This presentation premiered at WaterSmart Innovations

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INNOVATIONS

As The River Flows:

Catawba-Wateree's Innovative Model for Building Water Loss Control

Relevant Roles:
Chair, AWWA Water Loss Outreach Subcommittee
IWA Water Loss Specialist Group, US Representative
Chief Innovation Officer, Cavanaugh

Steve Cavanaugh, P.E.
steve.cavanaugh@cavanaughsolutions.com

CATAWBA WATEREE WATER MANAGEMENT GROUP


CATAWBA
WATEREE
WATER MANAGEMENT GROUP
LAKE RHODHISS
HICKORY
LENOIR
LAKE JAMES
LOOKOUT SHOALS LAKE
GRANITE FALLS
STATESVILLE
MORGANTON
HICKORY
LAKE NORMAN
SVILLE
VAL
MOUNTAIN ISLAND LAKE
North Carolina
LINCOLN CO.
MOUNT HOLLY
GA
LONG VIEW
CHARLOTTE
LAKE WYLIE
South Carolina
BELMONT
DUKE ENERGY
ROCK HILL
UNION CO.
GREAT FALLS
FISHING CREEK
LAKE
CHESTER MET
CHESTER CO.
CEDAR CREEK
RESERVOIR
LAKE WATEREE
LUGOFF-ELGIN WATER
CAMDEN
North Carolina
South Carolina

The Big Picture: Economic Intervention

Annual Water Balance

Annual M36 water audit

Apparent & Real Loss volumes

Level 1 validation

baseline

Stage 1

Loss Profiling & Uncertainty

Advanced Validation
- Level 2 Analytics
- Level 3 Field Study
- Margins of Error

Apparent Loss Profile
- Theft
- Meter Inaccuracy
- Data Handling

Real Loss Profile
- Reported Leakage
- Unreported Leakage
- Background Leakage

technical analysis

Stage 2

Cost-Benefit & Targets

Costs of losses
- by subcomponent
- in aggregate
- wholesale & retail

Costs of intervention strategies

Program design

System-specific

economic analysis

Stage 3

Intervention

Leakage Management:
- Active Leak Detection
- Pressure Optimization
- Repair Time Reduction
- Network Renewal

Revenue Protection:
- Theft Mitigation
- Meter Optimization & Renewal
- Billing Data System Integrity
- Revenue Recovery

cost-effectiveness

Stage 4

IWA/AWWA M36 Methodology – State of the Art Water Auditing & Loss Control

AWWA adopts IWA standard, abandons Unaccounted For Water

WRF study shows audit validity is a widespread challenge

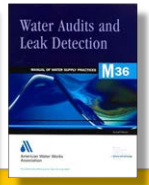
Validation method developed

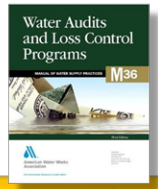
M36 1st Ed.

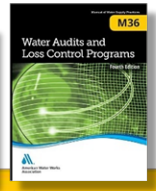
M36 2nd Ed.

M36 3rd Ed.

M36 4th Ed.







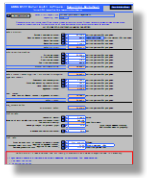
American Water Works Association

Water Research Foundation

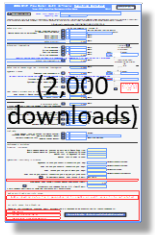
Ongoing Research & Development:
Performance Indicator Task Force
WRF 4695-Effective WLC Planning

1991 | 1999 | 2003 | 2006 | 2009 | 2010 | 2014 | 2015 | 2017 | 2019 | 2020

AWWA Audit Software v1



AWWA Audit Software v4



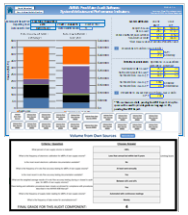
AWWA Audit Software v5

NORTH AMERICAN WATER LOSS 2015
Georgia

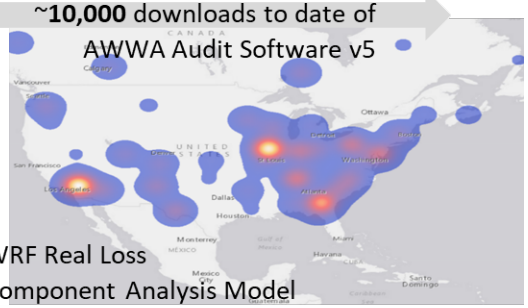
NORTH AMERICAN WATER LOSS 2017
California

NORTH AMERICAN WATER LOSS 2019
Tennessee

AWWA Audit Software v6



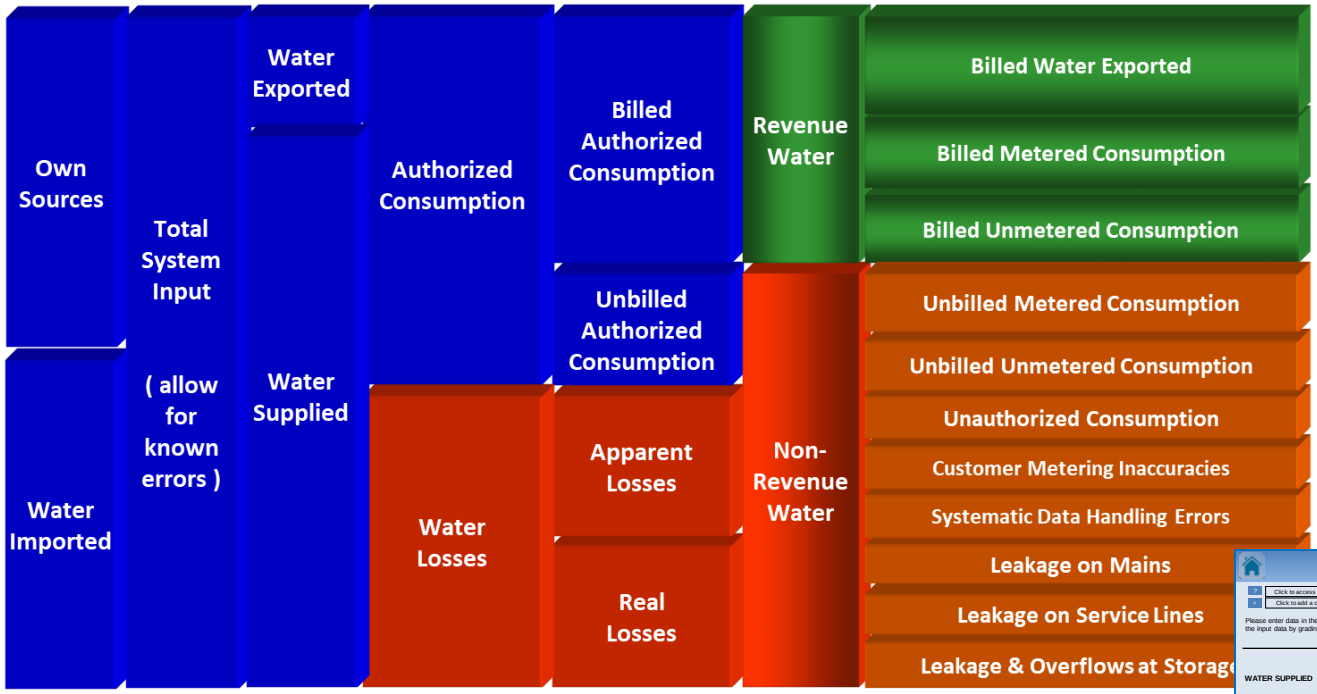
~10,000 downloads to date of AWWA Audit Software v5

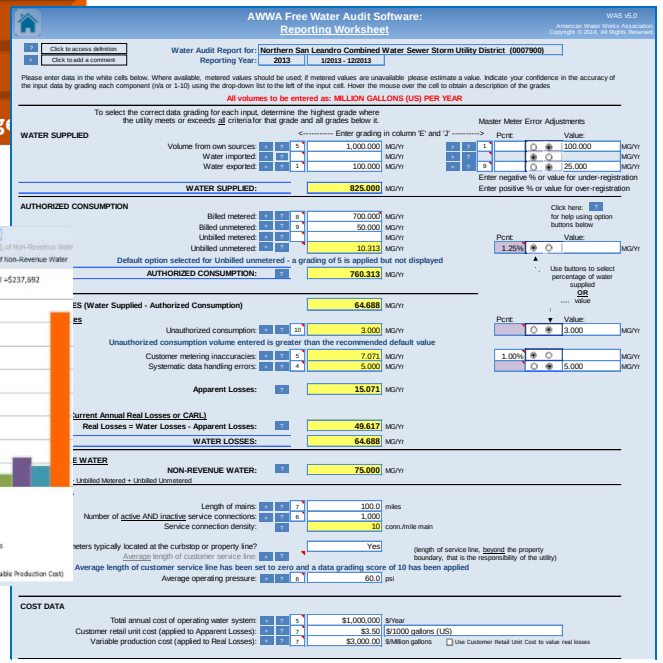


AWWA Compiler developed for large audit sets

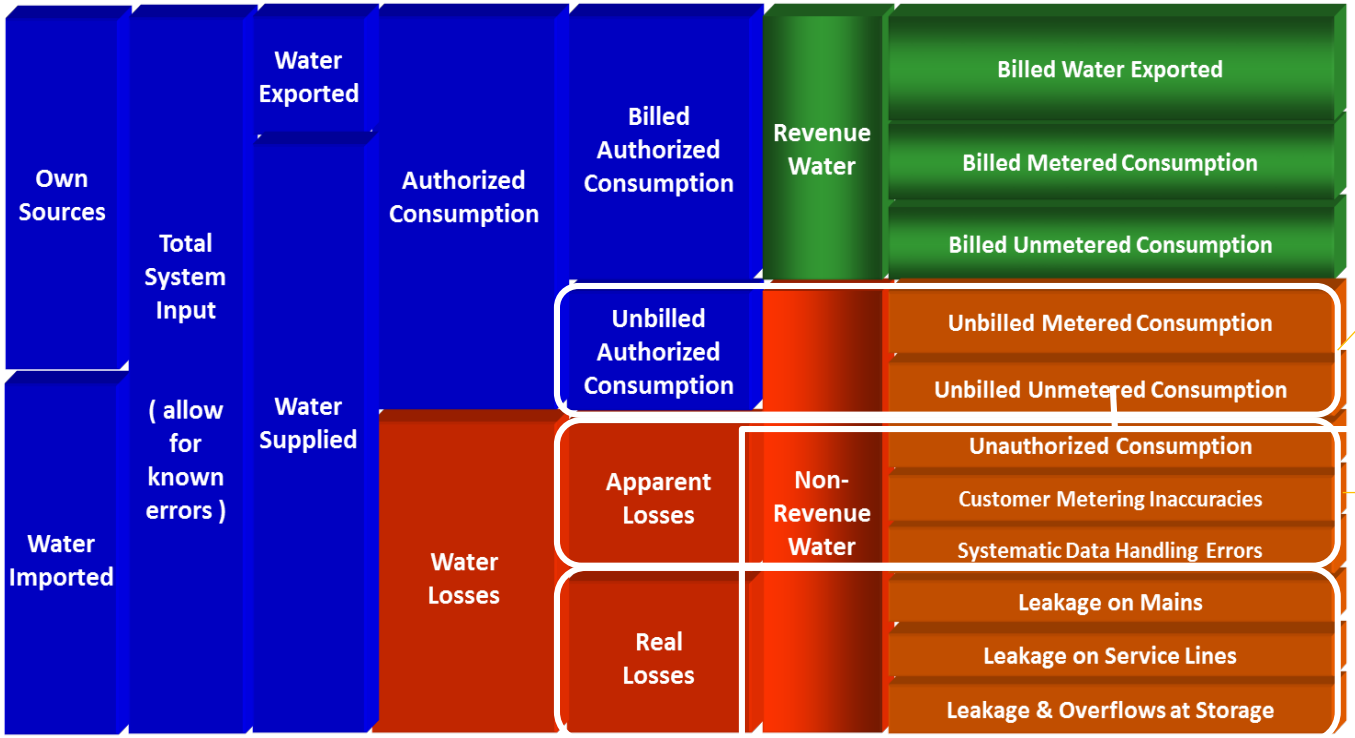
WRF Real Loss Component Analysis Model

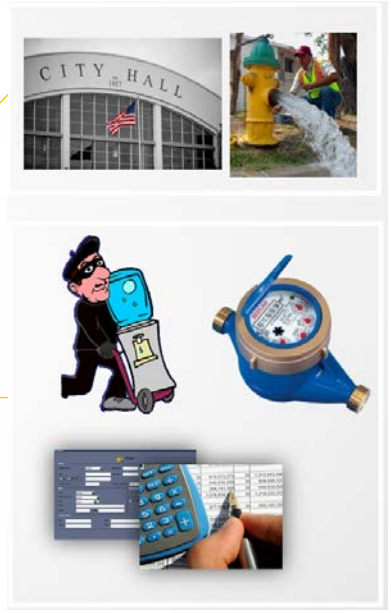
IWA/AWWA Standard Water Balance



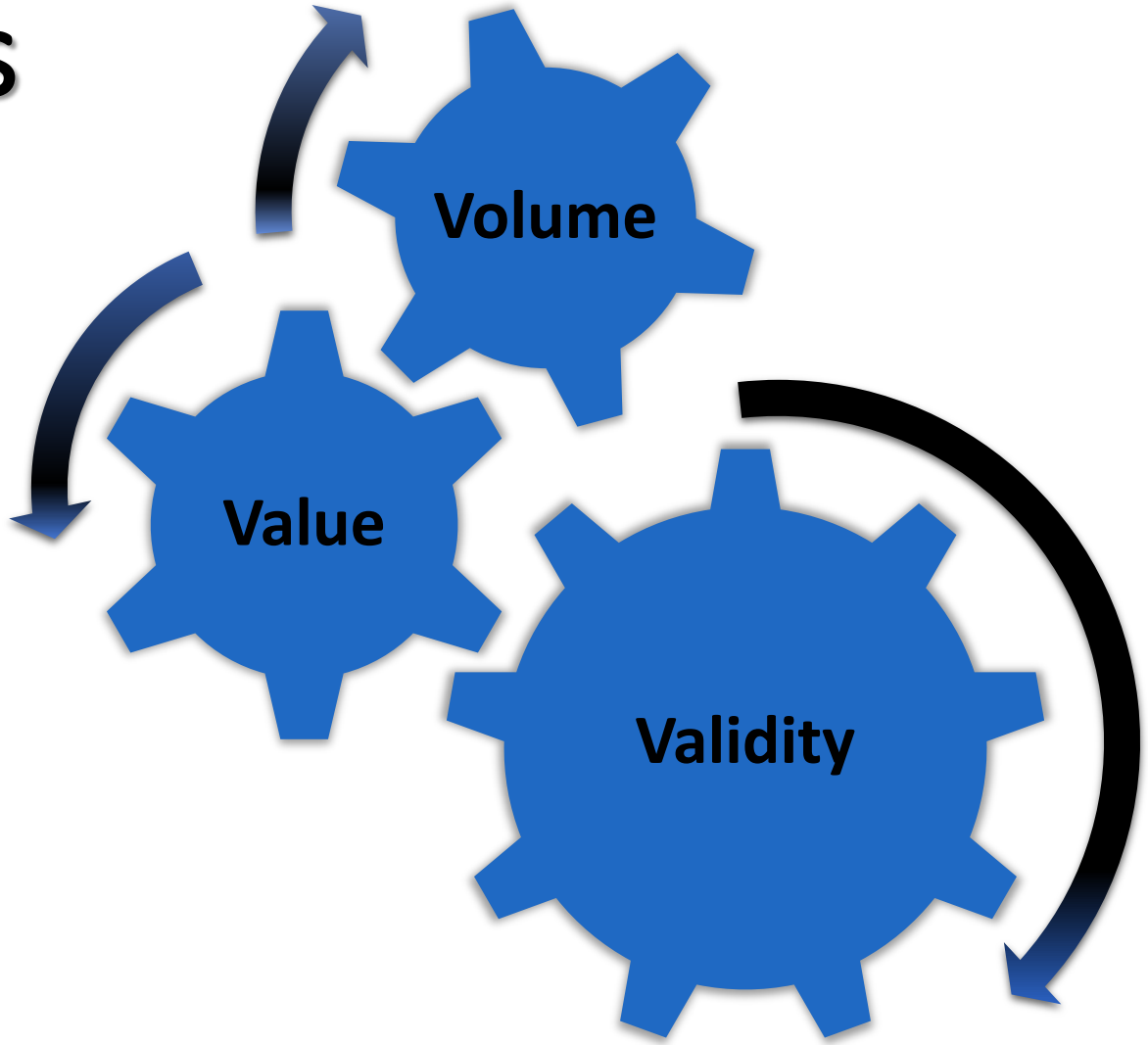


Non-Revenue Water

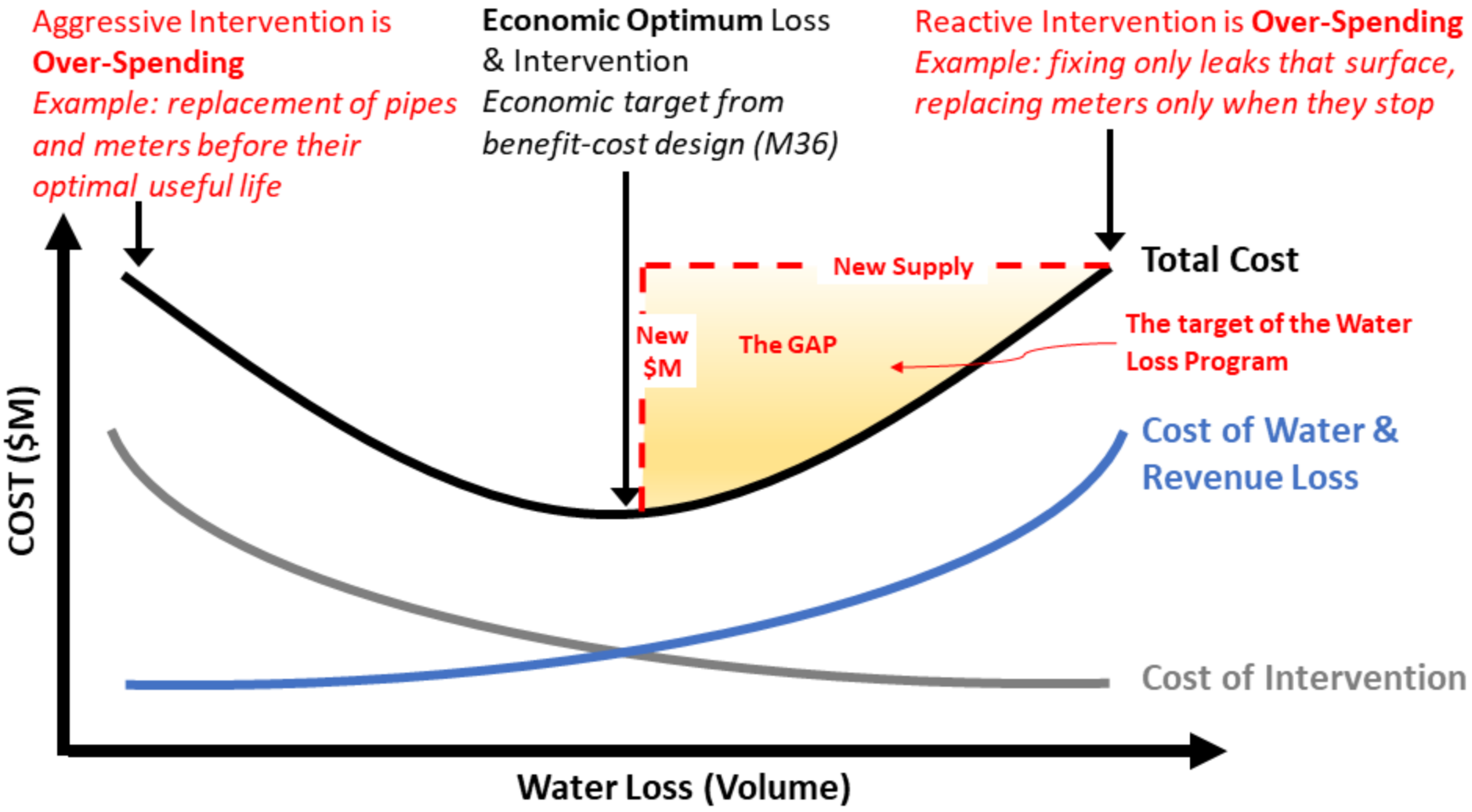


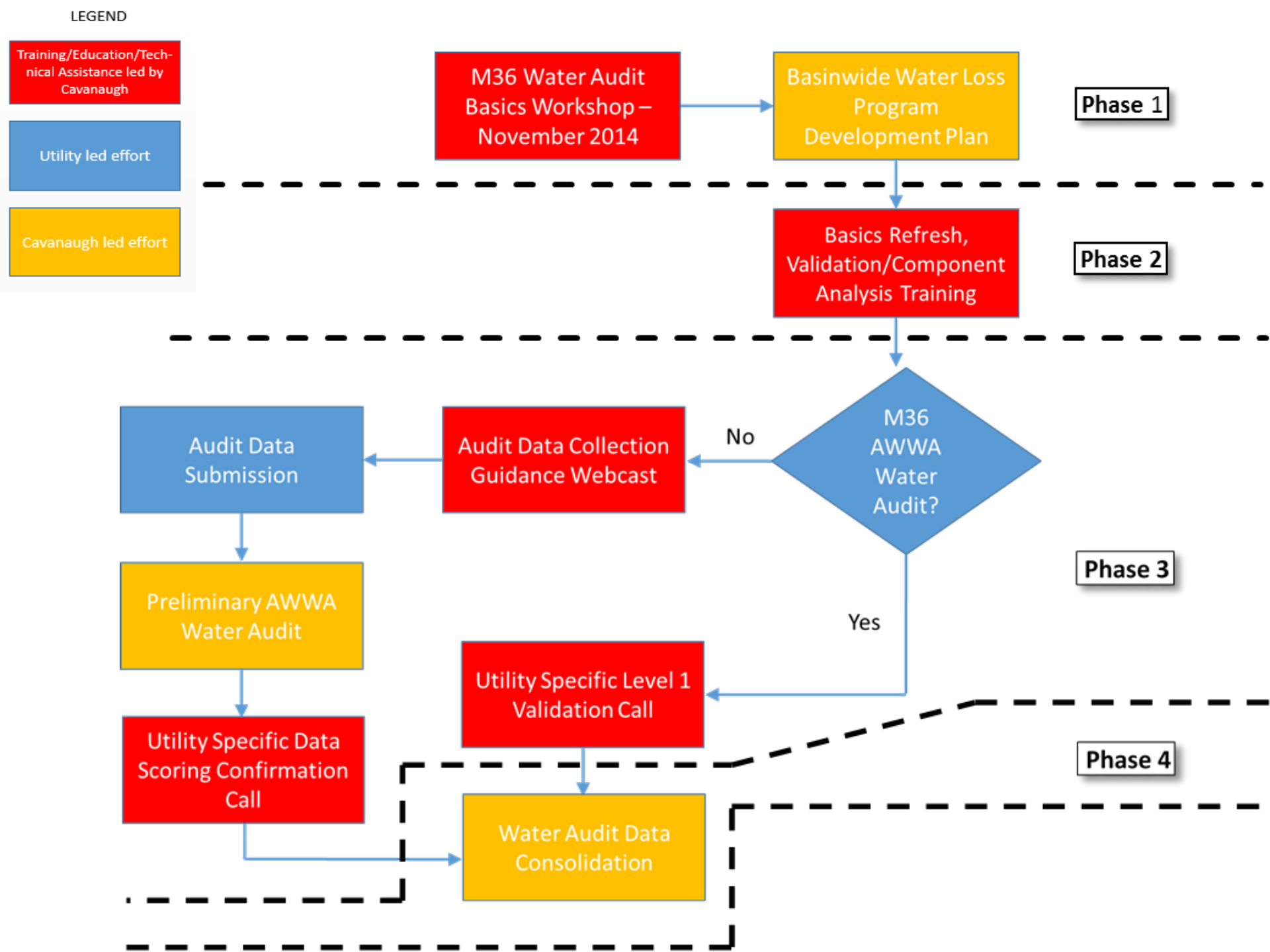


3-V's



AWWA M36 Economic Optimum




LEGEND
Training/Education/Tech-nical Assistance led by Cavanaugh
Utility led effort
Cavanaugh led effort
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Water Audit Data Consolidation
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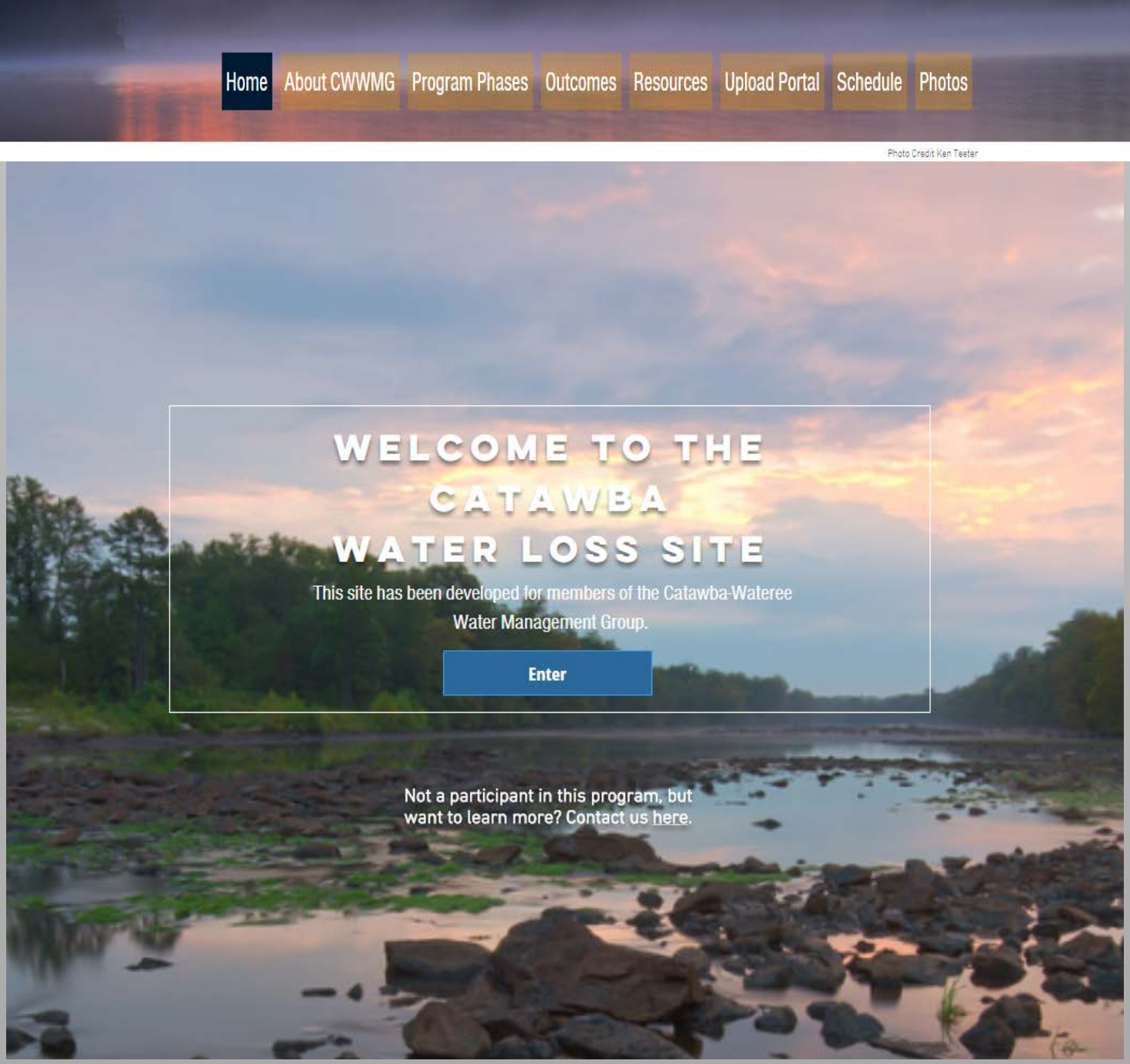
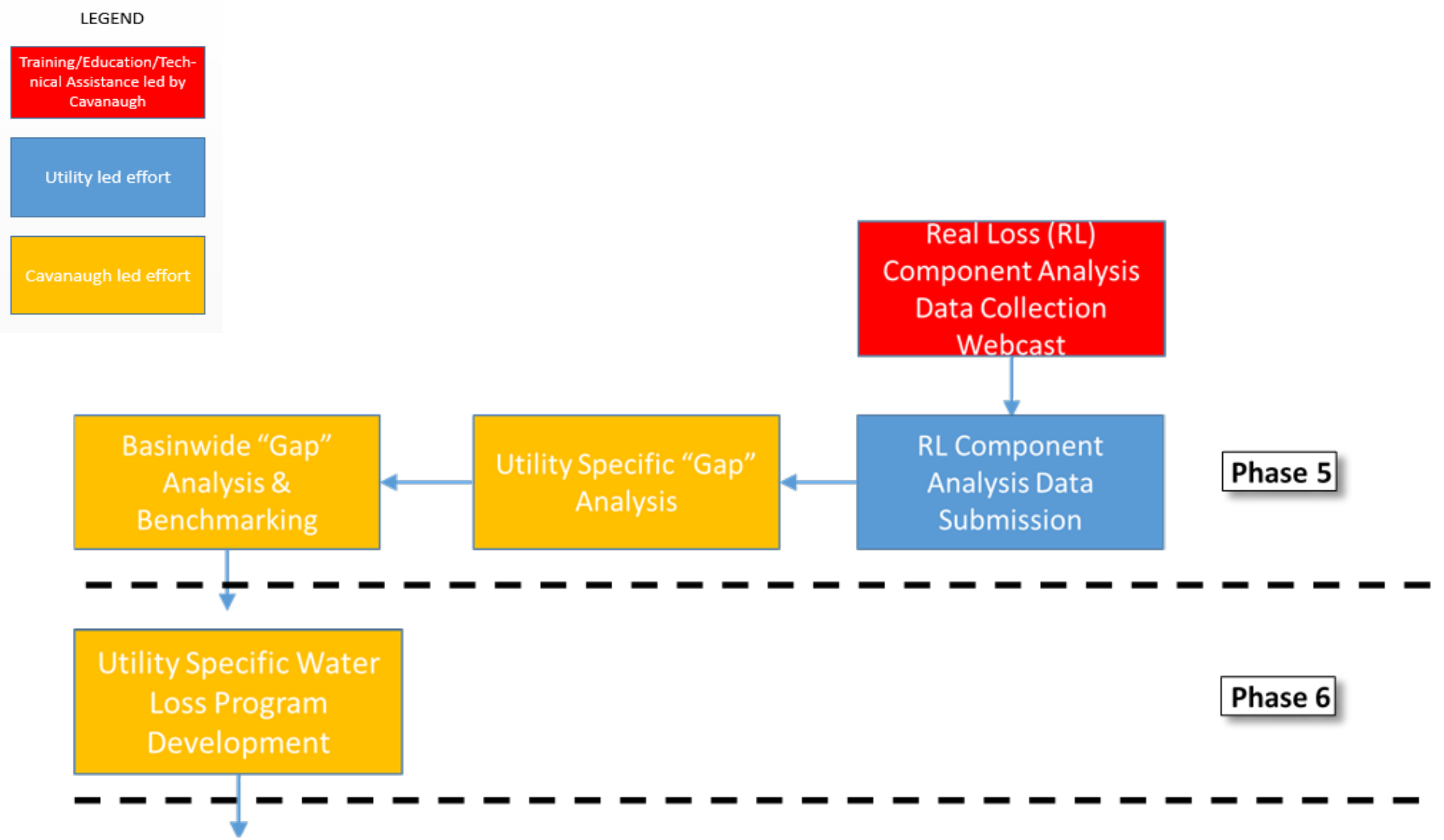

Home
About CWWMG
Program Phases
Outcomes
Resources
Upload Portal
Schedule
Photos
Photo Credit Ken Teeter
WELCOME TO THE CATAWBA WATER LOSS SITE
This site has been developed for members of the Catawba-Wateree Water Management Group.
Enter
Not a participant in this program, but want to learn more? Contact us here.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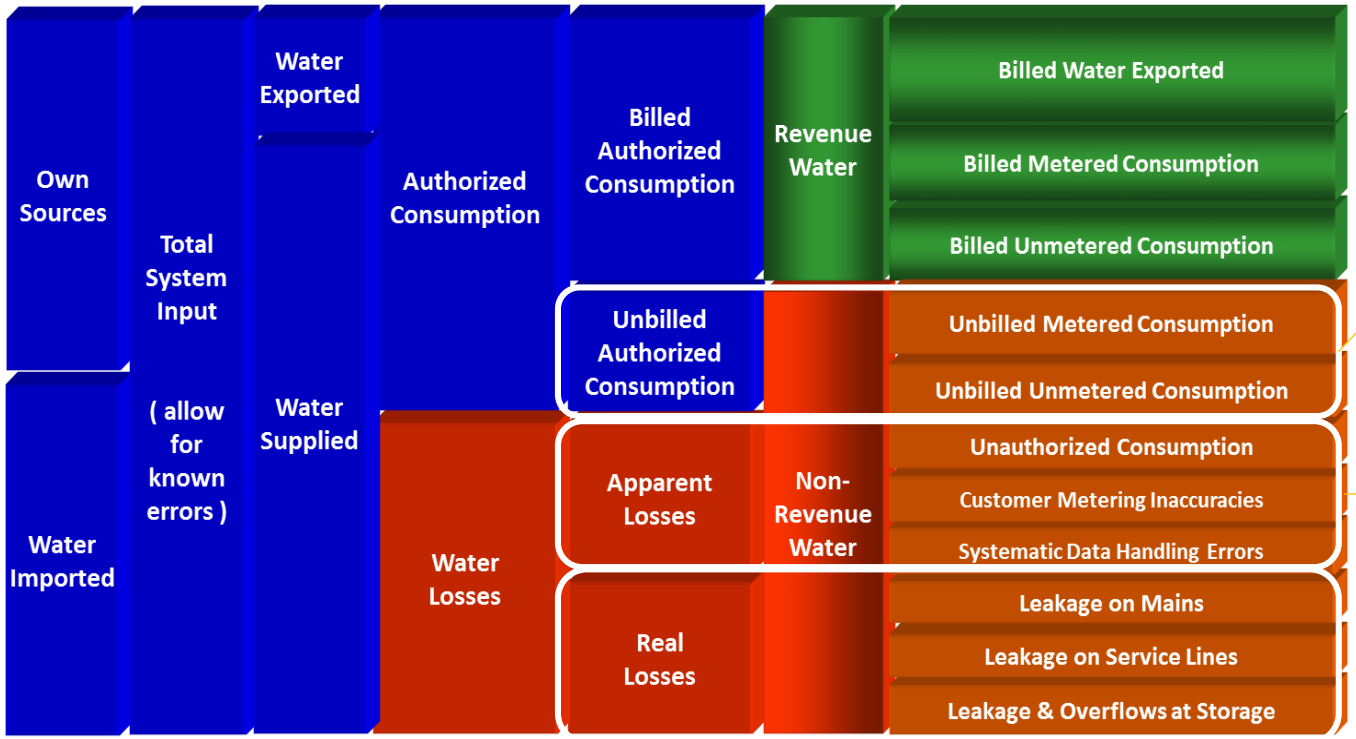
Basinwide "Gap" Analysis & Benchmarking
Phase 5
Utility Specific Water Loss Program Development
Phase 6


Own Sources
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Total System Input
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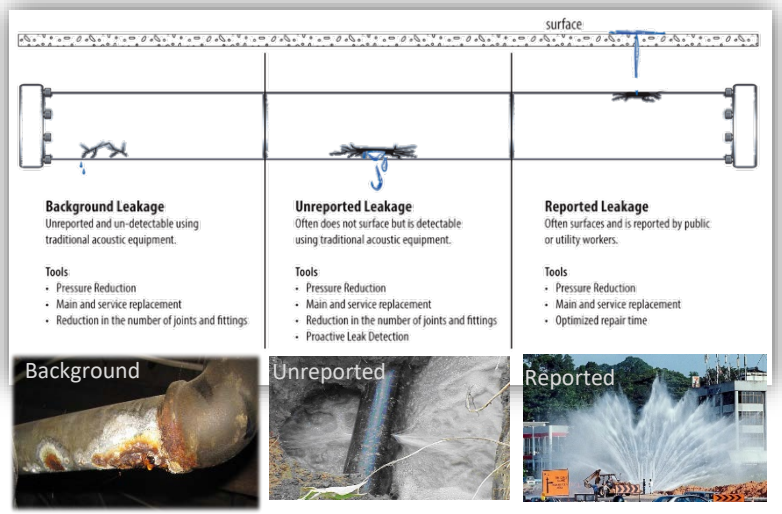
CITY HALL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Background Leakage
Unreported and un-detectable using traditional acoustic equipment.
Tools
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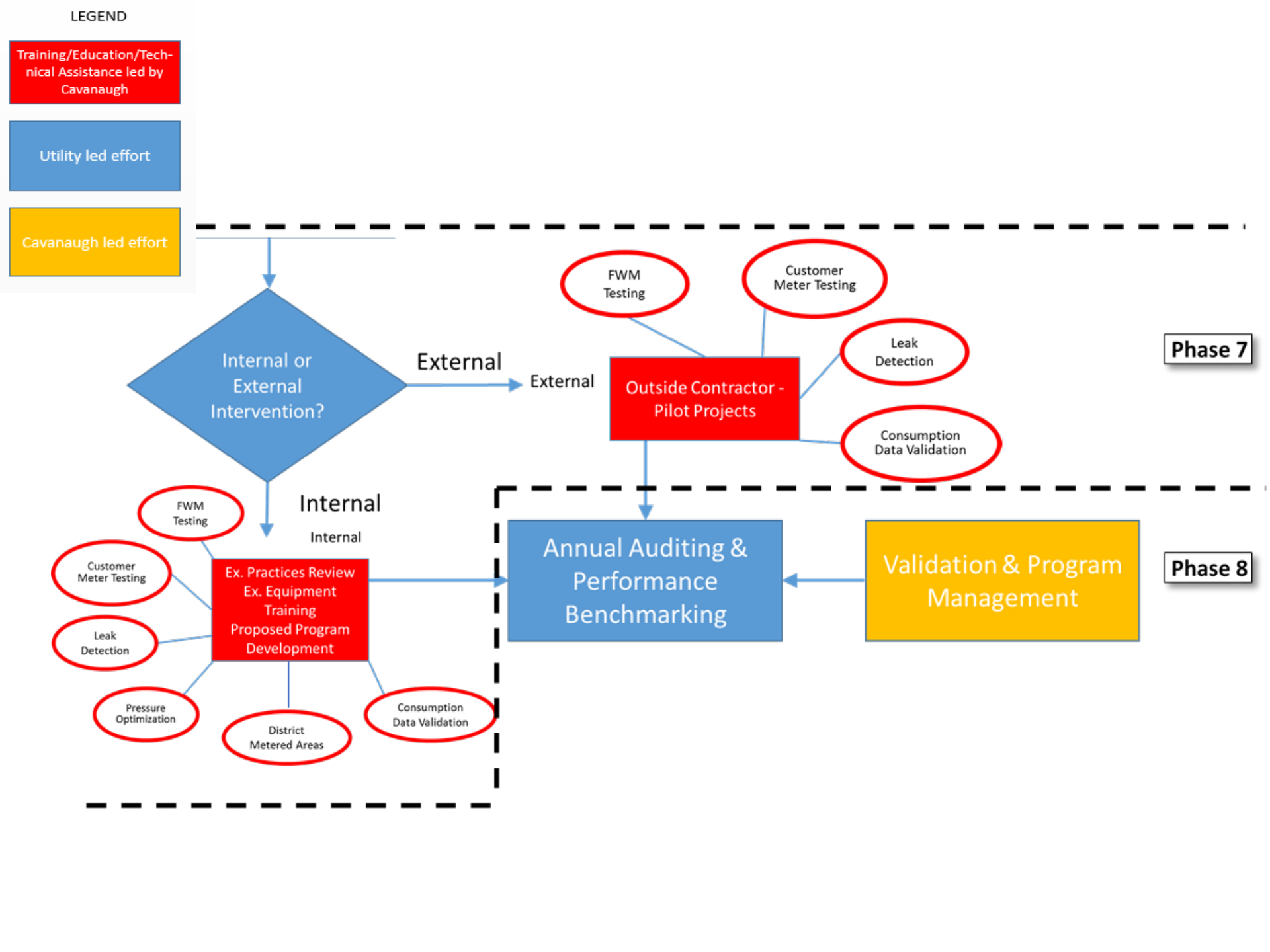
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Internal or External Intervention?
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Leak Detection
Consumption Data Validation
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Phase 7
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Leak Detection
Pressure Optimization
District Metered Areas
Consumption Data Validation
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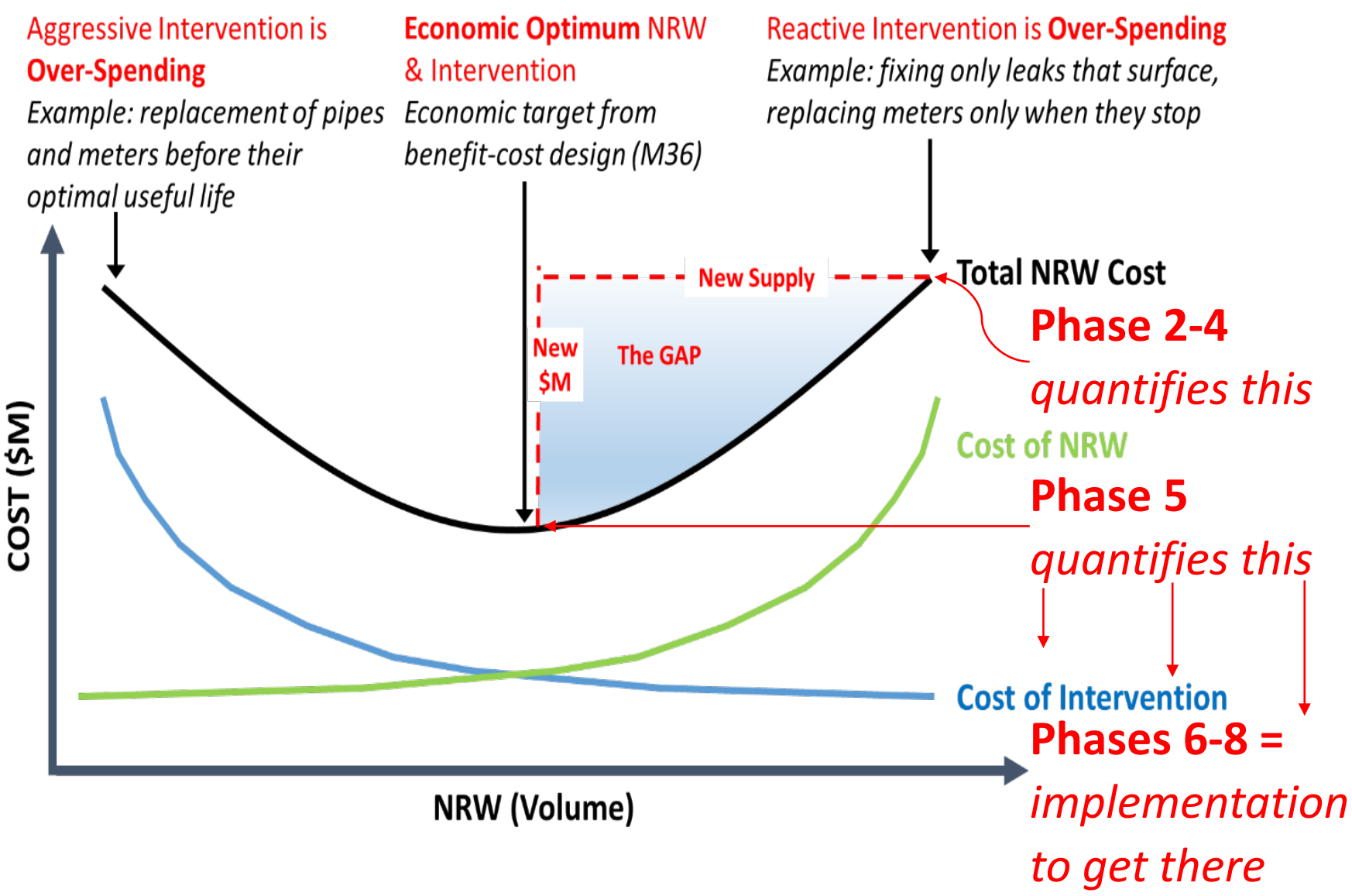
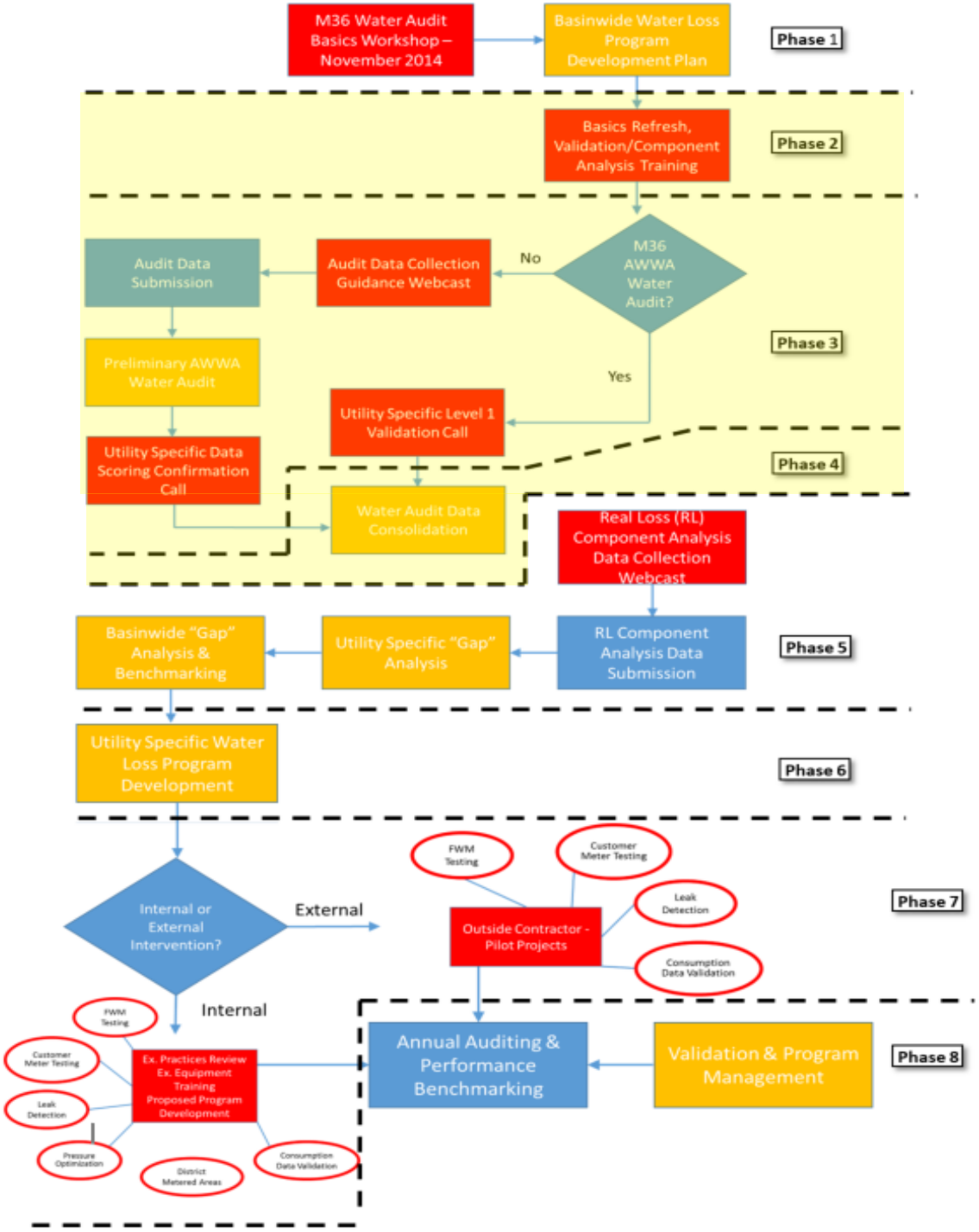
Ex. Equipment Training
Proposed Program Development
Annual Auditing & Performance Benchmarking
Validation & Program Management
Phase 8


Aggressive Intervention is
Over-Spending
Example: replacement of pipes and meters before their optimal useful life
Economic Optimum NRW & Intervention
Economic target from benefit-cost design (M36)
Reactive Intervention is Over-Spending
Example: fixing only leaks that surface, replacing meters only when they stop
New Supply
Total NRW Cost
New $M
The GAP
Phase 2-4
quantifies this
Cost of NRW
Phase 5
quantifies this
Cost of Intervention
Phases 6-8 =
implementation
to get there
COST ($M)
NRW (Volume)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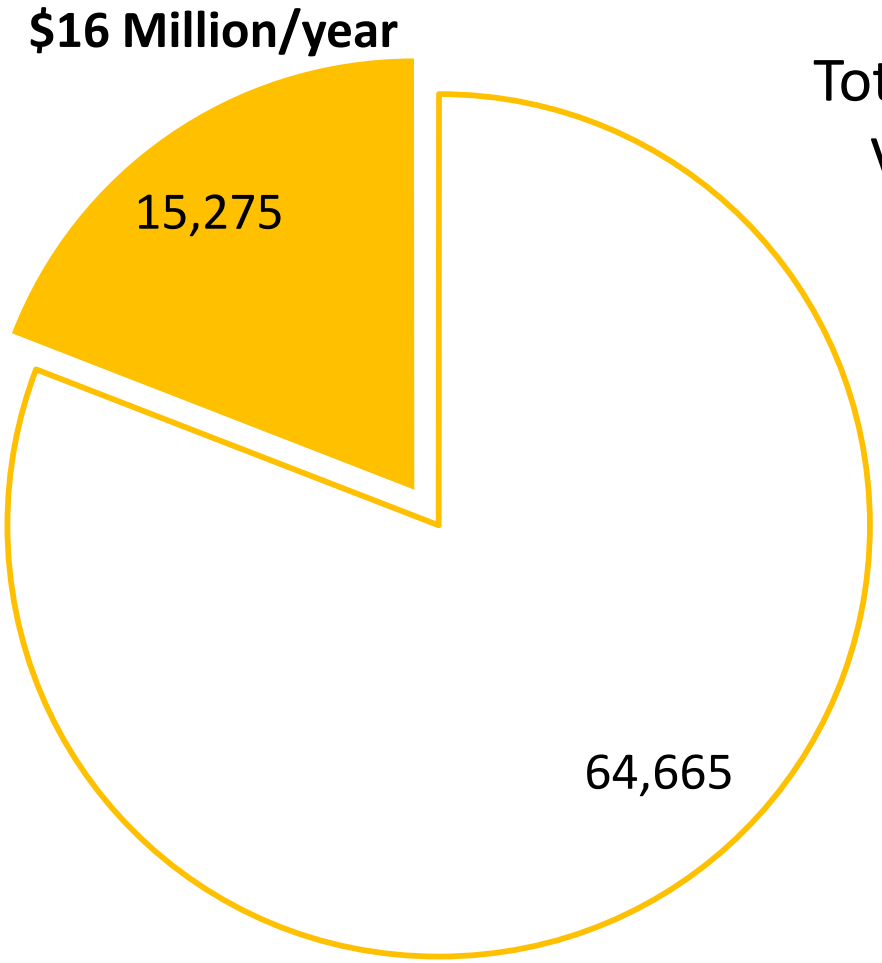
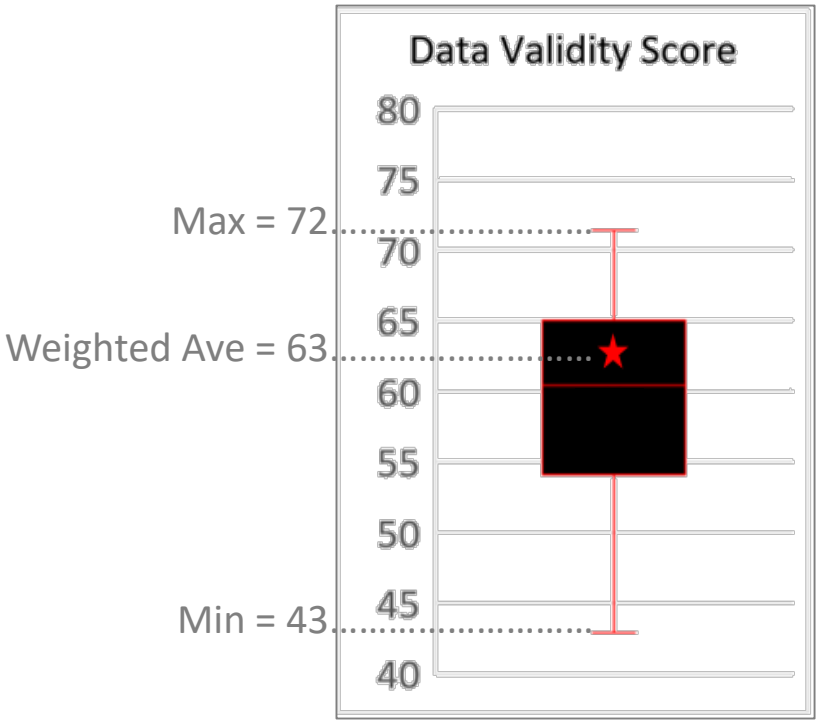
Statistics for Basinwide Aggregate



Total Non-Revenue Water Volume (MG) in 2016

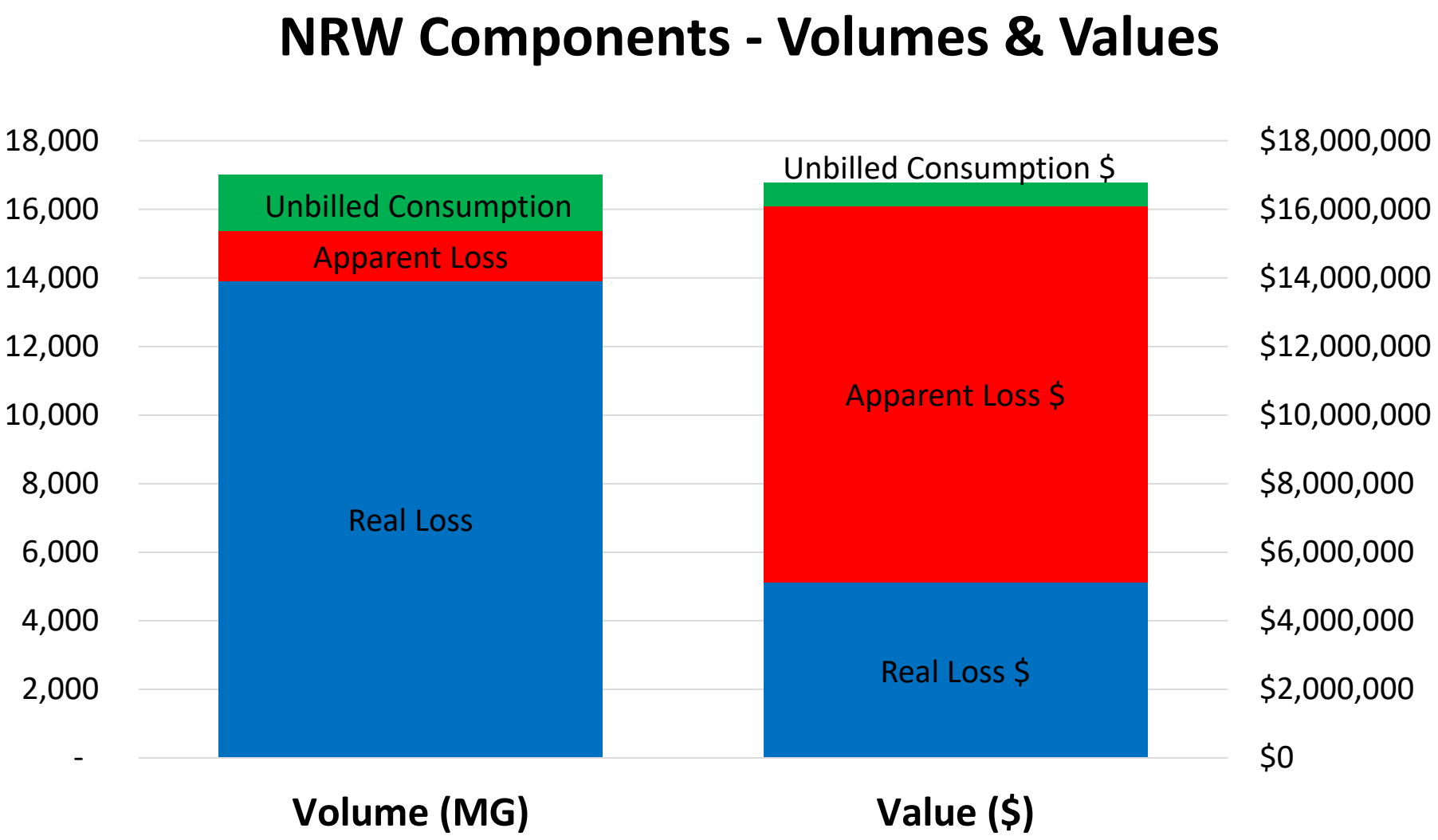
Billed Consumption

NRW

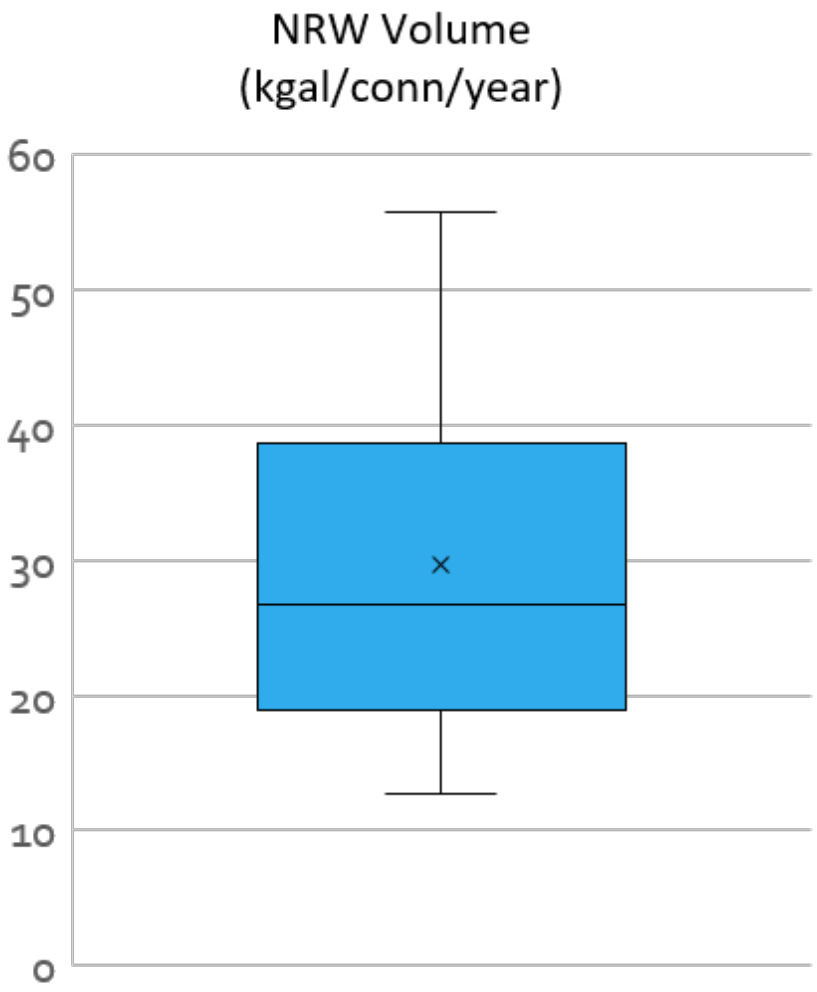


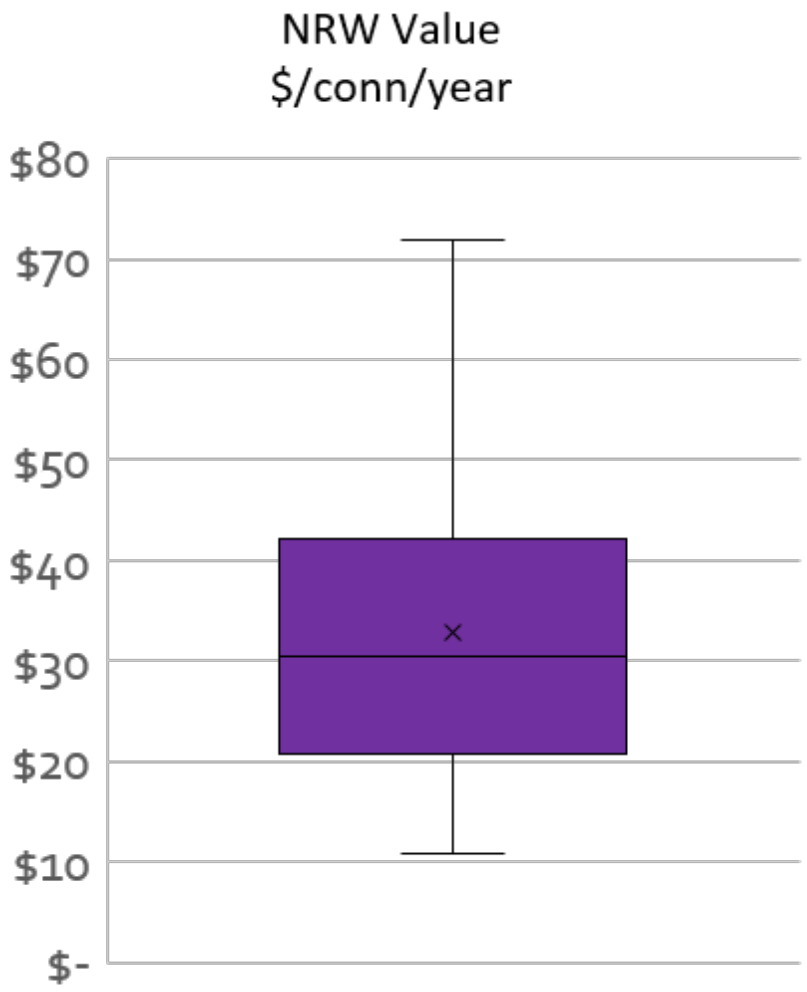
Margin of Error *+/-15%*

Catawba Water Loss Program Outcomes



Statistics for Individual Utilities





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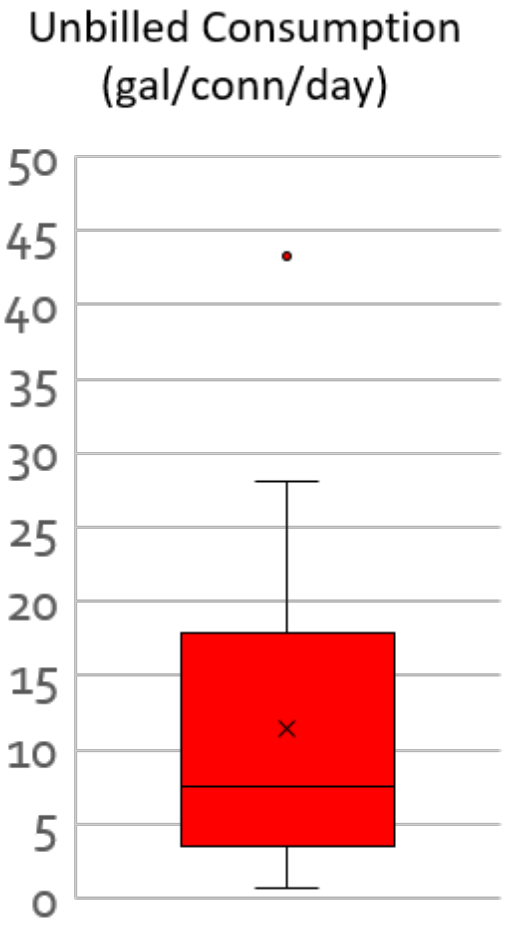

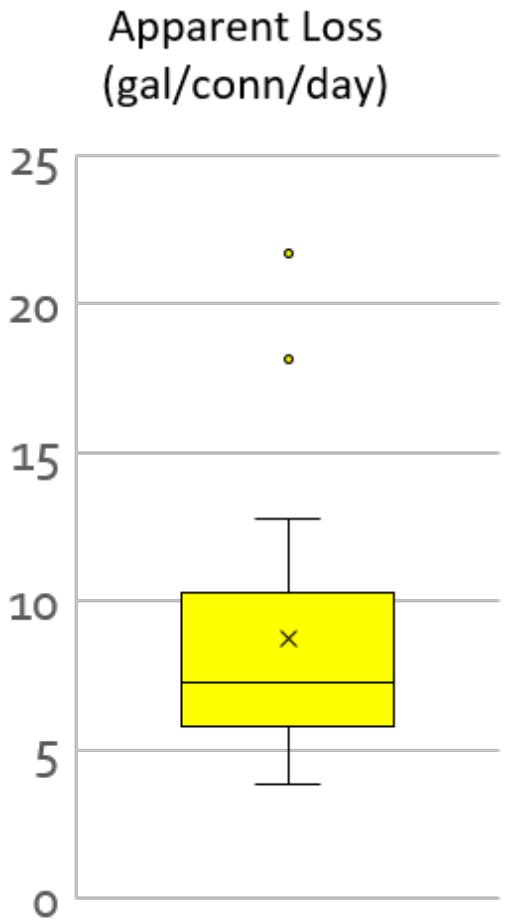

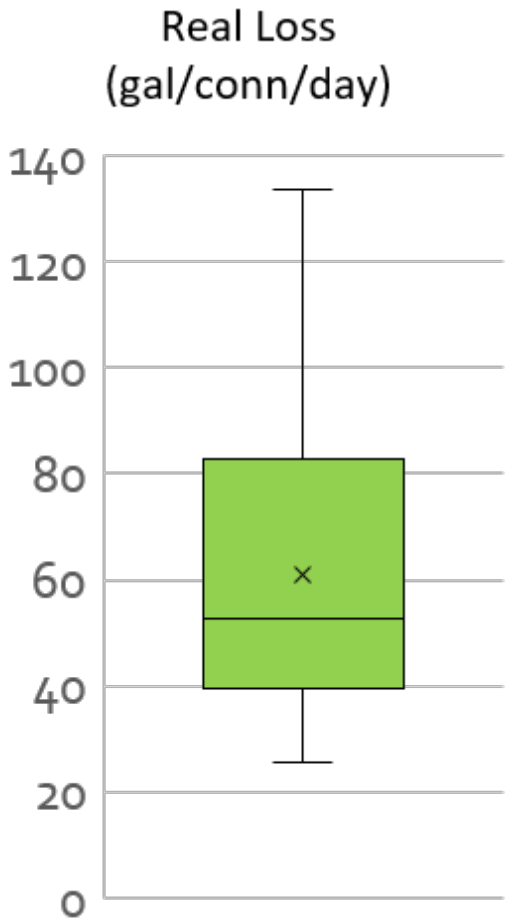

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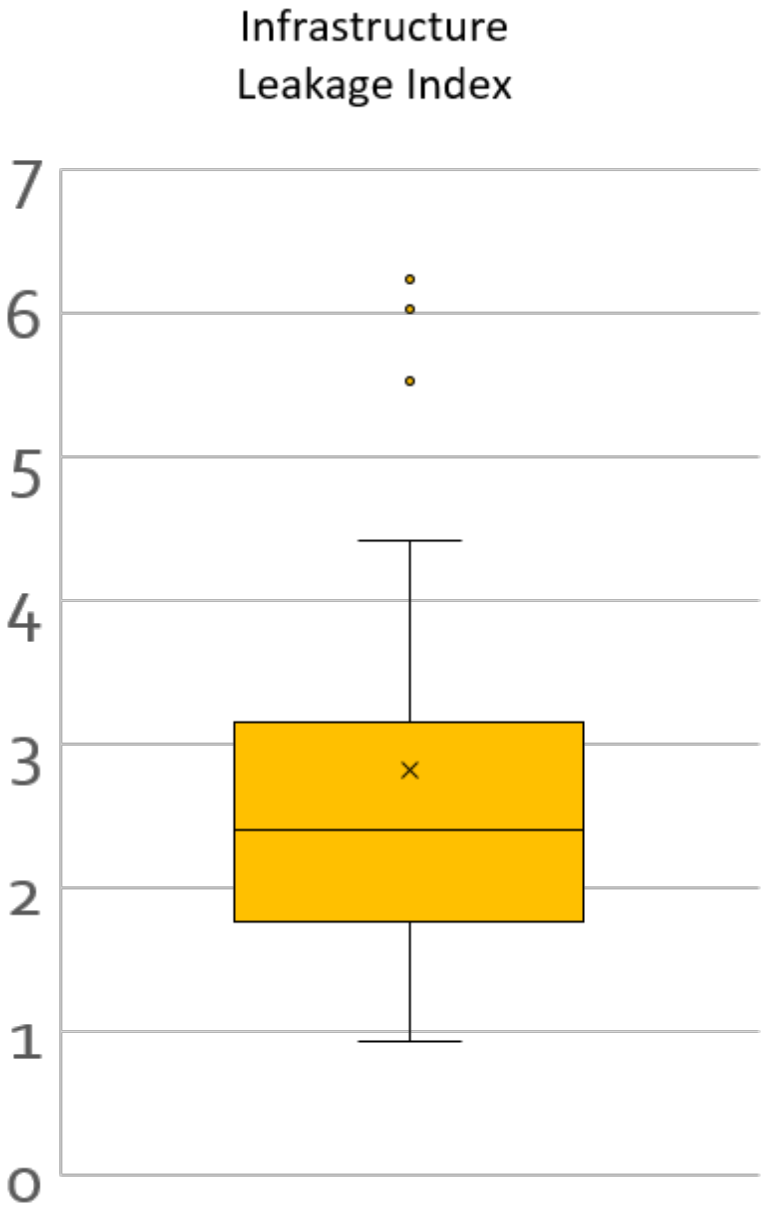

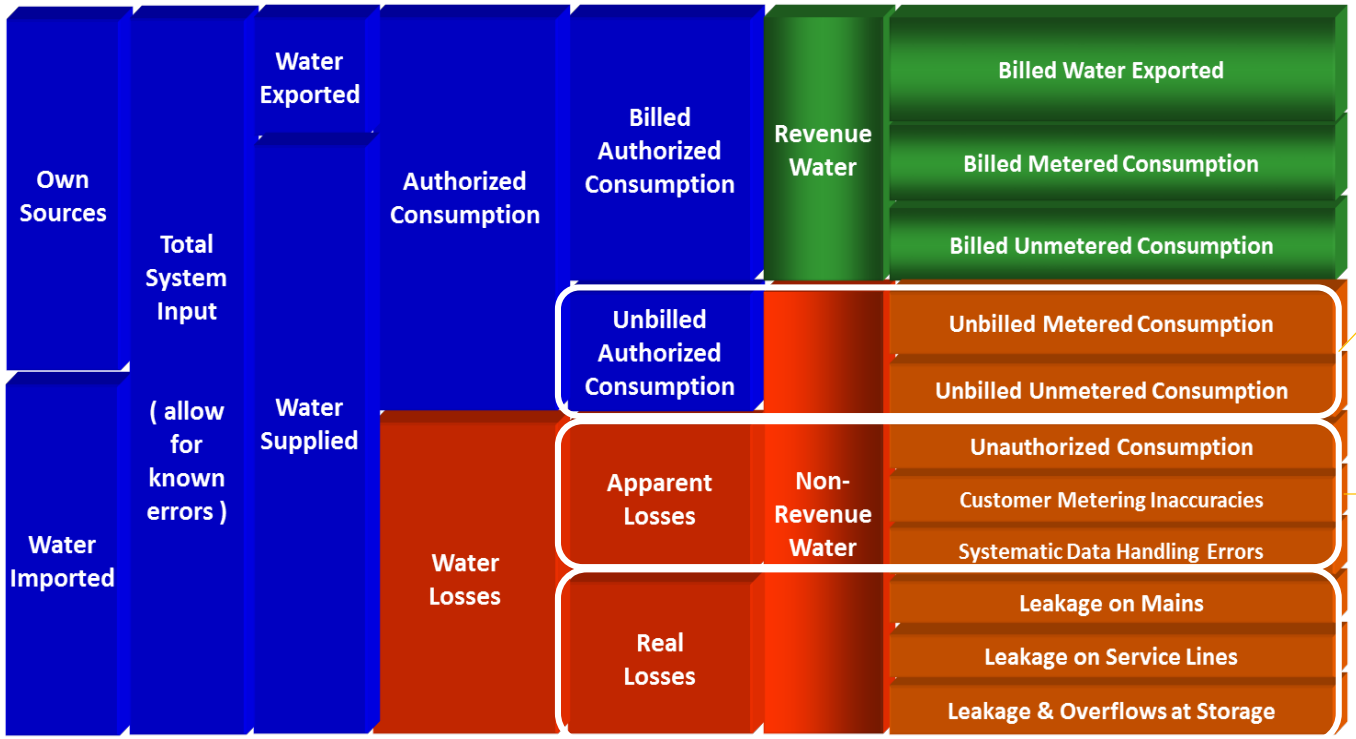
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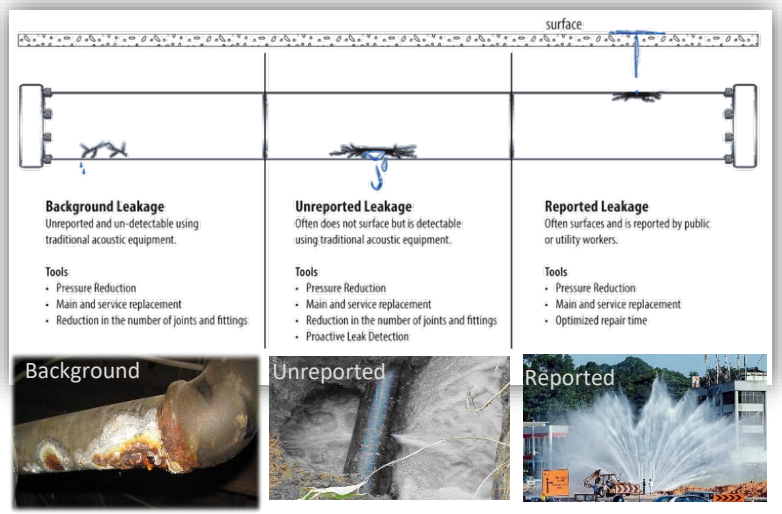
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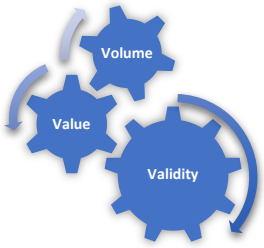

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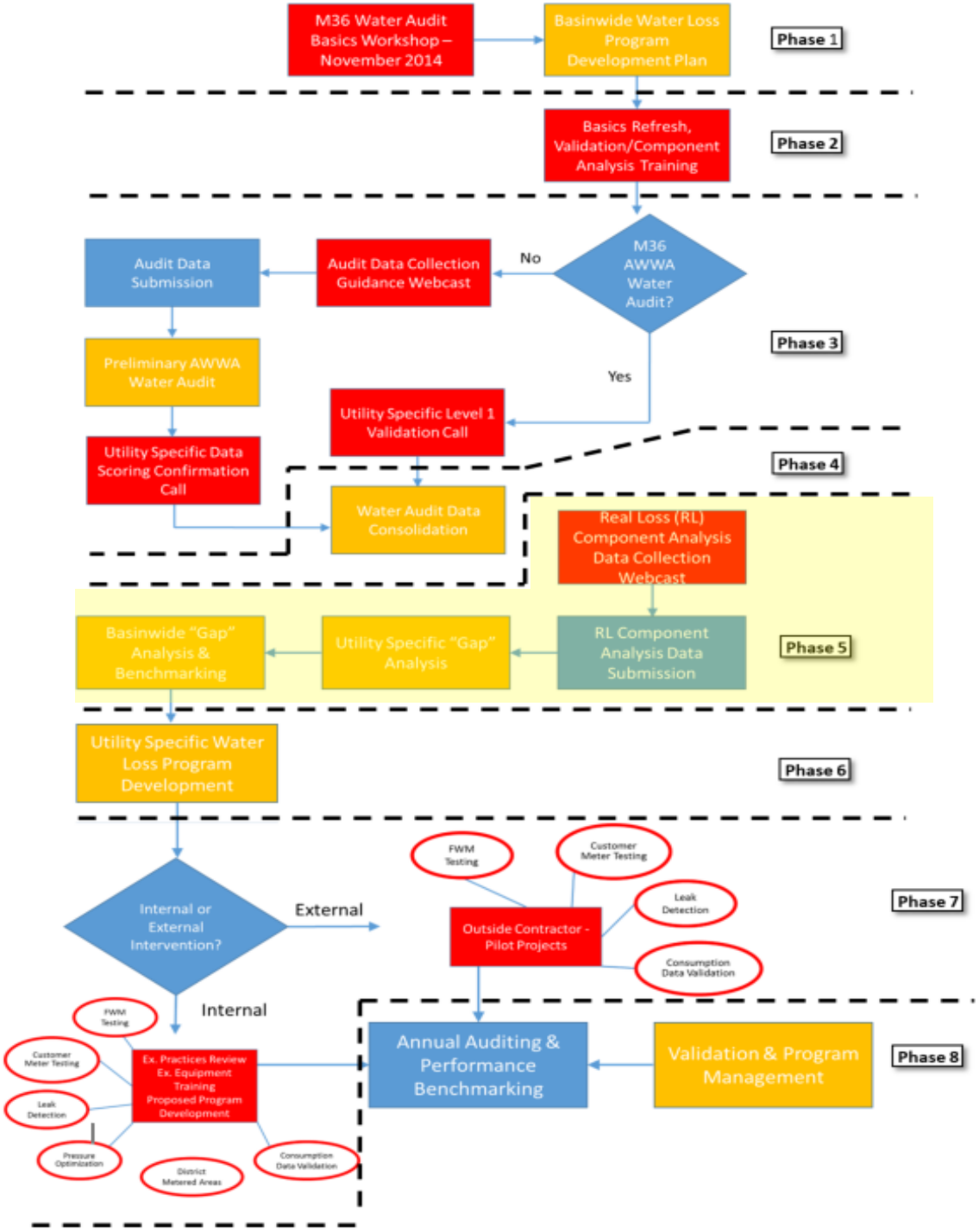
cost-effectiveness

Stage 4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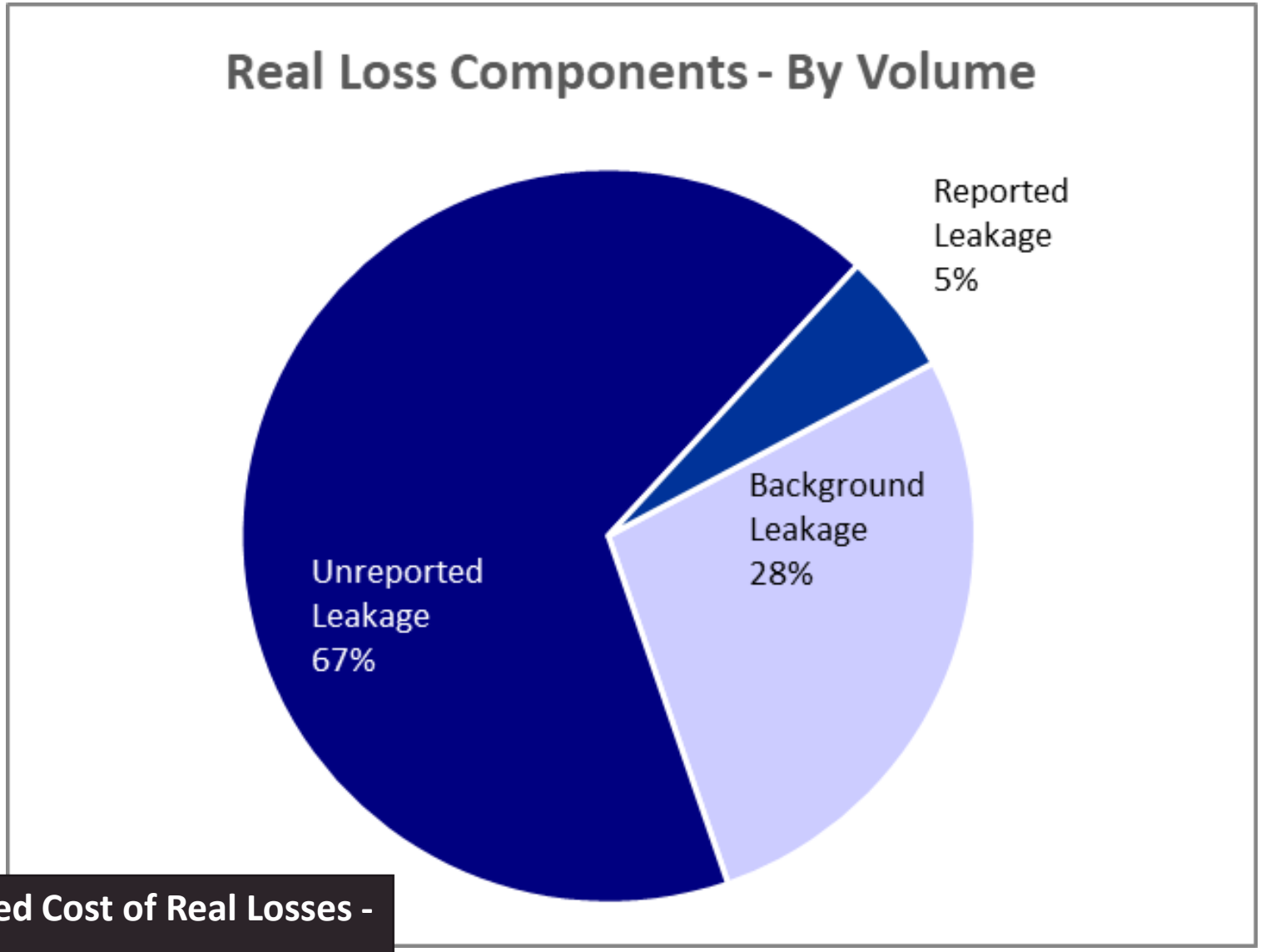
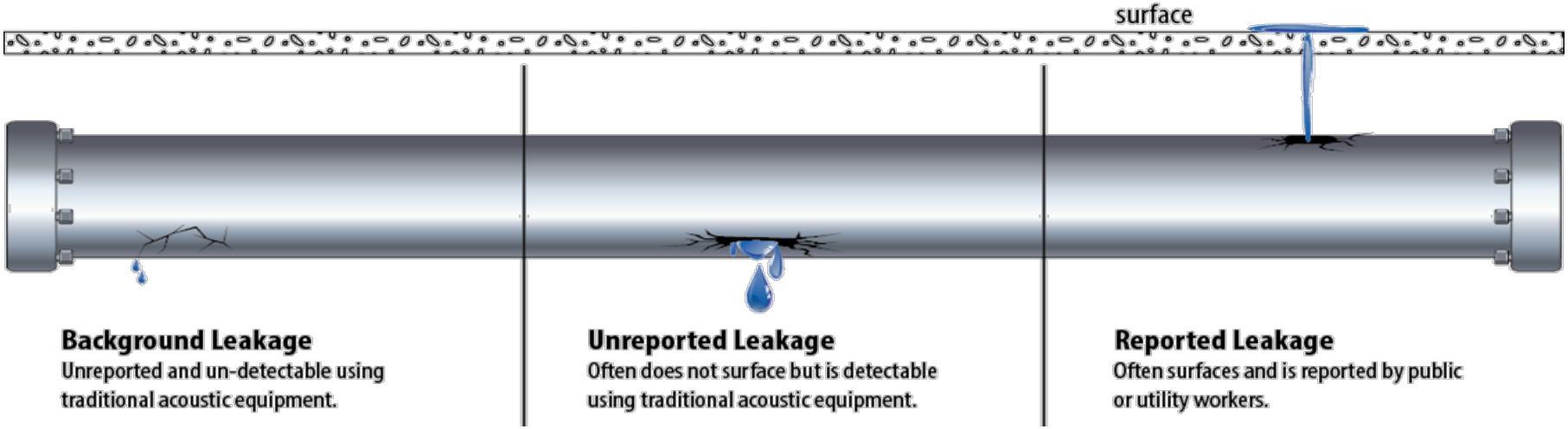
Catawba Water Loss Program Outcomes

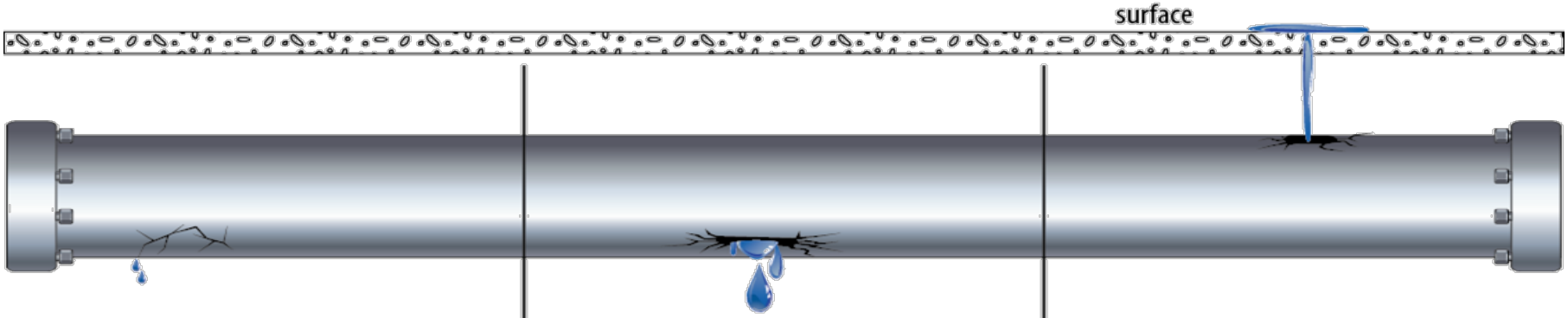


Annualized Cost of Real Losses - $5M

Types of Leakage



Selecting the Right Tool



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Main & service replacement
Reduction in number of joints/fittings
Proactive Leak Detection

Reported Leakage
Often surfaces and is reported by public or utility workers.

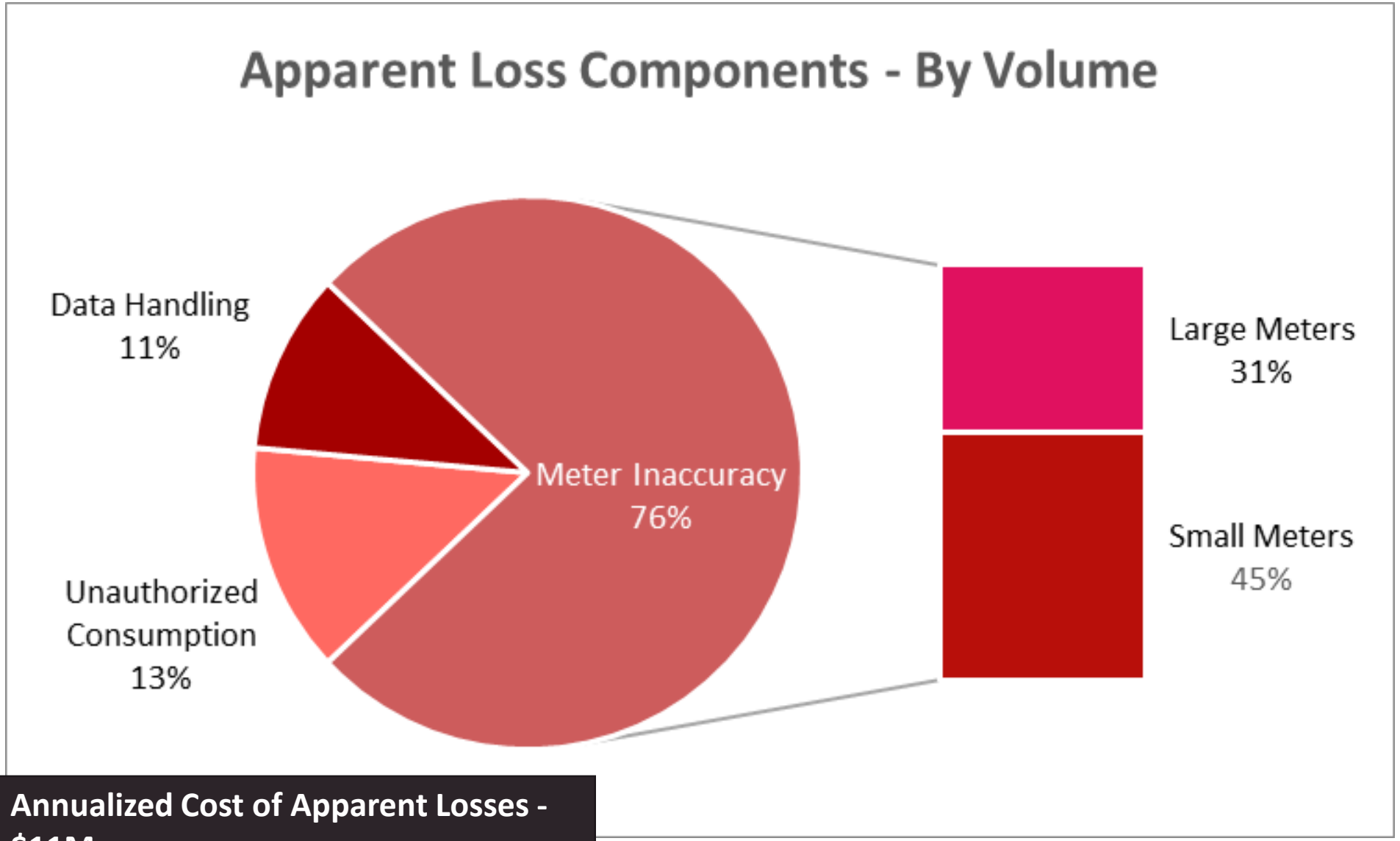
Tools
Pressure Management
Main & service replacement
Optimized repair time

Background

Unreported

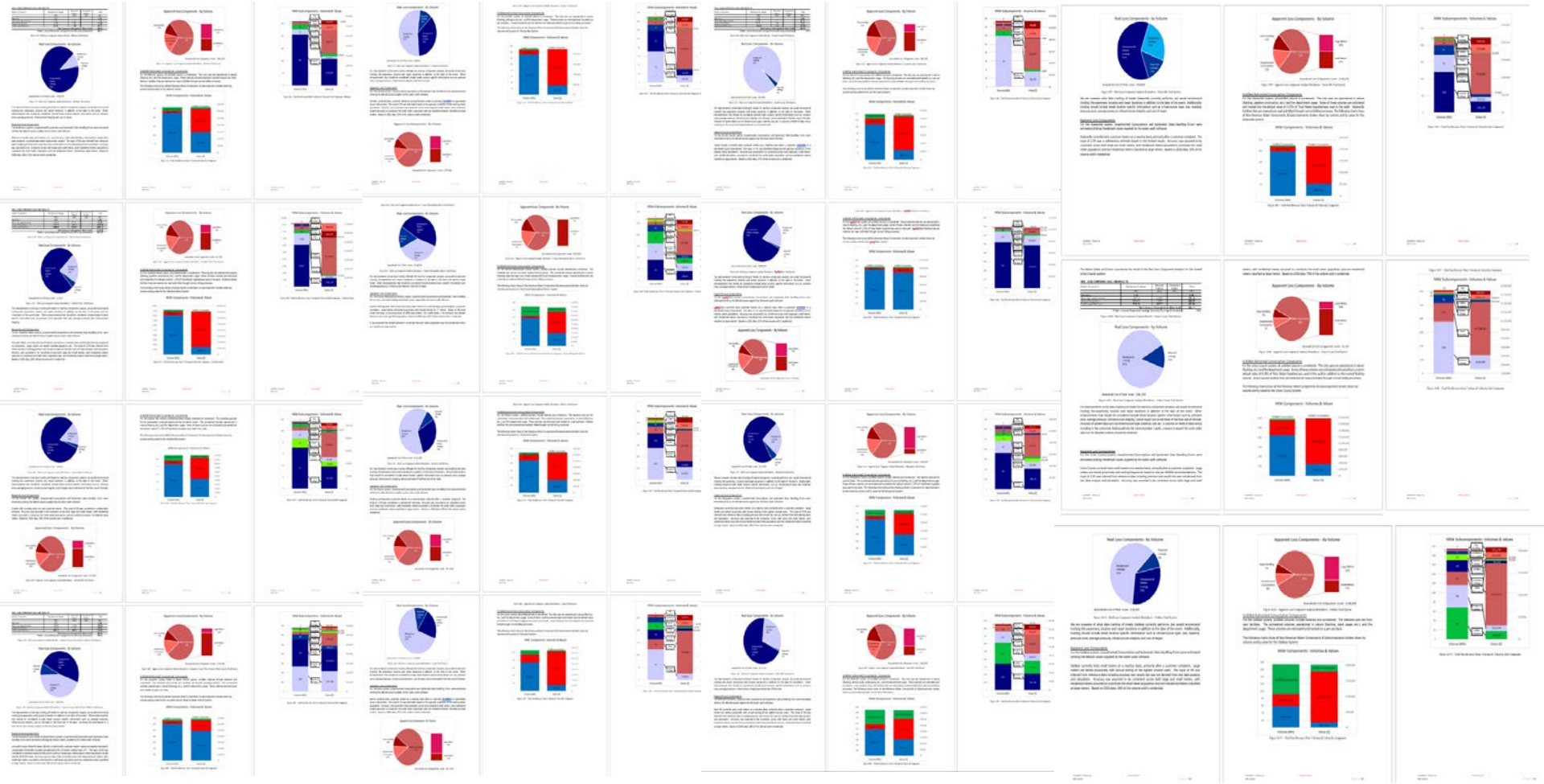
Reported

Catawba Water Loss Program Outcomes

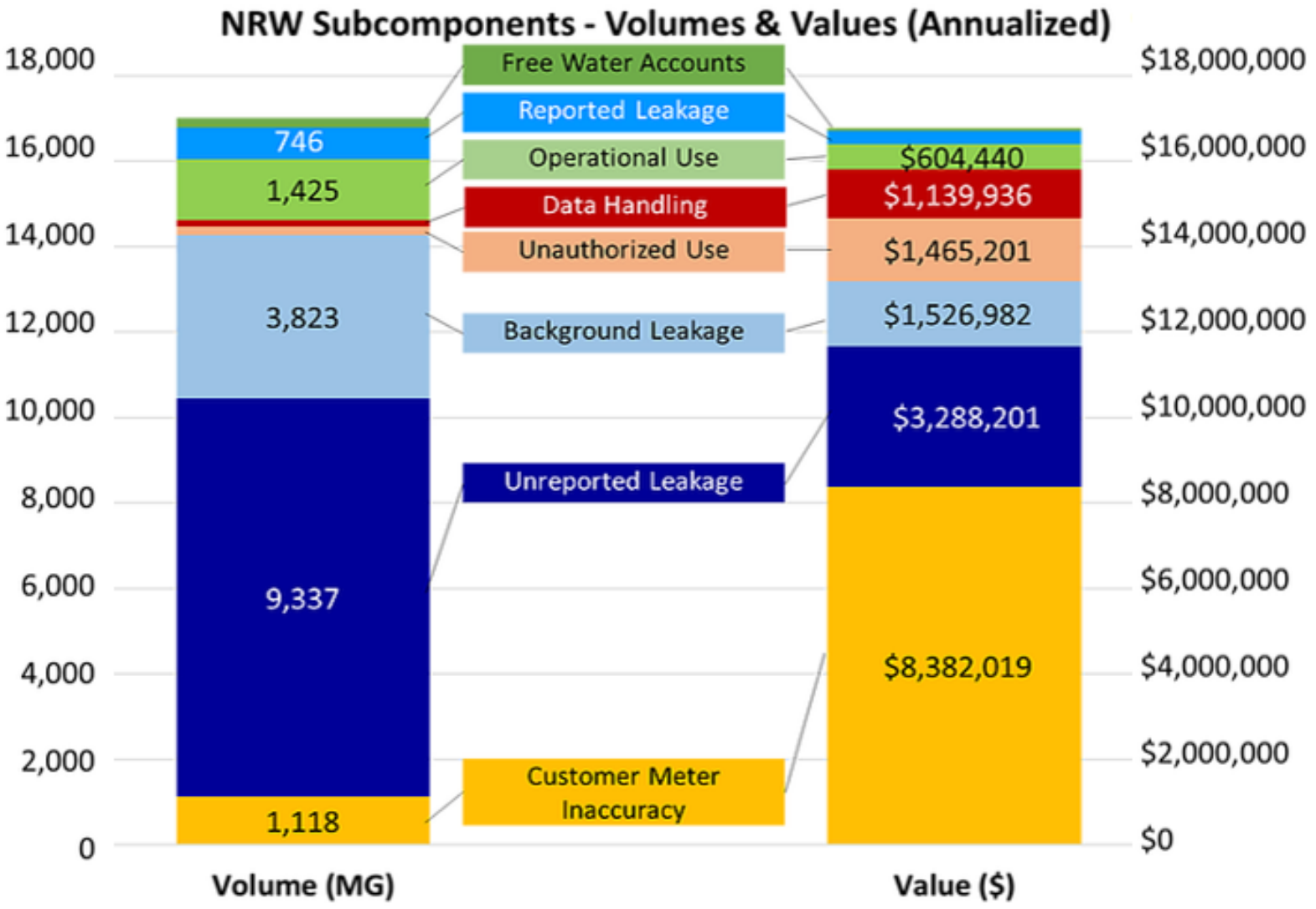


Annualized Cost of Apparent Losses - $11M

Disaggregated NRW Profiles (2017)



Catawba Water Loss Program Outcomes



The Big Picture: Economic Intervention

Annual Water Balance

Annual M36 water audit

Apparent & Real Loss volumes

Level 1 validation

baseline

Stage 1

Loss Profiling & Uncertainty

Advanced Validation
- Level 2 Analytics
- Level 3 Field Study
- Margins of Error

Apparent Loss Profile
- Theft
- Meter Inaccuracy
- Data Handling

Real Loss Profile
- Reported Leakage
- Unreported Leakage
- Background Leakage

technical analysis

Stage 2

Cost-Benefit & Targets

Costs of losses
- by subcomponent
- in aggregate
- wholesale & retail

Costs of intervention strategies

Program design

System-specific

economic analysis

Stage 3

Intervention

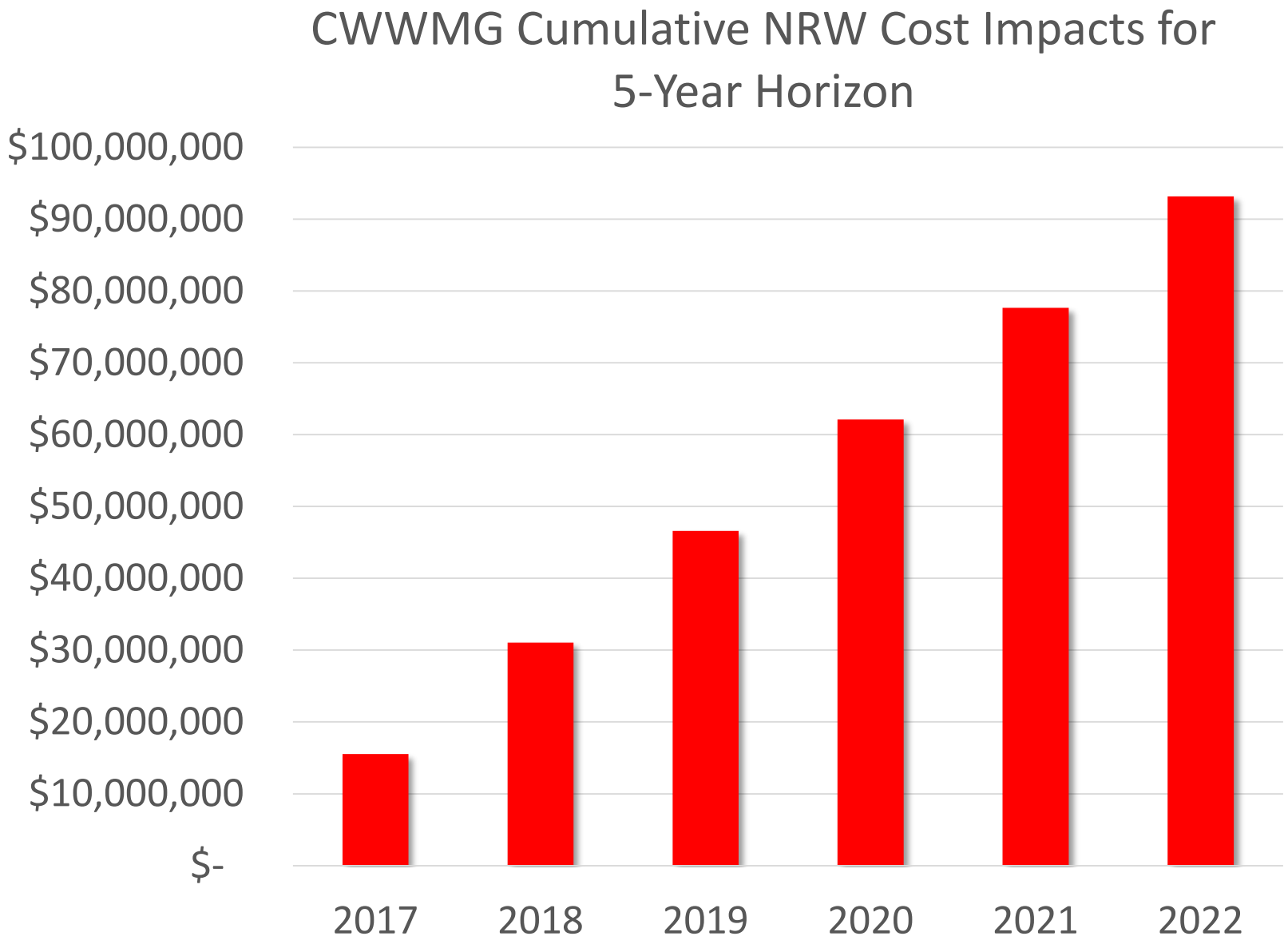
Leakage Management:
- Active Leak Detection
- Pressure Optimization
- Repair Time Reduction
- Network Renewal

Revenue Protection:
- Theft Mitigation
- Meter Optimization & Renewal
- Billing Data System Integrity
- Revenue Recovery

cost-effectiveness

Stage 4

Statistics for Basinwide Aggregate



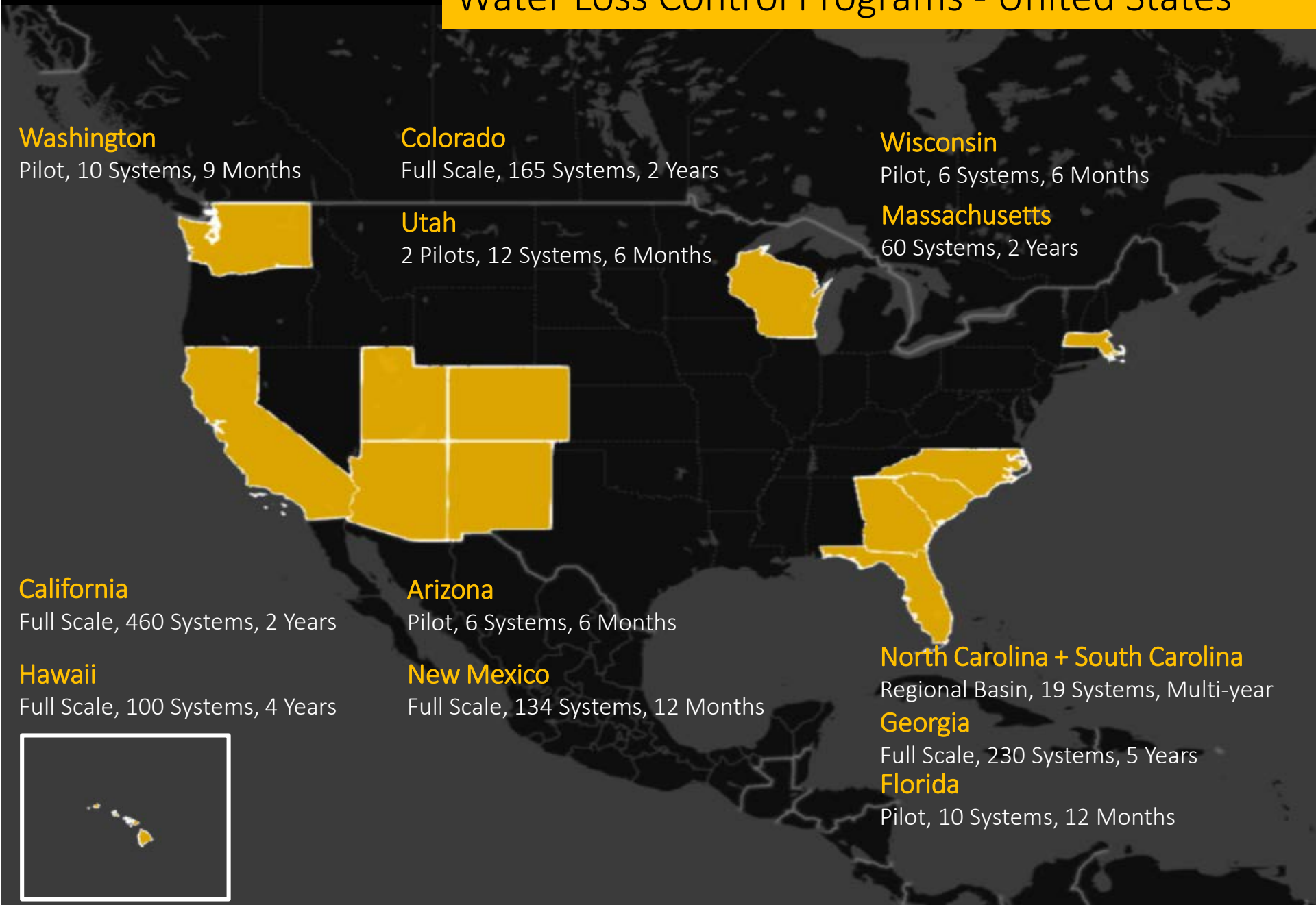
Advantages of a Basinwide Water Loss Program

Source Water

Collaboration

Perspective

Water Loss Control Programs - United States



Washington
Pilot, 10 Systems, 9 Months

Colorado
Full Scale, 165 Systems, 2 Years

Utah
2 Pilots, 12 Systems, 6 Months

Wisconsin
Pilot, 6 Systems, 6 Months

Massachusetts
60 Systems, 2 Years

California
Full Scale, 460 Systems, 2 Years

Hawaii
Full Scale, 100 Systems, 4 Years

Arizona
Pilot, 6 Systems, 6 Months

New Mexico
Full Scale, 134 Systems, 12 Months

North Carolina + South Carolina
Regional Basin, 19 Systems, Multi-year

Georgia
Full Scale, 230 Systems, 5 Years

Florida
Pilot, 10 Systems, 12 Months

American Water Works Association

NORTH AMERICAN WATER LOSS 2019

NASHVILLE, TENNESSEE
DECEMBER 3 – 5

Registration is Open!

www.awwa.org/waterloss

With Support From:

Alliance for Water Efficiency

EPA WaterSense

IWA the international water association

Local Host:

American Water Works Association
Kentucky/Tennessee Section

As The River Flows:

Catawba-Wateree's Innovative Model for Building Water Loss Control

Relevant Roles:
Chair, AWWA Water Loss Outreach Subcommittee
IWA Water Loss Specialist Group, US Representative
Chief Innovation Officer, Cavanaugh

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