EDAL DRILLING COMPANY LTD.

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GEOPHYSICAL SURVEY REPORT
REF NO. 6
(JOHN THORPE-MCHP)

SUBMITTED TO:
CONCERN WORLDWIDE-SL

TABLE OF CONTENT

1. INTRODUCTION

Concern Worldwide-SL contracted **EDAL** Drilling Company, to explore the possibility of getting ground water within the premises of John Thorpe-Maternal and Child Health Post. 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 between the Bullom sedimentary formation and the Freetown Basic complex.

The Bullom Group is comprised of unconsolidated to poorly consolidated sediments occupying the coastal plains of Sierra Leone. The deposits extend up to 50km inland and are found at heights up to 40m above present sea level (Culver and Williams; 1979). Although outcrops of Bullom Group are rare and generally poor, the available evidence suggest a lateral variable sequence of poorly consolidated, near horizontal, often iron-stained gravels, sands, clays with occasional intra-formation laterites.

The Freetown Complex is formed mainly by basaltic magmatism and outcrops can be found in the west as a result of younger igneous intrusions and erosion. The Bullom Group is resting unconformably on the Freetown complex.

However, groundwater potential could be high within the upper sedimentary formation and at depth within fracture bed rock if properly located using appropriate sitting methods.

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 refers to the landscape and other physical features on the project area. The project area is on a flat ground with an elevation of 34m above sea level. Project area is formed mainly by marine deposition. Trees and nearby hand dug wells all suggests groundwater occurrence.

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

The project area is made up of loose sandy-clay sediments derived from marine deposition. There are no visible strikes due to erosion. Rock formation is a good groundwater reservoir.

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:

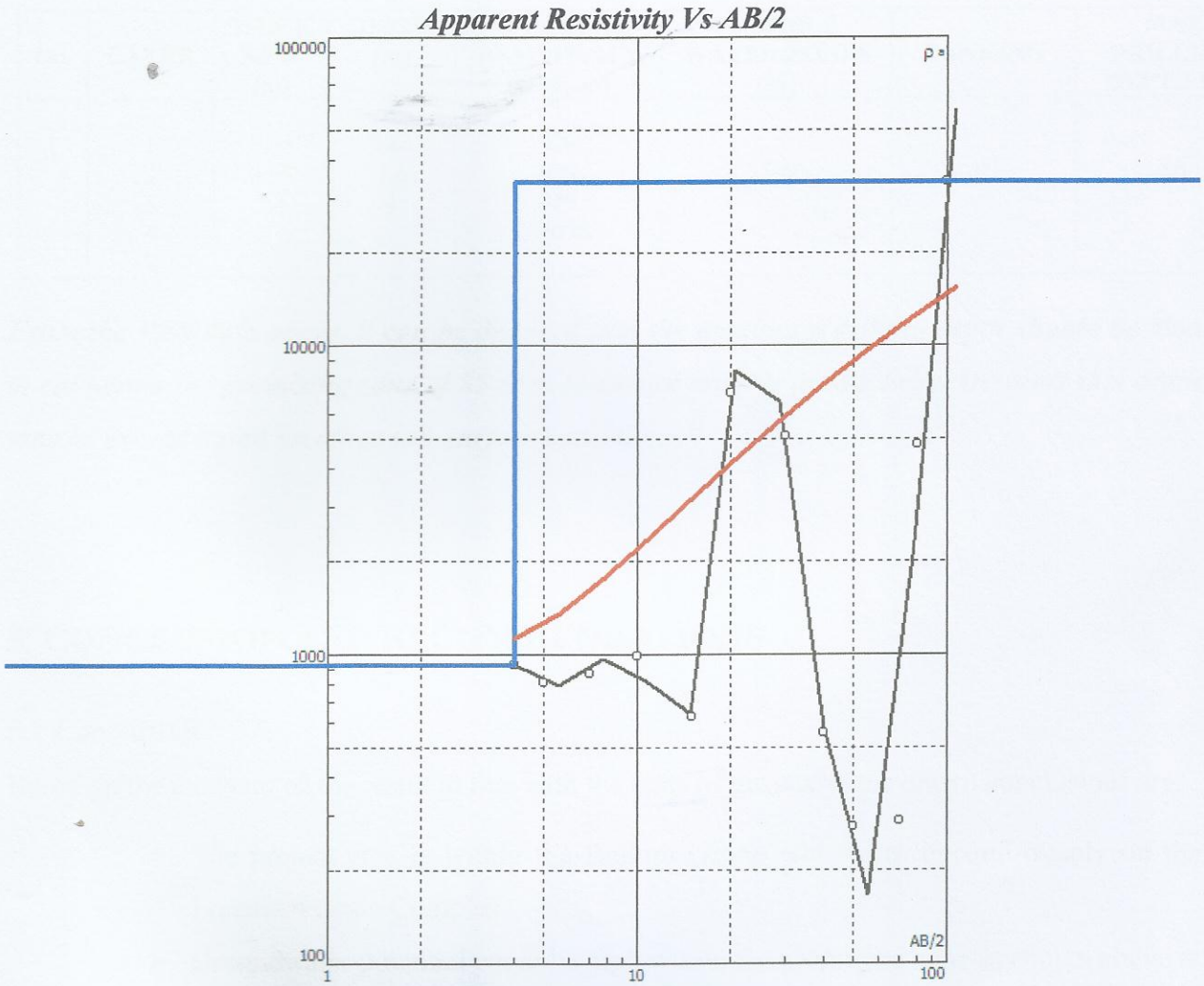
Table 1: Schlumberger Array VES Data

Client: **Concern Worldwide-SL**	Community: **John Thorpe-MCHP**
Project: **Geophysical Survey**	Sounding Number: **1**
District**: Western Area Rural District**	GPS Coordinate East: **0710120**
Date: **3rd November 2015**	GPS Coordinate North: **0928500**
Field Operator: **Abdul Rahman Turay**	Elevation: **34m**

Schlumberger Array VES Field Data

No.	AB/2	MN	Resistance (ohm)	Apparent Resistivity (ohm-m)
1	4	0.8	14.937	929.25
2	5	0.8	8.3269	812.36
3	7	0.8	4.5016	863.49
4	10	1.5	2.2376	894.28
5	15	1.5	1.6611	632.17
6	20	1.5	8.4	7028.18
7	30	1.5	2.7204	5125.29
8	40	7.6	0.85468	560.25
9	50	7.6	0.26836	275.76
10	70	7.6	0.14315	289.13
11	80	14	3.3401	4760.80
12	100	14	15.259	34077.75

Model-1: Schlumberger Array VES Curve and Model



N	1	2	3	4	
ρ	929	929	929	34078	
h	0.64	0.96	2.4		
d	0.64	1.6	4		
Alt	-0.64	-1.6	-4		

VES_name

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 4	0.64 0.96 2.4	0.64 1.6 4	929 929 929 34078	35-60	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 35-60m 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 Bullom Group which lies unconformably on the Freetown Basic Complex.
- Groundwater potential could be high within the promising zone as shown above at depth between 35-60m 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 sitting 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 first and second promising zone of 35-60m 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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