

# ASSET MANAGEMENT

AN APPROACH FOR PRIORITIZING PIPELINE REPLACEMENT

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# Overview

- Central Shoshone County Water District (CSCWD)
- Inherited systems
- Large amount of non-revenue water
- Multiple challenges
  - Old lines
  - Questionable record information
  - Need an useable, inexpensive, approach to system repair

# Outline

- Background
- CSCWD Leak Detection Monitoring
- Review of GIS and Asset Management
- CSCWD Asset Management Approach
- Conclusion/Take-Aways
- Questions

# Background – District History

- Original Construction in Early 1900s
  - Bunker Hill Water
  - Kellogg Power and Water
- Systems Inherited by Shoshone County
- District formed early 1990s



# Background – Where is CSWSD?



# Background – System

- System at a Glance
  - ~72.5 miles of pipeline
    - Pipeline size ranges from <2-inch to 24-inch
    - Pipeline material varies (steel, AC, PVC, DI, etc.)
  - 9 pump stations
  - 14 Storage Tanks



# Background – Demand and ERUs

- Existing Conditions
  - ~2,820 residential connections
  - ~3,138 ERUs
- System Production (2013)
  - Average Day = 2.9 MGD
    - 920 gal/ERU/day
  - Maximum Day = 4.3 MGD
    - 1,370 gal/ERU/day

# Background – Water Loss



# Background – Water Loss

- 2008 – Replaced two wooden stave water tanks
- 2009 – Metered the entire District with a radio read system



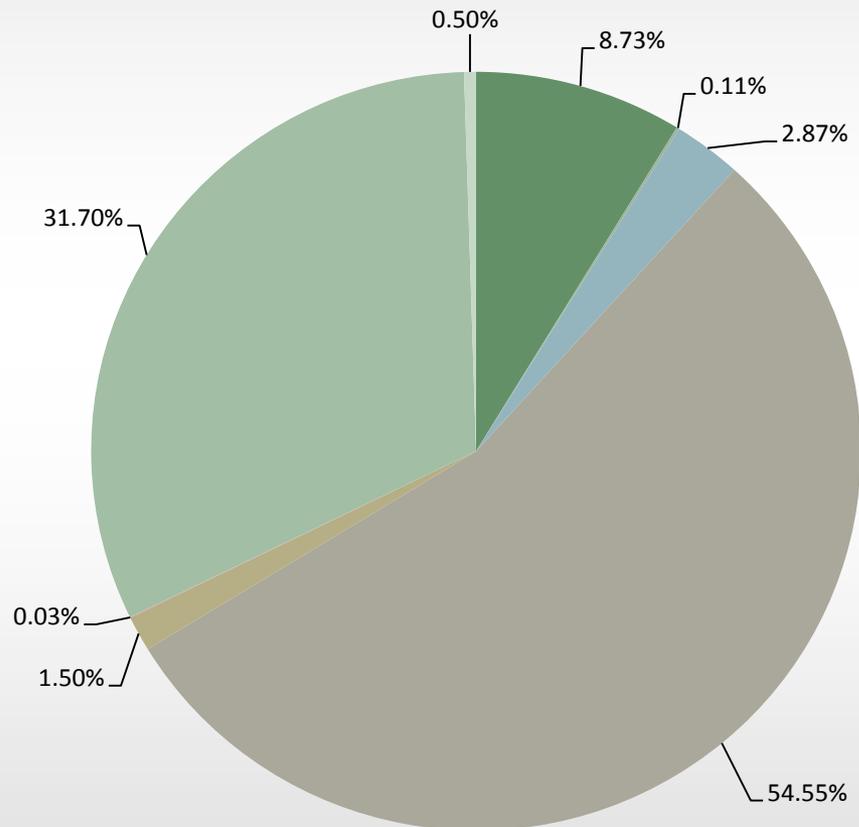
CSC Water Production	2007	2013	% Reduction
Average Day (MGD)	3.42	2.9	18
Maximum Day (MGD)	5.53	4.3	28

# CSCWD Leak Detection Monitoring

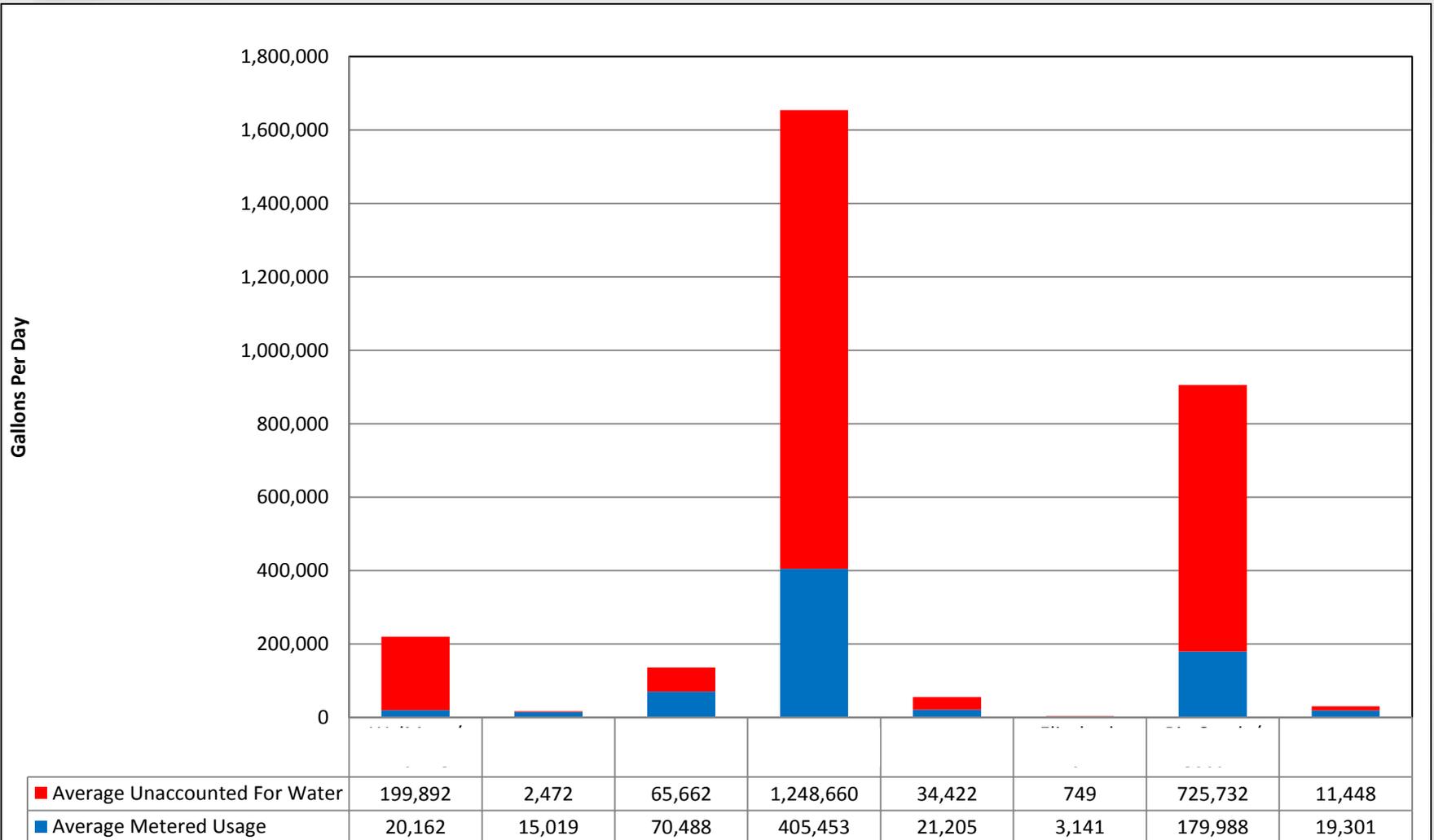
- An effort by the District to quantify and locate areas of their system with high non-revenue water loss
- Uses a combination of
  - WTP output data
  - Pumping station flows
  - Consumption via individual meters

# CSCWD Leak Detection Monitoring

Percentage of Total System Leakage by Zone



# CSCWD Leak Detection Monitoring



Next Step – Figure Out What to Fix

# Asset Management Review

- Operative/Reactive
  - AKA “Fail and Fix”
  - Operating an asset through its complete useful life
  - Funding maintenance is difficult since projects are only performed on an emergency basis
  
- Inspection/Condition-Based
  - AKA “Find and Fix”
  - Identify assets that are approaching failure
  - A consistent prioritization approach is critical

# Asset Management Review

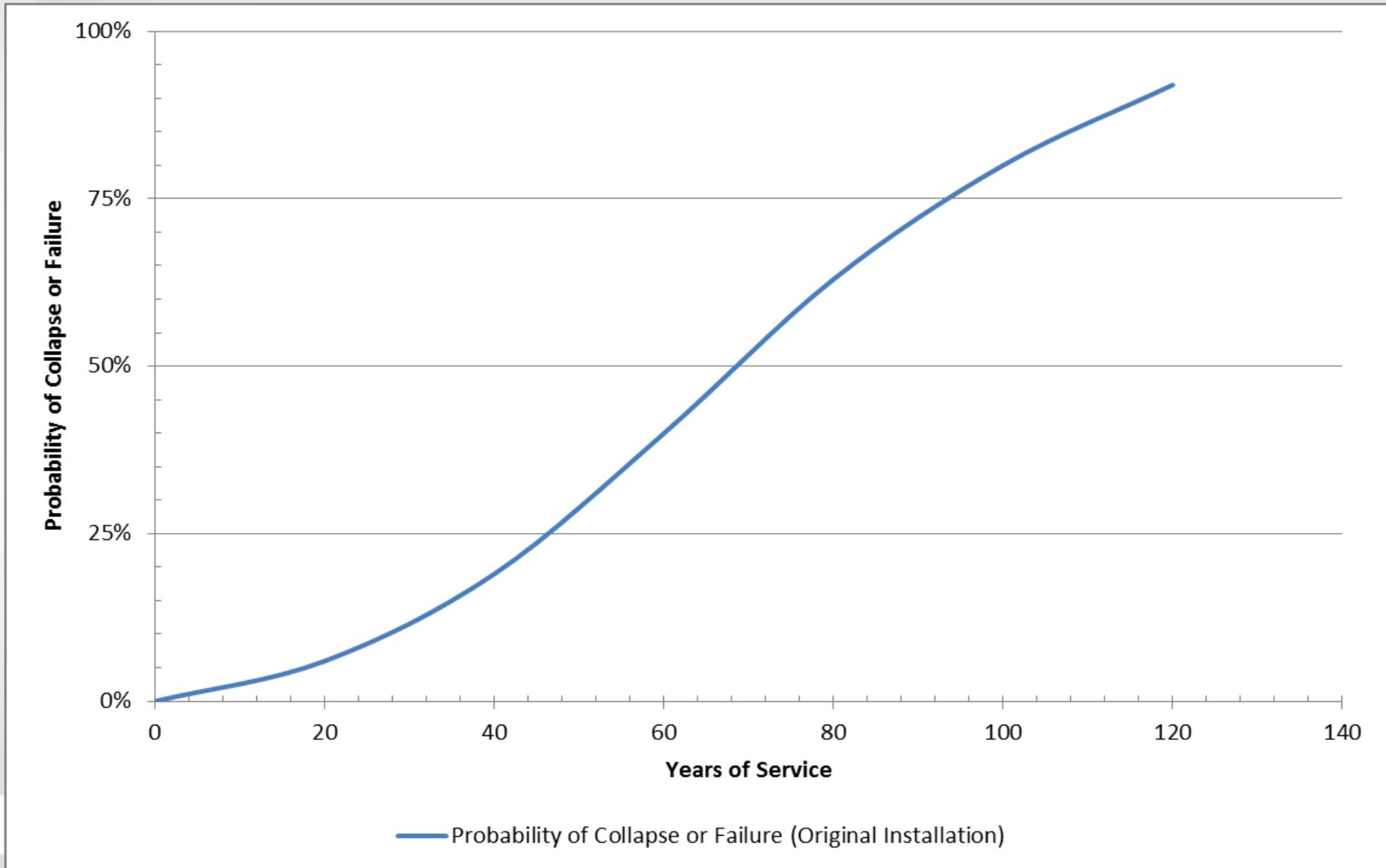
- Proactive

- Involves replacing or rehabilitating an asset before there is a likelihood of failure
- Involves regular inspections and condition assessments

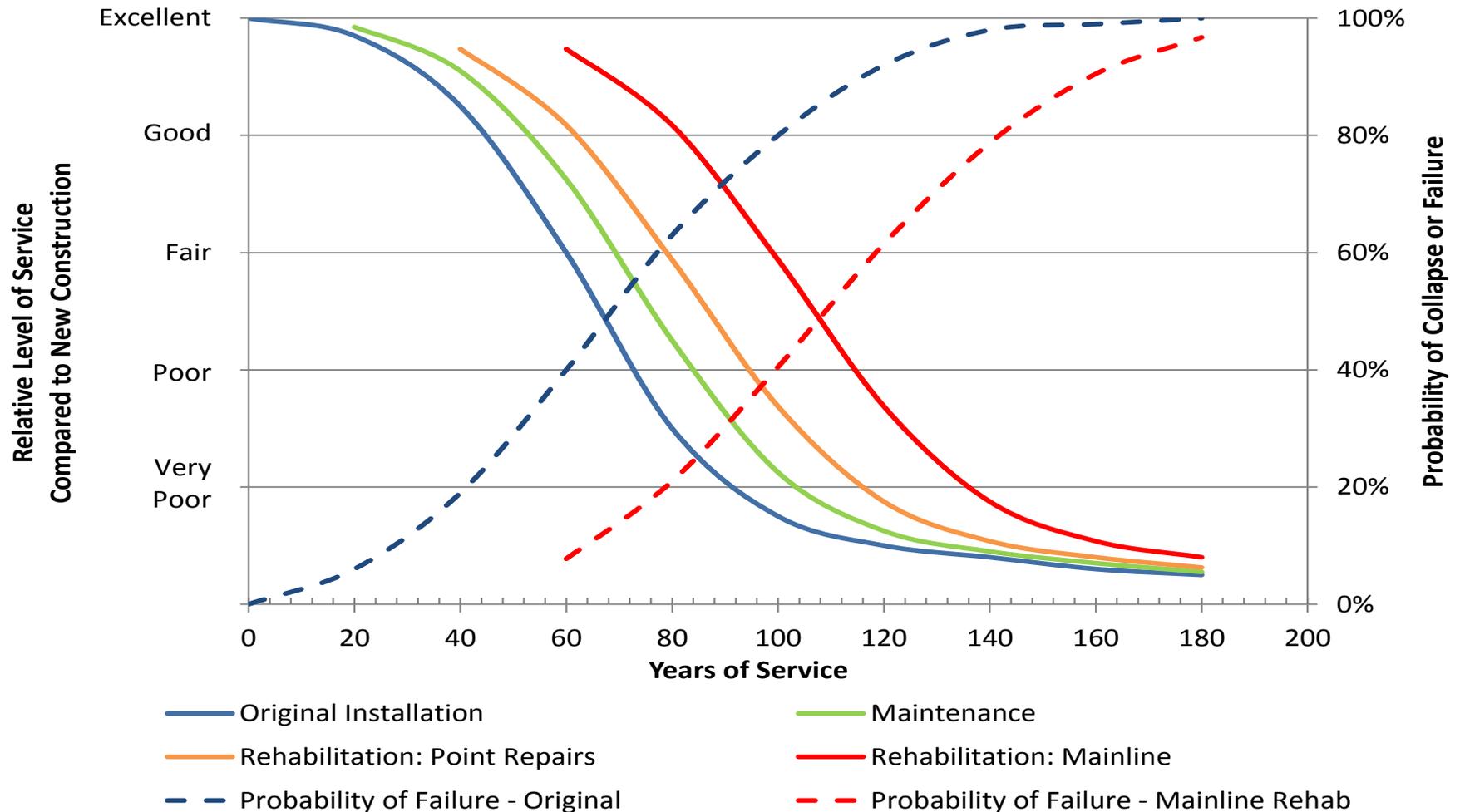
- Predictive

- Considers many criteria to minimize the life cycle cost of an asset
- Includes condition assessment and future projections

# Failure Probability Example



# Theorized Deterioration Cycles



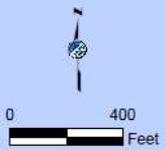
# GIS Review

- GIS – Geographic Information System
- Software is designed to store, manage, analyze, and display all forms of geographically referenced information
  - Relevant Items for a Water System: Pipe size, age, material, last maintenance, etc.
- Range from simple to complex

# GIS Review



**CSCWD**  
Water System  
Mapbook  
Pipe Size



**Legend**

Pipe Sizes

2 Inch
4 Inch
6 Inch
8 Inch
10 Inch
12 Inch
16 Inch
18 Inch
24 Inch
Other



March 20, 2014

Next Step – Apply This to Our System

# CSCWD Asset Management Approach

- Pipeline Prioritization
  - Condition Assessment
    - Material
    - Age
    - Leakage
  - Risk Assessment
  - Overall Priority = Condition + Risk

# CSCWD Approach – Condition Assessment

Condition Score	Material	Age	Leakage
10 (Worst)	Galvanized Steel	Greater than 60 years old	<2200 (gallons/in-dia* <u>mile</u> ) per day
9	Steel and Dipped/Wrapped Steel		
8	Cast Iron		
7		40 to 60 years old	
6			
5			<1000 (gallons/in-dia* <u>mile</u> ) per day
4			
3	Ductile Iron	20 to 40 years old	
2	AC		
1 (Best)	PVC, HDPE (Poly)	<20 years old	<20 (gallons/in-dia* <u>mile</u> ) per day

# CSCWD Approach – Risk Assessment

Risk Score 10 (worst) to 1 (best)	Size
10	24" pipes and larger
8	18" pipes
6	14" to 16" pipes
4	12" pipes
3	10" Pipes
2	8" pipes
4	6" pipes
6	4" pipes
8	2-3" pipes
10	<2" pipes

- Large Lines
  - Serve more ERUs
  - Higher Pressures
  - Higher Consequence to Line Failure
- Small Lines
  - Structural weakness
  - High leakage potential

# CSCWD Approach – Overall Prioritization

$$Priority\ Score = \left( \sum \{ (CS_M * WF_M) + (CS_{Age} * WF_{Age}) + (CS_L * WF_L) + (RS_{Size} * WF_{Size}) \} \right)$$

Where:

- $CS_M$  = Condition Score for Pipe Material
- $CS_{Age}$  = Condition Score for Pipe Age
- $CS_L$  = Condition Score for Pipe Leakage
- $RS_{Size}$  = Risk Score for Pipe Size
- $WF$  = Weighting Factor

## ■ Weighting Factors

- Developed and adjusted based on review of the data reliability and input from District staff

	Material	Age	Leakage	Size
<b>Weighting Factor</b>				
1 (lowest importance) to 10 (highest importance)	9	8	3	5

# CSCWD Approach – Overall Prioritization

Priority Score Range	Condition Rating	Priority for Replacement	Description
0-75	A	Low (Best Condition)	The line is generally considered in good condition, and repairs are not currently needed (no action required).
76-175	B	Moderate	The line is generally considered as serviceable; however, corrective actions are likely needed within the next 10 to 15 years to maintain a high level of service.
176-200	C	Poor Condition	The line is generally considered as being in poor condition with corrective actions needed very soon to maintain system integrity.
>200	D	High (Worst Condition)	The line is generally considered as being at the end of its useful life and in very poor condition with significant corrective actions needed as soon as possible to maintain a high level of service.

# CSCWD Approach – Prioritization Results

Condition Rating	Overall Priority Score	Length - Feet (miles)	Percent of the System (%)
A	0-75 (Best)	127,083 (24.06)	33.2
B	76-175 (Moderate)	114,100 (21.61)	29.8
C	175-200 (Poor)	73,474 (13.91)	19.2
D	>200 (Worst)	68,282 (12.93)	17.8

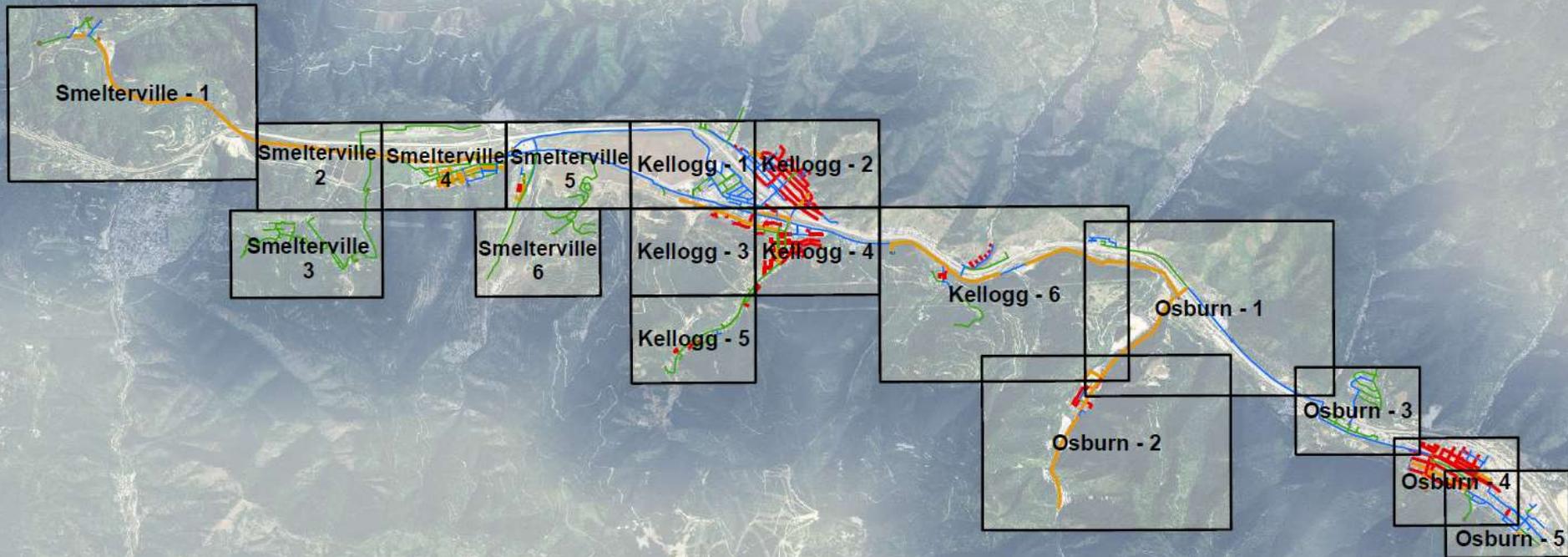
- Pipes with a Condition Rating “D” group scored highest (worst) in the prioritization ranking and are likely at the end of their useful life and in need of replacement.
- Pipes with a Condition Rating “C” group scored very high (poor) in the prioritization ranking and are likely nearing the end of their useful life and in need of replacement following Group D work.
- Condition Rating “B” pipes likely have some useful life left but still need to be scheduled for replacement.
- Condition Rating “A” pipes scored lowest (best) in the prioritization ranking and have the majority of their useful life left and therefore do not need to be replaced.

# Projected Costs

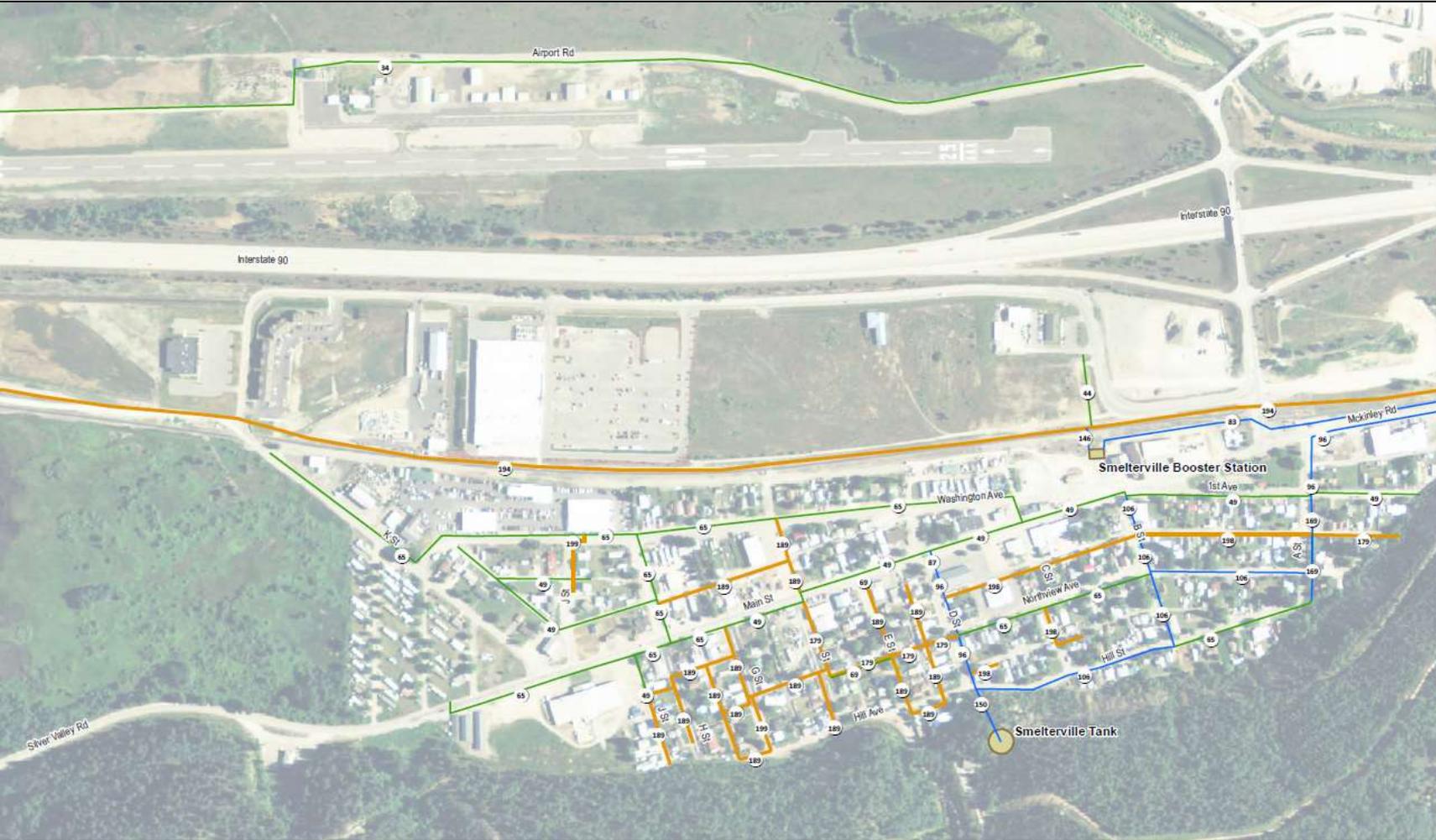
Condition Rating Group & Work Area	Length - Feet (miles)	Opinion of Probable Cost (Millions \$)
A	127,083 (24.06)	\$24.25 M
B	114,100 (21.61)	\$23.44 M
C	73,474 (13.91)	\$15.68 M
D	68,282 (12.93)	\$10.02 M
Pump Stations	-	\$ 3.36 M
Tanks/Reservoirs	-	\$1.54 M
<b>Total</b>	<b>382,939 (72.51)</b>	<b>\$54.04 M (\$78.29 M including "A" Work)</b>

# CSCWD Approach – Prioritization Results

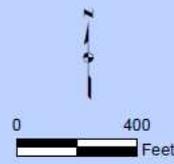
## CSCWD System Mapbook Condition Rating



# CSCWD Approach – Prioritization Results



## CSCWD Water System Mapbook Condition Rating



**Legend**

Condition Rating	Score Range
<span style="color: green;">—</span>	A (Best: 0-75)
<span style="color: blue;">—</span>	B (Moderate: 75-175)
<span style="color: orange;">—</span>	C (Poor: 175 - 199)
<span style="color: red;">—</span>	D (Worst: 200 or more)

65 Condition Total Score

# Summary

- Background
- CSCWD Leak Detection Monitoring
- Review of GIS and Asset Management
- CSCWD Asset Management Approach

# Conclusion/Take-Aways

- Evaluate your current approach to asset management
- GIS/Prioritization allows you to better understand your system
  - Existing condition
  - Repair/rehabilitation needs

# Conclusion/Take-Aways

- Plan the Work, Work the Plan
- Transition “up” the asset management hierarchy
  - i.e., “fail and fix” to “find and fix” to predictive
- Continually Update
  - This is a living document

# Acknowledgements

- Central Shoshone County Water District
  - Barney Norris – Manager
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# QUESTIONS?

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