WONE
Water Optimization for Network Efficiency
EPAL

Network Sectorisation & Monitoring for Non-Revenue Water Control

EPAL
Grupo Águas de Portugal

CASE STUDY KEY POINTS

How to **build capacity** and network knowledge to **reduce water losses** and **sustainably maintain** those gains

Active Leakage Control 'find and fix' in **DMAs** supported by **software application** data analysis

How EPAL **reduced leakage by 200 m^3/hour** from **500 to 150 litres/connection/day**

Be as smart as you need to be

PORTUGAL NATIONAL CONTEXT

Portugal

- **92.200 square km**
- **10.6 million population**

- Majority of **Water sector** publically owned
- Mix **private, public & concession** operators
- Divided into **bulk treatment companies**, separate from **distribution utilities**

We know that **water losses** within distribution systems are an **economic & environmental problem** which **must be addressed.**

A **water loss reduction** project brings **operational efficiency** along with **financial** and **sustainability** benefits.

PORTUGAL NATIONAL CONTEXT

Problems contributing to Non-Revenue Water (NRW):

- **Poor measurement** of system water balances;
- **Aging networks** and often built with poor quality materials;
- **Deficit of knowledge** regarding networks: GIS, technical, operational;
- **Insufficient data,** standardization & systematization of reporting;
- **Insufficient technical teams** with low skill levels and poor knowledge.

In Portugal, **efficiency targets** have been set for utilities to achieve and **funding mechanisms** created for their implementation.

Source: ERSAR – RASARP 2012 (Portuguese Regulatory Report)

EPAL – ORIGINS IN 1868

Bulk Supply to around 2.9 million people in 34 municipalities around the Lisbon area and the city itself

Management of **Águas de Lisboa & Vale do Tejo** totalling 96 municipalities

Direct Supply to 350,000 domestic and commercial customers within City of Lisbon

Largest water supplier in Portugal with a net profit of €47 M and a turnover of €144 M in 2015

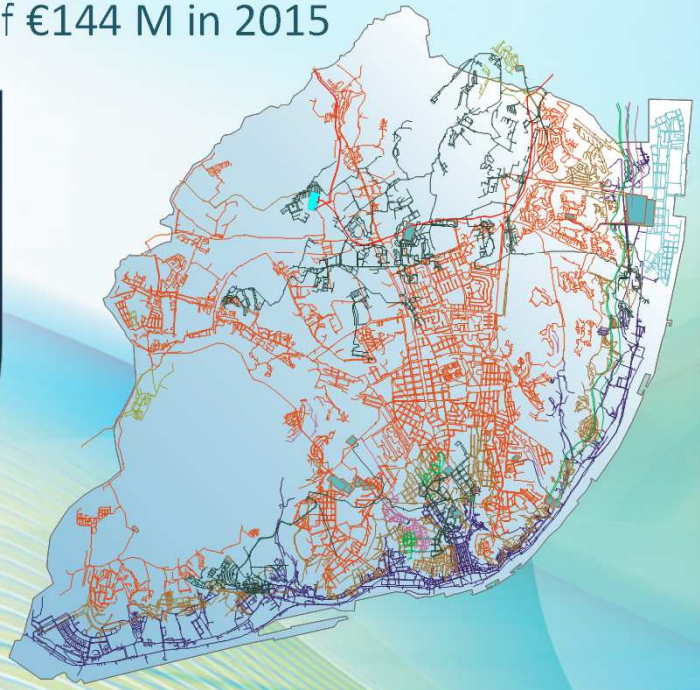
CITY OF LISBON DISTRIBUTION SYSTEM

550,000 Population

170,000 m^3 Daily Demand

1.450 km Distribution Mains

5 Pressure Zones



EPAL NON-REVENUE WATER SITUATION

Challenge

How to reduce annual NRW volume in the Lisbon distribution network which reached **40 million m³** at the turn of the millennium?

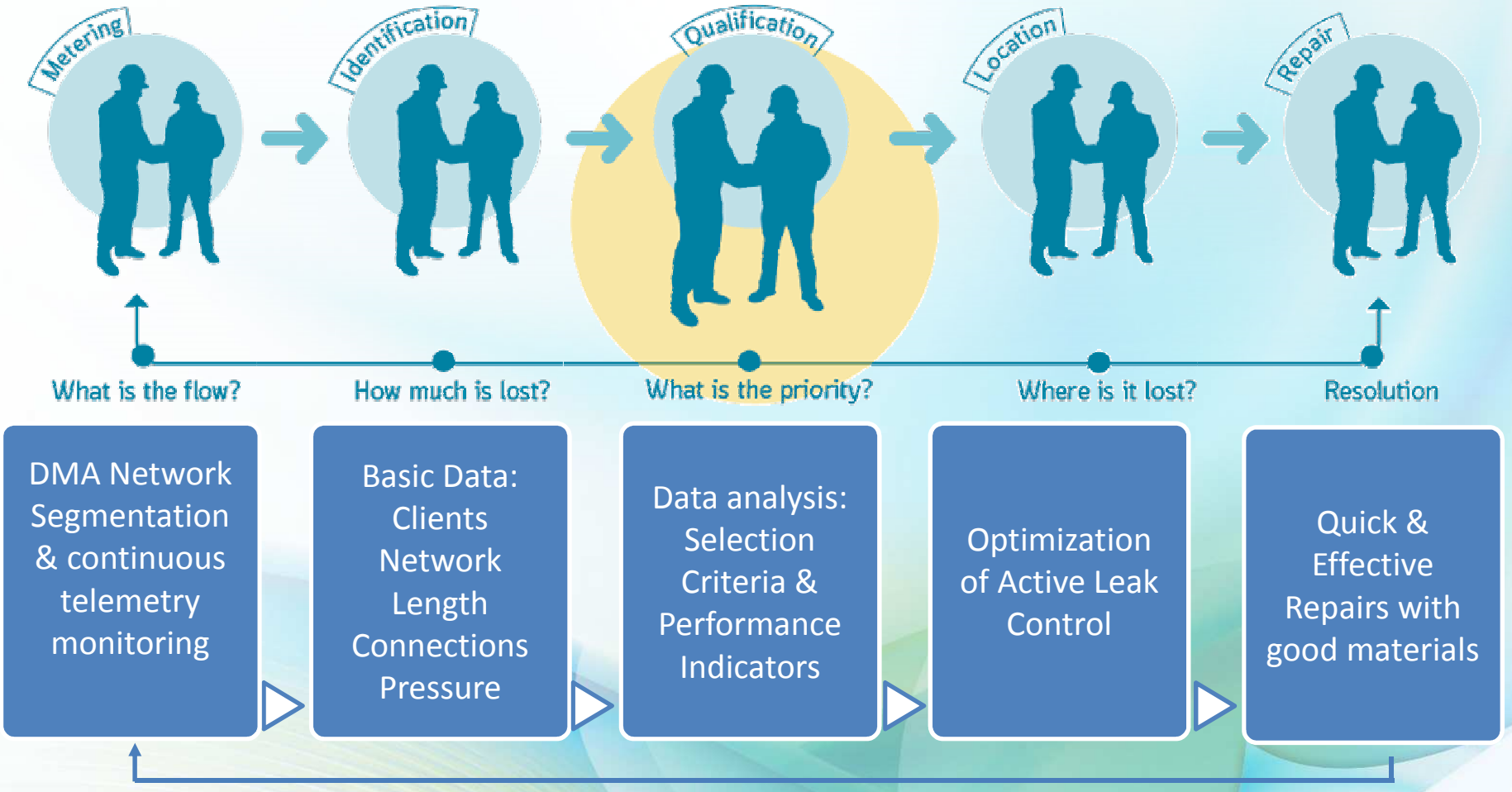
Strategy Decision

EPAL adopted solutions which:

1. **Minimize inefficiency** generated by water losses;
2. Are **easily implemented** and sustainable;
3. Are **transversal** to all areas of the company;
4. Allow **optimization of investments and resources**;
5. Generate **financial return** for the company and stakeholders, creating **greater resilience**.

Project undertaken by company employees to build capacity & retain knowledge in-house

STRATEGY REQUIREMENTS



4 PHASES TO IMPROVE NETWORK KNOWLEDGE

1. DMA PLANNING & SET UP

Create **metering points & telemetry**

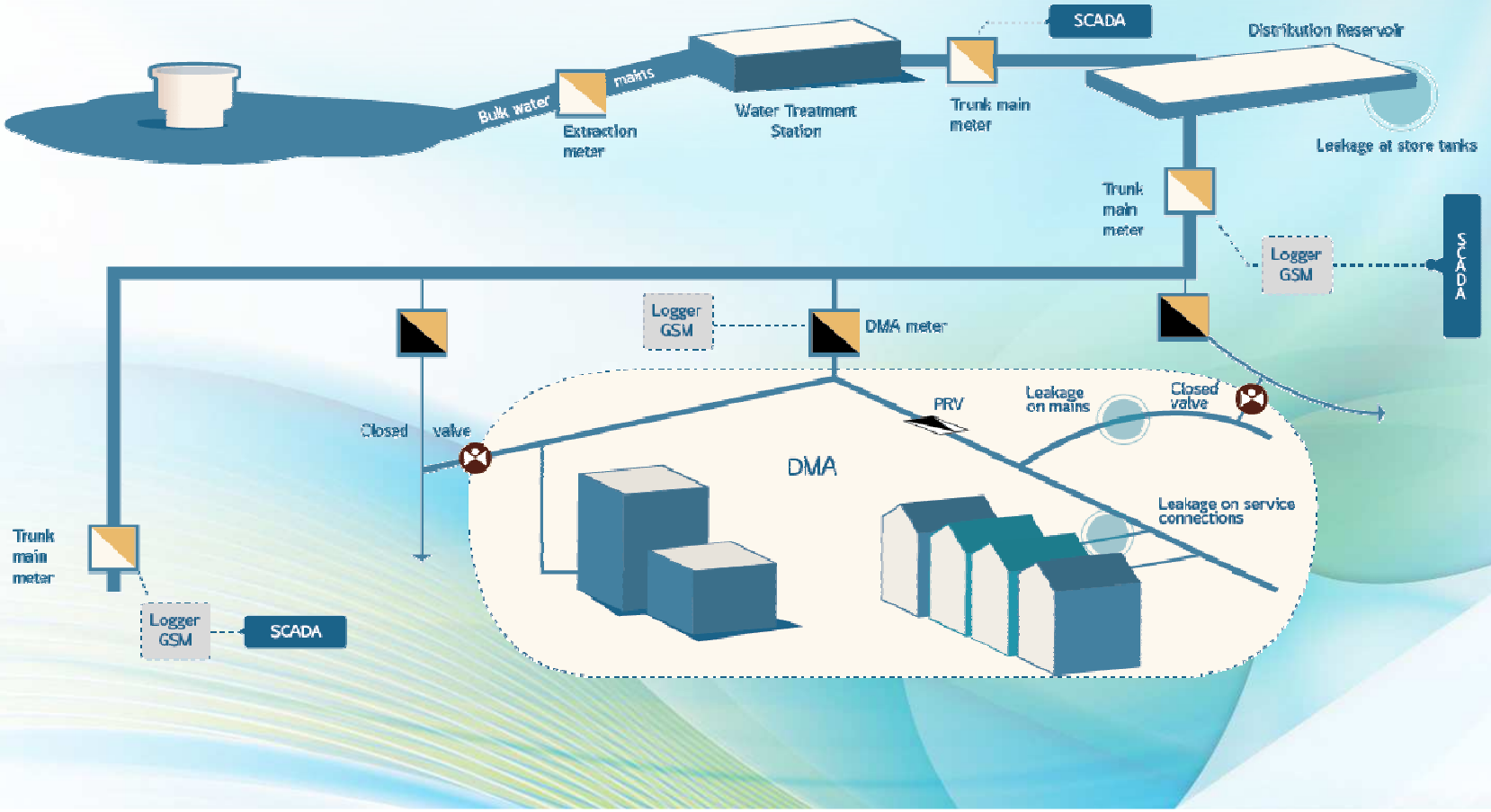
Design & boundary **validation**

DMA **Implementation**

2. CONTINUOUS MONITORING

Recording of **pressure & flow**

Passive system with **active alarms**



4 PHASES TO IMPROVE NETWORK KNOWLEDGE

3. DATA ANALYSIS

Integration in analysis **software**

Practical Performance Indicators

System **Alarm & Alert** Management

Leakage assessment & **Target setting**

Surgical Control of leakage

4. INFORMATION REPORTING

DMA **Proposals & Reference Manuals**

DMA **Analysis & Audit Project Reports**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Welcome Unidade Monitorização
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ADMINISTRATION
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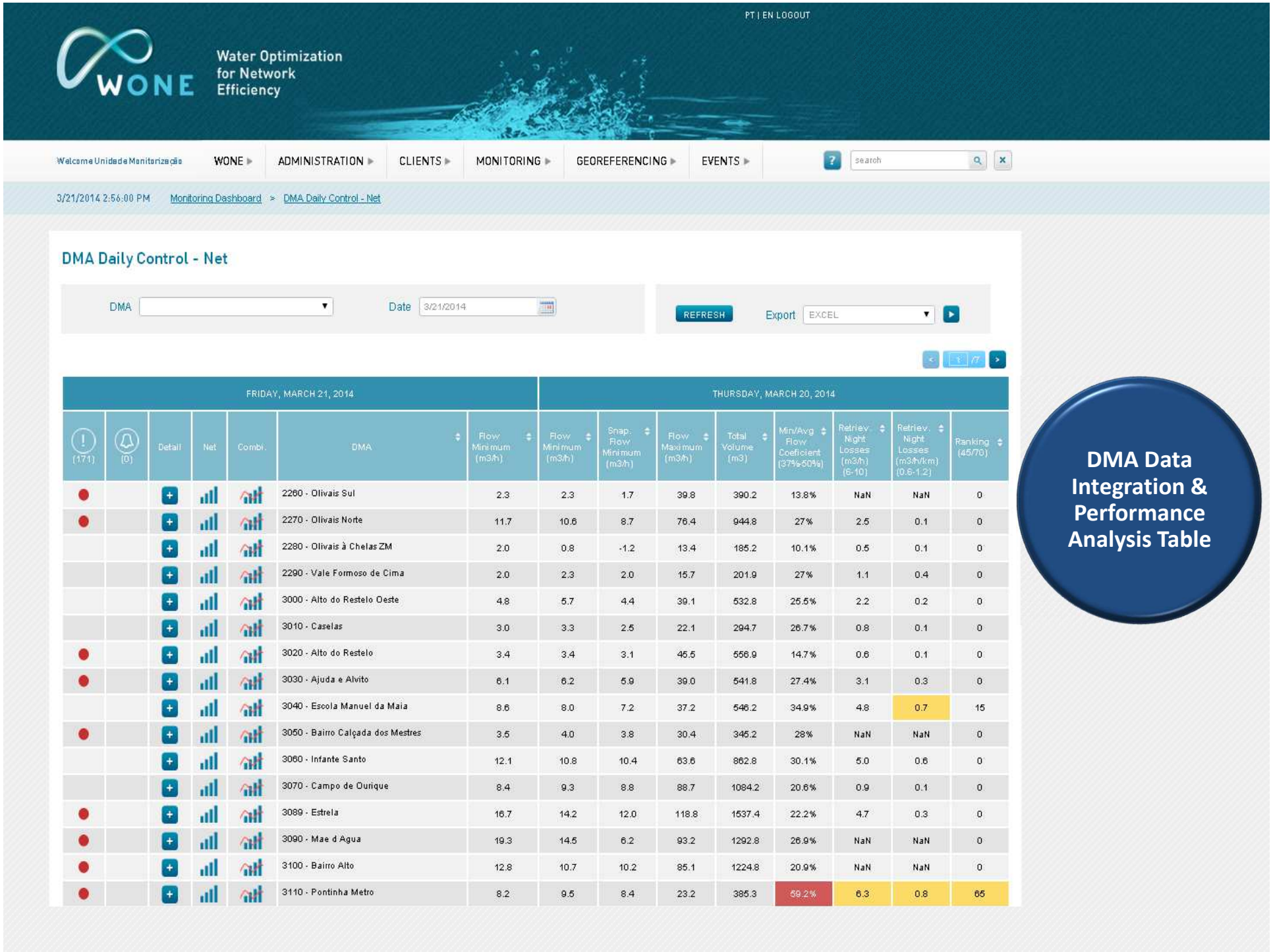
search
3/21/2014 2:57:02 PM
Monitoring Dashboard
Resume - Friday, March 21, 2014
DMA - POOREST PERFORMING
3110 PONTINHA METRO
2000 RESTELO
4180 CAMPO DAS AMOREIRAS
4140 AMEIXOEIRA
3590 GAGO COUTINHO
1020 RESTELO JERÓNIMOS
1040 SANTO AMARO
2190 BARBADINHOS
1170 ALFANDEGA
1180 XABREGAS E BEATO
0 10 20 30 40 50 60 70
< 37%
37% - 50%
> 50%
MORE
DMA - HIGHEST AVOIDABLE LOSSES
1040 SANTO AMARO
1180 XABREGAS E BEATO
1100 PRAÇA COMERCIO A SANTOS
3590 GAGO COUTINHO
3530 CHELAS ISEL
4040 BAIRRO PADRE CRUZ
1060 VALE DE ALCÂNTARA
1130 RESTAURADORES E ROSSIO
5120 CARVALHO DA AJUDA
2140 FUNDAÇÃO ORIENTE
0 2 4 6 8 10 12 14
< 6 m3/h
6 - 10 m3/h
> 10 m3/h
MORE
WARNINGS
Nº. DMA alarms deactivated
0
Nº. Monitoring Points in alarm
0
Nº. DMA deactivated
11
Nº. DMA Interventions
0
AVOIDABLE LOSSES PER NETWO
100
50
0
MORE
COMMUNICATIONS
DAM
189
187
CLIENTS
1173
1011
106
56
Up to date communications
No communication for 2 or more days
No communication for 1 day
MORE
INDICATORS
Monitorization Point Flow 0
2/189
Monitorization Point Pressure Anomalies
3/189
MORE
MORE
Distribution Network
1.250 km sectorized mains
1600 Monitoring Points
156 DMAs
© 2013 WONE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3/21/2014 2:56:00 PM
Monitoring Dashboard > DMA Daily Control - Net
DMA Daily Control - Net
DMA
Date
3/21/2014
REFRESH
Export
EXCEL
FRIDAY, MARCH 21, 2014
THURSDAY, MARCH 20, 2014
(171)
(0)
Detail
Net
Combi.
DMA
Flow Minimum (m3/h)
Flow Minimum (m3/h)
Snap. Flow Minimum (m3/h)
Flow Maximum (m3/h)
Total Volume (m3)
Min/Avg Flow Coeficient (37%-50%)
Retriev. Night Losses (m3/h) (6-10)
Retriev. Night Losses (m3/h/km) (0.6-1.2)
Ranking (45/70)
2260 - Olivais Sul 2.3 2.3 1.7 39.8 390.2 13.8% NaN NaN 0
2270 - Olivais Norte 11.7 10.6 8.7 76.4 944.8 27% 2.5 0.1 0
2280 - Olivais à Chelas ZM 2.0 0.8 -1.2 13.4 185.2 10.1% 0.5 0.1 0
2290 - Vale Formoso de Cima 2.0 2.3 2.0 15.7 201.9 27% 1.1 0.4 0
3000 - Alto do Restelo Oeste 4.8 5.7 4.4 39.1 532.8 25.5% 2.2 0.2 0
3010 - Caselas 3.0 3.3 2.5 22.1 294.7 26.7% 0.8 0.1 0
3020 - Alto do Restelo 3.4 3.4 3.1 45.5 556.9 14.7% 0.6 0.1 0
3030 - Ajuda e Alvito 6.1 6.2 5.9 39.0 541.8 27.4% 3.1 0.3 0
3040 - Escola Manuel da Maia 8.6 8.0 7.2 37.2 546.2 34.9% 4.8 0.7 15
3050 - Bairro Calçada dos Mestres 3.5 4.0 3.8 30.4 345.2 28% NaN NaN 0
3060 - Infante Santo 12.1 10.8 10.4 63.6 862.8 30.1% 5.0 0.6 0
3070 - Campo de Ourique 8.4 9.3 8.8 88.7 1084.2 20.6% 0.9 0.1 0
3089 - Estrela 16.7 14.2 12.0 118.8 1537.4 22.2% 4.7 0.3 0
3090 - Mae d Agua 19.3 14.5 6.2 93.2 1292.8 26.9% NaN NaN 0
3100 - Bairro Alto 12.8 10.7 10.2 85.1 1224.8 20.9% NaN NaN 0
3110 - Pontinha Metro 8.2 9.5 8.4 23.2 385.3 59.2% 6.3 0.8 65
DMA Data Integration & Performance Analysis Table

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3/21/2014 3:00:26 PM Monitoring Dashboard > DMA Daily Control - Net > Daily Total and Min. Graph

Daily Total and Min. Graph

Initial Date 1/22/2014 Final Date 2/21/2014

DMA 1000 - Algés e Restelo Report DMA Report Net

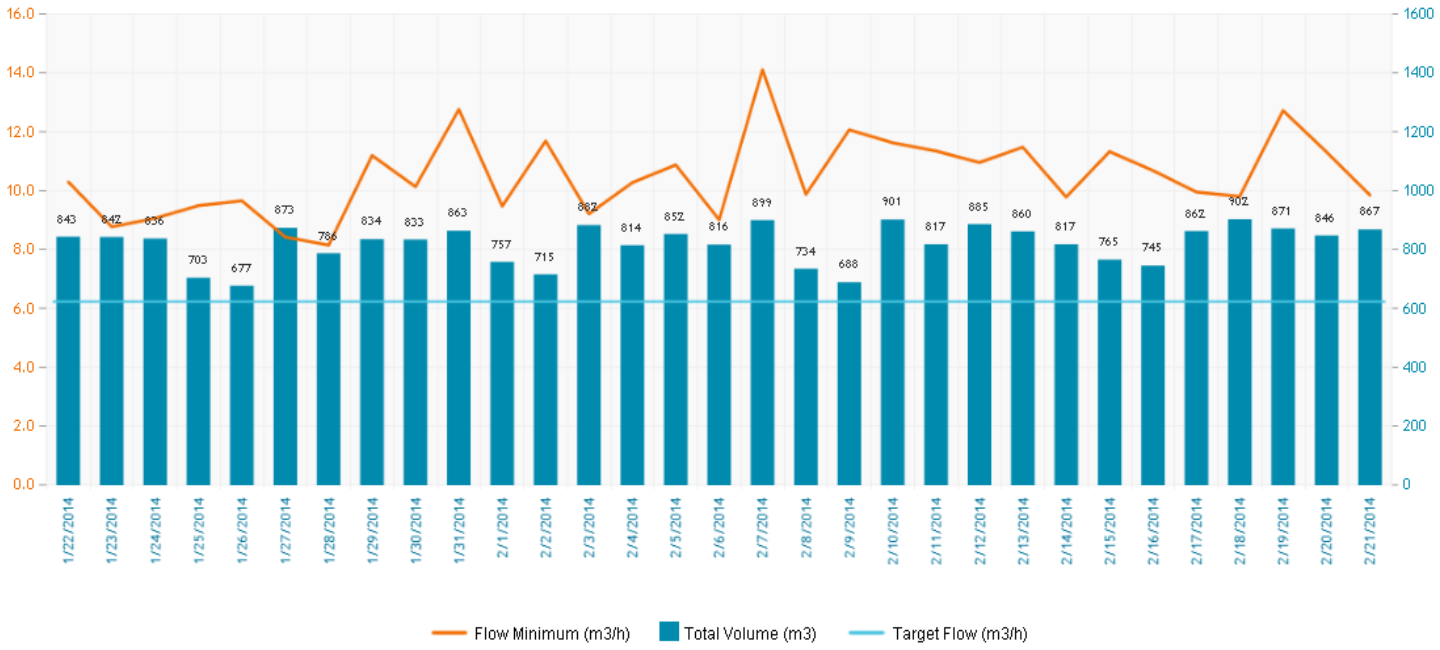
Min (Y1) Max (Y1)

Min (Y2) Max (Y2)

REFRESH Export EXCEL

DMA 1000 - Algés e Restelo

Wednesday, January 22, 2014 - Friday, February 21, 2014



DMA Total Consumption & Minimum Nightline

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3/21/2014 5:19:21 PM Monitoring Dashboard > DMA Daily Control - Net > Monitoring Point Daily Control > Pressure and Flow Profile Graph

Pressure and Flow Profile Graph

Initial Date 7/29/2012 Final Date 8/7/2012

Min (Y1) Max (Y1)

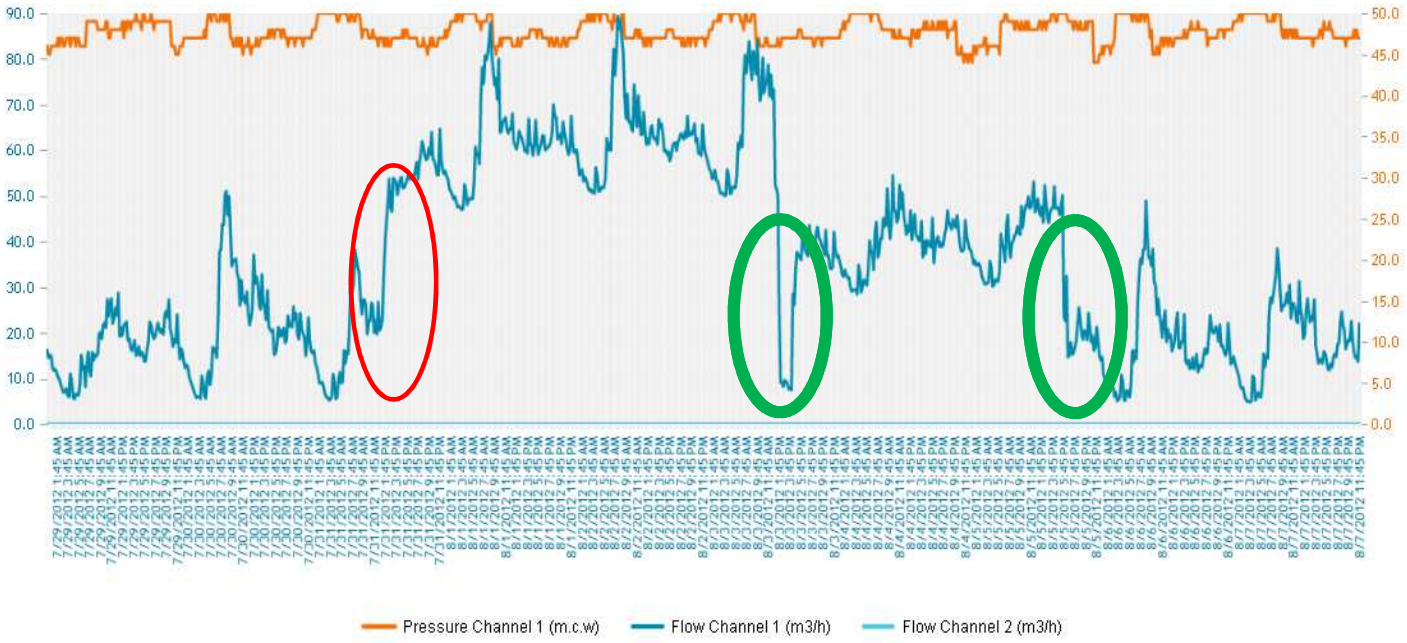
Min (Y2) Max (Y2)

Monitoring Point 41100000 - R Vieira Almeida

REFRESH Export EXCEL

Monitoring Point 41100000 - R Vieira Almeida

Sunday, July 29, 2012 - Tuesday, August 07, 2012



Leak Detection

Quantification

Repair Validation

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3/28/2014 4:39:57 PM Monitoring Dashboard » DMA Daily Control - Net » Daily Total and Min. Graph

Daily Total and Min. Graph

Initial Date 1/1/2014 Final Date 3/27/2014

DMA 3350 - Penha de França N Report DMA Report Net

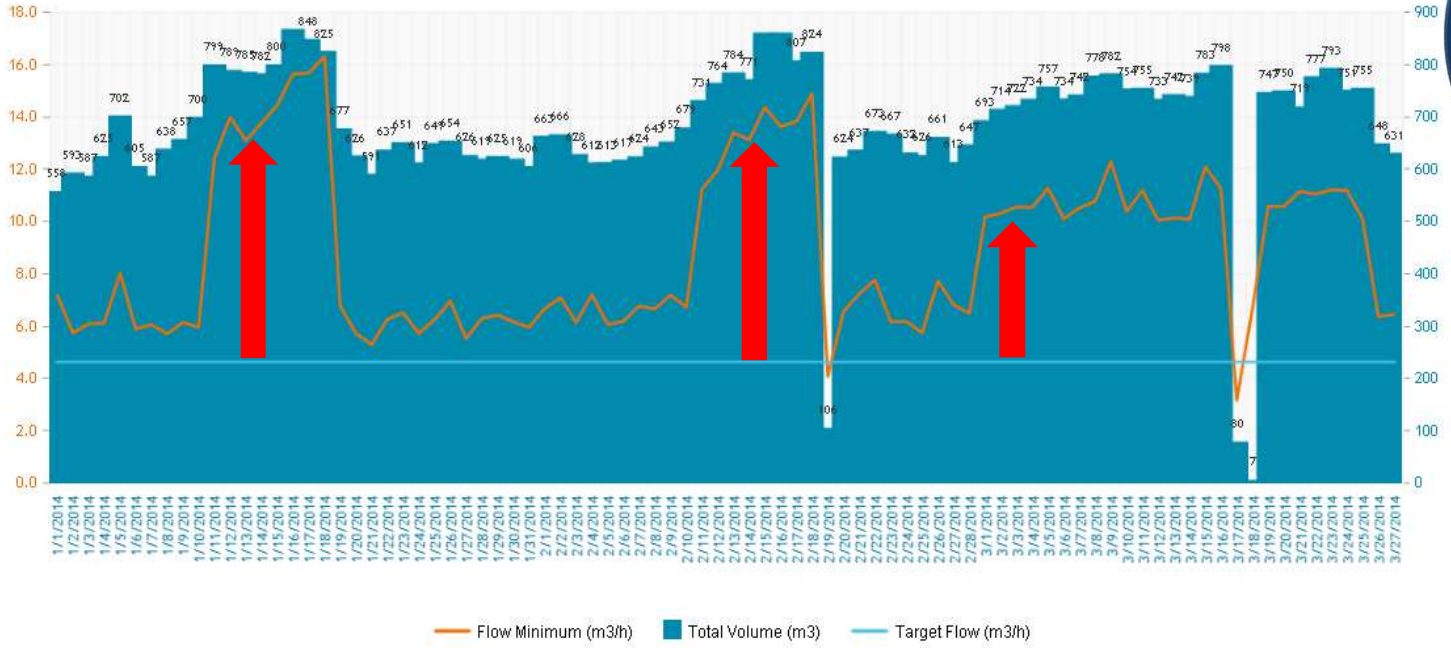
Min (Y1) Max (Y1)

Min (Y2) Max (Y2)

REFRESH Export EXCEL

DMA 3350 - Penha de França Norte

Wednesday, January 01, 2014 - Thursday, March 27, 2014



Constant Vigilance: 2014 Six years of waiting, then three in a row

CASE STUDY: DMA 1060

DMA Analysis Project Methodology:

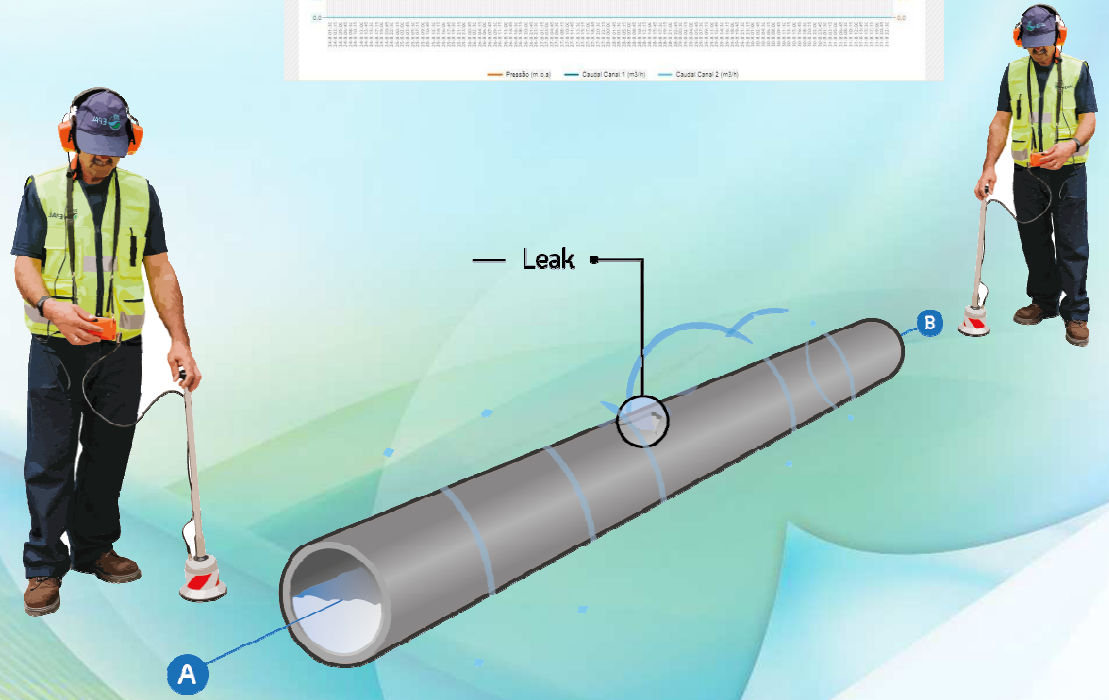
Data analysis revealed
Recoverable Night Flow 130 m^3/h

Fieldwork –Find 'n' Fix:

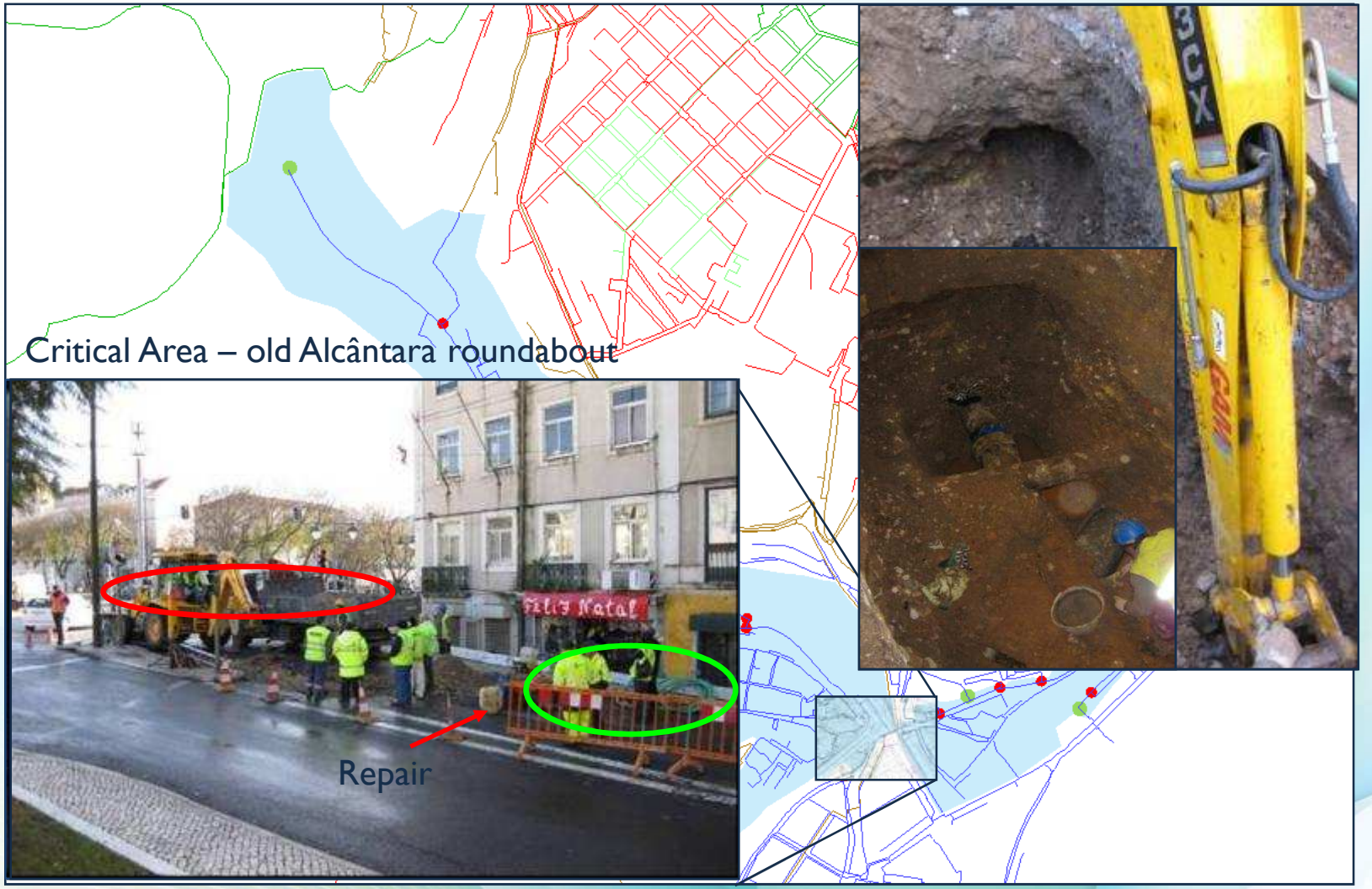
DMA boundary valve validation

- *Leak Detection*
- *Ground microphones*
- *Accoustic Correlation*
- *Temporary DMA Alterations*

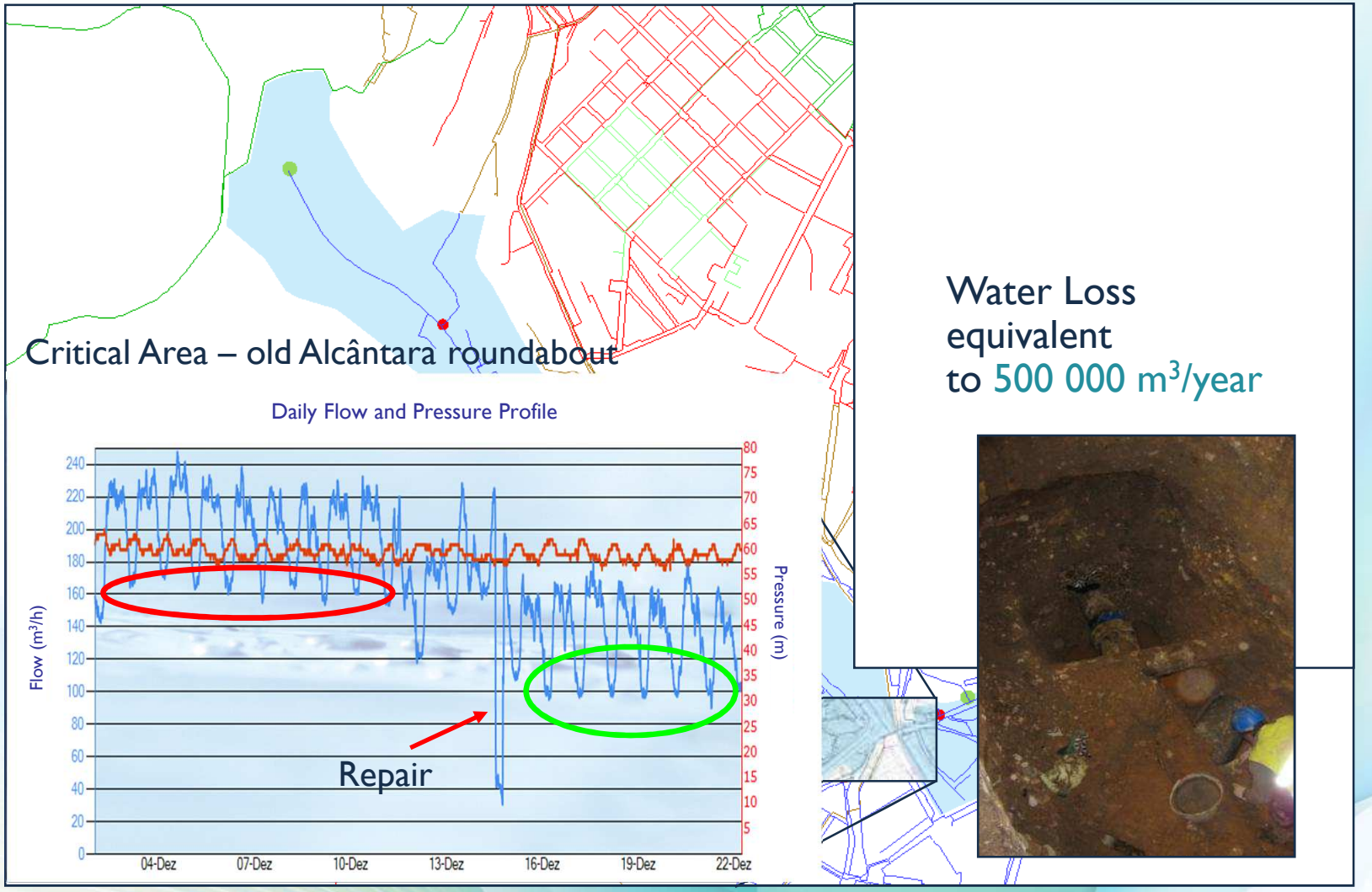
Leak Repair
Validation of results
Leak location registered on GIS



CASE STUDY: DMA 1060



CASE STUDY: DMA 1060



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3/21/2014 2:15:24 PM Monitoring Dashboard > DMA Daily Control - Net > Combined Graph - DMA

Combined Graph - DMA

Initial Date 11/25/2008 Min (Y1) 0

Final Date 3/13/2009 Max (Y1) 180

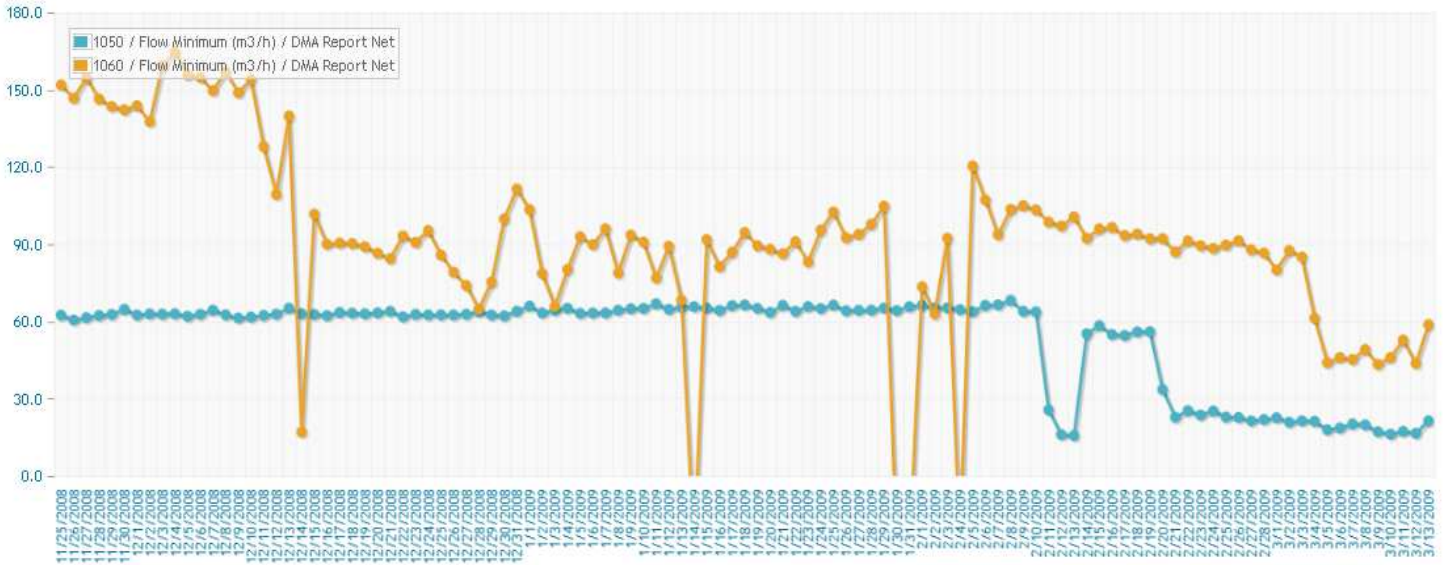
REFRESH Export EXCEL

DMA / Indicator / Report

1050 - Alcântara à São J | Flow Minimum (m3/h) | DMA Report Net

1060 - Vale de Alcântara | Flow Minimum (m3/h) | DMA Report Net

Tuesday, November 25, 2008 - Friday, March 13, 2009



Leak reduction in two DMAs paid for entire DMA project for whole city in 3 years!

110 m^3/h

50 m^3/h

1.4 million m^3/year

NON-REVENUE WATER REDUCTION SUCCESS

Cumulative savings of around 135 million m³ since 2005

		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
NRW	(l/conn/day)				582	518	488	367	350	325	270	226	174	142	143
	(%)				23.5	20.2	17.2	14.8	13.5	11.8	10.0	8.7	7.9	8.1	8.7
Real Losses	(ILI)				9.6	8.5	7.7	6.0	5.7	5.2	4.4	3.6	2.8	2.4	2.4

- Impact of Network Rehabilitation & Active Leakage Control
- Enhanced network management & control
- Positive results across all performance indicators
- Improved Resilience & greater know-how created within EPAL

KEY CASE STUDY RECOMMENDATIONS

Provoke a **cultural change** at all levels and areas, **adapting to new concepts of management**

Build **water loss control capacity**, both **physical infrastructure** and sufficiently **trained staff**

Acquire and retain **empirical knowledge** of the company's network within the organisation

Success achieved by creating a **dedicated water loss control team**, supported directly by management, with **resources and responsibility** over fundamental factors;

- DMA planning, implementation and subsequent management
- Maintenance of DMA meters, telemetry and boundary valves
- Active leak detection
- Data management software with KPIs focused on water loss assessment

Consider the correlation between **DMA size** and potential **achievable water loss reduction**

Water loss control concepts are well-known, the **challenge of sustainably managing** such systems over the long-term with **constant vigilance is the key goal**

Common-sense solutions, Smart People…

wone.epal@adp.pt +351 21 325 1396 www.epal.pt

EPAL

sharing Water Solutions