



Impacts of Pressure Monitoring and Leak Detection on Non-Revenue Water Loss



The Sound Choice
for Leak Detection.™

National Amounts

Water Networks



2.2 Million

Miles of underground pipes



250K to 300K

Breaks per year



>148K

Active drinking water systems



6 Billion

Gallons of treated water lost each day

Wastewater



10 to 37

Leaks per 100 miles of pipe



2 Minutes

Amount of time between water main breaks

Water Loss

MGD Treated and Distributed	DAILY Loss at 24%					YEARLY Loss at 24%				
	Treatment and Distribution Cost per 1,000 Gallons					Treatment and Distribution Cost per 1,000 Gallons				
	\$1	\$2	\$3	\$4	\$5	\$1	\$2	\$3	\$4	\$5
0.1	\$24	\$48	\$72	\$96	\$120	\$8,760	\$17,520	\$26,280	\$35,040	\$43,800
0.5	\$120	\$240	\$360	\$480	\$600	\$43,800	\$87,600	\$131,400	\$175,200	\$219,000
1	\$240	\$480	\$720	\$960	\$1,200	\$87,600	\$175,200	\$262,800	\$350,400	\$438,000
5	\$1,200	\$2,400	\$3,600	\$4,800	\$6,000	\$438,000	\$876,000	\$1,314,000	\$1,752,000	\$2,190,000
10	\$2,400	\$4,800	\$7,200	\$9,600	\$12,000	\$876,000	\$1,752,000	\$2,628,000	\$3,504,000	\$4,380,000
50	\$12,000	\$24,000	\$36,000	\$48,000	\$60,000	\$4,380,000	\$8,760,000	\$13,140,000	\$17,520,000	\$21,900,000
100	\$24,000	\$48,000	\$72,000	\$96,000	\$120,000	\$8,760,000	\$17,520,000	\$26,280,000	\$35,040,000	\$43,800,000

MGD = Million Gallons per Day

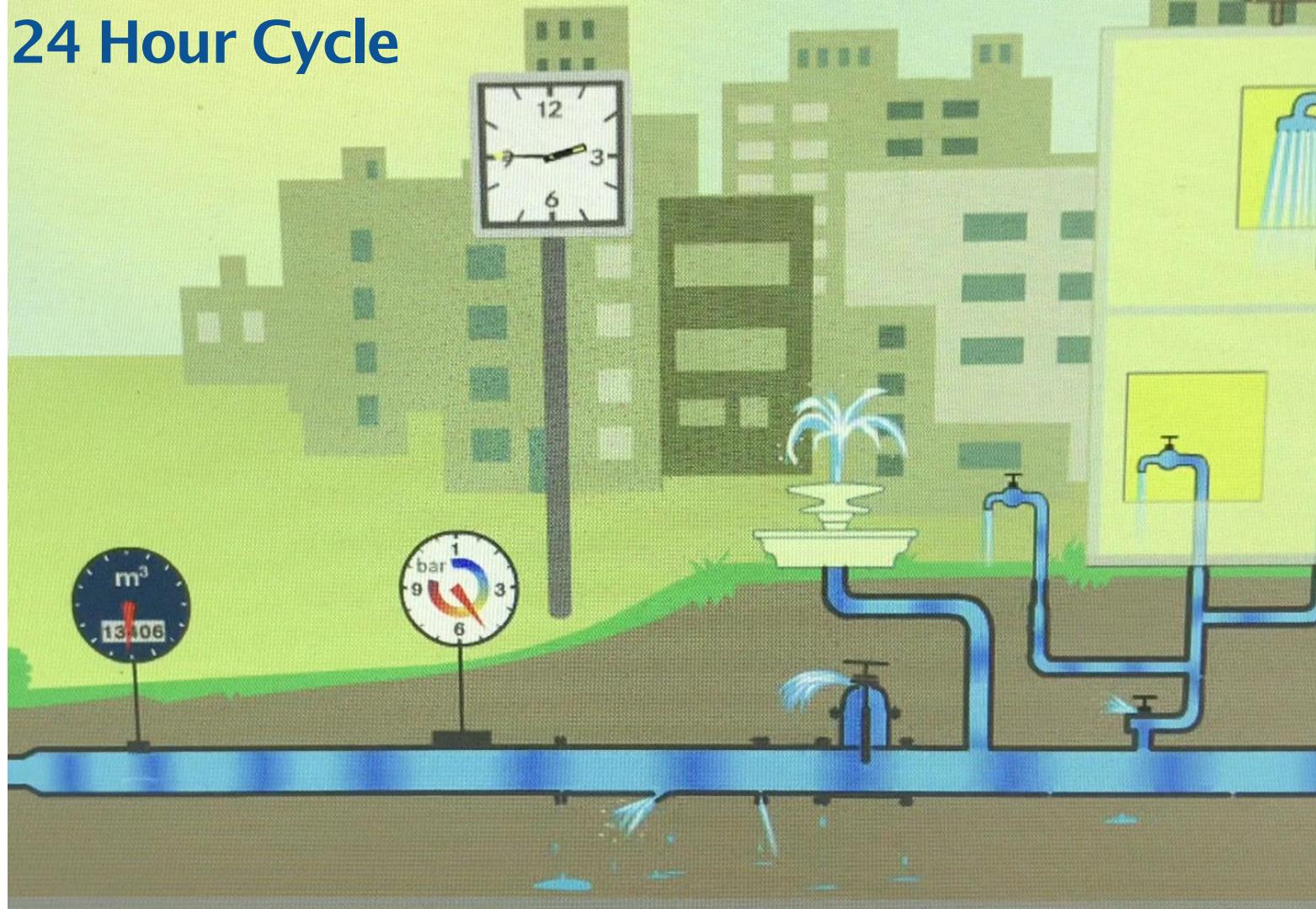
Leaks that Surface



Leaks that Do Not Surface



24 Hour Cycle



Non-Revenue Water Loss Tools

Methods to Stopping the Loss

1. Pressure Modulation (PRV Remote Control)

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- 4. Locating (Pinpoint / Survey – Ground Mics / Correlators)**

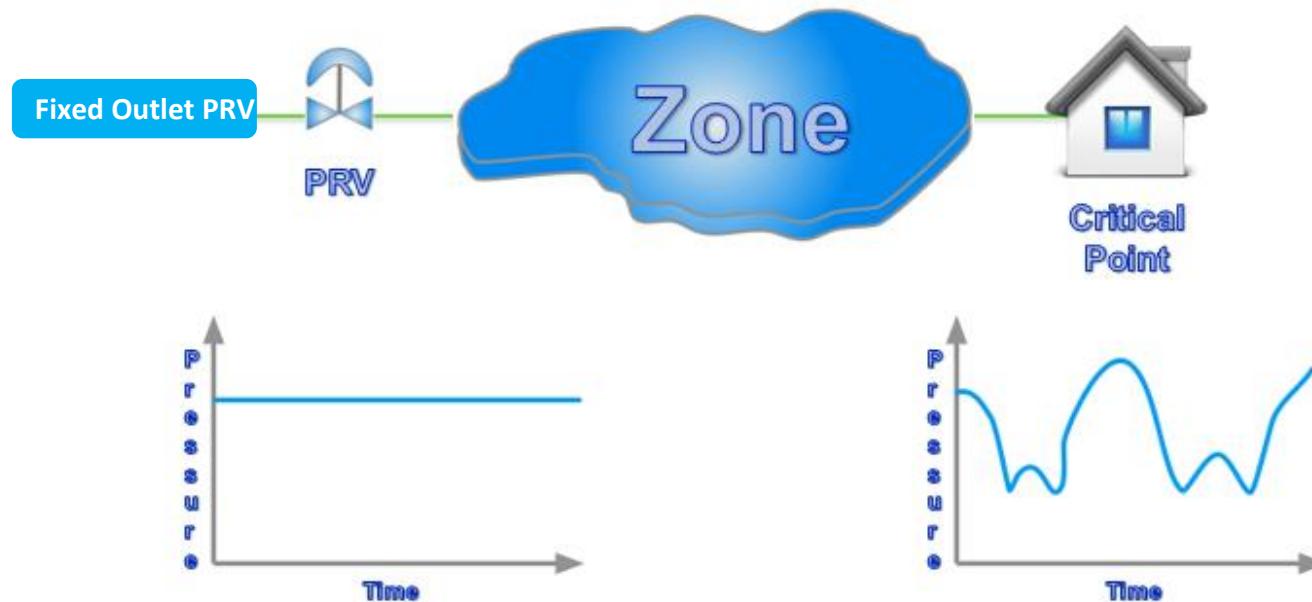
Pressure

Pressure Modulation Device

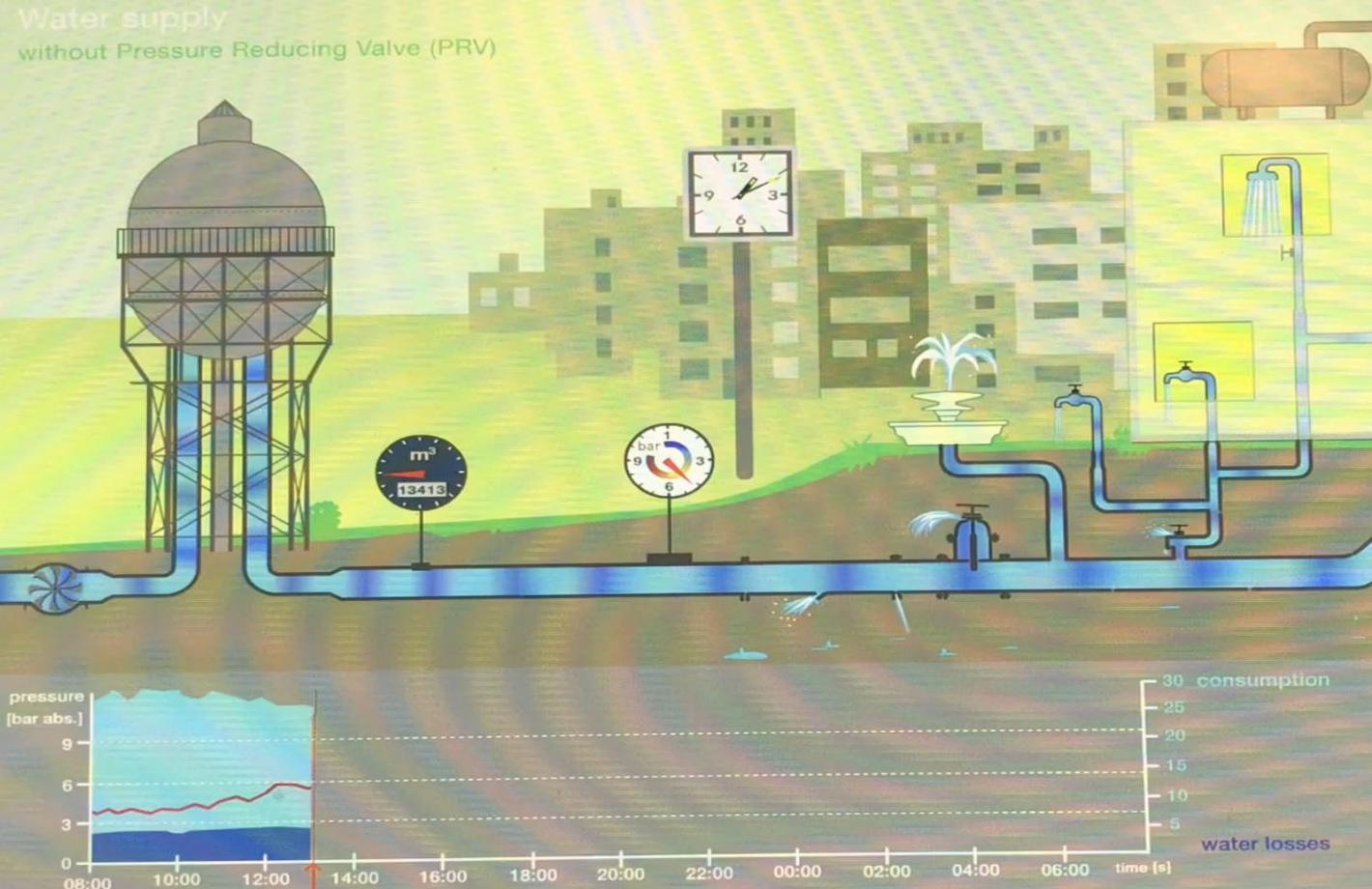
Modulation



Normal PRV Operations



No Pressure Control

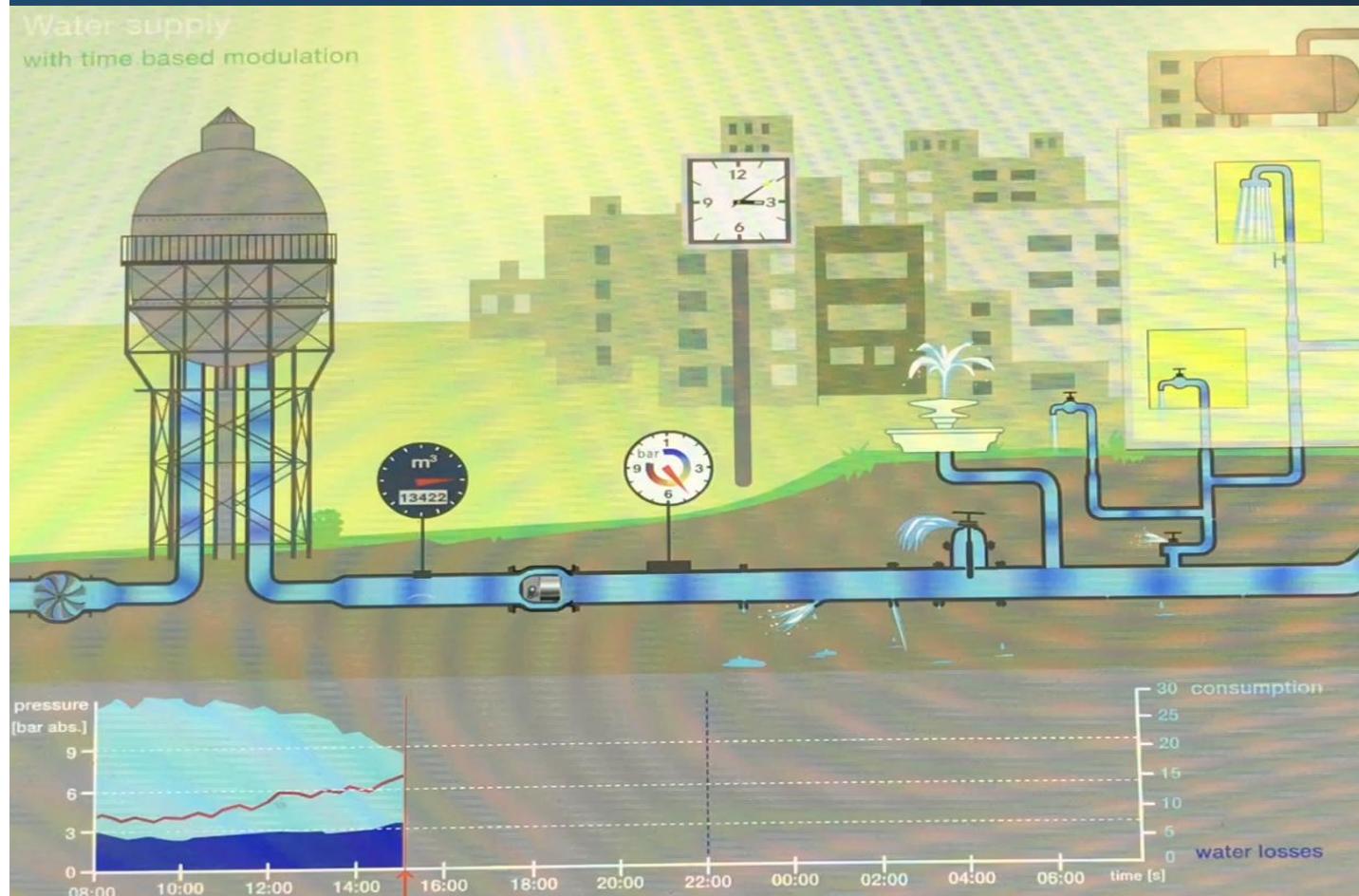


Modulated Control Options

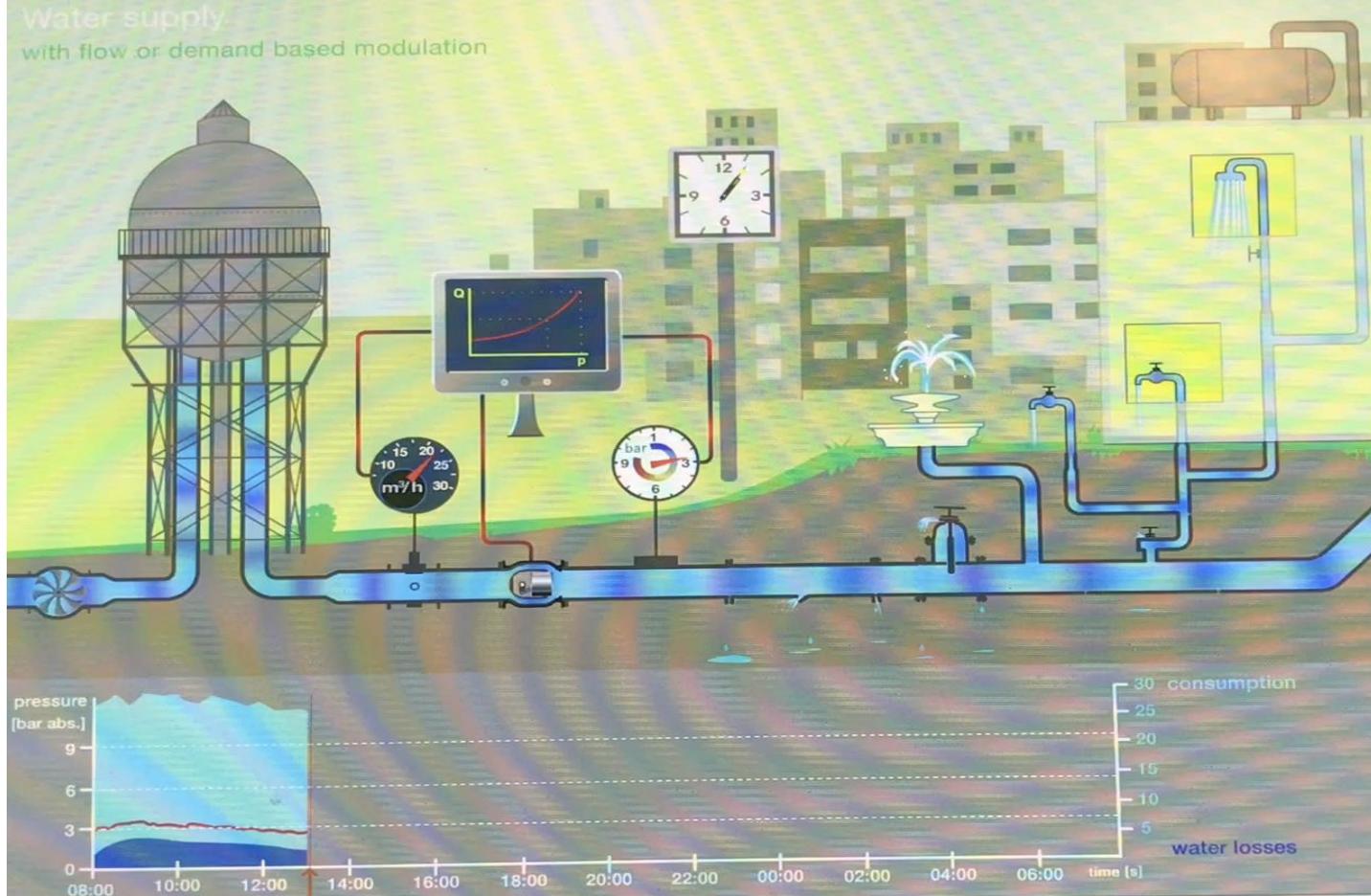
To combat **Critical Point** issues and get greater savings simply add a controller in either of the following modes:

- Night/Day (Timed)**
- Flow Modulated- Flow Meter**
- Critical Point Control**

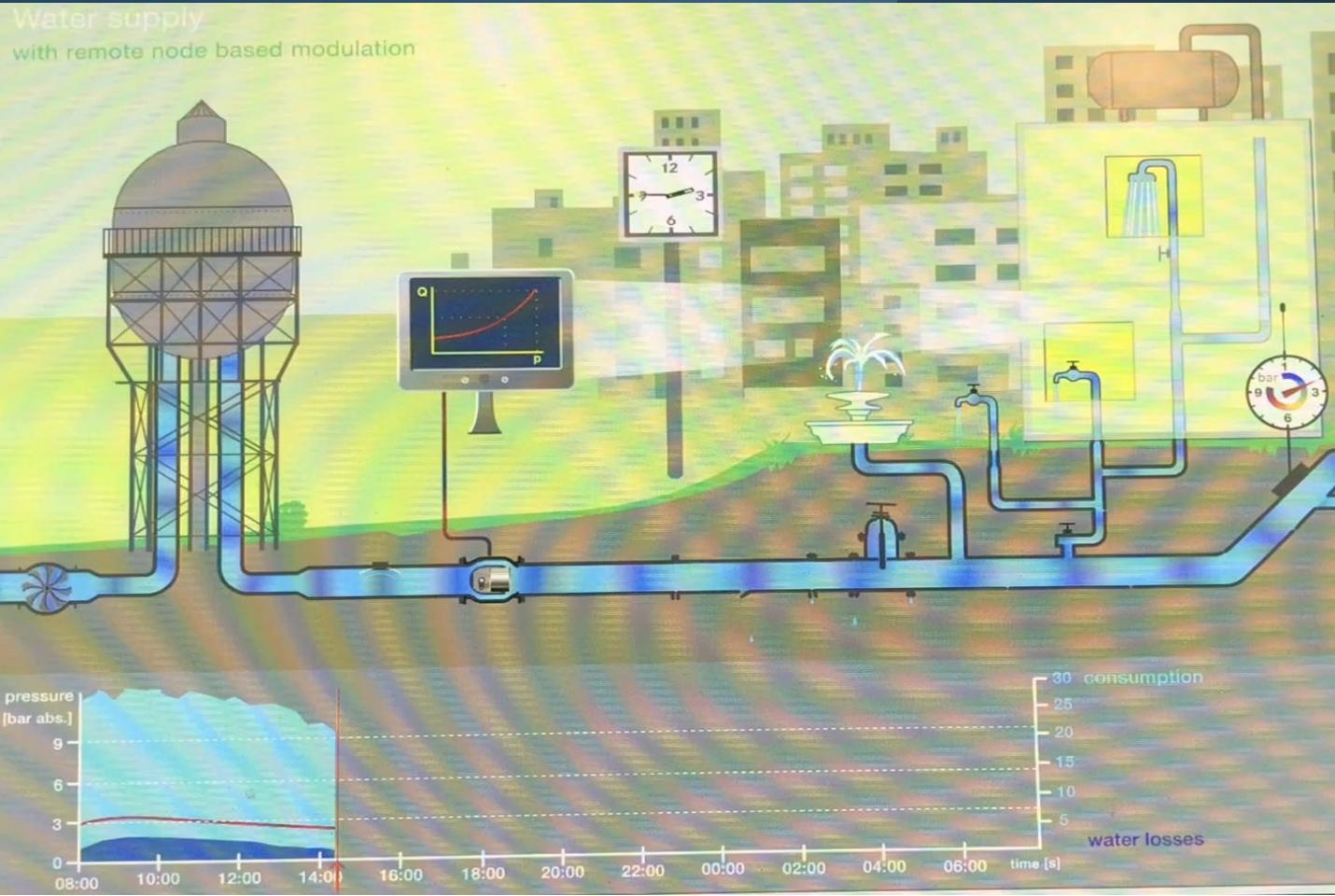
Timed Control



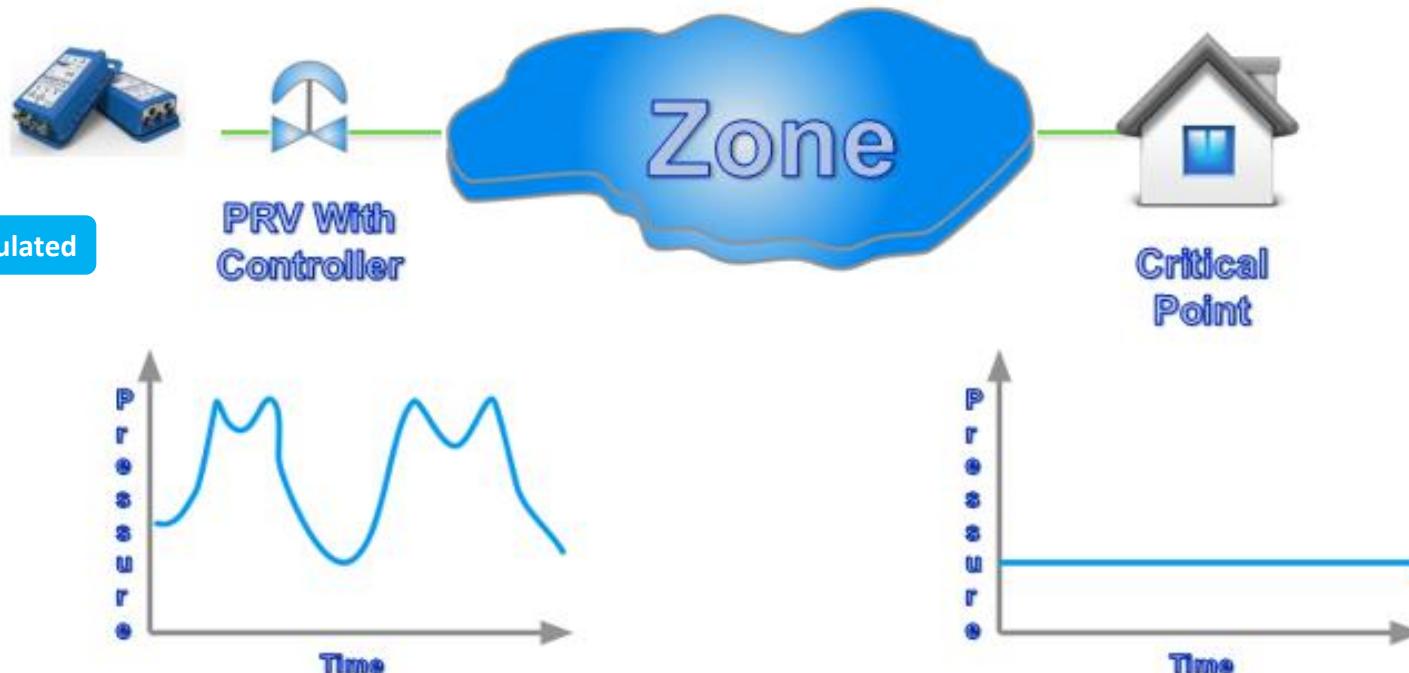
Modulated Flow Control



Critical Point Control



Modulated Pressure Management



Savings and Reductions of Application

- 74% Reduction of pipe burst
- 18% Savings in chemical cost
- 17% Reduction on labor cost
- 15% Reduction in Energy cost

Pressure Monitoring Devices

Remote
Pressure



Water
Quality



Pressure
Transient



Flow Rod



Localization Inside the Pipe

Hydrophone plus Pressure Transducer

- Continuous logging
- Multiple alarm profiles
- Audio & correlation on leak alarm



PLASTIC PIPE!!!



Acoustic Leak Detection

Active Leak Detection

Localize



Acoustic Noise Logging
For Leak Localization



Ground Microphones
For Leak Surveying
Locate

Correlators For
Leak Pinpointing

Locate



The 5 factors that affect leak sound transmission:

- 1.Type of Pipe**
- 2.Size of Pipe**
- 3.Pressure**
- 4.Size of Leak**
- 5.Soil Conditions**

Noise Sources

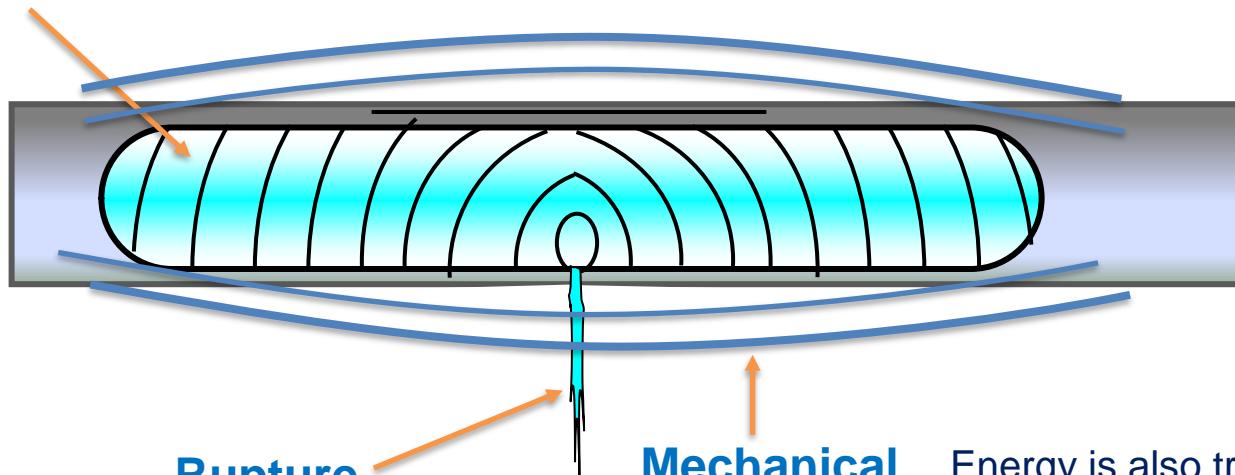
- Leaks
- Partial obstructions
- Customer use
- Pressure reducing valves (PRV's)
- Partially closed valves
- Proximity to sewer/culvert pipe
- Changes in diameter
- Pumps
- Transformers

**Only a trained human ear
can differentiate leak
noise from other sources
of noise.**

Acoustic Noise Transfer

Pressure Wave

Energy generated from the leak is transmitted through the water

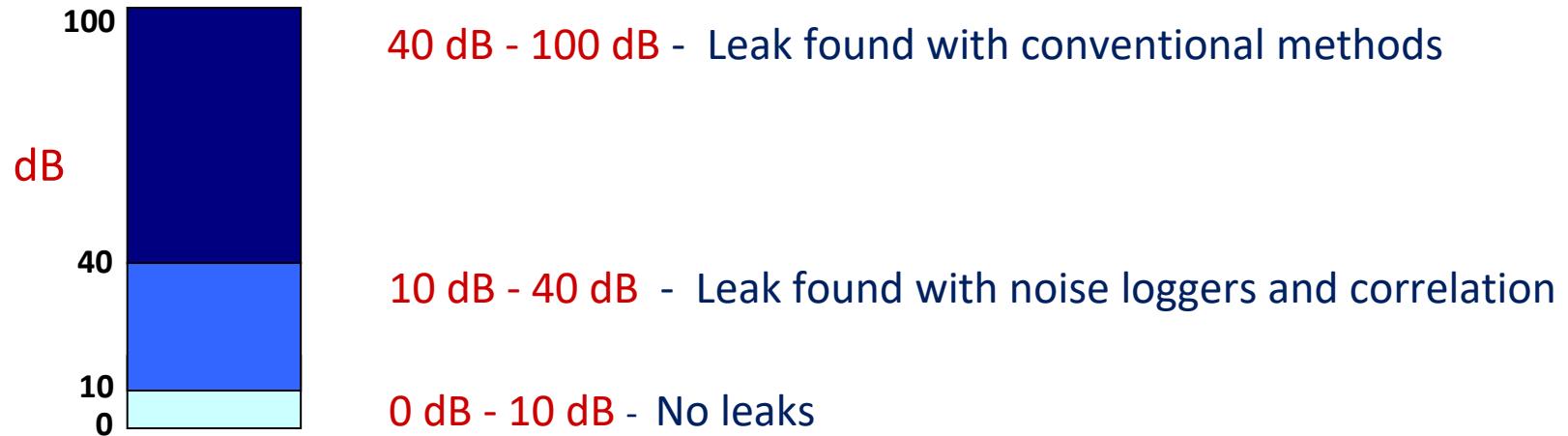


Rupture

Mechanical Vibration

Energy is also transmitted through the pipe wall

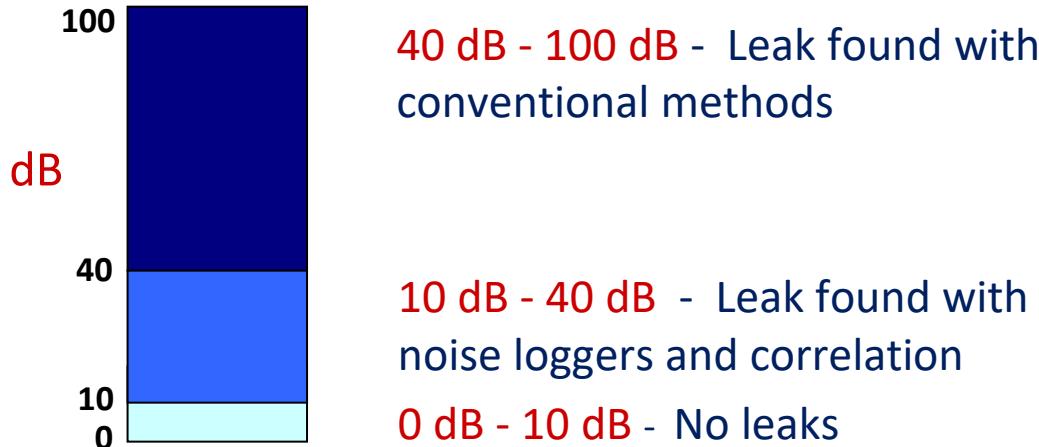
Decibel Ranges



Leaks on plastic pipes are often found at intensities of 20-40dB

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Leaks on plastic pipes are often found at intensities of 20-40 dB.



95-110dB	Motorcycle
90dB	Subway train
80dB	Alarm clock, blender
70-80 dB	Coffee grinder
70dB	Washing machine, TV
60-95 dB	Hairdryer
60dB	Normal conversation noise
50dB	Refrigerator humming, office environment
40dB	A babbling brook, birds chirping
30dB	Whispering nearby
20dB	Leaves rustling in a tree
10dB	Normal breathing

Network Tools

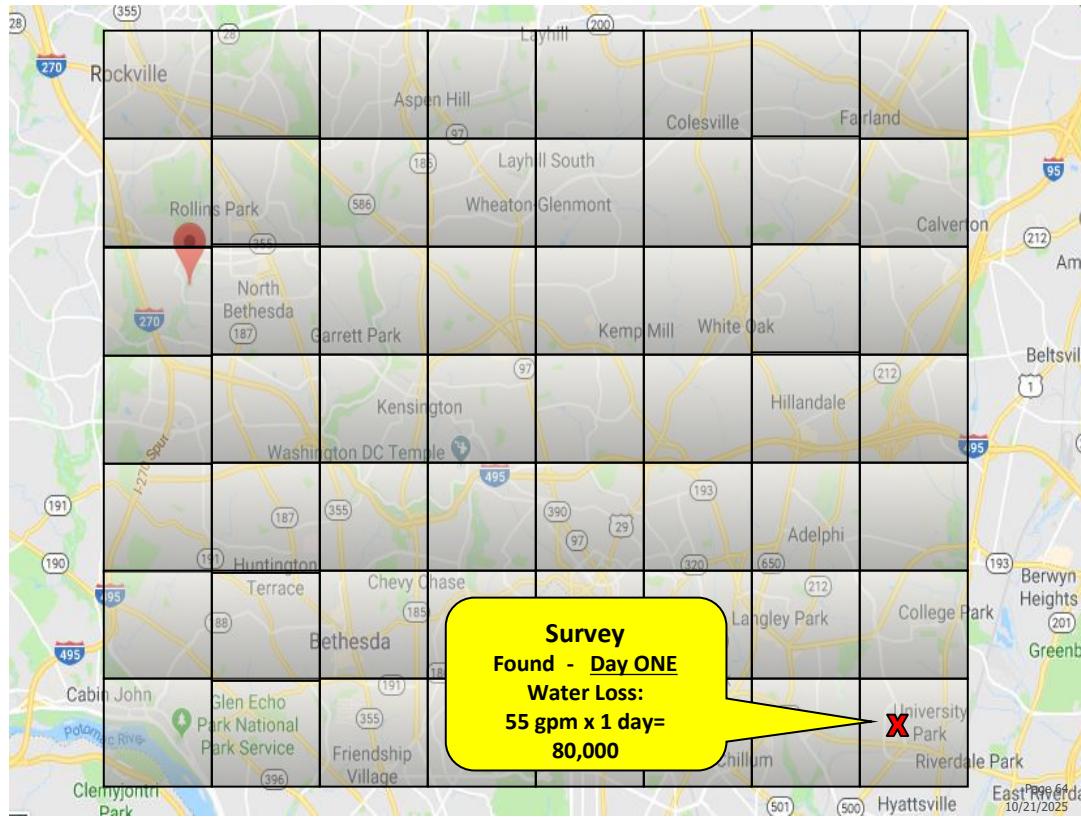
Acoustic Monitoring



Cellular

RF Drive-By

Network Monitoring versus a Survey



FCS 2004 presentation v010H

Network Monitoring

Found - Day 1

Water Loss:

55 gpm x 1 days= 80,000 gal

But what about this leak
on the other side of town...

How long until you discover it?

Survey

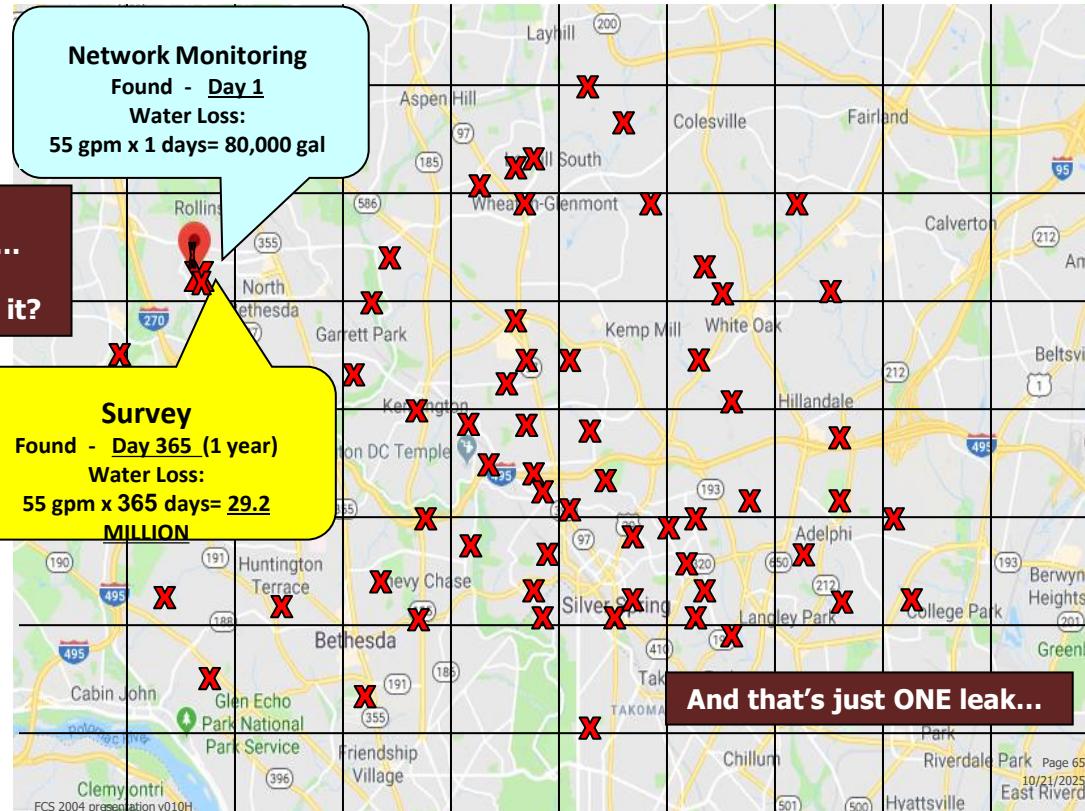
Found - Day 365 (1 year)

Water Loss:

55 gpm x 365 days= 29.2
MILLION

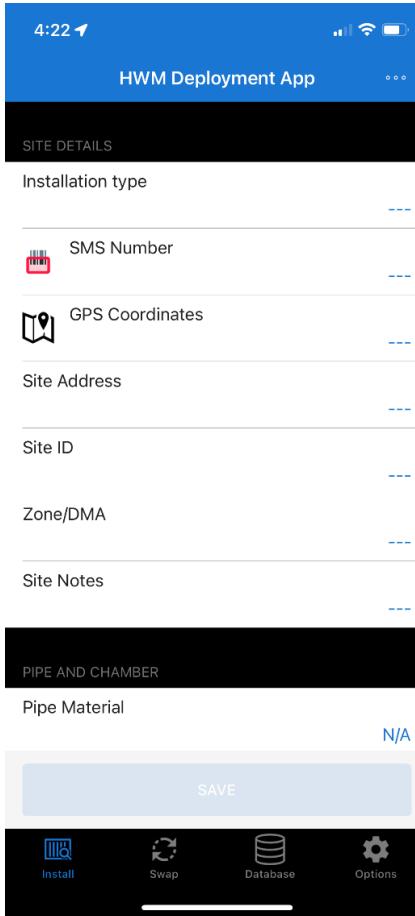
FCS 2004 presentation v010H

And that's just ONE leak...



System Integration

- Integrated sensor and electronics
- Bluetooth connection
- Deployment app
- Auto-correlation
- GIS imports
- Tilt detection



System View

Filter Sites

Mode ▼

Show ▼

Active ▼

Associated with ... ▼

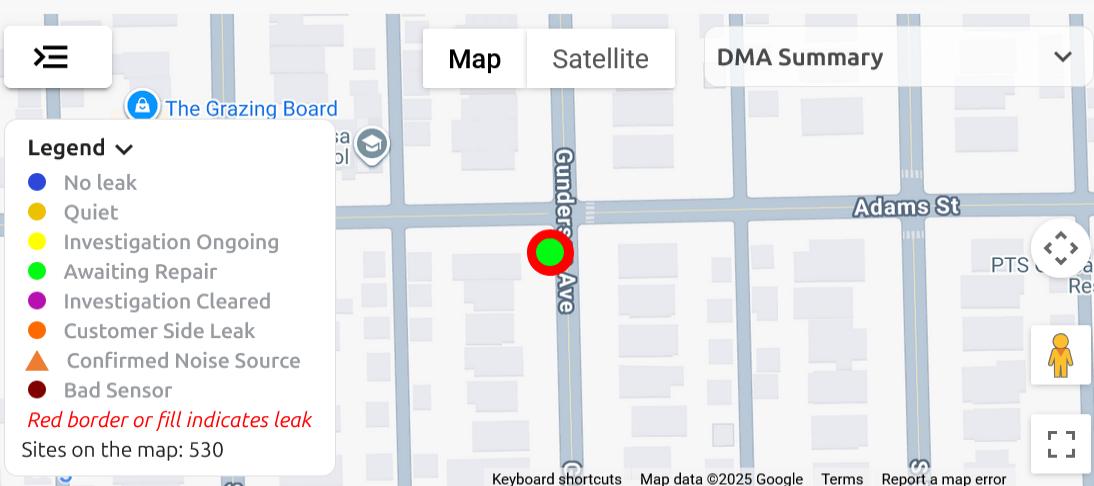
[Hide Filters](#)

Search by Address, ID, Serial or SMS ▼

Called in

[Show selected sites](#)

[Clear filters](#)



Site Details ★

[Edit](#)

[More](#)

[Back](#)

[Accounts List](#)

Site ID:

14-060

 [Create Job Pack](#) i

Easy ID:

Address:

545 Gunderson Ave, Oak Park, IL 60304, USA

Secondary Address:

GPS:  41.877961408471, -87.7869189834368

[Open in maps](#) 

System View

Filter Sites

Mode 

Show 

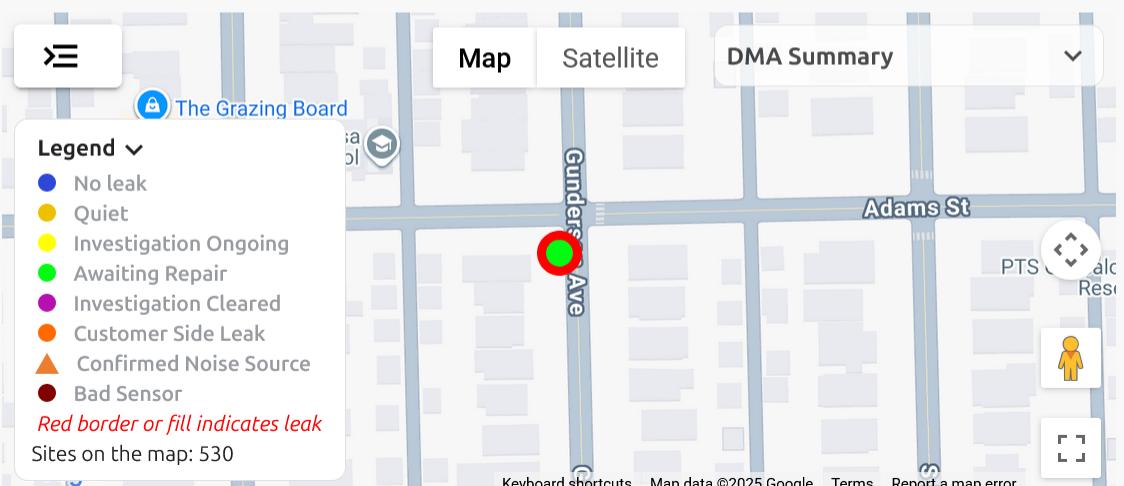
Active 

Associated with ... 

Search by Address, ID, Serial or SMS 

Called in 

 Show selected sites  Clear filters



Site Details

 Edit

 More

 Back

 Accounts List

Sms Number:

311270025836005

 Deactivate Site

Serial Number:

142701

Status:

 Leak

Battery:

3.6 V

CSQ:

12

Last called in:

08/05/2025 6:22 AM

Level:

24

Spread:

3

Last data received:

08/05/2025 3:30 AM

System View

Filter Sites

Mode

Show

Active

Associated with ...

 Hide Filters

Search by Address, ID, Serial or SMS

Called in

 Show selected sites

 Clear filters



 The Grazing Board

Legend

- No leak
- Quiet
- Investigation Ongoing
- Awaiting Repair
- Investigation Cleared
- Customer Side Leak
- Confirmed Noise Source
- Bad Sensor

Red border or fill indicates leak

Sites on the map: 530

Map

Satellite

DMA Summary

Gunders Ave

Adams St

PTS

Keyboard shortcuts

Map data ©2025 Google

Terms

Report a map error

 Site Details 

 Edit

 More

 Back

 Accounts List

Orientation:

OK(Vertical)

Last Note From Permanet:

Leak on Service 12-5-24 Detected by ATS/Jack

Installation note:

Oak Park IL

Owner:

 Awaiting Repair

Logger mode:

15

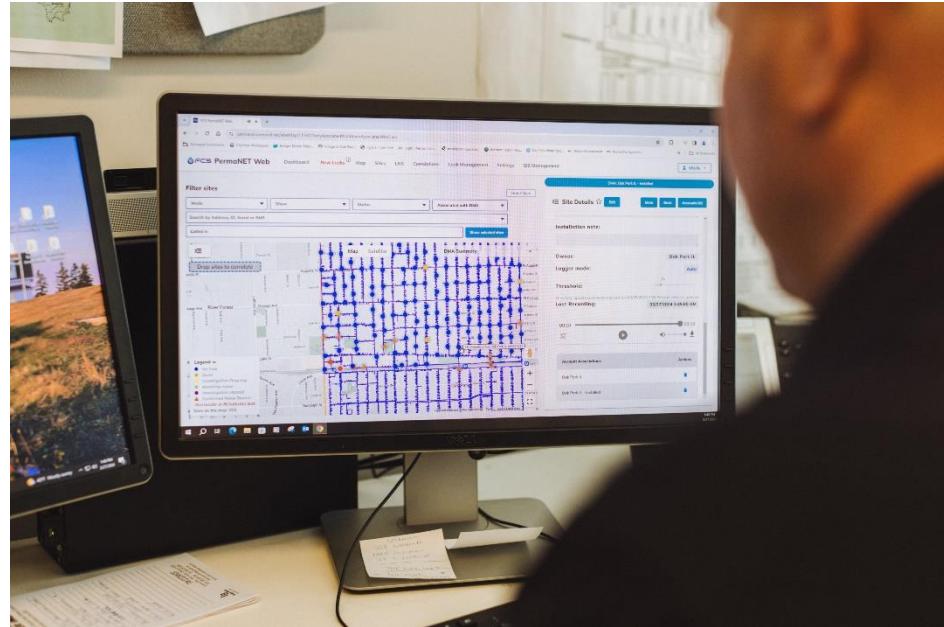
Threshold:

Lid Installation for Northern Climates



Monitoring and Data Analytics

Is monitoring and data analytics offered?

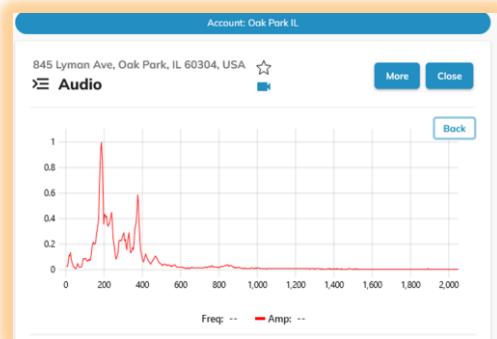


Secondary Validation

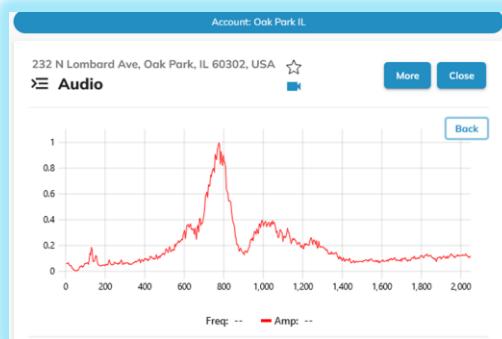
- ***Audio Files*** – Listen to the leak from anywhere.
- ***Histograms*** – Detail the noise level, the spread and the peak percentage of the noise levels.
- ***Correlation*** – Calculate leak location distance from multiple sensors with the audio files.

Audio Files

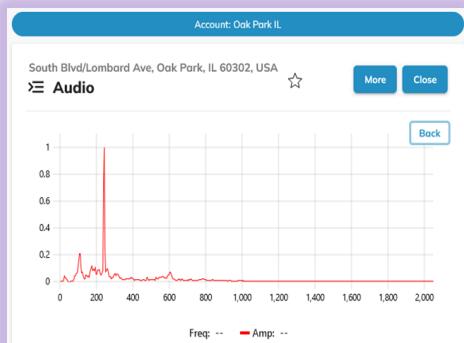
Amplitude by Frequency



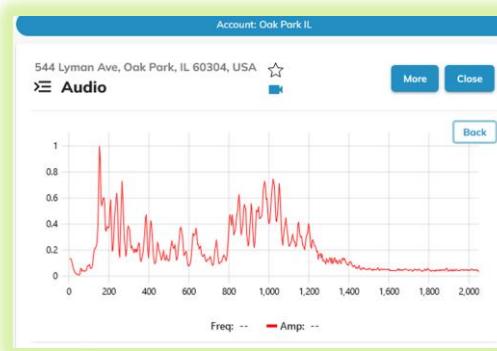
Large OD Pipe Leak



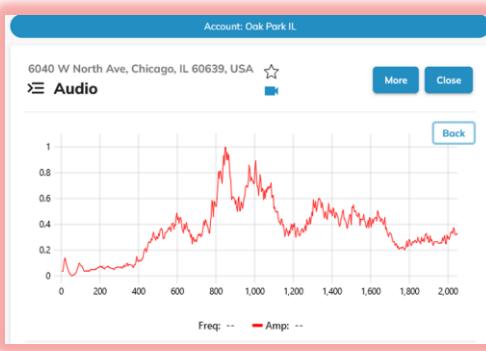
Packing Leak



Electrical

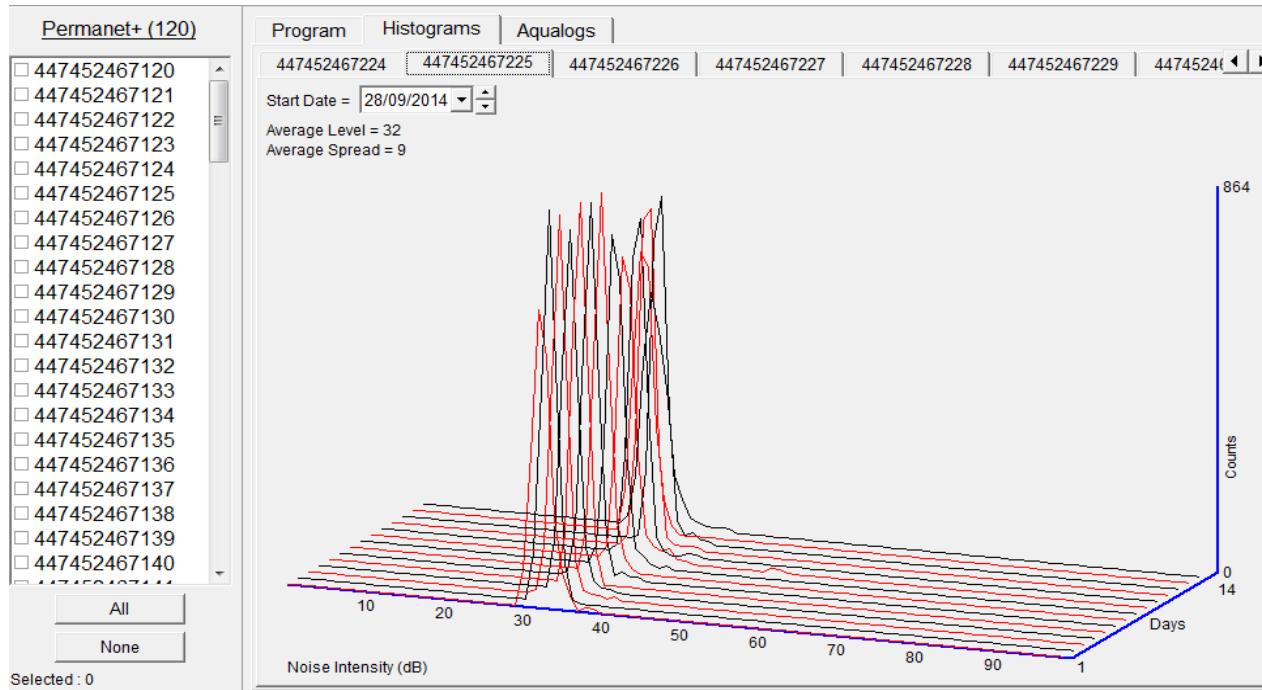


Small OD Pipe Leak

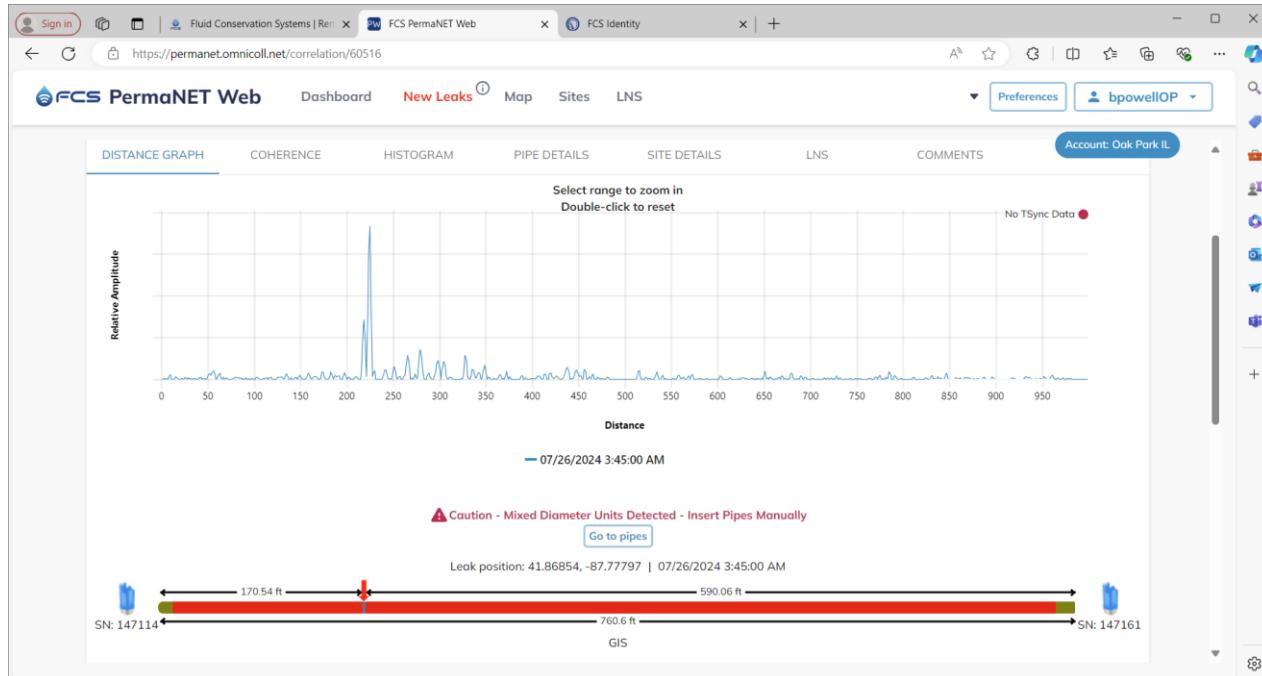


Hydrant Leak

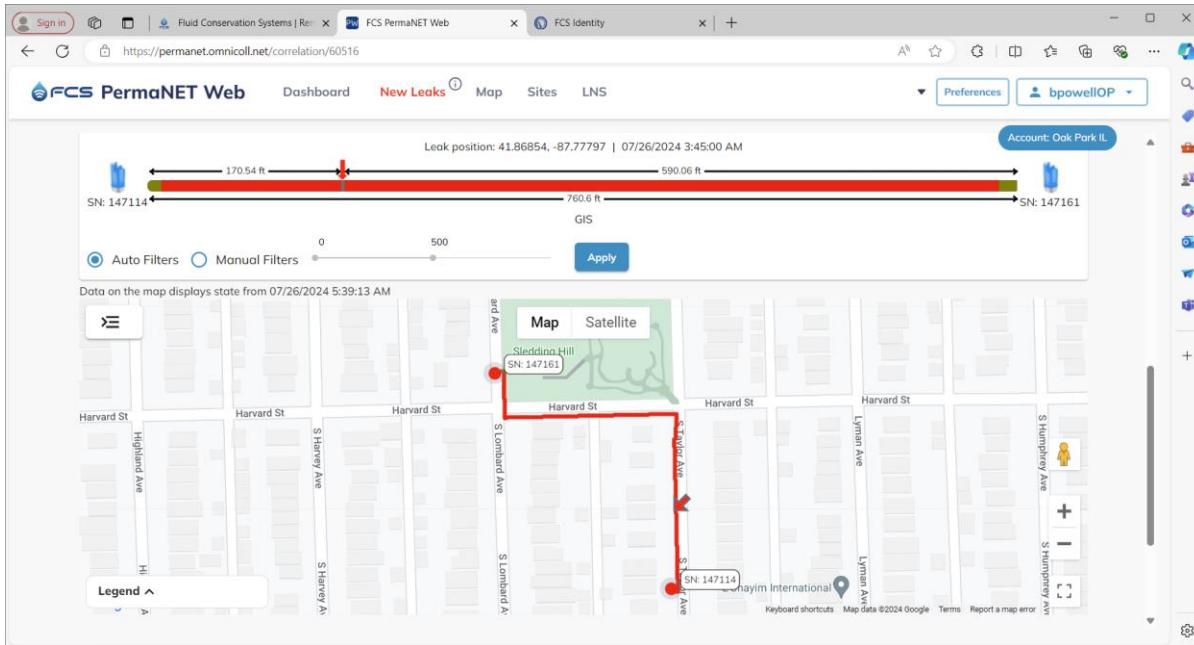
Histograms



Correlation



Correlation Location



Leak Detection Pilot Program

Ask the manufacturers to be able to pilot any loggers.

- How many loggers do you get in the pilot?
- How long does the pilot last?
- Is analysis provided during the pilot?
- Who will deploy the pilot?
- Can the loggers be moved during the pilot?
- How much does the pilot cost?
- Do I get any sort of credit at the end of the pilot?



The Sound Choice
for Leak Detection.™

(800) 531-5465 | info@fluidconservation.com | 1960 Old Gatesburg Road, Suite #150, State College, PA 16803