Partners for Water and Sanitation

Note on project reports

The following report has been prepared by Partners for Water and Sanitation in response to a project Terms of Reference.

The content of the report is based on the opinion of the author(s) and does not necessarily represent the opinions of the wider PfWS partnership, or the project funders.

Partners for Water and Sanitation

Project No: NIG - 72
Progress Review of Kabong Water Supply Project
Jos, Plateau State
Nigeria

TECHNICAL REPORT

Submitted by:

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

March 2007

Contents

1 Executive Summary

This report is a summary of the findings and recommendations from a follow up visit to the Kabong urban poor water supply project in the city of Jos, Nigeria. The project is an initiative by the NGO WaterAid to provide access to clean water for the urban poor. WaterAid requested technical assistance from PAWS to understand why the project had stalled and guidance on their options for supplying water to the suburb of Kabong.

The project has been fully reported following a technical visit by PAWS in December 2006. This report explores more fully some of the options recommended in that report and describes the follow up actions taken in country.

In particular the recommendation in the previous report concerning the potential use of Laminga WTW to supply Kabong through the 150 mm water main has been fully investigated. Our conclusion is that this option is not viable at this time.

Our recommendations are:

- that WaterAid carry out a geophysical survey of the Utan area to inform the decision about the possible borehole option;
- that WaterAid consider what advocacy support (if any) they are capable of providing to Plateau State Water Board in determining a more equitable distribution of the existing water supply in Jos and in supporting any proposals for a strategic solution to the water supply situation in Jos.

2 Introduction

The PAWS report following the visit in December 2006 identified a number of options for supplying water to the residents of Kabong:

- More equitable distribution of existing water supply
- Consideration given to power generation
- Finance the expansion of supply at Laminga (in return for more water distributed to Kabong)
- Create an alternative source of supply to PSWB sources (Borehole)
- Increase Supply from Yakubu Gowon

There were also actions recommended to be taken to better inform the choice of option. These actions are listed below with comments about the progress:

2.1.1 General Actions

- Testing of booster station pumps and motors using water tank / truck (PSWB / WaterAid). Check maximum pressure delivered by the pumps. Planned but not fully undertaken
- Decision by residents on preferred operating model/ institutional arrangements (WaterAid/Residents) No progress reported
- Completion of distribution network mapping exercise in Kabong. No progress reported
- Clarification and legalisation of Land Tenure for Kabong water supply assets. No progress reported
- Biological assessment of the quality of water in Kabong wells. No progress reported
- Removal of the ladder at Kabong Reservoir. Welding of flange onto outlet and replacement of rubber gasket. Installation of float valve on the reservoir if there is not one already, with pressure release valve set to 20m head. Planned but not fully undertaken

2.1.2 More equitable distribution of existing water supply

- Determination of location of all mains branches off 300mm (Tudun Wada) and 150mm (Laminga) mains with estimations of population served by each branch line (WaterAid / PSWB) to facilitate network modelling. Partially completed

- Pressure and maximum available flow testing of 150mm mains from Laminga works to Kabong Bridge (junction with 300mm mains) (PSWB / WaterAid) Partially completed

- GPS mapping of 150mm mains from Laminga to Kabong Bridge (WaterAid / PSWB). Completed

- Assessment of the fraction of customers with ball valve arrangements for their domestic water tanks and an approximation of the total domestic supply capacity on the 150mm and 300mm main lines. The nature and duration of peak demand on these lines needs to be quantified. Partially completed

2.1.3 Consideration given to power generation

- Economic feasibility study of the use of generating power to supply water to Kabong residents (PSWB / WaterAid). Cost per litre supplied. No progress reported

- Biological assessment of the quality of water in Kabong wells (public health risk posed by lack of standby generating capacity). No progress reported

2.1.4 Finance the expansion of supply at Laminga (in return for more water distributed to Kabong)

- Costing of refurbishment and maintenance requirements at Laminga (PSWB – Eng Zakka Fom) Partially completed

- Verification of equipment costs – internet search and contact suppliers with nameplate information or technical specifications. (WaterAid). Partially completed

- GPS mapping of 150mm mains from Laminga to Kabong Bridge (WaterAid / PSWB). Completed

- Pressure and maximum available flow testing of 150mm mains from Laminga works to Kabong Bridge (junction with 300mm mains) (PSWB / WaterAid) Partially completed

2.1.5 Investigate an alternative source of supply to PSWB sources (Borehole)

- Borehole investigations – preliminary survey of wells in area, followed by possible geo-electric investigation (contact Casmir Akaolisa for advice casakaolisa@yahoo.com). (WaterAid) No progress reported

- Biological assessment of the quality of water in Kabong wells. No progress reported

2.1.6 Increase Supply from Yakubu Gowon

- Costing of refurbishment and maintenance requirements at Yakubu Gowon (PSWB – Eng. Zakka Fom) Partially completed

- Verification of equipment costs – internet search and contact suppliers with nameplate information or technical specifications. (WaterAid). Partially completed

- Determine cost of constructing pit-latrine and septic tank, taking into account the possibility of labour contributions from residents. No progress reported

2.2 Actions Taken During the Visit

The main focus of this visit was to explore the possibility of Laminga WTW being the prime source of water for Kabong.

Our inspection of Laminga WTW showed that only one of the three pumps transferring water to the city of Jos, including the Kabong area was operational (two in December 2006); and only one of the two pumps transferring water to the Eastern Reservoirs was operational.

We were able to confirm that the design position was three pumps operating on a duty/assist/standby basis for water to the city and two pumps operating duty/standby to the Eastern reservoirs.

The pumps to the city would be capable of delivering 4 Ml/day and those to the Eastern Reservoirs capable of delivering 14 Ml/day; giving a total design output for Laminga WTW of 18 Ml/day.

A GPS survey of the mains to the city revealed the existence of a service reservoir complex at the Ministry of Works.

The two tanks on this site are designated MoW 1 size: 24 x 13.2 x 4.8 m (1521 m^3) and MoW 2 size: 9.6 x 13.2 x 3.6 m (456 m^3).

These tanks effectively break the head of water at this point.

There is a 300 mm AC inlet rising main from Laminga to both tanks with multiple 150 mm outlets from both tanks.
We were informed by PSWB that MoW 1 supplies the Kabong area through a 150 mm diameter main.

Simple modelling shows that flows in excess of 15 l/sec down the 3.8 Km of main to Kabong will not reach the end of the main due to frictional headloss.

The water seller at Gada Biu bridge claimed that water is available every day at his premises although the pressure does vary considerably. He also claimed that a cross connection between the 150 mm Laminga system and the 300 mm Tudun Wada system was present, although was not able to confirm the location of such a connection.

On the first day of our visit the flow at the water seller was estimated to be less than 10 l/min with a minimal pressure of < 1bar.
The existence of a cross connection could explain why there have been continual problems in supplying water to Kabong, as any water available would tend to flow back up the other system. Both systems were reported to be unlikely to be operational at the same time.

On our final day PSWB informed us that Tudun Wada reservoir was full and being held back from supply. They also informed us that valves on two 4 inch connections and two 6 inch connections from this system into the city had been closed.

The Distribution Manager from PSWB confirmed that it had taken over three days to fill Tudun Wada due to the vagaries of the power supply system.

We conducted a pressure and GPS survey of the Tudun Wada system following the opening of the main valve at the reservoir site.

The initial demand on Tudun Wada was such that the tanks dropped 0.2 m in 10 minutes, equivalent to a demand of over 2440 m^3/hour. If the 300 mm main from Tudun Wada was empty it would take 160 m^3 of water to fill. Although the initial demand was very high it could reasonably be expected to drop if the supply into Tudun Wada could be maintained, however PSWB explained that this was very difficult due to power problems at the supplying WTW (Yakubu Gowon).

The pressure was measured at various locations along the 300 mm main and noted as follows:

Brickworks 4.5 bar
Manager's house 1.5 bar
Water seller 1 bar
Booster station showed 2 bar on the inlet gauge
Stand pipe Rukuba road <1 bar – water leaking

New shopping complex (Laminga system) 1 bar

Water reached the first standpipe in Rukuba Road, with local residents commenting that this was only the second time in 4 years that water had been available. The previous occasion being some 4 weeks ago when WaterAid were able to facilitate a similar test.

It was noted during the pressure survey that numerous leaks existed on the distribution system, including visible pipework spray at one location, and water showing in road at many locations. These leaks do not normally show as water does reach that far down the distribution system.

Based on the assumption that observable leakage is representative of the buried network, the total amount of water being lost was estimated to be around 30-50% of that available – Between 732 m^3/hr and 1220 m^3/hr

It was planned that the pumps at Gada Biu bridge would be run. This was to test the electrical systems rather than their hydraulic performance. However, there was no power at the booster station to enable a test run of the pumps. Also, the positive suction head was measured to be around 0.1 bars – thought to be less than the net positive suction head recommended. The meter in the pump house indicated 2 bar inlet pressure and therefore can not be considered to be a reliable measurement device

No further investigative work was undertaken to explore the borehole option.

A costed list of required preventive maintenance spare parts was given to us by PSWB for both Laminga and Yakubu Gowon WTWs; however we were unable to confirm if the lists consisted of immediate requirements or those necessary for total refurbishment.
The list for Laminga was costed at ₦10,429,000 (£41,700) and for Yakubu Gowon at ₦13,441,204 (£53,800)
Both lists are reproduced as Appendices 4.3 and 4.4.

2.3 Conclusions

Laminga WTW is not capable of supplying the Kabong area due to the frictional headloss along the length of the 150mm supplying main. A resolution would be as considerable as a comprehensive up-sizing of the water supply network, or, a drastic reduction in demand.

It is highly probable that there is a cross connection between the Laminga and Tudun Wada supplies, somewhere close to Gada Biu bridge, which effectively eliminates any chance of water reaching the Kabong area under gravity. When water is available in one system it simply flows back up the other, rather than take the route into Kabong.

Kabong could be supplied by Tudun Wada, if sufficient incoming supplies could be maintained. However realistically this would require a refurbishment of the whole of the Jos water supply system. This is beyond the capacity of WaterAid to fund and support; however there could be role for WaterAid in supporting any proposals for a strategic scheme that might be put forward by PSWB.

The water distribution system in Jos suffers from very high leakage, which is not normally apparent due to the lack of a consistent water supply. This leakage should be addressed as part of any strategic refurbishment plan.

It was observed during the Joss pressure testing that numerous connections existed that were unknown to PSWB – Some as large as 50mm in diameter. Connections of this size in particular, but generally of all sizes, increase the velocity and therefore pressure losses trough the entire system. Measurement of, and charging for, such connections is essential, providing revenue for re-investment in infrastructure improvement.

Water is a scarce commodity on Jos and any future strategic funding application might be viewed in a more positive light by potential donors if the current supply were to be managed in an effective and equitable manner. The amount of water available is so low that systematic and planned rationing may be the only option currently available to ensure that all areas of the city receive water at some time. This is also an area that WaterAid could consider supporting in an advocacy role.

Whilst we did not undertake further investigations of the borehole option, particularly in and around Utan; a geophysical survey of the area should be undertaken to determine the availability of groundwater. In particular the estimated yield of any boreholes will be of importance. To supply the Kabong area with 40 litres/head/day an estimated daily total in excess of 1000 m^3 would be necessary.

3 Recommendations

3.1 Geophysical survey of Utan

Carry out a geophysical survey of the Utan area to assess the feasibility of a borehole supply scheme – however the scale of such a scheme (>1 ml/day just for Kabong) may effectively rule this out as anything other than an emergency option.

3.2 Strategic solution for Jos

WaterAid to consider what (if any) advocacy support to give to PSWB in support of a strategic water supply solution for Jos.

3.3 Equitable water sharing in Jos

WaterAid to consider what (if any) advocacy support to give to PSWB in determining and implementing a more equitable method of sharing the current water supply for Jos.

4 Appendix

4.1 Calculations

MoW Tanks Jos			
1	24 x 13.2 x 4.8 m	Volume m^3	1521
2	9.6 x 13.2 x 3.6 m	Volume m^3	456
Tudun Wada SR			
	36 m diameter	Volume tank m^3	6718
	22 ft water 6.6 m	Total volume m^3	13436
Drop 0.2 m in 10 minutes		Volume m^3	407
		m^3/hour	2,443
Volume of main			
9000 m of 150 mm main		Volume m^3	159

4.2 Selected images from site visits

4.2.1 Community standpipe, Kabong

4.2.2 Leak on line supplying standpipe, Kabong

4.2.3 Leak in builder's yard, Jos

4.2.4 Water seller, Gada Biu bridge, Kabong

4.2.5 Ministry of Works Reservoir 1

4.2.6 Outlet main from Ministry of Works Reservoir 1

4.2.7 Leak in Jos

4.2.8 Testing the water pressure in Jos

4.3 Spares Listing for Laminga WTW

PSWB

PREVENTIVE MAINTENANCE SPARE PARTS REQUIREMENT LIST FOR LAMINGA T/PLANT

S/NO.	ITEM	UNIT	QTY	UNIT COST	TOTAL COST
1.	Bearing type 6217	No	3	₦12,000.00	₦36,000.00
2.	" " NU217	"	3	12,000.00	36,000.00
3.	" " 6411	"	4	10,000.00	40,000.00
4.	" " 6411	"	4	10,000.00	40,000.00
5.	" " 6312	"	4	10,000.00	40,000.00
6.	" " 6212	"	4	8,000.00	32,000.00
7.	Robber Buffers 125/130	"	4	6,000.00	24,000.00
8.	" " 145/150	"	3	8,500.00	25,500.00
9.	" " 181	"	3	10,000.00	30,000.00
10.	Contactor types 3tf47	"	3	8,000.00	24,000.00
11.	" " 3tf46	"	3	7,500.00	22,500.00
12.	Overload types 3RH1122-AF00	"	3	5,000.00	15,000.00
13.	Overload types 3RT1024-1A	"	3	4,000.00	12,000.00
14.	Contactor types 3TB48	"	3	7,000.00	21,000.00
15.	Timer types 3RP1574-1No30	"	3	2,500.00	7,500.00
16.	Overload type 3RU1126-1F80	"	3	3,000.00	9,000.00
17.	" " 3RU1146-4H80	"	3	5,000.00	15,000.00
18.	" " LR2 D33	"	3	2,000.00	6,000.00
19.	Circuit breakers 250amps	"	3	14,000.00	42,000.00
20.	Circuit breakers 60amps	"	3	8,000.00	24,000.00
21.	High lift pump Q = 600m³/h H = 24 m	"	1	2,000,000.00	2,000,000.00
	Total	-	-	-	**₦2,502,000.00**

22.	High lift pump Q = 341m³/h H = 217m	"	1	1,500,000.00	1,500,000.00
23.	Electric motor – 75kw 132amps	"	1	1,200,000.00	1,200,000.00
24.	Electric motor – 30kw 56amps	"	1	700,000.00	700,000.00
25.	Vacuum chlorine regulator	"	2	800,000.00	1,600,000.00
26.	Chlorine valve AN40	"	1	250,000.00	250,000.00
27.	Chlorine pressure valve	"	1	250,000.00	250,000.00
28.	OBL safety valve (NRV)	"	1	300,000.00	300,000.00
29.	40w chokes (illumination)	"	100	350.00	35,000.00
30.	4ft florescence tube	"	100	150.00	15,000.00
31.	Starters	"	100	25.00	2,500.00
32.	Transformer oil	"	1 drum	75,000.00	75,000.00
33.	Aluminium Sulphate pump with motor 1150 l/h 10 bar	"	2	500,000.00	1,000,000.00
34.	Lime pump 291 L/h 10 bar	"	2	500,000.00	1,000,000.00
		TOTAL	-	=	**₦10,429,000.00**

4.4 Spares Listing for Yakubu Gowon WTW

PSWB.

PREVENTIVE MAINTENANCE SPARE PARTS REQUIREMENT LIST FOR YAKUBU GOWON DAM TREATMENT PLANT

S/N.	ITEM	TIME SPAN	UNIT	QTY	UNIT COST NAIRA	TOTAL COST NAIRA	REMARKS
	A. ELECTRICAL ITEMS FOR RAW WATER PUMPING STATION OLD SITE:						
1.	415A Fuses		No.	3	1,200	3,600	
2.	10A. Fuses		"	6	600	3,600	
3.	Contacts for EH175 ABB Contactors		"	9	2,000	18,000	
4.	Contacts for EH145 ABB Contactors		"	3	1,500	4,500	
5.	EH175 contactors		"	3	120,000	360,000	
6.	Control voltage contactor (ABB K22E, 110v)		"	3	15,000	45,000	
7.	Auxiliary contactor CAF-40E		"	3	5,000	15,000	
8.	Overload contactor ABB T200DU, 10A		"	3	35,000	105,000	
9.	10 (6A) Telemechanique push Button switch		"	3	500	1,500	
10.	Tripped Relay 3UN22 Siemens		"	3	25,000	75,000	
	RAW WATER PUMPING STATION-NEW SITE						
1.	500A Fuse		No.	3	1,500	4,500	
2.	10A Fuse		"	6	1,200	3,600	
3.	Contractors for 3TF56 Siemens Type contacts		"	9	2,500	22,500	
4.	Contactors for EH250 ABB Contactors		"	3	5,000	15,000	
5.	3TF56 Siemens Type contactors		"	3	120,000	360,000	
6.	Control voltage contactor 3TH2 Siemens		"	3	15,000	45,000	
7.	Auxiliary contactor Type 71E Siemens		"	3	5,000	15,000	
8.	Overload contactor Type T450DU Trip Class 10A. (220-310A)		"	3	45,000	135,000	
9.	Telemechanique Push Button Switch		"	3	500	1,500	
10.	Star Delta Timer Type 7PU6060 Siemens		"	3	15,000	45,000	
11.	Relay 3UN22 Siemens		"	3	25,000	75,000	
	Total	-	-	-	-	**N1,353,300.00**	

12.	Brush Holders		No.	12	52,000	624,000	
13.	Brushes		"	18	14,500	261,000	
14.	Rotor contacts		"	9	100,000	900,000	
15.	Stator contacts		"	9	133,334	1,200,000	
16.	110v. ABB contactor Type 22E		"	9	15,000	135,000	
17.	Mechanical Timer TP 40D (0.1-40s)		"	3	15,000	45,000	
18.	Auxiliary contactor Type CAF-22E ABB		"	3	15,000	45,000	
19.	Bolts and nuts 13mm		"	18	20	360	
	CHEMICAL DOSSING STATION-OLD AND NEW SITE						
1.	3 UA7 Type Siemens overload contactor		No.	10	15,000	150,000	
2.	3 TF2 OIE Siemens contactor		"	6	25,000	150,000	
3.	Legrand fuses 4As, 500v, 14 x 51		"	10	5,000	50,000	
4.	2A fuses		"	6	300	1,800	
5.	10 A Fuses (8hnnhs) 15 x 51		"	6	1,000	6,000	
6.	20 A Fuses (Legrand) 15 X 51		"	6	2,000	12,000	
7.	3 ua5, 200 overload (11A, 500v)		"	3	5,000	15,000	
8.	T Z24 Timer		"	3	5,000	15,000	
9.	Finder Relays (Type 55.34, 5A 250v)		"	16	5,000	80,000	
10.	Anly voltage monitor JVM-1 for failure and phase sequence volt 3 phase 380 VAC.		"	3	15,000	45,000	
11.	Vacuum chlorine regulator		"	2	800,000	1,600,000	
	Total	-	-	-	-	**5,335.160.00**	

	HIGH LIFT PUMPING STATION-OLD SITE						
1.	3UN6 Siemens Relay		No.	3	25,000	75,000	
2.	G 1A Siemens Type MCB		"	3	1,000	3,000	
3.	G 2A Siemens Type MCB		"	3	1,500	4,500	
4.	G 6A Siemens Type MCB		"	3	2,000	6,000	
5.	22E Type 220v small contactor		"	3	15,000	45,000	
6.	Air circuit breaker (ACB) contacts		Pairs	6	500,000	3,000,000	
7.	Drum starter contact		"	18	27,770	500,000	
8.	Push Button Switch (10A, 600v)		No.	3	500	1,500	
9.	Cable Lug 300mm		"	6	2,000	12,000	
10.	Cable Lug 150mm		"	6	1,500	6,000	
11.	Emery cloth/sand paper (rough)		Pkts	2	1,750	3,500	
12.	Emery cloth/sand paper (smooth		"	2	1,750	3,500	
13.	Bolts and nuts 19mm		No.	6	40	240	
14.	Bolts and nuts 18mm		"	6	35	210	
15.	Bolts and nuts 17mm		"	6	30	180	
16.	Bolts and nuts 16mm		"	6	25	150	
	HIGH LIFT PUMPING STATION-NEW SITE						
1.	100A. Fuse 1000Amp fuse		No.	9	20,000	180,000	
2.	10A Fuse		"	18	600	10,800	
3.	Tripped Relay 3 UN22 Siemens		"	3	25,000	75,000	
4.	7PU 4040 Siemens Type Relay		"	3	25,000	75,000	
5.	6A. Fuse		"	18	323	5,814	
6.	Cable Lug 300mm		"	18	2,000	36,000	
7.	Cable Lug 150mm		"	18	1,000	18,000	
8.	Rotor cable 170mm		Roll	3	16,667	50,000	
9	Control voltage contactor 3TH2 Siemens		No.	6	15,000	90,000	
10.	Auxiliary contactor type 80E Siemens		"	3	3,000	9,000	
11.	Bridge Rectifier (110v)		"	3	5,000	15,000	
	Total	-	-	-	-	**4,225,394.00**	

12.	Chlorine valve AN 40		"	1	250,000	250,000	
13.	Chlorine pressure relief valve		"	1	250,000	250,000	
14.	OBL safety valve (NRV)		"	1	300,00	300,000	
15.	Voltmeter Relay for min and max. voltage (5A. 250VAC)		"	3	15,000	45,000	
16.	1A. Fuses N2		"	6	200	1,200	
	GENERAL ILLUMINITION OF THE TREATMENT PLANT AND RAW WATER PUMPING STATION						
1.	4' Fluorescence tubes		No.	286	150	42,900	
2.	40w Chokes		"	286	350	100,100	
3.	Starters		"	286	25	7,150	
4.	125w Discharge Lamps		"	27	1,500	40,500	
5.	Halogen Lamps		"	10	3,700	37,000	
	QUANTITY OF TRANSFORMER OIL						
1.	Raw water pumping station -1000KVA transformer		No.	1	75,000	75,000	
2.	High lift pumping station old site 2000KVA transformer		"	1	75,000	75,000	
3.	High lift pumping station New site 2000KVA transformer		"	1	75,000	75,000	
	LIST OF MECHANICAL COMPONENTS/PARTS RAW WATER OLD SIDE						
1.	Bearing 6314		No.	6	14,500	87,000	
2.	Packing Gland 15mm		Roll	2	35,000	70,000	
3.	Rubber Buffers 225mm		No.	27	15,000	45,000	
	RAW WATER-NEW SITE						
1.	Bearing 6314		No.	9	14,500	130,500	
	Total	-	-	-	-	**1,631,350.00**	

2.	Packing Gland 15mm		Roll	2	35,000	70,000	
3.	Rubber Buffers 200mm		No.	27	15,000	45,000	
	HIGH LIFT PUMPING STATION-OLD SITE						
1.	Bearing 6314		No.	6	14,500	87,000	
2.	Packing Glands 15mm		Roll	2	35,000	70,000	
3.	Rubber Buffers 350mm		No.	27	20,000	60,000	
	HIGH LIFT PUMPING STATION-NEW SITE						
1.	Bearing 6314		No.	9	14,500	130,500	
2.	Packing Gland 15mm		Roll	2	35,000	70,000	
3.	Rubber Buffers 350mm		No.	27	20,000	60,000	
	CHEMICAL HOUSE						
1.	Packing Gland 10mm		Roll	2	25,000	50,000	
2.	Pump Seal		Set	18	3,000	54,000	
	GENERATOR HOUSE						
1.	Grease		Medium drum	1	35,000	35,000	
2.	Engine Oil		Drum	3 (660 Litres)	54,000	162,000	
3.	Distilled water		Litres	40	250	2,500	
	Total	-	-	-	-	**896,000.00**	
	Grand Total	-	-	-	=	**N13,441,204.00**	

4.5 GPS Data

	Point	Northings	Northings	Eastings	Eastings	Notes	Altitude
	10	0953	780	00853	435	Laminga CWT TWL	1227
	11	0954	421	00853	559	Car Wash 1	1209
	12	0954	422	00853	547	Car Wash 2	1210
	13	0954	573	00853	448	New Shopping Complex	1216
	14	0954	550	00853	448	Base of MoW Tank 1	1231
	15					Base of MoW Tank 2	1232
	16	0954	824	00853	298	Water Seller 1	1153
	17	0954	824	00853	298	Water Seller 2	1154
Plateau	18	0954	824	00853	298	Gada Biu Bridge	1155
	19	0953	878	00852	458	unrecorded point	1178
	20	0953	515	00851	898	Brickwork 1	1240
	21	0953	504	00851	913	Brickwork 2	1238
	22	0954	171	00852	132	Water Seller Tank	1255
	23	0954	316	00852	451	House	1235
	24	0955	801	00852	90	Stand Pipe Rukuba Road	1170
	25	0954	572	00853	444	Shopping Complex (revisited)	1213