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Hydro Geological Investigation of Aquifer Characteristics of Mumu Sub River Basin; a Case Study of Nkwo Amenyi Borehole, Awka Anambra State

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ABSTRACT

Hydro geological investigation was employed to study the aquifer characteristics of Mumu sub river basin near Nkwo market at Amenyi Awka in Anambra state with aim of delineating sites for drilling of productive boreholes. The study was done using schlumberger electrode spacing configuration, with varying electrode separation to determine the Lithologic units, geological Formation and depths to water table within the basin. The hydro geological investigation carried out revealed the predominance of sandstone of different sizes and colors down to the depth of 240 feet in the area. After exploration and during the exploitation, the borehole cuttings show that Aquaferous Ajali sandstone which is a member of the basin has abundant groundwater dominating the studied Area, The investigation has provided the hydro geophysical characteristic of the Aquifers of the sub-basin formation within the Anambra River Basin. This study will directly serve as a useful guide in prospecting for groundwater resources in the area.

Key words: Aquifer, lithology, Hydro geological survey, Drilling, Mamu sub basin Formation, Anambra River basin

INTRODUCTION

A river basin acts as a receptacle for all the rainfall in a catchment area, therefore rainfall, runoff, infiltration, evapotranspiration, and other hydro geological factors operating within the catchment makes a river basin.
River Mamu is dentric and drains all the river lines areas of Anambra state. Anambra River Basin state is underlain by cretaceous to recent sedimentary formations that are of varying aquifer potentials. The Mamu River basin is a tributary of Anambra basin and has many tributaries draining the basin. The study was necessitated due to incessant drilling of abortive borehole in the area. The study has showed the productive lithlolgic units of Mamu Formation as a member of Anambra basin that can yield commercial to a borehole in an economic quantity. It also revealed the depths where they can be encountered during groundwater exploitation within the study areas.

GEOLOGY OF THE STUDY AREA

The study area is within the Anambra basin. The roughly triangular shaped Anambra basin covers an area of about 40,00 sq km located in south central part of Nigeria extending northwards in the lower Benue River . Anambra Basin is one of the most economically strategic watersheds in southeastern Nigeria and occupies an area of about 95,000km 2 . It not only has abundant water resources but also holds potentials for oil and gas deposits.
Hydro stratigraphically, the basin is underlain by the Nkporo, Mamu, Ajali and Nsukka Formations a s well as the Imo and Bende-Ameki Formations.The Mamu River basin is made up of five Geological Formations which include Nanka sands, Imo shale, Nsukka Formation, Ajali Formation, and Mamu Formation at the eastern outskirts of Awka town.

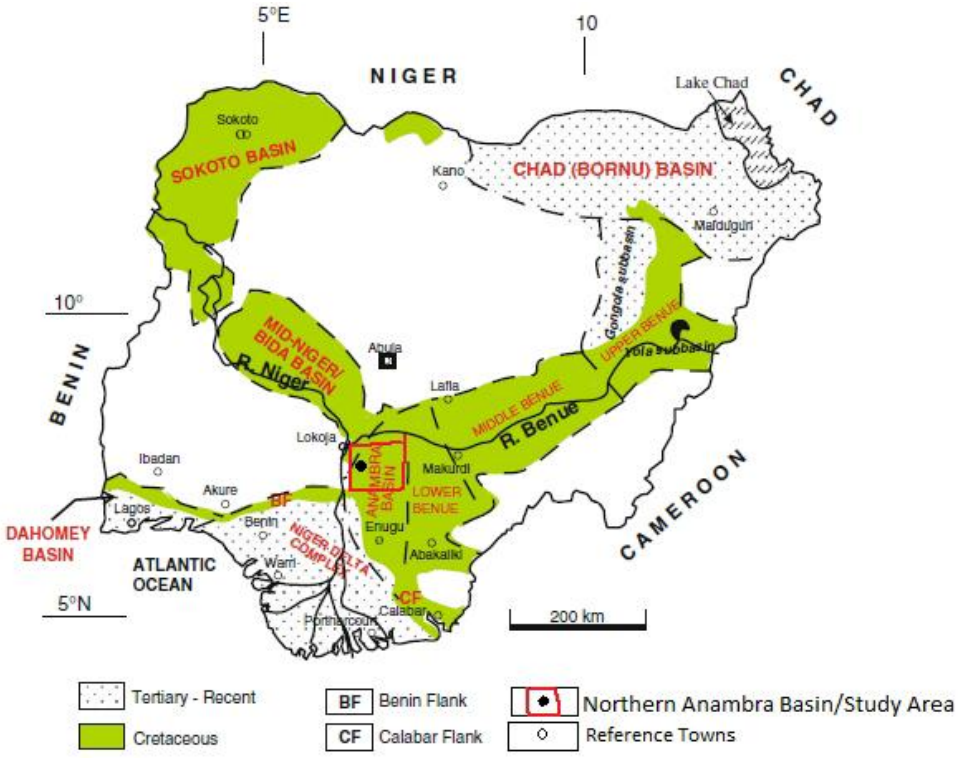

Figure 1; Map of Nigeria Showing all the Sedimentry Basin

Underlying groundwater system. The aquifer units are characterized by two distinct ionic regimes: Ca-HCO 3 and Na-SO 4 . The later is associated with the deeper groundwater flow system within the Mamu Formation while the former occurs in the upper shallow flow system within the Ajali Sandstone.

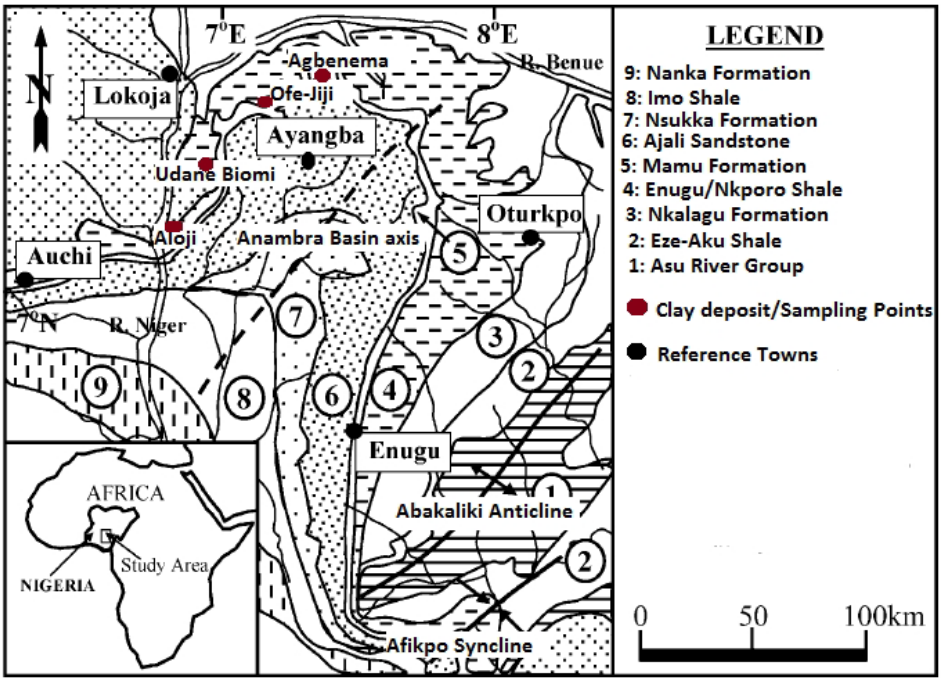

Figure 1: Map showing the study Area.

METHODOLOGY

The electrical resitivity probes, a means of hydro geological investigation was employed using Schaumberg electrode spacing configuration, with varying electrode separation to determine the Lithologic units, geological formation and depths to water bearing Formation was used in the study. The investigating Borehole was drilled after the hydro geological survey conducted by pacific geological Nigeria Ltd Company at Nkwo market Amenyi Awka enabled the author the assessment of the groundwater's potential and Hydro geological characteristics of the River Basin.

RESULT AND ANALYSIS

The hydro geological investigation carried out revealed the predominance of sandstone of different sizes and colours down to the depth of 240 feet in the area of Nkwo market at Amenyi Awka along old Enugu road Zik avenue Anambra states, Nigeria. The Aquiferous Started from 190 feet t0 240 feet and tramsit to imo shale that is an aqutard.

Therefore amenyi sands is hydrological made up of fine to coarse grains sands that is highly permeable and porous in Awka and Environs, numerous hand dug wells and erosion exposes the Amenyi sands which is has a poor aquifer at the depth of 60m at the lowest areas to 240meters as the highest level,

The lithological sequence is made up of the following; gravely coarse sands, lateritic sandstone and plastic clay that tend to swell when in contact with the drilling fluid and tend to shrink back as soon as the drilling stop, which can lead to pipe stuck.

LITHOLOGIC LOG OF BOREHOLE DRILLED AT NKWO MARKET AMENYI AWKA,

(1) **Site Location:** Nkwo market Awka, Anambra state

(2) **Description of the site:** Situated along old Enugu Road Amenyi Awka near Nkwo market Anambra state.

(3) Purpose: **Water supply to the community, market and customers**

(4) **Total Depth** :240 Feet

(5) **Rocks penetrated:** Amenyi sandstone, Ajali sandstone

(6) **Casing sizes:** 5 inches complete 10 bar

(7) **Screen used:** U PVC Screens – 2 lengths of screen by 20 feet each

(8) **Static water Level:** Yield 3 liters/ per sec, with 2 horse power pump.

(9) **Pump installation-**:Depth 180 feet

(10) **Physical quality of the water** :Clear and particle free

(11) **Drawdown**: 90 ft 1 hours pumping at 4 liters per seconds

(12) **Draw down stabilizer**s: It stabilized 1 hour, 15 minutes

BOREHOLE CUTTINGS / LITHOLOGICAL UNITS ENCOUNTERED.

Descriptions with 240 feet length of drilling pipes

0-20	Red latertic formation
20-40	Sandstone, brown, fine to coarse
40-60	Sand clayed at the top
60-80	Sand, pebbly blackish
80-100	Sand fine to coarse pebbly
100-120	Sand fine to coarse
120-140	Sand fine to coarse pebbly
160-180	Clay sandy plastic in nature
180-200	Sandy fine silt sand(aquiferous)
200- 220	Sand fine to medium whitish (aquiferous)
220=240	Sand coarse to medium whitish(aquiferous)

Bottom of the hole

***Logged by Dr Nwabineli Emmanuel Onochie*.**

Consultant Hydro geologist

SUMMARY AND CONCLUSION

The investigation has provided the hydro geophysical characteristic of the Aquifers of Mamu sub-basin formation within the Anambra River Basin. The investigation also revealed the depth to saturated Rock Formations, the water table and the different geo-electric sections encountered.

This study will directly serve as a useful guide in prospecting for groundwater resources in the area and at the same time limit the rate of abortive boreholes within the Amenyi Nkwo community in Awka Anambra State.

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