June 1, 2018

SB 555: Water Loss Performance Standards

Public Stakeholder

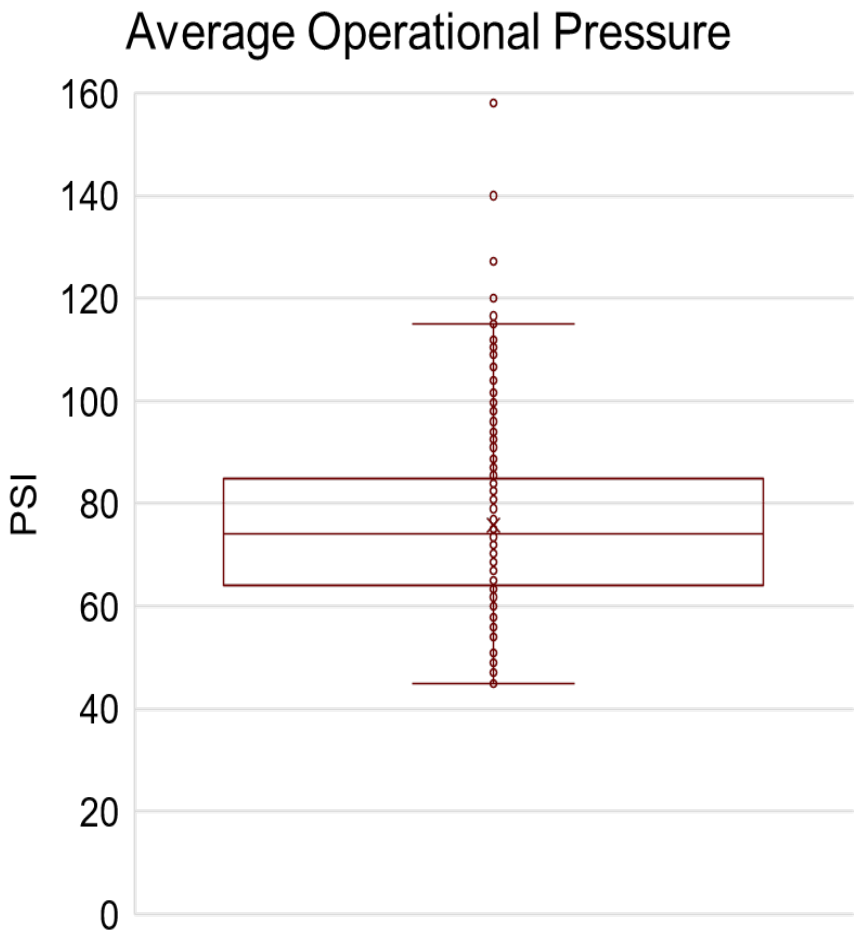
Workgroup Meeting #2

Pressure Management Methods

Pressure and Real Loss

Pressure influences leakage and main break rates
Highly affected: Flexible pipe material & Joints

Audits 2017
Pressure and Real Loss

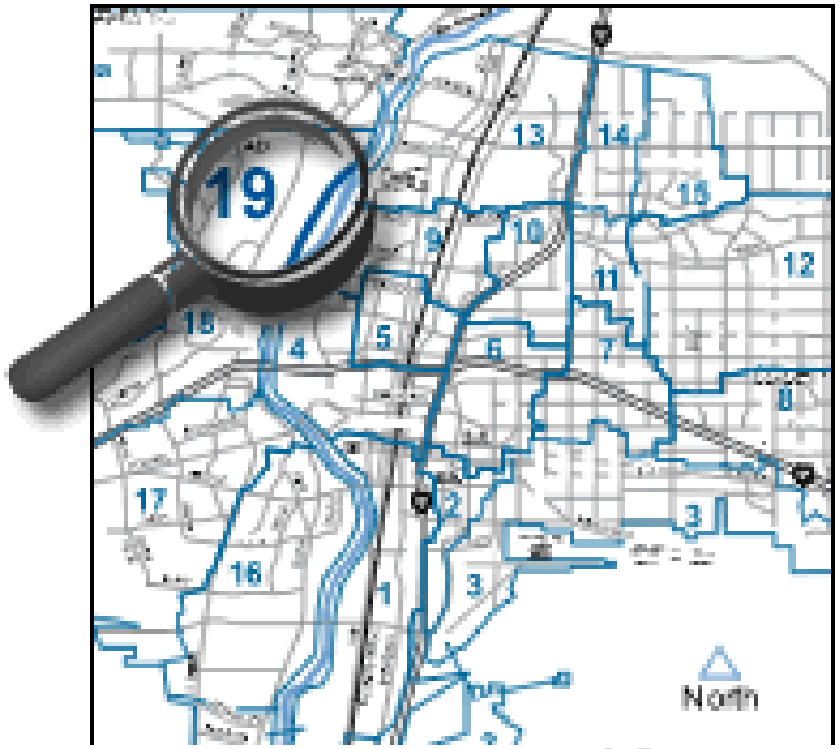


High operational pressures observed

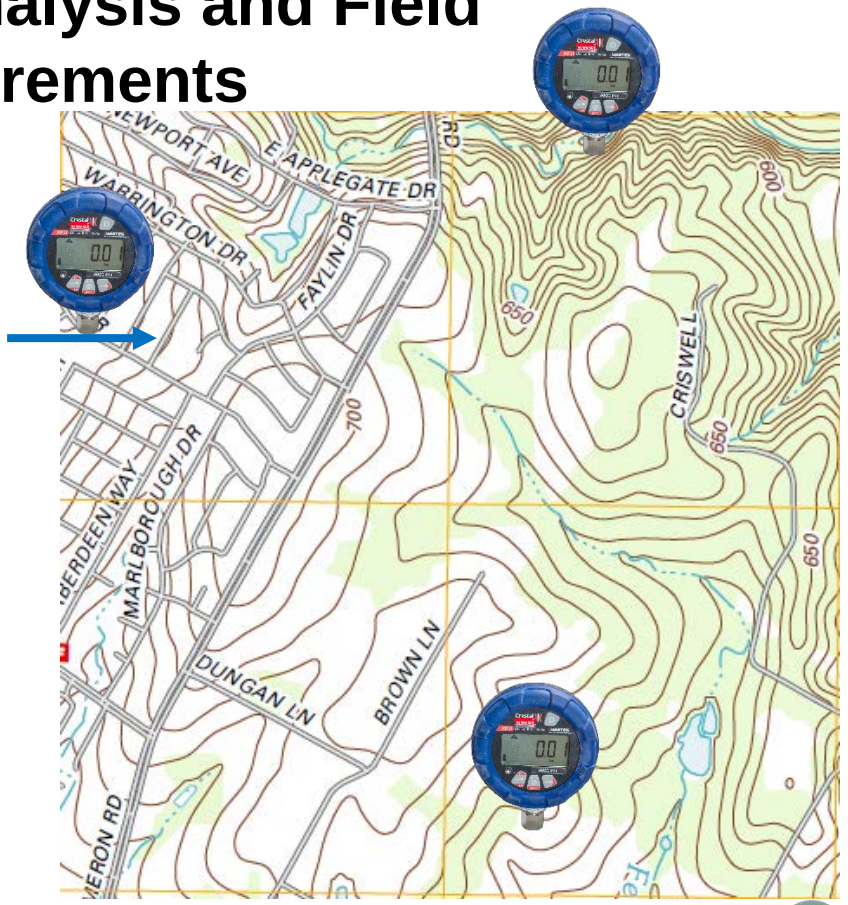
Pressure needs improved monitoring

Pressure Monitoring

Preliminary analysis and Field measurements



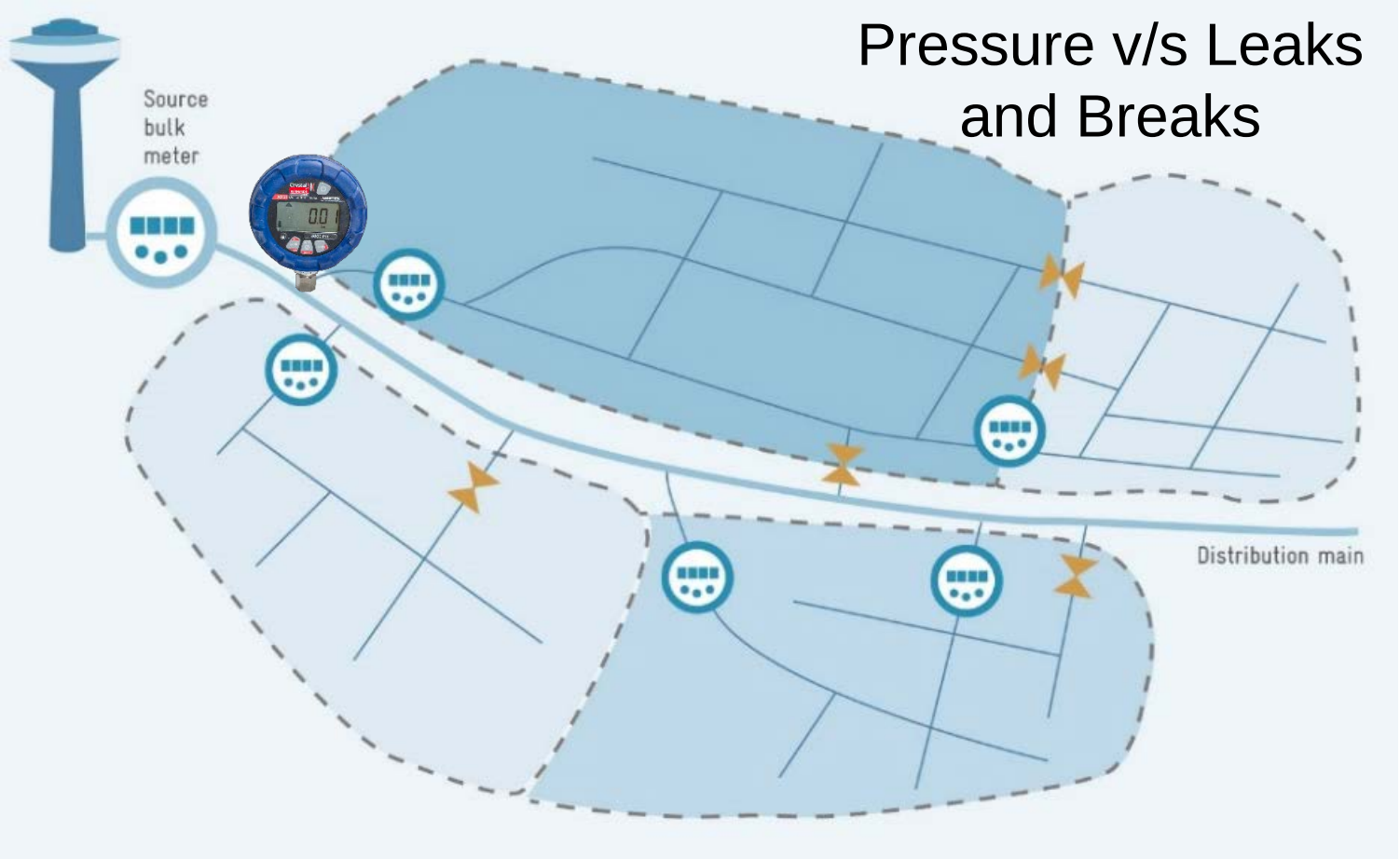
Desktop analysis



Average Zone Pressure and Critical point

Monitoring

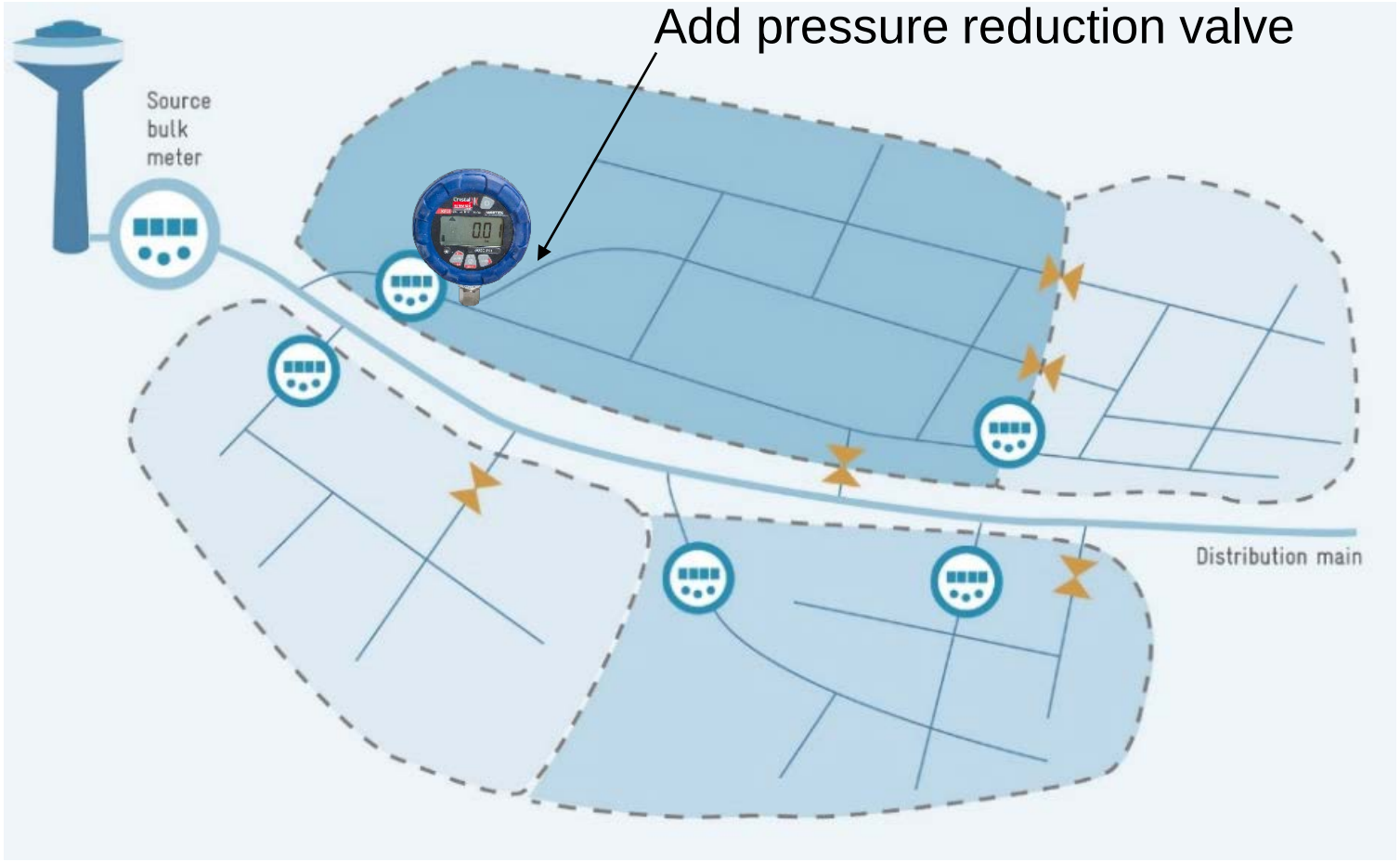
Impact studies



Pressure loggers + zones (or District Metered Areas)

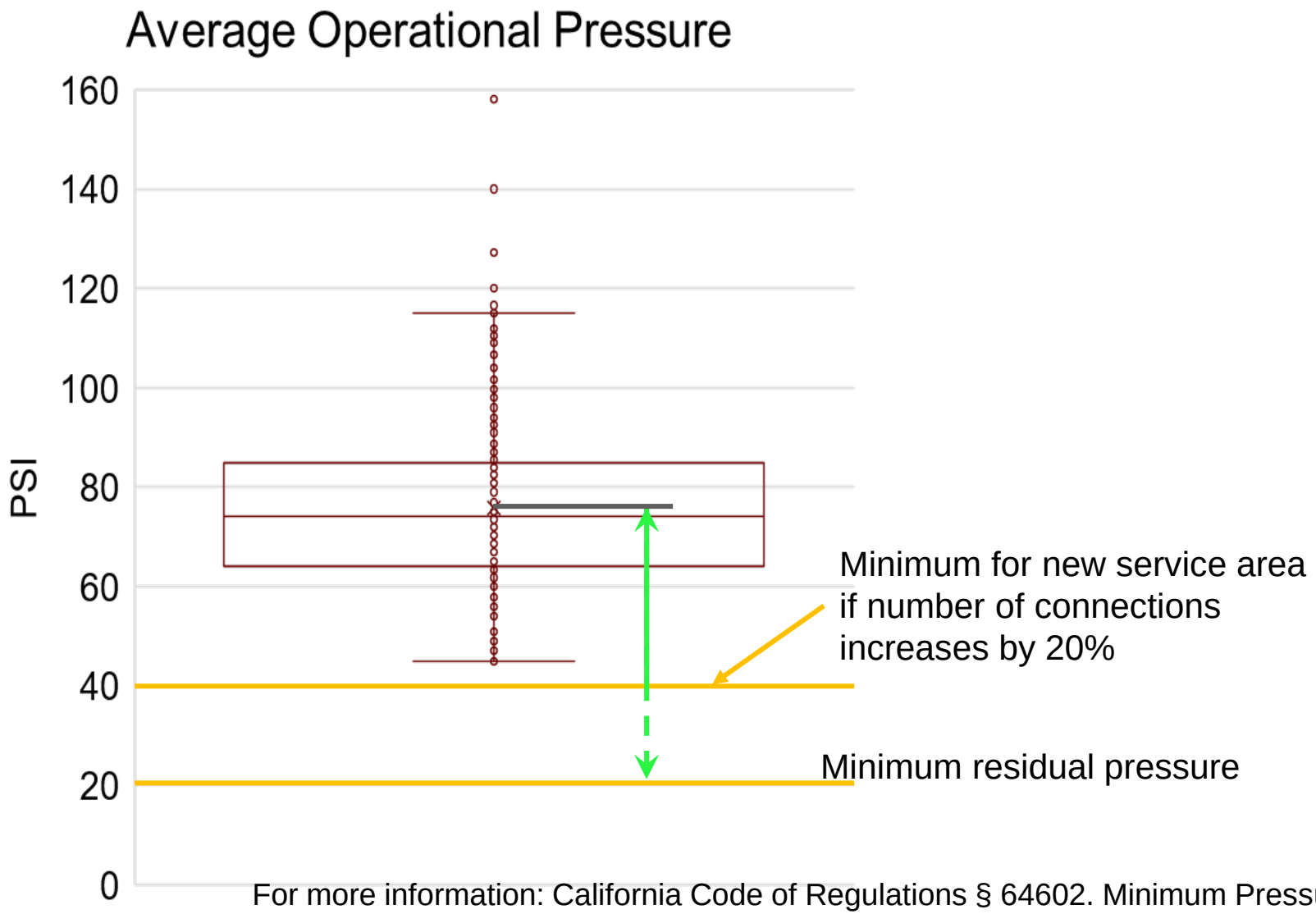
For more information, WRF: Leakage Management Technologies

Pressure Reduction



Pressure reducing valves + zones (or District Metered Areas)

Scope for Pressure Reduction?



For more information: California Code of Regulations § 64602. Minimum Pressure (California Waterworks Standards)

Fire Flow Requirements

Hydrants

- Tested for flow rate based on lowest pressure reached in operation
- Required residual pressure of 20 psi

Fire sprinkler systems

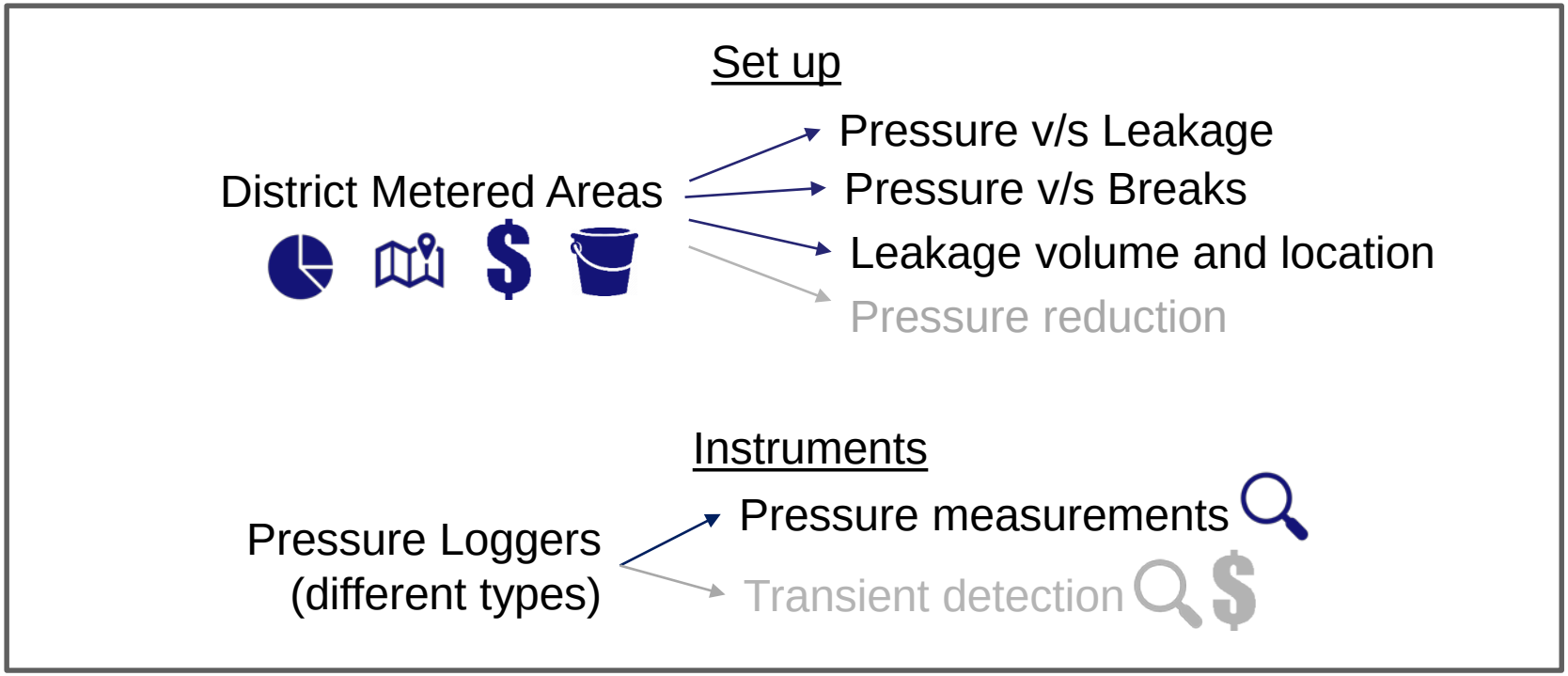
- Vary with occupancy and building
- Insurers rate building based on compliance with required flow

In CA Fire Code, required fire flows given at 20 psi

References: American Water Works Association M31, M17 and National Fire Protection Association 291 Fire Suppression Ratings Schedule: Insurance Services Office (Verisk Analytics)

Monitoring

Field measurements



Pressure Management

Pressure v/s Leakage
Pressure v/s Breaks
Leakage volume and location

Operational Pressure Reduction

District Metered Areas

+ Pressure reduction valves

+ Booster stations

Questions for Discussion

- To what extent does your agency monitor pressure for individual pressure zones in your distribution system?
- Has your agency identified opportunities for or implemented pressure reduction programs to reduce water loss and pipe failures in the distribution system?
- Has your agency encountered conflicts with fire follow requirements while practicing pressure reduction? If yes, in which scenarios do these conflicts typically occur?
- Has your agency identified solutions for balancing pressure reduction programs with fire flow requirements?
- Are there technologies and measures that your agency is unable to implement in its water distribution system for pressure monitoring and reduction, and why?

June 1, 2018

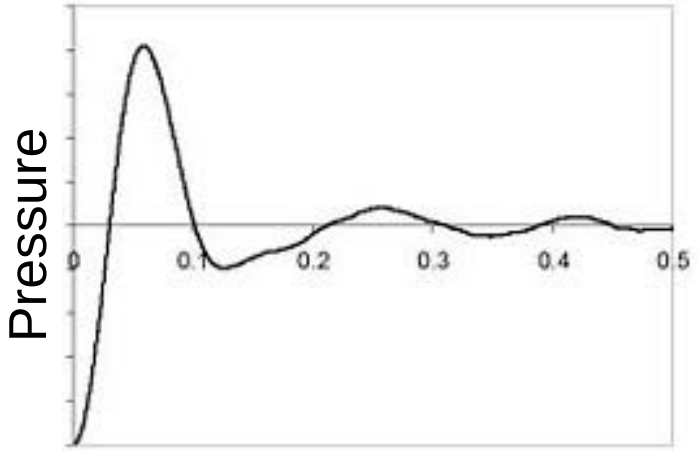
SB 555: Water Loss Performance Standards

Public Stakeholder Workgroup Meeting #2

Pressure Surge Control

Pipe Surges (Transients)

Pump shut down



Time since valve closure (sec)

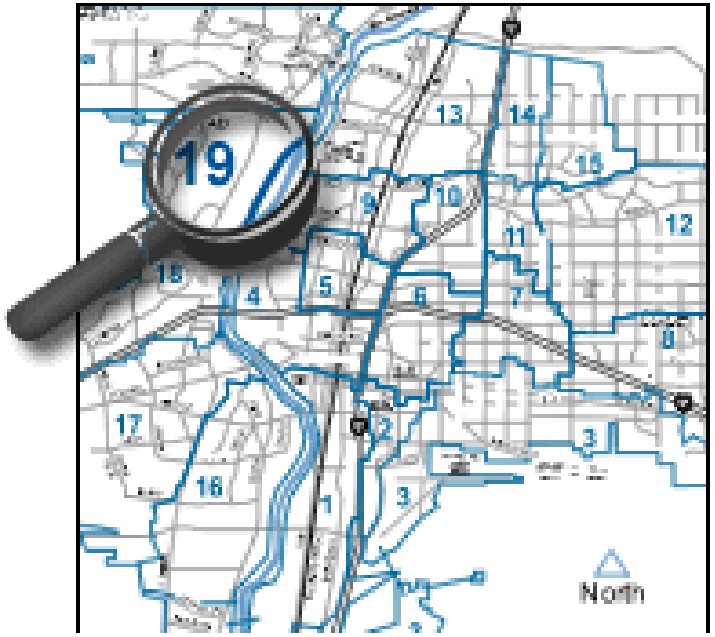
Rapid valve closure

Level changes in tanks

Rapid demand changes

For more information: Boulos et al, 2005, Hydraulic Transient Guidelines for Protecting Water Distribution Systems

Pressure Transient Monitoring



Desktop analysis

High frequency pressure loggers

Software for transient detection

Surge Monitoring and Control

Monitoring

Instruments

Pressure Loggers (different types)
- Pressure measurements
- Transient detection

Control

Operational changes
- Avoid rapid closing and opening of valves
- Correct level controls for tanks/reservoirs

Retrofits/Installations

Back up pump
To avoid sudden flow cut-off

Flywheel
Slow down pump responses

Surge tanks
Relief valves
Divert excess water/pressure

Questions for Discussion

- Has your agency attempted to monitor pressure surges in its distribution system?
- What is your agency's approach for pressure surge monitoring?
- Did your agency find that currently available technology and software were effective in detecting pressure surges?
- Are there technologies and practices that your agency is unable to implement in its water distribution system for pressure surge control, and why?

June 1, 2018

SB 555: Water Loss Performance Standards

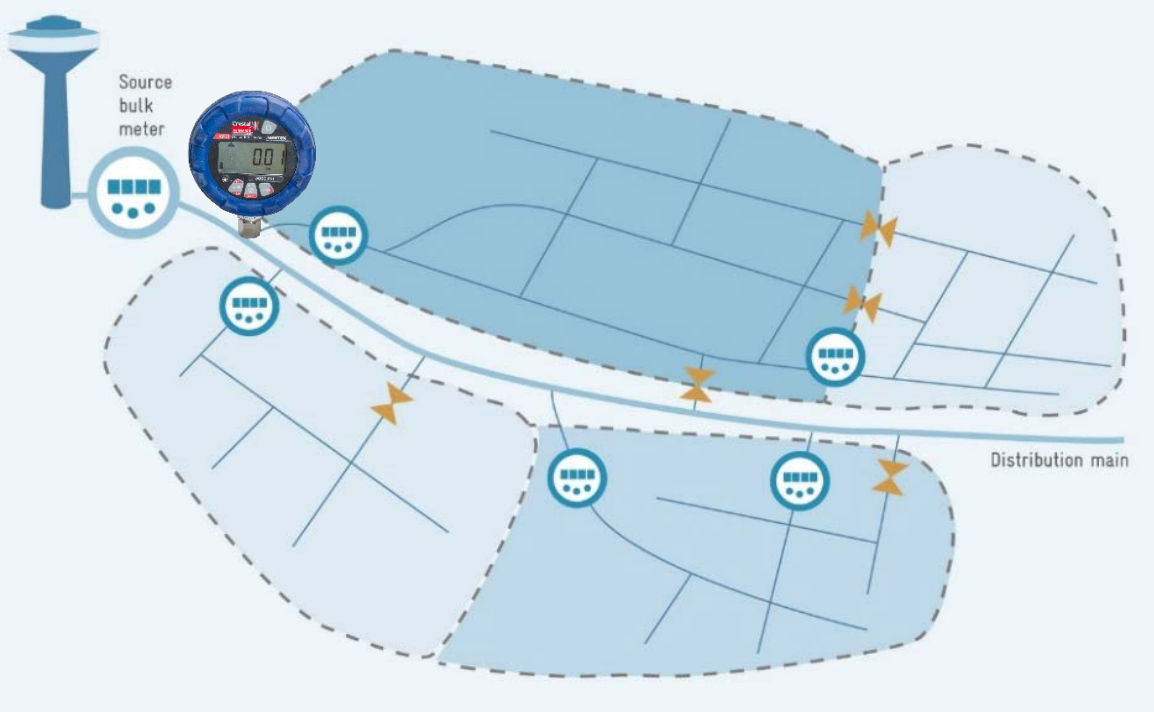
Public Stakeholder Workgroup Meeting #2

Case Studies

Background leakage reduction

Philadelphia Water Department, DMA: 2261 connections

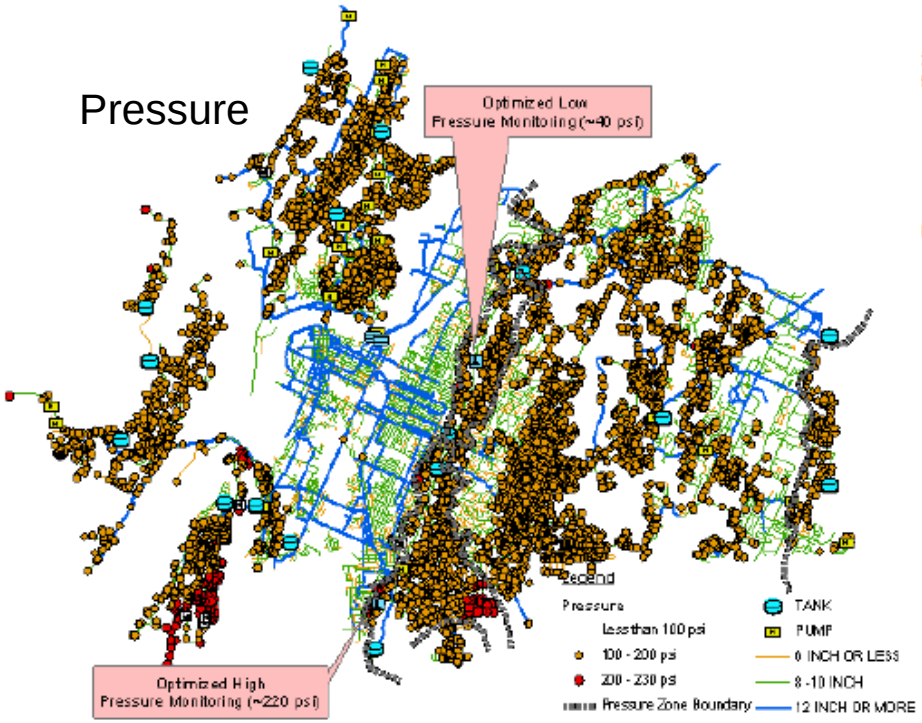
Average pressure reduced from 95 psi to 67 psi → Background leakage reduced from 350 to 60 gal per min

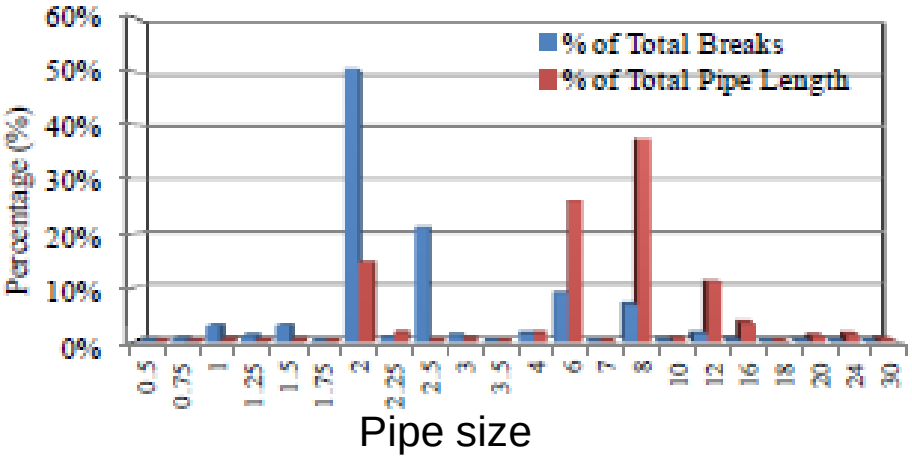


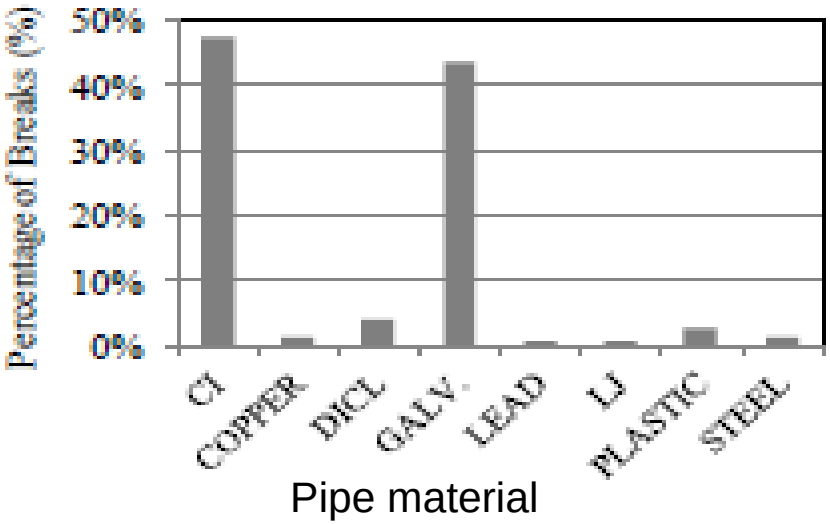
One time capital cost $380,000

Breaks v/s System Factors

Large system, Tennessee: 175,000 people





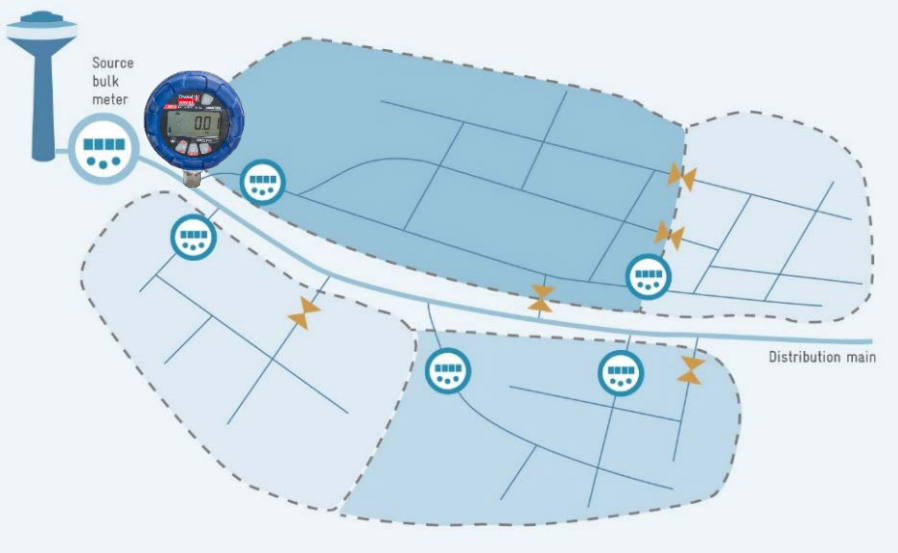


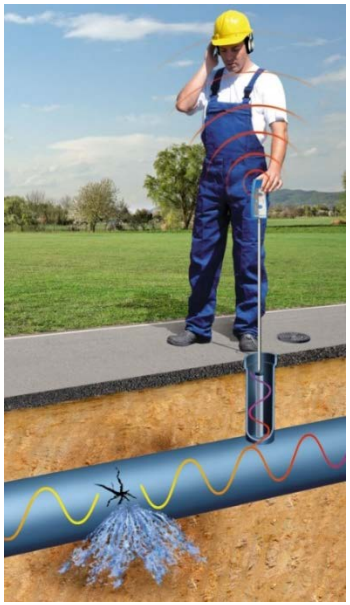
GIS regression analysis:
Pressure, pipe size and material

Good Practices on Leakage Management (European Commission, 2015)
Document on Case Studies

Pressure Reduction + Active Leakage Control

12 small zones
Dryanovo, Bulgaria: 1470 connections





4 DMA pilots
Razgrad, Bulgaria
716 connections

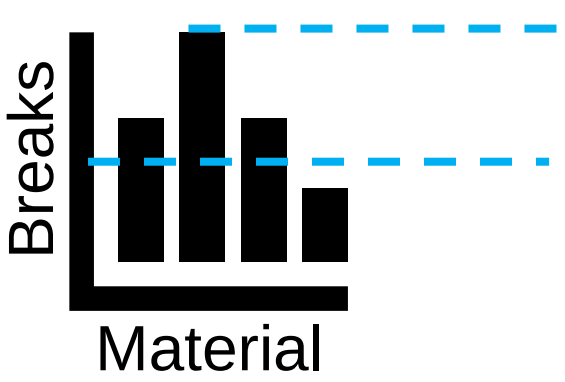
Night flow analysis to improve estimates
Reduced leakage by 228 gal/day

Identified high leakage zones
Meter testing to improve estimates
Reduced night flow by 2400 gal/min

Only repairs, no replacement

Maintaining Low Leakage

Salzburg, Austria



30 breaks/100 miles per year (Cast Iron)

16 breaks/100 miles per year

Permanent noise loggers
on high-traffic metallic pipes

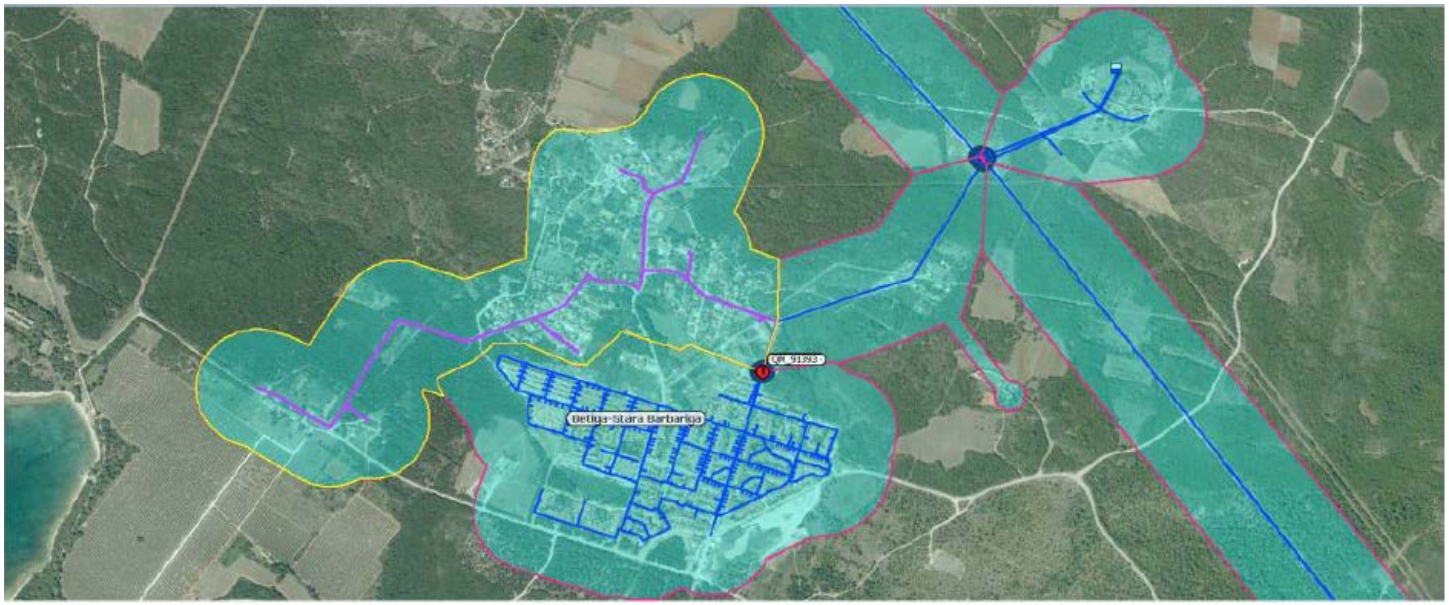
+

Divided 4 zones into 15 zones
to assess pressure v/s leaks

50 leaks detected in first year
Determined critical pipe groups to be replaced

Virtual DMAs

Pula, Croatia



Pressure reduction
(30% of system)
Solutions for fire flow purposes

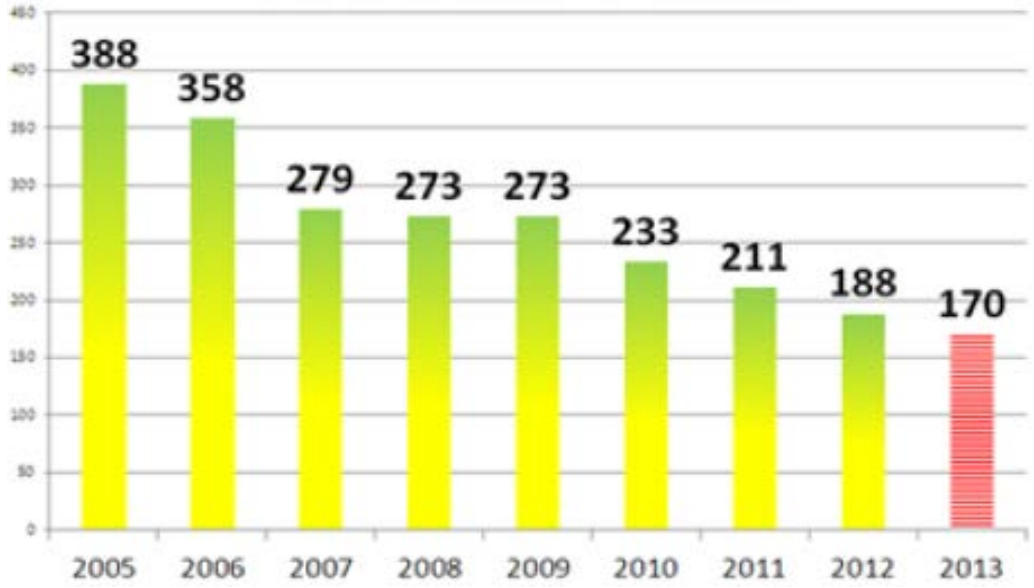
+

Quick leak response in oldest zones or zones with highest breaks

Non-Revenue Water reduction:
53 million gallons per year averaged over 9 years

Hilly Terrain

Iren Emilia system, Northern Italy



Leakage reduction (liters/connection/day)

PMA in existing zones,
(about 60% of total area)

+

Transients:
High frequency pressure loggers

20% reduction in energy consumption
57 gal per connection per day reduction in real loss