Portmore NRW Reduction Co-Management Program

Leak Detection technologies and strategies in Portmore

23rd March 2023

Introduction

- Technology is a powerful tool that can be used to solve practical and complex issues and stimulate growth, innovation and sustainability.

- In water networks, there are a number of technologies, strategies and equipments that are used or can be used to find or minimise leaks in any given system.

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Background

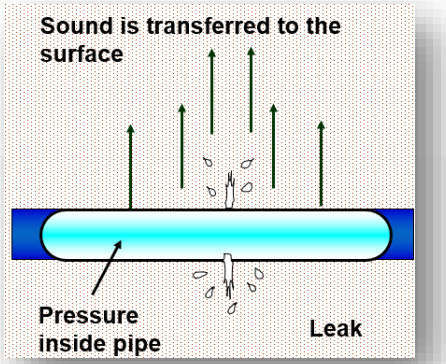
- In Portmore leaks were assigned generally to the distribution teams by way of service orders being generated from calls to the main office or from the NWC Control Centre.
- Originally there were less than four hundred leaks being reported on a monthly basis.
- This was handled by a team of two plumbing teams

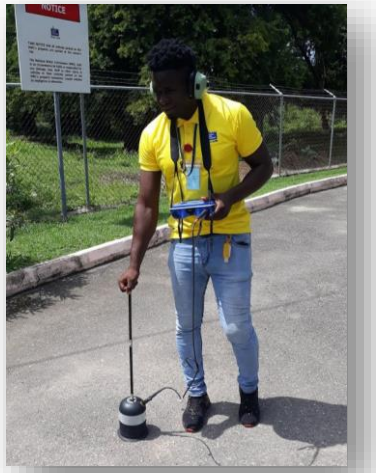
Agenda

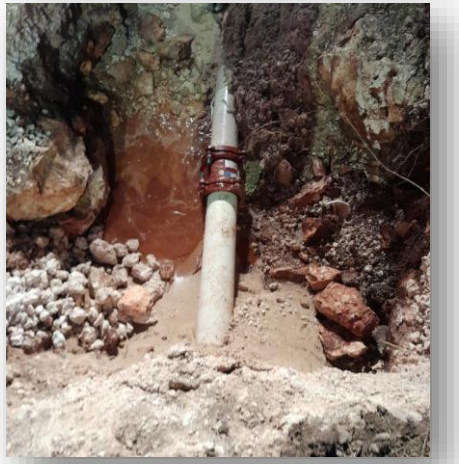
1. Acoustic Technologies used in Portmore
2. Step-test and Visual Inspection
3. Leak detection strategy
4. Results

Leak Detection – Acoustic Technologies

CONVENTIONAL ACOUSTIC TECHNOLOGY EQUIPMENT



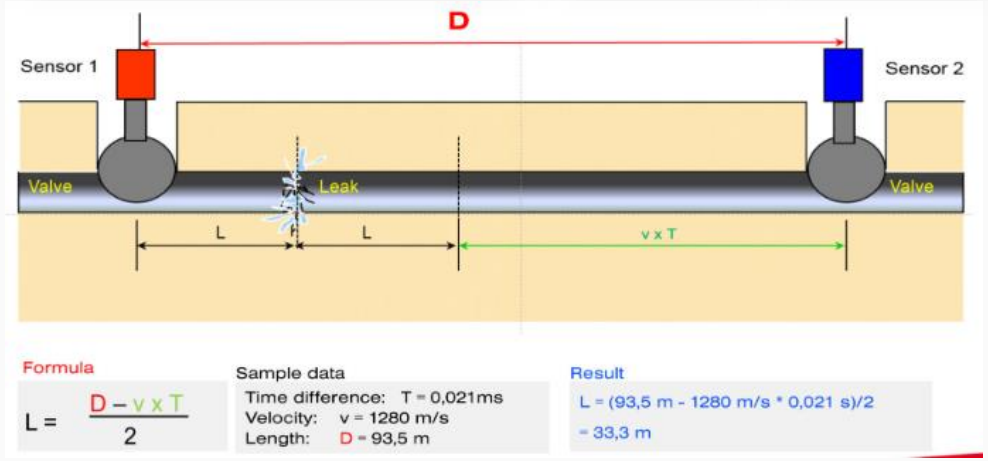




- Water leak creates an **energy disturbance (vibration)**
- Vibration passes through the water and the pipe wall in form of an **acoustic wave**
- Acoustic wave **travels in all directions, becoming weaker with distance from leak**
- This acoustic wave can be detected using a conventional **acoustic equipment (DXMic in Jamaica)**
- Conventional acoustic equipment used includes:
  1. Acoustic shielded **ground microphone** used on hard ground surfaces
  2. **Tripod foot** used on uneven surfaces
  3. High quality **headphones**
  4. **DXMic device** used to display all the characteristics of a sound and to apply filters, increase the sound volume and microphone sensitivity

Leak Detection – Acoustic Technologies

ARTIFICIAL INTELLIGENCE - FIDO SOLUCTION



- **Cloud Correlation technology**
- **Use of FIDO Bugs** – small microphones attached to access points of the network (3 years battery life)
- **AI technology** to locate and validate leak noises (92% accuracy)
- **Analyze all the noises**, including background noises and compare them to more then **2.4 million noise samples** stored in their library (the largest in the world)
- **Calculate the size of the leaks** relative to a baseline (90% accuracy)
- **Integration with GIS** and other softwares
- **Data-as-a-service (DAAS)**
- **No hardware investment –** Only pays to have access to data
- Woks in **every pipe material and diameter**
- Works in **any pressure condition**
- **24/7 data recording** (avoiding night works)
- **No need of human analysis**, eliminating the human error

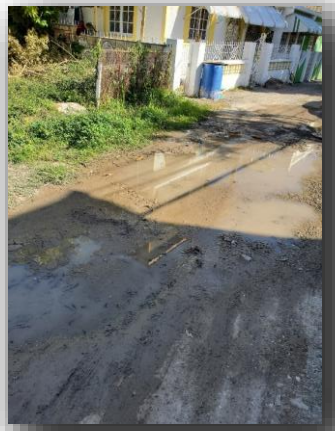
Leak Detection – Step-Test and Visual Inspection

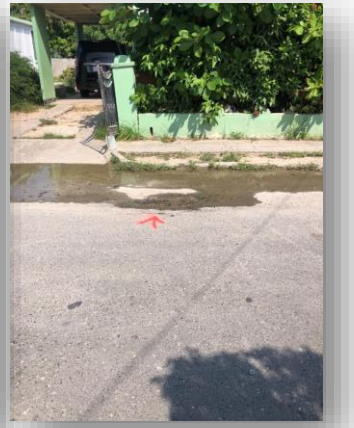
STEP TEST

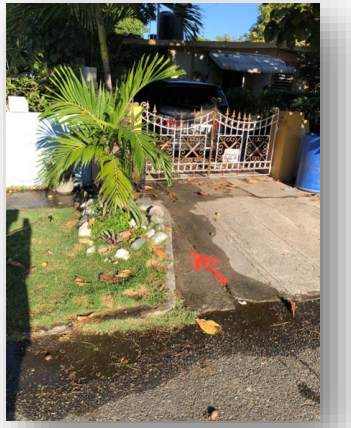
Valve closed	Area affected	Time closed	Flow (l/s)
None	None	1:25 AM	21.3
V1	A1	1:50 AM	21.1
V2; V3	A2	2:05 AM	16.8
V4	A3	2:10 AM	13.3
V5	A4	2:20 AM	11.8
PRV	A6	2:25 AM	9.4
V6	A5-CHE	2:35 AM	7.6
V7	A5-UF	2:40 AM	5.9
V8	A5-JH	2:45 AM	4.4
V9	A5-EH	3:00 AM	1.6

- Subdivision **of big areas in smaller areas**
- **Smaller the area** the better to localize the leaks
- **Identifies where** to carry out surveys

VISUAL INSPECTION







- **Quick survey** to find all the visible leaks
- **Big component** of real leaks
- **High cost-benefit** activity
- A system with low number of visible leaks is **good for public perception and utility reputation**

Leak Detection – Strategy

Definition of major KPI

KPI
Total leaks / day / technicians
Visible leaks / day / technician
Non visible leaks / day / technician
Acoustic Non visible leaks / day / technician
km survey / day / technician
Main leaks / day / technician

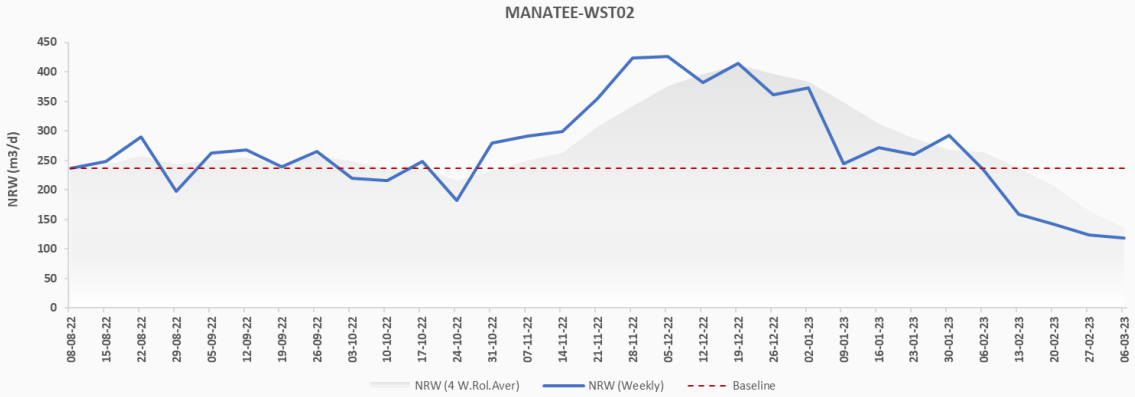
Training



Team management and supervision

Technicians	Total Leaks	Km inspected	Leaks/day	Km/day	Main leaks - confirmed
Calisha Hammond	1275	525	5.8	2.4	13
Cyril Larmond	1065	376	5.3	1.9	14
Demoy Reddie	1337	480	5.9	2.1	16
Deryck Taylor	1590	602	6.3	2.4	9
Howard Edwards	1393	603	6.0	2.6	22
Jason Russell	2048	495	9.3	2.2	28
Kirk Edwards	1494	496	6.7	2.2	2
Marlon Rigg	1779	413	7.3	1.7	16
Marlon Smith	698	246	7.0	2.5	18

Leak Prioritization (DMA selection)



Implementation of major activities

	Task Name	Start	Finish
1	Transmssion Main Intial Inspection	Fri 22-06-10	Thu 22-10-13
2	Transmssion Main Inspection	Mon 22-10-17	Fri 26-02-27
3	Night works	Mon 22-06-13	Fri 26-02-27
4	Acoustic logger installation	Mon 23-07-03	Fri 26-02-27
5	Training	Mon 22-07-04	Fri 26-01-30

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Leak Detection – Results

KPI Key Performance Indicator	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23
Active Leak Detection	*YEAR 2*										
Working days in average per technician	21.5	20.8	20.0	23.0	24.4	23.5	22.8	21.2	23.4	22.8	22.2
Average leak detection technicians	10.6	10.5	9.9	10.8	10.8	10.3	10.8	10.5	12.0	10.6	11.9
Total leaks / day /technician	8.7	7.0	7.7	8.3	6.9	8.3	6.7	8.7	9.6	9.9	10.2
Visible leaks / day / technician	7.0	5.4	5.6	6.1	5.0	6.2	4.9	6.3	6.9	7.3	7.3
Non visible leaks / day /technician	1.7	1.6	2.1	2.3	2.0	2.1	1.8	2.4	2.7	2.6	2.9
Km survey / day / technician	2.8	2.9	3.3	2.7	2.8	2.9	2.7	3.0	2.8	2.9	3.0
Leaks detected / KM / technician	3.1	2.4	2.3	3.1	2.5	2.9	2.5	2.9	3.4	3.5	3.4
Illegals /day/technician	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0
Defective meters /day/technician	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total leaks detected	1,986	1,523	1,520	2,063	1,831	2,002	1,658	1,923	2,684	2,404	2,701
Visible Leaks	1,588	1,176	1,113	1,504	1,311	1,501	1,203	1,393	1,935	1,774	1,935
Non visible leaks	398	347	407	559	520	501	455	530	749	630	766
% of Non -Visible leaks	20%	23%	27%	27%	28%	25%	27%	28%	28%	26%	28%
Total NVL found with the use of equipment	95	136	174	219	188	154	163	150	224	147	167
Total KM inspected	647	637	648	671	739	695	663	658	783	693	804

Leak Detection technologies and strategies in Portmore

Thank you

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Jamaica