



**“Managing Water Production and
Disposal”**

WATER AND WASTEWATER WORKSHOP



Water System Auditing and Loss Prevention

SC Office of Regulatory Staff

January 31, 2013
Willie J. Morgan, P.E.



New Sources of Water

1. New Dams
2. River Sharing
3. Rain Water Harvesting
4. Desalination
5. Icebergs

JUST PLUG
THE LEAKS!!



2012 Changes to DHEC Sanitary Survey

Section 18 – Water Audits

1. Abandons the Imprecise Term “UnAccounted For Water”
2. Guides inspector to check a system’s Water Audit and see if the Audit is guiding Water Loss Control (WLC) activities
3. Introduces the Water Balance and sets preferred Audit method as the AWWA Free Water Audit Software
4. Establishes System Criteria

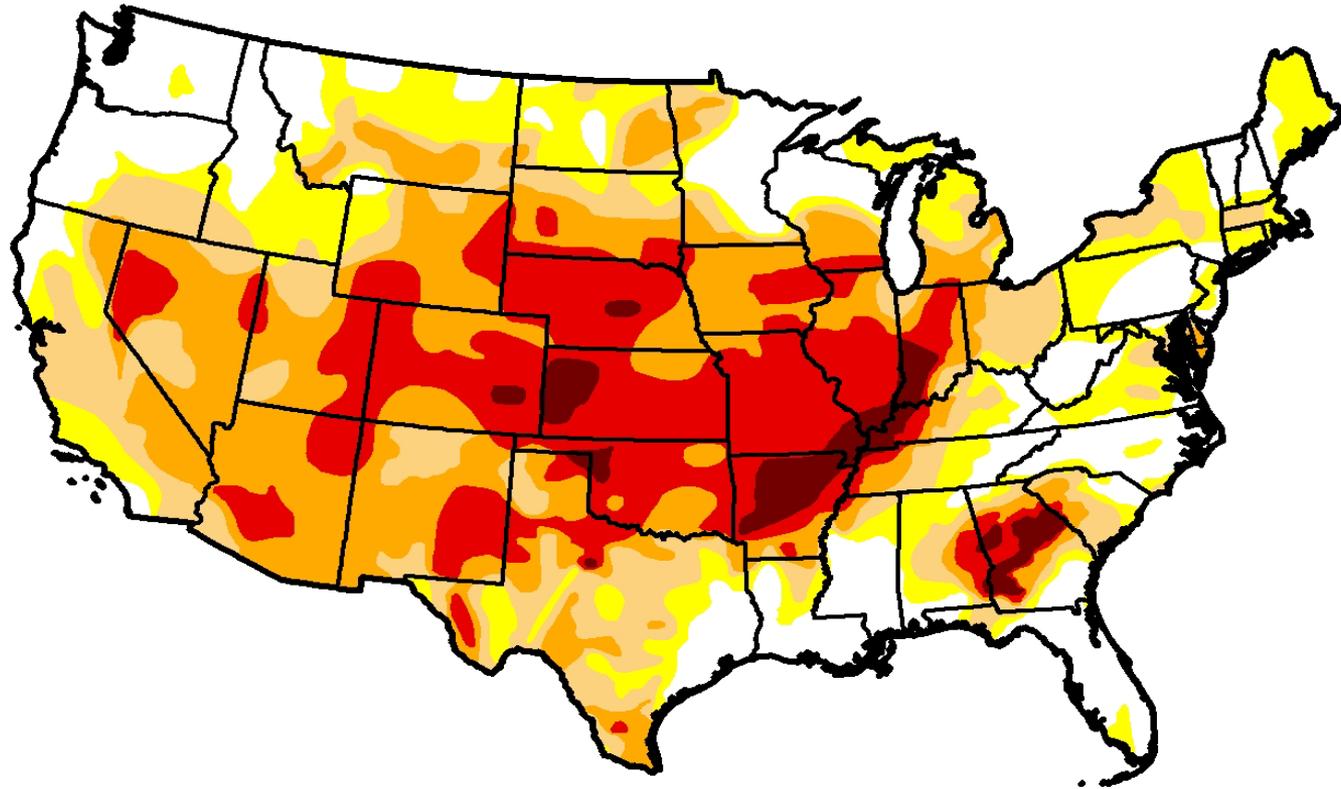
N-Not applicable - i.e. State & Non Community systems – also <100 taps
(under consideration)

S-System is routinely performing Water Audits and using the results in WLC

I-Needs Improvement – incomplete auditing, no program to control losses

U-Unsatisfactory – system does not perform an audit, no WLC program

US Drought Monitor: July 2012

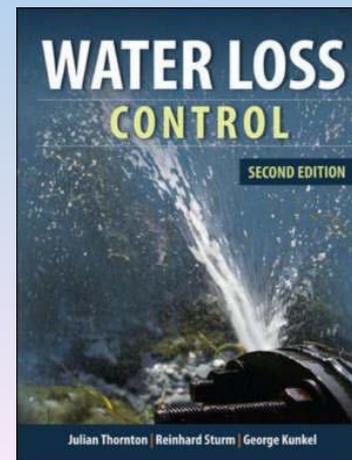
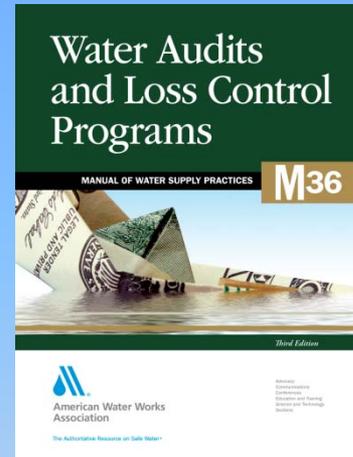


The Squeeze

- Frustrated that revenues are down
- Upset that critical O&M is deferred
- Disappointed with current loss control results
- Worried about a looming rate increase
- Anxious about the thought of regulation
- Concerned about staffing gaps
- Angry about “helpers” pushing conservation

AWWA Tools for Water Loss Control

- The “M” Series: Manuals of Practice
 - Guidance Manuals: widely recognized around the world as source of best practices in water utility operations and management
- AWWA Water Loss Control Committee’s Free Water Audit Software©
 - Originally released 2006; current Version 4.2 software (2010)
- Water Research Foundation Research Reports
- Textbooks
- www.awwa.com - type “water loss control” in search box; select first item in list



AWWA WLCM Meter Audit Software: Reporting Worksheet

Water Audit Report for [City/State Water Department]

Reporting Year: 2010

Please enter data to the right of the label. Where possible, entered values should be used. If measured values are available please enter a value. Report values reflecting conditions for only those for which a water loss control program is being implemented.

ALL VOLUMES TO BE ENTERED AS ANNUAL QUANTITIES

WATER SUPPLIED	Volume from own sources	95,529	million gallons (MG) per year
	Master meter error adjustment	633.4	million gallons (MG) per year
	Master Reported	96,162.4	million gallons (MG) per year
	Master Reported	96,162.4	million gallons (MG) per year
	WATER SUPPLIED	96,162.4	million gallons (MG) per year
AUTHORIZED CONSUMPTION	Billable Metered	53,816.5	million gallons (MG) per year
	Billable Unmetered	11.2	million gallons (MG) per year
	Unbillable Metered	21.2	million gallons (MG) per year
	Unbillable Unmetered	41.7	million gallons (MG) per year
	AUTHORIZED CONSUMPTION	126,841.6	million gallons (MG) per year
WATER LOSS (Water Supplied - Authorized Consumption)		39,325.8	million gallons (MG) per year
LOSS RATES	Unauthorized Consumption	7.14%	million gallons (MG) per year
	Customer Metering Consumption	11.2%	million gallons (MG) per year
	Data handling errors	7.11%	million gallons (MG) per year
	Approved Losses	7.87%	million gallons (MG) per year
WATER LOSS		39,325.8	million gallons (MG) per year
WATER LOSS RATE		40.89%	million gallons (MG) per year
NON-REVENUE WATER		31,476.6	million gallons (MG) per year
SYSTEM DATA	Length of water	7,147	mi
	Number of yellow bell service connections	547,273	
	Customer density	1.0	connections/mi
	Average length of private pipe	12.0	ft
	Average operating pressure	16.0	psi
COST DATA	Total annual cost of operating water system	\$147,654,000	\$/year
	Customer retail unit cost (excludes revenue losses)	\$1.39	/1000 gallons (G)
	Variable production cost (excludes revenue losses)	\$1.03	/1000 gallons (G)

DATA REVIEW - Please review the following information and make change above if necessary:

Input values should be indicated as either measured or estimated. You have entered:

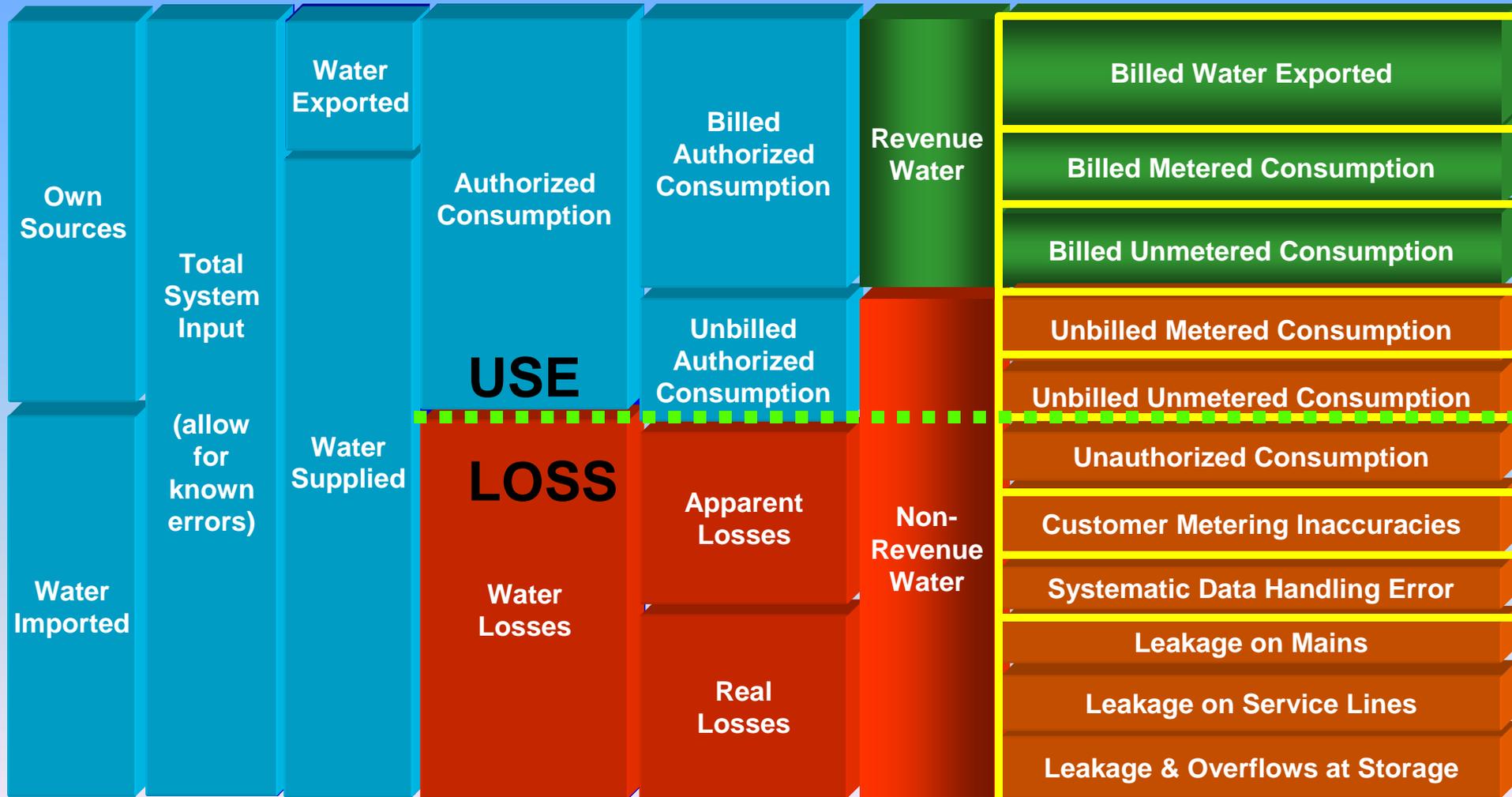
- 11 as measured volume
- 1 as estimated volume
- 1 without operating measured or estimated
- 11 is important to accurately measure the master meter - you have entered the measurement type as measured
- lost data: no problem identified

PERFORMANCE INDICATORS

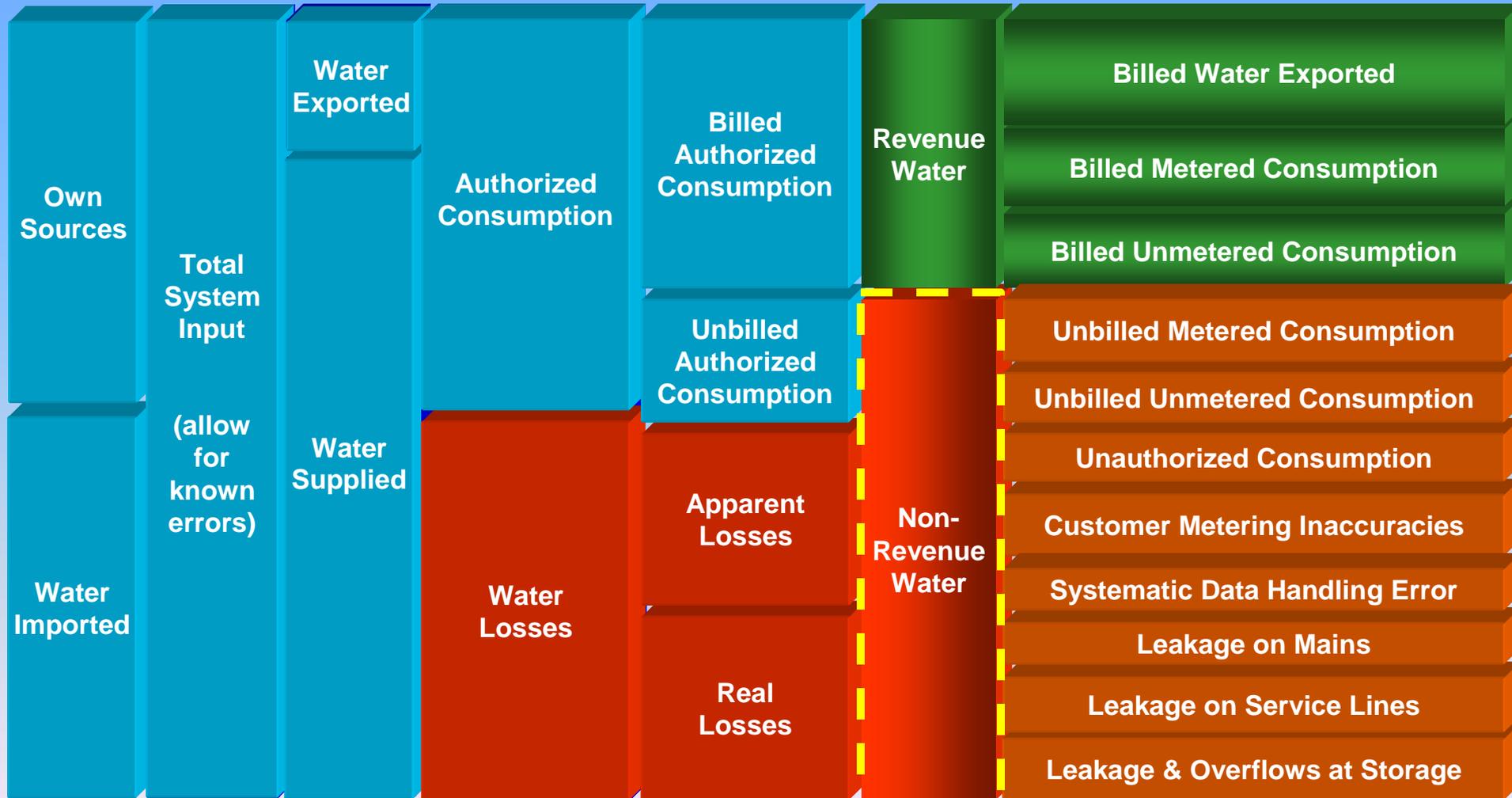
Financial Indicators	Non-revenue water as percent by volume	32.4%
	Non-revenue water as percent by cost	22.7%



Water Balance: Categorizing Use and Loss



Water Balance: Categorizing Use and Loss



Non-Revenue Water

1. Water put into the system that does NOT return revenue to the Utility.
2. All Water Loss plus Unbilled Consumption.
3. “Unaccounted-for water” has been abandoned forever.



Real vs Apparent Loss

- 1. Water Loss comes in 2 forms: Real and Apparent.**
- 2. Real Loss = Leakage. Cost is calculated as 'wholesale' rate.**
- 3. Apparent Loss = Slow meters, billing issues and theft. Cost is calculated at 'retail' rate.**

Data Validity

1. Tells us how reliable the audit is.
2. On a scale of 100.
3. Allows a utility to judge “what is the right next step”.

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Sewer Utilities: INFLOW AND INFILTRATION STUDY/AUDIT

- **Increases Loading on System**
- **Root Problem**
- **Back-up**
- **Sanitary Sewer Overflow**
- **Improper Connections**
- **Monitoring and Maintenance Program**
- **Increase Utility Revenue Requirement**
- **Permit Inflow and Infiltration**

AWWA WLCC Water Audit Software: Reporting Worksheet

[Back to Instructions](#)

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Water Audit Report for: **Philadelphia Water Department**
 Reporting Year: **2004**

Please enter data in the white cells below. Where possible, metered values should be used; if metered values are unavailable please estimate a value. Indicate this by selecting a choice from the gray box to the left, where M = measured (or accurately known value) and E = estimated.

ALL VOLUMES TO BE ENTERED AS ANNUAL QUANTITIES

WATER SUPPLIED

Volume from own sources:	<input type="button" value="M"/>	<input type="text" value="95,526.0"/>	million gallons (US) per year
Master meter error adjustment:	<input type="button" value="M"/>	<input type="text" value="695.4"/>	under-registered million gallons (US) per year
Water Imported:	<input type="button" value="M"/>	<input type="text" value="0.0"/>	million gallons (US) per year
Water Exported:	<input type="button" value="M"/>	<input type="text" value="7,210.2"/>	million gallons (US) per year
WATER SUPPLIED:		89,011.2	million gallons (US) per year

AUTHORIZED CONSUMPTION

Billed metered:	<input type="button" value="M"/>	<input type="text" value="57,535.2"/>	million gallons (US) per year
Billed unmetered:	<input type="button" value="M"/>	<input type="text" value="0.0"/>	million gallons (US) per year
Unbilled metered:	<input type="button" value="M"/>	<input type="text" value="179.3"/>	million gallons (US) per year
Unbilled unmetered:	<input type="button" value="E"/>	<input type="text" value="693.6"/>	million gallons (US) per year
AUTHORIZED CONSUMPTION:		58,408.1	million gallons (US) per year

WATER LOSSES (Water Supplied - Authorized Consumption) **30,603.1** million gallons (US) per year

Apparent Losses

Unauthorized consumption:	<input type="button" value="E"/>	<input type="text" value="1,145.2"/>	million gallons (US) per year
Customer metering inaccuracies:	<input type="button" value="E"/>	<input type="text" value="162.5"/>	million gallons (US) per year
Data handling errors:	<input type="button" value="E"/>	<input type="text" value="2,751.2"/>	million gallons (US) per year
Apparent Losses:		4,058.9	million gallons (US) per year

Real Losses

Real Losses (Water Losses - Apparent Losses):		26,544.2	million gallons (US) per year
WATER LOSSES:		30,603.1	million gallons (US) per year

NON-REVENUE WATER

NON-REVENUE WATER: **31,476.0** million gallons (US) per year

SYSTEM DATA

Length of mains:	<input type="button" value="M"/>	<input type="text" value="3,160.0"/>	miles
Number of <u>active AND inactive</u> service connections:	<input type="button" value="M"/>	<input type="text" value="548,289"/>	
Connection density:		174	conn./mile main
Average length of private pipe:	<input type="button" value="E"/>	<input type="text" value="12.0"/>	ft (pipe length between curbside and customer meter or property)
Average operating pressure:	<input type="button" value="E"/>	<input type="text" value="55.0"/>	psi

COST DATA

Total annual cost of operating water system:	<input type="button" value="M"/>	<input type="text" value="\$167,604,000"/>	\$/Year
Customer retail unit cost (applied to apparent losses):	<input type="button" value="M"/>	<input type="text" value="\$3.95"/>	\$/1000 gallons (US)
Variable production cost (applied to real losses):	<input type="button" value="M"/>	<input type="text" value="\$133.58"/>	\$/million gallons (US)

DATA REVIEW - Please review the following information and make changes above if necessary:

- Input values should be indicated as either measured or estimated. You have entered:
 - 12 as measured values
 - 6 as estimated values
 - 0 without specifying measured or estimated
- It is important to accurately measure the master meter - you have entered the measurement type as: measured
- Cost Data: No problems identified

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume:	35.4%
Non-revenue water as percent by cost:	11.7%

AWWA WATER AUDIT SOFTWARE

<http://www.awwa.org/resources-tools/water-knowledge/water-loss-control.aspx>



Discussion

1. How will this impact me as a Utility?

2. Complexity of the AWWA Water Audit Method?



Steve Cavanaugh, P.E.

