Malidade Area

Borehole Rehabilitation

In partnership with CCAP Synod of Livingstonia, Church & Society Programme (Malawi)

Supported by

Penicuik for Africa (Scotland)

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Introduction

Drinkwell International Limited (Drinkwell), of Malawi, in partnership with the Church of Central Africa Presbyterian (CCAP) Synod of Livingstonia, and with support from Penicuik for Africa (PfA), of Scotland, has undertaken to provide assistance in the Malidade area of the Mpherembe Traditional Authority (TA) in Mzimba district in northern Malawi to improve access to water through the rehabilitation of community (non-private) boreholes.

An agreed structure should be in place to manage these boreholes, through water committees of 10 local representatives. This community approach is the normal model used in Malawi to manage rural community boreholes, however, it often fails due to a break-down of the committee and their commitment to the asset in question leading to lack of ownership and follow-up. Also, there is little support provided from the local district authorities responsible for the area, particularly as it is a rural area and far from the district's administrative headquarters in Mzimba. The approach of Drinkwell is to encourage committee contribution during rehabilitation work to promote sustainability of borehole maintenance.

The aim of rehabilitating boreholes in the Malidade area is to reduce the use of open shallow wells (see Figure 1) and rivers as the alternative source of water. It is also to reduce the distance women and children have to walk to find and carry potable water (sometimes up to 2km).

Figure 1. Open Shallow wells at Site No. 9 Manoro.

Project Background

Attention was drawn to the Malidade area through conversation with the CCAP Synod of Livingstonia, in Mzuzu who have an ongoing programme work in the area. The CCAP's Church and Society Programme identified lack of access to clean water as significant issue whilst conducting field assessments in the area.

It was agreed to work in partnership with the Church and Society Programme of the CCAP to ensure Drinkwell were targeting areas of greatest need. There was also a significant benefit to the project from the existing and on-going functional relationships between the CCAP and the communities. A Community Based Educator (a CCAP volunteer) was also present at the assessments.

Drinkwell conducted assessments of 8 areas within the wider Malidade area (see Table 1). A further 3 areas (Emcisweni, Mtundula and Kasangani) did not require assessment. Twenty three boreholes were assessed as the communities had indicated they required rehabilitation; either because they were non-functional (i.e. no water) or required improvement work.

Assessment and Rehabilitation Summary

The assessments were undertaken on 28 and 29 January and 2 and 3 February 2015 and support was provided to the Malidade area through the rehabilitation of twelve boreholes on 11 to 13 and 18 to 21 February 2015.

Of the 23 boreholes, 16 were non-functional (4 of which were beyond repair), and 7 required improvement work (see Table 1). Based on the needs of the communities it was decided to rehabilitate 11 non-functional boreholes plus one school borehole in Jangavya that required significant improvement work.

Table 1. Assessment and Rehabilitation Summary

Malidade areas	Total boreholes	Population served	Households served	Boreholes assessed	Non-functioning boreholes	Boreholes rehabilitated
Jangavya and Kampondo	7	1,077	215	3	2	3
Kalanga	3	556	143	2	1	1
Manoro	7	3,224	692	4	4	4
Zaro and Chasamba	13	917	414	2	2	0
Chibangalala	6	1,037	214	4	2	2
Kabira	16	1,226	257	4	2	2
Thunduwike	22	3,426	807	2	2	0
Vwandamire	5	2,056	428	2	1	0
TOTAL	**79**	**13,519**	**3,170**	**23**	**16**	**12**

Description of work

In addition to the description of assessment findings and rehabilitation work required and undertaken, the location details, physical parameters, parts used are shown Tables 2 and 3. Committee contributions are also noted as during all rehabilitations there was some provision of labour from the communities.

Jangavya and Kampondo boreholes

1.Jangavya School

Assessment- 28 January 2015. **Functioning.** Installed in 1999 the borehole is heavily used by a school and 3 surrounding villages. The committee reported no flow for approximately 3 months in the dry season. There was also difficulty with pumping.

Rehabilitation- 20 and 21 February 2015. Seven rods were added to the existing 6 rods with the aim of increasing flow during the dry season. All of the pipes were replaced because they had been reconnected using fire (rather than using double sockets and solvent cement) and were not correctly aligned; this could explain the difficulty with pumping. The cylinder was replaced as the original cylinder did not hold water. It was blocked with a plunger seal and two foot valves (Figure 2).

The committee did not contribute any parts.

Figure 2. Items blocking cylinder at 1. Jangavya

2. Jangavya

Assessment - 28 January 2015. **Non-functioning**. Installed in 2007 the pump had not been functioning for 4 months. The committee reported potential issues with the pipes.

Rehabilitation - 13 February 2015. Following inspection it was found that the pump had failed due to misaligned pipes caused by reconnecting pipes using fire (Figure 3), also two damaged pipes had previously been removed. It was decided to reconnect the existing pipes and to restore the borehole to the original depth by adding two new pipes, with the aim of ensuring good flow throughout the year.

The committee had between 2000 to 3000 Kwacha in their water account so they were advised to use this fund for spare parts.

Figure 3. Misaligned pipes at 2. Jangavya.

3. Kampondo

Assessment - 28 January 2015. **Functioning**. Installed in 1999 the borehole serves a school and 3 surrounding villages. The committee reported it was heavy to pump and there were potential issues with the pipes.

Rehabilitation - 19 February 2015. **Non-functioning**. The pump had stopped functioning between the assessment and rehabilitation visits. The pump did not work because on further inspection there were too few rods for the length of pipe. Five new pipes were added to 7 existing pipes, 2 new rods were added to 10 existing rods. The cylinder was replaced as it did not hold water.

The committee did not contribute any parts; they were advised to purchase a pump spanner and fishing tool for future maintenance.

<u>Kalanga boreholes</u>

5. Kalanga

Assessment - 29 January 2015. **Non-functioning.** Installed in 2000 the pump had not been functioning for 5 months. The handle had broken (potentially as a result of an obstruction affecting the pumping action). The civil works were undermined due to erosion.

Rehabilitation - 12 February 2015. Following inspection it was found that there were issues with the integrity of the pipework due to the age and previous repair work undertaken. The pump required an almost full replacement; nine new pipes were added to 3 existing pipes and 5 new rods to 7 existing rods. The cylinder was replaced as it did not hold water.

The committee contributed river sand and stone and completed the civil works (Figure 4).

Figure 4. Before and after civil work improvement at 5.Kalanga.

6. Kalanga

Assessment -29 January 2015. **Functioning**. Installed in 2000 the borehole serves 4 surrounding villages and seasonal tobacco workers. Low flows were reported with a 20 minute wait between filling a bucket in the dry season. No rehabilitation undertaken.

Manoro boreholes

4. Manoro

Assessment - 29 January 2015. **Non-functioning**. Installed in 1998 the borehole serves 100 households; it had not been functional for 7 years. It was reported that the rods had been removed and taken to borehole 7 Manoro at a neighbouring school for a Presidential visit.

Rehabilitation - 12 February 2015. Following inspection it was found that there were issues with the pipework integrity and the cylinder did not hold water. The pump required an almost full replacement including pipework and cylinder; 7 new pipes were added to 5 existing pipes and 12 new rods were used.

The committee provided sand, stone and bricks in order for the village head (a mason) to complete significant improvement to the civil works (Figure 5).

Figure 5. Before and after civil work improvement at 4. Manoro

7. Manoro

Assessment - 29 January 2015 **Non-functioning**. Installed in 2000 the borehole serves a school and local villages. It had not been functional for 3 years.

Rehabilitation- 19 February 2015. Following inspection it was found that the pump was blocked with debris, there were issues with the pipework integrity and the cylinder did not hold water. Six new pipes were added to 4 existing pipes 6 new rods were added to 4 existing rods and a new cylinder was installed.

The committee contributed river sand and stone and completed the civil works.

Figure 6 Before and after civil work improvement at 7.Manoro

8. Manoro

Assessment - 29 January 2015 **Non-functioning**. Installed in 2000 the borehole serves 3 villages. It had not been functional for 3 months and during this time the villagers used open shallow wells (see Figure 1). It was reported that a rod was broken within the pump.

Rehabilitation -12 February 2015. Following inspection it was found that the pump was blocked with debris and the pipework integrity was also compromised. Five new rods were added to 7 existing rods and 10 new pipes were added to 2 existing pipes. A new cylinder was installed as the existing cylinder did not hold water.

The committee improved the civil works.

Figure 7. Rehabilitation at 8. Manoro

9.Manoro

Assessment -29 January 2015 **Non-functioning**. Installed in 2007 the borehole had not been functional for 3 months. The committee was found to be ineffective and initial feedback on the reason for failure was unclear.

Rehabilitation - 19 February 2015. Following inspection it was found that the cylinder was blocked with an unattached plunger and seal and a foot valve to a plunger stick (Figure 8). All of the pipes were replaced because they had previously been reconnected using fire and were not correctly aligned. Fifteen new pipes were used and 3 rods were added to the existing 12 rods to ensure good flow throughout the year. During rehabilitation the village chief was present and commenced formation of a new water committee.

The committee improved the civil works.

Figure 8. Parts blocking cylinder at 9. Manoro

<u>Zaro and Chasamba boreholes</u>

10. Zaro

Assessment -29 January 2015. **Non-functioning.** Beyond repair as the head was removed and the pump was blocked with debris.

11. Zaro

Assessment - 29 January 2015. **Non-functioning.** Beyond repair as the head was removed and the pump was blocked with debris.

Chibangalala boreholes

12. Chibangalala

Assessment -2 February 2015. **Functioning**. Installed in 1994 the borehole serves between 600 and 700 people. Low flows were reported with a 60 minutes wait between filling single buckets in the dry season. It was necessary to pump for 10 minutes each morning before there was a flow of water indicating an issue with pipework integrity. No rehabilitation undertaken.

13. Chibangalala

Assessment - 2 February 2015. **Functioning**. Installed in 2008 the borehole serves 70 households. Low flows were reported with a 15 minute wait between filling 5 buckets in the dry season. This is potentially due to the removal of two pipes, reducing the depth of the pump by 6 metres. No rehabilitation undertaken.

14. Chibangalala

Assessment -2 February 2015. **Non-functioning**. Installed in 2003 the borehole serves a school (Figure 9) and community of 600 to 700 people. It had not been functional for 2 months. During this time classroom time was lost because school children and teachers had to travel a greater distance to access safe water. Some children attended other schools that had functional boreholes.

Rehabilitation -11 February 2015. Following inspection it was found that the pipework integrity was compromised due to previous repairs. All 11 of the pipes were replaced and the borehole was restored to the original depth by adding 4 further new pipes and rods, with the aim of ensuring good flow throughout the year.

The committee provided two rods and completed improvements to the civil works.

Figure 9. School children at 14. Chibangalala

15. Chibangalala

Assessment - 2 February 2015. **Non-functioning**. Installed in 1994 the borehole serves 70 households. It had not been functional for 12 months. Discussions with the local community revealed all the rods had been removed (reportedly stolen), also the pump head was damaged (Figure 10) and the pedestal corroded.

Rehabilitation - 18 February 2015. The pump required an almost full replacement including pipework, rods and cylinder; 9 new pipes were added and 9 new rods were used. The borehole had previously been partly filled with sand by the committee in an attempt to reduce salinity, and this is the reason for the relatively shallow depth of 29 metres.

The committee provided one rod and sourced sand, stone and bricks in order for a local mason to complete significant improvement to the civil works (Figure 10). They were advised to purchase a pump spanner and fishing tool for future maintenance.

Figure 10 Damaged head and civil improvements at 15. Chibangalala

Kabira boreholes

The water in this area is saline and some community members indicated they may continue to drink from open shallow wells even if a functional borehole was available. The salinity also causes increased corrosion of parts, especially rods (Figure 11).

16. Kabira

Assessment -2 February 2015. **Functioning**. Installed in 1998 the covered shallow well serves 30 households. The shallow well is only 3m deep which would account for the low flows during the dry season. It is difficult to pump due to an issue with the fulcrum pin. No rehabilitation undertaken.

17. Kabira

Assessment -2 February 2015. **Functioning**. Installed in 2007 the borehole serves 15 households and there is good flow all year. There was a leak on the head which may have been caused by a blockage in the outlet pipe. No rehabilitation undertaken.

18. Kabira

Assessment - 2 February 2015. **Non-functioning**. Installed in 2007 the borehole serves 60 households and had not been functional for 12 months. Discussions with the local community revealed one rod had broken and three were corroded. The committee had been unable to fund replacements.

Rehabilitation - 20 February 2015. Five rods were added to restore the borehole to 12 rods.

The committee were unable to contribute any parts at the time of rehabilitation. They were advised to purchase spare rods from their water account.

Figure 11. Black residue due to corrosion by saline water at 18. Kabira

19. Kabira

Assessment - 2 February 2015. **Non-functioning**. Installed in 2007 the borehole serves 20 households, and had not been functional for 3 months. Discussions with the local community revealed two rods had broken and been removed due to corrosion. The hanger and hanger pins were significantly corroded.

Rehabilitation - 20 February 2015. Two rods were added to restore the borehole to 10 rods.

The committee were unable to contribute any parts at the time of rehabilitation.

Thunduwike boreholes

20. Thunduwike

Assessment - 2 February 2015. **Non-functioning.** Beyond repair as the head, rods and handle had been removed (Figure 12) and the pump and blocked with soil.

Figure 12. Beyond repair- inspection of 20. Thunduwike

21. Thunduwike

Assessment - 2 February 2015. **Non-functioning.** Beyond repair as the head, rods and handle has been and the pump was blocked. The borehole had not been functional for 25 years.

Vwandamire boreholes

22. Vwandamire

Assessment - 3 February 2015. **Non-functioning.** Installed in 1990 it had not been functional for 7 years. There is a good provision of water in the Vwandamire area due to the installation of a number of new boreholes in the area in 2006. No rehabilitation undertaken.

23. Vwandamire

Assessment - 3 February 2015. **Functioning.** Installed in 2007 the borehole serves 70 households. The committee reported it was heavy to pump but had good flow all year and no other issues. No rehabilitation undertaken.

Physical parameters

Table 2

Borehole	Elevation (m)	GPS coordinates	Borehole depth (m)	Static water level (m)
1 Jangavya School	1121	S 11 16.337,E 033 27.555	47.25	13.9
2 Jangavya	1104	S 11 15.108,E 033 27.665	46	10.6
3 Kampondo	1131	S 11 14.755,E 033 28.078	45	19
4 Manoro	1110	S 11 14.301,E 033 26.817	51	17
5 Kalanga	1101	S 11 15.347,E 033 26.494	44.8	6.7
6 Kalanga	1111	S 11 15.190,E 033 26.133	Not measured	Not measured
7 Manoro	1094	S 11 13.973,E 033 27.116	40.5	11
8 Manoro	1086	S 11 13.593,E 033 27.542	43.5	9.25
9 Manoro	1175	S 11 13.838,E 033 23.494	67	18
10 Zaro	1105	S 11 11.696,E 033 26.892	Not measured	Not measured
11 Zaro	1097	S 11 12.635,E 033 27.786	Not measured	Not measured
12 Chibangalala	1094	S 11 12.188,E 033 29.820	Not measured	Not measured
13 Chibangalala	1125	S 11 12.683,E 033 30.441	Not measured	Not measured
14 Chibangalala	1122	S 11 11.977,E 033 30.667	63	14
15 Chibangalala	1100	S 11 11.136,E 033 30.713	29.47	16.12
16 Kabira	1126	S 11 11.643,E 033 31.897	Not measured	Not measured
17 Kabira	1102	S 11 10.384,E 033 31.780	Not measured	Not measured
18 Kabira	1102	S 11 10.197,E 033 32.252	Not measured	Not measured
19 Kabira	1104	S 11 10.203,E 033 32.704	Not measured	Not measured
20 Thunduwike	1119	S 11 11.445,E 033 34.625	Not measured	Not measured
21 Thunduwike	1112	S 11 10.742,E 033 34.528	Not measured	Not measured
22 Vwandamire	1110	S 11 10.070,E 033 36.379	Not measured	Not measured
23 Vwandamire	1105	S 11 10.059,E 033 36.154	Not measured	Not measured

Parts used

Table 3

PARTS	1	2	3	4	5	7	8	9	14	15	18	19	TOTAL
Rods	7	0	2	11	5	5	5	3	3	8	5	2	56
Timing rod	0	1	0	1	0	1	0	0	1	1	0	0	5
Rod centralisers	9	0	12	12	11	7	12	7	0	9	5	2	86
Pipes	13	2	5	7	9	6	10	15	15	9	0	0	91
Pipe centralisers	13	5	12	5	7	2	6	12	15	8	0	0	85
Sockets	0	10	5	5	3	4	3	0	1	0	0	0	31
Brass Plunger	0	1	0	0	0	0	0	1	1	0	0	0	3
Brass Plunger seal	0	0	1	0	0	1	1	0	0	0	0	0	3
Plastic plunger	0	0	0	0	0	0	0	0	0	0	1	0	1
Plastic plunger seal	0	0	0	0	0	0	0	0	0	0	0	0	0
Plunger stick	0	0	0	0	0	0	0	0	0	0	0	0	0
Foot valve	0	0	0	0	0	0	0	1	1	0	0	0	2
Foot valve seal	1	0	1	0	0	0	1	0	0	0	0	0	3
Cylinder set*	1	0	1	1	1	1	1	0	0	1	0	0	7
Bush bearings	4	2	3	4	4	4	4	2	4	4	1	0	36
Hanger pin	1	0	1	0	1	1	0	0	0	1	0	1	6
Fulcrum pin	1	0	0	0	1	1	0	0	0	1	0	0	4
Pedestal Bolts	2	2	4	4	4	2	4	0	3	4	0	0	29
Cement bag	0	0	0	2	3	2	1	1	1	2	0	0	12
Handle	0	0	0	0	1	0	0	0	0	0	0	0	1
Flap valve	0	1	1	1	1	0	1	0	1	1	0	0	7
Hanger plus bolt	0	0	0	0	0	0	1	0	0	1	0	1	3
Head bund	0	0	0	1	0	0	1	0	0	1	0	0	3
Pedestal	0	0	0	0	0	0	0	0	0	0	0	0	0
Head	0	0	0	0	0	0	0	0	0	1	0	0	1
Fishing tool	0	0	0	1	1	1	1	0	0	0	0	0	4
Pump spanner	0	0	0	1	1	1	1	0	0	0	0	0	4
Head bolt	0	0	0	0	0	0	0	0	1	1	1	0	3

*Cylinder set includes brass cylinder, brass plunger set and foot valve.

Conclusion

A significant number of the assessed boreholes required an almost full replacement of pipes. These newly rehabilitated boreholes should function for a further 5-10 years without need for major repairs. Before the project there were 63 functional boreholes serving a remote population of 13,519, and following this work there are now 74. This work has provided a significant improvement in access to safe potable water in the Malidade area, reducing the distances travelled and the use of open shallow wells.

In addition to conducting the rehabilitation of the boreholes, Drinkwell also discussed with the community the importance and need for them to ensure the local water committee is proactive in raising some additional funds directly from the community, which can be used for any future minor repairs or routine maintenance that may be required. CCAP, through the Church and Society Programme, will continue to reinforce this message in the area. Drinkwell provided a list of all those parts that have been replaced to the water committee at the time of rehabilitation. A copy of this report will be lodged with the, Mzimba District Office, CCAP, Mzuzu University (Centre for Excellence and SMART Centre) and Penicuik for Africa (PfA).