KASTHEW CONSTRUCTION UGANDA LTD

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COMPLETION REPORT FOR EWB WATER PROJECT, SITE LOCATION: BUBAGO VILLAGE, BUWAYA SUBCOUNTY, MAYUGE DISTRICT

APRIL 2024

Contents

1.0 INTRODUCTION

Engineers Without Boarders contracted Kashew Contractors Limited towards Consultancy Services for, drilling and pumping test for one production borehole to serve communities of Bubago in Mayuge District with good quality water.

The Project

The project was undertaken under close consultation and supervision of contractors technical team, EWB's field supervisors and community leaders who were fully engaged from the initial site visits to completion of drilling processes.

Summary of activities

- Mobilize and setting Drilling Unit to selected VES point
- Drill and construct the well as guided.
- Conduct well development for the well
- To conduct Pumping test and water quality analysis

1.1 Project description

Drilling of one production borehole at selected VES point.

The aim of the project was to secure sustainable water supply source with potential yielding of water to supply EWB communities with reliable water.

The project was under the control of the project manager/site engineer and EWB field supervisors appointed by the client to closely monitor the progress of works.

The work was carried out in phases:

Phase One: Physical drilling and well construction
Phase Two: Pumping test and quality analysis

2.0 SCOPE OF THE WORK

2.0.1 Primary works

The scope comprised the following works which were carried out by the contractor. Works not mentioned but necessary to finish the fully functioning drinking water borehole project were considered as secondary works

a. Drilling 6 inch including drilling for temporary casing, formation sampling, down hole geophysical logging (conductivity and self-potential)

b. Installation of surface conductor case, permanent uPVC casing, permanent uPVC screen and gravel pack.
c. Seal off annular space between casing and borehole with clay, backfilling and subsequently bentonite into annular space.
d. Borehole development including. Borehole testing for borehole capacity test including water level measurement.

e. 24Hrs Pumping test and carrying analysis for water quality.

2.0.2 Secondary works

Secondary work meant works, which was included in the agreement though not specifically mentioned in the Bill of Quantities. The following items were among those classed as secondary work:

a) Meeting any and all legally necessary requirements relating to borehole drilling specified by any Department of the Government of the Republic of Uganda including providing any and all necessary records of borehole drilling to any Department of the Government of the Republic of Uganda that requires or requests them.
b) Any and all legally required and professionally accepted environmental protection, health, and safety measures.
c) Keeping the sites clean during work and cleaning up and restoration of site after completion of work.
d) All water supply for drilling activities.
e) All time and labor for maintenance, whether routine, scheduled, or unplanned, of the drilling rig, drilling accessories (including the compressor) and any additional technical.
f) Protection of works and equipment against damage.

3.0 UNDERGROUND WATER INVESTIGATIONS

3.0.1 Overview

Surveys were conducted by client. We were guided by the clients' supervisors to the selected and recommended VES point for potential drilling.

Picture showing rig positioned at recommended VES point

4.0 DRILLING PROCEDURE

4.0.1 Mobilisation

Key Personnel

The personnel involved in the project included;

1. Contractor's Site supervisor	Ssonko Martin
2. Technician-Driller	Dickens OLuge
3. EWB Field supervisors	Ali

Kasthew Construction (UG) Ltd deployed Mr. Ssonko Martin as the field supervisor and engineer for the project, with a postgraduate experience, and a hydro geologist; he was responsible for site operations. He was assisted by the operations team to manage day to day operations of the project.

Adequate safety equipment such as safety helmets, hard-toed boots and gloves, reflectors available and used by the crew while on site.

4.0.2 Logistics and Communication

The drilling team lodged at the site in tents, this place was appropriate for lodging. This ensured that work commenced very early. Contact between the field and office was through mobile telephones using the MTN, and Airtel networks, whereas contact

between the contractor and the client was through emails, phone calls, physical meetings and engagements, SMS and watsapp communication!

4.0.3 Contractor's equipment

The contractor provided the whole equipment, including drilling plant, tools, materials and everything else necessary for the proper completion of the borehole. All of the contractor's drilling equipment had the capacity to construct 6" diameter lined boreholes, including gravel packs to the maximum drilling depth based on the results of the geological survey.

4.0.3.1 Drilling Unit

Contractor's machines, tools and equipment were in safe condition before utilization and were fit for the purpose. The following equipment were used for the purpose of works;- an AMW mounted drilling rig compressor: Truck Mounted DTH 1500 AMW Truck Model No. 2518, ATLAS COPCO AIR COMPRESSOR. A support truck, This carried drilling unit tools and equipment such as; extra drilling bits, temporal casings, personnel mobile shelters, etc. And a support van/pick up used to transport some drilling crew and offered site mobile services like fetching fuel and generally coordinated on-site services.

The rig was equipped with drag bits, DTH hammers, and button bits of different sizes. The drill rods used were 4" in diameter and average lengths of 4.6m. Drilling in the overburden was achieved using a 14" and an 10" drag bit. Drilling was accomplished by use of 8" button bit reamer and drill bit in the hard rock. In a collapsing overburden formation, temporary casings were used to enable clean drilling below the collapsing formation.

The picture above show our drilling rig.

4.0.4 Erection and dismantling

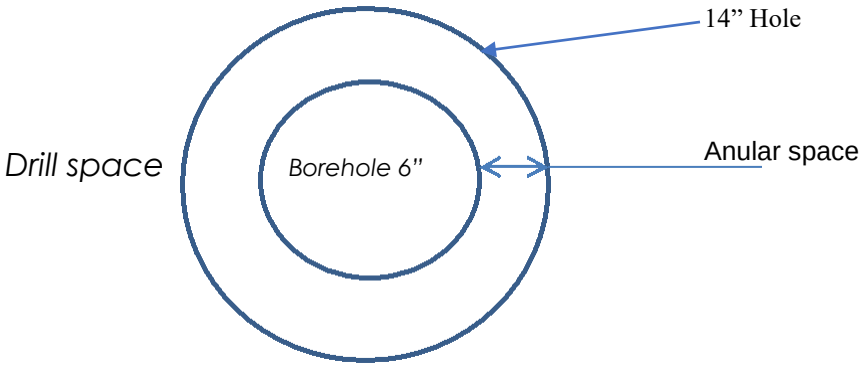
Erection of machinery and equipment at the drilling site comprised the ready to work installation required so that drilling, development, test pumping, casing, and any other required operations proceed without interruption. Erection was carried out while taking care to avoid all above-ground and below-ground hazards to natural and human environment.

Dismantling included removal of all machinery, equipment, stores and other materials and cleaning and restoration of the site.

4.0.5 Drilling

Drilling was started on December 19th 2023 and ended on December 22nd 2023!

The drilling crew ensured that the rig is set up at the exact point that was marked with a peg, we took all precautions to ensure the safety of all staff, members of the community and equipment deployed to the project. The contractor used drilling equipment that did not endanger the permeability of the aquifer. An appropriate drilling procedure was selected for the geology and other circumstances of the project location. The diameter of the drill hole was adequate to accommodate the chosen diameter casing and in addition a minimum 50 mm annular space. *A sample drilled hole is shown in the diagram below:*



Picture showing progress of the drilling works

4.0.5.1 DRILLING TECHNOLOGY

The drilling crew used mainly Air drilling method to cmpletion of the borehole. *See appendices for drilling logs.*

4.0.5.2 Borehole

The final depth of the borehole and all other relevant depths involved in the design of the borehole were jointly determined from measurements agreed upon by the Contractor's and Client's Supervisor/administrators on site.

All permanent borehole casings, screens and fittings were new with dimensions: 152mm*3mtrs (6") uPVC. The casings and screens were joined by threaded joints. The bottom of the casing columns were closed with a bail plug.

The entire casing and screen assembly were installed straight to cover the borehole depth and vertical in the borehole.

4.0.5.3 Gravel packing

A gravel pack was installed in the annulus space around the screens. The pack consisted of coarse sand and well-graded river gravel. The materials were free from shale, mica, clay, dirt or organic impurities of any kind.

The gravel pack had a minimum required thickness of 2mm and covered the entire screen length and rise to the top of the screen.

4.0.5.4 Borehole development and site completion

The drilling crew developed the borehole by a combination of jetting with water and surging with air, simultaneously rotating the jetting tool and slowly raising and lowering it through the length of all screens. The development continued until the required EWB standard was met.

The drilling crew developed the borehole with great care to avoid any damage to the casings.

4.0.5.5 Borehole Design

The final design of well was determined by the drilling crew and approved by EWB before installation proceeded. The visualized design for all the well is design B (Bottom to top Casing) were applied. The well was designed with 152mmx3mtrs (6") casing and screens in water strike zones. The water strike zones were gravel packed. *Refer to appendix B for Borehole design.*

In the above pictures; PVC casing pipes aligned for installation process.

Drilling summary

Location	Completion Date	Drilled depth	Water bearing zones	Driller's yield estimate	Actual Yield on Pumping test	PVC installation depth
Bubago	22nd March 2024	98.2mtrs	17-18 24-25 32-33 39-40 61-62	1.2m^3/hour	1.6m^3/hour	98.2mtrs

5. PUMPING TEST AND QUALITY ANALYSIS

A 24hours Pumping test experiment was completed on March 20th 2024. The exercise was commenced with a two steps test followed by a recovery done at each end of step test, and a constant test run for 24 Hours at a discharge rate of 1.6 cubic litres per hour. The purpose of the pumping test exercise was to estimate the aquifer yield and to monitor the well response to recovery after a constant discharge. Water sample was collected and delivered to the central lab Entebbe for portable water analysis. *Refer to Appendix C for pumping test results and D for Analysis certificate.*

Picture showing progress of pumping test experiment

6.0 OCCUPATIONAL HEALTH & SAFETY

KASTHEW CONSTRUCTION (UG) LTD operated under a comprehensive Safety Management System to ensure that all hazards identified in the workplace and potential occurrences detrimental to personnel, operations, assets and the environment and their impact on business performance were effectively managed. The company was committed to preventing occupational illness and injury in the workplace.

Health, safety and welfare of employees, client and service company personnel, site visitors and the general public were the first priority in all drilling and construction operations.

7.0 CONCLUSION

Our set objective was to ensure we succeed with the project and meet EWB's standard requirement. The borehole was successfully complete and capped on top to avoid contaminants and other foreign material from entering the borehole.

8.0 DEMOBILIZATION

On completion of the works at the sites, all equipment and materials were removed from the site, covered all settlement pits, and restored the site to what it was like originally before construction started.

9.0 APPENDICES

A: DRILLING LOGS

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CLIENT: ENGINEERS WITHOUT BORDERS DATE: 20/03/2024

DRILLING LOG

Location	BUBAGO	Grid Type: UTM( )		Well ID No.	
Parish	BUWAISWA	Long	33.574743	DWD	
Sub-County	BUWAYA	Lat	0.573220	AML	
County	BUNYA EAST	Alt	1126	Other ID No.	
District	MANUGE			Date Start	20/03/2024
Project No.		DTB:		Date completed	22/03/2024
Project Name				Possible yield (m^3)	

COMPRESSOR METER READING (START): _____ (END): _____

DRILLING DETAILS

TIME		Pipe (No.)	Depth (mtrs)	Drilling Diameter (Inches)	Soil Condition
Start	End				
08:34	08:38	01	1.6	14"	Reddish brown clay mixed with particles of laterite
08:46	08:48	02	6.2	-do-	moist sticky grey clay mixed with weathered rock
09:03	09:06	03	10.8	-do-	moist sticky grey clay mixed with weathered rock, fractures between 17-18m

DRILLING DETAILS

TIME		Pipe (No.)	Depth (mtrs)	Drilling Diameter (Inches)	Soil Condition
Start	End				
09:07	09:15	04	15.4	14"	sticky moist grey clay mixed with weathered rock
09:20	09:28	05	20	-do-	moist grey clay mixed with weathered rock and boulders in the 1m of the rod, water strike between 21-22m
12:33	12:35	06	24.6	-do-	moist grey clay mixed with weathered rock and boulders, water strike between 24-25m.
01:05	01:10	07	29.2	-do-	Boulders mixed with particles of weathered rock
	INSTALLATION OF TEMPORARY CASING AT 32.2m.				
09:25	09:33	08	33.8	8"	Boulders, water strike between 32-33m
09:39	09:56	09	38.4	8"	Hard black granite, water strike between 39-40m
10:03	10:18	10	43	-do-	Hard black granite
10:26	10:39	11	47.6	-do-	-do-
10:42	10:55	12	52.2	-do-	-do-
11:01	11:25	13	56.8	-do-	Hard black and white granite
11:28	11:40	14	61.4	-do-	Hard black and white granite, water strike bth 61-62m
11:43	11:46	15	66	-do-	Hard black granite
01:53	02:06	16	70.6	-do-	Hard black granite
02:09	02:20	17	75.2	-do-	-do-
02:25	02:39	18	79.8	-do-	-do-
02:43	02:57	19	84.4	-do-	-do-
03:02	03:20	20	89	-do-	-do-
03:25	03:40	21	93.6	-do-	-do-
03:46	03:52	22	98.2	-do-	-do-

DRILLING DETAILS

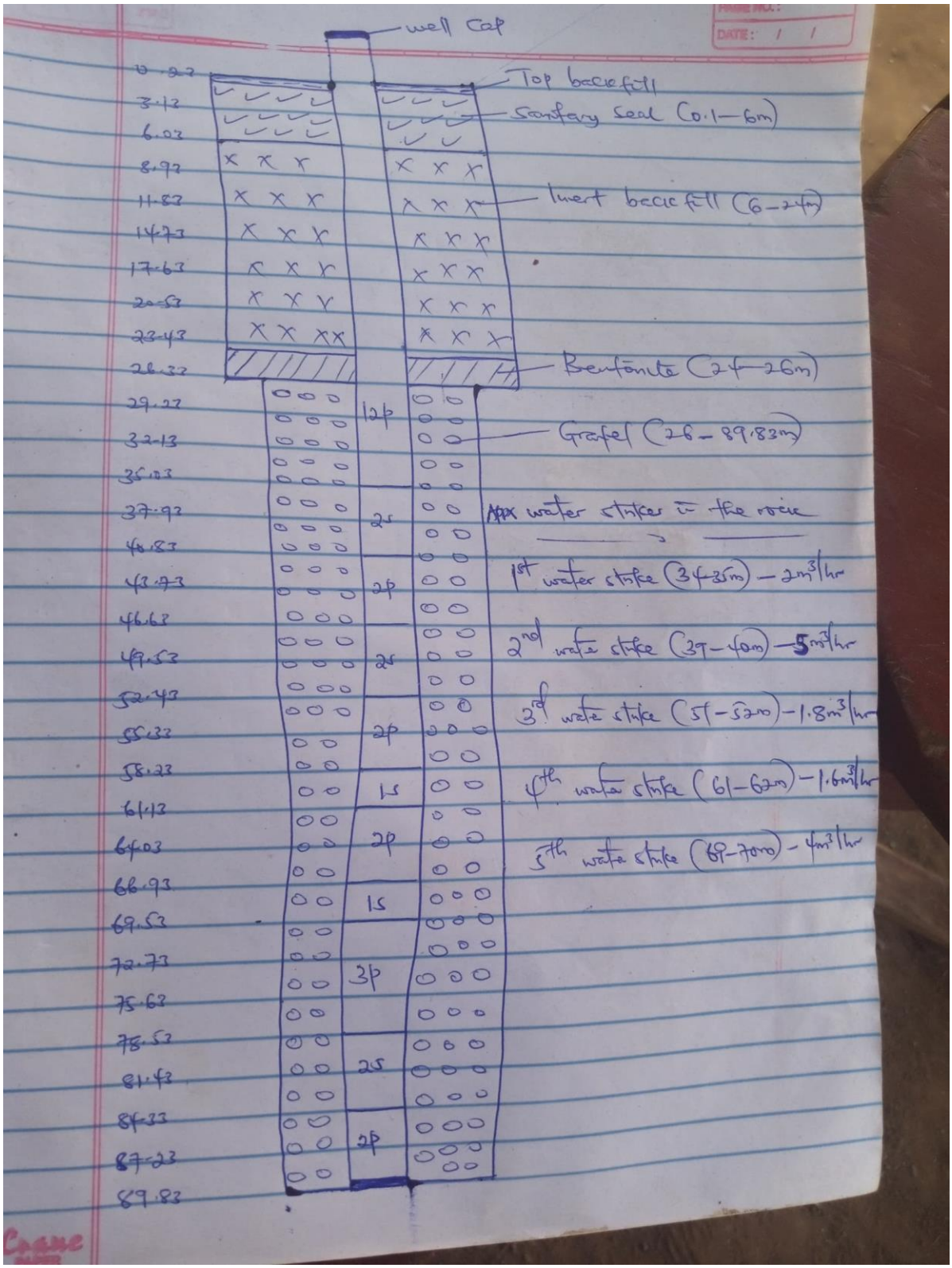
TIME		Pipe (No.)	Depth (mtrs)	Drilling Diameter (Inches)	Soil Condition
Start	End				

OTHER OBSERVATIONS:

- The hole after collapsed between 30 – 36m.
- Most of the water was in the overburden, the strong water strike was between 32 – 33m
- The temporary casing first sat at 28.2m but due to the collapsing formation between 28 - 32m, they later set at 32.2m.

Driller/Supervisor's Signature _____ Client Signature: _____

B: BOREHOLE DESIGN



C: PUMPING TEST RESULTS

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AQUIFER TEST DATA SHEET: DRAW DOWN				Well No:
Village		Village Code		Type of Test:
Parish		Grid East		Step 1: Draw down
Sub-County		Grid North		Constant Discharge: ☐
County		Altitude(m)		Draw down: ☑
District	MAYUNGE	Date		Distance from previous site (km)
Pump On	Date	Time		Contractor:
Pump Off	Date	Time		Measured by: SULA
Duration of Pump Test (min): 60MINS		Static Water Level (m.b.mp): 3.42M		Sketch of measuring
easuring Point (m.b.g.l): 0.03		Dynamic Water Level (m.b.mp): 64.88M		Pump installation depth (m): 70m

Date Clock Time	Time since start of Pump (mm)	Water Level m.b. MP	Draw Down in m.b. MP	Discharge Q (m^3/h)	E.C (us/cm)	Capacity of measuring container:..... Ltrs
	0	3.42	0.00			
	1	5.34	1.92			
	2	7.26	3.84			
	3	11.10	7.68			
	4	14.94	11.52	3.0		24 seconds
	5	18.78	15.36			discharge
	6	22.62	19.20			yellowish
	7	24.54	21.12			
	8	26.46	23.04			
	9	28.38	24.96			
	10	30.30	26.88	3.0		24 seconds
	12	34.15	30.73			discharge
	14	37.99	34.57			yellowish.
	16	39.91	36.49			
	18	41.83	38.41			
	20	45.67	42.25	3.0		24 seconds
	25	49.51	46.09			discharge
	30	51.43	48.01			yellowish.
	35	53.35	49.93			
	40	55.27	51.85			
	45	57.19	53.77			
	50	59.53	56.11	3.0		24 seconds
	55	61.03	57.61			discharg yellowish.
	60	64.88	61.46			
	70					
	80					
	90					
	100					
	120					

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AQUIFER TEST DATA SHEET: RECOVERY

Village		Village Code		Well No:	
Parish		Grid East		Type of Test:	STEP RECOVERY
Sub-County		Grid North		Step 2: Recovery	
County		Altitude(m)		Constant Discharge:	☐
District	MAYUNGE	Date		Draw down:	☐
Pump On	Date	Time		Distance from previous site (km)	
Pump Off	Date	Time		Contractor:	
Duration of Pump Test (Recocery):	60mins	Static Water Level (m.b.mp):	3.42m	Measured by:	SULA
Measuring Point (m.b.g.l):	0.03m	Dynamic Water Level (m.b.mp):	64.88m	Sketch of measuring	
				Pump installation depth (m):	70m

Date Clock Time	Time since start of Pump (mm)	Water Level m.b. MP	Draw Down in m.b. MP	Discharge Q (m^3/h)	E.C (us/cm)	Capacity of measuring container:..... Ltrs
	0	64.88	0.00			
	1	60.15	4.73			
	2	57.42	7.46			
	3	53.69	11.19			
	4	51.83	13.05			
	5	49.97	14.91			
	6	46.24	18.64			
	7	44.37	20.51			
	8	42.51	22.37			
	9	40.64	24.24			
	10	38.78	26.10			
	12	35.06	29.82			
	14	31.33	33.55			
	16	29.46	35.42			
	18	27.60	37.28			
	20	25.73	39.15			
	25	23.87	41.01			
	30	20.15	44.73			
	35	18.28	46.60			
	40	16.42	48.46			
	45	12.70	52.18			
	50	8.97	55.91			
	55	6.11	58.77			
	60	5.25	59.63			
	70					
	80					
	90					
	100					
	120					

59.63 / 61.46 x 100 = 97%

Supervisor:.....

Client:.....

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AQUIFER TEST DATA SHEET: DRAW DOWN

Village		Village Code		Well No:	
Parish		Grid East		Type of Test:	
Sub-County		Grid North		Step 1: Draw down	
County		Altitude(m)		Constant Discharge:	
District	MAYUNGE	Date		Draw down:	1
Pump On	Date	Time		Distance from previous site (km)	
Pump Off	Date	Time		Contractor:	
Duration of Pump Test (min): 60MINS		Static Water Level (m.b.mp): 5.25m		Measured by: SULA	
easuring Point (m.b.g.l): 0.03m		Dynamic Water Level (m.b.mp): 55.43m		Sketch of measuring	
				Pump installation depth (m): 70m	

Date Clock Time	Time since start of Pump (mm)	Water Level m.b. MP	Draw Down in m.b. MP	Discharge Q (m^3/h)	E.C (us/cm)	Capacity of measuring container:..... Ltrs
	0	5.25	0.00			
	1	10.26	5.01			
	2	13.27	8.02			
	3	16.28	11.03			
	4	17.78	12.53	2.0		36 seconds
	5	18.53	13.28			discharge yellowish
	6	19.29	14.04			
	7	20.79	15.54			
	8	22.30	17.05			
	9	25.31	20.06			
	10	28.32	23.07	2.0		36 seconds
	12	31.34	26.09			discharge
	14	34.35	29.10			yellowish.
	16	35.85	30.60			
	18	~~37.36~~ 32.11				
	20	110.37	35.12	2.0		36 seconds
	25	113.38	38.13			discharge
	30	114.88	39.63			yellowish.
	35	116.39	41.14			
	40	117.89	42.64			
	45	119.40	44.15			
	50	50.90	45.65	2.0		36 seconds
	55	52.41	47.16			discharge
	60	55.43	50.18			yellowish.
	70					
	80					
	90					
	100					
	120					

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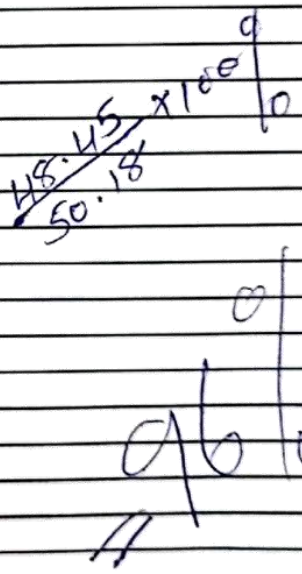
AQUIFER TEST DATA SHEET: RECOVERY

Village	BUBANGO	Village Code		Well No:	
Parish	BUWEISA	Grid East		Type of Test:	
Sub-County	BUWAAYA	Grid North		Step 2: Recovery	
County		Altitude(m)		Constant Discharge:	☐
District	MAYUNGE	Date		Draw down:	☐
Pump On	Date	Time		Distance from previous site (km)	
Pump Off	Date	Time		Contractor:	
Duration of Pump Test (Recocery): 6hrs		Static Water Level (m.b.mp): 5.25m		Measured by: SULA	
Measuring Point (m.b.g.l): 0.03m		Dynamic Water Level (m.b.mp): 55.43m		Sketch of measuring	
				Pump installation depth (m): 70m	

Date Clock Time	Time since start of Pump (mm)	Water Level m.b. MP	Draw Down in m.b. MP	Discharge Q (m^3/h)	E.C (us/cm)	Capacity of measuring container:..... Ltrs
	0	55.43	0.00			
	1	52.40	3.03			
	2	49.37	6.06			
	3	46.34	9.09			
	4	43.31	12.12			
	5	41.62	13.81			
	6	40.28	15.15			
	7	39.52	15.91			
	8	38.76	16.67			
	9	37.25	18.18			
	10	36.73	18.70			
	12	34.22	21.21			
	14	32.71	22.72			
	16	31.20	24.23			
	18	29.68	25.75			
	20	28.17	27.26			
	25	25.14	30.29			
	30	22.11	33.32			
	35	20.60	34.83			
	40	19.09	36.34			
	45	16.06	39.37			
	50	13.03	42.40			
	55	10.00	45.43			
	60	6.98	48.45			
	70					
	80					
	90					
	100					
	120					



Supervisor:..... Client:.....

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AQUIFER TEST DATA SHEET: DRAW DOWN					Well No:
Village	BUBAMGO	Village Code			Type of Test: CONSTANT
Parish	BUWEISA	Grid East			Step 1: Draw down
Sub-County	BUWAYA	Grid North			Constant Discharge: ✓
County		Altitude(m)			Draw down: ✓
District	MAYUNGE	Date	30/03/2024		Distance from previous site (km)
Pump On	Date 29/03/24	Time			Contractor:
Pump Off	Date 30/03/24	Time			Measured by: SULA
Duration of Pump Test (min):		Static Water Level (m.b.mp): 6.98m			Sketch of measuring
easuring Point (m.b.g.l): 0.03m		Dynamic Water Level (m.b.mp): 66.85m			Pump installation depth (m): 70m

Date Clock Time	Time since start of Pump (mm)	Water Level m.b. MP	Draw Down in m.b. MP	Discharge Q (m^3/h)	E.C (us/cm)	Capacity of measuring container:..... Ltrs
	0	6.98	0.00			
	1	8.03	1.05			
	2	8.51	1.53			
	3	9.08	2.10			
	4	9.45	2.47	1.6		45 seconds discharge yellowish.
	5	9.90	2.92			
	6	10.00	3.02			
	7	10.21	3.23			
	8	10.63	3.65			
	9	10.91	3.93			
	10	11.27	4.29	1.6		45 seconds discharge yellowish
	12	11.88	4.90			
	14	12.44	5.46			
	16	12.94	5.96			
	18	13.19	6.21			
	20	13.90	6.92	1.6		45 seconds discharge yellowish.
	25	15.55	8.57			
	30	17.04	10.06			
	35	18.22	11.24			
	40	19.45	12.47			
	45	20.45	13.47			
	50	21.35	14.37	1.6		45 seconds discharge yellowish
	55	22.20	15.22			
	60	22.92	15.94			
	70	24.40	17.42			
	80	25.73	18.75			
	90	26.59	19.61	1.6		45 seconds discharge Tured to clear
	100	27.29	20.31			
	120	28.82	21.84			

Supervisor:..... **Client:**.....

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www.kasthewdrilling.co.ug

Date Clock Time	Time since start of Pump (mm)	Water Level m.b. MP	Draw Down in m.b. MP	Discharge Q (m^3/h)	E.C (us/cm)	Capacity of measuring container:..... Ltrs
	140	31.38	2.440			
	160	32.66	25.68			
	180	33.94	26.96	1.6		45 seconds discharge clear.
	210	36.46	29.48			
	240	38.99	32.01			
	270	42.55	35.57			
	300	45.33	38.35			
	330	47.50	40.52			
	360	49.67	42.69	1.6		45 seconds discharge clear.
	390	51.44	44.46			
	420	52.48	45.50			
	450	53.52	46.54			
	480	54.59	47.61			
	540	55.83	48.85			
	600	57.13	50.15	1.6		45 seconds discharge clear.
	660	58.52	51.54			
	720	59.99	53.01			
	780	60.84	53.86			
	840	61.73	54.75			
	900	62.40	55.42			
	960	63.39	56.41	1.6		45 seconds discharge clear.
	1020	64.25	57.27			
	1080	64.68	57.70			
	1140	65.12	58.14			
	1200	65.98	59.00			
	1320	66.41	59.43	1.6		45 seconds discharge clear.
	1440	66.85	59.87			
	1560					
	1680					
	1800					
	1920					
	2040					
	2160					
	2400					
	2880					
	3120					
	3360					
	3600					
	3840					
	4080					
	4320					
	4560					
	4800					
	5040					

Supervisor:..... **Client:**.....

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www.kasthewdrilling.co.ug

AQUIFER TEST DATA SHEET: RECOVERY

Village		Village Code		Well No:	
Parish		Grid East		Type of Test: CONSTANT RECOVERY	
Sub-County		Grid North		Step 2: Recovery ✓	
County		Altitude(m)		Constant Discharge: ☐	
District	MAYUNGE	Date	30/03/2024	Draw down: ☐	
Pump On	Date 29/03/24	Time		Distance from previous site (km)	
Pump Off	Date 30/03/24	Time		Contractor:	
Duration of Pump Test (Recocery): 90MIN		Static Water Level (m.b.mp): 6.98m		Measured by: SULA	
Measuring Point (m.b.g.l): 0.03M		Dynamic Water Level (m.b.mp): 16.85		Sketch of measuring	
				Pump installation depth (m): 70M	

Date Clock Time	Time since start of Pump (mm)	Water Level m.b. MP	Draw Down in m.b. MP	Discharge Q (m^3/h)	E.C (us/cm)	Capacity of measuring container:..... Ltrs
	0	16.85	0.00			
	1	63.30				
	2	61.53				
	3	59.76				
	4	56.21				
	5	54.44				
	6	53.55				
	7	52.67				
	8	51.78				
	9	50.89				
	10	49.12				
	12	47.35				
	14	46.46				
	16	45.58				
	18	43.81				
	20	42.04				
	25	40.27				
	30	38.50				
	35	34.83				
	40	30.26				
	45	25.10				
	50	21.12				
	55	17.64				
	60	14.71				
	70	11.22				
	80	8.80				
	90	8.39				
	100	/	/	/	/	/ / /
	120					

16.85 / 6.98 × 100 %
RECOVERY
58.46 / 59.87 × 100 %
97 %

Supervisor:..... Client:.....

D. QUALITY ANALYSIS CERTIFICATE

Republic of Uganda

MINISTRY OF WATER AND ENVIRONMENT
NATIONAL WATER QUALITY REFERENCE LABORATORY - ENTEBBE

Certificate of Analysis

Client Name : Kasthew Construction (U) Limited
Client Address : Pilkington Road, Kampala
Sample type and condition : Portable water sample received in 1litre clean sealed Plastic bottle.
Sample by : Client
Date Sampled : 29th March 2024 Date received: 03rd April 2024
Analysis Start date : 03rd April 2024 Analysis Completion date: 05th February 2024

TEST RESULTS Ref: PM7.8/R-01 E00 NWQRL24-00645

Source Name			Bubago Borehole	Potable water standards (EAS12:2018 Maximum permisible for Natural potable Water)
Village			Bubago	
Parish			Buwaiswa	
Subcounty			Buwaya	
District			Mayuge	
Laboratory Identifier Number			E24/02859	
Parameter	**Method Code**	**Units**	**Test Results**	
Color (Apparent)	TM/C-04/01	PtCo	22	50
Turbidity	TM/C-03/01	NTU	4	25
pH	TM/C-01/01	pHunits	6.6	5.5-9.5
Electrical Conductivity	TM/C-02/01	µS/cm	418	2500
Total dissolved solids	TM/C-02/02	mg/L	293	1500
Total Hardness as $CaCO_3$	TM/C-06/01	mg/L	125	600
Calcium hardness as $CaCO_3$	TM/C-06/01	mg/L	79	600
Magnesium hardness as $CaCO_3$	TM/C-06/01	mg/L	46	600
Calcium	TM/C-06/01	mg/L	32	150
Magnesium	TM/C-06/01	mg/L	11	100
Sodium	TM/IO-03/01	mg/L	41	200
Potassium	TM/IO-03/01	mg/L	6.4	50
Total Alkalinity	TM/C-05/01	mg/L	140	-
Bicarbonates	TM/C-05/01	mg/L	171	-
Flourides	TM/IO-01/01	mg/L	0.22	1.5
Sulphates	TM/IO-01/01	mg/L	75	400
Chlorides	TM/IO-01/01	mg/L	7	250
Nitrates as N	TM/IO-01/01	mg/L	3.02	10
Nitrites as N	TM/IO-01/01	mg/L	0.01	0.9
Ammonium as N	TM/IO-01/01	mg/L	0.08	0.5
Phosphates as P	TM/IO-01/01	mg/L	0.1	0.7
Total Iron	TM/C-08/01	mg/L	0.27	0.3
E.coli	TM/M-01/01	CFU/100ml	20	<1
Total Coliform	TM/M-01/01	CFU/100ml	>2400	<1

Note;
1. *This certificate shall not be reproduced, except in full, without the approval of the NWQR Laboratory.*
2. ***Test results from sub-contracted Laboratory.*
3. ** Accredited Test Method.*
4. *Analysis site is National Water Quality Reference Laboratory-Entebbe*
5. *The laboratory is managed under ISO/IEC/ 17025 Laboratory quality management system.*

Disclaimer;
- These results relate to the sample as received and tested. Details of the sample with respect to source and representativeness is the responsibility of the client.
- Delayed delivery of samples may affect the integrity of the analytical results.
- This certificate of analysis does not substitute certification of a business or product by the relevant authority.

Reviewed & Authorized by:
Technical signatory

LABORATORY MANAGER
NWQRL 05 FEB 2024 WQRL
NATIONAL WATER QUALITY REFERENCE LABORATORY -ENTEBBE

Directorate of Water Resources Management
Department of Water Quality Management
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Issued by

PRINCIPAL ANALYST LABORATORIES
★ 05 FEB 2024 ★
NATIONAL WATER QUALITY REFERENCE LABORATORY – ENTEBBE
Sign:.....