

**AQUIFER GEOMETRY AND STRUCTURAL CONTROLS  
ON GROUNDWATER POTENTIAL IN MOUNT ELGON  
AQUIFER, TRANS-NZOIA COUNTY, KENYA.**

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**A dissertation submitted to the Department of Geology in partial fulfillment of the requirements for the Degree of Master of Science in Geology (Applied Geophysics) of the University of Nairobi.**

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**OCTOBER 2015**

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I hereby declare that this is my original work and has not been submitted by any other person, form or institution for award.

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## **Dedication**

This work is dedicated to my mother, Nora from whom I derive my motivation every day.

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## Abstract

Mount Elgon Aquifer is a trans-boundary aquifer shared between Kenya and Uganda. The aquifer originates from Mt. Elgon which is a solitary extinct volcano that straddles the Kenya-Uganda border. The geological formations in the area are Mozambique Mobile Belt overlain by Neogene volcanics and recent Soils. The enclosing coordinates of the study area are  $34^{\circ}40'E$  to  $35^{\circ}05'E$  to the east and  $0^{\circ}05'N$  to  $1^{\circ}15'N$  to the north. There have been pronounced boreholes failures in the Mt. Elgon aquifer on the Kenyan side. This research tries to resolve the aquifer geometry of Mt. Elgon Aquifer, structural influence of groundwater flow and effects of geological formations on borehole potentials. Hydrogeological surveys were done from the slopes of Mt. Elgon to the Lowlands of Kitale. It involved sending a direct current into the ground to deduce vertical and lateral changes in lithology and refining the resulting field data to deduce aquifer geometry and structural influences of groundwater flow. Existing borehole data were used to calculate the aquifer transmissivity and potential yields. A total of thirty three (33) Vertical electrical soundings were done parallel to geological strikes while three horizontal electrical profiling were done transverse to geological strike. Existing borehole data were further analyzed using surfer and Arc-GIS to deduce influence of major geological formations to borehole potential yields. The Aquifer geometry varies consistently from Mt. Elgon slopes toward the lowlands and the plains. The probed depth at the mountain slopes showed no metamorphic characteristics. The metamorphic become shallower as the volcanic thins down slope and towards the plains. A volcanic window and metamorphic ridge are observed northwards of the study area. From the potentiometric surface map, north-south trending fractures and fissures influence groundwater flow within the Mozambique Mobile Belt rocks. Aquifer Transmissivity map shows a water divide that separates the Nyanza and Turkana drainage basins. Koibotoss, Koykoy and Endebess bluffs are related to higher aquifer transmissive zones. The research shows that Mt. Elgon Aquifer is a potential groundwater zones but good understanding of geology and structural patterns is inevitable for successful borehole siting in the area.