



Calculation of Standard, Compliance Requirements and Low Losses

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Outline

- Calculation of standards - Example
 - Approach-specific assumptions
 - Costs versus Benefits
- Compliance requirements
 - Pressure monitoring – New proposed requirement
 - Variability in real loss for ongoing compliance
- Assumptions for improbable water loss estimates and data gaps

Goals

- Reduce real loss
- Allow for flexibility in selecting technologies
- Incorporate cost-effectiveness
 - Benefit to Cost ratio > 1
- Focus on key approaches for water loss control
- Consider system-specific costs and benefits
- Address data gaps

Example Median Hypothetical Utility

- Initial real water loss: 37 gallons per connection per day
- Miles: 140 miles
- Connections: 10,000

Example: Median Hypothetical Utility

Phase 2 (2023 to 2027)

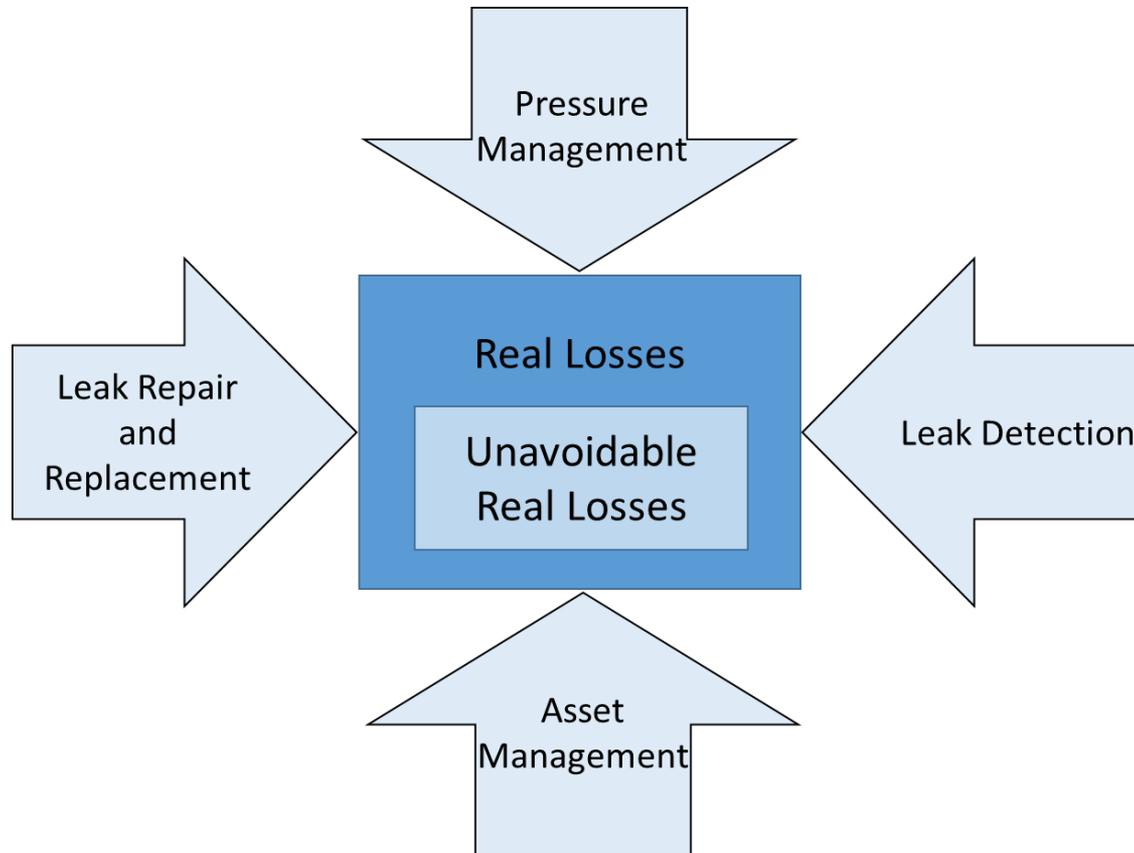
- Systems would be able to implement water loss control actions on a smaller scale
- Systems may not implement accelerated asset management in this phase

Phase 3 (2028 to 2035)

- Systems would implement accelerated asset management in this phase
- Larger scale implementation of water loss control actions
- Achieve economic level of leakage at the end of this phase

Example: Hypothetical Utility

Costs for four key approaches



Example: Hypothetical Utility

- Benefits include:
 - Water savings: \$1,700/AF
 - Reduction in main breaks:
 - Avoided property damage ~ \$5000/AF
 - Avoided outages: \$1,500/AF
 - Avoided costs of carbon emissions: \$45/AF

Leak Detection - Assumptions

- Costs: Equipment and staff, repair and replacement material
- Sensitivity to be assessed for the following factors:
 - Pipe material: Acoustic leak detection can incur higher costs per mile in case of non-metallic pipes.
 - Pipe size: Acoustic leak detection equipment have lower efficiencies in pipes with larger diameters (greater than 18 inches).

Repairs and Replacement

Current proportion of repair, rehabilitation and replacement needs identified during ongoing leak detection efforts inform projected proportion of needs

Reduced response time to leak repair

- Costs will include additional required staff
- Includes an incremental improvement in response time by 24 hours
- Number of breaks per 100 miles used to project water loss recovery in case of data gaps

Replacement

- Costs include material, staff and excavation

Leak detection

- With leak detection, a total of 1274 acre-feet can be recovered cost-effectively
- Achievable recovery in phases 2 and 3:
 - Phase 2: 357 acre-feet
 - Phase 3: 917 acre-feet

Pressure Management

Costs for the following actions will be included

- Annual pressure monitoring survey for the entire system
- Pressure transient monitoring for the entire system
- Pressure transient mitigation for a portion of the system
- Pressure reduction for a portion of the system.

Pressure Management

- Water loss recovery through pressure management recovery determined based on individual cost-benefit analysis
- Sensitivity analysis for factors influencing cost and recovery: Size of pressure zone, leakage volume, topography

Pressure Management

- With pressure management, a total of 612 acre-feet can be recovered cost-effectively
- Achievable recovery in phases 2 and 3:
 - Phase 2: 153 acre-feet
 - Phase 3: 459 acre-feet

Accelerated Asset Management

- Costs include:
 - Costs for prioritizing pipes for replacement
 - Material, staff and excavation
- All the water loss recovery in Phase 3
- Achievable recovery in phase 3: 153 acre-feet

Allowable Water Loss Volume

- Initial real loss level: 37 gallons per connection per day
- Cost-benefit analysis calculates water loss recovery of 2039 acre-feet over 13 years over 10,000 connections
- Equivalent to a reduction by 14 gallons per connection per day annually on an average
- **Allowable Water Loss Volume**
 - = **(37-14) gallons per connection per day**
 - = **23 gallons per connection per day by 2035**

Phase 2: 2023 - 2027

Leak Detection, repairs and replacement
357 acre-feet



Pressure management
153 acre-feet



510
acre-feet
recovered

Initial water loss level = 37 gallons per connection per day

Goal: 23 gallons per connection per day

Water loss recovery achievable after phases 1 and 2:

510 acre-feet over 10,000 connections over 5 years

~ 9 gallons per connection per day over Phase 2

Based on assumptions for Phase 2, achievable water loss volume for 2027:

28 gallons per connection per day

Phase 3: 2028 - 2035

Leak Detection, repairs and replacement
917 acre-feet



Pressure management
459 acre-feet



Asset management
153 acre-feet



1529
acre-feet
recovered

Initial water loss level = 37 gallons per connection per day

Water loss recovery needed for phase 3:
1529 acre-feet over 10,000 connections over 8 years:

17 gallons per connection per day over Phase 3

Weighted average of:

9 gallons per connection per day over Phase 2 (5 years) and

17 gallons per connection per day over Phase 3 (8 years)

= 14 gallons per connection per day over 13 years (both Phases)

Allowable water loss volume for 2035: 23 gallons per connection per day

Discussion on Compliance Requirements

- Pressure Monitoring – December 2021
 - ~~Proposed Grade 4 pressure monitoring requirement~~
 - Based on California Public Utilities Commission General Order 103A
 - Annual pressure surveys for each pressure zone
 - At representative points (for average pressure), using topography maps or data if necessary
 - Reporting through electronic annual reports
- Variability in estimates: Volumetric

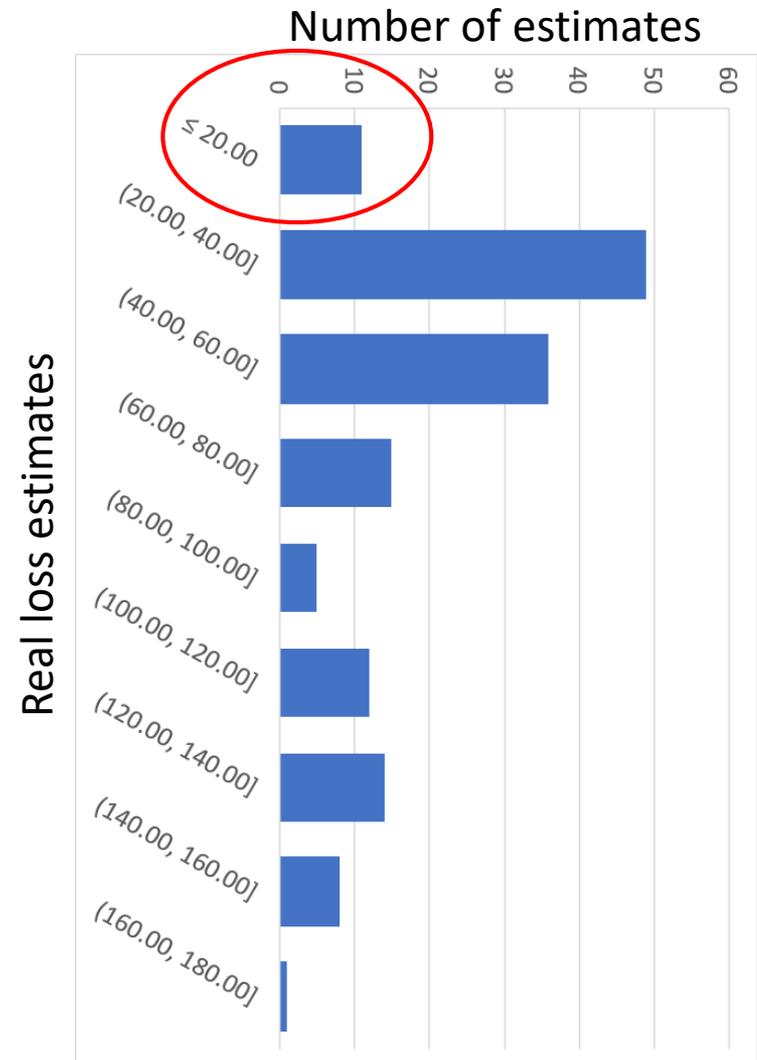
Assumptions for
improbably low water
loss and data gaps

A Look at National Estimates

- AWWA's Water Audit Data Initiative
- 63 suppliers from 2011 to 2017
- Overall median real loss: 39 gallons per connection per day
- Median real loss for western U.S. suppliers: 43 gal/conn/day:
 - Austin Water Utility, TX
 - City of Avondale, AZ
 - City of Santa Monica, CA
 - Clearlake, CA
 - Ojai, CA
 - Las Vegas Valley Water District, NV
 - San Antonio Water System, TX
 - South Jordan City, UT

Distribution of Real Loss Estimates (WADI)

- City of Llyodminster, Canada: Jumped from 17.86 to 28.87 gal/conn/day
- Louisville Water Company: Variable estimates from 53 to 19, before stabilizing at 37 gal/conn/day
- Orange County, Florida: Three estimates under 20 in 2011, 2012, 2017, with variation from 17 to 55 gal/conn/day
- Utilities Inc. (single estimate at 8 gal/conn/day for several utilities combined)



Behind the Low Real Loss

Supplier	2012	2013	2014	2015	2016
Albuquerque Bernalillo County Water Authority, NM	24.05	16.52	24.86	16.60	15.81

- Reduced water loss by 3.38 billion gallons/year since 2004
- Water Audit Data validity up from 74% to 87% since 2010
- Reduced response times to failures by 30% since 2009
- Continuous leak detection program

Supplier	2012	2013	2014	2015	2016
Cherokee County Water and Sewerage Authority, GA	20.26	18.17		25.98	19.22

- New system: 25-30 years
- Ongoing Capital Improvement Program
- Hydraulic models
- Systematic billing + Unbilled uses + Large & small meter testing

Low Real Loss Estimates

- Assumption: Real loss estimates below 20 gallons per connection per day are improbable
- Staff proposes to assign alternative initial water loss estimate to suppliers with real loss below 20 gallons per connection per day
- Assigned value: Median of real loss estimates for systems with water losses below 20 gallons per connection per day (currently 37 gallons per connection per day)

Low Real Loss Estimates

- Adjustments: Supporting documentation to demonstrate data accuracy and water loss control actions to explain real loss below 20 gallons per connection per day
- If demonstrated, initial real loss value of below 20 gallons per connection per day retained for calculation of standard