

SECTION 1 - EXECUTIVE SUMMARY

In 2020, the City of St. Helens, Oregon (City), contracted with Keller Associates, Inc. (Keller) to complete a wastewater master plan (WWMP) for the City's wastewater collection system. The study area consists of all areas within the City's Urban Growth Boundary (UGB). This section summarizes the major findings of the wastewater master plan, including brief discussions of alternatives considered and final recommendations.

1.1 PLANNING CRITERIA

City-defined goals and objectives, Public Works Design Standards (PWDS), engineering best practices, and regulatory requirements form the basis for evaluation and planning within this study. Applicable regulatory requirements include the Oregon Department of Environmental Quality (DEQ) Pump Station Regulatory Requirements, Capacity Management, Operation and Maintenance (CMOM) Guidance, Land Use and Comprehensive Plan Requirements, and City Municipal Code.

The capacity of the City's conveyance system is based on the ability of the system to convey projected 20-year peak instantaneous flow rates associated with the 5-year, 24-hour storm event. For the collection system model evaluation, pipes are considered at capacity when peak flows exceed 85% of full depth in accordance with industry standards. When sizing gravity collection systems, pipelines shall be sized to convey 20-year, projected peak flows at 85% or less depth to diameter ratio (d/D). Pump stations will be evaluated and sized (if necessary) to handle these peak flows with the largest pump out of service (defined as firm capacity).

1.2 PLANNING CONDITIONS

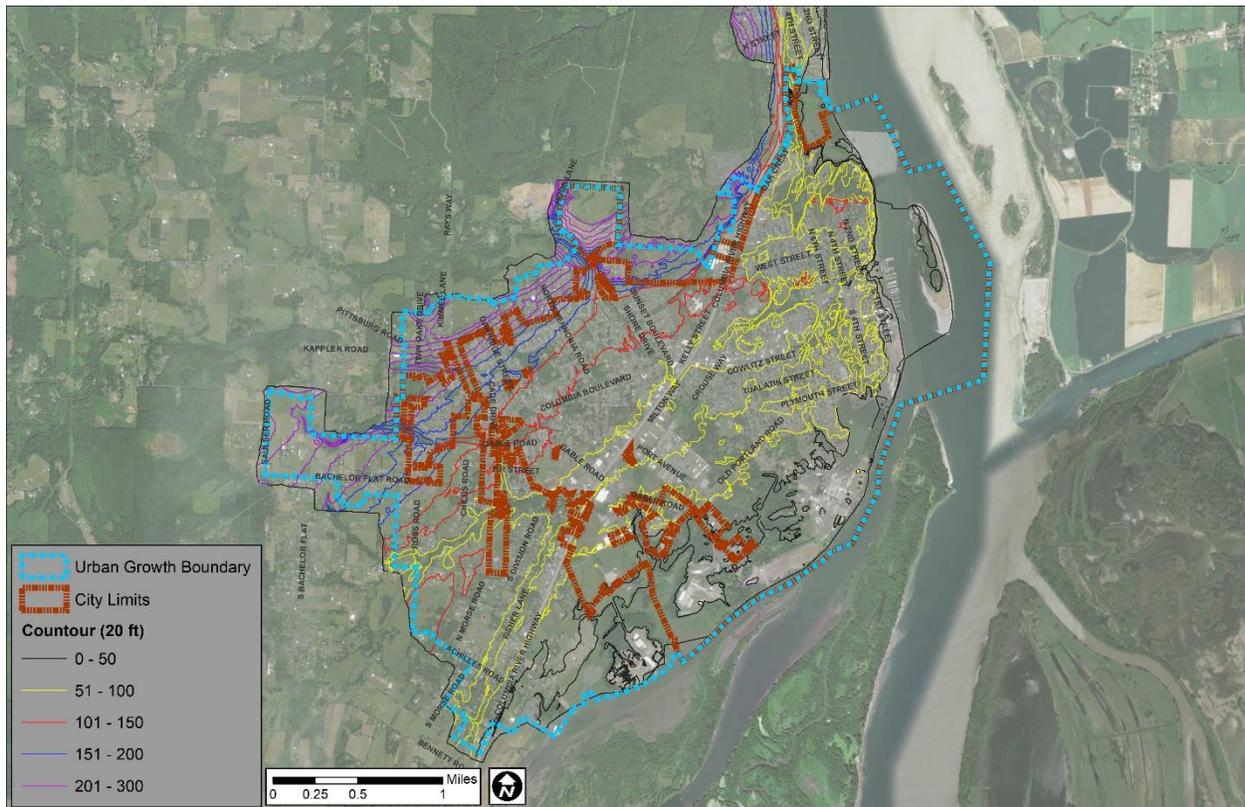
1.2.1 STUDY AREA AND LAND USE

The study area, consisting of the City's UGB and general topography, are shown in Figure 1-1. The study area slopes to the south and east toward the Columbia River. The City of St. Helens owns and operates a wastewater collection system within its UGB. Columbia City's wastewater collection system discharges to the collection system in St. Helens and flows to the City's Wastewater Treatment Plant (WWTP) for treatment. Evaluation of the Columbia City system, aside from the impacts of population growth and infiltration and inflow (I/I) on the St. Helens system, is not included in the scope of this study. The wastewater system currently serves only areas within the St. Helens and Columbia City UGBs. Further expansion of the UGB was not considered in this report.

1.2.2 DEMOGRAPHICS

The City's population has been increasing at a steady rate over the past few decades, but has leveled out in recent years. Historic populations for the City of St. Helens and Columbia City were obtained from the U.S. Census and Columbia County in cooperation with Portland State University (PSU). PSU analyzes historical trends and anticipates growth patterns to develop growth rates for 5-year increments. The most current population estimate provided by PSU for the combined area of St. Helens and Columbia City was 15,895 in 2020. The PSU coordinated growth rates provide a population projection for 2040 to be 19,506, which is St. Helens and Columbia City combined. These growth rates were reviewed and approved by the technical advisory committee (TAC) for this planning study. The estimated average annual growth rate from 2019 to 2040 is approximately 1.1% for St. Helens and 0.5% for Columbia City.

FIGURE 1-1: CITY LIMITS, UGB, AND TOPOGRAPHY



1.2.3 WASTEWATER FLOWS

Historical wastewater flows were evaluated using statistical methods following DEQ guidance to develop planning flows and provide flow projections for the planning period. Observed flows for each year from 2015–2019 and planning flows are summarized in Table 1-1 below. During the system flow evaluation process, it was discovered that the current influent flow measurement at the WWTP may not reliably measure peak influent flows during high flow events. The City provided direction to review available data, use engineering judgement, and estimate system flow planning criteria values to reflect the current system demand. Modified planning criteria was established and is presented in Table 1-1.

TABLE 1-1: OBSERVED HISTORICAL FLOWS & PLANNING FLOWS

St. Helens Historical Flows (MGD ¹)								
Year	2015	2016	2017	2018	2019	5-Year Avg	Planning	Modified Planning
Population	15,050	15,085	15,225	15,225	15,395		15,895	15,895
ADWF	0.98	1.31	1.25	0.95	1.09	1.11	1.11	1.11
MMDWF₁₀	2.71	2.56	2.87	3.03	2.79	2.79	3.03	3.03
AADF	2.35	2.43	2.64	1.92	1.85	2.24	2.24	2.24
AWWF	3.73	3.56	4.01	2.90	2.59	3.36	3.36	3.36
MMWWF₅	7.88	7.81	5.84	4.46	3.99	5.99	7.88	7.88
PWkF	14.19	7.54	8.93	5.90	8.86	9.08	14.19	14.19
PDAF₅	21.19	13.08	17.76	9.60	21.90	16.71	21.90	19.90
PIF₅	31.4	27.4	24.6	13.9	32.2	25.90	33.98	26.00
Yearly Total (MG¹)	856	889	955	700	669			
Total Rainfall (in/yr)	47	48	51	31	33			

1) MGD = million gallons per day; MG = million gallons

ADWF = Average Dry-Weather Flow

AADF = Average Annual Daily Flow

MMWWF₅ = Maximum Monthly Wet-Weather Flow

PDAF₅ = Peak Daily Average Flow

MMDWF₁₀ = Maximum Monthly Dry-Weather Flow

AWWF = Average Wet-Weather Flow

PWkF = Peak Week Flow

PIF₅ = Peak Instantaneous Flow

Comparison of the dry weather and wet weather system flows in Table 1-1 shows that the City of St. Helens experiences large increases in flow during wet weather events. The high wet weather flows are associated with large inflow and infiltration (I/I) influence in the system.

To project the planning flows derived from the analysis, a projected flow per capita (reported in gallons per capita per day, [gpcd]) was developed. Projected planning system flows (millions of gallons per day [MGD]) are based on 2019 modified planning flows with the addition of the product of projected unit flows (gpcd) and projected population increase shown in Table 1-2. Actual future flows will depend on several variables and could potentially be decreased through aggressive I/I reduction efforts.

TABLE 1-2: PROJECTED PLANNING FLOWS

Year	Planning	Planning Unit	Projected Unit	Projected Planning Flow (MGD)					
	Flow (MGD)	Flow (gpcd)	Flow (gpcd)	2019	2020	2025	2030	2035	2040
Population	15,395	15,395	15,395	15,395	15,895	16,727	17,605	18,530	19,506
ADWF	1.11	72	72	72	1.15	1.21	1.28	1.34	1.41
MMDWF₁₀	3.03	197	197	197	3.12	3.29	3.46	3.64	3.83
AADF	2.24	145	145	145	2.31	2.43	2.56	2.69	2.83
AWWF	3.36	218	218	218	3.47	3.65	3.84	4.04	4.25
MMWWF₅	7.88	512	300	300	8.03	8.28	8.54	8.82	9.11
PWkF	14.19	922	325	325	14.35	14.62	14.91	15.21	15.53
PDAF₅	19.90	1293	375	375	20.09	20.40	20.73	21.08	21.44
PIF₅	26.00	1689	525	525	26.26	26.70	27.16	27.65	28.16

1.3 COLLECTION SYSTEM EVALUATION

The existing wastewater collection system consists of approximately 60 miles of gravity sewer mains, 2.5 miles of force main, and nine pump stations.

1.3.1 PUMP STATION EVALUATION

There are nine pump stations and approximately 2.5 miles of force main operated and maintained by the City in its wastewater collection system. High level facility evaluations were completed in October of 2020 with City operations personnel to review conditions of the pump station facilities, current maintenance activities, and known operational problems encountered by City staff.

Each pump station is a duplex pump station with submersible pumps located in the wetwell, with the exception of Pump Station 2 (PS#2). PS#2 is a duplex self-priming pump station that operates on a variable frequency drive (VFD) with a high and low setting. Table 1-3 below provides a summary for the pump stations evaluated.

TABLE 1-3: PUMP STATION INVENTORY

Name	PS#1	PS#2	PS#3	PS#4	PS#5	PS#7	PS#8	PS#9	PS#11
Type	Duplex, Submersible	Duplex, Self-Priming	Duplex, Submersible	Duplex Submersible	Duplex, Submersible	Duplex, Submersible	Duplex, Submersible	Duplex, Submersible	Duplex, Submersible
Year Constructed	1950s	1990	1997	1995	1994	1986	1991	1994	1996
Pump Type	Paco / Hydromatic Submersible	Gorman Rupp's VSP (High / Low)	Wilo Type FA 10.51A Submersible	FLYGT NP - 3085	ABS AFP AFP(K) 1049.1-M105/4FM	Wilo Submersible	ABS SJS10W	Barns 4SE3724L	Hydromatic S4HVX-1500JD
Pump hp	36 / 30	40 / 22.5	6.2	3	14	15.5	1	3.7	15
Design Flow (gpm)	550	700 / 250	500	130	145	390	Unknown	200	143
Design Head (ft)	110	82 / 52	10.7	22	98	83	4	24	74
Low Level Alarm (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.42	N/A
Pump Off Level (ft)	1.33	1.50	2	6.2	2.00	3.83	2.83	0.58	0.75
Lead On Level (ft)	2	3	3.5	8.9	4.00	10.00	4.93	1.167	1.65
Lag On Level (ft)	2.5	3.5	4.33	10.0	5.00	10.5	Unknown	2.75	2
High Level Alarm (ft)	6	7.5	5.83	11.8	5.00	11	5.45	3.75	3.1
Level Control Type	Ultrasonic Level Sensor	Float Relays	Ultrasonic Level Sensor	Float Relays	Ultrasonic Level Sensor	Ultrasonic Level Sensor	Float Relays	Float Relays	Float Relays
Flow Meter	No	No	No	No	No	No	No	No	No
Pressure Gauge	Yes	No	No	No	No	No	No	No	No
Auxiliary Power Type	Portable Generator	On-Site Generator	Portable Generator	Portable Generator	On-site Generator	On-site Generator	Portable Generator	Portable Generator	Portable Generator
Transfer Switch	MTS	ATS	MTS	MTS	ATS	ATS	MTS	MTS	MTS
Bypass Piping	No	No	No	Yes	No	No	No	No	No
Oder Control	None	None	None	None	None	None	None	None	None
Wet Well Depth (ft)	18	9	15.5	20.6	10.5	16	4	13	6.15
Wet Well Diameter (ft)*	12.67	5	7	6	6	6	3	5	5
Force main Diameter (in)	6	6	6	4	4	6 / 8	3	6	4
Force Main Length (ft)**	1,010	1,050	20	610	1,700	2,620	260	70	2,500

*Pump Station 1 has a rectangular wetwell

**Estimated using City GIS data

The pump station evaluation presents general observations and recommendations, along with specific recommendations for individual pump station sites. The general recommendations are provided as a guideline to allow the City to maintain the pump stations for the 20-year planning period. Overall, the pump stations are in good condition and are well maintained with minor housekeeping items such as partial installation of redundant high-level alarms, lack of fall protection, and lack of up-to-date accurate pump station drawings and pump information. These housekeeping items were identified during observations and discussions with City staff. No significant deficiencies were identified in the overall pump station condition evaluation.

1.3.2 INFILTRATION & INFLOW

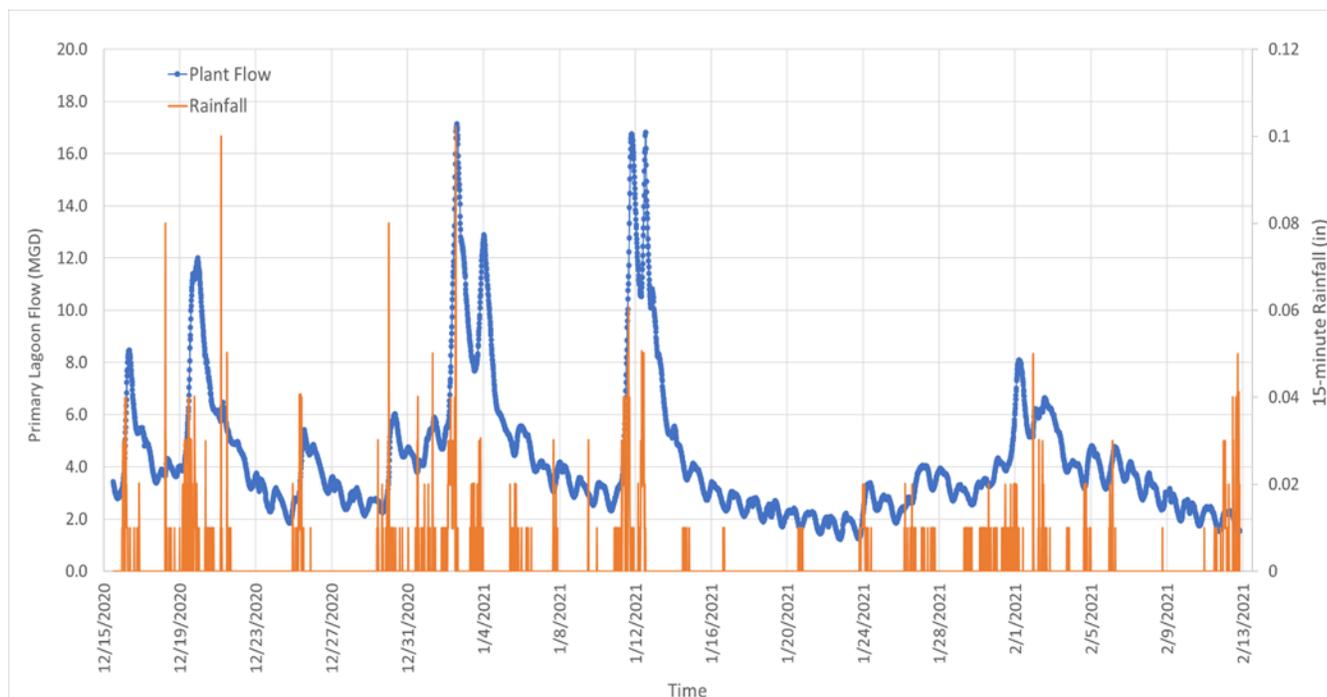
Infiltration and Inflow (I/I) is a concern in the St. Helens collection system. The rapid response between precipitation events and increased flows suggests that a significant component of peak flow is from storm water inflow. Estimated peak flows in the collection system are 20-25 times higher than annual dry weather flows. The sustained increase in flow over several days following a large storm event suggests that groundwater is also infiltrating into the City's wastewater collection system. Visual evidence of I/I influence in the system can be seen in Chart 1-1, which displays WWTP primary lagoon flow vs. 15-minute rainfall data for December 2020 through February 2021. The data is representative of typical wet weather seasonal response in the collection system.

Since the completion of the 2008 Wet Weather Capacity Evaluation, which documented I/I in St. Helens, the City has performed smoke testing and closed-circuit television (CCTV) inspections on the collection system. The City has also taken steps to address I/I in the system via pipeline replacement, pipe repair (including cure-in-place-pipe [CIPP] lining and spot repairs), and manhole rehabilitation and replacement. City staff have reported that the effort has produced noticeable I/I reduction (annual reported overflows have been reduced), but I/I still persists in the system.

This study included a high-level evaluation of I/I in the system. A preliminary evaluation to identify areas likely to experience the highest I/I was completed using available data. Pipeline age and material data, areas of suspected sump pump connections, City reported issues, and priority pipelines from the 2008 evaluation not addressed in the I/I reduction projects were compared to identify areas anticipated to have the highest I/I influence. The pipelines identified as highest risk for I/I should be considered as high priority for CCTV inspection and subsequent repair and/or replacement as needed. Overall, the evaluation identified approximately 8,000 feet of Priority 1 pipelines; 15,200 feet of Priority 2 pipelines; and 18,250 feet of Priority 3 pipelines for CCTV inspection. The primary area identified by City staff as likely to have improper stormwater sump pump connections was marked for additional investigations in order to locate and disconnect any stormwater sump pumps.

I/I prioritization and identification is an ongoing, evolving process. As the City collects more data, the prioritization evaluation needs to be updated to reflect the most recent data available. It is recommended the City work towards regular inspection of all system pipes and include this information in their ongoing I/I prioritization process.

CHART 1-1: DAILY FLOW AND PRECIPITATION DURING WET WEATHER



1.3.3 STAFFING EVALUATION

A high-level evaluation of existing wastewater staffing levels, deficiencies in existing staffing levels, and staffing recommendations was completed as part of this study. The City Public Works (PW) Operations staff, who are responsible for the operations and maintenance (O&M) of the wastewater collection system, and the WWTP staff, who are responsible for the O&M of the City’s nine pump stations, were interviewed to collect information on existing staffing levels, annual O&M activities, and level of service (LOS) goals for the City wastewater infrastructure. In general, St. Helens’ public works staff provide support for many City activities that are not directly related to public utility O&M (i.e. building maintenance, building remodels, City events, etc.), which reduces time and O&M activities they can spend and complete on utility infrastructure. It is recommended that either additional Full Time Employee (FTE) be budgeted for the PW Operations staff to complete the existing workload requested, or the responsibilities of the PW Operations staff be reduced to focus solely on utility O&M. Additionally, it is advised that staffing needs be re-evaluated every two to three years.

1.3.4 PIPELINE CAPACITY EVALUATION

A wastewater collection system model was developed using InfoSWMM software (Suite 14.7 Update #2) to evaluate existing and 20-year collection system capacity. Wastewater trunklines (10-inch diameter and larger) were included in the model as well as five pump stations. Some 8-inch pipelines were modeled to connect disparate areas that were served by 10-inch pipelines. Continuous flow monitoring was completed at six locations during the wet weather period between December of 2020 and January of 2021. The six flow monitoring locations divided the system into six monitoring basins, shown in Figure 1-2. The collected data was analyzed along with continuous precipitation data to establish typical 24-hour patterns, average base flows at each site, and gauge rainfall influence in the system. Both dry weather (minimal to no rain in days prior) and wet weather periods were used for base flows and calibration efforts.

Gravity pipelines were evaluated according to the City's Public Works Design Standards. Pipe capacity was assessed by evaluating the ratio of the depth of maximum flow to the diameter of the pipe (d/D), with pipes considered undersized if they exceed a ratio of 0.85. This planning criteria was established in meetings with City staff. Pump stations were evaluated based on the capacity to handle peak flows with the largest pump out of service (defined as firm capacity).

The calibrated model was used to assess the effects of a 5-year, 24-hour design storm event on the existing system. The existing system evaluation showed a significant portion of the modeled trunk lines operating at or above capacity. There are pipelines operating at or above capacity in each of the six monitoring basins, and almost all have manholes with the potential to overflow. The deficiencies found in the evaluation are caused by high peak flows and undersized trunklines. Figure 1-3 shows locations of over-capacity pipes in the existing system model, displayed in orange and red, with potential overflow locations marked with a red circle.

FIGURE 1-2: FLOW METER LOCATIONS AND MONITORING BASINS

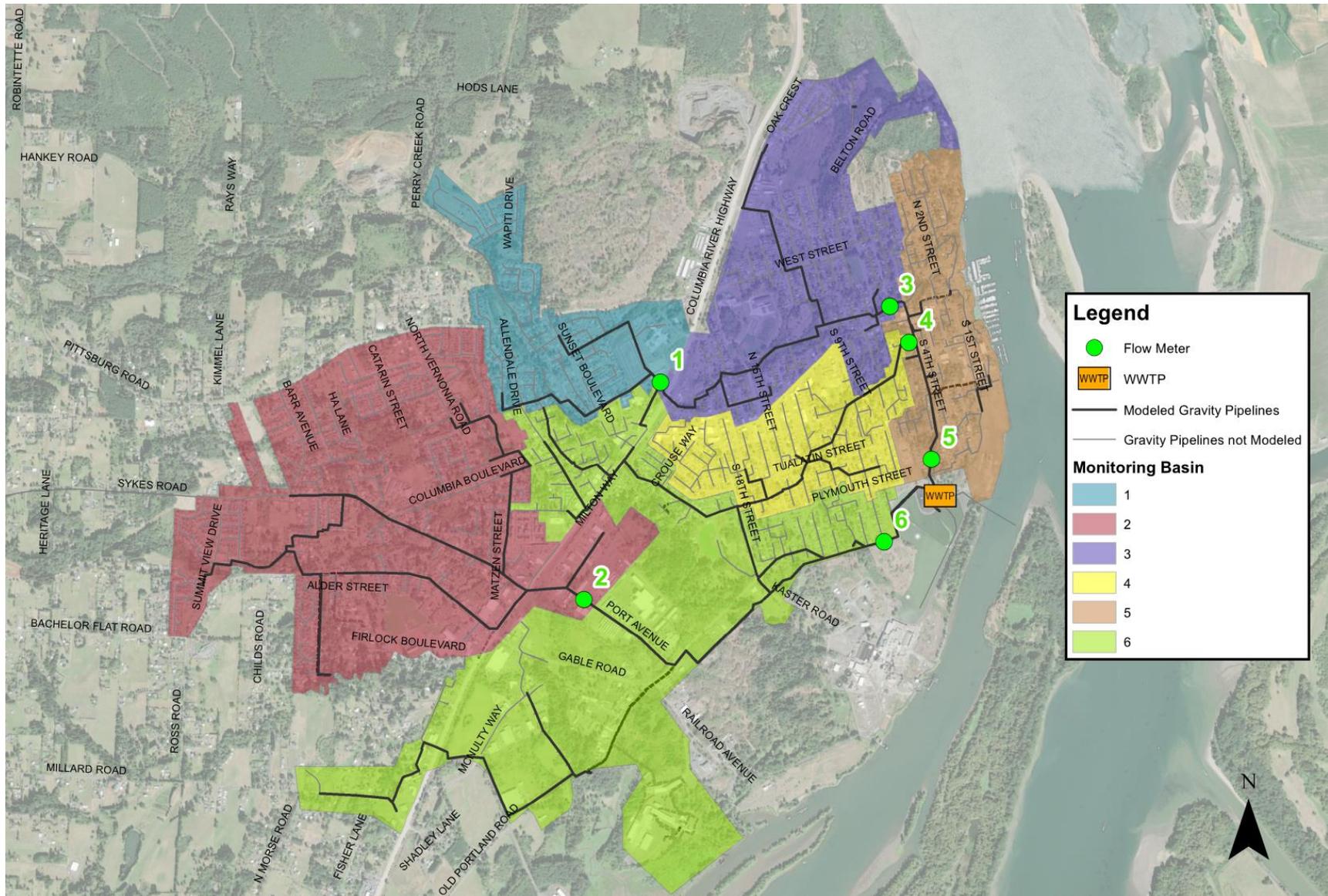
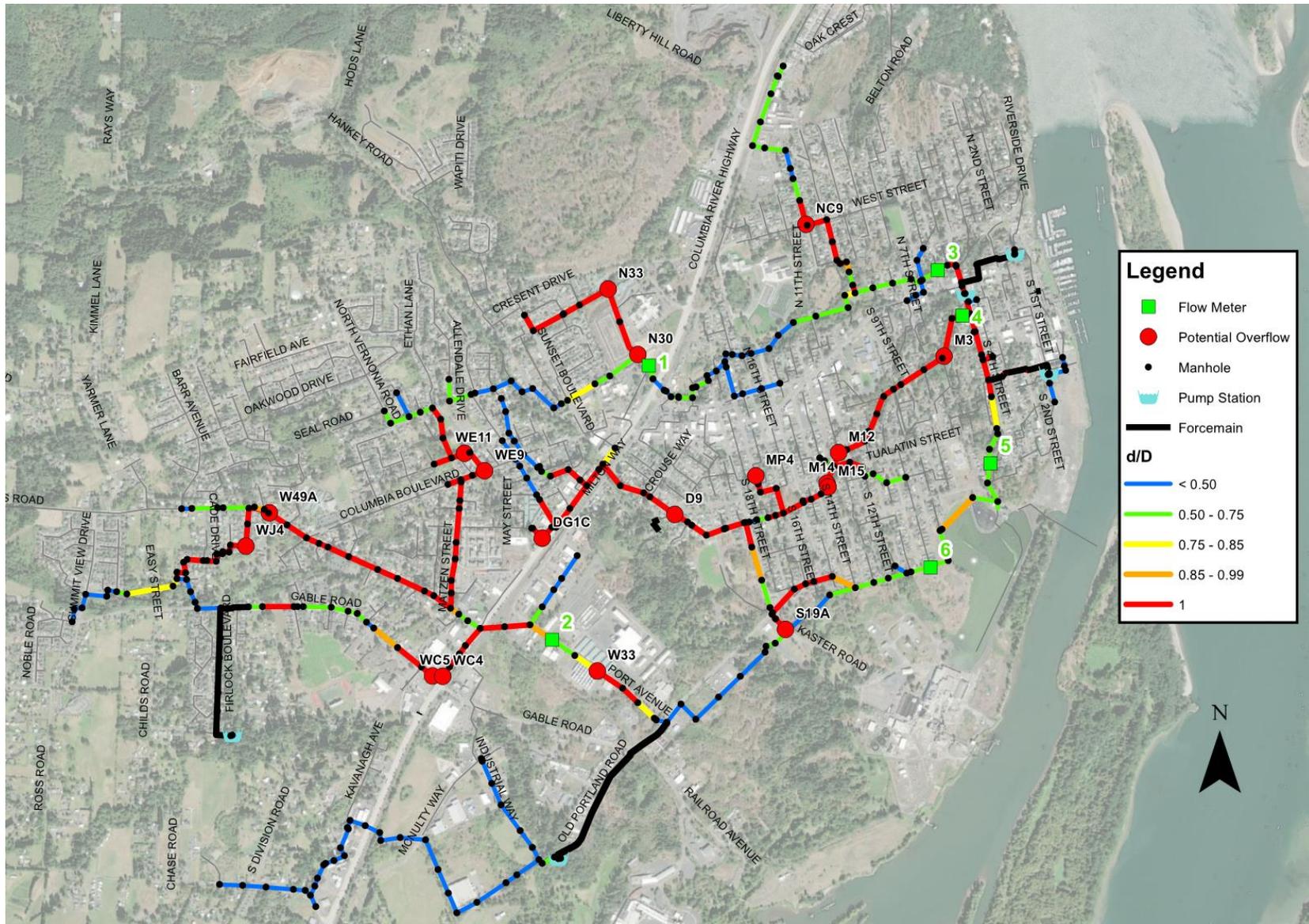


FIGURE 1-3: EXISTING SYSTEM EVALUATION - D/D AND POTENTIAL OVERFLOW LOCATIONS



For the 20-year capacity evaluation, future loads were distributed based on PSU population projections and City anticipated future residential, commercial, and industrial growth areas, shown in Figure 1-4. A majority of the areas anticipated to develop have topography that would allow for gravity flow to the existing collection system, while four growth areas may require additional infrastructure. These four identified areas are the Riverfront District (Growth Area #2), the Business Industrial Park (Growth Area #17), and Growth Areas #1 and #9 located near Pump Station 11 (PS#11).

The City is currently evaluating development options for the Riverfront District, which includes the relocation of Pump Station 1 (PS#1). A 10-inch pipeline at minimum slope would have the capacity to convey the projected 20-year flows through the Riverfront District. The proposed pipeline would be routed underneath the proposed roadways depicted in the current City planning documents.

The City is seeking new opportunities for the Industrial Business Park and completed parcellation framework report for the site. To provide sewer service for the future development, a pump station will be required. The pump station will likely need to be located near the waterfront to follow existing topography. The gravity sewer piping will follow the proposed roadway alignments and drain to the proposed pump station location. The force main can be routed along existing and/or proposed roadways and discharge to the existing trunkline on Kaster Road. The existing gravity trunkline downstream on Old Portland Road has a section of parallel pipes which are capacity limited and should be evaluated as part of the development process and plans.

The City has expressed interest in relocating PS#11 further north, to the intersection of Firlok Park Street and Hazel Street. If relocated, the depth of the wetwell could be sized at predesign to receive flow via a gravity line from the northern portions of Growth Areas #1 and #9, which would involve a bore under McNulty Creek to serve Growth Area #1. The southern portion of both growth areas could be served by 8-inch pipelines conveyed to existing gravity trunklines. Grinder pumps might need to be installed at residences adjacent to McNulty Creek, as the relative elevation of these locations may make serving them via gravity pipeline not feasible.

Overall, problem areas identified in the 20-year evaluation reflect the same areas identified in the existing system analysis, with many of the deficiencies being caused by high peak flows and undersized trunklines exacerbated in the 20-year model. Figure 1-5 shows locations of over-capacity pipes in the 20-year model, displayed in orange and red, with potential overflow locations marked with a red circle.

FIGURE 1-4: ANTICIPATED 20-YEAR GROWTH LOCATIONS

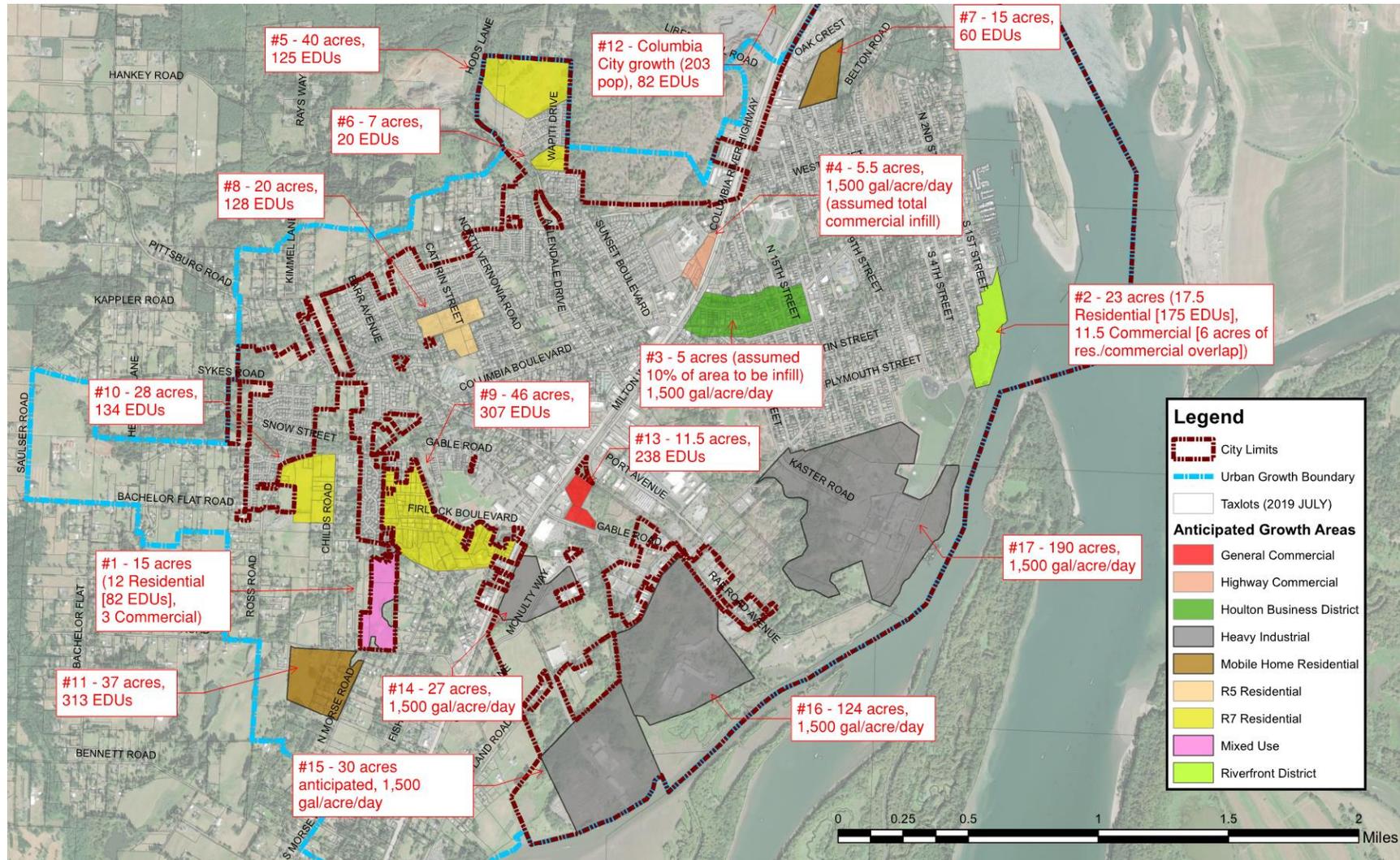
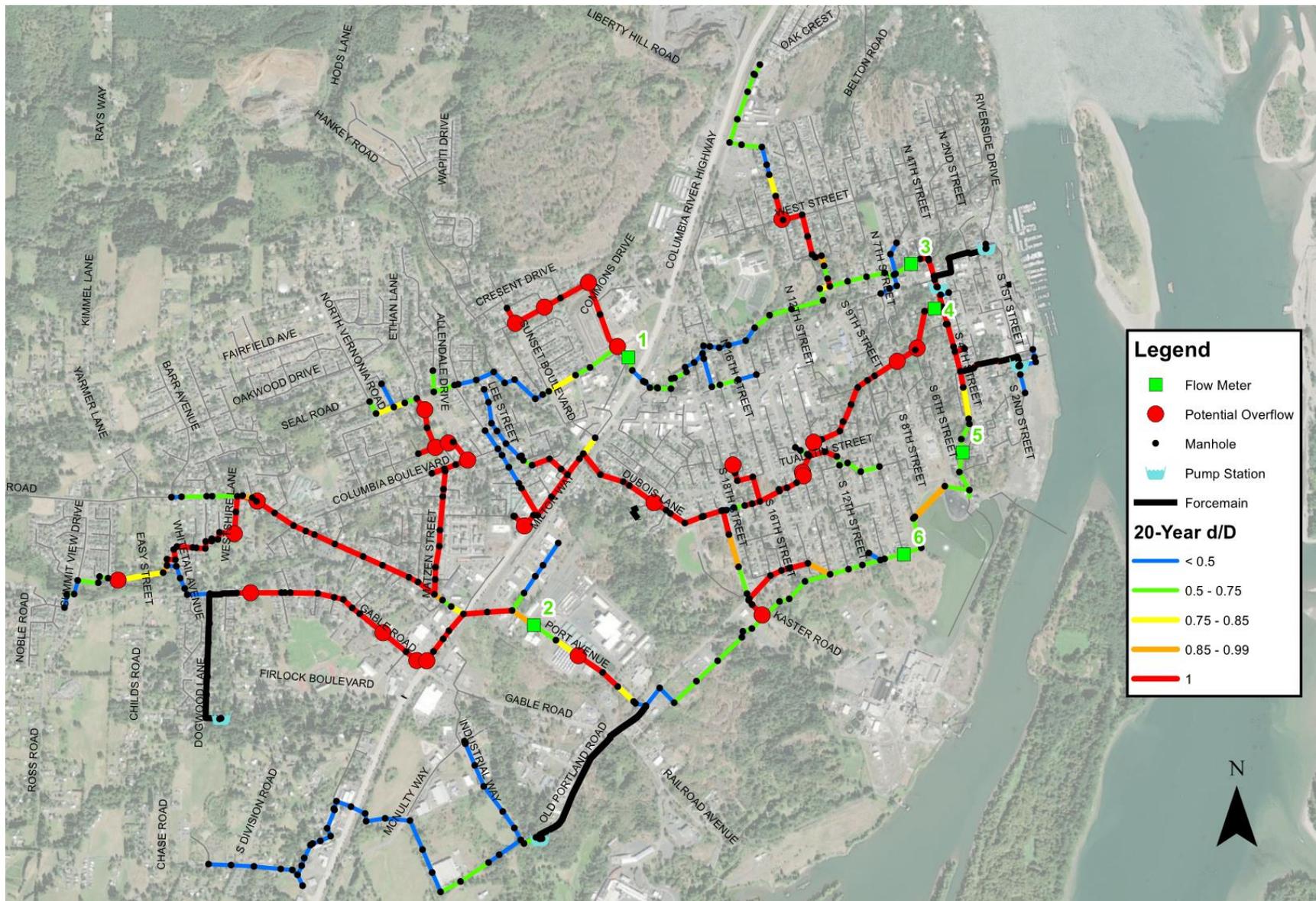


FIGURE 1-5: 20-YEAR SYSTEM EVALUATION - D/D AND POTENTIAL OVERFLOW LOCATIONS



1.3.5 PUMP STATION RESILIENCY

The compilation of this master plan included an assessment of pump station resiliency using a risk of failure evaluation. The risk of failure of an asset is a combination of the likelihood of failure and consequence of failure. Likelihood of failure is a measure of how likely an asset is to fail. An evaluation of the risks of failure can provide an importance, urgency, or priority to assets and provide guidance on the order in which asset deficiencies should be addressed. Assets with the highest risk of failure (product of likelihood of failure and consequence of failure) should be repaired or replaced first as they pose the largest threat to a system and community.

The analysis shows that PS#1 and PS#2 have the highest risks of failure. A failure at one of these pump stations would have the largest impact on the community and is most likely to happen based on the factors evaluated, indicating that deficiencies at these pump stations should be addressed soon after identified.

1.4 COLLECTION SYSTEM ALTERNATIVES

Alternatives to address collection system deficiencies discussed are summarized in the sections below. A few of the deficiencies identified do not have multiple, feasible, or cost-effective alternatives for improvements. Recommended improvements for these deficiencies are also included below.

1.4.1 SUMP PUMPS

Six alternatives were identified to address the presence of private sump pumps discharging into the collection system. The alternatives included: targeted distribution of educational material, smoke testing, dye testing and CCTV, visual inspection, point-of-sale inspection, and a reward-based disconnection incentive program. These alternatives were not considered mutually exclusive and could be performed in conjunction if the City chose to perform multiple projects at a time.

1.4.2 CONVEYANCE SYSTEM

Alternatives for conveyance were established for each flow metering basin. While some of the conveyance system deficiencies do not have multiple feasible alternatives, construction of new trunklines to redirect flow away from undersized pipelines or suspected points of overflow was considered by the City. The redirection of the conveyance system was considered a feasible alternative for Basins 2, 4, and 6. Upsizing the existing undersized trunklines to handle 20-year peak flows was considered a feasible alternative for each basin.

Additionally, the installation of parallel facilities or taking no action was presented to the City. The City could choose to construct parallel facilities in areas with limited remaining capacity, however this alternative was ultimately dismissed. Taking no action is not a viable option because surcharging and the potential for overflows would only worsen, which could result in negative impacts to human health and the environment, in addition to the increased risk of fines from the DEQ.

1.5 RECOMMENDED COLLECTION SYSTEM IMPROVEMENTS

To address the identified system deficiencies, the following improvements are recommended. Cost estimates for each of the recommended improvements are included in the section and incorporated in the Capital Improvement Plan (CIP).

1.5.11 WWTP INFLUENT FLOW METER

Priority 1 WWTP influent flow meter improvements address the suspected inaccurate influent peak flow measurement at the WWTP and would provide accurate measurement of influent peak flows during wet weather events. The total estimated cost for this improvement is \$68,000.

1.5.2 PUMP STATIONS

Priority 1 pump station improvements address the continuation of upgrades the City of St. Helens is currently performing as well as the operations improvements, which include the installation of overflow alarms and adding a SCADA alarm to sound when both pumps in a pump station turn on. It is recommended that pump station runtimes continue to be recorded and reviewed by staff in conjunction with the recommended alarm data if both pumps are running to track as pump stations may be nearing firm capacity. Additionally, it is recommended that Pump Station 3 be equipped with an on-site generator to address its backup power deficiency and simplify portable generator operations during outages. The total estimated cost for these improvements is \$100,000.

Priority 2 pump station improvements assume that the Riverfront District and Growth Areas #1 and #9 require the relocation of Pump Stations 1 and 11. Additionally, Priority 2 improvements address the general deficiencies, such as under-capacity pumps, fall protection provisions, level sensor redundancy, as well as flow and pressure monitoring. The total estimated costs for these improvements is \$5,000,000.

1.5.3 INFLOW AND INFILTRATION (I/I)

The City is advised to create an annual budget to fund an ongoing I/I reduction program, which would promote annual I/I improvement projects throughout the City. This type of work is anticipated to be a combination of sump pump identification and removal, lateral replacement, and mainline and manhole inspections and rehabilitation/replacement. System I/I reductions could reduce, delay, or eliminate the need for capacity-related pipeline upsizing projects and provide cost savings to the City over the planning period. Rather than have a separate replacement budget and I/I improvement budget, it is recommended the City adopt a combined fund of \$500,000 annually for the 20-year planning period. This dollar amount is reflective of the estimated annual pipeline replacement cost, presented in Table 1-4.

1.5.4 SUMP PUMPS

It is recommended the City pursue a combination of educational material distribution, point-of-sale inspection, and a reward-based incentive program. A portion of the recommended I/I annual budget should be reserved for the printing and distribution of educational materials and to support a sump pump disconnection incentive program. Additionally, the City ought to update its code to include language requiring the seller to evaluate and disconnect any sump pumps from the sanitary sewer during inspection and before the property transfers ownership.

1.5.5 CONVEYANCE SYSTEM

Priority 1 improvements address potential overflows near the downtown and “tunnel” pipelines for the City (Basin 5), as well as deficiencies in Basin 4. Improvements include rerouting Basin 4’s trunkline along Tualatin St. to Basin 6, and upsizing gravity mains on S 4th Street, S 16th Street and S 17th Street. The annual I/I reduction projects could have significant impacts to the peak flows in Basin 5. It is recommended that flow monitoring be included in the concept design phase of this project to further define existing flows and compare the peak flows in Basin 5 following the I/I reduction work and Basin 4 improvements. The total estimated cost for these improvements is \$8,100,000.

Priority 3 improvement projects will alleviate remaining existing and future capacity limitations in the collection system, but an intentional, ongoing I/I reduction program could reduce, delay, or eliminate the need for some of these improvements. These improvements include upsizing of existing undersized pipelines in Basins 1, 2, 3, and 6, and also involve construction of a new pipeline to reroute flow from Gable Road to Sykes Road, and reroute flow near Old Portland Road and Kaster Road in Basin 6. The total estimated cost for these improvements is \$17,800,000.

1.5.6 FUTURE INFRASTRUCTURE

There are four anticipated growth areas in the 20-year planning period that may require additional infrastructure to connect with the existing system, which include the Riverfront District (Growth Area #2), the Business Industrial Park (Growth Area #17), and Growth Areas #1 and #9 located near PS#11. Priority 2 improvements address the required infrastructure needed to serve the Riverfront District, Business Industrial Park, and Growth Areas #1 and #9. The costs for the proposed infrastructure at the Riverfront District are tied into the cost of the PS#1 relocation. The estimated cost of the proposed Riverfront District and Business Industrial Park infrastructure is \$13,500,000. The proposed infrastructure for Growth Areas #1 and #9 is tied into the cost to relocate PS#11 and is estimated at \$1,900,000.

1.5.7 OPERATIONS AND MAINTENANCE

In addition to regular maintenance, it is recommended that an annual pipeline replacement program be established. Typically, a budget for replacing the system components is based on average useful life. Average useful life of manholes and cleanouts are shown in Table 1-4.

It is recommended that the \$500,000 amount presented in the I/I section above serve as a combined I/I reduction program budget and annual replacement budget. It should be noted that this is an interim amount presented for City budgeting purposes, with the purpose of increasing over time to the recommended \$790,000 annual replacement budget for the system. Even after I/I improvements have significantly reduced peak flows in the system, the City should continue to maintain an annual replacement budget to fund ongoing O&M and meet the City’s LOS goals.

Pipelines should be cleaned approximately every three to five years (frequency can be adjusted based on pipe material plus scour conditions and observations by City staff). Manhole rehabilitation and service line repairs should be coordinated with pipeline rehabilitation work. Emphasis should be placed on areas where pipe conditions pose the largest threat of sanitary sewer surcharging or more immediate threat of collapse.

TABLE 1-4: ANNUAL REPLACEMENT BUDGET

Item	Lifespan	Cost/Year
Pipelines	75 Years	\$ 570,000
Manholes	50 Years	\$ 210,000
Cleanouts	50 Years	\$ 5,000
Total (rounded)		\$ 790,000

1.5.8 PLANNING RECOMMENDATIONS

The City is recommended to update their planning documents every 5 years. Updates to the planning documents and models allow the City to re-assess needs and properly allocate budgets to address system deficiencies. The next update should include an evaluation of both the wastewater collection system and WWTP. A Master Plan Update for both the wastewater collection system and the treatment plant was included as a Priority 2 improvement, with an estimated cost of \$300,000.

1.5.9 ENGINEERING DESIGN STANDARDS, CODE, AND COMPREHENSIVE PLAN REVIEW

The City's existing development code (Title 17), engineering design standards (Title 18), and comprehensive plan (Title 19) were reviewed for new development, as they pertain to wastewater conveyance, to identify potential deficiencies and provide recommendations for updates. The primary recommendations for review, updates, and additions include the following:

- Scheduling requirements
- Matching references to the Oregon Department of Transportation (ODOT)/ American Public Works Association (APWA) Oregon Standard Specifications for Construction (OSSC).
- Pipeline sizing, slope, cover, and utility spacing requirements
- Manhole design requirements
- Stream and creek crossing requirements

The City is advised to review and assess these recommended changes to these sections to City code, standards, and comprehensive plans to match current best practices in the industry. The City should then initiate the process of proposing changes to associated City documents to maintain consistency.

1.6 CAPITAL IMPROVEMENT PLAN

This section outlines the recommended plan to address the wastewater collection system deficiencies identified in previous sections. The alternative evaluation and recommended projects, with input from City staff, are the basis for the CIP for the wastewater collection system presented in this section.

1.6.1 SUMMARY OF COSTS

The cost summary of the 20-year CIP is listed in Table 1-5. Capital costs developed for the recommended improvements are Class 4 estimates as defined by the Association for the Advancement of Cost Engineering (AACE). Actual construction costs may differ from the estimates presented depending on specific design requirements and the economic climate when a project is at bid. An AACE Class 4 estimate is normally expected to be within -50 and +100 percent of the actual construction cost, which is typical for planning documents. As a result, the final project costs will vary from the estimated costs presented in this document. The costs are based on experience with similar recent collection system and WWTP upgrade projects. Equipment pricing from manufactures of the large equipment items was also used to develop the estimates. The total estimated probable project costs include contractor markups and 30% contingencies, which is typical of a planning-level estimate. Overall project costs include total construction costs, costs for engineering design, construction management services, inspection, as well as administrative costs. For the collection system projects, the contractor's overhead and profit are worked into the line items. Priorities are set for today and will be re-evaluated when there is a need for re-assessment. The CIP is based on modeling data that was available during the completion of this facilities plan. When projects are carried forward, the model, data, assumptions, etc., should be re-evaluated to make any necessary adjustments to the basis of the project. An estimated schedule for the next six years is shown in Table 1-6.

TABLE 1-5: 20-YEAR CAPITAL IMPROVEMENT PLAN (CIP)

Project No.	Project Name	Primary Purpose	Total Estimated Cost (2021)	SDC Growth Apportionment		City's Estimated Portion
				%	Cost	
Priority 1 Improvements						
1.1	WWTP Influent Flow Meter	Operations	\$ 68,000	11%	\$ 8,000	\$ 60,000
1.2	Basin 4 Pipeline Upsize and Reroute	Capacity	\$ 3,600,000	0%	\$ -	\$ 3,600,000
1.3	Basin 5 Pipeline Upsize	Capacity	\$ 4,500,000	3%	\$ 150,000	\$ 4,350,000
1.4	Install Overflow Alarms	Operations	\$ 9,000	24%	\$ 2,000	\$ 7,000
1.5	Pump Station 3 On-site Generator	Operations	\$ 90,000	0%	\$ -	\$ 90,000
1.6	Annual I/I Reduction Program (6-Year)	Capacity	\$ 3,000,000	24%	\$ 730,000	\$ 2,270,000
Total Priority 1 Improvement Cost (rounded)			\$ 11,300,000			\$ 10,400,000
Priority 2 Improvements						
2.1	Riverfront District Trunkline and Pump Station 1 Relocation	Capacity, Operations	\$ 2,400,000	22%	\$ 530,000	\$ 1,870,000
2.2	Relocate Pump Station 11	Capacity, Operations	\$ 1,900,000	49%	\$ 920,000	\$ 980,000
2.3	Industrial Business Park Trunklines and Pump Station	Capacity, Operations	\$ 11,100,000	100%	\$ 11,100,000	\$ -
2.4	Pump Station Upgrades	Operations, Safety	\$ 700,000	24%	\$ 170,000	\$ 530,000
2.5	Master Plan Update	Operations	\$ 300,000	100%	\$ 300,000	\$ -
2.6	Annual I/I Reduction Program (8-Year)	Capacity	\$ 4,000,000	24%	\$ 980,000	\$ 3,020,000
Total Priority 2 Improvement Cost (rounded)			\$ 20,400,000			\$ 6,400,000
Priority 3 Improvements						
3.1	Basin 6 Pipeline Upsize and Reroute	Capacity	\$ 6,200,000	8%	\$ 480,000	\$ 5,720,000
3.2	Basin 2 Pipeline Upsize and Reroute	Capacity	\$ 8,600,000	14%	\$ 1,190,000	\$ 7,410,000
3.3	Basin 1 Pipeline Upsize	Capacity	\$ 1,800,000	9%	\$ 170,000	\$ 1,630,000
3.4	Basin 3 Pipeline Upsize	Capacity	\$ 1,200,000	3%	\$ 40,000	\$ 1,160,000
3.5	Annual I/I Reduction Program (6-year)	Capacity	\$ 3,000,000	24%	\$ 730,000	\$ 2,270,000
Total Priority 3 Improvement Cost (rounded)			\$ 20,900,000			\$ 18,200,000
Total Collection System Improvement Costs (rounded)			\$ 52,600,000			\$ 35,000,000

Note:

The cost estimate herein is concept level information only based on our perception of current conditions at the project location and its accuracy is subject to significant variation depending upon project definition and other factors. This estimate reflects our opinion of probable costs at this time and is subject to change as the project design matures. This cost opinion is in 2021 dollars and does not include escalation to time of actual construction. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the cost presented herein.

TABLE 1-6: PRIORITY 1 CIP SCHEDULE

Project No.	Item	Cost (2021)	Opinion of Probable Costs					
			2022	2023	2024	2025	2026	2027
Priority 1 Improvements								
1.1	WWTP Influent Flow Meter	\$ 68,000	\$ 68,000					
1.2	Basin 4 Pipeline Upsize and Reroute	\$ 3,600,000		\$ 400,000	\$ 3,200,000			
1.3	Basin 5 Pipeline Upsize	\$ 4,500,000				\$ 500,000	\$ 4,000,000	
1.4	Install Overflow Alarms	\$ 9,000	\$ 9,000					
1.5	Pump Station 3 On-site Generator	\$ 90,000	\$ 90,000					
1.6	Annual I/I Reduction Program (6-Year)	\$ 3,000,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000
Total (Rounded)		\$ 11,300,000	\$ 700,000	\$ 900,000	\$ 3,700,000	\$ 1,000,000	\$ 4,500,000	\$ 500,000

Note:

The cost estimate herein is concept level information only based on our perception of current conditions at the project location and its accuracy is subject to significant variation depending upon project definition and other factors. This estimate reflects our opinion of probable costs at this time and is subject to change as the project design matures. This cost opinion is in 2021 dollars and does not include any escalation. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids, or actual construction costs will not vary from the cost presented herein.

1.6.2 OTHER ANNUAL COSTS

In addition to the capital improvement costs presented in Table 1-5 and Table 1-6, the following expected annual operating costs are recommended for consideration in setting annual budgets for the collection system:

Additional collection system replacement/rehabilitation needs: Based on linear feet of pipeline, and number of manholes and cleanouts, the City should ideally budget a total of \$790,000/year for pipeline replacement/rehabilitation. Currently, it is recommended the City should establish a \$500,000 annual fund for system replacement/rehabilitation. I/I replacement and rehabilitation projects performed as part of the Annual I/I Reduction Program may offset a portion or majority of these recommended costs, as pipeline rehabilitation addresses defects and extends pipeline lifespan.

The City should target the infiltration and inflow (I/I) projects as a part of the annual pipeline replacement/rehabilitation budget. Prioritizing these projects should help to reduce I/I flows into the system and potentially delay capital improvements triggered by increased system flows.

It is recommended that the City maintenance staff develop a program to clean the entire collection system every three years, and CCTV the entire collection system every six years.

Annual O&M costs for the collection system may increase slightly if Priority 3 improvements are made, as they increase the total linear feet of pipeline in the system.

It is estimated that approximately 3.5-4.0 FTE are needed to meet the recommended level of O&M for the City's LOS goals. As budgeted, the existing wastewater collections FTE staff appears to be adequate. However, the additional projects and work the PW Operations staff are currently requested to complete significantly decreases the budgeted FTE hours that can be spent on wastewater collections O&M. It is recommended that either additional FTE be budgeted for the PW Operations staff to complete the existing workload requested, or the responsibilities of the PW Operations staff be reduced to focus solely on utility O&M. In addition, it is recommended that staffing needs be reevaluated every two to three years.

1.6.3 OTHER FINANCIAL CONSIDERATIONS

The City previously had several wastewater debts that were refinanced into a single debt service in 2020. The yearly transfer for this payment is \$600,000 and is set to mature in 2034. The City is currently exploring options for paying off the sewer debt sooner, potentially between 2026 and 2031.

The City should complete a full-rate study for the wastewater utility in order to evaluate potential user rate and system development charge (SDC) impacts of the recommended CIP. Estimated SDC eligibility for each identified capital improvement is included in Table 1-5 for use in completing a full rate study. It is recommended the City actively pursue opportunities for grant funds, low-interest loans, or principal forgiveness funding sources to mitigate user rate impacts. As the City prepares to proceed on CIP projects, if outside funding is desired, it is recommended the City setup a one-stop meeting with Business Oregon to identify and assess potential funding sources for the sewer projects.