



American Water Works  
Association



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## **DRBC Workshop**

### **Water System Audits and Water Loss Control**

**Bordentown, NJ**

**April 13, 2011**

### **Module 2 Session 2**

### ***Overview of AWWA's Free Water Audit Software© & Compiler***

George Kunkel, P.E. Philadelphia Water Department

David Sayers Delaware River Basin Commission

AWWA Water Loss Control Committee

# AWWA Free Water Audit Software®

## A few people to credit....

- ◆ David Sayers, Delaware River Basin Commission – main software developer
- ◆ George Kunkel, P.E. Philadelphia Water Department
- ◆ Andrew Chastain-Howley, Miya (sub-committee chair)
- ◆ David Goff, P. E. Goff Water Audits and Engineering
- ◆ Alain Lalonde, Veritec/Miya
- ◆ Over 30 beta test utilities and testers.

# AWWA Free Water Audit Software©

## Chronology

- ◆ 2005 Beta Version 1.0 in development
- ◆ April 2006 First published software Version 2.0
- ◆ August 2007 Second version of software 3.0
  - April 2009, M36 Third Edition Published
- ◆ April 2009, Software Version 4.0 published – with important data grading capability
- ◆ January 2010, Software Version 4.1 posted: minor update to Version 4.0
- ◆ May 2010, Software Version 4.2 posted: minor update to Version 4.0 and French language version posted

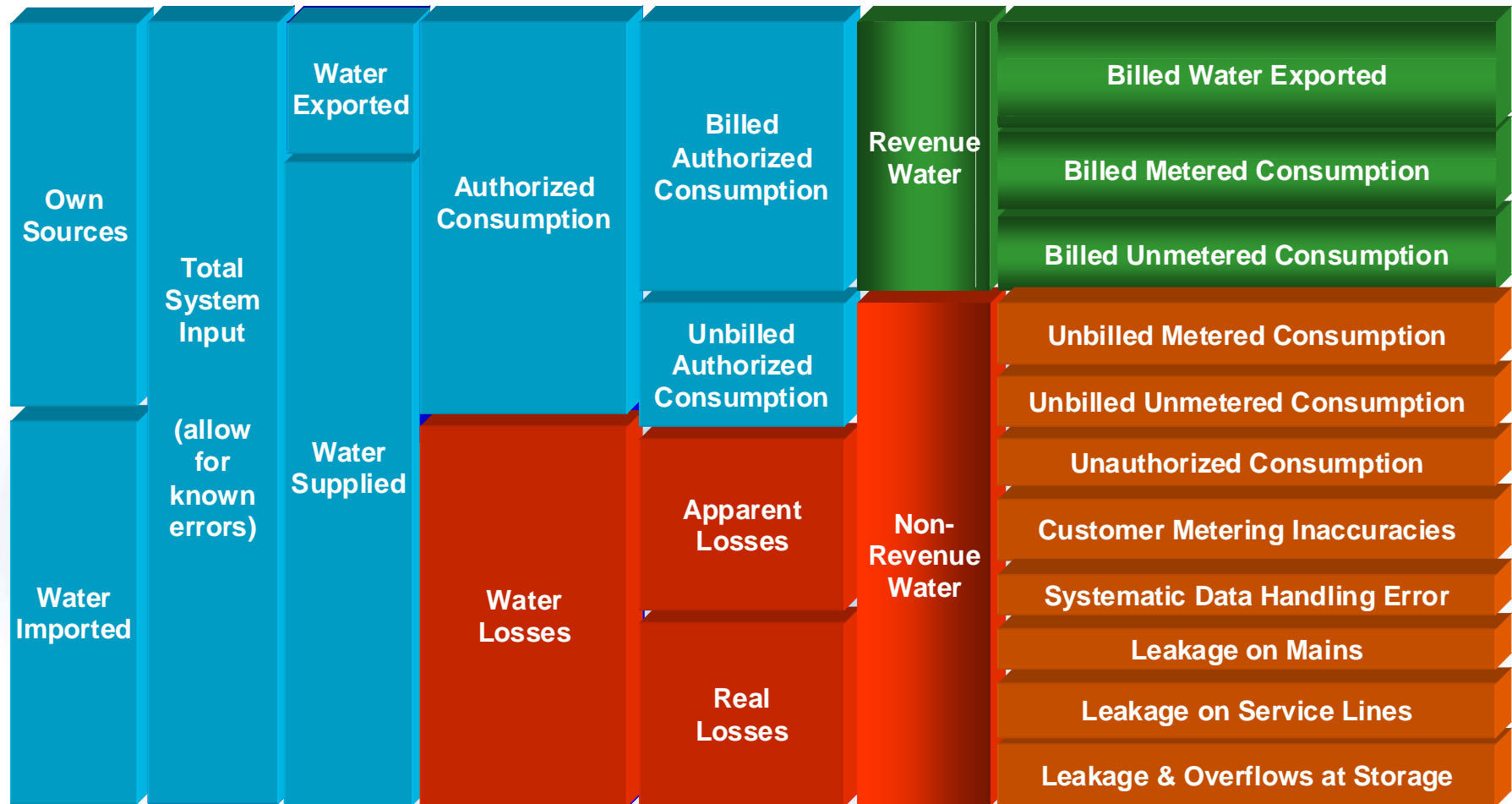
# *Why was the AWWA Free Water Audit Software© created?*

- 💧 Interest in water loss assessment is on the rise!
- 💧 Manuals are fine for reading, but in the cyber-age we also need computer tools!
- 💧 Most utilities need something simple and easy to assist with water audits
- 💧 Reduce the learning curve with respect to the new methodology
- 💧 Ensure standardization of data collection & analysis
- 💧 Version 4.0 – need to label the “quality” of the data
- 💧 No significant revision (Version 5.0) before 2012

# Water Audit Software Employs a Top-down Approach

- ◆ **Advantage: quickly pulls together data and information that is readily available**
- ◆ **Disadvantage: for most water utilities, incomplete or inaccurate data limits the *validity* of the top-down water audit**

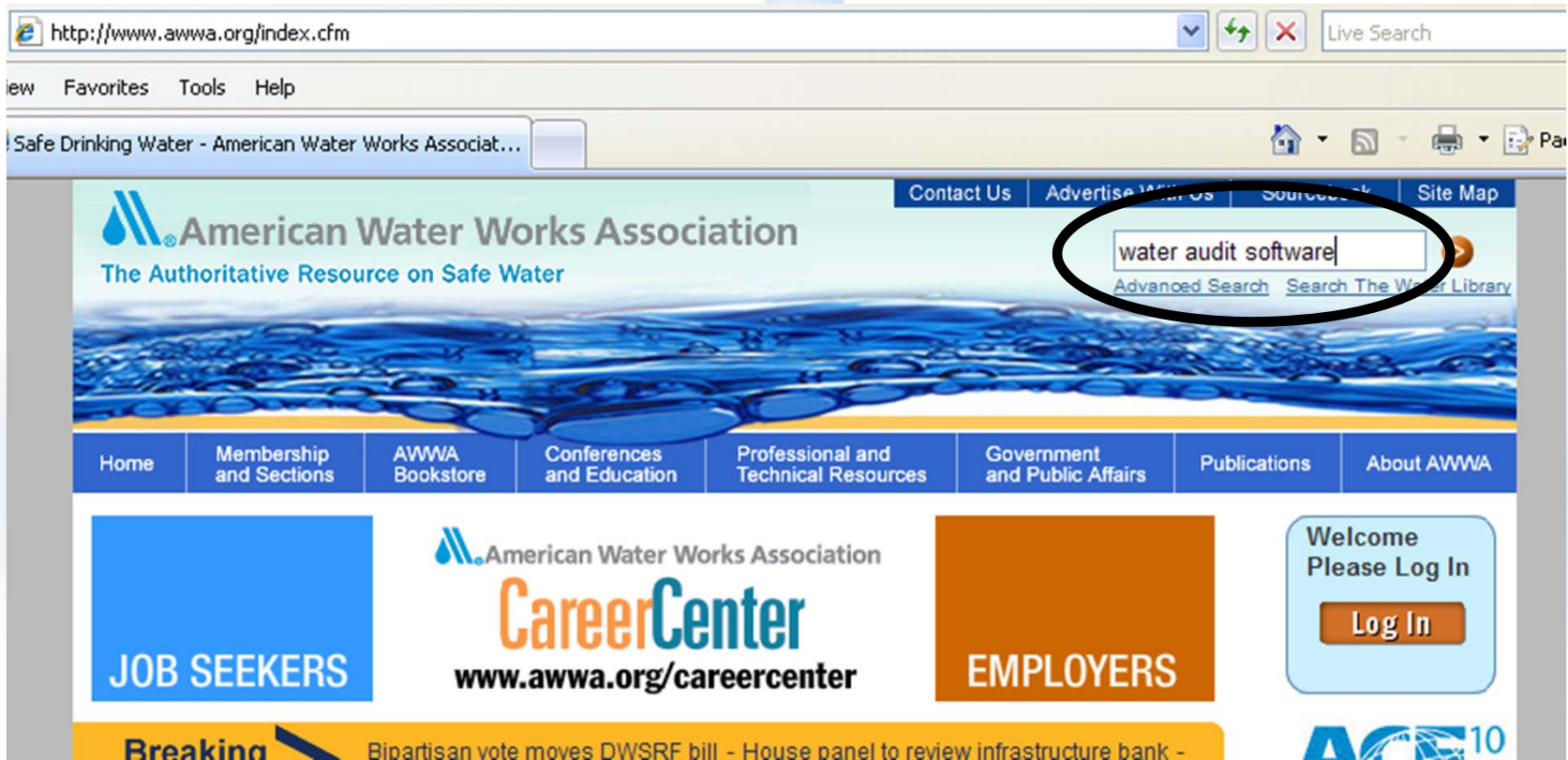
# IWA/AWWA Water Audit Method: Water Balance





# Obtaining & using AWWA's Free Water Audit Software©

## 🔹 How is the software obtained?



The screenshot shows the homepage of the American Water Works Association (AWWA). The browser address bar displays <http://www.awwa.org/index.cfm>. The page features a navigation menu with links for Contact Us, Advertise With Us, Sourcebook, and Site Map. A search bar is prominently displayed, containing the text "water audit software" and a search button. Below the search bar, there are links for "Advanced Search" and "Search The Water Library". The main content area includes a banner for "American Water Works Association" with the tagline "The Authoritative Resource on Safe Water". Below the banner is a navigation menu with links for Home, Membership and Sections, AWWA Bookstore, Conferences and Education, Professional and Technical Resources, Government and Public Affairs, Publications, and About AWWA. At the bottom, there are sections for "JOB SEEKERS", "CareerCenter" (www.awwa.org/careercenter), "EMPLOYERS", and a "Welcome Please Log In" button with a "Log In" link. A "Breaking" news banner at the very bottom mentions a bipartisan vote on the DWSRF bill.

# Obtaining & using AWWA's Free Water Audit Software©

## Follow the search results

The screenshot shows the American Water Works Association (AWWA) website. At the top, there is a navigation bar with links for "Contact Us", "Advertise With Us", "Sourcebook", and "Site Map". Below this is the AWWA logo and tagline "The Authoritative Resource on Safe Water". A search bar is located in the top right corner with the placeholder text "enter search term" and a search button. Below the search bar are links for "Advanced Search" and "Search The Water Library".

The main navigation menu includes: Home, Membership and Sections, AWWA Bookstore, Conferences and Education, Professional and Technical Resources, Government and Public Affairs, Publications, and About AWWA.

The search results section is titled "Search Results" and shows the search term "water audit software". Below the search bar are buttons for "Search", "Modify Search", and "Advanced Search". The results are displayed as "Search Results for water audit software" and "Results 1 - 10 of about 324". A pagination link "1 2 3 4 5 6 7 8 9 10 Next >>" is visible. The first search result is titled "AWWA Water Loss Control Committee's Free Water Audit Software" and is circled in black. The description for this result states: "The AWWA Water Loss Control Committee is pleased to offer Version 4.0 of its own Free Water Audit Software, available to all users."

On the right side of the search results, there is a sidebar with the text: "Looking for the best data management solutions for your plant or facility? Our water, wastewater, pretreatment and maintenance data management applications offer a wide range of analytical



# Obtaining & using AWWA's Free Water Audit Software©

Follow the link .....

The screenshot shows the AWWA website interface. At the top, there is a navigation bar with links for 'Contact Us', 'Advertise With Us', 'Sourcebook', and 'Site Map'. Below this is a search bar with the text 'Enter search term' and buttons for 'Advanced Search' and 'Search The Water Library'. The main content area features a large image of water ripples. Below the image is a navigation menu with tabs for 'Home', 'Membership and Sections', 'AWWA Bookstore', 'Conferences and Education', 'Professional and Technical Resources', 'Government and Public Affairs', 'Publications', and 'About AWWA'. The 'Professional and Technical Resources' tab is selected. On the left side, there is a vertical menu with links for 'AWWA Standards', 'AWWA Manuals', 'Work for Water', 'Small Systems', 'Operator Assistance', 'Water Science Topics', 'Water: Stats Surveys', 'Partnership for Safe Water', and 'Utility Management'. The main content area displays the breadcrumb trail: 'Home > Professional and Technical Resources > WaterWiser > Water Loss Control > Free Water Audit Software'. Below the breadcrumb trail, there are 'SHARE' and 'PRINT' icons. The main heading is 'How to Download the Water Audit Software'. The text below reads: 'Learn more about and download the Free Water Audit Software, in English or French, upon accepting the User Agreement:'. There are two circular buttons with download icons, labeled 'ENGLISH' and 'FRANÇAIS'. A large black circle is drawn around these two buttons. On the right side, there is a 'Log In' button and a 'Log In' button. At the bottom right, there are logos for 'erLibrary', 'Center', and 'itap.org'.

# Obtaining & using AWWA's Free Water Audit Software©

..... and accept

## USE AGREEMENT

The Water Loss Control Committee's Water Audit Software (the "Software") you seek to download and/or use is made available and licensed only on the condition that you ("User") agree with American Water Works Association ("AWWA") to the terms and conditions set forth below:

**PLEASE CAREFULLY READ THE TERMS OF THIS USE AGREEMENT. IF YOU AGREE TO BE BOUND BY THE TERMS OF THIS AGREEMENT, PLEASE CLICK "AGREE" AT WHICH TIME THE SOFTWARE WILL BE DOWNLOADED TO YOUR COMPUTER.**

1. User shall only use the Software in the form that it is downloaded from AWWA's WaterWiser website. User may only utilize the Software as a tool to compile a basic audit of User's water supply operations in an effort to determine water supply efficiency. User shall not modify the Software or use the Software except as herein authorized. The license granted to User is non-transferable and non-assignable. All rights not expressly granted by herein are reserved to AWWA and the owners of the Software.
2. User shall use the Software solely for a lawful and ethical purpose. User shall not copy, alter, modify, obscure, or add to the Software, nor reverse engineer, decompile or attempt to obtain the source code to the Software. User shall not allow any third party to use or copy the Software.
3. The term of this Agreement shall commence on User's acceptance of this Agreement and download of the Software, and shall continue until terminated, with or without cause, by either party. Upon any termination, User shall promptly delete all electronic files of the Software from User's systems, and shall cease all uses of the Software.
4. Although the Software is provided to User free of charge, it is copyrighted and not in the public domain. User may use the Software solely in its internal business and towards water supply efficiency. Neither AWWA nor any other party makes, extends, or confirms any representations, implied or expressed, in connection with the Software. User shall not make or extend any representation or warranty in connection with the Software that in any manner impacts AWWA or the owners of the Software.
5. AWWA MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE SOFTWARE, WHICH IS MADE AVAILABLE AND LICENSED ON AN "AS IS, WHERE IS" BASIS. AWWA DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUALITY, ACCURACY, AND NON-INFRINGEMENT. USER ASSUMES ALL RISK AS TO DOWNLOADING AND USE OF THE SOFTWARE. IN NO EVENT WILL AWWA BE LIABLE FOR SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING LOSS OF PROFITS OR INABILITY TO USE THE SOFTWARE, EVEN IF AWWA HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. USER'S ONLY REMEDY FOR ANY CAUSE OF ACTION ARISING HEREUNDER OR RELATED IN ANY MANNER TO THE SOFTWARE IS TO RETURN THE SOFTWARE AND DISCONTINUE ALL USES THEREOF.
6. User shall defend, indemnify, and hold AWWA harmless from and against any costs, losses, liabilities, damages, or penalties, including attorneys' fees, arising from or related to any wrongful act or omission, any violation of the law or of any party's rights, or any breach or derogation of the terms of this Agreement by User or its employees, directors, officers, representatives or agents.
7. This Agreement shall be construed under the laws of the state of Colorado without regard to its conflict of laws provisions. Any dispute involving this Agreement shall be exclusively resolved in the courts resident in the State of Colorado, Denver, Colorado. User hereby irrevocably submits to the personal and subject matter jurisdiction of such courts.

To download the Software, you must indicate agreement to comply with these terms of use:

I agree to comply with terms of use.

I do not agree to comply with terms of use.

# Obtaining & using AWWA's Free Water Audit Software©

..... and "SAVE AS"

http://www.awwa.org/files/science/WaterLoss/WaterAudit.xls - Windows Internet Explorer provided by American Water ITS - 5/23

http://www.awwa.org/files/science/WaterLoss/WaterAudit.xls

File Edit View Insert Format Tools Data Go To Favorites Help

New Tab Ctrl+T  
New Window Ctrl+N  
Open... Ctrl+O  
Save As...  
Close Tab Ctrl+W  
Page Setup...  
Print... Ctrl+P  
Send  
Import and Export...  
Properties  
Work Offline  
Exit

Loss Control Committee (WLCC) Free Water Audit Software v4.1

Copyright © 2010, American Water Works Association. All Rights Reserved. WAS v4.1

Sheet-based water audit tool is designed to help quantify and track water losses associated with water and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit, and is not meant to take the place of a full-scale, comprehensive water audit format.

The software contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the page by the buttons on the left below. Descriptions of each sheet are also given below.

CELL COLORS THROUGHOUT:

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

Please begin by providing the following information, then proceed through each sheet in the workbook:

NAME OF CITY OR UTILITY:  COUNTRY:

REPORTING YEAR:  START DATE (MM/YYYY):  END DATE (MM/YYYY):

NAME OF CONTACT PERSON:  E-MAIL:  TELEPHONE:   
Ext.

PLEASE SELECT PREFERRED REPORTING UNITS FOR WATER VOLUME

Click to advance to sheet... Click here: [?](#) for help about units and conversions

|                                     |   |
|-------------------------------------|---|
| <a href="#">Instructions</a>        | The current sheet   |
| <a href="#">Reporting Worksheet</a> | Enter the required data on this worksheet to calculate the water balance              |
| <a href="#">Water Balance</a>       | The values entered in the Reporting Worksheet are used to populate the water balance  |
| <a href="#">Grading Matrix</a>      | Depending on the confidence of audit inputs, a grading is assigned to the audit score |

Instructions Reporting Worksheet Water Balance Grading Matrix Service Connection Diagram Definitions

Saves this document as a file.

start Russell Ti... Microsoft... http://w... untyped - ... 11:55 AM

# Using AWWA's Free Water Audit Software©

- Read the instructions provided in the software
- Follow the tabs

|                              |  |
|------------------------------|--|
| <u>Instructions</u>          | The current sheet  |
| <u>Reporting Worksheet</u>   | Enter the required data on this worksheet to calculate the water balance                       |
| <u>Water Balance</u>         | The values entered in the Reporting Worksheet are used to populate the water balance           |
| <u>Grading Matrix</u>        | Depending on the confidence of audit inputs, a grading is assigned to the audit score          |
| <u>Service Connections</u>   | Diagrams depicting possible customer service connection configurations                         |
| <u>Definitions</u>           | Use this sheet to understand terms used in the audit process                                   |
| <u>Loss Control Planning</u> | Use this sheet to interpret the results of the audit validity score and performance indicators |



# *What data is needed?*

## ◆ **System input including**

- Volume from you own supplies
- Bulk water imported (purchased) and/or exported (sold)

## ◆ **Billed Water Consumption**

- Metered consumption: billed and unbilled
- Unmetered consumption: billed and unbilled

## ◆ **Quantity of water lost to unauthorized consumption**

## ◆ **Quantity of water not registered due to customer meter error or inaccuracy**

## ◆ **Quantity of water consumption not properly recorded due to systematic data handling errors in the customer billing system**



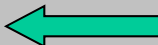
# *What data is needed?*

- Physical parameters of the water system
  - Length of mains
  - Number of service connections
  - Average length of customer service line
  - Average system operating pressure
- Financial data on the system
  - Annual operating costs to supply drinking water
  - Retail cost per unit charged to customers
  - Marginal production cost per unit

# Where is water quantity data entered?

- Water quantities are entered in the large white boxes

**PLEASE CHOOSE REPORTING UNITS FROM THE INSTRUCTIONS SHEET BEFORE ENTERING DATA**

**WATER SUPPLIED** << Enter grading in column 'E' 

Volume from own sources:

Master meter error adjustment (enter positive value):

Water imported:

Water exported:

---

**WATER SUPPLIED:**

---

**AUTHORIZED CONSUMPTION**

Billed metered:

Billed unmetered:

Unbilled metered:

Unbilled unmetered:

Default option selected for Unbilled unmetered - a grading of 5 is applied but not display

**AUTHORIZED CONSUMPTION:**

Click here:  for help using option buttons below

Pcnt: 125%   Value:

Use buttons to select percentage of water supplied

---

**WATER LOSSES (Water Supplied - Authorized Consumption)**

**Apparent Losses**

Unauthorized consumption:

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

Customer metering inaccuracies:

Systematic data handling errors:

Apparent Losses:

Pcnt: 0.25%   Value:

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

**Real Losses (Current Annual Real Losses or CARL)**

# Where is water quantity data entered?

- Look for the white boxes in the spreadsheet

**SYSTEM DATA**

|   |                      |                      |  |
|---|----------------------|----------------------|--|
| Length of mains:  | <input type="text"/> | <input type="text"/> |  |
| Number of <u>active AND inactive</u> service connections: | <input type="text"/> | <input type="text"/> |  |
| Connection density:                                       | <input type="text"/> | <input type="text"/> |  |
| <u>Average</u> length of customer service line:           | <input type="text"/> | <input type="text"/> | (pipe length between curbstop and customer meter or property boundary) |
| Average operating pressure:                               | <input type="text"/> | <input type="text"/> |  |

---

**COST DATA**

|   |                      |                      |         |
|---|----------------------|----------------------|---------|
| Total annual cost of operating water system:            | <input type="text"/> | <input type="text"/> | \$/Year |
| Customer retail unit cost (applied to Apparent Losses): | <input type="text"/> | <input type="text"/> |         |
| Variable production cost (applied to Real Losses):      | <input type="text"/> | <input type="text"/> | \$/     |

- That was easy, but what about those small white boxes?

# Grading the validity of the water quantity data

– 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.

# *Calculated Performance Indicators*

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## –Performance Indicators

- NRW% by volume
- Volumetric losses
- Losses per connection per day
- Losses per mile of main
- Unavoidable annual real losses (UARL)
- Infrastructure Leakage Index (ILI)



# Calculated Performance Indicators

## PERFORMANCE INDICATORS

### Financial Indicators

Non-revenue water as percent by volume of Water Supplied:

Non-revenue water as percent by cost of operating system:

Annual cost of Apparent Losses:

Annual cost of Real Losses:

### Operational Efficiency Indicators

Apparent Losses per service connection per day:

Real Losses per service connection per day\*:

Real Losses per length of main per day\*:

Real Losses per service connection per day per meter (head) pressure:

Unavoidable Annual Real Losses (UARL):

From Above, Real Losses = Current Annual Real Losses (CARL):

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

# *Special Features*

- All calculations are performed by the software
- Default values are offered for several components
- Be mindful of units selected for volumes and customer retail cost
- Gross data error checks are built-in
  - Ex: can't report Authorized Consumption volume greater than Water Supplied volume

# Example Data Sheets

- Examples which show two completed water audits are embedded into the body of the spreadsheet:
  - The Philadelphia Water Department (US) audit shows units of million gallons (US)
  - The Region of Peel (Canada) shows units of thousand cubic meters.



# AWWA WLCC Free Water Audit Software: Reporting Worksheet

[Back to Instructions](#)

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WAS v4.0

Click to access definition

Water Audit Report for: **Philadelphia Water Department**

Reporting Year: **2008**    **7/2007 - 6/2008**

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

**All volumes to be entered as: MILLION GALLONS (US) PER YEAR**

## WATER SUPPLIED

<< Enter grading in column 'E'

|                                |                                  |     |                   |  |
|--------------------------------|----------------------------------|-----|-------------------|--|
| Volume from own sources:       | <input type="button" value="?"/> | 7   | 94,536.900        | Million gallons (US)/yr (MG/Yr)                    |
| Master meter error adjustment: | <input type="button" value="?"/> | 10  | 2,779.300         | <input type="text" value="over-registered"/> MG/Yr |
| Water imported:                | <input type="button" value="?"/> | n/a |                   | MG/Yr  |
| Water exported:                | <input type="button" value="?"/> | 10  | 7,100.400         | MG/Yr  |
| <b>WATER SUPPLIED:</b>         |                                  |     | <b>84,657.200</b> | MG/Yr  |

## AUTHORIZED CONSUMPTION

|                                |                                  |     |                   |       |
|--------------------------------|----------------------------------|-----|-------------------|-------|
| Billed metered:                | <input type="button" value="?"/> | 7   | 57,242.400        | MG/Yr |
| Billed unmetered:              | <input type="button" value="?"/> | n/a |                   | MG/Yr |
| Unbilled metered:              | <input type="button" value="?"/> | n/a |                   | MG/Yr |
| Unbilled unmetered:            | <input type="button" value="?"/> | 8   | 764.200           | MG/Yr |
| <b>AUTHORIZED CONSUMPTION:</b> |                                  |     | <b>58,006.600</b> | MG/Yr |

Click here:  for help using option buttons below

Pcnt:  Value:  764.200

Use buttons to select percentage of water supplied  
**OR**  
value

**WATER LOSSES (Water Supplied - Authorized Consumption)**    **26,650.600** MG/Yr

## Apparent Losses

|                                  |                                  |   |                  |       |
|----------------------------------|----------------------------------|---|------------------|-------|
| Unauthorized consumption:        | <input type="button" value="?"/> | 8 | 2,086.300        | MG/Yr |
| Customer metering inaccuracies:  | <input type="button" value="?"/> | 8 | 190.300          | MG/Yr |
| Systematic data handling errors: | <input type="button" value="?"/> | 5 | 4,674.400        | MG/Yr |
| <b>Apparent Losses:</b>          |                                  |   | <b>6,951.000</b> | MG/Yr |

Pcnt:  Value:  2,086.300

190.300

Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

## Real Losses

|   |                                  |  |                   |       |
|---|----------------------------------|--|-------------------|-------|
| Real Losses = Water Losses - Apparent Losses: | <input type="button" value="?"/> |  | 19,699.600        | MG/Yr |
| <b>WATER LOSSES:</b>                          |                                  |  | <b>26,650.600</b> | MG/Yr |

## NON-REVENUE WATER

**NON-REVENUE WATER:**  **27,414.800** MG/Yr

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

**SYSTEM DATA**

Length of mains:   miles  
Number of active AND inactive service connections:    
Connection density:  conn./mile main  
Average length of customer service line:   ft (pipe length between curbstop and customer meter or property boundary)  
Average operating pressure:   psi

**COST DATA**

Total annual cost of operating water system:   \$/Year  
Customer retail unit cost (applied to Apparent Losses):   \$/1000 gallons (US)  
Variable production cost (applied to Real Losses):   \$/Million gallons

**PERFORMANCE INDICATORS**

**Financial Indicators**

Non-revenue water as percent by volume of Water Supplied:   
Non-revenue water as percent by cost of operating system:   
Annual cost of Apparent Losses:   
Annual cost of Real Losses:

**Operational Efficiency Indicators**

Apparent Losses per service connection per day:  gallons/connection/day  
Real Losses per service connection per day\*:  gallons/connection/day  
Real Losses per length of main per day\*:   
Real Losses per service connection per day per psi pressure:  gallons/connection/day/psi  
 Unavoidable Annual Real Losses (UARL):  million gallons/year  
 Infrastructure Leakage Index (ILI) [Real Losses/UARL]:

\* only the most applicable of these two indicators will be calculated

**WATER AUDIT DATA VALIDITY SCORE:**

**\*\*\* YOUR SCORE IS: 82 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

**PRIORITY AREAS FOR ATTENTION:**

Based on the information provided, audit accuracy can be improved by addressing the following components:

**1: Volume from own sources**

**2: Billed metered**

**3: Systematic data handling errors**

[For more information, click here to see the Grading Matrix worksheet](#)



# Assessing the Composite Data Validity Score

| Functional Focus Area   | Water Audit Data Validity Level / Score   |   |   |  |  |
|-------------------------|---|---|---|--|--|
|                         | 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.*

# *Follow-up Actions*

- Monitor and Manage
- Incrementally improve the extent and validity of the data over successive water audit periods
- Move into a “bottom-up” auditing approach incrementally
- Refer to M36 and other reference publications, IWA and privately authored
- Review case studies
- Software Support: send comments/questions/problems to **wlc@awwa.org**



DRBC Water Audit Workshop, Bordentown, NJ.

April 13, 2011



# Water Audit Data Management

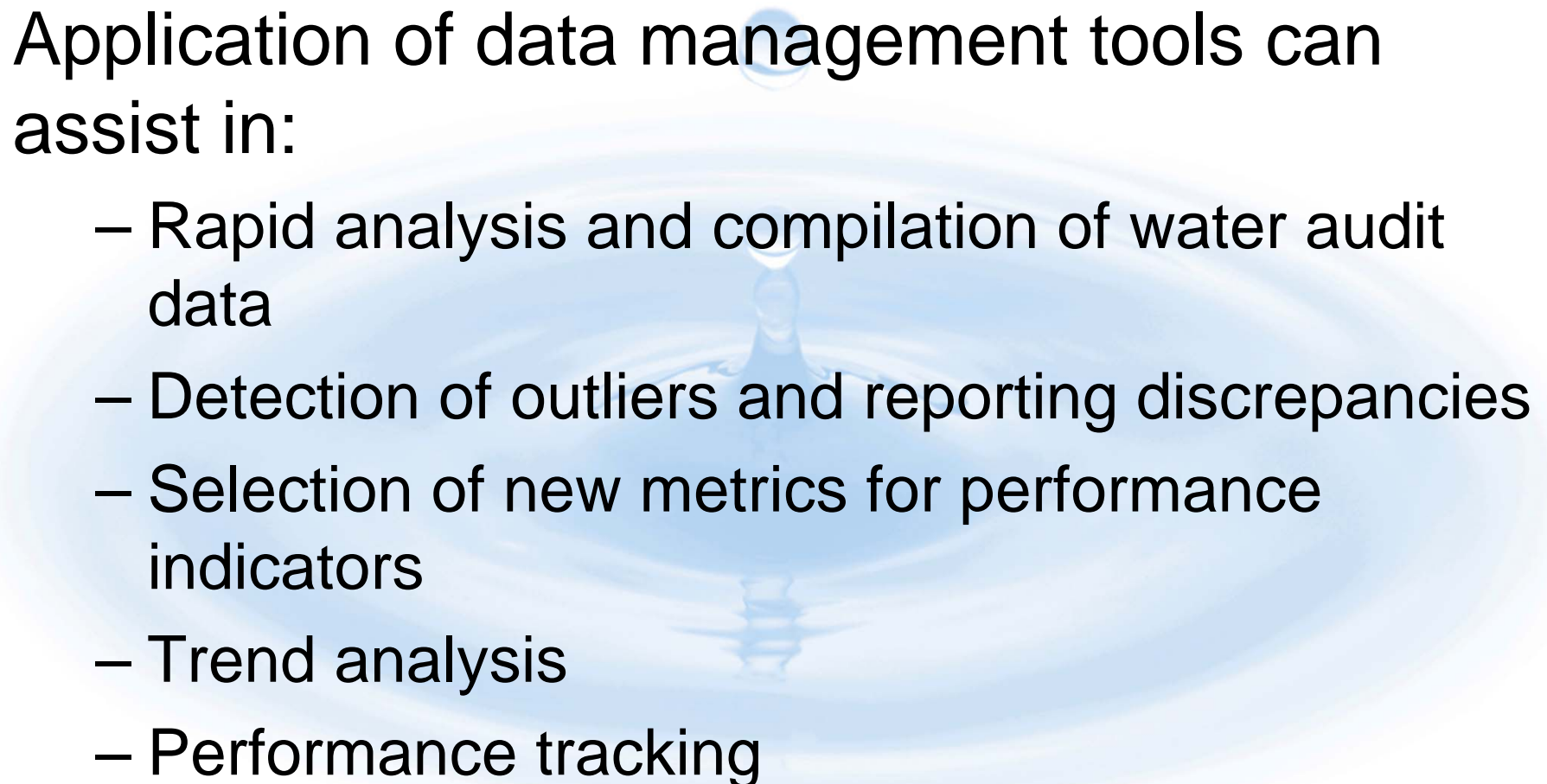
David Sayers,

Supervisor, Information Technology & Water Use, DRBC

# Water Audit Data Management



Application of data management tools can assist in:

- Rapid analysis and compilation of water audit data
  - Detection of outliers and reporting discrepancies
  - Selection of new metrics for performance indicators
  - Trend analysis
  - Performance tracking
- 

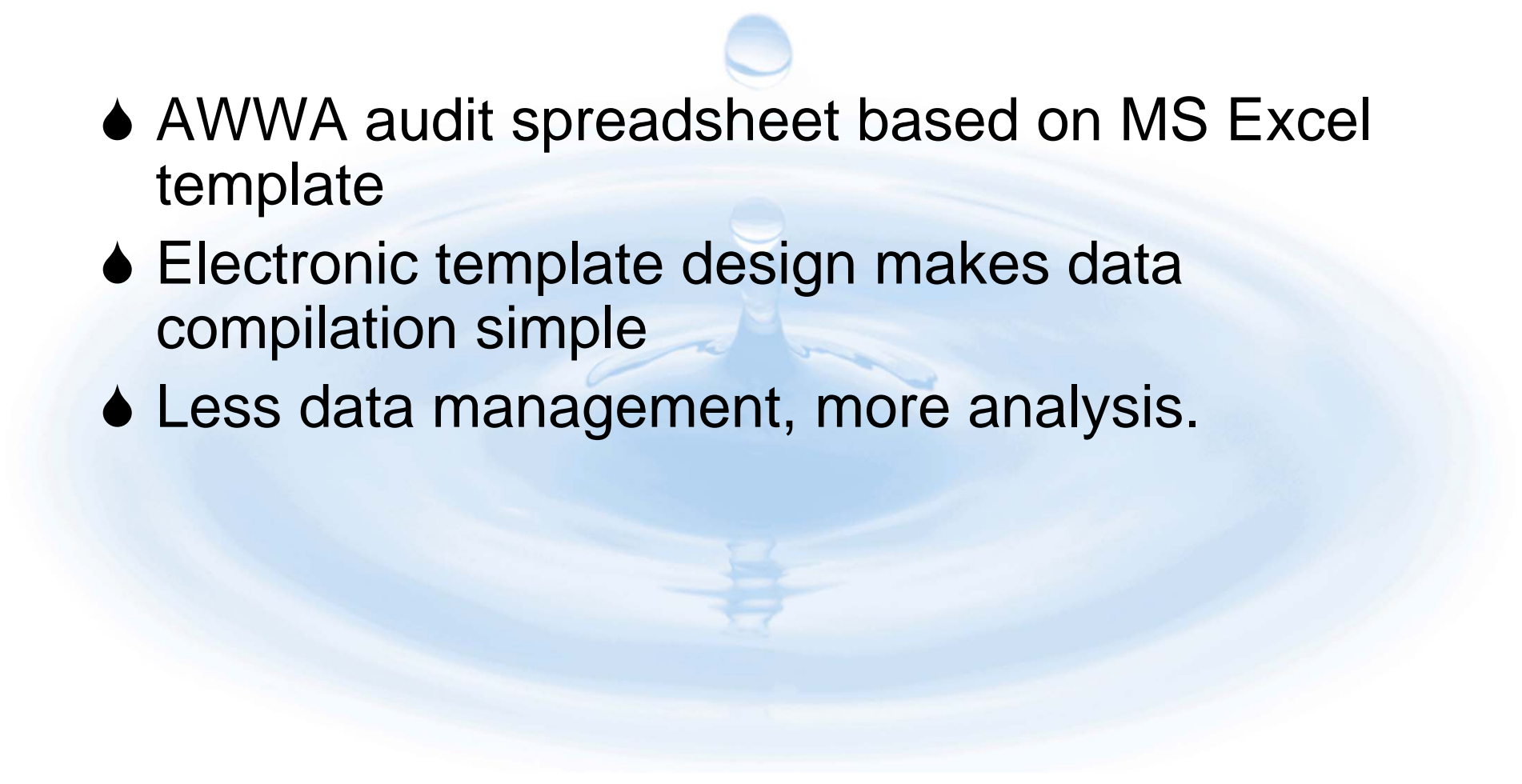
# Water Audit Data Management

AWWA Water Loss Control Committee developed a data management tool for multiple purposes:

## - The Compiler -


- ◆ DRBC program
- ◆ PAPUC pilot program
- ◆ Other regulatory programs
- ◆ AWWA paper / presentation June 2011
- ◆ Individual utilities with multiple, separate systems

# Data Collection & Analysis

- 
- A large, faint, light blue water splash graphic is centered in the background of the slide. It features a central water droplet falling into a pool of water, creating concentric ripples that spread outwards. The splash is semi-transparent and serves as a decorative backdrop for the text.
- AWWA audit spreadsheet based on MS Excel template
  - Electronic template design makes data compilation simple
  - Less data management, more analysis.



# Managing Water Audit Data



Go to audit  
management  
software...