State of Palestine

Palestinian Water Authority

NON-REVENUE WATER REDUCTION STRATEGY

Final Draft

Table of Contents

Contents

Abbreviations

AFD	Agence Française de Développement (French Development Agency)
EC	European Commission
MEQ	Ministry of Environmental Quality
GOI	Government of Israel
ICA	Israeli Civil Administration
IWRM	Integrated Water Resources Management
JSC	Joint Service Council
JWC	Joint Water Committee
JWU	Jerusalem Water Undertaking
MOA	Ministry of Agriculture
MOF	Ministry of Finance
MOH	Ministry of Health
MOJ	Ministry of Justice
MOLG	Ministry of Local Government
MOPAD	Ministry of Planning and Development
MOPH	Ministry of Public Works and Housing
NGO	Non-governmental Organization
NWC	National Water Council
ORGUT	Consortium led by ORGUT Consulting AB, also including Finnish Consulting Group Ltd. and Palestinian Wastewater Engineering Group
PIU	Project Implementation Unit
PMU	Project Management Unit
PNA	Palestinian National Authority
PSC	Project Steering Committee
PWA	Palestinian Water Authority
PWEG	Palestinian Wastewater Engineers Group
RCU	Reform Committee Unit
RSC	Reform Steering Committee
SIDA	Swedish International Development Cooperation Agency
TOR	Terms of Reference
TPAT	Technical, Planning and Advisory Services
WB	World Bank
WBWD	West Bank Water Department
WRM	Water Resources Management
WSSA	Water Supply and Sewerage Authority

Executive Summary

Introduction

Non-revenue water (NRW) is water which is supplied (produced and purchased) but not paid for, including technical losses (leakage), not billed water, Illegal connections, poor water meter performance and inaccurate reading and accounting of metered flows. The impacts of NRW are the loss of scarce resources and financial revenue in a cash strapped water sector.

The extent and delineation by type of NRW in Gaza and West Bank is not accurately measured, however if existing estimates are of the right order of magnitude, an average of 38% of total supply or 285 litres/property/day is lost. This is unacceptable and the PWA has a policy to drastically reduce NRW by 2020.

NRW reduction projects have been, and are being carried out by several service providers and proposed strategies have been discussed with providers who have been successful. A part of this strategy is to utilise the national forum within the Union of Service Providers to utilise existing knowledge and transfer successful techniques to all service providers.

Proposed Strategies

Continued NRW reduction programmes are expensive and the proposed strategies are designed to target NRW reduction in the most efficient way. As an illustration as to the costs which should be weighed against the benefits, initial estimates indicate a reduction of NRW from 38% to 35% represent and increased revenue of $40 million over ten years.

Proposed strategies are designed to find the extent; category and location of non revenue water, and then devise prioritised plans which represent the cheapest way to achieve reductions these include the following steps & processes:

- Install metering & ancillary works required for effective water accounting
- Complete high level audits, benchmark service providers, develop national priority list(s) of target areas
- Detailed investigations to define NRW by category
- Develop national priority action plans, dedicate funding & implement NRW reduction plans
- Ongoing reporting and NRW projects, national forum and NRW working group, public awareness and education campaigns.

To implement this process will require the ongoing input of the following organisations:

- Dedicated PWA team to manage the national strategy; – (Does not currently exist)
- National NRW forum for the exchange of information – (Exists within National Union of Service Providers but requires representation of all service providers)
- Dedicated NRW practitioner teams – (Exists within some large providers, roving teams required to help smaller service providers)

1 Introduction

1.1 Definition and Impacts

Non Revenue Water (NRW) can be described as water which is supplied (produced and purchased) but not paid for. NRW can be broken down into several categories, technical losses (leakage), not billed water, Illegal connections, the poor meter performance of bulk and revenue meters and inaccurate reading and recording of water meters. Strictly speaking non payment of bills is not NRW, however since increased collection ratios form part of the same management strategies for a reduction in NRW it has been included in the strategy.

The positive impacts of NRW reduction are greater access to scarce resources and increased financial revenue to a cash strapped water sector leading to a more efficient and sustainable sector and improved service to the customer. Illegal connections mean that honest customers pay for the water which is stolen which is unfair. Increased access to water in the commercial sector creates more business opportunities and can lead to the creation of valuable jobs.

1.2 NRW National Policy and Objectives

The PWA aspires to greatly reduce current levels of NRW by 2020, and has included policy statements within (Draft) 2012 Water Policy which states that it is the National Policy to:

- "Ensure that optimal use of water resources is a priority, including the allocation of public funds by encouraging efficient performance."
- "Encourage water service providers to reduce the quantity of non-revenue water to increase the availability of scarce sources to customers, increase their operational efficiency to progressively meet national targets."

1.3 Existing Situation

The extent and delineation by type of NRW in Gaza and West Bank is not accurately quantified. However the estimates included in the paragraph below indicate that the levels of NRW are unacceptable.

Average levels of NRW in Gaza and West Bank, excluding non-bill payment, within distribution supply zones is estimated at 38%, 285 litres/property/day (l/p/d), 48 litres/capita/day (l/c/d). The highest levels of NRW in the West Bank have been identified in Jericho and Bethlehem 290 l/p/d or 53 l/c/d and by percentage, Tulkarm at 40% (162 l/p/d or 31 l/c/d). In Gaza, estimates of NRW range from 64-87 l/c/d, 440-475 l/p/d. Estimated figures of NRW for the trunk mains operated by the West Bank Water Department vary between 10% and 25%. None of the estimated figures for NRW have been split between technical and other types of loss such as illegal connections.

Until sufficient, accurate and verified data is gathered and reported in a similar format it is difficult to assess the true extent of the problem and efficiently target funding to reduce the level of NRW experienced.

Bulk supplies purchased from Mekerot are paid for from taxes retained by the Israelis. Sales of bulk water to municipalities and other distribution service providers are often below cost price and remain unpaid. Domestic collection ratios in the West Bank range from 60-90%, and the knock on

effect is that bills for bulk water remain unpaid. Non payment is not restricted to those who are unable to pay.

1.4 Strengths and challenges

Implementation of a NRW reduction strategy brings many organisational and practical challenges; however we must recognise that NRW projects are not new to Palestine and that there are success stories and lessons to be learned from those service providers who have in the past and continue to address this problem.

Strengths

- The National Union of Service Providers has an existing forum to discuss NRW planning
- There are ongoing successful NRW projects with some larger service providers who can offer both practical administrative and practical advice on best practice to others

Challenges

Challenges to solving the problem of NRW include

- The PWA has insufficient manpower to promote, monitor a rigorous NRW reduction campaign
- The National Union of Service Providers does not include many small service providers and its forum is limited to information exchange
- Smaller service providers could not afford dedicated teams to set up and implement NRW schemes and a national team, offering practical advice and help them is not available
- Gaining the funding required to implement the strategy

Further challenges include:

- Rapid urbanization
- Increased the water demand & diminishing water supply
- Inadequate operation and maintenance policies
- Political, cultural and social influences

1.5 Proposed Strategy

The proposed strategy to reduce NRW is applicable to both bulk and distribution water service providers. The objective of the strategy is to develop assess levels and type of existing NRW, set targets and then enable service providers to progressively achieve the. The strategic objective is not for purely economic benefits since it includes reducing NRW to increase available scarce resources where they are inadequate.

Projects designed to reduce NRW can be phenomenally expensive and, if the problem or extent of the problem clearly defined and located, waste lot of money with little benefit. The proposed strategy is designed to target the reduction of NRW in the most cost efficient manner. However it should be noted when examining the investment required that a reduction in 10% of total estimates of the existing NRW represents in excess of $5M/yr increased revenues, or a net present saving of over $40M compounded over 10 years.

The problems of NRW are recognised nationally and NRW reduction projects have been, and are being carried out by several service providers. A part of this strategy is to set up a national forum where existing knowledge and successful techniques of NRW can be transferred those service providers who have been successful in NRW reduction.

The strategy is divided into two parts:

Part 1: Investigating and Assessing Water Losses (Sections 3-5)

Part 2: Planning and Implementing the Strategy (Sections 6-7)

2 Strategy Overview

2.1 Process

The strategy to reduce NRW is broken down into the following steps to achieve its objectives:

- Assess works and funding required for effective water accounting, (meters, zones etc.)
- Allocated funding and complete enabling works to allow effective water accounting
- Complete 1st level audits and benchmark service providers
- Develop national priority list(s) of target areas based on the audit results
- Allocate funding and complete detailed 2nd level investigations & audits by priority
- Develop national priority action plans, dedicate funding and implement action plans for NRW reduction
- Ongoing reporting and NRW projects
- Ongoing national forum and NRW working group
- Ongoing public awareness and education campaigns

2.2 Organisational Requirements

To complete the strategy the following organisational set up and teams are required:

- Dedicated PWA team to manage the national strategy; including approval and allocation of funding, monitoring, regulation and liaison with service providers **– Does not exist**
- National NRW forum including the PWA and service providers – **Exists within National Union of Service Providers**
- Dedicated NRW practitioner teams for larger service providers – **Exists within some providers**
- Dedicated national NRW practitioner team to work with smaller service providers and provide training **– Does not exist**

2.3 Priority of Actions

The implementation of investigations and NRW is expensive and investment must be maximised to the greatest effect and will be prioritised by area according to two parallel criteria included below:

- **Priority List A** - Including those areas where a reduction in NRW will dramatically increase the volume of water available to legitimate users, but are not necessarily those which will contribute best to the achievement of national targets, prioritized by:
  - Areas with the least water available to the consumer and greatest NRW by volume per capita.
- **Priority List B** - Those areas with highest NRW by volume prioritized by:
  - Estimated cost/m^3 reduction in NRW

Part 1: Investigating & Assessing Water Losses

3 Enabling Works

To reduce levels of NRW it is fundamental that the scale of the problem is defined; and that the location of areas with the highest levels of NRW can be identified. This can only be achieved if we have a sufficient and accurate method to account for inflow and outflow from distinct bulk and service water supply systems of sufficiently small size to pinpoint problem areas. The costs of installing or replacing the additional meters required for this purpose and carrying out the initial quantification are not insignificant. Service providers are required to requests for funding for the works required for this purpose. The services of the PMU will me made available to assist in the preparation of tender documents and supervision of works installation if required.

3.1 Bulk Service Providers

Bulk water service providers should ensure that correctly sized and calibrated meters, capable of recording instantaneous and bulk flow are installed at the source or at the point of purchase of bulk water (e.g. Mekorot), take-offs from the main, in and out of mass storage reservoirs (e.g. Halhul), balancing tanks and pump stations and at the point of purchase of external sources.

Bulk water service providers to replace incorrectly sized meters and those incapable of recording instantaneous flows and ensure that all existing meters are calibrated meters.

3.2 Distribution Service Providers

Distribution water service providers should ensure the correctly sized and calibrated flow meters, capable of recording instantaneous and bulk flow are installed at the point of purchase of bulk water, in and out of reservoirs and at booster pump stations.

Distribution networks should be sub-divided into discreet metered zones, district metered areas, with correctly sized meters capable of accurately measuring bulk & instantaneous flows, (minimum night & estimated peak flows). It is however recognised that due to the design of existing networks it is not always possible to install fully dedicated district metered zones and that instead it may be required to install leakage control zones to be utilised for specific testing for NRW.

Distribution service providers should ensure that customer revenue meters are installed at all points of sale, including all consumers, municipal and religious buildings. Service providers shall replace old and inaccurate meters.

3.3 Actions

- **PWA NRW team** prepare standard reporting format
- **Service Providers** prepare plans enabling works plans indicating metering requirements (bulk and customer), zoning requirements (valves & network configuration) including costs and submit to the PWA.
- **National NRW team** work with smaller service providers to prepare to prepare enabling works plans
- **PWA NRW team** collate, analyse and approve plans and request funding for enabling works if required.

- **PWA NRW team** apply for funding and prioritise allocation of funding
- **Service providers** prepare procurement documents, tender and implement enabling works
- **Training for the staff of all of the teams (PWA, National and Service provider team)**

4 Level 1 Audits, Benchmarking

4.1 Audits

Due to the overlap between customer meter reading and billing periods short term water balances by distribution service providers can be misleading and distort findings; however this is not the case for bulk service providers who can carry out this balance over much shorter periods. Therefore, further to the completion of any additional metering requirements the following tasks should be completed:

Bulk water service providers should initially provide 3 monthly reports, for the systems he is responsible for, to the PWA including:

- A mass balance of metered purchased water versus water delivered to service providers
- A clear comparison of metered sales versus bills paid by distributions service providers
- A clear comparison of metered purchases by the bulk service provider versus bills paid by the bulk service provider

Distribution water service providers should initially an annual report to the PWA including a mass balance of purchased water versus water delivered to customers as a total and within for each system they are responsible for. The report should clearly identify both bulk flow discrepancies and where service providers have failed to pay their bills.

4.2 Benchmarking

The initial findings of the 1st level audits for all service providers will be collated in a single report and used to benchmark service providers for examination of progress in the reduction of NRW.

In addition to benchmarking, the reports from the 1st level audits will be used a broad analysis of potential causes and initial target setting, nationally and for individual service providers. They will be further used to develop a priority plan for further detailed investigations to target those areas where NRW reduction will have the greatest effect in a) increasing available resources and b) prioritising the use of limited funding to the greatest effect.

4.3 Actions

- **PWA NRW team** prepare standard reporting format
- **Service Providers** carry out mass balance and metered sales v's bills paid audits
- **Service Providers** prepare report and submit to PWA
- **National NRW team** work with smaller service providers to carry out audit and submit report
- **PWA NRW team** collate, analyse, prepare national level report and set outline targets.
- **PWA NRW team** prepare prioritised plan for further investigations

5 Targeted Investigations

After the completion of 1st level audits, benchmarking and initial target setting, further investigations are required to try and differentiate between the sources of NRW and quantify them by category. These investigations can be expensive and should be prioritised by area according to two parallel criteria included in Section 2.3 Priority of Actions.

These investigations achieve best results in understanding NRW for different categories of loss, technical, illegal connections etc if the enabling works described in Section 2 are complete.

5.1 Accounting & non-payment

Investigation of NRW due to due to accounting/meter reading errors and non-payment of bills will be fully carried out immediately upon the completion of the level 1 audit as an immediate priority since they involve little cost in comparison to physical investigation of technical losses and illegal connections.

5.2 Technical & Illegal

These investigations can include night time “drop testing” of reservoirs, measurement of minimum night flows, logging of diurnal flow patterns, to assess the ratio of technical to other losses.

Differentiating between these types of losses and location can be notoriously difficult, especially in rural areas, where illegal connections can be made unobserved, or illegal storage is filled at night or irrigation carried out night. Care must be taken to avoid misleading results in areas where supply is irregular and supply systems and roof tanks are being re-filled at night.

5.3 Actions

- **PWA NRW team** prepare standard reporting format
- **Service Providers** prepare detailed investigation plan with costs and submit to PWA
- **National NRW** team work with smaller service providers to prepare investigation plans
- **PWA NWR** team approve plans if funding is required
- **Service Providers carry out investigations and prepare reports**
- **PWA NRW team** collate, analyse, prepare national level report and detailed targets.
- **PWA NRW team** prepare prioritised plan for NRW reduction programme of interventions

Part 2: Planning and Implementing the Strategy

6 Interventions

6.1 Good Management Practices

Although good management practices by service providers are not direct interventions to reduce NRW they are fundamental if there is to be an effective ongoing campaign to reduce losses. Where these are not in place they can take years to put in place. Good management practices include:

Asset management & operational planning including:

- Maintenance plans
- Emergency maintenance plans
- Network Operation management, minimizing network pressure
- Asset rehabilitation and capital replacement plans

Information management, correlation and analysis including:

- On-going water audits (included above)
- Asset records and record maintenance including age, material, asset details
- Asset maintenance records
- Burst records and repair times
- Records of available spare parts
- Records of customer complaints

6.2 Accounting & non-payment

Investigation of NRW due to due to accounting/meter reading errors and non-payment of bills can be carried out immediately upon the completion of the level 1 audit as an immediate priority since they involve little cost in comparison to physical investigation of technical losses and illegal connections.

Accounting/meter reading errors can be reduced by setting simple systems which provide quality assurance on both the methodology and processes of water accounting and which provide checks on the meters which have been read.

A reduction in the non payment of bills can present difficulties, as described in Section 1.3 and there no unique solution. Methods for increasing bill collection ratios could include the following:

- Giving incentives to service provider employees based upon improved collection.
- Offering customers in arrears a payment plan to gradually their debts
- Regular phone calls to customers who have not paid their bill to ask for payment
- Visiting customers' properties to ask for payment

- Pre-paid water meters for customers who consistently don't pay
- Public awareness campaign stressing the importance of payment
- Surveys to find out reasons for non payment
- Fine customers who consistently don't pay (as example after 2 or 3 bills)

6.3 Illegal Connections

Interventions to locate and reduce NRW due to illegal connections should include the following processes:

- Analysis of water use
- Physical investigations

Analysis of water use from metered records can reveal anomalies which lead to the location of illegal connections. This analysis should include properties with no record of connection and those which demonstrate consistent low use of water compared to others.

Physical investigations should include visiting properties with no record of connection, or with consistent low use to investigate the reason. In rural areas along long lengths of bulk supply mains where illegal use is suspected, service providers need to physically travel along the mains and investigate where customers get their supply. Illegal connections may be directly from supply mains or tapping from service connections where the property is some distance from the supply main.

6.4 Technical Losses

Technical losses, even when areas of high losses have been located can be difficult and expensive to mitigate. Sometimes the location of a broken pipe, causing large losses, can go undetected for years, since the water may simply disappear into the ground. There are many causes of technical losses, high pressure, badly installed pipes and service connections, an aging network, poor choice of network materials, a lack of maintenance etc. Interventions to mitigate this require dedicated teams and an ongoing sustained effort.

This strategy does not intend to describe in detail the technology and physical methodology which should be utilized to reduce technical losses as these will form part of the service provider planning and should be included as training requirements for service providers if those skills are not available.

In addition to the good management practices described for asset management & operational planning and the management, correlation and analysis of data, it is essential that service providers develop on-going leakage detection and maintenance plans based to deal with losses and that they assign specific capital and manpower budgets for the work required. It is especially important that these plans target the most cost efficient methods to deal with this based upon the value of NRW reduction.

Locating specific problems utilizing analytical and technical investigations is only one part of the solution and can be expensive in terms of manpower. Since the number of customers is much greater than operational staff a recommended strategy is to encourage members of the public to report problems which indicate leakage to the service provider and then responding to those reports

quickly. This requires specific and on-going public information and awareness campaigns and the organizational framework to address the issues as they arise.

6.5 Actions

- **PWA and Union of Service Providers working together to develop & share good management practices**
- **PWA NRW** team prepare standard reporting format for progress on NRW reduction
- **National NRW team, PWA NRW team and Union of service providers** work together to develop best practice manual and assess training requirements and budget requirements to implement training
- **Service providers** implement NRW reduction plans and report progress to PWA NRW team
- **PWA NRW team** collate national data, report progress and adjust targets

7 Maintain & Improve Strategy

Implementation of NRW reduction schemes is only the first step, albeit a very important one. One-off NRW reduction schemes can show great results and it is very easy to sit back and admire our success and for the initial enthusiasm to die to down while NRW levels creep up to former levels.

It must be stressed that the only way to tackle NRW is to have continued active ongoing campaigns. Campaigns need to be built into annual service provider plans and the results reported and monitored at a national level.

This requires specific and on-going public information and awareness campaigns and the organizational framework to address the issues, if possible, before they arise.

This should include at a minimum

- Customer metering policy including typing of customer meters, meter replacement
- Regular checking of bulk meter accuracy
- Active leakage control by regular survey and leakage monitoring in the zones or district metered areas, including physical investigations (e.g. sounding sticks)
- Ongoing replacement of old and leaking pipes
- Checking for illegal customers
- Revision of tariff structure policy if required to address high use of water where supplies are limited
- Regular meetings of the NRW forum to discuss and transfer best practice
- Continued training and improvement in detection techniques
- Continued public education to the value of water

8 Next Steps

The next steps which are required are to implement the strategy. Successful implementation will rely upon strong ownership of PWA and service providers and financial & technical support. Ownership of the strategy needs to be backed up by regulations so that the PWA has a defined mandate and service providers are obliged to act. This cannot take place until the current reforms to the water sector are in place. This should not stop us starting the process immediately.

8.1 Step 1 – Set up PWA NRW Team

Step 1 is to set up a dedicated PWA Non-Revenue Water Team. This core team should consist of a minimum of 6 full time persons split between Gaza and the West Bank including:

- Team Manager & Deputy Manager (2)
- NRW specialists/data managers (2)

Additional requirements include

- Transport and drivers as required
- Dedicated equipped office space

8.2 Step 2 – Set up Systems and Train PWA NRW Team

The NRW team will require training and support to set up the formats and systems required to implement the strategy.

8.3 Step 3 – Engage Service Providers

Step 3 is to engage the service providers and explain the strategy to them, their responsibilities and the steps to implement the strategy. This will require a series of workshops and help from other departments within the PWA. Feedback from the workshops will help define the extent of technical help required by smaller service providers and the make up and size of the NRW Practitioner Team.

8.4 Step 4 – Set up NRW Practitioner Team

Step 4 is to set up the NRW Practitioner Team, who will be required to give the technical advice and help to the smaller service providers to implement the strategy. It is envisage that this team, or teams, will be from the private sector. The PWA NRW Team will need to prepare detailed terms of reference for the practitioner team, apply for the funding required to operate the team and procure their services. The services of the PMU will me made available to assist in the preparation of tender documents and supervision of works installation if required.

8.5 Step 5 – Implement the Strategy

Step 5 will follow the processes defined in Sections 3 to 6 of the Strategy

Appendices

Appendix 1 Role of PWA NRW Team

The role of the dedicated PWA team, in addition to those described in the previous sections of the strategy, is to work with the service providers to provide a national platform for the planning and implementation of the national Non-Revenue Water Reduction Strategy and to monitor the progress of the implementation of the strategy. In the future their role will be to regulate service provider's performance regarding levels of NRW. This team does not include the NRW Practitioner team discussed in the strategy.

Detailed tasks to be carried out at each stage of the implementation of the strategy will include:

A1.1 Enabling Works

- Prepare a standard reporting format, and explanatory document for the preparation of enabling works plans.
- Distribute the reporting format to service providers and hold workshops on how to complete them and assess which service providers require help preparing enabling works plans by NRW practitioner team.
- Check, collate and compile enabling works plans, develop prioritised list and help with applications for any funding requirements.
- Monitor progress on the implementation of enabling works

A1.2 Level 1 Audits – Benchmarking

- Prepare a standard reporting format, and explanatory document for the completing the audit and preparation of audit reports.
- Distribute the reporting format to service providers and hold workshops on how to complete the audit and report. Assess which service providers require help to complete the audit by NRW practitioner team.
- Help with applications for any funding requirements for the audit.
- Monitor progress on the audits and reporting.
- Check, collate and compile completed audit reports
- Develop prioritised plan for further investigations.

A1.3 Detailed Investigations

- Prepare a standard reporting format, and explanatory document for the completing the detailed investigations and preparation of investigation reports.
- Distribute the reporting format to service providers and hold workshops on how to complete the investigations and report. Assess which service providers require help to complete the investigations by NRW practitioner team.

- Help with applications for any funding requirements for the investigations.
- Monitor progress on the investigations and reporting.
- Check, collate and compile completed investigation reports
- Develop prioritised list for NRW interventions

A1.4 Interventions

- Work with service providers to develop a short practical manual on good management practices to be use by smaller service providers
- Prepare standard reporting format for monitoring progress on NRW reduction
- Check, collate and compile completed progress reports, develop prioritised list for further help required
- Prepare funding applications where required for the implementation of NRW reduction plans

Appendix 2 NRW Practitioner Team

The exact make up and tasks required of the required NRW Practitioner Team cannot clearly be defined until the capabilities of the service providers have been assessed. The tasks which the practitioner team are likely to be asked to provide advice or carry out on behalf of some service providers include:

A2.1 Enabling Works

Preparation of enabling works plans including:

- Design of district meter areas (DMA) of leakage control zones, DMA manual development and schematic development
- Checking existing meters
- Preparation of enabling works plans
- Procurement and installation of bulk & customer meters, valves and ancillary works
- Meter commissioning & checking DMA integrity
- Customer tagging

A2.2 Level 1 Audits – Benchmarking

- Completion of level 1 audits and report preparation
- Completion of the audit and report preparation

A2.3 Detailed Investigations

- Development of detailed investigation plans
- Completion of investigations including isolation, peak flow testing, minimum night flow tests
- Completion of investigation reports

A2.4 Interventions

- Development of good management systems
- Development of detailed intervention plans
- Implementation of intervention plans including leak detection and repair & procurement of other works required e.g. system refurbishment, pipe replacement etc.
- Preparation of progress reports

A2.5 Training & Development

Continuous training and development to service provider staff during the implementation of NRW reduction works including both class room and on-the-job training, examples of the type of training which may be required include:

- Data Loggers - Setting up, downloading & analysis
- Flow Meters - Installation, setting up & maintenance
- Leakage Equipment - Functionality & maintenance
- Leakage Detection - Step testing & sounding techniques
- Flow Balancing - Design, undertaking & analysis
- Flow Meters - Installation, setting up & maintenance
- PRVs - Installation, setting up & maintenance
- Data Loggers - Installation
- Leakage Detection - Step testing, sounding & night work
- DMA Establishment - Isolation testing & customer tagging
- DMA Analysis - NRW, leakage & ILI