A UTILITY'S PERSPECTIVE: ASSET MANAGEMENT AND WATER LOSS CONTROL

Governor's Conference on the Future of Water in Kansas – 2018

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Agenda

- Meet WaterOne
- Water Loss
- Asset Management
  - Production
  - Distribution
- Conclusions
- Questions

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MEET WATERONE

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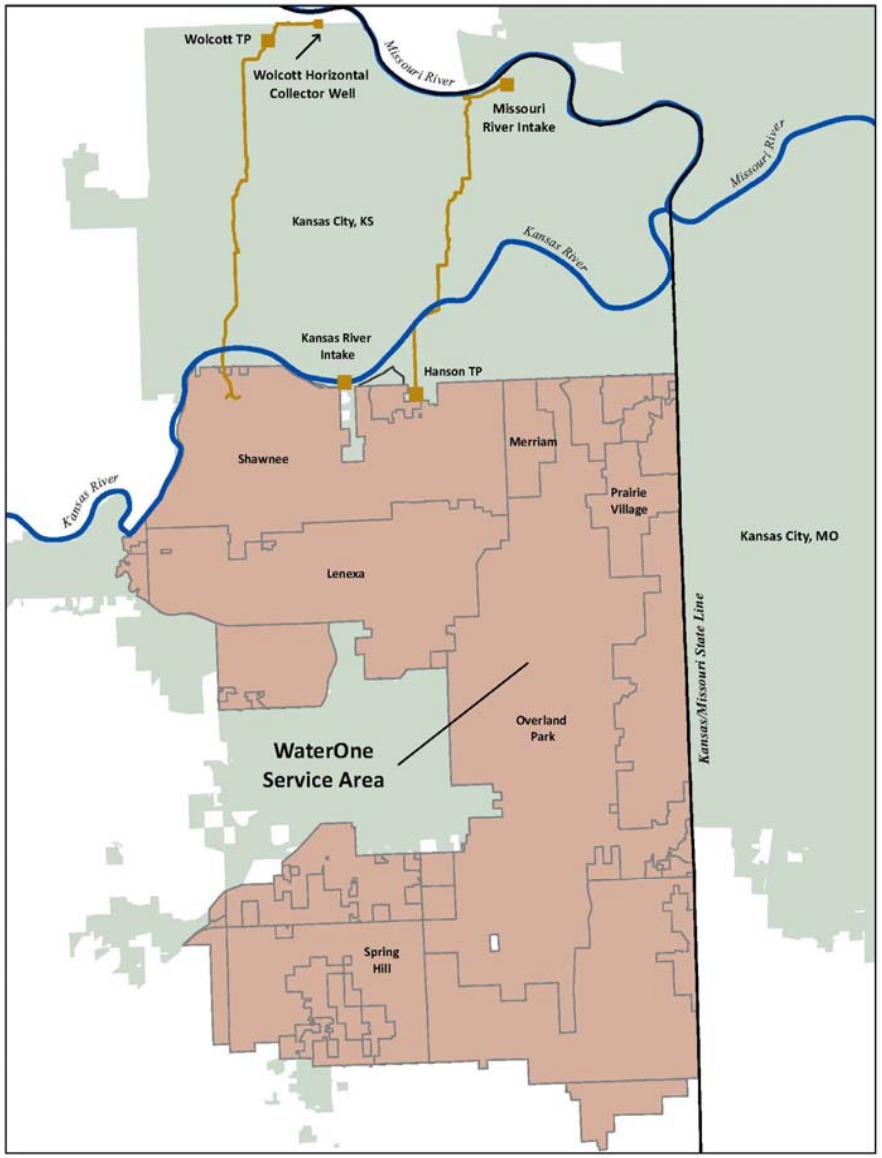
Meet WaterOne

- Johnson County, Kansas
  - Suburbs of Kansas City metro area
- Quasi-municipality
  - Independent, non-profit water-only
- 272 square mile service area
- 17 municipalities
- 395 FTEs
- Annual Revenue $116 million



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Meet WaterOne

- 146,000 service connections
  - 440,000 residents served
- 200 MGD treatment capacity
- 350 MGD peak hour capacity
- 2,700+ miles of main
- 18,000+ fire hydrants
- 47,000+ valves

Our Vision –"Setting the Standard for Utility Excellence"

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WATER LOSS CONTROL PROGRAM

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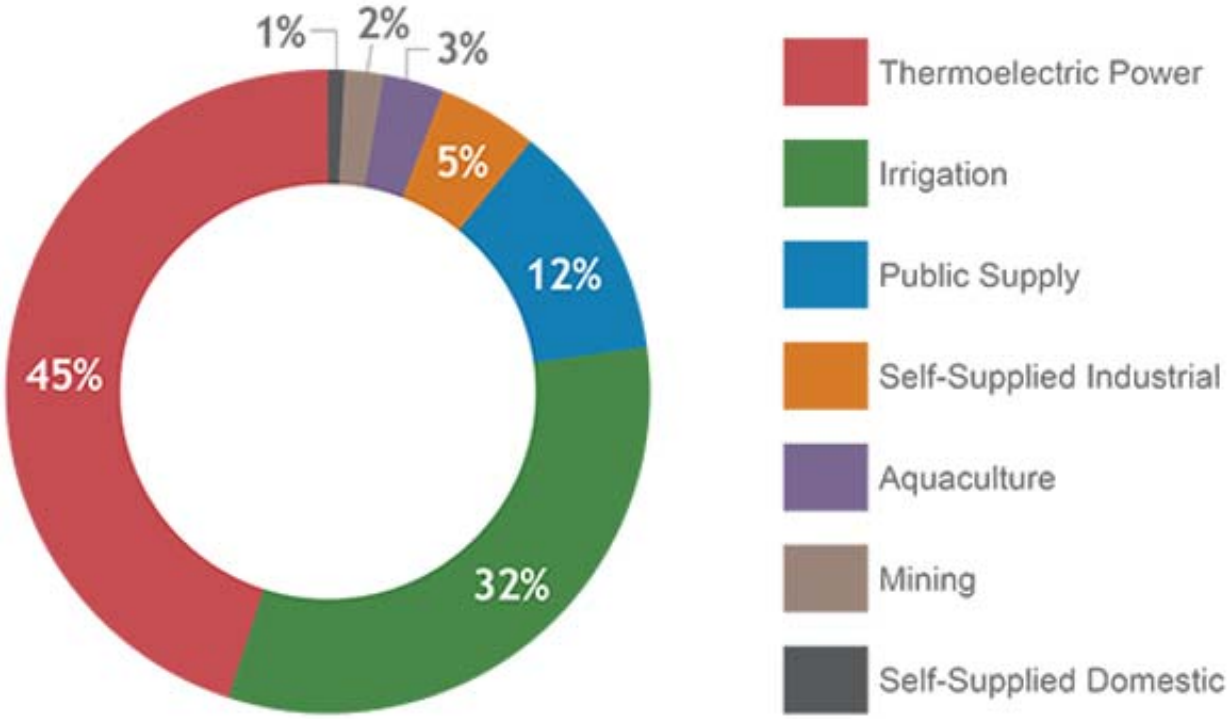
U.S. Freshwater Withdrawals



*Livestock is approximately less than 1% of total use and is not included.

How Much Water Do We Use?

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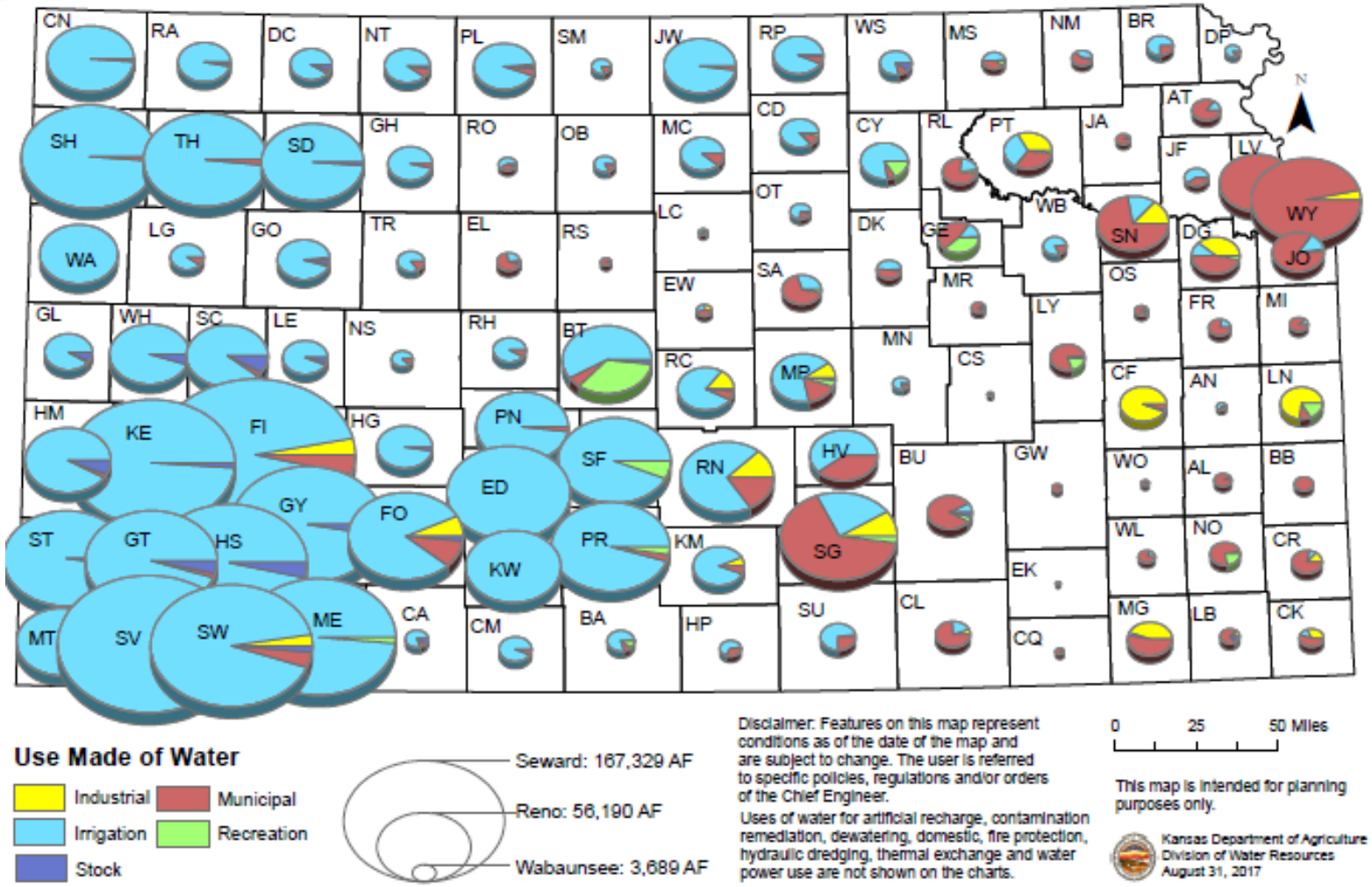
Reported Water Use for Kansas Counties-2016

- 85% Irrigation
- 10% Municipal
- 5% Industrial, recreational, stockwatering, hydraulic dredging and other uses
- 5 to 6 million acre-ft



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Water Loss

- Municipal
  - 246 utilities surveyed - 130.1 billion gallons
  - Over 50,000 utilities in the United States
  - Average water loss ~25%
  - Water Loss also referred to as Non-Revenue Water (NRW)

- Irrigation
  - Evaporation rates vary
  - Irrigation methods vary
  - Traditional center pivot systems
  - Retrofit with i-Wob/drag lines
  - Claim up to 90% reduction in evaporation

WaterOne analyzes NRW to ensure …

- Business efficiency
- Customer equity - everyone's paying their fair share
- We understand our system's use and performance
  - Helps drives decisions
  - Asset management
- To be good stewards of the environment – water is our most precious resource

Reasons for NRW

- Main breaks
- Meter inaccuracy – consumption not registered at the meter
- Authorized unmetered consumption (fire protection)
- Unauthorized consumption (theft)
- Unavoidable Losses

How do you get started?

- Resources available from the American Water Works Association (AWWA)

- AWWA Manual of Water Supply Practices M36 – Water Audits and Loss Control Programs
  - Includes software

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Components of a Water Loss Control Program

1. Water Audit – AWWA M36
2. Intervention – Take corrective action
3. Evaluation of KPI's
4. This is a long term process

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Data collected for NRW review

- ✓Volume from own sources
- ✓Water imported
- ✓System input volume
- ✓Water supplied
- ✓Water exported
- ✓Authorized consumption
- ✓Biller water exported
- ✓Billed meter consumptions
- ✓Revenue water
- ✓Unbilled meter consumption
- ✓Unbilled unmetered consumption
- ✓Systematic data handling errors
- ✓Customer metering inaccuracies
- ✓Unauthorized consumption
- ✓Leakage on Transmission and Distribution mains
- ✓Leakage on Overflows at Utility's Storage Tanks
- ✓Leakage on service connections up to the point of customer metering

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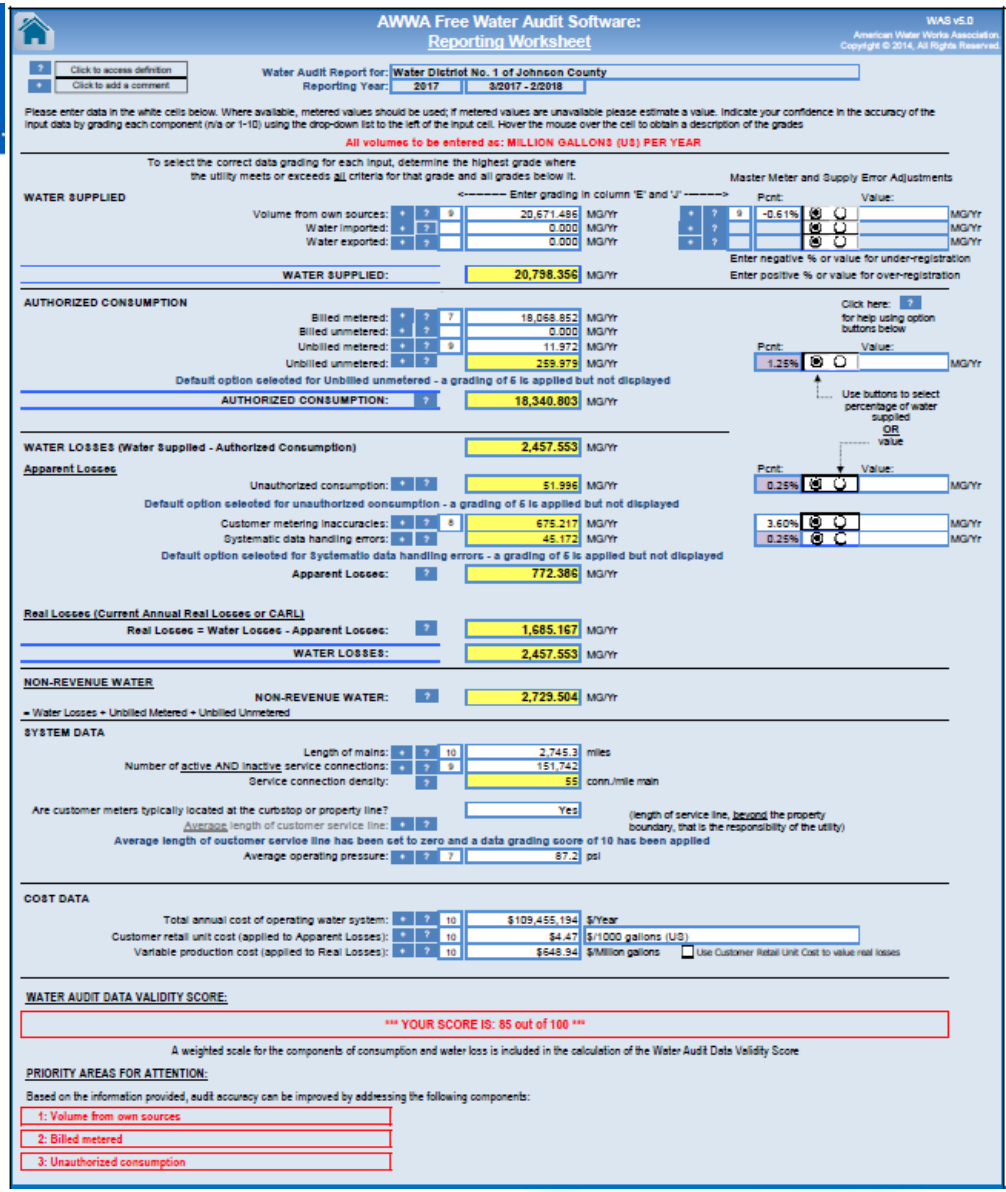
AWWA M36 Audit Software

- Input screen
- Various data inputs
  - Volume produced
  - Billed metered
  - Miles of pipe
  - Number of service connections
- Default values provided



AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0
American Water Works Association
Copyright © 2014, All Rights Reserved

Click to access definition
Click to add a comment

Water Audit Report for: Water District No. 1 of Johnson County
Reporting Year: 2017 3/2017 - 2/2018

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

<------- Enter grading in column 'E' and 'J' ------->

Master Meter and Supply Error Adjustments

WATER SUPPLIED				Pcnt:	Value:	
Volume from own sources:	9	20,671.486	MG/Yr	-0.61%		MG/Yr
Water imported:		0.000	MG/Yr			MG/Yr
Water exported:		0.000	MG/Yr			MG/Yr
WATER SUPPLIED:		20,798.356	MG/Yr			

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION				Pcnt:	Value:	
Billed metered:	7	18,068.852	MG/Yr			
Billed unmetered:		0.000	MG/Yr			
Unbilled metered:	9	11.972	MG/Yr			
Unbilled unmetered:		259.979	MG/Yr	1.25%		MG/Yr
AUTHORIZED CONSUMPTION:		18,340.803	MG/Yr			

Default option selected for Unbilled unmetered - a grading of 6 is applied but not displayed

Click here: ? for help using option buttons below

Use buttons to select percentage of water supplied OR value

WATER LOSSES (Water Supplied - Authorized Consumption)				Pcnt:	Value:	
		2,457.553	MG/Yr			
Apparent Losses						
Unauthorized consumption:		51.996	MG/Yr	0.25%		MG/Yr
Customer metering inaccuracies:	5	675.217	MG/Yr	3.60%		MG/Yr
Systematic data handling errors:		45.172	MG/Yr	0.25%		MG/Yr
Apparent Losses:		772.386	MG/Yr			
Real Losses (Current Annual Real Losses or CARL)						
Real Losses = Water Losses - Apparent Losses:		1,685.167	MG/Yr			
WATER LOSSES:		2,457.553	MG/Yr			

Default option selected for unauthorized consumption - a grading of 6 is applied but not displayed

Default option selected for Systematic data handling errors - a grading of 6 is applied but not displayed

NON-REVENUE WATER			
NON-REVENUE WATER:		2,729.504	MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA			
Length of mains:	10	2,745.3	miles
Number of active AND inactive service connections:	9	151,742	
Service connection density:		55	conn./mile main
Are customer meters typically located at the curbstop or property line?		Yes	
Average length of customer service line:			
Average operating pressure:	7	87.2	psi

(length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

COST DATA			
Total annual cost of operating water system:	10	$109,455,194	$/Year
Customer retail unit cost (applied to Apparent Losses):	10	$4.47	$/1000 gallons (US)
Variable production cost (applied to Real Losses):	10	$548.94	$/Million gallons

Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 85 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Billed metered
3: Unauthorized consumption

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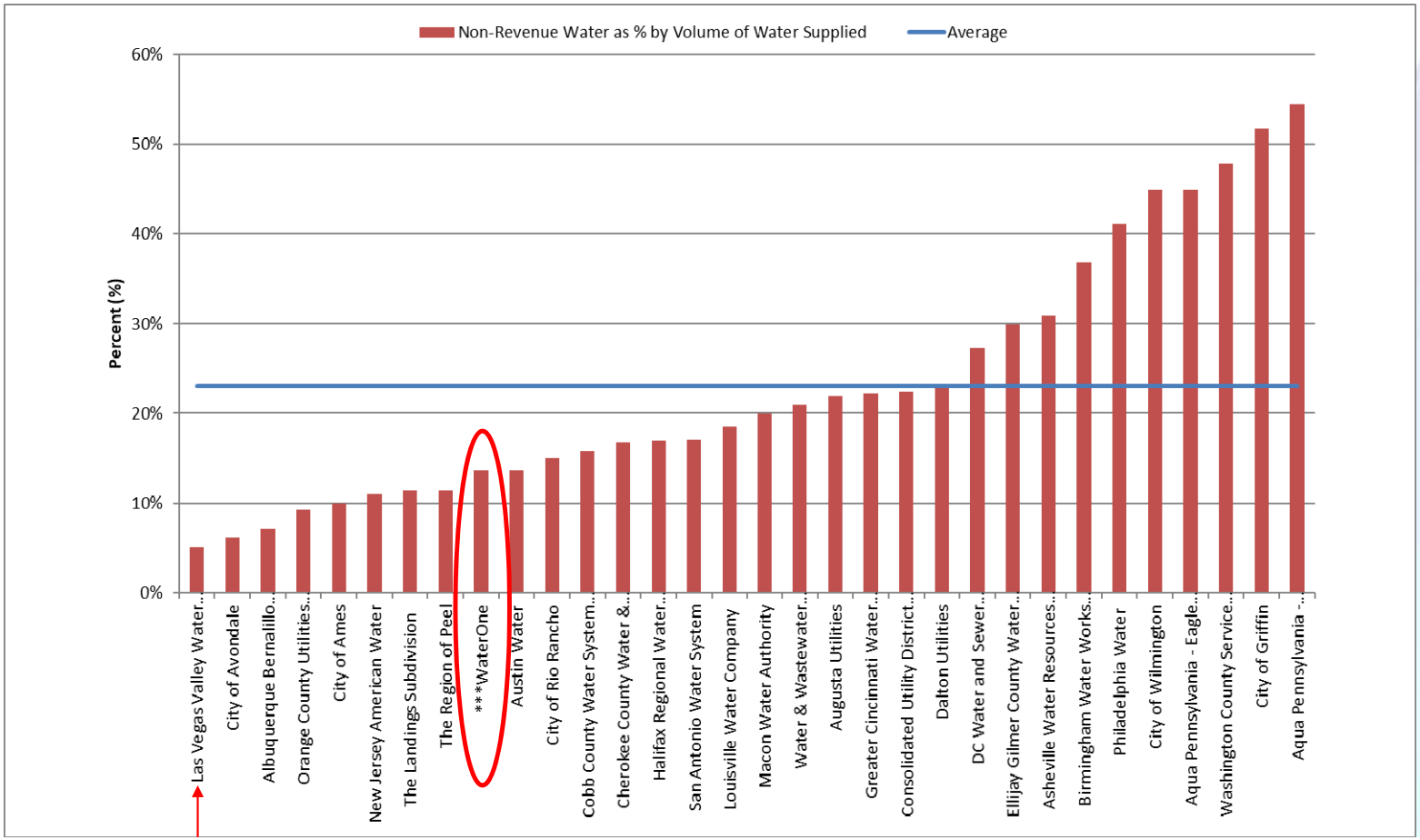
NRW % of Volume supplied



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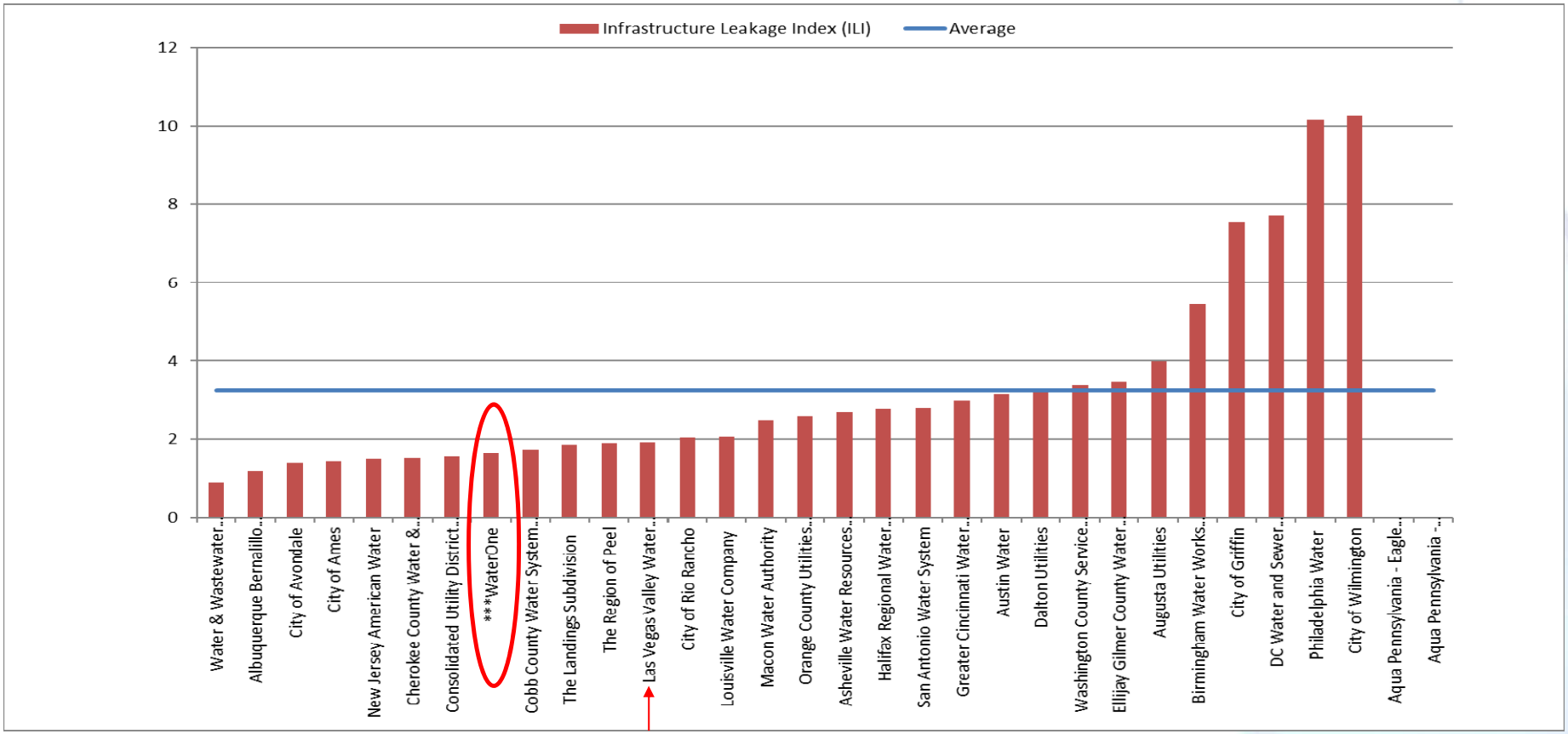
Infrastructure Leakage Index (ILI)



ILI compares the Annual Real Losses to the Unavoidable Real Losses - lower is better.

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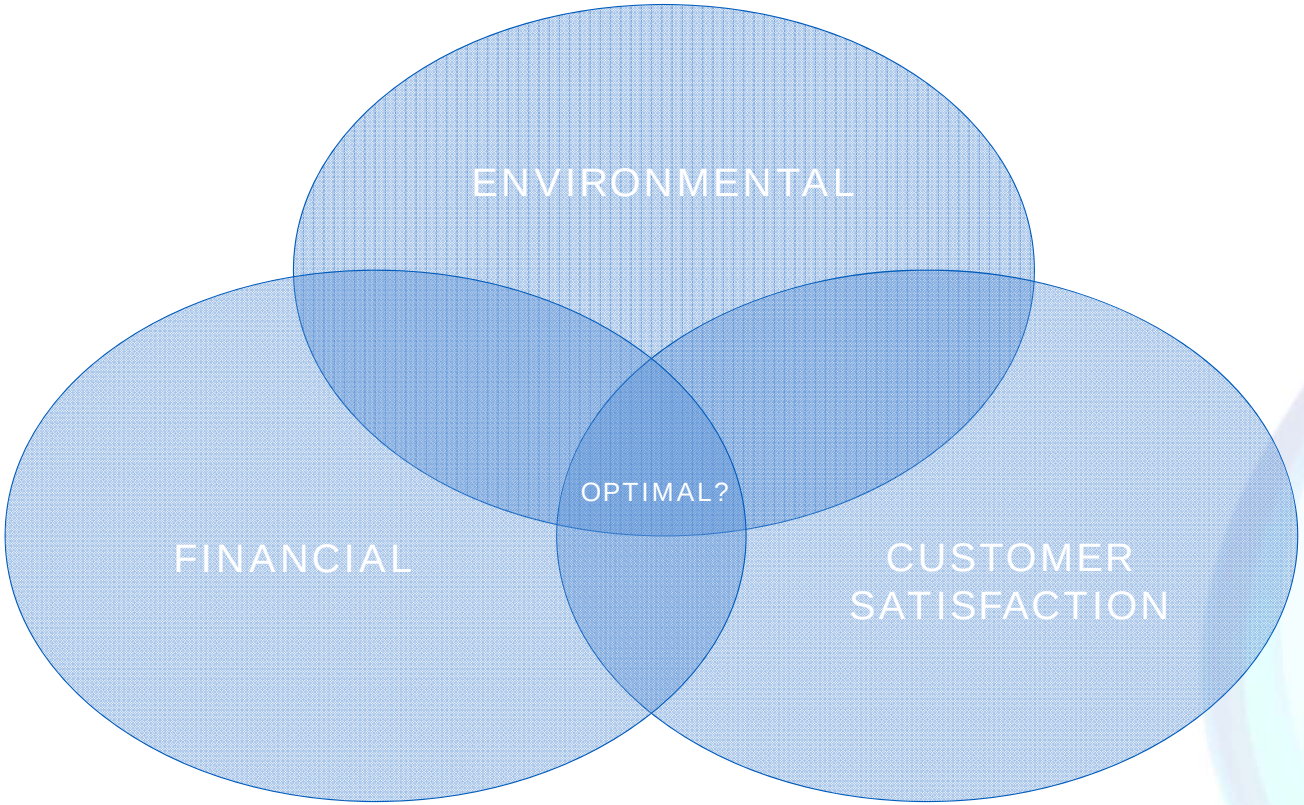

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ASSET MANAGEMENT PROGRAM AT WATERONE

-PRODUCTION

-DISTRIBUTION

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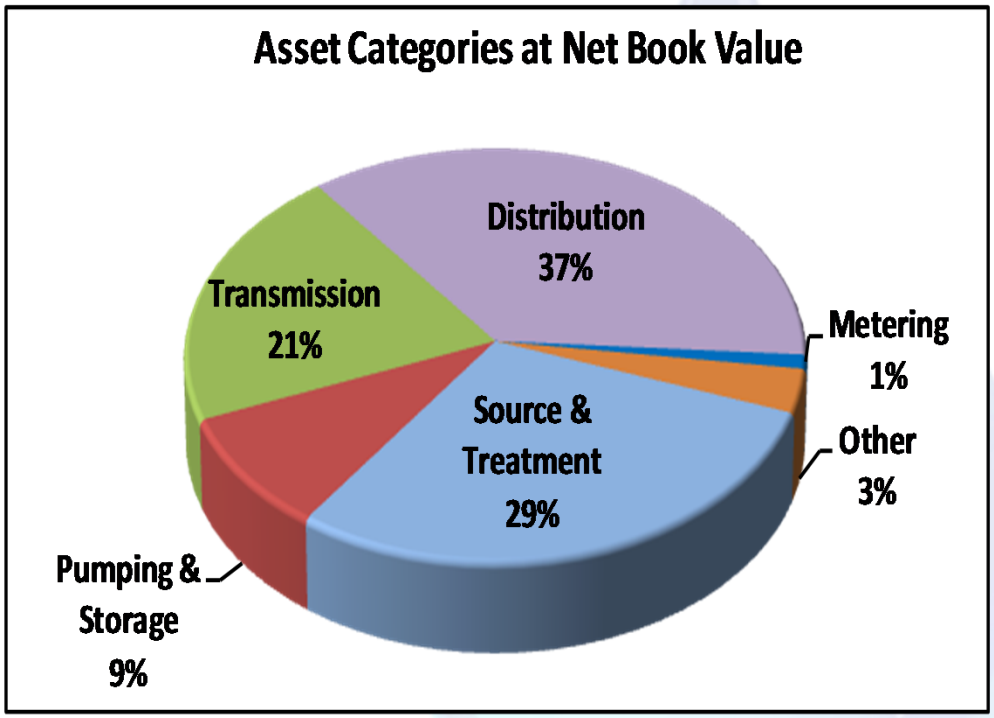
Asset Management - Overview

- An Asset Management Plan provides a framework for:
  - Identifying all the organization's assets
  - Defining the current and proposed levels of service to the customers
  - Analyzing and managing operational risk
  - Forecasting future financial requirements needed to execute the operational plan



Total net book value, $2.25 billion +/-

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Asset Management - Overview

- Asset management is also an integral part of WaterOne's strategic plan and relates directly to three of the strategic goals:
  - Goal 6 - Proactively Manage Infrastructure
  - Goal 4 - Ensure Financial Stability and Predictable Rates
  - Goal 1 - Ensure a Safe, Reliable, High Quality Water Supply

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Asset Management – Production History

- Aboveground assets - 38% of all of the value of all assets
- EPA Workshop Asset Management Workshop
- Established a proactive approach
- Track cost and asset condition using various tools
  - EPA Spreadsheet Tool
  - Enterprise Resource Planning Software (SAP)

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Production Asset Management – EPA Spreadsheet

- Tracks various attributes
  - Purchase cost and date
  - Current replacement cost
  - Location of asset
- Estimated remaining equipment life
- Track condition ratings, consequence & risk of failure
- Produces Projections - Future replacements and Costs

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Comprehensive Maintenance Program Overview 2011-2018

- Review of program & processes
- Reconfigured SAP maintenance management system
- Developed work plans & schedules
- Developed KPIs

INCREASE RELIABILITY THROUGH A COMPREHENSIVE PROGRAM

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Production Asset Management – SAP

- Field Verified Asset Inventory
- Used to create work orders
- Day to day maintenance of equipment
- Tracks smaller components of a larger system
- Tracks life cycle cost of assets
  - Hours
  - Parts
  - Number of work orders

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KPI Report

July 2018

Legend	Blue 2% > Target	Green +/- 2% Target	Yellow 2% - 5% < Target	Red >5% Target
Summary	6		0	0

KPI	Target	Actual	Status	Management Comment
1. Planned vs Actual Man-hours within 15% on 85% of work orders.	85.00%	92.52%		Work Order estimating accuracy above target.
2. Percent man-hours worked on "Emergency" work orders at or below 5%.	< 5%	0.82%		Emergency Work Order labor well below target.
3. Percent man-hours worked on "Corrective" work orders at or below 45%.	<45%	27.75%		Able to come in well below new target.
4. Percent man-hours worked on "PM" work orders at or above 50%.	50%>	55.50%		Working to balance pm's.
5. Planned man-hours at or above 85%.	85.00%	88.81%		Planned work beat target.
6. Department average backlog of 8 weeks (As of 8/7/2018)	8 Weeks	8		Backlog below target. Able to consistently maintain an approximate healthy backlog.

MAINTENANCE PROGRAM RESULTS

- Planned Work
  - **0%** in 2013 vs over **85%** in 2017
- Work orders Estimated vs Actual
  - **0%** estimating to close to **90%** accuracy in 2017
- Preventative Maintenance hours doubled
  - **26%** of hours in 2013 vs **51%** for 2017
- Interruptions to planned work dropped **15%**
- Corrective work orders
  - Over **60%** in 2013 vs **27%** hours spent in 2017
- Emergency work orders dropped significantly
  - Over **10%** in 2013 vs less than **1%** in 2017

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ASSET MANAGEMENT PROGRAM AT WATERONE

-PRODUCTION

-DISTRIBUTION

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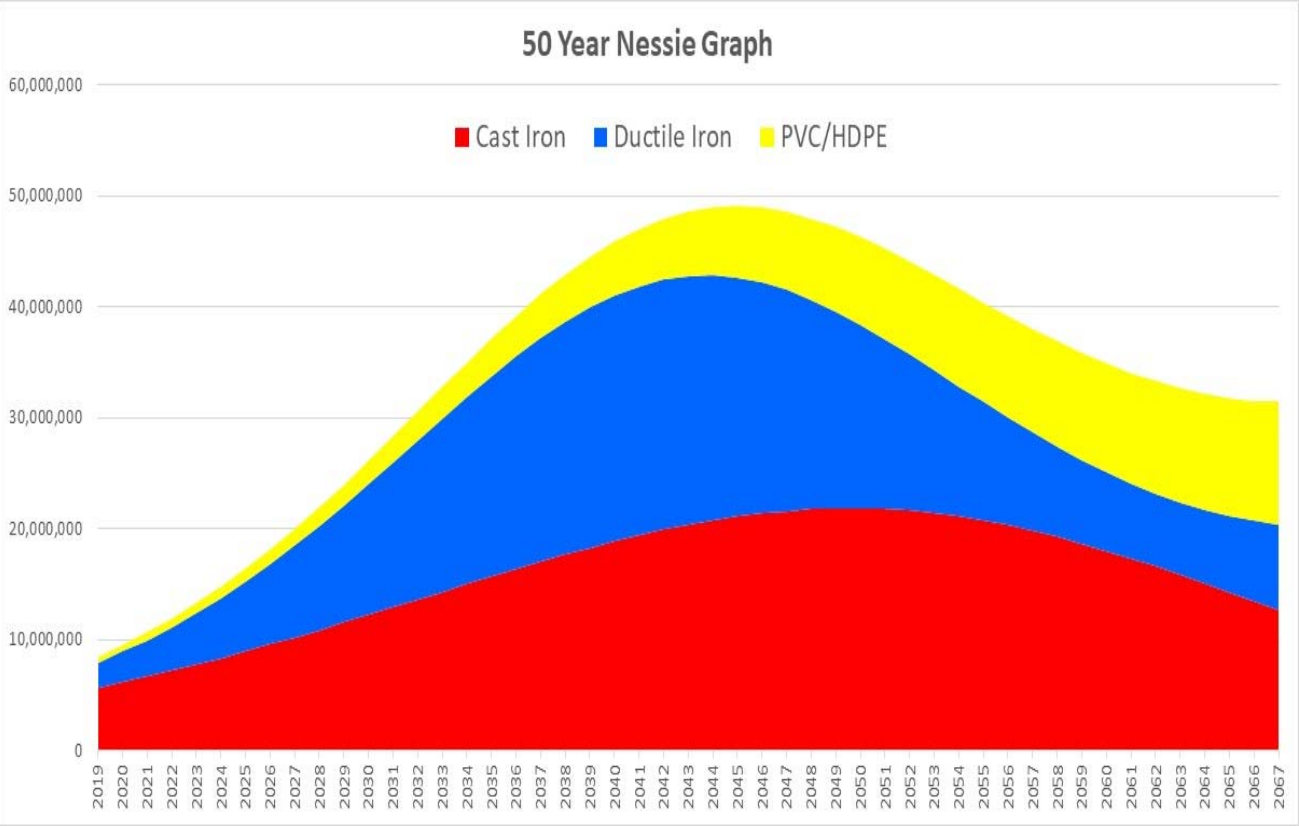
Asset Management – Distribution System

- Below ground assets - 58% of all of the value of all assets
- Use a tool known as the “Nessie Model”
- Financial model for long term planning
- Excel spreadsheet
  - Inputs (cost per foot, estimated pipe life, asset data)
  - Statistical assumptions (normal distribution, standard deviation)
  - Outputs (long-range replacement costs, miles of pipe to be replaced each year)

Nessie Model Description, Why is it Called “Nessie”



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Transmission Pipe vs. Dist. Pipe

- Initially both transmission and distribution pipe included in Nessie Model
- Behave differently
- Pipe divided into two major categories
  - Distribution pipe 16” and smaller
  - Transmission pipe 20” and larger
- Getting your arms around buried pipe

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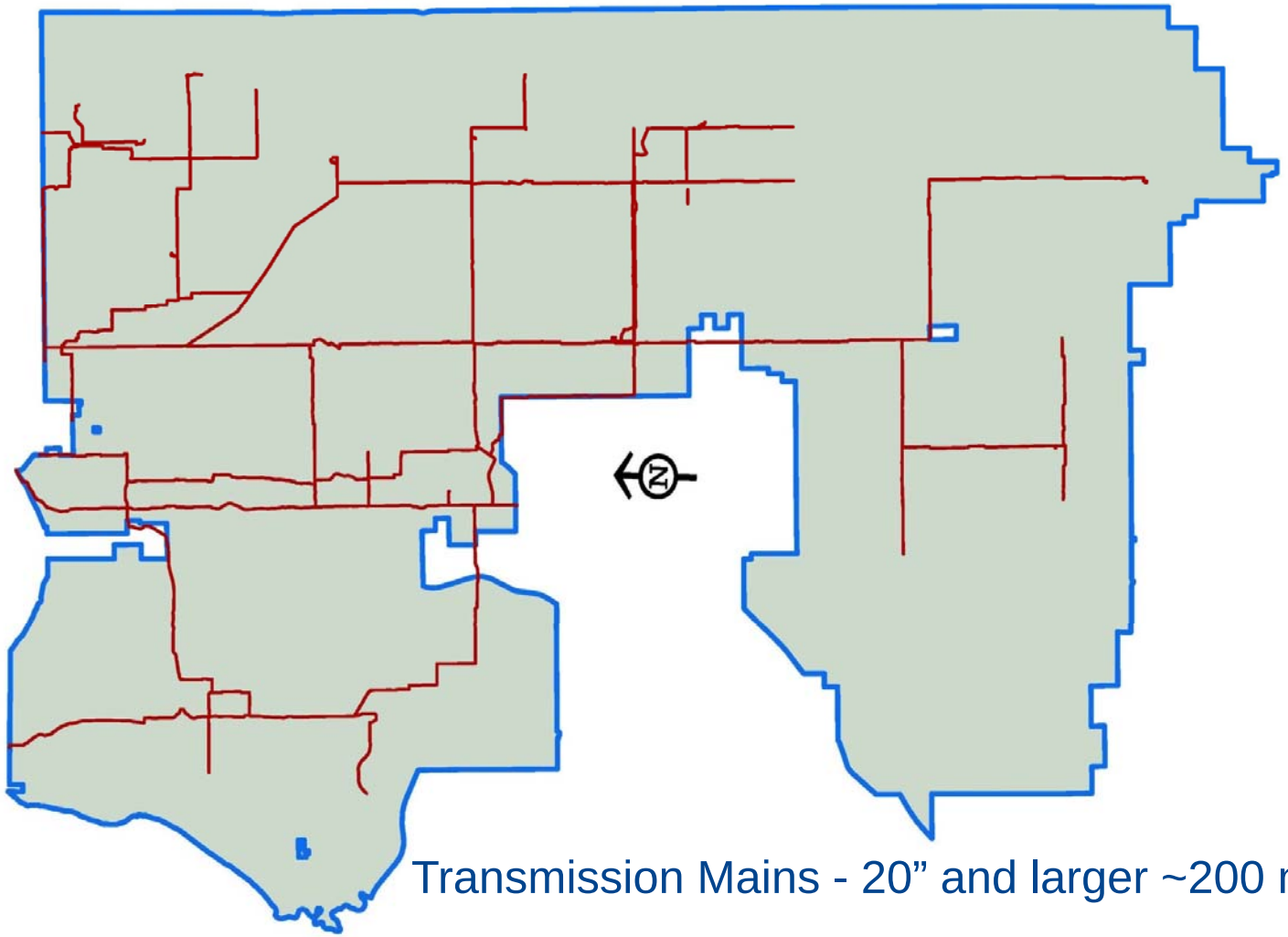

Transmission Mains - 20” and larger ~200 miles

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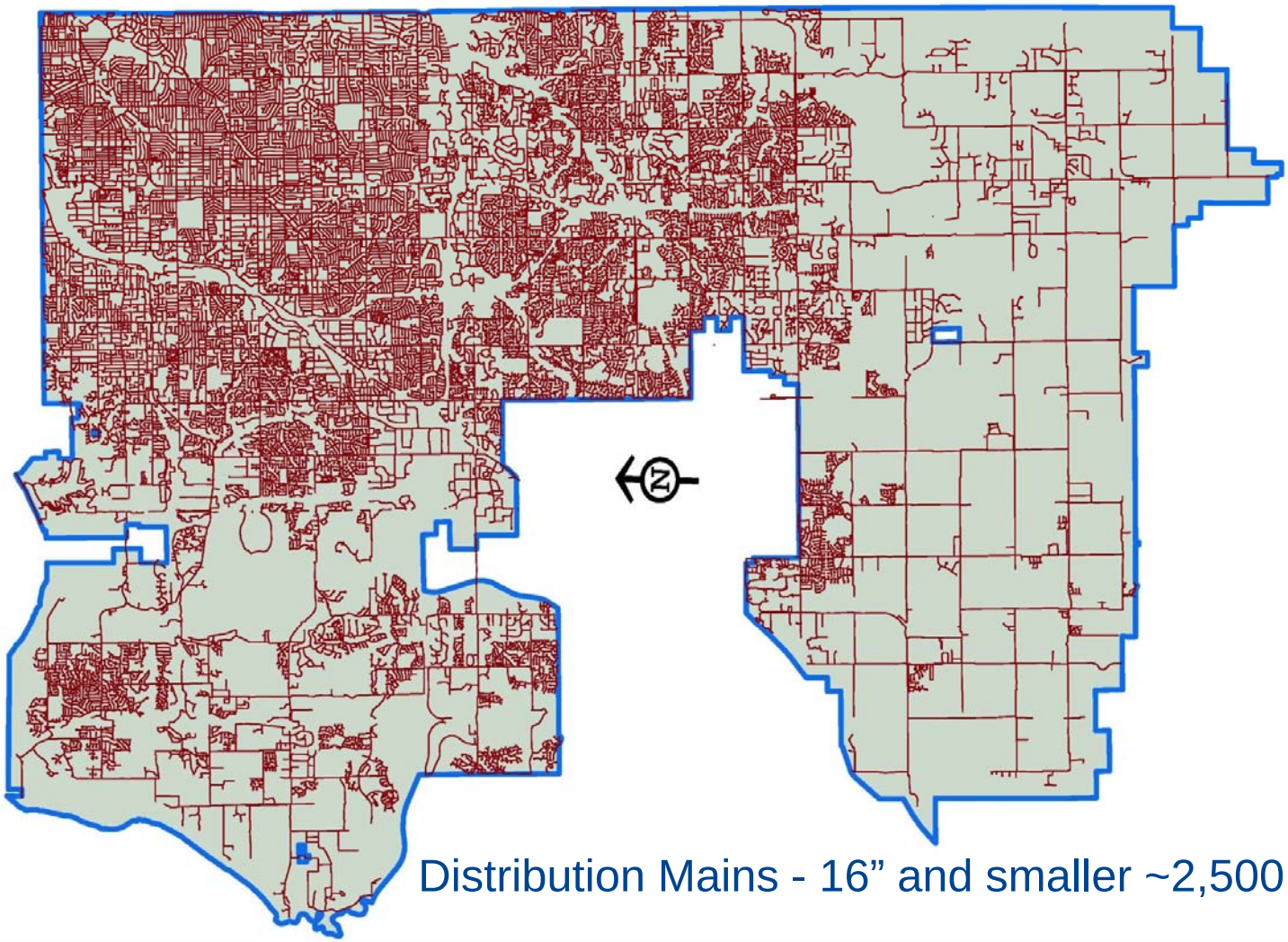

Distribution Mains - 16” and smaller ~2,500 miles

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Pipe Risk Management Strategy

- Transmission Pipe
  - Condition Assessment is used extensively
  - Electromagnetic and leak detection for PCCP and DI

- Distribution Pipe
  - Prioritized pipe replacement (No Condition Assessment, pilot PWA attempted)
  - Five point rating system
  - Ten criteria
  - Use GIS to help assign points & SAP to track break history
  - Over 60,000 segments
  - Focus on top 100

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Distribution - Pipe Risk Mgmt. Strategy

- The 10 criteria are as follows:
  1. Pipe Age
  2. Pipe Material, unwrapped ductile iron scores high
  3. Pipe Diameter, the larger the diameter the higher the rating
  4. Break History, break rate per mile or increasing break rate
  5. Large or Critical User (Hospitals or Industrial)
  6. Soil Type (Corrosiveness) – From USGS
  7. In a City Project Area (ex. Street Projects)
  8. Financial Break Even Formula (WRF #90892)
  9. Pressure
  10. Master Plan system upgrade mains

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Why would anyone want to invest in condition assessment???

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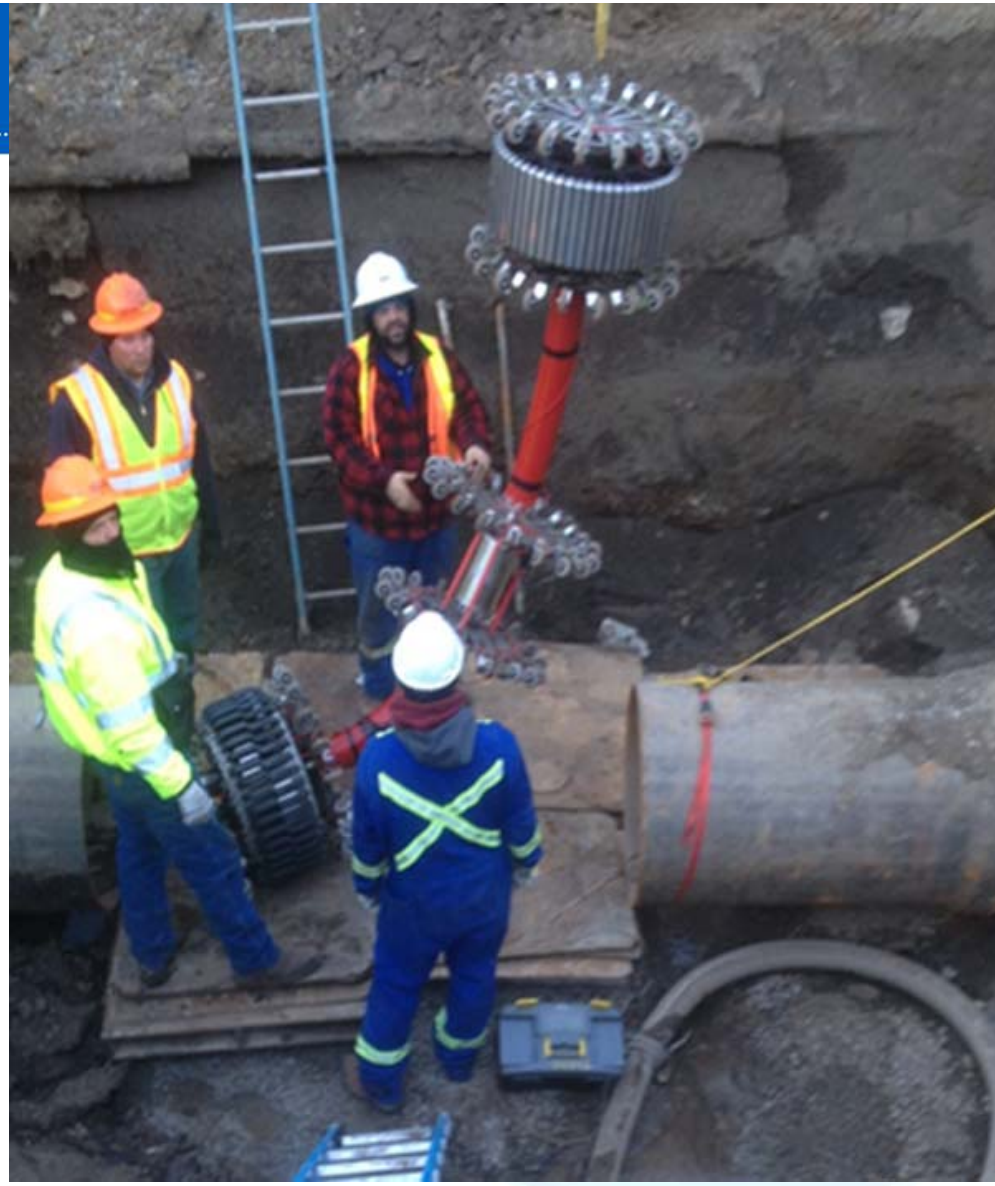
Condition Assessment Tool

- 30-inch TM was in fairly poor condition, but with areas of useful life
- RFT provided detailed locations of wall loss
- 3 worst wall loss locations in each pipe section were reported



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Repairs Made in Worst Locations

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Consequential?

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Optimization of Dist. Mains

- Condition assessment??
- Leak detection programs
- Pressure reduction
- Anode installation on all main break repairs
- Pilot anode retrofit in certain areas
- Statistical pipe failure prediction models
  - Weibull distribution
  - Binary logistic regression

CONCLUSIONS

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Conclusions

- We are responsible for maintaining our infrastructure/equipment
- Asset Management Plan – Just do it!
- Gain buy-in
- Incorporate into long range financial planning
- Asset Management & Planned Maintenance is the key to
  - Increased Reliability
  - Decreased Emergency Repairs
- Water loss is critical to understanding system performance & sustainability
- Tools - AWWA, EPA, and WSU

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What Questions do Y0u Have?

Governor's Conference on the Future of Water in Kansas – 2018

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