MEAK

MEDICAL & EDUCATIONAL AID TO KENYA

Medical Education Aid Kenya

M E A K – REPORT TO FONDATION EAGLE.

AGRICULTURAL TRAINING & PROVISION OF BOREHOLE IN J M GOODHOPE SCHOOL

FF0663

Date of Acceptance:

5TH May 2023

Amount of Donation:

GBP £24,230,280

Duration of project:

May / June 2023

Area of project

Ndaragwa Kenya

Report prepared by Alex Thiru – June 2023

JM GOODHOPE BOREHOLE DRILLING, TOWER INSTALLATION, DRIP IRRIGATION AND PLUMBING PROJECT IMPLEMENTATION REPORT

CONTRACTOR: WATERLOGIC ENGINEERING COMPANY

PROJECT SUPERVISOR: OSILIGI CHARITY PROJECTS

PREFACE

This report provides an overview of borehole drilling at JM Goodhope School, including its purpose, methods, equipment, and potential benefits to the school and the community, handling and future maintenance policies. The information presented in this abstract serves as a concise summary of the main aspects covered in the full report.

Impacted by the drought, JM Goodhope School was among many other schools hard hit by the shortage of water. This had a significant impact on the school, affecting both the educational environment as well as the well-being of students, staff and the community.

Among the challenges and consequences attributed to this menace of water shortages, are health and hygienic risks, as well as detrimental impacts on the quality of education, also physical and emotional repercussions to students, staff and the entire community.

The proactive measures taken by MEAK, Foundation Eagle and the Osiligi Charity includes projects of drilling a borehole, facilitating a drip irrigation system in the school farm as well as plumbing within the school. These measures will, in the long term, address the challenges posed by the drought and provide a ensured conducive learning environment within the school, promoteing sustainable practices such as agro farming, with enhanced curriculum development for the children fostering resilience in the face of the changing climate conditions, not only at the school but also to the wider community.

INTRODUCTION

The main reason for providing water to the school was to assist and encourage the embryonic farming programme that had already been instituted there. This programme has already expanded, with further significant expansion being rapidly implemented, they are already growing over 25 different vegetables and herbs, The diet of the school children and faculty members have been dramatically improved with nutritious and varied meals now being provided. The 'Dripsel' irrigation system which provides water to the plants in the evenings and early mornings has enabled the hitherto unused farming land to be cultivated and abundant growth is already evident, with the promise of further plentiful supplies of vegetables in the future.

The school farming project conducted at J M Goodhope School has been a terrific success on multiple levels. Firstly, and most importantly, they struck water at various depths and finally at a depth of 140 metres, which has proved to be one of the most productive boreholes that the engineers had ever drilled, producing crystal clear potable water at a rate of 20,000 litres an hour. This flow rate will enable the school to sanction distribution to the residents of the local township, who wish to join the 'water sharing' club, and pay the small monthly fee for the benefit of the abundant clean water.

Sparkling clean water from the borehole

THE PROCESS

SITE SELECTION:

The first step was to identify a suitable location for drilling. Geologists and hydro geologists conducted surveys and studies to assess the potential for groundwater availability in the school farm. Factors such as geological formations, water table depth, and proximity to existing water sources were considered during site selection. Vertical Electrical Sounding (VES) is the main technology behind mapping the availability of water by taking resistivity measurements using probes at a set distance of 1 meter apart.

Waterlogic engineering team carrying out a geological survey

PERMITS AND PERMISSIONS:

Obtaining the necessary permits and permissions is crucial before commencing drilling operations. This includes acquiring permits from Nyandarua county government, adhering to environmental regulations through the Environmental Impact Assessment (EIA) report, obtaining license from Water Resources Management Authority (WARMA) and ensuring compliance with any relevant laws or regulations.

Waterlogic engineering company, contracted to carry out the project was mandated to providing all the permits and licenses. So far we have the water quality analysis report and pump testing report. We expect WARMA and EIA reports to be availed in the course of the month.

DRILLING EQUIPMENT SETUP:

Once the site was selected and permits obtained, the drilling equipment was set up. This includes the installation of a drilling rig which was well positioned over the designated drilling location.

Drilling rig

DRILLING OPERATIONS:

Drilling begins by penetrating the surface layers of soil and rock using the rotary drilling method. The drilling rig applies downward force and rotates a drill bit to break through the ground. As the drill progresses into the ground, extra drill rods are added until eventually the drill reaches the required depth, which in our case was 140m. The most interesting thing is that the first aquifer was discovered after the first 30m of drilling! A geologist from the contracted company supervised the entire drilling process by closely monitoring and taking soil and rock samples taken at different depths.

The diameter of the borehole dug was 200mm, which can cope with the anticipated borehole production yielding 40,000 litres/ hr.

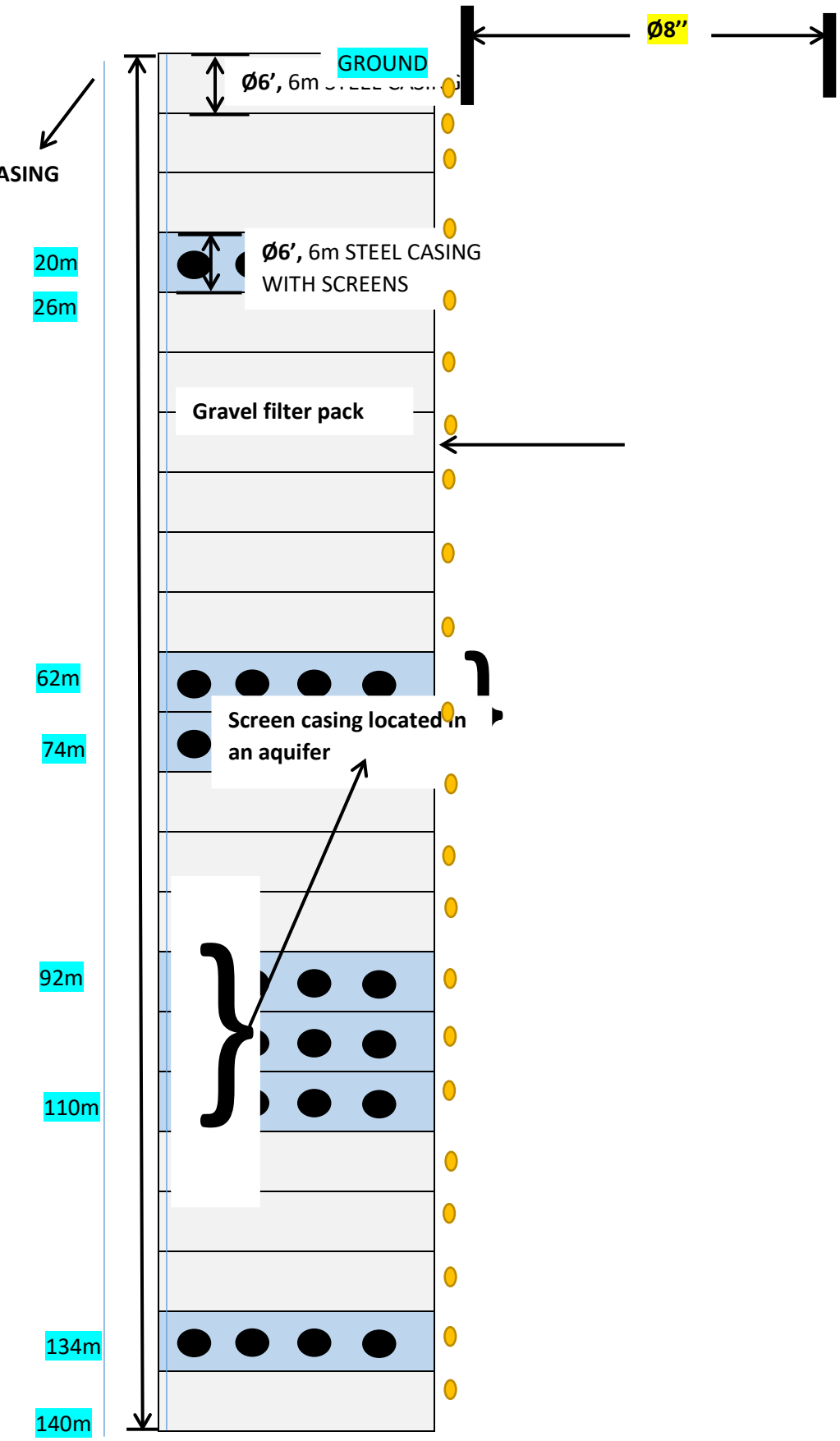
Sampling soil formations

CASING INSTALLATION:

As drilling progresses, steel casing pipes are installed to reinforce the borehole and prevent it from collapsing. The casing steel pipes were 6 inches diameter. These were inserted into the drilled hole and secured in place. The annular space between the casing and the borehole wall was filled with gravel filter as the sealing material to prevent dirt contamination and stabilize the well; as well as keeping sand out of the pump. In addition 8 inch steel casings, 3metres deep, were inserted to prevent erosion and contaminated water from getting in to the borehole.

The installed casings were plain in the areas with no water and with fine slots in areas with water as illustrated below

Steel screen casing


Ø8"
GROUND
Ø6', 6m
ASING
20m
Ø6', 6m STEEL CASING
WITH SCREENS
26m
Gravel filter pack
62m
Screen casing located in
an aquifer
74m
92m
110m
134m
140m

Technicians welding the casings

WELL DEVELOPMENT:

After the casing installation, the well was developed to enhance water flow. This involved processes such as air lifting, surge block, or water jetting to remove fine drilling cuttings, mud, and other obstructions from the well. This was aimed to improve the well's efficiency and water yield.

WELL COMPLETION:

Once the well was fully developed, it was equipped with a submersible pump fitted with 2 inch pipes, raisers, power and pump control cables and borehole cover. Additional plumbing was done to cater for the overflow that was developed after drilling.

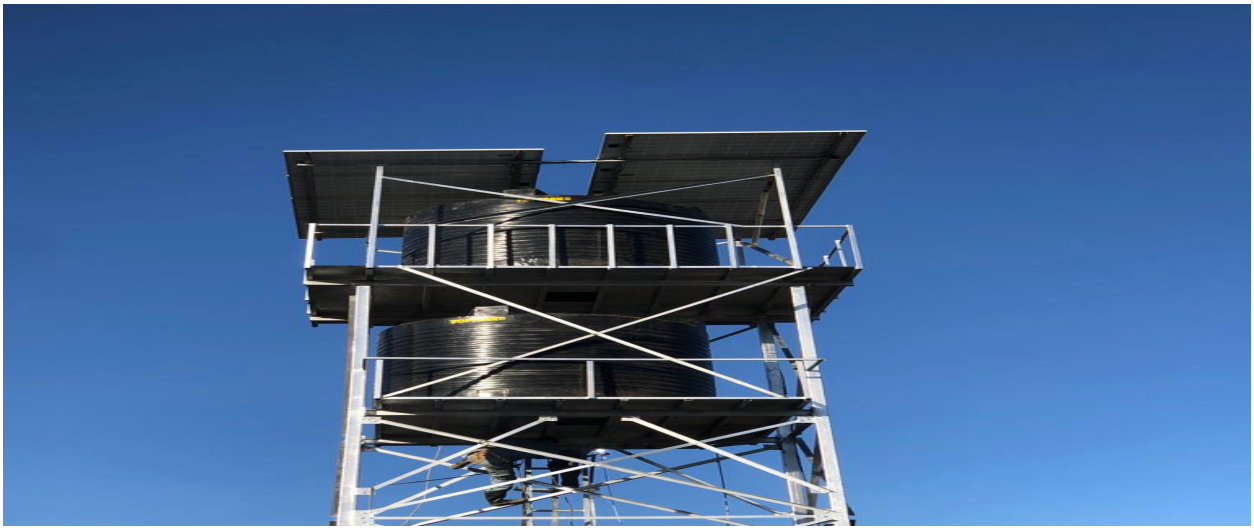
Pump installation, inverter and solar panel installation:

To facilitate water extraction and control, a hybrid Dayliff sunverter3 inverter (which can utilize both solar and grid connection, but prioritizes solar), 9 solar panels of 335watts each, yielding a total of 3.15 kva. A 2,2kv, single phase pump, capable of 200 metre head with a maximum yield of 20,000 ltrs/hr was then inserted.

The pump was later connected with jointed pipes up to the borehole cover and the wires dropped using the raisers. All the solar panels were connected in series, witrh a nominal voltage of 3kva, the inverter was fitted with PV disconnect, miniature circuit breaker (MCB) and then connected to the grid via an automatic voltage stabilizer (AVS).

Tower installation and tanks:

A 12m steel structure with a well-designed and firm concreted foundation was set up immediately after drilling. The structure was designed to support two 10,000 litres tanks with the solar panels at the top.



The drip irrigation and plumbing:

Water coming from the borehole is metered before being fed to the tanks. The bottom tank serves the drip irrigation system, while the top tank serves the schools needs and community access points.

The farm served by the drip irrigation system, measures 1000 square meters for vegetable production with an additional 400 square meters meant for seed nursery.

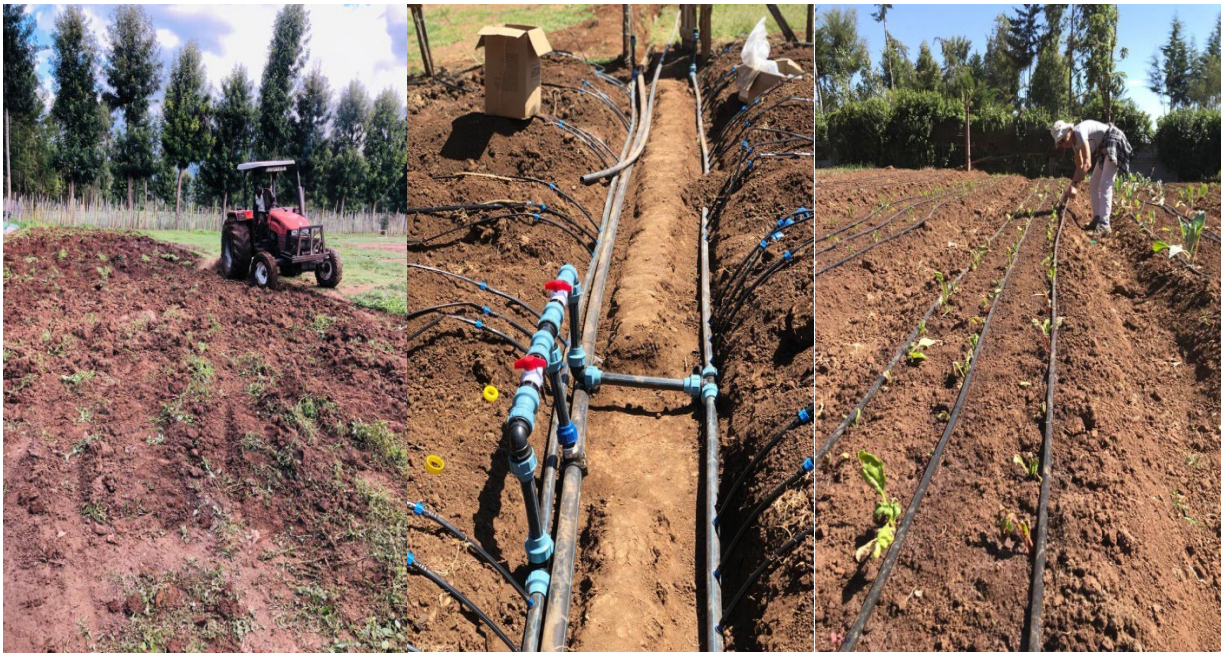
The seedbeds which are subdivided into one meter widths and have all been fitted with dripsel pipes, 3 per seedbed. Generally the main farm has been further subdivided into four sections (farm A, B, C & D) and each section fitted with a controlling gate valve to regulate the water to each section. An additional stand tap for nursery watering is also put in place. Flush points have also been installed and training on their purpose Has been given to Teresa, Joseph and Alex.

The drip irrigation tank has a tank capacity of 10,000 lts. A gate valve and water filter has been installed beneath the tower, to be used for isolation and maintenance purposes

A selection of tools and equipment as well as the provision of secure fencing have been funded in line with the scheme budget and proposal. This will help the children tending the crops and the fencing will keep away animal intrusion and safeguard the drip irrigation pipes and valuable equipment from pilferage or intentional damage.

Gallery of tools display and the practical use by the pupils

Measuring 1000sqr/metre farm



Cultivation, plumbing drip pipes and planting on the seedbeds

Plumbing for the school including boys, girls and visitors lavatories, boys and girls bathrooms, staff quarter, main house and the community water access points have all been correctly installed as per the proposed plumbing diagram.

Wash basin, community water access taps and a stand at JM Goodhope School

IMPACTS OF THE PROJECT

- Increased yields in crop production. The constant flow of water into the school has seen a tremendous increase in crop production and diversification

Before borehole drilling

After borehole drilling

Mitigation of the effects of drought at JM Goodhope has been completely solved. Thanks to Foundation Eagle, MEAK and Osiligi Charity Projects for making a dream come true. The school can now guarantee food security and self-sufficiency.

- A further spin off from the project is the reduction in the incidence of water borne diseases within the school and those people now taking the pure water. There were zero cases of diarrhoea or dysentery or any of the other water borne diseases in the past one month an encouraging sign of improved health within the community as a whole.

- Local residents have already been recruited and the water sharing scheme explained, with reasons for the charges clarified. Assurances have been given that the funds accumulated, will be solely used to fund servicing, repair and replacement of the various elements of the plant and equipment. It is anticipated that most residents of the local community will eventually join when the advantages of having abundant clean water available within the township, become apparent

Local having a taste of the sweet sparkling water from the school

I am convinced that the long term benefits to the school and the local community will be apparent and beneficial for very many years to come.

JM GOODHOPE MATERIAL COSTING

TASK	COST (Kshs)	PROGRESS	START	END
Phase 1 Geophysical Survey	-			
Data gathering & analysis	-	100%	05/08/2023	05/09/2023
Borehole data mapping	-	100%	05/09/2023	05/10/2023
Analysis & Reports (3)	50,000	100%	05/10/2023	05/10/2023
EIA	32,000	100%	05/10/2023	05/11/2023
NEMA GOVT. License	10,000	0%	05/10/2023	
WRMA licence	28,000	0%	05/10/2023	
TOTAL	**120,000**			
Phase 2 Borehole drilling & equipment				
Drilling	-	100%	05/10/2023	05/11/2023
Drilling & Casing	-	100%	05/11/2023	05/11/2023
Well head & capping	-	100%	05/11/2023	05/11/2023
Test pumping	1,391,534	100%	05/11/2023	05/12/2023
Equipment installation	788,986	100%	05/12/2023	05/12/2023
Water quality analysis (report)	-	100%	05/12/2023	05/12/2023
Completion report	-	100%	05/12/2023	15/5/2023
TOTAL	**2,180,520**			
Phase 3 Tower installation				
Tower Framework	570,600	100%	15/5/23	17/5/23
Tanks (2) - float sensors	170,000	100%	17/5/23	18/5/23
Solar structure	78,000	100%	18/5/23	19/5/23
Foundation	152,440	100%	19/5/23	19/5/23
Plumbing (2 stand pipes)	20,000	100%	19/5/23	19/5/23
TOTAL	**991,040**			
Phase 4 Drip irrigation installation				
1000sq/m	164,236	100%	17/5/23	17/5/23
Installation & Labour	64,400	100%	17/5/23	18/5/23
HDPE pvc pipe	42,920	100%	18/5/23	18/5/23
Trenching and backfilling	15,000	100%	18/5/23	19/5/23
Testing & commissioning	0	100%	19/5/23	19/5/23
Completion reports + sign off	0	100%	19/5/23	06/02/2023
Total	**286,556**			
Phase 5 school plumbing				
HDPE 3/4" 300m roll pvc pipes , fittings, trenching, backfilling, stand taps & wash basins	198,200	100%	16/5/23	18/5/23
Total	**198,200**			
GRAND TOTAL PAID TO WATERLOGIC ENGINEERING COMPANY				**3,776,316**
MISCELLANEOUS BUDGET				
logistics to and from Nairobi to Mombasa. Haller training (Teresa & Alex traveling and accomodation expenses)				
Farm tools , timber , nails and farm fencing posts				
1000Sq/m farm preparation labour cost				
seedlings and other plantings				
SUB-TOTAL PAID TO TERESA				**314,660**
GRAND TOTAL COST				**4,090,976**

The sterling equivalents to the above expenditure are as follows

Phase 1 Geographical survey KES 120,000 = £ 712.16

Phase 2 Borehole drilling and equipment KES 2,180,520 = £12,940.77

Phase 3 Tower installation KES 991,040 = £5881.54

Phase 4 Drip irrigation system KES 286,556 = £1700.63

Phase 5 School plumbing KES 198,200 = £1176.26

Miscellaneous costs KES 314,660 = £1867.71

Purchase by MB in the UK of tin badges for the schoolchildren reading

SCHOOL FARMING – TEAM MEMBER X 400

SCHOOL FARMING – TEAM LEADER X 100 £330.00

Total cost of project in Sterling £ 24,608.77

Budget was £24,230 so overspend of £ 378. 77 which will be met from MEAK reserves

CONCLUSION

Of the many projects that MEAK has carried out in conjunction with Fondation Eagle, I am bound to admit that this one has given me the most pleasure and satisfaction. It has been successful on every level and many thanks are due to Bhavna Dziurzynski who conceived the idea, Eric Mckinnon who brilliantly arranged and managed the provision of the borehole and ancillary equipment, and Joseph Wambugu (The Headmaster) Alex Thiru, Teresa Wanjiku and all the faculty and pupils at J M Goodhope School who have embraced the project with joy and unbridled enthusiasm.

Mike Belliere

Founder / Director

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