

Appendix Q

Pipe Replacement Plan Scoring And Figures

Figure Q1

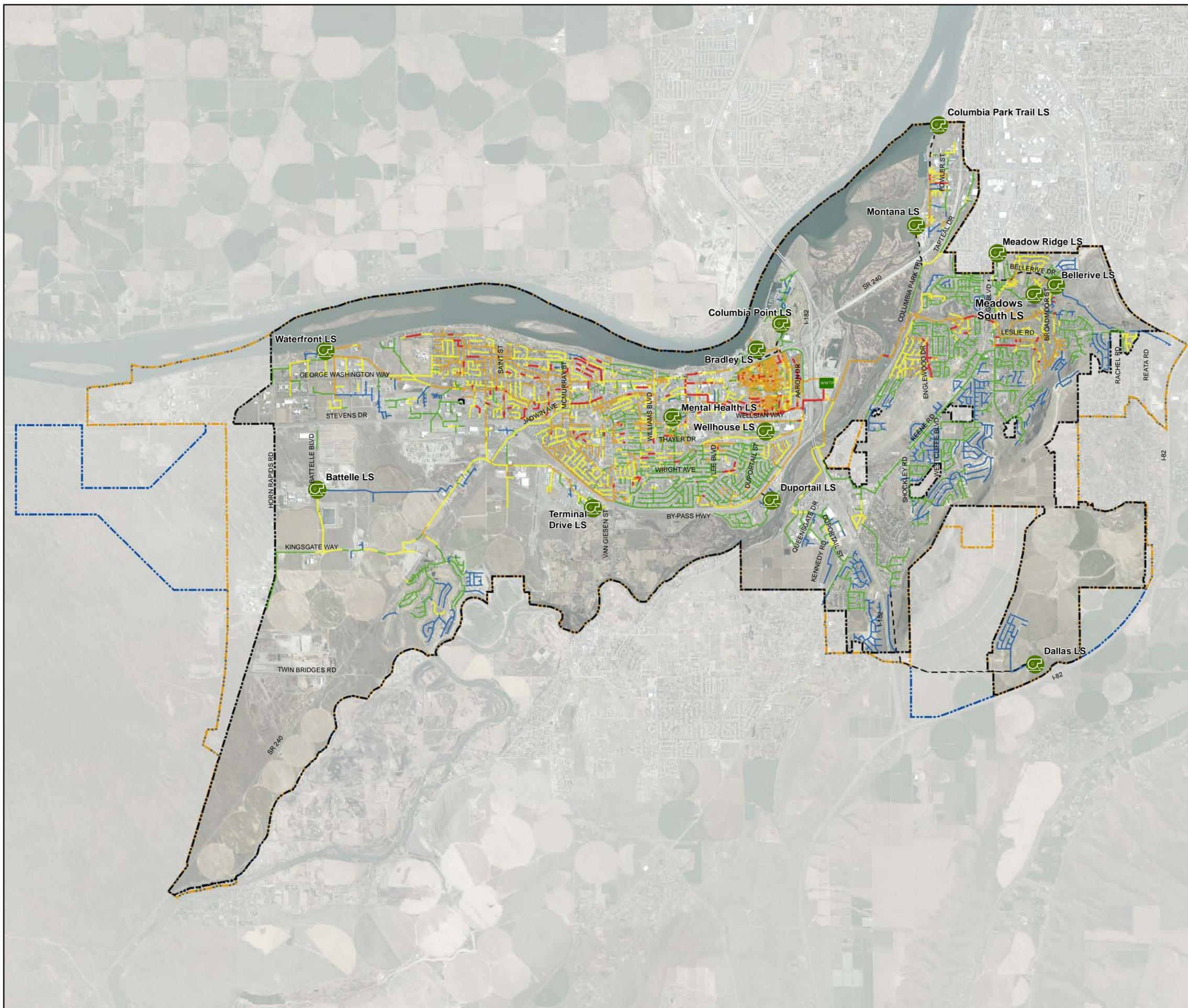
Prioritization Score
Given Current COR Data
75% LoF, 25% CoF

Legend

- City Limits
- UGA
- 50-yr Planning
- Waste Water Treatment Plant
- City Lift Stations

Prioritization Grade

- A
- B
- C
- D
- F



0 6,000 12,000 Feet



Date: Mar 30, 2016





Figure Q2

Prioritization of CCTV

50% LoF, 50% CoF

Legend

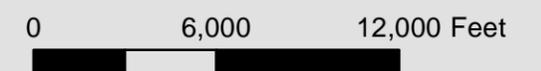
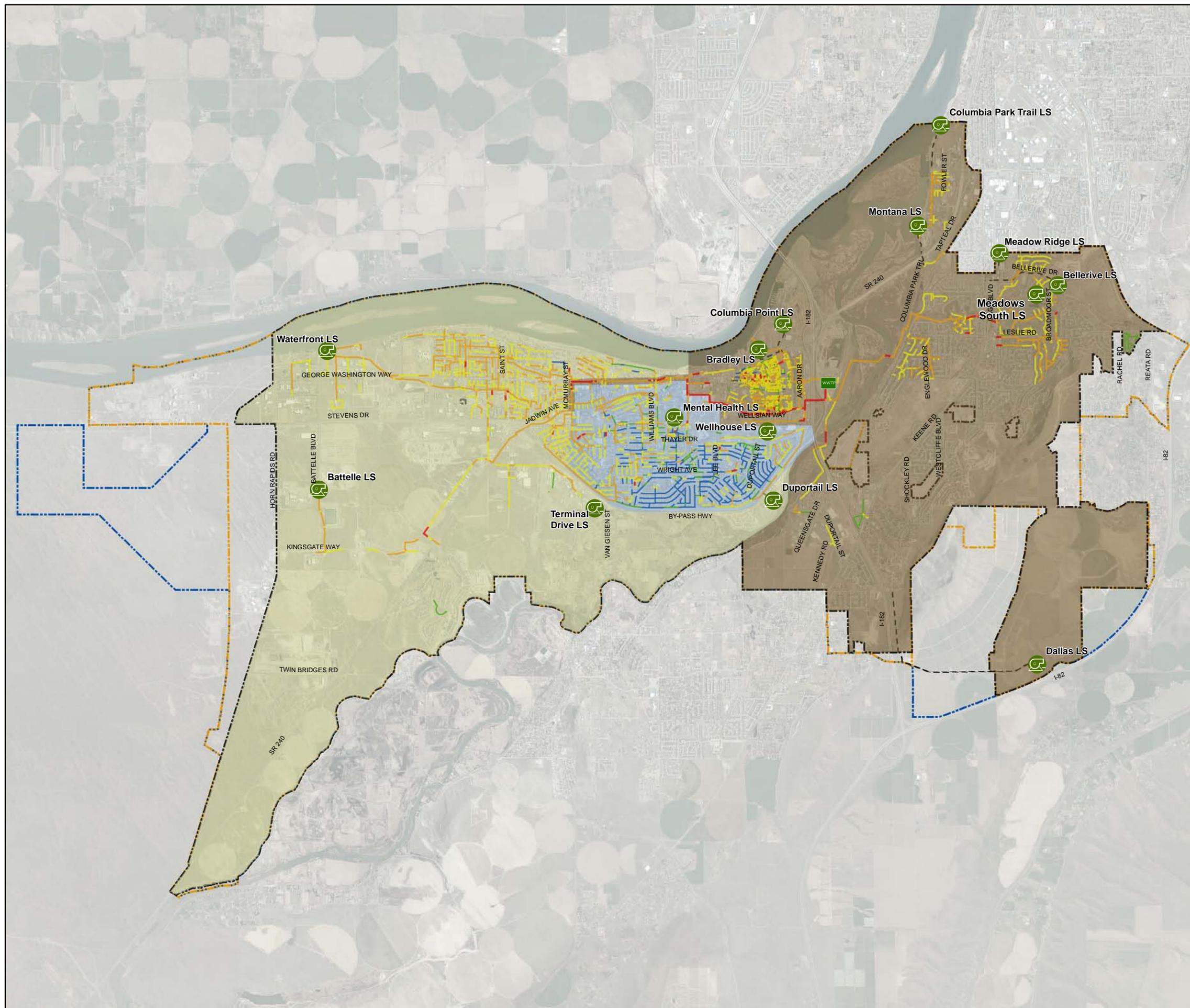
- City Limits
- UGA
- 50-yr Planning
- Waste Water Treatment Plant
- City Lift Stations

Prioritization Grade of CCTV

- A
- B
- C
- D
- F

CCTV Group

- 1 (291,119 LF)
- 2 (331,449 LF)
- 3 (282,794 LF)



Date: Mar 30, 2016





Pipe Prioritization Summary

PROJECT:	COR General Sewer Plan Update	DATE: 3/31/2016
CLIENT:	City of Richland	
CLIENT PROJ. NO.	J-U-B PROJ. NO.: 30-14-022	

		Prioritization Score (40-68)	System Total ¹	
Pipe Segments		102	6872	
Likelihood of Failure	PACP	Score(≥ 4)	3	
	Material	Concrete (100)	99	2692
		Clay, Asbestos Concrete (90)	-	24
		Metal (80)	3	142
		Age	≥ 30 years (100)	93
		25-30 years (80)	-	161
		20-25 years (60)	9	626
	O&M	≤ 6 Months (100)	9	26
		6-12 Months (80)	39	70
		12-18 Months (60)	4	44
Consequence of Failure	Size	≥ 42"Ø (100)	35	89
		36"Ø-42"Ø (90)	-	5
		30"Ø-36"Ø (80)	1	29
		≤ 6"Ø (50)	21	665
	Flow	8.9 gpm (100)	3	3
		4.45 gpm (≥50)	25	22
	Depth	≥ 30 feet (100)	2	54
		25-30 feet (80)	-	13
		20-25 feet (60)	17	51
	Location	Score (≥50)	3	96

¹ System Total values are based on all active and COR owned pipes.

Pipe Diameter	Total Length of Pipe in Ft. (Score 40-58)
6-inch	2,845
8-inch	5,365
10-inch	1,475
12-inch	909
15-inch	51
21-inch	2,427
24-inch	240
30-inch	428
54-inch	15,214

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Likelihood of Failure (LoF) Criteria (50%)

1. LoF Granite XP Total Pipe Score (10%)

A score from 0 to 100 is generated automatically by Granite XP software. If a score has not yet been assigned to a pipe segment then an estimated score will be made and confirmed by City staff. Note: Percentage was lowered because City staff noted current inspection effort is more focused on new pipes and not on existing system.

2. LoF Pipe Material (25%)

Generally Pipe Material has already been recorded in the GIS data, however, if a pipe does not have a material assigned then it will be estimated based on considering material data on nearby pipes and when a neighborhood was developed or a house was built. To generate a score, from 0 to 100, here is the scoring breakdown:

- PVC (Poly Vinyl Chloride) = 0
- CIPP (Lined) = 30
- DI (Ductile Iron) = 80
- CI (Cast Iron) = 80
- CP (Corrugated Pipe) = 80
- STL (Steel) = 80
- AC (Asbestos Concrete) = 90
- CL (Clay) = 90
- CON (Concrete) = 100

3. LoF Pipe Age (25%)

Like Pipe Material, Pipe Age will be determined by current GIS data, otherwise, an age will be estimated based on considering nearby pipes, with material data, and when the neighborhood was developed or the house was built. To generate a score, from 0 to 100, here is the scoring breakdown:

- 0 to 10 years = 0
- 10 years to 15 years = 20
- 15 years to 20 years = 40
- 20 years to 25 years = 60
- 25 years to 30 years = 80
- Over 30 years = 100

4. LoF Time Since Last CCTV Inspection (10%)

As CCTV data is collected a time stamp is attached to each pipe segment. The number of years since the last CCTV inspection is calculated based on this date. To generate a score, the following is proposed:

Since it takes about 10 years to CCTV the entire city the score breaks down as follows:

- More than or equal to 10 years = 100
- More than or equal to 7 years = 75
- More than or equal to 5 years = 50
- More than or equal to 3 years = 25
- Everything else = 0

5. LoF O&M Cleaning Frequency (30%)

The City has a PM List for Sewer based on field observations and institutional knowledge about problem areas in the system. To generate a score, the following is proposed:

- Routine = 0
- Quarterly = 50
- Monthly = 100

Consequence of Failure (CoF) Criteria (50%)

1. CoF Pipe Size (15%)

Generally the Pipe Size has already been recorded in the GIS data, however, a size can be estimated based on considering nearby pipes. To generate a score, from 0 to 100, here is the scoring breakdown:

- Greater than or equal to 42" = 100
- Greater than or equal to 36" = 90
- Greater than or equal to 30" = 80
- Greater than or equal to 24" = 70
- Greater than or equal to 21" = 60
- Greater than or equal to 18" = 50
- Greater than or equal to 15" = 40
- Greater than or equal to 12" = 30
- Greater than or equal to 10" = 20
- Greater than or equal to 8" = 10
- Less than or 8" = 50, to give a higher score to these pipes as they have been problematic
- If no diameter has been recorded or if it is unknown, then score is 0.

2. CoF Existing Peak Flow (15%)

Peak Flow values will be generated by the City Sewer Model as needed for calculation. Scoring will be based on the following:

- Peak flow values are multiplied by a factor to generate a score from 0 to 100. The factor will come from dividing 100 by the highest peak flow value; thereby distributing scores from 0 to 100.

3. CoF Pipe Depth (30%)

Pipe depths (in feet) are assigned to pipe from the lowest manhole invert elevation that the pipe is attached to in the GIS data. Scoring will be based on the following:

- Deeper than or equal to 30 Feet = 100
- Deeper than or equal to 25 Feet = 80
- Deeper than or equal to 20 Feet = 60
- Deeper than or equal to 15 Feet = 40
- Deeper than or equal to 10 Feet = 20
- If no value assigned or if less than 10 feet deep, then score is 0

4. CoF Location (40%) (Proximity to Waterways, Roads, Railroads, & Imp. Locations)

Location scores are based on comparing the pipe segment location to the nearest waterways, roads, railroads and predetermined set of important locations (Hospital, Schools, etc).

- Waterways: Polygon shapefile of Yakima River ave water level
- Roads: City Road shapefile. Road classification types are used to determine scores. The higher the traffic volume, the greater the effect on the risk score.
- Railroads: City Railroad Shapefile

Scoring will be based on the following:

- Distance from major waterway: Greater than 400 feet = 0, 200 to 400 feet = 20, 100 to 200 feet = 40, 50 to 100 feet = 60, 10 to 50 feet = 80, 1 to 10 feet = 90, Pipe Crosses Waterway = 100
- Roads - if any portion of pipe segments falls within 100 feet of the following roadway classifications: State Highway = 100, Principal Arterial = 90, Minor Arterial = 70, Collector = 50, Residential = 30
- Railroads – if pipe crosses railroad assign score of 100, if not assign score of 0