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Hydrogeological delineation of groundwater potential zones in the Nabogo basin, Ghana

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Abstract

This study has delineated groundwater potential zones of the Nabogo basin and categorized the northern and eastern parts, representing about 35 % of the total basin, as the most suitable areas for groundwater prospecting. The inhabitants of the basin depend on rainfall and small surface reservoirs for their various water supply needs, which become very scarce and unsustainable in the dry seasons due to the arid to semi-arid conditions of the basin. Thus, groundwater is increasingly being exploited to supplement the water needs of the populace. However, groundwater development in the basin is sometimes hindered by relatively low success rate of boreholes. Therefore, this study was aimed at delineating the groundwater potential zones of the basin to improve on development of the resource for supply to the populace. The methodology used involved acquisition of data on well-distributed boreholes in the basin, computation of transmissivity and specific capacity values from the data, and delineation of potential groundwater zones through integration of borehole yields, regolith thickness, static water level and transmissivity using the weighted overlay technique in a GIS environment. The study results indicate that transmissivity ranges from 0.1 to 535 m^2/day with a mean of 19.7 m^2/day while the specific capacity ranges from 0.25 to 170.88 m^3/day/m with a mean of 13.42 m^3/day/m. A groundwater potential map generated categorizes the basin into poor, moderate and high zones covering 652.52 km^2, 1250.45 km^2 and 1002.23 km^2 respectively, which would be very useful for groundwater development.

Keywords: Groundwater development · Transmissivity · Geographic information system · Groundwater potential · Ghana

1. Introduction

Groundwater is the second-most abundant and available freshwater resource of the globe and constitutes about 30 % of all the freshwater resources of the world (Subramany, 2008). It is a very important resource for domestic water supply, agriculture and industry (Murthy, 2000) in many countries due to: (i) its availability during drought seasons,