EXISTING COLLECTION SYSTEM AND CONDITION ASSESSMENT

4.1 INTRODUCTION

This chapter provides an overview of the City of Grants Pass (City's) existing wastewater collection system. The City operates and maintains approximately 181 miles of wastewater collection pipes and five pump stations, as shown in Figure 4.1.

This chapter provides a description of the City's existing collection system and a condition assessment of the facilities. The preliminary condition assessment of the City's existing sewer pipes, and pump stations was a cursory evaluation to provide an overall understanding of the City's collection system infrastructure. This included a review of age, remaining useful life, and recent maintenance and structural records. The assessment is useful for identifying improvement projects to extend the useful life of City infrastructure, and prevent failure in the system.

4.2 COLLECTION SYSTEM FACILITIES

The City's collection system consists of approximately 175 miles of gravity mains, 6 miles of force mains, and 5 pump stations that collect and convey wastewater to the Water Restoration Plant (WRP) located at 1200 SW Greenwood Ave. Figure 4.1 presents the City's existing collection system.

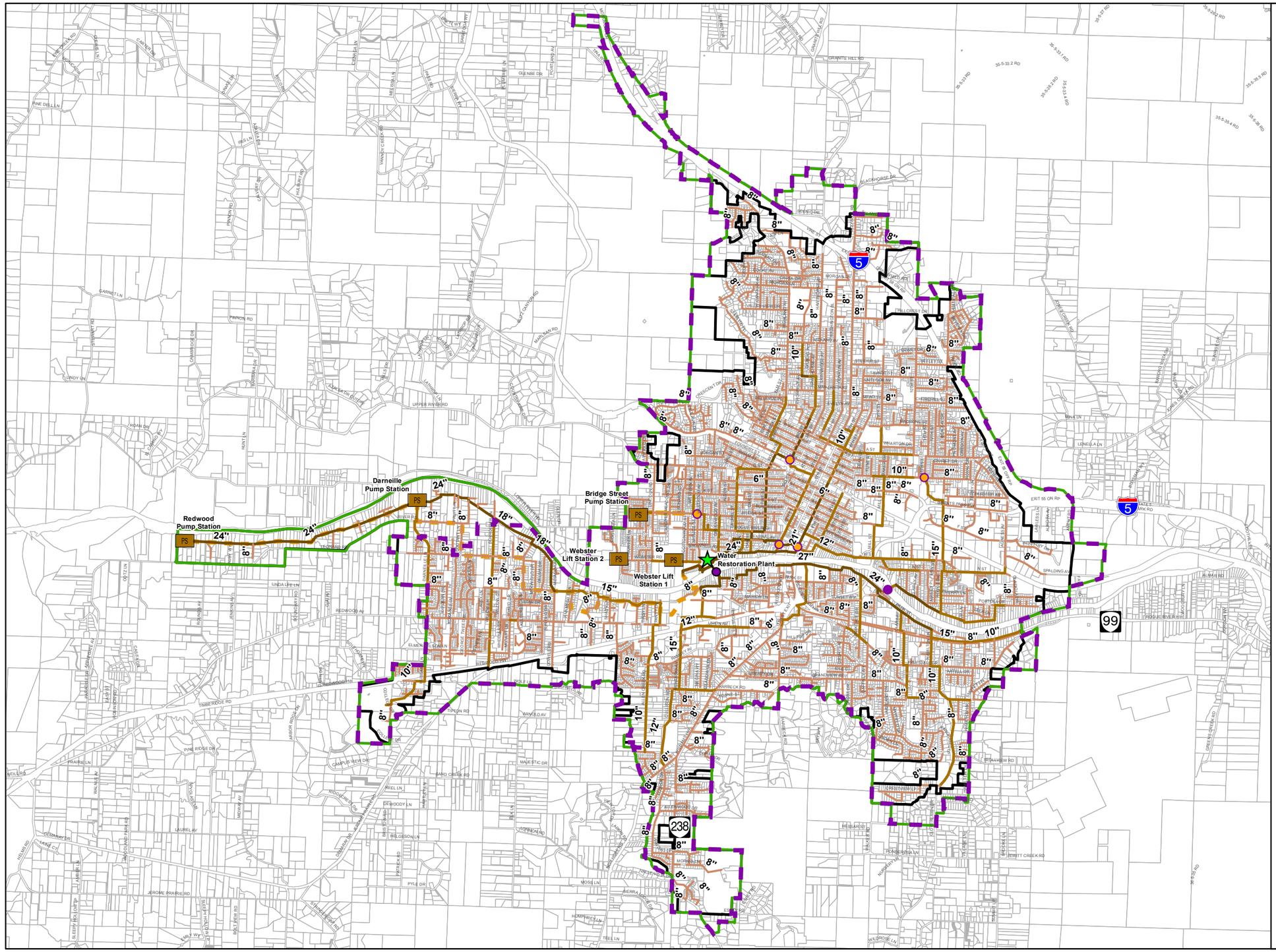
4.2.1 Wastewater Basins

The City's collection system is divided into 23 wastewater basins that are denoted alphabetically. Wastewater basin boundaries almost always follow topographic features such as ridge lines, streams, and rivers. The City established the basin boundaries to aid operation and maintenance efforts that follow topographic features.

Figure 4.2 shows the new areas from the UGB expansion discharge flow into the existing basins. These new areas are denoted with a double alphabet such as "AA" representing that new area "AA" will be incorporated into existing wastewater basin A.

4.2.2 Gravity Collection System

The City's existing sanitary sewer collection system is comprised of approximately 175 miles of gravity mains up to 48 inches in diameter. Table 4.1 provides an inventory of the gravity mains within the City's collection system. The collection system ranges in size from 4-inches to 48-inches in diameter with about 80 percent (%) of the system 8 inches or less in diameter, where 75.2% are 8-inch sewers.



Legend

- WRP
- Lift/Pump Station
- Diversions
- Siphon

Sewer Pipelines

- 8" and Smaller
- 10" - 16"
- 18" and Larger
- Force Mains
- Study Area
- Existing Sewer Service Area
- UGB
- Tax Lots

N

0 5,000 10,000 Feet

Figure 4.1
Existing Collection System
Wastewater Collection System Master Plan
City of Grants Pass

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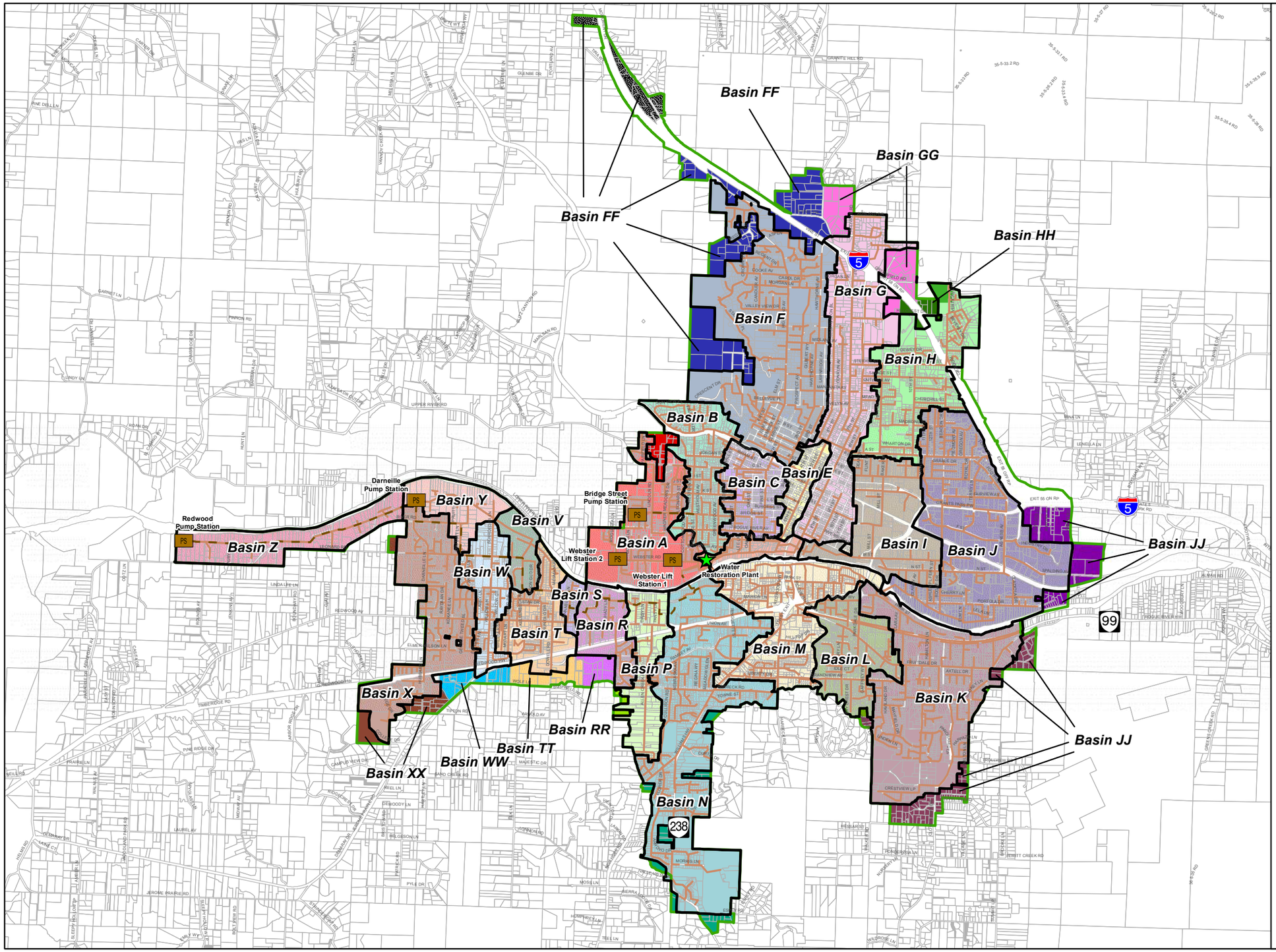

Legend

- WRP
- Lift/Pump Station
- Tax Lots
- Study Area
- Collection System Sewer Basins

Existing Wastewater Basins

- Basin A
- Basin B
- Basin C
- Basin D
- Basin E
- Basin F
- Basin G
- Basin H
- Basin I
- Basin J
- Basin K
- Basin L
- Basin M
- Basin N
- Basin P
- Basin R
- Basin S
- Basin T
- Basin V
- Basin W
- Basin X
- Basin Y
- Basin Z

Future Wastewater Basins

- AA
- FF
- GG
- HH
- JJ
- KK
- LL
- NN
- PP
- RR
- TT
- WW
- XX

N

0 5,000 10,000 Feet

Figure 4.2
Wastewater Basins
Wastewater Collection System Master Plan
City of Grants Pass

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Table 4.1 Collection System Gravity Main Inventory Wastewater Collection System Master Plan City of Grants Pass		
Diameter (inches)	**Length (feet)**	**Percent of Total Gravity Mains**
6" and Smaller	43,733	4.7%
8"	693,138	75.2%
10"	56,701	6.2%
12"	54,131	5.9%
14"	66	0.0%
15"	19,869	2.2%
18"	19,932	2.2%
21"	4,773	0.5%
24"	15,829	1.7%
27"	5,668	0.6%
30"	6,856	0.7%
36"	530	0.1%
42"	240	0.0%
48"	22	0.0%
Total (feet)	921,489	100.0%
Total (miles)	174.6	100.0%

4.2.3 Diversion Structures

The City also has diversion structures located throughout the collection system. These diversions are illustrated in Figure 4.1 as orange dots and detailed in Table 4.2. Diversions shunt flow from over-capacity pipelines to adjacent pipelines and effectively reduce peak flows in the over-capacity pipelines during rain events. Diversions can be an operationally effective and economic means of alleviating hydraulic constraints and preventing sanitary sewer overflows (SSOs). Despite the diversions, SSOs still occur within the collection system. SSOs that occurred since the last Master Plan in 2004 are listed in Table 4.3.

Table 4.2 Diversion Structures Locations Wastewater Collection System Master Plan City of Grants Pass	
Structure ID	**Location**
J41	At NE 11th Street and NE D Street
D57	At SE 7th Street and Voorhies Way
D33	On SW 5th Street 150 feet south of SW Central Avenue
B30	At SW Spruce Street and SW Bridge Street
Y35	At the Darneille Pump Station
F511	At NW 2nd Street and NW F Street

F511 is a special diversion that has a closed valve which if open would divert flow from Basin F to Basin E.

Table 4.3 Collection System Sanitary Sewer Overflows (2004 to Present) Wastewater Collection System Master Plan City of Grants Pass		
Date	**Location**	**Cause**
Jan 1, 2010	333 NE Fetzner Street	Mainline blockage resulted in spill to Skunk Creek
Feb 21, 2010	170 SE Smokey Lane	Mainline blockage
Dec 30, 2005	959 SE N Street	Storm event
Dec 30, 2005	NE A Street at NE 9th Street	Storm event resulted in spill to Skunk Creek
Dec 30, 2005	NE A Street at NE Flint Street	Storm event resulted in spill to Skunk Creek
Dec 30, 2005	730 NW 2nd Street (3 times during the same day)	Storm event resulted in spill to Gilbert Creek
Dec 30, 2005	506 SW Alder Street	Storm event resulted in spill to Gilbert Creek
Dec 31, 2005	730 NW 2nd Street	Storm event resulted in spill to Gilbert Creek
Dec 31, 2005	NE A Street at NE 9th Street	Storm event resulted in spill to Skunk Creek
Dec 31, 2005	NE A Street at NE Flint Street	Storm event resulted in spill to Skunk Creek
Dec 31, 2005	959 SE N Street	Storm event

4.2.4 Siphons

The City also has siphoned pipes located throughout the collection system. They are mainly necessary to cross the Rogue River. These structures are illustrated in Figure 4.1 as purple dots. One siphon is located east of Highway 199 between E Park Street and Le Karen Drive. The second river crossing is located south of the WRP.

4.2.5 Recent Pipe Projects Completed

The City recently completed several replacement projects that were identified in the previous Master Plan completed in 2004. As part of the Plan, six structural repair areas were identified and prioritized.

Since 2004, the City started replacing pipes in two of the highest priority structural repair areas. Figure 4.3 illustrates the pipes the City replaced since 2004.

- Pipes identified along Pine Street and connecting to Pine Street were replaced. The sewer along Pine Street between A Street and Central Avenue was upsized to help with capacity issues. Most of the rest of the sewers identified in this area were also replaced. Approximately 10,860 feet of pipes were replaced in this area, or about 73% of the recommended improvements were completed.
- The City started replacing the priority sewers in the vicinity of 5th Street. Approximately 5,280 feet of pipes were replaced as part of this priority area (35% of the proposed improvements completed).

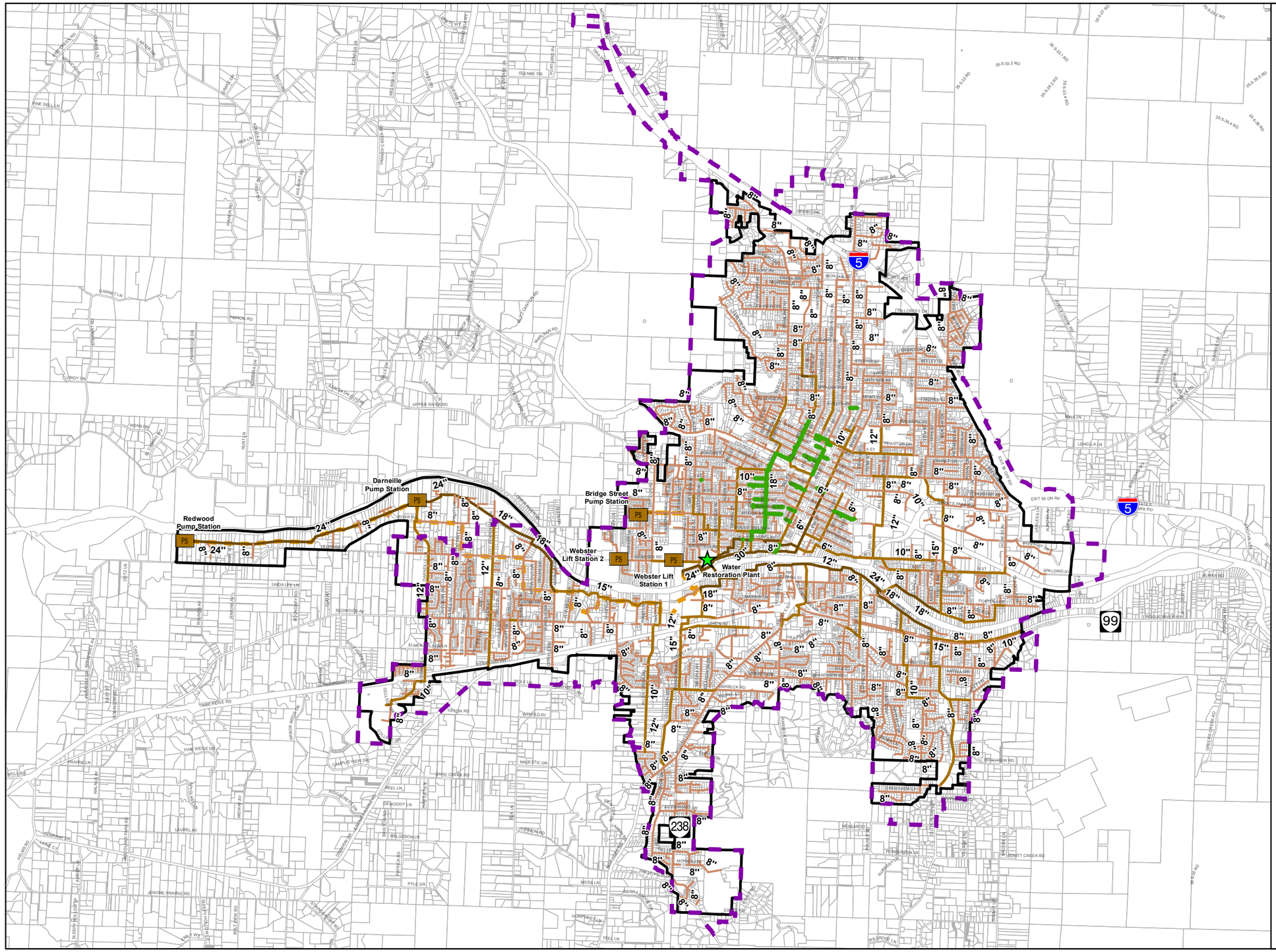
The City plans to continue replacing the pipes identified with structural and maintenance issues. This chapter presented updated priority areas identified with the latest information provided by the City, which is presented in Section 4.3.

4.2.6 Pump Stations

The topography of the City's service area is such that most of the system is operated under gravity flow conditions, at the exception of some areas that require pumping to higher elevations. The City operates and maintains five pump stations as illustrated in Figure 4.1. Figure 4.4 presents the pump station tributary areas and Table 4.4 summarizes the location and key features of each station.

The five pump stations in the system include the following:

- Webster Lift Station No. 1.
- Webster Lift Station No. 2.
- Bridge Street Pump Station.
- Redwood Pump Station.
- Darneille Pump Station.



Legend

- WRP
- Lift/Pump Station

Pipelines

- 8" and Smaller
- 10" - 16"
- 18" and Larger
- Force Mains
- Recently Completed Pipeline Projects
- Existing Sewer Service Area
- UGB
- Tax Lots

N

0 5,000 10,000 Feet

Figure 4.3
Sewer Pipelines Replaced Since 2004
Wastewater Collection System Master Plan
City of Grants Pass

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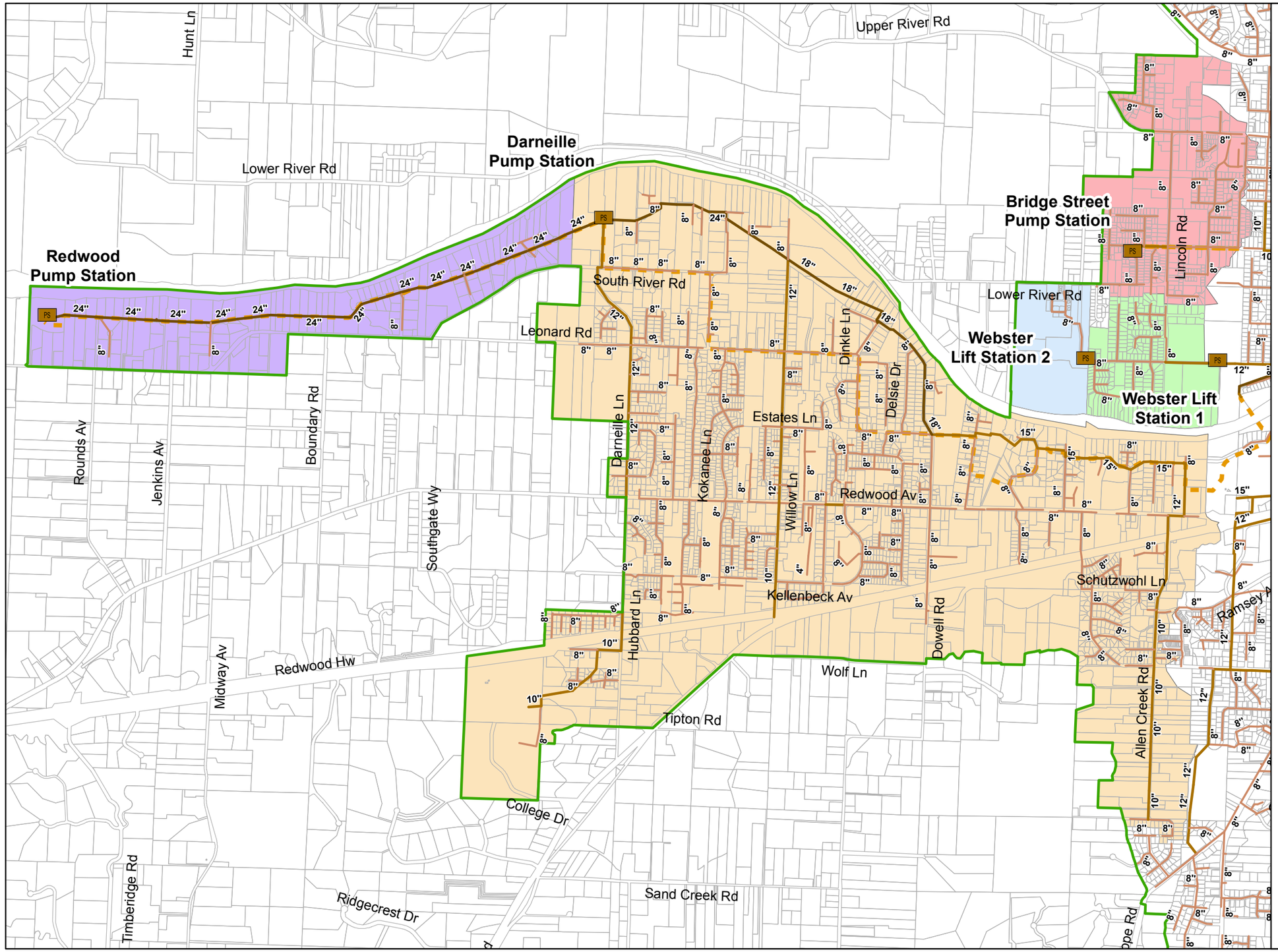


Figure 4.4
Pump Station Tributary Areas
Wastewater Collection System Master Plan
City of Grants Pass

Table 4.4 Existing Pump Stations
Wastewater Collection System Master Plan
City of Grants Pass

Pump Station	Sewer Basin	Address	Number of Pumps	Horsepower (hp)	Head (feet)	Pump Type	Pump Station Capacity		Year Constructed/ Rehabilitated
							Total (gpm)	Firm (gpm)	
Webster Lift Station No. 1	Basin A	1690 SW Webster Road	2 (1 duty, 1 standby)	7.5	10	Self-priming, vertical close-coupled, non-clog centrifugal; constant speed	200	100	1967
Webster Lift Station No. 2	Basin A	2240 SW Webster Road	2 (1 duty, 1 standby)	3	10	Self-priming, vertical close-coupled, non-clog centrifugal; constant speed	200	100	1967
Bridge Street Pump Station	Basin A	2171 SW Bridge Street	2 (1 duty, 1 standby)	20	75	Submersible, non-clog centrifugal; variable speed	1,300	650	1994/ 2010
Redwood Pump Station	Basin Z	4690 Leonard Road	2 (1 duty, 1 standby)	40	163	Submersible, non-clog centrifugal; variable speed	670	335	2000
Darneille Pump Station	Basin Y	3100 South River Road	3 (2 duty, 1 standby)	110	180	Submersible, non-clog centrifugal; variable speed	4,380	2,920	2000

4.2.6.1 Webster Lift Station No. 1

Webster Lift Station No. 1 was constructed in 1967 to serve a low lying area west of the Water Restoration Plant (WRP) in wastewater basin A. Webster Lift Station No. 1 receives flow from a 12-inch gravity sewer, lifts it approximately 6.3 feet (El. 891.52 to 897.79), and discharges back into the 12-inch gravity sewer. The pump station is located in the Webster Road Right-of-Way at the Reinhart Sports Park and predominantly serves mobile home parks and the sports park.

Webster Lift Station No. 1 includes a flow diversion manhole, wet well (manhole), buried pump dry pit, short force main, discharge manhole, power and SCADA systems, and ancillary appurtenances. The pump pit is equipped with two 7.5 horsepower (HP) vertical, non-clog centrifugal pumps with one providing duty service and the other in standby. The capacity of each pump is approximately 100 gallons per minute (gpm), with a total firm capacity of 100 gpm. The lift station is designed not to overflow.

4.2.6.2 Webster Lift Station No. 2

Similar to Webster Lift Station No. 1, Webster Lift Station No. 2 was constructed in 1967 to serve a low lying area west of the Water Restoration Plant (WRP). Webster Lift Station No. 2 receives flow from an 8-inch gravity sewer, lifts it approximately 4.4 feet (El. 895.18 to 899.53), and discharges back into an 8-inch gravity sewer. The 6-inch force main has a total length of 15 feet. The lift station is located at the east end of Rogue Lea Estates and the west end of Webster Road. Flow from Webster Lift Station No. 2 feeds Webster Lift Station No. 1.

Webster Lift Station No. 2 also includes a wet well (manhole), buried pump dry pit, short force main, discharge manhole, power and SCADA systems, and ancillary appurtenances. The pump pit is equipped with two 3 HP vertical, non-clog centrifugal pumps with one providing duty service and the other in standby. The capacity of each pump is approximately 100 gallons per minute (gpm), with a total firm capacity of 100 gpm. The pump station is designed not to overflow.

4.2.6.3 Bridge Street Pump Station

The Bridge Street Pump Station is a duplex submersible type station with a firm capacity of 650 gpm located at the southeast corner of Bridge Street and Tami Road. The pump station receives flow from a 12-inch gravity sewer and discharges approximately 1,900 feet away into the existing gravity system on Cottonwood Street via a 4-inch force main to manhole B111 and an 8-inch force main to manhole B195.

The station was originally constructed in 1994 to serve the area generally between the Lower and Upper River Roads, from the eastern edge of Reinhart Sports Park to the western edge of the UGB. Construction of this station was very difficult due to extensive groundwater and sloughing soil issues. This station was planned to serve a very large area west of Leonard and Cottonwood Streets to the western edge of the UGB. However, due to construction issues at the pump station, several shallow sewers were built along the Lower River Road, which prevent

gravity sewer extensions beyond Schaeffers lane. Several building lots in this area are served with individual grinder pump stations and long small-diameter force mains to the existing shallow gravity sewer.

The Bridge Street Pump Station and force main were improved in 2010. This involved a new pig port vault and addition of a flowmeter at the pump station; and adding approximately 650 feet of new 8-inch diameter force main piping to Manhole B195.

4.2.6.4 Redwood Pump Station

The Redwood Pump Station is located at the old Redwood Wastewater Treatment Plant (WWTP) on the western edge of the City's service area (outside the UGB). The pump station receives flow from a relatively small tributary area, as well as diverted flow from the Darneille Pump Station when peak flows exceed the capacity of Darneille as shown in Figure 4.4.

The Redwood Pump Station is a duplex submersible pump station with a firm capacity of 335 gpm. From the pump station, flow is routed through approximately 10,300 feet of 6-inch diameter force main to an influent manhole at the Darneille Pump Station.

4.2.6.5 Darneille Pump Station

The Darneille Pump Station is the largest of the City's pump stations. It receives flows from the southwest portion of the City as well as some areas outside the UGB, within the RSSSD service area. The total existing capacity of this pump station is 4,380 gpm (6.3 mgd) and the firm capacity is 2,920 gpm (4.2 mgd). The station is a wet pit/dry pit type station with above-grade electrical panels, generator, and chemical feed system (similar to the Redwood Pump Station). The station conveys flows through two parallel, 18,000-foot long, 12-inch force mains to a common 1,000-foot long, 14-inch force main that travels over the Rogue River via a pedestrian bridge, before discharging to the gravity system that drains to the WRP. The station has a Bioxide chemical injection system with two 3,000 gallon storage tanks.

The configuration and operation of this pump station is unique for several reasons.

- The City uses the 24-inch gravity interceptor upstream of the Darneille wet well as temporary storage for wastewater. The City uses the temporary storage in this interceptor intentionally, both during peak flow periods when pump station capacity is limited, and under normal operation (due to pump level setpoints). If influent flows exceed the capacity of Darneille, the City utilizes the interceptor as temporary storage until the pump station can "catch up" and pump the stored wastewater to the WRP.
- There is a diversion pipeline just upstream of the Darneille wet well that allows some of the stored wastewater to flow through another 24-inch interceptor to the Redwood Pump Station. The diversion helps reduce the extent of surcharging upstream of Darneille and helps prevent SSOs in the vicinity of the Darneille pump station.
- The force main from the Redwood Pump Station discharges just upstream of the Darneille wet well. During low-flow periods, this configuration does not cause any issues because

Darneille has adequate capacity to convey both the inflow to Darneille and the inflow from the Redwood force main. However, when flows exceed the Darneille pumping capacity and the upstream diversion is used, the operation of the pump stations essentially creates a circular pumping pattern from Redwood, to the diversion upstream of the Darneille wet well, and back to the Redwood Pump Station. This circular pumping scenario employs the available storage in the 24-inch interceptor, which has a limited volume. When the interceptor volume is consumed, capacity-related SSOs frequently occur at the Redwood Pump Station.

A schematic of the current operation is presented in Figure 4.5.

4.3 PIPE REMAINING USEFUL LIFE AND CONDITION ASSESSMENT

The structural condition of a collection system is a critical issue to examine when considering system upgrades or expansion. Repeated structural failure (such as pipes collapsing or the development of sink holes) at various locations along a pipeline alignment will make replacing such a pipeline a priority item. Maintenance history should also be considered since a high level of required maintenance for a pipeline can be an indicator of potential or pending structural problems. The analysis of the existing collection system was based on an examination of both condition and maintenance data that the City maintains in a GIS database.

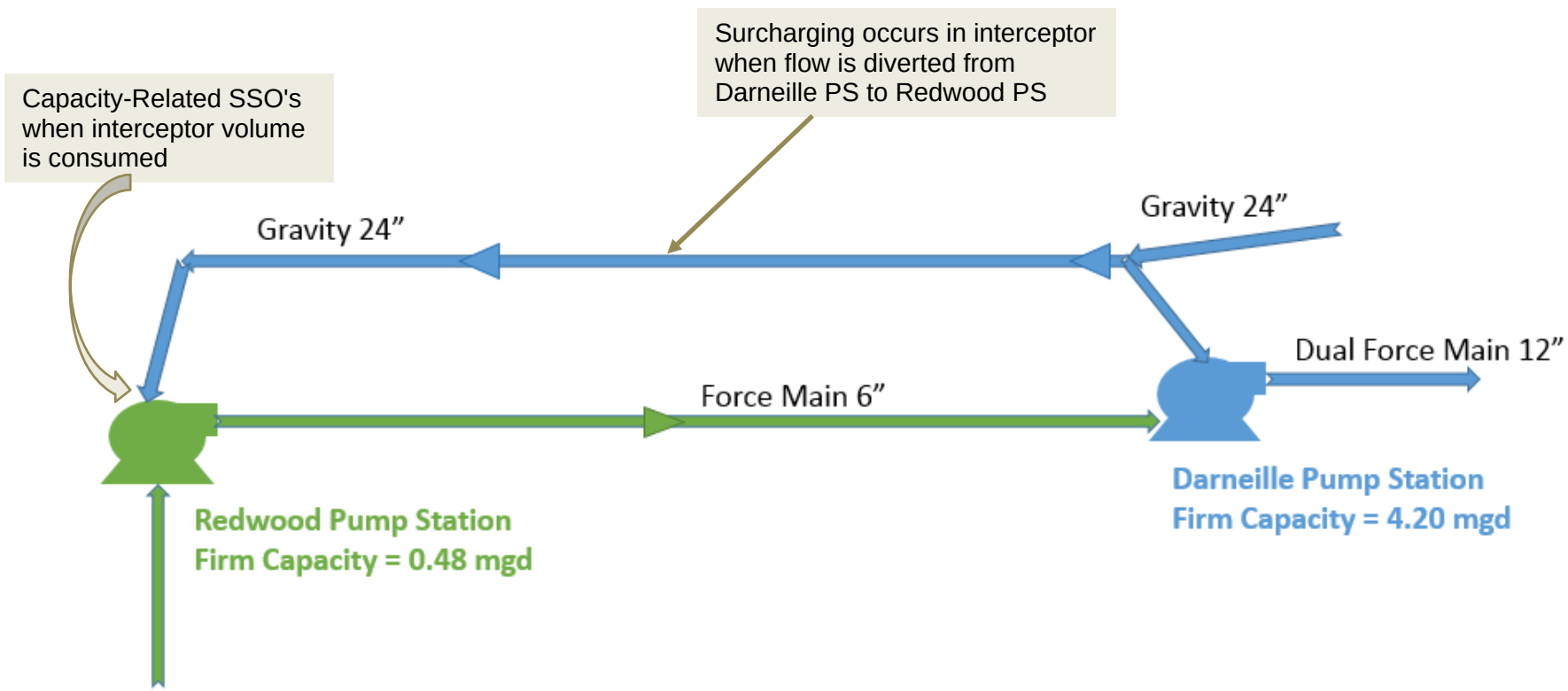
4.3.1 Data Inventory Introduction

Identifying and prioritizing near- and further-term sewer repair/renewal/replacement projects requires obtaining accurate information on the condition of the sewer collection system. Three sets of data were used for this analysis:

- Material and Installation Years are used to perform a Remaining Useful Life (RUL) Analysis (Section 4.3.2).
- Maintenance Records Data (Section 4.3.3).
- Structural Data (Section 4.3.4).

This data was evaluated to develop a comprehensive analysis as follows:

- The RUL analysis results were used to determine how much of the system is reaching its RUL in the next 20 years, and are directly related to how old the collection system is.
- Both structural and maintenance data was used to prioritize pipes identified in the RUL analysis that need replacement in the collection system. This prioritization method is detailed in Section 4.3.5.1.



DARNEILLE AND REDWOOD PUMP STATION CURRENT OPERATION SCHEMATIC

FIGURE 4.5

CITY OF GRANTS PASS
WASTEWATER COLLECTION SYSTEM MASTER PLAN

4.3.2 Remaining Useful Life (RUL)

Both age and condition of the collection system manholes and pipelines impact the quantity of inflow and infiltration (I/I) able to enter the system. Typically, older sewer pipes have a greater potential of allowing significant I/I into the collection system. Older pipelines are a priority when considering pipelines for rehabilitation.

The length of time that a pipe is anticipated to remain functional, commonly called the useful life, depends largely on the pipe material, but can also depend on soil conditions, wastewater constituents, and installation. Beyond the useful life, the increasing costs of maintenance associated with a failing pipe will likely warrant replacement.

Table 4.5 presents the estimated useful lives of various types of pipe materials. Unknown pipe materials in the system were assumed to have a useful life of 60 years. These values were customized based on staff's knowledge of the collection system.

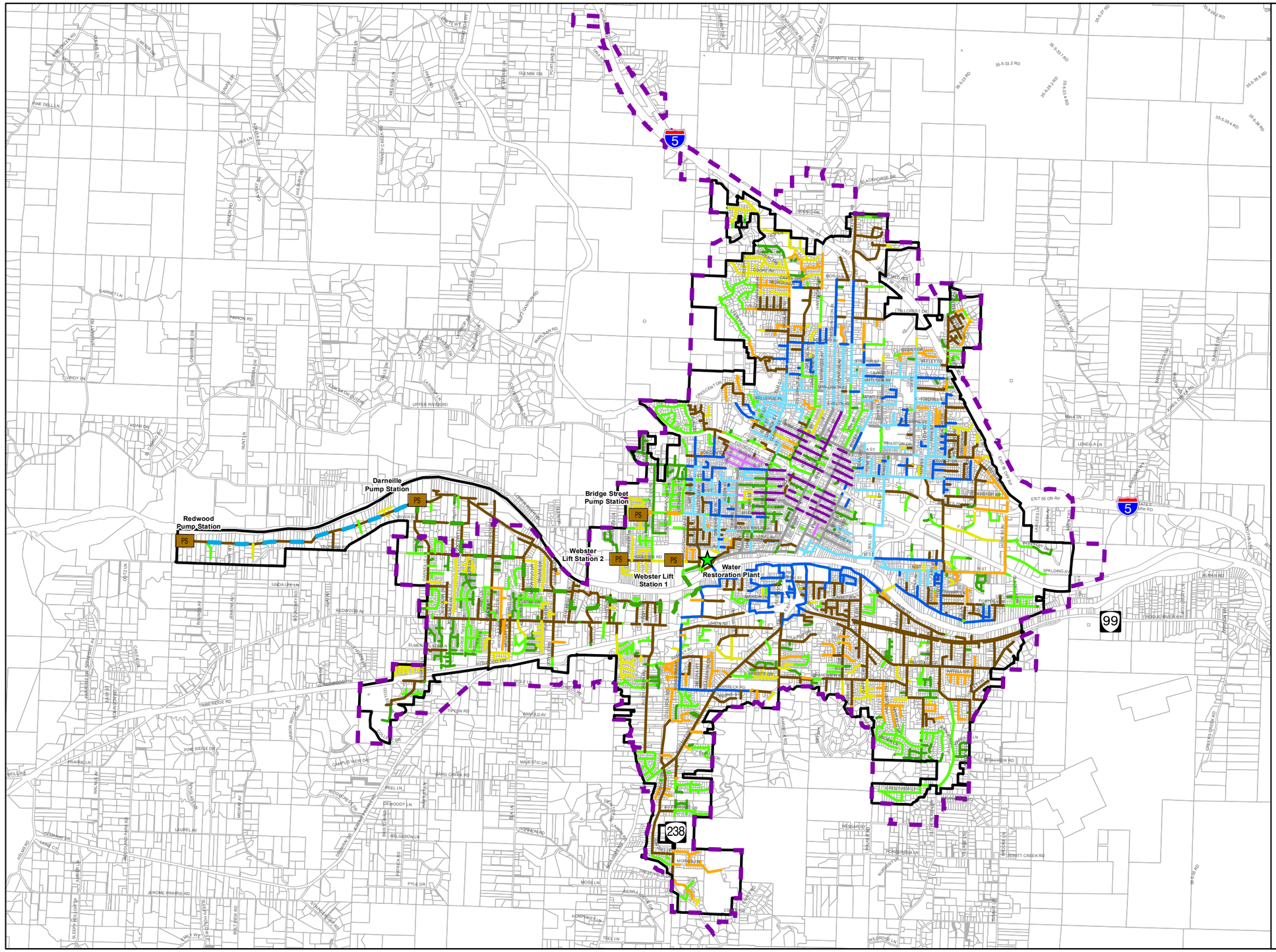
Table 4.5 Useful Life of Pipes
Wastewater Collection System Master Plan
City of Grants Pass

Pipe Material	Useful Life Assumptions (years)
Asbestos Cement (AC)	60
Concrete Pipe (CP)	60
Ductile Iron (DIP)	80
Polyvinyl Chloride (PVC)	80
Clay Tile/ Vitrified Clay Pipe (CT/VCP)	75
Unknown	60

Both the age and type of material were used to determine the RUL of the City's pipe collection system. The RUL can be defined as the length of time before a pipe will reach the end of its useful life, and is helpful for identifying upcoming rehabilitation or replacement projects due to the age and condition of a pipe. Information obtained from the City's GIS data was used to identify the pipe materials and years of installation. Figure 4.6 graphically presents the installation years throughout the City's collection system, while Figure 4.7 presents pipe material. All sewer pipes are taken into account for this analysis.

Table 4.6 presents the total length of pipe according to the year installed and material. The cells of the table are color-coded to indicate the RUL of pipes for each of the four categories below:

- Red indicates pipe that is beyond its predicted useful life,
- Dark orange indicates pipe that is expected to reach the end of their useful life in the next 10 years,
- Light orange represents pipe with an RUL of between 10 and 20 years, and
- Yellow represents pipe that has a remaining useful life of over 20 years.



Legend

- WRP
- Lift/Pump Station
- Existing Sewer Service Area
- UGB
- Tax Lots

Force Main Installation Year

- 1993
- 1999
- 2000

Gravity Main Installation Year

- Unknown
- 1915 - 1924
- 1925 - 1934
- 1935 - 1944
- 1945 - 1954
- 1955 - 1964
- 1965 - 1974
- 1975 - 1984
- 1985 -1994
- 1995 - 2004
- 2005 - 2015

N

0 5,000 10,000 Feet

Figure 4.6
Collection Pipe by Installation Years
Wastewater Collection System Master Plan
City of Grants Pass

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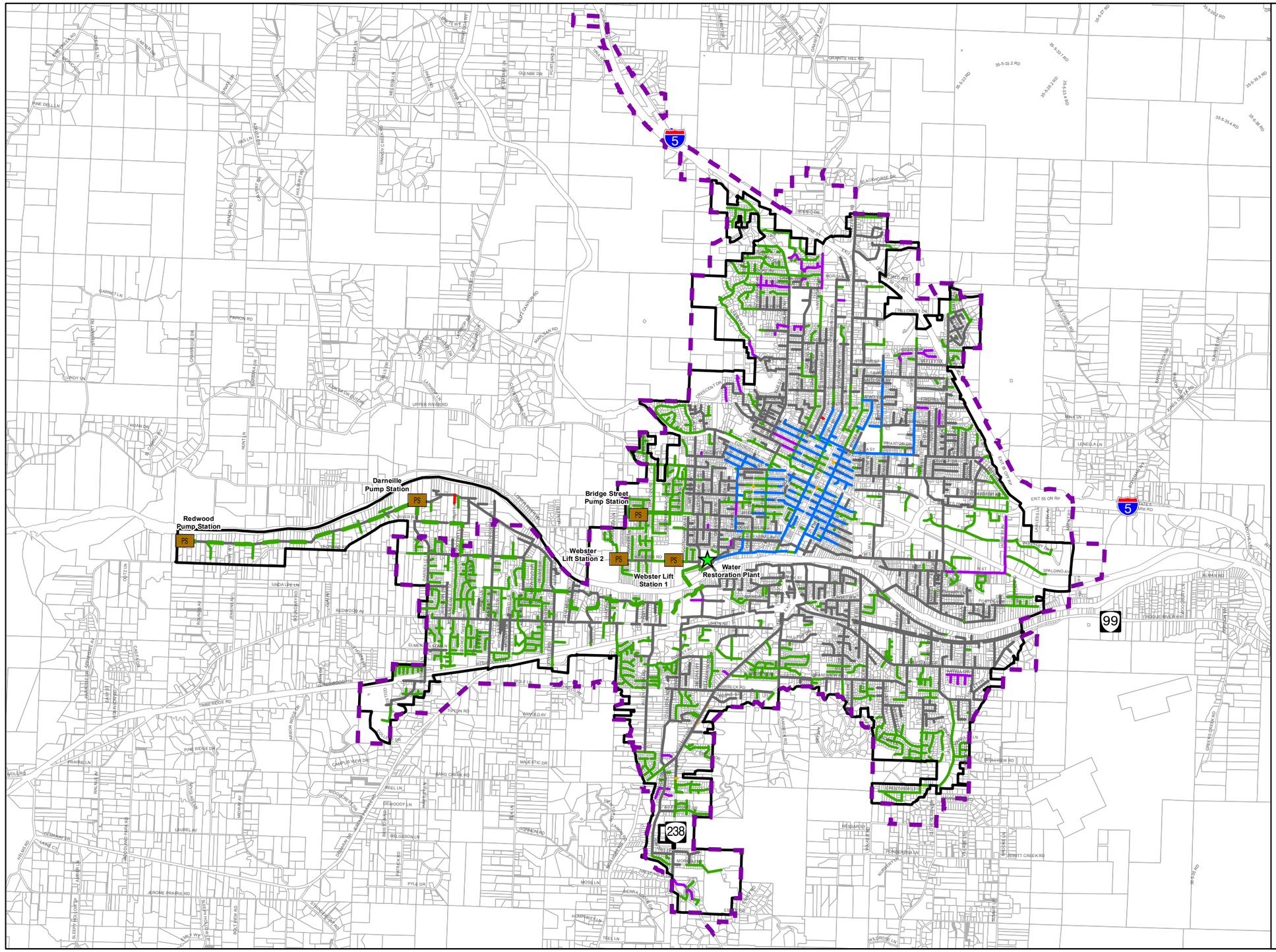

Legend

- WRP
- Lift/Pump Station
- Existing Sewer Service Area
- UGB
- Tax Lots

Gravity Main Material

- Unknown
- Asbestos Concrete
- Concrete
- Clay Tile/Vitrified Clay
- Ductile Iron Pipe
- Polyvinyl Chloride

Force Main Material

- Polyvinyl Chloride

N

Feet
0 5,000 10,000

Figure 4.7
Collection System Pipe by Type of Material
Wastewater Collection System Master Plan
City of Grants Pass

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Table 4.6 Pipe Length of Major Collectors
Wastewater Collection System Master Plan
City of Grants Pass

Major Pipelines Length by Year Installed and Material Type

Total Length (ft) by Year Installed(1)

Material Type	Unknown	1915-1924	1925-1934	1935-1944	1945-1954	1955-1964	1965-1974	1975-1984	1985-1994	1995-2004	2005-2015	Percent Total System (%)
DIP		284				33	241	270	50	48	69	**994**
PVC					1,723	22	2,821	19,259	79,812	193,271	92,703	**389,610**
VCP		20,263	33,287	5,261	1,610	646	302		101	91	704	**62,266**
CT			19								39	**58**
AC			573					26,025	796		58	**27,451**
CP		156	2,168		79,416	92,847	280,695	28,788	3,605	1,356	1,319	**490,401**
Unknown		896	239		13	10	53	68		233	367	**1,965**
Total Length (ft)	(2)	**21,600**	**36,287**	**5,262**	**82,774**	**93,571**	**284,153**	**74,421**	**84,376**	**195,028**	**95,273**	**972,745**
Percent Total System (%)	**0.0%**	**2.2%**	**3.7%**	**0.5%**	**8.5%**	**9.6%**	**29.2%**	**7.7%**	**8.7%**	**20.0%**	**9.8%**	**100.0%**

Notes:
(1) Total Length includes both gravity and force main pipes.
(2) Pipes with unknown installation year were allocated throughout the different years according to the distribution of existing pipes of known installation year.

Legend

RUL-Remaining Useful Life			
	Over 20 years of RUL	433,583	45.5%
	Between 10 and 20 years of RUL	283,159	29.7%
	Between 0 and 10 years of RUL	94,481	9.9%
	0 years of RUL	142,590	14.9%

Approximately 142,590 LF of collection pipes, which represents 14.9 percent of the pipes with known installation year, have reached their RUL, 94,481 LF or 9.9 % have an RUL of 10 years or less. Approximately 283,159 LF of pipe, or 29.7 % will reach the end of its useful life between 10 and 20 years from 2015, and the rest of the collection pipes have an RUL of over 20 years. In total, approximately 54.5 percent of the existing collection pipes with known installation year are expected to reach the end of their useful lives by the end of the planning period (2035). Pipes with unknown installation years have an unknown. These pipes (142 LF or 0.01%) were allocated throughout the different years according to the distribution of existing pipes of known installation year.

The location of the pipes reaching the end of their useful life in the planning period is shown in Figure 4.8.

Figure 4.9 is a graphical representation that shows the total length of pipe reaching the end of its assumed useful life in each of the coming planning years, and until 2095. This graph shows the life cycle of the system and will be used in Section 4.3.5.5 to help prioritize repair and replacement.

It is estimated that approximately 522,578 LF of pipe will be reaching the end of their useful life within the planning period, or about 24,885 LF of pipe per year for the next 20 years.

4.3.3 Maintenance Data Assessment

The City keeps track and maintains all maintenance data using their GIS database. The most recent data only (since 2010) was included and evaluated in this section.

4.3.3.1 <u>6-Months Cleaning</u>

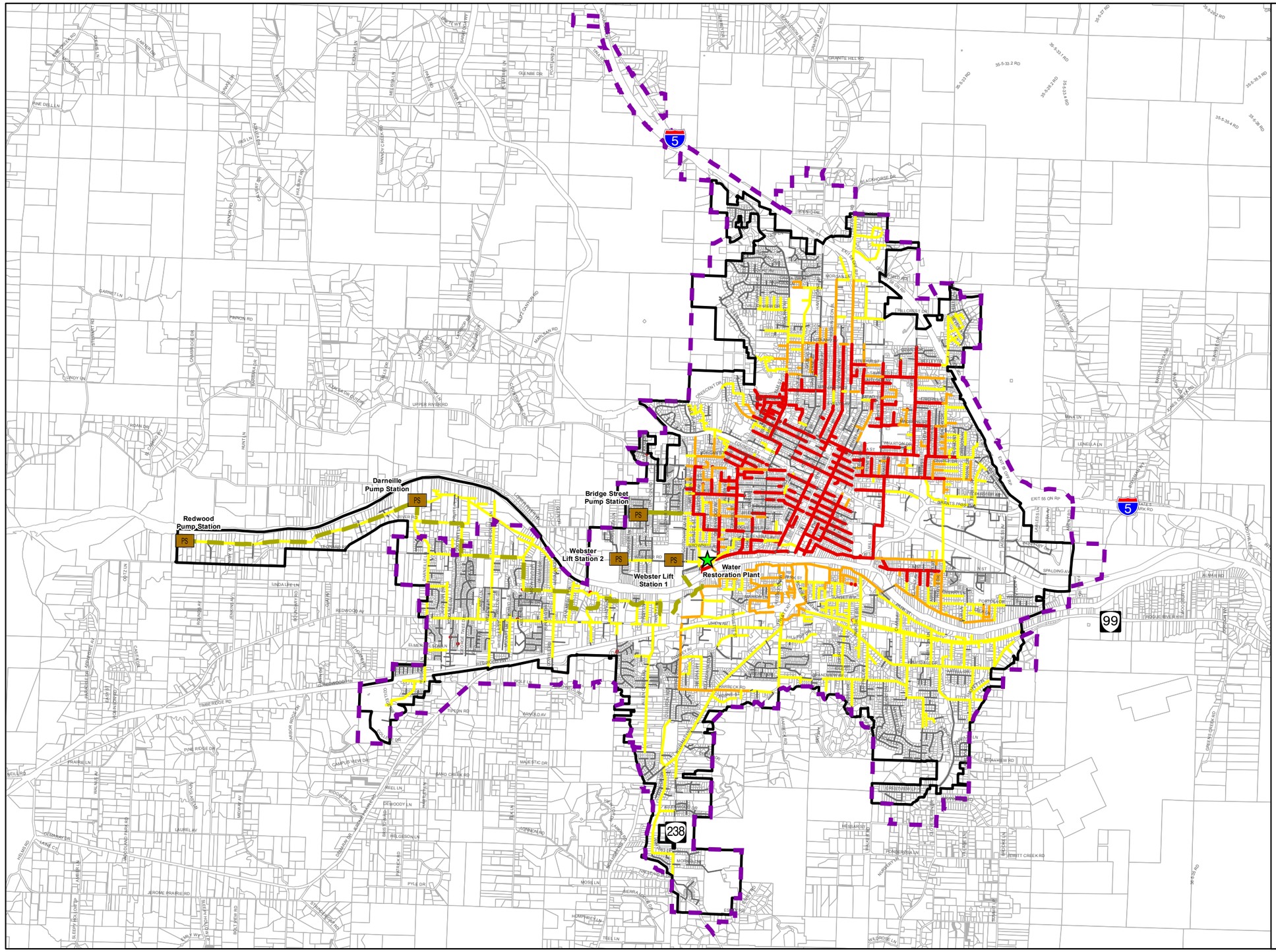
The City performs a routine cleaning program every 6-month on approximately 7 percent of their collection system. These pipes are determined based on staff's knowledge of recurring issues in these areas. Figure 4.10 shows the locations of the pipes that are included in the 6-month cleaning program.

4.3.3.2 <u>Rocks and Sand</u>

During each cleaning and maintenance action, the City estimates the total volume of rocks and sand removed from each sewer pipe and classifies the pipes in three categories:

- Volume removed less than 6 gallons,
- Volume removed between 3 and 5 gallons,
- Volume removed between 1 and 2.5 gallons.

Figure 4.11 shows the locations of the issues related to rocks and sand that were experienced since 2010.



Legend

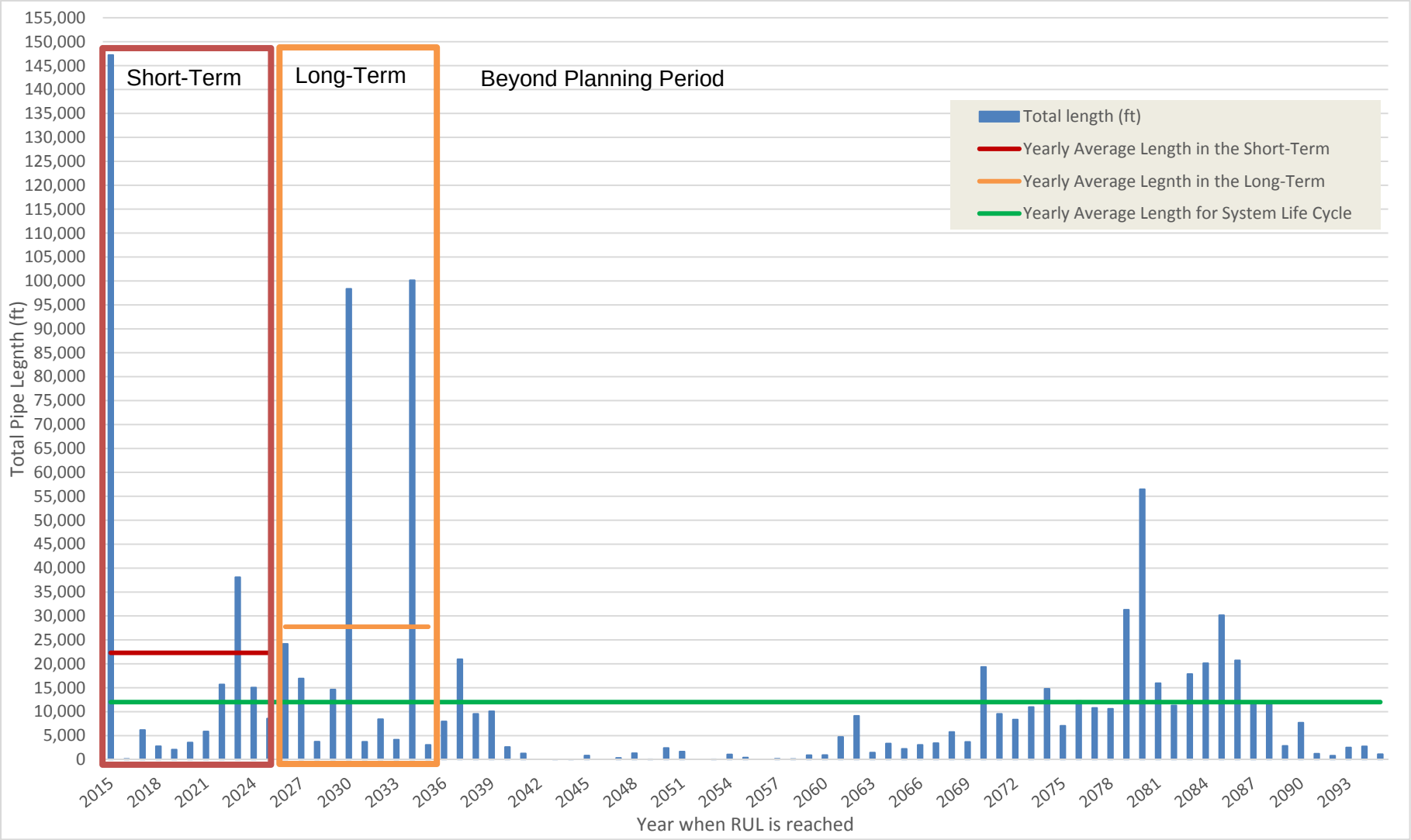
- WRP
- Lift/Pump Station
- Force Main
- Existing Sewer Service Area
- UGB
- Tax Lots

Pipelines Reaching end of Useful Life

- Before 2015
- Before 2025
- Before 2035
- After 2036

Feet
0 4,000 8,000

Figure 4.8
Location of Pipelines Reaching End of Useful Life by 2035
Wastewater Collection System Master Plan
City of Grants Pass



LENGTH OF PIPELINES REACHING RUL BEFORE 2025 AND 2035

FIGURE 4.9

CITY OF GRANTS PASS
WASTEWATER COLLECTION SYSTEM MASTER PLAN

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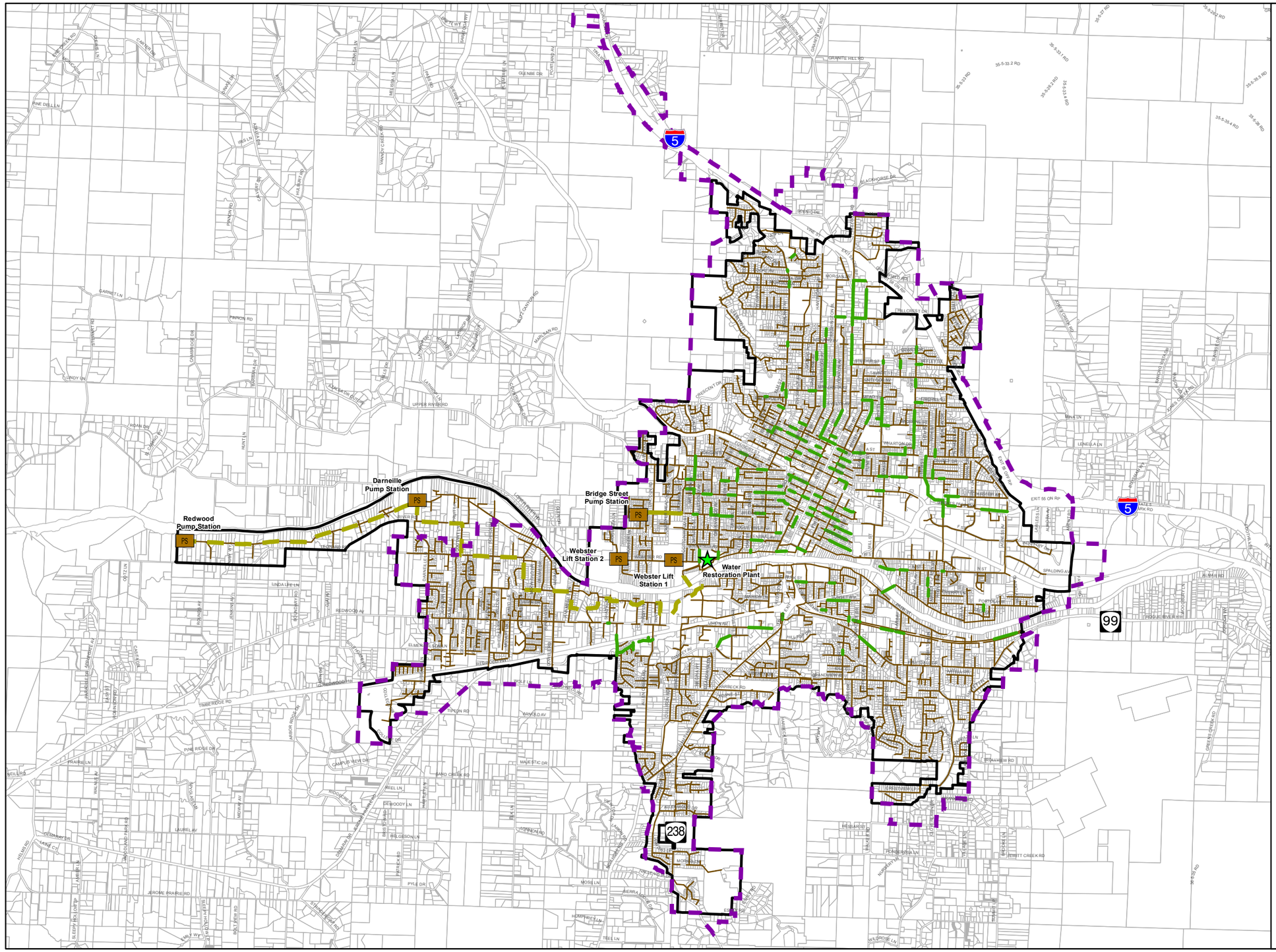

Legend

- 6 Month Sewer Cleaning Records
- WRP
- Lift/Pump Station
- Gravity Main
- Force Main
- Existing Sewer Service Area
- UGB
- Tax Lots

N

0 5,000 10,000 Feet

Figure 4.10
6-Month Cleaning Program Locations
Wastewater Collection System Master Plan
City of Grants Pass

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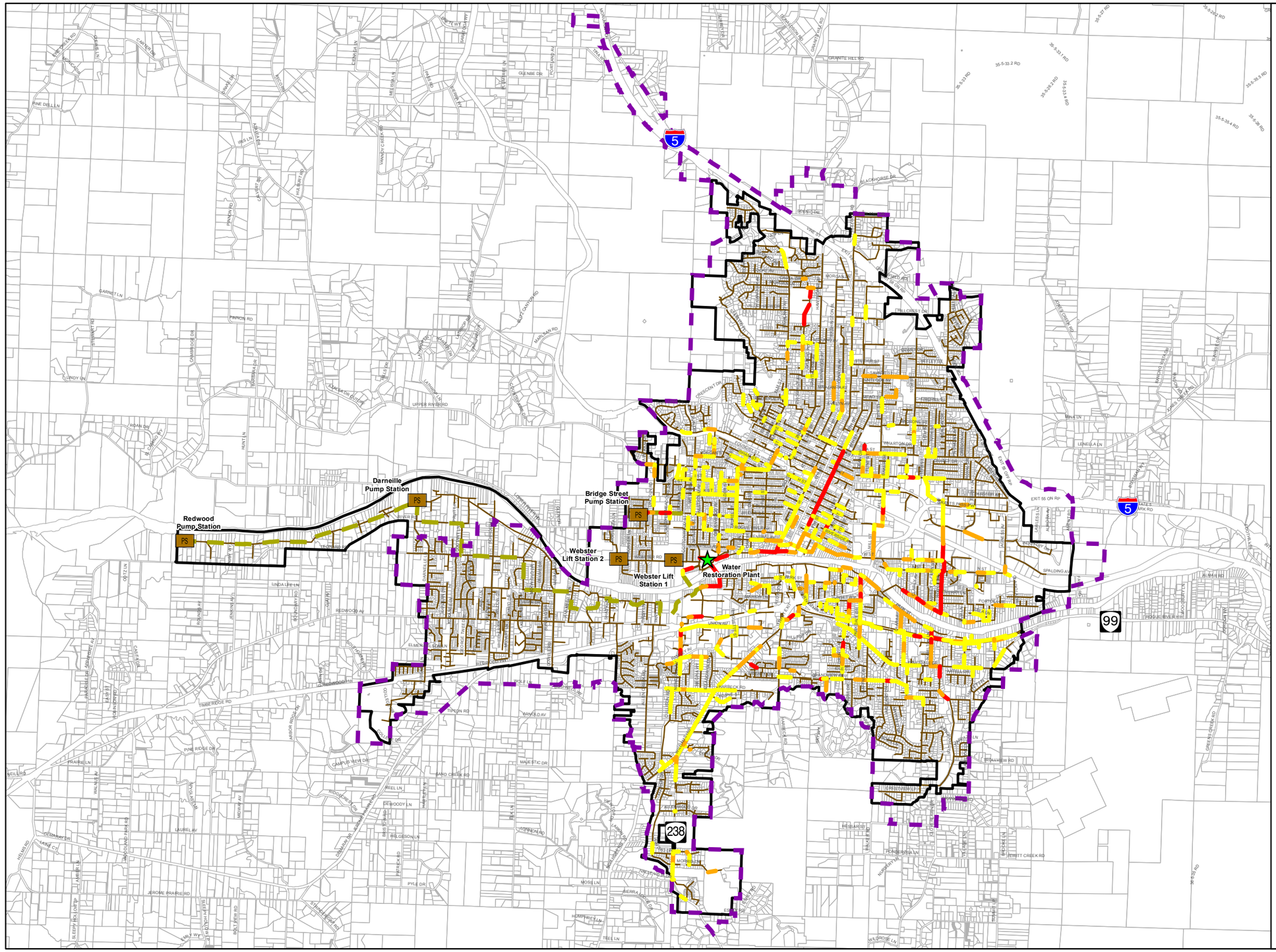

Legend

- WRP
- Lift/Pump Station

Sewer Pipelines with Rock and Sand Gallons of Debris Removed

- 1- 2.5 Gallons
- 3-5 Gallons
- > 6 Gallons
- Other Pipelines
- Force Main
- Existing Sewer Service Area
- UGB
- Tax Lots

N

0 5,000 10,000 Feet

Figure 4.11
Rocks and Sand Maintenance Issues
Wastewater Collection System Master Plan
City of Grants Pass

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4.3.3.3 Grease

The City also keeps track of grease issues throughout the collection system and classifies the field observed results into three categories based on severity:

- Heavy grease,
- Medium grease,
- Light grease.

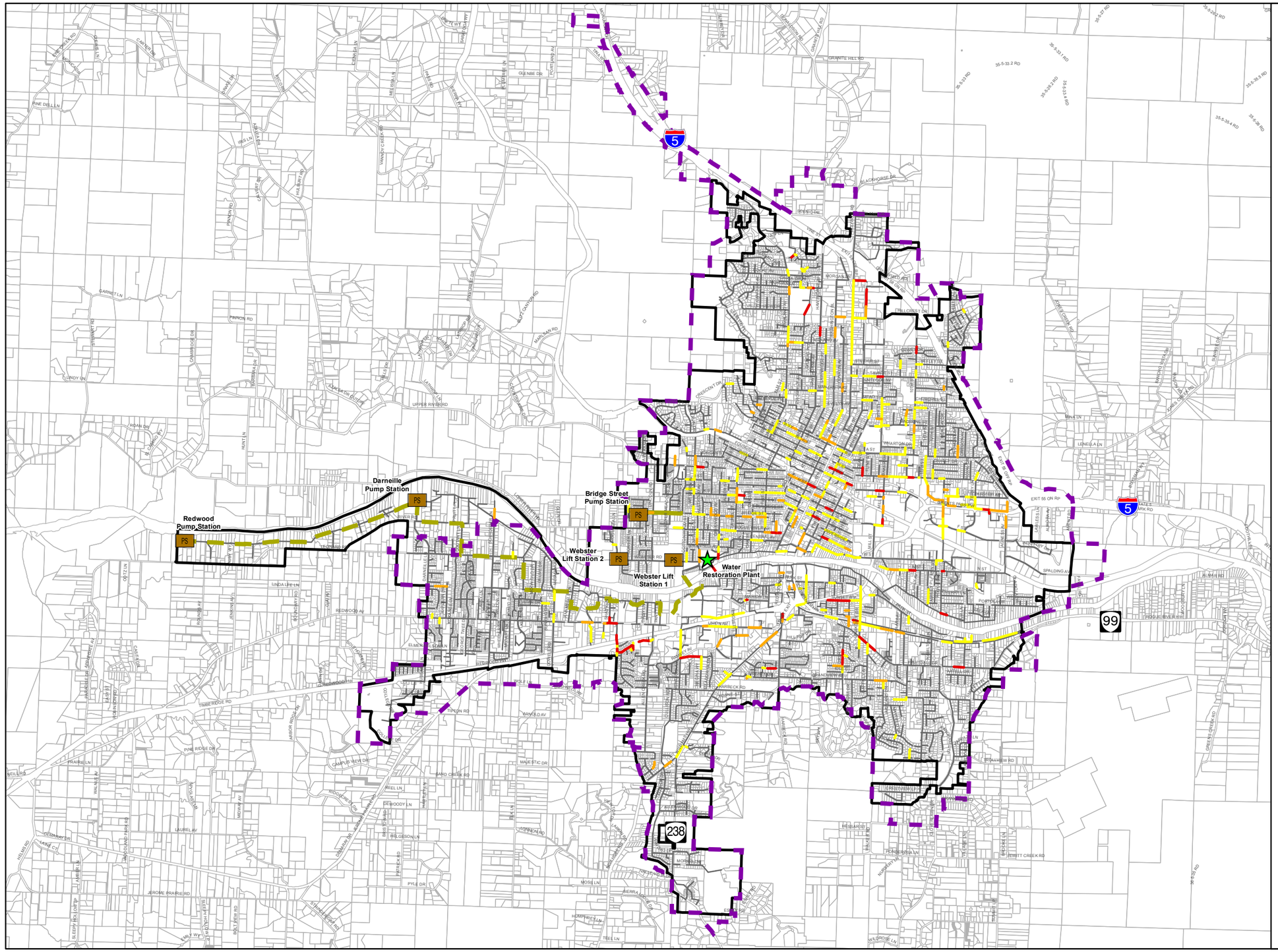
Figure 4.12 shows where the issues related to grease occurred since 2010 and highlights in most severe pipes in red. Grease accumulation can cause blockages and buildups in the system increasing the risk for overflows.

4.3.3.4 Roots

The City inventories root intrusion problems throughout the system using their GIS database. Roots encroachment related issues are also classified in three categories:

- Heavy root encroachment,
- Medium root encroachment,
- Light root encroachment.

Figure 4.13 shows the locations where the issues related to root intrusion occurred since 2010 and highlights the most severe areas in red. Sewers are vulnerable to root intrusions due to material, joints, and other factors. Clay and cast iron pipes seem to be more vulnerable to root intrusions. Root intrusions can be responsible for blockage, sewer backups and compromise the integrity of the sewer pipe.



Legend

- WRP
- Lift/Pump Station
- Force Main

Sewer Main with Grease by Severity

- Light
- Medium
- Heavy
- Other Pipelines
- Existing Sewer Service Area
- UGB
- Tax Lots

N

0 5,000 10,000 Feet

Figure 4.12
Grease Related Maintenance Issues
Wastewater Collection System Master Plan
City of Grants Pass

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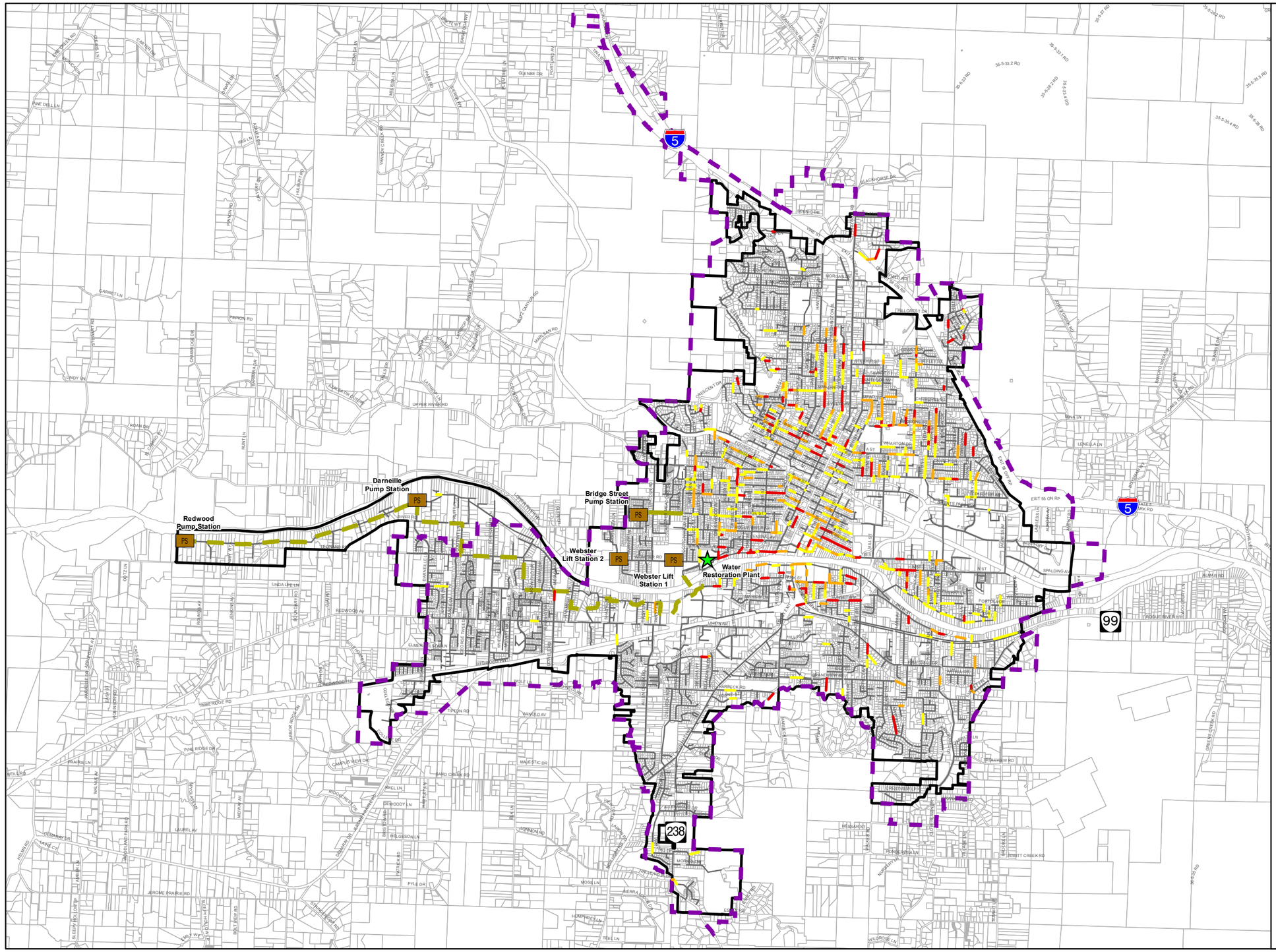

Legend

- WRP
- Lift/Pump Station
- Force Main

Sewer Main with Roots by Severity

- Light
- Medium
- Heavy
- Other Pipelines
- Existing Sewer Service Area
- UGB
- Tax Lots

N

0 5,000 10,000 Feet

Figure 4.13
Roots Related Maintenance Issues
Wastewater Collection System Master Plan
City of Grants Pass

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4.3.4 Structural Data Assessment

Video inspection using closed circuit television (CCTV) is the basic method used to assess gravity sewer condition. The City regularly performs video inspections of their system. CCTV records are not assigned a score, however the City keeps track of the defects in GIS describing the extent of the structural issue. Structural inspection databases were provided by the City for analysis. Only data after 2010 were evaluated in this section. Each pipe flagged under CCTV inspection by the City was assigned a specific type of defect based on the City' comments to each pipe.

Two different categories each with three types of structural defects were used:

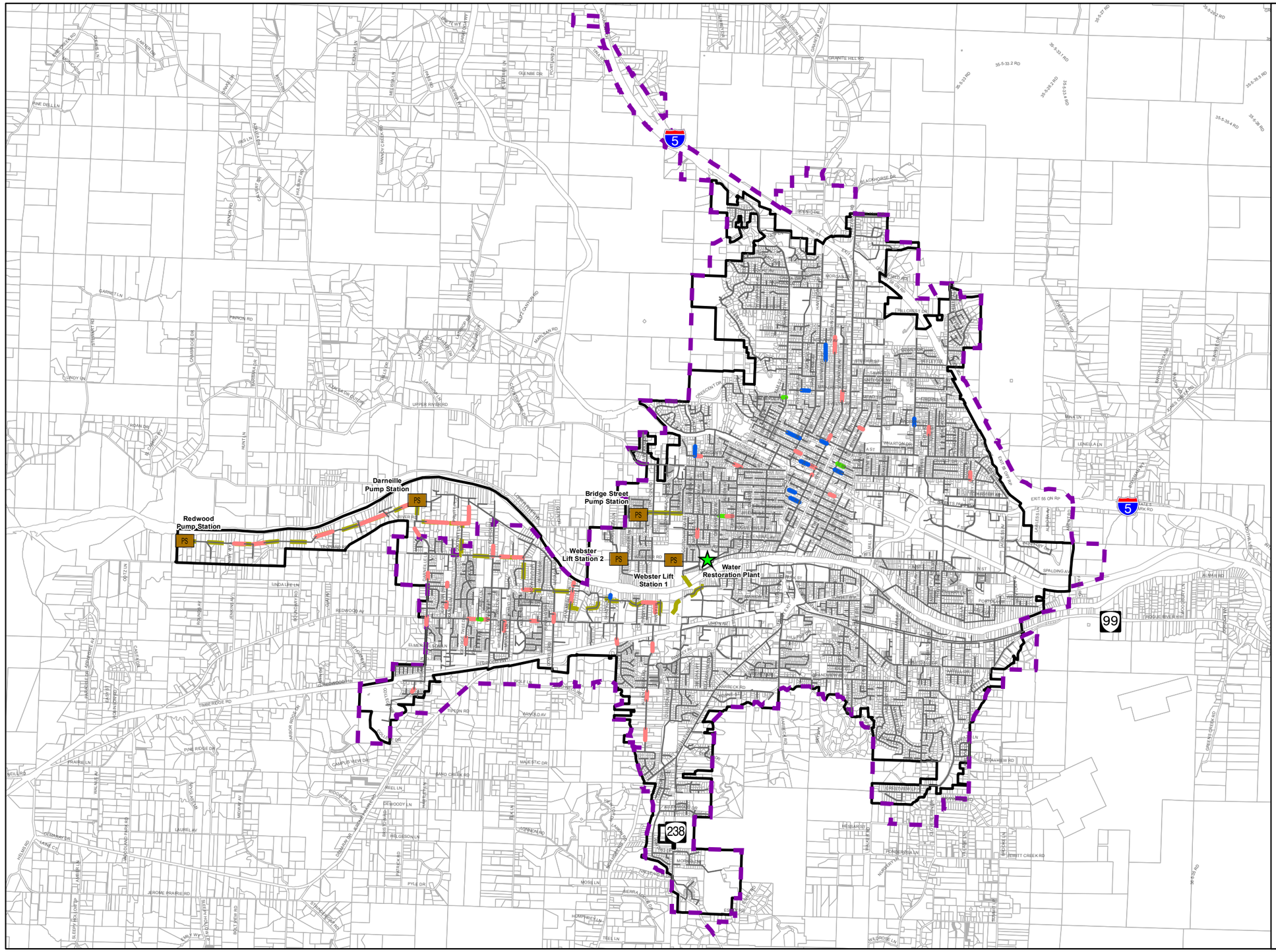
- Structural Holes:
  - Missing Pipe,
  - Hole in Pipe,
  - Broken Pipe,
- Structural Cracks:
  - Circumferential Crack,
  - Longitudinal Crack,
  - Crack (other).

Figures 4.14 and 4.15 show the structural defect locations color coded by the type of defect.

The City also provided corrosion data based on CCTV inspections that were also classified into three categories based on its severity:

- Heavy corrosion,
- Medium corrosion,
- Light corrosion.

Figure 4.16 illustrates the issues with pipe corrosion color coded by severity. Pipes noted as "corroded" only in the City's database with no additional description were categorized as "Light corrosion."



Legend

- WRP
- Lift/Pump Station
- Force Main

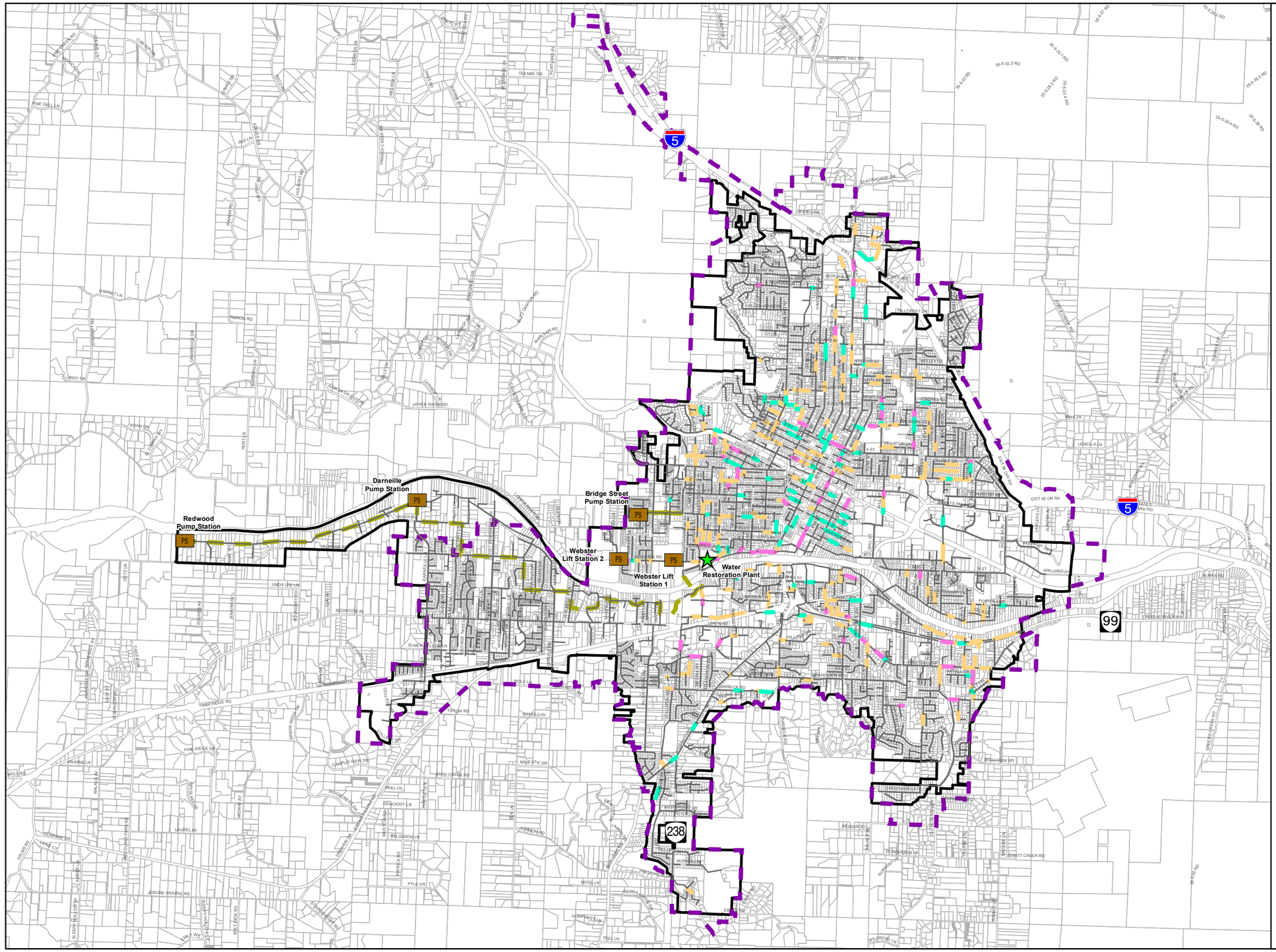
Sewer Main with Holes

- Missing Pipe
- Hole in Pipe
- Broken Pipe
- Other Pipelines
- Existing Sewer Service Area
- UGB
- Tax Lots

N

0 5,000 10,000 Feet

Figure 4.14
Pipes with Holes
Wastewater Collection System Master Plan
City of Grants Pass



Legend

- WRP
- Lift/Pump Station
- Force Main

Sewer Main with Cracks

- Circumferential Crack
- Crack (Other)
- Longitudinal Crack
- Other Pipelines
- Existing Sewer Service Area
- UGB
- Tax Lots

N

0 5,000 10,000 Feet

Figure 4.15
Pipes with Cracks
Wastewater Collection System Master Plan
City of Grants Pass

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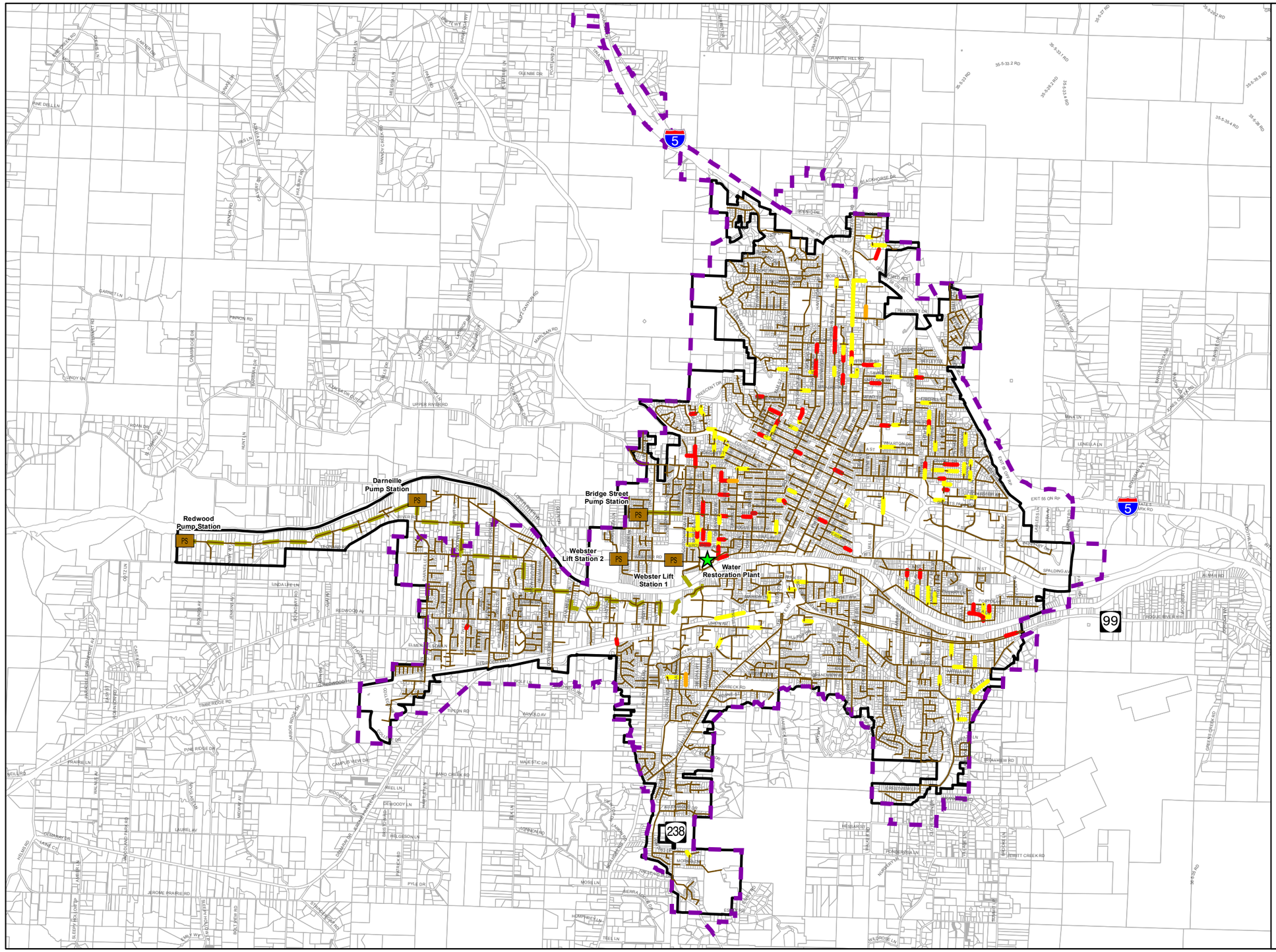

Legend

- WRP
- Lift/Pump Station
- Force Main

Sewer Main with Corrosion Issues

- Light
- Medium
- Heavy
- Other Pipelines
- Existing Sewer Service Area
- UGB
- Tax Lots

N

0 5,000 10,000 Feet

Figure 4.16
Pipes with Corrosoin Issues
Wastewater Collection System Master Plan
City of Grants Pass

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4.3.5 Repair and Replacement Prioritization - RUL and Condition Scoring

Each defect or condition presented in the sections above was assigned a score based on its condition. Maintenance and structural scores were added together to determine the highest priority pipes and were compared to the RUL results presented in Section 4.3.2 to help with prioritization.

4.3.5.1 Methodology

As part of the previous Master Plan, the City developed a customized scoring method using weighting factors to rank pipe defects and issues based on its magnitude. Both method and factors were updated to match the new data provided by the City and analysis performed. Table 4.7 summarizes the weighted factors used in this analysis. The total score obtained by each pipeline once evaluated with the scores below is an indication of the need for repair or replacement. Maintenance and structural scoring will then be used to help prioritize pipe replacement identified in the RUL analysis.

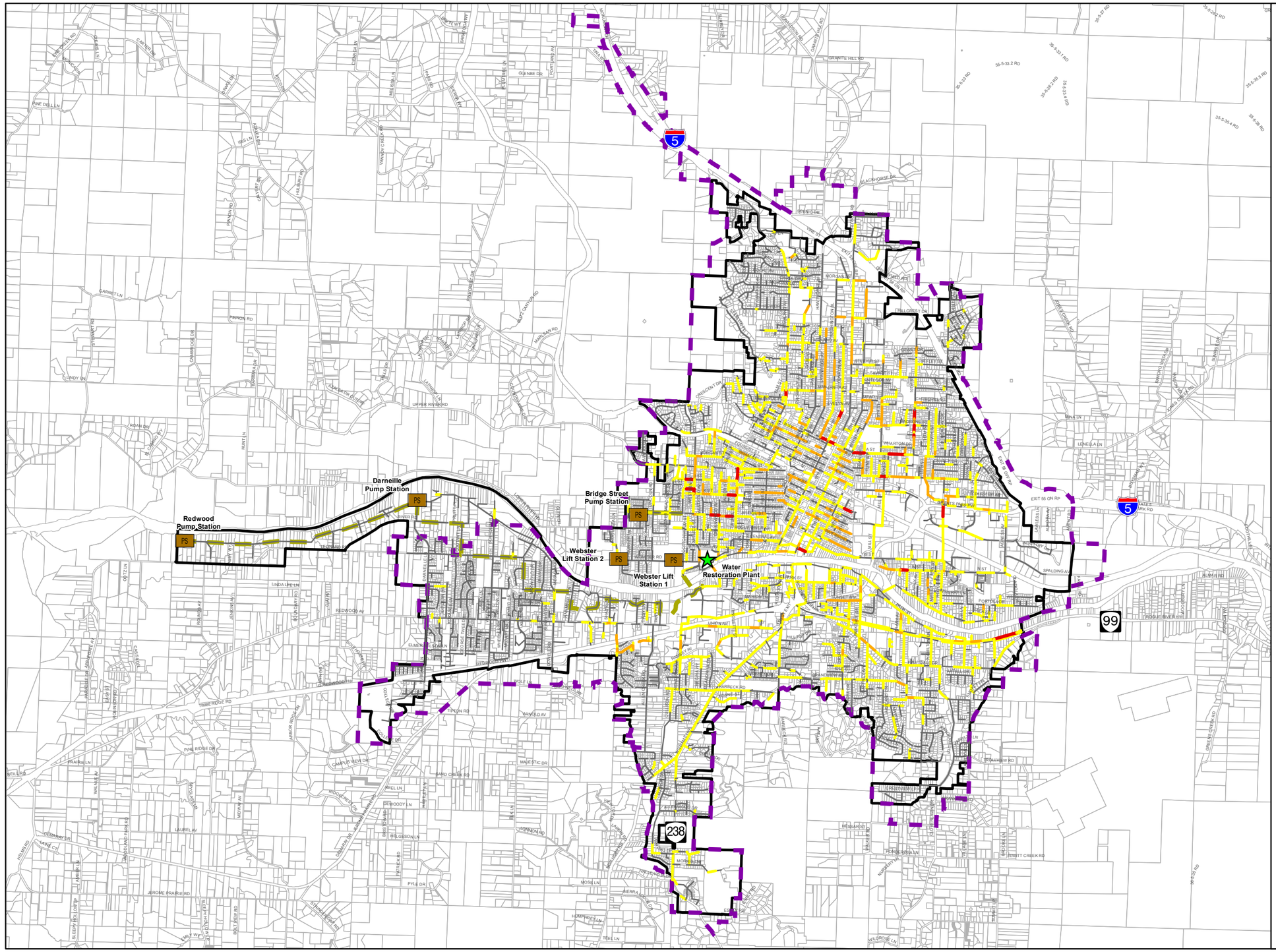
Table 4.7 Weighting Factors for Condition Assessment
Wastewater Collection System Master Plan
City of Grants Pass

Maintenance Data			Structural Data	
Maintenance Effort/Condition		**Weight**	**Defect**	**Weight**
6-Month Cleaning	Yes	7	Missing Pipe	10
	No	0	Hole in Pipe	9
Gallons of Rocks and Sand Removed During Cleaning	> 6	7	Broken Pipe	8
	3- 5	5	Circumferential Crack	5
	1 -2.5	3	Longitudinal Crack	7
Grease	Heavy	4	Crack (Other)	6
	Medium	2	Light Corrosion	4
	Light	1	Medium Corrosion	6
Roots	Heavy	5	Heavy Corrosion	8
	Medium	3		
	Light	2		

Notes:
Scoring values to evaluate condition assessment of the pipes in the City's collection system was taken from the former Master Plan and adjusted to reflect latest available data.

4.3.5.2 Maintenance Scoring

Figure 4.17 shows the summary of all maintenance criteria the City keeps track of. Pipes shown in the red are the pipes with the highest score which correspond to the most severe maintenance issues. These pipes are located mainly in wastewater basins A, B, and H.



Legend

- WRP
- Lift/Pump Station
- Force Main

Total Maintenance Score

- 21 - 30
- 11 - 20
- 1 - 10
- 0
- Existing Sewer Service Area
- UGB
- Tax Lots

N

0 5,000 10,000 Feet

Figure 4.17
Maintenance Data Scoring
Wastewater Collection System Master Plan
City of Grants Pass

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4.3.5.3 Structural Scoring

Figure 4.18 shows the summary of all structural defects identified by the City. Pipes with the highest structural score are shown in red on the figure and the ones with the least structural issues are shown in yellow. Pipes with the highest structural score are mainly located in the downtown core of the City, in wastewater basins B, G, and E.

4.3.5.4 Combined Structural and Maintenance Scoring

Both maintenance and structural analysis were combined to help prioritize pipes identified as part of the RUL evaluation and help focus the City's repair and replacement program. Figure 4.19 highlights in red the highest scoring pipes for both maintenance and structural data.

These are mainly located in the basins located in the downtown core of the City: wastewater basins A, C, E, G, and H. A few pipes are highlighted south of the Rogue River.

4.3.5.5 Pipe Replacement Prioritization

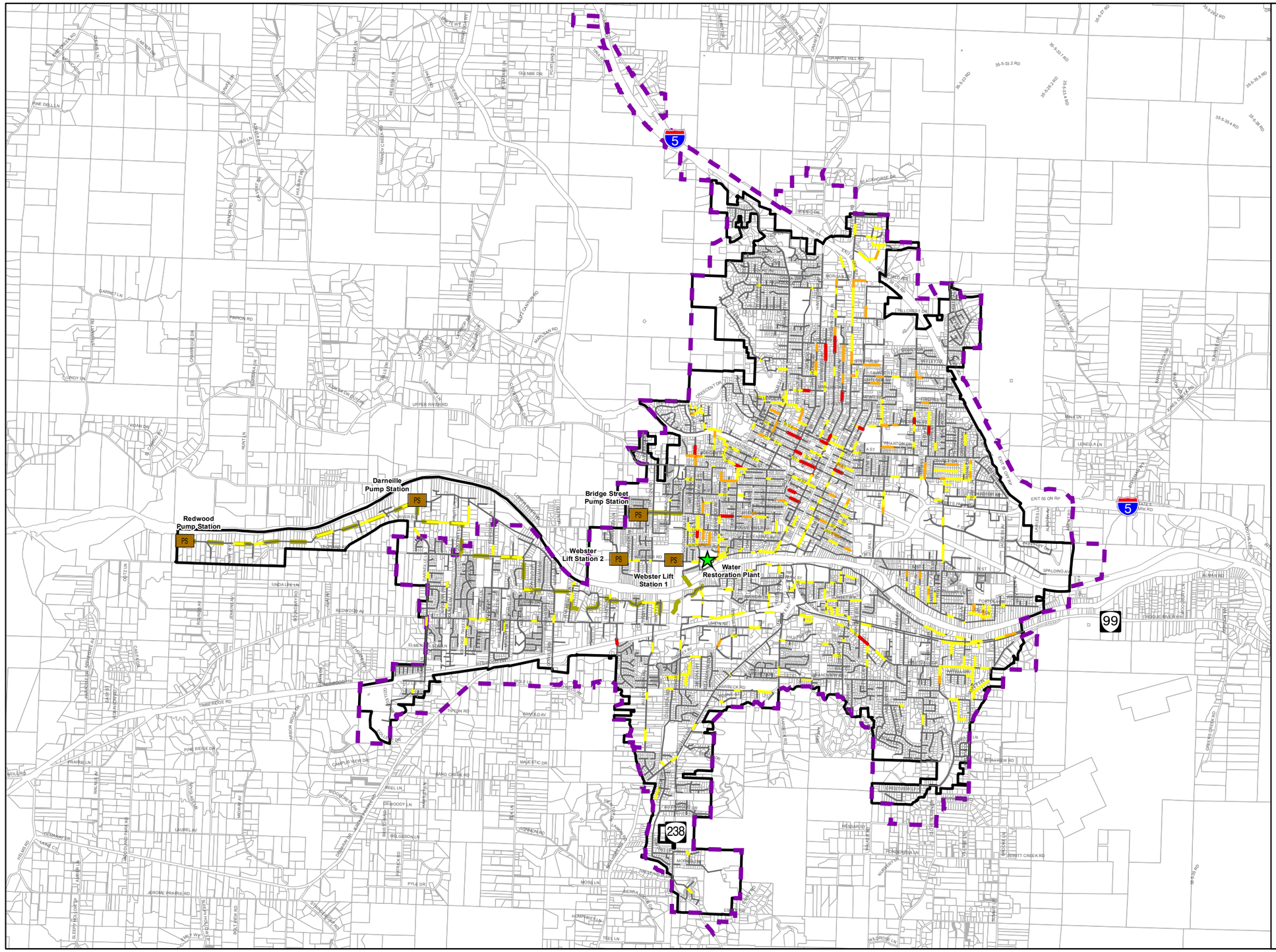
As shown in the RUL analysis, the City has old pipes, especially in the downtown area of the City. Approximately 146,000 LF of pipes (15.3 %) were installed more than 60 years ago.

The RUL analysis itself shows that 54.5% of the collection system would need to be replaced in the next 20 years, which would consist of replacing around 25,000 LF of pipes per year. However, some of these pipes do not present any maintenance or structural issues as identified by the City, and replacement could be pushed out to a later date after the end of the planning period (2035). In order to spread out repair and replacement and avoid having year where no pipes or too many need to be replaced, the life cycle of the entire system was taken into consideration. Using this assumption, approximately 12,000 LF of pipes would need to be replaced each year, which corresponds to approximately 250,000 LF (47 miles) of pipes to replace in the next 20 years.

Table 4.8 compares the linear feet of pipes reaching its RUL by planning period with the combined maintenance and structural score. Cells highlighted in red are recommended to be replaced in the next 5 years, the ones in orange, between 2021 and 2025 and the ones in yellow in the Long-Term planning period (after 2025). Approximately 250,000 LF of pipes is recommended to be replaced in the planning period (about 6.5% of the collection system per year in the next 20 years).

When an opportunity to replace a sewer main with known maintenance or structure issues by City staff occurs (road paving, other projects in the vicinity,…), the City should take the opportunity to replace the main regardless of pipe priorities.

All pipes highlighted in either red, orange, or yellow on Figure 4.20 are included in the CIP under the repair and replacement program (Chapter 6 - Capital Improvement Plan).



Legend

- WRP
- Lift/Pump Station
- Force Main

Total Structural Score

- 16 - 25
- 11-15
- 1-10
- 0
- Existing Sewer Service Area
- UGB
- Tax Lots

N

0 5,000 10,000 Feet

Figure 4.18
Structural Data Scoring
Wastewater Collection System Master Plan
City of Grants Pass

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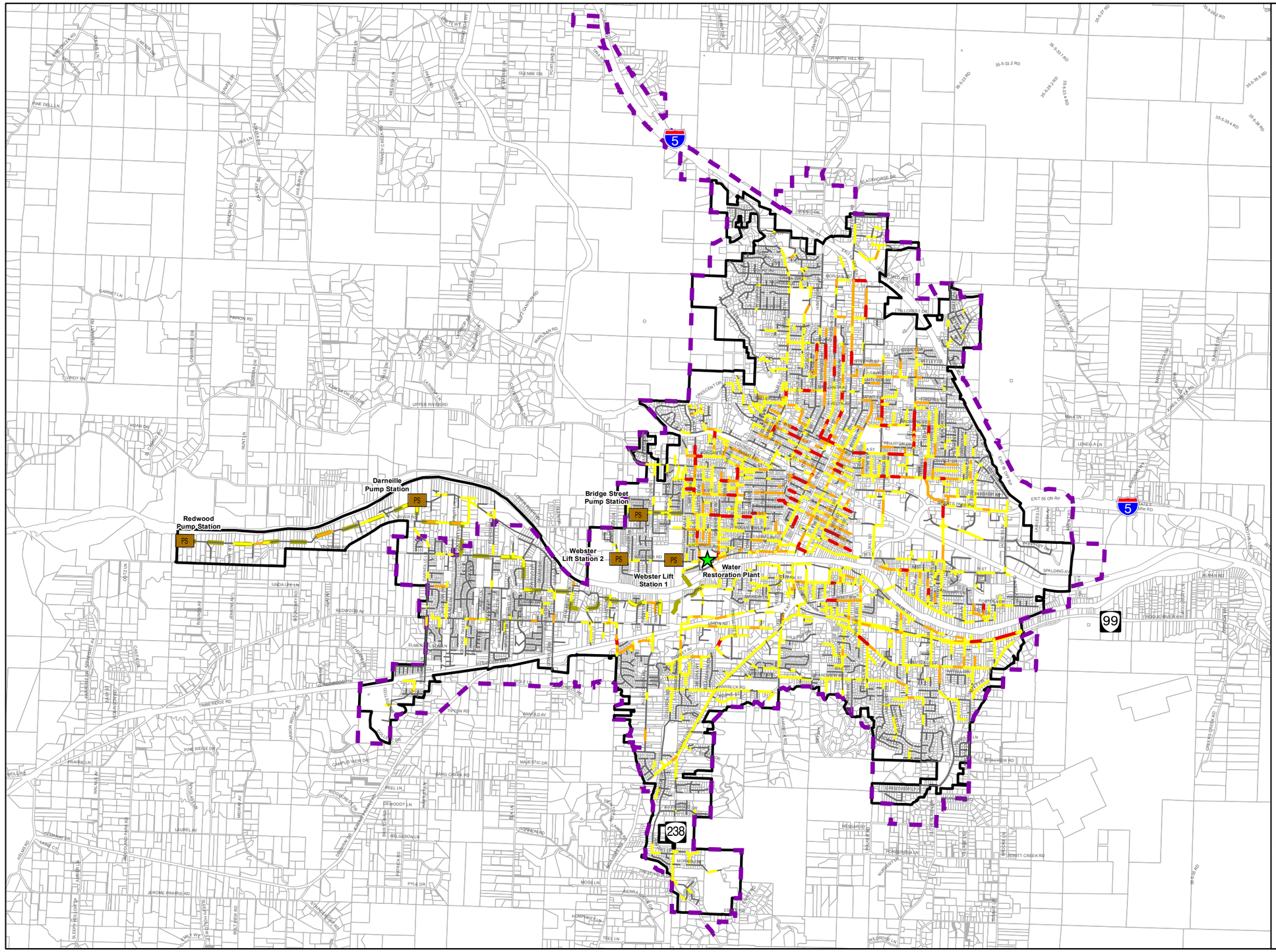

Legend

- WRP
- Lift/Pump Station
- Force Main

Maintenence and Structural Data Scoring

- 21 - 40
- 11 - 20
- 1 -10
- 0
- Existing Sewer Service Area
- UGB
- Tax Lots

Feet
0 5,000 10,000

Figure 4.19
Maintenance and Structural Data Scoring
Wastewater Collection System Master Plan
City of Grants Pass

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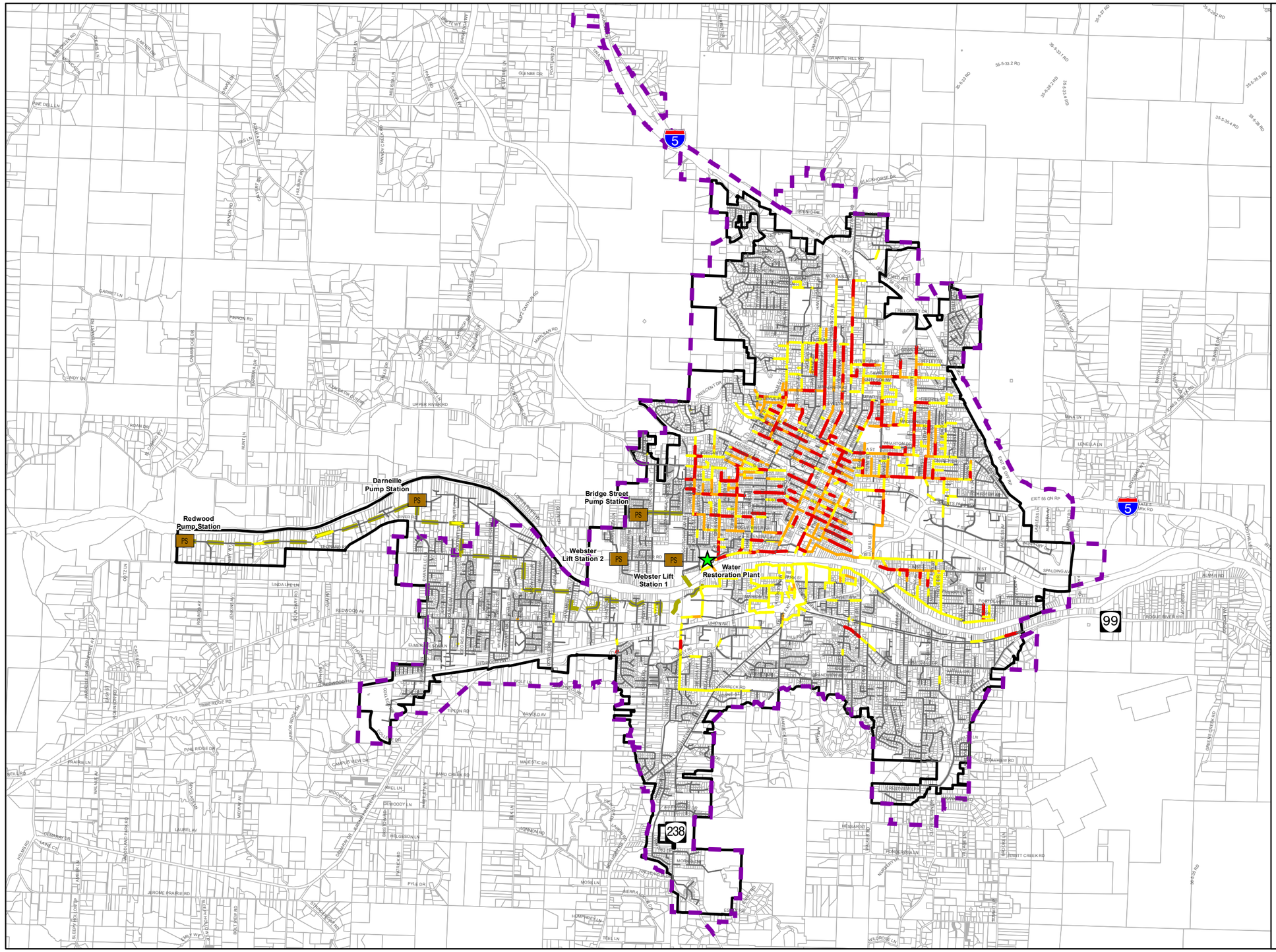

Legend

- WRP
- Lift/Pump Station
- Force Main

Pipes Recommended to be Replaced or Repaired

- 2015 - 2020
- 2021 - 2025
- 2026 - 2035
- Other Gravity Main
- Existing Sewer Service Area
- UGB
- Tax Lots

N

0 5,000 10,000 Feet

Figure 4.20
Condition Assessment Prioritization
Wastewater Collection System Master Plan
City of Grants Pass

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Table 4.8 Weighting Factors for Condition Assessment
Wastewater Collection System Master Plan
City of Grants Pass

Combined Maintenance and Structural Score

		0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	Total (ft)
RUL Score	**Over 20 years of RUL**	394,765	43,353	10,276	4,297	0	339	0	210	0	**453,239**
	Between 10 and 20 years of RUL	129,246	67,246	52,722	20,024	8,336	3,489	1,341	462	0	**282,867**
	Between 0 and 10 years of RUL	32,119	28,721	18,855	7,108	4,396	1,542	445	343	543	**94,071**
	0 years of RUL	28,674	32,897	24,124	21,892	14,938	10,344	7,007	1,215	1,477	**142,568**
	Total Length (ft)	**584,804**	**172,216**	**105,976**	**53,321**	**27,671**	**15,714**	**8,793**	**2,230**	**2,020**	**972,745**
	Percentage (%)	**60.1%**	**17.7%**	**10.9%**	**5.5%**	**2.8%**	**1.6%**	**0.9%**	**0.2%**	**0.2%**	**100.0%**

Proposed Replacement Year	Length (ft)	Percent System (%)
After 2035	722,267	74.3%
2026-2035	121,745	12.5%
2021-2025	64,141	6.6%
2015-2020	64,604	6.6%
Total (ft)	**972,745**	**100.0%**

4.3.6 Recommendations

This section provides guidelines for video inspection and condition assessment, including establishing standardized observation codes, data documentation procedures, and condition grading. Effective use of CCTV inspection data requires that the data recorded be consistent, complete, and capture in a format that can be readily accessed for analysis. Current industry best practice is to use the Pipeline Assessment and Certification Program (PACP) standards developed by the National Association of Sewer Service Companies (NASSCO). This program specifies observation codes and grades to be applied to all structural and maintenance-related defects.

The City has complete maintenance and structural data, and it is recommended that the City continues CCTV inspections and keeps updating its maintenance records. It is also recommended that PACP standards be adopted to facilitate analysis of data in the future. Under the PACP standards, all structural defects in any pipeline section are assigned a grade of 1 to 5, with 5 being the most critical condition. PACP standards also cover maintenance defects to use for maintenance planning purposes.

It is also recommended that the City develop an Asset Management Program (AMP) to store results and help making decisions on their repair and replacement (R&R) program. AMPs help utilities find the optimal timing for repair or replacement of assets by weighting the costs of continued maintenance against the costs of R&R. These plans also prioritize projects to reduce operation and maintenance risks with the goal of lowering cost to the ratepayers. An AMP includes level of risk, risk factors, results of risk-based analysis based on vulnerability and critically scoring, and implementation schedule. The AMP should be updated regularly (annually) to reflect changes made to the system. More detail on AMP recommendation can be found in Chapter 6 - Capital Improvement Plan.

4.4 CONDITION ASSESSMENT OF EXISTING PUMP STATIONS

A summary of condition assessment of the pump stations is presented in this section.

4.4.1 Webster Lift Station No. 1

The Webster Lift Station No. 1 has the following issues as noted during site visit. Webster Lift Station No. 1 is currently under design. Construction is planned to begin in 2016.

1. *Access and Maintenance*. Access to the buried dry pit is through a vehicle rated access hatch. This arrangement requires two staff for completing maintenance procedures due to confined space entry restrictions. Additionally, access hatches/manholes are not lined up with the pumps, making removal of pumps difficult.
2. *Corrosion*. The pump dry pit steel housing is corroded on visual inspection. The wet-pit manhole has no signs of hydrogen sulfide corrosion on concrete and appears to be in good condition. The original sewer was replaced by a 12-inch PVC sewer in the mid 1990's. The PVC sewer and manholes are in good condition.

3. *Aged Equipment*. The City replaced the impeller on one of the two pumps. The other pump has a worn impeller. The pump with the worn impeller discharges about one-third the capacity of the pump with the new impeller.

4. *SCADA Communication*. The SCADA equipment at the pump station is aged and nearing obsolescence. SCADA communication is currently through older hard wire telephone lines. Nuisance alarms occur which may be caused by shorting of wires.

5. *Public Visibility*. The existing pump station is in the roadway visible from the ball park and walkway. The City wishes to relocate to an area less intrusive and away from the roadway such that the operation and maintenance practices cause minimal disruption to park activities.

4.4.1.1 Webster Lift Station No. 1 Force Main

Since the lift station lifts flow and discharges back into the 12-inch gravity sewer, there is minimal piping and valving associated with this lift station. The maintenance crew generally does not have issues with Webster Lift Station No. 1.

4.4.2 Webster Lift Station No. 2

Webster Lift Station No. 2 is similar to Webster Lift Station No. 1 and has all the similar issues listed under 4.4.1.

4.4.3 Bridge Street Pump Station

The Bridge Street Pump Station has significant capacity and reliability issues related to the pump, guide rail, and level control issues at the pump station. These include:

1. *Poor fit of pumps and base elbow assemblies.* The fit of one pump is so severe that a large portion of the pumped flow discharges back into the wet well, reducing its capacity. Additionally, wear of the pump flange and/or base elbow may have occurred over time leading up to the current capacity issue.

2. *Severe Wear.* There is severe wear at the pump rail attachment points in addition to failing upper rail supports. The pumps cannot be accurately be positioned or reliable removed using the current guide rails.

3. *Unreliable Level Controls.* The pumps are started and stopped based on wet well level. However, level controls are unreliable and pumps may not be starting and stopping at the correct wet well level.

4. *Seismic Reliability.* Batteries for generators are not fastened for seismic restraint.

4.4.3.1 Bridge Street Force Main

The Bridge Street 8-inch and 4-inch force mains are in relatively good condition. The maintenance crew cleans the wet well using vactor trucks, and pigs the force mains once a year during low flow conditions. The odor control provided through carbon canisters along the force main routes are adequate. The City does not receive odor complaints.

4.4.4 Redwood Pump Station

The Redwood pump station is in generally good condition. The following major issues were noted:

1. *Safety.* Currently there is no safety grate below the hatch on the wet well. Installing a safety grate below the hatch would provide additional safety for staff observing the wet well. Additionally, above grade fuel tank may be subjected to vandalism. The above grade diesel tank is currently being replaced by an above grade propane tank.
2. *Seismic Reliability.* It is recommended to have the electrical and control panels restrained.
3. *Generator:* The generator at Redwood Pump Station is failing. A replacement has been purchased by the City.

4.4.4.1 Redwood Force Main

Similar to the Bridge Street force mains, the City maintenance crew cleans the wet well using vactor trucks once a year as part of their routine maintenance protocol.

4.4.5 Darneille Pump Station

Darneille pump station is relatively new pump station, however, the staff has reported several concerns:

1. *Wet Well Grease and Scum Issues.* Wet well design is a typical self-cleaning trench style channel. The City has stopped operating pumps in the self-cleaning mode because the pump at the end of the channel would clog.
2. *Wet Well Liner Issues.* The liner applied to the concrete wet well walls de-laminated from the concrete. Water got behind the liner resulting in bulges. In 2014, the City removed the liner from the wet well to keep the liner from plugging pump suctions leaving the concrete unprotected. The maintenance personnel noted that the concrete surface was soft when the liner was removed.
3. *Odor.* Hydrogen sulfide odor was detected out of carbon canisters, which had corroded tops and bolts.
4. *HVAC Issues.* The 18-inch diameter buried PVC exhaust air duct for the lower level of the pump room has a leak. Water drained from the duct into the room damaging sound attenuation panels. The City disconnected a transition duct from the exhaust fan to the PVC duct to allow the water to drain into the room. With the duct removed, the exhaust fan discharges back into the room. Additionally, all exhaust is from the ceiling of the pump room. There is no way to exhaust air from the floor level.
5. *Seismic Reliability.* Pipes, electrical and control panels do not have seismic bracing.

4.4.5.1 Darneille Force Main

The Darneille force main has significant grease and plastics issues. The City maintenance crew spends roughly 4-6 hours every week cleaning the wet well using their vactor truck to control the amount of grease and plastics conveyed through the system. In addition to cleaning the wet well, the force main vacuum release valves (VRVs) and ARVs are cleaned periodically.

The staff encounters the following issues during valve maintenance:

- Valve boxes for Darneille force main are located on busy streets requiring the staff adopt traffic control.
- Requires confined space entry.
- Heavy metal valves are difficult to work with and foul easily. Staff has replaced all VRVs with newer plastic body valves that are lighter and more stable.

4.4.6 Pump Station Condition Assessment Recommendations

A summary of condition assessment rating for each pump station is presented in Table 4.9. Each pump station was assessed on six categories based on a rating scale of 1 to 5 (1 being poor condition/least favorable and 5 is most favorable). These were based on visual inspection of the facilities, input from the City, and existing pump station records.

Based on these assessments, Webster Lift Station No. 1 and Bridge Street Pump Station will be replaced and rehabilitated, respectively within the current 5-year Capital Improvement Plan (CIP). The Webster Lift Station No. 2 is recommended to be replaced in the short - term (before 2025). Darneille Pump Station alternative analysis is recommended to be completed within the current 5-year CIP. Further discussion on Darneille Pump Station recommendation is located in Chapter 5 - Capacity Analysis.

Investigation in the Redwood area is recommended to address grease and plastics issues.

Table 4.9 Pump Station Condition Assessment Summary
Wastewater Collection System Master Plan
City of Grants Pass

Pump Station	Structural	Mechanical	Electrical	I&C	Site/ Civil	O&M	Rehab Anticipated During Planning Period?
Webster No. 1	1	1-2	1	1	2	1	Yes, under design
Webster No. 2	1	1-2	1	1	3	1	Yes, before 2025
Bridge Street	4	2	4	4	5	3	Yes, before 2020
Redwood	5	5	5	5	4	4	No
Darneille	1 (wet well) 2 (superstructure)	2-4	5	5	4	2	Yes, before 2025

Rating Scale:
(1) Poor condition.
(2) Needs work.
(3) Can live with it.
(4) Performs well.
(5) Want to see this at all our sites.