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GEOPHYSICAL SURVEY REPORT
REF NO. 4B
(APPROVED SCHOOL BIKE PARKING GROUND-KUNTORLOH)

SUBMITTED TO:
CONCERN WORLDWIDE-SL

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1. INTRODUCTION

In a quest to improve the water supply for Kuntorloh and its environs, Concern Worldwide-SL 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.

This study provides the necessary information used to predict 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 Freetown Basic Complex. The Freetown Complex is composed mainly of basaltic magmatism and outcrops can be found in the west as a result of younger igneous intrusions and erosion. The Freetown Complex is a layered gabbroic anorthosite intrusion, emplaced gneisses and schist of the Kasila Group. It forms part of the Peninsula and Banana Island. It is thought to have been formed due to multiple injections of magma that occurred intermittently. Most of these formations are overlain by hard compacted laterites and some sedimentary materials.

Therefore, groundwater potential of the Freetown Basic Complex is found within fractured zones of these igneous (crystalline) rocks. However, groundwater quality and quantity could be high if properly located through the appropriate hydrogeological and geophysical investigations.

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

The project area is at the base of the hills of Kuntorloh community with an elevation of 55m above sea level. The surface lithology is generally compacted laterite believed to have been derived from the weathering, erosion and subsequent deposition from elevated grounds (hills). Fresh trees, hand dug well and stream can be located near project area; all suggesting groundwater presence.

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

The project area consists of laterites underlain by gabbroic formations and minor intrusions which may have caused series of fractured and joint structure. Fracture and joints are water-bearing and thus holds a great potential for 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:

Table 1: Schlumberger Array VES Data

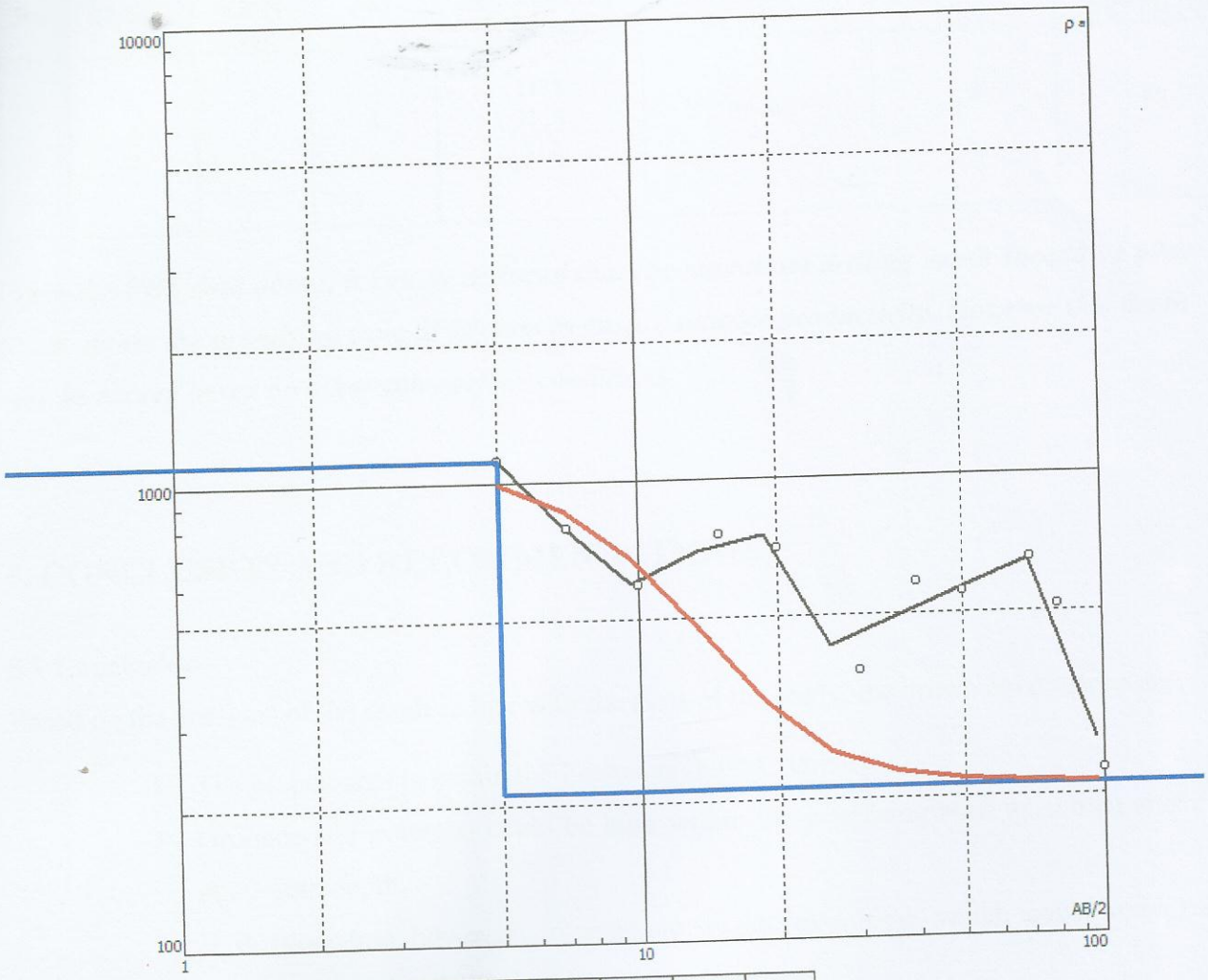
Client: **Concern Worldwide-SL**	Community: **Approved school park**
Project: **Geophysical Survey**	Sounding Number: **1**
District: **Western Area-Urban District**	GPS Coordinate East: **0700653**
Date: **9th November 2015**	GPS Coordinate North: **0935815**
Field Operator: **Abdul Rahman Turay**	Elevation: **55m**

Schlumberger Array VES Field Data

No.	AB/2	MN	Apparent Resistivity (ohm-m)
1	4	0.8	842.5317
2	5	0.8	1118.32
3	7	0.8	788.2614
4	10	1.5	592.4595
5	15	1.5	754.6783
6	20	1.5	702.9056
7	30	1.5	377.5369
8	40	7.6	584.6253
9	50	7.6	555.9223
10	70	7.6	652.1894
11	80	14	516.4028
12	100	14	226.4555

Model-1: Schlumberger Array VES Curve and Model

Apparent Resistivity Vs AB/2



N	1	2	3		
ρ	1118	1118	212		
h	2	3			
d	2	5			
Alt	-2	-5			

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 3 -	2 5 -	1118 1118 212	20-50	1st	80

From the VES data above, it can be deduced that the maximum drilling depth should be 80m to cut across the promising zone of 20-50m 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 Freetown Basic Complex.
- Groundwater potential could be high within the promising zone as shown above at 20-50m depth.
- 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 80m to cut across the promising zone of 20-50m 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 PVC screens and plain casings, well sorted gravels etc. for water quality and high yield.

REPORT SUBMITTED BY:

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