FACULTY OF ENGINEERING

DEPARTMENT OF MINING AND WATER RESOURCES ENGINEERING

WATER RESOURCES ENGINEERING PROGRAMME

FINAL YEAR PROJECT REPORT

INVESTIGATION OF THE SUSTAINABILITY OF THE GROUNDWATER SUPPLY FOR BUSITEMA SUB-COUNTY

Case Study: Busitema Sub County, Busia District

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ABSTRACT

This report is intended to show how the analytical methods and ArcGIS software were used to investigate the sustainability of the ground water supply for Busitema sub-county. This project was intended to create awareness on the status of the existing ground water supply (boreholes) in the sub-county. This in turn will help those in authority of providing water facilities for the people in the sub-county to know to what extent the existing water in the ground can serve the existing population by closely analyzing the thematic maps in ArcGIS software. In addition it is also intended to trace the location of the boreholes on the sub-county aquifer to see to which groundwater recharge potential zones they lay. It will in turn help government save funds and time on implementing ground water projects that are viable in a long run. Furthermore this study will help on providing information about the quantity of ground water so as to effectively supplement on that obtained from the surface and rainfall since groundwater is considered as one of the safest sources of water involving minimal stages of treatment. This involved obtaining the water demand since this was the prime factor in the planning process. A model was created to analyze the aquifer conditions and come up with thematic maps of the aquifer from which conclusions were generated

ACKNOWLEDGEMENT

I thank the Almighty God for the far that He has brought me, the gift of life, and protection during and throughout the writing of this project report.

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Lastly, I thank all those who were involved directly or indirectly during my project proposal writing.

May the good Lord reward you all!

DECLARATION

I the under signed **BUTITA SIMON PETER** do hereby declare that this report in its form and nature, organization and content is my own work and that has never been presented to any other institution of learning for any academic award.

NAME: BUTITA SIMON PETER

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SIGNATURE: ……………………………………..…

DATE: ……………………………………………..

APPROVAL

This is to certify that the project research has been carried out under my supervisors guidance and this report is ready for submission to the Board of examiners and senate of Busitema University with my approval.

MAIN SUPERVISOR:

Mr. BAAGALA BRIAN SEMPIJJA

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DEDICATION:

I dedicate this report to my beloved father Mr. WATENYERI JULIUS and my mother Mrs. KHAINZA JANE for all the support that they have offered me in my entire struggles of education up to this point in time.

May the almighty God bless them for me abundantly.

List of Acronyms/Abbreviations

PH Potential height

DO Dissolved oxygen

TDS Total dissolved oxygen

SWB Soil water balance

ADD Average day demand

GIS Geographical information system

DEM – Digital Elevation Model

DWD – Directorate of Water Development

DWRM – Directorate of Water Resources Management

NARO – National Agricultural Research Organization

NFA – National Forestry Authority

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1 CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Groundwater has been considered the most reliable source of fresh water on earth. The total volume of fresh groundwater stored on Earth is between 8 and 10 million km 3, or 96% of non-frozen freshwater(Gleeson *et al.*, 2015). Close to half of the world's population depends on groundwater for its drinking water supplies. At present, with a global withdrawal rate of 600–700 km3/year(Zektser and Everett, 2004), groundwater is the world's most extracted raw material. Particularly in the rural areas of developing countries, in arid and semi-arid regions and on islands, groundwater is the most important and safest source of drinking water. As of 2010, the world's aggregated groundwater abstraction was estimated at approximately 1000km^3 per year, approximately 67% of which is used for irrigation, 22% for domestic purpose and 11% for industrial purposes.(UNESCO and United Nations, 2009). Better understanding of groundwater systems and groundwater dynamics based on groundwater investigation, monitoring and assessment (both renewable and non–renewable) has led to increasing use of groundwater for drinking purposes in many parts of the world(Orellana *et al.*, 2012). Significantly groundwater storage depletion is taking place in many areas of intensive groundwater withdrawal.

Take an example the ratio of groundwater to surface water use for drinking purposes has changed in benefit of groundwater in many European countries in recent decades. Changes in ground water quantity, its quality impacts on human health, livelihoods, food security and national economic development. Not managing groundwater sustainably puts at risk massive benefits for human well-being, sustainable development and biodiversity conservation. Exploitation of many globally significant aquifers is not sustainable. Global abstraction of groundwater has at least tripled over the last 50 years(Gleeson *et al.*, 2015). Groundwater levels have dropped greatly in major aquifers, reducing amount of flow in streams and causing the degradation of riparian and wetland ecosystems. The long-term viability of irrigation-based economies in these regions is threatened, creating long-term risks for global food security. Over-exploitation of groundwater and contamination threatens drinking water supply for millions of people. Degradation of groundwater reduces resilience of communities and economies to climate change. Sustainable groundwater management supports biodiversity conservation.

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