



# Public Water System Water Loss Reduction Resources

## Background:

This document is intended to provide ideas and resources to water systems for addressing and reducing water losses. Water loss control should be incorporated into system operations and management.

It is recommended that a water system complete a water audit in order to understand the volumes and monetary values attributed to real losses and apparent losses for their system. The system can use the information from the water audit to guide them in determining the most appropriate actions to take in order to manage and reduce their water losses. NHDES recommends that the water audit be completed annually using the American Water Works Association (AWWA) Free Water Audit Software (version 6), which can be downloaded from the [AWWA website](#). NHDES has developed a [guide](#) with resources and tips to help water systems get started on a water audit.

The volumes attributed to water losses in the AWWA water audit are affected by the accuracy of the volumes attributed to the system input volume (water distributed to the system) and authorized consumption (water used by the customer or system once it's distributed). Here are some recommendations to improve the accuracy of the system input volume and authorized consumption volume:

- Flow-test the meters used for determining the system input volume at least once a year
  - In situ (in place) testing is recommended
  - Calibrate the meter(s) as needed based on the test results
- Install and read meters on all service connections, whether the account is billed or unbilled
  - Include municipal buildings, parks, and churches
- Use a meter to capture hydrant use, especially during flushing activities
- Provide contractors with a meter for construction sites
- Work with the fire department to encourage them to track the days and times of their water use for trainings, practice, and other fire suppression activities
- Any volumes that are currently estimated can be verified using meters to improve future calculations or estimates

## Real Losses:

- Common Causes:
  - Main line leakage (from pipes, joints, and fittings)
  - Service line leakage (up to the service meter)
  - Storage tank overflow
- Four Areas of Focus for Real Loss Control:
  - Proactive leak detection activities
  - Speed and quality of break repairs
  - Pressure management
  - Asset management
- Ways to Address and Reduce Real Losses:
  - Analyze break data
    - Identify areas of the distribution system that have had the most leaks

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- This exercise helps you see if an area of the system should be monitored more frequently for leaks and/or where to focus pipe replacement efforts
  - Look for patterns
    - Examples: leak type (pipe, valve, hydrant, etc.), pipe material, age, jointing, bedding, activities before breaks (ex. water hammer), and season of the year
- Utilize correlators and leak loggers
  - They can be installed in permanent locations or moved throughout the system
    - Install them in fixed locations
      - This approach is useful if there is an area of the system that is prone to leakage
    - Use a 'lift and shift' approach
      - Install them temporarily in an area of the system then move them to another area after a designated amount of time
      - This approach allows different areas of the system to be assessed
  - Assess your equipment and staff needs for implementation of either approach
    - Do you currently own the equipment? If not, when can it be purchased?
    - Is staff trained in the use of the equipment and analysis of the data?
- Establish a plan for frequent night flow analyses
  - Look at the distribution meter or zone meter readings at a period of anticipated low customer demand
  - Determine a baseline low flow rate and a flow rate above that baseline that indicates a leak
    - Example: The baseline flow rate for a system is 2 gpm. If the lowest flow rate during the night flow analysis is 2 gpm above the baseline (4 gpm), it indicates that further actions should be taken to determine if there is a potential leak in the system.
  - This analysis could be done for the whole system or in smaller sections of the system, such as district metered areas (DMAs) and zones.
- Establish a plan for leak detection surveys
  - Commit to a schedule (ex. 50% of the system completed in Year 1 and 50% in Year 2)
  - Determine who will perform the survey (ex. hire a contractor or use in-house staff)
    - If you plan to use a contractor, are there funds available?
    - If you plan to use in-house staff, do you own the equipment? If not, when can it be purchased? Is staff trained in the use of the equipment?
- Look at leak isolation and repair times
  - On average, how much time does it take from becoming aware of the leak to pinpointing it? How much time does it take from pinpointing the leak to repairing it?
  - Are there processes or equipment/tools that can reduce the amount of time it takes for leak detection and repair?
  - Are there processes or equipment/tools that can improve the quality of the repairs?
  - Are there other approaches that can be used to motivate customers to address leaks on their properties in a timely manner?
- Establish a plan for main and service pipe rehabilitation and/or replacement
  - Determine the timeline
  - Determine the goals (ex. the number of miles or percentage of the system per year)
  - Assess whether the number of fittings and joints can be reduced when replacing the pipe

- Analyze system pressures
  - Are areas of the system with higher pressure (greater than 80 psi) monitored more frequently for leaks?
  - Locate and eliminate pressure transients (ex. surges, water hammer)
  - Develop a pressure management strategy
    - Assess whether pressure can be reduced in high pressure areas and/or overnight
  - Make sure that you're looking at the system pressure and not just customer pressure (ex. pressure reducing valves at service connections deal more with customer pressure than system pressure)
- Develop an Asset Management Plan
  - At a minimum, map and inventory the assets in the system, especially pipes and valves
  - Use the plan to identify opportunities and priorities for system improvements
  - Establish a replacement schedule for assets, including curb stops and other valves

### **Apparent Losses:**

- Common Causes:
  - Unauthorized use (theft)
    - Examples: unauthorized hydrant use and service meter bypass or tampering
  - Data handling error
    - Examples: meter reading errors, billing software issues
  - Customer meter inaccuracy
    - Example: meter is faulty, inaccurate, sized improperly, or installed incorrectly
- Ways to Address and Reduce Apparent Losses:
  - Look at the data handling process to identify if there are ways that errors could occur, and correct those issues
    - Create a flowchart of the data handling process from the customer meter to the bill
    - Errors could happen during the transfer of data from the meter register to the reading device
      - Examples for reading meters through AMR or AMI: dropping digits or 0's, missing houses
      - Examples for reading meters manually: dropping digits or 0's, moisture accumulation making it hard to read the numbers
    - Errors could happen during the transfer of data from the reading device to the computer software
      - Example for AMR or AMI meter readings: dropping digits or 0's
      - Example for manual meter readings: handwriting that is hard to read
    - Adjustments could be made to the meter readings during the billing process
      - Make sure you keep track of the actual/registered volume vs billed volume for each account
    - Look for accounts where there was an owner change or the account was deactivated then reactivated
      - Sometimes, those accounts get accidentally dropped from the billing software
    - Look for accounts with really high volumes and really low volumes (0's)
      - There could be something going wrong with the meter or reading
  - Establish a plan for service meter replacement and/or testing
    - Make sure that you're being proactive and not just replacing meters as they die
    - Focus on accounts with the largest meters or that use the highest volumes

- Focus on meters based on age
      - This is especially important if the meter has internal moving parts or a battery with a life expectancy
    - To understand the accuracy of meters that were removed, test at least a sample of them before disposal. The results can help estimate the accuracy of similar meters as well as the estimated volume of water that was not captured by the meters.
  - Establish a plan for evaluating service meter sizes and downsizing meters as needed
    - Look at the volumes going through the meters and determine if that size or type of meter can accurately capture the low and high flows

**Resources:**

- Manuals/Guides:
  - [AWWA M36 Manual: Water Audits and Loss Control Programs](#)
- Webinars:
  - [NHDES Presentation Recording- Water Audits and Water Loss Control](#)
  - [EFC Webinar Recording- Introduction to Water Loss Control](#)
  - [EFC Webinar Recording- Developing a Water Loss Control Program](#)
  - [EFC Webinar Recording- Actions to Address Apparent Losses](#)
  - [EFC Webinar Recording- Actions to Address Real Losses](#)
  - [EFC Webinar Recording- Water Loss Control and Asset Management Nexus](#)
  - [EFC Webinar Recording- Importance of Billing Data for Water Loss Control Efforts](#)
- Tools:
  - [EFC Water Loss Control Toolbox](#) (includes dozens of tools and links to resources)
  - [AWWA Water Loss Control Website](#) (includes links to tools and resources)

**Consultants and Technical Assistance Providers:**

- [Environmental Finance Center \(EFC\)](#)
  - Free and available to any system serving fewer than 10,000 people
- [Granite State Rural Water Association \(GSRWA\)](#)
- [Resources for Communities and People \(RCAP\) Solutions](#)
  - NH Contacts: [etoledo@rcapsolutions.org](mailto:etoledo@rcapsolutions.org) and [mmistretta@rcapsolutions.org](mailto:mmistretta@rcapsolutions.org)
- [Engineering Firms That Could Be Hired](#)

**NHDES Contact:**

Please contact the NHDES Water Conservation Program at [waterconservation@des.nh.gov](mailto:waterconservation@des.nh.gov) with any questions or to provide other water loss control ideas that can be added to this guide.

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