



Partners for Water and Sanitation

Note on project reports

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**Partners for Water and Sanitation
Project No: 36 Eth**

Leakage Detection & Management Training

Submitted by:

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Training Support Report on Leakage Detection and Management /13th to 15th Jan, 2009/

1. Background

The Leakage Strategy Development Support to MoWR was one of the support programs that identified and commenced after a MoU was signed with the MoWR in August 2006. Based on this MoU, a series of assessment visits were conducted by PAWS UK partners. A visit was conducted by Eddie Moir and Steve Snape of United Utilities in January and February 2007 to various selected towns of the Country.

Alongside assisting the Ethiopian Federal MoWR in its effort to develop the Leakage strategy, the above assessment identified that there were critical gaps in the areas of town Water supply and Sanitation Utilities to undertake Leakage Detection and Management activities. In addressing this, the 1st LDM training was conducted in Adama town with 50 participants from the MoWR, 20 towns of the country and an International NGO. This first training support was appreciated by the participants and proposed to be delivered to other towns in the country where ever possible. This opinion was also appreciated by MoWR and a further training demand was forwarded to PAWS for further action.

2. The 2nd Phase Leakage Detection and Management Training

Based on the experience gained from the 1st phase training in Feb 2008, a well organised 2nd phase workshop was held during 13th to 15th Jan, 09; conducted by Eddie and Steve. Considerable progress was observed over the 1st training / workshop.

Although the general format was the same as the 1st workshop, some improvements, additions and alterations were made, where necessary, to ensure the content was fully appropriate.

The workshop was again delivered using two methods, with two days theoretical training supported by a days practical session. The suitability of the training centre that was chosen for the workshop contributed to the success of the event.

A number of presentations were delivered to promote debate and raise awareness regarding the importance of safe water. The participants were encouraged to work in small groups to discuss and assess Ethiopian water network management issues. Each group then presented back to the workshop, where possible solutions were raised. (Although, how to prevent hyenas from chewing through MDPE mains is not a problem often encountered in the UK!) Further presentations and discussions on leakage strategy, leakage determination and network management using district metering completed the first day.

Practical demonstration in the use of the basic acoustic listening device (listening stick) and an electronic equivalent were conducted around the training facility on day two. Further presentations were made on pressure management, network components and materials and leakage detection equipment.

In the afternoon, participants completed an exercise to design a step test, using plans of a small UK district meter area.

The third day was spent carrying out practical exercises using the test rig constructed by Addis Ababa Water and Sanitation Authority (AAWSA). It would be worth mentioning here that the Ethiopian Red Cross Society Training Centre has cooperated a lot both to facilitate the logistic aspects and also in allowing us to use their compound for installing the test rig for the practical demonstration purpose.

During the exercises, the two technicians from AAWSA discussed their experiences of actual leakage detection and repair. This greatly reinforced the training programme and was valued by all.

The test rig was utilised to simulate and then locate various leaks. The final practical exercise saw the participants design and conduct step tests on the rig, before analysing the data gathered.

Unfortunately, there was no electronic leakage detection equipment available for demonstration as AAWSA, who promised to supply us with LDM equipment didn't maintain its promise. Due to the heavy weight and bulkiness of such equipment it was also not possible to transport such items from the UK for this purpose. However, the assistance and cooperation we received from Saris branch office of AAWSA was very commendable as they assisted us both in installing the test rig and also in sharing their experience.

There were a total of 39 participants, of which 31 came from 21 towns in the country, 6 from MoWR and the remaining 2 from WaterAid Ethiopia.



Picture 1: Class Exercise on Step Testing




Picture 2: Discussion on Test Rig layout



Picture 3: Leakage Detection practical Demonstration

3. Course Evaluation

All candidates were provided with a course evaluation sheet. The results of this are summarised in the table below:-

	Average score	% Strongly Disagree	% Disagree	% Slightly Disagree	% Tend to Agree	% Agree	% Strongly Agree
Quality of the training facilities	4.92	4	4		25	21	46
Relevance of the course	5.05			5	19	40	36
Usefulness of the material and issues and currency	4.17	8	8	8	31	22	23
Relevance to the participants needs	5.38		2		14	24	60
Quality of Course (learning encouragement)	5.36				16	31	53
Objectives fully addressed	5.00	2		11	11	34	42
Engaged the participants	4.73	2		11	27	27	33
Suitable duration	4.51	6	5	11	14	28	36
Quality of the course	4.95			13	21	24	42
Relative to other training received this course was superior	5.08			5	21	34	40
Response and encouragement of the instructors	5.24			10	10	24	56
Knowledge of the instructors in the course	5.42			7	8	19	66
Instructors respect	5.50			2	14	16	68
Organised and prepared (instructors)	5.42			2	14	23	61
Ideal pace of instruction	5.47			2	8	29	61
Questions scored from 1-6							

Participants did comment on the lack of electronic equipment for demonstration. However, the effectiveness of this would have been diminished if the equipment was not readily available immediately after any instruction on use.

A number of participants have suggested the need for training and support to continue. This should be considered using existing “in country” training and education organisations. The potential to second experienced personnel from the Addis Ababa Water and Sanitation Authority and Adama Water Authority could be explored, to assist with future training.

Finance or external aid to enable the purchase of basic leakage detection equipment is required to facilitate full implementation of the training received.

In general, the preparation for the workshop was greatly improved, compared to the previous training. This could be expressed in terms of the following issues:

- Adequate workshop/training documents were captured in a CD drive and made available and distributed to the participants.
- Workshop banner prepared to show the significance of the training.
- A well designed certificate of participation was prepared and awarded to each participant.
- The workshop feedback was collected from the participant through well designed course evaluation format as summarised above.

- The workshop has contributed a lot in raising the PAWS profile as the event has got adequate press release both on Ethiopian Television and Press. The press article released on Ethiopia TV as shown in **Annex 3**.
- The workshop has paved the way for linking up the PAWS effort with WAE, particularly in Urban Water Supply and sanitation sector.



Picture 4: Group photo after completion of the Training

4. Conclusion

The course was, again, extremely well received by all participants. They conducted themselves both professionally and with great courtesy throughout the three days making presenting and training an honour and pleasure.

All candidates demonstrated a commitment to the industry and improving public access to safe water supplies. We feel confident that, with appropriate support, they will endeavour to implement an appropriate variation of the leakage strategy, which was discussed during the event, in their individual towns.

The workshop has now been successful on two occasions. The training material is relevant in Ethiopia and the basic methodology can be incorporated into each water authority's network management strategy. To move this project forward a link up to an Ethiopian technical college or university should be explored. The course would require further development, with possible additional modules such as water quality, asset management and operation, customer service, etc.

We feel the Ministry of Water Resources need to lead future project development with PAWS support. At present, our understanding is that they believe their role is to facilitate PAWS work.

The short wrap up meeting that conducted with Ato Yohannes Gebre Medhin, the head of Water Administration, Urban Water Supply and sanitation Department of the

MoWR, has indicated the way forward. In line with this, the PAWS assistance in the development of the user friendly manual for Leakage Detection & Management was requested.

Finally, in respond to WAE's demand for technical assistance on behalf of the Black Lion Hospital, the PAWS UK team together with the PAWS CM and an engineer from WAE paid visit to the site and have offered a technical assistance in their effort to alleviate the critical problems they faced in their Water Supply Systems and Sewerage network. The brief report of this technical assistance that offered by the UK team is attached as **Annex - 4**.

Annex 1: List of Participants for LDM Training

No	Name	Organisation/Town	No of Participants	Total by Region
1	Nigusie Lemma	Ministry of Water Resources	6	6
2	Tilahun Asmare			
3	Tesfaye Ashagrie			
4	Ephrem Legesse Zewdie			
5	Tsegaye Telila			
6	Tesfaye Emiru			
7	Zelalem Wegari	Water Aid Ethiopia	2	2
8	Ibrahim Mohammed	Zeway Water Supply Utility (WSU)	2	Oromiya /2/
9	Mesfin Abera			
10	Fithanegest Birhane			
11	Ahmed Mohamed Abdi	Degahabour WSU	2	Somali /4/
12	Nimo Ali Ahmed	Kebre Dahar WSU	2	
13	Abdiwali Mohamed Tahir			
14	Mahamud Mahamed Abdi	Axum WSU	2	
15	Yebrah kinfe			
16	Getachew Birhane	Adwa WSU	2	Tigray /5/
17	Gebre Egzeabeher Tesfay Abera			
18	Birhane Fisseha Teklu			
19	Getachew Gebray	Shire	1	Afar /2/
20	Yonas Berhe	Ssemera WSU	2	
21	Ahmed Hussen			
22	Mihret Zewdie	Bahir Dar WSU	1	Amhara /7/
23	Tilahun Azage	Kemise WSU	1	
24	Desalegn Hizkyas	Debre Tabor WSU	1	
25	Zelege Abegaz	Burie WSU	1	
26	Oumer Ibrahim	Debre Marikos WSU	1	
27	Sibhat Dessie	Woreta WSU	1	
28	Gebre Medhin Tesfaye	Sekota WSU	1	
29	Solomon Fisseha	Dire Dawa WSU	2	
30	Abduselam Ahmed Osman			
31	Siyoum Lengisho	Yirgalem WSU	1	SNNPR /2/
32	Abebaw Solomon Mergia	Wolkitie WSU	1	
33	Mulugeta Kebede	Assossa WSU	1	Benishangul Gumuz /1/
34	Oman Okelo Alero	Gambella WSU	2	Gambella/2/
35	Belete H/Giorgis K/Wold			
36	Daniel Belay Chanyalew	Harar WSU	2	Harar/2/
37	Kalid Alhamid			
38	Tariku Tadesse	AAWSA	2	Addis Ababa /2/
39	Yidnekachew Abebe			
Total			39	

**Annex 2: Leakage Detection & Management Workshop Support
Visit Agenda (13th to 15th January, 2009)**

Day 1 (13th January, 2009)

Date	Time	Activities	Presenter/responsible person	Facilitator(s)	
13th January, 2009	8:30 – 9:00	Registration	Organisers	Organisers	
	9:00 – 9:10	Introduction to the objectives & plan of the day	Ato Melkamu Jaleta	Organisers	
	9:10 – 9:20	Welcome address	Ms Sarina Prabasi	Ato Gulilat Birhane	
	9:20 – 9:30	Key Note Address	Ato Yohannes G/Medhin	Ato Gulilat Birhane	
	9:30 – 10:00	Introduction and background to the LDM	Eddie Moir	Steve Snape	
	10:00 – 10:30	Who are United Utilities	Eddie Moir	Steve Snape	
	10:30 – 11:00	Coffee / Tea Break			
	11:00 - 11:30	Leakage History	Eddie Moir	Melkamu Jaleta	
	11:30 – 12:15	Groups Discussion – Overview Water Supply and Leakage situation in each individual town (3 groups)	Participants in 3 groups	Melkamu, Eddie & Steve	
	12:15– 13:00	Group Presentation & Panel discussion on the findings	Group Reporters	Eddie & Steve	
	13:00 – 14:00	LUNCH BREAK			
	14:00 -15:00	Network Management & Leakage Strategy (NMLS)	Eddie Moir	Steve Snape	
	15:00 -15:30	Panel Discussion on the presentation of NMLS	Participants	Eddie Moir & Steve Snape	
	15:30 -16:00	COFFEE / TEA BREAK			
	16:00 – 17:00	Leakage Determination and Detection (LDD)	Eddie Moir	Steve Snape	
	17:00 -18:00	Panel Discussion on the presentation of LDD	Participants	Eddie Moir & Steve Snape	

Day 2 (14th January, 2009)

Date	Time	Activities	Presenter/responsible person	Facilitator(s)	
14th January, 2009	8:30 – 8:45	Registration	Organisers	Organisers	
	8:45 – 9:00	Review of the 1 st Day	Eddie Moir & Steve Snape	Ato Melkamu Jaleta	
	9:00– 9:15	Experience of AAWSA on LDM activities	Ato Zerihun Amde (AWSSA)	Ato Melkamu Jaleta	
	9:15 -9:30	Panel Discussion on AAWSA’s experience	Participants	Ato Zerihun	
	9:30 – 10:00	Water Pressure Management	Eddie Moir	Ato Melkamu Jaleta	
	10:00:10:30	Water Networks – materials and components, defects and failures	Eddie Moir	Steve Snape	
	10:30 – 11:00	Coffee / Tea Break			
	11:00 - 11:15	Leakage Strategy	Eddie Moir	Steve Snape	
	11:15 – 11:45	Groups Discussion – Appropriateness of sector strategy for LDM, the gaps in implementation manuals , etc (3 groups)	Participants in 3 groups	Melkamu, Eddie & Steve	
	11:45 – 12:15	Group Presentation & Panel discussion on the findings	Group Reporters	Eddie & Steve	
	12:15 – 13:00	Leakage Detection Techniques	Steve Snape	Eddie Moir	
	13:00 – 14:00	LUNCH BREAK			
	14:00 -14:45	Leakage Equipment	Eddie Moir	Steve Snape	
	14:45 -15:30	Step Testing	Steve Snape	Eddie Moir	
	15:30 -16:00	COFFEE / TEA BREAK			
	16:00 – 17:30	Class Exercise on Step Testing	Steve Snape & Eddie Moir	Melkamu	
	17:30 -18:00	Panel Discussion on the Step Testing Exercise	Participants	Eddie Moir & Steve Snape	

Day 3 (15th January, 2009)

Date	Time	Activities	Presenter/responsible person	Facilitator(s)
15th January, 2009	8:30 – 8:45	Registration	Organisers	Organisers
	8:45 – 9:30	Review of the 1 st Day	Eddie Moir & Steve Snape	Ato Melkamu Jaleta
	9:30 -10:00	Presentations on the Use of Listening Devices	Eddie Moir	Steve Snape
	10:00 – 10:30	Practical exercise on the use of Listening Devices for Leakage Detection	Eddie Moir & Steve Snape	Ato Melkamu Jaleta
	10:30 – 11:00	Coffee / Tea Break		
	11:00 – 12:30	Practical – Leakage Detection (Cont'd)	Eddie Moir & Steve Snape	Ato Ayele, head for Saris-Lafto branch office of AAWSA
	13:00 – 14:00	LUNCH BREAK		
	14:00 -14:15	Trip to practical Field Exercise site – Step Testing	Organisers	Organisers
	14:15 -15:45	Practical exercise on Step Testing	Eddie Moir & Steve Snape	Ato Ayele, head for Saris-Lafto branch office of AAWSA
	15:45 – 16:00	Return Trip from practical Field Exercise site	Organisers	Organisers
	16:00 -16:30	COFFEE / TEA BREAK		
	16:30 – 17:00	Wrap up & review of the workshop	Steve Snape & Eddie Moir	Melkamu
	17:00 - 17:30	Course Evaluation	Participants	Eddie Moir & Steve Snape

Annex – 3: Press Released by Ethiopian News Agency for LDM Training events

UK water experts providing training on leakage detection and management

UK water experts are providing training on water leakage detection and management to minimize water losses due to pipeline damages and relevant matters.

Upon the launching of the training, department head with the ministry of water resource, Yohannes Gebre-Medine said water resource policy which Ethiopia is implementing is expected to enhance water management in Ethiopia.

Such capacity building trainings, he said, would also help to effectively implement the policy.

The training was jointly organized by a UK-based NGO, Partners for Water and Sanitation (PAWS) together with Water AID-Ethiopia and ministry of water resources.

PAWS Ethiopia manager, Melkamu Jaleta told ENA that the training was organized with a view of sharing UK water experts' knowledge with their Ethiopian counterparts.

Similar training has been organized in Adama town before a year, the manager recalled.

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Annex – 4: Report on Visit to Black Lion Hospital, Addis Ababa, Ethiopia Friday 16th January 2009

Attendees:	Tania O’Conner	Black Lion Hospital
	Melkamu Jaleta	PAWS
	Eddie Moir	United Utilities
	Steve Snape	United Utilities
	Zelalem Wegari	WaterAid Ethiopia

Acronyms used:

PAWS – Partners in Water and Sanitation

AAWSA - Addis Ababa Water Supply and Sewerage Authority

Purpose:

- i) to undertake assessment of water sufficiency problem affecting upper levels of hospital buildings; and
 - ii) to offer advice and assistance on a foul water sewer blockage issue.
- i) For some months, the hospital has experienced problems feeding water to the upper floors of the campus. There are numerous leakage and undue usage issues which require attention. However, at this stage, it is not thought that these are a major contributing factor to the sufficiency problem.
- The upper floors of the hospital network are fed via a pump regime; this is supplied via a double compartment storage reservoir (on site). Neither compartment has been taken out of service for routine cleaning in many years (if ever)! There is a history of water quality issues on site and it is thought that the filters on the outlets of the reservoir may require cleaning. The reservoir is planned to be taken out of commission within the next two weeks, with an estimated duration of two days to complete the cleaning. If there is a significant amount of sedimentation in the reservoir and around the outlet pipe work – this could be causing a reduction in ‘upstream’ pressure to the pump set. On inspection the pump set was maintaining a downstream pressure of 2.5 bar (25m). When the upstream control was “throttled” by approximately 50%, the pressure immediately increased to 4.5 bar (45 metres). This indicated that the pump set can achieve the desired pressure, but, either supply is being starved due to a blockage (storage reservoir filters)? Or they have become inefficient and now require an internal inspection for impeller damage (cavitation or encrustation). If, when the storage reservoir has been cleaned and recommissioned, the sufficiency problem remains to the upper floors – an internal inspection of the pumps should be conducted. If the pumps are found to be in a good condition – a plan should be devised to, sequentially, isolate sections of the facility’s water network in attempt to locate the root cause.
- ii) The Addis Ababa Water Supply and Sewerage Authority (AAWSA) has contacted the hospital to inform of a non-compliance of the foul waste system. The hospital was attempting to divert foul waste from entry into the city’s top (rain) water sewer, into the foul sewer.

It has recently come to the attention of Tania O'Connor that the hospital foul sewer, within the grounds, has become blocked and raw effluent is overflowing and flooding is occurring at ground level. Appropriate action to alleviate the blockage has been arranged and work should commence within one week.

The hospital has also been informed that some form of primary treatment is required to remove hazardous substances, before connection will be permitted into the city sewerage system.

Eddie Moir will attempt to provide some suitable information to Tania O'Connor, regarding primary treatment of hospital effluent. This will be provided via email, on his return to UK, week commencing 19th January 2009.

Eddie Moir
Network Manager
United Utilities plc
and
PAWS UK Partner