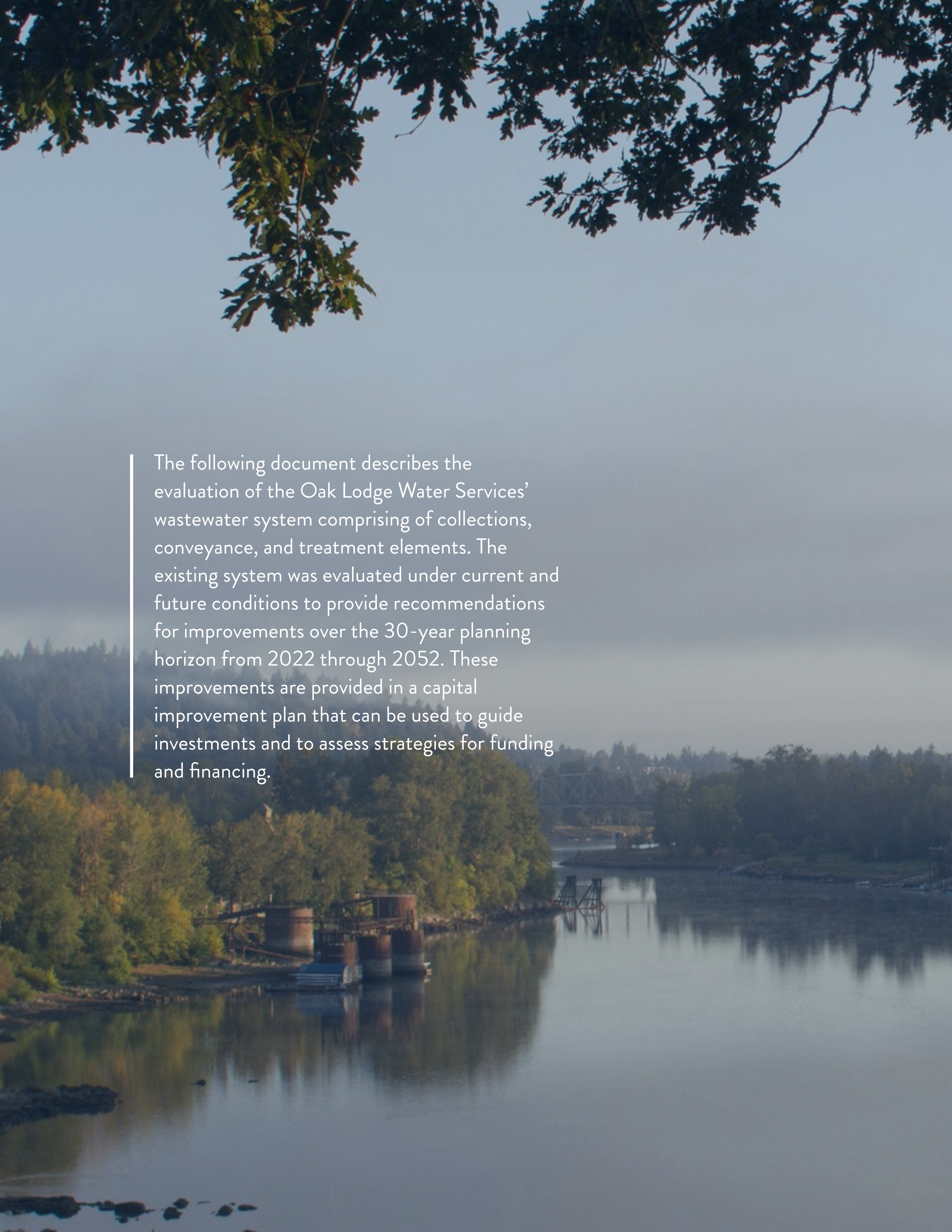
OAK LODGE
WATER SERVICES

Wastewater Master Plan

EXECUTIVE SUMMARY

2023

PREPARED BY: WSC



The following document describes the evaluation of the Oak Lodge Water Services' wastewater system comprising of collections, conveyance, and treatment elements. The existing system was evaluated under current and future conditions to provide recommendations for improvements over the 30-year planning horizon from 2022 through 2052. These improvements are provided in a capital improvement plan that can be used to guide investments and to assess strategies for funding and financing.

CONTENTS

SECTION 01

Oak Lodge Water Services (OLWS) contracted with Water Systems Consulting, Inc. (WSC) to develop a Wastewater Master Plan (WWMP) to guide the planning of capital project expenditures through a 30-year planning horizon. OLWS has established four core commitments to customers and the WWMP takes these into account in the evaluation of the wastewater system and the recommendations provided. The 2022 WWMP updates two previous planning documents: a 2007 Sanitary Sewer Master Plan that focused on the treatment system and a 1992 WWMP. The WSC team includes multiple subconsultant specialists that have contributed to the document's preparation and are referenced where appropriate.

OLWS CORE COMMITMENTS

OLWS and WSC have evaluated the Wastewater System with the goal of meeting the core commitments.

- Protect Public Health
- Provide Excellent Customer Service
- Make Smart Investments and Work to Keep Rates Affordable
- Keep Local Streams and Rivers Clean

SECTION 02

Existing System

The OLWS wastewater service area is located in northwestern Clackamas County and serves the communities of Oak Grove, Jennings Lodge, and portions of the adjacent municipalities of Milwaukie and Gladstone. OLWS owns the portion of the lateral service pipes that collect raw wastewater from individual customers between the private property line and the wastewater collection main. Wastewater collection mains range in size from 4- to 30-inch diameter pipes, with several of the larger diameter pipes designated as trunks that convey the wastewater towards the wastewater treatment plant (WWTP) located on SE Renton Avenue. Due to the topography of the service area, several lift stations with pressurized force mains are required to convey the collected wastewater to the WWTP. Raw wastewater passes through screens, aeration basins, clarifiers, and ultraviolet disinfection prior to discharge to the Willamette River. Waste sludge from the treatment process is digested, dewatered, and hauled offsite for land application.

The collections system is divided into six basins, with the flow collected within each basin culminating at a lift station. A map of each of the basins, the major trunk mains, and the associated lift stations is provided in Figure ES-1.

Operations and maintenance responsibilities for the wastewater system are divided between treatment and collections, with shared support between the teams provided when necessary. Data on the condition of existing assets are collected and stored within several software programs that aid the operations teams with planning and prioritizing work orders and preventative maintenance tasks across the system. The evaluations and recommendations within this WWMP are partially based upon data provided by OLWS from these software systems, as well as additional data that was collected by the WSC-led consultant team. Additional details on the existing wastewater system can be found in Chapter 2.0 of this WWMP.

100
MILES OF WASTEWATER PIPE

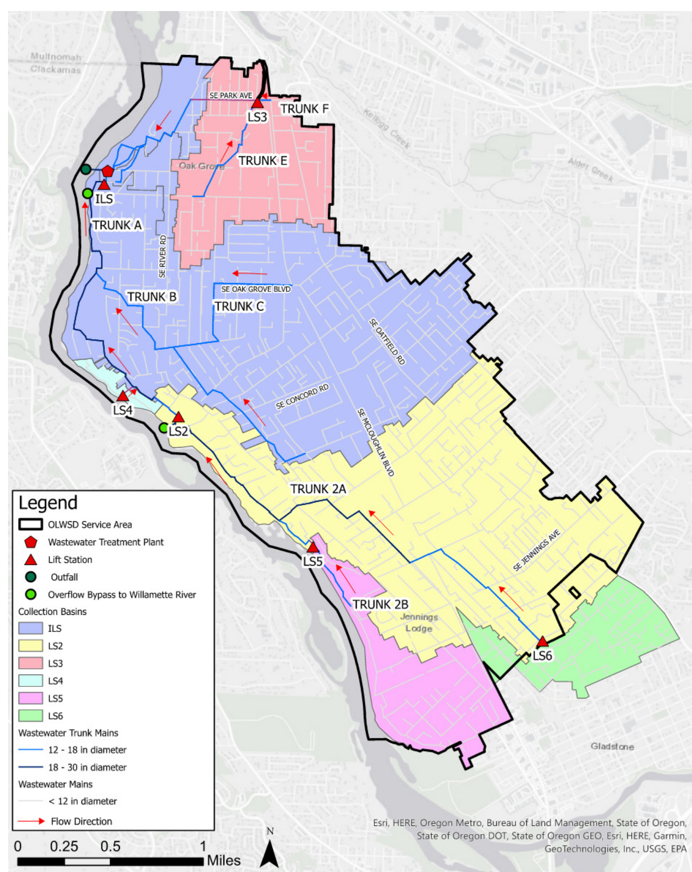
9,100
CUSTOMER CONNECTIONS

6
LIFT STATIONS

846
MANHOLES

1.5 billion
GALLONS OF WASTEWATER TREATED ANNUALY

Figure ES-1. OLWS Wastewater Service Area



SECTION 03

Regulations and Policies

OLWS maintains interagency agreements (IGAs) with several adjacent wastewater providers. A summary of each IGA is provided below:

CLACKAMAS COUNTY

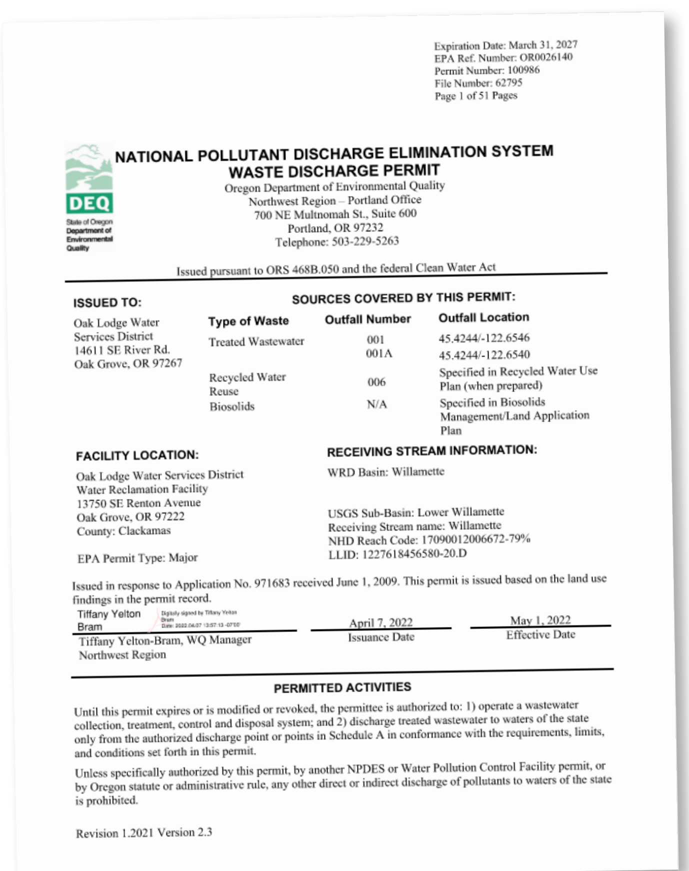
The majority of the OLWS collections system is located within Clackamas County roadways. An IGA streamlines the ability for OLWS to excavate and repair buried pipelines within County roadways. Additional IGAs with Clackamas Water Environment Services (WES) delineates service area boundaries and enables resource sharing during emergencies.

CITY OF GLADSTONE

Since 1971, a series of IGAs have covered the agreement for OLWS to receive, convey, and treat wastewater flows from the northern portion of Gladstone in an area that was formerly part of the Oak Lodge Sanitary District No. 2. At the time of writing, OLWS and Gladstone are working to finalize an updated IGA.

CITY OF MILWAUKIE

An IGA establishes rates and requirements for a limited number of properties within each agency's service boundary that are more efficiently provided by the other party's collection system.



Expiration Date: March 31, 2027
EPA Ref. Number: OR0026140
Permit Number: 100986
File Number: 62795
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NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT
Oregon Department of Environmental Quality
Northwest Region – Portland Office
700 NE Multnomah St., Suite 600
Portland, OR 97232
Telephone: 503-229-5263

DEQ State of Oregon Department of Environmental Quality

Issued pursuant to ORS 468B.050 and the federal Clean Water Act

ISSUED TO:
Oak Lodge Water Services District
14611 SE River Rd.
Oak Grove, OR 97267

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Outfall Location
Treated Wastewater	001 001A	45.4244/-122.6546 45.4244/-122.6540
Recycled Water Reuse	006	Specified in Recycled Water Use Plan (when prepared)
Biosolids	N/A	Specified in Biosolids Management/Land Application Plan

FACILITY LOCATION:
Oak Lodge Water Services District
Water Reclamation Facility
13750 SE Renton Avenue
Oak Grove, OR 97222
County: Clackamas

EPA Permit Type: Major

RECEIVING STREAM INFORMATION:
WRD Basin: Willamette

USGS Sub-Basin: Lower Willamette
Receiving Stream name: Willamette
NHD Reach Code: 17090012006672-79%
LLID: 1227618456580-20.D

Issued in response to Application No. 971683 received June 1, 2009. This permit is issued based on the land use findings in the permit record.

Tiffany Yelton Bram (Digitally signed by Tiffany Yelton Bram Date: 2022.04.07 13:57:13 -07'00')
Tiffany Yelton-Bram, WQ Manager
Northwest Region

April 7, 2022
Issuance Date

May 1, 2022
Effective Date

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to: 1) operate a wastewater collection, treatment, control and disposal system; and 2) discharge treated wastewater to waters of the state only from the authorized discharge point or points in Schedule A in conformance with the requirements, limits, and conditions set forth in this permit.

Unless specifically authorized by this permit, by another NPDES or Water Pollution Control Facility permit, or by Oregon statute or administrative rule, any other direct or indirect discharge of pollutants to waters of the state is prohibited.

Revision 1.2021 Version 2.3

AT A GLANCE

In 2022, OLWS received a new NPDES permit that imposed stricter discharge limits into the Willamette River. The WWMP includes a forecast of potential future regulations that were evaluated as part of the WWTP planning process. Future permit updates may include additional pollutants.

The OLWS wastewater and treatment system must comply with federal, state, and local regulations associated with publicly owned wastewater systems. During the preparation of this WWMP, the Oregon Department of Environmental Protection issued a new Waste Discharge Permit (#100986) for OLWS that lowered some of the waste discharge parameters for the disposal of treated wastewater into the Willamette River. In particular, lower limits for both carbonaceous BOD_5 and total suspended solids present compliance challenges for the existing facilities during the shoulder seasons. The new waste discharge limits are provided in Table ES-1. Additional details on the regulations and policies can be found in Chapter 3.0 of this WWMP.

Table ES-1. NPDES Permit Waste Discharge Limits

Parameter	Average Effluent Concentrations		Monthly Average (lb/d)	Weekly Average (lb/d)	Daily Maximum (lb/d)
	Monthly (mg/L)	Weekly (mg/L)			
MAY 1 – OCTOBER 31					
Carbonaceous BOD_5 ($CBOD_5$)	10	15	490	740	980
Total Suspended Solids (TSS)	10	15	490	740	980
NOVEMBER 1 – APRIL 30					
CBOD5	30	45	2,600	3,900	5,200
TSS	30	45	2,600	3,900	5,200

SECTION 04

Wastewater Flows

To evaluate the hydraulic performance of the wastewater system, the volume of wastewater flow must be estimated. Wastewater flow consists of the following elements:

- **Base Wastewater Flow (BWF)** is the flow that enters the system under normal average conditions, regardless of weather.
- **Groundwater Infiltration (GWI)** occurs in wet weather months when groundwater elevations are elevated with respect to buried elements of the collection system.
- **Rainfall-Derived Infiltration and Inflow (RDII)** occurs during and after rainstorms resulting from inflow through manhole covers and cross-connections and infiltration through pipe and manhole joints, cracks, and fractures.

AT A GLANCE

The OLWS system sees relatively high volumes of RDII that increases pumping and treatment costs, and increases the risks of sanitary sewer overflows (SSOs). The Master Plan recommends basin focused rehabilitation projects to systematically address and reduce RDII. See Projects C-1 through C-6 in the CIP.

Existing and Future Base Wastewater Flows

BWF across the existing system was estimated using data from the WWTP Influent Lift Station flow meters during dry weather periods. The total BWF across the system is estimated to be 1.85 million gallons per day (mgd). Data from the WWTP was also used to develop an average diurnal curve to estimate the typical fluctuations in wastewater during the course of a 24-hour day. Winter water consumption records were used to proportionally allocate BWF geospatially across the OLWS service area and to identify representative wastewater generation factors for different residential and non-residential land use categories.

Angelo Planning Group completed a buildable lands inventory (BLI) to estimate the capacity for growth within the OLWS wastewater service area in three categories:

Buildout Development.
The capacity for currently vacant and partially vacant properties to develop.

Middle Housing Densification.
The capacity for increased density of development for vacant and partially vacant properties and for conversions of 5 percent of developed single-family properties into multi-family properties.

Commercial Redevelopment.
Conversion of underutilized parcels near the SE Park Avenue Transit Station into multifamily housing.

AT A GLANCE

The OLWS service area is nearly built-out.
The majority of growth will likely be infill development.
A buildable lands inventory was conducted to determine the capacity and results in a relatively small growth rate, meaning that the WWTP and most pipes and pump stations are sufficiently sized if RDII can be reduced.

Full development of the capacity identified in the BLI over the 30-year planning horizon would result in an

AVERAGE ANNUAL GROWTH RATE OF

0.77%

which is comparable to, and slightly higher than, growth rates forecasted by the Portland State University Population Research Center. The calculated future BWF for the OLWS wastewater system assumes the full development capacity in the buildable lands inventory is 2.19 mgd.

Existing and Future GWI and RDII

To determine the amount of GWI and RDII in the OLWS wastewater system, flow monitoring was conducted at eight locations during the winter of 2021-2022. The flow monitoring data during storms that produced more than 1 inch of rain over 24 hours was used to develop parameters for estimating RDII flows based on rainfall patterns. The volume of GWI was estimated by subtracting the BWF from flow monitoring data during a period without rainfall.

Since wet weather flows are dependent upon the volume and peak intensity of rainfall during a storm, a “design storm” must be selected to estimate flows. A 5-year return interval storm with a total rainfall of 3.0 inches over 24 hours, as defined by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) was used to establish existing and future wet weather flow. The flows associated with this storm are used to evaluate the capacity of the collection system to achieve the design criteria for freeboard and SSOs that are identified in Chapter 5.0.

In the evaluation of the WWTP, the highest Peak Wet Weather Flow (PWWF) observed over the six years of available data occurred when a smaller antecedent storm with approximately 1 inch of total rainfall occurred in the 24 hours prior to a larger 24 hour storm with two or more inches of total rainfall. In order to better align with historic PWWF at the plant, a revised hyetograph was generated to include an antecedent storm of 1.26 inches of rainfall in the 48-hours prior to the 5-year, 24 hour design storm. The antecedent storm hyetograph was generated based on storm data from the flow monitoring period and represents an actual 48-hour storm in the OLWS service area.

Table ES-2 provides a summary of wastewater flows used for the evaluation and Table ES-3 presents the wastewater loading at the WWTP. Additional details on the existing and buildout wastewater system flows can be found in Chapter 4.0 of this WWMP.

Figure ES-2. Components of Wastewater Flow

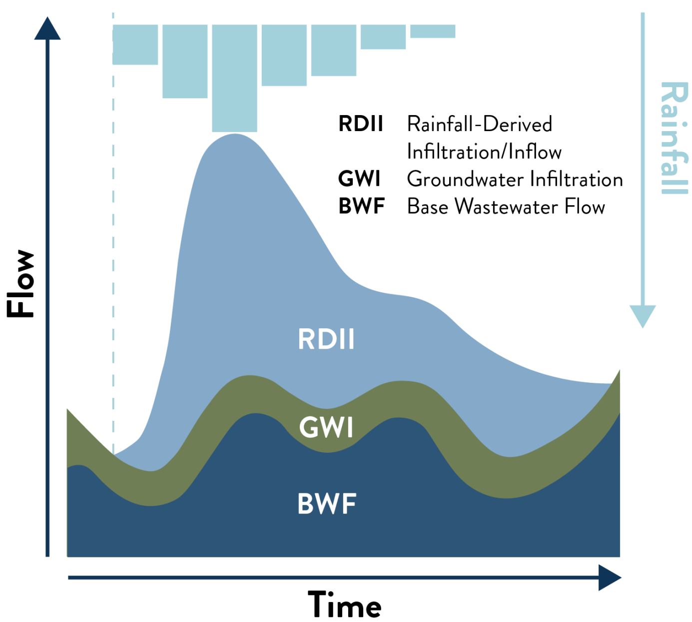


Table ES-2. Current and Future Flows for OLWS Wastewater System

Year	Equivalent Dwelling Units (EDU)	Base Wastewater Flow (gpd)	Peak Wet Weather Flow Collection System (gpd)	Peak Wet Weather Flow WWTP (gpd)
2022 – Existing	14,151	1,853,899	17,504,994	19,059,887
2052 - Buildout	16,726	2,191,112	17,956,410	19,522,181

Table ES-3. WWTP Loading

Parameter	2022	2052
Flow (mgd)		
• Average dry weather	2.2	2.5
• Average dry weather	3.2	3.5
• Average wet weather	4.4	4.8
• Max month dry weather	3.0	3.3
• Max month wet weather	6.3	6.7
• Peak day	15.1	15.5
• Peak hour	19.1	19.5
BOD (lb/d)		
• Annual average	4,950	5,850
• Max month dry weather	5,400	6,380
• Max month wet weather	6,290	7,440
TSS (lb/d)		
• Annual average	4,750	5,620
• Max month dry weather	5,230	6,180
• Max month wet weather	6,370	7,530

Note: ADWF is different than BWF. See Chapter 4 for more information.

AT A GLANCE

Although only 2,575 new dwelling units are projected over the next 30 years, OLWS sees a nearly tenfold increase in flows during wet weather. A diligent approach to rehabilitation of aging wastewater mains, manholes, and laterals will reduce RDII in wet weather, lessen the risk of sewer overflows, avoid costly pipe upsizing projects, and reduce the costs for pumping and treatment.

SECTION 05

Collections System Analysis

The collection system analysis looked at both capacity and condition data to determine deficiencies and to identify recommended improvements.

Hydraulic Capacity Evaluation

WSC developed a hydraulic model of the OLWS wastewater collection system to evaluate capacity based on a 5-year, 24-hour storm. Working with OLWS staff, evaluation criteria for wastewater mains focused on providing a minimum of two feet of freeboard between peak water surface elevations in manholes and the manhole rim to prevent overflows. In shallow manholes where the available freeboard is less than two feet, a maximum allowable surcharge relative to the overall manhole depth was used. Lift station capacity required the ability to pass wet weather flow with the largest pump out of service. Sanitary sewer overflows (SSOs) at any of the outfalls during the design storm are also not acceptable to OLWS, so surcharging must be kept below overflow weir elevations.

At buildout conditions, the wastewater system is anticipated to have 83 manholes (or approximately 3.6 percent of total system manholes) with insufficient freeboard and 36 locations where a SSO is anticipated. To address the capacity deficiencies at buildout, 19,259 linear feet of wastewater piping (primarily trunk mains and also representing approximately 3.6 percent of total pipe length in the system) must be upsized and the firm capacity of Lift Stations 2 and 5 must be increased.

AT A GLANCE

Unless action is taken, OLWS will experience multiple SSOs across the collection system. Upsizing of trunk mains is needed, but due to the locations, will require a large investment.

Condition Evaluation

OLWS has conducted closed-circuit television (CCTV) inspections on 98 percent of the collection system piping. Although the condition data from those CCTV inspections was collected using different defect coding systems over the years, the data was converted into NASSCO PACP equivalent defect scores for use evaluating the need for repairs and rehabilitation across the wastewater system. The pipe condition can be used to represent the likelihood of failure, with PACP Grade 4 and 5 defects requiring repair or replacement within the next 5 to 10 years to minimize the risk of failure. A proposed system for estimating consequence of failure was also proposed to support a risk-based prioritization method for determining where to invest in repairs when resources are limited.

AT A GLANCE

OLWS diligently inspects wastewater mains at regular intervals to assess condition before an unplanned failure occurs. These assessments have identified systemwide needs for repairs over the next 5 to 10 years. Continuous rehabilitation with prioritization of the highest risk mains will allow OLWS to invest wisely.

RDII Reduction Program

OLWS currently has capacity and condition deficiencies in the collection system that could be simultaneously addressed through an RDII reduction program. Focusing condition-based repairs within basins that are upstream of known capacity deficiencies may reduce the amount of trunk main upsizing while addressing the risk of structural failures.

A pilot-program for RDII reduction is recommended for the Lift Station 5 basin. Sub-basin flow monitoring will be conducted to identify areas of highest RDII to determine the extent and nature of wastewater rehabilitation. Smoke testing in each basin will identify potential sources of surface water entering the collection system so that repairs can be made. Focusing on those pipes with Grade 4 and 5 defects, rehabilitation of the wastewater main, the service laterals, and the manholes will be completed to both address structural defects and to reduce RDII. Following completion of repairs, another round of flow monitoring will be conducted to estimate the magnitude of RDII reduction and to guide future RDII reduction efforts in the Lift Station 2 and 6 basins. Additional details on the analysis of the OLWS wastewater collection system can be found in Chapter 5.0 of this WWMP.

AT A GLANCE

Without an ongoing RDII reduction program, expensive pipe upsizing will be necessary to avoid SSOs. Basin-wide investigations and targeted pipe repairs, most of which can be completed without excavation, will reduce capital and long-term operational costs.

SECTION 06

Wastewater Treatment Plant Analysis

The OLWS WWTP provides secondary treatment using activated sludge processes with ultraviolet disinfection to meet waste discharge requirements. The plant is rated for a total capacity of 20 mgd following a significant expansion in 2012 when a majority of the existing equipment was installed.

Existing WWTP Assessment

Brown and Caldwell (BC) utilized a combination of visual inspections, review of operational data, and discussions with OLWS operations staff to assess the condition, integrity, and operability of equipment at the WWTP. Findings from the assessment were used to make condition-based repair recommendations for the WWTP. Additional details can be found in Appendix A of the WWMP.

Plant data from 2016 to 2021 was evaluated to assess historical trends and operational performance. Effluent quality has almost consistently met permit requirements during the period with only recent exceedance of total suspended solids (TSS). With a new permit that limits the discharge concentration for carbonaceous biochemical oxygen demand (CBOD) and TSS to 10 mg/L, the WWTP may not reliably meet the new limits, especially for TSS. Future forecasts of long-term regulatory trends indicate that the WWTP could be subject to limits on total phosphorous and ammonia in upcoming permit cycles, which may require modifications to allow biological nutrient removal to take place.

AT A GLANCE

The WWTP cannot reliably meet new permit limits for total suspended solids. A high priority project to add tertiary treatment filters (T-12) will be completed.

A capacity assessment was conducted for the WWTP to identify existing capacity constraints and the timing of those constraints for each major treatment process. Extensive sampling throughout the plant was used to characterize the wastewater and to calibrate a biological process model and plant-wide solids mass balance to assess capacity.

Near term capacity constraints between now and 2030 include:

- Aeration system is near or at capacity under dry weather conditions
- Secondary clarifiers projected to reach solids loading limit under dry weather conditions when one clarifier is out of service
- Aerobic digesters require upstream thickening of solids to achieve hydraulic retention time requirements for Class B biosolids and aeration capacity may need to be increased to allow one of the four digesters to be taken out of service
- Any upsets to settling characteristics or clarifier operations could cause effluent to exceed the 10 mg/L limit for TSS

Longer term capacity constraints, beyond 2030, include the following:

- Aeration blowers projected to reach firm capacity limit in 2035 for wet weather conditions
- Similar to near term, the aeration capacity of the digester system is anticipated to be exceeded

The timing and extents of capacity constraints are based on the assumption that RDII will not increase due to aging wastewater mains. If RDII reduction projects are not completed, capacity constraints in the WWTP will occur sooner.

AT A GLANCE

Capacity constraints will be reached in the next 10 years due to limited aeration capacity. Improvements to the secondary treatment system will provide the necessary capacity while providing flexibility to meet potential future regulations.

Identification and Evaluation of WWTP Alternatives

Through a series of workshops with OLWS, conceptual alternatives for addressing condition and capacity deficiencies at the WWTP were identified and evaluated. Evaluation criteria included planning for future needs, operations and maintenance considerations, and environmental impacts. Conceptual cost estimates were developed for each alternative, both in terms of capital costs and long-term operational costs, to allow for comparison. The following improvements were recommended based on the results of the alternative analysis:

- Keep existing Huber Multi-Rake screens and adjust channel fit
- Keep existing grit removal equipment with improvements to HeadCell access
- Conversion of secondary treatment process to simultaneous nitrification denitrification (SND) to address aeration capacity issues
- Future addition of Anaerobic-Anoxic-Oxic (A2O) capabilities along with SND to address phosphorous removal if required in future discharge permits without the need for costly chemical addition
- Keep existing Trojan UV system and make gate and actuator improvements
- Add tertiary disc filters to reliably meet new TSS limit year-round
- Construction of a new solids handling building with redundant thickening and dewatering units, thickened waste activated sludge and digested sludge pumps, polymer and odor control equipment, electrical room, and drive-under solids storage hopper in area south of existing Digesters 1 and 2
- Replacement of Digesters 3 and 4 with two new aerobic digesters adjacent to the existing Digesters 1 and 2

Additional details on the alternatives analysis and recommendations for WWTP improvements can be found in Chapter 6.0 of this WWMP.

AT A GLANCE

Handling and managing solids at the plant is time-consuming and creates odors. A future recommendation for a new solids handling building will reduce operational costs and avoid the need to store solids onsite.

SECTION 07

Capital Improvement Plan

A capital improvement plan (CIP) was prepared to include anticipated timing and costs for recommended projects within the collections and treatment systems. Cost estimates are based on conceptual understanding of projects, and include a contingency markup to account for unknown aspects and a project development markup to cover planning, design, construction management, inspection, and administration costs.

Each CIP project was assigned a prioritization score based on weighted criteria identified by OLWS. Criteria include asset criticality and condition, customer criticality, regulatory mandates, relationship to other projects, ability to leverage outside funding, level of service, alignment with OLWS Board goals and adopted plans, public interest, and operations and maintenance effectiveness and efficiency. The recommended CIP takes prioritization scoring into account, but also strives to level spending which requires some deviations from strict adherence to prioritization scores. The total value of the CIP is $159,893,000. The CIP projects are divided into collections, treatment, and planning projects and are summarized in Table ES-4, 5, and 6. Additional details on the CIP can be found in Chapter 7.0 of this WWMP.

Table ES-4. Collections System CIP Projects

Project ID	Project Description	Prioritization Rank	Opinion of Probable Cost	Fiscal Years
C-1	LS 5 Basin RDII Reduction	1	$3.02M	2023-24
C-2	LS 2 Basin RDII Reduction	1	$4.95M	2024-25
C-3	LS 6 Basin RDII Reduction	1	$495K	2024-25
C-4	Influent LS Basin RDII Reduction	1	$7.17M	2025-27
C-5	LS 4 Basin RDII Reduction	5	$205K	2026-27
C-6	LS 3 Basin RDII Reduction	6	$8.37M	2031-32
C-7	Ongoing Condition Rehab	7	$25.7M	2033-52
C-8	Trunk A Upsizing	13	$11.9M	2028-30
C-9	Trunk B Upsizing	13	$10.4M	2029-31
C-10	Trunk 2A Upsizing	15	$1.9M	2030-31
C-11	Trunk C Upsizing	16	$144K	2031-32
C-12 to 20	Current 6-yr CIP projects	Various	$14.3M	2023-52
	Collection Projects Subtotal		**$88.4M**	

Table ES-5. Treatment System CIP Projects

Project ID	Project Description	Prioritization Rank	Opinion of Probable Cost	Fiscal Years
T-1,2,4,5,6,7,8&11	Secondary Treatment Upgrades for SND/A20	2,10,11	$3.5M	2026-30
T-3	Replace aeration blowers	4	$160k	2024-25
T-9&10	Rehab secondary clarifiers 1&2 and RAS Control Center	3,9	$3.7M	2024-29
T-12	Tertiary Filtration Facility	1	$12.0M	2023-25
T-13	Digester Blower Replace-ment	4	$170k	2023-26
T-14,15	UV Disinfection Rehab	12,17	$2.5M	2023-52
T-16,17	Influent Lift Station Rehab	25,28	$1.2M	2026-28
T-18,19,20 21,22	Headworks Improvements	16,21,24,30	$3.7M	2033+
T-23	WWTP Air Piping Inspection	13	$80k	2023
T-24,25	GBT and TWAS Refur-bishment	13	$325K	2026
T-26	Solids Handling Upgrades	8	$35M	2033+
T-27	W3 Sodium Hypochlorite Replace	29	$150k	2031
T-28	Secondary Clarifier 3&4 Rehab	6	$3.7M	2033+
T-29	Ongoing Electrical Upgrades	26	$2.3M	2023-52
T-30	Plant Drain LS Rehab	7	$120K	2026
	Treatment Projects Subtotal		**$69.2M**	

Table ES-6. Planning CIP Projects

Project ID	Project Description	Prioritization Rank	Opinion of Probable Cost	Fiscal Years
P-1	5-yr Cycle WWMP Updates	-	$2.2M	2027,32 & beyond
	Planning Projects Subtotal		**$2.2M**	

Next Steps

Treatment System Projects

A total of **30 treatment system projects** were identified as part of this wastewater master plan. Some of the recommended projects overlapped with current projects that are in the 2023-2028 OLWS 6-year CIP and have been modified accordingly. Although each project was assigned a unique prioritization score, the schedule for implementation for some projects can be grouped together to reduce costs and improve the ability to design and construct holistically. The highest priority project is T-12 which will provide a new tertiary treatment facility to improve reliability in meeting new waste discharge permit limits, particularly for TSS. A summary of the existing projects is provided below in Table ES-7.

Table ES-7. Projects from Existing Treatment CIP

Project Number	Capital Project Description
T-1,2,4,5, 6, 7, 8 & 11	**Secondary Treatment Upgrades for SND/A2O:** Adding density and improving controls to the existing aeration system, modifying the mixed liquor return system, and other improvements will allow the WWTP to address capacity constraints and provide the ability to meet potential future nutrient discharge limits.
T-3	**Replace Aeration Blowers:** Current aeration blower replacement is needed to provide reliable operations. This project is in the current OLWS CIP.
T-9,10	**Rehab Secondary Clarifiers 1 & 2 and RAS Control Center:** Recent condition assessment conducted by OLWS identified the need to rehab the secondary clarifiers.
T-12	**Tertiary Filtration Facility:** A new treatment process will improve reliability to meet new waste discharge permit limits.
T-13	**Digester Blower Replacement:** Current digester blower replacement is needed to provide reliable operations. This project is in the current OLWS CIP.
T-14,15	**UV Disinfection Upgrades:** Ongoing replacement of UV bulbs and upgrades to the flow control gates are necessary.
T-16,17	**Influent Lift Station Rehab:** Pump replacement and other improvements are necessary to provide reliable operations. This project is in the current OLWS CIP.
T-18,19,20 21,22	**Headworks Improvements:** Upgrades to screen seals in channel, access to head cell, providing a 3rd mechanical screen, and other improvements at the headworks will improve operations.
T-23	**WWTP Air Piping Inspection:** Inspection and identification of necessary repairs to the air piping is needed for reliable operations. This project is in the current OLWS CIP.
T-24,25	**GBT and TWAS Refurbishment:** A refurbishment of the existing GBT unit and replacement of TWAS pumps are necessary to provide reliabile operations.
T-26	**Solids Handling Upgrades:** A new solids handling building south of existing Digesters 3 & 4 and the replacement of Digesters 1 & 2 will provide improved reliability and operations for solids handling.
T-27	**W3 Sodium Hypochlorite Replace:** Replacement of the system is needed for reliable operations.
T-28	**Secondary Clarifier 3&4 Rehab:** Rehabilitation of mechanical elements are needed for reliable operations.
T-29	**Ongoing Electrical Upgrades:** Plant staff typically replace sensitive electrical equipment, such as variable frequency drives, to provide reliable operations.
T-30	**Plant Drain Lift Station Rehab:** Pump replacement and other improvements are necessary to provide reliable operations. This project is in the current OLWS CIP.

AT A GLANCE

Over the next 30 years, OLWS has significant investments necessary to deliver the expected level of service to customers. A combination of funding for capital projects, adjustments to SDCs, and increases in rates will be needed.

Collection System Projects

A total of **11 collection system projects** were identified as part of this wastewater master plan, which were added to supplement the existing nine projects identified by OWLS during their previous CIP process. The highest priority projects are projects C-1 through C-4, which focus on RDII reduction to alleviate the risk of SSOs. Each RDII project will include smoke testing to identify and remove any cross connections contributing inflow, flow metering to current and final levels of RDII, and rehabilitation of wastewater mains, service laterals, and manholes to reduce infiltration. The work of these projects is focused on poor condition infrastructure that needs to be replaced and has the potential to reduce the need for upsizing pipes within the collection system.

Table ES-8. Collection System CIP Projects for Addressing Capacity and Condition-Based Deficiencies

Project Number	Capital Project Description
C-1	**LS5 RDII Reduction Pilot:** Smoke testing 35,000 LF of pipe; flow metering at five locations (pre- and post-rehabilitation [rehab]); rehab of 173 LF of 6” pipe, 5,839 LF of 8” pipe, 2,556 LF of 10” pipe, and 215 LF of 12” pipe; rehab of six manholes (63 vertical feet [VF]); and rehab of 138 laterals from the main to the property connection.
C-2	**LS2 Basin RDII Reduction Program:** Smoke testing 165,414 LF of pipe; flow metering at 17 locations (pre- and post-rehab); rehab of 11,145 LF of 8” pipe, 304 LF of 12” pipe, 4 LF of 14” pipe, 251 LF of 18” pipe, 752 LF of 20” pipe, and 338 LF of 21” pipe; rehab of nine manholes (95 VF); and rehab of 198 laterals from the main to the property connection.
C-3	**LS6 Basin RDII Reduction Program:** Smoke testing 6,846 LF of pipe; flow metering at two locations (pre- and post-rehab); rehab of 171 LF of 8” pipe; rehabilitation of one manhole (11 VF); and rehab of 33 laterals from the main to the property connection. Scope is limited to OLWS-owned assets.
C-4	**ILS Basin RDII Reduction Program:** Smoke testing 207,931 LF of pipe; flow metering at 21 locations (pre- and post-rehab); rehab of 270 LF of 6” pipe, 12,724 LF of 8” pipe, 503 LF of 10” pipe, 250 LF of 12” pipe, 247 LF of 15” pipe, and 1,428 LF of 21” pipe; rehab of 17 manholes (179 VF); and rehab of 326 laterals from the main to the property connection.
C-5	**LS4 Basin RDII Reduction Program:** Smoke testing 2,335 LF of pipe; flow metering at one location (pre- and post-rehab); rehab of 491 LF of 8” pipe; rehab of one manhole (11 VF); and rehab of four laterals from the main to the property connection.
C-6	**LS3 Basin RDII Reduction Program:** Smoke testing 51,309 LF of pipe; flow metering at five locations (pre- and post-rehab); rehab of 19,504 LF of 8” pipe, 1,009 LF of 10” pipe, 1,788 LF of 12” pipe, and 996 LF of 15” pipe; rehab of 16 manholes (168 VF); and rehab of 428 laterals from the main to the property connection.
C-7	**Annual Condition Rehabilitation:** Annual budget for rehabilitating future Grade 5 and Grade 4 mains within the collection system. This project will take place after the RDII reduction programs and will address mains that developed Grade 5 and Grade 4 defects after the time of this master plan.
C-8	**Trunk Main A Upsizing:** Upsize Trunk Main A along the extents shown in Figure 5 10 and Appendix H to address capacity deficiencies. Project scope includes the installation of 3,516 LF of 24”, 240 LF of 27”, and 3,202 LF of 30” gravity wastewater main. Depending on the effectiveness of the RDII reduction in Projects C-1 through C-6, this scope may be reduced.
C-9	**Trunk Main B Upsizing:** Upsize Trunk Main B along the extents shown in Figure 5 10 and Appendix H to address capacity deficiencies. Project scope includes the installation of 362 LF of 15”, 4,600 LF of 18”, and 3,729 LF of 24” gravity wastewater main. Depending on the effectiveness of the RDII reduction in Projects C-1 through C-6, this scope may be reduced.
C-10	**Trunk Main 2A Upsizing:** Upsize Trunk Main 2A along the extents shown in Figure 5 10 and Appendix H to address capacity deficiencies. Project scope includes the installation of 322 LF of 15” and 1,698 LF of 18” gravity wastewater main. Depending on the effectiveness of the RDII reduction in Projects C-2 and C 3, this scope may be reduced.
C-11	**Trunk Main C Upsizing:** Upsize Trunk Main C along the extents shown in Figure 5 10 and Appendix H to address capacity deficiencies. Project scope includes the installation of 289 LF of 10” gravity wastewater main.

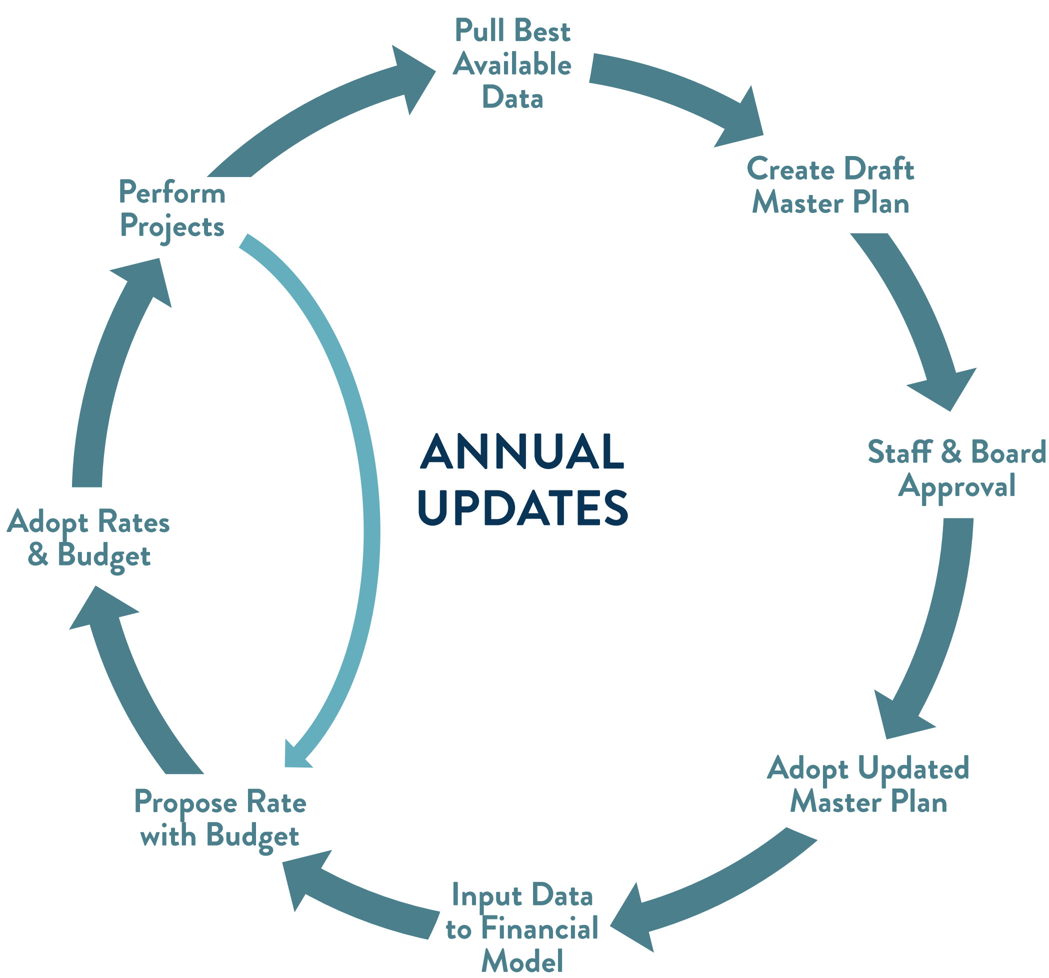
Planning Projects

WSC recommends an update to the WWMP on an approximate 5-year basis to refresh the CIP to improve the utility of the wastewater master plan. As time passes between each WWMP update, new regulations may be implemented, system conditions gradually deteriorate, and priorities for OLWS can shift. Updating the master plan every 5-years also requires less effort than developing a completely new master plan document. Project P-1 allocates budget every five years to provide an update to this wastewater master plan to facilitate future CIP development and reflect improvements made within the wastewater system. The next update will be particularly important as RDII reduction projects are completed and benefits of lower PWWFs can be assessed to determine the impacts on capacity and treatment system improvement recommendations.

AT A GLANCE

Over time, the system will change and new needs will arise. By updating the WWMP on a 5-year cycle, the plan will stay fresh and OLWS can stay ahead of financing needs.

Figure ES-3. Master Plan 5-Year Update Cycle



Staffing Considerations

Developing the WWMP has shown a need to conduct a detailed staffing analysis to determine OLWS' appropriate level of staff for current and future operations.

Staffing decisions come with many considerations that go beyond the scope of this WWMP. Individual project CIP budgets include project development costs and assume more automated processes, where appropriate. The recommended overall CIP accounts for some of the cost and should allow flexibility for OLWS to address staffing needs over the 30-year planning horizon as processes and equipment change.

Funding and Financing

OLWS will explore several options to fund the CIP including user fees, bonds, grants from outside agencies, and SDCs. The following sections will describe the potential for funding the recommended capital improvements through user fees and SDCs, bonds, or grants from outside agencies.

CIP Summary

The recommended CIP identifies approximately $160M in projects, with roughly 50% of the work to be completed within the next 10 years. An implementation schedule that provides for an average capital improvement budget of $8.0M per year for the next 10 years appears feasible but will likely require rate increases or additional funding mechanisms. Prioritization of projects is based upon the currently known deficiencies within the system. As continued inspections and assessments of wastewater mains, manholes, lift stations, and wastewater treatment plant facilities provide new information, there may be a need to adjust the prioritization and timing of the CIP.