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GEOPHYSICAL SURVEY REPORT

REF NO. 2

M.C.H.P-Foredugu

SUBMITTED TO:

INTERNATIONAL MEDICAL CROPS

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1. INTRODUCTION

In other to improve the water supply for the M.C.H.P-Foredugu Health Center, International Medical Crops contracted **EDAL** Drilling Company, to explore the possibility of getting ground water in this area. As part of our operations, we therefore carry out a Hydrogeological and Geophysical investigations in sitting the borehole position in the project area.

These studies among others provided enough data and information used in assessing the possibility of striking groundwater in the project area. This report documents the work carried out during the investigations at the site.

2. BACKGROUND / GEOLOGY OF PROJECT AREA

The project area lies within the Granite Greenstone Terrain (Basement Granites) which covers about 70% of the country's lithology.

This forms the basement on which the supracrustal rocks are resting. The basement rocks are granitoids and migmatite gneisses with ages greater 2700 million years. MacFarlane et al (1974) recognized three types of granitic rocks: the syn-kinematic granitic migmatites which ranges in composition from quartz diorite to legitimate granites with a predominance of grannodiorite. The homogeneous syn-kinematic granites are pale in colour and poor in mafic constituents. These are sporadically distributed throughout the basement with gradational intrusive and frequently distinct contact with a foliated host (Williams, 1978). The late kinematics granites (younger granites) are distinctly discordant bodies formed during the Liberian thermo-tectonic event, Ca 2700 Ma.

However, groundwater potential of the Basement Complex is found within weathered and fractured zones of these igneous (crystalline) rocks.

Therefore, proper siting (geological, hydrogeological/geophysical survey) should be conducted to identify possible fractured zones that probably contain groundwater

3. FIELD WORK

The field work was divided into two phases;

- Reconnaissance Survey; and
- Geophysical Survey

3.1 Reconnaissance Survey

The aim of the reconnaissance survey was to select suitable area (s) for geophysical survey, considering the geological/Hydrogeological, environmental and other physical conditions.

The reconnaissance survey included the following:

3.1.1 Geomorphological Survey of the Area

This describes the landscape and other physical features on the project area. The project area is generally flat with an elevation of about 76m above sea level. There were no in-situ outcrops in the immediate surroundings. Out crops can only be seen from a distance. The Geomorphology of the area suggested high ground water potentials.

3.1.2 Geological survey to determine the formation of the area and to identify possible hydrogeological features

The project area is overlain by hard compacted laterites which were derived from underlain weathered bedrock.

There was a hand dug well of about 10m deep at about 6m from the selected area. This suggested a water bearing formation at a near surface and thus there is a high potential of groundwater.

3.2 Geophysical Survey

The Geophysical survey consisted mainly of Electrical Resistivity i.e. Vertical Electrical Sounding (VES) using ABEM SAS 1000 Terrameter Resistivity meter.

3.2.1 Selection of Traverse Line

The traverse line was selected on the basis of geomorphologic and physical features as well as Hydrogeological features of the area. There was no visible strike direction of the geologic formation of the area due to weathering and surface erosion. Selected point for the Vertical Electrical Sounding (VES) was marked with a peg for identification.

3.2.2 Selection of VES points

The Vertical Electrical Sounding (VES) point was selected based on the site location and geological features.

3.2.3 Vertical Electrical Sounding (VES)

Vertical Electrical Sounding (VES) was carried out with the aim of determining the formation resistivities and the depth to bedrock, as well as finding the possibility of obtaining fractures at depth. The Schlumberger electrode configuration and the required procedures were used for the VES.

4. DATA ANALYSIS AND INTERPRETATION

The Vertical Electrical Sounding (VES) data and the corresponding curve are presented below:

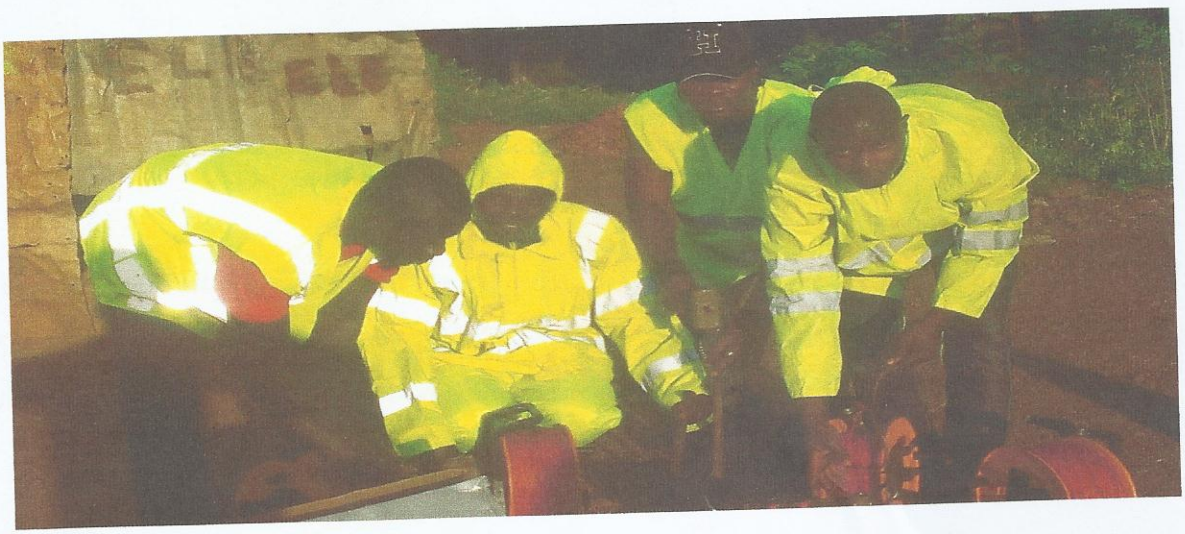
4.1 Table 1: Schlumberger Array VES Data

Client: **International Medical Crops**	Community: **M.C.H.P-Foredugu**
Project: **Geophysical Survey**	Sounding Number: 1
District: **Northern Province**	GPS Coordinate East: **0775111**
Date: 15th October,2015	GPS Coordinate North: **0967859**
Field Operator: James Kargbo	Elevation: **90m**

Schlumberger Array VES Field Data

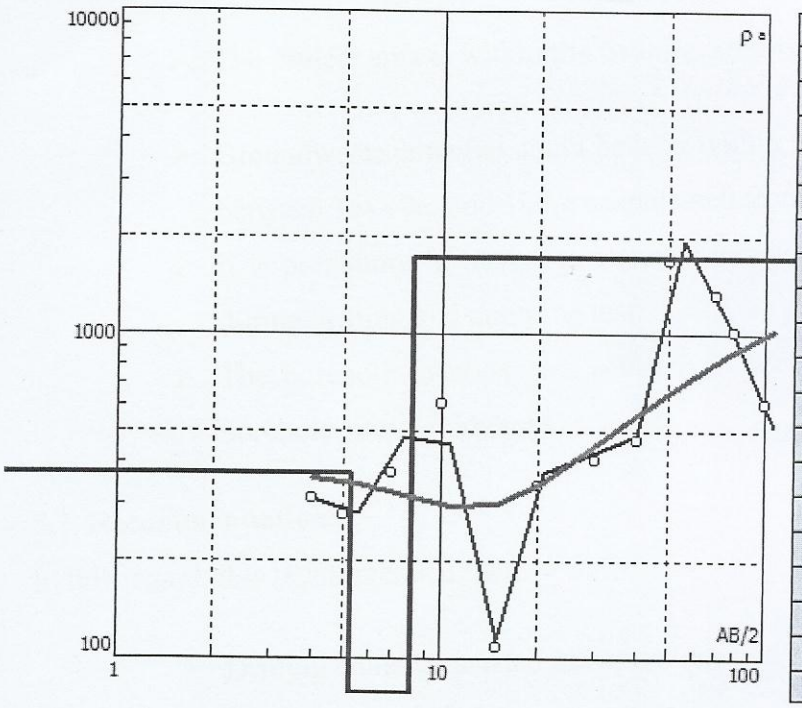
No.	AB/2	MN	Resistance (ohms)	Apparent Resistivity (ohm-m)
1	4	0.8	5.1449	309.0724
2	5	0.8	2.8129	274.4239
3	7	0.8	1.9411	372.3400
4	10	1.5	2.9389	612.1387
5	15	1.5	0.2859	108.8063
6	20	1.5	0.4078	341.2015
7	30	1.5	0.2169	408.6442
8	40	7.6	0.1397	468.0352
9	50	7.6	1.6402	1685.4413
10	70	7.6	0.6516	1316.0973
11	80	14	0.7064	1006.8642
12	100	14	0.2739	611.6977

Photo showing Geophysical team at work



The VES data is first presented in the form of a table (as shown above) from which a graph of Apparent Resistivity (pa) Vs half the Current Electrode Spacing (AB/2) is plotted.

Model 1. Schlumberger Array VES Curve and Model.



N	ρ	h	d	Alt
1	373	5.26	5.26	-5.258
2	77.7	2.9	8.16	-8.157
3	1723			

4.2: Table 2: Selection of Promising Points from VES Data

No.	LAYER	THICKNESS (m)	DEPTH (m)	APPARENT RESISTIVITY (Ohm-m)	POSSIBLE WATER ZONES (M)	RANKING	MAX DRILLING DEPTH (M)
1	1 2 3	15.26 2.1 -	5.26 8.96 -	373 77.7 1723	15-40 100	High	120

It can be deduced from the VES data above that the maximum drilling depth should be 120m to cut through the two promising zones of 15-40m and 100m to ensure reliable productivity. However this depth may be exceed based on other sub-surface conditions.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Based on the analyses of the result in line with the aims of the study, the drawn conclusions are;

- The project area is within the Granite Greenstone Terrain (Basement Granites).
- Groundwater potential could be high within two promising zones as shown above at depth between 15- 40m and 100m as indicated from the resistivity values.
- It is premature however, to estimate quantities/volume which could only be determined during drilling and pumping test.
- The borehole location was selected in accordance with both national and international borehole siting guidelines.

5.2 Recommendation

In this regard, it is recommended that;

- Drilling could be carried out at the selected point to confirm the existence of groundwater.
- The maximum drilling depth should be 120m to cut across the first and second promising zone of 15- 40m and 100m respectively to ensure reliable productivity. However, the supervisor may exceed this depth based on the field conditions.
- Both physico- chemical and bacteriological tests should be carried out on the borehole water samples from the completed well.
- Borehole must be constructed using the correct and standard materials such as standard uPVC screens and plain casings, well sorted gravels etc. for water quality and high yield.

REPORT SUBMITTED BY:

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