



Osiligi Charity Projects

**Repair of broken hand pumps
in Kenya
(FF 0465-25)**

Final Report

For the Eagle Foundation
November 2019

Summary

This report is about the work done to repair 235 broken hand pumps over a 9 month period (January to September 2019) using the £45,000 donated by the Eagle Foundation. All the repairs were done in Kenya, usually in very rural Kenya.

Some of the broken pumps may have ceased working recently, but many that we visit and repair broke down many years ago, some as long as 12 years ago.

The average cost per repair was around £200 (250 CHF) per pump and around 56,000 people now have access to clean water

Introduction

A properly constructed bore-hole and hand pump or well and hand pump will be constructed in the right place, built to a high standard, be well maintained and be looked after by a person or committee. Although many such pumps do exist in Kenya, we only visit the ones that have failed and are no longer working. These broken pumps were usually installed by Western charities but have long since been left and ignored. The aim of this project is to repair such pumps in order to provide a ground water supply from a non-functional borehole or damaged hand-pump to a rural community.

Most remote communities in Kenya rely on getting their water supply from an open source, river, pond, well or hand pump close to their village. The installed hand pumps need periodic maintenance otherwise they break down. An RWSN study from 2009 concluded that from the installed base of 12,000 hand pumps in Kenya, 3600 hand-pumps (30%) were broken. Although this study is 10 years old, we suspect that the 30% failure rate is still correct except now there are many more pumps installed. These broken pumps represent an enormous waste of resources as well as bringing misery to the families that rely on these pumps. The Osiligi charity has over the past 4 years attempted to repair as many of these broken hand pumps as possible at a repair rate of approximately 200 per year. By the end of 2019, we will be approaching 1000 repaired pumps

The cost of a repair is a fraction of the cost of a new borehole or replacement pump. For one new installation, approximately 25 - 30 pumps can be repaired. Until 2018, the funding for these repairs had come from a legacy. This legacy has now run-out and since January 2019, the funding has been provided from the Eagle Foundation and this has allowed the project to continue. The monthly expenditure is £5,000 and this money will typically repair around 14-20 pumps per month. The Eagle Foundation kindly donated £45,000 on the 4th September 2018 for this work.

Where we have repaired the broken pumps

Fig 1 Pump repair areas shown by blue arrows

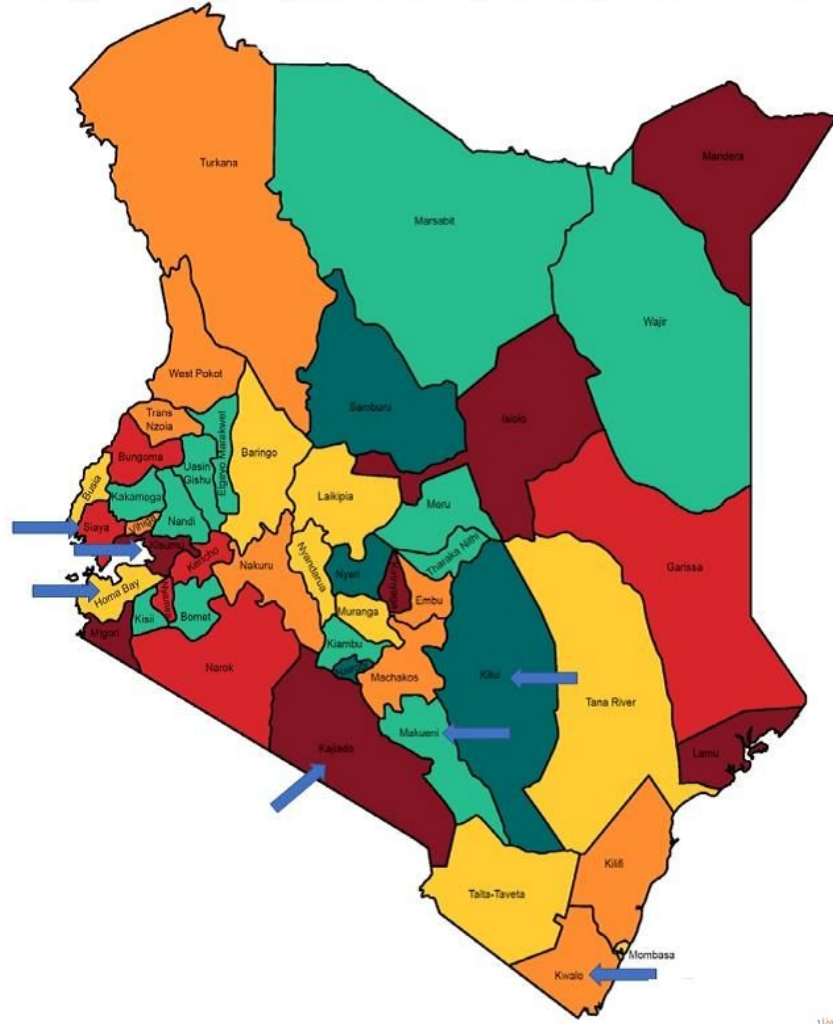


Figure 1 indicates the areas in Kenya where the Osiligi charity is working in; Siaya, Kisumu and Homa Bay counties in West Kenya, Kitui, Makindu in Makueni and Olitokitok in Kajiado counties in Central Kenya and Kwale in East Kenya.

When we started the project 4 years ago, finding the broken hand-pumps was a challenge. Now people come to us and we hear about the broken pumps through local contacts, contractors and from the local authorities.



Fig 2 Collecting water from a dirty pool.

Why repair the pumps?

When a village hand pump breaks the fall-back solution for the village is to rely on a water supply like the above dirty pond. This may be many miles away from the village..

Almost one third of the global population is without access to an improved water supply, mainly in Sub-Saharan Africa (SSA) and their rural communities. Six per cent of disease is water-related and responsible for the death of two million people a year, most of them children under five years (WHO/UNICEF, 2017. p12).

In the rural areas of Kenya there is very little piped water into the homes of rural communities, they have to rely on water from hand pumps or an open source such as a river or stagnant pond. Children have the risk travelling to and from an open water source due to attacks from animals or people and whilst collecting water, they cannot attend school.

The village bore-hole and hand pump is an important resource that must be kept working. This project is about repairing these broken pumps and giving the communities the resources (knowledge, spares and contact details of engineers who can help) to keep their pump working for many years to come.

Continuous improvement

The hand-pump repair project is a multi-year project so each year we try out new ideas. If the ideas benefits the project, we keep it going for subsequent years. If the idea does not benefit the project, we drop it.

During 2019, we tried 3 new ideas:

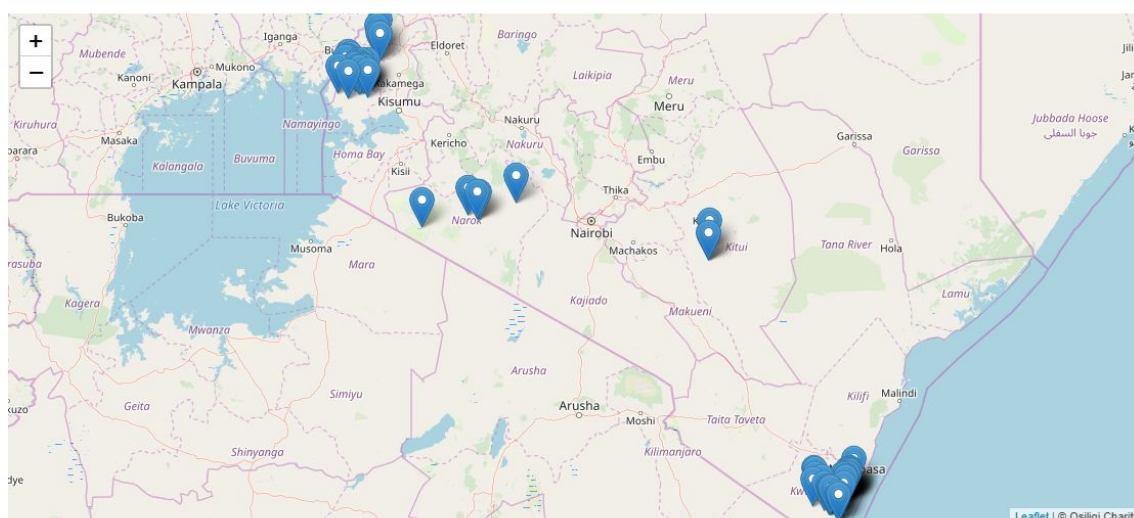
Water Quality. Previously, we have worked on the basis that a restored bore-hole will give superior quality water to an open pond so we have not tested the final water quality. During 2019, a water quality engineer, Richard Miesen, assisted the team with water quality testing and analysis. Over the coming years, we intend to implement water quality testing.

Installing new hand pumps. In January 2019 we were offered 60 new Blue Pumps so we ran a trial with the first 20 Blue Pumps. We put them into places where the old pump was beyond economic repair. The Blue Pump is not a direct replacement for the local pumps being replaced so each Blue Pump required considerable costs and time for civil engineering to construct new plinths. Also, the Blue Pumps were not permitted to be used in some regions in Kenya due to both local government regulations and requirements of the manufacturer & donor. The donor paid for the installation costs which created a small surplus for these 20 pumps. The period when we tested the Blue Pumps coincided with the project manager being ill such that the additional workload for the Blue Pumps just caused a distraction from the main pump repair project. It is unlikely that we will install more Blue Pumps after these 20 but we will consider installing new Afridev pumps. The 20 installed blue pumps have not been included in the data so over the 9 month period, the team repaired 235 pumps and installed 20 Blue Pumps.

Mapping. We track the repaired pumps through the village name and if we can, also via the GPS coordinates - GPS coordinates being the best but not all of our contractors have suitable GPS equipped phones. Having village names or a list of GPS coordinates for the repaired pump, although helpful, is not ideal as it is difficult to know a pump's location from its coordinates or name. During 2019 we started to map the repaired pumps onto a Google maps database so that it is easy to see the locations on a map. For 2019, about a quarter of the pumps are on this map with the intention of getting all future repaired pumps onto the map. You can see the map here - <https://osiligicharityprojects.co.ke/eaglepumps/>

We will need to equip the pump repairers with suitable phones in the future so that all pumps can have their GPS coordinates recorded.

Locations of Hand Pumps Repaired by Donations from Eagle Foundation



Location of some of the repaired handpumps put onto a map of Kenya.

How do we repair a pump?

The majority of hand pumps that we repair are Afridev hand pumps. Afridevs are the most popular pump in Kenya. They can be maintained without any expensive equipment and once the community have been shown how to repair an Afridev, they can make most repairs themselves. Afridev pumps are described as VLOM pumps - Village Level Operation & Maintenance. Since about a third of the installed pumps are broken, it suggests that the VLOM concept often does not work as the villagers rarely maintain them. The working parts of an Afridev can be removed from the top of the pump, leaving the pipes and pump housing in place. The following information is about repairing an Afridev pump, although we will repair any hand pump.

An Afridev pump consists of a top housing (the part you see) with a handle. Pipes go from this housing to the bottom of the well or borehole. At the bottom of the pipe is a cylinder, a pair of one way valves and a piston. The piston is connected to the handle by metal rods. When the handle is moved, the piston goes up and down so pumping the water up the pipe to the top of the pump. It is all very simple.

The community are involved whenever we repair a pump. This is part of their training and it helps the community to take ownership of their pump. The operation and maintenance of a handpump is key to sustainability and access to water for a rural community. It is important

that communities are given access to information and are trained to carry out minor repairs. We provide such training and leave a set of spares at each pump repaired.

Easy repairs (VLOM level)

From our records, about 70% of repairs could have been repaired by the local community - the other 30% of repairs were pumps that were badly installed or worn out due to long term use. What happens in practice is that the community does not even do the easy repairs. Once a pump has been left non-working and unused for about 2 years, the cylinder becomes corroded and it then becomes a major repair.

Easy repairs consist of replacing the piston rubber seal, replacing the one-way valves at the bottom of the cylinder or replacing the handle and rod bearings. They can all be achieved without removing the pump head or pipework.



The black rubber seal on the piston needs replacing every 2-3 years, depending on use.



The nylon bearing in the handle and rod need replacing every 3-5 years depending on use.

When we service a pump, we replace all the rubber parts and the bearings.

Major repairs

If the pipework needs to be removed, the repair is much more difficult and beyond VLOM level.

The pipework must be removed if:

- The pipes were split or leaking
- The bottom cylinder was corroded, seized or damaged
- The rods were seized or broken inside the pipework



The community helping to support the pipes during removal.



Repairing a split pipe. The split part is cut out and the pipe is re-joined.

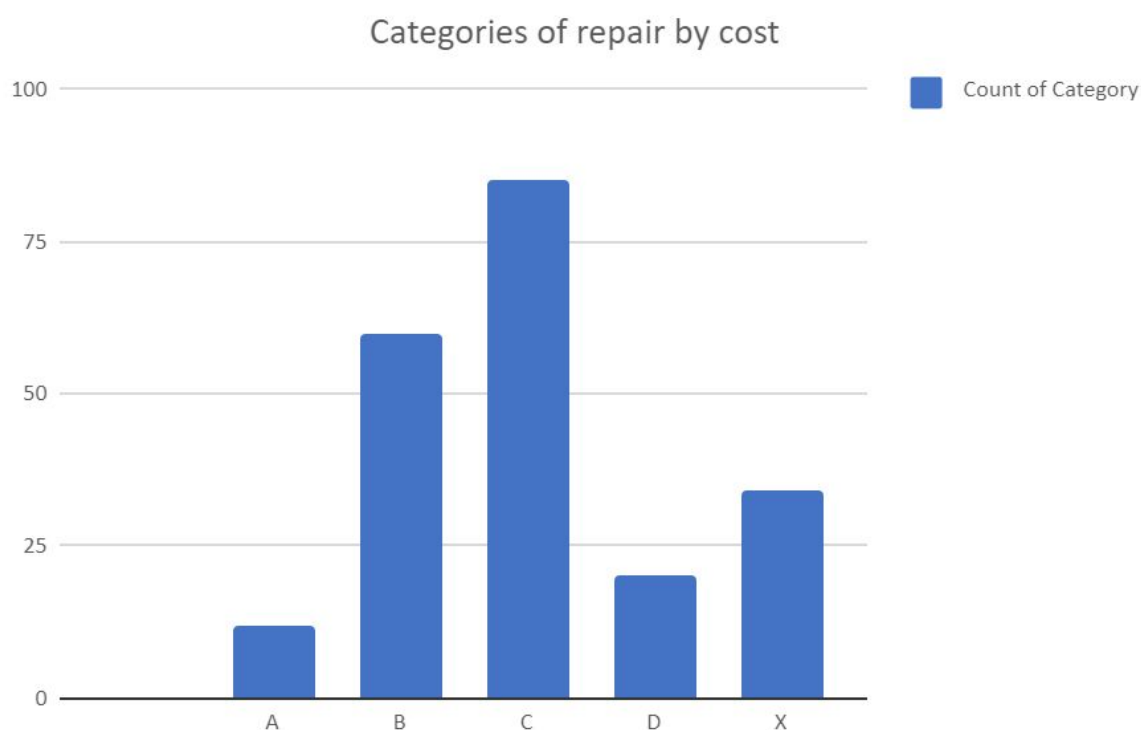
Very difficult repairs

Once a pump has been left non-working for a few years, it is often vandalised. Some of the parts may be stolen. If the top cover is removed, children will put stones down inside the pipes. This then seizes the rod, breaks the pipes and damages all the working parts. If such a pump is at a very important place, such as a school, hospital or where there is no other working pump within 5-10 miles, we will often repair or replace these pumps at a vast

expense. If the pump is deemed not so important, we will usually leave these vandalised pumps waiting until we are donated a new pump.

We have analysed the cost of repairing 211 of the 235 pumps and this is shown below - our data is not good enough to analyse the remaining 24 pumps. The direct costs (excluding transport, accommodation, meals etc) are split into 5 categories, A to X. A (12 pumps) is a simple repair where the parts cost less than 5,000Ksh (£40). B (60 pumps) is a more extensive repair where major parts needed replacing at a cost of between 5000Ksh and 25,000Ksh. All of A repairs and many of B repairs could have been done by the community themselves after suitable training.

Category C (85 pumps) is a more extensive repair where the pipes and rods had to be removed. These repairs cost between 25,000 - 50,000Ksh and are usually due to a broken pump being left unused for a long time, a pump that has been vandalised or a pump that has worn out due to heavy usage. D (20 pumps) is the installation of a new pumps as the old one was beyond economic repair. Finally, X (34 pumps) needed a more extensive repair such as having to employ a contractor to fish out broken pipes from the bore-hole or to flush the bore-hole because it was blocked.



How many people have been helped?

This sounds like an easy question but it is actually very difficult to answer accurately. Most villages do not know how many people live in the surrounding community and if you ask 2 people about this number, you normally get 2 very different answers. Also, once a pump is restored, it is often used by people in the neighbouring villages. A borehole can serve a community of between 5 to 100 households, plus a school of 250-1000 pupils or more. Each household may have a family of 5 - 10 people living in them. So the minimum number served by a pump is around 30 people with the maximum being around 2000 people.

For our estimates of the number of people helped, we use 250 people per pump. During this 9 month period, we repaired 235 pumps so this is a total of 58,750 people helped. When we repair a pump, we ask the community to estimate how many each pump serves (subject to the errors mentioned above). This data for 211 pumps is shown in appendix 1. By totalling the number using these pumps, we estimate 53,022 (47,022 for 211 pumps plus an estimated 6000 for the other 24 pumps). So our best estimate is between 53,000 and 59,000 people helped by these 235 pump repairs - let's call it 56,000..

Expenditure summary.

A summary of the expenditure and the number of pumps repaired from Jan – Sept 2019 is given in the table below.

Jan - Sept	Budget	Funds (Ksh)	Expenditure (Ksh)	Expenditure (£)	Variance (£)
Accommodation	£ 4,000.00	511800 Ksh	481000.00 Ksh	£ 3,759.28	£ 240.72
Communications	£ 1,000.00	127950 Ksh	115550.00 Ksh	£903.09	£ 96.91
Contractors	£ 5,000.00	639750 Ksh	610400.00 Ksh	£ 4770.61	£ 229.39
Food - Drink	£ 4,000.00	531240.00 Ksh	489008.00 Ksh	£ 3,821.87	£ 178.13
Materials	£ 20,000.00	2656200.00 Ksh	2650589.00 Ksh	£ 20715.82	£ -715.82
Misc	£ 1,000.00	132810.00 Ksh	119932.00 Ksh	£ 937.33	£ 62.67
Transport + Fuel	£ 5,000.00	664050.00 Ksh	743550.00 Ksh	£ 5811.25	£ -811.25
Project car + Fuel	£ 1,500.00	199215.00 Ksh	258690.00 Ksh	£ 2021.84	-£ -521.81
Administration	£ 3,500.00	464835.00 Ksh	464835.00 Ksh	£ 3,632.94	£ -132.94
Total	£ 45,000.00	5976450.00 Ksh	5933554.00 Ksh	£ 46374.01	£ -1374.01

There was a small overspend of £1374 during this period. This £1374 was the slight surplus received from installing the 20 Blue Pumps.

Between Jan – September 2019, 235 hand pumps have been restored at an average cost of £197.34 per pump (250CHF). We target 14-20 pump repairs per month at a cost of £250 - £300 each so we are very pleased to have averaged 26 repairs per month at a lower cost than budgeted.

Each month a report, expenditure and a budget request for the following month is provided. Based on the performance and results the next month's budget is provided. We aim to spend £5000 per month on pumps repairs. If the exchange rate is favourable, we repair slightly more pumps than months when the exchange rate is poor. The reports and expenditure are internally audited every 6 months.

Here are some photos of the repaired pumps



Pump repair 54 - school children collecting water after the repair.



Pump repair 139 - the village pump now working again.



Pump repair 72 - going fishing trying to remove broken pipes. This repair is still ongoing.



Pump repair 101 - the village pump now working again.



Pump 160 - repaired



One of the new Blue Pumps installed.



Pump 50 - school children enjoying the novelty of the working pump.



Pump 138 - being repaired - now working.

Improvements for 2020

We need to capture more complete data on the repaired pumps including the GPS coordinates of every pump, measurements at the site and better information on the repairs.

Conclusion

Around 56,000 people were provided with access to water from the restoration of 235 hand-pumps during the period of Jan – Sept 2019. The Eagle Foundation funding was critical to making this happen and it is through contributions of this kind that the Osiligi charity will be able to continue to repair more of the broken hand-pumps in the rural districts of Kenya.

The repairing of hand pumps is so much more cost effective than installing new handpumps. In our opinion, no more hand pumps should be built in Kenya until the existing stock of broken pumps are all repaired.

Some of the pumps repaired during the 9 months have been broken for the last 10-12 years.

Our thanks again to the EagleFoundation as without your financial help, these 235 pumps would not have been repaired and the 56,000 people would be relying on a dirty pool for their water supply.

Appendix 1 - data on the 235 pumps repaired

We keep track of the repairs on a large spreadsheet. A copy of this spreadsheet can be seen here <https://docs.google.com/spreadsheets/d/1hdTv4EmaPSwSDUJbk14VfFqNWjjR8QtGJt2dbbQ0Rgw/edit?usp=sharing>

So we can fit a version of the spreadsheet into this report, we have shown below a mini version of the spreadsheet with many of the columns missing.

No	County	Pump Name	Depth (m)	Water Column	People	Type of repair
1	Siaya	Nyalula Primary School	62	38	719	New pump
2	Kajiado	Moseti			100	Replaced worn out u-seal and a foot valve
3	Makueni	Kathonsweni			300	Replaced broken end rod, u-seal and bearings
4	Kitui	mukuyuni			200	Rising main, rods , foot valve and plunger
5	Siaya	Nyakongo	31.8	12	300	New pump
6	Kajiado	Ibirikkani			150	Repalced a broken u-seal and bearings and missing o-ring
7	Siaya	Ulafulu	25.2	6	260	New pump
8	Makueni	Wivia			250	u-seal
9	Siaya	Nina CBO	39	24	300	New pump
10	Siaya	Sikang	39.3	31.3	207	New pump
11	Siaya	Lolwe	40.5	23.3	200	New pump
12	Siaya	Equator Special School	50	48	125	New pump
13	Siaya	Umaji	23	18	200	New pump

14	Siaya	Kowet Primary School	25	21.5	230	New pump
15	Siaya	Uhuak	31.3	8	150	New pump
16	Kwale	Fwaombi2	21		450	Replace endrod, 7 risers & 7 rods
17	Kwale	Mivumoni2	24		150	Replace end valve, end rod and rods
18	Kwale	Ramisi	12		200	S/S rods, Pin, footvalve & hanger pins
19	Kwale	Msambweni	26		300	U-seal, bearing bushes and 8 S/S rods
20	Siaya	More C			250	
21	Siaya	Obudho Welo			350	
22	Homa Bay	Kanyada			300	
23	Homa Bay	Marindi			350	
24	Siaya	Kanyaboli			300	
25	Siaya	Kongongo	45	24	280	New pump
26	Kitui	Kitui central A	15.3	3	250	Rising main, rods, foot valve, and plunger.
27	Makueni	Busya 7 pump			200	Broken Rod replaced
28	Siaya	Salala	10	5	75	New pump
29	Kitui	Utethyo	17.1	4.6	450	Change fulcrum and hanger pin, u-seal, changed
30	Siaya	Umuhula	7.5	5.2	400	New pump
31	Siaya	Nyadheho	34	17.2	500	New pump
32	Makueni	Kanthuni			300	Replaced broken end rod, u-seal and bearings

33	Kitui	Itiliku well	19.9	6.1	200	Hanger and fulcrum pin, rods, plunger rod, foot valve and u-seal.
34	Kwale	Muhaka	40		300	Repaired risers
35	Siaya	Sikinga Kondiek	10	4.5	150	New pump
36	Busya				200	Broken Rod Repalced
37	Homa Bay	Korwa Water Pump	65	4	250	Replaced bearing bushes, handle and U seal
38	Kwale	Milalani	24		250	replaced rods
39	Siaya	Ndori	19.5	7.31	250	New pump
40	Homa Bay	Kosese Water Pump	25	14	300	Replaced U seals and centralisers
41	Kwale	Bongwe	18		200	replaced S/S rods and hanger pin
42	Siaya	Kowuo	41	20		New pump
43	Homa Bay	Kaudha Water Pump	45	15	500	Replaced U seals, bobbins, foot valve, centralisers and 5 rods
44	Kwale	Mihurini	32		400	U-seal and S/S rods
45	Siaya	Kamlag	30	10	150	New pump
46	Homa Bay	Kasimbi Water Pump	50	17	400	Replaced U seals, fulcrum & hanger pins, bearing bushes and fabricated a pump head.
47	Kwale	Mivumoni	18		250	Plunger, foot valve and hanger pins
48	Siaya	Udamayi	19	12	376	New pump
49	Siaya	Ang'asa	23.78	5.5	100	New pump
50	Homa Bay	Kokello water pump	65'	40'	250	

51	Kwale	Kolorado	27		200	Seal, Bearing, Cylinder, Leaking Riser.
52	Kitui	Katalani wll	9.1	3.96	200	Uprooted the rising main and replaced rising pipes and bent rods.
53	Kajiado	Tarakea Pump			120	Replaced Risers, rods bearings and u-seal.
54	Homa Bay	Rambusi C water point	45'	35'	200	
55	Kwale	Bongwe			300	End rod, u-seals, bearings, leaking rising main.
56	Kitui	Nzungi well	12.2	3	400	Foot valve, u-seal, plunger replaced.
57	Kajiado	Kiimani Pump			50	Replaced Cylinder Assembly
58	Homa Bay	Othoro	90'	60'	300	
59	Kwale	Waa			150	Cylinder, end valve, leaking riser.
60	Kitui	Kyango well	10	3.7	250	Fulcrum pin, hanger pin, u-seal changed.
61	Kajiado	Ole sudi Pump			300	replaced a broken u-seal and bearings and missing o-ring
62	Homa Bay	Wangliech	33.6	18.3	200	
63	Kwale	Mwanyana Tiwi	21			Rods, end rod, hanger pin, riser to be extracted cylinder.
64	Kajiado	Tarakea Pump			120	Replaced Risers, rods bearings and u-seal.
65	Kajiado	Kimana pump			220	Replaced cylinder ass. worn out u-seal and a foot valve
66	Homa Bay	Ongoro	17.1			

67	Kwale	Mkokwani	24		250	Leaking riser, rusted rods, corroded and worn out pedestal.
68	Kwale	Misufini	18		200	Seals, Bearing, Pin
69	Kitui	Tanganyika well	8.8	3.7	300	Hanger & fulcrum pin and plunger changed.
70	Kajiado	Kiimani Pump			50	Replaced Cylinder Assembly
71	Makueni	Kaunguni Market Pump			80	Replaced broken rod and u-seal
72	Homa Bay	Osodo	17.1			
73	Kwale	Manyatta	24		200	End rod, u-seals, bearings.
74	Kajiado	Ole sudi Pump			300	replaced a broken u-seal and bearings and missing o-ring
75	Makueni	Ovileni Pump			100	Broken Rod replaced
76	Kwale	Mwamji	18		100	Cylinder, end valve.
77	Kajiado	Kimana pump			220	Replaced cylinder ass. worn out u-seal and a foot valve
78	Kwale	Juhudi water project	21		300	Rods, end rod, hanger pin, 5 bolts.
79	Makueni	Kaunguni Market Pump			80	Replaced broken rod and u-seal
80	Kwale	Mayombe	24		250	Leaking riser, rusted rods.
81	Makueni	Ovileni Pump			100	Broken Rod replaced
82	Kitui	Kiloka well	18.3	6.1	350	Fulcrum pin, hanger pin and u-seal changed.
83	Kwale	Munje	30		200	Reseat cylinder, riser and rope
84	Kwale	Munje 2	10		150	Footvalve, plunger, hanger pin rusted and replaced

85	Kwale	Kikungoni	21		150	Leaking riser, seals, bearing sets
86	Kwale	Muhisini	12		200	Cylinder decorossion, endrod, footvalve and plunger
87	Kwale	Mkongwani Nyayoni	18		300	Broken down rods, replaced a leaking riser
88	Kwale	Munje	30		200	Reseat cylinder, riser and rope
89	Kwale	Munje 2	10		150	Footvalve ,plunger,hanger pin rusted ,replaced
90	Kwale	Kikungoni	21		150	Leaking riser,seals,bearing sets
91	Kwale	Muhisini	12		200	Cylinder decorossion ,endrod,footvalve and plunger
92	Kwale	Mkongwani Nyayoni	18		300	Broken down ,rods,replaced a leaking riser ,
93	Kajiado	Entarara Pump			200	Replaced a worn out u-seal.
94	Homa Bay	Ndiga Water Pump			250	
95	Kajiado	Sabuk Pump			80	2Risers, 2rods, bearings and u-seal replaced
96	Kajiado	Rombo Pump			100	Replaced a broken u-seal and bearings
97	Makueni	Mboonia pump			150	Replaced worn out u-seal and a foot valve
98	Makueni	Kwa musyoka Pump			180	Replaced broken end rod, foot valve and u-seal
99	Makueni	Wavindu Pump			100	
100	Homa Bay	Koweya Water Point			250	
101	Homa Bay	Korego Water Point			300	

102	Homa Bay	Akili B Water Point			200	
103	Homa Bay	Kakoko Water Point	45'	35'	200	Replaced three risers, U seal and O ring, Cylinder de-corrosion, Fishing out done, repaired on. 7/4/2018
104	Siaya	Sican B Water Point	90'	60'	300	Replaced three rods 3 risers, U seal and O ring. Repaired on 18/4/2018
105	Homa Bay	Akele A water pump			250	
106	Homa Bay	Thuon Gweno water pump	63'	33'	250	Replaced U-seal, O ring, two rods, two risers-used double sockets for the joints. Repaired on 2/4/2018
107	Siaya	Ang'asa Water Point	54'	35'	250	Replaced plunger, foot valve, rods, centralisers
108	Kitui	ikanga			300	one leaking riser was changed, the rest were cleaned, and two rusty rods were replaced
109	Kitui	kalawa			200	fulcrum pin and hanger pin changed new foot valve installed
110	Kitui	mulundi			200	foot valve changed, fitted centralizers replaced fulcrum pin, installed two new risers
111	Kajiado	Olemune Pump			150	Replaced cylinder assembly,bearings and hanger pin
112	Kitui	Malatani well 1			300	replaced rising pipes and bent rods
113	Kitui	malatani well 2			200	foot valve, u seal and plunger replaced, one rod change
114	Kitui	malatani well 3			250	hanger pin and u seal changed, two rods changed
115	Kitui	malatani well 4			300	plunger rod

116	Kwale	Mnazini Borehole	21		150	Riser repair and rod replacement. Bearings
117	Kwale	Lukore	25		200	Riser ,hangerpin,footvalve and plunger
118	Kwale	Tiwi-Chize borehole	18		100	Rods ,centralizer and bearing
119	Kwale	Mkomani Water Pump	9		120	Rods replacement,hanger pin
120	Kwale	Mwashipwi Borehole Project	23		80	Rod,risers repair jointing,plunger,foot valve and bearing.
121	Homa Bay	PAW DHAKO	63	33	250	
122	Homa Bay	OMINDI	110	80	200	
123	Homa Bay	ONGANG'	100	70	300	
124	Homa Bay	KOPAP	54'	35'	250	
125	Kajiado	Kambi Pump			180	Replaced bearings, Useal, oring, bobbins and two rusty rods
126	Kajiado	Tsavo Village Pump			240	Replaced a broken foot valve, bearings and u-seal
127	Kajiado	Olemune Pump			150	Replaced cylinder assembly,bearings and hanger pin
128	Kajiado	Kambi Pump			180	Replaced bearings, Useal, oring, bobbins and two rusty rods
129	Kajiado	Tsavo Village Pump			240	Replaced a broken foot valve, bearings and u-seal
130	Kajiado	Entarara, Mr. Joseph Pump			150	Replaced bearings and u-seal
131	Makueni	Ovileni pump			200	Replaced a broken rod and u-seal
132	Makueni	Peter Pump			120	Replaced bearings and u-seal

133	Kajiado	Entarara, Mr. Joseph Pump			150	Replaced bearings and u-seal
134	Makueni	Ovileni pump			200	Replaced a broken rod and u-seal
135	Makueni	Peter Pump			120	Replaced bearings and u-seal
136	Makueni	Khyagwaci Pump			160	Replaced a foot valve U-seal and oring
137	Kajiado	Enkerai pump	28	25.4	180	Replaced a leaking riser, broken u-seal and bearings and missing o-ring
138	Kitui	POTEA well	47'	37'	75	replaced rising pipes and bent rods
139	Kitui	Kilika well	40'	25'	100	foot valve, u seal and plunger replaced, one rod change
140	Kitui	Ngelani well	30'	22'	125	
141	Kitui	Vilita well	47'	39'	100	plunger rod, changed ,two rising pipes and two rods changed
142	Kwale	Shamu	27		250	restoration
143	Kwale	Makongeni	10		250	restoration
144	Kwale	Mwachema	30		250	Rods ,centralizer and bearing
145	Kwale	mwanjamba	45		250	Rods replacement,hanger pin
146	Kwale	Mbokweni	35		250	Riser main adjustments.
147	Homa Bay	Kuja C water pump	80'	30'	300	
148	Homa Bay	Nyabisawa water pump	50	12	350	
149	Homa Bay	Gangre C Water Pump	60	15	600	

150	Homa Bay	Kothieno D water pump	55	12	500	
151	Kajiado	Nkasiogi pump	27	24.8	120	Replaced worn out u-seal and a foot valve
152	Kajiado	Olamayian Pump	22	19.5	250	Replaced broken bearing set, rusty rods, u-seal and a bobbin.
153	Makueni	Ovileni A pump	27	23.5	100	Leaking riser replaced, useal and bearings changed
154	Makueni	Kathonsweni pump	36	28.8	300	Replaced broken end rod, u-seal and bearings
155	Kajiado	Nkasiogi pump	Depth 34.6m	SWL 24.8m	100	Replaced broken bearing, u-seal and o-ring
156	Kitui	Kali well at lthimani mbusyani kitui central	25'	13'	100	u seal and foot valve replaced/changed rods{ all }
157	Kitui	Kakamu well at kwa mbaka in malatani kitui east		16'	150	U seal changed foot valve replaced
158	Kitui	Kanga well at kambati in malatani kitui east	50'	40'	175	two rods changed, bearing sets fitted
159	Kitui	itu well at musyimi in malatani kitui east	60'	45'	100	four rising pipes and four rods changed, bearing sets fitted
160	Kwale	Ng'omeni Vidziweni Pump	18		250	Riser main repair, plunger and foot valve . rods replacement
161	Kwale	Yote Sawa Borehole	26		200	Plunger, Bearings and pins replacement
162	Kwale	Mbuwani Musa	18		200	Rods replacement, riser and cylinder overhaul

163	Kwale	Mkwakwani Saida pump	21		200	Rods replacement, hanger pin
164	Kwale	Mwakamba	30		200	u-seal,bearings, 3 rods and plunger
165	Homa Bay	Rambusi			300	-Replaced U-seal and Bearing bushes
166	Homa Bay	Kouma			250	-Replaced rods, Risers, Centralizers, Bushes and U-seal
167	Homa Bay	Ober			350	- Replaced: Foot valve, U-seal, Bobbin, Fulcrum pin
168	Kisumu	Tinga			200	-Replaced Riser, Used double sockets to join the leaking riser joints, Foot valve, Bobbin and U-seal
169	Kajiado	Naisiae pump	Depth 30m	SWL20m	150	Replaced a foot valve, welded hanger pin and bearings
170	Kajiado	Koinet Pump	Depth 28m	SWL 21m	80	Replaced broken bearing set, u-seal and cleaned cylinder
171	Makueni	Munathi pump	Depth 32.6m	SWL 26m	200	Replaced a broken rod and useal
172	Makueni	Uvileni pump	Depth 30m	SWL 22.5	150	Replaced a leaky riser bearings and useal
173	Makueni	Kakuyuni Pump	Depth 38m	SWL 30m	250	Replaced broken bearing, u-seal and o-ring
174	Kajiado	Munyura pump	34.6	24.8	180	Replaced broken foot valve and cylinder.
175	Kitui	Kwa mwiwa well at zombe	28'	20'	150	Replaced two rising pipes u seal and foot valve replaced
176	Kitui	Syokiomo village well at tungutu	55'	31'	175	two rods and two risers changed and foot valve replaced

177	Kitui	kathande well at zombe	30'	20'	175	three rods changed, bearing sets fitted
178	Kitui	tungutu well at kwa vonza	45'	30'	200	four rising pipes and four rods changed, bearing sets fitted
179	Kwale	Tiwi Uvumbuzi	21		120	Riser main repair
180	Kwale	Pump	18		150	Rods and riser replacement
181	Kwale	Tiwi Chidze	18		100	Rods replacement(rusted)
182	Kwale	Tiwi Migandini	15		200	Riser repair and cylinder
183	Kwale	Mwamose	30		200	Riser and plunger
184	Homa Bay	Lang'o romowater pump	60'	20'	250	Replaced U seal, bearings, bushes, Fulcrum pin
185	Homa Bay	Miginjo water pump	40	9	300	Replaced U seal , centralsiers
186	Homa Bay	AkeleWater Pump	50'	9	500	Replaced U seal, plunger, cylinder
187	Homa Bay	Orunga water pump	55'	12	400	Replaced U seal, Cylinder, bushes
188	Kisumu	Lwala	65'	12	350	Replaced U seal, bushes, fulcrum pin
189	Kisumu	Kouma	70'	12	400	Replaced U seal, plunger, centralisers
190	Kajiado	Osunyai pump	30	20	220	Replaced leaking pipes, rods, bobbins, useal and bearings
191	Kajiado	Nalangu Well	Depth 32m	SWL 26m	180	Replaced cylinder assembly, 2rods and broken riser,
192	Kitui	Kwa musyoki	27'	21'	100	u seal and foot valve replaced/changed rods{ all }

193	Kitui	Mukuyuni area	28'	21'	175	U seal changed foot valve replaced
194	Kitui	Katamani pump kitui south	30'	20'	250	two rods changed, bearing sets fitted
195	Kitui	Kamukuyuni well	45'	30'	200	four rising pipes and four rods changed, bearing sets fitted
196	Kwale	Muuyu Gutu Borehole	21		200	Riser main repair and replacement of parts
197	Kwale	Mcheza Kwao	20		200	Fixed a leaking riser and a defunct plunger
198	Kwale	Kirima Borehole	18		200	Rods and riser replacement and repair
199	Kwale	Tiwi Duga borehole	20		200	Leaking riser
200	Kwale	Mvinden Borehole	18		200	Riser and rods
201	Kajiado	Naisiae Borehole	Depth 34.5m	SWL27.2m	220	Replaced leaking pipes, rods, bobbins, useal and bearings
202	Kajiado	Lolkerra Well	Depth 26m	SWL20m	160	Replaced broken foot valve, missing useal and rod centralizers
203	Makueni	Kwa Mueni well	Depth 18m	SWL12.5m	250	Replaced Bearings, useal and rusty rods
204	Makueni	Kyagwasi Borehole	Depth 25m	SWL 19.7m	300	Replaced leaking pipes, rods, cylinder assembly, bobbins, useal and bearings
205	Homa Bay	Waringa			200	
206	Homa Bay	Nyagidha			350	
207	Homa Bay	Got Kokello			400	
208	Homa Bay	Kongwen A			350	

209	Homa Bay	Kongwen B			350	
210	Kisumu	Usare			300	
211	Kisumu	Kuogo			300	
212	Makueni	Mutua Kituluta				
213	Makueni	Kyagwasi borehole				
214	Makueni	Mutinda Kawelu well				
215	Makueni	Mbinda well				
216	Makueni	Matheka well				
217	Makueni	Uvileni primary borehole				
218	Makueni	Mativo well				
219	Makueni	Ruth well				
220	Makueni	Ndolo borehole				
221	Makueni	Katua well				
222	Makueni	Mbinda well				
223	Makueni	Katua well				
224	Makueni	Waita well				
225	Makueni	Kyagwasi brehole				
226	Makueni	Ndivo well				
227	Makueni	Mombuni well				
228	Makueni	Katua well				

229	Siaya	Simur	1184M			
230	Siaya	Siranga	1184M			
231	Siaya	Uboro	1150M			
232	Siaya	Agullu	1100M			
233	Siaya	Gongo	1203M			
234	Siaya	Dam	1202M			
235	Siaya	Saradidi	1231M			