Addressing and Controlling Water Loss

Jeff Cunningham, Business Development Manager
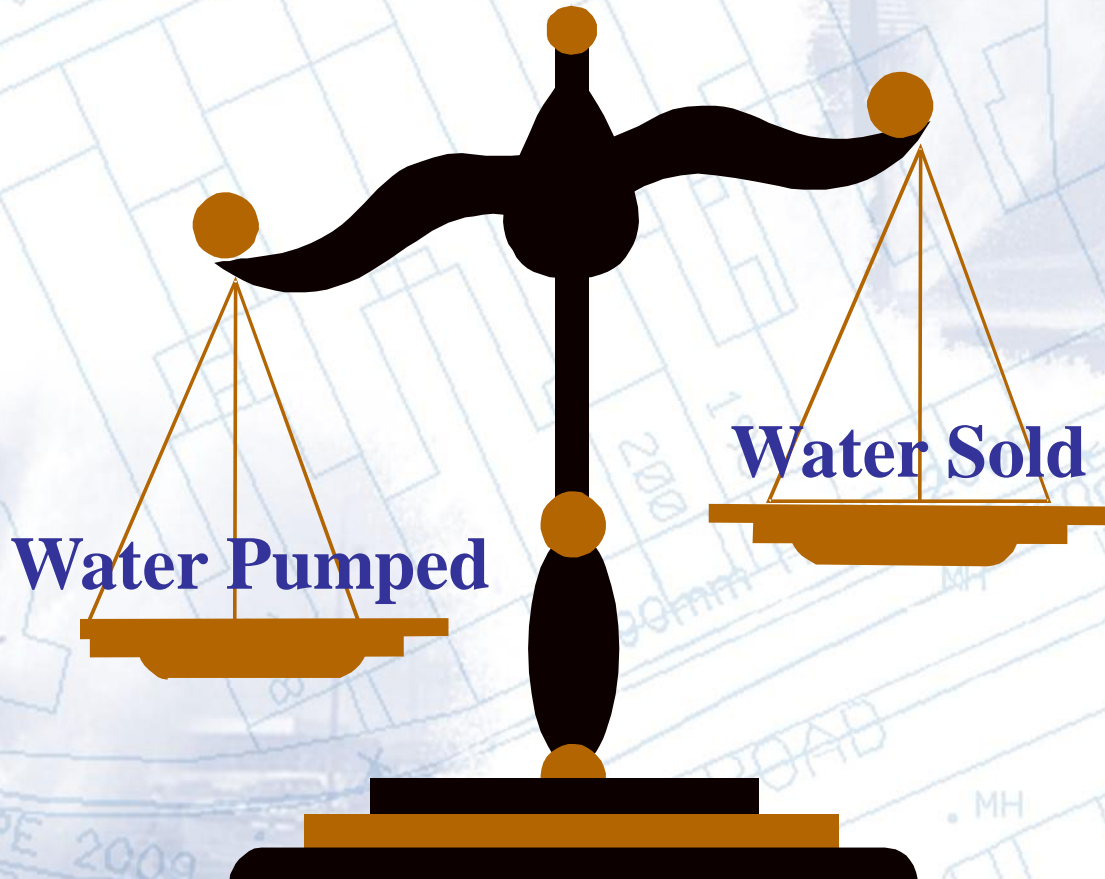
M.E. *SIMPSON*
Co., Inc.

Outline

- Review of Water Audit Process
- Understanding the terminology
- Identifying the issues
- Developing an action plan

WATER LOSS?

Gallons of water being pumped into the distribution system each billing period exceeds the gallons being sold.

Water Sold

Water Pumped

How To Calculate Non Revenue Water

- 💧 **Step One**: Perform a Water Audit using the AWWA Water Audit Software.

- 💧 **Step Two**: Validate the results

What exactly is Non Revenue Water?

Apparent Losses

+

Real Losses

+

Unbilled Metered Consumption

+

Unbilled Unmetered Consumption.

**This is water which does not provide *revenue potential* to the utility.

Term definitions created by the IWA/AWWA

Why is Non Revenue Water a better term to use than "Unaccounted for Water" ?

Apparent Losses

+

Real Losses

+

Unbilled Metered Consumption

+

Unbilled Unmetered Consumption.

(**This is water which does not provide *revenue potential* to the utility.)

"Unaccounted for Water" (usually expressed as a % of total water produced as "lost water") is a term that is confusing.

Does not give a clear understanding of
- What the losses are
- Where the losses are occurring

Definitions

Apparent Losses - unauthorized consumption + customer metering inaccuracies + systematic data handling errors

Apparent Losses are all types of inaccuracies associated with customer metering (worn meters, improperly sized meters, wrong type of meter for the water usage profile), systematic data handling errors (meter reading, billing, archiving and reporting), plus unauthorized consumption (theft or illegal use).

NOTE: Over-estimation of Apparent Losses results in under-estimation of Real Losses. Under-estimation of Apparent Losses results in over-estimation of Real Losses.

Definitions

Real Losses

Physical water losses from water system (water mains and customer service connections) and the utility's storage tanks, up to the point of customer consumption. In metered systems this is the customer meter, in unmetered situations this is the first point of consumption (stop tap/tap) within the property. The annual volume lost through all types of leaks, breaks and overflows depends on frequencies, flow rates, and average duration of individual leaks, breaks and overflows.

Definitions

Unbilled Authorized Consumption

🜄 Unbilled Metered Consumption

Metered consumption authorized by the water utility, but, for any reason, is <u>deemed by utility policy</u> to be *unbilled*. This includes metered water consumed by the utility itself in treatment or distribution operations, or metered water provided to civic institutions free of charge. **It does <u>not</u> include water supplied to neighboring utilities (water exported) which may be metered but not billed.**

🜄 Unbilled Unmetered Consumption.

Definitions

Unbilled Authorized Consumption

- Unbilled Metered Consumption
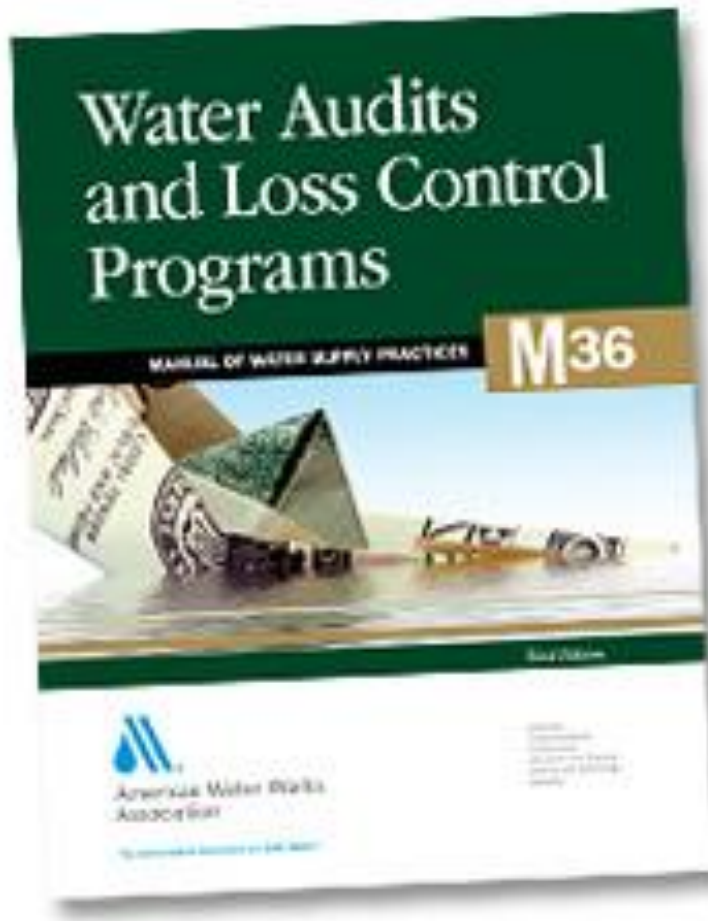- Unbilled Unmetered Consumption.

Authorized Consumption not billed or metered. Includes water for fire fighting, flushing of water mains and sewers, street cleaning, fire flow tests, etc.

This often includes use at the Utilities facilities- plant, parks, offices, etc.

In most water utilities it is a small component which is very often substantially overestimated.

Water Audit and M36 Publication

- In April, 2009, ... edition of Manual 36 e... s Control Programs

- Manual was ... e of the Water Loss Control...

- Concurrently ... veloped water audit softwar...

- The software ... AWWA on their website...

The Water Audit Process Roadmap

- How is the software obtained?

AWWA WLCC Water Audit Software

v 5.0 available free from AWWA at:

www.awwa.org

Added self-help features for data validity, BMP guidance

Standard Water Balance Format

Start here

Move this direction ➡

Own Sources	Total System Input (allow for known errors)	Water Exported		Revenue Water	Billed Water Exported
		Water Supplied	Authorized Consumption	Billed Authorized Consumption		Billed Metered Consumption
						Billed Unmetered Consumption
				Unbilled Authorized Consumption	Non-Revenue Water	Unbilled Metered Consumption
Water Imported						Unbilled Unmetered Consumption
			Water Losses	Apparent Losses		Unauthorized Consumption
						Customer Metering & Data Inaccuracies
				Real Losses		Leakage on Mains
						Leakage on Service Lines (before the meter)
						Leakage & Overflows at Storage

What data do I need?

Water Supplied

- Well meter data (Million gallons per year)

- Data from meter testing and calibrations and year completed

- Million gallons per year of water purchased (if any)

- Million gallons per year of wholesale water sold (if any)

What data do I need?

Authorized Consumptions

- Million gallons per year of water delivered and billed - metered

- Million gallons per year of water delivered and billed – unmetered

- Million gallons per year of water delivered but unbilled – metered

- Million gallons per year of water delivered but unbilled – unmetered

Where is the data entered?
– Look for the ~~white~~ boxes in the spreadsheet

PLEASE CHOOSE REPORTING UNITS FROM THE INSTRUCTIONS SHEET BEFORE ENTERING DATA

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

Master Meter and Supply Error Adjustments

WATER SUPPLIED

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

Pcnt: Value:

Volume from own sources:
Water imported:
Water exported:

Enter negative % or value for under-registration

WATER SUPPLIED: 0.000

Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Click here: [?]
for help using option
buttons below

Billed metered:
Billed unmetered:
Unbilled metered:
Unbilled unmetered: 0.000

Pcnt: Value:

ter a positive value, otherwise a default percentage of 1.25% (of billed metered) is applied and a grading of 5 is applied but not display

AUTHORIZED CONSUMPTION: [?]   0.000

Use buttons to select
percentage of water
supplied
OR
value

WATER LOSSES (Water Supplied - Authorized Consumption)   0.000

Apparent Losses

Pcnt: Value:

Unauthorized consumption: 0.000   0.25%

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies: 0.000
Systematic data handling errors: 0.000   0.25%

Apparent Losses: [?]   0.000

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: [?]   0.000

AWWA Free Water Audit Software v5.0

Please begin by providing the following information

Name of Contact Person:	John Two-Drops
Email Address:	superintendent@littletownXX.gov
Telephone | Ext.:	1-123-555- 1234
Name of City / Utility:	Little Town Water Utility
City/Town/Municipality:	Little Town
State / Province:	International (XX)
Country:	USA
Year:	2014 Calendar Year

Audit Preparation Date:	8/21/2015
Volume Reporting Units:	Million gallons (US)
PWSID / Other ID:	ABC XYZ

The following guidance will help you complete the Audit

All audit data are entered on the *Reporting Worksheet*

	Value can be entered by user
	Value calculated based on input data
	These cells contain recommended default values

Use of Option (Radio) Buttons:

Pcnt: 0.25%   ●   ○   Value:

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

Instructions
The current sheet. Enter contact information and basic audit details (year, units etc)

Reporting Worksheet
Enter the required data on this worksheet to calculate the water balance and data grading

Comments
Enter comments to explain how values were calculated or to document data sources

Performance Indicators
Review the performance indicators to evaluate the results of the audit

Water Balance
The values entered in the Reporting Worksheet are used to populate the Water Balance

Dashboard
A graphical summary of the water balance and Non-Revenue Water components

Grading Matrix
Presents the possible grading options for each input component of the audit

Service Connection Diagram
Diagrams depicting possible customer service connection line configurations

Definitions
Use this sheet to understand the terms used in the audit process

Loss Control Planning
Use this sheet to interpret the results of the audit validity score and performance indicators

Example Audits
Reporting Worksheet and Performance Indicators examples are shown for two validated audits

Acknowledgements
Acknowledgements for the AWWA Free Water Audit Software v5.0

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org

Areas of Non Revenue Water

NON-REVENUE WATER

NON-REVENUE WATER: [?]   541.741 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

AUTHORIZED CONSUMPTION

Click here: [?]
for help using option
buttons below

Billed metered:	[+] [?]	7	3,376.527 MG/Yr
Billed unmetered:	[+] [?]	n/a	MG/Yr
Unbilled metered:	[+] [?]	n/a	MG/Yr
Unbilled unmetered:	[+] [?]	8	24.253 MG/Yr

Pcnt: Value:

○ ◉   24.253   MG/Yr

↑
...... Use buttons to select
percentage of water
supplied

AUTHORIZED CONSUMPTION: [?]   3,400.780 MG/Yr

.... value

WATER LOSSES (Water Supplied - Authorized Consumption)   517.488 MG/Yr

Apparent Losses

Pcnt: Value:

Unauthorized consumption: [+] [?]   9.796 MG/Yr   0.25% ◉ ○   MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies: [+] [?] 6   140.689 MG/Yr   4.00% ◉ ○   MG/Yr

Systematic data handling errors: [+] [?]   8.441 MG/Yr   0.25% ◉ ○   MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: [?]   158.926 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: [?]   358.562 MG/Yr

WATER LOSSES: 517.488 MG/Yr

Areas of Non Revenue Water

AUTHORIZED CONSUMPTION

Billed metered:	+	?	7	3,376.527	MG/Yr
Billed unmetered:	+	?	n/a		MG/Yr
Unbilled metered:	+	?	n/a		MG/Yr
Unbilled unmetered:	+	?	8	24.253	MG/Yr

Click here: ? for help using option buttons below

Pcnt: Value: ○ ◉ 24.253 MG/Yr

Use buttons to select percentage of water supplied

AUTHORIZED CONSUMPTION: ? 3,400.780 MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption) 517.488 MG/Yr

value

Apparent Losses

Pcnt: Value:

Unauthorized consumption: + ? 9.796 MG/Yr 0.25% ◉ ○ MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies: + ? 6 140.689 MG/Yr 4.00% ◉ ○ MG/Yr
Systematic data handling errors: + ? 8.441 MG/Yr 0.25% ◉ ○ MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: ? 158.926 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: ? 358.562 MG/Yr

Pay attention to Grading score

WATER LOSSES: 517.488 MG/Yr

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 80 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

Performance Indicators

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

Water Audit Report for: **Fiction City**

Reporting Year: **2014-2015** | **1/2014 - 12/2015**

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 80 out of 100 ***

System Attributes:

Apparent Losses:	158.926	MG/Yr
+ Real Losses:	358.562	MG/Yr
= **Water Losses:**	**517.488**	MG/Yr
Unavoidable Annual Real Losses (UARL):	256.53	MG/Yr
Annual cost of Apparent Losses:	$373,917	
Annual cost of Real Losses:	$127,379	Valued at **Variable Production Cost**

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:

Non-revenue water as percent by volume of Water Supplied:	13.8%
Non-revenue water as percent by cost of operating system:	3.8% Real Losses valued at Variable Production Cost

Operational Efficiency:

Apparent Losses per service connection per day:	14.37	gallons/connection/day
Real Losses per service connection per day:	32.43	gallons/connection/day
Real Losses per length of main per day*:	N/A	
Real Losses per service connection per day per psi pressure:	0.33	gallons/connection/day/psi

From Above, Real Losses = Current Annual Real Losses (CARL):	358.56	million gallons/year
Infrastructure Leakage Index (ILI) [CARL/UARL]:	1.40	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

Performance Indicators

Annual cost of Apparent Losses:	$373,917
Annual cost of Real Losses:	$127,379

Valued at **Variable Production Cost**
Return to Reporting Worksheet to change this assumpiton

Financial:
- Non-revenue water as percent by volume of Water Supplied: 13.8%
- Non-revenue water as percent by cost of operating system: 3.8% Real Losses valued at Variable Production Cost

Unavoidable Annual Real Losses (UARL): 256.53 MG/Yr

From Above, Real Losses = Current Annual Real Losses (CARL): 358.56 million gallons/year

[?] Infrastructure Leakage Index (ILI) [CARL/UARL]: 1.40

Grading the data: an example

– How many miles of mains are in the system?

Length of mains: [?] [ ] [   ] miles

1. Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.
2. Paper records in poor condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.
3. Conditions between 2 and 4
4. Sound policy and procedures for permitting and documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.
5. Conditions between 4 and 6
6. Sound policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.
7. Conditions between 6 and 8
8. Sound policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping and asset management system are used to store and manage data.
9. Conditions between 8 and 10
10. Sound policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases.

Loss Control Planning

Determining Water Loss Standing

WAS v5.
American Water Works Association
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Water Audit Report for:	Fiction City
Reporting Year:	2014-2015 1/2014 - 12/2015
Data Validity Score:	80

Functional Focus Area	Level I (0-25)	Level II (26-50)	Level III (51-70)	Level IV (71-90)	Level V (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved

Loss Control Planning

	General Guidelines for Setting a Target ILI (without doing a full economic analysis of leakage control options)		
Target ILI Range	**Financial Considerations**	**Operational Considerations**	**Water Resources Considerations**
1.0 – 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		

Developing Water Loss Mitigation Plans

What do we tackle first?

Do we have "low-hanging fruit"?

Apparent Losses

Apparent Losses

			Pcnt:	▼	Value:
Unauthorized consumption:	[+] [?]	9.796 MG/Yr	0.25% ◉ ○		MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	[+] [?] [6]	140.689 MG/Yr	4.00% ◉ ○	MG/Yr
Systematic data handling errors:	[+] [?]	8.441 MG/Yr	0.25% ◉ ○	MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: [?]   **158.926** MG/Yr

How can this $$ loss be recovered?

Annual cost of Apparent Losses: $373,917

Controlling Apparent Losses

➢ Measurement Technology

   ♦ Accurate customer meters

   ♦ Refined datalogging capability

   ♦ Automatic Meter Reading gaining in use

➢ Improved Information Management

   ♦ Customer Billing Systems

➢ Rational Policies

   ♦ Service provision

   ♦ Unauthorized consumption

   ♦ Billing procedures

   ♦ Use of fire hydrants

Apparent Loss VS Real Loss

- Can Apparent Losses be hidden as Real Losses?

- Inaccurate meters (especially for low flow registration)
  - Worn meters
  - Wrong sized meters
  - Fireline meters (DC, Fire meters)
  - Rural Water Systems

Controlling Apparent Losses

5 areas that need controls

AUTHORIZED CONSUMPTION

Billed metered:	+	?	7	3,376.527	MG/Yr
Billed unmetered:	+	?	n/a		MG/Yr
Unbilled metered:	+	?	n/a		MG/Yr
Unbilled unmetered:	+	?	8	24.253	MG/Yr

Click here: ? for help using option buttons below

Pcnt: | Value: 24.253 | MG/Yr

Apparent Losses

Unauthorized consumption:	+	?	9.796	MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Pcnt: 0.25% | Value: | MG/Yr

Customer metering inaccuracies:	+	?	6	140.689	MG/Yr
Systematic data handling errors:	+	?		8.441	MG/Yr

Pcnt: 4.00% | Value: | MG/Yr
Pcnt: 0.25% | Value: | MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: ? **158.926** MG/Yr

Controlling Meter Inaccuracies

- Meter Testing

- Meter Right Sizing

- Meter Change-outs

- Billing and reading errors

Why start a meter testing program?

- Maintain revenue- a small percentage of inaccuracy can equal large revenue declines- Meters are your ***CASH REGISTER!***

- Controlling apparent water loss

- Maintain a realistic view of consumption versus rates for different meter classifications

- An opportunity to address meter sizing and application, as customers' processes

Commercial and Industrial Meters

High Revenue Meters

- Usually 10-12% of the customers use 50-60% of the water
- Test and repair industrial and commercial meters

- Replace obsolete meters

Average annual revenue per sampled meter record

Meter Size	Cu. Ft.	Revenue
0.625	6,737	$211.17
0.75	11,946	$311.29
1	20,718	$490.64
1.25	no data	no data
1.5	76,194	$3,770.29
2	97,335	$1,878.73
3	505,217	$7,991.87
4	470,220	$7,923.42
6	2,336,430	$42,795.00
8	9,496,130	$127,088.00
12	13,382,700	$179,486.00

Large Meter Testing Program

– 3% of annual revenue should be earmarked for meter testing

– Meter testing should be performed as on-going maintenance program

– An annual testing program will ensure that revenues stay up

– Test meters within 6 months

   of installation

Testing Frequency

– Influenced by the cost of water

- as water costs increase more accounts require annual testing

– The water quality

- harsh water requires more frequent testing

Using Revenue as a Basis for Testing Frequency

- Using the rule of investing 3% of a meter's annual revenue in the "maintenance" of that meter the following averages apply:

- $10,000 or greater = annual testing
  - $7,000 to $10,000 = every 2 years
  - $4,000 to $7,000 = every 3 years
  - Less than $4,000 = every 4 years

Testing Methodology

♦ Refer to the AWWA M-6 Manual

  ✓ Test specs are for meter test bench situations

  ✓ Field testing (testing meters "on site") requires following a <u>strict methodology</u>.

  **M-6 does not spell out <u>field testing</u> requirements.

♦ Refer to the meter manufacturer specs

♦ Newer style meters require different testing approach

Why develop a meter testing program?

- To ensure that the utility is receiving the revenue it deserves

- To promote conservation, reduce water loss and use best management practices

- To make sure that the cost of operating the utility is spread fairly among all customers

Evaluate Existing Meter

– Is it the right type?

– Is it the right size?

– Is it properly installed?

– Are the valves in working order?

Restoring Accuracy

- ## Repair costs
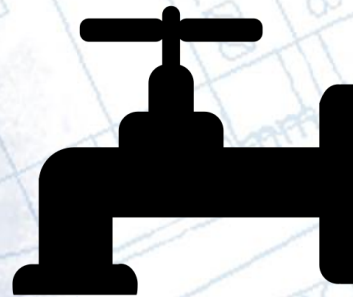 - ### Consider all repair costs
    - **Parts** - are they readily available?
    - **Labor** - can your personnel repair the meter?
    - **Downtime** - how much does it cost?
    - **Retesting** after repair
    - What is the **expected repair frequency**?

Restoring Accuracy

- Does the manufacturer offer a chamber or meter exchange program?

- Is it more economical to replace the entire meter?

Key Takeaway

- Establish a Long-term Testing and Maintenance Program
  Stick With It!

- *Meters Are Your Cash Registers!*

- Accurate Meters = Accurate Billings

Meter Change Out Programs

- Develop Business Case to decide on needs

- Decide level of new installations (retro fits, AMI/AMR, complete new meters)

- While you are at it, what else can you add to the project?
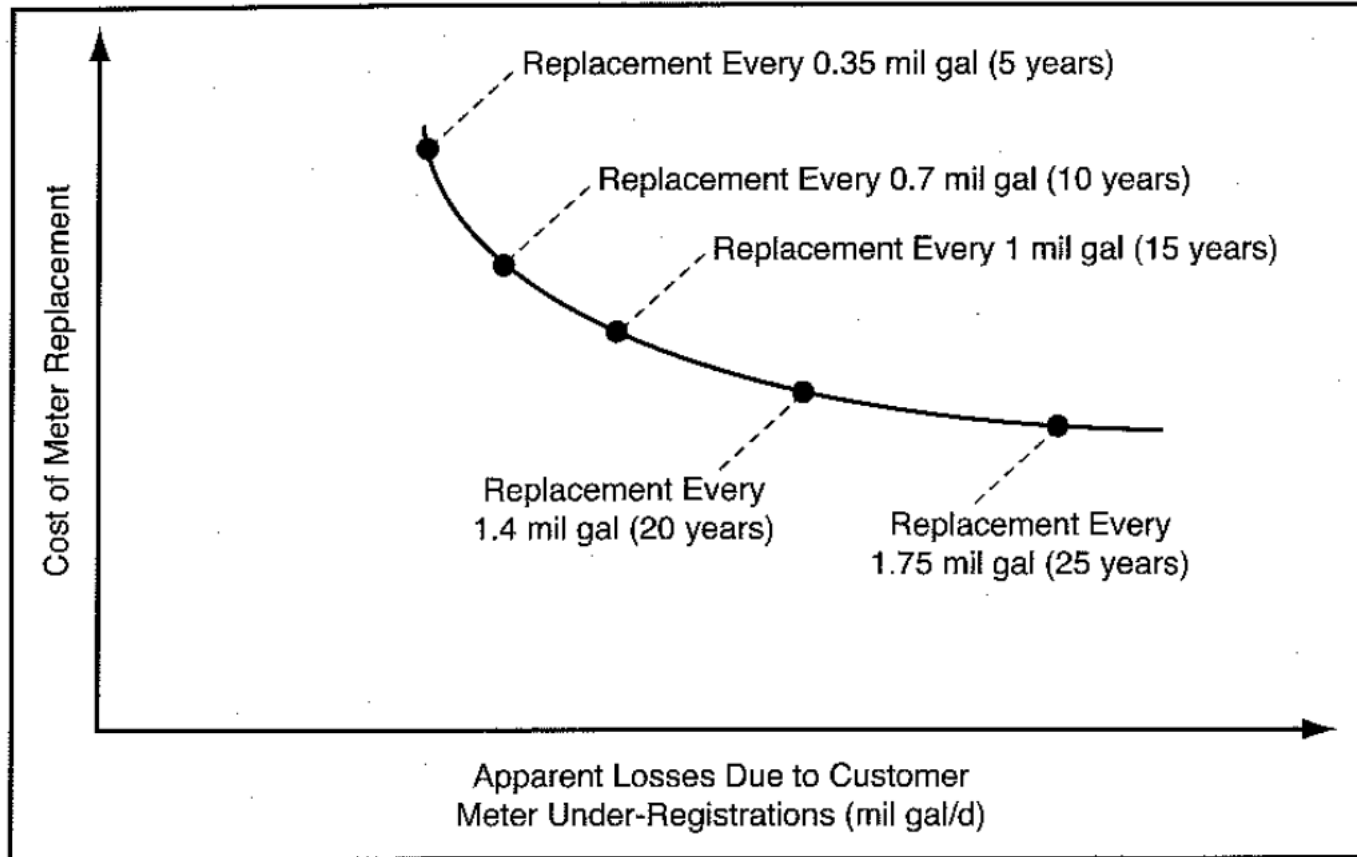
Meter Change outs

Replacement Every 0.35 mil gal (5 years)

Replacement Every 0.7 mil gal (10 years)

Replacement Every 1 mil gal (15 years)

Replacement Every 1.4 mil gal (20 years)

Replacement Every 1.75 mil gal (25 years)

Cost of Meter Replacement

Apparent Losses Due to Customer Meter Under-Registrations (mil gal/d)

Figure 5-21 Cost curve for meter replacement program

Source: *AwwaRF 2007*

Data Handling Errors

__Are we reading and billing correctly?__

- Wrong number of fixed zeroes (newer registers not programed correctly)

- Meters that are not being billed (Detector Checks, some FM's)

- Accounts that are being billed as sewage or trash only and not as water

AMR – Automated Meter Reading

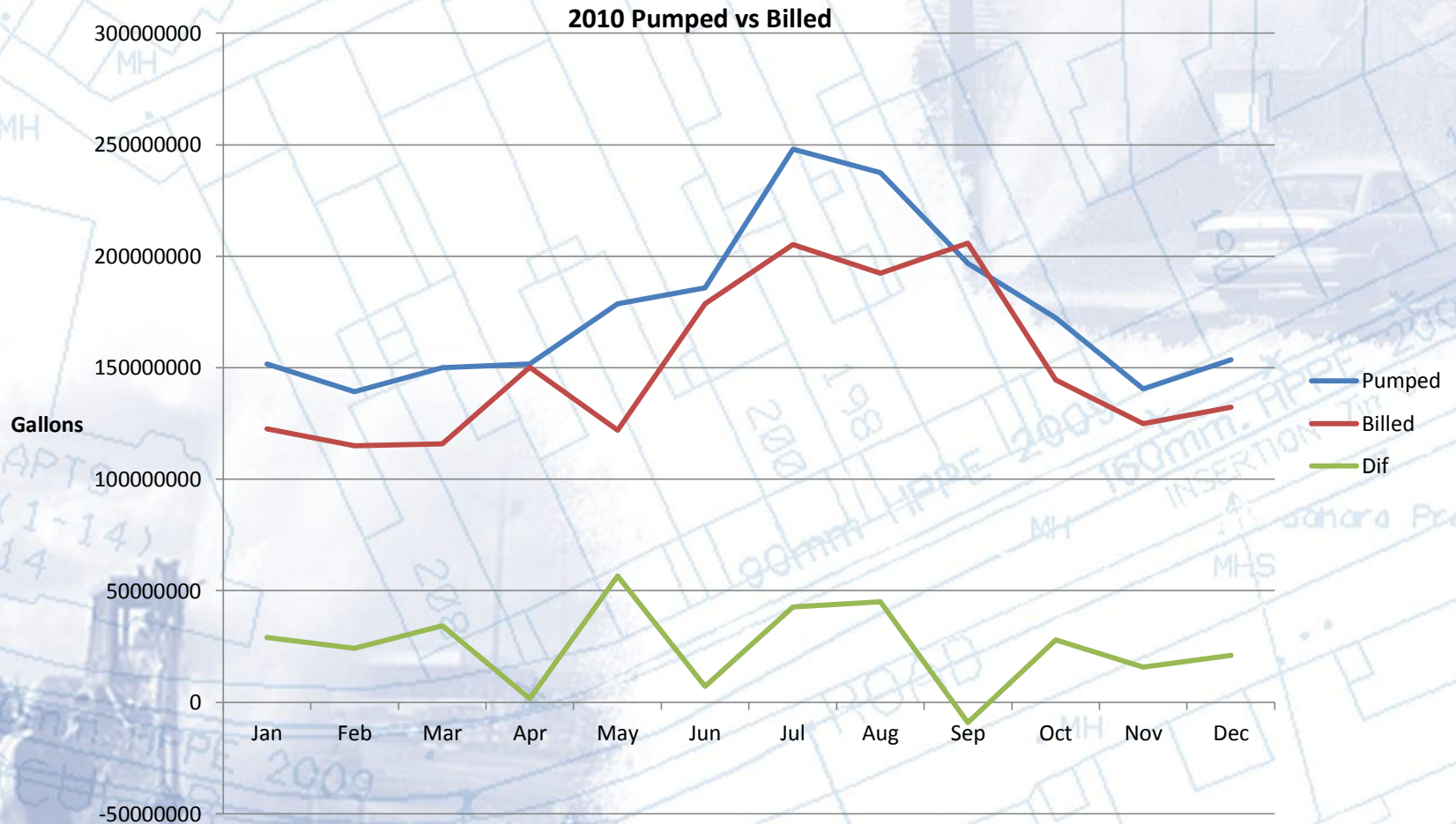- **Mobile Meter Reading (Efficient Reading with Monthly Data)**

AMI – Advanced Metering Infrastructure

- **Fixed Network Meter Reading (Daily or Hourly Data)**

AMA – Advanced Metering Analytics

- **Powerful Analytics Based Software Platform / Two-way Fixed Network Meter Reading (Useful and Meaningful Proactive Information)**

AMI Can Help Identify Non-Revenue Water

2010 Pumped vs Billed

Gallons

Legend:
- Pumped
- Billed
- Dif

Meter Reading Averages

Direct Read Meters (manual)

200 to 350 reads per day

Touch/Wand Reading Systems

300 to 450 reads per day

Radio Frequency – Handheld (walk-by mode)

1,800 to 2,200 reads per day

Radio Frequency – Mobile Interrogator (drive-by)

- 6.500 to 8,000 reads per day

– **Fixed Network (Advanced Metering Infrastructure**
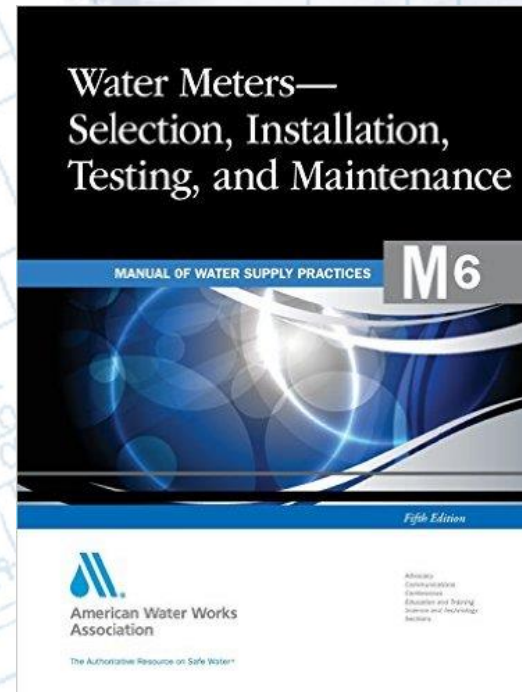
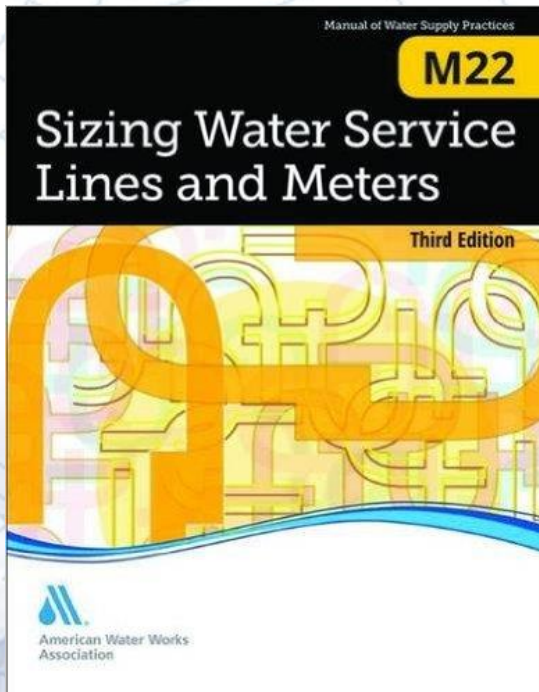- Multiple reads per meter per day (24/7 upload)

Resources

* Meter Manufacturer's Data

Water Loss Control

Apparent Losses

- Metering Inaccuracies; Unauthorized Consumption

($$ Non-Revenue Water $$)

Real Losses

- Leakage

($$ Non-Revenue Water $$)

Real Losses

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: [?] | 70.701 MG/Yr

How can this $$ loss be recovered?

Annual cost of Real Losses: $156,249 Valued at **Variable Production Cost**

Return to Reporting Worksheet to change this assumpiton

Water Loss Control
Leak Detection

As a leak "escapes" the pipe, it creates noise. That noise carries through the water and along the pipe material.

Water Loss Control
Leak Detection

- Based on physical contact with system apparatus
- Sound is heard by the tech, through the listening device.

Water Loss Control
Leak Detection

System Apparatus listening points in order of preference

- Pipe
- Mainline Valve
- Hydrant Valve
- Hydrant
- Service (b-box)

Water Loss Control
Leak Detection

- Known Leaks – (emergency call outs, scheduled leaks)

- Unknown Leaks – (found during surveys)

Water Loss Control Leak Detection

- Leak Survey Protocol
  - Choose a starting point
  - Choose a distinct pattern for the survey
  - Listen to the selected apparatus
  - document noise heard
  - Areas with noise, re-listen on a different day and a different time
  - Document any system defects

Water Loss Control
Leak Detection

- Leak Survey Protocol
  - Line Location is critical
  - Measurement is critical
  - Correlate each area with verified noise
  - Follow correlation procedures
  - Mark the leak

Water Loss Control
Leak Detection

♦ Correlation Completed – Leak marked for excavation

Leak Correlation Equipment
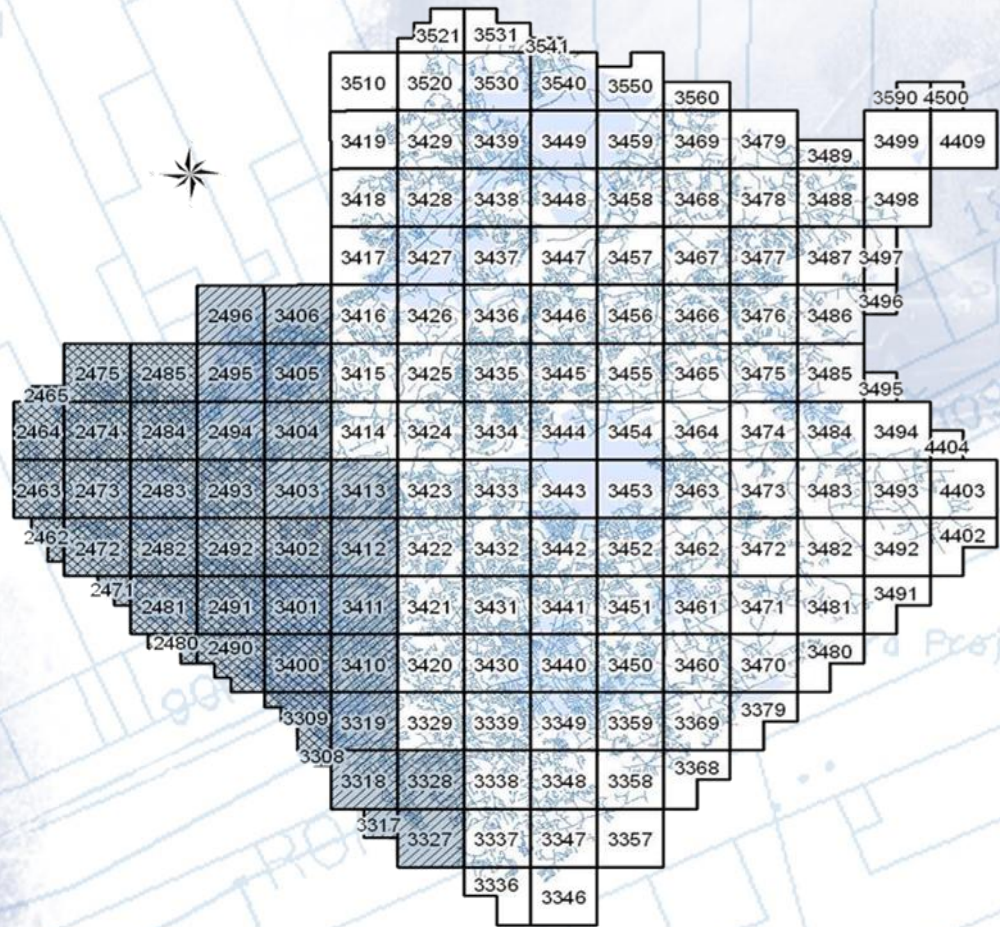
Water Loss Control
Leak Detection

Water Loss Control
Leak Detection

Water Loss Control Leak Detection

💧 Keep an active progress map

Record Data

- What did you find?

- What did you repair?

- Is there a pattern?

THIS IS AN ON-GOING PROCESS!!!!

Questions???

Thank YOU!!

Jeff Cunningham

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