



Business Case for Water Loss Control

Minimizing Water Losses with Acoustic Monitoring

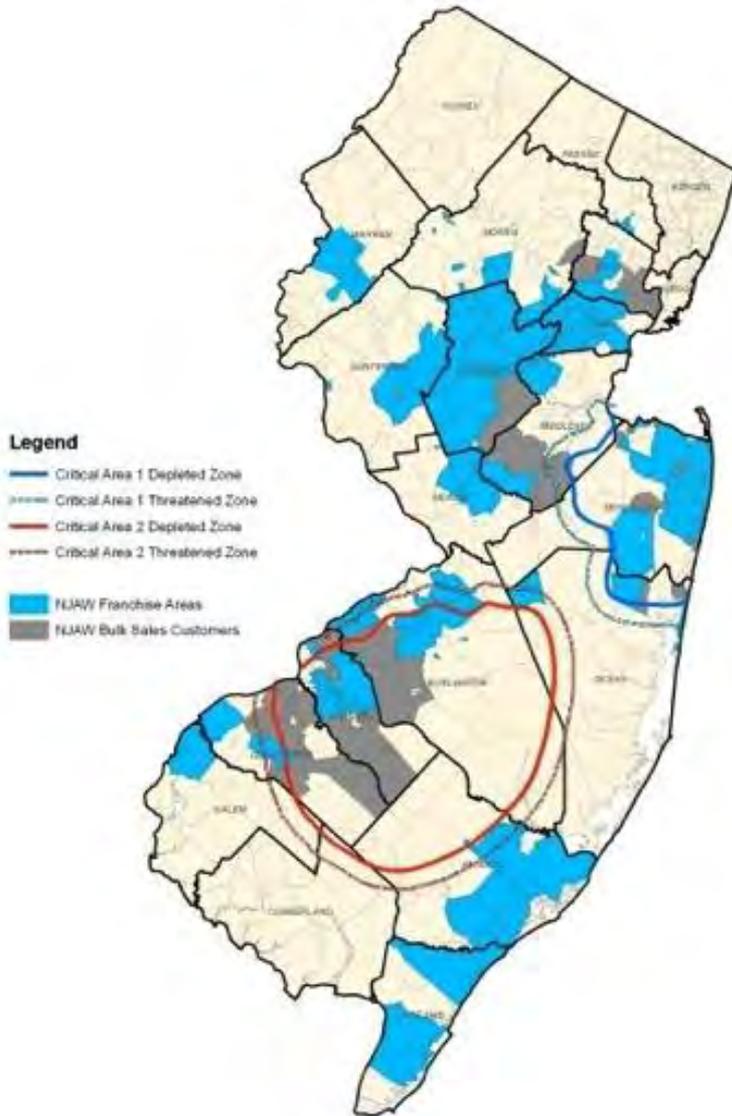
2017 Water Asset Management Conference

Boston, MA

October 11, 2017

Russell G. Titus

Superintendent



Population Served	2.5 million
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Counties Served	18
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Municipalities Served	192
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Total Employees	820
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Water Systems	33
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WW & Sewer Collection Systems	21
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Average System Delivery	330 MGD
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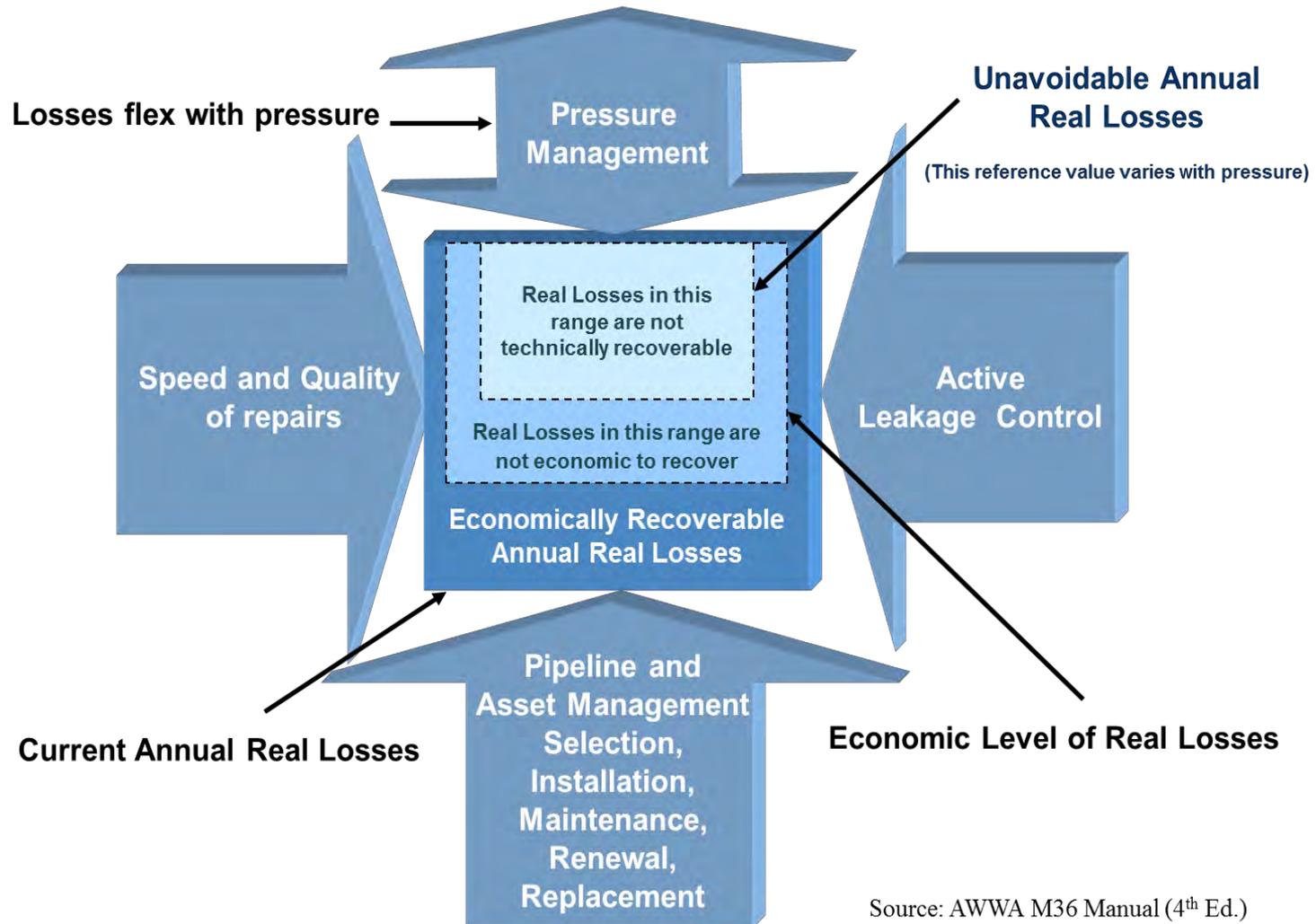
Average Non Revenue Water	15%
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Annual Electric Energy	196million kWh
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Annual Greenhouse Gas Emissions	129,000 metric tons CO ₂ e
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Surface Water Treatment Plants	7 (combined capacity of 350 MGD)
Reservoirs	5 (combined capacity of 6 billion gallons)
Wells	170 (combined capacity of 110 MGD)
Tanks	241
Operating Centers	11
Water & Sewer Mains	8,600 miles (2" to 72" diameter)
Aging Pipes	15% of pipes over 100 years by 2020
Valves	170,000
Hydrants	45,000



Source: AWWA M36 Manual (4th Ed.)

The NJAW water loss strategy follows the latest AWWA standards while also maximizing customer satisfaction, return on investment, and operational efficiency at an acceptable level of risk.

The key elements are:

- Providing accurate, regular metering of production flows and customer consumption volumes;
- Maintaining a system of real time hydraulic data collection and monitoring via a Supervisory Control and Data Acquisition (SCADA) System, Advanced Metering Infrastructure (AMI), or similar system of instruments and data collection technology;
- Compiling an annual water audit as a standard business practice for all systems; and
- Employing sufficient loss control methods to contain water and revenue losses at economic levels and to minimize system upsets.



Contact probe

High-quality headphones

Overnight correlators

Leak noise correlator



The Need for Permanent Leak Monitoring

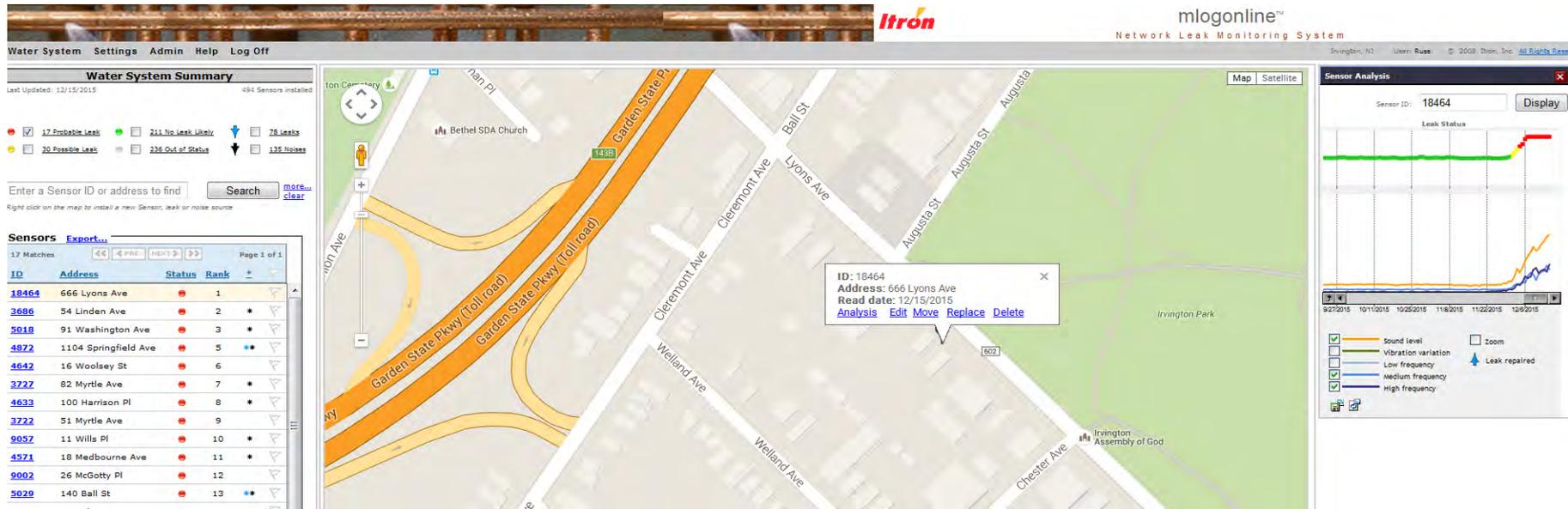
Innovation Overview

Early detection of leaks is vital for water distribution systems, with the ability to identify system failure points:

- mitigate impact customer levels of service
- minimize water loss
- extend asset life
- schedule and prioritize repairs on an informed, proactive basis
- minimize the risks of catastrophic failures

The Need for Permanent Leak Monitoring

In 2007, New Jersey American Water deployed its first automated leak reporting system in Irvington, Maplewood and West Orange. Approximately 3500 sensors have been placed on service pipelines with some connected to AMI. All return acoustic information to the vendor's cloud and the data is available to our staff.



Water System Summary
Last Updated: 12/15/2015 494 Sensors installed

- 17 Probable Leak
- 211 No Leak Likely
- 78 Leaks
- 30 Possible Leak
- 236 Out of Status
- 135 Noises

Enter a Sensor ID or address to find [more...](#) [clear](#)

Right click on the map to install a new Sensor, leak or noise source.

ID	Address	Status	Rank
18464	666 Lyons Ave	●	1
3686	54 Linden Ave	●	2
5018	91 Washington Ave	●	3
4872	1104 Springfield Ave	●	5
4642	16 Woolsey St	●	6
3727	82 Myrtle Ave	●	7
4633	100 Harrison Pl	●	8
3722	51 Myrtle Ave	●	9
9057	11 Wills Pl	●	10
4571	18 Medbourne Ave	●	11
9002	26 McGotty Pl	●	12
3029	140 Ball St	●	13

Sensor Analysis
Sensor ID: 18464

Leak Status

Read date: 12/15/2015
[Analysis](#) [Edit](#) [Move](#) [Replace](#) [Delete](#)

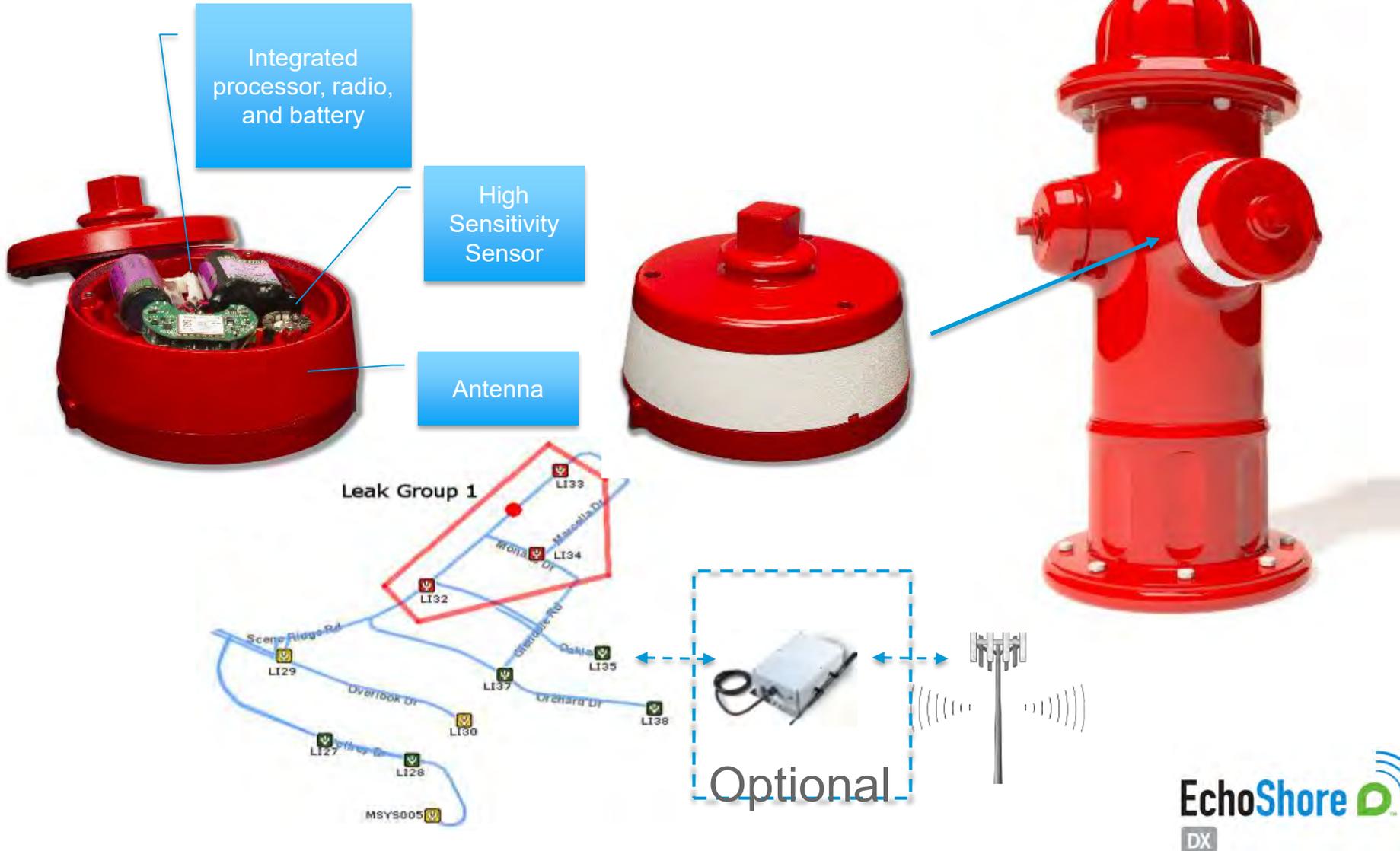
- Sound level
- Vibration variation
- Low frequency
- Medium frequency
- High frequency
- Zoom
- Leak repaired

The Need for Permanent Leak Monitoring

Innovation Overview

In 2009, American Water agreed to participate in a consortium focused on the development of fixed leak detection technology for water distribution systems. After a series of successful developmental field trials, the first commercial system, known as EchoShore-DX, was installed in Charleston, West Virginia.

Distribution Main Monitoring



Integrated processor, radio, and battery

High Sensitivity Sensor

Antenna

Leak Group 1

Optional

Cost Benefit Considerations

3-Year Break Average

Target NRW

Most Recent Year NRW

Rate of Rise

Cost of water

Miles of mains

Annual Production MG/Y

Variable Production Cost Current Year

NRW Cost Current Year

Leakage Current Year

Current Year Recovery Value

Crew Cost Per Year

Crew Repairs Per Day

Current Crew Labor Per Repair

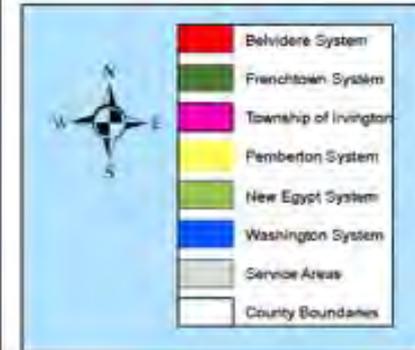
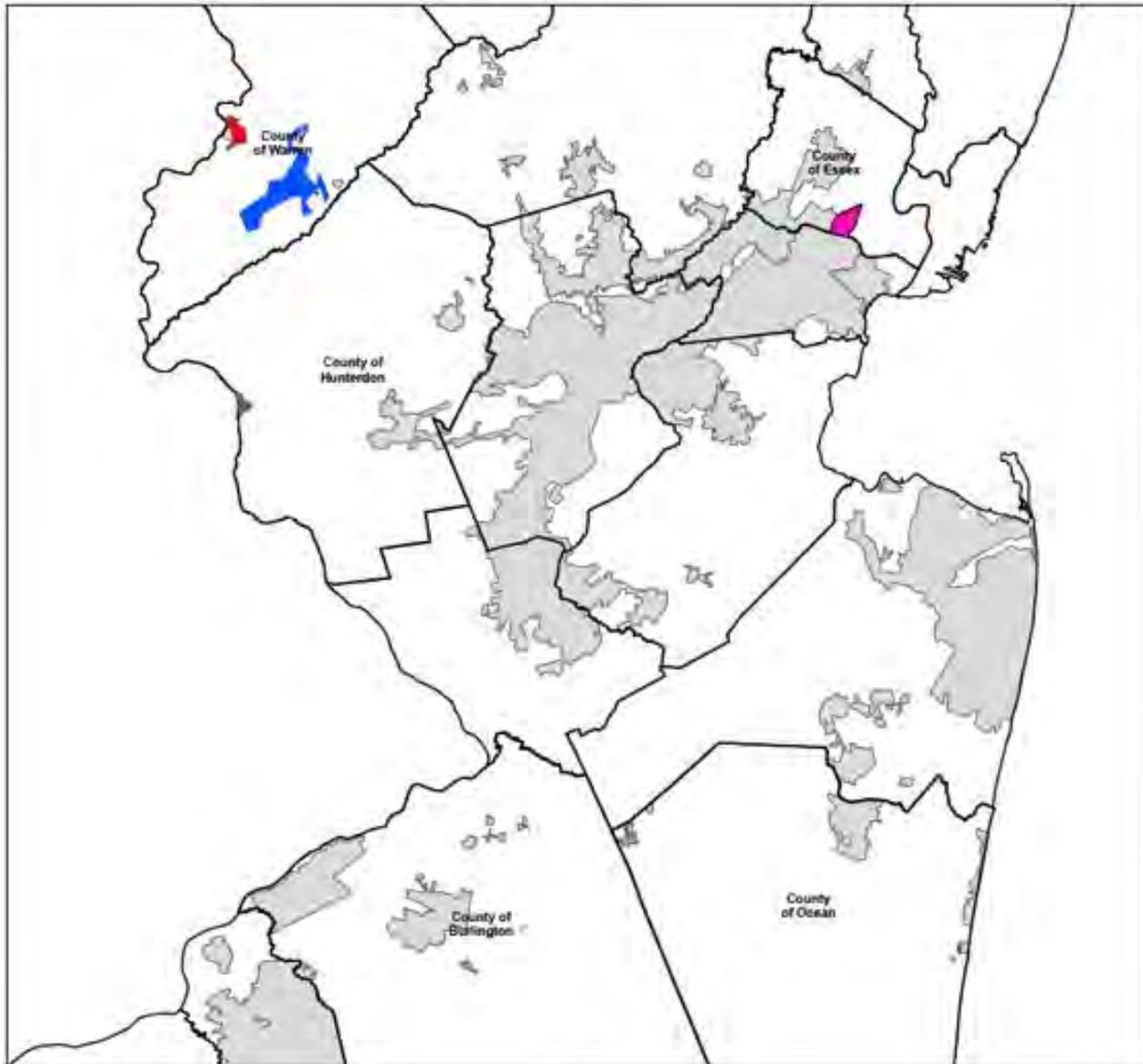
Labor Savings Per Repair

Average Repair Costs Per Break

Material Savings Per Break

Leak Recovery Credit Time - Months

EchoShore-DX Deployment Areas



New Jersey American Water
1025 Laurel Oak Rd
Voorhees, NJ 08043



- March, 2016: First Point of Interest (POI) investigations in Washington district
 - Results were immediate with 5 non-surfacing leaks being located within the first month
- March, 2017:
 - 173 POI hits
 - 85 leaks repaired, 32 investigations pending
 - Estimated 1,600 gpm in leakage eliminated
 - Estimated \$1.053M savings in Opex
 - Actual \$1.127M savings in Opex

Results and Benefits

- System was proactively surveyed previously by internal and external resources
- **15 leaks repaired**
- Estimated flow of all leaks located **410 GPM**
 - No leaks were surfacing at the time of location
 - Deferred capex investment value TBD
- **Improved regulatory allocation position**
- **Steady reduction in NRW %**
 - 1/31/2016 – 27.7%
 - 1/31/2017 – 23.2%

Washington and Belvidere Systems

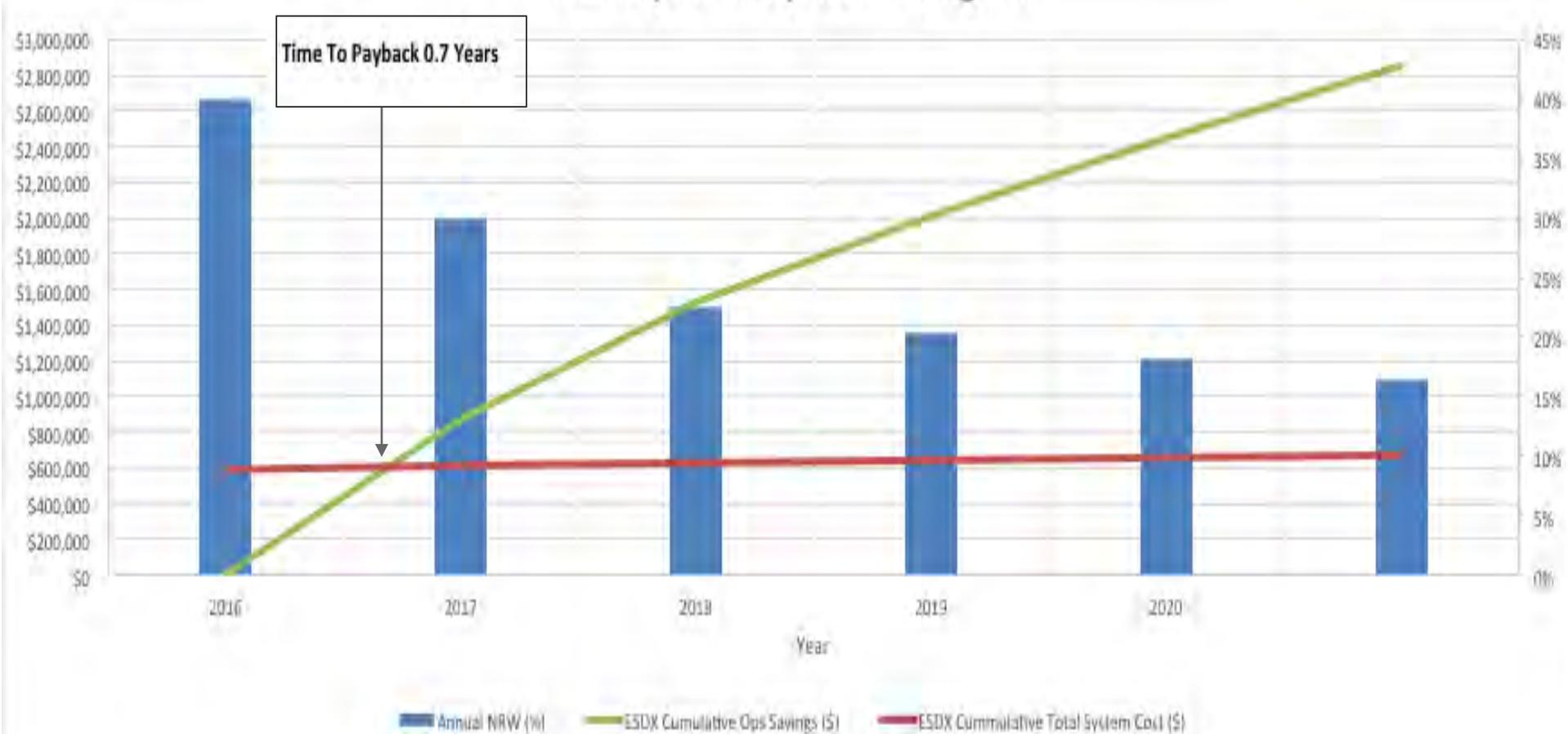


Results and Benefits

- No leak surveys in Irvington due to safety concerns
- Irvington now monitored 24/7 remotely, reducing risks
 - POI investigations and leak repairs are now scheduled
- April, 2016: First POI investigation
- March, 2017: 67 leaks repaired
 - Estimated flow of all leaks located 880 GPM
 - Over 90% of leaks located were not surfacing at the time location
- **Positive NRW Impact/Reduction: Essex Passaic Area**
 - **1/31/2016 - 27.3%**
 - **1/31/2017 - 24.4%**
 - **5/31/2017 – 23.3%**
- **System payback in 9 months**

Results and Benefits

ESDX System Payback - Irvington



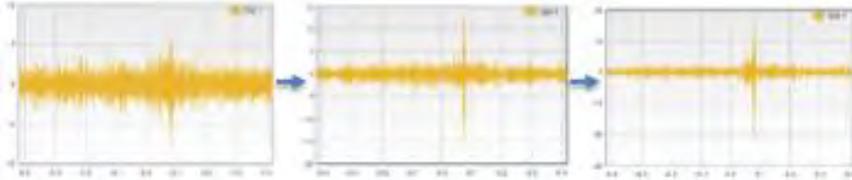
Results and Benefits

- Surveys were conducted during two previous years with no leaks being located
- MNF analysis indicated loss was about 36 gpm
- 2 leaks located
- **Significant reduction in NRW %**
 - **1/31/2016 – 46.9%**
 - **2/28/2017 – 10.2%**
- Improved regulatory allocation impact
- Deferred capital expenditure of \$1 million +/- for new well

Much more than the cost of water

- **Water loss nonsurfacing**
 - experience suggests 90 day run time underground
 - subject to details of break on case by case basis
- **Reduction in restoration materials**
 - paving, sidewalk, backfill
- **Reduction in repair materials**
 - repair parts, pipe
- **Reduction in repair labor**
 - faster repair, overtime reduction
 - system history suggests repairs average 3 overtime hours
- **Reduction in secondary damage**
 - to private property, other utilities, impact of outage

- **Reduces *Non-Revenue Water*** with early detection
 - Average leak goes undetected for up to 9 months
 - Many leaks never surface
- **Monitor leak progression** to determine urgency



- **Minimize risks of catastrophic bursts** by fixing leaks early
 - Liabilities \$1M+ considering collateral damages
 - Avoid bad publicity and customer dissatisfaction
- **Saves repair costs**
 - Lessen the extent of pipeline (asset) damage
 - Reduce the number of emergency (overtime) repairs
 - Minimize wasted capital associated with *false positives*
- Improve the **safety of field personnel** by eliminating the need for traffic controls during leak investigations



Detailed questions and inquiries:

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