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Partners for Water and Sanitation

Project No: NIG - 24 Review of Small Towns Pilot Water Supply Project Naka, Lessel, Ugbokpo, Benue State, Nigeria

TECHNICAL REPORT

Submitted by:

**Chris Underwood (South West Water, UK)
Jason Harvey (South West Water, UK)
Gabriel Ekanem (PAWS, Nigeria)**

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Contents

| | | |
|----------|--|-----------|
| 1 | Executive Summary | 4 |
| 2 | Introduction | 5 |
| 2.1 | Benue State Small Towns Pilot Project | 5 |
| 2.1.1 | Water Consumers Associations | 6 |
| 3 | Water Supply Schemes in Benue State Pilot Project | 7 |
| 3.1 | Naka..... | 7 |
| 3.2 | Ugbokpo..... | 8 |
| 3.3 | Lessel..... | 9 |
| 4 | Recommendations | 11 |
| 4.1 | Continuity of Engagement..... | 11 |
| 4.2 | Modelling of the Naka supply system | 11 |
| 4.3 | Replacement of the delivery main at Ugbokpo | 11 |
| 4.4 | Modelling of the supply system at Lessel | 11 |
| 4.5 | Engagement with Benue State Water Board (BSWB) | 11 |
| 4.6 | Technical Training..... | 12 |
| 5 | Further Information..... | 13 |
| 6 | Outstanding Issues..... | 14 |
| 7 | Appendix..... | 15 |
| 7.1 | GPS data | 15 |
| 7.2 | Calculations | 16 |
| 7.3 | Selected images from site visits..... | 17 |
| 7.3.1 | Gravity controlled standpipe at Naka | 17 |
| 7.3.2 | Naka WTW - Clarifier | 17 |
| 7.3.3 | Naka WTW – Treated water storage tank..... | 18 |
| 7.3.4 | Naka WCA Office | 18 |
| 7.3.5 | Ugbokpo WCA Office | 19 |
| 7.3.6 | Ugbokpo WTW – Treatment units..... | 19 |
| 7.3.7 | Ugbokpo WTW – Intake | 20 |
| 7.3.8 | Joints on main – Ugbokpo..... | 20 |
| 7.3.9 | Discarded joints – Ugbokpo | 21 |



| | | |
|--------|--|----|
| 7.3.10 | Borehole 2 at Lessel | 21 |
| 7.3.11 | Marker post – raw water main, Lessel | 22 |
| 7.3.12 | Site of WCA office, Lessel..... | 22 |
| 7.3.13 | WCA meeting, Lessel..... | 23 |
| 7.3.14 | Stakeholders meeting, Makurdi..... | 23 |
| 7.4 | Pump Information..... | 24 |
| 7.4.1 | Grundfos pump type CR-15-06 | 24 |



1 Executive Summary

In April 2005, Benue State Government, WaterAid Nigeria and PAWS signed a tripartite Memorandum of Understanding (MOU) to establish the framework for cooperation between the three parties for the development and implementation of programmes and projects in the field of water and sanitation. The initial period of the MOU was 2 years, the intervention proposed to start with a pilot project in three small towns: Naka, Lessel and Ugbokpo.

Various support and capacity building visits have been undertaken during the period since the signing of the MOU. This visit was to follow up on these visits and to establish the current position of the project.

PAWS reports from April 2005, September 2005 and July 2006 are available.

We have recommended that:

- PAWS continue the engagement in Benue State
- The supply systems at Naka and Lessel are modelled, once additional information has been obtained
- Options for the replacement of the transmission main at Ugbokpo are considered
- Benue State Water Board are engaged in the project and included in any future activities
- Further technical training for WCA members and potential service providers is undertaken

We have also highlighted some outstanding issues that were raised during our visit and require attention. The most important of which is that none of the small towns currently has a reliable water supply, this issue alone, if not addressed will cause the pilot to fail.



2 Introduction

2.1 Benue State Small Towns Pilot Project

The objectives of the intervention are:

- To design and implement a pilot programme for testing a new approach to service delivery in small towns
- To work with three small towns experiencing different issues with water and sanitation
- Develop a model which is easily transferable to 73 other small towns in Benue
- To have a visible process that involves all stakeholders

A number of factors influenced the project including:

- The need to close the gap created by lack of attention given to small towns water supply and sanitation due to the focus on urban and rural issues
- Federal Government policy and sector reforms of the World bank involving small towns
- The need to attract technical support to reactivate the small towns water schemes from total collapse

Whilst considerable progress has been made in the area of community involvement, including the setting up of Water Consumers Associations (WCA) in each small town; the technical aspects of the water supply schemes have not progressed as quickly.

Benue State Ministry of Water Resources and the Environment have reported recently on the pending activities and the current challenges and constraints. An extract from their report is reproduced below:

Pending Activities

- *Take over of schemes by WCAs*
- *Documentation of the process*
- *Bringing on stream three water supply schemes*
- *Establishment of an operational tariff structure agreed by the WCAs*
- *Restitution meetings on baseline and follow up action plans*
- *Workshop on M&E processes and evaluation of the project*
- *Production of the final policy by technical committee*
- *Capacity building for WCAs in the area of financial management*
- *Strategy for process replication in other small towns*

Challenges and Constraints

Incessant changes in administrations in the State especially at Local Government level

- *Non release of State Government counterpart funding for hardware such as rehabilitation of existing facilities and the setting up of water kiosks*



- *Long introductory process to engage with NGOs*
- *Change in PAWS Country manager*
- *Inability to bring water supply schemes on line at Ugbokpo and Lessel due to lack of funds*
- *Lack of funding to complete review of state policy on Water Supply and Hygiene*

Based on these constraints the Ministry is seeking to extend the project (and the MOU) by a period of one year to complete the pilot phase for replication across the State

2.1.1 Water Consumers Associations

Water Consumers Associations have been set up in all three small towns. All three Associations now have office premises; whilst in Naka and Lessel construction of water kiosks is well under way.



3 Water Supply Schemes in Benue State Pilot Project

3.1 Naka

The scheme in Naka to supply some 18000 people consists of the following assets:

- an impoundment reservoir (size unknown);
 - 2 number raw water pumps – with rated range of delivery from 6m³/h at 40m head to 24m³/h at 25m head
 - 63 mm galvanised iron main from reservoir pump sump to the treatment works – a distance of 801m
- water treatment works;
 - works was not running at the time of the visit
 - treatment consists of coagulation, flocculation and pressure filtration
 - coagulation pH measured at 6.2
 - floc tank ph measured at 5.0
 - manual alum and lime dosing facilities
 - Alum, lime and chloros dosing facilities 2 number pumps for each not capable of operation
 - 63mm pipework through the treatment process
 - pumps to pressure filters are 2 number Lowara pumps type CN 32160/22 with rated range of delivery from 6m³ /h at 37m head to 24m³/h at 20m head
- clear water storage tank (WTW site)
 - 5.2 x 5.4 x 3.0 m – 84m³ capacity
- high lift pumps;
 - 2 number Lowara pumps type CN50-250/150 with rated range of delivery from 27m³/h at 73m head to 66m³/h at 57m head
- transmission main to the town;
 - 10 m of 50 mm galvanised iron pipe with 2 number 90° bends changing to 63mm PVC to town
 - 63 mm PVC main of 2160 m length with 4 number 90° bends
 - one number air valve and one number wash out (positions logged with GPS)
- Overhead Tank;
 - 10m ground to base of tank
 - 5 panels x 4panels x 3panels (1.2m panels) – capacity 104 m³
 - 4" galvanised iron outlet pipe changing to 63mm PVC at ground level



- Various standpipes – we observed at least two gravity taps, reputed to be 10 years old and still working

We were informed that the scheme had last supplied water the day before our visit, taking 24 hours to fill the OHT, which lasted some 2 hours into supply.

3.2 Ugbokpo

The scheme at Ugbokpo to supply some 12000 people consists of the following assets:

- River intake
 - weir construction at intake
 - there was good flow in the river considering time of year
 - washing of clothes and bathing was being carried out in the weir pool immediately upstream of the intake
 - there was considerable evidence of defecation in the area of the intake
- Raw Water Pumps
 - one number submersible pump in wet sump on river bank, with water level in the sump some 3 – 4 m below ground level.
 - there is a 4 inch galvanised iron rising main to the treatment works a distance of some 260 m.
 - the pump was inaccessible so information could not be obtained.
- Treatment Works
 - works was not running at the time of the visit
 - treatment consists of coagulation, flocculation and filtration
 - clarifier capacity calculated to 1146 m³, surface area calculated to be 220 m³
 - filter capacity calculated to be 267 m³, surface area calculated to be 57 m²
 - chemical dosing facilities 3 number pumps not capable of operation
- High Lift Pumps
 - Grundfos pump type CR-15-06 A-F-A-E-HQQE, model A96501897 P10535 serial no 0003 with rated delivery of 17m³/h at 67.3m head
 - there were short lengths of 1.5 inch pipe in and out of pump



- Clear water storage tank (WTW)
 - calculated capacity 2441 m³

- Transmission main to OHT
 - the main to the OHT is 4" UPVC and approximately 3450 m in length, there was a bulk meter on the delivery line reading 36835 m³
 - examination of removed sockets indicated poor installation practice – displaced O rings – which would result in high levels of leakage, at least 35 sockets had been removed from 4" UPVC main and stored on the WTW site
 - we observed numerous examples of hydrocarbon usage on installed joints
 - there was one visible repair where pitch or tar used to seal inserted section of pipe
 - some sections of the pipe showed obvious damage through fire

- Overhead tank
 - Braithwaite tank consisting of 5 panels x 4 panels x 3 panels (1.2 m panels) giving a capacity of 104 m³
 - base of OHT is 10m above ground level

- Various standpipes

We were informed by the WCA members that the treatment plant last ran in August 2006. We were also informed that the Commissioner also visited the site on the morning of our visit (we in fact met him on site prior to the arrival of the Governor to the town) and also that the Governor's Task Force had been working on site the day before we visited.

The WCA members also informed us that water from the river sells at ₦20 for a 20 litre container within the town. They accompanied this with a plea for a simpler system that works; telling us about the number of cases of cholera and typhoid in the local hospital, attributed to from drinking dirty water.

3.3 Lessel

The scheme at Lessel to supply some 11000 people consists of the following assets:

- Boreholes



- 2 number boreholes
 - due to a communications problem the sites were not accessible so no information could be obtained
 - there was 50 mm pipe from the borehole connected to 80 mm DI all zinc painted pipe from the borehole compound
 - pipework from boreholes to treatment works – 860 m from BH 1 to TW
- Treatment Works
 - due to a communications problem the site was not accessible so no information could be obtained
-
- Overhead Tank (WTW site)
 - standard Braithwaite type tank of 3 panels x 4 panels x 5 panels (1.2 m panels) – calculated capacity of 104 m³
 - 18.6 m from ground to top of tank, 15 m from ground to base of tank
 - inlet 100 mm pipe
 - outlet 200 mm pipe
 - 2350 m of system to edge of town
- Various standpipes

We were informed by WCA members that the scheme had been working well until the generator broke down. There now appeared to be some problem with payment for the repairs, the required parts having been obtained but not yet fitted.

The WCA welcomed the development of the pilot project and felt that they were up to the challenges that lay ahead.

However there were some questions remaining:

Who is responsible for future repair and maintenance of the scheme?
Who is responsible for if there is a major breakdown of equipment?

They were also concerned about all the changes in Local Government administration that had caused problems.

Outstanding Issues:

- We need information about the size of the borehole pumps
- We need confirmation that the 200 mm pipe runs into the town
- A process is necessary for the hand over of plant – this process needs to be formally agreed
- Confirmation of the role of WCA and other players
- Who will be responsible for tariff setting and what mechanisms will be used?
- We have no information about leakage throughout the system?

Overall our impression of the scheme at Lessel is that it is well designed, we were not able to comment on the sufficiency of the scheme due to the lack of information about the borehole pumps and the sustainable yield of the boreholes.



4 Recommendations

4.1 Continuity of Engagement

PAWS continue the engagement with WaterAid Nigeria and Benue Ministry of Water resources and the Environment to complete the first phase of the pilot scheme in the three small towns.

4.2 Modelling of the Naka supply system

It is highly likely that frictional headloss within the transmission main is a major factor in restricting the amount of water available in Naka. Flow information and details of all major connections are necessary to model this system and provide advice about any improvement intervention. This is an area that PAWS can supply further input.

4.3 Replacement of the delivery main at Ugbokpo

The current transmission main into Ugbokpo is likely to suffer from extreme leakage around the poorly formed joints. There is an abandoned main running back from the overhead tank in the town that could be considered as an alternative supply system. Flow information is necessary to model this system and provide further advice about any improvement intervention. This is an area that PAWS can supply further input.

4.4 Modelling of the supply system at Lessel

Although the supply system at Lessel appears to be well designed, flow information and details of all major connections are necessary to model this system and provide advice about operation of the system. This is an area that PAWS can supply further input.

4.5 Engagement with Benue State Water Board (BSWB)

It was apparent that little consultation had taken place with BSWB prior to this visit; as the incumbent operators of all three small town schemes, BSWB should be a major player in the pilot and should be included in all future activities.



4.6 Technical Training

Whilst significant progress has been made with the formation of the WCAs in the small towns, each of the supply schemes appeared to suffer from a lack of capacity concerning treatment and distribution of water. If the pilot is to be successful, the capacity of WCA members and potential serviced providers will need increasing. This is an area that PAWS can supply further input.



5 Further Information

To enable us to more fully assess the schemes it would be useful to have the following information:

- the size, manufacturer and model type of the borehole pumps at Lessel
- confirmation that the 200 mm pipe runs into the town of Lessel
- any information about leakage throughout the systems

We have not been able to discover any information about the Lowara pumps used at two of the schemes. The manufacturer's web site does not list the model types noted during the visit. We will make direct contact with the manufacturer in an attempt to gain more information.



6 Outstanding Issues

The following issues were raised during our visit and require addressing:

- There is currently no documented and agreed process for the hand over of plant – this process needs to be formally agreed
- Confirmation of the role of WCA and other players
- Who will be responsible for tariff setting and what mechanisms will be used?
- All three schemes need to provide a reliable supply of water to the towns for the pilot to progress



7 Appendix

7.1 GPS data

| | Point | Northings | Northings | Eastings | Eastings | Notes | Altitude |
|-------|-------|-----------|-----------|----------|----------|---|----------|
| | 26 | 0735 | 821 | 00813 | 146 | Naka Intake PS | 165 |
| | 27 | 0735 | 830 | 00813 | 115 | Road by PS Naka | 163 |
| | 28 | 0735 | 508 | 00812 | 867 | Naka Works Inlet | 163 |
| | 29 | 0735 | 508 | 00812 | 873 | Outlet main at Naka WTW | 154 |
| | 30 | 0735 | 157 | 00812 | 510 | Air Valve 1 Naka main | 161 |
| | 31 | 0734 | 981 | 00812 | 357 | Bend 90 Naka main | 164 |
| | 32 | 0734 | 967 | 00812 | 367 | Wash Out Naka main | 165 |
| | 33 | 0734 | 774 | 00811 | 991 | T to hospital Naka | 173 |
| | 34 | 0734 | 782 | 00811 | 980 | Inlet to Naka OHT | 172 |
| | 35 | 0740 | 114 | 00752 | 980 | OHT at Ugbokpo | 166 |
| Benue | 36 | 0739 | 159 | 00753 | 50 | By bridge on rising main Ugbokpo | 142 |
| | 27 | 0738 | 274 | 00752 | 641 | Ugbokpo WTW | 151 |
| | 38 | 0738 | 164 | 00752 | 726 | Intake at Ugbokpo | 149 |
| | 39 | 0744 | 266 | 00831 | 452 | Hotel car park | 104 |
| | 40 | 0707 | 19 | 00901 | 364 | Bore Hole 2 Lessel | 143 |
| | 41 | 0706 | 994 | 00901 | 362 | Raw water main air valve Lessel | 149 |
| | 42 | 0706 | 971 | 00901 | 363 | Raw water main washout Lessel | 152 |
| | 43 | 0706 | 904 | 00901 | 344 | Inlet to Lessel WTW | 160 |
| | 44 | 0706 | 441 | 00901 | 314 | Bore hole 1 Lessel | 170 |
| | 45 | 0707 | 808 | 00901 | 224 | Kiosk Lessel | 196 |
| | 46 | 0708 | 101 | 00901 | 426 | Near end of main Lessel (500m to end from this poin | 199 |

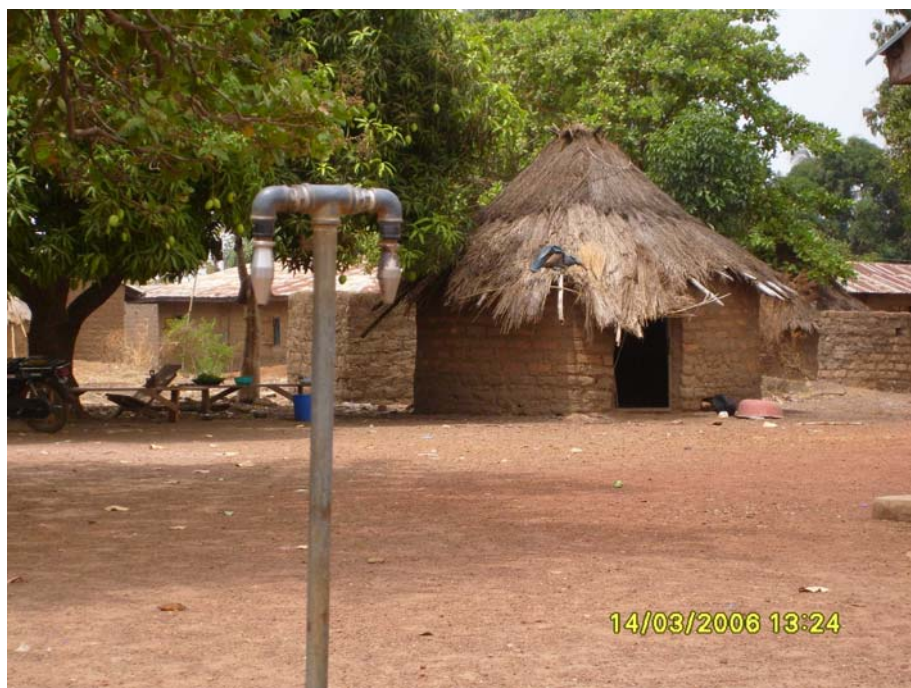


7.2 Calculations

| Point | Notes | Distance between points (m) | Cumulative Pipe length m | Altitude |
|--------|---|--------------------------------|-----------------------------|----------|
| 1 | Naka Intake PS | 0 | 0 | 165 |
| 2 | Road by PS | 59 | 59 | 163 |
| 3 | Works Inlet | 742 | 801 | 163 |
| 1 | Outlet main at Naka WTW | 0 | 0 | 154 |
| 2 | Air Valve 1 | 920 | 920 | 161 |
| 3 | Bend 90 | 425 | 1345 | 164 |
| 4 | Wash Out | 32 | 1377 | 165 |
| 5 | Inlet to Naka OHT | 781 | 2158 | 172 |
| 1 | Intake at Ugbokpo | 0 | 0 | 149 |
| 2 | Ugbokpo WTW | 258 | 258 | 151 |
| 1 | Ugbokpo WTW | 0 | 0 | 151 |
| 2 | OHT at Ugbokpo | 3446 | 3446 | 166 |
| BH1 to | Bore hole 1 Lessel | 0 | 0 | 170 |
| WTW | Inlet to Lessel WTW | 857 | 857 | 160 |
| WTW to | Outlet from Lessel WTW | 0 | 0 | 160 |
| supply | Kiosk Lessel | 1690 | 1690 | 196 |
| | Near end of main Lessel (500m to end from this point) | 650 | 2340 | 199 |

7.3 Selected images from site visits

7.3.1 Gravity controlled standpipe at Naka



7.3.2 Naka WTW - Clarifier



7.3.3 Naka WTW – Treated water storage tank



7.3.4 Naka WCA Office



7.3.5 Ugbokpo WCA Office



7.3.6 Ugbokpo WTW – Treatment units



7.3.7 Ugbokpo WTW – Intake



7.3.8 Joints on main – Ugbokpo



7.3.9 Discarded joints – Ugbokpo



7.3.10 Borehole 2 at Lessel



7.3.11 Marker post – raw water main, Lessel



7.3.12 Site of WCA office, Lessel



7.3.13 WCA meeting, Lessel



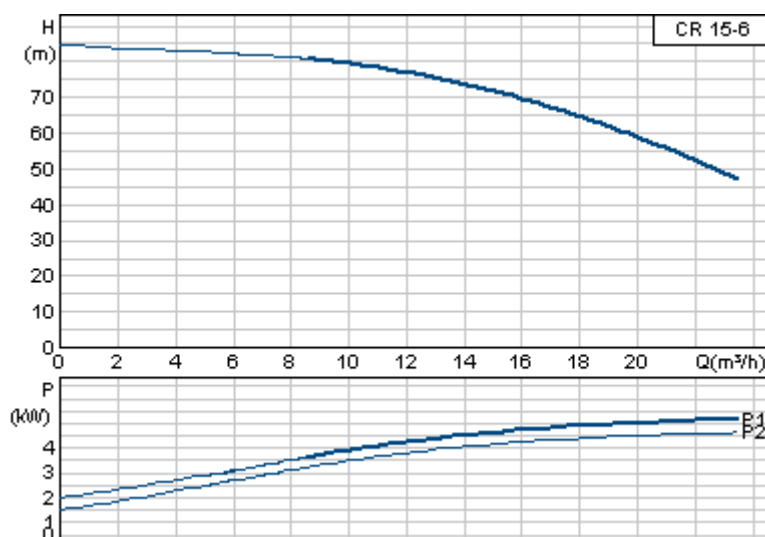
7.3.14 Stakeholders meeting, Makurdi





7.4 Pump Information

7.4.1 Grundfos pump type CR-15-06



| Description | Value |
|-------------------------|----------------------|
| Product name: | CR 15-6 A-F-A-E HQQE |
| Product No: | 96501897 |
| EAN number: | 5700396231402 |
| Technical: | |
| Speed for pump data: | 2919 rpm |
| Rated flow: | 17 m³/h |
| Rated head: | 67.3 m |
| Impellers: | 06 |
| Shaft seal: | HQQE |
| Approvals on nameplate: | CE |
| Curve tolerance: | ISO 9906 Annex A |
| Stages: | 06 |

Information from: <http://www.grundfos.co.uk/>