Water Loss Control & Water Loss Audits

Components of water loss control:

Eight Questions for every local water utility --

1. How much water does our water system lose each year?
2. How do we actually know how much water we’re losing?
3. What do water leaks and water main breaks cost our water system each year?
4. Who pays for all the damages when a water main breaks?
5. How accurate are our water meters?
6. What steps does the utility take to find and repair leaks before they become major breaks?
7. What is the average pressure in our water distribution system, and how is it managed to avoid unnecessarily high pressure?
8. How many miles of water mains are replaced each year, and at that rate, how many years would it take to replace the entire system?
Water Loss Audits

Unaccounted for Water ➔ Non-Revenue Water
# Where Has All the Water Gone...?

## The IWA/AWWA Water Balance

<table>
<thead>
<tr>
<th>Volume From Own Sources (corrected for known errors)</th>
<th>System Input Volume</th>
<th>Water Supplied</th>
<th>Water Exported (corrected for known errors)</th>
<th>Billed Water Exported</th>
<th>Revenue Water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Billed Authorized Consumption</td>
<td>Billed Metered Consumption</td>
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<td>Unbilled Authorized Consumption</td>
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<td></td>
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<td></td>
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<td>Customer Metering Inaccuracies</td>
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<td></td>
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<td>Unauthorized Consumption</td>
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<td></td>
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<td>Systematic Data Handling Errors</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Leakage on Transmission and Distribution Mains</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>Leakage and Overflows at Utility's Storage Tanks</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Leakage on Service Connections up to the Point of Customer Metering</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** All data in volume for the period of reference, typically one year.
Industry-recognized best practice for water loss control is based on annual water loss audits using a standardized format developed by the American Water Works Association (AWWA).

AWWA Free Water Audit Software (version 5.0)

- Can be readily conducted by any water utility
- Low cost -- Excel-based software is free
- Can be performed by existing utility staff
- Forgiving -- Allows entry of estimated or imprecise data
- Generates recommendations for where data quality should be improved
- Most utilities can complete the audit in 1 to 3 days without outside help
Cutting Our Losses: State-by-State Policies

- **Rudimentary Water Loss Reporting**: Some water suppliers are required to make simple estimates of water losses.
- **Annual Reporting with Standard Terminology**: Reports of water loss using industry-wide definitions are required each year.
- **AWWA Free Water Audit Software**: Utilities are to report water losses in an electronic format developed and endorsed by the water utility industry.
- **Validation of Data**: Third party experts or trained evaluators review the information and data sources used by utilities to prepare water loss audit reports (“Level 1” validation).
- **Volume-Based Performance Benchmarks**: Goals or targets are being set to reduce water losses by specific volumes.

- No Action
- **Rudimentary Water Loss reporting is required**
- **Annual Water Loss reporting with AWWA standard terminology is required**
- **Annual use of AWWA Free Water Audit Software is required**
- **Validation of water loss data is required**
- **System-specific, volume based performance benchmarking required**

- River basin agencies or other regional organizations where water loss reporting is being specifically addressed
- Water suppliers for which validated water audits are complete and available
Georgia Water Stewardship Act of 2010 (SB 370/HB 1094)

- Requires all public water systems in GA serving more than 3,300 individuals to conduct and file a standardized Water Loss Audit report (AWWA method) each year.
- 226 utilities in GA are subject to the annual reporting requirement.
- Level 1 validation is required.
- Validated audit reports are posted by the State.
- **Performance:** Georgia DNR - Environmental Protection Division requires each water supplier to develop and conduct a water loss control program and demonstrate “demonstrable progress” toward improvement of water supply efficiency over time.
California

SB 555 (2015)

• Requires annual AWWA water loss audit report by all urban water suppliers (400+ systems)

• Requires Level 1 validation of reports prior to filing

• Requires utilities to identify steps taken in the preceding year to increase the validity of data entered into the final audit and to reduce the volume of apparent and real losses.

• **Performance:** Standards for the volume of losses are to be set by rulemaking in 2019-2020.
NRDC Model State Legislation: Utility Water Loss Audits

- Requires public water suppliers to **perform a water loss audit each year, using the AWWA standard methodology**.
  
  - Regulations issued within 18 months
  
  - 1st annual audit report due 2 years after enactment of the bill
  
  - “Level 1” validation required
  
  - State must make audit reports available online

- 2-3 years after first audit cycle, state to set **requirements for “data validity” and performance standards to reduce water loss**

- **Technical assistance to utilities**, using available state funds, to support performance and validation of audits, improvement of water loss detection programs.
Hawaii - PASSED
  - Includes most core elements

Indiana - PASSED
  - Includes limited elements

New Jersey - INTRODUCED IN CURRENT SESSION (Dec. 2016)
  - S. 2926 & A. 4415
    - Includes all core elements of NRDC model bill (except that technical assistance program does not include funding)

Colorado - Introduced last session, no committee hearing
  - HB 16-1283 (2016)
    - Includes most core elements
Hawaii – New Law

SB 2645 (2016)

• Requires all county-run water systems (approx. 50 systems) to file an AWWA water audit report annually, starting in 2017.

• All other water suppliers are to begin annual filing in 2019.

• Requires Level 1 validation of reports prior to filing

• Requires utilities to identify steps taken in the preceding year to increase the validity of data entered into the final audit and to reduce the volume of apparent and real losses.

• **Performance**: No provision for setting a performance standard.
Indiana – New Law

Previous requirement

Indiana Dept of Environmental Management requires all public water supply systems to submit annual Public Water System Sanitary Surveys, including an answer of yes, no, or N/A to whether the system has “>25% water loss based on a 1 year average.”

SB 347 (2016)

• Requires all water utilities to submit a standardized AWWA water loss audit report to the Indiana Finance Authority, along with an infrastructure needs assessment.
• Training provided, but validation not required.
• IFA will review audits and submitted a report to the Governor and legislature in Nov. 2016 (1 year early).
New Jersey: Water Loss Rules & Data

How about New Jersey?
New Jersey – Current Rules

- ~89% NJ residents served by public water supplies
- >$7.9 billion need over 20 yrs for drinking water infrastructure (USEPA)
- DEP requires reporting of “Unaccounted-for Water” (UAW) every two years
  - UAW > 15% may trigger compliance actions
  - AWWA audit “optional”
- BPU (which regulates ~100 systems) requires UAW reporting in rate increase applications
- DRBC requirements limited in substance and geography (see next slide)

- **No statewide requirement for utilities to do AWWA water loss audits**
Delaware River Basin Commission (DRBC) Rules

- Interstate agency including representatives from DE, NJ, NY, PA, and the U.S. Army Corps of Engineers

- In 2009, DRBC adopted rule that all utilities submit annual water audits, beginning in 2012, using AWWA Free Water Audit Software.

- A good start, but:
  - No public reporting
  - No validation
  - No technical assistance program
  - No performance targets

- Several major NJ water systems, including Trenton, Camden, Pennsauken, Vineland, and New Jersey American Water are covered.
Evaluation of Water Audit Data for NJ Water Utilities
(Kunkel Water Efficiency Consulting, for NRDC)

- Highlights largely hidden loss of drinking water in NJ
- Authored by George Kunkel:
  - expert on municipal water loss
  - co-author of AWWA water loss audit manual
  - formerly of Philadelphia Water Dept.
- Reviews 76 audits filed by NJ water utilities in the Delaware Basin.
- Estimates of water losses statewide
## Estimated NJ Statewide Water Loss: Gallons & $$$

### Table 1 Summary of Findings: Evaluation of 2013 Water Audit Data Reported by New Jersey Water Utilities in the Delaware River Basin

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent losses reported</td>
<td>790 mg (2.1 mgd)</td>
</tr>
<tr>
<td>Estimated economically recoverable apparent losses</td>
<td>287.7 mg (0.79 mgd)</td>
</tr>
<tr>
<td>Estimated recoverable annual revenue from economically recoverable apparent losses</td>
<td>$1,244,507</td>
</tr>
<tr>
<td>Real losses reported</td>
<td>5,421 mg (14.8 mgd)</td>
</tr>
<tr>
<td>Estimated economically recoverable real losses</td>
<td>2,241 mg (6.14 mgd)</td>
</tr>
<tr>
<td>Estimated annual production cost savings from economically recoverable real losses</td>
<td>$2,311,531</td>
</tr>
</tbody>
</table>

### Table 2 Estimates of Statewide Losses and Potential Savings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent loss estimate</td>
<td>6,898 mg (18.9 mgd)</td>
</tr>
<tr>
<td>Estimated economically recoverable apparent losses</td>
<td>2,515.2 mg (6.9 mgd)</td>
</tr>
<tr>
<td>Estimated recoverable annual revenue from economically recoverable apparent losses</td>
<td>$12,576,000</td>
</tr>
<tr>
<td>Real losses estimate</td>
<td>47,383 mg (129.8 mgd)</td>
</tr>
<tr>
<td>Estimated economically recoverable real losses</td>
<td>19,591 mg (53.7 mgd)</td>
</tr>
<tr>
<td>Estimated annual production cost savings from economically recoverable real losses</td>
<td>$10,128,500</td>
</tr>
</tbody>
</table>

Source: Kunkel Water Efficiency Consulting (2017)

15 million gallons/day in treated drinking water loss*

Additional 2 million gallons/day unbilled

$7.75 million/year

*Equates to loss of 21 gallons per customer connection per day

Source: Kunkel Water Efficiency Consulting (2017)
NJ Statewide Water Loss Estimates

• ~130 million gallons of treated drinking water are lost each day across New Jersey ("real loss")
• Of this, over 50 million gallons per day of water losses, valued at $10 million per year (variable production costs), are likely to be cost-effective for utilities to save
• That’s equal to the water use of about 700,000 New Jersey residents, or a population 2.5 times the size of Newark
• Another $12.5 million per year in lost revenue ("apparent loss") will be cost-effective for utilities to recover through improved water measurement and billing practices

Water main break in Hoboken, NJ slows traffic on Willow Avenue approaching the Lincoln Tunnel (Dec 1, 2016)
Marisa Iati, NJ Advance Media for NJ.com

Source: Kunkel Water Efficiency Consulting (2017)
NJ utilities’ self-reported “data validity” scores (DRBC dataset) were significantly higher than 3rd-party validated audits from a national dataset

- NJ DRBC median score: 75 (out of 100)
- National dataset (mostly GA): 63 (out of 100)

NJ utilities’ reported losses (DRBC dataset) were about 50% lower than national dataset and a PA-DRBC dataset

- Normalized to gallons per service connection
- This is true for both real losses and apparent losses
- Suggests problem with data validity

Many other anomalies in audit data

➤ Audit training & third-party validation are critical!

Source: Kunkel Water Efficiency Consulting (2017)
QUESTIONS?

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Cutting Our Losses:
www.nrdc.org/resources/cutting-our-losses

NJ report at:
www.nrdc.org/experts/ed-osann (Jan. 17 blog)