

Original Research Article

Delineating Aquifer Systems Using Dar Zarouk Parameters Determined From Surface Geoelectric Survey: Case Study of Okigwe District, Southeastern Nigeria.

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ABSTRACT

This study is aimed at delineating the aquifer systems in the study area and hence determine the parts with higher aquifer yield. To achieve this, 120 Vertical Electrical Soundings (VES) were carried out in Okigwe District of Imo State of Nigeria, using the Schlumberger electrode array and a maximum electrode spread of 900m. Twelve of the VES stations were sited near existing boreholes to enhance interpretation. The resistivity of the aquifers zones varied across the study area. The highest thickness of 104.4m for the aquifer is recorded at Amonze (VES 95). Using an average transmissivity of 1032.0848 m²/day determined from pumping test data of the boreholes in the area, a mean conductance value of 91.222 m/day was obtained for the area. The hydraulic conductivity values obtained from the VES results varied from 9.8854 to 115.9646 m/day. The transmissivity values range from 992.04 to 10388m²/day. The storativity or storage coefficient determined for the area ranged from 1.59x10⁻⁴ to 7.80x10⁻³ while the specific capacity is fairly uniform with magnitude of about 877 m³/day. Using Dar Zarrouk parameters determined for the area, three aquifer systems have been identified viz: the Coastal plain sands aquifer, the Bende-Ameki sandstone/shale aquifer and the Ajali sandstone aquifer. The coastal plain sands aquifer serves the Southern part of Isiala Mbano, Ehime Mbano, Ihitte Uboma and the entire Obowo Local Government Areas (LGAs). The Bende-Ameki sandstone aquifer serves part of Ihitte Uboma, the Northern part of Ehime Mbano and Isiala Mbano. The Ajali sandstone aquifer serves the Northwestern part of the study area in Okigwe. Groundwater potential evaluation of the district based on the survey and borehole hydrogeological information revealed that the Southern part of the district is the most prolific in terms of groundwater exploitation and thus the most promising for siting productive boreholes.

Key Words: Hydraulic conductivity, Aquifer Systems, Aquiferous Zones, Dar Zarouk, VES.

1. INTRODUCTION

Okigwe District is in Imo State of Nigeria. The area lies between Latitudes 5°30'N and 5°57'N of the Equator and Longitudes 7°04'E and 7°26'E of the Greenwich Meridian (Fig. 1) covering an area of about 1824 km². The district is made up of six LGAs namely, Isiala Mbano, Ihitte Uboma, Ehime Mbano, Onuimo, Obowo and Okigwe. Scarcity of potable water in both the rural and urban areas of Okigwe District especially during the dry season has become a problem to the citizens of the area. Governments' intervention of siting the Okigwe regional water scheme in Onuimo LGA has not yielded the desired results of making potable water from the Imo River readily available largely due to pollution and paucity of funds for extensive project execution (IWADA, 2002).