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GEOPHYSICAL SURVEY REPORT
REF NO. 1
MOYAMBA GOVERNMENT HOSPITAL

SUBMITTED TO:
ACTION CONTRE LA FAIM
SIERRA LEONE MISSION

TABLE OF CONTENT

1. INTRODUCTION

In other to improve the water supply for the Moyamba Government Hospital, Action Contre La Faim-Sierra Leone Mission 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 59m 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.

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: Action Contre La Faim-S/L Mission	Community: **Moyamba Government Hospital**
Project: **Geophysical Survey**	Sounding Number: 1
District: **Moyamba District**	GPS Coordinate East: **0782701**
Date: 21st October,2015	GPS Coordinate North: **0902895**
Field Operator: Kemoh Alie Bayoh	Elevation: **59m**

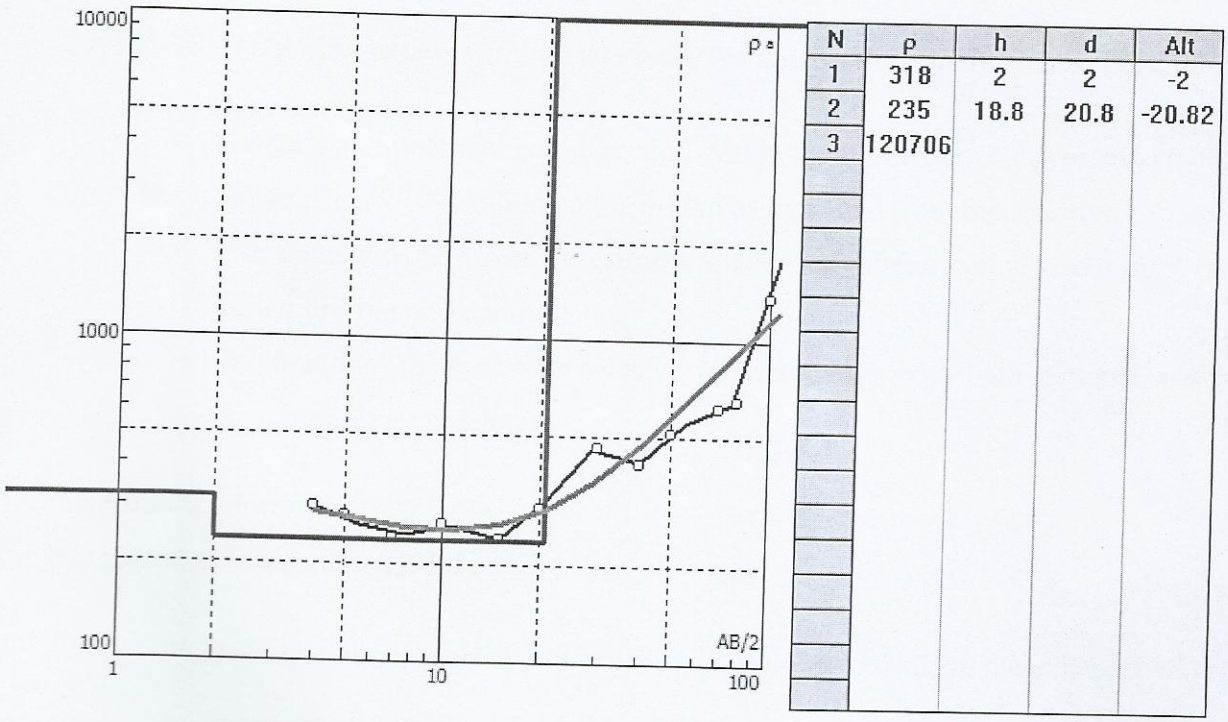
Schlumberger Array VES Field Data

No.	AB/2	MN	Resistance (ohms)	Apparent Resistivity (ohm-m)
1	4	0.8	4.8097	299.219
2	5	0.8	2.8504	278.082
3	7	0.8	1.2481	239.409
4	10	1.5	0.66690	266.534
5	15	1.5	0.62994	239.739
6	20	1.5	0.35871	300.128
7	30	1.5	0.24764	466.559
8	40	7.6	0.63002	412.980
9	50	7.6	0.50246	516.319
10	70	7.6	0.56826	618.666
11	80	14	0.45672	651.669
12	100	14	0.61583	1375.326

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	318	2	2	-2
2	235	18.8	20.8	-20.82
3	120706			

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	2 18.8 -	2 20.8 -	318 235 120706	15-20 30-50 70-80	High	120-150

It can be deduced from the VES data above that the maximum drilling depth should be 120-150m to cut through the three promising zones of 15-20m, 30-50m and 70-80m respectively 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 the promising zones as shown above at depth between 15- 20m, 30-50m, and 70-80m 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 120-150m to cut across the promising zones of 15-20m, 30-50m and 70-80m 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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