



O K L A H O M A
DEPARTMENT OF ENVIRONMENTAL QUALITY
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WATER LOSS AUDITING

AN INTRODUCTION



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WHAT IS WATER LOSS?



WHY CARE ABOUT WATER LOSS?

- WATER RESOURCE MANAGEMENT CONCERNS
- FINANCIAL CONCERNS
- OPERATIONAL CONCERNS
- SYSTEM INTEGRITY



EXAMPLE: 500,000 GPD CWS



Yearly savings: 32.802 MG & \$98,550.

CHANGING MINDSETS

HOW MOST PWS THINK OF WATER LOSS



FROM "UNACCOUNTED FOR" TO NON-REVENUE:



**If you don't understand the problem,
you may apply the wrong solution!**

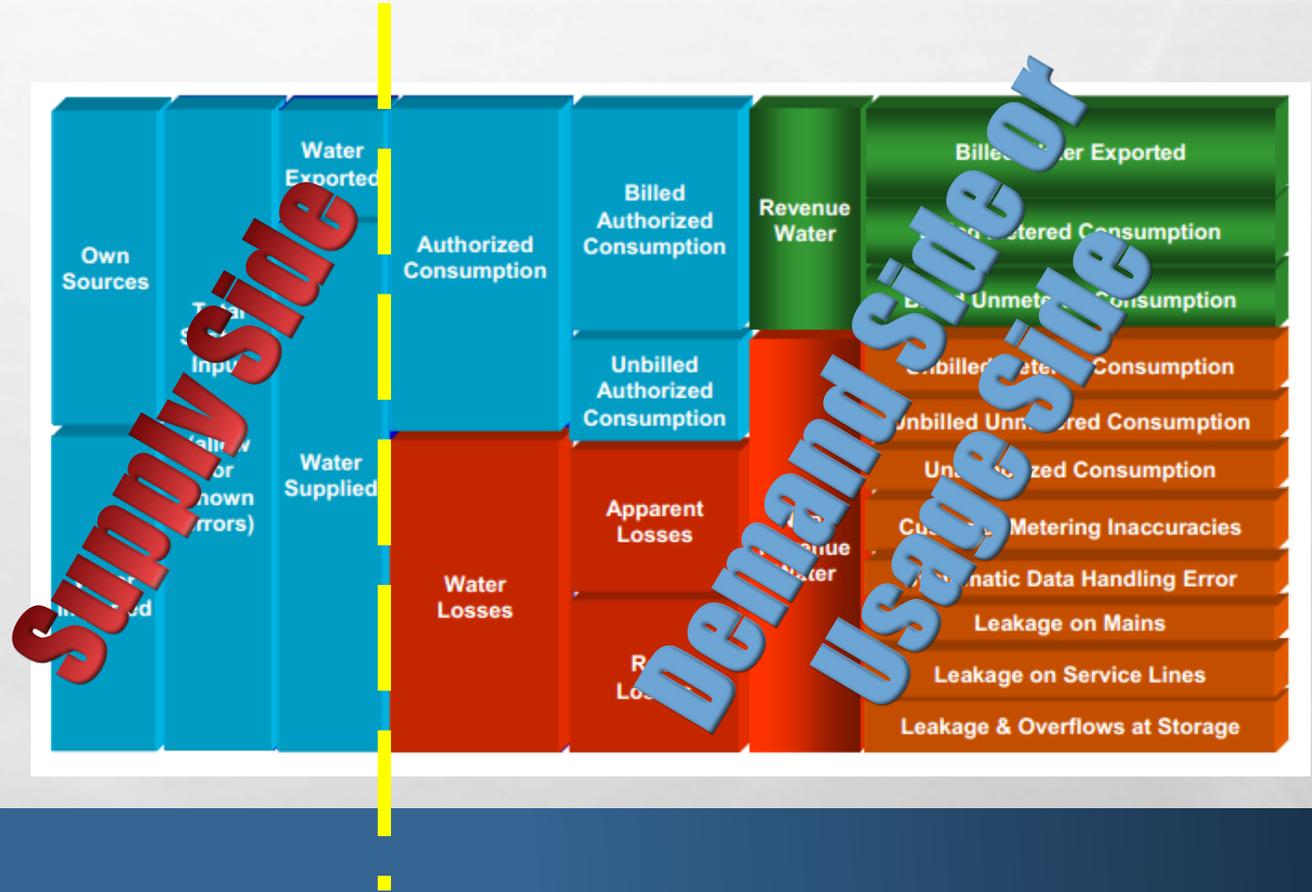


Types of Non-Revenue Water

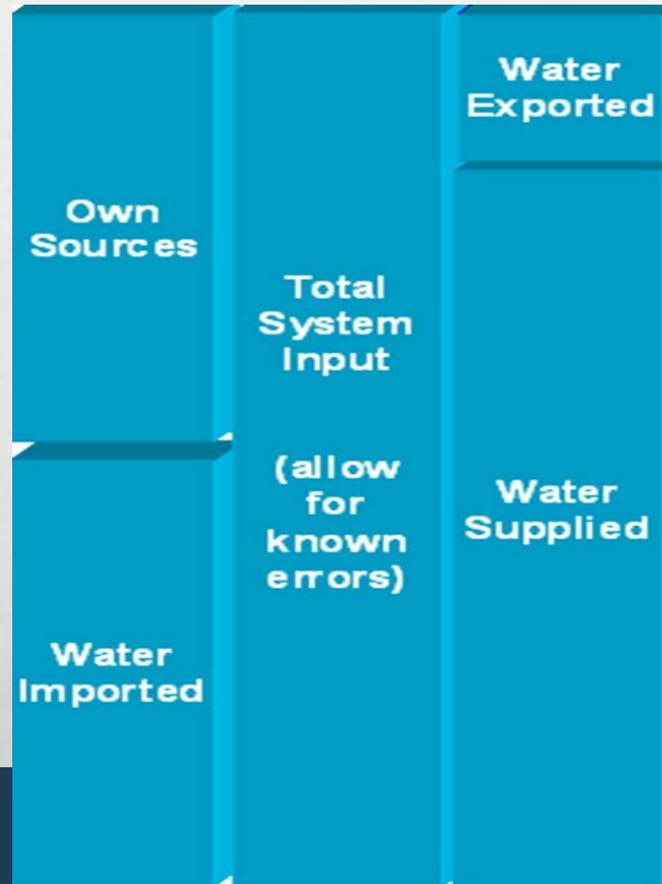
WHAT IS WATER LOSS AUDITING?

A SYSTEMATIC METHOD TO
ACCOUNT FOR ALL WATER IN
A PWS

ALSO ASSESSES VALIDITY OF
DATA

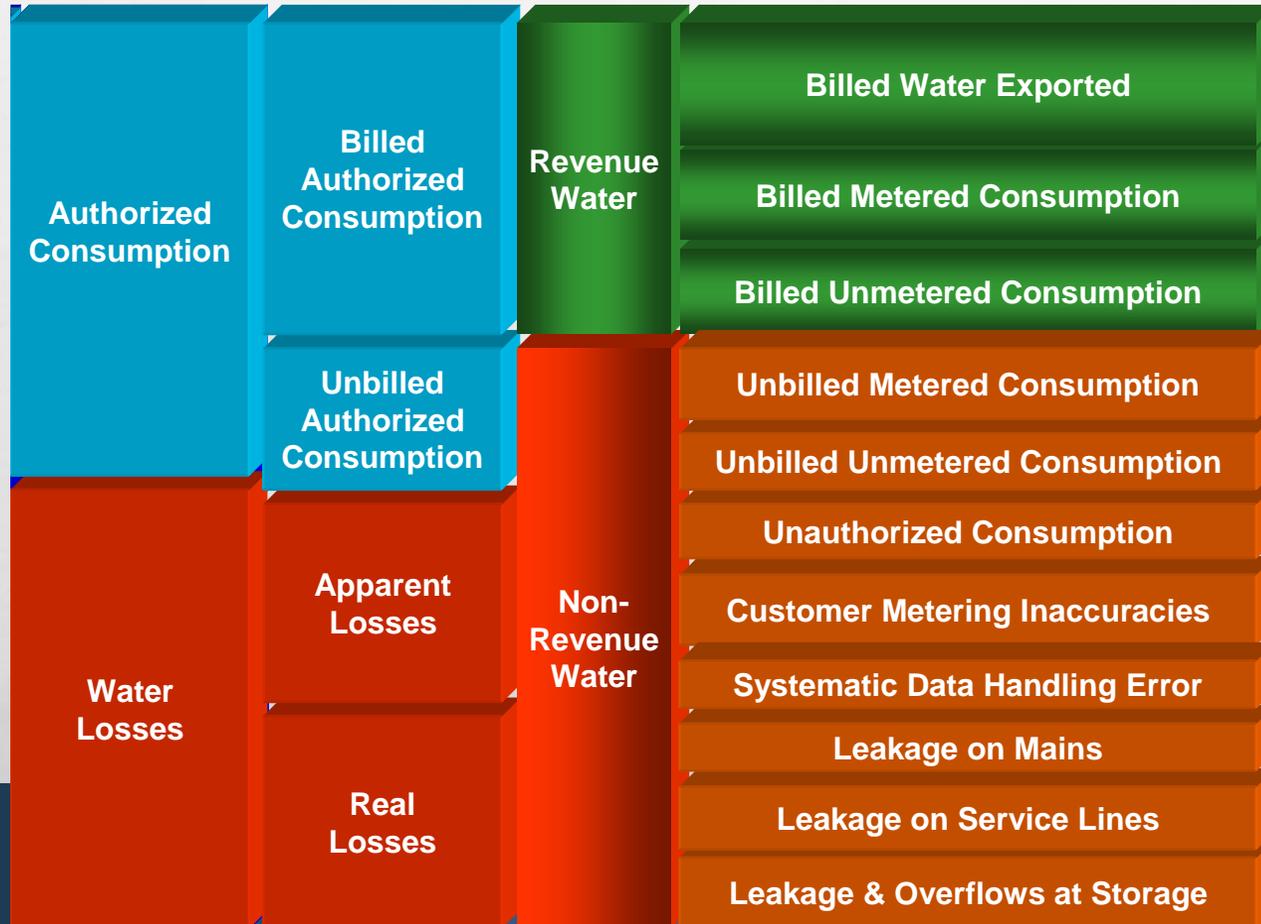


SUPPLY SIDE



- ACCOUNT FOR ALL OF THE INPUTS INTO THE SYSTEM FROM ALL SOURCES.

DEMAND SIDE



- ACCOUNT FOR ALL OF THE WATER "USES" FROM THE SYSTEM.

OTHER DATA:

- **SYSTEM DATA**

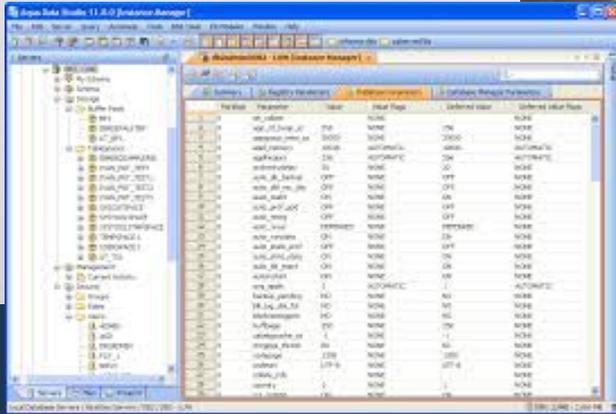
- **LENGTH OF MAINS**
- **# ACTIVE AND INACTIVE SERVICE CONNECTIONS**
- **METER LOCATION**
- **AVERAGE OPERATING PRESSURE**

- **FINANCIAL DATA**

- **ANNUAL COST OF OPERATING SYSTEM**
- **CUSTOMER RETAIL UNIT COST**
- **VARIABLE PRODUCTION COST**

RESULTS: REAL VS. APPARENT LOSSES

Apparent Losses:



Serial	Model	Year	Serial	Year	Serial	Year
10000.24	10000.24	10000.24	10000.24	10000.24	10000.24	10000.24
10000.24	10000.24	10000.24	10000.24	10000.24	10000.24	10000.24
10000.24	10000.24	10000.24	10000.24	10000.24	10000.24	10000.24
10000.24	10000.24	10000.24	10000.24	10000.24	10000.24	10000.24
10000.24	10000.24	10000.24	10000.24	10000.24	10000.24	10000.24
10000.24	10000.24	10000.24	10000.24	10000.24	10000.24	10000.24
10000.24	10000.24	10000.24	10000.24	10000.24	10000.24	10000.24
10000.24	10000.24	10000.24	10000.24	10000.24	10000.24	10000.24
10000.24	10000.24	10000.24	10000.24	10000.24	10000.24	10000.24

Real Losses:



RESULTS: PERFORMANCE INDICATORS

- **SYSTEM ATTRIBUTES:**

- **UNAVOIDABLE ANNUAL REAL LOSS (UARL)**
- **CURRENT ANNUAL REAL LOSS (CARL)**

- **INFRASTRUCTURE LEAKAGE INDEX (ILI)**

- **ILI = CARL / UARL**

- **OPERATIONAL EFFICIENCY**

- **REAL AND APPARENT LOSSES PER SERVICE CONNECTION**
- **REAL LOSSES PER MILE OF MAIN**
- **REAL LOSS PER CONNECTION PER PSI**
- **PERCENTAGES OF REAL AND APPARENT LOSS**

- **FINANCIAL INDICATORS**

- **NON-REVENUE WATER AS % OF WATER SUPPLIED**
- **NON-REVENUE WATER AS % OF OPERATIONAL COST**

- **DATA VALIDITY SCORE**

RESULTS: CATEGORIES OF REAL WATER LOSS

Current Annual Real Losses
Represents the total water that's being lost from the system



Economic Level of Real Losses = Water Loss Reduction that is ECONOMICALLY justified

BE CAREFUL WHEN WORKING IN REAL LOSS PERCENTAGES

System Consumption (gal/service line/d)	Real Losses (gal/service line/d)	System Input (gal /service line/d)	Real Losses as % of System Input Volume
150	60	210	28.6
300	60	360	16.7
600	60	660	9.1
1200	60	1260	4.8
1800	60	1860	3.2
2400	60	2460	2.4

EXAMPLE: TOWN "A"

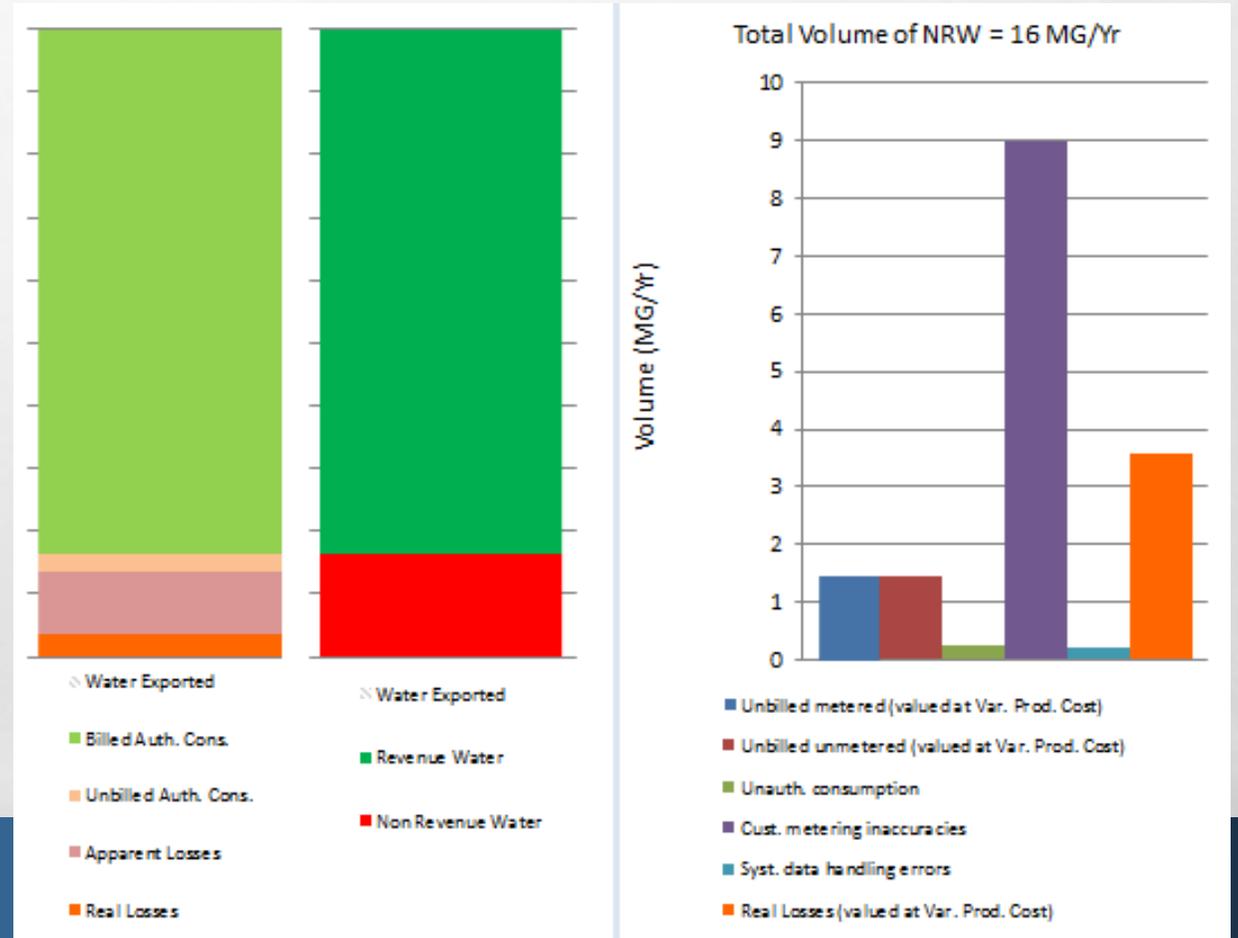
Going in, real water loss believed to be around 38% of production. Apparent loss unknown.

Actual losses:

Apparent Loss: 9.442 MG/yr (9%)

Real Loss (CARL): 3.560 MG/yr (4%)

Too small to calculate UARL or ILI



EXAMPLE: TOWN "B"

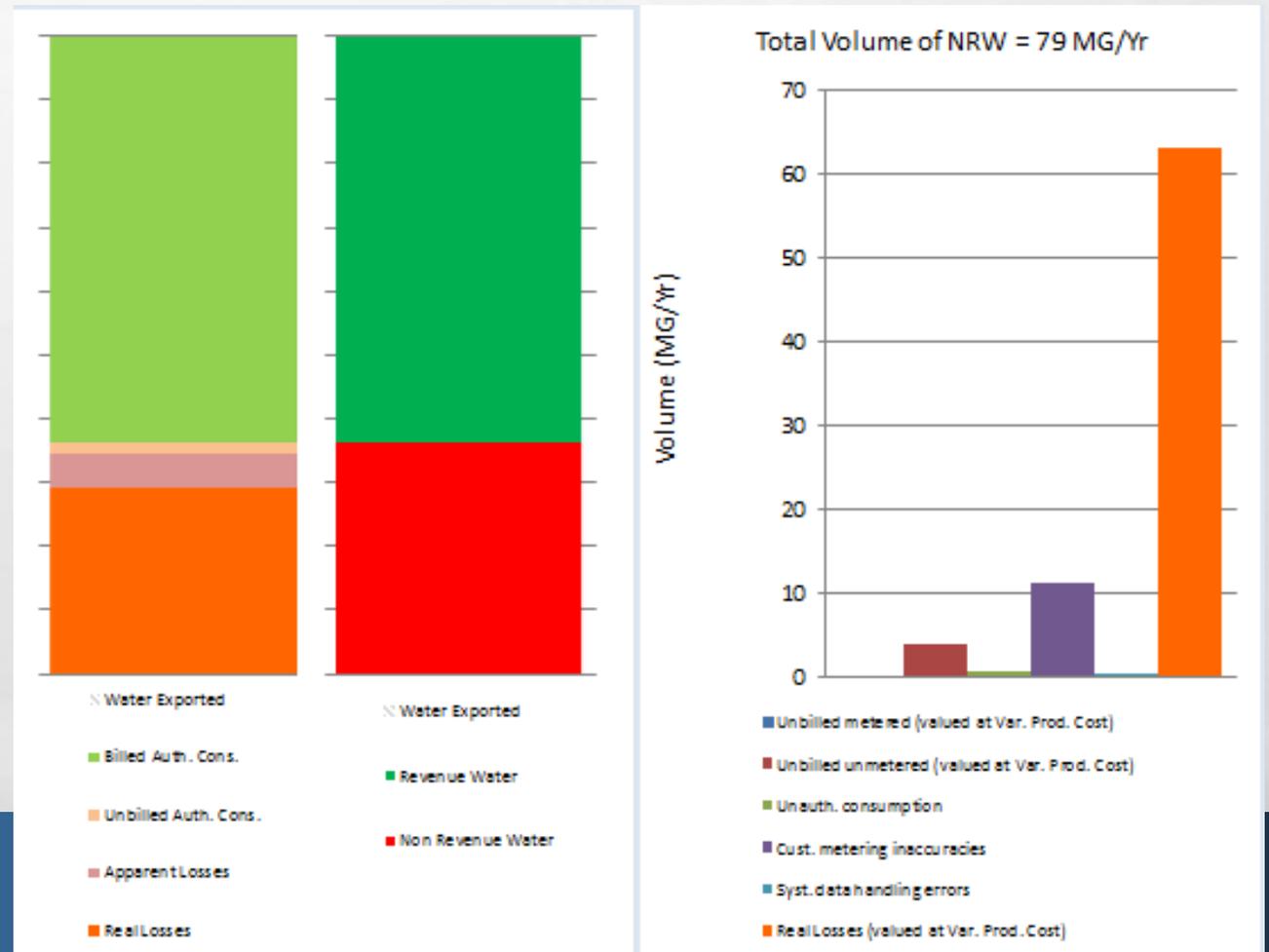
Going in, real water loss known to be high, but exact percentage unknown.

Actual Losses

Apparent Losses: 12.105 MG/yr (5.5%)

Real Losses (CARL): 63.3 MG/yr (29%)

Too small to calculate UARL or ILI



EXAMPLE: TOWN "C"

Going in, real water loss believed to be very high, greater than 50%.

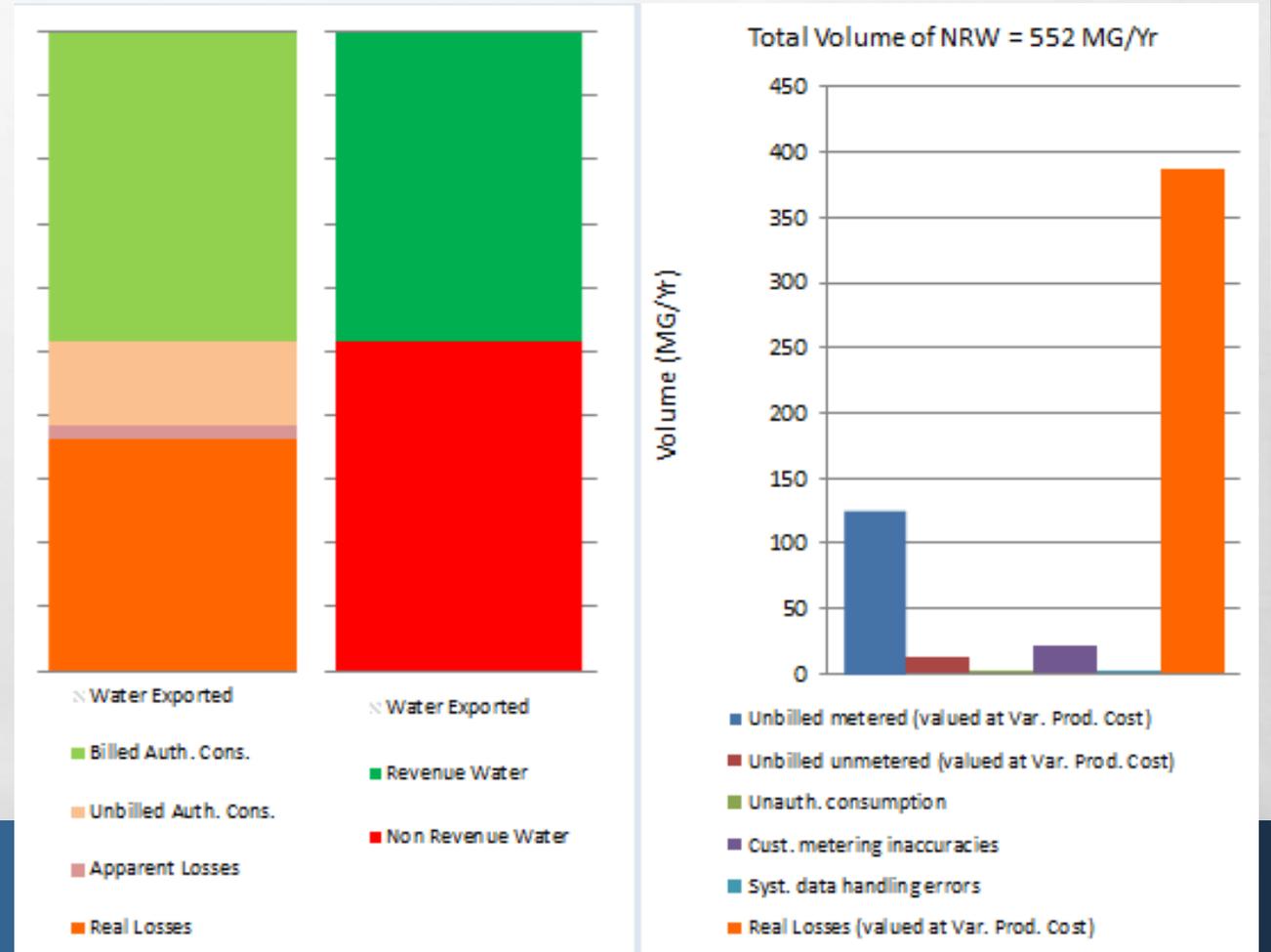
Actual Losses

Apparent Losses: 25.787MG/yr (2.4%)

Real Loss (CARL): 386.9 MG/yr (50.2%)

UARL: 49.3 MG/yr

ILI = 8.81



EXAMPLE: RURAL WATER DISTRICT

Going in, real water loss believed to be very high, greater than 50%.

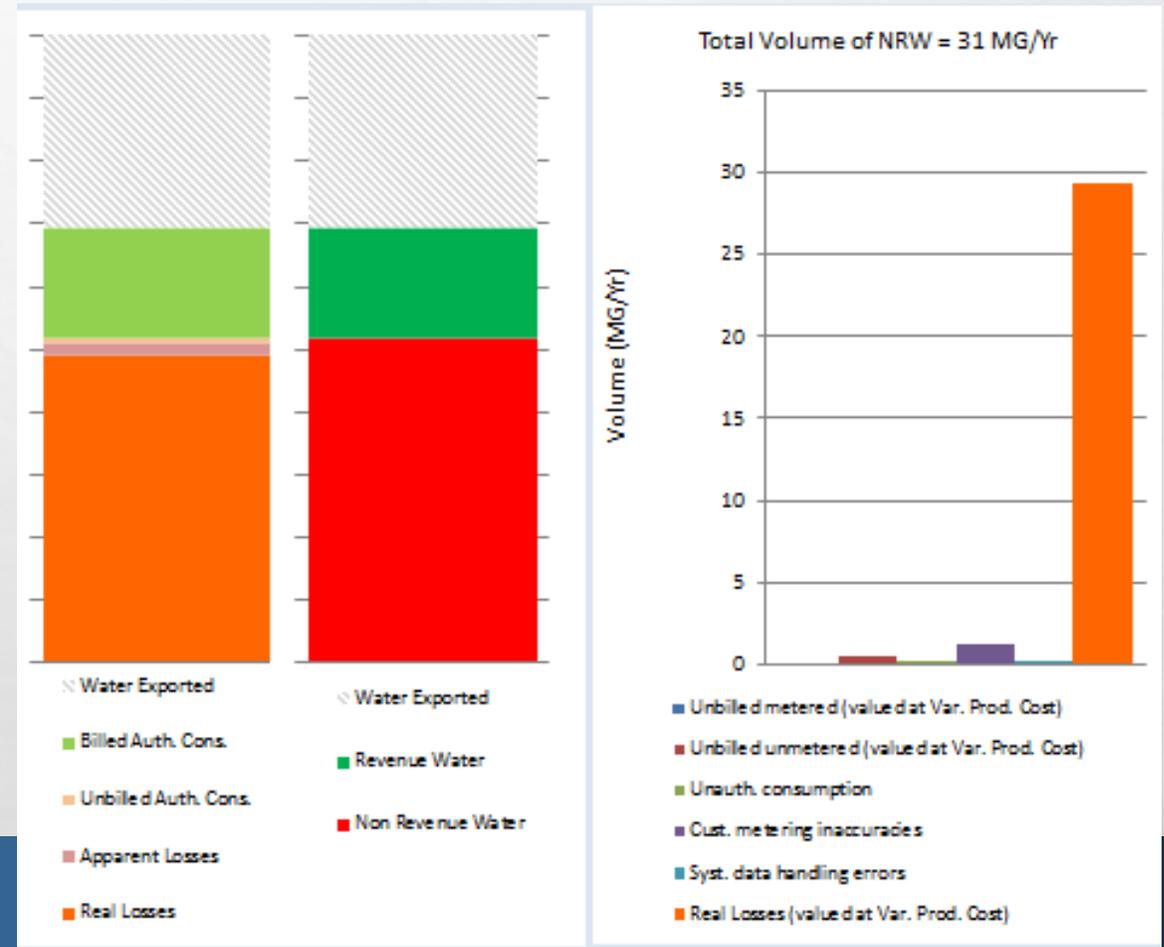
Actual Losses

Apparent Losses: 1.3 MG/yr (1.6%)

Real Loss (CARL): 29.3 MG/yr (49.2%)

UARL: 14.85 MG/yr

ILI = 1.97

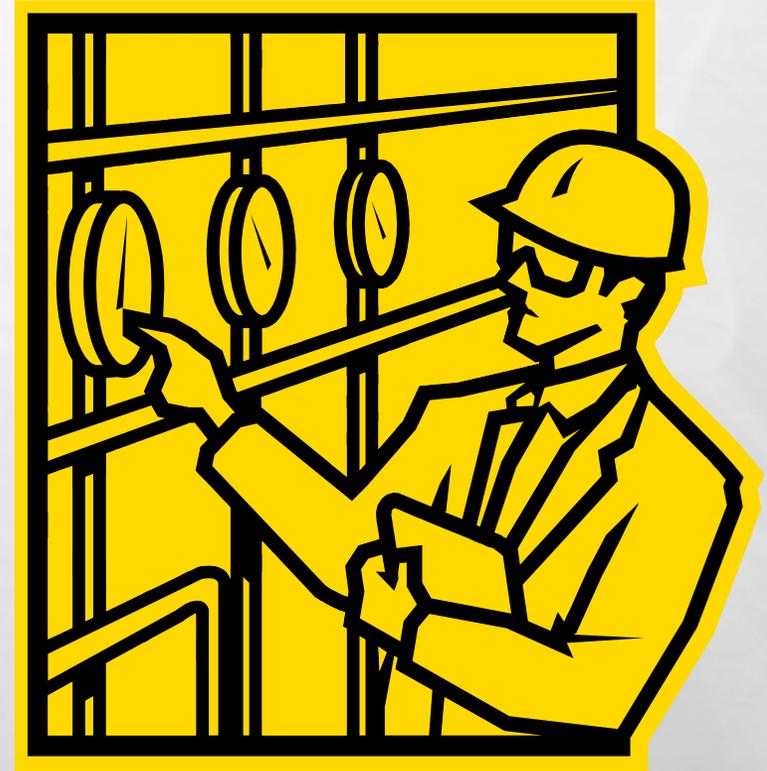


WATER LOSS AUDITING PILOT PROJECT

INNOVATIVE USE OF DWSRF SET-ASIDE FUNDING DESIGNATED FOR SOURCE WATER PROTECTION.

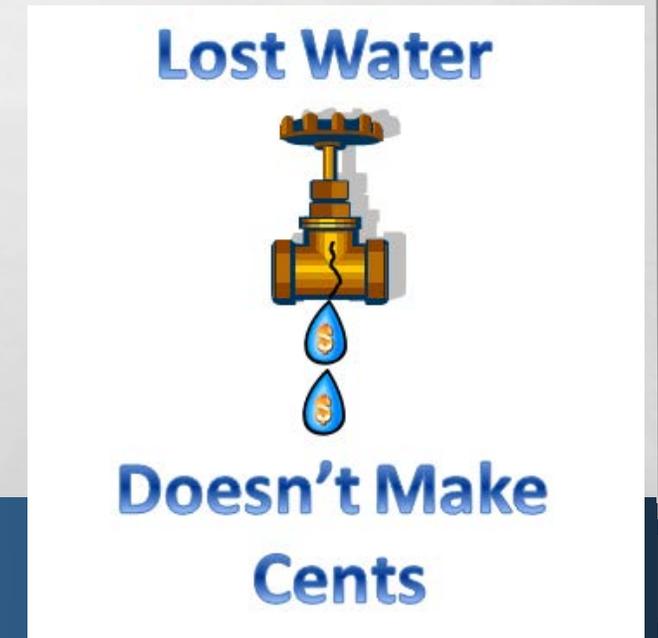
LOCAL ODEQ INSPECTORS TO CONDUCT WATER LOSS AUDITS AT SMALL COMMUNITY WATER SYSTEMS.

TOP-DOWN WATER LOSS AUDITS USING THE AWWA METHOD AND SOFTWARE.



WHY ARE WE DOING IT?

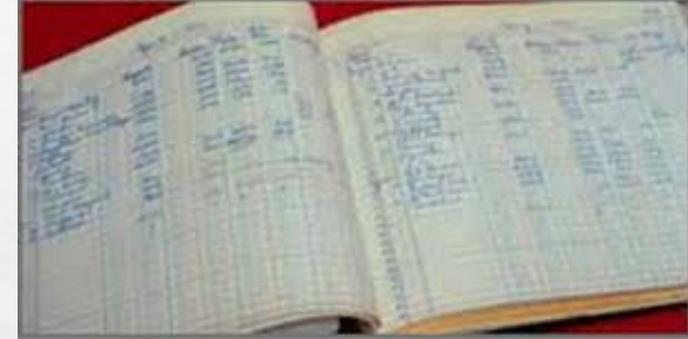
- TO INTRODUCE THE CONCEPT OF ACCURATE WATER LOSS AUDITING STATE-WIDE
- TO DEMONSTRATE THE USEFULNESS OF THE TOOL
- PROGRAM DEVELOPMENT



PROJECT GOALS

TO CONDUCT WATER LOSS AUDITS AT 40 SMALL COMMUNITY WATER SUPPLIES:

- TYPES AND AMOUNTS OF NON-REVENUE WATER
- RECOMMENDATIONS TO ADDRESS PROBLEMS
- COORDINATION WITH CONTRACTOR TO PINPOINT AND ADDRESS SOURCES OF WATER LOSS
- INFORMATION ON FUNDING FOR PROJECTS TO ADDRESS WATER LOSS



COMPLETED STEPS

- CORE GROUP OF ECLS AND DWSRF STAFF TRAINED IN AWWA WATER AUDIT METHOD
 - JANUARY 2015
 - CONDUCTED BY SWEFC
- 40 VOLUNTEER SYSTEMS SELECTED
 - SYSTEMS FROM ALL PARTS OF THE STATE
 - LESS THAN 10,000 POPULATION



DEQ Seeking Volunteer Water Systems for Water Loss Auditing Pilot Project

Over the next two years, the Department of Environmental Quality (DEQ) is piloting a water loss auditing program. The goal of the pilot project is to help community water systems with less than 10,000 consumers find and correct sources of non-revenue and unaccounted-for water. Agency personnel will work with volunteer water systems to assess production and metering efficiency, to determine the most cost-effective corrective actions, and to minimize losses.

What is a water loss audit?

A water loss audit is a tool to help identify and control water loss in a water distribution system. It is an accounting of all the water produced, sold, consumed, and lost in a water system. A water loss audit indicates how much water is lost due to faulty meters, data handling errors, and unauthorized use (apparent losses) and how much is lost due to leaks and overflows (real losses).

How is a water loss audit performed?

DEQ personnel will perform "top-down" water loss auditing using the International Water Association / American Water Works Association (IWA / AWWA) method, considered to be the industry standard for gauging water loss. The audit will involve software developed by the AWWA to calculate real and apparent water losses using metering and billing data routinely gathered by the water system. The audit is usually completed in a matter of hours, and the results are available immediately.



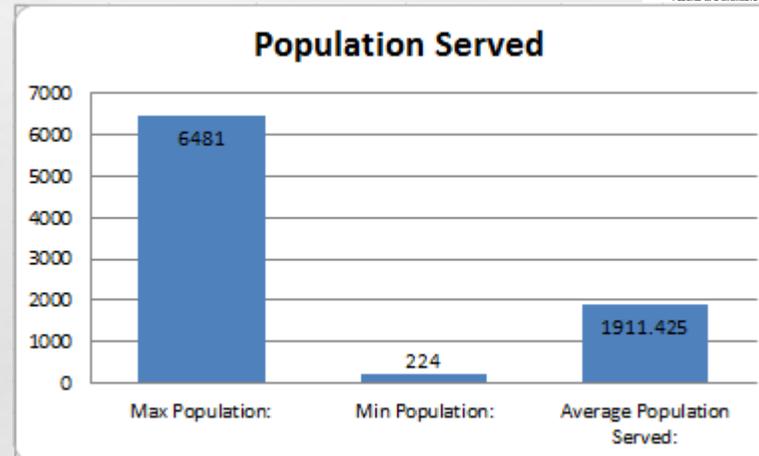
How much does it cost to have a water loss audit performed?

Having a water loss audit performed by a private consultant can cost a water system several thousands of dollars. However, for community water systems that meet the criteria of this pilot project and are selected to participate, there is no charge for the water audit or the software, which will be provided to the system for future use.

How can having a water loss audit benefit a water system?

Without a water loss audit, it is difficult to determine exactly how much water is unaccounted for in a water system, or how much lost revenue that missing water represents. A water loss audit put real volumes to amounts of lost water that were previously only a guess, allowing systems to pinpoint which portions and structures on a distribution system have

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CURRENT STATUS

- AUDITS FOR 40 SYSTEMS COMPLETE
- TARGET COMPLETION DATE FOR RECOMMENDATIONS END OF DECEMBER 2015
- CONTRACTOR TO FOLLOW UP WITH LEAK DETECTION EQUIPMENT AND METER ANALYSIS TO ADDRESS AUDIT RESULTS.

A screenshot of a software interface, likely a data management or monitoring system. It displays a table with multiple columns and rows of data. The table has a header row and several data rows. The interface includes a tree view on the left side and various menu options at the top.

COMPLETION OF PILOT PROJECT

- FINAL REPORT
 - TOTAL VOLUME OF WATER LOST / TOTAL REVENUE LOST
 - EACH SYSTEMS EXPERIENCE TO BE RELATED AS A CASE STUDY
 - OVERALL RESULTS TO BE USED TO INFORM FUTURE WORK
 - ADDITIONAL WATER AUDITS BY DEQ
 - TRAINING CWS STAFF TO CONDUCT THEIR OWN AUDITS
 - GROUNDWORK FOR POSSIBLE WATER AUDITING PROGRAM



QUESTIONS?

For more information, please contact:

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