

Water Distribution System

This portion of the BMP Tool Box includes those practices that address data collection and management related to the distribution system, as well as the four pillars of water loss control practices that progressive utilities may implement to manage real and apparent water loss:

- active leak detection,
- rapid and high quality leak repair,
- pressure management, and
- infrastructure management.

BMPs related to [system wide water loss control](#) and conducting Water Audits for water utilities are contained in the Water System Management portion of the Tool Box.

Noteworthy is that some leaks will likely persist within any distribution system that are too small or too difficult to detect, based on the economics of finding and repairing leaks, and/or limits in technology - and these contribute to what is considered "unavoidable real losses". In addition, utilities, especially those without specific water loss control programs, will have "potential recoverable real losses" which are those real water losses that are occurring that can be eliminated with active leak detection and repair programs. For utilities that are just beginning to characterize water loss and implement water loss controls, it is likely that considerable real losses exist. For this reason, "potential recoverable real losses" may be substantial for these organizations. Once more aggressive water loss control procedures are implemented, water utilities will have to become increasingly aware of the economic benefits of conducting additional loss recovery. For these organizations, potential recoverable real losses may become somewhat limited. For this reason, some amount of real water loss is considered unavoidable based on considerations related to the availability of water resources, operational issues, and financial issues.

The AWWA has developed a standardized parameter - the infrastructure leak index (ILI) - as a means to track and assess water loss control both within an organization and across multiple organizations. ILI is defined as the current annual real water loss (CARL) divided by the unavoidable annual real loss (UARL), where CARL is the sum of unavoidable annual water loss and potential recoverable annual water loss ([see System Management Water Loss Data Analysis/Water Balance Calculation for more information regarding how to calculate CARI](#)).

UARL can be estimated using an equation developed by AWWA (although the empirical data used to develop the relationships are based on utilities with 3,000 connection or more). This equation relates UARL to length of distribution piping (Lm), number of customer connections and fire hydrants (Nc), average pressure across the system (P), and length of customer service lines and hydrant leads (Lc) - $UARL (gal/yr) = P * (5.41Lm + 0.15Nc + 7.5Lc)$.

ILI is currently being tracked for water utilities - small and large - at hundreds of locations across the US. AWWA provides data and tracking tools to help individual water utilities assess their water loss control programs and benchmark themselves to similar sized organizations throughout the country (see link in resources).

The table below summarizes how goals should be evaluated and set for water utilities based on different levels of target ILI (AWWA, 2009).

Leak Management Target Setting Guidelines

Target ILI Range	Water Resources Constraints	Operational Constraints	Financial Constraints
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1-3	Available resources are greatly limited and are difficult and/or environmentally unsound to develop.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet demand.	Water resources are costly to develop or purchase. Ability to increase revenues via water rates is greatly limited due to regulation or low rate payer affordability.
3-5	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in long-range planning.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources can be developed or purchased at reasonable cost. Periodic water rate increases can be feasible and are tolerated by the customer base.
5-8	Water resources are plentiful, reliable, and easily developed and/or produced.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Costs to purchase or develop water are low, as are rates charged to customers.
>8	While operational and financial considerations may allow a long-term target greater than 7, such a level of leakage is not an effective utilization of water as a resource, such that setting a target greater than 8 is discouraged.		

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