanitary sewer related actions required of City at this time, the City recognizes the need to set aside funds to support the broader City goals.

  This planning study will include an evaluation of the materials currently available and required to support City maintenance staff in the event of an earthquake. The Oregon Seismic Resilience Plan outlines goals for sanitary sewer recovery for evaluation consideration. Items in this effort include but may not be limited to, near term fixes (not necessarily required), stockpiling of materials, identifying where materials may be stockpiled, upfront planning including contracts to have in place, prioritize critical assets to focus repairs first, development of repair or bypass design details, and general programmatic support which operations staff can leverage in the event of an emergency.

4.3 Project Prioritization

Once capital projects and program needs were identified, BC worked with the City to prioritize them. City of Hillsboro staff identified several guiding considerations for prioritization of projects and programs including:

- Replacement of aging/failing pipes
- Equity considerations (evaluated based on vulnerability mapping provided by the City)
- I/I reduction
- SSO risk reduction
- Protection of sensitive areas (wetlands, water bodies, congested urban areas)
- Replacement of concrete pipes that convey industrial flows

Based on these guidelines, BC developed an initial prioritization of capital projects, programs, and studies. The prioritization was reviewed by City staff in a workshop, resulting in the prioritized list of projects and programs as shown in Table 4-3. BC developed planning level costs for each project to support development of a rate analysis and implementation plan. Costs are discussed in Section 6 Implementation.

Table 4 3. CIP Priority Summary

Priority Ranking	Project Title	Priority Considerations					
		Replacement of aging or failing pipes	Equity: Improves conditions in high vulnerability community [a]	I/I reduction	SSO risk reduction	Protection of sensitive areas	Replacement of concrete pipes with industrial flows
1	Inflow and Infiltration (1911/1936)		✓	✓	✓		
2	Manhole Rehabilitation Program			✓	✓		
3	Turner Creek Feasibility Study	✓		✓	✓	✓	
4	Main Street	✓	✓	✓	✓	✓	
5	NE Harewood Street				✓		
6	TV HWY		✓	✓	✓	✓	
7	Emma Jones	✓				✓	
8	SE Walnut and SE 14th	✓	✓	✓			
9	Sunrise Lane				✓		✓
10	NW Garibaldi Street	✓	✓	✓	✓		
11	Arrington Court I/I	✓		✓			
12	NE 25th Avenue	✓		✓			
13	Rock Creek	✓					
14	Lincoln Elementary	✓		✓			
15	Walnut Street		✓		✓		
16	HDPE Weld Bead Removal				✓		
17	Replace Aging Concrete Pipes	✓	✓	✓			
18	Sanitary Sewer Master Plan Update						
19	Seismic Preparation Planning						

a. Determined using the Environmental Justice Screening and Mapping tool developed by the EPA. https://ejscreen.epa.gov/mapper/

Section 5

Sanitary System Operations and Maintenance Programs

This section provides an overview of the City of Hillsboro's (City or Hillsboro) Operations and Maintenance (O&M) programs, describes outcomes of a gap analysis performed by Brown and Caldwell (BC), and provides recommendations for new O&M programs.

5.1 Overview of Existing O&M Programs

The City has a comprehensive sanitary sewer O&M program which includes the following activities:

- Mainline inspections
- Routine mainline cleaning
- Off road surface inspection in stream corridors
- Warranty inspections, hotspot mainline cleaning
- Repairs and upgrades
- Trouble calls and requests
- Root cutting and chemical control reporting

Figure 5-1. City maintenance staff using vacuum truck to clean sewer pipelines

The City is responsible for maintaining sanitary sewer pipelines and inspection of features on pipelines less than 24 inches (2008 IGA and 2023 IGA). As of 2022, the City maintains a base inventory of 1,431,400 LF of sanitary sewer pipeline and cleans a third of that inventory each year.

To keep operations efficient, staff typically perform the following tasks as part of the routine mainline inspection activity:

- CCTV inspection of pipelines: one time every 8 years
- Inspection of manholes associated with the pipeline: one time every 8 years
- Manhole and lid maintenance, adjustment, or sealing as needed

Easements and access roads are inspected concurrently with the pipelines and manholes and any maintenance needs are identified and addressed as needed.

Pipelines are routinely cleaned (jetted) once every 4 years. Some pipelines require more frequent cleaning, anywhere from weekly, biweekly, quarterly, or yearly. Frequency depends on sags in the pipe, which collect debris and fats, oils, and grease (FOG). In addition to higher frequency line cleaning to address FOG, the City is developing a new FOG program to help reduce the amount of FOG from entering the sanitary sewer system.

Certain pipelines experience a large amount of root intrusion which requires regular cutting of the roots and chemical treatment to prevent root growth. Currently, the City reports problem root areas to CWS who performs the chemical treatment. The chemicals used for root treatment (typically metam-sodium and dichlobenil) kill the roots present in the sewer and inhibit future growth of these roots. These chemicals do not kill the above-grade tree and break down in the collection system prior to arrival at the wastewater treatment plant.

Offroad surface inspections of all manholes in stream corridors are performed every 2 years. If identified during inspection, staff will install or repair self-closing lids on these manholes.

Repairs and upgrades performed directly by City operations staff include lateral investigations.. Other sanitary sewer repairs and upgrades are addressed under the City's CIP. The City provides in-house utility locating services for sanitary sewer work within their jurisdiction on request.

Community member call with inquiries and general requests are received and responded to by Operations staff. Some calls warrant an emergency response and quick action, such as SSOs, while other calls are more general customer service coordination. The City tracks all of the inspections, repairs, and maintenance performed in the City's operating management system.

5.2 O&M Program Gap Analysis

The purpose of the O&M "gap analysis" was to identify O&M program requirements and develop program updates to meet current and projected level of service expectations. BC evaluated City O&M programs by reviewing available O&M program documents and conducting interviews with the City Public Works Department, Sanitary Sewer Operations, Locates, and Repair staff.

The gap analysis showed the City is currently meeting the frequency and metric-based O&M program requirements and as-needed and on-going O&M program requirements established in the 2008 IGA[1] and 2018 CWS performance standards. However, while the City currently meets these minimum performance standards, it faces significant challenges in doing so related to staffing limitations, use of overtime, and availability of equipment. Staff have also identified additional program needs to

[1] Note that because the final 2023 IGA was not available during development of this analysis, the 2008 IGA was used as the basis for evaluating O&M requirements. These requirements were then confirmed once the 2023 IGA was finalized.

meet service expectations. Results of the gap analysis are presented in Table 5-1 and a discussion of the challenges and needs is below.

The City's O&M program metrics include cleaning every line at least once every 4 years and inspecting all lines and manholes once every 8 years. Overtime is often required to perform non-routine maintenance while staying on schedule with routine cleaning and inspection maintenance activities. At times, the City has had to borrow staff and equipment from other departments for emergency work such as winter storm response or have sanitary sewer staff use overtime to complete routine O&M activities during these times. As the inventory of sanitary sewer assets increases as the City grows, meeting performance standards will become more challenging without increases in staffing and equipment. Recommendations for O&M program adjustments to address the gap analysis are described below. Staffing recommendations related to the gap analysis are discussed in Section 6.2

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Table 5 1. O&M Program Gap Analysis

Service or Program Description	2008 IGA Requirements	2018[e] CWS Performance Standards	Current Requirements and Standards Being Met? [a]	*Challenges or Background Information	Future Considerations [d]	Justification for New Program or Program Change
Line cleaning	Lines < 24"	Every line 1x/4 years	Yes, but with *challenges	***Challenges**: Overtime is often required to perform non-routine maintenance while keeping up with routine maintenance activities that have metric based performance standards (e.g., 1x/4 years). In addition, borrowing of sanitary sewer staff and equipment by other departments emergency work (e.g., winter storm response) or routine work in other departments (e.g., vactor truck for storm sewer) can result in overtime being needed to complete sanitary sewer O&M activates.	Sanitary sewer line and manhole inventory are increasing due to development. [b] Experienced staff retirements and increased family leave and vacation allocations are compounding factors that may decrease staff efficiency and total working hours per employee from current levels. Manhole inventory increasing due to development. [b]	--
Maintenance CCTV inspection	Lines <24"	Every line 1x/8 years	Yes, but with *challenges			--
Manhole inspections	Lines <24"	Every MH 1x/8 years	Yes, but with *challenges			--
Offroad surface inspection in stream corridors, self closing lid install, and marking	Lines <24"	Every MH 1x/2 years	Yes, but with *challenges			--
Warranty Inspection	Lines <24"	2 months before end of maintenance period	Yes	--		--
Easement and access road maintenance	Lines <24"	As needed and based on easement documents	Yes	--	Easement inventory will increase due to proposed developer and CIP projects.	--
Vector Control	Lines <24"	As needed	Yes	--	--	--
Overflow and complaint response, investigation, and reporting	Lines <24"	As needed	Yes	--	--	--
Emergency response	Lines <24"	As needed	Yes	--	--	--
Fats, oil, and grease program	Inside City	Must have a program; required elements not specified	Yes	Background: Program is under development and there is an opportunity to increase public outreach while reducing high frequency line cleaning.	Program to be developed	Enhanced program could reduce the number of lines that are scheduled for high frequency cleaning.
Lateral investigation and minor repairs including point repairs and individual laterals	Lines <24"	As needed	Yes, but with *challenges	***Challenges:** Laterals belong to homeowners. CIP needs to confirm location and condition of laterals, see **New**-Lateral pre/post inspection program. Non routine maintenance often requires overtime.		--
Utility locates	Lines <24"	As requested	Yes, but with *challenges	***Challenges:** Utility locates for laterals are not within 2-foot accuracy and boring activities have caused damage to the SS, see **New**-Lateral accuracy program.	2023 IGA changes language from 'locate assets within City' to 'locate City owned sanitary assets.'	--
Manhole and lid maintenance and adjustment (includes sealing)	Lines <24" (excludes sealing)	As needed	Yes	--	Memorialize Hillsboro is already performing sealing in future IGA (not revised in 2023 IGA).	Performing the sealing at time lid has been opened for inspection is proactive and efficient.
Root cutting and chemical control	Lines <24"	As needed	No	Background: Hillsboro performs root cutting and inspection, but reports findings to CWS for chemical control/foaming for efficiency purposes.		
NEW-Manhole rehab [c]	None	None	--	--	Rehab manholes for lines <24".	This new program would involve the O&M repair crew and allows Hillsboro to proactively address I/I on a project-by-project basis.
NEW -Flow monitoring and sampling [c]	None	None	--	Background: Hillsboro relies on CWS and third party contractors to perform flow monitoring and sampling and would like to make informed decisions about wastewater suspected to put staff at risk in a timely manner, e.g., monitoring of sewer lines that receive industrial wastewater prior to cleaning.	Event based flow monitoring and sampling for lines <24".	This new program will provide Hillsboro the opportunity to proactively make informed decisions that can impact safety or other risks associated with O&M work.
NEW-Lateral pre/post inspection program [c]	None	None	--	--	--	This new program would involve scoping pre-CIP project (existing infrastructure) and then scoping after to confirm no damages. **See lateral investigation gap identification.**
NEW-Lateral accuracy program [c]	None	None	--	--	--	This new program will be schedule based (pre-boring) utility locating with GPS data that has accuracy of 2-feet. Providing more accurate locate data could reduce damage from boring activities. **See utility locates gap identification.**

a. Hillsboro tracks metric based performance (e.g. linear feet cleaned or MHs inspected) data in their GIS and asset management data bases. The data is used to generate quarterly reports for CWS reporting.

b. 2019 Water Master Plan projects 20 percent increase in average daily demand between 2018 and 2030. This increase in water use correlates to an increase in sewer discharges, where the number of linear feet of pipe and other assets will increase.

c. New programs or tasks are being developed by Hillsboro and related information provided to BC as part of the SSMP development.

d. Note that because the final 2023 IGA was not available during development of this gap analysis, the 2018 IGA was used as the basis for evaluating O&M requirements. These requirements were then confirmed once the 2023 IGA was finalized.

5.2.1 O&M Program Recommendations

The gap analysis resulted in recommendations for four new programs including manhole rehabilitation, flow monitoring and sampling, lateral pre/post inspection program, and lateral accuracy program and upgrades to the existing FOG program. By implementing these programs, the City will be able to provide better levels of service to its customers.

- **Manhole Rehabilitation Program:** This Program will allow the City to proactively address manhole rehabilitation on a project-by-project basis but will also increase City staffing needs. The need for this program was also identified as part of the capital planning process as discussed in Section 4.2.2. This Manhole Rehabilitation program was incorporated into the CIP costs in Section 6.1 and staffing analysis in Section 6.3.
- **Flow Monitoring and Sampling Program:** The City currently relies on CWS and third-party contractors to perform flow monitoring and sampling. The City plans to implement an event-based flow monitoring and sampling program for lines less than 24 inches. This will better enable the City to make informed decisions about wastewater suspected to put staff at risk in a timely manner, examples include monitoring of sewer lines that receive industrial wastewater prior to cleaning.
- **Lateral Pre/Post Inspection Program:** Lateral maintenance is the responsibility of homeowners. The City performs lateral investigations, as needed. These investigations meet CWS requirements. The City is proposing a new lateral pre/post inspection program that would involve scoping laterals prior to initiating capital improvement project work on existing infrastructure and then scoping after the project construction is complete to confirm no damage occurred.
- **Lateral Accuracy Program:** Utility locates are being performed when requested and meet CWS requirements; however, accuracy of the locates is not within the two-foot industry standard and boring activities have caused damage to the sanitary sewer. The City is proposing a new lateral accuracy program to increase the accuracy of locate data and reduce issues resulting from inaccuracy of the locates. (e.g., boring through sanitary sewer pipelines post locate).
- **FOG Program Upgrade:** The CWS and COH IGA details the City will have a FOG abatement and reduction program. The COH and CWS will work collaboratively in developing reporting metrics and process to meet CWS's compliance and reporting requirements for the Permit. The City is currently updating its FOG program with a goal of reducing the amount of FOG deposited into the public sanitary sewer system which should help reduce the need for high frequency line cleanings. Expanding the ongoing outreach program with an increased focus on Food Service Establishments (FSE) and commercial/industrial sewer users could more effectively address reducing FOG and hotspots in the sanitary sewer collection system.

Section 6

Implementation

The development of the Sanitary Sewer Master Plan (SSMP) included identification of high priority capital projects and new and expanded Operation and Maintenance (O&M) program needs. This section provides details on costs associated with implementation of the SSMP, staffing needs, and levels of service.

6.1 Capital Improvement Projects Cost Summary

The recommendations for the 10-year CIP include fifteen capital projects, one O&M program, and three planning studies. Brown and Caldwell (BC) developed planning level cost estimates for each capital project and program. All costs are planning level estimates shown in 2023 dollars. Table 6-1 summarizes capital costs for the 10-year Capital Improvement Program (CIP) and lists the projects in order of priority. Table A-1 (in Appendix A) describes how high priority projects were identified and prioritized.

Table 6 1. 10 year CIP Summary

Project No.	Project Title	Total Project Cost
1	Inflow and Infiltration (1911/1936) [a]	$6,721,000
2	Manhole Rehabilitation Program	$1,000,000/biennium ($5,000,000 over 10 years)
3	Turner Creek Feasibility Study	$250,000
4	Main Street	$2,764,000
5	NE Harewood Street	$3,156,000
6	TV HWY	$925,000
7	Emma Jones	$634,000
8	SE Walnut and SE 14th	$2,615,000
9	Sunrise Lane	$12,365,000
10	NW Garibaldi Street	$7,248,000
11	Arrington Court I/I	$11,713,000
12	NE 25th Avenue	$2,172,000
13	Rock Creek	$4,580,000
14	Lincoln Elementary	$973,000
15	Walnut Street	$1,174,000
16	HDPE Weld Bead Removal	$743,000
17	Replace Aging Concrete Pipes	$250,000/biennium ($1,250,000 over 10 years)
18	Sanitary Sewer Master Plan Update	$350,000
19	Seismic Preparation Planning	$100,000
	TOTAL 10-YEAR CIP COST	**$64,733,000**

Note: Project costs rounded to nearest $1,000.
a. Project is currently in progress. Dollar value shown is for anticipated construction cost prepared and provided by City engineering staff.

The City budgets on a biennial basis. During the development of SSMP, the City is conducting a cost-of-service rate study to inform how to schedule and implement these projects over the planning period. The City plans to implement the projects in order of priority to the extent feasible given staffing and funding constraints. Cost estimate assumptions are presented in Table 6-2. These cost estimates are included in the Fact Sheets in Appendix A.

Table 6 2. Cost Estimate Assumptions

Item	Unit	Estimated Cost [a]	Description
Construction contingency		30%	Percentage applied to subtotal for construction, mobilization, and erosion and sediment control
Traffic control (per site)	lump sum	Site specific	
Manhole rehabilitation (epoxy coating, structural)	each	$11,400	Developed from bid prices for recent Pacific Northwest projects
CIPP liner (traditional)	--	--	Dependent on length and diameter
Pipe bursting	--	--	Dependent on length and diameter.
Open cut replacement	--	--	Dependent on length, diameter, and depth.
Lateral rehabilitation	linear foot		Replace all laterals on every project to the residence. Assume 50 ft of 6-in polyvinyl chloride pipe using open cut replacement.
Erosion and sediment control		1%	Percentage applied to construction subtotal costs only.
Mobilization		5%	Percentage applied to construction subtotal costs only.
Basic permitting	lump sum	$15,000	
Engineering services		20%	Engineering consultant costs.
City project administration		15%	City Administrative Costs, including engineering.
Easement acquisition	square feet	$10	Cost to acquire an easement; the cost per square foot of land is subject to change based on market conditions.
Easement survey and legal		20% of acquisition costs	
Wetland permitting and administrative contingency		25%	Additional to City Project Administration Costs; applicable only where wetland permitting is expected.
Administration for residential outreach		25%	Additional to City Project Administration Costs; applicable only where additional residential coordination might be required.
Contingency for party laterals		5%	Additional construction costs where City identified the potential for party laterals are likely to exist.
Construction management		10%	Funds associated with management during construction; could be allocated to engineering consultants, City staff, or combination of both.
Escalation		3%	Percentage per year.

Note: Costs were developed using Association for the Advancement of Cost Engineering (AACE) Class 5 level cost estimate. Class 5 estimates are planning level costs and have an expected accuracy range of -50% to +100%.

a. Unless otherwise noted, all percentages identified are applied to the construction subtotal. which includes Construction Contingency.

b. Assumptions indicated are a starting point and may vary per CIP depending on the perceived complexity of a project or anticipated additional costs incurred in any one of the cost estimate items.

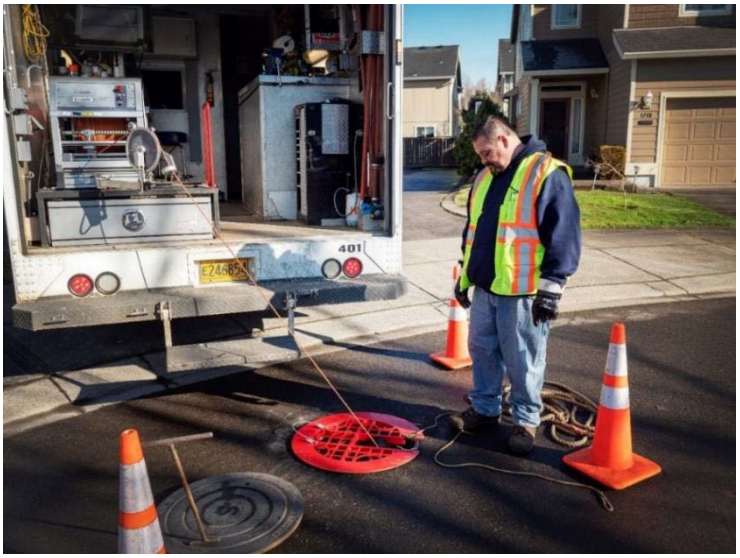
6.2 Staffing Plan

BC developed staffing need recommendations to support the SSMP implementation by evaluating current O&M program gaps, new O&M programs, and capital project delivery. The analysis integrated the information from the O&M Gap Analysis (Section 5.2) and CIP prioritization with City

compensation plans, data on time it takes to complete activities, and interviews with City staff. The staffing needs evaluation aligns with the 10 to 15-year planning period of this SSMP. This evaluation focused on the Sanitary Sewer Operations and the Sanitary Sewer Environmental and Engineering Services (E&ES) staffing needs within the Storm and Sanitary Sewer Division Public Works Department. The key drivers for recommended staffing changes are:

- Keeping pace with capital improvement and maintenance projects (aging infrastructure, I/I, and repairs).
- Implementing recommended new O&M programs.
- Reducing FOG/hotspots and the additional O&M associated costs.
- Proactively addressing known maintenance challenges including I/I.
- Projected growth in pipeline inventory of 12 percent over the next 10 years.[1]
- Providing more accurate information to support informed decisions for safety of O&M work and reduction of damage to existing system.

6.2.1 Operations and Maintenance



The O&M Gap Analysis demonstrated that while the City is currently meeting most O&M program requirements, it is often due to the use of overtime and borrowed equipment. The inventory of sanitary sewer assets is increasing as the City expands, and meeting CWS performance standards will become more challenging without corresponding increases in staffing and equipment. The staffing analysis found that the City will need an additional FTE to address the existing and future workload of Operations staff for existing programs without reliance on overtime. This driven both by the projected 12 percent increase in sewer assets over the planning period and the City's desire to meet existing O&M needs without heavy reliance on overtime. The staffing analysis found a staffing deficit in all major O&M activities including inspection, cleaning, repairs, and trouble call response. The results of the staffing analysis are included in Appendix C.

In addition, the City plans to implement four new O&M programs that will enable staff to proactively address ongoing sanitary sewer concerns: manhole rehabilitation, flow monitoring and sampling, lateral pre/post inspections, and lateral accuracy. The staffing analysis concluded the City will need additional Operations staff to implement these programs.

Retirement and changes to City leave policies are additional factors that are anticipated to reduce the available working hours of staff from prior levels. Retirement of experienced staff will make continued achievement of performance standards more difficult since there will be a loss of

[1] Projected growth is based on historical growth. CWS is currently completing hydraulic modeling for a capacity analysis. This information was not available at the time this SSMP was prepared.

institutional knowledge. Newly trained staff may not be as efficient initially at completing work as more experienced staff. City personnel policies will be changing in the future, including increases in paid family and medical leave allowances per the 2023 State requirements, as well as an increase in annual vacation time to incentivize employment with the City. These are difficult to quantify and were not included in the staffing analysis calculations. However, they are recognized as stressors and challenges on City staffing.

6.2.2 Environmental and Engineering Services

The two main drivers for augmenting the E&ES staff are keeping pace with capital project oversight workload and upgrading the FOG program. Currently the City's ability to implement needed sanitary sewer capital improvement projects is constrained by staffing resources for project oversight and there is a capital project backlog. The City is delivering roughly $1M per year in capital projects; the proposed 10-year CIP would put this closer to $5M per year. To deliver the needed capital projects identified in the CIP, the City will need additional FTE over the course of the next several years.

Environmental Services staff will increase FTEs for the FOG program as noted in Table 6-3 and Figure 6-1. This will allow the program to expand outreach and inspection program efforts with an increased focus on Food Service Establishments (FSE) and commercial/industrial sewer users to more effectively address reducing FOG and hotspots in the sanitary sewer. This program, if implemented effectively, will help reduce the strains on operations and maintenance caused by the need for higher frequency cleaning in FOG impacted areas of the system. The other critical functions the E&ES perform are inspections and plan review. Staff reported no existing backlog and no significant increase anticipated in future Environmental Services inspections or Engineering plan review. The staffing analysis recommended existing staffing levels be maintained for these two functional areas.

6.2.3 Recommendations

The results and assumptions of the staffing evaluation are presented in Appendix C. In summary, the analysis found that the City will need to increase Operations staff to meet LOS and planned capital project delivery over the next 10 years. The City reviewed these recommendations and developed a hiring plan. Table 6-3 summarizes the planned staffing changes by fiscal year. Additional details for staffing needs are in Appendix C. Figure 6-1 presents the proposed staffing changes by biennium year for the Storm and Sanitary Sewer Division. This staffing plan is phased over time and is based on City positions typically being full or halftime.

Table 6 3. Hillsboro Sanitary Sewer Staffing Plan

Planned Hires	FY25	FY26	FY27	FY28
O&M (6 FTE Total)		Senior M&O Techs (1.5 FTE)	Senior M&O Techs (3.0 FTE)	
E&ES (4.5 FTE total)	Engineering Coordinator (1.0 FTE)		Sr. Engineering Tech (1.0 FTE)	Project Manager (1.0 FTE)

The staffing analysis and associated staffing plan represent the best estimate of future needs based on currently available information. Staffing needs may change as new information becomes available and as the City moves forward with CIP and O&M programs implementation.

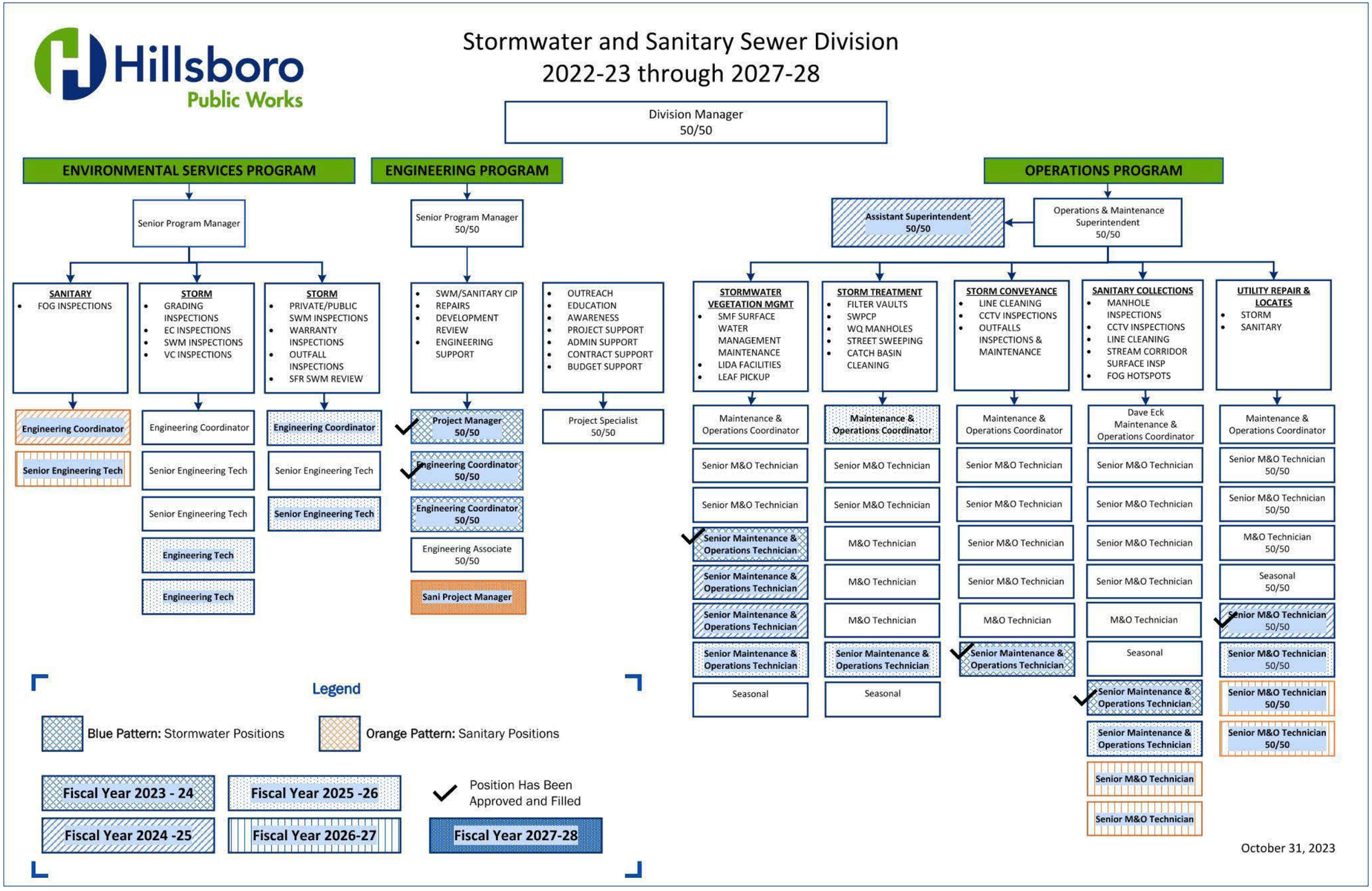


Figure 6-1. Storm and Sanitary Sewer Division organizational chart 2023-25 through 2027-29

6.3 Level of Service

Developing the SSMP requires the City to determine a level of service consistent with the City's regulatory obligations and the expectations of the City's ratepayers. Through the SSMP process, the City identified a number of system challenges including:

- Aging infrastructure
- Inflow and infiltration
- Increasing O&M needs related to City growth and new assets

The SSMP is comprised of approximately $60M in capital projects and $5M in O&M programs, plus staffing increases to support new O&M programs and CIP project delivery. The City's current level of service meets minimum IGA requirements for O&M while requiring the use of overtime and without sufficient staffing and time to address recognized system needs such as addressing inflow and infiltration. The City currently maintains about 1.4 million linear feet of pipe; this is projected to increase by 12 percent over the next 10 years. Capital projects are being executed at a pace that is not sufficient to address deficiencies identified in the system.

The proposed LOS as represented by this SSMP will meet minimum IGA requirements without reliance on overtime, while accounting for system growth, including additional O&M programs, and implement high-priority CIPs over the next 10 to 15 years. Table 6-4 summarizes current and recommended LOS by service area.

Table 6 4. Current and Recommended Levels of Service

Area	Current LOS	Recommended LOS
O&M	• Reactive system maintenance • Meets minimum requirements for existing system with reliance on overtime and borrowed equipment • Insufficient staffing for system growth	• More proactive maintenance • Meets minimum IGA requirements without reliance on overtime • Addresses anticipated increase of system assets • Implements four new programs and expands FOG program • Augments staff based on identified needs
Capital Project Implementation	• Approximately $800,000 per year • No comprehensive prioritized project list • Capital projects backlog due to staffing limitations	• ~$5M/year in project delivery • Prioritized CIP with project list based on highest needs in system • Sufficient staffing to support 10-year CIP
Benefits	• Meets permit/IGA requirements	• Proactive maintenance to help minimize future issues • Addresses known system needs and deficiencies • Provides sufficient staff resources to minimize need for overtime and borrowing resources • Provides for system growth

6.4 Next steps

The City is developing a sanitary sewer system financial plan including an update to the sewer local service fee based on this SSMP. The financial plan will account for the current revenue streams such as rates, connection charges, and capital cash reserves. The plan will also account for potential revenue streams such as system reinvestment funding from rates and revenue bonds to support implementation of the SSMP recommendations. The financial plan and any recommended changes to the rate structure will be presented to City Council for approval in October 2024.

Section 7

References

Intergovernmental Agreement (IGA) between City of Hillsboro and Clean Water Services, January 4, 2005.

Amendment to the Intergovernmental Agreement (IGA) between City of Hillsboro and Clean Water Services, July 1, 2008.

Hillsboro Comprehensive Plan, January 2, 2018.

City of Hillsboro Water Master Plan, June 4, 2019. Prepared by HDR, Inc.

City of Hillsboro Stormwater Master Plan, January 15, 2021. Prepared by Otak, Inc.

Section 8

Limitations

This document was prepared solely for City of Hillsboro, Oregon, in accordance with professional standards at the time the services were performed and in accordance with the contract between City of Hillsboro and Brown and Caldwell dated May 24, 2022. This document is governed by the specific scope of work authorized by City of Hillsboro; it is not intended to be relied upon by any other party except for regulatory authorities contemplated by the scope of work. We have relied on information or instructions provided by City of Hillsboro and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

Appendix A: CIP Fact Sheets

CIP Fact Sheets

Table A 1. Capital Project Review and Prioritization Workshop Summaries

Table A 1. Capital Project Review and Prioritization Workshop Summaries	
Workshop 1 (March 15, 2023)	
Purpose	To review the initial capital projects list which included high risk pipes identified in risk analysis which were then combined, based on location, into 14 capital projects.
Discussion	• City staff confirmed the need for certain segments to be rehabilitated, especially those adjacent to previous rehabilitation projects (e.g., Emma Jones). • City staff confirmed pipe bursting was the preferred rehabilitation technology unless it was deemed infeasible due to depth of pipe or other site-specific issues. • Many pipe segments flagged as high risk for failure were already rehabilitated in previous capital projects or were already included in future capital (I/I) projects and were removed from the capital project list.
Outcomes	• City to review the capital projects and associated fact sheets and provide comments and revisions. • City and BC will meet over the course of next two workshops to review City comments and prioritize refreshed list of capital projects. The project prioritization will particularly focus on diversity, equity and inclusion (DEI) and high-risk locations.
Workshop 2 (April 19, 2023)	
Purpose	To review draft capital project fact sheets with City staff and verify all pipe segments and manholes that should be rehabilitated are included in the fact sheets. Also to discuss rehabilitation methods for each capital project, naming conventions, and any pertinent information that would influence the cost estimate.
Discussion	• City staff and BC reviewed detailed feedback from staff for each fact sheet. • City staff recommended all capital projects include replacement of all laterals from the main to the house to address I/I. • Additional cost contingency was added to capital project which included "party laterals" where one lateral is shared amongst many individuals. The capital project will install one lateral per individual household. • Pipe bursting was the assumed rehabilitation technology except in a few instances. • City staff shared extensive background information on each project. This background information was included in the project fact sheets and reflected in the project cost estimate. For example, the City shared that the Emma Jones pipeline is buried deep (~20 feet) and is not reinforced concrete. The City had previously rehabilitated the upstream pipe segment which is adjacent to a wetland. The project team then updated the fact sheet to reflect permitting required for work in the wetland, updated the rehabilitation method to CIPP (due to pipe depth).
Outcomes	Capital project prioritization (next workshop) will focus on high priority considerations: DEI, protection of sensitive areas, addressing I/I, and replacement of concrete pipe conveying industrial flows.
Workshop 3 (June 20, 2023)	
Purpose	To prioritize the capital projects that were updated following Workshop 2. The prioritized list will become the City's next 10-year CIP.
Discussion	• Capital projects were assigned a priority of "high", "medium", or "low" considering the risk of pipeline failure, potential impacts on wetlands, replacement of concrete pipe with industrial flows, and impacts to DEI communities. • BC developed a weighted scoring system, based on the City's consequence and likelihood of failure metrics, which was used to identify segments of pipe to include in risk analysis. The low/medium/high system allows for City staff to more easily weigh in on priority of capital projects, over the 10-year planning period, which already contain the priority pipe segments resulting from the risk analysis.
Outcomes	Capital projects were ordered based on priority.

Fact sheets were developed for 14 out of the 19 capital projects and summarize the project area, probable estimate of costs, and funding source. The remaining five capital projects do not have fact sheets because of the nature of those projects (e.g., multi-location rehabilitation projects or programmatic planning efforts). The Capital Improvement Project Evaluation Technical Memo (BC, 2023) contains more information regarding all proposed capital projects.

Sanitary Sewer CIP Fact Sheet

ID:	CIP 4		Prepared Date: September 8, 2023
Name:	Main Street		
Location:	1765 E Main Street, Hillsboro, OR 97123		
Cost:	$2,764,000	Funding Biennium: FY24	Priority Rank: 4

Description

CIP 4 will rehabilitate 2,196 linear feet (LF) of 8-inch to 18-inch concrete pipe and replace two manholes on Main Street between NE 14th Ave and NE 28th Ave. The existing pipe was originally installed in the 1960s and is nearing its anticipated lifespan. All pipe within the CIP is in a combination commercial/residential area near the railroad. Rehabilitation of these pipe segments will directly bolster system resiliency for users along Main Street from 14th to 24th Avenue. These pipe segments are critical to the broader conveyance capabilities of the basin they serve.

Recent pipeline inspections identified the following defects: FOG (fats, oil, and grease), defective point repair, intruding tap, broken pipe with pressurized infiltration (gusher), and high-water mark (90 percent). If left in its current state, the pressurized infiltration defect could lead to a larger hole in the pipe allowing soil to enter and destabilize the surrounding pipe bedding. FOG accumulation increases the risk of sanitary sewer overflows (SSOs).

To reduce the amount of inflow and infiltration (I/I) coming into the wastewater system, the City of Hillsboro (COH) is replacing laterals, the pipelines conveying wastewater from homes/businesses to the wastewater main in the road, as part of the rehabilitation project. The segments identified for replacement contribute to the I/I of Turner Creek Basin. The completion of this CIP is an incremental step in the basin wide approach to reduction of I/I in this basin.

The existing pipeline will be rehabilitated via pipe bursting. Pipe bursting is a rehabilitation method by which the existing pipe is opened and forced outward by a bursting tool, allowing pipe replacement without trenching and removing the old pipe. A new, plastic pipeline is then pulled into place. Two manholes will be replaced with a corrosion-resistant concrete manhole. This portion of the collection system experiences high volumes of wastewater flows. The wastewater will be bypassed around the pipelines and manholes during construction.

Also included in this CIP is construction of an access easement. The easement will provide COH staff direct access to the pipeline and adjacent manholes, which has been lacking and impedes their ability to properly maintain and respond to emergencies should they occur in this area. Easement costs are estimates only. The efforts required to negotiate terms for the price of the property required for access has not yet been initiated and may evolve or change location completely.

Benefits

Benefits of this project include:

- Rehabilitates existing infrastructure.
- Pipe bursting fully replaces the existing pipe with a new pipe.
- Pipe and manhole replacement materials are resistant to wastewater-derived corrosion.
- Lateral replacement for surrounding residential connections.
- Turner Creek Basin partial I/I reduction.

CIP 4 Cost Estimate

Construction

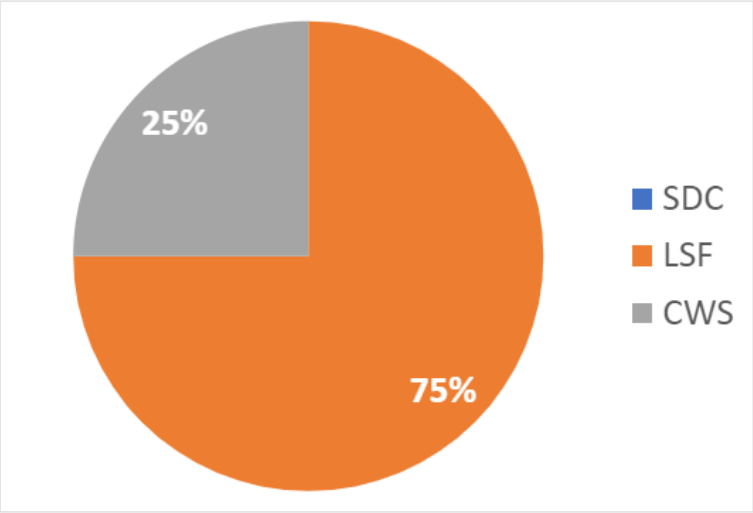
Item	Assumption	Amount
Pipeline Rehabilitation	Pipe Burst	$630,000
Lateral & MH Replacement	Open cut, precast polymer concrete MH	$597,300
Easement Construction	12' wide road	$9,600
Bypass Pumping		$45,900
Traffic Control		$62,100
Subtotal, Construction		*$1,344,600*
Mobilization	5%	$67,300
Erosion and Sediment Control	1%	$700
Subtotal, Construction, Mob, ESC		*$ 1,412,600*
Construction Contingency	30%	$423,800
Subtotal, Construction & Contingency		**$1,836,300**

Additional Cost Factors

Item	Assumption	Amount
Basic Permitting	Lump sum	$15,000
Engineering Services	20%	$367,300
City Project Administration	15%	$275,500
Easement Acquisition	$10/SF	$26,100
Easement Survey and Legal	20% of Acquisition	$5,300
Construction Management	10%	$183,700
Escalation to 2024	3% per year	$55,100
Subtotal, Additional Cost Factors		**$927,700**
Total Project Cost (Rounded)		**$2,764,000**

a. Costs for the easement acquisition and construction will be sourced through City of Hillsboro funding sources.

Funding Summary



Note: SDC = System Development Charges (COH), LSF = Local Service Fee (COH), CWS = Clean Water Services (District)

Project Location

EdgeID	Material	Install Year	Diameter (in)	Length (ft)	Buried Depth (ft)	Rehab Method	No. of active taps
49911	CONC	1960	12	309	N/A	Pipe Burst	3
49943	CONC	1960	12	183	N/A	Pipe Burst	3
68607	CONC	1964	8	231	N/A	Pipe Burst	3
68612	CONC	1963	8	412	N/A	Pipe Burst	9
36042	CONC	1960	12	308	N/A	Pipe Burst	9
36035	CONC	1960	12	351	N/A	Pipe Burst	8
49901	CONC	1960	12	331	N/A	Pipe Burst	12
36022	CONC	1960	18	71	N/A	Pipe Burst	0

Locator Map

City of Hillsboro
Washington County, Oregon

CIP 4 - Main Street

Sewershed: Turner Creek

Wednesday, August 30, 2023

0 50 100 200 Feet N

Sanitary Sewer CIP Fact Sheet

ID:	CIP 5		Prepared Date: September 8, 2023
Name:	NE Harewood Street		
Location:	NE Harewood Street near NW Glencoe Road		
Cost:	$3,059,000	Funding Biennium.: FY26	Priority Rank: 5

Description

CIP 5 will install a new 468 linear feet (LF) 18-inch concrete pipe parallel to the existing pipe. This segment of pipe slated for replacement is located near the intersection of NE Harewood Street and NW Glencoe Road and is adjacent to the Glencoe Swale. This pipeline serves the North Side drainage basin in the northwest portion of Hillsboro. This pipeline conveys flow to the Hillsboro Water Resource Recovery Facility.

Recent pipeline inspections show the pipe appears to be flowing more than half full at times. Hydraulic modeling of the system will be completed prior to design to confirm capacity needs. CIP 5 assumes replacement of this segment in kind (18 inches). Additionally, inspections revealed the pipe has a significant (70 percent) 300-foot sag. Pipeline sags are detrimental to the performance of the pipeline because wastewater flow through this section slows down and allows solids to drop out of solution causing buildup of solids and backup of flow. This is a critical segment of the conveyance main as it supports the transport of effluent from a large portion of the Jackson School neighborhood.

This pipeline is buried approximately 25 feet below grade and adjacent to a wetland, so traditional methods such as open cut replacement and pipe bursting are not feasible. Additionally, prolonged bypass operations to support traditional replacement methods would be difficult and cost prohibitive. The proposed method of rehabilitation is a cased bore which is a trenchless method of installing pipelines using horizontal augers or pipe jacking. A steel casing is installed as the borehole progresses which will protect the deeply buried pipeline, pulled through the casing before a connection is made upstream and downstream. This method of pipe installation is used in sensitive areas where displacement of soil needs to be avoided or where deep installation would require a large installation footprint. Once the new pipeline is installed and flow is diverted to the new pipeline, the old pipeline will be decommissioned and abandoned in place.

This pipeline is located within a wetland area and construction will require extra planning to mitigate impacts on the wetland.

Benefits

Benefits of this project include:

- Rehabilitates existing infrastructure.
- Trenchless pipeline installation method will have minimal impact to adjacent wetland.
- Increased reliance on a critical conveyance asset.

CIP 5 Cost Estimate

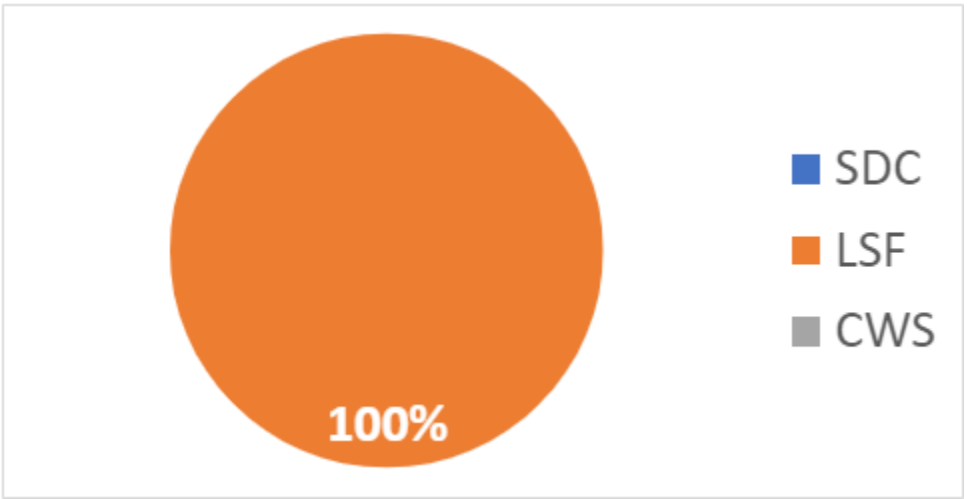
Construction

Item	Assumption	Amount
Pipeline Abandonment		$12,900
Horizontal Boring	Lump sum	$828,000
Pipe Replacement	Steel Cased, 18" HDPE	$76,500
Manholes	2 new	$62,200
Bypass Pumping		$81,100
Subtotal, Construction		*$1,060,700*
Mobilization	5%	$53,100
Erosion and Sediment Control	4%	$42,500
Subtotal, Construction, Mob, ESC		*$1,156,300*
Construction Contingency	40%	$462,600
Subtotal, Construction & Contingency		**$1,618,900**

Additional Cost Factors

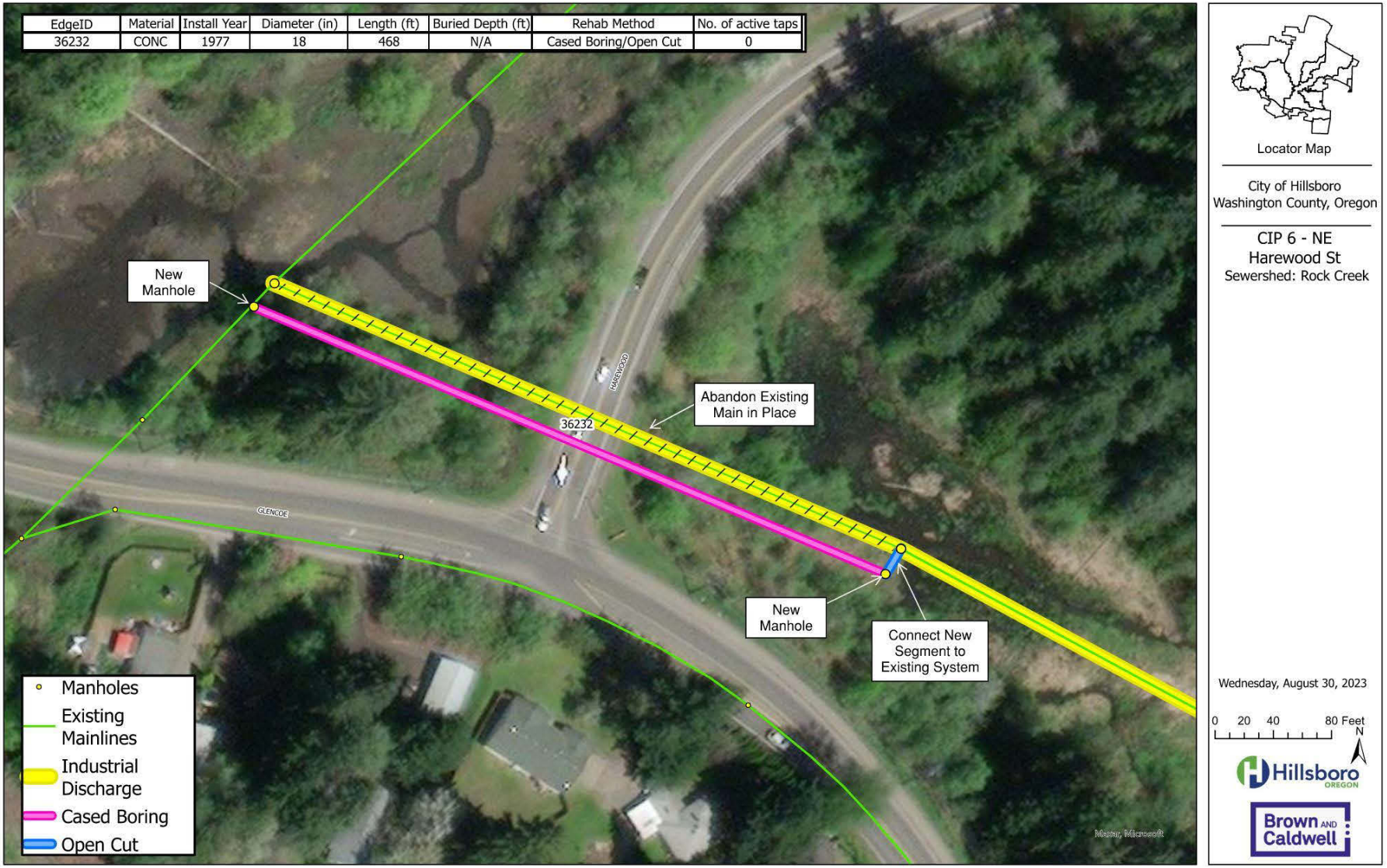
Item	Assumption	Amount
Basic Permitting	Lump sum	$15,000
Engineering Services	35%	$566,700
City Project Administration	15%	$242,900
Wetland Permitting and Admin Contingency	25%	$404,800
Construction Management	10%	$161,900
Escalation to 2026	3% per year	$145.800
Subtotal, Additional Cost Factors		**$ 1,537,100**
Total Project Cost (Rounded)		**$ 3,156,000**

Funding Summary



Note: SDC = System Development Charges (COH), LSF = Local Service Fee (COH), CWS = Clean Water Services (District)

Project Location



Sanitary Sewer CIP Fact Sheet

ID:	CIP 6		Prepared Date: September 8, 2023
Name:	TV Highway		
Location:	SE Tualatin Valley Highway		
Cost:	$925,000	Funding Biennium: FY26	Priority Rank: 6

Description

CIP 6 will rehabilitate a total of 360 linear feet (LF) of 12-inch and 18-inch pipe. Three pipe segments are located adjacent to Rock Creek and one pipe segment is in the Tualatin Valley (TV) Highway right-of-way. Both projects serve the larger Turner Creek basin in the west and central portion of Hillsboro by conveying effluent to the local treatment facility. Given the proximity to Rock Creek, rehabilitating the adjacent pipe segments will protect the creek from potential pipe breaks and sanitary sewer overflows (SSOs).

COH experienced an SSO in the pipeline adjacent to Rock Creek in 2016. A break in the main pipeline required COH to repair the collapsed section of pipe. The repaired pipe segment near Rock Creek is now made of two different materials, concrete, and PVC, and is listed as two separate pipe segments in the figure below (EdgeIDs 49801 and 816812). This CIP will replace the repaired section with a new pipeline of the same pipe material.

The three pipe segments located adjacent to Rock Creek (EdgeIDs 49801, 816812 and 35939 shown in figure below) are also currently being undermined and exposed by seasonal flow from the nearby creek. Due to the seasonal fluctuations of Rock Creek, Inflow and Infiltration (I/I) is a concern with this segment known to experience high flows creeping towards maximum capacity. The pipe is currently situated with only minimal depth of cover, which increases the potential risk of compromising the pipe's integrity. COH is currently monitoring these pipe segments for signs of erosion. To minimize the potential for impacts to service in the event these segments reach capacity or fail, COH will rehabilitate these pipe segments by pipe bursting the 18-inch main and replacing with 21-inch pipe segments. These three pipe segments are undersized and flow full due to the amount of flow and debris. When replaced, the segments will be upsized and connected to the adjacent manholes.

Recent pipeline inspections for the singular pipe on TV HWY (EdgeID 801803) show this pipe segment also has a PVC repair (similar to EdgeID 49801) as well as surface corrosion on the inside of the concrete pipe. Pipe bursting this segment will replace the pipeline with a continuous HDPE pipe segment and increase the resiliency of the pipeline that flows underneath the TV Highway. This is the only segment in this CIP slated to be replaced with pipe matching the diameter of the original segment.

COH monitors this pipeline for potential SSOs given the history and amount of flow through the pipe and the proximity to Rock Creek.

Benefits

Benefits of this project include:

- Rehabilitates existing infrastructure.
- Pipe bursting fully replaces the existing pipe with a new pipe.
- Increases capacity of the collection system.
- Reduces likelihood pipelines located adjacent to the creek will be washed out.
- Environmental stewardship
- Potential I/I reduction

CIP 6 Cost Estimate

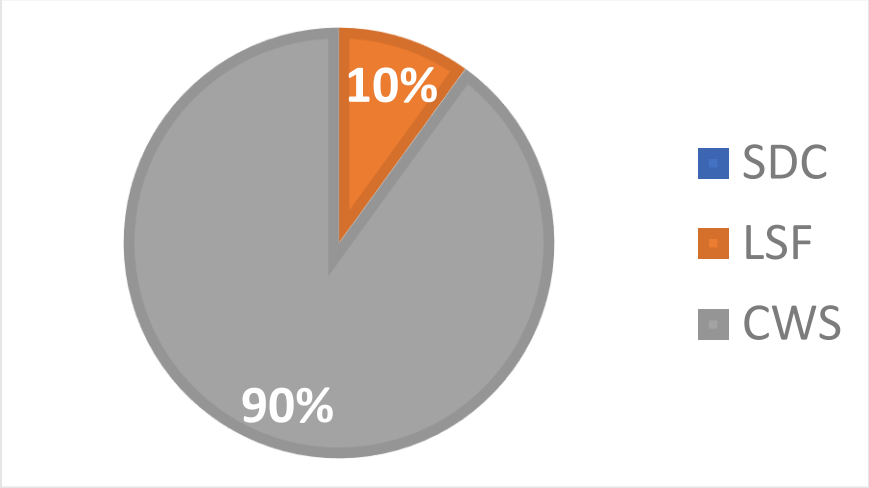
Construction

Item	Assumption	Amount
Pipeline Rehabilitation	Pipe burst	$319,100
Bypass Pumping		$14,600
Traffic Control	Lump sum	$5,600
Subtotal, Construction		*$339,300*
Mobilization	5%	$17,000
Erosion and Sediment Control	4%	$13,600
Subtotal, Construction, Mob, ESC		*$369,900*
Construction Contingency	30%	$111,000
Subtotal, Construction & Contingency		**$480,900**

Additional Cost Factors

Item	Assumption	Amount
Basic Permitting	Lump sum	$15,000
Engineering Services	30%	$144,300
City Project Administration	15%	$72,200
Wetland Permitting and Admin Contingency	25%	$120,300
Construction Management	10%	$48,100
Escalation to 2026	3% per year	$43,300
Subtotal, Additional Cost Factors		**$443,200**
Total Project Cost (Rounded)		**$925,000**

Funding Summary

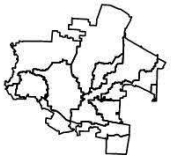


Note: SDC = System Development Charges (COH), LSF = Local Service Fee (COH), CWS = Clean Water Services (District)

Sanitary Sewer CIP Fact Sheet

Project Location

EdgeID	Material	Install Year	Diameter (in)	Length (ft)	Buried Depth (ft)	Rehab Method	No. of active taps
49801	CONC	1961	18	9	N/A	Pipe Burst	0
816812	PVC	-	18	145	N/A	Pipe Burst	0
801803	CONC	1960	12	45	N/A	Pipe Burst	0
35939	CONC	1961	18	161	N/A	Pipe Burst	0



Locator Map

City of Hillsboro
Washington County, Oregon

CIP 6 - TV HWY

Sewershed: Turner Creek

Friday, August 11, 2023

0 62.5 125 250 Feet N

Hillsboro OREGON

Brown AND Caldwell

Wastewater CIP Project Fact Sheet

ID:	CIP 7		Prepared Date: September 8, 2023
Name:	Emma Jones		
Location:	3765 NE Jackson Road, Hillsboro, OR 97124		
Cost:	$634,000	Funding Biennium: FY26	Rank: 7

Description

CIP 7 will rehabilitate 422 feet of 21-inch concrete pipe located in the Emma Jones green space adjacent to Jackson School Road. The concrete pipe was installed in 1981. The pipeline conveys wastewater from the North Side drainage basin, through the Jackson School neighborhood, along the Emma Jones natural area, until it reaches the Rock Creek Advanced Wastewater Treatment Facility.

Historically, the North Plains Pump Station operated by Clean Water Services (CWS) once discharged upstream, to the east of this portion of the main. The corrosion from gases naturally released by aging sewage caused spalling in the concrete pipe. CWS rerouted the North Plains force main to a new discharge point and repaired several segments of the main but did not rehabilitate the segment this CIP has designated for repair, now showing signs of similar corrosion.

Recent pipeline inspections show this pipe segment has a number of priority defects including grease deposits, surface corrosion both on the walls of the pipe, from the flowing of effluent, and on the crown of the pipe. If left in its current state, H_2S from the wastewater will continue to corrode the concrete, further compromising the structural stability of the pipe. This pipe segment is not made of reinforced concrete and surface corrosion severely degrades the integrity of the pipe.

Pipeline rehabilitation includes lining the existing pipe with a UV-cured cured-in-place pipe (CIPP). The pipeline will be under full bypass to clean, install, and cure the liner. The pipeline is in a greenspace, so impacts to traffic will be minimal. This CIP includes work adjacent to Emma Jones Nature Preserve; costs for additional wetland permitting are included in the cost estimate.

Also included in this CIP is construction of an access easement. The easement will provide COH staff direct access to the pipeline and adjacent manholes, which has been lacking and impedes their ability to properly maintain and respond to emergencies should they occur in this area. Easement costs are estimates only. The efforts required to negotiate terms for the price of the property required for access has not yet been initiated and may evolve or change location completely.

Benefits

Benefits of this project include:

- Rehabilitates existing infrastructure.
- CIPP liner restores structural integrity of existing pipe, provides protective barrier for H_2S corrosion, root intrusion, and infiltration.
- CIPP is a trenchless rehabilitation method; minimal impacts to the area are anticipated.
- Improves access for maintenance.
- The pipe is a larger interceptor and conveys flows across town and thus does not have any lateral connections. Lack of laterals reduces the time and cost to rehab the pipe and reestablish service.

CIP 7 Cost Estimate

Construction

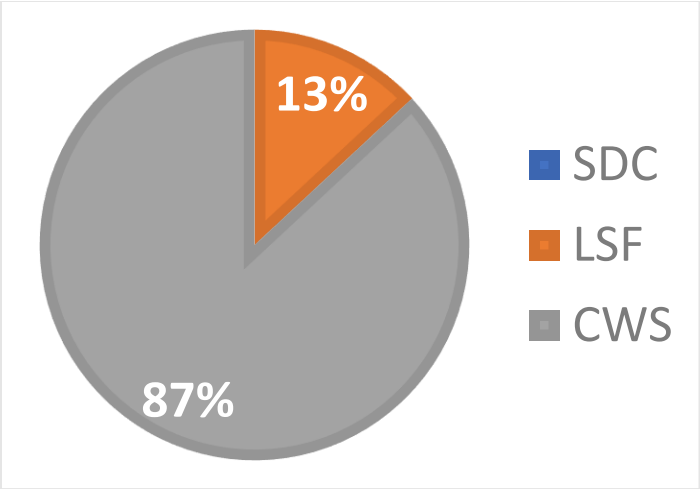
Item	Assumption	Amount
Pipeline Rehabilitation	UV Cured CIPP	$83,400
Easement Construction[a]		$9,900
Bypass Pumping		$31,700
Subtotal, Construction		*$125,000*
Mobilization	5%	$6,250
Erosion and Sediment Control	1%	$1,250
Subtotal, Construction, Mob, ESC		*$132,500*
Construction Contingency	30%	$39,750
Subtotal, Construction & Contingency		**$304,750**

Additional Cost Factors

Item	Assumption	Amount
Basic Permitting	Lump sum	$15,000
Engineering Services	20%	$60,950
City Project Administration	15%	$45,713
Easement Acquisition[a]	$10/SF	$58,437
Easement Survey and Legal	20% of Acquisition	$11,687
Wetland Permitting and Admin Contingency	25%	$76,188
Residential Outreach Admin	5%	$2,922
Construction Management	10%	$30,475
Escalation to 2026	3% per year	$27,428
Subtotal, Additional Cost Factors		**$328,799**
Total Project Cost (Rounded)		**$634,000**

a. Costs for the Easement Acquisition and construction will be sourced through City of Hillsboro funding sources.

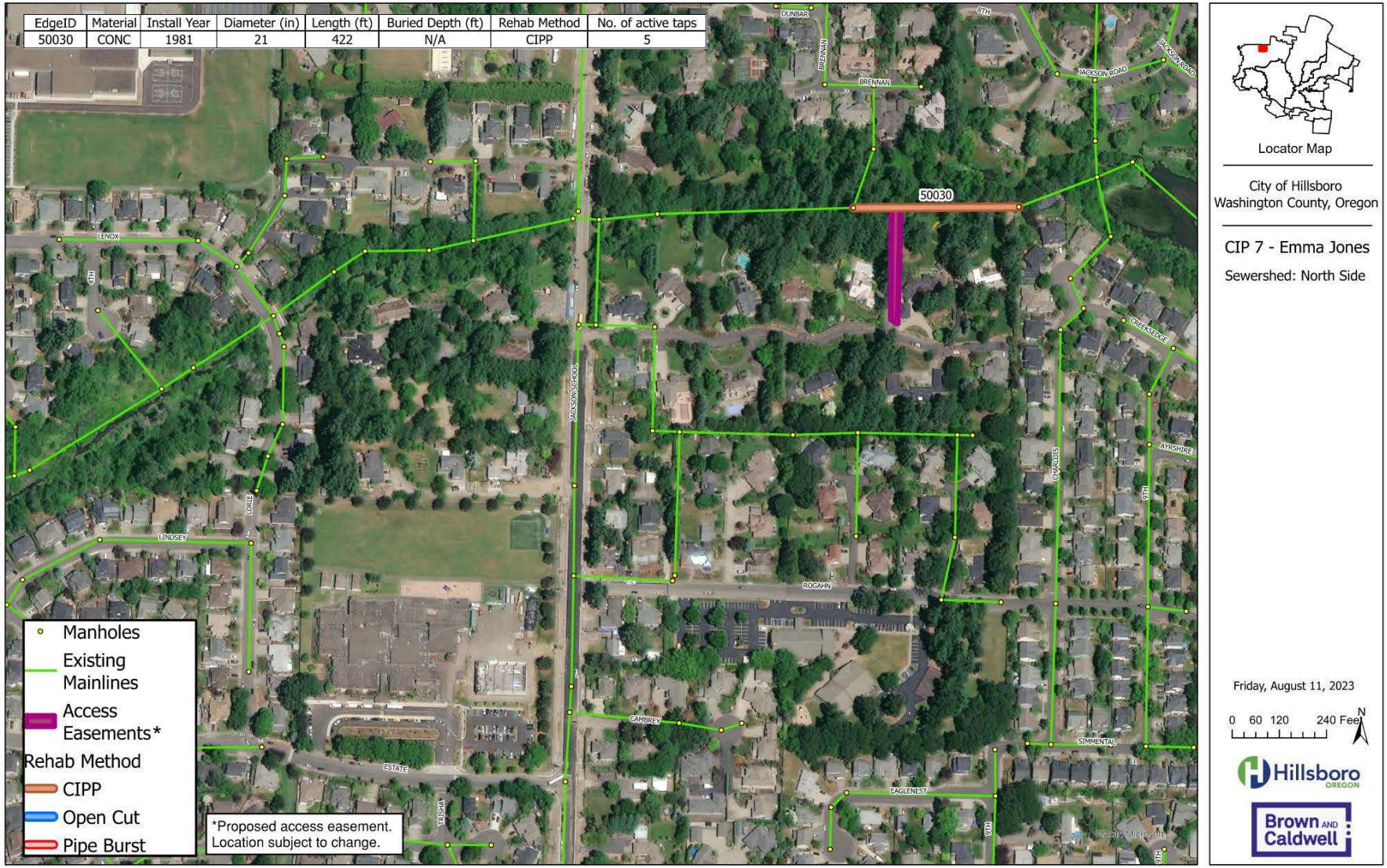
Funding Summary



Note: SDC = System Development Charges (COH), LSF = Local Service Fee (COH), CWS = Clean Water Services (District)

Wastewater CIP Project Fact Sheet

Project Location



Sanitary Sewer CIP Project Fact Sheet

ID:	CIP 8		Prepared Date: September 8, 2023
Name:	SE Walnut Street & SE 14th Avenue		
Location:	1370 SE Walnut Street, Hillsboro, OR 97123		
Cost:	$2,615,000	Funding Biennium: FY26	Priority Rank: 8

Project Description and Background

CIP 8 will rehabilitate 2,058 linear feet (LF) of 8-inch concrete and HDPE pipe. This project is south of SW Oak Street and bound between 12th Avenue and Turner Creek and is shown in the Project Location figure below. The 8-inch pipes in this area primarily serve the immediate surrounding businesses and residents southeast of downtown Hillsboro. The original concrete pipe was installed between 1959 and 1967; the HDPE pipe was installed in 2000.

Recent pipeline inspections show these pipe segments have several priority defects including FOG (fats, oil, and grease), missing and projecting aggregate, visible holes/visible soil, defective point repair, and infiltration. If left in its current state, hydrogen sulfide (H_2S) from the wastewater will continue to erode the concrete and further compromise the structural stability of the pipe. Soil can get washed into the pipe through the holes and destabilize the pipe bedding. One pipe segment was observed to have a point repair that is defective and dropped out of alignment with the host pipe. Open cut replacement is needed to repair the pipe bedding and reinstate the repair.

To reduce the amount of inflow and infiltration (I/I) coming into the wastewater system, COH is replacing laterals, the pipelines conveying wastewater from homes/businesses to the wastewater main in the road, as part of the rehabilitation project. The segments identified for replacement contribute to the I/I of Turner Creek Basin. The completion of this CIP is an incremental step in the basin wide approach to reduction of I/I in this basin.

Pipeline rehabilitation will be completed with both pipe bursting and open cut approaches. Open cut methodology was selected for sections where the point repair is defective. Bedding material under each section will be repaired and existing pipe will be removed and replaced. The project includes costs associated with bypassing wastewater to burst and open cut replace pipe segments. These pipelines are located within ROW and will require traffic control and public outreach.

Also included in this CIP is construction of two access easements. The easements will provide COH staff direct access to the pipeline and adjacent manholes, which has been lacking and impedes their ability to properly maintain and respond to emergencies should they occur in this area. Easement costs are estimates only. The efforts required to negotiate terms for the price of the property required for access has not yet been initiated and may evolve or change location completely.

Benefits

Benefits of this project include:

- Rehabilitates existing infrastructure.
- Improves access for maintenance.
- Pipe bursting fully replaces the existing pipe with a new pipe.
- Open cut replacement addresses deficiencies in pipe bedding and the resultant pipe sags.
- Lateral replacement for surrounding residential connections.
- Turner Creek Basin partial I/I reduction.

CIP 8 Cost Estimate

Construction

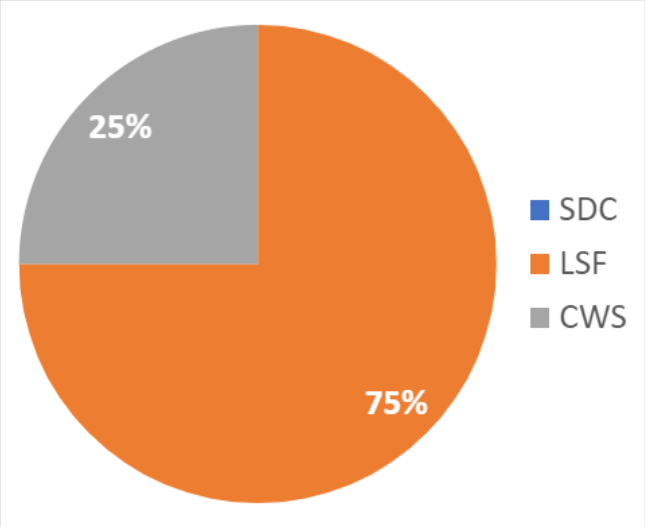
Item	Assumption	Amount
Pipeline Rehabilitation	Pipe burst	$338,400
Pipeline Replacement & Laterals	Open cut	$515,300
Easement Construction		$16,600
Bypass Pumping		$52,600
Traffic Control		$57,300
Subtotal, Construction		*$980,200*
Mobilization	5%	$49,100
Erosion and Sediment Control	1%	$9,900
Subtotal, Construction, Mob, ESC		*$1,039,200*
Construction Contingency	30%	$311,800
Subtotal, Construction & Contingency		**$1,351,000**

Additional Cost Factors

Item	Assumption	Amount
Basic Permitting	Lump sum	$15,000
Engineering Services	20%	$270,200
City Project Administration	15%	$202,700
Easement Acquisition	$10/SF	$90,600
Easement Survey and Legal	20% of Acquisition	$18,200
Wetland Permitting and Admin Contingency	25%	$337,800
Residential Outreach Admin	5%	$4,600
Party Lateral Contingency	5%	$67,600
Construction Management	10%	$135,100
Escalation to 2026	3% per year	$121,600
Subtotal, Additional Cost Factors		**$1,263,400**
Total Project Cost (Rounded)		**$2,615,000**

a. Costs for the Easement Acquisition and construction will be sourced through City of Hillsboro funding sources.

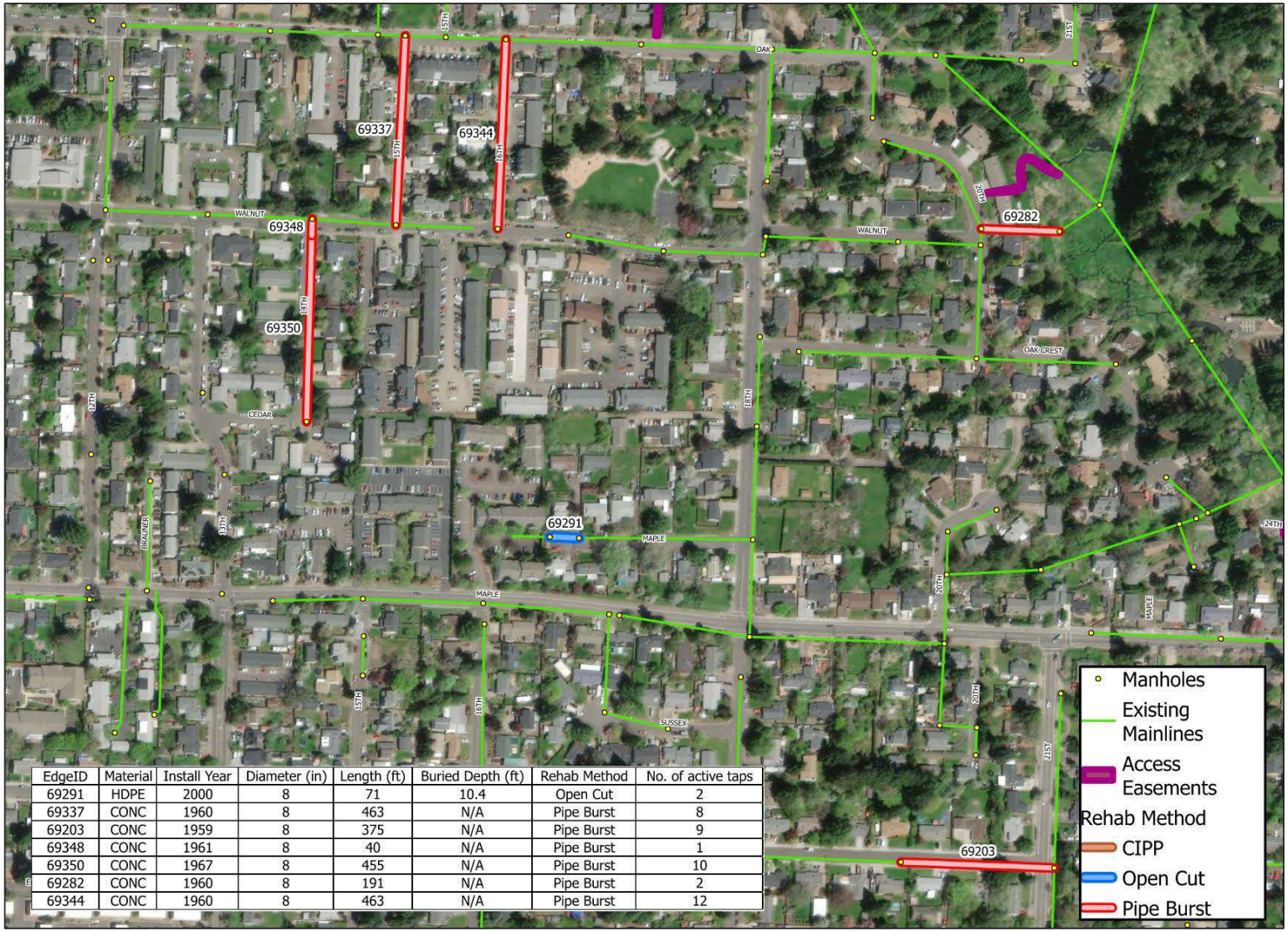
Funding Summary



Note: SDC = System Development Charges (COH), LSF = Local Service Fee (COH), CWS = Clean Water Services (District)

Sanitary Sewer CIP Project Fact Sheet

Project Location



EdgeID	Material	Install Year	Diameter (in)	Length (ft)	Buried Depth (ft)	Rehab Method	No. of active taps
69291	HDPE	2000	8	71	10.4	Open Cut	2
69337	CONC	1960	8	463	N/A	Pipe Burst	8
69203	CONC	1959	8	375	N/A	Pipe Burst	9
69348	CONC	1961	8	40	N/A	Pipe Burst	1
69350	CONC	1967	8	455	N/A	Pipe Burst	10
69282	CONC	1960	8	191	N/A	Pipe Burst	2
69344	CONC	1960	8	463	N/A	Pipe Burst	12

Locator Map

City of Hillsboro
Washington County, Oregon

CIP 8 - SE Walnut St & SE 14th Avenue
Sewershed: Turner Creek

Wednesday, August 30, 2023

0 62.5 125 250 Feet

N

Sanitary Sewer CIP Fact Sheet

ID:	CIP 9		Prepared Date: September 8, 2023
Name:	Sunrise Lane		
Location:	1276 NE Sunrise Lane, Hillsboro, OR 97124		
Cost:	$11,941,000	Funding Biennium: FY28	Priority Rank: 9

Project Description and Background

CIP 9 will rehabilitate 5,113 linear feet (LF) of 8- to 10-inch concrete pipe located predominantly in the Sunrise Lane right-of-way (ROW), along NE Thomas Street, and a segment between residential parcels south of Sunrise Lane. The project pipes are shown in the Project Location figure below. The original pipe was installed between 1968 and 1969. The 8 and 10-inch pipe primarily conveys wastewater from the surrounding residents on Sunrise Lane between Jackson School Road and 17th Avenue and on 9th Avenue between Sunrise Lane and Baldwin Drive.

COH prioritizes replacing concrete pipe that conveys wastewater flows from industries. Depending on the industry, industrial wastewater can be more corrosive than domestic wastewater which increases the wear on the pipes.

COH plans to time the construction of CIP 9 with a transportation project on Sunrise Lane. Sunrise Lane will be a "complete street" project will include replacement of sidewalks, bike lanes, and stormwater conveyance infrastructure. However, there is some uncertainty of the timing of this transportation project, and it may need to be constructed in two separate phases.

Recent pipeline inspections show deficient pipe segments have the following defects: significant sags (70 percent +), grease deposits, surface aggregate projecting, and debris. In some cases, debris surplus caused inspections to be abandoned or the CCTV camera to go under water. If left in its current state, hydrogen sulfide (H_2S) from the wastewater will continue to erode the concrete and further compromise the structural stability of the pipe. The large sags in the pipe will continue to collect debris increasing the risk of future sanitary sewer overflows (SSOs).

Pipeline rehabilitation will be completed via open cut replacement. Open cut methodology was selected to correct the identified significant sags. Bedding material under each section will be repaired and existing pipe will be removed and replaced. The project includes costs associated with bypassing wastewater to open cut replace pipe segments. The manholes in this project area will be coated with a protective coating to protect the existing concrete from further corrosion.

These pipelines are located within the right-of-way (ROW) and will require traffic control and public outreach.

Benefits

Benefits of this project include:

- Rehabilitates existing infrastructure.
- Open cut replacement addresses deficiencies in pipe bedding and the resultant pipe sags.
- Debris removal will increase hydraulic capacity of the pipe and reduce the risk of future SSOs.
- Manholes in this area will be coated to prevent further corrosion.
- Lateral replacement for surrounding residential connections.
- Possibility of overlapping upgrades with roadway improvements.
- Supports continued Industrial Discharge conveyance.

CIP 9 Cost Estimate

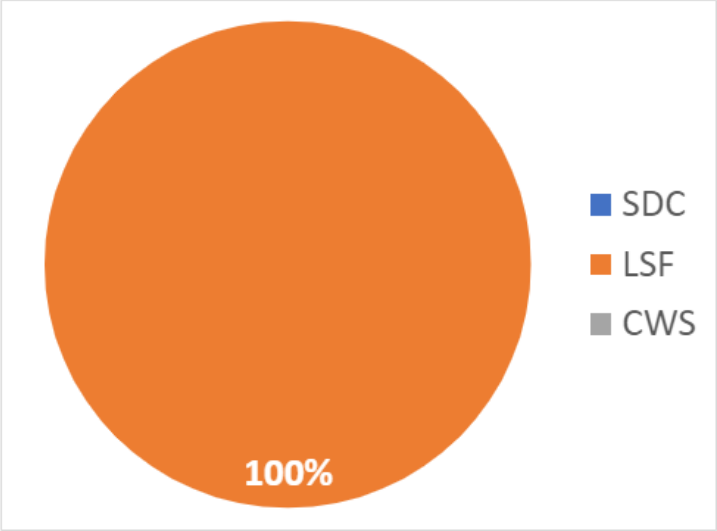
Construction

Item	Assumption	Amount
Pipeline & Lateral Replacement	Open Cut; upsize 10” to 12” diam.	$4,860,900
Manhole Rehabilitation	22 manholes, epoxy coating	$250,900
Bypass Pumping		$116,800
Traffic Control		$143,000
Subtotal, Construction		*$5,120,700*
Mobilization	5%	$256,100
Erosion and Sediment Control	1%	$51,300
Subtotal, Construction, Mob, ESC		*$5,428,100*
Construction Contingency	30%	$1,628,430
Subtotal, Construction & Contingency		**$7,056,530**

Additional Cost Factors

Item	Assumption	Amount
Basic Permitting	Lump sum	$15,000
Engineering Services	30%	$2,117,000
City Project Administration	15%	$1,058,500
Party Lateral Contingency	5%	$352,900
Construction Management	10%	$705,700
Escalation to 2028	3% per year	$1,058,500
Subtotal, Additional Cost Factors		**$5,307,600**
Total Project Cost (Rounded)		**$12,365,000**

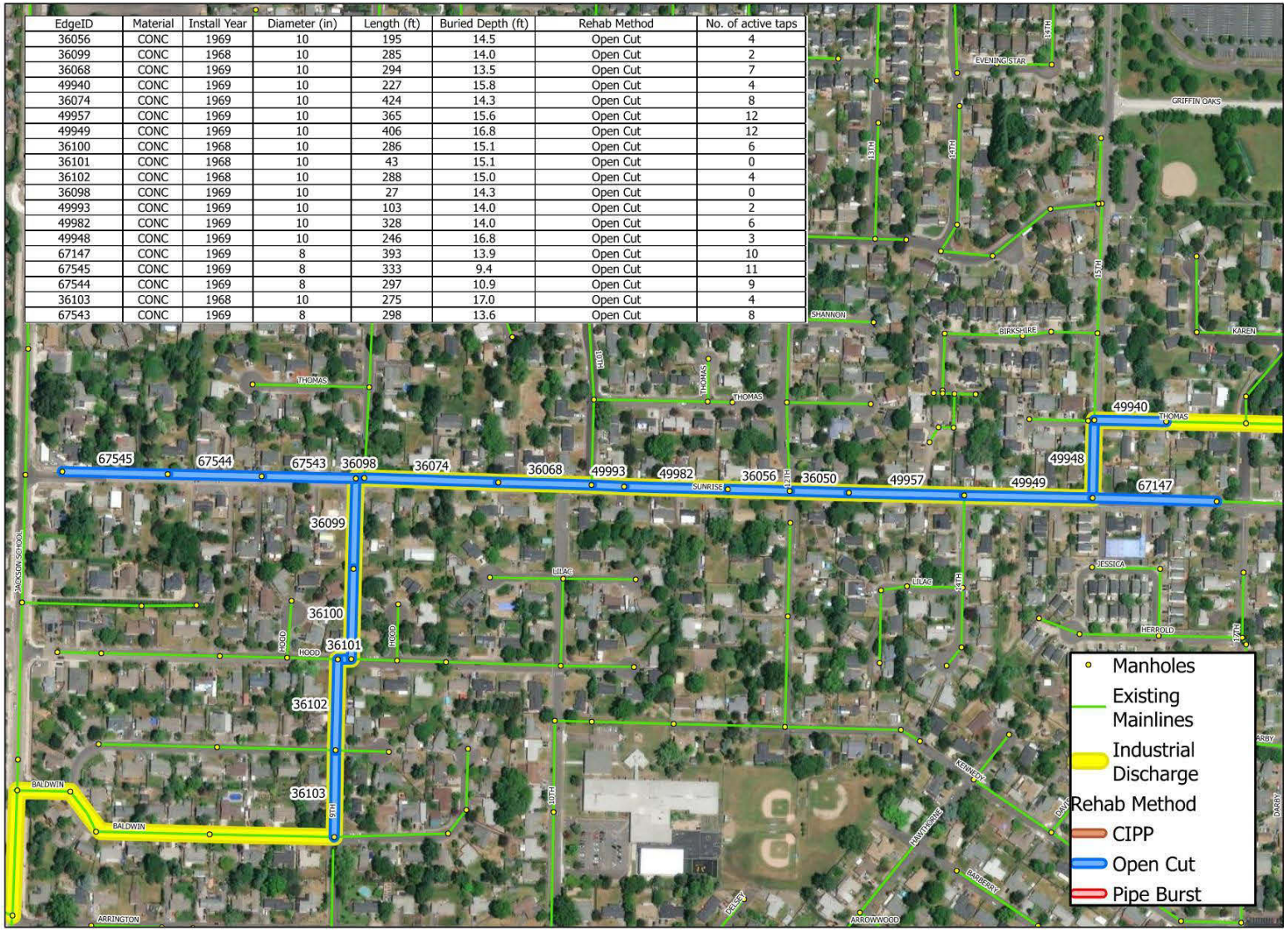
Funding Summary



Note: SDC = System Development Charges (COH), LSF = Local Service Fee (COH), CWS = Clean Water Services (District)

Project Location

EdgeID	Material	Install Year	Diameter (in)	Length (ft)	Buried Depth (ft)	Rehab Method	No. of active taps
36056	CONC	1969	10	195	14.5	Open Cut	4
36099	CONC	1968	10	285	14.0	Open Cut	2
36068	CONC	1969	10	294	13.5	Open Cut	7
49940	CONC	1969	10	227	15.8	Open Cut	4
36074	CONC	1969	10	424	14.3	Open Cut	8
49957	CONC	1969	10	365	15.6	Open Cut	12
49949	CONC	1969	10	406	16.8	Open Cut	12
36100	CONC	1968	10	286	15.1	Open Cut	6
36101	CONC	1968	10	43	15.1	Open Cut	0
36102	CONC	1968	10	288	15.0	Open Cut	4
36098	CONC	1969	10	27	14.3	Open Cut	0
49993	CONC	1969	10	103	14.0	Open Cut	2
49982	CONC	1969	10	328	14.0	Open Cut	6
49948	CONC	1969	10	246	16.8	Open Cut	3
67147	CONC	1969	8	393	13.9	Open Cut	10
67545	CONC	1969	8	333	9.4	Open Cut	11
67544	CONC	1969	8	297	10.9	Open Cut	9
36103	CONC	1968	10	275	17.0	Open Cut	4
67543	CONC	1969	8	298	13.6	Open Cut	8



Locator Map

City of Hillsboro
Washington County, Oregon

CIP 9 - Sunrise Lane (Industrial)

Sewershed: North Side

Friday, August 11, 2023

0 80 160 320 Feet

N

Sanitary Sewer CIP Project Fact Sheet

ID:	CIP 10		Prepared Date: September 8, 2023
Name:	NW Garibaldi Street		
Location:	870 NW Garibaldi St, Hillsboro, OR 97124		
Cost:	$7,248,000	Funding Biennium: FY28	Priority Rank: 10

Description

CIP 10 will rehabilitate 1,695 linear feet (LF) of 8-inch and 15-inch concrete pipe. The pipeline serves the residential neighborhood east of McKay Creek and is shown in the Project Location figure below. The McKay Creek Basin conveys flows to the Hillsboro Water Resource Recovery Facility. Portions of the 8-inch concrete pipe were installed in 1972 and 1980; the 15-inch concrete pipe was installed in 1972.

Recent pipeline inspections show these pipe segments have several priority defects including broken pipe, missing aggregate, visible rebar, infiltration, holes with visible soil, and a hole in pipe which caused the pipeline survey to be abandoned. If left in its current state, the pipeline will experience increased infiltration and soil coming into the pipe from the holes and broken sections. Voids in the soil can form behind the holes and destabilize the pipe bedding. Roots were noted in several pipe segments and a root ball was discovered in one segment which was estimated to take up 95 percent of pipe diameter. COH regularly treats several pipe segments in CIP 10 for roots. Regular (annually to quarterly) root treatment increases wear and tear on the clay and concrete pipe.

To reduce the amount of inflow and infiltration (I/I) coming into the wastewater system, COH is replacing laterals, the pipelines conveying wastewater from homes/businesses to the wastewater main in the road, as part of the rehabilitation project. The segments identified for replacement contribute to the I/I of McKay Creek Basin. The completion of this CIP is an incremental step in the basin wide approach to reduction of I/I in this basin.

Pipeline rehabilitation includes replacing existing pipelines by pipe bursting and open cut replacement. The project includes costs associated with bypassing wastewater to install new pipe. The pipeline is in the right of way (ROW), so traffic control will be required.

Also included in this CIP is construction of two access easements. The easements will provide COH staff direct access to the pipeline and adjacent manholes, which has been lacking and impedes their ability to properly maintain and respond to emergencies should they occur in this area. Easement costs are estimates only. The efforts required to negotiate terms for the price of the property required for access has not yet been initiated and may evolve or change location completely.

Benefits

Benefits of this project include:

- Rehabilitates existing infrastructure.
- Supports COH goals of rehabilitating aging concrete pipe.
- Pipe bursting fully replaces the existing pipe with a new pipe.
- Improves access for maintenance.
- Cessation of regular root treatment.
- Increased hydraulic capacity after root ball removal and pipe diameter increase.
- Lateral replacement for surrounding residential connections.
- McKay Creek Basin potential I/I reduction

CIP 10 Cost Estimate

Construction

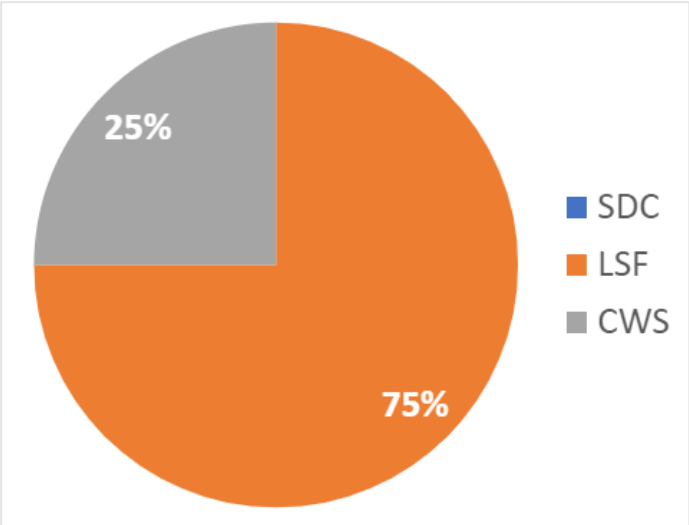
Item	Assumption	Amount
Pipeline Rehabilitation	Pipe burst	$199,300
Pipeline & Lateral Replacement	Open cut	$2,773,600
Easement Construction[a]		$7,000
Bypass Pumping		$39,500
Traffic Control		$46,200
Subtotal, Construction		*$3,065,600*
Mobilization	5%	$153,300
Erosion and Sediment Control	1%	$30,700
Subtotal, Construction, Mob, ESC		*$3,249,600*
Construction Contingency	30%	$974,900
Subtotal, Construction & Contingency		**$4,224,500**

Additional Cost Factors

Item	Assumption	Amount
Basic Permitting	Lump sum	$15,000
Engineering Services	20%	$844,900
City Project Administration	15%	$633,700
Easement Acquisition	$10/SF	$40,700
Easement Survey and Legal	20% of Acquisition	$8,200
Residential Outreach Admin	5%	$213,300
Party Lateral Contingency	5%	$211,300
Construction Management	10%	$422,500
Escalation to 2028	3% per year	$633,700
Subtotal, Additional Cost Factors		**$3,023,300**
Total Project Cost (Rounded)		**$7,248,000**

a. Costs for the Easement Acquisition and construction will be sourced through City of Hillsboro funding sources.

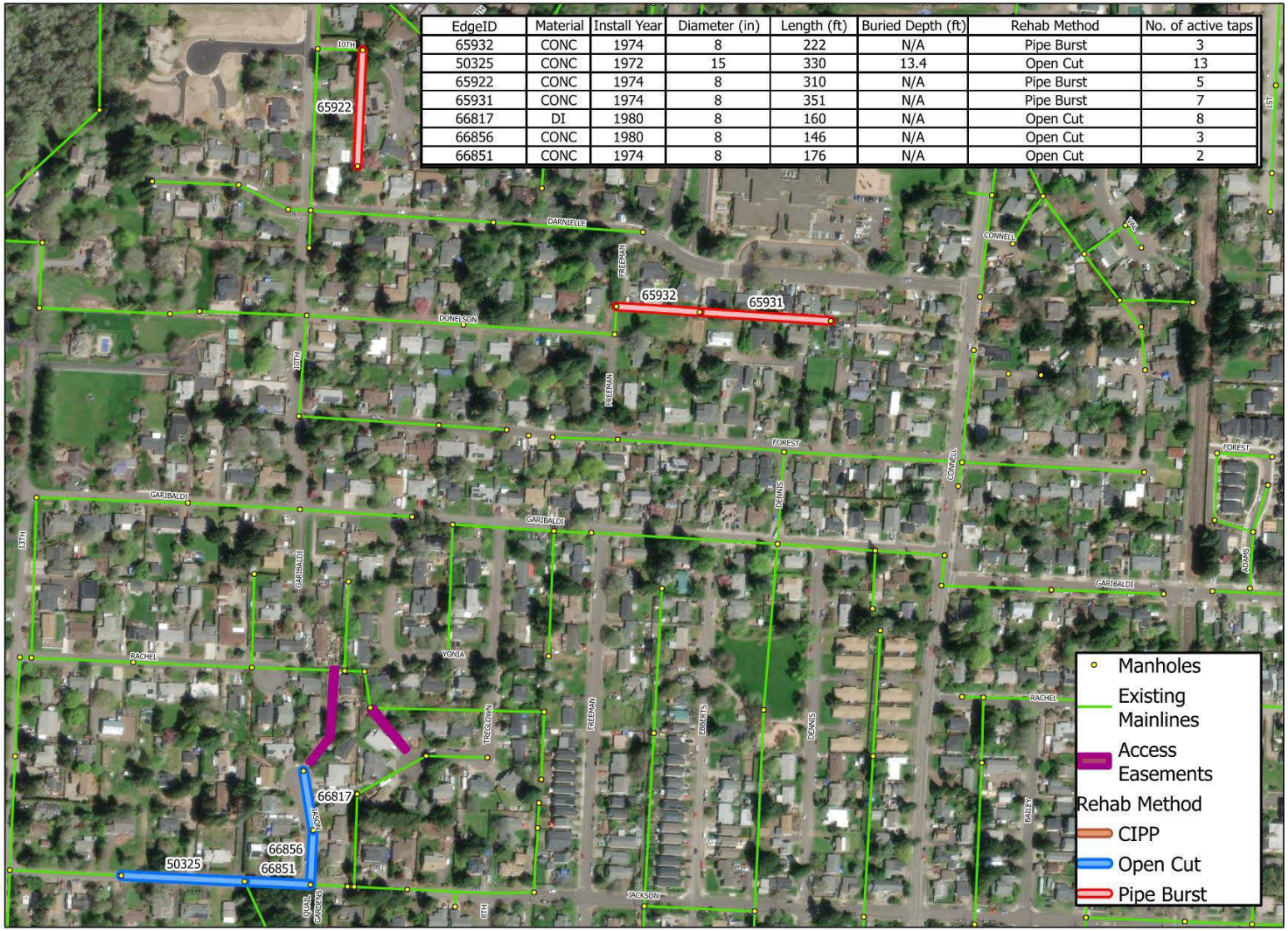
Funding Summary



Note: SDC = System Development Charges (COH), LSF = Local Service Fee (COH), CWS = Clean Water Services (District)

Sanitary Sewer CIP Project Fact Sheet

Project Location



EdgeID	Material	Install Year	Diameter (in)	Length (ft)	Buried Depth (ft)	Rehab Method	No. of active taps
65932	CONC	1974	8	222	N/A	Pipe Burst	3
50325	CONC	1972	15	330	13.4	Open Cut	13
65922	CONC	1974	8	310	N/A	Pipe Burst	5
65931	CONC	1974	8	351	N/A	Pipe Burst	7
66817	DI	1980	8	160	N/A	Open Cut	8
66856	CONC	1980	8	146	N/A	Open Cut	3
66851	CONC	1974	8	176	N/A	Open Cut	2

Locator Map

City of Hillsboro
Washington County, Oregon

CIP 10 - NW Garibaldi Street
Sewershed: North Side/ Hillsboro Plant

Wednesday, August 30, 2023

0 65 130 260 Feet N

Hillsboro OREGON

Brown AND Caldwell

Sanitary Sewer CIP Fact Sheet

ID:	CIP 11		Prepared Date: September 8, 2023
Name:	Arrington Road I/I		
Location:	1370 NE Arrington Rd, Hillsboro, OR 97124		
Cost:	$11,713,000	Funding Biennium: FY28	Priority Rank: 11

Description

CIP 11 will rehabilitate 2,864 linear feet (LF) of 8-inch concrete pipe with priority condition defects and another 12,389 LF of pipe slated for rehabilitation to reduce Inflow and Infiltration (I/I). Located adjacent to NE Arlington Road and NE Cornell Road, this pipeline serves the Mooberry Elementary School, Poynter Middle School, and the surrounding neighborhoods. The original pipe was installed in 1960 and 1977, which means the sewer infrastructure in this neighborhood at time of construction will be well over 50 years old.

Recent pipeline inspections revealed pipe segments with several priority defects including protruding aggregate and infiltration. If left in its current state, hydrogen sulfide (H_2S) from the wastewater will continue to degrade the concrete and decrease the structural integrity of the pipe. Several pipe segments in CIP 11 are treated regularly for roots. Regular (annually to quarterly) root treatment increases wear and tear on the clay and concrete pipe. One pipe segment was observed to have a large sag causing the camera to go underwater and the survey had to be abandoned.

COH plans to rehabilitate the CIP 11 project area as part of the broader I/I program. The I/I projects address not only cracked gravity mains but also the connected laterals that convey wastewater from homes to the sewer main. CIP 11 is one of the largest CIPs COH has in their 10-year Master Plan because it is meant to encompass a broad footprint of the drainage basin to prevent I/I from infiltrating the system. By addressing large areas of the collection system, COH provides a holistic approach to mitigating I/I for Turner Creek and North Side basins.

Pipeline rehabilitation will be completed via pipe bursting. The pipe segments comprising the 12,389 LF of pipe identified to reduce I/I will require validation for project inclusion through further review of condition assessment data and flow monitoring. The project includes costs associated with bypassing wastewater to allow a contractor to systematically replace pipe segments.

These pipelines are located within ROW and will require traffic control and public outreach.

Benefits

Benefits of this project include:

- Rehabilitates existing infrastructure.
- Pipe bursting fully replaces the existing pipe with a new pipe.
- Cessation of regular root treatment.
- Reduction in I/I in the Turner Creek and North Side basins.
- Lateral replacement for surrounding residential connections.

CIP 11 Cost Estimate

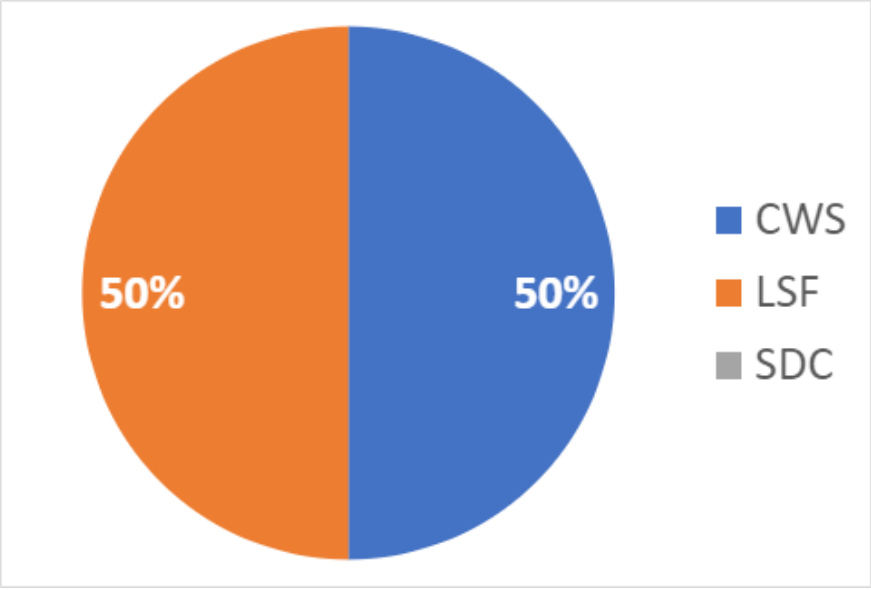
Construction

Item	Assumption	Amount
Pipeline Rehabilitation	Pipe burst	$2,128,700
Lateral Replacement	Open cut	$2,627,900
Bypass Pumping		$147,300
Traffic Control		$89,300
Subtotal, Construction		*$4,993,200*
Mobilization	5%	$249,700
Erosion and Sediment Control	1%	$50,000
Subtotal, Construction, Mob, ESC		*$5,292,900*
Construction Contingency	30%	$1,587,870
Subtotal, Construction & Contingency		**$6,880,770**

Additional Cost Factors

Item	Assumption	Amount
Basic Permitting	Lump sum	$15,000
Engineering Services	20%	$1,376,200
City Project Administration	15%	$1,032,200
Residential Outreach Admin	5%	$344,100
Party Lateral Contingency	5%	$344,100
Construction Management	10%	$688,100
Escalation to 2028	3% per year	$1,032,200
Subtotal, Additional Cost Factors		**$4,831,900**
Total Project Cost (Rounded)		**$11,713,000**

Funding Summary



Note: SDC = System Development Charges (COH), LSF = Local Service Fee (COH), CWS = Clean Water Services (District)

Project Location

EdgeID	Material	Install Year	Diameter (in)	Length (ft)	Buried Depth (ft)	Rehab Method	No. of active taps
67240	CONC	1977	8	134	N/A	Pipe Burst	1
67237	CONC	1977	8	231	N/A	Pipe Burst	5
68731	CONC	1959	8	395	N/A	Pipe Burst	10
68733	CONC	1959	8	395	N/A	Pipe Burst	8
68267	CONC	1960	8	350	N/A	Pipe Burst	6
67238	CONC	1977	8	336	N/A	Pipe Burst	7
67253	CONC	1977	8	258	N/A	Pipe Burst	6
67260	CONC	1960	6	283	N/A	Pipe Burst	4
67154	CONC	1977	8	217	N/A	Pipe Burst	2
67217	CONC	1960	8	92	N/A	Pipe Burst	2
67241	CONC	1977	8	96	N/A	Pipe Burst	0
67252	CONC	1977	8	117	N/A	Pipe Burst	3
67261	CONC	1960	6	113	N/A	Pipe Burst	2
68459	CONC	1960	8	242	N/A	Pipe Burst	3
Arrington Court I&I Rehab	PVC	1974	6	279	N/A	I&I Rehab	3
	CONC	1959-1977	8	7863	N/A	I&I Rehab	153
	CONC	1959-1963	10	1383	N/A	I&I Rehab	24

Locator Map

City of Hillsboro
Washington County, Oregon

CIP 11 - Arrington Court I&I

Sewershed: Turner Creek/ North Side

Wednesday, August 30, 2023

0 65 130 260 Feet N

Sanitary Sewer CIP Fact Sheet

ID:	CIP 12		Date Prepared: September 8, 2023
Name:	NE 25th Avenue		
Location:	2469 NE Sunrise Lane, Hillsboro, OR 97124		
Cost:	$2,172,000	Funding Biennium: FY30	Priority Rank: 12

Project Description and Background

CIP 12 will rehabilitate 1,574 linear feet (LF) of 8-inch and 10-inch concrete pipe. CIP 12 is located along NE 25th Avenue and borders the commercial and residential area near the Hillsboro Airport and is shown in the Project Location figure below. The original pipe was installed in the 1960s. The pipelines included in CIP 12 serves the Hillsboro Plant and Turner Creek drainage basins.

Recent pipeline inspections show these pipe segments have several priority defects including broken pipe, aggregate projecting, high-water marks (50 percent +), and infiltration. If left in its current state, the broken pipe segments could allow soil to enter the pipe both filling the pipe with debris and creating voids on the outside of the pipe, reducing the stability of the surrounding soil. Several infiltration runners were noted in these pipe segments.

To reduce the amount of inflow and infiltration (I/I) coming into the wastewater system, COH is replacing laterals, the pipelines conveying wastewater from homes/businesses to the wastewater main in the road, as part of the rehabilitation project. The segments identified for replacement contribute to the I/I of Turner Creek and Hillsboro Plant Basins. The completion of this CIP is an incremental step in the basin wide approach to reduction of I/I in this basin.

The project includes costs associated with bypassing wastewater to burst and replace the existing pipe. Pipeline rehabilitation includes replacing the existing concrete pipe with new HDPE pipe of the same size. The pipeline is in the right of way (ROW), so traffic control will be required.

Benefits

Benefits of this project include:

- Replaces existing infrastructure.
- Pipe bursting fully replaces the existing pipe with a new pipe.
- Reduction of I/I in the Hillsboro Plant and Turner Creek basins.
- Lateral replacement for surrounding residential connections.

CIP 12 Cost Estimate

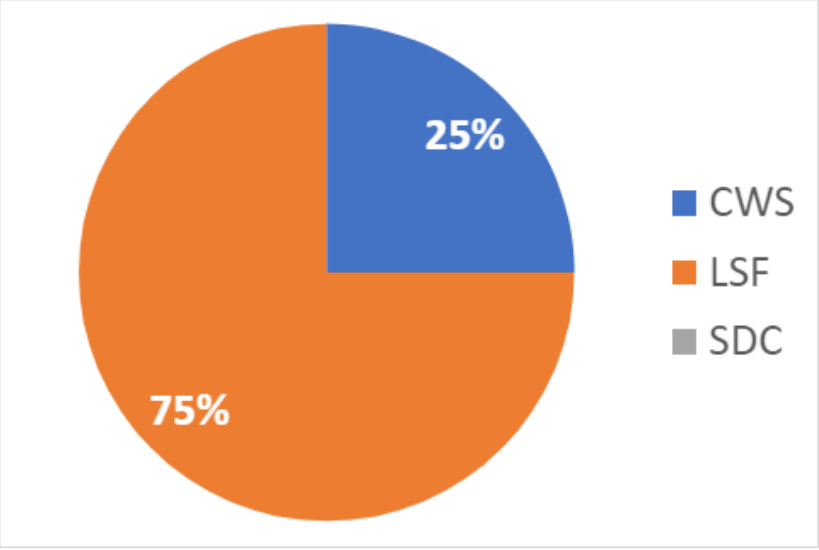
Construction

Item	Assumption	Amount
Pipeline Rehabilitation	Pipe burst	$506,700
Lateral Replacement	Open cut	$406,200
Bypass Pumping		$21,700
Traffic Control		$43,300
Subtotal, Construction		*$977,900*
Mobilization	5%	$48,900
Erosion and Sediment Control	1%	$9,800
Subtotal, Construction, Mob, ESC		*$1,036,600*
Construction Contingency	30%	$311,000
Subtotal, Construction & Contingency		**$1,347,600**

Additional Cost Factors

Item	Assumption	Amount
Basic Permitting	Lump sum	$15,000
Engineering Services	20%	$269,600
City Project Administration	15%	$202,200
Construction Management	10%	$134,800
Escalation to 2030	3% per year	$283,000
Subtotal, Additional Cost Factors		**$904,600**
Total Project Cost (Rounded)		**$2,253,000**

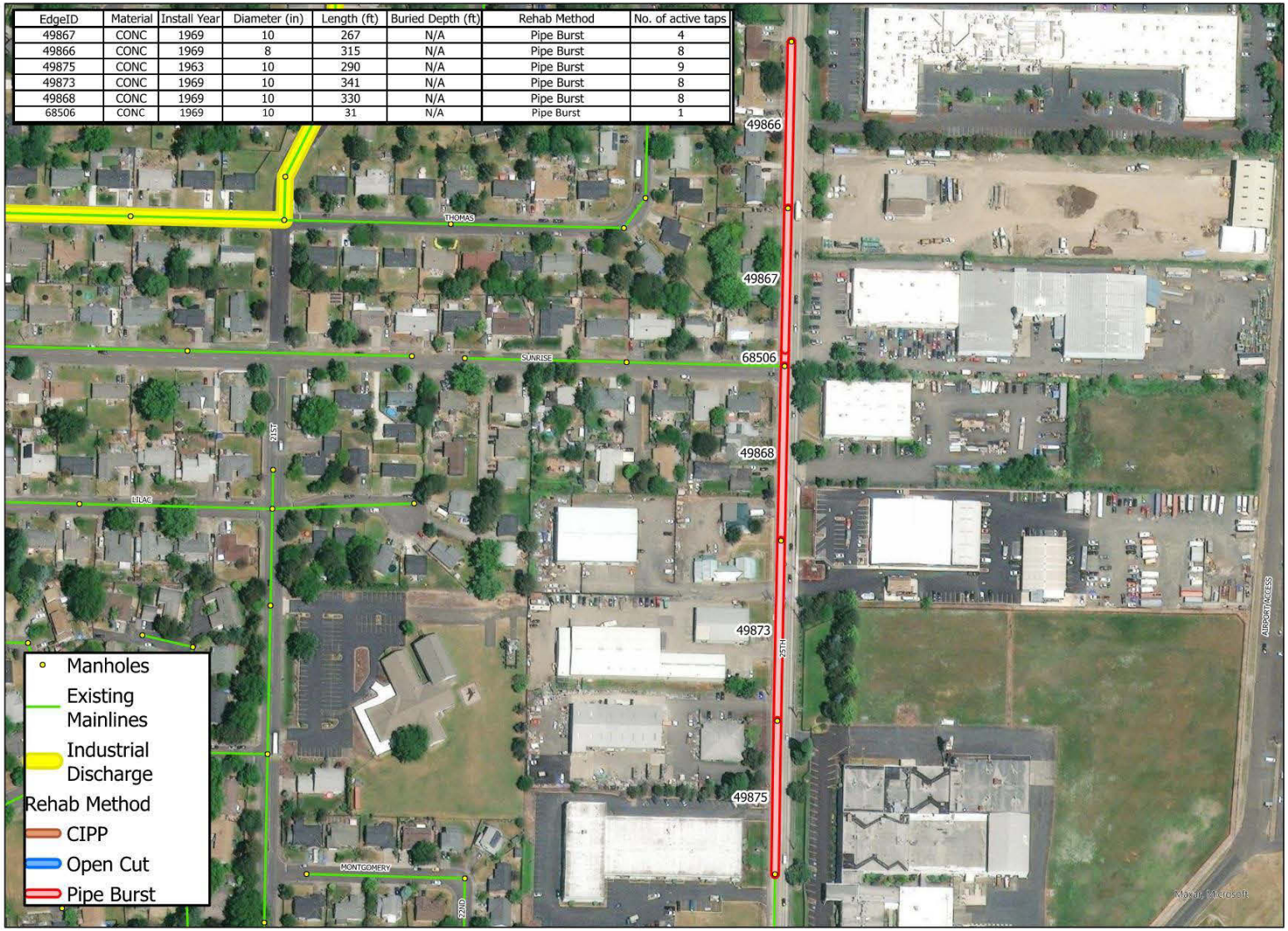
Funding Summary

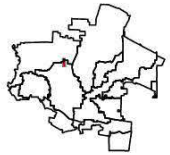


Note: SDC = System Development Charges (COH), LSF = Local Service Fee (COH), CWS = Clean Water Services (District)

Project Location

EdgeID	Material	Install Year	Diameter (in)	Length (ft)	Buried Depth (ft)	Rehab Method	No. of active taps
49867	CONC	1969	10	267	N/A	Pipe Burst	4
49866	CONC	1969	8	315	N/A	Pipe Burst	8
49875	CONC	1963	10	290	N/A	Pipe Burst	9
49873	CONC	1969	10	341	N/A	Pipe Burst	8
49868	CONC	1969	10	330	N/A	Pipe Burst	8
68506	CONC	1969	10	31	N/A	Pipe Burst	1





Locator Map

City of Hillsboro
Washington County, Oregon

CIP 12 - NE 25th Ave

Sewershed: Hillsboro Plant/ Turner Creek

Friday, August 11, 2023

0 45 90 180 Feet N

Sanitary Sewer CIP Fact Sheet

ID:	CIP 13		Prepared Date: September 8, 2023
Name:	Rock Creek		
Location:	1625 SE Brookwood Avenue, Hillsboro, OR 97123		
Cost:	$4,580,000	Funding Biennium: FY30	Priority Rank: 13

Project Description and Background

CIP 13 will rehabilitate 3,536 linear feet (LF) of 8-inch and 10-inch concrete pipe. CIP 13 is located along SE Golden Road and SE Brookwood Avenue and borders residential area near the Rock Creek Trail. The project area is shown in the Project Location figure below. The existing pipe was installed in the 1970s. The 8- and 10-inch pipe primarily serves the surrounding neighborhoods, fire station and businesses along SE Golden Road. These segments of gravity main convey flows for the Rock Creek drainage basin.

Recent pipeline inspections show these pipe segments have several priority defects including broken pipe, infiltration, missing aggregate, and fats, oil, and grease (FOG). If left in its current state, hydrogen sulfide (H_2S) from the wastewater will continue to erode the concrete further compromise the structural stability of the pipe. Several pipe segments in CIP 13 are treated regularly for root intrusion. Regular (annually to quarterly) root treatment increases wear and tear on the clay and concrete pipe.

Pipeline rehabilitation includes replacing the existing concrete pipe with new HDPE pipe. Segments of 8" pipe will be upsized to 15" pipe diameter in SE Frewing Road to provide additional capacity in this priority stretch of sanitary gravity main. The manhole (labeled 71143) has also been included for replacement. This manhole which is primarily used for venting compressed air from the nearby CWS force main and requires a new odor control filtering system and replacement due to corrosion. The project includes costs associated with bypassing wastewater to burst and replace the existing pipe.

These pipelines are located within ROW and will require traffic control and public outreach.

Benefits

Benefits of this project include:

- Replaces existing infrastructure.
- Pipe bursting fully replaces the existing pipe with a new pipe.
- Cessation of regular root treatment.
- Lateral replacement for surrounding residential connections.

CIP 13 Cost Estimate

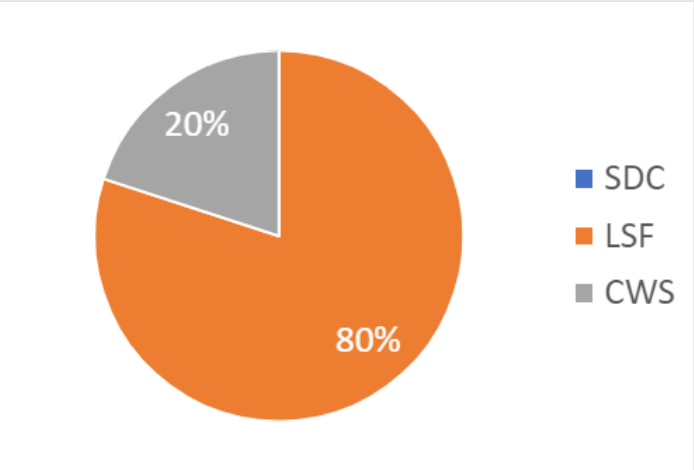
Construction

Item	Assumption	Amount
Pipeline Rehabilitation	Pipe burst	$883,300
Lateral & MH Replacement	Open cut, precast polymer concrete MH	$792,000
Bypass Pumping		$45,600
Traffic Control		$99,000
Subtotal, Construction		*$1,819,900*
Mobilization	5%	$91,000
Erosion and Sediment Control	1%	$18,200
Subtotal, Construction, Mob, ESC		*$1,929,100*
Construction Contingency	30%	$578,800
Subtotal, Construction & Contingency		**$2,507,900**

Additional Cost Factors

Item	Assumption	Amount
Mobilization	5%	$125,400
Basic Permitting	Lump sum	$15,000
Erosion and Sediment Control	1%	$25,100
Engineering Services	30%	$752,400
City Project Administration	15%	$376,200
Construction Management	10%	$250,800
Escalation to 2030	3% per year	$526,700
Subtotal, Additional Cost Factors		**$2,071,600**
Total Project Cost (Rounded)		**$4,580,000**

Funding Summary

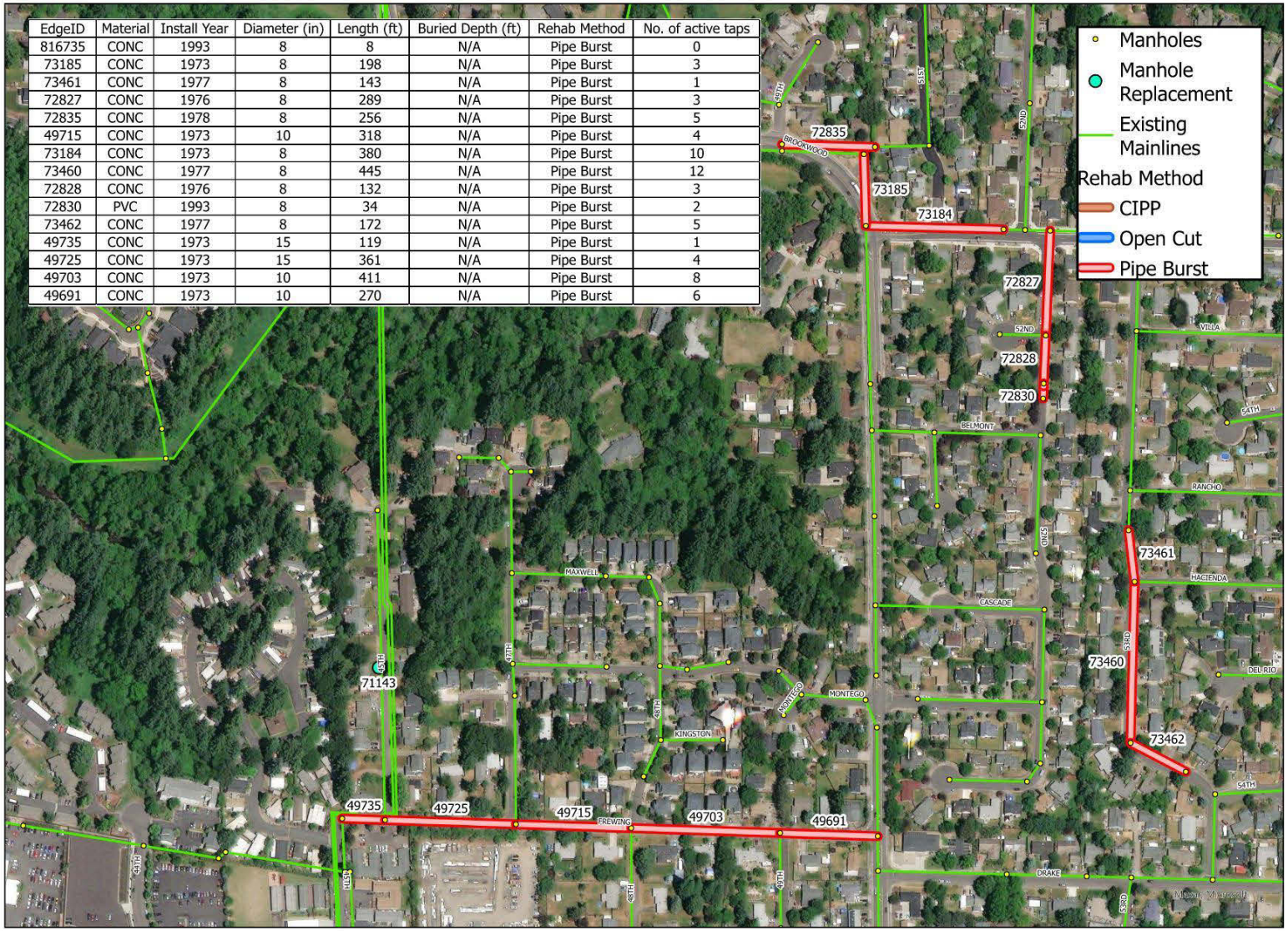


Note: SDC = System Development Charges (COH), LSF = Local Service Fee (COH), CWS = Clean Water Services (District)

Sanitary Sewer CIP Fact Sheet

Project Location

EdgeID	Material	Install Year	Diameter (in)	Length (ft)	Buried Depth (ft)	Rehab Method	No. of active taps
816735	CONC	1993	8	8	N/A	Pipe Burst	0
73185	CONC	1973	8	198	N/A	Pipe Burst	3
73461	CONC	1977	8	143	N/A	Pipe Burst	1
72827	CONC	1976	8	289	N/A	Pipe Burst	3
72835	CONC	1978	8	256	N/A	Pipe Burst	5
49715	CONC	1973	10	318	N/A	Pipe Burst	4
73184	CONC	1973	8	380	N/A	Pipe Burst	10
73460	CONC	1977	8	445	N/A	Pipe Burst	12
72828	CONC	1976	8	132	N/A	Pipe Burst	3
72830	PVC	1993	8	34	N/A	Pipe Burst	2
73462	CONC	1977	8	172	N/A	Pipe Burst	5
49735	CONC	1973	15	119	N/A	Pipe Burst	1
49725	CONC	1973	15	361	N/A	Pipe Burst	4
49703	CONC	1973	10	411	N/A	Pipe Burst	8
49691	CONC	1973	10	270	N/A	Pipe Burst	6



Locator Map

City of Hillsboro
Washington County, Oregon

CIP 13 - Rock Creek

Sewershed: Rock Creek

Friday, August 11, 2023

0 70 140 280 Feet

N

Hillsboro OREGON

Brown AND Caldwell

Sanitary Sewer CIP Fact Sheet

ID:	CIP 14		Prepared Date: September 8, 2023
Name:	Lincoln Elementary School		
Location:	801 NE Lincoln St, Hillsboro, OR 97124		
Cost:	$973,000	Funding Biennium: FY 2030	Priority Rank: 14

Project Description and Background

CIP 14 will rehabilitate 692 linear feet (LF) of 8-inch concrete pipe. Specific segments included are summarized in the included Project Location figure. This project is in the residential neighborhood along NE Lincoln Street. These pipe segments primarily serve the residential neighborhood and convey flow to the Turner Creek trunkline. These pipe segments were constructed in 1960.

Recent pipeline inspections show these pipe segments have several priority defects including missing concrete aggregate and root intrusion. If left in its current state, the concrete pipe will continue to corrode and more aggregate will be exposed and fall out of the concrete into the pipe, reducing the structural stability of the pipe. Several pipe segments in CIP 14 are treated regularly for roots. Regular (annually to quarterly) root treatment increases wear and tear on the clay and concrete pipe. Pipeline inspections for some of these segments had to be abandoned for unspecified reasons, further indicating risks, and contributing for the need to rehabilitate these segments of pipe.

To reduce the amount of inflow and infiltration (I/I) coming into the wastewater system, COH is replacing laterals, the pipelines conveying wastewater from homes/businesses to the wastewater main in the road, as part of the rehabilitation project. The segments identified for replacement contribute to the I/I of Turner Creek Basin. The completion of this CIP is an incremental step in the basin wide approach to reduction of I/I in this basin.

Pipeline rehabilitation includes replacing the existing concrete pipe with new HDPE pipe. The project includes costs associated with bypassing wastewater to burst and replace the existing pipe. The pipeline is in the right of way (ROW), so traffic control will be required. This CIP includes work adjacent to Turner Creek; costs for additional wetland permitting and mitigation have been accounted for in the cost estimate.

Benefits

Benefits of this project include:

- Rehabilitates existing infrastructure.
- Pipe bursting fully replaces the existing pipe with a new pipe.
- Cessation of regular root treatment.
- Lateral replacement for surrounding residential connections.
- Turner Creek basin partial I/I reduction.

CIP 14 Cost Estimate

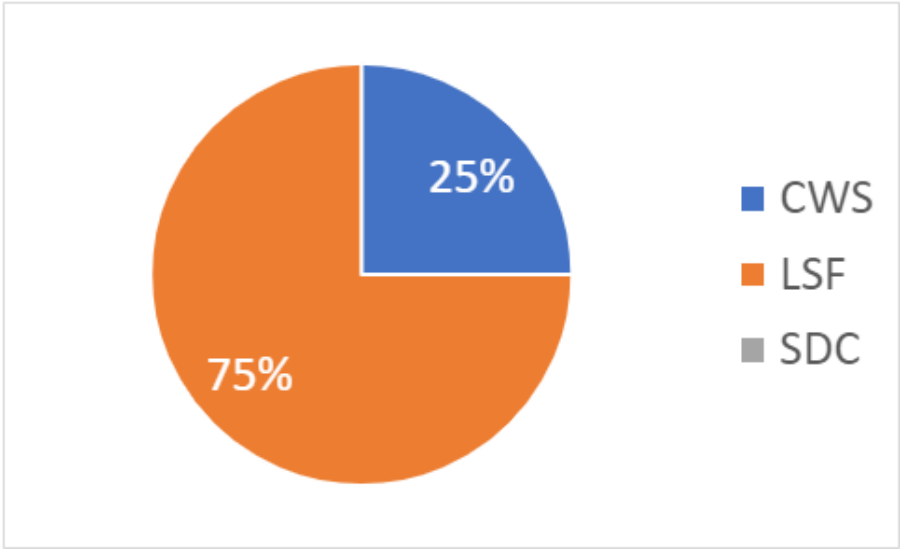
Construction

Item	Assumption	Amount
Pipeline Rehabilitation	Pipe burst	$175,200
Lateral Replacement	Open cut	$158,600
Bypass Pumping		$10,400
Traffic Control		$19,600
Subtotal, Construction		*$363,800*
Mobilization	5%	$18,200
Erosion and Sediment Control	1%	$3,638
Subtotal, Construction, Mob, ESC		*$385,638*
Construction Contingency	30%	$115,700
Subtotal, Construction & Contingency		**$501,338**

Additional Cost Factors

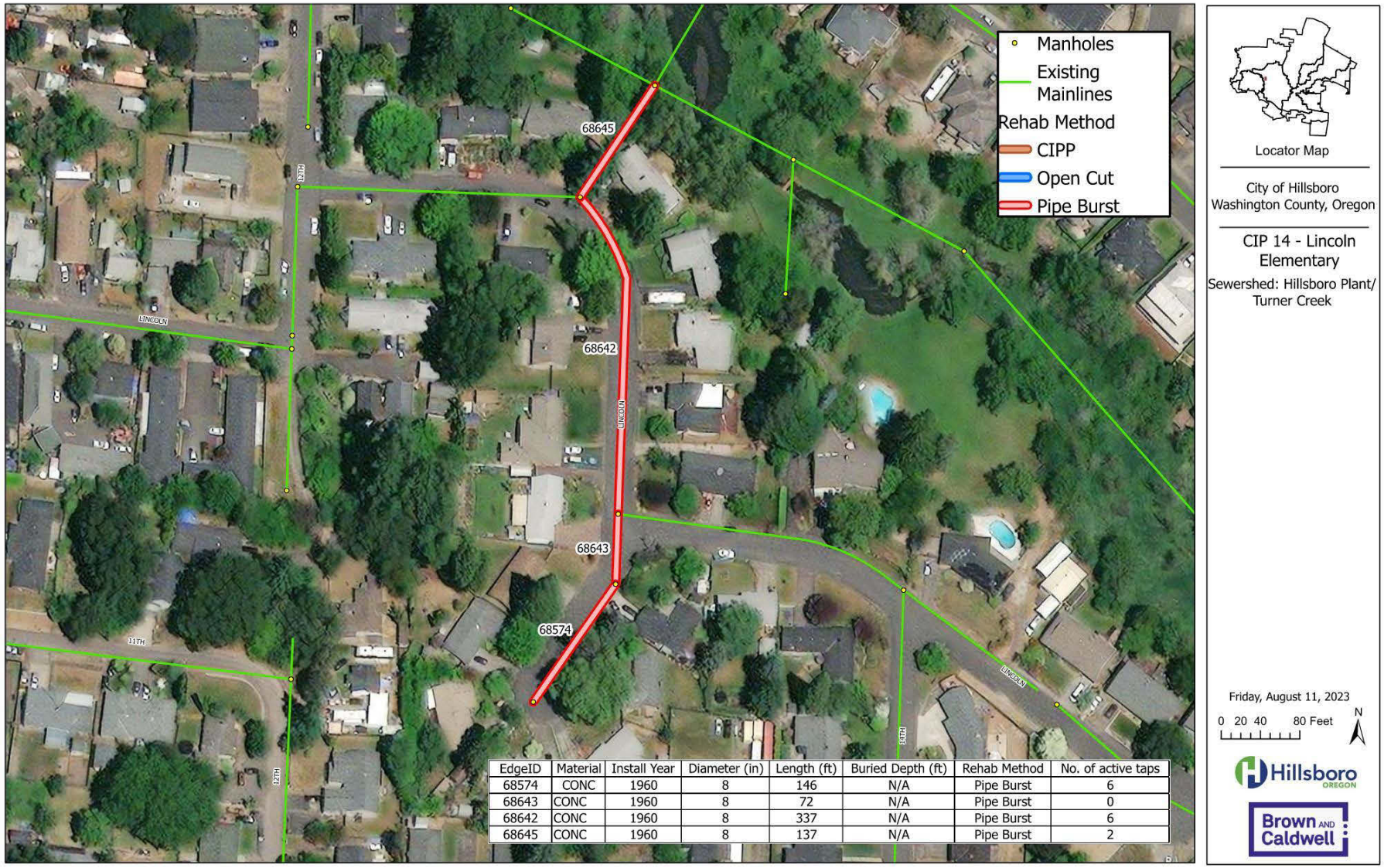
Item	Assumption	Amount
Basic Permitting	Lump sum	$15,000
Engineering Services	20%	$100,300
City Project Administration	15%	$75,300
Wetland Permitting and Admin Contingency	25%	$125,400
Construction Management	10%	$50,200
Escalation to 2030	3% per year	$105,300
Subtotal, Additional Cost Factors		**$471,500**
Total Project Cost (Rounded)		**$973,000**

Funding Summary



Note: SDC = System Development Charges (COH), LSF = Local Service Fee (COH), CWS = Clean Water Services (District)

Project Location



EdgeID	Material	Install Year	Diameter (in)	Length (ft)	Buried Depth (ft)	Rehab Method	No. of active taps
68574	CONC	1960	8	146	N/A	Pipe Burst	6
68643	CONC	1960	8	72	N/A	Pipe Burst	0
68642	CONC	1960	8	337	N/A	Pipe Burst	6
68645	CONC	1960	8	137	N/A	Pipe Burst	2

Sanitary Sewer CIP Fact Sheet

ID:	CIP 15		Date Prepared: September 8, 2023
Name:	Walnut Street		
Location:	299 SE Walnut Street, Hillsboro, OR 97123		
Cost:	$1,174,000	Funding Biennium: FY2030	Priority Rank: 15

Project Description and Background

CIP 15 will rehabilitate a total of 458 linear feet (LF) of 21-inch HDPE pipe. All pipe within the CIP is located within a combination commercial/ industrial area near the railroad. This project is located on SE Walnut Street between 1st and 2nd Avenues. The pipeline serves residents, businesses, and government agencies in the western portion of Hillsboro. The 21-inch pipeline conveys flows not just from the surrounding area but also from the upstream most connection in the Hillsboro Plant drainage basin.

Recent pipeline inspections show this pipe segment has several priority defects including major sags, grease, and high-water marks, indicating it is flowing close to capacity. Pipeline sags are detrimental to the performance of the pipeline because wastewater flow through this section slows down and allows solids to drop out of solution causing buildup of solids and backup of flow. If left in its current state, the large sags in the pipe will continue to collect debris increasing the risk of future sanitary sewer overflows (SSOs) upstream.

Pipeline rehabilitation will be completed with an open cut approach. Open cut methodology was selected for sections where significant sags are present (70 percent+). Bedding material under each section will be repaired and existing pipe and adjacent manholes will be removed and replaced. The project includes costs associated with bypassing wastewater to open cut replace pipe segments.

This pipeline is located within ROW and will require traffic control and public outreach.

Benefits

Benefits of this project include:

- Replaces existing infrastructure.
- Open cut replacement addresses deficiencies in pipe bedding and the resultant pipe sags.
- Supports Hillsboro Plant drainage basin resiliency.

CIP 15 Cost Estimate

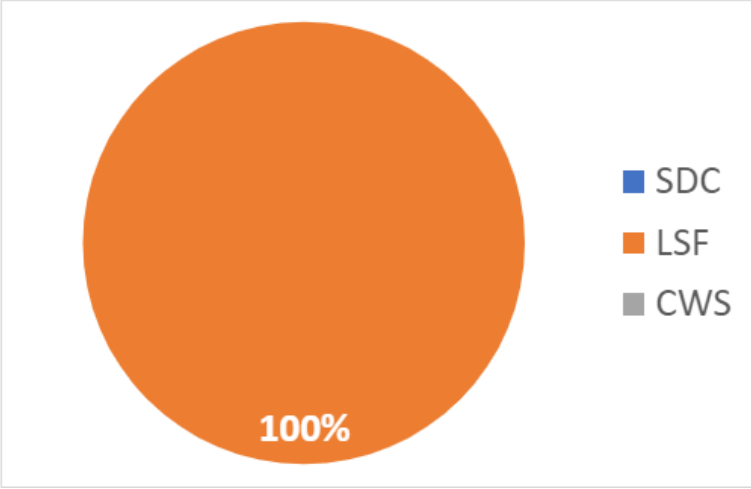
Construction

Item	Assumption	Amount
Pipeline & Lateral Replacement	Open Cut	$479,100
Bypass Pumping		$14,100
Traffic Control		$13,200
Subtotal, Construction		*$506,400*
Mobilization	5%	$25,400
Erosion and Sediment Control	1%	$5,100
Subtotal, Construction, Mob, ESC		*$536,900*
Construction Contingency	30%	$161,100
Subtotal, Construction & Contingency		**$698,000**

Additional Cost Factors

Item	Assumption	Amount
Basic Permitting	Lump sum	$15,000
Engineering Services	20%	$139,600
City Project Administration	15%	$104,700
Construction Management	10%	$69,800
Escalation to 2030	3% per year	$146,600
Subtotal, Additional Cost Factors		**$475,700**
Total Project Cost (Rounded)		**$1,174,000**

Funding Summary



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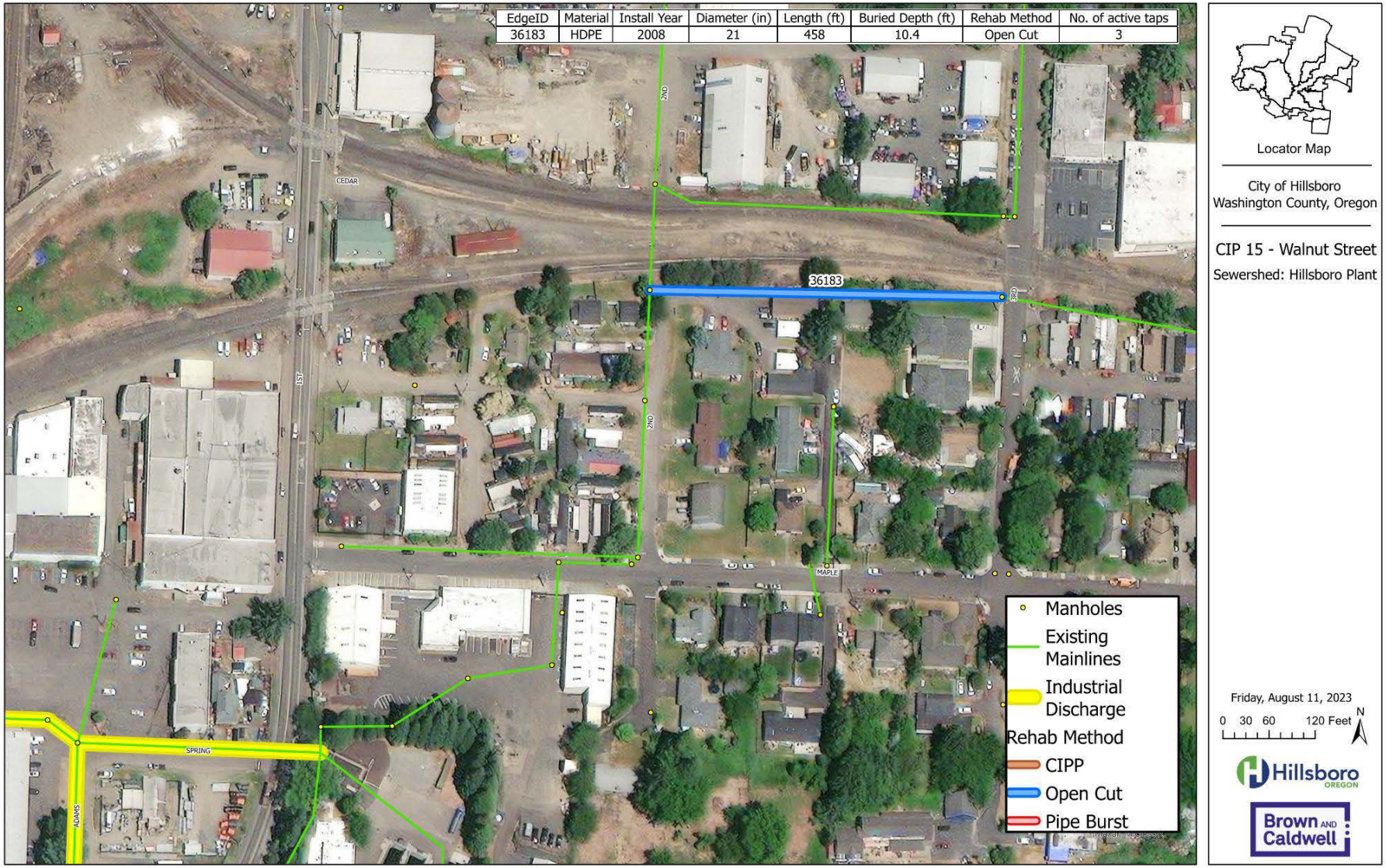
Project Location



Sanitary Sewer CIP Fact Sheet

ID:	CIP 16		Date Prepared: September 8, 2023
Name:	HDPE Weld Bead Removal		
Location:	City Wide		
Cost:	$743,000	Funding Biennium: FY 2030	Priority Rank: 16

Project Description and Background

CIP 16 will remove beads that were formed in the HDPE pipe when it was originally fused and installed. The butt fusion process is the most common method of HDPE pipe fusion and can create beads on the inside and outside of the fused joints that are typically removed in wastewater applications. The internal HDPE pipe beads can restrict flow, catch toilet paper and other waste which can potentially cause a back up in the pipe. Removing the internal beads allows for reduced friction and a smoother flow throughout the pipe.

This CIP includes approximately 8,500 linear feet (LF) of HDPE pipe to de-bead at approximately every joint. The pipes range in diameter between 6 and 21-inches. The figure below shows the locations of the pipes in the western portion of the city.

COH will contract out the de-beading services to a local sewer rehabilitation contractor. Many companies provide this service as HDPE de-beading is a common practice on butt fused HDPE pipe.

It is important to remove the HDPE beads in the flow path to prevent materials in the wastewater from catching, hence bypass pumping will be required for each pipeline so the invert of the pipe is exposed. These pipelines are located within ROW and will require traffic control and public outreach.

Benefits

Benefits of this project include:

- Rehabilitates existing infrastructure.
- Increases pipe capacity by removing shelves for debris to build up against.
- Increases maintenance efficiency; removes hazards where equipment might get stuck.
- Improves environment for adequate condition assessment capabilities in the future.

CIP 16 Cost Estimate

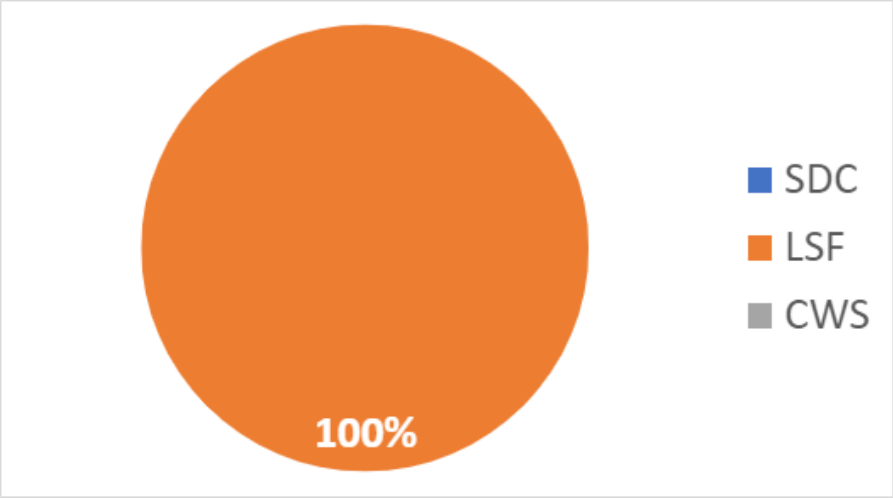
Construction

Item	Assumption	Amount
Pipeline Rehabilitation	Weld bead removal	$37,100
Bypass Pumping		$110,000
Traffic Control		$218,000
Subtotal, Construction		*$365,100*
Mobilization	5%	$18,300
Subtotal, Construction, Mob, ESC		*$383,400*
Construction Contingency	30%	$115,100
Subtotal, Construction & Contingency		**$498,500**

Additional Cost Factors

Item	Assumption	Amount
Basic Permitting	Lump sum	$15,000
City Project Administration	15%	$74,800
Construction Management	10%	$49,900
Escalation to 2030	3% per year	$104,700
Subtotal, Additional Cost Factors		**$244,400**
Total Project Cost (Rounded)		**$743,000**

Funding Summary



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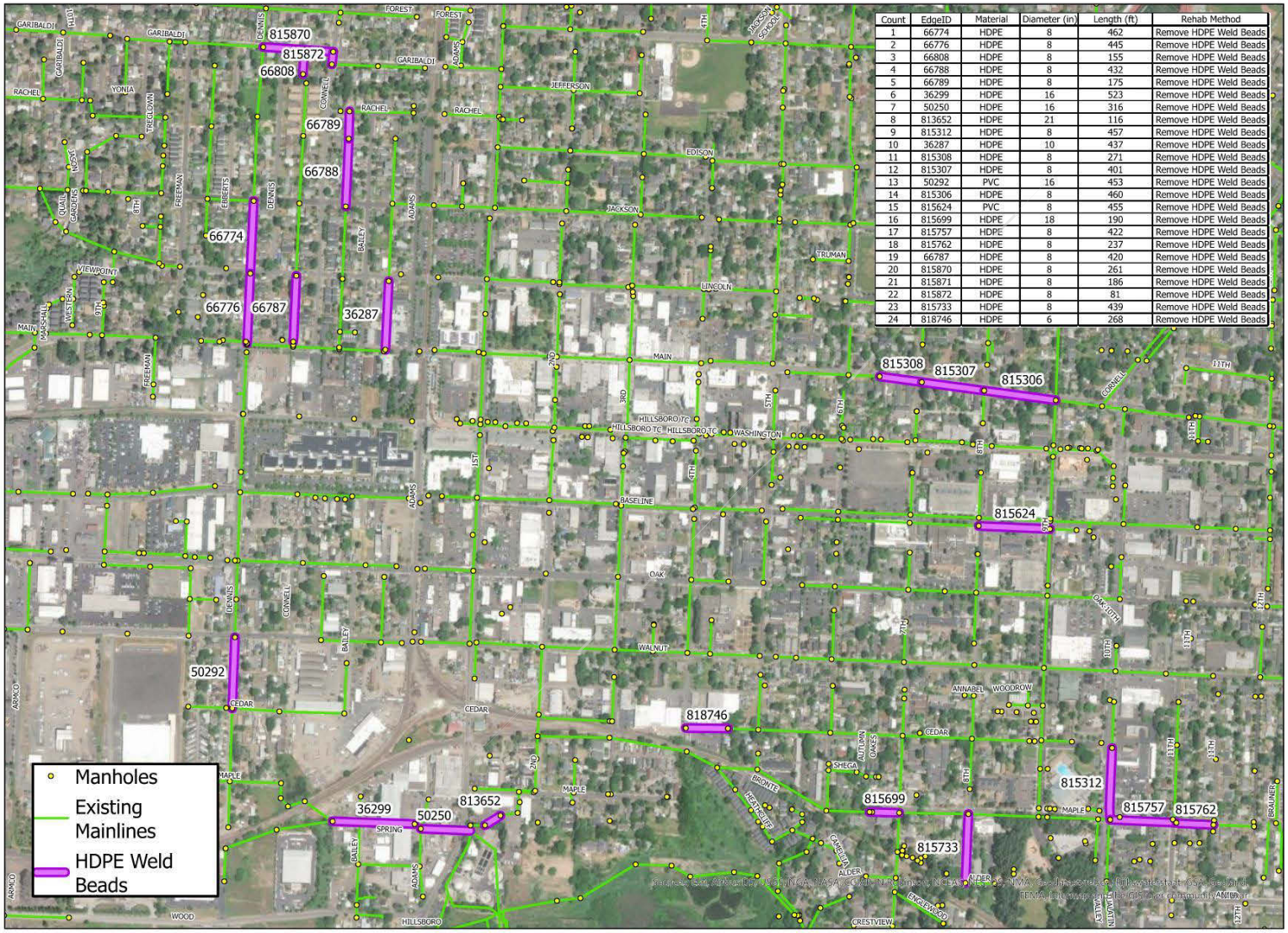
Project Location



Count	EdgeID	Material	Diameter (in)	Length (ft)	Rehab Method
1	66774	HDPE	8	462	Remove HDPE Weld Beads
2	66776	HDPE	8	445	Remove HDPE Weld Beads
3	66808	HDPE	8	155	Remove HDPE Weld Beads
4	66788	HDPE	8	432	Remove HDPE Weld Beads
5	66789	HDPE	8	175	Remove HDPE Weld Beads
6	36299	HDPE	16	523	Remove HDPE Weld Beads
7	50250	HDPE	16	316	Remove HDPE Weld Beads
8	813652	HDPE	21	116	Remove HDPE Weld Beads
9	815312	HDPE	8	457	Remove HDPE Weld Beads
10	36287	HDPE	10	437	Remove HDPE Weld Beads
11	815308	HDPE	8	271	Remove HDPE Weld Beads
12	815307	HDPE	8	401	Remove HDPE Weld Beads
13	50292	PVC	16	453	Remove HDPE Weld Beads
14	815306	HDPE	8	460	Remove HDPE Weld Beads
15	815624	PVC	8	455	Remove HDPE Weld Beads
16	815699	HDPE	18	190	Remove HDPE Weld Beads
17	815757	HDPE	8	422	Remove HDPE Weld Beads
18	815762	HDPE	8	237	Remove HDPE Weld Beads
19	66787	HDPE	8	420	Remove HDPE Weld Beads
20	815870	HDPE	8	261	Remove HDPE Weld Beads
21	815871	HDPE	8	186	Remove HDPE Weld Beads
22	815872	HDPE	8	81	Remove HDPE Weld Beads
23	815733	HDPE	8	439	Remove HDPE Weld Beads
24	818746	HDPE	6	268	Remove HDPE Weld Beads

Locator Map

City of Hillsboro
Washington County, Oregon

CIP 16 - HDPE Weld Bead Removal

Sewershed: Hillsboro Plant

Friday, August 11, 2023

0 162.5325 650 Feet N

Hillsboro OREGON

Brown AND Caldwell

Appendix B: Basis of Opinion of Probable Costs

Estimate Summary Report

8/9/2023 5:08 PM

BC Project Number: 158562.004.414
Estimate Version Number: 3
Estimate Date: 08/09/2023
Lead Estimator: Stefani Couch

SANITARY SEWER MASTER PLAN

CITY OF HILLSBORO
SANITARY SEWER MASTER PLAN
PLANNING LEVEL

Estimator	Stefani Couch
BC Project Manager	Brittany Sorenson
BC Office	Portland
Est Version Number	3
QA/QC Reviewer	Catherine Dummer
QA/QC Review Date	07/10/23
BC Project Number	158562.004.414

SANITARY SEWER MASTER PLAN

Phase	Description	Takeoff Quantity		Grand Total Price		Gross Total Cost with Markups
01 TOTALS						
01 CIP 1 - Emma Jones						
01. Pipeline Rehabilitation						
33100	_Pipe Rehabilitation	422.00	lf	197.48	/lf	83,338
	01. Pipeline Rehabilitation	**422.00**	**lf**	**197.48**	**/lf**	**83,338**
05. Easement Access and Acquisition						
02999	Temporary Access Roads, 12' wide (easement not included)	291.00	lf	33.97	/lf	9,885
	05. Easement Access and Acquisition	**291.00**	**lf**	**33.97**	**/lf**	**9,885**
06. Bypass Pumping						
01560	_Bypass Pumping, from manhole West of alignment	0.80	week	20,108.10	/week	16,086
01560	_Bypass Pumping, from manhole North of alignment	0.80	week	19,513.46	/week	15,611
	06. Bypass Pumping	**1.00**	**LS**	**31,697.25**	**/LS**	**31,697**
	01 CIP 1 - Emma Jones	**422.00**	**LF**	**296.02**	**/LF**	**124,920**
03 CIP 3 - Sunrise Lane						
02. Pipeline Replacement						
31240	Dewatering Systems	1,321.00	lf	7.55	/lf	9,979
31240	Dewatering Systems	3,792.00	lf	7.55	/lf	28,641
33490	Trench for 12" HDPE - 12' Deep	1,321.00	lf	342.83	/lf	452,884
33490	Trench for 12" HDPE - 15.1' Deep	3,792.00	lf	415.66	/lf	1,576,181
33490	_Trench for Utilities (Shored) - 6" - 3' Cover (Laterals)	5,600.00	lf	87.94	/lf	492,473
33495	_Trench Asphalt Pavement Removal and Replacement - 12" HDPE	1,321.00	lf	126.21	/lf	166,720
33495	_Trench Asphalt Pavement Removal and Replacement - 12" HDPE	3,792.00	lf	148.36	/lf	562,574
33495	_Trench Asphalt Pavement Removal and Replacement - (Laterals)	5,600.00	lf	115.85	/lf	648,769
33526	_HDPE Pipe, buried - 12"	1,321.00	lf	184.35	/lf	243,531
33526	_HDPE Pipe, buried - 12"	3,792.00	lf	145.50	/lf	551,725
33526	_HDPE Pipe, buried - 6" - (Laterals)	5,600.00	lf	22.75	/lf	127,381
	02. Pipeline Replacement	**5,113.00**	**lf**	**950.69**	**/lf**	**4,860,858**
03. Manhole Rehabilitation						
33999	Manhole Rehabilitation	0.00			/LS	250,820
	03. Manhole Rehabilitation	**22.00**	**ea**	**11,400.90**	**/ea**	**250,820**
06. Bypass Pumping						

Phase	Description	Takeoff Quantity	Grand Total Price	Gross Total Cost with Markups
01560 _Bypass Pumping		7.50 week	15,570.03 /week	116,775
06. Bypass Pumping		1.00 LS	116,775.22 /LS	116,775
07. Traffic Control				
01543 _Traffic Control, One-Lane Closure		1,321.00 lf	27.96 /lf	36,941
01543 _Traffic Control, One-Lane Closure		3,792.00 lf	27.96 /lf	106,020
07. Traffic Control		1.00 LS	142,961.43 /LS	142,961
03 CIP 3 - Sunrise Lane		5,113.00 LF	1,050.54 /LF	5,371,414
04 CIP 4 - Walnut Street				
02. Pipeline Replacement				
31240 Dewatering Systems		458.00 day	7.63 /day	3,493
32740 Surface Restoration - Allowance		458.00 lf	342.49 /lf	156,862
33490 Trench for 21" HDPE - 10.4' Cover		458.00 lf	367.41 /lf	168,275
33490 _Trench for Utilities (Shored) - 6" - 3' Cover (Laterals)		150.00 lf	87.94 /lf	13,191
33495 _Trench Asphalt Pavement Removal and Replacement		458.00 lf	142.93 /lf	65,461
33495 _Trench Asphalt Pavement Removal and Replacement - (Laterals)		150.00 lf	115.85 /lf	17,378
33526 _HDPE Pipe, buried - 21"		458.00 lf	111.32 /lf	50,986
33526 _HDPE Pipe, buried - 6" - (Laterals)		150.00 lf	22.75 /lf	3,412
02. Pipeline Replacement		458.00 lf	1,045.98 /lf	479,058
06. Bypass Pumping				
01560 _Bypass Pumping		0.66 week	21,277.42 /week	14,043
06. Bypass Pumping		1.00 LS	14,043.10 /LS	14,043
07. Traffic Control				
01543 _Traffic Control, One-Lane Closure		458.00 lf	28.77 /lf	13,178
07. Traffic Control		458.00 LS	28.77 /LS	13,178
04 CIP 4 - Walnut Street		458.00 LF	1,105.41 /LF	506,279
08 CIP 8 - Lincoln Elementary				
01. Pipeline Rehabilitation				
33100 _Pipe Rehabilitation - Pipe Burst		692.00 lf	253.14 /lf	175,170
01. Pipeline Rehabilitation		692.00 lf	253.14 /lf	175,170

Phase	Description	Takeoff Quantity	Grand Total Price	Gross Total Cost with Markups
02. Pipeline Replacement				
33490	_Trench for Utilities (Shored) - 6" - 3' Cover (Laterals)	700.00 lf	87.94 /lf	61,559
33495	_Trench Asphalt Pavement Removal and Replacement - (Laterals)	700.00 lf	115.85 /lf	81,096
33526	_HDPE Pipe, buried - 6" - (Laterals)	700.00 lf	22.75 /lf	15,923
	02. Pipeline Replacement	700.00 lf	226.54 /lf	158,578
06. Bypass Pumping				
01560	_Bypass Pumping - Pipe Burst	0.33 week	31,469.06 /week	10,385
	06. Bypass Pumping	1.00 LS	10,384.79 /LS	10,385
07. Traffic Control				
01543	_Traffic Control, One-Lane Closure	692.00 lf	28.29 /lf	19,579
	07. Traffic Control	1.00 LS	19,578.67 /LS	19,579
	08 CIP 8 - Lincoln Elementary	692.00 LF	525.59 /LF	363,711
09 CIP 9 - Main Street				
01. Pipeline Rehabilitation				
33100	_Pipe Rehabilitation - Pipe Burst	643.00 lf	262.82 /lf	168,994
33100	_Pipe Rehabilitation - Pipe Burst	1,502.00 lf	236.65 /lf	355,453
33100	_Pipe Rehabilitation - Pipe Burst	71.00 lf	1,485.36 /lf	105,460
	01. Pipeline Rehabilitation	2,216.00 lf	284.25 /lf	629,907
02. Pipeline Replacement				
02999	Demolition, Manholes, 60" dia, 10.5' deep avg	2.00 ea	4,511.57 /ea	9,023
03380	Pipe Field Closure with Stub, 24" dia	2.00 ea	4,771.48 /ea	9,543
33490	_Trench for Utilities (Shored) - 6" - 3' Cover - (Laterals)	600.00 lf	87.94 /lf	52,765
33490	_Trench for Utilities (Shored) - 6" - 3' Cover - (Laterals)	1,750.00 lf	87.94 /lf	153,898
33490	Trench for 60" Manhole, 10.5' deep avg, add to pipe trench	3.10 ea	1,993.75 /ea	6,181
33495	_Trench Asphalt Pavement Removal and Replacement - (Laterals)	600.00 lf	115.85 /lf	69,511
33495	_Trench Asphalt Pavement Removal and Replacement - (Laterals)	1,750.00 lf	115.85 /lf	202,740
33526	_HDPE Pipe, buried - 6" - (Laterals)	600.00 lf	22.75 /lf	13,648
33526	_HDPE Pipe, buried - 6" - (Laterals)	1,750.00 lf	22.75 /lf	39,807
33635	Manhole, 60" Precast Polymer Concrete, 10.5' deep avg	2.00 ea	20,055.06 /ea	40,110
	02. Pipeline Replacement	2,350.00 lf	254.14 /lf	597,226
06. Bypass Pumping				

Phase	Description	Takeoff Quantity	Grand Total Price	Gross Total Cost with Markups
01560 _Bypass Pumping - Pipe Burst - 5 Set Ups		1.10 week	41,660.91 /week	45,827
06. Bypass Pumping		1.00 LS	45,827.00 /LS	45,827
07. Traffic Control				
01543 _Traffic Control, One-Lane Closure		2,216.00 lf	28.01 /lf	62,061
07. Traffic Control		1.00 LS	62,060.80 /LS	62,061
09 CIP 9 - Main Street		4,566.00 LF	292.38 /LF	1,335,021
10 CIP 10 - SE Walnut St. & SE 14th Avenue				
01. Pipeline Rehabilitation				
33100 _Pipe Rehabilitation - Pipe Burst		1,987.00 lf	170.30 /lf	338,388
01. Pipeline Rehabilitation		1,987.00 lf	170.30 /lf	338,388
02. Pipeline Replacement				
31240 Dewatering Systems		71.00 day	7.59 /day	539
33490 Trench for 8" HDPE - 10.4' Cover		71.00 lf	282.58 /lf	20,063
33490 _Trench for Utilities (Shored) - 6" - 3' Cover (Laterals)		2,100.00 lf	87.94 /lf	184,677
33495 _Trench Asphalt Pavement Removal and Replacement		71.00 lf	119.36 /lf	8,474
33495 _Trench Asphalt Pavement Removal and Replacement - (Laterals)		2,100.00 lf	115.85 /lf	243,288
33526 _HDPE Pipe, buried - 8"		71.00 lf	147.44 /lf	10,468
33526 _HDPE Pipe, buried - 6" - (Laterals)		2,100.00 lf	22.75 /lf	47,768
02. Pipeline Replacement		2,171.00 lf	237.35 /lf	515,278
05. Easement Access and Acquisition				
02999 Temporary Access Roads, 12' wide (easement not included)		485.00 lf	34.16 /lf	16,565
05. Easement Access and Acquisition		485.00 lf	34.16 /lf	16,565
06. Bypass Pumping				
01560 _Bypass Pumping - Pipe Burst - 5 Set Ups		1.00 week	44,718.45 /week	44,718
01560 _Bypass Pumping - Open Cut		0.10 week	78,351.10 /week	7,835
06. Bypass Pumping		1.00 LS	52,553.56 /LS	52,554
07. Traffic Control				
01543 _Traffic Control, One-Lane Closure		2,058.00 lf	28.00 /lf	57,628
07. Traffic Control		1.00 LS	57,627.90 /LS	57,628

Phase	Description	Takeoff Quantity	Grand Total Price	Gross Total Cost with Markups
10 CIP 10 - SE Walnut St. & SE 14th Avenue		4,158.00 LF	235.79 /LF	980,413
11 CIP 11 - NW Garibaldi St				
01. Pipeline Rehabilitation				
	33100 _Pipe Rehabilitation - Pipe Burst	883.00 lf	225.64 /lf	199,243
	01. Pipeline Rehabilitation	883.00 lf	225.64 /lf	199,243
02. Pipeline Replacement				
	31240 Dewatering Systems	330.00 lf	7.56 /lf	2,495
	33490 Trench for 15" HDPE - 13.4' Deep	330.00 lf	2,946.23 /lf	972,257
	33490 _Trench for Utilities (Shored) - 6" - 3' Cover (Laterals)	1,400.00 lf	87.94 /lf	123,118
	33490 _Trench for 8" HDPE, 13.4' Deep	482.00 lf	2,792.81 /lf	1,346,134
	33495 _Trench Asphalt Pavement Removal and Replacement - 15" HDPE	330.00 lf	131.87 /lf	43,516
	33495 _Trench Asphalt Pavement Removal and Replacement - (Laterals)	1,400.00 lf	115.85 /lf	162,192
	33495 _Trench Asphalt Pavement Removal and Replacement - 8" HPDE	482.00 lf	118.87 /lf	57,294
	33526 _HDPE Pipe, buried - 6" - (Laterals)	1,400.00 lf	22.75 /lf	31,845
	33526 _HDPE Pipe, buried, 15"	330.00 lf	62.67 /lf	20,681
	33526 _HDPE Pipe, buried - 8"	482.00 lf	29.12 /lf	14,037
	02. Pipeline Replacement	2,212.00 lf	1,253.87 /lf	2,773,570
05. Easement Access and Acquisition				
	02999 Temporary Access Roads, 12' wide (easement not included)	205.00 lf	33.91 /lf	6,952
	05. Easement Access and Acquisition	205.00 lf	33.91 /lf	6,952
06. Bypass Pumping				
	01560 _Bypass Pumping - Pipe Burst - 3 Set Ups	0.66 week	41,660.91 /week	27,496
	01560 _Bypass Pumping - Open Cut	0.47 week	25,397.45 /week	11,937
	06. Bypass Pumping	1.00 LS	39,433.00 /LS	39,433
07. Traffic Control				
	01543 _Traffic Control, One-Lane Closure	330.00 lf	27.99 /lf	9,235
	01543 _Traffic Control, One-Lane Closure	1,321.00 lf	27.96 /lf	36,941
	07. Traffic Control	1.00 LS	46,176.24 /LS	46,176
11 CIP 11 - NW Garibaldi St		3,095.00 LF	990.43 /LF	3,065,374
12 CIP 12 - Arrington Court				

Phase	Description	Takeoff Quantity	Grand Total Price	Gross Total Cost with Markups
01. Pipeline Rehabilitation				
33100	_Pipe Rehabilitation - Pipe Burst	396.00 lf	348.14 /lf	137,863
33100	_Pipe Rehabilitation - Pipe Burst, 8" dia	10,162.00 lf	134.69 /lf	1,368,743
33100	_Pipe Rehabilitation - Pipe Burst, 6" dia	675.00 lf	305.66 /lf	206,318
33100	_Pipe Rehabilitation - Pipe Burst, 10" dia	1,383.00 lf	300.60 /lf	415,730
	01. Pipeline Rehabilitation	3,934.00 lf	541.09 /lf	2,128,654
02. Pipeline Replacement				
33490	_Trench for Utilities (Shored) - 6" - 3' Cover (Laterals)	11,600.00 lf	87.94 /lf	1,020,123
33495	_Trench Asphalt Pavement Removal and Replacement - (Laterals)	11,600.00 lf	115.85 /lf	1,343,879
33526	_HDPE Pipe, buried - 6" - (Laterals)	11,600.00 lf	22.75 /lf	263,861
	02. Pipeline Replacement	2,950.00 lf	890.80 /lf	2,627,863
06. Bypass Pumping				
01560	_Bypass Pumping - Pipe Burst - 12 set ups	6.00 week	24,538.77 /week	147,233
	06. Bypass Pumping	1.00 LS	147,232.62 /LS	147,233
07. Traffic Control				
01543	_Traffic Control, One-Lane Closure	30.00 day	2,975.13 /day	89,254
	07. Traffic Control	1.00 LS	89,253.94 /LS	89,254
	12 CIP 12 - Arrington Court	6,884.00 LF	725.31 /LF	4,993,003
13 CIP 13 - NE 25th Ave				
01. Pipeline Rehabilitation				
33100	_Pipe Rehabilitation - Pipe Burst	315.00 lf	405.25 /lf	127,654
33100	_Pipe Rehabilitation - Pipe Burst	1,228.00 lf	308.63 /lf	378,994
	01. Pipeline Rehabilitation	1,543.00 lf	328.35 /lf	506,648
02. Pipeline Replacement				
33495	_Trench Concrete Pavement Removal and Replacement - (Laterals)	1,850.00 lf	196.81 /lf	364,091
33526	_HDPE Pipe, buried - 6" - (Laterals)	400.00 lf	22.75 /lf	9,099
33526	_HDPE Pipe, buried - 6" - (Laterals)	1,450.00 lf	22.75 /lf	32,983
	02. Pipeline Replacement	1,850.00 lf	219.55 /lf	406,172
06. Bypass Pumping				
01560	_Bypass Pumping - Pipe Burst - 2 Set ups	0.74 week	29,265.54 /week	21,657

Phase	Description	Takeoff Quantity	Grand Total Price	Gross Total Cost with Markups
06. Bypass Pumping		1.00 LS	21,656.50 /LS	21,657
07. Traffic Control				
01543	_Traffic Control, One-Lane Closure	1,543.00 lf	28.01 /lf	43,221
07. Traffic Control		1.00 LS	43,220.92 /LS	43,221
13 CIP 13 - NE 25th Ave		3,393.00 LF	288.15 /LF	977,697
14 CIP 14 - Rock Creek				
01. Pipeline Rehabilitation				
33100	_Pipe Rehabilitation - Pipe Burst	2,057.00 lf	168.79 /lf	347,211
33100	_Pipe Rehabilitation - Pipe Burst	999.00 lf	334.63 /lf	334,300
33100	_Pipe Rehabilitation - Pipe Burst	480.00 lf	420.24 /lf	201,715
01. Pipeline Rehabilitation		3,536.00 lf	249.78 /lf	883,226
02. Pipeline Replacement				
02999	Demolition, Manholes, 60" dia, 10.5' deep avg	1.00 ea	4,511.54 /ea	4,512
03380	Pipe Field Closure with Stub, 24" dia	1.00 ea	4,771.46 /ea	4,771
33490	_Trench for Utilities (Shored) - 6" - 3' Cover (Laterals)	2,200.00 lf	87.94 /lf	193,472
33490	_Trench for Utilities (Shored) - 6" - 3' Cover (Laterals)	900.00 lf	87.94 /lf	79,148
33490	_Trench for Utilities (Shored) - 6" - 3' Cover (Laterals)	250.00 lf	87.94 /lf	21,985
33490	Trench for 60" Manhole, 10.5' deep avg, add to pipe trench	1.00 ea	2,944.47 /ea	2,944
33495	_Trench Asphalt Pavement Removal and Replacement - (Laterals)	2,200.00 lf	115.85 /lf	254,874
33495	_Trench Asphalt Pavement Removal and Replacement - (Laterals)	900.00 lf	115.85 /lf	104,266
33495	_Trench Asphalt Pavement Removal and Replacement - (Laterals)	250.00 lf	115.85 /lf	28,963
33526	_HDPE Pipe, buried - 6" - (Laterals)	2,200.00 lf	22.75 /lf	50,043
33526	_HDPE Pipe, buried - 6" - (Laterals)	900.00 lf	22.75 /lf	20,472
33526	_HDPE Pipe, buried - 6" - (Laterals)	250.00 lf	22.75 /lf	5,687
33635	Manhole, 60" Precast Polymer Concrete, 10.5' deep avg	1.00 ea	20,802.80 /ea	20,803
02. Pipeline Replacement		3,350.00 lf	236.40 /lf	791,939
06. Bypass Pumping				
01560	_Bypass Pumping - Pipe Burst - 4 Set ups	1.68 week	27,101.26 /week	45,530
06. Bypass Pumping		1.00 LS	45,530.12 /LS	45,530
07. Traffic Control				
01543	_Traffic Control, One-Lane Closure	3,536.00 lf	28.00 /lf	99,002

Phase	Description	Takeoff Quantity	Grand Total Price	Gross Total Cost with Markups
07. Traffic Control		1.00 LS	99,001.72 /LS	99,002
14 CIP 14 - Rock Creek		6,886.00 LF	264.26 /LF	1,819,696
16 CIP X TV HWY				
01. Pipeline Rehabilitation				
33100 _Pipe Rehabilitation - Pipe Burst		45.00 lf	2,132.59 /lf	95,966
33100 _Pipe Rehabilitation - Pipe Burst		154.00 lf	824.56 /lf	126,983
01. Pipeline Rehabilitation		199.00 lf	1,120.35 /lf	222,949
06. Bypass Pumping				
01560 _Bypass Pumping - Pipe Burst - 2 Set Ups		0.10 week	145,616.80 /week	14,562
06. Bypass Pumping		1.00 LS	14,561.68 /LS	14,562
07. Traffic Control				
01543 _Traffic Control, One-Lane Closure		199.00 lf	27.85 /lf	5,541
07. Traffic Control		1.00 LS	5,541.20 /LS	5,541
16 CIP X TV HWY		199.00 LF	1,221.37 /LF	243,052
17 CIP Harewood				
02. Pipeline Replacement				
02301 _Pipe Abandonment		468.00 lf	27.40 /lf	12,823
02999 Construction Access		447.00 lf	34.02 /lf	15,208
33490 Trench for 18" HDPE, 23.5' cover		40.00 lf	523.66 /lf	20,946
33526 _HDPE Pipe, buried or installed in casing - 18"		508.00 lf	79.28 /lf	40,274
33635 Manholes		2.00 ea	31,065.74 /ea	62,131
33999 Horizontal Boring		1.00 LS	872,945.47 /LS	872,945
02. Pipeline Replacement		468.00 lf	2,188.74 /lf	1,024,328
06. Bypass Pumping				
01560 _Bypass Pumping		4.00 week	20,253.44 /week	81,014
06. Bypass Pumping		1.00 LS	81,013.77 /LS	81,014
17 CIP Harewood		468.00 LF	2,361.84 /LF	1,105,342
18 CIP X HDPE Weld Bead Removal				

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Phase	Description	Takeoff Quantity	Grand Total Price	Gross Total Cost with Markups
06. Bypass Pumping				
01560 _Bypass Pumping - 12 Set Ups		2.64 week	41,660.91 /week	109,985
06. Bypass Pumping		1.00 LS	109,984.81 /LS	109,985
07. Traffic Control				
01543 _Traffic Control, One-Lane Closure		7,794.00 lf	27.96 /lf	217,952
07. Traffic Control		1.00 LS	217,951.50 /LS	217,952
18 CIP X HDPE Weld Bead Removal		7,794.00 LF	42.08 /LF	327,936
01 TOTALS				21,213,860

Appendix C: Staffing Needs Analysis

Table C 1. Engineering and Environmental Services Staffing (10 year) Needs Matrix

Activity	Existing Level of Effort					Future Level of Effort (In addition to existing effort)				Proposed Staffing Adjustment	
	Frequency/Coverage	Annual Target	Annual FTE Needed	Annual FTE Available	Annual FTE Deficit	Driver for Change	Frequency/Coverage	Annual Target	Annual FTE Needed	FTE Increase (Deficit + Future)	Rationale
Project Oversight • Capital improvement projects (CP) • I/I improvement projects • Complaint response/repairs • Point repairs by contractor	3-4 projects of various size occurring at a time.	$830,000[a]	0.55	0.55[b]	0 Assumes any deficit or backlog is embedded in 10-year CIP plan as future effort.	Keeping pace with capital improvement and maintenance projects (aging infrastructure, I/I, or needing repairs).	Implement CIPs as planned in SSMP.	$16 million in improvement projects within the 10-year CIP.	2.7[c]	2.7	The City's ability to implement needed sanitary sewer capital improvement projects is constrained by staffing resources for project oversight. Additional staff are needed to meet the growing CIP needs.
FOG Program • Inspect FSEs • Residential/youth outreach • Commercial/industrial outreach • Data management	**Commercial, industrial, and residential inspection program that performs activities** per local performance standards. [d]	Not yet established	0.05	0.05	0	Reducing FOG/hotspots, and the additional O&M costs associated with them.	Expand program to regularly perform program inspections and outreach on an ongoing basis. Perform inspections per local performance standards frequency.	Not yet established	1.0[e]	1.0	Additional staff will allow activities to occur on a regular ongoing basis, as well as significantly increase inspection of FSEs and commercial/industrial sewer users operating food production or other establishments that contribute FOG to cleaning hotspots.
Inspections • Frontage improvements • CIPs and Point Repairs	1 year after finish or at completion.	All	1.1[f]	1.1	0	--	--	--	--	--	No backlog reported and no significant increase in future inspections anticipated.
Plan Review • Long-term planning • Near term planning/modeling • Plan review	50-60 plans reviewed per year.	All	0.55[g]	0.55	0	--	--	--	--	--	No backlog reported and no increase in future reviews anticipated.
Total Existing			2.3	2.3	0	**Total Adjustment**			**3.7**		

Abbreviations

CIP = Capital Improvement Projects *FOG = fat, oil, grease* *FSE = Food Service Establishments* *FTE = full-time equivalent* *IGA = Intergovernmental Agreement* *I/I = inflow and Infiltration* *O&M = operations and maintenance*

General Notes

If not otherwise defined in the footnotes below, Engineering and Environmental Services activities, frequency, coverage, and targets were determined through workshops with City staff.

The staffing needs for this evaluation are limited to the Sanitary Sewer Environmental Services and Engineering staff within the Surface Water Management and Sanitary Sewer Division Public Works Department.

The contributing effort of the Senior Program Manager of the Surface Water Management and Sanitary Sewer Division Public Works Director is not included in this matrix.

Footnotes

a. *Back calculated based on assumptions listed in future CIP effort listed in footnote c below.*
b. *Three staff members support project oversight and report the following percentages of their time as dedicated to this effort: 5%, 20%, and 30%.*
c. *Assumes 15% of the cost of an improvement project is needed for staff to support the project and assumes 2X the salary of the average mid step salary position within Engineering and Environmental Services group to account for benefits and other overhead expenses for staff.*
d. *Existing effort is limited to keeping education materials available to the public and occasional performing outreach which meets minimum IGA requirements, see O&M Program Gap Analysis, June 2023.*
e. *Assumed one FTE required to expand program back to pre-Covid-19 level of effort. This is not considered a deficit since minimum program requirements are being met.*
f. *One staff member spends 100% of their time performing inspections, and one staff member spends 10% of their time performing oversight on inspections.*
g. *Two staff members support plan reviews and report the following percentages of their time as dedicated to this effort: 25% and 30%.*

Table C 2. Operations Staffing (10 year) Needs Matrix

Activity [a]	Existing Level of Effort						Future Level of Effort (In addition to existing effort)					Proposed Staffing Adjustment		
	Frequency [b]	Coverage [c]	Annual Target [d]	Annual Person Days Needed [e]	Annual Person Days Available [f]	Annual Person Days Deficit (as overtime) [g]	Driver for Change	Frequency	Coverage	Annual Target	Annual Person Days Needed	Required (=Deficit + Future) Person Days Increase	Required (=Deficit + Future) FTE Increase	Rationale
Mainline Inspections [h] • Maintenance CCTV inspection • Manhole Inspection • Manhole and lid maintenance, adjustment, and sealing • Siphon Maintenance • Easement and access road maintenance	Every line 1x/8 years Every MH 1x/8 years As needed As inspected As needed	1,431,380 ft	178,920 ft	350	258	92	Inventory projected to increase by 12% over 10 years.	--	176,450 [s] additional ft	44,112 [t] additional ft	32 for O&M	99	0.74	Existing targets are being met utilizing existing FTEs working overtime. Hiring of additional staff will reduce overtime needed to meet O&M targets.
Routine Mainline Cleaning [i]	Every line 1x/4 years	1,431,380 ft	357, 850 ft	258	191	67	Inventory projected to increase by 12% over 10 years.	--	75,860 [s] additional ft	22,056 [t] additional ft	43 for O&M	135	1.0	
Offroad surface inspection in stream corridors [j] • Manhole inspection • Marking • Self-closing lid install	Every MH 1x/2 years As needed As needed	323 inspection activities	162 inspection activities	65	47	17	--	--	--	--	--	17	0.13	
Warranty Inspection [k]	2 months before end of maintenance period	--	200 inspections	13	10	4	--	--	--	--	--	4	0.03	
Hotspot Mainline Cleaning [i]	As needed	32,375 ft	83,715 ft	60	44	16	Assumes Engineering FOG program will prevent increase, see Table A1.	--	--	--	--	16	0.12	
Fat, Oil, and Grease Program [i]	Ongoing	20,000 ft	20,000 ft	14	11	4	--	--	--	--	--	4	0.03	
Repairs/Upgrades [l] • In-house repairs/upgrades • Lateral investigation and minor repairs • Utility locates	As needed As needed As requested	15,000 ft	100 ft	318	236	81	--	--	--	--	--	81	0.60	
Trouble Calls/Requests [m] • Emergency response • Overflow and complaint response, investigation, and reporting • Vector control • Customer service coordination	As needed As needed As needed As needed	100 response activities	--	285	242	43	--	--	--	--	--	43	0.32	
Root Cutting and Chemical Control Reporting [n]	As needed	44,000 ft	14,670 ft	57	42	15	--	--	--	--	--	15	0.11	
Existing Program, Existing Staffing Subtotal				1421	1081	339	**Existing Program, Future Staffing Subtotal**				75	414	3.1 FTE	

Table C 2. Operations Staffing (10 year) Needs Matrix

Activity [a]	Existing Level of Effort						Future Level of Effort (In addition to existing effort)					Proposed Staffing Adjustment		
	Frequency [b]	Coverage [c]	Annual Target [d]	Annual Person Days Needed [e]	Annual Person Days Available [f]	Annual Person Days Deficit (as overtime) [g]	Driver for Change	Frequency	Coverage	Annual Target	Annual Person Days Needed	Required (=Deficit + Future) Person Days Increase	Required (=Deficit + Future) FTE Increase	Rationale
NEW Lateral Accuracy Program [o]	--	--	--	--	--	-	Provide more accurate locate data to reduce potential damage from boring activities.	Schedule based, pre-boring activities.	28,000 ft	2,000 ft	200	200	1.5	Hiring of additional staff will provide support to new programs as identified in the June 2023 O&M Program Gap Analysis.
NEW Lateral Pre/Post Inspection Program [p]	--	--	--	--	--	--	Scope pre/post CIP (existing infrastructure) to confirm no damages.	Prior to and after CIPs.	--	500 each	50	50	0.37	
NEW Manhole Rehab Program [q]	--	--	--	--	--	--	Proactively address I/I.	Project-by-project basis, as needed.	800 manholes	25 manholes	88	88	0.65	
NEW Flow Monitoring Program [r]	--	--	--	--	--	--	Proactively make informed decisions that can impact safety or other risks associated with O&M work.	Event based, as needed.	--	100 each	100	100	0.74	
			Subtotal	--	--	--	**Future Program, Future Staffing Subtotal**				438	438	**3.3 FTE**	
												Total	6.4 FTE	

Abbreviations:

CCTV= closed-circuit television CIPs= Capital Improvement Projects FOG= fat, oil, grease FTE= full-time equivalent ft= feet GIS= Geographic Information System IGA= Intergovernmental Agreement I/I= inflow and infiltration MH= manhole O&M= operation and maintenance

General Notes

The staffing needs evaluation shown in this table is limited to the Sanitary Sewer Operations staff within the Surface Water Management and Sanitary Sewer Division Public Works Department.

The contributing effort of the Senior Program Manager of the Surface Water Management and Sanitary Sewer Division Public Works Director is not included in this matrix.

Footnotes

a. *Operations activities are grouped together and correlated to how time is tracked in City GIS and workorders where multiple activities are performed at the same time as the main activity. For new programs, staff provided effort per unit of measurement based on existing time tracked in GIS for similar activities.*
b. *Existing Operations activities and frequency requirements are defined by the 2008 CWS IGA and 2018 Performance Standards where applicable and as identified in the June 2023 O&M Program Gap Analysis Matrix.*
c. *Existing Operations coverage quantities account for either the total inventory or applicable portion of an inventory based on City GIS data and work orders.*
d. *Existing Operations annual targets list measurement units for the main activity performed, e.g., there are XX number of manholes within the targeted length of sanitary sewer pipe (ft).*
e. *Annual Operations person days needed to complete a task = # of recorded hours to complete target/hours in a workday.*
f. *Total annual person days available and corresponding hours and FTE is defined in **Table A3**. Person days available per activity = (person days needed per activity/total person days needed for all activities)*total available person days.*
g. *Operations staff report meeting annual targets with a deficit of employees by working overtime. Person days deficit = person days needed–person days available.*
h. *Daily production rate of 1,022 ft per day with 2 FTEs required to perform work.*
i. *Daily production rate of 2,772 ft per day with 2 FTEs required to perform work, where hotspot cleaning, routine cleaning, and FOG tracing/removal is same daily production rate.*
j. *Daily production rate of 5 per day with 2 FTEs required to perform work.*
k. *Daily production rate of 15 per day with 1 FTE required to perform work.*
l. *Daily production rate of 1 per day with 2.5 FTE required to perform work.*
m. *Daily production rate of 1 per day with 2.5 FTE required to perform work, including 1 of the 2.5 FTE dedicated to coordination/customer service who does not perform work in the field.*
n. *Daily production rate of 1,022 ft per day with 4 FTE required to perform work.*
o. *Daily production rate of 20 per day with 2 FTE required to perform work.*
p. *Daily production rate of 20 per day with 2 FTE required to perform work.*
q. *Daily production rate of 1 per day with 3.5 FTE required to perform work.*
r. *Daily production rate of 1 per day with 2 FTE required to perform work.*
s. *Assumed average annual increase of 1.3% as shown in annual performance report data would apply over the next 10 years.*
t. *Assumed the same performance standard as shown in existing effort frequency column would apply in the future, e.g., clean 1x/4 years and inspect 1x/8 years.*