

2022 Annual Report

Inflow and Infiltration



1. Introduction

Schedule D.1 of the Clean Water Services (CWS) watershed-based NPDES Permit requires an annual inflow and infiltration (I/I) report which must include:

- An assessment of I/I issues at the four water resource recovery facilities based on comparisons of summer and winter flows.
- Details of activities performed in the previous year to identify and reduce I/I.
- Details of activities planned for the following year to identify and reduce I/I.
- A summary of sanitary sewer overflows that occurred during the previous year.

CWS is making continual progress in identifying and reducing I/I throughout the collection system. CWS continued its commitment to I/I abatement and rehabilitation through its Capital Improvement Program (CIP) and substantial maintenance, television (TV) inspection, and flow monitoring programs. Staff members use these programs to identify, quantify, and reduce I/I within the sanitary sewer collection system.

2. Collection System Description

CWS' collection system includes 43 pump stations, approximately 1,850 miles of sanitary sewer line, 65 miles of force main, and about 46,700 sanitary sewer manholes. Pipes range from 4 inches to 84 inches in diameter. CWS has intergovernmental agreements with each of the 12 cities in its service area and with Washington County that articulate the division of responsibilities and Performance Standards for managing, operating, and maintaining the collection system. The Performance Standards detail maintenance frequency and measurement criteria for activities such as line cleaning, manhole maintenance and repairs, root control, TV inspections, and emergency response. These standards provide consistency across the entire service area and are designed to maintain the collection system efficiently and cost-effectively; identify and address potential issues in a timely manner; and minimize the risk of sanitary sewer overflows due to inadequate capacity, maintenance, or structural deficiencies.

3. Inflow and Infiltration Abatement Programs – 2022

3.1 Inflow and Infiltration Assessment

The following table summarizes the statistics used to compare summer and winter flows at CWS’ four water resource recovery facilities (WRRFs) to support an assessment of facility I/I issues in 2022. Winter flows include those from November to April; summer flows include those from May through October.

Table 1: Water Resource Recovery Facility Influent Flow Statistics

	Rock Creek	Durham	Forest Grove	Hillsboro
Average winter flow, MGD	41.5	27.3	5.3	5.8
Peak winter flow, MGD	114.2	77.0	18.3	14.8
Winter peaking factor	2.8	2.8	3.5	2.6
Average summer flow, MGD	33.1	21.9	4.4	1.5
Peak summer flow, MGD	59.0	39.4	5.0	5.7
Summer peaking factor	1.8	1.8	1.1	3.8
Ratio of winter to summer average monthly flow	1.3	1.2	1.2	3.9

Peaking factors in excess of 4 and high ratios of winter versus summer average flows are considered to be an indication of significant levels of I/I entering the sanitary sewer system. Winter peaking factors at the WRRFs range from 2.6 to 3.5; winter to summer average flow ratios range from 1.2 to 3.9. The Forest Grove WRRF has the highest winter peaking factor of 3.5. The Hillsboro WRRF has the highest summer peaking factor of 3.8 and a winter versus summer average flow ratio of 3.9. CWS is focusing on I/I reduction capital projects in the Forest Grove basin and the City of Hillsboro is partnering with CWS to focus on I/I reduction within its city. The relatively high peaking factors indicate the need for CWS to continue monitoring conveyance system flows in the Forest Grove and Hillsboro facility basins while continuing to evaluate potential project locations for I/I reduction opportunities as part of the West Basin I/I Abatement Study. Areas where CWS is initiating long-term I/I abatement planning include the Forest Grove sewershed, the sanitary pipes that feed the Beaverton sewer trunk in the Rock Creek sewershed, and the sanitary pipes that feed the Fanno Creek Interceptor in the Durham sewershed.

3.2 Activities Performed in 2022 to Identify and Reduce I/I

3.2.1 Capital Improvement Program

Capital Improvement Program Staffing: CWS employed a principal engineer (0.5 FTE), engineer (1 FTE), inspector (1 FTE), and engineering technician (1 FTE) to work on CWS’ I/I reduction program. The principal engineer is responsible for managing the overall I/I reduction program and the large-diameter sewer rehabilitation program. The engineers, inspector, and engineering technician are responsible for planning, designing, inspecting, and administering the I/I abatement projects.

CIP Prioritization: CWS has observed rapid residential growth over the past decade and anticipates this trend will continue. Capital project priorities have accordingly been focused on capacity assurance. One method of providing capacity is reducing I/I. Recent I/I abatement efforts have targeted high I/I basins to achieve capacity for growth and to reduce or eliminate downstream gravity sewer, pump station, and treatment plant expansion projects.

3.3 Study and Project Summary 2022

3.3.1 Clean Water Services

I/I Abatement Master Planning: CWS continued to review flow meter data and strategically relocate meters to further isolate and identify the sanitary flow basins experiencing the highest rates of I/I. The cost of the work was \$89,000.

West Basin I/I Abatement Study: CWS continued to analyze data from the flow meters and micrometers installed within the area tributary to the Hillsboro, Rock Creek, and Forest Grove water resource recovery facilities. The data will help staff members determine I/I rates to identify and prioritize future I/I abatement projects. The prioritized projects will be included in the West Basin Facility Plan, which is scheduled to be completed in 2024.

Forest Grove I/I Abatement: Phase 1 was completed and results were analyzed to determine the approximate I/I flow reductions attributed to this phase. Design work for Phase 2 at 23rd and Main began at a cost of \$98,000. Construction of Phase 2 began in July 2022 at a cost of \$1.5 million and will be wrapping up in 2023.

Cedar Hills Rehabilitation: CWS spent \$103,000 in 2022 to design Phase 3. The project includes approximately 13,000 linear feet of 6, 8, and 10-inch sanitary sewer mainline and their associated structures and service lateral connections. Construction is planned for late FY 2022-23 with an estimated cost of \$6 million.

Aloha 3 Pump Station Project: In 2022, CWS began a multi-departmental project to investigate I/I and high flows within the Aloha 3 Pump Station basin. The data will help staff members determine I/I rates to identify and prioritize future I/I abatement projects in conjunction with a potential pump station upgrade.

Garden Home Phase 2: Construction was completed for the rehabilitation of 3,100 feet of 6- and 8-inch sewer mainline in January 2022. This project included rehabilitating the sewer mainline by pipe bursting and lining, rehabilitating approximately 17 manholes, and rehabilitating 55 lateral connections at a cost of \$693,000.

East Basin Master Plan: Approximately \$30 million in I/I reduction improvements were identified from the master plan developed in 2021 for the Durham WRRF flow basin (also known as the East Basin Master Plan). The associated projects are planned to be implemented over the next decade. Planning and investigations began in 2022 to evaluate the current state of I/I within the Fanno Trunk Basin.

3.3.2 City of Beaverton

Beaverton completed the Erickson Trunk Basin Sewer Improvements project for Phases 1 and 2. This project cost \$4.3 million.

3.4 Activities Planned for 2023 to Identify and Reduce I/I

3.4.1 Clean Water Services

I/I Abatement Master Planning: CWS will continue to review flow meter data and strategically relocate meters to further isolate and identify the sanitary flow basins experiencing the highest rates of I/I.

West Basin Master Plan and I/I Abatement Study: CWS will analyze data from the flow meters installed within the area tributary to the Hillsboro, Rock Creek, and Forest Grove WRRFs to determine I/I rates to identify and prioritize future I/I abatement projects. The prioritized I/I abatement projects will become part of the West Basin Facilities Plan and funds will be requested in later years to begin planning the project. The West Basin Facility Plan is scheduled to be completed in 2024.

Forest Grove I/I Abatement: CWS is scheduled to complete construction of Phase 2 (23rd and Main). Work includes rehabilitating or replacing approximately 4,000 linear feet of 8-inch clay and concrete pipe and replacing 70 sanitary laterals and 15 manholes at a cost of \$1.5 million. The scope of Phase 3 will be evaluated in 2023-24 and construction is planned for 2024.

Cedar Hills I/I Abatement: Construction is planned to rehabilitate approximately 13,000 linear feet of 6, 8, and 10-inch sanitary sewer mainline and their associated structures and service lateral connections. The cost is estimated to be \$6 million.

Aloha 3 Pump Station Project: Investigation and planning for the Aloha 3 Pump Station basin will continue in 2023 to determine the current state of the pump station and what improvements are necessary.

East Basin I/I Abatement and Rehabilitation: CWS will begin planning and hire a consultant to perform a preliminary assessment for the approximately \$30 million in I/I reduction projects within the Durham sewershed. The first projects are tentatively scheduled to be implemented in 2025.

3.4.2 City of Hillsboro

NW 1911-1936 Turner Creek Sanitary I/I Abatement: The City will advance the design to rehabilitate or replace the remaining sanitary sewer in the 1911-1936 Sewer District.

3.4.3 City of Beaverton

SW 131st Hanson to Barlow Road: The City is planning to begin design in 2023 to build off of the work from the Erickson Trunk Improvements. Construction is anticipated to begin in 2024.

4. Operations and Maintenance

CWS provides regional services for chemical or mechanical root control, manhole rehabilitation activities, and flow monitoring which are presented in this report.

Lateral Rehabilitation: CWS continued implementing its comprehensive lateral rehabilitation in accordance with Resolution and Order (R&O 98-67). CWS CCTV inspected 70 private laterals and repaired or replaced 27 lateral as part of routine maintenance.

Manhole Rehabilitation and Root Control: CWS performed chemical or mechanical root control on 214,338 linear feet of sanitary sewer. CWS crews rehabilitated 71 manholes to eliminate or reduce infiltration, and repaired 8 internal pipes to reduce infiltration.

Flow Monitoring: CWS continued to operate and upgrade its flow monitoring program, which includes 70 portable flow meters. The portable flow meters provide flexibility in monitoring locations and allow flow data to be collected in support of CWS and its co-implementers' capital projects. CWS has 59 permanent flow monitors installed and maintains 14 telemetered rain gauges across the service area. Flow monitoring data provides conveyance system and plant operators information to better manage their respective systems and provides data for I/I evaluation.

Preventive Maintenance Program: The Performance Standards for CWS and its co-implementers include internal pipe CCTV inspection of every line once every eight years. All new construction is internally inspected at the time of construction and again within 12 months of completion of construction.

CWS crews TV inspected 515,349 linear feet of sanitary sewer one or more times within its maintenance area. CWS' co-implementers inspected an additional 674,831 linear feet of sanitary sewer one or more times. The combined CWS and co-implementer effort represent internal pipe inspection of 12.7% of the total system inventory of sanitary sewer lines.

5. Summary of Sanitary Sewer Overflows

CWS implements a program to reduce sanitary sewer overflows (SSO) based on the capacity, management, operation, and maintenance (CMOM) approach. For wastewater collection systems, one of the key performance indicators is the number of SSOs per 100 miles of sewer pipe per year. Over the past seven years (2016-2022), CWS has averaged fewer than one SSO event per 100 miles of sewer main per year, indicative of a high-performing collection system.

This section summarizes SSOs that occurred during 2022. The date given is the date the SSO started; if the start date is unknown the date the SSO was first reported to CWS or a co-implementer city is listed. CWS and cities responded to seven SSOs, of which four reached surface waters. Of the seven events, the causes included two blockages caused by

roots, grease, and rags; two contractor bore-throughs; one from a fouled flow-through plug; one from a force main break; and one from high influent flows resulting from a one-in-five-year storm event exceeding the Forest Grove WRRF's high head influent pump station capacity. For all SSOs, appropriate corrective action was taken as described. CWS submitted written reports on all SSOs to DEQ, except when waived by DEQ as noted.

1. Date: May 7, 2022

OERS #: 2022-1051

Location: 5345 SW Thomas Street, unincorporated Washington County

Estimated volume: Unknown.

Cause: Blockage from roots.

Follow-up actions: Cleared the root blockage to restore flow and cleaned the impacted areas of the street and stormwater conveyance system. Since the line was in the City of Portland's jurisdiction, the City took over the investigation of the source of the root intrusion and clearing the remaining roots in the line.

Results of ambient monitoring: Initial sampling on May 7 confirmed discharge to an unnamed tributary of Fanno Creek. Follow-up sampling on May 11 showed no further impact.

2. Date: May 27, 2022

OERS #: 2022-1250

Location: 15160 SW Bangy Road, Lake Oswego

Estimated volume: Unknown, confined to buildings.

Cause: Blockage from roots, grease, and rags.

Follow-up actions: Cleaned the public mainline to restore flow; business owners cleaned and disinfected the impacted buildings. Sleeved the joint in the public mainline to prevent further root intrusion. Provided fats, oils, and grease technical assistance to the facilities where the backup occurred.

Results of ambient monitoring: The SSO was confined to the buildings and did not reach surface waters.

3. Date: August 15, 2022

OERS #: 2022-1899

Location: 15570 SW Jenkins Road, Beaverton

Estimated volume: 10 gallons.

Cause: Fouled flow-through plug on a service line during a construction project.

Follow-up actions: Under the direction of CWS personnel, the contractor cleaned and disinfected the impacted areas of the street. CWS will require and verify that more frequent checks of flow-through plugs are performed during work and will include this in standard operating procedures.

Results of ambient monitoring: The SSO did not reach surface waters.

- 4. Date: August 24, 2022**
OERS #: 2022-1970
Location: 4100 SW 187th Avenue, Beaverton
Estimated volume: 10-15 gallons.
Cause: Contractor bore through a CWS sanitary line.
Follow-up actions: Inspected and cleaned the impacted areas of the street, removed soil from the pothole that may have been impacted, and repaired the impacted sanitary line.
Results of ambient monitoring: The SSO was contained in a pothole in the street and did not reach surface waters.
- 5. Date: November 7, 2022 (exact start date unknown)**
OERS #: 2022-2555
Location: 16285 SW Bull Mountain Road, Tigard
Estimated volume: Unknown.
Cause: Blockage caused when a contractor bore through a CWS sanitary line.
Follow-up actions: Inspected and cleaned the impacted areas, and cleaned and repaired the impacted sanitary line.
Results of ambient monitoring: Initial sampling on November 7 confirmed discharge to an unnamed tributary of the Tualatin River. Follow-up sampling on November 10 showed no further impact.
- 6. Date: October 31, 2022 (exact start date unknown)**
OERS #: 2022-2489
Location: 14701 SW 163rd Avenue, Tigard
Estimated volume: Unknown.
Cause: Break in CWS' Meyers Farm Pump Station force mainline.
Follow-up actions: Repaired the force main and cleaned the impacted areas including the stormwater conveyance system. CWS is analyzing alarm system data to determine if warning systems can be developed.
Results of ambient monitoring: Initial sampling on October 31 confirmed discharge to an unnamed tributary of the Tualatin River. Follow-up sampling on November 10 showed no further impact.
- 7. Date: December 26, 2022**
OERS #: 2022-2937
Location: 1345 SW Fern Hill Road, Forest Grove
Estimated volume: Unknown.
Cause: High influent flows to the Forest Grove WRRF from a one-in-five-year storm event exceeding the Forest Grove facility's high head influent pump station capacity.
Follow-up actions: Pumped down, cleaned, and disinfected the flooded basement of the high head pump station. Cleaned the impacted areas, including the street, stormwater conveyance system, and high head pump station basement. CWS updated

the alarm system at the Forest Grove facility to improve notifications. CWS also plans to build a wall in the high head pump station basement to prevent future overflows and increase the capacity of the Forest Grove facility with an upgrade of the UV disinfection system and effluent pump station.

Results of ambient monitoring: The Tualatin River flooded the area surrounding where the overflow occurred. Initial sampling on December 27 confirmed discharge to the flooded Tualatin River. Follow-up sampling on January 10 and 11 showed no further impact.